



CERN Timing Workshop ITER

Geneva, 15 Feb 2008

Franck Di Maio – ITER IO



Highlights

- CODAC overview
- High Performance networks
- A view on the planning

Ref: [IBF07](#)



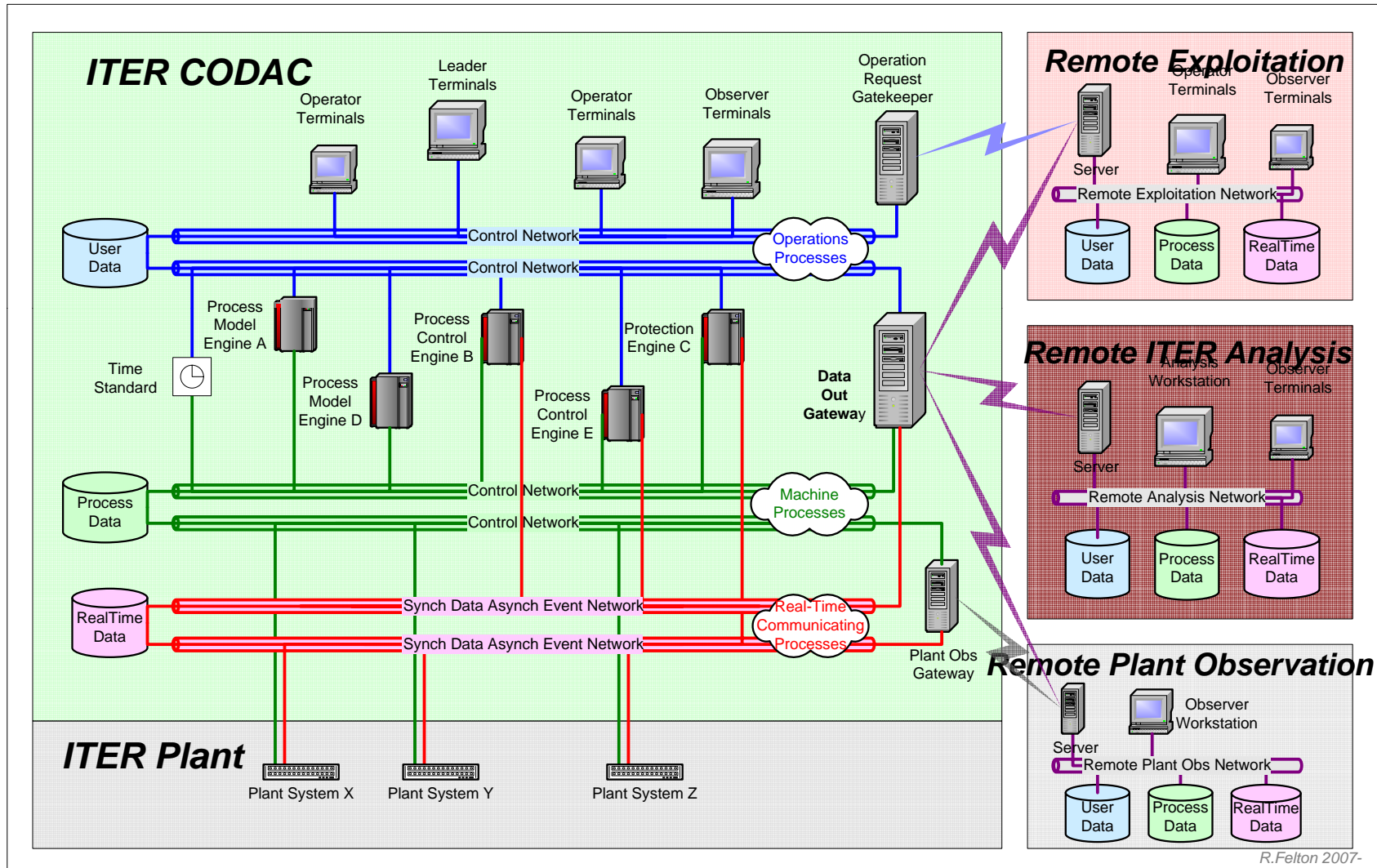
CODAC Packages

- WBS 4.5: CODAC (COntrol Data Access & Communications)
- WBS 4.6: Central Interlock System (Investment Protection)
- WBS 4.8: Central Safety System

- These are all Fund procurements. Means procured by ITER, not in-kind.
- But the plant systems and their control will be in-kind procurements.



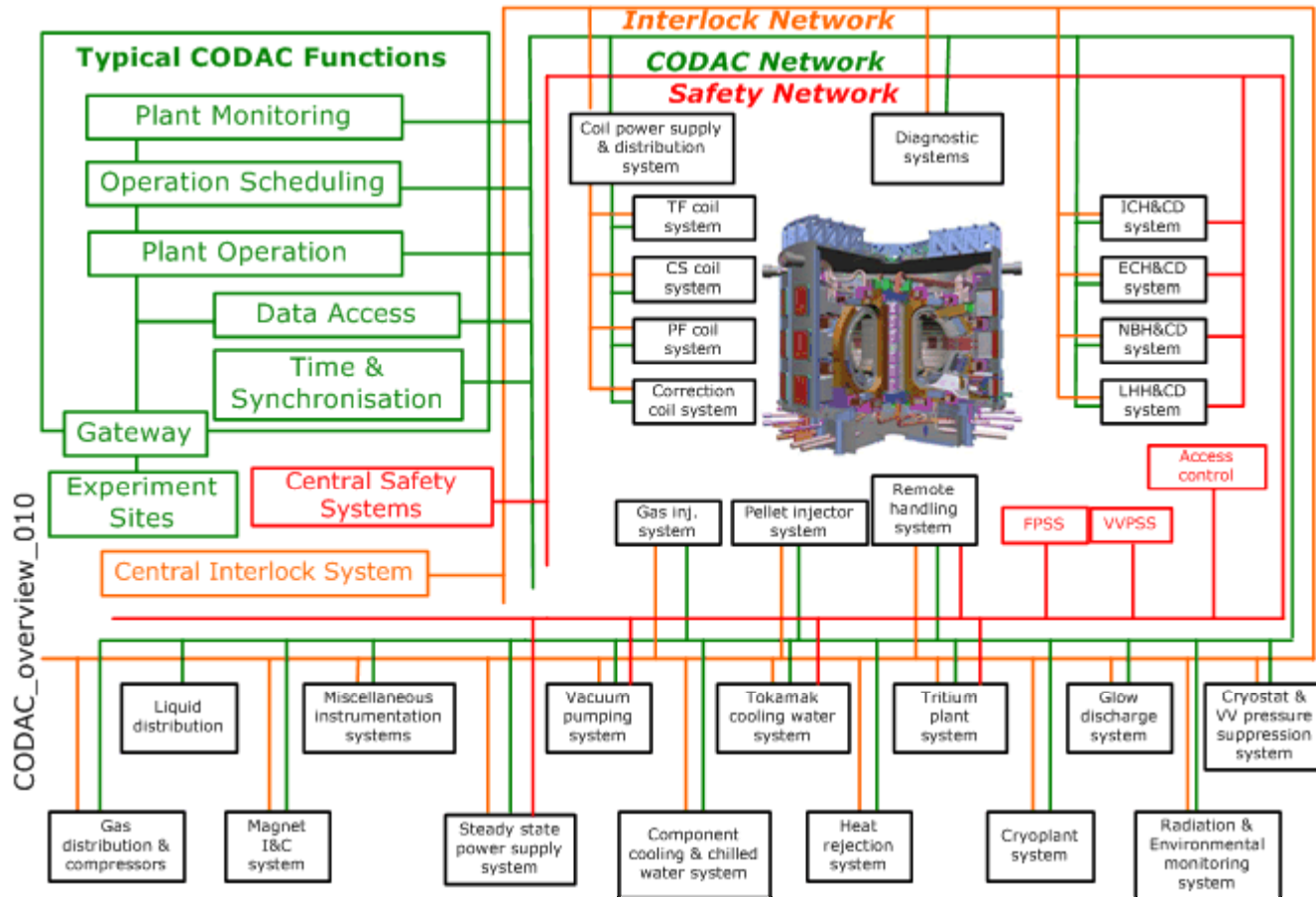
CODAC Systems Overview



R.Felton 2007-07-27

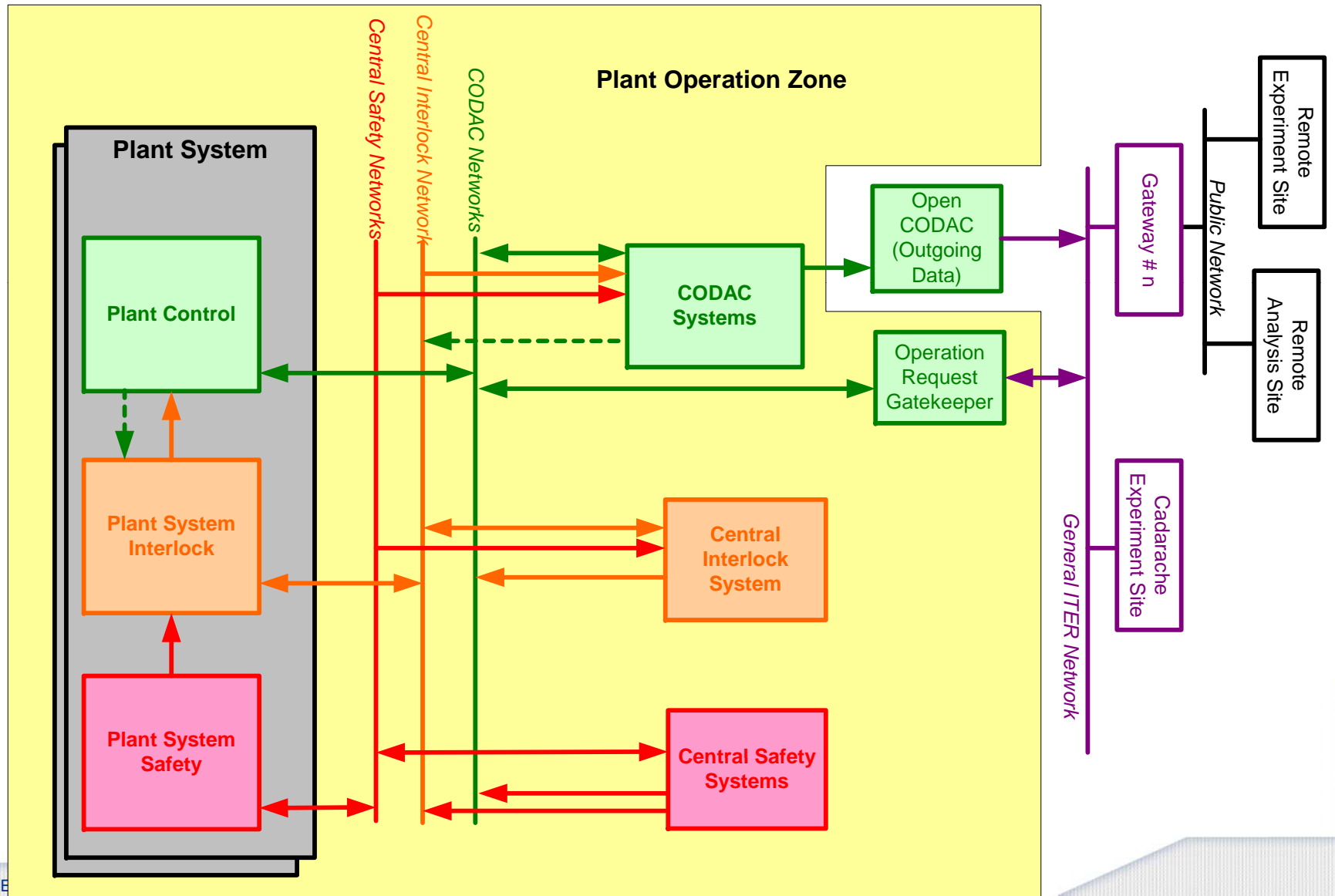


CODAC Systems Overview



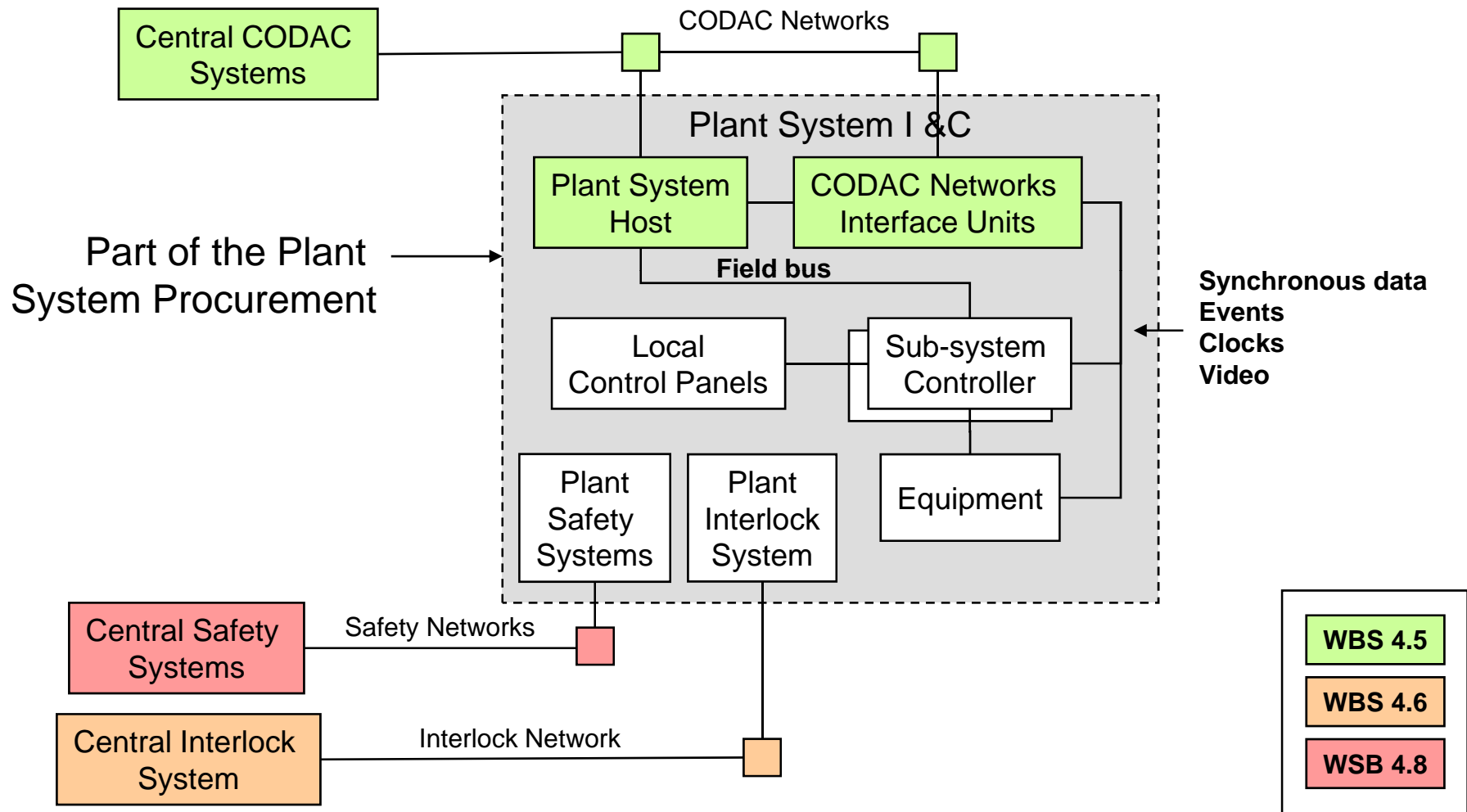


Networks segregation



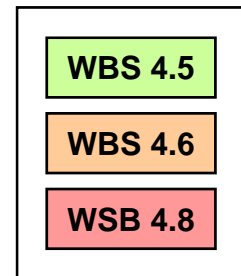
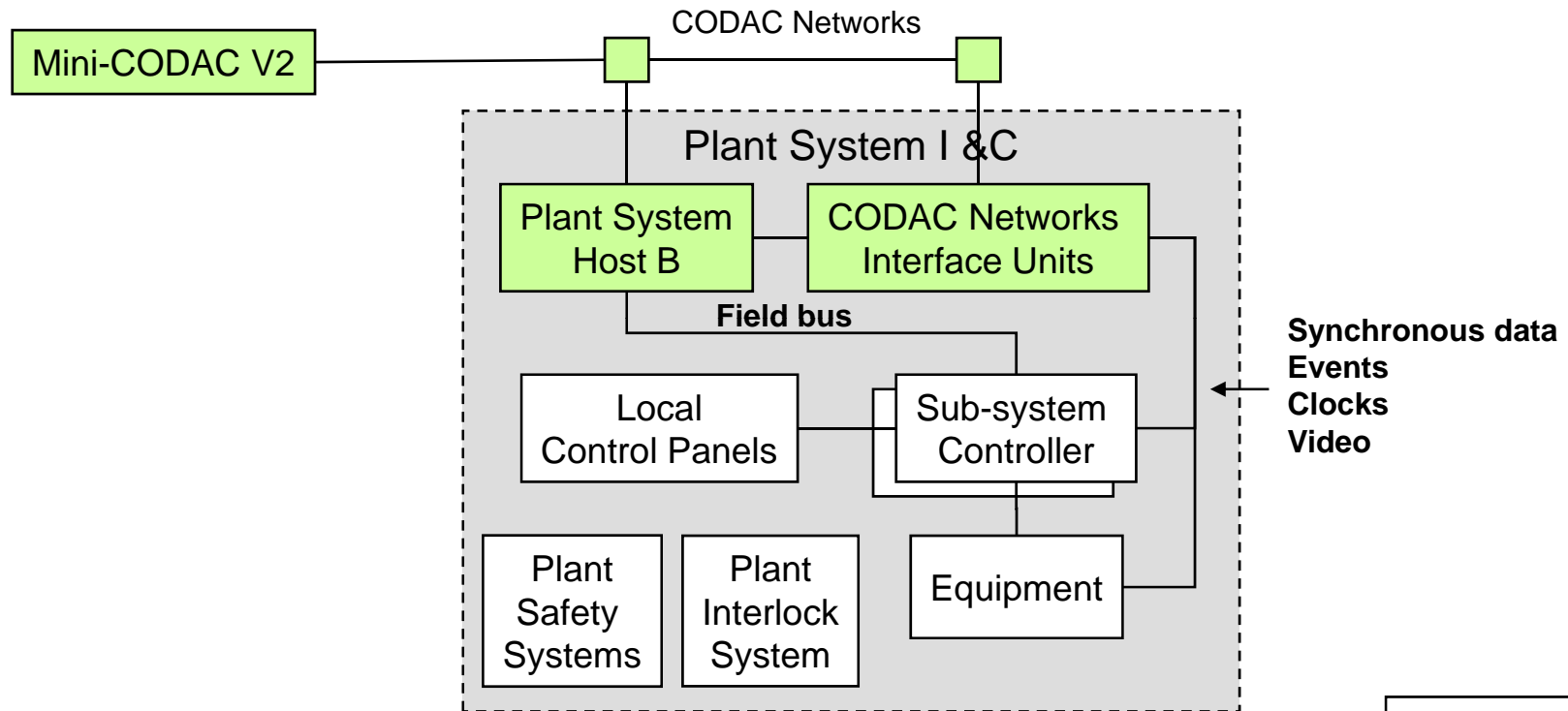


Plant Systems Integration



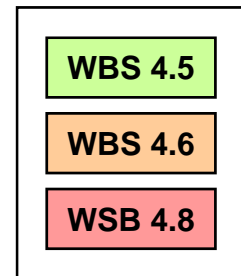
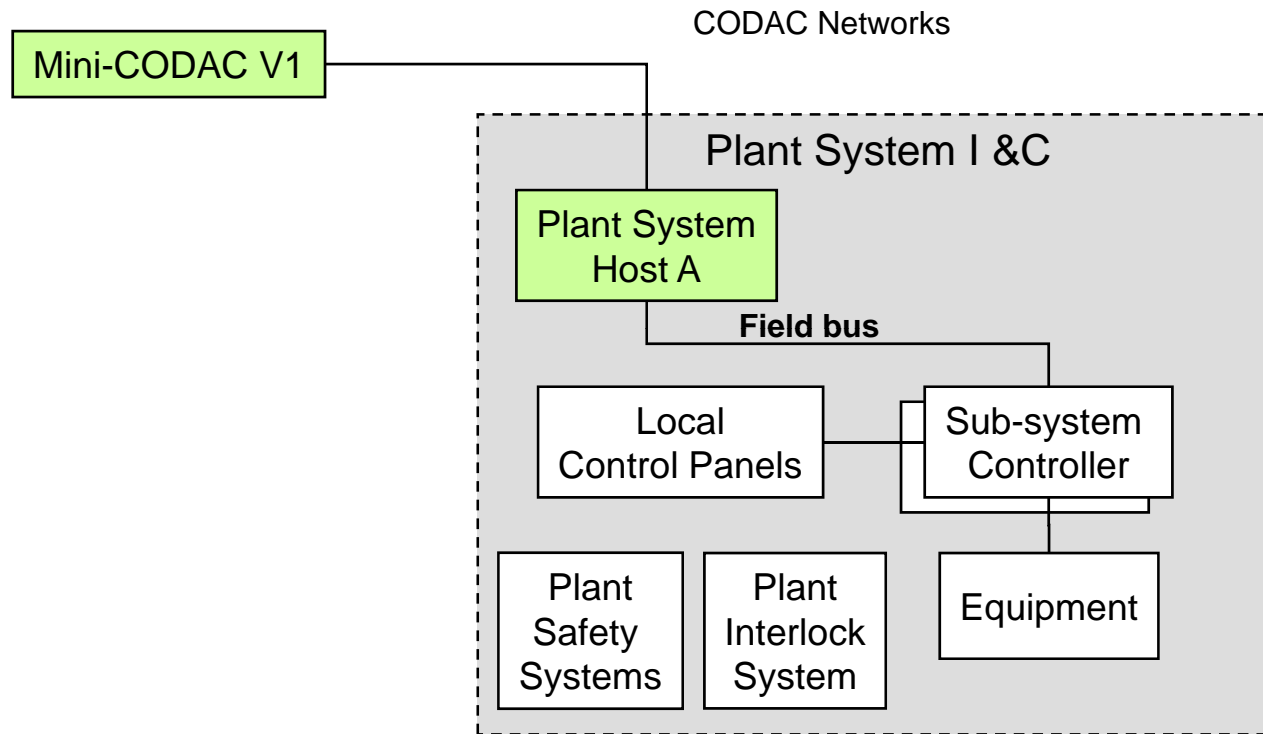


Plant Systems Tests, Phase II





Plant Systems Tests, Phase I





CODAC – Scope

- Plant Systems I&C Support
 - General I&C specifications and interfaces definition
 - Selection of standardized components & tools (ex: PLC)
 - Support for specifications, design and integration tests
 - Mini-CODAC (for integration tests)
- CODAC Hardware & Infrastructure
 - Servers: general purpose, data-storage, high performance.
 - Networks: conventional + dedicated (synchronous data, events distribution, time distribution)
 - Control Rooms infrastructure
- CODAC Software
 - Core software (communications, alarms, reporting, visualization...)
 - Operation software (schedule management, pulse control...)
 - Plant System Host (PSH) software
 - Data management
- Central Interlock System
- Central Safety Systems (nuclear, access, conventional)



ITER Networks (1/2)

Conventional networks within CODAC scope:

- The Plant Operation Network (**PON**) is responsible for the provision and management of all standard Network Communications connecting Plant Systems and CODAC Systems and is the backbone of CODAC.
- The Plant Commissioning Network (**PCN**) has the same functionality as the Plant Operation Network, but is connected only to Plant Systems which are in an un-commissioned state. It will be used during initial integration and commissioning as well as during and following interventions to a Plant System which reduce the reliability of the Plant System, to the extent that formal re-commissioning will be required.
- The Network Monitoring Network (**NMN**) provides an independent monitoring of all CODAC Networks and creates a CIS alarm in case of failure of a network.
- The Disaster Backup Network (**DBN**) provides an independent link between the CODAC data store and an off-site store with no common-mode risks.
- The Audio-Video Network (**AVN**) provides the physical and logical support for Audio and Video communication throughout the ITER plant. These data include both monitoring information and experimental data.

Conventional networks outside of CODAC scope:

- The General ITER Network (**GIN**) provides the link between CODAC and all other on-site and off-site activities. GIN will use the high performance RENATER network for all off-site user connections.
- The Open Public Network (**OPN**) provides the link between CODAC and all other on-site and off-site activities which do not require ITER authorisation. OPN will use the high performance RENATER network for all off-site connections.



ITER Networks (2/2)

High performance CODAC networks

- The Synchronous DataBus Network (**SDN**) is complementary to the CODAC Communication Network. It communicates data required for operation, including feedback control, when the delay or jitter of these data must be stricter than the Quality of Service guaranteed by the PON.
- The Time Communication Network (**TCN**) provides a project-wide definition of time and communicates this time to all Systems. It allows actions, events and data in all ITER Systems to be synchronised.
- The Event Distribution Network (**EDN**) manages the signaling of intermittent events between CODAC Systems or Plant Systems with a lower latency than the Synchronous DataBus.

Safety & Interlocks:

- The Central Interlock System Network (**CIN**) provides the physical network and the supervisory logic to allow the continued operation of the plant in its present state, or to cause an appropriate corrective action if an off-normal event is detected and not avoided by preventive CODAC actions.
- The Central Safety System Networks (**CSN**) provide the physical network and the supervisory logic to allow the continued operation of the plant in a safe state, or to cause an appropriate corrective action if an off-normal event is detected and not avoided by preventive CODAC actions.



Synchronous Data Bus

- Non-persistent, transient, low (1msec) latency data, representing engineering and physics.
- Needed for fast control of the plant and of the plasma

Number of signals	4000
Jitter	0.05 ms
Data producers (plant systems)	80
Data consumers	50
Transmission delay	1 ms
Source to Destination delay	5 ms



Time Communication Network

- The Time Communication Network (TCN) provides a project-wide definition of time and communicates this time to all Systems.
- It allows actions, events and data in all ITER Systems to be synchronised.

Time resolution	10 ns
Time precision	10 ns
Synchronise itself to UTC as the absolute reference, to within	1 s
Guarantee monotonic progression of its time, recovering any error with respect to UTC with a correction rate of	1e-4
?	?



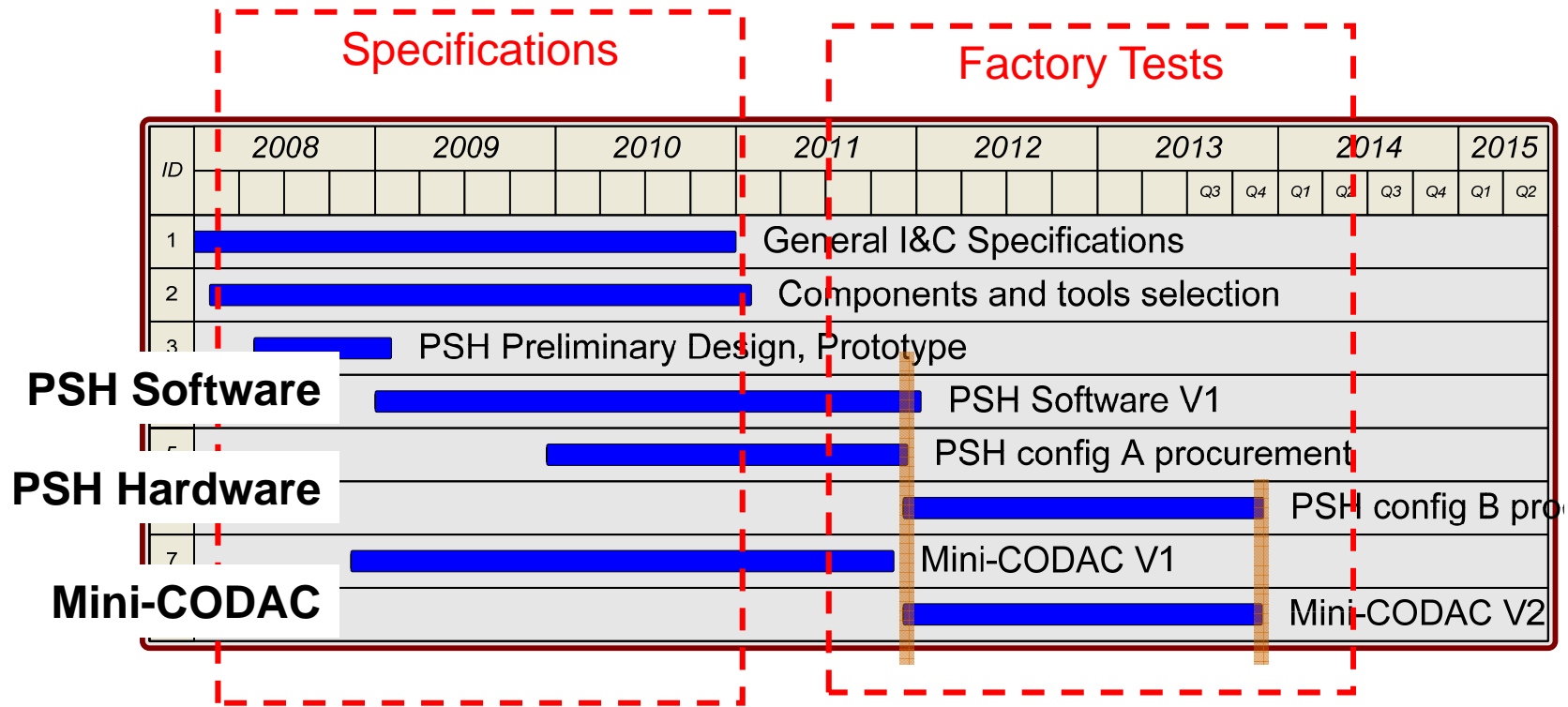
Event Distribution Network

- The Event Distribution Network (EDN) manages the signaling of intermittent events between CODAC Systems or Plant Systems with a lower latency than the Synchronous DataBus.

Number of sources of events	500
Number of consumers of events	500
Maximum latency	10 μ s
?	?



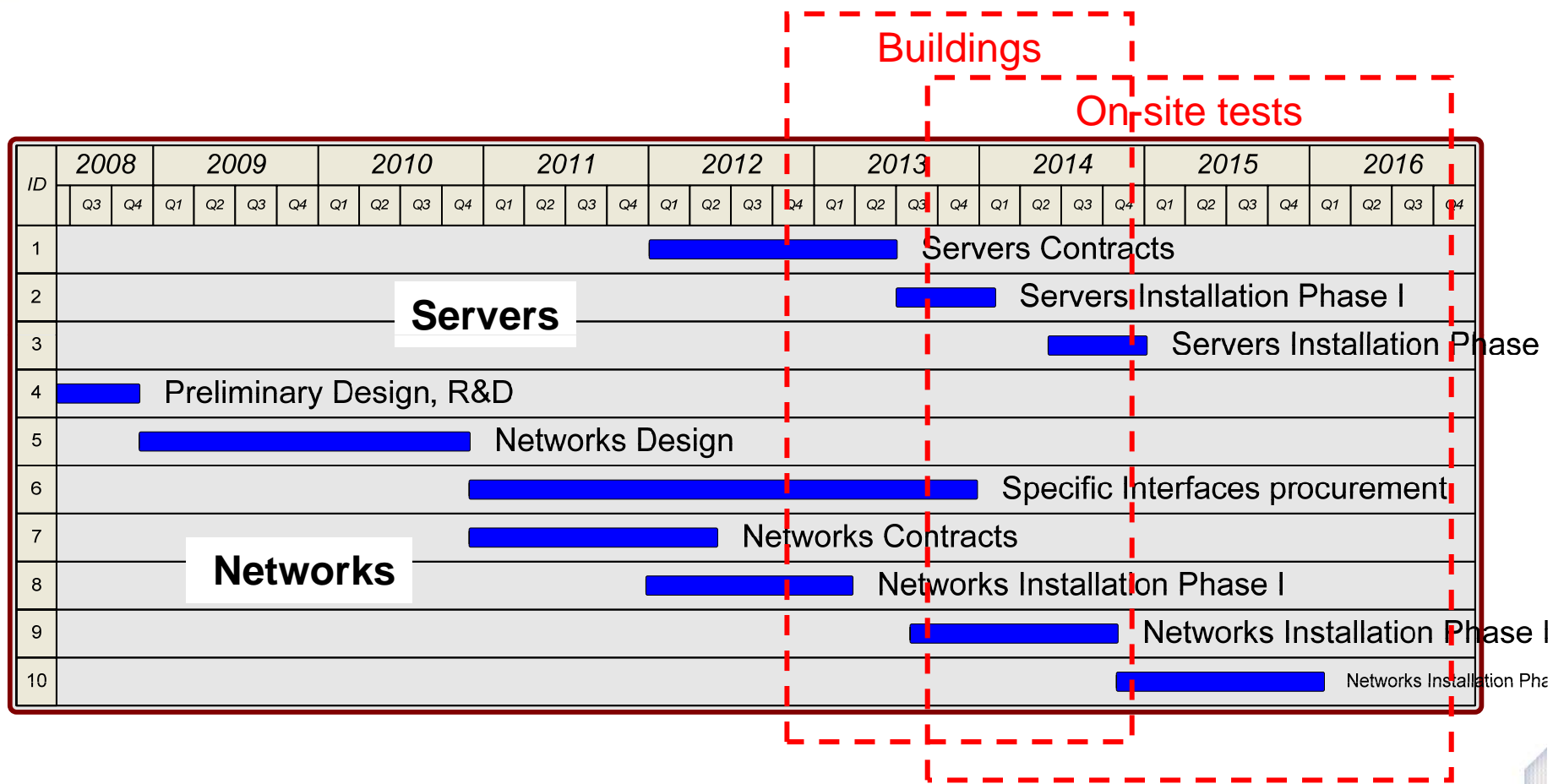
CODAC – Provisional Schedule Plant Systems I&C Support (Partial)



Provisional: to be adjusted with IPS milestones



CODAC – Provisional Schedule CODAC Hardware & Infra. (partial)



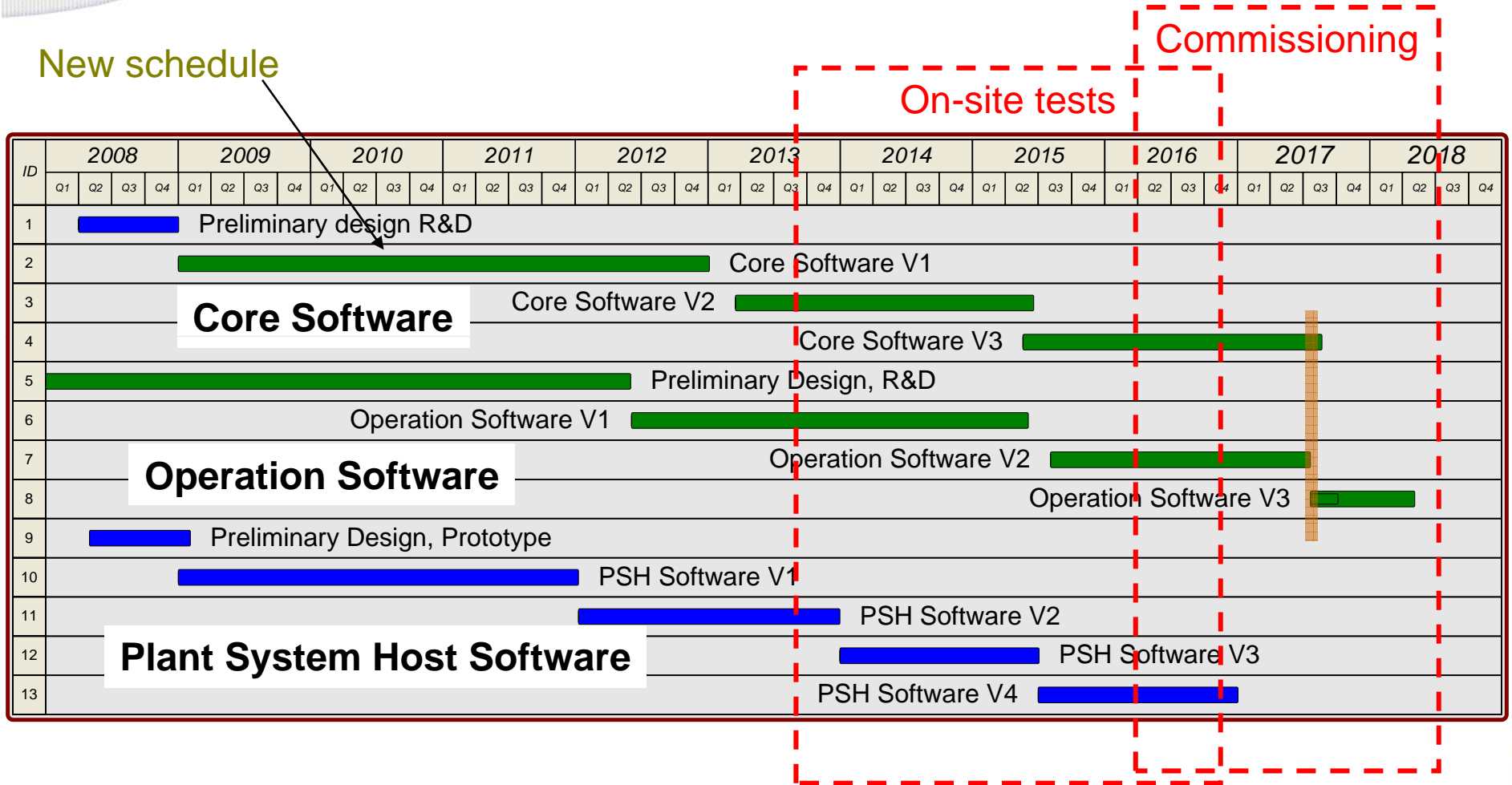
Provisional: to be adjusted with IPS milestones



CODAC – Provisional Schedule

CODAC Software (partial)

New schedule



Provisional: to be adjusted with IPS milestones