

PPP over serial link

PPP is a data link layer protocol mainly intended to establish point to point connection over the serial link like the console port we have on our Switchfin targets.

Let's see how we can demonstrate this.

In the latest Switchfin we have PPP option in the menuconfig. Please enable it and build the image.

Connect the serial port of a PC with PPP support with the PR1 Appliance console port. Establish the ssh session with the PR1 Appliance.

On the PR1 Appliance set the PPP configuration file

```
#/etc/ppp/options
```

```
lock
```

```
nocrtscts
```

```
10.0.0.209:10.0.0.2
```

```
linkname ppp0
```

```
local
```

```
nodefaultroute
```

```
/dev/ttyBF0
```

```
115200
```

```
-detach
```

Those lines say:

- PR1 Appliance will use **/dev/ttyBF0** device for the PPP
- PR1 Appliance will get address **10.0.0.209** and the other end will be **10.0.0.2**
- The PR1 Appliance console has no flow control signals wired (RTS,CTS, DTR, DSR, etc.)

so we say **nocrtscts**

- we will give name **ppp0** to the link

PPP in Switchfin

Written by Administrator

Friday, 15 June 2012 12:06 - Last Updated Friday, 15 June 2012 15:08

On the host we may have configuration like this:

```
#!/etc/ppp/options  
lock  
nocrtscts  
10.0.0.2:10.0.0.209  
linkname ppp0  
local  
nodefaultroute  
/dev/ttyS0  
115200  
-detach
```

Finally let's load the ppp over serial link module

```
root@pr1:~> modprobe ppp_async
```

and we will get the link up

```
root@pr1:~> ifconfig
```

.....

```
ppp0 [ ] [ ] [ ] [ ] Link encap:Point-to-Point Protocol [ ]  
inet addr:10.0.0.2 [ ] P-t-P:10.0.0.209 [ ] Mask:255.255.255.255  
UP POINTOPOINT RUNNING NOARP MULTICAST [ ] MTU:1500 [ ] Metric:1  
RX packets:6 errors:0 dropped:0 overruns:0 frame:0  
TX packets:6 errors:0 dropped:0 overruns:0 carrier:0  
collisions:0 txqueuelen:3
```

and we may ping PR1 Appliance from the PC (or vice versa) like this:

```
[root@Switchfin ~]# ping 10.0.0.209  
PING 10.0.0.209 (10.0.0.209) 56(84) bytes of data.  
64 bytes from 10.0.0.209: icmp_seq=1 ttl=64 time=26.7 ms  
64 bytes from 10.0.0.209: icmp_seq=2 ttl=64 time=25.9 ms
```

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Friday, 15 June 2012 12:06 - Last Updated Friday, 15 June 2012 15:08

64 bytes from 10.0.0.209: icmp_seq=3 ttl=64 time=25.9 ms

Similarly you may ssh the PR1 Appliance thru the new ppp0 interface.

Point-to-Point *Tunneling* Protocol and VPN

PPP can work not only over serial link. Let's see how it can be used to create VPN over the Ethernet.

In addition we will test the MPPE (Microsoft Point-to-Point Encryption/Compression) support built in as kernel module.

Let's use one of the Linux PC in the network as PPPoE server.

PPPoE is a simple protocol and basically it is pretty much like the DHCP negotiation.

Description how to do PPPoE server can be found at [PPPoE Server Under Ubuntu/Debian](#)

The necessary configuration at the PC are

```
#/etc/ppp/pppoe-server-options  
# PPP options for the PPPoE server  
# LIC: GPL  
lcp-echo-interval 10  
lcp-echo-failure 2  
debug  
auth  
# MPPE requires mschap-v2  
require-mschap-v2  
require-mppe  
refuse-pap  
refuse-chap  
refuse-mschap
```

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```
#/etc/ppp/chap-secrets  
# Secrets for authentication using CHAP  
# client[] server[] secret[] IP addresses  
# allow any client, any server, any IP addr  
* * * * *
```

CHAP is an authentication schema.

To prevent exchanging the username/password (as it is in the other popular authentication PAP) this method sends random number (challenge) which is processed by both PPP ends using hash function.

The results of the hash is compared.

Let's load the MPPE module and start the server

```
root@switchfin:~# modprobe ppp-mppe  
root@switchfin:~#/usr/sbin/pppoe-server -T 60 -I eth0 -N 250 -R 192.168.0.1
```

Now let's go to the PR1 Appliance side. We use the same image with the built PPP option.

The required configuration files are:

```
#/etc/ppp/peers/mylink  
plugin rp-pppoe.so eth0  
mtu 1492  
mru 1492  
require-mppe  
debug
```

PPPoE we will start using pppd plugin rp-pppoe.so.

We will use eth0 as carrier interface.

We will use Microsoft Point-to-Point Encryption MPPE

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Friday, 15 June 2012 12:06 - Last Updated Friday, 15 June 2012 15:08

```
# /etc/ppp/chap-secret
# Secrets for authentication using CHAP
# client      server secret      IP addresses
# allow any client, any server, any IP addr
* * "" *
```

Some of the PPP stuff is compiled as modules. We don't need **ppp_async** now but we need few others:

```
root@pr1:~>modprobe sha1_generic
root@pr1:~>modprobe ppp_mppe
root@pr1:~>modprobe pppoe
```

Now we have the following modules loaded in PR1 Appliance:

```
root@pr1:~> lsmod
pppoe 6973 2 - Live 0x043e4000
pppox 1123 1 pppoe, Live 0x04607800
ecb 1141 2 - Live 0x04606000
ppp_mppe 4733 2 - Live 0x043e2000
ppp_generic 13111 7 pppoe,pppox,ppp_mppe, Live 0x05b9c000
slhc 3685 1 ppp_generic, Live 0x04411000
sha1_generic 1309 4 - Live 0x0460c000
wpr1 16852 62 - Live 0x04730000
dahdi 165436 65 wpr1, Live 0x04780000
crc_ccitt 953 1 dahdi, Live 0x042f8000
mmc_block 6180 2 - Live 0x0408e000
mmc_spi 6493 0 - Live 0x0408c000
crc7 711 1 mmc_spi, Live 0x042f5000
crc_itu_t 980 1 mmc_spi, Live 0x042f4c00
mmc_core 36905 2 mmc_block,mmc_spi, Live 0x043f0000
```

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and we can start the PPP link

```
root@pr1:~> pppd call mylink &  
[1] 478 pppd call mylink  
root@pr1:~> Plugin rp-pppoe.so loaded.  
RP-PPPoE plugin version 3.3 compiled against pppd 2.4.4
```

On the PR1 Appliance we see that the ppp is established

```
root@pr1:~> ifconfig  
...  
ppp0 [UP] [BROADCAST] [MULTICAST] Link encap:Point-to-Point Protocol  
inet addr:192.168.0.14 P-t-P:10.0.0.1 Mask:255.255.255.255  
UP POINTOPOINT RUNNING NOARP MULTICAST MTU:1488 Metric:1  
RX packets:10 errors:0 dropped:0 overruns:0 frame:0  
TX packets:10 errors:0 dropped:0 overruns:0 carrier:0  
collisions:0 txqueuelen:3
```

on the host we have

```
root@switchfin:~# ifconfig  
...  
ppp0 [UP] [BROADCAST] [MULTICAST] Link encap:Point-to-Point Protocol  
inet addr:10.0.0.1 P-t-P:192.168.0.14 Mask:255.255.255.255  
UP POINTOPOINT RUNNING NOARP MULTICAST MTU:1488 Metric:1  
RX packets:10 errors:0 dropped:0 overruns:0 frame:0  
TX packets:10 errors:0 dropped:0 overruns:0 carrier:0  
collisions:0 txqueuelen:3
```

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RX bytes:322 (322.0 B) TX bytes:322 (322.0 B)

and we can ssh the PR1 Appliance over ppp

root@yni:~# ssh 192.168.0.14