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A Compact Study on Optical Network

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ABSTRACT

In recent past optical network has improved very much. Optical network increasing its bandwidth demand. Providers of the networks are moving towards a milestone in network evolution. It provides high speed; high capacity reduced the costs for new applications such as internet and advance digital services.

In this paper briefly described about the technologies and the explained the connectivity. This paper also provides the information about transmission capacity which is very high compared to copper wire. DWDM allows signals to be transmitted simultaneously on a single fiber. Network management explains the how to manage the network.

Key Words: Maximum 4 Key words.

1. INTRODUCTION

Initially computer communication started using copper wires as the medium for carrying electrical signals encoding the data to transmit the information from one computer to another computer. The communication through the copper wires has become part of our past. The present communication is optical communication system it also called as optical telecommunication system. It was started in 1970 and it works in wavelength range of 800 nm to 1600 nm. It can be used in local area network (LAN) or over wide area network (WAN) which can cross the metropolitan and regional areas all the way to national and international. It is a type of communication that transfers the signals from one point to another point using optical fiber as communication medium.

2. COMPONENTS APPLICATIONS

Optical add/drop multiplexers:

The first element to be integrated into optical network is the optical multiplexer. It is used to combine multiples wavelengths onto a single mode fiber (SMF) which allows all the signals to be routed in the same fiber. It is generally used for optical telecommunications networks. Here “add” refers to the capability of a device to add one or more new wavelengths to an existing multi wavelength signal and “drop” refers to remove one or more wavelengths passing those signals to another network path.

Optical switches:

In telecommunication optical switch is a switch that enables the signal in optical fibers from one circuit to another. It provides functionality similar to an electrical switch by routing the incoming wavelength.

Multiplexers:

It is a combinational circuit that transmits two or more digital input signals and direct to the single output line. Multiplexer is also called as data selector. Multiplexer used to increase the amount of data that can be sent through the network within bandwidth. By connecting the multiplexer and demultiplexer over a single line one can save the costing.

3. TECHNOLOGIES

As fiber optics came into use. The communication network providers soon found that there is a huge improvement of the technology. It started increasing everywhere and could reduce the cost in existing networks.

Today’s technology is similar earlier technology but much more efficient and precise. In particularly it has gain in the field of optical amplifiers that is true enabler for optical networks by transmitting the wavelength across a single fiber.

3.1 Transmission capability

Optical networking uses thin film substrate or plastic optical fiber to transmit the information in the form light signals. It is much more reliable for transmission capacity compare to the copper wire.

It is originally refers to optical signal as the optical signal and laser technology has improved the capability of optical signal is

3.2 Dense wavelength division multiplexing

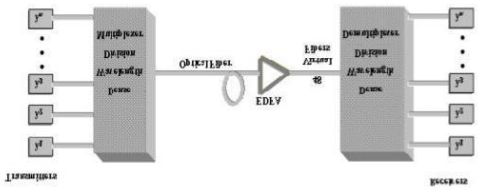
increased by combining two or more wavelengths onto a single fiber using different wavelengths of laser light. By implementing DWDM system and optical amplifiers networks can provides of variety of bits rate. It has the band range of 1550 nm.

DWDM can be implemented by two basic types:

Unidirectional: All the wavelengths communicate in one directions.

Bidirectional: In this system signal split into separate bands and signal travels in the opposite directions.

Using this technique it allows multiple signals to be transmitted simultaneously over single optical fiber each signal on a different wavelength. These provides high speed Ethernet connectivity and carrier interconnect in addition to manage the storage area network.



3.3. Optical amplification

Today amplifiers are more powerful than the earlier amplifiers; the total power of amplifiers has steadily increased. The amplifier has improved significantly which provides less noise that is very essential to DWDM system.

In modern optical networks optical amplifiers have the functions to transmit the terabits of data over a long distance. It is a device that amplifies the optical signals directly. In amplifiers it is possible to send each signal over a different fiber instead of using different wavelength over a same fiber. The multi-fiber networks after traveling some distance typically 60-80 km it light signal become feeble. At this point feeble signal can be detect and can use another set of laser to regenerate the signals. This process is called regeneration. New optical amplifier technology such as Raman amplifiers it has made possible even more longer distance.

Today DWDM signals may transmit without being regenerated for 1000s of km.

common LED (Light Emitting diodes) Light bulbs to authorize data transfer up-to he speed of 224 gigabits Ps. While comparing lifi and wifi both are quite very much alike as both carry data

3.4 Reconfigurable Optical Add/Drop Multiplexer

It is a device that can be add or block or redirect controlled infrared and visible light beams of various wavelength in a fiber optic network. The latest optical networking idea is Reconfigurable Optical Add/Drop Multiplexer. It provides the continuous high speed, high capacity services to customers using meshed and ring networks. Capacity can managed as needed because it can remotely add or drop at each network node. It is vitally important for wavelength service delivery.

4. NETWORK MANAGEMENT

One most important and difficult issue involved with optical network is optical network management for some reasons such restoration performance and wavelength services. It is too large to cover whole network management some of the important point has been given in this module. The optical network is evolving and being implemented on the top of an existing SONET architecture which provides its own restoration and protection. In addition to mediation between the optical and the SONET layer the network management system must be able to prevent possible conflicts, or at the minimum enable the service provider to identify conflicts. Network management system for optical must assist providers in troubleshooting the networks by isolating questionable wavelengths on each fiber approaches 40 or more it is important to have an intelligent method to monitor all of them. As discussed earlier provisioning end to end services can difficult especially as network capacity decreases. An intelligent NMS can help providers to establish and maintain new end to end wavelength services to maximize their bandwidth revenues.

5. LIFI TECHNOLOGY

Light fidelity or lifi is a light based communication technology which is a wireless connection traverse at very high speeds. By applying the visible light spectrum technique, light fidelity (Li-Fi) can send data and solve the capacity which is 10,000 times better than that of the radio spectrum which is available. Li-Fi uses electromagnetically. But lifi runs on visible light whereas wifi uses radio waves. It is a visible light communication i.e; VLC System in which it accommodates a photo detector to accept light signal and signal processing element which

converts the data content into streamable content. An LED light bulb which is semi conductor light source can be dipped and dimmed, up and down at intensely high speeds by not visible to the human naked eye.

5.1. Comparison between lifi and wifi

While we think Lifi with 224 Gigabits per second leaves wifi in dust. Lifi's exclusive use of visible light could and a mass uptake. Lifi signals do not pass through walls so for full connectivity LED Light bulbs needed to be placed, there is a deficiency in Lifi internet when there are less amount of LED bulbs found. Hence in this case LIFI takes a Hit when it compares to a public wifi network.

LIFI has a shorter range for this reason it is more secure than compare to WIFI. LIFI can acquire 70 Megabits P/s when it is mirrored off to a surface by embedded light beans.

5.2. Future of Li-Fi

LIFI will allow faster and trustworthy internet connections but it will not replace the present technologies such as 4G, LTE & WIFI, but it will work smoothly beside them. Wifi does not support connectivity by using light, while LIFI can easily access to the internet connectivity by using light. Even though light is been used for data transmission in fiber optic cables and point to point to links. But LIFI can universally access a ultra high speed internet for mobile communications.

Advantages:

- Maintenance cost is low.
- Light cannot pass through walls so it provides privacy and security that WIFI cannot.
- Data transmission can be achieved up to 10GB Ps.
- LIFI technology uses visible light spectrum it can solve the problem related to the in adequacy of radio frequency bandwidth.

CONCLUSION

This paper deals with the concepts of optical networking. The paper talks about the various optical network components applications all-optical network like Optical Amplifiers, Optical Add/Drop Multiplexers, Optical Splitters etc. Important optical networking concepts like reconfigurable optical add/drop multiplexer and DWDM are explained in detail. This paper also gives the information about Li-Fi which is explained in detailed.

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