



Data Communication and networking

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Routing



- ❑ Routing is the process of moving a packet of data from source to destination. Routing is usually performed by a dedicated device called a router.

IP Routing

- ❑ Is the set of protocols that determine the path that data follows in order to travel across multiple networks from its source to its destination. Data is routed from its source to its destination through a series of routers, and across multiple networks. The IP Routing protocols enable routers to build up a forwarding table that correlates final destinations with next hop addresses.

- ❑ Set of Rules Governing Communication is called Protocol.
- ❑ Protocol represents an agreement between communicating devices.
- ❑ Without Protocol, two devices may be connected but they will not be able to communicate.
- ❑ A Protocol defines what is communicated, how it is communicated and when is communicated.

Example:

- ❑ Consider the communication between a person speaking French and Japanese. They can only communicate provided they both speak the same language.

IU Intra- and Interdomain Routing

- ❑ Today, an internet can be so large that one routing protocol cannot handle the task of updating the routing tables of all routers.
- ❑ For this reason, an internet is divided into autonomous systems

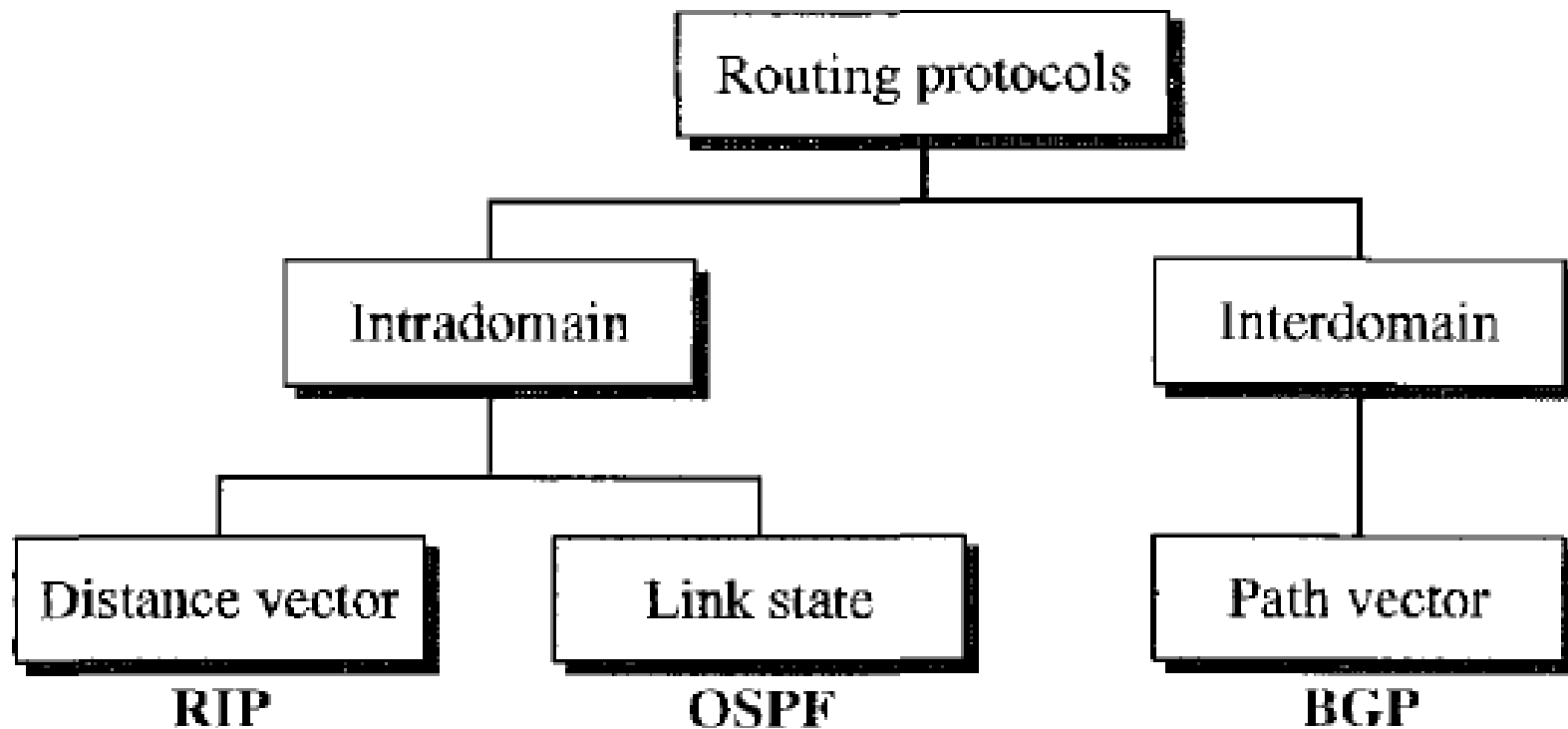
Autonomous systems

- ❑ An autonomous system (AS) is a group of networks and routers under the authority of a single administration

Intra domain Routing

- ❑ Routing inside an autonomous system is referred to as intra domain routing

- ❑ Routing between autonomous systems is referred to as inter domain routing.



IU IP Routing protocols

These Protocols Include

- ❑ RIP (Routing Information Protocol)
- ❑ IGRP (Interior gateway Routing Protocols)
- ❑ EIGRP (Enhanced Interior gateway Protocol)
- ❑ BGP (Border gateway Protocol)

IU Types of Routing Protocols

❑ There are two major categories of Routing Protocols:-

- 1) Static Routing Protocols
- 2) Dynamic Routing Protocols

IU Static Routing Protocols

- ❑ Static routing is not really a routing protocol. Static routing is simply the process of manually entering routes into a device's routing table via a configuration file that is loaded when the routing device starts up. As an alternative, these routes can be entered by a network administrator who configures the routes manually. Since these manually configured routes don't change after they are configured (unless a human changes them) they are called 'static' routes.
- ❑ Static routing is the simplest form of routing, but it is a manual process. Use static routing when you have very few devices to configure (Less than 5) and when you know the routes will probably never change.

IU Static Routing Protocols

- ❑ Static routing also does not handle failures in external networks well because any route that is configured manually must be updated or reconfigured manually to fix or repair any lost connectivity.

IU Dynamic Routing Protocols

In dynamic routing, the routers monitor the network, and can change their routing tables based on the current network conditions. The network thus adapts to changing Conditions.

Dynamic routing protocols are supported by software applications running on the routing device (the router) which dynamically learn network destinations and how to get to them and also advertise those destinations to other routers. This advertisement function allows all the routers to learn about all the destination networks that exist and how to those networks

IU Types of Dynamic Routing Protocols

- ❑ Dynamic routing protocols can be categorized on the basis of various parameters.

Dynamic routing protocols are classified into following protocols:-

- 1) Routing Information Protocol (RIP)
- 2) Interior gateway routing protocol (IGRP)
- 3) Open shortest path first (OSPF)
- 4) Border Gateway Protocol (BGP)

- ❑ **Distance vector** routing is so named because it involves two factors: **the *distance***, or metric, of a destination, and the ***vector***, or direction to take to get there. Routing information is only exchanged between directly connected neighbors.
- ❑ The whole idea of distance vector routing is the sharing of information between directly connected neighbors.
- ❑ DV determine the path to remote networks using **hop count** as the metric.

Hop Count

- ❑ A hop count is defined as the number of times a packet needs to pass through a router to reach a remote destination

- ❑ In **distance vector** routing, each node shares its routing table with its immediate neighbors periodically and when there is a change.
- ❑ Router periodically (every 30 seconds, transmits the routing table via a broadcast packet that reaches all other routers on the local segments.

- ❑ Routers send updates only when there's a change
- ❑ Router that detects change creates a link-state advertisement (LSA) and sends it to neighbors
- ❑ Neighbors propagate the change to their neighbors
- ❑ Routers update their topological database if necessary

Distance Vector vs. Link State

Distance Vector

- Updates frequently
- Each router is "aware" only of its immediate neighbors
- Slow convergence
- Prone to routing loops
- Easy to configure

Link State

- Updates are event triggered
- Each router is "aware" of all other routers in the "area"
- Fast convergence
- Less subject to routing loops
- More difficult to configure

IU Routing Information Protocol (RIP)

- ❑ Most common routing protocol used to transfer routing information between routers
- ❑ Allows the router to determine which path it will use to send data, based on a concept called Distance vector routing.
- ❑ Whenever data travels on a router, and thus through a new network number, it is considered to have traveled one hop.
- ❑ A path that has a hop count of 4 indicates that data traveling along that path must have passed through four routers before reaching its final destination on the network
- ❑ Broadcasts its routing table every 30 seconds

IU Interior Gateway Routing Protocol (IGRP)

- ❑ Developed by Cisco Corporation
- ❑ Its a distance-vector protocol
- ❑ Sends routing updates at 90-second intervals
- ❑ When the router detects changes, its sends only partial updates to neighbor routers
- ❑ When determining the best path, it also takes into consideration such things as:
 - Bandwidth
 - Load
 - Delay
 - Reliability

IU Open shortest path first (OSPF)

- ❑ Makes more intelligent path selection than RIP, IGRP, and EIGRP
- ❑ It sends only changes, not the entire routing table Support VLSM
- ❑ considers any or all of the following:
 - Bandwidth
 - Delay
 - Reliability
 - Load
- ❑ The Open Shortest Path First (OSPF) most widely used in the network of big business companies

IU Difference between RIP, OSPF and IGRP Routing Protocols

Characteristics	RIP	IGRP	OSPF
Type	Distance Vector	Hybrid	Link State
Update Timers	30 Sec	90 Sec	Only when changes occur
Updates	Full Table	Full Table	Only changes
Hop count Limit	15	255	None
Default Metric	Hop count	Bandwidth/Delay	Bandwidth/Delay