APROL R 4.0 D1 System Manual





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The following documentation D1 System Manual

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The Extended Engineering manual group contains the following manuals

D1 System Manual D2 System API D3 Gateway Editor D4 Backup & Recovery with the order number: MAAPEENG40-ENG

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APROL Documentation D1 System Manual V4.09

belongs to the manual set Extended Engineering

Target group, conventions, and format

Li N C

The manual **D1 System Manual** is intended for project engineers and system administrators, and describes additional functionalities (e.g. offline engineering, web interface process data, language localization) that go beyond the framework of basic engineering.

In this documentation the following formatting is used:

Кеу	[Esc]-Key
Menu item	"Module-Groups/open"
Directory name	HOME/ENGIN/HTML/049

In this manual the following icons are used to highlight special information:

\checkmark	Listing	
×	Listing	
	Listing	
0	Tipp or suggestion	
	Note	
\wedge	Warning	
?	Reference	
	This description is under construction at present.	
200°	Please inform yourself in regular intervals about the current APROL documentation of internet side www.br-automation.com , in the area Material related downloads.	on our
ToDo	This point is to be carried out by the user	
st of neces	sary configuration steps	X
ext step		
onfiguratior	n finished	Æ

1 APROL system collection

1.1 Why use time synchronization?

Information about the revision history can be obtained in the chapter <u>Revision history</u> in the **appendix**.

A process control system created with **APROL** generally consists of several networked computers. Information is entered for the process control system using programs that run on these computers. This information is logged with the date and time (timestamp) and recorded to a central location. To trace the log down to the last second (i.e. obligation to provide proof), the clocks on the computer need to be running synchronously. Since this is hardly ever the case, a procedure for synchronizing these clocks must be carried out.

Although each computer has a built-in hardware clock with a battery buffer (the BIOS clock), these clocks tend to drift from the original time and are only used for indicating or transmitting the time and date when starting the computer.

The Linux operating system works with an internal software clock. When the computer is started, the Linux system takes its time from the BIOS clock and then operates with the UNIX system clock. This clock determines the time from the CPU clock rate. This clock rate is afflicted by a tolerance from computer to computer, which is why the clocks can also vary from each other.

1

The UNIX system time is calculated from the seconds that have elapsed since 1/1/1970 until the selected point in time "x" (determining the time).

That is why it is absolutely required to synchronize the clocks on all computers connected to a networked **APROL** system. If a DCF77 or GPS clock should be used as the centralized timekeeper, an additional radio-controlled clock can be installed on one computer to increase the security of the system time (e.g. if the first radio-controlled clock should fail).

1.1.1 Synchronizing time with XNTP

If it's desired, all computers that are connected to an **APROL** system can be subjected to an automatic time synchronization procedure where the time is retrieved from **one** central clock. Synchronizing the time for all computers is an optimal solution when using a DCF77 or GPS clock on the time server. In this case, the time server forcibly assigns the valid time to all other computers on the network.

APROL uses the standardized XNTPD service for synchronization. This service works with a platform-independent protocol to synchronize the computer clocks on a network. This service works with a platform-independent protocol to synchronize the computer clocks on a network. The computer designated as the server for time synchronization supplies the time; the client simply takes the time supplied by the server.

The time synchronization procedure in small steps:

Function	Description
The computer is turned on and Linux is started / booted.	In this procedure, the time used by the hardware clock is applied to the Linux system time.
<i>xntpd</i> is started from its start script before the APROL system and " hart " adopts the chosen synchronized time in the system time.	The selected system time can come from the following sources: - Radio-controlled clock on the computer - Time server that's been specified with <i>AprolConfig</i> or (worst case) - The computer's hardware clock
<i>xntpd</i> starts its "job".	It continually compares the system time with the given time source. If it determines that deviations are taking place, it changes the frequency used to create the target time for the computer until all times are synchronized again.
The computer is shut down.	It writes the system time to the hardware clock.

To see how this daemon works, use the following command as the root user: $\ensuremath{\mathsf{ntpdc}}\xspace -\ensuremath{\mathsf{c}}\xspace \ensuremath{\mathsf{sysinfo}}\xspace$

To analyze the output more precisely, go to http://www.ntp.org.

The daemon can also be monitored in the Runtime system throughout the entire network. In this case, use the UCB_XNTP block from the PCC_SYSTEM library in a plan in the LR_INFO group.

Changing the configuration of the **XNTP** daemon can be done at any time by the superuser (root) by opening the *AprolConfig --xntp* script.

1.2 Web server and Web browser

The reason for installing and using the Web server concept is explained in the *Getting Started* manual in the *Web server* section.

If you are not satisfied with the default Web browser, you can install another browser in Linux, and then choose it with the "**Extras / Options**" menu item in the **CaeManager**, tab HTML / Web, for the Engineering and Runtime systems (project documentation).



Since Flash animations are used in **APROL**, the Web browser you decide to use must support this plug-in!

1.2.1 Alarm intervention texts

The occurrence of an alarm is an event that often requires immediate action by the operator of the process control system to prevent substantial damage. The steps to be taken after a very important alarm occurs are not routine or done every day.

When an alarm like this occurs, therefore, it's extremely helpful to have a text that exactly describes the next step for handling the situation.

For this reason, the **APROL** system includes the option of being able to select **intervention texts** when alarms occur.

There is the possibility to display intervention text as HTML pages for example with the AprCcAlarm block from the APROL library in the *Alarm* group.

The pages themselves (a separate page should be created for each important alarm) need to be stored in the Engineering system's home directory in the following path: /home/<CC-Account>/ENGIN/PROJECTS/<project name>.pgp/WEB/<country code>/IVTEXTS

Each intervention text side must have a unique name. => <Unique-name>.html

After being downloaded, the pages are stored in the following directory of the Runtime system: /home/<CC-Accounts/RUNTIME/WEB/<country code>/IVTEXTS

To be able to use these pages, the documentation server must be specified for the Runtime system as described in the chapter <u>*Own project documentation*</u>.

1.2.1.1 Advantages of PHP4 and Flash integration

Integrating PHP4 and Flash beginning with Release 2.0 of **APROL** has increased the options for displaying project documentation online as well as for displaying intervention texts. PHP4 is used by the Web server, whereas Flash is used by the Web browser.

PHP4 allows you to do things like create your project documentation HTML pages in several languages. Using PHP4 would then show the project documentation or intervention text in the correct language depending on the country's native language, which is an option that can be configured in KDE.

Using Flash animation in the online documentation or HTML pages for the intervention texts allows them to be designed more efficiently.

The following is an example of an HTML page (excerpt) for an intervention text that demonstrates the behavior mentioned above:

```
<?
if ($language=="001")
                                  {
                                  $path="_001";
                                  }
                                  else if ($language=="033")
                                  $path="_033";
                                  }
                                  else
                                  {
                                  $path="";
                                  }
?>
<--The part above allows the language to be taken from KDE
and e.g. the Flash film to be selected in the appropriate
language (<?//echo $path;?>)--!>
<table cellpadding="0" cellspacing="0" width="100%" height="80%"
                                  border="0">
>
                                      <object classid="clsid:D27CDB6E-AE6D-11cf-96B8-444553540000"</pre>
                                             width="600" height="400">
                                  <param name=movie value="objects/pro1<?echo $path;?>.swf">
                                  <param name=quality value=high>
                                  <embed src="objects/prol<?echo $path;?>.swf" quality=high
                                              type="application/x-shockwave-flash" width="600"
                                                 height="400"></embed>
```

1.2.2 **Project documentation**



This description is under construction at present.

Please inform yourself in regular intervals about the current *APROL* documentation on our internet side **www.br-automation.com**, in the area Material related downloads.

1.3 General information about the SNMP mechanism

The SNMP chapter describes the SNMP mechanism in **APROL** when using UCB blocks.

First, we'll briefly touch on the scope of the SNMP package in the SuSE LINUX distribution. Then we'll talk about the server components and how to configure and use SNMP clients.

The next section will explain how to create SNMP blocks with the help of UCB technology.

Finally, we'll cover how to create the executable script – the actual logic behind the block – using an example.

SNMP server and SNMP client:

SNMP is an acronym for "Simple Network Management Protocol".

The approach chosen in **APROL** to gather information about SNMP-capable devices and software is used by the SNMP clients available in Linux. **APROL**-wise, the functionality of this client is integrated into the respective project via the generally available UCB mechanism in **APROL**. This is a standardized solution for both the operating system and **APROL** when connecting SNMP-capable devices.

SNMP makes it possible to query and process system parameters from SNMP-capable hardware and software, regardless of the operating system being used.

The SNMP package must be installed in Linux to query SNMP parameters or provide them. In the SuSE distribution, the package is called *ucdsnmp* and is located in the *n* series. The SNMP package contains the *snmpd* server components as well as the *snmpwalk, snmpget* query tools.

The server tools are needed to make the computer SNMP-capable, i.e. to make system parameters ready for querying. The ucdsnmpd.conf configuration file is needed for the configuration.

This file must be modified for the following example. Another entry must be added to the /etc/ucdsnmpd.conf configuration file.

The line 'view system included host fe' needs to be added underneath the 'view system included system fe' line. Then the SNMP server is restarted with /sbin/init.d/snmpd restart.

The query tools are used with a certain syntax so that any kind of SNMP-capable hardware or software can be queried.

The presence of the /usr/share/snmp/mibs directory is mandatory for SNMP. This directory contains the MIB files. These files are translation tables for the SNMP client or server, which we will talk about a bit further down.

1.3.1 Configuring and using the SNMP clients

The SNMP clients:

The SNMP package in Linux contains the *snmpwalk* and *snmpget* clients. The *snmpwalk* command is used for general queries, whereas the *snmpget* command is used for special queries.

The snmpwalk SNMP client:

The *snmpwalk* client is needed to read a number of related parameters and show them in a tree structure.

One application example would be the command series *snmpwalk localhost public system*. This command shows the complete tree structure of the "system" area on the local computer.

The output could look like this:

<pre>stavrakakis:~ # snmpwalk localhost -v1 -c public system</pre>	
SNMPv2-MIB::sysDescr.0 = STRING: Linux stavrakakis 3.0.67-1.1-default #1 SMP Fri Mar 1 15:59:52 UTC 2013 (b1d6aa8) x86_64	
SNMPv2-MIB::sysObjectID.0 = 0ID: NET-SNMP-MIB::netSnmpAgent0IDs.10	
DISMAN-EVENT-MIB::sysUpTimeInstance = Timeticks: (2489447) 6:54:54.47	
SNMPv2-MIB::sysContact.0 = STRING: root@localhost	
SNMPv2-MIB::sysName.0 = STRING: stavrakakis	
SNMPv2-MIB::sysLocation.0 = STRING: unknown	
SNMPv2-MIB::sysORLastChange.0 = Timeticks: (10) 0:00:00.10	
SNMPv2-MIB::sysORID.1 = 0ID: SNMP-FRAMEWORK-MIB::snmpFrameworkMIBCompliance	
SNMPv2-MIB::sys0RID.2 = 0ID: SNMP-MPD-MIB::snmpMPDCompliance	
SNMPv2-MIB::sysORID.3 = 0ID: SNMP-USER-BASED-SM-MIB::usmMIBCompliance	
SNMPv2-MIB::sysORID.4 = 0ID: SNMPv2-MIB::snmpMIB	
SNMPv2-MIB::sysORID.5 = 0ID: TCP-MIB::tcpMIB	
SNMPv2-MIB::sysORID.6 = 0ID: IP-MIB::ip	
SNMPv2-MIB::sysORID.7 = 0ID: UDP-MIB::udpMIB	
SNMPv2-MIB::sysORID.8 = 0ID: SNMP-VIEW-BASED-ACM-MIB::vacmBasicGroup	
SNMPv2-MIB::sysORDescr.1 = STRING: The SNMP Management Architecture MIB.	
SNMPv2-MIB::sysORDescr.2 = STRING: The MIB for Message Processing and Dispatching.	
SNMPv2-MIB::sysORDescr.3 = STRING: The management information definitions for the SNMP User-based Security Model.	
SNMPv2-MIB::sys0RDescr.4 = STRING: The MIB module for SNMPv2 entities	
SNMPv2-MIB::sysORDescr.5 = STRING: The MIB module for managing TCP implementations	
SNMPv2-MIB::sysORDescr.6 = STRING: The MIB module for managing IP and ICMP implementations	
SNMPv2-MIB::sysORDescr.7 = STRING: The MIB module for managing UDP implementations	
SNMPV2-MIB::sysORDescr.8 = STRING: View-based Access Control Model for SNMP.	
SNMPV2-MIB::sysORUpTime.1 = Timeticks: (10) 0:00:00.10	
SNMPV2-MIB::sysORUpTime.2 = Timeticks: (10) 0:00:00.10	
SNMPV2-MIB::sysORUplime.3 = Timeticks: (10) 0:00:00.10	
SNMPV2-MIB::sysORUpTime.4 = Timeticks: (10) 0:00:00.10	
SNMPV2-NIB::sysORUpTime.5 = Timeticks: (10) 0:00:00.10	
SNMPV2-MIB::sysORUpTime.6 = Timeticks: (10) 0:00:00.10	
SNMPV2-MIB::sysORUpTime.7 = Timeticks: (10) 0:00:00.10	
SNMPv2-MIB::sysORUpTime.8 = Timeticks: (10) 0:00:00.10 stavrakakis:~ # I	
	-
—	

Illustration 1: snmpwalk output

The snmpget SNMP client:

Another way to retrieve information is to use the *snmpget* client. This second client reads concretely specified values from the SNMP tree.

One application example is the command series *snmpget localhost public system.sysDescr.0*, which only outputs the related value of the "system-sysDescr.0" variable on the local computer.

The output could look like this:

	stavrakakis:~ # snmpget localhost -v1 -c public system.sysDescr.0	4
	SNMPv2-MIB::sysDescr.0 = STRING: Linux stavrakakis 3.0.67-1.1-default #1 SMP Fri Mar 1 15:59:52 UTC 2013 (b1d6aa8) x86_64	
	stavrakakis:~ #	
		H
		Ē
1	L	Ľ

Illustration 2: snmpget output

For each query, a concrete text term is specified as the query variable. In this case, "system.sysDescr.0". In the first query, this was the term "system".

These variables exist on the system level as number codes, not in the specified text form. To carry out a Text-->Number or Number-->Text conversion, you need the aforementioned MIB files.

A text variable like **host.hrStorage.hrStorageTable.hrStorageEntry. hrStorageUsed.1** is converted by the SNMP client or server to the number code **25.2.3.1.6.1** using the MIB file, where the main system variable "host" is decoded ("HOST-RESOURCES.TXT").

These numeric codes are used to read values from system variables or assign the returned variables a name. If the software or hardware is now SNMP-capable, it needs to be checked whether the configuration properties for the corresponding hardware or software are stored in the MIB files, or if there is even a separate MIB file present, which must then be copied to the /usr/share/snmp/mibs directory.

1.3.2 Creating SNMP blocks

SNMP blocks based on UCB technology:

A sensible approach when developing blocks that provides data from SNMP queries is to use UCB blocks. The blocks should be stored in a customer library, so that basic functionalities can be encapsulated in a way that can be validated.

How to create this type of block will be explained using a concrete example that reads how much space is left on a partition on a SNMP-connected device.

First the "SNMPTEST" library is created in the CaeManager. This is identified as a customer library.

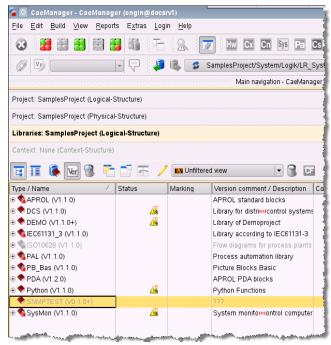


Illustration 3: Creating the SNMPTEST library

A new group called 'Harddisk' is created in the next step. This group will later contain one or more SNMP blocks that will be responsible for determining the hard disk data.

Then a block called "SNMPUsedRootDisk" is configured. This block is used to determine the space being used on the root partition of the computer. It belongs to the Harddisk group we've created and is of type UCB.

UCB blocks are used since their internal script capabilities are flexible and well-suited for all tasks.

Group:	E String_Utf8	•	New group
Description:			
Name:	SNMPUsedRootDisk]@
Description:	SNMP blockfor Harddisk monitoring		
Туре:	UCB Block		
Scaleable	block	func	tional size: 📘 1 💌
Derived fr	im:		

Illustration 4: Creating the block

Each UCB block requires a default input "UcbTrigger" and a default output "UcbStatus".

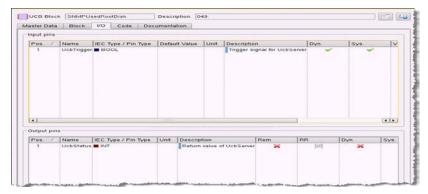


Illustration 5: Configuring the default inputs and outputs

Since SNMP can be used across the network, you will configure a second input of type *STRING* that can be modified by the user. The input is called "**Host**" since this is where the IP address or host name of the hardware or software being queried is entered.

To receive a return value that can be displayed e.g. in the **DisplayCenter**, an additional output should be created. The output value is a string in this case. The pin is of type *STRING* and receives the name **"UsedDisk"**.

ister Data	/ Blo	ck 📝 1/O Code	Doc	umentatio	n					
nput pins										_
Pos. /	Name	IEC Type / Pin Type	Defau	ilt Value	Unit Descript	on	0	Dyn.	Sys.	V
1	UcbTrigge	er 📕 BOOL			Trigger sig	signal for UcbS	erver	¥	×	
2	Host	STRING[64]			IP Addr	ess		×	×	
1										••
Output pin	s									
Pos. /	Name	IEC Type / Pin Type	Unit	Descrip	tion	Rem.	RR		Dyn.	Sys.
1	UcbStatu	s 📕 INT		Return	value of UcbServ	er 💥		12	¥	

Illustration 6: Creating the UsedDisk output

If several communities have been set up in ucdsnmpd.conf, an additional input pin named "**Community**" can optionally be configured, which can be evaluated by the *snmpget* or *snmpwalk* client in the script.

1.3.3 Creating the script

Determining the space used on the root partition:

This script is a simple Unix bash script that reads the aforementioned SNMP variables on the system level using the *snmpget* or *snmpwalk* tools.

The basic procedure will be expanded using the scrip for determining the space used.

The basic structure of each UCB script looks like this:

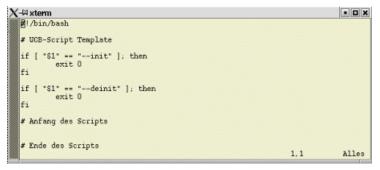


Illustration 7: The script template

The actual script can now be written in the main area (between the start and end lines). However, first it has to be ascertained as to which variables should be read via SNMP so that the used space can be output in MB. Since there's not really a direct method for finding this value, a few calculations will have to be made.

The following values are needed to calculate the amount of space used:

- The position of the root partition on the disk
- The inode density

 \checkmark

 \checkmark The number of used blocks on the partition

The names for these system variables are stored in the HOST-RESOURCES.TXT file in the /usr/share/snmp/mibs directory.

The command "snmpwalk localhost public host" shows all system variables.

"host.hrStorage.hrStorageTable.hrStorageEntry.hrStorage Index.*" is particularly interesting. There are as many entries as there are partitions. To check out which variable represents the root partition, check the

"host.hrStorage.hrStorageTable.hrStorageEntry.hrStorageDescr.*" entry and look for the value "/".

The root partition is thus "host.hrStorage.hrStorage Entry.hrStorageIndex.1" in the example. The ".1" at the end identifies the root partition throughout the rest of this description.

The variable "host.hrStorage.hrStorageTable. hrStorageEntry.hrStorageAllocationUnits.1" is used for the inode density.

If the ".1" is replaced by another number, then the inode density is output for another partition.

Then the value for the number of used blocks in the partition must be output. This value is contained in the "host.hrStorage.hrStorageEntry. hrStorageUsed.1" variable.

The "snmpget localhost public host.hrStorage.hrStorageTable.hrSto rageEntry.hrStorageUsed.1" and "snmpget localhost public host.hrStorage.hr StorageTable.hrStorageEntry.hrStorageAllocationUnits.1" commands return the variables and their values in the following format:

host.hrStorage.hrStorageEntry.hrStorageTable.hrStorageEntry.hrStorageIndex.1 = <Value>

The output is the same in every case so that the <Value> can be filtered out with just a few bash commands.

The first approach for the script would have to look like this:



Illustration 8: Developing the script - Step 1

An IF statement is created to intercept empty values, and an arithmetic operation determines the correct ending value.

The finished script looks like this:



Illustration 9: Script for determining the space used on the root partition

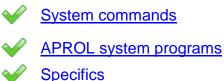
With "echo <OutputPinName>=<\$ENDVALUE>", the calculated value is written to the output pin of the UCB block, where it can be further processed or displayed in the **DisplayCenter**.

1.4 System commands and programs

The system commands, programs, and features described in the following chapters and sections should make it possible for you to get a closer and deeper look at *APROL* systems. However,

the commands and programs should only be used by experienced users or system administrators since making incorrect entries can damage the **APROL** system.

The following table provides an overview:



1.5 System commands

The following commands and programs are not listed by priority, but should aid in analysis procedures. Commands from the Linux operating system are also listed if they are useful when working with **APROL**. All commands are entered in an Xterm window or a virtual console. Logging into the **APROL** system with the Linux login mechanism is required.

The following table provides an overview:



1.5.1 AprolCmd

AproICmd allows an accelerated starting and stopping of the APROL system. Individual applications can be started and stopped separately without needing to know the dependencies. Starting and stopping individual applications no longer has to be done using Linux system commands.

The following runlevels exist where certain programs can be started:

Run level	List of "running" programs in this and following levels								
1	losys2, (losys until R 1.0), Customer Application								
2 SysInfo, Customer Application									
3	LRTASK, InaDriver, ProfiboardDriver, EventDriver, Customer Application								
4	PrintServer, Customer Application								
5	UcbServer, TrendServer, AlarmServer, AlarmSpooler, CompressorServer, AggregateServer, IosXfer, ChronoLogServer, Customer Application								

The following screenshot contains possible commands for AprolCmd:

🔲 🖸 engin : bash		
File Edit View Scrollback B	ookmarks Settings Help	
	1 2.1.19)	
Options	Purpose	
APROL commands -start aprol -restart aprol -start aprol -surce aprol -init <newlayel> -master2slaye -slaye2master</newlayel>	: Start APROL : Stop APROL : State of APROL : State of APROL : State of APROL for all client redundance appl. : Stat. Source APROL for smellevels- : Stat. Source APROL for smellevels- : switch this system from slave to master (redundancy only)	
-level aprol applikation-commands	: RunLevel of APROL :	
-start <app></app>	: Start <app></app>	
-stop <app> -restart <app></app></app>	: Stop <app> : Restart <app></app></app>	
-state <app></app>	: State of <app></app>	
-source <app></app>	: Set source-flag for appl. (if client redundance)	
extra options for applik -inst <selfid></selfid>	ation-commands : : instance <selfid> of applikation</selfid>	
common options -host <host> -system <system></system></host>	: : host AprolLoader default: localhost : name of Aprolsystem	
-asynchronous <timeout></timeout>	: set execution to asynchronous mode with <timeout> in seconds, AprolCmd will send command and termi- nate, if there is no response within <timeout≻ secs; default is synchronous mode, that means: AprolCmd will wait till command is executed</timeout≻ </timeout>	[
-ver	: modify application name to origName_ <self-option> : set Language to AreaCode : print short version information, then exit <#dodul.Vers>.<prg-najor-versnr>.<prg-ninor-versnr.></prg-ninor-versnr.></prg-najor-versnr></self-option>	
-version -info -showlog -help, -h, -?	: print long version information, then exit : print extended version information, then exit : Start SysLogReport : show this help, then exit	
ngin@docsrv1:~>		
	engin : bash	×

Illustration 10: AprolCmd

1.5.2 GetEnvi

GetEnvi is taken from "get environment". This call shows all of the environment variables on the *APROL* system you are logged in to.

Command:

<computer>:~ > GetEnvi

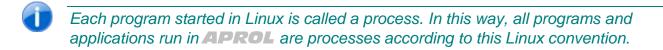
The following image shows the result of this command: The names of the environment variables are self-explanatory.

🔲 🖸 engin : bash	it.	
File Edit View Scrollback Bookmarks Settings Help	•	
StdGetInstalledLanguages : 001 049		
PccGetAprolsysPath : /home/aprolsys		
PccGetDocPath : /opt/aprol/doc PccGetHtmlPath : /opt/aprol/doc/html/HTML	(00)	
PccGetHtmlPath : /opt/aprol/doc/html/HTML PccGetUserHtmlPath : /home/engin/ENGIN/HTML/0		
PccGetVncRecorderPath : /home/aprolsvs/vnc2swf	001	
PccGetAprolDataPath : /home/aprolsys/APROL_DAT	ΤΔ	
PccGetClcPath : /home/aprolsys/APROL_DAT		
PccGetUserClcPath : /home/engin/ENGIN/chrono		
PccGetClcReplicationPath : /home/aprolsys/APROL DAT		
PccGetUserClcReplicationPat: /home/engin/ENGIN/chrono	olog/replication	
PccGetTrdPath : /home/aprolsys/APROL_DAT	TA/chronotrend	
License mode : LICENSED		
Licensee : Bernecker + Rainer		
: Industrie-Elektronik Ges	s.m.b.H.	
: Niederlassung Essen		
License info : 49dc1617d189c630 Delivery date : 12/30/2010		
Licensing date : 02/19/2013		
MinLicDeliveryDate4Upgrade : 01/12/2010		
CheckDeliveryDate4Upgrade : TRUE		
Registered serial number : A9A77JNQXXX		
Registration counter : 44		
Material number : AP.SR-ROEX-NEW		
Remaining EVAL time : 00 days, 00 hours, 00 mi	in, 00 secs	
Dongle info : no dongle		
Support dongle info : no dongle		
Customer dongle info : no dongle		
Registered dongle info : no dongle	- DID	
Loquendo license : Loquendo demo license fo Prince license : Not licensed	or B+R, expiration date: 20.02.2012 (PIK: BE7AD	SOBBOIIOESCUA)
	Rainer Industrie-Elektronik Ges.m.b.H. (ON62L-2	25400-08104-02042-04
VMware version : 9.0.0	Name industrie-Etektronik des.m.b.n. (04022-2	E0H00-0650A-C3CK2-04
reg. BuR AS STD (SD) IMAGE : 4.0.14.198 (3.0.16.2628)	78) (IM 2.0)	
BuR AS STD (SD) IMAGE Vers.: 4.0.14.198 (3.0.16.2628)		
reg. BuR AS REDU (SD) IMAGE: 4.0.14.0 (3.0.16.262878)		
BuR AS_REDU (SD) IMAGE Vers: 4.0.14.0 () (IM_2.0 E		
BuR APROL-DVD Version : DVD1 3.9-0110, DVD2 3.9-	-0110, DVD3 3.9-0110	***
req. BuR AutoYast-DVD Vers.: 3.9-011		
BuR AutoYast-DVD Version : 3.9-012		
req. BuR Language-DVD Vers.: 3.9-01		
BuR Language-DVD Version : no info		
BuR Documentation Version : 3.9-01 BuR Patch Version : no info		
	, © 1995-2013 Bernecker + Rainer Industrie-Ele	tronik Ges.m.h.H
Product Rel. (short) : APROL R 3.9-0110 (64Bit)		CONTRACTOR SUBJECT
Product Rel. (very short) : 3.9-0110	,	
Product Rel. Date : 03/05/2013		
Product Major-Rel. Date : 07/12/2010		
APROL Release limit : 06/30/2014 12:00:00 CEST	τ	
engin@docsrv1:~>		
		- -
engin ; bash		<u> </u>
engin : bash		

Illustration 11: Results of calling "GetEnvi"

1.5.3 ps

This command comes from Linux and UNIX and shows the processes currently running under Linux on the computer.



Various options (arguments) can be attached to this system command in different combinations. If you want to learn more about this command, simply open up the manual by running "*man ps*" in an Xterm window. Right now, we will only deal with one combination.

Command: ps --ef |grep runtime

For the following explanation, it's required that your Runtime system has been set up and configured under the "**runtime**" Linux login.

	engi	n : basi	h						
File	Edit	View	Scrollt	ack	Bookr	narks S	ettings	Help	
engin		13416	1	з	10:14	?			CaeManagernocrashhandler
engin		13502	1	0	10:14	?	00:0	03:06	LoginServer nocrashhandler
engin	:	22609	22564	0	13:53	?	00:0	00:00	/bin/sh /usr/bin/startkde
ngin	:	22707	22609	0	13:53	?	00:0	00:00	/usr/bin/ssh-agent /bin/bash /etc/Xll/xinit/xinitrc
ngin		22755	1	0	13:53	?	00:0	00:00	dbus-launchsh-syntaxexit-with-session
engin		22756	1	0	13:53	?	00:0	00:00	/bin/dbus-daemonforkprint-pid 5print-address 7session
enğin		22763	1	0	13:53	?	00:0	00:00	/usr/lib64/kde4/libexec/start kdeinit +kcminit startup
engin	:	22764	1	0	13:53	?	00:0	00:00	kdeinit4: kdeinit4 Running
engin	:	22765	22764	0	13:53	?	00:0	00:00	kdeinit4: klauncher [kdeinit]fd=9
angin		22767	1	0	13:53	?	00:0	00:00	kdeinit4: kded4 [kdeinit]
ngin		22772	22609	0	13:53	?	00:0	00:00	kwrapper4 ksmserver
engin	:	22773	22764	0	13:53	?	00:0	00:00	kdeinit4: ksmserver [kdeinit]
ngin		22775	22773	0	13:53	?		00:07	
ngin		22777	1	0	13:53	?	00:0	00:00	kdeinit4: kalobalaccel [kdeinit]
ngin		22779	1	0	13:53	?	00:0	00:00	/usr/bin/knotify4
ngin		22781	1	0	13:53	?	00:0	00:37	kdeinit4: plasma-desktop [kdeinit]
enğin		22783	22781	0	13:53	?	00:0	00:11	ksysguardd
engin					13:53	?			kdéiňit4: kio file [kdeinit] file local:/tmp/ksocket-engin/klaunc
		.slave	e-socke	et 1	local:/	tmp/ksc			/plasma-desktopN22781.slave-socket
ngin	:	22790	1	0	13:53	?	00:0	00:00	kdeinit4: kaccess [kdeinit]
ngin		22800	1	0	13:53	?	00:0	00:01	kdeinit4: krunner [kdeinit]
enğin		22805	1	0	13:53	?	00:0	00:00	kdeinit4: kmix [kdeinit]
ngin		22807	1	0	13:53	?	00:0	00:00	kdeinit4: klipper [kdeinit]
ngin		22970	1	0	13:56	?			StartManager - nocrashhandler
ngin		23054	1		13:56				LoginServer nocrashhandler
ngin		24179	1		13:58				kdeinit4: konsole [kdeinit]
ngin			24179	0	14:05	pts/5	00:0	00:00	/bin/bash
engin					14:06		00:0	04:44	CaeManager -languageCode 049
engin		27251	24179	1	15:37	pts/4	00:0	00:00	/bin/bash
ngin		27281	27251	50	15:37	pts/4	00:0	00:00	ps -ef
engin					15:37				grep engin
		srvl:~							<u> </u>
-	>		en	gin :	bash			P	engin : bash

Illustration 12: Results of calling 'ps'

All running processes of the CC-Account 'runtime' are displayed using the user ID (runtime). Following the user ID are the process ID (PID), the parent process ID (PPID), the starting time of the process, the terminal where the process was started, how long the process has been running since before *ps* was run, and the command that was used to start the process.

1.5.4 Optimizing the database

If data that isn't needed anymore is deleted in the charts when configuring with the CaeManager, then it's possible that instances that are no longer used are still present in the project. These instances unnecessarily enlarge the database area in the *caedb* for this project.

The database optimization is called via the 'File / CAE Database / Database Optimization' menu in the CaeManager.

This menu item affects the **project that is currently open**! If selected, all of the instances in the project are checked to see if they are used. If it is determined that there are instances that are no longer being used, then they are deleted. The progress is indicated because this process can take some time for larger projects.

This function should be used shortly before the project is completed to free the database from unnecessary ballast and to keep it as small as possible (data storage, transport to tape / CD, etc.). It is **absolutely not necessary** to use this function frequently!

1.6 APROL system programs

1.6.1 losys tools

The **APROLFehler! Kein Name für eine Eigenschaft übergeben.** runtime system manages all process variables in the process data base losys.

APROL offers a quick overview of a certain system status via console applications.

These tools allow you to look into the losys data base, and the manipulation of the data on the local and on a remote server.



These tools are only allowed to be used by an experienced user. They do not replace the normal operation via the GUI applications and are not allowed to be used for a normal process control.

The use of these console applications is documented in the SysLog report with a time stamp, computer name, PIN, and description. Operations in the process control are recorded in AuditTrail report. The losys tools are especially good for checking or setting certain variables during debugging.

The following tools are available:

\checkmark	losStat (losys status information)
\checkmark	losLsClients (List of all the clients accessing the losys)
\checkmark	losLsObjects (List of all of the process variables in an losys)
\checkmark	losEv (Chronological cycle of filtered process variables)
\checkmark	losInOut (Import and export of process variables)
\checkmark	pio (Read / write process variables)

1.6.2 Extension of all losys tools for multi-runtime systems

Together with the introduction of multi-runtime systems in **APROL**, the syntax of the losys tolls has been extended.

1.6.2.1 Launching Options

The instance name of the **APROL** system can now also be specified for the options '-iosys' and '-mask'. These are referred to as <INSTANCE> in the following description.

The 'losLsObjects' example shows which additional calls are possible for the '-iosys' and '-mask' options:

Syntax up-to-now: IosLsObjects -iosys <HOST_NAME>:[PORT] -mask "*String*" Example: IosLsObjects -iosys I3supp4064:0 -mask "APROL*_Idle*" Output: APROL_SYSTEM_01_M_IdleStatePercent APROL_SYSTEM_01_M_IdleStateWarning APROL_SYSTEM_01_M_IdleStateViolationTime Notes: If no [PORT] is specified, the port 0 is used as fallback. losLsObjects -iosys <HOST_NAME_MASTER>:[PORT], <HOST_NAME_SLAVE>:[PORT]-mask "*String*"

Extension for multi-runtime systems

IosLsObjects -iosys <INSTANCE> -mask "*String*" **Example:** IosLsObjects -iosys APROL_SYSTEM_01 -mask "APROL*_Idle*" **Output:** APROL_SYSTEM_01_M_IdleStatePercent APROL_SYSTEM_01_M_IdleStateWarning APROL_SYSTEM_01_M_IdleStateViolationTime **Notes: -**

losLsObjects -iosys "*" -mask "*String*" Example:

IosLsObjects -iosys "*" -mask "APROL*_Idle*" Output: APROL_SYSTEM_01_M_IdleStatePercent APROL_SYSTEM_01_M_IdleStateWarning APROL_SYSTEM_01_M_IdleStateViolationTime APROL_SYSTEM_02_M_IdleStatePercent APROL_SYSTEM_02_M_IdleStateViolationTime APROL_SYSTEM_01_M_IdleStatePercent

APROL_SYSTEM_01_M_IdleStateWarning

APROL_SYSTEM_01_M_IdleStateViolationTime

Notes:

There is a search over all systems which are known to the project and are activated when the '*' wildcard is used.

losLsObjects -mask "*String*"@<INSTANCE> -showlosysConnection **Example:**

losLsObjects -mask "APROL*_Idle*"@APROL_SYSTEM_01 -showlosysConnection **Output:**

APROL_SYSTEM_01_M_IdleStatePercent@APROL_SYSTEM_01 APROL_SYSTEM_01_M_IdleStateWarning@APROL_SYSTEM_01 APROL_SYSTEM_01_M_IdleStateViolationTime@APROL_SYSTEM_01 **Notes:**

The '-showlosysConnection' parameter is optional and show which process variable originates from which losys connection.

IosLsObjects -mask "*String*"@<INSTANCE> "*tcapc*" @<INSTANCE_2> **Example:** IosLsObjects -mask "APROL*_Idle*"@APROL_SYSTEM_01 "APROL*_Idle*"@APROL_SYSTEM_02 **Output:** APROL_SYSTEM_01_M_IdleStatePercent APROL_SYSTEM_01_M_IdleStateWarning APROL_SYSTEM_01_M_IdleStateViolationTime APROL_SYSTEM_02_M_IdleStatePercent APROL_SYSTEM_02_M_IdleStatePercent

```
APROL_SYSTEM_02_M_IdleStateViolationTime
```

It is possible to query PVs from different systems simultaneously with this type of call.

The following syntax is now allowed for the use of the '-mask' launching option:

<PV name>[@<APROL system instance>]



Not allowed. IosLsObjects -iosys APROL_SYSTEM_01, APROL_SYSTEM_02 -mask ...

1.6.2.2 Processing

All losys tools evaluate the \$HOME/RUNTIME/runtime-system.cnf during runtime in order to resolve the <INSTANCE> identifier. This file is created automatically during the code generation of the project, and contains the basic system definitions for the **APROL** systems which are used. Each section begins with the system definition [HW/ Instance name of the APROL system]



A file with the name runtime-user-system.cnf can be used for a temporary monitoring or diagnosis. This allows access to **APROL** system instances which are not connected to the CAE project and must be composed in the same syntax as the runtime-system.cnf. A project-spanning connection is not supported.

Example runtime-system.cnf:

```
[HW/APROL SYSTEM 01]
  project name=SamplesProject
  active_conn=l3supp4064:0
  alasrv self=dem1
  ccname=APROL_Runtime_01_SYS
  ccdesc=B&R APC 810 Runtime Server, Default Runtime System
  cluster=I3supp4064.br-automation.com
  runtimeuser=runtime
  is a term=1
  is_a_fas=1
  is a serv=1
  is redundant=0
[HW/APROL SYSTEM 02]
  project name=SamplesProject
  active conn=l3supp4064:1
  alasrv self=001
  ccname=APROL_Runtime_02_SYS
  ccdesc=B&R APC 810 Runtime Server, Multi Runtime System 02
  cluster=I3supp4064.br-automation.com
  runtimeuser=runtime2
  is_a_term=1
```

is_a_fas=1 is_a_serv=1 is_redundant=0

1.6.2.3 losStat

With losStat it is possible to check the availability of an losys on the local, or a remote, runtime system. A time can be optionally defined (Reconnect time) after which the connection should be rebuilt, in the case that the connection from the application to the losys is lost.

Option	Description
-checkconn	Test the losys connection with a result based exit code. Exit code 0: losys found Exit code 1: losys not found
-iosys <host[:port][,host[:port]]> -iosys <instance <i="" name="">APROL system></instance></host[:port][,host[:port]]>	Specification of the losys to be used Examples: -iosys 192.168.0.23:3 Shorter version: -iosys :3 (local system, Port 3) -iosys 192.168.0.123 (Runtime system, Port 0) -iosys APROL_SYSTEM_01 Instance name of the APROL systems to be contacted -iosys "*" All instance names of the APROL systems known and activated in the project The systems must be specified in the following order when there is a redundant configuration: <master: [port]="">, [<slave: [port]]<br="">(Also see reconnect option) Default = local system: Port 0</slave:></master:>
	Reconnect time (in seconds). If the connection to the losys is lost, then an attempt is made to reestablish the connection after the defined period. This parameter should always be specified in a redundant configuration, because otherwise the application is terminated when a connection attempt to the master fails. Example: -reconnect 10
-preferUserSystems	Preferred systems with the same name from the runtime-user-system.cnf
-self <selfoption></selfoption>	Change own instance description according to the scheme APPLICATION- NAME_ <self-option> Example: -self TEST</self-option>
-languageCode <area code=""/>	no function (Default setting English)
-ver	Short information about APROL and application version
-version	Detailed information about APROL and application version
-info	Name and version of the application and the corresponding library with the following data: Module, date, time, type, system, architecture, host name
-showlog	Opens the SysLog report (Browser window with a listing of all APROL application calls, from the current day, including command line parameters, date, etc.)
-help, -h, -?	Show the help text

Application examples:

Determining the status of a local losys on port 2

IosStat -iosys :2

positive result:

2006.09.25 17:13:31 IosStat: Iosys found

Negative result (missing losys connection):

2006.09.25 17:14:20 IosStat: Iosys not found or lost

Determining the status of a remote losys on port 0, with re-connection after 5 seconds

IosStat -iosys 192.168.0.12:0 -reconnect 5

positive result:

2006.09.25 17:13:31 IosStat: Iosys found

Negative result (missing losys connection):

2006.09.25 17:16:32 IosStat: Iosys not found or lost 2006.09.25 17:16:37 IosStat: Iosys not found or lost 2006.09.25 17:16:42 IosStat: Iosys not found or lost

Conditional output after communication loss to the losys

IosStat -iosys :1 -checkconn || echo "Iosys not found."

Positive result:

2006.09.25 17:20:05 IosStat: Iosys found 2006.09.25 17:20:05 IosStat: Leave with exit code 0

Negative result (missing losys connection):

```
2006.09.25 17:20:25 IosStat: Iosys not found or lost
2006.09.25 17:20:25 IosStat: Leave with exit code 1
Iosys not found.
```

1.6.2.4 losLsClients

losLsClients is capable of listing all of the clients that communicate with a local or remote losys. Optionally, for example, a filtering can be set using search masks. In order to search for similar variable names there is the possibility of a fuzzy search using the Levenshtein distance, which provides a measurement for the difference between two strings. The Levenshtein distance describes the minimum number of operations, **Inserting, deleting,** and **swapping** to transfer one string into another. During debugging, losLsClients can check if a certain application is registered in the losys, or if the connection is lost.

Option	Description
-mask <mask> -mask "<mask>"@[<instance>]</instance></mask></mask>	Filtered display of the connected clients. The use of wildcards is possible. Example: -mask *InaDriver_* -mask "*InaDriver_*"@APROL_SYSTEM_01
-mask <mask> -mld <distance></distance></mask>	The option '-mld' must be used in connection with the '-mask' function. (Levenshtein distance, to define the filter algorithm.) Example: -mask HA_* -mld 1
-iosys <host[:port][,host[:port]]> -iosys <instance <b="" name="">APROL system></instance></host[:port][,host[:port]]>	Specification of the losys to be used Examples: -iosys 192.168.0.23:3 Shorter version: -iosys :3 (local system, Port 3) -iosys 192.168.0.123 (Runtime system, Port 0) -iosys APROL_SYSTEM_01 Instance name of the APROL systems to be contacted -iosys "*" All instance names of the APROL systems known and activated in the project The systems must be specified in the following order when there is a redundant configuration: <master:[port]>, [<slave:[port]] (Also see reconnect option) Default = local system: Port 0</slave:[port]] </master:[port]>

Option	Description
-reconnect <time></time>	Reconnect time (in seconds). If the connection to the losys is lost, then an attempt is made to reestablish the connection after the defined period. This parameter should always be specified in a redundant configuration, because otherwise the application is terminated when a connection attempt to the master fails. Example: -reconnect 10
-preferUserSystems	Preferred systems with the same name from the runtime-user-system.cnf
-showlosysConnection	Number of the losys connection
-showSystemInstanz	Display of the system instance
-self <selfoption></selfoption>	Change own instance description according to the scheme APPLICATION- NAME_ <self-option> Example: -self TEST</self-option>
-languageCode <area code=""/>	no function (Default setting English)
-ver	Short information about APROL and application version
-version	Detailed information about APROL and application version
-info	Name and version of the application and the corresponding library with the following data: Module, date, time, type, system, architecture, host name
-showlog	Opens the SysLog report (Browser window with a listing of all APROL application calls, from the current day, including command line parameters, date, etc.)
-help, -h, -?	Show the help text

Application examples:

Display all clients on a remotely running losys, on port 2, with a defined reconnect time of 5 seconds

IosLsClients -iosys 192.168.0.42:2 -reconnect 5

positive result:

```
...
14 engl.InaDriver_01.8258
15 engl.SysInfo_01.8248
16 opl.LoginServer_01.11124
...
```

Negative result (missing losys connection):

Wait for successful connection by checking continuously in a 5 second interval (Abort with [Ctr1]+[C]).

Categorization of the identifiers:

Composition of the instance description as example

eng1.InaDriver_09.8285:

eng1	:Computer name
InaDriver_	:Application name
09	:Self ID (is set with the "self" option)
8285	:PID allocated by the system
8285	:PID allocated by the system

Display the clients on a locally running losys, on port 2, with a defined mask, and Levenshtein distance

IosLsClients -iosys 127.0.0.1:0 -mask *InaDriver_* -mld 1

positive result:

L	Е	V	Е	Ν	S	Η	т	Е	I	Ν	-	М	0	D	Е	
Di	st	ar	iCe	9			i	de	ent	if	ier					
==		==	=			==	==	==	==	==						
	C)							en	ıg1	.Ina	aDr	iv	rer	_098285	
	C)							en	ıg1	.Ina	aDr	iv	rer	_088279	

Negative result (missing losys connection):

```
2006.09.25 17:46:27 IosLsClients:
Error ( main.cc, 247): cannot connect to IOSYS
```

Display of all clients which contain the text 'Display' and the corresponding losys connection.

IosLsClients -mask "*Display*" -showIosysConnection

Output:

```
1 l3supp4064.__unknown_@localhost:0.22147
2 l3supp4064.DisplayCenter_dem1@localhost:0.11314
```

1.6.2.5 losLsObjects

This tool lists all existing process variables (PVs) within a local or remote losys. The number of PVs that are listed can be limited. Apart from that, a fuzzy search using the Levenshtein distance is also possible with losLsObjects (see *losLsClients*).

Program options:

Option	Description
-max <object_count></object_count>	Number of PV listed in each line +1 Default = 1024
-query	Reports the current value, as well as the type of the PV
-mask <mask> -mask "<mask>"@[<instance>] -mask <plan instance="" name=""></plan></instance></mask></mask>	Filtering of one/several PV (possible with wildcards). Example: -mask HA_* (Shows all PVs beginning with 'HA_'.) -mask "HA*"@APROL_SYSTEM_01 (Shows all PVs beginning with 'HA_' from the APROL system with the instance name 'APROL_SYSTEM_01'.) Filtering PVs in a chart instance
-mask <mask> -mld <distance></distance></mask>	Levenshtein distance, to define the filter algorithm (<u>must</u> be placed in connection with "-mask") Example: _mask HA_* -mld 1
-pv <pvname_1> [<pvname_n>]</pvname_n></pvname_1>	Specification of a PV (several PV names separated with a space) Example: -pv HA_RPSF_DI476_K1_12_01
-iosys <host[:port][,host[:port]]></host[:port][,host[:port]]>	Specification of the losys to be used Examples:

Option	Description
-iosys <instance <b="" name="">APROL system></instance>	<pre>-iosys 192.168.0.23:3 Shorter version: -iosys :3 (local system, Port 3) -iosys 192.168.0.123 (Runtime system, Port 0) -iosys APROL_SYSTEM_01 Instance name of the APROL systems to be contacted -iosys "*" All instance names of the APROL systems known and activated in the project The systems must be specified in the following order when there is a redundant configuration: <master:[port]>,[<slave:[port]] (also="" 0<="" default="local" option)="" port="" pre="" reconnect="" see="" system:=""></slave:[port]]></master:[port]></pre>
-reconnect <time></time>	Reconnect time (in seconds). If the connection to the losys is lost, then an attempt is made to reestablish the connection after the defined period. This parameter should always be specified in a redundant configuration, because otherwise the application is terminated when a connection attempt to the master fails. Example: -reconnect 10
-preferUserSystems	Preferred systems with the same name from the runtime-user-system.cnf
-showlosysConnection	Number of the losys connection
-showSystemInstanz	Display of the system instance
-self <selfoption></selfoption>	Change own instance description according to the scheme APPLICATION- NAME_ <self-option> Example: -self TEST</self-option>
-languageCode <area code=""/>	no function (Default setting English)
-ver	Short information about APROL and application version
-version	Detailed information about APROL and application version
-info	Name and version of the application and the corresponding library with the following data: Module, date, time, type, system, architecture, host name
-showlog	Opens the SysLog report (Browser window with a listing of all APROL application calls, from the current day, including command line parameters, date, etc.)
-help, -h, -?	Show the help text

Application examples:

Listing the first five process variables of type "Hardware I/O" (beginning with "HA") on a remote losys, with port number 0

IosLsObjects -iosys 192.168.0.120:0 -mask HA* -max 4

Result:

HA_RPSB_AI375_K1_05_AI01 HA_RPSB_AI375_K1_05_AI02 HA_RPSB_AI375_K1_05_AI03 HA_RPSB_AI375_K1_05_AI04 HA_RPSB_AI375_K1_05_AI05

Listing all PV similar to "TC243_1_TC243_BTI_1" (Levenshtein distance = 3) on a local losys, with port number 2

IosLsObjects -iosys 127.0.0.1:2 -mask TC243_1_TC243_BTI_1 -mld 3

positive result:

Negative result (missing losys connection):

2006.09.25 18:45:30 IosLsObjects: Error (main.cc, 331): cannot connect to IOSYS

Determining the data type as well as the actual value of the PV "TC243_1_TC243_BTI_1" on a local losys, with automatic reconnect after 5 seconds

IosLsObjects -iosys 127.0.0.1:0 -mask TC243_1_TC243_BTI_1 -query -reconnect 5

positive result: TC243_1_TC243_BTI_1 Int

: 1

Negative result (missing losys connection):

Wait for successful connection by checking continuously in a 5 second interval (Abort with [Ctrl]+[C]).

Display of all objects which contain the text 'Display' and the corresponding losys connection.

IosLsObjects -mask "*Display*" -showIosysConnection

Output:

APROL_SYSTEM_OPERATOR_01_M_AppDisplayCenter_dem3@localhost:0 APROL_SYSTEM_01_M_AppDisplayCenter_dem1_UsedMem@localhost:0 APROL_SYSTEM_01_M_AppDisplayCenter_dem1_UsedRMem@localhost:0 APROL_SYSTEM_01_M_AppDisplayCenter_dem2_UsedMem@localhost:0

1.6.2.6 losEv

losEv allows recording a chronological list of the quoted variables. This record is event-driven, and can be applied to a local or remote iosys. In this way, for example, driver variables can be monitored in order to create an exact diagnostic of errors

Program options:

Option	Description				
-autoStop <time></time>	The losEv is stopped automatically after <time> seconds. Default = deactivated Example:</time>				
	IosEv -pv TestVariable -autoStop 30				
-mask <mask></mask>	Filtering of one/several PV (possible with wildcards) Example:				
-mask " <mask>" [<instance>]</instance></mask>	-mask HA_RPSF_* -mask "HA_RPSF_*"@APROL_SYSTEM_01				

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Option	Description
-vtdump [vtmask]	PVs, which have the type VSET are broken down in detail with this option Certain Vts can be filtered out with [vtmask] (see <u>Vset</u> and <u>Vt</u>). Example: _vtdump `*info*`
-human	Formatting a vtdump to a readable format.
-pv <pvname_1> [<pvname_n>]</pvname_n></pvname_1>	Specification of a PV (several PV names separated with a space) Example: -pv HA_RPSF_DI476_K1_12_01
-file <file></file>	Reading PVs from an external file Example: -file ./list/myListFile.lst The file can be created with losLsObjects (see example after table).
-maxlines <count></count>	Displays a maximum number of lines +1 Example: -maxlines 12 Default = 1024
-realformat <format></format>	The numerical output of the real values is formatted so that instead of a display with exponents, a more exact display takes place. Default = %%g
-intformat <format></format>	The numerical output of the integer values is formatted so that instead of a display with exponents, a more exact display takes place. Default = %%Id
-tsformat [real time timeus]	Output from formatted values of time stamps. Default = time
-x	Additionally to the time, the date is shown.
-noheader	Deactivation of the head and "clear screen" function
-showidler	Shows the IDLE flag changes (see <u>PV status flags</u>)
-hidelpAddr	Hide the host IP address
-hideCid	Hide the CID (PID) number
-iosys <host[:port][,host[:port]]> -iosys <instance <b="" name="">APROL system></instance></host[:port][,host[:port]]>	Specification of the losys to be used Examples: -iosys 192.168.0.23:3 Shorter version: -iosys :3 (local system, Port 3) -iosys 192.168.0.123 (Runtime system, Port 0) -iosys APROL_SYSTEM_01 Instance name of the APROL systems to be contacted -iosys "*" All instance names of the APROL systems known and activated in the project The systems must be specified in the following order when there is a redundant configuration: <master: [port]="">, [<slave:[port]]< td=""> (Also see reconnect option) Default = local system: Port 0</slave:[port]]<></master:>
-reconnect <time></time>	Reconnect time (in seconds). If the connection to the losys is lost, then an attempt is made to reestablish the connection after the defined period. This parameter should always be specified in a redundant configuration, because otherwise the application is terminated when a connection attempt to the master fails. Example: -reconnect 10
-preferUserSystems	Preferred systems with the same name from the runtime-user-system.cnf
-iosys_watchdog	Timeout for Watchdog Default = 30s

Option	Description
-showlosysConnection	Number of the losys connection
-showSystemInstanz	Display of the system instance
-self <selfoption></selfoption>	Change own instance description according to the scheme APPLICATION- NAME_ <self-option> Example: -self TEST</self-option>
-languageCode <area code=""/>	no function (Default setting English)
-ver	Short information about APROL and application version
-version	Detailed information about APROL and application version
-info	Name and version of the application and the corresponding library with the following data: Module, date, time, type, system, architecture, host name
-showlog	Opens the SysLog report (Browser window with a listing of all APROL application calls, from the current day, including command line parameters, date, etc.)
-help, -h, -?	Show the help text

Application examples:

Monitoring the process variable "HA_RPSF_DI476_K1_12_01" with a maximum display of five lines. The process variable is in a local losys, with the port number 2.

IosEv -iosys :2 -pv HA_RPSF_DI476_K1_12_01 -maxlines 4

positive result:

 .
 .

 EVENT NAME
 HOST
 CID
 TIME
 STATUS
 TYPE VALUE/ACC_CNT

 ---- IVSQFP
 IVSQFP
 IVSQFP
 IVSQFP
 IVSQFP

 CHA
 HA_RPSF_DI476_K1_12_01
 010.049.083.150
 29085
 17:12:34.876
 -VS--P
 INT
 0

 CHA
 HA_RPSF_DI476_K1_12_01
 010.049.083.150
 29085
 10:09:16.704
 -VS--P
 INT
 1

(Total 5 lines)

Each time the process variables changes the chronological list is updated with one line. When the parameter "maxlines" is overwritten, then the whole list is deleted, and the recording begins anew.

Negative result (PV not present): STATUS TYPE VALUE/ACC_CNT ----- IVSQFP -----Categorization of the display: EVENT NAME HOST CID TIME STATUS TYPE VALUE/ACC_CNT ----- IVSQFP ---- -----CHA HA_RPSF_DI476_K1_12_01 010.049.083.150 29085 17:12:34.876 -VS--P INT 0 CHA HA RPSF D1476 K1 12 01 010.049.083.150 29085 10:09:16.704 -VS--P INT 1 "EVENT": Event that modifies the PV Name of the PV "NAME": "HOST": IP address of the PV source "CID": PID of the provider "TIME": Time of the event, which occurred

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"STATUS":	Status of the following flags:
	(I)dle, (V)alid (V), (S)ourced, (Q), (F)orce, (P)ersist
"TYPE":	Data type of the PV value
"VALUE/ACC	CNT": Value of the PV

Monitoring defined process variables from the external file "5-pv-lst" without column heading, on a remote losys, with port number 0

IosEv -iosys 192.168.0.85:0 -file 5-pv.lst -noheader

Tip to create the file "5-pv.lst" by exporting existing PVs out of the losys. The choice is limited to the digital inputs of the control "RPSF". The first five PVs will be written into the file.

0

IosLsObjects -mask HA_RPSF_DI* -max 4 -iosys :2 > 5-pv.lst **Contents of file "5-pv.lst":** HA_RPSF_DI450_EXP1_11_01 HA_RPSF_DI450_EXP1_11_03 HA_RPSF_DI450_EXP1_11_04 HA_RPSF_DI450_EXP1_11_07

HA_RPSF_DI450_EXP1_11_08

positive result:

connecting pv HA_RPSF_DI450_EXP1_11_01 connecting pv HA_RPSF_DI450_EXP1_11_03 connecting pv HA_RPSF_DI450_EXP1_11_04 connecting pv HA_RPSF_DI450_EXP1_11_05 connecting pv HA_RPSF_DI450_EXP1_11_06 CHA HA_RPSF_DI450_EXP1_11_01 010.049.083.150 29085 17:10:14.280 -VS--P INT 0 010.049.083.150 29085 17:10:14.280 -VS--P INT CHA HA_RPSF_DI450_EXP1_11_03 0 010.049.083.150 29085 17:10:14.280 -VS--P INT 0 010.049.083.150 29085 17:10:14.280 -VS--P INT 0 010 049 083 150 29085 17:10:14 280 -VS--P INT 0 CHA HA_RPSF_DI450_EXP1_11_04 HA RPSF DI450 EXP1 11 05 CHA _ HA_RPSF_DI450_EXP1_11_06 010.049.083.150 29085 17:10:14.280 -VS--P INT 0 CHA

(The result can also be diverted into a file with the command IOSEV -IOSYS 192.168.0.85:0 -file 5-pv.lst > divertfile.lst. The contents of this file are shown with the command tail -f umlenkdatei.lst).

Negative result (missing losys connection):

2006.09.28 10:55:19 IosEv: Error (main.c, 341): 192.168.0.85:0

IOSYS connecting

Monitoring a VSET variable "testPV" with a view of the contents, on a local system, with the port number 0, as well as a listing of all IDLE events.

IosEv -iosys 127.0.0.1:0 -pv testPV -vtdump -showidler

Digression:

Creating a PV of the type VSET (internal variable "iVar" of type STRING, with the value "Hello World") on a remote losys with the port number 0.

pio -iosys 10.49.83.150:0 -pv testPV -v 4-iVar:"Hello World" -sourced

Result:

Vset

Result:

EVENT	NAME	HOST	CID	TIME			VALUE/ACC_CNT IVSQFP		
IDLE-	testPV	000.000.000.000	00000	01:00:00.000 -	???	?			
CHA	testPV	010.049.083.228	05134	16:49:32.767 -	/ VSET	(iVar	Vt_STRING	Hello World)
IDLE+	testPV	010.049.083.228 0	05134	16:49:32.767 IV-	VSET	(iVar	Vt_STRING	Hello World)
IDLE-	testPV	010.049.083.228	05134	16:49:32.767 -1	/ VSET	(iVar	Vt_STRING	Hello World)
CHA	testPV	010.049.083.228	05138	16:49:48.041 -1	/ VSET	(iVar	Vt STRING	Hello World)
						,			
IDLE+	testPV	010.049.083.228	05138	16:49:48.041 IN	/ VSET	(iVar	Vt_STRING	Hello World)

Event display of all PVs without the column headers which contain the text 'Sinus', and with a value formatting for the display from 2 places before and 3 after the decimal point, and the corresponding losys connection.

IosEv -mask "*Sinus*" -realformat 02.3f -noheader -showIosysConnection

Output:

CHA DemoSinus120Grad@localhost:0	010.049.080.249	09595	12:03:07.471	-VSP	REAL -0).753
CHA DemoSinus240Grad@localhost:0	010.049.080.249	09595	12:03:07.471	-VSP	REAL 0.	.946
CHA SYS_AT_Gen_Sin.Sinus@localhost:0	010.049.080.249	09593	12:03:07.732	-VSP	REAL 56	5.645
CHA SYS_AT_Gen_Sin_d.Sinus@localhost:0	010.049.080.249	09593	12:03:07.732	-VSP	REAL 56	5.645
CHA SYS_AT_Sinus120.Sinus@localhost:0	010.049.080.249	09593	12:03:07.732	-VSP	REAL 18	3.483
CHA SYS_AT_Sinus240.Sinus@localhost:0	010.049.080.249	09593	12:03:07.732	-VSP	REAL 10	04.874
CHA DemoSinus@localhost:0	010.049.080.249	09595	12:03:07.872	-VSP	REAL -0	0.930

1.6.2.7 IosInOut

It is possible to export the contents of a defined process variable from a local, or remote, losys with losInOut. There is the possibility of importing this (or a self-created) list back into the system. For error analysis, the list created with losInOut shows the status of defined PVs at a certain point in time.



A record of all of the operations in the process control coming from IosInOut occurs under "External process control" in the AuditTrail report.

Variables with the status '(S)ource' cannot be set.

<u>Syntax</u>:

IosInOut -in|-out -datafile <filename> -pvlistfile <filename> [-replace] [-checktype] [options]

Program options:

Option	Description
-in <pvlistfile> [-time?]</pvlistfile>	Set values in the losys from a file Optional, manual setting of time, when the PV was set
[-timeStamp <t>]</t>	Time stamp (only in connection with -in)
[-timeString <s>]</s>	Time string (only in connection with -in)
[-timeBack <s>]</s>	Difference to current time in seconds (only in connection with -in)
-iosys <host[:port][,host[:port]]> -iosys</host[:port][,host[:port]]>	Specification of the losys to be used Examples: -iosys 192.168.0.23:3 Shorter version:

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Option	Description
<instance <b="" name="">APROL system></instance>	-iosys :3 (local system, Port 3) -iosys 192.168.0.123 (Runtime system, Port 0) -iosys APROL_SYSTEM_01 Instance name of the APROL systems to be contacted -iosys "*" All instance names of the APROL systems known and activated in the project The systems must be specified in the following order when there is a redundant configuration: <master:[port]>,[<slave:[port]] (Also see reconnect option) Default = local system: Port 0</slave:[port]] </master:[port]>
-reconnect <time></time>	Reconnect time (in seconds). If the connection to the losys is lost, then an attempt is made to reestablish the connection after the defined period. This parameter should always be specified in a redundant configuration, because otherwise the application is terminated when a connection attempt to the master fails. Example: -reconnect 10
-preferUserSystems	Preferred systems with the same name from the runtime-user-system.cnf
-out <pvlistfile></pvlistfile>	Insert the current PV values from the losys into the file <pvlistfile> (standard). The PV data type and value, as well as information about status flags are exported out of the losys, but not the name of the PV. The file can be automatically created with the command losLsObjects.</pvlistfile>
-xmlOut	Output in XML format on the monitor
-type	Add the PV type's valid and remanent flag to the output (see <u>PV status flags</u>).
-connInfo	Output of the corresponding losys connection
-pvlistfile <name></name>	Specification of the file containing the PV names (one name per line). The file can be automatically created with the command losLsObjects. Standard file extension: "Ist" Example: -pvlistfile myPVList.lst
-datafile <name></name>	Specification of the file containing the PV values to write/read (one value per line). Default file extension: "dat" Example: -datafile myDataFile.dat
-path <path></path>	Path to file <pv file="" list=""> Example: -path ./toPVListings/</pv>
-replace	Overwrites the current file <data file="">.</data>
-noStringQuotes	PV values in the data type STRING are output without quotation marks
-self <selfoption></selfoption>	Change own instance description according to the scheme APPLICATION- NAME_ <self-option> Example: -self TEST</self-option>
-languageCode <area code=""/>	no function (Default setting English)
-ver	Short information about APROL and application version
-version	Detailed information about APROL and application version
-info	Name and version of the application and the corresponding library with the following data: Module, date, time, type, system, architecture, host name
-showlog	Opens the SysLog report (Browser window with a listing of all APROL application calls, from the current day, including command line parameters, date, etc.)
-help, -h, -?	Show the help text

Application examples:

Exporting the losys values from the defined PVs from the file "5-pv.lst", with specification of the data type, and remanent flag on a local losys, with the port number 2. The results will be written in the file "5-pv.dat".

IosInOut -iosys 127.0.0.1:2 -type -out -pvlistfile ./5-pv.lst -datafile ./5-pv.dat

Digression:

To create the file "5-pv.lst" by exporting existing PVs out of the losys. The choice is limited to the digital inputs of the control "RPSF". The first five PVs will be written into the file.

IosLsObjects -mask HA_RPSF_DI* -max 4 -iosys :2 > 5-pv.lst

Contents of file "5-pv.lst"

HA_RPSF_DI450_EXP1_11_01 HA_RPSF_DI450_EXP1_11_03 HA_RPSF_DI450_EXP1_11_04 HA_RPSF_DI450_EXP1_11_05 HA_RPSF_DI450_EXP1_11_06

positive result:

Contents of file "5-pv.dat"

INT, 0, valid, persistent

Negative result (when the input/output file is not found):

2006.09.28 13:26:38 IosInOut: Error (IosInOut.c, 406): Unable to open file /home/opr/RUNTIME/IosInOut/5-pv.dat !

Creating an XML file "5-pv.xml" with a defined PV list "5-pv.lst", from a remote system, with the port number 0, and reconnection after five seconds.

IosInOut -iosys 10.49.83.150:0 -xmlOut -pvlistfile 5-pv.lst -path ./ -reconnect 5 > 5-pv.xml

positive result:

Contents of file "5-pv.xml"

<iosys> <appInfo> <progName>IosInOut</progName> <progVersion>2.1.5</progVersion> <aprolRel>APROL R 3.4-000</aprolRel>

<copyRight> © 1995-2006 Bernecker + Rainer Industrie-Elektronik Ges.m.b.H. </copyRight> </appInfo>

```
<queryInfo>
<server>cc4opr01</server>
<user>cc4opr</user>
<time>28.09.2006 13:37:22 CEST</time>
</queryInfo>
```

<data> <pv>HA_RPSF_DI450_EXP1_11_01</pv> <value>0</value>

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```
<type>INT</type>
<valid>false</valid>
<persistent>true</persistent>
</data>
...
```

Negative result (missing losys connection):

Wait for successful connection by checking continuously in a 5 second interval (Abort with [Ctr1]+[C]).

1.6.2.8 pio

This tool serves in creating, as well as for a selective status query, of PVs in a local or remote losys. Existing PVs can be displayed and set. A special limitation of user rights is not implemented for pio.



A record of all of the operations in the process control coming from pio occurs in the 'External process control' action group in the AuditTrail report.

The project context is not recorded when the value changes via 'pio', and so a 'project' filter may have to be reset in order to see the records in the report.

Option	Description
-pv <name></name>	Specification of the PV
-g [-wait]	Read PV value
-get [-wait]	Output the following PV information: - Name - Type - Value
-getmask -g [-wait]	Reproduce the value, and the set flags of the PV. (<u>must</u> be used in connection with the option "-g")
-wait	Puts the "pio" in a waiting state until an event, of the PVs being monitored, takes place.
-s <value></value>	Set the PV value to <value>. If the PV is a string, then it can be written with a number or a string. (If the PV does not exist, then a new one is created. When the PV is not remanent, then it remains alive until the last client disconnects. See <u>PV status flags</u>.)</value>
	Optional, manual setting of time, when the PV was set
[-timeStamp <t>]</t>	- Time stamp (double [sec.usec]) (only in connection with -in)
[-timeString <s>]</s>	- Time string (only in connection with -s)
[-timeBack <s>]</s>	- Difference to current time in seconds (only in connection with -s)
-source	Sets the PV "sourced" flag (see <u>PV status flags</u>)
-noUnsource	A variable is no longer marked as being valid in the losys after pio has terminated.
-invalid	Sets the PV "invalid" flag (see <u>PV status flags</u>)
-valid	Sets the PV "valid" flag (see <u>PV status flags</u>)
-v VTtype-VTname [:VTvalue]	Set the PV type to VSET, and assigns it a value (see <u>Vset</u>). 0: VT type is not changed 2: VT type is changed into INT 3: VT type is changed into DOUBLE 4: VT type is changed into STRING

Option	Description
	8: VT type is changed into BOOL 9: VT type is changed into TIMESTAMP Example: -v 2-myName[:5] (Type: INT, Name: myName [Wert:5])
-setType <type></type>	transforms a PV into the following type: 0: No Type 1: INT 2: REAL 3: STRING (Standard) 7: TIMESTAMP
-iosys <host[:port][,host[:port]]> -iosys <instance <i="" name="">APROL system></instance></host[:port][,host[:port]]>	Specification of the losys to be used Examples: -iosys 192.168.0.23:3 Shorter version: -iosys :3 (local system, Port 3) -iosys 192.168.0.123 (Runtime system, Port 0) -iosys APROL_SYSTEM_01 Instance name of the APROL systems to be contacted -iosys "**" All instance names of the APROL systems known and activated in the project The systems must be specified in the following order when there is a redundant configuration: <master:[port]>,[<slave:[port]] (Also see reconnect option) Default = local system: Port 0</slave:[port]] </master:[port]>
-reconnect <time></time>	Reconnect time (in seconds). If the connection to the losys is lost, then an attempt is made to reestablish the connection after the defined period. This parameter should always be specified in a redundant configuration, because otherwise the application is terminated when a connection attempt to the master fails. Example: -reconnect 10
-preferUserSystems	Preferred systems with the same name from the runtime-user-system.cnf
-iosys_watchdog	Timeout for Watchdog Default = 30s
-connInfo	Output of the corresponding losys connection
-newFormat	Multiple output of the value of the variables
-self <selfoption></selfoption>	Change own instance description according to the scheme APPLICATION- NAME_ <self-option> Example: -self TEST</self-option>
-languageCode <area code=""/>	no function (Default setting English)
-ver	Short information about APROL and application version
-version	Detailed information about APROL and application version
-info	Name and version of the application and the corresponding library with the following data: Module, date, time, type, system, architecture, host name
-showlog	Opens the SysLog report (Browser window with a listing of all APROL application calls, from the current day, including command line parameters, date, etc.)
-help, -h, -?	Show the help text

Application examples:

Event related output of detailed information about a PV, which is on a local losys, with the port number 2.

pio –iosys :2 -pv HA_RPSF_DI476_K1_12_01 -get -wait

positive result: HA_RPSF_DI476_K1_12_01 - pv of type INT, current value = 0 = 0x0 negative result (missing losys connection): 2006.09.28 14:14:37 pio: Error (pio.c, 189): cannot connect to IOSYS

1.6.3 Explanation about PV Vsets, Vts, and status flags

1.6.3.1 Vset

A TBase database is made up of a tree structure. Node points in the TBase database are referred to as Vsets. They can be empty, or contain further data, for example further Vsets. The following scheme shows the structure of the TBase database, whereby the Vset at the end of the path is empty:

```
LL/IEC61131_3B/ADD_INTV1.0I ( )
```

1.6.3.2 Vt

Vts is data, which can be contained in a Vset. A Vt is always made up of a unique identifier, a data type, and a suitable value. Here, see the following example:

\L\L/IEC61131_3\B/ADD_INT\V1.0\C-CODE (source = "return(IN01 + IN02);" ,)

A Vt is present in the brackets at the end of the path. The identifier is "source", the data type "Vt_STRING", and the contents "return (IN01 + IN02);". The contents of the Vts can contain any character chain. In this example there is a fragment of C code.

1.6.3.3 PV Status flag

A process variable in the losys consists of a name, a status and a value. The status of the PV is defined with different status flags, which are described here shortly.

Status flag	Description
I= idle	The idle flag is set to true when only one process is connected to the PV, e.g. When creating the PV
V= valid	If a type, as well as a value, has been assigned to the PV, then the valid flag is set to true. If the PV obtains an undefined status due to a connection loss to the controller, then this flag is set to false; the PV is then invalid.
Q= source	The source flag is only relevant for queries in the losys libraries. It marks the connected client as

Status flag	Description
	provider, whereby it obtains write permission for the PV. The source concept is a basic function in APROL , which guarantees that a PV can only be written from one source. If a process has received the source status for a PV, then it can assume that only it has the right to change the PV.
S= sourced	The sourced flag shows that the PV is allocated to a provider.
F= force	The force flag is reserved for future use.
P= persist	A remanent PV can be recognized by the set remanent flag. Remanence in losys means that the value, and the type, of the remanent PV are written into a remanence file upon terminating the losys, and are restored upon starting the losys.

1.7 Special features

This section will cover features that are not immediately noticeable on **APROL** systems. It is particularly geared towards UNIX and Linux experts.

The aprolsys Linux user
 The rhosts file and aprolsys
 System variables

1.7.1 The *aprolsys* Linux user

The **aprolsys** has a special function in an **APROL** process control system. It is present on all **APROL** servers and belongs to the 'aprol' Linux user group, which also contains all other **APROL** Linux users. The Linux user **aprolsys** plays a central role on an **APROL** server since it has authorization to access groups. This user ID is used to start the **TBase server** database server, which can access all CAE databases on this **APROL** server. In addition, the entire **APROL** software installed under /opt/aprol is installed by the **aprolsys** user. This guarantees that only users in the "aprol" group have the corresponding authorization.

1.7.1.1 The *rhosts* file and *aprolsys*

The *rhosts* file is identical for all CC-Accounts. It is created when building the control computer tasks and contains all of the computers configured in the **CaeManager** with their respective systems. Even the Engineering server with the Engineering system is included in the file.

This file is copied to the corresponding system environments (\$HOME directory) on the individual systems when performing terminal and server downloads. Additional entries still have to be made by the system administrator in the /etc/hosts.equiv file.

1.8 System variables

System variables are used to self-monitor a runtime system in addition to monitoring the Linux operating system in the process control system's GUI applications.

By using the system variables in the engineering phase (displaying in specific process graphics), the alarm and message system, and the trend system of an **APROL** system, the following is achieved:

 \checkmark

Increased security of the process control system with self-monitoring, for example: Generating messages when insufficient memory or not enough hard drive space, displaying inactive or necessary programs, etc.

- Quick overview of the system status, the Linux operating system, and the process control system.
- If engineering has been configured accordingly, the operator of the process control system can receive information about the system status in plain text and pass it on to the system administrator.

The values of the system variables are provided by the **SysInfo** program. **SysInfo** retrieves information regarding the **APROL** programs to be monitored from **losys**; the additional information comes from the Linux operating system.

At this point, you can recognize that only you can only obtain information about the system variables and the server where **SysInfo** itself is running. **SysInfo** always connects itself to the current **losys** on the Runtime system. If system variables from **APROL** applications on a server without a running **losys** (Operator system on an operator station) should be evaluated, these applications must have a connection to **losys**.

How the system variables can be used in a CFC can be found in the **APROL** documentation "B2 Project Engineering", chapter <u>Input of system variables</u>.

1.8.1 System variables for applications

The return value (type = INT) of system variables for the individual applications provides information about the status of the applications. The following return values are possible:

Return value	Description
0	Error! Variables are not supplied and information about the application status is not available. Possible cause: The program has not been started. It is also possible that losys, SysInfo or neither program has been started.
1	The application has been started and is running.
2	No function at this time.
3	No function at this time.

These system variable names are formed as follows:

<Instance name of the server>_<M | S >_App<Application>_<Self-ID of the application>

Example:

CC01_M_AppLoginServer_dai1



The following applies for the nomenclature of the system variables: If a redundancy system is present then the configured slave is marked with the letter 'S'.

Some applications exist whose status or memory needs are not monitored, as for example the OperatorManager or the AlarmViewer.



Please note that no self-ID is used in the syntax for the system variables for monitoring the control computer task!

The system variables for monitoring the CC task have the following syntax:

<Instance name>_<M | S>_AppCCT_<Task name>_<Usage>

Redundancy variables of the applications

In a redundancy system, it may be necessary to determine which application is currently controlling the process. This is possible by evaluating the redundancy variables.

These system variable names are formed as follows:

```
<Instance name of the server>_<M | S >_App<Application>_<Self-ID of the application>_ReduActiv
```

When an application controls the process on this server, the value of the redundancy variable corresponds to the process ID of this application. If the application does not control the process on this server, the variable has the value "0".

Example:

CC01_M_AppUcbServer_dai1_ReduActiv



When a process redundancy is realized on a compact system then only **one** redundancy variable is created. The value of this variable changes with a redundancy switch from the PID of the application that has become inactive to the PID of the application currently controlling the process.

In the **CaeManager** you can place a redundancy variable on the input border of the CFC and use it in the logic. For this, choose "**System variable**" in the shortcut menu. In the dialog that opens, the existing system variables are offered for choice, whereby the redundancy variable ends with "_ReduActiv".

Search filter									_		
State	• *ReduActiv* •				• H	ardware	•				
Name					• H	ost name	•				
EC type					• Ti	ip	٠				
Description	•										
izzy search	Lancone	114	• max. dist.	-1] 0					0	Reset
ound variab	Is	40 / 18				1/0 II	EC type	e Uni		Description	Hardware
I/O type Sys	0	0.00000000	DL_SYSTEM_0	mener dem		+0	UINT	e jon	t.	Redundancy variable of application	APROL Run
Sys	- č		OL SYSTEM 0			-0	UINT			Redundancy variable of application	APROL_Run
Sys	ŏ		DL_SYSTEM_0			-	UINT			Redundancy variable of application	APROL_Run
Sys	ŏ		DL_SYSTEM_0			+0	UINT			Redundancy variable of application	APROL_Run
Sys	ŏ		OL SYSTEM 0			-	UINT			Redundancy variable of application	APROL Run
Sys	ŏ		OL SYSTEM O	-	-	-0	UINT			Redundancy variable of application	APROL Run
Sys	ŏ		DL_SYSTEM_0	-	-	-0	UINT			Redundancy variable of application	APROL_Run
Sys	-		DL_SYSTEM_0			+0	UINT			Redundancy variable of application	APROL Run
Sys	ŏ		DL SYSTEM O			•• I	UINT			Redundancy variable of application	APROL Run
Sys	Õ		DL SYSTEM O	-	-		UINT			Redundancy variable of application	APROL Run
Sys			DL_SYSTEM_0			+0	UINT			Redundancy variable of application	APROL Run
Sys	0		DL_SYSTEM_0			+0	UINT			Redundancy variable of application	APROL_Run
Sys	0	APR	DL_SYSTEM_0	MultiRun	1_ReduActiv	+0	UINT			Redundancy variable of application	APROL_Run
Sys	0	APR	DL_SYSTEM_0	T_Python	_ReduActiv	+0	UINT			Redundancy variable of application	APROL_Run
4	-	ADD	N SVSTEM O	Roaktoron	1_RoduActiv	-	LUNT	2.	_	Podundance variable of application	
Jse extende	d I/O i	nforma	tion								
Pos		Use	Information								-
1		~	Value								
2			Name								
3			Unit Description								
× 1.											l
							Read	ý			
Im								v type of a		Refresh	

Illustration 13: Choice of the redundancy variable

Monitoring the memory needs of the runtime applications

The system variables with the nomenclature

```
<Instance description of server>_<M | S >_App<Application>_<Self ID of application>_UsedMem and
```

<Instance description of server>_<M | S >_App<Application>_<Self ID of
application>_UsedRMem

are available for monitoring the memory needs of the runtime applications.

The system variables are of the type 'LREAL'. The value of these system variables are set with the size of the virtual memory currently needed by the process in [MB].

If the process or the information cannot be detected, the variable is set to the value "-1".

1.8.2 System variables for monitoring the redundancy status

The system variable <Instance name of the server>_<M | S >_RedundancyState is of the type SINT, and serves the status detection of the server redundancy.

The following return values are possible:

Return value	Description
2	The computer is the configured master and currently controlling the process.
1	The computer is the configured slave and currently controlling the process.
0	The computer is not controlling the process but is online.
-1	The computer is "offline" due to operating conditions (i.e. the APROL system is stopped).

-2	The computer is (unexpectedly) "offline" i.e. without power, eventually loss of power without UPS, or unreachable in the network.
----	---

If there is no server redundancy, then the system variables can only return the value "2".



The system variable <Instance name of the server>_<M | S >_RedundancyState is solely available on a redundancy runtime server.

1.8.3 System variables for memory and hard disk capacity

When using these system variables it must be noted:

In Linux, individual hard disks are not known with letter names, and partitions are specified as directories in the file system. Hard disks are generally mounted in the root directory with a name. This is referred to as a mounting point.

If you also have mounted date media on your computer that you want to monitor, you can enter the corresponding mounting points when configuring **SysInfo** (system monitoring) for the optional **Partitions 1** to **4**.

The system variables have the following prefix: <Instance name of the server>_<M | S >

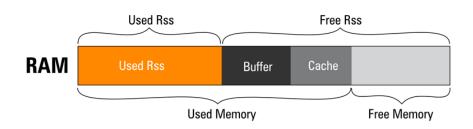


Illustration 14: Scheme for "A Linux computer's memory management"

Variable	Description	Туре
_FreeAPROLDATASpace	This system variable states the size of the free memory space of the APROL_DATA partition in MBytes. If no separate partition has been created for APROL_DATA, the root partition data is output.	LREAL

Variable	Description	Туре
_FreeMemory	Currently unused memory This system variable states the size of the unused RAM memory in MBytes. A Linux system's memory management always almost completely uses the RAM memory that is available (at least after a certain amount of runtime). The operating system uses a part of the memory that should not be neglected as a buffer or cache. Thus, this size alone is not a criterion in seeing if there are problems with the memory management.	LREAL
_FreeMemoryViolationTime	Time of the memory protection violation [s]. Please note the following description about configuration.	DINT
_FreeMemoryWarning	Warning on completely overloaded memory. Please note the following description about configuration.	BOOL
_FreePartition1Space	Free space in the additional partition 1 [MB]	LREAL
_FreePartition4Space	Free space in the additional partition 4 [MB]	LREAL
_FreeRootDiskSpace	Free space in the root partition [MB].	LREAL
FreeRssMemory	Currently unused RSS memory (RSS=Resident Set Size) This system variable states the size of the unused RSS memory in MBytes. The RSS memory is the part of the used RAM memory that solely contains program code and data (heap and stack). Buffer and cache areas do not belong to it. A Linux system's memory management always almost completely uses the RAM memory that is available (at least after a certain amount of runtime). The operating system internally uses a part of the memory, which should not be neglected, as a buffer or cache.	LREAL

Variable	Description	Туре
_FreeSwapMemory	Currently free swap memory This system variable states the size of the unused swap memory in MBytes. (Swap=swap memory on the hard disk). A Linux system's memory management always almost completely uses the RAM memory that is available (at least after a certain amount of runtime). The operating system uses a part of the memory that should not be neglected as a buffer or cache. If the RAM memory is not sufficient due to the size or number of programs, then the operating system stores unused memory pages in the swap memory, i.e. it is stored out to the hard disk.	LREAL
_APROLDATASpace	Size of the APROL_DATA partition [MB]. If no separate partition has been created for APROL_DATA, the root partition data is output.	LREAL
Partition1Space	Size of the additional partition 1 [MB].	LREAL
_Partition4Space	Size of the additional partition 4 [MB].	LREAL
_RootDiskSpace	Size of the root partition. This system variable states the size of the root partition in MBytes.	LREAL
_SystemType	Allows a differentiation between runtime / operator / gateway systems. System type can adopt the following values: 1 = Runtime system 2 = Operator system 3 = Runtime system with integrated operator system 4 = Gateway system	SINT
_TotalMemory	Size of the available memory. This system variable states the size of the available memory (=inserted RAM memory) in MBytes. A Linux system's memory management always almost completely uses the RAM memory that is available (at least after a certain amount of runtime). The operating system uses a part of the memory that should not be neglected as a buffer or cache. If the RAM memory is not sufficient due to the size or number of programs, then the operating system stores unused memory pages in the swap memory, i.e. it is stored out to the hard disk.	LREAL

Variable	Description	Туре
_TotalSwapMemory	Size of the available swap memory. This system variable states the size of the available swap memory in MBytes. (Swap=swap memory on the hard disk). A Linux system's memory management always almost completely uses the RAM memory that is available (at least after a certain amount of runtime). The operating system uses a part of the memory that should not be neglected as a buffer or cache. If the RAM memory is not sufficient due to the size or number of programs, then the operating system stores unused memory pages in the swap memory, i.e. it is stored out to the hard disk.	LREAL
_UsedAPROLDATASpace	Used hard-disk space in the APROL_DATA partition. This system variable states the size of the used hard-disk space of the APROL_DATA partition in MBytes. If no separate partition has been created for APROL_DATA, the root partition data is output.	LREAL
UsedMemory	Size of the used memory This system variable states the size of the used RAM memory in MBytes. A Linux system's memory management always almost completely uses the RAM memory that is available (at least after a certain amount of runtime). The operating system uses a part of the memory that should not be neglected as a buffer or cache. Thus, this size alone is not a criterion in seeing if there are problems with the memory management.	LREAL
UsedRssMemory	Currently used RSS memory This system variable states the size of the used RSS memory in MBytes. (RSS=Resident Set Size). The RSS memory is the part of the used RAM memory that solely contains program code and data (heap & stack). Buffer and cache areas do not belong to it. A Linux system's memory management always almost completely uses the RAM memory that is available (at least after a certain amount of runtime). The operating system uses a part of the memory that should not be neglected as a buffer or cache.	LREAL
UsedPartition1Space	Used space in the additional partition 1 [MB]	LREAL

Variable	Description	Туре
_UsedPartition4Space	Used space in the additional partition 4 [MB]	LREAL
_UsedRootDiskSpace	Used memory space in the root partition. This system variable states the size of the used hard-disk space of the root partition in MBytes.	LREAL
_UsedSwapMemory	Currently used swap memory This system variable states the size of the used swap memory in MBytes. (Swap=swap memory on the hard disk). A Linux system's memory management always almost completely uses the RAM memory that is available (at least after a certain amount of runtime). The operating system uses a part of the memory that should not be neglected as a buffer or cache. If the RAM memory is not sufficient due to the size or number of programs, then the operating system stores unused memory pages in the swap memory, i.e. it is stored out to the hard disk.	LREAL
_UsedChronoLogDiskSpace	Size of the ChronoLog data [MB] in the directory /home/aprolsys/APROL_DATA/chronolog	LREAL
_UsedChronoPlex ForwardingBuffer	Size of the ChronoPlex routing buffer [MB] in directory /home/aprolsys/APROL_DATA/chronolog /replication	LREAL
_UsedVncRecorderSpace	Size of the data [MB] of the VncRecorder in directory /home/aprolsys/vnc2swf	LREAL

With the following options, the SysInfo process' warnings about the low idle time or too little free memory can be configured.

Option	Value range	Default value
-warningDelay <sec></sec>	[2 200]	10 [s]
-warningIdleState <%>	[0100]	10 [s]
-warningMemoryState <%>	[0100]	10 [s]

If the parameter *-warningIdleState* or the parameter*-warningMemoryState* has been fallen short of for at least "*warningDelay*" seconds, the following system variables are supplied with the corresponding values by the **SysInfo** process:

_IdleStateWarning	Fallen short of configured level
_IdleStateViolationTime	Duration of shortfall
_FreeMemoryWarning	Fallen short of configured level
_FreeMemoryViolationTime	Duration of shortfall

1.8.4 System variables for the computer's CPU

These system variables provide information about the load on the computer. The load on the computer is largely determined by the load on the CPU.

The system variables have the following prefix: <Instance of the computer>_<M \mid S >

Variable	Description	Туре
_IdleStatePercent	Free CPU capacity (computing performance) in percent.	REAL
_IdleStateViolationTime	Violation of free CPU capacity [s]. Please note the previous chapter about configuration.	DINT
_IdleStateWarning	Warning upon low CPU capacity. Please note the previous chapter about configuration.	BOOL
_SystemStatePercent	SYSTEM share of the CPU load in percent.	REAL
_UserStatePercent	USER share of the CPU load in percent. Most of the time, this is the Runtime system as the Linux user.	REAL

1.8.5 System variables for processes in the operating system

In addition to the CPU load, it also makes sense sometimes to monitor the number of running processes on the computer. The system variables below are available to do so.

The system variables have the following prefix: <Instance name of the computer>_<M | S >

Variable	Description	Туре
_ProcessCount	Number of running processes. This system variable states the size of the running processes. It is to be noted that threads are counted as individual processes!	INT
_LoadAverage_1	 1 minute average of the system load. The number of processes that are waiting to be processed, or are being processed, by the CPU. A value that is smaller than, or equal to, the number of CPUs is ideal. A (much) larger value, especially over a long period, is speculation for a (very) heavily loaded computer. The reason is not necessarily anything to do with the CPU load! Hard disk I/Os, or similar, can also be the reason. 	REAL

Variable	Description	Туре
_LoadAverage_5	 5 minute average of the system load. The number of processes that are waiting to be processed, or are being processed, by the CPU. A value that is smaller than, or equal to, the number of CPUs is ideal. A (much) larger value, especially over a long period, is speculation for a (very) heavily loaded computer. The reason is not necessarily anything to do with the CPU load! Hard disk I/Os, or similar, can also be the reason. 	REAL
_LoadAverage_15	 15 minute average of the system load. The number of processes that are waiting to be processed, or are being processed, by the CPU. A value that is smaller than, or equal to, the number of CPUs is ideal. A (much) larger value, especially over a long period, is speculation for a (very) heavily loaded computer. The reason is not necessarily anything to do with the CPU load! Hard disk I/Os, or similar, can also be the reason. 	REAL

1.8.6 System variables for times in the process control system

These system variables provide information about the times and flags in the operating system.

```
The system variables have the following prefix: 
 <Instance name of the computer>_<M \mid S >
```

Variable	Description	Туре
_DayLightSaving	Flag for changing summer / winter time This system variable states if the summer time is active. The value is 1 for an active summer time, otherwise 0	INT
_TimeDiffUTC2Timezone	Time difference between UTC and the time zone This system variable states the time difference between UTC (Universal Time Coordinated) and the local time zone in seconds. This value is positive for time zones east of the 0 longitude, negative for the time zones to the west.	DINT
_TimeStamp	Current time as seconds after 1970.	DT
_TimeString	Current time in text format.	STRING
_TimeZoneString	Current time zone in text format.	STRING
_Uptime	Time that the system has been running This system variable states the computer's up time, i.e. the time that the computer has been running.	DINT

1.8.7 System variables for licensing

The state of the licensing can be monitored with these system variables. It makes sense to pass the "_LicenseState" system variable to the message and alarm system.

The system variables have the following prefix: <Instance name of the computer>_<M | S >

Variable	Description	Туре
_LicenseEvalTime	This system variable states the remaining time in evaluation mode. The value is output in [sec].	DINT
_LicenseState	This system variable provides the license status. -1 = Unknown license error 0 = Unknown status 1 = Evaluation mode active 2 = Evaluation period expired 3 = License activated 4 = License expired	INT

1.8.8 'ApcHwInfo' system service

The 'ApcHwInfo' **APROL** system service provides system variables of APC data (e.g. temperature, operating time) for the system and self-monitoring of B&R APCs and PPCs.

This following hardware is not supported at present:

- ✓ PPC800
- ✓ APC810
- APC910
- ?

Detailed information about the modules (CPU board, bus unit, memory module, of fan kit) can be found in the <u>APC810 / PPC800 Implementation Guide</u> and the <u>APC910</u> <u>Implementation Guide</u>.

1.8.8.1 Configuration of the ApcHwInfo

The 'ApcHwInfo' system service is configured in the '**APROL** system' project part, in the 'System services' section.

A description of the 'ApcHwInfo' launching options can be found in manual 'X99 CC Modules', chapter <u>ApcHwInfo launching options</u>.

If the 'ApcHwInfo' is running on a supported platform, it creates a set of system variables (e.g. panel, temperature, fan) which are refreshed cyclically.

If the '-enableSuccessMessages' option is used, general state information is also written to the respective text variables in addition to the error messages.

Status	Configuration		Gro	up / Application / In	stance	/ Stat	us Start	Autostart	Resta	art Des	cription	
APROL Operator_SYS APROL Operator_SYS Basic data C C tasks S CC tasks S C			1	Monitoring Management System services		3				Cent	itoring ap ral mana uired APP plies B&P	gen tOL
	System services			-001		4			5			in all
	System monitoring			+- ChronoChartPrin	iter	×.					inuous tr	
	APROL connections		115	LoginServer SysInfo		100					entication	
	Project connections	1.000		System monitoring							nostics p	
└-✔ <mark>S</mark> Documentation	-3	1										
	1 17773					******					-	
	#	-	Application /	Prio 2	Category		uccessMess		alue	Used	Usa	
		1	1 2	ApcHwinto_001	3	System		uccessmest		tefault>	×	
		1	3	ApcHwinfo 001	3	System		tchdog	30		2	1.0
		1	4	ApcHwinfo 001	3	Start	restart	iteritare g			×	-
			5	ApcHwinfo 001	3	System	-self		00	1	×	1
		1	6	ApcHwinfo_001	2	Start	-setBoar	FanUpdate	Time 60		×	1
		2	7	ApcHwinfo_001	2	Start	setBoar	dTempUpdat	eTimeo		×	3
		3	8	ApcHwinfo_001	2	Start		IUpdateTime			×	1
		10000	9	ApcHwinfe_001	2	Start		sticUpdateTi		00	×	3
				ApcHwinfo_001		Start	setUpsL			1.0		

Illustration 15: Configuration of the 'ApcHwInfo'

The system variables made available by the system service can be placed, for example, on the input border or as borderless I/Os in a CFC.

aster data	Cha	It I/O List	Documentation						
R R ;	9 \$	100%	- Al A 100% -	8 🙆	2		OPbAnz0/	DemoPb	GL
CC02 M	ApcB	ocBusUnitDev usUnitHwRev cBusUnitMod	ision - · · · ·			MBZ UIST IIST DIM IAUSA	oPbAnz07		
Search filter		: System va	riables - CaeMana	iger (engin@do	estvi)				n
State	•				▼ Hardware	•			_
lame	*Apc				- Host nam	e *			
EC type	•				Tip	•			
zzy search	Non	100	nax. dist. 📑]0			+1 0	Rese	t
zzy search ound variab	Non	100	nax. dist1	0		pe Unit	+1 0	Rese	t
zzy search ound variab //O type Sys	Non	69 / 2177)	pcBusUnitParentCo	mpatid		NT	Description Parent compatib	ility ID of the bus	
zzy search ound variab I/O type	Non oles (3	69 / 2177) Name CC02_M_A CC02_M_A	pcBusUnitParentCo pcBusUnitParentDe	empatid wiceld		NT NT	Description Parent compatibi Parent device ID	lity ID of the bus of the bus unit	
zzy search ound variab //O type Sys Sys Sys	Non oles (3	69 / 2177) Name CC02_M_A CC02_M_A	pcBusUnitParentCo	empatid wiceld		NT NT	Description Parent compatib	lity ID of the bus of the bus unit	
zzy search ound variab I/O type Sys Sys Sys	Noni ples (3	69 / 2177)	pcBusUnitParentCo pcBusUnitParentDe	empatid wiceld		NT NT	Description Parent compatibi Parent device ID	lity ID of the bus of the bus unit	unit
zzy search ound variab //O type Sys Sys Sys	Noni ples (3	69 / 2177)	pcBusUnitParentCo pcBusUnitParentDe	empatid wiceld		NT NT	Description Parent compatibi Parent device ID	lity ID of the bus of the bus unit	unit
zzy search ound variab VO type Sti Sti Sti se extende Pos 1 2	Non oles (3 S	69 / 2177)	pcBusUnitParentCo pcBusUnitParentDe	empatid wiceld		NT NT	Description Parent compatibi Parent device ID	lity ID of the bus of the bus unit	unit
zzy search ound variab I/O type St St St St St St St St St St St St St	Non oles (3 S	69 / 2177) Name CC02_M_A CC02_M_A CC02_M_A CC02_M_A nformation Information Value	pcBusUnitParentCo pcBusUnitParentDe	mpatid wiceld Cycles	✓ /0 IEC ty ↔ UDI ↔ UDI ↔ UDI	NT NT	Description Parent compatibi Parent device ID	lity ID of the bus of the bus unit	unit
SH SH SH SH SH SH SH SH SH SH SH SH SH S	Non oles (3 S	69 / 2177)	pcBusUnitParentCo pcBusUnitParentDe	impatid wiceld Cycles			Description Parent compatibi Parent device ID	lity ID of the bus of the bus unit	unit

Illustration 16: Accessing system variables in the CFC

1.8.8.2 Module-Independent Variables

Variable	Description
<computer name="">_ApcErrorText</computer>	Variable of the losys type 'STRING' in which errors are written, and also status messages when the option '-showSuccessMessages' is set.
<computer name="">_ApcHwType</computer>	Hardware where the ApcHwInfo is currently running. Only certain platforms (PPC800, APC810, APC910) are supported.
<computer name="">_ApcHwld</computer>	ID of the found hardware
<computer name="">_ApcHwVersion</computer>	Version of the found hardware

D1 System Handbuch

<pre><computer name="">_ApcMtcxVersion</computer></pre>	Firmware version of the found MTCX chip set
<computer name="">_ApcBatteryState</computer>	Buffer battery status (numerical)
<computer name="">_ApcBatteryStateText</computer>	Status of the buffer battery (alphanumeric), e.g. good, bad, unknown, unsupported value

Note:

The newest firmware version must always be present on the MTCX chip set, so that correct values are written to all variables. A firmware update may be necessary with the respective operating system if this is not the case.

At least the firmware version 0.08 is necessary for the detection of a UPS attached to an APC910.

Temperature values which cannot be detected from the system are occupied with the value 'NULL'. These values are eventually filled after a firmware update is carried out.

Some variables are hardware-dependent (PowerTemp and PowerBoardTemp are not available on an APC910). Variables which are not available on a system are set to invalid after they have been created. Variables which cannot be detected because of optional hardware that has not been inserted adopt the value 'NULL' or an empty string, but and are basically valid.

The process variables as of chapter <u>Variables for the system unit</u> are only created when the ApcHwInfo encounters supported hardware (see above).

Variable	Description
<computer name="">_Apc<module id="">DeviceId</module></computer>	Device ID of the module
<computer name="">_Apc<module id="">CompatId</module></computer>	Compatibility ID of the module
<computer name="">_Apc<module id="">VendorId</module></computer>	Vendor ID of the module
<computer name="">_Apc<module id="">HwRevision</module></computer>	Hardware revision of the module
<computer name="">_Apc<module id="">SerialNo</module></computer>	Serial number of the module
<computer name="">_Apc<module id="">ModelNo</module></computer>	Model number of the module
<computer name="">_Apc<module id="">ParentDeviceId</module></computer>	Parent device ID of the module
<computer name="">_Apc<module id="">ParentCompatId</module></computer>	Parent compatibility ID of the module
<computer name="">_Apc<module id="">Temp1</module></computer>	Temperature1 of the module
<computer name="">_Apc<module id="">Temp2</module></computer>	Temperature2 of the module
<pre><computer name="">_Apc<module id="">Temp3</module></computer></pre>	Temperature3 of the module
<pre><computer name="">_Apc<module id="">Temp4</module></computer></pre>	Temperature4 of the module
<computer name="">_Apc<module id="">PowerOnCycles</module></computer>	Power-on cycles of the module
<computer name="">_Apc<module id="">PowerOnHours</module></computer>	Hours of operation of the module

1.8.8.3 Variables for the module

<module ID> represents:

CPU	CPU module
Fan	Fan kit
SlideIn1	Slide-in module1
SlideIn2	Slide-in module2
IF1	Interface module 1
IF2	Interface module 2
DRAM1	Memory module 1
DRAM2	Memory module 2
BusUnit	Bus unit
SystemUnit	State of the APC910 base board
DisplayLink	DisplayLink
Panel <no.></no.>	Panel 0 - 15
Ups	Uninterruptible power supply
Unit	

1.8.8.4 Variables for the CPU Module

Variable	Description
<computer name="">_ApcCpuDeviceId</computer>	Device ID of the CPU module
<computer name="">_ApcCpuCompatId</computer>	Compatibility ID of the CPU module
<computer name="">_ApcCpuVendorId</computer>	Vendor ID of the CPU module
<computer name="">_ApcCpuHwRevision</computer>	Hardware revision of the CPU module
<computer name="">_ApcCpuSerialNo</computer>	Serial number of the CPU module
<computer name="">_ApcCpuModelNo</computer>	Model number of the CPU module
<computer name="">_ApcCpuParentDeviceId</computer>	Parent device ID of the CPU module
<computer name="">_ApcCpuParentCompatId</computer>	Parent compatibility ID of the CPU module
<computer name="">_ApcCpuTemp1</computer>	Temperature1 of the CPU module
<computer name="">_ApcCpuTemp2</computer>	Temperature2 of the CPU module
<computer name="">_ApcCpuTemp3</computer>	Temperature3 of the CPU module
<computer name="">_ApcCpuTemp4</computer>	Temperature4 of the CPU module

1.8.8.5 Variables for the Fan Kit (Optional)

Variable	Description
<computer name="">_ApcFanDeviceId</computer>	Device ID of the fan kit
<computer name="">_ApcFanCompatId</computer>	Compatibility ID of the fan kit
<computer name="">_ApcFanVendorId</computer>	Vendor ID of the fan kit
<computer name="">_ApcFanHwRevision</computer>	Hardware revision of the fan kit
<computer name="">_ApcFanSerialNo</computer>	Serial number of the fan kit
<computer name="">_ApcFanModelNo</computer>	Model number of the fan kit
<computer name="">_ApcFanParentDeviceId</computer>	Parent device ID of the fan kit
<computer name="">_ApcFanParentCompatId</computer>	Parent compatibility ID of the fan kit
<computer name="">_ApcFanSpeed1</computer>	Speed1 of the fan kit
<computer name="">_ApcFanSpeed2</computer>	Speed2 of the fan kit
<computer name="">_ApcFanSpeed3</computer>	Speed3 of the fan kit
<computer name="">_ApcFanSpeed4</computer>	Speed4 of the fan kit
<computer name="">_ApcFanPowerOnCycles</computer>	Power-on cycles of the fan kit
<computer name="">_ApcFanPowerOnHours</computer>	Hours of operation of the fan kit

1.8.8.6 Variables for the Slide-In Module1 (Optional)

Variable	Description
<computer name="">_ApcSlideIn1DeviceId</computer>	Device ID of the slide-in module1
<computer name="">_ApcSlideIn1CompatId</computer>	Compatibility ID of the slide-in module1
<computer name="">_ApcSlideIn1VendorId</computer>	Vendor ID of the slide-in module1
<computer name="">_ApcSlideIn1HwRevision</computer>	Hardware Revision of the slide-in module1
<computer name="">_ApcSlideIn1SerialNo</computer>	Serial number of the slide-in module1
<computer name="">_ApcSlideIn1ModeINo</computer>	Model number of the slide-in module1
<computer name="">_ApcSlideIn1ParentDeviceId</computer>	Parent device ID of the slide-in module1
<computer name="">_ApcSlideIn1ParentCompatId</computer>	Parent compatibility ID of the slide-in module1
<computer name="">_ApcSlideIn1Temp</computer>	Temperature of the slide-in module1

1.8.8.7 Variables for the Slide-In Module2 (Optional)

Variable	Description
<computer name="">_ApcSlideIn2DeviceId</computer>	Device ID of the slide-in module2
<computer name="">_ApcSlideIn2CompatId</computer>	Compatibility ID of the slide-in module2
<computer name="">_ApcSlideIn2VendorId</computer>	Vendor ID of the slide-in module2
<computer name="">_ApcSlideIn2HwRevision</computer>	Hardware Revision of the slide-in module2
<computer name="">_ApcSlideIn2SerialNo</computer>	Serial number of the slide-in module2
<computer name="">_ApcSlideIn2ModeINo</computer>	Model number of the slide-in module2
<computer name="">_ApcSlideIn2ParentDeviceId</computer>	Parent device ID of the slide-in module2
<computer name="">_ApcSlideIn2ParentCompatId</computer>	Parent compatibility ID of the slide-in module2
<computer name="">_ApcSlideIn2Temp</computer>	Temperature of the slide-in module2

1.8.8.8 Variables of the Interface Modules (Optional)

Variable	Description
<computer name="">_ApcIF1DeviceId</computer>	Device ID of the interface module1
<computer name="">_ApcIF1CompatId</computer>	Compatibility ID of the interface module1
<computer name="">_ApcIF1VendorId</computer>	Vendor ID of the interface module1
<computer name="">_ApcIF1HwRevision</computer>	Hardware Revision of the interface module1
<computer name="">_ApcIF1SerialNo</computer>	Serial number of the interface module1
<computer name="">_ApcIF1ModelNo</computer>	Model number of the interface module1
<computer name="">_ApclF1ParentDeviceId</computer>	Parent device ID of the interface module1
<computer name="">_ApcIF1ParentCompatId</computer>	Parent compatibility ID of the interface module1
<computer name="">_ApcIF1Temp</computer>	Temperature of the interface module1
<computer name="">_ApcIF1PowerOnCycles</computer>	Power-on cycles of the interface module1
<computer name="">_ApcIF1PowerOnHours</computer>	Hours of operation of the interface module1

Variable	Description
<computer name="">_ApcIF2DeviceId</computer>	Device ID of the interface module2
<computer name="">_ApcIF2CompatId</computer>	Compatibility ID of the interface module2
<computer name="">_ApcIF2VendorId</computer>	Vendor ID of the interface module2
<computer name="">_ApcIF2HwRevision</computer>	Hardware Revision of the interface module2
<computer name="">_ApcIF2SerialNo</computer>	Serial number of the interface module2
<computer name="">_ApcIF2ModeINo</computer>	Model number of the interface module2
<computer name="">_ApcIF2ParentDeviceId</computer>	Parent device ID of the interface module2
<computer name="">_ApcIF2ParentCompatId</computer>	Parent compatibility ID of the interface module2
<computer name="">_ApcIF2Temp</computer>	Temperature of the interface module1
<computer name="">_ApcIF2PowerOnCycles</computer>	Power-on cycles of the interface module1
<computer name="">_ApcIF2PowerOnHours</computer>	Hours of operation of the interface module1

1.8.8.9 Variables for memory modules 1 and 2

Variable	Description
<computer name="">_ApcDRAM1DeviceId</computer>	Device ID of the memory module1
<computer name="">_ApcDRAM1CompatId</computer>	Compatibility ID of the memory module1
<computer name="">_ApcDRAM1VendorId</computer>	Vendor ID of the memory module1
<computer name="">_ApcDRAM1HwRevision</computer>	Hardware Revision of the memory module1
<computer name="">_ApcDRAM1SerialNo</computer>	Serial number of the memory module1
<computer name="">_ApcDRAM1ModelNo</computer>	Serial number of the memory module1
<computer name="">_ApcDRAM1ParentDeviceId</computer>	Parent device ID of the memory module1
<computer name="">_ApcDRAM1ParentCompatId</computer>	Parent compatibility ID of the memory module1

The memory module 2 is optional.

Variable	Description
<computer name="">_ApcDRAM2DeviceId</computer>	Device ID of the memory module2
<computer name="">_ApcDRAM2CompatId</computer>	Compatibility ID of the memory module2
<computer name="">_ApcDRAM2VendorId</computer>	Vendor ID of the memory module2
<computer name="">_ApcDRAM2HwRevision</computer>	Hardware Revision of the memory module2
<computer name="">_ApcDRAM2SerialNo</computer>	Serial number of the memory module2
<computer name="">_ApcDRAM2ModelNo</computer>	Model number of the memory module2
<computer name="">_ApcDRAM2ParentDeviceId</computer>	Parent device ID of the memory module2
<pre><computer name="">_ApcDRAM2ParentCompatId</computer></pre>	Parent compatibility ID of the memory module2

1.8.8.10 Variables for the bus unit

Variable	Description
<computer name="">_ApcBusUnitDeviceId</computer>	Device ID of the bus unit
<computer name="">_ApcBusUnitCompatId</computer>	Compatibility ID of the bus unit
<computer name="">_ApcBusUnitVendorId</computer>	Vendor ID of the bus unit
<computer name="">_ApcBusUnitHwRevision</computer>	Hardware revision of the bus unit

<computer name="">_ApcBusUnitSerialNo</computer>	Serial number of the bus unit
<computer name="">_ApcBusUnitModelNo</computer>	Model number of the bus unit
<computer name="">_ApcBusUnitParentDeviceId</computer>	Parent device ID of the bus unit
<computer name="">_ApcBusUnitParentCompatId</computer>	Parent compatibility ID of the bus unit
<computer name="">_ApcBusUnitPowerOnCycles</computer>	Power-on cycles of the bus unit
<computer name="">_ApcBusUnitPowerOnHours</computer>	Hours of operation of the bus unit

1.8.8.11 Variables for the System Unit

Variable	Description
<computer name="">_ApcSystemUnitDeviceId</computer>	Device ID of the base board
<computer name="">_ApcSystemUnitCompatId</computer>	Compatibility ID of the base board
<computer name="">_ApcSystemUnitVendorId</computer>	Vendor ID of the base board
<computer name="">_ApcSystemUnitHwRevision</computer>	Hardware revision of the base board
<computer name="">_ApcSystemUnitSerialNo</computer>	Serial number of the base board
<computer name="">_ApcSystemUnitModelNo</computer>	Model number of the base board
<computer name="">_ApcSystemUnitParentDeviceId</computer>	Parent device ID of the base board
<computer name="">_ApcSystemUnitParentCompatId</computer>	Parent compatibility ID of the base board
<computer name="">_ApcSystemUnitTemp1</computer>	Temperature1 of the base board
<computer name="">_ApcSystemUnitTemp2</computer>	Temperature2 of the base board
<pre><computer name="">_ApcSystemUnitTemp3</computer></pre>	Temperature3 of the base board
<computer name="">_ApcSystemUnitTemp4</computer>	Temperature4 of the base board
<computer name="">_ApcSystemUnitPowerOnCycles</computer>	Power-on cycles of the base board
<computer name="">_ApcSystemUnitPowerOnHours</computer>	Hours of operation of the base board

1.8.8.12 Variables for the DisplayLink

Variable	Description
<computer name="">_ApcDisplayLinkDeviceId</computer>	Device ID of the DisplayLink
<computer name="">_ApcDisplayLinkCompatId</computer>	Compatibility ID of the DisplayLink
<computer name="">_ApcDisplayLinkVendorId</computer>	Vendor ID of the DisplayLink
<computer name="">_ApcDisplayLinkHwRevision</computer>	Hardware revision of the DisplayLink
<computer name="">_ApcDisplayLinkSerialNo</computer>	Serial number of the DisplayLink
<computer name="">_ApcDisplayLinkModelNo</computer>	Model number of the DisplayLink
<computer name="">_ApcDisplayLinkParentDeviceId</computer>	Parent device ID of the DisplayLink
<computer name="">_ApcDisplayLinkParentCompatId</computer>	Parent compatibility ID of the DisplayLink
<computer name="">_ApcDisplayLinkPowerOnCycles</computer>	Power-on cycles of the DisplayLink
<computer name="">_ApcDisplayLinkPowerOnHours</computer>	Hours of operation of the DisplayLink
<computer name="">_ApcDisplayLinkTemp1</computer>	Temperature1 of the DisplayLink
<pre><computer name="">_ApcDisplayLinkTemp2</computer></pre>	Temperature2 of the DisplayLink
<pre><computer name="">_ApcDisplayLinkTemp3</computer></pre>	Temperature3 of the DisplayLink
<pre><computer name="">_ApcDisplayLinkTemp4</computer></pre>	Temperature4 of the DisplayLink

1.8.8.13 Variables for the panels 0 to 15

Up to 16 panels that have the same variable set are supported (depending on the hardware).

Only the variables for the first panel are described in the following. The variable names for the other panels are adjusted respectively.

Variable	Description
<computer name="">_ApcPanel0Found</computer>	Panel0 found
<computer name="">_ApcPanel0DeviceId</computer>	Device ID of the Panel0
<computer name="">_ApcPanel0CompatId</computer>	Compatibility ID of the Panel0
<computer name="">_ApcPanel0VendorId</computer>	Vendor ID of the Panel0
<computer name="">_ApcPanel0HwRevision</computer>	Hardware revision of the Panel0
<computer name="">_ApcPanel0SerialNo</computer>	Serial number of the Panel0
<computer name="">_ApcPanel0ModelNo</computer>	Model number of the Panel0
<computer name="">_ApcPanel0Linked</computer>	Panel0 connected
<computer name="">_ApcPanel0Locked</computer>	Panel0 locked
<computer name="">_ApcPanel0ScanCodesLocked</computer>	Scan codes locked
<computer name="">_ApcPanel0Temp</computer>	Temperature of the Panel0

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<computer name="">_ApcPanel0Speed</computer>	Speed of the panel fan
<computer name="">_ApcPanel0BacklightOnCycles</computer>	Power-on cycles of the Panel0
<computer name="">_ApcPanel0BacklightOnHours</computer>	Hours of operation of the Panel0

1.8.8.14 Variables for the PPC800/APC810 power supply

Variable	Description
<computer name="">_ApcPowerTemp</computer>	Power supply temperature
<computer name="">_ApcPowerBoardTemp</computer>	Temperature of the power supply board

1.8.8.15 Variables for the uninterrupted power supply

Variable	Description	
<computer name="">_ApcUpsDeviceId</computer>	Device ID of the UPS	
<computer name="">_ApcUpsCompatId</computer>	Compatibility ID of the UPS	
<computer name="">_ApcUpsVendorId</computer>	Vendor ID of the UPS	
<computer name="">_ApcUpsHwRevision</computer>	Hardware revision of the UPS	
<computer name="">_ApcUpsSerialNo</computer>	Serial number of the UPS	
<computer name="">_ApcUpsModelNo</computer>	Model number of the UPS	
<computer name="">_ApcUpsDetected</computer>	UPS detected	
<computer name="">_ApcUpsLinked</computer>	UPS connected	
<computer name="">_ApcUpsTemp</computer>	Temperature of the UPS	
<computer name="">_ApcUpsBatCurrent</computer>	Read UPS battery current	
<computer name="">_ApcUpsBatVoltage</computer>	Read UPS battery voltage	
<computer name="">_ApcUpsStatusFlags</computer>	Read UPS status flags	

1.8.8.16 Specialties for the PPC800 / APC810

The following variables are mapped to other areas for the PPC800 and APC810:

Board -> SystemUnit

BoardIo -> BusUnit

EthBoard -> IF Option 1

EthController -> IF Option 2

1.9 InaConnect

You can use the *InaConnect* program to connect to a controller, load modules to it and initialize it, etc. without having to start a Runtime system. If one of the **InaDriver** packages is installed on your Runtime system or Engineering system, then this program is present. The program can be used two ways:



As a command shell (ideal for diagnostics and error analysis).

Directly executing commands (ideal for using in scripts or loading modules to the controller).

The following image shows the options and starting parameters provided by this program.

engin@tfcc242:~ - Befehlsfenster -		EX
Sitzung Bearbeiten Ansicht Le		
InaConnect (INA Managemen		
Options -fifoname FILE -medium MEDIUM	Purpose : write data to fifofile : choose medium (serialPort ; Ethernet ; Profibus)	
"Ethernet" needs node paramete -node NODE	: ers or ip parameter : : set destination node number to NODE (0 <= NODE <= 255 for (0 <= NODE <= 99 for	
-bcast BCAST_ADDR -ip DEST_IP_ADDR -mynode MYNODE -socket SOCKET	: set broadcast ip address	
"Profibus" -pbAddr PB_ADDR -pbBoard BDARD -pbLsap LSAP -softing	: : set destination pb address to PB_ADDR : use FROFIBUS board BOARD (0 <= BOARD < 3) : use PROFIBUS sap LSAP, optional : use Softing's PROFIboard, default: BuR	
"serialPort" -comport COMPORT	: : use comport COMPORT, must be COM1 COMx or USB1 USBx	
-route ROUTE -setRT RTVal	: set routing info to ROUTE, default: "" : set ina parameter RT to RTVal, default = 165	
"Functions"	:	
-download FILE -burn	: download file FILE : burn downloaded file	•
Befehlsfenster		Ă

Illustration 17: InaConnect options after running with -help

1.9.1 *InaConnect* in the command shell

The InaConnect options show that the connection to a controller can be established in three ways: *Profibus, Ethernet,* and *serial.* How the connections are established over the assorted media is explained in the following sections. We will now explain which functions can be executed if the connection is established.

For information about how to establish the connection over various media, please refer to the sections that are listed in the table below.

- Connecting with Profibus
- Connecting with Ethernet
 - Serial connection

To make sure that there is a connection to a controller (i.e. incorrect connection parameters were not entered), you can query the status of the connection with "v 3 = debuglevel 3".

The following option or command can be set for all connections:

Option	Option input	Object input description
-setRT	VAL	Timeout for the response telegram. 165ms if not specified.

The following actions or commands can now be carried out:

Action / Command	Short	Description
connect	С	Establishes the connection to the controller using the parameters entered when run. Must be called before all other actions.
disconnect	d	Breaks the connection.
status	S	Displays the current status of the connection: CONN_establish_connection = Establishing CONN_stable_connection = Established CONN_lost_connection = Lost CONN_disconnecting = Disconnecting CONN_disconnected = disconnected
options	0	Options for an additional connection: 1 = Ethernet, 2 = Profibus, 3 = Serial
put	p	Loads a file to the controller. The file and its path are specified after the p and are separated with a space. The mode then follows another space. 2 = Load to User RAM (default if no mode specified), 3 = Load to User flash (burns it).
get	g	Loads a file from the controller. The module and filename must be specified. The file is then located in the directory where <i>InaConnect</i> was started.
reset	r	Triggers a reset on the selected controller. The mode follows the <i>r</i> . TOTAL, DIAGNOSE or NORMAL.
logbook	1	Reads the error logbook. The entries must then be specified (maximum 39).
info	i	Reads CPU information (software version, type, etc.).
meminfo	m	Reads information about the memory.
listmodule	lm	Lists the modules. <i>Im</i> * lists all modules in the CPU. <i>Im</i> < <i>ModuleName></i> shows information about the module.
delmodule	dm	Deletes the specified module on the controller.
pvlist	pl	Lists the global PVs on the controller. <i>pl</i> * lists all PVs. By specifying the start index and the range, the search can be shortened. The PV start index of a task can be determined with the <i>Im</i> < <i>Task</i> > command.
forcelist	fl	Lists the PVs for forcing. The task class is also output.
forceon	fn	Forces a PV to a whole-number value by specifying its address and task class.
forceoff	ff	Resets the forcing for a PV (address, task class) or all PVs with ALL.
gettime	gt	Outputs the date and time of the CPU and computer.
settime	st	Applies the computer date and time to the controller.
clearmem	cm	Deletes the contents of the memory range (warning: all data is deleted). The controller must be in diagnostics mode (<i>r DIAGNOSE</i>). The command is only possible when using a serial connection. Once deleted, a total initialization must be performed to reset the controller (<i>r TOTAL</i>).

Action / Command	Short	Description
tkinfo	tki	Returns the status of the individual task classes on the connected controller with name, number, and status (STOP, RUNNING, IDLE).
tkresume	tkr	Starts a task class, i.e. if a task class was stopped with $tks < TC$ >, then it is restarted with $tkr < TC$ >. This means that all tasks in this task class are resumed.
tksuspend	tks	Stops the task class <i>TC</i> . All tasks in this task class are stopped and can be restarted using <i>tkr</i> <tc>.</tc>
taskresume	tr	Starts a specific task that is currently stopped. The task name must be specified.
tasksuspend	ts	Stops a specific task that has been started and is located on the CPU. The name must be specified.
quit	q	Terminates the connection and exits the program.
verbose	v	Sets the debug level (1: Error ; 2: Transactions ; 4: data).
trace	t	Indicates the debug level.
?	?	Displays this list in shortened form.

1.9.1.1 Connecting with Profibus

The starting options for the connection come after the program name (InaConnect).

Option	Option input	Object input description
-medium	Profibus	Selects the Profibus connection.
-softing		A Softing board is implemented in the computer. A Profibus card from B&R is integrated by default (without this specification).
-pbAddr	ADDR	Specifies the controller's station address.
-pbBoard	NR	Number of the Profibus card in the computer (0-2). 0 is used if nothing is specified.
-pbLsap	LSAP	A special LSAP can optionally be used instead of the station address as well.

Example:

InaConnect -- medium Profibus -- pbAddr ADDR -- pbBoard NR

1.9.1.2 Connection with Ethernet

The starting options for the connection come after the program name (*InaConnect*). For the connection to be set up properly, the controller must be configured accordingly.

Option	Option input	Object input description
--------	-----------------	--------------------------

Option	Option input	Object input description
-medium	Ethernet	Selects Ethernet with TCP/IP.
-socket	NR	Port for communicating with the partner station (controller) given in HEX format. 0x2b97 is used if no port is specified.
-ip	ADDR	The IP address of the controller.
-node	NODE	Node number of the controller. The IP address then does not need to be specified. The controller reports and returns the IP address.
-mynode	NODE	Specifies the source node number.
-bcast	BCAST	Broadcast address when working with node numbers and the broadcast address is not 255.255.255.255.

Example 1:

InaConnect -medium Ethernet -ip ADDR

Example 2:

InaConnect -medium Ethernet -node NODE -mynode NODE

If the InaDriver is already running, use the starting options as follows: InaConnect -medium Ethernet -mynode NODE

1.9.1.3 Serial connection

The starting options for the connection come after the program name (*InaConnect*). For the connection to be set up properly, the controller must be configured accordingly.

Option	Option input	Object input description
-medium	serialPort	Selects the serial connection.
-comport	СОМ	Specifies the port (ttyS0 to ttyS3 depending on how the computer is equipped, e.g. COM1 to COM4 (DOS/Windows)). The remaining parameters are configured as follows: Baud rate = 57600, Parity = EVEN, Timeout=14ms
-route	ROUTE	Information for routing.

Example:

InaConnect -medium serialPort -comport COM



If the controller that you are trying to connect to has parameters other than those specified under -comport, then this needs to be configured in the command shell. Command = o 3.

If the controller should be configured differently, the following parameters for the serial connection can be additionally changed and saved after entering the "*o* 3" command in the command shell:

Parameter	Number	Description
comBD	4	Specifies a different baud rate. The following values are possible: 110, 300, 600, 1200, 2400, 3600, 4800, 9600, 19200, 38400 ,57600 ,115200.
comPa	5	Parity (0 =NO, 1=ODD , 2=EVEN).
comIT	6	Timeout (0 to 60000 ms).

1.9.1.4 InaConnect for routing

If the corresponding controllers should be connected over a network, you can use *InaConnect* to route to each controller or reach each connected device to request or send data.

The following input sets up the connection to the first device and routes you to the point that you want to reach. Example with Ethernet and TCP/IP:

InaConnect -medium Ethernet -ip <IP Address> -node <Node Number>

The option -route is appended to this line to add the route. To specify all of the different options at this point would simply be too much. For this reason, we'll just illustrate one example.

The following device configuration is being used; the device at position 5 should be accessed over the CAN bus.

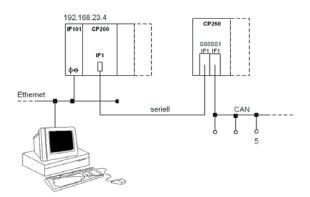


Illustration 18: Routing with InaConnect

Establish a direct connection with the controller (IP address 192.168.23.4): InaConnect -medium Ethernet -ip 192.168.2.34 -node 3

Routing to device 5 is handled with the following options:

-route CP/SL0/SS0/IF1/SL0/SS1/IF1.5

Routing parameter	Description
CP/	The CPU is addressed.
SL0/SS0/IF1/	Accesses the serial interface IF1 in slot 0, sub-slot 0.
	Since a serial connection should be used to connect to the CPU (SS0/IF1), it isn't specified.
SL0/SS1/IF1.5	From the second CPU, routing continues over slot 0 and sub-slot 1 to IF1 (CAN bus interface) and thereon device 5.

1.9.2 InaConnect as a command (call)

As mentioned at the beginning of the InaConnect section, a large part of the command scope can be used from the command line to write a script or send individual commands to the controller.

This chapter will no longer go into the medium being used (-medium) and the remaining parameters needed for it. This information can be obtained from the following sections:

\checkmark	Connecting with Profibus	
\checkmark	Connecting with Ethernet	
\checkmark	Serial connection	

The following table describes the options and the corresponding parameters:

Option	Specification	Description
- download	FILE	Specifies the file (with path) to be loaded to the controller.
-burn		"Burns" the file to the controller.
-upload -file	Module FILE	These options belong together. The module that should be loaded from the controller and <i>FILE=Name</i> with path, how the module should be saved on the computer.
-reset	MODE	Triggers a reset on the selected controller. The following specifications can be given for MODE: TOTAL, DIAGNOSE or NORMAL.
-logbook	NUM	Reads the error logbook. NUM = Specifies the number of entries (maximum 39).
-cpuinfo		Reads CPU information (software version, type, etc.).
-meminfo		Reads information about the memory.
- dom_info	MODULE	Retrieves information about the module (MODULE).
-delete	MODULE	Deletes the specified module on the controller.
-gettime		Outputs the date and time of the CPU as well as the computer.
-settime		Applies the computer date and time to the controller.
-d	LEVEL	Sets the debug level (1: Error ; 2: Transactions ; 4: data).

2 Description about the UTF8StringAPI

2.1 Motivation

When using ASCII character set, the number of Bytes exactly corresponds to the number of characters in the string. There can be a difference in the number of Bytes and the number of characters in a string with the usage of Unicode and the connected UTF-8 coding.

As a result, using the standard C library functions to process strings can lead to errors.

2.2 From ASCII to UTF8

ASCII (*American Standard Code for Information Interchange*) is a 7 bit character code, which was published as standard in 1967.

Each character corresponds to a bit pattern of 7 bits. There are $2^7 = 128$ different bit patterns, as each bit can adopt two values. These bit patterns can also be interpreted as whole numbers 0-127 (hexadecimal 00-7F).

Apart from 95 printable characters the ASCII code also defines 33 non-printable characters.

The 95 printable characters contain all of the letters of the Latin alphabet in capital and small case letters, the numbers 0 to 9, as well as various punctuations.

The 33 non-printable characters conform to the control codes for peripheral equipment (printer, data exchange, etc.).

In the following years there were different attempts to display the missing characters. Platform independent 8 bit expansions of the ASCII evolved (e.g. codepage 437 = MSDOS).

In the new standard ISO8859 were 15 defined variations (ISO 8859-1 = Latin-1 west European, ISO8859-2 = Latin-2 east European, etc..., ISO8859-15 = Latin-9 west European with several French punctuations and the Euro symbol that were missing from Latin-1) of 8 bit character codes for the different language regions. In Windows the Windows-1252 character code is used that is based on the ISO 8859-1.

In order to display all of the possible letters, special characters, and characters of humankind in one character code, a lot more than 8 bits are needed.

The Unicode character code reserves 32 bits for each character. To reduce the memory needs and remain compatible with ASCII and ISO 8859, the Unicode character UTF8 has been used for the coding.

UTF8 (8 bit Unicode Transformation format) is the most widely spread coding for Unicode characters. Thereby, each Unicode character is allocated a specially coded Byte chain of variable length. UTF8 supports up to four Bytes on which, as by all UTF formats, it is possible to display all 1.114.112 Unicode characters.

A UTF-8 character is composed of one, two, three or four Bytes. All standard ASCII characters are displayed in one Byte, most of the characters in the divers ISO 8859 coding in two Bytes,

some characters of the ISO 8859 coding (e.g. the Euro character '€) in three Bytes, characters from non-European languages in maximum four bytes.

These Byte sequences belong together and are in any case not allowed to be torn apart by operations within a computer program. This can happen when using the functions of the standard C library for the language 'C'!

The standard C library functions for editing character strings (*strlen, strcpy, strcpy, strcat, strncat, ...*) presume an ASCII character set. The do not interpret characters, and are therefore Byte orientated!

2.3 UTF8 Coding

The difference between "character orientated" and "Byte orientated" is explained with the following example [1]:

The character "A" has the following bit pattern in not only ASCII, ISO8859, etc., but also in UTF8:

0	1	0	0	0	0	0	1
---	---	---	---	---	---	---	---

Thus 1 Byte is needed for the character. If you use a function from the standard C library to copy this character everything proceeds well.

The character "Ü" has the following bit pattern in memory (display with 8 bit limit):

1 1 0 0 0 0 1 1 1 0 0 1 1 1 0 0												r/				
	1	1	0	0	0	0	1	1	1	0	0	1	1	1	0	0

Start Byte

1. Following Byte

L

The Euro character "€" has the following bit pattern (display with 8 bit limits):

1	1	1	0	0	0	1	0	1	0	0	0	0	0	1	0	1	0	1	0	1	1	0	0
												<u> </u>											

Start Byte

1. Following Byte 2. Following Byte

Now the character string "Aۆ" should be looked at:

char $buf[32] = \{0\};$

char *str = "Aۆ";

int len = strlen(str); // returns 6 as result, as 'str' UTF-8 coded is 6 Bytes long!

strncpy(buf, str, 3); // Copies 'A' and the first two Bytes of "€" to "buf"

// The result is a non-legal UTF-8 character string!

strncpy(buf, &str[2], 3); // Copies the 1st. and 2nd. following Bytes of the "€" and the start Byte of the "Ü"

// to "buf". The result is a non-legal UTF-8 character string!

I.e. when a character string contains UTF coded multi-Byte characters the functions of the standard C library cannot be used without further intervention.

2.4 Function description of the STRING data type

B&R offers functions for safe processing of character strings, which contain UTF8 characters.

These functions' API is described here. The functions are implemented in the **APROL** PccStd library, and can therefore be used everywhere in **APROL** by including the "AprolStringUtf8.h" header and linking the "libPccStd" library.

The blocks for processing character strings in the "IEC61131_3" library, in the "StringFunctions" group, have been expanded by one version.



The functions can be used without any further bother, i.e. incorporating the "AprolStringUtf8.h" header, in any function block.

Error handling:

The API functions that are offer have a pointer to a variable of the type "int" as the last parameter. Each API function must have the respective initialized pointer passed over to it, otherwise **no** processing takes place. A code example can be found within each function description from which it is evident how one uses this pointer. In contrast to the code examples, the error code must always be checked, not the value, when using the API functions.

Error code:	Meaning:
UTF8_NOERRORFLAG	error is a NULL pointer
UTF8_NOERROR	No error.
UTF8_NULLSRC	A NULL pointer for src was assigned.
UTF8_NULLSTR	A NULL pointer for ins / rep / toFind was assigned.
UTF8_NULLDEST	A NULL pointer for dest was assigned.
UTF8_START	The value for start was assigned with smaller than 1.
UTF8_LEN	The value for len was assigned with smaller than 0.
UTF8_HIGHSTART	The value for start is larger than the number of characters in src.
UTF8_HIGHLEN	The value for len is larger than the number of characters in src.
UTF8_HIGHSTARTLEN	The value of the sum start + len is larger than the number of characters in src.
UTF8_MAXSTARTLEN	The value of the sum start + len is larger than the maximum string length.
UTF8_WIDTH	The number a character Bytes could not be detected.
UTF8_STARTFOLLOW	The value from start does not lie immediately behind the last character position in src.

Following error codes are assigned by the API:

The following functions are available:

2.4.1 UTF8_getAPIVersion

Function declaration:	const char* UTF8_getAPIVersion(void);
Function description:	Delivers the version number of the UTF8 string API. The function delivers a pointer to a static version string, which is maximally 7 Bytes large, including '\0'.
	<pre>Code fragment: #include <aprolstringutf8.h> char Version[7] = {0}; strcpy(Version, UTF8_getAPIVersion()); printf("UTF8 String API Version: %s\n", Version);</aprolstringutf8.h></pre>
	Output

Output:

"UTF8 String API Version: V1.0"

Return value:	Value:	Meaning:
	Pointer on static version string	Version string of the UTF8 API functions. The function delivers the string if it corresponds to the version of API 1.0. V1.0

2.4.2 UTF8_LengthInCharacters

Function declaration:	int UTF8_LengthInCharacters(const char *src, int *error);			
Function description:	This function delivers the number of characters in the transferred character string, without a final '\0'.			
	Example: The number of characters "The apple does not fall fa should be detected. The f	ar from the tree!"	-	
	<pre>Code fragment: #include <aprolstringutf8 int error= 0: char *quelle = "The apple int len = UTF8_LengthIn if(error) { /* Error handling * }</aprolstringutf8 </pre>	does not fall far Characters(quelle,		
Parameters:	Name:	Туре:	Description:	
	src	const IN char*	Character string for which the number of characters should	

Function declaration:	int UTF8_LengthInCharacters(const char *src, int *error);				
	error	int*	OUT	The function's error code is assigned to this parameter. ATTENTION: This concerns a pointer that must point to a variable of the type "int"!	
Error codes:	Value:	Meaning:			
	UTF8_NOERROR	No erro	r.		
	UTF8_NULLSRC	src is a NULL pointer.			
	UTF8_WIDTH	The number a character Bytes could not be detected.			
Return value:	Value:	Meanin	g:		
	UTF8_NOERRORFLAG	error is	a NULL p	pointer	
	>= 0		nber of cl er string.	haracters in the transferred	

2.4.3 UTF8_LengthInBytes

Function declaration:	int UTF8_LengthInBytes	s(const char *s	rc, int *error);
Function description:	This function delivers the number of Bytes in the transferred character string. without final '\0'. Example: The number of bytes in the character string "The apple does not fall far from the tree!" should be detected. The function delivers the value 38.		
	<pre>Code fragment: #include <aprolstringutf8 int error = 0: char *quelle = "The apple int bytes = UTF8_Length if(error) { /* Error handling * }</aprolstringutf8 </pre>	does not fall fa nInBytes(quelle,	
Parameters:	Name:	Туре:	Description:
	src	const IN char*	Character string for which the number of characters should be

Function declaration:	int UTF8_LengthInBytes(const char *src, int *error);			
	error	int*	OUT	The function's error code is assigned to this parameter.
				Attention: This concerns a pointer that must point to a variable of the type "int"!
Error codes:	Value:	Meani	ng:	
	UTF8_NOERROR	No erre	or.	
	UTF8_NULLSRC	src is a	a NULL p	pointer.
Return value:	Value:	Meani	ng:	
	UTF8_NOERRORFLAG	error is	s a NULL	_ pointer
	>= 0	The nu string.	umber of	Bytes in the transferred character

2.4.4 UTF8_Copy

Function declaration:	char* UTF8_Copy(char *dest, size_t n, const char *src, int *error);
Function description:	This function copies a character string in a transferred Byte array. Copies the character string contained in src to dest, and delivers a pointer to dest. The character string in the target Byte array is always terminated with '\0'. Example: The character string "The apple does not fall far from the tree!" should be copied.
	<pre>Code fragment: #include <aprolstringutf8.h> int error = 0; char *quelle = "The apple does not fall far from the tree!"; char ziel[65] = {0}; UTF8_Copy(ziel, 39, quelle, &error); if(error) { /* Error handling */ }</aprolstringutf8.h></pre>

If n exceeds the maximum string length, the resulting character string is cut corresponding to the last legal UTF8 character. The maximal string length on a computer, as well as the control computer, is 65 Bytes.

Function declaration:	char* UTF8_Copy(char *dest, size_t n, const char *src, int *error);				
	It must definitely be e size, including '\0'! If t errors.				
Parameters:	Name:	Туре:		Description:	
	dest	char *	OUT	Target for the copy of the transferred character string.	
	n	size_t	IN	Number of Bytes of the target Byte array. More than n Bytes are not copied.	
	src	const char*	IN	Character string that should be copied.	
	error	int*	OUT	The function's error code is assigned to this parameter. ATTENTION: This concerns a pointer that must point to a variable of the type "int"!	
Error codes:	Value:	Meaning:			
	UTF8_NOERROR	No error.			
	UTF8_NULLSRC	src is a NULL	pointer.		
	UTF8_NULLDEST	dest is a NUL	L pointer.		
	UTF8_WIDTH	Number of a detected.	character's Bytes	could not be	
Return value:	Value:	Meaning:			
	ZERO	An error occu error is a NUI -> see error o	•	ssing, or	
	Pointer to dest	The character string was copied			

2.4.5 UTF8_Delete

Function declaration:	char* UTF8_Delete(const ch	nar *src, i	int start, int len, int *error);
Function description:	This function deletes a part string from the transferred character string. From the character string transferred from src, len characters are deleted from the position start, and a pointer to the resulting character string is returned. The returned pointer points to a static Byte array in which the resulting character string is stored. The size of the static Byte array is 65 bytes, including final '\0'.			om src, len characters are deleted the resulting character string is a static Byte array in which the
		fall far fro ling follow transmits	/ing white the start	e!" spaces should be deleted. For this position 17, and 6 for the number
	Code fragment:			
	<pre>#include <aprolstring error="0;</pre" int=""></aprolstring></pre>	JUtf8.h>		
	char *quelle = "The ag		not fall	far from the tree!";
	<pre>char ziel[65] = {0}; char *temp = UTF8_Del</pre>		le, 17, 6.	<pre>&error);</pre>
	if(error)		, .,	
	<pre>{ /* Error handling */ } else { strcpy(ziel, temp); } Output:</pre>			
	The result is the character string: "The apple does not fall far fro tree!"			apple does not fall far from the
	It is also possible to o without having knowledge	edge abo be at lea	out the nu	aracters as of the character start mber of characters in src. For this, in length than the rest of the
Parameters:	Name:	Туре:		Description:
	SrC	const char*	IN	Contains the character string to be edited.
	start	int	IN	States the start position in the character string, starting with 1 as of the first character.
	len	int	IN	States how many characters should be deleted starting from

Function declaration:	char* UTF8_Delete(const cł	nar *src,	int start, int len, int *error);
	error	int*	OUT	The function's error code is assigned to this parameter.
				ATTENTION:
				This concerns a pointer that must point to a variable of the type "int"!
Error codes:	Value:	Meanin	ig:	
	UTF8_NOERROR	No erro	or.	
	UTF8_START	The trai	nsferred v	value for start is smaller than 1.
	UTF8_LEN	The trai	nsferred	value for len is smaller than 0.
	UTF8_HIGHSTART			value for start is larger than the cters in src.
	UTF8_WIDTH	Numbe detecte		racter's Bytes could not be
Return value:	Value:	Meanin	ig:	
	ZERO		r occurre a NULL p	d during processing, or pointer.
	Pointer on the copy of the transferred character string in src.			d during processing. as been set respectively.
	Pointer to the resulting character string			s called with valid values, and no during the processing.

2.4.6 UTF8_Find

Function declaration:	int UTF8_Find(const char *src, const char *toFind, int *error);
Function description:	A transferred part string is searched for in the transferred character string. The function delivers the position of the first match with toFind in the character string src, beginning with the value 1 for the first character. If no match is found, the function returns the value 0.
	Example: In the character string "The apple does not fall far from the tree!", "far" should be searched for. For this, the character string that is to be searched and the character string to search for are transferred to the

Function declaration:	int UTF8_Find(const char *src, const char *toFind, int *error);				
	<pre>function. Code fragment: #include <aprolstringutf8.h> int error = 0; char *quelle = "The apple does not fall far from the tree!"; int pos = UTF8_Find(quelle, "far", &error); if(error) { /* Error handling */ } Output: The result is the value: "23"</aprolstringutf8.h></pre>				
Parameters:	Name:	Туре:		Description:	
	SrC	const char*	IN	Character string being searched.	
	toFind	const char*	IN	Character string being searched for.	
	error	int*	OUT	The function's error code is assigned to this parameter.	
				ATTENTION: This concerns a pointer that must point to a variable of the type "int"!	
Error codes:	Value:	Meaning	a:		
	UTF8_NOERROR	No error	-		
	UTF8_NULLSRC	src is a l	NULL p	ointer.	
	UTF8_NULLSTR	toFind is	a NUL	L pointer.	
	UTF8_WIDTH	Number detected		aracter's Bytes could not be	
Return value:	Value:	Meaning	g:		
	LITF8 NOFRRORFI AG	error is a	a NLII I	nointer	
	0	No mato	:h.		
	>= 1	Position of the first match, beginning with th value 1 for the first character.			

2.4.7 UTF8_Insert

Function declaration:	char* UTF8_Insert(con);	st char *sr	c, const o	char *ins, int start, int *error
Function description:	This function serves to insert strings in an existing character string. Inserts in the character string src, from the position start, the character string contained in ins. The function delivers a pointer to the resulting character string. The returned pointer points to a static Byte array in which the resulting character string is stored. The size of the static Byte array is 65 bytes, including the final '\0'.			
	Example: In the character string "The apple does fall far from the tree!" the word "not" should be inserted, so that the resulting character string "The apple does not fall far from the tree!" is delivered. For this the function is called with the original character string, the character string to be inserted, and the start position 17.			delivered. For this the function
	<pre>Code fragment: #include <aprolstringutf8.h> int error = 0; const char *quelle = "The apple does not fall far from the tree!"; const char *insert = "not "; char ziel[65] = {0}; char *temp = UTF8_Insert(quelle, insert, 17, &error); if(error) { /* Error handling */ } else { strcpy(ziel, temp); } Output: The result conforms to the character string: "The apple does not fall far from the tree!"</aprolstringutf8.h></pre>			&error); g: "The apple does not fall ing length, the resulting
Parameters:	character string is cut t Name:	Туре:		Description:
	SrC	const char*	IN	Character string into which should be inserted.
	ins	const char*	IN	Character string that should be inserted.
	start	int	IN	States the start position in the character string, starting with 1 as of the first

Function declaration:	char* UTF8_Insert(con);	st char *sr	c, const o	char *ins, int start, int *error
	error	int*	OUT	The function's error code is assigned to this parameter. ATTENTION: This concerns a pointer that must point to a variable of the type "int"!
Error codes:	Value:	Meaning	:	
	UTF8_NOERROR	No error.		
	UTF8_NULLSRC	src is a N	ULL point	er.
	UTF8_NULLSTR	ins is a N	er.	
	UTF8_START	start is sn	n 1.	
	UTF8_STARTFOLLOW	the string from src		
	UTF8_MAXSTARTLEN			
	UTF8_WIDTH			
Return value:	Value:	Meaning	:	
	ZERO	An error o error is a -> see err	luring processing, or nter.	
	Pointer on the copy of the transferred character string in src.		luring processing. The error respectively.	
	Pointer to the resulting character string			alled with valid values, and during the processing.

2.4.8 UTF8_Left

Function declaration:	char* UTF8_Left(const char *src, int len, int *error);
Function description:	This function extracts a left part string from the transferred character string. len characters from the first position in the character string src are extracted. A pointer is delivered to the resulting character string. The returned pointer points to a static Byte array in which the resulting character string is stored. The size of the static Byte array is 65 bytes, including the final '\0'.

Example:

In the character string

Functionchar* UTF8_Left(const char *src, int len, int *error);declaration:	har* UTF8_Left(const char *src, int len, int *error);
--	---

"The apple does not fall far from the tree!" the first 9 characters should be extracted.

Code fragment:

```
#include <AprolStringUtf8.h>
int error = 0;
const char *quelle = "The apple does not fall far from the tree!"
char ziel[65] = {0};
char *temp = UTF8_Left(quelle, 9, &error);
if(error)
{
    /* Error handling ... */
}
else
{
    strcpy(ziel, temp);
}
```

Output:

The result conforms to the character string: "The apple"

Note:

If *len* exceeds the maximum string length, the character string is cut corresponding to the last legal UTF8 character.

Parameters:	Name:	Туре:		Description:	
	SIC	const char*	IN	Character string from which is to be extracted.	
	len	int	IN	Number of characters that should be extracted.	
	error	int*	OUT	The function's error code is assigned to this parameter. ATTENTION: This concerns a pointer that must point to a variable of the type "int"!	
Error codes:	Value:	Meaning:			
	UTF8_NOERROR	No error.			
	UTF8_NULLSRC	src is a N	IULL po	inter.	
	UTF8_LEN	len is sm	aller 0.		
	UTF8_HIGHSTART	len is larç	ger than	the number of characters in src.	
	UTF8_MAXSTARTLEN	len exceeds the maximum string length.			
	UTF8_WIDTH	Number of a character's Bytes could not detected.			
Return value:	Value:	Meaning	:		
				Description of suit the LITEOOtrin of D	

Function declaration:	char* UTF8_Left(const char *src, int len, int *error);			
	ZERO	An error occurred during processing, or error is a NULL pointer. -> see error codes		
	Pointer to copy of the transferred character string	An error occurred during processing. The error code has been set respectively.		
	Pointer to the resulting character string	The function was called with valid values, and no errors occurred during the processing.		

2.4.9 UTF8_Mid

Function declaration:	char* UTF8_Mid(const char *src, int start, int len, int *error);
Function description:	This function extracts a middle part string from the transferred character string. Ien characters from the position start from the character string src are extracted. A pointer is delivered to the resulting character string. The returned pointer points to a static Byte array in which the resulting character string is stored. The size of the static Byte array is 65 bytes, including the final '\0'.
	Example: In the character string "The apple does not fall far from the tree!" the character string "does not fall far" should be extracted. For this, the function is called with the original character string, the start position 11, and the length of 16 characters.
	<pre>Code fragment: #include <aprolstringutf8.h> int error = 0; const char *quelle = "The apple does not fall far from the tree!"</aprolstringutf8.h></pre>
	<pre>char ziel[65] = {0}; char *temp = UTF8_Mid(quelle, 11, 16, &error); if(error) { /* Error handling */ } else { strcpy(ziel, temp); }</pre>
	Output:
	The result conforms to the character string: does not fall far

Note:

If start + len exceeds the maximum string length, or the length of src, the

Function declaration:	char* UTF8_Mid(const	char *sro	c, int star	t, int len, int *error);		
	character string is cut corresponding to the last legal UTF8 character.			ast legal UTF8 character.		
Parameters:	Name:	Туре:		Description:		
	src	const char*	IN	Character string from which is to be extracted.		
	start	int	IN	States the start position in the character string, starting with 1 as of the first character.		
	len	int	IN	Number of characters that should be extracted.		
	error	int*	OUT	The function's error code is assigned to this parameter.		
				ATTENTION: This concerns a pointer that must point to a variable of the type "int"!		
Error codes:	Value:	Meaning:				
	UTF8_NOERROR	No error.				
	UTF8_NULLSRC	src is a NULL pointer.				
	UTF8_START	start is	smaller th	an 1.		
	UTF8_LEN	len is s	maller 0.			
	UTF8_HIGHSTARTLEN	start +	len is large	er than the length of src.		
	UTF8_MAXSTARTLEN	start +	len excee	d the maximum string length.		
	UTF8_WIDTH	Number of a character's Bytes could not be detected.				
Return value:	Value:	Meanir	ng:			
	ZERO	An error occurred during processing, or error is a NULL pointer. -> see error codes				
	Pointer on the copy of the transferred character string in src.			during processing. The error et respectively.		
	Pointer to the resulting character string			called with valid values, and during the processing.		

2.4.10 UTF8_Replace

Function declaration:	char* UTF8_Replace(co int *error);	onst char	*src, c	onst char *rep, int start, int len,
Function description:	This function serves to exchange part strings in an existing character string Exchanges in the character string src, from position start, len characters with the string contained in rep. The function delivers a pointer to the resulting character string. The returned pointer points to a static Byte array in which the resulting character string is stored. The size of the static Byte array is 65 bytes, including the final '\0'.			n position start, len characters on delivers a pointer to the inter points to a static Byte array
	Example: In the character string "The apple does not fall near the tree!" the word "near" should be exchanged for the word "far from" so that the resulting character string "The apple does not fall far from the tree!" is delivered. For this, the function is called with the original character string, the character string to be inserted, the start position 23, and the number of characters, len 3, to be replaced. Code fragment:			not fall far from the tree!" is ith the original character string,
	<pre>#include <aprolstringutf8.h> int error = 0; const char *quelle = "The apple does not fall near the tree!"; const char *replace = "far"; char ziel[65] = {0}; char *temp = UTF8_Replace(quelle, replace, 23, 3, &error); </aprolstringutf8.h></pre>			
	<pre>if(error) { /* Error handling */ } else { strcpy(ziel, temp);</pre>			
	} Output:			
	The result conforms to the character string: The apple does not fa the tree!			: The apple does not fall far from
	When exceeding the max cut corresponding to the			th, the resulting character string is haracter.
Parameters:	Name:	Туре:		Description:
	SIC	const char*	IN	Character string into which should be inserted.
	rep	const char*	IN	Character string that should be inserted.
	start	int	IN	States the start position in the character string, starting with 1 as of the first character.
	len	int	IN	Number of characters that should be replaced.

Function declaration:	char* UTF8_Replace(co int *error);	onst char	*src, c	onst char *rep, int start, int len,	
	error	int*	OUT	The function's error code is assigned to this parameter. ATTENTION: This concerns a pointer that must point to a variable of the type "int"!	
Error codes:	Value:	Meaning	g:		
	UTF8_NOERROR	No error			
	UTF8_NULLSRC	src is a l	NULL p	ointer.	
	UTF8_NULLSTR	rep is a	NULL p	ointer.	
	UTF8_START	start is s	maller	han 1.	
	UTF8_MAXSTARTLEN	start exceeds maximum string length.			
	UTF8_STARTFOLLOW	start doe the string		e immediately before the end of src.	
	UTF8_MAXSTARTLEN	EN Resulting character string exceeds max. s length.			
	UTF8_WIDTH	Number detected		aracter's Bytes could not be	
Return value:	Value:	Meaning	g:		
	ZERO	An error error is a -> see e	a NULL	•	
	Pointer to copy of the transferred character string			ed during processing. has been set respectively.	
	Pointer to the resulting character string			is called with valid values, and no during the processing.	

2.4.11 UTF8_Right

Function declaration:	char* UTF8_Right(const char *src, int len, int *error);
Function description:	This function extracts a right part string from the transferred character string. The last len characters are extracted from the character string src. A pointer is delivered to the resulting character string. The returned pointer points to a static Byte array in which the resulting character string is stored. The size of the static Byte array is 65 bytes, including the final '\0'.

Example:

In the character string "The apple does not fall far from the tree!" the last 10 characters should be extracted.

Code fragment:

```
#include <AprolStringUtf8.h>
int error = 0;
const char *quelle = "The apple does not fall far from the tree!"
char ziel[65] = {0};
char *temp = UTF8_Right(quelle, 10, &error);
if(error)
{
    /* Error handling ... */
}
else
{
    strcpy(ziel, temp);
}
```

Output:

The result conforms to the character string: from the tree! If *len* exceeds the maximum string length or the length of src, the character string is cut corresponding to the last legal UTF8 character.

Parameters:	Name:	Туре:		Description:
	SIC	const char*	IN	Character string from which is to be extracted.
	len	int	IN	Number of characters that should be extracted.
	error	int*	OUT	The function's error code is assigned to this parameter.
				ATTENTION: This concerns a pointer that must point to a variable of the type "int"!
Error codes:	Value:	Meaning:		
	UTF8_NOERROR	No error.		
D1 System Handbuch				

Function declaration:	char* UTF8_Right(const char *src, int len, int *error);		
	UTF8_NULLSRC	src is a NULL pointer.	
	UTF8_HIGHSTART	len is larger than the length of src.	
	UTF8_MAXSTARTLEN	len exceeds the maximum string length.	
	UTF8_WIDTH	Number of a character's Bytes could not be detected.	
Return value:	Value:	Meaning:	
	ZERO	An error occurred during processing, or error is a NULL pointer. -> see error codes	
	Pointer on the copy of the transferred character string in src.	An error occurred during processing. The error code has been set respectively.	
	Pointer to the resulting character string	The function was called with valid values, and no errors occurred during the processing.	

1] Further examples, as well as information about UTF8: http://de.wikipedia.org/wiki/UTF-8

2.5 Images

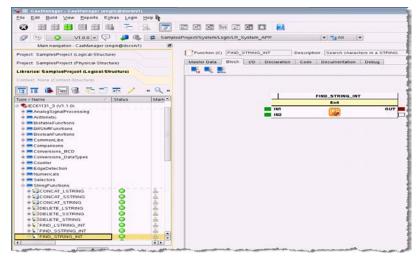


Illustration 19: Block 'FIND_STRING_INT'

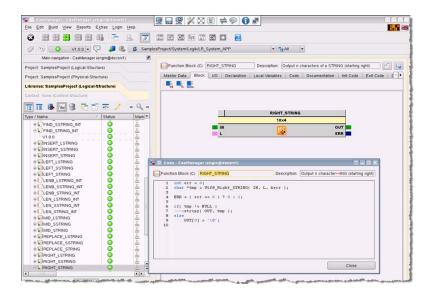


Illustration 20: Block 'RIGHT_STRING'

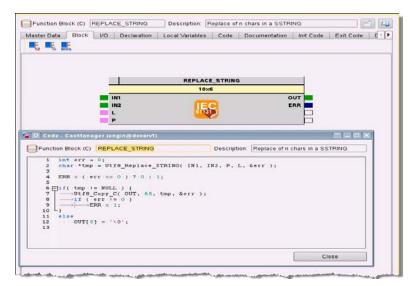


Illustration 21: 'REPLACE_STRING'

2.6 General information about the LSTRING data type

APROL supports the use of strings that are longer than 64 bytes, by providing the additional IEC type LSTRING. This new IEC type can solely be used for logic on the control computer.

The use of blocks that are enabled for the controller is suppressed with thorough plausibility checks and explicit error messages during compilation of the project parts.

2.7 Usage of the LSTRING data type

The data type LSTRING can be chosen on the input and output pins of the supported block types. On a "Function" block type, the new IEC type can only be configured on the input pins.

Furthermore, connectors of the type LSTRING can be created.

Variables of the type LSTRING are dynamic, meaning that their memory needs correspond to the length of the string in bytes. A block pin of the type LSTRING can be initialized with a default value with a maximum length of 32767 bytes.

When using the LSTRING_UTF8 functions, the length of the LSTRING data type is limited to 32767 bytes for the "Function" and "Function block" block types.

Block pins of the type STRING can be connected with block pins of the data type LSTRING (type conversion).



Please note that LSTRINGs, which have been configured as **input pins are not** allowed to be modified, i.e. also not freed with LSTRING_free!



The responsibility for the memory for the automatically created variables of the type LSTRING lies solely on the person who has written the C code!

All of the automatically created variables of the type LSTRING must be initialized at first, as otherwise the first access results in a memory error.

Furthermore, all of the automatically created variables must be released again (LSTRING_free(xx)) before leaving the block (i.e. in each cycle), otherwise memory leaks occur!

The initialization must take place as follows:
LSTRING variable = {{0}};

2.8 Function description of the LSTRING data type

B&R supplies you with these functions for a secure editing of LSTRINGs.

These functions' API is described here. The functions are implemented in the **APROL** PccStd library, and can therefore be used everywhere in **APROL** by including the "AprolStringUtf8.h" header and linking the "libPccStd" library.

New functions, which use this API, have been created for the LSTRING data type in the "IEC61131_3" library, in the "StringFunctions" group.

The functions can be used without any further bother, i.e. incorporating the "AprolStringUtf8.h" header in each function block or function.

Error handling:

The API functions that are offer have a pointer to a variable of the type "int" as the last parameter. Each API function must have the respective initialized pointer passed over to it, otherwise **no** processing takes place. A code example can be found within each function description from which it is evident how one uses this pointer. In contrast to the code examples, the error code must always be checked, not the value, when using the API functions.

Following error codes are assigned by the API:

Error code:	Meaning:
UTF8_NOERRORFLAG	error is a NULL pointer
UTF8_NOERROR	No error.
UTF8_NULLSRC	A NULL pointer for src was assigned.
UTF8_NULLSTR	A NULL pointer for ins / rep / toFind was assigned.
UTF8_NULLDEST	A NULL pointer for dest was assigned.
UTF8_START	The value for start was assigned with smaller than 1.
UTF8_LEN	The value for len was assigned with smaller than 0.
UTF8_HIGHSTART	The value for start is larger than the number of characters in src.
UTF8_HIGHLEN	The value for len is larger than the number of characters in src.
UTF8_HIGHSTARTLEN	The value of the sum start + len is larger than the number of characters in src.
UTF8_MAXSTARTLEN	The value of the sum start + len is larger than the maximum string length.
UTF8_WIDTH	The number a character Bytes could not be detected.
UTF8_STARTFOLLOW	The value from start does not lie immediately behind the last character position in src.
UTF8_NULLLSTRING	A NULL pointer was assigned for the src LSTRING.
UTF8_NOBUFFER	A NULL pointer was assigned for the internal buffer (internal error message)
UTF8_EXCEEDBUFFER	The string is larger than the internal buffer, (internal error message)

The following functions are available:

2.8.1 LSTRING_val

Function declaration:	char* LSTRING_val(LSTRING lstr);
Function description:	Makes the string contained in LSTRING Istr available as a C string, meaning a pointer to the internal string is output.
	Example:

The string of the input pin IN (of type LSTRING) should be accessed.

Function declaration:	char* LSTRING	char* LSTRING_val(LSTRING lstr);		
	Code fragment char *s = LSTRIN			
Parameters:	Name:	Туре:		Description:
	lstr	LSTRING	OUT	LSTRING, to which a value should be assigned.
Return value:	Value:	Meaning:		
	Pointer to C string	Internal cha	racter cha	in held in LSTRING

2.8.2 LSTRING_setc

Function declaration:	int LSTRING_se	tc(LSTRING Ist	tr, const c	har *cstr);	
Function description:	This function al character set.	This function allocates the Istr LSTRING the value of the cstr character set.			
	Example:	Example:			
		A function block's OUT output pin of the type LSTRING should obtain the value "The apple does not fall far from the tree!".			
	Code fragment: LSTRING_setc(OUT	', "The apple doe	es not fall	far from the tree!");	
Parameters:	Name:	Туре:		Description:	
	lstr	LSTRING	OUT	LSTRING, to which a value should be assigned.	
	cstr	const char*	IN	The C string that should be allocated to the LSTRING.	
Return value:	Value:	Meaning:			
	0	No error.			
	1	the one that is	already sa sage can l	of the cstr C string is exactly aved in the LSTRING. be ignored when working n.	

2.8.3 LSTRING_set

Function declaration:	int LSTRING_se	t(LSTRING d	est, LSTR	ING src);
Function description:	This function all LSTRING.	locates the sr	C LSTRIN	G the value of the lstr
				e type LSTRING should he type LSTRING.
	Code fragment: LSTRING_set(OUT,			
Parameters:	Name:	Туре:		Description:
	lstr	LSTRING	OUT	LSTRING, to which a value should be assigned.
	cstr	LSTRING	IN	LSTRING whose value should be assigned.
Return value:	Value:	Meaning:		
	0	No error.		
	1	The internal identical!	pointers to	the value of both strings are

2.8.4 LSTRING_free

Function declaration:	int LSTRING_	free(LSTRING	lstr);	
Function description:		This function releases the memory contained in the lstr LSTRING for the character set.		
	Code fragmer			
Parameters:	Name:	Туре:		Description:
	lstr	LSTRING	IN/OUT	LSTRING who's internal memory should be released.
Return value:	Value:	Meaning:		
	0	No error.		
	-1	NULL pointe	er transferre	ed

2.8.5 LSTRING_sprintf

Function declaration:	int LSTRING_sp	orintf(LSTRIN	G Istr, cor	nst char *format, …);
Function description:	This function writes, with the help of the format formatting string, the transferred value (numeric, C string, etc) into the Istr LSTRING stated in the first position.			
	This function co library. Internall			tf function contained in the C າ is used.
	As LSTRINGs are dynamic, the known problems with sprintf (writing over the allocated memory) cannot occur.			
	The error should be analog to that of a printf, i.e. it is normally dropped.			
	Example: An error message should be written into a variable of the type LSTRING, which is generated from several parts.			
	Code fragment: INT counter = 7; REAL value = 12.5			
	rc = LSTRING_spri value);	ntf(OUT, "Err	or in run	%d with value %f", counter,
Parameters:	Name:	Туре:		Description:
	lstr	LSTRING	OUT	LSTRING who's value should be written.
Return value:	Value:	Meaning:		
	>=0	No error, nui	mber of wri	tten bytes
	-1	NULL pointe	r transferre	ed

2.8.6 LSTRING_UTF8_LengthInCharacters

Function declaration:	int LSTRING_UTF8_LengthInCharacters(LSTRING src, int *error);
Function description:	This function delivers the number of characters in the transferred LSTRING.
	Example: In a function block, the src LSTRING declared as a "local variable" should obtain the value "The apple

Function declaration:	int LSTRING_UTF8_Lengt	hInCharacter	s(LSTRI	NG src, int *error);	
	does not fall far from the tree!", and the number of characters in this string detected. The function delivers the value 37.				
	Code fragment: int error = 0;				
	LSTRING_setc(src, "The app	le does not fa	all far fi	rom the tree!");	
	int len = LSTRING_UTF8_Leng	thInCharacters	s(src, &ei	rror);	
	if(error)				
	<pre>{ /* Error handling * }</pre>	/			
Parameters:	Name:	Туре:		Description:	
	SrC	LSTRING	IN	LSTRING whose number of characters should be determined.	
	error	int*	OUT	The function's error code is assigned to this parameter. ATTENTION: This concerns a pointer that must point to a variable of the type "int"!	
Error codes:	Value:	Meaning:			
	UTF8_NOERROR	No error.			
	UTF8_NULLLSTRING	A NULL po src LSTRIN		assigned for the	
	UTF8_WIDTH	The numbe not be dete		cter Bytes could	
Return value:	Value:	Meaning:			
	UTF8_NOERRORFLAG	error is a N	ULL poin	ter	
	>= 0	The numbe transferred		acters in the r string.	

Function int LSTRING UTF8 LengthInBytes(LSTRING src, int *error); declaration: Function This function delivers the number of bytes contained in the transferred LSTRING character string, without a final '\0'. description: **Example:** In a function block, the src LSTRING declared as a "local variable" should obtain the value "The apple does not fall far from the tree!", and the number of characters in this string detected. The function delivers the value 38. **Code fragment:** int error = 0; LSTRING_setc(src, "The apple does not fall far from the tree!"); int len = LSTRING_UTF8_LengthInBytes(src, &error); if(error) { /* Error handling ... */ } Parameters: Type: **Description:** Name: LSTRING IN LSTRING whose number src of necessary bytes should be detected for saving the character string, without final '\0'. OUT The function's error code error int* is assigned to this parameter. Attention: This concerns a pointer that must point to a variable of the type "int"! Error codes: Value: Meaning: UTF8_NOERROR No error. UTF8_NULLLSTRING A NULL pointer was assigned for the src LSTRING. **Return value:** Value: Meaning: **UTF8 NOERRORFLAG** error is a NULL pointer

2.8.7 LSTRING_UTF8_LengthInBytes

Function declaration:	int LSTRING_UTF8_LengthInBytes(LSTRING src, int *error);

>= 0

The number of Bytes in the transferred character string.

2.8.8 LSTRING_UTF8_Copy

E		0			
Function declaration:	char* LSTRING_UTF8_Copy(LSTRING dest, LSTRING src, int *error);				
Function description:	This function copies the character string contained in the src LSTRING into the dest LSTRING and delivers a pointer to the content of the dest LSTRING.				
	Example: In a function block, an input pin declared as an LSTRING 'LSTRING <i>src</i> ' should be copied to an output pin declared as an LSTRING 'LSTRING <i>dest</i> '.				
	<pre>Code fragment: int error = 0; LSTRING_UTF8_Copy(dest, src, &error);</pre>				
	if(error) { /* Error handling */				
Demonstration	}	T		Decerintians	
Parameters:	Name:	Туре:	_	Description:	
	dest	LSTRING	OUT	Target for the copy of the transferred LSTRING.	
	SrC	LSTRING	IN	LSTRING that should be copied.	
	error	int*	OUT	The function's error code is assigned to this parameter. ATTENTION: This concerns a pointer that must point to a variable of the type "int"!	
Error codes:	Value:	Meaning:			
	UTF8_NOERROR	No error.			
UTF8_NULLLSTRING A NULL pointer was trans LSTRING.				s transferred for the src or dest	
	UTF8_NULLDEST dest is a NULL pointer.				

Function declaration:	char* LSTRING_UTF8	_Copy(LSTRING dest, LSTRING src, int *error);
	UTF8_WIDTH	Number of a character's Bytes could not be detected.
Return value:	Value:	Meaning:
	ZERO	An error occurred during processing, or error is a NULL pointer. -> see error codes
	Pointer to dest	The character string was copied

2.8.9 LSTRING_UTF8_NCopy

Function declaration:	char* LSTRING_UTF8_NCopy(LSTRING dest, size_t n, LSTRING src, int *error);					
Function description:	This function copies the character string contained in the src LSTRING into the dest LSTRING and delivers a pointer to the content of the dest LSTRING. A maximum of 'n' bytes are copied, including final '\0'					
	Example: In a function block, an input pin declared as an LSTRING 'LSTRING <i>src'</i> should be copied to an output pin declared as an LSTRING 'LSTRING <i>dest</i> '.					
	<pre>Code fragment: int error = 0; LSTRING_UTF8_NCopy(dest, 17, src, &error); if(error) { /* Error handling */ }</pre>					
Parameters:	Name:	Туре:		Description:		
	dest	LSTRING	OUT	Target for the copy of the transferred LSTRING.		
	n	size_t	IN	Maximum number of bytes that are copied		
	src LSTRING IN LSTRING that sho copied.					

Function declaration:	char* LSTRING_UTF8_ int *error);	_NCopy(LST	RING d	est, size_t n, LSTRING src,
	error	int*	OUT	The function's error code is assigned to this parameter. ATTENTION: This concerns a pointer that must point to a variable of the type "int"!
Error codes:	Value:	Meaning:		
	UTF8_NOERROR	No error.		
	UTF8_NULLLSTRING	A NULL poin LSTRING.	ter was	transferred for the src or dest
	UTF8_NULLDEST	dest is a NUI	LL poin	ter.
	UTF8_WIDTH	Number of a detected.	charac	ter's Bytes could not be
Return value:	Value:	Meaning:		
	ZERO	An error occo error is a NU -> see error o	LL poir	uring processing, or nter.
	Pointer to dest	The characte	er string	was copied

2.8.10 LSTRING_UTF8_Delete

Function declaration:	char* LSTRING_UTF8_Delete(LSTRING src, int start, int len, int *error);
Function description:	This function deletes a part string from the transferred LSTRING. From the character string transferred from src LSTRING, len characters are deleted from the position start, and a pointer to the resulting character string is returned. The returned pointer points to a static byte array in which the resulting character string is stored. The size of the static Byte array is 32768 bytes, including final '\0'.
	Example: In a function block, the src LSTRING declared as a "local variable" should obtain the value "The apple does not fall far from the tree!". The word "not" should be deleted from this character string, including the spaces that follow. For this purpose the function transmits the start position 17, and 6 for the number of characters that should be deleted. The obtained character string should be saved in the dest output pin of the type LSTRING.

Code fragment:

```
int error = 0;
LSTRING_setc( src, "The apple does not fall far from the tree!" );
char *temp = LSTRING_UTF8_Delete( src, 17, 6, &error);
if(error)
{
    /* Error handling ... */
}
else
{
    LSTRING_setc( dest, temp );
}
```

Output:

_

The result is the character string: "The apple does not fall far from the tree!"

It is also possible to delete all of the characters as of the character start without having knowledge about the number of characters in src. For this, the value of len must be at least larger in length than the rest of the character string in src.

Parameters:	Name:	Туре:		Description:
	SIC	LSTRING	IN	Contains the character string to be edited.
	start	Int	IN	States the start position in the character string, starting with 1 as of the
	len	Int	IN	States how many characters should be deleted starting from the start position.
	error	int*	OUT	The function's error code is assigned to this parameter.
				ATTENTION: This concerns a pointer that must point to a variable of the type "int"!
Error codes:	Value:	Meaning:		
	UTF8_NOERROR	No error.		
	UTF8_NULLLSTRING	A NULL point LSTRING.	ter was	transferred for the src
	UTF8_START	The transferred value for start is smaller than		
		0.04	De	scription about the UTF8StringAPI

Function declaration:	char* LSTRING_UTF8_ *error);	Delete(LSTRING src, int start, int len, int
	UTF8_LEN	The transferred value for len is smaller than 0.
	UTF8_HIGHSTART	The transferred value for start is larger than the number of characters in src.
	UTF8_WIDTH	Number of a character's Bytes could not be detected.
Return value:	Value:	Meaning:
	ZERO	An error occurred during processing, or error is a NULL pointer.
	Pointer on the copy of the transferred character string in src.	An error occurred during processing. The error code has been set respectively.
	Pointer to the resulting character string	The function was called with valid values, and no errors occurred during the processing.

2.8.11 LSTRING_UTF8_Find

Function declaration:	int LSTRING_UTF8_Find(LSTRING src, LSTRING toFind, int *error);
Function description:	A transferred part string is searched for in the character string of the transferred LSTRING. The function delivers the position of the first match with toFind in the character string src, beginning with the value 1 for the first character. If no match is found, the function returns the value 0.
	Example: In a function block, the src LSTRING declared as a 'local variable' should obtain the value 'The apple does not fall far from the tree!'. The word "far" should be searched for in the character string. For this, the character string that is to be searched and the character string to search for are transferred to the function.
	Code fragment: int error = 0;
	LSTRING_setc(src, "The apple does not fall far from the tree!");
	<pre>int pos = UTF8_Find(src, "far", &error); if(error) { /* Error handling */ }</pre>

Output:

The result is the value: "23"

Parameters:	Name:	Туре:		Description:
	SrC	LSTRING	IN	Character string being searched.
	toFind	LSTRING	IN	Character string being searched for.
	error	int*	OUT	The function's error code is assigned to this parameter.
				ATTENTION: This concerns a pointer that must point to a variable of the type "int"!
Error codes:	Value:	Meaning:		
	UTF8_NOERROR	No error.		
	UTF8_NULLLSTRING	A NULL poi toFind LSTI		is transferred for the src or
	UTF8_WIDTH	Number of a detected.	a chara	cter's Bytes could not be
Return value:	Value:	Meaning:		
	LITER NOERRORFLAG	error is a N	UII no	inter
	0	No match.		
	>= 1	Position of tor tor		match, beginning with the character.

2.8.12 LSTRING_UTF8_Insert

Function declaration:	char* LSTRING_UTF8_Insert(LSTRING src, LSTRING ins, int start, int *error);
Function description:	This function serves to insert strings into the character string of an existing LSTRING.
	It inserts in the src character string, from the position start, the character string contained in ins.
	The function delivers a pointer to the resulting character string.
	The returned pointer points to a static byte array in which the resulting character string is stored. The size of the static Byte array is 32768 bytes,

Function	char* LSTRING_UTF8_Insert(LSTRING src, LSTRING ins, int start,
declaration:	int *error);

including final '\0'.

Example: In a function block, the src LSTRING declared as a 'local variable' should obtain the value "The apple falls far from the tree!".

The word "not" should be inserted in this character string, so that "The apple does not fall far from the tree!" is delivered as the resulting character string.

For this the function is called with the original character string, the character string to be inserted, and the start position 17.

The result should be written to the OUT output pin that has been declared as LSTRING.

Code fragment:

```
int error = 0;
LSTRING_setc( src, "The apple does not fall far from the tree!" );
char *temp = LSTRING_UTF8_Insert( src, "not ", 17, &error );
if(error)
{
    /* Error handling ... */
}
else
{
    LSTRING_setc( OUT, temp );
}
```

Output:

The result conforms to the character string: "The apple does not fall far from the tree!"

Parameters:	Name:	Туре:	Description:
	SIC	LSTRING IN	Character string into which should be
	ins	LSTRING IN	Character string that should be inserted.
	start	Int IN	States the start position in the character string, starting with 1 as of the first character.

Function declaration:	char* LSTRING_UTF8_Ins int *error);	sert(LSTRING sr	c, LSTRING ins, int start,	
	error	int* O	 UT The function's error code is assigned to this parameter. ATTENTION: This concerns a pointer that must point to a variable of the type "int"! 	
Error codes:	Value:	Meaning:		
	UTF8_NOERROR	No error.		
	UTF8_NULLLSTRING	A NULL pointer was transferred for the src or ins LSTRING.		
	UTF8_START	start is smaller th	nan 1.	
	UTF8_STARTFOLLOW	start does not lie	e immediately before the end	
	UTF8_MAXSTARTLEN	The resulting cha	aracter string exceeds the length	
	UTF8_WIDTH	Number of a cha detected.	aracter's Bytes could not be	
Return value:	Value:	Meaning:		
	ZERO	An error occurred during processing, or error is a NULL pointer. -> see error codes		
	Pointer on the copy of the transferred character string in src.		d during processing. The een set respectively.	
	Pointer to the resulting character string		s called with valid values, and ed during the processing.	

2.8.13 LSTRING_UTF8_Left

Function declaration:	char* LSTRING_UTF8_Left(LSTRING src, int len, int *error);
Function description:	This function extracts a left part string from the character string of the transferred LSTRING. len characters from the first position in the character string src are extracted. A pointer is delivered to the resulting character string.
	The returned pointer points to a static byte array in which the resulting character string is stored. The size of the static Byte array is 32768 bytes, including final '\0'.

Example:

Function declaration:	char* LSTRING_UTF8_Left(LSTRING src, int len, int *error);
	In a function block an

In a function block, an src LSTRING that is declared as a 'local variable' should obtain the value 'The apple does not fall far from the tree!'.

The first 9 characters should be extracted from this character string. The result should be written to the OUT output pin that has been declared as LSTRING.

Code fragment:

```
int error = 0;
LSTRING_setc( src, "The apple does not fall far from the tree!" );
char *temp = LSTRING_UTF8_Left( src, 9, &error );
if(error)
{
    /* Error handling ... */
}
else
{
    LSTRING_setc( OUT, temp );
}
```

Output:

The result conforms to the character string: "The apple"

Note:

If *len* exceeds the maximum length of 32768 characters, the character string is cut corresponding to the last legal UTF8 character.

Parameters:	Name:	Туре:		Description:
	SIC	LSTRING	IN	Character string from which is to be extracted.
	len	int	IN	Number of characters that should be extracted.
	error	int*	OUT	The function's error code is assigned to this parameter. ATTENTION: This concerns a pointer that must point to a variable of the type "int"!
Error codes:	Value:	Meaning:		
	UTF8_NOERROR	No error.		
	UTF8_NULLLSTRING	A NULL poin LSTRING.	ter was	transferred for the src or ins

Function declaration:	char* LSTRING_UTF8_Left(LSTRING src, int len, int *error);		
	UTF8_LEN	len is smaller 0.	
	UTF8_HIGHSTART	len is larger than the number of characters in src.	
	UTF8_MAXSTARTLEN	len exceeds the maximum string length.	
	UTF8_WIDTH	Number of a character's Bytes could not be detected.	
Return value:	Value:	Meaning:	
	ZERO	An error occurred during processing, or error is a NULL pointer. -> see error codes	
	Pointer to copy of the transferred character string	An error occurred during processing. The error code has been set respectively.	
	Pointer to the resulting character string	The function was called with valid values, and no errors occurred during the processing.	

2.8.14 LSTRING_UTF8_Mid

Function declaration:	char* LSTRING_UTF8_Mid(LSTRING src, int start, int len, int *error);
Function description:	This function extracts a mid part string from the character string of the transferred LSTRING. Ien characters from the position start from the character string src are extracted. A pointer is delivered to the resulting character string. The returned pointer points to a static byte array in which the resulting character string is stored. The size of the static Byte array is 32768 bytes, including final '\0'.
	Example: In a function block, the src LSTRING declared as a "local variable" should obtain the value "The apple does not fall far from the tree!". The character string "does not fall far" should be extracted from this character string. For this, the function is called with the original character string, the start position 11, and the length of 16 characters. The result should be written to the OUT output pin that has been declared as LSTRING.
	Code fragment: int error = 0;

Function declaration:	char* LSTRING_UTF8_Mid(LSTRING src, int start, int len, int *error);		
	LSTRING_setc(src, "The apple does not fall far from the tree!");		

```
char *temp = LSTRING_UTF8_Mid( src, 11, 16, &error );
if(error)
{
    /* Error handling ... */
}
else
{
    LSTRING_setc( OUT, temp );
}
```

Output:

The result conforms to the character string: does not fall far

Note:

If *len* exceeds the maximum length of 32768 characters, the character string is cut corresponding to the last legal UTF8 character.

Parameters:	Name:	Туре:		Description:	
	SrC	LSTRING	IN	Character string from which is to be extracted.	
	start	int	IN	States the start position in the character string, starting with 1 as of the	
	len	int	IN	Number of characters that should be extracted.	
	error	int*	OUT	The function's error code is assigned to this parameter.	
				ATTENTION:	
				This concerns a pointer that must point to a variable of the type "int"!	
Error codes:	Value:	Meaning:			
	UTF8_NOERROR	No error.			
	UTF8_NULLLSTRING	A NULL pointer was transferred for the src or ins LSTRING.			
	UTF8_START	start is smaller than 1.			
	UTF8_LEN	len is smaller 0.			
	UTF8_HIGHSTARTLEN	start + len is	larger t	han the length of src.	
	UTF8_MAXSTARTLEN	start + len ex	ceed th	e maximum string length.	

Function declaration:	char* LSTRING_UTF8_Mid(LSTRING src, int start, int len, int *error);				
	UTF8_WIDTH	Number of a character's Bytes could not be detected.			
Return value:	Value:	Meaning:			
	ZERO	An error occurred during processing, or error is a NULL pointer. -> see error codes			
	Pointer on the copy of the transferred character string in src.	An error occurred during processing. The error code has been set respectively.			
	Pointer to the resulting character string	The function was called with valid values, and no errors occurred during the processing.			

2.8.15 LSTRING_UTF8_Replace

-			
Function declaration:	char* LSTRING_UTF8_Replace(LSTRING src, LSTRING rep, int start, int len, int *error);		
Function description:	The function serves to exchange part strings in an existing character string. Exchanges in the src LSTRING, from position start, len characters with		
	the string contained in rep. The function delivers a pointer to the resulting character string.		
	The returned pointer points to a static Byte array in which the resulting character string is stored. The size of the static Byte array is 32768 bytes, including the final '\0'.		
	Example:		
	In a function block, the		
	src LSTRING declared as a "local variable" should obtain the value "The apple does not fall near the tree!".		
	The word "near" in this character string should be replaced by the word "far", so that "The apple does not fall far from the tree!" is delivered as the resulting character string.		
	For this, the function is called with the original character string, the character string to be inserted, the start position 23, and the number of characters, len 3, to be replaced.		
	The result should be written to the OUT output pin that has been declared as LSTRING.		
	Code fragment:		
	<pre>int error = 0; LSTRING_setc(src, "The apple does not fall near the tree!");</pre>		
	<pre>char *temp = LSTRING_UTF8_Replace(src, "far", 23, 3, &error);</pre>		
	Description about the LITE8StringAPI		

Function declaration:	char* LSTRING_UTF8_R int len, int *error);	eplace(LSTR	ING sro	, LSTRING rep, int start,
	<pre>if(error) { /* Error handling */ } else { LSTRING_setc(OUT, ten }</pre>			
	Output: The result conforms to the from the tree!		•	
	When exceeding the maxi string is cut corresponding	•		•
Parameters:	Name:	Туре:		Description:
	SIC	LSTRING	IN	Character string into which should be inserted.
	rep	LSTRING	IN	Character string that should be inserted.
	start	int	IN	States the start position in the character string, starting with 1 as of the first character.
	len	int	IN	Number of characters that should be replaced.
	error	int*	OUT	The function's error code is assigned to this parameter. ATTENTION: This concerns a pointer that must point to a variable of the type "int"!
Error codes:	Value:	Meaning:		
	UTF8_NOERROR	No error.		
	UTF8_NULLLSTRING	A NULL poii rep LSTRIN		s transferred for the src or
	UTF8_START	start is smal	ller than	1.
	UTF8_MAXSTARTLEN	start exceed	ls maxir	num string length.
	UTF8_STARTFOLLOW	start does n of the string		mediately before the end c.

Resulting character string exceeds max. string length.

UTF8_MAXSTARTLEN

Function declaration:	char* LSTRING_UTF8_Replace(LSTRING src, LSTRING rep, int start, int len, int *error);				
	UTF8_WIDTH	Number of a character's Bytes could not be detected.			
Return value:	Value:	Meaning:			
	ZERO	An error occurred during processing, or error is a NULL pointer. -> see error codes			
	Pointer to copy of the transferred character string	An error occurred during processing. The error code has been set respectively.			
	Pointer to the resulting character string	The function was called with valid values, and no errors occurred during the processing.			

2.8.16 LSTRING_UTF8_Right

	0		
Function declaration:	char* LSTRING_UTF8_Right(LSTRING src, int len, int *error);		
Function description:	This function extracts a right part string from the transferred character string. The last len characters are extracted from the character string src. A pointer is delivered to the resulting character string. The returned pointer points to a static byte array in which the resulting character string is stored. The size of the static Byte array is 32768 bytes, including final '\0'.		
	Example: In a function block, the src LSTRING declared as a 'local variable' should obtain the value 'The apple does not fall far from the tree!'. The last 10 characters should be extracted from this character string. The result should be written to the OUT output pin that has been declared as LSTRING.		
	<pre>Code fragment: int error = 0; LSTRING_setc(src, "The apple does not fall far from the tree!");</pre>		
	<pre>char *temp = LSTRING_UTF8_Right(src, 10, &error); if(error) { /* Error handling */ } else {</pre>		

Function declaration:	char* LSTRING_UTF8_Right(LSTRING src, int len, int *error);					
	LSTRING_setc(OUT, temp });				
	Output: The result conforms to the character string: from the tree!					
	Note: If <i>len</i> exceeds the maximum length of 32768 characters, the character string is cut corresponding to the last legal UTF8 character.					
Parameters:	Name:	Туре:		Description:		
	SrC	LSTRING	IN	Character string from which is to be extracted.		
	len	int	IN	Number of characters that should be extracted.		
	error	int*	OUT	The function's error code is assigned to this parameter.		
				ATTENTION: This concerns a pointer that must point to a variable of the type "int"!		
Error codes:	Value:	Meaning:				
	UTF8_NOERROR	No error.				
	UTF8_NULLLSTRING	A NULL pointe LSTRING.	er was ti	ansferred for the src		
	UTF8_HIGHSTART	len is larger th	an the l	ength of src.		
	UTF8_MAXSTARTLEN	len exceeds th	ne maxir	num string length.		
	UTF8_WIDTH	Number of a c detected.	characte	r's Bytes could not be		
Return value:	Value:	Meaning:				
	ZERO	An error occur error is a NUL -> see error co	L pointe	ng processing, or r.		
	Pointer on the copy of the transferred character string in src.			ng processing. een set respectively.		

Function declaration:	char* LSTRING_UTF8_Right(LSTRING src, int len, int *error);

Pointer to the resulting character string

The function was called with valid values, and no errors occurred during the processing.

2.9 Examples for the Charge and Splitter blocks

2.9.1 Example Charge block

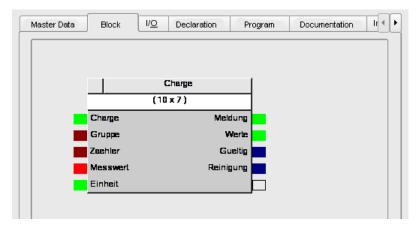


Illustration 22: Function block Charge (pin layout)

I/O-Variable P Name IEC Type Default Value Unit Description K Rights Eingänge: - ???	
P Name IEC Type Default Value Unit Description K Rights Eingänge: - ??? 1 Charge LSTRING - ??? 2 Gruppe INT 0 ??? 3 Zaehler INT 0 ??? 4 Messwert REAL 0 ??? 5 Einheit LSTRING - ??? Ausgänge: - ??? 1 Meldung LSTRING - ???	
Eingänge: - ??? 1 Charge LSTRING - ??? 2 Gruppe INT 0 ??? 3 Zaehler INT 0 ??? 4 Messwert REAL 0 ??? 5 Einheit LSTRING - ??? Ausgänge: - ??? 🖉	
1 Charge LSTRING — ??? 2 Gruppe INT 0 ??? 3 Zaehler INT 0 ??? 4 Messwert REAL 0 ??? 5 Einheit LSTRING — ??? Ausgänge: — ??? 🖉	s Auf
2 Gruppe INT 0 ??? 3 Zaehler INT 0 ??? 4 Messwert REAL 0 ??? 5 Einheit LSTRING — ??? Ausgänge:	
3 Zaehler INT 0 ??? 4 Messwert REAL 0 ??? 5 Einheit LSTRING — ??? Ausgänge:	
4 Messwert REAL 0 ??? 5 Einheit LSTRING — ??? Ausgänge:	
5 Einheit LSTRING — ??? Ausgänge: 1 Meldung LSTRING — ???	
Ausgänge: 1 Meldung LSTRING – ??? 🗭	
1 Meldung LSTRING - ??? 💋	
-	
2 Werte LSTRING – ???	
3 Gueltig BOOL – ???	
4 Reinigung BOOL — ???	

Illustration 23: Function block Charge (I/O)

Master Data	Block	I/ <u>O</u> De	eclaration	Program	Documentation	l II ₹
Open head	er					
1						
Includes & [Defines					
1						_
Local Varia	ble					
Local Varia Name	ble	Default Value	Dimension	Description		
Name alteCharge	IEC Type		Dimension	???		
Name	IEC Type	Default Value	Dimension			
Name alteCharge	IEC Type		Dimension	???		
Name alteCharge	IEC Type		Dimension	???		
Name alteCharge	IEC Type		Dimension	???		
Name alteCharge	IEC Type		Dimension	???		
Name alteCharge	IEC Type		Dimension	???		

Illustration 24: Function block Charge (local variables)

Function block Charge program code

```
/* This function block writes a status message in the */ \,
/* "Message" output pin at the beginning of a new charge
                                                            */
                                                           */
/* and in each cycle the charge, the group, the counter,
/* and the measurement value formatted to the "Values" output pin */
/*
                     * /
/* Special treatment:
                                   */
/* If the charge is a cleaning charge, visible that the ^{\star/}
/* word "cleaner" is in the charge ID, then "value" is not */
/* written, and "cleaning" is set.
                                    * /
/*
                     */
/\star If the is not delivered or the group's number is not positive, an error is signaled in
"valid"
          */
BOOL charge_legal = 0;
BOOL gruppe_legal = 0;
BOOL einheit_legal = 0;
BOOL reinigung = 0;
BOOL chargenwechsel = 0;
BOOL erstecharge = 0;
BOOL interner_fehler = 0;
LSTRING clean = \{\{0\}\};
LSTRING_setc( clean, "cleaner" );
/*
if ( !init )
{
  LSTRING_setc( alteCharge, "" );
  init = 1;
}
*/
/* The charge must be consigned */
charge_legal = Charge
                 && LSTRING_val( Charge )
                 && (strcmp( LSTRING_val( Charge ), "" ) != 0 );
/* The group number must be larger than 0 */
gruppe_legal = Gruppe > 0;
/* Unit is also allowed to be empty */
einheit_legal = Einheit && LSTRING_val( Einheit );
```

```
if ( charge_legal )
{
  int error = 0;
  int pos = LSTRING_UTF8_Find( Charge, clean, &error );
  if ( error != UTF8_NOERROR )
  {
     interner_fehler = 1;
  }
  else
   {
     Reinigung = (pos > 0);
     if ( strcmp( LSTRING_val( Charge ), LSTRING_val( alteCharge ) ) != 0 )
     {
        chargenwechsel = 1;
        if ( strcmp( "", LSTRING_val( alteCharge ) ) != 0 )
        {
          erstecharge = 1;
        }
     }
  }
if ( charge_legal && !interner_fehler )
{
  if ( gruppe_legal )
     Gueltig = 1;
  LSTRING beendet = \{\{0\}\};
  LSTRING laeuft = \{\{0\}\};
  if ( chargenwechsel && !erstecharge )
  {
     LSTRING_sprintf( beendet, "Charge '%s' finished,", LSTRING_val( alteCharge ) );
     LSTRING_sprintf( laeuft, "%s '%s' gestartet",
             (reinigung) ? "Cleaning charge" : "Batch",
             LSTRING_val( Charge ) );
     LSTRING_set( alteCharge, Charge );
  }
  else
   {
     LSTRING_setc( beendet, "" );
     LSTRING_sprintf( laeuft, "%s '%s' läuft",
             (reinigung) ? "Cleaning charge" : "Batch",
             LSTRING_val( Charge ) );
  }
  if (Gueltig)
   {
     LSTRING_sprintf( Meldung, "%s%s",
             LSTRING_val( beendet ),
             LSTRING_val( laeuft ) );
     LSTRING_sprintf( Werte, "%s;%d;%d;%f%s%s",
          LSTRING_val( Charge ),
          (gruppe_legal) ? Group: -1,
          Zaehler,
          Messwert,
          (einheit_legal) ? ";" : "",
          (einheit_legal) ? LSTRING_val( Einheit ) : "" );
  }
  else
  {
     LSTRING_setc( Meldung, "Fehler" );
     LSTRING_setc( Werte, "" );
     Gueltig = 0;
```

Reinigung = 0;

```
}
LSTRING_free( beendet );
LSTRING_free( laeuft );
}
else
{
Gueltig = 0;
Reinigung = 0;
LSTRING_setc( Meldung, "Fehlerhafte Charge" );
LSTRING_setc( Werte, "" );
}
```

LSTRING_free(clean);

2.9.2 Example splitter block

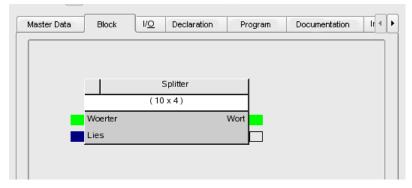


Illustration 25: Function block Splitter (pin layout)

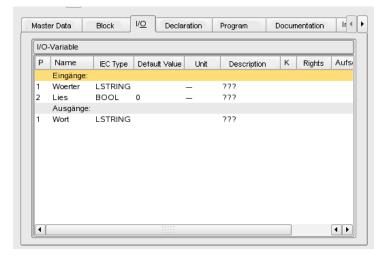


Illustration 26: Function block Splitter (I/O)

Master Data	Block	I/ <u>O</u> De	claration	Program	Documentation .	Ir
Open heade	er "					
1						
includes & l	Defines					
1						
Local Variat						
Name	IEC Type	Default Value	Dimension	Description		_
Gelesen		0		777		
Speicher	LSTRING			777	-	
	LSTRING			777		

Illustration 27: Function block Splitter (local variables)

Function block Splitter program code

```
/* This function block reads words via the "words" input */
                                                              * /
/* pin, and adds them to the locally held "memory".
/* Cycle by cycle, word by word is output from this */
/* "memory" into the "word" output variable.
                                                            * /
int error = 0;
LSTRING leer = \{\{0\}\};
LSTRING_setc( leer, " " );
if ( Lies && !Gelesen )
{ /* New words */
  Gelesen = 1;
  LSTRING temp = \{\{0\}\};
  LSTRING_set( temp, Speicher );
  if (!strcmp( LSTRING_val( temp ), "" ) )
     LSTRING_set( Speicher, Woerter );
  else
     LSTRING_sprintf( Speicher, "%s %s", LSTRING_val( temp ),
                  LSTRING_val( Woerter ) );
  LSTRING_set( alteWoerter, Woerter );
  LSTRING_free( temp );
}
else
{
  if (!Lies)
     Gelesen = 0;
}
int pos = LSTRING_UTF8_Find( Speicher, leer, &error );
if ( pos > 0 )
{
  char *w = LSTRING_UTF8_Left( Speicher, pos-1, &error );
  LSTRING_setc( Wort, w );
  int len = LSTRING_UTF8_LengthInCharacters( Speicher, &error );
  char *p = LSTRING_UTF8_Mid( Speicher, pos+1, len-2, &error );
  LSTRING_setc( Speicher, p );
}
else
{
  LSTRING_set( Wort, Speicher );
  LSTRING_setc( alteWoerter, "" );
```

```
LSTRING_setc( Speicher, "" );
}
LSTRING_free( leer );
```

3 Configuration of the AlarmMonitor via XML

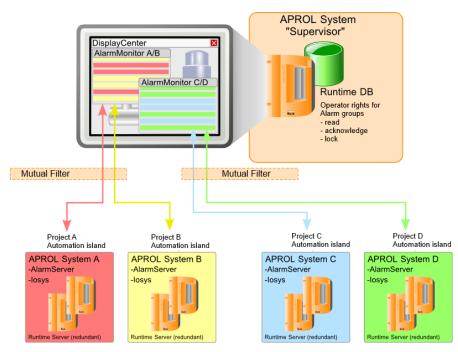


Illustration 28: Connection of one AlarmMonitor to several CC-Accounts

A maximum of one **AlarmServer** instance is allowed to run within a CC-Account (Linux login). A **DisplayCenter** that is on an operator station connects itself with one or more CC-Accounts, i.e. with the **AlarmServer** and **losys** system services contained therein.

3.1 Configuration of the AlarmMonitor via XML

APROL provides an interactive system to you with the **AlarmMonitor**, which allows the operator to summarize all alarm-state parameters, and react accordingly. You can quickly and simply configure both the look & feel, and the functionality of the **AlarmMonitor** via XML, and thus adapt it to company's operating principles.

The following chapters provide you with a guide for this sort of configuration in the **AlarmMonitor**.

Detailed information about the functionality, and the operation of the **AlarmMonitor** can be found in the manual "C1 Interactive process Control", chapter <u>Alarm system</u>.

Information about the usage of alarm blocks can be found in manual "B2 Project Engineering", chapter <u>Alarm blocks in the CFC</u>.

Details about the **DisplayCenter's** launching options can be found in the manual 'X99 CC Modules'.

APROL offers the configuration of a central overview of the **alarms from different areas of automation**.

An operator has the possibility to **monitor and process alarm events from one or more CC-Accounts in one AlarmMonitor**. Several **AlarmMonitors** can be started in one **DisplayCenter**.

The system software of all connected CC-Accounts must be at least that of **APROL** R 3.6. It may come to a faulty display when operating with **APROL** versions < R 3.6.

3.2 General information about the configuration of the AlarmMonitor

The following illustration shows you the basic structure of the **AlarmMonitor**:

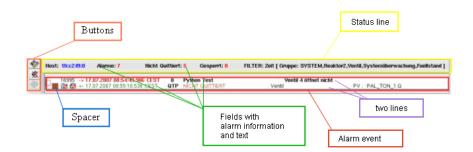


Illustration 29: Description of the AlarmMonitor

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The **alarms** are configured with alarm blocks. In contrast, the alarm events are shown in the **AlarmMonitor**.

You can adjust both the alarm line and the alarm list as follows:

- Font formatting and color scheme of the alarm line/list,
- Display of significant information regarding the alarm events,
- Placing and configuration of the buttons in the alarm line/list,
- Geometry management of the alarm line and the alarm list,
- Definition and configuration of several AlarmMonitors
- Connection of several CC-Accounts to one or more AlarmMonitors

Here for example, you can stipulate the number and the order of the visible alarm events, and set which buttons are shown at which place.

The information about a displayed alarm event can be sorted in one or more rows, where the individual rows can be made up of different fields. These fields can contain text or alarm information, and be arranged in any order. Furthermore, it is possible allocate different fonts, fore-, and background colors to the fields and information.

j yr Ma		p Ha Ha Ha I m	•		• ? • • • • • • • • • • • • • • • •	.	••••
2		-> 17.08.2007 10:09:23	GR: Ventil	AL: Python Test	Ventil 4 öffnet nicht	Q:	QUITTIERBERECHTIGT
X	E	-> 17.08.2007 09:02:20	GR: Fuellstand	AL: Achtung, Füllstand ist zu hoch!	Achtung, Füllstand ist zu hoch! (99.000000	%)	Q: NICHT QUITTIERBAR
d a	IE	-> 17.08.2007 09:02:20	GR: Fuellstand	AL: Überlaufgefahr!	Achtung! Füllstand ist bei 99 Prozent.	Q:	QUITTIERBERECHTIGT

Illustration 30: Example of an individually tailored alarm line

**	Alarme: 8	Quittierpflichtig: 6 Gesperr	t 0
949 ALARM	Python Test	Ventil 4 öffnet nicht	
Priorităt: 0	-> 17.08.2007 08:55:44.226	ANSTEHEND	Ventil
- 10 ALARM	LS27102 Trockenlauf Entleerungspum	P27102 Trockenlauf LS27102 11 Betrieb	
Priorität: 0	-> 17.08.2007 08:53:59.376	<- 17.08.2007 08:54:04.753	Reaktor2
- 7 ALARM	M27201 Drehzahlwächter	M27201 Rührer bei 2.01 bar, 49.70 *C un	d 1480.00 l gestört
Priorität: 0	-> 17.08.2007 08:53:58.359	<- 17.08.2007 08:54:03.359	Reaktor2
8 ALARM	LS27101 Umwälzpumpe Reaktor 2	P27101 Trockenlauf bei 47.62 *C, 4.51 ba	Ir
Priorität: 0	-> 17.08.2007 08:53:45.679	<- 17.08.2007 08:53:50.682	Reaktor2
9 ALARM	SysUeberwach	CPU-Auslastung zu hoch	
Priorität: 0		<- 16.08.2007 15:31:12.603	Systemüberwachung
- 7 ALARM	Achtung, Füllstand ist zu hoch!	Achtung, Füllstand ist zu hochl (99.00000	
Priorität: 1	-> 23.07.2007 14:10:46.910	ANSTEHEND	Fuelistand
4 ALARM	Überlaufgefahr!	Achtung! Füllstand ist bei 99 Prozent.	
Priorität: 2	-> 23.07.2007 14:10:46.910	ANSTEHEND	Fuelistand
- 2 ALARM	TestAlarm	TEST ALARM III Wert1 0.5, Wert2 6.00 , W	
Priorität: 0	-> 04.07.2007 15:39:16.573	ANSTEHEND	SYSTEM

Illustration 31: Example of an alarm list configured via XML

The configuration of the **AlarmMonitor** is specified by **two XML files**. The **layout file** serves to define the layout. The definition of the communication takes place with the **monitor file**.

Different default XML configuration files are supplied by B&R. To adapt the **AlarmMonitor's** configuration to the company standards please copy the supplied XML file, which you can then modify and use.

The files can be found in /opt/aprol/cnf/DisplayCenter/alarm_layout and /opt/aprol/cnf/DisplayCenter/monitor_layout.

The rules for creating valid XML configuration files for the **AlarmMonitor** are stored in a DTD file (DTD - <u>D</u>ocument <u>Type D</u>efinition). Further explanations about this can be found in chapter <u>The layout and monitor DTD files</u>.

Which configuration file is to be used can be chosen in the CC modules for each **DisplayCenter** instance. It is necessary to explicitly assign a layout configuration file to an instance of the **DisplayCenter** for this purpose. A benefit of this procedure is that another configuration can be used very quickly by assigning another file.

You can start the **DisplayCenter** from the command line in the runtime system immediately with the desired configuration file. For this temporary use of the XML file please use the command:



AprolStartDisplayCenter -start 01 --replace_args alarmLayout/alarmMonitor <XML file name>

The permanent allocation of an XML file takes place in the CC modules dialog with the -alarmLayout/alarmMonitor option for the **DisplayCenter**.



Basic knowledge about XML and DTD, structure and syntax, should be present in order to adapt or create an XML configuration file.

Further information can be found in the following chapter, and in the manual 'X6 SelfHTML' on the start page of the **APROL** documentation.

3.2.1 Special features when operating with several CC-Accounts

An XML file, which contains the number of **AlarmMonitors** to be shown and the connection information to the CC-Accounts, must be allocated to the **DisplayCenter** in the '-alarmMonitor' option in order to be able to use the multi-AlarmServer function in the **AlarmMonitor**.



A maximum of 63 CC-Accounts, and therefore AlarmServers, can be connected. A larger number of connected CC-Accounts results in longer response times, and a greater system and network load.



Details about the **DisplayCenter's** launching options can be found in the manual 'X99 CC Modules'.

If the option is not 'used' then there is only a connection to the default CC-Account.

The default settings, when using the option, are one **AlarmMonitor** and the default CC-Account (via the am_llocal_monitor.xml file).

It is possible to access **several** projects on an **APROL** server from **one** operator station.

Furthermore, it is possible to access **several APROL** servers from **one** operator station.



This has the **following results** for the interpretation of the operator rights, as well as the interpretation of the alarm filter.



The same operator names on different CC-Accounts are identical from the point of view of the alarm system.

Access rights to alarm groups (View / acknowledge / lock) are only detected from the local runtime database and are valid for the access to all of the contacted runtime systems.

If an alarm group that is not in the local database should be accessed, **the access right is basically granted** (Tri-state principle).

If the **same alarm group name is on several runtime systems** then it is interpreted as one group.

An alarm group filter is always set for all runtime systems that are connected with the **AlarmMonitor**.

The same behavior applies to all other filter parameters (e.g. PV, priority).

Furthermore, the following notes should be observed for the alarm system when connecting several CC-Accounts:



Historical display (AlarmViewer)

The **alarms of all concerned** CC-Accounts **must** be forwarded to the **CAE project's logging server**. This is the only way it is possible to show the history of the alarm events from different CC-Accounts in a combined list.



Online trends of the alarm parameters

The online trend for alarm event status parameters can also be opened for alarms from 'foreign' **APROL** systems. The losys on the remote system is contacted for this. It is not possible to access the historical records in order to show the previous course of events.



Intervention texts:

It is not possible to open the intervention text for alarm events from 'foreign' **APROL** systems.



Graphic for the alarm: It is not possible to open the 'Process graphic for the alarm' for alarm events from 'foreign' **APROL** systems.

The following covers detailed information about the XML, and DTD files used for the **AlarmMonitor** configuration, as well as their dependencies. An overview is given about the way in which changes can be made to the configurations.

3.3 The XML configuration file for the AlarmMonitor

A well-formed and valid XML configuration file contains the basic information for the display and behavior of the alarm line and the alarm list in the **DisplayCenter**. Different XML configuration files are supplied by B&R, which are made up of different standard configurations in different languages.

The layout configuration files, which control the **appearance**, are in the /opt/aprol/cnf/DisplayCenter/alarm_layout

directory after the **APROL** installation and can be chosen directly or used and adjusted as a template:

Configuration	Description		
al_1alarm_1line_ <language code="">.xml</language>	Alarm line: 1 alarm event, single-line		
	Alarm list: single-line, floating		
al_1alarm_2lines_ <language code="">.xml</language>	Alarm line: 1 alarm event, double -line		
	Alarm list: two line, cannot be freely positioned		
al_3alarms_1line_ <language code="">.xml</language>	Alarm line: 3 alarm events, single-line		
	Alarm list: single-line, floating		
al_old_style_1line_ <language code="">.xml</language>	Alarm line: 1 alarm event, single-line		
	Alarm list: single-line, cannot be freely positioned		
al_old_style_2lines_ <language code="">.xml</language>	Alarm line: 1 alarm event, single-line		
	Alarm list: two line, cannot be freely positioned		

The following language codes are available:

001, 007, 031, 033, 034, 049, 086

The monitor configuration files, which control connections, are in the

/opt/aprol/cnf/DisplayCenter/alarm_monitor
directory after the APROL installation and can be chosen directly or copied and adjusted:

Configuration	Description
am_1local_monitor.xml	One AlarmMonitor connected to the default CC-Account
am_2_monitor.xml	Two AlarmMonitors, each connected to the default CC-Account

3.3.1 losys and CC-Account settings

The connections to the desired CC-Accounts (one or more) are configured with the 'monitor.xml' **monitor** configuration file.

The desired CC-Account must be specified in the 'system' element in the monitor configuration file for this purpose.

This can be done with the 'iosys', 'al_server_selfid' and 'name' attributes, as well as the 'inst_ref' attribute.

The parameters are used to connect directly to the CC-Account by explicitly stating the connection parameters (losys, AlarmServer self ID) and the name of the instance and the description.

If the 'inst_ref' () attribute is given then it is interpreted first of all and provokes a query for the rest of the information from the local runtime database.

Attribute	Description
alarmview_id	The value of the 'id' attribute of the 'alarmview' element in the layout configuration file. The desired layout is allocated to the monitor from the layout file with this.
name <language code=""></language>	Freely chosen name of the AlarmMonitor , which is shown in the DisplayCenter . This serves to differentiate several CC-Accounts.

A separate entry is necessary for each AlarmMonitor that should be displayed.

The 'system' element is a sub-element of the 'alarmmonitor' element.

Attribute	Description
inst_ref	Instance name of an APROL system with a configured AlarmServer from the local runtime database.
	The 'DEFAULT_CC' key word can be used. This serves as a place holder for the CAE project's default control computer.
iosys	Only if 'inst_ref' is not used:
	List of the host names and losys ports, separated by commas.
	e.g. iosys="host1:1, host2:1"
	(with usage on redundancy systems)

Attribute	Description			
al_server_selfid	Only if 'inst_ref' is not used:			
	The self ID of the AlarmServer (entry in the CC modules of the APROL system)			
name	Only if 'inst_ref' is not used:			
	Name of the APROL system project part			
inst	Only if 'inst_ref' is not used:			
	Instance name of the APROL system			
desc <language code=""></language>	Only if 'inst_ref' is not used:			
	Description of the respective country's language			

The following language codes are available:

001, 007, 031, 033, 034, 049, 086

Example 1

```
<alarmmonitor_cnf>
  <alarmmonitor alarmview_id="1" name001="power supply Plant 1-6" name049="Stromversorgung Anlage 1-6">
    <system inst_ref="CC01"/>
  </alarmmonitor>
</alarmmonitor_cnf>
Example 2
<alarmmonitor_cnf>
    <system iosys="host1:1,host2:1" al_server_selfid="dem1"
    name="name of aprol system"
    inst="Inst of aprol system"
    desc001="Desc" desc049="Beschreibung"
    />
    <system iosys="host3:1,host4:1" al_server_selfid="dem3"
    name="name of aprol system"
    inst="Inst of aprol system"
    desc001="Desc" desc049="Beschreibung"
    />
```

</alarmmonitor_cnf>

1

The above mentioned 'alarm_layout' and 'alarm_monitor' directories are completely overwritten after an update of the **APROL** system software, as the configurations that are supplied are always adapted, i.e. extended, to the extensions of the alarm system.

If you use your own XML files instead of the B&R supplied standard configurations, you must adapt these accordingly so that the new functionalities are also available in the visualization.

The /home/<CC-Account>/ENGIN/cnf/DisplayCenter/alarm_layout, and /home/<CC-Account>/RUNTIME/cnf/DisplayCenter/alarm_layout directories are available in the engineering and runtime environment.

Global XML layout configuration files can be stored in these directories.

The configuration files are copied from the 'alarm_layout' and 'alarm_monitor' directories in the engineering system into the respective runtime system directories.

Any existing content in these directories is overwritten. This means that files, which should be preserved after a download, should be stored in the engineering system.

Changes to the configuration of the AlarmMonitor can be carried out as follows:

- by copying and modifying the currently allocated XML file in the engineering system
- by assigning the standard configuration

or by assigning another XML file

3.3.2 Modification of an XML configuration file

In most cases it is not necessary to create the file from scratch. The modification of an existing file is more practical. Modifications in an XML file must be compatible with the rules in the layout.dtd, or monitor.dtd files (see chapter <u>The layout and monitor DTD files</u>).

The changed view in the **DisplayCenter** that is caused by a modified XML file can be quickly and easily tested in the runtime environment. For this, start the **DisplayCenter** from the command line with the command:

AprolStartDisplayCenter -start 01 --replace_args -alarmLayout|alarmMonitor <XML file name>

In order to modify a file, it should be opened in an XML editor. The kxmleditor is available to you, which you can start from the KDE menu "**APROL/Tools/XML-Editor (kxmleditor)**".

After the changes have been made please save the file with a new name. The naming can be freely chosen. A sensible name should give an indication of the actual configuration.

Also pay attention to integrate the country code into the file name of a layout file (<File name>_<Language code>.xml). This corresponds to the **APROL**-wide conventions, and helps you to optimize the multi-lingual application of **APROL**.

A check takes place when the **DisplayCenter** is started, to see if the allocated layout file is in the correct language (according to the **APROL** language settings), and eventually another language version is used. This automatic correction is pointed out with a respective message. This check does not take place with names that do not have a language code.

You can also check the language specific display in the **DisplayCenter** quickly in the runtime system. Start the **DisplayCenter** from the command line in the desired language with the command

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AprolStartDisplayCenter -start 01 --add_args -languageCode <Language code>

The **DisplayCenter** is automatically started with the configuration file in the correct language. With languages apart from German and English, this naturally has the pre-requisite that the language has been installed with the Language DVD.

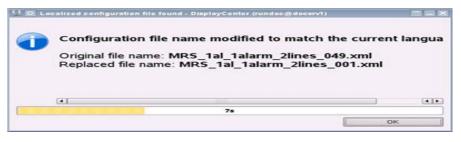


Illustration 32: Automatic choice of the language version of a layout file

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In the **AlarmMonitor** (line or list view) it is possible for you to check the name of the current layout file, and the directory from which the file is loaded, at any time using the "**Configuration file**" shortcut menu.

Simple changes in the layout configuration, related to things such as color or fonts, can take place with changes to attribute values (XML tag). If necessary, further attributes can be added or deleted. Which possibilities can actually be used (for example, the input of character data, or choice of a pre-defined option) can be seen in the DTD file. If an attribute is not stated, or an attribute value is not assigned, then the standard value is automatically adopted when it is in the DTD file.

Further changes correspond to ordering (sorting, adding, deletion) of elements, as well as the correction of the respective content, and attributes. This is significant, for example, for a restructuring of the lines and fields in the status lines or alarm events, whereby amongst other things, the order of the alarm information or texts can be laid down.



If changes have been made to the alarm_layout or monitor_layout directories in the engineering system then a generation of the CC task and a download to the runtime system is necessary, so that the configuration is distributed to the operator system.

3.3.3 Allocation of the configuration files

Each **DisplayCenter** instance must have a **layout** configuration file allocated, from which the instructions for the **AlarmMonitor's** configuration can be taken. A **monitor** configuration files does not have to be allocated.

In the engineering environment, the allocation takes place in the control computer's CC modules (via the **DisplayCenter's** '-alarmLayout' and '-alarmMonitor' options).

The XML files are available for choice in the /home/<CC-

Account>/ENGIN/cnf/DisplayCenter/alarm_layout and opt/aprol/cnf/DisplayCenter/alarm_layout directories.

If XML files with the identical name are in both directories, then the file in /home/<CC-Account>/ENGIN/cnf/DisplayCenter/alarm_layout is used.

The directory structure and the fallback behavior of the monitor configuration files are parallel to this.



If a change in the configuration has taken place, then a generation of the CC task is necessary. The settings in the engineering system are adopted with a download to the runtime system.

The allocation of configuration files to a **DisplayCenter** can also take place with the help of the **StartManager**. Here, a configuration file is chosen from the list in the **DisplayCenter's** '- alarmlayout' **and** '-alarmMonitor' options, and saved in the **StartManager**.

In this case a choice can be made from the /home/<CC-Account>/RUNTIME/cnf/DisplayCenter/alarm_<layout|monitor> directories and from the

/opt/aprol/cnf/DisplayCenter/alarm_<layout|monitor> **APROL-Global directory.**



The allocation using the **StartManager** is temporary, and is overwritten with a download from the engineering system. The **StartManager** informs about these circumstances with a corresponding message.

Information about using the **StartManager** can be found in manual "B5 download & Debugging", chapter <u>System management</u>.

3.4 Description of the configuration possibilities

The **AlarmMonitor's** configuration possibilities are described in the following. The DTD file stipulates all of the possible elements, their order, attributes, and possible attribute values. The structure and content of valid XML files can be deduced from the DTD file. (See chapter <u>The</u> <u>DTD file</u>). Each of the elements is explained, and their function in the configuration, whereby some attributes are explained more closely. As a basic clarification, examples of XML files, as well as images of XML file tree structure are used. You will find this structure view again in the kxmleditor that is installed with **APROL**.

3.4.1 Construction of the layout configuration file

The element definition of the alarmlayout root element in the **layout** configuration file specifies the basic structure of a valid XML file. Firstly, fonts (fontlist) are defined. General settings are made in the following configuration of the **AlarmMonitor** (alarmview), and subsequently display styles (styles), the presentation of the alarm line (linelayout), and alarm list (listlayout). For a speeded, uniform configuration you can fall back on the pre-defined fonts and display styles.

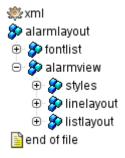


Illustration 33: Rough structure of the alarmlayout in kxmleditor

(See DTD file, <u>alarmlayout</u>).

The following illustration displays the structure of an XML file in a detailed manner, and serves to give you orientation in the file structure:

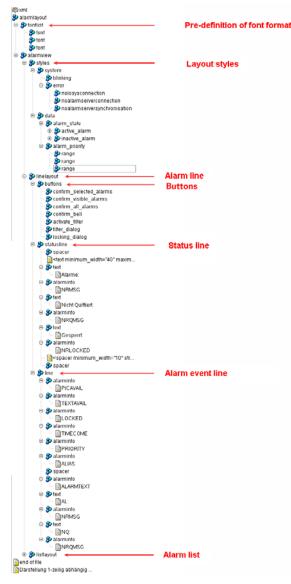


Illustration 34: Detailed structure of an XML file

3.4.2 Geometry management

You can define the geometry management for the line and list view quickly and easily via XML. As the structure of the XML file is identical for both of these types of display, you will quickly be able to find the way in the clearly structured construction of the elements. You can immediately identify and modify a different geometry management for alarm line and alarm list.

In this way, the following points can be realized quickly:

a tailor made configuration for the use of Multiscreening

Defining the layout and content of the status line

Placing and configuration of the buttons in the alarm line/list

an optimal layout for the display in different languages

3.4.2.1 Positioning of the alarm line

The alarm line can be shown above, underneath, on the left, or right of the process graphic in the **DisplayCenter** with the help of the alarmview attribute in the **layout** configuration file. For this, please modify the location attribute (see DTD file, <u>alarmview</u>).

It should be noted when using the left and right option that the width of the alarm line is the width of the status line, or alarm event, as well as the position of the buttons. The necessary modifications of the linelayout/statusline and linelayout/line elements should be made in order to guarantee the readability of the display. The alarm display is too wide, and considerably limits the display of the process graphic when there is an inappropriate configuration.

3.4.2.2 Variable field width

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With the use_splitter attribute in the layout configuration file, you can set if the width of individual fields in the displayed alarms can be manipulated by dragging the frames. If a field is dragged to a certain size (left click on the edge of a field, hold and drag), an automatic attempt is made to align all of the edges of all of the alarms' respective fields as a vertical straight line. This is limited, as the width of the affected fields and the neighboring fields can only be varied according to their configuration (minimum and maximum width, stretchfactor). Further limitations result because the length of the field's content can vary in different alarms.

The option is activated per default, and recognizable with grey lines between fields. This option is limited in its use in combination with the stipulation of stretch factors (see <u>Dynamic field width</u>). The attribute for the alarm line and alarm list can be configured separately in the <code>linelayout</code> and <code>listlayout</code> elements.

3.4.2.3 Configuration of the alarm line and alarm list

With the linelayout and listlayout elements in the layout configuration file, you can individually configure the **AlarmMonitor** for the operator stations, and quickly realize an optimal display of the alarm line/list in combination with the process graphic. This makes it possible for the operator to quickly judge the state of the system and the alarms, as well as an intuitive operation of the **AlarmMonitor**.

Alarm line and alarm list are configured separately, but are principally built up in the same way. They each have sub-elements for displaying buttons, the status line, and one or more rows in the alarm events.

You can define font and color formats with the font, style, backgroundcolor, foregroundcolor, and mouseover_color attributes. Further information about this can be found in chapter <u>Font</u> <u>formatting and color</u>.

🖻 🌮 alarmview
💿 🌮 styles
😑 🌮 linelayout
🕀 🜮 buttons
🕀 🌮 statusline
🕀 🜮 line
🕀 🜮 line
🖻 🌮 listlayout
💿 🌮 buttons
🖲 🌮 statusline
🕀 🌮 line
🕀 🜮 line

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Illustration 35: Structure from linelayout and listlayout in the kxmleditor

(See DTD file, linelayout, listlayout).

Optional attribute 'paddingframe_color':

The color of the outmost frame of the alarm and status field elements can be defined for the 'linelayout', 'listlayout' and 'statusline' elements with the optional paddingframe_color attribute.

The property is passed on from the 'linelayout' and 'listlayout' to the named 'statusline'. That means that the color must not be set explicitly if the color to be used is that of the parent element.

If the attribute is not set, the standard color for the window background is used.

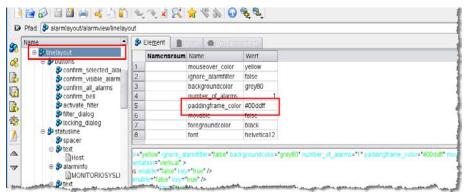


Illustration 36: 'paddingframe_color' attribute for the alarm line

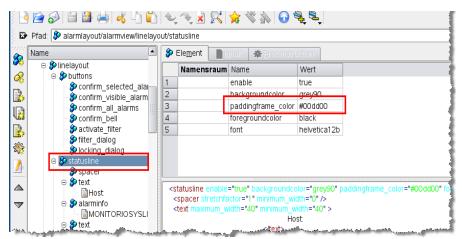


Illustration 37: 'paddingframe_color' attribute for the status line (deviates)

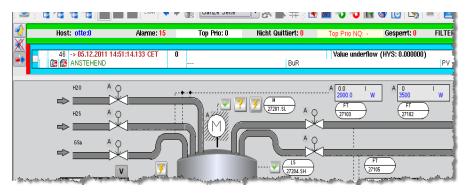


Illustration 38: Resulting coloring of the alarm and status lines

3.4.2.4 Amount of shown alarm events

The number of alarm events shown is defined with the <code>number_of_alarms</code> attribute in the layout configuration file. 1-3 displayed alarm events makes sense for the alarm line (<code>linelayout</code>), so that the size of the process graphic is not unnecessarily impaired. For the alarm list (<code>listlayout</code>), the number can be increased as this is displayed in the whole window of the **DisplayCenter**, or on another screen when used with Multiscreening.

2	Host:	tfcc249:0 Alanme: 7		Nicht Quitt	ert: 5	Gesperrt: 0	FILTER: Zeit [Gruppe: SYSTEM,Reaktor2,Ventil,Systemüberwachung,Fuelistan				
*		16995 -> 17. 健 🛃 <- 17.	07.2007 08:54:49.90 07.2007 08:55:10.53	6 CEST 0	Pyti P NIC	ion Test IT QUITTIERT	Ventil 4 öffnet ni Ventil	eht PV:/PAL_TON_1.Q			

Illustration 39: Alarm line with one alarm event displayed

*		Alarme: 2	Nicht Guittiert: 2	Gesperrt: 0	FILTER: 2	Zeit [Gruppe: SY:	STEM,Reaktor2,Ventil
2	00	-> 14.08.2007 09	26:17.687 CEST 0	M27201 Drehz	ahiwächter	Reaktor2	M27201 Rührer bei 2.36 bar, 65.00 °C und 74
<u>× </u>	🗆 😂 🖽	→ 13.08.2007 12	:28:45.900 CEST 0	TestAkarm		SYSTEM	TEST ALARM !!! Wert1 0.1, Wert2 7.00 , Wert3 15.599,
	•						()

Illustration 40: Alarm line with two alarm events displayed

3.4.2.5 Floating alarm line

A floating alarm line can be configured with the movable attribute in the linelayout element in the layout configuration file. This can be released in the visualization by a double-click on the alarm line's grabber, or by dragging the grabber from the fixed position. Docking to the configured position in the main window takes place with a double-click on the title bar of the alarm line.

<u>u</u> o 1	isplayCenter
<u>F</u> ile \	iew <u>G</u> oto <u>A</u> larms <u>T</u> ools <u>L</u> ogin
	"te 省 🐔 📷 🎬 🛙
<u>े</u> 🛃	Host: docsrv1:0,tchwtemrs01:0 Ai
Monitor 1	7714 -> 03/21/2013 11:37:5
6	
4	Bezeichner
\$	
S	Bezeichner
4	Bezeichner / C C C C
4	Bezeichner / C C C C C C
	Bezeichner CCCCCCCCC
3	Bezeichner CCCCCCCCC

Illustration 41: Alarm line's grabber

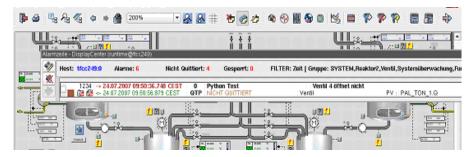


Illustration 42: Freely positioned alarm line

 \bigwedge

Please do not configure a floating alarm list in combination with a deactivated WindowManager (launching option -noWindowManager for the **DisplayCenter**), in order to make sure that the alarm list is displayed in the uppermost window.

Further information about the use of the floating alarm line/list can be found in the manual "C1 Interactive Process Control".

3.4.2.6 Behavior of switch-able macros with an open alarm list

In order to be able to carry on monitoring and operating the state of system components when the alarm list is open please modify the <code>listlayout</code> element. With the <code>unmap_makros</code> attribute you can determine if the pop-up macros in the process graphic remain in the foreground when the alarm list is opened, or if they are covered.

🖬 🐝 🌮 🗶 🗰 Alarme: 6 🛛 18	icht Quittier	rl: 4 Gespenrl: 0	FILTER: Zeit Gruppe: S	YSTEM,Reaktor2,Ventil,Systemiberna
1270 -> 24.07.2007 10:27:05.940 CES		Python Test NICHT QUITTIERT	Ventil 4 ö Ventil	fmet nicht PV: PAL_TON_1.0
1 → 23.07.2007 17:57:26.182 CES	T O T OP	LS2710 2027104	Spumpe Reaktor 2 Reaktor2	P27102 Trockentaul LS27102 11 Betriebsstunden; Füllstan PV: R2P6_LS27102_STOER
1 → 23.07.2007 15:30:33.207 CES		SysUe Absperventi (sa NICHT (sec)	Q Systemüberwach	astung zu hech ung PV: BspUe_SysHmSrvCheckD1_1_TON,
 → 23.07.2007 14:10:46.910 CES ⁽³⁾ ⁽	ST 1 4	Achtur Anto Ant	Fuelistand	Füllstand ist zu hoch! (39,000000 %) PV: BapA_Groesser90
4 → 23.07.2007 14:10:46.910 CES		Uberta	Achtung! Fuelistand	Füllstand ist bei 93 Prozent. PV: BspA_Groesser98
2 → 04.07.2007 15:39:16.573 CES		TestAlarm 04.07.2007 16:08:59.400		ARM !!! Wert1 0.5, Wert2 6,00 , Wert3 9,387, Wert 4 8,0000

Illustration 43: Macro that is in the foreground

3.4.2.7 Behavior of the alarm list when changing the process graphic

If a displayed alarm event has a process graphic allocated to it, then there is the possibility to jump to the respective process graphic with the icon. Information about the configuration of this functionality in the layout configuration file can be found in chapter <u>Alarm information (alarminfo)</u>. With the auto_close attribute you can determine if the opened alarm list is faded out when changing the process graphic, or if it is still shown in the foreground.

If a floating alarm list is configured (movable attribute), the auto_close attribute should not be set to true in order to place this on another screen in a Multiscreening environment. In this case, the alarm list does not cover the process graphic, but is closed anyway when the "Diagram for the alarm" is called up.

3.4.2.8 Buttons, status line, and lines of the alarm events

In order to optimally configure the operation of the **AlarmMonitor** you can define allowable interactive interventions and information that is to be shown in the layout configuration file, which help the operator to concentrate on important aspects of the process control.

Alarm line and alarm list are each composed of a status line, the buttons, and one or more alarm events. The status line display and the buttons are optional.

Buttons (buttons)

There are seven different buttons available, which can be shown in the alarm line and the alarm list. The alignment of the chosen buttons takes place with the orientation and position attributes.

\$\$\$\$	Alarme: 4	Nich	t Quittiert: 2 Gesperrt: 0	FILTER: Ze	it [Gruppe: Reaktor2,Fuellstand]	ā	₽	٠	\$ ×
3 → 06.07.2007 06.07.2007 ← 06.07.2007	08:58:44.209 CEST 08:58:49.212 CEST		M27201 Drehzahlwächter NICHT GUITTIERT	M27201 Reaktor2	Rührer bei 2.01 bar, 49.93 °C und 1480.00 PV: R2P5_M272015				
3 → 06.07.2007 3 → 06.07.2007 C 06.07.2007	7 08:58:38.948 CEST 7 08:58:43.952 CEST (LS27101 Umwälzpumpe Reaktor 2 NICHT GUITTIERT	P27101 Reaktor2	Trockenlauf bei 47.27 °C, 4.49 bar PV: R2P2_LS27101	STOR	R		
	/ 09:50:06.108 CEST	1	Achtung, Füllstand ist zu hoch!	Achtun Fuellstand	g, Füllstand ist zu hoch! (99.000000 %) PV: BspA_Groesser	90			

Illustration 44: Horizontally aligned buttons, left next to the status line

Alarme: 7	Nicht Quittiert: 4	Gespent: 0	FILTER: Zeit [Gruppe: S	YSTEM,Reaktor2,Ventil,Syster	müherwachung,Fuellstand 🗎 📩 👝 👝 🗸	n e
4			100			100
20344 -	> 19.07.2007 17:30:26.875	CEST 0	Python Test	Ventil 4 öffnet nicht		
- 🎦 🙆 📕	- 19.07.2007 17:30:47.153	CEST QTP	NICHT QUITTIERT	Ventil	PV: PAL_TON_1.Q	4
21 -	> 19.07.2007 15:30:35.154		SysUeberwach	CPU-Auslastung zu he		. 3
- 🎒 🙆 📕 -	- 19.07.2007 15:31:42.353	CEST OTP	NICHT QUITTIERT	Systemüberwachung	PV: BspUe_SysHmSrvCheck01_1_TON_3.6	2 2
	> 06.07.2007 08:58:44.209		M27201 Drehzahlwächter	M27201 Rühner bei 2.	01 bar, 49.93 °C und 1480.00 I gestört	72
- 🔲 🙆 💋 -	- 06.07.2007 08:58:49.212	CEST QP	NICHT QUITTIERT	Reaktor2	PV: R2P5_M27201SL_STOER	1.5

Illustration 45: Vertically aligned buttons, right next to the status line

It must be stipulated for each button if it is to be shown (enable), and if the respective function call should be possible per function key (key). The call per function key can be suppressed, for example, to avoid an accidental acknowledgement of alarms.

Further information about the use of the buttons in the **AlarmMonitor** can be found in manual 'C1 Interactive Process Control', chapter <u>AlarmMonitor</u>.

Four further buttons for navigation within the alarm list, and a fifth button to leave the list, are automatically shown.



Illustration 46: Additional, automatically displayed buttons for the alarm list

Status line (statusline) and alarm event lines (line)

By the composition of the status line and the lines of the alarm events, you can combine the alarm events' icons and status information. Furthermore, you have the possibility to integrate fields with static text into any place in these lines. Via the configuration of the status line and the alarm event's lines you can define which relevant information is shown to the operator in the **AlarmMonitor**, as well as in which layout they are displayed.

Which information is shown, and how you can configure this is described in chapter <u>Information</u> <u>about the alarm events</u>. Information about the configuration of fonts and colors can be found in chapter <u>Font formatting and color</u>. In the following paragraphs you can find how the geometry management influences the alarm events within the status line and the alarm event's lines (e.g. if the status line is shown, or how much place is available for the separate information).

The status line and the alarm event's lines can be flexibly and individually composed from individual fields that are set next to each other, which are composed of the <code>alarminfo, text</code> and <code>spacer</code> sub-elements. These can be made in any number and order.

All alarms that occur are shown according to the specifications of the line element. One line is configured in each line element. At least one line alarm event line must be stated, if needed more.

A checkbox is set automatically to choose the alarm event at the beginning of each alarm event, this cannot be configured.

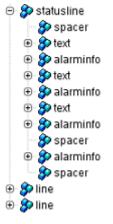


Illustration 47: Structure of statusline and line in the kxmleditor

(See DTD file, <u>statusline</u>, <u>line</u>).

Display of the status line

The enable attribute defines for the status line if it should be shown. You can configure a differentiated display for the alarm line (main element linelayout) and alarm list (main element listlayout).

Defining the field width for alarminfo, text and spacer

In order to give the operator a clear view of all of the relevant information, please pay attention to the configuration of the individual field widths. No spaces are inserted between the fields in the alarm event's lines. The complete space available must be divided; otherwise the fields are centered, whereby grey areas are inserted at the beginning and the end.

The fields are distributed over the whole width in the status line. Areas that are not filled, before, after, and between the fields, are also displayed in grey.

%	1	Host:	Doc Srv1:0	Alarme:	2		Nicht G	Quittiert:	2		Gesperrt:	0		Π.	FILTER: Zeit [Grup	L L
*		ia 🖉 «-	14.08.2007 09:20.1	2 -> 14.08.2 2.694 CEST			CEST JITTIERT		M27201		ahlwä aktor2	M27201	Rühr		2.36 bar, PV : B2F5_M27201SL_ST	ER
						_`	Auto	matica	ally ins	erte	d grev an		/			

Illustration 48: Free space is supplemented with grey areas

The space available changes in connection with the screen resolution and the width of the window in which the alarm line, or alarm list, appears.



When configuring the field width it must be taken into account that the alarm information can vary in its length. Also, for the clarity it makes sense to form columns with vertical straight lines within multiple lined alarm events, and on the alarm events. This does not happen automatically.

The width can be configured with different methods, fixed or dynamically. For this, the minimum_width, maximum_width, and stretchfactor attributes are available for all three elements.

The minimum width of a field can be stated with minimum_width. The maximum_width attribute stipulates the maximum width of a field. Content that exceeds the maximum width is cut and displayed with '...' in the **AlarmMonitor**. If the mouse pointer lies over the text then the whole text is shown as a tool tip. If no maximum width is defined, then the whole content is always shown in the respective field. With long content, this could mean that the view has to be scrolled horizontally. The value of both attributes is made in pixel.



Please note that this concerns real pixels, which results in different displays on monitors with different resolutions.

With the stretchfactor attribute you have the possibility to dynamically adapt the width of fields. Here, an aspired ratio of the field width is forced with the ratio of the stretch factors. The attribute values can be whole positive numbers, including 0.

If the stretchfactor attribute is defined for several elements, then initially the width of the respective fields is dictated by the content (when no limits have been imposed). The available rest space is distributed amongst the fields, so that a fitting of the width ratio and the stretch ratio is aimed for. If the relationship cannot be met with the available space, then firstly the field with the largest stretch factor is made wider. If the width ratio is met, and there is still space available, then this is divided proportionally to the remaining fields with a stretch factor.

The widths of the fields that do not have a stretch factor, or have the value 0, are not influenced by this mechanism.

The following examples show normal configurations for the width of fields, in which the attributes are combined with each other.

Fixed field width:

A fixed field width can be made by allocating the same value for the minimum and the maximum width.

Example:

```
<alarminfo maximum_width="210" minimum_width="210" font="helvetical2">
Requires acknowledgement:
</alarminfo>
```



Illustration 49: Configuration with fixed field width

Note here that the size needs change, for example, with another font. Thus the allocated width may not be sufficient to show the complete text.



You can avoid this by not defining either minimum or maximum for the respective field. In this case the width of the field is governed by the width of the content, and thereby adjusted to the varying size needs.

Dynamic field width:

When stating the stretch factor and the minimum width, the space available is dynamically divided amongst the affected fields. Thereby, the fields are at least as wide as thee content, whereby the minimum width is not undercut.

Example:

```
<alarminfo stretchfactor="1" minimum_width="200" >
ALIAS
</alarminfo>
<alarminfo stretchfactor="2" minimum_width="400" >
ALARMTEXT
</alarminfo>
```

You can dynamically adjust the field width to the content to be shown, and thereby limit the width not only to a minimum but also a maximum value. Here, the minimum width is shown at least. If the content is wider, then the field automatically gets wider, does not become wider than the maximum width.

Example:

```
<alarminfo maximum_width="210" minimum_width="80" >
ALARMTEXT
</alarminfo>
```

24.07.2007 15:48:21	0	Python Test	Ventil		Ventil 4 off	fnet
24.07.2007 15:30:33	0	SysUeberwach	Systemilerwachung		CPU-Auslastu	ing
23.07.2007 17:57:26	0	L827102 Trockenlauf Entleerungsp	mpe Reaktor 2 Reaktor2	P27102	Trockenlauf LS:	271
23.07.2007 14:10:46	1	Achtung, Püllstand ist zu hoch!	Puellstand		Achtung, Pùl	110
23.07.2007 14:10:46	3	Überlaufgefahr!	Puellstand		Achtung: P01	11st
> > 04.07.2007 15:39:16	0	TestAlarm 5YS	MET	THET AL	ARM !!! Wert1 0.	.5,

Illustration 50: Configuration with variable field width

219 -> 23.07.2007 16:40:42.236 CEST	0	Python Test	Ventil 4 öffnet nicht	
🔚 🦲 🥵 🗢 23.07.2007 16:41:02.380 CEST	QTP	NICHT QUITTIERT	Ventil	PV: PAL_TON_1.0
1 -> 23.07.2007 15:30:33.207 CEST	0	SysUeberwach	CPU-Auslastung zu hoch	
🔚 🚾 🚳 条 23.07.2007 15:31:36.422 CEST	QTP	NICHT QUITTIERT	Systemüberwachung	PV: BspUe_SysHnSrvCheck01_1_TON_3.Q
> 23.07.2007 14:10:46.910 CEST	1	Achtung, Füllstand ist zu hoch!	Achtung, Füllstand ist zu ho	ch! (99.000000 %)
🔤 🎯 🥵 ANSTEHEND			Fuelistand	PV: BspA_Groesser90
4 → 23.07.2007 14:10:46.910 CEST	2	Überlaufgefahrt	Achtung! Füllstand ist bei 95	3 Prozent.
🖃 💼 🚳 ANSTEHEND	QP.	NICHT QUITTIERT	Fuelistand	PV: BspA_Groesser98
2 -> 04.07.2007 15:39:16.573 CEST	0	TestAlarm	TEST ALARM !!! Wort1 0.5,	Wert2 6.00 , Wert3 9.387, Wert 4 8.0000
- 🔁 🔁 🛃 ANSTEHEND	QTP	04.07.2007 16:08:59.400 CEST	SYSTEM	PV: SYS AT SR 1.0

Illustration 51: Configuration with partly fixed, partly variable field width



The alarminfo and text elements are not allowed to both simultaneously have a stretchfactor > 0 within on line.

The content of the alarminfo and text fields can be aligned with the align attribute.



The use of the use_splitter attribute can lead to problems in the display when used in combination with stretch factors.

If within a line an alarminfo element and a text element simultaneously have a stretch factor > 0. then is could help to set the use splitter attribute to "false".

3.4.3 Information about the alarm events

The layout configuration via XML makes it possible to quickly and specifically define which information and buttons are shown in the **AlarmMonitor**, and where they are shown. In this way, you can configure the visual display without much effort so that the priority and state of the alarms, can be immediately registered and properly judged by the operator.

The configuration of the following information and objects is possible for example:

- interactive icons. Message text alarm-state parameter, Number of pending, locked, and alarms requiring acknowledgment,
 - Suppression set alarm filter,
 - extended time display,
 - automatic sorting of the alarm events according to priority or reception time,
 - static text

The identical structure in the XML code of the alarm line (linelayout element) and the alarm list (listlayout element) allow for a quick and comfortable modification of the file. In order to save time you can define global display styles (styles) for the **AlarmMonitor**, which can be separately specified in more detail for the alarm line and the alarm list. (See chapter Font formatting and <u>co</u>lor).

An individual configuration for the display in Multiscreening is also possible. Notes about his can be found in chapter Geometry management.



Illustration 52: Structure of alarmview in kxmleditor

(See DTD file, alarmview).

3.4.3.1 Local warning tone

With the activate alarmbell attribute in the layout configuration file, you can define for the alarmview element if a local warn tone should sound when an alarm occurs. The local warn tone is generated on the respective computer on which the **DisplayCenter** is started, and can only be turned off for this with the attribute. In contrast, the global warn tone that is audible with a horn in

a hall, and on other operator stations, is not influenced in this way, but can be turned off for the current alarm with the "Acknowledge warn tone" button in the **DisplayCenter**.

Example:

<alarmview activate_alarmbell="true" location="top" >

3.4.3.2 Positioning the alarm line and amount of shown alarm events

You can position the alarm line with the help of the location attribute (alarmview element) in the layout configuration file. For the linelayout and listlayout elements, the number of alarm events displayed is stipulated with the number_of_alarms attribute. Please note the information about this in chapter <u>Geometry management</u>.

3.4.3.3 Suppressing the alarm filter

In order to make sure that no alarm is faded out by a filter in the alarm line, or the alarm list, please modify the <code>linelayout</code> and <code>listlayout</code> elements in the layout configuration file. That normally no alarm filter is used in any of the displays can be forced with the <code>ignore_alarmfilter</code> attribute.

3.4.3.4 Time display

An exact error analysis is made possible when you extend the reception and discharge times of the alarms with additional information.

With the show-milliseconds attribute in the layout configuration file, alarmview element for alarm line and alarm list simultaneously, you can state if the milliseconds are additionally shown. This setting can also be carried out separately in the linelayout and listlayout elements for the alarm line and alarm list. (The sub-element's attributes have priority over the main elements). Also, you can configure the display of the time zone in the linelayout and listlayout elements. For this use the show_timezone attribute.

-> 19.07.2007 16:49:55

Illustration 53: Simple time display

-> 19.07.2007 16:52:57.512 CEST

Illustration 54: Extended time display

3.4.3.5 Sorting alarm events

With an automatic sorting of alarm events you can support an operator in properly judging the displayed alarms, as well as the order of necessary actions.

Sorting the displayed alarm events in the alarm line (if multi-line) and the alarm list can take place with help of the sorting attribute either according to the occurrence of the alarm or according to the priority. You configure the sorting for both the alarm line and alarm list with the alarmview element in the layout configuration file.

If you sort according to time, then the alarm event that occurred last is at the top. When sorting according to priority, the alarm events are sorted in ascending order from top to bottom (whereby "0" is seen as the highest priority).

19 -> 31.07.2007 14:02:57.609 CEST		LS27102 Trockenlauf Entleerung: NICHT QUITTIERT	spumpe Reaktor 2 Reaktor2	P27102 Trockenlauf LS27102 11 Betriebsstunden; Füllstanc PV: R2P6_LS27102_STOER
> 23.07.2007 14:10:46.910 CEST		Achtung, Füllstand ist zu hoch!	Fuellstand	Füllstand ist zu hoch! (99.000000 %) PV: BspA_Groesser90
4 -> 23.07.2007 14:10:46.910 CEST		Überlaufgefahr! NICHT QUITTIERT	Achtung! Fuellstand	Füllstand ist bei 99 Prozent. PV: BspA. Groesser98
2 -> 04.07.2007 15:39:16.573 CEST	0	TestAlarm 04.07.2007 16:08:59.400 CEST		ARM !!! Wert1 0.5, Wert2 6.00, Wert3 9.387, Wert 4 8.0000 PV: SYS_AT_SR_1.0

Illustration 55: Sorting according to reception time

19 -> 31.07.2007 14:02:57.609 CEST			spumpe Reaktor 2 Reaktor2	P27102 Trockenlauf LS27102 11 Betriebsstunden; Füllstand PV: R2P6_LS27102_STOER
2 -> 04.07.2007 15:39:16.573 CEST		TestAlarm 04.07.2007 16:08:59.400 CEST	TEST AL/ SYSTEM	ARM !!! Wert1 0.5, Wert2 6.00 , Wert3 9.387, Wert 4 8.0000 PV: SYS_AT_SR_1.Q
> 23.07.2007 14:10:46.910 CEST	1	Achtung, Füllstand ist zu hoch! 	Achtung, Fuelistand	Füllstand ist zu hoch! (99.000000 %) PV: BspA_Groesser90
4 -> 23.07.2007 14:10:46.910 CEST		Überlaufgefahr! NICHT QUITTIERT	Achtung! Fuellstand	Füllstand ist bei 99 Prozent. PV: BspA_Groesser98

Illustration 56: Sorting according to priority

3.4.3.6 Information in the status line and in the alarm event's lines

With the respective configuration of the **AlarmMonitor** it can be ensured that the operator receives all of the relevant information concerning alarms in the visualization. Furthermore, you can make certain functionalities available to him via icons.

Not only the design of the status line (statusline element), but also the alarm event's lines (line element) take place with the ordering of the following elements in the layout configuration file:



You can combine these elements in any number and order. Attributes for display of the content and the width can be stipulated for each field. Further information about this can be found in the chapters <u>Geometry management</u> and <u>Font formatting and color</u>.

The following styles can be used as the value 'style' attribute in the 'alarminfo', 'text' and 'spacer' elements:

Style	Description
alarm_top_priority	Shows field in the style highest priority of the pending alarms.
	(smaller number corresponds to higher priority)

Style	Description
	Shows field in the style highest priority of the pending, non- acknowledged, alarms that require acknowledgement.



Illustration 57: Allocation of priority style attributes in the status line

These style key words do not refer to an own style, but refer to the 'alarm_priority' style from alarmlayout/alarmview/styles/data/, for which an allocation of priority and color has already taken place.



The before mentioned key words have been implemented by B&R as an example in the alarm layout configurations'al_1alarm_2lines_001.xml' and 'al_1alarm_2lines_049.xml'.

3.4.3.7 Alarm information (alarminfo)

A field is inserted with the *alarminfo* element in the layout configuration file, which shows current information about the system in the status line, and shows current information about the alarm in the alarm event's lines. Only the key words that are listed in the table are allowed as content for the *alarminfo* element in the XML file.



Illustration 58: Structure of alarminfo in the kxmleditor

(See DTD file, <u>alarminfo</u>).

Configuration of one line in the alarm event:

The following key words are available to you for an *alarminfo* element:

The information that is shown is valid for the filter that has been actually set in the **AlarmMonitor**

Key word (line of the alarm event)	Description			
ACKN	["ALLOWED TO ACKNOWLEDGE" "IS ACKNOWLEDGE" "CANNOT BE ACKNOWLEDGED" "NOT ALLOWED TO ACKNOWLEDGE"]			
ACKNSTATE	Type of alarm (MODE in alarm configuration)["RA" "RTA" " "] (RA= requires acknowledgement; RTA= requires text acknowledgement)			

Key word (line of the alarm event)	Description				
ALARMTEXT	Message text (value of TEXT in the alarm configuration)				
ALIAS	Alias (value from the alarm configuration)				
GROUP	Group of the alarm (value from the alarm configuration)				
GROUPDESC	Description of the alarm group				
LOCKED	Shows with an icon if an alarm is locked. The informative icon is faded in for alarms that are currently locked, and faded out for alarms that are not locked.				
MULTI	Number of non-acknowledged occurrences of the alarm ("-" when the alarm does not need to be acknowledged)				
NAME	Name of the triggering PV				
NUMBER	Running number of the current alarm in the AlarmServer				
PICAVAIL	Shows with an icon if a "Diagram for alarm" has been configured for this alarm. Eventually, it is possible to jump to the respective process graphic via the icon.				
	Icon when 'process graphic for alarm' is present:				
PRIORITY	Priority of the alarm (value PRIO from the alarm configuration)				
SYSTEMNAME	Name of the APROL system from which the alarm originates. This is either the name of the local runtime database (when using 'inst_ref'), or the value of the 'name' attribute of the 'system' element in the monitor configuration file.				
TEXTAVAIL	Shows with an icon if an intervention text has been configured for this alarm. Eventually, the intervention text can be opened as a pop-up via the icon. Icon when an intervention text is present:				
	Icon for locked alarms: ≤				
TIMEACKN	Acknowledgement time or ["NOT ACKNOWLEDGED"]				
TIMECOME	Reception time of the alarm				
TIMEGO	Discharge time of the alarm or ["PENDING"]				



Information about the alarm configuration can be found in manual "B2 Project Engineering", chapter <u>Alarm blocks in the CFC</u>.

Configuration of the status line

The following key words are intended for the *alarminfo* in the configuration of the status line. They can also be used in the configuration of the alarm events' lines:

Keyword	Description
FILTER	Short description of the most important filter settings
MONITORIOSYSLIST	List of the host names and losys port specification, separated by commas
	e.g.: <name>:<port>; <name>:<port></port></name></port></name>
	This is either the name of the local runtime database (use of 'inst_ref'), or the value of the 'iosys' attribute of the 'system' element in the monitor configuration file.
MONITORNAME	Name of the monitor
	Language dependence of the 'name <language code="">' attribute of the 'alarmmonitor' element from the layout configuration file, or the 'id' attribute of the 'alarmview' element from the layout configuration file.</language>
MONITORSYSNAMELIST	List of names of the APROL systems
	This is either the name of the local runtime database (use of 'inst_ref'), or the value of the 'name' attribute of the 'system' element in the monitor configuration file.
NRLOCKED	Number of locked alarms.
NRMSG	Number of pending alarms
NRQMSG	Number of alarms requiring acknowledgement
TOPPRIO	highest priority of all pending alarms (smaller number corresponds to higher priority)
TOPPRIOACK	Highest priority amongst the pending, non-acknowledged alarms

1 > 26 07 2007 12 00 46 470 CEST LS27 101 Umwalzpumpe Reaktor 2 P27 101 Trockeniau bei 47 92 *C. 4 53 bar Alemnet 0 Quitterpflichtig: 6

Illustration **59**: The key words intended for the status line can also be used for the alarm events

3.4.3.8 Text (text)

You can insert fields with static text, for example to prepend explanations to the alarm information. Character data (text or numbers) must be entered in the text element in the layout configuration file.

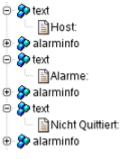


Illustration 60: Structure of text in kxmleditor

(See DTD file, *text*).

3.4.3.9 Spacer (spacer)

You can raise the clarity of the displayed information in the **AlarmMonitor** greatly by using spacers in the layout configuration file. To define spaces between information and text fields use the spacer element. Color and width of the individual fields can be configured with the corresponding attributes. Detailed information about this can be found in the chapters <u>Geometry</u> <u>management</u> and <u>Font formatting and color</u>.

(See DTD file, <u>spacer</u>).

3.4.4 Font formatting and color

You help the operator in quickly differentiating and evaluating the different alarm and system information with layout configurations regarding font and color. The configuration can also be adjusted according to the environment that affects the work with the **AlarmMonitor** (for example lighting and noise level).

A quick and easy configuration is made possible with the following mechanism:



Pre-definition of certain formats, that can be referenced to

Global definition of certain formats for underlying elements

Attribute values for color can be entered with the hexadecimal notation of the RGB value, or by stating a standard color name (for example, VGA standards, or W3C CSS specifications). A list of the allowed color names can be found in the usr/share/X11/rgb.txt file.

3.4.4.1 Highlighting the mouse pointer position

You can provide the operator with an optimal operation of the **AlarmMonitor** with a simple modification to the **layout** configuration file, paying special attention to the lighting conditions.

With the mouseover_color attribute you can define in which color the alarm event's frame is displayed as long as the mouse pointer is over this alarm event.

Different configurations are possible for the alarm line (linelayout element) and the alarm list (listlayout element).

3.4.4.2 Font formatting (fontlist, font)

The use of font formatting in the layout configuration file allows you to speed up the configuration of a uniform appearance. The data in the alarm system that is relevant to the process control can be optically highlighted.

You can define the font formatting (font element) with different properties in the fontlist element. At least one font element must be defined, if necessary more. In other places, the value that has been defined in the alias attribute can be allocated to font attributes. Then, the properties such as size, font, etc. are adopted according to the definition and are shown.

The benefit of this procedure is that the changes in attribute values of a font formatting instantly take effect in all places where it is referenced. There is then no need to laboriously search through the entire XML file, with the danger of making mistakes.

Furthermore, by modifying the font element you can create language specific configurations quicker.

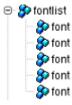


Illustration 61: Structure of the fontlist in kxmleditor

Example of font definitions in the XML file:

```
<fontlist>
	<font size="10" family="Adobe Helvetica" alias="helvetica10" />
	<font size="12" family="Adobe Helvetica" alias="helvetica12i" italic="1" />
	<font size="16" family="Adobe Helvetica" bold="1" alias="helvetica16bi" italic="1" />
	</fontlist>
```

Example of referencing fonts in the XML file:

```
<inactive_alarm>
<unconfirmed foregroundcolor="black" font="helvetica10" />
<text_unconfirmed foregroundcolor="black" font="helvetica16bi" />
</inactive_alarm>
```

Note:

Attribute values for fonts (family) must be declared with a standard font name (for example courier). The declaration of the font size (size) is in points.



In the **DisplayCenter's** "Fontcheck" shortcut menu, you should check to see if all of the fonts entered are available. Fonts that do not exist are automatically replaced.



Illustration 62: Message about font correction

```
(Also see DTD file, <u>fontlist</u>,<u>font</u>).
```

3.4.4.3 Display styles (styles)

With the styles element in the layout configuration file, you create configurations for the display of system messages, as well as the state and preferred display of alarm events.

The styles element does not have an own attribute. It is divided into two sub-elements, system and data.

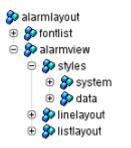


Illustration 63: Structure of the alarmlayout in kxmleditor

(See DTD file, styles)

For the linelayout, listlayout, line, alarminfo, spacer and text elements, a reference can be made with the style attribute to another styles/data element's defined display style (alarm_state or alarm_priority). The respective field is then displayed in another way according to the alarm state or the priority. Individual changes regarding font and color can be made for each element with the attributes font, backgroundcolor and foregroundcolor.

3.4.4.4 Display of system messages (system)

Displaying certain system messages can be speedily configured in the layout configuration file so that the operator can quickly and certainly recognize changed system states (e.g. the loss of a connection to the **APROL system**).

The system element establishes the display of system messages. It must be specified exactly once in each styles element, and does not have any own attributes. It is divided into two subelements, blinking and error.



Illustration 64: Structure of system in kxmleditor

(See DTD file, <u>system</u>)

Blinking for pending alarms (blinking)

The display of pending alarms can be individually adapted to environmental influences such as lighting conditions or the surrounding noise level. They therefore also help the operator to register current system states quickly.

The blinking element's attribute sets, that when an alarm occurs, then the frame of the alarm line or the alarm list's status line blinks in the set color. This can be turned off with the "Acknowledge warning tone" button in the **DisplayCenter**.

(Also see DTD file, *blinking*)

Display of different error messages (error)

Certain system states affect the display of the process graphic and also the display of the alarm events. The reason can be the loss of connection to the losys, due to a download or a redundancy switch. Even when the **AlarmServer** is not started, or the connection to the **APROL** system is interrupted, as well as during the synchronization with the **APROL** system after having started the **DisplayCenter**, are subject to special states of the system.

In order to signalize certain states in the system to the operator it is possible to display the following states through font and color formatting.

missing connection to the losys

missing connection to the APROL system

failed synchronization with the AlarmServer

The error element is divided into three sub-elements for different system errors as follows:

noiosysconnection noalarmserverconnection noalarmserversyschronisation

With the error element's attributes the same formatting can be allocated to all ancillary error messages, respective of one or more attributes (Foreground color/font color, background color, and font). Although it is also possible to allocate an individual attribute value (for example, the same font for all error messages, but different colors) to the different error messages



Illustration 65: Display of the system error message noiosysconnection

	Qo to A													1000										1994	
36 °	12 9	3 73	78 7	8 18	122		*	+ Q	a (m	hole Pag		- E1	31:		100	10	14	9	20	3	Die	-	 	- 6	73
			Va con	meatic	on to	Alam	nServ	er - 5	vate				×sr	5 10	awa-	doc		0.ta	nwte	mest	01-0				
			vo con	meatic	on to .	Alarn	nServ	er - Sj	yste				×sr	S , IO	sys:	doo	ervt:	o,tei	tawte	mrst	91:0				
		,	Va con	meatic	on to .	Alam	nServ	rer - Sj	yste		2 2		×sri	5 , 10	sys:	doc	irv1:	0,to	hwte	mrst	91:0				
		,	Vo con	meatic	on to .	Alam	nServ	rer - 5)	yste				×sr:	5,10	sys:	doa	ervt:	0,tci	hwte	ms	01:0				
		,	Vo con	meatic	on to .	Alarn	nServ	rer - Sj	yste		20		×sr:	5 , 10	sys:	doo	arvt:	0,tci	tawte	omrst	01:0				
		,	vo con	meatic	on to .	Alarn	nServ	rer - Sj	yste				×sr:	S , IO	sys:	doc	irvt:	0,tci	towte	omrst	91:0				
		,	Vo con	meatic	on to .	Alarn	nServ	rer - Sj	yste		2.0		≍ sr:	5 , 10	sys:	doc	ervt:	0,ta	towte	ms	91:0				
		,	Vo con	meatic	on to .	Alam	nServ	rer - Sj	yste		2 -		× 57:	8,10	sys:	doa	ervt:	0,to	nwte	mrst	o1:0				

Illustration 66: Display of the system error message noalarmserverconnection

O [splayCenter (runtime@DocSrv1) <2>	_ 8 ×
Datei Ansicht Gehe zu Alarme Werkzeuge Login Hilfe	B.R -
📭 🗉 🖓 Az 🐔 🔹 🔹 🖀 (Ganze Seite 🔍 🖳 🎬 🏦 🍖 🛷 🕸 🚱 🖄 🖄 🖄 👘 🌮 🌮 🛜 🚍	着 🕀 🔚
No synchronization to AlarmServer	

Illustration 67: Display of the system error message noalarmserversyschronisation

(Also see DTD file, error)

3.4.4.5 Alarm data dependent display (data)

You can quickly configure the **AlarmMonitor** in the layout configuration file so that the state of the alarms can be immediately registered and judged by the operator.

The state and priority dependent display can be configured according to



Foreground/font color



🖉 Font

can be configured.

The data element must be declared in the XML file exactly one time, and does not have any own attributes. It is divided into two sub-elements, alarm_state and alarm_priority.

Both of these display styles can be allocated in other places via referencing the style attribute, of the entire alarm line (linelayout), the entire alarm list (listlayout), individual alarm events lines (line), and individual fields (alarminfo, text, spacer). The display of the affected elements takes place in relation to the state of the alarm, or the priority. If style, color, or font declarations are made simultaneously for one entry, then the local color or font declarations have priority.

By modifying the display style you can save time and adjust all of the elements that refer to this style.



Illustration 68: Structure of data in kxmleditor

(See DTD file, data)

State-dependent display (alarm_state)

If you want to link the visual display of the alarm events with the state of the alarms, please modify the <code>alarm_state</code> element. This element is divided into two sub-elements, and does not have an own attribute. A distinction is made between pending (<code>active_alarm</code>) and non-pending (<code>inactive_alarm</code>) alarms, which are then divided into further states.

A pending alarm can adopt five different states.

Alarms that do not require acknowledgement are no longer shown when they are no longer active. Thus, an alarm that is not pending can only have two different states.

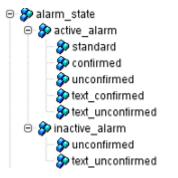


Illustration 69: Structure of alarm_state in kxmleditor

Following table explains the elements:

Elements	Alarm state				
standard	pending, confirmation not necessary				
confirmed	pending, acknowledged				
unconfirmed	not acknowledged				
text_confirmed	pending, acknowledged with text				
text_unconfirmed	requires text acknowledgement, not acknowledged				

With the active_alarm and inactive_alarm elements you can stipulate the same formatting regarding one or more attributes, for all of the underlying alarm states. Although it is also possible to allocate an individual attribute value (for example, the same font for all alarm states, but different colors) to each of the different states.

(See DTD file, <u>alarm_state</u>, <u>active_alarm</u>, <u>inactive_alarm</u>)

21621 -> 20.07.2007 15:04:32.861 CEST	0	Python Test	Ventil 4 öffnet nicht		
- Ca 😫 ANSTEHEND		NICHT QUITTIERT	Venti	PV:	PAL_TON_1.Q
21 -> 19.07.2007 15:30:35.154 CEST	0	SysUeberwach	CPU-Austastung zu hoch	201	Really Further Charles 1 Total 2 C
		NICHT QUITTIERT	Systemüberwachung		BspUe_SysHinSrvCheckD1_1_TON_3.Q
	op.	M27201 Drehzahlwächter NICHT OUTTIERT	M27201 Rührer bei 2.01 bar, Reattor2	1010	R2PS_M27201SL_STOER
	0	LS27101 Umwätzsumpe Reaktor 2	P27101 Trockeniauf bei 47.2		
- 06.07.2007 08:58:30.546 CEST	oe.	NICHT QUITTERT	Reaktor2		R2P2_LS27101_STOER
2 -> 04.07.2007 15:39:16.573 CEST		Test/iam			
Render Anstehend	OTP	04.07.2007 16:00:59.400 CEST	SYSTEM		6.00, Wert3 9.307, Wort 4 8.0000
	WIP	04.01.2007 16.00.08.400 CEST	arotem	16.65	SVS_AT_SR_1.Q

Illustration 70: Alarm state shown via color coding of individual fields

B	1319	-> 24.07.2007 11:16:45.176 CEST	0	Python Test	Ventil 4 of	
	Ca 62	ARSTEHEND	QTP	NICHT OUTTIERT	Ventil	PV: PAL_TON_1.0
E	1	-> 23.07.2007 17:57:26.182 CEST	0	LS27102 Trockenlauf Er	ntleerungspumpe Reaktor 2	P27102 Trockenlauf LS27102 11 Betriebsstunden; Füllstand 1
	CD 😥	4 ~ 23.07.2007 17:57.31.188 CEST	QP	NICHT QUITTIERT	Reaktor2	PV: R2P6_LS27102_STOER
	1	> 23.07.2007 15:30:33.207 CEST	0	SysUeberwach	CPU-Austa	stung zu hoch
	CO 😥	 23.07.2007 15:31:36.422 CEST 	QTP	NICHT QUITTIERT	Systemüberwachu	ng PV: Bsplie_SysHmSrvCheck01_1_TON_3.(
		-> 23.07.2007 14:10:46.910 CEST	1	Achtung, Füllstand ist z	u hoch! Achtung, F	ulistand ist zu hoch! (99.000000 %)
	(in f2	ARSTEHEND			Fueltstand	PV: BtpA_Groesser90
	- 4	-> 23.07.2007 14:10:46.910 CEST	2	Obertaufgefahr!		ülstand ist bei 99 Prozent.
	CO 😭	ANSTEHEND	OP.	NICHT QUITTIERT	Fuelistand	PV: BspA_Groesser98
	2	-> 04.07.2007 15:39:16.573 CEST	0	Testviarm	TEST ALA	RM !!! Wert1 0.5, Wort2 6.00 , Wort3 9.387, Wert 4 8.0000
	CB 😥	ANSTEHEND	QTP	04.07.2007 16:00:59.400	CEST SYSTEM	PV: SYS_AT_SR_1.0

Illustration 71: Alarm state shown via font color and colored columns

25751 -> 23.07.2007 12:50:38.579 CEST	0	Python Test	Ventil 4 öffnet nicht	PV: PAL_TON_1.0
C5 65 ANSTEREND	QTP	NICHT OUTTIERT	Ventil	
76 -> 23.07.2007 10:43:58.702 CEST	OTP	SysUeberwach NICHT GUTTIERT	CPU-Auslastung zu hoch Systemüberwachung	PV: BspUk_SysHwSrvCheck01_1_TON_3.Q
3 → 06.07.2007 08:58:44.209 CEST	0	M27201 Direhzahlwächter	M27201 Rührer bei 2.01 bar	r, 49.93 °C und 1480.00 I gestört
	QP	NICHT OUTTIERT	Realtor2	PV: R2P5_M27201SL_STOER
3 -> 06.07.2007 08:58:38.948 CEST	0	LS27101 Unwätzpumpe Reaktor 2	P27101 Trockenlauf bei 47.	27 °C, 4.48 bor
	QP	NICHT OUTTIERT	Reaktor2	PV: R2P2_LS27101_STOER
2 -> 04.07.2007 15:39:16:573 CEST	0	Test/Harm	TEST ALARM !!! Wort1 0.5,	Wert2 6.00 , Wert3 9.307, Wert 4 0.0000
	QTP	04.07 2007 16:08:59,400 CEST	SYSTEM	PV: SVS_AT_SR_1.0

Illustration 72: Alarm state shown by background color of alarm events

Example from an XML file:

```
<alarm_state>

<active_alarm>

<standard backgroundcolor="white" foregroundcolor="black" font="helvetical2b" />

<confirmed backgroundcolor="orange" />

<unconfirmed backgroundcolor="red" />

<text_confirmed backgroundcolor="red" />

<text_unconfirmed backgroundcolor="red" />

</active_alarm>

<unconfirmed backgroundcolor="red" />

<unconfirmed backgroundcolor="yellow" />

<text_unconfirmed backgroundcolor="yellow" />

</unconfirmed backgroundcolor="yellow" />

</alarm_state>
```

Example for referencing to a display style:

```
<line backgroundcolor="white" foregroundcolor="black" font="helvetical2">
        <spacer backgroundcolor="white" maximum_width="2" minimum_width="2"/>
        <spacer maximum_width="15" minimum_width="15" style="alarm_state" />
        <spacer backgroundcolor="white" maximum_width="2" minimum_width="2"/>
        </line>...
```

Priority-dependent display (alarm_priority)

You configure a priority dependent display of the alarm events with the alarm_priority element. This can contain any amount of range elements, but at least one sub-element must be declared.

With the alarm_priority element's attributes it is possible to dictate the same formatting for all priorities, respective of one or more attributes (Foreground color/font color, background color, and font). Although it is also possible to allocate an individual attribute values (for example, the same font for all priorities, but different colors) to different priorities, or parts thereof.

Please define one range element for each priority part that is to be defined. The respective value (for example, value="1"), or value range (for example, value="4-25", value="3-", value="-3") can be set with the value attribute.



Illustration 73: Structure of alarm_priority in kxmleditor

(See DTD file, alarm_priority, range)

Examples from an XML file:

```
<alarm_priority font="helvetical2b" foregroundcolor="black">
    <range backgroundcolor="red" value="0" />
    <range backgroundcolor="orange" value="1" />
    <range backgroundcolor="yellow" value="2" />
</alarm_priority>
```

19 -> 31.07.2007 14:02:57.609 CEST		LS27102 Trockenlauf Entleerungs NICHT QUITTIERT	pumpe Reaktor 2 Reaktor2	P27102 Trockenlauf LS27102 11 Betriebsstunden; Füllstand PV: R2P6_LS27102_STOER
2 -> 04.07.2007 15:39:16.573 CEST		TestAlarm 04.07.2007 16:08:59.400 CEST	TEST ALA SYSTEM	ARM !!! Wert1 0.5, Wert2 6.00 , Wert3 9.387, Wert 4 8.0000 PV: SYS_AT_SR_1.Q
> 23.07.2007 14:10:46.910 CEST	1	Achtung, Füllstand ist zu hoch! 	Achtung, Fuelistand	Füllstand ist zu hoch! (99.000000 %) PV: BspA_Groesser90
4 -> 23.07.2007 14:10:46.910 CEST		Überlaufgefahr! NICHT QUITTIERT	Achtung! Fuelistand	Füllstand ist bei 99 Prozent. PV: BspA_Groesser98

Illustration 74: Color display of the alarm priority

Please note that a lower number represents a higher priority.

Example:

In the AlarmMonitor, the respective alarm event entry should be shown completely with the background color which corresponds to the priority of the alarm.

Implementation:

Define the desired background color depending on the alarm priority in the 'alarm_priority' element. Then set the 'style' attribute to the value 'alarm_priority' in the 'listlayout' or 'linelayout' element.

Do not set any further attributes for the background color in the sub-elements. The color specifications take effect in all complete lines defined in the layout.

dalarm priority	font="helvetical2b">
	value="0,11-" foregroundcolor="black" backgroundcolor="#ffffff"/>
~i alige	vacue= 0,11- Toregroundcocor= brack backgroundcocor= #TTTTTT />
<range< td=""><td>value="1" foregroundcolor="white" backgroundcolor="#ff0000"/></td></range<>	value="1" foregroundcolor="white" backgroundcolor="#ff0000"/>
<range< td=""><td>value="2" foregroundcolor="white" backgroundcolor="#ff3300"/></td></range<>	value="2" foregroundcolor="white" backgroundcolor="#ff3300"/>
<range< td=""><td>value="3" foregroundcolor="white" backgroundcolor="#ff6600"/></td></range<>	value="3" foregroundcolor="white" backgroundcolor="#ff6600"/>
	value="4" foregroundcolor="black" backgroundcolor="#ff9900"/>
scange	value="5" foregroundcolor="black" backgroundcolor="#ffcc00"/>
	value="6" foregroundcolor="black" backgroundcolor="#ffff00"/>
crange	value="7" foregroundcolor="black" backgroundcolor="#ffff33"/>
-i dige	Tartes / Toregrounded or - brack backgrounded - #11100 /
<range< td=""><td>value="8" foregroundcolor="black" backgroundcolor="#ffff66"/></td></range<>	value="8" foregroundcolor="black" backgroundcolor="#ffff66"/>
<range< td=""><td>value="9" foregroundcolor="black" backgroundcolor="#ffff99"/></td></range<>	value="9" foregroundcolor="black" backgroundcolor="#ffff99"/>
scange	value="10" foregroundcolor="black" backgroundcolor="#ffffcc"/>

Illustration 75: Definition for 'alarm_priority'

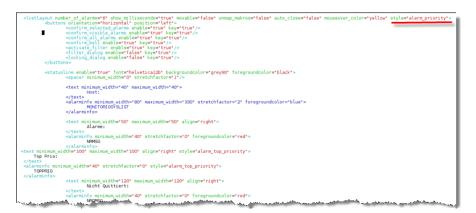


Illustration 76: Adoption of the 'style' from 'alarm_priority' in the 'List_layout'

🕺 😧 💥 📩 Alarme: 53	Top Pt	rio: 0 Nicht Quittiert: 36	Top Prio NQ: 0	Gespert: 49 FILTER: Zeit Gruppe: BALARIMP,BuR,Fackel,Faulturm,Gasspeicher,Molor,MultiRum1,PAL,Pun 📰 👻 👻 🚖
12 → 25.02.2013 09:24:38.960 CET	4 QP	Iocahost NICHT OUTTIERT	SYSTEM	NTP service not configured or available ([Assr/shin/htpld::mod: Connection refused/b]) PV: SYS_HW_MonCc01_Dt_AlaSthtp2_v Ala
37 → 25.02.2013 09:24:38.960 CET	6 QP	Iocahost NICHT QUITTIERT	SYSTEM	NTP monitoring error ([Ausr/sbin/htpd:::read: Connection refused/w]) PV: SVS_HW_MonCc01_DL_AlaStMon_v Ala
264 -> 25.02.2013 08:55:50.857 CET	0 QP	Iocahost NICHT QUITTIERT	SYSTEM	Quster state error (Please configure Heartbeat via Apro/Config) PV: SYS_HW_MonCc01_Em_RS3.0
277 → 25.02.2013 08:54:54.019 CET	0 QP	CTRL TR 27.02.2013 16:58:25.695 CET	SYSTEM	S21 of cnf. Master - Application InaDriver failure (State: Stopped) PV: TRDIAG_CPU_S2L_inaMaCcApp01_AppSL_v Ala
223 → 25.02.2013 08:54:40.015 CET	0 QP	CTRL TR NICHT QUITTIERT	SYSTEM	Controller life signal lost PV: TRDIAG_CPU_Life_LifeSt_v.Ala
226 → 25.02.2013 08:54:48.014 CET	0 QP	CTRL84 NICHT QUITTIERT	SysMon	Controller life signal lost PV: SVS_LR_MonCcEbdCtr01_Life_LifeSt_v.Ala
101	1 QP	Incaliest NCHT OUTTIERT	SYSTEM	ControlComputer life signal lost PV SVS_HW_MonCc01_Life_LifeSt_v Ata
105 → 12.02.2013 11:45:33.459 CET	3 0P	localhost NICHT OUTTIERT	SYSTEM	Evaluation time expired PV. SVS.JHW.MonCc01_Lic_AlaSt3_v Ala
222 -> 04.02.2013 14:40.02.449 CET	3 0P	localhost NICHT OUTTIERT	SYSTEM	Ivarilog directory has reached limit (1043 MByte) PV: SVS_HW_MonCc01_Files_DirVarLogSt_v.Ala
95 → 22.01.2013 12:25:55.034 CET	0 QP	CTRL TR NICHT GUITTIERT	SYSTEM	SNTP on controller is not configured PV: TRDIAG_CPU_Dt_NoCtg_vAla

Illustration 77: Coloring of the alarm events with the color of the alarm priority

3.4.4.6 Fixed allocation of font formatting and color

Referencing pre-defined formatting and styles in the layout configuration file, as well as the global definition of font format and color make it possible for you to create configurations quickly and comfortably. Furthermore, you have the possibility to allocate this formatting permanently to the following elements:

linelayout, listlayout, statusline, line, alarminfo, text ${\hbox{and}}$ spacer.

(As the spacer element has no content, the font, align and foregroundcolor attributes do not apply).

3.5 The layout and monitor DTD files

The DTD files that have been defined by B&R help you to make sure that you adapted XML configuration has a correct syntax (DTD - Document Type Definition). Rules for the structure of the XML files are stipulated in the DTD file. Well-formed XML files are thereby additionally limited to a certain structure and certain a content.

Amongst other things, the DTD file controls the following specifications:

 \checkmark

which of the elements in the XML file are compulsory, or optional

- in which order, and nesting structure the elements are to reside
 - which attributes are necessary, or allowed, and which attribute values can be accepted
 - eventually default values for attributes

Each XML file, which serves to configure the **AlarmMonitor**, must be allocated to this DTD file. (This can be ensured when you use the standard configurations that are delivered with **APROL**, or modify copies of these files in the kxmleditor).

The 'layout.dtd' file that is responsible for the appearance, and the 'monitor.dtd' file that is responsible for connection to the **APROL** systems are stored in the <code>/opt/aprol/cnf/DisplayCenter/ directory.</code>

A validation with the allocated DTD file takes place when starting the **DisplayCenter** to check the validity of the configuration. If the XML file is not valid then an error message is shown and the visualization (the **DisplayCenter**) cannot be started as a precaution.

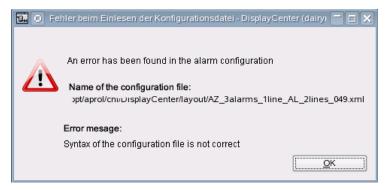


Illustration 78: Message when using a configuration file with errors

The rules for the configuration file can be seen in a DTD file if one is familiar with DTD file syntax.

At any rate, **changes should never be made to the DTD file**. Changes in the configuration are only allowed to be carried out with the XML file.



See chapter Content of the DTD file for the structure of the DTD file.

In the engineering system you have the possibility to check an XML configuration file on the basis of the DTD file <code>layout.dtd</code>. For this purpose execute the command line command

0

xmllint <XML file name> --valid --noout

in the directory in which the XML file to be checked is situated. Thereafter, erroneous lines in the XML file are shown with the specification of the affected attribute / value.

3.5.1 Brief information about the number and order of the elements

The following basic information about the structure of a DTD file is valid for all of the DTDs used in **APROL**.

The definition of an element (main element) in the DTD file stipulates which sub-elements can, or must, be entered in the XML file, and in which number and in which order.

An element definition is built according to the following scheme:

<!ELEMENT nameOberelement (element1, element2?)>

 Other possible definitions are listed and explained in the table.

 DTD
 Meaning in XML

DTD	Meaning in XML				
(element)	Element must be used exactly one time				
(element+)	Element must be used at least once, or more often				
(element?) Element be omitted, or used once					
(element*)	Element can be omitted, or used as many times as necessary				

DTD	Meaning in XML
(element1, element2)	fixed order
(element1 element2)*	Elements of both types can be used in any number, and in any order
EMPTY	Main element has no content
#PCDATA	Main element has only text content

3.5.2 Brief information about attributes

A definition of an element's attributes and attribute values in the DTD file represents which attributes are compulsory or optional in the XML file. Additionally, the value range that can be chosen for the attribute values is stated. If CDATA is stated as value range, then character data such as text, numbers, or special characters can be used. If options such as (option1 | option2) are stated, then an attribute is only allowed to possess these values.

The following is an example for the definition of an attribute. Other possible definitions are listed and explained in the table.

Example:

```
<!ATTLIST elementName
attribut1 CDATA #IMPLIED
attribut2 (1 | 2) #IMPLIED
```

DTD		Meaning in XML
CDATA or	#REQUIRED	Attribute must be used, entry of a non-pre-defined value, or a value from the options is necessary
(option1 op	tion2) #REQUIRED	
CDATA	#IMPLIED	Attribute can be left out if necessary, it has no
or		default value
(option1 op	tion2) #IMPLIED	
CDATA	"standard value"	Attribute is set to the standard value, can be
or		overwritten with a value the has not been defined, or a value from the options
(option1 op	tion2) "standard value"	

3.5.3 Content of the monitor DTD file

The structure of the monitor.dtd DTD file is shown in the following:

<?xml version="1.0" encoding="ISO-8859-15"?>

```
<!ELEMENT alarmmonitor_cnf ( alarmmonitor+ )>
```

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<!ELEMENT alarmmonitor (system+) > <!ATTLIST alarmmonitor alarmview_id CDATA #REQUIRED name001 CDATA #IMPLIED name007 CDATA #IMPLIED name031 CDATA #IMPLIED name033 CDATA #IMPLIED name034 CDATA #IMPLIED name036 CDATA #IMPLIED name039 CDATA #IMPLIED name040 CDATA #IMPLIED name048 CDATA #IMPLIED name049 CDATA #IMPLIED name086 CDATA #IMPLIED name420 CDATA #IMPLIED name421 CDATA #IMPLIED <!ELEMENT system EMPTY> <!ATTLIST system iosys CDATA #IMPLIED al_server_selfid CDATA #IMPLIED name CDATA #IMPLIED inst CDATA #IMPLIED inst ref CDATA #IMPLIED desc001 CDATA #IMPLIED desc007 CDATA #IMPLIED desc031 CDATA #IMPLIED desc033 CDATA #IMPLIED desc034 CDATA #IMPLIED desc036 CDATA #IMPLIED desc039 CDATA #IMPLIED desc040 CDATA #IMPLIED desc048 CDATA #IMPLIED desc049 CDATA #IMPLIED desc086 CDATA #IMPLIED desc420 CDATA #IMPLIED desc421 CDATA #IMPLIED active (true | false | TRUE | FALSE | 1 | 0) "true" >

3.5.4 Content of the layout DTD file

The following shows the structure of the DTD file 'layout.dtd':

```
<?xml version="1.0" encoding="ISO-8859-15"?>
<!ELEMENT alarmlayout ( (fontlist+, styles?, alarmview+) )>
<!ELEMENT fontlist ( font+ )>
<!ELEMENT font EMPTY>
<!ATTLIST font
                  #REQUIRED
alias
         CDATA
family CDATA #REQUIRED
         CDATA
                    #REQUIRED
Size
italic (true|false|TRUE|FALSE|1|0)
                                        "false"
bold (true false TRUE FALSE 1 0)
                                        "false"
underline (true|false|TRUE|FALSE|1|0)
                                        "false"
strike_out (true|false|TRUE|FALSE|1|0) "false"
>
<!ELEMENT alarmview ( styles?, linelayout, listlayout )>
<!ATTLIST alarmview
location (top|bottom|left|right|TOP|BOTTOM|LEFT|RIGHT) "top"
```

```
show_milliseconds (true|false|TRUE|FALSE|1|0)
                                                  "true"
activate_alarmbell (true | false | TRUE | FALSE | 1 | 0)
                                                  "true"
                                                  "TIME"
sorting (time|priority|TIME|PRIORITY)
use_splitter (true | false | TRUE | FALSE | 1 | 0)
                                                  "true"
id
              CDATA
                     #IMPLIED
iosys
              CDATA
                       #IMPLIED
            CDATA
host_alias
                       #TMPLTED
reconnect (true | false | TRUE | FALSE | 1 | 0)
                                                  "true"
>
<!-- alarmview / iosys are no longer evaluated as of the multi-alarm server -->
<!-- alarmview / host_alias are no longer evaluated as of the multi-alarm server -->
<!-- alarmview / alarmserver are no longer evaluated as of the multi-alarm server and has been removed -->
<!ELEMENT styles ( system, data )>
<!ELEMENT system ( blinking?, error? )>
<!ELEMENT blinking EMPTY>
<!ATTLIST blinking
backgroundcolor CDATA
                          #REQUIRED
foregroundcolor CDATA
                          #REQUIRED
<!ELEMENT error ( noiosysconnection?, noalarmserverconnection?, noalarmserversynchronisation? )>
<!ATTLIST error
                          #IMPLIED
font
                 CDATA
backgroundcolor CDATA
                        #IMPLIED
foregroundcolor CDATA
                          #IMPLIED
>
<!ELEMENT noiosysconnection EMPTY>
<!ATTLIST noiosysconnection
font.
                 CDATA
                         #IMPLIED
backgroundcolor CDATA #IMPLIED
foregroundcolor CDATA
                          #IMPLIED
<!ELEMENT noalarmserverconnection EMPTY>
<!ATTLIST noalarmserverconnection
font
                CDATA #IMPLIED
backgroundcolor CDATA #IMPLIED
foregroundcolor CDATA #IMPLIED
>
<!ELEMENT noalarmserversynchronisation EMPTY>
<!ATTLIST noalarmserversynchronisation
                 CDATA #IMPLIED
font
backgroundcolor CDATA
                         #IMPLIED
foregroundcolor CDATA
                         #IMPLIED
>
<!ELEMENT data ( alarm_state?, alarm_priority? )>
<!ELEMENT alarm_state ( active_alarm?, inactive_alarm? )>
<!ELEMENT active_alarm ( standard?, confirmed?, unconfirmed?, text_confirmed?, text_unconfirmed? )>
<!ATTLIST active_alarm
font
                 CDATA
                          #IMPLIED
backgroundcolor CDATA
                          #IMPLIED
foregroundcolor CDATA
                          #IMPLIED
>
<!ELEMENT inactive_alarm ( unconfirmed?, text_unconfirmed? )>
<!ATTLIST inactive_alarm
                 CDATA
                          #IMPLIED
font
backgroundcolor CDATA
                          #IMPLIED
foregroundcolor CDATA #IMPLIED
<!ELEMENT standard EMPTY>
<!ATTLIST standard
font
                 CDATA
                          #IMPLIED
backgroundcolor CDATA
                          #IMPLIED
```

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```
foregroundcolor CDATA
                          #IMPLIED
>
<!ELEMENT confirmed EMPTY>
<!ATTLIST confirmed
font
                CDATA
                          #IMPLIED
backgroundcolor CDATA #IMPLIED
foregroundcolor CDATA #IMPLIED
>
<!ELEMENT unconfirmed EMPTY>
<!ATTLIST unconfirmed
font
                CDATA
                         #IMPLIED
backgroundcolor CDATA
                         #IMPLIED
foregroundcolor CDATA
                         #IMPLIED
<!ELEMENT text_confirmed EMPTY>
<!ATTLIST text_confirmed
font
                CDATA
                          #IMPLIED
backgroundcolor CDATA
                          #IMPLIED
foregroundcolor CDATA
                         #IMPLIED
>
<!ELEMENT text_unconfirmed EMPTY>
<!ATTLIST text_unconfirmed
font CDATA #IMPLIED
backgroundcolor CDATA #IMPLIED
foregroundcolor CDATA #IMPLIED
>
<!ELEMENT alarm_priority ( range+ )>
<!ATTLIST alarm_priority
font
               CDATA
                          #IMPLIED
backgroundcolor CDATA #IMPLIED
foregroundcolor CDATA
                          #IMPLIED
>
<!ELEMENT range EMPTY>
<!ATTLIST range
value CDATA
                          #REQUIRED
                CDATA
                          #IMPLIED
font.
backgroundcolor CDATA
                          #IMPLIED
foregroundcolor CDATA
                          #IMPLIED
>
<!ELEMENT linelayout ( buttons, statusline?, line+ )>
<!ATTLIST linelayout
number_of_alarms
                      CDATA
                                #REQUIRED
movable (true false | TRUE | FALSE | 1 | 0) "false"
use_splitter (true | false | TRUE | FALSE | 1 | 0) "true"
ignore_alarmfilter (true false TRUE FALSE 1 0) "false"
show_milliseconds (true|false|TRUE|FALSE|1|0) "true"
show_timezone (true | false | TRUE | FALSE | 1 | 0) "true"
style (alarm_state|alarm_priority|ALARM_STATE|ALARM_PRIORITY) #IMPLIED
                      CDATA #IMPLIED
font
                      CDATA
backgroundcolor
                               #IMPLIED
                      CDATA
                               #IMPLIED
foregroundcolor
                      CDATA
mouseover_color
                               "yellow"
>
<!ELEMENT listlayout ( buttons, statusline?, line+ )>
<!ATTLIST listlayout
number_of_alarms
                  CDATA
                           #REQUIRED
unmap_makros (true | false | TRUE | FALSE | 1 | 0) "true"
auto_close (true | false | TRUE | FALSE | 1 | 0) "true"
movable (true | false | TRUE | FALSE | 1 | 0) "false"
use_splitter (true|false|TRUE|FALSE|1|0) "true"
 ignore_alarmfilter (true|false|TRUE|FALSE|1|0) "false"
```

```
show_milliseconds (true false TRUE FALSE 10) "true"
show_timezone (true|false|TRUE|FALSE|1|0) "true"
style (alarm_state|alarm_priority|ALARM_STATE|ALARM_PRIORITY) #IMPLIED
font CDATA #IMPLIED
backgroundcolor CDATA
                           #IMPLIED
foregroundcolor CDATA
                           #IMPLIED
mouseover_color CDATA
                          "vellow"
>
<!ELEMENT buttons ( confirm_selected_alarms, confirm_visible_alarms, confirm_all_alarms, confirm_bell,
activate_filter, filter_dialog, locking_dialog )>
<! ATTLIST buttons
orientation (horizontal|vertical|inline|HORIZONTAL|VERTICAL|INLINE) #REQUIRED
position (left|right|LEFT|RIGHT) #REQUIRED
>
<!ELEMENT confirm_selected_alarms EMPTY>
<!ATTLIST confirm_selected_alarms
enable (true false TRUE FALSE 1 0) #REQUIRED
key (true false TRUE FALSE 1 0) #REQUIRED
>
<!ELEMENT confirm_visible_alarms EMPTY>
<!ATTLIST confirm_visible_alarms
enable (true false TRUE FALSE 1 0) #REQUIRED
key (true false TRUE FALSE 1 0) #REQUIRED
>
<!ELEMENT confirm_all_alarms EMPTY>
<!ATTLIST confirm_all_alarms
enable (true false TRUE FALSE 1 0) #REQUIRED
key (true false TRUE FALSE 1 0) #REQUIRED
>
<!ELEMENT confirm_bell EMPTY>
<!ATTLIST confirm_bell
enable (true | false | TRUE | FALSE | 1 | 0) #REQUIRED
key (true false TRUE FALSE 1 0) #REQUIRED
<!ELEMENT activate_filter EMPTY>
<!ATTLIST activate_filter
enable (true false TRUE FALSE 1 0) #REQUIRED
key (true false TRUE FALSE 1 0) #REQUIRED
>
<!ELEMENT filter_dialog EMPTY>
<!ATTLIST filter dialog
enable (true false TRUE FALSE 1 0) #REQUIRED
key (true false TRUE FALSE 1 0) #REQUIRED
>
<!ELEMENT locking_dialog EMPTY>
<!ATTLIST locking_dialog
enable (true false TRUE FALSE 1 0) #REQUIRED
key (true false TRUE FALSE 1 0) #REQUIRED
>
<!ELEMENT statusline ( (alarminfo|spacer|text)* )>
<!ATTLIST statusline
enable (true | false | TRUE | FALSE | 1 | 0) #REQUIRED
font CDATA #IMPLIED
backgroundcolor CDATA #IMPLIED
foregroundcolor CDATA #IMPLIED
>
<!ELEMENT line ( (alarminfo|spacer|text)* )>
<!ATTLIST line
style (alarm_state|alarm_priority|ALARM_STATE|ALARM_PRIORITY) #IMPLIED
```

font CDATA #IMPLIED backgroundcolor CDATA #IMPLIED foregroundcolor CDATA #IMPLIED <!ELEMENT alarminfo (#PCDATA)> <!ATTLIST alarminfo style (alarm_state|alarm_priority|ALARM_STATE|ALARM_PRIORITY) #IMPLIED align (left|right|center|LEFT|RIGHT|CENTER) "left" font CDATA #IMPLIED backgroundcolor CDATA #IMPLIED foregroundcolor CDATA #IMPLIED minimum_width CDATA #IMPLIED maximum_width CDATA #IMPLIED stretchfactor CDATA #IMPLIED !-- The following key words can be used within an alarminfo tag--> <!-- NAME : Name of the triggering PV --> <!-- ALIAS : Alias (from the alarm configuration) --> <!-- NUMBER : Number of the actual alarm (running number from Alarmserver / reset in Alarmserver_2 during a server restart) --> <!-- MULTI : Number of non-acknowledged occurrences of the alarm ("-" when the alarm does not need to be acknowledged) <!-- ALARMTEXT (previously STATE) : Alarmtext (from alarm configuration) --> <!-- GROUP : Group of the alarm (from alarm configuration) --> <!-- GROUPDESC : Group description of the alarm --> <!-- ACKN : ["ALLOWED TO ACKNOWLEDGE" | "IS ACKNOWLEDGE" | "CANNOT BE ACKNOWLEDGED" | "NOT ALLOWED TO ACKNOWLEDGE"] --> <!-- ACKNSTATE : Type of alarm (from alarm configuration)["RA" | "RTA" | " "] --> <!-- TIMECOME : Reception time of the alarm --> <!-- TIMEGO : Discharge time of the alarm or ["PENDING"] --> <!-- TIMEACKN : Acknowledgement time or ["NOT ACKNOWLEDGED"] --> <!-- PRIORITY : Priority of the alarm (from alarm configuration) --> <!-- PICAVAIL : Shows with an icon if a "Diagram for alarm" has been configured for this alarm --> <!-- TEXTAVAIL : Shows with an icon if an intervention text has been configured for this alarm --> <!-- LOCKED : Shows an icon when this alarm is currently locked. --> <!--neu SYSTEMNAME : Name of the APROL system from which the alarm originates. - Name of the caedb in case <system_ref> or no configuration file is stated for the '-alarmMonitor' DC option, - Name of the 'name' attribute in the <system> element of the alarmMonitor configuration file. --> <!-- The following key words are thought for the configuration of the status line --> <!-- FILTER : Short description of the active filter (NEW!) --> <!-- NRLOCKED : Number of locked alarms (NEW!)-->

<!-- gone HOSTNAME no longer as of 3.6 : Host name of the Losys connection (from configuration file) -->

```
<!--neu MONITORIOSYSLIST : List of the host names with Iosys port (name:p,..)
from the configuration file, in case the '-alarmMonitor' DC option and <system> is set -->
<!--neu MONITORSYSNAMELIST : List of the system names
- Name from the 'name' attribute from the configuration file, in case the '-alarmMonitor' DC option and
<system> set
- Name of the APROL system from the caedb, in case <system_ref> or no configuration file is stated for the
'-alarmMonitor' DC option. -->
<!--neu MONITORNAME: Name of the monitor
- from the name### attribute from the configuration file, in case the '-alarmMonitor' set
- <id> attribute from the conf. file for '-alarmlayout', in case '-alarmMonitor' DC option not set -->
<!-- gone HOSTALIAS no longer as of 3.6 : Host alias of the Iosys connection ( from configuration file ) -
<!-- NRMSG : Number of pending alarms -->
<!-- NRQMSG : Number of alarms requiring acknowledgement -->
<!ELEMENT text ( #PCDATA )>
<!ATTLIST text
style (alarm_state|alarm_priority|ALARM_STATE|ALARM_PRIORITY) #IMPLIED
align (left|right|center|LEFT|RIGHT|CENTER) "left"
font CDATA #IMPLIED
backgroundcolor CDATA #IMPLIED
foregroundcolor CDATA #IMPLIED
minimum_width CDATA #IMPLIED
maximum_width CDATA #IMPLIED
stretchfactor CDATA #IMPLIED
>
<!ELEMENT spacer EMPTY>
<!ATTLIST spacer
style (alarm_state|alarm_priority|ALARM_STATE|ALARM_PRIORITY) #IMPLIED
backgroundcolor CDATA #IMPLIED
minimum_width CDATA #IMPLIED
maximum width CDATA #IMPLIED
stretchfactor CDATA #IMPLIED
>
```

3.6 New functionality in the APROL releases

You can configure the **AlarmMonitor** via XML in order to meet your needs. In the scope of newer releases there are always extended functionalities available.



If you use your own XML files instead of the B&R supplied standard configurations, you must adapt these accordingly so that the new functionalities can also be used in the visualization.

The following table gives an overview in which **APROL** release the scope of the functionalities has been expanded:

APROL release	New functions	
Pre - R 3.2	New optional attribute show_timezone for the element linelayout and listlayout	
	see chapter <u>Alarm information (alarminfo)</u> .	
	New optional attribute mouseover_color for the element linelayout and listlayout	
	see chapter <u>Highlighting the mouse pointer position</u> .	
	New compulsory element filter_dialog for the element buttons see chapter <u>Buttons, status line und lines of the alarm event</u> .	
	New compulsory element locking_dialog for the element buttons see chapter <u>Buttons, status line und lines of the alarm event</u> .	
	New key word MULTI for the element alarminfo see chapter <u>Alarm information (alarminfo)</u> .	
	Dropped key words ACT and VALUE for the element alarminfo	
R 3.2-02	New key word LOCKED for the element alarminfo see chapter <u>Alarm information (alarminfo)</u> .	
R 3.4	New use_splitter attribute for the alarmview, linelayout and listlayout elements see chapter <u>Variable field widths</u> .	
	New key word GROUPDESC for the alarminfo element see chapter <u>Alarm information (alarminfo)</u> .	
R 3.6	New key words TOPPRIO and TOPPPRIOACK for the alarmlayout element.	
	New key word SYSTEMNAME for the alarminfo element.	
	New key words MONITORIOSYSLIST, MONITORNAME, and MONITORSYSNAMELIST for the statusline element.	
	New alarm_top_priority and alarm_top_priority_ack styles for the alarminfo, text and spacer attributes from the statusline element.	
	New id attribute for the alarmview element in the layout file.	
	New '-alarmRepack', '-alarmMonitor' and '-showTopOnNewAlarmTimeout' DisplayCenter options	
	'-alarmCnf' option renamed to '-alarmLayout'.	
	New monitor XML file introduced for configuration.	

3.7 Speech output for alarms

 \bigcirc

The **APROL** alarm system offers the possibility of speech output via the DisplayCenter's AlarmMonitor.

Speech output of individually selected alarms - via context menu on the alarm event,



Speech output of all of the alarms shown in the alarm line or AlarmMonitor (context menu), or



Automatic speech output of all new alarms, which are shown in the alarm line or AlarmMonitor.

A 3rd.-party software license, *Loquendo TTS7* (Including the respective license), is necessary for the use of this function, which converts text information into a synthetic speech output.

A demo license with a time limitation is present after the **APROL** system software installation, so that the function can be tested and evaluated until the demo license expires, even though there is no definite user license.



The expiry date of the time-limited demo license can be seen in the CaeManager via the 'Help / APROL Info Licenses' menu item.

The TtsServer outputs an audio warning when the DisplayCenter is started for the first time if the demo license is being used, and every 10 minutes thereafter.

The system currently supports the languages German, English, and Chinese (Mandarin). The *Loquendo TTS7* software installation takes place automatically in the scope of the **APROL** system software installation.

The 'TTSLicense.txt' license file must be located on the **APROL** server in the /home/aprolsys/APROL/license/LTTS7/ directory.

Information about the Loquendo licensing can be found in the chapter <u>Licensing the</u> <u>Loquendo TTS7 software for speech output of alarms</u>

3.7.1 Extension of the alarm layout configuration

It is possible to configure how, and with which information, the text is to be composed for the speech output via the AlarmMonitor's layout file. When doing so, all of the free text and usable alarm information in the alarm line such as alarm text, ALIAS text, priority, time of the occurrence, etc., are supported.

In order to allow a speech output for alarms, the XML format of the AlarmMonitor's layout configuration has been extended.

Within the 'alarmview' element, the first sub-element can be defined as <speech>.

In the next structural level, the elements <statusline> (AlarmMonitor's status line), and <line> (Alarm output) can be used.

The <alarminfo> and <text> sub-elements can, in turn, be used for the <line> and <statusline> elements.

The <alarminfo> element can contain the key words (see layout.dtd) for the alarm information or for the status information.

It is not possible to use the 'PICAVAIL' and 'TEXTAVAIL' key words here.



You can find detailed information in the chapter <u>Alarm information (alarminfo)</u> , and <u>Text</u> (<u>text)</u> .

If the *speak_new_alarms=true* attribute is set for the <speech> element in the layout configuration file, an automatic reading of new alarms is activated when the DisplayCenter is activated.

By setting the *enable=true* attribute in the <statusline> element you trigger that a status message is output each time the list has been processed by the automatic reading. The content of this message can be respectively configured.

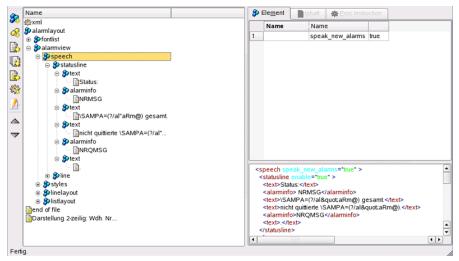


Illustration 79: Element <statusline> in the AlarmMonitor's layout configuration file

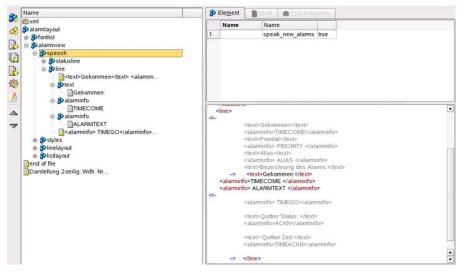


Illustration 80: Element <line> in the AlarmMonitor's layout file

B&R supplies you with the 'al_1alarm_2lines_049.xml' and 'al_1alarm_2lines_001.xml' example configuration files in the

/opt/aprol/cnf/DisplayCenter/alarm_layout/ directory.

These XML files can be used as templates. After storing the modified file in the /home/<CC-Account>/ENGIN/cnf/DisplayCenter/alarm_layout/ directory, it is available after the download in the corresponding directory in the runtime system.

3.7.2 Use of the Loquendo controls

It is possible to place pauses in any place of the text, make adjustments to the loudness, the speed of speech, or the intonation for the optimization and individual adjustment of the speech output. For this purpose it is possible to insert all of the TTS system's controls into the text format for the alarm output.

These controls are control sequences, which are composed of a backslash '\' and a key word.

The control sequence can be placed anywhere within the <text> element.

The following is an **example** of the use of a control for the **creation of a speech pause**, as well as the **change of volume**.

Insert medium speech pause (120 ms):

Syntax for Loquendo control	Example:
	<text>The alarm alias is \pause</text> <alarminfo>ALIAS<alarminfo></alarminfo></alarminfo>

Raise loudness by 50 percent:

Syntax for Loquendo control	Example:
	<text>This alarm has the priority \volume=+50%</text> <alarminfo>PRIORITY</alarminfo>

Furthermore, the voice and language can be chosen with the Loquendo controls, and audio files played.



A comprehensive documentation about the available controls can be found in the documentation 'X12 Loquendo User's guide'.

Optional use of the phonetic speech SAMPA:

In order to optimize the pronunciation of text that has eventually been spoken falsely, the <u>ASCII</u> based <u>phonetic</u> <u>Alphabet</u> SAMPA (Abbreviation for <u>Speech</u> <u>Assessment</u> <u>Methods</u> <u>Phonetic</u> <u>Alphabet</u>) can be used within the <text> element of the layout configuration file.

Converters that are available on the internet can be used to transfer the text into the phonetic language.

The English word 'Alarm' is entered in the '*al_1alarm_2lines_001.xml*' configuration file as an example of the phonetic alphabet SAMPA.

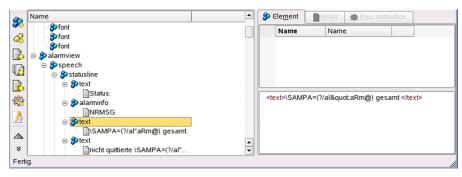


Illustration 81: Use of the phonetic alphabet 'SAMPA'

3.7.3 Speech output via the TtsServer

The DisplayCenter sends the text that is to be output to the TtsServer.

The TtsServer synthesizes the text that is to be output and outputs it on the local audio device.

The DisplayCenter starts the TtsServer in the language (via '-languageCode' option) in which it has been started. Thereafter, the speaker (voice) and the language is set by the TtsServer depending on the language settings.

The respective license for this language must be present on the computer (as a rule the operator station).

Allocation country code / Speaker and language:

049	Voice: Stefan, Language: German
086	Voice: Lisheng, Language: Chinese
001 and all other country codes	Voice: Simon, language English



A TtsServer language change during operation is not possible at the moment.

After the APROL system's language has changed, it is necessary to terminate the TtsServer before the DisplayCenter restarts (with the 'kill' Linux command).

The TtsServer always runs in the DisplayCenter's operator system, which is started with the '-enableAlarmTts' option, and makes the **local audio device** available for the speech output.

If further DisplayCenter instances are started with the '-enableAlarmTts' option in the same operator system, the same instance of the TtsServer is used for speech output.



No further TtsServer instances are started in this case.

If the TtsServer finds no valid license file, a speech output is not possible. The TtsServer evaluation takes place every 30 seconds.

3.7.4 Interactive and automatic speech output of alarms in the DisplayCenter

The speech output of alarms can be started **interactively** via the AlarmMonitor's context menu.

You have the following possibilities:



Speech output of the alarm that was selected beforehand,



Speech output of all visible alarms

i.e. all of the visible alarms in the AlarmMonitor with the current filter setting are read aloud. This depends on the number of lines that are shown at the time.

The one-time output of a list of alarms can be stopped immediately at any time with the '**Alarms** *I* **Skip pending alarms in the speech output**' menu item (or the respective icon in the toolbar). Thereby, the queue for the text to be read is emptied.

Skip all pending text for the speech output

Illustration 82

}

It is possible to invocate the automatic reading of newly received alarms with the '**Alarms / Read new alarms**' menu item (or with the respective icon in the toolbar), and as of the planned **APROL** R 3.6, separately for each configured AlarmMonitor.

Read new alarms

Illustration 83

As soon as a new list or line is shown in the AlarmMonitor, the new alarms contained in the current sorting are read **starting at the bottom**. The alarms are thus read in chronological order with a Time/Priority sorting,

With an alarm flood, it is possible that not all of the newly received alarms are displayed due to the limited amount of lines. In this case, the alarms that are not displayed are also not read out.

New alarms are only immediately read when the list has really been actualized.

The following applies to **APROL** R 3.6:

Newly occurring alarms are only read immediately,



a) when the '**-alarmRepack**' option is used **and** the display is on the first page (Top) or

b) when the '-showTopOnNewAlarmTimeout' option is configured with the value '0' so that the list is actualized immediately.

It is therefore **not possible** to use the speech output **as the only form** of monitoring the system!

It only serves to point out irregular states, which imply a visual analysis on a monitor!

If the *speak_new_alarms=true* attribute is set for the <speech> element in the layout configuration file, an automatic reading is activated when the DisplayCenter is activated.

By setting the *enable=true* attribute in the <statusline> element you trigger that a status message is output each time the list has been processed by the automatic reading. The content of this message can be respectively configured.



Illustration 84: Menu guidance in the DisplayCenter for speech output of alarms

The following message is output in the DisplayCenter when calling the speech output if no Loquendo license is present:



Illustration 85: Message in the DisplayCenter with a missing Loquendo license

In this case (no license), an entry that contains the text to be spoken is made in the **APROL** system messages instead of that the text is transferred from the DisplayCenter to the TtsServer.

28.01.2010 10:49:6	1 Warnung	✤DisplayCenter_TTS	meeting 1.br-automation.com:3.0	৵ 19443	Warning (AlarmTts.cc, 108): Speech output not possible, TtsServer not ready. Could not say: Wrong configuration of the monitoring HM! Check GFC.\pause=100
28.01.2010 10:49:3	1 Warnung	DisplayCenter_TTS	✤meeting1.br-automation.com:3.0	19443	Warning (AlarmView.cc, 135): No monitor configuration specified, connecting to AlarmServer of default CC
28.01.2010 10:49:3	0 App. Start	✤DisplayCenter_TTS	✤ meeting 1.br-automation.com:3.0	📌 19443	Startup of 'DisplayCenter_TTS' (DisplayCenter V 2.2.267, R 3.5-206) with args: -self TTS -alarmLayout al_talarm_Zines_049.xml -downloadRestart 10 -enableAlarmTts -losys meeting1:0 -losysConnTimeout 15 -maximize -showTopCnNewAlarmTimeout 30 nocrashhandler

Illustration **86**: APROL system messages if the speech output is not possible (E.g. with a missing Loquendo TTS7 license)

A warning is also written in the **APROL** system messages if the TtsServer cannot open the audio device for reading.

Internal error message for the LTTS7 library written in the

/home/aprolsys/tmp/LTTS7_error.log file.

3.7.5 Limitations

The speech output always takes place on the computer's audio device, on which the DisplayCenter is executed.

Only the first Linux user (**APROL** system) that logs into the graphical user interface (KDE) on this computer obtains the access rights to the local audio device.

If several **APROL** systems are present on the computer, it may be necessary to log out of all of the systems, and then to log into the operator system from which the DisplayCenter for speech output is to be started.

For this reason, no speech output is possible on a remote system where a DisplayCenter that has been started via remote access.

This concerns the following situations:



A DisplayCenter that has been started from another **APROL** system via StartManager (E.g. from the engineering system on the same computer),



Starting the DisplayCenter via krdc or VNC

Further limitations are:



The activation of the automatic speech output of new alarms in several DisplayCenter instances **in one APROL** system should be avoided.

The order of the output during a simultaneous output of both instances cannot be controlled, and is interrupted in certain circumstances.



The activation of the automatic speech output of new alarms when **sorting the list** according to priority is not possible.

The sorting of the list according to time is not possible in this view, so that a chronological speech output is not possible.



If the alarm text is not available in the language, in which the DisplayCenter has been started, the text is read by a reader of another language.

This leads naturally to incomprehensible speech output and can furthermore lead to false output by the interpretation of numerical values.

3.7.6 Licensing of the Loquendo TTS7 software for speech output for alarms

The licensing must be carried out once on each computer where the DisplayCenter outputs speech for the alarm system.

The licensing that has been performed is retained after an update of the **APROL** system software. The license file must be saved before an already licensed Linux computer is completely newly installed (Linux operating system).

Information about the Loquendo TTS7 software, the licensing, as well as the license regulations can be found in the *APROL* system environment in:

1. KDE menu **'Tools / LooquendoLicenseManager (Licensing speech output)'** --> Loquéndo Tool for Licensing The description that is available is opened.



2. CaeManager: '**Help /License information**' menu -->License regulations

3. Start page of the APROL documentation: Manual '**X12- Loquendo User's Guide**' --> Information about the use of the Loquendo controls for controlling the speech output.

4. APROL documentation '**D1 System manual**', chapter <u>Licensing of the Loquendo</u> <u>TTS7 software for licensing alarms</u> --> the description for licensing procedure

Proceed as follows for licensing:

Step:	Description:
1	please open the <i>LoquendoLicenseManager</i> with the " Tools / Licensing speech output (LoquendoLicenseManager)" KDE menu. In this case, the <i>LoquendoLicenseManager</i> is opened from the console.
2	Please enter your own PIK (product key) according to the B&R license documents. Please enter your e-mail address.

runtimeGrechnername:~> LoquendoLicenseManager	

* Loquendo S.p.A. – Loquendo License Request *	

Loquendo uses a license key to protect itself against illegal copy. The license is host-based: each computer has a different license key. Once Loquendo SW has been installed on a computer, you need to run	
this program to enable it.This operation should be repeated for every computer running the software.	
The program will ask you to enter some information: Enter your Loquendo Account , username , name of the computer. Finally, enter a valid email address.	
Enter your Loquendo Account. Example: 68E48795C784BF5007 <pik> name runtime</pik>	
Enter your email address. Example: Mario.Rossi@loquendo.com <e-mail></e-mail>	
Your Loquendo Request License File has been successfully created. (LoquendoLicenseRequest.txt) Please comnect http://www.loquendo.com/customerarea to get your license(s)	
runt ime@rechnername:~>	\$
	(

Illustration 87

3	A 'LoquendoLicenseRequest.txt' file is created in the home directory of the APROL system, which amongst others, contains computer-specific coded information.	
4	Please transfer the 'LoquendoLicenseRequest.txt' file to a computer with an internet connection. This can also be a computer with a Windows operating system.	
5	Start a browser and enter the following URL: http://licensing.nuance.com	
6	Confirm with the 'Loquendo Licensing' link.	
7	Please enter the product key 'PIK' that you know (according to the B&R license documents), and confirm the procedure with [OK].	
8	On the following page, please choose the 'LoquendoLicenseRequest.txt' file in the file system with the [Search] button. Click on the [Load] button, and then on [Get License].	
9	After waiting for a short time, the computers that are to be licensed are listed on the following page under the ' Your license ' entry. Please click on the ' Download license ' column, on the entry of the computer that is to be licensed.	
10	By doing so, a *.sh (Shell script) file is transferred to the computer via download. This file has the following nomenclature: <product key="">_<loquendo release="">_<host name="">_TTS_Shell.sh Transfer the downloaded file to the computer (Operator station) for which the license is intended.</host></loquendo></product>	
11	Make the file executable with the following Linux command:	
12	Then please execute this file as the 'root' Linux superuser.	
13	A 'TTSLicense.txt' license file is stored in the /opt/Loquendo/LTTS7/ directory with help of the script.	
14	Copy the 'TTSLicense.txt' license file into the /home/aprolsys/APROL/license/LTTS7/ directory.	
15	The licensing is now finished.	



The Loquendo TTS7 software licenses can be obtained from B&R with the material number **AP.ACC-1476**.

3.7.7 Components of a TTS system

TTS (Text-To-Speech) systems are always composed for two components, hereafter called NLP and DSP:



NLP (Natural Language Processing):

= Conversion of text in phonetics and prosody description.

DSP (Digital Speech Processing): Speech engine:

= based on the output from the NLP components, the synthesis of the speech signal is performed.

Prosody encompasses the entire speech-specific properties such as, for example, accent, intonation, or pauses (in speech).

4 Offline engineering

4.1 Introduction to offline engineering

The installation of an **APROL** patch is only possible **when no offline stand is checked out**. All of the project parts that have been checked out must be checked in. Only thereafter is it possible to carry out the installation of an **APROL** patch in online mode!

Offline engineering supports the regional and logically separated engineering performed by a user team in the context of an *APROL* CAE database.

The following cases, amongst others, lead to offline engineering in **APROL**:



/!\

In a large project with several users, it's often the case during the project design phase that a user has to edit project elements from the entire project outside of the engineering area.

 \checkmark

The system requires complete engineering with one Engineering system for step-by-step commissioning and corrective measures. If the user team is more than one person, then the Engineering has to be expanded outside of the system to provide the result back to the system when finished.

In both of these cases, it's possible to copy the entire engineering environment and continue to work in both the copy and the original. However, this can only be done with a large degree of consultation between the users.

This requires a very good knowledge of the *caedb* merging, which allows project elements to be put back together properly.

4.2 Solution

Offline engineering was developed in **APROL** to solve the issues listed above. It provides users with the tools needed to edit project elements quickly and smoothly, regardless of their location. This takes place in the **online environment** by clearly blocking off project elements that should be checked out in the **offline environment**. Only the elements are released in the offline environment that have been checked out.

Offline engineering provides the following advantages:



Checking project elements in and out is secured by the authorization system provided in **APROL** and prevents unauthorized transfer of project know-how.



A status indicator shows whether project elements are currently checked out or whether all elements can be edited in the original without limitations.

New project elements can be added in both the online and offline environments.

The entire CAE management system (user management, assigning user rights in the project, operator management) is present in both environments.

The entire project is available in both environments. **Online environment**: Checked-out elements are read-only, otherwise with write access

Offline environment: Read access to all elements, write access to checked out parts.

Smooth management in **APROL** for recombining both environments (offline and online).

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ja Öffnen		📕 👪 🗁 🧟 🚺		Sys 🔁 CS 💌 📶			
Schließen	Strg+W	9 🖓 🤑 🕵 🔹	SamplesProject/System	/Logik/LR_System_APP		▼	
Speichern	Strg+S	Ha	upt-Navigation - CaeMana	iger (engin@docsrv1)		avaoaanaaaaa	
import/Expor		I-Structure)					_
CAE-Datenba	ink 🕨						
Offline-Engin	ering •	🔒 Verriegeln	Strg+L				
🗟 Drucken	Strg+P	S Entriegeln	Strg+Umscha	t+L			
🕕 Eigenschafte	n F12	Strg+Alt+L					
🕨 Beenden	Strg+Q	Projektierungsteile ausch Projektierungsteile einche		5 9 8 8 X	0		
Typ / Name		Start Offline-Engineering		kommentar / Beschreibung	Kompilierungszeit	Kompiliert von	Ăn
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🕀 🚍 Borderlos		Offline-Projektierungsteile		ng borderloser I/O im CFC			11.0
• ECFC loka		N-A		spiele für die VIII lokaler Variabler			04.0
Controller Debugging Dynamisierungen		14.45		ougging von Lifwo-Liste eines CF			31.0
Embedde		1. (18. 8. *		spiele für die Am Dynamisierunge gebettete Applikationen			31.0
	IdedCfcViewer	0-1-0		gebetteter CFCViewer	20.03.2013 15:09:09 CET		31.0

Illustration 88: Opening offline engineering

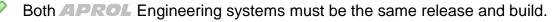
4.3 Requirements for offline engineering

The user **checking in** or **out** in the **online** and **offline environments**, must be logged in to the Engineering system **exclusively** while conducting this activity.

The user must have the rights for **offline engineering**:

Read (R) = Read from the database (check out)

Write (W) = Write to the database (check in)



An Engineering system must be present in the offline environment.

If a **preconfigured Engineering system** (created with *AprolConfig*) is present, then you must know the password for *root* (the *root* user in Engineering). You can use this to install the offline environment in a preconfigured Engineering system.



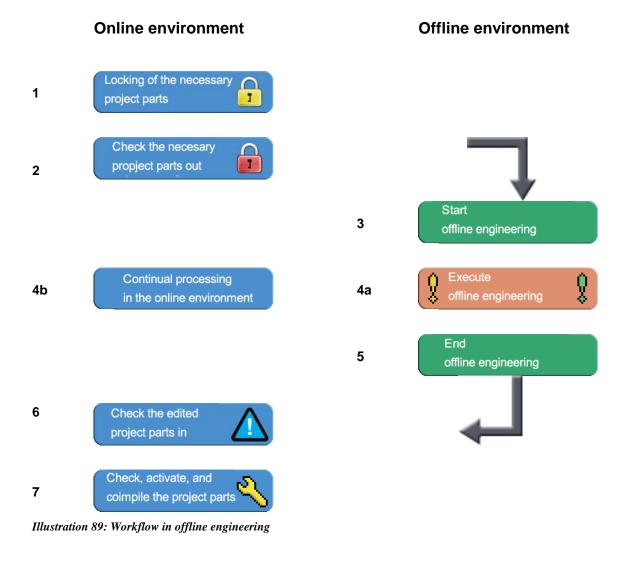
When performing offline engineering, **no updates or upgrades** can take place in the respective offline and online environments!

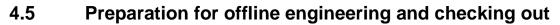
Environment	ronment Changes	
Online engineering	User A changes a CFC.	Rights from user management and project
Online engineering	User B locks this CFC and checks it out.	Offline engineering R
Offline engineering	User C starts offline engineering.	Offline engineering W
Offline engineering	Users A, B, C, and D make changes.	Rights from user management and project
Offline engineering	User C stops offline engineering.	Offline engineering R
Online engineering	User D checks in.	Offline engineering W
Online engineering	User A enables all changes and adds them to the project.	Rights from user management and project

In an extreme case, the following scenario is possible after assigning rights accordingly:

4.4 Structure of offline and online engineering

The following image shows the general structure of offline and online engineering after and during distribution:





4.5.1 Locking the necessary project parts

Offline engineering is not possible without locking project elements. This determines which project and database elements are provided for offline engineering.

The user doing the locking and checking out has no effect on the subsequent offline engineering. It's only important that all of the elements locked by this user are later checked out of the offline environment and re-checked into the online environment.

Project parts, folders, the entire CAE project, and an entire library can be locked.

The higher-level directory in which a project part is to be created must be locked in order to create a new project part normally, or with cut & paste, in the offline engineering.

If a directory is locked and checked-out then a project part cannot be created in online engineering. Locking directories is necessary so that the name space within the directories is preserved.

Locking directories optionally locks (must be confirmed explicitly) all of the subdirectories and project parts there under recursively.

4.5.2 Checking out the necessary project parts

This procedure is started with the menu item

'File / Offline Engineering / Check out project parts'. In this procedure, all project elements that were locked earlier by the currently logged in user are marked as checked out. This means that all checked out elements can no longer be edited in the online environment. The offline engineering mechanism in **APROL** ensures this.



The mechanism for checking out for offline engineering falls back on the elements of the backup mechanism of **APROL**.

Information about additionally incorporating engineering components for the backup can be found in the **APROL** documentation "B2 Project Engineering".

Versions that have the version status *Modified* cannot be checked out. The system recognizes this case and asks whether the *Modified* status for all found project elements should be versioned.



If the question stated above is answered with "no", the checking out procedure is aborted for security reasons!

Conditions for preparing the creation of the import file for offline engineering:



Possession of rights for offline engineering

Locking project elements for offline engineering

All project elements for offline engineering must be versioned.

If all the conditions above for checking out are met, then the user is assigned a unique signature. This signature is also used to identify the offline database that is now created. This establishes a clear and unique connection between the online and offline environments.

Check out project elements creates a copy of the *caedb*, which is then compressed into an archive with the respective engineering environment. The file created in this was has the name ENGIN_OFFLINE_<APROL-Release/Build>_<Computer-rname>_<APROL-

System>_<User>_<Date>_<Timestamp>.tar

and is in the directory

/home/<CC-Account>/APROL_CAE_OFFLINE

The archive can only be transferred to the engineering system in the offline environment.

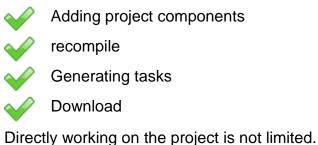
Items can only be checked out once per user! Checking out from the same online engineering can be done multiple times!

4.6 Working in the online environment

4.6.1 Further work in the engineering environment

Engineering in the online environment can now continue as before. The only limitation is that checked out components cannot be changed.

Functionalities such as these are possible at any time.



4.7 Working with and exiting offline engineering

4.7.1 Start offline engineering

To begin working with offline engineering, an Engineering system that has the same release and build as the online environment must be present on a computer. In addition, the user making changes must have the **W right** for offline engineering.

If a **preconfigured Engineering system** (created with *AprolConfig*) is present, then you must know the password for *root* (the *root* user in Engineering). You can use this to install the offline environment in a preconfigured Engineering system.

This procedure is started with the menu item 'File / Offline Engineering / Start Offline Engineering'. After selecting the offline archive, exclusive access to the current engineering system (offline environment) is checked. Since the entire current engineering environment is replaced by offline engineering, it's not allowed for any other application to access this engineering system at this point.

Now a backup of the current engineering is created before the offline archive is decompressed. If this process is ended without errors, the CaeManager is restarted and work can begin on the project now that it's in the offline environment.

If an error occurs – e.g. importing the offline environment fails – the previous engineering environment is restored.

4.7.2 Carry out offline engineering

Engineering in the offline environment can now continue as before. The only limitation now is that elements that are **not checked out** are available, but **they may not be changed**.

Functionalities such as these are possible at any time.

- Editing the elements identified when checking out
- Deleting and restoring checked out project elements (recycle bin)



Adding project components

- 🤌 recompile
- Generating tasks

Directly working on the project is not limited.

!(!)

Illustration 90: Available for editing / edited in offline engineering

All checked out project elements are marked with a **green** '!'. If they are being edited, the color changes from **green** to **yellow**.

Project elements that are not explicitly marked may not be edited. For these parts, it's not possible to trace the changes in the online environment. This includes, e.g. all other non-versioned parts in the engineering.



/!\

In offline engineering, you can't check out elements for another offline engineering session!

Configuration tips point out things that should be taken into account in offline engineering.

The following table provides an overview of changes that are allowed in project elements that have been released for offline engineering:

Project element	Changes allowed	Note
Hardware CC	Yes	If identified for offline engineering. When configuring CC modules, be aware of limitations of files in the file system!
Hardware controllers	Yes	If identified for offline engineering. When configuring B&R module references in 3 rd -party connection, be aware of limitations of files in the file system!

Project element	Changes allowed	Note
CFCs	Yes	If identified for offline engineering.
Static process graphics	Yes	If identified for offline engineering.
Dynamic process graphics	Yes	If identified for offline engineering.
Equipment	Yes	If identified for offline engineering.
Parameter set template	Yes	If identified for offline engineering.
Project modules	Yes	Importing project modules only.
User rights	No	Changes are lost.
Operator rights	No	Changes are lost.
Project part name	No	Changes not possible
Instance name	No	Changes not possible
Files in the file system	No	E.g. Central Python module Alarm line configuration These changes are present in the archive, but must be inserted manually into the engineering.
Configurations for applications on the Engineering system	No	E.g. dynamic.list, ControllerManager configurations These changes are present in the archive, but must be inserted manually into the engineering.



The table above is not necessarily complete. Only the project elements marked with **Yes** can definitely be modified if they have been checked out for offline engineering.

If new project elements are created in offline engineering, make sure that there are no overlaps with online engineering. If there is a conflict, it can only be solved by changing one of the two environments.

In offline engineering, assigning versions is done from the online environment. That means: e.g. for element XYZ, version 2.4 (from the online environment) becomes 2.5 and 2.6, etc. If version 2.7 of element XYZ is checked in, then the temporary versions are not carried with it. They are ignored when checking in. The following applies for the XYZ element:

Version 2.7 of XYZ is added as *Modified* to version 2.4 in the online environment. When a version is made, it receives version 2.5.

4.7.3 Finish offline engineering

To exit offline engineering, the user must have the **R right** in offline engineering. A working version (*Modified*) may not be among the project elements released for offline engineering. If this *does* happen to be the case, let the system know and assign the version if desired.

This procedure is started with the menu item

'File / Offline Engineering / Finish Offline Engineering'. Versioning the status *modified* is possible when finishing (see chapter <u>Preparation for offline engineering and checking out</u>, point checking out project part). After creating an archive of the offline environment being worked, the previously saved engineering environment on the Engineering system is restored.

The Start – Edit – Close process for the offline environment can be repeated until the offline engineering has been checked back into the respective online environment!

If the result of offline engineering is brought back into the online environment, then offline engineering can no longer be continued. All subsequent changes made in offline engineering can therefore not be added to the online environment.

4.8 Merging offline and online

4.8.1 Checking in the edited project parts

The user must have the **W right** for offline engineering to check in elements. After selecting the offline archive, the signature it contains is compared with the one in the online database.

If the signatures match, then the changes made in the offline engineering are applied to the online engineering if desired.

 Λ

Changes can only be applied on an all-at-once basis. If an error occurs when checking in, then the entire check-in procedure is aborted.

All of the project elements checked in from offline engineering are inserted into the online engineering with the working version *Modified* regardless of the version in the offline engineering. In addition, all elements are marked with a CAE message (blue triangle) to indicate that they come from offline engineering. **This indicator can be removed if desired**.



Illustration 91: Offline engineering checked in and work version

Also see chapter <u>*Working with and exiting offline engineering</u>, point carrying out offline engineering.*</u>

4.8.2 Checking, activating, and compiling the project parts

The project elements now exist in the online environment as a working version (Modified). Now your task is to check these elements with the system, create a version, activate them, and compile them. If necessary, generation processes have to be carried out.

Downloading to the corresponding systems and controllers represents the last step.

4.9 Offline engineering with project-specific data reduction

The '**Project-specific CaeBackup with data reduction**' option especially supports the external editing of a CAE project from an engineering database with several projects and/or libraries.

When using this option, the other 'Consider the generated data from projects and libraries' and 'Consider the as-built documentation of the CAE libraries and the existing project documentation' options are deactivated automatically and are also made insensitive. These data are thus omitted from the backup and the CAE database is reduced in size.



Illustration 92: Offline engineering with project-specific data reduction

The archive that is created when using the project-specific data reduction contains:

only the **CAE project** that was chosen when the checking-out of the project parts took place,

only the CAE library blocks that were being used in this project,

(existing labels from the CAE library are not saved with the rest)

only the newest and / or activated versions of all project parts,

only the project data **without a generated part** and **without documentation** (E.g. without the /GENERATED directory)

The data transfer to an external service provider can eventually be accelerated with the data reduction.



The amount of reduction depends on the number of libraries used in the CAE project and the number of versions that exist.

5 IosDiagnosticManager

The analysis of the process database (losys) is supported by the **losDiagnosticManager**. This GUI application unifies all functions of the 'losys tools' and offers many other functions (e.g. signal generators) to influence PVs for diagnostic purposes.

The losDiagnosticManager is opened via the 'Diagnosis / losDiagnosticManager ' KDE menu.



The use of the console applications '<u>losys-Tools</u>' or the GUI-based losDiagnosticManager allows you to look into the losys data base, and manipulate the data localy or on a remote losys.

You obtain a short overview of the current system state.

⚠

These losys tools are only allowed to be used by an experienced user. They do not replace the normal operation via the GUI applications and are not allowed to be used for a normal process control.

5.1 Notes on support of multi-runtime systems

A multi-runtime system is composed of several runtime systems **which belong to one CAE project** and are configured therein.

That means that the PVs are distributed over several losys systems in one CAE project.



Detailed information about multi-runtime systems can be found in manual 'B2 Project Engineering', chapter <u>Multi-runtime systems in APROL</u>

Both the console applications 'losys tools' (such as *losEv*) and the losDiagnosticManager can record and display PVs and clients from the different runtime systems of a CAE project.

5.2 General information about using the losDiagnosticManager

The GUI is split into two parts and offers you the followign possibilities:

The left part displays the losys clients and the PVs registered in the losys.

You can use wildcards and the Levenshtein distanz to filter the losys clients and losys PVs.

The view can be switched between a flat list and a tree structure.

The right part **displays the Watch window**. The events (change-events) of the (observed) PVs are displayed here. One or more Watch windows can be created.



Use the 'Extras / align View Vertically' menu item to order the above mentioned areas above one another.

The following actions can be carried out on PVs in the losDiagnosticManager:



Display all PVs (which are registered in the connected losys)



Change the attributes of a PV(value, type, status) via <u>Properties dialog</u> or <u>Signal</u> <u>generator</u>



Display of change events

- in the dynamic Watch
- in the static Watch

Display of the online trend for a PV



Opening AuditTrail for a PV

Each time the attribute of a PV is changed with the losDiagnosticManager, an AuditTrail entry is made.

These changes are recorded in the 'External process control' action group and allow a specific filtering of the AuditTrail report.

Creation of PVs

5.2.1 losys clients / losys PVs

A connection must be established to the corresponding losys for each '**APROL** system'. Use the 'losys / Connection to losys' menu item for this purpose or the context menu entry of the selected runtime system with the same name.

Either the clients of an 'APROL system' (via context menu) or all clients of all 'APROL systems (menu item 'losys / Load all Clients') can then be loaded.

D losys clients are all applications (e.g. DisplayCenter or drivers) which are running in this **APROL** system and are connected to the losys.

The loading of the PVs for each '**APROL** system' or all '**APROL** systems' is made in the same way.

6	los	DiagnosticManager - Io	osDiagnosticManager (rundoc@	docsrv1)	
tei losys Watch Signalgenerator Re	ports Extras L	ogin Hilfe			8.8 -
Verbindung zum losys	Strg+V				
🛓 🚁 Verbindung zum losys trennen	Strg+D				
	Strg+C				
	and the second second				
	Strg+P	12		Oynamischer Watch1 (0)	
Ic Neue PV	Strg+N 184988	1)		DOXED	2 11
Filter. •			Distanz:		PV-Wert PV-Typ PV-Status PV-Nam
tuntime-System / Client Name	Prozess-ID	CC-Account	Display		
CC_System_Anlage_01 (docsrv1:0)					
- <unknown_application></unknown_application>	13808	<unkown_ccaccount></unkown_ccaccount>	Persona da se p		
-AlarmServer_dem1	5579	rundoc	unknown_display		
- CCT_FastTask1	5543	rundoc	unknown_display		
- CCT_MultiRun1	5544	rundoc	unknown_display		
- CCT_Python1	5545	rundoc	unknown_display		
- CCT_Reaktoren1	5546	rundoc	unknown_display		
- CCT_TrendTest1	5548	rundoc	unknown_display		
- CCT_Umwelt1	5549 5550	rundoc	unknown_display		
- CCT_ValidTest1	5550	rundoc	unknown_display		
- ChronoLogServer_dem1		rundoc	unknown_display		
- DisplayCenter_dem1	14218 5552	rundoc	docsrv1.br-automation.com.6.C		
- EventDriver_CTRL03	5551	rundoc	unknown_display		
 InaDriver_CTRL03 IosDiagnosticManager 	14524	<pre>rundoc <unkown ccaccount=""></unkown></pre>	unknown_display		
- losDispatcher 001	5427	rundoc	unknown display		
- losDispatcher_001	5427	rundoc2			
- losHttp 001	5253	rundoc2	unknown_display unknown_display		
ReportSpooler dem1	5581	rundoc	unknown_display		
- SvsDataTransfer 001	5497	rundoc	unknown_display		
- SysDataTransfer 002	5499	rundoc	unknown_display		
- Sysbaca fransier_002	5494	rundoc	unknown_display		
TrendServer dem1	5578	rundoc	unknown display		
UcbServer dem1	5577	rundoc	unknown_display		
CC System Anlage 02 (docsrv1:1)					
··· ··· ······					
			(1)	4	•
ys-Clients aller verbundenen Ru		Vana			

Illustration 93: IosDiagnosticManager

'losys clients' tab:

The 'losys clients' view is helpfull to find out which, or how many, applications access the losys from which server or operator station (by specifying the CC-Account, dispolay, host).

The entries in the 'losys clients' tab can be displayed in a list or tree view (default). The clients in the tree view are displayed under the corresponding runtime system.

The entries can be exported in different fromats (CSV, TXT, XML) via the context menu.

You can then access the exported data in a Windows environment, for example with Excel.

This makes sense, for example, for commissioning and acceptance documentation. The scope of the clients after the commissioning phase is thus documented.

'losys PVs' tab:

The entries in the 'losys PVs' tab can be displayed in a list or tree view (default). The PVs in the tree view are displayed under the corresponding runtime system.

After the PVs have been read ('Load PVs' or 'Load all PVs'), only the PV names are shown.

If other PV attributes are shown, the PV must be selected in the list and then registered via the 'Register PV' context menu or the properties dialog ('PV will be registered automatically). The PV status, PV type, live value, and signal are then displayed as further PV attributes.

1

A PV is registerred automatically when it is dragged and dropped into a Watch.

The number of listed PVs (taking the Levenshtein distance into account) and the total amount of PVs read are displayed in the label of the 'losys PV' tab.



This is the same as the behavior in the 'losys Clients' tab (with respect to the clients).

This behavior in the 'losys Clients' tab is the same.

A PVs properties dialog is dynamic, i.e. the values displayed are refreshed in the dialog after a change event.

🚺 🖸 PV-Eigenschaften bearbeiten - IosDiagnosticManagei 🗖 🗖 🗙
Allgemein
Name: ValveFP_Valve01d_S_05_L2_BtnSet1
Runtime-System Instanz: CCSYS1
Aktueller Wert: 0
Gewünschter Wert: 0
Werthistorie:
_ Signalgenerator
Signaltyp: -
Zeitstempel
Zeitstempel vorgeben
28 ₩ 10.02.2014 ▼ ♥○ ♥○ 14:20:04.230 ▼ ♥○ ♥○ ♥⊙
losys-Typ
Status
idle 🕱 Valid 🗌 Source 🗌 Source 🖪 Remanent
Übernehmen Abbrechen

Illustration 94: PV properties

The last twenty values from the 'Value history' drop-down list are recorded in a ring buffer. A selected list value is adopted in the 'Desired value' input field. Changes which are made are carried out after the [Adopt] button is pressed.

5.2.2 Static / dynamic Watch

A new Watch window is created via the 'Watch / New <dynamic | static> Watch' menu.

window.

6	osDiagnosticM	anager - losD	iagnostic	lanager	(rundoc@d	locsrv1)					8 8 8
	Login Hilfe										
Neuer dynamischer Watch Strg+Y											
Neuer statischer Watch Strg+S Lade Watchs											
ntime-Syste 🟹 Watches speichern	Dynamisch	er Watch1 (0)	<u></u>								
losys-Clie Alle Tabellen-Spalten anzeigen Erweiterten Zeitstempel anzeigen	002	ৰ জা	B H								
Filter • Distanz • U	Valid Ereignis	Zeitstempel	PV-Wert	PV-Typ	PV-Status	PV-Name	Applikation	PID Ho	stname	Host IP	Signal
Image: C_System_Anlage_01 (docsn1.0); -CUknown_Application> -CUknown_Application> -CUknown_Application> -Comparison -Comparison <td< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></td<>											

Illustration 95: Creating a Watch

The **dynamic Watch** shows **an incoming event** for each inserted process variable **as a separate entry** within a list view. Each entry contains the actual attributes and corresponding values of the process variable at the time point of the event.



Explanatory tool tips are available on each column heading (e.g. PV type or PV status).

The list grows with each incomming event. Incomming events are always at the top. **The time factor is relevant** for this view.

The corresponding runtime system instance name is shown in the 'PV Name' column after the '@' character.

	U.	🗙 📼	<u>e</u>	E,			
√alid		Zeitstempel	PV-Wert	Р∨-Тур	PV-Status	PV-Name	A
	Ja	14:54:14.783	116.860001	REAL	-VSP	SYS_LR_DemoFbLRStat.UserTime@APROL_Runtime_01_SYS	С
-Ō.	Ja	14:54:13.583	16.587677	REAL	-VS	SYS_HW_MonCc01_Sys_UserLoad@APROL_Runtime_01_SYS	C
-Ō.	Ja	14:54:12.383	116.849998	REAL	-VSP	SYS_LR_DemoFbLRStat.UserTime@APROL_Runtime_01_SYS	С
-0.	Ja	14:54:11.983	16.582914	REAL	-VS	SYS_HW_MonCc01_Sys_UserLoad@APROL_Runtime_01_SYS	С
-0.	Ja	14:54:11.181	116.839996	REAL	-VSP	SYS_LR_DemoFbLRStat.UserTime@APROL_Runtime_01_SYS	C
-0.	Ja	14:54:10.781	26.732674	REAL	-VS	SYS_HW_MonCc01_Sys_UserLoad@APROL_Runtime_01_SYS	C
-0.	Ja	14:54:09.580	28.643215	REAL	-VS	SYS_HW_MonCc01_Sys_UserLoad@APROL_Runtime_01_SYS	C
-0.	Ja	07:44:07.520		STRING	-VS	SYS_HW_MonCc01_Ups_UpsCfg_m4rname@APROL_Runtime_01_SYS	U
-0.	Ja	01:00:00.000	-	NONE		SYS_HW_MonCc01_Ups_UpsCfg_m4rname@APROL_Runtime_01_SYS	
- Ō.	Ja	14:54:08.780	116.830002	REAL	-VSP	SYS_LR_DemoFbLRStat.UserTime@APROL_Runtime_01_SYS	C
-0.	Ja	14:54:08.380	10.769231	REAL	-VS	SYS_HW_MonCc01_Sys_UserLoad@APROL_Runtime_01_SYS	С
0.	Ja	14:54:07.580	10.309278	REAL	-VS	SYS_HW_MonCc01_Sys_UserLoad@APROL_Runtime_01_SYS	С
-0.	Ja	14:54:07.180	116.820000	REAL	-VSP	SYS_LR_DemoFbLRStat.UserTime@APROL_Runtime_01_SYS	C
-0.	Ja	14:54:06.780	12.000000	REAL	-VS	SYS_HW_MonCc01_Sys_UserLoad@APROL_Runtime_01_SYS	C
-0.	Ja	14:54:05.580	12.437811	REAL	-VS	SYS_HW_MonCc01_Sys_UserLoad@APROL_Runtime_01_SYS	С
-0.	Ja	07:44:02.159	0	INT	-VS	SYS_LR_MonCcExtCtrl01_Mem_UmumFree@APROL_Runtime_01_SYS	
	Ja	07:44:10.969	0	INT	-VS	SYS_LR_MonCcExtCtrl01_Mem_UmulayCur@APROL_Runtime_01_SYS	

Illustration 96: Dynamic Watch

The columns which are to be displayed can be selected via the column header context menu.

	scher Wati	ch1 (3)	H							
√alid	Ereignis	Zeitstempel	PV-Wert	PV-S	Allo Chaltan antaigan	1	Applikation	PID	Hostname	Signal
Nein		01:00:00.000	-	J	Alle Spalten anzeigen	CSYS1				-
O Ja		01:00:00.000	-		🗙 Valid	CCSYS1				-
📖 🔘 Ja		01:00:00.000	-		🗶 Ereignis	DCCSYS1				-
					🗶 Zeitstempel					
					X PV-Wert					
					PV-Typ					
					🕱 PV-Status					
					X PV-Name					
					🗶 Applika 🧔					
					X PID					
					🗶 Hostname					
					Host IP					
					🗙 Signal					

Illustration 97: Showing / hiding columns

The dynamic Watch can be used to record and analyze processes / analysis of dependencies in the runtime behavior of signals.

The static Watch shows a list view of exactly one entry for each inserted process variable.

When an event occurs for one of the inserted process variables, the atributes, and values of the **existing entry** is updated.

(alia)	Zeitetennel	D) () A (ast	DUT	Dichebue	PV-Name /	Dunking Custom
√alid	Zeitstempel	PV-Wert	PV-Typ	PV-Status		Runtime-System
-O Ja	14:54:22.025	54.822334	REAL	-VS	APROL_SYSTEM_0HL_Runtime_01_SYS	
-O Ja	14:54:23.014	51.371571	REAL	-VS	APROL_SYSTEM_0mmt@IS_AprolSystem	IS_AprolSystem
-O Ja	14:54:22.384	54.822334	REAL	-VS	SYS HW MonCc01muL Runtime 01 SYS	APROL_Runtime 01_SYS
Ja	14:54:20.783	116.889999	REAL	-VSP	SYS LR DemoFbLIML Runtime 01 SYS	APROL Runtime 01 SYS
Ja	01:00:00.000	-	NONE		SYS LR MonCcExtrueL Runtime 01 SYS	APROL Runtime 01 SYS
- 🙆 Ja	01:00:00.000	-	NONE	J	SYS LR MonCcExtmuL Runtime 01 SYS	
Ja	01:00:00.000	-	NONE	J	SYS_LR_MonCcExt+4L_Runtime_01_SYS	
Ja	01:00:00.000	-	NONE		SYS LR MonCcExtrueL Runtime 01 SYS	
L Ja	01:00:00.000		NONE		SYS LR MonCcExtmuL Runtime 01 SYS	

Illustration 98: Static Watch

The corresponding runtime system instance name is shown in the 'PV Name' column after the '@' character.



The statistic Watch can be used to monitor PVs over a longer period of time. It is suitable for identifying signal jumps together with the online trend.

5.2.2.1 General information about using the Watch window

\checkmark

Adopting a Watch window:

A name can be assigned to a Watch (double-click on the Watch tab or via the respective context menu).

It is possible to rename a Watch window, in order to give the PV composition a descriptive name.



A watch can take on the following states:

- active (i.e. started, incomming events are displayed)

- inactive (i.e. stopped, occuring events are not displayed)

Initially, a Watch is inactive. A watch can only be active when at least one PV is inserted.

The state and number of change events is displayed in the Watch tab.



Adding PVs:

A PV can be inserted into a Watch via the 'losys PV' tab, 'Observe PVs' context menu, a double-click, and drag & drop.



Save composition:

The composition of the Watch process variables can be saved in a file. The names of listed process variables is saved (PV sub-set). This offers the possibility to re-load the variable composition into a Watch at a later stage.

A Watch which has been saved can be loaded with the 'Watch / Load Watch' menu item. A file selection dialog is opened to select the composition stored in the file system.

The Watch name is used as the file name when saving (or exporting), and is restored when loading.



Export / Printout:

The information in a watch can be exported into a file and printed via the context menu or the toolbar. The output formats CSV, TXT, and XML are available for the export.

You can then access the exported data in a Windows environment, for example with Excel.

An export allows you to provide and transfer data for the support, amongst others.



Trigger a separate window:

A separate Watch window can be positioned freely for a better overview, as is usual in **APROL**.

5.3 Use of a signal generator

Motivation for the use of a signal generator:

The course of a signal can be simulated (e.g. sawtooth) with the signal generator, for example, during the commisioning phase.

Signal generators can be created and configured independently of the PVs. The signal generator configuration can be made in the losDiagnosticManager with the help of a wizard.

The wizard is in the 'Signal Generator / New Signal Generator' menu.

10				Manager (n	undoc@docstv1)		00	0
Datei losys Watch Signalgenerato	Reports Extr	as <u>L</u> ogin	Hilfe			E		-
🎠 📴 🔟 🐺 😨 🐼								
Runtime-Systeme: Alle Runtime-System	ne		-	Q Dynam	ischer Watch1 (0)			
	DV/4/ 105005 / 1	V-Signalge	enerator-Ass	stent - losDi	agnosticManager (rundoo	@docsrv1) 👻	0	
Filter. •	Allgemeine E	nstellungen					m	10
ime-System / PV Name								
CC_System_Anlage_01 (docsiv1 CC_System_Anlage_02 (docsiv1 AL=001-CLIENTS	Name: S	inus]		
– AL=001-REDU – AL_001_MultiRun2_ack – AL_001_MultiRun2_ackbell	losys-Typ:	EAL						
– AL_001_MultiRun2_bellont – AL_001_MultiRun2_evont – AL_001_MultiRun2_locked	Signaltyp: S	inus				•		
AL_001_MultiRun2_prio_0 AL_001_MultiRun2_prio_0_ackbell AL_001_MultiRun2_prio_0_bellcnt								
AL_001_MultiRun2_prio_0_evcnt AL_001_MultiRun2_total						Seite 1 /	2	
AL_001_Reaktor2_ack AL_001_Reaktor2_ackbell	Vorherig	(e)	Näch	ste	Ok	Abbrechen		
AL_001_Reaktor2_bellcnt AL_001_Reaktor2_evcnt								
AL_001_Reaktor2_locked AL_001_Reaktor2_prio_0				•			•	Þ
ROL R 4.0-00	10 / 1 Sa	mplesProj	ect		[rv1 🔒 Operator 10		5

Illustration 99: Create signal generator 1/2

⊡ ⊙ ⊂Sinussignal-E	V-Signalgenerator-Assistent - losDiagnosticManager nstellungen	(rundoc@docsrv1) 🛛 😒 🔿
Periode (ms):		Start
Min:	0	Anhalten
Max:	3e0 T	
Schrittweite:	10 Max Geben Sie das Maximum	an
Anzahl:	2	
		Seite 2 / 2
Vorheri	e Nächste Ok	Abbrechen

Illustration 100: Create signal generator 2/2

A signal generator which is configured or loaded from a file can be assigned to **one or more PVs of the same IEC data type**.

The signal generators which have already been created are shown in an overview ('Signal Generator / Show Existing Signal Generators' menu).

Further PVs can be added to a signal generator via the PV context menu or darg & drop from the overview dialog (**only if the IEC data type of the PVs is the same**).

Individual PVs can be unregistered from the signal generator via the 'Unregister PV from Signal Generator' context menu.



The start, stop, configuration, and PV value change of a signal generator is recorded in AuditTrail ('External process control' action group).

The use of a signal generator can be filtered in AuditTrail.

Eile Edit View History	Bookmads Tools Help						
AuditTrail-Report	4						
🔶 sije 📓 hmpssidecsvit	beautomation.com/PROJECTS/Sa	nglesProject/049/standard/action/ext_act	ions.cm?lasg=049.project=SamplesProject.date	etaday, actione anti-ide USERACTIO		AGE fuysmisged	ି × Ø
Ber		Auc	ditTrail-Report - Get	iltert			<u> </u>
a 🛋 🚔 🐱	🖾 🔸 🖾 🗰 🖬	1 🔍 🗾 🗋 🖬 04.02 Seite	2014 00.00.00	04.02.2014 24.00.00	0 100	Ergebnisse /	Samples Project
To 28 🕗 🎫 🛲	1 7d 30d 50d	Th 24h 70 500 500			III III III III III	* 25 50 10	200
Aktionsgruppen:	Externe Prozessführung Alle	Externe Prozessführung Wert ge Externe Prozessführung Signalg Externe Prozessführung Signalg	esetzt enerator Start enerator Stop	erator-Typen an 📰			
>							
Zeit 🔫 🛋	Aktion 🤝 🛋	Anwendung 🔝 🔺	Webzugriff von 🔻 🔺 Verbund	ener losys 🔻 🔺 Prozessva	iriable 🔻 🛋 Ve	råndert 🔻 🔺 Info	Operator 🔻 🔺

Illustration 98: Logging in AuditTrail ('External process control' action group)

The following signal types are available depending on the selected losys type:

V Cyclic	Step	Saw tooth
؇ Ramp	Toggle	Sine
🞸 Random	Triangle	History

5.4 Write PV values to the losys / evaluate from losys

It is possible to export the contents of a defined process variable from a local, or remote, losys with this function. There is the possibility of importing this (or a self-created) list back into the system.



For error analysis, the created list shows the status of defined PVs at a certain point in time.

Two files must be selected after the function has been started.

The first file (list file) must contain the names of the relevant process variables (one PV on each line).

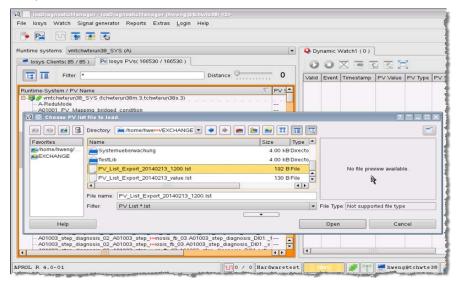


Illustration 101: Write PV values to the Iosys / evaluate from Iosys (step 1)

The value of the respective PV is saved in the second file (data file) in the case of an export (one value in each line): If it is an import, values which are written to the respective PV must exist in the second file.



This functionality is the same as the 'losInOut' command line application. Examples of its use can be found in chapter <u>losInOut</u>.

20		YS (A)			-	Q Dynamic Watch1 (
Iosys Clients(85	(/85) PV Ic	sys PVs(166530 / 16	6530)			Leeve
				0		
Filte	г [*		Dist	ance:	···· 0	Valid Event Timest
stem / PV Name				V PV S	tatus 🔺	
tchwterun38 SYS (t	chwterun38m:3	,tchwterun38s:3)				
duMode						
01 PV Mapping br		sDiagnosticManager				
at o File scien	ion dialog - lo	solagnosticManager	r (nweng@tchwte	(56)		
	Directory:	/home/hwe###/EX	CHANGE 💌 <	۱) 🛋 🎞 🕻	
	Name	/home/hwe//EX	CHANGE 💌 <	۱		TE C
	Name	/home/hwe!***/EX	CHANGE 💌 <	* 💌 🎦		Vpe
	Name	/home/hwe#4/EX	CHANGE 🕶 ∢	* 👝 🎦	Size T	Vpe A irecto
	Name / PALC		CHANGE 💌 <	*	Size T 33 B D	irecto
	Name / PALC	TRLBackup	CHANGE 💌 🐳	*	Size T 33 B D 4.00 kB D	Vpe irecto irecto
	Name / PALC	TRLBackup		* * *	Size T 33 B D 4.00 kB D 4.00 kB D 4.00 kB D	Vpe irecto irecto
	Name / PALC	TRLBackup mueberwachung ib		* * *	Size T 33 B D 4.00 kB D 4.00 kB D 4.00 kB D	Vpe irrecto irrecto irrecto irrecto
Favorites	Name mm PALC Syste	TRLBackup mueberwachung ib		* * *	Size T 33 B D 4.00 kB D 4.00 kB D 4.00 kB D	Vpe irrecto irrecto irrecto irrecto
	Name mm PALC Syste TestL	TRLBackup mueberwachung Ib		* * *	Size T 33 B D 4.00 kB D 4.00 kB D 4.00 kB D	ype ▲ irecto irecto irecto • ↓

Illustration 102: Write PV values to the Iosys / evaluate from Iosys (step 2)

6 losys HTTP interface

APROL supplies an losys HTTP interface

for accessing losys data from external systems



for accessing losys data from web sites

6.1 General information

The *losHttp* application is configured in the CC modules and is started per default on each runtime system.

6.1.1 **IosHttp application**

The losHttp application accepts HTTP post requests from a defined TCP port (via the '-portOffset' command line option). The specified offset is based on the default port 55590.

The reading and writing of losys variables are possible requests.

The losys that is specified when starting the losHttp is always contacted ('-iosys <host:port>' command line option).

6.1.2 Web server configuration

Access from an external computer must take place via the Apache server. This acts as a proxy server for the requests to the losHttp and forwards them to the responsible losHttp.

The '<Projektname>_IosHttp.conf' include file is generated for the 'apache2.conf' and loaded on all control computers, and contains the assignment of the desired runtime system to the port of the correspoding losHttp.

The include file is in the directory /home/aprolsys/APROL/cnf/apache2/.

6.2 Detailed information

6.2.1 Request - Specification

The following requests are accepted by the losHttp (on the specified port). The 'get' and 'post' HTTP methods can be used. If 'post' is used then the parameters must be transferred in the 'application/x-www-form-urlencoded' MIME type.

URL	Query - Parameter	Meaning	Response Data
t	id= <pv1>,<pv2>, <i>or</i> id=<pv1>&id=<pv2>;fld=<bit mask></bit </pv2></pv1></pv2></pv1>	Query of the current values for the specified losys variables (Data of the last event)	XML format (see below)
/iosys/ <projec t name>/<runti me system instance>/jso n/get</runti </projec 	the same as /iosys/xml/get	As in /iosys/ <project name>/<runtime system<br="">instance>/xml/get</runtime></project 	json format (see below)
/iosys/ <projec t name>/<runti me system instance>/set</runti </projec 	<pv1>=<value1>&<pv2>=<valu e2>&</valu </pv2></value1></pv1>	Set the stated losys variable to the specified value. The type is detected automatically from the value that is transferred: Number without '.' and without 'e,E' : losType_INT (losVar_set_int), Number with '.' or with 'e,E': losType_REAL(losVar_set_real) , otherwise: losType_REAL (losVar_set_string)	no data

The 'fld' parameter serves to control the attribute (bit mask: see the <u>table</u> below) that is contained in the response.).

Response HTTP status code and explanation:

Status	Explanation
200	OK
204	OK, no content (always with /iosys/set requests)
400	bad request (erroneous query, e.g. false query parameter)
404	not found (path not specified as above)
410	recource timeout (Validity of the token expired), see below
500	Internal error
502, 503	losys could not be contacted.

6.2.2 Response formats

6.2.2.1 XML format

<?xml version="1.0" encoding="UTF-8" ?>

```
<points token="<Character string>">
    <point ts="<zeitstring>" id="<pv>" nr="<nr>" uts="<unix-timstamp>" ty-pe="<iosys-type>" val="<wert>" flags="IVSQFP" />
    <point .... />
    <point .... />
    <point .... />
    </points>
```

A 'point' node exists for each ID that is specified in the query. The attributes can be directories can be taken from the table below.

6.2.2.2 json format

The json format can be selected.

See 'www.json.org' for detailed information about the json format.

[{'token': '<character string>' } , [{ 'ts' : 'time string' , 'id' : '<PV>' , 'no' : 0 , 'uts' : unix time stamp , 'type' : iosys type , 'val' : '<value>' , 'flags' : 'IVSQFP'} , { .. } , { .. }]]

Array with 2 elements:

- 1. Element: Object with the name 'token' and value character string (see below)
- 2. Element: Array of objects. An object exists for each ID that is specified in the query. The objects have the following attributes:

Attribute	Meaning	Default in Response? (without 'fld' attribute in the request)	Control bit in the 'fld' parameter
ts	Time stamp of the last losys event in the form 'yyyy-mm-dd hh:mm:ss.mmm'	x	0
id	Name of the losys variables	x	1
val	Value of the losys variables (last event)	x	2
flags	Status of the losys variables' flags. Format: IVSQFP with idle (I), valid (V), sourced (S), source (Q), force (F), persistent (P)	x	3
type	Type of the losys variables: losType_NONE = 0 ,	-	4

	losType_INT = 1 , losType_REAL = 2 , losType_STRING = 3 ,		
uts	Unix time stamp of the last losys event (microsecond precision)	-	5
nr	Position of the ID in the query.	-	6

Notes:

No error is reported if the variable is being provided, even though 'set' does not provoke a value change in this case.

Attributes can be omitted if they do not exist. E.g. If the variable does not exist, 'val' is missing (Status: idle).

HTTP status code and explanation:

Status	Explanation
200	ОК
204	OK, no content (always with set requests)
400	bad request (erroneous query, e.g. false query parameter)
404	not found (path not specified as above)
410	Recource timeout (validity of the token expired), see below
500	Internal error
502, 503	losys could not be contacted

The 'token' attribute

If a fixed list of variables should be queried in a short space of time, then the amount of data that is to be transferred can be reduced with the following technique, and the 'Long Polling' technique can be used.

- I) The complete list of the variables that are to be queried (ID list) is transferred in the first request.
- II) The one token ('token' attribute) is contained as a character string in the response. This remains valid for a short time (10 s).
- III) The client only sends the token in the subsequent requests, instead of the ID list. The validity is extended.
- IV) The response normally contains the same token.

If an error occurs (HTTP status not equal to 200), the token is invalid. E.g. if more than 10 seconds pass since the last token usage. The ID list be re-transferred completely in a new query.

V) A new token is contained in the response.

'Long Polling' technique

The response to a request which uses a token takes place either



immediately, if a change of value or status has taken place for the monitored variable since the last usage of the token,

or after the arrival of the next losys event on one or more of the monitored variables



but after 10 seconds at the latest

Only the variables where the value has changed since the last query are contained in the response!

The technique is know as 'Long Polling', and offers a sort of event driven behavior.

Please note, it is not possible to guarantee that all losys events of the monitored variables are reported. A registration of all losys events cannot be ensured for a client application!

Example of a query:

wget -q -0 - "http://localhost/iosys/<project name>/<runtime system
instance>/json/get?id=ottemobil_IdleStatePercent;"

losHttp configuration file:

The connection configuration for the losHttp server is distributed with a download.

The '<project name>_losHttp.conf' configuration file is created in the /home/aprolsys/APROL/cnf/apache2 directory during a download.

Content of the file:

Each runtime system has a line in the syntax

ProxyPass/iosys/<project name>/<runtime system instance>/ http://<server host name, where the runtime system is located>:<port number>/iosys/

6.2.3 HTML test page with system variables

A test page can be opened with the URL https://<runtime cluster>/ioshttp/iosys.html.

There are some system variables displayed on the test page which are constantly refreshed with asynchrone Java script query (AJAX).

7 losys connection

7.1 Configuration of an losys connection

Amongst others, it may be necessary to make project variables available in a project -spanning manner.

The losys connection allows a read and write access to the project variables of another CAE project, and therefore an exchange between two losys in two different projects.

The following steps are necessary for the configuration of an losys connection:

Step	Action
1	Definition of the variables: Configuration of gateway variables in the ' APROL system' project part, section ' APROL connections', on both communication partners.
	Attention: Identical variable names are to be used in both CAE projects
2	Definition of the write direction : 'Input or output' variable type of the configured gateway variable in the ' APROL system' project part.
3	Definition of the CAE project that is to be contacted: Configuration of the losys '-export' option on the source or target runtime system
4	Creation of the configuration file on the runtime system where the '-export' option was configured.

7.1.1 Definition of the variables

1. Configuration of the variables in the source system

Open the '**APROL system**' project part on the source system and select the '**APROL** Connections' section.

Create a new connection in the **'Device-free connection'** with the **'New**' context menu. The name for the connection can be freely selected, e.g. 'losys2losys'.

Select the newly created connection entry and create a new gateway variable in the 'Variable' entry.

ile Edit Build ⊻iew Reports Extras Login Help		84.4
🛛 😸 🖽 🖽 🖽 🗁 💁 🔽 📼 🖾	1 🥦 📧 🖪 🔣 🔟	
◎ ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●	dware/ControlComputer/APROL_Runtime_SYS - TaAll -	
Main navigation - CaeManager (engin@docsrv1) 🖉		
Project: SamplesProject (Logical-Structure)	ROL_Runtime_SYS Instance APROL_SYSTEM_01	
Project SamplesProject (Physical-Structure)	4)[;	
ibraries: SamplesProject (Logical-Structure)	re 🚡 🚴 🐁 🖉 🤐 🎿 💭 🔚 Context: Device-free connection	
Intext: None (Context Structure)	Design free connection (11	
🛐 🔟 🚯 😕 🎦 🤉 🦯 🔉 🔍 🖉 🍑 🏹 👬 Manage	e @ Alarmvariablen New Ctri+N Record	rverListe
ne / Name / Statu *		
SamplesProject (V1.0.3+)	O PDA connection	
Borderlose IO	OFMS connection	
🖲 CFC lokale Variablen	e Simatic SS/S7 connection insert template	
🖲 Controller Debugging	OPC connection	
Dynamisierungen Embedded	Q 3964R connection 🕞 Delete Del	
ExecutionOrder	Dispatcher age Rename	
A Hardware	CTRL03 ale PV Substitution	
ControlComputer	Q MbpDriver 🍅 Import	
PAPROL_Operator_HW	RK512 connection	
@ APROL_Operator_SYS	Sysbata transfer (2) SamplesProject Export pre-build data	
# APROL_Runtime_2_HW	TrendExtData Ge Configuration preview Ctri+F1	
	O TIDriver	

Illustration 103: Configuration of the gateway variables in the source system

The 'Mode' and 'Type' fields must be configured in all cases.

The communication direction is specified with the 'Mode' (input or output).

A gateway variable that is written / set in the project of the source system is configured as an output and must be configured in the project of the target system an input as it is read there, and vice versa.

Specify the IEC type of the gateway variable in 'Type'.



Information about the further parameters can be found in the tool tips.

2. Configuration of the variables in the target system

Gateway variables with the same name must be configured in the '**APROL system**' project part on the communication partner (target system).



It is mandatory that **variable names identical** to that of the communication partner are used.

7.1.2 Definition of the CAE project that is to be contacted

On the target system:

	. Application 🖉	Prio	Category	Option	Value	Used	Ven
1	losys_dem2	3	System	-export		-	
2	losys_dem2	1	System	-port	1	Х	
3	losys_dem2	3	System	-prefix		-	
4	losys_dem2	3	Start	-restart	5	X	
5	losys_dem2	3	System	-self	dem2	Х	

Illustration 104: Configuration of the export switch in the 'APROL system' project part

The '-export' CC module option specifies the connection information of another losys for exchanging process variables.

-export <Server name communication target>:<Iosys port>

Example of a redundant communication partner:

```
-export meeting1:0, meeting2:0
```

The names of the process variables to be exported are read from the /home/<CC-Account>/RUNTIME/<local server name>:<Iosys port>.export.cfg file.

With runtime or gateway systems that are configured for redundancy, the name of the <local server name>:<Iosys-Port>.export.cfg file is to be adjusted for both redundancy partners (according to the respective computer name).

This option can be combined with the '-prefix' option, so that with the respective use of the options that export variables in the target losys can be uniquely identified.



The '-prefix' option can only be used in connection with the '-export' option. The character string which is specified as prefix is added before the variable in the configuration list.

7.1.3 Creation of the communication file

On the target system:

Create the <local server name>:<Iosys port>.export.cfg file manually in the /home/<CC-Account>/RUNTIME directory.

Enter the names of the gateway variable that have been configured underneath each other in the newly created configuration file.

Example: Iosys2Iosys_VAR1 Iosys2Iosys_VAR2 Iosys2Iosys_VAR3

8 APROL SQL

Up-to-now, only the ChronoLog system was available to record and evaluate historical data. A comfortable display of the selected information was also possible with the *APROL* reports.

In this manual, we would like to present how you can call your data with the help of ODBC/JDBC and the standard query language SQL-92

(http://www.contrib.andrew.cmu.edu/~shadow/sql/sql1992.txt).

The 'AprolSqlServer' service has been developed for this purpose, which accepts your queries and applies them to the ChronoLog database. You now have a free choice of query tools by using the open database interface ODBC/JDBC.



APROL SQL only offers a read-only access to the historical data. It is not possible to manipulate the data.

This manual requires a basic knowledge of ODBC/JDBC. Furthermore, basic knowledge about Linux is of an advantage.



Information about the **example usage in the B&R 'SamplesProject'** can be found in the directory 'Widgets / ListView / SQLqueryPIC'.

SSL encryption

The data transfer between the query client and the **APROL** SQL server is with SSL encryption per default. **No configuration** is necessary for the SSL encryption in the **APROL** environment.

Note

Use SQL name delimiters (") for table and column nmaes in order to avoid name conflicts with SQL key words.

Example:

• SELECT "ts" FROM "base"."Download"

8.1 System design

This chapter informs you about the assignment of historical data to the corresponding **APROL** systems and the distributed applications of the AprolSqlServer.

The following example listing defines the term 'historical data' and serves as the basis for the following thereafter.

Historical data is:

- The course of configurations made by the project engineer
- Switching operations made by the operator
- Trend records of a process

• Alarms and their acknowledgement

The 'switching operations made by the operator' create data about the action which has been carried out, and are then stored in a ChronoLog database. The other points have a similar behavior. The main difference is where the data is saved.

Each example has a direct reference to an **APROL** system type where the data is generated and stored.

Parallel to the above list, the following applies:

- Engineering system
- Operator system (and protocol server)
- runtime system
- Runtime system (and protocol server)

Historical data in **APROL** are therefore bound to a system type. If these systems are installed on different hardware, there is physical distance, and thus several ChronoLog databases. The expressions in brackets describe the 'data forwarding' to a central **APROL** system. More about this later.

All operator systems must be observed in order to answer the question 'Which switching operations has operator A carried out in the period from x to y?' completely. At the end of the day, operator A could have interacted with different systems. Another sort question is 'Which project parts were deleted by project engineer B?'. This concerns a certain engineering system, and can be answered directly.

It is therefore possible to classify the historical data according to type:

- Local data
- Distributed data

Project creation data is local, i.e. it can only be answered by the respective engineering system.

Data from the runtime and operator systems is of the distributed type, and therefore techniques for centralization must be applied in order to query it like local data.

These techniques are:

- 1.Data forwarding
- 2. Query forwarding

In 'Data forwarding', generated historical data from an operator system is forwarded to the recording protocol server and saved there in the ChronoLog. An all-encompassing query can only be answered by the protocol server.

In 'Query forwarding', the generated data is stored in the corresponding local ChronoLog and is not forwarded. If a user sends a query to a certain runtime system, this system automatically detects all other effected systems and then sends partial queries. These are processed independently and individual partial answers are returned. The runtime system which was originally contacted summarizes these responses and sends a summary back to the user. A query can be answered by every runtime system.

The procedure of 'Query forwarding' is used for trend data whose evaluation should take place promptly after it is recorded. All other runtime relevant data is made available via 'Data forwarding'. In order to give you the full picture, it must be pointed out that, apart from the 'Data forwarding', a local logging of the historical data takes place on the respective system (e.g. for the archiving).

It can then be said that historical data is either based on runtime or CAE. Furthermore, a historical data query is only possible on a runtime or engineering system. The operator system is not contacted in any case. This is why independent AprolSqlServer services are only started on those two system types.

The following rule of thumb can be used as a simplification:



Each engineering system is contacted for its own queries.

The protocol server is contacted for all queries in runtime.

These rules are used as the basis for the following documentation.

Redundancy capability is supported by the ChronoLog database.

8.2 Setting up a connection to the AprolSqlServer

8.2.1 Authentication and authorization

You need a name and password to connect to the AprolSqlServer. **APROL** SQL uses the **APROL** user and operator management to authentify and authorize. I.e. Users and operators can log in to the AprolSqlServer if they have the necessary rights.

Users need the global right 'AprolSqlServer: Read' to access the SQL server.

Operators need the right 'AprolSqlServer: Read'.

There is the possibility to create users and operators which only have the right to access SQL. This is thought of for someone who is involved in reporting, but not at all with the operation of the system.

This is set via the 'SQL system user' or 'SQL system operator' master data option.

SQL-System-User

Illustration 105: Settings for SQL system user

The SqlSystemUser users are only used for authentication to obtain data for SQL queries in APROL SQL.

If the 'SQL system user' option is activated on an existing account, all other rights apart from the 'AprolSqlServer' are revoked automatically. We therefore recommend exporting the respective user / operator beforehand, as it is not otherwise possible to undo this step.

APROL provides a pre-defined SQL system user and operator for the first access to **APROL** SQL. Both accoints are activated in the delivery state.

Environment	User / Operator	Password
Engineering	SqlSystemUser	.SqlSystemUser
Runtime	SqlSystemOperator	.SqlSystemOperator

If an authentication via LDAP is set, these users/operators must of course exist on the LDAP server.



The standard SqlSystemUser and SqlSystemOperator should be deactivated in order to secure the queries. It is not possible to change the passwords.

It is of course possible to assign the above mentioned rights to users / operators in the user management / OperatorManager.



For detailes information about the user and operator management, please read the respective section in manuals 'B1 Engineering Environment, chapters <u>User</u> <u>management</u> and <u>Operator management</u>.

In the case of the **APROL** web reports with access to **APROL** SQL data, e.g. EnMon or ConMon, the access to the report is made with the authentication of the necessary user/operator for this report with their password.

If **APROL** SQL data is accessed with foreign tools, e.g. SQuirreL, a user/operator which is marked as SqlSystemUser must be specified. Either your own or the default 'SqlSystemUser' / 'SqlSystemOperator' can be used for this purpose

8.2.2 Client connection with ODBC

This chapter informs you about connecting to an AprolSqlServer with an ODBC-capable client program.

 Λ

ODBC drivers depend on the system architecture (e.g. 64 bit Windows), and thus the compatibility must be taken into account! A 32 bit client program needs the 32 bit version of the driver, and a 64 bit program the 64 bit version.

8.2.2.1 Installation of the JDBC and ODBC remote driver in Linux

In Linux, the configuration part is created automatically during the build of the CAE project, and is distributed via the download. The manual driver configuration is not necessary.

ODBC Drivers:

A corresponding driver is necessary for Linux-based ODBC client programs to connect to an AprolSqlServer. The drivers are pre-installed and can be found in the following paths:

32 bit version

/opt/aprol/lib/SimbaEngine/client/libSimbaClient_unixODBC.so

64 bit version (Requirement: 64 bit **APROL**)

/opt/aprol/lib64/SimbaEngine/client/libSimbaClient_unixODBC.so

The client program only needs the path specification to load the correct driver. This information is stored in the 'odbcinst.ini' file. The configuration file is created automatically when a project is

generated, so that it does not have to be adjusted manually. This is also available to the target systems after a download.

The 'odbcinst.ini' can be found in the following paths depending on the **APROL** system:

Engineering system:

/home/<Engineering system>/ENGIN/cnf/AprolSqlServer/odbcinst.ini

Runtime system:

/home/<Runtime system>/RUNTIME/cnf/AprolSqlServer/odbcinst.ini



Manual adjustments are overwritten without a prompt!

odbc.ini configuration file:

All available data sources are defined in the 'odbc.ini' configuration file, which can be accessed by an ODBC-capable client program. The driver version which must be used is also specified.

The 'odbc.ini' is created during a 'build' of the CAE project. The current engineering system and logging server of all respective projects are written in the configuration during this process.

The file can then be found in the path:

/home/<Engineering system>/ENGIN/cnf/AprolSqlServer/odbc.ini

A download must be carried out subsequently, so that the configuration is available on all runtime systems. The target path on each runtime system is the following:

/home/<Runtime system>/RUNTIME/cnf/AprolSqlServer/odbc.ini

Manual adjustments are overwritten without a prompt!

Connection establishment with DSN:

Only the name of the data source (Data Source name) is important for the client program to establish a connection with an AprolSqlServer. All other configuration parameters can be detected automatically with this information.

This name is composed as follows:

1 Engineering system (32 / 64 bit version)

Engin_<*Project name*>_32

Engin_<Project name>

2 Protocol server (32 / 64 bit version)

Protocol_<Project name>_32

Protocol_<Project name>

You can also see the data source names in the 'odbc.ini'. It is distinguished as a bracketed expression (e.g. [Protocol_SamplesProject_32]).

8.2.2.2 Installation of the JDBC and ODBC remote driver in Windows

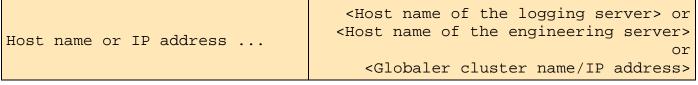
A corresponding driver is necessary, so that JDBC and ODBC-capable client programs in Microsoft Windows can connect to an AprolSqlServer. You can install these with the help of the Windows installer which is provided.

/windows_drivers_and_tools/AprolOdbcJdbcDriverSetup.exe

븅 AprolOdbcJdbcDriver	
Connection to APROL protocol server	Ber
Please enter the DSN parameters for the APROL protocol server.	
Hostname or IP address of the APROL protocol server	
Port number of the APROL protocol server (default port is 55503)	
55503	
Name of your APROL project	
SamplesProject	
,	
Cancel < Back	Next >

Illustration 106: Input of APROL -specific data.

Enter the host name of the engineering system or the logging server.



The pre-selected port should remain unchanged.

Name of your APROL project	Name	of	your	APROL	project
----------------------------	------	----	------	-------	---------

<Project name>

This information is used for the automatic configuration of the ODBC client. The necessary Windows registry paths are configured to allow a subsequent connection to the client program.

A dialog with the necessary **APROL**-specific settings for the clients is shown at the end if the installation.

Read settings

The manual adjustment/extension is explained in the following chapter.

The 'Install.txt' file is in the installation path after the installation and points out the relevant documentation.

Configuration of a data source for ODBC:

You can use the 'odbcad32.exe' ADBC data source administration tool to add or change an ODBC data source.

Ablaufverfolgun	g Verbindur	ngs-Pooling	Info
Benutzer-DSN	System-DSN	Datei-DSN	Treiber
ystemdatenquellen:		ſ	Hinzufügen
Name	Treiber		
APROL SQL 64Bit	APROL SQL Driver 64Bit		Entfernen
			Konfigurieren
gespeiche Auf eine S	DBC-Systemdatenquelle werd art, wie eine Verbindung zu eir Systemdatenquelle können alle	nem Datenprovider h	nergestellt wird.
gespeiche Auf eine S	ert, wie eine Verbindung zu eir	nem Datenprovider h	nergestellt wird.

Illustration 107: ODBC data source administration tool

The following tools are in a 64 bit Windows environment:

C:\Windows**SysWOW64**\odbcad32.exe (for **32** bit settings)

C:\Windows\System32\odbcad32.exe (for 64 bit settings)



These are two individual programs.

You must execute the 64 bit and 32 bit applications on a 64 bit Windows system, because the respective architecture-dependent registry path must be written. This is the only possible way to ensure that you can establish a connection to the AprolSqlServer with any ODBC-capable client program.

The following tools are in a 32 bit Windows environment:

 $C:\Mindows\System32\odbcad32.exe$

Additional parameter must be entered so that a connection can be established with the **APROL**-specific properties. For this purpose, select the data source in the 'System DSN' / 'User DSN' tab, and open the configuration dialog. The options dialog must then be opened and the following parameters entered:

Client Configuration Dialog 💦 💦 🔀				
Data Source Settings Data Source Name: Description:	APROL SQL 64Bit			
Connection Settings				
Server IP:	Protokollserver			
Server Port:	55503			
Connection Timeout (s):	0			
Login Timeout (s):				
Secondary Servers	OK Cancel			

Illustration 108: Dialog 'Client configuration'

Options			—
Message Fetch SSL Vse SSL SSL Certificate File:	10 C:\Program Files\APROL\Apr	olOdbcJdbc	Driver\SSLCertif
Custom Property PROJECT SYSTEM UID PWD	SamplesProject aprolsys SqISystemOperator .SqISystemOperator		Add Remove Edit Property
	C	OK	Cancel

Illustration 109: Dialog 'Client configuration / Options'

Кеу:	Value:	
PROJECT	<cae data="" of="" project="" source="" the=""></cae>	
SYSTEM	Runtime system: aprolsys engineering system <cc-account data="" of="" source="" the=""></cc-account>	
UID	User Identification	
PWD	UID password	

Default installation path is C:\Program Files\APROL\AprolOdbcJdbcDriver

The SSL certificate file is stored in the following directory:

<installation path>\SSLCertificates\ca.crt

The 'Use SSL' option must be set according to the AprolSqlServer in the 'Client Configuration / Options'!

8.2.3 Client connection via ODBC

This chapter informs you about connecting to an AprolSqlServer with a JDBC-capable program.

A corresponding driver is necessary for JDBC-capable client programs to connect to an AprolSqlServer. The necessary driver can be found in the same path as the ODBC driver (see chapter '<u>ODBC Driver</u>' or '<u>Installation of the JDBC & ODBC remote drivers</u>').

The installation provides JDBC3 and JDBC4 drivers.



Type 3 driver

Typ 3 drivers are very suitable for internet protocols in connection with firewalls.

Type 4 driver



Typ 4 drivers are very suitable for internet solutions, which should use quick network protocols.

B&R recommends the use of type 4 drivers.

A JDBC connection is established via a URL with all necessary parameters and the driver specification. You can use the following syntax in a JDBC client program after substituting the '<>' tags with the correct values:

The URL is composed as follows when SSL encryption (default) is activated:

- 1 URL with SSL encryption for runtime data jdbc:simba://<host name of the logging server>:55503; SYSTEM=aprolsys;PROJECT=<project name>; UseSsl=1;TrustedStorePath=<install path>\\SSLCertificates\\jdbckeystore; TrustedStorePassword=.aprol
- URL with SSL encryption for engineering data jdbc:simba://<host name of the engineering server>:55503; SYSTEM=<CC-Account of the engineering system>;PROJECT=<project name>; UseSsl=1;TrustedStorePath=<install path>\\SSLCertificates\\jdbckeystore; TrustedStorePassword=.aprol

The URL is composed as follows when SSL encryption is not activated:

 URL for runtime data jdbc:simba://<host name of the logging server>:55503; SYSTEM=aprolsys;PROJECT=<project name>

• URL for engineering data

jdbc:simba://<host name of the engineering server>:55503; SYSTEM=<CC-Account of the engineering system>; PROJECT=<project name>



Please note that the URL is not allowed to contain spaces, e.g. before or after a semicolon.

The JAVA keystore with the necessary certificates can be found respective of the operating system in the following paths:

• Windows

<install path>\SSLCertificates\jdbckeystore

- Linux
 - /opt/aprol/etc/jkeystore

The free 'SQuirreL SQL Client' query tool can be found in the 'Tools' KDE menu (<u>http://squirrel-sql.sourceforge.net</u>) and allows you to establish the primary connection. It is very good for showing an overview of the SQL tables which are in the connected data source.

You can find brief instructions for establishing a connection in the chapter <u>Using SQuirreL as a</u> <u>database client</u>.

8.2.4 Connecting via Python and PHP

The **APROL** installation already contains the necessary modules for connecting to the AprolSqlServer with the scripting languages Python and PHP.

8.2.4.1 Python

The 'pyodbc' module for SQL data access can be used in Python.

Detailed information about the pyodbc module can be found on the pyodbc project page (<u>https://code.google.com/p/pyodbc/</u>).

Example:

Query of the data from the table Alarm in the data source Protocol_SamplesProject.

```
#! /usr/bin/python
# -*- coding: utf-8 -*-
import pyodbc
cnxn = pyodbc.connect(
    'DSN=Protocol_SamplesProject;UID=SqlSystemOperator;PWD=.SqlSystemOperator',
    autocommit=True)
cursor = cnxn.cursor()
cursor.execute('select * from base.Alarm where ts >= '2012-10-20'')
row = cursor.fetchone()
print '[0]:', row[0]  # access by column index
```

8.2.4.2 PHP

The PHP odbc module can be used to access SQL data via PHP.

The path of the odbc.ini file must be made known to the PHP environment in an environment variable in order to be able to establish a connection (see example).

Detailed information about the odbc module in PHP can be found on the PHP documentation pages (<u>http://www.php.net/manual/de/book.uodbc.php</u>).

Example:

Query of data in the table *Alarm* in the data source *AprolSqlDemo* via a PHP-supported web query to a web server.

```
<?php
/*Set the enviropnment variable of the AprolSqlServer;
Path of the odbc.ini*/
putenv('ODBCSYSINI=/opt/aprol/cnf/AprolSqlServer');
/*Establishment of the ODBC connection.*/
$conn = odbc_connect('AprolSqlDemo', 'SqlSystemOperator', '. SqlSystemOperator ');
$sql = 'Select * from base.Alarm where ts >= '2012-10-20'';
$rs = odbc_exec($conn,$sql);
while (odbc_fetch_row($rs))
 ł
   //Address the result via index
   echo odbc_result($rs,6);
   //Address the result vis column name
   echo odbc_result($rs,'alias');
}
odbc_close($conn);
?>
```

8.3 Operating and configuring the AprolSqlServer

This chapter informs you about configuring and operating the AprolSqlServer, and how to view the logging information.

8.3.1 Starting and stopping the service

It may be necessary to restart the service in order to make a change in the configuration take effect (e.g. after the SSL encryption is switched off).

The service must normally only be stopped, because the 'Monit' process monitoring detects stopped processes and restarts them.

You need the rights of the Linux superuser 'root' to operate the service manually.

The service can be found in the path:

/etc/init.d/aprolsqlserver

The following options are available to you:

/etc/init.d/aprolsqlserver <Option>

Option	Description
start	Starts the service

Option	Description	
stop	Stops the service	
restart	Stops and starts the service	
status	Outputs the current status:	
	A2-1 Status: running – The AprolSqlServer is ready.	
	A2-2 Status: unused – The AprolSqlServer is shut down.	

Another status overview is available with the **APROL** system diagnostic manager.

8.3.2 **Port configuration**

The configuration of the AprolSqlServer is read once during start-up. If it is necessary to adjust the configuration, the server must be stopped and started an already mentioned.

The configuration file can be found in the path:

/opt/aprol/cnf/AprolSqlServer/aprolsqlserver.ini

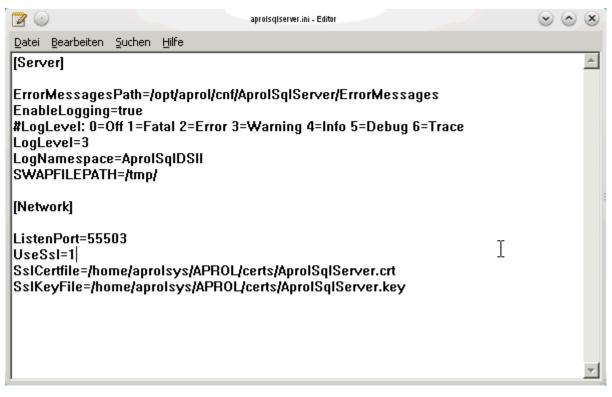


Illustration 110: 'aprolsqlserver.ini' file

The standard port for reaching the service is 55503. This information can be found in the configuration file, in the category *'[Network]', 'ListenPort=55503'*.

Note about changing the default port number:

If you must change the port number (Default: 55503) because of any network restrictions, the firewall configuration must also be adjusted accordingly. Detailed information about this can be found in the manual 'A2 Getting Started', chapter Optional Adjustments to the Firewall.

The port number of the *APROL* SQL server must also be adjusted. For this purpose edit the /opt/aprol/cnf/AprolSqlServer/aprolsqlserver.ini file and then restart the AprolSqlServer. This must be done as the Linux user 'root' with the command /etc/init.d/aprolsqlserver restart.

8.3.3 Configuration of the connection encryption

The data transfer between query client and AprolSqlServer is carried out with SSL encryption per default.

The SSL encryption is set in the following file:

/opt/aprol/cnf/AprolSqlServer/aprolsqlserver.ini

Option	Description	
UseSsl	0 : Deactivate encryption	
	1 : Activate encryption	
SslCertfile	Certificate	
SslKeyFile	Private key	

8.3.4 Logging

All operation actions are saved in the following log file.

/var/log/AprolSqlServer.err

SQL queries which have been made, errors, and warnings are also saved in the **APROL** 'System messages' report, which can also be queried via the SQL table 'System messages'.

More about this in chapter Pre-defined SQL tables.

8.4 APROL SQL Tables

8.4.1 Pre-defined SQL tables

This chapter contains a detailed listing of all pre-defined system tables.
--

Table name	Description	
<u>Alarm</u>	The table contains all the historical information of alarm events, such as occurrence, acknowledgement, and leaving of an alarm. A user-defined display of the alarm events can be composed by using the data fields.	
<u>CaeUpdate</u>	The table contains all the historical information of the logging of the CAE database update procedure.	
<u>Changelog</u>	The table contains all of the historical information of the logging data of all relevant user actions in the APROL engineering environment.	
<u>Compressor</u>	The table contains all the historical information of the logging of compressed data. The correction of recorded values (assignment of substitute values) is also a part of this.	
<u>Download</u>	The table contains all the historical information of the logging and analysis of all download jobs.	
<u>Parameter</u>	The table contains all the historical information of the logging of the download / upload jobs of parameter sets in the parameter center.	
<u>SFC</u>	The table contains all historical data for the evaluation of declared and used SFC control variables for provision and additional functionalities (e.g. time monitoring of steps) in SFC programs and SFC function blocks. The table also encompasses all the historical information of the logging of SFC sequence data. Amongst others, SFC start, init, reset, pause, transition reset, and overrun of the maximum retention time.	
<u>Shiftlog</u>	The table contains all the historical information of the logging of the shift logbook entries. The APROL shift logbook allows the operator to electronically record all relevant process control events and eventual measures taken.	
<u>Sysconf</u>	The table contains all the historical information of the description of all relevant configuration changes. For example, configurations for NTP, ChronoPlex, or VNC.	
<u>Syssetup</u>	The table contains all the historical information of the logging of all installations which have been carried out.	
<u>Systemmessage</u>	The table contains all the historical information of the logging of all relevant APROL system messages. The APROL system messages from the GUI applications, background programs, and scripts allow a comfortable and flexible evaluation for diagnostic purposes.	
SystemmessageANSL	The table contains all the historical information of the logging of all ANSL system messages. Possible errors in the ANSL communication with (redundant) controllers can be detected quickly and simply with the	

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Table name	Description
	system messages.
<u>Trend</u>	The table contains all the historical information for the evaluation of the data of the recorded trend events.
TrendComment	The table contains all the historical information of comments made for recorded trend events.
<u>UseractionAlarm</u>	The table contains all the historical information of the logging of AuditTrail entries for alarm management. Amongst others, alarm acknowledgement, release, and locking.
UseractionClogmodify	The table contains all the historical information of the logging of AuditTrail entries for modification of the logging data.
<u>UseractionController</u>	The table contains all the historical information of the logging of AuditTrail entries for controller management. Amongst others, starting and stopping controller tasks, the download of a controller AR-OS version, and moving or deleting controller modules.
<u>UseractionExt</u>	The table contains all the historical information of the logging of AuditTrail entries for external process control. Amongst others, setting values via external applications, and starting and stopping the signal generator.
<u>UseractionLogin</u>	The table contains all the historical information of the logging of AuditTrail entries for the security login (i.e. login and logout attempts).
<u>UseractionParameter</u>	The table contains all the historical information of the logging of AuditTrail entries for the parameter history (i.e. parameter upload and download).
<u>UseractionPic</u>	The table contains all the historical information of the logging of AuditTrail entries for process control. Amongst others, switching operations, opening and closing graphic macros and the alarm list, as well as the modification of the alarm list filter settings.
<u>UseractionSFC</u>	The table contains all the historical information of the logging of AuditTrail entries for SFC interventions. Amongst others, setting the Controlled- Mode, setting the SFC init, reset, pause, and reset, as well as the tip mode and forcing the SFC.
<u>UseractionSys</u>	The table contains all the historical information of the logging of AuditTrail entries for system control. Amongst others, starting and stopping the APROL system, and starting and stopping applications.

Tabelle: Alarm

The table contains all the historical information of alarm events, such as occurrence, acknowledgement, and leaving of an alarm. A user-defined display of the alarm events can be composed by using the data fields.

Column name (Chronolog Attribute)	SQL-Type	Description
ack_text (acktext)	LONGVARCHAR(32767)	Acknowledgement text
ack_ts (ackts)	TIMESTAMP	Time stamp of the acknowledgement
alias	VARCHAR	Alias name of an alarm in source language

(Chronolog Attribute)	SQL-Type	Description
begin_ts (begin)	TIMESTAMP	Time stamp of the arrival of an alarm (on 'leaving'- events)
comment	LONGVARCHAR(32767)	Comment for the alarm
display	VARCHAR(128)	Display description
duration	DOUBLE	Duration for pending alarm
end_ts (end)	TIMESTAMP	Time stamp of the leaving of an alarm (on 'arrival'- events)
flags	VARCHAR(3)	Code of the alarm data record [Type][Property][Code] Type: A=alarm M=message Property: B=Arrival of an alarm/message E=Leaving of an alarm/message Q=Acknowledgement entry L=Alarm locked R=Alarm released Code: 1=Alarm does not require acknowledgement 2=Alarm requiring acknowledgment 3=Alarm requiring text acknowledgment
group	VARCHAR(64)	Alarm group
host	VARCHAR(64)	APROL computer name
ivtext	LONGVARCHAR(32767)	File name of intervention text
lockmode	SMALLINT UNSIGNED	Reason for locking or unlocking 0 = not available 1 = by operator interaction in the alarm list or locking list 2 = by operator interaction in a faceplate 3 = by system or logic
locktext	LONGVARCHAR(32767)	Rationale for the locking or unlocking (optional)
multi	INTEGER	Multiple occurrence alarm (number)
priority	INTEGER	Alarm priority
project	VARCHAR(32)	Project name
pv	VARCHAR	Name of the process variable
system	VARCHAR	CC-Account
system_inst	VARCHAR	Runtime system instance of assigned alarm block
system_name	VARCHAR	Runtime system name of assigned alarm block
text	LONGVARCHAR(32767)	
tr_alias (tralias)	· · · · · ·	Alias name of an alarm in the project language
ts	TIMESTAMP	Time stamp of the alarm data record
ts_switch_mark (SQL only)	VARCHAR(1)	Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch
username	VARCHAR	Operator account name

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Column name (Chronolog Attribute)	SQL-Type	Description
(user)		

Tabelle: CaeUpdate

The table contains all the historical information of the logging of the CAE database update procedure.

procedure.		
Column name (Chronolog Attribute)	SQL-Type	Description
display	VARCHAR(128)	Display description
end_ts (end)	TIMESTAMP	Time stamp of the end of a CAE update
errors	INTEGER	Number of errors
firstname	LONGVARCHAR(32767)	User's first name
host	VARCHAR(64)	APROL computer name
loglevel (level)	INTEGER	Log level
message	LONGVARCHAR(32767)	Message text
messagetype	VARCHAR(16)	Message type: error warning message stepBegin stepEnd
newaprolrelease	VARCHAR(64)	APROL release after CAE update
newdbversion	VARCHAR(16)	Database version after CAE update
oldaprolrelease	VARCHAR(64)	APROL release before CAE update
olddbversion	VARCHAR(16)	Database version before CAE update
start_ts (start)	TIMESTAMP	Time stamp of the beginning of a CAE update
stepname	VARCHAR(16)	Name of a CAE update step
success	BIT	Success code of a CAE update
surname	LONGVARCHAR(32767)	User's surname
system	VARCHAR	CC-Account
ts	TIMESTAMP	Time stamp of the CAE update data record
ts_switch_mark (SQL only)	VARCHAR(1)	Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch
username (user)	LONGVARCHAR(32767)	Operator account name
warnings	INTEGER	Number of warnings

Tabelle: Changelog

The table contains all of the historical information of the logging data of all relevant user actions in the APROL engineering environment.

Column name (Chronolog Attribute)	SQL-Type	Description
actionsource	VARCHAR(16)	Action group
actiontype	VARCHAR(32)	Action performed
addasbuiltdatarerestore	BIT	Carry out backup of as-built documentation
addcustomerdatarestore	BIT	Carry out backup of customer data
addgenerateddatarestore	BIT	Carry out backup of generated data

Column name	SQL-Type	Description
(Chronolog Attribute)		Application name (download)
application		Application name (download)
aprolrelease		APROL release description
backupfile		Name of the backup file
command		Executed system command
dbelapsetime	BIT	Database optimization: Remove generation times
dbinstance	BIT	Database optimization: Remove unreferenced instances
dbk	BIT	Carry out restoration of the controller address database
dbofflineref	ВІТ	Database optimization: Delete invalid offline references
dbtrash	BIT	Database optimization:
		Empty trash bin
dbuserdata	BIT	Database optimization:
		Delete old user data
dbver	ВІТ	Database optimization: Delete old versions
destination	VARCHAR	APROL target CC-Account (download)
display	VARCHAR(128)	Display description
dstppname	VARCHAR	APROL target system.
		Name of the project part (download)
dsttype	VARCHAR	APROL target system type (download)
errors	INTEGER	Number of errors
firstname	LONGVARCHAR(32767)	User's first name
host	VARCHAR(64)	APROL computer name
jobno	VARCHAR	Job number
key	VARCHAR	Unique key of a download
oldpath	LONGVARCHAR(32767)	Old path of the project part
oldversion	VARCHAR(32)	Old version of the project part
path	LONGVARCHAR(32767)	
project	VARCHAR(32)	Project name
pvn	VARCHAR	Instance name (download)
restorefile	VARCHAR	Name of the restoration file
restorepath	LONGVARCHAR(32767)	Path of the restoration file
source	VARCHAR(16)	APROL source CC-Account (download)
srcppname	VARCHAR	APROL source system name (download)
start	TIMESTAMP	Time stamp of download start
success	BIT	Success code (download)
surname	LONGVARCHAR(32767)	
system	VARCHAR	CC-Account
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL	VARCHAR(1)	Switch mark for change from daylight saving
only)		time to standard time
		0 = no switch
		B = hour after switch

Column name (Chronolog Attribute)	SQL-Type	Description
username (user)	LONGVARCHAR(32767)	Operator account name
usermode		User code (engineering user runtime user) outdated
version	VARCHAR(32)	Version number of the project part
warnings	INTEGER	Number of warnings

Tabelle: Compressor

The table contains all the historical information of the logging of compressed data. The correction of recorded values (assignment of substitute values) is also a part of this.

Column name (Chronolog Attribute)	SQL-Type	Description
average (avg)	DOUBLE	Average value in the compression time period
maximum (max)	DOUBLE	Maximum in the compression time period
minimum (min)	DOUBLE	Minimum in the compression time period
modified	BIT	Indicator: Value changed
compression (prefix)	VARCHAR(3)	Compression interval
project	VARCHAR(32)	Project name
pv	VARCHAR	Name of the process variable
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL only)	VARCHAR(1)	Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch
val	DOUBLE	Value
validity	DOUBLE	Validation

Tabelle: Download

The table contains all the historical information of the logging and analysis of all download jobs.

Column name (Chronolog Attribute)	SQL-Type	Description
jobno	INTEGER	Job number
uuid (key)	VARCHAR(64)	Unique ID
level	INTEGER	Output level
message	LONGVARCHAR(32767)	Message text
project	VARCHAR(32)	Project name
pvn	VARCHAR	Download target
source	INTEGER	Download source 1,2=DownloadManager 3=ControllerManager 4=ControllerLoader 5=System
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark	VARCHAR(1)	Switch mark for change from daylight saving time to

Column name (Chronolog Attribute)	SQL-Type	Description
(SQL only)		standard time 0 = no switch B = hour after switch
type	INTEGER	Message type 1=Message 2=Success 3=System command 4=User interaction 5=warning 6=error

Tabelle: Parameter

The table contains all the historical information of the logging of the download / upload jobs of parameter sets in the parameter center.

Column name (Chronolog Attribute)	SQL-Type	Description
paramaction (action)	VARCHAR	Parameter management action
at	VARCHAR	Equipment instance
connected	VARCHAR	Connection state
description (desc)	VARCHAR	Description
dflt	VARCHAR	Standard value (default)
display	VARCHAR(128)	Display description
enginmode	BIT	User was engineering user
firstname	LONGVARCHAR(32767)	Operator's first name
fix	BIT	Value cannot be changed in runtime if 'TRUE'
host	VARCHAR(64)	APROL computer name
maximum (max)	VARCHAR	Maximum
minimum (min)	VARCHAR	Minimum
modified	BIT	Modified
name	LONGVARCHAR(32767)	Parameter name
oldvalue	LONGVARCHAR(32767)	Old value
paramset	VARCHAR	Name of the parameter set
project	VARCHAR(32)	Project name
pvname	VARCHAR	Name of the process variable
set	BIT	Parameter download: Parameter value set in losys Parameter upload: Parameter value from the parameter set in the losys
superuser	BIT	User was APROL super user
surname	LONGVARCHAR(32767)	Operator's surname
template	VARCHAR	Name of the parameter template

Column name (Chronolog Attribute)	SQL-Type	Description
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL only)		Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch
tsrc	VARCHAR	Source of the change(e.g. surface, system)
type	VARCHAR	IEC type
username (user)	LONGVARCHAR(32767)	Operator account name
valid	VARCHAR	Validity of the value
val (value)	LONGVARCHAR(32767)	Current value

Tabelle: SFC

The table contains all historical data for the evaluation of declared and used SFC control variables for provision and additional functionalities (e.g. time monitoring of steps) in SFC programs and SFC function blocks. The table also encompasses all the historical information of the logging of SFC sequence data. Amongst others, SFC start, init, reset, pause, transition reset, and overrun of the maximum retention time.

Column name (Chronolog Attribute)	SQL-Type	Description
begin	VARCHAR	Start time stamp (init)
class	VARCHAR	Data class: flow – Sequence data
		flow = Sequence data control = Control data
		context = Context data
cmode	BIT	Status of SFC Controlled-Mode
controller	VARCHAR	Controller name or IP address
cvset	BIT	Control via the logic (FALSE) or SFCViewer(TRUE)
duration	FLOAT	Duration since last activation of the init step
event	VARCHAR(32)	SFC event type
force	VARCHAR(16)	Force mode:
		active: forced active
		inactive: forced inactive
		off: not forced
host	VARCHAR(64)	APROL computer name
instance	VARCHAR(64)	SFC object instance
object	VARCHAR(64)	SFC object type
objectname	VARCHAR(64)	SFC object name
pause	FLOAT	Duration of pausing SFC
project	VARCHAR(32)	Project name
projectpath	LONGVARCHAR(32767)	Project path of the SFC
sfcname	VARCHAR	SFC name
smode	BIT	The status of control for an SFC step
system_inst	VARCHAR	Runtime system instance of assigned controller

Column name (Chronolog Attribute)	SQL-Type	Description
system_name	VARCHAR	Runtime system name of assigned controller
systemvariables	BIGINT UNSIGNED	Bit-coded specification of the set control variable
task	VARCHAR	Task name
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL only)	· · ·	Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch
value		Collection attribute (The meaning of this attribute changes according to the value of the 'event' attribute): The event status to the respective event

Tabelle: Shiftlog

The table contains all the historical information of the logging of the shift logbook entries. The APROL shift logbook allows the operator to electronically record all relevant process control events and eventual measures taken.

Column name (Chronolog Attribute)	SQL-Type	Description
category	VARCHAR	Path specification of the category of a shift logbook entry
confirm	VARCHAR	Confirmation time stamp
confirmtext	VARCHAR	Confirmation text
confirmuser	VARCHAR	Operator account name of the confirming operator
host	VARCHAR(64)	APROL computer IP
message	LONGVARCHAR(32767)	Message of a shift logbook entry
msgid	VARCHAR	Unique ID of the data record
mustconfirm	BIT	Flag if the confirmation of a shift logbook entry is necessary
parentid	VARCHAR	Code of the parent data record
project	VARCHAR(32)	Project name
server	VARCHAR	APROL computer name
subject	VARCHAR	Subject of a shift logbook entry
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL only)	VARCHAR(1)	Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch
type	VARCHAR	Type of the node(e.g. parent)
username (user)	VARCHAR	Operator account name

Tabelle: Sysconf

The table contains all the historical information of the description of all relevant configuration changes. For example, configurations for NTP, ChronoPlex, or VNC.

Column name (Chronolog Attribute)	SQL-Type	Description
aspect	VARCHAR(64)	AprolConfig aspect
host	VARCHAR(64)	APROL computer name
messagetype		Message type: info_global = Message warning = Warning error = Error
newval	LONGVARCHAR(32767)	New value
oldval	LONGVARCHAR(32767)	Old value
pid	INTEGER	Process ID
rel	VARCHAR(64)	APROL release description
script	LONGVARCHAR(32767)	Name of the writing application with the prefix 'script_'
system	VARCHAR	CC-Account
text	LONGVARCHAR(32767)	Message text
timekey	VARCHAR	UNIX time stamp
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL only)	VARCHAR(1)	Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch
username (user)	LONGVARCHAR(32767)	User name

Tabelle: Syssetup

The table contains all the historical information of the logging of all installations which have been carried out.

Column name (Chronolog Attribute)	SQL-Type	Description
aspect	VARCHAR(64)	AprolConfig aspect
host	VARCHAR(64)	APROL computer name
messagetype	VARCHAR(32)	Message type: info_global = Message warning = Warning error = Error
newval	LONGVARCHAR(32767)	New value
oldval	LONGVARCHAR(32767)	Old value
pid	INTEGER	Process ID
rel	VARCHAR(64)	APROL release description
script	LONGVARCHAR(32767)	Name of the writing application with the prefix 'script_'
system	VARCHAR	CC-Account
text	LONGVARCHAR(32767)	Message text
timekey	VARCHAR	UNIX time stamp

Column name (Chronolog Attribute)	SQL-Type	Description
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL only)		Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch
username (user)	LONGVARCHAR(32767)	User name

Tabelle: Systemmessage

The table contains all the historical information of the logging of all relevant APROL system messages. The APROL system messages from the GUI applications, background programs, and scripts allow a comfortable and flexible evaluation for diagnostic purposes.

Column name (Chronolog Attribute)	SQL-Type	Description
application	VARCHAR	Name of the writing application
debugid	VARCHAR	Debug ID
debuglevel	INTEGER	Number of the debug level
display	VARCHAR(128)	Display description
host	VARCHAR(64)	APROL computer name
job	VARCHAR	Job number
last_ts (last)	TIMESTAMP	Time stamp of the last repeated system message entry
messagetype	VARCHAR(32)	Message type: systemstate_start = APROL system start systemstate_stop = APROL system stop systemstate_info = APROL system information systemstate_error = APROL system error systemstate_redu = APROL system redundancy info_startup = Application started info_shutdown = Application stopped info_internal = Internal message info_global = Message info_hint = Advice info_success = Success message warning = Warning warning_high = High-priority warning warning_low = Low-priority warning error = Error debug = Debugging entry
pid	INTEGER	Process ID
repeated	BIT	Repeated message (number of occurrences)
script		Name of the writing application with the prefix 'script_'
success	BIT	Success code
system	VARCHAR	CC-Account
text	LONGVARCHAR(32767)	Message text
tid	VARCHAR(16)	Thread ID (multi-threading)

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Column name (Chronolog Attribute)	SQL-Type	Description
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL only)		Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch
uniq	VARCHAR	ID of a build process

Tabelle: SystemmessageANSL

The table contains all the historical information of the logging of all ANSL system messages. Possible errors in the ANSL communication with (redundant) controllers can be detected quickly and simply with the system messages.

)	SQL-Type	Description
application	VARCHAR	Name of the writing application
cpu_name	LONGVARCHAR(32767)	Name of the CPU
display	VARCHAR(128)	Display description
error	VARCHAR	Error message
eventtype	VARCHAR(32)	Event type
host	VARCHAR(64)	APROL computer name
level	INTEGER	ANSL level
messagetype	VARCHAR(32)	Message type: ansl_error = ANSL error ansl_info = ANSL message
modul_name	LONGVARCHAR(32767)	Module name
object_id	LONGVARCHAR(32767)	Object ID
object_name	LONGVARCHAR(32767)	Object name
object_type	LONGVARCHAR(32767)	Object type
objecttype	VARCHAR	Object type
pid	INTEGER	Process ID
system	VARCHAR	CC-Account
text	LONGVARCHAR(32767)	Message text
tid	VARCHAR(16)	Thread ID (multi-threading)
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL only)	VARCHAR(1)	Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch

Tabelle: Trend

The table contains all the historical information for the evaluation of the data of the recorded trend events.

Column name (Chronolog Attribute)	SQL-Type	Description
pv	VARCHAR	Name of the process variable
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL only)	VARCHAR(1)	Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch
value	DOUBLE	Value of the process variable

Tabelle: TrendComment

The table contains all the historical information of comments made for recorded trend events.

Column name (Chronolog Attribute)	SQL-Type	Description
display	VARCHAR(128)	Display description
host	VARCHAR(64)	APROL computer name
project	VARCHAR(32)	Project name
system	VARCHAR	CC-Account
text	LONGVARCHAR(32767)	Comment text
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL only)	. ,	Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch
username (user)	LONGVARCHAR(32767)	Operator account name

Tabelle: UseractionAlarm

The table contains all the historical information of the logging of AuditTrail entries for alarm management. Amongst others, alarm acknowledgement, release, and locking.

Column name	SQL-Type	Description
(Chronolog		
Attribute)		
acktext	LONGVARCHAR(32767)	Alarm acknowledgement text
action	VARCHAR(32)	Switching operations carried out by the operator from
		the alarm actions group.
alias	VARCHAR	Alarm alias
display	VARCHAR(128)	Display description
enginmode	BIT	Operator was engineering user
firstname	LONGVARCHAR(32767)	User's first name
alarmgroup	VARCHAR	Alarm group of the affected action
(group)		
host	VARCHAR(64)	APROL computer name

Column name (Chronolog Attribute)	SQL-Type	Description
lockmode	SMALLINT UNSIGNED	Reason for locking or unlocking 0 = not available 1 = by operator interaction in the alarm list or locking list 2 = by operator interaction in a faceplate 3 = by system or logic
locktext	LONGVARCHAR(32767)	Rationale for the locking or unlocking (optional)
project	VARCHAR(32)	Project name
pv	VARCHAR	Name of the process variables
superuser	BIT	Operator was APROL super user
surname	LONGVARCHAR(32767)	User's surname
system_inst	VARCHAR	Runtime system instance of assigned alarm block
system_name	VARCHAR	Runtime system name of assigned alarm block
text	LONGVARCHAR(32767)	Alarm text
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL only)	VARCHAR(1)	Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch
username (user)	LONGVARCHAR(32767)	Operator account name

Tabelle: UseractionClogmodify

The table contains all the historical information of the logging of AuditTrail entries for modification of the logging data.

Column name (Chronolog Attribute)	SQL-Type	Description
action	VARCHAR(32)	Modification of log data
category	VARCHAR	Category
display	VARCHAR(128)	Display description
enginmode	BIT	Operator was engineering user
firstname	LONGVARCHAR(32767)	User's first name
host	VARCHAR(64)	APROL computer name
name	LONGVARCHAR(32767)	Controller variable name
project	VARCHAR(32)	Project name
rdate	VARCHAR	Time stamp of the change of controller variable values
reason	LONGVARCHAR(32767)	Reason for the change of controller variable values
superuser	BIT	Operator was APROL super user
surname	LONGVARCHAR(32767)	User's surname
system_inst	VARCHAR	Runtime system instance of recording block
system_name	VARCHAR	Runtime system name of recording block
text	LONGVARCHAR(32767)	Changes made to controller variable values
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark	VARCHAR(1)	Switch mark for change from daylight saving time to

Column name (Chronolog Attribute)	SQL-Type	Description
(SQL only)		standard time 0 = no switch B = hour after switch
username (user)	LONGVARCHAR(32767)	Operator account name
valid	BIT	Validity code

Tabelle: UseractionController

The table contains all the historical information of the logging of AuditTrail entries for controller management. Amongst others, starting and stopping controller tasks, the download of a controller AR-OS version, and moving or deleting controller modules.

	SQL-Type	Description
action	VARCHAR(32)	Switching operations carried out by the operator from the controller actions group.
class	VARCHAR	Task class
connection	LONGVARCHAR(32767)	Connection parameters
controller	VARCHAR	Controller name or IP address
controlleraddress	VARCHAR(64)	Controller address
cycles	VARCHAR	Task cycles
destmemtype	VARCHAR	Target memory (e.g. USERROM)
display	VARCHAR	Display description
duration	INTEGER	Duration of connection establishment [ms]
end_time	TIMESTAMP	Time point of action end
enginmode	BIT	Operator was engineering user
errorcode	VARCHAR	Error code
firstname	LONGVARCHAR(32767)	User's first name
forceval	VARCHAR	Forced (force) value
host	VARCHAR(64)	APROL computer name
iotype	VARCHAR	I/O type
memtime	VARCHAR	Memory type
mode	VARCHAR	Copy mode for controller (EI mode; overload mode)
modules	VARCHAR	CPU module name
name	VARCHAR	Controller variable name
newforcedstate	VARCHAR	Current force status
newtime	VARCHAR	Old time value (upon time changes on the controller)
newval	LONGVARCHAR(32767)	New value
oldtime		New time value (upon time changes on the controller)
oldval	LONGVARCHAR(32767)	Old value
originalval	VARCHAR	Original value
path	LONGVARCHAR(32767)	Variable name
pid	INTEGER	Process ID

Column name (Chronolog Attribute)	SQL-Type	Description
project	VARCHAR(32)	Project name
pv_name	VARCHAR	Name of the process variable
res_addr	VARCHAR(64)	Resulting connection
sel_addr	VARCHAR(64)	Selected connection
size	VARCHAR	Size of copied data
sourcememtype	VARCHAR	Source memory
start_time	TIMESTAMP	Time point of action begin
superuser	BIT	Operator was APROL super user
surname	LONGVARCHAR(32767)	User's surname
system	VARCHAR	CC-Account
system_inst	VARCHAR	Runtime system instance of assigned controller
system_name	VARCHAR	Runtime system name of assigned controller
task	VARCHAR	Task name
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL only)	VARCHAR(1)	Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch
type	VARCHAR	Type of controller restart
username (user)	VARCHAR	Operator account name
version	VARCHAR(32)	Version number

Tabelle: UseractionExt

The table contains all the historical information of the logging of AuditTrail entries for external process control. Amongst others, setting values via external applications, and starting and stopping the signal generator.

Column name (Chronolog Attribute)	SQL-Type	Description	
action	VARCHAR(32)	Executed external action	
		extsetval = Setting a value	
		extsgstart = Start of the signal generator	
		extsgstop = Stop of the signal generator	
application	VARCHAR	Name of the writing application	
changed	BIT	Flag if change carried out	
display	VARCHAR(128)	Display description	
enginmode	BIT	Variable set in engineering mode	
firstname	LONGVARCHAR(32767)	User's first name	
host	VARCHAR(64)	APROL computer name	
iosys	VARCHAR	Executing losys	
lastval	LONGVARCHAR(32767)	Last (old) value	
name	LONGVARCHAR(32767)	Name of the process variables	
parameter	VARCHAR	Start parameter for external process	
project	VARCHAR(32)	Project name	

Column name (Chronolog Attribute)	SQL-Type	Description
pv	VARCHAR	Name of the process variables
remotehost	VARCHAR(64)	Remote connection
sgtype	VARCHAR	Data type of the data created by the signal generator (losDiagnosticManager)
sourced	BIT	Flag if variable is being supplied
surname	LONGVARCHAR(32767)	User's surname
system	VARCHAR	CC-Account
system_inst	VARCHAR	Runtime system instance of changed process variable
system_name	VARCHAR	Runtime system name of changed process variable
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL only)	VARCHAR(1)	Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch
username (user)	LONGVARCHAR(32767)	Operator account name
val	LONGVARCHAR(32767)	(New) Value
valid	BIT	Flag if variable is valid

Tabelle: UseractionLogin

The table contains all the historical information of the logging of AuditTrail entries for the security login (i.e. login and logout attempts).

Column name (Chronolog Attribute)	SQL-Type	Description
action	VARCHAR(32)	Switching operations carried out by the operator from the authentication actions group.
device	VARCHAR	Login method (hardware)
display	VARCHAR(128)	Display description
enginmode	BIT	Operator was engineering user
firstname	LONGVARCHAR(32767)	User's first name
host	VARCHAR(64)	APROL computer name
idle	BIT	Logout due to operator inactivity
project	VARCHAR(32)	Project name
shutdown	BIT	Logout due to computer shutdown
superuser	BIT	Operator was APROL super user
surname	LONGVARCHAR(32767)	User's surname
system	VARCHAR	CC-Account
system_inst	VARCHAR	Instance of assigned runtime system
system_name	VARCHAR	Name of assigned runtime system
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL only)	VARCHAR(1)	Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch

Column name (Chronolog Attribute)	SQL-Type	Description
username (user)	LONGVARCHAR(32767)	Operator account name

Tabelle: UseractionParameter

The table contains all the historical information of the logging of AuditTrail entries for the parameter history (i.e. parameter upload and download).

Column name (Chronolog Attribute)		Description
action	VARCHAR(32)	Switching operations carried out by the operator from the parameter actions group.
changed	BIT	Change flag (parameter changed)
parametercount (count)	INTEGER	Number of parameters
display	VARCHAR(128)	Display description
enginmode	BIT	Operator was engineering user
firstname	LONGVARCHAR(32767)	User's first name
host	VARCHAR(64)	APROL computer name
modcnt	INTEGER	Number of modified parameters
paramset	VARCHAR	Name of the parameter set
project	VARCHAR(32)	Project name
superuser	BIT	Operator was APROL super user
surname	LONGVARCHAR(32767)	User's surname
system_inst	VARCHAR	Instance of runtime system changing parameter process variable
system_name	VARCHAR	Name of runtime system changing parameter process variable
template	VARCHAR	Name of the parameter template
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL only)	VARCHAR(1)	Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch
tsrc	VARCHAR	Source of the request commandline = command line call surface = GUI call
username (user)	LONGVARCHAR(32767)	Operator account name

Tabelle: UseractionPic

The table contains all the historical information of the logging of AuditTrail entries for process control. Amongst others, switching operations, opening and closing graphic macros and the alarm list, as well as the modification of the alarm list filter settings.

-		
	SQL-Type	Description
(Chronolog Attribute)		
,,		Cultabing an exation a corriad out by the energter from
action	VARCHAR(32)	Switching operations carried out by the operator from
		the process graphic actions group.
active	BIT	Alarm filter status (active inactive)
authfail	VARCHAR	Reason for failure of authentication in two-man rule
authmode	INTEGER	Mode of authentication in two-man rule
block	VARCHAR(128)	Block name
closemacros	BIT	Graphic macros were closed due to a process graphic being closed.
commituser	LONGVARCHAR(32767)	Login of a second operator for authentication in two- man rule
display	VARCHAR(128)	Display description
enginmode	BIT	Operator was engineering user
firstname	LONGVARCHAR(32767)	
groupfilter	VARCHAR	Group of a set group filter
host	VARCHAR(64)	APROL computer name
lastval	LONGVARCHAR(32767)	
name	LONGVARCHAR(32767)	
	· · · · · ·	
notackfilter	BIT	A 'logic filter' will be TRUE when an operator uses the alarm filter and only filters alarms which are 'not
		acknowledged'.
picture	VARCHAR(64)	Process graphic name
picturedesc	. ,	Process graphic description text
pin	VARCHAR	Name of the block pin
priofilter	VARCHAR	Set priority filter
·	VARCHAR(32)	
project	· · ·	Project name
pvfilter		PC filter regex (regular expression)
superuser	BIT	Operator was APROL super user
surname	LONGVARCHAR(32767)	
system_inst	VARCHAR	Runtime system instance of assigned graphic block or process graphic
system_name	VARCHAR	Runtime system name of assigned graphic block or
		process graphic
text	LONGVARCHAR(32767)	Executed system call
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark	VARCHAR(1)	Switch mark for change from daylight saving time to
(SQL only)	, , , , , , , , , , , , , , , , , , ,	standard time
		0 = no switch
		B = hour after switch
username (user)	LONGVARCHAR(32767)	Operator account name
val	LONGVARCHAR(32767)	Current value
l a		

Column name (Chronolog Attribute)	SQL-Type	Description
/	LONGVARCHAR(32767)	Confirmation comment
verifytext	LONGVARCHAR(32767)	Confirmation text

Tabelle: UseractionSFC

The table contains all the historical information of the logging of AuditTrail entries for SFC interventions. Amongst others, setting the Controlled-Mode, setting the SFC init, reset, pause, and reset, as well as the tip mode and forcing the SFC.

Column name (Chronolog Attribute)		Description
action	VARCHAR(32)	Switching operations carried out by the operator from the SFC actions group.
application	VARCHAR	Name of the writing application
display	VARCHAR(128)	Display description
enginmode	BIT	Operator was engineering user
firstname	LONGVARCHAR(32767)	User's first name
host	VARCHAR(64)	APROL computer name
instance	VARCHAR	SFC instance
objectname	VARCHAR(64)	SFC object name
objecttype	VARCHAR(64)	SFC object type
project	VARCHAR(32)	Project name
superuser	BIT	Operator was APROL super user
surname	LONGVARCHAR(32767)	User's surname
system_inst	VARCHAR	Runtime system instance of assigned controller
system_name	VARCHAR	Runtime system name of assigned controller
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL only)	VARCHAR(1)	Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch
username (user)	LONGVARCHAR(32767)	Operator account name
val (value)	INTEGER	Current value

Tabelle: UseractionSys

The table contains all the historical information of the logging of AuditTrail entries for system control. Amongst others, starting and stopping the APROL system, and starting and stopping applications.

Column name (Chronolog Attribute)	SQL-Type	Description
action	VARCHAR(32)	Switching operations from the system actions group.
application	VARCHAR	Name of the writing application
command	LONGVARCHAR(32767)	Executed system command
connectedhost	VARCHAR(64)	Connected server (download)

Column name (Chronolog	SQL-Type	Description
Attribute)		
connectedsystem	VARCHAR	Connected system (download)
destination	LONGVARCHAR(32767)	Download target
display	VARCHAR(128)	Display description
dstppname	LONGVARCHAR(32767)	Download target (name of the project part)
dsttype	VARCHAR(64)	Type of system (download)
enginmode	BIT	Operator was engineering user
errors	INTEGER	Number of errors which occurred
firstname	LONGVARCHAR(32767)	User's first name
host	VARCHAR(64)	APROL computer name
jobno	INTEGER	Job number
level	VARCHAR	Init level with sysinitaprol
project	VARCHAR(32)	Project name
source	LONGVARCHAR(32767)	Download source
srcppname	LONGVARCHAR(32767)	Download source (name of the project part)
start	TIMESTAMP	Time stamp download start
subtarget	LONGVARCHAR(32767)	Selected sub-target of a download target
success	BIT	Success code
superuser	BIT	Operator was APROL super user
surname	LONGVARCHAR(32767)	User's surname
system	VARCHAR	CC-Account
system_inst	VARCHAR	Instance of controlled runtime system
system_name	VARCHAR	Name of controlled runtime system
text	LONGVARCHAR(32767)	Status information about host change (old/new project), (old/new computer), (old/new CC-Account)
ts	TIMESTAMP	Time stamp of the data record
ts_switch_mark (SQL only)	VARCHAR(1)	Switch mark for change from daylight saving time to standard time 0 = no switch B = hour after switch
username (user)	VARCHAR	Operator account name
usermode	VARCHAR(64)	Code of the user mode (engineering user code) - outdated
warnings	INTEGER	Number of warnings which occurred

8.4.2 JSON table scheme files

This chapter informs you about the difference between dynamic and static SQL tables.

As already mentioned in the introduction, historical data is saved in the ChronoLog database. The data stored here is ordered chronologically and does not have an SQL-conform structure. The definition of an SQL table with reference to the corresponding attributes of the ChronoLog database is missing. For this purpose, a table scheme file in JSON format (<u>http://de.wikipedia.org/wiki/JavaScript_Object_Notation</u>) has been introduced. A JSON file describes an SQL table exactly and is read directly by the AprolSqlServer. The file name corresponds to the SQL table name. A detailed description about the structure of this file can be found in the chapter 'Manual creation of table scheme files'.

The table schemes can be found in the following path:

/opt/aprol/cnf/AprolSqlServer/<Table name>.json

APROL differentiates between dynamic and static table schemes.

Static table schemes are fixed SQL tables which are already completely available directly after the installation. An exact description of all tables can be found in chapter 'Available SQL tables'.

Dynamic table schemes are project-dependent SQL tables. These tables are first created after a generation via the GenLib/Devil process and are distributed via the DownloadManager. They encompass PDA and SFC data.

The following SQL schemes have been introduced in order to clearly differentiate the different areas:

A2-3 base: Static tables

A2-4 sfc : Dynamic SFC tables

A2-5 pda : Dynamic PDA tables

they must be specified in an SQL query and when selecting a table. 'base' is used per default if there is no specification.

Example:

SELECT ts FROM sfc.SFC_Test

8.4.3 Manual creation of table scheme files

8.4.3.1 Structure of the configuration file in JSON format

```
Test_Schema.json // Table name
{
    'DataSourceHeader':
    {
        'Name': 'TestBlock',
        'Description': 'Test description'
    },
     'DataSourceDefinition':
    {
        'IdSchema': 'country:forename/surname/state/city/street',
        'country': 'GERMANY',
        'forename':
        [
           'david',
```

```
'karsten',
        'petros',
        'rufus'
    ],
    'state': 'nrw/me',
    'street':
    [
        '*.12',
        '*.42'
    ]
},
'TableDefinition':
ſ
    {
        'ColumnKey': 'ts',
        'ColumnAlias': 'Timestamp',
        'lecType': 'DATE_AND_TIME',
    'Description': 'la',
        'Comment': '1b',
        'Unit': '1c'
    },
        'ColumnKey': 'country',
        'IecType': 'STRING',
        'SqlType': 'VARCHAR(255)',
    'Description': '2a',
        'Comment': '2b',
        'Unit': '2c'
    }
1
```

8.4.3.2 Section 'DataSourceHeader':

The fields here are only for documentation. The '*Name*' field specifies the name of the data source, and '*Description*' an extensive description.

8.4.3.3 Section 'DataSourceDefinition':

The data source of the table is defined via 'the ChronoLog identifier here. The standard '*IdSchema*' field specifies the structure of the identifier and names the respective section of the key. The naming is arbitrary, but **must be unique** (no overlapping of identifier and ChronoLog field). The amount of data can now be described over definite value assignments of the individual sections. For this purpose, the section name is created as attribute and fed with one or more values. The prefix of a key can only be made up of one value. Each section which is not defined is evaluated as a wildcard.

The example above describes the table '*Test_Schema*' which allows entries with the '*GERMANY*' prefix and contain the first names '*david*', '*karsten*', '*petros*' or '*rufus*'. The surname is irrelevant (wildcard). Only '*nrw/me*' is allowed as '*state*' field, and the street must end with the house number '*12*' or '*42*'. The specification of the town is irrelevant.

The following ChronoLog identifiers result from this:

- A1-1 GERMANY:david/*/nrw/me/*/*.12
- A1-2 GERMANY:rufus/*/nrw/me/*/*.12
- A1-3 GERMANY:karsten/*/nrw/me/*/*.12
- A1-4 GERMANY:petros/*/nrw/me/*/*.12
- A1-5 GERMANY:david/*/nrw/me/*/*0.42

- A1-6 GERMANY:rufus/*/nrw/me/*/*0.42
- A1-7 GERMANY:karsten/*/nrw/me/*/*0.42
- A1-8 GERMANY:petros/*/nrw/me/*/*0.42

A ChronoLog call which is linked disjunctively with this identifier results in the complete amount of data.

8.4.3.4 Project substitution

The automatic substitution of the project specified in the *odbc.ini* is done by writing the value of a section with '*\$project*'.

• • •

```
'forename': '$project',
```

• • •

The project name in the odbc.ini is now specified as a fixed value for the 'Test_Schema' table.

8.4.3.5 Section 'TableDefinition':

The columns available in the table are defined here. Each '{ }' block corresponds to one column. The sorting from top to bottom corresponds to the column sorting from left to right.

Description of the individual fields:

ColumnKey: This value refers to the ChronoLog entry. Either one field or previously named section in the identifier must be selected here. The value is also used as SQL table column name. **Mandatory field**

ColumnAlias: An value entered here overrides the *ColumnKey* value for the SQL table column names.

lecType: Definition of the data record type of all entries in the column in IEC format.

SqlType: Definition of the data record type of all entries in the column in SQL format.

Description: Description of the column as meta-information.

Comment: Comment of the column as meta-information.

Unit: Unit of the column as meta-information.

Additional information:

A conversion operation from source to SQL data record types is given with the specification of the *lecType* and *SqlType* fields. If none or only one of the fields is used, the following rule applies:

only *lecType*: Specification of the source types. Cast in SQL target type is made implicitly - if possible.

only *SqlType*: Specification of the source type corresponds to the target type.

No specification: Source type is transformed to VARCHAR(255)

Only the columns defined here are available to the SQL statement.

8.4.3.6 Example of an SQL select statement:

SELECT Timestamp, country FROM Test_Schema WHERE Timestamp > '2012-01-01';

8.4.3.7 Validation of a table configuration

The 'SqlTableSchemaValidator' tool is available to validate a JSON table configuration. It checks a file for the correct content and returns reasons for errors.

Example:

SqlTableSchemaValidator /opt/aprol/cnf/AprolSqlServer/Alarm.json

8.5 APROL SQL Appendix

|url=appendixaprolsqlserver.htm

8.5.1 Driver parameter

Кеу:	Value:
PROJECT	<cae data="" of="" project="" source="" the=""></cae>
SYSTEM	Runtime system: aprolsys engineering system <cc-account data="" of="" source="" the=""></cc-account>
UID	User Identification
PWD	UID password
ARKPATH	The SQL server supports the well-know arkpath function from ChronoLog, which allows access to a secured ChronoLog container.
TREND_SOURC E	The parameter selects the trend data source, i.e. selects the APROL system which is contacted. The parameter can adopt the following values:
	protocol: Trend data is read from the logging server.
	local: Trend data is read from the system where the AprolSqlServer is installed.
	default or option not used: The trend data is called from the runtime system where the trends were recorded.

8.5.2 Supported SQL data types

The following SQL92 data types are supported by the AprolSqlServer.

The specifications in brackets are optional. If this information is omitted, the default values are used (following in pointed brackets).

- 🧹 🛛 BIT
- V INT
- INT UNSIGNED
- V TINYINT
- V TINYINT UNSIGNED
- V SMALLINT

SMALLINT UNSIGNED

- V BIGINT
- BIGINT UNSIGNED
- V REAL
- V DOUBLE
- FLOAT(size) [default: 53]
- VUMERIC(size, scale) [default: 38, 0]
- DECIMAL(size, scale) [default: 38, 0]
- V DATE
- V TIME
- TIMESTAMP(precision) [default: 6]
- CHAR(size) [default: 1]
- VARCHAR(size) [default: 255]

8.5.3 IEC to SQL data type mapping

The following table contains the assignment of IEC data types to SQL data types, as they are used in the table configuration.

Not all IEC data types have an SQL data type assigned.

IEC Data type	SQL data type
ANY_BIT	INTEGER UNSIGNED
BOOL	BIT
BIT	BIT
BYTE	SMALLINT UNSIGNED
WORD	INTEGER UNSIGNED
DWORD	INTEGER UNSIGNED
LWORD	INTEGER UNSIGNED
SINT	SMALLINT
INT	INTEGER
DINT	INTEGER
LINT	INTEGER
USINT	SMALLINT UNSIGNED
UDINT	INTEGER UNSIGNED
ULINT	INTEGER UNSIGNED
REAL	DOUBLE
LREAL	DOUBLE
TIME	INTEGER

IEC Data type	SQL data type
DATE	DATE
DT	TIMESTAMP
TOD	TIME
ANY_NUM	DOUBLE
STRING	VARCHAR(32767)
SSTRING	VARCHAR(64)
LSTRING	VARCHAR(32767)

8.5.4 Use of the AprolSqlQueryTool as database client

We offer you the SQL query tool 'AprolSqlQueryTool' in Linux for the first introduction. It is available on engineering and operator systems and can be started via the APROL start menu, in the 'Diagnosis' menu item.

8.5.4.1 Description of the user interface

)ate	nquelle Engin_Sam	plesPi	oject	✓ Statement S	elect * from CaeUpdate		~	Ausführen
	Tabellen	1		ts (datetime)	username (string)	host (string)	system (string)	essagetype (st
1	Alarm		1	2010-05-27 13:10:03.526	Admin	blaut	engin	stepBegin
2	CaeUpdate		2	2010-05-27 13:10:03.527	Admin	blaut	engin	message
3	Changelog	Ш	3	2010-05-27 13:10:03.527	Admin	blaut	engin	message
4	Compressor		4	2010-05-27 13:10:03.527	Admin	blaut	engin	message
5	Download		5	2010-05-27 13:10:03.527	Admin	blaut	engin	message
6	PDA_PdaR		<	2010-05-27				<
7	Parameter			pening database *			444	
8	SFC		*** St	arting SQL query				
9	SFC_Control		- SQL		ct * from CaeUpdate (row count:11895; f (closed) ***			
10	SEC Flow	$ \hat{\mathbf{v}} $		Rubuse connectio	in closed.			

Illustration 111: User interface of the AprolSqlQueryTool

8.5.4.2 Input fields

Data Source:

Selects a data source. The list is obtained from the *odbc.ini* configuration file. A selection updates the table overview (see underneath).

Statement:

Input field for the SQL statement to be executed. A history of the last 20 successful statements is stored.

Button [Execute]:

The execution is started when pressed.

Status icon:

Signalizes errors or the case of a success.

8.5.4.3 Display areas

Table overview:

All tables specified in the data source. The current SQL statement is substituted by the table name with a mouse click. If the field is free an SQL statement is generated.

Result table:

Display of the results of the executed SQL statements.

Log window:

Display of the activities from the AprolSqlQueryTool.

Status bar

Signalizes the final state. Error or success is stored with more information.

8.5.4.4 Main menu

'Open Configuration File...' menu item:

Opens the "odbc.ini" file with kwrite.

'Process Query Jobs...' menu item:

Opens a modular dialog for processing a query job list (see underneath). The job file must have the file extension '.sql_queries' and be in JSON format. The target file is written with the file extension '.log' Upon confirmation, the list is processed top-down and a log is written in the target file. It is also possible to export the results to one individual file. The job description is selected as the name. The checkbox must be set for this.

'Export Result...' menu item:

Saves the current result table in the format CSV file. Semi-colons are used as separators here.

'Restore Standards' menu item:

Sets the layout and statement history.

'Finished' menu item:

Ends the GUI application and saves the settings.

'APROL Info Licenses' menu item:

The **APROL** license dialog is opened.

8.5.4.5 Query job list

A query job list contains SQL statements which can be processed by the AprolSqlQueryTool. The file format is JSON. A job entry must contain an attribute name as unique identifier and is valid in the file system (is used eventually as export file name). The actual statement must be specified as the respective attribute value.

 \wedge

Important: The quotation marks used must be masked with "\"!

Example:

```
{
   "select1": "Select * from base.PDA_PdaReaktor2 where \"ts\" >= '2012-10-03' and \"from\" = 'FT27102'",
   "select2": "Select * from base.CaeUpdate where ts >= '2012-10-02'",
   "select3": "Select * from base.CaeUpdate where ts >= '2012-10-03'"
}
```

8.5.4.6 Logging

The processing of an SQL statement via the input field is recorded in a log file (JSON format) in the path:

/<Engineering system>/ENGIN/cnf/AprolSqlQueryTool/queries.log /<Runtime system>/RUNTIME/cnf/AprolSqlQueryTool/queries.log

Each block contains consecutive numbering. Furthermore, the current time stamp, the statement, the runtime, and the number of result lines is logged. In a negative case, the reason for the error is written in the file *queries.log*.

8.5.5 Use of SQuirreL as database client

The setup of a connection via SQuirreL is described in the following.

8.5.5.1 Setup of the database driver

٥ 🍼	Change Driver: AprolSqlDriverJDBC3	\odot \odot \otimes		
Change Driver: J	AprolSqlDriverJDBC3			
Driver				
Name:	AprolSqlDriverJDBC3			
Example URL:	jdbc:simba:// <host>:55503;SYSTEM=<cc-account>;PR0JECT=<</cc-account></host>	<project></project>		
Website URL:				
Java Class Pat /opt/aprol/lib64	h Extra Class Path /SimbaEngine/client/SimbaJDBCClient3.jar 🔺	n]		
Class Name: com.simba.client.core.jdbc3.JDBC3Driver 🔹				
	OK Close			

Illustration 112: Setup of the database driver

Step	Description
1	Select 'Drivers' tab and 'New Driver' menu
2	Specify name of the driver. 'AprolSqlClientDriver'
3	Enter URL (replace pointed brackets): 'jdbc:simba:// <host>:55503;RUNTIME=<aprolsys cc-<br="" ="">Account>;PROJECT=<project>'</project></aprolsys></host>
4	Select 'Add' in the 'Extra Class Path' tab. Seelct the file '/opt/aprol/lib64/SimbaEngine/client/SimbJDBCCLient.jar' (on 32 bit systems: '/opt/aprol/lib/SimbaEngine/client/SimbJDBCCLient.jar')
5	Press [ListDrivers] button The following is displayed in the 'ClassName' field: 'com.simba.client.core.JDBCDriver'
6	Finish driver configuration with [OK].

8.5.5.2 Setting up an alias (DB connection alias)

۵ 🍼	Add Alias 💿 🔿 🛞
Name:	Connection to protocol server
Driver:	✓ AprolSqlDriverJDBC4 ▼ New
URL:	jdbc:simba://protocolserver.your-domain.com:55503;SYSTEM=aprolsys;PROJECT=Samples
User Name:	aprol
Password:	•••••
🗌 Auto logon	Connect at Startup
	🕆 Properties
Warning - Pass	words are saved in clear text

Illustration 113: Setting up an alias (DB connection alias)

Step	Description
1	Select the 'New Alias' menu in the 'Aliases' tab
2	Specify name of the alias: e.g. 'Connection to pdadevelop01"
3	Select driver: 'AprolSqlClientDriver'
4	Adjust URL: 'jdbc:simba://pda.your-automation.com: 55503;SYSTEM=aprolsys;PROJECT=SamplesProject'(example)
5	Select 'Connect at Startup' checkbox
6	Finish alias setup with [OK]

8.5.5.3 SSL connection via SQiurreL

The parameters shown in the following illustrations are to be entered for an encrypted connection via SQiurreL. The actual values should be entered instead of the placeholders in brackets.

	olSqlClientDriver				
ample URL: jdbd					
	::simba:// <host>:55503:SYSTEM=<system< th=""><th colspan="4">L: jdbc:simba://<host>:55503:SYSTEM=<system>:PR0jECT=<project;usessl=1:trustedstorepath= aprol="" etc="" jkeystore;trustedstorepasswor<="" opt="" th=""></project;usessl=1:trustedstorepath=></system></host></th></system<></host>	L: jdbc:simba:// <host>:55503:SYSTEM=<system>:PR0jECT=<project;usessl=1:trustedstorepath= aprol="" etc="" jkeystore;trustedstorepasswor<="" opt="" th=""></project;usessl=1:trustedstorepath=></system></host>			
ebsite URL:				-	
(Für SSL-			
ava Class Path	Extra Class Path	Verschlüsselung			
pt/aprol/lib64/Sin	nbaEngine/client/SimbaJDBCClient4.ja	if .	•	List Drivers	
				44.5	
				Up	
				Down	
				Add	
			•	Delete	
9					
[simba.client.core.jdbc4.JDBC4Driver				

Illustration 114: SQL access via SQiurreL

Step	Description
4	Adjust URL: 'jdbc:simba://pda.your-automation.com: 55503; SYSTEM=aprolsys;PROJECT=SamplesProject'; UseSsl=1;TrustedStorePath= <install path="">\\SSLCertificates\\jdbckeystore; TrustedStorePassword=.aprol' (Example)</install>

8.5.5.4 Establish database connection

0	Connectto: AprolSqlServer@pdadevelop01 (JDBC3) 🛇 🔿 🚫					
Connect to: AprolSqlServer@pdadevelop01 (JDBC3)						
Alias:	AprolSqlServer@pdadevelop01 (JDBC3)					
Driver:	AprolSqlDriverJDBC3					
URL:	jdbc:simba://pdadevelop01:5206;SYSTEM=aprolsys;PROJECT=SamplesProject					
User:	aprol					
Password:	••••					
	🖹 Properties					
Warning - Caps lock may interfere with passwords						
	Connect Close					
Į						

Illustration 115: Establish database connection

Step	Description
1	Select 'Connection to pdadevelop01' entry in 'Aliases' tab.
2	Execute the 'Connect' action

Step	Description
3	Establish connection with the [Connect] button (no user or password is necessary).

8.5.6 Note about SQL queries

8.5.6.1 TOP clause

The number of lines in the result can be limited with the help of the TOP clause.

The following example returns the first 10 lines:

SELECT TOP 10 * FROM base.CaeUpdate;

8.5.6.2 Date and time specifications

Date and time specifications must be defined in the following format.

- 1. Date output
 - 1.1.Format: '<YYYY>-<MM>-<DD>'
 - 1.2.Example: '2013-12-31'
- 2. Exact date and time
 - 2.1.Format: 'HH:MM:SS' or 'HH:MM:SS.FFFFFF'
 - 2.2.Example: '13:49:47' or '13:49:47.081094'
- 3. Time stamp specification
 - 3.1.Format: '<date specification> <time specification>'
 - 3.2.Example: '2013-12-31 13:49:47.081094'

8.5.6.3 Performance observation

Historical information consist of a data content and a time specification. Each table has the column 'ts' which depicts this time specification. We recommend that the 'ts' column is always taken into account in SQL statements in order to give the best performance.

Example:

SELECT * FROM base.Trend WHERE ts > ' 2013-12-31'

8.5.6.4 Optimization of SQL queries by the AprolSqlServer

The AprolSqlServer can speed up 'group by' queries considerably.

In doing so, the following must be noted:

1) An accelerated query is only then possible if columns are accessed in the 'group by' query where the content is detected by using of the ChronoLog identifier.

Example query:

SELECT pv from Alarm GROUP BY pv

In this case, 'pv' is part of the identifier of the corresponding ChronoLog data record.

2) A performance gain with trend queries is only then possible when the column 'pv' is accessed in the 'group by' query.

Example query:

SELECT pv from Trend GROUP BY pv

3) Queries can only be accelerated if the 'group by' aggregation is executed before a filter command.

Example query:

Optimization:

SELECT pv FROM Trend GROUP BY pv HAVING pv LIKE 'Value%'

No optimization: SELECT pv FROM Trend WHERE pv LIKE 'Value%' GROUP BY pv

/// DISTINCT' queries **cannot** be accelerated by the AprolSqlServer.

Example: 'SELECT DISTINCT pv FROM Alarm' delivers the same amount of results as the query in 1). Even so, the processing of the 'DISTINCT' queries takes much longer.

9.1 General information about event-driven report creation

The ReportSpooler functionality allows an automatic creation of reports (e.g. AuditTrail, shift logbook, change control, as well as own customer-specific reports) of pre-defined events or points in time.

The reports created are available in PDF format for making high quality prints.

Similar to the mechanism for the creation of the As Built documentation in the CAE libraries, the program **Prince** from the company *YesLogic*, licensed from B&R and delivered on the APROL DVD, is used for the creation of the printable PDF files.



The license for this program can be seen in the CaeManager under "**Help/License** information".

Prince converts XHTML documents into the PDF format, and formats thereby according to rules laid down in CSS style sheets. Requirement for this is that the source document is in form of a local file.

You have the possibility to incorporate images (PNG or GIF format) into the source document. This can also apply to trend diagrams that are created with *ChronoChart*.

The program *Prince* supports CSS rules for page formatting (e.g. Header, footer, control of page break), as well as table breaks (Table header, column, footer).

Having added special CSS rules, this allows a display of the report in the web browser, as well as a high resolution printout.

An XHTML conform notation is mandatory. Pay attention to the notes in manual "**B4 Project and library documentation**".

9.1.1 General procedure for creation of PDF files

The following image shows a schematic overview of the creation of PDF files via **Prince** in **APROL**:

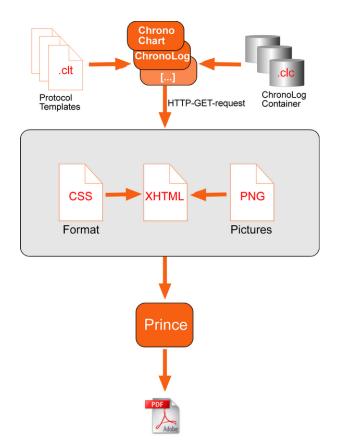


Illustration 116: Overview of PDF creation in the APROL system

The reports are created with the help of ChronoLog templates in XHTML format. The documents are transferred over the HTTP protocol, and are saved as temporary local files on the logging server, because **Prince** only allows local files as source files. Finally the conversion into PDF format is carried out via Prince.

9.2 Configuration of the report creation with the block AprCcTrigReport

The block *AprCcTrigReport* is available in the CAE library '**APROL**', in the group *Reports*, for the configuration of the event driven report creation.

With the *AprCcTriggerReport* block, a report is created upon the occurrence of a trigger event. The report can be output to a file on the logging server and/or to a printer. The block configures the CC module *ReportSpooler*. The use of the *ReportSpooler* block must be configured in the scope of the control computer's CC modules.

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After a trigger has arrived, a triggering of the **same** block instance is only possible when the previous job has been processed.

Jobs from different blocks are placed in a queue, and processed sequentially.

Block view:

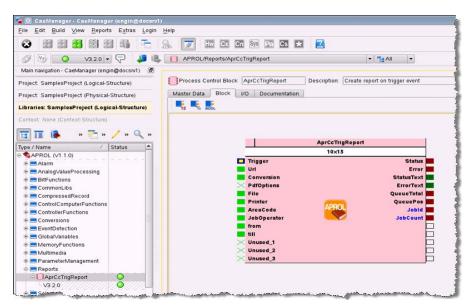


Illustration 117: The AprCcTrigReport block



The AprCcTrigReport block can be used in the "APROL" library only in the existing form.

Copying and modifying the block for use in customer libraries is not possible!

Block inputs:

Name	Туре	Description / Default value	Attribute (CRDS)*
trigger	BOOL	The report creation is triggered by a positive edge on this input.	CRDS
Url	STRING	The URL is stated without protocol (http[s]:) and server. The ReportSpooler always contacts the one configured in the project's logging server. If the URL begins with "/", it is interpreted as an absolute URL on the logging server. cgi programs can be addressed in /cgi- bin/ with this for example. If the URL begins with "/" then it is interpreted as a URL that addresses a project template that follows a URL's country code (e.g. 001). The ReportSpooler prefixes the name of the logging server and the path to the project templates including the country code (input "AreaCode") from the URL that is entered. Please also note the example shown in the notes. Constant CGI parameters can be attached in both cases. Default value: standard/syslog/syslog.clt	C-DS
Conversion	STRING	Possible values: "PDF": Conversion to PDF, "PDF pdf2ps": Conversion to PDF, additionally to Postscript (if necessary for printing), "none": no conversion (e.g. CSV format) Default value: <i>PDF</i>	C-DS

Name	Туре	Description / Default value	Attribute (CRDS)*
PdfOptions	STRING	Currently not supported Default value: ?	S
File	STRING	File name under which the report should be saved. The reports are saved on the logging server in the project specific REPORTS path. /home/aprolsys/APROL_DATA/PROJECTS/ <project name="">/REPORTS. Additionally stated path components are newly created! If no name is stated, or a valid process variable is not connected the report is not saved. The set outputs from the ReportSpooler, <i>JobId</i> and <i>JobCount</i>, can be used to dynamically allocate a file name. Use the key words \$JobCount and/or \$JobId as part of the key words. They are replaced by the</project>	C-DS
Printer	STRING	respective numerical values. Printer name or class (ProtocolServer). The printer or the printer class must be configured on the logging server in the LINUX printer configuration. If nothing is entered here, or a no valid process variable is connected, the report	C-DS
AreaCode	STRING	is not printed. Language code for the choice of the ChronoLog template (is also attached to the URL as CGI parameter). Default value: 001	C-DS
JobOperator	STRING	Name of the operator who started the report creation. Is attached to the URL as CGI parameter! Default value: system	C-DS
from	STRING	Starting time point of the query time period of a ChronoLog template in the form "TT.MM.JJJJ hh:mm[:ss]" or "JJJJ-MM-TT hh:mm[:ss]". Date or time components can be omitted. Details can be found in the APROL documentation 'D2 System API'. Is attached to the URL as CGI parameter! Default value : 00:00	C-D-
till	STRING	End time point of the query time period in the form "TT.MM.JJJJ hh:mm[:ss]" or "JJJJ-MM-TT hh:mm[:ss]". Date or time components can be omitted. Details can be found in the APROL manual 'D2 System API'. Is attached to the URL as CGI parameter! Default value : 24:00	C-D-

Name	Туре	Description / Default value	Attribute (CRDS)*
Unused_1	STRING	Currently not supported Default value: ?	
Unused_2	STRING	Currently not supported Default value: ?	
Unused_3	STRING	Currently not supported Default value: ?	

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The file name can be dynamically allocated with the use of key words, or by connecting a process variable. In this case new files are always saved in the file system when triggering takes place.

Please make sure with the appropriate measures that there is always enough room on the corresponding partition.

Details can be found in the APROL documentation "Backup & Recovery", chapter <u>Hard-drive management</u>.

Block outputs:

Name	Туре	Description / Default value	Attribute (CRDS)*
Status	INT	Meaning of the status code: 0 = "done_ok" : no error upon processing the last job, 1 = "done_error" : Error upon processing the last job, 2 = "idle" : Idle , 3 = "canceled": Interruption due to change of the process control, 4 = "timeout" : Obtained no response from logging server, 5 = "active" : Report request being processed (no triggering allowed), 6 = "pending" : Report request in queue (no triggering allowed).	C-DS
Error	INT	Meaning of the error code: 0 = "ok" >0 = "Error": See "Error_Text" output for a short description.	C-DS
StatusText	STRING	Short status text	C-DS
ErrorText	STRING	Short error text	C-DS
QueueTotal	INT	The total number of pending jobs in the global queue	C-DS
QueuePos	INT	All jobs are processed one block after the other. This output states the current position of this job in the global queue.	C-DS

Name	Туре	Description / Default value	Attribute (CRDS)*
Jobld	ULINT	The output <i>JobId</i> is an identifier of the job currently waiting, or the last job. The counter takes all of the trigger events of all of the block instances into account. The <i>JobId</i> output is held as a remanent variable by the losys. That means that after a ReportSpooler restart, or after a successful download, all of the values are preserved	C-DS
JobCount	ULINT	A counter is available on the output <i>JobCount</i> , which is incremented with every trigger event of this block instance. The <i>JobCount</i> output is held as a remanent variable by the losys. That means that after a ReportSpooler restart, or after a successful download, all of the values are preserved	C-DS

Description for the "Attribute" column:

Attribute	Meaning
С	Can be linked
R	Connection required
D	Dynamically configurable
S	System pin

Example for URLs for the creation of **APROL** standard reports:

Report type	URL			
AuditTrailReport	standard/action/overview.clt?id=USERACTION:			
AlarmReport	standard/alarm/show_alarm_list.clt?css=standard; group=filter;alias=filter;pv=filter;prio=filter			
TargetControlReport	standard/changecontrol/targetlist.clt			
System messages	standard/syslog/syslog.clt			
TrendReport	standard/trend/trd_data.clt?project= <project>&runtimesystem =<cc-account>&id=TRD:<pv name="">&nmax =<max.numberevents></max.numberevents></pv></cc-account></project>			
ProcessDataReport	/cgi-bin/losInOut.pl?lang= <area code>&server=<server>&runtimesystem=<cc-account> &port=<port nr="">&pv=<pv name=""> &xsl=/opt/aprol/doc/xsl-sheets/<area- code>/online/Result/iosinouthtml.xsl Please pay attention that the URLs here begin with "/"!</area- </pv></port></cc-account></server></area 			

Report type	URL
CustomerReport	<pre>customer/<name customer="" of="" specific="" template="" the=""> Customer specific ChronoLog templates are stored in the directory /home/<cc-account>/ENGIN/PROJECTS/ <project name>.pgp/WEB/<language code="">/REPORTS/ customer", and are available on the logging server after generation and subsequent download!</language></project </cc-account></name></pre>
	Further information about the ChronoLog mechanism can be found in the APROL documentation "D2 System API".

9.2.1 Configuration and functionality of the ReportSpooler

In the scope of the configuration of the CC modules the ReportSpooler must be activated, and the options *-iosys, -restart. -self* are to be checked, or configured.

After receiving a positive edge on the input *Trigger*, the ReportSpooler gets the values of the inputs *Url*, *Printer* and *File*. Thereafter, a report request (HTTP post request) is sent to the CGI program *AprolCreatereport*. The request is rowed in a global queue, which is carried out sequentially.

The ReportSpooler analyses the status, or the returned status text, of the CGI program and makes this available on the block outputs *Error* and *ErrorText*. The current status of the processing requests is shown on the outputs *Status* and *StatusText*.

9.2.2 AprolCreateReport

The CGI program *AprolCreateReport* is given the URL of the report, a filename, and parameters in order to control the conversion, by a client (ReportSpooler).

The report (created using the ChronoLog mechanism) and all of the necessary files for a display (XHTML, CSS, PNG) are obtained with the URL, and saved in a local (temporary) directory.

The Linux tool *wget* has been modified for data transfer so that the handling of very large URLs (ChronoChart) is also possible.

Finally, a PDF document is created (if a PDF conversion is desired) using the local files via **Prince.**

When a printer name has been assigned, the document is sent to that printer. If a filename (including path) is assigned, the document is saved there.

If configured, the report created is sent back to the HTTP client. In any case, a status message is sent back to the client that contains information about a successful, or faulty, event.

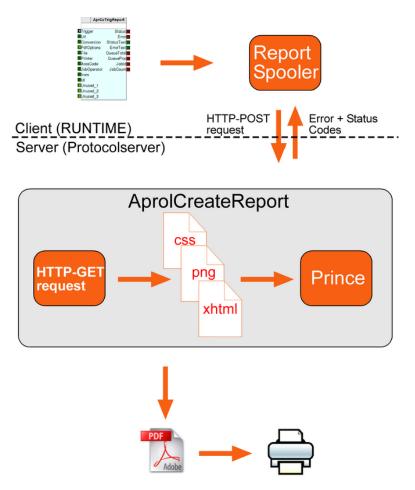


Illustration 118: Overview of event driven report creation in the APROL system

9.3 Workflow and path of action for event driven report creation

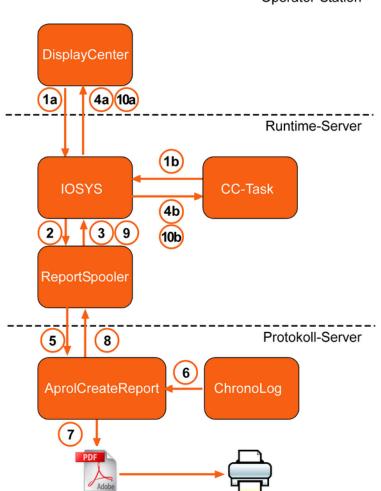
The following overview clearly shows the time sequence of events and the interaction of the process control system's components involved in the creation of the report.

In the overview, the server and operator stations involved are shown separately. Depending upon the topology of the process control system, these components can be on the same (compact system) or on different computers.

The numbering in the following table corresponds to the numbering in the schematic overview.

Step	Description
1a / 1b	Interaction of the operator in the DisplayCenter (1a) or the control computer task (1b) sets process variables in the losys, which parameterize the report and start the workflow via the trigger variable.
2	The ReportSpooler adopts the report's parameter and appends the job to the end of the queue.
3	Thereupon, the process variables of the block are set by the ReportSpooler, like e.g. the queue position on the "QueuePos" pin.
4a, 4b	The block outputs are visualized by the DisplayCenter (4a) or evaluated by the control computer task (4b).

Step	Description
5	Upon the start of the job an HTTP post request is deposited to the CGI program AprolCreateReport.
6	Report creation via depositing an HTTP get request of the parameterized URL.
7	After conversion to PDF format, the report is stored as a file on the logging server and / or the report is output on the printer.
8	HTTP responses about the status, errors in the report creation, and the transformation into PDF format are reported.
9	Setting process variables, which contain the status and error codes and the corresponding Texteam block output.
10a, 10b	The block outputs are visualized by the DisplayCenter (10a) or evaluated by the control computer task (10b).



Operator-Station

Illustration 119: Overview of the workflow and path of action

9.4 Creation of customer specific reports

Individual ChronoLog templates are to be created for the creation of customer specific reports, which are stored in the directory/home/<CC-Account>/ENGIN/PROJECTS/<Project

name>.pgp/WEB/<Language>/REPORTS/customer.



The creation of customer specific reports requires knowledge about the *APROL* ChronoLog system, as well as basic XHTML and CSS knowledge.

1. Details about the ChronoLog system can be found in the APROL documentation "D2 System API"

2. Basic information about XHTML and CSS can be found in the external documentation "SelfHTML" from the APROL documentation manual group X-AddOns.

The files that exist in this directory can be called up via the URL http(s)://<Computer name>/PROJECTS/<Project name>/<Language>/customer.

Alternatively, the call can made via the '**Reports / Customer Reports**' KDE menu, or via the report overview page.

The web server automatically creates a list of the directories and files that are stored (see screenshot), over which it is possible to navigate and open directly.

		Name	Last modified	Size	Descriptio
0	Parent Directory				
	add-ons/		14-Dec-2009 14:34		
	debug/		14-Dec-2009 14:34		
	navigation/		14-Dec-2009 14:34		
	patches/		14-Dec-2009 14:34	(m)	
	print		14-Dec-2009 14:34	-	
-	screen/		14-Dec-2009 14:34		
1	central_draft.css		14-Dec-2009 14:34	1.0K	
	external_link gif		14-Dec-2009 14:35	66	
	hcalendar.png		14-Dec-2009 14:35	633	
	hcard png		14-Dec-2009 14:35	673	
5	icon-geo.png		14-Dec-2009 14:35	4.6K	
	icon-hatom.png		14-Dec-2009 14:35	713	
	icon-haudio png		14-Dec-2009 14:35	1.1K	
	icon-hcalendar-add.png		14-Dec-2009 14:35	1.1K	
	icon-hcalendar-download png		14-Dec-2009 14:35	1.1K	
	icon-hcalendar png		14-Dec-2009 14:35	707	
	icon-hcard-add png		14-Dec-2009 14:35	707	
	icon-hcard-download png		14-Dec-2009 14:35	721	
	icon-hcard.png		14-Dec-2009 14:35	1.0K	
5	icon-hresume png		14-Dec-2009 14:35	724	
5	icon-rel-tag png		14-Dec-2009 14:35	720	
	icon-xfn.png		14-Dec-2009 14:35	721	
0	markup_draft.html		14-Dec-2009 14:34	2.5K Your Page Title	
0	microformats.css		14-Dec-2009 14:35	3.8K	

Illustration 120: Automatically created web server listing

If an individual start page design is required, or an own menu structure is necessary, then this can be stored actively with an index.html, or index.htm, or index.php file as a start page in the specified directory.



In this case, the above mentioned listing is no longer created automatically by the web server, but must be eventually created with a (PHP) script.

The following illustration shows the connection between the XHTML formatted content, the CSS rules of the corresponding style sheet, and the resulting layout of the report:

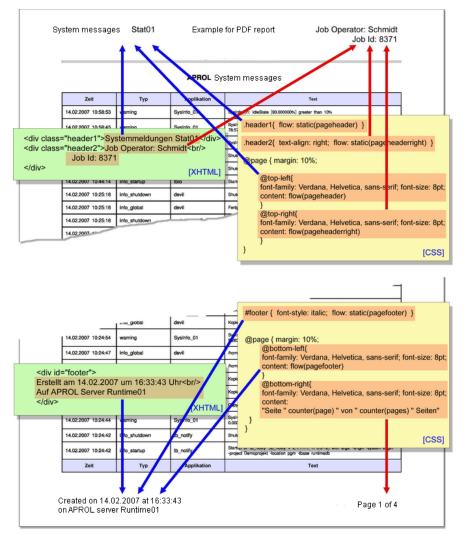


Illustration 121: Interrelationship between XHTML formatted content, CSS rules, and resulting layout

The displayed example shows the creation of header and footer, which are shown on each side, as well as the implementation of a consecutive page number.

		APROL S	ystem messages
Zoit	Тур	Applikation	Text
14.02.2007 10:58:53	warning	Systrio_01	Systing_01: IdeState (\$2.000000%) greater than 10%
14.02.2007 10:58:45	warning	Systrio_01	Systels_01: IdeState cyclic warning! klie: 0.000000, system: 21.428572, user: 78.571428, procStr: 168
14.02.2007 10:58:45	warning	Systefo_01	Systin0_01: IdleState (0.000000%) less than 10%
14.02.2007 10:51:34	info_shutdown	tbio	Shutslown of 'thio' with exit code 0
14.02.2007 10:51:27	info_shutdown	tbio	Shutslown of 'thio' with exit code 0
14.02.2007 10:44:14	info_startup	tbio	Startup of 1bio' (Bio V 21.30, R 3.3-12) with args runtimedb
14.02.2007 10:25:16	info_shutdown	devil	Shutdown of 'davil' with exit code 0
14.02.2007 10:25:16	info_global	devil	Forig
14.02.2007 10:25:16	info_shutdown	script_AprolCreateRunt	Shutdown of script 'AproCreateRantime'
14.02.2007 10:25:16	info_global	devil	CustomerTaskPostBuildScript (Verz: /homelengin/scripts/) nicht gefunden
14.02.2007 10:25:16	info_global	devil	Kopiere ProjektDokumentation Datei nach «COD1» fettig
14.02.2007 10:25:15	info_shutdown	spript_AprolUpdateKde	Shutdown of script 'AproXipdateKde'
14.02.2007 10:25:15	info_startup	script_AprolUpdateKde	Startup of script 'AproUpdateKor', APROL R 3.3-12 (648k), args: ENON
14.02.2007 10:25:12	info_global	devil	Creating ProjectDocumentationSearchindex
14.02.2007 10:25:10	warning	Systefo_01	Systinto_01: IdeState (19.444449%) greater than 10%
14.02.2007 10:25:06	info_global	devil	Kopiere ProjektDokumentation Datei nach «COO1»
14.02.2007 10:25:06	info_global	devil	Kopiere Protokoldaten nach «COEt» ferlig
14.02.2007 10:25:04	warning	Systrio_01	Sysisto_01: IdeState cyclic warning! Idle: 0.00000, system: 62.50000, user: 37.500000, procNet: 177
14.02.2007 10:24:59	info_global	devil	Kopiere Gatewaytell von CC01 fortig
14.02.2007 10:24:54	warning	Systrio_01	Sysisto, 01: IdeState cyclic warning! Kler 0.00000, system: 94.736847, user: 5.263158, procCet: 176
14.02.2007 10:24:47	info_global	devil	/home/engivENGN/GWS nicht gefinden
14.02.2007 10:24:47	info_global	devil	/home/engin/ENGN/rosinOut witht gefunden
14.02.2007 10:24:47	info_global	devil	Kopiere d PORMEL far CC01 in Cemoprojekt,pgp fertig
14.02.2007 10:24:47	info_global	devil	Kopiere Projektion/kguration für CC01 in Demoprojekt.pgp fietig
14.02.2007 10:24:44	info_global	davil	Copy Standard Konfiguration für CC01 in Demoprojekt.pgp fertig
14.02.2007 10:24:44	warning	Systrio_01	Sysido_01: KieState cyclic warning! Kie: 0.00000, system: 100.00000, user: 0.00000, proCet: 177
14.02.2007 10:24:42	info_shutdown	tb_notify	Shutdown of 10_nosity with suit code 0
14.02.2007 10:24:42	info_startup	tb_notify	Startup of "bi_molify (bi_molify V 21.1.1.1, R 33-12) with anger -engin -system engin -project Demographit -location pgm -dbase runtimedb
Zeit	Тур	Applikation	Text

Illustration 122: Display of the generated report in Adobe Reader

A web form has been designed for the error analysis of the report templates that you have created, which can be found in the professional queries ('APROL / Reports / Detail report / ChronoLog-ProfiReport' KDE menu).

For the error-analysis call up the "Creation, PDF transformation and printing reports" entry.

Here, the ReportSpooler's HTTP request can be manually added. After setting the "with debug messages" option, the debug output of the CGI program *AprolCreateReport* is shown in the browser, as well as eventual error messages.

In the scope of the **APROL** logging, all of the URLs of all of the ReportSpooler's HTTLP requests are recorded. The URL can be copied into the before mentioned form from the **APROL** system messages, for error analysis purposes.

Error analysis - step 1:

Calling the APROL system messages / copy the URL

Error analysis - step 2:

Inserting the URL in the web form

Error analysis - step 3:

Display of the debug output of the CGI program, as well as the eventual error messages (e.g. XHTML syntax error) in the browser.

9.4.1 Redundancy

The ReportSpooler supports the **APROL** process redundancy.

Furthermore, the following limitations apply:

If the process control is transferred to a partner during the processing of a request, then the status message and eventual error message are not available on the block's outputs. When the logging server that is processing the HTTP requests carries on running, the report creation is terminated properly.

All of the requests in the queue are lost with a switching.

All of the requests are also removed from the queue when the ReportSpooler is terminated (e.g. when stopping the **APROL** system)

10 Digital signature of PDF documents

10.1 Basic information about the digital signature

10.1.1 Motivation and intention

The digital signature of PDF documents in **APROL** offers you the following advantages:

Guarantee that the origin of the report is the **APROL** process control system

Tamper-proof storage and forwarding of reports

Confirmation or commenting the content of the automatically generated report by the operator (signing reports)

Identity of the operator that signed the report can be checked



The content of the data (E.g. the PDF document) is not encrypted by attaching a signature, but the possibility is then given to check for subsequent manipulations.

10.1.2 What is signing?

Electronic signature:

The electronic signature is a legal term that is defined in the signature law (*Law about framework for electronic signatures, abrev. SigG*).

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The different forms of electronic signatures are defined in §2 SigG.

An electronic signature is understood to be data that is linked to electronic information.

The following can be achieved with this data:



Identification of the person signing, i.e. creating the signature

The possibility to check the integrity of the signed electronic documents

Digital signature:

The digital signature is the technical implementation of the electronic signature. Basically, an encrypted hash value is created with the private key that is contained in the certificate.

It is possible to recognize if changes have been made to the data after the signature was made by re-creating a hash value and comparing it with the value that was created originally. It is although not possible to recognize which changes have been made.

10.1.3 What do digital signatures in APROL serve for?

A PDF file can be created optionally for all of the **APROL** reports that are in HTML form and can be displayed in the web browser; by means of which a printout is then made possible.

All of the reports that are created in PDF format by the **APROL** system **obtain a digital signature per default**, and are thus protected from subsequent manipulation.

The signature is made with the **APROL** system certificate of the server on which the report was created. These signatures are referred to as **certification signatures** in the following. The **APROL** process control system is ensured as the origin of the report with this signature.

The PDF document can be **additionally** signed with a personalized user or operator certificate. The person signing confirms the content of the document with this signature, whereby, the purpose of the signature must be given.

These signatures are referred to as *approval signatures* in the following.

1

A function to attach electronic signatures to self-created PDFs is available in the **APROL** web portal (Reports / Sign Document). Apart from signing **APROL** reports, it is now possible to attach a digital signature to documents which were created with external tools.

I.e. Reports created with Jaspersoft studio can be signed retrospectively. Jaspersoft studio allows the creation of custom-made reports with a connection to the **APROL** data via a JDBC data source querying the AprolSqlServer data.

The functionality also allows the 'countersigning' of a report which has been signed beforehand.

Changes that have been made to the content are made clearly visible with integrity check in *Adobe Reader,* because of the PDF document signature. The identity of the person signing is also verified.

In this way, a tamper-proof storage and forwarding of reports (E.g. historical process data) is guaranteed.

10.1.4 What is asymmetric encryption?

Basis of the digital signature is the asymmetric encryption. It is a cryptographic process whereby each of the communication partners possesses a key pair which is made up of a secret part (private key) and a non-secret part (public key). Asymmetric crypto-graphical systems are also therefore referred to as public key process.

In contrast to this, symmetrical crypto-graphical systems use one mutual (secret) key for the communicating partners.

The asymmetric encryption process is implemented as follows when creating PDF signatures in **APROL**:

Private key for creation of a digital signature

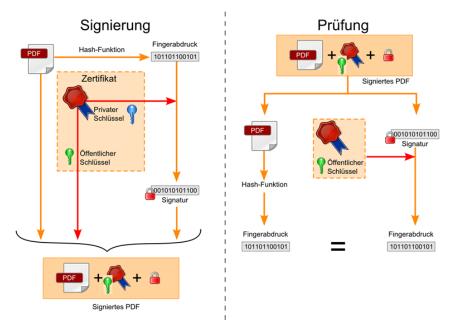
A so-called digital fingerprint is calculated from the PDF document via hash function (E.g. MD5 check sum). A unique signature can be created for the PDF document with the private key and the fingerprint. Thus, only the fingerprint is encrypted when signing and not the document.

The signature and the certificate, which contains the public key, are attached to the PDF document.

Public key for checking the digital signature

The public key from the signed PDF document is used to decrypt the signature (Result: digital fingerprint). Parallel to this, the digital fingerprint of the original document is re-calculated.

If the fingerprint from the signature and the original document are the same, then there have been no subsequent changes since the signature was made.



Detailed information can be found in the following schematic overview!

Illustration 123: Schematic display of the signing in APROL

10.1.5 What is a certificate?

A certificate (Here: X.509 format) is composed of the following components:

- 1) Identity of the owner (E-mail address, name, ...)
- 2) Public key of the owner

CA signature, i.e.

3) Signature created by the certification authority about the identity of the owner and the owner's pubic key.

and an optional **CA certificate**

4) Certificate of the certification authority including their identity and public key for checking the CA signature

10.1.6 In which format are certificates saved?

Certificates can be saved in many different file formats.

The **APROL** certificates are saved according to the PKCS#12 standard in files with the suffix '*.p12'. The standard format is used in order to save private keys together with the respective certificate in a password protected manner.



PKCS stands for **P**ublic **K**ey **C**ryptography **S**tandards and describes a series of cryptographic specifications.

10.1.7 What is a certification authority?

A certification authority (Abbreviation CA) is an organization that supplies signed digital signatures.

A certification authority can by a special company, or an institution or department within a company. It is also possible that public organizations or government agencies serve as certification authorities, e.g. the Federal Network Agency in Germany.

10.1.8 What is the time stamp server used for?

Digital documents can be given a certified time stamp.

It is thus possible to determine when a document was created or signed. This is the way that the time point of the original unchanged data is detected. A subsequent forward or back-dating of content is ruled out in this way.

A pre-requisite for using a time stamp is that the issuing company or institution can also be trusted. Companies or institutions which offer time stamps (ZSA) are referred to as **T**imestamping **A**uthority (TSA).

The use of a time stamp server is supported in **APROL**.

10.2 How do I create digital signatures in APROL?

10.2.1 What are certificates used for in APROL?

Certificates are used for the following purposes in **APROL**:



For digital certification (Certification signature) of PDF documents by the **APROL** system

For personal digital signatures (E.g. approval signature) of PDF documents by operators and users

As a root certificate when creating personalized user and operator certificates

For the establishment of secure HTTP connection (https) when communicating with the web server



(Not a part of this description)

LDAP certificate SSL connection to the LDAP server

(Not a part of this description)

10.2.2 Which certificates are available in APROL?

The following certificates are available for the digital signature in **APROL**:

Certificate type	Description			
Root certificate	All of the certificates that are created for APROL are derived from the APROL root certificate. The APROL root certificate is solely created by B&R. The private key (File: 'ca.key') and the certificate (File: 'ca.crt') are stored in separate files in the directory /opt/aprol/etc during the APROL installation.			
System certificate	Each PDF file is signed with the system certificate per default (Certification signatures). The APROL system certificate is solely created by B&R. The system certificate (File: 'APROL_SYSTEM.p12') is stored in the			
	/opt/aprol/etc directory during the APROL installation.			
User certificate	This certificate is for attaching a user's personal signature. They are created in the user management and contain the identity of the engineering user (especially that of their login). The certificates are saved in 'P12' format in the CAE database.			
Operator certificate	This certificate is for attaching an operator's personal signature. It is created in the OperatorManager. They contain the operator's identity (especially that of the login). The certificates are saved in 'P12' format in the CAE database.			

The root certificate is pre-configured as being a trustworthy certification organization in Firefox, Konqueror, and Adobe Reader on the **APROL** servers.

10.2.2.1 How are certificates used for the digital signature in APROL?

The following overview shows the use of certificates for signing PDF documents in **APROL**:

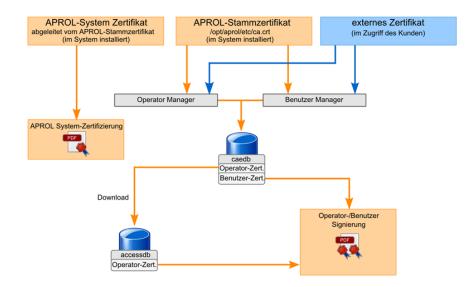


Illustration 124: Use of the certificates in APROL

Use of the **APROL** system certificate:

Each PDF file from an **APROL** report that is in HTML format and can be displayed in the web browser is signed **per default** with this certificate.

This signature (*Certification signature*) is added to the PDF document **per default** when pressing the [**Print**] or [**Sign document**] buttons.



The **APROL** system certificate is based on the **APROL** root certificate, and can be replaced by an external certificate!

I.e. It also remains based on the **APROL** root certificate if an external root certificate is used for the operator / user.

Use of the **APROL** root certificate:

The **APROL** root certificate is used for creating user certificates in the user management and operator certificates in the OperatorManager.

Use of the user certificate:

User certificates are stored in the CAE database and are available on the engineering server. The user certificate is read from the CAE databank when a **user creates** an authorization signature (via [**Sign**] button).

Detailed information about the creation of user certificates and signing can be found in chapter <u>Creating a user certificate</u> and <u>How are PDF documents signed in APROL?</u>

Certificates from external certification organizations (external certificates) can also be used instead of the user certificate that is based on the *APROL* root certificate.

Use of the operator certificate:

Operator certificates are stored in the CAE database. They are adopted in the 'access' database during the build process. They are transferred to the logging server and all operator stations via a download.

The operator certificate is read from the CAE databank when an **operator creates** an authorization signature (via [**Sign**] button).

Detailed information about the creation of user certificates and signing can be found in chapter <u>Creating an operator certificate</u> and <u>How are PDF documents signed in APROL?</u>



Certificates from external certification organizations (external certificates) can also be used instead of the operator certificate that is based on the *APROL* root certificate.

10.2.2.2 Can certificates from an external certification authority be used?

Certificates that originate from external certification authorities (free or commercial) can also be used for the digital signatures in **APROL**.

Pre-requisite for this is that these certificates are in the '*.p12' format and are stored in the file system of the *APROL* server (E.g. in the directory /home/<CC-Account>/ENGIN/EXCHANGE/).

They are entered automatically into the certificate list of the web browser, depending on the external certification authority, and must be exported from there to the **APROL** server.

An external certificate can only be imported in the engineering environment (**User management** or **OperatorManager**).

If the external certificate is already in the CAE database (I.e. has been imported), a security query takes place to avoid the unintended overwriting of the existing certificate.

10.2.3 How are certificates for users and operators created?

The following chapter describes the creation of a user certificate in the user management.

The procedure for the creation of an operator certificate is basically the same, and therefore only the differences will be made clear.

10.2.3.1 Creating a user certificate

A user certificate is created in the 'User management / Master data tab'.

The 'Signing is possible' checkbox specifies if the selected user is allowed to sign a document with an existing certificate.

Then, the buttons for creating and managing the certificate are made sensitive.

The mandatory fields of the certificate creation are checked with the respective validators to see if the entries are missing or incomplete.

	Stammdaten	Rechte-Verwaltung			
aprol Engineer	Benutzer-Login	Schulte			
Guest	Vorname:	Karl			Account ist aktiviert
Schulte	Nachname	Schulte			LDAP Lokale Authentifizierung zulassen
Service Startup	Passwort				
<template_a< td=""><td>Passwort wiederholen:</td><td></td><td></td><td>LDAP Passwort Policy <udap default<="" server="" td=""></udap></td></template_a<>	Passwort wiederholen:			LDAP Passwort Policy <udap default<="" server="" td=""></udap>	
<template_e <template_g< td=""><td></td><td></td><td>200</td><td>210</td><td></td></template_g<></template_e 			200	210	
<template_s .<="" td=""><td></td><td>Firmendaten setzen</td><td>Engineering Partner Dater</td><td>setzen</td><td></td></template_s>		Firmendaten setzen	Engineering Partner Dater	setzen	
	Firma				
	Abteilung:	Engineer			
	Straße	B&R Straße 1			
	Postleitzahl	5142		Stadt	Eggelsberg
	Bundesland	Oberösterreich		Land:	Costerreich
	Telefonnummer.	+43 (0)7748 6586-0		E-Mail:	office@br-automation.com
	Beschreibung	Benutzer auf Basis des	Templates "Engineers"		
	Zertifikat	V Signianung arlaubt			
	Zertifikat	X Signierung erlaubt	7. diduct consistent	Zastificat IZaabaa	Taddlat innadiana Taddlat anadian
		Zertifikat erzeugen	Zertifikat anzeigen	Zertifikat löschen	Zertifikat importieren Zertifikat exportieren
	Zertifikat. Browser:		Zertifikat anzeigen	Zertifikat löschen	Zertifikat importieren Zertifikat exportieren
		Zertifikat erzeugen			Zertifikat importieren Zertifikat exportieren

Illustration 125: Mandatory fields for the creation of a user certificate

After all necessary entries have been made, the same-named dialog can be opened with the [**Create certificate**] button, which is now sensitive.

Enter the validity period for the certificate and allocate a certificate password. The certificate password that is entered here is only used for the digital signing of PDF documents. The password should **not** be the password of the **APROL** user because of security purposes.

Confirm the entries with [Create certificate]. The created certificate is then displayed.

User Login /	Naster data	Rights administ	ration					
aprol Engineer Guest	User login:	aprol				Account is activated		
Schulte	First name: Surname Password:	Aprol				LDAP: Enable local authentication		
Service		Standard Create certificate - CaeManager (engin@docsrv1)						
<pre><template_admini <template_engine<="" pre=""></template_admini></pre>	Repeat password	•••••	Create a personal o	ertificate in order to :	sign APROL reports	using PDF format	<ldap default="" server=""></ldap>	
<template_guests></template_guests>		Set company	Common Name:	aprol (Standard, Apr	rol)			
stemplate_betweex	Company:	Bernecker + Ra	Company:		Industrie-Elektronik	Ges.m.b.H		
	Department. Street Zip code: State:	Demecker + Na	Department	Engineer				
			Country:	Austria				
		Engineer	State:	Oberösterreich				
		B&R Straße 1	City: E-Mail:	5142 Eggelsberg office@br-automation.com				
		5142						
		Oberösterreich					•	
	Telephone number:	+43 (0)7748 658	Validity:	28 07/02/2018		1826 🗘 Days m		
	Description:	049: Bent er 2	Password: Repeat password:					
	Certificate:	× Certification p	3 ate Show	Create certificate	Delete certificate	Cancel	Export certificate	
	Browser.	Firefox		•				
	Idle time:	🗌 Use idle time	0					
Help	0				Save	ок	Cancel	

Illustration 126: Input of validity period and password

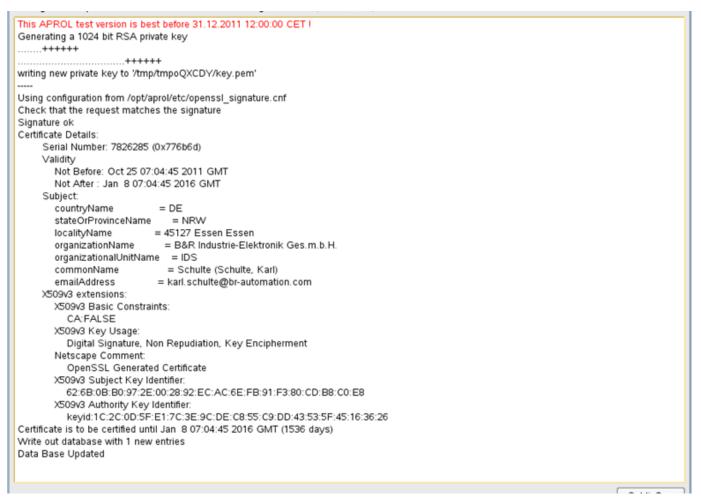


Illustration 127: Display of the created user certificate

The following functionalities can be used after a user certificate has been created:

	Standard	🔽 🖸 Show certificate - CaeManager (engin@docsrv1) 2 🗖 🗕	
Password:	•••••	Show personal certificate of Login: aprol (Standard, Aprol)	
Repeat password:	•••••	Mac verify error: invalid password?	_
Company:	Set company data Set engineeri Bernecker + Rainer Industrie-Elektronik	TKAC vertiled OK subjects = DE state/of/rowinceName = NRVW localityName = 45127 Essen Essen	
Department.	Engineer	notBetereiOct 25 09 07 55 2011 GMT notAfteriuJan 8 09:07 55 2016 GMT	
Street:	B&R Straße 1		
Zip code:	5142		
State:	Oberd 🚰 💿 Password for certificate		
Felephone number:	+43 (C Please enter the certificate pass		
		SWU	
Description:	049:	1	
Description:	049: <u>K</u>	<u>C</u> ancel	lose
Description: Certificate:			lose
	Certification pennitted		
Certificate:	Certification personted Create certificate Show cert Firefox		



Delete certificate:

Show certificate:

An existing user certificate is deleted after the confirmation of an additional security query.



Import certificate:

The import of certificates makes it possible to adopt certificates which have a secret password. It is thus not necessary that a central certification authority of an engineering user must be made with the certificate password being specified.

If a certificate has already been created for the user that is logged in, a security query takes place to avoid the unintended overwriting of the existing certificate.



Export certificate:

An existing user certificate can be exported to the file system of the engineering server in '*.p12' format.

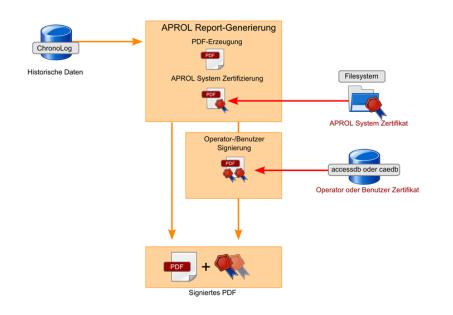
10.2.3.2 Creating an operator certificate

An operator certificate is created in the 'OperatorManager / Master data tab'.

In addition to the user certificates, the default validity period for operator certificates can be preset in the 'Project properties', in the 'Runtime (1/2)' tab. The settings made there do not influence the validity of any existing operator certificates.

The procedure **in the engineering environment** is the same as the before mentioned procedure for creating user certificates.

Information about creating operator certificates in the runtime system and the return to the engineering environment can be found in chapter <u>How is it possible to create an</u> operator certificate on a running system and make it available for signing?



10.2.4 How are PDF documents signed in APROL?

Illustration 128: Schematic representation of the signature creation in APROL

10.2.5 Which inputs are necessary for the creation of a signature?

By making a personal signature, the person signing confirms that they have taken notice of the content. A special reason for the signature (E.g. 'Authorization') can also be made in the 'Reason' field.

The 'Sign documents and reports' form can be opened in all **APROL** reports via the 'Sign Document' toolbar button.

Specify if this is with a user or operator certificate by selecting the respective radio button.

Enter the user / operator name, the certificate password, the reason, and the location into the form.



The corresponding master data is faded in automatically after the user / operator name and certificate password have been entered, and the [**Apply**] button has been pressed.

Eile Edn V	gattantrol reported iew Higtory <u>B</u> ookmado	s Iools Help		
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Ball			ChangeControl report	
-	n n n n n	🖥 💷 🔍 🗾 🕤 28.01 2014 00 0		
-		🖲 🖸 APROL System Diagnostics	Manager - Mozilla Firefox 📃 🛙	
*		Attps://tcmmredu01.brautomation.com/	01/diagnose/index.php?signui+https%3A%2F%2Ftcmmredu01_b+automation_com%2F001%2Fchangecontrol%2Findex.clt%3Ftram%3D28	12.2
TargetControl sport Time 👻 🔺	Type .	APROL Control Computer: temps redu01 (temps Created at: 04/28/2014 14/59/19	Reports - Sign Documents and English to every service of the servi	
		MRS_Test ·	Sign Documents and Reports	
28.04.2014	✓ Project	Documentation Beports	Select certificate Select year personal certificate.	meeng
13:55:09	User management	Runtime Reports Interactive Reports System & Self-diagnosis repo	Certificate: Use certificate from Operator account Project: Mile Stat Convertion Conver	. mmeng
13.52.03	Uper management	Sign Documents	Certificate:	miseng
1342:41	Project	Project navigation APROL systems (local)	E-Mat	miseng
10:32:08	Jul Lbmy	* SAPROL SDM	Organization:	
10:32:06	Lbmy	1	Location	miseng
10:32:06	Libmy		Federal state: Country:	miseng
10:32:06	Libmy		Reason for signing	mmeng
25.04.2014	Library		Peason:	mseng
5.04.2014	√Lbmy		Ø Visible signature in PDF document on first page Plocing: Top right 0 (DIN A4 0) (Landscape 0) (10 0 pt 0)	mmeng
10:31:19	Jubany		✓ Sign 04/28/2014	miseng
	Download		Location Date Name	- mneng

Illustration 129: Necessary input for the creation of a digital signature.

If all of the necessary information has been specified, the creation of the digital signature can be carried out via the [**Sign**] button.

APROL ontrol Computer: tomrsredu01 [tomrs Irealed at: 04/28/2014 14:59:19	aredu01_HWJ - tomrare	Reports - Sign Docur du01.br-automation.com	ments	Perfection in Automation
MRS_Test v	Sign Documents a			
Runtime Reports Interactive Reports	Certificate: Engineering system:	Use certificate from Engineering account	nt	
 System & Self-diagnosis repo Sign Documents 	Engineering user:	Schulte		Load certificate
 Project navigation APROL systems (local) 	Certificate: Common na	Service (Service, Harry		
APROL SDM	E-Mait Organization Unit: Location:	karl.scschuite@br-automation.com Bernecker + Rainer Industrie-Elektron TestCenter 45127 Essen Essen	ak Gesm.b.H	
	Federal state Country:	P: NRW Germany		
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	Visible s	ignature in PDF document on first p		pt 0
	✓ Sign 45127 Esse		04/28/2014	Schulte (Schulte, Karl)
	Location		Date	Name

Illustration 130: Creation of a digital signature

The PDF document is then created, with the APROL system certificate and the personal signature of the selected user / operator, on the server which was contacted.

J

The position for displaying the signature can be set with the 'Visible signature on the first page...' checkbox.

The setting of the page orientation (portrait / landscape) must be set to the orientation in the source document, i.e. the PDF being signed.

The orientation in the **APROL** reports is 'landscape' per default.

The PDF document is then transferred to the browser, which starts the *Adobe Reader* in order to display it.

Edit View Decument Tools Window Help											
isateReps											
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				-							-
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Signatures											1000
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- Valdare Al	Changed	Control-F	Report, generie	rt Wednesd	ay, 26.10.2011 16:	09:22		Reason: Genehr Location: 45127	niat	MESE	
R Certified by APROL System	Von: 12.1	0.2011 00:	00:00 bis: 31.12.3	3947 23:59:59	.999999 auf APROI	L-Server: otte		Edeadon. 45127	Essen		_
Only commenting, form fill-in, s Valid certified Document	Zeit	Benutzer	Kontext	Name	Projektierungsteil	Aktion	Version	Versionskommentar	System	Server	Display
Changes have been made to Signature is valid, but revoc	26.10.2011 15:45:00	Schulte	Benutzerverwaltung		User /Schulte /	Benutzer geändert	0	ilobale Rechte ge	engin	otte	deesse125.br- automation.com
Signature date/time are from	26.10.2011 14:40:23	aprol	Benutzerverwaltung		User /aprol /	Benutzer geändert			engin	otte	deesse125.br- automation.com
Last Checked: 2011.10.26.15.01 Field: Signature1 (invisible sign	26.10.2011 14:40:23	aprol	Benutzerverwaltung		User /Schulte /	Benutzer geändert			engin	otte	deesse126.br- automation.com
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Last Checked: 2011.10.26 15:09 Field: Signature2 on page 1	25.10.2011 08:47:06	aprol	Benutzervorwaltung		User /aprol /	Benutzer geändert	0	liobale Rechte ge	engin	otte	deesse126.br- automation.com
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	20.10.2011 13:43:44	Admin	Benutzerverwaltung		User /aprol /	Benutzer geändert	0	llobale Rechte ge	engin	otte	otte:0
	20.10.2011 13:41:20	Admin	Benutzerverwaltung		User /aprol /	Benutzer geändert			engin	otte	otte:0
	19.10.2011 14:14:19	Admin	Projekt	SamplesProject		Projektierungsteil generiert			engin	otte	otte:0
	19.10.2011 14:13:51	Admin	Projekt	SamplesProject	Hardware /ControlComputer	Projektierungsteil kompiliert	V1.57		engin	otto	otte:0
	12.10.2011.00	100100 - 31.12.3 (0m 0a)	947 23:59:59.999999	Erzeugt am Erzeugt auf	26.10.2011 16:09:22	Report	ChangeCortes	i-Report	Seite: 1 von: 2		

Illustration 131: Display of the signed PDF document in the Adobe Reader

The person that has signed must check the content of the document at this point. The document must then be saved to the file system; otherwise there will be no backup copy of the document.

The validity of the certificate signature and the signature is explained in further example.

Bearbeiten Anzeige Fenster Hilfe		
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Zertifiziert durch APROL System, Zertifikat ausgestellt von	APROL Root CA. Unterschrieben und alle Unterschriften sind gültig.	
Unterschriften	•	
8.	Alle prüfen	
🗉 🤶 Zertifiziert von APROL System		
Nur Kommentare, Ausfüllen von Formularen, Ur	nterschreiben und Hinzufügen von Seiten erlaubt.	
Gültige Dokument-Zertifizierung:		
An diesem Dokument wurden Änderungen v	orgenommen, die vom Zertifikataussteller bestätigt wurden.	Alarm-Report, ge
Identität des Unterzeichners ist gültig.		Alarm-Report, ge
Die Uhrzeit der Signatur stammt von der Uhr	r des Computers vom Signierer.	Von: 28.10.2011 00:
Unterschriftsinformationen		Ereignis-Begir
Grund: System-Signatur mit dem APROL-Zer	tifikat.	
Ort:		💧 🎗 🖾 28.10.2011 09:
Zertifikatdetails		
Zuletzt geprüft: 2011.10.28 11:59:38 +02'00'		▲ \$ \$ 28.10.2011 09:
Feld: Signature1 (Unsichtbare Unterschrift)		
	e (Service, Stefan) <office@br-automation.com></office@br-automation.com>	👜 🎖 💋 28.10.2011 09:
Unterschrift ist gültig:		
Dokument wurde nach dem Unterschreiben		
	errung der Identität des Unterzeichners nicht geprüft werden.	Filter Einstellungen:
Die Uhrzeit der Signatur stammt von der Uhr Unterschriftsinformationen	r des Computers vom Signierer.	Gruppe:
Grund: Gehnemigt		Priorităt:
Ort: 5142 Eggelsberg		Alias:
Zertifikatdetails		Text:
Zuletzt geprüft: 2011.10.28 11:59:39 +02'00'		
Feld: Signature2 auf Seite 1		
Klicken Sie, um diese Version anzuzeigen.		

Illustration 132: Validity of the certificate signature and the signature

The standard directory '/home/<CC-Account>/<RUNTIME | ENGIN>/REPORTS/' is suggested for saving the signed PDF file.

10.2.6 What is the difference between certifying and signing in Adobe Reader?

The most digital signatures are authorization signatures. Signatures that certify an Adobe PDF document are called certification signatures. Only the first signee of a PDF document (normally the author) can insert a certification signature. A certification signature confirms the content of the document. Additionally, it allows the signee to specify the changes that are allowed for the document in the scope of the certification. Changes to the document are shown in the 'Signature' window.

Source: http://help.adobe.com

Implementation in **APROL**:

The certification signature is made by the **APROL** system (via 'System certificate'). (Confirmation of the content, author is the **APROL** system).

The original state is ensured with the certificate signature.

The personal authorization signature is made by the user / operator by using the user / operator certificate.

The original state after approval is ensured with the approval signature. The identity of the person signing can also be verified.

10.2.7 How can an operator certificate be created retrospectively?

An operator certificate can be created during runtime if the creation of an operator password in an engineering environment is not desired because of security or secrecy reasons. It is thus possible to create a certificate in which only the respective operator knows the password.

In the same way, the certificate can be renewed with a new password when a certificate password has been spied out.

Changing the password of a certificate is only possible by creating the certificate again!

Use the following procedure to create a personal certificate for an operator on a running system and make it available for signing:

Step:	Description
1	Create a new operator certificate in the runtime environment. If the OperatorManager was started in the runtime environment, the new certificate
	will be saved in the '*.p12' format in the file system.
2	The certificate must be transferred to the file system of the engineering server (eventually via external medium) in the directory /home/ <cc- Account>/ENGIN/EXCHANGE/, for example.</cc-
3	On the engineering server, the new certificate must be imported to the CAE database with the OperatorManager.
4	It is adopted automatically in the database for web access ('access' database) during the build process.
5	The certificate is distributed to all operator stations and the logging server with a download.

10.2.8 When is a signature displayed as being valid by the Adobe Reader

The signatures on an **APROL** server are marked as 'valid' per default, as the **APROL** root certificate is entered into the list of trusted certificates during the **APROL** installation.

An overview of the valid certificates in the *Adobe Reader* can be found via the **'Document / Manage Trusted Identities'** menu item.

All of the certificates in the *Adobe Reader* (including the validity period) are listed after selecting the **'Display / Certificates'** entry.

The **APROL** root certificate (APROL Root CA) is present in the list.

You can find detailed information about the **APROL** root certificate via the [Show Certificate] button.

isiCirateReps	Sign Security Security	Settings	:		8 Per .						
Centied by	Manage	Trusted [dentities.		ои	anage Trusted Identities			- *	2		Signature Pari
Cennes by		Accessibility <u>B</u> ead sility <u>Q</u> uick Check	ing Options	Digplay	Contacts Centricates						Signatur Par
	Accessibility Sepup Assistant. ChangeControl-Report, gen Von: 24.10.2011 00:00:00 bis: 3			Name Issuei TC TrustCenter CA B PN 12R-CA 1 PN DigiRistar Qualified CA Kinfo@diginotar.nD DigiRistar Root CA Kinfo DigiRistar Platinum CA - G2 SvesSian Platinum CA		Issuer	Add Contacts	1	chrieben von Schulte (Schulte		
81 1921						DigiNotar Root CA <infc< td=""><td>Bequest Contact</td><td colspan="2">the a</td><td colspan="2">).27 12:17:08 MESZ ehmigt 27 Essen</td></infc<>	Bequest Contact	the a).27 12:17:08 MESZ ehmigt 27 Essen	
1				122	Entrust	Entrust	Edit Trust	1			
	Zeit	Benutzer	Konte		Entruit	Entrust	Export		Server	Display	
	26.10.2011 15:45:00	Schulte	Benutzerven	ES .	🔯 QueVadis Root CA 3 🔯 QueVadis Root Certification Authority	QueVadis Reet CA3	Delete		otte	deesse126.br- automation.com:2	
	26.10.2011 14:40:23	aprol	Benutzerver		Entrust net Certification Authority (2048) Federal Common Policy CA APROL Root CA <into@brautamation.com)< td=""><td>Entrust.net Certification Federal Common Policy</td><td>NewGinus</td><td></td><td>otte</td><td>deesse126.br- automation.com:2</td><td></td></into@brautamation.com)<>	Entrust.net Certification Federal Common Policy	NewGinus		otte	deesse126.br- automation.com:2	
	26.10.2011 14:40:23	aprol	Benutzerver	1	N RUL REELLA CIMEREN AUTOMATION COM				otte	deesse126.br- automation.com:2	
	26.10.2011 13:57:35	aprol	OperatorMar		Help	-	Show Certificate Close		otte	deesse126.br- automation.com:2	

Illustration 133: Display of the valid certificates in the Adobe Reader

The **APROL** root certificate can be imported into a non-**APROL** server in the following manner:

Step:	Description
1	Transfer the APROL root certificate from the APROL server (from the /opt/aprol/etc/ca.crt directory) to an external medium. Copy the root certificate to the non- APROL server.
2	All of the following steps are to be carried out in the Adobe Reader on the non-APROL server. Edit the trusted identities. Menu (Adobe 10): 'Edit / Protection / Manage Trusted Identities'.

Step:	Description
3	Image: Control of the second of the secon
	28.10.2011 000000 - 28.10.2011 24.00.00 Erzeugt wn: 28.10.2011 156.46 Report: Alarm Report: Selfe: 1 Util 0 fb 0m Erzeugt wn: Serkod@coe voi: 1 Impact: MILLESTRATION 1344 Selfe: 1 voi: 1 Illustration 134 Select the 'Certificate' entry in 'Display'. Confirm with the [Add Contact] button. Select the 'Approl L'root certificate.

Step:	Description	
4	Zu importierende Kontakte auswählen In diesem Dialogfeld können Sie die Kontakte auswählen, die in Ihre vertrauenswürdigen Identitäten importiert werden sollen. Sie können auch die Vertrauenswürdigkeit für beliebige Zertifikate festlegen, die den importierten Kontakten zugeordnet sind. Kontakte	3
	Name E-Mail Entfernen	
	APROL Root CA info@br-automation.com Durchsuchen	
	Suchen	
	Zertifikate In dieser Liste werden die Zertifikate angezeigt, die dem derzeit ausgewählten Kontakt zugeordnet sind.	
	Antragsteller Aussteller Ablaufdatum Details APROL Root CA <info@< td=""> APROL Root CA <info@< td=""> 08.01.2016 09:32:43 Vertrauenswürdigkeit</info@<></info@<>	
	Hilfe Importieren Abbrechen	
	Illustration 135	
	Confirm with the [Trusted] button.	

Step:	Description
5	Kontakteinstellungen importieren
	∠Zertifikatdetails
	Thema: APROL Root CA <info@br-automation.com></info@br-automation.com>
	Aussteller: APROL Root CA <info@br-automation.com></info@br-automation.com>
	Verwendung : Nicht angegeben
	Ablaufdatum: 08.01.2016 09:32:43
	Vertrauenswürdigkeit
	Zur erfolgreichen Signaturprüfung muss ein zum Signieren von Dokumenten verwendetes Zertifikat als Vertrauensanker festgelegt werden oder mit einem Vertrauensanker verkettet sein. Für einen Vertrauensanker wird keine Sperrungsüberprüfung des Zertifikats durchgeführt.
	Dieses Zertifikat als vertrauenswürdigen Stamm verwenden
	Bei Unterschriftsvalidierung gilt dieses Zertifikat für folgenden Zweck als
	vertrauenswürdig:
	Unterschriebene Dokumente oder Daten
	Zertifizierte Dokumente
	Dynamischer Inhalt
	Eingebettete JavaScripts mit hoher Berechtigungsstufe Privilegierte Systemvorgänge (Netzwerk, Drucken, Dateizugriff
	usw.)
	Zertifikatdetails
	Hilfe OK Abbrechen
	Illustration 136
	Activate the following checkboxes: 'Use this certificate as trustworthy root' and
	'Certified Document' . Confirm the entry with [OK].

Step:	Description								
	Zu importierende Kor	ntakte auswählen				X			
			uswählen, die in Ihre vertrau eit für beliebige Zertifikate fe:						
	Name		E-Mail		Entfernen	J			
	APROL Root CA		info@br-automation.com		Durchsuchen]			
					Suchen]			
	Zertifikate In dieser Liste werden die Zertifikate angezeigt, die dem derzeit ausgewählten Kontakt zugeordnet sind.								
	Antragsteller	Aussteller	Ablaufdatur	n	Details	1			
	APROL Root CA <in< th=""><th></th><th>CA <info@ 08.01.2016<="" th=""><th></th><th>Decails</th><th></th></info@></th></in<>		CA <info@ 08.01.2016<="" th=""><th></th><th>Decails</th><th></th></info@>		Decails				
					Vertrauenswürdigkeit	J			
	Hilfe			[Importieren Abbreche	n.			
	Illustration 137								
	Import the contact ([Import] button).								
		it ([import] bu							
	Vertrauenswürdige	ldentitäten verw	valten			X			
	Anzeige: Zertifikate			~					
	Name	Aussteller	Ablaufdatum	🔼 🦳 к	iontakte hinzufügen				
	Entrust	Entrust	2013 06 14 22-10			_			
	Entrust	Import abgesch	lossen		t anfordern				
	Dr. Karl Älltinger								
	DigiNotar Qualifi	Importdetails:							
	DEUCSCHE TEIER	1 Ausstellerzerti	fikat(e) importiert.		rdigkeit bearbeiten.	•••			
	DFN-CERT Servi				ortieren				
	Common Policy				öschen				
	Christof Kordus								
	CAcert WoT Us			ОК					
	Adobe Root CA				e Gruppe				
					Zertifikat anzeigen				
	Hilfe				Schließen				
	Illustration 138								
	The import proce	ss is now finic	shed						
		55 15 HOW HINS							

Step:	Description						
8	Vertrauenswürdige Ident	titäten verwalten					
	Anzeige: Zertifikate		~				
		ssteller Ablaufdatum	Kontakte hinzufügen				
		rust 2019.09.09 14:57 ROL Root CA <i< td=""> 2012.07.19 09:25 iNotar Root CA 2025.04.21 17:18</i<>	Kontakt anfordern				
		utsche Telekom 2019.07.09 23:59 utsche Telekom 2019.06.30 23:59	Vertrauenswürdigkeit <u>b</u> earbeiten				
	Common Policy Com	nmon Policy 2010.10.06 18:53 nmon Policy 2027.10.15 16:08	Exportieren				
	Christof Kordus APR		Löschen				
	Adobe Root CA Ado	be Root CA 2023.01.09 00:07					
	APROL Root CA APR		✓ Neue Gruppe				
			Zertifikat <u>a</u> nzeigen				
	Hilfe		<u>S</u> chließen				
	Illustration 139						
	The APROL root ce	ertificate is now in the list of	trusted certificates.				

10.2.9 Can certificates be declared invalid?

In the case of the self-created user and operator certificates, it is not possible to withdraw by creating and distributing a list for blocking certificates (English: **C**ertificate **R**evocation **L**ist, Abbr.: CRL).

10.2.10 What do I do when the password for a user / operator certificate is known by a third-party?

If a user's or operator's password has been spied out by a third-party, a new user or operator password must be created and made available via the method already described.

10.2.11 How safe is the APROL signature?

The APROL signature is a so-called 'Advanced electronic signature' (An electronic signature that allows the possibility of checking the authenticity and originality of the data that is signed by it).

Features of an 'Advanced electronic signature':



Protects the signed document from changes

Uses signature keys

Is linked to the key owner

It is not a 'Qualified electronic signature'

The presence of the private key on all operator stations and the logging server limits the security of the signature. Thus, the access to the *APROL* servers must be made restrictively.

10.2.12 How do I sign with a private certificate (present on an external medium)?

There is the basic possibility to use an external certificate, which is not in the **APROL** CAE database but on an **external** medium, for example. It must be in 'P12' format.

For this purpose, select 'Use of a local certificate file' from the 'Certificate' drop-down list in the 'Sign documents and reports' form and press the [Select certificate] button.



The local certificate will only be used to sign the current document and will not be saved permanently!

https://tomisredu01.br-automation.com/0)01/diagnose/	index php?	signurl=https%3A%2F%2Ftcmrsredu01.bi	automation.com%2F001%2Fchangecontiol	62Findex.clt1	63Ffrom%3D28.0	1.2014
PROL atrol Computer: tomrsredu01 [tomrs ated at: 04/28/2014 14:59:19	redu01_HW	/] - tomrsre	Reports - Sign Doct du01.br-automation.com	uments	illi Er Pertecti	ng lish	B
MRS_Test +	Sign Doc	uments a	and Reports				
Doc umentation	Se Se	lect certif	licate				
Reports			rsonal certificate.				
📋 Runtime Reports	Ce	rtificate:	Use local certificate from filesystem				0
Interactive Reports	Ce	rtificate file:	Select certificate file				
茨 System & Self-diagnosis repo	A Ce	rtificate:					
Sign Documents	_	Common na	me;				
Project navigation	E	E-Mait	😟 🖸 File Upload				
APROL systems (local)	c	Organizati		=			
APROL SDM		Jnit:	< 📷 miseng 🔯 Deski	top			
APROL SUM	L	ocation:					
	F	ederal st	Orte		✓ Größe	Letzte Änderur	ng
	0	Country:	Suchen Quetzt verwendet	AprolShowDocumentation.desktop	1,9 KB	02.01.2014	=
	Reason for Reason:		miseng	AprolStartCaeManager.desktop	1,4 KB 1,6 KB	02.01.2014	
		Desktop	AproiStanDownloadManager.desktop	1,5 KB	02.01.2014	-	
		Dateisystem	AprolStartOperatorManager.desktop	1,6 KB	02.01.2014		
		Visible		and and and and a second second	1.4.40	00.01.0014	
		lacing:	affa Hinzutügen			All File	s 0
	🖌 Vi	gn			D Öffnen	Abbre	chen
	4	5127 Es			Innen	Tople	
	Lo	cation		Cate Hanes			
						S	ign

Illustration 140: Use of a 'local certificate'

10.2.13 How do I configure the time stamp server?

In order to be able to adopt a certified time stamp when creating an approval certificate, the 'Use an external time stamp server' option must be selected in the project properties ('Runtime 1/2' tab).

tammdaten	Engineering-Partner	Bibliotheken	Engineering (1/2)	Engineering (2/2)	Lokalisierung	Download	Kommunikations-	Parameter	/ Runtime (1/2)	Rent
Alarm- Trend-I SFC-R	CS-Reports Report Report		og Profi-Report spezifische Reports sport	APROL EnM Conk	Zeitste npel-Se TSA-URL TSA-Benutzer SA-Passwort TSA-Passwort TSA-Policy (O	river (TSA) Eiş -Wiederholung	http://zeitstempel	l dfn de	er (en 2 – 0	ensc PPo
	atur von PDF-Reports	ator-Zertifikate	Gültigkeitsdauer -	5 Dahre		(Ōĸ		Abbrechen	

Illustration 141: Setting of the time stamp server in the project properties

Example for a (free) time stamp server:

URL:http://Zeitstempel.dfn.de/

Procedure:

A query is sent from the **APROL** server to the configured URL at the time of creating the signature, and contains the hash value of the document. The time stamp server detects the actual time, signs the time and hash value of the document, and sends this signature back together with its certificate. The signature and certificate are written together in the PDF document.

The time stamp server uses its own certificate to sign the time stamp. This must be confirmed as being trustworthy one time when opening the PDF document with the *Adobe Reader*. As a result, time stamps from this time server will be marked as trustworthy in all further documents.

A

If a time stamp server is being used, then it must be ensured that the configured time stamp server can be reached via HTTP from the **APROL** server where the signature was created. Otherwise the personal approval signature will not be created! The document then only contains the **APROL** system signature with the time stamp of the **APROL** server where the signature was created.

Input field:	Short description:	Default value:
TSA-URL	URL with which the time stamp server can be reached.	'http://zeitstempel.dfn.de' Neither authentication nor the specification of a TSA policy is necessary for this provider.
TSA user	User name for authentication on the time stamp server. This field should only be filled out when the provider of the time stamp server requires authentication.	no entry

The parameters of the used time stamp server are entered in the dialog:

Input field:	Short description:	Default value:
TSA password	Password for authentication on the time stamp server. This field should only be filled out when the provider of the time stamp server requires authentication.	no entry
TSA password repetition	Password repetition for authentication on the time stamp server. This field should only be filled out when the provider of the time stamp server requires authentication.	no entry
TSA policy (OID)	Optional specification of a Policy Object ID which is sent with the request to the time stamp server. This field should only be filled out when the provider of the time stamp server requires this. The necessary value is supplied by the provider.	no entry

11 TranslationManager

The **TranslationManager** offers you optimal support in translating efficiently and comfortably. With this tool, which is integrated into **APROL**, you create translations for the visualization, for the alarm system, and for the APROL system software.

Detailed information about the **localization of XLS and CLT files** (for reports) can be found in chapter <u>Translating xsl and clt files</u>.

Detailed information about the **localization of KDE menus** can be found in chapter <u>Translating KDE menus for APROL</u>.

Detailed information about **inputting Chinese characters** can be found in chapter <u>Tools for entering Chinese characters</u>.

Detailed information about the **language switching** and **the GNU gettext mechanism** can be found in chapter <u>Detailed information about language switching</u>.

Detailed information about **language switching via gettext in the Python API** can be found in manual <u>'D2 System API', chapter Localization with gettext in the Python API</u>.

Use the **TranslationManager** for translations and profit from automatic plausibility checks, and a high degree of consistency in the translations of the respective target language. This provides you with the professional creation of international text.

The **TranslationManager** saves you navigating manually to the necessary PO files, as also the time-consuming generation and installation of the MO files. These actions are automatically carried out with a click of the button, whereby the corresponding context (e.g. alarm text or visualization text) is taken into account.

The simple handling, as well as many supporting details, makes the **TranslationManager** an indispensible tool for creating translations in **APROL**.

You will especially regard the following highlights in practice:

- clear list view of the PO entries
 - quick, uniform translation of identical source strings in different PO files (high consistency)
 - Display of translation suggestions
- Group translations

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- Error recognition and marking
- functional support with searching, replacement, sorting, amongst others
- Evaluation of translations made / to be done
- direct generation and installation of the translations
- simple import / export in CSV format for editing in OpenOffice or Excel
- quick division of the translations to several translation teams via import / export

The following demonstration shows how quick and easy the translation of alarm text is carried out:

1. In an opened project in the CaeManager, choose "Extras/Translate alarm text".

2. Carry out the desired translations, whereby you can directly accept the translation suggestions that are made.

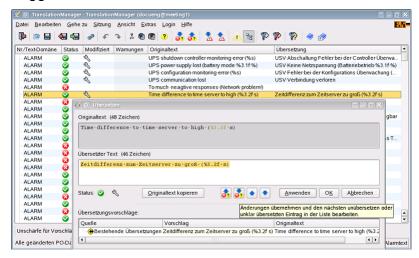


Illustration 142: Translating

3. Generate and install the MO files using the toolbar, or with "Edit/Generate and install the translations".

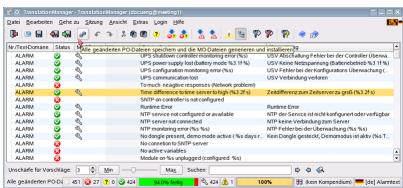


Illustration 143: Generate and install the MO files

The translated alarm text is available after the control computer task has been built, and a download to the target system.

11.1 Launching the TranslationManager

In order to start the **TranslationManager** you need the "TranslationManager: Start" user right.

To be able to use the context oriented launching of the **TranslationManager** for alarm and visualization text, the 'Prepare translation of alarm and visualization text' runtime option must be set in the project properties / 'Localization' tab. You can choose the desired target language, for which the corresponding PO files are created, in the respective combo box.

roject	nam	16:	SamplesProject					
Mast	er da	ata	Engineering part	ner	Libraries	Engineering (1/2)	Engineering (2/2)	Localization
Localization of the alarm text and visualization text contained in the project								
Prepare alarm text and visualisation text translation								
			Language]			
	1	×	😹 English (US)					
	2		🚘 Russian	***				
	3		🗮 Dutch					
	4		🚺 French					
	5		翼 Spanish					
	6		🗮 Hungarian					
	7		🚺 Italian					
	8		🚺 Romanian					
	9		🚝 Danish					
	10		Swadich	-	J			
Se	cond	lan	guage for the loggin	g of I	nistorical alaı	m data		
1.2	naus		😹 English (US) 🔹	-				

Illustration 144: Prepare project specific translations of the alarm and visualization text

Depending upon the area of application, you can start the **TranslationManager** separately or directly out of the **CaeManager**, for example to translate visualization text for a certain project.

The TranslationManager can be used in the following context:

- alarm: Localization of alarm text (This context is solely available in the engineering environment).
- visualization: Localization of visualization text (This context is solely available in the engineering environment).
- **aproltr**: **APROL** translation environment for localizing the **APROL** system software (provided with the installation of the **APROL** translation developer package from the Language DVD)

The context is automatically detected when the **TranslationManager** is started. You also have the possibility,

- to choose a certain context for the start of the application (see command line level), and

- to change the context in the **TranslationManager** ('**New session**' or '**Load session**' in the '**Session**' menu).

The status line informs you, amongst others, about the current context and the set target language.

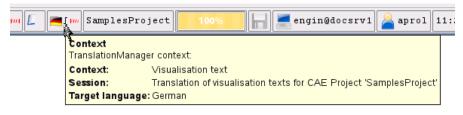


Illustration 145: Context display with tool tip in the status line

By stating the context, the necessary processes for generating and installing the MO files are defined.

You can start the **TranslationManager** in the following ways:

1. 'Extras' menu in the CaeManager

You can start the **TranslationManager** in context directly out of the **CaeManager**, where the corresponding PO files are automatically loaded.

In an open CAE library you call up the **TranslationManager**, to translate visualization text from this library, with "**Extras/Translated visualization text**".

In an open project, you can load both visualization text and alarm text for translation with the "Extras" menu.



Further notes about the translation from visualization and alarm text can be found in chapter <u>Translation with the TranslationManager</u>.

2. KDE menu

Furthermore, you can start the translation tool manually via "Language/TranslationManager" in the KDE menu. Thereby, the PO files are automatically opened. Apart from that you can open it in context with 'Session / New session' or 'Session / Load session', or you can selectively load PO files with 'File / Open'.



Detailed information about translation sessions can be found in chapter <u>Translation</u> <u>sessions</u>.

3. Command line level

You can also start the **TranslationManager** from the command line. In this manner, this translation tool is also available to you in the runtime environment.

Please use the TranslationManager command to start the application, or the AprolStartTranslationManager command.

You can tailor the start behavior to meet your needs with additional launching options, and control the automatic loading of certain PO files/compendiums. Amongst others, the following launching options are available to you for the **TranslationManager**:

Option	Description
-compendium <file name=""></file>	Reference to the compendium that should be loaded at the start of the application. Example: TranslationManager -compendium /home/ <cc- Account>/ENGIN/PROJECTS/<project name="">.pgp/po/ de/<file name="">_po_Compendium</file></project></cc-

Option	Description
-context <alarm visualisation aproltr></alarm visualisation aproltr>	 With this option, all of the necessary files for this context are automatically loaded, meaning for the Context alarm: ALARM.po from the set language in the project properties Context visualization: VISU.po from the set language in the project properties Context aproltr: all of the PO files concerning the language environment, e.g. in /home/aproltr/TRANSLATE/fr/ A project must always be stated when using the alarm and visualization context. The target language and path of the PO files are detected automatically using the project and the context. The -file option can be used to explicitly load PO files in the context of aproltr.
-file <po file=""></po>	TranslationManager -context alarm -project Demoprojekt With this option, one PO file is loaded after the start of the application. If several files should be loaded, use a wildcard filter or the -filelist option. When using wildcards, the path/file name must be within quotation marks. Example: TranslationManager -file
	"/home/engin2/ENGIN/PROJECTS/Demoprojekt.pgp/ po/fr/AL*.po"
-filelist " <po file1;="" file2;="" po="">"</po>	With this option, several PO files are loaded after the start of the application. The list of files must be placed within quotation marks, the file names must be separated by a semi-colon. The -filelist option is ignored when using the -context option.
-import <csv file=""></csv>	With this option, a CSV file is imported after the start of the application. Example: TranslationManager -import /home/engin2/tmp/alarm1.csv
-openall	This option loads all PO files in the current directory and up to two directories deeper. This allows quick access to all relevant PO files. The search depth can be changed with the -scandepth option.
-opensession	This option opens a saved session with the respective PO files. The session files are searched for in the ENGIN/cnf/TranslationManager/user directory.

Option	Description
-project <project name=""></project>	With this option, a project is chosen after the start of the application. The query dialog for the choice of the project can be suppressed when using the -context option in combination with the -project option.
-scandepth	This option defines the search depth for the -openall option.

11.2 Basic functionalities

11.2.1 Translation sessions

A translation session is a user specific composition of files, which are necessary for the translation in the **TranslationManager**. It contains

- a list of PO files
- a certain context (alarm, visualization, aproltr)
- an optional compendium.

A session can be saved and loaded again at a later stage ("**Session**" menu). Thus, specific editing of certain PO files is accelerated and simplified.

In the context "Translation of the alarm text" for example, the PO file is loaded with respect to the chosen project and the chosen target language in the project properties.

You configure the session with "Session/Session options."

🖉 🔍 Session Settings 📀 🗧	
Settings Compendium	
Translation Session	
Descriptive name of this translation session:	
Target Language	
Target Language for this Session: 😹 English (US)	-
PO/POT-Files	
Base directory for PO/POT-files:	
List of PO/POT-files or wildcard filter for PO/POT-files relative to base direct	ctory:
<u>OK</u> <u>C</u> ancel	

Illustration 146: Session options

Enter a description for this session in the *Settings* tab. This description is available in the context display tool tip of the status line (see chapter <u>Opening the TranslationManager</u>). Here, you can also save the directory path to the necessary PO files, and the names of the files that are to be used. In the context of the alarm text, the chosen project is also displayed.

The automatic display of translation suggestions accelerates the translation work and simultaneously increases the consistency of the translations. An external compendium can be optionally linked. For this purpose choose a compendium file for this session in the *Compendium* tab. This compendium then gives you additional translation suggestions.

11.2.2 Compendiums

A further increase in efficiency and higher consistency of translations can be met with the use of compendiums. These can be loaded with the 'Session / Session Options / 'Compendium' tab' menu.

11.2.3 CSV import / export

The loaded PO files can be exported into a CSV (CSV=comma separated values) file for editing with external tools (e.g. Excel). The exported data can be quickly divided, for example, and made available to different translation teams. After the editing has taken place, the data can be imported.

The "**Export**" and "**Import**" functions are available in the "**File**" menu. Change to the desired directory in the dialog that opens, and enter the name of the CSV file to be saved, or choose a CSV file to be imported. The /home/<CC-Account>/ directory is opened per default for the import/export.



When exporting and subsequently importing, all of the additional information contained in the PO file, such as header and format information (e.g. #, python), etc. are lost. Only the "fuzzy" status is exported and reset with the import. Apart from that a standard header is used for the import.

The CSV file is built according to the following scheme:

"<Text domain>","<Status>","<Ambiguity>","<Original text>", "<Translation>"

The following values are possible for the translation status:

- 1: translated
- 2: un-clear (fuzzy)
- 3: not translated

The character set for the CSV file is Unicode (UTF-8). Commas are used as field separators.

If the PO file which was exported is loaded during the import, then an attempt is made to ascribe or import the changes that have been made in the translations to the loaded PO file. If an original text from the CSV file is found in the text domain that is loaded, then this translation is replaced by the CSV file. The entry is marked as modified with the following symbol when the translation has been changed with the variation from the CSV file.

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Illustration 125

11.3 Translation with the TranslationManager

With the **TranslationManager**, you can create quick and comfortable translations for visualization text, alarm text, as well as for the **APROL** system software. The creation of the necessary PO files is based on the Linux gettext mechanism.

In preparation, please activate the "Prepare translation of the alarm and visualization text" option for the respective project in the project properties, *Runtime options* tab. You also set the desired target language for the translation there (see chapter <u>Launching the TranslationManager</u>).

From a project, you call up the **TranslationManager** in context with the "**Extras**" menu (e.g. "**Translate alarm text**"). The necessary files for the set target language are automatically detected and loaded.

From an open CAE library, you can start the **TranslationManager** for translations of this library's visualization text. For this purpose choose "**Translate visualization text**" in the "**Extras**" menu and select the desired target language for the translation in the subsequent dialog.

🖢 🖸 Choose language - CaeMana	ger (engin@docsrv1)					
Choose language						
Choose a target language for the tra	Inslation of the texts dis	played in the visualisation.				
Target language:	English (US)					
ſ	ок	Cancel				

Illustration 147: Choice of the target language in the context of a CAE library

The TranslationManager shows you the file name with the source/target strings in the "Nr./Text domain" column, whereby a tool tip delivers additional information about the directory path.

A library with the following path/file name is created per default for the visualization text:

/home/<CC-Account>/ENGIN/LIBRARIES/<CAE library name>/po/<Local code>/<Library name>_VISU.po

Menu item	Description
"File/Open"	Loading PO files
"File/Import"	Loading CSV files
"Session/Load session"	Loading a saved composition of files (PO files and eventually compendiums)
"Session/Load compendium"	Loading a compendium

In order to remove an open text domain from the **TranslationManager**, please select one of the domain's entries and choose "**Remove file**". In this way, this text domain (e.g. ALARM.po) is removed with all of its entries.

You can switch between the tree view and the flat view with "View/Tree structure" or with the toolbar. In order to increase the clarity, several text domains with the same original text are grouped together in a branch that can be expanded in the tree view. By editing the root element (n domains), the mass translation of all sub text domains is possible.

🗎 🖬 📑 🖪		€ 4		10	60	🖒 🧿 💑 🎄 🤽 🏦 🛣 🐨 🕰 🔂	2 2
Text domain 🦯	Nr.	State	Amb.	Mod.	Warn	Original text	Translation
2 Domains		22	2			Hostname	Host name
- libraium	3	0	2			Hostname	Host name
VISU		0	2			Hostname	Host name
2 Domains		22	2			State	State
2 Domains		21	2			8	&
2 Domains		21	2			A	A
2 Domains		21	2			AUTO	AUTO
2 Domains			2			Alarm(s) locked	
2 Domains		Q 1	2			All inputs	All Inputs
② 2 Domains		01	2			CLOSE	CLOSE
2 Domains		01	2			Configuration Error	Configuration error
2 Domains		01	2			E	E
② 2 Domains		01	2			EXT	EXT

Illustration 148: Text domains in the tree view

In the flat view for example, the context specific sorting of multiple original text (e.g. sorting according to ALARM.po, VISU.po) is also possible. The multiple occurrence of the same original text is marked in the tool tip, and in the "Ambiguity" column.

11.3.1 Status information

The intuitive operation of the **TranslationManager** is additionally supported by clear symbols. You get an instant overview of the current state of the translation both in the "Status" column, and in the status line of the application. This affects the status of the individual translations and the status of all of the loaded text domains in total.

11.3.2 Editing the PO files

By double-clicking on the desired line, this entry is opened in the "Translate" dialog.

It is not necessary to close this dialog to be able to edit other original text in the opened "Translate" dialog. You can load the desired text in the open dialog with the buttons within the dialog, and with the many navigation possibilities in the main window.

Original text: (8 characters)			
1 Hostname			
ranslated text: (9 characters	;)		
1 Host name			
state: 🧭		Copy original text	🚓 歳 🔭 Apply OK Canc
		Copy original text	
uggested translations:	Distance		
uggested translations: Source	Distance	∠ Suggestion	Original text
uggested translations: Source 	0	Suggestion Host name	Original text Hostname
uggested translations: Source CExisting translations		∠ Suggestion	Original text
tate: ⊘ uggested translations: Source ⊖ ⊕Existing translations → alternative → alternative → alternative	0	/ Suggestion Host name Host name	Original text Hostname Hostname

Illustration 149: Working in the "Translate" dialog

The actual status of the translation is displayed to you with the symbols mentioned before.

If you want to use the original text as basis for the translation, please press [**Copy original text**]. You can directly confirm the copied text, or edit it in the "Translated text" field.

The consistency of the translation can be considerably raised with the use of translation suggestions. The translation suggestions are shown from all of the original text in the open files (PO and compendium), which correspond or are similar to the chosen text. You can limit the

number of translation suggestions shown with the Fuzziness for suggestion field (in the main window of the **TranslationManager**). You do not have to close the "Translate" dialog to do this. The change in fuzziness has an immediate effect on the suggestion display.

😑 🖬 🦻 🍽	n View Extra Login Help	ð 🤋 💑 á	6 <u>1 1</u> 7 +				Ban
Text domain / Nr.	🖉 💽 Translate						7 2 2 0 8
3 2 Domains							
libra ium 3	Original text: (5 characters)						
- VISU	1 State						
2 Domains							
libra ium 4							
VISU							
2 Domains 2 Domains							
e 2 Domains e 2 Domains	Translated text. (5 characters)						
2 Domains 2 Domains	1 State						1
2 Domains							
2 Domains							
2 Domains							
2 Domains 2 Domains 2 Domains 2 Domains			[Manual And and a second se				1
 2 Domains 2 Domains 	State: 🥝		Copy original text	* *	3 3 2 2	Apply	OK Cancel
2 Domains 2 Domains 2 Domains 2 Domains 100ra ium 18	State: 🥥 Suggested translations:		Copy original text	••	3 3 1 2	Apply	OK Cancel
2 Domains 2 Domains 2 Domains 2 Domains 10bralum 18 VISU		Distance	Copy original text		Original text	Apply	OK Cancel
2 Domains 2 Domains 2 Domains 2 Domains 2 Domains 10braum 18 VISU 2 Domains	Suggested translations: Source	0	/ Suggestio State		Original text State	Apply	
2 Domains 2 Domains 2 Domains 2 Domains 1000 1000 1000 1000 1000 1000 1000 10	Suggested translations: Source	0	/ Suggestio State State		Original text State State	Apply	
2 Domains 2 Domains 2 Domains 2 Domains 1bra_ium 18 VISU 2 Domains 2 Domains 2 Domains 2 Domains 2 Domains	Suggested translations: Source	0	Suggestio State State State State		Original text State State State	Apply	^
2 Domains 2 Domains 2 Domains 2 Domains 2 Domains W1SU 2 Domains 2 Domains 2 Domains 2 Domains	Suggested translations: Source	0	Suggestio State State State USTATE		Original text State State State USTATE	Apply	^
2 Domains 2 Domains 2 Domains 2 Domains 2 Domains 10 ra. Jum 18 V/SU 2 Domains 2 Domains 2 Domains 2 Domains 10 ra. Jum 22	Suggested translations: Source	0	Suggestio State State State State		Original text State State State	Apply	
2 Domains 2 Domains 2 Domains 2 Domains 2 Domains 107a_ium 18 ViSU 2 Domains 2 Domains 2 Domains 2 Domains 2 Domains	Suggested translations: Source	0	Suggestio State State State USTATE		Original text State State USTATE Taste	Appiy	^
2 Domains 2 Domains 2 Domains 2 Domains libraium 2 Domains 2 Domains 2 Domains 2 Domains 2 Domains 1 Domains 1 Biraium 1 ViSU	Suggested translations: Source	0	Suggestio State State State USTATE		Original text State State USTATE Taste	Apply	^
2 Domains 2 Domains 2 Domains 1 Domains 1 Ibra. Ium 2 Domains 2 Domains 2 Domains 2 Domains 2 Domains 1 Ibra. Ium 22 Domains 2 Domains 2 Domains	Suggested translations: Source Source Statemative Statemative Existing translations Existing translations	0	✓ Suggestio State State USTATE Button	on .	Original text State State USTATE Taste	Apply	^

Illustration 150: Limitation of the translation suggestions with the fuzziness

The suggested text is shown directly as the translation by selecting a translation suggestion, which in turn can be applied as it is, or edited.

You adopt the translation displayed with [Apply]. The dialog is additionally closed with [OK].

Modified entries are marked with the following icon:

Z

Illustration 151

The changes are only adopted permanently when the file is saved ("**Save all**", "**Save as**", or "**Save all as**" in the "**File**" menu).

11.3.2.1 Navigation

After translating an original text you can navigate quickly and specifically to further entries. For this purpose please use the '**Go to**' menu, or the respective buttons in the main window, or directly in the 'Translate' dialog.

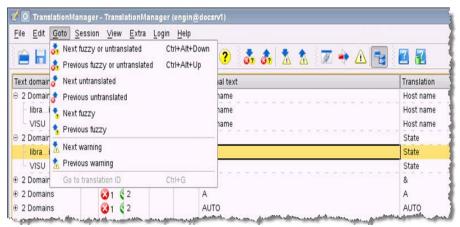


Illustration 152: Quick navigation to the desired entry

11.3.2.2 Sorting

A further aid for the specific translation of original text is the sort function. By clicking the column heading, all of the entries are sorted according to that column (e.g. according to status or original text).

11.3.2.3 Find / Replace

Both searching for original text and/or translations, and the replacement within translations is possible in the **TranslationManager**. For this purpose please choose "**Search**" or "**Search and replace**" in the "**Edit**" menu.

librariendium	7		Video file
librariendium	8	õ 🔰 🗹 🗹	Search ?
librariendium	68	😮 🕞 Sea	arch
librariendium	78	😮 💦	arch text
librariendium	79	2	
librariendium	80	😮 🛛 🔤	arm
librariendium	81	8	
librariendium	82	😮 – Sea	arch options
librariendium	83	😮 🛛 🗙	Search in original text Beware of case sensitivity
librariendium	88		
librariendium	94	😮 👘 🎽	Search in translation 🕱 Ignore keyboard acclerators
librariendium	95	2	Start at current item
librariendium	96	8	Search backwards Fuzzy search: 2
librariendium	99	8	
librariendium	100	8	Search Close
librariendium	102	8	
librariendium	103	8	SFCTip \nd ist derzeit deaktiviert.\n\n
librariendium	104	8	SFCTipMode \d ist derzeit deaktiviert.\n\n
librariendium	119	3	Alarm 1 Max
Search: alarm			C Fuzzyness for suggestions: 2 🗘 Min
APROL R 3.9-0110		m 🐼 2 m 🥐 m 🔇 21	49.3% done 💦 🔊 🎢 🖓 🖛 🖓 🗰 🗐 🚛 [100% 📗 📄

Δ

If you want to carry out a fuzzy search, then please set this in the search options in the "Search" dialog. The fuzziness for the translation suggestions is not taken into account in the search. In this way it is possible to tailor both the search and the suggestions without one overwriting the others settings. An activated fuzzy search is signalized by a yellow background in the input field.

You can comfortably fine-tune the search with the options in this dialog.

In the "Search and replace" dialog you can also tailor the search for translations, and apply replacements selectively or globally to the places found.

The original texts are also saved in the CAE database (library or project). Because only the translations are edited in the PO files, and not the source of the original text, searching and replacing is solely possible in the translations.

11.3.2.4 Syntax checks

In order to increase the precision of the translations, the **TranslationManager** supports you with an automatic syntax check. In this manner you are not only made aware of

- surplus blanks at the beginning or

- deviant punctuation marks at the end of a translation

but also for example of a changed order of C arguments.

Illustration 153: Text search

Syntax errors are signalized in the "Translate" dialog in the following way:

Illustration 154

You obtain detailed information in the tool tip.

You can also show these detailed information for the selected entry in the main window of the **TranslationManager**. You can hide or show the syntax warnings with "**View/Show warnings**".

11.3.3 Visualization text

You can translate visualization texts in the engineering system into another target language, and make them available to the display in the runtime system. Translated visualization texts are shown in the **DisplayCenter** in the translated language at runtime. Thereby, the following entries from language switching are taken into account:

- in libraries:
- \checkmark Default values on the input pins of a graphic block
- V Text in graphic blocks
- Constants in the configuration dialog of the widgets
- Static tool tips in the graphic blocks
- Strings within the Python code of a graphic block
- Oynamization type "Text list"
- in projects:
- V Text in the process graphic
- Graphic blocks in CFCs and hyper macros
- \checkmark Constants in the widget configuration dialog in process graphics

Detailed information about **language switching via gettext in the Python API** can be found in manual <u>'D2 System API', chapter Localization with gettext in the Python API</u>.

During a 'Build all (Project)', the compendium /home/<CC-Account>/ENGIN/PROJECTS/<Project name>.pgp/po/<Local Code>/libraries_compendium.po is created from the translations in the linked CAE libraries, and offers you translation suggestions for the CAE project.

Translations that have been made for the CAE libraries automatically flow into the CAE project when graphic blocks are used from the CAE libraries that have already been translated. Thus, translations should always be made first in the context of the CAE libraries.

You can carry out changes and extensions of the translations within the context of the project. These changes are not ascribed to the CAE libraries.

You carry out the localization in the visualization in the following manner:

1. Start the **TranslationManager** from a library's context via **'Extras / Translate Visualization Text'** and choose the target language.

[?]

J

A "Build (Library)" must be carried out in the CAE library after having activated the option for the first time, or after having changed the target language, in order to create the respective PO file.

2. Do the translation (see chapter *Editing the PO files*) and save the PO file

3. Change into the project and choose the target language in the project properties (see chapter *Launching the TranslationManager*)

4. Carry out a "Build all (Hardware)" for the control computer to

- create the PO files for the configured target language

- create the "libraries_compendium.po" compendium from the PO files of the libraries used

in directory /home/<CC-Account>/ENGIN/PROJECTS/<Project name>.pgp/po/<Local code>/

5. Start the TranslationManager via "Extras/Translate visualization text" and create the translations

6. "Edit/Generate and install the translations"

7. Download to the target systems



Further information about this can be found in the manual "B3 CAE Library Engineering", chapter <u>Localization of the visualization</u>.

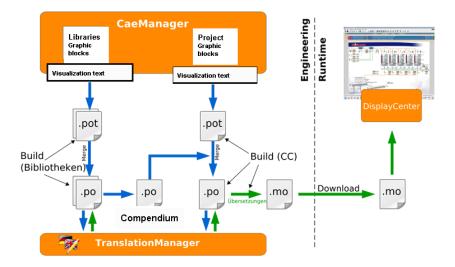


Illustration 155: Schematic sequence of the localization of the visualization

11.3.4 Alarm texts

Projected constant text in the alarm blocks (AprCcAlarm, AprCcAlarmBasic) can be translated into an alternative language during the project engineering. These translated texts are displayed and recorded in the runtime system at runtime.

The following alarm data are subject to the language switching:



I/O constants on the alarm block instances' TEXT input (alarm text to be shown)

I/O constants on the alarm block instances' ALIAS input (description for the message system)

The alarm bocks that are placed both in the CFC and in the hyper macros are taken into account.

31100033 0010	rol function block		Instance	Testalarm				Max. inst	ance length non
ame AprC	CcAlarm	Open	Instance description	049:-					
escription Bloc	k to configure messa	ge system with parameter							
brary APR	OL		Operator note						
scription APR	OL standard blocks								
roup Alarr	m		Link to operator note	1					
escription Obse	ervation blocks for Pr	ocess Control System	Task 🦄	System1@A	APRO	L SYSTEM 01			
Mar all	• •• ••			Modificatio	on filte				
1946 - 1941 - 1944 - 1945 - 19	Carolando,	Value Start-Up Value Process varia	ible IEC-Type Pintype	_	on filte Unit	er, all	Minimum	Maximum	Source (Opera
Group / Param	neter / Instance Testalarm	Value Start-Up Value Process varia	BOOL	e l	21	Description Alarm signal mocess variable		Maximum	Source (Opera
Group / Param	reter / Instance Testalarm Testalarm	Value Start-Up Value Process varia Rising edge (1)	BOOL AlarmTriggerVal	e L	21	Description Alarm signal mocess variabl Defines alarm signal level		Maximum	Source (Opera
Group / Param	neter / Instance Testalarm Testalarm Testalarm	Value Start-Up Value Process varia Rising edge (1) %Alarm, mandatory :==nowledgement	BOOL AlarmTriggerVal AlarmMode (INT	e L lue (BOOL)	Unit	Description Alarm signal ##ocess variabl Defines alarm signal level Defines the tyr## of notificatio		Maximum	Source (Opera
Group / Param	neter / Instance Testalarm Testalarm Testalarm Testalarm	Value Start-Up Value Process varia Rising edge (1) %Alarm, mandatory winowledgement 0	t (3) BOOL AlarmTriggerVal AlarmMode (INT AlarmPrio (INT)	e lue (BOOL)	Unit	Description Alarm signal ##ocess variabl Defines alarm signal level Defines the tyree of notificatio Specify priority number		Maximum	Source (Opera
Group / Param	neter / Instance Testalarm Testalarm Testalarm Testalarm Testalarm	Value Start-Up Value Process varia Rising edge (1) % Alarm, mandatory +=nowledgement 0 % TEST ALARM III ==13 % 3t Wert 4	t (3) BOOL AlarmTriggerVal AlarmMode (INT AlarmPrio (INT) \$ %.41 AlarmText (LSTR	e Lue (BOOL) I)	Unit	Description Alarm signal invocess variabl Defines alarm signal level Defines the tyme of notificatio Specify priority number Shown alarmtext		Maximum	Source (Opera
Group / Param	neter / Instance Testalarm Testalarm Testalarm Testalarm Testalarm Testalarm	Value Start-Up Value Process varia Rising edge (1) %Alarm, mandatory winowledgement 0	BOOL AlarmTriggerVal AlarmMode (INT AlarmPrio (INT) 5,41 AlarmText (LSTR hung) AlarmGroup (LS	e L lue (BOOL) I)	Unit	Description Alarm signal evecess variabl Defines alarm signal level Defines the tyree of notificatio Specify priority number Shown alarmtext Groupname feelints of design		Maximum	Source (Opera
Group / Param	neter / Instance Testalarm Testalarm Testalarm Testalarm Testalarm Testalarm	Value Start-Up Value Process varia Rising edge (1) % Alarm, mandatory i=nowledgemeni 0 % STEST ALARM III i=n2 % 31. Wet 4 % SYSTEM (049. Gn=stemüberwach	BOOL AlarmTriggerVal AlarmPrio (NT AlarmPrio (NT) S.41 AlarmText (LSTF Nung) AlarmGroup (LS ProcessGraphic	e L lue (BOOL) I)	Unit	Description Alarm signal invocess variabl Defines alarm signal level Defines the tyrne of notification Specify priority number Shown alarmtext Groupname fimits of design Specify process picture		Maximum	Source (Opera
Group / Param	neter / Instance Testalarm Testalarm Testalarm Testalarm Testalarm Testalarm	Value Start-Up Value Process varia Rising edge (1) % Alarm, mandatory i=nowledgemeni 0 % STEST ALARM III i=n2 % 31. Wet 4 % SYSTEM (049. Gn=stemüberwach	BOOL AlarmTriggerVal AlarmMode (INT AlarmPrio (INT) 5,41 AlarmText (LSTR hung) AlarmGroup (LS	e L lue (BOOL) I)	Unit	Description Alarm signal evecess variabl Defines alarm signal level Defines the tyree of notificatio Specify priority number Shown alarmtext Groupname feelints of design		Maximum	

Illustration 156: Configuration of the I/O constants in the placed instance of an alarm block



Naturally only constant text and its translation can be taken into account during the language switching. Dynamically generated alarm text is not subject to the language localization.

The localization of the alarm data is carried out in the following steps:

1. One-time configuration of the target language in the project properties (see chapter <u>Launching</u> <u>the TranslationManager</u>)

A "**Build (Hardware)**" for the control computer must be carried out in the CAE project after having activated the option for the first time, or after having changed the target language, in order to create the respective PO file.

2. Start the **TranslationManager** via "**Extras/Translate alarm text**", and creation of the translation (see chapter <u>Editing the PO files</u>)

- 3. "Edit/Generate and install the translations"
- 4. Download to the target systems

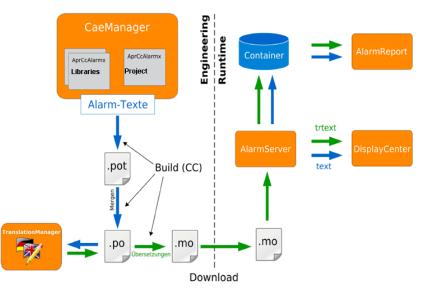


Illustration 157: Localization of the alarm text workflow

In the runtime system the alarm text is recorded by the AlarmServer in the projected language and (when present) in the translated language. The translated language must correspond to the configured target language in the Project properties/Runtime options. Under these conditions, the AlarmServer provides the projected and the translated text to both the **DisplayCenter** and the **AlarmReport**. The display of these texts depends on the language of the runtime application that is started.

Which language is set for the **DisplayCenter**, or the **AlarmReport**, is detected during runtime. The display of the data takes place after the following evaluation:

set language	set language
=	≠
translations target language	translations target language
 Display in the translated language (Fallback to the projected language in case of missing translation) Display of the projected text in the tool tip 	 Display in the projected language Display of the translated text (if available) in too tip

🖬 🧿 DisplayCenter (docurun@meeting1)			
Datei Ansicht Gehe zu Alarme Werkzeuge	Login <u>H</u> ilfe		
🐌 🌢 🔩 🍇 🍕 🔹 🔹 🛔 Ganze S	ieite 🔹 🛃 📕 🗮 👔	🖬 🖪 🚱 🗏 🛤 🍄 🌮 🏘 🔶	
Alarme: 21 Nicht Q	uittiert: 20 Gesperrt: 0 F	ILTER: Zeit [Gruppe: 0,BuR,Computers,Server,SysMonCtri0	[@ ₽ ×
5 -> 16.07.2008 14:01:46.868 CEST	0 10.49.80.97 QP NICHT QUITTIERT	Application failure (state: 0) SysMonCtrl02 PV: FPC0	2_Ct02cpu_li
	0 10.49.80.130 QP NICHT QUITTIERT		1_Ct01cpu_l
	0 Meeting1 QP NICHT QUITTIERT		ess mismatch C_CC01Hw_U
	0 Meeting1 QP NICHT QUITTIERT	Zu wenig freier Arbeitsspeicher (17060 kByte) Server Freememon too law (17060 kByte) PV: FPCC	C_CC01Hw_M
5 -> 16.07.2008 14:01:46.465 CEST	0 Meeting1 QP NICHT QUITTIERT	Keinen Dongle gesteerte, bernornstater 17050 kByte) Kein Dongle gesteerte, bernornstater 17050 kByte) Server PV: FPCC	rs, 32 min, 36 C_CC01Hw_D
	0 docsrv1 QP NICHT QUITTIERT		_OP01Hw_M
5 -> 16.07.2008 14:01:46.465 CEST	0 Meeting1 QP NICHT QUITTIERT	Die Demozeit ist fast abgelaufen	0

Illustration 158: Display of the translated alarm text in the DisplayCenter (original text in tool tip)

The projected text and also the translated text (if available) are shown in the alarm properties. In order to show the alarm properties choose "**Properties**" in the shortcut menu of the alarm event.

In the **AlarmReport**, you can manually control the display of the original and translated text with CGI parameters in the URL. For this purpose the following parameters are available:

Parameter	Description
usetr=y	 Display in the translated language (Fallback to the projected language in case of missing translation) Display of the projected text in the tool tip
usetr=n	 Display in the projected language Display of the translated text (if available) in too tip
checktr=y	 Display in the projected and translated language Display is "blank" when the translation does not exist!

le Edit ⊻iew Higtory Bo] Alarm-Report-Alarm Liste	4		-					
🕸 📓 https://docswyc.bo	-automation.com/PROJECTS/SamplesProject/04	9/standard/alam/index.clt?lang+0	001_project=Sampi	esProject,flags=101,L	stView=contex_checktr=y			· •
		7a 30a 50a 1h 34h	7d 30d 500				000	
	Priorität: 0 - 2 2 2 4 Alarmlisten-Filter: Alarm und Meldanger		sten-Ansicht: iste _▲					
	*							
	Ereignis-Beginn 🔫 📥	Ereignis-Ende	Dauer 🌱 🌥	Priorităt 🐨 🛋	PV/ Alias	Alarmtext 🖛 🛋	Gruppe 🐨 🛎	🕹 Projekt 🐨 🖉
								SamplesProject
	🋦 🕴 🗙 03/22/2013 11:35:24.616	Anstehend	-		Projektiert: CTBL TB © Übersetzung (001): fehit!	Projektiert: Controller life signal lost Übersetzung (001): fehit!	SYSTEM	SamplesProject
	▲ ! 🗙 03/22/2013 11:35:22.615	03/22/2013 11:35:24.216	0m 1.601s	.⊀0	Projektiert: CTRL TR PrÜbersetzung (001): fehitt	Projektiert: Controller life signal lost Übersetzung (001): fehit!	SYSTEM	SamplesProject
	🏔 🕴 🗙 03/22/2013 11:35:20.614	03/22/2013 11:35:22.215	0m 1.600s		Projektiert: CTRL TR © Übersetzung (001): fehit!	Projektiert: Controller life signal lost Übersetzung (001): fehitt	SYSTEM	SamplesProject
	A 1. X anon marked				Projektiert: CTRL TR	Projektiert: Controller life signal lost		SamplegProject

Illustration 159: Use of the checktr=y parameter

11.3.5 Translation of the APROL system software

In order to optimize the multilingual application of **APROL** even further, you can carry out translations for the text in the graphical user interfaces of the process control system, and integrate it into the software.

In order to localize the **APROL** system software, which is mostly done by translations offices, there is the separate translation environment "aproltr" available. You set up the environment with the Language DVD, whereby a new Linux user with the name "*aproltr*" is created. The directory /home/aproltr/TRANSLATE/ is created for this user, containing further language-dependent sub-directories (de/, en/, fr/, ..). The Language DVD also supplies the language packages for **APROL**.

The following language packets are available to you on the Language DVD:



D1 System Handbuch

\checkmark	Spanish
- V	Czech
- V	Hungarian
V	Norwegian
\sim	Finnish
\checkmark	Turkish
\sim	Lithuanian
\checkmark	Portuguese
\checkmark	Danish
\checkmark	Latvian
\checkmark	Swedish
\checkmark	APROL -Translation-devel package to handle translations for APROL



Please pay attention to chapter <u>Content of the Language DVD</u> and <u>Creation of the translation environment</u>.

12 Language localization

Detailed information about the **localization of languages** in **APROL** and the KDE environment, and also **language switching** can be found in the chapter <u>TranslationManager</u>.

12.1 Installation requirements

The source language of **APROL** for translation is English.

The responsible technical office handles, manages, and passes the translation on to the end customer.

The following packages must be installed:

AutoYaST DVD for Linux:

The following special selections:

APROL AutoYaST Chinese basic system

APROL AutoYaST Russian basic system

APROL installation DVD:

APROL Installation

The following packages must also be installed:



APROL Language for AutoYaST (at least version 3.0-0) DVD with additional packages for foreign language support.

12.2 Contents of the APROL Language DVD

The number of supported languages is being extended constantly (e.g. in **APROL** R 3.6-08 there were 20 languages available on the **APROL** language DVD).



Information about extensions to the localization can be found in the manual 'A1 Release Notes'.

The desired selection can be selected with **YaST** and installed.

Installing the **APROL** Language DVD as well as the "**APROL** AutoYaST Chinese basic system" for Chinese or the "**APROL** AutoYaST Russian basic system" for Russian allows the following:

[?]

- KDE can be switched to the foreign language, and X11 fonts (Xterm output) become available in the foreign language.

- APROL can be switched to the foreign language.

- Language files (po files) can be translated and installed so that the translation results can be checked.

- The language-specific XSL and CLT files can be generated and installed after the po files, which are responsible for the XSL and CLT area (diagnostics, Audit Trail, reports, etc.), have been translated.

Remark:

This two-step procedure is necessary since it's not possible to dynamically switch languages at runtime. Instead, language-specific XSL and CLT files are used.

- An input tool becomes available specifically for entering Chinese characters (Simplified Chinese).



Installing the "**APROL AutoYaST Chinese basic system**" provides the Chinese input tool "**fcitx**".

In a Chinese language environment, however, a different tool – "**xcin**" – is enabled and opened up by default when starting KDE. Please refer to the instructions in the chapter Working with the fcitx tool in order to

enable the '**fcitx**' tool for a given system (Engineering, runtime, operator, translation developer 'aproltr').

12.3 Creating a translation environment

Carry out the following steps to create a translation environment:

Step	Description
1	Install "APROL-Translation-devel".
2	Change to the "/home/aproltr/TRANSLATE/" directory.
3	Run "make newLanguage LANGUAGE= <local name="">".</local>

About step 1:

A new Linux user named "*aproltr*" is created when installing "**APROL**-Translation-devel" with YaST. A "TRANSLATE" subdirectory containing all of the pot language files is generated in this user's home directory. This includes all of the source identifiers.

The POT files have the following contents (example: CaeManager.pot):

... #: CaeManager.cc:219 msgid "&Working area" msgid "" ... The msgid entries show all of the strings or source strings to be translated.

About step 2:

--Switch to the "/home/aproltr/TRANSLATE/" directory.

About step 3: (Example for Dutch)

- Run "make newLanguage LANGUAGE=nl".

The environment for a translation is created under /home/aproltr/TRANSLATE/nl. This is where the blank po files (created from the pot language files) are stored.

12.4 Translation steps

The translation encompasses the following areas:

- 🧹 🛛 po files
 - 🖌 🖌 xsl /clt files
 - Project-specific engineering data

12.4.1 Translating po files

Large parts of language-specific descriptions in the *caedb* are subject to language switching using the *po mechanism*.

The corresponding *po files* are listed in the following:

CAEDB_AprolHwc.po
CAEDB_AprolPnkMod.po
CAEDB_AprolRules.po
CAEDB_AprolSystem.po
CAEDB_UserRights.po
CAEDB_sysinfo.po
CAEDB_Tipps.po

The following steps are necessary to translate po files:

Step	Description
1	Edit po files.
2	Execute " <i>make</i> ".
3	Execute "make install".

About step 1:

All po language files are in Unicode format (**UTF-8**). This is the encoding system that is able to support most international languages. The format is easy to internationalize, and it provides the first opportunity for combining several languages since all of the languages are stored in a single encoding.

Once the po files have been generated, the translation can then be maintained using a suitable editor (e.g. kwrite or kbabel + a Chinese input tool).

The translations are to be entered in msgstr (compare this with chapter <u>Creating a translation</u> <u>environment, Step 1</u>).

Remark:

TRANSLATE presently contains the current B&R-created po files for Chinese and Russian (subdirectory "zh_CN" for Simplified Chinese and "ru" for Russian).

About step 2:

A "make" must be carried out under /home/aproltr/TRANSLATE after the translation has been finished.

This converts all of the po files to binary (stored as GMO files in the PO area as well as an MO file for the local "Installation" under po/LC_MESSAGES).

A check file is also stored in the po area (e.g. zh_CH.check) where all un-translated strings and entries identified as fuzzy are listed.

Fuzzy entries ("unsharp" or imprecise translations) result when a change has been made in the source area (pot file) so that during the "make" (merging the new pot file with the language-specific po file), the translation made is no longer current or it's identified as needing revision.

Fuzzy entries are simply ignored and not put into the GMO or MO files. For this reason, any existing fuzzy entries must be deleted after the translation takes place!

Example:

CaeManager: Translation string "Display/Hide user specific working versions" must be edited!

changecontrol_clt: Translation string "Audit Trail" missing!

About step 3:

These binary files are installed when a "*make install*" is carried out (files stored as mo files under /opt/aprol/share/locale/zh_CN/LC_MESSAGES).

The translation can then be checked.



Restarting applications in order to check the translations is mandatory.

Note about ALT + letter code entries:

ALT + letter codes (shortcuts) are identified by an ampersand "&". The ampersand comes right before the actual shortcut character, as shown in the following example:

msgid "&Close"

msgstr "XXX (&C)" – where "XXX" is the translation.

The ALT + letter character of the source string ("C" in this case should also be entered in the target string in parentheses. This makes it possible for users and operators who are not familiar with the foreign language to still be able to operate **APROL** (In the previous example: closing the application ('**Close**' menu item) by using the [ALT] + [C] keys).

12.4.2 Translating xsl and clt files

(APROL menus: Diagnose and Reports)

Since xsl and clt files do not effect language switching at runtime, but are available in languagespecific form whereby the translations are also given as po files (*_xsl.pi, *_clt.po), the languagespecific xsl and clt files must still be generated with a "make" after these po files are translated. This is illustrated as follows.

The "XSL" and "CLT" subdirectories contain the xsl and clt source files and are located below the "TRANSLATE" directory level. The language-dependent xsl and clt files are generated by patching the source xsl and clt files (PccTr(xxx) entry patched) with the respective translation gotten from the accompanying mo language files.

Example:

/!\

After entering / changing a translation in /home/aproltr/TRANSLATE/zh_CN/systeminfo_xsl.po, a first '*make*' needs to be carried out in this directory.

This generates the systeminfo_xsl.gmo binary data in the current directory and installs it as /home/aproltr/TRANSLATE/zh_CN/LC_MESSAGES/systeminfo_xsl.mo (necessary because the translation is taken from the 'locally' installed language file when generating the accompanying language-specific XSL file).

If a second "make" is then carried out in /home/aproltr/TRANSLATE/, then the language-specific file (./086/systeminfo/systeminfo.xsl) will be generated under /home/aproltr/TRANSLATE/XSL.

A "make clean" must definitely be carried out before the second "make"!

This results from the source file ./systeminfo/systeminfo.xs1 by the respective translation's patching of all Pcctr entries (taken from the mo language file mentioned above).

Excerpt (a line with a language-specific entry) from systeminfo.xsl (source file and language-specific target file):

./systeminfo/systeminfo.xsl:<title><xsl:text>PccTr("System information")</xsl:text></title>

./086/systeminfo/systeminfo.xsl:<title><xsl:text>Chinese translation</xsl:text></title>

A subsequent "make install" in /home/aproltr/TRANSLATE also installs the XSL and CLT areas in addition to the mo language files (/home/aproltr/TRANSLATE/zh_CN/*.gmo is installed as *.mo in /opt/aprol/share/locale/zh_CN):

XSL files in /home/aproltr/TRANSLATE/XSL/086 are installed in /opt/aprol/doc/xsl-sheets/086.

CLT files in /home/aproltr/TRANSLATE/CLT are installed in /opt/aprol/doc/clt/086.

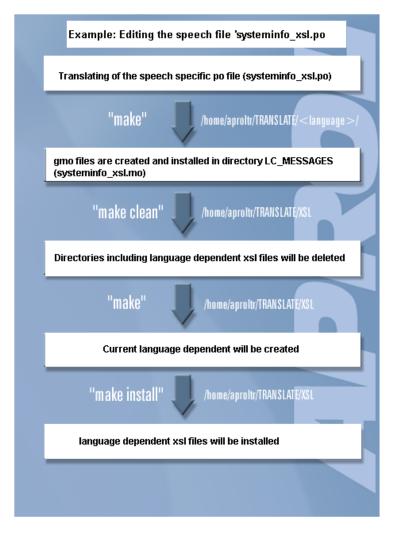


Illustration 160: Overview of the translation mechanism for XSL files

12.4.3 Translating KDE menus for APROL

In Linux 9.3, the **APROL** KDE menu tree is put together using the following files:

/etc/xdg/menus/aprolmain.menu Merging of aprol.menu

Home directory of the Engineering/Runtime/Operator System:

<home-dir>/.config/menus/aprol.menu:

Definition of the **APROL** menu tree in XMS structure

The following are integrated: /opt/aprol/share/desktop-directories/*.directory (definition of the sub-menus in the **APROL** KDE tree) and /opt/aprol/share/applications/*.desktop (definition of the menus in the **APROL** KDE tree).

To translate the **APROL** KDE menu into the desired target language, the desktop files and directory files need to be edited and expanded.

Example: AprolStartOperatorManager.desktop:

KDE Config File

Important: This is an UTF-8 file

and must be edited in an UTF-8 environment. [Desktop Entry] Encoding=UTF-8 GenericName=Starts OperatorManager GenericName[zh_CN]=Starts OperatorManager GenericName[de]=Starts OperatorManager GenericName[en_US]=Starts OperatorManager Name=OperatorManager Name[zh CN]=XXXXXXX Name[de]=OperatorManager Name[en_US]=OperatorManager Exec=AprolStartOperatorManager Icon=/opt/aprol/doc/html/Icons/operatormanager.png Path= Type=Application Terminal=0 TerminalOptions= X-KDE-SubstituteUID=false X-KDE-Username= Categories=X-APROL-ENGIN;X-APROL-RUNTIME To e.g. guarantee Chinese language support (zh_CN), the following entries have to be made: GenericName[zh_CN]=Starts OperatorManager Name[zh_CN]=XXXXXXX

The Chinese name is to be entered under Name[zh_CN] (it appears as a menu entry in the user interface).

not the actual "description" should be entered in GenericName[zh_CN], otherwise **APROL** can only be operated by the users/operators who understand the country's language. The English name (OperatorManager in this case) should be entered instead.

In Linux 8.x, the description (GenericName) appeared as a tool tip. In Linux 9.x, it's a bit different: It can only be made visible if the program bar has been configured so that the description is also displayed, and is then shown in brackets.

Remark: The program bar can be configured so that either only the menu name (Name entry) can be displayed, or the name and the description (GenericName entry) in brackets, or the description can be displayed with the name in brackets (right-click on program bar, Set up program bar, Menus, K-Menu, Menu entry format: Only name, Name (description), Description (name)).

Directory files can be edited and the language-specific entry can be made in the same way.

Example: aprol-print.directory

[Desktop Entry] Icon=/opt/aprol/doc/html/Icons/printer.png Name=Print Name[de]=Druck Name[en_US]=Print Name[zh_CN]=XXX Until now, there has been no mechanism for managing and re-circulating these files. Remark: Working with *kmenuedit* here is quite complicated and isn't being taken into

12.4.4 Translating within the caedb

(project-specific data or B&R libraries)

consideration for that very reason.

It is definitely possible to create translations to the target language within the CaeManager or to export the language-dependent parts of a caedb area in an ASCII file using the "tbio" database tool to make translation in this file more effective with an editor (e.g. kwrite) and then bring it back that way (to the *caedb* and the *APROL* source when using B&R libraries).

B&R libraries (*APROL, DCS, IEC61131, ISO10628, SYSTEM, SYSTEM_RIO,* and *STANDARD*) and the "*SampleTrigRec*" library (examples for using customer-specific logging blocks) **contain language-specific "descriptions" that are stored in special fields in the form** Field
Name><Lang> depending on the type of description (short description, normal description, comment, note, URL entries for HTML help pages, etc.).

<Field Name> describes the type of description (currently: caption, comment, desc, hints, info, introduction, maindesc, reference, rem, restrictions, short, text, url). <Lang> defines the country code (001 for English, 049 for German, 086 for Chinese, etc.). Example: *desc049*.

Exporting and – after the translation is performed – importing using the "*tbio*" database tool is explained using as example with the "*Standard*" library and the target language Chinese (country code 086).

The exact path of the area being exported must be specified for the export function (here: VLVL/STANDARD). In addition, the "-g" option specifies the country code of the target language to be exported.

The *tbio* call looks like this for the export:

tbio -S "" /home/engine/ENGIN/caedb -x '\L\L/STANDARD' -g 086 > caedb_export_libSTANDARD.txt

Remark:

The results of the export are redirected to an ASCII file (*caedb_export_libSTANDARD.txt*). This only contains the language-specific parts of the Standard library as shown in the example below.

If there is already an entry in the target language, it will be output; otherwise an English or German entry will be output (i.e. search order: 001, 049, ..., first hit is output). Each line is commented accordingly when exporting with "*tbio*", as can be seen from the following excerpts:

// desc086: original entry.

```
\L\L/STANDARD\G/Zeitbausteine (
   desc086 = "already existing Chinese translation"
)
// no attribute named "desc001", using "desc049".
\L\L/STANDARD\INTERN\GlobalVar (
   desc086 = "Global variables in the library"
)
// no attribute named "desc001", using "desc049".
\L\L/STANDARD\OS\controller/m68k/V0232 (
   desc086 = "No specific aspects for this OS version in this library."
)
// using "desc001".
\L\L/DCS\B/DcsHmAdj\V3.0\FP-CODE\IB/95 (
   desc086 = "Desired value on locking"
)
```

After the export, **the translation can take place in this ASCII file** (i.e. the English entries which are usually available are translated to the target language).

Re-importing to the caedb database is also done with tbio:

tbio caedb -S localhost -i -m caedb_export_libSTANDARD.txt

The "-*m*" option (merge mode) merges imported translations with existing translations (in the *caedb*); the imported translation overwrites one already present in the *caedb*.



When using a B&R library, the ASCII file must also be put back into the APROL source files.

12.5 Testing the translation

Switching to the "th" test language or country code "099" is only done for testing reasons. For this reason the accompanying language files (/opt/aprol/share/locale/th/*.mo) are delivered with **APROL**. You receive a source identifier (English) which is prefixed with a Unicode special character. If necessary, this checks whether

- An identifier shown in the user interface actually is used after the language switching takes place (Unicode special character must be displayed)

- The display is actually Unicode-capable (character must be correctly displayed).

Internal note: Globally switching to "th" (AprolSelectLanguage 099) is currently not possible. The application must therefore be explicitly started in an xterm with the language specified.

Example: AprolStartCaeManager - languageCode 099

12.6 Tools for entering Chinese characters

There are a number of different input tools available (xcin, scim/skim, fcitx, etc.). These are referred to as "An X Input Method Server for Chinese".

Detailed information to the KDE fonts used:

Name: ttf-arphic-20001125-589

Summary: Chinese TrueType fonts by Arphic Technology (only license in this package)

Example of a font: AR PL KaitiM GB,12,-1,5,50,0,0,0,0,0

Name: ttf-arphic-gkai00mp-20001125-589

Summary: "AR PL KaitiM GB" Chinese TrueType font by Arphic Technology

Name: ttf-founder-simplified-0.20040419-6

Summary: Simplified Chinese TrueType fonts made by Beijing Founder Electronics

Example of a font: FZSongTi,20,-1,5,50,0,0,0,0,0

Detailed information about the X11 fonts used:

rpm package "ifntchia", X11 font for Simplified Chinese (GB2312.1980), in bdf-format (guob16.bdf GB2312 + GB8565-88 by Koichi Yasuoka), can be determined by entering the "xslfonts" command:



These fonts only support the medium setting of xterm!

Known problem: Not all characters are displayed correctly! Please use xiterm instead of xterm (Internationalized Terminal Emulator for X11) so that all Chinese characters are displayed correctly!

12.7 Working with the *fcitx* tool

a) Set up the environment and start fcitx:

export LC_CTYPE="zh_CN.UTF-8"



The "UTF-8" extension is mandatory. Otherwise characters entered e.g. in the DisplayEditor are not saved correctly!

export XMODIFIERS="@im=fcitx"
export XIM=fcitx
export XIM_PROGRAM=fcitx
export GTK_IM_MODULE=fcitx
export QT_IM_MODULE=fcitx

Start fcitx in this environment: The input tool opens up.

Remark:

If this environment should always be active for **aproltr** or activated when KDE starts, then it must be added to one of the scripts that is loaded automatically when the X-Windows system is started (e.g. ~/.xinitrc or ~/.xsession. The "~/.xim" file is the best in SuSE Linux).

Creating the *.xim* file in the home directory with the entries listed above (setting the environment variables for fcitx) now enables "*fcitx*" for the current system.

If the graphic KDE is started in a Chinese language environment for this system, **the "xcin" input tool is no longer started automatically** (otherwise enabled by default), depending on the default setting under /etc/X11/xim.d/xcim.

The 'fcitx' input tool is started manually (e.g. on the command line by entering the command 'fcitx &').



This environment must be able to be configured for the Engineering, Runtime, and Operator systems so that library function blocks can be described in the foreign language with the CaeManager.

Entering Chinese characters

"Ctrl + Space" activates the input tool or opens up the input window for Chinese characters. Pressing "Ctrl + Space" again closes the tool and "normal" input is possible again.

b) Start the TranslationManager (or a KDE editor such as kbabel, kwrite) in the environment set under (a) to edit the PO language files, or start the CaeManager to enter Chinese characters (entering project descriptions, library descriptions, etc.).



The fcitx environment is necessary since this is the only way for the KDE editor to establish a "connection" to the "X Input server" for entering Chinese characters.

Digression:

The **"APROL** search engine" allows you to search the product documentation, the **B&R** hardware documentation, library documentation, and customer-specific project documentation. This search engine is integrated into the **APROL** language switching system and is capable of handling several languages.

The descriptive texts for the **APROL** database listed in the language switching chapter are kept within a Vset (special **APROL**-internal data structure) in a field with the field name descxxx (where xxx stands for the country as the country code) and a corresponding field value.

Translations in the caedb (project-specific data or B&R libraries)

The output language of **APROL** is English. If the environment is started in a different language and translation hasn't taken place yet for it, the places where translations can be made are marked with a blue bar. The entry in the fallback English language is shown within the field with the accompanying country code.

12.8 Detailed information about language switching

The *GNU gettext* mechanism is used to switch languages. The language information is kept in "reference tables" (identifiers in the source language (English) and in the target language). These are files that are stored in the "GNU message catalog" format (.mo file extension).

A separate .mo file is kept for each binary program (application, etc.), shared library, script (Bash, Perl, Python), and product-specific part of the CAE database.

Examples:

CaeManager + corresponding shared libraries: CaeManager-mo, as well as PccCaeExpl.mo PccCaePrj.mo.

CAE database: CAEDB_AprolHwc.mo CAEDB_AprolPnkMod.mo CAEDB_AprolRules.mo CAEDB_AprolSystem.mo CAEDB_UserRights.mo CAEDB_sysinfo.mo CAEDB_Tipps.mo

Scripts: AprolConfig: AprolConfig.mo

XSL and CLT area: *_xsl files

These files are located in the /opt/aprol/share/locale/<Local code>/LC_MESSAGES directory.

They are accessed at runtime (GNU gettext mechanism).

<local code> stands for the 'local code' of the target language (e.g. **en** for English, **de** for German, **zh_CN** for Chinese (Simplified Chinese), etc.).

12.9 Technical notes (internal)

All identifiers that are handled using the .po language mechanism are identified in a special way in the CAE database:

E.g. desc_tr = TR("English identifier"), info_tr=TR("xxx"), etc.

When the CAE database is generated using the .imp files, identifiers indicated in this way are parsed from the imp files with the xgettext tool and applied to the corresponding .pot file.

The actual translation of the text output (e.g. menu or message texts) in an application is done in ASCII files that are identified by the extension ".po". The PO extension stands for "portable object". The files are based on PO templates that have the extension .pot.

These templates are generated automatically when the executable programs or libraries are generated (compiled), and they contain all of the identifiers to be translated from the application's source code. Calling the GNU tool xgettext determines which texts in the source code are intended for language switching and enters them into the POT file belonging to the application.

The POT files thus form the uniform template for all translations that should be generated for the applications. The PO files for the different languages are derived from the POT files.

The appropriate translations are assigned to the application strings in the PO files. An individual PO file is thereby assigned to exactly one language and one application as a reference table.

The machine-readable binary files (with the .mo extension) are generated from the PO files using the "msgfmt" GNU tool. These are files that the application accessed when the language is switched. The task of generating these binary files is taken over from the translator by a "make" script.

The MO files are located in the /opt/aprol/share/locale/<language>/LC_MESSAGES directory after the installation. The identifier <language> provides the code for the selected language.

(e.g. de for German, en for English)

13 Database for parameter management

13.1 General information about the database for parameter management

13.1.1 General information about the database structure

All of the necessary data in the runtime system for parameter management (e.g. for uploading and downloading parameter sets) are stored in the rational SQL database $MySQL^{TM}$.

Please note the special information about licensing in chapter Licensing information.

The basic database concept guarantees a secure distinction between the data created in the **APROL** system (engineering system or runtime system), and the data imported via an open interface.

Thus, a change of internally created data via the SQL interface, or a manipulation of external data in the parameter is suppressed due to security reasons.

The MySQL max server serves as the database management system, which uses tables of the type 'innodb'.

A database with the same name is created for each **APROL** runtime system in the scope of the database management system, in the /var/lib/mysql/ directory.

Each database created contains:



Eight tables for the engineering system's parameter data, as well as the parameter sets created in runtime.



three tables for connection of external systems (labeled with the suffix '_EXT')

The following users are set up for each database per default:

Database user:	Password:
doku_ <name database="" of=""></name>	.doku
ext_ <name database="" of=""></name>	.extern

The assigned passwords can be subsequently changed as follows:

mysqladmin -u <Database user> -p.doku password '<New password>'

The user 'doku_<Name of database>' has read-only access for all of tables in this database. The user 'ext_<Name of database>' is furthermore allowed to insert, change and delete data in the table for external connections.

13.1.2 Description of the table structure

The following conventions apply to the description of the table structure:

Table names are displayed in capital letters and are bold



Primary keys are displayed with bold

Foreign keys are displayed with italics

Note the relationships and dependencies that are displayed in the overview.

DESCRIPTION

D_ID	LangCode	DescText
INT(11)	INT(11)	TEXT
NOT NULL (A)	NOT NULL	NOT NULL

The '**DESCRIPTIONS**' table contains all descriptions of the individual items of equipment, parameters, templates, and parameter sets. The '**D_ID**' field contains a unique identification for the description. In the '**LangCode**' field a numerical country code is used to identify the language of the description text in the 'DescText' field. A certain description in a given language can therefore be queried with the combined primary keys (**D_ID**, **LangCode**).

A reference to the corresponding description is stored in the in the '**D_ID**' field in the tables '**EQUIPMENT**', '**PARAMETER**', '**TEMPLATE**' and '**PARAMSET**'.

EQUIPMENT

E_Instance	E_Name	Deleted	D_ID
VARCHAR(255)	VARCHAR(255)	TINYINT(4)	INT(11)
NOT NULL	NOT NULL	NOT NULL	

The '**EQUIPMENT**' table contains all defined system components. The instance name in the '**E_Instance**' field is used as the primary key. The name of the equipment is stored in the 'E_Name' field. The 'Deleted' field is used internally to mark deleted system components, to which pre-defined templates refer to, and for this reason cannot be deleted.

PARAMETER

P_Name	E_Instance	Data type	Min	Max
VARCHAR(255)	VARCHAR(255)	VARCHAR(30)	TEXT	TEXT
NOT NULL	NOT NULL	NOT NULL		

PARAMETER (continuation)

DefaultValue	Unit	isConst	Deleted	StrictRange	D_ID
TEXT	VARCHAR(30)	TINYINT(4)	BOOL	TINYINT(4)	INT(11)
Not NULL		NOT NULL	NOT NULL	NOT NULL	

The '**PARAMETER**' table contains all defined parameters. The primary key here is the combination of the name of the parameter in the '**P_Name**' filed and the instance name of the

equipment. The 'E_Instance' field is a reference to the same named field in the 'EQUIPMENT' table.

The 'Datatype', 'Min', 'Max', 'DefaultValue' and 'Unit' fields contain the attributes of the parameters, as they were output in engineering. The default value in 'DefaultValue' is stored in the database as a TEXT type in order to offer the greatest flexibility. This value is internally converted by means of the data type in the 'Datatype' field. The 'TINYINT' type flag in the 'isConst' field states if it is a matter of a parameter (isConst = 0) or a system constant (isConst = 1). The 'Deleted' field is used, as by the equipment, to mark parameters that are still referenced as deleted.

The 'StrictRange' field mirrors the 'Strict check of parameter values' option in the project properties.

TEMPLATE

T_Instance	T_Name	modified	AprolUser	D_ID
VARCHAR(255)	VARCHAR(255)	BIGINT(20)	VARCHAR(255)	INT(11)
NOT NULL	NOT NULL	NOT NULL		

TEMPLATE (continuation)

Persist	
TINYINT(4)	
NOT NULL	

The '**TEMPLATE**' table uses the unique instance description of the template in the '**T_Instance**' field for the primary key. The name of the template is stored in the 'T_Name' field. The 'Modified' field contains a UNIX time stamp, which gives the time point of the last change. The name of the **APROL** user that made the last change to the template is stored in the 'AprolUser' field. The 'Persist' flag is only used internally, and marks the template as a remanent data set.

PARAMSET

PS_Name	T_Instance	AprolUser	modified	RO	D_ID
VARCHAR(255) NOT NULL	VARCHAR(255) NOT NULL	VARCHAR(255) NOT NULL	BIGINT(20) NOT NULL	TINYINT (4) NOT NULL	INT(1 1)

PARAMSET (continuation)

Confirmed	
TINYINT(4)	
NOT NULL	

The parameter sets are stored in the '**PARAMSET**' table. A combination of the parameter set name ('PS_Name' field) and the corresponding template instance description.

The 'T_Instance' field is a reference to the same named field in the 'TEMPLATE' table.

The 'Modified' field contains a UNIX time stamp, which gives the time point of the last change. The name of the **APROL** user who made the last change is entered in the 'AprolUser' field. The 'RO' field is used internally to differentiate between parameter sets created in the engineering system (RO = TRUE) and parameter sets created in the runtime system (RO = FALSE).

Parameter sets which have the value of the 'RO' field = 'TRUE' cannot be changed in the runtime system as they are then deleted upon a download from the engineering system, and subsequently newly transferred from the engineering system.

The 'Confirmed' field is not used.

TEMPLATE_PARAMS

T_Instance	P_Name	E_Instance	Fix
VARCHAR(255)	VARCHAR(255)	VARCHAR(255)	TINYINT(4)
NOT NULL	NOT NULL	NOT NULL	NOT NULL

All of the parameters belonging to a template are saved in the '**TEMPLATE_PARAMS**' table. The composition of the templates is defined by references to entries in the '**PARAMETER**' table ('**P_Name**' and '**E_Instance**'), and templates from the '**TEMPLATE**' table (referenced by '**T_Instance**').

The value in the 'Fix' field for the parameter templates is stipulated in the project engineering. If the value of the 'Fix' field = 'TRUE' then the value of this parameter is not allowed to be changed in the runtime system.

PARAMSET_PARAMS

T_Instance	PS_Name	P_Name	E_Instance	Value
VARCHAR(255)	VARCHAR(255)	VARCHAR(255)	VARCHAR(255)	TEXT
NOT NULL	NOT NULL	NOT NULL	NOT NULL	NOT NULL

PARAMSET_PARAMS (continuation)

Fix	
TINYINT	
NOT NULL	

Analog to the '**TEMPLATE_PARAMS**' table, all of the parameters of a parameter set are referenced in the '**PARAMSET_PARAMS**' table.

The '**T_Instance**' and '**PS_Name**' fields refer to exactly one parameter set from the '**PARAMSET**' table. The '**P_Name**' and '**E_Instance**' fields refer to one parameter in the '**PARAMETER**' table.

The 'Value' field contains the value of the parameter within the parameter set.

The value in the 'Fix' field for the parameter templates is stipulated in the project engineering. If the value of the 'Fix' field = 'TRUE' then the value of this parameter is not allowed to be changed in the runtime system.

The parameter sets (created in runtime) from a changed template (in engineering) remain in their original composition by saving a parameter set's parameter once again. Changed template can be marked in the ParameterCenter by comparing the parameter contained in a parameter set with the parameters of the corresponding template.

PARAMSET_EXT

PS_Name	T_Instance	User	modified	D_ID	Confirm ed
VARCHAR(255) NOT NULL	VARCHAR(255) NOT NULL	VARCHAR(25 5)	BIGINT(20) NOT NULL	INT(11)	TINYINT (4) NOT NULL

PARAMSET_PARAMS_EXT

T_Instance	PS_Name	P_Name	E_Instance	Value
VARCHAR(255)	VARCHAR(255)	VARCHAR(255)	VARCHAR(255)	TEXT
NOT NULL	NOT NULL	NOT NULL	NOT NULL	NOT NULL

DESCRIPTION_EXT

D_ID	LangCode	DescText
INT(11)	INT(11)	TEXT
NOT NULL	NOT NULL	NOT NULL

VERSION

VERSION_ID
INT(11)
NOT NULL

The '**PARAMSET_EXT**', '**PARAMSET_PARAMS_EXT**' and '**DESCRIPTION_EXT**' tables (labeled by the '_EXT' suffix) serve to connect external systems.

Data can be inserted with these tables, as long as the database user has the respective rights.

The database user 'ext_<Name of the database>' has the necessary rights. The corresponding password is: '.extern'.

The '**VERSION**' table contains the curretn version of the table layout in order to be able to react to possible changes.

The structure of the external table is extensively identical to the corresponding internal tables.

Only the 'RO' field in the '**PARAMSET**' table and the 'Fix' field in the '**PARAMSET_PARAMS**' table are not contained in the corresponding external table.

In order to insert data into the external table, the fields marked as foreign key must refer to existing entries in the internal table.

Thus when inserting a parameter set for example, the entry in the '**T_Instance**' field must exist in the field with the same name in the '**TEMPLATE**' table.

The same applies for all fields in the external '**PARAMSET_PARAMS_EXT**' table (Exception: 'Value' field).

Furthermore, the values of a parameter ('Value' field) in the '**PARAMSET_PARAMS_EXT**' table must be within the min. and max. values that are stipulated in the 'Min' and 'Max' fields in the '**PARAMETER**' table.

The names of the external parameter sets, which are set by the 'PS_Name' field in the '**PARAMSET_EXT**' table, must be different to the names that are in the internal '**PARAMSET**' table.

If the name of a parameter set is used twice then the name in the internal table has priority. That means that the entry from the internal '**PARAMSET**' table is displayed in the **ParameterCenter**.

The description about the external parameter sets should be stored in the '**DESCRIPTION_EXT**' table, whereby a valid country code and a unique identifier must be assigned.

Details can be found in the description about the 'DESCRIPTION' table.

The identifier is entered in the 'D_ID' field of the '**PARAMSET_EXT**' table in order to allocate the description to the parameter set. The country code is detected internally from the system settings, and considered for the display.

13.1.2.1 Diagram 'Dependencies'

The 'Dependencies' diagram shows all tables as ellipses.

A foreign key dependency is displayed in the form of arrows between the ellipses. The names of the key fields are thereby incorporated in the corresponding arrows.

Example:

The arrow displayed between 'PARAMSET' and 'TEMPLATE' with the labeling 'T_Instance' says that the 'T_Instance' field from the '**PARAMSET**' table refers to the corresponding field in the '**TEMPLATE**' table.

The intended order for inserting data records is made clear with the diagram. If a parameter set is to be inserted then first of all the description in the 'DESCRIPTION_EXT' table must take place. Subsequently, the parameter set must be entered in the 'PARAMSET_EXT' table. Thereafter, the respective parameters can be inserted in the 'PARAMSET_PARAMS_EXT' table. The latter pre-requisites the existence of the parameter used being in the 'PARAMETER' table.

13.2 General information about replication

The MySQL replication is set up in **AprolConfig**, 'Management' tab, in the 'MySQL' aspect.

A cross-replication is set up, in which each server serves as both master and slave.

6	A	AprolConfig (Verwaltung)
tammdaten	🖗 Konfigurationsaspekte 🛛 🧳 Verw	valtung 🖩 RecoveryPoints
		Test, Initialisierung und Start der MySQL-Replikation
VSQL		Wert Beschreibung
	Replikationsreferenz-Host	Erster Replikationspartner (im Fehlerfall der Server mit den konsistenten Referenzdaten)
MySQL	Root-Passwort Referenz-Host	
	Replikationspartner-Host	Zweiter Replikationspartner (im Fehlerfall einer korrupten Datenbank der Server, der synchronisiert wir
	Root-Passwort Partner-Host	Root-Passwort für der Replikationspartner-Host

Illustration 161: Setup of the MySQL replication in AprolConfig

Using this configuration aspect, a MySQL database replication can be created and tested for parameter sets on redundancy runtime servers. The respective fields must be filled with the host names and the 'root' passwords of both computers involved.

The configured runtime master can be entered in the 'Replication reference host' field and the configured runtime slave in the 'Replication partner host' field when a replication is set up for the first time.

If there is an inconsistent database then the computer that is not effected by the error must be entered in the 'Replication reference host' field because the reference database with the consistent state is there. This can also be the server which is normally the slave. This sort of error state may be the complete crash of a redundancy partner, or a hard-disk crash with subsequent new installation.

In the above mentioned cases (First-time installation or in case of errors), the [Initialize and start replication] button must be pressed after inputting the parameters. Inputting a false host name, or especially specifying the master as 'Replication reference host' when it was the one that had the hard-disk crash, can lead to a complete loss of data. For this reason, the data that was entered in the fields is not saved but must be entered each time that AprolConfig is started.

It is possible to test a replication with the [**Test replication**] button before a first-time installation or during running operations. A test database is used for this purpose, so that the proper parameter database is not affected by the test.

Project-spanning configuration leads to a loss of replication:

If **runtime systems from two different CAE projects are on one control computer**, the parameter management replication cannot be set up correctly on the control computer (with the 2 redundancy partners).

A MySQL replication can only be set up between 2 control computers. Therefore, the replication between control computer 1 and 2, and the subsequent replication between control computer 2 and 3 leads to a loss of the first replication.

13.2.1 Additional information

After the configuration has been completed, the following threads are running in **each** of both database management systems.

A master thread which writes each data change in binary lof files (Bin-Log files).

A slave I/O thread which monitors the master and collects changes in the binary log files.

A slave SQL thread which transfers the 'collected' data from the so-called 'relay log files' to the database management system.

13.2.2 AprolConfigParameterManagement

The 'AprolConfigParameterManagement' script serves to configure the database management system for parameter management and supports the following options:

-install	Checks if a MySQL installation exists, if the 'default-user' has been created, and if a root password has been specified.
-deinstall	Deletes all existing MySQL RPMs.
-create <system name=""></system>	Creates a MySQL database with the name <system name="">, including the tables which are necessary for the parameter management.</system>
	The database-specific users doku_ <system name=""> and ext_<system name=""> are also created.</system></system>
	If a database with the same name already exists, a message is output and no further action is taken.
-delete <system name=""></system>	Deletes the specified MySQL database <system name=""> from the database management system.</system>
-update	Carries out all '-install' option steps and then a '-create' for all runtime systems.

13.3 Backup

The 'BuRMySQLBackup' script performs a backup and restoration of single MySQL databases.

During the backup, the script writes a file for each table from the database which is specified in the '-system' option and stores them in the '-basedir' option directory.

<system name>_<timestamp>_.txt

When restoring, the timestamp which is in the file name <system name>_<timestamp>_.txt must be given in the '-restore' option. By doing so, the corresponding backup files of the individual database tables can be identified.



The content of the database specified in the '-system' option is deleted during a restoration, i.e. the data is not merged.

The script is executed as follows in order to create a backup:

BuRMySQLBackup -backup -hostname <server name> -system <system name> basedir <directory>

The script is executed as follows in order to carry out a restoration:

BuRMySQLBackup -restore -timestamp <timestamp> -hostname <server name>
-system <system name> -basedir <directory>

The MySQL Linux user must have write permission for the directory which is specified in the '-basedir' option, because it actually creates the backup.

This is a 'hot backup', i.e. the backup is created while the system is running.

13.4 Purge BinLog-Files

The 'PurgeMySQLBinlogs' script deletes Bin-Log files which are no longer necessary in a controlled manner.

The script is called like this:

PurgeMySQLBinlogs --slave=<slave name> --target=<target file>

The 'PurgeMySQLBinlogs' script is started on the master (i.e. the server on which one is) and specifying the slave (i.e. the replication partner).

A file name is specified in the '--target' option and obtains the suffix '_<timestamp>.tar.bz2' automatically. Copies of the deleted Bin-Log files are stored in the archive. If this is not necessary, the '--no_backup' option can suppress this.

The script aborts if the replication is not carried out correctly or the replication partner cannot be contacted. The former can be avoided with the '--force_r' option, and the latter with the '--force_s' option.



The Bin-Log files sould only be deleted with the 'PurgeMySQLBinlogs' script in order to ensure that the MySQL replication still functions.

The binary log contains all instructions which update or could have updated data (e.g. a DELETE instruction without the respective data record). The instructions are saved in the form of 'events' which describe the changes. Furthermore, the binary log also contains information about how long the execution of the datachanging instruction was.

13.5 Diagnostics

13.5.1 BuRMySQLToolbox

The BuRMySQLToolbox serves to manipulate the database. Information about the database can also be entered.

Example:

The '-show_master_status [-hostname <host name>]' option shows if the master thread is running.

The '-show_slave_status [-hostname <host name>]' option shows if the slave I/O / slave SQL threads are running.

It is possible to check if the configured replication is running properly with this.

13.6 Information about licensing

When using the **APROL** parameter management, special license conditions need to be taken into consideration for *MySQL* applications.

Please note that the entire *MySQL*-specific source text of the server, the mysqlclient library and client, as well as the GNU readline library are subject to the conditions outlined in the GNU General Public License.

The commercial use of **MySQL** in the context of the **APROL** ParameterManagement is therefore only permitted with a valid **MySQL license**.

Please make sure that your **APROL license** also has a valid **MySQL license**. If you are unsure whether your **APROL** system has a valid **MySQL** license, then you are obligated to refer to the conditions of your **APROL** license. In this case, contact your respective **APROL** sales office.

Also note that a MySQL license is required on each machine where the MySQL server is running. There is no limitation regarding the number of MySQL servers that can run on a machine, or regarding the number of clients that can be connected simultaneously to a server running on this machine! For this reason, you need a *MySQL* license for each control computer in the process control system when using the **APROL** parameter management. That means that two licenses are needed when using a redundancy system with two control computers.

14 Authentication via LDAP / Active Directory Server

A separate **openLDAP server** or **Active Directory Server** can be optionally used for the authentication of an engineering user or an operator.

The Lightweight Directory Access Protocol (LDAP) is an application protocol that is derived from the network technology. It allows the query and modification of a directory service (that is a hierarchical database distributed over the network) via an IP network.

The **P**luggable **A**uthentication **M**odules (**PAM**) are a software library, which provides a general programming interface (API) for authentication services.

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Basic information about LDAP and PAM can be found under http://en.wikipedia.org

The users / operators that are defined in the **APROL** user management or OperatorManager are awaited as configured users on the LDAP server. They are authenticated with their password that is stored in the LDAP server.

The assignment of rights for the process control system is made solely in **APROL**.

The **LoginServer** must always be active. If the LoginServer is stopped on purpose, or due to a crash, then it is not possible to authenticate another user and the automatic logout according to the idle time is no longer carried out. Stopping the LoginServer on purpose, or in the case of it crashing, **does not impede the operation of** *APROL* in any way. Even when the LoginServer is stopped, the user that is already logged in remains so and it is possible for them to work with their allocated rights.

An **openLDAP server** can be installed on any Linux computer in the network, as long as it can be reached by the **APROL** servers that use LDAP for authentication. It is recommended that the openLDAP server is installed on a runtime server because the presence of an engineering system is not necessary for a running system, and an operator station may not always be available.

An Active Directory Server can be installed on any Windows computer in the network.

If **engineering users** are to be authenticated via LDAP, then the LDAP client must be set up on each engineering server.

If **operators** are to be authenticated via LDAP, then the LDAP client must be set up on each operator station.

Decide on which computer you would like to install the server and to which extent the authentication should take place (engineering users / operators).

In the following you will find a guideline for the openLDAP and Active directory servers.

Optional steps are pointed out at the beginning of the respective chapter.

This applies: (S) = Server, (C) = Client, (A) = **APROL**

LDAP client configuration LINUX

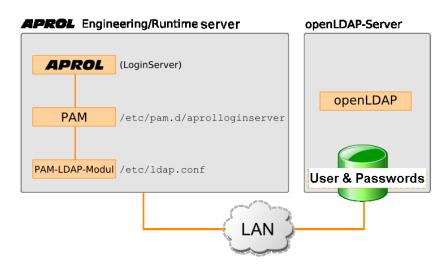


Illustration 162: LDAP Client configuration (Linux)

Basic procedure for an openLDAP server:

Step:	Chapter
1	(S) <u>How is an openLDAP server set up in Linux with YaST2?</u> (Chapter: 14.5.1)
2	(S) <u>How is an openLDAP server configured?</u> (Chapter: 14.5.3)
3	(S) <u>How is the default password policy adjusted?</u> (Chapter: <i>14.5.3.1)</i>
4	(S) <u>How is a minimum database structure set up?</u> (Chapter: <i>14.5.3.2)</i>
5	(S) <u>How is an LDAP query user set up for the openLDAP server?</u> (Chapter: <i>14.5.3.3)</i>
6	(S) <u>How is an Active Directory Server (ADS) configured in Linux?</u> (Chapter: 14.5.6)
7	(S) <u>User management openLDAP</u> (Chapter: 14.6)
8	(S) <u>How is a user created on the openLDAP server?</u> (Chapter: 14.7.4)
9	(C) <u>Connecting APROL to the openLDAP / Active Directory Server</u> (Chapter: 14.9)
10	(S) <u>How is the PAM-LDAP module configured for use with the openLDAP server?</u> (<i>Chapter: 14.9.3</i>)
11	(S) <u>How is the security of the connection between an APROL server and an openLDAP server increased?</u> (Chapter: 14.10.1)
12	(S) <u>How is the certificate that is necessary for the SSL connection to an openLDAP</u> <u>server created?</u> (Chapter: 14.10.2)

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13	(S) <u>How are unencrypted connections to the openLDAP server suppressed?</u> (Chapter: 14.10.3)
14	(C) <u>How is the SSL encryption activated on the APROL server?</u> (Chapter: 14.10.4)
15	(C) <u>How is the security of the SSL connection increased?</u> (Chapter: 14.10.5)
16	(A) <u>How is the LDAP authentication configured for the engineering system in the CaeManager?</u> (Chapter: 14.11.1)
17	(A) <u>How is the LDAP authentication configured for the runtime system in the</u> <u>CaeManager?</u> (Chapter: 14.11.2)
18	(A) <u>How is the complexity check for passwords activated for the local</u> <u>authentication?</u> (<i>Chapter: 14.11.2.1</i>)

LDAP client configuration WINDOWS

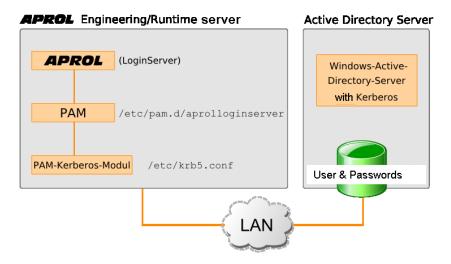


Illustration 163: LDAP Client configuration (Windows)

Basic procedure for an Active Directory server:

Step:	Chapter
1	(S) <u>How is an Active Directory server installed?</u> (Chapter: 14.5.2)
2	(S) <u>How is an Active Directory server configured?</u> (Chapter: 14.5.5)
3	(S) <u>How is an Active Directory Server (ADS) configured in Linux?</u> (Chapter: 14.5.6)
4	(S) <u>User management on an Active Directory server</u> (Chapter: 14.8)
5	(S) <u>How is a user created on an Active Directory server?</u> (Chapter: 14.8.1)

6	(S) <u>Password policies / Account policies on an Active Directory server?</u> (Chapter: 14.12)
7	(S) <u>How is the maximum number of passwords that are saved in the history</u> <u>specified?</u> (Chapter: 14.12.1.1)
8	(S) <u>How is the maximum age of a password specified?</u> (Chapter: 14.12.1.2)
9	(S) <u>How is the minimum length of a password specified?</u> (Chapter: 14.12.1.3)
10	(S) <u>How is the complexity check for new passwords activated?</u> (Chapter: 14.12.1.4)
11	(S) <u>How is the maximum number of false logins configured?</u> (Chapter: 14.12.1.5)
12	(C) <u>How is an APROL server connected to an Active Directory server?</u> (Chapter: 14.9.4)
13	(C) <u>How is the PAM-Kerberos module configured for the connection to an Active</u> <u>Directory server?</u> (Chapter: 14.9.4.2)
14	(A) <u>How is the LDAP authentication configured for the engineering system in the CaeManager?</u> (Chapter: 14.11.1)
15	(A) <u>How is the LDAP authentication configured for the runtime system in the</u> <u>CaeManager?</u> (Chapter: 14.11.2)
16	(A) <u>How is the complexity check for passwords activated for the local</u> <u>authentication?</u> (<i>Chapter: 14.11.2.1</i>)

14.1 Breakdown of the placeholders in the LDAP examples

The examples in this chapter contain the following placeholders and have the following meanings:

Place holder	Used in example	
<domain name=""></domain>	my-domain	
<top domain="" level="" name=""></top>	COM	
<ip address=""></ip>	10.49.83.107	
<first name=""></first>	Max	
<last name=""></last>	Mueller	
<country></country>	Germany	
<city></city>	Essen	
<department></department>	Development	

Please adjust the basis DN to your own domain.



The domain name of your network is a suggestion for a descriptive **basis DN**. However, you can also choose any other identifier. The **basis DN** is detected automatically from the name of the computer (domain). The following basis DN results from the domain 'my-domain.com' in our example:

dc=my-domain,dc=com



The order of the parameters in the shell commands must be adhered to strictly (e.g. with 'ldapdelete', the order of the parameters is ou=<Department>ou=<City>ou=<Country>).

14.2 Use of the B&R example configurations

The '*.ldif' configurations that are delivered in /opt/aprol/etc/LDAP/server or /opt/aprol/etc/LDAP/client only serve as example configurations.

LDIF' is the abbreviation for LDAP **D**ata Interchange Format.

It is in any case necessary to adjust the configuration to suit your company's and policy's needs.

The use of an example configuration allows setting up and using an LDAP server directly, whilst using a simple inetOrgPerson scheme.



When executing an LDAP command, e.g. Idapadd, it must be noted that the command is called either from the same directory in which the LDIF files are stored or that the absolute path of the LDIF files is specified.

'root' rights are not necessary for the execution of LDAP commands.

14.3 Which benefits arise from the use of an LDAP server for the authentication on an APROL server?

Depending on the LDAP server being used, the authentication can be extended and configured on the server with the following functions:

Pre-warning time upon expired password:

A pre-warning time can be optionally set for the 'password expires' function, so that when logging in, a warning dialog points out that the password will expire in 'n' days / minutes.

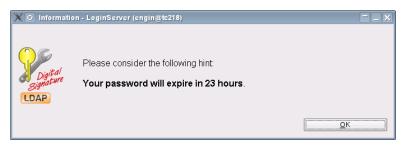


Illustration 164: Pre-warning time upon expired password

Password expires:

If a rule with 'password expires' has been allocated to the LDAP user and the password has expired then a new password is demanded when logging in the next time and the login is then carried out.

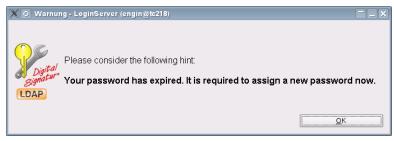


Illustration 165: Notification for an expired password

Grace logins after password expiry:

A number of so called 'grace logins' can be configured optionally when using the 'password expires' function. They allow the possibility to log in with the old password again even though it has expired.



Illustration 166: Grace logins after password expiry

14.4 How does the behavior of the APROL authentication process change when using an LDAP server?

Course of the authentication process in APROL:



The script 'AprolStartLoginServer' **must definitely be used** when starting the LoginServer manually from the command line.

The LoginServer is **not allowed** to be started with the 'LoginServer' command because it does not supply the necessary runtime environment.

If an LDAP server is used for authentication, a check is made to see **if the user has already been created** in the **APROL** user management.

Afterwards, a check is made to see if the user exists in the LDAP server.

Subsequently, there is a comparison of the password stored in the **APROL** LoginServer (Security Login Dialog) and the LDAP server password.

🗙 🖸 Security-	.ogin - LoginServer (engin@tc218)
Digital Digital Signature	Please enter your login and password User aprol Password :
LDAP	QK Cancel

Illustration 167: LDAP authentication

If the LDAP server cannot be contacted, or the user has not been configured in this server, then a fallback for authentication with the password stored in the **APROL** user management is offered.

X O Warnur	X 🖸 Warnung - LoginServer (engin@tc218)			
Digital	The user is unknown to the authentication module (PAM / LDAP) or is not set up on the LDAP server.			
Bignature	Should a local APROL system authentication be carried out instead?			

Illustration 168: Fallback to APROL system authentication



Thus the LDAP server is not a 'single point of failure', i.e. an operation is still guaranteed when the LDAP server is temporarily not available.

Passwords that have been changed directly in the LDAP server (and which can also be changed via the LoginServer) are available on all operator stations without having to carry out a download.

For this, it is necessary that the LDAP server can be reached, so that there is no fallback to the **APROL** authentication.

The connection to the LDAP server is monitored by the LoginServer and the connection status is refreshed every 5 minutes.

The status is in the information area of the control panel (tray) and can be refreshed as desired with the **'Check availability of the LDAP server'** context menu.

14.5 Installation and configuration of an LDAP server / Active Directory Server

14.5.1 How is an openLDAP server set up in Linux with YaST2?

Pre-requisite for the use of the openLDAP server is the installation of the **APROL** R 3.6-04 and the corresponding AutoYaST DVD.

The following RPM packages are installed automatically in this case.



- openldap2-2.4.20-0.5.1.x86_64.rpm
- \checkmark

 \checkmark

?

- yast2-ldap-server-2.17.35-0.2.1.x86_64.rpm

yast2-ca-management-2.17.17-0.2.34.noarch.rpm

The openLDAP server is configured in the example as follows:

In the password expiry guidelines, the period for the validity of the passwords (password expires) is specified (here: 30 days).

The allowed amount of usage of passwords that have expired (grace logins) is set to the value 3.

A query user is also created, that is used in the configuration of the LDAP client during the authentication over LDAP at a later stage.

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter Use of
the B&R example configurations
(Observer (1, 2))

(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> placeholders in the LDAP examples

(Chapter: 14.1)

The configuration of the LDAP server takes place in the YaST control center.

The following configuration is made when starting the configuration of the LDAP server for the first time with the **'LDAP server'** icon.

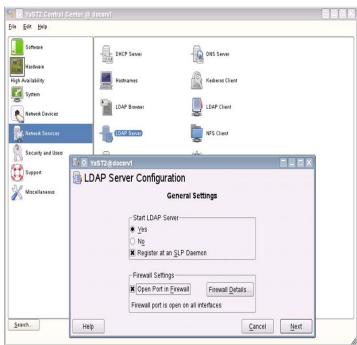


Illustration 169: Configuration of the LDAP server

Navigation: YaST2 / Network Services / LDAP Server /General Settings



Start LDAP server	Yes
Start LDAP server / Log into an SLP daemon	Enabled
Firewall Settings / Open firewall port (identical to the APROL default settings)	Enabled
Firewall Settings / [Firewall Details] / Network interfaces	Select interface
Confirm with [Continue]	

The LDAP client configuration is made easier by logging the LDAP server into an SLP daemon.

The Service Location Protocol (SLP) is a protocol to find network services in a TCP/IP based network.

Basic information about SLP can be found under http://en.wikipedia.org

Choose server type

🗊 🖸 YaST2@docsrv1	×
lDAP Server Configuration	
Server type	
Stand-alone server	
O Master server in a replication setup	
$\bigcirc \frac{\text{Replica}}{\text{All data, including configuration, is replicated from a remote server.}}$	
Help Cancel Back	Next

Illustration 170: Choice of the LDAP server type

Navigation: YaST2 / Network Services / LDAP Server / General Settings / Select server type	
This is an independent server	Enabled
Confirm with [Continue]	

O YaST2	@docsrv1	
📵 LDAP	Server Configuration	
	Basic Settings ■ Enable TLS ■ Enable LDAP over SSL (Idaps) interface Use common Server Certificate Import Certificate CA Certificate File (PEM Format) ■ Browse	
	Certificate <u>Fi</u> le (PEM Format)	
	Certificate Key File (PEM Format - Unencrypted) Browse	
Help	(Launch CA Management Module) Cancel Back	Next

Illustration 171: TLS settings

Navigation: YaST2 / Network Services / LDAP Server / General Settings / Select server type / TLS settings



Create new database:

🗊 🖸 YaST2@d	locsrv1	
📵 New Da	tabase	
	Database Type Indb	
	Base DN dc=br-automation.dc=com	
	Administrator DN Cn=Administrator	
	LDAP Administrator Password	
	Validate Password	
	Database Directory	
	Avar/lib/ldap Browse	
Help	<u>Cancel</u>	Next

Illustration 172: Database basic settings

Navigation: YaST2 / Network Services / LDAP Server / General Settings / Select server type / TLS settings / New database		
Database type	hdb	
Basis DN	dc=< Domain Name >,dc=< Top Level Domain Name>	
Administration DN	cn=Administrator	
Appended Basis DN	activated	
Password of the LDAP administrator	<password></password>	
Directory for database	/var/lib/ldap	
Use this database	activated	
Confirm with [Continue]	~	

The 'Administrator_DN' is used for the administration of the LDAP database at a later stage. The password set here can be changed again at a later stage via 'YaST / Network Services / LDAP Server / Databases / <**Domain hdb entry**>'.

The domain name of your network is a suggestion for a descriptive basis DN. However, you can also choose any other identifier.



The **basis DN** is detected automatically from the name of the computer (domain). The following basis DN results from the domain 'my-domain.com' in our example:

dc=my-domain,dc=com



The **basis DN** should be **unique**, when taking **all of the LDAP servers in the network** (segment) into account.



The abbreviation 'hdb' stands for **H**ierarchical **D**ata **B**ase. HDB is a Berkeley database with a hierarchical structure and is based on 'bdb'.

The abbreviation 'bdb' stands for **B**alanced Tree **D**ata **B**ase.

A summary of the server configuration is shown in the following dialog:

Start configuration Start LDAP server: Yes Register with the SLP service: Yes

Initialize the database with the following parameters Database ending:dc=**my-domain**,dc=**com** Administrator-DN:cn=Administrator,dc=**my-domain**,dc=**com**

Overview dialog

Navigation: YaST2 / Network Services / LDAP Server / General Settings / Select server type / TLS settings / New database / Confirmation dialog

check

hin

Content of the overview dialog

Confirm with [Finish]

 Testing the openLDAP server after the setup has taken place:
 Image: Constant of the command line on the LDAP server

 On the command line on the LDAP server
 Image: Constant of the command line on the LDAP server

 ps aux | grep slapd
 Image: Constant of the command line on the command l

Output:

ldap 21677 0.0 0.3 245716 15196 ? Ssl Mar30 0:01 /usr/lib/openldap/**slapd** -h ldap:// ldaps:// ldapi:// -F /etc/openldap/slapd.d -u ldap -g ldap -o slp=on

Next configuration step:

Chapter How is an openLDAP server configured?

(Chapter: 14.5.3)

14.5.2 How is an Active Directory server installed?

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An Active Directory Server should be installed according to the Microsoft installation instructions.

The configuration for the use with **APROL** is now carried out.

Next configuration step:

Chapter How is an Active Directory Server configured?

(Chapter: 14.5.5)

14.5.3 How is an openLDAP server configured?

After the LDAP server has been set up successfully, the configuration of the LDAP server must be called up once more via the 'LDAP server' icon.

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>

(Chapter: 14.2)

?

Information about the placeholders can be found in chapter <u>Breakdown of the</u> <u>placeholders in the LDAP examples</u>

(Chapter: 14.1)

A mask for the configuration of other LDAP server options now appears.

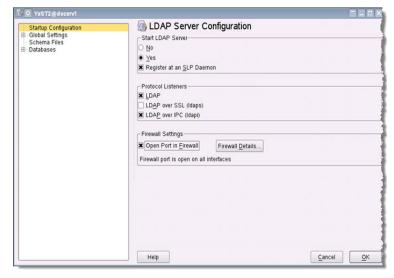


Illustration 173: Start configuration

Navigation: YaST2 / Network Services / LDAP Server /Start configuration	×
Start LDAP server	Yes
LDAP	Enabled
LDAP over SSL (Idaps)	Deactivated
LDAP over IPC	Enabled
Open firewall port	Enabled
Select 'Schema files' entry in the navigation	

At first, the configuration without 'SSL' is described here.

Further information about using SSL can be found in chapter <u>Extended security with</u> <u>use of SSL / TLS</u>

(Chapter: 14.10)

The 'LDAP over IPC' option (in 'Protocol listener') **is not allowed to be turned off because otherwise it will not be possible to make another configuration using YaST again**.



If the option is turned off, then it can be turned on manually via the following configuration file:

/etc/sysconfig/openIdap

The following entry must be made here:

OPENLDAP_START_LDAPI=yes

All further basic settings do not have to be adjusted.



The 'Protocol Listener / LDAP' setting uses port 389. The 'Protocol Listener / LDAP over SSL' setting uses port 636.

So called scheme files are used for the data storage and specification of the available fields when managing users in directory service servers. An LDAP scheme describes the list of possible types of entries (object classes) together with the attributes linked to them.

An object class can have mandatory attributes and optional attributes.

Example configuration:

scheme
core
cosine
dnszone
inetorgperson
rfc2307bis
vpiloqq

Add scheme.

to 🧕 YeST2			* × - E
Startkonfiguration © Globale Einstellungen Scherma-Dateien © Datenbanken		person bis	
	uchen in:	E/etc/openidap/schema	
	Computer root	collective.schema mis.c.schema corba.schema mis.df corb.adi mis.schema corb.adi mis.schema corb.adi opentidap.idf corb.adi opentidap.idf corb.adi opentidap.idf corb.adi opentidap.idf discorb.schema fordolsystema discorb.schema fordolsystema discorb.schema samba3.schema discorb.schema yast.schema inetorgerson.idf java.schema java.schema java.schema java.schema java.schema	
	ateiname:	ppolicy.schema	
C	ateien des Typ	s: •Jdif • 🖌 🖡 🖌 🕹	
	Hilfe	Hinzufügen Loschen	erwerfen OK

Illustration 174: Select and add scheme file

Navigation: YaST2 / Network Services / LDAP Server /Scheme files		
[Add]	Select ppolicy.schema file	
Select 'Databases / dc= <top domain="" level="" name="">,dc=<top level<="" th=""></top></top>		
	Authentication via LDAP / Active Directory Server	

The specifications for the schemes can be adopted. Custom scheme files can also be added.

Databases

The dc=my-domain,dc=com default database that was set up at the beginning can be found here.

Password policy configuration:

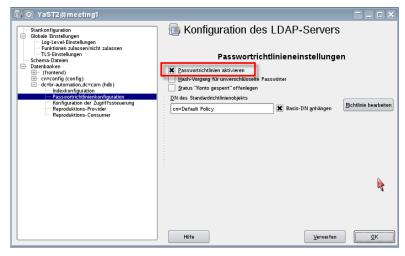


Illustration 175: Password policy configuration

Navigation: YaST2 / Network Services / LDAP Server / Databases /dc= <top domain="" level="" name="">,dc=<top domain="" level="" name=""></top></top>		
Activate password policy	activated	
Continue with [Edit Policy]		
How is the default password policy adjusted?		
(Chapter: 14.5.3.1)		

1

?

This password policy is the **default policy** that is used when a user has not been allocated any other rights (over the 'pwdPolicySubentry' attribute).

14.5.3.1 How is the default password policy adjusted?

After entering the administrator password, policies such as password aging policies (password expires) and password change policies can be set via [Edit Policy].

This chapter deals with the creation of the default password policy. A detailed description can be found in chapter <u>How is a password policy created manually on an openLDAP server?</u>

(Chapter: 14.7.3)

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>



(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> placeholders in the LDAP examples

(Chapter: 14.1)

Password change policies:

🐁 🛈 YaST2@meeting1			
🔌 Passwortrichtlini	enkonfiguration		
Passwortänderungsrichtlinien	Passwortablaufrichtlinien	Sperrrichtlinien	1
Maximale Anzahl der in der History ge	peicherten Passwörter		
0			▲ ▼
🗶 Benutzer muss Passwort nach Rüc	ksetzung ändern		
🗶 Benutzer darf Passwort ändern			
Altes Passwort für Passwortänderu	ng erforderlich		
Überprüfung der Passwortqualität			
Kei <u>n</u> e Überprüfung			
 Nicht überprüfbare Passwörter 	akzeptieren		
Nur überprüfte Passwörter akz	eptieren		
Mindestlänge des Passworts			
8	1		
Hilfe			<u>V</u> erwerfen

Illustration 176: Password Change Policies

Navigation: YaST2 / Network Services / LDAP Server / Databases /dc= <top domain="" level="" name="">,dc=<top domain="" level="" name=""> / [Edit policy] / Password Change Policies</top></top>		
Only accept checked passwords	activated	
Minimum length of the password	8	
Continue with the 'Password expiration rules' tab	 	

The password that is demanded is that of the LDAP administrator 'Administrator'.

Password aging rules

🔥 🖸 YaST2@meeting1					
Passwortrichtlinien	konfiguration				
<u>P</u> asswortänderungsrichtlinien	Passwortablaufrichtlinien		Sperrrichtlinien		1
- Mindestalter des Passworts					
Tage	Stunden		Minuten		Sekunden
0	0	-	0	-	0
– Höchstalter des Passworts					
Tage	Stunden		Minuten		Se <u>k</u> unden
30	0		0	•	0
– Zeitpunkt für Warnung vor Passwortablaut	f				
Tage	Stun <u>d</u> en		Minuten		Sekunden
2	0		0	•	0
Zulässige Verwendungshäufigkeit abgelaufe	ner Passwörter)
3					÷
Hilfe					Verwerfen <u>O</u> K

Illustration 177: Password expiration rules

Navigation: YaST2 / Network Services / LDAP Server / Databases /dc= <top domain="" level="" name="">,dc=<top domain="" level="" name=""> / [Edit policy] / Password expiration rules</top></top>		
Maximum age of the password	30	
Time point of warning before password expiry	2	
Allowed usability of expired passwords (grace logins)	3	
Continue with the 'Lockout policies' tab	>	

Lockout policies:

Passwortänderungsrichtlinien	Passwortablaufrichtlinien	Sperrricht	ļinien		
Passwortsperre aktivieren					
ngahl der Bind-Fehler vor Passworts	perrung				
3					
Passwortsperrdauer					
Tage	Stunden	Minuten		S <u>e</u> kunden	
0	t) [0	\$ 5	\$	0	1
Bind-Fehler-Verweildauer im Cache-					
Tage	Stunden	Minuten		Sekunden	
0	0	3		0	1

Illustration 178: Lockout policies

Navigation: YaST2 / Network Services / LDAP Server / Databases /dc= <top domain="" level="" name="">,dc=<top level="" lockout="" policies<="" th=""><th>I Domain Name> / [Edit policy]</th></top></top>	I Domain Name> / [Edit policy]
Number of bind errors before password locking	3
Back to the previous dialog with [OK]	
Navigation: YaST2 / Network Services / LDAP Server / Databases /dc= <domain name="">,dc=<top domai<="" level="" td=""><td>n Name></td></top></domain>	n Name>
Finish configuration with [OK]	Æ

Next configuration step:	
Chapter How is a minimum database structure set up?	- 11 - E
(Chapter: 14.5.3.2)	

14.5.3.2 How is a minimum database structure set up?

A database structure is necessary to manage the LDAP users in the LDAP database. A minimalistic structure will be imported in this example.

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>

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(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> <u>placeholders in the LDAP examples</u>

(Chapter: 14.1)

Adding a structure:

In the command line	2
vi struktur.ldif	Adjust manually
dn: cn=Administrator,dc= <domain b="" name<=""></domain>	e>,dc= <top domain="" level="" name=""></top>
objectClass: organizationalRole	
cn: Administrator	
dn: CN=Users, DC= <domain name="">, DC=<to< th=""><th>p Level Domain Name></th></to<></domain>	p Level Domain Name>
objectClass: top	
objectClass: inetOrgPerson	
cn: Users	
sn: Users	
dn: ou= <country>, dc=<domain name="">, do</domain></country>	z= <top domain="" level="" name=""></top>
objectClass: organizationalUnit	
ou: <country></country>	
dn: ou= <city>,ou=<country>,dc=<doma< td=""><td>in Name> , dc=<top domain="" level="" name=""></top></td></doma<></country></city>	in Name> , dc= <top domain="" level="" name=""></top>
objectClass: organizationalUnit	
ou: <city></city>	
<pre>dn: ou=<department>, ou=<city>, ou=<co ,dc=<domain name="">, dc=<top domai<="" level="" pre=""></top></domain></co </city></department></pre>	
objectClass: organizationalUnit	
ou: <department></department>	
In the command line	
General syntax:	
ldapadd -h <ip address=""></ip> -x -W -D cn= Name>,dc= <top domain="" level="" name=""></top> -f	
Example:	
ldapadd -h 10.49.83.107 -x -W -D cn= f struktur.ldif	-Administrator,dc=my-domain,dc=com -
Configuration finished	<i>A</i> ∰
Next configuration step:	
Chapter How is an LDAP query user set up for the	ne openLDAP server?

(Chapter: 14.5.3.3)

1) The password that is demanded is that of the LDAP administrator 'Administrator'.

2) The hierarchical tree structure is called a **D**irectory **I**nformation **T**ree (DIT) and depicts the entire namespace held by a server. The hierarchy of the company is illustrated in the database of the openLDAP server by the Directory Information Tree.

14.5.3.3 How is an LDAP query user set up for the openLDAP server?

The openLDAP server does not allow any anonymous queries (per default). LDAP clients therefore need an LDAP query user to carry out queries on the LDAP server.

The **LDAP query user** needs its **own password policy** in order to avoid that the password of the LDAP query user becomes invalid (password expires). If the LDAP query user was to use the default password policy then its password must be changed regularly and would result in having to adjust all of the LDAP clients.

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>

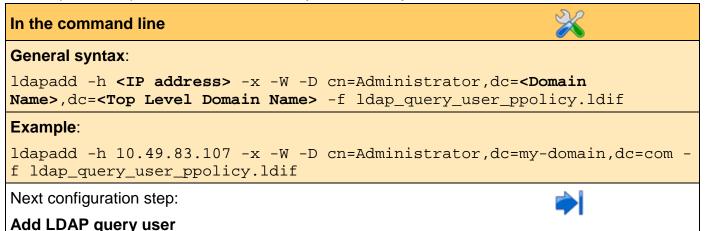


(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> <u>placeholders in the LDAP examples</u>

(Chapter: 14.1)

At this point, the parameters should be adjusted to suit your own needs.



The LDAP query user that is used later for the configuration of the **APROL** client authentication is then added:

Add LDAP query user.

In the command line

General syntax:

ldapadd -h <IP address> -x -W -D cn=Administrator,dc=<Domain
Name>,dc=<Top Level Domain Name> -f ldap_query_user.ldif

Example:

```
ldapadd -h 10.49.83.107 -x -W -D cn=Administrator,dc=my-domain,dc=com - f ldap_query_user.ldif
```

Next configuration step:

Allocate a new password to the 'LDAP Query' user

Assigning a password policy:

The *pwdPolicySubentry* attribute is used to allocate a user a password policy other than the default. The value that is entered is the complete path of the password policy that is to be used. In this case, the password policy used is *LDAP-Query User Policy* and is only allocated to the LDAP query user. For this reason, the ldap_query_user.ldif LDIF file contains the following entry:

pwdPolicySubentry: cn=LDAP-Query User Policy,dc=my-domain,dc=com

Allocate a new password to the 'LDAP Query' user:

In the command line

General syntax:

ldappasswd -h <IP address> -x -W -S -D cn=Administrator,dc=<Domain
Name>,dc=<Top Level Domain Name> "cn=LDAP Query,cn=Users,dc=<Domain
Name>,dc=<Top Level Domain Name>"

Example:

ldappasswd -h 10.49.83.107 -x -W -S -D cn=Administrator,dc=mydomain,dc=com "cn=LDAP Query,cn=Users,dc=my-domain,dc=com"

Configuration finished

Then, the (new) password that is to be set for the 'LDAP Query' user is asked for twice and the 'Administrator' user's LDAP password afterwards.

Next configuration step: Chapter <u>How is an Active Directory Server (ADS) configured in Linux?</u>

(Chapter: 14.5.6)

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14.5.4 How is the connection to an LDAP server tested?

It is possible to test the access to the LDAP server with the following command.

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>

(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> placeholders in the LDAP examples

(Chapter: 14.1)

In the command line

Ant

General syntax:

```
ldapsearch -h <IP address> -p <Port> -s sub -D
"cn=Administrator,dc=<Domain Name>,dc=<Top Level Domain Name>" -b
"DC=<Domain Name>,DC=<Top Level Domain Name>" " cn=Administrator " -W
```

Example:

```
ldapsearch -h 10.49.83.107 -p 389 -s sub -D "cn=Administrator,dc=my-
domain,dc=com" -b "DC=my-domain,DC=com" " cn=Administrator " -W
```

Configuration finished

1

The LDAP password that is queried when using the ldap* commands is the password of the LDAP administrator that has been set up.

hing

In the example, the following is output when the LDAP server access was successful:

```
extended LDIF
#
#
# LDAPv3
# base <DC=my-domain,DC=com> with scope subtree
# filter: cn=Administrator
# requesting: ALL
# Administrator, my-domain.com
dn: cn=Administrator,dc=my-domain,dc=com
objectClass: organizationalRole
cn: Administrator
# search result
search: 2
result: 0 Success
# numResponses: 2
# numEntries: 1
```

14.5.5 How is an Active Directory server configured?

Kerberos is a distributed authentication service (network protocol) for open and insecure computer networks (for example, the internet). Microsoft uses Kerberos as the standard protocol for authentication in Windows 2000/2003 based networks and for the Windows 2000/XP clients. In contrast, the respective PAM module is installed in Linux (pam_krb5).

Basic information about Kerberos can be found under http://en.wikipedia.org

The following points **must be ensured** for an existing Active Directory Server:

First name, last name, and login name of the users and operators.

1) The **Distinguished Name** (DN) of a user must be **unique**. Because the user names are managed in directories in the Active Directory Server, the pair of values (first name, surname) must therefore be **unique**.



2) The tuple **first name**, **last name**, and also the **login name** must correspond to the entry in the *APROL* user management or OperatorManager.

3) The **login name (uid)** in the Active Directory Server is only allowed to exist **once**. There is no plausibility check in the LDAP server!

Login name (uid)

J

A double 'uid' could come about, for example, when there is a name change (e.g. due to marriage). It is possible to duplicate the LDAP user with a new name but to oversee the uniqueness of the uid.

This cannot happen in the **APROL** system because there is a check for this.

The policies for the users and operators correspond to those from **APROL** (with respect to the fallback mechanism).

A password change in the **OperatorManager** only **takes effect after a download** to the operator stations.

If the LDAP connection is damaged the login is still guaranteed as fallback with local *APROL* authentication.

Kerberos time synchronization.

Time synchronization on all affected computers is mandatory when using Kerberos.

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The NTP time synchronization can be configured via AprolConfig on the APROL servers.

Next configuration step:

Chapter How is an Active Directory Server (ADS) configured in Linux?

(Chapter: 14.5.6)

14.5.6 How is an Active Directory Server (ADS) configured in Linux?

The **'Apache Directory Studio'** (ADS) can be reached via the 'Tools' KDE menu, and allows the complete analysis and configuration of the openLDAPv3 or Active Directory Server. This tool is also suitable for the import / export of LDIF files, so that the use of the command line for creating new users in the LDAP server is obsolete.



A user's password that was exported with the APROL OperatorManager or user management cannot be checked directly in the editor of the Apache Directory Studio via the [Verify] button. Instead, the password can be tested directly with the connected LDAP server via the [bind] button.

As an alternative to using the ADS, there is the possibility of using the not so comfortable configuration via **YaST** or via a **manual configuration**.

In order to use the ADS, a connection must be made to the LDAP server.

👔 💿 Neue LDAP Verb	indung	
N etzwerk-Parameter Bitte geben Sie einen Verbin	dungsnamen und die Netzweik-Parameter ein.	LDAP
Verbindungsname: LDAP Se	rver Standort	
Hostname:	<hostname></hostname>	•
Port:	389	•
Verschlüsselungs-Methode:	Keine Verschlüsselung	· · · · · · · · · · · · · · · · · · ·
		Netzweikparameter überprüfen
0	< Zurück Weiter>	

Illustration 179: Configuration of the connection to the LDAP server (step 1/3)

Navigation: ADS / View 'Connections' / Context menu 'New Connection' (step	1/3)	
Connection name	<any description=""></any>	
Host name	<host name=""></host>	
Port	389	
Encryption methods	No encryption	
Check the configuration and reach-ability of the LDAP server with [Check network parameters].		
Confirm with [Continue]	>	



In order to establish a secure connection via SSL, the port and the encryption method must be adjusted (and the LDAP server must be configured for SSL connections).

Port	636
Encryption methods	SSL encryption (Idaps://)

🗊 💿 Neue LDAP Verbindung	
Authentifizierung Bitte wählen Sie eine Authentifizierungs-Methode und geben Sie ihre Anmeldedaten	ein.
Authentifizierungs-Methode Einfache Authentifizierung	
Authentifizierungs-Parameter Bind DN oder Benutzer: cn=Administrator,dc=tccomp131,dc=br-automation,dc=cor	n 🔽
	thentifizierung überprüfen
 SASL Einstellungen Kerberos Einstellungen 	
? <u>Zurück</u> <u>Weiter></u> <u>F</u> ert	ig stellen Abbrechen

Illustration 180: Configuration of the connection to the LDAP server (step 2/3)

Navigation: ADS / View 'Connections' / Context menu 'New Connection' (step 2/3)		
Authentication methods	Simple authentication	
Bind DN or user	cn=Administrator,dc=my- domain,dc=com	
Bind password	<password></password>	
Save password	Disabled	
Test the configuration with [Check authentication].		
This can only be done when the 'Save password' checkbox is activated temporarily.		
Confirm with [Continue]		



The specified 'Bind DN' must be the Administrator!



We do not recommend saving the password, in order to avoid that non-authorized employees access the LDAP directory!

Information about 'Creating a connection via SSL':



If the certificate is custom-made and not from a certification organization, then a warning will be output when it is checked. If the certificate can be trusted, then 'Always trust this certificate' can be chosen and confirmed with [**OK**]. This warning only appears with invalid certificates that are not trusted.

Basis DN	t DSE bestimmen		Basis DNs abrufen
Basis DN:			Ŧ
Limits Max. Anzahl: 1000 Max. Suchzeit (s): 0	Alias Dereferenzierung ✓ Finden des Basis-DN ✓ Suchen	Verweisbehandlung Verweisen manu Verweisen autorr Verweise ignorie	atisch folgen
Sub-Einträge währen	I während des Browsens verwenden d des Browsens abrufen (erfordert zusät Seitengrößer 100 I Blättern e während des Browsens abrufen		
0	< <u>Z</u> urück	Weiter > Fertig stelle	n Abbrechen
	: Configuration of		
avigation: AL	OS / View 'Connection	ons' / Context	menu 'Ne
specify Ba	asis DN with F	Root DSE	
lax. num	ber		

👔 🖸 Neue LDAP Verbindung

Sie können zusätzliche Parameter zum Browsen spezifizieren

rowser Optionen

e LDAP server (step 3/3)

LDAP

chen

Navigation: ADS / View 'Connections' / Context menu 'New Connection' (step 3/3)		
Specify Basis DN with Root DSE	activated	
Max. number	1000	
Max. search time (s)	0	
Finding the Basis DN	activated	
Find	activated	
Reference handling	Follow references manually	
Use 'ManageDsalT Control' during the browsing	Disabled	
Open sub-entries during the browsing	Disabled	
Search page by page	Disabled	
Open operational attributes during the browsing	activated	
Confirm with [Finish]	A#	

If the 'Open operational attributes during the browsing' field is activated, then additional information is shown in the object properties. E.g. The name of the allocated LDAP password policy is shown in the view of the 'pwdPolicySubentry' attribute for a user.

Next configuration step for an openLDAP server: Chapter User management openLDAP (Chapter: 14.6)

Next configuration step for an Active Directory server:

Chapter User management on an Active Directory server

(Chapter: 14.8)

14.6 Transfer of the APROL user data to the LDAP server

In earlier **APROL** releases, user and operator data had to be exported interactively from the **APROL** user management and the OperatorManager in the form of LDIF files. An interactive import of these LDIF files in the LDAP server was also then necessary, i.e. via the ApacheDirectoryStudio (ADS).

APROL R 4.0 simplifies the transfer of user and operator data into an LDAP server which has been configured for this purpose. The 'AprolJobDispatcher' takes over the job of importing the data into the LDAP server.

An interactive export of the LDIF file is still possible!

Compare chapter <u>How is an APROL system pre-configured for an LDIF export?</u> and How is an LDIF file imported in the openLDAP server with Apache Directory Studio?

14.6.1 Configuration of the AproljobDisplatcher for the transfer of user data to the LDAP server

We recommend that you configure the LDAP server on the same hardware as the **APROL** logging server in order to import the **APROL** user data automatically. The description of the LDAP server configuration can be found in chapter <u>How is an openLDAP server configured?</u>

One 'AprolJobDispatcher' can be found on each **APROL** system as of **APROL** R 4.0. The 'AprolJobdispatcher' which is on the logging server does not need any further configuration. The 'Job-Dispatcher' configuration aspect (in AprolConfig) **must be activated on each APROL** server which is involved. The 'AprolJobDispatcher' makes its job directory and the jobs therein avaiable. Each 'AprolJobDispatcher' looks regularly for jobs there.

The 'AprolJobDispatcher' which is on an engineering system needs the host name of the logging server. Start AprolConfig for this purpose and select the 'Job-Dispatcher' configuration aspect. Enter the fully qualified host name (FQHN) of the loggin server in the 'Host name' field. The 'Server path' field should not be changed.

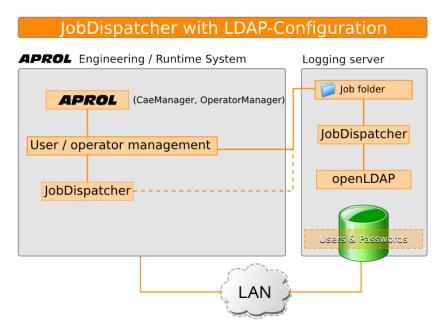


Illustration 182: Schemativ overview of the JobDispatcher LDAP configuration

14.6.2 Transfer of the LDAP data from the user management and OperatorManager

Ensure that you are logged in with the CC-Account of an engineering user and have the **APROL** rights to edit users and operators.

Start the user management (e.g. in the 'Extras / User Management' CaeManager menu). You have the possibility to transfer one or more users to the LDAP server. Select the 'Transfer to LDAP Server' entry in the context menu of the selected user(s). The user data is then exported in LDIF format and a job is generated for the 'AprolJobDispatcher'. The job is stored in the job directory as a file. The 'AprolJobDispatcher' which is on the computer where the LDAP server is running processes the job file and forwards the job to the LDAP server. This then imports the user data.

Parallel to this, it is possible to transfer the operator data of a project via the OperatorManager (e.g. **'Extras / OperatorManager'** menu in the CaeManager). Then select the **'Transfer to LDAP Server'** entry in the context menu of an operator group or operator.

The process is recorded in a ChronoLog report. You can recognize a misconfiguration of the user data in this way. The report can be shown after the transfer with the [**Show**] button. The responsible logging server must be specified upon opening for the first time.



The OperatorManager is opened in the Runtime system from the KDE menu or the corresponding desktop icon.

14.6.3 Functionality of the AprolJobDispatcher mechanism

The new 'AprolJobDispatcher' components have been introduced to **APROL R 4.0**. They take over the job of automatically importing the LDIF file to the LDAP server. Generally, the 'AprolJobDispatcher' can take on jobs and assign them to an executing instance, depending on the job type.

The 'AprolJobDispatcher' needs a 'client' and 'job recipient' as participants. The jobs are handed over to the configured job directory and have a specified file format.



An NFS directory with the respective rights for client and job recipient is necessary for the job transfer, because of security reasons.

The NFS directory is created with AprolConfig on the computer which is specified as being the server.

The 'AprolJobDispatcher' checks the job directory for new jobs in regular intervals. These are evaluated one after the other and assigned to the corresponding job recipient.

The following illustration shows the relationship between the components 'client', 'job recipient', 'JobDispatcher', and 'job directory'.

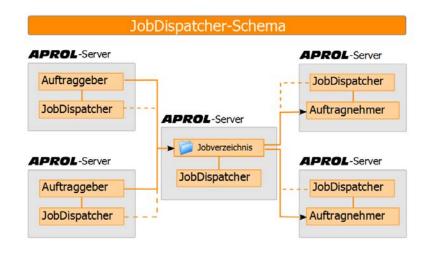


Illustration 183: Schematic display of the function of the AprolJobDispatcher

14.6.4 Security

A job is a file which is transferred and executed in the network on a control level. It is therefore necessary to secure jobs against unwanted infiltration and manipulation.

An unwanted manipulation of a job (code injection) is prevented with a reliable integrity check. Each job is checked with a unique checksum for this purpose.

Each job is signed with an **APROL** internal SSL certificate and can therefore not be created with any other tools, and cannot be executed without a registered target process. It is also not possible to tarn and execute a process as a job (trojan).

The NFS mechanism also prevents other processes, apart from the JobDispatcher, to write in the directory.

The generation of reports (logging) also ensures a good amount of transparency. The activities of individual jobs can be recognized with more ease and are easier to follow.

14.7 User management openLDAP

This chapter describes the user management via the command line and alternatively via YaST.

1) The **Distinguished Name** (DN) of a user must be **unique**. Because the user names are managed in directories in the openLDAP Server, the pair of values (first name, surname) must therefore be **unique**.



2) The tuple **first name**, **last name**, and also the **login name** must correspond to the entry in the *APROL* user management or OperatorManager.

3) The **login name (uid)** in the openLDAP Server is only allowed to exist **once**. There is no plausibility check in the openLDAP server!

Login name (uid)

1

A double 'uid' could come about, for example, when there is a name change (e.g. due to marriage). It is possible to duplicate the LDAP user with a new name but to oversee the uniqueness of the uid.

This cannot happen in the **APROL** system because there is a check for this.

Next configuration step (Recommended):	
Chapter How are additional password policies created on an openLDAP server with the Apache Directory Studio?	· · ·
(Chapter: 14.7.1)	
Next configuration step (Alternative):	
Chapter How are additional password policies created on an openLDAP server with YaST?	· ·
(Chapter: 14.7.2)	
Next configuration step (Alternative):	
Chapter How is a password policy created manually on an openLDAP-Server?	· ·
(Chapter: 14.7.3)	

14.7.1 How are additional password policies created on an openLDAP server with the Apache Directory Studio?

The **'Apache Directory Studio'** can be reached via the 'Tools' APROL-KDE menu. There are 2 possibilities at this point:

You can either copy and modify the default policy (**recommended**), *or* carry out an export / import of the default policy as LDIF file.

Method 1: Copy the default policy (recommended)

👔 🗿 LDAP - cn=Default	Policy,dc=tcco	mp131,dc=br-automation	,dc
<u>D</u> atei <u>B</u> earbeiten <u>N</u> avigiere	n LDAP <u>F</u> enster	<u>H</u> ilfe	3
] 📬 🖩 🏔 🆃 🍂	•] �• • •		
LDAP Browser		cn=Default Policy,dc=tccomp1	31,d
🍫 🔊	Ē 🔄 ▽ 🛛	N: cn=Default Policy,dc=tccomp1	31.
▼ = ▼ ▼	3 🦅 💆	Attributbeschreibung	
		objectClass	-}
Root DSE (2)		objectClass	1
⊽ 🎯 dc=tccomp131,d	c=br-automatio	pw dAttribute	-1
🗀 cn=Administra	ator	cn	- 3
🗀 cn=Default P		pwdCheckQuality	
📋 cn=LDAP-Qu	Neu	•	1
🔏 ou=Idapconf	Öffne Eintrag		-1
🕨 🤱 ou=Germany	Öffnen mit	DIT F3	j,
Þ 🗿 cn=Users	Gehe zu DN		-
👂 🚀 Suchen	G Hoch	F4	
▶ 🛄 Lesezeichen	_		-1
	Eintrag / DN ko	pieren Strg+C	3
	Einfügen	Strg+V	-1
	💢 Eintrag löscher		1
	Verschiebe Ein Eintrag umben	-	
	Eintrag umben		

Illustration 184: Copy existing policy

Navigation: KDE Tools / ADS / LDAP Browser 'Default Policy' / Context menu 'Copy DN'



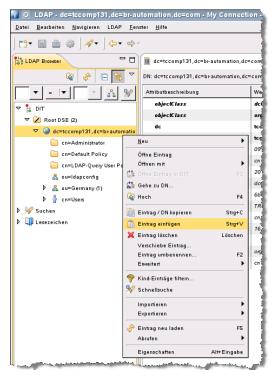


Illustration 185: Insert a copy of the default policy

Select the basis DN entry.

Navigation: ADS / LDAP Browser 'Basis-DN' / Context menu 'Insert Entry'

👔 🖸 Kopierstrategi	je auswählen 🗖 🕻	
Der Eintrag cn=Default Pol	olicy,dc=tccomp131,dc=br-automation,dc=com existier bereits. Bitte auswählen, wie fortgefahren werden	soll.
◯ Kopierprozess beend	den	
🔿 Ignoriere Eintrag und	d fortfahren	
🔘 Überschreibe Eintrag	g und fortfahren	
 Eintrag umbenenner 	n und fortfahren	
RDN: CI	n 🔽 = <neue policy=""> +</neue>	-
RDN Vorschau:	n=\ <neue policy\=""></neue>	
	OK Abbrech	en

Illustration 186: Resolution of the name conflict when inserting

Navigation: ADS / LDAP Browser 'Basis-DN' (place for inserting) / Context menu 'Insert Entry' / Copy strategy		
Rename entry and continue	activated	
RDN attribute	cn	
RDN Name	<new name="" policy=""></new>	
Continue with [OK]	🔶	

Select the 'cn' attribute (default) in the 'RDN' field and enter the new name of the policy.

 Navigation: ADS / LDAP Browser '<New Policy Name>' / Tab 'cn=<New Policy Name>...'

 Change / Adjustment of the attribute

 A description of the attributes can be found in the context menu of the respective

0

A description of the attributes can be found in the context menu of the respective attribute, via 'Open Scheme Browser / Attribute Type Description'.

N: cn=Default Policy,dc=tccomp1	21 dethy automation deteam		⇒ ⇒ ¥ ‰
N. cn-Delaut Policy, uc-tecompt	si,oc-ol-automation,oc-com		= = * *
Attributbeschreibung	Wert		
objectClass	namedObject (strukturell)		
objectClass	pwdPolicy (zusätzlich)		
pw dAttribute	userPassword		
cn	Default Policy		
pwdCheckQuality	2		
pwdExpireWarning	172800		
pwdFailureCountInterval	180		
pwdGraceAuthNLimit	3		
pwdLockout	TRUE		
pwdLockoutDuration	300		
pwdMaxAge	2592000		
pwdMaxFailure	3		7
pwdMinLength	📑 Neues Attribut	Umschalttaste+Strg++	
pwdMustChange	- Nover Wert	Strg++	
createTimestamp	🔗 Neue Suche	Strg+H	
creatorsName	Prove Batch-Operation		
entryCSN	Lokalisiere DN in DIT	F3	
entryDN	Öffne Schema Browser		Objektklassen Reschreibung
entryUUID	Anzeigen in	•	Attribut-Typ Beschreibung
hasSubordinates	Wert kopieren	Strg+C	Gleichheits-Regel Beschleibung
modifiersName	Einfügen	Strg+V	Teilstring-Regel Beschreibung
modifyTimestamp	💥 Wert löschen	Löschen	🚳 Sortier-Regel Beschreibung
structuralObjectClass	Alle auswählen	Strg+A	Syntax Beschreibung
subschemaSubentry	Enveitert	•	

Illustration 187: Information about the attributes in the ADS help



Detailed descriptions about the options can be found in chapter

How is a password policy created manually on an openLDAP-Server?

ANY

Configuration step finished

Next configuration step:

Chapter How is a user created on the openLDAP server?

(Chapter: 14.7.4)

Method 2: Export / import of the default policy as LDIF file (alternative)

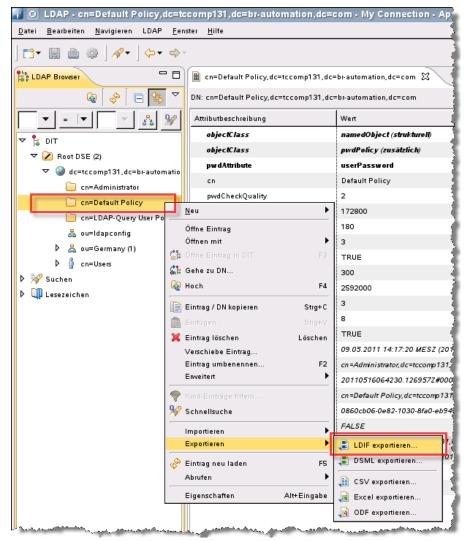


Illustration 188: Exporting the password policies as LDIF file

👔 🖸 LDIF Export 🛛 🗖 🗖 🗶				
Zu exportierende Daten Bitte Such-Parameter für den Export definieren.				
Verbindung:	local B <u>r</u> owsen			B <u>r</u> owsen
Suchbasis:	cn=Default Policy, de	c=tccomp131,dc=braut 💌	Q	Br <u>o</u> wsen
Filter:	(objectClass=*)		•	F <u>i</u> lter Editor
Abgerufene Attribute:				•
	✓ Alle Benutzer Att	tribute 🗌 Operationale Attri	butes	
Steuerungen				
ManageDsalT				
Sub-Einträge	Sub-Einträge			
Seitenweise Sud	Seitenweise Suche Seitengröße: 100 🗹 Blättern			
Scope		Limits-		
O Objekt		Max. Anzahl: 1000		
O One Level		Max. Suchzeit (s): 0		
Subtree	,			
Alias Dereferenzierung		Verweisbehandlung		
✓ Finden des Basis-DN		 Verweisen automatisch 	folgen	
🖌 Suchen		🔿 Verweise ignorieren		
?	< <u>Z</u> urück	Weiter > Eertig ste	llen	Abbrechen

Illustration 189: Settings for LDIF export

Navigation: ADS / LDAP Browser 'Default Policy' / Context menu 'Export, Export LDIF' / LDIF Export		
Connection ame>		
Search basis	cn=Default Policy,dc= <domain Name>,dc=<top domain="" level="" name=""></top></domain 	
Filter	(objectClass=*)	
Opened attribute	<empty></empty>	
All user attributes	activated	
Operational attribute	Disabled	
Controller	Disabled	
ManageDsalT	Disabled	
Sub-entries	Disabled	
Search page by page	Disabled	
Scope: Sub-tree	selected	
Limits / Max. Number	1000	
Limits / Max. Search Time (s)	0	
Alias Differentiation Finding the Basis DN		

D1 System Handbuch

Find	activated
Reference handling: Follow references automatically	selected
Continue with [Continue]	>

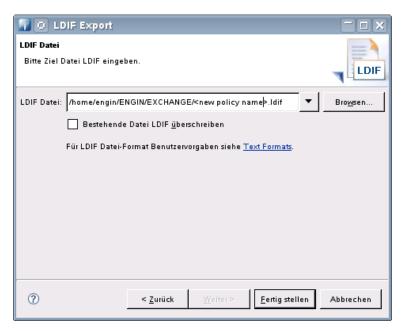


Illustration 190: Settings for LDIF export

Navigation: ADS / LDAP Browser 'Default Policy' / Context menu 'Export, Export LDIF' / LDIF Export		
Select target file /home/ <cc-account>/ENGIN/EXCHANGE/<net< td=""> Policy Name>.ldif</net<></cc-account>		
Continue with [Finish]	>	

Edit / Adjust the LDIF file

In the command line		
<pre>vi /home/<cc-account>/ENGIN/EXCHANGE/<new name="" policy="">.ldif</new></cc-account></pre>	adjust manually	
dn: cn= <new name="" policy="">,dc=<domain name="">,dc=<top level<="" th=""><th>Domain Name></th></top></domain></new>	Domain Name>	
cn: <new name="" policy=""></new>		
objectClass: pwdPolicy		
objectClass: namedObject		
pwdAttribute: userPassword		
pwdCheckQuality: 2		
pwdExpireWarning: 129600		
<pre>pwdFailureCountInterval: 300</pre>		
pwdGraceAuthNLimit: 3		
pwdInHistory: 5		

pwdLockout: TRUE	
pwdLockoutDuration: 120	
pwdMaxAge: 172800	
pwdMaxFailure: 1	
pwdMinAge: 86400	
pwdMinLength: 8	
pwdMustChange: TRUE	
pwdSafeModify: TRUE	
Configuration step finished	Aug.



Detailed descriptions about the options can be found in chapter

How is a password policy created manually on an openLDAP-Server?

Next configuration step (Then continue from here): Chapter <u>How is an LDIF file imported into the openLDAP server with Apache</u> <u>Directory Studio?</u> (Chapter: 14.7.5.3)

Next configuration step:

Chapter <u>How is a user created on the openLDAP server?</u>

(Chapter: 14.7.4)

14.7.2 How are additional password policies created on an openLDAP server with YaST?

As an alternative to the manual method, a new password policy can also be created with YaST.

The **default password policy** will always be used if the user does not have another password policy assigned.

It is not possible to enter less than a minimum password length of 6 characters when entering a new LDAP password because of security reasons (limited by the PAM-LDAP module). This limitation has priority over the password policies that can be configured for the LDAP server.

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> the B&R example configurations



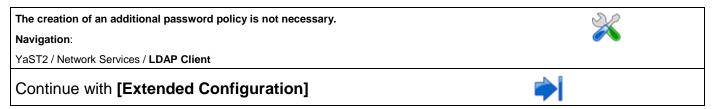
(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> <u>placeholders in the LDAP examples</u>

(Chapter: 14.1)

🔮 🖸 YaST2@tcz400	
Konfiguration des LDAP-Clients	
Benutzerauthentifizierung	
LDAP nicht verwenden	
LDAP verwenden	
 LDAP verwenden, jedoch <u>Anmeldungen deaktivieren</u> 	
C LDAP-Client	
Adressen von LDAP-Servern	
10.49.83.107	Suchen
LDAP-Basis- <u>D</u> N	
dc=br-automation,dc=com	DN <u>h</u> olen
LDAP TLS/SSL	
LDAP Version 2	
Automounter starten	
Home-Verzeichnis bei Anmeldung erstellen	
Erweiterte Konfiguration	
Hilfe	erfen <u>O</u> K

Illustration 191: Configuration LDAP client



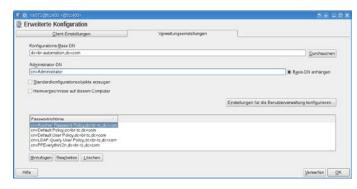


Illustration 192: Advanced Configuration

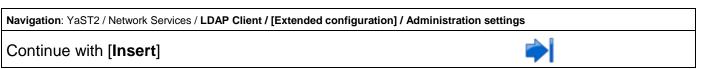




Illustration 193: Name of the password policy object

Navigation: YaST2 / Network Services / LDAP Client / [Extended configuration] / Administration settings / Insert	
Name of the password policy object	<name></name>

	^ X			
🐁 Passwortrichtlinienkonfiguration				
Passwortänderungsrichtlinien Passwortablaufrichtlinien	Sperrrichtlinien			
Maximale Anzahl der in der History gespeicherten Passwörter				
🕱 <u>B</u> enutzer muss Passwort nach Rücksetzung ändern				
🕱 Ben <u>u</u> tzer darf Passwort ändern				
Altes Passwort für Passwortänderung erforderlich	Altes Passwort für Passwortänderung erforderlich			
┌Überprüfung der Passwortqualität				
Keine Überprüfung				
 Nicht überprüfbare Passwörter akzeptieren 				
○ Nu <u>r</u> überprüfte Passwörter akzeptieren				
Mindestlänge des Passworts				
0				
Hilfe Verv	verfen			

Illustration 194: Password rules configuration

 Navigation: YaST2 / Network Services / LDAP Client / [Extended configuration] / Administration settings / Insert

 Either accept default settings or set desired policies

 Image: Detailed descriptions about the options can be found in chapter

 How is a password policy created manually on an openLDAP-Server?

Aur

Continue with [OK]



14.7.3 How is a password policy created manually on an openLDAP-Server?

A password policy allows the openLDAP administrator to define rules for a user's password. This password policy can be allocated to selected users.

The **default password policy** will always be used if the user does not have another password policy assigned.

These rules contain, amongst others, the following specifications:

maximum password age,

minimum password age,

minimum password length,

maximum amount of erroneous login attempts with subsequent blocking of the user,



Specification of the demanded complexity of a new password,



The ppolicy scheme must be loaded into the openLDAP server. Detailed information can be found in chapter <u>How is an openLDAP server configured?</u> (Chapter: 14.5.3)

Password policies are prepared by copying and adjusting the file that is in LDIF format and then importing into the LDAP server.

The placeholders must be filled out with definite value in this case.

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>



(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> <u>placeholders in the LDAP examples</u>

(Chapter: 14.1)

Manual creation of a password policy:

The creation of an additional password policy is not necessary.				
In the command line				
cp default_user_ppolicy.ldif new_use	cp default_user_ppolicy.ldif new_user_policy.ldif			
vi new_user_policy.ldif	adjust manually			
dn: cn= <new name="" policy="">,dc=<domain name="">,dc=<top domain="" level="" name=""></top></domain></new>				
cn: <new name="" policy=""></new>				
objectClass: pwdPolicy				
objectClass: namedObject				
pwdAttribute: userPassword				
pwdCheckQuality: 2				
pwdExpireWarning: 129600				
<pre>pwdFailureCountInterval: 300</pre>				
pwdGraceAuthNLimit: 3				
pwdInHistory: 5				
pwdLockout: TRUE				
pwdLockoutDuration: 120				
pwdMaxAge: 172800				

Configuration finished
ldapadd -h 10.49.83.107 -x -W -D cn=Administrator,dc=my-domain,dc=com - f new_user_policy.ldif
Example:
ldapadd -h <ip address=""></ip> -x -W -D cn=Administrator,dc= <domain< b=""> Name>,dc=<top domain="" level="" name=""></top> -f new_user_policy.ldif</domain<>
General syntax:
In the command line
pwdSafeModify: TRUE
pwdMustChange: TRUE
pwdMinLength: 8
pwdMinAge: 86400
pwdMaxFailure: 1

Content of the default_user_ppolicy.ldif with configured policies:

dn: cn=Default User Policy,dc=my-domain,dc=com cn: Default User Policy objectClass: pwdPolicy objectClass: namedObject pwdAttribute: userPassword pwdMustChange: TRUE pwdCheckQuality: 1 pwdExpireWarning: 86400 pwdGraceAuthNLimit: 3 pwdInHistory: 5 pwdMaxAge: 2592000 pwdMinAge: 864000 pwdMinLength: 8 pwdSafeModify: TRUE

These policies show, amongst others, the following points:

The user is informed that their password is expiring one day before the password loses its validity

An expired password can be used 3 times before the user account is locked

Limits the validity of the user password to 30 days

Specifies the minimum password length as 8 characters

The period is normally specified in [s].

Another password policy can be assigned to a user with the *pwdPolicySubentry* attribute. If the attribute is not specified, the automatically created 'Default Policy' is used when the *openLDAP* server is set up.



Explanation of the attributes:

Attribute:	Default:	Description:
pwdExpireWarning	129600	Pre-warning time [s] before expiry of the password
pwdFailureCountInterval	300	Time [s] after which the counter for invalid entry of the password is reset (see <pwdmaxfailure>)</pwdmaxfailure>
pwdGraceAuthNLimit	3	Number of 'grace logins' for which a login with an old password is made possible.
<u>pwdInHistory</u>	5	'n' number of old passwords that exclude a repetition of the same password
pwdLockout	TRUE	Activate lock after several <pwdmaxfailure> invalid passwords</pwdmaxfailure>
pwdLockoutDuration	120	Locking period [s] upon several invalid passwords and activated lock
<u>pwdMaxAge</u>	172800	Validity [s] of the password (password expires)
pwdMaxFailure	3	Number of invalid inputs that eventually lead to a locking of the account
pwdMinAge	86400	Minimum time [s] after which the password must be changed for the first time
pwdMinLength	8	Minimum password length in characters
pwdMustChange	TRUE	Necessity to change the password when logging in for the first time This entry is not evaluated
pwdSafeModify	TRUE	The authentication with the old password must be carried out when setting a new password
pwdCheckQuality	2	Activation of the password quality check

?

A more detailed description of the attributes can be found in: 'http://www.zytrax.com/books/ldap/ch6/ppolicy.html#pwdpolicyattributes'

14.7.4 How is a user created on the openLDAP server?

Next configuration step: (**recommended**) Chapter <u>How is a user created on the openLDAP server with Apache Directory</u> <u>Studio?</u>

(Chapter: 14.7.5)

Next configuration step: (alternatively)

Chapter How is a user created manually on the openLDAP server?

(Chapter: 14.7.6)

14.7.5 How is a user created on the openLDAP server with Apache Directory Studio?

In **APROL**, the users created in the user management, and the operators that are managed in the OperatorManager can be exported as LDIF files and then imported into the LDAP system. The import via the Apache Directory Studio (ADS) GUI is described here.

-	_	-
	~	
1000	н	
-		
1		_

The LDIF files that are exported from the **APROL** user management / OperatorManager are base-64 coded, so that a normal display in plain text is not possible.



It must be noted that the password that is assigned in **APROL** user management / OperatorManager is also in the LDIF files that are exported from **APROL**, and is also used as the start-up password for the authentication via LDAP. This password can be changed, depending on the password policy, when the user logs in for the first time.

Next configuration step: Chapter <u>How is an APROL system pre-configured for an LDIF export?</u> (Chapter: 14.7.5.1)

14.7.5.1 How is an APROL system pre-configured for an LDIF export?

The LDAP server properties must be configured before an export of the users / operators is carried out.

The dialog in the 'Runtime Options / Operator Authentication' tab, in the project properties, is used to configure the runtime environment. For the engineering system, the configuration is made in 'Extras / Global Engineering Options'. In these dialogs, it is also possible to select the template for the creation of the LDIF files.

LDAP server properties for the user export

O LDAP-Server Eige	nschaften - CaeManager (engin@tccomp131)	? — 🗆 🗙
LDAP-Server Eigenscha	ften	
Basis-DN:	dc=my-domain, dc=com	
Basis-DN für Benutzer:	ou=Development, ou=Essen, ou=Germany	
Benutzer-Template:	/opt/aprol/etc/LDAP/server/ldif_export_user_template_V1.0.Idif	
		rechen
		echen

Illustration 195: LDAP server properties for the user export

Navigation: CaeManager / Extras / Global Engineering Options / LDAP Server	Properties
Basis DN	dc= <domain name="">,dc=<top level<br="">Domain Name></top></domain>
Basis DN for users	ou= <organization unit=""></organization>

User template	Path is already entered
Confirm with [OK].	Æ



Basis DN for users:

Users that are exported from the user management are created in the directory specified here when importing them into the LDAP directory.

LDAP server properties for the operator export

-	🧧 🛈 LDAP-Server Eige	nschaften - CaeManager (engin@tccomp131)	? = 🗆 🗙
	LDAP-Server Eigenscha	ften]
	Basis-DN:	dc=my-domain, dc=com	
	Basis-DN für Benutzer:	ou=Development, ou=Essen, ou=Germany	
	Benutzer-Template:	/opt/aprol/etc/LDAP/server/ldif_export_user_template_V1.0.Idif	
	[brechen
			brechen

Illustration 196: LDAP server properties for the operator export

Navigation: CaeManager / Chose project / Context menu 'Properties' / 'Runtime Options' tab / LDAP Server Properties		
Basis DN	dc= <domain name="">,dc=<top level<br="">Domain Name></top></domain>	
Basis DN for users	ou= <organization unit=""></organization>	
User template	Path is already entered	
Confirm with [OK].	Æ	



Basis DN for operators:

Operators that are exported from the OperatorManager are created in the directory specified here when importing them into the LDAP directory.

Next configuration step:

Chapter <u>How are users and operators exported from the APROL system in LDIF</u> format?

(Chapter: 14.7.5.2)

14.7.5.2 How are users and operators exported from the APROL system in LDIF format?

The LDAP user policies can be named in the master data of the users and operators.

The policy with the name 'Default Policy' is used per default as it is always available after the installation of an openLDAP server.

1) The **Distinguished Name** (DN) of a user must be **unique**. Because the user names are managed in directories in the Active Directory Server, the pair of values (first name, surname) must therefore be **unique**.



2) The tuple **first name**, **last name**, and also the **login name** must correspond to the entry in the *APROL* user management or OperatorManager.

3) The **login name (uid)** in the Active Directory Server is only allowed to exist **once**. There is no plausibility check in the openLDAP server!

Login name (uid)

1

A double 'uid' could come about, for example, when there is a name change (e.g. due to marriage). It is possible to duplicate the LDAP user with a new name but to oversee the uniqueness of the uid.

This cannot happen in the **APROL** system because there is a check for this.

Preparation of a user for the LDIF export

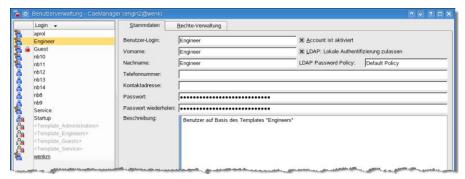
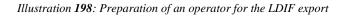


Illustration 197: Preparation of a user for the LDIF export

Navigation: CaeManager / User management / Detail view of the user	24
LDAP: Allow local authentication	activated
LDAP Password Policy	Default Policy
Confirm with [OK].	

Preparation of an operator for the LDIF export

🎽 💿 Operator editier	en - OperatorManager (engin2@wenk)	^ v 🗆 X
Operator: Demo	onstration	ENGINEERING
Stammdaten	$\underline{G}ruppen \qquad Login-\underline{K}onfiguration \qquad \underline{O}perator-Rechte (\underline{\Sigma}) \qquad Alar\underline{m}gruppen (\underline{\Sigma}) \qquad Applik$	ations- <u>R</u> echte (Σ)
Operator-Login:	Demonstration 🕱 Account ist akti	viert
Vorname:	Demonstration 🔀 LDAP: Lokale A	uthentifizierung zulassen
Nachname:	Demonstration LDAP Password P	olicy: Default Policy
Telefonnummer:		
Kontaktadresse:		
Passwort:	•••••	
Passwort wiederholen:	•••••	
Beschreibung:	Operator für Demonstartionszwecke mit Slideshow	
addition of the summary		



Navigation: OperatorManager / Edit operator / Master data



LDAP: Allow local authentication	activated
LDAP Password Policy	Default Policy
Confirm with [OK].	

User export

O Dateinamen zum	n Speichern unter angebe				
	Verzeichnis: 📄 /hom	e/engin/ENGIN/E	XCHANGE	_ • • • •	- 🖻 🎞 🖸
Favoriten	Name	Größe	Тур	Datum	Attribut
	. 📄	4096	Verzeichnis	16.05.2011 12:39:33	lesen/schreiben
		4096	Verzeichnis	08.07.2008 08:08:13	lesen/schreiben
	default_policy.ldif	374	Datei	16.05.2011 08:21:10	lesen/schreiben
	jhippler_policy.ldif	376	Datei	16.05.2011 08:23:28	lesen/schreiben
	jhippler_policy_t	377	Datei	16.05.2011 11:40:52	lesen/schreiben
	test. Idif	72	Datei	16.05.2011 14:35:18	lesen/schreiben
	User_import.Idif	909	Datei	12.05.2011 15:19:10	lesen/schreiben
	User_jdoe.ldif	785	Datei	12.05.2011 08:44:59	lesen/schreiben
	Dateiname: default po	licy.ldif			
	Dateityp: LDIF-Date	ien (*.ldif)			
			•)	
				Speichern	Abbrechen

Illustration 199: Selection of the file name and target directory

Navigation: CaeManager / Extras / User management / Select user / 'Export for LDAP Server (LDIF)' context menu	
File name <select file="" name=""></select>	
Confirm with [Save]	Aug.

Operator export

	Verzeichnis: 📄 /hon	ne/engin/ENGIN/E	XCHANGE	- • • •) 🖹 🎞 🖸
Favoriten	Name	Größe	Тур	Datum	Attribut
		4096	Verzeichnis	16.05.2011 12:39:33	lesen/schreiben
		4096	Verzeichnis	08.07.2008 08:08:13	lesen/schreiben
	default_policy.ldif	374	Datei	16.05.2011 08:21:10	lesen/schreiben
	jhippler_policy.ldif	376	Datei	16.05.2011 08:23:28	lesen/schreiben
	jhippler_policy_t.	377	Datei	16.05.2011 11:40:52	lesen/schreiben
	test. Idif	72	Datei	16.05.2011 14:35:18	lesen/schreiben
	User_import.Idif	909	Datei	12.05.2011 15:19:10	lesen/schreiben
	User_jdoe.ldif	785	Datei	12.05.2011 08:44:59	lesen/schreiben
	Dateiname: default_p	olicy.ldif			
	Dateityp: LDIF-Dat	eien (*.ldif)			
)	

Illustration 200: Selection of the file name and target directory

Navigation: OperatorManager / Select operator / 'Export for LDAP Server (LDIF)' context menu	
File name <select file="" name=""></select>	
Confirm with [Save]	

Next configuration step:	×
Chapter How is an LDIF file imported into the openLDAP server with Apache Directory Studio?	
(Chapter: 14.7.5.3)	
Next configuration step:	
Chapter Connecting APROL to the openLDAP / Active Directory Server	
(Chapter: 14.9)	

14.7.5.3 How is an LDIF file imported into the openLDAP server with Apache Directory Studio?

The are the following possibilities to start the import wizard in the ADS:



'Connections' view Connections view / Select connection / Import > LDIF Import from the context menu 'LDAP Browser' view

LDAP Browser view / Select entry / Import > LDIF Import from the context menu **Menu bar**

Menu bar / File / Import... / LDIF in LDAP

📓 🛛 LDIF Import	ł	
LDIF Import Wähle eine Verbindung	g und die zu importierende LDIF Datei	LDIF
LDIF Datei: /home/en	gin/ENGIN/EXCHANGE/User_import.ldif	▼ Bro <u>w</u> sen
Import nach: local		B <u>r</u> owsen
Loggen		
🖌 Loggen aktivieren		
 Verwende vo 	rgegebene Logdatei	
🔿 Verwende ei	gene Logdatei	
/home/engin/EN	GIN/EXCHANGE/User_import.ldif.log	Bro <u>w</u> sen
✓ Bestehende	Logdatei überschreiben	
Optionen		
Aktualisiere besteh	ende Einträge	
🔲 Bei einem Fehler	weiterfahren	
0	< <u>Z</u> urück <u>W</u> eiter > <u></u>	

Illustration 201: Import wizard in the ADS

Navigation: Import Wizard	×
LDIF file	<ldif file="" operator="" user="" with=""></ldif>
Import to	<select connection=""></select>
Activate logging	activated
Use pre-defined log file	activated

D1 System Handbuch

rwrite existing log file activated			
date existing entries		Disabled	
ntinue on error		Disabled	
rn	n with [Finish]	Æ	
	Import to:		
	The field is already pre-defined with the e	exception of one case. If the Import Wizard is .DAP' menu, a connection must be chosen	
	Use pre-defined log file:		
A new file can be created via the 'Use own log file' option instead of overwriting an existing log file.			
	Overwrite existing log file:		
		to enter a new file name during an import.	
		to enter a new file name during an import.	

Next configuration step:

14.7.6 How is a user created manually on the openLDAP server?

Users are **manually** prepared by copying and adjusting the file that is in LDIF format and then importing into the LDAP server.

The users / operators that are to authenticated in LDAP must be known to **APROL** because the **APROL** rights are configured there. Therefore, new operators must be introduced by downloading to the operator stations.

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>

?

Information about the placeholders can be found in chapter <u>Breakdown of the</u> <u>placeholders in the LDAP examples</u>

(Chapter: 14.1)

(Chapter: 14.2)

1) The **Distinguished Name** (DN) of a user must be **unique**. Because the user names are managed in directories in the openLDAP Server, the pair of values (first name, surname) must therefore be **unique**.



2) The tuple **first name**, **last name**, and also the **login name** must correspond to the entry in the *APROL* user management or OperatorManager.

3) The **login name (uid)** in the openLDAP Server is only allowed to exist **once**. There is no plausibility check in the openLDAP server!

Login name (uid)

1

A double 'uid' could come about, for example, when there is a name change (e.g. due to marriage). It is possible to duplicate the LDAP user with a new name but to oversee the uniqueness of the uid.

This cannot happen in the **APROL** system because there is a check for this.

Subsequently, create a new user:

In the command line		
cp user_template_inetOrgPerson.ldif	new_user.ldif	
vi new_user.ldif Adjust manually		
dn: CN= <first name=""> <surname>,OU=<department>,OU=<city>,OU=<country>,</country></city></department></surname></first>		
DC= <domain name="">,DC=<top domain="" level="" name=""></top></domain>		
objectClass: top		
objectClass: person		
objectClass: inetOrgPerson		
<pre>pwdPolicySubentry: cn=<default name="" new_user_policy="" policy="" user="">,dc=<domain name="">,dc=<top domain="" level="" name=""></top></domain></default></pre>		
cn: <first name=""> <surname></surname></first>		
uid: <login name=""></login>		
sn: <last name=""></last>		
In the command line		
General syntax:		
ldapadd -h <ip address=""></ip> -x -W -D cn: name> ,dc= <top domain="" level="" name=""></top> -f		
Example:		
ldapadd -h 10.49.83.107 -x -W -D cn f muellerm.ldif	=Administrator,dc=my-domain,dc=com -	
Next configuration step:	i	
Specify password		
Another password policy can be assigned to a u		

attribute is not specified, the automatically created 'Default Policy' is used when the openLDAP server is set up.

The password must then be set as follows:

In the command line

General syntax:

ldappasswd -h <IP address> -x -W -S -D cn=Administrator,dc=<Domain name>,dc=<Top Level Domain Name> "cn=<First name> <Surname>,ou=<Department>,ou=<City>,ou=<Country>, dc=<Domain name>,dc=<Top Level Domain Name>"

Example:

```
ldappasswd -h 10.49.83.107 -x -W -S -D cn=Administrator,dc=my-
domain,dc=com "cn=Max Mueller,ou=Development,ou=Essen,ou=Germany,dc=my-
domain,dc=com"
```

Configuration finished

Next configuration step:

Chapter Connecting APROL to the openLDAP / Active Directory Server

(Chapter: 14.9)

14.7.7 How is a user removed from an openLDAP server?

A user can be removed with the following command:

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>

(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> placeholders in the LDAP examples

(Chapter: 14.1)

In the command line

General syntax:

?

ldapdelete -h <IP address> -x -W -D cn=Administrator,dc=<Domain
Name>,dc=<Top Level Domain Name>
 "cn=<First name>
 <Surname>,ou=<Department>,ou=<City>,ou=<Country>,

dc=<Domain name>,dc=<Top Level Domain Name>"

Example:

```
ldapdelete -h 10.49.83.107 -x -W -D cn=Administrator,dc=my-
domain,dc=com "cn=Max Mueller,ou=Development,ou=Essen,ou=Germany,dc=my-
domain,dc=com"
```

Configuration finished



hing

14.7.8 How is a locked user account unlocked on an openLDAP server?

Unlocking a locked user account on an openLDAP server:

If the user account is locked (pwdLockout is TRUE), the account can be unlocked by the administrator in one of the following ways:

Delete the executable pwdAccountLockedTime attribute. In this way, the user can continue with the current password as long as it has not expired.

Set the value TRUE or FALSE to the executable pwdReset attribute. The value FLASE is only used when the password has not expired, and has the same effect as deleting the attribute.

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>

(Chapter: 14.2)

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Information about the placeholders can be found in chapter <u>Breakdown of the</u> <u>placeholders in the LDAP examples</u>

(Chapter: 14.1)

The second method ('pwdReset' attribute) is used here:

In the command line vi benutzer.ldif Adjust manually dn: CN=<First name> <Surname>, OU=<Department>, OU=<City>,OU=<Country>,dc=<Domain name>, DC=<Top Level Domain Name> changetype: modify replace: pwdReset pwdReset: TRUE In the command line **General syntax:** ldapmodify -h <IP address> -x -W -D cn=Administrator,dc=<Domain name>,dc=<Top Level Domain Name> -f benutzer.ldif Example: ldapmodify -h 10.49.83.107 -x -W -D cn=Administrator,dc=mydomain,dc=com -f benutzer.ldif hin Configuration finished dn: cn=Max Mueller,ou=Development,ou=Essen,ou=Germany,dc=my-domain,dc=com changetype: modify replace: pwdReset pwdReset: TRUE

14.7.9 How is a password policy allocated to an existing user on an openLDAP server?

Adjustment of the 'benutzer.mod.ldif' file.

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>

(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> <u>placeholders in the LDAP examples</u>

(Chapter: 14.1)

In the command line

?

vi benutzer.mod.ldif

adjust manually

dn: cn=<First name> <Surname>,ou=<Department>, ou=<City>,ou=<Country>,dc=<Domain name>, dc=<Top Level Domain Name>

changetype: modify

replace: pwdPolicySubentry

pwdPolicySubentry: cn=<Default User Policy|New User Policy Name>,dc=<Domain name>,dc=<Top Level Domain Name>

Save and continue with LDAP command

dn: cn=Max Mueller,ou=Development,ou=Essen,ou=Germany,dc=my-domain,dc=com changetype: modify

replace: pwdPolicySubentry

pwdPolicySubentry: cn=New User Policy,dc=my-domain,dc=com

In the command line

General syntax:

```
ldapmodify -h <IP address> -x -W -D cn=Administrator,dc=<Domain
name>,dc=<Top Level Domain Name> -f benutzer.mod.ldif
```

Example:

```
ldapmodify -h 10.49.83.107 -x -W -D cn=Administrator,dc=my-
domain,dc=com -f benutzer.mod.ldif
```

Configuration finished

14.7.10 How is a user on an openLDAP server edited?

The attribute that is to be modified is specified with 'replace'.

Adjustment of the 'benutzer.mod.ldif' file.

her

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>

?

(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> <u>placeholders in the LDAP examples</u>

(Chapter: 14.1)

In the command line

vi benutzer.mod.ldif

adjust manually

hing

dn: cn=<First name> <Surname>,ou=<Department>,ou=<City>,ou=<Country>,
dc=<Domain name>,dc=<Top Level Domain Name>
changetype: modify
replace: <Attribute>
<Attribute>
-In the command line

General syntax:

ldapmodify -h <IP address> -x -W -D cn=Administrator,dc=<Domain
name>,dc=<Top Level Domain Name> -f benutzer.mod.ldif

Example:

```
ldapmodify -h 10.49.83.107 -x -W -D cn=Administrator,dc=my-
domain,dc=com -f benutzer.mod.ldif
```

Save and continue with LDAP command

14.7.11 How is the password of a user on an openLDAP server changed?

Changing the password on an openLDAP server:

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>

?

(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> placeholders in the LDAP examples

(Chapter: 14.1)

In the command line

General syntax:

```
ldappasswd -h <IP address> -x -W -S -D cn=Administrator,dc=<Domain
name>,dc=<Top Level Domain Name> "cn=<First name>
<Surname>,ou=<Department>,ou=<City>,ou=<Country>,
dc=<Domain name>,dc=<Top Level Domain Name>"
```

Example:

ldappasswd -h 10.49.83.107 -x -W -S -D cn=Administrator,dc=mydomain,dc=com "cn=Max Mueller,ou=Development,ou=Essen,ou=Germany,dc=mydomain,dc=com"

Configuration finished

1

14.7.12 How are all of the configured users on an openLDAP server listed?

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>

(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> <u>placeholders in the LDAP examples</u>

(Chapter: 14.1)

In the command line

General syntax:

```
ldapsearch -h <IP address> -p <Port> -D cn=Administrator,dc=<Domain
name>,dc=<Top Level Domain Name> -b "DC=<Domain name>,DC=<Top Level
Domain Name>" "uid=*" -W
```

Example:

?

```
ldapsearch -h 10.49.83.107 -p 389 -D cn=Administrator,dc=my-
domain,dc=com -b "DC=my-domain,DC=com" "uid=*" -W
```

Configuration finished

14.8 User management on an Active Directory server

The following describes the creation of user accounts on a Kerberos capable Windows Active Directory Server, and the configuration of accounts and password policies, based on the example of a Windows 2003 server. The Kerberos authentication is necessary because of security reasons and for the evaluation of the password policies on a Windows server.

hing

The Distinguished Name of a user must be **unique**. As a user's DN contains the first name and surname, the pair of values (first name, surname) must therefore be **unique**.



The tuple first name, last name, and also the login name must correspond to the entry in the APROL user management or OperatorManager.



Time synchronization on all affected computers is mandatory when using Kerberos. The NTP time synchronization can be configured via AprolConfig on the APROL servers.

Next configuration step:

Chapter <u>How is a user created on an Active Directory server?</u> (Chapter: 14.8.1)

14.8.1 How is a user created on an Active Directory server?

Create a new user with the 'Active Directory Users and Computer' program.

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>



(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> <u>placeholders in the LDAP examples</u>

(Chapter: 14.1)

🐗 Active Directo	ory Users and Comp	uters		
🎻 <u>Fi</u> le <u>A</u> ction	<u>V</u> iew <u>W</u> indow <u>H</u> e	əlp		
← → 🗈 📧] 🐰 🛍 🗙 🖻	0	3 🕄 💵 🦉 💯	🖢 🖓 🍕
Active Directory Users and Computer Users 37 objects				
🗄 💼 Saved Que		Name		Туре
E Builtin	2.1000	🛛 🕰 Adi	ministrator	User
🗄 🛅 Compu	iters		rol User	User
🕀 🧭 Domair	n Controllers		rt Publishers	Secu
	nSecurityPrincipals		sAdmins	Secu
			sUpdateProxy	Secu
	Delegate Control		hain Admins	Secu
	Find		hain Computers	Secu Secu
	<u>N</u> ew	Þ	Computer	Jecc
	All Tas <u>k</u> s	Þ	Contact	
Create a new objec	View		Group	
	New Window from H	Hara	InetOrgPerson	
		iere	MSMQ Queue Alias	
	Refresh		Printer	
	Export <u>L</u> ist		User	
	P <u>r</u> operties		Shared Folder	
	Help			

Illustration 202: Create user.

Navigation: Start / Administrative Tools / Active Directory Users and Computers / <Database> / Users / Context menu 'New' / User



Continue with 'User' context menu

The general account information is entered. An account name ('User logon name') that is also configured with the respective rights in the **APROL** system (User management / OperatorManager) must be used in order to authenticate users and operators in **APROL**.

The general account information is entered:

New Object - User		x
Create in:	deessetest2.local/Users	
<u>F</u> irst name:	Max Initials: MM	
Last name:	Mueller	
Full n <u>a</u> me:	Max MM. Mueller	
User logon name: mueller	@deessetest2.local	
User logon name (pre- DEESSETEST2\	Windows 2000):	
,		
	< <u>B</u> ack. <u>N</u> ext > Cancel	

Illustration 203: Create user.

Navigation: Start / Administrative Tools / Active Directory Users and Computers / <database> / Users / Context menu 'New' / User</database>		
First name	input	
Last name	input	
Full name	input	
User logon name	input	
User logon name (2.nd part)	@ <computer name="">.local</computer>	
User logon name (Pre Windows 2000)	input	
Continue with [Next]	►	

Subsequently, an initial password, which can be changed later by the user, must be specified. 'User must change password at next logon'):

New Object - User	×
Create in: deessetest2.local/Users	
Password: Confirm password:	
User <u>m</u> ust change password at next logon	
User cannot change password	
Password never expires Account is disabled	
< <u>B</u> ack <u>N</u> ext > C	ancel

Illustration 204: Create user.

Navigation: Start / Administrative Tools / Active Directory Users and Computers / <database> / Users / Context menu 'New' / User</database>		
Password	enter	
Confirm password enter		
Continue with [Next]		
Chapter How is a user edited on an Active Directory server?		
(Chapter: 14.8.2)		

14.8.2 How is a user edited on an Active Directory server?

A user's data can be entered via the 'Properties' entry in the context menu.

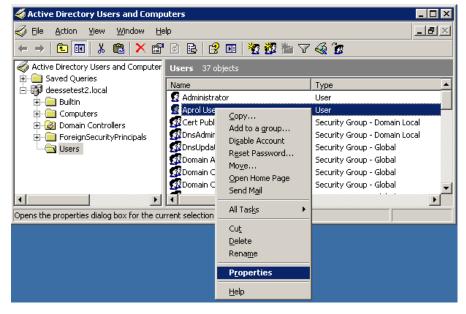


Illustration 205: Edit user

Navigation: Start / Administrative Tools / Active Directory Users and Computers / <Database> / Users / <Select user> / 'Properties' context menu

A first name and surname that is also configured with the respective rights in the **APROL** system (User management / OperatorManager) must be entered in the 'General' tab in order to authenticate users and operators in **APROL**.

Aprol User Properties	? ×
Member Of	Dial-in Environment Sessions
Remote control T	erminal Services Profile COM+ UNIX Attributes
General Address	Account Profile Telephones Organization
Aprol Use	er
<u>F</u> irst name:	Aprol Initials:
Last name:	User
Di <u>s</u> play name:	Aprol User
Description:	
Offi <u>c</u> e:	
<u>T</u> elephone number:	<u>ther</u>
E- <u>m</u> ail:	
Web page:	Other
	OK Cancel Apply

Illustration 206: User properties 'General'

Navigation: Start / Administrative Tools / Active Directory Users and Computers / <database> / Users / <select user=""> / 'Properties' context menu / General</select></database>	
First name	enter
Last name	enter
Display name	enter
Continue with the 'Account' tab	>

Aprol User Properties ? 🗙				
Member Of Dial-in Environment Sessions Remote control Terminal Services Profile COM+ UNIX Attributes General Address Account Profile Telephones Organization				
User logon name: ☐pro User logon name (pre- <u>W</u> indows 2000): DEESSETEST2\ ☐prol				
Log On Io				
User must change password at next logon User cannot change password Password never expires Store password using reversible encryption				
Account expires Image: New regime Image: C End of: Donnerstag, 14. April				
OK Cancel Apply				

Illustration 207: User properties 'Account'

 Navigation:
 Start / Administrative Tools / Active Directory Users and Computers / <Database> / Users / <Select user> / 'Properties' context

 User logon name
 enter

 User logon name
 enter

User logon hame (Fait 2)	entei
User logon name (Pre Windows 2000)	enter
Do not require Kerberos pre-authentication	Disabled
Continue with your own adjustments	>

The following account options can be configured in the Active Directory Server as user properties and are taken into account in the **APROL** system.

Option: User must change password at next logon'

openLDAP: Cannot be configured directly



A new password can be requested at the next log in if the pwdReset attribute is added and set to TRUE.

The pwdMustChange attribute must be set to TRUE in the password policy.

Force a change of the initial password. The user is asked to create a new password the next time that they log in.

This request is made in the same way as that of an expired password in the **APROL** system.

Option: Account is disabled

openLDAP: Cannot be configured directly



By setting the pwdAccountLockedTime attribute, a valid timestamp with the current time, in the format YYYMMDDhhmmssZ, is made; e.g. 20110317160517Z.

The locking of the account is lifted by removing the attribute. There is not a request to change the password after the unlocking has taken place.

A login does not take place in the **APROL** system if the account is locked, and corresponding message is displayed.

Alternatively:

The account can also be locked via the user management / OperatorManager in **APROL**.

Option: Do not require Kerberos pre-authentication

It is recommended not to set this option!

If the **'Do not require Kerberos pre-authentication'** option is set, the following limitations must be taken into account:



1. Windows Server 2003: A check does not take place to see if a password has expired or if it must be set initially. A login does take place at any rate.

2. *Windows Server 2000*: If the account is deactivated and the password has expired, there is not the corresponding warning that the account has been locked.

Navigation: Start / Administrative Tools / Active Directory Users and Computers / <database> / Users / <select user=""> / 'Properties' context menu / Account</select></database>		
Desired policies	Activate / deactivate	
Finish configuration with [OK]	\J D	

Next configuration	n step:
--------------------	---------

Chapter Password policies / Account policies on an Active Directory server?

(Chapter: 14.12)

14.8.3 How is the password of a user changed on an Active Directory Server?

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>



(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> placeholders in the LDAP examples

(Chapter: 14.1)

🐇 Active Directory Users and Computers			
File Action View Window He	lp		_ 8 ×
Active Directory Users and Compl	Users 38 objects		
E - B Saved Queries	Name 🗸	Туре	▲
Builtin Computers	Max MM, Mueller LDAP Query	<u>C</u> opy Add to a group Di <u>s</u> able Account	
Resets the password for the current select	ion.	R <u>e</u> set Password	
		Mo <u>v</u> e Open Home Page Send M <u>a</u> il	
		All Tas <u>k</u> s 🔹 🕨	
		Cu <u>t</u> Delete Rena <u>m</u> e	
		Properties	
		Help	

Illustration 208: Reset password

Navigation: Start / Administrative Tools / Active Directory Users and Computers / <Database> / Users / <Select user>

Continue with 'Reset Password...' context menu

Reset Password	<u>? ×</u>			
<u>N</u> ew password:	•••••			
<u>C</u> onfirm password:	••••••			
User must change password at next logon				
The user must logoff and then logon again for the change to take effect.				
	OK Cancel			

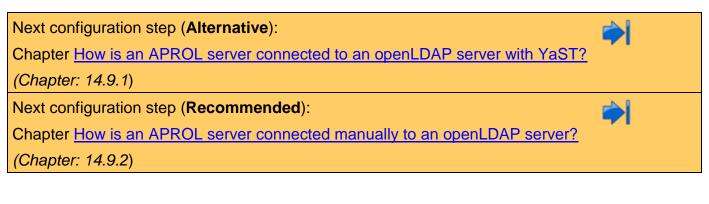
Illustration 209: Enter password

Navigation: Start / Administrative Tools / Active Directory Users and Computers / <database> / Users / <select user=""> / 'Reset Password' context menu</select></database>		
New password	<password></password>	
Confirm password	<password></password>	
Finish configuration with [OK]	Æ	

14.9 Connecting APROL to the openLDAP / Active Directory Server

The following chapter explains the connection of a Linux computer acting as LDAP client to an *openLDAP server* and an Active Directory Server.

openLDAP-Server:



Active Directory Server:

Next configuration step:

Chapter How is an APROL server connected to an Active Directory server?

(Chapter: 14.9.4)

?

14.9.1 How is an APROL server connected to an openLDAP server with YaST?

The following configuration setting must be carried out when starting the configuration of the LDAP client for the first time with the 'LDAP client' icon.

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>

(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> <u>placeholders in the LDAP examples</u>

(Chapter: 14.1)

YaST-Kontrollzentrum @ Datei Bearbeiten Hilfe	13off248			E X
Software Hardware System Netzwerkgeräte Netzwerkdienste	Administration von einem entfernten Rechner (VNC) Hostnamen LDAP-Client	DHCP-Server Kerberos-Client LDAP-Server Netzwerkdienste (xinetd)	- DNS-Server	br
Sicherheit und Benutzer	SLP Same	Camba Sanar	Windows-Doma	inenmitglied
	LDAP-Client Adressen von LDAP-S	jedoch Anmeldungen deaktivieren		
Suchen	i LDAP-Basis- <u>D</u> N dc=example.dc=com X LDAP_ILS/SSL LDAP_Version 2			Sughen
	Automounter starten Horne-Verzeichnis be	el Anmeldung erstellen Erweiterre Konfiguratio	n	erfen

Illustration 210: Configuration of the LDAP client

Navigation: YaST2 / Network Services / LDAP Client	×	
Do not use LDAP	activated	
Addresses of LDAP servers	<fully-qualified domain="" name=""> of the computer where the openLDAP server has been set up and is running</fully-qualified>	
LDAP Basis DN	dc= <domain name="">,dc=<top domain<br="" level="">Name></top></domain>	
LDAP TLS/SSL	deactivated (for now)	
LDAP Version 2	deactivated (for now)	
Start auto-mounter	Disabled	
Create home directory on login	Disabled	
Continue with [Extended Configuration]		



The domain name **must** be specified as a **fully qualified domain name** because of its later use with SSL.

The *openLDAP* server also supports the LDAPv2 protocol. However, the LDAPv3 protocol is used in the following,



The basis configuration is carried out here (for the moment) without the SSL support. Further information can be found in chapter <u>Extended security with use of SSL / TLS</u> (Chapter: 14.10)



The basis DN can also be queried automatically and chosen with the [Get DN] button. The uppermost entry in the dialog that opens is the basis DN, and it can be adopted with [OK].

'Administration Settings' tab:

🔮 🖸 YaST2@meeting1	
🖳 Erweiterte Konfiguration 🛛 🖌	
Client-Einstellungen Verwaltungseinstellungen	
Konfigurations-Base DN	
ou=ldapconfig.dc=example.dc=com	Durchsuchen
Administrator-DN cn=Administrator	Basis-DN anhängen
Standardkonfigurationsobjekte erzeugen	
	Einstellungen für die Benutzerverwaltung konfigurieren
Passwortrichtlinie	
Hinzufügen Beagbeiten Löschen	
Hilfe	<u>V</u> erwerfen <u>O</u> K

Illustration 211: 'Administration Settings' tab

Navigation: YaST2 / Network Services / LDAP Client / [Extended configuration] / Administration settings		
Administration DN	cn=Administrator	
Appended Basis DN	activated	
Create standard configuration objects	Disabled	
Home directory on this computer	Disabled	
Finish configuration with [OK]	A	



No further settings are necessary in the 'Client settings' tab. The specifications are accepted.

 Next configuration step:
 Image: Chapter Which additional manual adjustments must be carried out?

 (Chapter: 14.9.1.1)

14.9.1.1 Which additional manual adjustments must be carried out?

Adjustment of the Idap.conf

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>

?

(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> placeholders in the LDAP examples

(Chapter: 14.1)

The following entries must be added to the /etc/ldap.conf file:

In the command line		
vi /etc/ldap.conf		Carry out manual adjustments
binddn	cn=LDAP Query,cn=Users, dc= <domain name=""></domain> ,dc= <top b="" doma<="" level=""></top>	in Name>
bindpw	<password></password>	

Insert / change the *pam_filter* entry.

<pre>#pam_filter</pre>	objectClass=posixAccount	Uncomment
pam_filter	objectClass= inetOrgPerson	insert / change



The pam_filter entry is only allowed to be active **once** in the configuration file. AS the pam_filter entry exists in several places in the configuration file, it must be ensured that only one entry is active.

If the 'Old password necessary for password change' option is set in the password policies, or the 'pwdSafeModify' attribute is activated, then the following adjustment must be made in the existing 'pam_password' entry in the /etc/ldap.conf file.

🔥 🛈 YaST2@meeting1			
🐁 Passwortrichtlinier	konfiguration		
Passwortänderungsrichtlinien	Passwortablaufrichtlinien	Sperrrichtlinien	
Magimale Anzahl der in der History gespeid	herten Passwörter		
0		7	×
Benutzer muss Passwort nach Rückset	zung ändern		
🗶 Benytzer darf Passwort ändern			
Altes Passwort für Passwortänderung e	rforderlich		
Überprüfung der Passwortqualität-			
Keine Überprüfung			
Nicht überprüfbare Passwörter akz	eptieren		
🔿 Nur überprüfte Passwörter akzeptie	ren		
Mindestlänge des Passworts			
0			
Hilfe			Verwerfen <u>O</u> K

Illustration 212: Password Change Policies

If the 'exop_send_old' password change protocol is used (Old password necessary for password change) **and** the check for multiple use of the same password in the history is turned on (Maximum number of password saved in the history) and it fails, then an error message is **not** shown.



Instead, a message is returned that the password has been changed successfully, although this is not the case.

B&R does not recommend using the 'exop_send_old' protocol because of an error that has been detected with it.

pam_	password	l
------	----------	---

exop

If the 'exop_send_old' password change protocol is used (Old password necessary for password change) **and** the check for multiple use of the same password in the history is turned on (Maximum number of password saved in the history) and it fails, then an error message is **not** shown.



Instead, a message is returned that the password has been changed successfully, although this is not the case.

B&R does not recommend using the 'exop_send_old' protocol because of an error that has been detected with it.

Configuration finished



Next configuration step:

Chapter <u>How is the PAM-LDAP module configured for use with the openLDAP</u> <u>server?</u> (Chapter: 14.9.3)

. . ,

14.9.2 How is an APROL server connected manually to an openLDAP server?

The following files must be copied and edited manually if you do not use YaST:

Chapter How is an APROL server connected to an openLDAP server with YaST?

(Chapter: 14.9.1)

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>

(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> placeholders in the LDAP examples

(Chapter: 14.1)

Copy files:

 In the command line
 X

 cp /opt/aprol/etc/LDAP/client/pam.d/aprolloginserver /etc/pam.d/
 Image: Command line of the c

Manual changes in the /etc/ldap.conf

h	n the command line	
v	1 /erc/ldan cont	Carry out manual adjustments

host	<fully domain="" name="" qualified=""></fully>
base	dc= <domain name="">,dc=<top domain="" level="" name=""></top></domain>
binddn <domain name=""></domain> ,d	cn=LDAP Query,cn=Users,dc= c= <top domain="" level="" name=""></top>
bindpw	<password 'query'="" of="" query="" the="" user=""></password>
ssl	no
ldap_version	3
pam_filter o	bjectClass= inetOrgPerson
tls_checkpeer	no
#ssl	on
#ssl	start_tls
Eventually, further a	adjustments



The 'host' entry **must** be specified as a **fully qualified domain name** because of its later use with SSL.

If the **'Old password necessary for password change'** option is set in the password policies, or the *'pwdSafeModify'* attribute is activated, then the following adjustment must be made in the existing *'pam_password'* entry in the /etc/ldap.conf file.

🍓 🛈 YaST2@meeting1			
🔌 Passwortrichtlinier	konfiguration		
Passwortänderungsrichtlinien	Passwortablaufrichtlinien	Sperrrichtlinien	
Maximale Anzahl der in der History gespei	:herten Passwörter		
0		2	×
🕱 Benutzer muss Passwort nach Rückser	zung ändern		
Benutzer darf Passwort ändern			
Altes Passwort für Passwortänderung e	rforderlich		
Überprüfung der Passwortqualität-			
Keine Überprüfung			
Nicht überprüfbare Passwörter akz	eptieren		
🔿 Nu <u>r</u> überprüfte Passwörter akzepti	ren		
Mindestlänge des Passworts			
0			
Hilfe			Verwerfen <u>O</u> K

Illustration 213: Password Change Policies

If the 'exop_send_old' password change protocol is used (Old password necessary for password change) and the check for multiple use of the same password in the history is turned on (Maximum number of password saved in the history) and it fails, then an error message is **not** shown.

Instead, a message is returned that the password has been changed successfully, although this is not the case.

B&R does not recommend using the 'exop_send_old' protocol because of an error that has been detected with it.

pam_password	exop
	>

Manual changes in the /etc/nsswitch.conf

The services, netgroup and aliases entries are extended with *ldap*; the passwd_compat entry is added.

In the command line			
vi /etc/nsswitc	1.conf		Carry out manual adjustments
passwd: compat			
group: files lo	lap		
hosts: files ma	lns4_minimal [NOTFOUND=r	eturn] dns	
networks:	files dns		
services:	files ldap		
protocols:	files		
rpc: files			
ethers: files			
netmasks:	files		
netgroup:	files ldap		
publickey:	files		
bootparams:	files		
automount:	files nis		
aliases:	files ldap		
passwd_compat:	ldap		
Configuration finis	ned		Æ

Next configuration step:	
Chapter How is the PAM-LDAP module configured for use with the openLDAP	· · ·
server?	
(Chapter: 14.9.3)	

14.9.3 How is the PAM-LDAP module configured for use with the openLDAP server?

The Pluggable Authentication Modules (PAM) are a software library, which provides a general programming interface (API) for authentication services.

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Basic information about **PAM** can be found under http://en.wikipedia.org

The aprolloginserver file is added to the /etc/pam.d directory:



14.9.4 How is an APROL server connected to an Active Directory server?

The manual configuration, which is described in the following, is necessary to allow a **Kerberos authentication** on the Windows server. The Kerberos authentication is necessary because of security reasons and for the evaluation of the password policies (amongst others, for password expires).

The connection of an *APROL* server via **Kerberos**, to a Windows based **Active Directory Server should not be carried out with YaST**.



Reason:

Because of the configuration with YaST, **all** of the PAM module configuration files are adjusted and **overwritten** automatically. This leads to the fact that when a Linux login is made an authentication **only** takes place over the Active Directory Server.

14.9.4.1 How is Kerberos configured for connection to an Active Directory server?

The Kerberos authentication is necessary because of security reasons and for the evaluation of the password policies on an Active Directory Server.

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>

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(Chapter: 14.2)

Information about the placeholders can be found in chapter <u>Breakdown of the</u> <u>placeholders in the LDAP examples</u>

(Chapter: 14.1)

Adjusting the krb5.conf file:

In the command line	×
cp /opt/aprol/etc/LDAP/client/krb5.conf /etc/krb5.conf	
vi /etc/krb5.conf	

[libdefaults] default_realm	<pre><realm kerberos="" of="" server="" the=""> in capital letters</realm></pre>
<pre>[realms] <domain name="">.<top domain="" level="" name=""> in capital letters</top></domain></pre>	Domain name of the realm
[realms] kdc	<ip address="" host="" name="" =""> of the Kerberos server</ip>
[realms] default_domain	<domain name="">.<top domain<br="" level="">Name></top></domain>
[realms] admin_server	<ip address="" host="" name="" =""> of the Kerberos server</ip>
[domain_realm] . <domain name="">.<top domain="" level="" name=""></top></domain>	<pre><domain name="">.<top domain="" level="" name=""> in capital letters</top></domain></pre>
Configuration finished	Æ

Example:

```
[libdefaults]
       default_realm = MY-DOMAIN.COM
       clockskew = 300
[realms]
MY-DOMAIN.COM = {
       kdc = 10.49.80.51
        default_domain = my-domain.com
        admin_server = 10.49.80.51
[logging]
       kdc = FILE:/var/log/krb5/krb5kdc.log
        admin_server = FILE:/var/log/krb5/kadmind.log
       default = SYSLOG:NOTICE:DAEMON
[domain_realm]
        .my-domain.com = MY-DOMAIN.COM
[appdefaults]
pam = {
        ticket_lifetime = 1d
        renew_lifetime = 1d
        forwardable = true
        proxiable = false
       minimum_uid = 1
        external = sshd
        use_shmem = sshd
        clockskew = 300
        banner = ""
        ignore_unknown_principals = false
       no_ccache = true
```



The realm of the Kerberos server (administrator area) is normally the realm of the domain, i.e. <Domain name>.<Top Level Domain Name>.

The connection of the domain to the realm is defined in the [domain_realm] section.

Next configuration step:

Chapter <u>How is the PAM-Kerberos module configured for the connection to an</u> <u>Active Directory server?</u>

(Chapter: 14.9.4.2)

14.9.4.2 How is the PAM-Kerberos module configured for the connection to an Active Directory server?

The /etc/aprolloginserver configuration file for PAM must be adjusted for the use with Kerberos.

In the com	nmand line			*
cp /opt/aprol/etc/LDAP/client/pam.d/aprolloginserver.krb5 /etc/pam.d/aprolloginserver¶				
Configura	tion finished			Æ
auth	required	pam_krb5.so	no_user_check¶	
account	required	pam_krb5.so	try_first_pass no_user_check	P
password	required	pam_krb5.so	no_user_check¶	
session	optional	pam krb5.so	no user check¶	



Chapter How is the LDAP authentication configured for the engineering system in the CaeManager?

(Chapter: 14.11.1)

14.10 Extended security via use of SSL / TLS for the openLDAP server

SSL is only used on an openLDAP server.

Kerberos, which already offers an extended security, is used on an Active Directory Server.

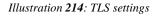
Apart from connecting to the LDAP server over port 389, an SSL connection can also be established over port 636 when a certificate is specified.

14.10.1 How is the security of the connection between an APROL server and an openLDAP server increased?

The TLS / SSL encryption is activated with YaST2 via the LDAP server administration. The 'LDAP server' YaST module is in 'Network services'.

Configuration on an openLDAP server:

🕞 🖸 YaST2@meeting1	
Startkonfiguration Globale Einstellungen Log-Level-Einstellungen Funktionen zulassennicht zulassen Schema-Dateien Ostenna-Dateien	logical for the second
	TLS-Einstellungen
	Grundeinstellungen
	ILS aktivieren
	LDAP über SSL (Idaps) Schnittstelle aktivieren
	Allgemeines Server-Zertifikat verwenden
	Zertifikat importieren
	CA-Zertifikatdatei (PEM-Format)
	Durchsuchen
	Zgrifikat-Datei (PEM-Format)
	Zertifikatschlüsseldatei (PEM-Format - nicht verschlüsselt)
	Durchsuchen
	CA-Verwaltungsmodul starten
	Hilfe <u>V</u> erverfen



Increasing the security is not absolutely necessary in order to guarantee a functioning system.	*
Navigation: YaST2 / Network Services / LDAP Server / Global Settings / TLS Settings	
Activate TLS	activated
If there is no general server certificate, continue with [Start CA management module], chapter <u>How is the certificate that is necessary for the SSL connection</u> to an openLDAP server created? (<i>Chapter: 14.10.2</i>) and then continue further from here.	•
Use general server certificate	activated
Finish with [OK]	Æ

Next configuration step:

Chapter How are unencrypted connections to the openLDAP server suppressed?

(Chapter: 14.10.3)

The 'Enable LDAP over SSL (Idaps) interface' option is also activated automatically when the 'Enable TLS' option is activated.



The easiest thing is to use the common server certificate. Alternatively, a manually created certificate can be imported, e.g. an X.509 (SSL) certificate that has been purchased from a certification organization.

14.10.2 How is the certificate that is necessary for the SSL connection to an openLDAP server created?

A root CA is needed next. This root CA serves as a container. A server CA for the *openLDAP* server is inserted in this container afterwards.

Information about the templates in /opt/aprol/etc/LDAP/ can be found in chapter <u>Use of</u> <u>the B&R example configurations</u>

(Chapter: 14.2)

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Information about the placeholders can be found in chapter <u>Breakdown of the</u> <u>placeholders in the LDAP examples</u>

(Chapter: 14.1)

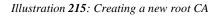
A detailed description about the attributes (How to recreate SMT 11 CA and server certificate) can be found under:

http://www.novell.com/support/php/search.do?cmd =displayKC&docType=kc&externalId=7006024

If no certificate exists up to now, then only a certificate must be created.

A certificate for the Linux server is created in the example. Thus, the name 'YaST_Default_CA' is to be used:

🔥 🖸 YaST2@meeting1	
🐁 Erzeugen eines/r neuen Root CA (Schrit	t 1/3)
CA-Name:	,
YaST_Default_CA	
Allgemeiner Name:	
YaST_Default_CA	
E-Mail-Adressen 🖉 Standard	Löschen
	Standard
	Hinzufügen
Eirma/ Organisation:	Abteilung:
Eina organisation.	Augenung.
<u>o</u> rt:	Bundesland:
Land:	
Deutschland	▼
Hilfe	Abbrechen Zurück Weiter



Navigation: YaST2 / Network Services / LDAP Server / Global Settings / TLS Settings / [Start CA management module] / [Create Root CA] (Step 1/3)		
CA name	YaST_Default_CA	
General name	YaST_Default_CA	
The other fields	<your information=""></your>	
Continue with [Continue]	►	

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D1 System Handbuch

Spaces are not allowed in general CA names!

Navigation: YaST2 / Network Services / LDAP Server / Global Settings / TLS Settings / [Start CA management module] / [Create Root CA] (Step 2/3)	
Key length	Adopt default
Valid period	Adopt default

Validity period	customer-specific
[Advanced settings]	customer-specific
Continue with [Continue]	

No changes are necessary in the [Extended Settings] button at present.

Navigation: YaST2 / Network Services / LDAP Server / Global Settings / TLS Settings / [Start CA management module] / [Create Root CA] (Step 3/3)		
Overview dialog		check
Finish with [Create]		*
CA name: YaST_Default_C General name: YaST_Defa Organisation/Company: B Organization unit: B&R	ult_CA &R Industrie Elektronik GmbH	
E-Mail-Address:	information@my-domain.com (default)	
Town: Ess	en	
Federal state:	Nordrheinwestfalen	
Country:	DE	
Key length: 2048-bit		
Valid period: 3650 days		
Basic Constaints:	CA:true (critical)	
Issuer Old Name:	Copy Subject Old Name from CA	
Key Usage:	cRLSign	
	keyCertSign	
nsComment:	"YaST Generated CA Certificate"	
nsCertType:	sslCA	
	emailCA	
Subject Old Name:	Copy standard e-mail address	
Subject Key Identifier:	hash	
Authority Key Identifie	r: keyid:always,issuer:always	

Creating a general server certificate:

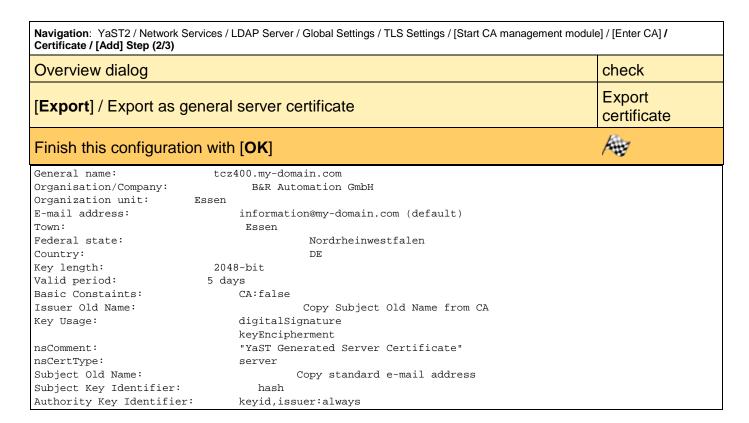
Navigation: YaST2 / Network Services / LDAP Server / Global Settings / TLS Settings / [Start CA management module] / [Enter CA] / Certificate / [Add] Step (1/3)	
General name	<fully domain="" name="" qualified=""></fully>
Continue with [Continue]	>

 \bigwedge

The fully qualified domain name must be used as 'general name', so that the certificate can be referenced.

The name in the example is: tcz400.my-domain.com

Navigation: YaST2 / Network Services / LDAP Server / Global Settings / TLS Settings / [Start CA management Certificate / [Add] Step (2/3)	t module] / [Enter CA] /
Password	<password></password>
Key length	Adopt default
Validity period	customer-specific
[Advanced settings]	customer-specific

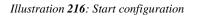


Next configuration step: Chapter <u>How are unencrypted connections to the openLDAP server suppressed?</u> (Chapter: 14.10.3)

14.10.3 How are unencrypted connections to the openLDAP server suppressed?

If you have turned on the SSL encryption on the LDAP server, it is still possible to establish nonencrypted connections to the LDAP server. The protocol listener 'LDAP' is normally switched on during the first configuration of the server.

Startkonfiguration	📄 Konfiguration des LDAP-Servers
Schema Datelen Datenbarken	LDAP-Server starten



Navigation: YaST2 / Network Services / LDAP Server /Start configuration	×
Protocol Listener / LDAP	Disabled
Confirm with [OK].	Æ

Next configuration step:	
Chapter How is the SSL encryption activated on the APROL server ?	
(Chapter: 14.10.4)	

14.10.4 How is the SSL encryption activated on the APROL server?

The use of TLS / SSL must be activated manually on an **APROL** server (LDAP client).

The SSL entry is only allowed to be created manually on the client.



A configuration via YaST should be avoided because this leads to an SSL entry that is **not** compatible with 2/2/2/2/2.

In the command line	×
vi /etc/ldap.conf	
ssl	on
Configuration finished	ĺ∰



The **ssl** entry is only allowed to be active **once** in the configuration file! As the entry exists in several places in the configuration file, it must be ensured that only one entry is active.





14.10.5 How is the security of the SSL connection increased?

The public key of the server certificate must be stored on the **APROL** server (LDAP client) in order to allow the client to authenticate the server certificate.

The /etc/ldap.conf file on the client must also be adjusted:

In the command line	e	*				
<pre>scp root@<ldap server="">:/etc/ssl/certs/YaST-CA.pem /etc/ssl/certs/ldapca.pem</ldap></pre>						
vi /etc/ldap.conf		adjust				
tls_checkpeer	yes					
tls_cacertfile	/etc/ssl/certs/ldapo	ca.pem				
tls_cacertdir	/etc/ssl/certs					
Configuration finish	ned	Æ				



The **tls_checkpeer** entry is only allowed to be active **once** in the configuration file! As the entry exists in several places in the configuration file, it must be ensured that only one entry is active.

Next configuration step:

Chapter How is the LDAP authentication configured for the engineering system in the CaeManager?

(Chapter: 14.11.1)

14.10.6 When is a certificate finally activated?

An LDAP server restart is necessary when a certificate is changed. /etc/init.d/ldap restart

14.11 Configuration of the LDAP authentication for the engineering and runtime system

APROL must be configured respectively for the communication with the LDAP server.

The following points must be taken into account:

Activation in the user management (engineering users)



Activation in the OperatorManager (operators)

The LDAP configuration must be carried out on all engineering servers and operator stations where the users and operators are to be authenticated via the LDAP server.



Detailed information can be found in chapter <u>Connecting APROL to the openLDAP /</u> <u>Active Directory Server</u>

(Chapter: 14.9)



The Distinguished Name of a user must be **unique**. As a user's DN contains the first name and surname, the pair of values (first name, surname) must therefore be **unique**.

The tuple first name, last name, and also the login name must correspond to the entry in the APROL user management or OperatorManager.

14.11.1 How is the LDAP authentication configured for the engineering system in the CaeManager?

Activation for engineering users:

🧯 🖸 Globale Engineering-Optionen - CaeManager (engsamp@me) 🗖 🗆 🗙
Sicherheits-Optionen
Erweiterte Überprüfung der Passwortsicherheit
Minimale Passwortlänge: 8 🚔
Maximale Passwortlänge: 32
Globale Build-Optionen
Controller-Encoding Latin1
Engineering-Benutzer Authentifizierung
O Lokale APROL-System-Authentifizierung
LDAP Authentifizierung
Login-Stack
<u>S</u> tandard wiederherstellen
OK Abbrechen

Illustration 217: Configuration of the LDAP authentication for engineering users

Navigation:	\sim
CaeManager / Extras / Global Engineering Options	<i>6</i>
LDAP authentication	activated
Login stack	activated

LDAP server properties:

🧧 💿 LDAP-Server Eige	nschaften - CaeManager (engin@tccomp131)	? — 🗆 🗙
LDAP-Server Eigenscha	ften]
Basis-DN:	dc=my-domain, dc=com	
Basis-DN für Benutzer:	ou=Development, ou=Essen, ou=Germany	
Benutzer-Template:	/opt/aprol/etc/LDAP/server/ldif_export_user_template_V1.0.ldif	
		<u>A</u> bbrechen

Illustration 218: LDAP server properties:

Navigation: CaeManager / Extras / Global Engineering Options / LDAP Server	Properties 🛛 💥
Basis DN	dc= <domain name="">,dc=<top level<br="">Domain Name></top></domain>
Basis DN for users	ou= <organization unit=""></organization>
User template	Path is already entered
Confirm with [OK].	Aug.

Next configuration step:	
Chapter How is the LDAP authentication configured for the runtime system in the	
CaeManager?	
(Chapter: 14.11.2)	

14.11.2 How is the LDAP authentication configured for the runtime system in the CaeManager?

Activation for operators:

rojektname:									
SamplesProjec	:t								
Stammdaten	Engineering-Partner	Bjbliotheken	Engineering	Download	Kommunikations-Parameter	Runtime (1/2)	Runtime (2/2)	Druck-Einstellungen	Dokumentation
Authentifizie	erung								
Alarm-B	eport			AuditTrail-Report			Operator Authentifizierung		New York
Trend-Report ChronoLog Profi-Rep		Profi-Report		 Lokale APROL-System-Authentifizierung 					
Compressor-Report			LDAP Authentifizierung						
Process	Data-Report			SchichtLog	Buch		X Login-Sta	ck LDAF	P-Server Eigenschaften

Illustration 219: Configuration of the operator authentication

Navigation:	*
CaeManager / Project properties / Runtime (1/2)	
LDAP authentication	activated
Login stack	activated
Confirm with [OK].	

LDAP server properties:

O LDAP-Server Eige	nschaften - CaeManager (engin@tccomp131)	? — 🗆 🗙
~LDAP-Server Eigenscha	ften	
Basis-DN:	dc=my-domain, dc=com	
Basis-DN für Benutzer:	ou=Development, ou=Essen, ou=Germany	
Benutzer-Template:	/opt/aprol/etc/LDAP/server/ldif_export_user_template_V1.0.Idif	
		brechen

Illustration 220: LDAP server properties:

Navigation: CaeManager Navigation: CaeManager / Project properties / Runtime (1/2) / LDAP Server Properties	×
Basis DN	dc= <domain name="">,dc=<top level<br="">Domain Name></top></domain>
Basis DN for users	ou= <organization unit=""></organization>
User template	Path is already entered
Confirm with [OK].	À#



A **web authentication is not possible** for the LDAP authentication at present. Because of this, if the 'LDAP authentication' option is activated, then the authentication for **all web reports must be turned off** (checkboxes) in the project properties (Project properties / 'Runtime (1/2)' tab / Authentication).

A password change in the **OperatorManager** only **takes effect after a download** to the operator stations.

If the LDAP connection is damaged the login is still guaranteed as fallback with local *APROL* authentication.

Next configuration step:	
Chapter How is the complexity check for passwords activated for the local authentication?	
(Chapter: 14.11.2.1)	

14.11.2.1 How is the complexity check for passwords activated for the local authentication?

The complexity check for the local **APROL** authentication can be activated as follows.

When the 'Extended check of password security' option is activated, it ensures that the user management / OperatorManager use the 'cracklib' for any passwords that are newly allocated.

One of the checks that is then made is a comparison with a negative list. This list is in clear text in the file /opt/aprol/share/cracklib/aprol_dict.txt and can be adjusted as described.

Increasing the security is not absolutely necessary in order to guarantee	a functioning system.	N/
Navigation:		
CaeManager / Extras / Global Engineering Options		
Extended check for password security		activated
vi /opt/aprol/share/cracklib/aprol_dict.txt		adjust
AprolCreateCracklibDict	Execute script as root in the /opt/aprol/share/cracklib/ directory	
Configuration finished		Æ

14.12 Password policies / Account policies on an Active Directory server?

The configuration of account and password policies is described on the hand of a Windows 2003 server in the following.

14.12.1 How are password policies configured on an Active Directory server?

The password and account policies described in the following can be configured on an Active Directory server and on an openLDAP server. The configured policies are evaluated in the **APROL** system and are taken respectively into account.

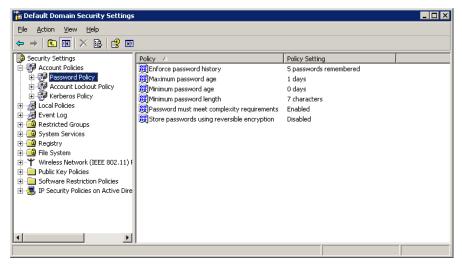


Illustration 221: Windows 2003 Server / password policies

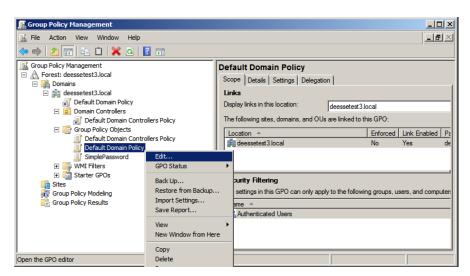


Illustration 222: Windows 2008 Server / open password policies

🗐 Group Policy Management Editor		
File Action View Help		
	Policy Policy Force password history Maximum password age Minimum password age Minimum password length Password must meet complexity requirements	Policy Setting 3 passwords remembered 1 days 0 days 7 characters Enabled Disabled
Account Lockout Policy Kerberos Policy	x	

Illustration 223: Windows 2008 Server / edit password policies

Next configuration step:	
Chapter <u>How is the maximum number of passwords that are saved in the history</u> <u>specified?</u>	
(Chapter: 14.12.1.1)	

14.12.1.1 How is the maximum number of passwords that are saved in the history specified?

Enforce password history

Navigation:	×
Start / Administrative Tools / Domain Security Settings / Security Settings / Account Policies / Password Poli	су 🥙
Enforce password history	5
Confirm with [OK].	净



For comparison with openLDAP-Server:

Maximum number of passwords saved in the history

Attribute in the password policy: pwdlnHistory

The maximum number of password that are saved in the password history can be specified in the configuration of the password change policies. It is possible to define, for example, that new passwords do not correspond to the last 5 passwords.

Error messages are shown in the **APROL** system if a password rule is not adhered to when the password is allocated.



14.12.1.2 How is the maximum age of a password specified?

Maximum password age

Navigation:	K
Start / Administrative Tools / Domain Security Settings / Security Settings / Account Policies / Password Poli	су 🥙
Maximum password age	30
Confirm with [OK].	净

For comparison with openLDAP-Server:

Maximum age of the password

Attribute in the password policy: pwdMaxAge (Unit: [s])

You can configure the password expiry here. This security setting specifies the period for which the password can be used before the user is prompted to change their password.

The allocation of a new password in the **APROL** system when the password has expired is made possible if this is configured respectively.



14.12.1.3 How is the minimum length of a password specified?

Minimum password length

Navigation:	No.
Start / Administrative Tools / Domain Security Settings / Security Settings / Account Policies / Password Poli	icy 🧥
Minimum password length	8
Confirm with [OK].	Æ

For comparison with openLDAP-Server:

Minimum length of the password

Attribute in the password policy: pwdMinLength

This security setting specifies the minimum number of characters that a user account password must have.

Error messages are shown in the **APROL** system if a password rule is not adhered to when the password is allocated.

Next configuration step: Chapter How is the complexity check for new passwords activated? (Chapter: 14.12.1.4)

14.12.1.4 How is the complexity check for new passwords activated?

Password must meet complexity requirements

Navigation:	X
Start / Administrative Tools / Domain Security Settings / Security Settings / Account Policies / Password Policies	cy 🥙
Password must meet complexity requirements	Enabled
Confirm with [OK].	<i>A</i> ∎

This check can only be activated or deactivated in its entirety.

The following complexity checks are carried out by a Windows 2003 server:

The password must correspond to the complexity requirements

This security setting determines if passwords must correspond to complexity requirements.

If this policy is activated, passwords must correspond to the following minimum requirements.

The account name of the user is not allowed to be part thereof, or a part of the account name comprising of more than two consecutive characters.

Minimum length : 6 characters

Characters from at least three of the following categories must be contained:

English capital letters (A to Z)

English small case letters (a to z)

Base 10 characters (0 to 9)

non-alphabetical characters (e.g. !, \$, #, %)

Complexity requirements are forced when passwords are changed or newly allocated.

1

Normally, the settings of the computer that is allocated to a domain are the same as that of the domain controller.

For comparison with openLDAP-Server:

Only accept checked passwords

Attribute in the password policy: pwdCheckQuality

There are 3 possible settings here:

There are no policy checks if this parameter is '0' (Default).

If the value of the parameter is '1' and the password is in clear text, then a user-defined function (if defined with the pwdCheckModule attribute) is executed to check the validity of the password. If this function is not available, the password is accepted (going from the point of view that all other checks that are defined in the other pwdPolicy attributes are met successfully).

If the value is '2' and the password is in clear text, then a user-defined function is executed to check the validity of the password. If this function is not available, the password is rejected.

If there is no module supplied by the user, then the pwdCheckQuality attribute can be safely omitted.

The setting switches the password complexity check on. Information about the checks that are made can be found with the help of the Windows server.

Error messages are shown in the **APROL** system if a password rule is not adhered to when the password is allocated.

Next configuration step: Chapter <u>How is the maximum number of false logins configured?</u>

(Chapter: 14.12.1.5)

14.12.1.5 How is the maximum number of false logins configured?

Account lockout threshold

🚡 Default Domain Security Settings		
<u>File Action View H</u> elp		
← → 🗈 🖪 🗙 😫 🖬		
Security Settings	Policy A	Policy Setting
🖻 🛃 Account Policies	B Account lockout duration	Not Defined
🕀 🛃 Password Policy	🐯 Account lockout threshold	0 invalid logon attempts
Generation Account Lockout Policy Generation Strength Str	Reset account lockout counter after	Not Defined
🕀 🛃 Local Policies		
🗄 📲 Event Log		
😟 📴 Restricted Groups		
😟 📴 System Services		
🕀 🧰 Registry		
🕀 🧰 File System		
🗎 🗄 🕆 🍸 Wireless Network (IEEE 802.11) F		
🗄 🖳 Public Key Policies		
🗄 🕀 📄 Software Restriction Policies		
E - 🛃 IP Security Policies on Active Dire		
	•	•
1	J	J

Illustration 224: Account Lockout Policy, Windows Server 2003

Navigation: Start / Administrative Tools / Domain Security Settings / Security Settings / Account Policies / Account Locke	out Policy
Account lockout threshold	3
Confirm with [OK].	Æ

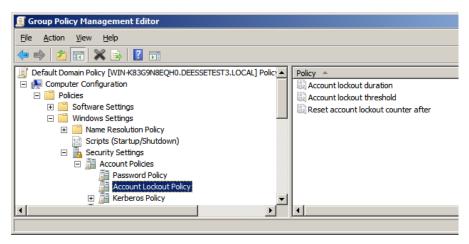


Illustration 225: Account Lockout Policy, Windows Server 2008 (for comparison)

1

For comparison with openLDAP-Server: Number of bind errors before password locking Attribute in the password policy: pwdMaxFailure

This setting determines if and when a locking of an account should take place when there are erroneous login attempts. The duration of the locking can also be changed with additional options.

The number '0' switches the check off.

A login does not take place in the **APROL** system if the account is locked, and corresponding message is displayed.

Next configuration step:

Chapter How is an APROL server connected to an Active Directory server?

(Chapter: 14.9.4)

14.12.1.6 How is a locked user account unlocked on an Active Directory Server?

Unlocking a locked user account on an Active Directory Server:

Aprol User Properties ? 🗙
Member Of Dial-in Environment Sessions Remote control Terminal Services Profile COM+ UNIX Attributes General Address Account Profile Telephones Organization
User logon name:
User logon name (pre- <u>W</u> indows 2000): DEESSETEST2\ aprol
Log On Io
Account is locked out Account options:
□ User must change password at next logon □ User cannot change password □ Password never expires □ Store password using reversible encryption
Account expires Never End of: Donnerstag, 14. April 2011
OK Cancel Apply

Illustration 226: Deactivation of Account is locked out, Windows Server 2003

Navigation:	X
Start / Administrative Tools / Active Directory Users and Computers	<i>(</i>
/ <database> / Users / <select user=""> / Properties / Account</select></database>	
Account is locked out	Disabled
Confirm with [OK].	争

14.12.2 How is the LDAP authentication configured for the runtime system in the CaeManager?

Activation for operators:

rojektname:							
amplesProject							
Stammdaten Engineering Pattner Bjbliotheken	Engineering	Download	Kommunikations-Parameter	Runtime (1/2)	Runtime (2/2)	Druck-Einstellungen	Dokumentation
Authentifizierung							
Alarm-Beport		AuditTrail-R	eport		Operator Aut		
Irend-Report	ChronoLog Profi-Report			Lokale APROL-System-Authentifizierung			
Compressor-Report		Kundenspe	zifische Reports			thentifizierung	
ProcessData-Report		SchichtLog	Buch		X Login-Sta	ck LD/	AP-Server Eigenschaften

Illustration 227: Configuration of the operator authentication

Navigation: CaeManager / Project properties / Runtime (1/2)	×
LDAP authentication	activated
Login stack	activated
Confirm with [OK].	

LDAP server properties:

O LDAP-Server Eige	nschaften - CaeManager (engin@tccomp131)	? — 🗆 🗙
LDAP-Server Eigenscha	ften]
Basis-DN:	dc=my-domain, dc=com	
Basis-DN für Benutzer:	ou=Development, ou=Essen, ou=Germany	
Benutzer-Template:	/opt/aprol/etc/LDAP/server/ldif_export_user_template_V1.0.ldif	
L		obrechen

Illustration 228: LDAP server properties:

Navigation: CaeManager Navigation: CaeManager / Project properties / Runtime (1/2) / LDAP Server Properties	×
Basis DN	dc= <domain name="">,dc=<top level<br="">Domain Name></top></domain>
Basis DN for users	ou= <organization unit=""></organization>
User template	Path is already entered
Confirm with [OK].	ĺ₩

An authentication is also basically possible via the LDAP server.

In contrast to the LoginServer, there is no fallback to the operators stored in **APROL** if the operator is not known to the LDAP server.

This fallback is only carried out when the LDAP server cannot be reached or the configuration is erroneous.

Therefore, when the LDAP authentication is activated, only the operators which are known to the LDAP server can log in via web authentication.

A password change in the **OperatorManager** only **takes effect after a download** to the operator stations.

If the LDAP connection is damaged the login is still guaranteed as fallback with local *APROL* authentication.

Next configuration step:

Chapter How is the complexity check for passwords activated for the local authentication?

(Chapter: 14.11.2.1)

14.12.2.1 How is the complexity check for passwords activated for the local authentication?

The complexity check for the local **APROL** authentication can be activated as follows.

When the 'Extended check of password security' option is activated, it ensures that the user management / OperatorManager use the 'cracklib' for any passwords that are newly allocated.

One of the checks that is then made is a comparison with a negative list. This list is in clear text in the file /opt/aprol/share/cracklib/aprol_dict.txt and can be adjusted as described.

Increasing the security is not absolutely necessary in order to guarantee	a functioning system.	N/
Navigation:		
CaeManager / Extras / Global Engineering Options		
Extended check for password security		activated
vi /opt/aprol/share/cracklib/aprol_dict.txt		adjust
AprolCreateCracklibDict	Execute script as rc /opt/aprol/share/cra	
Configuration finished		Æ

15.1 Revision history

Manual version	Date	Change	Author / checked by
4.09	04.08.2014	Extension of chapter <u>Connecting</u> <u>via Python and PHP</u>	KSc <i>R</i> S
4.08	01.07.2014	New chapter <u>Optimization of SQL</u> <u>queries by the AprolSqlServer</u>	KSc <i>R</i> Sc
	24.06.2014	Update of chapter <u>Pre-defined SQL</u> <u>tables</u>	KSc
	16.06.2014	Revision of chapter <u>Database for</u> parameter management	KSc <i>TK</i>
4.07	02.06.2014	Chapter <u>Pre-defined SQL tables</u> updated	KSc RSc
	08.05.2014	Hyperlink in chapter <u>AprolConfigParameterManagement</u> <u>MySQL</u>	RN
4.06	30.04.2014	Chapter <u>Digital signature of PDF</u> <u>documents</u> Signing any PDF document Update of chapter <u>IEC to SQL data</u> <u>type mapping</u> Chapter <u>APROL SQL</u> : Note about ARKPATH	KSc <i>CKo, GWa, R</i> S
	30.04.2014	Chapter <u>Pre-defined SQL tables</u> updated	RN
4.05	01.04.2014	Chapter <u>Pre-defined SQL tables</u> updated	KSc
4.04	12.03.2014	Corrections in chapter <u>APROL SQL</u>	KSc GW
	11.03.2014	Corrections in chapters <u>Offline</u> <u>engineering / Solution</u> and <u>Introduction to offline engineering</u>	KSc <i>RM</i>
4.03	05.03.2014	Chapter <u>Pre-defined SQL Tables</u>	RN
	27.02.2014	New chapter <u>losHttp</u>	KSc SO, CKo

Manual version	Date	Change	Author / checked by
	25.02.2014	Corrections in chapter <u>APROL SQL</u>	RN DB RS
4.02	13.02.2014	New chapter <u>IosDiagnosticManager</u>	KSc JRu, OK
	27.01.2014	Chapter <u>Pre-defined SQL Tables</u>	RN
4.01	13.12.2013	Revision of chapter <u>Authentication</u> <u>and authorization</u> Information about SQL authentication	RN
	09.12.2013	Format auf DIN A4	RN
4.00	20.11.2013	New chapter <u>Transfer of the</u> <u>APROL user data to the LDAP</u> <u>server</u>	KSc
	13.11.2013	Revision / restructure of the chapter <u>APROL SQL</u> :	RSc
	07.11.2013	Revision of chapter <u>Licensing of</u> <u>the Loquendo TTS7 software for</u> <u>speech output for alarms</u>	KSc
	09.10.2013	Revision of chapter AprolSqlServer	KSc / RSc
	17.09.2013	Extension of chapter IosDiagnosticManager	RN
	21.08.2013	REvision of chapter <u>How is the</u> <u>LDAP authentication configured for</u> <u>the runtime system in the</u> <u>CaeManager?</u>	KSc <i>ELa, JR</i>
	15.08.2013	Chapter <u>AprolSqlServer</u> Correction 'TIMESTAMP', image links, formatting, terminology, screenshots Notes about type 3 & 4 drivers Chapter <u>Available SQL tables</u> , new SQL tables	RN DB RS
	10.07.2013	New chapter <u>AprolSqlServer</u>	KSc
	24.06.2013	Chapter <u>IosEv</u> : New '-autoStop' option	KSc <i>MM</i>
	15.05.2013	Revision of chapter <u>losys tools</u>	KSc DD <i>RK</i>
	25.03.2013	Update of the screenshots	KSc
	01.03.2013	Extension of chapter <u>Alarm data</u> <u>dependent display (data)</u>	KSc
	14.02.2013	New chapter <u>System variables</u> <u>ApcHwInfo</u>	KSc <i>MHa, MH</i> e

Manual version	Date	Change	Author / checked by
	18.09.2012	Chapter <u>Configuration of the report</u> <u>creation with the block</u> <u>AprCcTrigReport</u> , change of the TrendReport URL	RN
	11.09.2012	Extension of chapter <u>Working with</u> and exiting offline engineering	KSc <i>MM</i>
	07.05.2012	Correction in chapter <u>Working with</u> <u>the fcitx tool</u>	KSc <i>MWe</i>
	25.04.2012	Expansion of the chapter <u>pio</u>	KSc <i>CKo</i>
	06.12.2011	Chapter <u>How is an APROL server</u> <u>connected to an openLDAP server</u> <u>with YaST?</u> and chapter <u>How are</u> <u>additional password policies</u> <u>created on an openLDAP server</u> <u>with YaST?</u> Screen-shot actualized	KSc
	23.11.2011	Chapter How is the LDAP authentication configured for the runtime system in the CaeManager? Screen-shot actualized Extensions in chapter: <u>How are additional password</u> <u>policies created on an openLDAP</u> <u>server with YaST?</u>	KSc
	10.11.2011	Corrections in chapter <u>Overview of</u> request and response types	KSc SO
	10.11.2011	Revision of chapter <u>Digital</u> signature of PDF documents	KSc MRo, CK, SO
	04.11.2011	Correction of chapter <u>How is the</u> <u>security of the SSL connection</u> <u>increased?</u> New chapter <u>When is a certificate</u> <u>finally activated?</u>	KSc AW
	02.11.2011	New chapter <u>Digital signature of</u> PDF documents	KSc SO
3.09	07.10.2011	New chapter 'losys connection'	KSc
	09.09.2011	Extension of chapter <u>Authentication</u> <u>via LDAP / Active Directory Server</u>	KSc
3.08	29.07.2011	Extension of chapter <u>Authentication</u> <u>via LDAP / Active Directory Server</u>	KSc <i>AWo</i>
3.07	16.06.2011	Information chapter <u>TranslationManager</u>	RN

Manual version	Date	Change	Author / checked by
	17.05.2011	Correction chapter <u>Authentication</u> <u>via LDAP / Active Directory Server</u>	RN, JH
	15.04.2011	Correction chapter <u>How is the</u> <u>PAM-Kerberos module configured</u> for the connection to an Active <u>Directory server?</u>	RN CK
3.06	07.04.2011	New chapter <u>Authentication via</u> <u>LDAP</u>	MWe, RN <i>BSc, MT, TK</i>
	21.02.2011	Chapter <u>System Variables</u> , unit MByte and LREAL data type	RN <i>I</i> S
3.05	02.11.2010	Chapter <u>The losys Web interface</u> Cancellation of the application	KSc
	09.09.2010	Correction in chapter <u>Extension of</u> <u>the alarm layout configuration</u>	KSc
3.04	12.08.2010	Revision of terms: ST, SFC, CFC	RN
3.03	28.06.2010	Revision of chapter <u>Licensing of</u> <u>the Loquendo TTS7 software for</u> <u>speech output for alarms</u>	KSc SO
3.02	25.01.2010	New chapter <u>Licensing of the</u> Loquendo TTS7 software for speech output for alarms	KSc SO, MT, HSc
	26.04.2010	Changes in chapter <u>System</u> variables for memory and hard disk capacity	RN
	14.12.2009	Revision of chapter <u>Creating</u> customer-specific reports	KSc CKo
3.01	01.12.2009	'-alarmRepack' option in chapter <u>New functionality in the APROL</u> <u>releases</u>	RN SO
	18.11.2009	Offline engineering with project- specific data reduction	KSc <i>JR, MW</i> e
	02.11.2009	Update of chapter <u>Alarm system</u>	RN, KSc <i>SO, AT</i>
	29.10.2009	Actualization of chapter <u>Preparation for offline engineering</u> <u>and checking out</u>	RN, KSc SO
2.06	25.05.2009	Update of chapter <u>OPC server</u>	RN <i>JR, BS, M</i> Sc
2.05	23.01.2009	System variables for licensing	KSc
2.04	26.01.2009	System variables for memory management	KSc
<u> </u>	07.01.2009	Note about system variable syntax for monitoring the CC task	KSc <i>I</i> S

Manual version	Date	Change	Author / checked by
2.03	08.10.2008	Update of the chapter <u>Usage of the</u> <u>LSTRING data type</u>	KSc ELa
2.02	12.08.08	Revision of the chapter <u>Usage of</u> <u>the LSTRING data type</u>	KSc <i>ELa, W</i> S
2.01	17.07.2008	Complete revision of the chapter <u>TranslationManager</u>	MSa <i>MSc, MW</i>
2.00	02.07.2008	Revision of the chapter <u>Configuration of the AlarmMonitor</u> <u>via XML</u>	MSa
	25.06.2008	Revision of chapter <u>System</u> <u>variables</u>	KSc
	22.04.2008	Chapter <u>UTF8 STRING API</u> extended with description LSTRING data type	KSc WS
	11.03.2008	Extension of chapter <u>System</u> <u>variables</u>	KSc WS
	18.01.2008	Revision of the chapter <u>Configuration of the AlarmMonitor</u> <u>via XML</u>	MSa <i>DM</i>

File name of this documentation: *APROL_R40_D1_SystemManual_001.pdf*

15.2 Document information

Document version:	4.09
Document date:	04.08.2014

16 Glossary

\$HOME

General name for a home directory. Also represented by "~" in an Xterm window. This name is often used for environment variables containing the path specification of the home directory in scripts.

Application

A program.

APM

APM is the abbreviation for application memory. It is needed to store user programs on the controller.

CPU

Controller CPU.

Data Access Server

Data access servers can be simple programs which provide access to the register of a controller. Complex programs are also possible, which make it possible to access a multitude of variables in a large number of devices using an extensive communication mechanism. The data access server allows one or more data access clients the transparent access to the most varied of data sources. Data access clients can be very simple (e. g. Excel spreadsheets) or also very extensive and components of a larger system (e.g. SCADA).

DDE

DDE is the acronym for Dynamic Data Exchange. DDE describes a mechanism for exchanging data between Windows applications. If data was exchanged using "Copy & Paste" by DDE before the introduction, then data exchange takes place dynamically with DDE. The information transferred is shown on an item using any data type. However, data exchange takes place relatively slowly.

User

The term "user" includes anyone working in a team to plan, configure, and program one or more process control systems. Designers can be engineers and service technicians as well as system administrators.

File

Files include data that has been organized, stored, and named.

force

This term comes from the English language, and means: "with force". In the area of process control, a PV on a controller is forced to take a value from a different place (external). This process is useful in debugging.

HMI interface

Implementation for the operation and display of process for users.

Command shell

A way to enter programs. A program is started and awaits input from the keyboard. The program outputs information depending on the entries given.

Country code

A country code identifies a language with a number (usually the international dialing prefix).

Examples: 001=English(American), 007=Russian, 031=Dutch, 033=French, 048=Polish, 049=German

Levenshtein

In information theory, the Levenshtein distance (or edit distance) between the two strings is given by the minimum number of operations (*insert, delete, substitute*) needed to transform one string into the other. This distance is named for the Russian scientist Vladimir Levenshtein, who introduced it in 1965.

For example, the Levenshtein distance between "**kitten**" and "**sitting**" is **3** since these three edits change one into the other, and there is no way to do it with fewer than **3** edits: Tier -->Toer (substitute **i** with **o**) --> Tor (delete **e**)

In practice, the Levenshtein distance is used to determine the similarity between strings, e.g. for correcting misspellings or recognizing duplicates.

LGPL

The GNU Lesser General Public License is, like GPL and GFDL, another free license provided by the Free Software Foundation.

The LGPL was primarily created for program libraries as indicated by its old name, Library General Public License. The guidelines are very similar to those of GPL, but LGPL can be linked to a non-(L)GPLed program, which may include free software or proprietary software.

OLE

Acronym for **O**bject Linking and Embedding. The term stands for the dynamic linking of objects in different Office applications.

OPC

OLE for Process Control.

Project element

A project part is a element that can be edited in the process control system engineering. **Examples:**

Function switch plan, control computer, controller, etc.

SCADA system

Acronym for "Supervisory control and data acquisition system".

SV

Abbreviation for system variable.

Vset

An APROL database element (BAE-DB, runtime DB, etc.). A Vset is a named, associative container for Name = Value pairs.

Vsets

See Vset.

CORPORATE HEADQUARTERS

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