Apollon project status

29th Tango Collaboration Meeting
Solaris (Krakow, Poland)

Jean-Luc Paillard, Jean-Luc Veray,
Mickaël Pina, Jérémy Froment
Electronic and IT LULI support teams

20/05/2015

Localization, introduction

High intensity laser facility

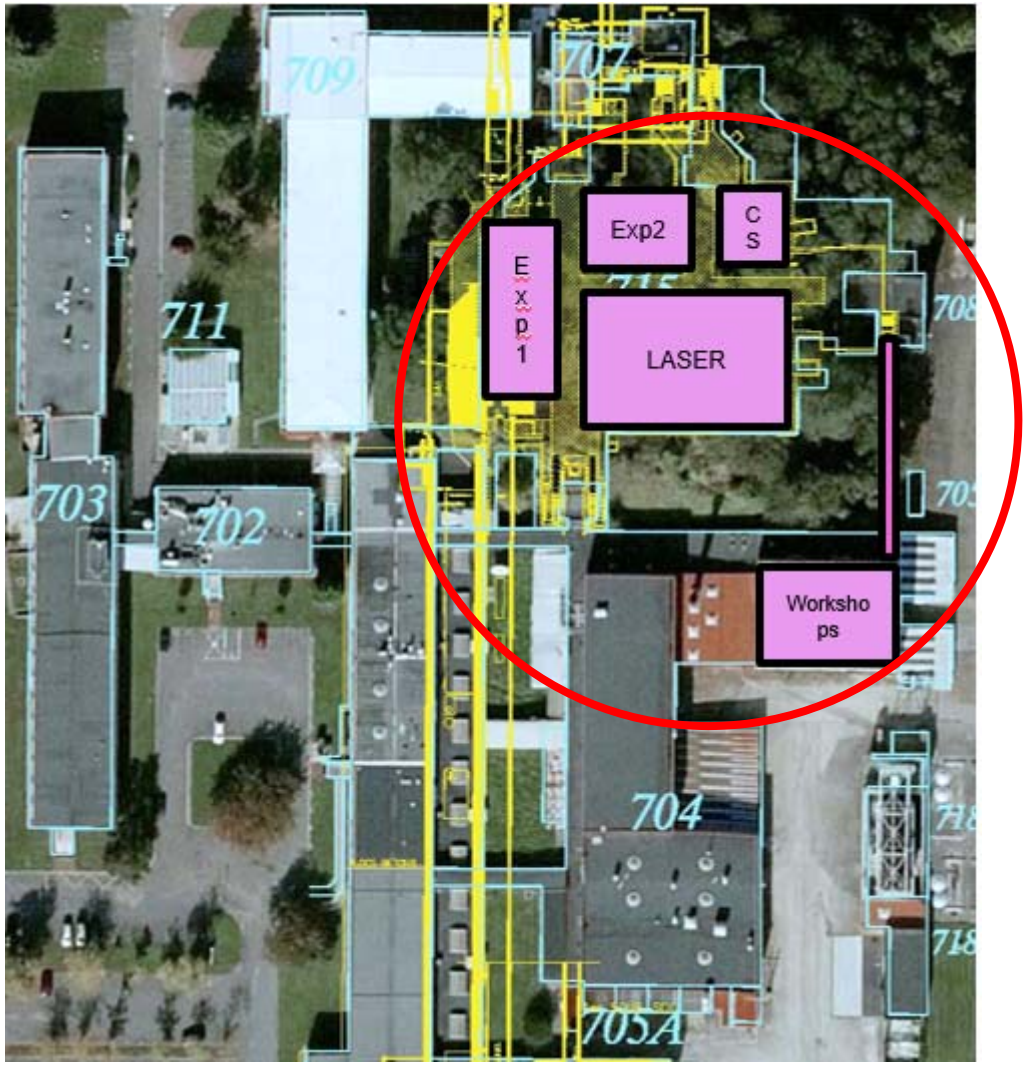
Site : “L’Orme des Merisiers”

(Former linear accelerator building)

CILEX : 13 labs collaboration

Project manager and
80% of human resources

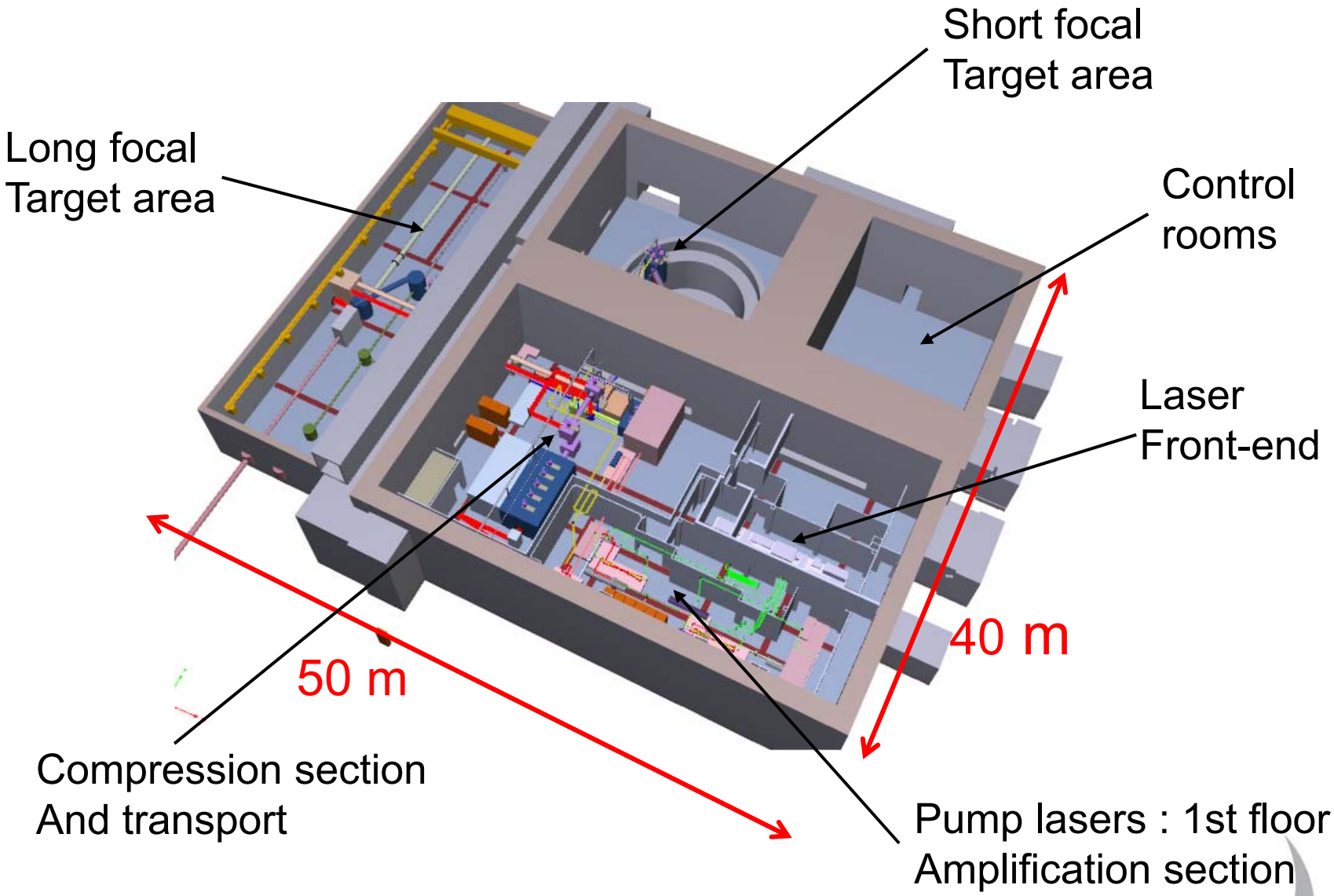
More about the building



Underground
Heavy shielded installation
With wall thickness : 5 m

Laser : 700 m² (cleanroom)
Exp1 (long focal) : 420 m²
Exp2 (short focal) : 210 m²
Control rooms : 200 m²
Workshops : 480 m²
Offices : 300 m²

3D CAD view


Short focal
Target area
Long focal
Target area
Control
rooms
Laser
Front-end
40 m
50 m
Compression section
And transport
Pump lasers : 1st floor
Amplification section

Science, Budget & human forces

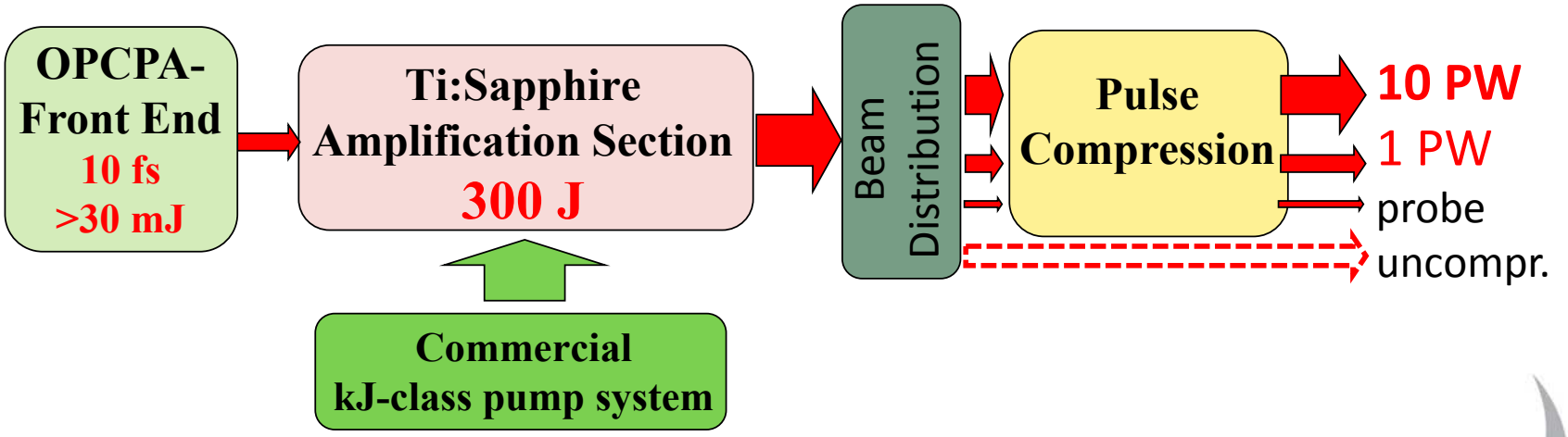
- Research program
  - Electron acceleration
  - Ion acceleration
  - X-ray sources
  - High-field physics and Applications

- Budget : ~ 28 M€ including building upgrade
  not sufficient to achieve all performances
  (French and European funding agencies)

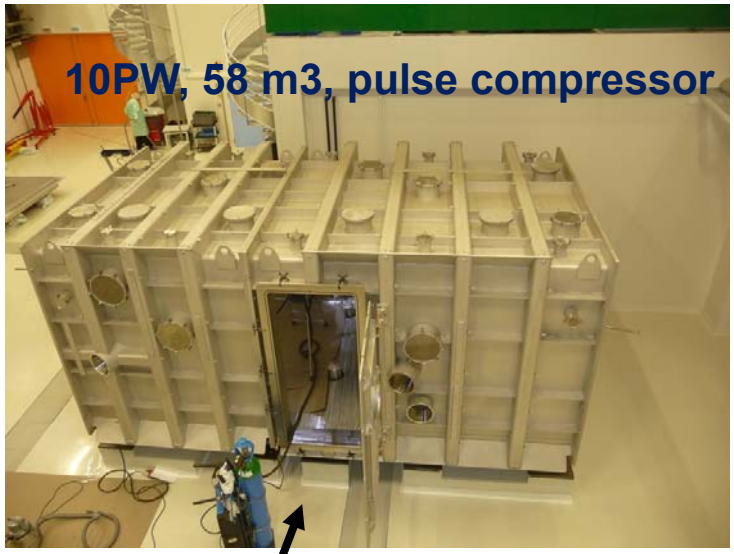
- Human forces : ~ 25 FTE, decreasing…

4 Laser beams

- F1 : 15 fs –> few ps , 150 J max, 1 shot/min, diam 40 cm
- F2 : 15 fs –> few ps, 15 J max, 1 shot/min, diam 15 cm
- F3 : shirped pulse, 1 ns / 140 J max
- F4 : probe beam, 20 fs, 200 mJ,



Recent photos in integration phase



OPCPA-Front End
10 fs
>30 mJ

Ti:Sapphire Amplification Section
300 J

Commercial kJ-class pump system

Beam Distribution

Pulse Compression

10 PW
1 PW
probe
uncompr.

Control system work package

- Control system WP team
  - Jean-Luc Paillard (WP leader)
  - Jean-Luc Veray (PSS, Vacuum control system leader, DB)
  - Mickaël Pina (SSS, Image & motors CS)
  - Jeremy Froment (Image & motors CS, diagnostics CS)
  - Patrick Rommeluère (PLCs for vacuum control, 0.2FTE)
- Support teams
  - Electronic team (hardware, cabling) : 2 FTE
    + external company
  - IT (system, virtualization) : ~ 1 FTE
- Mission : Design, development, deployment and evolution of the control system for the facility
- Perimeter : *Laser and target areas of Apollon facility*

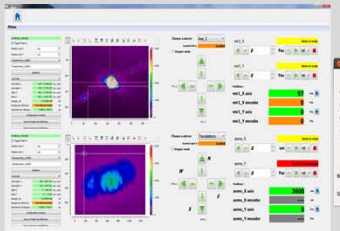
Control system overview

Laser control system

MySQL

Tango

Data SetUp



Taurus

PYTango

TANGO

Devices Servers	python	C++			
Synchros Security Sequence	Pump Lasers	Images	Motor drivers	Diagnostics Event Builder	Vacuum systems

LabVIEW

SIEMENS

OPCPA-Front End
10 fs
>30 mJ

Ti:Sapphire Amplification Section
300 J

Commercial kJ-class pump system

Beam Distribution

Pulse Compression

10 PW
1 PW
probe
uncompr.

Target areas control systems

Short focal **Long focal**

MySQL

Tango

Data SetUp

LabVIEW

Labview binding

PYTango

TANGO

Devices Servers	python			
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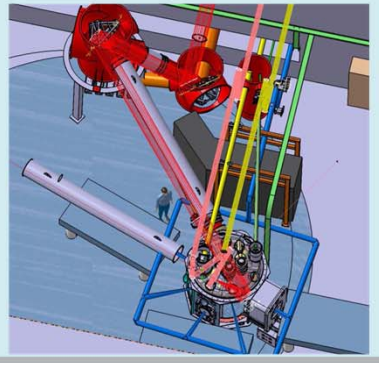
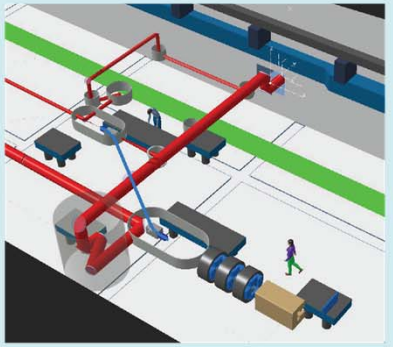
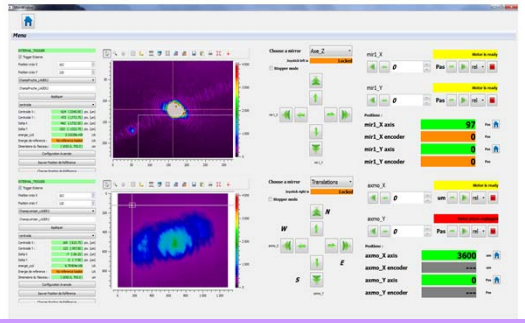
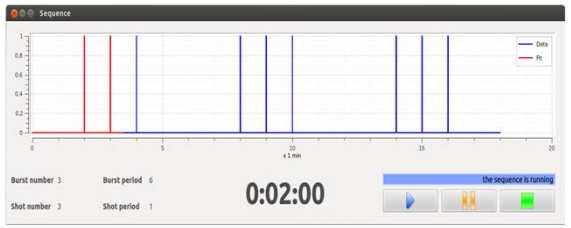
SIEMENS

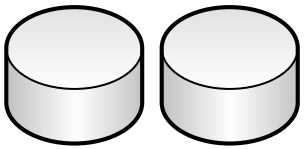




Laser control system







Pytango

TANGO

Sequence DS	Alignment DS	Processing DS	Event Builder

SSS DS	GFT DS	Acq. DS	Pilmot	New Focus	SmarAct	Diags	Pumps laser…

TCP DS	LIMA	Modbus TCP	TCP DS	Dedicated	PLC DS

synchronization Systems

CCD

Motor drivers

Gentec Slink

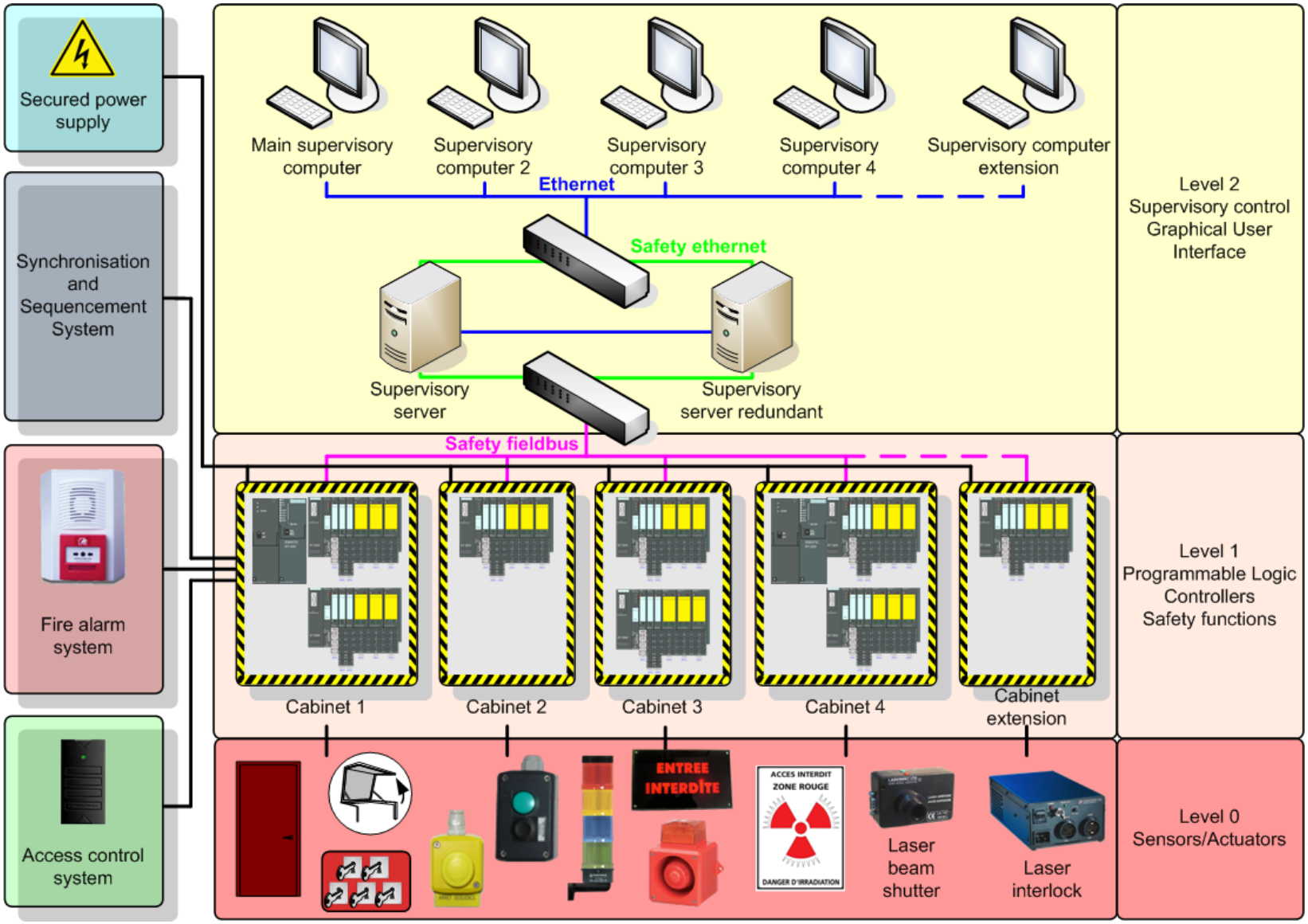
proprietary systems

PLCs

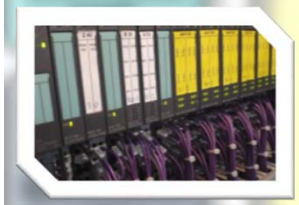
Versions in use

- OS : (64 bits)
  - Ubuntu 12.04 LTS -> 14.04 LTS
  - Windows 7, 8
- Tango 8.1.2
- PyTango 8.0.2
- Taurus 3.4.0
- LIMA : 1.4.1
- Python 2.7 (PythonXY 2.7.6.0 distribution)

PSS


Secured power supply
Synchronisation and Sequencement System
Fire alarm system
Access control system
Main supervisory computer
Supervisory computer 2
Supervisory computer 3
Supervisory computer 4
Supervisory computer extension
Ethernet
Safety ethernet
Supervisory server
Supervisory server redundant
Safety fieldbus
Cabinet 1
Cabinet 2
Cabinet 3
Cabinet 4
Cabinet extension
ENTREE INTERDITE
ACCES INTERDIT ZONE ROUGE
DANGER D'IRRADIATION
Laser beam shutter
Laser interlock
Level 2 Supervisory control Graphical User Interface
Level 1 Programmable Logic Controllers Safety functions
Level 0 Sensors/Actuators

PSS

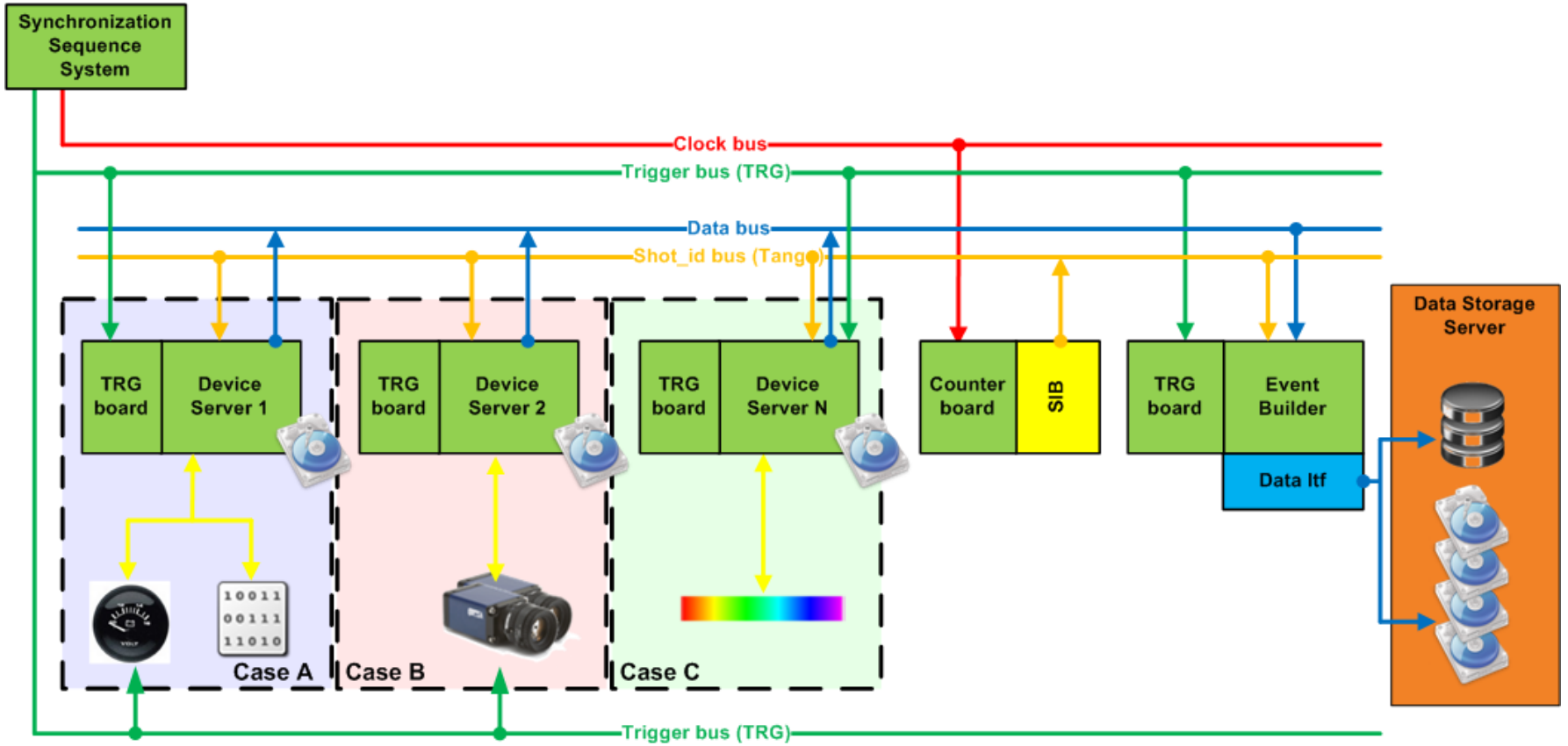


75 I/O cards in 5 cabinets
122 input signals/256 output signals
750 variables to communicate with GUI and PLC

PLC program done
GUI views under development
Cabling equipements by subcontractors

Design step started on January, 2013
Setting up equipments since March, 2015
Expected to be completed on July, 2015

Time stamping, event builder

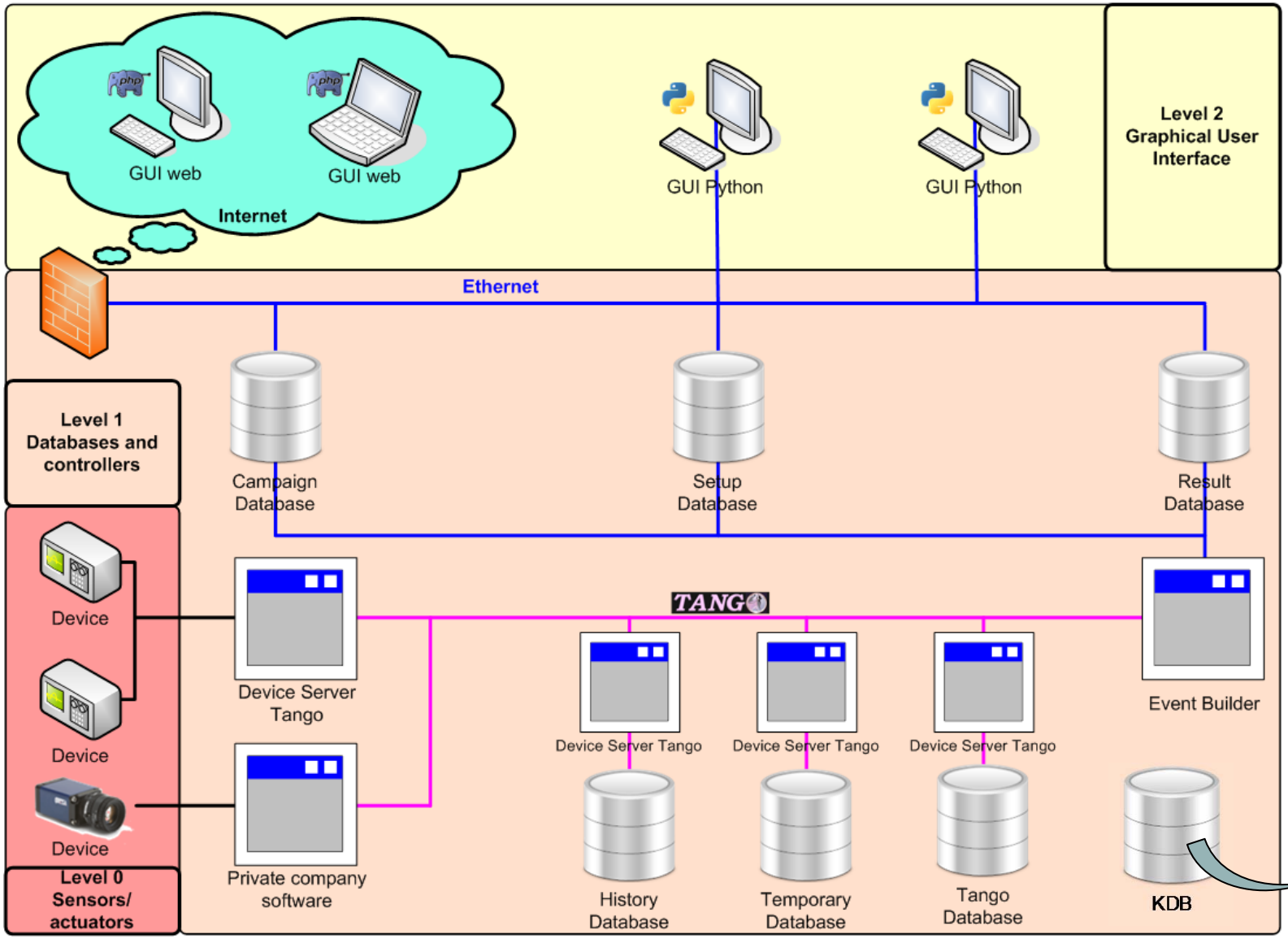


Data Identifier :

YYMMDDHHMMSS_XXXXXXXX_DOMAIN_FAMILY_MEMBER

shot_id device

Database


GUI web
GUI web
Internet
GUI Python
GUI Python
Level 2
Graphical User
Interface
Ethernet
Level 1
Databases and
controllers
Campaign
Database
Setup
Database
Result
Database
Device
Device
Device
Level 0
Sensors/
actuators
Device Server
Tango
Private company
software
TANGO
Device Server Tango
Device Server Tango
Device Server Tango
Event Builder
History
Database
Temporary
Database
Tango
Database
KDB
Same as
Alba's CDB

Milestones, summary

- Milestones :
  - March 2015 : building commissioned
  - March 2016 : commissioning of amplification section
  - October 2016 : 1 PW (F2) in operation
  - 2017 : First experimental campaigns

- Summary :
  - The most intense laser facility in France
  - Construction is going on, including control system around TANGO framework
  - Thanks to the Tango community !

Thanks,

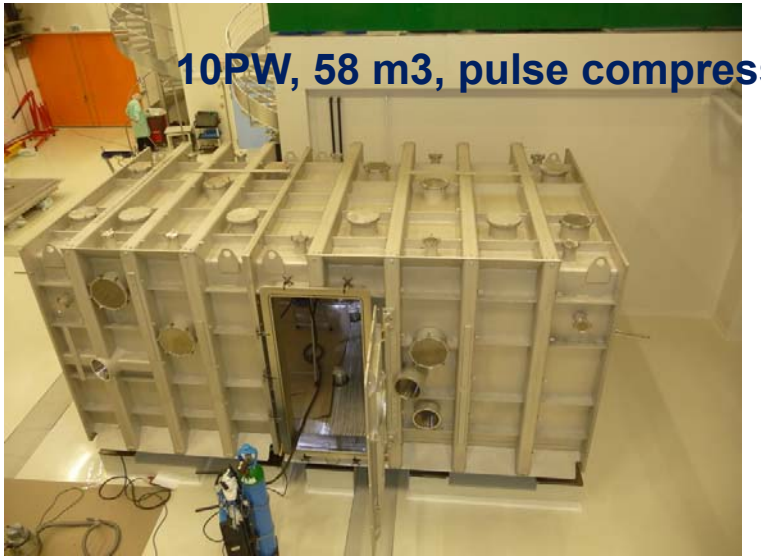
Collaboration : Institutes and Laboratories

Funding agencies

Apollon

- Back up slides

Inside the building in April 2015



10PW, 58 m3, pulse compressor

Long focal target area

Short focal target area

Status

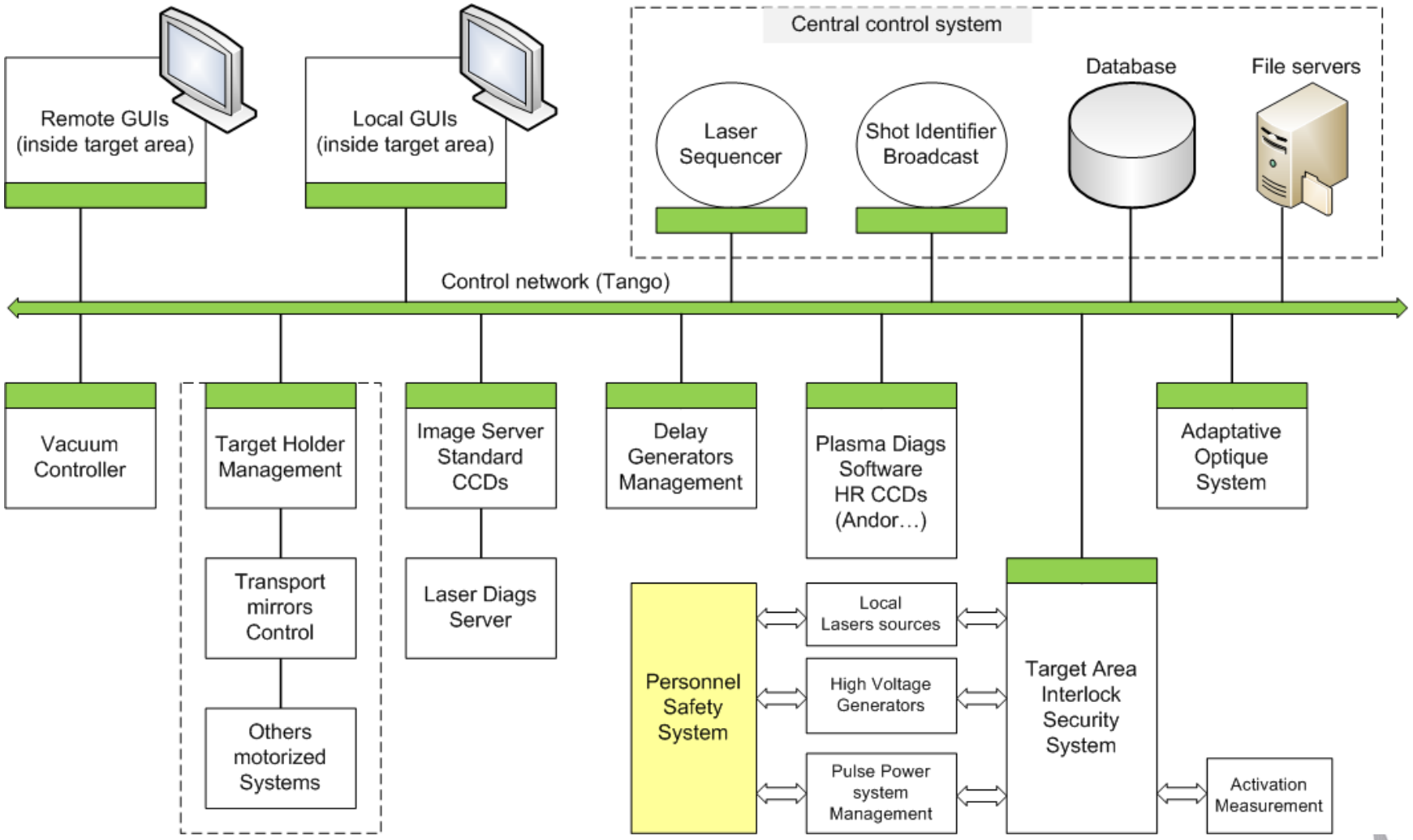
	Hardware	Software
LAN	50% installed	SIO
Hypervisors	in deployment	
Services servers	in deployment	
PSS	60% installed	
SSS	30% installed	
Image servers	30% installed	in deployment
Motors servers	in deployment	
Diags servers		development
Tango database		testbed validation
SetUp database		development
Result database		testbed validation
Cabling database		SIO

Figures (in evolution)

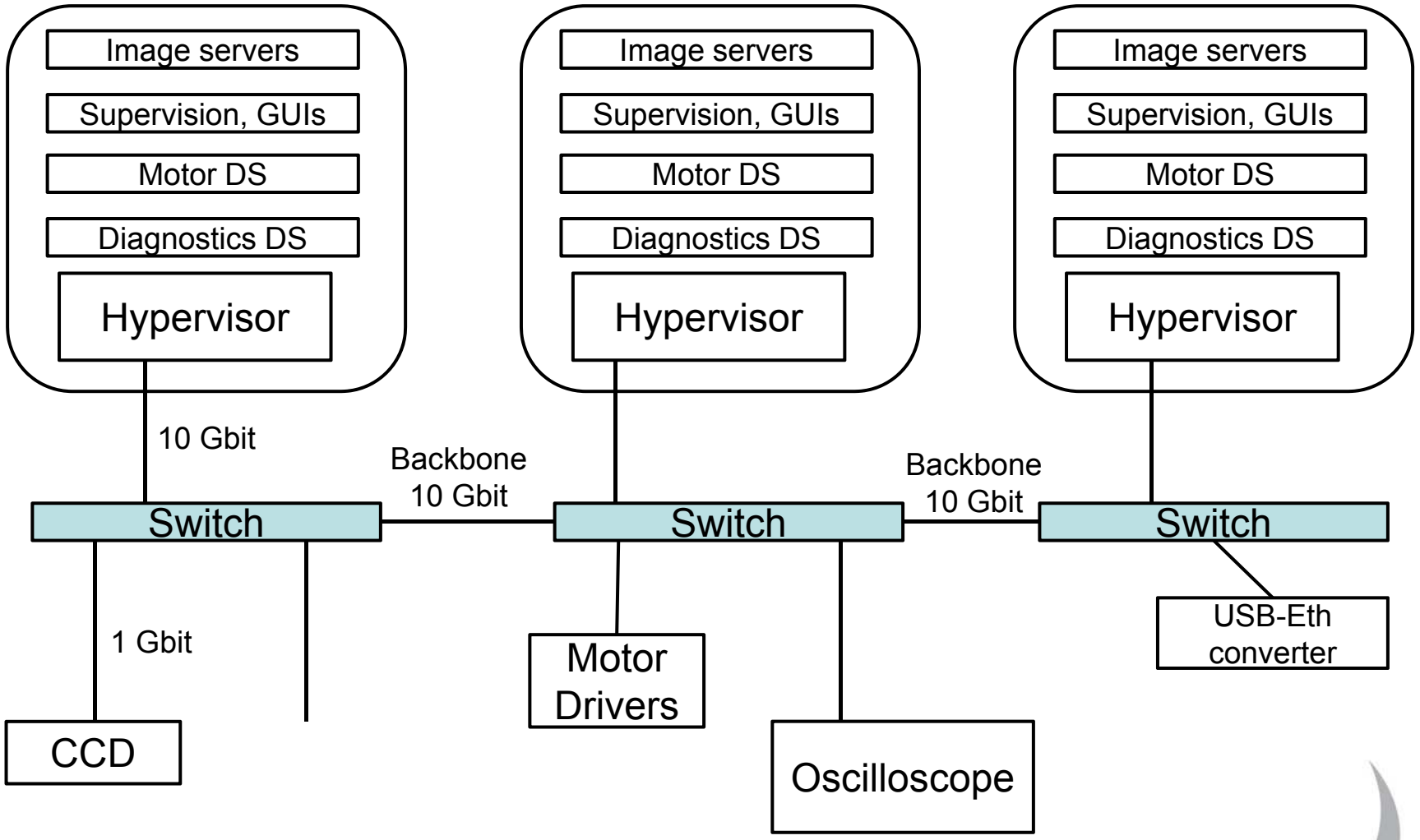
	Laser subsystem			Target areas		
	PSS	SSS	SSL	CF	LF	Total
binary inputs	92	480		TBD	TBD	572
binary ouputs	265	288		TBD	TBD	553
analog inputs		24		TBD	TBD	24
analog outputs		24		TBD	TBD	24
CCD			90	20	20	130
motors			190	62	50	302
pumps			36	10	22	68
valves			98	28	69	195
gauges			25	6	18	49

Minimum estimate

Target Area control systems



Virtualization concepts



Device names and colors conventions

Based on 3 fields Tango Device name :

Domain/Family/Member

Domain : Laser section or zone : 2 to 5 characters

Family : device type, 3 letters

Member : XXX_NNN, 3 letters and 3 digits

Colors convention = Tango convention

State	Colour
ON, OPEN, EXTRACT	Green
OFF, CLOSE, INSERT	White
MOVING, RUNNING	Light Blue
STANDBY	Yellow
FAULT	Red
INIT	Beige
ALARM	Orange
DISABLE	Magenta
UNKNOWN	Grey