HY335 PHASE_A REPORT

AS 9
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1.1

IP address

- **9.200.0.0/23**
  - **9.200.0.255 broadcast address**

subnets

- **for students**
  - stud1: **9.200.0.7/23**
  - stud2: **9.200.0.42/23**
  - stud3: **9.200.0.69/23**
- **for staff**
  - staf1: **9.200.0.144/23**
  - staf2: **9.200.0.166/23**
  - staf3: **9.200.0.177/23** .
- **gateways**
  - **9.200.0.1** gateway for GENE (CERN,EPFL)
  - **9.200.0.2** gateway for ZURI (ETHZ)

Configuration of student 1

```
root@student_1:~# ifconfig && netstat -rn
9-CERN: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 9.200.0.7  netmask 255.255.254.0  broadcast 9.200.0.255
        ether 62:ac:86:2b:b4:18  txqueuelen 1000  (Ethernet)
        RX packets 977925  bytes 50963638 (48.6 MiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 181  bytes 15386 (15.0 KiB)
        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
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 28  bytes 2856 (2.7 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 28  bytes 2856 (2.7 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

ssh: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 158.9.11.5  netmask 255.255.0.0  broadcast 0.0.0.0
        ether 56:91:8b:d5:13:0a  txqueuelen 1000  (Ethernet)
        RX packets 7523  bytes 848502 (828.6 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 3416  bytes 469102 (458.1 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

Kernel IP routing table
Destination     Gateway         Genmask         Flags   MSS Window  irtt Iface
0.0.0.0         9.200.0.1       0.0.0.0         UG        0 0          0 9-CERN
9.200.0.0       0.0.0.0         255.255.254.0   U         0 0          0 9-CERN
158.9.0.0       0.0.0.0         255.255.0.0     U         0 0          0 ssh
root@student_1:~#
```

Configuration of staff 2

```
root@staff_2:~# ifconfig && netstat -rn
9-ETHZ: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 9.200.0.166  netmask 255.255.254.0  broadcast 9.200.0.255
        ether 26:bc:e3:d2:74:d3  txqueuelen 1000  (Ethernet)
        RX packets 976916  bytes 50921176 (48.5 MiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 235  bytes 20510 (20.0 KiB)
        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
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 16  bytes 1792 (1.7 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 16  bytes 1792 (1.7 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

ssh: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 158.9.11.8  netmask 255.255.0.0  broadcast 0.0.0.0
        ether d2:df:21:39:b8:c4  txqueuelen 1000  (Ethernet)
        RX packets 6888  bytes 791540 (772.9 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 2805  bytes 357088 (348.7 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

Kernel IP routing table
Destination     Gateway         Genmask         Flags   MSS Window  irtt Iface
0.0.0.0         9.200.0.2       0.0.0.0         UG        0 0          0 9-ETHZ
9.200.0.0       0.0.0.0         255.255.254.0   U         0 0          0 9-ETHZ
158.9.0.0       0.0.0.0         255.255.0.0     U         0 0          0 ssh
root@staff_2:~#
```

ZURI configuration

```
ZURI_router# show interface brief
Interface       Status  VRF             Addresses
---------       ------  ---             ---------
ZURI-L2         up      default         9.200.0.2/23
ZURI-L2.10      up      default
ZURI-L2.20      up      default
ZURI-L2.30      down    default
```

GENE configuration

```
GENE_router# show interface brief
Interface       Status  VRF             Addresses
---------       ------  ---             ---------
GENE-L2         up      default         9.200.0.1/23
GENE-L2.10      up      default
GENE-L2.20      up      default
GENE-L2.30      down    default
```

ping from sutdent_1to GENE

```
root@student_1:~# ping 9.200.0.1
PING 9.200.0.1 (9.200.0.1) 56(84) bytes of data.
64 bytes from 9.200.0.1: icmp_seq=1 ttl=64 time=2.23 ms
64 bytes from 9.200.0.1: icmp_seq=2 ttl=64 time=2.23 ms
64 bytes from 9.200.0.1: icmp_seq=3 ttl=64 time=2.23 ms
64 bytes from 9.200.0.1: icmp_seq=4 ttl=64 time=2.23 ms
64 bytes from 9.200.0.1: icmp_seq=5 ttl=64 time=2.21 ms
64 bytes from 9.200.0.1: icmp_seq=6 ttl=64 time=2.23 ms
64 bytes from 9.200.0.1: icmp_seq=7 ttl=64 time=2.45 ms
64 bytes from 9.200.0.1: icmp_seq=8 ttl=64 time=4.58 ms
64 bytes from 9.200.0.1: icmp_seq=9 ttl=64 time=2.44 ms
64 bytes from 9.200.0.1: icmp_seq=10 ttl=64 time=2.22 ms
^C
--- 9.200.0.1 ping statistics ---
```

ping from staff_2 to ZURI

```
root@staff_2:~# ping 9.200.0.2
PING 9.200.0.2 (9.200.0.2) 56(84) bytes of data.
64 bytes from 9.200.0.2: icmp_seq=1 ttl=64 time=2.84 ms
64 bytes from 9.200.0.2: icmp_seq=2 ttl=64 time=2.19 ms
64 bytes from 9.200.0.2: icmp_seq=3 ttl=64 time=2.20 ms
64 bytes from 9.200.0.2: icmp_seq=4 ttl=64 time=2.22 ms
64 bytes from 9.200.0.2: icmp_seq=5 ttl=64 time=2.19 ms
64 bytes from 9.200.0.2: icmp_seq=6 ttl=64 time=2.18 ms
64 bytes from 9.200.0.2: icmp_seq=7 ttl=64 time=2.23 ms
64 bytes from 9.200.0.2: icmp_seq=8 ttl=64 time=2.23 ms
^C
--- 9.200.0.2 ping statistics ---
8 packets transmitted, 8 received, 0% packet loss, time 7009ms
rtt min/avg/max/mdev = 2.189/2.289/2.849/0.217 ms
root@staff_2:~#
```

1.2

New IPs

- ➔ **for students**
  - ◆ 1(CERN): **9.200.1.7/24**
  - ◆ 2(ETHZ): **9.200.1.42/24**
  - ◆ 3(EPFL): **9.200.1.69/24**
- ➔ **for staff**
  - ◆ 1(CERN): **9.200.0.144/24**
  - ◆ 2(ETHZ): **9.200.0.166/24**
  - ◆ 3(EPFL): **9.200.0.177/24**
- ➔ **gateways**
  - ◆ **GENE**
    - (Staff) **L2.10 : 9.200.0.1/24**
    - (Students) **L2.20 : 9.200.1.1/24**
  - ◆ **ZURI**
    - (Staff) **L2.10 : 9.200.0.2/24**
    - **(**Students**) L2.20 : 9.200.1./2/24**

traceroute from EPFL student_3 to EPFL staff_3

```
root@student_3:~# traceroute 9.200.0.177
traceroute to 9.200.0.177 (9.200.0.177), 30 hops max, 60 byte packets
 1  9.200.1.1 (9.200.1.1)  8.342 ms  8.172 ms  7.213 ms
 2  9.200.0.177 (9.200.0.177)  41.525 ms  41.496 ms  42.707 ms
```

traceroute form EPFL student_3 to ETHZ staff_2

```
root@student_3:~# traceroute 9.200.0.166
traceroute to 9.200.0.166 (9.200.0.166), 30 hops max, 60 byte packets
 1  9.200.1.1 (9.200.1.1)  8.685 ms  8.383 ms  8.258 ms
 2  9.200.0.166 (9.200.0.166)  43.802 ms  43.686 ms  43.499 ms
root@student_3:~#
```

traceroute form ETHZ staff_2 to EPFL student_3

```
root@staff_2:~# traceroute 9.200.1.69
traceroute to 9.200.1.69 (9.200.1.69), 30 hops max, 60 byte packets
 1  9.200.0.2 (9.200.0.2)  4.437 ms  24.327 ms  3.981 ms
 2  9.200.1.69 (9.200.1.69)  15.775 ms  30.420 ms  15.564 ms
```

1.3

traceroute from PARI host to ATLA host

```
root@PARI_host:~# traceroute 9.107.0.1
traceroute to 9.107.0.1 (9.107.0.1), 30 hops max, 60 byte packets
 1  PARI-host.group9 (9.103.0.2)  0.685 ms  0.520 ms  0.553 ms
 2  MIAM-PARI.group9 (9.0.6.2)  0.826 ms  0.826 ms NEWY-PARI.group9 (9.0.5.2)  2.640 ms
 3  ATLA-NEWY.group9 (9.0.11.2)  3.120 ms ATLA-MIAM.group9 (9.0.13.1)  1.132 ms  1.202 ms
 4  host-ATLA.group9 (9.107.0.1)  2.178 ms  3.149 ms  3.117 ms
root@PARI_host:~#
```

1.4

Εκτελώντας την εντολή iperf3, βλέπουμε ότι ανήκουμε στο configuration 2 καθώς είναι το μόνο configuration με 10Mbps BOST-LOND και 100Mbps PARI-NEWY.

BOST-LOND ~11Mbps

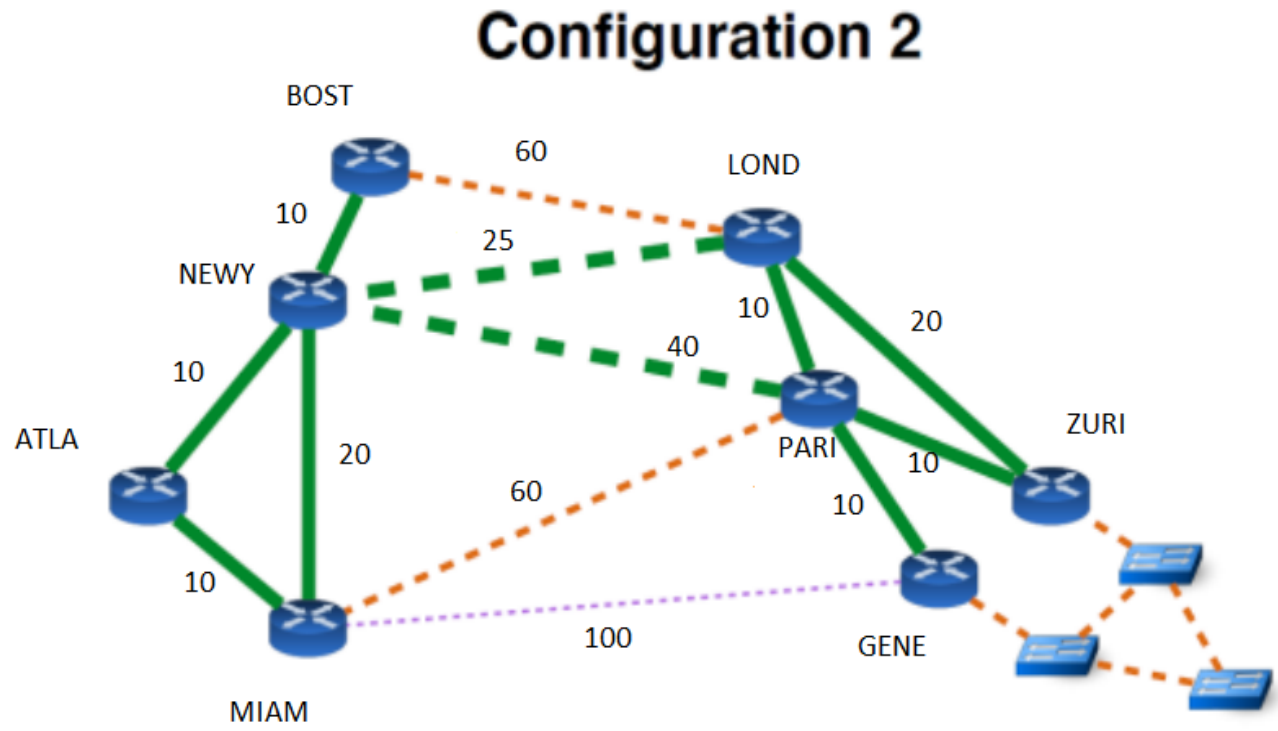
```
root@BOST_host:~# iperf3 --server --one-off
-----------------------------------------------------------
Server listening on 5201
-----------------------------------------------------------
Accepted connection from 9.101.0.1, port 35452
[  5] local 9.106.0.1 port 5201 connected to 9.101.0.1 port 35454
[ ID] Interval           Transfer     Bandwidth
[  5]   0.00-1.00   sec  2.07 MBytes  17.4 Mbits/sec
[  5]   1.00-2.01   sec  1.09 MBytes  9.12 Mbits/sec
[  5]   2.01-3.00   sec  1.25 MBytes  10.6 Mbits/sec
[  5]   3.00-4.00   sec  1.15 MBytes  9.65 Mbits/sec
[  5]   4.00-5.00   sec  1.19 MBytes  9.99 Mbits/sec
[  5]   5.00-5.04   sec  67.9 KBytes  13.4 Mbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bandwidth
[  5]   0.00-5.04   sec  0.00 Bytes  0.00 bits/sec                  sender
[  5]   0.00-5.04   sec  6.82 MBytes  11.4 Mbits/sec                  receiver
root@BOST_host:~#
```

PARI - NEWY ~100Mbps

```
root@PARI_host:~# iperf3 --client 9.105.0.1 time 5
Connecting to host 9.105.0.1, port 5201
[  4] local 9.103.0.1 port 47186 connected to 9.105.0.1 port 5201
[ ID] Interval           Transfer     Bandwidth       Retr  Cwnd
[  4]   0.00-1.00   sec  13.2 MBytes   111 Mbits/sec  540   46.7 KBytes
[  4]   1.00-2.00   sec  11.8 MBytes  99.0 Mbits/sec  397   35.4 KBytes
[  4]   2.00-3.00   sec  11.8 MBytes  99.1 Mbits/sec  346   43.8 KBytes
[  4]   3.00-4.00   sec  11.9 MBytes   100 Mbits/sec  436   52.3 KBytes
[  4]   4.00-5.00   sec  11.9 MBytes   100 Mbits/sec  364   62.2 KBytes
[  4]   5.00-6.00   sec  11.3 MBytes  94.9 Mbits/sec  452   28.3 KBytes
[  4]   6.00-7.00   sec  12.4 MBytes   104 Mbits/sec  378   25.5 KBytes
[  4]   7.00-8.00   sec  11.9 MBytes   100 Mbits/sec  368   31.1 KBytes
[  4]   8.00-9.00   sec  11.8 MBytes  99.4 Mbits/sec  477   33.9 KBytes
[  4]   9.00-10.00  sec  11.8 MBytes  99.1 Mbits/sec  423   26.9 KBytes
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bandwidth       Retr
[  4]   0.00-10.00  sec   120 MBytes   101 Mbits/sec  4181             sender
[  4]   0.00-10.00  sec   119 MBytes   100 Mbits/sec                  receiver

iperf Done.
```

Weight Assignment



traceroute from ATLA host to ZURI loopback

```
root@ATLA_host:~# traceroute 9.152.0.1
traceroute to 9.152.0.1 (9.152.0.1), 30 hops max, 60 byte packets
 1  ATLA-host.group9 (9.107.0.2)  0.125 ms  0.020 ms  0.017 ms
 2  NEWY-ATLA.group9 (9.0.11.1)  0.366 ms  0.347 ms  0.319 ms
 3  LOND-NEWY.group9 (9.0.8.1)  0.633 ms  0.570 ms  0.539 ms
 4  9.152.0.1 (9.152.0.1)  2.718 ms  2.695 ms  2.568 ms
root@ATLA_host:~#
```

Σύμφωνα με τα βάρη που αναθέσαμε περιμένουμε η διαδρομή να είναι: ATLA host -> ATLA router -> NEWY router -> LOND router -> ZURI lo. Από το screenshot του traceroute βλέπουμε ότι όντως έτσι γίνεται.

1.5

Δεν χρειάστηκε να κάνουμε κάποιες αλλαγές στα βάρη για να έχουμε την άμεση επικοινωνία του ATLA host με του NEWY host καθώς το οι διαδρομές ATLA -> NEWY και αντίστροφα έχουν βάρος 10(20 μαζί με τον host) ενώ η διαδρομή ATLA -> MIAM -> NEWY έχει 30(40 μαζί με τον host).

traceroute from ATLA host to NEWY host(before static)

```
root@ATLA_host:~# traceroute 9.105.0.1
traceroute to 9.105.0.1 (9.105.0.1), 30 hops max, 60 byte packets
 1  ATLA-host.group9 (9.107.0.2)  0.162 ms  0.020 ms  0.016 ms
 2  NEWY-ATLA.group9 (9.0.11.1)  0.424 ms  0.463 ms  0.409 ms
 3  host-NEWY.group9 (9.105.0.1)  0.411 ms  2.124 ms  0.282 ms
```

Για να μπορέσουμε να έχουμε την στατική διαδρομή προσθέσαμε στον MIAM router 2 επιπλέον static routes. Ένα για το NEWY host μέσω του NEWY_port και το άλλο για τον ATLA host μέσω του ATLA_port και έτσι έχουμε την διαδρομή που θέλουμε. *(Μας δούλευε και χωρίς αυτές τις static routes αν αλλάζαμε το βαρος της ATLA-MIAM διαδρομής από 10 σε 15 αλλά τελικά βάλαμε τα static.)

```
MIAM_router# show ip route static
Codes: K - kernel route, C - connected, S - static, R - RIP,
       O - OSPF, I - IS-IS, B - BGP, E - EIGRP, N - NHRP,
       T - Table, v - VNC, V - VNC-Direct, A - Babel, D - SHARP,
       F - PBR, f - OpenFabric,
       > - selected route, * - FIB route, q - queued route, r - rejected route

S>* 9.105.0.0/24 [1/0] via 9.0.12.1, port_NEWY, 00:34:55
S>* 9.107.0.0/24 [1/0] via 9.0.13.1, port_ATLA, 00:34:46
```

traceroute from ATLA host to NEWY host(after static)

```
root@ATLA_host:~# traceroute 9.105.0.1
traceroute to 9.105.0.1 (9.105.0.1), 30 hops max, 60 byte packets
 1  ATLA-host.group9 (9.107.0.2)  0.668 ms  0.472 ms  0.209 ms
 2  MIAM-ATLA.group9 (9.0.13.2)  0.476 ms  0.501 ms  0.447 ms
 3  NEWY-MIAM.group9 (9.0.12.1)  0.554 ms  0.528 ms  0.518 ms
 4  host-NEWY.group9 (9.105.0.1)  0.911 ms  0.842 ms  0.483 ms
```