Chapter 5
Design and Analysis of Optical Packet Switch Routers: A Review

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ABSTRACT

Optical packet switching is connectionless networking solution through which we can get high speed data transfer and optimum bandwidth utilization using wavelength division multiplexing technique. For realizing optical packet switching the numbers of optical packet switch architectures are available in market. In this chapter the authors discuss the overall development of optical packet switching; some recently published optical packet switch architectures are discussed in the chapter and a comparison is performed between the switches through loss, cost and buffer analysis.

INTRODUCTION

The word telecommunication is derived from the Greek word tele + Communication which mean the communication at long distance through signals coming from a transmitter to receiver. For an effective telecommunication system an effective telecommunication medium is also required as a choice of a proper mean of transport, for this the signals has played an important role.

In past historical time, the one of the most common way of generating a signal would be with the help of light and sound. However by using these modes of communication the data transmission were insecure because, no any method of encryption of message is used.

The growth in the telecommunication sector arises in a true means when electricity came in to existence. Here the electromagnetic energy in fact provides an extremely fast data transmission. So we can say that the starting point of all present days telecommunication was the invention of electric cell by Alessandro Volta (1800).

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After some times more advanced technologies came in to existence in to the field of telecommunication. In 1809, Thomas S. Somnering invented a telegraphic system that composed of a battery, number of wires (35 Approximate) and a group of sensors that are made by gold (Morse, 1840).

As the next advancement, step in 1843 Samuel Morre proposed a way to assign each latter and number to ternary code. This improvement makes the telegraph system more improved and accurate.

The major drawback of telegraph system is that it can be used by only trained people and it works only within a certain building or offices so it can be used by only limited peoples. So due to these drawbacks the research goes in to the other direction and the first big step in this direction was the invention of transducers that are able to transform an acoustic signal in to an electric signal and vice versa with acceptable information loss, in 1850.

After seven year G. Bell independently mange and build a prototype of early telephone machine (Bell, 1876). In telegraph and telephone systems the need of a distributed and reliable communication network soon become obvious. The routing issues in to the network was first solved by human operators and circuit communication, for this the PSTN came in to existence. But the major drawback of this system is that it did not guarantee the privacy and confidentiality of conversation.

With the last step, we have seen that the electronics is a fundamental part in the telecommunication field, at the first in the field of transmission, and soon this is used in the circuit communication also.

In the starting days of 1938 a new technology says PCM (Pulse Code Modulation) came in to existence and by using this technology the digital transmission of a voice signal by digital coding and decoding is achieved. The PCM was first used on a large scale in 1962 in United State. In the mid sixties the Paul Baron an employee of RAND Corporation gives the concept of packet switching network. According to this model the data is divided in to the small size units called the packets and each packet contains bulk of data, each packet is divided in to two parts header and payload the header contains the routing information of each packet and body contains the data that is to be transmitted.

In the starting 70's the Vincent Cerf, Bob Kahn and team developed, TCP/IP protocol suit, through which a communication of computers and heterogeneous machines through a series of physical and logical layers. The packet switching network and TCP/IP were chosen by military project ARPANET.

As the time passes the demand of higher bandwidth and fast speed network is required so in order to meet these requirements the concept of optical fiber communication came in to existence.

EVOLUTION OF OPTICAL FIBER COMMUNICATION SYSTEM

The development of fiber optic technology provided the medium through which transmission of light is possible. As the name shows, this type of communication system uses optical waves that carries signals, the bit rate distance product can be improved in optical fiber several orders of magnitude as compared to the microwave and coaxial system.

In this section the year wise growth of optical communication system is discussed. In early 1880 Alexander Graham Bell and his assistant created a photo phone which is first invention in fiber optic communication. This devise allowed transmission of sound on a beam of light. In 1880 Bell invented first wireless telephone system which is used to transmit signals between the two buildings. Due to its use of atmospheric transmission medium, the photo phone is not used practically until advancement in laser and optical fiber technology permits secure transmission of light. The photo phones are used in the military system after many years.