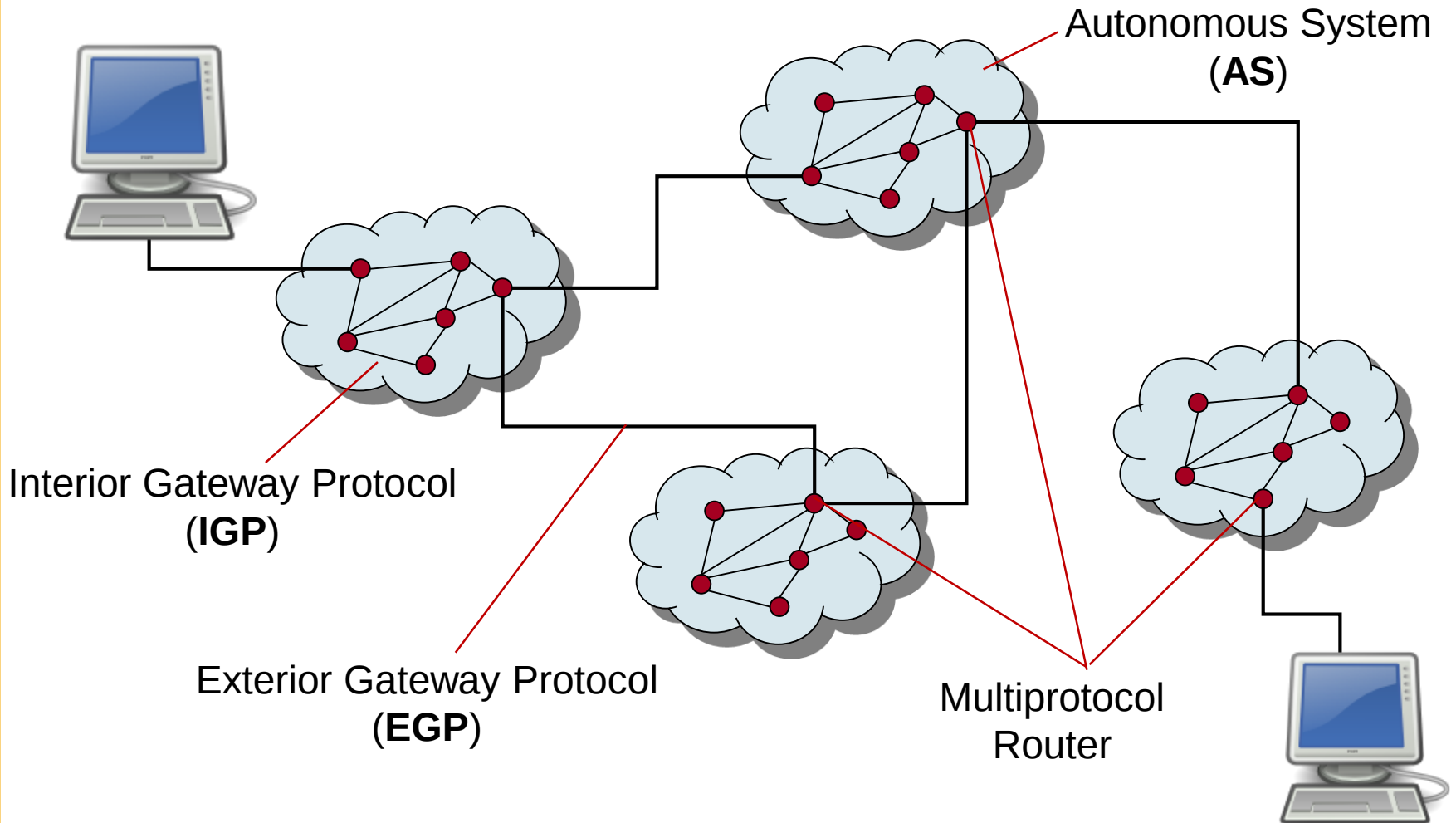


Routing in the Internet

1



OSPF – Open Shortest Path First (1/4)

2

ARPANET: **Bellman-Ford Algorithm/Distance-Vector Routing**

- Count-to-infinity problem
- Slow convergence

OSPF – Open Shortest Path First:

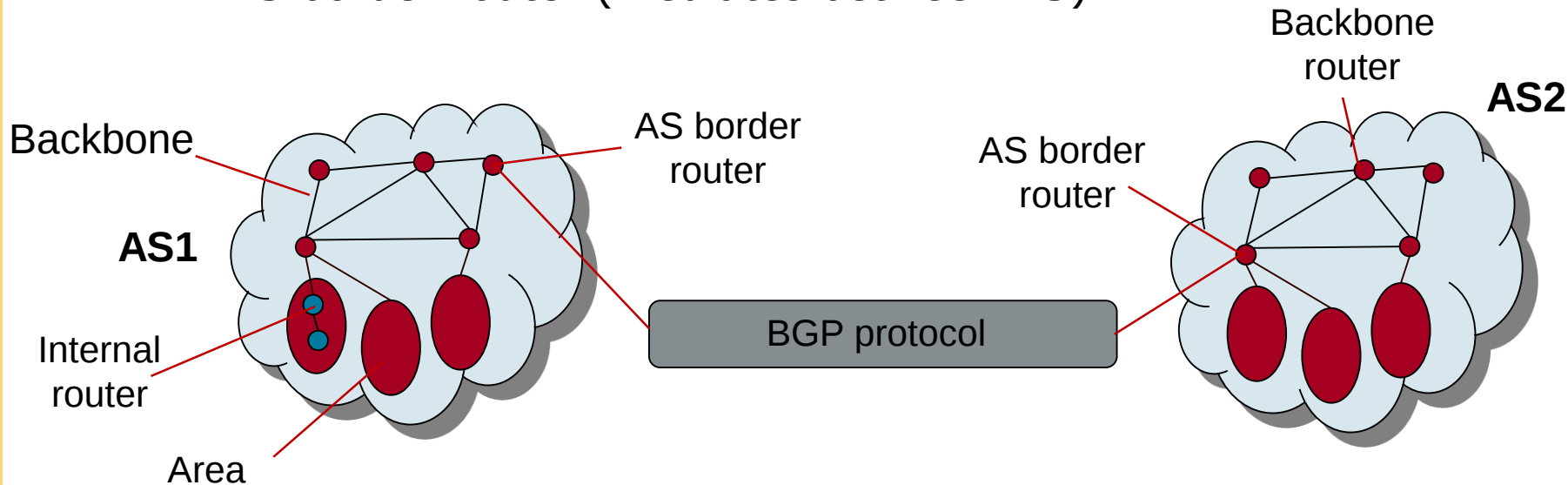
- Introduced in 1990, RFC 2328
- Link-state routing based on Dijkstra algorithm
- Manufacturer-independent
- Supports different metrics and allows also hierarchical routing
- Fast, dynamic adaptation to topology changes
- Routing in the LAN (broadcast network) and WAN

OSPF – Open Shortest Path First (2/4)

3

Hierarchical Routing Between Autonomous Systems

- Internal router (fully in the LAN)
- Border router (connects two or more areas)
- Backbone router
- AS border router (mediates between AS)



OSPF – Open Shortest Path First (3/4)

4

Message Types for Communication Between Routers

Hello	Who are my neighbors?
Link State Update	Link state update to neighbors (Status, metrics/costs)
Link State Ack	Acknowledgement of the link state update
Database Description	Link state packets with the current sender information
Link State Request	Link state request to neighbors to determine the current connection data

OSPF – Open Shortest Path First (4/4)

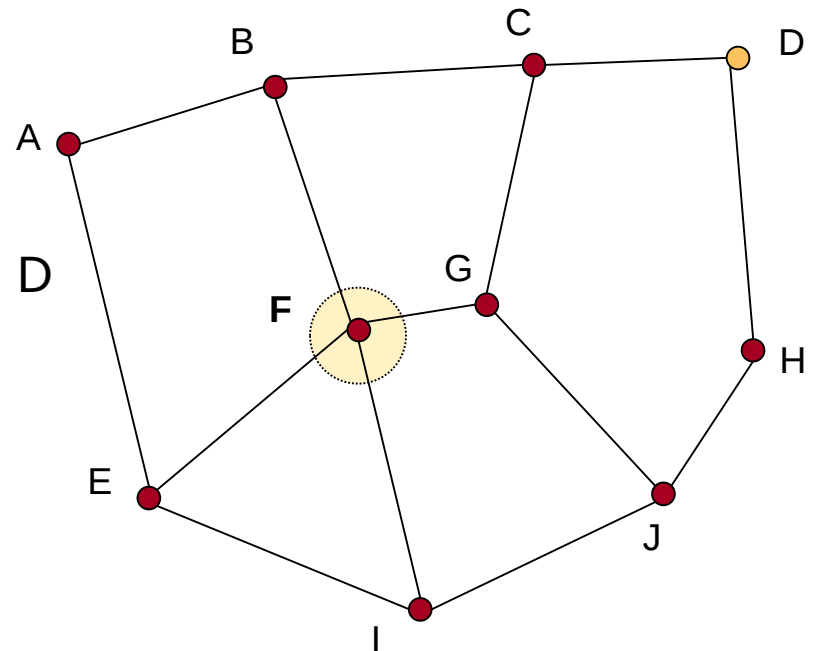
5

Example:

Information that **F** receives from its neighbors via router **D**:

B: B – C – D
G: G – C – D
I: I – J – H – D
E: E – F – G – C – D

- F calculates the shortest path to D



- Count-to-infinity is avoided!

BGP – Border Gateway Protocol

6

- Exterior Gateway Routing
- Only for AS border router (!)
- Must observe certain rules
 - political, safety, economic regulations
 - manual configuration (scripts)(IGP → take care “only” for the most efficient packet delivery)
- BGP routers communicate via TCP connection
 - reliable, hides details of the networks crossed
- Principally distance-vector routing
 - Manages distance AND associated path
 - Informs neighbor of the path used