Tutorial on txThings (CoAP Libraries)

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In this tutorial, we will describe how to run a CoAP server on Raspberry Pi and run the CoAP client on a Windows PC/Laptop. The CoAP server and clients are implemented using txThings, which is a Phyton implementation of CoAP. This tutorial also describes Copper, a GUI CoAP client tool for interacting with a CoAP server.

1 ABOUT TXTHINGS

txThings - CoAP library for Twisted framework
txThings is a Python implementation of Constrained Application Protocol (CoAP):
http://tools.ietf.org/html/rfc7252

txThings is based on Twisted - asynchronous I/O framework and networking engine written in Python.
http://twistedmatrix.com/

txThings uses MIT License (like Twisted itself).
http://opensource.org/licenses/mit-license.php

http://sixpinetrees.blogspot.com/

txThings has the following features:

- support for draft-ietf-core-coap-13 - including automatic piggyback/separate response handling. No caching support.
- support for draft-ietf-core-block-12 (no support for server initiative though - waiting for the resolution)
- limited support for RFC6690 (Core Link Format) - server only.

Other nice things:

- txThings works nicely on RaspberryPi
- txThings is compatible with Kivy - brilliant new Python GUI library
- txThings is fully asynchronous (thanks to twisted framework)

2 INSTALLING TXTHINGS ON RASPBERRY PI

txThings is posted on Github . txThings example codes are available on the Raspberry Pi on *reference/TxThings/examples*

Three examples are available:

- server.py - CoAP server that starts on localhost, port 5683 and hosts several resources
- client_GET.py - example client which performs GET request to localhost, port 5683
- client_PUT.py - example client which performs PUT request to localhost, port 5683

Client_GET and client_PUT both use port 61616 - to use them simultaneously change port number in one of the clients. Server will send blockwise responses for default settings. To use txThings you need Python 2.7 with Twisted installed (I suggest using the latest Twisted version, but older releases also work - tested with 11.1).

To install Twisted and txThings on your Raspberry Pi shell, run the following commands:

1. `sudo pip install twisted==15.1.0`
2. `sudo pip install txthings`

3 INSTALLING TXTHINGS IN CYGWIN ON WINDOWS

1. Run Cygwin Setup
2. Install python-setuptools (see **Figure 1**)

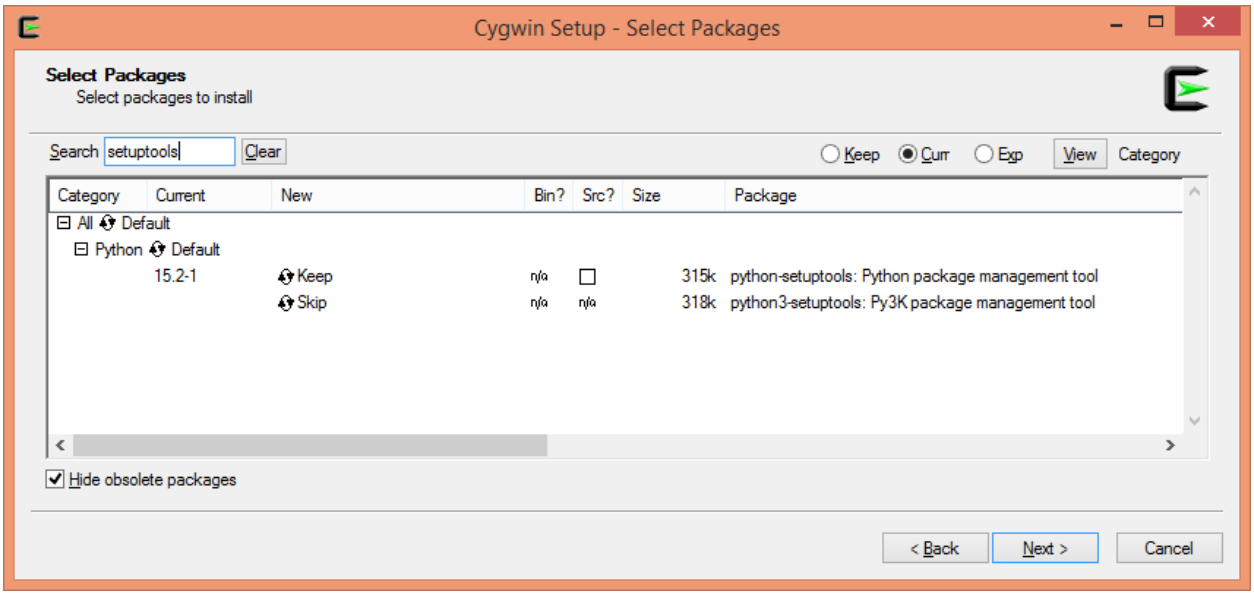

Figure 1. Install `setuptools` on Cygwin

3. Install wget (see **Figure 2**)

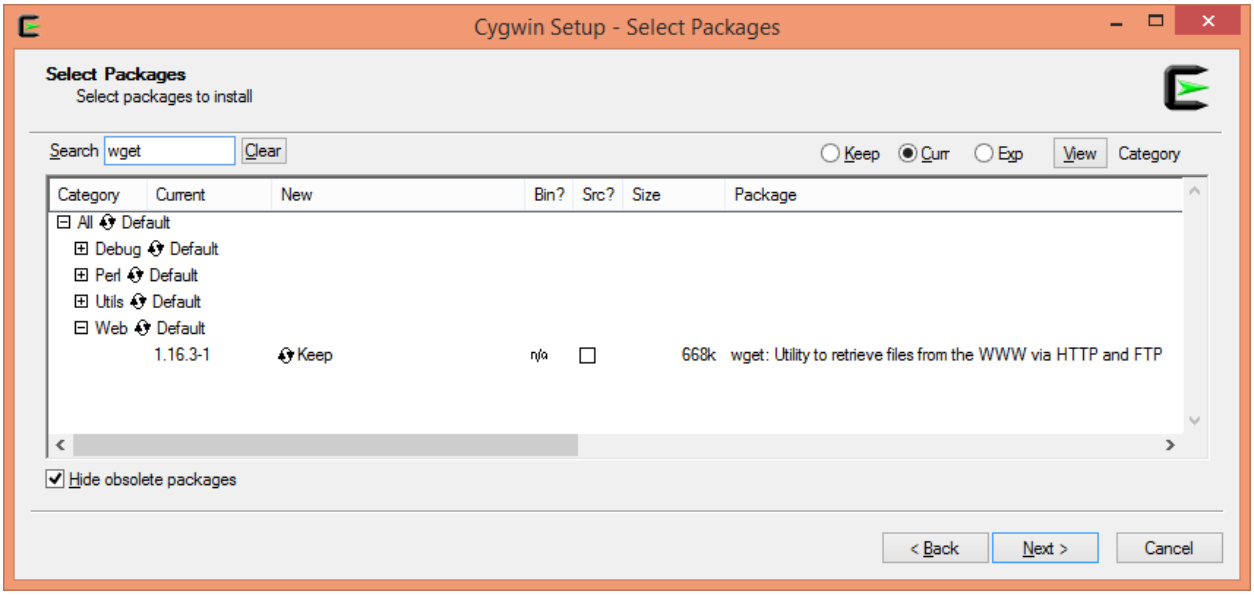

Figure 2. Install wget on Cygwin

4. Run Cygwin
5. Run the following commands (see **Figure 3**):
    a. `wget https://bootstrap.pypa.io/get-pip.py` (to download get-pip.py)
    b. `python get-pip.py`
    c. `pip freeze` (to see which Python tools are installed)
    d. `pip install pip --upgrade`
    e. `pip install twisted==15.1.0`
    f. `pip install txThings`

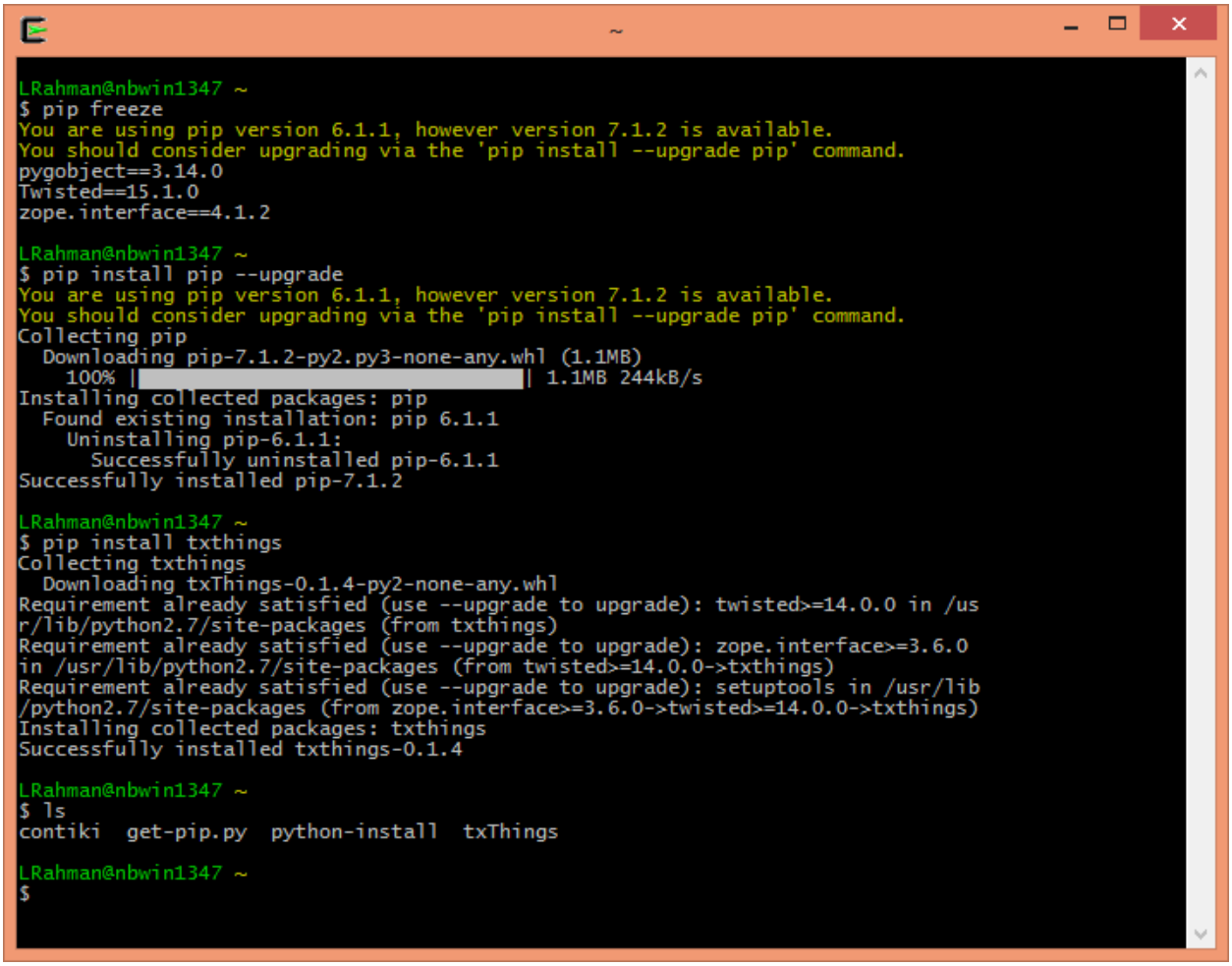

Figure 3. Installing Twisted and txThings

4 RUN COAP SERVER ON RASPBERRY-PI

1. From the Raspberry's console or using *ssh* to the Raspberry-Pi, go to the examples directory at : *reference/txThings/examples*
2. Run the CoAP server : *python2 server.py* or *sudo python server.py*
   (See **Figure 4**)

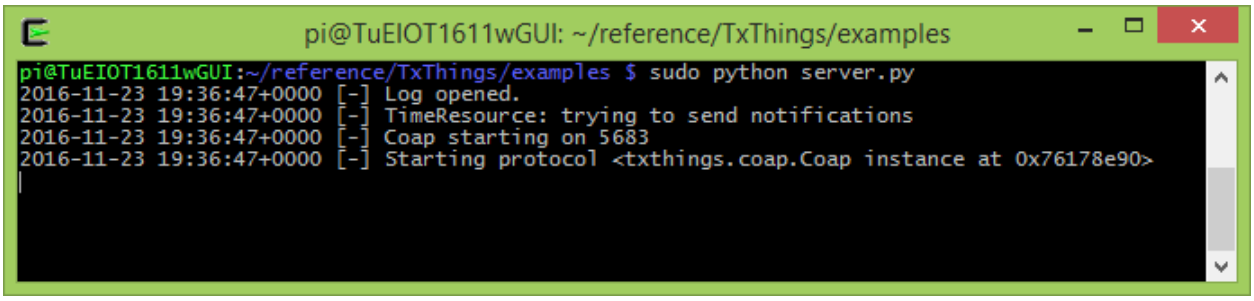

Figure 4. Running the CoAP Server on Raspberry-Pi using SSH

5 RUN COAP CLIENT ON PC

1. If using Windows, open Cygwin
2. Go to the examples directory at : *txThings/examples*
3. Change the resource name (in this example from 'obs' to 'counter') and remote IP address in the source code of *clientGET.py* or *clientPUT.py* (see **Figure 5**)

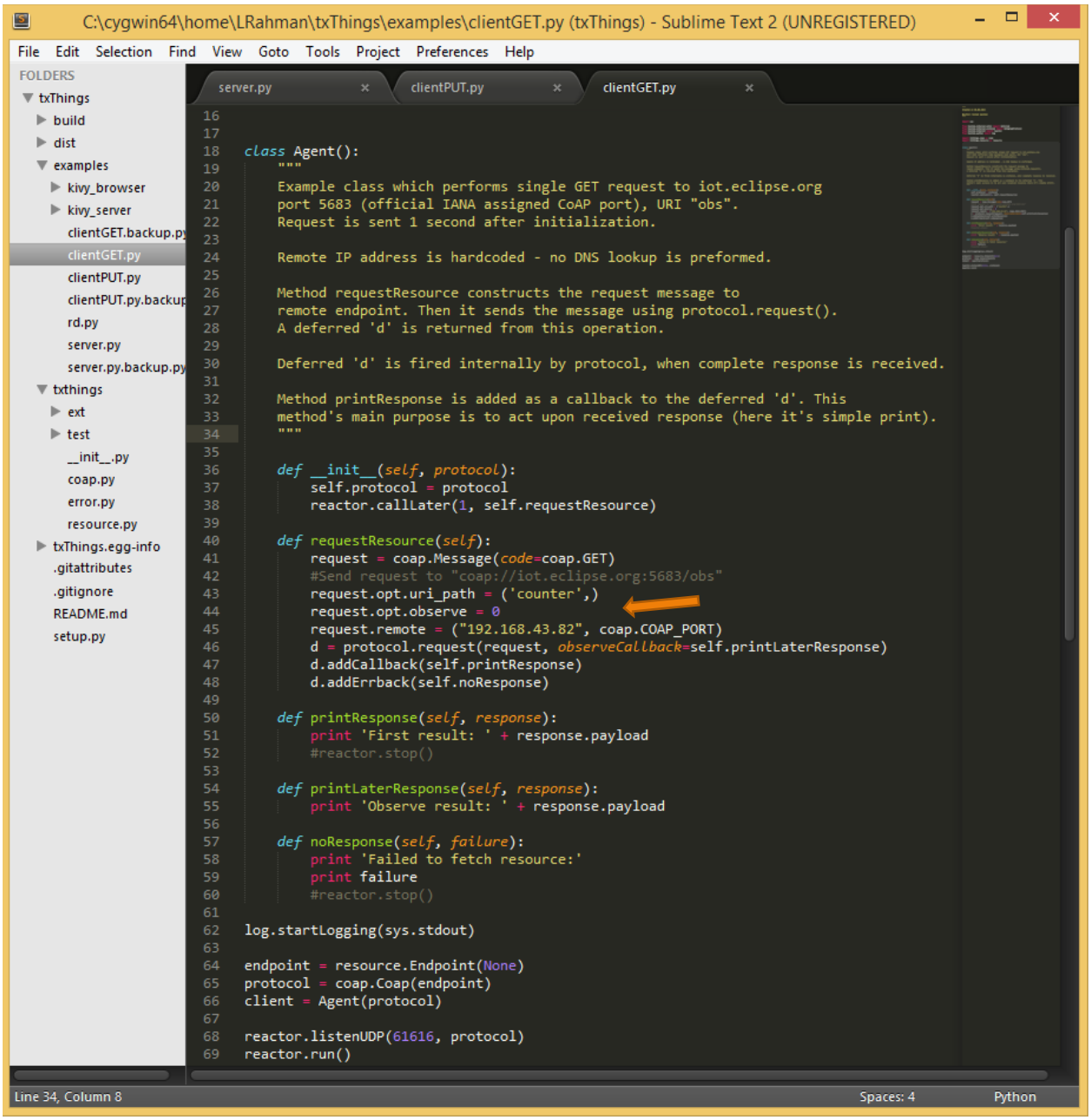

Figure 5. In the source code of *clientGET.py,* change the resource name to 'counter' and remote IP Address to the IP Address of the Raspberry Pi running server.py

4. Run the CoAP clients (see **Figure 6**):
    a. For GET operation: *python clientGET.py*
    b. For PUT operation: *python clientPUT.py*

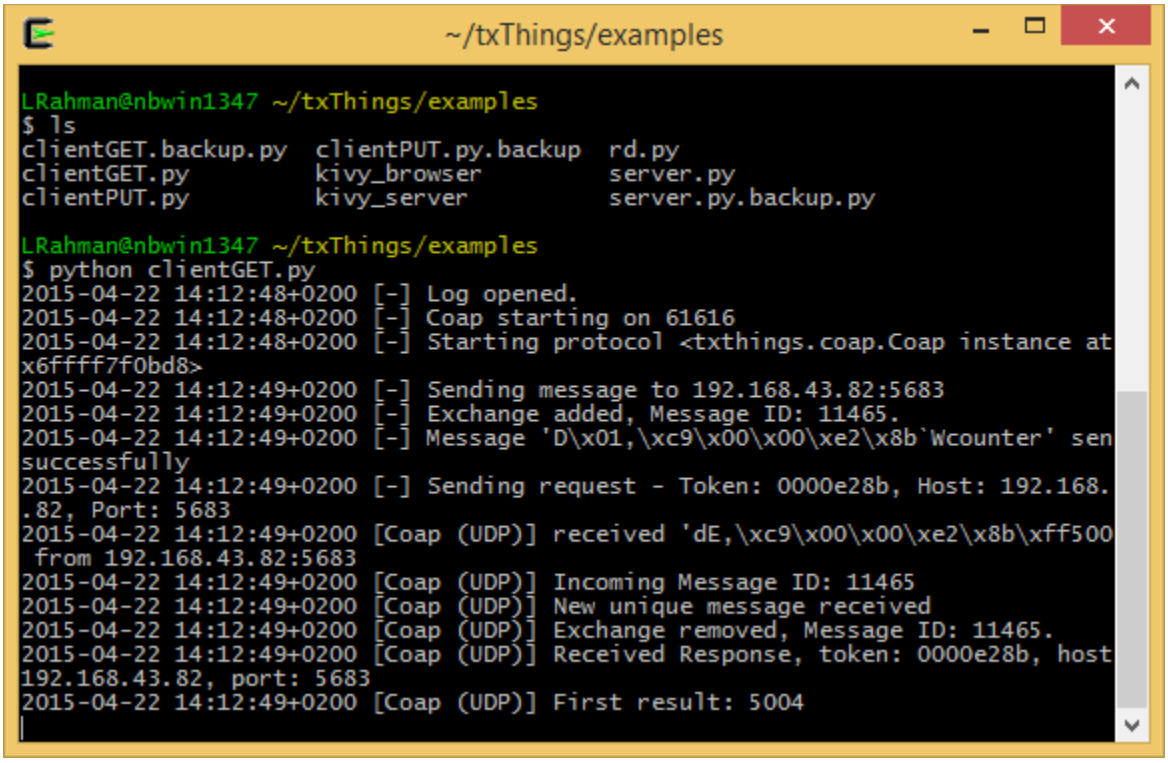

Figure 6. Run *clientGET.py* on a Windows PC using Cygwin

6 RUN COPPER ON FIREFOX

The Copper (Cu) CoAP user-agent is an add-on for the Firefox Web browser. It allows browsing, bookmarking, and direct interaction with CoAP resources. Install Copper on Firefox from https://addons.mozilla.org/en-US/firefox/addon/copper-270430/

Once installed, simply enter a CoAP URI into the address bar of Firefox Web browser (See **Figure 7**, **Figure 8** and **Figure 9**)

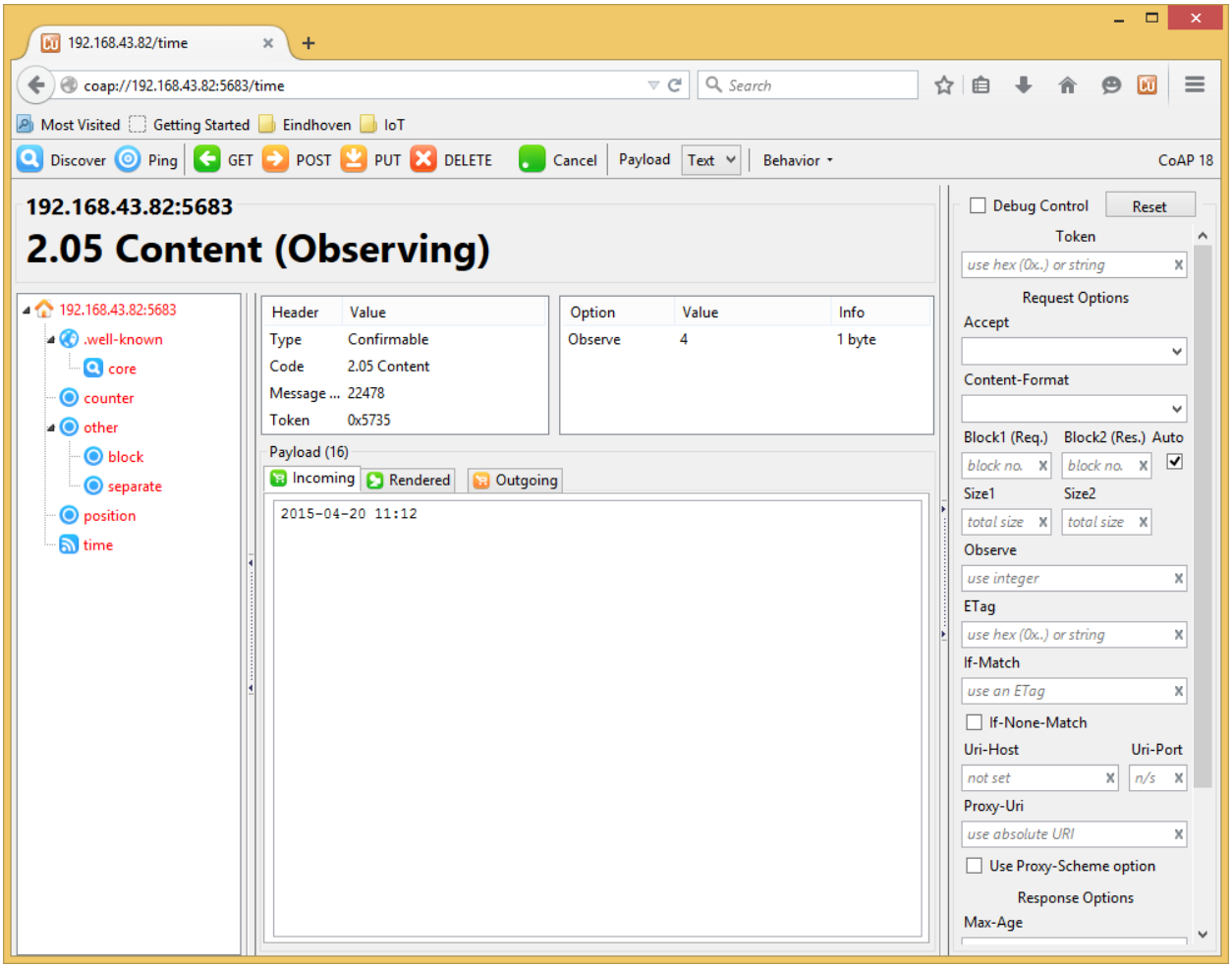

Figure 7. Running the OBSERVE operation on the resource "time" using Copper

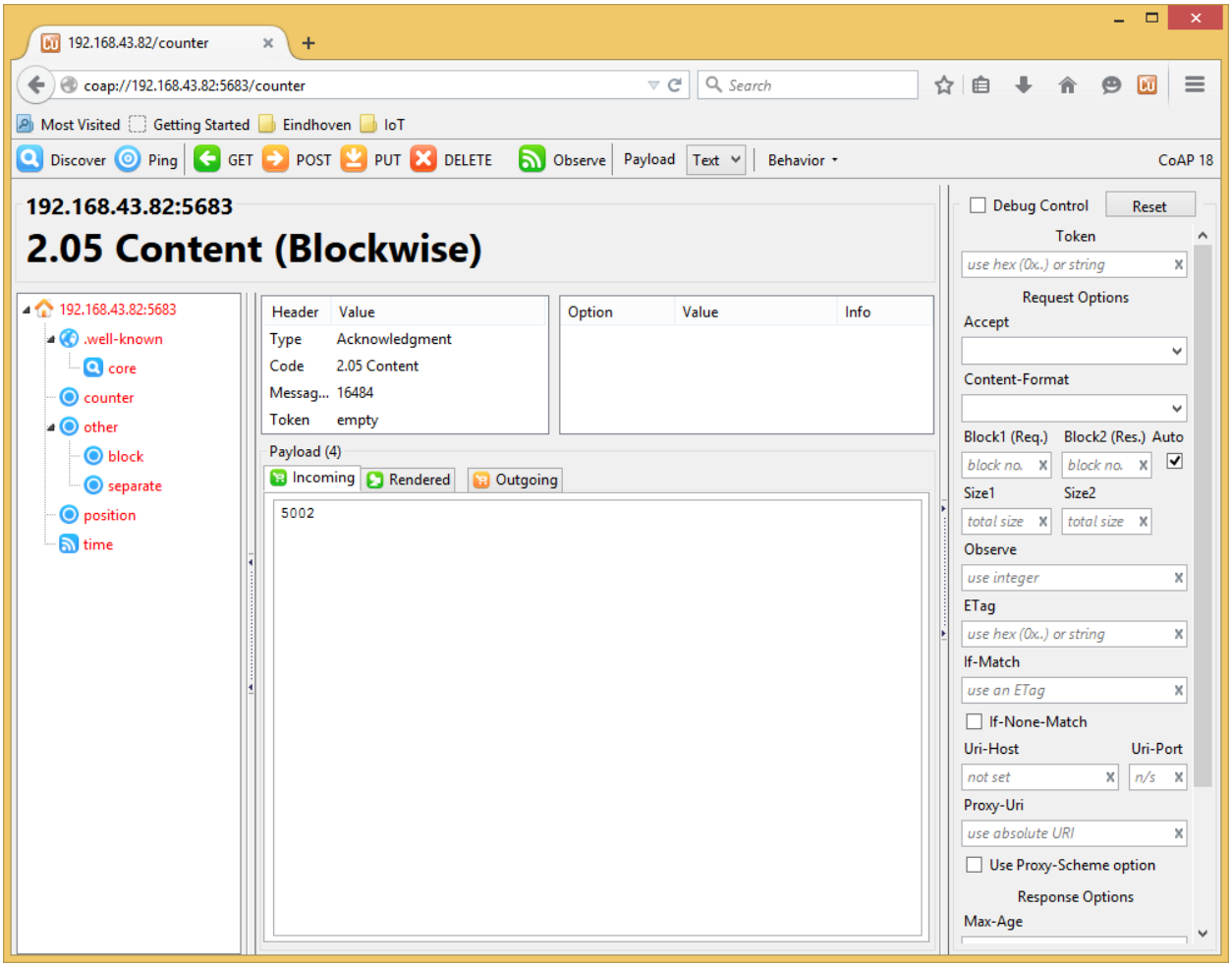

Figure 8. Running the GET operation on the resource "counter" using Copper

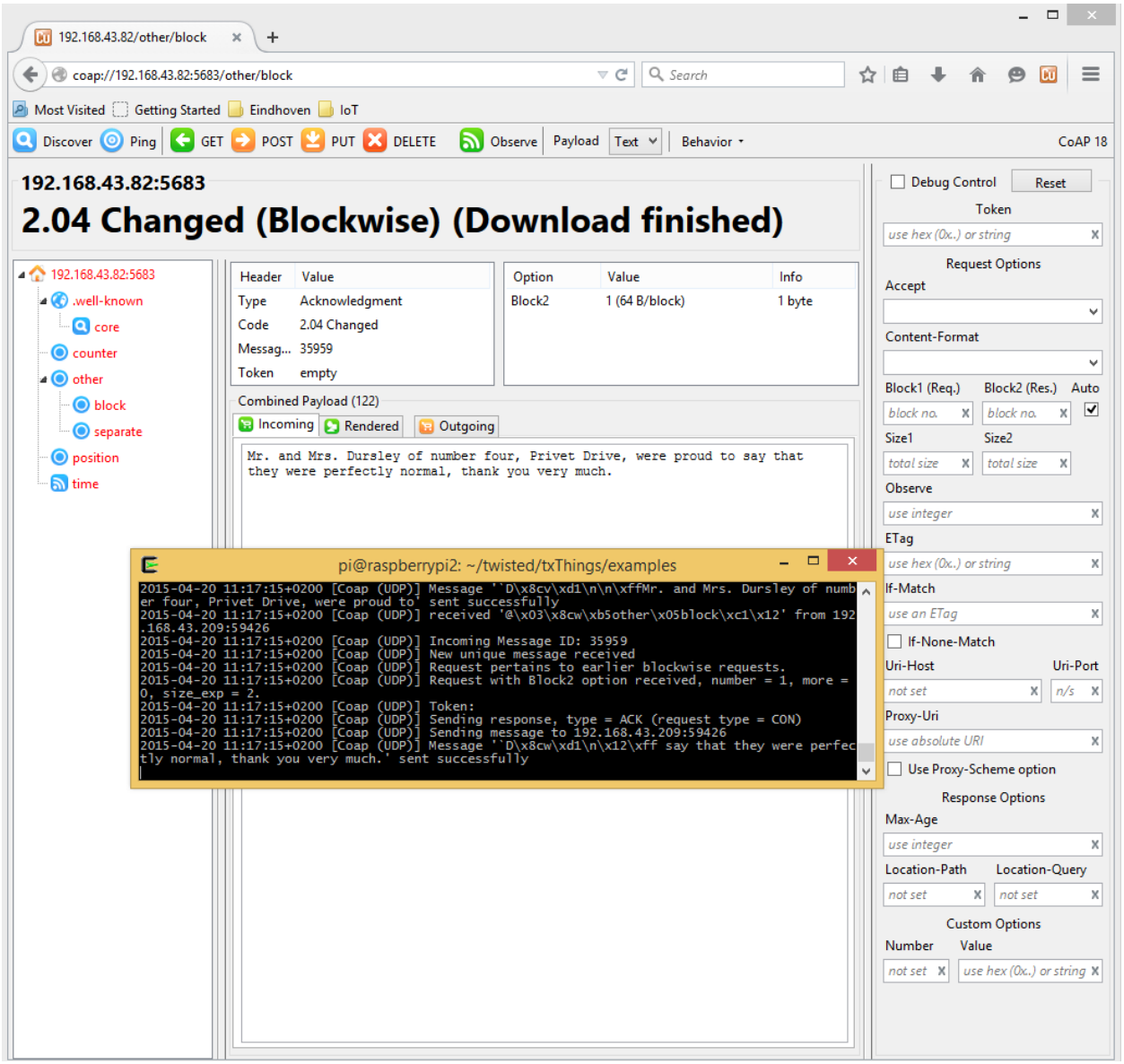

Figure 9. Running the PUT operation on the resource "block" using Copper