Open Shortest Path First (OSPF) Protocol

- OSPF designed to support large autonomous systems:

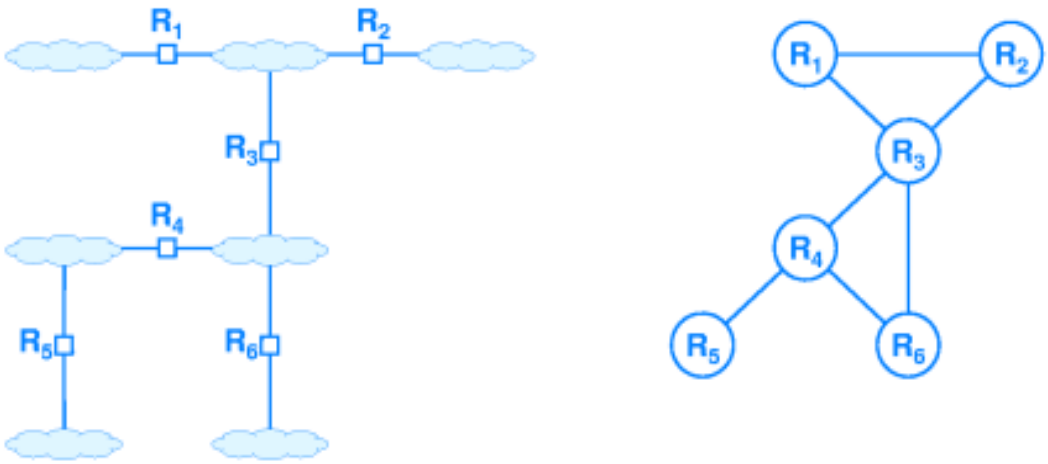
- Routing within an AS (IGP)
- CIDR support (includes address mask for each address)
- Authenticated message exchange
- Imported routes; OSPF allows a router to introduce routes learned from other means, e.g. BGP
- Link-state routing
- Efficient for multi-access networks (e.g. Ethernet):

  * In link-state routing all routers attached to the network broadcast link status

  * In OSPF a single router is designated to broadcast on the network

OSPF Operation

- Each router participating in OSPF periodically probes adjacent routers
- Then it broadcasts a link-status message
- Routers that receive the message use Dijkstra's SPF algorithm to compute shortest paths



(a) (b)

OSPF Hierarchical Routing (1/2)

- To achieve hierarchy OSPF allows an AS to be partitioned for routing purposes
- Partitions knows as *areas*

- Groups of networks and routers

- In the router configuration, an area is configured as ranges of addresses

  * Example: 198.15.2.0 to 198.15.3.255, 198.15.7.*

- An area's topology is hidden from outside the area
- A router in an area is *unaware* of the topology outside the area
- Route advertisements are flooded only throughout the area, not the entire AS
- External link advertisements are still flooded throughout the entire AS

OSPF Hierarchical Routing (2/2)

- Since route advertisements are flooded only throughout an area, we need some means to tell a router in an area how to reach destinations outside the area but within the same AS
- Different areas are connected by Area Border Routers (ABR)
- A special area called the *backbone area* carries transit traffic from one area to another

- The backbone is an area consisting of networks and routers (including ABRs)
- All ABRs belong to the backbone area

- Using its routing table, each ABR summarizes the reachability information of its area and distributes this information to other routers in the backbone
- The backbone routers have reachability information about all networks in the entire AS
- The backbone ABRs in turn summarize the reachability information to routers in the non-backbone areas
- Every router in the AS knows how to reach other destination in the same AS