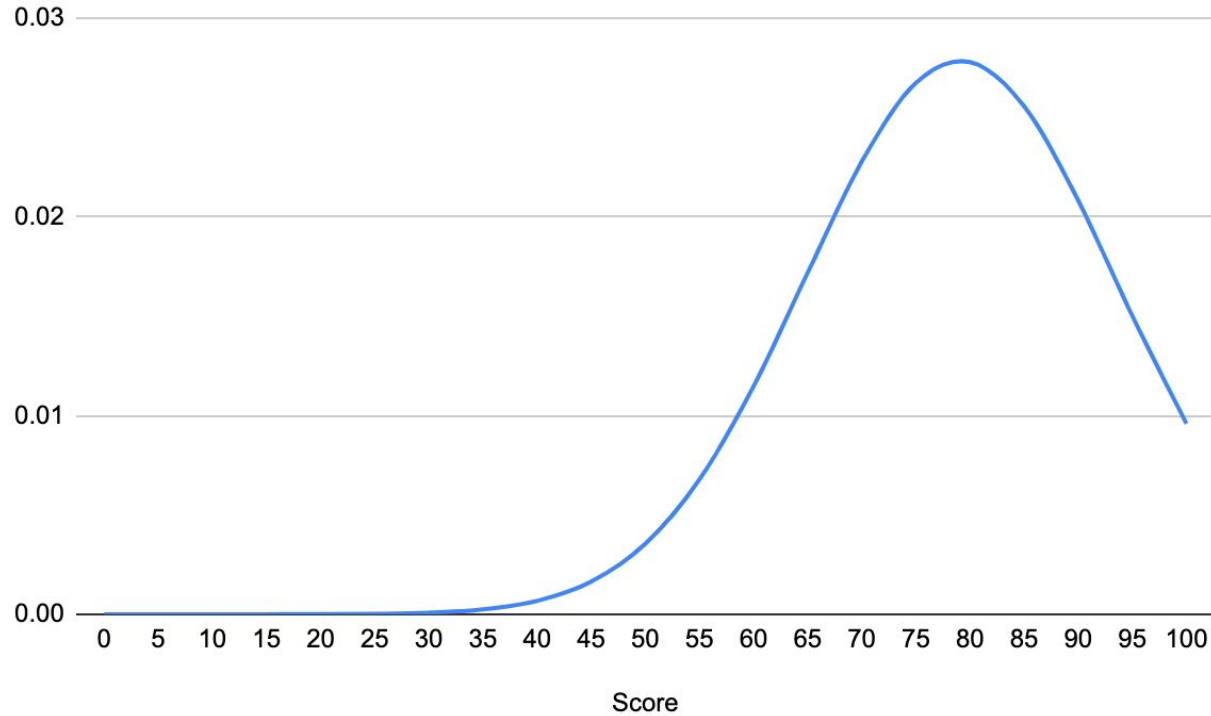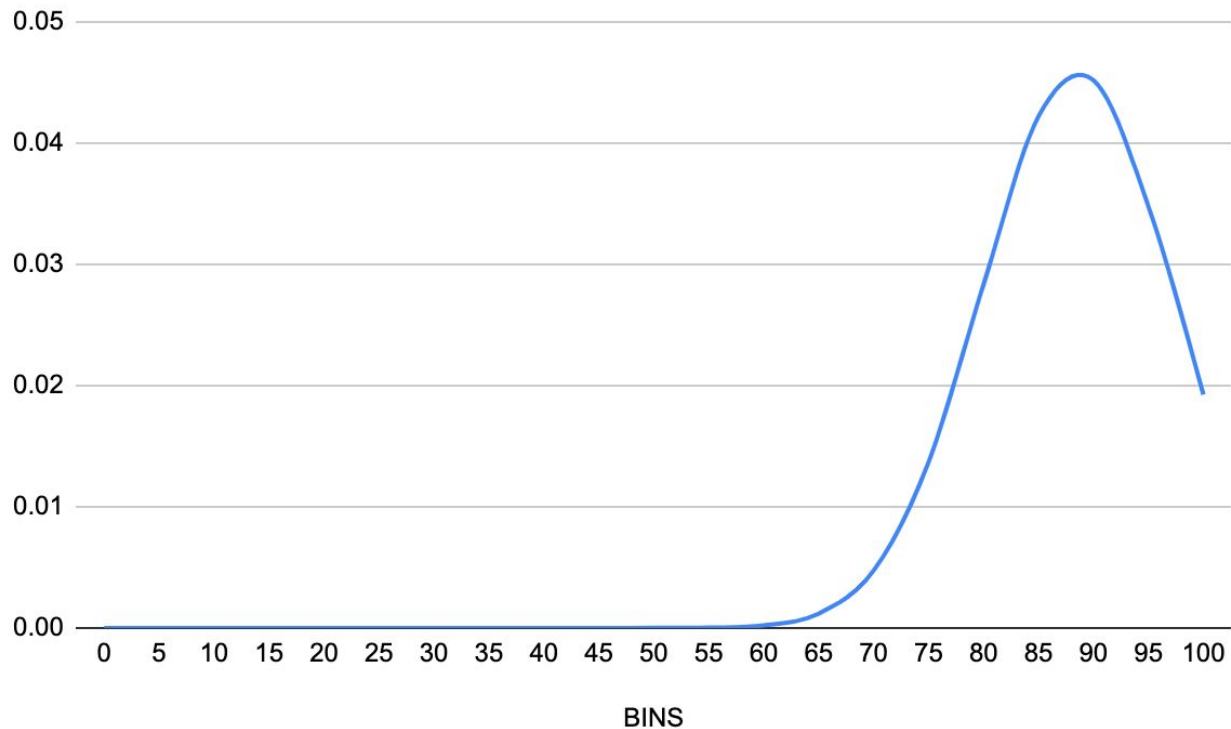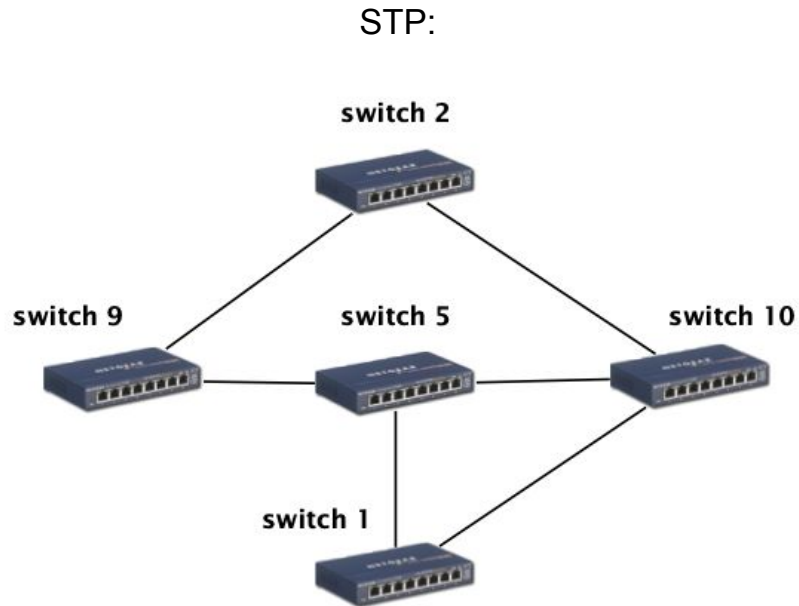# Midterm Review

Midterm raw score distribution

Midterm adjusted score distribution (sqrt of score * 10)

If A-B-C is not the shortest path for A to reach C, then A-B-C-D-E *cannot* be the shortest path for A to reach E.

STP:

switch 2

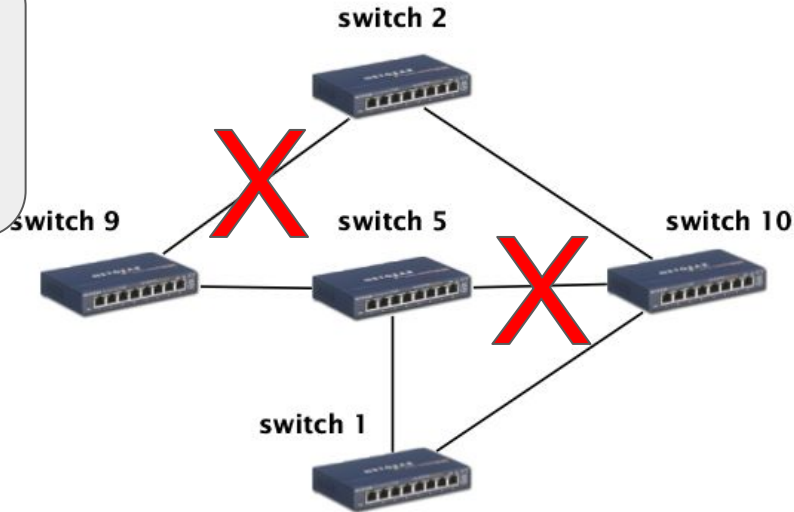**switch 9**   **switch 5**   **switch 10**

switch 1

If A-B-C is not the shortest path for A to reach C, then A-B-C-D-E *cannot* be the shortest path for A to reach E.
TRUE

STP:

[2,9] and [2, 10] are not equal as hop count is more important than switch ID

switch 2

switch 9   switch 5   switch 10

switch 1

Original		NEW	
Prefix	Next Hop	Prefix	Next Hop
80.160.0.0/16	1		
80.161.0.0/16	1		
80.162.0.0/16	5		
80.163.0.0/16	1		
80.164.0.0/16	1		
80.165.0.0/16	6		
80.166.0.0/16	6		
80.167.0.0/16	1		
80.168.0.0/16	2		
80.169.0.0/16	2		
80.170.0.0/16	2		
80.171.0.0/16	2		
80.172.0.0/16	1		
80.173.0.0/16	4		
80.174.0.0/16	3		
80.175.0.0/16	3		

Original		NEW	
Prefix	Next Hop	Prefix	Next Hop
80.160.0.0/16	1	0.0.0.0/0	1
80.161.0.0/16	1	80.162.0.0/16	5
80.162.0.0/16	5	80.165.0.0/16	6
80.163.0.0/16	1	80.166.0.0/16	6
80.164.0.0/16	1	80.173.0.0/16	4
80.165.0.0/16	6	80.174.0.0/15	3
80.166.0.0/16	6	80.168.0.0/14	2
80.167.0.0/16	1		
80.168.0.0/16	2		
80.169.0.0/16	2		
80.170.0.0/16	2		
80.171.0.0/16	2		
80.172.0.0/16	1		
80.173.0.0/16	4		
80.174.0.0/16	3		
80.175.0.0/16	3		

IP: 81.0.0.2/24
GW: 81.0.0.1
MAC: 00:C2

IP: 192.168.1.1/24
MAC: 00:A2

IP: 20.0.0.2/30
MAC: 00:B2

host 1

link A   link B   link C

NAT
IP router

IP Router

host 2

IP: 192.168.1.10/24
GW: 192.168.1.1
MAC: 00:A1

IP: 20.0.0.1/30
MAC: 00:B1

IP: 81.0.0.1/24
MAC: 00:C1
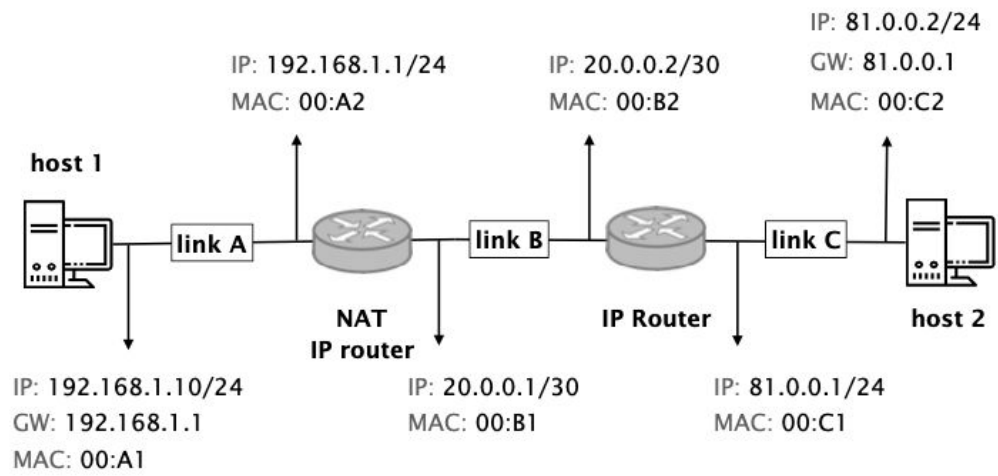
	Src MAC	Dst MAC	Src IP	Dst IP	Src TCP port	Dst TCP port
From host 1 to host 2						
Link A						
Link B						
Link C						
From host 2 to host 1						
Link C						
Link B						
Link A						

IP: 81.0.0.2/24
GW: 81.0.0.1
MAC: 00:C2

IP: 192.168.1.1/24
MAC: 00:A2

IP: 20.0.0.2/30
MAC: 00:B2

host 1

link A

link B

link C

host 2

NAT
IP router

IP Router

IP: 192.168.1.10/24
GW: 192.168.1.1
MAC: 00:A1

IP: 20.0.0.1/30
MAC: 00:B1

IP: 81.0.0.1/24
MAC: 00:C1
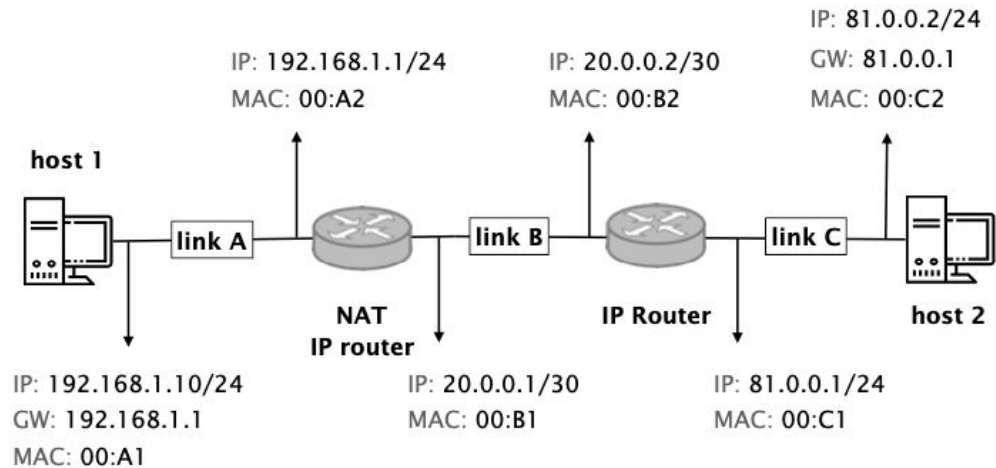
	Src MAC	Dst MAC	Src IP	Dst IP	Src TCP port	Dst TCP port
From host 1 to host 2						
Link A	00:A1	00:A2	192.168.1.10	81.0.0.2	1337	80
Link B	00:B1	00:B2	20.0.0.1	81.0.0.2	1337	80
Link C	00:C1	00:C2	20.0.0.1	81.0.0.2	1337	80
From host 2 to host 1						
Link C	00:C2	00:C1	81.0.0.2	20.0.0.1	80	1337
Link B	00:B2	00:B1	81.0.0.2	20.0.0.1	80	1337
Link A	00:A2	00:A1	81.0.0.2	192.168.1.10	80	1337
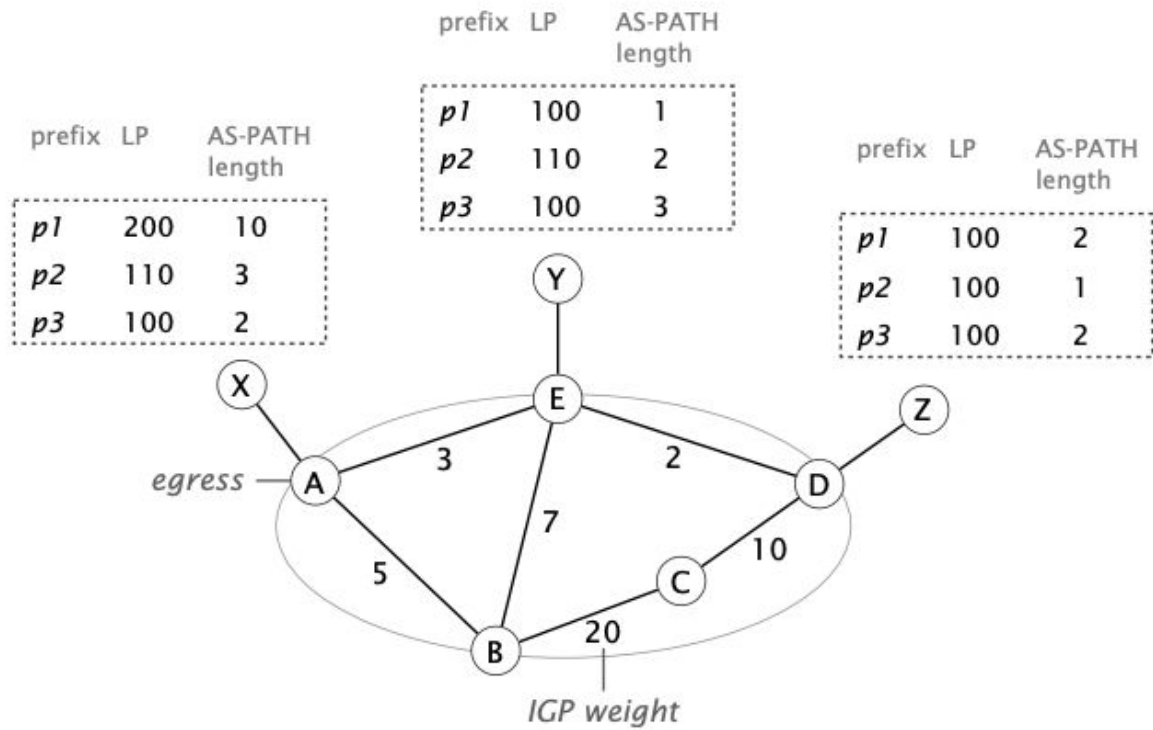
An ISP network which receives BGP routes for 3 external prefixes ($p1$, $p2$, $p3$) from 3 routers (X, Y, Z) in neighboring ASes.

prefix	LP	AS-PATH length
p1	100	1
p2	110	2
p3	100	3

prefix	LP	AS-PATH length
p1	200	10
p2	110	3
p3	100	2

prefix	LP	AS-PATH length
p1	100	2
p2	100	1
p3	100	2

A

prefix	egress	internal NH
p1	A	direct
p2	E	E
p3	A	direct

B

prefix	egress	internal NH
p1	A	A
p2	E	E
p3	A	A

C

prefix	egress	internal NH
p1	A	D
p2	E	D
p3	D	D

D

prefix	egress	internal NH
p1	A	E
p2	E	E
p3	D	direct

E

prefix	egress	internal NH
p1	A	A
p2	E	direct
p3	D	D

Transport Layer

Transport

Network layer: communication between hosts

Transport layer: communication between processes

Transport

Network layer: communication between hosts

Transport layer: communication between processes

Muxing across many processes

Unit of data: segment

Transport

- Two principal transports: TCP and UDP
- TCP: Transmission Control Protocol
  - reliable, in-order delivery
  - congestion control
  - flow control
  - connection setup
- UDP: User Datagram Protocol
  - unreliable, unordered delivery
  - no-frills extension of "best-effort" IP
- services not available:
  - delay guarantees
  - bandwidth guarantees