Presentation On Routing Protocol

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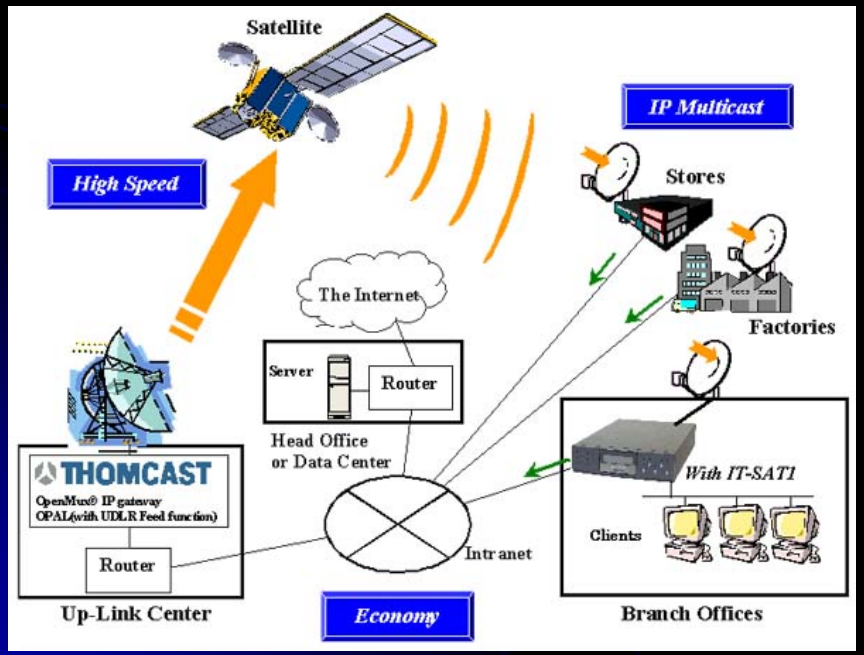
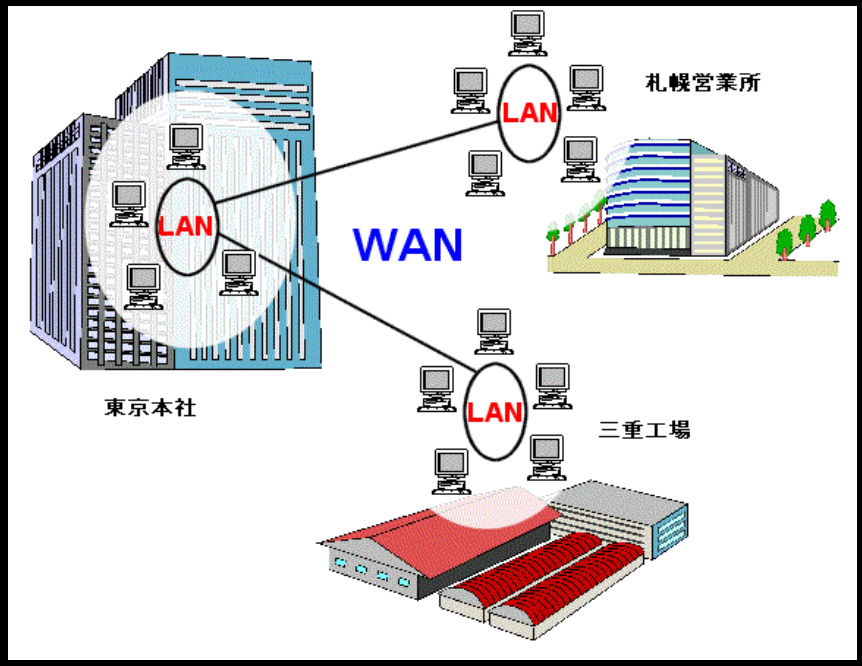
Networks

- A computer network that spans a relatively large geographical area.
- Typically, a WAN consists of two or more local-area networks (LANs). Computers connected to a wide-area network are often connected through public networks, such as the telephone system.
- They can also be connected through leased lines or satellites. The largest WAN in existence is the Internet.



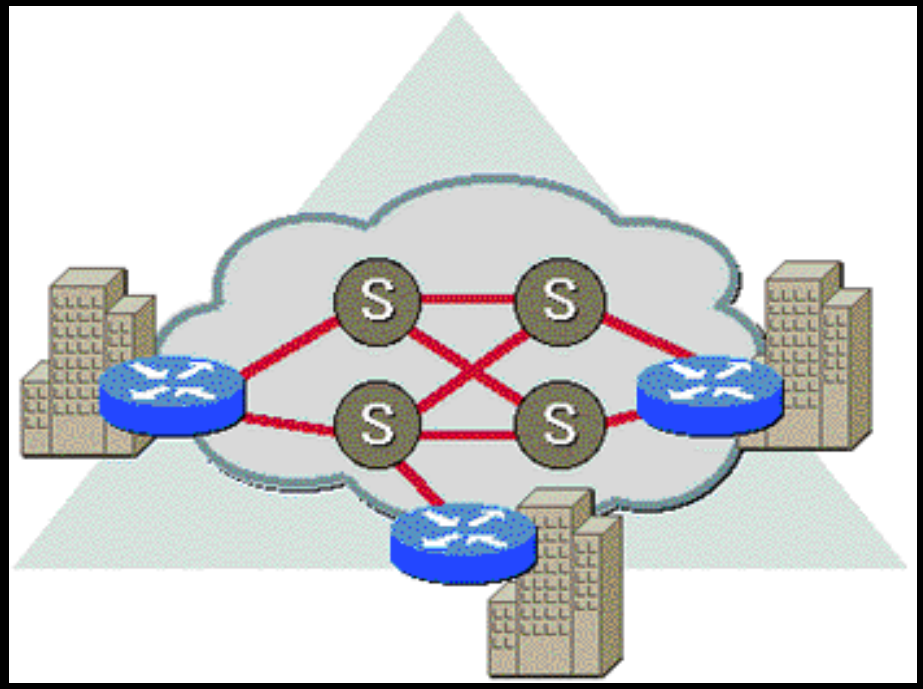


Routers

- A device that determines the next network point to which a data packet should be forwarded enroute toward its destination.

Routing is ……..

- Selecting the best outgoing path that a packet has to take in a Internet work.



Types Of Routing

- Static Routing

  The network Managers configures the routing table to set fixed path between two routers. If a link goes down, it will issue an alarm but would not reroute the traffic

- Dynamic Routing

Router reconfigures routing table automatically [30 sec.] and recalculates the most efficient path interm of load, line delay and bandwidth.
Some of these Dynamic Routers even balance the traffic load across multiple links and allows many links to handle peak traffic conditions.

Static Routing

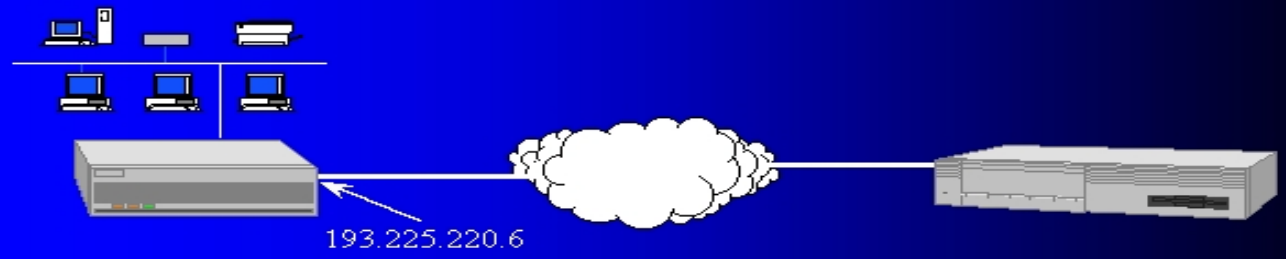
- Static routing provides a means of explicitly defining the next hop from a router for a particular destination.

- A router SHOULD provide a means for defining a static route to a destination, where the destination is defined by a network prefix.

- The mechanism SHOULD also allow for a metric to be specified for each static route.

Static routing

Network: 193.225.219.0



User's router

Provider's Access Server

Static route for 193.225.219.0

to address 193.225.220.6

Default route pointing to the asynchronous interface

Dynamic Routing Potocols

(Unicast Routing)

1. IGP (Interior Gateway Protocol)
   (a) RIP (Routing Information Protocol)
   (b) OSPF (Open Shortest Path First)

2. EGP (Exterior Gateway Protocol)
   (c) BGP4 (Border Gateway Protocol Version 4)

(Multicast Routing)

(i) DVMRP (Distance Vector Multicast Routing Protocol)
(ii) MOSPF (Multicast OSPF)
(iii) PIM (Protocol Independnet Multicast Protocol)
(iv) MBGP (Multicast BGP)

Dynamic routing

Network: 193.225.219.0

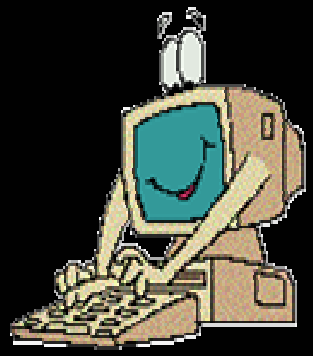
User's router

Provider's Access Server

Enable routing protocol on both interfaces

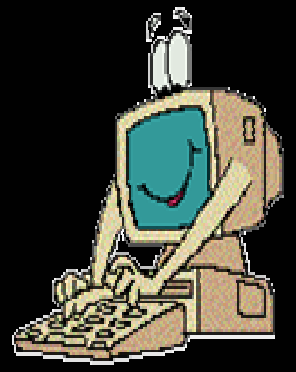
What is Protocol

A protocol is a set of communication rules the end points in a telecommunication connection use when they send signals back and forth. Protocols exist at several levels in a telecommunication connection. There are hardware telephone protocols. There are protocols between the end points in communicating programs within the same computer or at different locations. Both end points must recognize and observe the protocol.



Routing Protocol

- Each router on the network keeps a routing table and moves it to destinations using some rules or Protocols. Many of these protocols are already standardized and used widely. For example, RIP- Routing Information Protocol. Old way & does not perform well in today's increasing complex Network, as it uses too much bandwidth.



Interior and Exterior Protocols

The routing protocols are broadly divided into two classes,

Interior Gateway Protocols (IGPs), and Exterior Gateway Protocols (EGPs).

The interior routing protocols supported by Cisco include the Routing Information Protocol (RIP), HELLO, and the Interior Gateway Routing Protocol (IGRP).

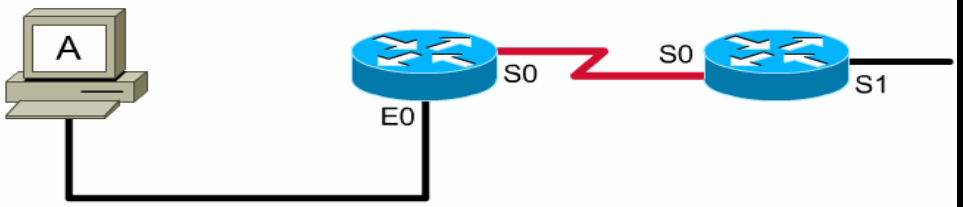
- **IGRP**
- **RIP**
- **HELLO**
- **EGP**
- **BGP**

ROUTING PROTOCOLS

- OSPF : Open Shortest Path First. New standard and work very efficiently Uses smaller header and packets.
- IS IS: Intra Autonomous System to Intra Autonomous system.
- EGP: External gateway protocol.
- BGP: Border Gateway protocol.
- IDPR: Inter Domain Policy Routing.

Routing Tables

Destination Network	Interface (Next Hop)
172.16.0.0	S0
172.18.0.0	--
192.168.24.0	S0
Default Router	S1

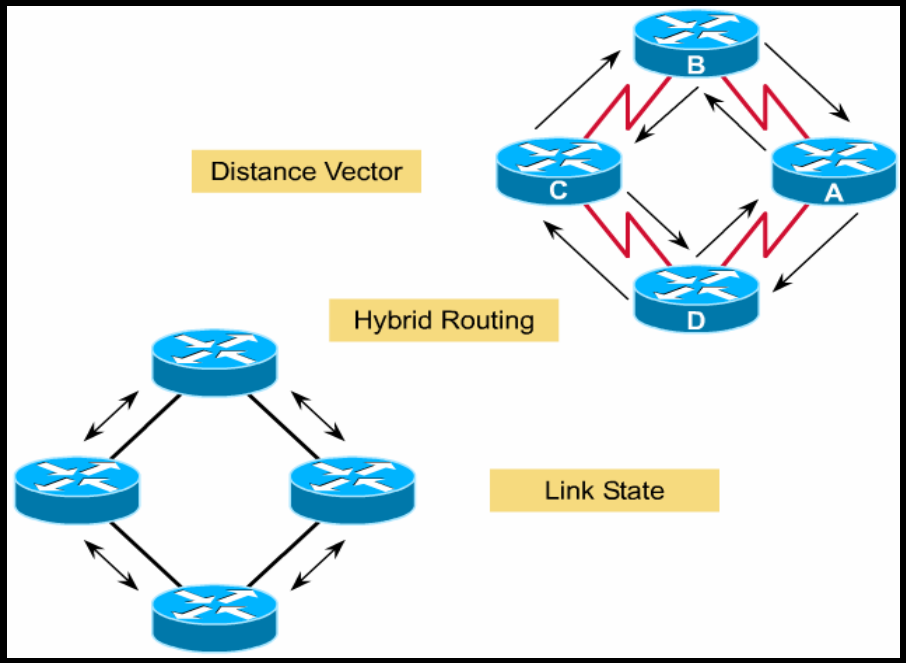


• The router accepts the packet on one interface, determines which path to use, and then proceeds to switch the packet.

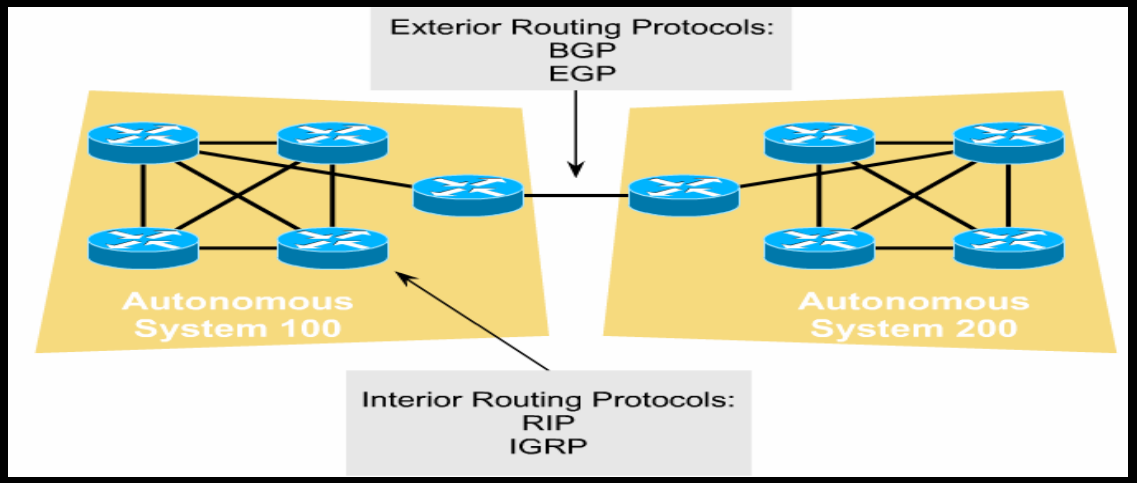
• Routing tables store information on possible destinations and how to reach each of the destinations. Routing tables need to store only the network portion of IP addresses for routing.

Classes of Routing Protocols

- Distance Vector
- Hybrid Routing
- Link State



Interior and Exterior Routing Protocols



•Interior protocols are used for routing information within networks that are under a common network administration, called autonomous systems.

•Exterior protocols are used to exchange routing information between autonomous systems.

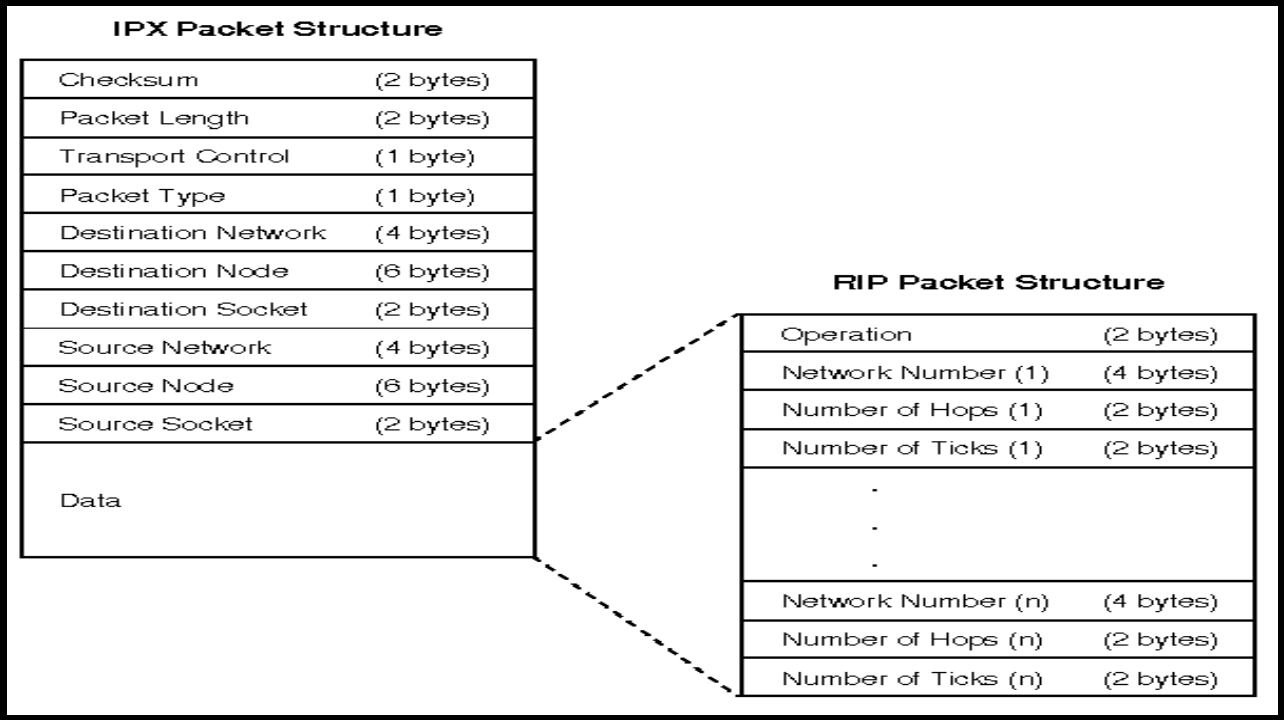
RIP

(Routing Information Protocol)

RIP is probably the most widely used. It is a distance-vector protocol based on a 1970s Xerox design.

Ported to TCP/IP when LANs first appeared in the early 80s, RIP has changed little in the past decade and suffers from several limitations, some of which have been overcome with RIP-2,

RIP Packed Sructure



Interior Gateway Routing Protocol

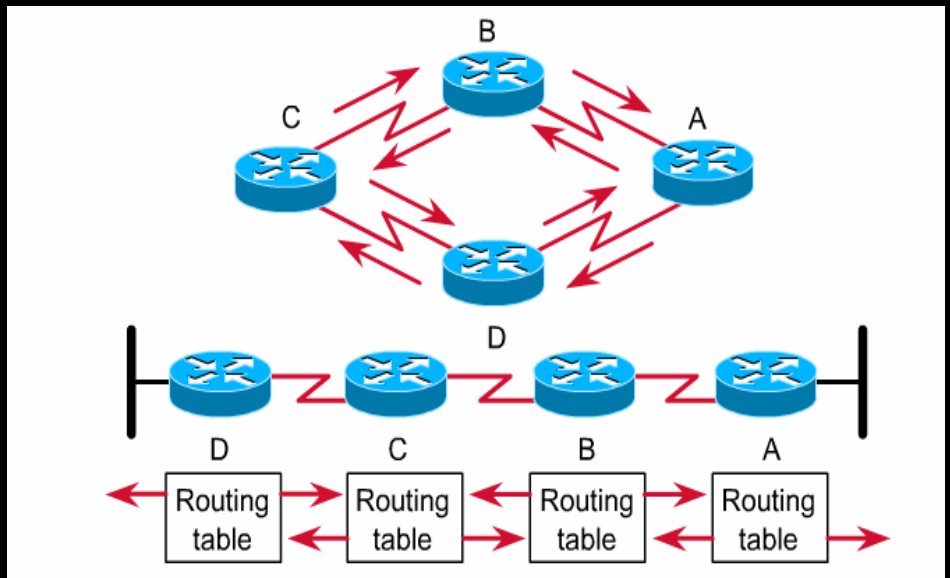
- IGRP is a distance-vector interior routing protocol used within an autonomous system.

- IGRP uses a combination of metrics: network delay, bandwidth, reliability, and load.

- A router running IGRP sends an IGRP update broadcast every 90 seconds.

- Network administrators can determine the settings for each of these metrics.

Interior Gateway Routing Protocol (IGRP)



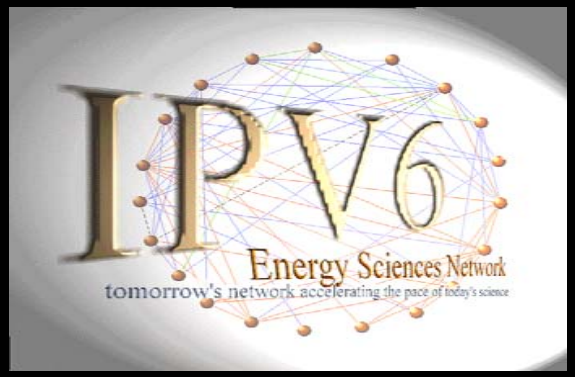
- Pass periodic copies of routing table to neighbor routers and accumulate distance vectors

PIM-SM Multicast Routing Protocol

PIM-SM RFC. PIM-SM was designed to operate efficiently across wide area networks, where groups are sparsely distributed. It uses the traditional IP multicast model of receiver-initiated membership, supports both shared and shortest-path trees, is not dependent on a specific unicast routing protocol, and uses soft-state mechanisms to adapt to changing network conditions.

Internet Protocol Version

- **IPv4**
- **IPv6 (Next Generation)**



IPv6 Header

What's good about IPv6

- **Larger Address space**

128 bit: 3.4¡ß10^38

- **Redesign to solve the current problems such as.**
  - Routing
  - Security
  - Auto-configuration
  - Plug & Play

IPv4 Address

1) IPv4 Address Internet address classes
2) Multicast addresses (224.0.0.0/4)
3) Broadcast addresses
4) Unspecified address is 0.0.0.0
5) Loop back address is 127.0.0.1
6) Public IP addresses
7) Private IP addresses (10.0.0.0/8, 172.16.0.0/12, and 192.168.0.0/16)
8) Auto configured addresses (169.254.0.0/16)
9) Text representation: Dotted decimal notation
10) Network bits representation: Subnet mask in dotted decimal notation or prefix length.
11) DNS name resolution: IPv4 host address (A) resource record
12) DNS reverse resolution: IN-ADDR.ARPA domain

IPv6 Address

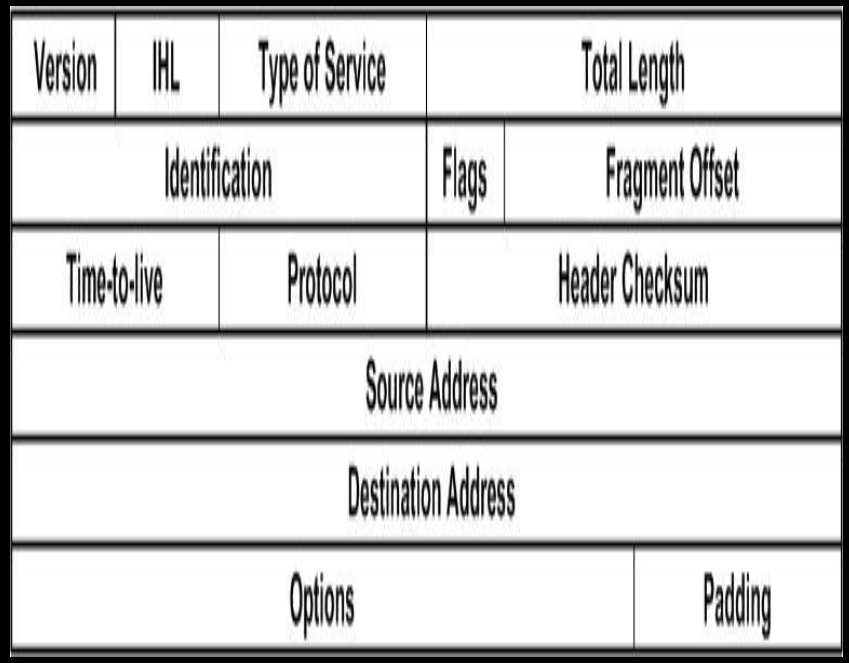
1) Not applicable in IPv6
2) IPv6 multicast addresses (FF00::/8)
3) Not applicable in IPv6
4) Unspecified address is ::
5) Loop back address is ::1
6) Aggregately global unicast addresses
7) Site-local addresses (FEC0::/48)
8) Link-local addresses (FE80::/64)
9) Text representation: Colon hexadecimal format with suppression of leading zeros and zero compression. IPv4-compatible addresses are expressed in dotted decimal notation.
10) Network bits representation: Prefix length notation only
11) DNS name resolution: IPv6 host address (AAAA) resource record
12) DNS reverse resolution: IP6.ARPA domain

IPv6 VS IPv4

1995 vs 1975

- IPv6 only twice the size of IPv4 header
- Only version number has the same position and meaning as in IPv4.
- Removed: header length type of service idntification ,flags ,fragment offset,header checksum
- Datagram length replaced by payload length
- Protocol type replaced by hop limit
- Added: priority and flow label
- All fixed size fields.

IPv4 & IPv6 Header



Changes from IPv4 to IPv6

- Expanded addressing capabilities
- Header format simplification
- Improved support for extensions and options
- Flow labeling capability
- Authentication and privacy capabilities

NeuroGrid Routing Applet

- The absence of a centralized index you do a search using your wits, and the wits of your friends. You don't (as one might imagine from routing in some P2P systems) ask all your friends and rely on them to ask each of their friends propagating your question all around the world.

Routing Applets

- http://www.neurogrid.net/applet.html
- http://members.rogers.com/fmobrien/experiments/garouter.html

Input? Feedback? Discussion!

Thanks!

(Vielen Dank)