

Routing: OSPF



Dr. G. Omprakash

Assistant Professor, ECE, KLEF



Routing

Goal of the network layer: Deliver a datagram from its source to one or more destinations

- **Unicast routing:** Datagram is destined for only one destination
- **Multicast routing:** Datagram is destined for several destinations
- **Intradomain routing:** Study of routing within an organization/university (internal routing)
 - An intradomain routing protocol is also called an **Interior Gateway Protocol (IGP)**
- **Interdomain routing:** Study of routing between independently operated networks
 - All networks must use the same interdomain routing protocol or **exterior gateway protocol**
 - The protocol that is used in the Internet is **BGP (Border Gateway Protocol)**



Open Shortest Path First: OSPF

- OSPF: Unicast and Intradomain routing protocol
- OSPF is more widely used in company networks
- Requirements for OSPF:
 - OSPF is an *open* protocol \implies the specification is a public document.
 - Protocol had to support a variety of distance metrics, including physical distance, delay...
 - It has to be a dynamic algorithm (adapted to changes in the topology)
 - It has to support routing based on type of service
 - Route real-time traffic one way and other traffic a different way
 - OSPF had to do load balancing
 - Splitting the load over multiple lines.
 - Support for hierarchical systems is needed
 - Security was required to prevent spoofing of routers



OSPF Implementation

OSPF is implemented as a program in the network layer

- An IP datagram that carries a message from OSPF sets the value of the protocol field to 89
- The OSPF messages are encapsulated inside datagrams.

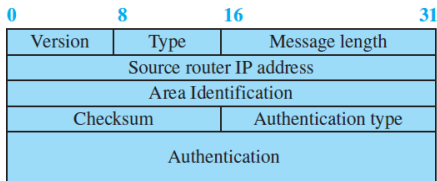


Figure: OSPF Common Header

- **Authentication:** The OSPF common header has the provision for authentication of the message sender.
 - This prevents a malicious entity from sending OSPF messages to a router



OSPF

OSPF represents the actual network (a) as a graph (b) and then use the link state method to have every router compute the shortest path from itself to all other nodes

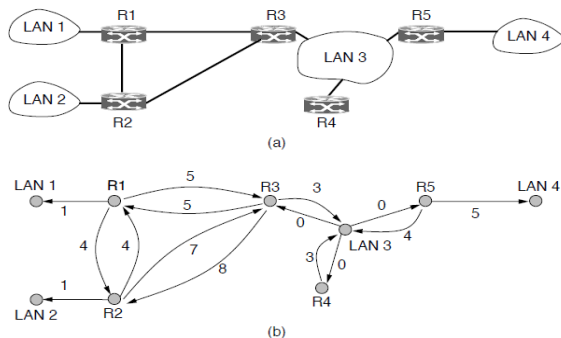


Figure: a) An autonomous system. (b) A graph representation of (a)



OSPF Messages

Five different types of messages

- **Type 1:** The *hello* message
 - It is used by a router to introduce itself to the neighbors and announces all neighbors that it already knows
- **Type 2:** The *database description* message
 - It is normally sent in response to the hello message to allow a newly joined router to acquire the full LSDB¹
- **Type 3:** The *link-state request* message
 - It is sent by a router that needs information about a specific LS.
- **Type 4:** The *link-state update* message
 - It is the main OSPF message used for building the LSDB.
- **Type 5:** The *link-state acknowledgment* message
 - It is used to create reliability in OSPF; each router that receives a link-state update message needs to acknowledge it.

¹The collection of states for all links is called the link-state database (LSDB)



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Thankyou