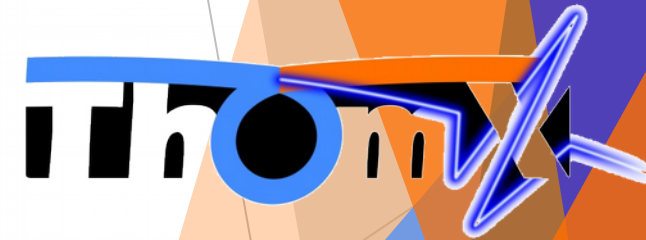


Control-Command

Olivier Dalifard, **Philippe Gauron**,
Jean-Claude Marrucho, Monique Taurigna
LAL

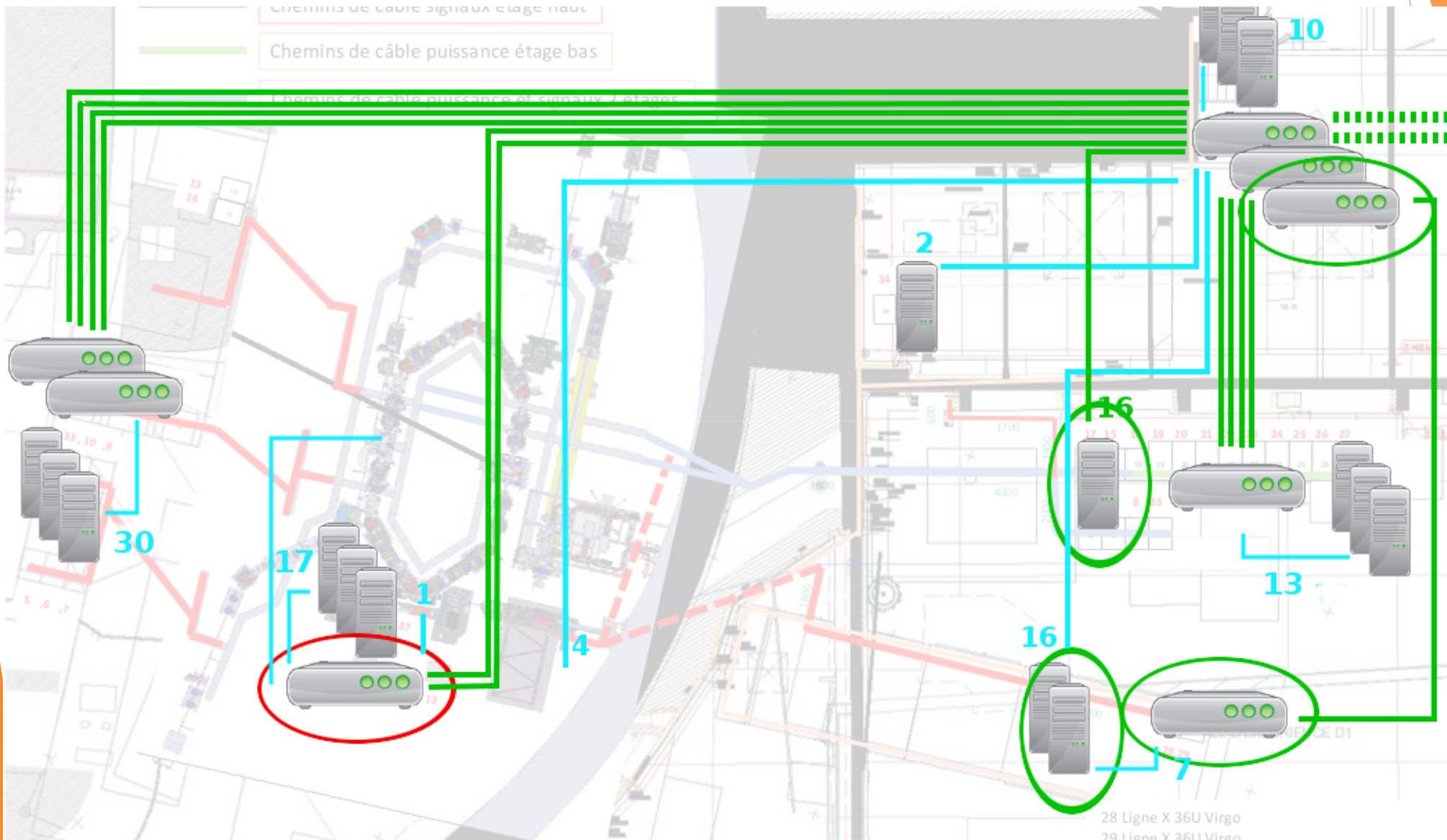


Control-command team organisation

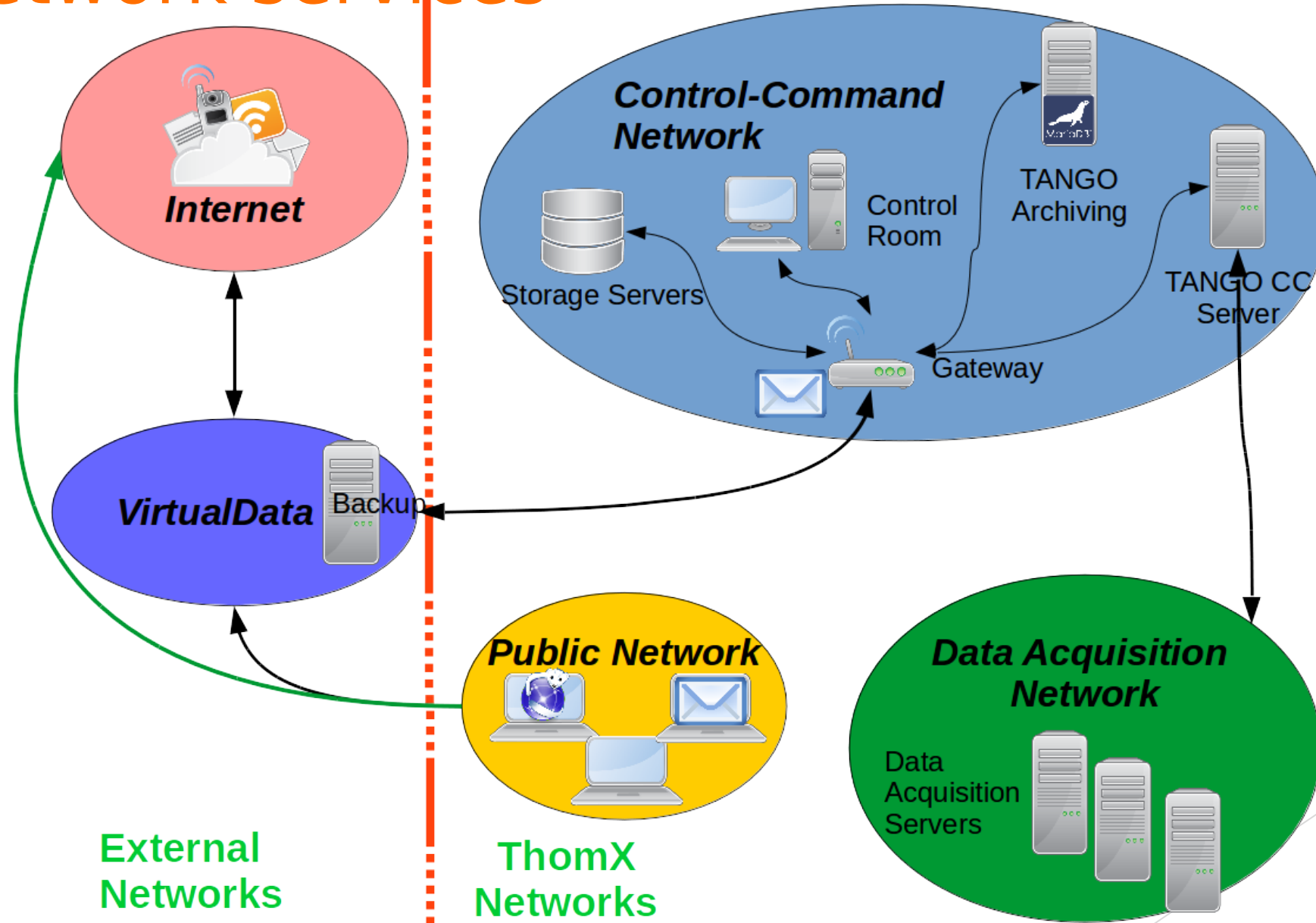
- ▶ Control team : 4 people (4 C++, 1 Java developer, 1 Labview, 2 python, 1 sysadmin) with support of laboratory IT group for system & network administration
- ▶ Responsibility area : DS development, acquisition PLC development, commissioning GUI, TANGO services, system & network infrastructure
- ▶ Development reference repositories on IN2P3 Gitlab through Mercurial
- ▶ Documentation : Atrium (content management system), trac (CC internal doc), gitlab (Markdown doc about code)



Network Interconnection



Network services



Network services access for users

Service	Description	Read	Write
eLog 	User logs	everywhere	everywhere
ArchivingRoot 	Archiving	everywhere	inside
Machine status 		everywhere	inside
SMTP from hardware	Sending error mail	-	inside
Atrium 	Project documentation	everywhere	everywhere
Gitlab 	Source code	everywhere	everywhere
Matlab token 	High-level GUI	yes	-
GLPI ticket 	Ticket management	everywhere	everywhere



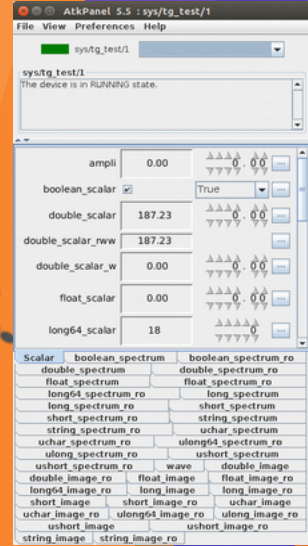
Control-command software

- ▶ Tests : hardware device servers are configured and tested on hardware, with equipment responsible if possible
- ▶ GUI specified with commissioning team and developed by CC group with 1 commissioning delegate, state: **80 % done, to validate**
 - GUI developped in Taurus (Qt+TANGO) : Laser, RF-Canon, Power supply, RF-section
 - GUI RF-modulator in Java
 - GUI developped in Labview for Vacuum, RF feedback motor
 - GUI for synchro done by users, **diag to be done**



Test environment for commissioning team

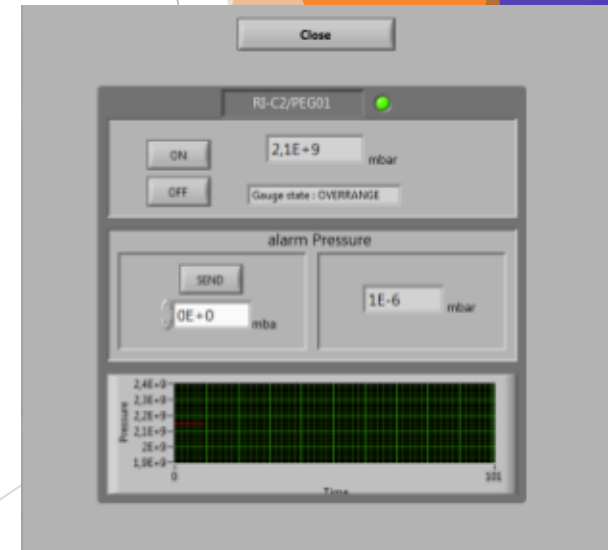
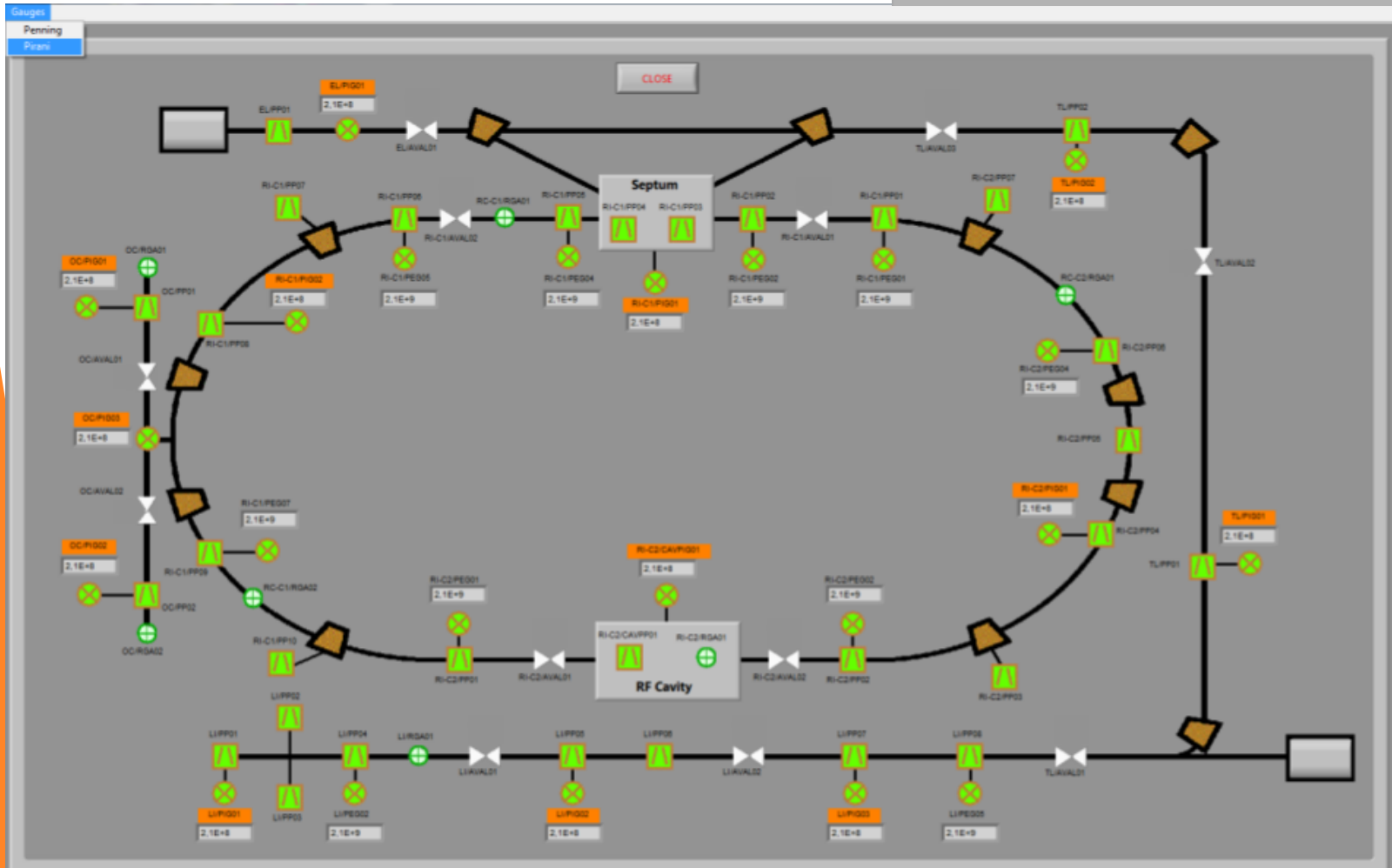
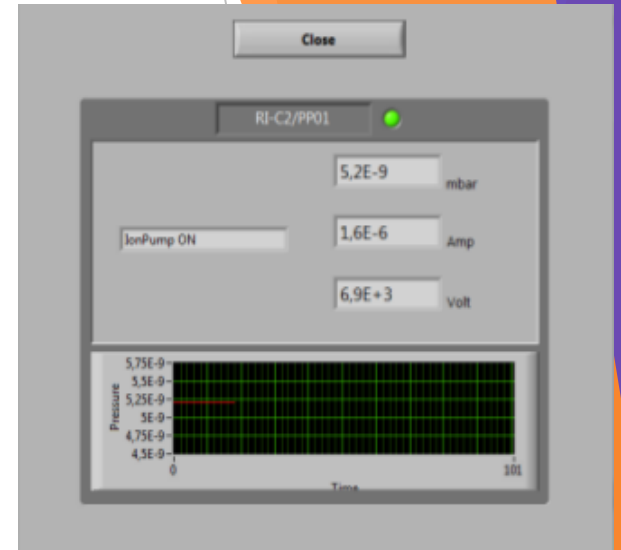
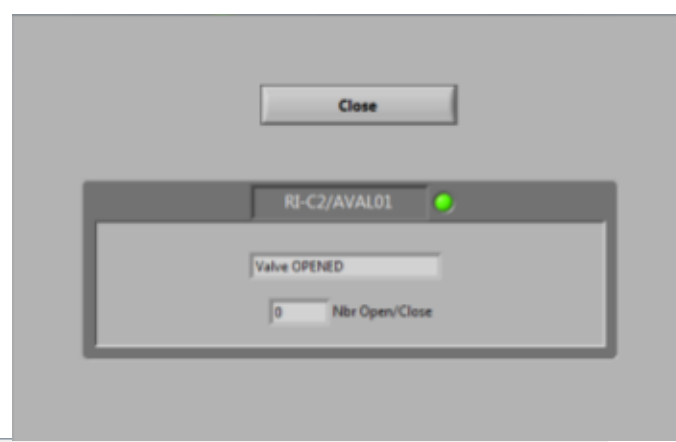
- ▶ Several test environment have been provided for commissioning tests
 - Commissioning team has Access to TANGO server, distinct from the real hardware, to allow test with MML and random values attributes through a TangoTest Device Server
 - Current installation of SimulatorDS simulating the real device servers TANGO attributes & commands
 - Commissioning laptops & testbed installed to test hardware with Device servers and validate them



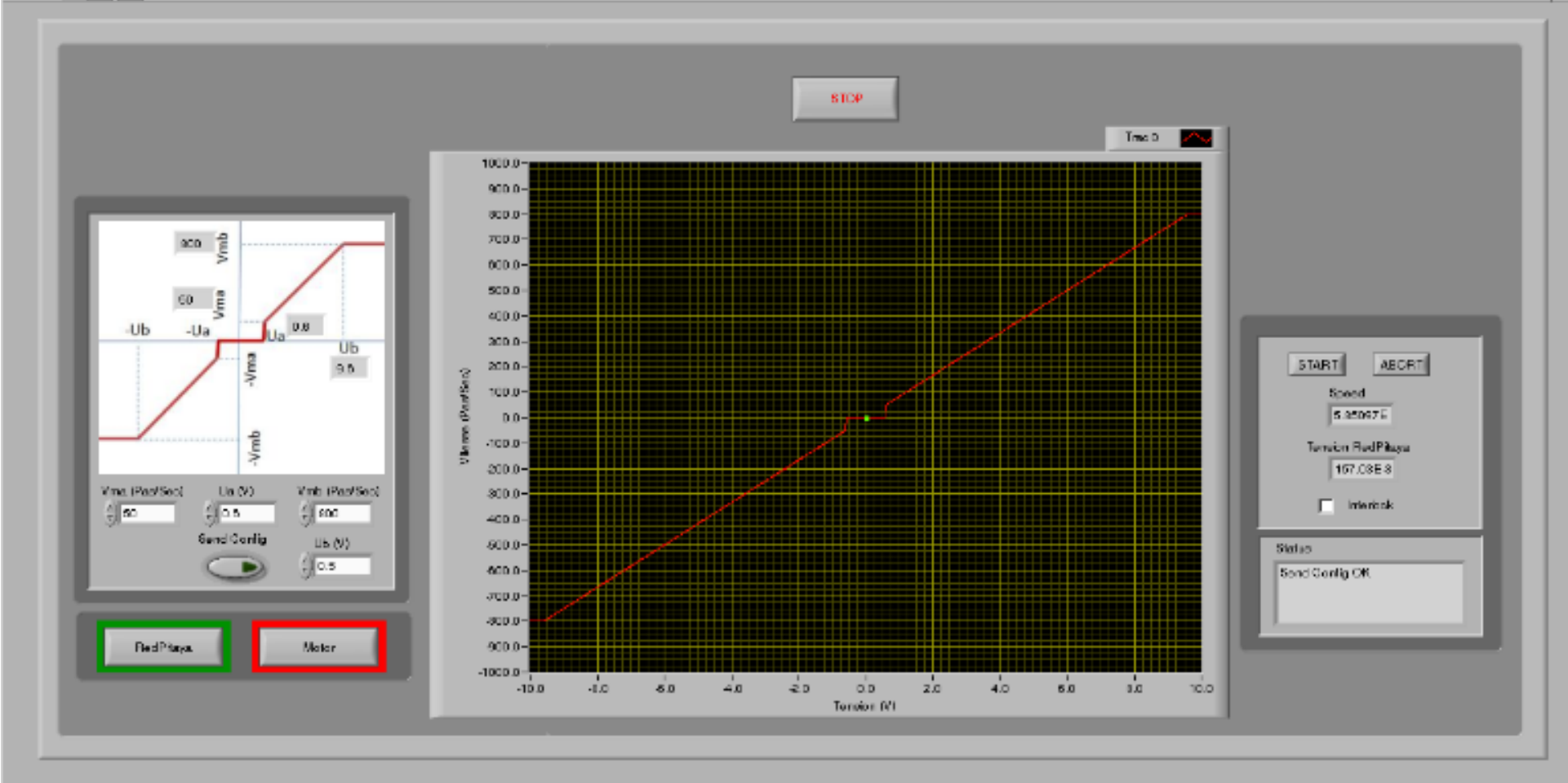
Commissioning GUI: Synchro



Commissioning GUI: Vacuum



Commissioning GUI: RF Feedback Motor



Commissioning GUI: Power supply

The screenshot shows the 'sys/tg_test/1' window. At the top, there is a 'State' indicator (a blue circle) and a 'Status' bar that reads 'The device is in RUNNING state.'. Below this, there are two rows of data: 'current' with a value of -143.15 and a setpoint of 0.00, and 'Voltage' with a value of 6.00 and a setpoint of 10.00. The 'current SP' is set to 20.00 with a numeric keypad below it. There are 'Reset' and 'Apply' buttons. At the bottom, a line graph shows 'Voltage' over time from 15:51:20 to 15:52:10. The voltage fluctuates between approximately 0 and 9 units.

The screenshot shows the 'Power Supply' window. It features a table with columns for 'State', '31 Devices', 'Current', 'Voltage', and 'Current'. A dropdown menu is open over the 'Zones' column, showing options: 'All', 'Linac', 'Transfer line', 'Extraction line', 'Ring-C1', 'Ring-C2', and 'All'. The table contains 10 rows of data, each with a blue circle icon, a 'sys/tg_test/1' label, and numerical values for current (-184.15), voltage (1.00), and current (20.00). There are also input fields for current setpoints (all set to 20.00) and checkboxes for each row. On the right side, there are buttons for 'Select All', 'Start Selected', 'Stop Selected', 'Current Set Point' (set to 0.00), and 'Send Selected'.



Commissioning GUI: RF Canon/Section, Modulator

RF CANON

Eau régulée **53.23** °C Atténuateur **53.23** 0.00

Température de consigne **0.00**

Vanne 1 Vanne 2 Vanne 3

Gradient **20.00**

Phase laser canon **0.00** °C Jauge vide **53.23** mbar

État laser on/off

Pression SF6 HF Igloo Pression SF6 HF Halle

Relecture délai photodiode **53.23** ms Relecture largeur PA **53.23** ms

Délai de déclenchement laser/PA **53.23** ms

Thermocouple **53.23** °C

— long64_scalar
— long_scalar

RF SECTION

Eau régulée **53.23** °C

Température de consigne **0.00**

Vanne 1 Vanne 2 Vanne 3

Phase section **120.19** °C

État laser on/off

Pression SF6 HF Igloo Pression SF6 HF Halle

Thermocouple **53.23** °C

MODULATOR

THOMX modulator

Capacitive Voltage Divider (kV) **0384.00**

Current Transformer (A) **0312.00**

Full Width Half Maximum (uS) **0003.80**

CCPS Set Value (V) **1100.00**

Switch PlswthSet (uS) **0003.80**

LI/HFH/SHF-01-MOD-01

Ver Simulator 1. Connected. Read access.

LI/HFH/SHF-01-MO... State: **TRIG**

StatusBits **03** AccessLevel **10** 0 = Remote



Commissioning GUI: Photocathod Laser

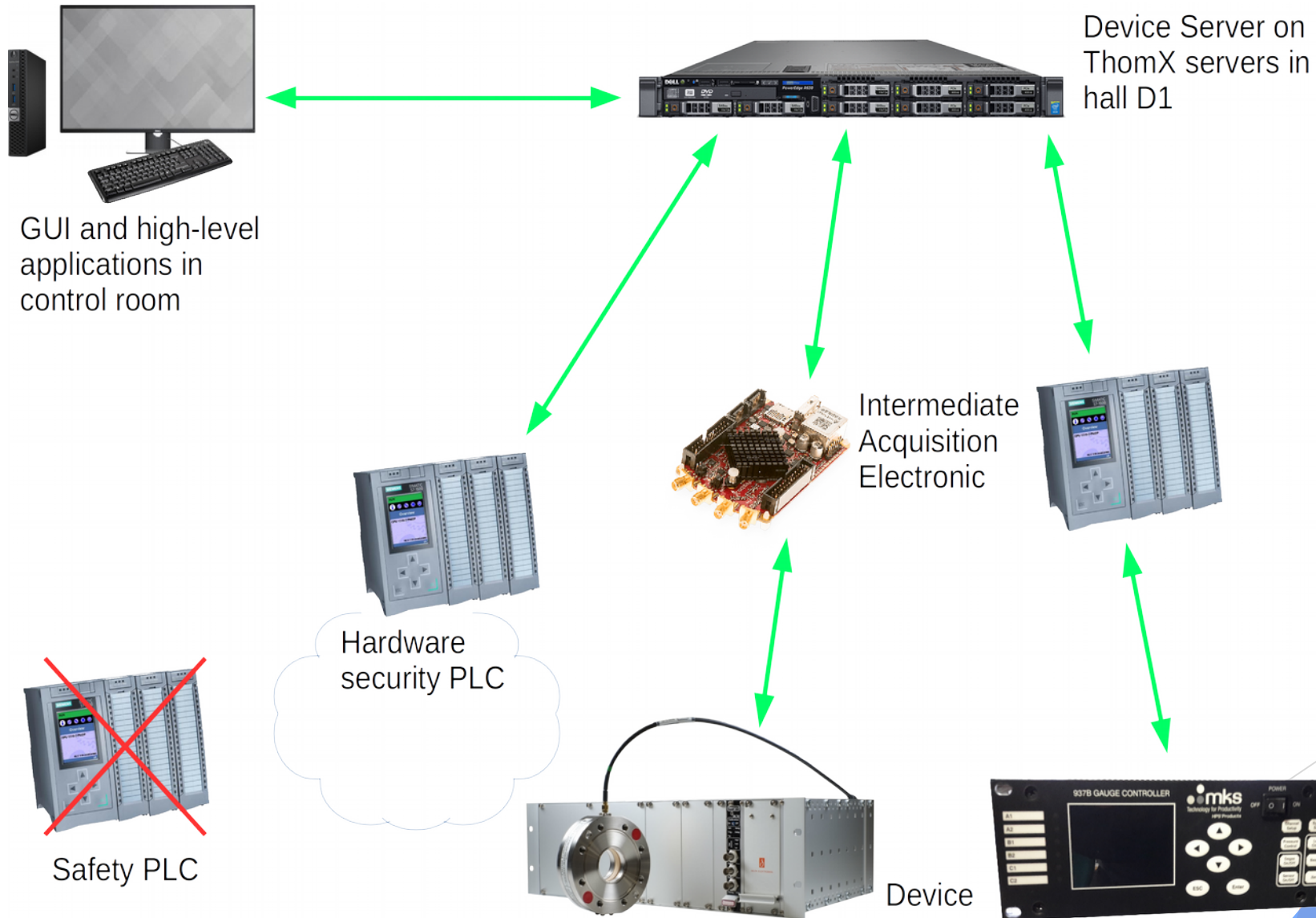
The screenshot displays the 'Laser photocathode' control interface. It features several sections:

- LASER:** Includes a radio button for 'État laser on/off' (currently off), a green progress bar for 'Energie mesurée' at -219.44 MeV, and a 'Lien soft' button.
- Synchro du Laser:** Includes a radio button for 'État on/off' (currently off) and a green progress bar for 'valeur du Jitter' at -219.44.
- Densité pilotable:** Includes a radio button for 'État laser on/off' (currently off) and a green progress bar for 'valeur' at -219.44.
- Miroir du Laser:** Includes a radio button for 'État du moteur on/off' (currently off) and a green progress bar for 'Position' at -219.44 mm, with a 'Lien soft' button below.
- Image Transverse du Laser:** Includes a radio button for 'État Camera on/off' (currently off) and a table of measured values:

Taille mesurée	-219.44	+/-	-219.44
	-219.44	+/-	-219.44
Barycentre	-219.44	+/-	-219.44
	-219.44	+/-	-219.44
- Retour Camera:** A camera view showing a laser spot on a grid, with a 'Lien soft' button above it.
- Miroir du Laser (bottom):** Another camera view showing a laser spot on a grid, with a 'Lien soft' button above it.



Data path from device to user



Data Management

▶ Archiving

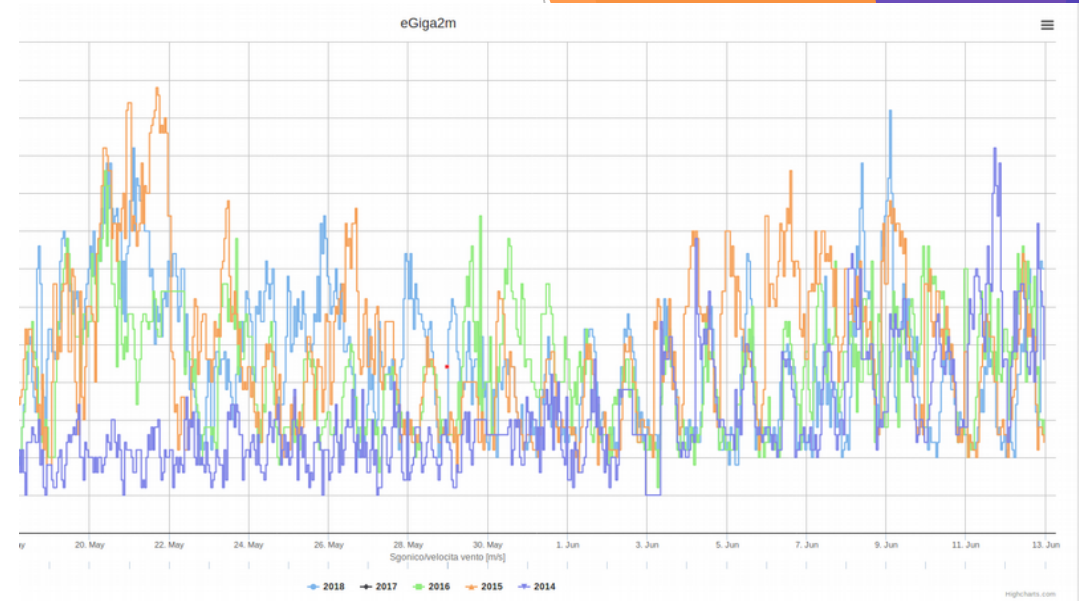
- For machine 'administration': slow control (t° , current)
- Uses ArchivingRoot with PyTangoArchiving (Archiving management) and egiga2m (web visualisation)
- Tested, to validate

▶ Data Acquisition (high rate)

- Device servers will directly provide data
- Data will be accessible for High-level applications

▶ Space disk estimation

- Archiving: 46 Gb
- Analysis: 5 Tb
- X line: 40 Tb



Postmortem organisation

- ▶ For control part
 - For the control part, this will be based on ArchivingRoot Snap to capture the machine state
 - PyAlarm Device Servers to evaluate conditions states
- ▶ Upside control part
 - PANIC alarm system : need to define the condition to enter postmortem
 - ArchivingRoot Snap : need to define device attributes to snap

Commissioning schedule

SubSystem	End of installation	CC commissioning
System and network	July 2018	-
Control room	September 2018	-
LINAC, Extraction Line, Transfert Line	October 2018	February 2019
Ring	February 2019	May 2019
FP cavity	July 2019	October 2019
X line table 1	November 2018	January 2019
X line table 2	July 2019	October 2019

- ▶ Identified risks
 - Disk space evaluation
 - GUI needs

Conclusion

- ▶ Commissioning GUI : 80 % done, to validate, 20 % (diag) to be done (users)
- ▶ Current development on first commissioning step (LI+EL+TL):
 - 119 controlled devices
 - 1 device to provide for commissioning (UV camera)
 - 1 device to be delivered by supplier (laser)

Status	#devices	#DS level1	#DS level2	ThomX dev.	External dev.
<i>Unchoosen</i>	10	5	0	5	0
<i>To develop</i>	12	8	1	7	2
<i>To validate</i>	34	9	6	5+5	5
<i>Tested</i>	378	10	8	1+2	15

Conclusion

- ▶ To be defined, depending on commissioning team needs:
 - discussion for synoptics needs & machine security
 - training on GUI and applications
 - Definition on alarm/warning threshold

Thank you for your attention and my acknowledgements to the CC team