



TANGO Control System Status

Status: A mature system

Collaboration issues

Next phase of development

EUROPEAN SYNCHROTRON RADIATION FACILITY

SYNCHROTRON SOLEIL

SYNCHROTRON ELETTRA

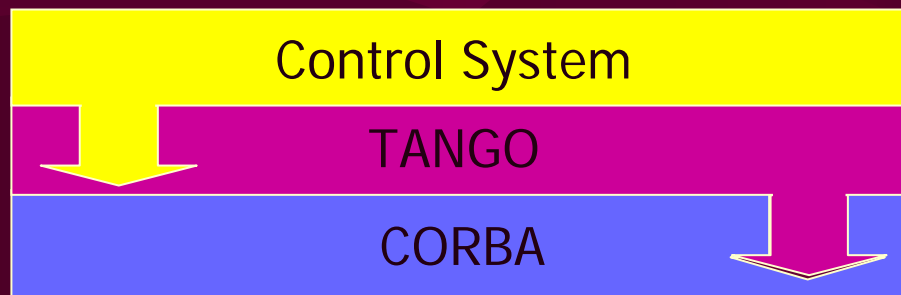
SYNCHROTRON ALBA

JM Chaize, ESRF PCAPAC
Jefferson Lab 2006



What is TANGO ?

- A CORBA framework for doing control
 - A toolbox to implement the system
 - A specialization of CORBA adapted to Control
 - Hide the complexity of Corba to the programmer





A software bus

Generic Services

development tools



API Library

TANGO Software Bus distributed on a network



Hardware Hardware Hardware Hardware Hardware

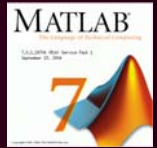


Catalog of device servers



Much more than a software bus

- Code generator for C++, Java
- Configuration tool
- Administration tool
- Archiving service
- Access control service
- Logging service
- Scan service
- Application Toolkit for Java
- Application Toolkit for QT
- Synopsis animation tool
- Alarm service
- Web interface
- Python client and servers
- Bindings for Matlab
- Bindings for Labview
- Binding to a SCADA
- Bridge with EPICS
- Many utility classes
- List of abstract classes
- Hardware access class catalog
- Mailing list and Wiki
- Tutorials





Jdraw: Generic Synoptic animation

The screenshot displays the Jdraw software interface. The main window shows a synoptic diagram of the BM22 Infrared Station. The diagram includes the following components: Storage ring, Movable Mirror, Absorber, M2, M3, M4, M5, M6, Tunnel Roof, Diamond, and Microscope. A red line connects the Movable Mirror component in the diagram to the control panel on the right.

The control panel, titled "AtkPanel : sr/d-irm/id22", has a menu bar with "File", "View", "Preferences", and "Help". It shows the selected component "sr/d-irm/id22" with a green indicator. The status text reads: "The IR Mirror is ON. It's position is controlled by a closed loop. The IR Mirror is in slotted mode". Below the status, there are several data fields with values and edit buttons:

HM average T	48.96 deg C	...
SM Upper average Temp	52.18 deg C	...
SM Lower average Temp	52.70 deg C	...
SM Temp diff	-0.52 deg C	...
Mirror position	-49150. um	-0049150 ...

At the bottom of the control panel, there is a "Scalar" tab.



Jive

Database browser and Test Device Launcher

The screenshot displays the Jive 3.7 software interface, which is a database browser and test device launcher. The main window is titled "Jive 3.7 [Orion:11000,orion:10000]" and features a menu bar with "File", "Edit", and "Tools". Below the menu bar is a tree view showing a hierarchy of servers and devices. The tree is organized into folders: "Server", "Device", "Class", "Alias", and "Property". The "Device" folder is expanded, showing a list of devices including "LiberadbControl", "Linac", "LinacCooling", "LinacGun", "LinacGunAux", "LinacGunHVPS", "LinacHVPS", "linac", "SAdc150", "SDac712", "LinacHVPS", "elin/mod1/hv", "elin/mod2/hv", "LinacModAux", "LinacModulator", "LinacRF", "LinacSequence", "logconsumer", "MachstatWrap", and "MBFeedback". A context menu is open over the "elin/mod2/hv" device, listing actions such as "Copy", "Paste", "Rename", "Delete", "Monitor device", "Test device", "Define device alias", "Go to device node", "Restart device", and "Device wizard".

The "Device Info" panel shows the following details for the selected device:

```
- Device Info -----
Device:          elin/mod2/hv
type_id:        IDL:Tango/Device_3:1.0
iiop_version:   1.2
host:           1-pinj-2 (160.103.72.52)
port:           33237
Server:         LinacHVPS/linac
Server PID:     3711
Exported:       true
```

The "Polling Status" panel shows the following information:

```
- Polling Status -----
Polled command name = State
Polling period (mS) = 2000
Polling ring buffer depth = 10
Time needed for the last command reading (mS) = 0.678
Data not updated since 1 S and 472 mS
Delta between last records (in mS) = 2000, 2000, 2000,

Polled command name = Status
Polling period (mS) = 2000
Polling ring buffer depth = 10
Time needed for the last command reading (mS) = 0.852
```

The "Device Panel" for "elin/mod2/hv" shows the following attributes:

Attribute	Name	Status
HighVoltage		
HVDac	Label	Status
State	Writable	READ
Status	Data format	Scalar
	Data type	DevString
	Max Dim X	1
	Max Dim Y	0

The "Device Panel" also shows the following polling status information:

```
Attribute: elin/mod2/hv/HVDac
Duration: 0 msec
measure date: 25/09/2006 16:31:12 + 724ms
quality: VALID
Read: 0.0

Attribute: elin/mod2/hv/State
Duration: 0 msec
measure date: 25/09/2006 16:31:19 + 562ms
quality: VALID
DISABLE

Attribute: elin/mod2/hv/Status
Duration: 0 msec
measure date: 25/09/2006 16:31:27 + 961ms
quality: VALID
Read: Can' t be switch on while :
Modulators are not warm
Bad focus current 1 in klystron 2
Bad focus current 2 in klystron 2
Bad focus current 3 in klystron 2
Modulator 2 HV relay closed
```




POGO Device Server Code Generator

File Edit Help

- New Class Ctrl-N
- Open Ctrl-O
- Import Ctrl-I
- Generate Source Ctrl-G
- Generate Doc Ctrl-H
- Exit Ctrl-Q

Inherited from: PowerSupply
Revision: Release_1_0
Author:
Class Repository: ESRF

- Status
 - Off
 - On
 - Reset
 - Standby
 - Warmup
- Attributes
 - Current
 - Voltage
 - Frequency
 - CurrentSetPoint
- States
 - Tango::ON
 - Tango::OFF
 - Tango::FAULT
 - Tango::STANDBY

POGO Language Generated: C++ Java

Command Window

Command Name:

Argin Type: Tango

Argin Description:

Argout Type: Tango

Argout Description:

Command: Set the

Edit Attribute Window

Attribute name: **current**

Attribute Type: SCALAR

Data Type: Tango::DEV_DOUBLE

Read/Write Type: Tango::READ_WRITE

Expert Only
 Polled

Default Attribute Properties

Label	Current
Unit	Amperes
Standard Unit	A
Display Unit	A
Display Format	%6.3f
Max. Value	15
Min. Value	0
Max. Alarm	15
Min. Alarm	0
Description:	Current

Allowed for State... OK Cancel

Allowed for State... Default Properties OK Cancel

C++ or Java



ATKpanel a generic client

The screenshot displays the ATKpanel software interface. A central dialog box titled "Attribute property editor" is open, showing the following details:

- Identification: Device: sy/ps-sext/defocusing, Attribute: dc
- Current value: 9.55 Amp (displayed in a green box)
- Properties: Label: dc, Minimum value: 0, Maximum value: 20, Minimum alarm: 9, Maximum alarm: 10, Format: %4.2f, Unit: Amp
- Description: Actual DC current in the defocussing sextupole|
- Buttons: Apply change, Information, Dismiss

The main interface shows a list of parameters on the left:

- bpss t0: 100299 us
- dc voltage: 17.88 Volt
- dc current: 0.02 Amp
- rms voltage: 0.08 Volt
- rms current: 0.01 Amp
- dc: 9.40 Amp (with a numeric keypad showing 09.40)
- rms: 6.25 Amp (with a numeric keypad showing 06.25)
- phase: 0 us (with a numeric keypad showing 00000)
- ac 1: 100.00 %
- ac 2: 0.00 % (with a numeric keypad showing 000.00)
- ac 3: 0.00 % (with a numeric keypad showing 000.00)
- ac 4: 0.00 % (with a numeric keypad showing 000.00)

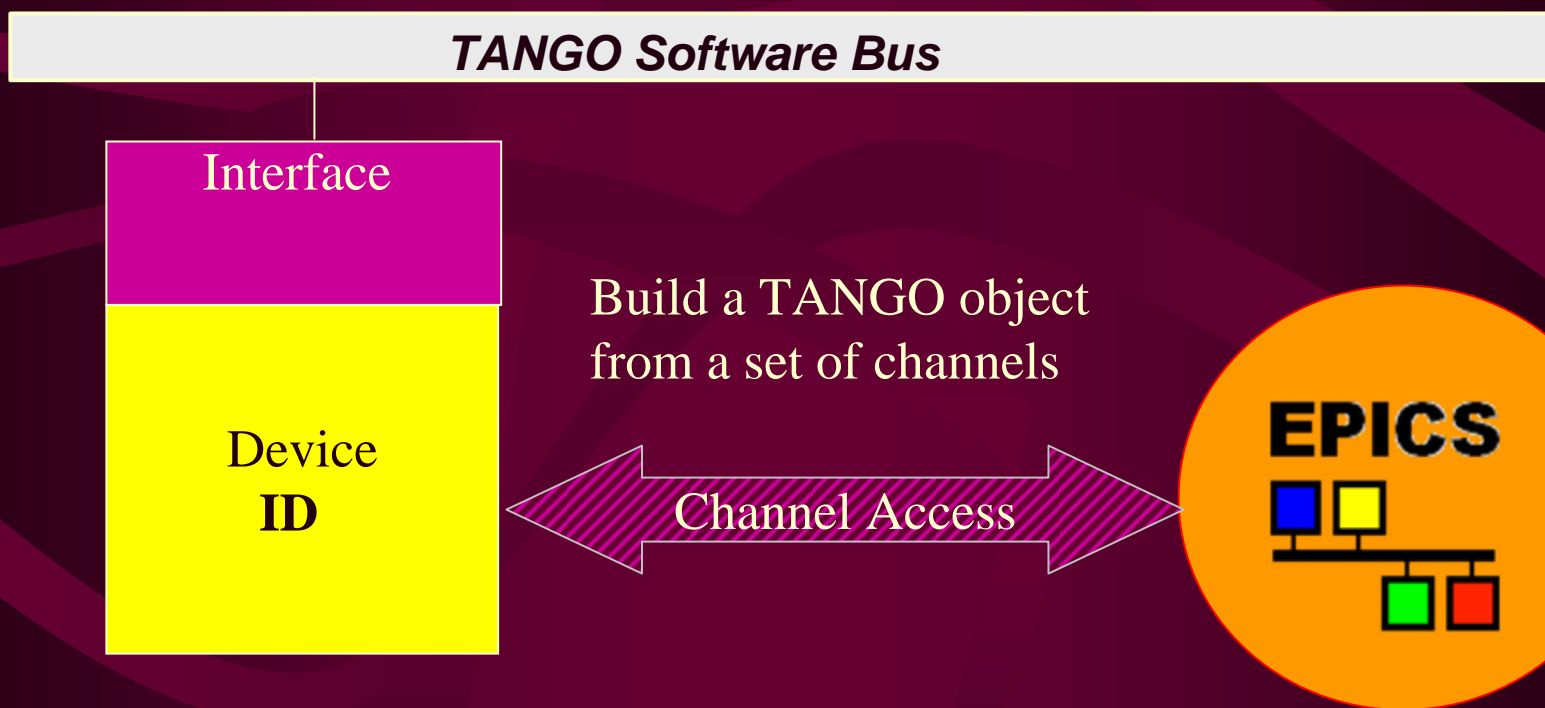
At the bottom, there are tabs for "Scalar", "voltage_wave", "current_wave", and "wave_preview". A graph on the right shows a red waveform labeled "sy/ps-sext/defocusing/voltage_wave (Y1)" with a y-axis from 363.0 to 364.0 and an x-axis from 0.0 to 250.0. A "View Graph" checkbox is checked.



TANGO to EPICS bridge

- Read an EPICS sub system from a TANGO client

An object oriented layer
above EPICS...





EPICS to TANGO bridge

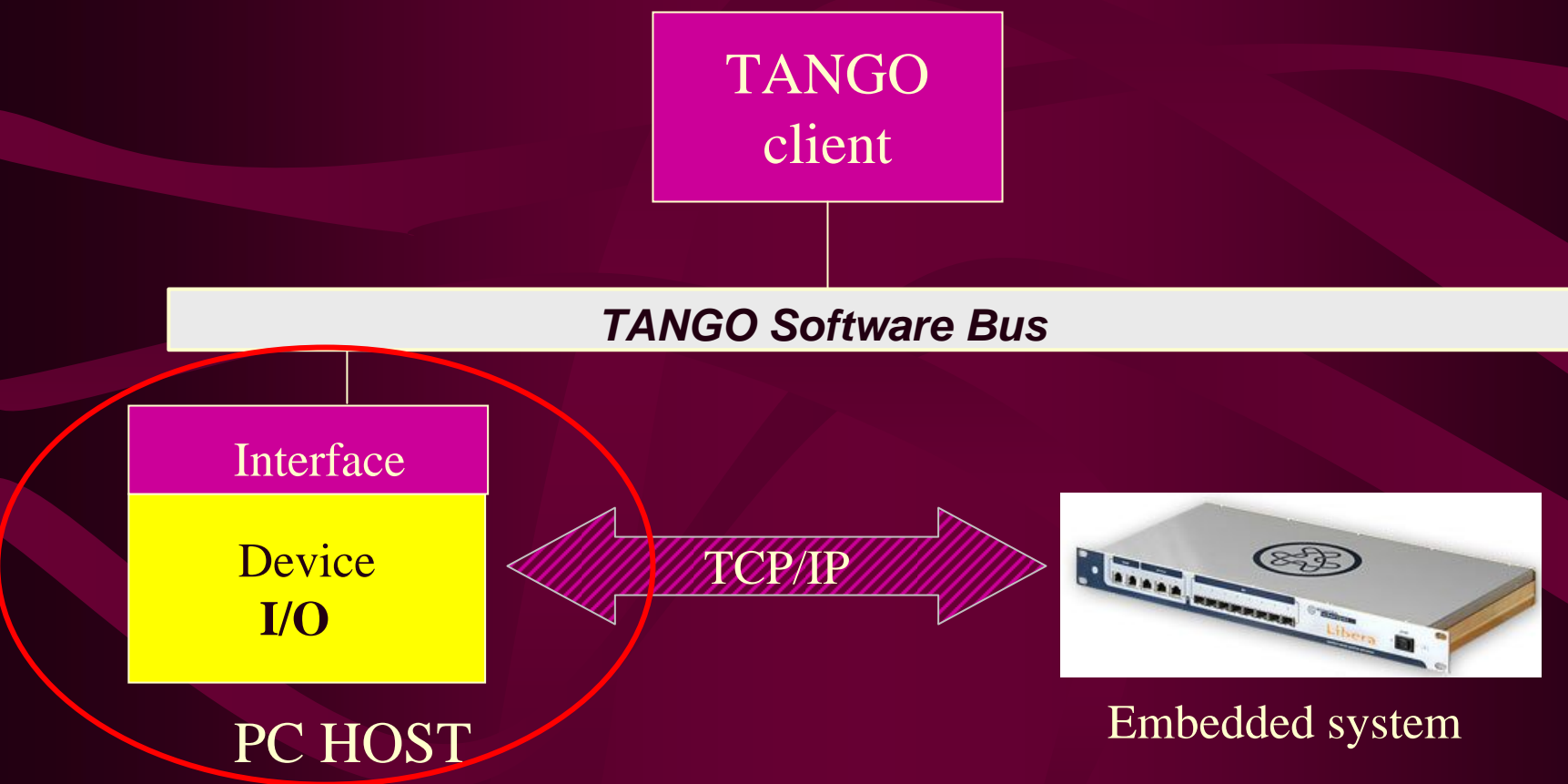
- Integrate a TANGO server to an EPICS control system





Embedded TANGO servers

- Traditional architecture





Embedded TANGO servers

- Embedded server

Refer to
Talk of G. Gaio
This afternoon



TANGO Software Bus

Interface



Embedded system



Embedded TANGO servers

- Next steps

Project in progress
at ESRF



TANGO server
Mapped into a
FPGA





Embedded TANGO servers

- Next steps

TANGO
client

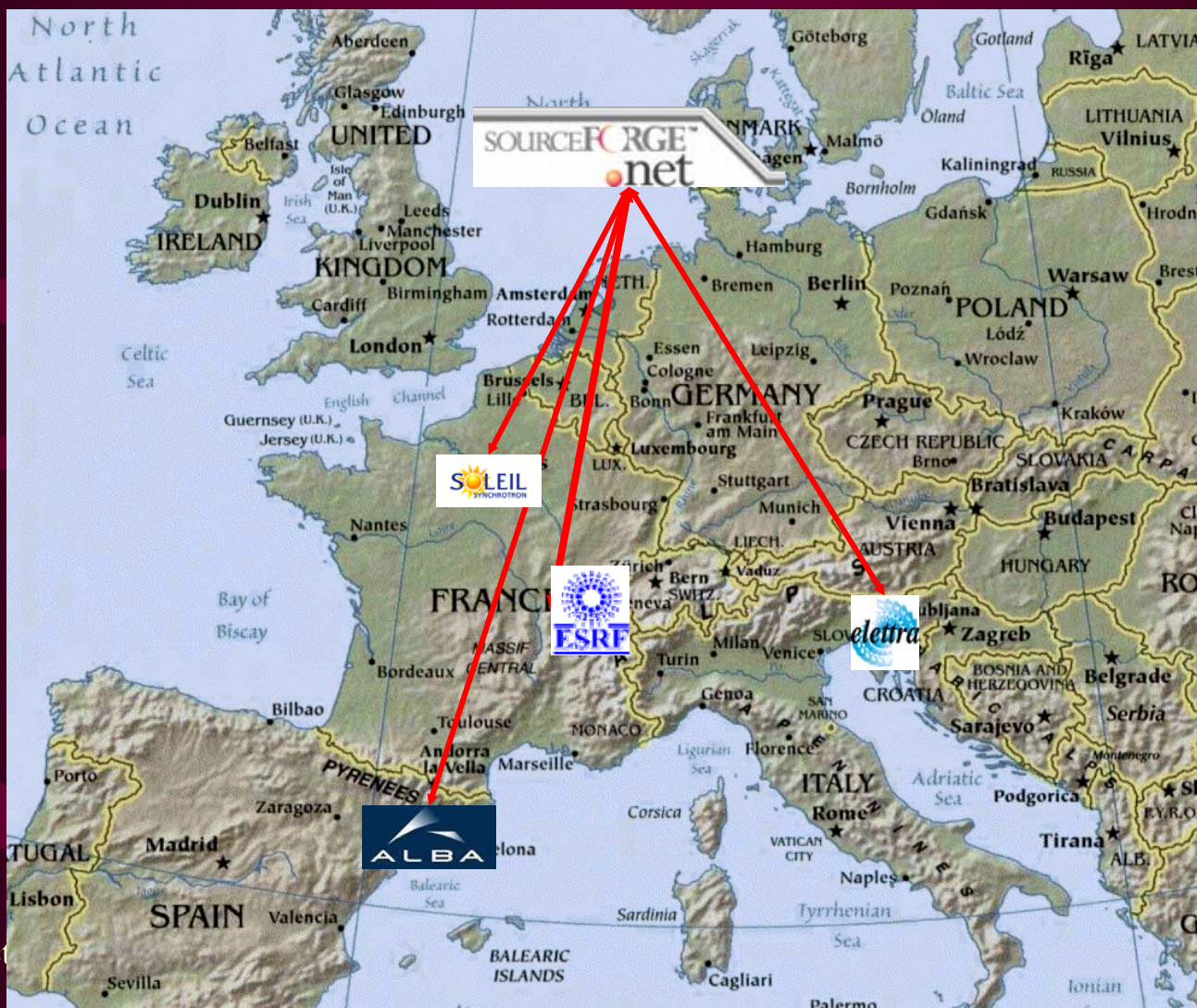
TANGO Software Bus

Gumstix SBC





Collaboration





Collaboration

- 4 institutes, around 20 programmers (not full time)
- responsibilities well defined.
- Fruitful open source Sourceforge project
- Workload sharing.
- 2 “mature” institutes (ESRF and ELETTRA)
 - Modernization program
- 2 institutes in construction phase (SOLEIL and ALBA)
- 4 plenary meetings a year
- The first goal is reached : TANGO is working





TANGO@esrf

Grenoble (France)

Light source 6 GeV
(844m)

40 beamlines

Light for users since 1992

Control system modernization

- 150 control computers
- Linux, Windows, Solaris
- VME, PC, CompactPCI, SUN



Tango used for accelerator control

- 350 servers running, 1400 devices on 97 hosts

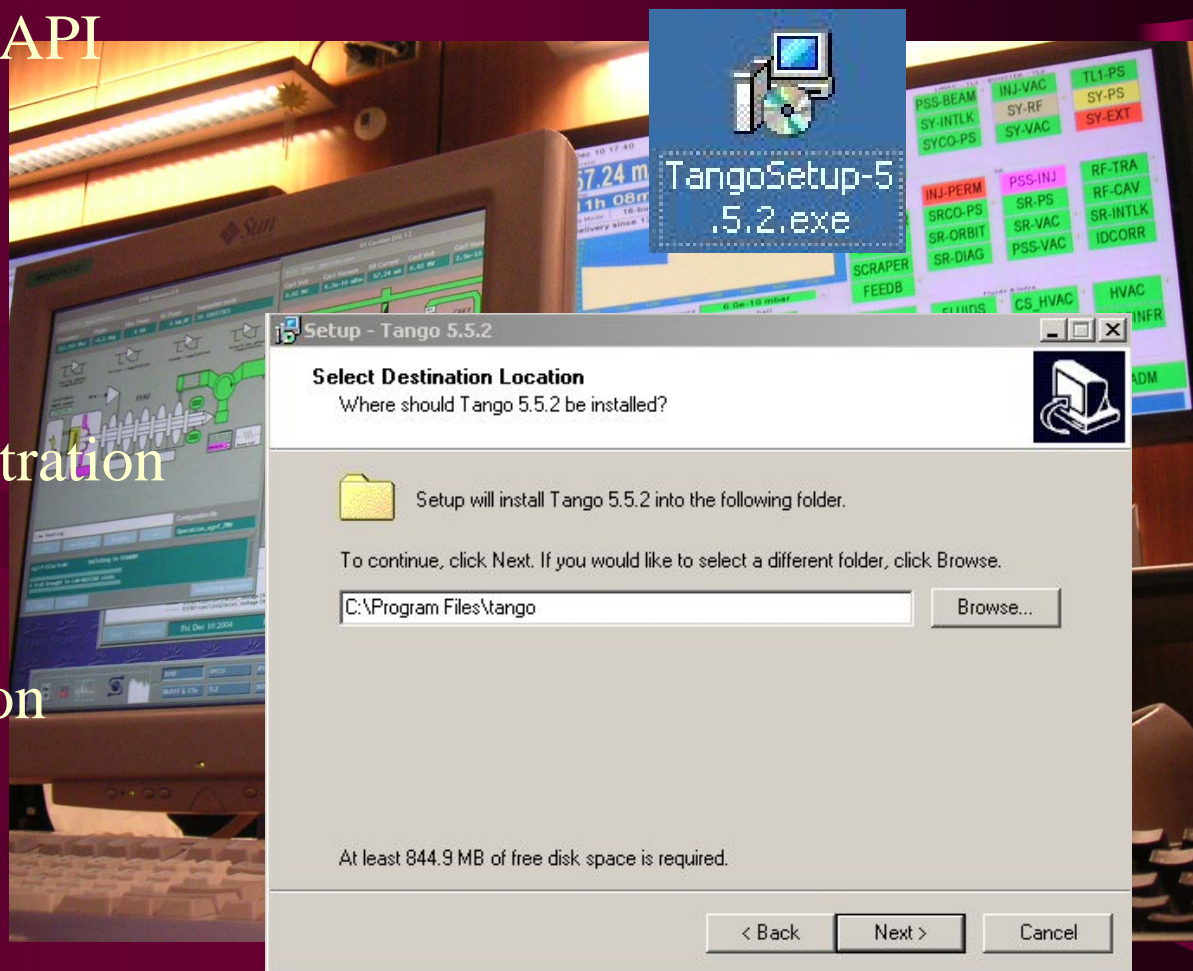
20 beamlines over 40 started with TANGO

20 different instances of TANGO



TANGO@esrf

- Core development C++ API
- Java API
- class generator
- database server
- database browser
- Control System administration tool
- Java ATK
- Synoptic editor/animation
- ...





TANGO@soleil

Gif sur Yvette (France)

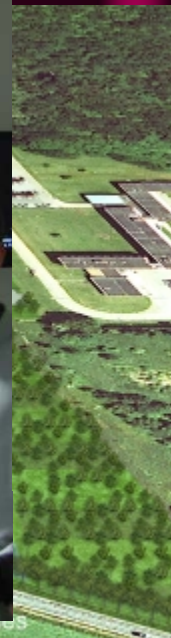
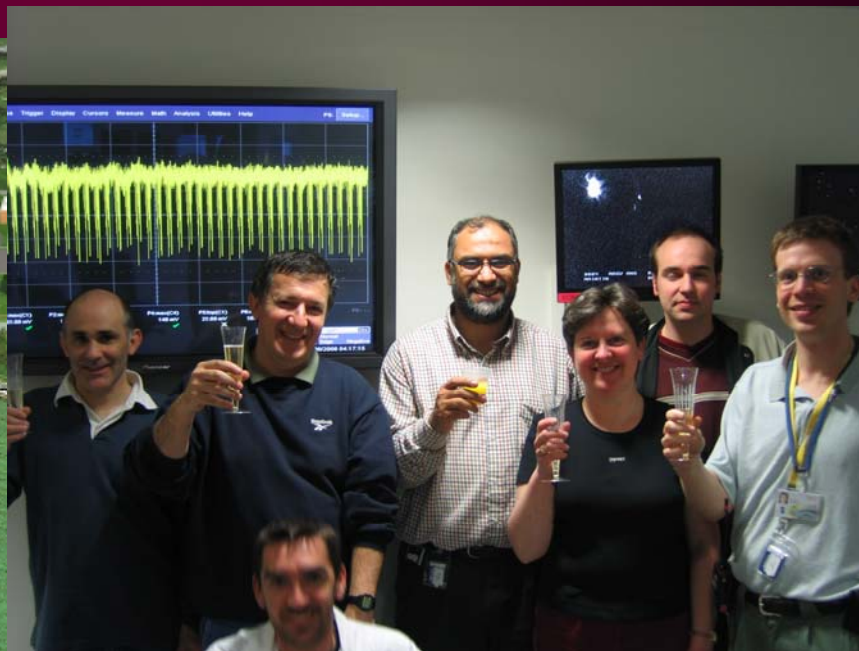
Light Source 2.75 GeV
(345m)

23 beamlines

Linac, Booster in operation

Storage ring commissioned,

First beam on beamlines



Tango used for accelerator and beamlines control

8000 devices in operation for the accelerator

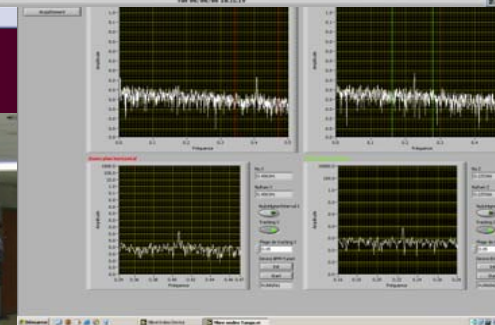
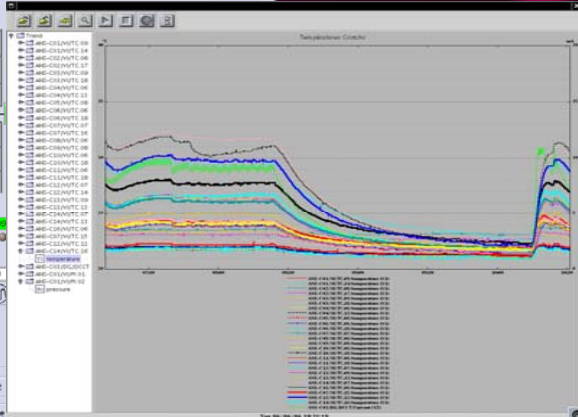
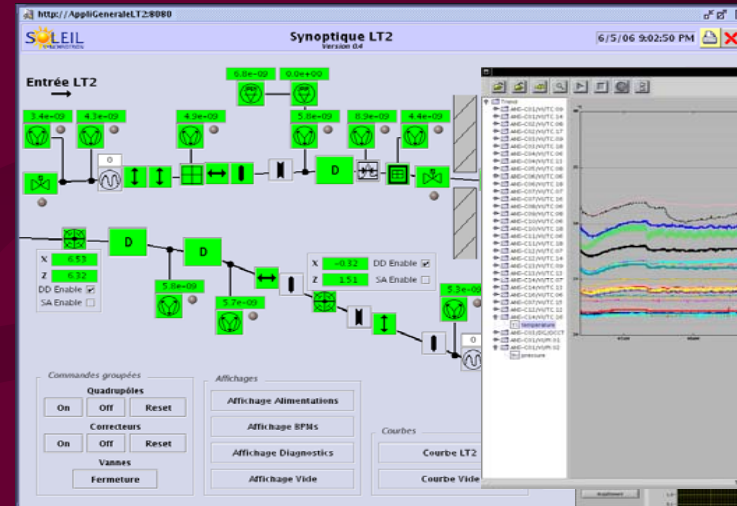
First beam on beamlines

First institute exclusively based on TANGO



TANGO@soleil

- Scada interface
- History database
- Java panels
- Industrial I/O classes
- Many utility classes
- Matlab and labview bindings
- Logging system
- Etc...





TANGO@elettra

Trieste (Italy)

Light source 2-2.4 GeV
(260m)

1Gev Linac, no booster

Light for users since 1993

21 beamlines, 1000 users annually

Control system modernization:

PC with Linux

VME, PowerPC, Linux+RTAI



Booster Injector

FERMI@ELETTRA

Tango used for accelerator control system upgrade:

- 140 servers running (RF Master Oscillator Plant, Digital BPM, Fast Local Orbit Feedback...)

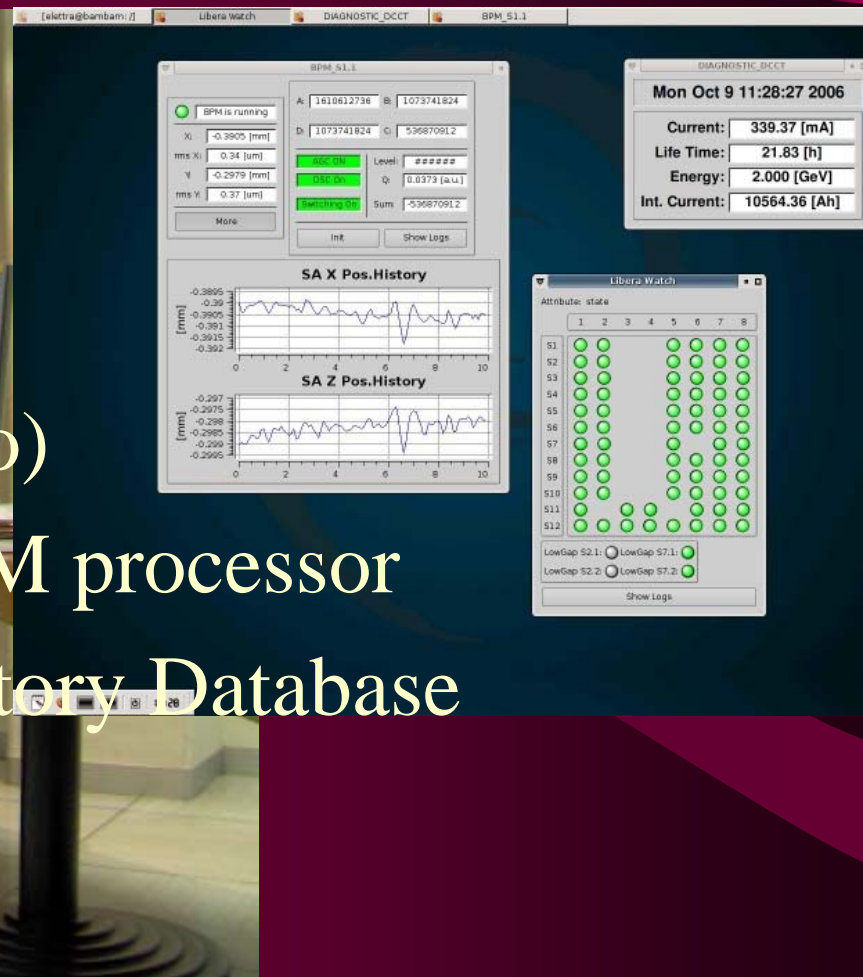
Tango is the control system of the new projects:

- Booster injector (Commissioning June 2007)
- Free Electron Laser (FEL) FERMI@ELETTRA



TANGO@Elettra

- Database clustering
- Web interface
- Alarm system
- Qt/C++ toolkit (Qtango)
- Porting servers on ARM processor
- Archive events for History Database
- Etc...





TANGO@alba

Barcelona (Spain)

Light source 3 GeV
(268.8 m)

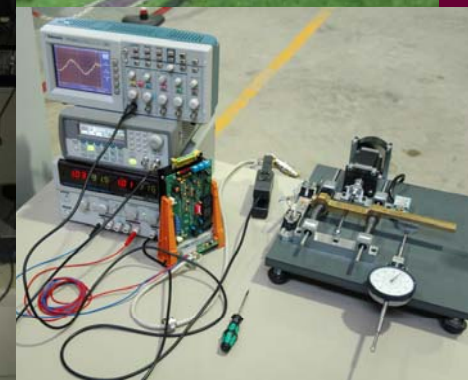
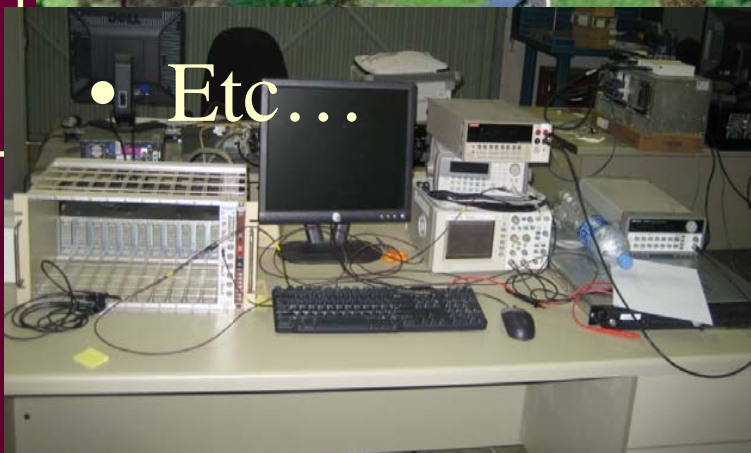
23 straight sections

Emittance = 4.3 nmrad

Starting construction soon

Light for the users: 2009

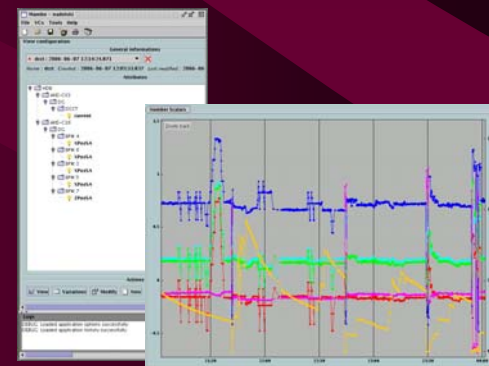
Tango will be used for
accelerator and beamlines
control





Examples of co-development

- Libera BPM
 - server developed at Soleil
 - ESRF ported TANGO server API
 - ELETTRA ported the server and embedd it in the controller.
- History Database
 - server developed at Soleil based on polling
 - Archive event system developed at ESRF
 - ELETTRA added the Archive events mechanism





What can be improved...

- Huge number of device servers developed
 - Difficult to have an overview
 - Need to better classify, identify, find...
 - Better use of abstract interfaces
- 4 different web sites
 - Tango-controls.org has been created
- A lot of different GUI tools
 - Can be integrated in a workbench...





Increasing number of users

- TANGO and universities
 - (UK, France)
- New users and existing servers
- TANGO discussion
 - (Spain)
 - ...
- Last collaboration enlarged audience
 - 11 institutes represented
- Need to define new rules for decision making





New collaboration rules

- Management board defining the strategy
 - 4 people (1 coordinator per institute)
 - Regular cyber meetings
- Different working groups by center of interest
 - History Database
 - Industrial I/O
 - Java ATK
 - Web site
 - Embedded systems
 -
- Plenary sessions twice a year





The work continue...

- Move to a unique web site <http://tango-controls.org>
- Build an Eclipse Workbench
- Distributed naming service
- FPGA embedded TANGO
- Better manage the large number of available classes
 - Search machine...
- Better packaging
- Generalization of abstract interfaces
 - More generic servers
- Java GUI panels supplied for each abstract interface
- Split the documentation in several books
- Tutorials and examples...





Thank you for your attention

- WWW sites for TANGO
 - New common site <http://tango-controls.org>
- <http://sourceforge.net/projects/tango-cs>

Thanks to TANGO team of
ESRF, SOLEIL, ELETTRA and ALBA