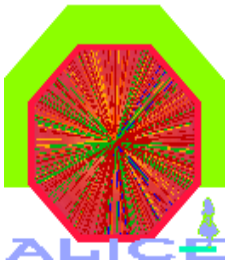


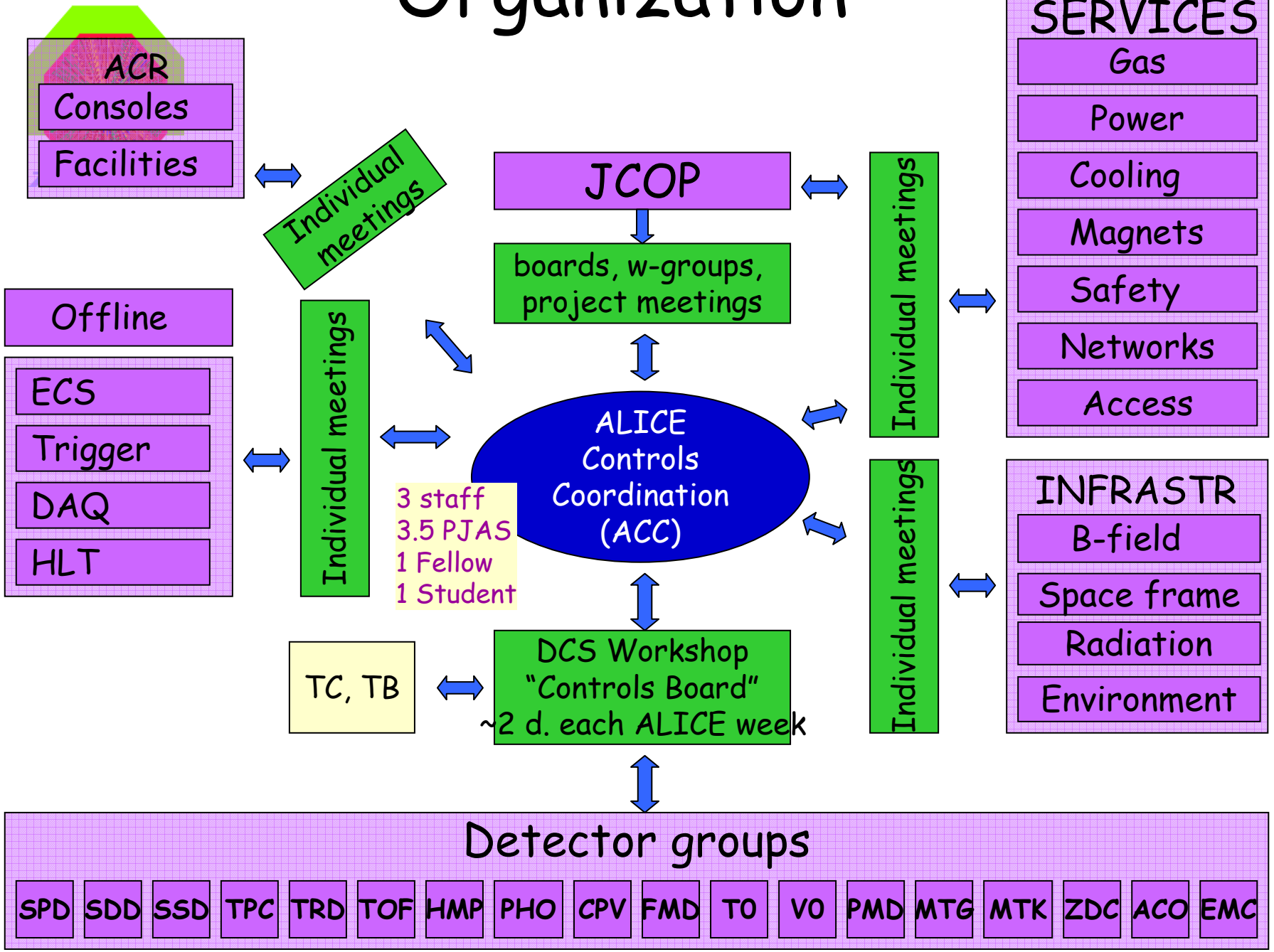
ALICE DCS part 1

DCS workshop 3.4.06

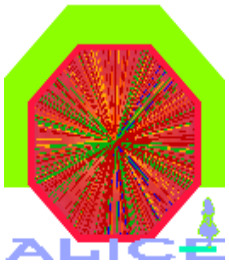
L.Jirden for the ALICE team

- Organization & responsibilities
- Coordination role
- JCOP participation
- Installation & commissioning
- Critical issues part 1

Organization



Liaison with Detectors



ALICE Controls Coordination (ACC)

DCS Workshop

Individual meetings

User Req. Doc (URD)

Overview Drawings

Documented ALICE Standards:

- ALICE DCS State Diagrams
- Guidelines & Conventions
- ALICE DCS Computing Rules
- FedServer API for ALICE DCS
- Interlocks
- etc

Common Solutions

Detector groups

SPD SDD SSD TPC TRD TOF HMP PHO CPV FMD T0 V0 PMD MTG MTK ZDC ACO EMC

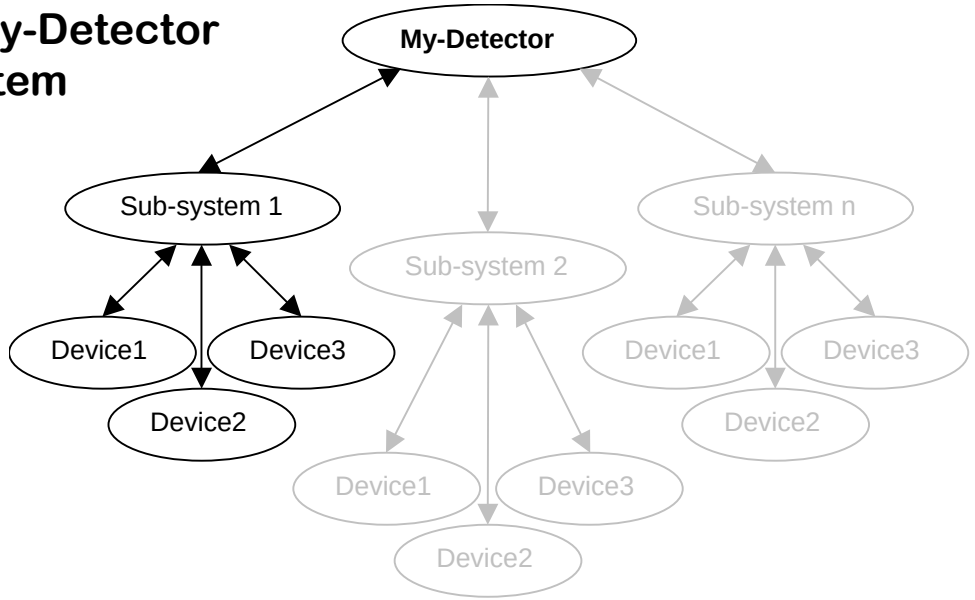
For each detector:

Template version 2 (19 December 2001)

DCS User Requirements Document for My-Detector

Version x (dd month yyyy)

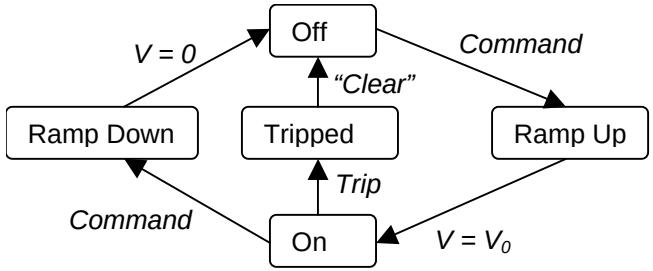
1. Introduction
2. Description of My-Detector
3. The Control System

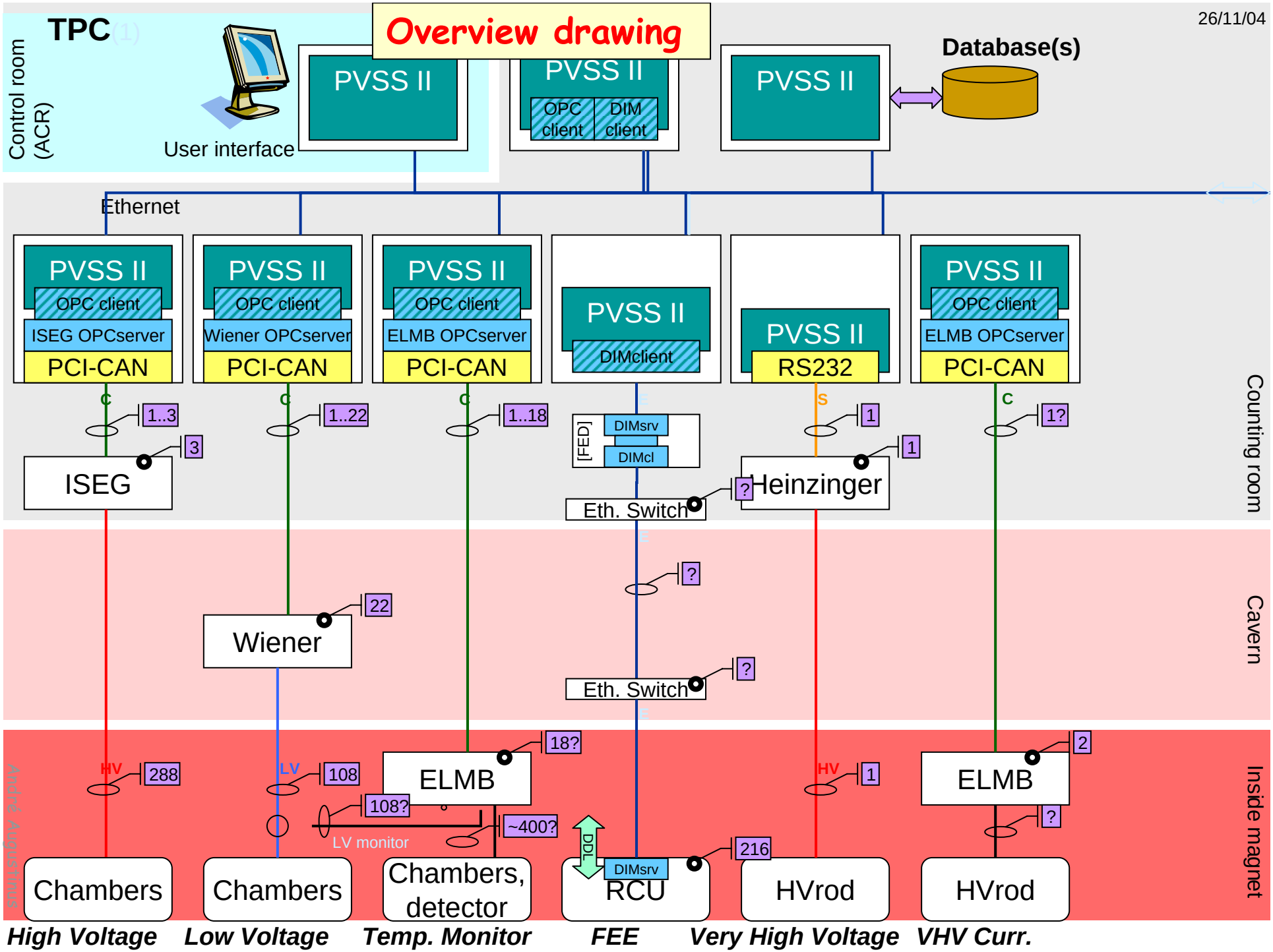


I.Description and requirements of the Sub-systems

1) Sub-system 1
a) Functionality
b) Device or Equipment
c) Interlocks and Safety aspects
d) Operational and Supervisory aspects

etc.




TPC
Overview drawing
26/11/04
Control room (ACR)
User interface
PVSS II
PVSS II
OPC client
DIM client
PVSS II
Database(s)
Ethernet
PVSS II
OPC client
ISEG OPCserver
PCI-CAN
PVSS II
OPC client
Wiener OPCserver
PCI-CAN
PVSS II
OPC client
ELMB OPCserver
PCI-CAN
PVSS II
DIMclient
PVSS II
RS232
PVSS II
OPC client
ELMB OPCserver
PCI-CAN
Counting room
C
1..3
3
ISEG
C
1..22
C
1..18
[FED]
DIMsrv
DIMcl
Eth. Switch
S
1
1
?
Heinzinger
C
1?
Cavern
?
22
Wiener
Eth. Switch
?
Inside magnet
HV
288
LV
108
18?
ELMB
108?
~400?
LV monitor
DDL
HV
1
2
ELMB
?
André Augustinus
Chambers
Chambers
Chambers, detector
DIMsrv
216
RCU
HVrod
HVrod
High Voltage
Low Voltage
Temp. Monitor
FEE
Very High Voltage
VHV Curr.

Sub-systems: Common and specific solutions

	SPD	SDD	SSD	TPC	TRD	TOF	HMPID	PHOS	CPV	μ-trk	μ-trg	FMD	T0	V0	PMD	ZDC	ACO	EMC	Trig.	DCS
HV	CAEN	iseg	CAEN Easy	iseg	iseg +distr	CAEN	CAEN	Iseg +V reg.	CAEN	CAEN +distr	CAEN	CAEN	CAEN	CAEN	CAEN	CAEN	CAEN	Iseg		
LV	CAEN Easy	AREM pro	CAEN Easy	Wiener	Wiener	ALICE box	CAEN Easy	Wiener	Wiener	Wiener	Wiener	CAEN Easy	CAEN	CAEN Easy	CAEN Easy		CAEN Easy	Wiener		
VME	Wiener VME	Wiener VME	Wiener VME		Wiener VME	Wiener VME	Wiener VME	Wiener VME		Wiener VME	Wiener VME		Wiener VME	Wiener VME	Wiener VME	Wiener VME			Wiener VME	
MON			ELMB	ELMB			PLC	ELMB	ELMB	ELMB	ELMB				ELMB			?	DIM	ELMB
FED	*JTAG*	*DCS*	*JTAG*	*RCU*	*DCS*	*DRM*		*RCU*				*RCU*	*DRM*	*DCS*				***RCU***		
Cool																				
GAS																				
				VHV			Liquid	LED		GMS			Thresh			Position		LED?		RackCtrl
				Pulser				Crystal					Laser							Align
				Laser																BField
				Drift Vel.																RadMon

Common solution	67	Common/specific	7
FED concept	7	Unknown	2
Specific solution	11	TOTAL	105

Responsibilities

DAQ + ACC
ACR
Consoles
CR facilities

JCOP + ACC + service groups
Safety
CSAM
DSS
JCOP + ACC

JCOP + ACC + service groups
Services
Gas
Electricity
Cooling
Magnets
Access

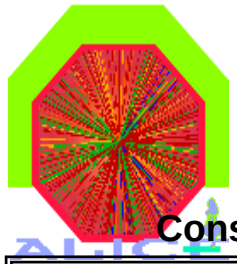
External Systems
ECS
Trigger
DAQ
HLT
Offline
LHC ACC

ACC Central DCS
Back-End
H/W infrastructure
JCOP + ACC
Tools & Components

ACC frastr
B-field
Space Frame
Env. Param.
Radiation

ACC ACC ACC etectors
SPD SDD SSD TPC TRD TOF HMP PHO FMD T0 V0 PMD MTI MTK ZDC ACO
~100 sub-systems

Central DCS



CERN

Consoles

System Management
DCS Operator
DCS Status
Safety Status
ACR Consoles

Remote Access

Firewall
IP Reach for KVM
Terminal Server
Terminal Server

Backend Servers

Domain Controller
Domain Controller
DB Server (Config.)
DB Server (Archive)
DB Server (Archive)
File Server
Information Server

DCS network

Worker Nodes

Network and Security
Alarms
FSM
General DCS
Electricity & Racks

Gas & Cooling
LHC & Access
General services
Environment
Alignment

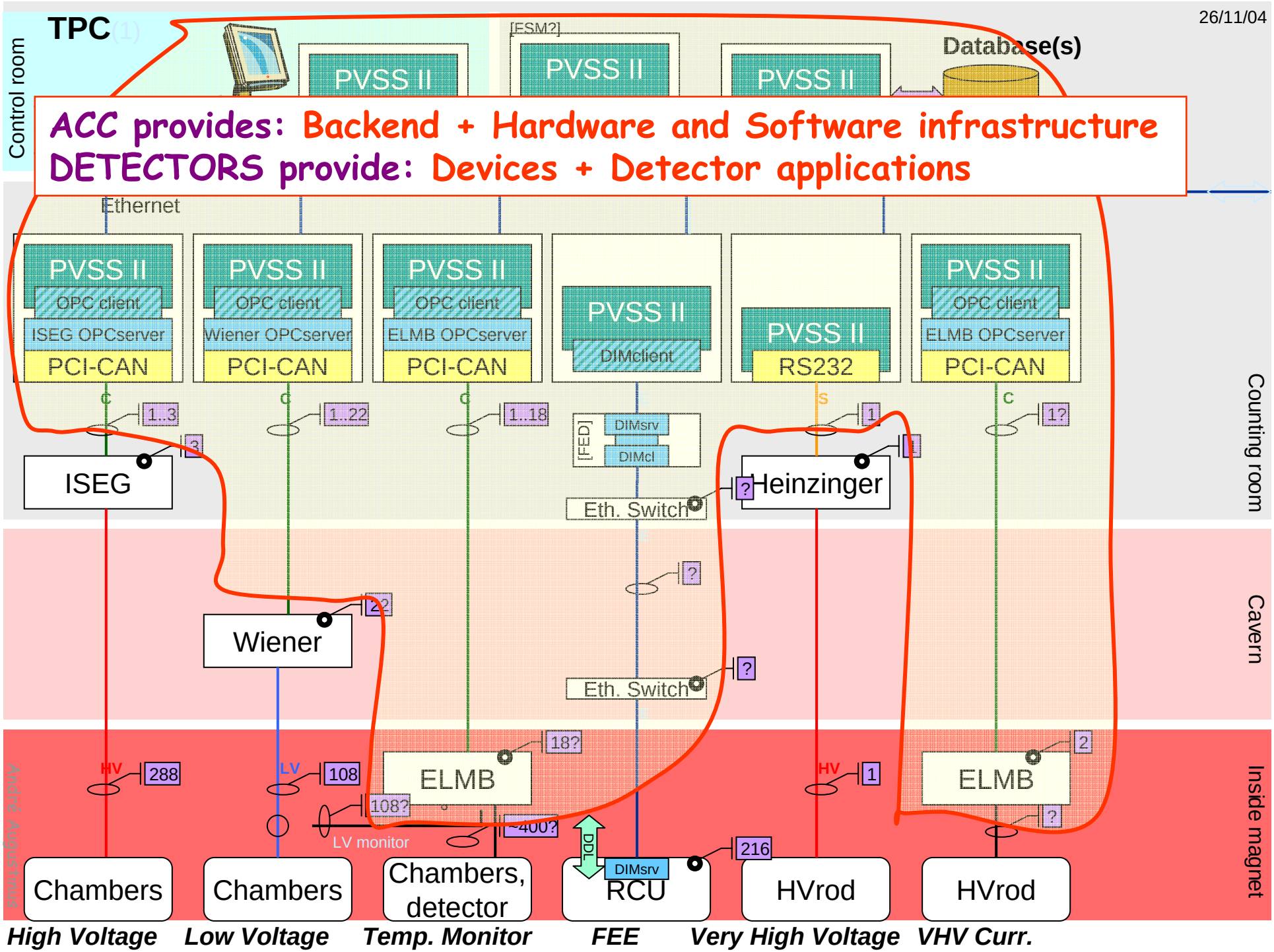
Detector DCS

Infrastructure, network

Racks, network, cabling
KVM switches
controlled power plugs

Spares

Hot swap spare servers
Disks & memories

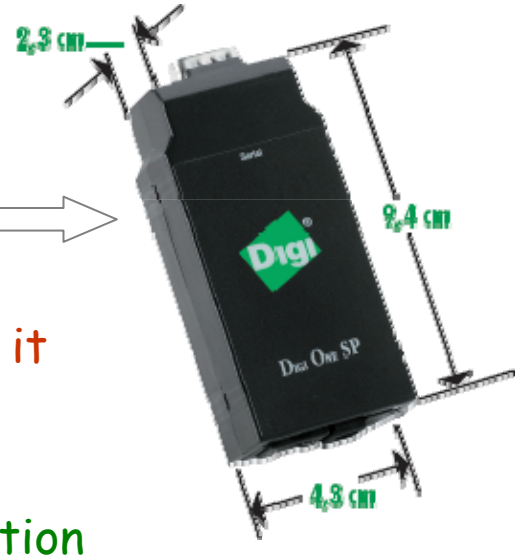

26/11/04
TPC
Control room
[ESM?]
PVSS II
PVSS II
PVSS II
Database(s)
ACC provides: Backend + Hardware and Software infrastructure
DETECTORS provide: Devices + Detector applications
Ethernet
PVSS II
OPC client
ISEG OPCserver
PCI-CAN
PVSS II
OPC client
Wiener OPCserver
PCI-CAN
PVSS II
OPC client
ELMB OPCserver
PCI-CAN
PVSS II
DIMclient
PVSS II
RS232
PVSS II
OPC client
ELMB OPCserver
PCI-CAN
Counting room
Cavern
Inside magnet
ISEG
Wiener
Heinzinger
Eth. Switch
Eth. Switch
[FED]
DIMsrv
DIMcl
ELMB
ELMB
LV monitor
DDL
DIMsrv
RCU
Chambers
Chambers
Chambers, detector
HVrod
HVrod
High Voltage
Low Voltage
Temp. Monitor
FEE
Very High Voltage
VHV Curr.
André Augustinus

Coordination in purchase of equipment

- **Purchased by ACC**
  - **Computers**
    - Servers for back-end
    - PC's for back-end and front-end (~90)
      - all details on DCS web page: http://alicedcs.web.cern.ch/AliceDCS/Meetings/
    - PCI's: Kvaser, Peak, Caen PCI-VME bridge, MXI
  - **Network**
    - Global network (~400 ports), sub-contracted to IT/CS
    - On-detector network (~1000 ports) by ACC
  - **Devices**
    - ELMB's (~150) + ELMB power
    - Serial device (RS232)

Serial devices (RS232)

- **Aim for standard way of interfacing this class**
  - *Physical* **interface (cables and alike)**
    - Needs a COM port on a PC; cable length is limited
    - A standard (and transparent !) way to use serial over Ethernet overcomes this limit
      - CERN *standard*; expertise exists
      - Examples exist, several detectors start using it
      - Exist in single and multi-port version
  - *Software* **interface (transporting the data)**
    - PVSSII has all one needs to 'drive' a serial connection
    - Examples exist
  - *Functional* **interface (exchange sensible data)**
    - Application dependent
    - to be developed by the detector (using the above!)



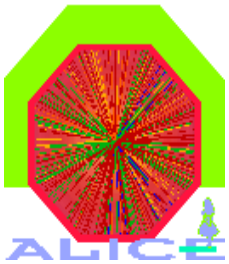
Coordination in purchase of equipment

- **Coordinated by ACC**
  - LVPS
    - Wiener PL512, water-cooled (6 detectors ~115 units)
    - Caen Easy (7 detectors ~110 units)
    - Caen SY1527 (2 detectors, 1 units)
    - AREM Pro (1 detector, 6 units)
  - HVPS
    - ISEG, 4 module types (4 detectors, ~15 crates)
    - Caen SY1527 (13 detectors, ~20 main-frames)
  - VME
    - Wiener 6U & 9U, local PS, water & air cooled (15 detectors, ~60 crates)

Detector computer distribution

- Strict separation per detector, to allow for:
  - Staged installation
  - Independent operation
- Distribution of sub systems based on:
  - Number of channels
  - Estimated resources needed by a sub system
  - Performance tests done by several groups
  - Some specific requests

Detector computers

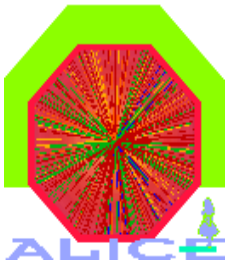


Operator Node - ON
Worker Node - WN
Front-End Dev - FED

SPD	SDD	SSD	TPC	TRD	TOF
Operator Node	Operator Node	Operator Node	Operator Node	Operator Node	Operator Node
HV + LV	HV	HV + LV	HV	HV	HV
FED + Crate	LV + FED + Crate	FED + Crate + ELME	LV + ELMB	LV	LV
FED	FED	FED	VHV	FED	FED + Crate
FED			FED	FED	FED [18]
			Pulser	FED	
			Laser		
			Laser		
			Drift velocity		
			FED		

HMPID	PHOS	CPV	Muon Trk	Muon Trg	FMD
Operator Node	Operator Node	Operator Node	Operator Node	Operator Node	Operator Node
HV + LV	HV + FED + LED	HV + LV + ELMB	HV	HV + LV	HV + LV + FED
Crate + PLC	LV + ELMB + Crate		LV	Crate + ELMB	FED
	FED		Crate + ELMB +GMS		

T0	V0	PMD	ZDC	ACORDE	EMC
Operator Node	Operator Node	Operator Node	Operator Node	Operator Node	Operator Node
HV + LV	HV + LV + Crate	HV + LV	HV + Crate	HV + LV	HV + LV + FED
FED + Crate + Laser		Crate + ELMB			FED
FED					



PVSS & FSM distribution

- **PVSS**
  - **Baseline approach**
    - Each detector DCS will be a *distributed* PVSS system
    - Each WN will run a single PVSS project
      - when several sub systems are controlled from a single WN these shall be grouped in a single project
    - All detector DCS's will form one big distributed system (of distributed systems)
- **FSM**
  - **integrated in the respective PVSS projects**
    - One PVSS project can have several FSMs
    - Detector DCS FSM' to run on least loaded node

Training & Tutorials

- JCOP courses
  - Are appreciated
  - At least one person from each detector has now taken the basic course
  - Problem: manpower changes, students graduating
  - Make handouts available
- DCS workshops
  - ALICE "tutorials"
- DCS week planned
  - JCOP advanced course + ALICE tutorials

ALICE DCS week

- Program (preliminary)
  - Monday

		hours
Framework tools & components; recap	IT/CO	8

  - Tuesday

Alarm handling	IT/CO	2
Configuration Dbase	IT/CO	5
Access control	IT/CO	1

  - Wednesday

FSM	IT/CO + ALICE	8

  - Thursday

DIM	IT/CO	1
Framework devices	IT/CO	1.5
Conditions	ALICE	1.5
Distributed systems	ALICE	1
ALICE Front-End Device (FED)	ALICE	2
ALICE FEE configuration	ALICE	1

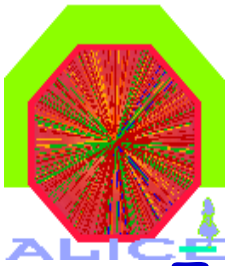
  - Friday

ALICE DCS guidelines/standards/rules	ALICE	2
Detector specific applications & AOB	ALICE	6

Detectors

	HMP	TPC	SPD	TRD	TOF	MTK	MTG	T0	PMD	ACO	PHO	SDD	SSD	FMD	V0	ZDC	CPV	EMC
User requirements																		
Use of tools & components																		
Basic device control																		
FSM for at least one subsystem																		
Test with ECS/DAQ																		
All subsystems ready																		

done/used
not done/not used



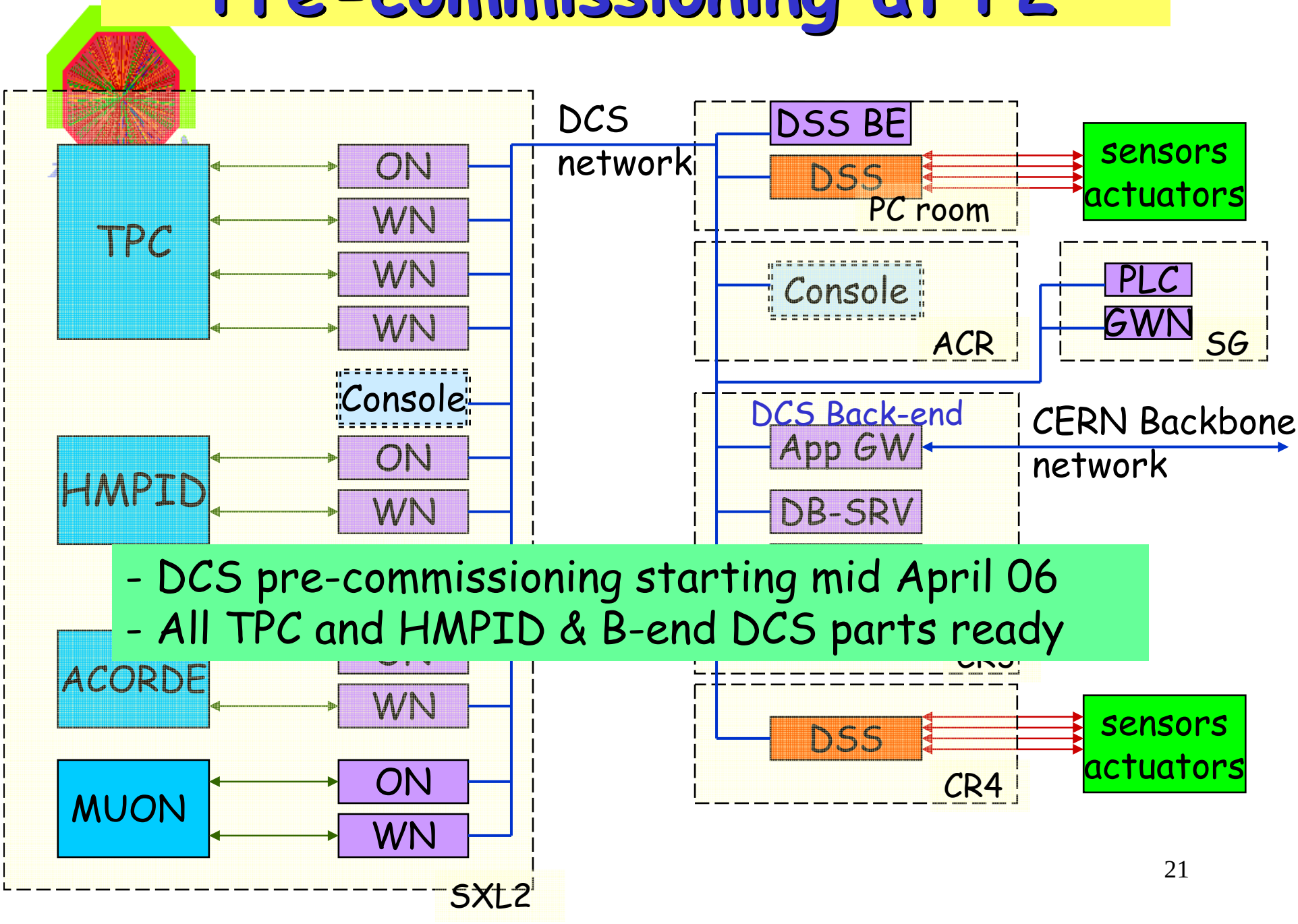
JCOP ⟷ ALICE

- JCOP ⇒ ALICE
  - Most Fw components + DSS system + GAS control
  - Advice, assistance: PLC applications, OPC tests, etc
  - Participation in ALICE DCS workshops
- ALICE ⇒ JCOP
  - ISEG component
  - BCAM component
  - Cooling control
  - Terminal Server evaluation
  - Performance testing
    - Caen HV
    - PVSS scaling
    - Oracle archiving

Main scheduled "challenges" before LHC start-up

- **Pre-commissioning on surface at P2**
  - Functional verification of DCS including
    - 2 detectors with final devices
    - all main sub-systems and services
  - Final validation of ALICE approaches for
    - Back-end, FSM, configuration, archival, alarms
    - Software & hardware interlocks
    - Interface with ECS, DAQ, TRG, HLT

Pre-commissioning at P2



- DCS pre-commissioning starting mid April 06
- All TPC and HMPID & B-end DCS parts ready

DCS final installation - procedure -

- H/W and S/W infrastructure
  - ACC install and verify network, PC's (with PCI), and base s/w
- Detector hand over to ACC
  - S/W projects
    - the detector PVSS project
    - 3rd party software with documentation and installation kits
    - Front-end configuration and control tools
  - Documentation (stored on DCS web pages)
    - Description of the PVSS hierarchy
    - Assignment of the managers to the detector computers
    - Configuration of the OPC servers (where they should run, what devices should be accessed)
    - FED servers (where they should run)
    - archival – what parameters are archived
    - parameters to be stored in the conditions database (including the datapoint names)
    - FERO configuration description

DCS final installation - procedure -

- Verification
  - ACC checks for obvious errors
    - incorrect path names, incorrect external dependencies, violations of the DCS conventions such as naming of the systems or DIM services etc.
  - For viruses
  - For completeness of documentation
- Installation
  - ACC uploads software to the installation server on DCS network
  - ACC + Detector expert install on target machines
    - setting-up of the PVSS system
    - integration into global DCS,
    - configuration of database access and FW access control
  - back-up
- Commissioning
  - Detector expert validates functionality with devices
  - Detector expert demonstrates functionality of alerts, operational panels, FSM, etc.

Detector final installation planning

DETECTORS	From (D time)	To
PHOS, TOF, TRD, HMPID, ACORDE	10 July	1 Sept
TPC	4 Sept	2 Oct
SDD, SSD (ITS Barrel)	3 Oct	8 Nov
FMD, T0, V0 on C-side	9 Nov	28 Nov
SPD, SDD, SSD	29 Nov	10 Jan 07
TOF, TRD	31 Jan 07	6 Mar 07
FMD, T0, V0, PMD on A-side	4 Apr 07	23 Apr 07

DCS final installation planning

For each sub-system (in total ~ 100):

Pre-commissioning on surface (institute/CERN)	who	ready
◆ PVSS - OPC – h/w device connection	AA	date
◆ FSM, configuration, archival, alarms	BB	date
◆ s/w interlocks, operations panels	CC	date

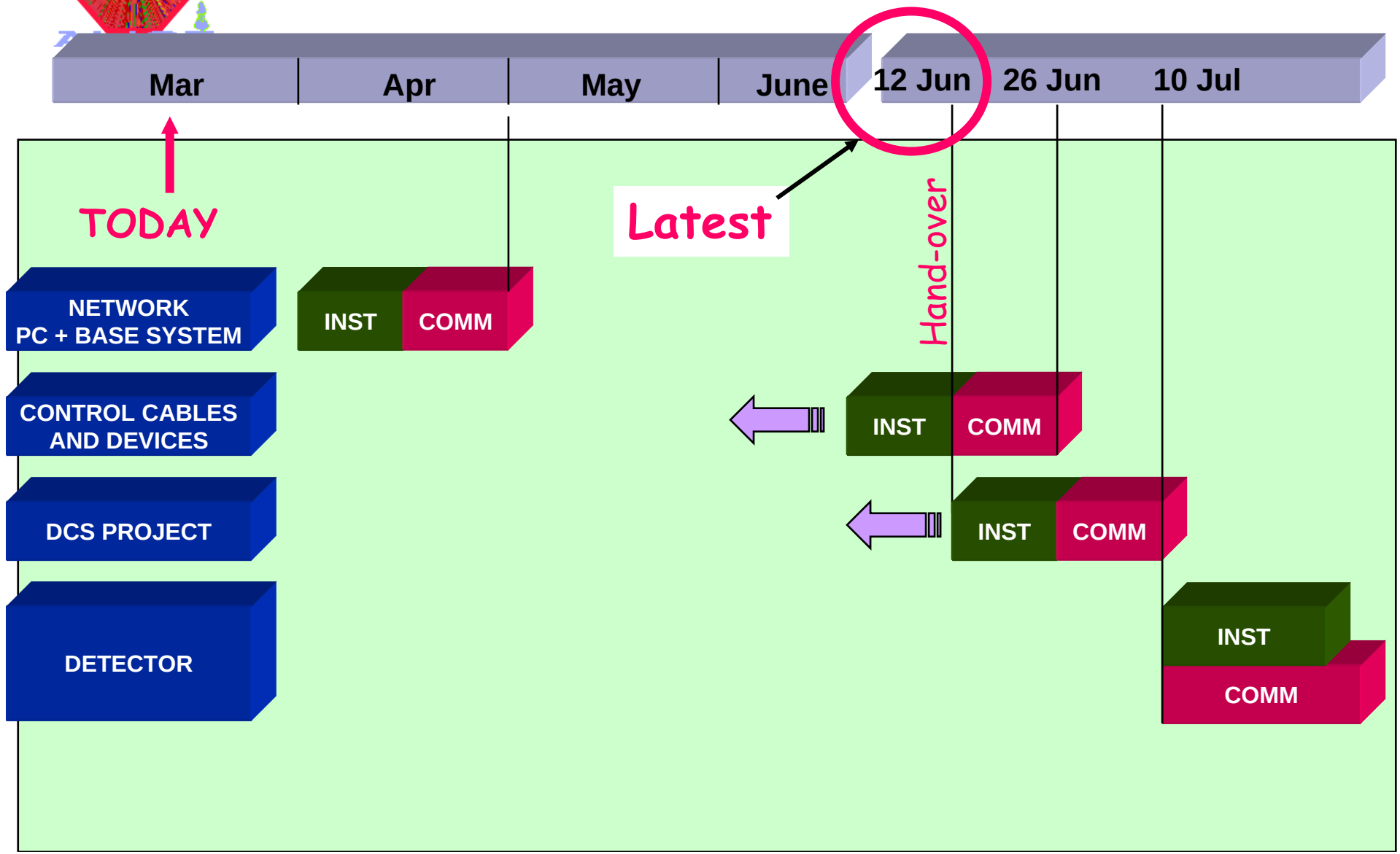
Commissioning in the experimental area	who	ready
◆ s/w hand-over to ACC	AA	<D-4 weeks
◆ Installation & commissioning of devices	BB	<D-2 weeks
◆ Commissioning devices with detector	CC D	

D = detector installation date

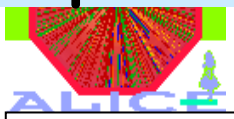
Final installation

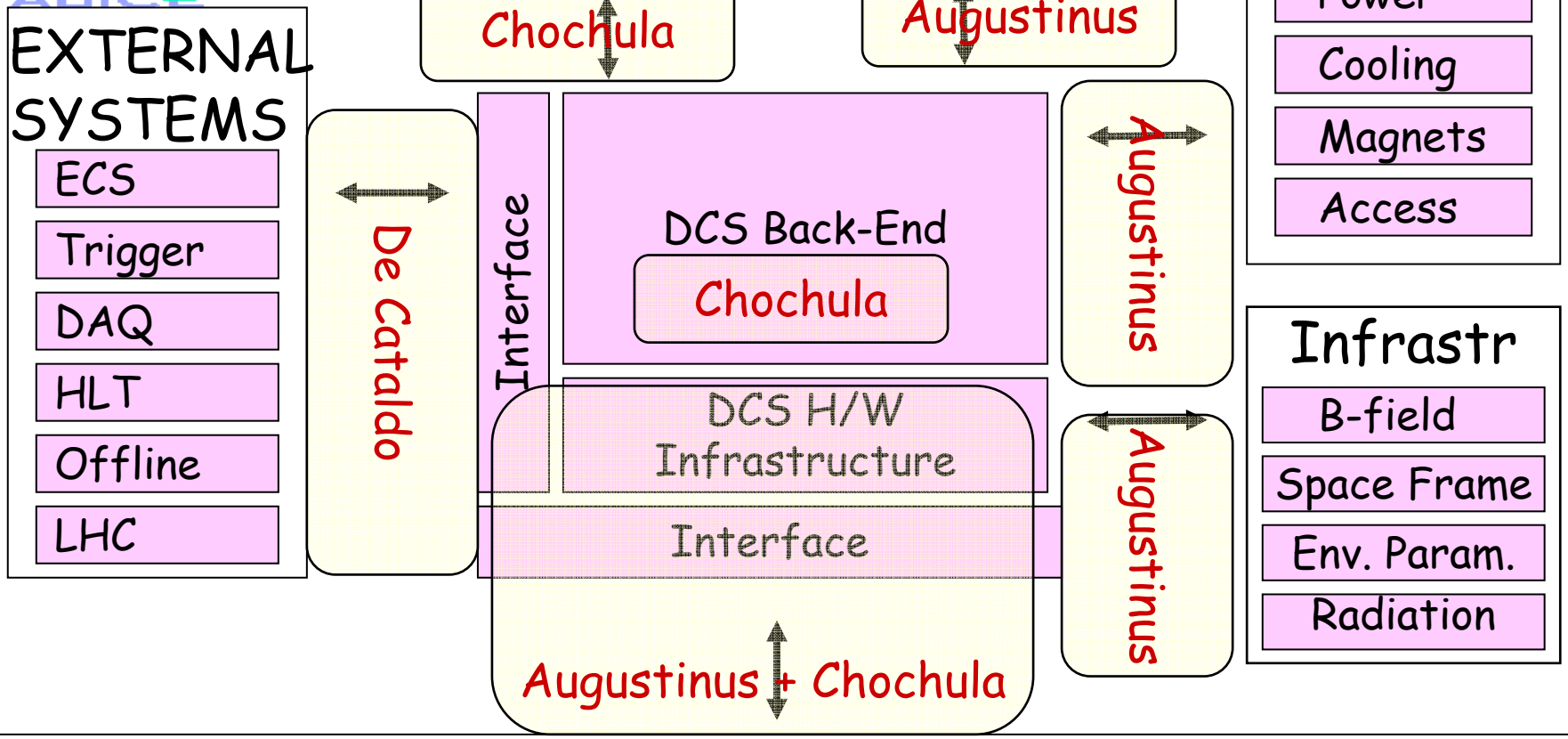
Final installation:

PHOS, TOF, TRD, HMPID, ACORDE



DCS commissioning responsibilities





Detectors

SPD SDD SSD TPC TRD TOF HMP PHO FMD T0 V0 PMD MTI MTK ZDC ACO

~100 sub-systems

Testing and validating DIP

- First use/commissioning of DIP
  - CSAM data ⇨ DCS pre-commissioning May 06
  - MCS data ⇨ DCS Magnet tests end May 06
  - DCS data ⇨ LHC final commissioning end 06?
- Assistance from JCOP?

Integration with other on-line systems

- DCS ⟺ ECS ⟺ DAQ commissioning
  - Done for 2 detectors (HMPID and SPD)
  - Planned for TPC during pre-commissioning June 06

Global status today ("dashboard" on DCS website)

	SPD	SDD	SSD	TPC	TRD	TOF	HMP ID	PHOS	CPV	μ-trk	μ-trg	FMD	T0	V0	PMD	ZDC	ACO	EMC	Trig.	DCS
DET																				
HV	CAEN	iseg	CAEN Easy	iseg	iseg +distr	CAEN	CAEN	Iseg +V reg.	CAEN	CAEN +distr	CAEN	CAEN	CAEN	CAEN	CAEN	CAEN	CAEN	Iseg		
LV	CAEN Easy	AREM pro	CAEN Easy	Wiener	Wiener	ALICE box	CAEN Easy	Wiener	Wiener	Wiener	Wiener	CAEN Easy	CAEN	CAEN Easy	Easy +distr		CAEN Easy	Wiener		
VME	Wiener VME	Wiener VME	Wiener VME		Wiener VME	Wiener VME	Wiener VME	Wiener VME		Wiener VME	Wiener VME		Wiener VME	Wiener VME	Wiener VME	Wiener VME			Wiener VME	
MON			ELMB	ELMB			PLC	ELMB	ELMB	ELMB	ELMB				ELMB			?	DIM	ELMB
FED	JTAG	DCS	JTAG	RCU	DCS	DRM		RCU				RCU	DRM	DCS				RCU		
Cool																				
GAS																				
				VHV			Liquid	LED		GMS			Thresh			Position		LED?		RackCtrl
				Pulser				Crystal					Laser							Align
				Laser																BField
				Drift Vel.																RadMon

Control with FSM
Basic control with PVSS
Activity started, without PVSS
Under definition
No (SW) activity started
No (SW) activity started, but common effort

5 "critical" detectors

	SPD	SDD	SSD	TPC	TRD	TOF	HMP ID	PHOS	CPV	μ-trk	μ-trg	FMD	T0	V0	PMD	ZDC	ACO	EMC	Trig.	DCS
DET																				
HV	CAEN	iseg	CAEN Easy	iseg	iseg +distr	CAEN	CAEN	Iseg +V reg.	CAEN	CAEN +distr	CAEN	CAEN	CAEN	CAEN	CAEN	CAEN	CAEN	Iseg		
LV	CAEN Easy	AREM pro	CAEN Easy	Wiener	Wiener	ALICE box	CAEN Easy	Wiener	Wiener	Wiener	Wiener	CAEN Easy	CAEN	CAEN Easy	Easy +distr		CAEN Easy	Wiener		
VME	Wiener VME	Wiener VME	Wiener VME		Wiener VME	Wiener VME	Wiener VME	Wiener VME		Wiener VME	Wiener VME		Wiener VME	Wiener VME	Wiener VME	Wiener VME			Wiener VME	
MON			ELMB	ELMB			PLC	ELMB	ELMB	ELMB	ELMB				ELMB			?	DIM	ELMB
FED	JTAG	DCS	JTAG	RCU	DCS	DRM		RCU				RCU	DRM	DCS				RCU		
Cool																				
GAS																				
				VHV			Liquid	LED		GMS			Thresh			Position		LED?		RackCtrl
				Pulser				Crystal					Laser							Align
				Laser																BField
				Drift Vel.																RadMon

Control with FSM
Basic control with PVSS
Activity started, without PVSS
Under definition
No (SW) activity started
No (SW) activity started, but common effort

15 "critical" subsystems

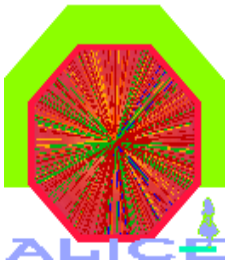
	SPD	SDD	SSD	TPC	TRD	TOF	HMP ID	PHOS	CPV	μ-trk	μ-trg	FMD	T0	V0	PMD	ZDC	ACO	EMC	Trig.	DCS
DET																				
HV	CAEN	iseg	CAEN Easy	iseg	iseg +distr	CAEN	CAEN	Iseg +V reg.	CAEN	CAEN +distr	CAEN	CAEN	CAEN	CAEN	CAEN	CAEN	CAEN	Iseg		
LV	CAEN Easy	AREM pro	CAEN Easy	Wiener	Wiener	ALICE box	CAEN Easy	Wiener	Wiener	Wiener	Wiener	CAEN Easy	CAEN	CAEN Easy	Easy +distr		CAEN Easy	Wiener		
VME	Wiener VME	Wiener VME	Wiener VME		Wiener VME	Wiener VME	Wiener VME	Wiener VME		Wiener VME	Wiener VME		Wiener VME	Wiener VME	Wiener VME	Wiener VME			Wiener VME	
MON			ELMB	ELMB			PLC	ELMB	ELMB	ELMB	ELMB				ELMB			?	DIM	ELMB
FED	JTAG	DCS	JTAG	RCU	DCS	DRM		RCU				RCU	DRM	DCS				RCU		
Cool																				
GAS																				
				VHV			Liquid	LED		GMS			Thresh			Position		LED?		RackCtrl
				Pulser				Crystal					Laser							Align
				Laser																BField
				Drift Vel.																RadMon

Control with FSM
Basic control with PVSS
Activity started, without PVSS
Under definition
No (SW) activity started
No (SW) activity started, but common effort

Remarks

- If not started on HV and LV, then mainly because of no hardware (waiting for PS)
- LV wiener, when application exist, it is with CANbus version of PL500
- For several detectors the environment monitoring is still under definition (number/type of sensors etc.)
- For HV/LV/ELMB detectors can profit from framework etc. For FEE more effort is needed from detectors. Thus red or yellow in FEE is more worrying than red in HV/LV
- For Crate control, cooling and gas an effort is expected from the ACC (thus less work for detectors)

- The FEE for TOF,T0 is green/yellow: work on SW has started, some PVSS panels exist, but it need to be clarified if this adheres completely to the FED concept
- The FEE for FMD is yellow/red: They started to use the RCU, but not really using the 'DCS part' of it
- The Laser for TPC is green/yellow: all parts of the system have been worked on, not all under PVSS
- The Vo is indicated mainly red because of lack of information
- The environment monitoring for EMC is not yet defined. There will be a LED calibration system, the controls of it need to be clarified. EMC has experience with PVSS (older version of their FEE), but not with the sub-systems listed here



Progress monitoring

- For Public
  - Status dashboard on web
- For Experts
  - Status panel on DCS top node accessed via Terminal Server