Cyril PRESENT, Aurélien BAUCHET

Sopra group.

PETAL LASER

The PETAL laser will be a high energy multi-Petawatt laser beam near Bordeaux (France) :
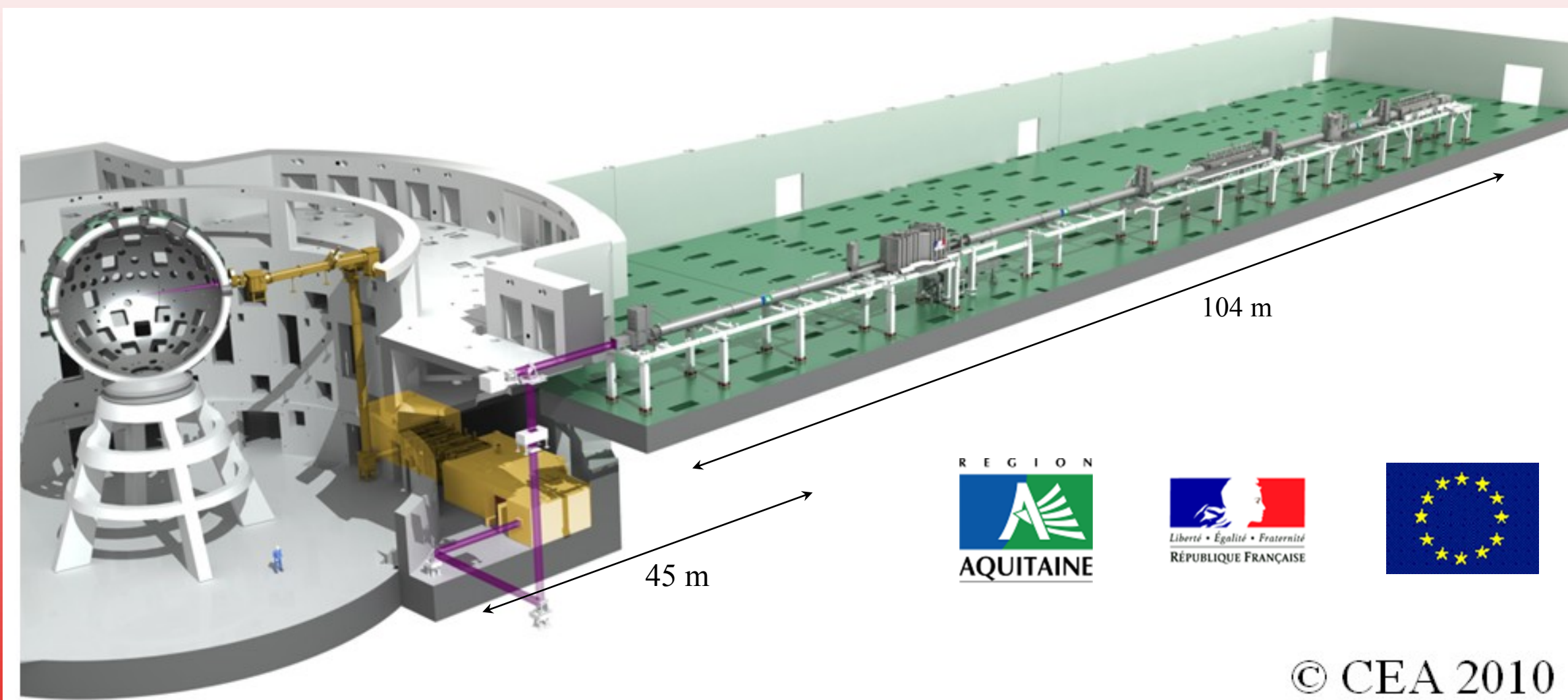
⇒ 500 fs to 10 ps short pulse

⇒ few kJ compressed energy

France

LMJ   PETAL

PETAL Beam on LMJ

PETAL is installed in the building of the Laser MegaJoule facility.
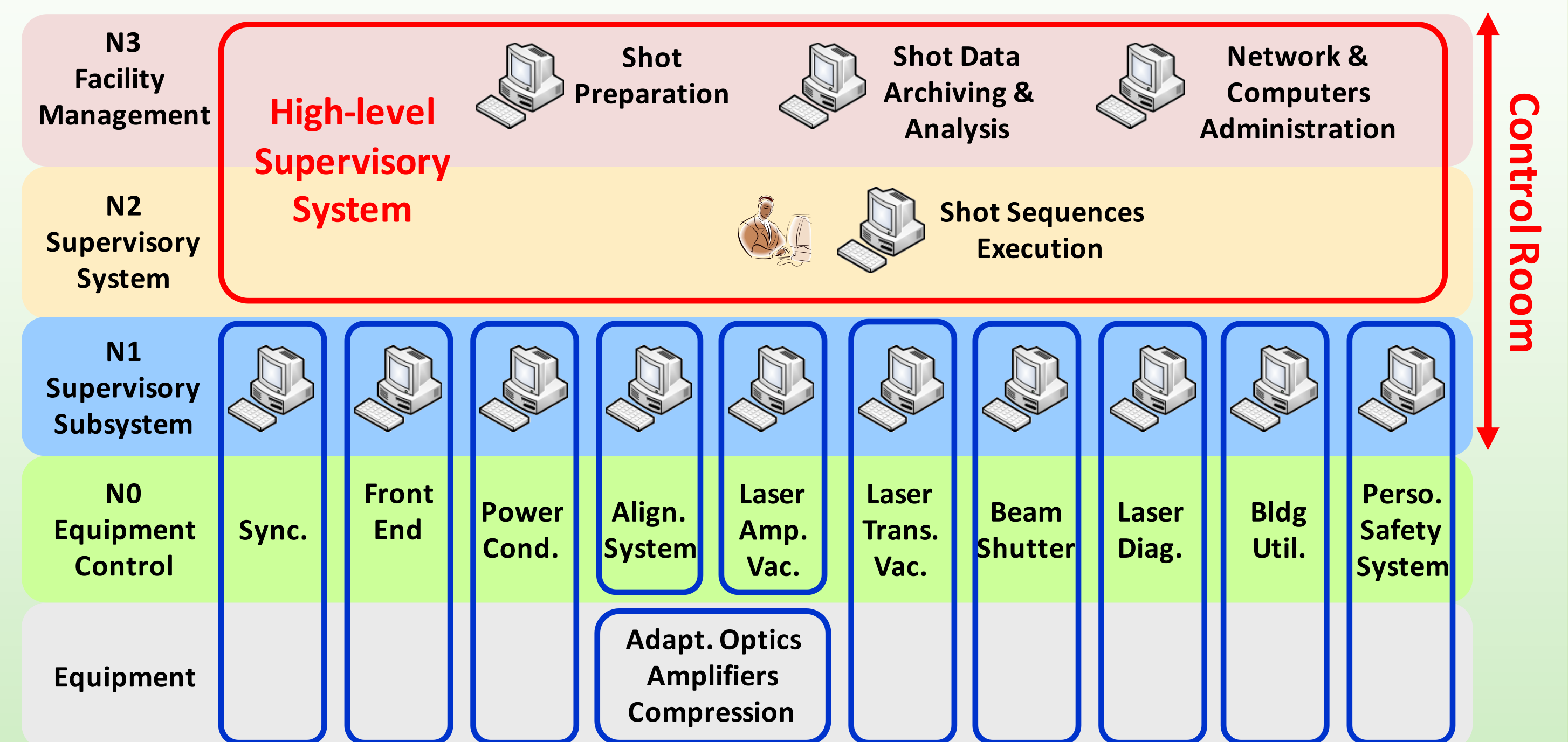
PETAL Project

PETAL is dedicated to academic research : designed and constructed by the CEA /CESTA for the Région Aquitaine which receives a financial support from the French Ministry of Research and of the European Union .
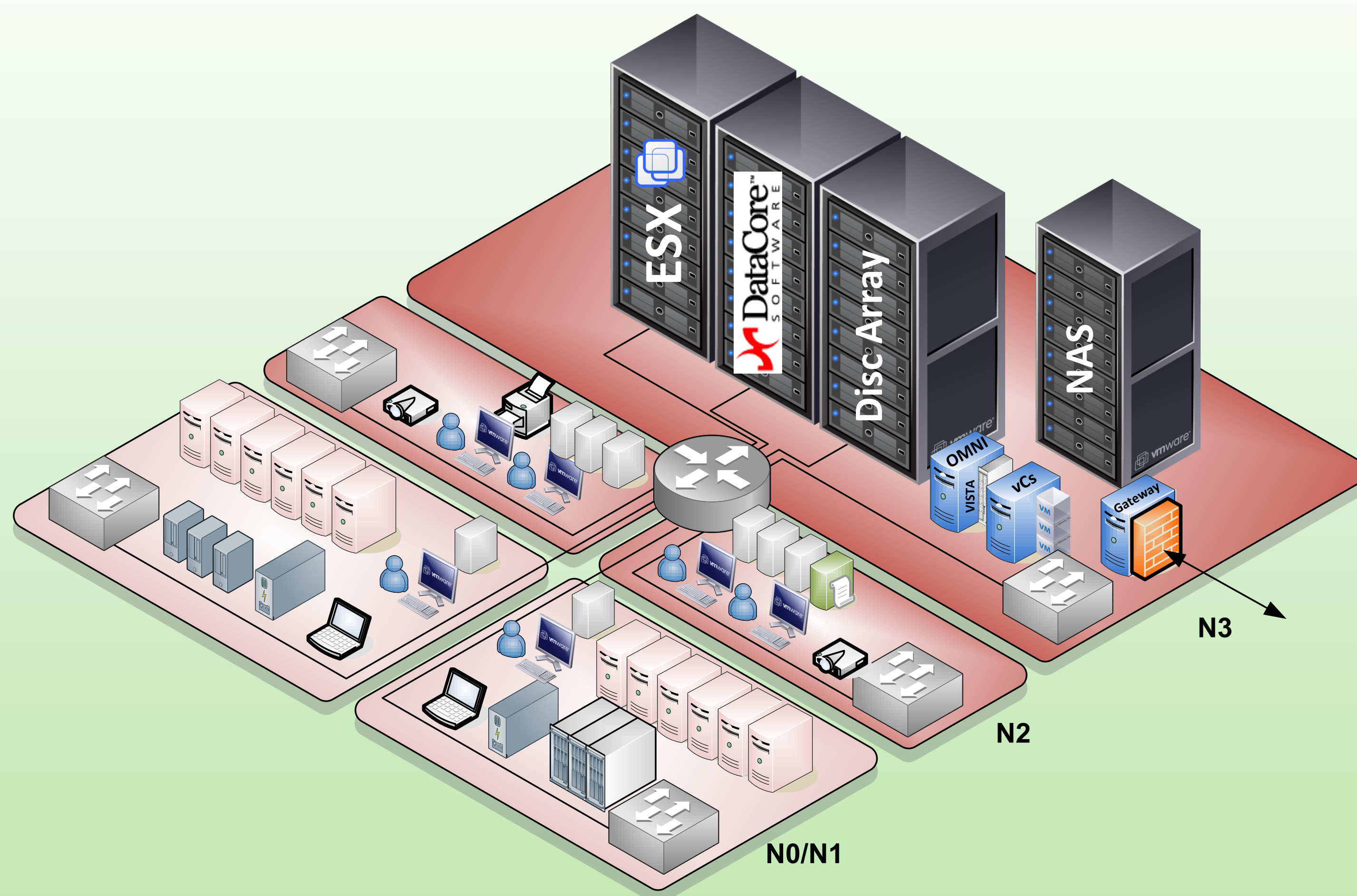
Petal PETAWATT AQUITAINE LASER

104 m

45 m

AQUITAINE   RÉPUBLIQUE FRANÇAISE

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Control System Architecture

PETAL's control system is distributed on a pyramid of 4 layers

N3 Facility Management	High-level Supervisory System	Shot Preparation — Shot Data Archiving & Analysis — Network & Computers Administration
N2 Supervisory System		Shot Sequences Execution
N1 Supervisory Subsystem		
N0 Equipment Control		Sync. / Front End / Power Cond. / Align. System / Laser Amp. Vac. / Laser Trans. Vac. / Beam Shutter / Laser Diag. / Bldg Util. / Perso. Safety System
Equipment		Adapt. Optics Amplifiers Compression

Control Room

The N1 and N0 layer is divided into 10 major subsystems, corresponding to the main functions of the beam's control system. The Shot Sequences Execution controls the states of each subsystem to lead to the shot.

PETAL Infrastructure

All the N1, N2 and N3 layers are virtualized using VMware and DataCore solutions. N3, N2 layers and each subsystem (N1, N0) are localized on a VLAN linked to the central backbone.
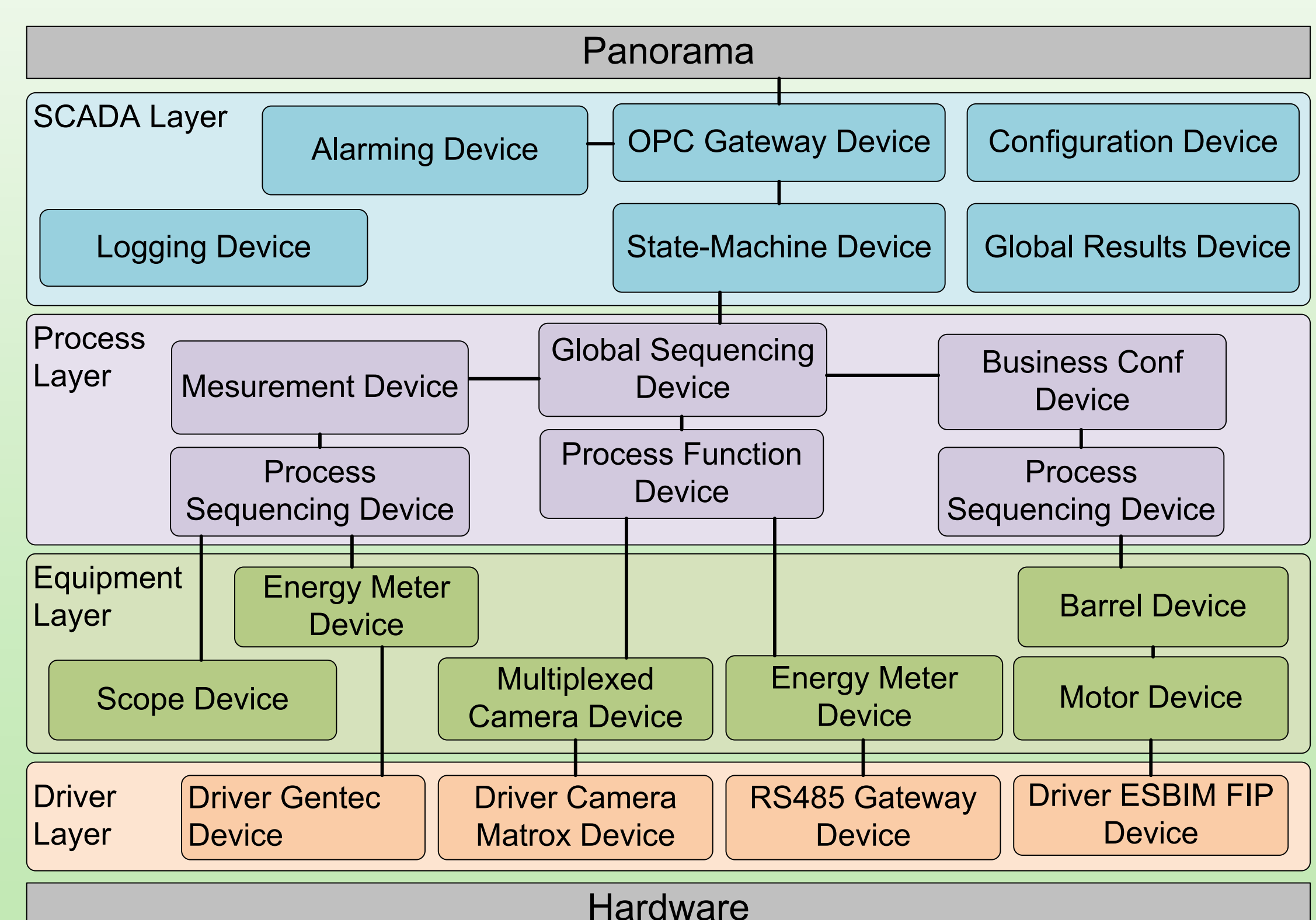
ESX   DataCore   Disc Array   NAS

OMNI   VISTA   vCS   Gateway

N3

N2

N0/N1

PETAL set up two twin plat-forms. The first one is dedicated to operation process, the second to control system integration process.

TANGO-based architecture

The N0 Layer has been built on a 4 layers software TANGO-based architecture with reusable core components written in C++ :

. "SCADA" layer : regroups all the interface, logging and global system state management components

. "Process" layer : regroups components used implement the specific task of each subsystem (use SCXML for the sequence), plugin base system to implement algorithms

. "Equipment" layer : regroups all the components that controls a specific equipment (cameras, motors, barrel wheel)

. "Driver" layer : regroups components that allows access to a shared resource (RS485 modbus gateway, specific control card for AON input and output cards)

	Panorama
SCADA Layer	Alarming Device — OPC Gateway Device — Configuration Device — Logging Device — State-Machine Device — Global Results Device
Process Layer	Mesurement Device — Global Sequencing Device — Business Conf Device — Process Sequencing Device — Process Function Device — Process Sequencing Device
Equipment Layer	Energy Meter Device — Scope Device — Multiplexed Camera Device — Energy Meter Device — Barrel Device — Motor Device
Driver Layer	Driver Gentec Device — Driver Camera Matrox Device — RS485 Gateway Device — Driver ESBIM FIP Device
	Hardware

Specific behaviour is externalized in configuration files and through the use of a SCXML sequences files.

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San Francisco