

Breakout

Ett breakout-interface är ett fysiskt höghastighetsinterface som görs om till flera logiska interface av lägre hastighet.

Inkoppling

I praktiken kopplas enbart 1 speciell SFP (fiber alt. DAC) in i switchen som går till en breakoutkabel. En breakoutkabel delar sig i flera delar. Kabeln kan vara fristående från SFPn eller integrerad i SFPn. Breakout via en fiber-SFP stöder finns för både multimode och singlemode.

Hastigheter

Vilka hastigheter som stöds beror på vilka hastigheter som porten stöder och därmed vilka kanaler (engelska: lanes) som ligger bakom hastigheten. Exempelvis är en 40 Gbit/s-interface egentligen 4x10 Gbit/s, vilket gör att 1 40 Gbit/s-interface kan bli 4x10Gbit/s-interface via breakout.

Rate	Technology	Breakout Capable	Electric Lanes	Optical Lanes*
10G	SFP+	No	10G	10G
25G	SFP28	No	25G	25G
40G	QSFP+	Yes	4x 10G	4x10G, 2x20G
50G	SFP56	No	50G	50G
100G	QSFP28	Yes	4x 25G	100G, 4x25G, 2x50G
200G	QSFP56	Yes	4x 50G	4x50G
2x 100G	QSFP28-DD	Yes	2x (4x25G)	2x (4x25G)
400G	QSFP56-DD	Yes	8x 50G	4x 100G, 8x50G

Konfiguration

Breakout konfigureras ej direkt på interfacet utan i global config-läge.

Modulläge

Det går att konfigurera en hel modul i breakoutläge. Då startar modulen om vid konfiguration.

```
switch# configure terminal
switch(config)# interface breakout module 1
Module will be reloaded. Are you sure you want to continue(yes/no)? yes

! Återställ
no interface breakout module module_number
```

Per-interfaceläge

Ingen omstart av modul sker när det konfigureras i interfaceläge.

```
!! interface
interface breakout module 1 port 1 map 10g-4xswitch

! flera interface
interface breakout module 1 port 1-4 map 10g-4xswitch

! återställ
no interface breakout module 1 port 1 map 10g-4x

! Beroende på porttyp så syns olika varianter:
C93600CD-GX# show int eth1/32
Ethernet1/32 is down (XCVR not inserted)
admin state is down, Dedicated Interface
  Hardware: 10000/25000/40000/50000/100000/200000/400000 Ethernet, address: 643a.eada.bad0 (bia
643a.eada.bad0)

C93600CD-GX(config)# interface breakout module 1 port 32 map ?
100g-2x      Breaks out a 200G high BW front panel port into two 100G ports
100g-2x-pam4 Breaks out a 200G high BW front panel port into two 100G ports with mode pam4
100g-4x      Breaks out a 400G high BW front panel port into four 100G ports
10g-4x       Breaks out a 40G high BW front panel port into four 10G ports
200g-2x      Breaks out a 400G high BW front panel port into two 200G ports
25g-4x       Breaks out a 100G high BW front panel port into four 25G ports
```

50g-2x	Breaks out a 100G high BW front panel port into two 50G ports
50g-4x	Breaks out a 200G high BW front panel port into four 50G ports

Verifying:

```
switch(config-if)# show int eth1/49 transceiver
```

```
Ethernet1/49
```

```
transceiver is present
```

```
type is QSFP-40G-SR-BD
```

```
name is CISCO-AVAGO
```

```
part number is AFBR-79EBPZ-CS2
```

```
revision is 01
```

```
[[[
```

```
switch(config-if)# show int eth1/52 transceiver
```

```
Ethernet1/52
```

```
transceiver is present
```

```
type is QSFP-Cazadero
```

```
name is CISCO-DNI
```

```
part number is CAZADERO-R
```

```
revision is 03
```

```
nominal bitrate is 10000 MBit/sec per channel
```

```
[[[
```

```
switch(config-if)# show int eth1/53 transceiver
```

```
Ethernet1/53
```

```
transceiver is present
```

```
type is QSFP-Cazadero
```

```
name is CISCO-DNI
```

```
part number is CAZADERO-R
```

```
revision is 03
```

```
nominal bitrate is 10000 MBit/sec per channel
```

```
[[[
```

```
switch(config)# interface breakout module 1 port 52-53 map 10g-4x
```

```
[[[
```

```
switch(config-if)# show int br | i up
```

```
mgmt0 -- up 10.122.160.192 100 1500
```

```
Eth1/49 -- eth routed up none 40G(D) — Running 40G
```

```
Eth1/50 -- eth routed up none 40G(D) --
```

```
Eth1/52/1 -- eth routed up none 10G(D) — Broken out to 10G
```

```
Eth1/53/1 -- eth routed up none 10G(D) -- Broken out to 10G
```

FEC för breakout

Forward error correction (FEC) behövs på alla kablar förutom 1-2 meter passiva DAC-kablar. Standard i Ciscoswitchar är FC-FEC CL74 men RS-FEC Consortium 1.6, RS-FEC IEEE, och andra FEC-agloritmer kan konfigureras.

För 25gbit/s Ethernet används två primära FEC-algoritmer:

- FC-FEC, felrättning med låg latens under 100 nanosekunder, optimerad för bursts. Används på 3 och 5 meter passiva DAC-kablar och på optiska kablar upp till 10 meter. Används även på 100Gbit/s-interface.
- RS-FEC. Bättre felrättning. Krävs på 25Gbit/s multimode fiber, upp till 100 meter. Kan även behövs på aktiv DAC över 10 meter.

Konfiguration och verifiering

```
switch# (config-if)# fec ?
auto FEC auto
fc-fec CL74(25/50G)off Turn FEC off
rs-cons16 RS FEC Consortium 1.6 (25G)
rs-fec CL91(100G) or Consortium 1.5 (25/50G)
rs-ieee RS FEC IEEE (25G)

switch# show interface fec
-----
Name    Ifindex  Admin-fec  Oper-fec  Status  Speed  Type
-----
Eth1/1  0x1a000000 auto    auto    connected  10G    SFP-H10GB-AOC2M
Eth1/2  0x1a000200    Rs-fec  notconneced  auto    QSFP-100G-AOC3M
Eth1/3/1 0x38014000 auto    auto    disabled  auto    QSFP-H40G-AOC3M
Eth1/3/2 0x38015000 auto    auto    disabled  auto    QSFP-H40G-AOC3M
Eth1/3/3 0x38016000 auto    auto    disabled  auto    QSFP-H40G-AOC3M
Eth1/3/4 0x38017000 auto    auto    disabled  auto    QSFP-H40G-AOC3M

```

Lista över Nexusswitchar

Den här saxades 2026-04-01 från [Cisco](#). Det är bäst att läsa deras dokumentation för relevant info.

Switches	4x10G	4x25G	2x50G	2x100G	2x200G	2x400G	4x50G	4x100G	8x100G
N9K-X9636C-RX	Yes	Yes	Yes	No	No	No	No	No	No
N9K-X9636C-R	Yes	Yes	Yes	No	No	No	No	No	No
N9K-X9636Q-R	Yes	No	No	No	No	No	No	No	No
N9K-X96136YC-R	No	No	No	No	No	No	No	No	No
N3K-C3636C-R	Yes	Yes	Yes	No	No	No	No	No	No
N3K-C36180YC-R	Yes	Yes	Yes	No	No	No	No	No	No
N9K-93108TC-EX	Yes	Yes	Yes	No	No	No	No	No	No
N9K-93180YC-EX	Yes	Yes	Yes	No	No	No	No	No	No
N9K-93108TC-FX	Yes	Yes	Yes	No	No	No	No	No	No
N9K-93180YC-FX	Yes	Yes	Yes	No	No	No	No	No	No

Switches	4x10G	4x25G	2x50G	2x100G	2x200G	2x400G	4x50G	4x100G	8x100G
N9K-9348GC-FXP	Yes	Yes	Yes	No	No	No	No	No	No
N9K-X9732C-EX	Yes	Yes	Yes	No	No	No	No	No	No
N9K-X9736C-EX	Yes	Yes	Yes	No	No	No	No	No	No
N9K-X9732C-EXM	Yes	Yes	Yes	No	No	No	No	No	No
N9K-X9736C-FX	Yes	Yes	Yes	No	No	No	No	No	No
N9K-X9736Q-FX	Yes	No	No	No	No	No	No	No	No
N9K-X9788TC-FX	Yes	Yes	Yes	No	No	No	No	No	No
N9K-X9732C-FX	Yes	Yes	Yes	No	No	No	No	No	No
N9K-C9348GC-FXP	Yes	Yes	Yes	No	No	No	No	No	No
N9K-C9336C-FX2	Yes	Yes	Yes	No	No	No	No	No	No
N9K-C93216TC-FX2	Yes	Yes	Yes	No	No	No	No	No	No
N9K-C93360YC-FX2	Yes	Yes	Yes	No	No	No	No	No	No

Switches	4x10G	4x25G	2x50G	2x100G	2x200G	2x400G	4x50G	4x100G	8x100G
N9K-C9364C-GX	Yes	Yes	Yes	No	No	No	No	No	No
N9K-C9316D-GX	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No
N9K-C93600CD-GX	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No
N9K-X9716D-GX	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No
N9K-C9332D-GX2B	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No
N9K-C9348D-GX2A	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No
N9K-X9400-16W	Yes	Yes	Yes	Yes	No	No	Yes	No	No
N9K-X9400-8D	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No
N9K-X98900CD-A	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No

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