

Module

10

Frame Relay and ATM

Version 1 ECE , IIT Kharagpur

Lesson

34

ATM: Concepts And Header

10.2.1 INTRODUCTION

IP has a varying packet size which causes no problem while multiplexing but makes switching difficult. ATM uses a fixed packet size irrespective of traffic, and Connection Oriented service is used for achieving large throughput (Connectionless Service will be accommodated anyway).

In ATM the fixed size packets are referred to as Cells. It may be defined as unit of information. When the standard was formulated there were two conflicting schools of thought. One group wanted a cell size of 64 bytes and the other wanted it to be 32 bytes. The contention was not resolved so finally a compromise was reached and the cell size was decided to be 48 bytes, with a header of 5 bytes. Thus each ATM cell is of 53 bytes.

The problem of combining traffic with different bit rate is thus solved in a simple yet hugely effective way of transmitting more number of cells from high bit rate data.

Switching will be done on cells. ATM is asynchronous transmission. In synchronous frames the position of the slot in the frame is itself is the address or identifier of the data contained therein, so no separate headers are required. Knowing only the beginning of the frame and the position of the slot it can be correctly retrieved. The best example of synchronous transmission is a TDM frame.

In ATM each cell is independently transmitted. Each cell's header uniquely provides information about that cell for switching and other purposes. Each cell header has the path ID to be followed (connection oriented).

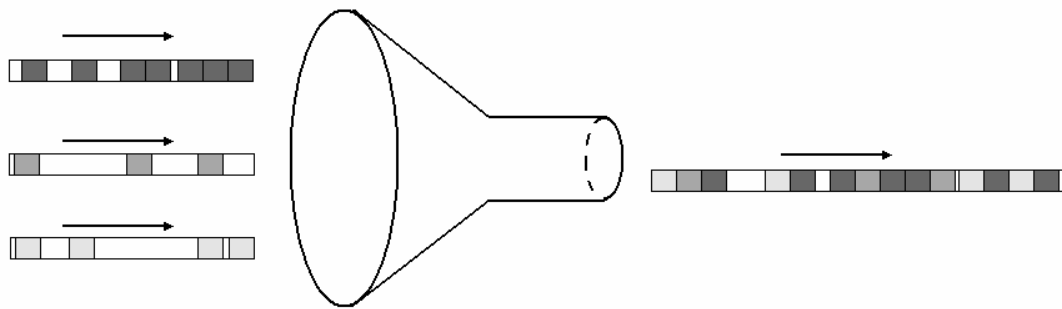


Figure 1Idea of statistical multiplexing in ATM

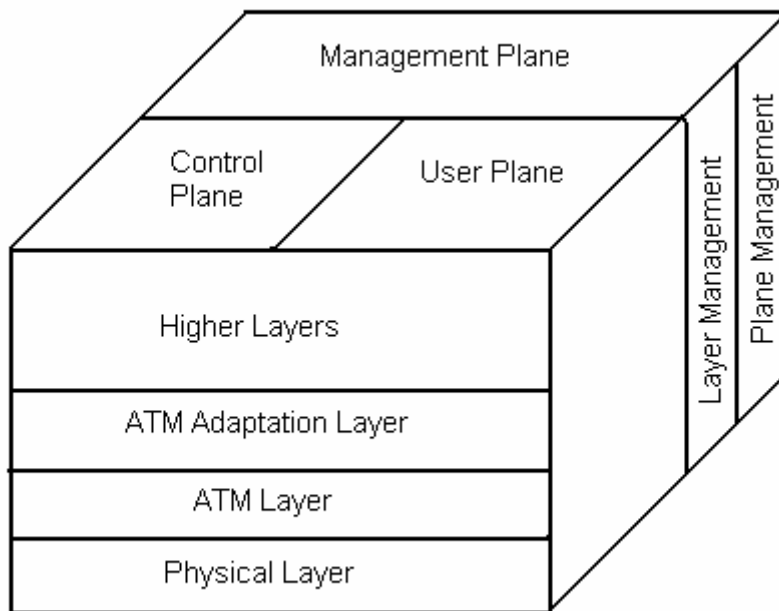
The cells from the different data streams are combined together as shown in the figure above. After combining some sort of framing is done on the cells according to the backbone network used. For 155 Mbps SDH data the ATM cells are framed to fit into the SDH frames like tributaries. Thus asynchronous cells are carried on synchronous network—ATM on SDH. In case of SONET also some sort of framing operation is done. For synchronization and framing the physical layer is responsible.

On the other hand, ATM as of its own does not require any framing, but depending on the network/ transmission system (E4, T4, SONET, and SDH) through which the ATM cells are carried through, framing may be applied.

Salient features of ATM are

Disadvantages of ATM are

Figure below shows the overall hierarchy of function in an ATM-based network. This hierarchy is seen from the point of view of the internal network functions needed to support ATM as well as the user-network functions. The ATM layer shown therein further consists of the virtual channel and virtual path levels which have been discussed in chapter 38.



10.2.2 ATM HEADER

The ATM header is as shown in the figure below. It is composed of a 5-octet header and a 48-octet payload (user data). The incoming user data stream is divided into 48-octet cells with 5-octet header added to each cell before the cells are transmitted into the ATM network.

The header contains the necessary information to allow the ATM network to deliver a cell to its destination. The *GFC* field is used only in cells between a host and the network. It was originally conceived as having some utility for flow control or priority between hosts and the network.

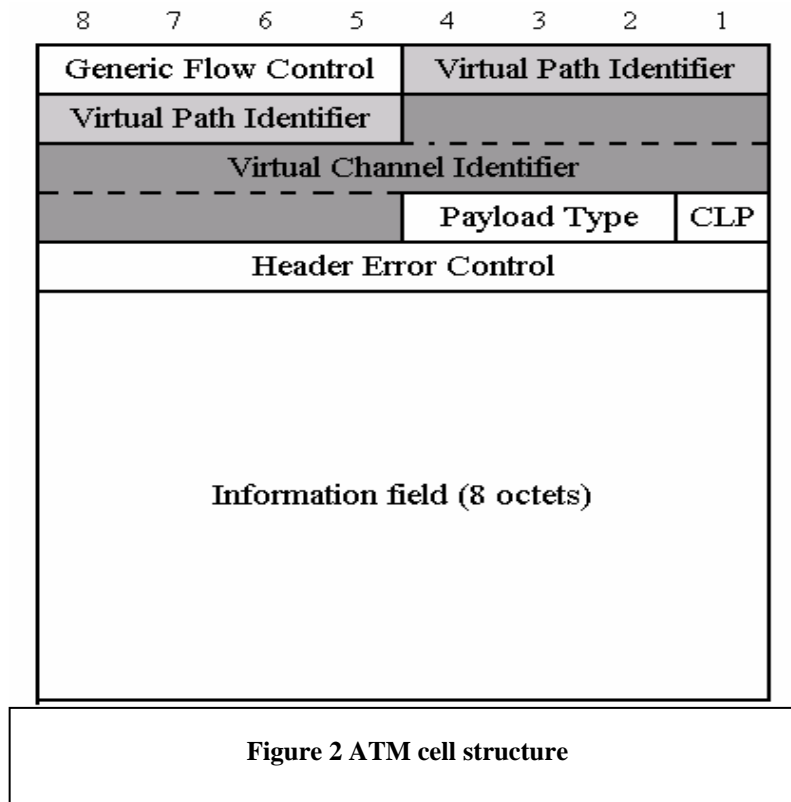
The *VPI* field is a small integer selecting a particular virtual path (will be explained later). Similarly the *VCI* field selects a particular virtual circuit within the chosen virtual path. A host can host up to 256 VP bundles and 65536 virtual circuits.

The *PTI* field defines the type of payload the cell contains such as user data of type 1 or 0 or maintenance information.

The *CLP* bit may be set by a host to differentiate between high-priority traffic (*CLP*=0) and low-priority traffic (*CLP*=1).

Finally the *HEC* field is a checksum over the header. It does not check the payload. The code used is slightly sophisticated than a Hamming code and can correct all single-bit errors and detect 90 percent of multibit errors.

Following the header is the 48 bytes of payload. Not all 48 bytes are available to the user, since some of the AAL protocols pit their headers and trailers inside the payload.



Objective Questions

34.01

Subjective Questions

34.11

Level 2 Questions

34.21