OCS Web GUI access from sing113

OCS1 - 192.168.14.31/24

OCS2 - 192.168.14.32/24

OCS3 - 192.168.14.33/24

OCS4 - 192.168.14.34/24

OCS5 - 192.168.14.35/24

OCS Ring -- East to West -- 1-2-3-4-5-1

LC(Channel) OCS-Send OCS-Receive

9 1 2

9 2 3

9 3 4

9 4 5

9 5 1

10 1 3

10 2 4

10 3 5

10 4 1

10 5 2

11 1 4

11 2 5

11 3 1

11 4 2

11 5 3

12 1 5

12 2 1

12 3 2

12 4 3

12 5 4

LC 9-12 are used for base mesh.

OCS1 LC 9-16 -- Pica8-1 Port 33-40 (EPS1)

OCS2 LC 9-16 -- Pica8-1 Port 41-48 (EPS2)

OCS3 LC 9-16 -- Pica8-2 Port 25-32 (EPS3)

OCS4 LC 9-16 -- Pica8-2 Port 33-40 (EPS4)

OCS5 LC 9-16 -- Pica8-2 Port 41-48 (EPS5)

Pica8-1

Connected with sing113(192.168.1.113) via console

Management port IP 192.168.1.241/24

Pica8-2

Connected with sing114(192.168.1.114) via console

Management port IP 192.168.1.242/24

sing113 - eth11(192.168.110.13) -- Pica8-1(23) -- EPS1

sing114 - eth11(192.168.110.14) -- Pica8-1(24) -- EPS2

sing115 - eth11(192.168.110.15) -- Pica8-2(15) -- EPS3

sing116 - eth11(192.168.110.16) -- Pica8-2(16) -- EPS4

sing117 - eth11(192.168.110.17) -- Pica8-2(17) -- EPS5

Step1 - Adding OVS bridges

Pica8-1

ovs-vsctl add-br br0 -- set bridge br0 datapath\_type=pica8

ovs-vsctl set-fail-mode br0 secure

ovs-vsctl add-br br1 -- set bridge br1 datapath\_type=pica8

ovs-vsctl set-fail-mode br1 secure

Pica8-2

ovs-vsctl add-br br0 -- set bridge br0 datapath\_type=pica8

ovs-vsctl set-fail-mode br0 secure

ovs-vsctl add-br br1 -- set bridge br1 datapath\_type=pica8

ovs-vsctl set-fail-mode br1 secure

ovs-vsctl add-br br2 -- set bridge br2 datapath\_type=pica8

ovs-vsctl set-fail-mode br2 secure

# To show switch configuration: ovs-vsctl show

# To delete a bridge: ovs-vsctl del-br br0

Step2 - Adding interfaces

Pica8-1

Server-facing interface:

ovs-vsctl add-port br0 te-1/1/23 -- set interface te-1/1/23 type=pica8

ovs-vsctl add-port br1 te-1/1/24 -- set interface te-1/1/24 type=pica8

OCS-facing interface:

ovs-vsctl add-port br0 te-1/1/33 -- set interface te-1/1/33 type=pica8

ovs-vsctl add-port br0 te-1/1/34 -- set interface te-1/1/34 type=pica8

ovs-vsctl add-port br0 te-1/1/35 -- set interface te-1/1/35 type=pica8

ovs-vsctl add-port br0 te-1/1/36 -- set interface te-1/1/36 type=pica8

ovs-vsctl add-port br0 te-1/1/37 -- set interface te-1/1/37 type=pica8

ovs-vsctl add-port br0 te-1/1/38 -- set interface te-1/1/38 type=pica8

ovs-vsctl add-port br0 te-1/1/39 -- set interface te-1/1/39 type=pica8

ovs-vsctl add-port br0 te-1/1/40 -- set interface te-1/1/40 type=pica8

ovs-vsctl add-port br1 te-1/1/41 -- set interface te-1/1/41 type=pica8

ovs-vsctl add-port br1 te-1/1/42 -- set interface te-1/1/42 type=pica8

ovs-vsctl add-port br1 te-1/1/43 -- set interface te-1/1/43 type=pica8

ovs-vsctl add-port br1 te-1/1/44 -- set interface te-1/1/44 type=pica8

ovs-vsctl add-port br1 te-1/1/45 -- set interface te-1/1/45 type=pica8

ovs-vsctl add-port br1 te-1/1/46 -- set interface te-1/1/46 type=pica8

ovs-vsctl add-port br1 te-1/1/47 -- set interface te-1/1/47 type=pica8

ovs-vsctl add-port br1 te-1/1/48 -- set interface te-1/1/48 type=pica8

Pica8-2

Server-facing interface:

ovs-vsctl add-port br0 te-1/1/15 -- set interface te-1/1/15 type=pica8

ovs-vsctl add-port br1 te-1/1/16 -- set interface te-1/1/16 type=pica8

ovs-vsctl add-port br2 te-1/1/17 -- set interface te-1/1/17 type=pica8

OCS-facing interface:

ovs-vsctl add-port br0 te-1/1/25 -- set interface te-1/1/25 type=pica8

ovs-vsctl add-port br0 te-1/1/26 -- set interface te-1/1/26 type=pica8

ovs-vsctl add-port br0 te-1/1/27 -- set interface te-1/1/27 type=pica8

ovs-vsctl add-port br0 te-1/1/28 -- set interface te-1/1/28 type=pica8

ovs-vsctl add-port br0 te-1/1/29 -- set interface te-1/1/29 type=pica8

ovs-vsctl add-port br0 te-1/1/30 -- set interface te-1/1/30 type=pica8

ovs-vsctl add-port br0 te-1/1/31 -- set interface te-1/1/31 type=pica8

ovs-vsctl add-port br0 te-1/1/32 -- set interface te-1/1/32 type=pica8

ovs-vsctl add-port br1 te-1/1/33 -- set interface te-1/1/33 type=pica8

ovs-vsctl add-port br1 te-1/1/34 -- set interface te-1/1/34 type=pica8

ovs-vsctl add-port br1 te-1/1/35 -- set interface te-1/1/35 type=pica8

ovs-vsctl add-port br1 te-1/1/36 -- set interface te-1/1/36 type=pica8

ovs-vsctl add-port br1 te-1/1/37 -- set interface te-1/1/37 type=pica8

ovs-vsctl add-port br1 te-1/1/38 -- set interface te-1/1/38 type=pica8

ovs-vsctl add-port br1 te-1/1/39 -- set interface te-1/1/39 type=pica8

ovs-vsctl add-port br1 te-1/1/40 -- set interface te-1/1/40 type=pica8

ovs-vsctl add-port br2 te-1/1/41 -- set interface te-1/1/41 type=pica8

ovs-vsctl add-port br2 te-1/1/42 -- set interface te-1/1/42 type=pica8

ovs-vsctl add-port br2 te-1/1/43 -- set interface te-1/1/43 type=pica8

ovs-vsctl add-port br2 te-1/1/44 -- set interface te-1/1/44 type=pica8

ovs-vsctl add-port br2 te-1/1/45 -- set interface te-1/1/45 type=pica8

ovs-vsctl add-port br2 te-1/1/46 -- set interface te-1/1/46 type=pica8

ovs-vsctl add-port br2 te-1/1/47 -- set interface te-1/1/47 type=pica8

ovs-vsctl add-port br2 te-1/1/48 -- set interface te-1/1/48 type=pica8

# To show switch configuration: ovs-vsctl show

Step3 - Adding flow entries

# To clear flow table: ovs-ofctl del-flows br0

# Simple testing when connecting ovs1 with ovs2 via LC-9:

# ovs-ofctl add-flow br0 in\_port=23,dl\_type=0x0806,nw\_dst=192.168.110.14,actions=output:33

# ovs-ofctl add-flow br0 in\_port=33,dl\_type=0x0806,nw\_dst=192.168.110.13,actions=output:23

# ovs-ofctl add-flow br1 in\_port=24,dl\_type=0x0806,nw\_dst=192.168.110.13,actions=output:41

# ovs-ofctl add-flow br1 in\_port=41,dl\_type=0x0806,nw\_dst=192.168.110.14,actions=output:24

# ovs-ofctl add-flow br0 in\_port=23,dl\_type=0x0800,nw\_dst=192.168.110.14,actions=output:33

# ovs-ofctl add-flow br0 in\_port=33,dl\_type=0x0800,nw\_dst=192.168.110.13,actions=output:23

# ovs-ofctl add-flow br1 in\_port=24,dl\_type=0x0800,nw\_dst=192.168.110.13,actions=output:41

# ovs-ofctl add-flow br1 in\_port=41,dl\_type=0x0800,nw\_dst=192.168.110.14,actions=output:24

EPS1 -- Pica8-1 br0

For ARP datagrams,

ovs-ofctl add-flow br0 in\_port=23,dl\_type=0x0806,nw\_dst=192.168.110.14,actions=output:33

ovs-ofctl add-flow br0 in\_port=23,dl\_type=0x0806,nw\_dst=192.168.110.15,actions=output:34

ovs-ofctl add-flow br0 in\_port=23,dl\_type=0x0806,nw\_dst=192.168.110.16,actions=output:35

ovs-ofctl add-flow br0 in\_port=23,dl\_type=0x0806,nw\_dst=192.168.110.17,actions=output:36

ovs-ofctl add-flow br0 in\_port=33,dl\_type=0x0806,nw\_dst=192.168.110.13,actions=output:23

ovs-ofctl add-flow br0 in\_port=34,dl\_type=0x0806,nw\_dst=192.168.110.13,actions=output:23

ovs-ofctl add-flow br0 in\_port=35,dl\_type=0x0806,nw\_dst=192.168.110.13,actions=output:23

ovs-ofctl add-flow br0 in\_port=36,dl\_type=0x0806,nw\_dst=192.168.110.13,actions=output:23

For IP datagrams,

ovs-ofctl add-flow br0 in\_port=23,dl\_type=0x0800,nw\_dst=192.168.110.14,actions=output:33

ovs-ofctl add-flow br0 in\_port=23,dl\_type=0x0800,nw\_dst=192.168.110.15,actions=output:34

ovs-ofctl add-flow br0 in\_port=23,dl\_type=0x0800,nw\_dst=192.168.110.16,actions=output:35

ovs-ofctl add-flow br0 in\_port=23,dl\_type=0x0800,nw\_dst=192.168.110.17,actions=output:36

ovs-ofctl add-flow br0 in\_port=33,dl\_type=0x0800,nw\_dst=192.168.110.13,actions=output:23

ovs-ofctl add-flow br0 in\_port=34,dl\_type=0x0800,nw\_dst=192.168.110.13,actions=output:23

ovs-ofctl add-flow br0 in\_port=35,dl\_type=0x0800,nw\_dst=192.168.110.13,actions=output:23

ovs-ofctl add-flow br0 in\_port=36,dl\_type=0x0800,nw\_dst=192.168.110.13,actions=output:23

EPS2 -- Pica8-1 br1

For ARP datagrams,

ovs-ofctl add-flow br1 in\_port=24,dl\_type=0x0806,nw\_dst=192.168.110.15,actions=output:41

ovs-ofctl add-flow br1 in\_port=24,dl\_type=0x0806,nw\_dst=192.168.110.16,actions=output:42

ovs-ofctl add-flow br1 in\_port=24,dl\_type=0x0806,nw\_dst=192.168.110.17,actions=output:43

ovs-ofctl add-flow br1 in\_port=24,dl\_type=0x0806,nw\_dst=192.168.110.13,actions=output:44

ovs-ofctl add-flow br1 in\_port=41,dl\_type=0x0806,nw\_dst=192.168.110.14,actions=output:24

ovs-ofctl add-flow br1 in\_port=42,dl\_type=0x0806,nw\_dst=192.168.110.14,actions=output:24

ovs-ofctl add-flow br1 in\_port=43,dl\_type=0x0806,nw\_dst=192.168.110.14,actions=output:24

ovs-ofctl add-flow br1 in\_port=44,dl\_type=0x0806,nw\_dst=192.168.110.14,actions=output:24

For IP datagrams,

ovs-ofctl add-flow br1 in\_port=24,dl\_type=0x0800,nw\_dst=192.168.110.15,actions=output:41

ovs-ofctl add-flow br1 in\_port=24,dl\_type=0x0800,nw\_dst=192.168.110.16,actions=output:42

ovs-ofctl add-flow br1 in\_port=24,dl\_type=0x0800,nw\_dst=192.168.110.17,actions=output:43

ovs-ofctl add-flow br1 in\_port=24,dl\_type=0x0800,nw\_dst=192.168.110.13,actions=output:44

ovs-ofctl add-flow br1 in\_port=41,dl\_type=0x0800,nw\_dst=192.168.110.14,actions=output:24

ovs-ofctl add-flow br1 in\_port=42,dl\_type=0x0800,nw\_dst=192.168.110.14,actions=output:24

ovs-ofctl add-flow br1 in\_port=43,dl\_type=0x0800,nw\_dst=192.168.110.14,actions=output:24

ovs-ofctl add-flow br1 in\_port=44,dl\_type=0x0800,nw\_dst=192.168.110.14,actions=output:24

EPS3 -- Pica8-2 br0

For ARP datagrams,

ovs-ofctl add-flow br0 in\_port=15,dl\_type=0x0806,nw\_dst=192.168.110.16,actions=output:25

ovs-ofctl add-flow br0 in\_port=15,dl\_type=0x0806,nw\_dst=192.168.110.17,actions=output:26

ovs-ofctl add-flow br0 in\_port=15,dl\_type=0x0806,nw\_dst=192.168.110.13,actions=output:27

ovs-ofctl add-flow br0 in\_port=15,dl\_type=0x0806,nw\_dst=192.168.110.14,actions=output:28

ovs-ofctl add-flow br0 in\_port=25,dl\_type=0x0806,nw\_dst=192.168.110.15,actions=output:15

ovs-ofctl add-flow br0 in\_port=26,dl\_type=0x0806,nw\_dst=192.168.110.15,actions=output:15

ovs-ofctl add-flow br0 in\_port=27,dl\_type=0x0806,nw\_dst=192.168.110.15,actions=output:15

ovs-ofctl add-flow br0 in\_port=28,dl\_type=0x0806,nw\_dst=192.168.110.15,actions=output:15

For IP datagrams,

ovs-ofctl add-flow br0 in\_port=15,dl\_type=0x0800,nw\_dst=192.168.110.16,actions=output:25

ovs-ofctl add-flow br0 in\_port=15,dl\_type=0x0800,nw\_dst=192.168.110.17,actions=output:26

ovs-ofctl add-flow br0 in\_port=15,dl\_type=0x0800,nw\_dst=192.168.110.13,actions=output:27

ovs-ofctl add-flow br0 in\_port=15,dl\_type=0x0800,nw\_dst=192.168.110.14,actions=output:28

ovs-ofctl add-flow br0 in\_port=25,dl\_type=0x0800,nw\_dst=192.168.110.15,actions=output:15

ovs-ofctl add-flow br0 in\_port=26,dl\_type=0x0800,nw\_dst=192.168.110.15,actions=output:15

ovs-ofctl add-flow br0 in\_port=27,dl\_type=0x0800,nw\_dst=192.168.110.15,actions=output:15

ovs-ofctl add-flow br0 in\_port=28,dl\_type=0x0800,nw\_dst=192.168.110.15,actions=output:15

EPS4 -- Pica8-2 br1

For ARP datagrams,

ovs-ofctl add-flow br1 in\_port=16,dl\_type=0x0806,nw\_dst=192.168.110.17,actions=output:33

ovs-ofctl add-flow br1 in\_port=16,dl\_type=0x0806,nw\_dst=192.168.110.13,actions=output:34

ovs-ofctl add-flow br1 in\_port=16,dl\_type=0x0806,nw\_dst=192.168.110.14,actions=output:35

ovs-ofctl add-flow br1 in\_port=16,dl\_type=0x0806,nw\_dst=192.168.110.15,actions=output:36

ovs-ofctl add-flow br1 in\_port=33,dl\_type=0x0806,nw\_dst=192.168.110.16,actions=output:16

ovs-ofctl add-flow br1 in\_port=34,dl\_type=0x0806,nw\_dst=192.168.110.16,actions=output:16

ovs-ofctl add-flow br1 in\_port=35,dl\_type=0x0806,nw\_dst=192.168.110.16,actions=output:16

ovs-ofctl add-flow br1 in\_port=36,dl\_type=0x0806,nw\_dst=192.168.110.16,actions=output:16

For IP datagrams,

ovs-ofctl add-flow br1 in\_port=16,dl\_type=0x0800,nw\_dst=192.168.110.17,actions=output:33

ovs-ofctl add-flow br1 in\_port=16,dl\_type=0x0800,nw\_dst=192.168.110.13,actions=output:34

ovs-ofctl add-flow br1 in\_port=16,dl\_type=0x0800,nw\_dst=192.168.110.14,actions=output:35

ovs-ofctl add-flow br1 in\_port=16,dl\_type=0x0800,nw\_dst=192.168.110.15,actions=output:36

ovs-ofctl add-flow br1 in\_port=33,dl\_type=0x0800,nw\_dst=192.168.110.16,actions=output:16

ovs-ofctl add-flow br1 in\_port=34,dl\_type=0x0800,nw\_dst=192.168.110.16,actions=output:16

ovs-ofctl add-flow br1 in\_port=35,dl\_type=0x0800,nw\_dst=192.168.110.16,actions=output:16

ovs-ofctl add-flow br1 in\_port=36,dl\_type=0x0800,nw\_dst=192.168.110.16,actions=output:16

EPS5 -- Pica8-2 br2

For ARP datagrams,

ovs-ofctl add-flow br2 in\_port=17,dl\_type=0x0806,nw\_dst=192.168.110.13,actions=output:41

ovs-ofctl add-flow br2 in\_port=17,dl\_type=0x0806,nw\_dst=192.168.110.14,actions=output:42

ovs-ofctl add-flow br2 in\_port=17,dl\_type=0x0806,nw\_dst=192.168.110.15,actions=output:43

ovs-ofctl add-flow br2 in\_port=17,dl\_type=0x0806,nw\_dst=192.168.110.16,actions=output:44

ovs-ofctl add-flow br2 in\_port=41,dl\_type=0x0806,nw\_dst=192.168.110.17,actions=output:17

ovs-ofctl add-flow br2 in\_port=42,dl\_type=0x0806,nw\_dst=192.168.110.17,actions=output:17

ovs-ofctl add-flow br2 in\_port=43,dl\_type=0x0806,nw\_dst=192.168.110.17,actions=output:17

ovs-ofctl add-flow br2 in\_port=44,dl\_type=0x0806,nw\_dst=192.168.110.17,actions=output:17

For IP datagrams,

ovs-ofctl add-flow br2 in\_port=17,dl\_type=0x0800,nw\_dst=192.168.110.13,actions=output:41

ovs-ofctl add-flow br2 in\_port=17,dl\_type=0x0800,nw\_dst=192.168.110.14,actions=output:42

ovs-ofctl add-flow br2 in\_port=17,dl\_type=0x0800,nw\_dst=192.168.110.15,actions=output:43

ovs-ofctl add-flow br2 in\_port=17,dl\_type=0x0800,nw\_dst=192.168.110.16,actions=output:44

ovs-ofctl add-flow br2 in\_port=41,dl\_type=0x0800,nw\_dst=192.168.110.17,actions=output:17

ovs-ofctl add-flow br2 in\_port=42,dl\_type=0x0800,nw\_dst=192.168.110.17,actions=output:17

ovs-ofctl add-flow br2 in\_port=43,dl\_type=0x0800,nw\_dst=192.168.110.17,actions=output:17

ovs-ofctl add-flow br2 in\_port=44,dl\_type=0x0800,nw\_dst=192.168.110.17,actions=output:17

Multicast channel

OCS1-4 receive LC-13 from OCS5

# OCS5 needs to receive LC-13 from some OCS so as to activate it.

Multicast IP address 224.0.55.55 <---> MAC 01:00:5e:00:37:37

EPS1 -- Pica8-1 br0

ovs-ofctl add-flow br0 in\_port=37,dl\_type=0x0800,nw\_dst=224.0.55.55,actions=output:23

EPS2 -- Pica8-1 br1

ovs-ofctl add-flow br1 in\_port=45,dl\_type=0x0800,nw\_dst=224.0.55.55,actions=output:24

EPS3 -- Pica8-2 br0

ovs-ofctl add-flow br0 in\_port=29,dl\_type=0x0800,nw\_dst=224.0.55.55,actions=output:15

EPS4 -- Pica8-2 br1

ovs-ofctl add-flow br1 in\_port=37,dl\_type=0x0800,nw\_dst=224.0.55.55,actions=output:16

EPS5 -- Pica8-2 br2

ovs-ofctl add-flow br2 in\_port=17,dl\_type=0x0800,nw\_dst=224.0.55.55,actions=output:45

Adding multicast routing rule

/sbin/route -n add -net 224.0.0.0 netmask 240.0.0.0 dev eth11

EXP1 - Multiple unicasts using iperf

Receiver -- sing113-sing116:

iperf -s -u

Sender -- sing117:

iperf -c 192.168.110.13 -u -t 10 -b 1000M & iperf -c 192.168.110.14 -u -t 10 -b 1000M & iperf -c 192.168.110.15 -u -t 10 -b 1000M & iperf -c 192.168.110.16 -u -t 10 -b 1000M

EXP2 - IP multicast using iperf

Receiver -- sing113-sing116:

iperf -s -u -B 224.0.55.55

Sender -- sing117:

iperf -c 224.0.55.55 -u -T 5 -t 10 -b 1000M

# -T specifies the ttl of multicast (default ttl=1)

[# iperf3 does not support multicast while iperf2 multicast is limited to no more than 1Gbps...](https://iperf.fr/iperf-doc.php)

EXP3

[NACK-Oriented Reliable Multicast (NORM)](http://www.nrl.navy.mil/itd/ncs/products/norm) - [src-norm-1.5r6.tgz](http://downloads.pf.itd.nrl.navy.mil/norm/src-norm-1.5r6.tgz)

Receiver -- sing113-sing116:

./norm addr 224.0.55.55/5002 rxcachedir ./

Sender -- sing117:

./norm addr 224.0.55.55/5002 rate 10000000000 send file\_10GB

# CPU bounded (only one processor is used) - maximum rate achieved is no more than 600Mbps

EXP4

[MINT](http://mc-mint.sourceforge.net/) - [mint-1.2.tar.gz](http://jaist.dl.sourceforge.net/project/mc-mint/mc-mint/Mint%201.2/mint-1.2.tar.gz)

# CPU bounded - maximum rate achieved is no more than 2Gbps

EXP5

[Fastcast](https://github.com/RuedigerMoeller/fast-cast) - [fast-cast-3.0.zip](https://codeload.github.com/RuedigerMoeller/fast-cast/zip/3.0)

tcpdump -i eth10 ip multicast -s 65535 -w dump.cap

# tcpdump to capture ip multicast packets on eth10

Traffic monitor - iptraf or iftop

Advanced system monitor - htop

# Monitor CPU%, MEM%, etc. of different processors/processes