Optical Communication Networks

Maheedhar kelam
Student, Department of CS
University of Bridgeport,
Bridgeport, Connecticut
mkelam@my.bridgeport.edu

Tarek Eltaieb
Professor, Department of CS
University of Bridgeport,
Bridgeport, Connecticut
taltaeib@my.bridgeport.edu

Abstract— The evolution of optical communication and networking have shown greater impact in ominous ways over the past decades and has an intense potential for future. The term "optical networks" denotes high-capacity telecommunications networks based on optical technologies and components that can facilitate with capacity, routing, grooming and restoration at the wavelength level. Optical networking based on the bidirectional gigabit Ethernet forms a base for productivity. Optical processing in higher layers than physical layer in the future provides cheap,multi-Tbps HD media-rich communications

Keywords—Ethernet;Opticalnetworks; Transmission; Bandwidth

I. INTRODUCTION

Optical communication network refers to data communication network, Often the enhancement using the optical fiber technology is vital (Cvijetic& Djordjevic, 2013), being the main communication medium used is the optical fiber cables, which converts and transports data in form of pulses of light between the sender and the receiver nodes. The optical network is the most reliable and fastest communication networks used since it the transmission medium used is light. The electrical signal with the help of optical transmitter device converts to light pulses by the help of an optical transmitter (Cvijetic& Djordjevic, 2013).

Compared to the copper based networks, the optical network light pulses are easily transported to longer distances, so the pulses take longer to be regenerated (Cvijetic& Djordjevic, 2013). A signal is converted to electric signal immediately it has been transported to the network of destination and transferred into the receiver node through the use of optical receiver device. Compared to copper networks, optical networks are less likely to experience inference externally and it also attains higher bandwidth speeds (Cvijetic& Djordjevic, 2013)

II. EVOLUTION OF OPTICAL FLIP FLOPS

The evolution of Internet use has led to the overwhelming demand for transmission bandwidth The recent evolution with regards to photonic switching and optical signal processing, have led to the achievement of bit rates in the level of gigabits per second per wavelength as well as terabits per second per fiber., optical flip-flops can easily be used to carry

out all the functions of optical signal processing in optical packet switching networks in many years to come These optical flip-flops can be useful as regenerative memory elements, basic building blocks of optical shift registers and optical counters, as storage of the header information of a packet etc.

A. Bidirectional Gigabit Ethernet

On 10BaseT standard each and every bit that is transmitted by a computer is coded physically in a one bit of transmission. For example, if 8 bits are transmitted, the wire will generate 8 signals ('How Gigabit Ethernet Works', n.d). This is happens differently in other standards. On 100BaseT standard, 8B/10B-coding system is used. In this case, each group comprising of 8 bits are coded a signal of 10 bit so the signals on the wire are not represented by the bits. So if the data transfer rate is 100mbps, the standard is 100BaseT then the clock rate will be $(10/8*100) = 125$ MHz

The gigabit works differently in the sense that it alters the coding and one bit in the Gigabit Ethernet cable becomes two instead of one ('How Gigabit Ethernet Works', n.d). It uses four voltages and not two on a signal that is represented by '1' or '0'. It also makes use of all the wires and not four. In this instance, all the pairs are employed in a bi-directional manner. Below is an Ethernet cabling pin out. B1=bi-directional, DA, DB, DC=Data A/B/C/D

Pin	Color	Function
1	White with Green	+BI-DA
2	Green	-BI-DA
3	White with Orange	+BI-DB
4	Blue	+BI-DC
5	White with Blue	-BI-DC
6	Orange	-BI-DB
7	White with Brown	+BI-DD
8	Brown	-BI-DD

B. Hybrid radio and Optical Communications

Many radio stations worldwide have implemented strategies to develop streaming for hybrids. FM, DAB, DAB+, DMB, DRM, DRM+ and HD are examples of signals that hybrid radio functions with. Terrestrial FM

broadcast signal is used by the hybrid radio to enhance audio production but uses the Internet to show things like the images of artists, their names, title of their songs, weather updates and so on (Vernom, n.d). Listeners have the advantage of obtaining the IP worlds and broadcasts offered by the hybrid radio.

FM on smartphones does not use that much battery and it does not use the bandwidth allocation of the user (Vernom, n.d). The use of optical communication to enhance hybrid radio enables the broadcasters offer their listeners quality and easily available access to their services. With many smartphone having the hybrid radio, it's just a matter of time and each and every person will have access to the hybrid radio (Vernom, n.d).

C. Optical Amplifiers

According toPremaratne & Agrawal, (2011), optical amplifiers are devices that are used to increase the amplitude of an optical signal directly without the need of converting it to electrical signal. The optical amplifier absorbs lights as it spreads. Light is amplified as it is passed through the medium when the quantity is higher in the high-energy state compared to the lower energy state. The amplified bears of light have similar characteristics to photon signals (Premaratne & Agrawal, 2011).

There are four types of optical amplifiers; doped fiber amplifier,semi-conductor optical amplifier, fiber Raman amplifier and fiber optical parametric amplifier (Premaratne & Agrawal, 2011).Optical amplifiers are important since they support the whole wavelength and bit rate. They also use WDM to boost the fiber optics links capacity.

D. Energy-efficient light paths

Energy consumption is in the minds of many people today especially due to the fact that many networks and communications are being established. The most beneficial way of mitigating energy consumption in the ICT industry is through the development of energy efficient architectures in the network design. A good design approach to be considered is the IP over WDM network. In this case, the EDFAS, Transponders and IP Routers energy consumption are reduced. IP over WDM can be achieved through light path bypass and non-bypass.

According to Zhang & Chowdhury (n.d), while using the light path non-bypass, there is termination of the entire light path that is strike to a node. The IP routers receive the forwarded and processed data transmitted by the light paths. Contrary to the light path non-bypass, the light paths bypass allows traffic of IP to directly by-pass the route that is intermediate if the destination of it is not the intermediate node (Zhang &Chowdhury, n.d).

III.   CONCLUSION

In conclusion, the optical communication network is growing at an exponential rate as many people make use of the Internet**.** The gigabit works differently in the sense that it uses one bit and the Gigabit Ethernet cable becomes two instead of one. Optical communication networks have also been used to enhance hybrid radios today. Energy efficiency is the main issue experts in the ICT field want to combat especially now that there are many networks and communications established.

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