# CHAPTER 1

## INTRODUCTION

The emergence of the Internet has caused a rapid growth in the size and complexity of networks in the world. It has also resulted in a massive increase in the amount of traffic being carried by the 'backbone' networks. This traffic was seen to be 'self-similar' in nature when the number of sources was very large [LTWW94]. The backbone in most cases is an ATM network. Thus, the ATM network must be studied with 'self-similar' background traffic. In ATM the Quality of Service (QoS) is an assured parameter. One of the parameters of QoS is the Cell Delay Variation (Jitter).

### 1.1 ATM NETWORKS

Asynchronous Transfer Mode also known as cell relay was developed as a protocol for Broadband ISDN .The specifications for it were developed by the ITU and the ATM Forum.

ATM involves the transfer of data in discrete chunks and allows multiple logical connections to be multiplexed over a single physical interface. It is essentially a packet switched technology, so the information flow on each logical connection is organized into fixed size packets called cells, with each cell carrying 53 bytes (48 bytes data + 5 bytes header). The data rates are in the order of Mega bits per second. Since the data stream is a multiplex of different sub-streams, we find that ATM traffic is also self-similar in nature [WWWT94].

### 1.2 IMPORTANCE OF JITTER

In an ATM network since the connection is contracted, QoS is an assured parameter, the CDV and the CLR must be kept within the negotiated limits. This means that the design of the ATM networks must take into account any variations in the traffic, and also that the limits on the CDV and CLR must be realistic and achievable. For this to be done it is

essential to know the effect of the background traffic on the traffic stream of interest, and also to know how the CLR is affected by the CDV.

The CDV is an important parameter for CBR traffic, since the destination requires that the cells arrive periodically. This is also the type of traffic that is most affected by the background traffic. The CBR traffic is also sensitive to loss, since it is usually voice or video traffic. Hence we consider the effect of self-similar background traffic on CBR traffic.

## 1.3 SELF-SIMILAR TRAFFIC MODELLING

Self-similarity is the property associated with one type of fractal - an object whose appearance is unchanged regardless of the time scale at which it is viewed. This property is characterised by 'burstiness' across an extremely wide range of time scales. When viewed at varying time-scales, the object's correlation structure remains unchanged. Multiplexed self-similar traffic tends to be more bursty in nature i.e. it has a higher Hurst parameter [TG97].

Self-similar traffic is very different from Poisson traffic and all the conventional traffic models that are currently widely used. Since self-similar traffic is very different from the conventional traffic models, there is an urgent need to revise all the studies on CDV and CLR which were done earlier using Poisson and MMPP models. This must be done in order to make realistic buffer estimates and set realistic CDV and CLR limits.

## 1.4 ORGANIZATION OF THESIS

In Chapter 2 we study self-similarity and LRD in detail. In Chapter 3 we do the theoretical Jitter analysis using both the Poisson process and the proposed process, which produces heavily tailed behaviour. In Chapter 4 the simulation of the jitter using both Poisson and self-similar traffic and the variation of CDV with the H parameter is studied. In Chapter 5 we discuss the results that have been obtained. Finally, the conclusion based on the results obtained is given in Chapter 6.