Laser Megajoule Facility (L.M.J.)
Control system status report

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Presented by

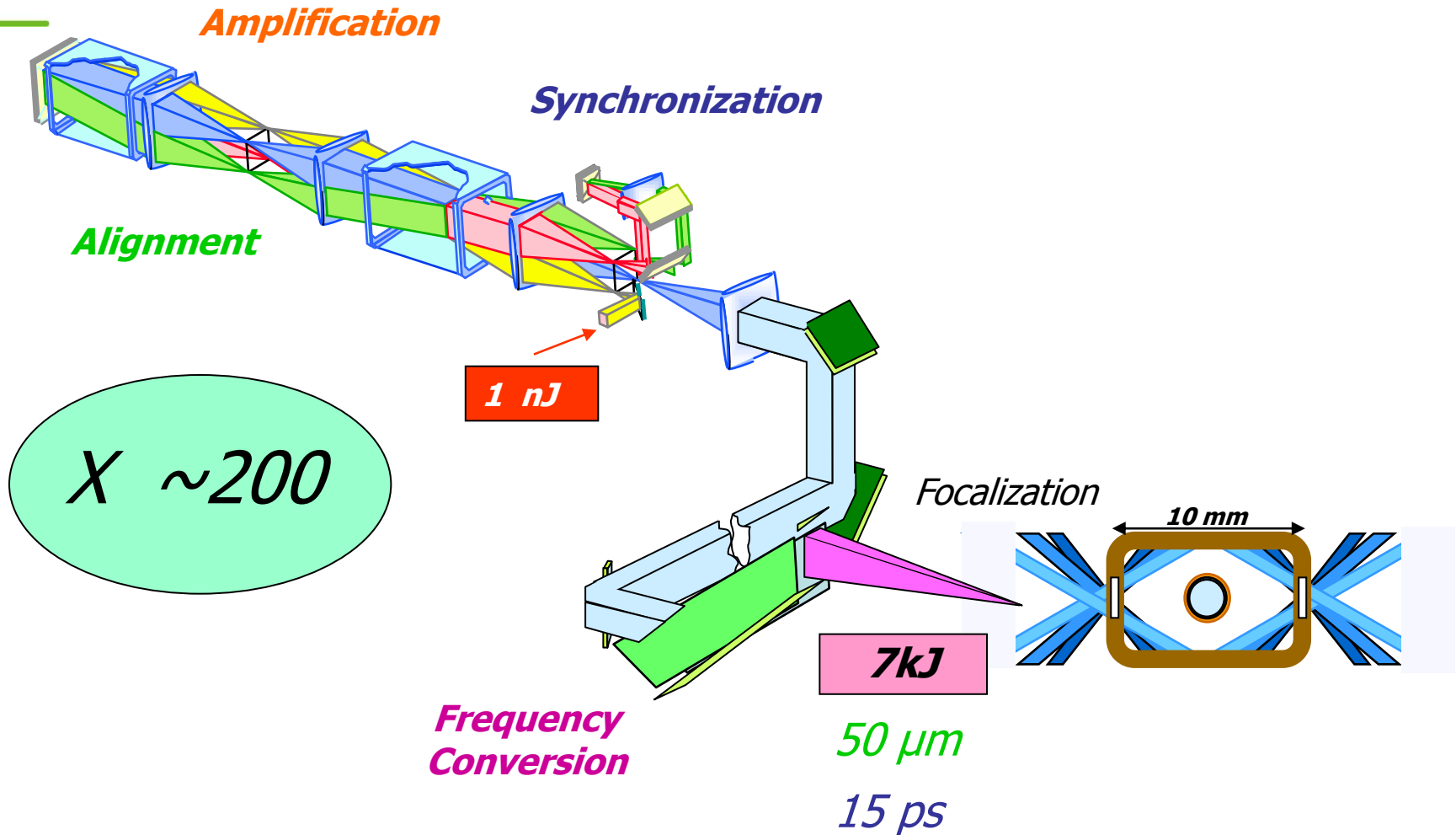*Jean-Jacques Dupas, CEA, DAM, DIF, F-91297 Arpajon, France*

Presentation overview

- **Laser Megajoule (L.M.J.) facility**

- **Laser Integration Line (L.I.L.) prototype**

- **Control system architecture and industrial policy**

- **Common components software framework**

- **High level supervisory software**

- **Control system road map**
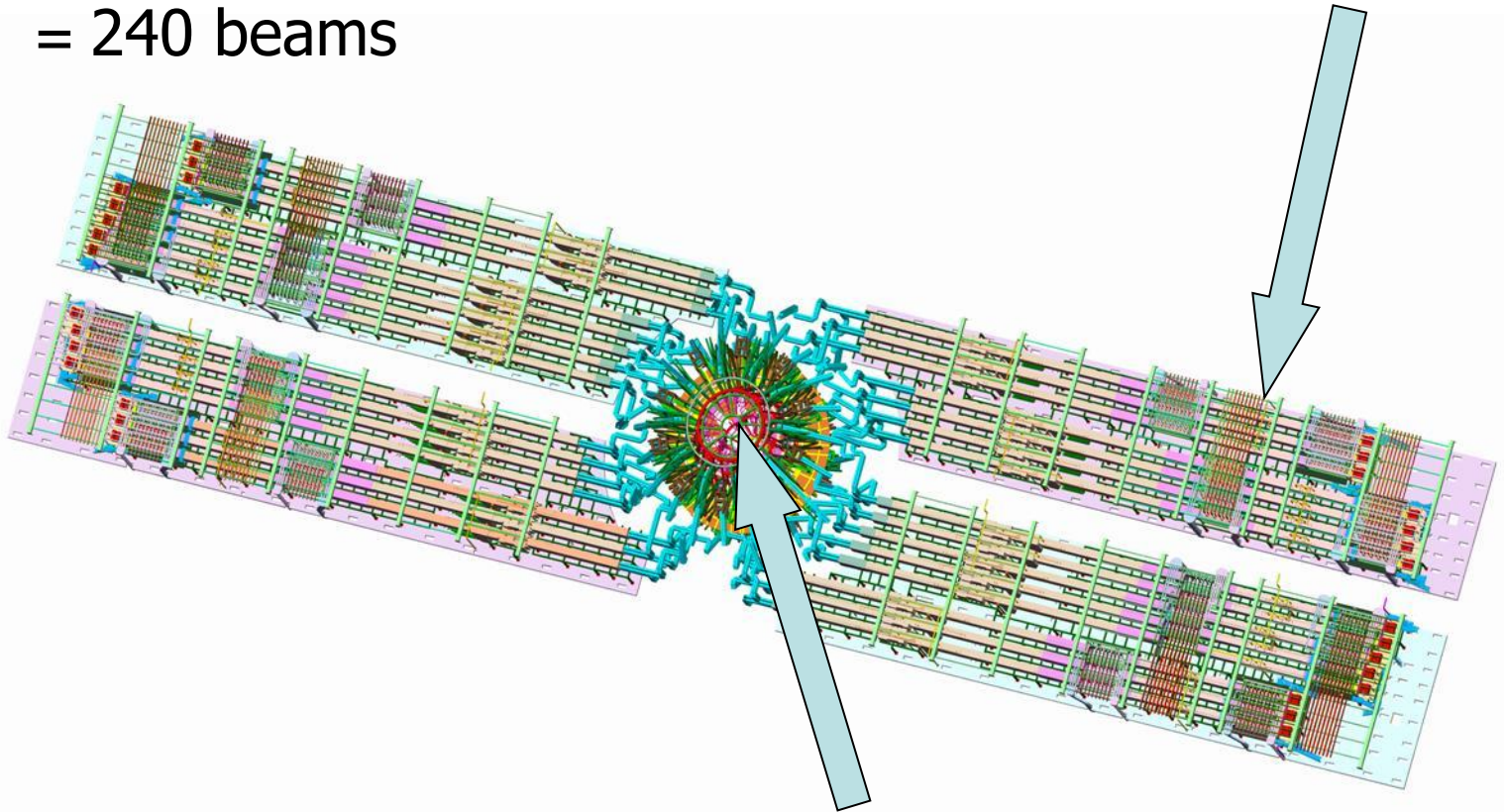
LMJ facility overview

LMJ is designed to deliver about 2 MJ of energy on tiny targets for high density plasma physics and fusion experiments

Amplification

Synchronization

Alignment

1 nJ

X ~200

Focalization

10 mm

7kJ

50 μm

15 ps

Frequency Conversion

LMJ facility overview

Up to 30 bundles of 8 beams located in 4 bays = 240 beams

More than 1 MJ of 350 nm UV light on a target

LMJ building

Mai 2003: beginning
End 2006: target chamber put in place
End 2008: building completed

First laser bay, 5 bundles completed

Second laser bay, assembly of bundles is ongoing

Third laser bay

Target bay

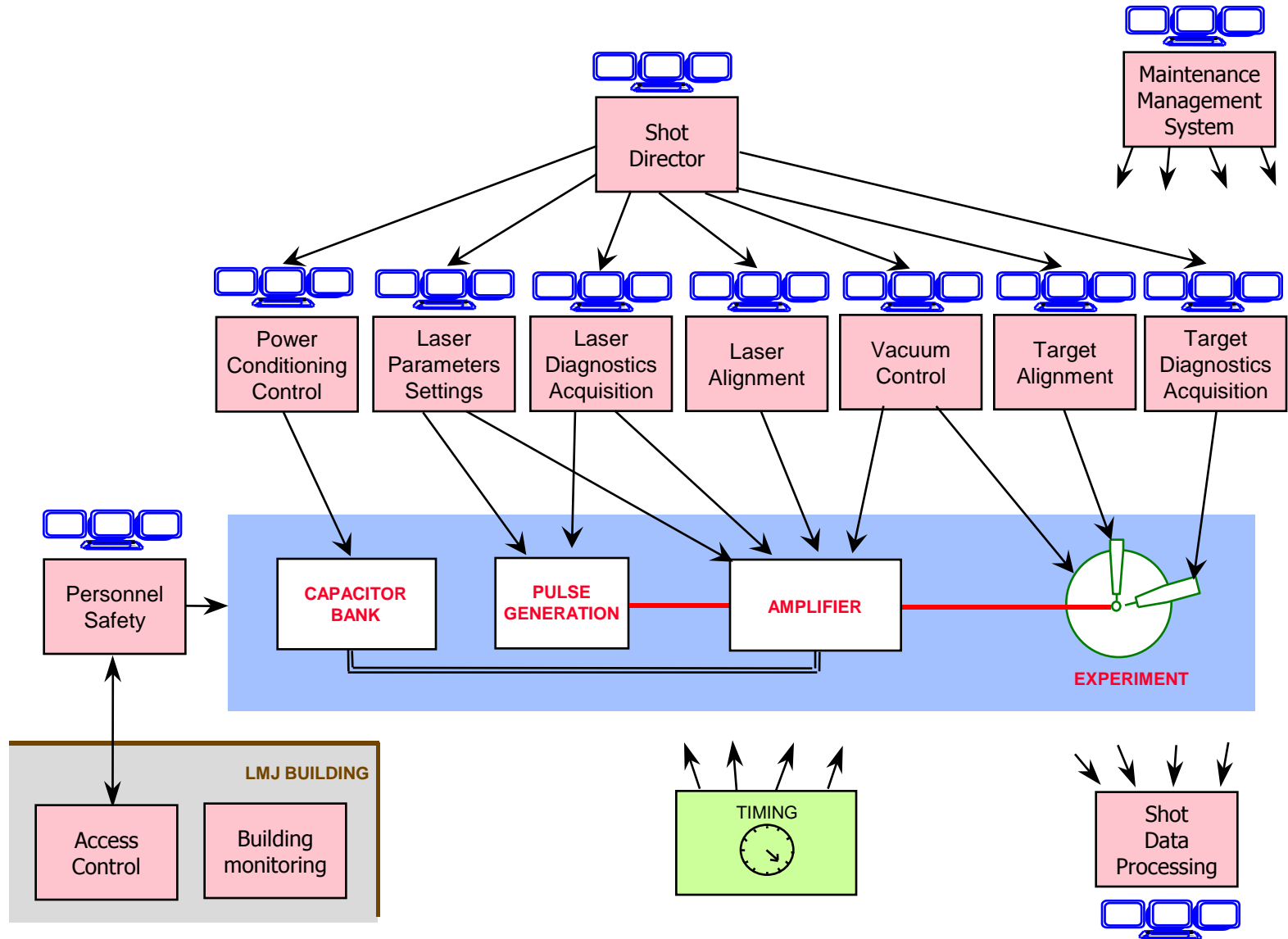# LIL facility = LMJ prototype

• LIL was commissioned in March 2002

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LMJ Control system functionalities

LMJ control system architecture

**Control Points
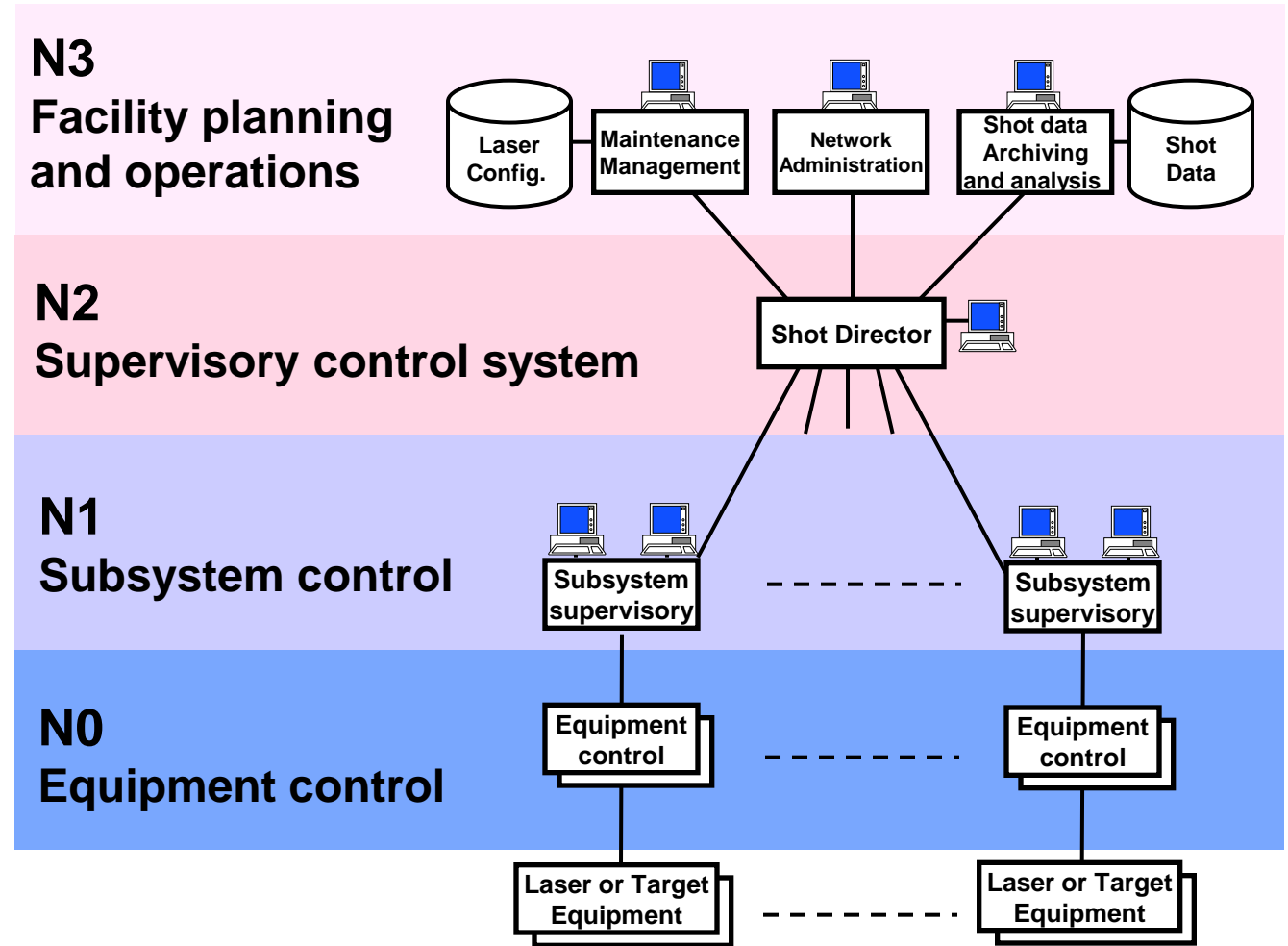500 000**

**Alarms
100 000**

**Processors
500**

**Shot data
~1 GB / shot
2 years on line**

**N3
Facility planning
and operations**

Laser Config.

Maintenance Management

Network Administration

Shot data Archiving and analysis

Shot Data

**N2
Supervisory control system**

Shot Director

**N1
Subsystem control**

Subsystem supervisory — — — — — — Subsystem supervisory

**N0
Equipment control**

Equipment control — — — — — — Equipment control

Laser or Target Equipment — — — — — — Laser or Target Equipment

LMJ industrial policy

N3
Facility planning and operations

N2
Supervisory control system

N1
Subsystem control

N0
CC Equipment

Equipment

High level Supervisory

Maintenance Management

Shot data archiving and analysis

Network Administration

Supervisory control system

Control Room

Powe Cond.
PAM
Timing
Align.
Laser High Vac.
PEPC
Laser Diag.
Target Chamb Equip.
Target Diag.
Bldg Util.
Pers. Safety
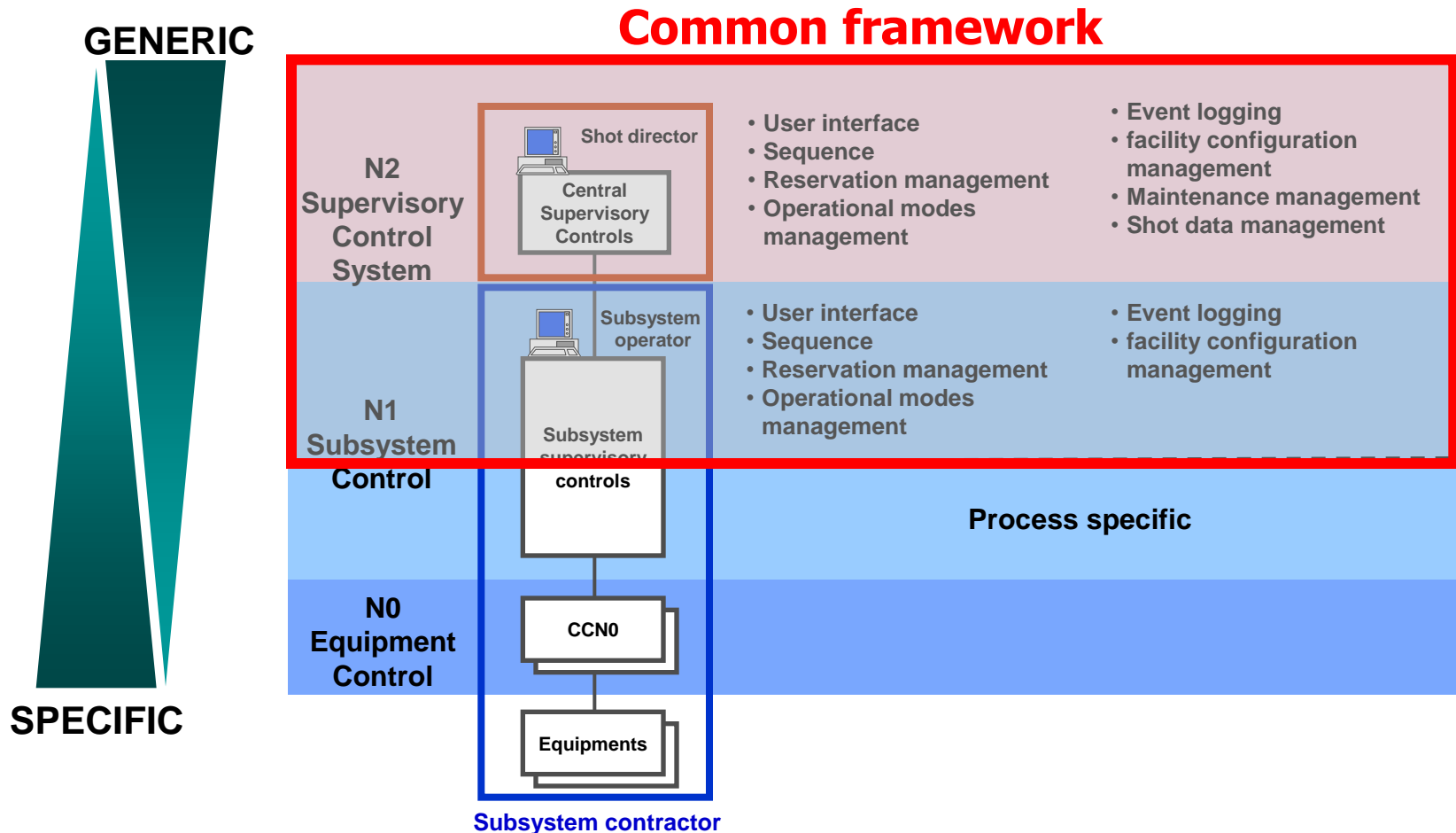
Adapt. Optics Amplifiers Freq. conv.
Laser low Vac.

General framework

During the N2-N3 conception phase we have identified common functional components with N1 level

Common framework
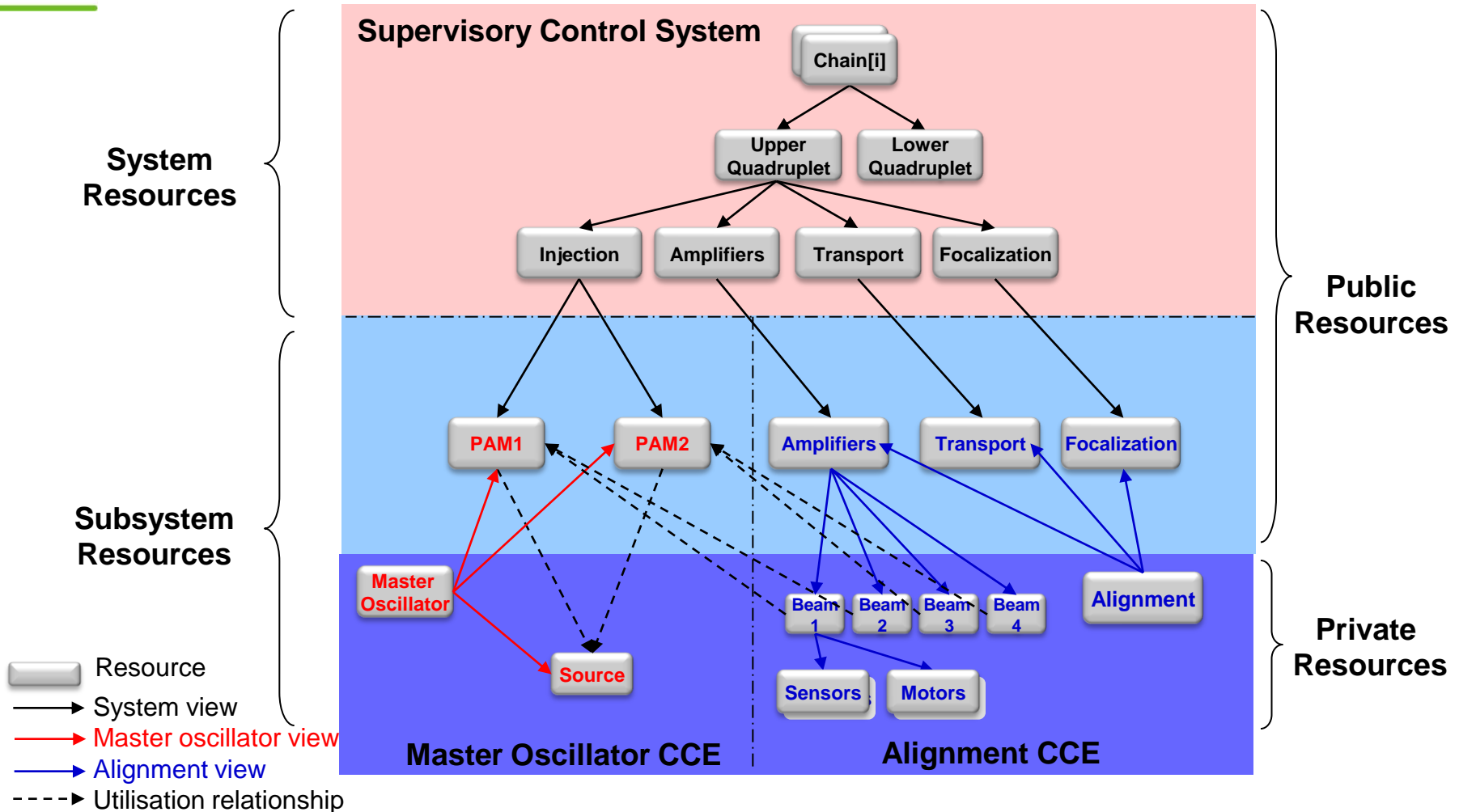
GENERIC

SPECIFIC

N2 Supervisory Control System

N1 Subsystem Control

N0 Equipment Control

Shot director

Central Supervisory Controls

Subsystem operator

Subsystem supervisory controls

CCN0

Equipments

• User interface
• Sequence
• Reservation management
• Operational modes management

• Event logging
• facility configuration management
• Maintenance management
• Shot data management

• User interface
• Sequence
• Reservation management
• Operational modes management

• Event logging
• facility configuration management

Process specific

Subsystem contractor

General framework data model
Resources

Resource

Name

Attributes
  Reservation sate
  …

Methods
  Reserve()
  Release()

Functions

Name

Attributes
  Reservation state
  …

Methods
  Execute()
  Reserve()
  Release()

Control Points

14 °C

10 kV

Name

Attributes
  Value

Methods
  Read()
  Subscribe()

Operational Modes State machine

Stopped

Standby

Running

Alarms

Nom

Attributes
  On/Off

Methods
  Subscribe()
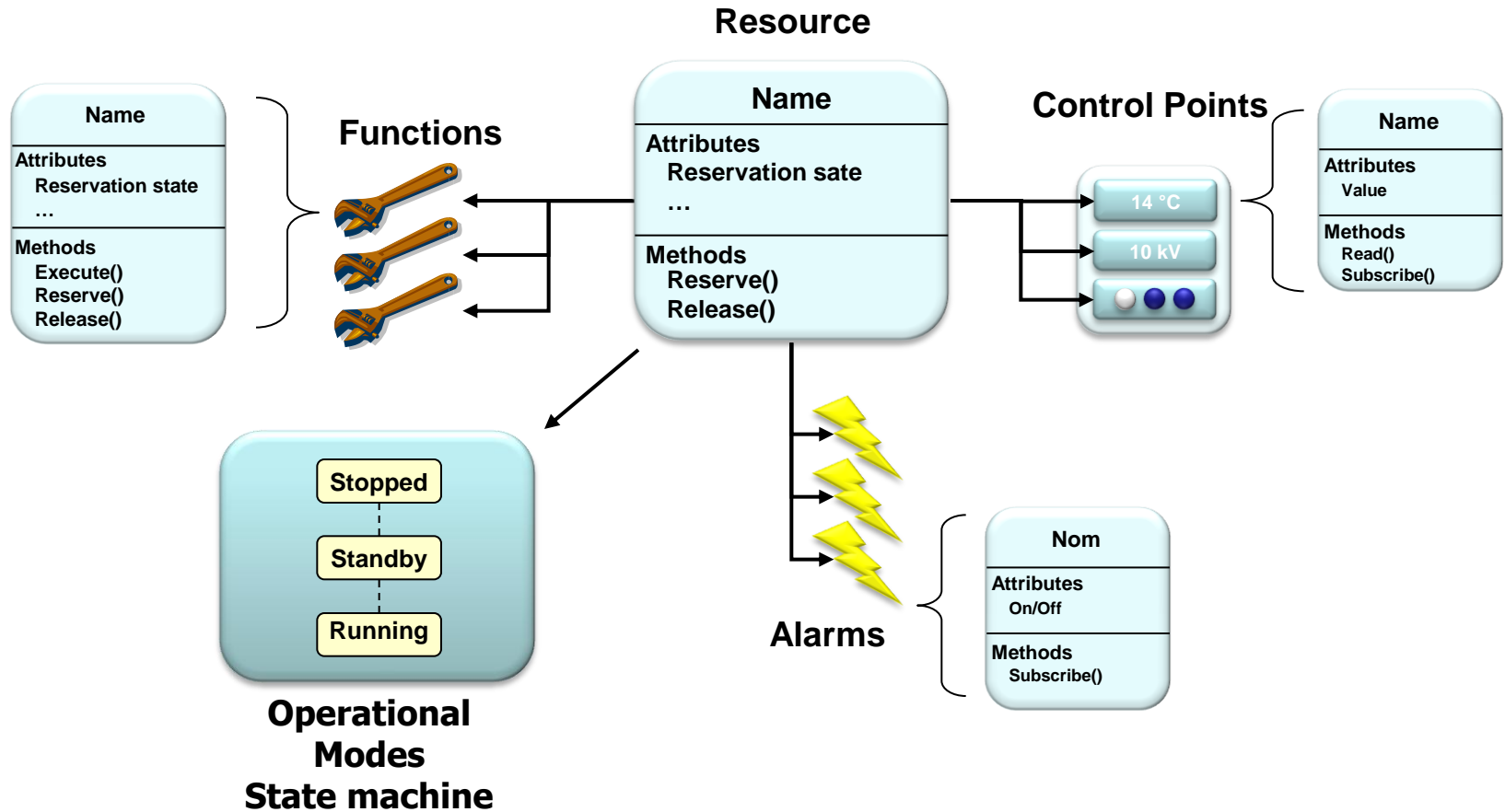
General framework data model
Functional trees

General framework common components
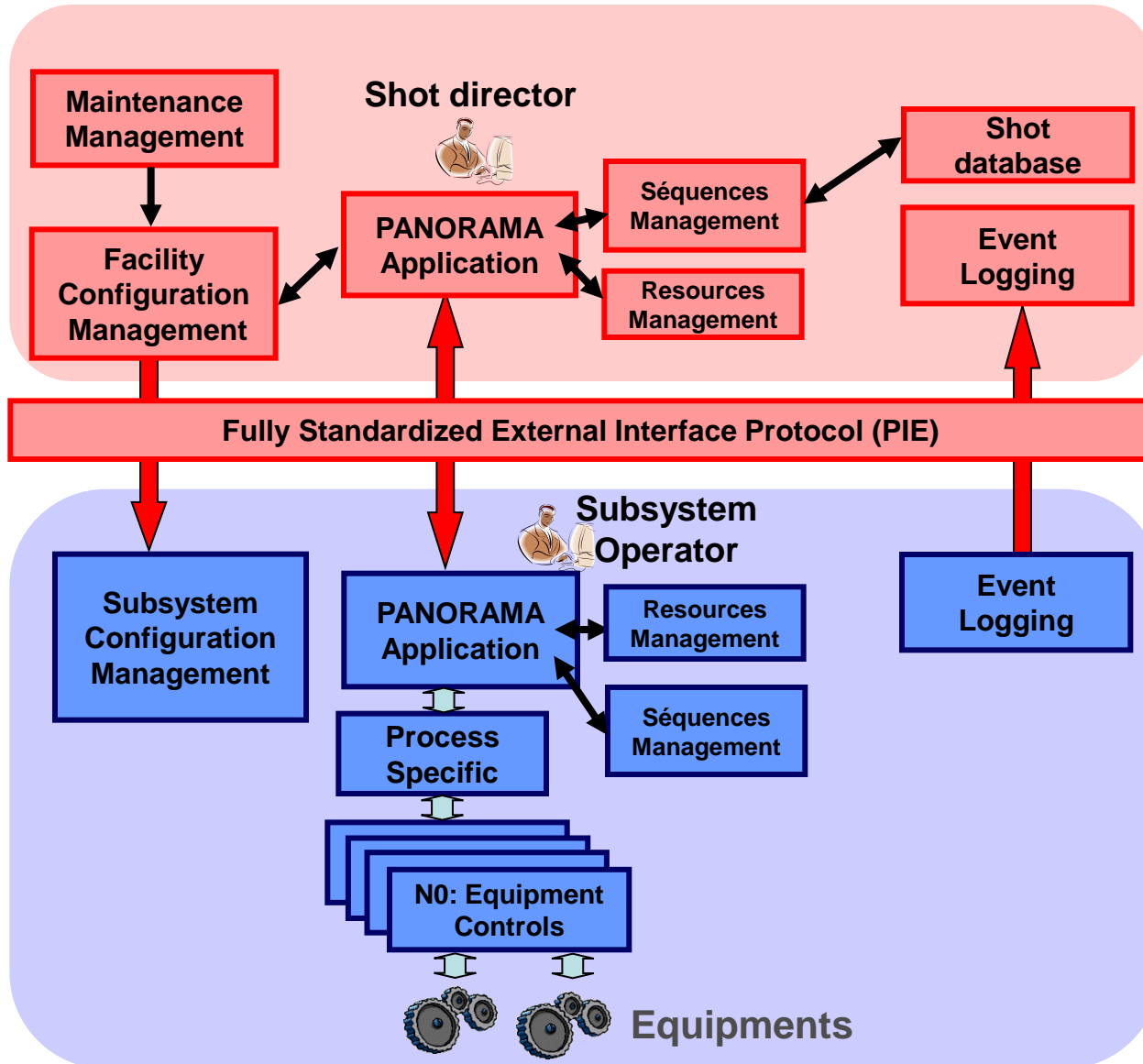
General framework common components
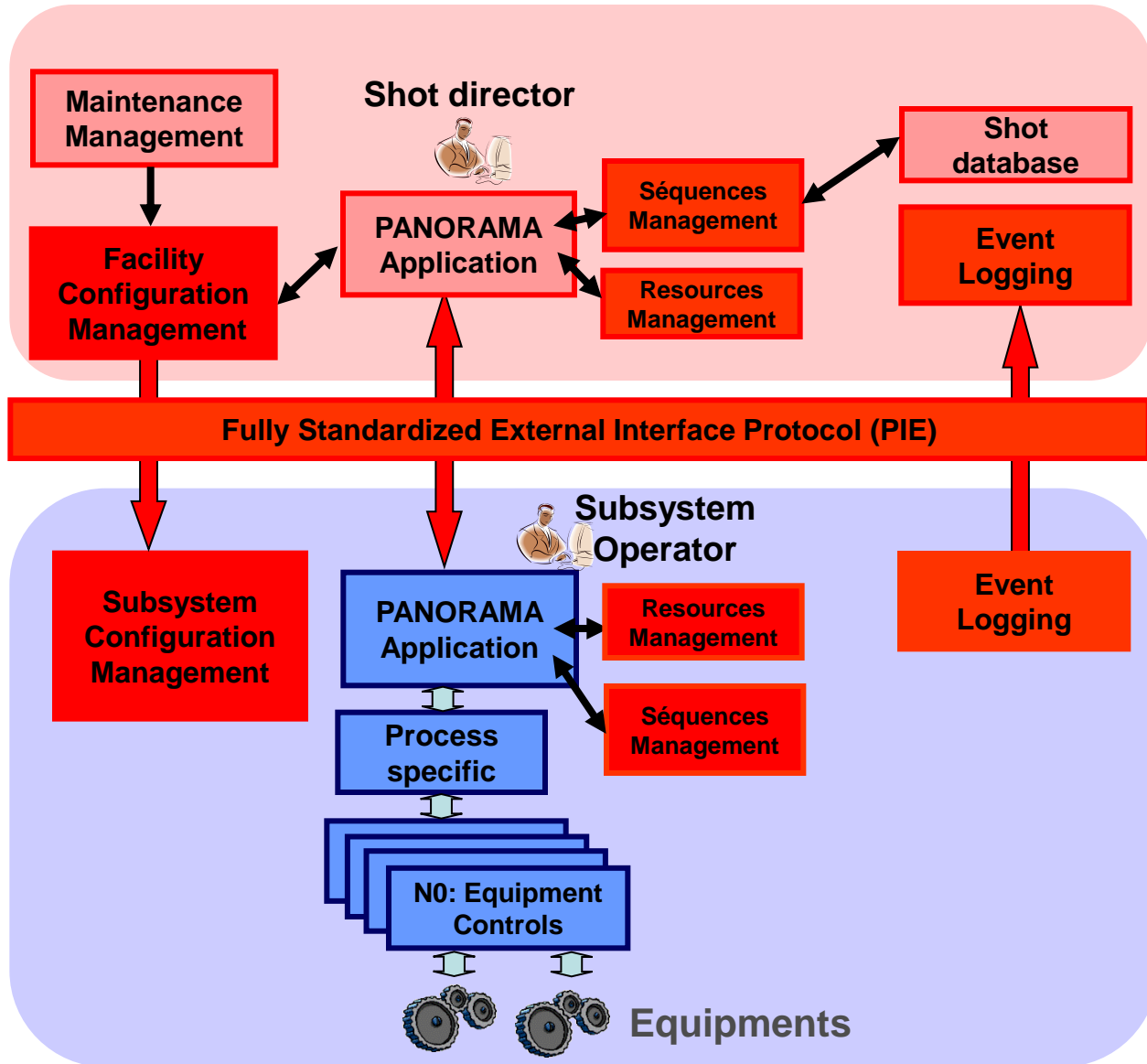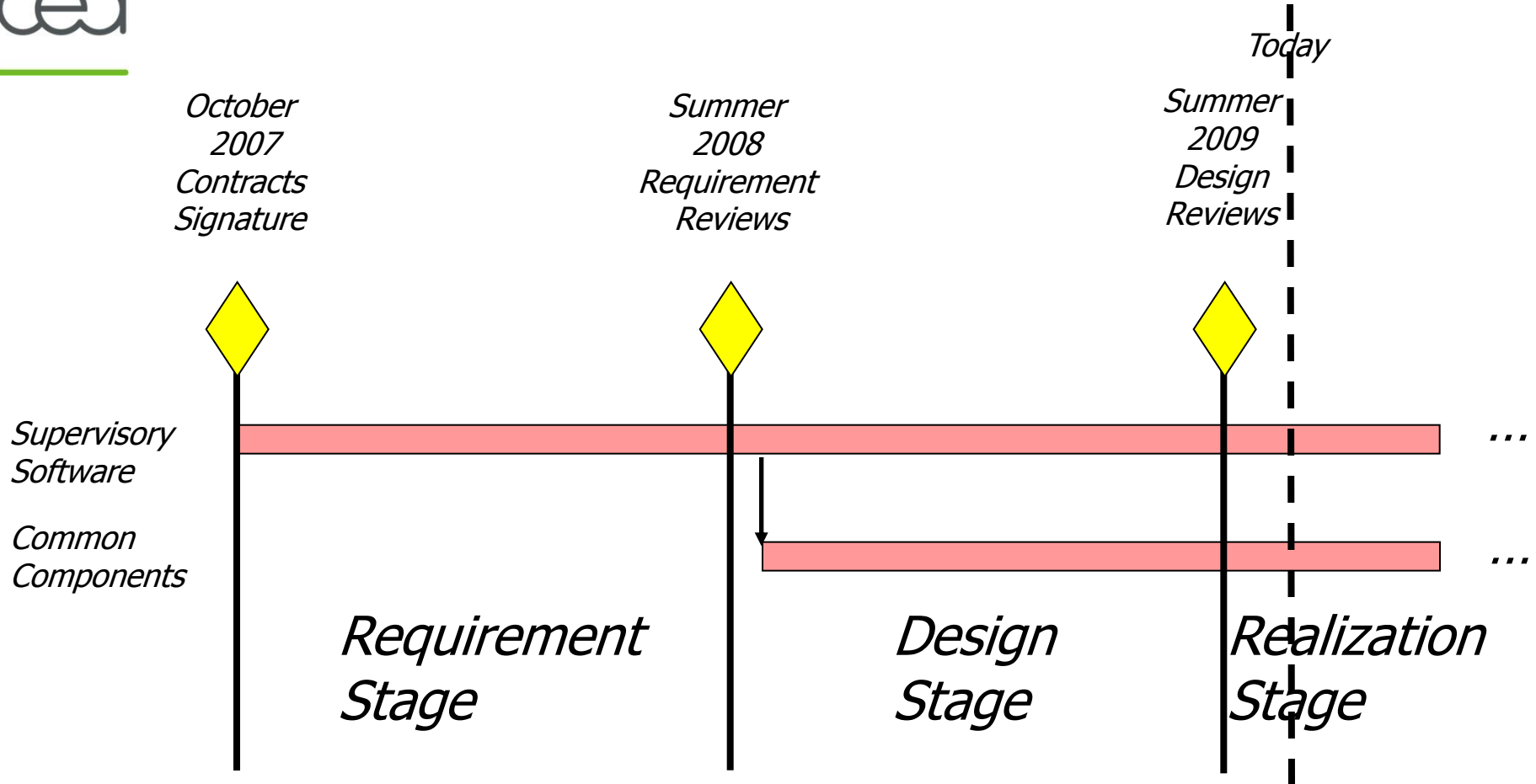
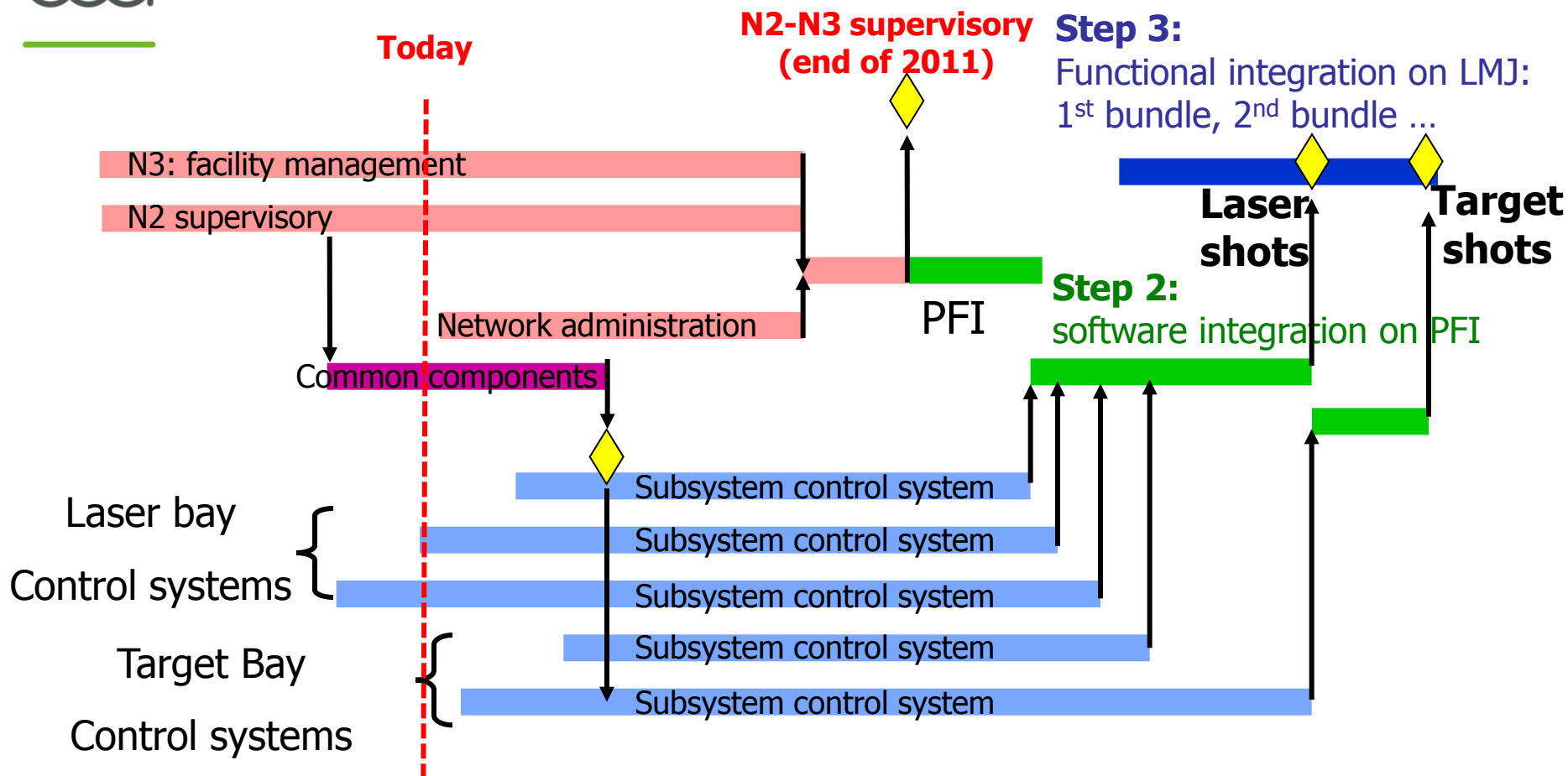# Supervisory software technical choices

- **SCADA: Panorama E^2 from CODRA**

- **Specific developments: .Net**

- **Database: Oracle 10g, N-Hybernate**

- **Shot data storage: XML and HDF5**

- **CMMS: D7i product from Datastream**

Supervisory software status

LMJ control system road map

Any questions?