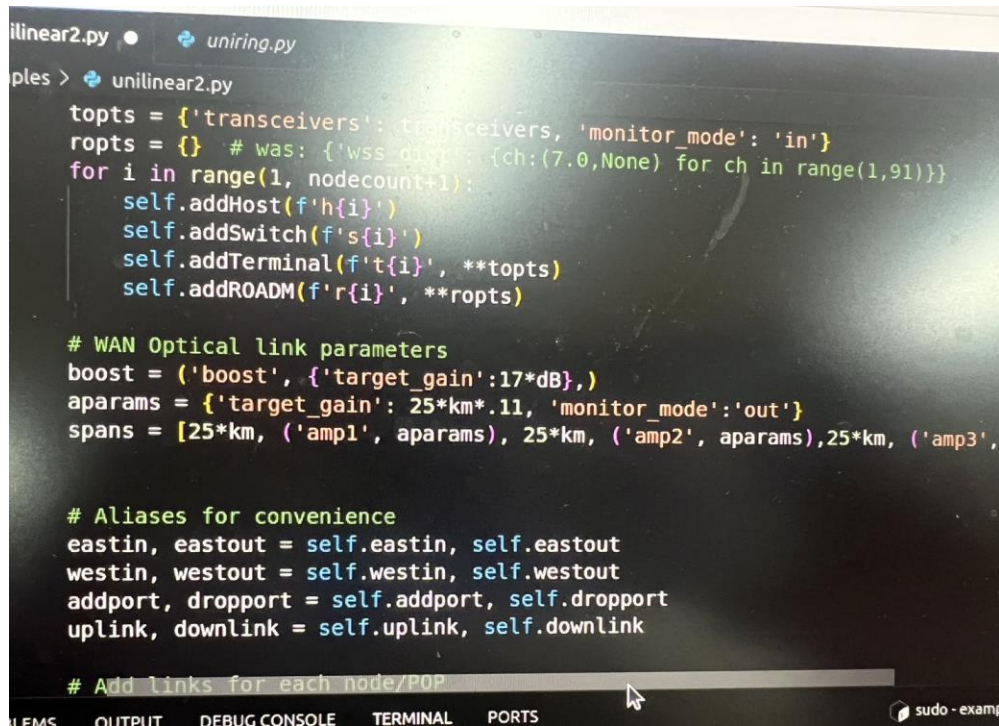


測量rodam之間Amplifier的變化(1)

- 每25公里設一個amplifier之OSNR變化,共4個



```
unilinear2.py • uniring.py
ples > unilinear2.py
topts = {'transceivers': transceivers, 'monitor_mode': 'in'}
ropts = {} # was: {'wss_dist': {ch:(7.0,None) for ch in range(1,91)}}
for i in range(1, nodecount+1):
    self.addHost(f'h{i}')
    self.addSwitch(f's{i}')
    self.addTerminal(f't{i}', **topts)
    self.addROADM(f'r{i}', **ropts)

# WAN Optical link parameters
boost = ('boost', {'target_gain':17*dB},)
aparams = {'target_gain': 25*km*.11, 'monitor_mode':'out'}
spans = [25*km, ('amp1', aparams), 25*km, ('amp2', aparams), 25*km, ('amp3',

# Aliases for convenience
eastin, eastout = self.eastin, self.eastout
westin, westout = self.westin, self.westout
addport, dropport = self.addport, self.dropport
uplink, downlink = self.uplink, self.downlink

# Add links for each node/POP
```

- <CH3:191.45THz>:表示為特定頻道在波長191.45terahertz
- OSNR: 31.13 dB : OSNR代表光信號與噪聲比。
表示在給定頻寬內信號功率與噪聲功率的比率。
- GOSNR:經過某種泛用處理過後的OSNR

```

84 # Note doubled transceivers for unidirectional
85 # We also waste a transceiver/port pair for loop
86 transceivers = tuple((f'tx{ch}', power, 'C')
87                       for ch in range(1, 2*nodecount))

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

*** t1 receiving <ch5:191.55THz> at port 11: Success! gOSNR: 24.9
*** t1 receiving <ch6:191.60THz> at port 12: Success! gOSNR: 23.3
mininet-optical> osnr
<name: t1-monitor, component: t1, mode: in>:
<ch4:191.50THz> OSNR: 28.75 dB gOSNR: 28.00 dB
<ch5:191.55THz> OSNR: 25.74 dB gOSNR: 24.99 dB
<ch6:191.60THz> OSNR: 23.98 dB gOSNR: 23.35 dB
<name: t2-monitor, component: t2, mode: in>:
<ch1:191.35THz> OSNR: 28.74 dB gOSNR: 28.00 dB
<name: t3-monitor, component: t3, mode: in>:
<ch2:191.40THz> OSNR: 25.73 dB gOSNR: 24.99 dB
<name: t4-monitor, component: t4, mode: in>:

```

```

82 operational power and node and network with the spe
83 self.nodecount = nodecount
84 # Add node (host, switch, terminal, ROADMS (east, wes
85 # Note doubled transceivers for unidirectional links!
86 # We also waste a transceiver/port pair for loopback
87 transceivers = tuple((f'tx{ch}', power, 'C')
                       for ch in range(1, 2*nodecount+1))

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

<name: t2-monitor, component: t2, mode: in>:
<ch1:191.35THz> OSNR: 28.74 dB gOSNR: 28.00 dB
<name: t3-monitor, component: t3, mode: in>:
<ch2:191.40THz> OSNR: 25.73 dB gOSNR: 24.99 dB
<name: t4-monitor, component: t4, mode: in>:
<ch3:191.45THz> OSNR: 23.97 dB gOSNR: 23.35 dB
<name: r1-r2-amp1-monitor, component: <r1-r2-amp1 2.8dB>, mode: out>:
<ch1:191.35THz> OSNR: 31.13 dB gOSNR: 30.23 dB
<ch2:191.40THz> OSNR: 31.13 dB gOSNR: 30.12 dB
<ch3:191.45THz> OSNR: 31.13 dB gOSNR: 30.23 dB
<name: r1-r2-amp2-monitor, component: <r1-r2-amp2 2.8dB>, mode: out>:
<ch1:191.35THz> OSNR: 30.64 dB gOSNR: 29.62 dB

```


測量rodam之間Amplifier的變化(2)

- 每12.5公里設一個amplifier之OSNR變化,共8個

```

*** t4.turn on <ch6:191.60THz> on port 10: Success! gOSNR: 25.816605 dB OSNR: 26.03 dB
*** t1 receiving <ch4:191.50THz> at port 10: Success! gOSNR: 22.803694 dB OSNR: 23.01 dB
*** t1 receiving <ch5:191.55THz> at port 11: Success! gOSNR: 21.076946 dB OSNR: 21.25 dB
mininet-optical> osnr
<name: t1-monitor, component: t1, mode: in>:
<ch4:191.50THz> OSNR: 26.03 dB gOSNR: 25.82 dB
<ch5:191.55THz> OSNR: 23.01 dB gOSNR: 22.80 dB
<ch6:191.60THz> OSNR: 21.25 dB gOSNR: 21.08 dB
<name: t2-monitor, component: t2, mode: in>:
<ch1:191.35THz> OSNR: 26.01 dB gOSNR: 25.80 dB
<name: t3-monitor, component: t3, mode: in>:
<ch2:191.40THz> OSNR: 23.00 dB gOSNR: 22.79 dB
<name: t4-monitor, component: t4, mode: in>:
<ch3:191.45THz> OSNR: 21.24 dB gOSNR: 21.07 dB
<name: r1-r2-amp1-monitor, component: <r1-r2-amp1 0.7dB>, mode: out>:
<ch1:191.35THz> OSNR: 31.26 dB gOSNR: 30.85 dB
<ch2:191.40THz> OSNR: 31.26 dB gOSNR: 30.79 dB
<ch3:191.45THz> OSNR: 31.26 dB gOSNR: 30.84 dB
<name: r1-r2-amp2-monitor, component: <r1-r2-amp2 0.7dB>, mode: out>:
<ch1:191.35THz> OSNR: 31.02 dB gOSNR: 30.48 dB
<ch2:191.40THz> OSNR: 31.02 dB gOSNR: 30.41 dB
<ch3:191.45THz> OSNR: 31.02 dB gOSNR: 30.48 dB
<name: r1-r2-amp3-monitor, component: <r1-r2-amp3 0.7dB>, mode: out>:
<ch1:191.35THz> OSNR: 30.67 dB gOSNR: 30.11 dB
<ch2:191.40THz> OSNR: 30.66 dB gOSNR: 30.04 dB
<ch3:191.45THz> OSNR: 30.66 dB gOSNR: 30.11 dB
<name: r1-r2-amp4-monitor, component: <r1-r2-amp4 0.7dB>, mode: out>:
<ch1:191.35THz> OSNR: 30.16 dB gOSNR: 29.64 dB
<ch2:191.40THz> OSNR: 30.16 dB gOSNR: 29.58 dB
<ch3:191.45THz> OSNR: 30.16 dB gOSNR: 29.64 dB
<name: r1-r2-amp5-monitor, component: <r1-r2-amp5 0.7dB>, mode: out>:
<ch1:191.35THz> OSNR: 30.45 dB gOSNR: 30.01 dB
<ch2:191.40THz> OSNR: 30.45 dB gOSNR: 30.01 dB
<ch3:191.45THz> OSNR: 30.45 dB gOSNR: 30.01 dB

```

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
sudo-examples + v [ ] [ ] ...

<ch3:191.45THz> OSNR: 30.16 dB gOSNR: 29.64 dB
<name: r1-r2-amp5-monitor, component: <r1-r2-amp5 0.7dB>, mode: out>;
<ch1:191.35THz> OSNR: 29.45 dB gOSNR: 29.01 dB
<ch2:191.40THz> OSNR: 29.45 dB gOSNR: 28.95 dB
<ch3:191.45THz> OSNR: 29.45 dB gOSNR: 29.01 dB
<name: r1-r2-amp6-monitor, component: <r1-r2-amp6 0.7dB>, mode: out>;
<ch1:191.35THz> OSNR: 28.53 dB gOSNR: 28.16 dB
<ch2:191.40THz> OSNR: 28.53 dB gOSNR: 28.12 dB
<ch3:191.45THz> OSNR: 28.53 dB gOSNR: 28.17 dB
<name: r1-r2-amp7-monitor, component: <r1-r2-amp7 0.7dB>, mode: out>;
<ch1:191.35THz> OSNR: 27.38 dB gOSNR: 27.09 dB
<ch2:191.40THz> OSNR: 27.38 dB gOSNR: 27.06 dB
<ch3:191.45THz> OSNR: 27.38 dB gOSNR: 27.10 dB
<name: r1-r2-amp8-monitor, component: <r1-r2-amp8 0.7dB>, mode: out>;
<ch1:191.35THz> OSNR: 26.01 dB gOSNR: 25.80 dB
<ch2:191.40THz> OSNR: 26.02 dB gOSNR: 25.78 dB
<ch3:191.45THz> OSNR: 26.02 dB gOSNR: 25.81 dB
<name: r2-r1-amp1-monitor, component: <r2-r1-amp1 0.7dB>, mode: out>;
<ch4:191.50THz> OSNR: 31.26 dB gOSNR: 30.84 dB
<ch5:191.55THz> OSNR: 24.89 dB gOSNR: 24.64 dB
<ch6:191.60THz> OSNR: 22.41 dB gOSNR: 22.22 dB
<name: r2-r1-amp2-monitor, component: <r2-r1-amp2 0.7dB>, mode: out>;
<ch4:191.50THz> OSNR: 31.02 dB gOSNR: 30.48 dB
<ch5:191.55THz> OSNR: 24.83 dB gOSNR: 24.54 dB
<ch6:191.60THz> OSNR: 22.38 dB gOSNR: 22.16 dB
<name: r2-r1-amp3-monitor, component: <r2-r1-amp3 0.7dB>, mode: out>;
<ch4:191.50THz> OSNR: 30.66 dB gOSNR: 30.11 dB
<ch5:191.55THz> OSNR: 24.74 dB gOSNR: 24.44 dB
<ch6:191.60THz> OSNR: 22.33 dB gOSNR: 22.11 dB
<name: r2-r1-amp4-monitor, component: <r2-r1-amp4 0.7dB>, mode: out>;
<ch4:191.50THz> OSNR: 30.16 dB gOSNR: 29.64 dB
<ch5:191.55THz> OSNR: 24.61 dB gOSNR: 24.31 dB
<ch6:191.60THz> OSNR: 22.25 dB gOSNR: 22.03 dB
<name: r2-r1-amp5-monitor, component: <r2-r1-amp5 0.7dB>, mode: out>;
<ch4:191.50THz> OSNR: 29.46 dB gOSNR: 29.01 dB
<ch5:191.55THz> OSNR: 24.49 dB gOSNR: 24.11 dB
<ch6:191.60THz> OSNR: 22.12 dB gOSNR: 21.91 dB
<name: r2-r1-amp6-monitor, component: <r2-r1-amp6 0.7dB>, mode: out>;
<ch4:191.50THz> OSNR: 28.54 dB gOSNR: 28.17 dB
<ch5:191.55THz> OSNR: 24.09 dB gOSNR: 23.82 dB

```



```

<ch5:191.55THz> OSNR: 24.61 dB gOSNR: 24.31 dB
<ch6:191.60THz> OSNR: 22.25 dB gOSNR: 22.03 dB
<name: r2-r1-amp5-monitor, component: <r2-r1-amp5 0.7dB>, mode: out>:
<ch4:191.50THz> OSNR: 29.46 dB gOSNR: 29.01 dB
<ch5:191.55THz> OSNR: 24.40 dB gOSNR: 24.11 dB
<ch6:191.60THz> OSNR: 22.12 dB gOSNR: 21.91 dB
<name: r2-r1-amp6-monitor, component: <r2-r1-amp6 0.7dB>, mode: out>:
<ch4:191.50THz> OSNR: 28.54 dB gOSNR: 28.17 dB
<ch5:191.55THz> OSNR: 24.09 dB gOSNR: 23.82 dB
<ch6:191.60THz> OSNR: 21.94 dB gOSNR: 21.74 dB
<name: r2-r1-amp7-monitor, component: <r2-r1-amp7 0.7dB>, mode: out>:
<ch4:191.50THz> OSNR: 27.39 dB gOSNR: 27.10 dB
<ch5:191.55THz> OSNR: 23.64 dB gOSNR: 23.40 dB
<ch6:191.60THz> OSNR: 21.66 dB gOSNR: 21.47 dB
<name: r2-r1-amp8-monitor, component: <r2-r1-amp8 0.7dB>, mode: out>:
<ch4:191.50THz> OSNR: 26.03 dB gOSNR: 25.82 dB
<ch5:191.55THz> OSNR: 23.01 dB gOSNR: 22.80 dB
<ch6:191.60THz> OSNR: 21.25 dB gOSNR: 21.00 dB
<name: r2-r3-amp1-monitor, component: <r2-r3-amp1 0.7dB>, mode: out>:
<ch2:191.40THz> OSNR: 24.88 dB gOSNR: 24.61 dB
<ch3:191.45THz> OSNR: 24.88 dB gOSNR: 24.64 dB
<name: r2-r3-amp2-monitor, component: <r2-r3-amp2 0.7dB>, mode: out>:
<ch2:191.40THz> OSNR: 24.82 dB gOSNR: 24.53 dB
<ch3:191.45THz> OSNR: 24.82 dB gOSNR: 24.55 dB
<name: r2-r3-amp3-monitor, component: <r2-r3-amp3 0.7dB>, mode: out>:
<ch2:191.40THz> OSNR: 24.73 dB gOSNR: 24.43 dB
<ch3:191.45THz> OSNR: 24.74 dB gOSNR: 24.46 dB
<name: r2-r3-amp4-monitor, component: <r2-r3-amp4 0.7dB>, mode: out>:
<ch2:191.40THz> OSNR: 24.60 dB gOSNR: 24.30 dB
<ch3:191.45THz> OSNR: 24.60 dB gOSNR: 24.32 dB
<name: r2-r3-amp5-monitor, component: <r2-r3-amp5 0.7dB>, mode: out>:
<ch2:191.40THz> OSNR: 24.39 dB gOSNR: 24.10 dB
<ch3:191.45THz> OSNR: 24.39 dB gOSNR: 24.13 dB
<name: r2-r3-amp6-monitor, component: <r2-r3-amp6 0.7dB>, mode: out>:
<ch2:191.40THz> OSNR: 24.08 dB gOSNR: 23.81 dB
<ch3:191.45THz> OSNR: 24.08 dB gOSNR: 23.83 dB
<name: r2-r3-amp7-monitor, component: <r2-r3-amp7 0.7dB>, mode: out>:
<ch2:191.40THz> OSNR: 23.63 dB gOSNR: 23.39 dB
<ch3:191.45THz> OSNR: 23.63 dB gOSNR: 23.41 dB

```

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```

<ch6:191.60THz> OSNR: 24.09 dB gOSNR: 23.89 dB
<name: r3-r2-amp7-monitor, component: <r3-r2-amp7 0.7dB>, mode: out>:
<ch5:191.55THz> OSNR: 27.39 dB gOSNR: 27.14 dB
<ch6:191.60THz> OSNR: 23.65 dB gOSNR: 23.46 dB
<name: r3-r2-amp8-monitor, component: <r3-r2-amp8 0.7dB>, mode: out>:
<ch5:191.55THz> OSNR: 26.03 dB gOSNR: 25.85 dB
<ch6:191.60THz> OSNR: 23.02 dB gOSNR: 22.86 dB
<name: r3-r4-amp1-monitor, component: <r3-r4-amp1 0.7dB>, mode: out>:
<ch3:191.45THz> OSNR: 22.40 dB gOSNR: 22.19 dB
<name: r3-r4-amp2-monitor, component: <r3-r4-amp2 0.7dB>, mode: out>:
<ch3:191.45THz> OSNR: 22.37 dB gOSNR: 22.15 dB
<name: r3-r4-amp3-monitor, component: <r3-r4-amp3 0.7dB>, mode: out>:
<ch3:191.45THz> OSNR: 22.32 dB gOSNR: 22.10 dB
<name: r3-r4-amp4-monitor, component: <r3-r4-amp4 0.7dB>, mode: out>:
<ch3:191.45THz> OSNR: 22.24 dB gOSNR: 22.02 dB
<name: r3-r4-amp5-monitor, component: <r3-r4-amp5 0.7dB>, mode: out>:
<ch3:191.45THz> OSNR: 22.12 dB gOSNR: 21.90 dB
<name: r3-r4-amp6-monitor, component: <r3-r4-amp6 0.7dB>, mode: out>:
<ch3:191.45THz> OSNR: 21.93 dB gOSNR: 21.73 dB
<name: r3-r4-amp7-monitor, component: <r3-r4-amp7 0.7dB>, mode: out>:
<ch3:191.45THz> OSNR: 21.65 dB gOSNR: 21.46 dB
<name: r3-r4-amp8-monitor, component: <r3-r4-amp8 0.7dB>, mode: out>:
<ch3:191.45THz> OSNR: 21.24 dB gOSNR: 21.07 dB
<name: r4-r3-amp1-monitor, component: <r4-r3-amp1 0.7dB>, mode: out>:
<ch6:191.60THz> OSNR: 31.25 dB gOSNR: 31.00 dB
<name: r4-r3-amp2-monitor, component: <r4-r3-amp2 0.7dB>, mode: out>:
<ch6:191.60THz> OSNR: 31.02 dB gOSNR: 30.68 dB
<name: r4-r3-amp3-monitor, component: <r4-r3-amp3 0.7dB>, mode: out>:
<ch6:191.60THz> OSNR: 30.66 dB gOSNR: 30.32 dB
<name: r4-r3-amp4-monitor, component: <r4-r3-amp4 0.7dB>, mode: out>:
<ch6:191.60THz> OSNR: 30.15 dB gOSNR: 29.83 dB
<name: r4-r3-amp5-monitor, component: <r4-r3-amp5 0.7dB>, mode: out>:
<ch6:191.60THz> OSNR: 29.46 dB gOSNR: 29.18 dB
<name: r4-r3-amp6-monitor, component: <r4-r3-amp6 0.7dB>, mode: out>:
<ch6:191.60THz> OSNR: 28.54 dB gOSNR: 28.31 dB
<name: r4-r3-amp7-monitor, component: <r4-r3-amp7 0.7dB>, mode: out>:
<ch6:191.60THz> OSNR: 27.39 dB gOSNR: 27.22 dB
<name: r4-r3-amp8-monitor, component: <r4-r3-amp8 0.7dB>, mode: out>:
<ch6:191.60THz> OSNR: 26.03 dB gOSNR: 25.90 dB
mininet-optical>

```

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```
<ch1:191.35THz> OSNR: 30.16 dB gOSNR: 29.64 dB
<ch2:191.40THz> OSNR: 30.16 dB gOSNR: 29.58 dB
<ch3:191.45THz> OSNR: 30.16 dB gOSNR: 29.64 dB
<name: r1-r2-amp5-monitor, component: <r1-r2-amp5 0.7dB>, mode: out>:
<ch1:191.35THz> OSNR: 29.45 dB gOSNR: 29.01 dB
<ch2:191.40THz> OSNR: 29.45 dB gOSNR: 28.95 dB
<ch3:191.45THz> OSNR: 29.45 dB gOSNR: 29.01 dB
<name: r1-r2-amp6-monitor, component: <r1-r2-amp6 0.7dB>, mode: out>:
<ch1:191.35THz> OSNR: 28.53 dB gOSNR: 28.16 dB
<ch2:191.40THz> OSNR: 28.53 dB gOSNR: 28.12 dB
<ch3:191.45THz> OSNR: 28.53 dB gOSNR: 28.17 dB
<name: r1-r2-amp7-monitor, component: <r1-r2-amp7 0.7dB>, mode: out>:
<ch1:191.35THz> OSNR: 27.38 dB gOSNR: 27.09 dB
<ch2:191.40THz> OSNR: 27.38 dB gOSNR: 27.06 dB
<ch3:191.45THz> OSNR: 27.38 dB gOSNR: 27.10 dB
<name: r1-r2-amp8-monitor, component: <r1-r2-amp8 0.7dB>, mode: out>:
<ch1:191.35THz> OSNR: 26.01 dB gOSNR: 25.80 dB
<ch2:191.40THz> OSNR: 26.02 dB gOSNR: 25.78 dB
<ch3:191.45THz> OSNR: 26.02 dB gOSNR: 25.81 dB
<name: r2-r1-amp1-monitor, component: <r2-r1-amp1 0.7dB>, mode: out>:
<ch4:191.50THz> OSNR: 31.26 dB gOSNR: 30.84 dB
<ch5:191.55THz> OSNR: 24.89 dB gOSNR: 24.64 dB
<ch6:191.60THz> OSNR: 22.41 dB gOSNR: 22.22 dB
<name: r2-r1-amp2-monitor, component: <r2-r1-amp2 0.7dB>, mode: out>:
<ch4:191.50THz> OSNR: 31.02 dB gOSNR: 30.48 dB
<ch5:191.55THz> OSNR: 24.83 dB gOSNR: 24.54 dB
<ch6:191.60THz> OSNR: 22.38 dB gOSNR: 22.16 dB
<name: r2-r1-amp3-monitor, component: <r2-r1-amp3 0.7dB>, mode: out>:
<ch4:191.50THz> OSNR: 30.66 dB gOSNR: 30.11 dB
<ch5:191.55THz> OSNR: 24.74 dB gOSNR: 24.44 dB
<ch6:191.60THz> OSNR: 22.33 dB gOSNR: 22.11 dB
<name: r2-r1-amp4-monitor, component: <r2-r1-amp4 0.7dB>, mode: out>:
<ch4:191.50THz> OSNR: 30.16 dB gOSNR: 29.64 dB
<ch5:191.55THz> OSNR: 24.61 dB gOSNR: 24.31 dB
<ch6:191.60THz> OSNR: 22.25 dB gOSNR: 22.03 dB
<name: r2-r1-amp5-monitor, component: <r2-r1-amp5 0.7dB>, mode: out>:
<ch4:191.50THz> OSNR: 29.46 dB gOSNR: 29.01 dB
<ch5:191.55THz> OSNR: 24.40 dB gOSNR: 24.11 dB
<ch6:191.60THz> OSNR: 22.13 dB gOSNR: 21.91 dB
```

Data rate與OSNR之相關性

- Data rate=頻寬* $\log(1+OSNR)$

#log以2為底

#之前10個host都設頻寬為128GPbs