Q.1	Explain Routing in the internet: intra and intr domain routing.

Ans.

Intra-domain rounting:

an internet is divided into
autonomous systems. An autonomous system (AS) is a group of networks and routers under the authority of a single administration. Routing inside an autonomous system is referred to as intra-domain routing.

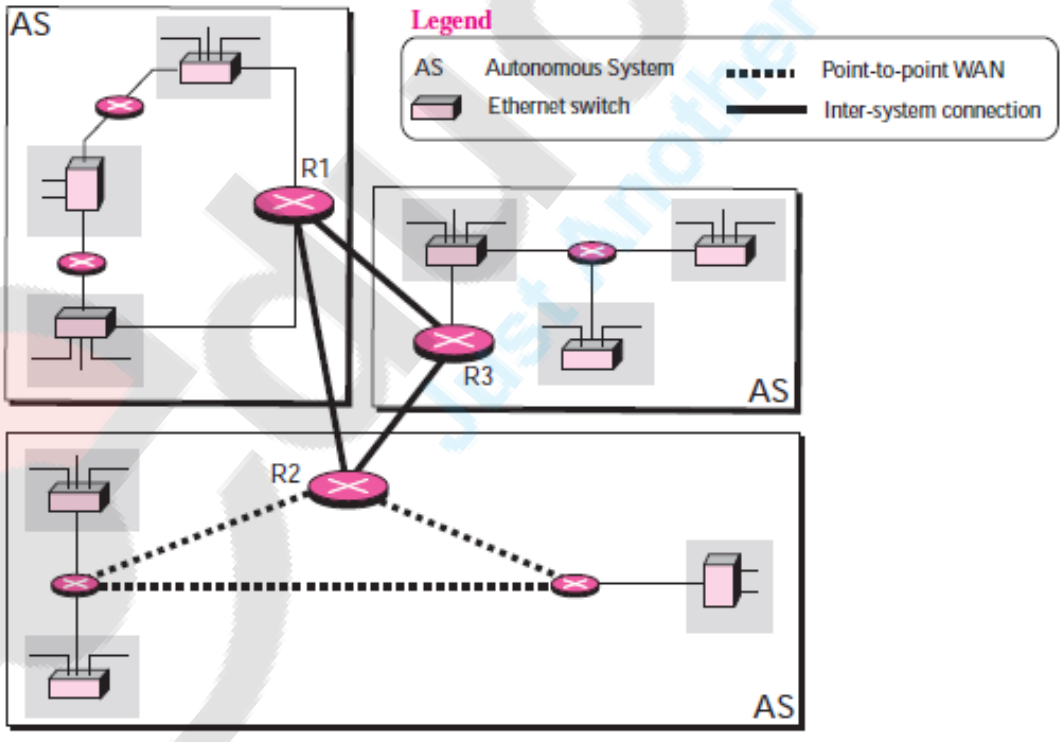
- routing within an AS(Autonomous System).
- ignores the internet outside the autonomous system.
- protocols for intra domain routing are also called interior gateway protocols.
- popular protocols are RIP ams OSPF.

Inter-domain routing:

Routing between autonomous systems is
referred to as inter-domain routing. Each autonomous system can choose one or more intradomain routing protocols to handle routing inside the autonomous system

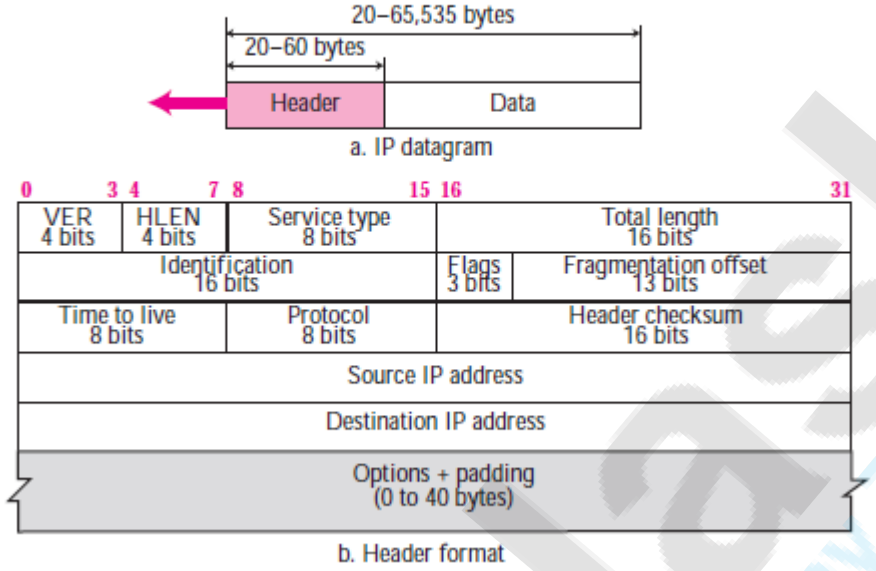
- routing between AS's.
- assumes that the internet consists of a collection of interconnected AS's.
- protocol for inter domain routing are also called exterior gateway protocols.
- routing protocols are BGP.

Figure 11.1 *Autonomous systems*



Q2.	What is Subnetting.
Ans.	Subnetting enables the network administrator to further divide the host part of the address into two or more subnets. In this case, a part of the host address is reserved to identify the particular subnet. This is easier to see if we show the IP address in binary format. The full address is: 10010110.11010111.00010001.00001001 The Class B network part is: 10010110.11010111 The host address is: 00010001.00001001 If this network is divided into 14 subnets, however, then the first 4 bits of the host address (0001) are reserved for identifying the subnet. he subnet mask is the network address plus the bits reserved for identifying the subnetwork -- by convention, the bits for the network address are all set to 1, though it would also work if the bits were set exactly as in the network address. In this case, therefore, the subnet mask would be 11111111.11111111.11110000.00000000. It's called a mask because it can be used to identify the subnet to which an IP address belongs by performing a bitwise AND operation on the mask and the IP address. The result is the subnetwork address: Subnet Mask 255.255.240.000 11111111.11111111.11110000.00000000 IP Address 150.215.017.009 10010110.11010111.00010001.00001001 Subnet Address 150.215.016.000 10010110.11010111.00010000.00000000 The subnet address, therefore, is 150.215.016.000.
Q.3	What is Datagram.
Ans.	**Datagram:** Packets in the network (internet) layer are called datagrams. A datagram is a variable-length packet consisting of two parts: header and data. The header is 20 to 60 bytes in length and contains information essential torouting and delivery. It is customary in TCP/IP to show the header in 4-byte sections. A brief description of each field is in order.

Figure 7.2 *IP datagram*



Version (VER). This 4-bit field defines the version of the IP protocol. Currently the version is 4. However, version 6 (or IPv6) may totally replace version 4 in the future. This field tells the IP software running in the processing machine that the datagram has the format of version 4.

Header length (HLEN). This 4-bit field defines the total length of the datagram header in 4-byte words. This field is needed because the length of the header is variable (between 20 and 60 bytes). When there are no options, the header length is 20 bytes, and the value of this field

Service type. In the original design of IP header, this field was referred to as type of service (TOS), which defined how the datagram should be handled. Part of the field was used to define the precedence of the datagram; the rest defined the type of service (low delay, high throughput, and so on).

Total length. This is a 16-bit field that defines the total length (header plus data) of the IP datagram in bytes. To find the length of the data coming from the upper layer, subtract the header length from the total length. The header length can be found by multiplying the value in the HLEN field by four.

Identification. This field is used in fragmentation (discussed in the next section).

- **Flags.**This field is used in fragmentation (discussed in the next section).
- Fragmentation offset. This field is used in fragmentation (discussed in the next section).
- **Time to live**. A datagram has a limited lifetime in its travel through an internet. This field was originally designed to hold a timestamp, which was decremented by each visited router.

Q.4	Explain DVMRP and MOSPF protocol of Multicast routing protocol

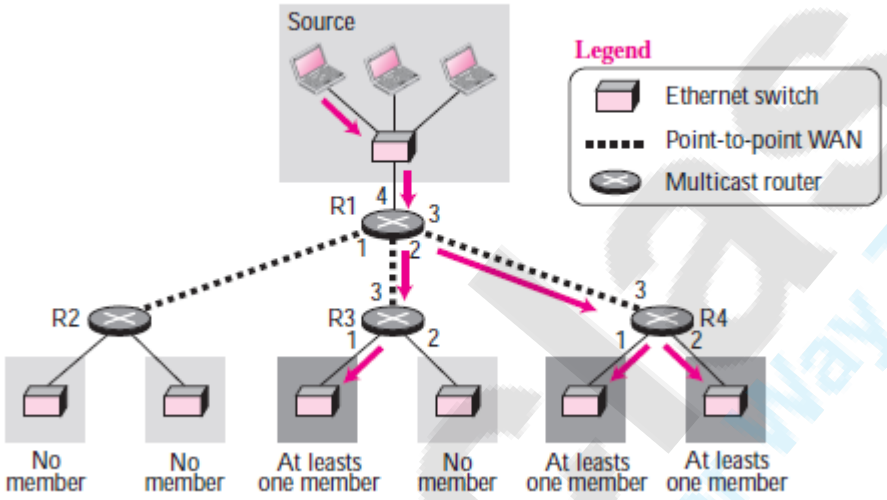
Ans.

Multicast routing protocol:

In multicasting, there is one source and a group of destinations. The relationship is one to many. In this type of communication, the source address is a unicast address, but the destination address is a group address, a group of one or more destination networks in which there is at least one member of the group that is interested in receiving the multicast datagram.

In multicasting, the router may forward the received datagram through several of its interfaces.

Figure 12.2 *Multicasting*



DVMRP:

The distance vector multicast routing protocol is multicast routing protocol that takes the routing decision based upon the source address of the packet.

his algorithm constructs the routing tree for a network.

• Whenever a router receives a packet, it forwards it to some of its ports based on the source address of packet.

• The rest of the routing tree is made by downstream routers.

• In this way, routing tree is created from destination to source.

The protocol must achieve the following tasks:

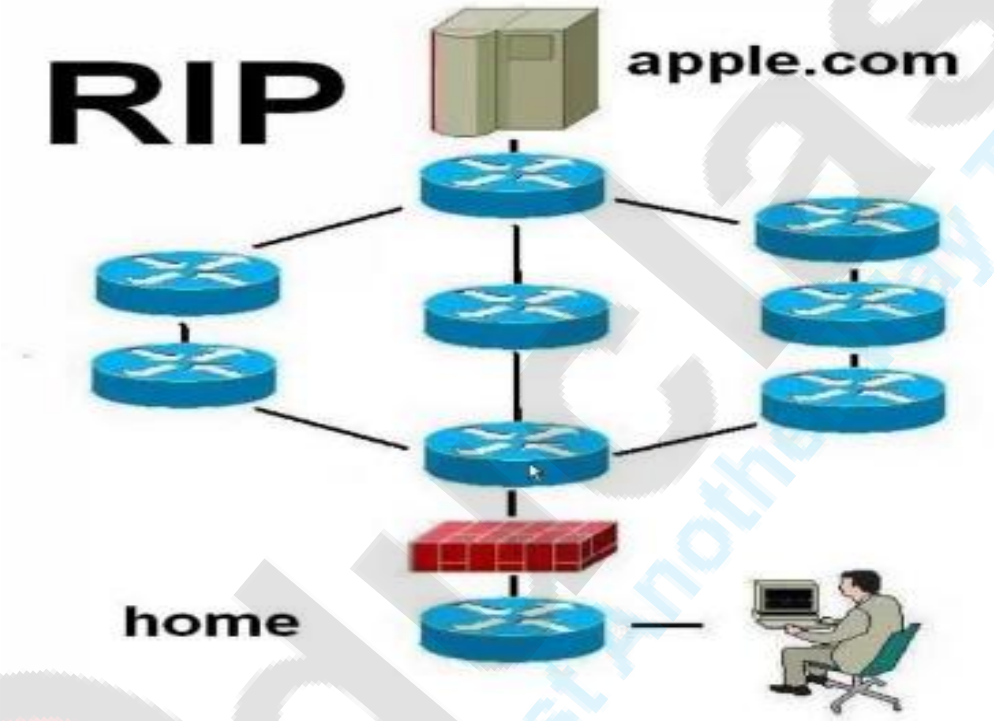
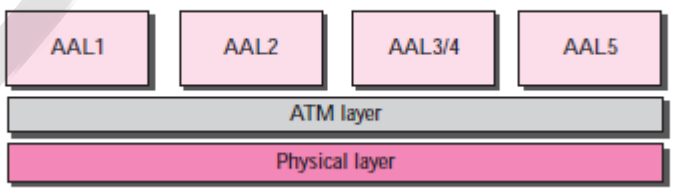
1. It must prevent the formation of loops in the network.

2. It must prevent the formation of duplicate packets.

3. It must ensure that the path traveled by a packet is the shortest from its source to the router.

4. It should provide dynamic membership.

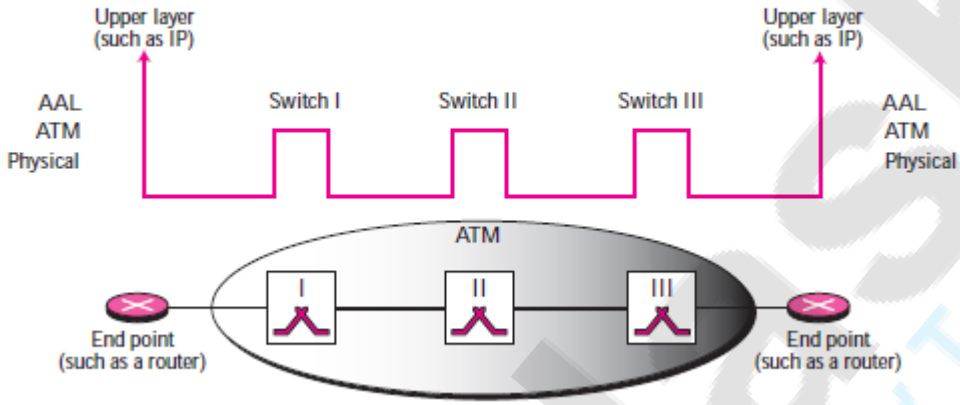
	To accomplish this, the DVMR algorithm uses a process based on following decision making strategies: **1. Reverse Path Forwarding (RPF)** **2. Reverse Path Broadcasting (RPB)** **3. Reverse Path Multicasting (RPM)** **MOSPF:** MOSPF (Multicast Open Shortest Path First) is an extension to the OSPF (Open Shortest Path First) protocol that facilitates interoperation between unicast and multicast routers. MOSPF is becoming popular for proprietary network multicasting and may eventually supersede RIP (Routing Information Protocol). Here's a brief explanation of how MOSPF works: Multicast information goes out in OSPF link state advertisements (LSA). That information allows a MOSPF router to identify active multicast groups and the associated local area networks (LANs). MOSPF creates a distribution tree for each multicast source and group and another tree for active sources sending to the group. The current state of the tree is cached. Each time a link state changes or the cache times out, the the tree must be recomputed to accomodate new changes.
Q. 5	OSPF protocol of unicast routing protocol
Ans	**OSPF:** Routers connect networks using the Internet Protocol (IP), and OSPF (Open Shortest Path First) is a router protocol used to find the best path for packets as they pass through a set of connected networks. OSPF is designated by the Internet Engineering Task Force (IETF) as one of several Interior Gateway Protocols (IGPs) -- that is, protocols aimed at traffic moving around within a larger autonomous system network like a single enterprise's network, which may in turn be made up of many separate local area networks linked through routers. The OSPF routing protocol has largely replaced the older Routing Information Protocol (RIP) in corporate networks. Using OSPF, a router that learns of a change to a routing table (when it is reconfigured by network staff, for example) or detects a change in the network immediately multicasts the information to all other OSPF hosts in the network so they will all have the same routing table information. **Features and advantage of OSPF** It supports both IPv4 and IPv6 routed protocols. It supports load balancing with equal cost routes for same destination. Since it is based on open standards, it will run on most routers. It provides a loop free topology using SPF algorithm. It is a classless protocol. It supports VLSM and route summarization. It supports unlimited hop counts. It scales enterprise size network easily with area concept. It supports trigger updates for fast convergence. Just like other routing protocols, OSPF also has its negatives. **Disadvantage of OSPF** It requires extra CPU process to run SPF algorithm. It requires more RAM to store adjacency topology. It is more complex to setup and hard to troubleshoot.

Q.6	Explain RIP protocol of unicast routing protocol
Ans.	**RIP:** The Routing Information Protocol (RIP) defines a way for routers, which connect networks using the Internet Protocol (IP), to share information about how to route traffic among networks. RIP is classified by the Internet Engineering Task Force (IETF) as an Interior Gateway Protocol (IGP), one of several protocols for routers moving traffic around within a larger autonomous system network -- e.g., a single enterprise's network that may be comprised of many separate local area networks (LANs) linked through routers 
Q. 7	Explain ATM layers.
Ans.	ATM LAYERS: ATM (asynchronous transfer mode) is a dedicated-connection switching technology that organizes digital data into 53-byte cell units and transmits them over a physical medium using digital signal technology. Individually, a cell is processed asynchronously relative to other related cells and is queued before being multiplexed over the transmission path. Because ATM is designed to be easily implemented by hardware (rather than software), faster processing and switch speeds are possible. **Figure 3.35** *ATM layers* 

The physical and ATM layer are used in both switches inside the network and end points (such as routers) that use the services of the ATM. The application adaptation layer (AAL) is used only by the end points.

Figure 3.36 shows the use of these layersinside and outside an ATM network.

Figure 3.36 *Use of the layers*



Q. 8 What is the Need for ATM

ATM (asynchronous transfer mode) is a dedicated-connection switching technology that organizes digital data into 53-byte cell units and transmits them over a physical medium using digital signal technology.

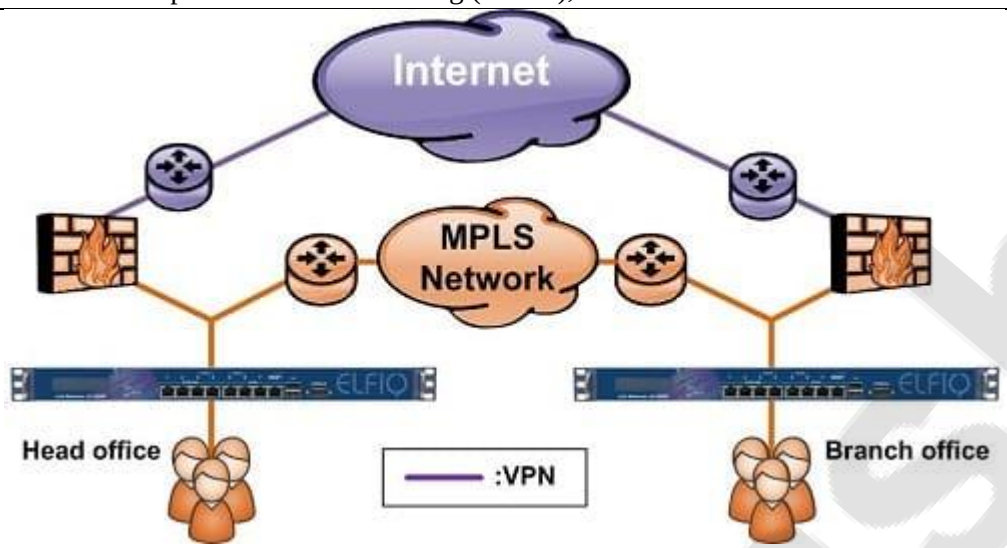
Individually, a cell is processed asynchronously relative to other related cells and is queued before being multiplexed over the transmission path.

Because ATM is designed to be easily implemented by hardware (rather than software), faster processing and switch speeds are possible.

The prespecified bit rates are either 155.520 Mbps or 622.080 Mbps.

Speeds on ATM networks can reach 10 Gbps. Along with Synchronous Optical Network (SONET) and several other technologies, ATM is a key component of broadband ISDN (BISDN).

Q.9	What is Multi protocol Label switching (MPLS),



Multiprotocol Label Switching (**MPLS**) is a type of data-carrying technique for high-performance telecommunications networks. MPLS directs data from one network node to the next based on short path labels rather than long network addresses, avoiding complex lookups in a routing table.

Label switching is a high-performance packet forwarding technology that integrates the performance and traffic management capabilities of data link layer (Layer 2) switching with the scalability, flexibility, and performance of network layer (Layer 3) routing.

MPLS is a multi-talented, smart, scalable, protocol-independent transport. In an MPLS network, data packets are assigned labels. Packet-forwarding decisions are made solely on the contents of this label, without the need to examine the packet itself.

Advantages

The advantages of MPLS include enhances data integrity.

The service recognizes a Class of Service (CoS), which is attached after the network layer and before the IP address. It is extremely versatile.

By being able to select the perfect routes and heal the network should the route go down, your network will remain in working order through some faults (if configured correctly). It also allows for prioritization and other enhancements.

Disadvantages

The only real disadvantage to MPLS is that you will generally need to upgrade your equipment unless you have routers that are field upgradeable.

However, when you consider the uptime in this environment and the better paths that you can utilize, it is a expense that is well worth it.
