Unicast Routing - Interdomain routing

ICNE532C - Computer Networks

S.Venkatesan

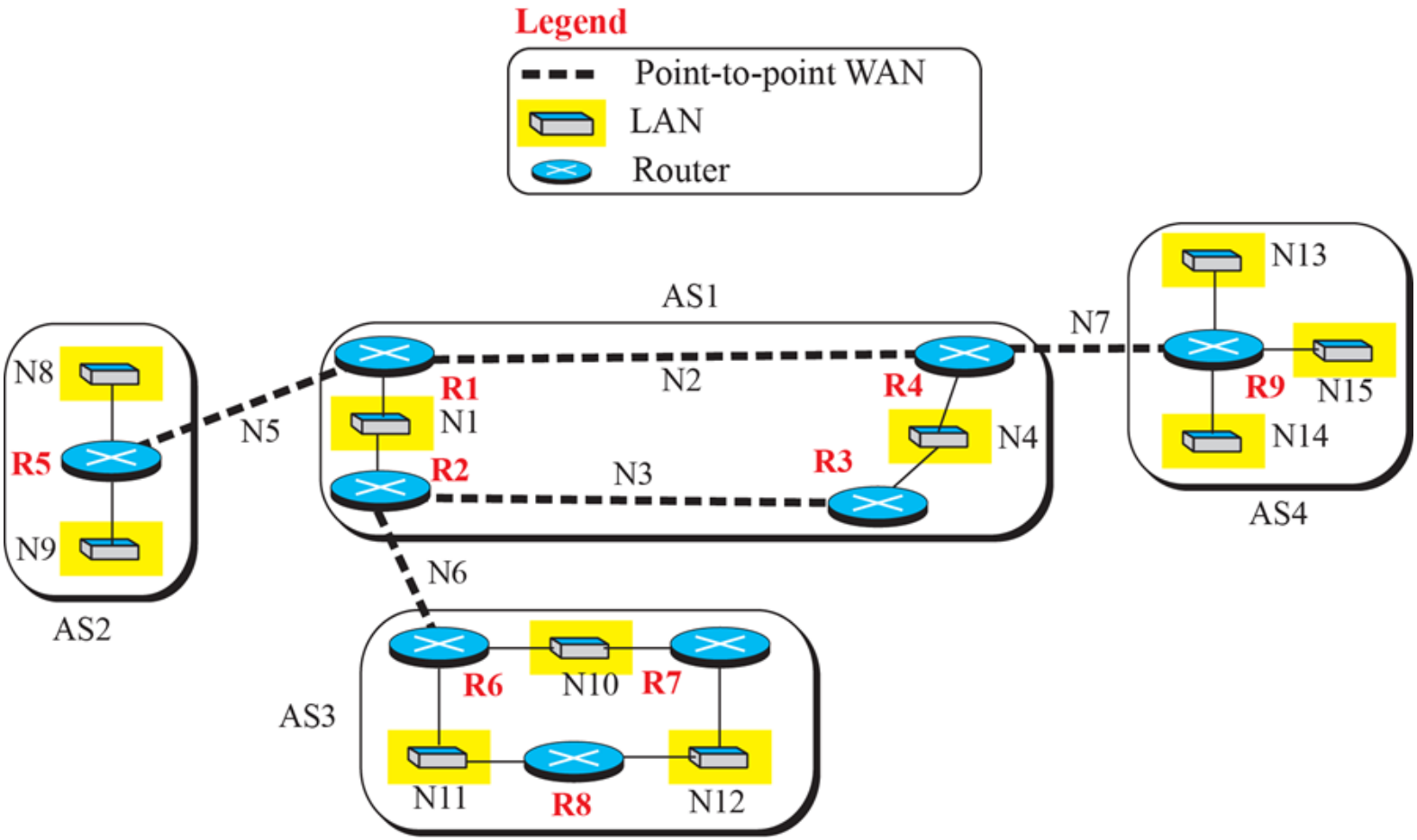
Indian Institute of Information Technology, Allahabad

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Border Gateway Protocol (BGP)

- Inter-domain routing protocol
- Path-Vector algorithm

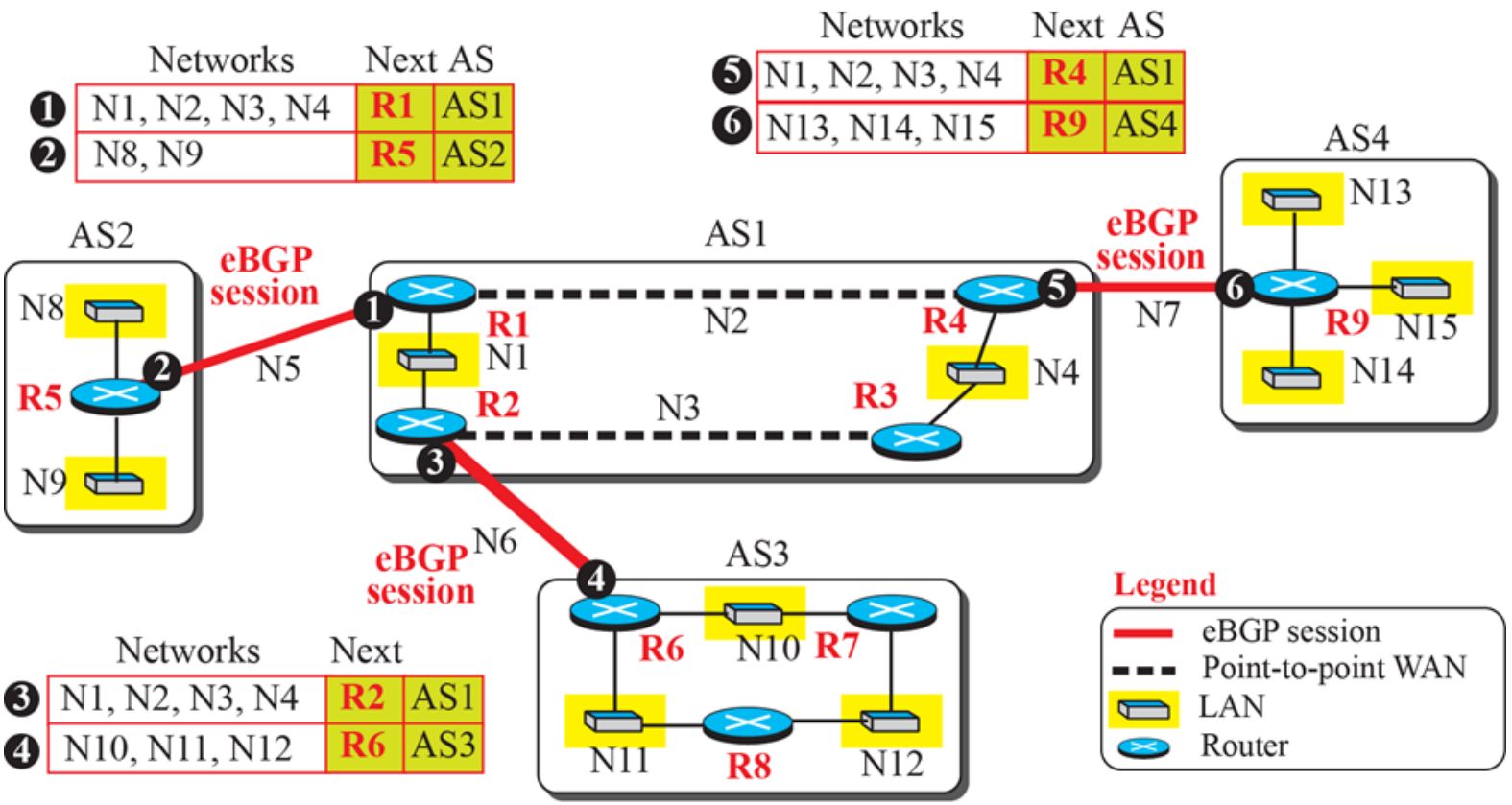
Border Gateway Protocol



Border Gateway Protocol

- external BGP - on each border router - it runs intradomain, eBGP and iBGP
- internal BGP - all routers - it runs intradomain and iBGP

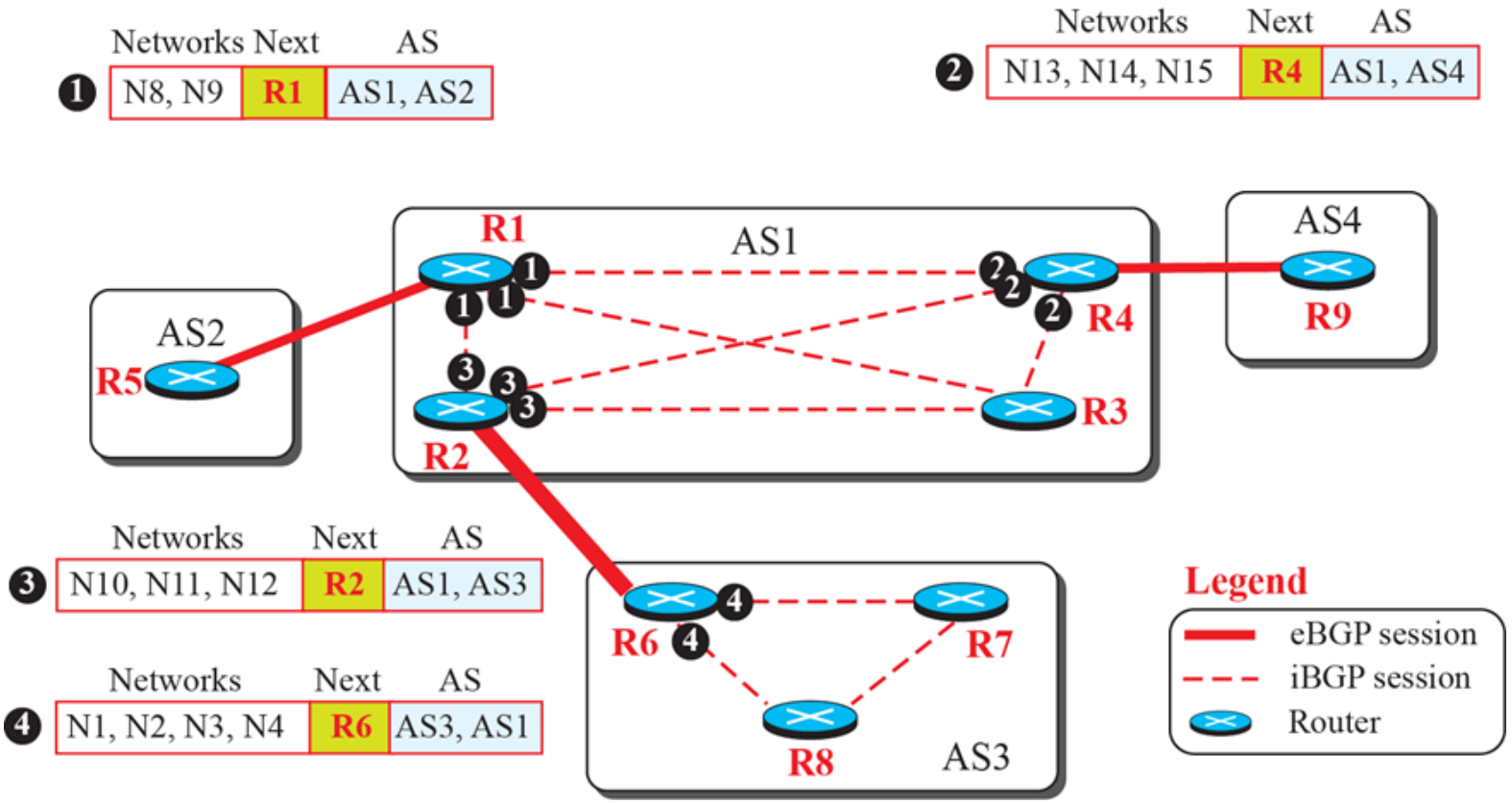
Operation of External Border Gateway Protocol



Reachability information is incomplete -eBGP

- How to route a packet destined for nonneighbour ASs.
- None of the nonborder routers know how to route a packet destined for any networks in other ASs.

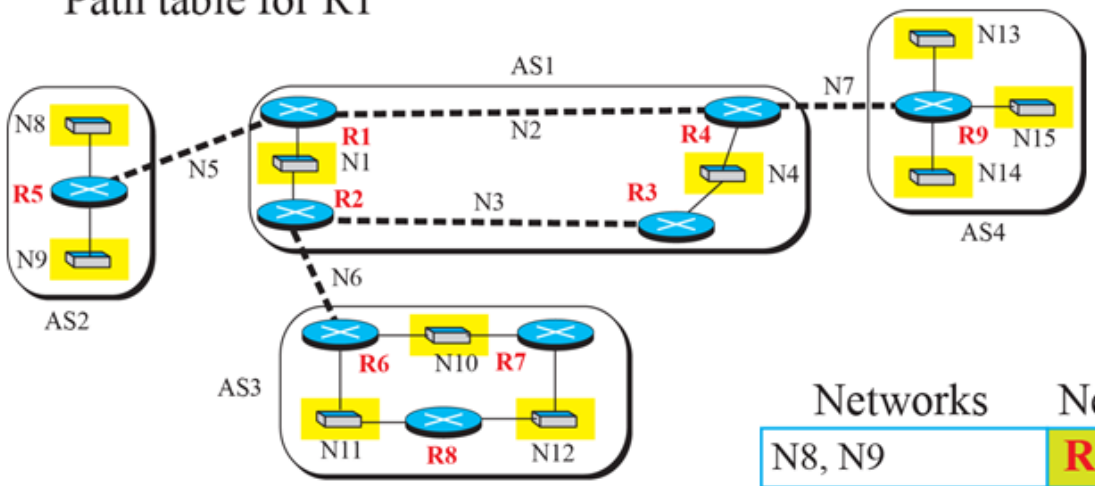
Operation of Internal Border Gateway Protocol



BGP path tables

Networks	Next	Path
N8, N9	R5	AS1, AS2
N10, N11, N12	R2	AS1, AS3
N13, N14, N15	R4	AS1, AS4

Path table for R1



Networks	Next	Path
N8, N9	R1	AS1, AS2
N10, N11, N12	R6	AS1, AS3
N13, N14, N15	R1	AS1, AS4

Path table for R2

Networks	Next	Path
N8, N9	R2	AS1, AS2
N10, N11, N12	R2	AS1, AS3
N13, N14, N15	R4	AS1, AS4

Path table for R3

Injection of Information into Intradomain Routing

- Stub ASs - area border router adds a default entry at the end of its forwarding table and defines the next router to be the speaker router at the end of the eBGP connection.
- Transient ASs - is complicated - need to inject the whole contents of the path table for R1 into its intradomain forwarding table.

Forwarding tables after injection from BGP

Des.	Next	Cost
N1	—	1
N4	R4	2
N8	R5	1
N9	R5	1
N10	R2	2
N11	R2	2
N12	R2	2
N13	R4	2
N14	R4	2
N15	R4	2

Table for R1

Des.	Next	Cost
N1	—	1
N4	R3	2
N8	R1	2
N9	R1	2
N10	R6	1
N11	R6	1
N12	R6	1
N13	R3	3
N14	R3	3
N15	R3	3

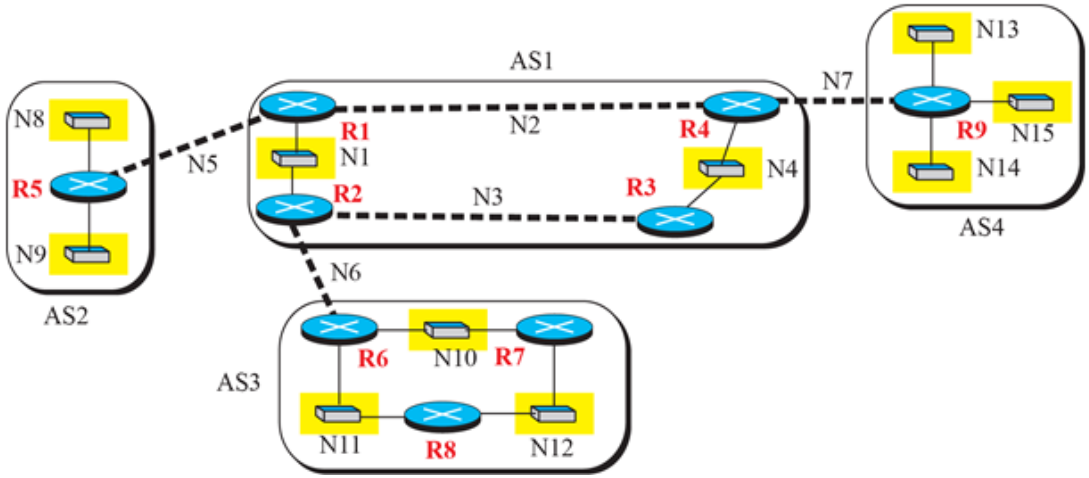
Table for R2

Des.	Next	Cost
N1	R2	2
N4	—	1
N8	R2	3
N9	R2	3
N10	R2	2
N11	R2	2
N12	R2	2
N13	R4	2
N14	R4	2
N15	R4	2

Table for R3

Des.	Next	Cost
N1	R1	2
N4	—	1
N8	R1	2
N9	R1	2
N10	R3	3
N11	R3	3
N12	R3	3
N13	R9	1
N14	R9	1
N15	R9	1

Table for R4



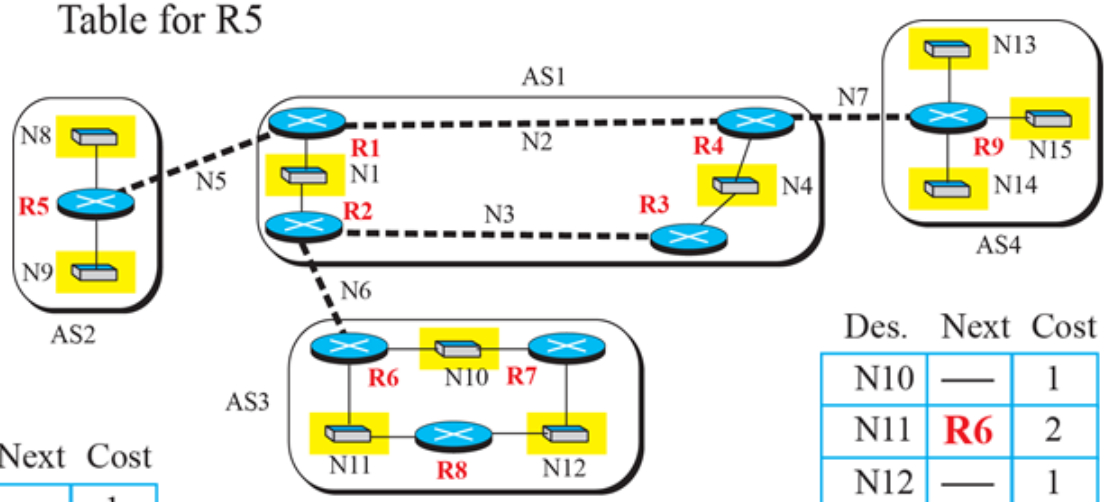
Forwarding tables after injection from BGP

Des.	Next	Cost
N8	—	1
N9	—	1
0	R1	1

Table for R5

Des.	Next	Cost
N13	—	1
N14	—	1
N15	—	1
0	R4	1

Table for R9



Des.	Next	Cost
N10	—	1
N11	R6	2
N12	—	1
0	R6	2

Table for R7

Des.	Next	Cost
N10	—	1
N11	—	1
N12	R7	2
0	R2	1

Table for R6

Des.	Next	Cost
N10	R6	2
N11	—	1
N12	—	1
0	R6	2

Table for R8

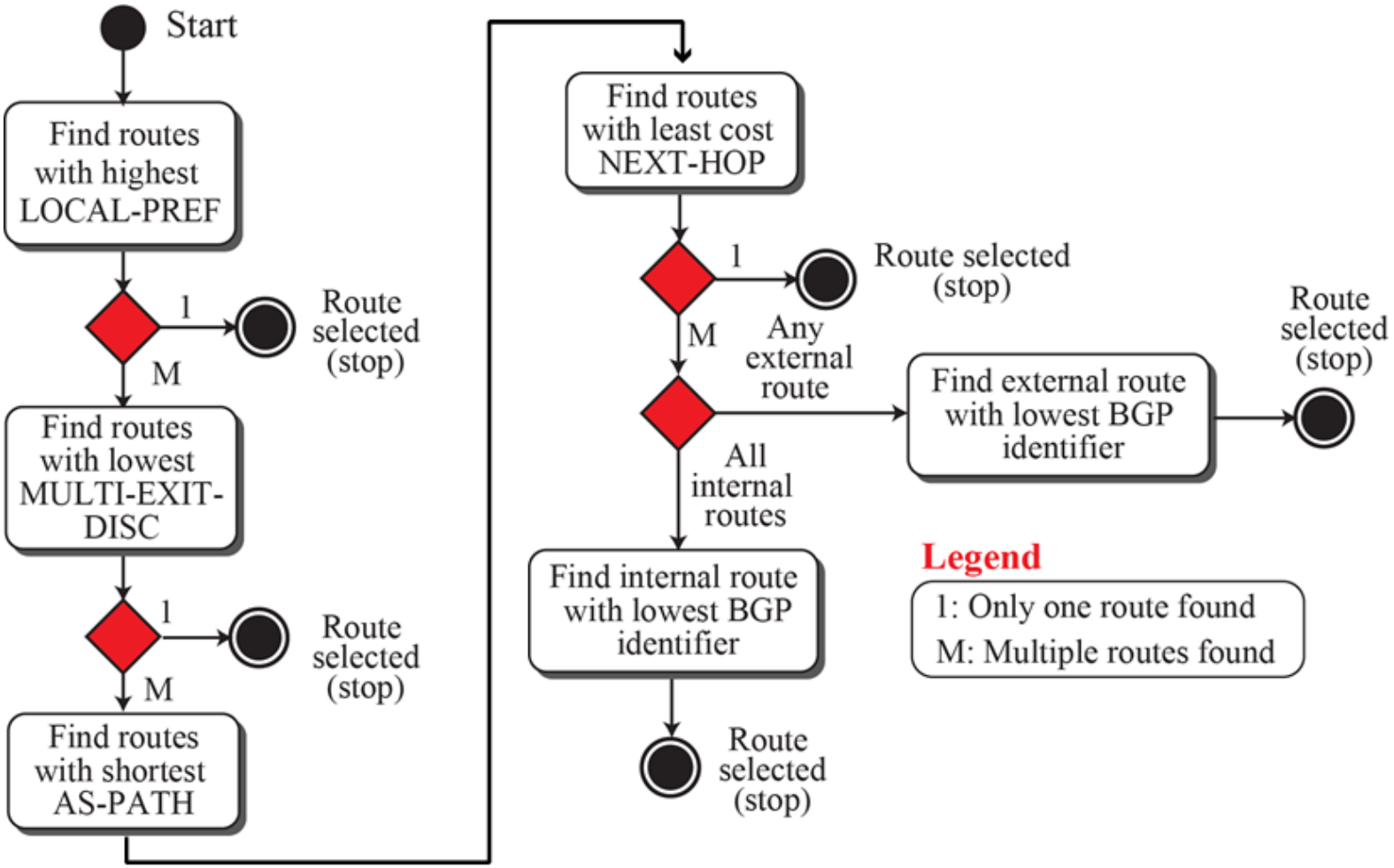
Address Aggregation

- Prefixes 14.18.20.64/26 , 14.18.20.128/26, 14.18.20.192/26 and 14.18.20.0/26
- 14.18.20.0/24

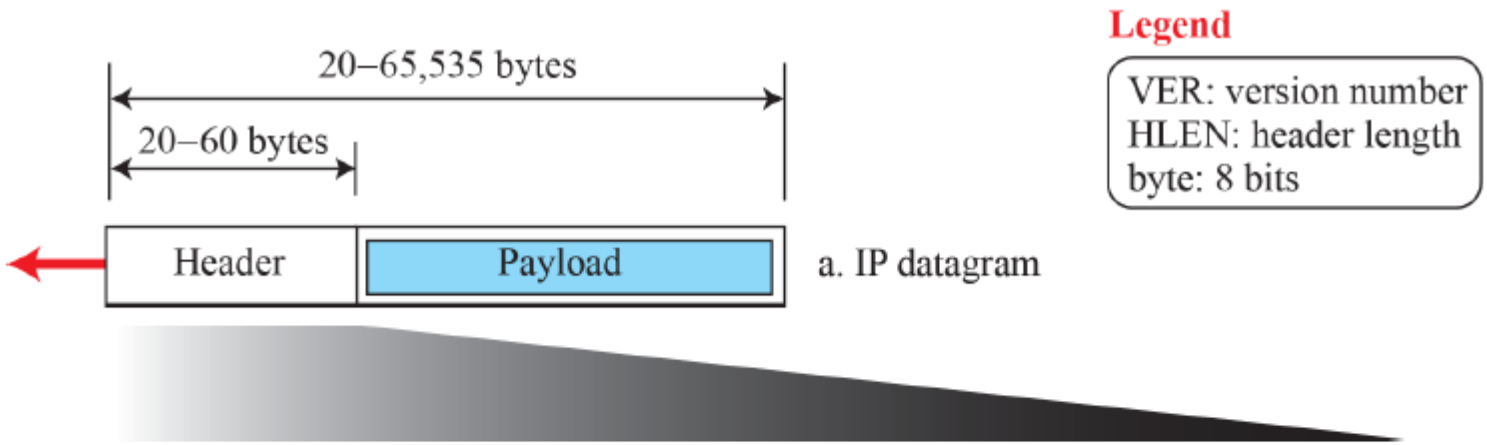
Path Attributes

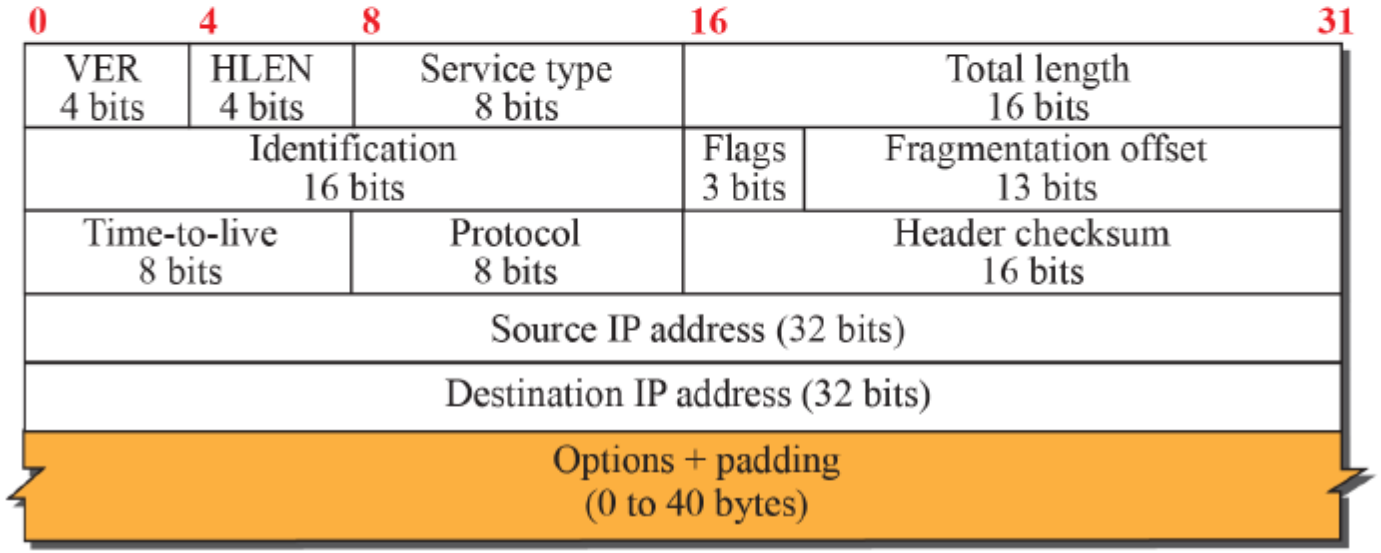
- Origin
- AS-PATH
- Next-Hop
- MULT-EXIT-DISC (multiple exit discriminator)
- Local - Pref
- Atomic-Aggregate
- Aggregator

Route Selection



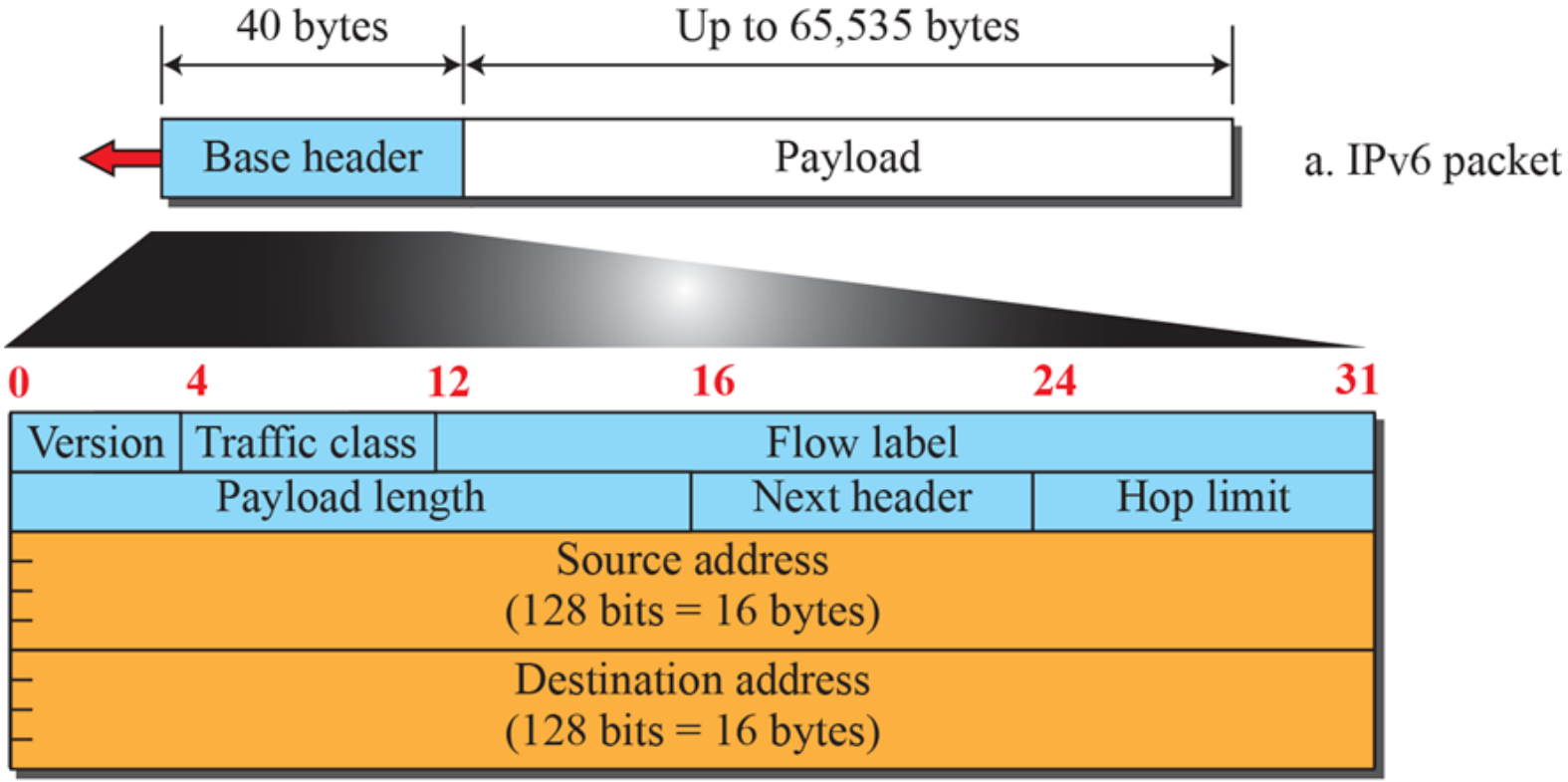
IP datagram





b. Header format

IPv6 datagram



References

[1] Behrouz A. Forouzan *Data Communications and Networking*. McGraw-Hill fifth edition.