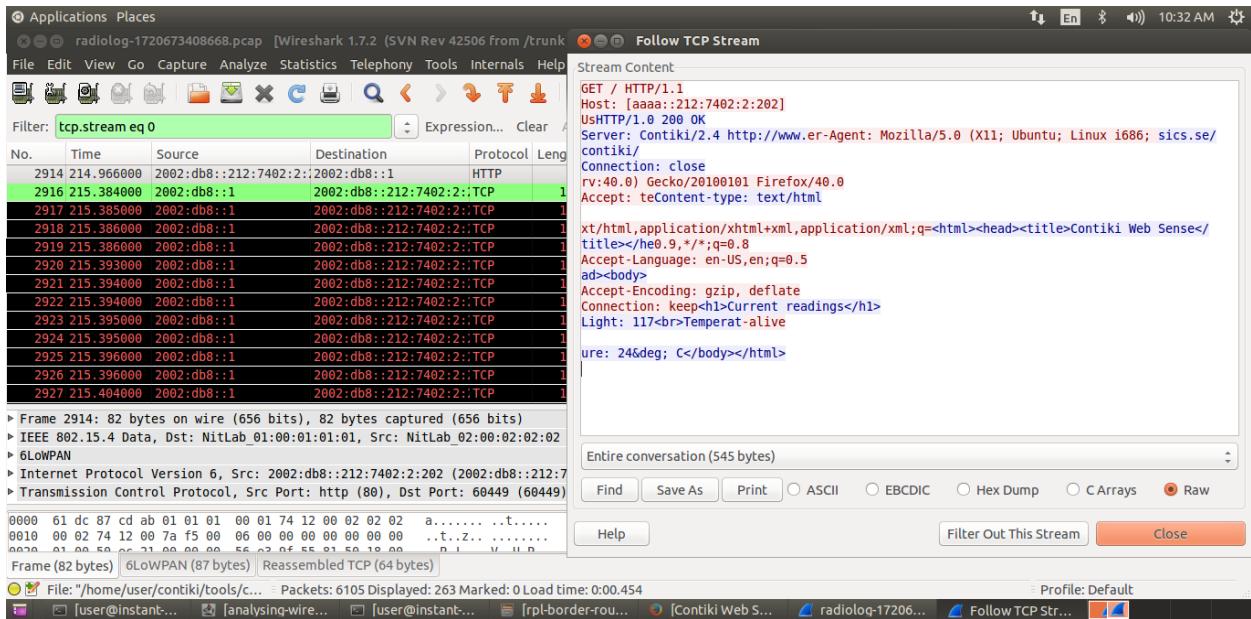
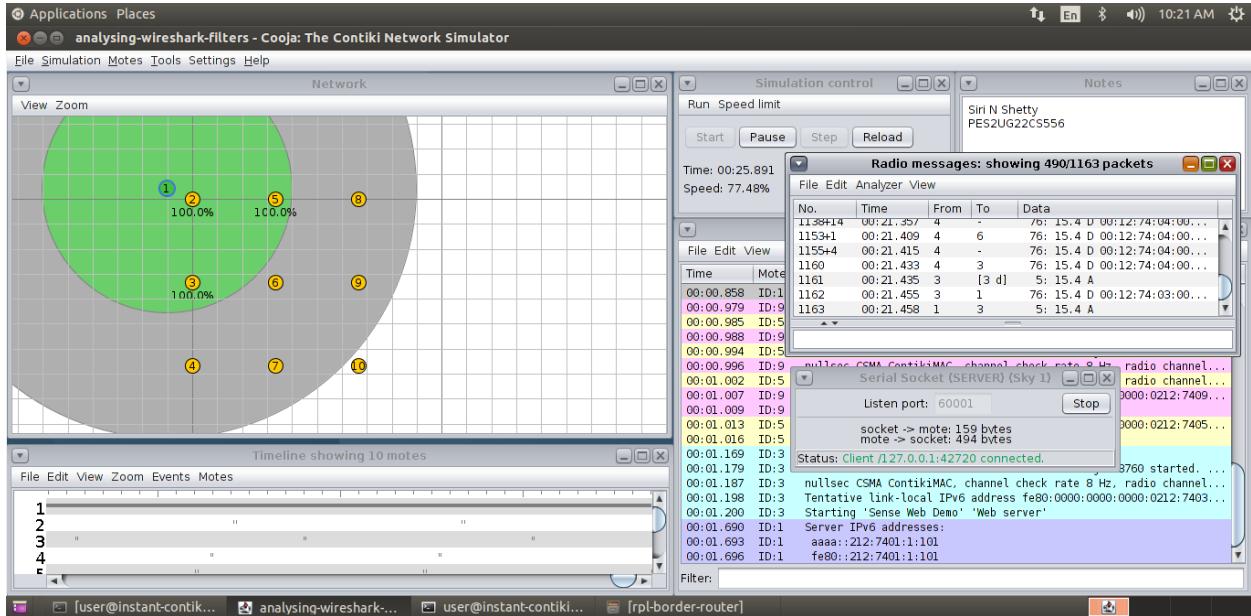


Developing Next-Gen IoT Solutions with Contiki OS and Cooja Simulator

Submissions – Day 4 (11th July 2024)

Siri N Shetty (PES2UG22CS556)

1. Wireshark with filters and statistic



Applications Places

radiolog-1720673408668.pcap [Wireshark 1.7.2 (SVN Rev 42506 from /trunk)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: `tcp.stream eq 0`

No. Time Source Destination Protocol Length Info

2996	218.830800	2002:db8::1	2002:db8::212:7402:2::TCP	64	[TCP Dup ACK 2986#10] 60449 > http [ACK] Seq=299 Ack=200 Win=3686400 Len=0
2997	218.831000	2002:db8::1	2002:db8::212:7402:2::TCP	64	[TCP Dup ACK 2986#11] 60449 > http [ACK] Seq=299 Ack=200 Win=3686400 Len=0
2998	218.831000	2002:db8::1	2002:db8::212:7402:2::TCP	64	[TCP Dup ACK 2986#12] 60449 > http [ACK] Seq=299 Ack=200 Win=3686400 Len=0
2999	218.832000	2002:db8::1	2002:db8::212:7402:2::TCP	64	[TCP Dup ACK 2986#13] 60449 > http [ACK] Seq=299 Ack=200 Win=3686400 Len=0
3000	218.832000	2002:db8::1	2002:db8::212:7402:2::TCP	64	[TCP Dup ACK 2986#14] 60449 > http [ACK] Seq=299 Ack=200 Win=3686400 Len=0
3001	218.833000	2002:db8::1	2002:db8::212:7402:2::TCP	64	[TCP Dup ACK 2986#15] 60449 > http [ACK] Seq=299 Ack=200 Win=3686400 Len=0
3002	219.322000	2002:db8::1	2002:db8::212:7402:2::TCP	64	[TCP Dup ACK 2986#16] 60449 > http [ACK] Seq=299 Ack=200 Win=3686400 Len=0
3003	219.324000	2002:db8::1	2002:db8::212:7402:2::TCP	64	[TCP Dup ACK 2986#17] 60449 > http [ACK] Seq=299 Ack=200 Win=3686400 Len=0
3004	219.331000	2002:db8::1	2002:db8::212:7402:2::TCP	64	[TCP Dup ACK 2986#18] 60449 > http [ACK] Seq=299 Ack=200 Win=3686400 Len=0
3005	219.332000	2002:db8::1	2002:db8::212:7402:2::TCP	64	[TCP Dup ACK 2986#19] 60449 > http [ACK] Seq=299 Ack=200 Win=3686400 Len=0
3006	219.333000	2002:db8::1	2002:db8::212:7402:2::TCP	64	[TCP Dup ACK 2986#20] 60449 > http [ACK] Seq=299 Ack=200 Win=3686400 Len=0
3007	219.339000	2002:db8::1	2002:db8::212:7402:2::TCP	64	[TCP Dup ACK 2986#21] 60449 > http [ACK] Seq=299 Ack=200 Win=3686400 Len=0
3008	219.339000	2002:db8::1	2002:db8::212:7402:2::TCP	64	[TCP Dup ACK 2986#22] 60449 > http [ACK] Seq=299 Ack=200 Win=3686400 Len=0

Frame 3006: 64 bytes on wire (512 bits), 64 bytes captured (512 bits)

IEEE 802.15.4 Data, Dst: NitLab_02:00:02:02:02, Src: NitLab_01:00:01:01:01

6LoWPAN

Internet Protocol Version 6, Src: 2002:db8::1 (2002:db8::1), Dst: 2002:db8::212:7402:2:202 (2002:db8::212:7402:2:202)

Transmission Control Protocol, Src Port: 60449 (60449), Dst Port: http (80), Seq: 299, Ack: 200, Len: 0

Frame (64 bytes) | 6LoWPAN (68 bytes)

File: "/home/user/contiki/tools/c... | Packets: 6105 Displayed: 263 Marked: 0 Load time: 0:00.428 | Profile: Default

User Instant-cont... | Analysing-wires... | User Instant-cont... | rpl-border-router | Contiki Web S... | radiolog-17206734...

Applications Places

radiolog-1720673408668.pcap [Wireshark 1.7.2 (SVN Rev 42506 from /trunk)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: `tcp.analysis.lost_segment`

No. Time Source Destination Protocol Length Info

2557	193.651000	2002:db8::1	2002:db8::212:7402:2::TCP	64	[TCP Previous segment lost] 60449 > http [ACK] Seq=49 Ack=4294967249 Win=3686400 Len=0
3323	232.174000	2002:db8::1	2002:db8::212:7402:2::TCP	64	[TCP Previous segment lost] 60477 > http [ACK] Seq=49 Ack=1 Win=28800 Len=0
3359	232.754000	2002:db8::1	2002:db8::212:7402:2::TCP	64	[TCP Previous segment lost] 60476 > http [ACK] Seq=49 Ack=1 Win=28800 Len=0
4378	274.452000	2002:db8::1	2002:db8::212:7405:5::TCP	64	[TCP Previous segment lost] 53465 > http [ACK] Seq=97 Ack=1 Win=3686400 Len=0
4656	282.478000	aaaa::212:7405:5:505	aaaa::1 TCP	84	[TCP Previous segment lost] http > 53465 [ACK] Seq=1 Ack=49 Win=60 Len=0
4716	285.158000	aaaa::212:7405:5:505	aaaa::1 TCP	84	[TCP Previous segment lost] http > 53465 [FIN, ACK] Seq=78 Ack=145 Win=60 Len=0

Frame 2557: 64 bytes on wire (512 bits), 64 bytes captured (512 bits)

IEEE 802.15.4 Data, Dst: NitLab_02:00:02:02:02, Src: NitLab_01:00:01:01:01

6LoWPAN

Internet Protocol Version 6, Src: 2002:db8::1 (2002:db8::1), Dst: 2002:db8::212:7402:2:202 (2002:db8::212:7402:2:202)

Transmission Control Protocol, Src Port: 60449 (60449), Dst Port: http (80), Seq: 49, Ack: 4294967249, Len: 0

Frame (64 bytes) | 6LoWPAN (68 bytes)

File: "/home/user/contiki/tools/c... | Packets: 6105 Displayed: 6 Marked: 0 Load time: 0:00.507 | Profile: Default

User Instant-cont... | analysing-wires... | User Instant-cont... | rpl-border-router | Contiki Web S... | Pictures | radiolog-17206734...

radiolog-1720673408668.pcap [Wireshark 1.7.2 (SVN Rev 42506 from /trunk)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: http and !(tcp.stream eq 0)

No. Time Source Destination Protocol Length Info

3518	238.518000	2002:db8::1	2002:db8::212:7402:2:HTTP	112	Continuation or non-HTTP traffic
3519	238.519000	2002:db8::1	2002:db8::212:7402:2:HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic
3520	238.519000	2002:db8::1	2002:db8::212:7402:2:HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic
3521	238.525000	2002:db8::1	2002:db8::212:7402:2:HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic
3522	238.525000	2002:db8::1	2002:db8::212:7402:2:HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic
3523	238.526000	2002:db8::1	2002:db8::212:7402:2:HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic
3524	238.527000	2002:db8::1	2002:db8::212:7402:2:HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic
3525	238.529000	2002:db8::1	2002:db8::212:7402:2:HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic
3526	238.530000	2002:db8::1	2002:db8::212:7402:2:HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic
3527	238.863000	2002:db8::1	2002:db8::212:7402:2:HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic
3528	238.864000	2002:db8::1	2002:db8::212:7402:2:HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic
3529	238.864000	2002:db8::1	2002:db8::212:7402:2:HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic
3530	238.865000	2002:db8::1	2002:db8::212:7402:2:HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic

Frame 3518: 112 bytes on wire (896 bits), 112 bytes captured (896 bits)
IEEE 802.15.4 Data, Dst: NitLab_02:00:02:02:02, Src: NitLab_01:00:01:01:01
► 6LoWPAN
► Internet Protocol Version 6, Src: 2002:db8::1 (2002:db8::1), Dst: 2002:db8::212:7402:2:202 (2002:db8::212:7402:2:202)
► Transmission Control Protocol, Src Port: 60479 (60479), Dst Port: http (80), Seq: 97, Ack: 86, Len: 48

0000 61 dc 2b cd ab 02 02 02 00 02 74 12 00 01 01 01 a.+.....t....
0010 00 01 74 12 00 78 07 00 00 3f 00 00 00 00 00 00 ..t.x...?....
0020 00 01 00 00 62 00 00 01 01 00 cc 3f 00 00 77 1f .t...0...
Frame (112 bytes) 6LoWPAN (116 bytes)

File: "/home/user/contiki/tools/c... Packets: 6105 Displayed: 198 Marked: 0 Load time: 0:00.454 Profile: Default

[user@instant-cont... [analysing-wireshar... [user@instant-cont... Trpl-border-router] [Contiki Web Sense... radiolog-17206734...

Applications Places

radiolog-1720673408668.pcap [Wireshark 1.7.2 (SVN Rev 42506 from /trunk)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: http Expression... Clear Apply Save

No.	Time	Source	Destination	Protocol	Length	Info
3543	239.400000	2002:db8::1	2002:db8::212:7402:2::HTTP	112	Continuation or non-HTTP traffic	
3544	239.401000	2002:db8::1	2002:db8::212:7402:2::HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic	
3545	239.402000	2002:db8::1	2002:db8::212:7402:2::HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic	
3546	239.406000	2002:db8::1	2002:db8::212:7402:2::HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic	
3547	239.410000	2002:db8::1	2002:db8::212:7402:2::HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic	
3548	239.411000	2002:db8::1	2002:db8::212:7402:2::HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic	
3550	239.746000	2002:db8::212:7402:2::2002:db8::1	HTTP	103	Continuation or non-HTTP traffic	
3552	239.751000	2002:db8::1	2002:db8::212:7402:2::HTTP	112	Continuation or non-HTTP traffic	
3553	239.751000	2002:db8::1	2002:db8::212:7402:2::HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic	
3554	239.752000	2002:db8::1	2002:db8::212:7402:2::HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic	
3555	240.088000	2002:db8::1	2002:db8::212:7402:2::HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic	
3556	240.088000	2002:db8::1	2002:db8::212:7402:2::HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic	
3557	240.090000	2002:db8::1	2002:db8::212:7402:2::HTTP	112	[TCP Retransmission] Continuation or non-HTTP traffic	

Frame 3543: 112 bytes on wire (896 bits), 112 bytes captured (896 bits)
 IEEE 802.15.4 Data, Dst: NitLab_02:00:02:02:01, Src: NitLab_01:00:01:01:01
 6LoWPAN
 Internet Protocol Version 6, Src: 2002:db8::1 (2002:db8::1), Dst: 2002:db8::212:7402:2:202 (2002:db8::212:7402:2:202)
 Transmission Control Protocol, Src Port: 60479 (60479), Dst Port: http (80), Seq: 145, Ack: 113, Len: 48

0000 61 dc 2c cd ab 02 02 00 02 74 12 00 01 01 01 ..a.,.....t....
 0010 00 01 74 12 00 78 d7 00 00 3f 00 00 00 00 00 ..t.x.. .?.....
 0020 00 00 05 00 62 04 8a 10 01 00 0c 3f 00 58 7d 1f ..e.....? D=0

Frame (112 bytes) | 6LoWPAN (116 bytes)

File: "/home/user/contiki/tools/c... Packets: 6105 Displayed: 205 Marked: 0 Load time: 0:00.494 Profile: Default

User@Instant-cont... analysing-wireshar... user@instant-cont... rpl-border-router Contiki Web Sense... radiolog-17206734...

Applications Places

radiolog-1720673408668.pcap [Wireshark 1.7.2 (SVN Rev 42506 from /trunk)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: tcp.stream eq 19 Expression... Clear Apply Save

No.	Time	Source	Destination	Protocol	Length
5208	304.967000	2002:db8::1	2002:db8::212:7405:5::HTTP	74	
5209	304.967000	2002:db8::1	2002:db8::212:7405:5::HTTP	74	
4233	268.691000	2002:db8::212:7405:5:505	2002:db8::1	TCP	59
4343	273.196000	2002:db8::212:7405:5:505	2002:db8::1	TCP	59
4345	273.199000	2002:db8::212:7405:5:505	2002:db8::1	TCP	103
4401	274.846000	2002:db8::212:7405:5:505	2002:db8::1	TCP	92
4425	275.736000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	82
4458	276.304000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	103
4459	276.304000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	103
4507	278.271000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	65
4615	281.205000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	103
4681	283.156000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	69
4699	284.058000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	70

Frame 4507: 65 bytes on wire (520 bits), 65 bytes captured (520 bits)
 IEEE 802.15.4 Data, Dst: NitLab_01:00:01:01:01, Src: NitLab_05:00:05:05:05
 6LoWPAN
 Internet Protocol Version 6, Src: 2002:db8::212:7405:5:505 (2002:db8::212:7405:5:505)
 Transmission Control Protocol, Src Port: http (80), Dst Port: 53465 (53465), Seq: 11

0000 61 dc 41 cd ab 01 01 01 00 01 74 12 00 05 05 a.A.....t....
 0010 00 05 74 12 00 7a f5 00 00 00 00 00 00 00 ..t.z..
 0020 01 00 50 00 00 00 00 00 11 01 00 00 00 00 00 ..n.....D=0

Frame (65 bytes) | 6LoWPAN (70 bytes)

File: "/home/user/contiki/tools/c... Packets: 6105 Displayed: 465 Marked: 0 Load time: 0:00.476 Profile: Default

User@instant-cont... analysing-wireshar... user@instant-cont... rpl-border-router Contiki Web... radiolog-17...

Applications Places

radiolog-1720673408668.pcap [Wireshark 1.7.2 (SVN Rev 42506 from /trunk)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: 6lowpan.src == 2002:db8::212:7405:5:505 Expression... Clear Apply Save

No.	Time	Source	Destination	Protocol	Length	Info
4233	268.691000	2002:db8::212:7405:5:505	2002:db8::1	TCP	59	http > 53465 [SYN, ACK] Seq=4294967248 Ack=1 Win=60 Len=0 MSS=48
4242	270.168000	2002:db8::212:7405:5:505	2002:db8::1	TCP	59	http > 53466 [SYN, ACK] Seq=4294967295 Ack=1 Win=60 Len=0 MSS=48
4343	273.196000	2002:db8::212:7405:5:505	2002:db8::1	TCP	59	http > 53465 [SYN, ACK] Seq=4294967248 Ack=1 Win=60 Len=0 MSS=48
4345	273.199000	2002:db8::212:7405:5:505	2002:db8::1	TCP	103	[TCP segment of a reassembled PDU]
4347	273.202000	2002:db8::212:7405:5:505	2002:db8::1	TCP	59	http > 53466 [SYN, ACK] Seq=4294967295 Ack=1 Win=60 Len=0 MSS=48
4401	274.846000	2002:db8::212:7405:5:505	2002:db8::1	TCP	92	http > 53465 [PSH, ACK] Seq=1 Ack=49 Win=60 Len=37
4425	275.736000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	82	HTTP/1.0 200 OK [Illegal Segments]
4458	276.304000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	103	Continuation or non-HTTP traffic
4459	276.304000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	103	[TCP Fast Retransmission] Continuation or non-HTTP traffic
4507	278.271000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	65	Continuation or non-HTTP traffic
4615	281.205000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	103	Continuation or non-HTTP traffic
4681	283.156000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	69	Continuation or non-HTTP traffic
4699	284.058000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	70	Continuation or non-HTTP traffic

Frame 4233: 59 bytes on wire (472 bits), 59 bytes captured (472 bits)
 IEEE 802.15.4 Data, Dst: NitLab_01:00:01:01:01, Src: NitLab_05:00:05:05:05
 6LoWPAN
 Internet Protocol Version 6, Src: 2002:db8::212:7405:5:505 (2002:db8::212:7405:5:505), Dst: 2002:db8::1 (2002:db8::1)
 Transmission Control Protocol, Src Port: http (80), Dst Port: 53465 (53465), Seq: 4294967248, Ack: 1, Len: 0

Frame (59 bytes) [6LoWPAN (64 bytes)]

File: "/home/user/contiki/tools/c... Packets: 6105 Displayed: 34 Marked: 0 Load time: 0:00.525 Profile: Default

user@instant-c... analysing-wires... user@Instant-c... rpl-border-router Contiki Web Se... radiolog-17206... Pictures

Applications Places

radiolog-1720673408668.pcap [Wireshark 1.7.2 (SVN Rev 42506 from /trunk)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: 02:db8::212:7405:5:505 & 6lowpan.dst == 2002:db8::1 Expression... Clear Apply Save

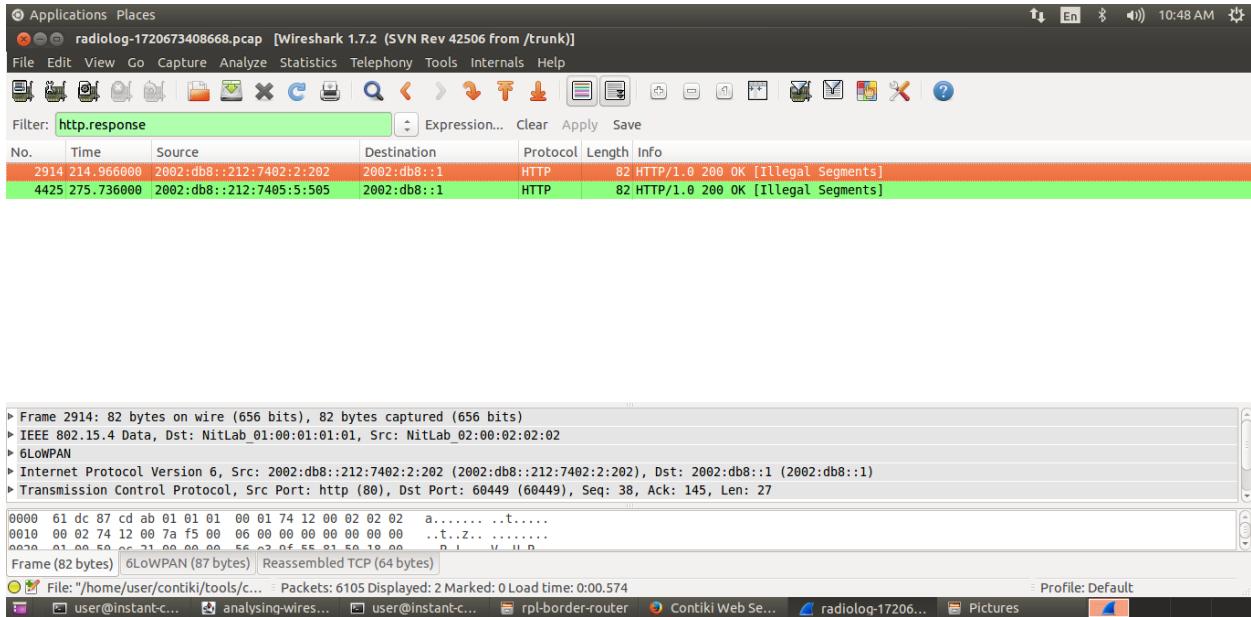
No.	Time	Source	Destination	Protocol	Length	Info
4233	268.691000	2002:db8::212:7405:5:505	2002:db8::1	TCP	59	http > 53465 [SYN, ACK] Seq=4294967248 Ack=1 Win=60 Len=0 MSS=48
4242	270.168000	2002:db8::212:7405:5:505	2002:db8::1	TCP	59	http > 53466 [SYN, ACK] Seq=4294967295 Ack=1 Win=60 Len=0 MSS=48
4343	273.196000	2002:db8::212:7405:5:505	2002:db8::1	TCP	59	http > 53465 [SYN, ACK] Seq=4294967248 Ack=1 Win=60 Len=0 MSS=48
4345	273.199000	2002:db8::212:7405:5:505	2002:db8::1	TCP	103	[TCP segment of a reassembled PDU]
4347	273.202000	2002:db8::212:7405:5:505	2002:db8::1	TCP	59	http > 53466 [SYN, ACK] Seq=4294967295 Ack=1 Win=60 Len=0 MSS=48
4401	274.846000	2002:db8::212:7405:5:505	2002:db8::1	TCP	92	http > 53465 [PSH, ACK] Seq=1 Ack=49 Win=60 Len=37
4425	275.736000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	82	HTTP/1.0 200 OK [Illegal Segments]
4458	276.304000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	103	Continuation or non-HTTP traffic
4459	276.304000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	103	[TCP Fast Retransmission] Continuation or non-HTTP traffic
4507	278.271000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	65	Continuation or non-HTTP traffic
4615	281.205000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	103	Continuation or non-HTTP traffic
4681	283.156000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	69	Continuation or non-HTTP traffic
4699	284.058000	2002:db8::212:7405:5:505	2002:db8::1	HTTP	70	Continuation or non-HTTP traffic

Frame 4233: 59 bytes on wire (472 bits), 59 bytes captured (472 bits)
 IEEE 802.15.4 Data, Dst: NitLab_01:00:01:01:01, Src: NitLab_05:00:05:05:05
 6LoWPAN
 Internet Protocol Version 6, Src: 2002:db8::212:7405:5:505 (2002:db8::212:7405:5:505), Dst: 2002:db8::1 (2002:db8::1)
 Transmission Control Protocol, Src Port: http (80), Dst Port: 53465 (53465), Seq: 4294967248, Ack: 1, Len: 0

Frame (59 bytes) [6LoWPAN (64 bytes)]

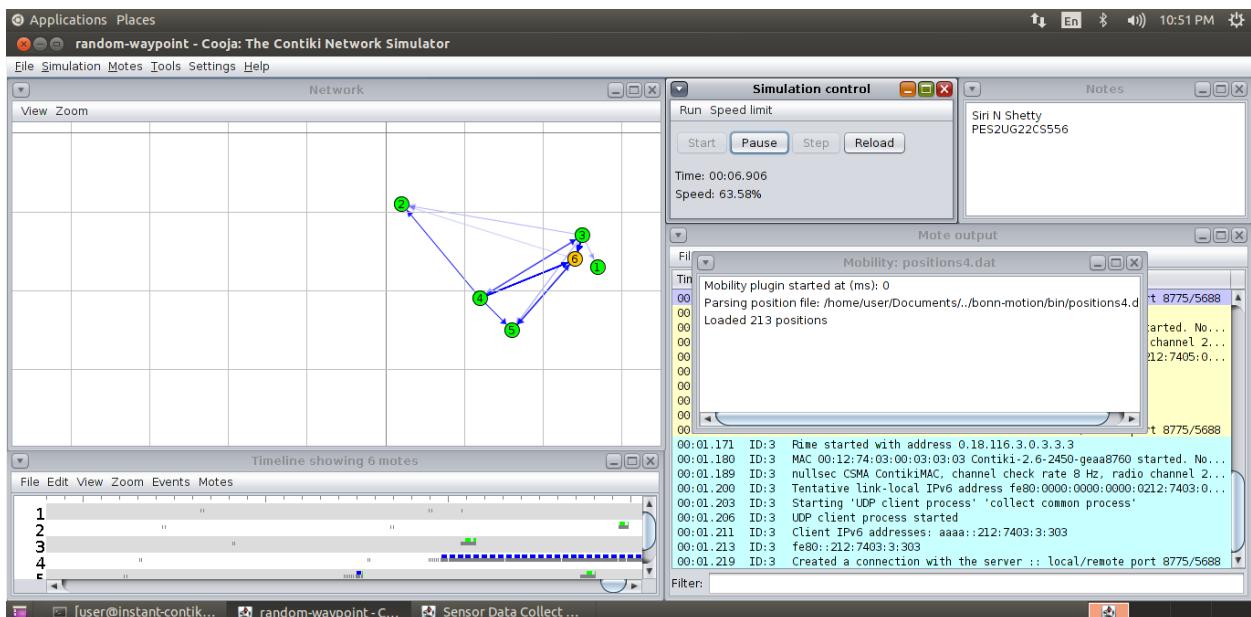
File: "/home/user/contiki/tools/c... Packets: 6105 Displayed: 34 Marked: 0 Load time: 0:00.503 Profile: Default

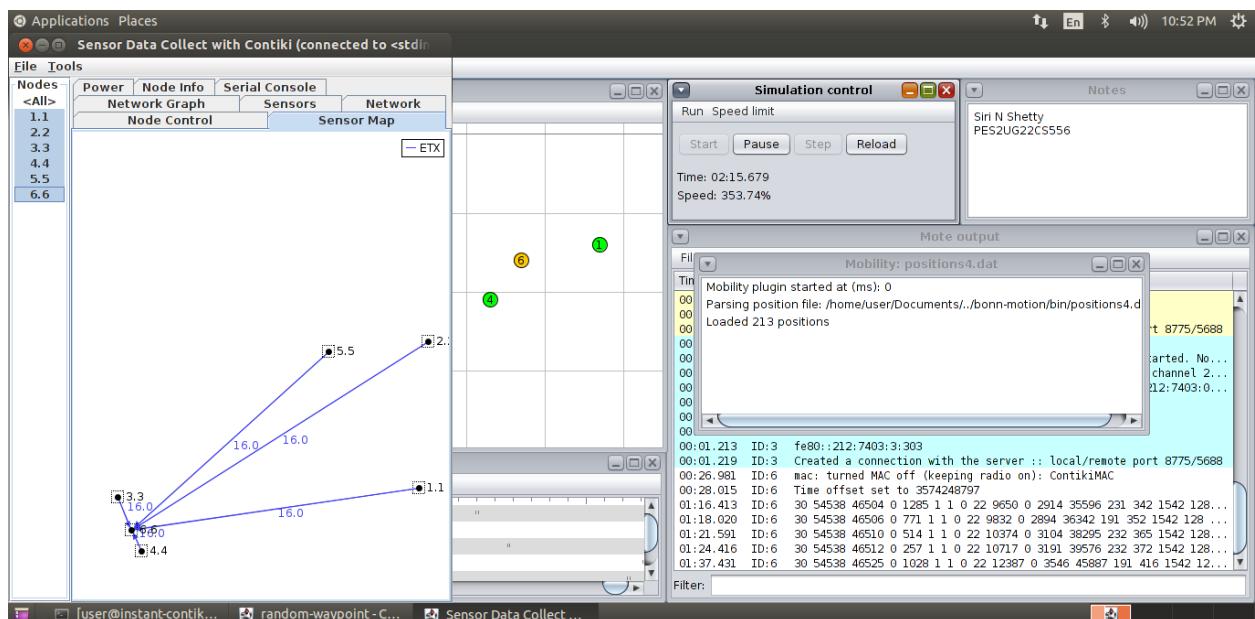
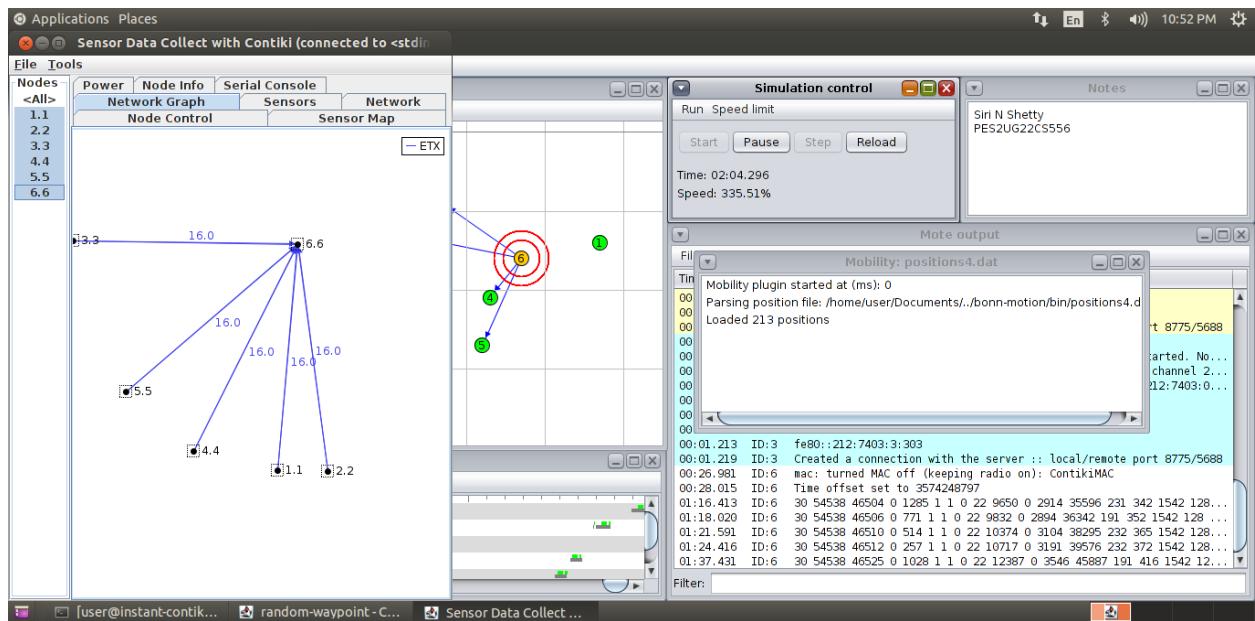
user@instant-c... analysing-wires... user@Instant-c... rpl-border-router Contiki Web Se... radiolog-17206... Pictures

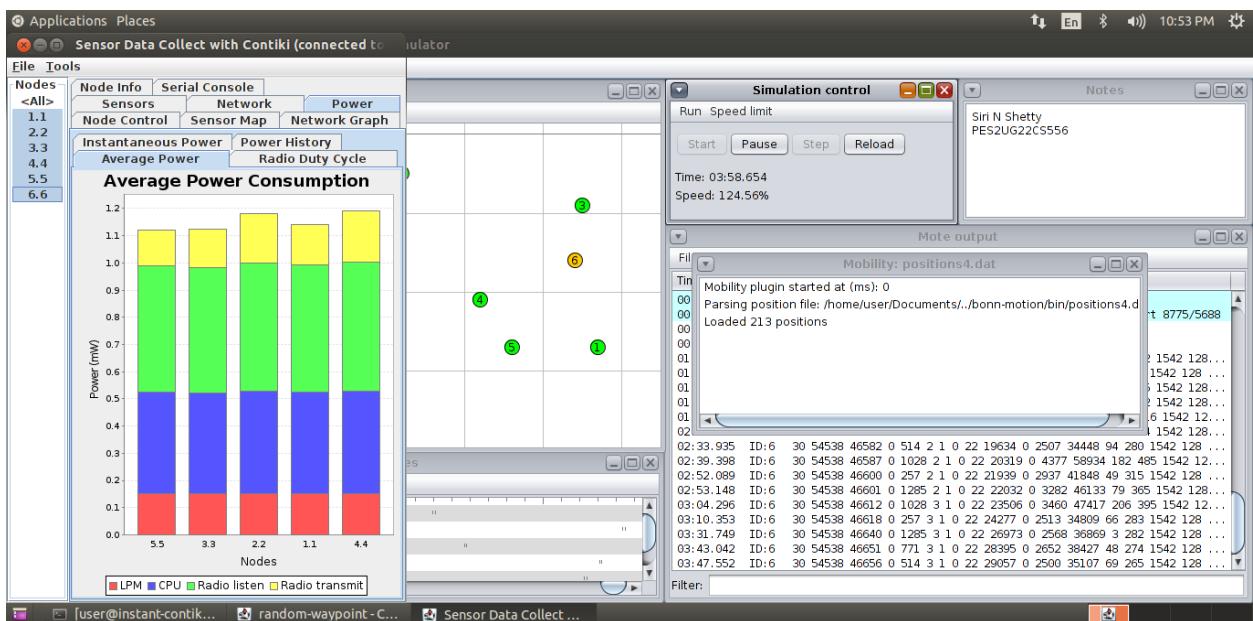
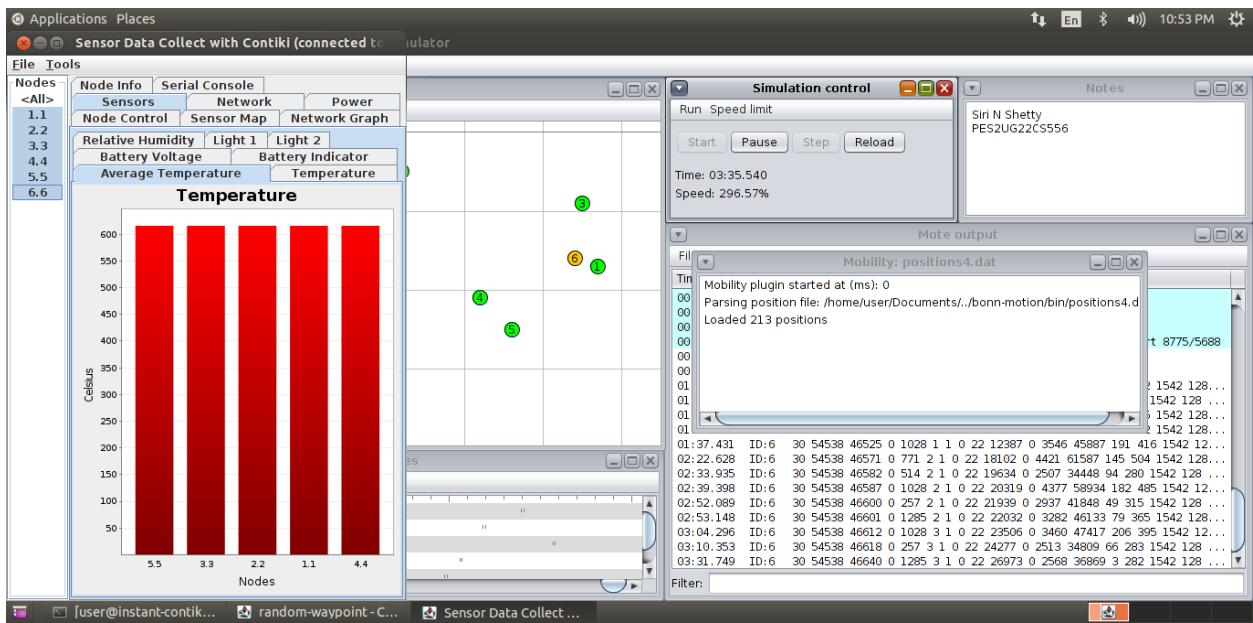


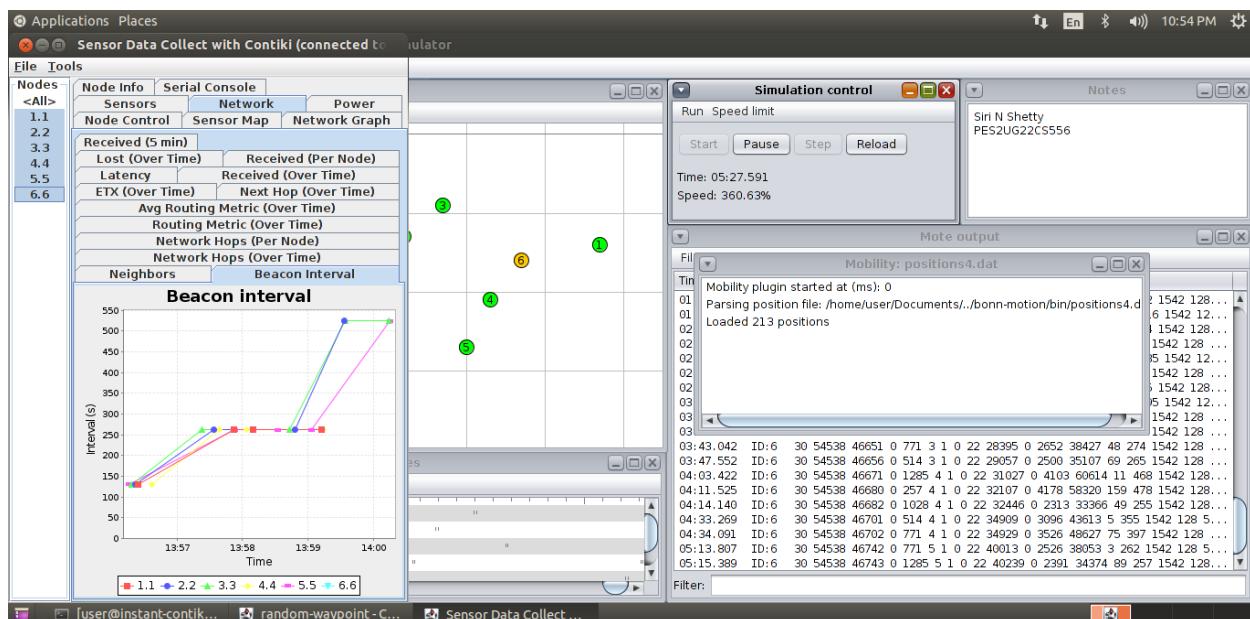
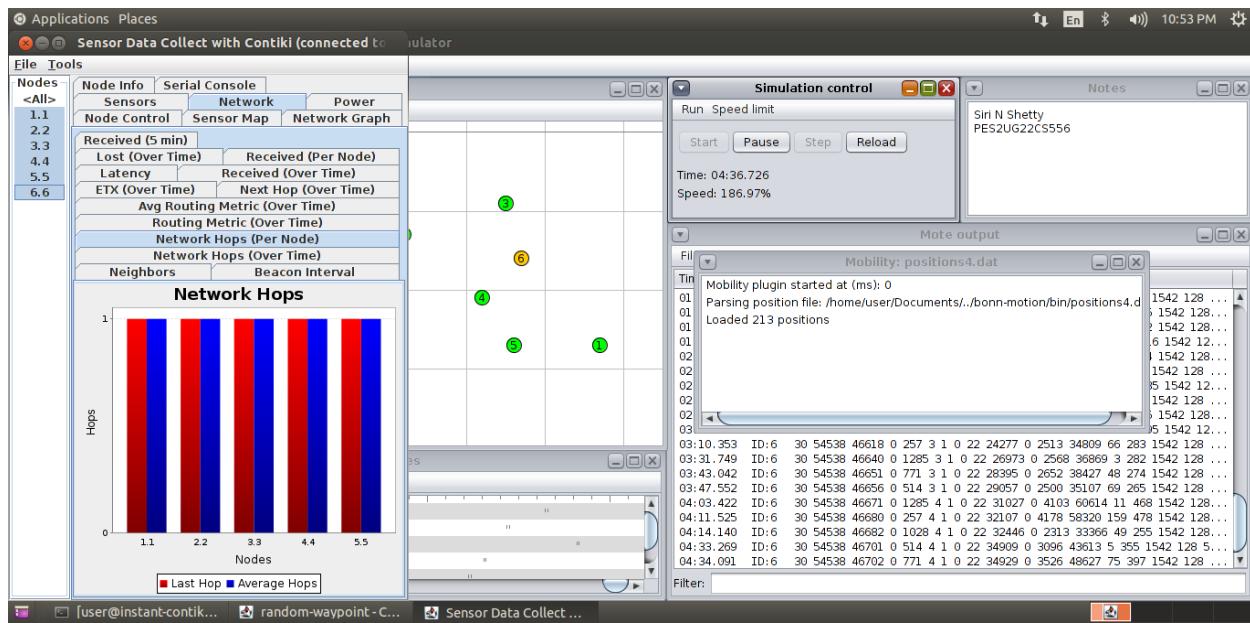
2. Mobility Models

a. RandomWaypoint

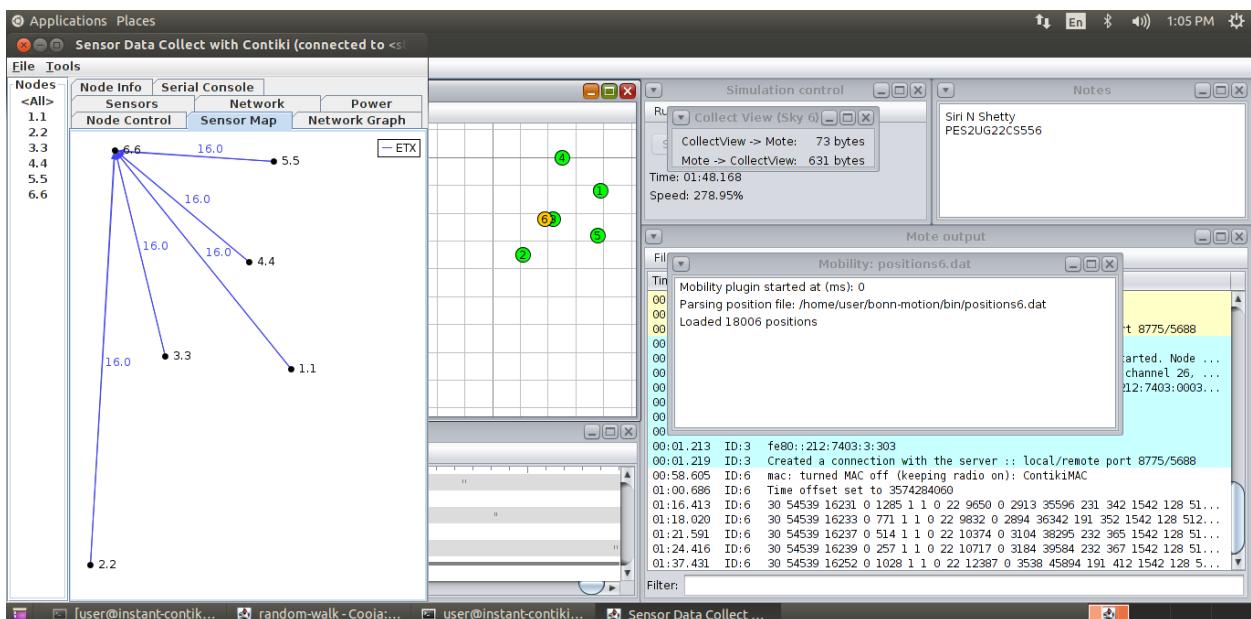
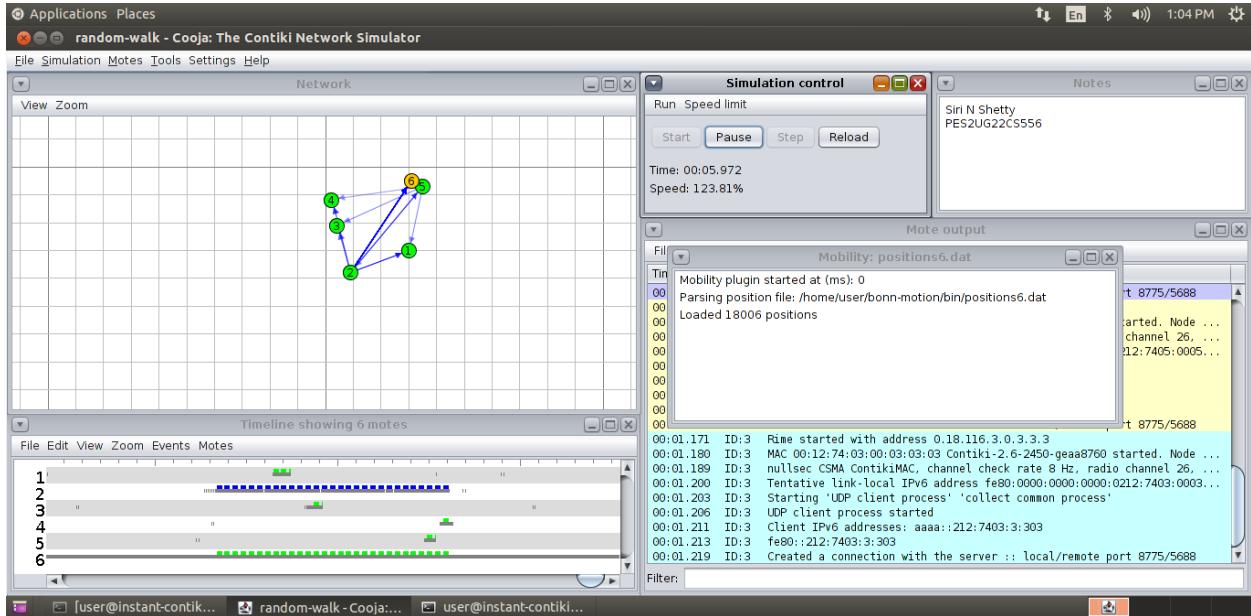


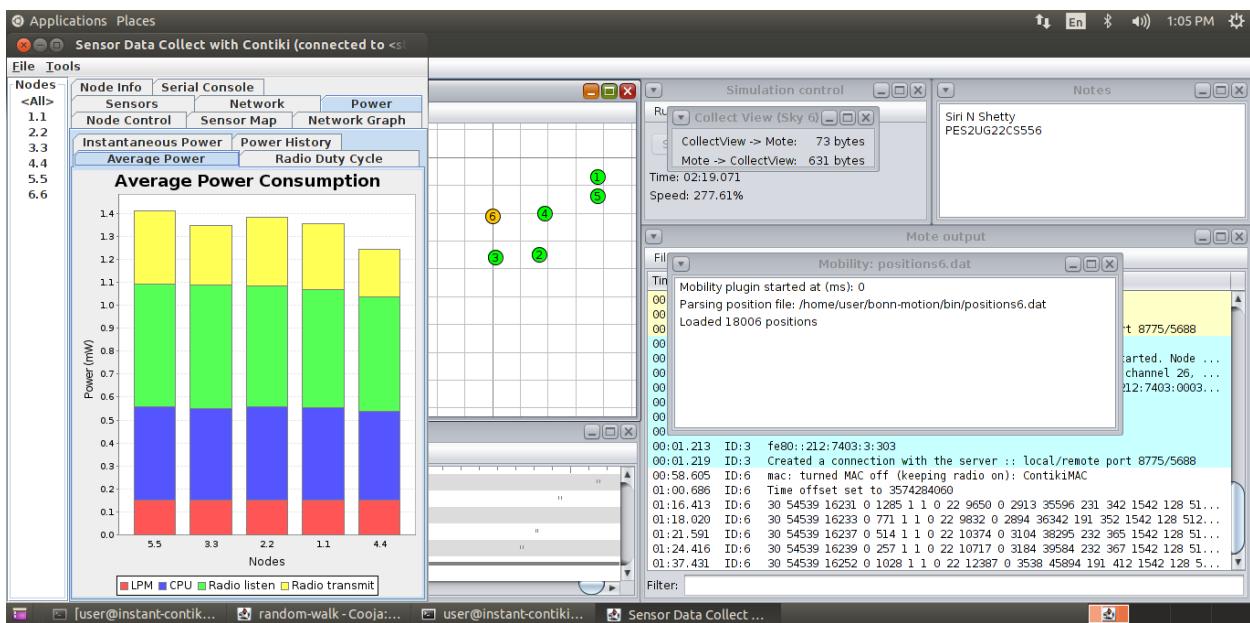
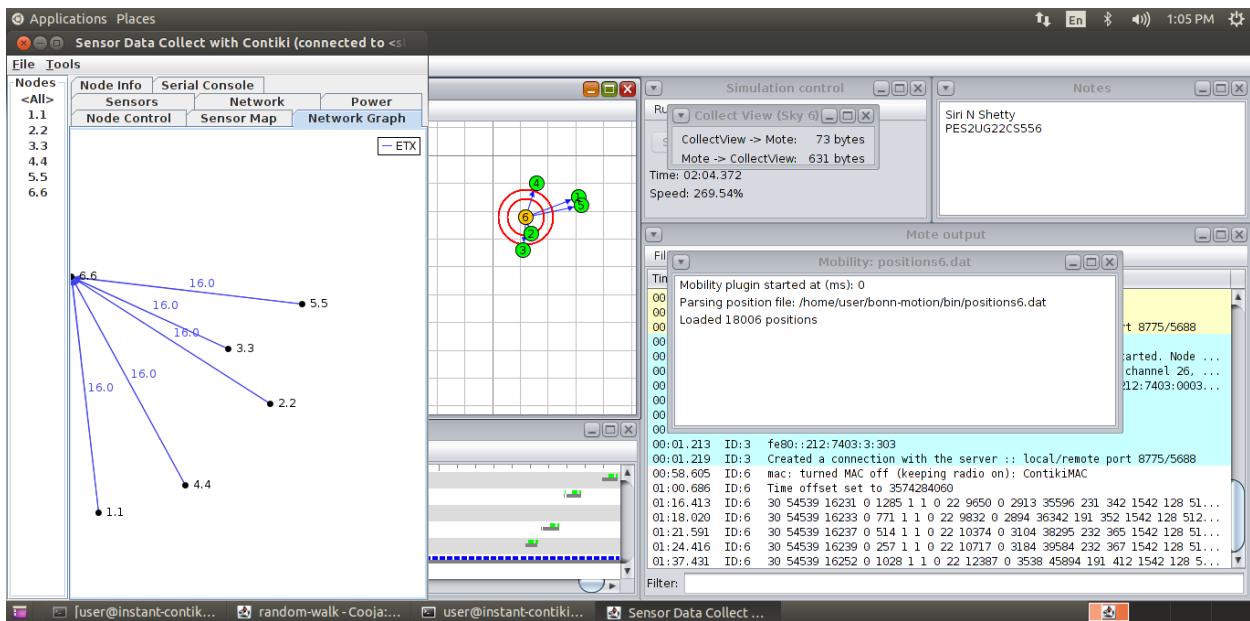


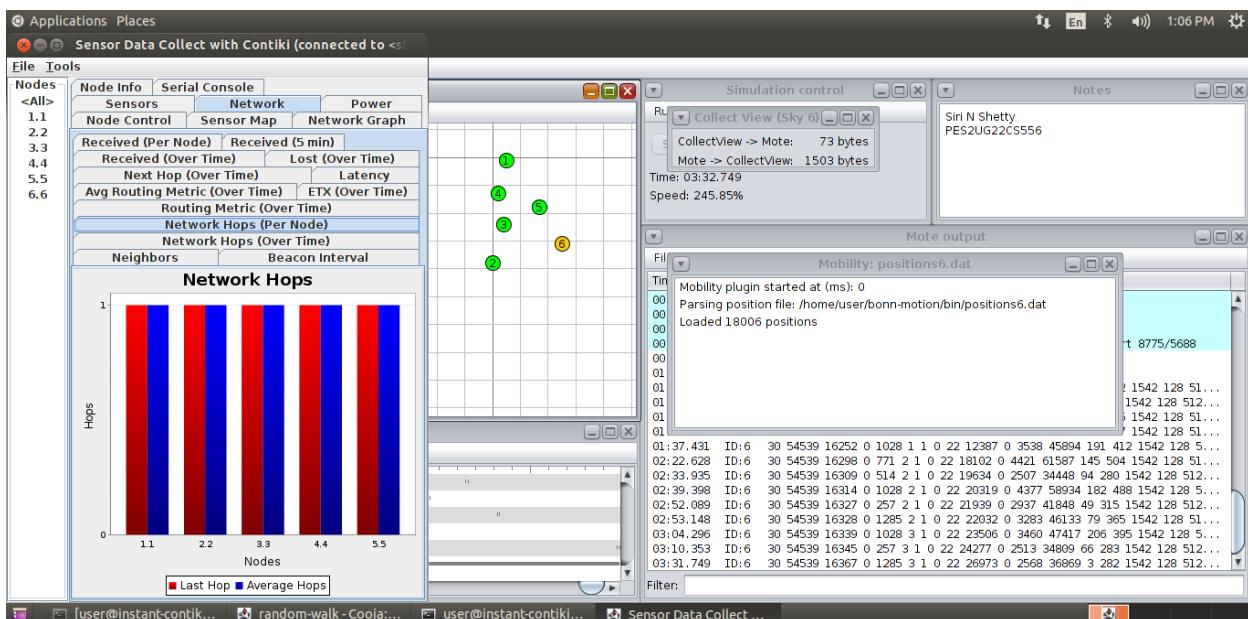
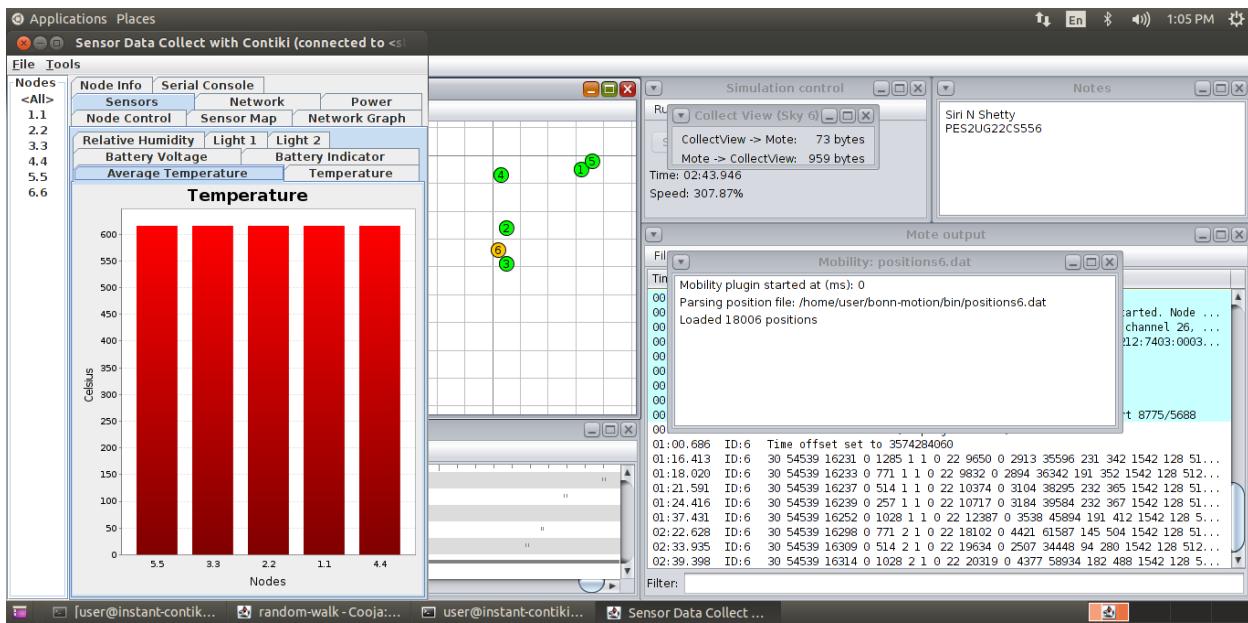




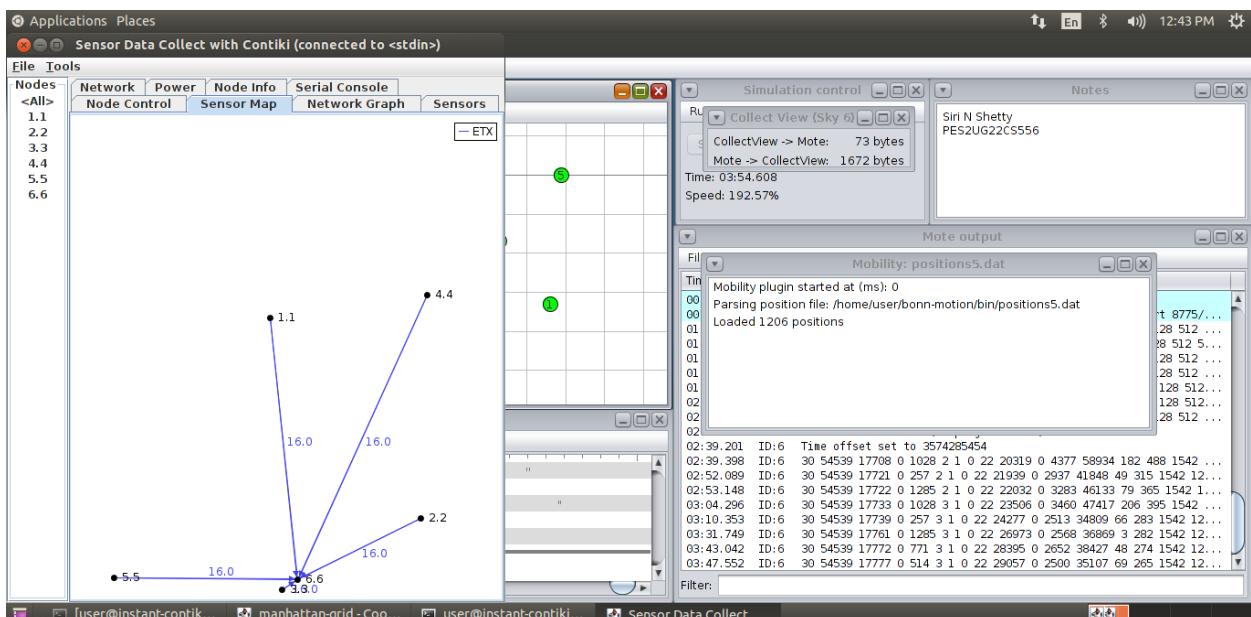
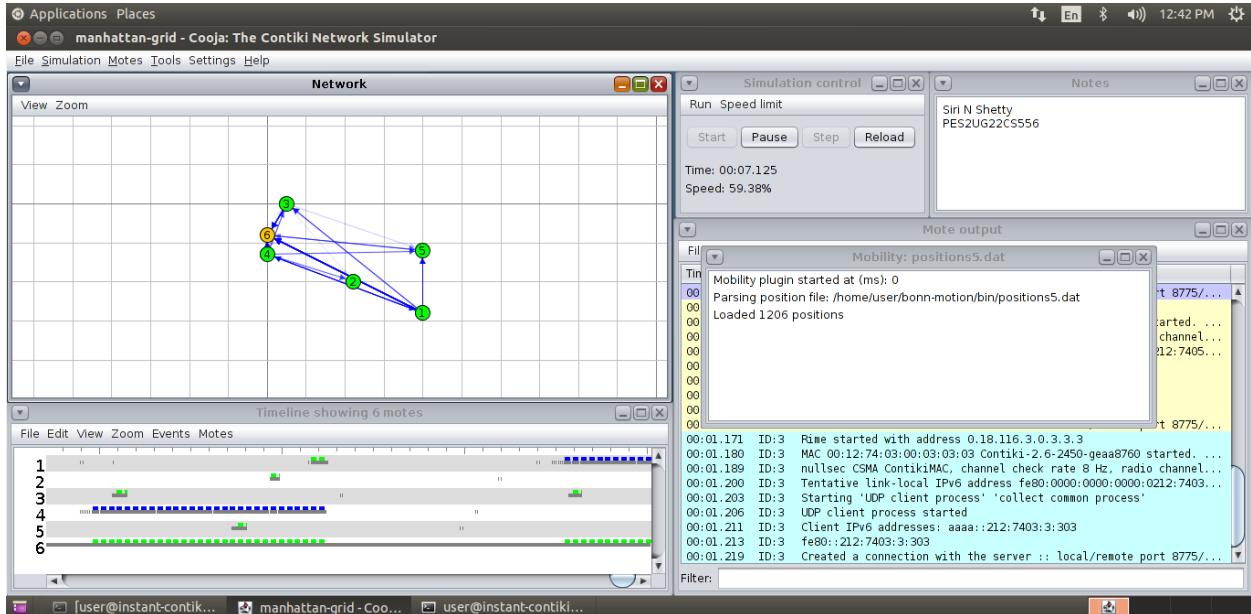
b. Random Walk

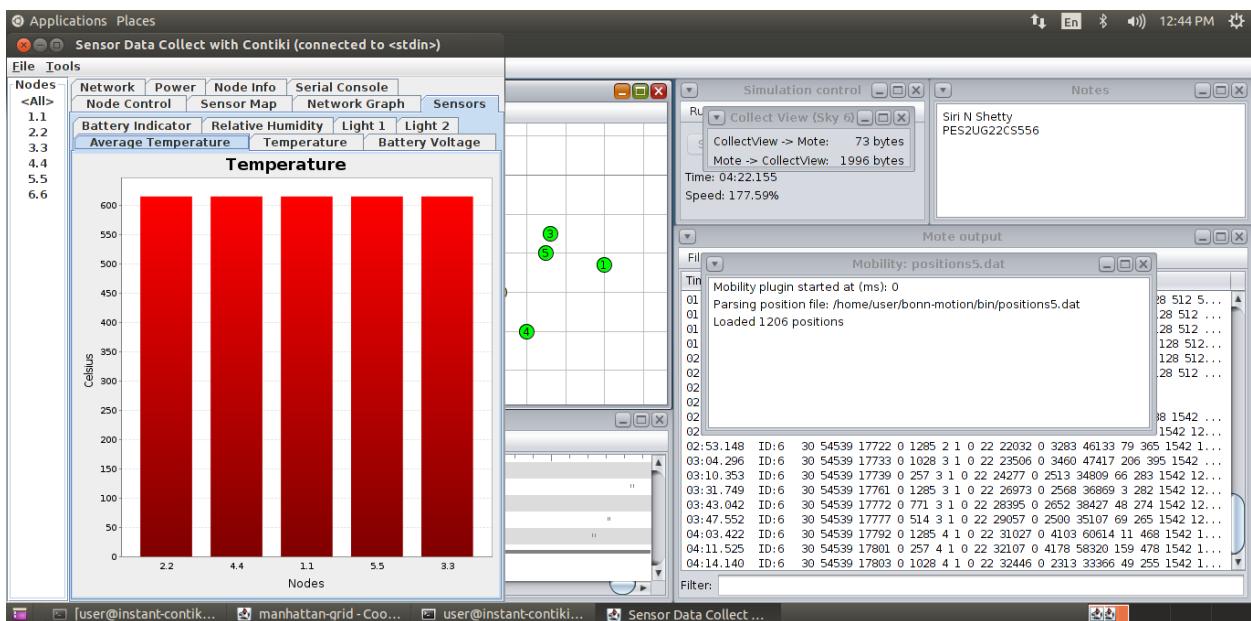
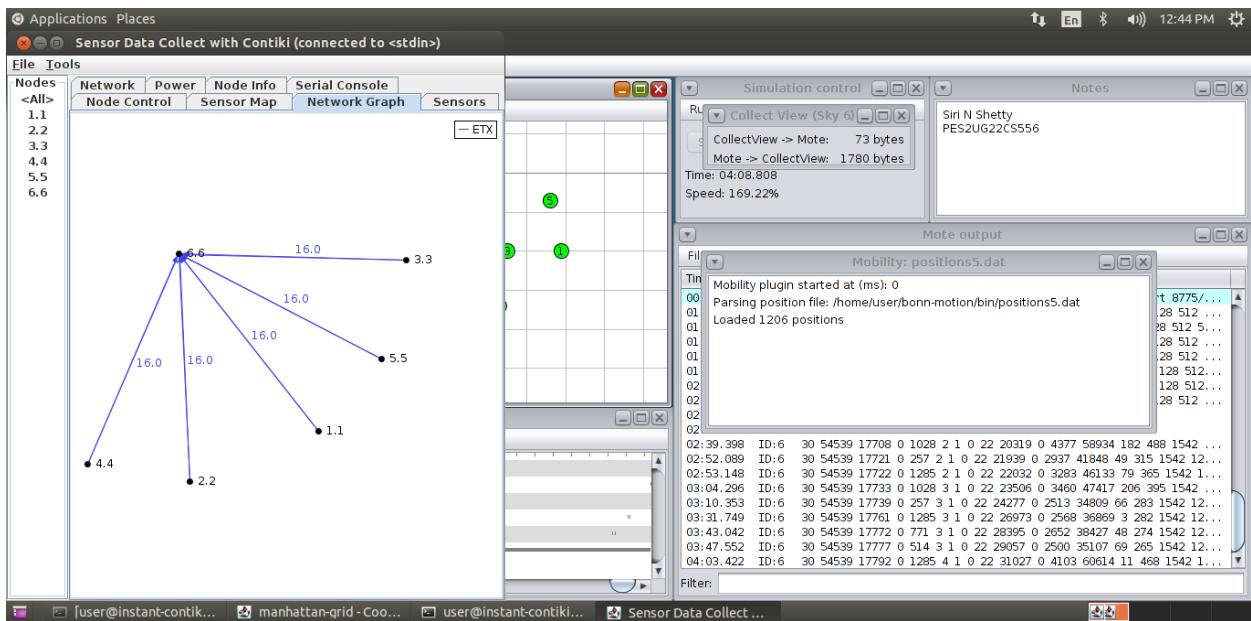


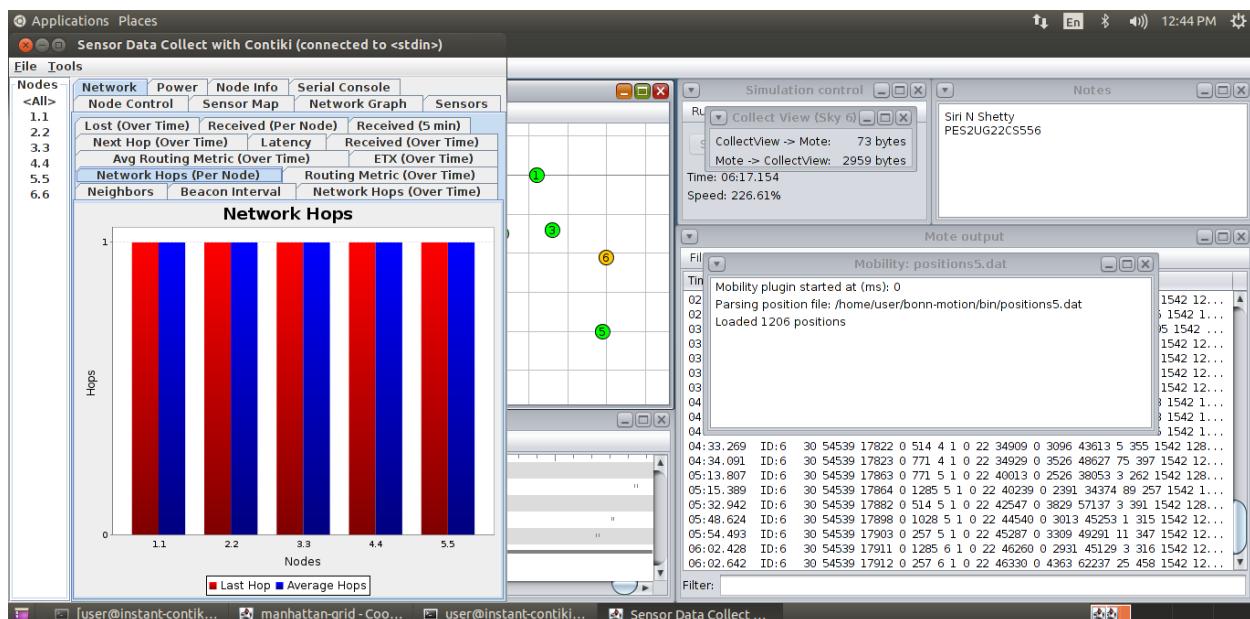
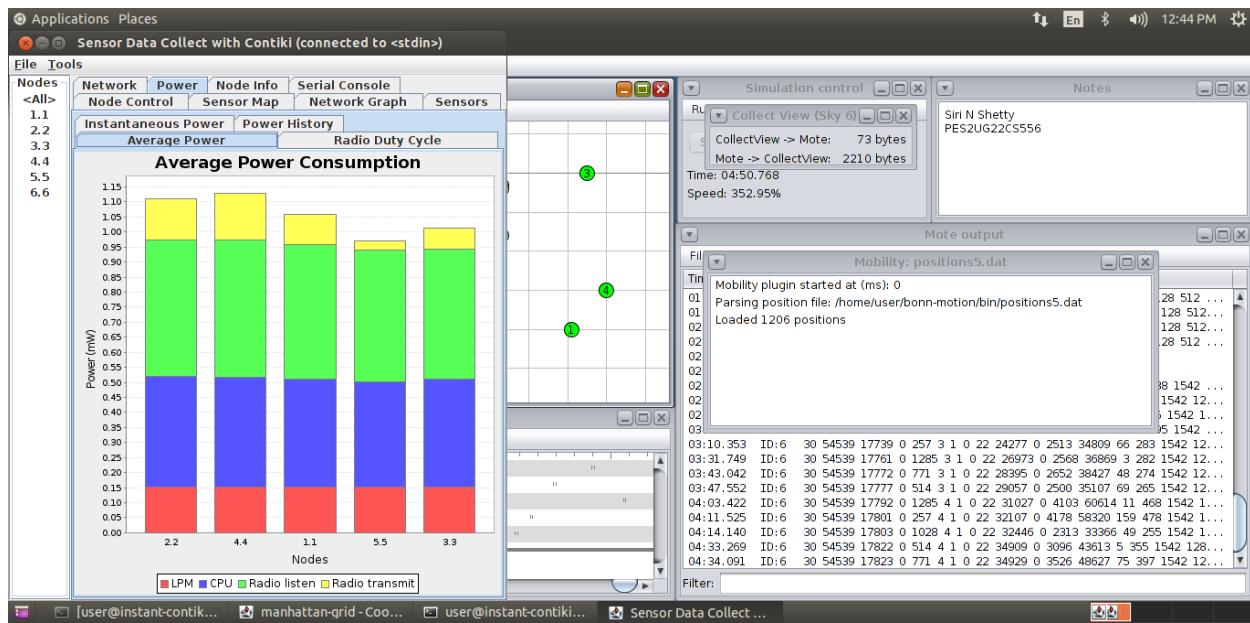




c. Manhattan Grid Mobility







d. Reference Point Group Mobility (RPGM)

