Module 10

Frame Relay and ATM

Lesson

35

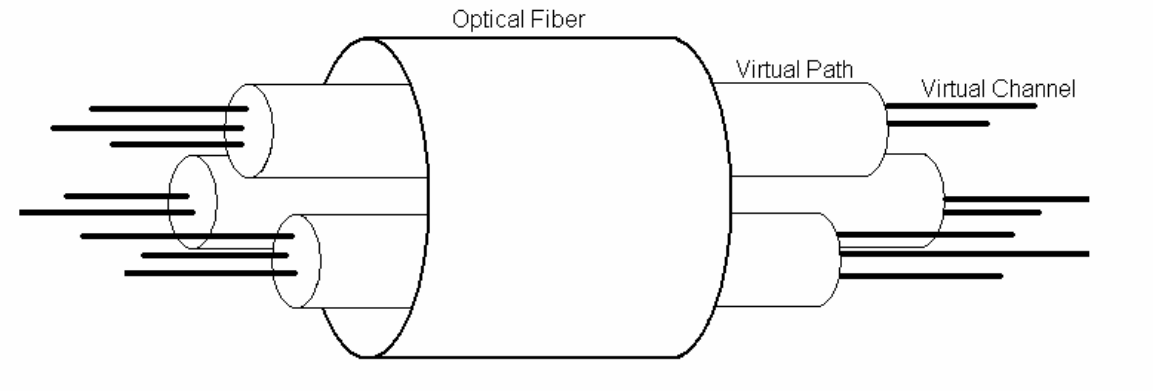
ATM: Virtual Path, Virtual Channel. ATM Adaptation Layer (AAL)

10.3.1 VIRTUAL PATH AND VIRTUAL CHANNEL

Connection between two endpoints is accomplished through virtual paths and virtual circuits. The physical fiber between end points may consist of many virtual paths (VP). A VP provides a connection or a set of connections between two switches. VP is like a highway that connects two cities. Cell networks are based on Virtual circuits (VC). All cells belonging to a single message follow the same virtual circuit as the lanes of a highway. Figure below shows the relation between a physical medium VP and VC.

Several virtual paths utilize/access the bandwidth of the media. For example if media bandwidth is B and there are N VPs, then each VP may have a bandwidth of B/N.

Each VP is divided into several Virtual Channels. The VP BW is then divided into the VCs. VPI (virtual path identifier) specifies the VP number assigned to the user for that session. If it does not require the full VP BW then only some VCs may be allocated and the VCI (virtual circuit identifier) carries the VC number.



☞ *THE VPI IS FOR A PARTICULAR LINK ONLY, NOT THE ENTIRE PATH. AT EACH NODE THE VPI, VCI VALUE MAY BE CHANGED.*

The whole idea behind dividing a virtual connection identifier into two parts is to allow hierarchical routing. Most of the switches in a typical ATM network are routed using VPIs. The switches at the boundaries of the network, those that interact directly with the endpoint devices, use both VPIs and VCIs.

10.3.2 ATM ADAPTATION LAYER

The purpose of the ATM Adaptation Layer (AAL) is to adapt the PDUs passed down from the higher layer onto ATM cells. As the higher level PDUs may in general be of an arbitrary size, so one of the two sublayers in the AAL is responsible for **segmentation and reassembly (SAR)** of the higher layer PDUs. The other sublayer, the **convergence sublayer (CS)**, is responsible for packaging the higher layer PDU with any additional information required for the adaptation necessary and offering an interface to the B-ISDN user.

While ATM is service independent, so as to be future-proof, it is also possible to cater for a number of services that are already present. The ATM adaptation layer is used to adapt the ATM layer to the services that will be using them. There are two sub-layers in the ATM Adaptation Layer (AAL) called the Convergence Sublayer (CS) and the Segmentation And Reassembly (SAR) sub-layer. The CS is service dependent and the main function of it is to adapt the service to the ATM methods. The SAR is defined to put the CS-PDU's into the cells. It will also handle the insertion of the header and trailer of the SAR-PDU if they are specified. The SAR ends up with 48 byte SAR-PDU so that when a 5 byte header is put on the unit there will be a 53 byte cell formed.

ATM Service Classification

There is a standard method of classification of the possible types of service defined, based on the timing relationship between the source and destination, the bit rate of the source and the connection mode. However not all eight possibilities are needed and there are four classes available. These are shown in Figure below and are called Classes A, B, C and D. Class A would be constant bit rate connection oriented real time services, like voice or video that is uncompressed. Class B is the same, except that the bit rate is now variable, and so would represent the compressed versions of the voice and video services. Classes C and D do not require the timing between the source and destination and are variable bit rate. The difference would be that Class C is connection oriented and Class D is connectionless. These services would be mainly data services. For each service there is an adaptation layer assigned, so that Class A uses AAL 1, and Class B AAL 2 and so on.

Service Classifier	A	B	C	D
Synchronisation	Required		Not required	
Bit rate	Constant	Variable		
Connection	Connection oriented			Connectionless

The ATM adaptation layer classifies the traffic as shown above. Examples of different types of traffic are

Telephone	Class A
Video	Class B
FTP	Class C
Email	Class D

Different number of VPI and VCI are reserved for different class of service.

When the service definitions and format for the AAL's was standardized, it was seen that the AAL 3 and AAL 4 were similar and were not different in any real sense. They were amalgamated into a single AAL called AAL 3/4. What the AAL's standardized is the method of putting together the cells and what headers should be included. For the AAL 3/4 the overhead on a single cell is large and the method is complicated. Therefore a new AAL was decided upon called AAL 5, which will perform similar functions to that of the AAL 3/4, but with reduced functionality and at a higher level. A further point is that it is not necessary to use any AAL if one is not required, or it is possible to invent a specific type for a specific application as needed, although this would restrict internetworking to devices that understand the specific AAL.

☞*ATM is really costly due to the VP and VC setup.*
☞*IP is catchy, ATM is more organized.*

Objective Questions

35.01

Subjective Questions

35.11

Level 2 Questions

35.21