COMPASS DCS

COMPASS Front-End, Trigger and DAQ Workshop, March 2020

FCT Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR
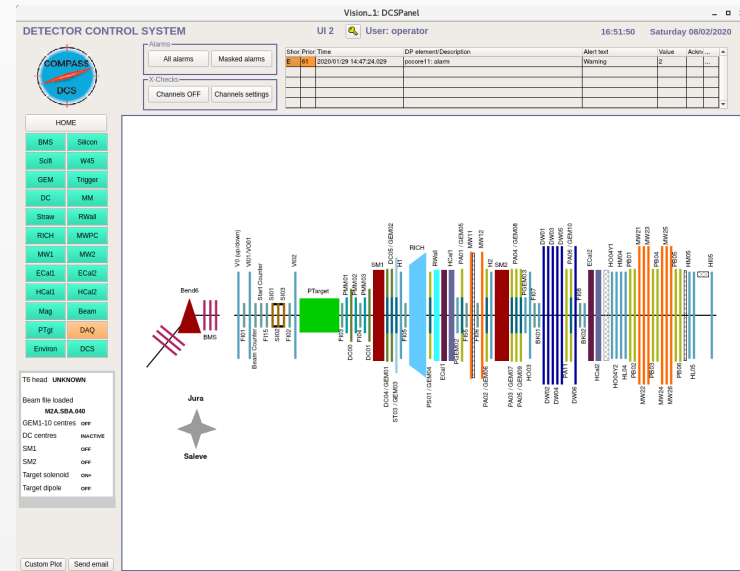
Overview

LIP Lisbon group responsibility since 2003

- Changed/Evolved a lot over the years

2003

2020

Monitors and controls equipment from COMPASS detectors
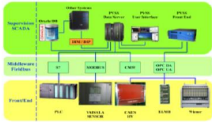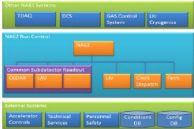and related external systems

Overview

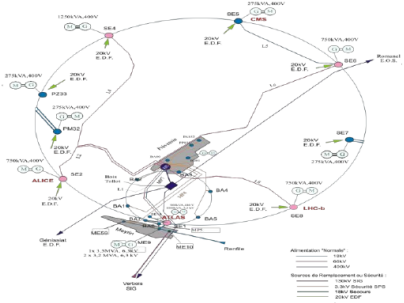Siemens WinCC OA as SCADA
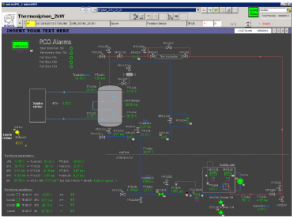
- Chosen, adopted and supported by CERN

From WinCC OA & JCOP Framework training course

Scalability

Modularity

Redundancy

Multiplatform

Openess

Commercial

Support

Overview

JCOP framework

- Layer of software on top off WinCC OA

  - Guidelines, components for commonly used equipment, tools

- Modular

- Homogeneous control systems

- Reduce cost of development and maintenance

3D Viewer	CtrlUtils	Magnet Control System	CAEN Devices
Access Control	Device Comment	RDB Archiver Component	ELMB (Embedded Local Monitor Board)
CAN Wrappers and Tools	DIM	RDB External API	ELMB CAN PSU
Component Installation Tool	DIP Component	RPC	ISEG Power Supplies
Configuration Database Tool	External Applications	System Overview Tool	Rack Control
Configuration DB System Information Tool	Farm Monitoring and Control	Trending Tool	Wiener MPOD Power Supplies
Cooling and Ventilation	FSM (Controls Hierarchy)	XML Parser	Wiener VME Crates and Power Supplies
Core	FSM-Configuration DB Tool		

http://jcop.web.cern.ch/jcop-framework-components
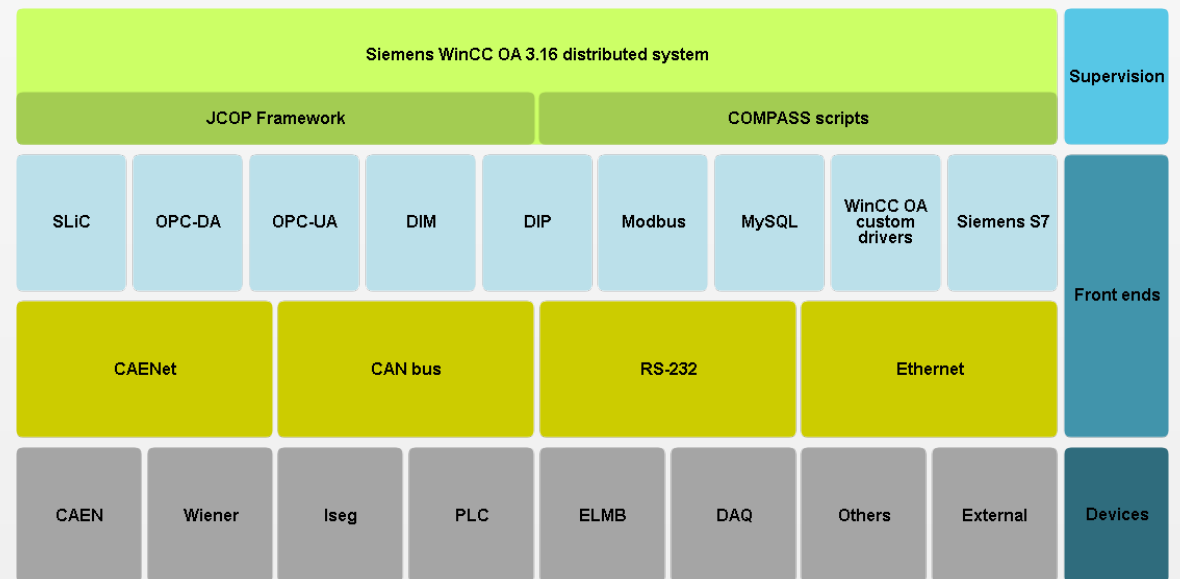
COMPASS DCS – Short term plans
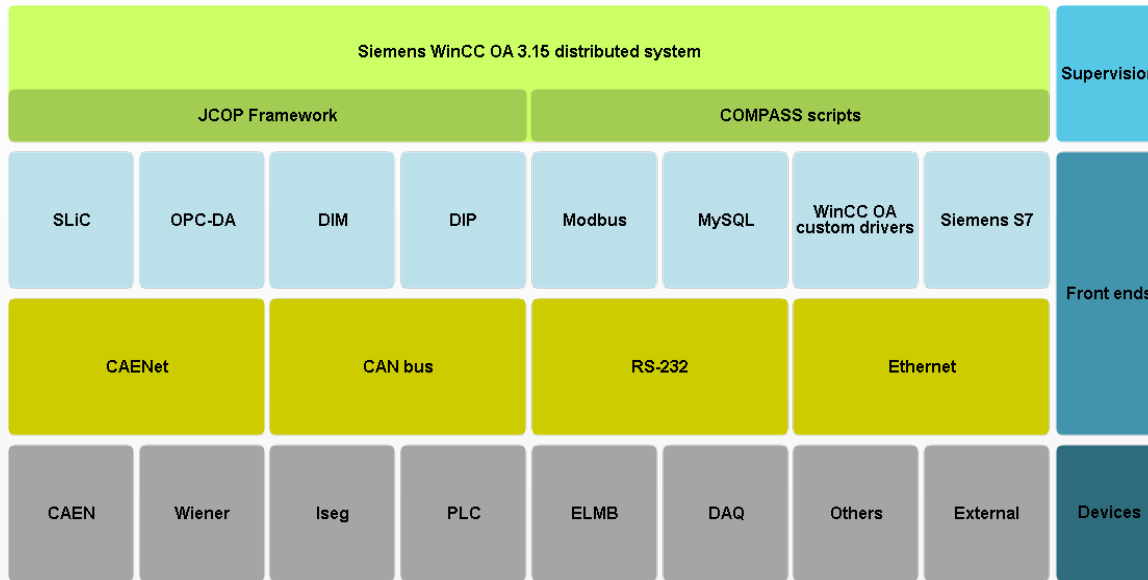
2018 – Drell Yan

DCS
- No revolution!
- Evolution and adaptation

COMPASS
- Major investment in new equipment

2021

COMPASS DCS – Short term plans

Siemens WinCC OA 3.16 distributed system									Supervision
JCOP Framework				COMPASS scripts					
SLiC	OPC-DA	OPC-UA	DIM	DIP	Modbus	MySQL	WinCC OA custom drivers	Siemens S7	Front ends
CAENet		CAN bus		RS-232		Ethernet			
CAEN	Wiener	Iseg	PLC	ELMB	DAQ	Others	External		Devices
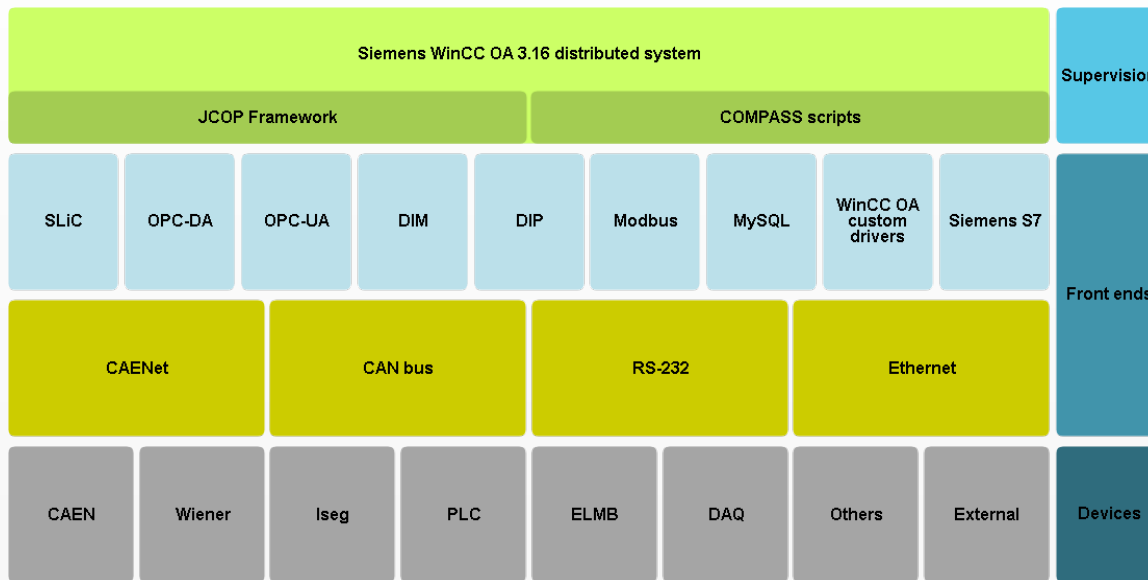
2021

DCS hardware upgrade

WinCC OA upgrade
- 3.15 → 3.16
  - Major upgrade

JCOP framework upgrade

OPC-DA is being phased out → move to OPC-UA
- COMPASS OPC-UA "compatible" equipment will be moved to OPC-UA
- Thanks to COMPASS effort older non-supported equipment will be decommissioned

- CANopen, CAEN, Iseg, Wiener and IPBus OPC-UA servers
  - Based on Quasar framework developed at CERN
    - https://github.com/quasar-team/quasar/wiki
    - Provides consistent implementations of OPC-UA servers

COMPASS DCS – Short term plans

## Start transition from PCI-CAN to Ethernet-CAN interfaces

CAN Evolution

Today's Status

- Various CAN interfaces
  - ISEG: PEAK (PCI & USB) and SYSTEC(USB), Wiener: KVASER(PCI), SYSTEC(USB) ELMB: KVASER(PCI), SYSTEC(USB)
- Different ways to interface these gateways to the OPC Servers
- Newly supported and recommended Ethernet-CAN interface: ANAGATE based on Linux running on ARM CPUs

Plans

- Ongoing and LS2 plans (with OPC DA being phased out)
  - Homogenize the CAN hardware and software across CERN to facilitate installation, maintenance and support
  - Drop of the support of the Wrappers (after OPC DA decommissioning)
  - ANAGATE: recommended solution for upgrade and new developments
    - SYSTEC will continue to be supported beyond LS2
  - LS3 and beyond
    - Recommendations to JCOP to evaluate alternatives to CANbus for future detector electronics

Philippe Gayet EN-ICE   9

From IV JCOP Workshop 2015
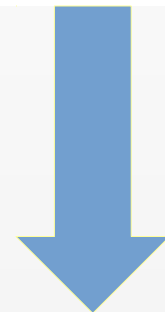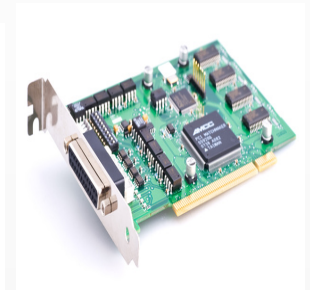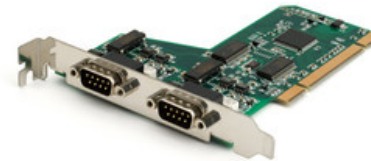
Anagate X series

COMPASS DCS – Short term plans

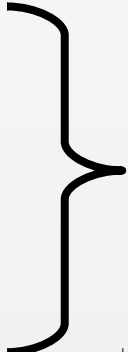Adaptation of COMPASS DCS to Physic Programmes and integration of new equipment

Logging of all user actions

LDAP/FreeIPA user authentication

Improve DAQ related monitoring
- Configuration DB, Detectors readout (ex: NINO discriminator boards work ongoing)

Additional monitoring of external systems
- Access control and monitoring
- Beam
- Accelerators status   } To be defined
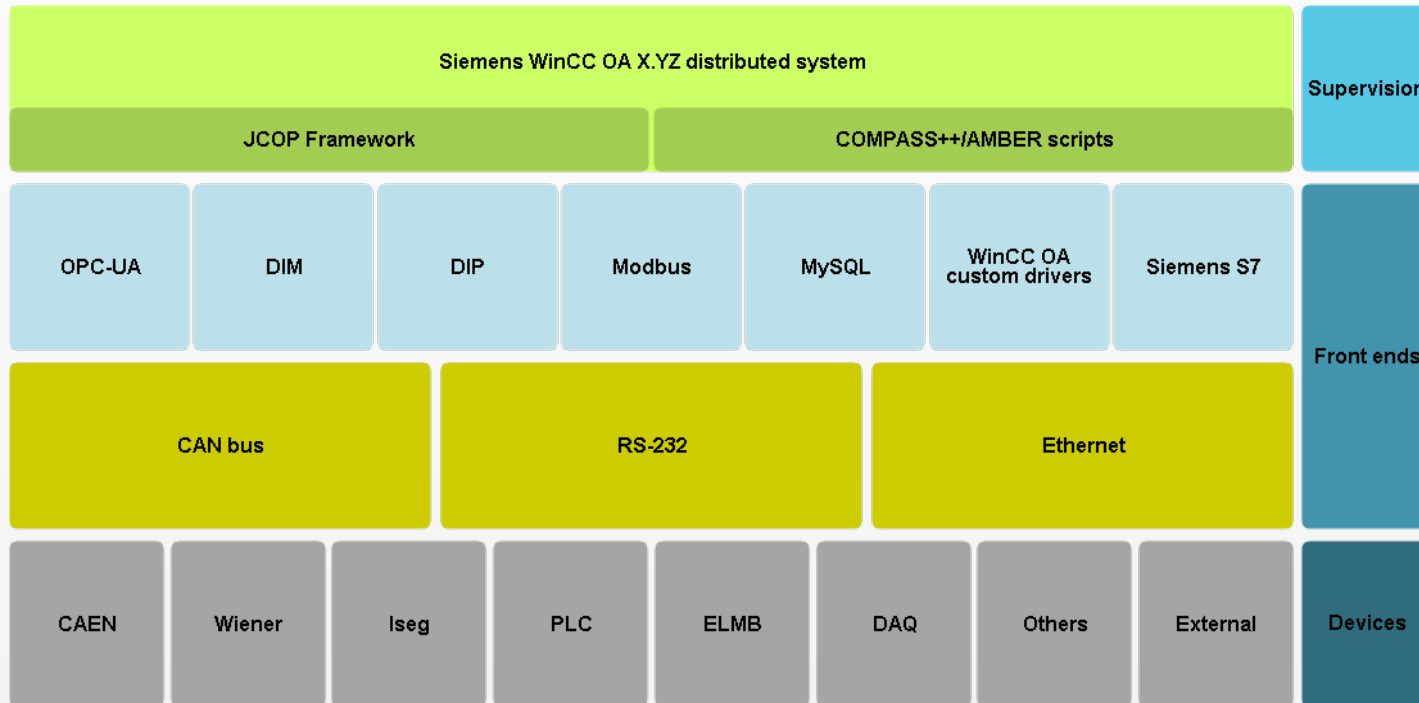- Water
- Piped Gas

COMPASS++/AMBER DCS – Long term plans

New hardware and project

Adopt CERN solutions

Linux only

Decommission non supported protocols

Improve COMPASS/AMBER and external systems integration

Adopt existing features of WinCC OA and JCOP framework
- Redundancy, FSM, etc

COMPASS++/AMBER DCS – Long term plans

Redundancy

- Increase of availability and reliability

  - Hot standby → switch on the fly

  - Load balancing

- Duplication of hardware and software

JCOP FSM component

- Tool to build a finite state machine + expert system

- Abstract representation of the experiment

  - Requires the development of a new project

  - Definition of detectors and experiment states

    - Not only a task for the DCS team

  - High level view and control

COMPASS++/AMBER DCS – Long term plans

Recent problem – CentOS7 End-of-Life

- End-of-lifetime announced to be June 30th 2024

- Falls directly into data taking period

- Conflict with JCOP Coordination Board to stick with WinCC OA 3.16 (not compatible with CC8 at the moment)

- Options

  - Keep CC7 for ~6 extra months

    - DCS machines aren't exposed to GPN

  - Upgrade to CC8 before 2024 data taking

    - WinCC OA 3.16

      - Backward–compatibility of libraries to be guaranteed by RedHat

    - WinCC OA 3.18

      - if ready and recommended

COMPASS++/AMBER DCS – Long term plans

Conclusion

- Detector control systems at CERN are and will continue to use WinCC OA

  - We plan to stay in CERN ecosystem

    - Reduce costs of development and maintenance
    - Support

- For the major changes

  - Time
  - Manpower   } **Needed!**
  - Other resources/investments

Thank you!

Extra slides

Other SCADA tools

Just a few…

EPICS

https://epics.anl.gov/

C2MON

https://c2mon.web.cern.ch/c2mon/

Tango controls

https://www.tango-controls.org/

For discussion :)