Features of Link-state routing protocols

Link-state advertisement (LSA) or Link-state Packet(LSP)

- a small packet of routing information that is sent between routers

Topological database or **Link-state Database**

- a collection of information gathered from LSAs

SPF algorithm

- a calculation performed on the database that results in the SPF tree

Routing table

- a list of the known paths and interfaces

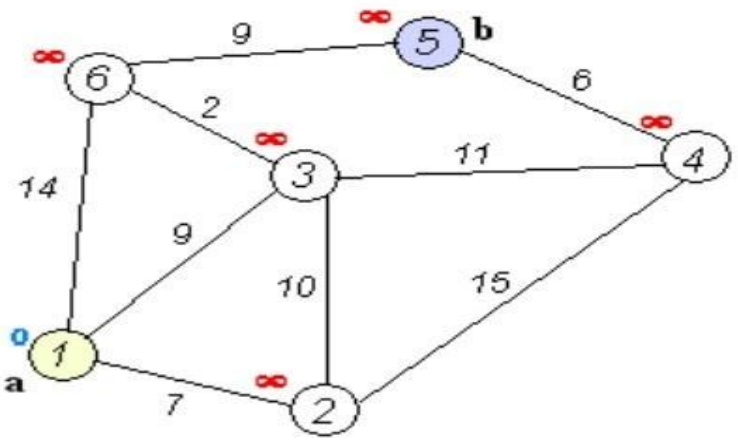
link-state routing algorithm

1. Each router is responsible for meeting its neighbors and learning their names.
   - Used a **Hello Protocol,** which send a data packet contains RID and address of the network on which the packet is being sent
2. Each router constructs a **LSP/LSA** which consists of a list of names and cost for each of its neighbors.
3. The **LSP/LSA** is transmitted to ***all other routers***. Each router stores the most recently generated **LSP/LSA** from each other router.
   - Link-state flooding: **Sequencing** and **Aging** procedures
   - Each routers store the identical **Link State Database**
4. Each router uses complete information on the network topology to compute the *shortest path route* to each destination node.
   - Use **SPF or Dijkstra's algorithm** to calculate the shortest path

Dijkstra's algorithm

Also known as the **shortest path first (SPF)** algorithm

Nodes	2	3	4	5(b)	6
1(a)	7	9	∞	∞	14
2	7	9<7+10	7+15	∞	14
3	7	9	22<11+10+7	∞	14<7+10+2
6	7	9	22	9+2+10+7	14



Dijkstra's algorithm(Cont.)

Link-State (LS) Algorithm for Source Node *u*

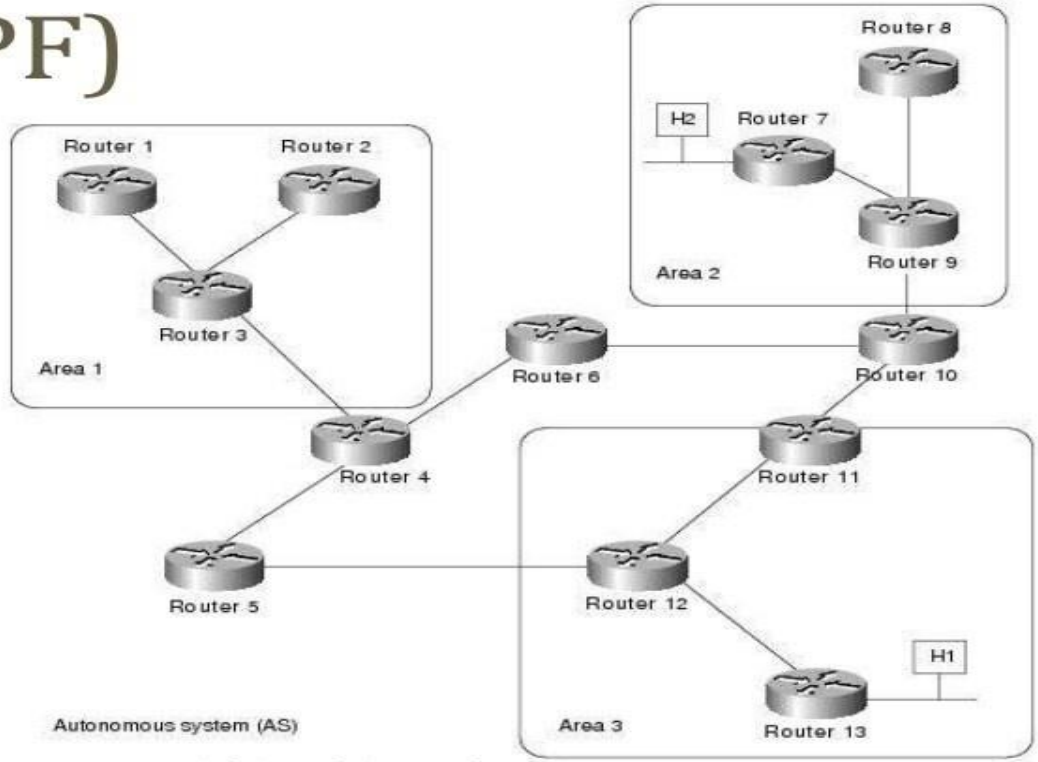
```
1  Initialization:
2    N' = {u}
3    for all nodes v
4      if v is a neighbor of u
5        then D(v) = c(u,v)
6      else D(v) = ∞
7
8  Loop
9    find w not in N' such that D(w) is a minimum
10   add w to N'
11   update D(v) for each neighbor v of w and not in N':
12         D(v) = min( D(v), D(w) + c(w,v) )
13   /* new cost to v is either old cost to v or known
14    least path cost to w plus cost from w to v */
15 until N'= N
```

Open Shortest Path First (OSPF)

- A routing protocol developed for Internet Protocol networks by the Interior Gateway Protocol (IGP)
- Based on the Dijkstra's Algorithm
- Serving large, heterogeneous internetworks

- **OSPF Version 1** (1988)
- **OSPF Version 2** (1998) Supported IPv4
- **OSPF Version 3** (2008) Supported IPv6

Open Shortest Path First (OSPF)



OSPF can operate within a hierarchy

Collection of networks under a common administration that share a common routing strategy