

TRABALHO FINAL MININET

Parte_1

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Cruso : GEC

1 - Preparação do Ambiente

Pré-requisitos

- Máquina virtual com **Mininet** instalada.
- **Putty** (com *X11 forwarding habilitado*).
- **Xming** rodando no Windows.

Conectar via Putty

1. Abra o Xming e mantenha-o em execução.
2. Abra o Putty, vá em:

Connection → SSH → X11 → Enable X11 Forwarding

3. Conecte-se ao IP da VM (exemplo: **192.168.56.101**)
4. Login:

user: **mininet**
password: **mininet**

2 - Criar a Topologia em Árvore (Profundidade 3, Ramificação 5)

Limpar topologias anteriores

```
sudo mn -c
```

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```

pedro@CapDellG15:~$ sudo mn -c
*** Removing excess controllers/ofprotocols/ofdatapaths/pings/noxes
killall controller ofprotocol ofdatapath ping nox_core lt-nox_core ovs-openflowd ovs-controller ovs-testcontroller udpbwtest mnexec ivs ryu-manager 2> /dev/null
killall -9 controller ofprotocol ofdatapath ping nox_core lt-nox_core ovs-openflowd ovs-controller ovs-testcontroller udpbwtest mnexec ivs ryu-manager 2> /dev/null
pkill -9 -f "sudo mnexec"
*** Removing junk from /tmp
rm -f /tmp/vconn* /tmp/vlogs* /tmp/*.out /tmp/*.log
*** Removing old X11 tunnels
*** Removing excess kernel datapaths
ps ax | egrep -o 'dp[0-9]+' | sed 's/dp/nl:/' 
*** Removing OVS datapaths
ovs-vsctl --timeout=1 list-br
ovs-vsctl --timeout=1 list-br
*** Removing all links of the pattern foo-ethX
ip link show | egrep -o '([-.[:alnum:]]+-eth[[:digit:]]+)'
ip link show
*** Killing stale mininet node processes
pkill -9 -f mininet:
*** Shutting down stale tunnels
pkill -9 -f Tunnel=Ethernet
pkill -9 -f .ssh/mn
rm -f ~/.ssh/mn/*
*** Cleanup complete.

```

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Criar topologia com largura de banda 30 Mbps

`sudo mn --topo=tree,depth=3,fanout=5 --mac --link=tc,bw=30`

{

```

pedro@CapDellG15:~$ sudo mn --topo=tree,depth=3,fanout=5 --mac --link=tc,bw=30
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3 h4 h5 h6 h7 h8 h9 h10 h11 h12 h13 h14 h15 h16 h17 h18 h19 h20 h21 h22 h23 h24 h25 h26 h27 h28 h29 h30 h31 h32 h33 h34 h35 h36 h37 h38 h39 h40 h41 h42 h43 h44 h45 h46 h47 h48 h49 h50 h51 h52 h53 h54 h55 h56 h57 h58 h59 h60 h61 h62 h63 h64 h65 h66 h67 h68 h69 h70 h71 h72 h73 h74 h75 h76 h77 h78 h79 h80 h81 h82 h83 h84 h85 h86 h87 h88 h89 h90 h91 h92 h93 h94 h95 h96 h97 h98 h99 h100 h101 h102 h103 h104 h105 h106 h107 h108 h109 h110 h111 h112 h113 h114 h115 h116 h117 h118 h119 h120 h121 h122 h123 h124 h125
*** Adding switches:
s1 s2 s3 s4 s5 s6 s7 s8 s9 s10 s11 s12 s13 s14 s15 s16 s17 s18 s19 s20 s21 s22 s23 s24 s25 s26 s27 s28 s29 s30 s31
*** Adding links:
(30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s2) (30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s8) (30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s14) (30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s20) (30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s26) (30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s2, s3) (30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s2, s4) (30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s2, s5) (30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.

```


A mensagem de erro que aparece nos prints acima não é um erro fatal. A topologia foi criada com sucesso.

Essas mensagens:

(Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.)

não impedem o Mininet de funcionar — são apenas avisos do kernel dizendo que para links muito numerosos com controle de banda (HTB), o valor quantum ficou grande.}

- Explicando:

- `tree` → tipo de topologia (árvore)
- `depth=3` → profundidade da árvore
- `fanout=5` → cada switch conecta a 5 nós ou switches filhos
- `--mac` → atribui MACs padronizados
- `--link=tc,bw=30` → define 30 Mbps de largura de banda por enlace

3 - Inspecionar informações da rede

No prompt mininet> execute:

`nodes`

|

```
mininet> nodes
available nodes are:
c6 h1 h10 h100 h101 h102 h103 h104 h105 h106 h107 h108 h109 h11 h110 h111 h112 h113 h114 h115 h116 h117 h118 h119 h12 h120 h121 h122 h123 h124 h125 h13 h14 h15 h16 h17 h18 h19 h2 h20 h21 h22 h23 h24 h25 h26 h27 h28 h29 h3 h30 h31 h32 h33 h34 h35 h36 h37 h38 h39 h4 h40 h41 h42 h43 h44 h45 h46 h47 h48 h49 h5 h50 h51 h52 h53 h54 h55 h56 h57 h58 h59 h6 h60 h61 h62 h63 h64 h65 h66 h67 h68 h69 h7 h70 h71 h72 h73 h74 h75 h76 h77 h78 h79 h8 h80 h81 h82 h83 h84 h85 h86 h87 h88 h89 h9 h90 h91 h92 h93 h94 h95 h96 h97 h98 h99 s1 s10 s11 s12 s13 s14 s15 s16 s17 s18 s19 s2 s20 s21 s22 s23 s24 s25 s26 s27 s28 s29 s3 s30 s31 s4 s5 s6 s7 s8 s9
mininet>
```

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Mostra todos os hosts e switches.

`Net`

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```
mininet> net
h1 h1-eth0:s3-eth1
h2 h2-eth0:s3-eth2
h3 h3-eth0:s3-eth3
h4 h4-eth0:s3-eth4
h5 h5-eth0:s3-eth5
h6 h6-eth0:s4-eth1
h7 h7-eth0:s4-eth2
h8 h8-eth0:s4-eth3
h9 h9-eth0:s4-eth4
h10 h10-eth0:s4-eth5
h11 h11-eth0:s5-eth1
h12 h12-eth0:s5-eth2
h13 h13-eth0:s5-eth3
h14 h14-eth0:s5-eth4
h15 h15-eth0:s5-eth5
h16 h16-eth0:s6-eth1
h17 h17-eth0:s6-eth2
h18 h18-eth0:s6-eth3
h19 h19-eth0:s6-eth4
h20 h20-eth0:s6-eth5
h21 h21-eth0:s7-eth1
h22 h22-eth0:s7-eth2
h23 h23-eth0:s7-eth3
h24 h24-eth0:s7-eth4
h25 h25-eth0:s7-eth5
h26 h26-eth0:s9-eth1
h27 h27-eth0:s9-eth2
h28 h28-eth0:s9-eth3
h29 h29-eth0:s9-eth4
h30 h30-eth0:s9-eth5
h31 h31-eth0:s10-eth1
h32 h32-eth0:s10-eth2
h33 h33-eth0:s10-eth3
h34 h34-eth0:s10-eth4
h35 h35-eth0:s10-eth5
h36 h36-eth0:s11-eth1
h37 h37-eth0:s11-eth2
h38 h38-eth0:s11-eth3
h39 h39-eth0:s11-eth4
```

```
h40 h40-eth0:s11-eth5
h41 h41-eth0:s12-eth1
h42 h42-eth0:s12-eth2
h43 h43-eth0:s12-eth3
h44 h44-eth0:s12-eth4
h45 h45-eth0:s12-eth5
h46 h46-eth0:s13-eth1
h47 h47-eth0:s13-eth2
h48 h48-eth0:s13-eth3
h49 h49-eth0:s13-eth4
h50 h50-eth0:s13-eth5
h51 h51-eth0:s15-eth1
h52 h52-eth0:s15-eth2
h53 h53-eth0:s15-eth3
h54 h54-eth0:s15-eth4
h55 h55-eth0:s15-eth5
h56 h56-eth0:s16-eth1
h57 h57-eth0:s16-eth2
h58 h58-eth0:s16-eth3
h59 h59-eth0:s16-eth4
h60 h60-eth0:s16-eth5
h61 h61-eth0:s17-eth1
h62 h62-eth0:s17-eth2
h63 h63-eth0:s17-eth3
h64 h64-eth0:s17-eth4
h65 h65-eth0:s17-eth5
h66 h66-eth0:s18-eth1
h67 h67-eth0:s18-eth2
h68 h68-eth0:s18-eth3
h69 h69-eth0:s18-eth4
h70 h70-eth0:s18-eth5
h71 h71-eth0:s19-eth1
h72 h72-eth0:s19-eth2
h73 h73-eth0:s19-eth3
h74 h74-eth0:s19-eth4
h75 h75-eth0:s19-eth5
h76 h76-eth0:s21-eth1
h77 h77-eth0:s21-eth2
h78 h78-eth0:s21-eth3
```

```

h79 h79-eth0:s21-eth4
h80 h80-eth0:s21-eth5
h81 h81-eth0:s22-eth1
h82 h82-eth0:s22-eth2
h83 h83-eth0:s22-eth3
h84 h84-eth0:s22-eth4
h85 h85-eth0:s22-eth5
h86 h86-eth0:s23-eth1
h87 h87-eth0:s23-eth2
h88 h88-eth0:s23-eth3
h89 h89-eth0:s23-eth4
h90 h90-eth0:s23-eth5
h91 h91-eth0:s24-eth1
h92 h92-eth0:s24-eth2
h93 h93-eth0:s24-eth3
h94 h94-eth0:s24-eth4
h95 h95-eth0:s24-eth5
h96 h96-eth0:s25-eth1
h97 h97-eth0:s25-eth2
h98 h98-eth0:s25-eth3
h99 h99-eth0:s25-eth4
h100 h100-eth0:s25-eth5
h101 h101-eth0:s27-eth1
h102 h102-eth0:s27-eth2
h103 h103-eth0:s27-eth3
h104 h104-eth0:s27-eth4
h105 h105-eth0:s27-eth5
h106 h106-eth0:s28-eth1
h107 h107-eth0:s28-eth2
h108 h108-eth0:s28-eth3
h109 h109-eth0:s28-eth4
h110 h110-eth0:s28-eth5
h111 h111-eth0:s29-eth1
h112 h112-eth0:s29-eth2
h113 h113-eth0:s29-eth3
h114 h114-eth0:s29-eth4
h115 h115-eth0:s29-eth5
h116 h116-eth0:s30-eth1
h117 h117-eth0:s30-eth2
h118 h118-eth0:s30-eth3
h119 h119-eth0:s30-eth4

```

```

h120 h120-eth0:s30-eth5
h121 h121-eth0:s31-eth1
h122 h122-eth0:s31-eth2
h123 h123-eth0:s31-eth3
h124 h124-eth0:s31-eth4
h125 h125-eth0:s31-eth5
s1 lo: s1-eth1:s2-eth6 s1-eth2:s8-eth6 s1-eth3:s14-eth6 s1-eth4:s20-eth6 s1-eth5:s26-eth6
s2 lo: s2-eth1:s3-eth6 s2-eth2:s4-eth6 s2-eth3:s5-eth6 s2-eth4:s6-eth6 s2-eth5:s7-eth6 s2-eth6:s1-eth1
s3 lo: s3-eth1:h1-eth0 s3-eth2:h2-eth0 s3-eth3:h3-eth0 s3-eth4:h4-eth0 s3-eth5:h5-eth0 s3-eth6:s2-eth1
s4 lo: s4-eth1:h6-eth0 s4-eth2:h7-eth0 s4-eth3:h8-eth0 s4-eth4:h9-eth0 s4-eth5:h10-eth0 s4-eth6:s2-eth2
s5 lo: s5-eth1:h11-eth0 s5-eth2:h12-eth0 s5-eth3:h13-eth0 s5-eth4:h14-eth0 s5-eth5:h15-eth0 s5-eth6:s2-eth3
s6 lo: s6-eth1:h16-eth0 s6-eth2:h17-eth0 s6-eth3:h18-eth0 s6-eth4:h19-eth0 s6-eth5:h20-eth0 s6-eth6:s2-eth4
s7 lo: s7-eth1:h21-eth0 s7-eth2:h22-eth0 s7-eth3:h23-eth0 s7-eth4:h24-eth0 s7-eth5:h25-eth0 s7-eth6:s2-eth5
s8 lo: s8-eth1:s9-eth6 s8-eth2:s10-eth6 s8-eth3:s11-eth6 s8-eth4:s12-eth6 s8-eth5:s13-eth6 s8-eth6:s1-eth2
s9 lo: s9-eth1:h26-eth0 s9-eth2:h27-eth0 s9-eth3:h28-eth0 s9-eth4:h29-eth0 s9-eth5:h30-eth0 s9-eth6:s8-eth1
s10 lo: s10-eth1:h31-eth0 s10-eth2:h32-eth0 s10-eth3:h33-eth0 s10-eth4:h34-eth0 s10-eth5:s35-eth0 s10-eth6:s8-eth2
s11 lo: s11-eth1:h36-eth0 s11-eth2:h37-eth0 s11-eth3:h38-eth0 s11-eth4:h39-eth0 s11-eth5:s40-eth0 s11-eth6:s8-eth3
s12 lo: s12-eth1:h41-eth0 s12-eth2:h42-eth0 s12-eth3:h43-eth0 s12-eth4:h44-eth0 s12-eth5:s45-eth0 s12-eth6:s8-eth4
s13 lo: s13-eth1:h46-eth0 s13-eth2:h47-eth0 s13-eth3:h48-eth0 s13-eth4:h49-eth0 s13-eth5:s50-eth0 s13-eth6:s8-eth5
s14 lo: s14-eth1:h5-eth0 s14-eth2:s16-eth6 s14-eth3:s17-eth6 s14-eth4:s18-eth6 s14-eth5:s19-eth6 s14-eth6:s1-eth3
s15 lo: s15-eth1:h51-eth0 s15-eth2:h52-eth0 s15-eth3:h53-eth0 s15-eth4:h54-eth0 s15-eth5:s55-eth0 s15-eth6:s14-eth1
s16 lo: s16-eth1:h56-eth0 s16-eth2:h57-eth0 s16-eth3:h58-eth0 s16-eth4:h59-eth0 s16-eth5:s60-eth0 s16-eth6:s14-eth2
s17 lo: s17-eth1:h61-eth0 s17-eth2:h62-eth0 s17-eth3:h63-eth0 s17-eth4:h64-eth0 s17-eth5:s65-eth0 s17-eth6:s14-eth3
s18 lo: s18-eth1:h66-eth0 s18-eth2:h67-eth0 s18-eth3:h68-eth0 s18-eth4:h69-eth0 s18-eth5:s70-eth0 s18-eth6:s14-eth4
s19 lo: s19-eth1:h71-eth0 s19-eth2:h72-eth0 s19-eth3:h73-eth0 s19-eth4:h74-eth0 s19-eth5:s75-eth0 s19-eth6:s14-eth5
s20 lo: s20-eth1:s21-eth0 s20-eth2:s22-eth0 s20-eth3:s23-eth0 s20-eth4:s24-eth6 s20-eth5:s25-eth6 s20-eth6:s1-eth4
s21 lo: s21-eth1:h76-eth0 s21-eth2:h77-eth0 s21-eth3:h78-eth0 s21-eth4:h79-eth0 s21-eth5:s80-eth0 s21-eth6:s20-eth1
s22 lo: s22-eth1:h81-eth0 s22-eth2:h82-eth0 s22-eth3:h83-eth0 s22-eth4:h84-eth0 s22-eth5:h85-eth0 s22-eth6:s20-eth2
s23 lo: s23-eth1:h86-eth0 s23-eth2:h87-eth0 s23-eth3:h88-eth0 s23-eth4:h89-eth0 s23-eth5:s90-eth0 s23-eth6:s20-eth3
s24 lo: s24-eth1:h91-eth0 s24-eth2:h92-eth0 s24-eth3:h93-eth0 s24-eth4:h94-eth0 s24-eth5:s95-eth0 s24-eth6:s20-eth4
s25 lo: s25-eth1:h96-eth0 s25-eth2:h97-eth0 s25-eth3:h98-eth0 s25-eth4:h99-eth0 s25-eth5:s100-eth0 s25-eth6:s20-eth5
s26 lo: s26-eth1:h67-eth6 s26-eth2:s28-eth6 s26-eth3:s29-eth6 s26-eth4:s30-eth6 s26-eth5:s31-eth6 s26-eth6:s1-eth5
s27 lo: s27-eth1:h101-eth0 s27-eth2:h102-eth0 s27-eth3:h103-eth0 s27-eth4:h104-eth0 s27-eth5:h105-eth0 s27-eth6:s2-eth1
s28 lo: s28-eth1:h106-eth0 s28-eth2:h107-eth0 s28-eth3:h108-eth0 s28-eth4:h109-eth0 s28-eth5:h110-eth0 s28-eth6:s26-eth2
s29 lo: s29-eth1:h111-eth0 s29-eth2:h112-eth0 s29-eth3:h113-eth0 s29-eth4:h114-eth0 s29-eth5:h115-eth0 s29-eth6:s26-eth3
s30 lo: s30-eth1:h116-eth0 s30-eth2:h117-eth0 s30-eth3:h118-eth0 s30-eth4:h119-eth0 s30-eth5:h120-eth0 s30-eth6:s26-eth4
s31 lo: s31-eth1:h21-eth0 s31-eth2:h22-eth0 s31-eth3:h23-eth0 s31-eth4:h24-eth0 s31-eth5:h25-eth0 s31-eth6:s26-eth5
c0
mininet>

```

Exibe as conexões entre nós.

Dump

|

```
mininet> dump
<Host h1: h1-eth0:10.0.0.1 pid=21704>
<Host h2: h2-eth0:10.0.0.2 pid=21706>
<Host h3: h3-eth0:10.0.0.3 pid=21708>
<Host h4: h4-eth0:10.0.0.4 pid=21710>
<Host h5: h5-eth0:10.0.0.5 pid=21712>
<Host h6: h6-eth0:10.0.0.6 pid=21714>
<Host h7: h7-eth0:10.0.0.7 pid=21716>
<Host h8: h8-eth0:10.0.0.8 pid=21718>
<Host h9: h9-eth0:10.0.0.9 pid=21720>
<Host h10: h10-eth0:10.0.0.10 pid=21722>
<Host h11: h11-eth0:10.0.0.11 pid=21724>
<Host h12: h12-eth0:10.0.0.12 pid=21726>
<Host h13: h13-eth0:10.0.0.13 pid=21728>
<Host h14: h14-eth0:10.0.0.14 pid=21730>
<Host h15: h15-eth0:10.0.0.15 pid=21732>
<Host h16: h16-eth0:10.0.0.16 pid=21734>
<Host h17: h17-eth0:10.0.0.17 pid=21736>
<Host h18: h18-eth0:10.0.0.18 pid=21738>
<Host h19: h19-eth0:10.0.0.19 pid=21740>
<Host h20: h20-eth0:10.0.0.20 pid=21742>
<Host h21: h21-eth0:10.0.0.21 pid=21744>
<Host h22: h22-eth0:10.0.0.22 pid=21746>
<Host h23: h23-eth0:10.0.0.23 pid=21748>
<Host h24: h24-eth0:10.0.0.24 pid=21750>
<Host h25: h25-eth0:10.0.0.25 pid=21752>
<Host h26: h26-eth0:10.0.0.26 pid=21754>
<Host h27: h27-eth0:10.0.0.27 pid=21756>
<Host h28: h28-eth0:10.0.0.28 pid=21758>
<Host h29: h29-eth0:10.0.0.29 pid=21760>
<Host h30: h30-eth0:10.0.0.30 pid=21762>
<Host h31: h31-eth0:10.0.0.31 pid=21764>
<Host h32: h32-eth0:10.0.0.32 pid=21766>
<Host h33: h33-eth0:10.0.0.33 pid=21768>
<Host h34: h34-eth0:10.0.0.34 pid=21770>
<Host h35: h35-eth0:10.0.0.35 pid=21772>
<Host h36: h36-eth0:10.0.0.36 pid=21774>
<Host h37: h37-eth0:10.0.0.37 pid=21776>
<Host h38: h38-eth0:10.0.0.38 pid=21778>
```

```
<Host h39: h39-eth0:10.0.0.39 pid=21780>
<Host h40: h40-eth0:10.0.0.40 pid=21782>
<Host h41: h41-eth0:10.0.0.41 pid=21784>
<Host h42: h42-eth0:10.0.0.42 pid=21786>
<Host h43: h43-eth0:10.0.0.43 pid=21788>
<Host h44: h44-eth0:10.0.0.44 pid=21790>
<Host h45: h45-eth0:10.0.0.45 pid=21792>
<Host h46: h46-eth0:10.0.0.46 pid=21794>
<Host h47: h47-eth0:10.0.0.47 pid=21796>
<Host h48: h48-eth0:10.0.0.48 pid=21798>
<Host h49: h49-eth0:10.0.0.49 pid=21800>
<Host h50: h50-eth0:10.0.0.50 pid=21802>
<Host h51: h51-eth0:10.0.0.51 pid=21804>
<Host h52: h52-eth0:10.0.0.52 pid=21806>
<Host h53: h53-eth0:10.0.0.53 pid=21808>
<Host h54: h54-eth0:10.0.0.54 pid=21810>
<Host h55: h55-eth0:10.0.0.55 pid=21812>
<Host h56: h56-eth0:10.0.0.56 pid=21814>
<Host h57: h57-eth0:10.0.0.57 pid=21816>
<Host h58: h58-eth0:10.0.0.58 pid=21818>
<Host h59: h59-eth0:10.0.0.59 pid=21820>
<Host h60: h60-eth0:10.0.0.60 pid=21822>
<Host h61: h61-eth0:10.0.0.61 pid=21824>
<Host h62: h62-eth0:10.0.0.62 pid=21826>
<Host h63: h63-eth0:10.0.0.63 pid=21828>
<Host h64: h64-eth0:10.0.0.64 pid=21830>
<Host h65: h65-eth0:10.0.0.65 pid=21832>
<Host h66: h66-eth0:10.0.0.66 pid=21834>
<Host h67: h67-eth0:10.0.0.67 pid=21836>
<Host h68: h68-eth0:10.0.0.68 pid=21838>
<Host h69: h69-eth0:10.0.0.69 pid=21840>
<Host h70: h70-eth0:10.0.0.70 pid=21842>
<Host h71: h71-eth0:10.0.0.71 pid=21844>
<Host h72: h72-eth0:10.0.0.72 pid=21846>
<Host h73: h73-eth0:10.0.0.73 pid=21848>
<Host h74: h74-eth0:10.0.0.74 pid=21850>
<Host h75: h75-eth0:10.0.0.75 pid=21852>
<Host h76: h76-eth0:10.0.0.76 pid=21854>
<Host h77: h77-eth0:10.0.0.77 pid=21856>
```

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<Host h78: h78-eth0:10.0.0.78 pid=21858>
<Host h79: h79-eth0:10.0.0.79 pid=21860>
<Host h80: h80-eth0:10.0.0.80 pid=21862>
<Host h81: h81-eth0:10.0.0.81 pid=21864>
<Host h82: h82-eth0:10.0.0.82 pid=21866>
<Host h83: h83-eth0:10.0.0.83 pid=21868>
<Host h84: h84-eth0:10.0.0.84 pid=21870>
<Host h85: h85-eth0:10.0.0.85 pid=21872>
<Host h86: h86-eth0:10.0.0.86 pid=21874>
<Host h87: h87-eth0:10.0.0.87 pid=21876>
<Host h88: h88-eth0:10.0.0.88 pid=21878>
<Host h89: h89-eth0:10.0.0.89 pid=21880>
<Host h90: h90-eth0:10.0.0.90 pid=21882>
<Host h91: h91-eth0:10.0.0.91 pid=21884>
<Host h92: h92-eth0:10.0.0.92 pid=21886>
<Host h93: h93-eth0:10.0.0.93 pid=21888>
<Host h94: h94-eth0:10.0.0.94 pid=21890>
<Host h95: h95-eth0:10.0.0.95 pid=21892>
<Host h96: h96-eth0:10.0.0.96 pid=21894>
<Host h97: h97-eth0:10.0.0.97 pid=21896>
<Host h98: h98-eth0:10.0.0.98 pid=21898>
<Host h99: h99-eth0:10.0.0.99 pid=21900>
<Host h100: h100-eth0:10.0.0.100 pid=21902>
<Host h101: h101-eth0:10.0.0.101 pid=21904>
<Host h102: h102-eth0:10.0.0.102 pid=21906>
<Host h103: h103-eth0:10.0.0.103 pid=21908>
<Host h104: h104-eth0:10.0.0.104 pid=21910>
<Host h105: h105-eth0:10.0.0.105 pid=21912>
<Host h106: h106-eth0:10.0.0.106 pid=21914>
<Host h107: h107-eth0:10.0.0.107 pid=21916>
<Host h108: h108-eth0:10.0.0.108 pid=21918>
<Host h109: h109-eth0:10.0.0.109 pid=21920>
<Host h110: h110-eth0:10.0.0.110 pid=21922>
<Host h111: h111-eth0:10.0.0.111 pid=21924>
<Host h112: h112-eth0:10.0.0.112 pid=21926>
<Host h113: h113-eth0:10.0.0.113 pid=21928>
<Host h114: h114-eth0:10.0.0.114 pid=21930>
<Host h115: h115-eth0:10.0.0.115 pid=21932>
<Host h116: h116-eth0:10.0.0.116 pid=21934>

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<Host h117: h117-eth0:10.0.0.117 pid=21936>
<Host h118: h118-eth0:10.0.0.118 pid=21938>
<Host h119: h119-eth0:10.0.0.119 pid=21940>
<Host h120: h120-eth0:10.0.0.120 pid=21942>
<Host h121: h121-eth0:10.0.0.121 pid=21944>
<Host h122: h122-eth0:10.0.0.122 pid=21946>
<Host h123: h123-eth0:10.0.0.123 pid=21948>
<Host h124: h124-eth0:10.0.0.124 pid=21950>
<Host h125: h125-eth0:10.0.0.125 pid=21952>
<OVSSwitch s1: lo:127.0.0.1,s1-eth1:None,s1-eth2:None,s1-eth3:None,s1-eth4:None,s1-eth5:None pid=21957>
<OVSSwitch s2: lo:127.0.0.1,s2-eth1:None,s2-eth2:None,s2-eth3:None,s2-eth4:None,s2-eth5:None,s2-eth6:None pid=21960>
<OVSSwitch s3: lo:127.0.0.1,s3-eth1:None,s3-eth2:None,s3-eth3:None,s3-eth4:None,s3-eth5:None,s3-eth6:None pid=21963>
<OVSSwitch s4: lo:127.0.0.1,s4-eth1:None,s4-eth2:None,s4-eth3:None,s4-eth4:None,s4-eth5:None,s4-eth6:None pid=21966>
<OVSSwitch s5: lo:127.0.0.1,s5-eth1:None,s5-eth2:None,s5-eth3:None,s5-eth4:None,s5-eth5:None,s5-eth6:None pid=21969>
<OVSSwitch s6: lo:127.0.0.1,s6-eth1:None,s6-eth2:None,s6-eth3:None,s6-eth4:None,s6-eth5:None,s6-eth6:None pid=21972>
<OVSSwitch s7: lo:127.0.0.1,s7-eth1:None,s7-eth2:None,s7-eth3:None,s7-eth4:None,s7-eth5:None,s7-eth6:None pid=21975>
<OVSSwitch s8: lo:127.0.0.1,s8-eth1:None,s8-eth2:None,s8-eth3:None,s8-eth4:None,s8-eth5:None,s8-eth6:None pid=21978>
<OVSSwitch s9: lo:127.0.0.1,s9-eth1:None,s9-eth2:None,s9-eth3:None,s9-eth4:None,s9-eth5:None,s9-eth6:None pid=21981>
<OVSSwitch s10: lo:127.0.0.1,s10-eth1:None,s10-eth2:None,s10-eth3:None,s10-eth4:None,s10-eth5:None,s10-eth6:None pid=21984>
<OVSSwitch s11: lo:127.0.0.1,s11-eth1:None,s11-eth2:None,s11-eth3:None,s11-eth4:None,s11-eth5:None,s11-eth6:None pid=21987>
<OVSSwitch s12: lo:127.0.0.1,s12-eth1:None,s12-eth2:None,s12-eth3:None,s12-eth4:None,s12-eth5:None,s12-eth6:None pid=21990>
<OVSSwitch s13: lo:127.0.0.1,s13-eth1:None,s13-eth2:None,s13-eth3:None,s13-eth4:None,s13-eth5:None,s13-eth6:None pid=21993>
<OVSSwitch s14: lo:127.0.0.1,s14-eth1:None,s14-eth2:None,s14-eth3:None,s14-eth4:None,s14-eth5:None,s14-eth6:None pid=21996>
<OVSSwitch s15: lo:127.0.0.1,s15-eth1:None,s15-eth2:None,s15-eth3:None,s15-eth4:None,s15-eth5:None,s15-eth6:None pid=21999>
<OVSSwitch s16: lo:127.0.0.1,s16-eth1:None,s16-eth2:None,s16-eth3:None,s16-eth4:None,s16-eth5:None,s16-eth6:None pid=22002>
<OVSSwitch s17: lo:127.0.0.1,s17-eth1:None,s17-eth2:None,s17-eth3:None,s17-eth4:None,s17-eth5:None,s17-eth6:None pid=22005>
<OVSSwitch s18: lo:127.0.0.1,s18-eth1:None,s18-eth2:None,s18-eth3:None,s18-eth4:None,s18-eth5:None,s18-eth6:None pid=22008>
<OVSSwitch s19: lo:127.0.0.1,s19-eth1:None,s19-eth2:None,s19-eth3:None,s19-eth4:None,s19-eth5:None,s19-eth6:None pid=22011>
<OVSSwitch s20: lo:127.0.0.1,s20-eth1:None,s20-eth2:None,s20-eth3:None,s20-eth4:None,s20-eth5:None,s20-eth6:None pid=22014>
<OVSSwitch s21: lo:127.0.0.1,s21-eth1:None,s21-eth2:None,s21-eth3:None,s21-eth4:None,s21-eth5:None,s21-eth6:None pid=22017>
<OVSSwitch s22: lo:127.0.0.1,s22-eth1:None,s22-eth2:None,s22-eth3:None,s22-eth4:None,s22-eth5:None,s22-eth6:None pid=22020>
<OVSSwitch s23: lo:127.0.0.1,s23-eth1:None,s23-eth2:None,s23-eth3:None,s23-eth4:None,s23-eth5:None,s23-eth6:None pid=22023>
<OVSSwitch s24: lo:127.0.0.1,s24-eth1:None,s24-eth2:None,s24-eth3:None,s24-eth4:None,s24-eth5:None,s24-eth6:None pid=22026>
<OVSSwitch s25: lo:127.0.0.1,s25-eth1:None,s25-eth2:None,s25-eth3:None,s25-eth4:None,s25-eth5:None,s25-eth6:None pid=22029>
<OVSSwitch s26: lo:127.0.0.1,s26-eth1:None,s26-eth2:None,s26-eth3:None,s26-eth4:None,s26-eth5:None,s26-eth6:None pid=22032>
<OVSSwitch s27: lo:127.0.0.1,s27-eth1:None,s27-eth2:None,s27-eth3:None,s27-eth4:None,s27-eth5:None,s27-eth6:None pid=22035>
<OVSSwitch s28: lo:127.0.0.1,s28-eth1:None,s28-eth2:None,s28-eth3:None,s28-eth4:None,s28-eth5:None,s28-eth6:None pid=22038>
<OVSSwitch s29: lo:127.0.0.1,s29-eth1:None,s29-eth2:None,s29-eth3:None,s29-eth4:None,s29-eth5:None,s29-eth6:None pid=22041>
<OVSSwitch s30: lo:127.0.0.1,s30-eth1:None,s30-eth2:None,s30-eth3:None,s30-eth4:None,s30-eth5:None,s30-eth6:None pid=22044>

```

```

<OVSSwitch s31: lo:127.0.0.1,s31-eth1:None,s31-eth2:None,s31-eth3:None,s31-eth4:None,s31-eth5:None,s31-eth6:None pid=22047>
<Controller c0: 127.0.0.1:6653 pid=21697>
mininet> 

```

Mostra IP, MAC, portas e interfaces de todos os dispositivos.

Para inspecionar um nó específico

h1 ifconfig -a

```
mininet> h1 ifconfig -a
h1-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet 10.0.0.1 netmask 255.0.0.0 broadcast 10.255.255.255
        inet6 fe80::200:ff:fe00:1 prefixlen 64 scopeid 0x20<link>
          ether 00:00:00:00:00:01 txqueuelen 1000  (Ethernet)
            RX packets 887 bytes 65666 (65.6 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 17 bytes 1422 (1.4 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
        inet 127.0.0.1 netmask 255.0.0.0
        inet6 ::1 prefixlen 128 scopeid 0x10<host>
          loop txqueuelen 1000  (Local Loopback)
            RX packets 0 bytes 0 (0.0 B)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 0 bytes 0 (0.0 B)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

s1 ifconfig -a

```

mininet> s1 ifconfig -a
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1280
        inet 172.28.4.67 netmask 255.255.240.0 broadcast 172.28.15.255
        inet6 fe80::215:5dff:feea:2f8 prefixlen 64 scopeid 0x20<link>
          ether 00:15:5d:ea:02:f8 txqueuelen 1000 (Ethernet)
            RX packets 141075 bytes 152660051 (152.6 MB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 18609 bytes 1291269 (1.2 MB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
        inet 127.0.0.1 netmask 255.0.0.0
        inet6 ::1 prefixlen 128 scopeid 0x10<host>
          loop txqueuelen 1000 (Local Loopback)
            RX packets 187549 bytes 23421828 (23.4 MB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 187549 bytes 23421828 (23.4 MB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

ovs-system: flags=4098<BROADCAST,MULTICAST> mtu 1500
        ether 06:45:d3:ec:54:f3 txqueuelen 1000 (Ethernet)
          RX packets 0 bytes 0 (0.0 B)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 0 bytes 0 (0.0 B)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s1: flags=4098<BROADCAST,MULTICAST> mtu 1500
        ether ba:f4:ca:39:22:49 txqueuelen 1000 (Ethernet)
          RX packets 0 bytes 0 (0.0 B)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 0 bytes 0 (0.0 B)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s2: flags=4098<BROADCAST,MULTICAST> mtu 1500
        ether 5e:55:b9:33:b2:4d txqueuelen 1000 (Ethernet)
          RX packets 0 bytes 0 (0.0 B)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 0 bytes 0 (0.0 B)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

```

```

s3: flags=4098<BROADCAST,MULTICAST> mtu 1500
        ether 12:77:0d:05:fa:44 txqueuelen 1000 (Ethernet)
          RX packets 0 bytes 0 (0.0 B)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 0 bytes 0 (0.0 B)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s4: flags=4098<BROADCAST,MULTICAST> mtu 1500
        ether 8a:db:1f:71:d2:4c txqueuelen 1000 (Ethernet)
          RX packets 0 bytes 0 (0.0 B)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 0 bytes 0 (0.0 B)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s5: flags=4098<BROADCAST,MULTICAST> mtu 1500
        ether d6:0c:7b:94:37:4c txqueuelen 1000 (Ethernet)
          RX packets 0 bytes 0 (0.0 B)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 0 bytes 0 (0.0 B)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s6: flags=4098<BROADCAST,MULTICAST> mtu 1500
        ether f2:bc:97:99:6b:49 txqueuelen 1000 (Ethernet)
          RX packets 0 bytes 0 (0.0 B)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 0 bytes 0 (0.0 B)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s7: flags=4098<BROADCAST,MULTICAST> mtu 1500
        ether 0e:5c:9f:f9:5d:42 txqueuelen 1000 (Ethernet)
          RX packets 0 bytes 0 (0.0 B)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 0 bytes 0 (0.0 B)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s8: flags=4098<BROADCAST,MULTICAST> mtu 1500
        ether 16:d0:b7:c3:d5:41 txqueuelen 1000 (Ethernet)
          RX packets 0 bytes 0 (0.0 B)
          RX errors 0 dropped 0 overruns 0 frame 0

```

```
s9: flags=4098<Broadcast,Multicast> mtu 1500
    ether f6:ac:c6:b0:4d txqueuelen 1000  (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s10: flags=4098<Broadcast,Multicast> mtu 1500
    ether be:74:30:e3:4a:4f txqueuelen 1000  (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s11: flags=4098<Broadcast,Multicast> mtu 1500
    ether 32:a0:f4:52:38:4f txqueuelen 1000  (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s12: flags=4098<Broadcast,Multicast> mtu 1500
    ether fe:5b:b9:1d:3a:42 txqueuelen 1000  (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s13: flags=4098<Broadcast,Multicast> mtu 1500
    ether b6:35:46:3b:a7:4b txqueuelen 1000  (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s14: flags=4098<Broadcast,Multicast> mtu 1500
    ether f6:3e:d2:72:11:46 txqueuelen 1000  (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
s15: flags=4098<Broadcast,Multicast> mtu 1500
    ether 9e:b5:9f:fc:b1:46 txqueuelen 1000  (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s16: flags=4098<Broadcast,Multicast> mtu 1500
    ether 36:8a:c0:26:0f:49 txqueuelen 1000  (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s17: flags=4098<Broadcast,Multicast> mtu 1500
    ether 1a:77:13:0d:30:4f txqueuelen 1000  (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s18: flags=4098<Broadcast,Multicast> mtu 1500
    ether 2a:f2:6f:9e:69:47 txqueuelen 1000  (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s19: flags=4098<Broadcast,Multicast> mtu 1500
    ether 7a:16:ab:d6:79:43 txqueuelen 1000  (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s20: flags=4098<Broadcast,Multicast> mtu 1500
    ether da:48:8d:38:5f:42 txqueuelen 1000  (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```

s21: flags=4098<Broadcast,Multicast> mtu 1500
      ether 56:42:5a:46:f2:47 txqueuelen 1000  (Ethernet)
      RX packets 0 bytes 0 (0.0 B)
      RX errors 0 dropped 0 overruns 0 frame 0
      TX packets 0 bytes 0 (0.0 B)
      TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s22: flags=4098<Broadcast,Multicast> mtu 1500
      ether ae:76:6a:96:4d:41 txqueuelen 1000  (Ethernet)
      RX packets 0 bytes 0 (0.0 B)
      RX errors 0 dropped 0 overruns 0 frame 0
      TX packets 0 bytes 0 (0.0 B)
      TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s23: flags=4098<Broadcast,Multicast> mtu 1500
      ether c6:87:23:06:d2:45 txqueuelen 1000  (Ethernet)
      RX packets 0 bytes 0 (0.0 B)
      RX errors 0 dropped 0 overruns 0 frame 0
      TX packets 0 bytes 0 (0.0 B)
      TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s24: flags=4098<Broadcast,Multicast> mtu 1500
      ether 2a:d4:7e:41:e4:4b txqueuelen 1000  (Ethernet)
      RX packets 0 bytes 0 (0.0 B)
      RX errors 0 dropped 0 overruns 0 frame 0
      TX packets 0 bytes 0 (0.0 B)
      TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s25: flags=4098<Broadcast,Multicast> mtu 1500
      ether 66:48:0f:6b:f1:45 txqueuelen 1000  (Ethernet)
      RX packets 0 bytes 0 (0.0 B)
      RX errors 0 dropped 0 overruns 0 frame 0
      TX packets 0 bytes 0 (0.0 B)
      TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s26: flags=4098<Broadcast,Multicast> mtu 1500
      ether 8e:77:81:3f:d1:4e txqueuelen 1000  (Ethernet)
      RX packets 0 bytes 0 (0.0 B)
      RX errors 0 dropped 0 overruns 0 frame 0
      TX packets 0 bytes 0 (0.0 B)
      TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

```

```

s27: flags=4098<Broadcast,Multicast> mtu 1500
      ether d6:36:f0:43:2c:48 txqueuelen 1000  (Ethernet)
      RX packets 0 bytes 0 (0.0 B)
      RX errors 0 dropped 0 overruns 0 frame 0
      TX packets 0 bytes 0 (0.0 B)
      TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s28: flags=4098<Broadcast,Multicast> mtu 1500
      ether ca:44:1f:53:5e:45 txqueuelen 1000  (Ethernet)
      RX packets 0 bytes 0 (0.0 B)
      RX errors 0 dropped 0 overruns 0 frame 0
      TX packets 0 bytes 0 (0.0 B)
      TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s29: flags=4098<Broadcast,Multicast> mtu 1500
      ether c6:5e:be:a2:d6:45 txqueuelen 1000  (Ethernet)
      RX packets 0 bytes 0 (0.0 B)
      RX errors 0 dropped 0 overruns 0 frame 0
      TX packets 0 bytes 0 (0.0 B)
      TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s30: flags=4098<Broadcast,Multicast> mtu 1500
      ether 16:7c:d4:58:ab:45 txqueuelen 1000  (Ethernet)
      RX packets 0 bytes 0 (0.0 B)
      RX errors 0 dropped 0 overruns 0 frame 0
      TX packets 0 bytes 0 (0.0 B)
      TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s31: flags=4098<Broadcast,Multicast> mtu 1500
      ether 86:d2:85:49:8e:46 txqueuelen 1000  (Ethernet)
      RX packets 0 bytes 0 (0.0 B)
      RX errors 0 dropped 0 overruns 0 frame 0
      TX packets 0 bytes 0 (0.0 B)
      TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s1-eth1: flags=4163<UP,BROADCAST,RUNNING,Multicast> mtu 1500
      inet6 fe80::30fb:1eff:fe24:3e93 prefixlen 64 scopeid 0x20<link>
      ether 32:fb:1e:24:3e:93 txqueuelen 1000  (Ethernet)
      RX packets 193 bytes 14126 (14.1 KB)
      RX errors 0 dropped 0 overruns 0 frame 0
      TX packets 835 bytes 61486 (61.4 KB)

```

```

s1-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::806:caff:fe4b:26a3 prefixlen 64 scopeid 0x20<link>
ether 0a:06:ca:4b:26:a3 txqueuelen 1000 (Ethernet)
RX packets 208 bytes 15356 (15.3 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 820 bytes 60256 (60.2 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s1-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::54d5:7dff:fee9:6b75 prefixlen 64 scopeid 0x20<link>
ether 56:d5:7d:e9:6b:75 txqueuelen 1000 (Ethernet)
RX packets 200 bytes 14676 (14.6 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 828 bytes 60936 (60.9 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s1-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::381f:1aff:fe94:97c7 prefixlen 64 scopeid 0x20<link>
ether 3a:1f:1a:94:97:c7 txqueuelen 1000 (Ethernet)
RX packets 218 bytes 16156 (16.1 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 810 bytes 59456 (59.4 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s1-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::2044:4aff:fe43:6ccc prefixlen 64 scopeid 0x20<link>
ether 22:44:4a:43:6c:cc txqueuelen 1000 (Ethernet)
RX packets 222 bytes 16496 (16.4 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 806 bytes 59116 (59.1 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s10-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::404e:1aff:fece:620a prefixlen 64 scopeid 0x20<link>
ether 42:4e:1a:ce:62:0a txqueuelen 1000 (Ethernet)
RX packets 17 bytes 1422 (1.4 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1018 bytes 74836 (74.8 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

```

```

s10-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::94a3:a2ff:fea1:ede5 prefixlen 64 scopeid 0x20<link>
ether 96:a3:a2:a1:ed:e5 txqueuelen 1000 (Ethernet)
RX packets 16 bytes 1332 (1.3 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1018 bytes 74836 (74.8 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s10-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::ace8:4eff:fe89:5760 prefixlen 64 scopeid 0x20<link>
ether ae:e8:4e:89:57:60 txqueuelen 1000 (Ethernet)
RX packets 17 bytes 1422 (1.4 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1018 bytes 74836 (74.8 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s10-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::4c6e:69ff:fea9:clee prefixlen 64 scopeid 0x20<link>
ether 4e:6e:69:a9:c1:ee txqueuelen 1000 (Ethernet)
RX packets 17 bytes 1422 (1.4 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1016 bytes 74676 (74.6 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s10-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::d83e:52ff:fe2d:62ea prefixlen 64 scopeid 0x20<link>
ether da:3e:52:2d:62:ea txqueuelen 1000 (Ethernet)
RX packets 17 bytes 1422 (1.4 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1016 bytes 74676 (74.6 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s10-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::b403:a0ff:fe8e:e5a0 prefixlen 64 scopeid 0x20<link>
ether b6:03:a0:8e:e5:a0 txqueuelen 1000 (Ethernet)
RX packets 983 bytes 72226 (72.2 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 45 bytes 3386 (3.3 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

```

```
s11-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::847e:8ff:fe07:c835 prefixlen 64 scopeid 0x20<link>
        ether 86:7e:08:07:c8:35 txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1016 bytes 74676 (74.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s11-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::8442:3cff:fed8:8de8 prefixlen 64 scopeid 0x20<link>
        ether 86:42:3c:d8:8d:e8 txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1019 bytes 74926 (74.9 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s11-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::644b:a0ff:fe41:1b4a prefixlen 64 scopeid 0x20<link>
        ether 66:4b:a0:41:1b:4a txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1018 bytes 74836 (74.8 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s11-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::e4de:f0ff:fe22:617d prefixlen 64 scopeid 0x20<link>
        ether e6:de:f0:22:61:7d txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1016 bytes 74676 (74.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s11-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::8c22:76ff:fed0:581d prefixlen 64 scopeid 0x20<link>
        ether 8e:22:76:d0:58:1d txqueuelen 1000 (Ethernet)
        RX packets 16 bytes 1332 (1.3 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1016 bytes 74676 (74.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
s11-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::2844:aff:fe17:7669 prefixlen 64 scopeid 0x20<link>
        ether 2a:44:0a:17:76:69 txqueuelen 1000 (Ethernet)
        RX packets 982 bytes 72156 (72.1 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 46 bytes 3456 (3.4 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s12-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::ecd1:b6ff:fe97:c786 prefixlen 64 scopeid 0x20<link>
        ether ee:d1:b6:97:c7:86 txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1018 bytes 74836 (74.8 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s12-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::dcf8:79ff:fe75:2ccc prefixlen 64 scopeid 0x20<link>
        ether de:ef:79:75:2c:cc txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1018 bytes 74836 (74.8 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s12-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::dcc2:60ff:fec:f19 prefixlen 64 scopeid 0x20<link>
        ether de:c2:60:cc:0f:19 txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1016 bytes 74676 (74.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s12-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::6899:c0ff:fefc:8f00 prefixlen 64 scopeid 0x20<link>
        ether 6a:99:c0:fc:8f:00 txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1018 bytes 74836 (74.8 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```

s12-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::fce3:8aff:fe3f:ae8c prefixlen 64 scopeid 0x20<link>
        ether fe:e3:8a:3f:ae:8c txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1019 bytes 74926 (74.9 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s12-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::5c6b:4fff:feed:9aeb prefixlen 64 scopeid 0x20<link>
        ether 5e:6b:4f:ed:9a:eb txqueuelen 1000 (Ethernet)
        RX packets 986 bytes 72476 (72.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 42 bytes 3136 (3.1 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s13-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::7c03:c9ff:fe66:1680 prefixlen 64 scopeid 0x20<link>
        ether 7e:03:c9:66:16:80 txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1018 bytes 74836 (74.8 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s13-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::a073:41ff:fe8e:79a prefixlen 64 scopeid 0x20<link>
        ether a2:73:41:8e:07:9a txqueuelen 1000 (Ethernet)
        RX packets 16 bytes 1332 (1.3 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1016 bytes 74676 (74.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s13-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::f8c9:fcff:fecf:f1a9 prefixlen 64 scopeid 0x20<link>
        ether fa:c9:fc:cf:f1:a9 txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1016 bytes 74676 (74.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

```

```

s13-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::482f:9aff:fe2d:a483 prefixlen 64 scopeid 0x20<link>
        ether 4a:2f:9a:2d:a4:83 txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1016 bytes 74676 (74.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s13-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::2cf1:42ff:fe56:905f prefixlen 64 scopeid 0x20<link>
        ether 2e:f1:42:56:90:5f txqueuelen 1000 (Ethernet)
        RX packets 16 bytes 1332 (1.3 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1016 bytes 74676 (74.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s13-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::9c5b:fdff:feec:e382 prefixlen 64 scopeid 0x20<link>
        ether 9e:5b:fd:ec:e3:82 txqueuelen 1000 (Ethernet)
        RX packets 979 bytes 71906 (71.9 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 49 bytes 3706 (3.7 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s14-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::2475:13ff:fee8:ce6 prefixlen 64 scopeid 0x20<link>
        ether 26:75:13:e8:0c:e6 txqueuelen 1000 (Ethernet)
        RX packets 40 bytes 2956 (2.9 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 988 bytes 72656 (72.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s14-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::3ca5:e2ff:fed:6a34 prefixlen 64 scopeid 0x20<link>
        ether 3e:a5:e2:da:6a:34 txqueuelen 1000 (Ethernet)
        RX packets 47 bytes 3546 (3.5 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 981 bytes 72066 (72.0 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

```

```
s14-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::28fb:a3ff:feb6:6f65 prefixlen 64 scopeid 0x20<link>
        ether 2a:fb:a3:bf:6f:65 txqueuelen 1000 (Ethernet)
        RX packets 46 bytes 3456 (3.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 982 bytes 72156 (72.1 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s14-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::b0be:3cff:feee:b46b prefixlen 64 scopeid 0x20<link>
        ether b2:be:3c:ee:b4:6b txqueuelen 1000 (Ethernet)
        RX packets 43 bytes 3206 (3.2 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 985 bytes 72406 (72.4 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s14-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::f8f5:6bff:fe15:ed54 prefixlen 64 scopeid 0x20<link>
        ether fa:f5:6b:15:ed:54 txqueuelen 1000 (Ethernet)
        RX packets 43 bytes 3226 (3.2 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 985 bytes 72386 (72.3 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s14-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::90b2:acff:fe80:5429 prefixlen 64 scopeid 0x20<link>
        ether 92:b2:ac:80:54:29 txqueuelen 1000 (Ethernet)
        RX packets 828 bytes 60936 (60.9 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 200 bytes 14676 (14.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s15-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::ce1:f5ff:fe57:3bb prefixlen 64 scopeid 0x20<link>
        ether 0e:e1:f5:57:03:bb txqueuelen 1000 (Ethernet)
        RX packets 16 bytes 1332 (1.3 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1019 bytes 74926 (74.9 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
s15-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::ccc6:45ff:febd:8aaf prefixlen 64 scopeid 0x20<link>
        ether ce:c6:45:bd:8a:af txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1019 bytes 74926 (74.9 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s15-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::7c3c:89ff:fe10:9c2b prefixlen 64 scopeid 0x20<link>
        ether 7e:3c:89:10:9c:2b txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s15-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::107b:19ff:fe7f:c745 prefixlen 64 scopeid 0x20<link>
        ether 12:7b:19:7f:c7:45 txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1019 bytes 74926 (74.9 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s15-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::2404:5dff:fe6a:b63e prefixlen 64 scopeid 0x20<link>
        ether 26:04:5d:6a:b6:3e txqueuelen 1000 (Ethernet)
            RX packets 16 bytes 1332 (1.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s15-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::5093:4dff:feac:4912 prefixlen 64 scopeid 0x20<link>
        ether 52:93:4d:ac:49:12 txqueuelen 1000 (Ethernet)
            RX packets 988 bytes 72656 (72.6 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 40 bytes 2956 (2.9 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```

s16-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::d0af:deff:fe79:989f prefixlen 64 scopeid 0x20<link>
        ether d2:af:de:79:98:9f txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1018 bytes 74836 (74.8 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s16-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::841d:f8ff:fe50:bd71 prefixlen 64 scopeid 0x20<link>
        ether 86:1d:f8:50:bd:71 txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1018 bytes 74836 (74.8 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s16-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::c815:67ff:fe6d:6ec6 prefixlen 64 scopeid 0x20<link>
        ether ca:15:67:6d:6e:c6 txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1016 bytes 74676 (74.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s16-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::b07d:47ff:fe95:5b28 prefixlen 64 scopeid 0x20<link>
        ether b2:7d:47:95:5b:28 txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1016 bytes 74676 (74.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s16-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::d8a9:3cff:fe84:ca00 prefixlen 64 scopeid 0x20<link>
        ether da:a9:3c:84:ca:00 txqueuelen 1000 (Ethernet)
        RX packets 16 bytes 1332 (1.3 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1016 bytes 74676 (74.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

```

```

s16-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::10a4:d2ff:fef4:877d prefixlen 64 scopeid 0x20<link>
        ether 12:a4:d2:f4:87:7d txqueuelen 1000 (Ethernet)
        RX packets 981 bytes 72066 (72.0 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 47 bytes 3546 (3.5 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s17-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::d495:ccff:fe15:c85f prefixlen 64 scopeid 0x20<link>
        ether d6:95:cc:15:c8:5f txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1019 bytes 74926 (74.9 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s17-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::56e3:4aff:feb2:f3a prefixlen 64 scopeid 0x20<link>
        ether 52:e3:4a:bc:2f:3a txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1016 bytes 74676 (74.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s17-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::540f:96ff:fe16:6ef7 prefixlen 64 scopeid 0x20<link>
        ether 56:0f:96:16:6e:f7 txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1016 bytes 74676 (74.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s17-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::1074:67ff:fea0:1172 prefixlen 64 scopeid 0x20<link>
        ether 12:74:67:a0:11:72 txqueuelen 1000 (Ethernet)
        RX packets 16 bytes 1332 (1.3 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1016 bytes 74676 (74.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

```

```
s17-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::e0ba:78ff:febe:e261 prefixlen 64 scopeid 0x20<link>
ether e2:ba:78:be:e2:61 txqueuelen 1000 (Ethernet)
RX packets 16 bytes 1332 (1.3 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1018 bytes 74836 (74.8 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s17-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::9036:48ff:fe1c:84e2 prefixlen 64 scopeid 0x20<link>
ether 92:36:48:1c:84:e2 txqueuelen 1000 (Ethernet)
RX packets 982 bytes 72156 (72.1 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 46 bytes 3456 (3.4 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s18-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::1c69:1eff:fe1f:2ed7 prefixlen 64 scopeid 0x20<link>
ether 1e:69:1e:1f:2e:d7 txqueuelen 1000 (Ethernet)
RX packets 16 bytes 1332 (1.3 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1018 bytes 74836 (74.8 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s18-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::6023:f2ff:fe04:c305 prefixlen 64 scopeid 0x20<link>
ether 62:23:f2:04:c3:05 txqueuelen 1000 (Ethernet)
RX packets 16 bytes 1332 (1.3 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1019 bytes 74926 (74.9 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s18-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::fc1e:d2ff:fe8d:3574 prefixlen 64 scopeid 0x20<link>
ether fe:1e:d2:8d:35:74 txqueuelen 1000 (Ethernet)
RX packets 17 bytes 1422 (1.4 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1016 bytes 74676 (74.6 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
s18-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::745e:77ff:fe91:12ff prefixlen 64 scopeid 0x20<link>
ether 76:5e:77:91:12:ff txqueuelen 1000 (Ethernet)
RX packets 16 bytes 1332 (1.3 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1019 bytes 74926 (74.9 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s18-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::ac44:9bff:fe31:4423 prefixlen 64 scopeid 0x20<link>
ether ae:44:9b:31:44:23 txqueuelen 1000 (Ethernet)
RX packets 16 bytes 1332 (1.3 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1016 bytes 74676 (74.6 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s18-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::8aa:baff:fea:83c3 prefixlen 64 scopeid 0x20<link>
ether 0a:aa:ba:1a:83:c3 txqueuelen 1000 (Ethernet)
RX packets 985 bytes 72406 (72.4 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 43 bytes 3206 (3.2 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s19-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::98ce:e7ff:fe13:b470 prefixlen 64 scopeid 0x20<link>
ether 9a:ce:e7:13:b4:70 txqueuelen 1000 (Ethernet)
RX packets 16 bytes 1332 (1.3 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1018 bytes 74836 (74.8 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s19-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::d8a7:feff:fee4:5065 prefixlen 64 scopeid 0x20<link>
ether da:a7:fe:e4:50:65 txqueuelen 1000 (Ethernet)
RX packets 16 bytes 1332 (1.3 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1016 bytes 74676 (74.6 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
s19-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      inet6 fe80::dcad:e0ff:fe29:65be prefixlen 64 scopeid 0x20<link>
        ether de:ad:e0:29:65:be txqueuelen 1000 (Ethernet)
          RX packets 16 bytes 1332 (1.3 KB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 1018 bytes 74836 (74.8 KB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s19-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      inet6 fe80::d05f:b6ff:fe54:8369 prefixlen 64 scopeid 0x20<link>
        ether d2:5f:b6:54:83:69 txqueuelen 1000 (Ethernet)
          RX packets 14 bytes 1172 (1.1 KB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 1018 bytes 74836 (74.8 KB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s19-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      inet6 fe80::e8:ffff:fea:cd5e prefixlen 64 scopeid 0x20<link>
        ether 02:e8:ff:ae:cd:5e txqueuelen 1000 (Ethernet)
          RX packets 14 bytes 1172 (1.1 KB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 1018 bytes 74836 (74.8 KB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s19-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      inet6 fe80::b00a:14ff:fe6b:2e23 prefixlen 64 scopeid 0x20<link>
        ether b2:0a:14:6b:2e:23 txqueuelen 1000 (Ethernet)
          RX packets 985 bytes 72386 (72.3 KB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 43 bytes 3226 (3.2 KB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s2-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      inet6 fe80::8ce2:39ff:fee3:5393 prefixlen 64 scopeid 0x20<link>
        ether 8e:e2:39:e3:53:93 txqueuelen 1000 (Ethernet)
          RX packets 40 bytes 2976 (2.9 KB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 988 bytes 72636 (72.6 KB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
s2-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::8c27:c6ff:fe9b:dc9a prefixlen 64 scopeid 0x20<link>
ether 8e:27:c6:9b:dc:9a txqueuelen 1000 (Ethernet)
RX packets 43 bytes 3206 (3.2 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 985 bytes 72406 (72.4 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s2-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::9cdd:fff:feb4:7dbb prefixlen 64 scopeid 0x20<link>
ether 9e:dd:0f:b4:7d:bb txqueuelen 1000 (Ethernet)
RX packets 42 bytes 3136 (3.1 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 987 bytes 72546 (72.5 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s2-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::50d4:52ff:fe55:5161 prefixlen 64 scopeid 0x20<link>
ether 52:d4:52:55:51:61 txqueuelen 1000 (Ethernet)
RX packets 41 bytes 3046 (3.0 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 987 bytes 72566 (72.5 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s2-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::4892:3cff:fe22:741c prefixlen 64 scopeid 0x20<link>
ether 4a:92:3c:22:74:1c txqueuelen 1000 (Ethernet)
RX packets 47 bytes 3546 (3.5 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 981 bytes 72066 (72.0 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s2-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::58df:4cff:fe8e:cb1b prefixlen 64 scopeid 0x20<link>
ether 5a:df:4c:8e:cb:1b txqueuelen 1000 (Ethernet)
RX packets 835 bytes 61486 (61.4 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 193 bytes 14126 (14.1 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
s20-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::b829:ebff:fea7:9388 prefixlen 64 scopeid 0x20<link>
        ether ba:29:eb:a7:93:88 txqueuelen 1000 (Ethernet)
            RX packets 44 bytes 3296 (3.2 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 984 bytes 72316 (72.3 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s20-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::5c00:33ff:fed7:1c4d prefixlen 64 scopeid 0x20<link>
        ether 5e:00:33:d7:1c:4d txqueuelen 1000 (Ethernet)
            RX packets 49 bytes 3706 (3.7 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 979 bytes 71906 (71.9 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s20-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::8c09:c4ff:fecf:781d prefixlen 64 scopeid 0x20<link>
        ether 8e:09:c4:cf:78:1d txqueuelen 1000 (Ethernet)
            RX packets 46 bytes 3456 (3.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 982 bytes 72156 (72.1 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s20-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::a4b3:2eff:fe3a:e1d2 prefixlen 64 scopeid 0x20<link>
        ether a6:b3:2e:3a:e1:d2 txqueuelen 1000 (Ethernet)
            RX packets 49 bytes 3706 (3.7 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 979 bytes 71906 (71.9 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s20-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::e86e:aeff:fe0a:c7d prefixlen 64 scopeid 0x20<link>
        ether ea:6e:ae:0a:0c:7d txqueuelen 1000 (Ethernet)
            RX packets 49 bytes 3706 (3.7 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 979 bytes 71906 (71.9 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
s20-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::clc:7eff:feff:8519 prefixlen 64 scopeid 0x20<link>
        ether 0e:1c:7e:f5:85:19 txqueuelen 1000 (Ethernet)
            RX packets 810 bytes 59456 (59.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 218 bytes 16156 (16.1 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s21-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::413:75ff:fec8:9b57 prefixlen 64 scopeid 0x20<link>
        ether 06:13:75:c8:9b:57 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s21-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::b87c:68ff:feff:5885 prefixlen 64 scopeid 0x20<link>
        ether ba:7c:68:f0:58:85 txqueuelen 1000 (Ethernet)
            RX packets 16 bytes 1332 (1.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1019 bytes 74926 (74.9 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s21-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::d4d4:2cff:fee9:3830 prefixlen 64 scopeid 0x20<link>
        ether d6:d4:2c:e9:38:30 txqueuelen 1000 (Ethernet)
            RX packets 16 bytes 1332 (1.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s21-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::54:d1ff:fe14:c629 prefixlen 64 scopeid 0x20<link>
        ether 02:54:d1:14:c6:29 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
s21-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::74b8:3dff:fe1:5d:ef prefixlen 64 scopeid 0x20<link>
        ether 76:b8:3d:c1:5d:ef txqueuelen 1000 (Ethernet)
            RX packets 16 bytes 1332 (1.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s21-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::1453:f1ff:fe1:fef9 prefixlen 64 scopeid 0x20<link>
        ether 16:53:f1:c1:fe:f9 txqueuelen 1000 (Ethernet)
            RX packets 984 bytes 72316 (72.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 44 bytes 3296 (3.2 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s22-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::e02e:d3ff:feec:978a prefixlen 64 scopeid 0x20<link>
        ether e2:2e:d3:ec:97:8a txqueuelen 1000 (Ethernet)
            RX packets 16 bytes 1332 (1.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s22-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::fc8d:6dff:fe62:fbff3 prefixlen 64 scopeid 0x20<link>
        ether fe:8d:6d:62:fb:f3 txqueuelen 1000 (Ethernet)
            RX packets 16 bytes 1332 (1.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s22-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::cf3:d4ff:fe25:f328 prefixlen 64 scopeid 0x20<link>
        ether 0e:f3:d4:25:f3:28 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
s22-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::2092:92ff:fe73:b783 prefixlen 64 scopeid 0x20<link>
        ether 22:92:92:73:b7:83 txqueuelen 1000 (Ethernet)
            RX packets 16 bytes 1332 (1.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s22-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::a4db:b8ff:fe22:2b5e prefixlen 64 scopeid 0x20<link>
        ether a6:db:b8:22:2b:5e txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s22-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::2412:31ff:fe3c:d97e prefixlen 64 scopeid 0x20<link>
        ether 26:12:31:3c:d9:7e txqueuelen 1000 (Ethernet)
            RX packets 979 bytes 71906 (71.9 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 49 bytes 3706 (3.7 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s23-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::a4ef:29ff:fef3:af5d prefixlen 64 scopeid 0x20<link>
        ether a6:ef:29:f3:af:5d txqueuelen 1000 (Ethernet)
            RX packets 16 bytes 1332 (1.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s23-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::c0a9:86ff:fe68:7265 prefixlen 64 scopeid 0x20<link>
        ether c2:a9:86:68:72:65 txqueuelen 1000 (Ethernet)
            RX packets 16 bytes 1332 (1.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
s23-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::8cda:3eff:fe37:f112  prefixlen 64  scopeid 0x20<link>
        ether 8e:da:3e:37:f1:12  txqueuelen 1000  (Ethernet)
        RX packets 17  bytes 1422 (1.4 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 1018  bytes 74836 (74.8 KB)
        TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0

s23-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::3c6d:3bff:febb:782c  prefixlen 64  scopeid 0x20<link>
        ether 3e:6d:3b:bb:78:2c  txqueuelen 1000  (Ethernet)
        RX packets 16  bytes 1332 (1.3 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 1019  bytes 74926 (74.9 KB)
        TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0

s23-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::7038:3eff:fe05:3876  prefixlen 64  scopeid 0x20<link>
        ether 72:38:3e:05:38:76  txqueuelen 1000  (Ethernet)
        RX packets 16  bytes 1332 (1.3 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 1016  bytes 74676 (74.6 KB)
        TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0

s23-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::34fb:1dff:fedc:9fd7  prefixlen 64  scopeid 0x20<link>
        ether 36:fb:1d:dc:9f:d7  txqueuelen 1000  (Ethernet)
        RX packets 982  bytes 72156 (72.1 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 46  bytes 3456 (3.4 KB)
        TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0

s24-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::e863:3cff:fe24:3dc7  prefixlen 64  scopeid 0x20<link>
        ether ea:63:3c:24:3d:c7  txqueuelen 1000  (Ethernet)
        RX packets 16  bytes 1332 (1.3 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 1016  bytes 74676 (74.6 KB)
        TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0
```

```
s24-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::28bc:74ff:fe3e:3178 prefixlen 64 scopeid 0x20<link>
        ether 2a:bc:74:3e:31:78 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s24-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::cc88:3fff:feed:69c2 prefixlen 64 scopeid 0x20<link>
        ether ce:88:3f:ed:69:c2 txqueuelen 1000 (Ethernet)
            RX packets 16 bytes 1332 (1.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s24-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::1849:70ff:fe06:1dbb prefixlen 64 scopeid 0x20<link>
        ether 1a:49:70:06:1d:bb txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s24-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::cb9:b7ff:fe79:1a47 prefixlen 64 scopeid 0x20<link>
        ether 0e:b9:b7:79:1a:47 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s24-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::9898:21ff:fe46:7486 prefixlen 64 scopeid 0x20<link>
        ether 9a:98:21:46:74:86 txqueuelen 1000 (Ethernet)
            RX packets 979 bytes 71906 (71.9 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 49 bytes 3706 (3.7 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
s25-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::947e:beff:feel:7d4 prefixlen 64 scopeid 0x20<link>
        ether 96:7e:be:e1:07:d4 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s25-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::a891:c4ff:fe1f:ff46 prefixlen 64 scopeid 0x20<link>
        ether aa:91:c4:1f:ff:46 txqueuelen 1000 (Ethernet)
            RX packets 16 bytes 1332 (1.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s25-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::c8a8:eaff:fe94:56be prefixlen 64 scopeid 0x20<link>
        ether ca:a8:ea:94:56:be txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s25-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::6cc3:94ff:fed1:2d62 prefixlen 64 scopeid 0x20<link>
        ether 6e:c3:94:d1:2d:62 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s25-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::1cc0:1dff:fea7:3788 prefixlen 64 scopeid 0x20<link>
        ether 1e:c0:1d:a7:37:88 txqueuelen 1000 (Ethernet)
            RX packets 16 bytes 1332 (1.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s25-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::4084:cbff:fea3:b9a7 prefixlen 64 scopeid 0x20<link>
        ether 42:84:cb:a3:b9:a7 txqueuelen 1000 (Ethernet)
            RX packets 979 bytes 71906 (71.9 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
```

```
s26-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::e803:77ff:fe8d:7f99 prefixlen 64 scopeid 0x20<link>
        ether ea:03:77:8d:7f:99 txqueuelen 1000 (Ethernet)
            RX packets 49 bytes 3706 (3.7 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 979 bytes 71906 (71.9 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s26-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::bc92:5ff:fe51:8d58 prefixlen 64 scopeid 0x20<link>
        ether be:92:05:51:8d:58 txqueuelen 1000 (Ethernet)
            RX packets 49 bytes 3706 (3.7 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 979 bytes 71906 (71.9 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s26-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::80e8:eaaff:fe94:29a3 prefixlen 64 scopeid 0x20<link>
        ether 82:e8:ea:94:29:a3 txqueuelen 1000 (Ethernet)
            RX packets 49 bytes 3706 (3.7 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 979 bytes 71906 (71.9 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s26-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::28ff:b6ff:fe7c:cd0c prefixlen 64 scopeid 0x20<link>
        ether 2a:ff:b6:7c:cd:0c txqueuelen 1000 (Ethernet)
            RX packets 47 bytes 3546 (3.5 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 981 bytes 72066 (72.0 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s26-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::3ccc:a7ff:fed8:bae0 prefixlen 64 scopeid 0x20<link>
        ether 3e:cc:a7:d8:ba:e0 txqueuelen 1000 (Ethernet)
            RX packets 47 bytes 3546 (3.5 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 981 bytes 72066 (72.0 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s26-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::4000:94ff:fea1:604d prefixlen 64 scopeid 0x20<link>
        ether 42:00:94:a1:60:4d txqueuelen 1000 (Ethernet)
            RX packets 806 bytes 59116 (59.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
```

```
s27-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::d89e:44ff:fe64:cfc3 prefixlen 64 scopeid 0x20<link>
ether da:9e:44:64:cf:c3 txqueuelen 1000 (Ethernet)
RX packets 14 bytes 1172 (1.1 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1016 bytes 74676 (74.6 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s27-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::e8f9:e0ff:fe3b:98d9 prefixlen 64 scopeid 0x20<link>
ether ea:f9:e0:3b:98:d9 txqueuelen 1000 (Ethernet)
RX packets 14 bytes 1172 (1.1 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1016 bytes 74676 (74.6 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s27-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::785f:d5ff:fe96:2a8f prefixlen 64 scopeid 0x20<link>
ether 7a:5f:d5:96:2a:8f txqueuelen 1000 (Ethernet)
RX packets 14 bytes 1172 (1.1 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1016 bytes 74676 (74.6 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s27-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::985c:31ff:fec7:e33c prefixlen 64 scopeid 0x20<link>
ether 9a:5c:31:c7:e3:3c txqueuelen 1000 (Ethernet)
RX packets 16 bytes 1332 (1.3 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1016 bytes 74676 (74.6 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s27-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::70ec:caff:fe8c:79d5 prefixlen 64 scopeid 0x20<link>
ether 72:ec:ca:8c:79:d5 txqueuelen 1000 (Ethernet)
RX packets 14 bytes 1172 (1.1 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1018 bytes 74836 (74.8 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s27-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::e817:dff:fe1f:8b7b prefixlen 64 scopeid 0x20<link>
ether ea:17:0d:1f:8b:7b txqueuelen 1000 (Ethernet)
RX packets 979 bytes 71906 (71.9 KB)
RX errors 0 dropped 0 overruns 0 frame 0
```

```
s28-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::d076:36ff:fe47:8cc6 prefixlen 64 scopeid 0x20<link>
        ether d2:76:36:47:8c:c6 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s28-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::40f:2aff:fe87:c163 prefixlen 64 scopeid 0x20<link>
        ether 06:0f:2a:87:c1:63 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s28-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::d85f:66ff:fed2:75c3 prefixlen 64 scopeid 0x20<link>
        ether da:5f:66:d2:75:c3 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s28-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::18f6:b2ff:fe19:57ad prefixlen 64 scopeid 0x20<link>
        ether 1a:f6:b2:19:57:ad txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s28-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::a838:16ff:feec:76dd prefixlen 64 scopeid 0x20<link>
        ether aa:38:16:ec:76:dd txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s28-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::a092:17ff:fedc:985e prefixlen 64 scopeid 0x20<link>
        ether a2:92:17:dc:98:5e txqueuelen 1000 (Ethernet)
            RX packets 979 bytes 71906 (71.9 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
```

```
s29-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::78a1:edff:fe88:a5e1 prefixlen 64 scopeid 0x20<link>
        ether 7a:a1:ed:88:a5:e1 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s29-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::8825:7eff:fe40:ccc4 prefixlen 64 scopeid 0x20<link>
        ether 8a:25:7e:40:cc:c4 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s29-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::b817:a4ff:fe25:1e20 prefixlen 64 scopeid 0x20<link>
        ether ba:17:a4:25:1e:20 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s29-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::8dd:70ff:fe83:f63b prefixlen 64 scopeid 0x20<link>
        ether 0a:dd:70:83:f6:3b txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s29-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::80d9:44ff:fe5c:4876 prefixlen 64 scopeid 0x20<link>
        ether 82:d9:44:5c:48:76 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s29-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::e072:9cff:fee7:284e prefixlen 64 scopeid 0x20<link>
        ether e2:72:9c:e7:28:4e txqueuelen 1000 (Ethernet)
            RX packets 979 bytes 71906 (71.9 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
```

```
s3-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::3c08:1fff:fecb:4e40 prefixlen 64 scopeid 0x20<link>
          ether 3e:08:1f:cb:4e:40 txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s3-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::7481:91ff:fe9b:9d2d prefixlen 64 scopeid 0x20<link>
          ether 76:81:91:9b:9d:2d txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s3-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::4c85:d2ff:fe92:20c9 prefixlen 64 scopeid 0x20<link>
          ether 4e:85:d2:92:20:c9 txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1019 bytes 74926 (74.9 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s3-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::f8cd:ffff:fe02:90f prefixlen 64 scopeid 0x20<link>
          ether fa:cd:df:02:09:0f txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s3-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::1c31:2fff:feef:cde prefixlen 64 scopeid 0x20<link>
          ether 1e:31:2f:ef:0c:de txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s3-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::eccd:f3ff:fecf:9351 prefixlen 64 scopeid 0x20<link>
          ether ee:cd:f3:cf:93:51 txqueuelen 1000 (Ethernet)
            RX packets 988 bytes 72636 (72.6 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
```

```
s30-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::90e0:24ff:fed5:85ae prefixlen 64 scopeid 0x20<link>
        ether 92:e0:24:d5:85:ae txqueuelen 1000 (Ethernet)
            RX packets 13 bytes 1082 (1.0 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s30-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::300f:60ff:fef1:ab79 prefixlen 64 scopeid 0x20<link>
        ether 32:0f:60:f1:ab:79 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s30-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::9853:5eff:fe3f:2928 prefixlen 64 scopeid 0x20<link>
        ether 9a:53:5e:3f:29:28 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s30-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::5858:68ff:feba:8d25 prefixlen 64 scopeid 0x20<link>
        ether 5a:58:68:ba:8d:25 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s30-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::d069:94ff:fedc:c544 prefixlen 64 scopeid 0x20<link>
        ether d2:69:94:fd:c5:44 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s30-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::c40b:c9ff:fed5:d5d7 prefixlen 64 scopeid 0x20<link>
        ether c6:0b:c9:d5:d5:d7 txqueuelen 1000 (Ethernet)
            RX packets 981 bytes 72066 (72.0 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
```

```
s31-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::4c31:4bff:fe:9d8 prefixlen 64 scopeid 0x20<link>
        ether 4e:31:4b:f2:b9:d8 txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s31-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::802b:62ff:fe30:2392 prefixlen 64 scopeid 0x20<link>
        ether 82:2b:62:30:23:92 txqueuelen 1000 (Ethernet)
            RX packets 13 bytes 1086 (1.0 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s31-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::1495:74ff:fe:5:6cf6 prefixlen 64 scopeid 0x20<link>
        ether 16:95:74:f5:6c:f6 txqueuelen 1000 (Ethernet)
            RX packets 13 bytes 1082 (1.0 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s31-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::a05b:f3ff:fea:9ada prefixlen 64 scopeid 0x20<link>
        ether a2:5b:f3:aa:9a:da txqueuelen 1000 (Ethernet)
            RX packets 14 bytes 1172 (1.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1015 bytes 74586 (74.5 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s31-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::3049:85ff:fe54:f99f prefixlen 64 scopeid 0x20<link>
        ether 32:49:85:54:f9:9f txqueuelen 1000 (Ethernet)
            RX packets 13 bytes 1086 (1.0 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s31-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::5c3e:bbff:fe64:53e0 prefixlen 64 scopeid 0x20<link>
        ether 5e:3e:bb:64:53:e0 txqueuelen 1000 (Ethernet)
            RX packets 981 bytes 72066 (72.0 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
```

```
s4-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::8cf:50ff:fe97:c75d prefixlen 64 scopeid 0x20<link>
        ether 0a:cf:50:97:c7:5d txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1018 bytes 74836 (74.8 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s4-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::e83c:4fff:fe00:59b2 prefixlen 64 scopeid 0x20<link>
        ether ea:3c:4f:00:59:b2 txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1016 bytes 74676 (74.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s4-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::1410:82ff:fe10:6a23 prefixlen 64 scopeid 0x20<link>
        ether 16:10:82:10:6a:23 txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1019 bytes 74926 (74.9 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s4-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::a031:6dff:fe00:989f prefixlen 64 scopeid 0x20<link>
        ether a2:31:6d:00:98:9f txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1019 bytes 74926 (74.9 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s4-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::40c6:bcff:fe7f:d205 prefixlen 64 scopeid 0x20<link>
        ether 42:c6:bc:7f:d2:05 txqueuelen 1000 (Ethernet)
        RX packets 17 bytes 1422 (1.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1016 bytes 74676 (74.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s4-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::40cf:9fff:fe90:b01b prefixlen 64 scopeid 0x20<link>
        ether 42:cf:9f:90:b0:1b txqueuelen 1000 (Ethernet)
        RX packets 985 bytes 72406 (72.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
```

```
s5-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::49d:b3ff:fe12:dfd5 prefixlen 64 scopeid 0x20<link>
ether 06:9d:b3:12:df:d5 txqueuelen 1000 (Ethernet)
RX packets 17 bytes 1422 (1.4 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1017 bytes 74746 (74.7 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s5-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::30f6:baff:fe2f:72ca prefixlen 64 scopeid 0x20<link>
ether 32:f6:ba:2f:72:ca txqueuelen 1000 (Ethernet)
RX packets 17 bytes 1422 (1.4 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1019 bytes 74906 (74.9 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s5-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::7ce1:4eff:fe06:9406 prefixlen 64 scopeid 0x20<link>
ether 7e:e1:4e:06:94:06 txqueuelen 1000 (Ethernet)
RX packets 17 bytes 1422 (1.4 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1020 bytes 74996 (74.9 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s5-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::c499:69ff:fe19:3ac0 prefixlen 64 scopeid 0x20<link>
ether c6:99:69:19:3a:c0 txqueuelen 1000 (Ethernet)
RX packets 17 bytes 1422 (1.4 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1019 bytes 74906 (74.9 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s5-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::a41b:b4ff:fefc:8fa8 prefixlen 64 scopeid 0x20<link>
ether a6:1b:b4:fc:8f:a8 txqueuelen 1000 (Ethernet)
RX packets 17 bytes 1422 (1.4 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1019 bytes 74906 (74.9 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s5-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet6 fe80::64b0:a8ff:feb0:f8d4 prefixlen 64 scopeid 0x20<link>
ether 66:b0:a8:bd:f8:d4 txqueuelen 1000 (Ethernet)
RX packets 987 bytes 72546 (72.5 KB)
RX errors 0 dropped 0 overruns 0 frame 0
```

```
s6-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::4c11:cbff:fe2a:21e3 prefixlen 64 scopeid 0x20<link>
          ether 4e:11:cb:2a:21:e3 txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s6-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::4c59:d2ff:fe1f:7876 prefixlen 64 scopeid 0x20<link>
          ether 4e:59:d2:1f:78:76 txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1019 bytes 74926 (74.9 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s6-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::3089:68ff:fecb:f6d3 prefixlen 64 scopeid 0x20<link>
          ether 32:89:68:cb:f6:d3 txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1019 bytes 74926 (74.9 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s6-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::26:11ff:febb:7cbc prefixlen 64 scopeid 0x20<link>
          ether 02:26:11:bb:7c:bc txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s6-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::35:fcff:fe82:e001 prefixlen 64 scopeid 0x20<link>
          ether 02:35:fc:82:e0:01 txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1017 bytes 74746 (74.7 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s6-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::b0f1:9eff:fe68:8007 prefixlen 64 scopeid 0x20<link>
          ether b2:f1:9e:68:08:07 txqueuelen 1000 (Ethernet)
            RX packets 987 bytes 72566 (72.5 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
```

```
s7-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::1c49:f5ff:fe35:db12 prefixlen 64 scopeid 0x20<link>
          ether 1e:49:f5:35:db:12 txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s7-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::d43e:cbff:fe48:e0b5 prefixlen 64 scopeid 0x20<link>
          ether d6:3e:cb:48:e0:b5 txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s7-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::bc37:53ff:fe25:2880 prefixlen 64 scopeid 0x20<link>
          ether be:37:53:25:28:80 txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s7-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::f05a:cbff:fef1:3c78 prefixlen 64 scopeid 0x20<link>
          ether f2:5a:cb:f1:3c:78 txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s7-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::a8c9:ffff:fe68:e167 prefixlen 64 scopeid 0x20<link>
          ether aa:c9:0f:68:e1:67 txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s7-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::484a:59ff:fe01:6a71 prefixlen 64 scopeid 0x20<link>
          ether 4a:4a:59:01:6a:71 txqueuelen 1000 (Ethernet)
            RX packets 981 bytes 72066 (72.0 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
```

```
s8-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::28b0:81ff:fe00:7663 prefixlen 64 scopeid 0x20<link>
        ether 2a:b0:81:c0:76:63 txqueuelen 1000 (Ethernet)
        RX packets 45 bytes 3386 (3.3 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 983 bytes 72226 (72.2 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s8-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::c80b:d8ff:fe92:d403 prefixlen 64 scopeid 0x20<link>
        ether ca:0b:d8:92:d4:03 txqueuelen 1000 (Ethernet)
        RX packets 45 bytes 3386 (3.3 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 983 bytes 72226 (72.2 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s8-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::b0fc:e5ff:fe11:5dc5 prefixlen 64 scopeid 0x20<link>
        ether b2:fc:e5:11:5d:c5 txqueuelen 1000 (Ethernet)
        RX packets 46 bytes 3456 (3.4 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 982 bytes 72156 (72.1 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s8-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::1041:47ff:fe3e:a8bf prefixlen 64 scopeid 0x20<link>
        ether 12:41:47:3e:a8:bf txqueuelen 1000 (Ethernet)
        RX packets 42 bytes 3136 (3.1 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 986 bytes 72476 (72.4 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s8-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::a8f3:17ff:fe6a:91b8 prefixlen 64 scopeid 0x20<link>
        ether aa:f3:17:6a:91:b8 txqueuelen 1000 (Ethernet)
        RX packets 49 bytes 3706 (3.7 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 979 bytes 71906 (71.9 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s8-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::8811:35ff:fece:b6f0 prefixlen 64 scopeid 0x20<link>
        ether 8a:11:35:ce:b6:f0 txqueuelen 1000 (Ethernet)
        RX packets 820 bytes 60256 (60.2 KB)
```

```

s9-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::ece2:5fff:fe2c:e5df prefixlen 64 scopeid 0x20<link>
          ether ee:e2:5f:2c:e5:df txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s9-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::244a:31ff:fe59:298f prefixlen 64 scopeid 0x20<link>
          ether 26:4a:31:59:29:8f txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s9-eth3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::cd6:4dff:fe8c:ec56 prefixlen 64 scopeid 0x20<link>
          ether 0e:d6:4d:8c:ec:56 txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1016 bytes 74676 (74.6 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s9-eth4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::f431:9ff:fe29:fbda prefixlen 64 scopeid 0x20<link>
          ether f6:31:09:29:fb:da txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s9-eth5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::8059:baff:fe4c:e785 prefixlen 64 scopeid 0x20<link>
          ether 82:59:ba:4c:e7:85 txqueuelen 1000 (Ethernet)
            RX packets 17 bytes 1422 (1.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1018 bytes 74836 (74.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s9-eth6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::6cc5:ebff:fe83:b726 prefixlen 64 scopeid 0x20<link>
          ether 6e:c5:eb:83:b7:26 txqueuelen 1000 (Ethernet)
            RX packets 983 bytes 72226 (72.2 KB)

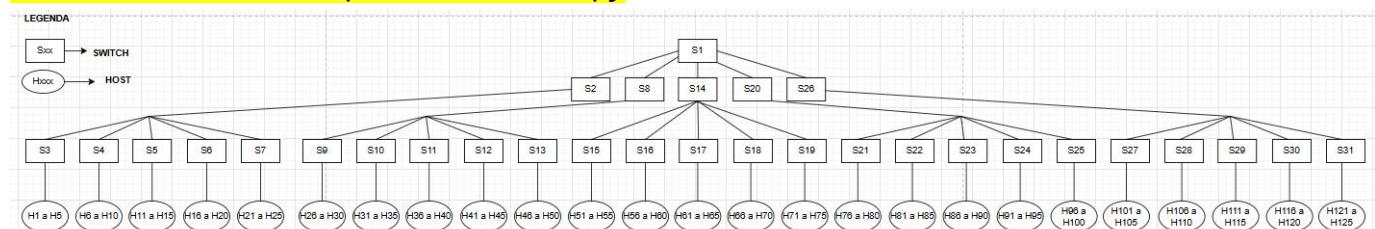
```



4 - Desenho ilustrativo da topologia

Você pode visualizar a topologia com o **MinEdit (GUI do Mininet)**:

```
sudo ~/mininet/examples/miniedit.py
```



Passos:

1. Monte manualmente uma topologia semelhante (Tree → depth=3, fanout=5).
 2. Cada nó pode exibir IP e MAC se você habilitar as opções de visualização.
 3. Tire um **print da tela** com as informações dos hosts e switches.

5 - Teste de Conectividade (Ping)

Testar a comunicação entre todos os nós:

pingall

{

1

```

*** Results: 0% dropped (15500/15500 received)
mininet>

```

Testar dois hosts específicos:

```
h1 ping -c 4 h2 & h1 ping -c 4 h125
```

```
mininet> h1 ping -c 4 h2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=12.5 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.582 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=0.068 ms
64 bytes from 10.0.0.2: icmp_seq=4 ttl=64 time=0.061 ms

--- 10.0.0.2 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3057ms
rtt min/avg/max/mdev = 0.061/3.296/12.476/5.303 ms
mininet> h1 ping -c 4 h125
PING 10.0.0.125 (10.0.0.125) 56(84) bytes of data.
64 bytes from 10.0.0.125: icmp_seq=1 ttl=64 time=14.4 ms
64 bytes from 10.0.0.125: icmp_seq=2 ttl=64 time=6.81 ms
64 bytes from 10.0.0.125: icmp_seq=3 ttl=64 time=0.795 ms
64 bytes from 10.0.0.125: icmp_seq=4 ttl=64 time=0.132 ms

--- 10.0.0.125 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3021ms
rtt min/avg/max/mdev = 0.132/5.538/14.413/5.747 ms
mininet>
```

6 - Monitorar pacotes com tcpdump

Você pode abrir janelas Xterm para ver o tráfego.

xterm h1 h2

```
*** Starting CLI:  
mininet> xterm h1 h2  
mininet>
```

The screenshot shows two terminal windows side-by-side. Both windows are titled "Node: h1". The left window displays raw network traffic captured by tcpdump, showing ICMP echo requests and replies between host 1 and host 2. The right window shows a root shell on host 1, where a ping command is being run to host 2.

```
0x0050: 2627 2829 2a2b 2c2d 2e2f 3031 3233 3435 &(')*,-./012345  
0x0060: 3637 67  
17:42:53.540363 IP 10.0.0.1 > 10.0.0.2: ICMP echo request, id 62855, seq 2, length  
0x0000: 0000 0000 0002 0000 0000 0800 4500 .....E.  
0x0010: 0054 182d 4001 4001 107a 0a00 0001 0a00 ..T.,@.,z.....  
0x0020: 0002 0800 3b9f F587 0002 4d55 0a69 0000 ....C.,Me.i..  
0x0030: 0000 a83c 0808 0000 0000 1011 1213 1415 ...<.....  
0x0040: 1617 1819 1a1b 1c1d 1e1f 2021 2223 2425 ***!#%  
0x0050: 2627 2829 2a2b 2c2d 2e2f 3031 3233 3435 &(')*,-./012345  
0x0060: 3637 67  
17:42:53.540424 IP 10.0.0.2 > 10.0.0.1: ICMP echo reply, id 62855, seq 2, length  
0x0000: 0000 0000 0001 0000 0000 0002 0800 4500 .....E.  
0x0010: 0054 8937 0000 4001 dd6f 0a00 0002 0a00 ..T.,@.,o.....  
0x0020: 0001 0000 4398 F587 0002 4d55 0a69 0000 ....C.,Me.i..  
0x0030: 0000 a83c 0808 0000 0000 1011 1213 1415 ...<.....  
0x0040: 1617 1819 1a1b 1c1d 1e1f 2021 2223 2425 ***!#%  
0x0050: 2627 2829 2a2b 2c2d 2e2f 3031 3233 3435 &(')*,-./012345  
0x0060: 3637 67  
17:42:54.544583 IP 10.0.0.1 > 10.0.0.2: ICMP echo request, id 62855, seq 3, length  
0x0000: 0000 0000 0002 0000 0000 0000 0800 4500 .....E.  
0x0010: 0054 171f 4001 4001 0f88 0a00 0001 0a00 ..T.,@.,o.....  
0x0020: 0002 0800 ea84 F587 0003 4e65 0a69 0000 ....C.,Me.i..  
0x0030: 0000 f84e 0808 0000 0000 1011 1213 1415 ...N.....  
0x0040: 1617 1819 1a1b 1c1d 1e1f 2021 2223 2425 ***!#%  
(30.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.  
*** Starting CLI:  
mininet> xterm h1 h2  
mininet>
```

Em h2, capture pacotes recebidos:

```
tcpdump -XX -n -i h2-eth0
```

"Node: h2"

```
0x0050: 2627 2829 2a20 2c2d 2e2f 3031 3233 3435 &(')*+,-./012345
0x0060: 3637 67
17:42:53,540363 IP 10.0.0.1 > 10.0.0.2: ICMP echo request, id 62855, seq 2, length 64
0x0000: 0000 0000 0002 0000 0001 0800 4500 .....E.
0x0010: 0054 162d 4000 4001 107a 0a00 0001 0a00 .T.-@.E.z.....
0x0020: 0002 0800 398 5F87 0002 4d65 0a69 0000 ...;.....Me.i..
0x0030: 0000 a83c 0800 0000 0000 1011 1213 1415 ...<.....
0x0040: 1617 1819 1a1b 1c1d 1e1f 2021 2223 2425 ...(*....!#%
0x0050: 2627 2829 2a20 2c2d 2e2f 3031 3233 3435 &(')*+,-./012345
0x0060: 3637 67
17:42:53,540424 IP 10.0.0.2 > 10.0.0.1: ICMP echo reply, id 62855, seq 2, length 64
0x0000: 0000 0000 0001 0000 0002 0800 4500 .....E.
0x0010: 0054 8937 0000 4001 dd6f 0a00 0002 0a00 .T.;.E.o.....
0x0020: 0001 0000 4398 F587 0002 4d65 0a69 0000 ...C.....Me.i..
0x0030: 0000 a83c 0800 0000 0000 1011 1213 1415 ...<.....
0x0040: 1617 1819 1a1b 1c1d 1e1f 2021 2223 2425 ...(*....!#%
0x0050: 2627 2829 2a20 2c2d 2e2f 3031 3233 3435 &(')*+,-./012345
0x0060: 3637 67
17:42:54,544583 IP 10.0.0.1 > 10.0.0.2: ICMP echo request, id 62855, seq 3, length 64
0x0000: 0000 0000 0002 0000 0001 0800 4500 .....E.
0x0010: 0054 171f 4000 4001 0f88 0a00 0001 0a00 .T.;.E.....
0x0020: 0002 0800 ea84 F587 0003 4e65 0a69 0000 ...;.....Ne.i..
0x0030: 0000 F84e 0800 0000 0000 1011 1213 1415 ...N.....
0x0040: 1617 1819 1a1b 1c1d 1e1f 2021 2223 2425 ...(*....!#%
0x0050: 2627 2829 2a20 2c2d 2e2f 3031 3233 3435 &(')*+,-./012345
0x0060: 3637 67
17:42:54,544653 IP 10.0.0.2 > 10.0.0.1: ICMP echo reply, id 62855, seq 3, length 64
0x0000: 0000 0000 0001 0000 0002 0800 4500 .....E.
0x0010: 0054 89cf 0000 4001 dcd7 0a00 0002 0a00 .T.;.E.....
0x0020: 0001 0000 f284 F587 0003 4e65 0a69 0000 ...;.....Ne.i..
0x0030: 0000 F84e 0800 0000 0000 1011 1213 1415 ...N.....
0x0040: 1617 1819 1a1b 1c1d 1e1f 2021 2223 2425 ...(*....!#%
0x0050: 2627 2829 2a20 2c2d 2e2f 3031 3233 3435 &(')*+,-./012345
0x0060: 3637 67
17:42:55,5689524 IP 10.0.0.1 > 10.0.0.2: ICMP echo request, id 62855, seq 4, length 64
0x0000: 0000 0000 0001 0000 0002 0800 4500 .....E.
0x0010: 0054 17b5 4000 4001 0ef2 0a00 0001 0a00 .T.;.E.....
0x0020: 0002 0800 5028 F587 0004 4f65 0a69 0000 ...P....o.e.i..
0x0030: 0000 9lac 0800 0000 0000 1011 1213 1415 ...(*....!#%
0x0040: 1617 1819 1a1b 1c1d 1e1f 2021 2223 2425 ...(*....!#%
0x0050: 2627 2829 2a20 2c2d 2e2f 3031 3233 3435 &(')*+,-./012345
0x0060: 3637 67
17:42:55,5689532 IP 10.0.0.2 > 10.0.0.1: ICMP echo reply, id 62855, seq 4, length 64
0x0000: 0000 0000 0001 0000 0002 0800 4500 .....E.
0x0010: 0054 8a6a 0000 4001 dc3c 0a00 0002 0a00 .T.;.E.<.....
0x0020: 0001 0000 5826 F587 0004 4f65 0a69 0000 ...X....o.e.i..
0x0030: 0000 9lac 0800 0000 0000 1011 1213 1415 ...(*....!#%
0x0040: 1617 1819 1a1b 1c1d 1e1f 2021 2223 2425 ...(*....!#%
0x0050: 2627 2829 2a20 2c2d 2e2f 3031 3233 3435 &(')*+,-./012345
0x0060: 3637 67
17:42:56,592476 IP 10.0.0.1 > 10.0.0.2: ICMP echo request, id 62855, seq 5, length 64
0x0000: 0000 0000 0002 0000 0000 0001 0800 4500 .....E.
0x0010: 0054 1826 4000 4001 0e81 0a00 0001 0a00 .T.;.E.....
0x0020: 0002 0800 a7c7 F587 0005 5065 0a69 0000 ...;.....Pe.i..
0x0030: 0000 380a 0900 0000 0000 1011 1213 1415 ...8.....
0x0040: 1617 1819 1a1b 1c1d 1e1f 2021 2223 2425 ...(*....!#%
0x0050: 2627 2829 2a20 2c2d 2e2f 3031 3233 3435 &(')*+,-./012345
0x0060: 3637 67
17:42:56,592514 IP 10.0.0.2 > 10.0.0.1: ICMP echo reply, id 62855, seq 5, length 64
0x0000: 0000 0000 0001 0000 0002 0800 4500 .....E.
0x0010: 0054 8a70 0000 4001 d38 0a00 0002 0a00 .T.;.E.6.....
0x0020: 0001 0000 afc7 F587 0005 5065 0a69 0000 ...;.....Pe.i..
0x0030: 0000 380a 0900 0000 0000 1011 1213 1415 ...8.....
0x0040: 1617 1819 1a1b 1c1d 1e1f 2021 2223 2425 ...(*....!#%
0x0050: 2627 2829 2a20 2c2d 2e2f 3031 3233 3435 &(')*+,-./012345
0x0060: 3637 67
17:42:57,615429 ARP Request who-has 10.0.0.1 tell 10.0.0.2, length 28
0x0000: 0000 0000 0001 0000 0000 0002 0806 0001 .....o.....
0x0010: 0800 0504 0001 0000 0000 0002 0a00 0002 .....o.....
0x0020: 0000 0000 0000 0000 0001 .....o.....
17:42:57,620276 ARP Reply 10.0.0.1 is-at 00:00:00:00:00:01, length 28
0x0000: 0000 0002 0000 0000 0001 0806 0001 .....o.....
0x0010: 0800 0504 0002 0000 0000 0001 0a00 0001 .....o.....
0x0020: 0000 0000 0002 0a00 0002 .....o.....
17:43:06,329385 IP6 fe80::200:ff:fe00:18 > ff02::2: ICMP6, router solicitation, length 16
```

Em h1, envie pacotes Ping:

```
ping -c 5 10.0.0.2
```

"Node: h1"

```
root@CapDellG15:/home/pedro# ping -c 5 10.0.0.2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=15.4 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.789 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=0.179 ms
64 bytes from 10.0.0.2: icmp_seq=4 ttl=64 time=0.136 ms
64 bytes from 10.0.0.2: icmp_seq=5 ttl=64 time=0.080 ms

--- 10.0.0.2 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4054ms
rtt min/avg/max/mdev = 0.080/3.316/15.396/6.045 ms
root@CapDellG15:/home/pedro#
```

Você verá os pacotes ICMP chegando em h2, com endereços MAC e IP exibidos.

7 - Testes de Desempenho (TCP com iPerf)

Cenário:

- h1 → servidor TCP na porta 5555
- h2 → cliente TCP
- Teste de 20 segundos, relatório a cada 1 segundo
- Testar bw = 30 Mbps e depois bw = 40 Mbps

1º Teste (bw = 30 Mbps)

Abra dois terminais:

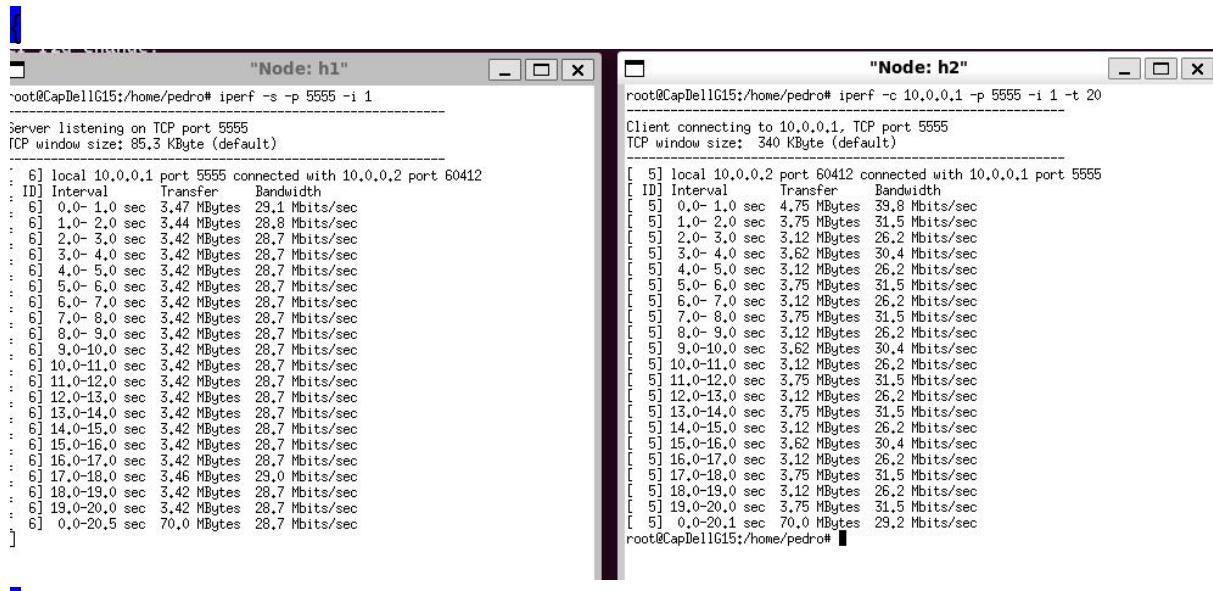
xterm h1 h2

No h1 (servidor):

iperf -s -p 5555 -i 1

No h2 (cliente):

iperf -c 10.0.0.1 -p 5555 -i 1 -t 20



The image shows two terminal windows side-by-side. The left window is titled "Node: h1" and the right window is titled "Node: h2". Both windows display the output of an iperf test. The h1 window shows a server listening on port 5555 and connecting to a client at 10.0.0.1. The h2 window shows a client connecting to the server at 10.0.0.1. Both windows show a series of 20 data points over 20 seconds, with bandwidth values fluctuating between 26.2 and 31.5 Mbps.

```
root@CapDell1G15:/home/pedro# iperf -s -p 5555 -i 1
-----
[  0] local 10.0.0.1 port 5555 connected with 10.0.0.2 port 60412
[  0] Interval Transfer Bandwidth
[  0] 0.0- 1.0 sec 3.47 MBytes 29.1 Mbits/sec
[  1] 1.0- 2.0 sec 3.44 MBytes 28.8 Mbits/sec
[  2] 2.0- 3.0 sec 3.42 MBytes 28.7 Mbits/sec
[  3] 3.0- 4.0 sec 3.42 MBytes 28.7 Mbits/sec
[  4] 4.0- 5.0 sec 3.42 MBytes 28.7 Mbits/sec
[  5] 5.0- 6.0 sec 3.42 MBytes 28.7 Mbits/sec
[  6] 6.0- 7.0 sec 3.42 MBytes 28.7 Mbits/sec
[  7] 7.0- 8.0 sec 3.42 MBytes 28.7 Mbits/sec
[  8] 8.0- 9.0 sec 3.42 MBytes 28.7 Mbits/sec
[  9] 9.0-10.0 sec 3.42 MBytes 28.7 Mbits/sec
[ 10] 10.0-11.0 sec 3.42 MBytes 28.7 Mbits/sec
[ 11] 11.0-12.0 sec 3.42 MBytes 28.7 Mbits/sec
[ 12] 12.0-13.0 sec 3.42 MBytes 28.7 Mbits/sec
[ 13] 13.0-14.0 sec 3.42 MBytes 28.7 Mbits/sec
[ 14] 14.0-15.0 sec 3.42 MBytes 28.7 Mbits/sec
[ 15] 15.0-16.0 sec 3.42 MBytes 28.7 Mbits/sec
[ 16] 16.0-17.0 sec 3.42 MBytes 28.7 Mbits/sec
[ 17] 17.0-18.0 sec 3.46 MBytes 29.0 Mbits/sec
[ 18] 18.0-19.0 sec 3.42 MBytes 28.7 Mbits/sec
[ 19] 19.0-20.0 sec 3.42 MBytes 28.7 Mbits/sec
[ 20] 0.0-20.5 sec 70.0 MBytes 28.7 Mbits/sec

root@CapDell1G15:/home/pedro# iperf -c 10.0.0.1 -p 5555 -i 1 -t 20
-----
Client connecting to 10.0.0.1, TCP port 5555
TCP window size: 340 KByte (default)
-----
[  5] local 10.0.0.2 port 60412 connected with 10.0.0.1 port 5555
[  5] Interval Transfer Bandwidth
[  5] 0.0- 1.0 sec 4.79 MBytes 39.8 Mbits/sec
[  5] 1.0- 2.0 sec 3.75 MBytes 31.5 Mbits/sec
[  5] 2.0- 3.0 sec 3.12 MBytes 26.2 Mbits/sec
[  5] 3.0- 4.0 sec 3.62 MBytes 30.4 Mbits/sec
[  5] 4.0- 5.0 sec 3.12 MBytes 26.2 Mbits/sec
[  5] 5.0- 6.0 sec 3.75 MBytes 31.5 Mbits/sec
[  5] 6.0- 7.0 sec 3.12 MBytes 26.2 Mbits/sec
[  5] 7.0- 8.0 sec 3.75 MBytes 31.5 Mbits/sec
[  5] 8.0- 9.0 sec 3.12 MBytes 26.2 Mbits/sec
[  5] 9.0-10.0 sec 3.62 MBytes 30.4 Mbits/sec
[  5] 10.0-11.0 sec 3.12 MBytes 26.2 Mbits/sec
[  5] 11.0-12.0 sec 3.75 MBytes 31.5 Mbits/sec
[  5] 12.0-13.0 sec 3.12 MBytes 26.2 Mbits/sec
[  5] 13.0-14.0 sec 3.75 MBytes 31.5 Mbits/sec
[  5] 14.0-15.0 sec 3.12 MBytes 26.2 Mbits/sec
[  5] 15.0-16.0 sec 3.62 MBytes 30.4 Mbits/sec
[  5] 16.0-17.0 sec 3.12 MBytes 26.2 Mbits/sec
[  5] 17.0-18.0 sec 3.75 MBytes 31.5 Mbits/sec
[  5] 18.0-19.0 sec 3.12 MBytes 26.2 Mbits/sec
[  5] 19.0-20.0 sec 3.75 MBytes 31.5 Mbits/sec
[  5] 0.0-20.1 sec 70.0 MBytes 29.2 Mbits/sec
```

Isso gera um relatório de throughput (em Mbps) a cada segundo por 20 segundos.

2º Teste (bw = 40 Mbps)

Feche o Mininet atual:

```
exit
```

```
[1] mininet> exit
*** Stopping 1 controllers
c8
*** Stopping 4 terms
*** Stopping 19 links
.....
*** Stopping 31 switches
s1 s2 s3 s4 s5 s6 s7 s8 s9 s10 s11 s12 s13 s14 s15 s16 s17 s18 s19 s20 s21 s22 s23 s24 s25 s26 s27 s28 s29 s30 s31
...
h1 h2 h3 h4 h5 h6 h7 h8 h9 h10 h11 h12 h13 h14 h15 h16 h17 h18 h19 h20 h21 h22 h23 h24 h25 h26 h27 h28 h29 h30 h31 h32 h33 h34 h35 h36 h37 h38 h39 h40 h41 h42 h43 h44 h45 h46 h47 h48 h49 h50 h51 h52 h53 h54 h55 h56 h57 h58 h59 h60 h61 h62 h63 h64 h65 h66 h67 h68 h69 h70 h71 h72 h73 h74 h75 h76 h77 h78 h79 h80 h81 h82 h83 h84 h85 h86 h87 h88 h89 h90 h91 h92 h93 h94 h95 h96 h97 h98 h99 h100 h101 h102 h103 h104 h105
*** Done
comando feito em 733.816 seconds
pedro@CapDeLLG15: $
```

```
[1] sudo mn -c
```

```
[1] pedro@CapDeLLG15: $ sudo mn -c
*** Removing excess controllers/ofprotocols/ofdatapaths/pings/noxes
killall controller ofprotoctl ofdatapath ping nox_core lt-nox_core ovs-openflowd ovs-controller ovs-testcontroller udpbwtest mnexec ivs ryu-manager 2> /dev/null
killall controller ofprotoctl ofdatapath ping nox_core lt-nox_core ovs-openflowd ovs-controller ovs-testcontroller udpbwtest mnexec ivs ryu-manager 2> /dev/null
pkill -9 -f sudo
*** Removing junk files
rm -f /tmp/*core* /tmp/*vlog* /tmp/*.*.out /tmp/*.*.log
*** Removing old X11 tunnels
*** Removing excess kernel datapaths
ps ax | egrep -o 'dp[0-9]+*' | sed 's/dp/nl/:'
*** Removing OVS datapaths
ovs-vsctl --timeout=1 list-br
ovs-vsctl --timeout=1 list-br
*** Removing all links of the pattern foo-ethX
ip link show | egrep -o '([_-[:alnum:]]]-eth[[:digit:]]+)' | ip link show
*** Killing stale mininet node processes
pkill -9 -f mininet
*** Shutting down stale tunnels
pkill -9 -f Tunnel=Ethernet
pkill -9 -f .ssh/mn
rm -f ~/.ssh/mn/*
*** Cleanup complete.
pedro@CapDeLLG15: $
```

Recrie a topologia com 40 Mbps:

```
sudo mn --topo=tree,depth=3,fanout=5 --mac --link=tc,bw=40
```

```
[1] pedro@CapDeLLG15: $ sudo mn --topo=tree,depth=3,fanout=5 --mac --link=tc,bw=40
*** Creating network
*** Adding controller
c8
*** Configuring hosts
h1 h2 h3 h4 h5 h6 h7 h8 h9 h10 h11 h12 h13 h14 h15 h16 h17 h18 h19 h20 h21 h22 h23 h24 h25 h26 h27 h28
h29 h30 h31 h32 h33 h34 h35 h36 h37 h38 h39 h40 h41 h42 h43 h44 h45 h46 h47 h48 h49 h50 h51 h52 h53 h54 h55 h56 h57 h58 h59 h60 h61 h62 h63 h64 h65 h66 h67 h68 h69 h70 h71 h72 h73 h74 h75 h76 h77 h78 h79 h80
h81 h82 h83 h84 h85 h86 h87 h88 h89 h90 h91 h92 h93 h94 h95 h96 h97 h98 h99 h100 h101 h102 h103 h104 h105
h106 h107 h108 h109 h110 h111 h112 h113 h114 h115 h116 h117 h118 h119 h120 h121 h122 h123 h124 h125
*** Adding switches:
s1 s2 s3 s4 s5 s6 s7 s8 s9 s10 s11 s12 s13 s14 s15 s16 s17 s18 s19 s20 s21 s22 s23 s24 s25 s26 s27 s28 s29 s30 s31
*** Adding links:
(s1, s2) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s3) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s4) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s5) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s6) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s7) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s8) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s9) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s10) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s11) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s12) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s13) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s14) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s15) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s16) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s17) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s18) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s19) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s20) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s21) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s22) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s23) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s24) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s25) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s26) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s27) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s28) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s29) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s30) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s1, s31) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
...
(s31, h12a) (40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(s40, s0b) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
...
*** Configuring hosts
h1 h2 h3 h4 h5 h6 h7 h8 h9 h10 h11 h12 h13 h14 h15 h16 h17 h18 h19 h20 h21 h22 h23 h24 h25 h26 h27 h28 h29 h30 h31 h32 h33 h34 h35 h36 h37 h38 h39 h40 h41 h42 h43 h44 h45 h46 h47 h48 h49 h50 h51 h52 h53 h54 h55 h56 h57 h58 h59 h60 h61 h62 h63 h64 h65 h66 h67 h68 h69 h70 h71 h72 h73 h74 h75 h76 h77 h78 h79 h80 h81 h82 h83 h84 h85 h86 h87 h88 h89 h90 h91 h92 h93 h94 h95 h96 h97 h98 h99 h100 h101 h102 h103 h104 h105
h106 h107 h108 h109 h110 h111 h112 h113 h114 h115 h116 h117 h118 h119 h120 h121 h122 h123 h124 h125
*** Starting controller
c8
*** Starting 31 switches
s1 s2 s3 s4 s5 s6 s7 s8 s9 s10 s11 s12 s13 s14 s15 s16 s17 s18 s19 s20 s21 s22 s23 s24 s25 s26 s27 s28 s29 s30 s31 ...(40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
...
(40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
(40.00Mbit) *** Error: Warning: sch_htb: quantum of class 50001 is big. Consider r2q change.
```

```
[1] pedro@CapDeLLG15: $
```

Repita o teste iPerf:

xterm h1 h2

h1 (servidor):

iperf -c 10.0.0.1 -p 5555 -i 1 -t 20

Compare os resultados — o throughput médio deverá se aproximar da largura de banda configurada.

The image shows two terminal windows side-by-side. The left window is titled "Node: h1" and the right window is titled "Node: h2". Both windows display the output of an iPerf test. The h1 window shows it is a server listening on port 5555, and the h2 window shows it is a client connecting to port 5555. Both windows show a series of data transfers over 20 seconds, with bandwidth values fluctuating around 38.4-39.8 Mbit/sec. The command used in both cases is iperf -c 10.0.0.1 -p 5555 -i 1 -t 20.

```
root@CapDellG15:/home/pedro# iperf -s -p 5555 -i 1
-----
[  ] local 10.0.0.1 port 5555 connected with 10.0.0.2 port 5712
[ 0] Interval Transfer Bandwidth
[ 0] 0.0- 1.0 sec 4.57 MBytes 38.4 Mbits/sec
[ 1] 1.0- 2.0 sec 4.59 MBytes 38.5 Mbits/sec
[ 2] 2.0- 3.0 sec 4.55 MBytes 38.2 Mbits/sec
[ 3] 3.0- 4.0 sec 4.56 MBytes 38.3 Mbits/sec
[ 4] 4.0- 5.0 sec 4.56 MBytes 38.3 Mbits/sec
[ 5] 5.0- 6.0 sec 4.55 MBytes 38.2 Mbits/sec
[ 6] 6.0- 7.0 sec 4.59 MBytes 38.5 Mbits/sec
[ 7] 7.0- 8.0 sec 4.55 MBytes 38.2 Mbits/sec
[ 8] 8.0- 9.0 sec 4.56 MBytes 38.3 Mbits/sec
[ 9] 9.0-10.0 sec 4.56 MBytes 38.3 Mbits/sec
[10] 10.0-11.0 sec 4.55 MBytes 38.2 Mbits/sec
[11] 11.0-12.0 sec 4.59 MBytes 38.5 Mbits/sec
[12] 12.0-13.0 sec 4.55 MBytes 38.2 Mbits/sec
[13] 13.0-14.0 sec 4.56 MBytes 38.3 Mbits/sec
[14] 14.0-15.0 sec 4.56 MBytes 38.3 Mbits/sec
[15] 15.0-16.0 sec 4.55 MBytes 38.2 Mbits/sec
[16] 16.0-17.0 sec 4.56 MBytes 38.3 Mbits/sec
[17] 17.0-18.0 sec 4.56 MBytes 38.3 Mbits/sec
[18] 18.0-19.0 sec 4.56 MBytes 38.2 Mbits/sec
[19] 19.0-20.0 sec 4.59 MBytes 38.5 Mbits/sec
[20] 0.0-20.1 sec 91.9 MBytes 38.3 Mbits/sec

root@CapDellG15:/home/pedro# iperf -c 10.0.0.1 -p 5555 -t 20 -i 1
-----
Client connecting to 10.0.0.1, TCP port 5555
TCP window size: 238 KByte (default)
[  ] local 10.0.0.2 port 5712 connected with 10.0.0.1 port 5555
[ 0] Interval Transfer Bandwidth
[ 0] 0.0- 1.0 sec 5.12 MBytes 43.0 Mbits/sec
[ 1] 1.0- 2.0 sec 4.75 MBytes 39.8 Mbits/sec
[ 2] 2.0- 3.0 sec 4.50 MBytes 37.7 Mbits/sec
[ 3] 3.0- 4.0 sec 4.38 MBytes 36.7 Mbits/sec
[ 4] 4.0- 5.0 sec 4.75 MBytes 39.8 Mbits/sec
[ 5] 5.0- 6.0 sec 4.50 MBytes 37.7 Mbits/sec
[ 6] 6.0- 7.0 sec 4.50 MBytes 37.7 Mbits/sec
[ 7] 7.0- 8.0 sec 4.75 MBytes 39.8 Mbits/sec
[ 8] 8.0- 9.0 sec 4.38 MBytes 36.7 Mbits/sec
[ 9] 9.0-10.0 sec 4.50 MBytes 37.7 Mbits/sec
[10] 10.0-11.0 sec 4.75 MBytes 39.8 Mbits/sec
[11] 11.0-12.0 sec 4.50 MBytes 37.7 Mbits/sec
[12] 12.0-13.0 sec 4.75 MBytes 39.8 Mbits/sec
[13] 13.0-14.0 sec 4.38 MBytes 36.7 Mbits/sec
[14] 14.0-15.0 sec 4.50 MBytes 37.7 Mbits/sec
[15] 15.0-16.0 sec 4.75 MBytes 39.8 Mbits/sec
[16] 16.0-17.0 sec 4.50 MBytes 37.7 Mbits/sec
[17] 17.0-18.0 sec 4.38 MBytes 36.7 Mbits/sec
[18] 18.0-19.0 sec 4.75 MBytes 39.8 Mbits/sec
[19] 19.0-20.0 sec 4.50 MBytes 37.7 Mbits/sec
[20] 0.0-20.0 sec 91.9 MBytes 38.5 Mbits/sec
```

8- Encerrar e limpar ambiente

exit
sudo mn -c

```

mininet> exit
*** Stopping 1 controllers
c0
*** Stopping 6 terms
*** Stopping 155 links
.....
.....*** Stopping 31 switches
s1 s2 s3 s4 s5 s6 s7 s8 s9 s10 s11 s12 s13 s14 s15 s16 s17 s18 s19 s20 s21 s22 s23 s24 s25 s26 s27 s28
s29 s30 s31
*** Stopping 125 hosts
h1 h2 h3 h4 h5 h6 h7 h8 h9 h10 h11 h12 h13 h14 h15 h16 h17 h18 h19 h20 h21 h22 h23 h24 h25 h26 h27 h28
h29 h30 h31 h32 h33 h34 h35 h36 h37 h38 h39 h40 h41 h42 h43 h44 h45 h46 h47 h48 h49 h50 h51 h52 h53 h
54 h55 h56 h57 h58 h59 h60 h61 h62 h63 h64 h65 h66 h67 h68 h69 h70 h71 h72 h73 h74 h75 h76 h77 h78 h79
h80 h81 h82 h83 h84 h85 h86 h87 h88 h89 h90 h91 h92 h93 h94 h95 h96 h97 h98 h99 h100 h101 h102 h103 h
104 h105 h106 h107 h108 h109 h110 h111 h112 h113 h114 h115 h116 h117 h118 h119 h120 h121 h122 h123 h12
4 h125
*** Done
completed in 1209.538 seconds
pedro@CapDellG15: $ sudo mn -c
[sudo] password for pedro:
*** Removing excess controllers/ofprotocols/ofdatapaths/pings/noxes
killall controller ofprotocol ofdatapath ping nox_core lt-nox_core ovs-openflowd ovs-controller ovs-te
stcontroller udpbwtest mnexec ivs ryu-manager 2> /dev/null
killall -9 controller ofprotocol ofdatapath ping nox_core lt-nox_core ovs-openflowd ovs-controller ovs
-testcontroller udpbwtest mnexec ivs ryu-manager 2> /dev/null
pkill -9 -f "sudo mnexec"
*** Removing junk from /tmp
rm -f /tmp/vconn* /tmp/vlogs* /tmp/*.*out /tmp/*.*log
*** Removing old X11 tunnels
*** Removing excess kernel datapaths
ps ax | egrep -o 'dp[0-9]+' | sed 's/dp/nl:/'
*** Removing OVS datapaths
ovs-vsctl --timeout=1 list-br
ovs-vsctl --timeout=1 list-br
*** Removing all links of the pattern foo-ethX
ip link show | egrep -o '([-_.[:alnum:]]+-eth[[:digit:]]+)'
ip link show
*** Killing stale mininet node processes
pkill -9 -f mininet:
*** Shutting down stale tunnels
pkill -9 -f Tunnel=Ethernet
pkill -9 -f .ssh/mn
rm -f ~/.ssh/mn/*
*** Cleanup complete.
pedro@CapDellG15: $
```

Resumo Rápido dos Comandos

Etapa	Comando	Função
Limpar topologia antiga	<code>sudo mn -c</code>	Remove redes anteriores
Criar topologia	<code>sudo mn --topo=tree,depth=3,fanout=5 --mac --link=tc,bw=30</code>	Monta a árvore
Ver nós	<code>nodes</code>	Lista hosts e switches
Ver conexões	<code>net</code>	Mostra ligações
Ver interfaces	<code>dump</code>	Mostra IPs, MACs e portas
Testar ping	<code>pingall</code>	Testa conectividade geral
Capturar pacotes	<code>tcpdump -XX -n -i h2-eth0</code>	Mostra pacotes em h2
Servidor TCP	<code>iperf -s -p 5555 -i 1</code>	Roda no h1
Cliente TCP	<code>iperf -c 10.0.0.1 -p 5555 -i 1 -t 20</code>	Roda no h2
Recriar topologia (40 Mbps)	<code>sudo mn --topo=tree,depth=3,fanout=5 --mac --link=tc,bw=40</code>	Refaz com nova bw
Encerrar	<code>exit + sudo mn -c</code>	Fechá e limpa tudo