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Homework 2 - PPPoE Report

COSE242(00) – Data Communications

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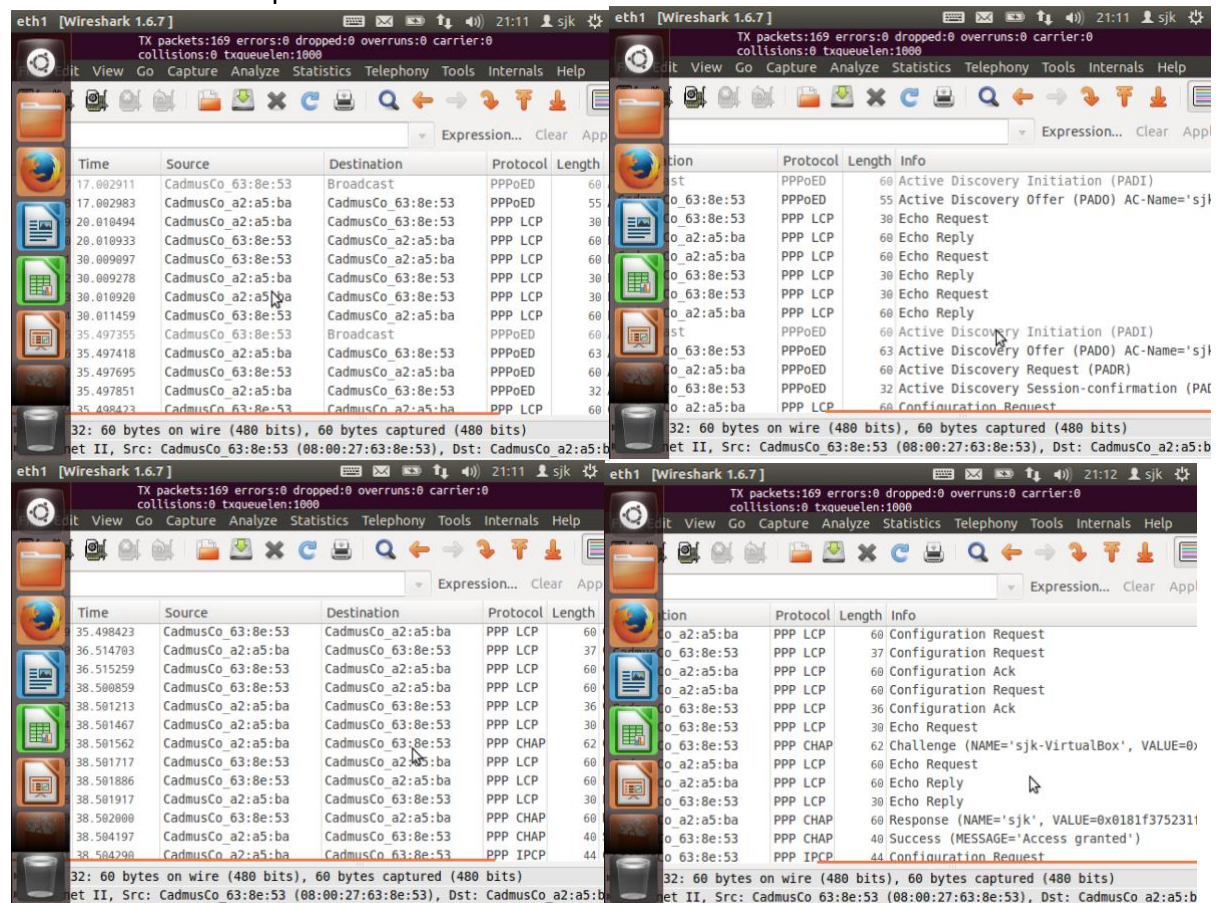


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Data Communications Homework #2

PPP over Ethernet operation



PPPoE is a network configuration used for establishing Point To Point connection over an Ethernet protocol. This means there is a point to point connection between two Ethernet ports. We set up the PPP connection and use it as a dial up connection between points on the network.

Here we see the initiation process as the client sends a PPPoE Active Discovery Initiation (PADI) packet to the server to initiate the session.

The server responds with a PPPoE Active Discovery Offer (PADO) packet.

Eventually the client responds with PPPoE Active Discovery Request (PADR) packet to the server. Finally we get the Active Discovery Session (PADS) confirmation and get prompted on the VM2 for the username and password we initially set in VM1.

```

root@sjk-VirtualBox: /home/sjk
TX packets:169 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:11803 (11.8 KB) TX bytes:16584 (16.5 KB)

Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
inet6 addr: ::1/128 Scope:Host
UP LOOPBACK RUNNING MTU:65536 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:0
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)

ppp0
Link encap:Point-to-Point Protocol
inet addr:10.0.0.1 P-t-P:192.168.0.150 Mask:255.255.255.255
UP POINTOPOINT RUNNING NOARP MULTICAST MTU:1492 Metric:1
RX packets:4 errors:0 dropped:0 overruns:0 frame:0
TX packets:4 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:3
RX bytes:76 (76.0 B) TX bytes:76 (76.0 B)

ppp1
Link encap:Point-to-Point Protocol
inet addr:10.0.0.1 P-t-P:192.168.0.151 Mask:255.255.255.255
UP POINTOPOINT RUNNING NOARP MULTICAST MTU:1492 Metric:1
RX packets:4 errors:0 dropped:0 overruns:0 frame:0
TX packets:4 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:3
RX bytes:76 (76.0 B) TX bytes:76 (76.0 B)

root@sjk-VirtualBox: /home/sjk

root@sjk-VirtualBox: /home/sjk
TX packets:77 errors:0 dropped:0 overruns:0 frame:0
TX packets:131 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:4906 (4.9 KB) TX bytes:12054 (12.0 KB)

Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
inet6 addr: ::1/128 Scope:Host
UP LOOPBACK RUNNING MTU:65536 Metric:1
RX packets:140 errors:0 dropped:0 overruns:0 frame:0
TX packets:140 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RX bytes:11954 (11.9 KB) TX bytes:11954 (11.9 KB)

ppp0
Link encap:Point-to-Point Protocol
inet addr:192.168.0.150 P-t-P:10.0.0.1 Mask:255.255.255.255
UP POINTOPOINT RUNNING NOARP MULTICAST MTU:1492 Metric:1
RX packets:4 errors:0 dropped:0 overruns:0 frame:0
TX packets:4 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:3
RX bytes:76 (76.0 B) TX bytes:76 (76.0 B)

ppp1
Link encap:Point-to-Point Protocol
inet addr:192.168.0.151 P-t-P:10.0.0.1 Mask:255.255.255.255
UP POINTOPOINT RUNNING NOARP MULTICAST MTU:1492 Metric:1
RX packets:4 errors:0 dropped:0 overruns:0 frame:0
TX packets:4 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:3
RX bytes:76 (76.0 B) TX bytes:76 (76.0 B)

root@sjk-VirtualBox: /home/sjk

```

Here we can see the Point-to-Point Protocols set up on both VM1 (left) and VM2 (right).

1 차 과제의 PPP 와 여기서의 PPP connection frame 간의 차이점 기술

The connection frame from assignment one operates at the data link layer. In this assignment we see a point to point protocol set up which will operated at both the layer 2 and layer 3 which is the network layer.

Also in this assignment we can see that the PPP connection frame needs authentication, while the PPP in the previous assignment does not.

Ping sent from VM2 to VM1

Top-Left Screenshot (Terminal):

```

root@sjk-VirtualBox:/home/sjk# ping 10.0.0.1
PING 10.0.0.1 (10.0.0.1) 56(84) bytes of data.
^C
--- 10.0.0.1 ping statistics ---
14 packets transmitted, 0 received, 100% packet loss, time 13025ms
root@sjk-VirtualBox:/home/sjk#
  
```

Top-Right Screenshot (Wireshark):

Capturing from eth1 [Wireshark 1.6.7]

Time	Source	Destination	Protocol	Length	Info
110.955098	CadmusCo_63:8e:53	CadmusCo_a2:a5:ba	PPP LCP	60	Echo Reply
111.748917	192.168.0.150	10.0.0.1	ICMP	106	Echo (ping) request id=0x09dd, seq=1/256
112.748401	192.168.0.150	10.0.0.1	ICMP	106	Echo (ping) request id=0x09dd, seq=2/512
113.756446	192.168.0.150	10.0.0.1	ICMP	106	Echo (ping) request id=0x09dd, seq=3/768
114.765711	192.168.0.150	10.0.0.1	ICMP	106	Echo (ping) request id=0x09dd, seq=4/1024
115.766426	192.168.0.150	10.0.0.1	ICMP	106	Echo (ping) request id=0x09dd, seq=5/1280
116.766261	192.168.0.150	10.0.0.1	ICMP	106	Echo (ping) request id=0x09dd, seq=6/1536
117.766535	192.168.0.150	10.0.0.1	ICMP	106	Echo (ping) request id=0x09dd, seq=7/1792
118.545422	CadmusCo_63:8e:53	CadmusCo_a2:a5:ba	PPP LCP	60	Echo Request
118.545597	CadmusCo_a2:a5:ba	CadmusCo_63:8e:53	PPP LCP	30	Echo Reply
118.545882	CadmusCo_a2:a5:ba	CadmusCo_63:8e:53	PPP LCP	30	Echo Reply
118.546250	CadmusCo_63:8e:53	CadmusCo_a2:a5:ba	PPP LCP	60	Echo Reply
118.766533	192.168.0.150	10.0.0.1	ICMP	106	Echo (ping) request id=0x09dd, seq=8/2048

32: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface II, Src: CadmusCo_63:8e:53 (08:00:27:63:8e:53), Dst: CadmusCo_a2:a5:ba (08:00:27:63:8e:53)

Bottom-Left Screenshot (Terminal):

```

root@sjk-VirtualBox:/home/sjk# ping 10.0.0.1
PING 10.0.0.1 (10.0.0.1) 56(84) bytes of data:
64 bytes from 10.0.0.1: icmp_req=1 ttl=64 time=0.457 ms
64 bytes from 10.0.0.1: icmp_req=2 ttl=64 time=1.06 ms
64 bytes from 10.0.0.1: icmp_req=3 ttl=64 time=0.590 ms
64 bytes from 10.0.0.1: icmp_req=4 ttl=64 time=0.576 ms
64 bytes from 10.0.0.1: icmp_req=5 ttl=64 time=0.563 ms
64 bytes from 10.0.0.1: icmp_req=6 ttl=64 time=0.835 ms
64 bytes from 10.0.0.1: icmp_req=7 ttl=64 time=0.728 ms
64 bytes from 10.0.0.1: icmp_req=8 ttl=64 time=0.761 ms
64 bytes from 10.0.0.1: icmp_req=9 ttl=64 time=0.850 ms
64 bytes from 10.0.0.1: icmp_req=10 ttl=64 time=1.31 ms
64 bytes from 10.0.0.1: icmp_req=11 ttl=64 time=0.724 ms
64 bytes from 10.0.0.1: icmp_req=12 ttl=64 time=0.684 ms
64 bytes from 10.0.0.1: icmp_req=13 ttl=64 time=0.671 ms
64 bytes from 10.0.0.1: icmp_req=14 ttl=64 time=0.850 ms
^C
--- 10.0.0.1 ping statistics ---
14 packets transmitted, 14 received, 0% packet loss, time 13002 ms
rtt min/avg/max/mdev = 0.457/0.761/1.317/0.215 ms
root@sjk-VirtualBox:/home/sjk#
  
```

Bottom-Right Screenshot (Wireshark):

Capturing from eth1 [Wireshark 1.6.7]

Time	Source	Destination	Protocol	Length	Info
44.223727	192.168.0.151	10.0.0.1	ICMP	106	Echo (ping) request id=0x139b, seq=4/1024
44.223886	10.0.0.1	192.168.0.151	ICMP	106	Echo (ping) reply id=0x139b, seq=4/1024
45.223188	192.168.0.151	10.0.0.1	ICMP	106	Echo (ping) request id=0x139b, seq=5/1280
45.223345	10.0.0.1	192.168.0.151	ICMP	106	Echo (ping) reply id=0x139b, seq=5/1280
46.223599	192.168.0.151	10.0.0.1	ICMP	106	Echo (ping) request id=0x139b, seq=6/1536
46.223817	10.0.0.1	192.168.0.151	ICMP	106	Echo (ping) reply id=0x139b, seq=6/1536
47.223760	192.168.0.151	10.0.0.1	ICMP	106	Echo (ping) request id=0x139b, seq=7/1792
47.223945	10.0.0.1	192.168.0.151	ICMP	106	Echo (ping) reply id=0x139b, seq=7/1792
48.223459	192.168.0.151	10.0.0.1	ICMP	106	Echo (ping) request id=0x139b, seq=8/2048
48.223631	10.0.0.1	192.168.0.151	ICMP	106	Echo (ping) reply id=0x139b, seq=8/2048
48.693794	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x7824c049
49.223582	192.168.0.151	10.0.0.1	ICMP	106	Echo (ping) request id=0x139b, seq=9/2304
49.223745	10.0.0.1	192.168.0.151	ICMP	106	Echo (ping) reply id=0x139b, seq=9/2304

1: 106 bytes on wire (848 bits), 106 bytes captured (848 bits) on interface II, Src: CadmusCo_63:8e:53 (08:00:27:63:8e:53), Dst: CadmusCo_a2:a5:ba (08:00:27:63:8e:53)

Here we can see the packets being transmitted and received very clearly. The previous assignment is not as profound. In addition, we see the exact percentage of packet loss.

VM1 <-> VM3 ping

```

root@sjk-VirtualBox: /home/sjk
UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
RX packets:14166 errors:0 dropped:0 overruns:0 frame:0
TX packets:4675 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:14142410 (14.1 MB)  TX bytes:418020 (418.0 KB)

eth1    Link encap:Ethernet  HWaddr 08:00:27:f2:a5:09
        inet6 addr: fe80::a00:27ff:fe2:a509/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:20 errors:0 dropped:0 overruns:0 frame:0
        TX packets:103 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:1455 (1.4 KB)  TX bytes:15004 (15.0 KB)

lo      Link encap:Local Loopback
        inet addr:127.0.0.1 Mask:255.0.0.0
        inet6 addr: ::1/128 Scope:Host
        UP LOOPBACK RUNNING  MTU:65536  Metric:1
        RX packets:138 errors:0 dropped:0 overruns:0 frame:0
        TX packets:138 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:0
        RX bytes:21399 (21.3 KB)  TX bytes:21399 (21.3 KB)

ppp0    Link encap:Point-to-Point Protocol
        inet addr:192.168.0.152 P-t-P:10.0.0.1 Mask:255.255.255.255
        UP POINTOPOINT RUNNING NOARP MULTICAST  MTU:1492  Metric:1
        RX packets:4 errors:0 dropped:0 overruns:0 frame:0
        TX packets:4 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:3
        RX bytes:76 (76.0 B)  TX bytes:70 (70.0 B)

```

```

eth1 [Wireshark 1.6.7]
sjk@sjk-VirtualBox:~$ sudo su
[sudo] password for sjk:
Edit View Go Capture Analyze Statistics Telephony Tools Internals Help
Expression... Clear App

```

No.	Time	Source	Destination	Protocol	Length	Info
0	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	PPPoE	60	Active Discovery Initiation (PADI)
1	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	PPPoE	63	Active Discovery Offer (PADO) AC-Name='sjk'
2	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	PPPoE	60	Active Discovery Request (PADR)
3	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	PPPoE	32	Active Discovery Session-confirmation (PADS)
4	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	PPP LCP	60	Configuration Request
5	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	PPP LCP	37	Configuration Request
6	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	PPP LCP	60	Configuration Ack
7	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	PPP LCP	60	Configuration Request
8	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	PPP LCP	36	Configuration Ack
9	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	PPP LCP	30	Echo Request
10	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	PPP CHAP	58	Challenge (NAME='sjk-VirtualBox', VALUE=0)
11	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	PPP LCP	60	Echo Request
12	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	PPP LCP	30	Echo Reply

```

1: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on eth1
Interface II, Src: CadmusCo_63:8e:53 (08:00:27:63:8e:53), Dst: Broadcast (ff:ff:ff:ff:ff:ff)

```

```

eth1 [Wireshark 1.6.7]
sjk@sjk-VirtualBox:~$ sudo su
[sudo] password for sjk:
Edit View Go Capture Analyze Statistics Telephony Tools Internals Help
Expression... Clear App

```

No.	Time	Source	Destination	Protocol	Length	Info
0	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	PPP LCP	60	Echo Reply
1	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	ICMP	106	Echo (ping) request id=0x1048, seq=2/512
2	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	ICMP	106	Echo (ping) reply id=0x1048, seq=2/512
3	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	ICMP	106	Echo (ping) request id=0x1048, seq=3/768
4	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	ICMP	106	Echo (ping) reply id=0x1048, seq=3/768
5	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	ICMP	106	Echo (ping) request id=0x1048, seq=4/1024
6	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	ICMP	106	Echo (ping) reply id=0x1048, seq=4/1024
7	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	ICMP	106	Echo (ping) request id=0x1048, seq=5/1280
8	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	ICMP	106	Echo (ping) reply id=0x1048, seq=5/1280
9	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	ICMP	106	Echo (ping) request id=0x1048, seq=6/1536
10	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	ICMP	106	Echo (ping) reply id=0x1048, seq=6/1536
11	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	ICMP	106	Echo (ping) request id=0x1048, seq=7/1792
12	0.000000	08:00:27:f2:a5:09	08:00:27:f2:a5:09	ICMP	106	Echo (ping) reply id=0x1048, seq=7/1792

```

1: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on eth1
Interface II, Src: CadmusCo_63:8e:53 (08:00:27:63:8e:53), Dst: Broadcast (ff:ff:ff:ff:ff:ff)

```

Here we see another Point to Point protocol being set up between VM1 and VM3. We see the initiation process of PADI, PADO, PADR, PADS to finish establishing this ppp connection.

VM2 <-> VM3 (no ppp connection) ping

```

root@sjk-VirtualBox: /home/sjk
RX packets:4 errors:0 dropped:0 overruns:0 frame:0
TX packets:4 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:3
RX bytes:76 (76.0 B) TX bytes:70 (70.0 B)

root@sjk-VirtualBox:/home/sjk# ping 10.0.0.1
PING 10.0.0.1 (10.0.0.1) 56(84) bytes of data.
64 bytes from 10.0.0.1: icmp_req=1 ttl=64 time=0.564 ms
64 bytes from 10.0.0.1: icmp_req=2 ttl=64 time=0.736 ms
64 bytes from 10.0.0.1: icmp_req=3 ttl=64 time=0.627 ms
64 bytes from 10.0.0.1: icmp_req=4 ttl=64 time=0.665 ms
64 bytes from 10.0.0.1: icmp_req=5 ttl=64 time=0.714 ms
64 bytes from 10.0.0.1: icmp_req=6 ttl=64 time=0.642 ms
64 bytes from 10.0.0.1: icmp_req=7 ttl=64 time=0.675 ms
64 bytes from 10.0.0.1: icmp_req=8 ttl=64 time=1.06 ms
64 bytes from 10.0.0.1: icmp_req=9 ttl=64 time=0.657 ms
64 bytes from 10.0.0.1: icmp_req=10 ttl=64 time=0.630 ms
^C
--- 10.0.0.1 ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 899ms
rtt min/avg/max/mdev = 0.564/0.697/1.062/0.130 ms
root@sjk-VirtualBox:/home/sjk# ping -c 2 10.0.2.15
PING 10.0.2.15 (10.0.2.15) 56(84) bytes of data.
64 bytes from 10.0.2.15: icmp_req=1 ttl=64 time=0.035 ms
64 bytes from 10.0.2.15: icmp_req=2 ttl=64 time=0.034 ms
--- 10.0.2.15 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 99ms
rtt min/avg/max/mdev = 0.034/0.034/0.035/0.005 ms
root@sjk-VirtualBox:/home/sjk#

root@sjk-VirtualBox: /home/sjk
root@sjk-VirtualBox:/home/sjk# ping 10.0.0.1
PING 10.0.0.1 (10.0.0.1) 56(84) bytes of data.
^C
--- 10.0.0.1 ping statistics ---
14 packets transmitted, 0 received, 100% packet loss, time 13025ms

root@sjk-VirtualBox:/home/sjk# which pppd
/usr/sbin/pppd
root@sjk-VirtualBox:/home/sjk# pppd -detach crtscts lock debug noaccomp nopcomp a
syncmap 0xffffffff record /root/test01 10.0.2.15:10.0.2.15 /dev/ttyS0 38400
using channel 6
Using interface ppp2
Connect: ppp2 <-> /dev/pts/0
sent [LCP ConfReq id=0x1 <magic 0xf663f318>]
sent [LCP ConfReq id=0x1 <magic 0xf663f318>]
sent [LCP ConfReq id=0x1 <magic 0xf663f318>]
sent [LCP ConfReq id=0x1 <magic 0xf663f318>]
sent [LCP ConfReq id=0x1 <magic 0xf663f318>]
sent [LCP ConfReq id=0x1 <magic 0xf663f318>]
sent [LCP ConfReq id=0x1 <magic 0xf663f318>]
sent [LCP ConfReq id=0x1 <magic 0xf663f318>]
sent [LCP ConfReq id=0x1 <magic 0xf663f318>]
^CTerminating on signal 2
sent [LCP TermReq id=0x2 "User request"]
Child process pppd (charshunt) (pid 3006) terminated with signal 2
Modem hangup
Connection terminated.
root@sjk-VirtualBox:/home/sjk#

```