

Answer on Question #53260, Engineering / Other

Task:

Write short notes on Multimedia over ATM networks. (Multimedia Computing)

Answer:

➤ Video Bit-rates over ATM:

- **CBR** (Constant Bit Rate): if the allocated bit-rate of CBR is too low, then cell loss and distortion of the video content are inevitable.
- **VBR** (Variable Bit Rate): the most commonly used video bit-rate for compressed video, can be further divided into:
 - * *rt*-VBR (real-time Variable Bit Rate): for compressed video.
 - * *nrt*-VBR (non real-time Variable Bit Rate): for specified QoS.
- **ABR** (Available Bit Rate): data transmission can be backed off or buffered due to congestion. Cell loss rate and minimum cell data rate can sometimes be specified.
- **UBR** (Unspecified Bit Rate): no guarantee on any quality parameter.

➤ ATM Adaptation Layer (AAL):

- Converts various formats of user data into ATM data streams and vice versa.
- Different types of protocols of (AAL):
 - **AAL Type 1**: supports real-time, constant bit rate (CBR), connection-oriented data streams.
 - **AAL Type 2**: intended for variable bit rate (VBR) compressed video and audio (inactive).
 - **AAL Types 3 and 4**: have been combined into one type — AAL Type 3/4. It supports variable bit rate (VBR) of either connection-oriented or connectionless general (non real-time) data services.
 - **AAL Type 5**: the new protocol introduced for multimedia data transmissions, promising to support all classes of data and video services (from CBR to UBR, from *rt*-VBR to *nrt*-VBR).

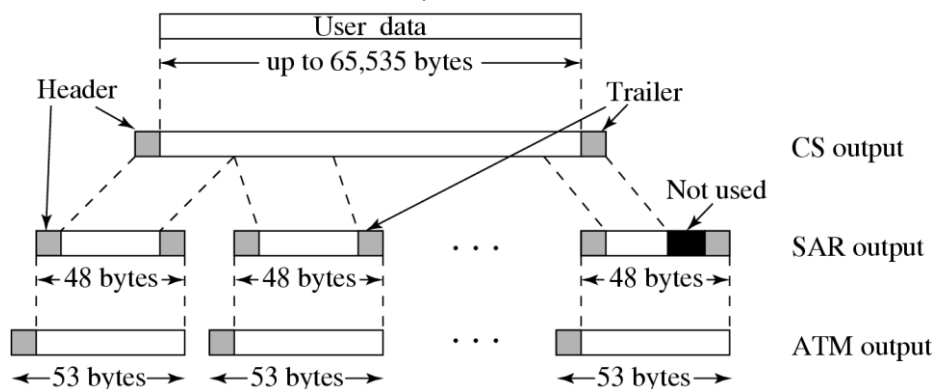


Fig. 1: Headers and Trailers added at the CS and SAR sublayers

- Headers and trailers are added to the original user data at the CS (Convergence Sublayer) and SAR (Segmentation And Reassembly sublayer)
 - eventually form the 53-byte ATM cells with the 5-byte ATM header appended.

	AAL 1	AAL 3/4	AAL 5
CS Header/Trailer Overhead	0 byte	8 bytes	8 bytes
SAR Header/Trailer Overhead	1 or 2 bytes	4 bytes	0 byte
SAR Payload	47 or 46 bytes	44 bytes	48 bytes
CS Checksum	None	None	4 bytes
SAR Checksum	None	10 bits	None

Table 1: Comparison of AAL Types

- AAL 3/4 has an overhead of designating 4 bytes header/trailer for each SAR cell, whereas AAL 5 has none at this sublayer. Considering the numerous number of SAR cells, this is a substantial saving for AAL 5.
- As part of the SAR trailer, AAL 3/4 has a (short) 10-bit “Checksum” for error checking. AAL 5 does it at the CS and allocates 4 bytes for the Checksum.

Video Requirement	Support in ATM	Support w/t ATM
Bandwidth	Scalable to several Gbps	Up to 100 Mbps
Latency and Jitter	QoS support	RSVP
CBR or VBR	AAL 1, 2, 5, LAN emulation, circuit emulation,etc.	ISDN and ADSL
Multicasting	Multicast switch, or permanent virtual circuit	IP-multicast or Protocol Independent Multicast (PIM)

Table 2: Support for Digital Video Transmission

➤ **MPEG-2 Convergence to ATM**

- The ATM Forum has decided that MPEG-2 will be transported over AAL5:
 - Two MPEG-2 packets (each 188 bytes) from the Transport Stream (TS) will be mapped into one AAL-5 SDU (Service Data Unit).
- When establishing a virtual channel connection, the following QoS parameters must be specified:
 - Maximum cell transfer delay.
 - Maximum cell delay.
 - Cell Loss Ratio (CLR).
 - Cell Error Ratio (CER).
 - Severely Errored Cell Block Ratio (SECBR).

➤ **Multicast over ATM**

- Multicast in ATM networks had several challenges:
 - ATM is connection-oriented; hence ATM multicasting needs to set up all multipoint connections.
 - QoS in ATM must be negotiated at the connection set-up time and be known to all switches.
 - It is difficult to support multipoint-to-point or multipoint-to-multipoint connections in ATM, because AAL 5 does not keep track of multiplexer number or sequence number.