Discuss the two approaches of packet switching. Which protocol is associated with virtual circuit approach and datagram approach respectively.

Datagram switching	Virtual Circuit Switching
Also known as connectionless switching.	Also known as connection-oriented switching.
Path is not fixed.	Path is fixed.
Intermediate nodes take the routing decisions to forward the packets.	Intermediate nodes do not take the routing decisions to forward the packets.
Congestion cannot occur as all the packets travel in different directions.	Congestion can occur
Packet is considered as an independent entity.	Packet is not considered as an independent entity.
Protocol: IP	Protocol: X.25

Differentiate between open loop and closed loop algorithms to handle the congestion at network layer.

Open Loop Algorithm	Closed Loop Algorithm
Easy to build	Difficult to build
More stable	Less stable
Optimization cannot be performed.	Optimization can be performed.
Feedback mechanism is absent	Feedback mechanism is present
Requires less maintenance	Requires more maintenance
Less reliable	More reliable
Slower	Faster
Example: Retransmission policy, window policy	Example: Implicit Signalling, Explicit Signalling

In RIP, why is expiration timer value six times that of the periodic timer value? How does the hop count limit alleviate RIP's problems? Why do OSPF messages propagate faster than RIP messages?

Expiration timer value six times that of the periodic timer value to

1. Ensures route stability
2. Allow time for convergence
3. Minimize unnecessary route recalculations

Hop count limit alleviate RIP's problems by:

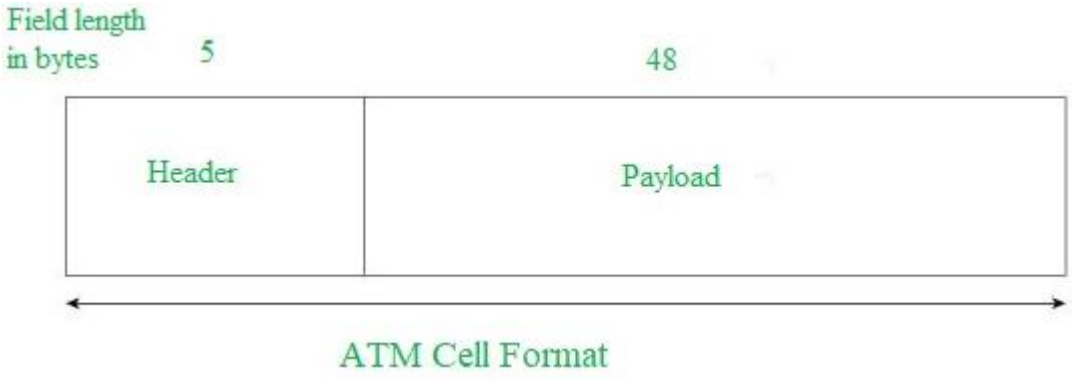
1. Alleviating Count-to-Infinity Problem
2. Reducing Routing Overhead
3. Enhancing Security

OSPF Messages Propagate Faster Than RIP Messages due to

1. Triggered Updates
2. Multicast Updates
3. Immediate Neighbour Updates

Discuss ATM in network layer in detail. Why is AAL5 called SEAL? Describe the address binding in IP over ATM.

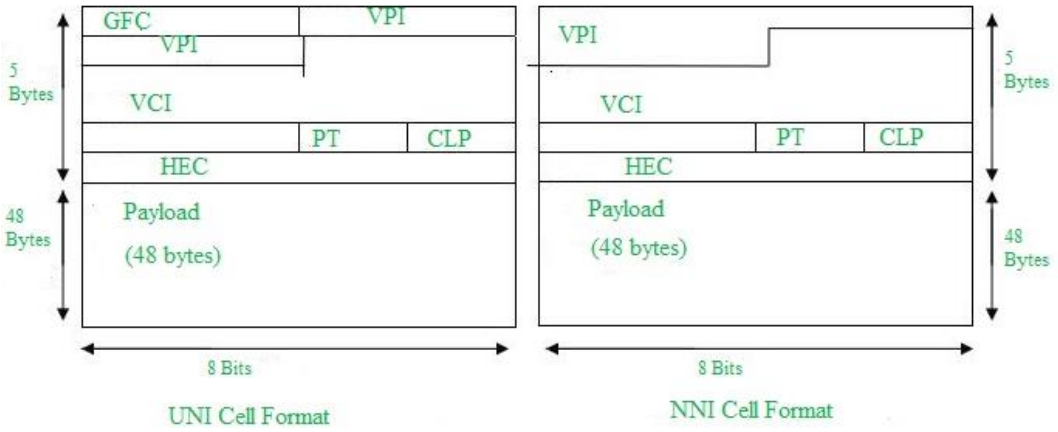
ATM stands for Asynchronous Transfer Mode. It is a switching technique that uses time division multiplexing (TDM) for data communications.



Asynchronous Transfer Mode can be of two format types which are as follows:

1. **UNI Header:** This is used within private networks of ATMs for communication between ATM endpoints and ATM switches.

2. **NNI Header:** is used for communication between ATM switches.



AAL5 is called SEAL (Simple and Efficient Adaptation Layer) due to:

1. **Simplicity:** Simpler design compared to other AALs, reducing overhead and complexity.
2. **Efficiency:** Efficient handling of variable-length data, making it suitable for IP and other protocols.

Methods of Address Binding in IP over ATM:

1. **ATMARP (ATM Address Resolution Protocol):** Resolves IP addresses to ATM addresses dynamically.
2. **Static mapping:** Manual mapping of IP-to-ATM address.
3. **NBMA (Non-Broadcast Multi-Access):** Employs a central server for address resolution in non-broadcast ATM networks.

Explain Application firewalls in detail.

Application firewall operates at Layer 7 of the OSI model. It focusses on the application-level data and protocols that pass through them. It understands application-specific vulnerabilities and threats, enabling more targeted protection.

Types of Application Firewalls:

1. **Proxy Firewalls:**
   - Act as intermediaries between clients and servers.
   - Filter and analyze traffic at the application level.
   - Can mask internal IP addresses and offer content filtering.

2. **Web Application Firewalls (WAFs):**
   - Specialized for protecting web applications.
   - Defend against common web attacks like SQL injection, XSS, and file inclusion.
   - Enforce application-specific security policies.

3. **Database Firewalls:**
   - Safeguard databases from unauthorized access and attacks.
   - Monitor database traffic for anomalies and block malicious queries.
   - Enforce data integrity and confidentiality.