



Delta Tau Power PMAC



TANGO Device Server Software Manual

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1 Scope

This document describes the installation and use of a TANGO device server which implements a sample set of the functionality in the Observatory Sciences Power PMAC SSH communications library, demonstrating how the library may be deployed within the TANGO framework to monitor and control the Delta Tau Power PMAC.

It assumes that the user has a working knowledge of TANGO concepts, and that the required software detailed in Section 4.2 has been installed, including TANGO and the Observatory Sciences Power PMAC SSH communications library.

Where appropriate, references are provided to existing sources of information.

2 Reference Documents

- [RD1] Power PMAC User's Manual. Delta Tau Document 050-PRPMAC-0U0. Dated March 25, 2014.
- [RD2] Power PMAC Software Reference Manual. Delta Tau Document 050-PRPMAC-0S0. Dated May 23, 2014.
- [RD3] The TANGO Control System Manual. Version 7.2. Distributed with the TANGO source for this version which can be downloaded at <http://www.tango-controls.org/download>.
- [RD4] Power PMAC SSH Communications Library Manual. Version 1.0. Available to download from <http://www.observatorysciences.co.uk/>.

3 Introduction

The Power PMAC UMAC CPU is the most powerful and most flexible controller that Delta Tau presently offers. It is intended to be used in a 3U UMAC Rack, which is a modular rack format permitting the user to configure their rack with whatever I/O, servo control cards, MACRO cards, or any other accessory card Delta Tau offers for the UMAC Rack format, to build a totally user-customized system. The Power PMAC UMAC CPU can control up to 256 axes, whether through direct local control, or distributed control over a MACRO fibre optic ring, or over an EtherCat network.

The Power PMAC may be controlled through an Ethernet interface by writing commands and reading replies and status as text strings over an SSH protocol connection. Observatory Sciences Ltd. have produced a C++ library to control and monitor the Power PMAC using an SSH connection.

TANGO (<http://tango-controls.org/>) is an open source distributed control system which can monitor and control multiple devices on the same computer or distributed across a network.

The Power PMAC TANGO device server illustrates implementing the functionality of the Power PMAC SSH communications library within the TANGO framework. It is intended as a demonstration and a resource which you are invited to build upon as a starting point to implement the functionality required in your project.

4 Requirements

This section details the hardware and software requirements for building and using the Power PMAC TANGO device server software.

4.1 Hardware Requirements

The following hardware is required to use the device server:

- Standard PC with an Ethernet port.
- Power PMAC present on the network. For operation with the TANGO device server, the Power PMAC should be configured to have a static IP address, and this address must be specified in the device server properties, as described in Section 7.3.

See [RD1] for details of how to configure the Power PMAC IP address.

4.2 Software Requirements

The following software must be installed to build and run the device server:

- TANGO control system. Available to download from <http://www.tango-controls.org/>.
- Jive (distributed with TANGO), a graphical tool for inspecting and manipulating TANGO databases.
- Power PMAC SSH Communications Library. This C++ library is required by the device server to handle communication with the Power PMAC via the SSH protocol. It is available to download from the Observatory Sciences website, <http://www.observatorysciences.co.uk/>. Installation instructions are given in the user manual for the library, [RD4].

5 Supported Platforms

The software has been built and tested under the CentOS operating system. The standard Linux build system (make) is used, with a Makefile provided. The version of software utilities and libraries used is shown in the table below.

Note that CentOS is effectively identical to the corresponding Red Hat Enterprise Linux release.

O/S version	Linux Kernel	gcc compiler	make utility	TANGO
CentOS 6.5	2.6.32-431	4.4.7	3.81	7.2.6

6 Source Code Structure

The software consists of a single TANGO server containing two classes; the first (**PowerPMACBox**) handles general Power PMAC controller functions, and the second (**PowerPMACAxes**) handles functions related to individual axes.

The classes have been generated in the standard manner using Pogo. Within the two directories **PowerPMACBox** and **PowerPMACAxes** are .xmi project files which can be opened in Pogo to edit the structure of each class. The attributes and commands in the classes are wrappers for corresponding methods in the SSH control library; functionality is implemented within the protected regions in the generated source code files.

7 Installation

This section covers building and installation of the Power PMAC TANGO server on a Linux operating system.

7.1 Prepare Makefile

Before building the software, some changes are required to the Makefile to provide the correct configuration for the target machine.

7.1.1 Power PMAC SSH Communications Library Paths

The Power PMAC SSH Communications Library is required by the TANGO device server to handle communication with the Power PMAC via SSH.

The TANGO device server needs to know the locations of the communications library header file, `PowerPMACcontrol.h`, and shared library file `libPowerPMACcontrol.so` in order to use them.

The Makefile contains the instructions telling the preprocessor and linker where to search for these files. The default search locations are as follows:

File	Default search locations
<code>PowerPMACcontrol.h</code>	<code>/usr/local/include</code> or <code>../PowerPMACcontrol/src</code>
<code>libPowerPMACcontrol.so</code>	<code>/usr/local/lib</code> or <code>../PowerPMACcontrol/src</code>

These are the standard installation locations when `make install` is run during the communications library installation described in [RD4]. If these files have been installed in a different location, then the lines in the Makefile highlighted below need to be modified:

- a. Search paths for `PowerPMACcontrol.h`

```
80 INC_DIR_USER= -I . \
81             -I $(POWERPMACAXES_HOME) \
82             -I $(POWERPMACBOX_HOME) \
83             -I /usr/local/include\
84             -I ../PowerPMACcontrol/src
```

- b. Search paths for `libPowerPMACcontrol.so`

```
92 LIB_DIR_USER= -L . \
93             -L/usr/local/lib\
94             -L ../PowerPMACcontrol/src
```

In each case substitute the location where the file is to be found.

7.1.2 Pogo Preferences Path

Ensure that the following line in the Makefile corresponds to the location of your Pogo build environment preferences, which are required to build the Power PMAC TANGO device server.

```
25 MAKE_ENV = /usr/local/tango/share/pogo/preferences
```

7.1.3 Linker Library Path

In order that the TANGO device server may locate the Power PMAC SSH communications library at runtime, its location needs to be in the linker library path. This is achieved by editing the `LD_LIBRARY_PATH` environment variable. To view the present contents of the variable, open a terminal and enter

```
$ echo $LD_LIBRARY_PATH
```

If the directory containing `libPowerPMACcontrol.so` is not included in this variable, add it to the path for this session by typing

```
$ export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/usr/local/lib
```

Optionally include this line in your shell startup script.

7.2 Build

In the source directory, build the device server with the command:

```
$ make
```

The built executable may be installed in `/usr/local/bin` (to be easily accessible from the shell) by executing the following command. This requires root privileges, so will need to be executed by the superuser or using `sudo`.

```
$ make install
```

7.3 Add Server to TANGO Database

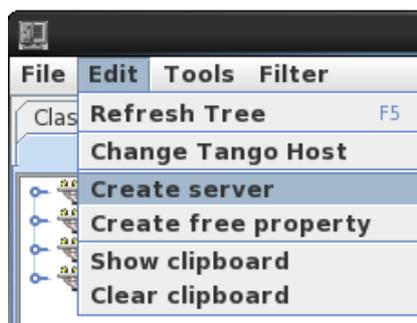
This section describes how to add the Power PMAC server to the TANGO database. Open a terminal and enter the following command to start the database application.

```
$ DataBases 2 -ORBEndPoint giop:tcp::10000 &
```

Run Jive:

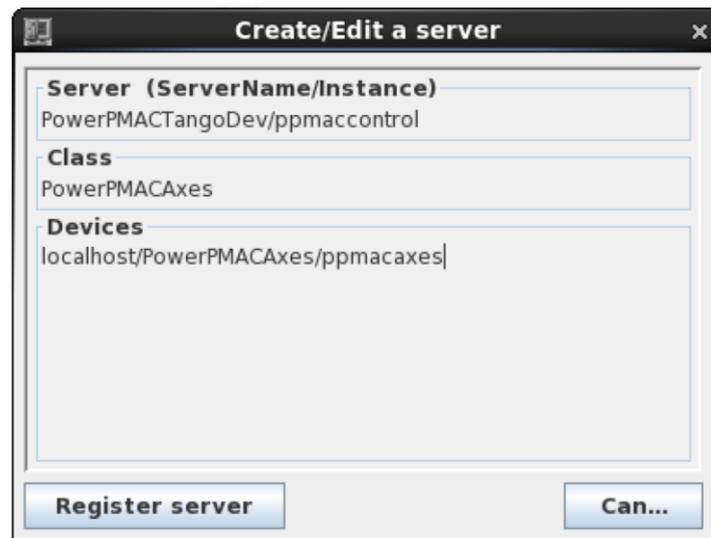
```
$ jive &
```

From the Edit menu, select Create server.

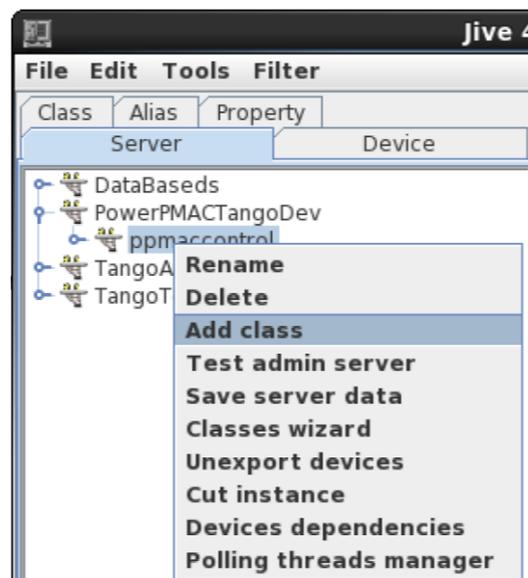


Fill in the following details on the Create/Edit a server dialog which appears, and then click Register server.

Field	Value
Server (ServerName/Instance)	PowerPMACTangoDev/ppmaccontrol
Class	PowerPMACAxes
Devices	localhost/PowerPMACAxes/ppmacaxes

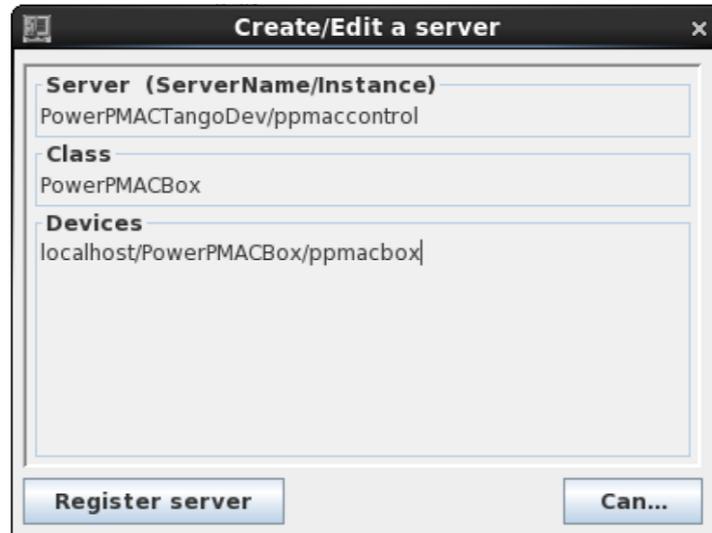


Add the second class to this server by right-clicking on the server name and selecting Add class from the pull-down menu.

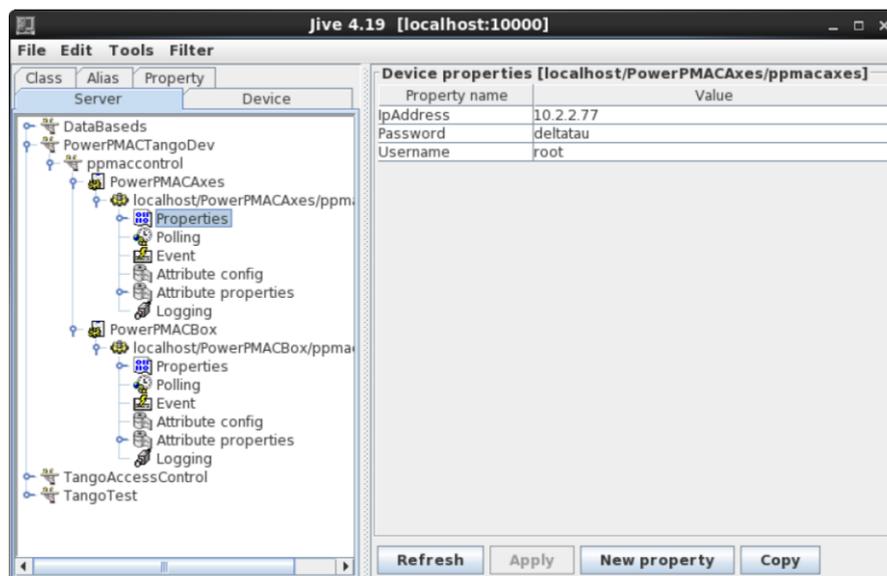


Fill in the following details on the Create/Edit a server dialog which appears, and then click Register server.

Field	Value
Class	PowerPMACBox
Devices	localhost/PowerPMACBox/ppmacbox



Add properties to the device server to supply the correct connection information for your network. For each of the two classes **PowerPMACAxes** and **PowerPMACBox**, select **Properties** from the tree in the left-hand pane, and select **New Property** in the lower right part of the screen. Add properties to both classes for **IpAddress**, **Username** and **Password**, in a similar manner to the example below.



The Power PMAC TANGO device server is now set up and ready to use.

8 Usage

Open a terminal. If they are not already running, start the TANGO Database process with the following command:

```
$ DataBases 2 -ORBEndPoint giop:tcp::10000 &
```

and Jive:

```
$ jive &
```

Start the Power PMAC TANGO device server. If the application is in the default search path for applications, simply type

```
$ PowerPMACTangoDev ppmaccontrol
```

Otherwise navigate to the directory containing the executable and enter

```
$ ./PowerPMACTangoDev ppmaccontrol
```

8.1 Test Screens

In Jive, right-click on the device and select **Monitor device** to bring up an interactive screen which may be used to test that everything is set up correctly and that communication with the Power PMAC is successful.