Serial Point-to-Point Links

- Leased lines use serial connections.
- cHDLC (High Level Data Link Controller) is the default protocol on serial interfaces. It is a Cisco proprietary version of the open standard HDLC.
- PPP (Point to Point Protocol) is an open standard and adds support for PAP and CHAP authentication.
- Frame Relay also uses serial interfaces (it supports point-to-point and multipoint).
- HDLC, PPP and Frame Relay are Layer 2 protocols.

Clock Rate

- The customer side of the serial connection is set as DTE (Data Terminal Equipment)
- The service provider side is set as DCE (Data Communications Equipment)
- A clock rate must be set in bits per second on the DCE side
- The clock rate controls the actual speed the link runs at
- The DTE side synchronises with the DCE side - do not attempt to set a clock rate on the DTE

```
SP1(config)#int s4/0
SP1(config-if)#clock rate 128000
```

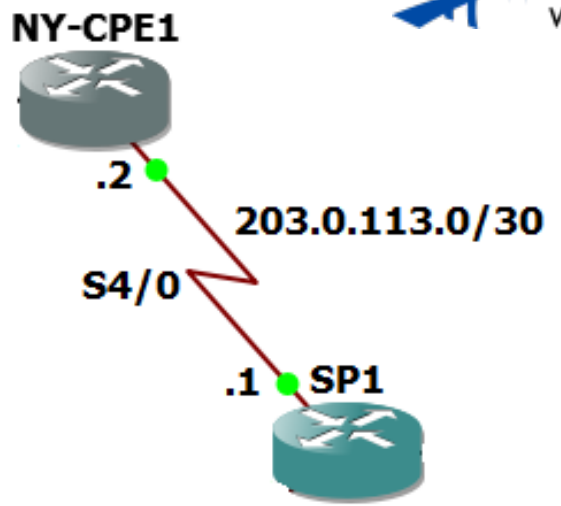
Bandwidth

- A bandwidth statement in kbps can optionally be configured on an interface
- **This does not affect the physical bandwidth of the interface– that is controlled by the clock rate**
- If you configure a bandwidth of 64kbps on a 128kbps interface, the interface will still transmit at 128kbps
- The bandwidth statement affects software policy such as routing protocol metrics and QoS
- The default bandwidth on a serial interface is 1.544Mbps (T1)

```
SP1(config)#int s4/0
SP1(config-if)#bandwidth 128
```

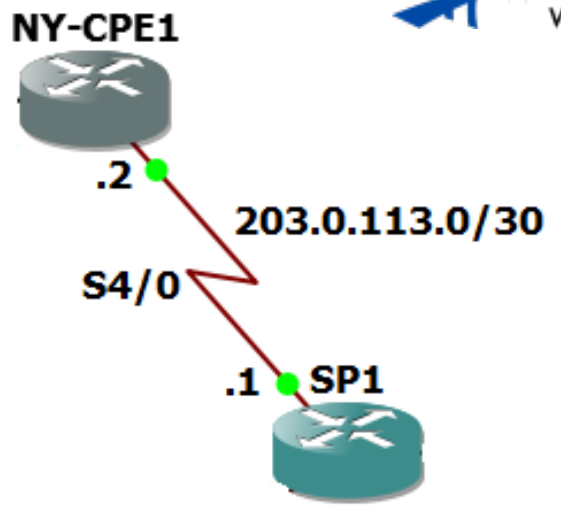
cHDLC Configuration

```
SP1(config)#int s4/0
SP1(config-if)#clock rate 128000
SP1(config-if)#bandwidth 128
SP1(config-if)#ip add 203.0.113.1 255.255.255.252
SP1(config-if)#no shutdown

NY-CPE1(config)#int s4/0
NY-CPE1(config-if)#bandwidth 128
NY-CPE1(config-if)#ip add 203.0.113.2 255.255.255.252
NY-CPE1(config-if)#no shutdown
```



PPP Configuration

```
SP1(config)#int s4/0
SP1(config-if)#clock rate 128000
SP1(config-if)#bandwidth 128
SP1(config-if)#encapsulation ppp
SP1(config-if)#ip add 203.0.113.1 255.255.255.252
SP1(config-if)#no shutdown

NY-CPE1(config)#int s4/0
NY-CPE1(config-if)#bandwidth 128
NY-CPE1(config-if)#encapsulation ppp
NY-CPE1(config-if)#ip add 203.0.113.2 255.255.255.252
NY-CPE1(config-if)#no shutdown
```



PPP Verification – show ip interface brief

```
NY-CPE1#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        unassigned      YES NVRAM  administratively down down
FastEthernet1/0        10.0.0.1        YES NVRAM  up                    up
FastEthernet2/0        unassigned      YES NVRAM  administratively down down
FastEthernet3/0        unassigned      YES NVRAM  administratively down down
Serial4/0              203.0.113.2     YES manual up                    up
```

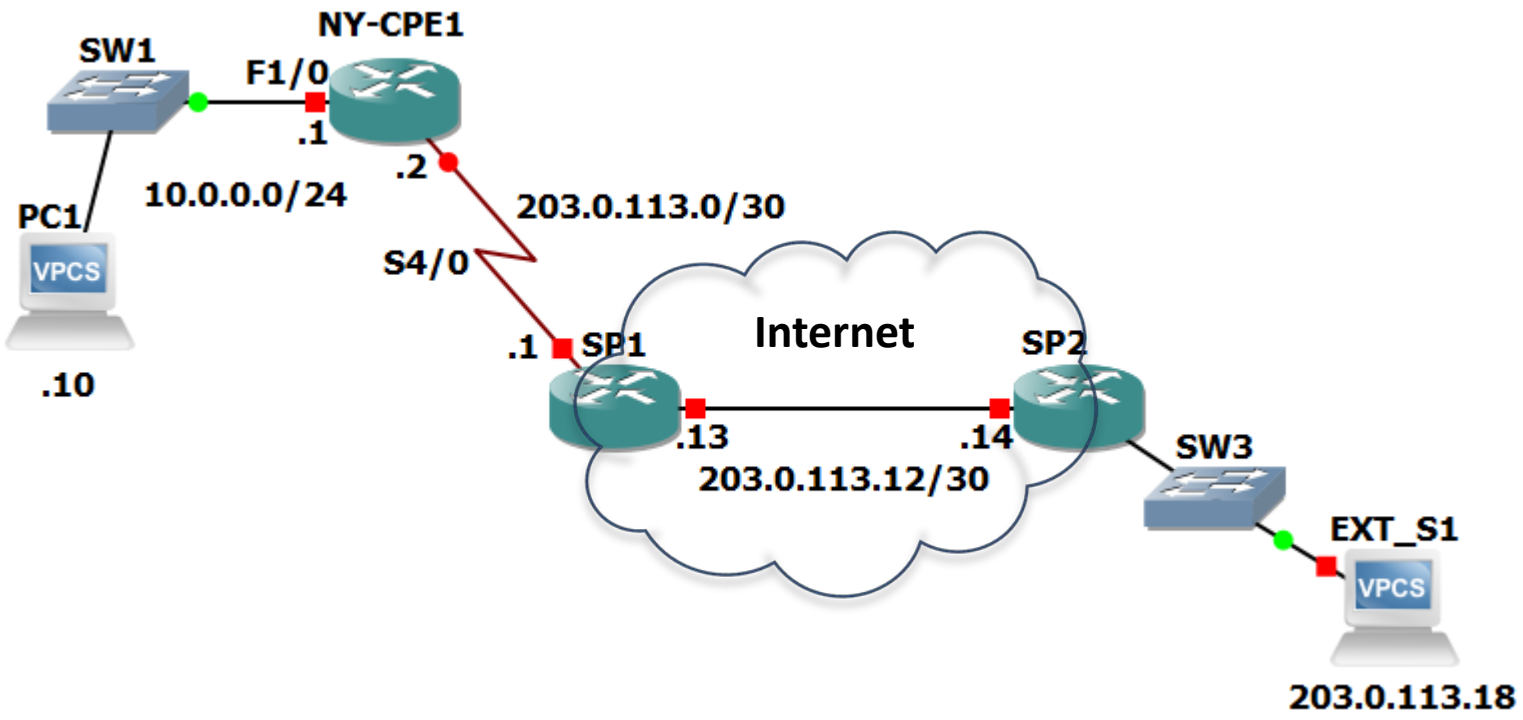
PPP Verification – show interface


```
NY-CPE1#show interface serial 4/0
Serial4/0 is up, line protocol is up
  Hardware is M4T
  Internet address is 203.0.113.2/30
  MTU 1500 bytes, BW 128 Kbit/sec, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation PPP, LCP Open
! Truncated
```

PPP Verification – show ppp all

```
NY-CPE1#show ppp all
Interface/ID OPEN+ Nego* Fail-     Stage    Peer Address    Peer Name
------------ ---------------------- -------- --------------- ----------
Se4/0        LCP+ IPCP+ CDPCP+     LocalT   203.0.113.1
```

Lab


NY-CPE1
SW1
F1/0
.1
.2
10.0.0.0/24
203.0.113.0/30
PC1
VPCS
.10
S4/0
.1
SP1
Internet
SP2
.13
.14
203.0.113.12/30
SW3
EXT_S1
VPCS
203.0.113.18