Experiential Learning Workshop on Networking

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Exploration Topics

- Summary:
  - OSI Layers, Queuing, IP Address
- Exercise 1
  - Catching up with previous exercises.
- IP Routing
- Exercise - 2
- Misc Content
- Summary

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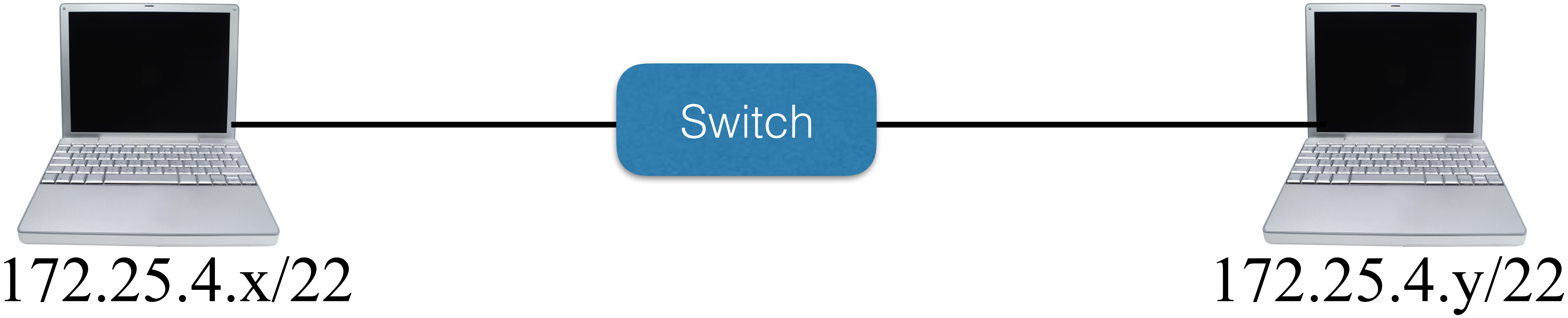
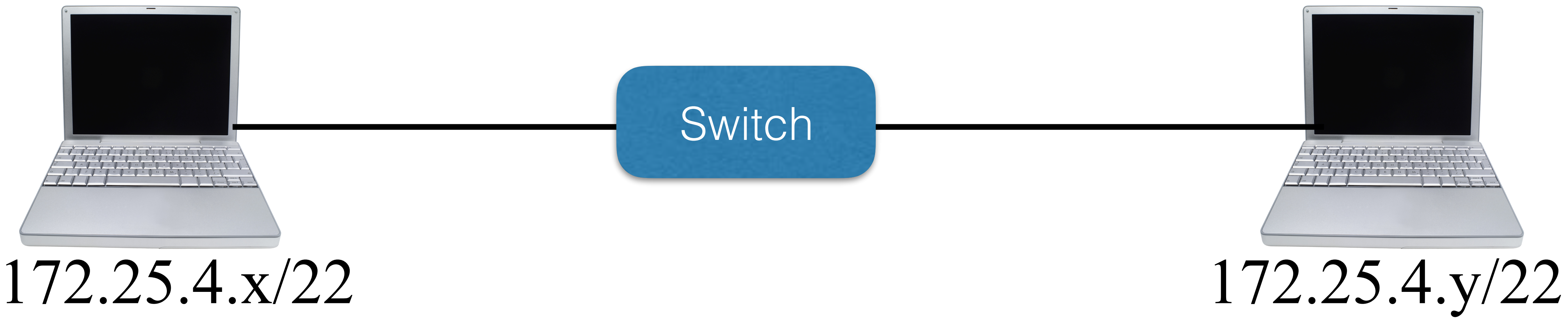
Queuing Delay: Case 4



- Run a server program (server.py)
  - It mimics processing (sleep) delay of N seconds
- Run the multiple invocations of client program.
- Note the delays in response
  - Each client will have different response time.
  - Corresponds to queueing delay

Addressing Queuing Delay: Case 5



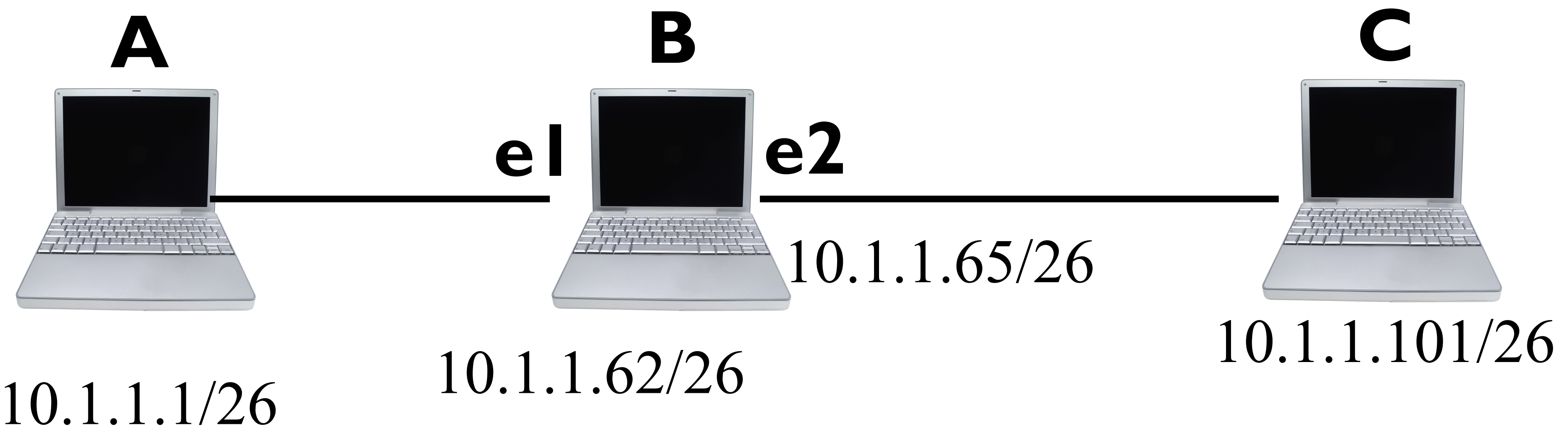
- Run a server program (serverQ.py)
  - It mimics processing (sleep) delay of N seconds
  - Run multiple instances of server program
- Run the multiple invocations of client program.
- Note the delays in response
  - Each client will talk to a different server.
  - No queueing delay

IP Addressing

- Assign IP Address to your machine
- Ping your neighbours
- Change your subnet
- See reachability
- Analyze IP packet header
- Change TTL
- Change default route.
- Access internet
- Assign ARP mapping
- access other hosts

IP Address Exercise - 3 (Routing)

- Connect 3 systems in following way
- Check connectivity
    - A can reach B (e1)
    - C can reach B (e2)
    - A can not reach C and vice versa
        - Requires routing



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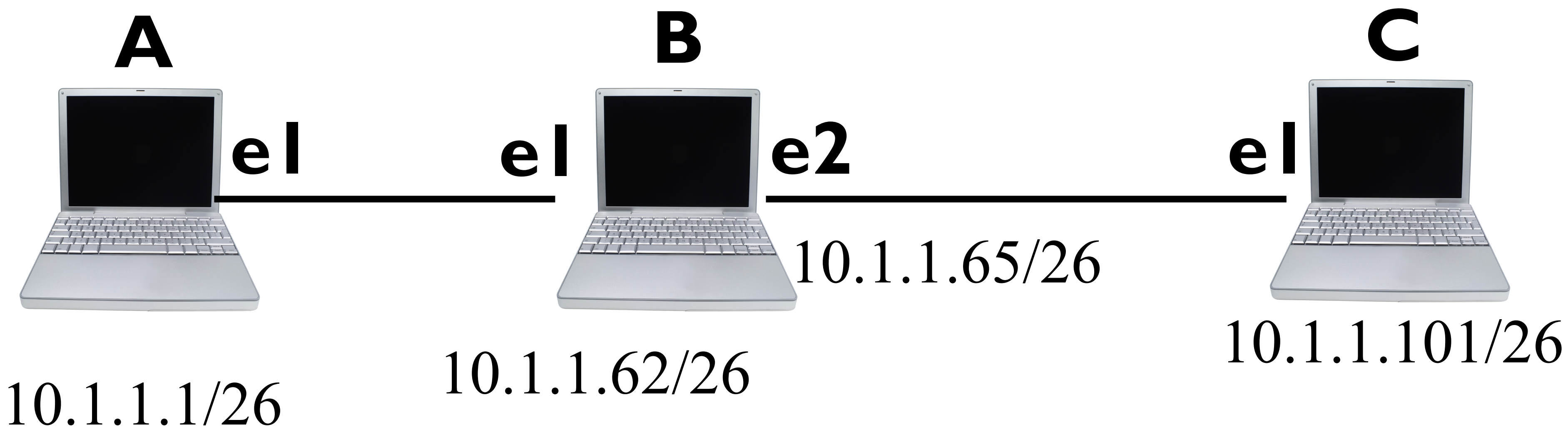
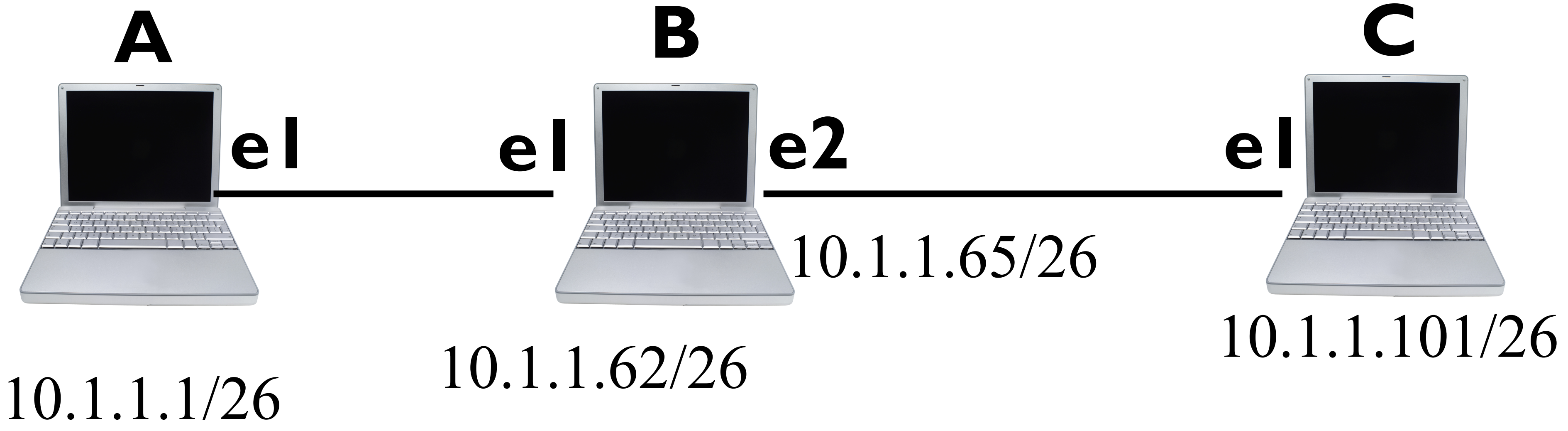
Routing Exercise - 4

- Connect 3 systems in following way
- Convert B into a router
  - `sudo sysctl -w net.ipv4.ip_forward=1`
- On A
  - `sudo ip route add 10.1.1.64/26 via 10.1.1.62`
- On C
  - `sudo ip route add 10.1.1.0/26 via 10.1.1.65`



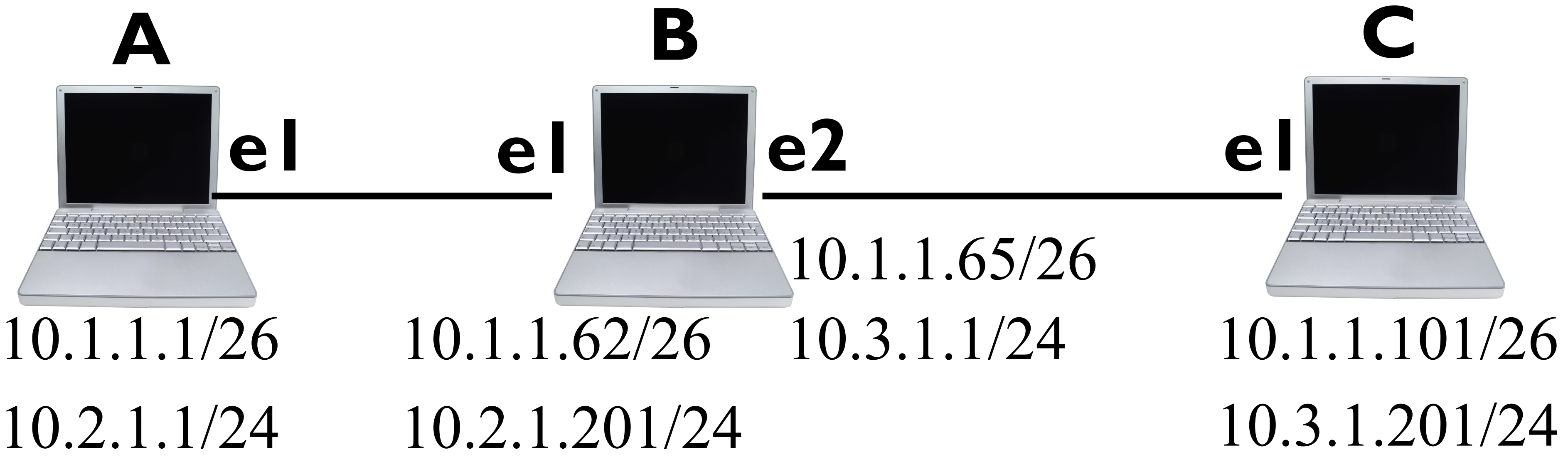
Routing Exercise - 4

- Do `nc` chat between A & C
- Do wireshark capture at A, and C
  - Identify the difference in Link layer headers
    - Note MAC Addresses
  - Identify the difference in Network Headers
    - Note TTL and Checksum values



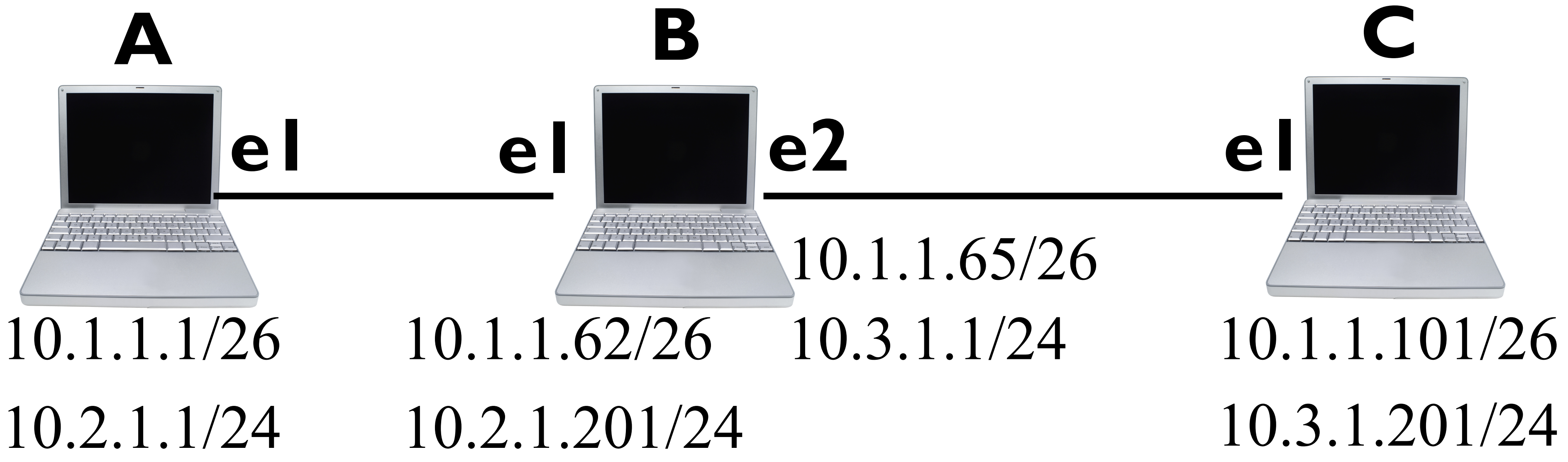
Routing Exercise - 5a

- Add additional IP addresses to A, B & C as follows.
  - A :`10.2.1.1/24`
    - `sudo ip addr add 10.2.1.1/24 dev` <e1>
  - B(e1) :`10.2.1.201/24`
  - B(e2): `10.3.1.1/24`
  - C :`10.3.1.201/24`
- Define routing and check reachability of A & C



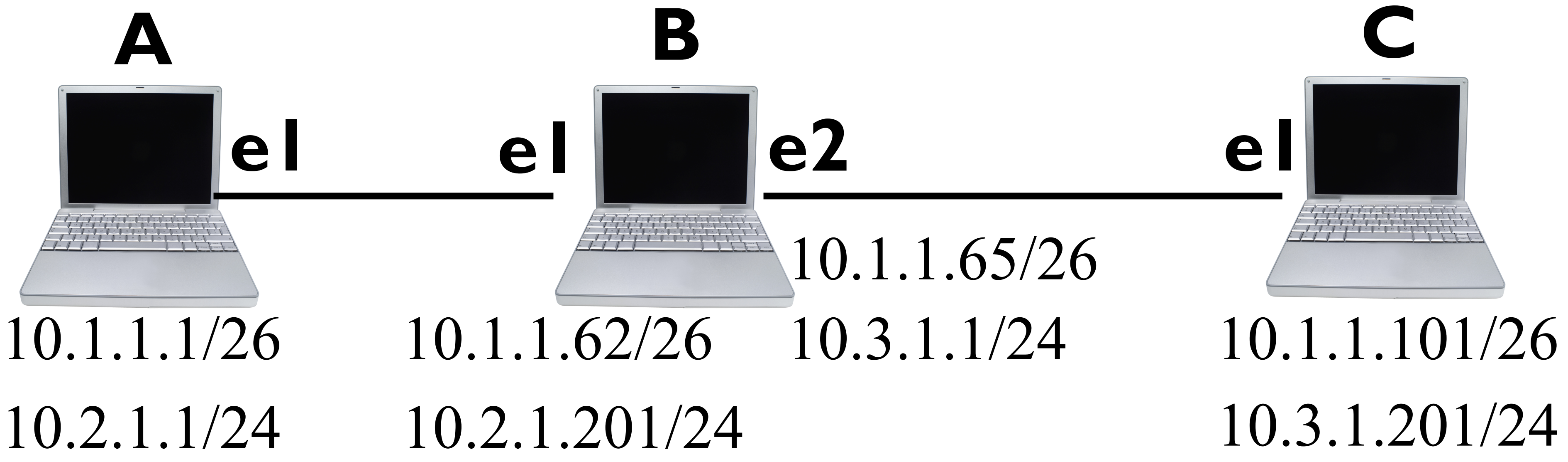
Routing Exercise - 5a

- Define routing to check reachability of A & C
- Do `nc` chat between A & C(`10.3.1.201`)
  - On C, do `nc -l 10.3.1.201 12345`
  - On A, do `nc 10.3.1.201 12345`
- Do wireshark capture at A & C
  - What is the source IP address?



Routing Exercise - 5b

- From A using 10.1.1.1, ping C(`10.3.1.201`)
  - `ping -I 10.1.1.1 10.3.1.201`
- Analyze what happens using wireshark capture
- On C, run `nc -u –l 22222`
- On A, chat `nc u –s 10.1.1.1 10.3.1.201 22222`
- Analyze with wireshark



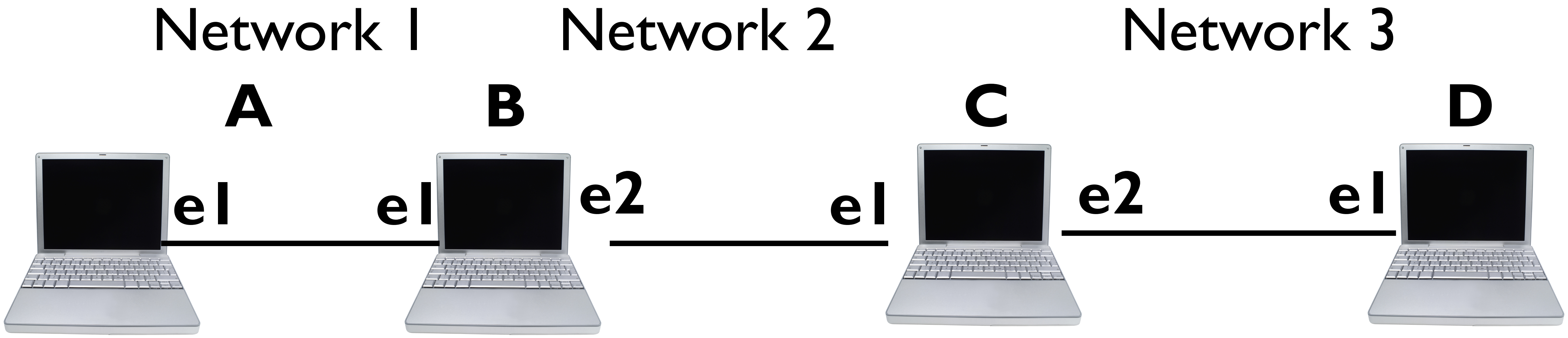
A
e1
10.1.1.1/26
10.2.1.1/24

B
e1
10.1.1.62/26
10.2.1.201/24
e2
10.1.1.65/26
10.3.1.1/24

C
e1
10.1.1.101/26
10.3.1.201/24

Routing Exercise - 6a

- Connect 4 systems in following way
- Convert B & C into router
- Assign your IP Addresses (3 networks)
- Define routing appropriately
- Check reachability from each one to each other



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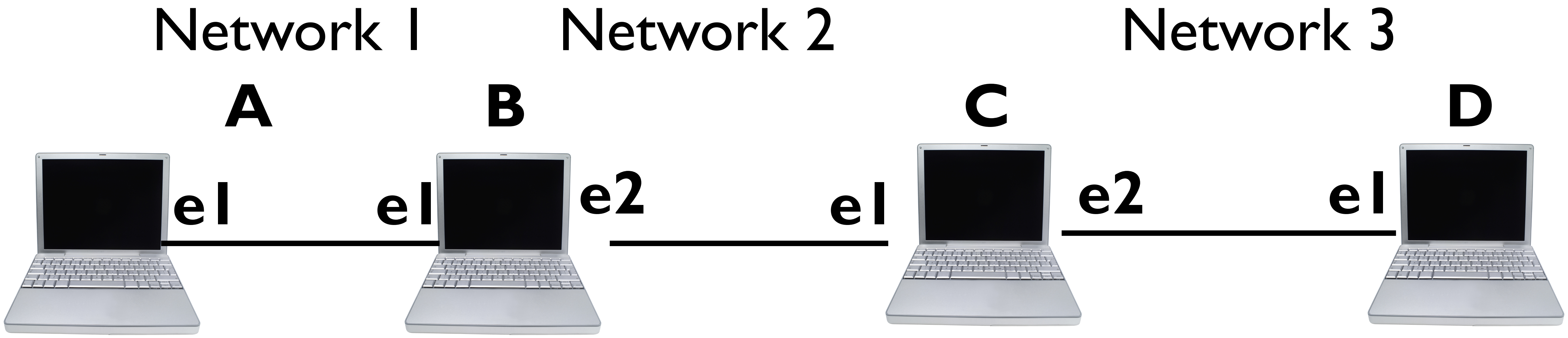
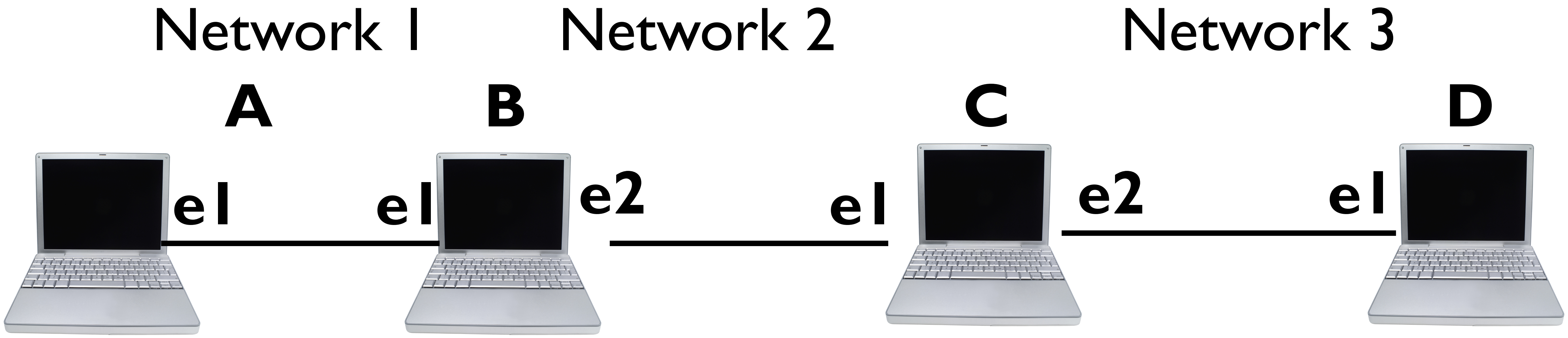
Routing Exercise - 6b

- On A, define routing for network 3 only
  - Do not define routing for network 2
- On C, define routing for network 1 only
  - Do not define routing for network 2
- Check reachability between A to D
  - Can A & C also communicate
  - Can D & B also communicate



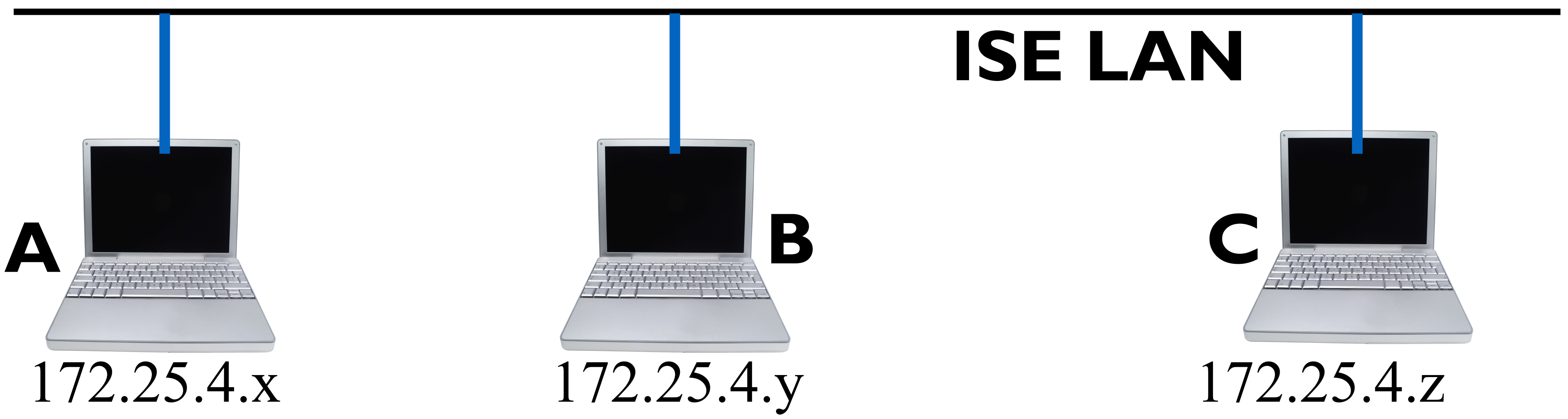
Routing Exercise - 7 (MITM)

- Let A & D chat (using nc)
- Do wireshark capture on B and C
  - Can you see the communication between A & D



Exercise - 8 (MITM)

- Restore connectivity to as before in the lab.
  - Note B is not a router any more
- Should get IP Address 172.25.4.x/22
- Note down your default router
  - `$ip route show`
- Objective::When A & C communicate, B can snoop
- Use ARP Spoofing to fool A & C go via B



Exercise - 8 MITM Contd.

- Convert B into a router
  - `sudo sysctl -w net.ipv4.ip_forward=1`
- Insstall ARP Sniffer on B
  - `sudo apt-get install dsniff`
- Issue ARP Spoof command on B for A & C
  - `arpspoof -i` <e1> `-t <`Address of A> `-r` <Address of C>
- Run wireshark on B for IP address of A & C
  - capture filter: `host` <A> `or host` <C>
- Let A & C chat
- Read the chat in wireshark on B.

Thank You