DOP: / /2023 DOS: / / 2023

Experiment No: 06

Aim: - To study and demonstrate working of 6LoWPAN in Contiki OS (simulator).

Theory:

Contiki:

Contiki is an open-source operating system for the Internet of Things (IOT). It runs on networked embedded systems and wireless sensor nodes. It designed for microcontrollers with small amounts of memory. A typical Contiki configuration is 2 kilobytes of RAM and 40 kilobytes of ROM. Contiki provides IP configuration, both for IPV4 and IPV6.

- It has an IPV6 stack.
- Contiki supports 6LoWPAN header compression and the CoAP application layer protocol.

6LoWPAN:

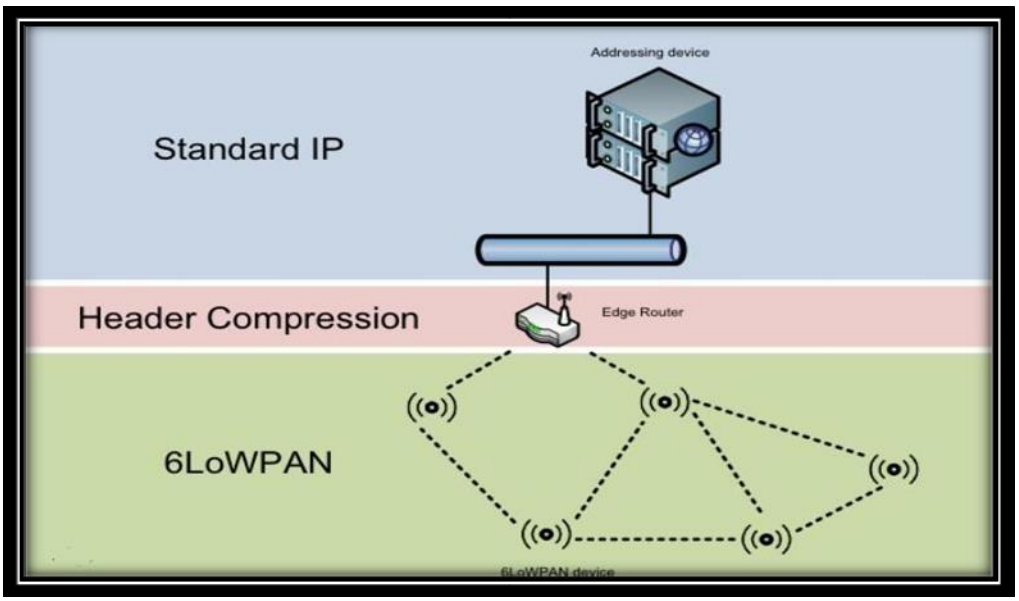
6LoWPAN stands for IPv6 over Low-power Wireless Personal Area Networks. It is a standard protocol for realizing IPv6 communication on wireless networks composed of low-power wireless modules.

6LoWPAN specification contains packet compression and other optimization mechanisms to enable the efficient transmission of IPv6 packets on a network with limited power resources and reliability, which makes efficient IPv6 communication over low-power wireless networks possible.

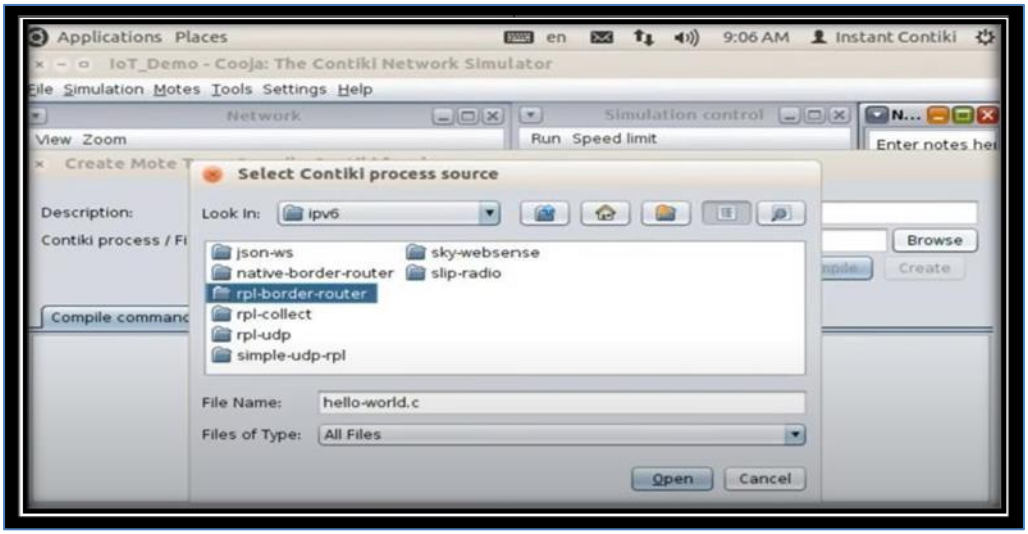
Various low-power wireless networks have been proposed and implemented before 6LoWPAN, but currently, 6LoWPAN is regarded as one of the preferred protocols to realize the Internet of Things (IoT).

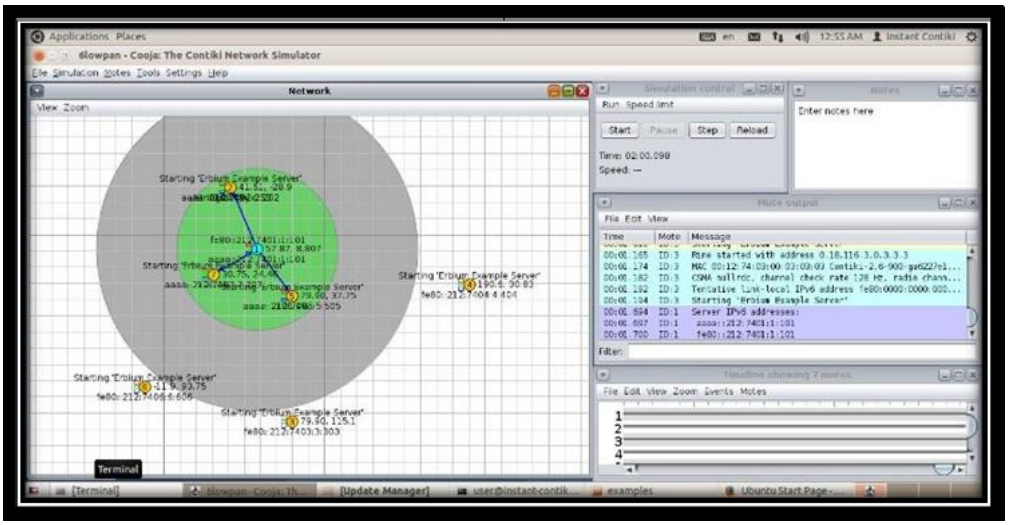
This is because 6LoWPAN communication based on IPv6 allows once closed low-power wireless networks to interface with the global network, the

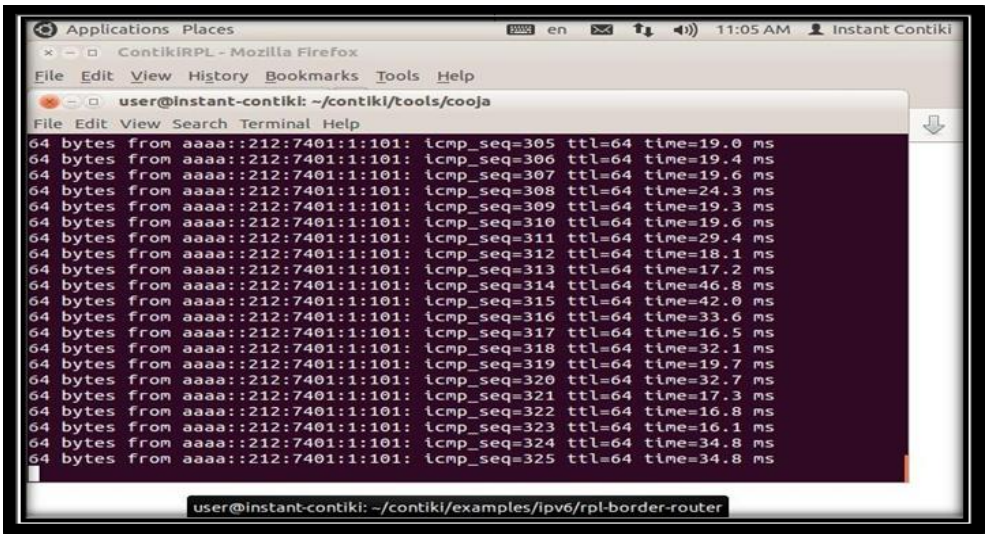
Internet, and implement more advanced intelligent services that were not possible in the past. Simply, Low-power devices with limited processing capabilities should be able to participate in the Internet of Things. So, the 6LoWPAN is used such that the Internet Protocol could and should be applied even to the smallest devices.



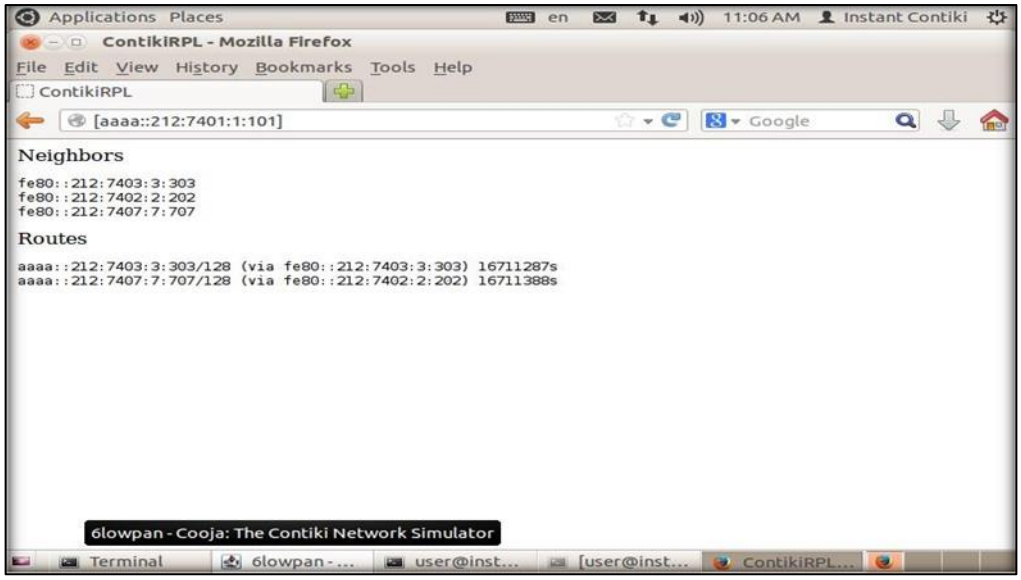
6LoWPAN simulation using Cooja simulation:

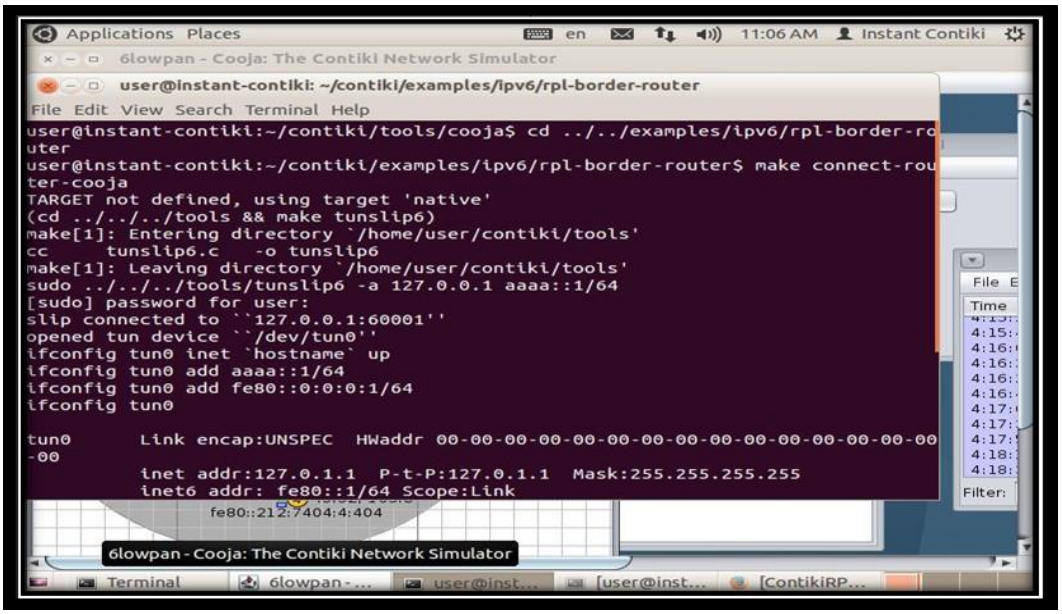


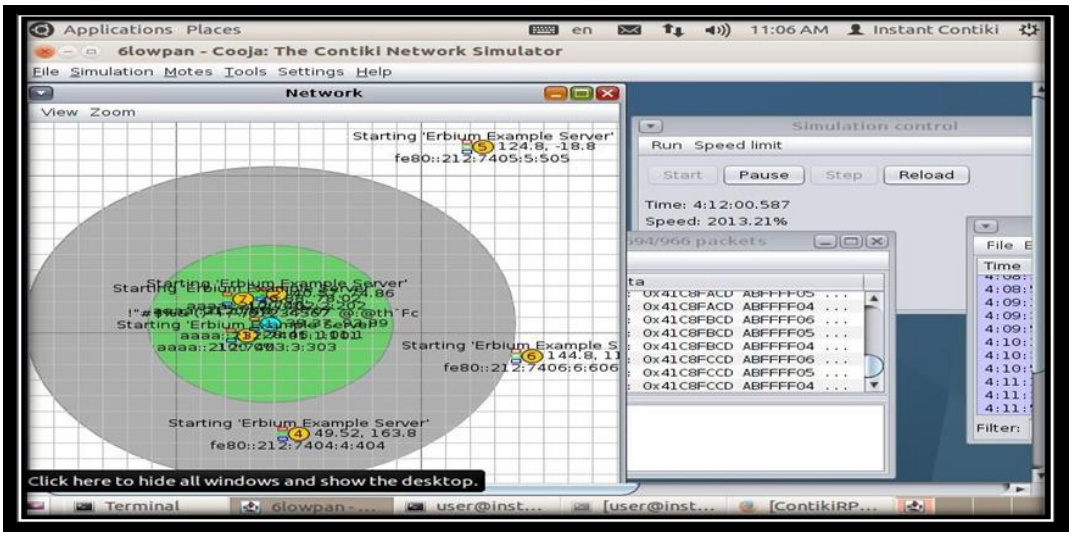




Result:


Applications Places
en
11:06 AM
Instant Contiki
ContikiRPL - Mozilla Firefox
File Edit View History Bookmarks Tools Help
ContikiRPL
[aaaa::212:7401:1:101]
Google
Neighbors
fe80::212:7403:3:303
fe80::212:7402:2:202
fe80::212:7407:7:707
Routes
aaaa::212:7403:3:303/128 (via fe80::212:7403:3:303) 16711287s
aaaa::212:7407:7:707/128 (via fe80::212:7402:2:202) 16711388s
6lowpan - Cooja: The Contiki Network Simulator
Terminal
6lowpan - ...
user@inst...
[user@inst...
ContikiRPL...

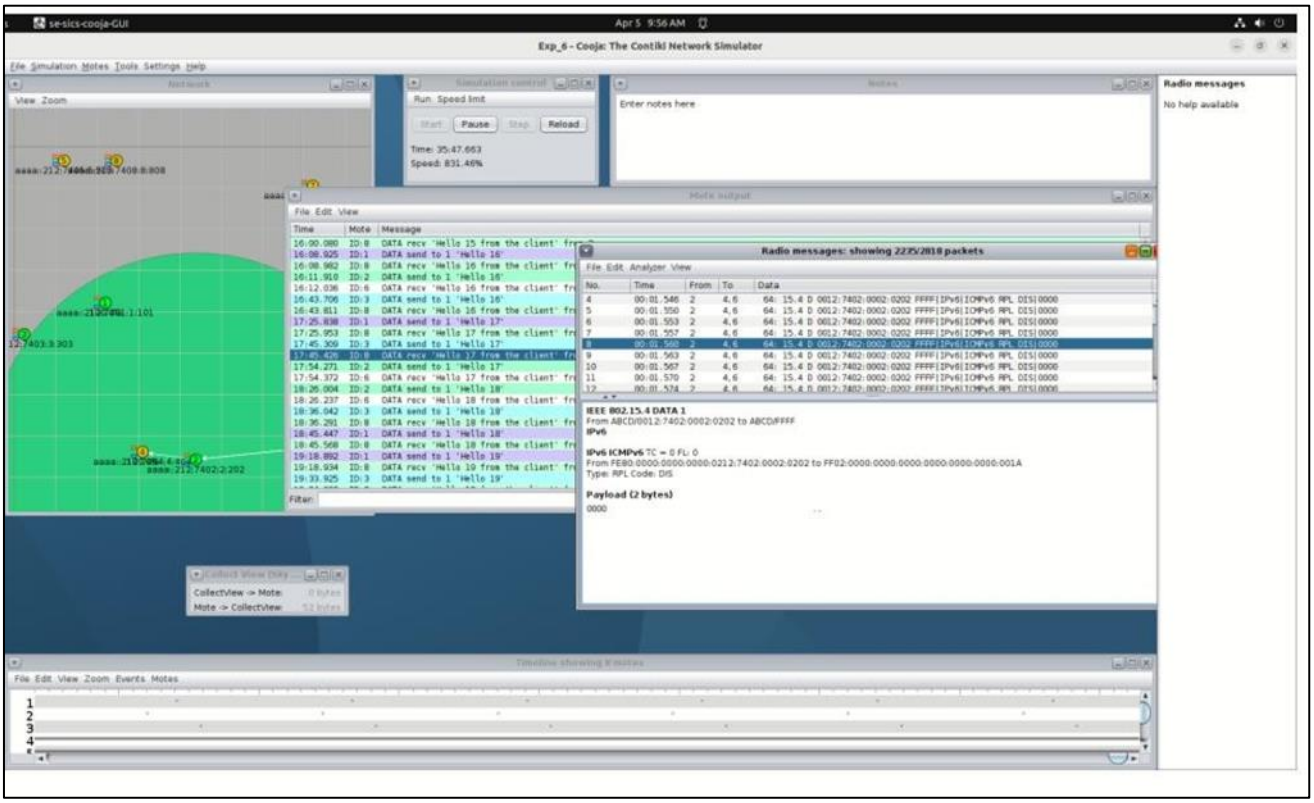

Applications Places
en
11:06 AM
Instant Contiki
6lowpan - Cooja: The Contiki Network Simulator
user@instant-contiki: ~/contiki/examples/ipv6/rpl-border-router
File Edit View Search Terminal Help
user@instant-contiki:~/contiki/tools/cooja$ cd ../../examples/ipv6/rpl-border-router
user@instant-contiki:~/contiki/examples/ipv6/rpl-border-router$ make connect-router-cooja
TARGET not defined, using target 'native'
(cd ../../../tools && make tunslip6)
make[1]: Entering directory `/home/user/contiki/tools'
cc tunslip6.c -o tunslip6
make[1]: Leaving directory `/home/user/contiki/tools'
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
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
fe80::212:7404:4:404
6lowpan - Cooja: The Contiki Network Simulator
Terminal
6lowpan - ...
user@inst...
[user@inst...
[ContikiRP...


Applications Places
en
11:06 AM
Instant Contiki
6lowpan - Cooja: The Contiki Network Simulator
File Simulation Motes Tools Settings Help
Network
View Zoom
Starting 'Erbium Example Server'
124.8, -18.8
fe80::212:7405:5:505
Simulation control
Run Speed limit
Start Pause Step Reload
Time: 4:12:00.587
Speed: 2013.21%
Starting 'Erbium Example Server'
49.52, 163.8
fe80::212:7404:4:404
Click here to hide all windows and show the desktop.
Terminal
6lowpan - ...
user@inst...
[user@inst...
[ContikiRP...

```
user@instant-contiki: ~/contiki/examples/ipv6/rpl-border-router
File  Edit  View  Search  Terminal  Help
ifconfig tun0 add aaaa::1/64
ifconfig tun0 add fe80::0:0:0:1/64
ifconfig tun0

tun0      Link encap:UNSPEC  HWaddr 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-0
-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
          collisions: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
```



Conclusion: Thus, we have studied and demonstrate the working of 6LoWPAN in Contiki OS simulator