

# TANGO Controls Collaboration - Annex 1

## TANGO – Technical Description and Development Projects

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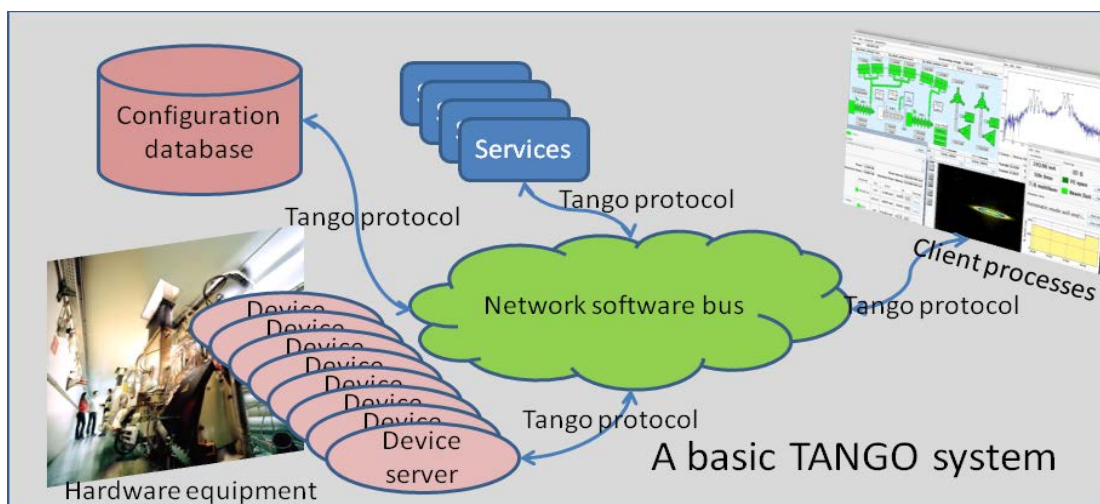
The “TANGO Control System Framework” is an open source software suite for building Distributed Control Systems (DCS) or Supervisory Control and Data Acquisition (SCADA) systems in a distributed environment.

Its strong points are high performance and extreme scalability. The high performance is achieved by using efficient binary network protocols. The extreme scalability is due to its object oriented design and peer-to-peer communication. These features allow TANGO to be easily scalable from small embedded systems up to large and complex installations distributed over a large number of computers.

The TANGO Control System Framework is mostly used in Europe by a number of research institutes to control large scientific installations and a wide range of smaller equipment and data sources.

### The Basic Concepts:

- TANGO Controls defines a so called software bus for exchanging objects and data over an Ethernet network.
- It manages the communication between software objects named “Devices” distributed over a network.
- Each Device models a piece of hardware or a software process visible on an Ethernet network.
- The Devices are implemented and instantiated by autonomous software processes named Device servers.
- A basic TANGO control system is typically made of a set of Device servers, a configuration database server and some client processes implementing the Graphical User Interface (GUI) (see picture below)
- All communications are peer-to-peer. It provides a naming service and a database for persisting data.



## The main characteristics of TANGO:

- It is a software suite supported on multiple platforms which delivers a powerful, flexible, reliable and scalable SCADA and DCS.
- It supports multiple languages as clients and servers and a number of other languages as clients only.
- Its modular design allows it to be easily adapted to a heterogeneous environment.
- It is freely downloadable as software packages for different platforms in binary form or as source distribution.
- It proposes a number of extensions or tools for services such as archiving, access control, sequencing tools, data management tools.
- It can control hardware and software devices.
- It is a free SCADA which has for the last 15 years, in 24/7 mode, directly controlled hundreds of thousands of set- and read-points and actions on many sites.

## Definitions

The TANGO Control System Framework allows the development of an unlimited number of device servers and related services. Therefore it is necessary to clearly define the components which are officially part of the product and to distinguish them from the components developed by users for their specific needs. The TANGO Control System Framework is split over 2 separate SourceForge<sup>1</sup> projects: The TANGO Control System Framework and the Tango Device Servers repository

### *TANGO Control System framework (TANGO-CS)<sup>2</sup>*

The TANGO Control System framework (referred to as TANGO-CS) is made up of a set of software components necessary to build, maintain, and administrate a control system. It supports the development of ad-hoc device servers.

TANGO-CS contains the following components:

- The Core components which allow the running of a basic setup:
  - Tango core libraries in 3 different languages: C++, Java and Python
  - Utility libraries (Yat, Yat4Tango).
  - The Database server and the database browsing tool .
  - The Starter device server and the administration tool.
  - The generic clients and servers (Atkpanel, tangotest, log viewer, ...)
  - The Java application toolkit (ATK)
  - The Python application toolkit (Taurus)
- Some service components: archiving system, console tool, access control, synoptic animation, alarm services.
- The code generator (Pogo): a tool for developing new device servers.
- Software links to other software and systems:
  - Binding for Matlab, Labview, Igor, Octave, Scilab,...
  - Device Servers for accessing other protocols such as modbus, serial line, socket, Epics, Opc-UA...

The TANGO-CS project source code is released under 2 different licenses:

- The core libraries under **LGPLv3**<sup>3</sup>: allowing to reuse them with other licensing rules.

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<sup>1</sup> <http://sourceforge.net>

<sup>2</sup> <https://sourceforge.net/projects/tango-cs/>

<sup>3</sup> <http://www.gnu.org/licenses/lgpl-3.0.html>

- All the other components under strict **GPLv3**<sup>4</sup> licences: Imposing redistribution.

TANGO-CS can be downloaded in source version or binary version for various operating systems from <http://tango-controls.org>

Debian packages are also available in debian official repository

The source code is hosted at SourceForge <http://sourceforge.net/projects/tango-cs/>

### *TANGO Device Servers repository*<sup>5</sup>

Tango Device Servers (TANGO-DS) is a repository for some of the TANGO device classes developed by the community and shared as free open-source software. It contains hundreds of device classes interfacing a collection of hardware equipment or software processes developed by the different partners.

Each device class can be downloaded individually and has its own license (often GPL).

TANGO-DS source code is hosted on: <http://sourceforge.net/projects/tango-ds/>

## **Proven Value of TANGO**

TANGO-CS is based on a proven solution, which has been implemented at many sites for large and small installations. The peer-to-peer communication model of TANGO-CS makes it highly scalable. The strong emphasis on efficient coding of high-speed protocols makes it a high performance solution for small and large data volumes. TANGO-CS implements a software bus which can be used for a wide variety of controls and high-level applications. The software is mature, tested and of a high quality.

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<sup>4</sup> <http://www.gnu.org/licenses/gpl-3.0.html>

<sup>5</sup> <https://sourceforge.net/projects/tango-ds/>

## TANGO Development projects

A development project becomes an official Tango development project as soon as it is based on Tango technology and is used by more than one member institute.

Each Tango Development project is identified and endorsed by the SC, a project leader is nominated by the SC. The Project leaders should report the advancement of the project on an annual basis during the Community meeting or by a written report.

In January 2016 the following Tango Development projects exist:

Project	Leader	Host Institute(s)
Alarm system	Graziano Scalamera	ELETTRA
HDB	Gwenaelle Abeille	Soleil
HDB++	Lorenzo Pivetta	ELETTRA
	Reynald Bourtembourg	ESRF
Matlab Binding	Nicolas Leclercq	Soleil
LabView Binding	Nicolas Leclercq	Soleil
Igor Pro Binding	Nicolas Leclercq	Soleil
C language binding	Jens Meyer	ESRF
Code Generator (Pogo)	Pascal Verdier	ESRF
Control system manager (astor + starter)	Pascal Verdier	ESRF
Database browser (jive)	Jean-Luc Pons	ESRF
Database server	Emmanuel Taurel	ESRF
GUI ATK	Faranguiss Poncet	ESRF
GUI QTango	Giacomo Strangolino	ELETTRA
GUI Taurus	Carlos Pascual-Izarra	ALBA
C++ Libraries	Emmanuel Taurel	ESRF
Python libraries (PyTango)	Tiago Coutinho	ESRF
	Jairo Moldes	ALBA
Java libraries	Pascal Verdier (client)	ESRF
	Gwenaelle Abeille (server)	Soleil
LogViewer	Jean-Luc Pons	ESRF
mTango (web/mobile applications)	Igor Khokhriakov	HZG

JavaScript + REST api	Igor Khokhriakov	HZG
Packaging source	Emmanuel Taurel	ESRF
Packaging Debian	Frederic Picca	Soleil
Panic alarm system	Sergy Rubio	ALBA
Synoptic tool (jdraw)	Jean-Luc Pons	ESRF
Tango Web	Gregory Viguier	Soleil
Virtual box	Andy Gotz	ESRF
Web site + forums + mailing lists	Andy Gotz Jean-Michel Chaize	ESRF