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**

- Data Analysis
- Config
- Monitor
- Sequencing
- Archiving
- Application Tool-Kit

**Development tools**

- User environment (Matlab, Labview, Igor, Python)

**API Library**

TANGO Software Bus distributed on a network

**Catalog of device servers**

- Hardware
- Device
- Device
- Device
- Device
- Device

**Interface Generator**
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
Jive
Database browser and Test Device Launcher
POGO Device Server Code Generator

C++ or Java
void Hazemeyer::write_Current(Tango::WAttribute &attr)
{
    DEBUG_STREAM << "Hazemeyer::write_Current(Tango::WAttribute &attr) entering."
    // Add your own code to control device here
}

void Hazemeyer::off()
{
    DEBUG_STREAM << "Hazemeyer::off(): entering...!" << endl;
    // Add your own code to control device here
}

void Hazemeyer::on()
{
    DEBUG_STREAM << "Hazemeyer::on(): entering...!" << endl;
    // Add your own code to control device here
}

Device Attributes Description
Hazemeyer Class
Revision: Release_1_0 - Author:

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data Type</th>
<th>R/W Type</th>
<th>Export</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>DEF_DOUBLE</td>
<td>READ_WRITE</td>
<td>No</td>
</tr>
<tr>
<td>Voltage</td>
<td>DEF_DOUBLE</td>
<td>READ</td>
<td>No</td>
</tr>
<tr>
<td>Frequency</td>
<td>DEF_DOUBLE</td>
<td>READ</td>
<td>Yes</td>
</tr>
<tr>
<td>CurrentSetPoint</td>
<td>DEF_DOUBLE</td>
<td>READ</td>
<td>No</td>
</tr>
</tbody>
</table>
ATKpanel: a generic client

9.55 Amp
Astor/Starter
Tango Control System Manager

- Get host list
- Get status
- Get server list

DB server → Ethernet → Starter server

Host 1
TANGO to EPICS bridge

• Read an EPICS sub system from a TANGO client

An object oriented layer above EPICS...

TANGO Software Bus

Interface

Device ID

Build a TANGO object from a set of channels

Channel Access

EPICS
EPICS to TANGO bridge

- Integrate a TANGO server to an EPICS control system

EPICS CA SERVER

- Push attributes
- Build a channel

EPICS Device support

- In Channels
- Per attribute

TANGO Device discover

EPICS/TANGO C++ DLL

TANGO Software Bus

Interface

Micro diff Device

TANGO Client

Client
Embedded TANGO servers

- Traditional architecture

![Diagram of TANGO architecture with TANGO client, TANGO Software Bus, Interface, Device I/O, and PC HOST connected via TCP/IP and Embedded system]
Embedded TANGO servers

• Embedded server

Refer to Talk of G. Gaio
This afternoon

TANGO Software Bus

Interface

Embedded system

TANGO client
24th October 2006 JM Chaize, ESRF   PCAPAC Jefferson Lab 2006

Embedded TANGO servers

• Next steps

TANGO Software Bus

TANGO client

TANGO server
Mapped into a FPGA

Project in progress at ESRF
Embedded TANGO servers

- Next steps

![Diagram of TANGO client connected to TANGO Software Bus via Gumstix SBC](image)
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
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
- ...

24th October 2006

JM Chaize, ESRF PCAPAC Jefferson Lab 2006
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 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

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
TANGO@Elettra

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

**TANGO@alba**
- Python server
- Industrial I/O Abstract classes
- Motor control classes
- Motor/Counter device pool
- New web site
- Etc…
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
Examples of co-development

- Database server
  - Server developed at ESRF
  - Add multiple servers and clustering by ELETTRA
- Java ATK
  - Core developed by ESRF
  - Panels developed at SOLEIL/ESRF
- And many other cases…
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 used in several schools and universities
  - (UK, France, Italy, Germany…)
- New users (EMBL, CEA…) developing servers
- TANGO for Petra-3 beamlines in discussion
  - (Spectra + Pearl interface)
- Last collaboration meeting with 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…
• 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