Midterm review

CSE 461

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Virtual Circuit Model

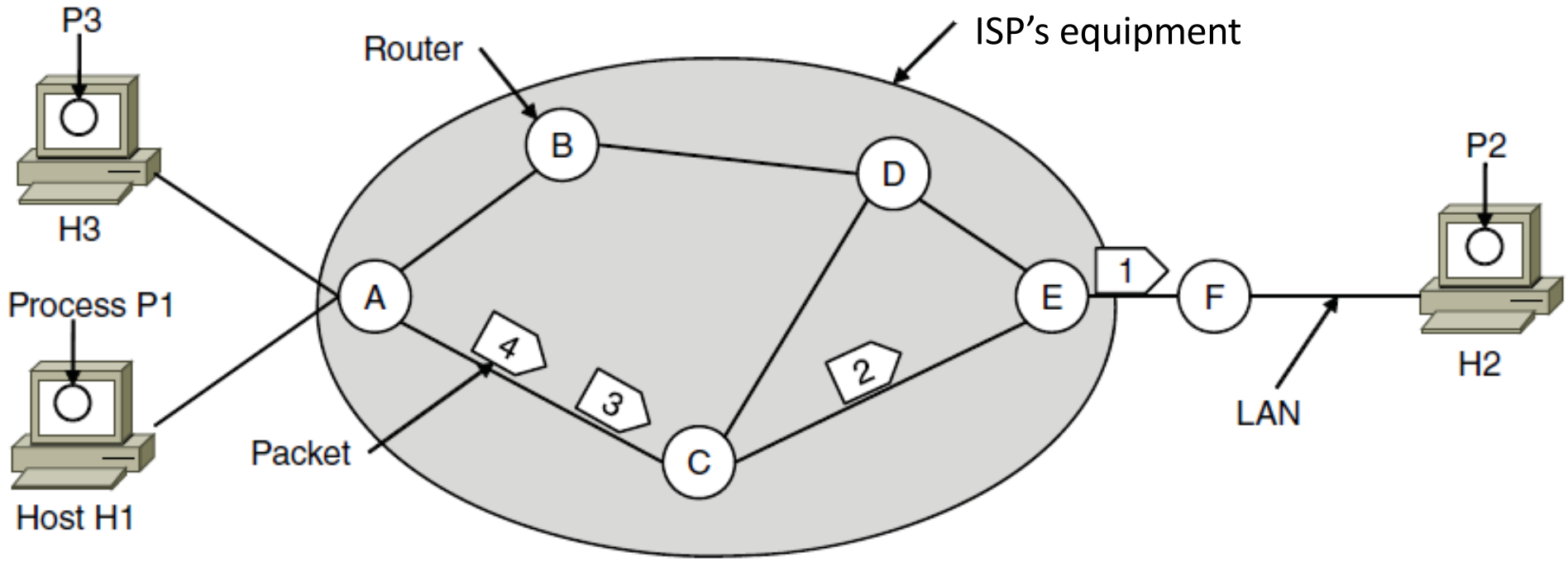
Three phases:

1. Connection establishment, circuit is set up
   - Path is chosen, circuit information stored in routers
2. Data transfer, circuit is used
   - Packets are forwarded along the path
3. Connection teardown, circuit is deleted
   - Circuit information is removed from routers

Virtual Circuits

Packets contain a short label to identify the circuit

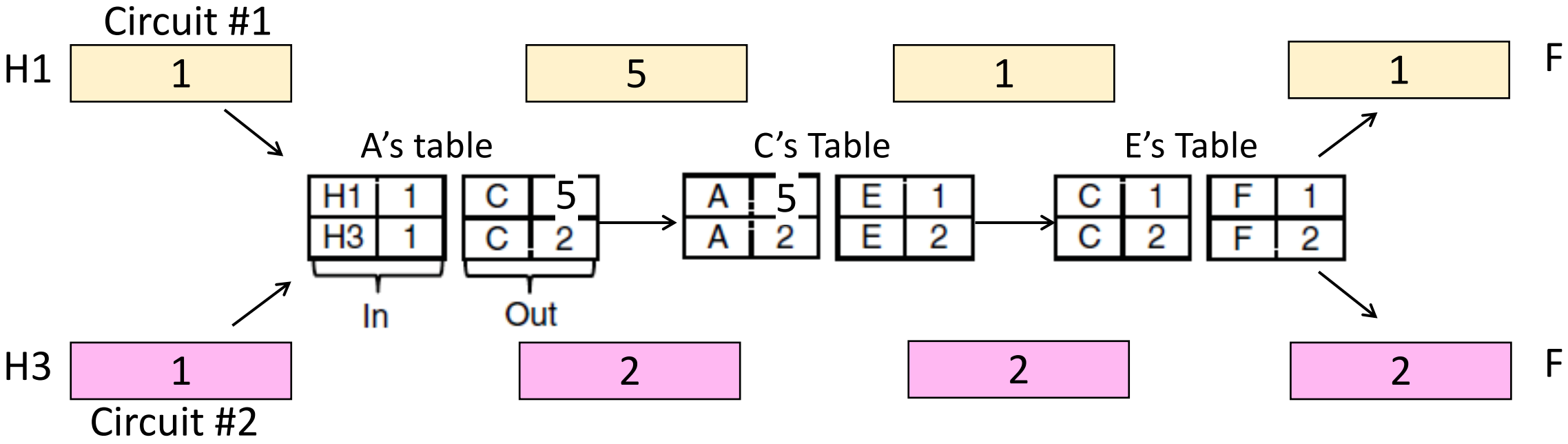
- Labels are unique for a link



Virtual Circuits (2)

Each router has a forwarding table keyed by circuit

- Gives output line and next label to place on packet



Sequence number space for Go-back-N

Sequence space should be W + 1

1. Sender sends packets 1…W
2. Receiver gets the first packet sends the ack
3. Acks is lost
4. Sender retransmits 1

➔ Receiver must distinguish this case from acks is not lost and sender sends W+1

Sequence number space for selective repeat

Sequence space should be at at least 2W

1. Send sends sequences packets 1…W
2. Receiver gets them all and sends acks, starts expecting W+1…2W
3. All acks are lost
4. Sender retransmits 1…W

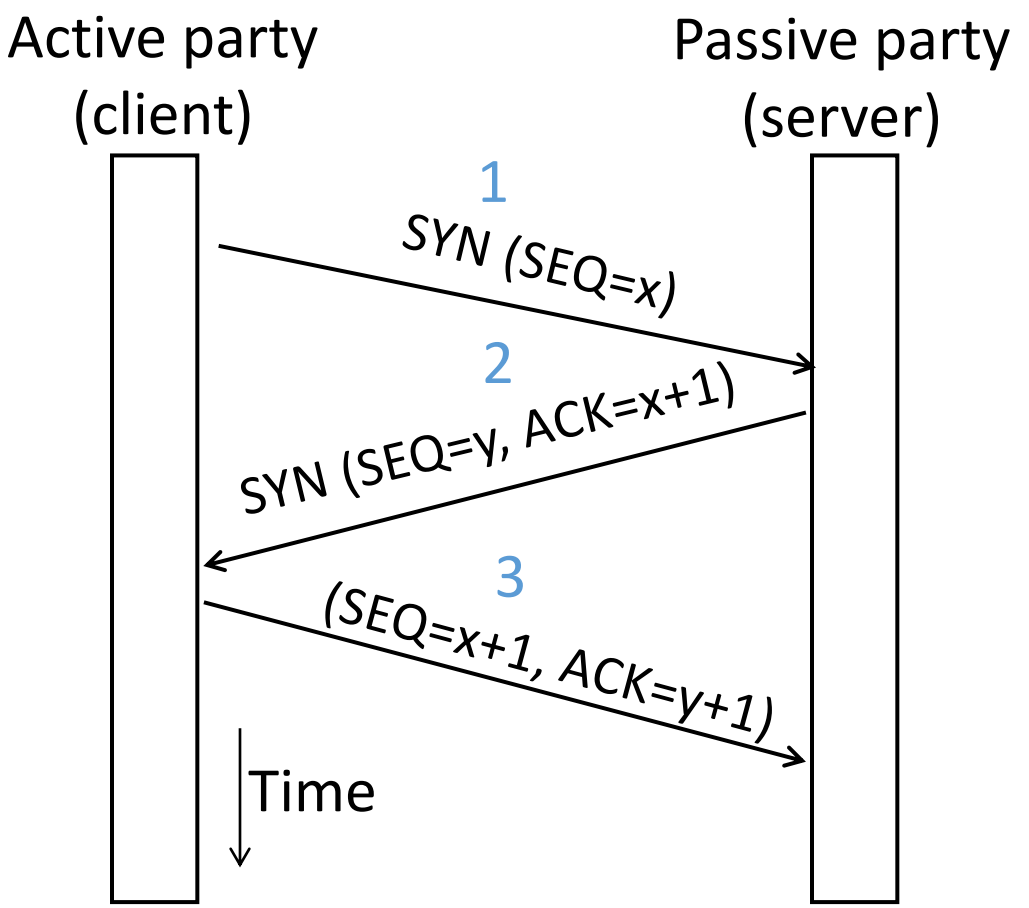
➔ Receiver must distinguish this case from acks are not lost and sender sends W+1…2W

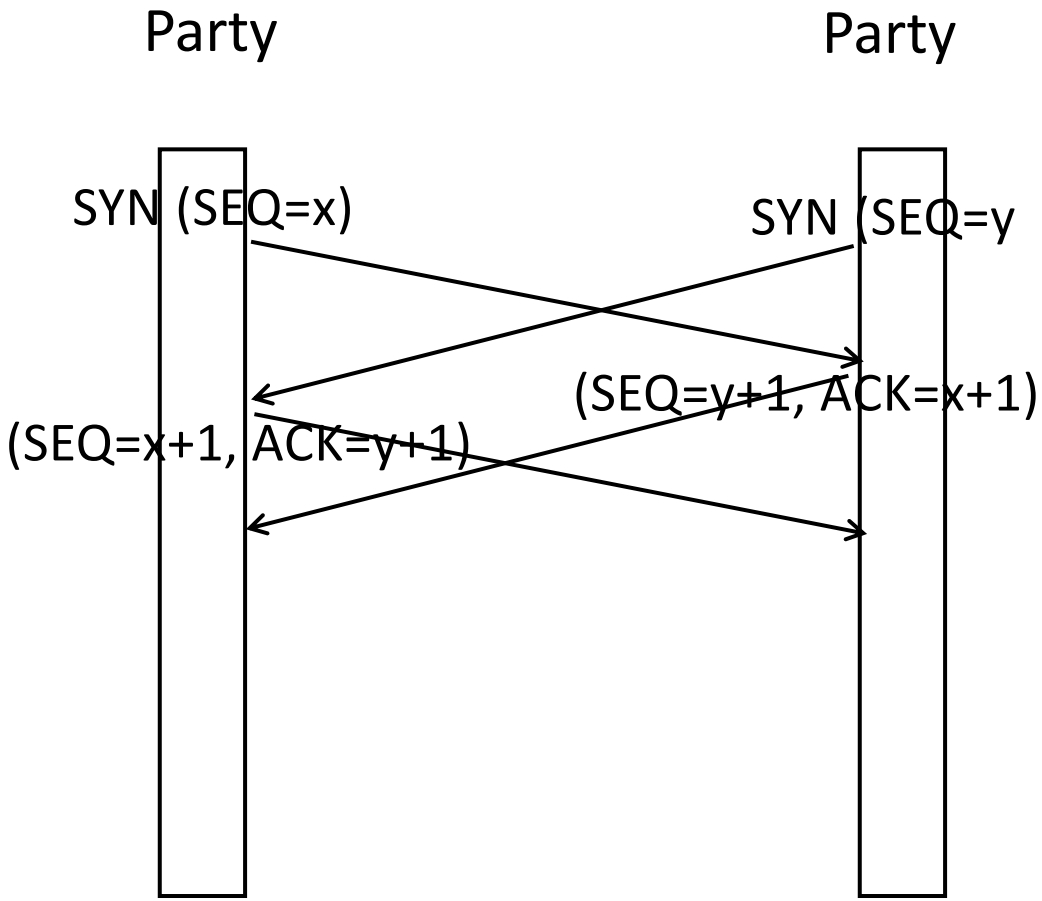
Longest-prefix matching

10.1.1.0/24	A
10.1.2.0/24	B
10.1.0.0/16	C

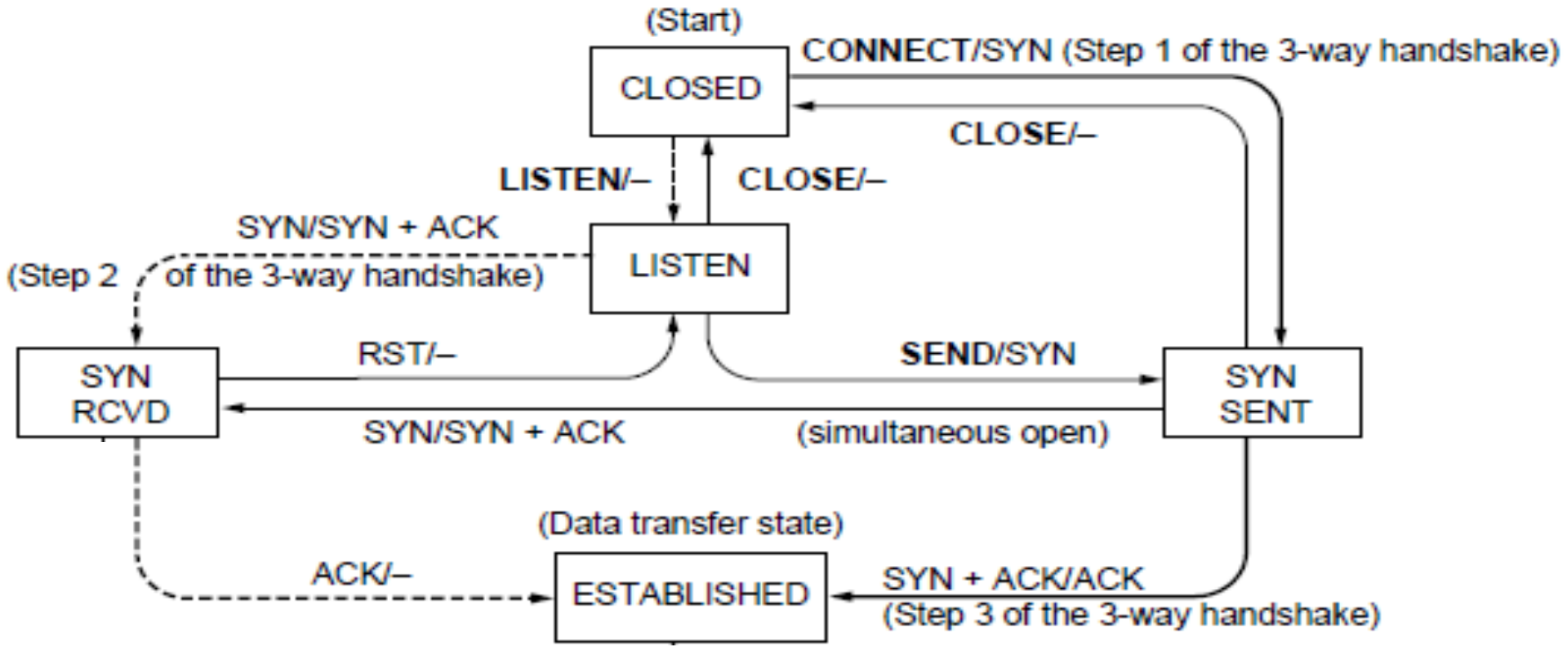
10.3.3.3 → DROP
10.1.2.3 → B
10.1.1.3 → A
10.1.3.3 → C

TCP handshake and simultaneous open

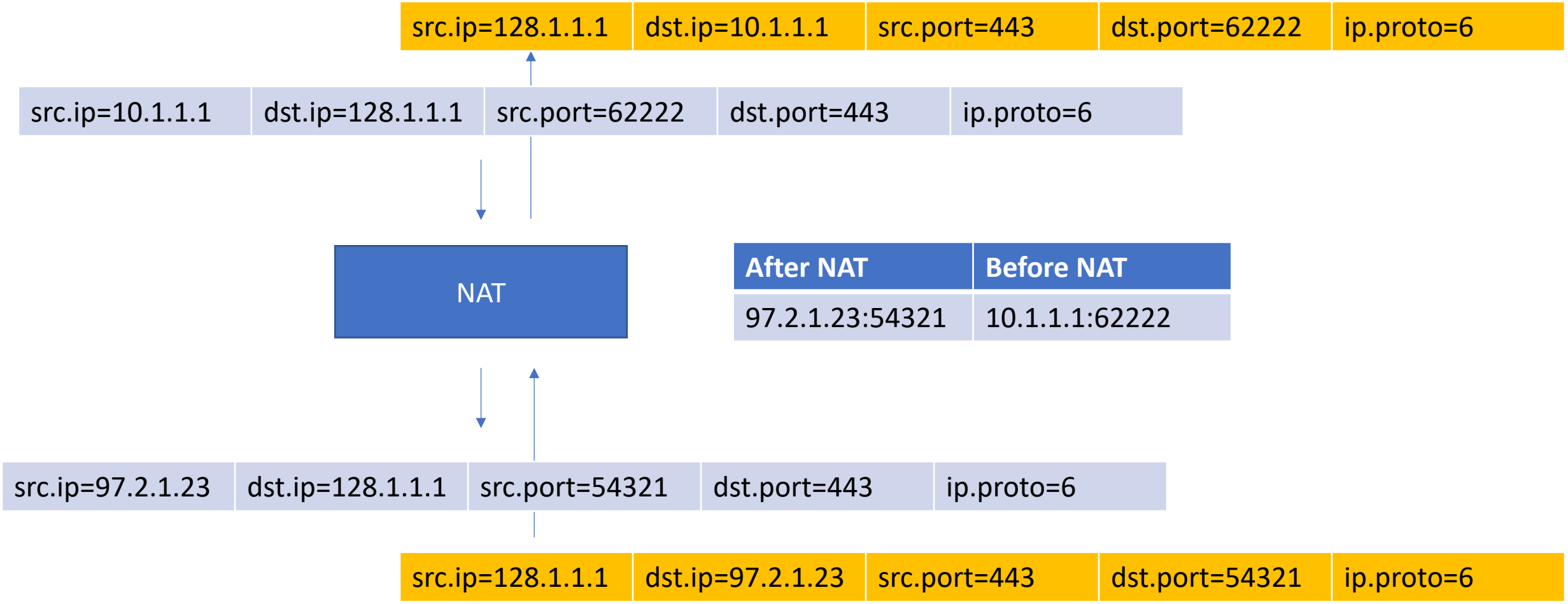




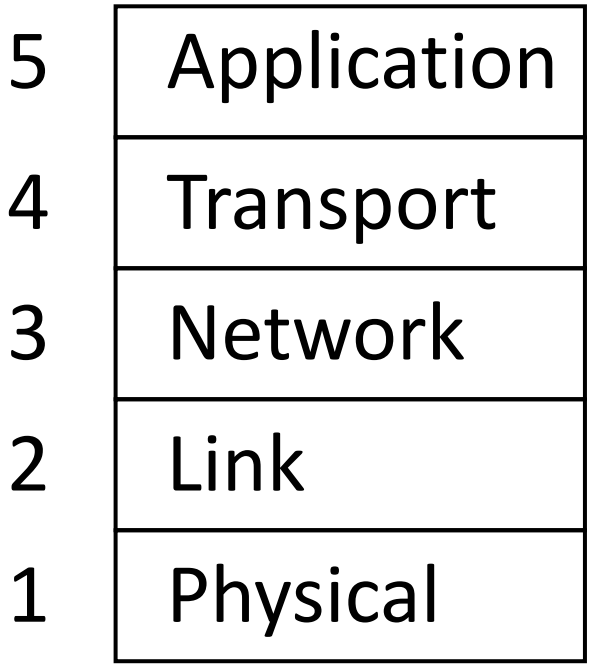
TCP handshake and simultaneous open



NATs


src.ip=128.1.1.1
dst.ip=10.1.1.1
src.port=443
dst.port=62222
ip.proto=6
src.ip=10.1.1.1
dst.ip=128.1.1.1
src.port=62222
dst.port=443
ip.proto=6
NAT
After NAT
Before NAT
97.2.1.23:54321
10.1.1.1:62222
src.ip=97.2.1.23
dst.ip=128.1.1.1
src.port=54321
dst.port=443
ip.proto=6
src.ip=128.1.1.1
dst.ip=97.2.1.23
src.port=443
dst.port=54321
ip.proto=6

Protocols and layers



What is the function of each layer?
Example protocols in each?
What are the (dis)advantages of layering?

Transport layer

1. What abstractions are provided by UDP and TCP?
2. What the key elements of TCP flow control?
3. What is a key property of AIMD control?
4. How does TCP figure out the right window size?

Network layer

- How do we circumvent address space exhaustion in the Internet?
- How does traceroute work?
- Name some techniques used to scale routing

Routing

- What problems are distance vector and link state routing solving?
  - Do they compute identical paths?
  - What are the key differences between the two?
- How does BGP differ from shortest-path routing?
- How is policy expressed in BGP?
- What is ECMP and how is it implemented?