

## A Survey on High Speed Optical Network

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**Abstract**— In this paper, we have studied the various types of networks such as long haul, metro, local area networks. The network can be made by passive optical networks which include all the component, passive in nature. These types of networks provide low loss as well as high-speed compared to conventional type of networks. The spectral efficiency (SE) and high-baud-rate signal transmission is the important criteria for high speed, based on the digital coherent optical communications and digital signal processing (DSP). DSP implies the re- subtitle of advanced modulation formats and moreover enables the most important electrical and optical impairments to be processed and rewarded in the digital area, at the transmitter or receiver face. In this paper, we summarize and explore the movement on high-speed signal generation and detection and also show the development on DSP for high-speed signal.

**Key words**:- Passive optical networks, Digital signal processing, Time division multiplexing, Frequency division multiplexing

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### I. INTRODUCTION

**OPTICAL FIBRE**:-A communication system consist a transmitter, receiver and channel. At the transmitter information is created as per the information channel. The information must travel through this channel to the receiver end. The optical fiber used in the field of science and engineering is known as fiber optics [1].

An optical fiber is a flexible, transparent fiber made by silica or plastic. Its thickness is about slightly thicker than human hair. It allows transmission over a wide range and a higher bandwidth than cable wire. Fibers are used instead of metal wire due to which less loss occurs during transmission. Optical fiber includes a core surrounded by cladding material with a lower index of refraction. Total internal reflection is used to keep light. In the core which causes the fiber to act as a waveguide.

There are two types of fiber:-

**MULTIMODE FIBER**:-Fiber that propagates in a lot of path or modes is called multi mode fibers. It is used for short distance communication.

**SINGLE MODE FIBER**:-Fiber that propagates in single way or single modes is called single mode fibers. It is used for longer than 1,000 meters (3,300 ft).

### II. OPTICAL NETWORK

Optical network can generate or store the data in electronics form. In its connected the n numbers of system. When the number of online users increases then the optical network helps to maintain the speed of transmission and receiving data. Optical network in transmitter electrical signal converted into optical signal and in the receiver end optical signal is converted into electrical signal. [1]

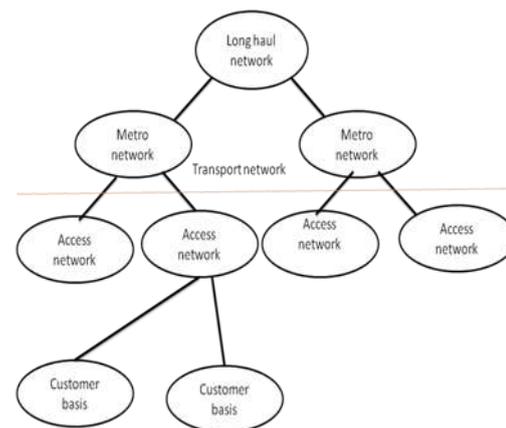


Fig1:-Optical network architecture [5]

### III. ADVANTAGES OF OPTICAL NETWORK

- In the optical network the attenuation of the signal is very low.
- In this system the power requirement is low and also having lower distortion.
- It required small space and it can be made at low cost.
- High speed capability which means its send 50 terabits per second by the help of single fiber.

### IV. GENERATION OF OPTICAL NETWORKING

#### 1. First generation optical network:

- Used for transmission purpose
- Switching and other network function.

Ex. Synchronous optical network/synchronous digital hierarchy (SONET/SDH)

2. Second generation optical network:-
- Wavelength division multiplexing (WDM)
  - Optical network components
  - Wavelength of routing network

V. HIGH SPEED SIGNAL PROPAGATION AND DETECTION

High speed signal should be generated on the basis of FDM(frequency division multiplexing) and TDM(time division multiplexing).high speed optical network for higher capacity and high strength uses multiple modulation technique mostly are TDM,FDM,PDM(polarization division multiplexing)and SDM (special division multiplexing). In frequency division multiplexing technique recently reported all optical OFDM and multiple spectral multiplexing technique .In recent technique high speed signal rate generate by the help of ETDM and OTDM.100G which based on coherent detection mostly generated.40Gor 1T is an attractive optical signal carrier for future networking purpose , due to that the complexity should be reduced and the costing of transmission and receiving where low. FDM work for two types, first for all type OFDM second for spectral slice FDM similarly TDM is divided into ETDM and OTDM [2-5]

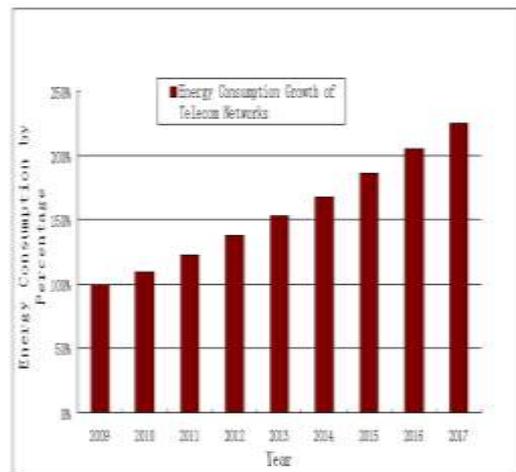


Fig 3:-Energy consumption on telecom network [8][9]

Minimizing energy consumption in optical networking are generally known as four types: component, network, transmission and application. In the component types highly integrated component such as switching fabric ,wavelength converters and optical buffer are developed ,which will reduced the energy consumption .In the transmission type low attenuation and low dispersion fibers ,energy efficient optical transmitters and receiver ,by these improve the transmission energy and being introduced .At the application type, to reduced the energy level green approaches for cloud computing and method for energy efficient system connectivity like proxy are used [11].

The telecom network are divided into three domain: core ,metro and access .The core network is the mid part of telecom hierarchy and it provide global coverage .The metro network generally used in metropolitan area, covering distances of a few ten to a few hundreds of kilometer and is dominantly based on a deep rooted SONET/SDH optical ring system. The access network used to connect the end users with the immediate service provider. Optical networks are generally connected like topologies. [12]

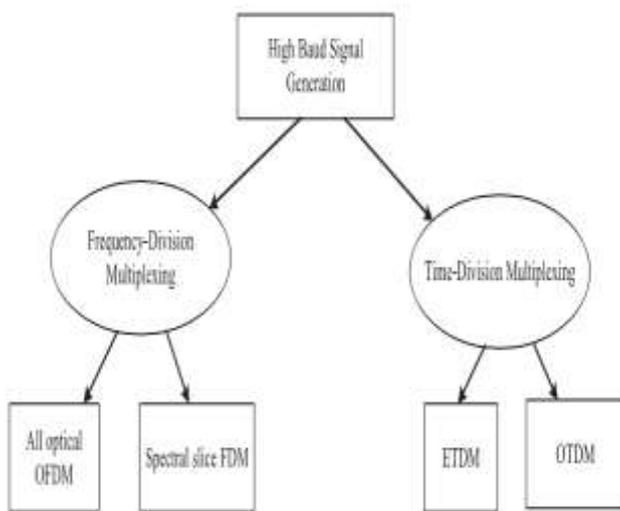


Fig 2:-High baud signal generation using TDM and FDM [3]

VI. ENERGY EFFICIENT IN TELECOM OPTICAL NETWORK

Now a day in which telecom known as the frequent and mostly useable application for the communication purposes .There are various communicating technology ,telecom is one of them which works by the help of optical networking .Optical network also having the improve significant now this time. To make optical network cost efficient optical network having routing, wavelength assignment and traffic grooming strategies. [6-10]

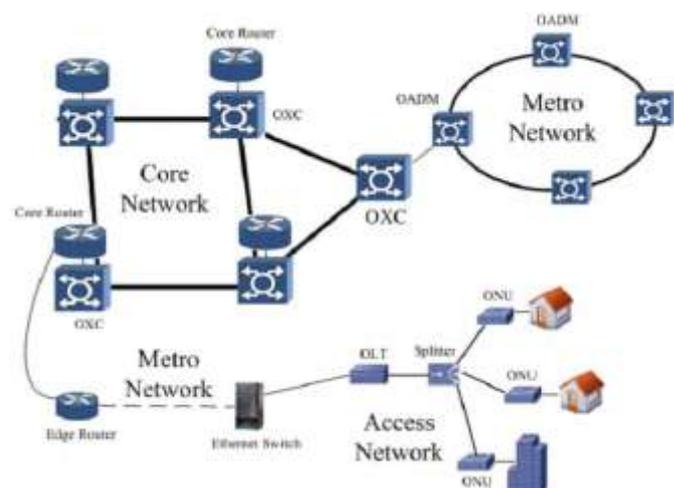


Fig4:-Telecom network hierarchy [7]

## VII.CONCLSION

In this paper we discussed about high speed optical network and have found some fascinating reality about high speed optical network that help in the development of optical fiber communication .In this paper we have discuss about some realistic applications ,advantages, generation etc of high speed optical networking. In the above statement we also talk about the progress in the field of high speed optical networking with the help of optical fiber communication. Looking into the opportunities in future we believe that they will monitor or development allow with the wide expansion in the field of optical fiber communication technology.

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