Technical Term Paper

Name

Institution

Abstract

The paper takes a look at technological developments in the sphere of multiplexing technology. It investigates the availability of various optical multiplexing technologies that exist particularly in the current carrier-grade networking gear. In addition, it investigates the process of ratification of the known networking standards and proceeds with presenting a report summarizing various processes for different standing IEEE networking workgroups, for instance, the 802.11. Further, it reviews both current and potential developments of multicore processors and multiprocessor computers from major chipmakers and presents findings indicated herein. Moreover, it compares different programming project methodologies and picks a methodology that best suits the development of applications on mobile devices. Finally, the paper examines the availability of a cloud-based storage backup system that will suit the program.

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Introduction

Long before the invention of computer communication system based on computer networks, the only mode of communication between machines of calculations and computers that had been already in existence was humans, who acted as carriers of instructions between them. Since that time, much advancement has been made in the communication sector. It is this technological advancement that sets forth the study of optical multiplexing technologies that saw researchers visiting the Massachusetts Institute of Technology. This research work included the study of the communication ratification process of networking standards considering that this institution was a technological nerve center. Further, the study saw the team interviewing a technical team from the General Electric and Bell labs, who were partners in managing their telephone connections. Further, they had an opportunity to investigate both current and upcoming developments in the field of multicore processors and multiprocessor computers from major chipmakers, since all these were found in the institution.

Body of the Paper & Results

Optical Multiplexing Technologies

The study focuses on the optical time division multiplexing technology. This is basically a technology that operates on the basis of high speed transmissions. Besides, this technology uses pulses that are extremely narrow and have a greater bandwidth thereby producing more efficient spectra of optical fibers. In its operations, the study notes that time division multiplexing causes a synthesis of high bit rate streams of data by slipping a stream of light into the required domain of optical multiplexing. Further, it was observable that time division multiplexing allows for simultaneous multiple signals to the same optical fiber. However, there is a marked difference in realizations of the time division multiplexing and the WDM types of technologies. According to the interviews conducted with system operators, the time division multiplexing technology has been recently used to obtain a single light stream of up to 40 GB / s over rate. In this system, such sources of light as mode-locked laser light sources produce a sequence of extremely narrow optical pulses, that are directed into an N zero data stream and an N data stream meant for different channel signals by XGb/s. In this eventuality, there is a slip signal modulation together with one clock cycle delay that cause multiplexing of data that results from the total rate that can be approximately (N*X) Gb /s. The extensive research that covered five different systems within the institution found out that overall rates noted in time division multiplexing systems went up to the level of 200Gb /s or even beyond. Essentially, such kinds of high speed fiber dispersion systems use two different methods in their resolutions. These include the dispersion management, which is basically a dispersion that occurs through a compensation fiber and eventually cause the total dispersion of zero. Alternatively, they may use the technology of soliton transmission, which must take into consideration the signal power, a shape of the pulse

and the compression using dispersal effects modulated with the self-phase technology to solve problems. The study has proven that the time division multiplexing technology supports to a large extent a long distance and high capacity transmissions achieve better technical solutions (Arora, Subramaniam, 2002).

The study also analyzed a wavelength division multiplexing technology unit under the guidance of a specialist. The specialist was able to explain that the exponential growth in technology, brought about mainly by the entry of the internet, made many carriers find it very useful in the field of the fiber technology. According to them, the installation of spare fibers found extensive use in a new growth and new capacities. They further explained three methods of capacity expansion. These include installing more cables, increasing system bitrates to multiplex more signals and wavelength multiplexing. The research has found out that it is generally preferable to install more cables in several instances, particularly, in areas considered to be metropolitan, since the fiber technology has become considerably cheaper and more efficient to install. (Tomlinson, 1978). However, in cases whereby conduit systems are not available or a completely new infrastructure is required, this technology may just prove too expensive to implement. Nonetheless, an undertaking to increase only system bitrates may as well prove to be expensive if not more. Wavelength-division multiplexing has been found to work quite simpler than it often appears to be. For instance, the study considered the fact that people are always able to notice such different components of the chromatic spectra as red, blue and yellow colors. The findings are that these colors undergo transmission through space in unison and may mix up properly in space. However, they are quite easy to be separated using a prism, separating sun rays into a variety of colors (see Fig. 1) (Delange, 1970).

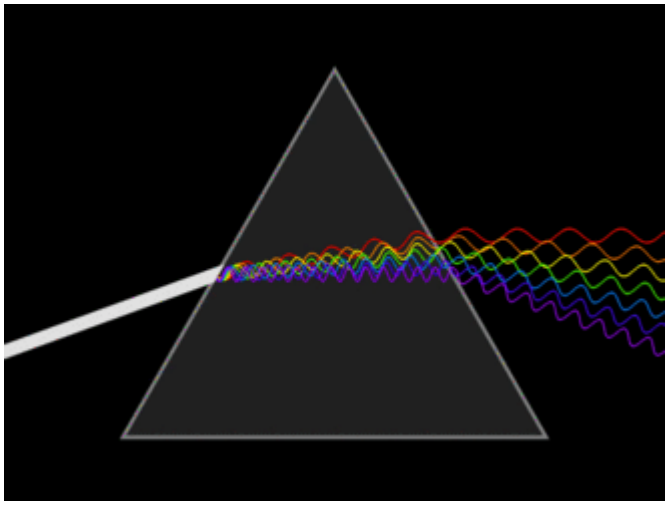

Figure1. Separating a beam of light into colors using a prism.

However, some improvements have been made to this system giving a new model known as "Dense Wavelength-Division Multiplexing" because current systems only offer from 4 to 32 wavelength channels. The research has investigated modifications done to come up with a new model. This has a technical requirement of lasers only that are of specific wavelengths and which are quite stable in addition. De-multiplexers of the dense wavelength-division multiplexer are capable of identifying each wavelength within the dense region without any kind of crosstalk. According to the interview, the wavelength-division multiplexer has several advantages that have become worth pursuing, since they are quite usable. Individual wavelengths can be elucidated from a normal link making it unnecessary to render currently used equipment as obsolete. Furthermore, this undertaking merely needs laser transmitters that have been chosen for wavelengths that would be a perfect match for the wavelength-division multiplexer, thereby making sure that each channel gets appropriate decoding at the receiving end (Arora, Subramaniam, 2002).

Ratification Process of Networking Standards

The study conducted at the Massachusetts Institute of Technology covered the process of ratification of various forms of networking standards. The findings were quite amazing, especially a voting requirement that it had to go through. For instance, the research noted that the process of ratification of the "IEEE 1901 Draft Standard" that took place in April 2010 saw the first sponsor coming with an overwhelming 80% approval by voting entities. As a matter of fact, this served to set grounds for ratification of initial global power line standards of networking referred to as the "Standards Development Organization". The successful entry of the IEEE standards of networking meant that power line networking had reached a new stage of performance. Nowadays, various stakeholders including retail vendors and Smart Grid companies can shift their product developments concerning a powerline product quite rapidly based on the foundation of worldwide standards that have been put in place to ensure interoperability and enjoy benefits of their compatibilities with several HomePlug AV based products that got an entry into the market much earlier (Villegas, 2007).

According to some specialists interviewed for the study, the process of ratification is based upon the IEEE 802.11 standards. This is basically a set of standards that have been used for the implementation of the wireless local area network also known as "WLAN". However, this is often done in the 2.4, 3.6 and 5 GHz bands of frequency. Essentially, they are created and maintained to some extent by the IEEE Standards Committee and are provided for the creation of products of the wireless network using the brand name of "Wi-Fi". The study has noted that the family known as 802.11 often consists of a sequence of over air techniques of modulation that applies the same protocol. However, the most popular modulation techniques are the ones

associated with the 802.11b and 802.11g protocols, which are actually amendments to the original standards (Fleishman, Glenn, 2009).

Developments in Multicore Processors and Multiprocessor Computers

The study has analyzed the current situation concerning a multicore processor and evaluated potential developments in that area. A multicore processor is defined as a single component computing system with multiple independent processors considered as units that read and execute instructions of the program. In this case, instructions are just ordinary instructions of the CPU. These include adding and moving data. However, multiple cores can ofen run multiple instructions simultaneously. This serves to raise the overall speed of programs amenable to parallel computing. What often happens is that their manufacturers integrate cores into a unit of integrated circuit die referred to as a chip multiprocessor or even into a multiple number of dies organized into a single package (Lemstra, Hayes, Groenewegen, 2003).

Initial processors were developed with just a single core. However, multiple core processors composed of a number of cores that are larger than traditional techniques do not stand the test of efficiency any more. This is caused by the issue of congestion that results from having to supply instructions and data to several processors. As a matter of fact, the threshold for many cores lies approximately within a range of several cores, beyond which the technology of network on chip becomes disadvantageous. Conversely, a dual core processor is composed of two cores, while a quad core processor has four cores. Essentially, a multiple core processor can implement the task of multiprocessing in just one unit of physical package. In this respect, designers may choose to couple several cores into a tight or loose multicore device. For instance, different sets of cores may share or not share caches. Thus, they may implement the technology of shared memory types of inter core methods of communication. Currently, network topologies

for common interconnect cores include a bus, ring, three-dimensional mesh and others. Homogenous types of multicore systems are composed only of identical cores, while heterogeneous systems have dissimilar cores (Murthy, Guruswamy).

Recent improvements in a multicore processor have to do with software algorithms and their better implementation. Specifically, gains that can possibly be achieved are restricted by the fraction of the used software in case it can be parallelized to enable them to run on multiple cores at the same time. This improvement has been described by the Amdahl's law and may achieve speed-up factors that approach the number of cores or more, in case the problem is sufficiently split to perfectly fit within the cache of every core and technically evades the use of slow system memories. However, most applications cannot be accelerated to a large extent, unless programmers inject into a program a prohibitive amount of efforts towards factoring the whole problem. The parallelization is considered as a grey area that has a great potential for further improvements of processor technology (Cheung, Nim, Kiyoshi, Winzer, Gerhard, 1990).

Programming Project Methodologies

Various forms of agile methodologies are based on the same philosophy, characteristics and practices. However, from the standpoint of their actual implementation, each of them is entitled to its own recipe of practices, tactics and terminologies. For instance, the scrum is described as a lightweight type of framework of management that has been used for managing and controlling all types of incremental projects. The scrum has recently gained some significant amount of popularity especially in the software community. This has been caused by the fact that it is simple, evidently productive and has a peculiar ability to be used as a wrapper for various practices in the world of engineering through other agile methodologies (Lemstra, Hayes, & Groenewegen, 2003).

There is also “Extreme Programming” that has recently entered into the market as one of the most popular agile methods. This is a principled approach meant for delivering high quality software faster and with a certain amount of continuity. It has been credited with promoting high customer involvements and ensuring rapid feedback loops. Further, there is a crystal methodology that has emerged as considerably lightweight and an adaptable approach to the idea of developing software. Essentially, the crystal methodology is itself a conglomeration of such smaller methodologies as Crystal Clear, Crystal Orange and Crystal Yellow. A striking feature of these smaller methodologies is the fact that they are driven by factors that include the size of a team, the critical nature of a system and priorities as determined in the project. Other methodologies that are quite noticeable are a dynamic system development method that has grown out of the need for setting standards for an industrial project delivery framework. Moreover, there is a feature-driven development and lean software methodologies. However, a methodology that would suit a mobile device is the Extreme Programming (XP), because its major goal is to develop for mobile devices a multimedia streaming application (Walker, Chair, 2009).

Storage Backup Systems

The study has come up with five online storage services or backup systems. Indeed, it is everyone’s desire to access files from any computer anywhere in the world as this is considered to be very convenient. This technology has been around for some time, but the recent entry of new generation services has made it look as a basic requirement considering it so cheap and easy to use. As a matter of fact, most of these online service providers enable their customers to share their files with preferred friends and colleagues, who may not be close to them geographically. The research has come up with several storage backup systems, which include Box.net that

integrates Gmail and Zoho. Box.net can store all required documents and serve as a hub of one's virtual office. "Live Mesh" also originates from the study findings as the only component of the latest ventures of Microsoft that is into cloud computing. Among other backup systems there are Dropbox, JungleDisk and Oosah (Lemstra, Hayes, & Groenewegen, 2003).

Conclusions and Recommendations

The research has found out the potential significance of remote backup systems that can be employed for safer data storages. This service provides its users with a workable system for storage of computer files and with a backup system. The future of technology will be shaped to a great extent by this application built on the basis of the client's software program, which typically runs on a predetermined schedule. It collects data, compresses them and moves them into off-site hardware of a remote backup service provider. It is area field that should be investigated on further, so that its utilization can fully harness the unused potential that seems to remain untapped ("Federal Standard 1037C: Glossary of Telecommunications Terms").

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