Tutorial 7 – Contiki CoAP

Aim

Contiki is an event based operating system that designed to operate on resource scarce and low power embedded system platforms. This tutorial shows you how to use the Constrained Application Protocol (CoAP) over 6loWPAN networking communications stack of Contiki. CoAP is a specialized web transfer protocol (a popular example is HTTP) for use with constrained nodes and constrained networks in the IoT. The protocol is designed for machine-to-machine (M2M) applications such as smart energy and building automation.

6lowpan/IPv6 Routing

Please refer to Tutorial 5 on the details of how to set up a 6LoWPAN network with Contiki.

Step 1: Install a RPL Border Router

Program the sensortag with rpl-border-router example from contiki-examples/networking/rpl-border-router

Step 2: Run the tunslip6 program

Example:

```
sudo ~/contiki-git/tools/tunslip6 -B 115200 -s /dev/ttyACM0 aaaa::1/64
```

Step 3: Download CoAP example program from course website,

and unzip the file.

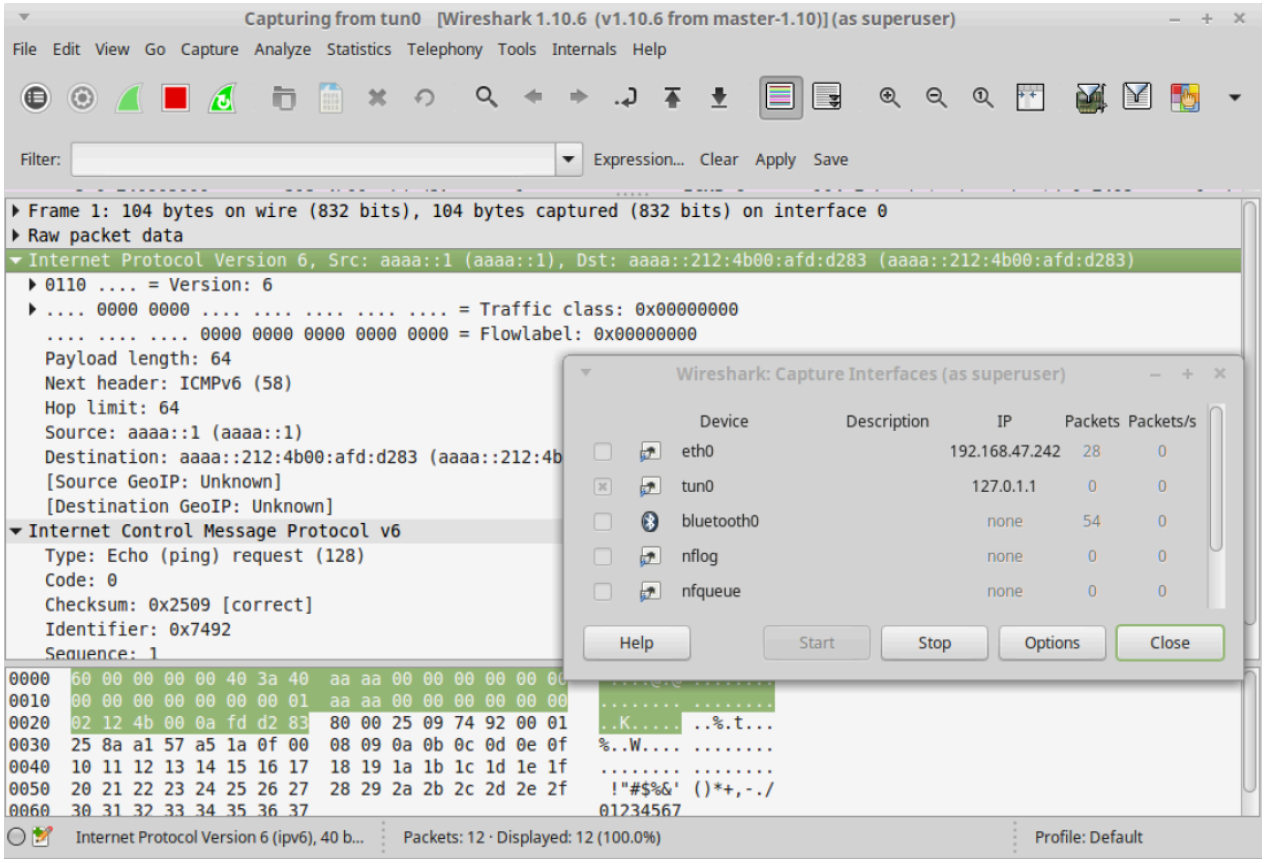
```
cd ~/contiki-examples/networking
wget --user <zID> --password <zPass> https://www.cse.unsw.edu.au/~cs6733/17s2/labs/
lab04/er-rest-example.tar.gz
tar –zxvf er-rest-example.tar.gz
```

Compile the er-example-server file, and load it to a sensorTag. Restart the tag after a new program is loaded.

Step 4: Run Wireshare on a terminal as a super user,

```
sudo wireshark
```

and set tun0 (rpl-border-router) as the target interface. Then Wireshark will sniff all inbound and outbound packets from tun0 interface of your VM.



Step 5: Install Copper add-on for Firefox from:

https://addons.mozilla.org/en-US/firefox/addon/copper-270430/. Interact with er-example-server in Step 3 (see below figure).

1) Enter the IPv6 address to you browser. Uses coap instead of http.

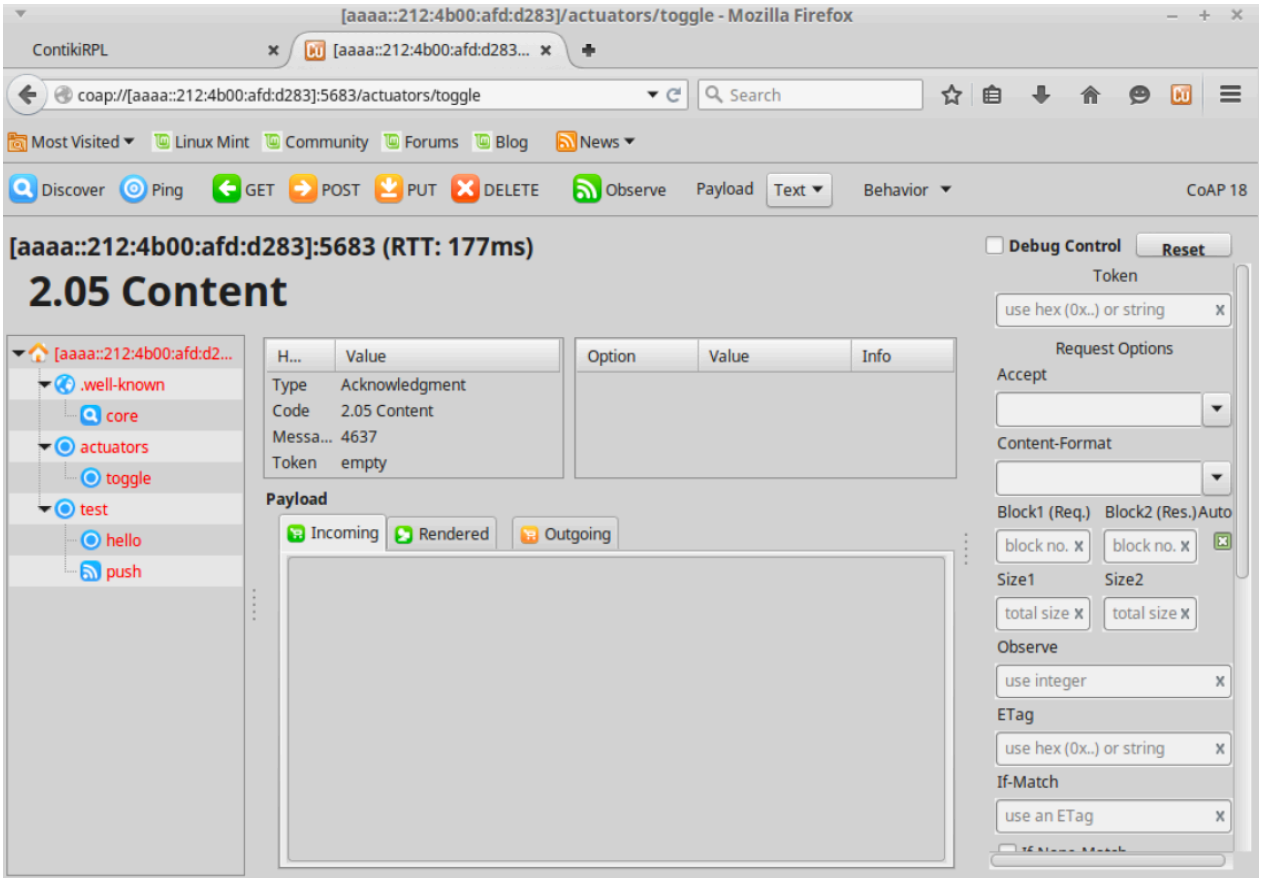
```
Coap://[aaaa::212:4b00:afd:d283] (please replace the IPv6 address with the address of your sensorTag.)
```

2) Click on “Discover” item.

3) Select “actuators/toggle” from menu, then click on “POST” (the red LED of your sensorTag should be toggled)

4) Select “test/hello” from menu, then click on “GET” (“Hello world” message should be shown in the Payload area.

5) Try other features…



Step 6: Interact with ER-EXAMPLE-CLIENT

which is a CoAP client that polls the /actuators/toggle resource every 10 seconds and cycles through 4 resources on button press (target address is hard-coded).

1) Change the hard-coded server address in er-example-client.c to the IPv6 address of your sensorTag, e.g., aaaa::212:4b00:afd:d283.

2) Change CONTIKI_PROJECT in Makefile from er-example-server to er-example-client

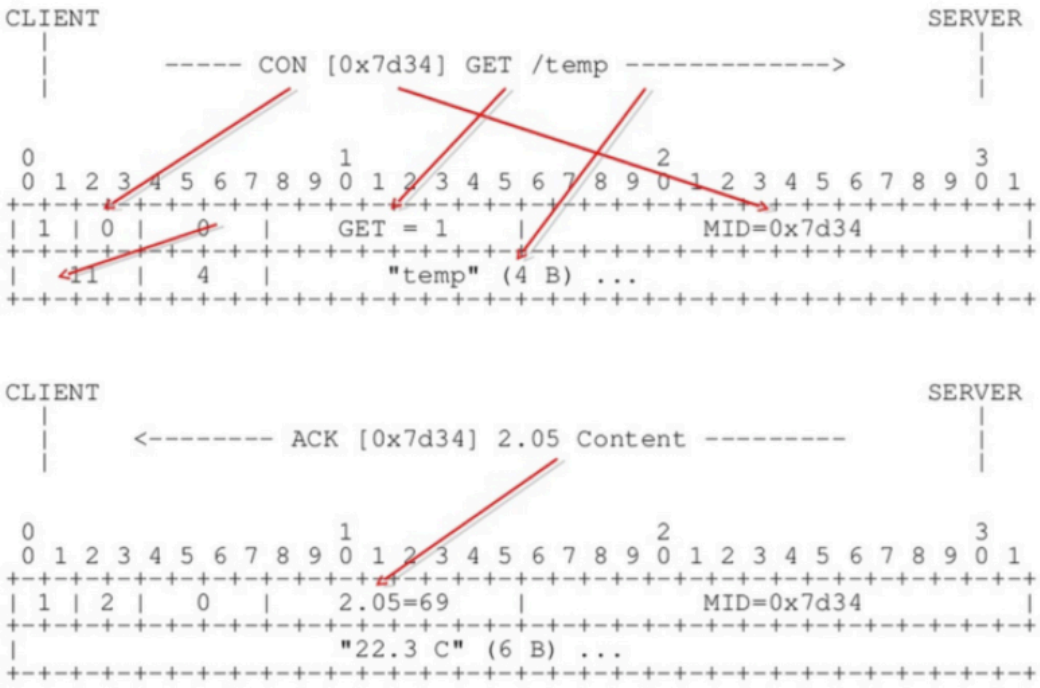
```
CONTIKI_PROJECT=er-example-client
```

3) Load the er-example-client to a new sensorTag by

```
make prog
```

Step 7: Analysis CoAP Packet format

Now, you are able to analyze both request and response CoAP packets for both GET and POST commands captured by Wireshark and produce four figures (see the above figure for an example).



Conclusion

This lesson has introduced the basics of CoAP in Contiki 6LoWPAN.

Related Documentation

- Contiki Wiki: https://github.com/contiki-os/contiki/wiki