ThingWorx Raspberry Pi 2 Model B Setup Guide

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Contents

1. Introduction

The Edge MicroServer is a powerful component of the ThingWorx architecture. The Edge MicroServer allows for the rapid deployment of connections between the ThingWorx platform and an associated data reporting device, with minimal design requirements on the part of the user.

The Edge MicroServer provides an "always-on" connection to the platform, and it opens a local web server that interacts with the REST API available on the platform.

This document provides installation and usage instructions for setting up the Raspberry Pi – 2 on the ThingWorx Platform. Note that this guide utilizes the ThingWorx C SDK built on the Raspberry Pi device to create an application server, and will not provide guidance on configuring the Raspberry PI-2 with the Edge MicroServer (EMS).

About the Raspberry Pi 2

The Raspberry Pi 2 is a single board computer that runs on a quad core Broadcom BCM2836 CPU with a 1 GB RAM. The Raspberry Pi 2 Model B is a second generation Raspberry Pi with 4 USB ports, 40 GPIO, Full size HDMI port, Ethernet port, composite video port, CSI camera port and DSI display port.

This guide will detail the steps to get the Raspberry Pi 2 connected with the ThingWorx platform and to pull data from and push data into the Raspberry Pi serial port.

2. Installation

Before beginning, please note that the raspbian OS (Download from: *https://www.RaspberryPi.org/downloads/*) needs to be loaded into a micro SD and loaded on to the Raspberry Pi device.

Please note that this guide was written for a computer running Microsoft Windows.

Connect the Raspberry Pi to a local machine

There are two ways to log on to the device:

Connect the device via the full size HDMI port of Raspberry Pi through an HDMI connector to a display monitor, the USB port to a keyboard in use, another USB port to a mouse in use and Ethernet port to a LAN connection.

Raspberry Pi Default Login Credentials:

Username: pi

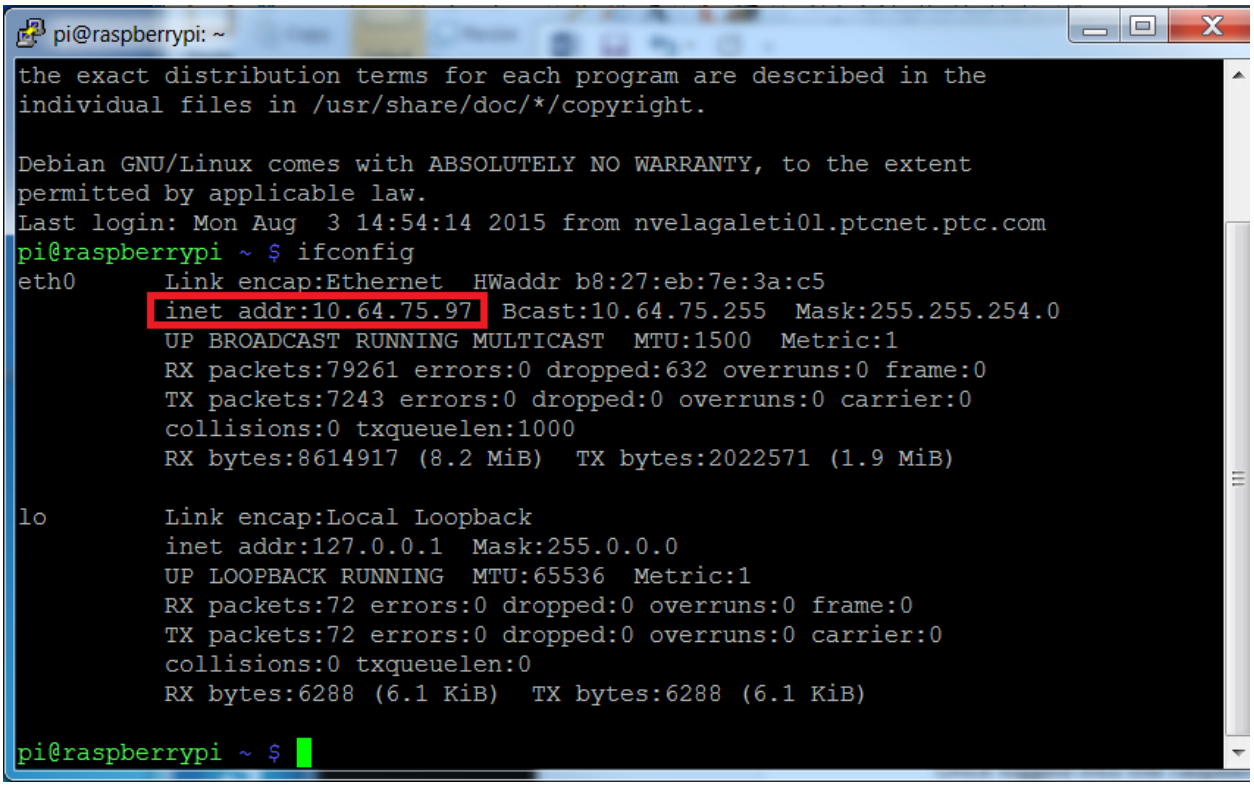
Password: raspberry

The password and keyboard layout can be changed by system configuration using the following command on the Raspberry Pi terminal:

```
sudo raspi-config
```

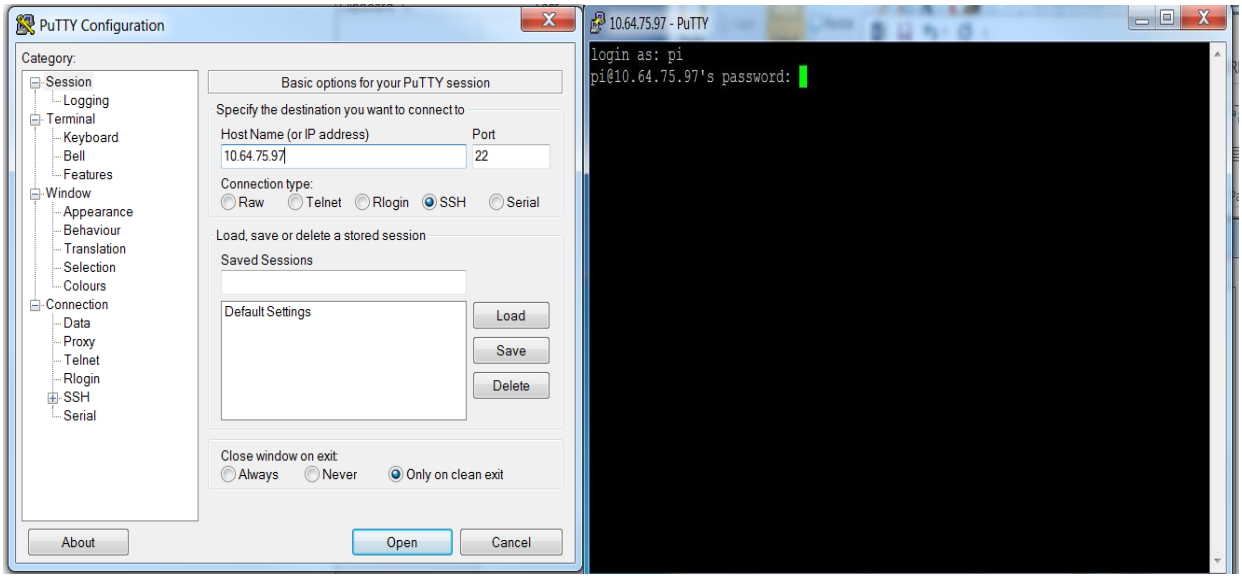
Once logged into the Raspberry Pi device, the IP address of the device can be checked using the following command on the Raspberry Pi terminal:

```
ifconfig
```



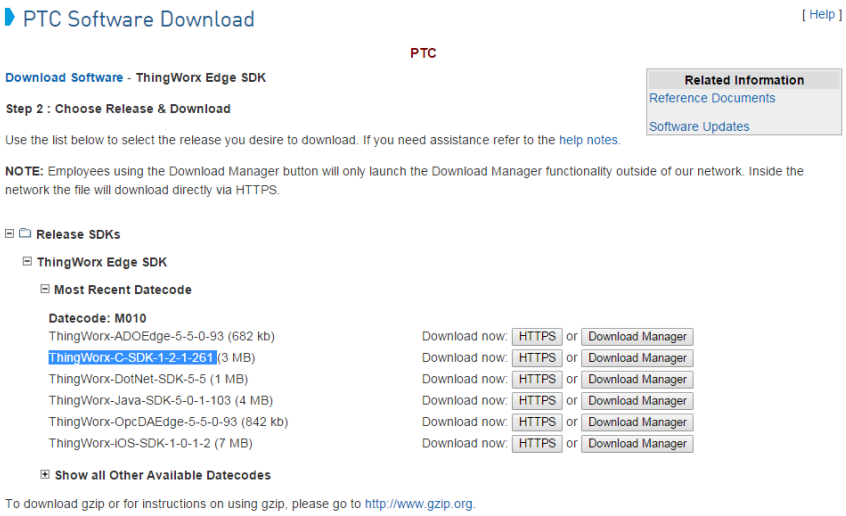
The IP address of the device is the inet address of eth0.

The Raspberry Pi can be used remotely by SSH connection at this IP address using terminal or PuTTY session.



Download and Install the Thingworx C SDK Package

1. Download the latest version of ThingWorx C SDK from the PTC Software Downloads site under Thingworx Edge SDK at *https://support.ptc.com*



2. After extracting the files into the directory: tw-c-sdk; Secure copy the entire directory to the Raspberry Pi device by using a SFTP client such as WinSCP or my typing the command (to the right) in a Linux terminal.

scp –r tw-c-sdk pi@**10.64.75.97**:

Note that this command will only work if the tw-c-sdk folder, which was downloaded from the PTC Downloads site, is located in the root directory **of the terminal program you are using** to connect to the Raspberry Pi. It will copy the ThingWorx SDK on the root directory of Raspberry Pi device. For example, ensure the tw-c-sdk root folder is copied to the home/username/ directory inside the Cygwin installation directory if you are using Cygwin terminal. Be sure to use the IP address of your actual device in place of the one listed above. You can find the IP address of the device by connecting to the Raspberry Pi Linux terminal and using “ifconfig” command as used in the installation part of the set up guide.

3. Enter “raspberry” if prompted for a password. The copy should complete successfully.

3. Configuration and Setup

For the purposes of this setup guide, you can use an example from the ThingWorx C SDK folder to test the connectivity of the device with the ThingWorx application platform. We will use the SteamSensor example which can be found in the following directory within the C-SDK:

/tw-c-sdk/examples/SteamSensor/

Testing the SteamSensor example

1. Navigate to the SteamSensor example in the path: tw_c_sdk/examples/SteamSensor/

   Note: tw_c_sdk represents the folder containing the ThingWorx C SDK files downloaded earlier from *www.support.ptc.com*

2. The SteamSensor directory has different folders for different platforms such as Linux, OSX, Win32. Since Raspberry Pi is basically a Linux supported terminal, we will navigate to the Linux directory in the SteamSensor example.

3. The Linux folder consists of the Makefile to build the source code of the SteamSensor. Build the Makefile with the command on the right.

   ```
   make BUILD=release
   ```

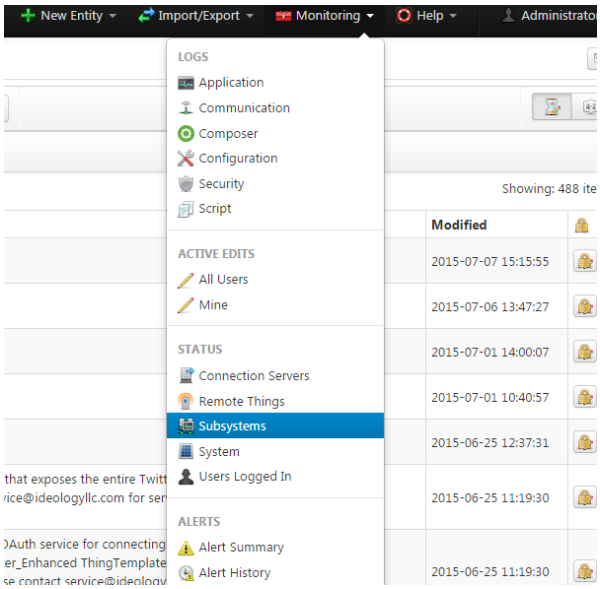
4. After the build, navigate to bin/gcc-linux-x86-64/release folder from the Linux folder. The release folder consists of the SteamSensor executable file. Run this file using the command on the right.

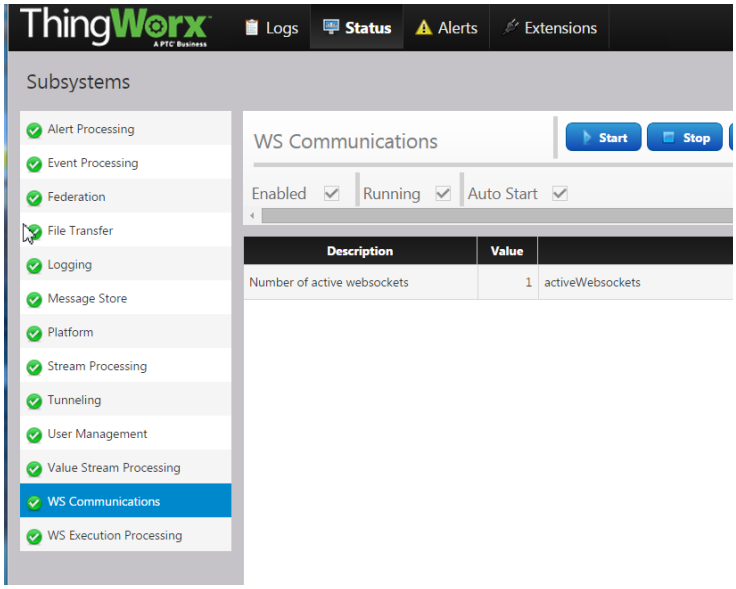
   ```
   ./SteamSensor
   ```

5. The SteamSensor server has been started on Raspberry Pi.

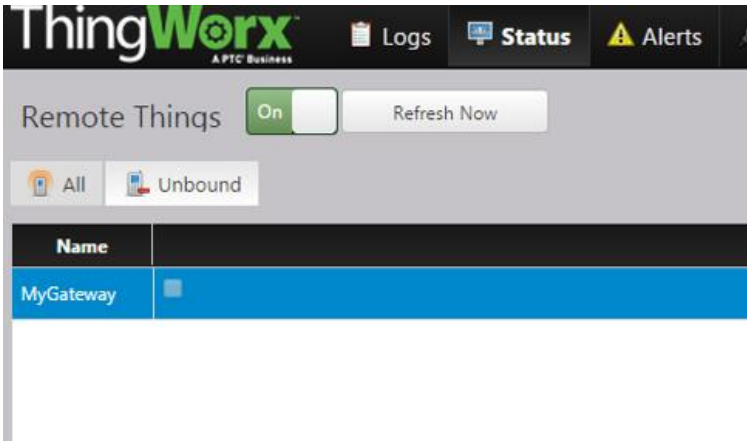
6. Connect to the ThingWorx Composer from your computer.

7. In ThingWorx Composer, click the “Monitoring” drop-down, choose “subsystems”, and then click “WS Communications” and “Refresh Now”. You should see an active web socket listed.



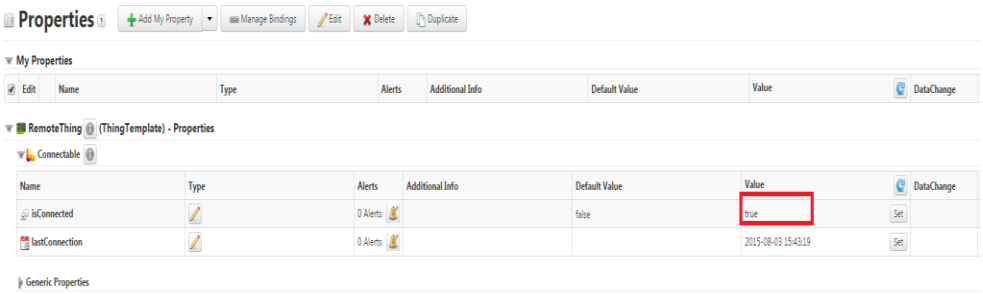


6. An unbound remote thing representing the SteamSensor1 running on the Raspberry Pi device should be listed here. The name is dependent on that supplied in the configuration file.



Configuring and Running an Application

1. Create a new Thing in Composer that implements the "RemoteThing" Thing Template. Name the thing as "SteamSensor1"
2. Click "Properties" on the left, and check the value under "isConnected". It should be set to true now.



3. Finally, click "Manage Bindings", and then the "Remote" tab. Here, you should see a list of available properties to bind, from the SteamSensor remote device.

Communicating via Serial Port

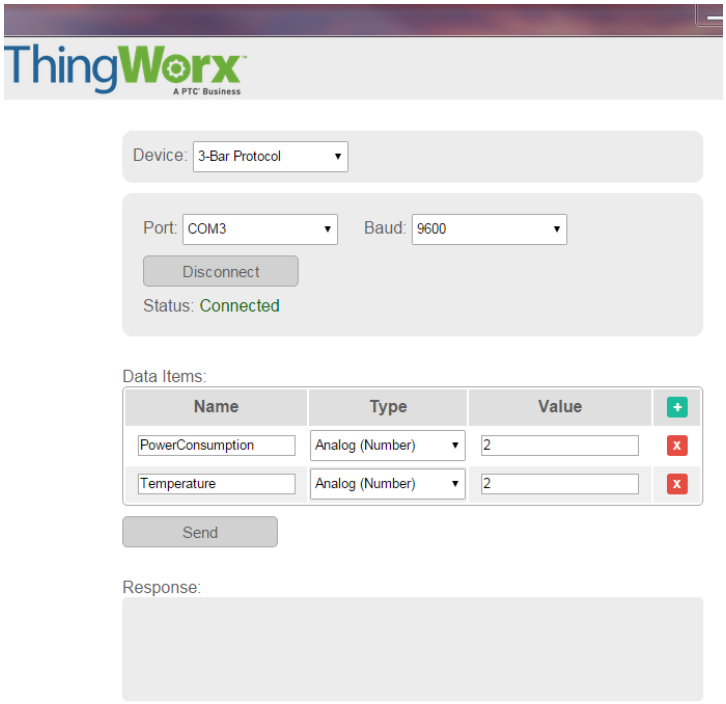
This section will guide you through the process of using a connected PC to simulate a data-reporting device using the ThingWorx Data Injector, and using it to connect to the SteamSensor server running on the Raspberry Pi device.

1. Verify that the SteamSensor executable is up and running. Connect one end of the serial cable to your computer and the other end to one of the USB ports of the Raspberry Pi device.

2. In Google Chrome, download and install the Chrome ThingWorx Data Injector extension at: *https://chrome.google.com/webstore/detail/thingworx-data-injector/fplddibkdnnainjhgjddkgnlbiebnabc?hl=en-US*

3. Run the ThingWorx Data Injector application. Choose "3-Bar Protocol" from the Device drop-down, and ensure the value for Port is a recognized valid Port (use default value if in doubt), and choose 9600 for Baud Rate.

   Click "Connect". You should see the Status Message change to "Connected".



4. To test the connection between the PC and the SteamSensor server running on Raspberry

Note: The SteamSensor example has to be configured in the SteamSensor/src/main.c file. The function

Pi, press the “Send” button on the Data Injector.

dataCollectionTask() can be modified accordingly to send data to a particular property via the serial port.

5. In the Raspberry Pi (via terminal), from the root directory, type the following command (on right):

cat < /dev/ttyUSB0

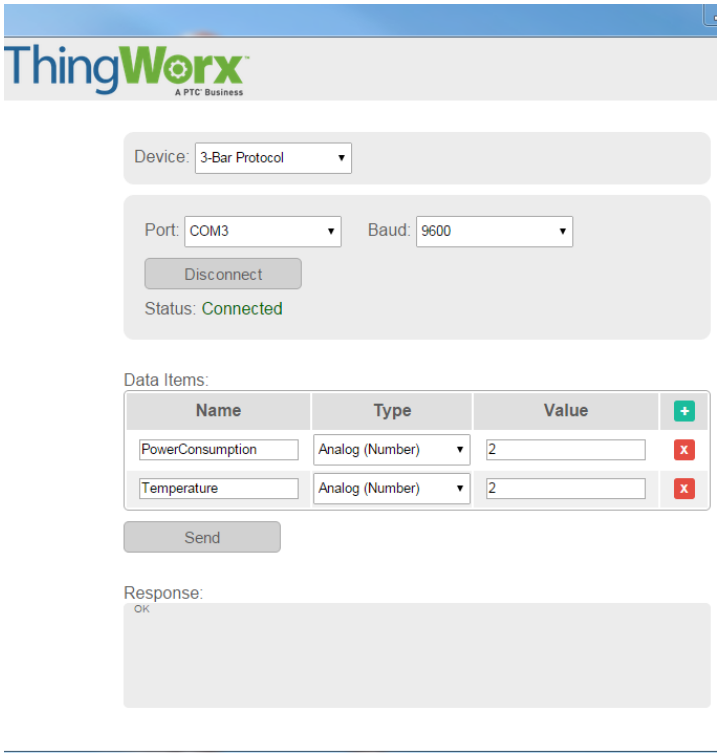
6. The values sent from the ThingWorx Data Injector can be seen in the terminal.

Note that the serial port representing the serial connection between the computer and Raspberry Pi here is /dev/ttyUSB0. This may vary for a different connection.

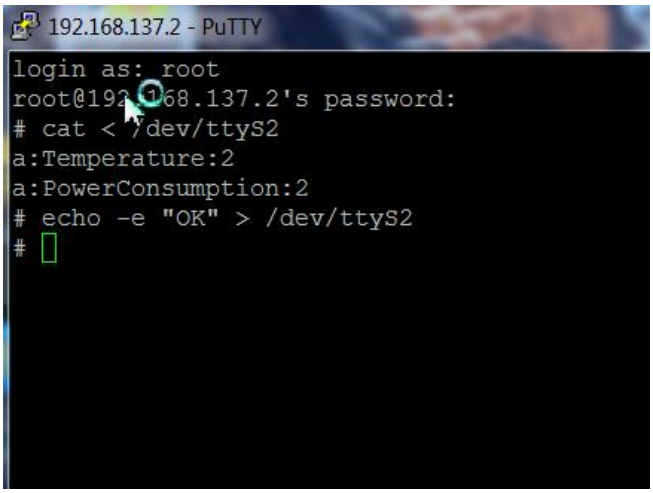
7. Next, type the following command:

echo –e “OK” > /dev/ttyUSB0

8. You should see the “OK” response in the data injector.



9. Refer to the terminal window screenshot at right to verify your commands:



4. Troubleshooting

	Problem	Solution(s)
1.	Cannot connect to My ThingWorx Composer.	1. Before starting tomcat, check if there are any other servers running. Restart Tomcat and connect to *http://localhost* on your browser. The manager app should indicate that the ThingWorx application is running.
2.	Cannot see the "SteamSensor1" thing on the ThingWorx Monitoring / Remote Things page.	1. Ensure that the SteamSensor executable is up and running on the terminal. 2. Go to the SteamSensor1 thing created on the ThingWorx composer. Check the properties, ensure that the isConnected property is true. In case it is false, it means that the server SteamSensor is not running on your device.
3.	Not able to read data from the remote data injector.	1. Choose "3-Bar Protocol" on the Data Injector. Do NOT choose "Raspberry Pi 2. Change the Baud value to that accepted by your Raspberry Pi device. 3. Ensure your serial cable is well connected to the Raspberry Pi through a serial to USB connector.
4.	Unable to send data, or cannot see any COM ports for sending data to the Raspberry Pi from the Data Injector.	1. Ensure your serial cable is well connected to one of the USB port of Raspberry Pi through a serial to USB connector. To check whether serial connection is established on your Raspberry Pi device, Go to the Raspberry Pi terminal and check the devices by using the command: ls –a /dev/tty*. You should be able to see ttyUSBx. a. Open Device Manager from Control Panel in Windows. b. Click on "Ports (COM & LPT)", and click "Action > Add Hardware / Add Legacy Hardware" c. Follow the steps in the wizard to manually add serial port (COM) drivers.

		d. Restart your computer and attempt to send data again. 2. Try using an alternative COM port from the data injector. 3. Attempt to send data without using the data injector, by utilizing the Windows PowerShell through Windows Command Prompt (tutorials available through Microsoft).

This guide has been tested for compatibility with the Raspberry Pi 2 Model B and the following ThingWorx platform and operating system:

ThingWorx Platform Version	OS
ThingWorx 6.0.1	Windows 7, Service Pack 1