



Hands on: Static Routing Challenge

Internet Engineering June 18, 2019
Teaching Assistants



Agenda

Knowledge part:

1. Currently situation
2. Procedure of static routing

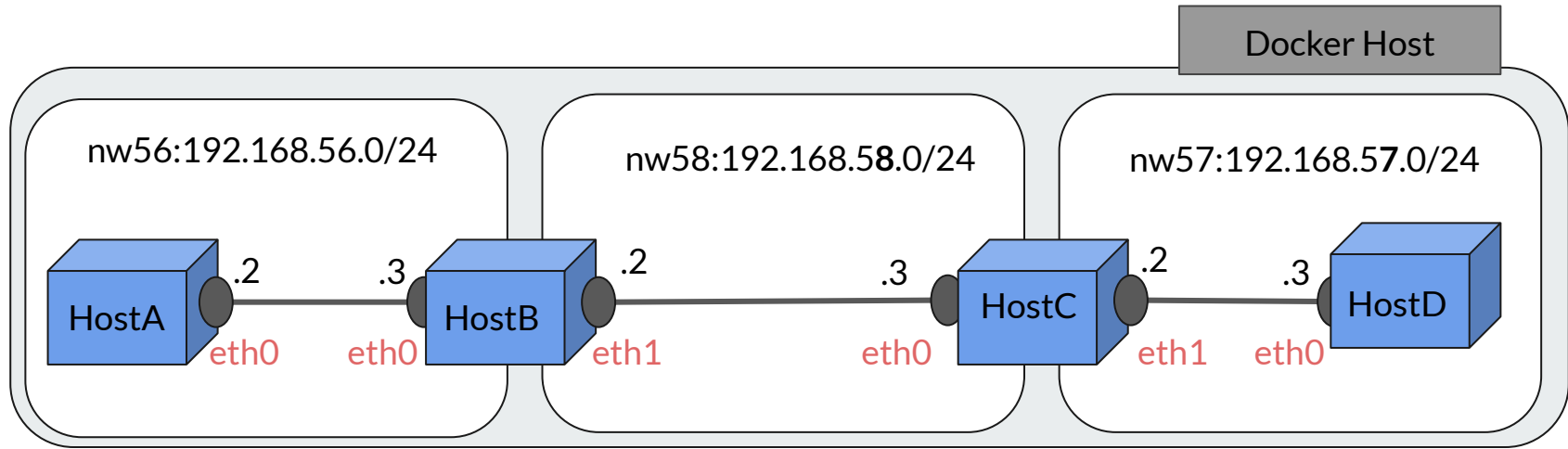
Assignment part:

1. Setting up the environment
2. Network topology for assignment

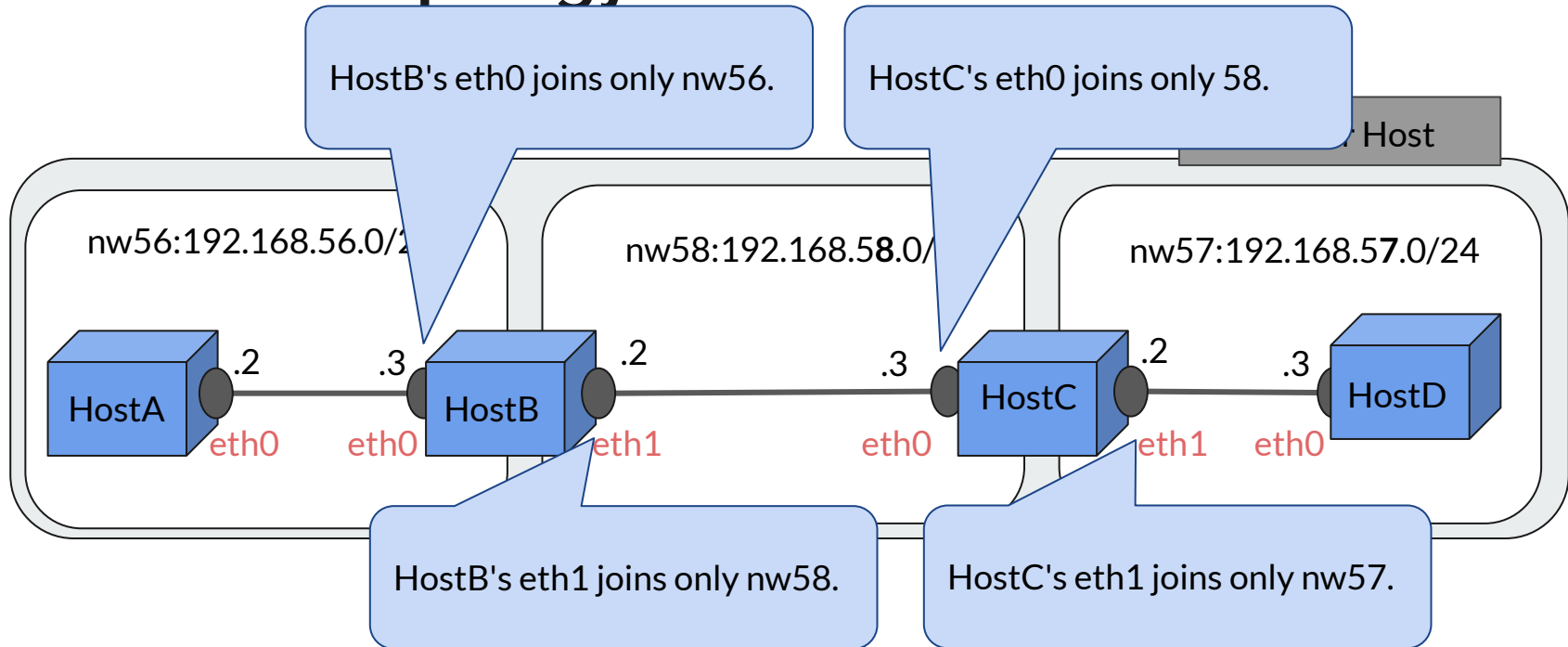
Knowledge part



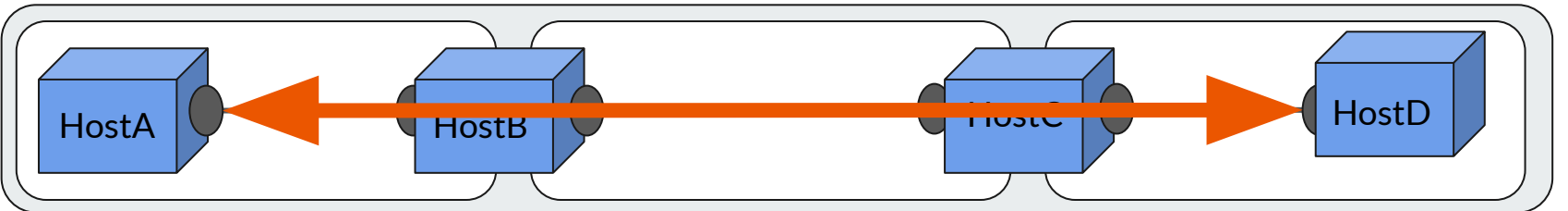
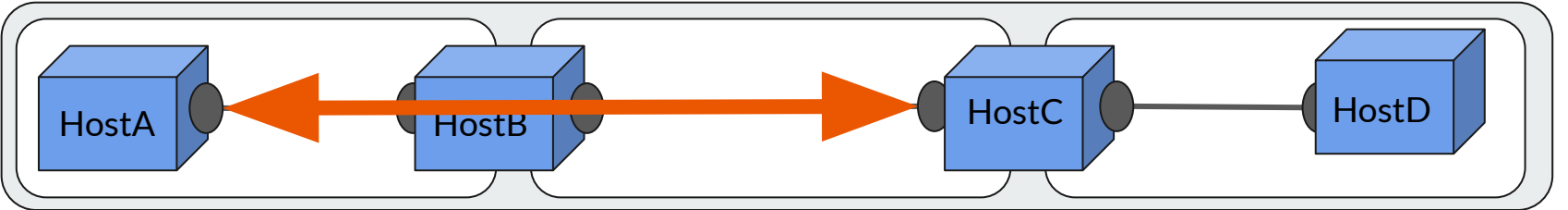
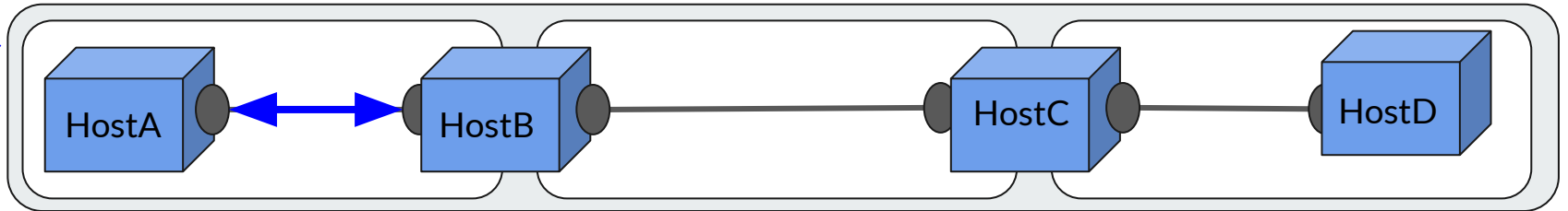
Network Topology



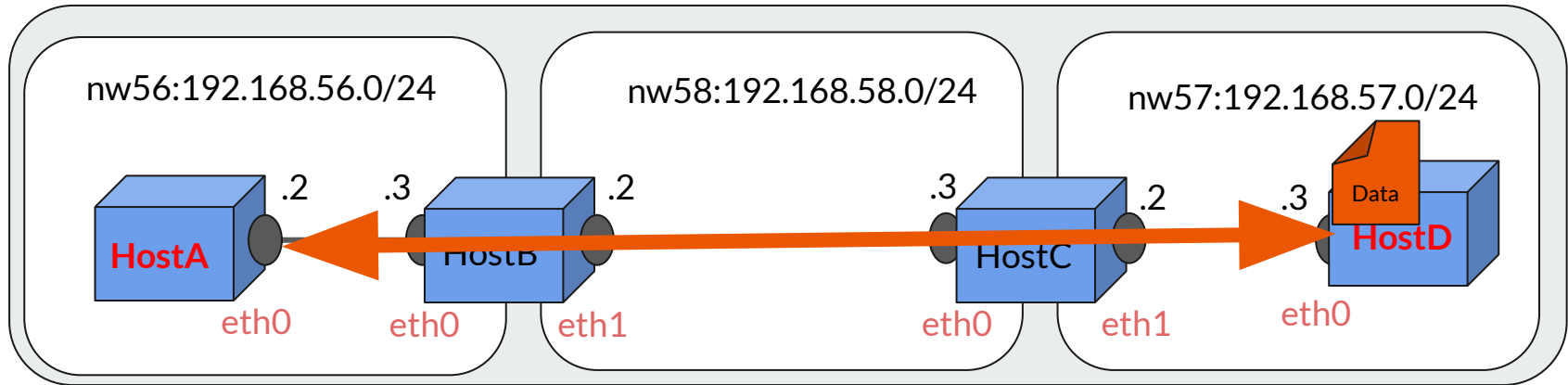
Network Topology



Currently Situation

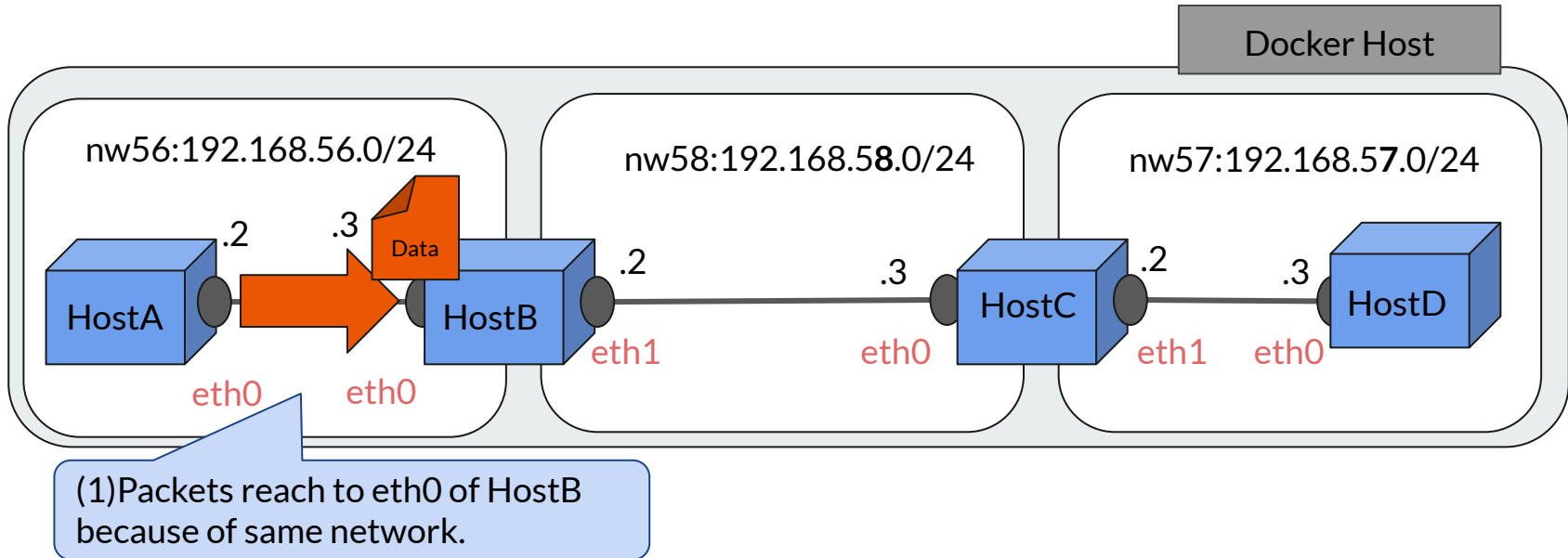


Goal : Connect between HostA and HostD

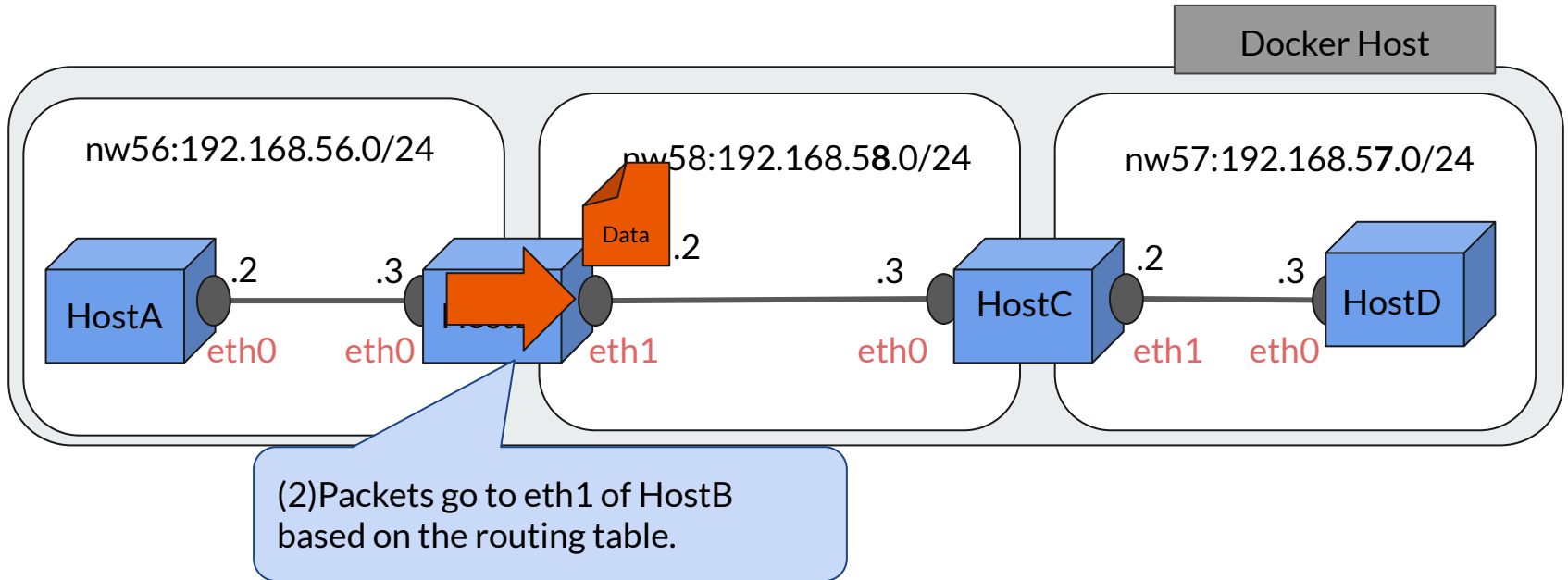


To deliver packets from HostA to HostD (even HostC), HostA has to know the route till HostD, and vice versa.

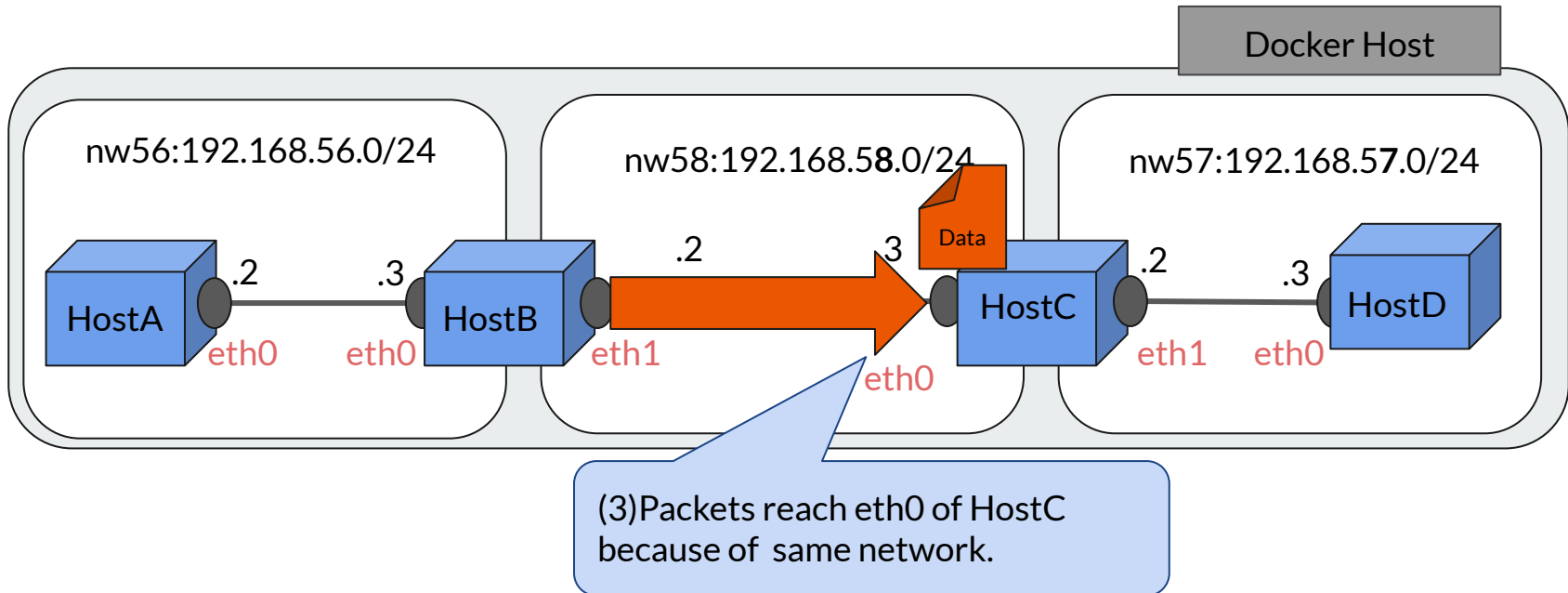
Deliver flow from HostA to HostD



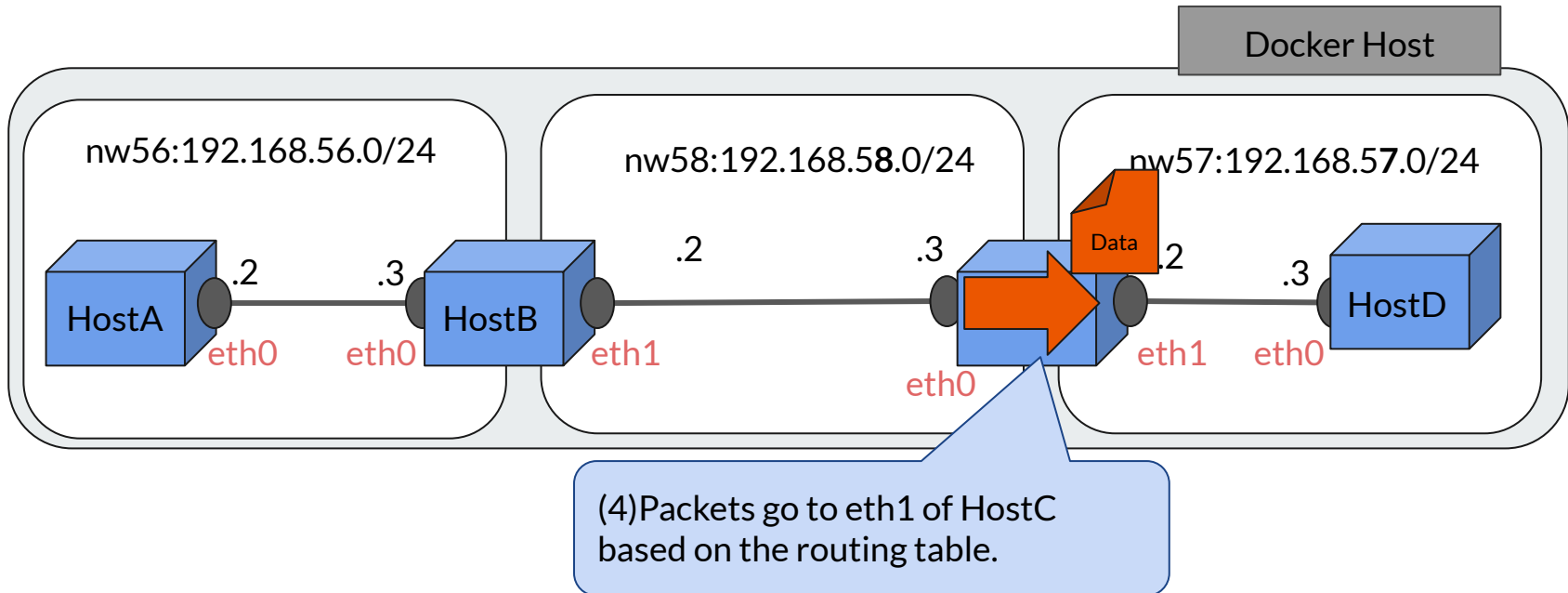
Deliver flow from HostA to HostD



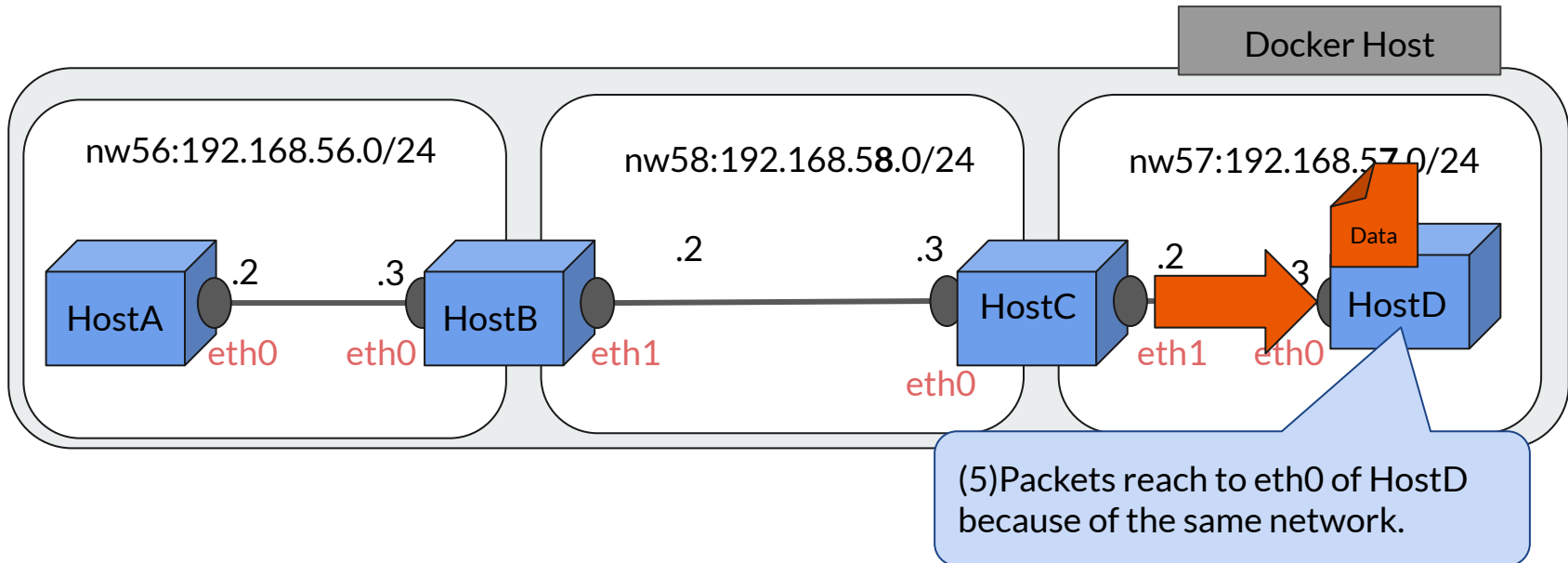
Deliver flow from HostA to HostD



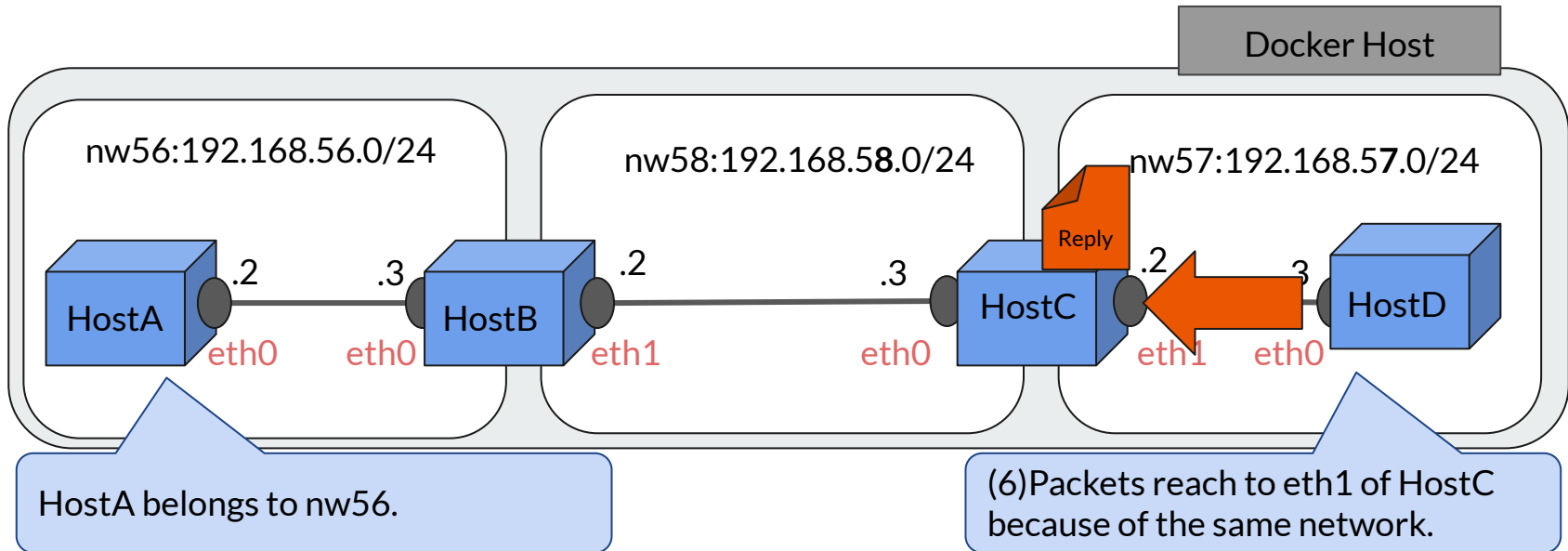
Deliver flow from HostA to HostD



Deliver flow from HostA to HostD



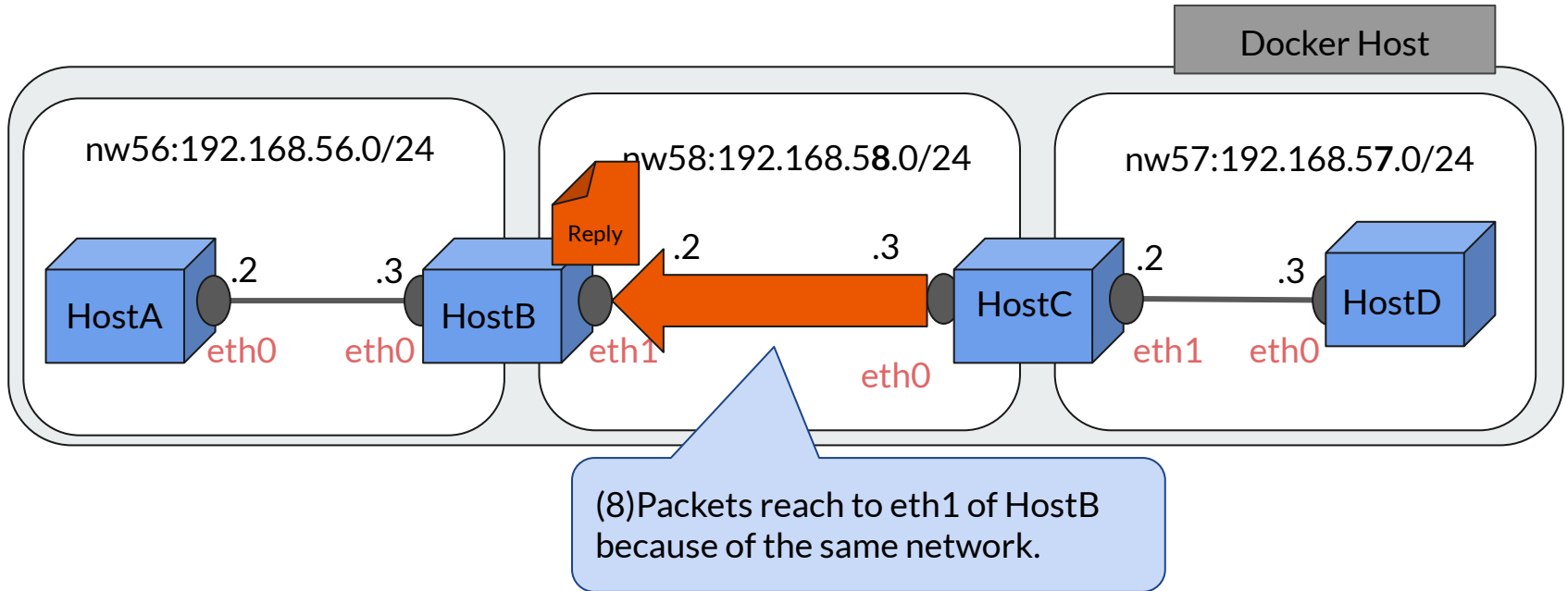
Response flow from HostD to HostA



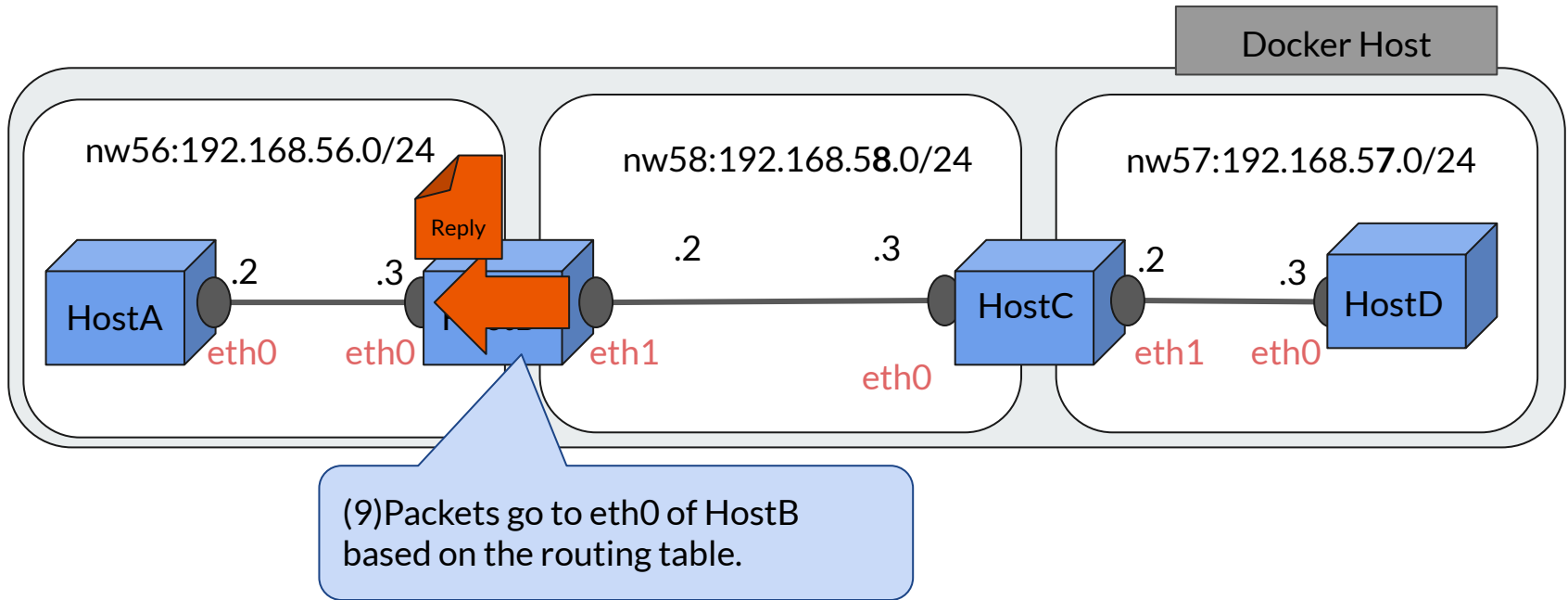
Response flow from HostD to HostA



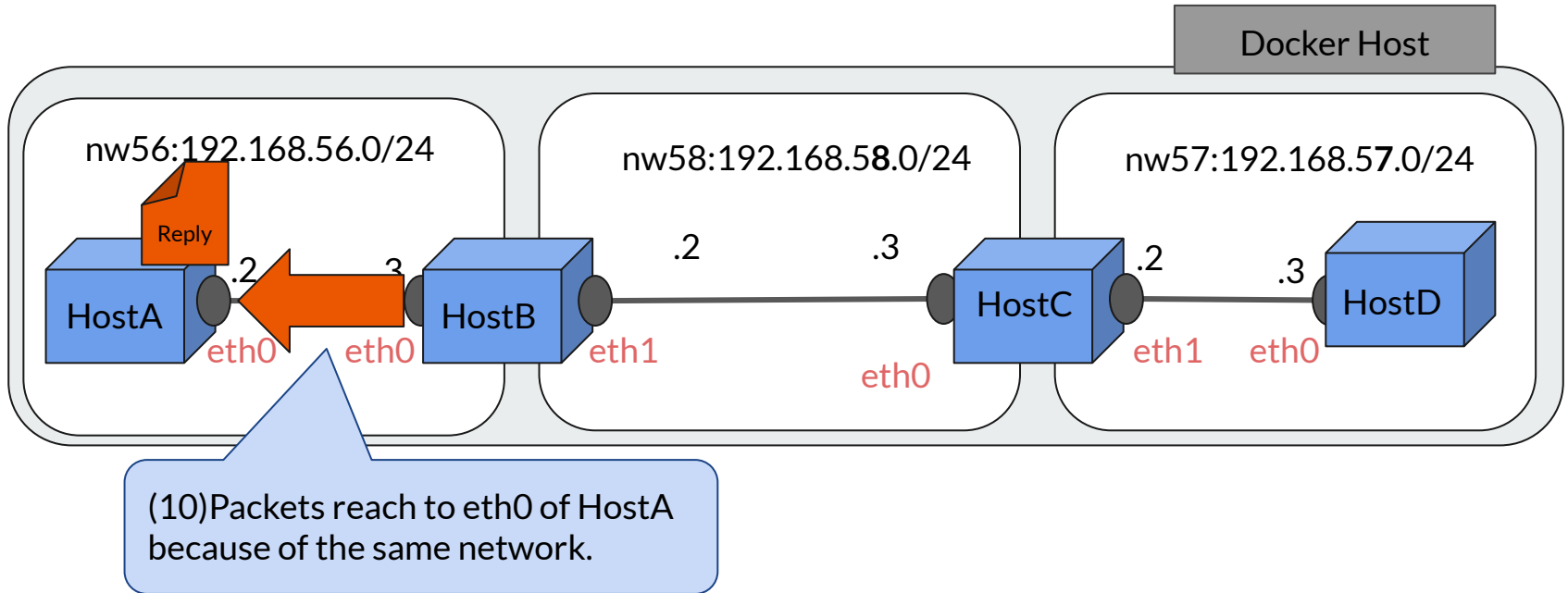
Response flow from HostD to HostA



Response flow from HostD to HostA



Response flow from HostD to HostA





Routing Table

host	destination address	Next Hop	
A	nw57 (192.168.57.0/24)	hostB (192.168.56.3)	-> p.9
B	nw57 (192.168.57.0/24)	hostC (192.168.58.3)	-> p.11
D	nw56 (192.168.56.0/24)	hostC (192.168.57.2)	-> p.14
C	nw56 (192.168.56.0/24)	hostB (192.168.58.2)	-> p.16



How to Make Static Route

We use **ip command** to route packets statically to the destination.

The way is as follows:

```
$ ip route add <destination address>/<netmask> via <next hop>
```

We see the example in [the next page](#).

BE CAREFUL!!!!!! If you stop the container, the changes will be REVERTED.

In other word, if you press CTRL-D or type `exit` command, you need to re-type `ip` command AGAIN.

If your host machine is restarted, the container will stop.

Procedure of Static Routing (Example)

host	destination address	Next Hop	
A	nw57 (192.168.57.0/24)	hostB (192.168.56.3)	-> p.9
B	nw57 (192.168.57.0/24)	hostC (192.168.58.3)	-> p.11
		hostC (192.168.57.2)	-> p.14
C	nw56 (192.168.56.0/24)	hostB (192.168.58.2)	-> p.16

We add this routing table statically.

Procedure of Static Routing (HostA-HostC)

\$ docker attach hostA

\$ sudo ip route add 192.168.57.0/24 via 192.168.56.3

```
ieng@ieng:~$ docker attach hostA
ieng@bb46dbffbfad:~$ ip r
default via 192.168.56.1 dev eth0
192.168.56.0/24 dev eth0 proto kernel
ieng@bb46dbffbfad:~$ sudo ip route add 192.168.57.0/24 via 192.168.56.3
[sudo] password for ieng:
ieng@bb46dbffbfad:~$ ip r
default via 192.168.56.1 dev eth0
192.168.56.0/24 dev eth0 proto kernel scope link src 192.168.56.2
192.168.57.0/24 via 192.168.56.3 dev eth0
ieng@bb46dbffbfad:~$
```

To see the entry of routing table

The password is ieng

`ip r` command shows the entry of the routing table.

The output is <destination address>/<netmask> via <next hop> dev <interface>.

Therefore, we can verify that 192.168.57.0/24's next hop is 192.168.56.3 and it was correctly added.



Procedure of Static Routing (HostA-HostC)

```
$ docker attach hostC
```

```
$ sudo ip route add 192.168.56.0/24 via 192.168.58.2
```

```
$ docker attach hostA
```

```
$ ping 192.168.58.3
```

```
ieng@3e92d4f86e27:~$ ping -c 3 192.168.58.3
PING 192.168.58.3 (192.168.58.3) 56(84) bytes of data.
64 bytes from 192.168.58.3: icmp_seq=1 ttl=63 time=0.305 ms
64 bytes from 192.168.58.3: icmp_seq=2 ttl=63 time=0.319 ms
64 bytes from 192.168.58.3: icmp_seq=3 ttl=63 time=0.319 ms

--- 192.168.58.3 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 122ms
rtt min/avg/max/mdev = 0.305/0.314/0.319/0.015 ms
```

Congratulations!!



Let's Add Another Routing Table!

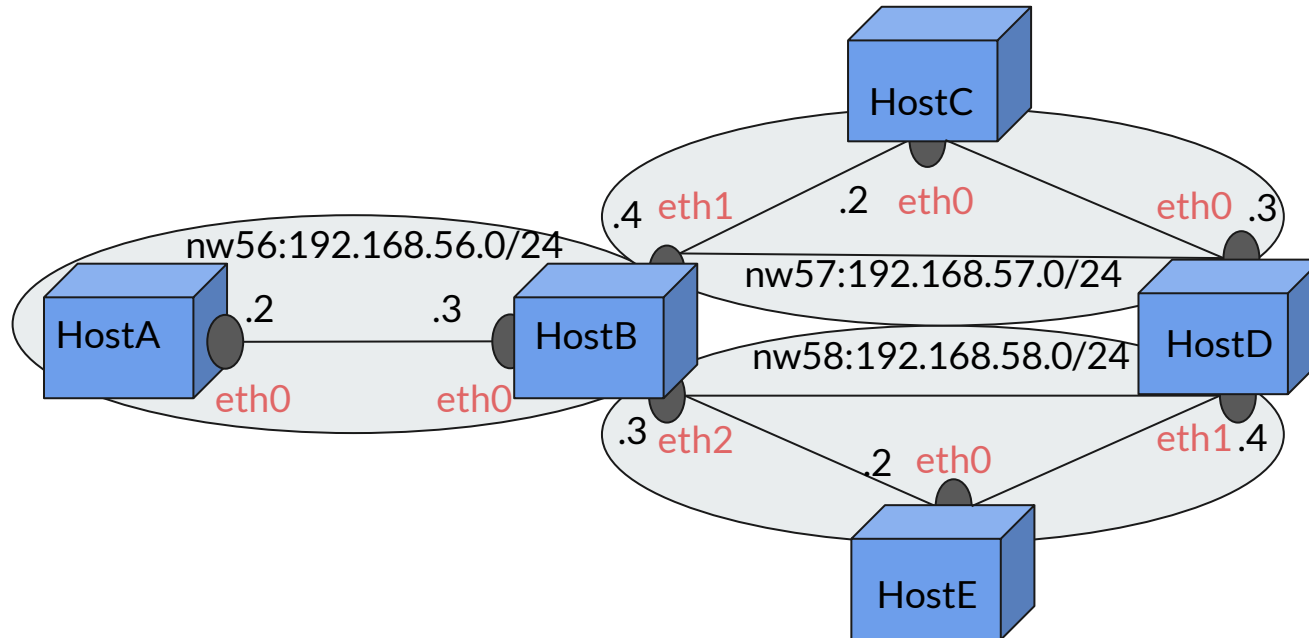
After you add ALL of routing tables, you can receive ICMP echo reply like as follows!

```
ieng@bb46dbffbfad:~$ ping -c 3 192.168.57.3
PING 192.168.57.3 (192.168.57.3) 56(84) bytes of data.
64 bytes from 192.168.57.3: icmp_seq=1 ttl=62 time=0.170 ms
64 bytes from 192.168.57.3: icmp_seq=2 ttl=62 time=0.136 ms
64 bytes from 192.168.57.3: icmp_seq=3 ttl=62 time=0.187 ms

--- 192.168.57.3 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 44ms
rtt min/avg/max/mdev = 0.136/0.164/0.187/0.023 ms
ieng@bb46dbffbfad:~$ █
```

Assignment part

Network Topology for assignment





The Cheat Sheet of Commands

- If you want to check the configure of the container

```
$ docker inspect <container name>
```

- If you want to check the configure of docker network

```
$ docker network inspect <network name>
```

- If you want to check the routing table

```
$ ip r (or $ ip route or $ ip route show...)
```

- If you want to delete the routing table

```
$ ip route del <destination network>/<netmask> via <next hop>
```