Link State Routing

Introduction

- Initial state : similar to distance vector i.e., state of link to neighbors known.
- Goal: To find the path of least cost to destination.
- Basic Idea -- Every node knows how to reach its neighbors. If this info is dissemination (broadcast) to every node, every node ultimately has the information to build the complete map of the network.

Mechanisms

- Two mechanisms:
  - Reliable dissemination of link state information -- process is called reliable flooding.
  - calculation of routes using the collected information -- the computation is based on Dijkstra's algorithm.

Reliable Flooding

- Process of making sure that all the nodes participating in the link state routing protocol get a copy of the link-state information from all other nodes.
- Each node sends out link-state information on its directly connected links.
- Each node that receives this, forwards it.

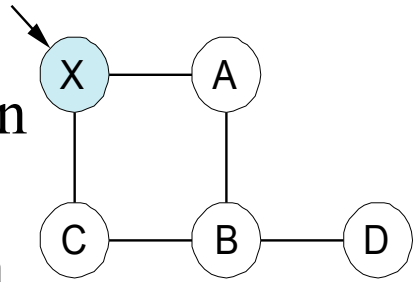
Link State Information

- Each node creates a link-state packet (LSP) that contains:
  - ID of the node that created LSP
  - a list of directly connected nodes and the cost to each node.
  - sequence number
  - TTL

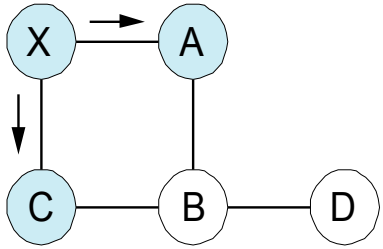
} → for reliability

An Example

- X receives LSP from some node Y.
- X checks to see if it already has an update from Y. If it does, it compares the sequence number in the new LSP to the one stored.
- If New seq no < Old sequence number, then, discard LSP.
- Else store LSP and send the LSP to all neighbors except the one that sent the LSP.
- If no update from Y, keep it.



(a)



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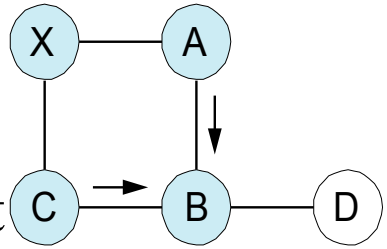

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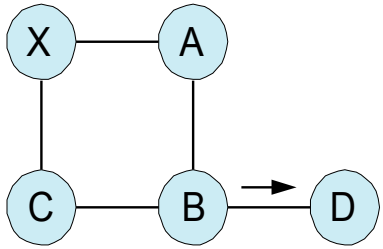
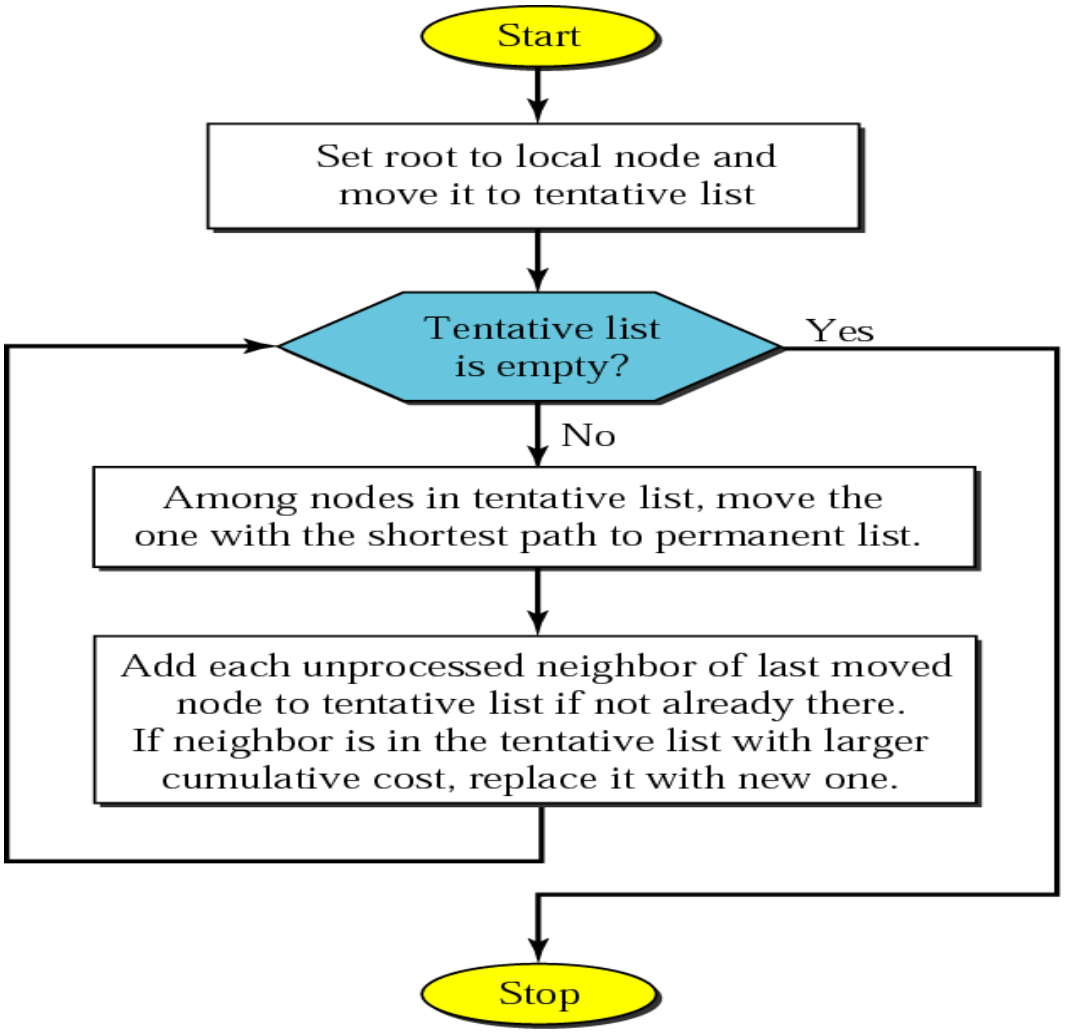


(d)

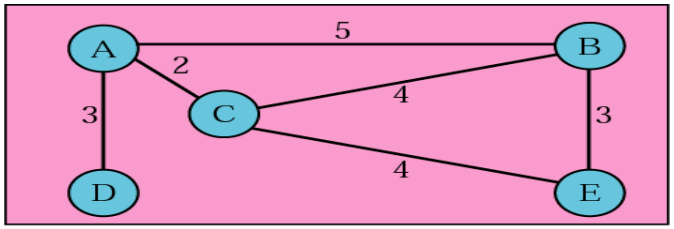
Dissemination of LSPs

- LSPs are sent periodically (upon the expiry of a timer) or may be triggered due to a change in topology (as in RIP).
- To minimize overhead, LSPs are not created unless needed --periodicity is of the order of hours.
- Sequence numbers help in identifying new information
- TTL helps in ensuring that packets don't stay in the network indefinitely.

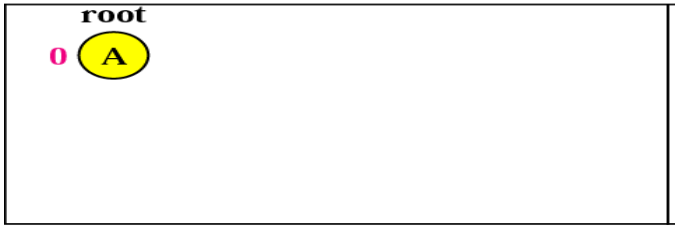
Dijkstra Algorithm



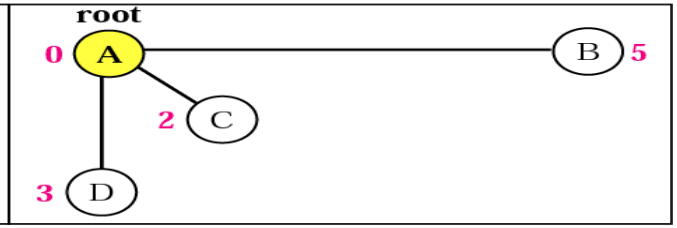
Formation of shortest path tree



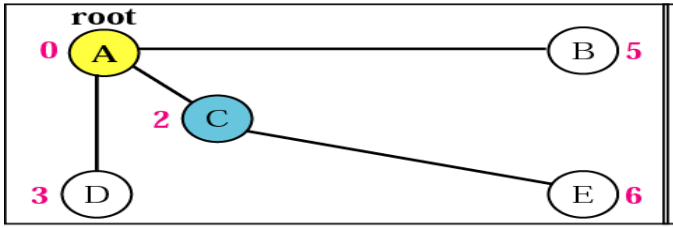
Topology



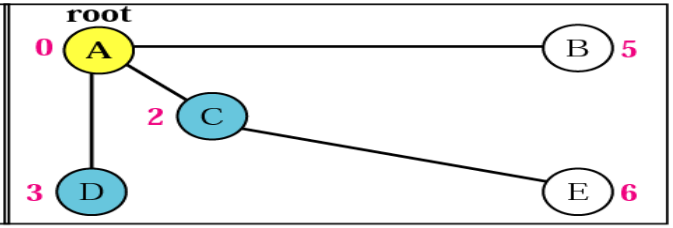
1. Set root to A and move A to tentative list



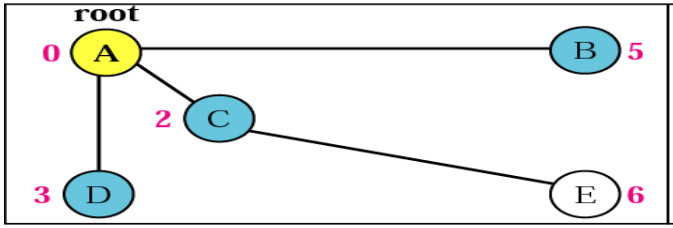
2. Move A to permanent list and add B, C, and D to tentative list



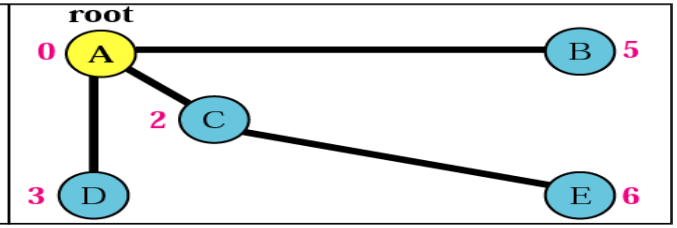
3. Move C to permanent and add E to tentative list



4. Move D to permanent list.



5. Move B to permanent list



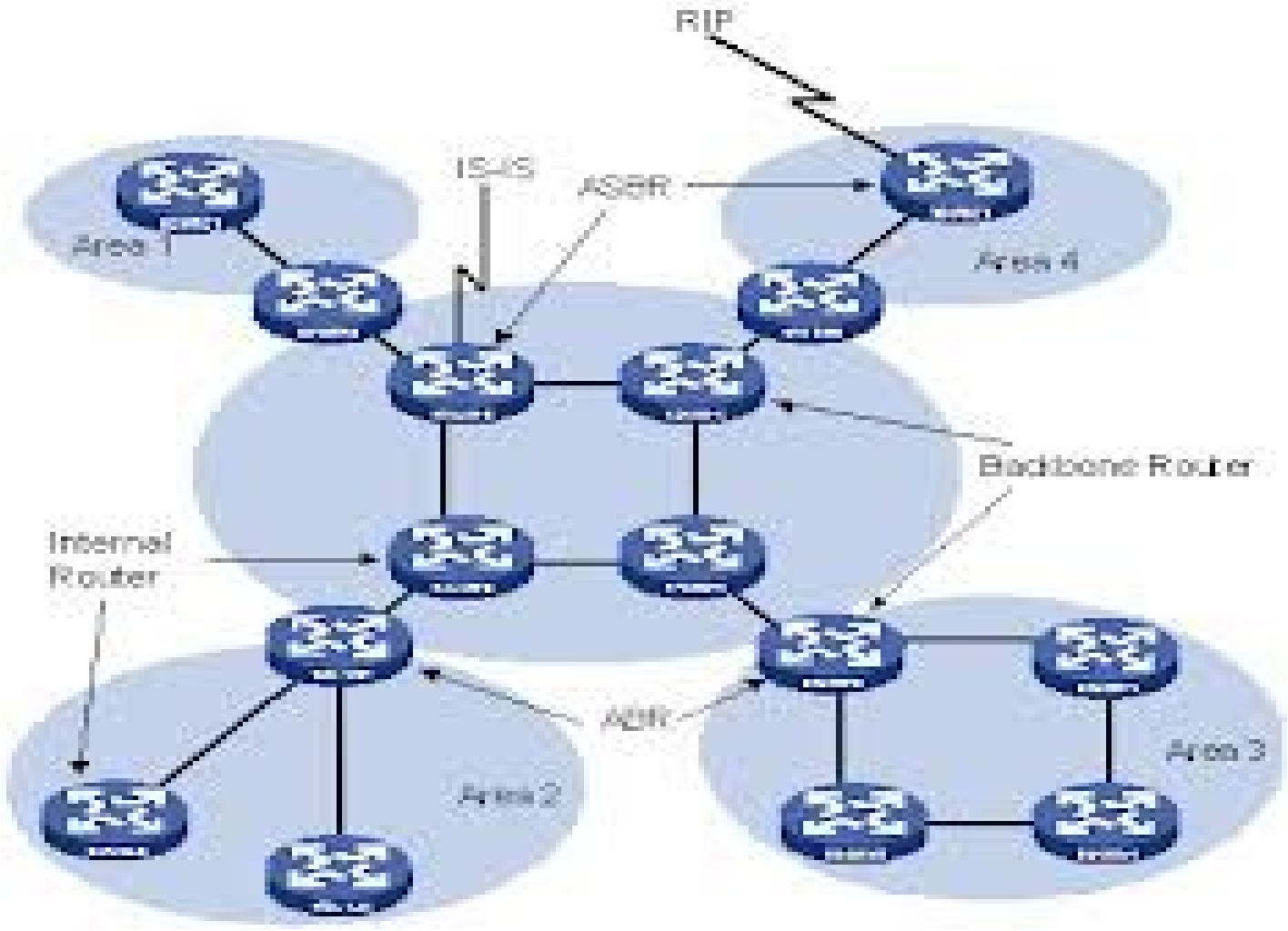
6. Move E to permanent list (tentative list is empty)

Routing table for node A

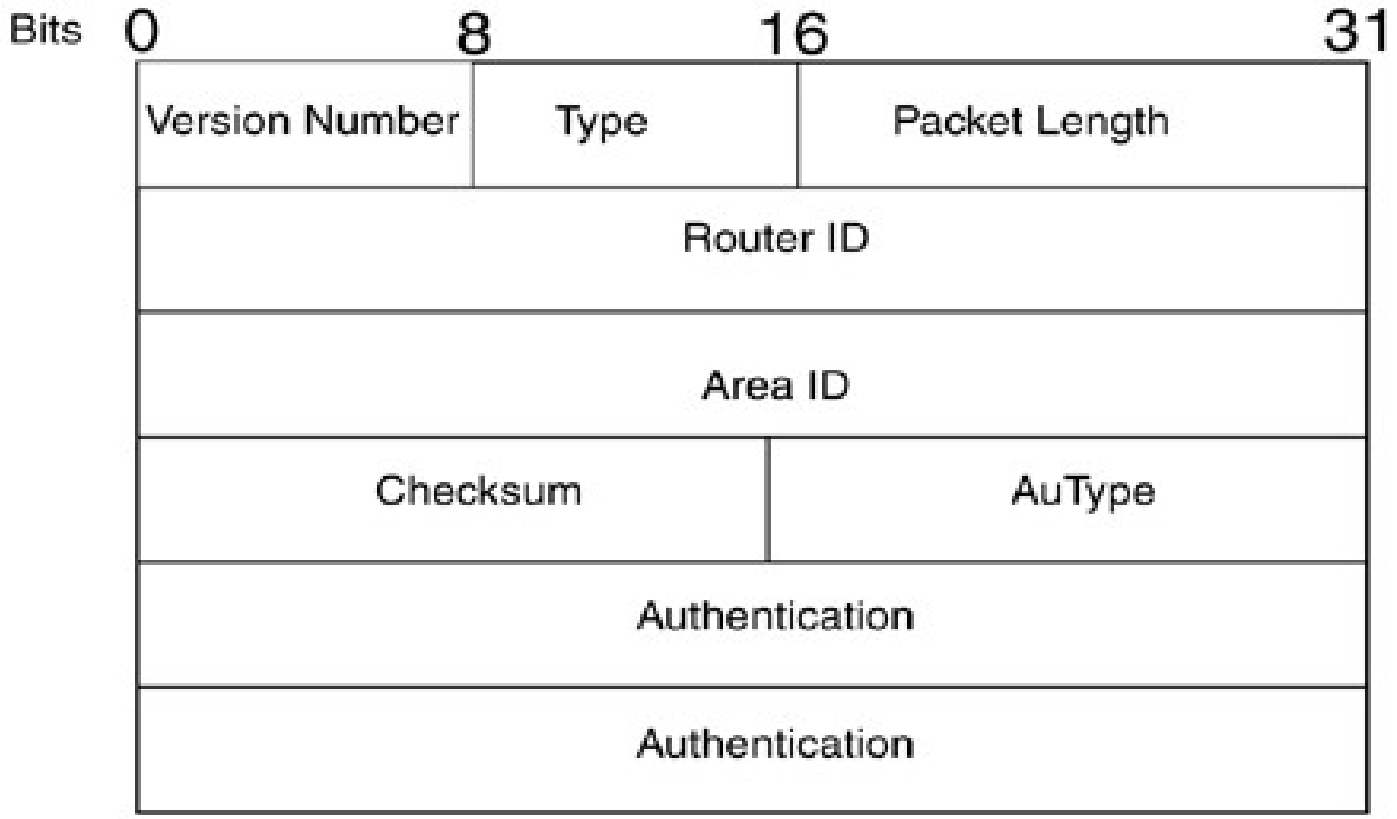
Node	*Cost*	*Next Router*
A	0	—
B	5	—
C	2	—
D	3	—
E	6	C

- OSPF packets are encapsulated in IP datagrams

OSPF Protocol



OSPF Header Format



- OSPF packets are encapsulated in IP datagrams

OSPF Link state Advertisement