

LAYER-3 SWITCHING

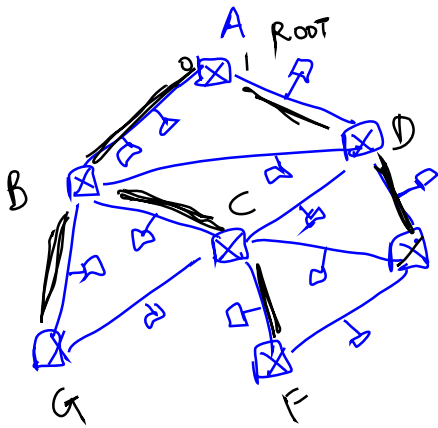
Shortcomings of Ethernet Switching

Fwd table

Dest	Port
host 1	0
host 2	1
...	...
...	0
...	1

MAC addresses
all hosts

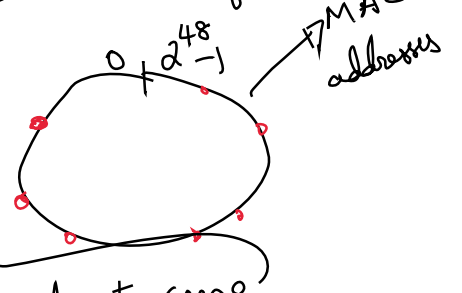
N-hosts
 $O(N)$



- C → E: C-B-A-D-E
- 1) path not optimal (shortest path)
 - 2) not using some links - resource utilization poor
 - 3) $O(N)$ table size

Layer-3 (IP): Hierarchical addressing

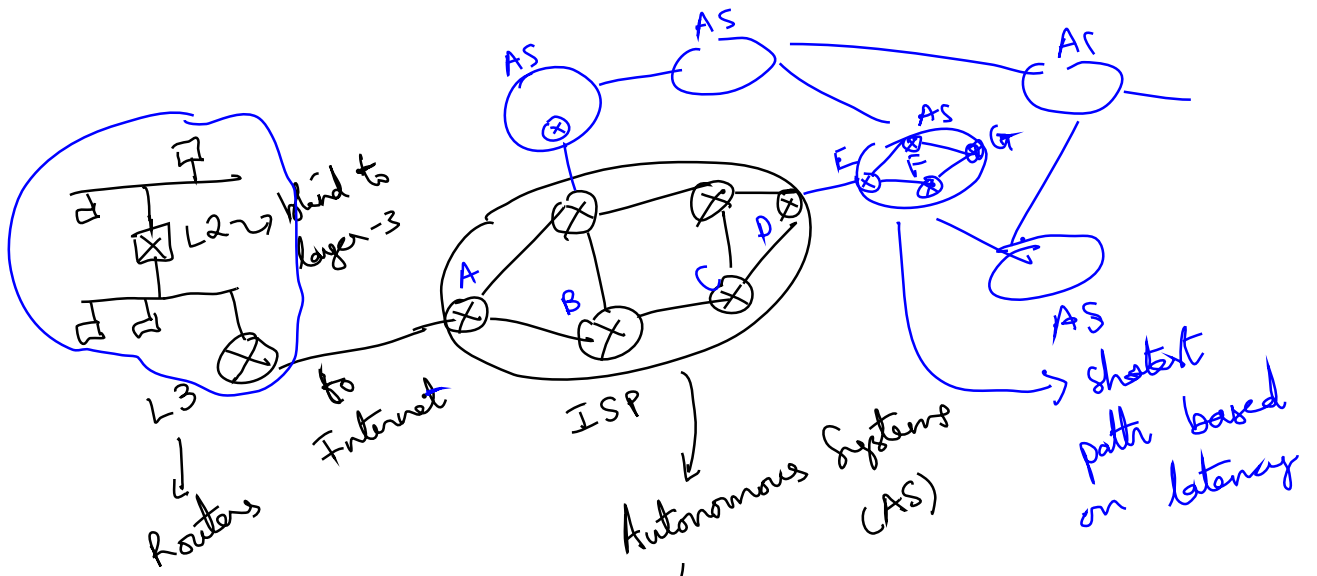
FLAT ADDRESSING (Layer 2)
4) Stability is an issue for large SPT
MAC addresses



If Root fails: SPT is reconstructed
or other switch in spanning tree fails
Hello messages from Root don't come

Larger LANS → more freq. SPT construction

Other Issues: No common addressing scheme across globe
no common communication protocols



A → G:
 A - B - C - D - E - F - G
 ↘
 not same optimum criteria

can choose any internal routing protocol
 (Eg: Shortest path: number of hops)

Intra-domain routing: Routing protocols within AS

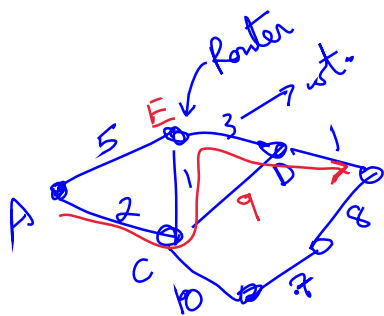
Inter-domain routing: — ' — between ASes

↳ BGP Border Gateway Protocol

INTRA-DOMAIN ROUTING ——— DISTANCE VECTOR ———> RIP Routing Information Protocol

————— link-state routing ———> OSPF — Open Shortest path first

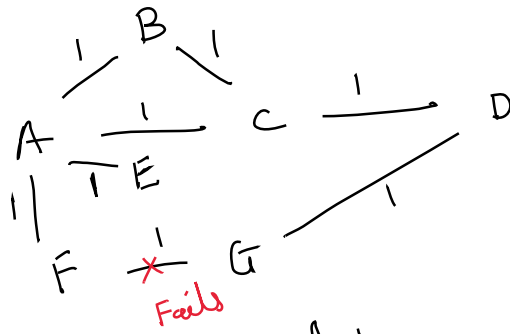
IS-IS: Intermediate System to IS



Use shortest path
 Avoid loops

DISTANCE VECTOR

F tells A:
(G, ∞)



F's table

Dest	Next	Cost
G	G	1

A sends out: (A, 0), A hears: (B, 0), (F, 0), (G, 0)

Forwarding
table
at A

Dest.	Next hop	Cost
A	-	0
B	B	1
C	C	1
F	F	1
E	E	1

→ shared
with
neighbours

A sends out to OWN Neighbours: (A, 0), (B, 1), (C, 1), (F, 1)
hears: (from B) (C, 1), (A, 1)

(from C) (D, 1), (B, 1), (D, 1)
(from F) (A, 1), (G, 1),

Dest	Next	Cost
A	-	0
B	B	1
C	C	1
F	F	1
D	C	2
E	E	1
G	F	2
G	G	3

Invalid after (G, ∞) from F
→ announce to neighbours

C tells A: (G, 2)

- Triggered Update: Event triggers a routing update to neighbours
Eg: $F \rightarrow G$ fails which triggers an update (G, ∞) to A

- Periodic updates: Tell neighbors information in routing table about (Dest, dist) to various destinations