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# Observing Sensor Data in WSNs using HTTP and Telosb SkyWebsense in Contiki

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# Outline

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## General Idea

- Firmware Required

## Simulation on Cooja

- Creating a Port using Cooja
- Configuring the Border-Router

## Observing Sensor Data using a Webbrowser

- Observing Results

## Websense on Tmote Sky

- Border-Router on Tmote Sky
- Websense on Tmote Sky

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General Idea  
Firmware Required

# General Idea

- Sensors deployed in a testing field need to be accessed for regular or sporadic measurement check
- Sensors are connected 'wirelessly' via a common network and a border router controls the traffic, Sensor Data acquisition is simpler

Border Router controls the addressing and routing of the sensor data in the network

TARGET of this tutorial : To simulate a sensor network and acquire sensor measurements and to test out with Tmote Sky motes

## Source Files

- *examples/ipv6/sky-websense*
  - **sky-websense.c**: main source code to be used
  - **wget.c & wget.h** : WGET implementation for accessing data through a webserver (used when application is based on HTTP/HTTPS)
  - *examples/ipv6/rpl-border-router*  
For border-router working on RPL (Routing Protocol for Low-power and lossy networks)

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## Simulation on Cooja

- Creating a Port using Cooja

- Configuring the Border-Router

# Simulation on Cooja

## Adding a border-router:

- Open Cooja Simulator and create a new simulation
- Add motes – Sky Motes
- choose firmware :  
*examples/ipv6/rpl-border-router/border-router.c*
- Compile and create 1 such Border Router Mote

## Adding sky-websense motes:

- Add motes – Sky Motes
- choose firmware:  
*examples/ipv6/sky-websense/sky-websense.c*
- Compile and create 4 or 5 such Websense motes in the network

## Creating a Port using Cooja

- In the Network window – click on View menu – select *Mote Type, Mote ID, Addresses* options for ease of viewing the simulation and motes
- on the BORDER ROUTER mote – Right Click – More tools for section – and click on SERIAL SOCKET(SERVER)
- a new box appears with an option of *Listen Port* – make sure it is 60001 which will be the UDP port which we shall use for the simulation
- Click on Start for the SERIAL SOCKET box and also start the simulation



# Configuring the Border-router for COOJA

- open a new Terminal and guide to the same directory as mentioned :  
*examples/ipv6/sky-websense*
- in the Terminal write:  
*make connect-router-cooja*
- give in the password 'user'

you will see that a link-local and a global IPv6 address is assigned to the border router. This is done through a SLIP the port 60001 which was mentioned previously

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Observing Sensor Data using a Webbrowser  
Observing Results

# Observing the network via Webbrowser

- shift to a new workspace by using CTRL+ALT+  
Arrow\_Keys  
(ubuntu hack: for working simultaneously on many things)
- Open Mozilla Firefox from Applications – Internet section
- type the global IPv6 Address of the Border-router:  
**http://[IPv6 Address of the Border Router]**
- TIP: always write IPv6 addresses in Square Brackets

In the simulation: Border-Router address:  
**aaaa::212:7401:1:101** (global IPv6 address)



# Simulation Environment and Results

```
user@instant-contiki:~$ cd contiki-2.7/examples/ipv6/sky-websense/
user@instant-contiki:~/contiki-2.7/examples/ipv6/sky-websense$ make connect-rout
er-cooja
using saved target 'sky'
sudo ../../tools/tunslip6 -a 127.0.0.1 aaaa::1/64
[sudo] password for user:
slip connected to `127.0.0.1:60001'
opened tun device `/dev/tun0'
ifconfig tun0 inet hostname up
ifconfig tun0 add aaaa::1/64
ifconfig tun0 add fe80::0:0:0:1/64
ifconfig tun0

tun0      Link encap:UNSPEC  HWaddr 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00
-00

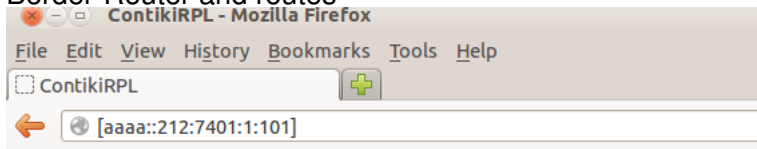
        inet addr:127.0.1.1  P-t-P:127.0.1.1  Mask:255.255.255.255
        inet6 addr: fe80::1/64 Scope:Link
        inet6 addr: aaaa::1/64 Scope:Global
        UP POINTOPOINT RUNNING NOARP MULTICAST  MTU:1500  Metric:1
        RX packets:0 errors:0 dropped:0 overruns:0 frame:0
        TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
        collists:0 txqueuelen:500
        RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

*** Address:aaaa::1 => aaaa:0000:0000:0000
Got configuration message of type P
Setting prefix aaaa::
Server IPv6 addresses:
  aaaa::212:7401:1:101
  fe80::212:7401:1:101
```

Output on terminal when connected to Border Router

# Observing Results on Mozilla Firefox

## Border-Router and routes



### Neighbors

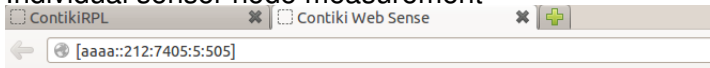
```
fe80::212:7405:5:505  
fe80::212:7402:2:202  
fe80::212:7403:3:303
```

### Routes

```
aaaa::212:7405:5:505/128 (via fe80::212:7405:5:505) 16711308s  
aaaa::212:7404:4:404/128 (via fe80::212:7405:5:505) 16711409s  
aaaa::212:7402:2:202/128 (via fe80::212:7402:2:202) 16711308s  
aaaa::212:7403:3:303/128 (via fe80::212:7403:3:303) 16711309s
```

# Observing Results on Mozilla Firefox

## Individual sensor node measurement



## Current readings

Light: 142

Temperature: 24° C

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Websense on Tmote Sky

Border-Router on Tmote Sky

Websense on Tmote Sky



# Border-Router on Tmote Sky

- when working in group: Decide on make one Tmote Sky as a border router and others as the websense sensor nodes
- For border router, make sure the Sky mote is connected on **/dev/ttyUSB0** port on the computer

```
$ cd examples/ipv6/rpl-border-router
$ make sky-motelist (TO CHECK CONNECTION)
$ make TARGET=sky border-router.upload
$ make connect-router
```

**NOTE:** if there is an error while flashing the program on the mote type this on terminal and do the steps again

```
$ sudo chown :user /dev/ttyUSB*
```

# Websense on Tmote Sky

- For other motes: flash the websense firmware

```
$ cd examples/ipv6/sky-websense  
$ make TARGET=sky sky-websense.upload
```

Note the global IPv6 address of the border-router and observe the routing table on Mozilla Firefox  
Further Check the measurements on respective Global IPv6 addresses of sensor nodes in Mozilla Firefox

# Hacks for the work

- if the IPv6 Address of the border is not set, press RESET button on Sky mote.
- to personally check the connectivity to the Border Router or other sensor nodes in terminal use:

```
$ ping6 IPv6 address-of-sensornode(BorderRouter)
```

e.g.

```
$ ping6 aaaa::212:7400:1360:dd87
```

- it is also advisable to press RESET button on the Websense sensors