ANNEX A · ROUTING

Name _____ **Group G =** _____ **Date** _____

TASK 1 · READ YOUR TABLE, BE THE ROUTER (ALONE)

1 On your PC run `ip route`. Copy the two lines and say in your own words what each one means.

_____

_____

2 This is a router's table. For each destination write the line that wins and where the packet goes next.

Line	Destination network	Gateway / interface
a	`10.3.0.0/24`	connected, `bridge-lan`
b	`10.3.10.0/24`	connected, `vlan10`
c	`172.16.0.0/24`	connected, `ether1`
d	`10.5.0.0/16`	`172.16.0.5`
e	`0.0.0.0/0`	`172.16.0.254`

`10.3.10.7` → _____ `10.5.20.9` → _____ `172.16.0.8` → _____

`8.8.8.8` → _____ `10.4.0.1` → _____

PART A · YOUR GROUP AND A PARTNER GROUP (REAL ROUTERS)

Partner group: H = _____ Backbone: your router is `172.16.0.G`, theirs is `172.16.0.H`.

1 Cable `ether1` to the backbone switch. IP → Addresses → + : `172.16.0.G/24` on `ether1`.

2 From the router (Tools → Ping): `172.16.0.H`. Result: _____

3 From your PC: `ping -c 3 172.16.0.H`. Result: _____ Why is it different from step 2?

_____

4 IP → Routes → + : Dst. Address `10.H.0.0/16`, Gateway `172.16.0.H`. The partner group adds the route to you.

5 From your PC, with an address your partners give you:

```
ping -c 3 10.H.0.1
traceroute -n ADDRESS-OF-A-PARTNER-PC
```

Lines printed by `traceroute`, and who each address is:

1 _____ is _____

2 _____ is _____

3 _____ is _____

6 Why does one route `10.H.0.0/16` reach their dev and design VLANs too? _____

DONE WHEN a PC of each group pings a PC of the other and `traceroute` shows both routers in the middle.

PART B · THREE ROUTERS IN A LINE (ALONE, VIRTUAL LAB)

```
pc1 --- ether3 [r1] ether2 ----- ether2 [r2] ether3 ----- ether2 [r3] ether3 --- pc3
10.1.0.11          172.16.12.0/30              172.16.23.0/30          10.3.0.11
```

1 `cd ~/labs` then `containerlab deploy -t routing.clab.yml` (3–4 minutes). One terminal per router: `ssh admin@clab-routing-r1` (also `r2`, `r3`; password `admin`). **Never touch `ether1`.**

2 Addresses. In each router: `/ip address add address=... interface=...`

Router	ether2	ether3
r1	172.16.12.1/30	10.1.0.1/24
r2	172.16.12.2/30	172.16.23.1/30
r3	172.16.23.2/30	10.3.0.1/24

3 Routes. Each router needs a sign for every network it does not touch. Fill in the gateways and type them.

```
r1:  /ip route add dst-address=10.3.0.0/24 gateway=_________________
r2:  /ip route add dst-address=10.1.0.0/24 gateway=_________________
r2:  /ip route add dst-address=10.3.0.0/24 gateway=_________________
r3:  /ip route add dst-address=10.1.0.0/24 gateway=_________________
```

From pc1 (`docker exec -it clab-routing-pc1 bash`): `ping -c 3 10.3.0.11` and `traceroute -n 10.3.0.11`.

Number of lines: _____ Addresses, in order: _____

DONE WHEN pc1 pings pc3 and `traceroute` shows the three routers and then pc3.

4 Break it and find it. On r3: `/ip route remove [find where dst-address=10.1.0.0/24]`.

From pc1: `traceroute -n -m 5 -w 1 10.3.0.11`. Last hop that answers: _____

In pc3: `tcpdump -n -c 4 -i eth1 icmp` while pc1 pings. Do the pings arrive at pc3? _____

So what exactly is broken, and in which router? _____
Put the route back and check.

5 Extra. r1 and r3 are at the edge of the network. Replace their route by a default route (`/ip route add gateway=...`). Why is one line enough for them and not for r2? _____

6 Clean up: `containerlab destroy -t routing.clab.yml --cleanup`.

EXIT TICKET (ALONE, NO NOTES)

1. A PC sends a packet to an address outside its own network. It hands it to:
   A · the DNS server B · its default gateway C · the destination directly D · every PC in the LAN
2. `dst-address=10.5.0.0/16 gateway=172.16.0.5` means:
   A · 172.16.0.5 is my address B · block 10.5.x.x C · for any 10.5.x.x, hand the packet to 172.16.0.5 D · 10.5.0.0 is the DNS
3. A table has `10.5.0.0/16` via A and `0.0.0.0/0` via B. A packet for `10.5.20.9` goes:
   A · via A, the most specific route B · via B, the default C · to both D · nowhere
4. Group 3 has the right route to group 5, but the ping fails. Most likely:
   A · the cable is too long B · DNS is down C · the mask is /16 D · group 5 has no route back to group 3
5. `traceroute` prints: A · every switch on the way B · one line per router on the way C · the routing table D · open ports