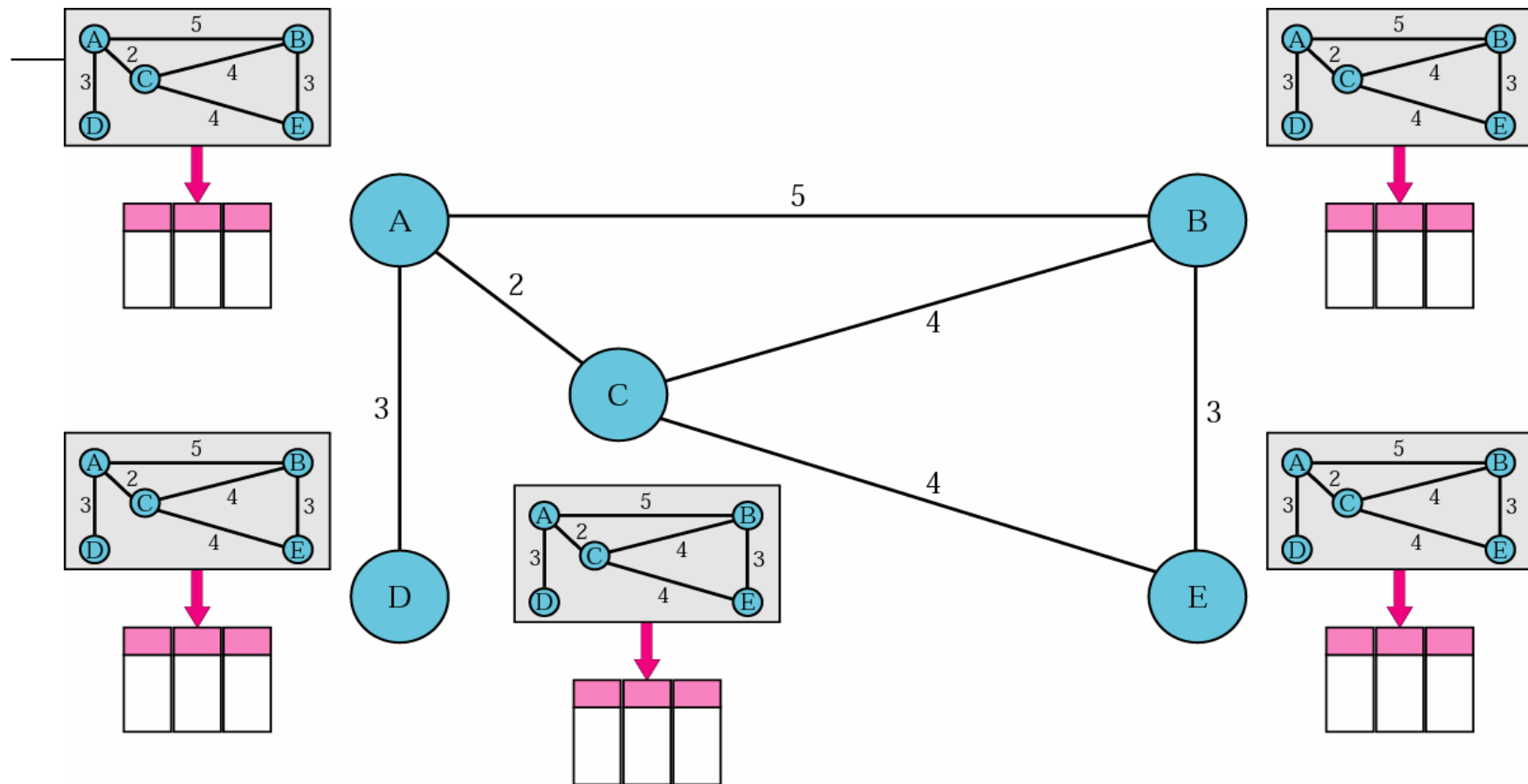# 14.4   LINK STATE ROUTING

In link state routing, if each node in the domain has the entire topology of the domain, the node can use Dijkstra's algorithm to build a routing table.

The topics discussed in this section include:

Building Routing Tables

Figure 14.15   *Concept of link state routing*
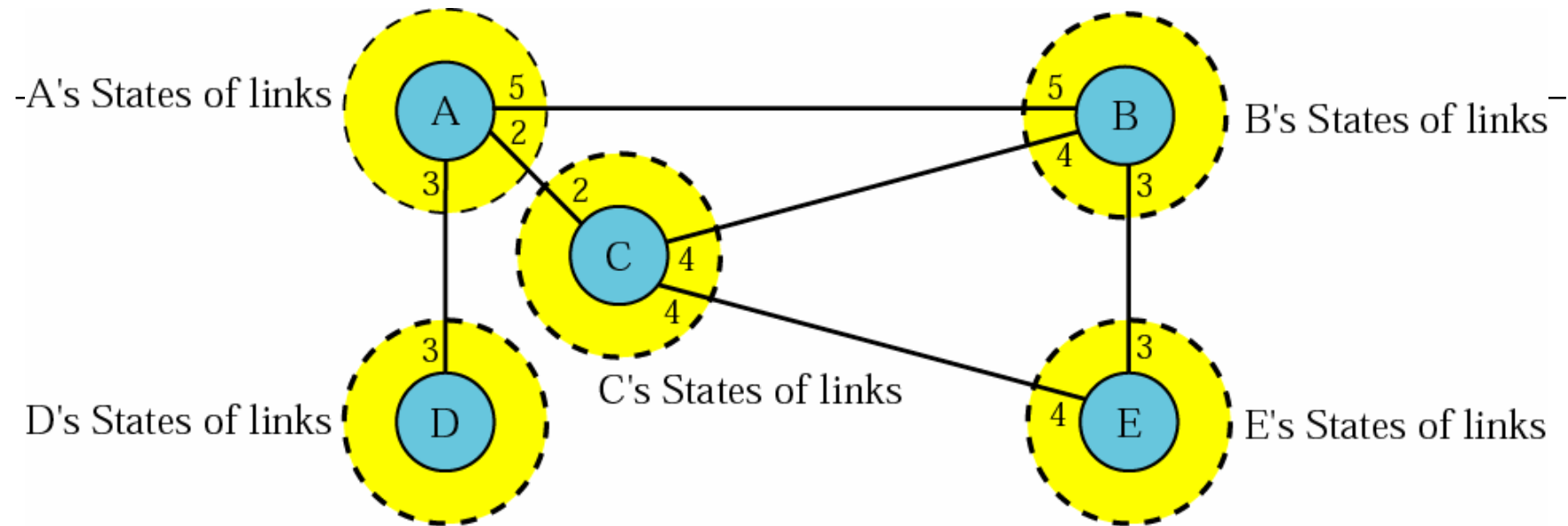
Link State Routing

- From Figure 14.15
  - Each node uses the same topology to create a routing table

  - But the routing table for each node is unique
    - Like a city map

Link State Routing

- Assumption of link state routing
  - Although the global topology knowledge is not clear and each node has partial knowledge
    - It knows the state (type, condition, cost) of its link
  - However, the while topology can be compiled from the partial knowledge of each node
    - See the Figure 14.16

Figure 14.16   Link state knowledge

-A's States of links

B's States of links

A

5
2
3

2

C

4
4

C's States of links

5

B

4
3

D's States of links

3

D

3

E

4

E's States of links

- ☐ Each node has a partial knowledge of the network
- ☐ There is an overlap in the knowledge
- ☐ The overlap guarantees the creation of a common topology
  - ■ A picture of the whole domain for each node

Building Routing Tables

- For sets of actions in link state routing
  - *Creation* of the states of the links by each node
    - Called the *link state packet* or *LSP*
  - *Dissemination* of LSPs to every other router, called *flooding*, in an efficient and reliable way
  - *Formation* of a shorten path tree for each node
  - *Calculation* of a routing table based on the shortest path tree

Creation of Link State Packet (LSP)

- Assume a LSP carries
  - ***The node identity***
  - ***The list of links***
    - Both are needed to make the topology
  - ***A sequence number***
    - Distinguishes new LSPs from old ones
  - ***Age***
    - Prevent old LSPs from remaining in the domain for a long time

Creation of Link State Packet (LSP)

- LSP are generated on two occasions
  - When there is a *change* in the topology of the domain
    - Quickly inform any node to update its topology

  - On a *periodic* basis
    - The period is much longer compared to the distance vector routing
    - 60 minutes or 2 hours

Flooding of LSPs

- Flooding: the LSP must be disseminated to all other nodes in the domain
  - Not only to its neighbors
- Rules
  - The creating node sends a copy of the LSP out of each interface
  - All receiving nodes compare the incoming one with the copy it may already have
    - If the newly LSP is older than the one it has by checking sequence number
      - Discard the LSP
    - Else
      - Discard the old LSP
      - Sends a copy of it out of each interface except the incoming one

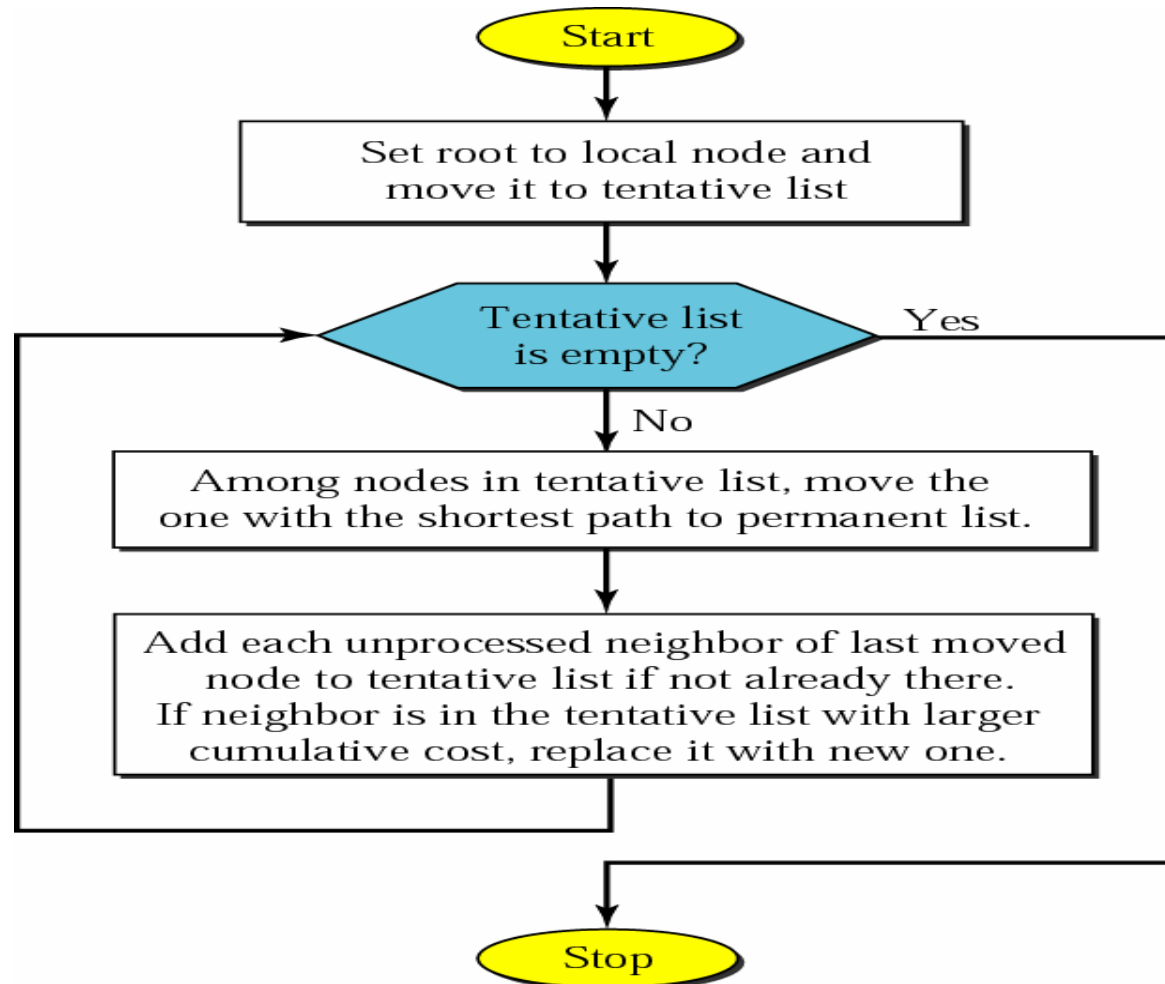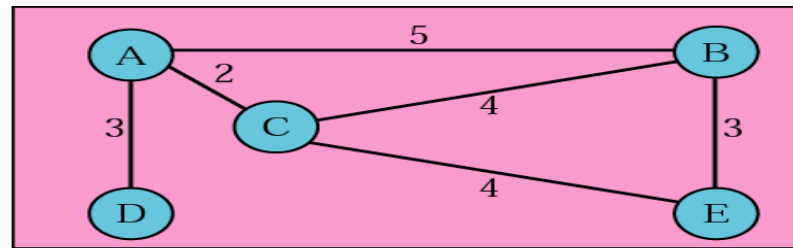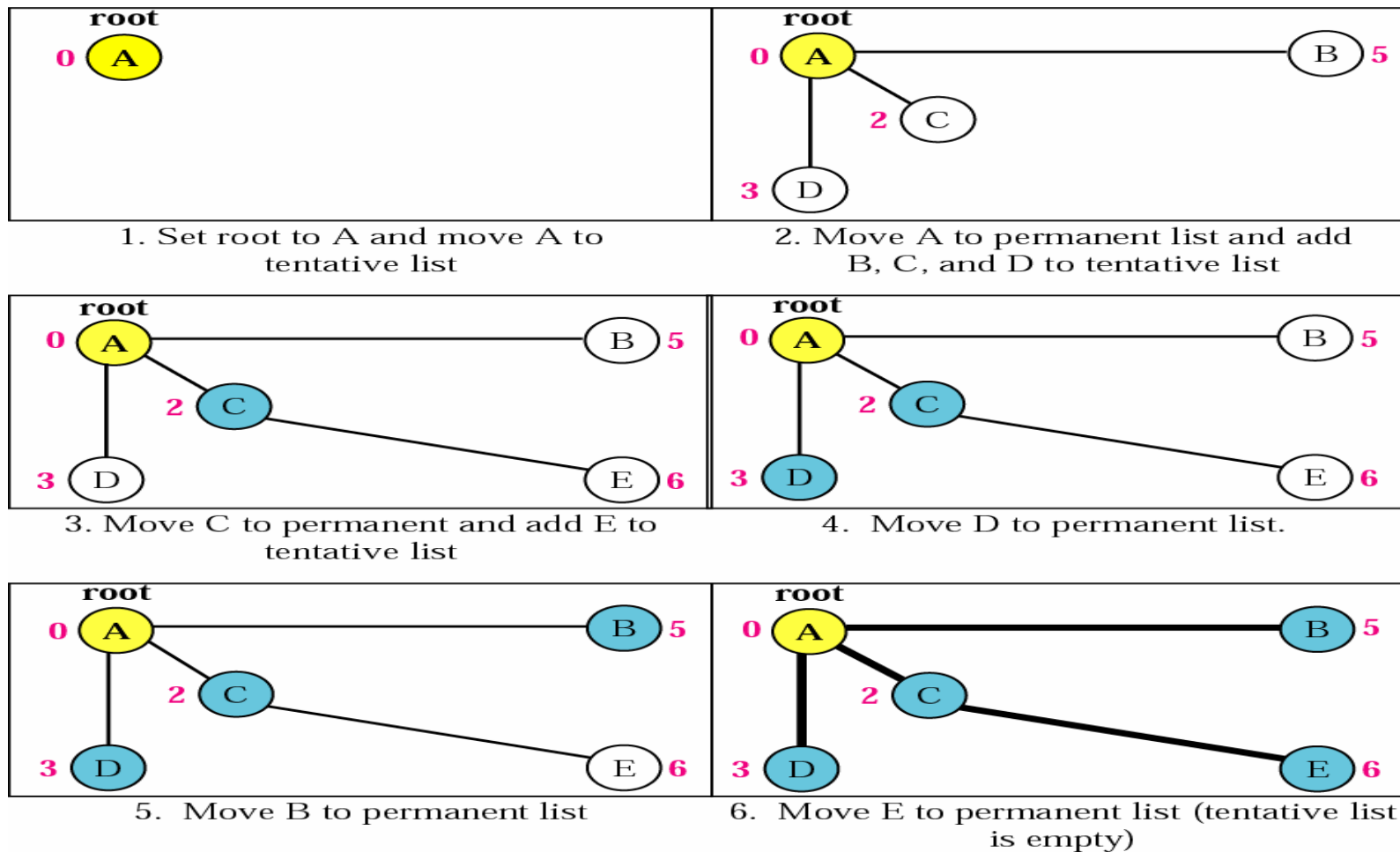# Formation of Shortest Path Tree: Dijkstra Algorithm

Figure 14.18 *Example of 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)

Calculation of Routing Table from Shortest Path Tree

□ Example:

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