ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 09, pp.57056-57059, September, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

FIBER OPTICS AND CLOUD COMPUTING

***Prem Ravi Kumar**

Malvern International Academy, Malaysia

ARTICLE INFO

Article History:
Received 04th June, 2017
Received in revised form
24th July, 2017
Accepted 23rd August, 2017
Published online 29th September, 2017

Key words:

Bandwidth, Broadband, Fiber optics, Latency, Telecommunication with cloud computing.

ABSTRACT

Fiber optics and cloud computing growth has taken all the attention of various communities like researches, student, business, consumer and government organization. Big data is the main reason for coming of cloud computing in the show, everyday lots of data in the size of PETA bytes are uploaded in the digital world which required lots of storage and computing resources. Fiber optics and cloud Computing is a marketing term which is also known as utility computing delivers the service as software and proper hardware, platform and infrastructure as a service in pay-as-you-go model to consumers has the potential to transform a large part of the IT industry, making software with fiber optics networking even more attractive as a service.

Citation: Prem Ravi Kumar, 2017. "Fiber optics and cloud computing", *International Journal of Current Research*, 9, (09), 57056-57059.

INTRODUCTION

The Fiber optic communication has revolutionized the telecommunications industry. It has also made its presence widely felt within the data networking community using fiber optic cable, optical communications have enabled telecommunications linksover much greater distances and with much lower levels of loss in the transmission medium and possibly most important of all, fiber optical communications has enabled much higher data rates to be accommodated, as a result of these advantages, fiber optic communications systems are widely employed for applications ranging from major telecommunications backbone infrastructure to Ethernet systems, broadband distribution, general data networking and documents are accessible on our own network, but they can't be accessed by computers outside the network. Using of cloud computing, the software programs aren't run from one's personal computer, but are rather stored on servers accessed via the Internet. Cloud Computing provides resources and capabilities of Information Technology (e.g., applications, storages, communication, collaboration, infrastructure) via services offered by CSP (cloud service provider). Cloud Computing has various characteristics as shared infrastructure, self-service, pay-per use model, dynamic and virtualized, elastic and scalable. Cloud computing has the capacity of scaling and elasticity which is perfect for such an environment.

Corresponding author:* **Prem Ravi Kumar
Malvern International Academy, Malaysia.

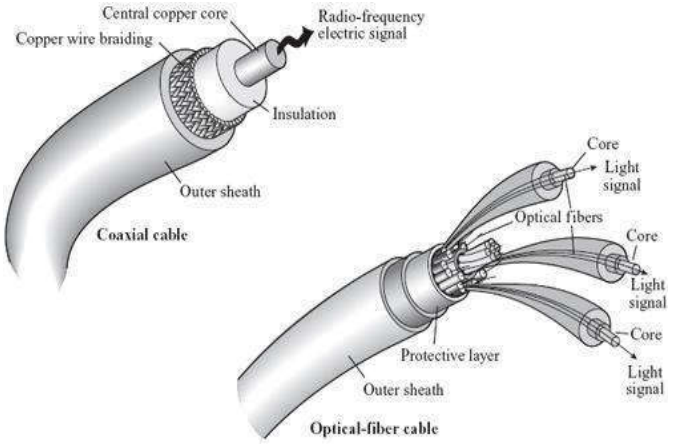
Why we should use cloud computing with fiber optic not with coaxial cable

Compared with optical fiber, coaxial cable enjoys the advantages of relatively cheaper price and more convenient installment. As a result, in the monitor system within a small scope, as the transmission distance is very close, transmitting the monitoring image with coaxial cable cannot distort the image so that it can meet actual requirement. Moreover, coaxial cable can compensate for different rate by doing balance adjustment in order to distort as less video signal from receiving terminal. However, coaxial amplifier cannot be cascaded with no limitation, usually at most 2 to 3 coaxial amplifiers can be cascaded in one to one system, or the quality of video transmission cannot be ensured and adjustments seems very difficult. As a result, in the case of using coaxial cable in monitoring system, in order to ensure relatively better image quality, it is common to limit the transmission distance within about 400 or 500 meters. Besides, there exist some disadvantages of transmitting image signals in monitoring system:

1) Climate change has a big influence on coaxial cable, so image quality can be affected.
2) As coaxial cable is thick, it is not easy to install it in intensive monitoring.
3) Coaxial cable is just able to transmit video signal, other cables have to be installed if control data signal, and audio signal and other signals have to be transmitted at the same time.

4) Coaxial cable has a limited capability of resistance, so it cannot be applied in high-resistance situation.
5) Coaxial amplifier also has the shortcomings of adjusting.
6) If a portion of a twisted-pair cable is damaged, the entire network is not shut down as it may be the case with coaxial cable. Disadvantages. Easily pick up noise.

Fiber optics: -An optical fiber offers low power loss. This allows for longer transmission distances. In comparison to copper; in a network, the longest recommended copper distance is 100m while with fiber, it is 2000m. Interference - Fiber optic cables are immune to electromagnetic interference. The performance of any communication system isultimately limited by the signal-to-noise ratio (SNR) ofthe received signal and available bandwidth. Thislimitation cans be stated more formally by using theconcept of channel capacity introduced within theframework of information theory (Handbook of Fiber Optic Data Communication : Chapter 15, 2013). Optical underwater Communication is an effectivealternative to current underwater technology especially insome particular environments such as shallow, coastaland fresh inland water where the use of this approach isuseful to overcome all the shortcomings related to the useof acoustic communication and to allow a wide adoptionof underwater monitoring systems (Ming-Jun Li *et al*., 2008). Both thetransmission capacity and flexibility in optical networkdesign can significantly be improved using wavelengthdivision multiplexing (WDM) systems (Shannon, 1948). Due toeconomic advantages, maturing technology, and highinformation capacity, single-mode fiber- optictransmission media will be embedded in futuretelecommunications networks. A desirable feature forthese future optical networks would be the ability toprocess information directly in the optical domain forpurposes of multiplexing, de-multiplexing, filtering,amplification, and correlation. Optical signal processingwould beadvantageous because potentially it can bemuch faster than electrical signal photon-electron-photonconversions. Several new classes of optical networks arenow emerging (Jian Chao Li and Dennis R. Alexander, 2007). For example, code-division multipleaccess (CDMA) networks using optical signal processingtechniques were recently introduced (Noshada and Rostami, 2012; Behrend *et al*., 2011; A Platform Computing Whitepaper. ―Enterprise Cloud Computing: Transforming IT.‖ Platform Computing, 2010; Rimal *et al*., 2009; Dillon *et al*., 2010; Information Networking and Applications (AINA), 2010; Zhou *et al*., 2010). The opticalfibers, widespread and commonly used intelecommunications, are the transmission mediums that have been recently considered as very attractive to buildlinks for T/Transfer.

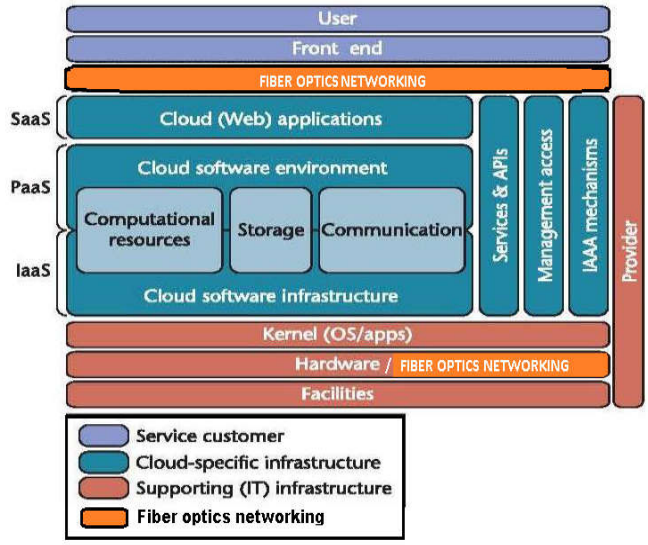


Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model promotes availability and is composed of five essential characteristics (On-demand self-service, Broad network access, Resource pooling, Rapid elasticity, Measured Service); three service models (Cloud Software as a Service (SaaS), Cloud Platform as a Service (PaaS), Cloud Infrastructure as a Service (IaaS)); and, four deployment models (Private cloud, Community cloud, Public cloud, Hybrid cloud). Key enabling technologies include:

(1) Fast wide-area networks,
(2) Powerful, inexpensive server computers,
(3) High-performance virtualization for commodity hardware.

About the cloud computing

According to U.S National Institute of Standards and Technology (NIST), ―Cloud Computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or cloud provider interaction‖. In simple words, Cloud Computing is the combination of a technology, platform that provides hosting and storage service on the Internet. In such an environment users need not own the infrastructure for various computing services. In fact, they can be accessed from any computer in any part of the world. This integrates features supporting high scalability and multi-tenancy, offering enhanced flexibility in comparison to the earlier existing computing methodologies. It can deploy, allocate or reallocate resources dynamically with an ability to continuously monitor their performance. Moreover, cloud computing minimizes the capital expenditure. This approach is device and user-location independent. Main goal of the cloud computing is to provide scalable and inexpensive on-demand computing infrastructures with good quality of service levels (Rimal *et al*., 2009). Cloud Computing is a general term for anything that involves delivering hosted services over the Internet. Instead of a static system architecture, Cloud Computing supports the ability to dynamically scale up and quickly scale down, offering cloud consumers high reliability, quick response times, and the flexibility to handle traffic fluctuations and demand. Cloud Computing also supports multi tenancy, providing systems configured in such a way that they can be pooled to be shared by many organizations or individuals (A Platform Computing Whitepaper―Enterprise Cloud Computing: Transforming IT.‖ Platform Computing, 2010). Virtualization technology allows cloud vendors to convert one server into many virtual machines, thereby eliminating client-server computing with single-purpose systems. This maximizes hardware capacity and allows customers to leverage economies of scale. Benefits of Cloud computing are enormous. The most important one is that the customers don't need to buy the resource from a third party vendor, instead they can use the resource and pay for it as a service thus helping the customer to save time and money.Cloud is not only for Multinational companies but it's also being used by small and medium enterprises.



Optical Fiber Is the Key to Cloud Computing

In the "cloud" network, subscribers' terminals are simplified into a pure and single device with only input and output functions but meanwhile utilize the powerful computing and processing functions from the "cloud". This means that the terminal must have a very fast connection, because the simple terminal means fast network and powerful platform requirement, where "pipes" are put forward higher requirement. Thus, fiber is the ideal "pipe" for cloud computing. The following image shows the evolution of memory storage.

Cloud-computing In fact, computer applications, software and even file storage now reside on the Internet or in the "cloud". Yet another driving force is mobile Internet traffic, which relies heavily on cloud computing. It is said that there is over 1 Exabyte of data currently stored in the cloud. And this number is growing exponentially every day. The greatest thing that will limit your ability to work seamlessly in the "cloud" is your Internet connection. Thus, to access the tremendous amounts data, we need fiber networks that can carry Terabits—one trillion bits per second. Fiber jumper cables can offer more available bandwidth and speed which meets the demands of the "cloud". Obviously, no technology is more effective at meeting that challenge than fiber at present.

What's more, FTTH infrastructure is expected as a solution to meet the growing demands for high bandwidth. It brings fiber optic connections directly into homes, allowing for delivery speeds up to a possible 100 Mbps, or even more. These speeds open the door to a variety of new services and applications for residential, business and public service markets. The relationship between FTTH and cloud computing is subtle. FTTH encourages the growth of cloud computing with its benefits. And cloud computing may in turn drives the development of FTTH.

The Future of cloud computing with fiber optics

Cloud-computing: -Cloud computing is seen by many as the next generation of information technology. The abundant supply of information technology capabilities offers many benefits to our lives. However, like any new technology advancement, cloud computing also faces many challenges, e.g. cloud security. Though there are many unknown factors in the "cloud" waiting for us to explore, it is no doubt that we need optical fibers in order to better reach the "cloud". Now, with the benefits of optical fibers, the cloud computing is increasingly developing. Will it automatically work out better and cheaper for you in the long term.

Conclusion

Fibre optics systems have allowed scientists to make many important advances in the telecommunication, mechanical and medical fields.Sound, video, and computer communications are more reliable than in the past. As cloud computing market continues to mature, current and potential information technology capabilities offers many benefits to our lives. The world of fiber optics has opened many possibilities for solving technological problems and has improved human civilization, strengths and downfalls of the technology. Fiber optic cable, as an indispensable component of network infrastructure, plays a vital role in cloud computing.

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