Sample Questions for Autumn Mid Semester Examination 2024-25

Distributed Operating System (CS30009)

Topic: Asynchronous Transfer Mode (ATM)

Short Question (1 mark)

Q1. State advantages of ATM over traditional switching, i.e., circuit switching and packet switching technology

Answer:

- **Flexibility**: ATM can handle both constant and variable rate traffic.
- **High speeds**: ATM's cell concept allows for very high-speed switching.
- **Fixed length**: ATM cells have a fixed length, which simplifies transmission and reception compared to variable-length packets
- **Bandwidth efficiency**: ATM is more bandwidth efficient than packet switching because it doesn't introduce additional overhead or padding to cells
- **Traffic shaping**: ATM can use traffic shaping to avoid congestion and packet loss
- **Broadcasting**: ATM can provide broadcasting, which is essential for television distribution.

Q2. State various classes of traffic are present in ATM Adaptation Layer.

Answer:
There are four classes of traffic present in the ATM Adaptation Layer. These are-
1. Constant bit rate traffic (for audio and video)
2. Variable bit rate traffic but with bounded delay
3. Connection-oriented data traffic
4. Connection less data traffic

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Q1. What is the head-of-line *blocking* problem in the ATM switching network? How to overcome this?

Answer:

- In an ATM network, if two ports each have streams of cells for the same destination, substantial input queues will build up, blocking other cells behind them that want to go to output ports that are free. This problem is known as *head-of-line* blocking.
- A different switch design copies the cell into a queue associated with the output buffer and lets it wait there, instead of keeping it in the input buffer. This approach eliminates head-of-line blocking and gives better performance.

Q2. Draw and briefly describe each of the fields of the cell header.

Answer:

Virtual Path Identifier | **Cell Loss Priority**

GFC (4 bits)	VPI (8 bits)	VCI (16 bits)	Payload Type (3 bits)	CLP (1 bit)	CRC (8 bits)

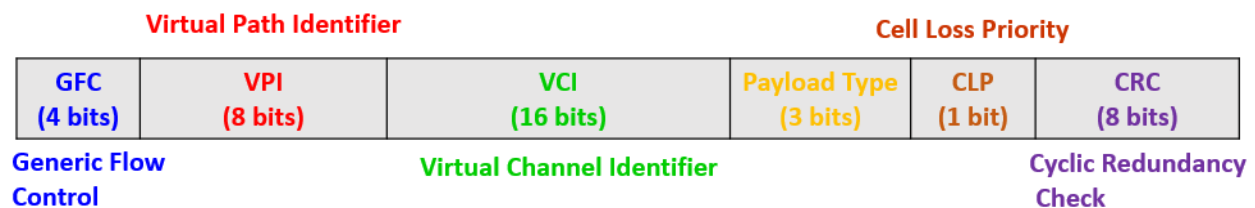**Generic Flow Control** **Virtual Channel Identifier** **Cyclic Redundancy Check**

Figure: Cell Header Layout

- Generic Flow Control (GFC) is used for flow control. It is a 4 bit long field.

- Virtual path Identifier (VPI) and Virtual Channel Identifier (VCI) together identify path and circuit of a cell. Routing tables along with the way use this information for routing. These fields are modified at each hop along the path. The purpose of VPI is to group together a collection of virtual circuits for the same destination and make it possible for a carrier to reroute all of them without having to examine the VCI field. VPI is 8 bits and VCI is 16 bits fields.

- Payload type field distinguishes data cells from control cells, and further identifies several kinds of control cells. It is a 3 bits long field.

- Cell Loss Priority (CLP) identifies the less important cells which drop if congestion occurs. Field size is 1 bit.

- Cyclic Redundancy Check (CRC) identifies redundancy and corrects it. It is an 8 bits long field.

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