DE LA RECHERCHE À L'INDUSTRIE

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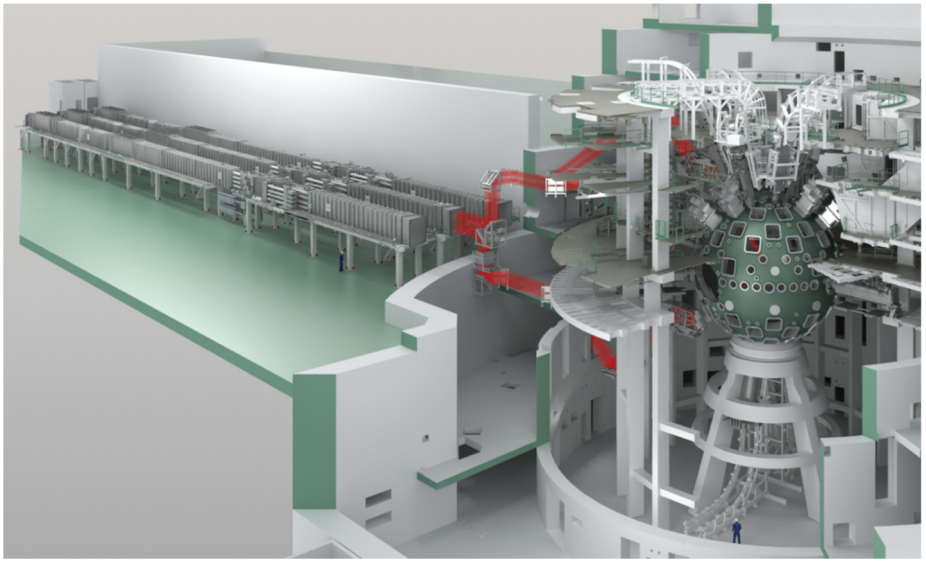
Laser Megajoule Facility
Control system status report



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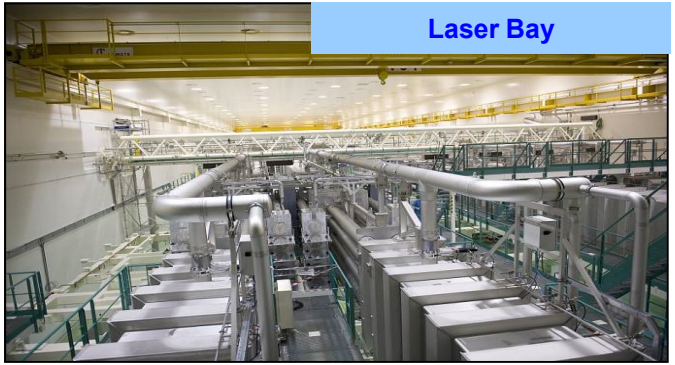
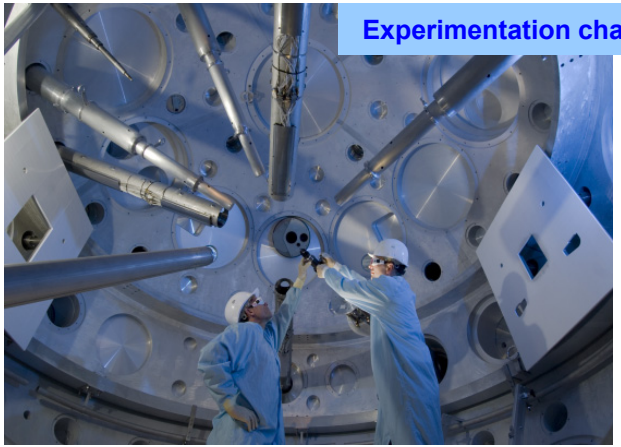
Command Control Architecture

- Presentation of the LMJ facility
- Command Control Architecture
- Command Control Integration
- Command Control Milestones

LMJ facility overview

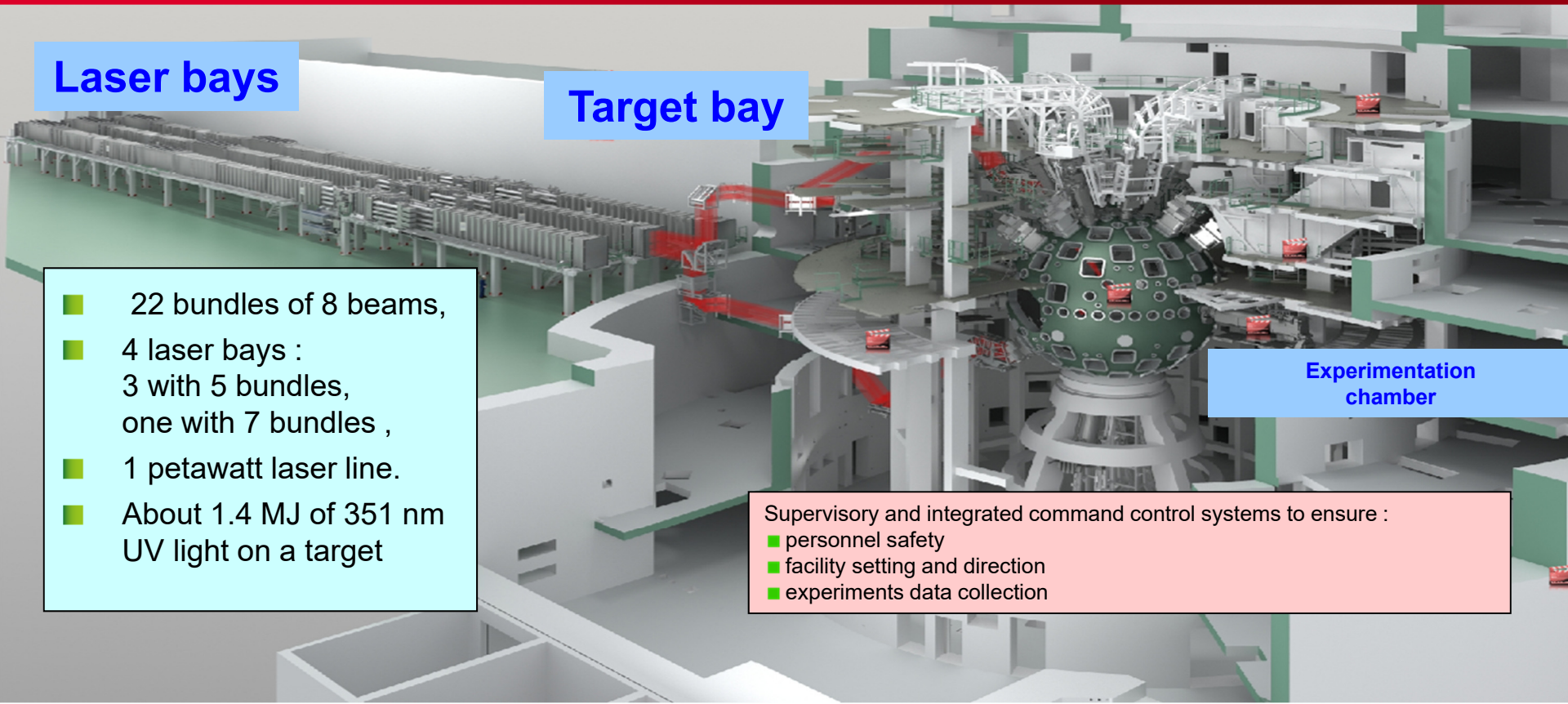


Laser Bay



Experimentation chamber

LMJ facility overview



- 22 bundles of 8 beams,
- 4 laser bays :
  3 with 5 bundles,
  one with 7 bundles ,
- 1 petawatt laser line.
- About 1.4 MJ of 351 nm UV light on a target

Supervisory and integrated command control systems to ensure :
- personnel safety
- facility setting and direction
- experiments data collection

Command Control Architecture

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Hardware architecture

The LMJ Command Control System is commissioned on two independent platforms

- One for Command Control Integration (PFS & PFI)
- An other for Laser operations and experiments (PI & PCI)

Each of these platforms consists of

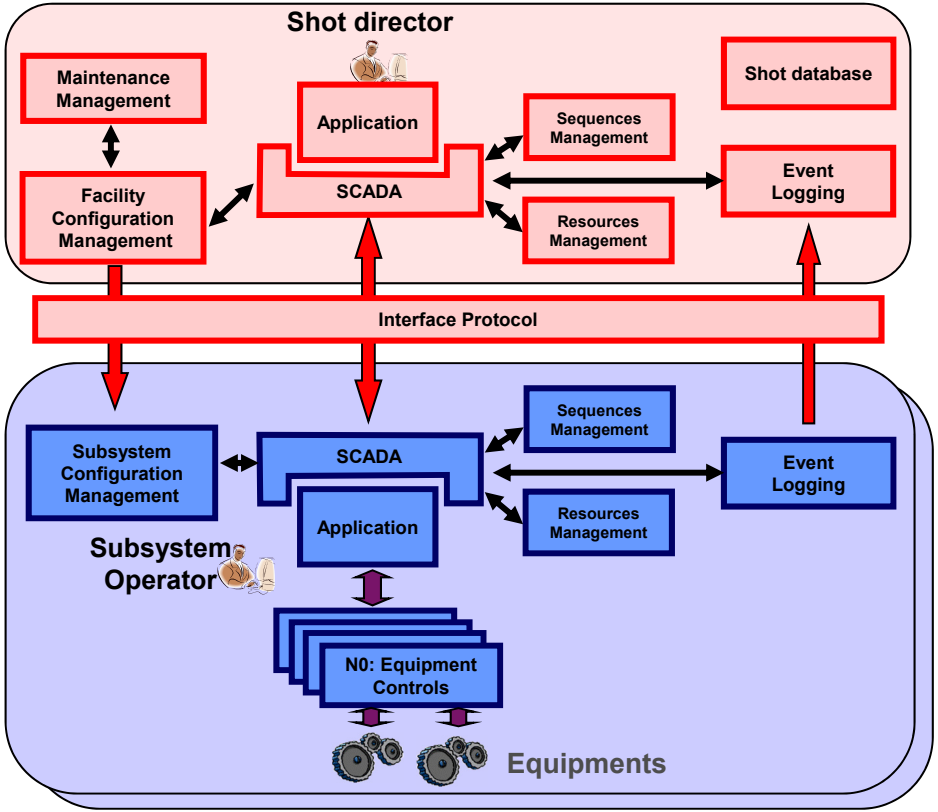
two virtualization infrastructures composed of:

- 2 DataCore servers, each one managing 20 To of disks,
- 11 ESX Dell PowerEdge R815 servers, with 4x12 cores and 256 GB of RAM
- Dimensioned to execute more than an hundred of virtual machines
- Independent contexts are configured using Virtual Routing and Forwarding technologies (VRF) to allow several test or operational contexts to be operated at the same time

Software architecture

N2-N3 Software

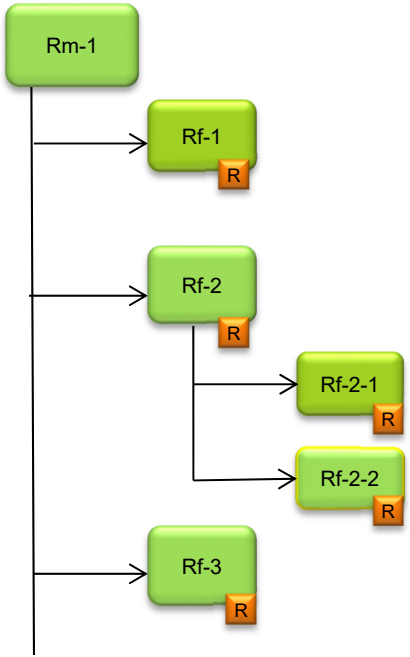
N0-N1 Software

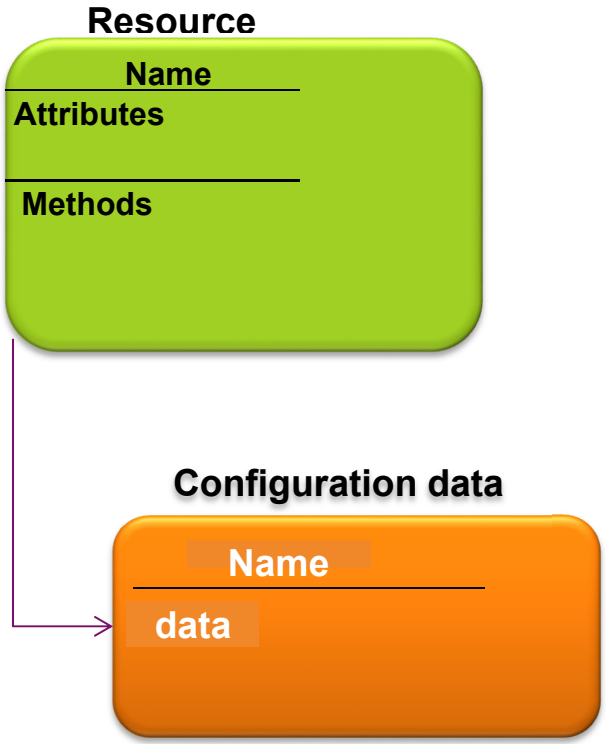


X12

Power Conditioning
PEPC
Timing
Target Diagnostics
Target Chamber Equipments
Cryogenic Equipments
Personal Safety
Laser Diagnostics
MO & PAM
Alignment
Vacuum Control
Utilities

Framework data model





Rm-1 Resource

R Configuration data

relationship

Presentation of the LMJ facility

Command Control Architecture

Command Control Integration

Command Control Milestones

Integration Strategy

The strategy is a 3-step process:

Who ?

Where ?

STEP 1 : Factory acceptance tests

- Acceptance tests for equipment
- Acceptance tests for control system

Contractors

In Factory

STEP 2 : Command Control Integration with equipment simulators

- Global tests for the supervisory system
- Global tests for each control subsystems
- Tests of the whole control system

Subsystem By Subsystem

CEA

Subsystem By Subsystem

On PFI

STEP 3 : Integration with real equipment

- Industrial tests for each subsystem
- System tests of the whole process
- Bundle delivery for validation from operations control room

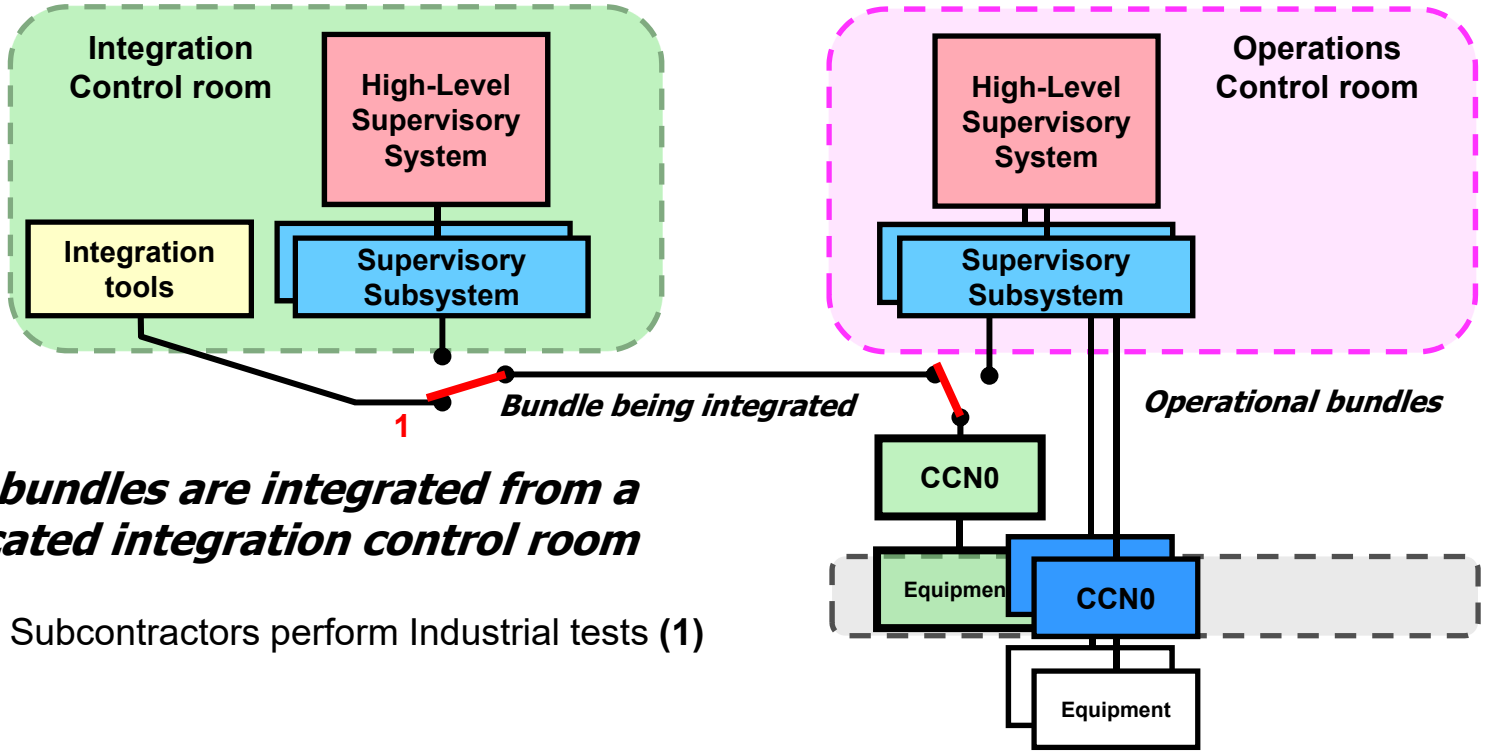
Contractors

CEA

Bundle By Bundle

In LMJ

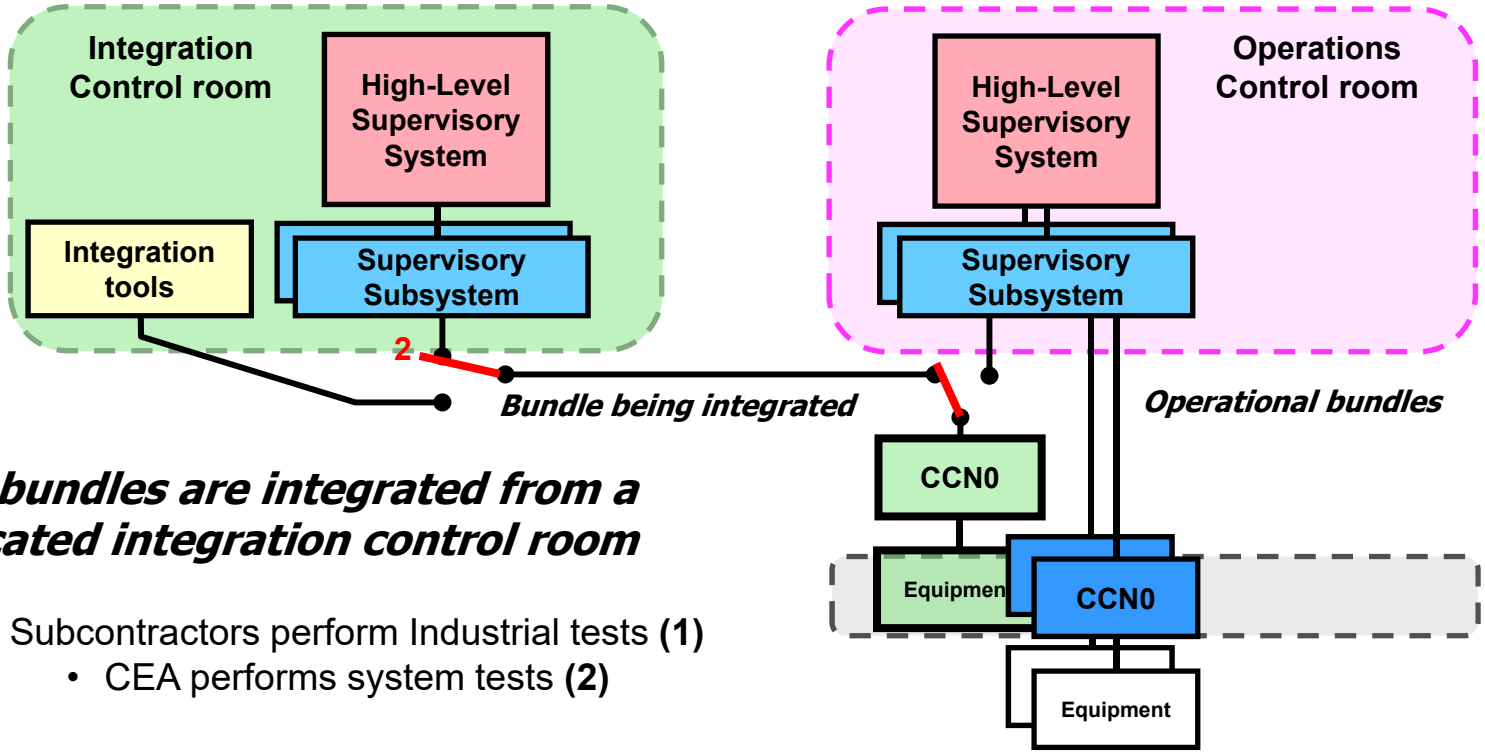
Integration with real equipments in the LMJ building



New bundles are integrated from a dedicated integration control room

- Subcontractors perform Industrial tests **(1)**

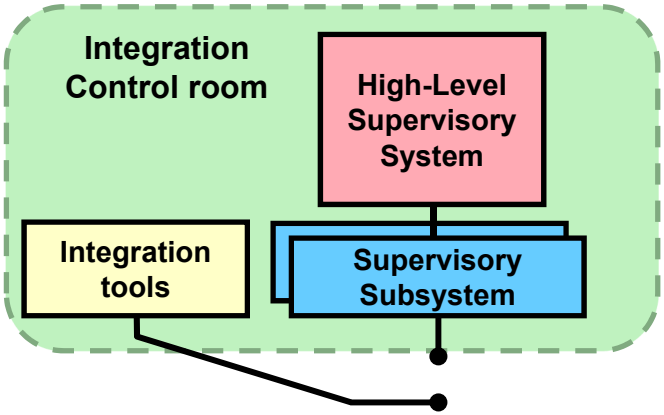
Integration with real equipments in the LMJ building

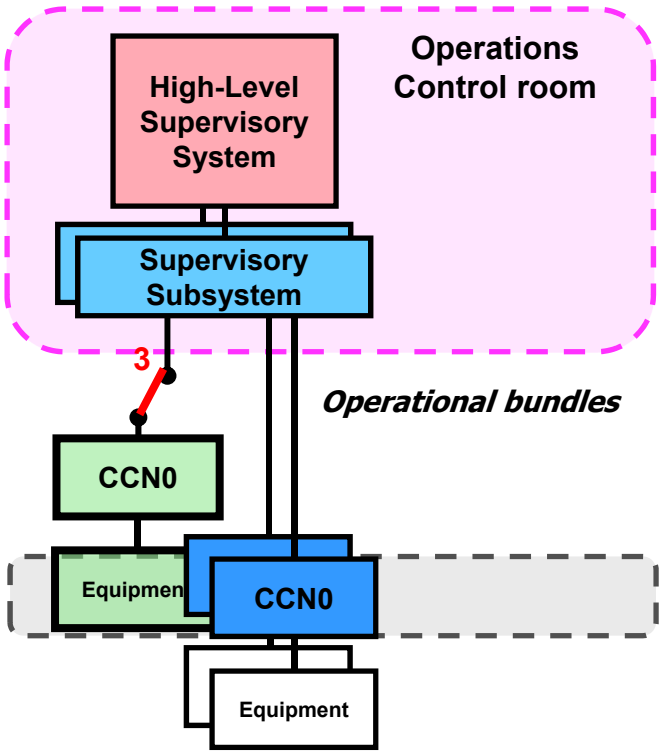


New bundles are integrated from a dedicated integration control room

- Subcontractors perform Industrial tests **(1)**
  - CEA performs system tests **(2)**

Integration with real equipments in the LMJ building

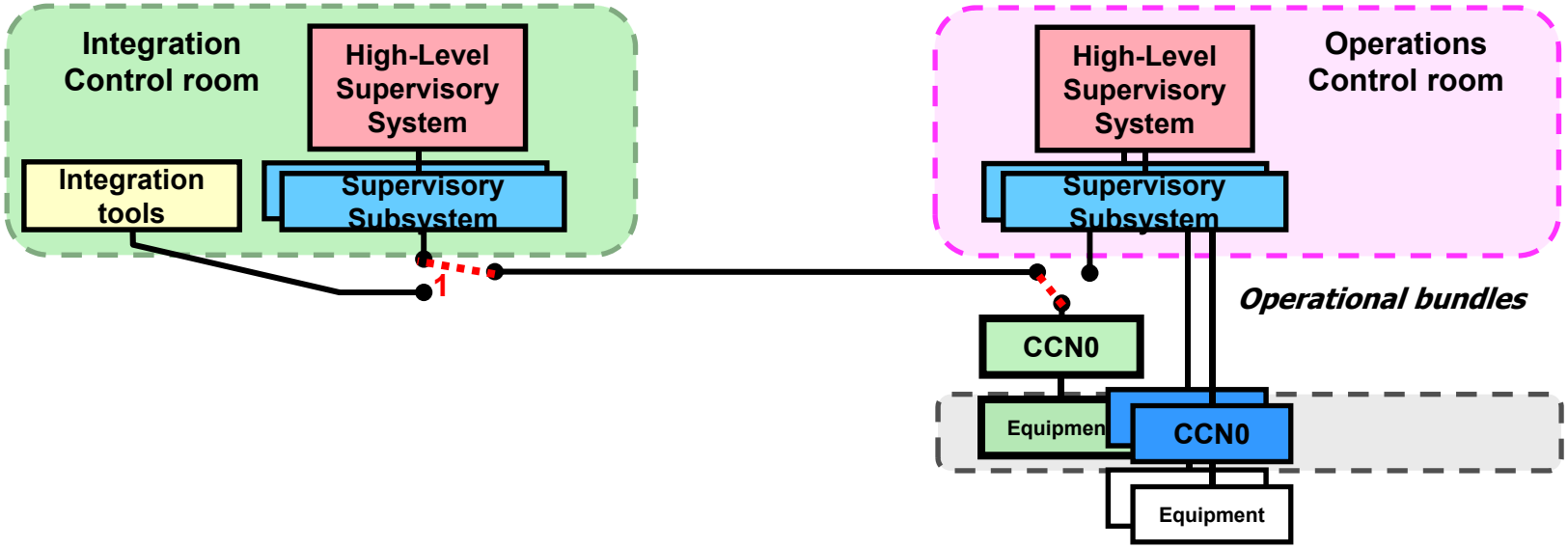




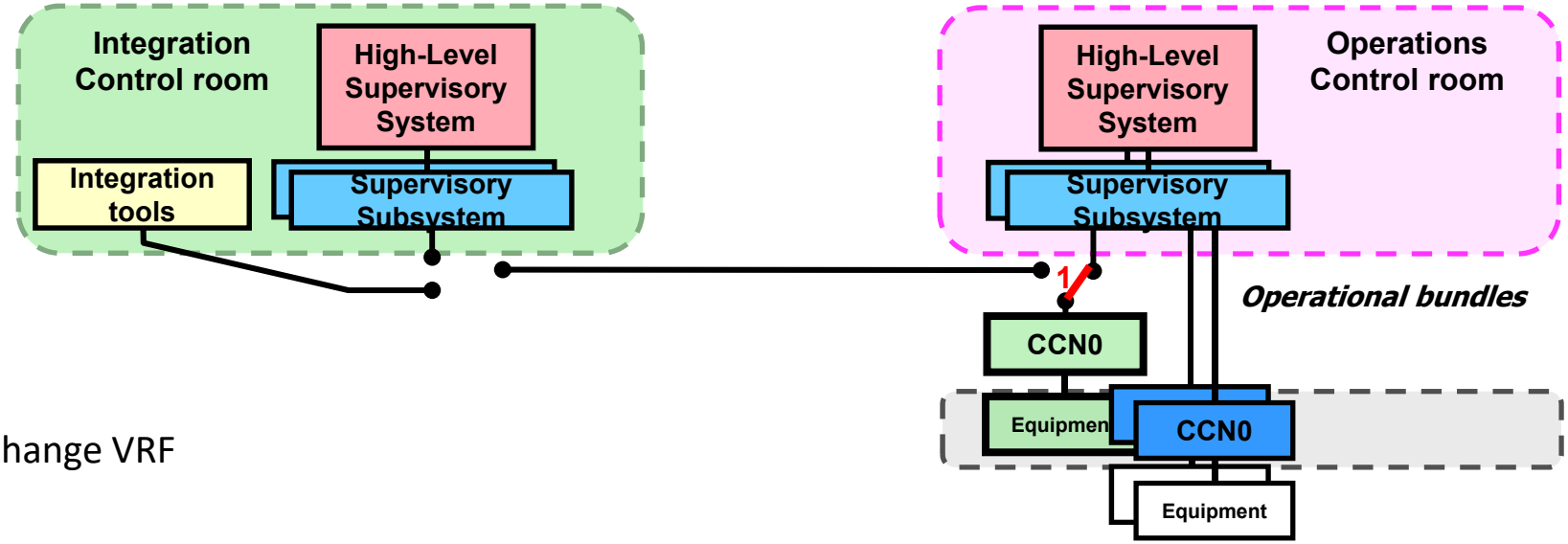
New bundles are integrated from a dedicated integration control room

- Subcontractors perform Industrial tests **(1)**
  - CEA performs system tests **(2)**
- And commissions from operations control room **(3)**

Commissioning bundle

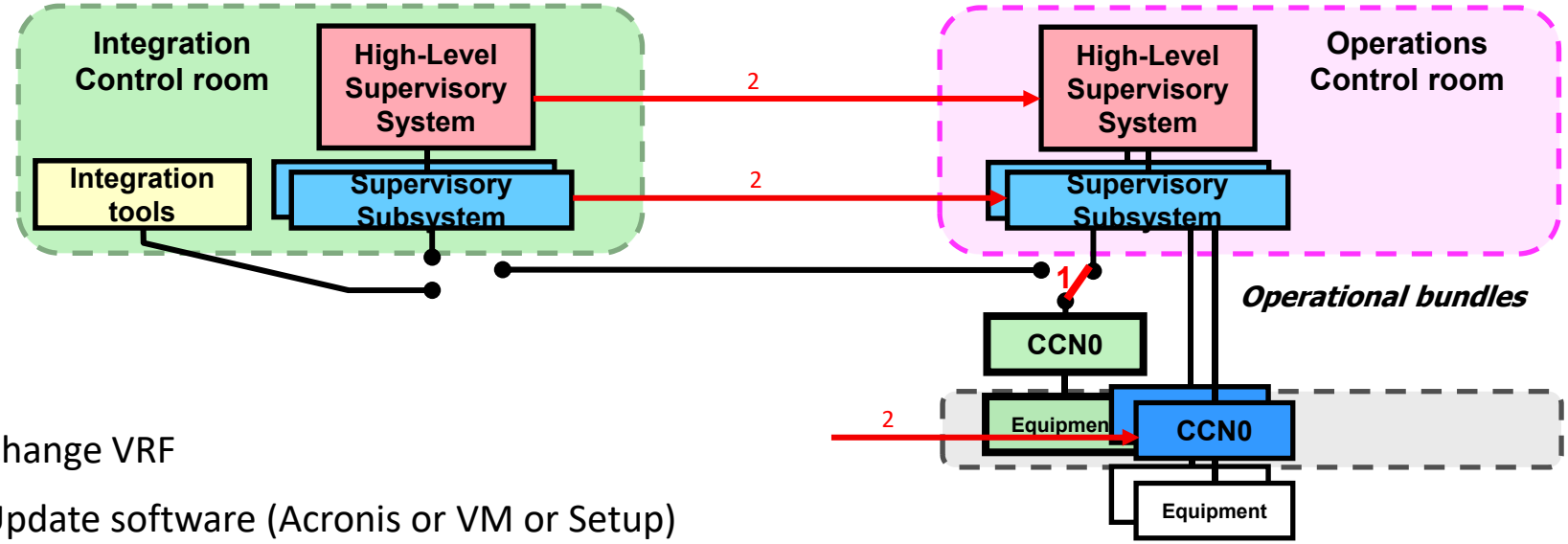


Commissioning bundle



1: Change VRF

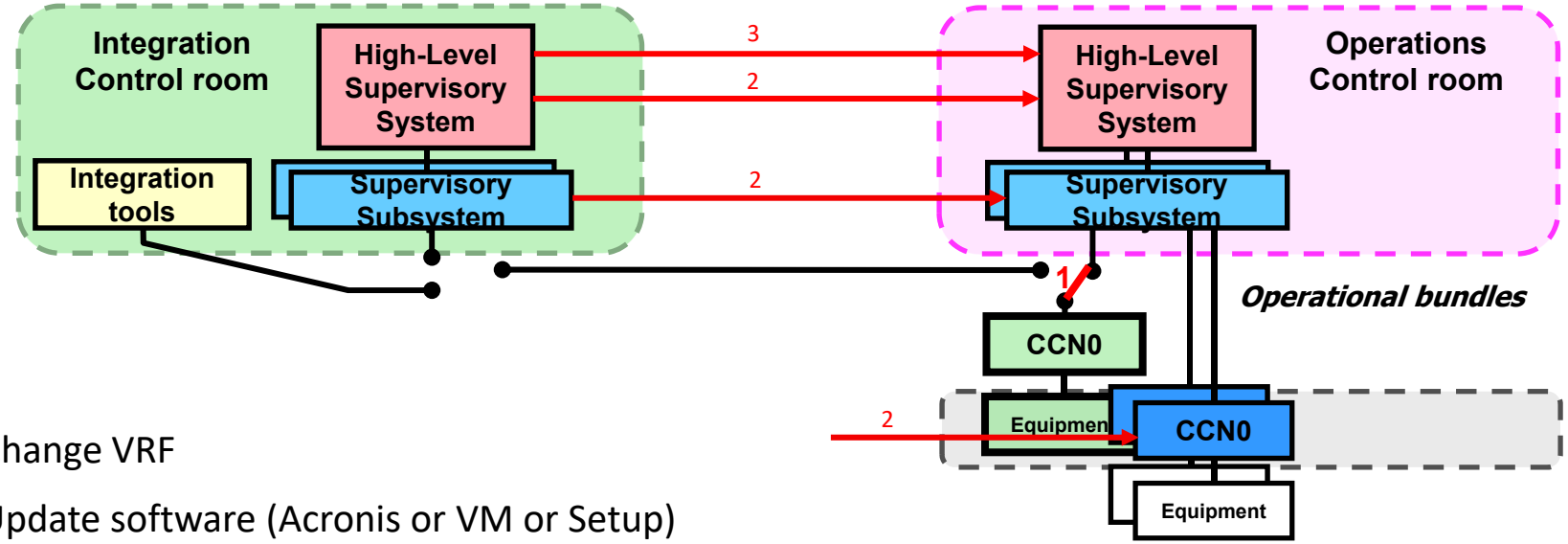
Commissioning bundle



1: Change VRF

2: Update software (Acronis or VM or Setup)

Commissioning bundle



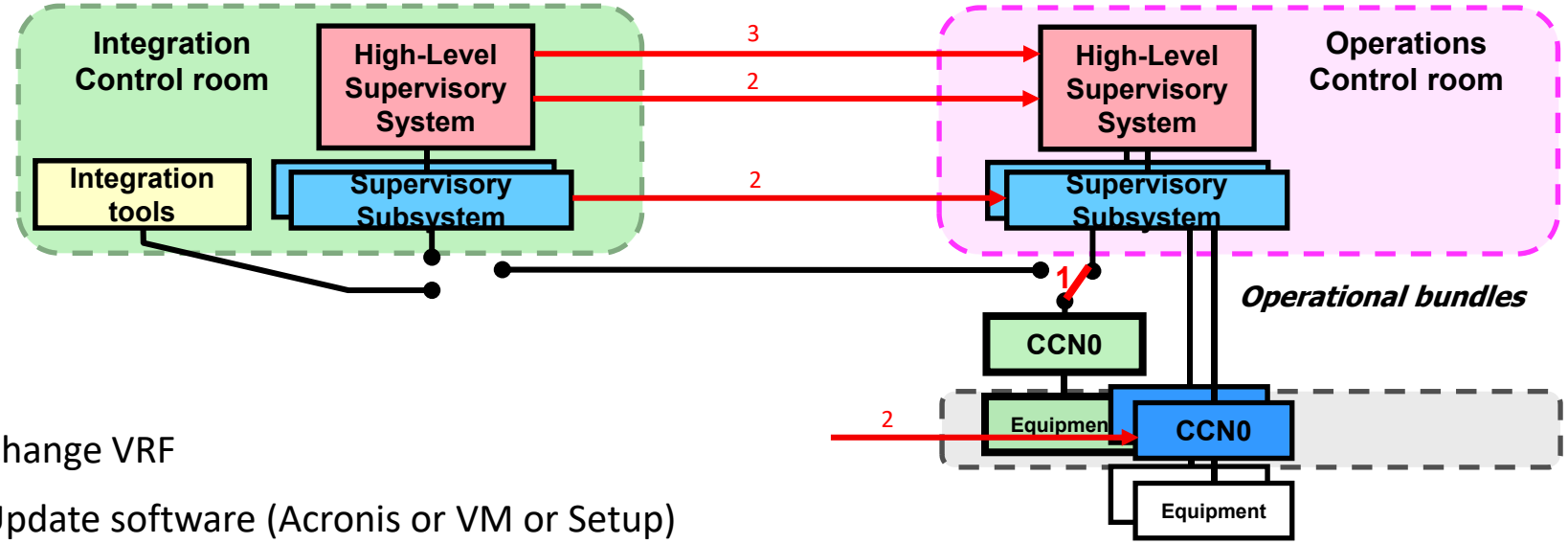
1: Change VRF

2: Update software (Acronis or VM or Setup)

3: Update framework data

- ✓ Update framework data of operational bundles
- ✓ Export – Import framework data of commissioning bundle

Commissioning bundle



1: Change VRF

2: Update software (Acronis or VM or Setup)

3: Update framework data

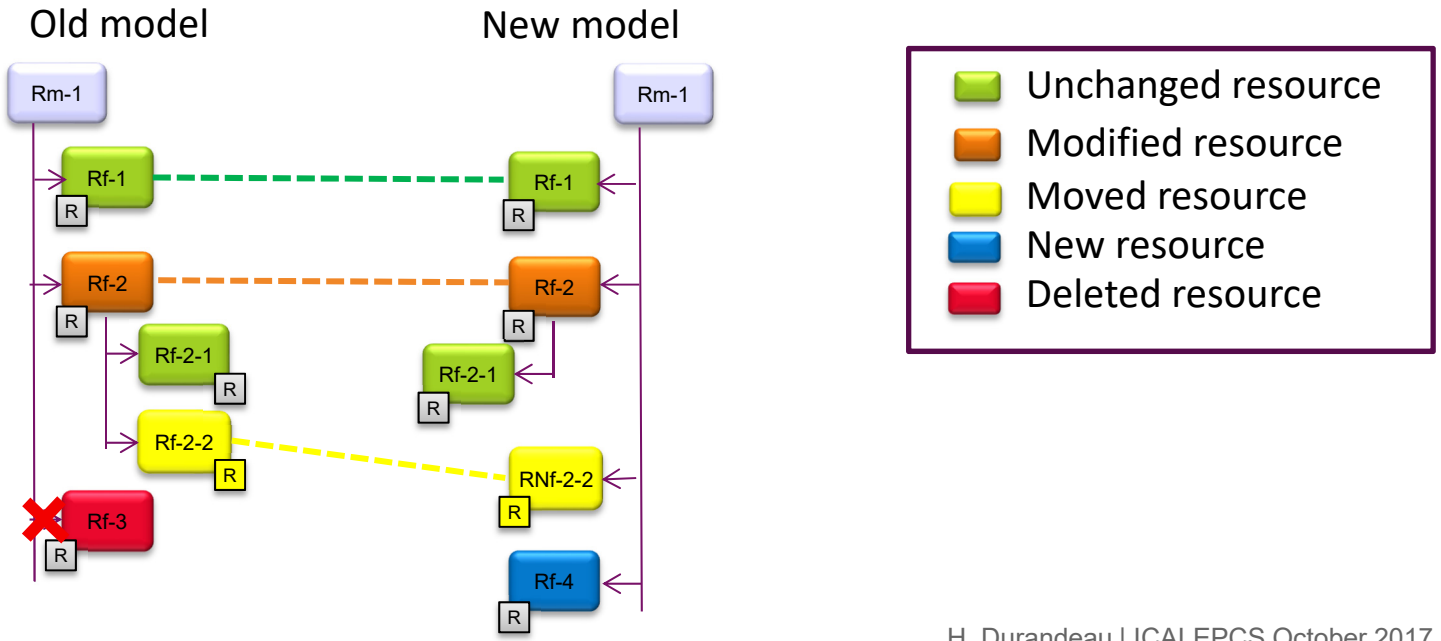
- ✓ Update framework data of operational bundles
- ✓ Export – Import framework data of commissioning bundle

4: Performs system tests

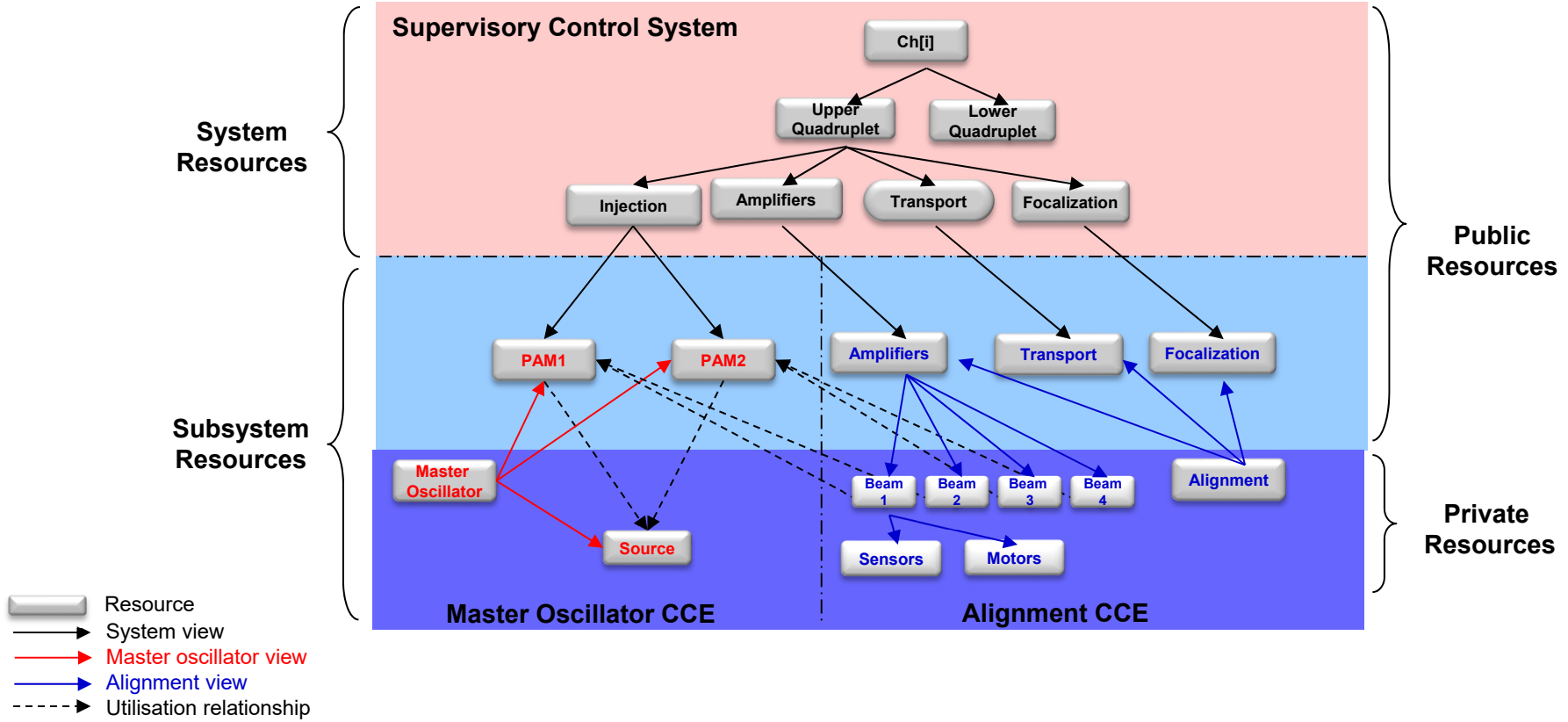
Update the framework data

When updating Supervisory Subsystem we can have to change the framework data model.

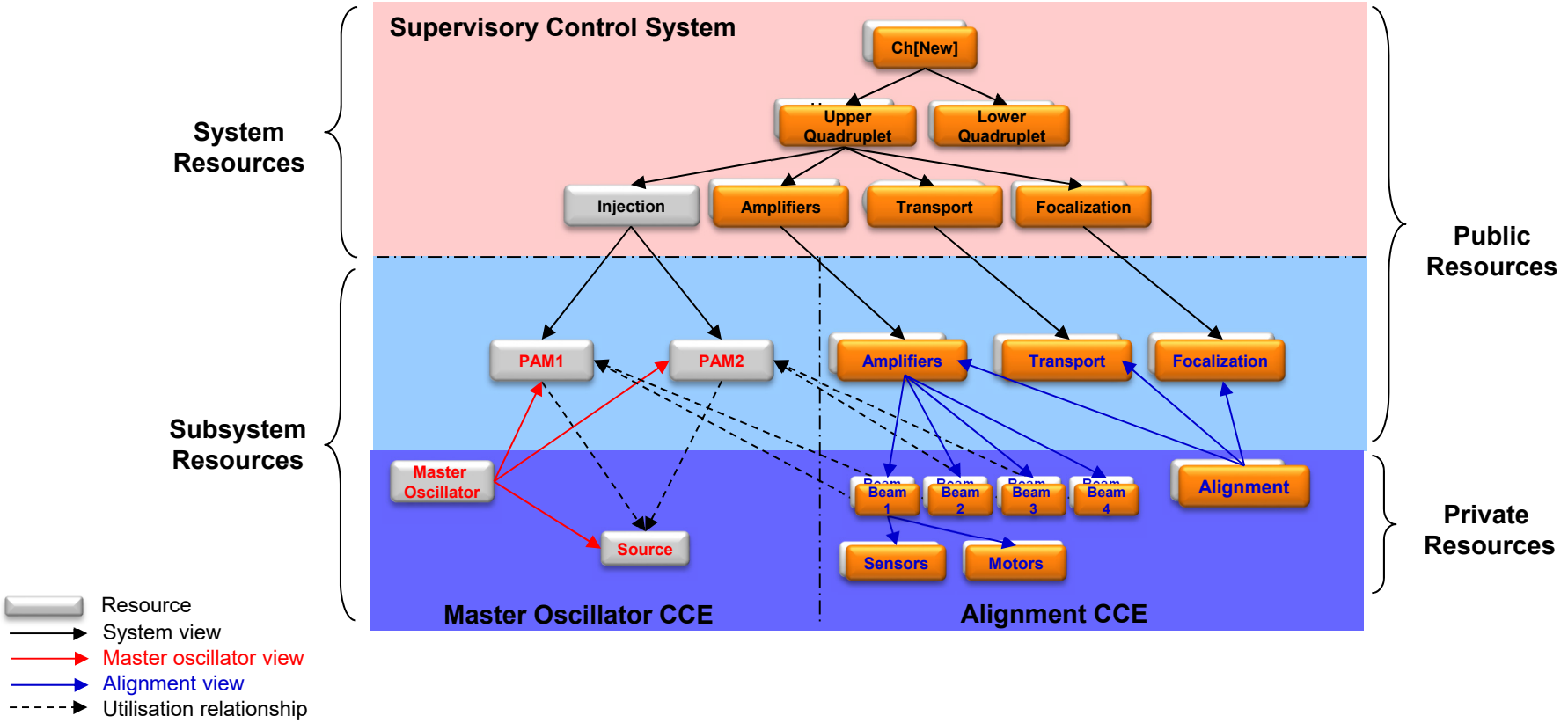
We have to update operational bundles into the new model with the same data.



Framework data of commissioning bundles



Framework data of commissioning bundles



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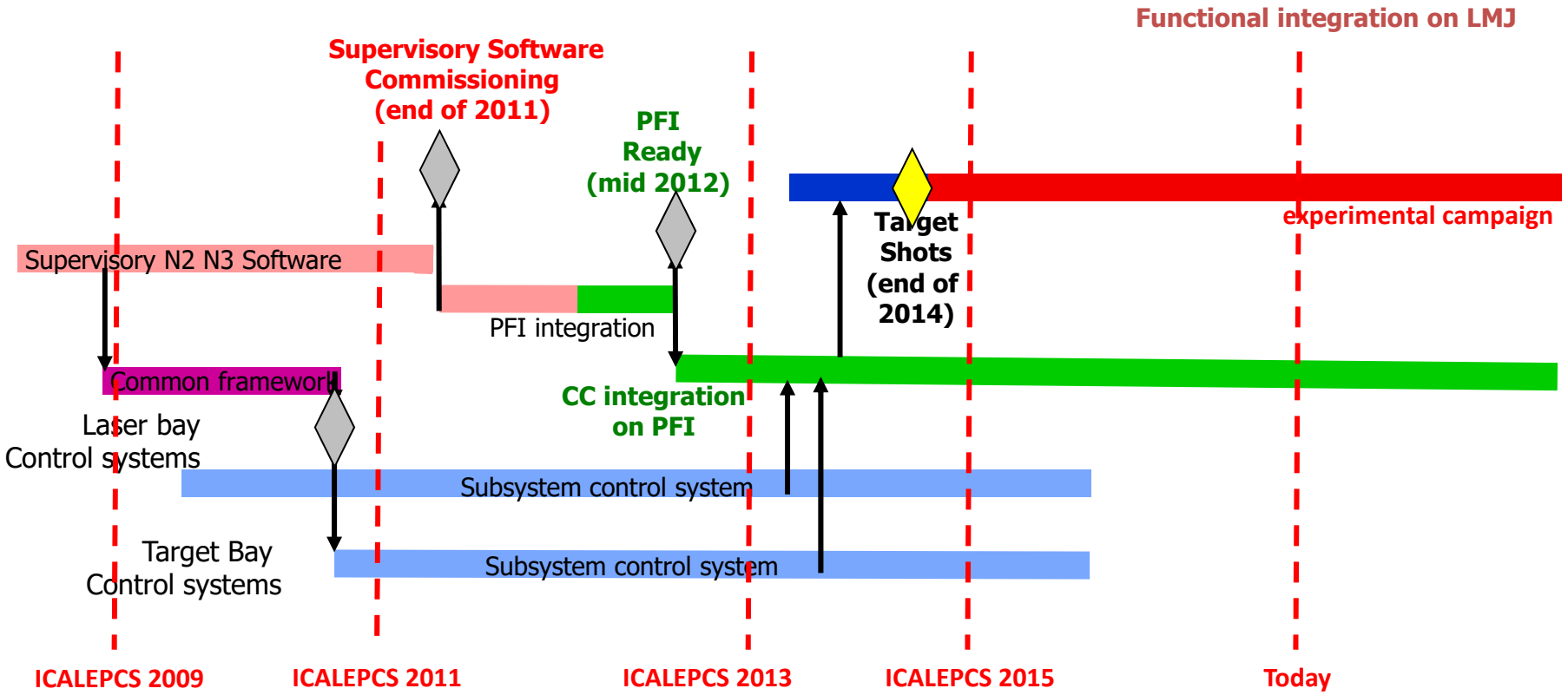
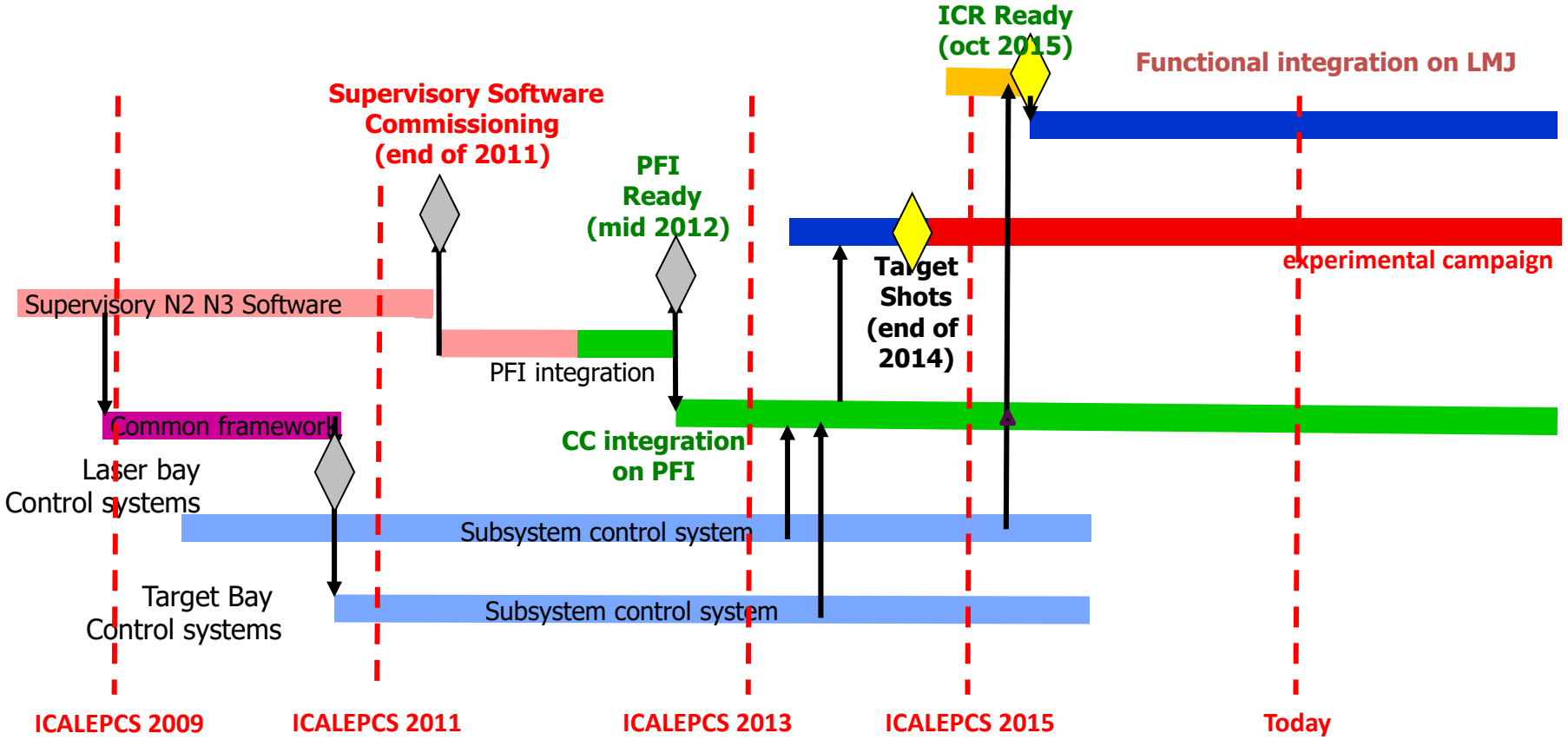
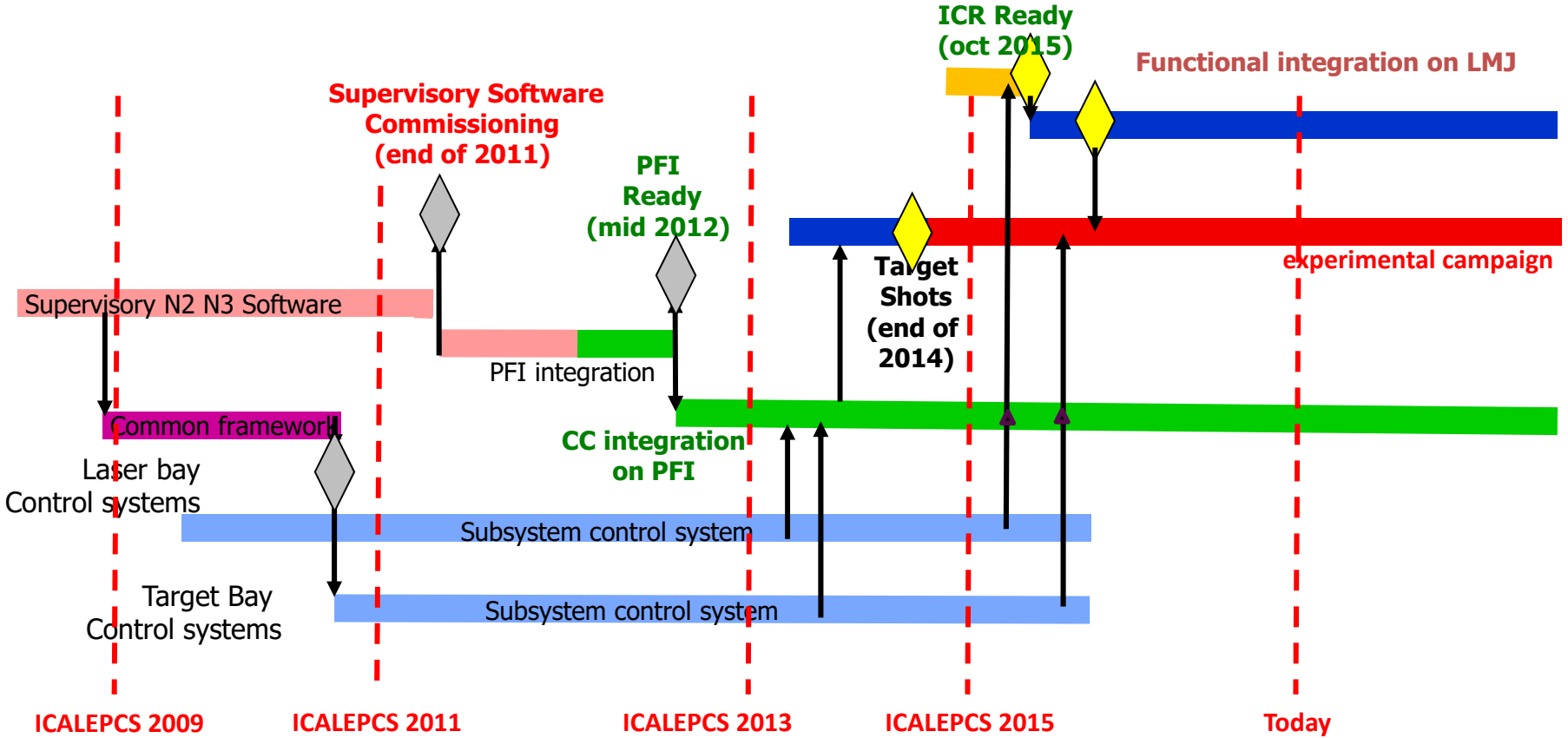
Control system milestones



Control system milestones



Control system milestones



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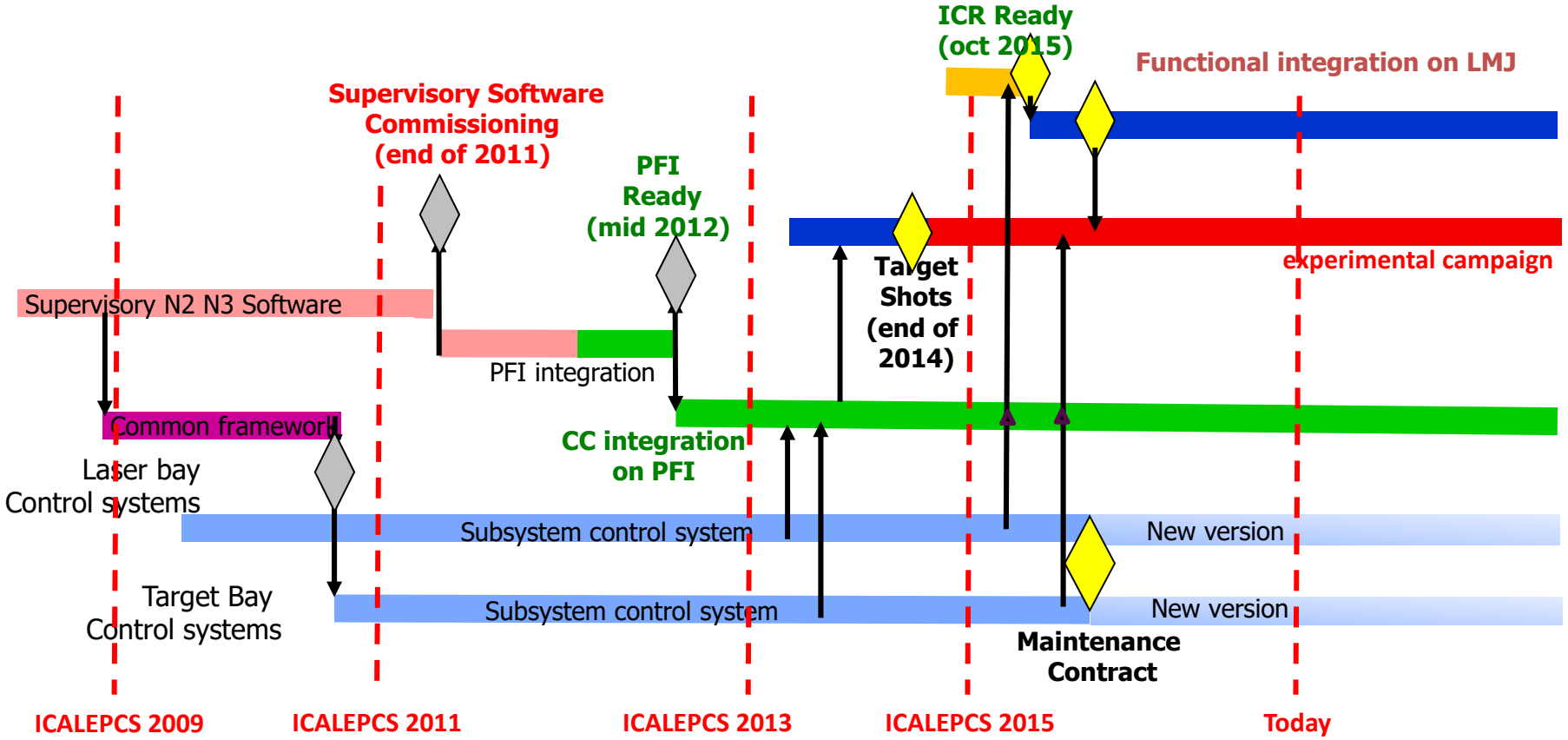

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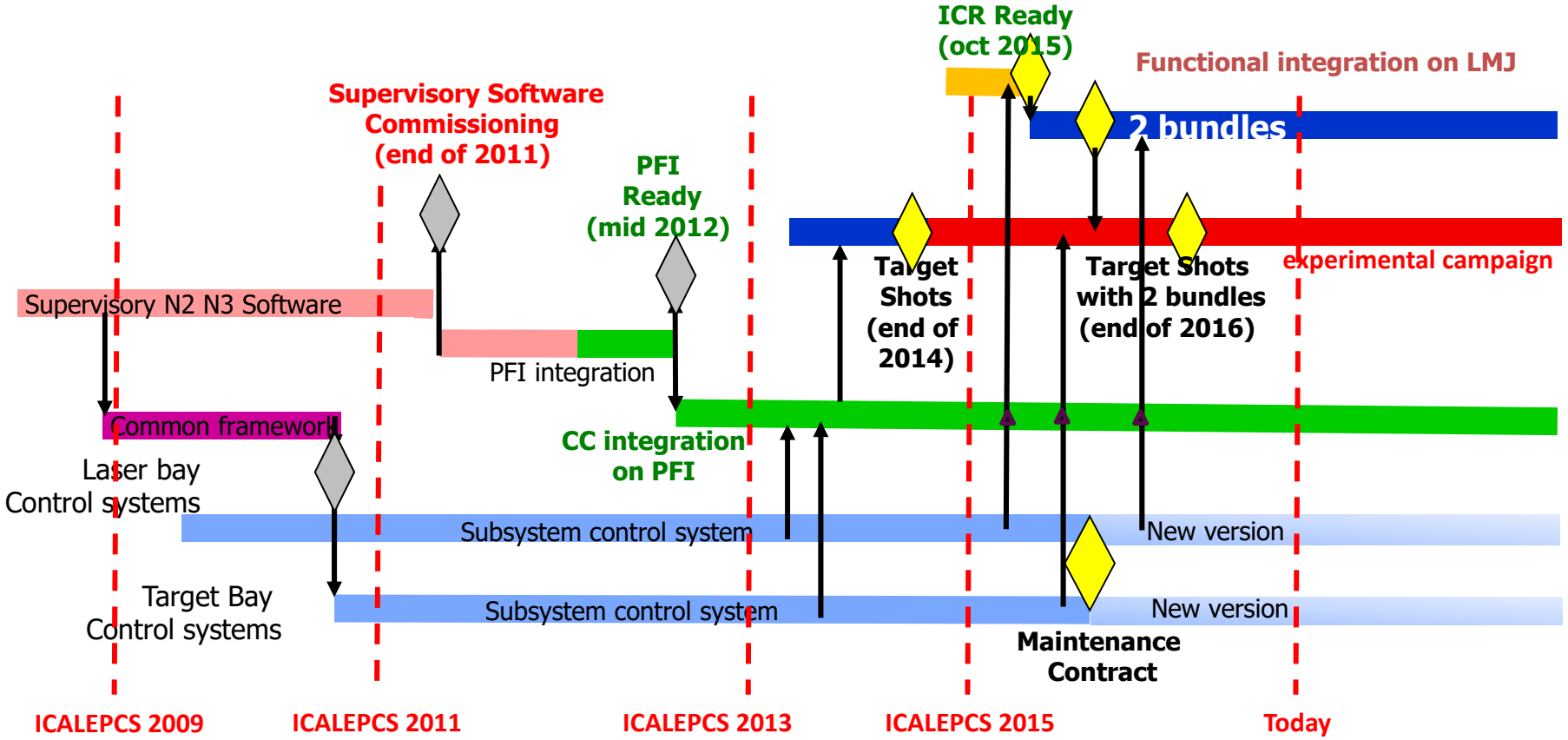
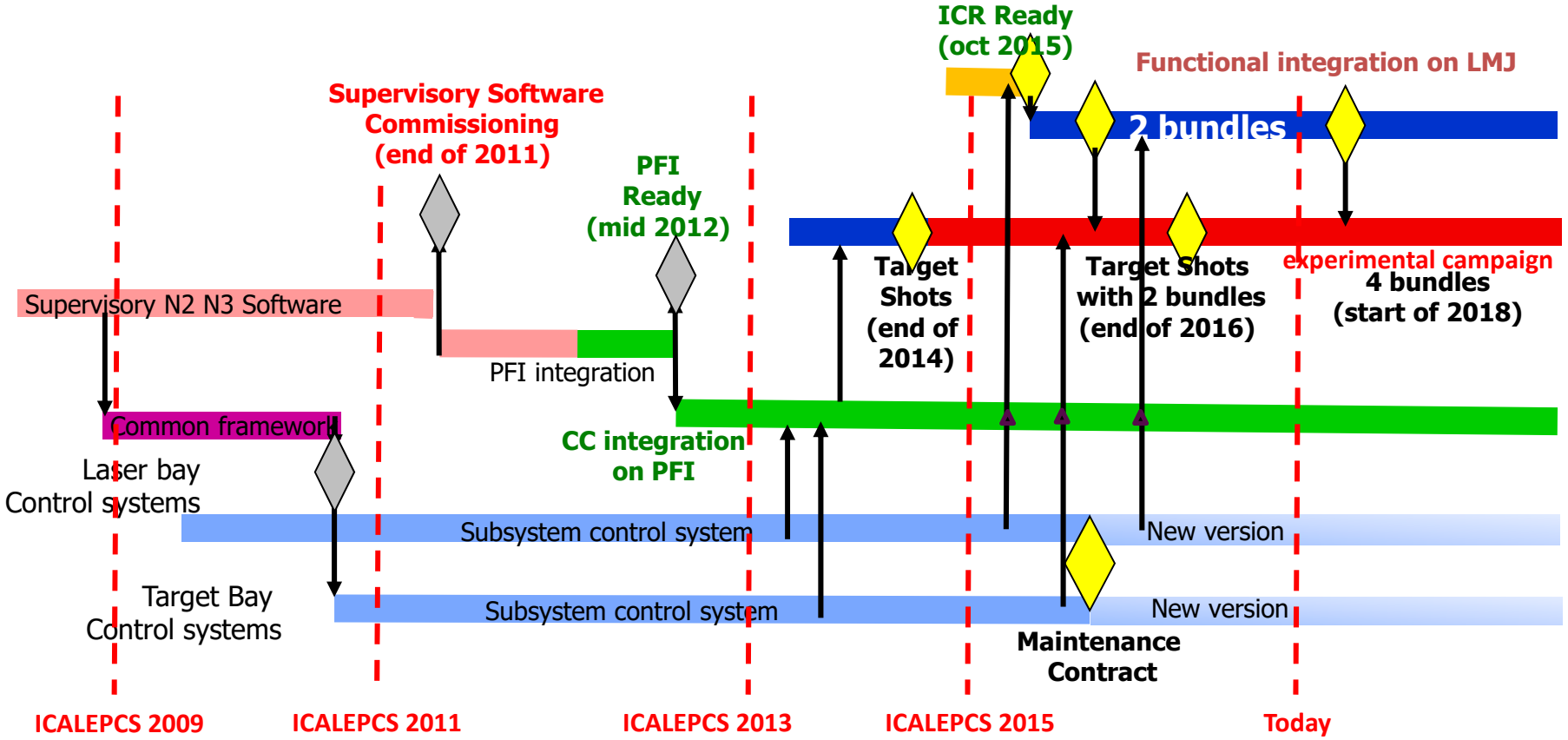


Control system milestones



Thank you for your attention