



# ALMA Common Software Basic Track

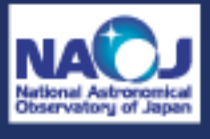
A walk through ACS functionality

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# Topics covered



✧ ACS services

✧ ACS generic GUIs and clients



- ✧ Every application needs a set of **core** integration infrastructure services, like for instance:
  - ✧ messaging (request/response and publish/subscribe)
  - ✧ logging
  - ✧ error management
  - ✧ alarms
  - ✧ configuration data
- ✧ In ACS these services have been identified as essential for the application domain
- ✧ These have been implemented mostly on top of standard CORBA Services
  - ✧ DDS/zeroMQ/other implementations or studies to replace at some point CORBA for some of them
- ✧ The ACS work consists in wrapping the implementation to simplify their usage by the application developers



# Messaging



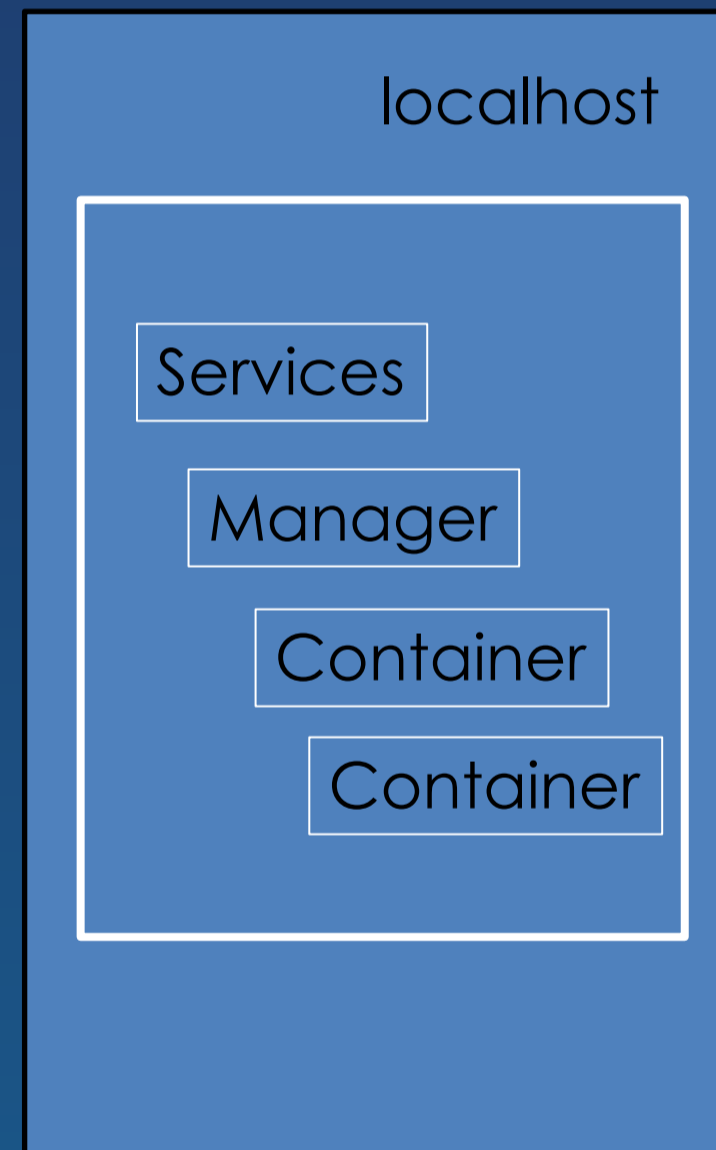
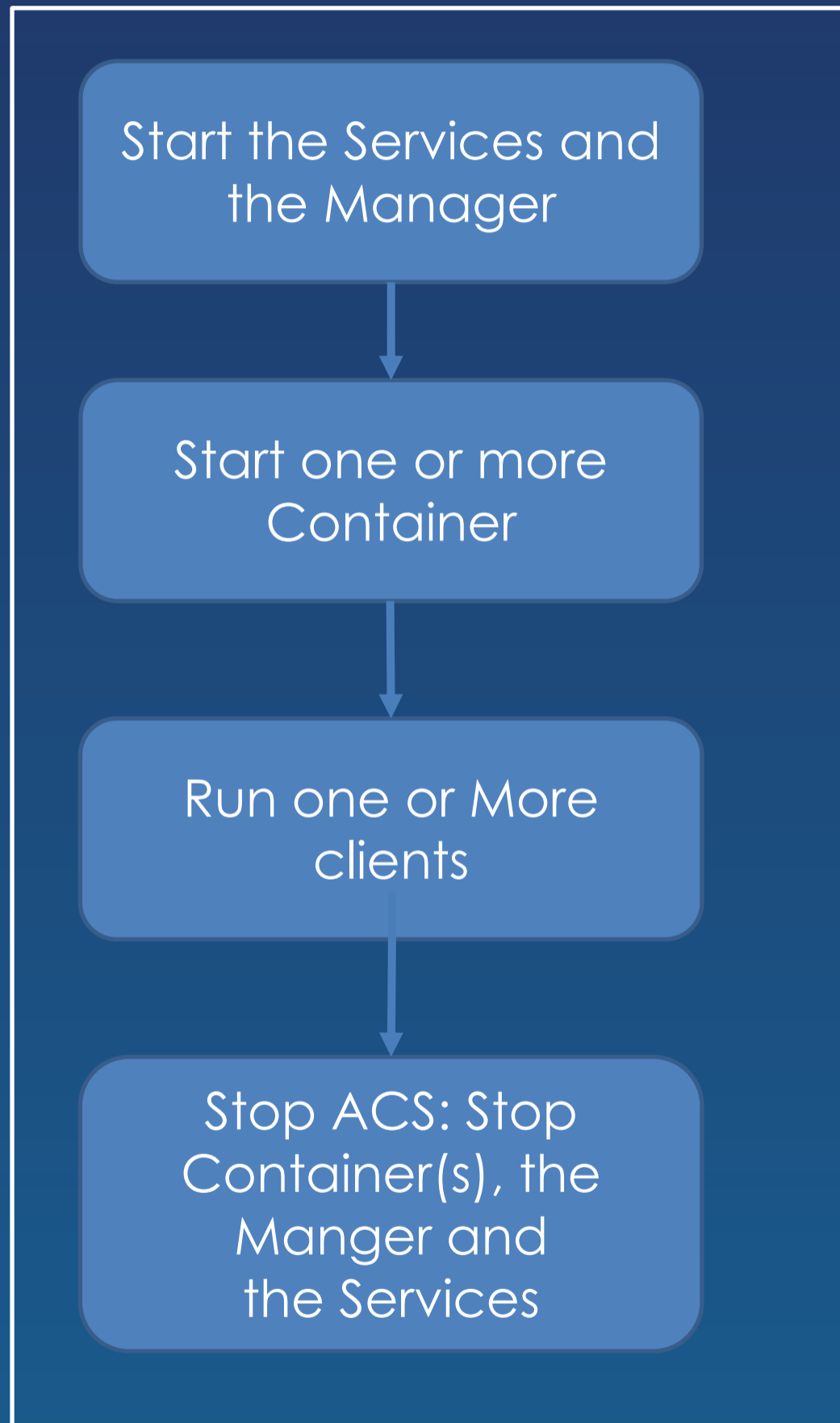
- ✧ Enables the communication between system components
- ✧ Supports both request-response and publish-subscribe message patterns
  - ✧ anonymous publish/subscribe data transfer is seen more and more as a key need for the messaging system
- ✧ In ACS:
  - ✧ CORBA messaging provides request-response
  - ✧ CORBA Notify Service provides publish-subscribe
    - ✧ New technologies may replace the Notify Service, offering some advantages
    - ✧ DDS implementation exists, zeroMQ/other studies



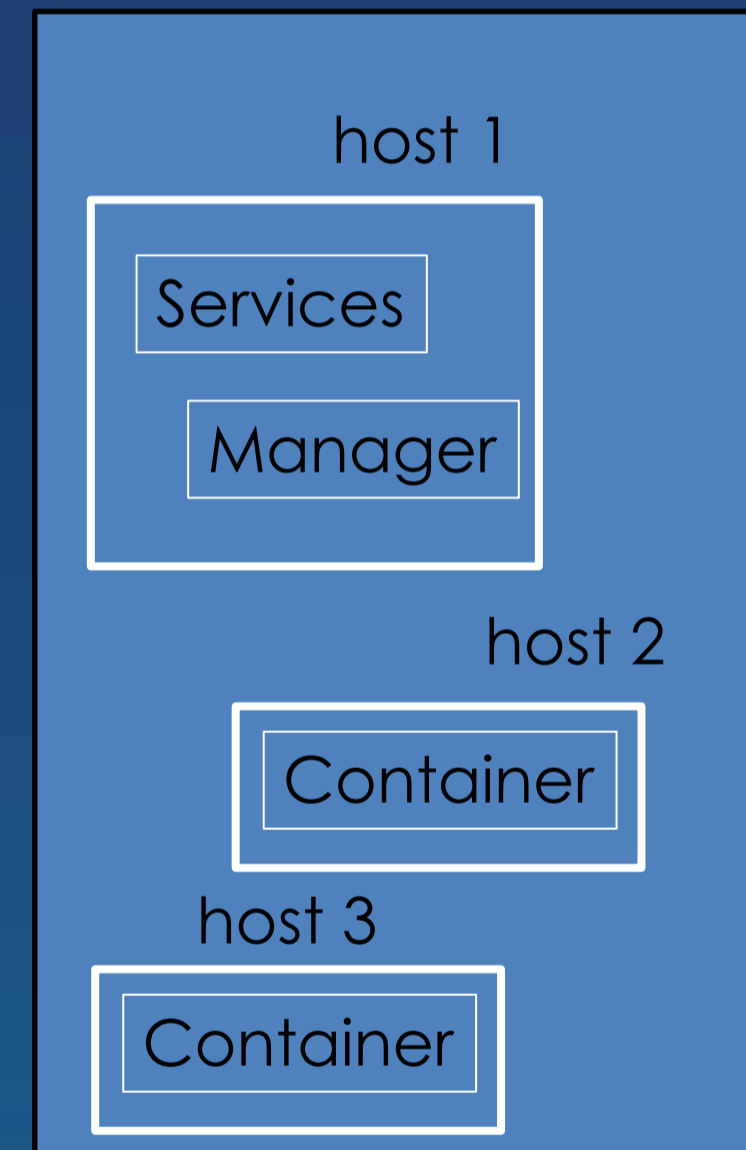
# ACS Command Center: starting/stopping ACS



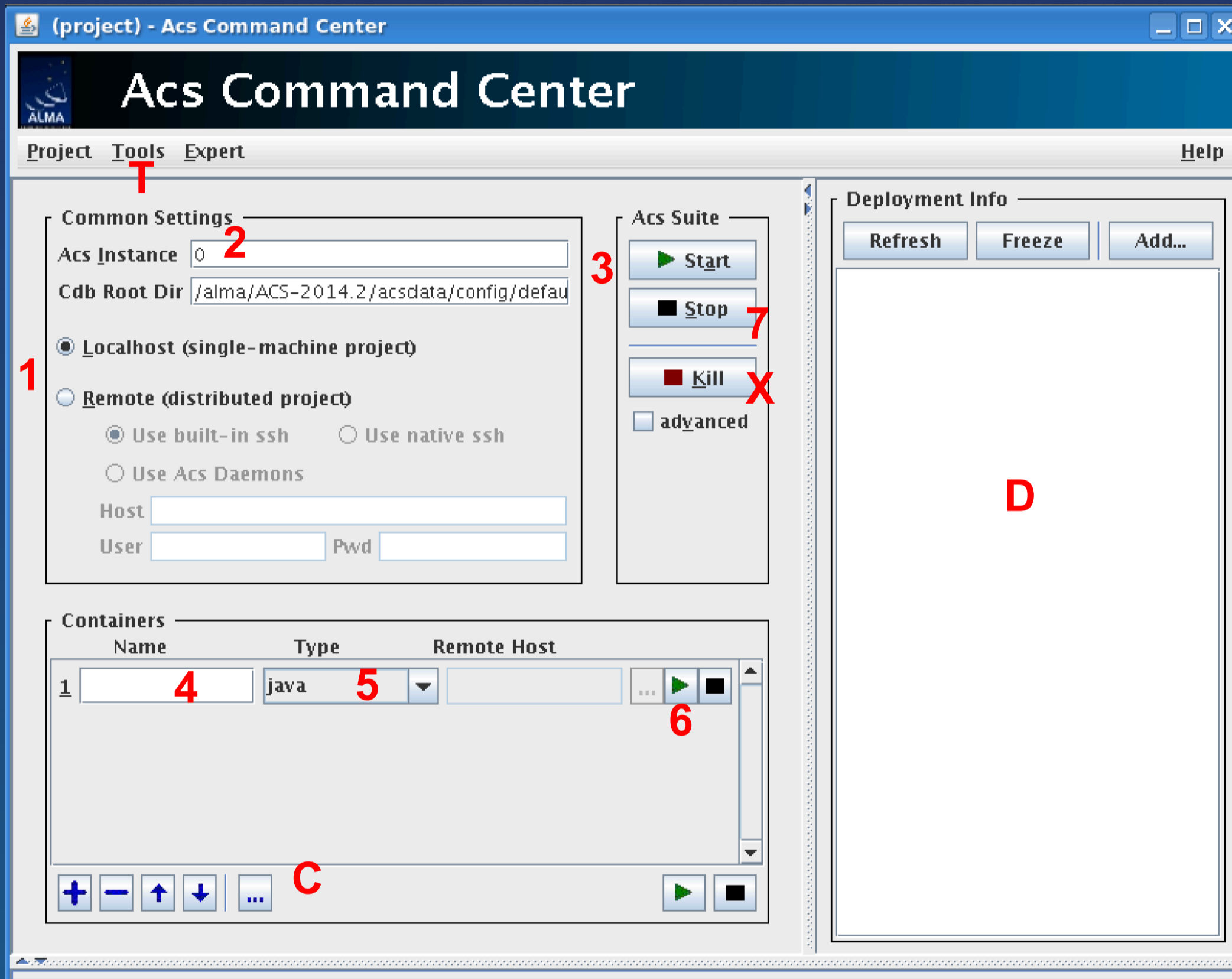
## Typical ACS session



Simple deployment scenario



Complex deployment scenario



- Select localhost (1)
- Specify ACS instance (2)
- Play button starts Services and manager (3)
  - Output logs will show in Log Area (L)
  - freshly started Manager now appears in the deployment info view (D)
- Specify Container Name (4)
- Specify Container Type (5)
- Start Container (6)
  - More containers can be added via (C)
- Run your clients.
  - Predetermined clients can be started from (T)
- Stop Containers, Manager and Services (7)
  - All output goes to the logging area (L)
- If you encounter problems, and find the Acs session in an inoperable state, you can attempt to terminate it (X)





The screenshot displays the ALMA ACS Event Browser interface. On the left is a 'Channel Tree' showing a hierarchical view of services and their configurations. The main area is divided into three panes: 'Service Summary', 'Event List', and 'Event Details'.

**Service Summary Table:**

Service	#cons	#suppliers
Alarm	0	0
Logging	0	1
Notification	10	5
Property Archivi	0	1

**Event List Table:**

Timestamp	Event source	# Events in channel	Event type
2009-09-16T14:36:27.528	state	31	stateEvent
2009-09-16T14:36:27.570	m1Pos	2328	pttDataEvent
2009-09-16T14:36:27.593	esData	2328	esDataEvent
2009-09-16T14:36:27.696	m1Pos	2329	pttDataEvent
2009-09-16T14:36:27.700	esData	2329	esDataEvent
2009-09-16T14:36:27.803	m1Pos	2330	pttDataEvent
2009-09-16T14:36:27.807	esData	2330	esDataEvent
2009-09-16T14:36:27.910	m1Pos	2331	pttDataEvent
2009-09-16T14:36:27.914	esData	2331	esDataEvent
2009-09-16T14:36:28.017	m1Pos	2332	pttDataEvent
2009-09-16T14:36:28.021	esData	2332	esDataEvent
2009-09-16T14:36:28.126	m1Pos	2333	pttDataEvent
2009-09-16T14:36:28.135	esData	2333	esDataEvent
2009-09-16T14:36:28.240	m1Pos	2334	pttDataEvent
2009-09-16T14:36:28.246	esData	2334	esDataEvent
2009-09-16T14:36:28.352	m1Pos	2335	pttDataEvent

**Event Details Table (Details of pttDataEvent):**

Name	Type	Value
pttDataEvent	struct	Members: setpoint, readback, key, timestan
setpoint / actuatorSpace	struct	Members: ptt
ptt	array	size: 2952
ptt[0]	double	0.0
ptt[1]	double	1.0

Average event rate from all subscribed channels: 9.55 events/s

[Further details here](#)



# Logging system



- ✧ Logging is fundamental for the operation of distributed systems, in order to understand and keep track of what happens between concurrent components
- ✧ Logging is used to publish any kind of status and diagnostic information for interested clients and for archival
- ✧ The current implementation of ACS is based on the Notification Service
  - ✧ Replacement to use newer technologies may come (DDS, zeroMQ, ...)



# Logging tools: jlog logging client



LoggingClient - Online

File View Search Drill down Expert

Log level: Info Discard level: Debug Pause Clear logs Filters Drill down

← ↑ ↓ → ↻ Search...

TimeSt...	Entry Type	Source Ob...	Log Message	Detailed info
22:04:09...	Info	Manager	Request for component 'curl:///NameService' issued.	LogField Value
22:04:09...	Info	Manager	Component 'curl:///NameService' provided.	TimeStamp
22:04:09...	Info	Manager	ORB status: connectionThreadsUsed=0%, lost calls=0,	Entry Type
				Source Object
				File
				Line
				Routine
				Host

LoggingClient - Online

File View Search Drill down Expert

Log level: Info Discard level: Debug Pause Clear logs Filters Drill down

← ↑ ↓ → ↻ Search...

TimeStamp	Entry Type	Source Object	Log Message	Detailed info
19:08:14.412	Info	CONTROL/DV04/FrontEnd	FrontEnd band# 3 locked at 9.208718e+10	LogField Value
19:08:14.320	Info	CONTROL/DV06/FrontEnd	FrontEnd band# 3 locked at 9.208718e+10	TimeStamp 2010-11-15T19:07:52.217
19:08:14.011	Info	CONTROL/DV06/FrontEnd	Optimized EDFA value 1.686493, for a target voltage of 2.5V	Entry Type Info
19:08:12.750	Info	CONTROL/DV04/FrontEnd	Optimized EDFA value 1.486290, for a target voltage of 2.5V	Source Object CONTROL/Array001
19:08:10.456	Info	CONTROL/DV05/FrontEnd	FrontEnd band# 3 locked at 9.208718e+10	File alma.Control.TotalPowerProcessor.TotalPowerProcessorImpl
19:08:10.169	Info	CONTROL/DV08/FrontEnd	FrontEnd band# 3 locked at 9.208718e+10	Line 232
19:08:09.522	Info	CONTROL/DV05/FrontEnd	Optimized EDFA value 2.451853, for a target voltage of 2.5V	Routine addDigitizer
19:08:09.517	Info	CONTROL/DV05/FrontEnd/WCA3	WCA PLL adjust to near zero	Host gas01
19:08:09.457	Info	CONTROL/DV02/FrontEnd	FrontEnd band# 3 locked at 9.208718e+10	Process CONTROL/ACC/javaContainer
19:08:09.455	Info	CONTROL/DV08/FrontEnd	Optimized EDFA value 1.668773, for a target voltage of 2.5V	Context
19:08:09.341	Info	CONTROL/DV05/FrontEnd/WCA3	WCA Lock Acquired	Thread RequestProcessor-29
19:08:09.168	Info	CONTROL/DV05/FrontEnd/WCA3	WCA Frequency set to: 9.20872e+10	Log ID 4550
19:08:09.149	Info	CONTROL/PM02/FrontEnd	FrontEnd band# 3 locked at 9.208718e+10	Priority
19:08:08.966	Info	CONTROL/DV05/FrontEnd	Attempting lock with EDFA value 2.451853, and target PM current 0.000541	URI
19:08:08.854	Info	CONTROL/DV03/FrontEnd	FrontEnd band# 3 locked at 9.208718e+10	Stack ID
19:08:08.685	Info	CONTROL/PM02/FrontEnd	Optimized EDFA value 1.704569, for a target voltage of 2.5V	Stack Level
19:08:08.680	Info	CONTROL/PM02/FrontEnd/WCA3	WCA PLL adjust to near zero	Log Message Adding new Processor Client for Antenna: DV08 Polarization: 1
19:08:08.583	Info	CONTROL/DV02/FrontEnd	Optimized EDFA value 1.612308, for a target voltage of 2.5V	Audience
19:08:08.577	Info	CONTROL/DV02/FrontEnd/WCA3	WCA PLL adjust to near zero	Array
19:08:08.527	Info	CONTROL/DV03/FrontEnd	Optimized EDFA value 1.612405, for a target voltage of 2.5V	Antenna
19:08:08.503	Info	CONTROL/PM02/FrontEnd/WCA3	WCA Lock Acquired	
19:08:08.401	Info	CONTROL/DV02/FrontEnd/WCA3	WCA Lock Acquired	
19:08:08.351	Info	CONTROL/DV03/FrontEnd/WCA3	WCA PLL adjust to near zero	

100K Engine not filtered Table not filtered Engineer



# Error System



- ✧ Provides a unified way of dealing with errors/exceptions through the system
- ✧ CORBA supports “distributed” exceptions
- ✧ The ACS Error System provides additionally the following features:
  - ✧ Error format standardisation
  - ✧ Error handling design patterns
  - ✧ Error trace
  - ✧ Error logging
  - ✧ Synchronous and asynchronous error handling
  - ✧ Error browsing and definition tools



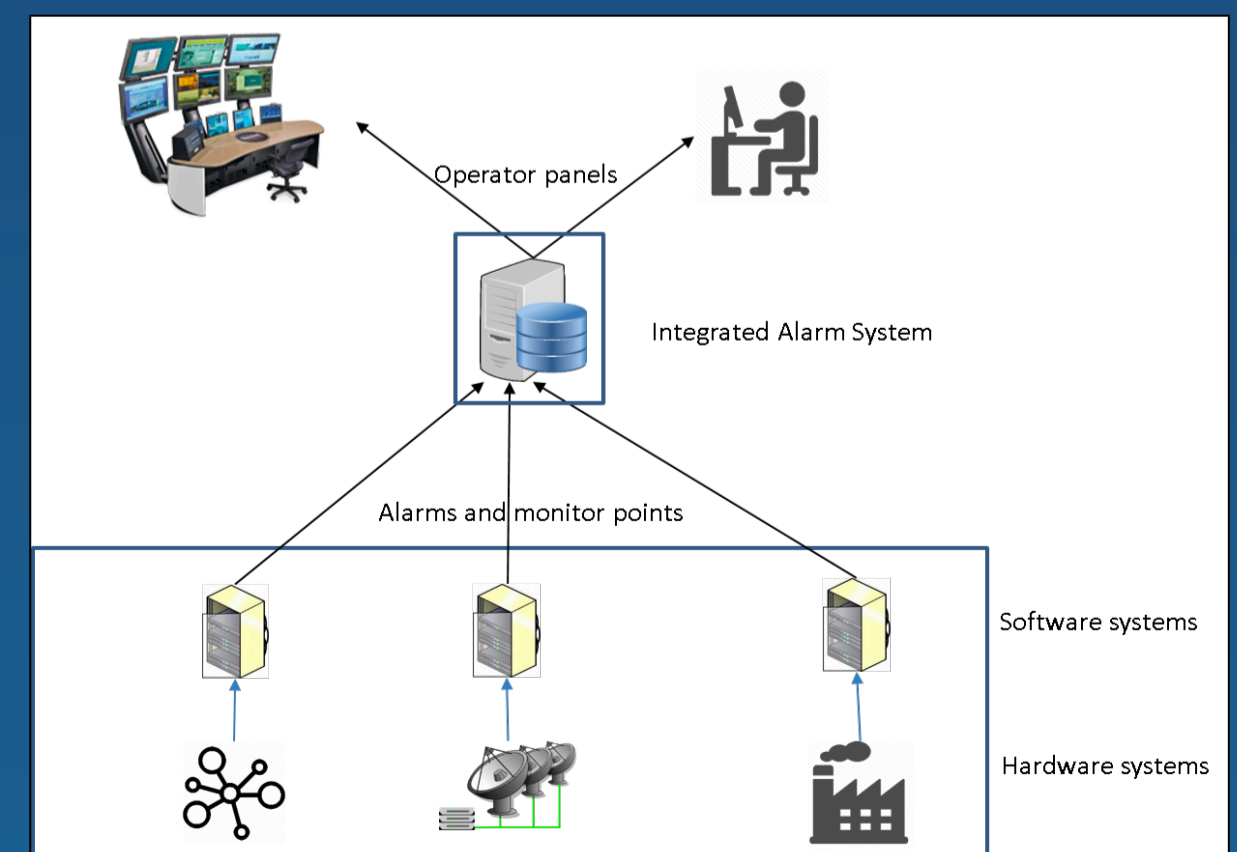
# Alarm System



- ✧ Deals with **abnormal** situations
  - ✧ Fault states (FS)
  - ✧ Range from severe alarms to warning states
- ✧ Provides
  - ✧ FS collection, analysis and distribution, definition and archiving
  - ✧ FS reduction
  - ✧ Dedicated alarm consoles
- ✧ The ACS alarm system is a porting of the CERN LASER system out of the box

- ✧ Alma using the “Integrated Alarm System (A. Caproni) to provide further capabilities – CTA intends to use it as well.

<https://integratedalarmsystem-group.github.io/>





# Alarm System Console



Alarms

Auto ack: None Reduce Pause Search Show Hide

	Time	Component	Family	Cause	Description	Action	Priority
	2010-06-09T20:07...	CONTROL/DV04/LLC	LLC	The fast fiber stretch...	LLC VF signal level of...	Reset needs to be d...	HIGH
	2010-06-09T17:58...	CentralLO	TimeSource	AllowedAccumulate...	The accumulated jit...	Check the 125[MHz]...	HIGH
	2010-06-09T17:58...	CentralLO	TimeSource	Allowed125MHzJitter...	The current jitter of t...	Check the 125[MHz]...	LOW

**Alarm details**

Field	Value
Component	CentralLO
Source timestamp	2010-06-09T17...
Cause	AllowedAccumula...
Priority	HIGH
Description	The accumulated ...
Action	Check the 125[M...
Consequence	A drift in the 125...
Status	Active
Host	lo-art-1
Help page:	<a href="http://tempuri.org">http://tempuri.org</a>
Contact	ALMA Support Te...
Email	
GSM	
Code	5
Family	TimeSource
Triplet	<TimeSource, Ce...
ID	TimeSource:Centr...

0 2 0 1 0



# Configuration Database



- ✧ The ACS Configuration Database (CDB) addresses: defining, accessing and maintaining the configuration of a system
- ✧ For each component in the system, there might be a set of static (or quasi-static) configuration parameters that have to be configured in a persistent store and read when the component is started up or re-initialized.
- ✧ This includes the “deployment structure” of the system, i.e., which statically deployed Components are part of the system and their inter-relationships
- ✧ This information is used by the component/container infrastructure in runtime
- ✧ See presentation of Tomás: Software deployment: Configuration Database and GIT



# Configuration Database Browser



Configuration Database Browser

File Edit Administration

Refract CDB Tree CURRENT LOCATION: /root/MACI/Managers/Manager

Save Changes to XML record Reset Data

ATTRIBUTE NAME	ATTRIBUTE VALUE
xmlns:cdb	urn:schemas-cosylab-com:CDB:1.0
xmlns	urn:schemas-cosylab-com:Manager:1.0
xmlns:baci	urn:schemas-cosylab-com:BACI:1.0
xmlns:xsi	http://www.w3.org/2001/XMLSchema-insta...
CommandLine	
Timeout	50.0
HeartbeatTimeout	2.0
CacheSize	10
MinCachePriority	0
MaxCachePriority	31
CentralizedLogger	Log
ServerThreads	5
Startup	CLOCK1,TIMER1,MO...
Execute	
ServiceComponents	Log,LogFactory,Notif...

root  
MACI  
Components  
Containers  
Managers  
  Manager  
alma  
  CLOCK1  
  LAMP1  
    brightness  
  MOUNT1  
    cmdAz  
    cmdEl  
    actAz  
    actEl  
  MOUNT2  
  MOUNT3  
  MOUNT4  
    cmdAz  
    cmdEl  
    actAz  
    actEl

==> Returning XML record for: /MACI/Components  
 ==> Returning XML record for: /alma/LAMP1  
 ==> Returning XML record for: /alma/MOUNT1  
 ==> Returning XML record for: /alma/MOUNT4  
 ==> Returning XML record for: /alma/PBEND\_B\_01  
 ==> Returning XML record for: /alma/TEST\_PS\_10  
 ==> Returning XML record for: /alma/TEST\_PS\_6  
 ==> Returning XML record for: /alma/TEST\_PS\_8  
 ==> Returning XML record for: /MACI/Managers/Manager

Configuration Database Browser

File Edit Administration

Refract CDB Tree CURRENT LOCATION: /root/MACI/Managers/Manager

Save Changes to XML record Reset Data

Table View XML View

```

<?xml version="1.0" encoding="UTF-8"?>
<Manager xmlns:cdb="urn:schemas-cosylab-com:CDB:1.0"
xmlns="urn:schemas-cosylab-com:Manager:1.0"
xmlns:baci="urn:schemas-cosylab-com:BACI:1.0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
CommandLine=""
Timeout="50.0" HeartbeatTimeout="2.0" CacheSize="10"
MinCachePriority="0" MaxCachePriority="31"
CentralizedLogger="Log" ServerThreads="5">
  <Startup>
    <cdb:_ string="CLOCK1"></cdb:_>
    <cdb:_ string="TIMER1"></cdb:_>
    <cdb:_ string="MOUNT1"></cdb:_>
  </Startup>
  <Execute>
    <cdb:_ string=""></cdb:_>
  </Execute>
  <ServiceComponents>
    <cdb:_ string="Log"></cdb:_>
    <cdb:_ string="LogFactory"></cdb:_>
    <cdb:_ string="NotifyEventChannelFactory"></cdb:_>
    <cdb:_ string="ArchivingChannel"></cdb:_>
    <cdb:_ string="LoggingChannel"></cdb:_>
    <cdb:_ string="InterfaceRepository"></cdb:_>
    <cdb:_ string="CDB"></cdb:_>
  </ServiceComponents>
</Manager>

```

root  
MACI  
Components  
Containers  
Managers  
  Manager  
alma  
  CLOCK1  
  LAMP1  
    brightness  
  MOUNT1  
    cmdAz  
    cmdEl  
    actAz  
    actEl  
  MOUNT2  
  MOUNT3  
  MOUNT4  
    cmdAz  
    cmdEl  
    actAz  
    actEl

==> Returning XML record for: /MACI/Components  
 ==> Returning XML record for: /alma/LAMP1  
 ==> Returning XML record for: /alma/MOUNT1  
 ==> Returning XML record for: /alma/MOUNT4  
 ==> Returning XML record for: /alma/PBEND\_B\_01  
 ==> Returning XML record for: /alma/TEST\_PS\_10  
 ==> Returning XML record for: /alma/TEST\_PS\_6  
 ==> Returning XML record for: /alma/TEST\_PS\_8  
 ==> Returning XML record for: /MACI/Managers/Manager

See here for further details: [Link](#)

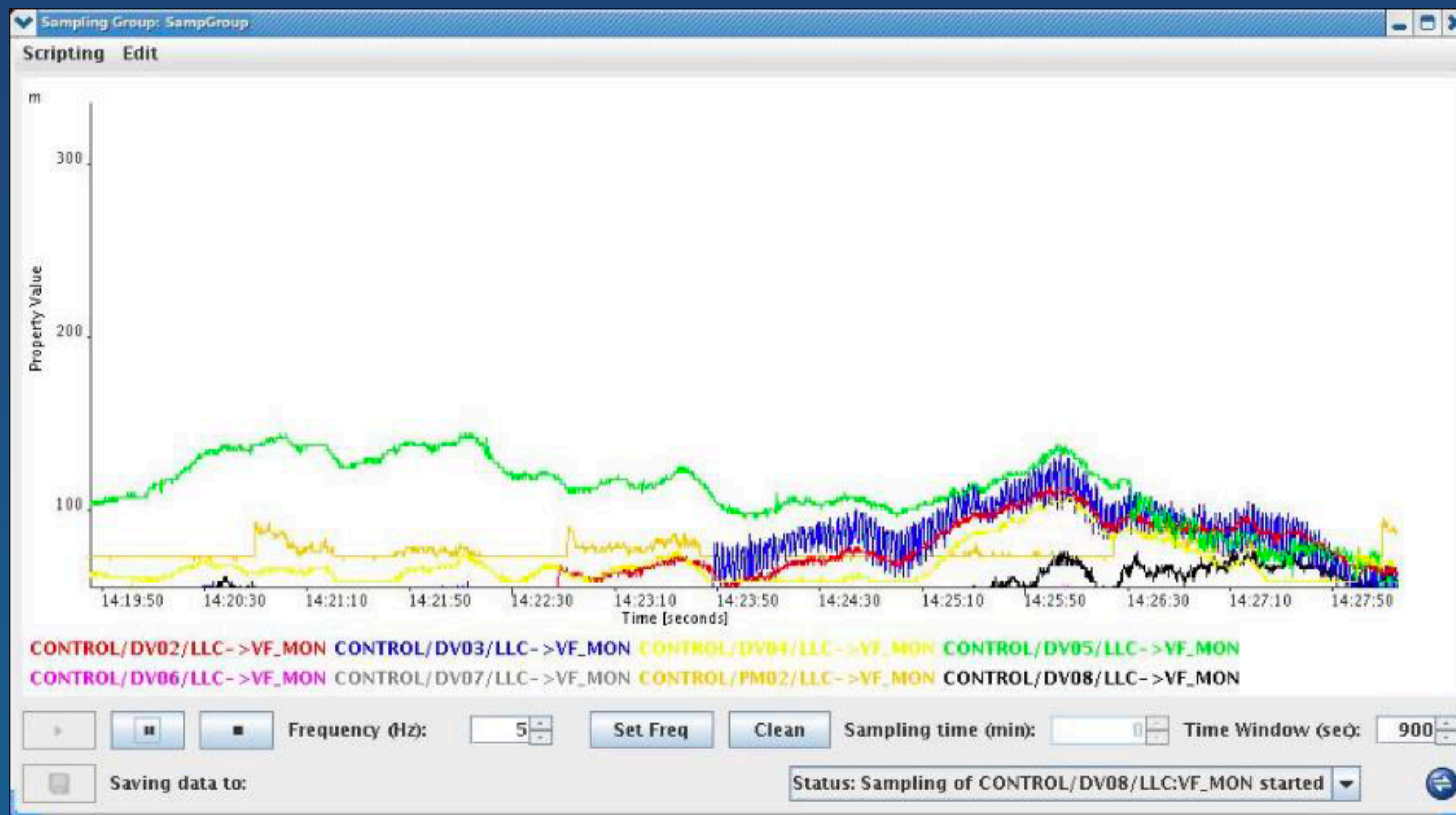




# Sampling System



- ✧ Sampling of any Property
- ✧ High sustained frequency
- ✧ Optimized data transport
- ✧ Simultaneous sampling
- ✧ Plotting GUI



More details here: [Link](#)

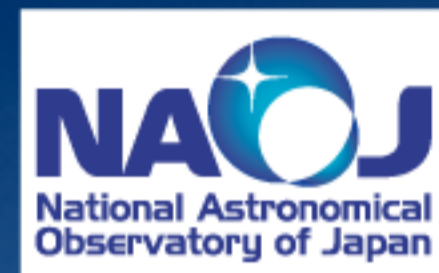


# Component simulation



- ✧ The component simulator is based on the CDB and Python
- ✧ Useful in ALMA early stages but not much used anymore
- ✧ Further details: [Link](#)

# Questions?



## Acknowledgements

ACS presentations were originally developed by the ALMA Common Software development team and has been used in many instances of training courses since 2004. Main contributors are (listed in alphabetical order): Jorge Avarias, Alessandro Caproni, Gianluca Chiozzi, Jorge Ibsen, Thomas Jürgens, Matias Mora, Joseph Schwarz, Heiko Sommer.

The Atacama Large Millimeter/submillimeter Array (ALMA), an international astronomy facility, is a partnership of Europe, North America and East Asia in cooperation with the Republic of Chile. ALMA is funded in Europe by the European Organization for Astronomical Research in the Southern Hemisphere (ESO), in North America by the U.S. National Science Foundation (NSF) in cooperation with the National Research Council of Canada (NRC) and the National Science Council of Taiwan (NSC) and in East Asia by the National Institutes of Natural Sciences (NINS) of Japan in cooperation with the Academia Sinica (AS) in Taiwan. ALMA construction and operations are led on behalf of Europe by ESO, on behalf of North America by the National Radio Astronomy Observatory (NRAO), which is managed by Associated Universities, Inc. (AUI) and on behalf of East Asia by the National Astronomical Observatory of Japan (NAOJ). The Joint ALMA Observatory (JAO) provides the unified leadership and management of the construction, commissioning and operation of ALMA.