Journal of Wireless Communication and Simulation

May – August 2025 **Vol – 13** **Issue –2**

ENRICHED PUBLICATIONS PVT. LTD

S-9, IIndFLOOR, MLU POCKET,
MANISH ABHINAV PLAZA-II, ABOVE FEDERAL BANK,
PLOT NO-5, SECTOR-5, DWARKA, NEW DELHI, INDIA-110075,
PHONE: - + (91)-(11)-47026006

Journal of Wireless Communication and Simulation

Aims and Scope

Wireless communications has become very important with the ever-increasing demands of the software development to serve the millions of applications across various disciplines. For large software projects, innovative software development approaches are of vital importance. In order to gain higher software standards and efficiency, software process adaptation must be derived from social behavior, planning, strategy, intelligent computing, etc., based on various factors. This Journal addresses the state of the art of all aspects of software engineering, highlighting the all tools and techniques for the software development process.

Journal of Wireless Communication and Simulation

Journal of Wireless Communication and Simulation

(Volume-13, Issue-2, 2025)
Contents

May - August 2025 **Vol – 13** **Issue - 2**

A COMPREHENSIVE STUDY OF 4G WIRELESS SYSTEMS AND ITS APPLICATIONS

MD. Amzad
Corporate Trainer, Treasurer, Archer Foundation
Email Id: amzad.be@gmail.com

Abstract

This research paper focused on the comprehensive study of network Fourth generation wireless system (4G) is a packet switched wireless system with wide area coverage and high throughput. It is designed to be cost effective and to provide high spectral efficiency. With the major wireless service providers planning to start deployment of 4G wireless networks by mid 2010, research and industry communities are racing against time to find solutions for some of the prominent still open issues in 4G networks. The growing interest in 4G networks is driven by the set of new services will be made available for the first time such as accessing the Internet anytime from anywhere, global roaming, and wider support for multimedia applications. In this paper describe some of the key opportunities will be made available by 4G networks, present key challenges and point to some proposed solutions.

Keywords: 4G networks, Wireless Networks, Security and Privacy, Quality of Service, Architecture

I . **Introduction**

The wireless system in widespread use today goes by the name of 2.5G-an "in between" service that serves as a stepping stone to 3G. Whereby 2G communications is generally associated with Global System for Mobile (GSM) service, 2.5G is usually identified as being "fueled " by General Packet Radio Services

(GPRS) along with GSM.In 3G systems, making their appearance in late 2002 and in 2003, are designed for voice and paging services, as well as interactive media use such as teleconferencing, Internet access, and other services. The problem with 3G wireless systems is bandwidth-these systems provide only WAN coverage ranging from 144 kbps (for vehicle mobility applications) to 2 Mbps (for indoor static applications). Segue to 4G, the "next dimension" of wireless communication. The 4g wireless uses Orthogonal Frequency Division Multiplexing (OFDM), Ultra Wide Radio Band (UWB), and Millimeter wireless and smart antenna. Data rate of 20mbps is employed. Mobile speed will be up to 200km/hr.Frequency band is 28 GHz. it gives the ability for worldwide roaming to access cell anywhere. The existence of 4G Networks in today's technology-driven society is important indicators of advancement and change. 4G, or Fourth Generation networks, are designed to facilitate improved wireless capabilities, network speeds, and visual technologies. It is anticipated that as these networks continue to thrive, the demand for advanced related technologies will also grow, thereby creating new alternatives for savvy technology users to exceed their desired expectations. The following discussion will evaluate the current state of 3G Networks and will examine the future potential of these networks in expanding technology-based capabilities for consumers and industries alike. In this research paper we present an overall vision of the 4G networks starting by presenting some of the key features they will provide.

II. Background Study Of Research Work

Within the cable television industry, the expansion to 4G Networks is a very real possibility in 2009. Recently, Comcast and T-Mobile have collaborated and agreed to the development of a "mobile 4G network" to be tested in Washington D.C. and Baltimore, MD [11]. However, this process is lengthy, and the rollout of such a network is not expected for close to two years, as the

network requires extensive and detailed testing in order to ensure that there are no “bugs” that could interrupt the flow of mobile traffic across the network [11]. This type of opportunity is of critical importance in developing a network that is capable of advancing technology to never-before-seen heights. Similarly, AT&T, one of the world's largest telecommunications providers, will begin its own rollout of a 4G Network in 2011, enabling its vast user base to explore new downloading speeds and capabilities [18]. The utilization of LTE mobile broadband technology is an opportunity for the corporation to expand its horizons into 4G territory, upstaging current 3G capabilities [18]. In the process of expanding into the new 4G enterprise, AT&T will seek to overcome any limitations brought on by the 3G Network process. As AT&T begins its rollout process, there are many considerations involved in ensuring that the transition is a success, and that existing networks are not interrupted in the process of developing the 4G platform. In addition, mobile providers such as AT&T will likely develop new pricing strategies from some of their most popular products, including the iPhone, in response to the challenges of developing faster networks [21].

The 4G Network process requires a unique approach to developing effective models for strategic purposes. The necessity for 4G networks is associated with the increased utilization of data websites such as You Tube and Facebook, which require tremendous bandwidth in order to be used successfully [10]. Because these websites are becoming increasingly popular amongst the general public, it is more important than ever for telecommunications providers to develop opportunities to accommodate the needs of the consumer population. Consumers have come to depend on different sources of data as a source of entertainment and for convenience. Therefore, it is important that organizations such as Verizon and AT&T continue to identify areas where technological improvements are required. In January 2009, the first operating 4G Network was established by a joint venture between Clearwire

and Intel, which reflected an opportunity for residents and businesses in Portland, Oregon to "connect wirelessly anywhere in Portland at true broadband speeds" [13]. However, with the technology quickly approaching a widespread rollout, many cities, states, and countries will soon possess similar capabilities, as consumers and businesses alike will be provided with different opportunities to expand their networks and interfaces with advanced capabilities. Furthermore, it is evident that the Clear wire strategy is not without its disadvantages, and additional efforts must be made to overcome any technology-related problems that might persist before a widespread rollout is even considered. The future 4G infrastructures will consist of a set of various networks using IP (Internet protocol) as a common protocol so that users are in control because they will be able to choose every application and environment. Based on the developing trends of mobile communication, 4G will have broader bandwidth, higher data rate, and smoother and quicker handoff and will focus on ensuring seamless service across a multitude of wireless systems and networks. The key concept is integrating the 4G capabilities with all of the existing mobile technologies through advanced technologies. Application adaptability and being highly dynamic are the main features of 4G services of interest to users. These features mean services can be delivered and be available to the personal preference of different users and support the users' traffic, air interfaces, radio environment, and quality of service. Connection with the network applications can be transferred into various forms and levels correctly and efficiently. The dominant methods of access to this pool of information will be the mobile telephone, PDA, and laptop to seamlessly access the voice communication, high-speed information services, and entertainment broadcast services. The fourth generation will encompass all systems from various networks, public to private; operator-driven broadband networks to personal areas; and ad hoc networks. The 4G systems will

interoperate with 2G and 3G systems, as well as with digital (broadband) broadcasting systems. In addition, 4G systems will be fully IP-based wireless Internet.

III. Capabilities And Challenges Of 4g Networks

Although the 4G Network platform is not brand new, many telecommunications providers have not yet developed their own alternatives that will support this network in full. Therefore, 4G-related products are still in the development phase, with additional products to be developed and rolled out on a periodic basis. With the creation of these alternatives, it is likely that 4G Networks will continue to expand their scope and promote their own brand of personalization for consumers that seek these types of alternatives [16]. In general, the possibilities associated with 4G .Networks are endless, as high-speed data transmission and associated capabilities are more feasible than ever. This supports the notion that the demand for more complex networks and related capabilities are stronger than ever, as a greater number of consumers continue to buy into the potential that exists with advanced networks, such as 4G.

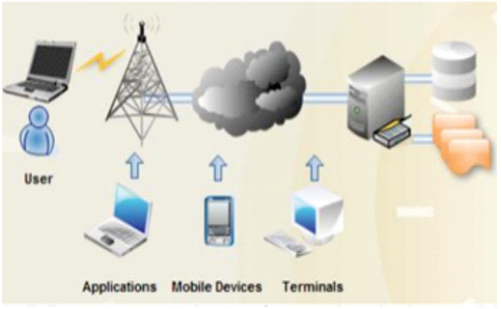


Figure 1: 4G will allow everyone to access the Internet from everywhere using almost any wireless device.

Security and Privacy

In the development of 4G Networks, security measures must be established that enable data transmission to be as safe as possible. Specifically, “The 4G core addresses mobility, security, and QoS through reuse of existing mechanisms while still trying to work on some mobility and handover issues” [3]. Therefore, it is necessary for the organization to develop an effective series of tools that support maximum 4G security measures as a means of protecting data that is transmitted across the network from

hackers and other security violations. Because of the nature of the 4G network, there is an increased likelihood of security attacks, and therefore, multiple levels of security, including increased requirements for authentication, will be necessary to protect data and information that is transmitted across the network [3].

Quality of Service

With respect to network quality, many telecommunications providers are promising that there will be enhanced connectivity, and the quality of data that is transmitted across the network will be of the highest possible quality, as in the case of Ericsson's 4G Network for TeliaSonera [7]. The company promises that "The new 4G network will do for broadband what mobile telephony did for voice. With real-time performance, and about 10 times higher data rates compared to today's mobile broadband networks, consumers can always be connected, even on the move" [7].

IV. Features of 4g Wireless Systems

- Support for interactive multimedia, voice, streaming video, Internet, and other broadband services**.**
- IP based mobile system
- High speed, high capacity, and low cost per bit
- Global access, service portability, and scalable mobile services
- Seamless switching, and a variety of Quality of Service driven services
- Better scheduling and call admission control techniques**.**
- Ad hoc and multi hop networks (the strict delay requirements of voice make multi hop network service a difficult problem)**.**
- Better spectral efficiency**.**

Seamless network of multiple protocols and air interfaces (since 4G will be all]IP, look for 4G systems to be compatible with all common network technologies, including802.11, WCDMA, Blue tooth, and Hyper LAN)**..** An infrastructure to handle pre existing 3G systems along with other wireless technologies, some of which are currently under development.

V. Future Scope

The future scope of 4G development and a variety of current and evolving technologies to make 4G a reality. Highlighting the primary drivers for 4G wireless systems are cost, speed, flexibility, and universal access. Both service providers and users want to reduce the cost of wireless systems and the cost of wireless services. The less expensive the cost of the system, the more people who will want to own it. The high bandwidth requirements of upcoming streaming video necessitates a change in the business model the service providers use from the dedicated channel per user model to one of a shared-use, as-packets-are-needed model. This will most likely be the model service provider's use when 4G systems are commonplace (if not before). Increased speed is a critical requirement for 4G communications systems. Data-rate increases of 10-50X over 3G systems will place streaming audio and video access into the hands of consumers who, with each wireless generation, demand a much richer set of wireless-system features. Power control will be critical since some services (such as streaming video) require much more power than do others (such as voice). 4G's flexibility will allow the integration of several different LAN and WAN technologies. This will let the user apply one 4G appliance, most likely a cell-phone/PDA hybrid, for many different tasks—telephony, Internet access, gaming, real-time information, and personal networking control, to name a few. A 4G appliance would be as important in home-networking applications as it would as a device to communicate with family, friends, and co-workers. Finally, a 4G wireless phone would give a user the capability of global roaming and access the ability to use a cell phone anywhere worldwide. At this point, the 4G wireless system would truly go into a "one size fits all" category, having a feature set that meets the needs of just about everyone.

VI. Conclusion

The conclusion of 4G wireless networks not only enables more efficient, scalable, and reliable wireless services but also provides

wider variety of services. These opportunities come with a need for rethinking our security, privacy, architect and billing technologies have been used for previous generations future research will overcome these challenges and integrate newly developed services to 4G networks making them available to everyone, anytime and everywhere. The mobile technology though reached only at 2.5G now, 4G offers us to provide with a very efficient and reliable wireless communication system for seamless roaming over various networks including Internet, which uses IP network. The 4G systems will be implemented in the coming years, which are a miracle in the field of communication engineering technology.

VII. References

[1] 3GPP TS 23.107 v.5.9.0, "Quality of Service (QoS) Concept and Architecture," June 2003.

[2] Accenture, Accenture 4G accelerator solution. 2009.

[3] E. Buracchini, "The Software Radio Concept," IEEE Commun. Mag., vol. 38, no. 9, 2000, pp. 138–43.

[4] J. Chavis, What is a 4G network?, 2009.

[5] H. Eguchi, M. Nakajima, and G. Wu, "Signaling Schemes over a Dedicated Wireless Signaling System in the Heterogeneous Network," Proc. IEEE VTC, Spring 2002, pp. 464–67.

[6] Ericsson, Ericsson to build commercial 4G network for TeliaSonera. 2009.

[7] J. Fleck, "A Distributed Near Real-time Billing Environment," Telecommun. Info. Net. Architecture, 1999, pp. 142–48.

[8] F. Ghys and A. Vaaraniemi, "Component-based Charging in a Next-generation Multimedia Network," IEEE Commun. Mag., vol. 41, no. 1, Jan. 2003, pp. 99–102.

[9] S. Higgenbotham, Countdown to 4G: who's doing what, when, 2008.

[10] R. Jackson, T-Mobile 4G network coming with help from Comcast, 2009.

[11] T. H. Le and A. H. Aghvami, "Performance of an Accessing and Allocation Scheme for the Download Channel in Software Radio," Proc. IEEE Wireless Commun. And Net. Conf., vol. 2, 2000, pp. 517–21.

[12] A. Lyle, Clear, first 4G network launched, 2009
[13] J. Al-Muhtadi, D. Mickunas, and R. Campbell, "A Lightweight Reconfigurable Security Mechanism for 3G/4G Mobile Devices," IEEE Wireless Commun., vol. 9, no. 2, Apr. 2002, pp. 60–65.
[14] N. Montavont and T. Noel, "Handover Management for Mobile Nodes in IPv6 Networks," IEEE Commun. Mag., vol. 40, no. 8, Aug. 2002, pp. 38–43.
[15] D. Perkins, 4G: challenges and opportunities, 2007.
[16] A. D. Stefano and C. Santoro, "NetChaser: Agent Support for Personal Mobility," IEEE Internet Comp., vol. 4, no. 2, Mar./Apr. 2000, pp. 74–79.

LIGHT FIDELITY (LI-FI): REJUVENATION IN WIRELESS TECHNOLOGY

Abhishek Giri
Depart. of Electronics & Communication
IAMR College of Engg. E-mail: abhishekgiri101@gmail.com

Anand Singh (Astt. Professor)
Depart. of Electronics & Communication
IAMR College of Engg.

Abstract

Li-Fi stands for Light-Fidelity. Dr. Herald Haas ,the professor of mobile communications at the university of Edinburgh school of engineering ,first time publically displayed the proof of Light Fidelity(Li-Fi) ,a method of Visible Light communication(VLC). Li-Fi is the transfer of data through light by taking fiber out of fiber optics and sending data through LED light, it transfer data through illumination by sending data through an LED light bulb . Li-Fi is ideal for high density wireless data coverage in confined areas where there are no obstacles. Li-Fi is a wireless optical networking technology they uses light emitting diodes (LEDs) for transmission of data. It works on the visible light communication (VLC) technology that uses as medium to deliver high-speed communication in analogy to the Wi-Fi. Li-Fi provides better bandwidth, efficiency, availability and security than Wi-Fi. In the present paper we will give a detailed study on Li-Fi technology, its advantages and its future scope.

Keywords-Light Fidelity, LED, VLC, Wi-Fi, Bandwidth.

Introduction

Conventional wireless communication schemes like Wi-Fi predominantly use radio/micro wave frequencies for data transmission, primarily because of the availability of high sensitivity

receivers and ability to provide broad coverage at low frequencies and line of sight communication at high frequencies. But the drawback is RF can support only a limited bandwidth due to allotting of the frequencies in the airways. In this technology radio waves are replaced with visible light as the carrier. In a recent breakthrough, UK scientists have achieved record data transmission speeds of 10 gigabits per second - more than 250 times faster than 'superfast' broadband using LED light bulbs.

Principle

The idea of this communication scheme is transmission of „Data through illumination". The intensity of the LEDs is varied by changing the current passed through them at very high speeds. . This ON-OFF activity of LED lights enablesdata transmission using binary codes i.e., when the LED is ON, logical „1" is transmitted and when the LED is OFF, logical „0" is transmitted.

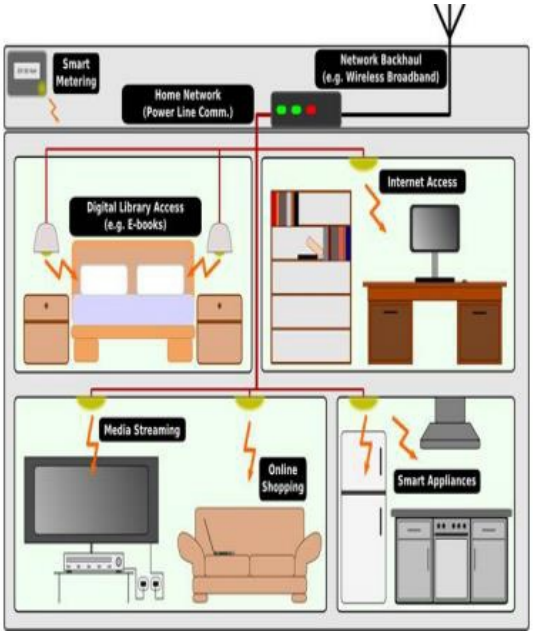


FIGURE 1

Light emitting diodes can be switched on and off faster since operating speed of LED"s is less than 1 µs, than the human eye can detect, causing the light source to be appear continuously. This invisible on-off activity enables a kind of data transmission using binary codes. Switching on and LED is a logical „1", switching it off is a logical „0".A light sensitive device (photo detector) receives the signal and converts it back into original data. This method of using rapid pulses of light to transmit information wirelessly is called Visible Light Communication (VLC) .

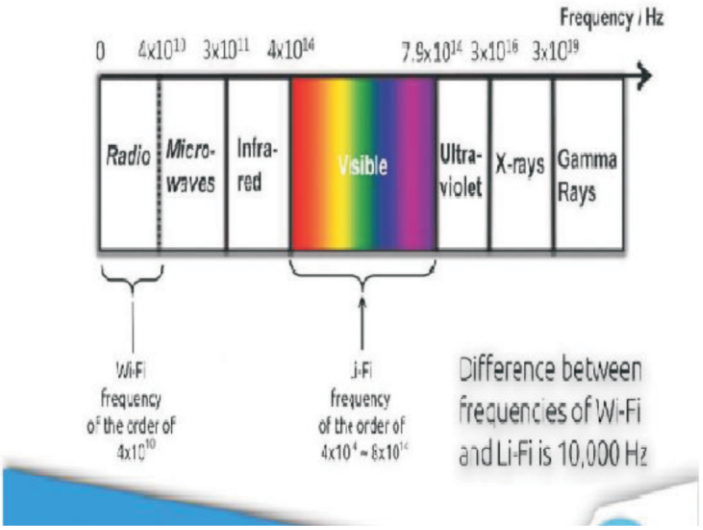


FIGURE 2

A Visible Light Communication Li-Fi is a fast and cheap as compared to the Wi-Fi. The Visible light communication is a data communications medium using visible light between 400 THz (780 nm) and 800 THz (375 nm) as optical carrier for data transmission and illumination. Visible light do not affect the vision. Spectrum of radio and light wave visible light LED are used everywhere. Infrared light is already in use for communication such as wireless remote control, Infrared wireless LAN and Infrared inter-building communication. Visible light LED"s

are in the initial stages to be used in every home and office, which makes visible light LED"s ideal for ubiquitous data transmitter. Growth rate of LED lighting is acknowledged globally,who knows???!!! The market share of LED lighting will take over the lighting market by 2020.

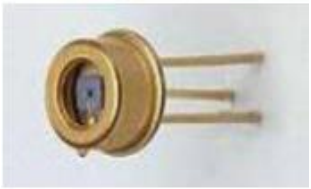
Image sensors are used as receivers which makes it possible to detect incoming data and accurate direction of incoming vector from transmitter to receiver. The image sensor technology will allow VLC to prefer various new applications like applications indoor navigation, augmented reality, accurate control of robots or vehicles and accurate position measurement.

Devices used in visible light communication Fig 3 shows the example of devices used in visible light communication.

FIGURE 3 Devices used in Visible light communication

Devices which are used for transmission purpose in VLC are visible light LED and fluorescent lamp. LED light intensity is modulated by controlling its current. fluorescent lamps can transmit signals at 10bit/s and LED"s can increase it up to 500 Mbit/s. Devices like pin photodiode sensor(simultaneous image acquisition and data reception) as shown in fig 4 below.

(a) Pin Photo diode



(b) Avalanche Photodiode

(c) Image Sensor

Construction And Working

Li-Fi is implemented using white LED light bulbs at downlink transmitter. These devices are used for illumination only by applying a constant current. If the current varies fast optical output can be made to vary at extremely high speeds this variation is used to carry high speed data.

Working

An overhead lamp fitted with an LED with signal processing technology streams data embedded in its anultra high speed beam reaches the photodiodes. A receiver dongle sinceand converts the tiny changes in amplitude into an electrical signal, which are again converted back into a data stream & transmitted to a computer or mobile device.

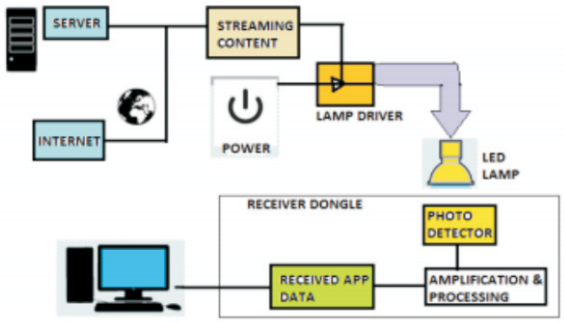


Figure 2: Working of Li-Fi.

FIGURE 5

Data rates more than 100 Mbps can be achieved by using high speed LEDs with adequate multiplexing. Parallel data transmission using arrays of LEDs where each LED transmits a separate stream (packet) of data which increases the VLC data rate. Though the lights have to be kept on in order to transmit data, they can also be dimmed up to a point and the data still can be transmitted without hampering the speed of the data transmission.

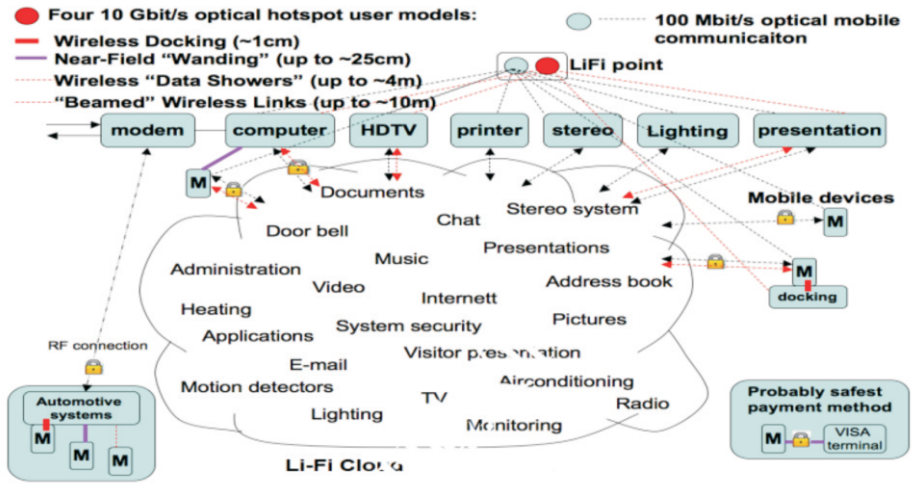


Figure: 1.2

FIGURE 6(LI-FI network)

Technical Aspects and Modulation

VLC means use of the visible light portion of the electromagnetic spectrum for transmitting information. A VLC group is certified by the IEEE 802.15 in 2011.

VLC consisting of

- mobile-to-mobile (M2M),
- fixed-to-mobile (F2M)
- Infrastructure-to-mobile (I2M)

communications.

VLC is to focuses on medium-range communications for intelligent traffic systems at low-speed and on short-range mobile to mobile and fixed to mobile communications at high speeds to exchange data. all the Data rates are between 100 kbps and 100 Mbps using various modulation schemes. VLC defines physical layer (PHY) & media access control (MAC) layer for VLC/Li-Fi.

The MAC layer of VLC have3 multi-

access technologies:

- peer-to-peer,
- star configuration
- broadcast mode
- Physical layers such as addressing, collision avoidance and data acknowledgement protocols are also handled by the VLC

Li-Fi systems use the following different modulation schemes:

- On-Off Keying (OOK): The 802.15.7 standard uses Manchester coding which helps in making the period of positive pulses is same as the period of negative ones,
- Variable Pulse Position Modulation (VPPM): PPM encodes the data using the position of the pulse within a set time period. The duration of the period containing
the pulse are long to analyze the different position of the data
- Color Shift Keying (CSK): This is used if the illumination system uses RGB-type LEDs. By combination different colors of light, the output data can be carried by the color itself and the intensity of the output data comes out nearly constant
- Sub-Carrier Inverse PPM (SCIPPM): This is divided into two parts
  - sub-carrier part-used for saving energy
  - DC part. The DC part is used only for lighting or indicating
- Frequency Shift Keying (FSK): data is represented by varying the frequencies of the carrier signal. for transmitting two distinct values (0 and 1), we need two distinct frequencies to differentiate between them.
- SIM-OFDM (Sub-Carrier Index Modulation OFDM): This is a new approach to transmission in which an additional dimension is added to conventional 2D amplitude/phase modulation (APM)

LED as Light Source

LED id used as it has the ability to be switched on and off repeatedly in very short intervals of time. Due to this they are suitable light sources for Li-Fi. LEDs emit light when the energy levels change in the semiconductor diode. This change in energy generates photons; some of themare emitted as light. The wavelength determines the different energy levels and the type of semiconductor material used to form the LED chip. Solid-state design allows LEDs to withstand vibration, shocks, frequent switching and extremes of environment without compromising thereforethey are efficient to work for more than thousand hours without any difficulties

The basic LED consists of a semiconductor diode chip mounted in the reflector cup of a lead frame that is connected to electrical wires, and arethen encased in a solid epoxy lens. The variations in data rate depend upon the size and type of the led. Normal sized LED bulbs can be reduced to micro-LEDs which handle millions of variations in light intensity. A micro-LED light bulb can transmit 3.5 Gbps and data rates of more than 10 Gbps are possible. The micro LED bulbs allow the light stream to be beamed in parallel thereby results in transmitting huge amounts of data in terms of Gbps.

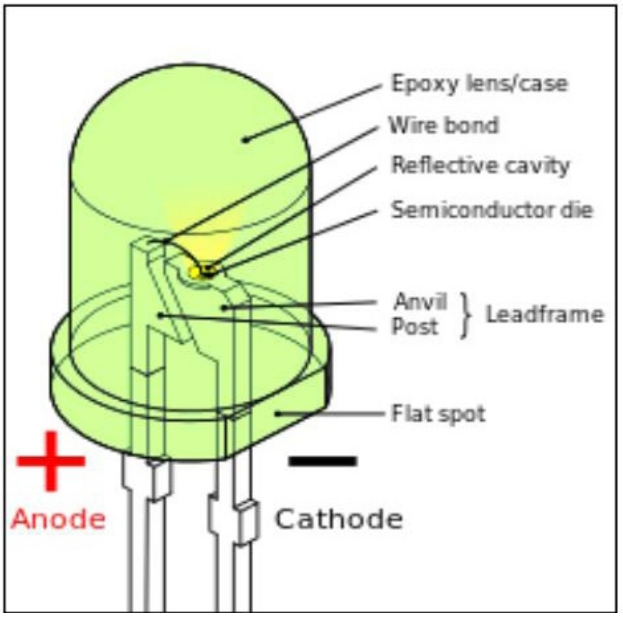


FIGURE 7

Theoretical Analysis

In ordinary inverting amplifier the input voltage is applied to a resistor, and the amplifier generates an output voltage in response to the amount of current that flows through the input resistor to the virtual ground at the negative op-amp input. A current-to-voltage amplifier is an inverting amplifier with the input current I in applied directly to the negative op-amp input. Since no current flows into the op-amp input, the output voltage must be

$$\mathbf{Vout = Itin\ X\ -Rf}$$

This is the gain of the amplifier and is called trans-impedence.

The sensitivity Sl (in units of mA/(mW/cm2)) is defined as the photocurrent per unit light intensity incident on the photodiode. It is a function of the light wavelength .for light intensity N (in mW/cm2) the photocurrent I (in mA) is given by The sensitivity at any wavelength l is given on the data sheet in terms of the peak sensitivity at 800 nm times a correction factor called the relative spectral response, or RSR

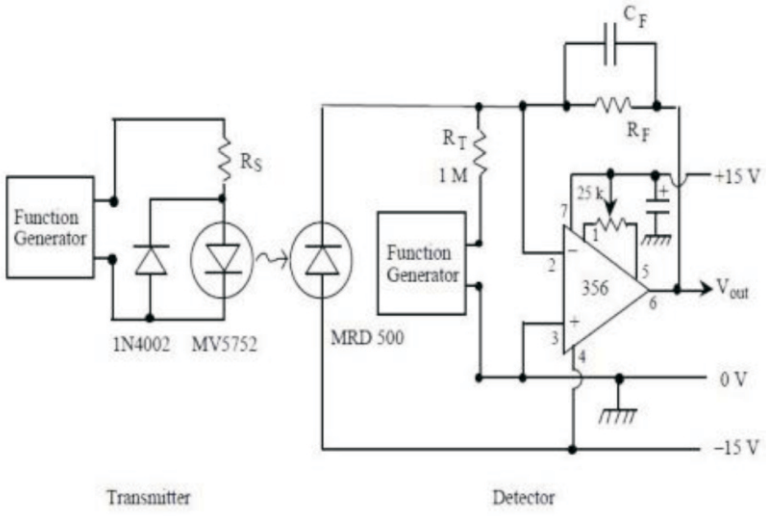


FIGURE 8

Comparison btw Li-fi and Wi-Fi

Li-Fi is a terminology which is used to describe visible light communication technology applied to high speed wireless communication. Wi-Fi is great for general wireless coverage within buildings, and Li-Fi is ideal for high density wireless data coverage in confined area and for relieving radio interference issues, so the two technologies can be considered complimentary [4]. Comparisons of two technologies are given below in table 1.

Sl.No	Parameters	Light Fidelity	Wireless Fidelity
1	Speed for data transfer	Faster transfer speed (>1 Gbps)	Data Transfer speed (150 Mbps)
2	Medium through which data transfers occurs	Used Light as a carrier	Used Radio spectrum
3	Spectrum Range	Visible light spectrum has 10,000 time broad spectrum in comparison to radio frequency	Radio frequency spectrum range is less than visible light spectrum.
4	Cost	Cheaper than Wi-Fi because free band doesn't need license and it use light.	Expensive in comparison to Li-Fi because its uses radio spectrum.
5	Network topology	Point to point	Point to point
6	Operating frequency	Hundreds of Tera Hz (THz)	2.4 GHz

Table 1 Comparison of Li-Fi & Wi-Fi

Applications Of Li-fi

Li-Fi technology can find application in a wide variety of fields. A detailed discussion of its various applications is given below.

- Medical and Healthcare
- Airlines and Aviation
- Underwater Explorations and Communications
- Traffic
- GB Technology
- Smart Lighting
- Mobile Connectivity.
- RF Spectrum Relief
- RF Avoidance
- Indoor Wireless Communication.

Limitation

- The main problem is that light cannot pass through objects, so if the receiver is inadvertently blocked in any way, then the signal will immediately be cut out. If the light signal is blocked one could switch back over to radio waves.
- Factors like interference from external light source like sunlight, bulbs, refracting objects and opaque material can cause interruption in the communication system.
- high installation costs,maintenance as well as and unawareness about the technology
- Wi-Fi (radio frequency) is still needed as it cannot provide light source for data transmission for the high speed moving objects as well as it

cannot be successful in remote areas as electricity is still an issue in remote areas of our country .

Conclusion

There is cornucopia of opportunity one should pounce in Li-Fi technology. If this technology find its feet in the market every light emitting bulb in our house can overcome the Wi-Fi to transmit data wirelessly. It has raised many eyebrows as well as attracted many technical pandits as it is the best technology which can replace the traditional Wi-Fi which can fulfill demand of the over increasing wireless internet users , it will decrease the traffic of the air ways which is clogged with RF frequencies .which have relatively distorted the high speed internet which alternatively help in solving the shortage of the RF frequencies Hence the future applications of the Li-Fi can be predicted and extended to different platforms like education fields, medical field, industrial areas and many other fields

Refernce

- www.lificonsortium.org/
- "Harald Haas: Wireless data from every light bulb" , https://www.youtube.com/watch?v=NaoSp4NpkGg
- http://en.wikipedia.org/wiki/Li-Fi [3] http://teleinfobd.blogspot.in/2012/01/what-is-lifi.html
- E. Monteiro and S. Hranilovic, ―Constellation design for colorshift keying using interior point methods,‖ in Proc. IEEE GLOBECOM Workshops, pp. 1224–1228. 2012.
- G. Cossu, A. M. Khalid, P. Choudhury, R. Corsini, and E. Ciaramella, ―Long distance indoor high speed visible light communication system basedonRGBLEDs,‖ in Proc.AsiaCommun.Photon. Conf. pp. 1–3., 2012.
- Rajagopal, S., Roberts, R.D., Sang-Kyu Lim, "IEEE 802.15.7 visible light communication: modulation schemes and dimming support", IEEE Communications Magazine, Volume 50, Issue 3, pp. 72 - 82, March 2012

A COMPREHENSIVE STUDY OF GI-FI TECHNOLOGY AND ITS APPLICATIONS

MD. Amzad
Corporate Trainer, Treasurer, Archer Foundation
Email Id: amzad.be@gmail.com

Abstract

This research paper focused on the study of Gi-Fi technology stands for Gigabit Wireless. Gi-Fi is a wireless transmission system which is ten times faster than other technology and its chip delivers short-range multigigabit data transfer in a local environment. Gi-Fi is a wireless technology which promises high speed short range data transfers with speeds of up to 5 Gbps within a range of 10 meters. The Gi-Fi operates on the 60GHz frequency band. This frequency band is currently mostly unused. It is manufactured using (CMOS) technology. This wireless technology named as Gi-Fi.

Keywords: Gi-Fi, CMOS, Bluetooth, Wi-Fi

I. Introduction

The Gi-Fi or gigabit wireless refers to a wireless communication at a data rate of more than one billion bits (gigabit) per second. By 2004 some trade press used the term "Gi-Fi" to refer to faster versions of the IEEE 802.11 standards marketed under the trademark Wi-Fi.

[1]In 2008 researchers at the University of Melbourne demonstrated a transceiver integrated on a single integrated circuit (chip) that operated at 60 GHz on the CMOS process.[2] It will allow wireless transfer of audio and video data at up to 5 gigabits per second, ten times the current maximum wireless transfer

rate, at one-tenth the cost. Researchers chose the 57–64 GHz unlicensed frequency band since the millimeter-wave range of the spectrum allowed high component on-chip integration as well as the integration of very small high gain arrays. The available 7 GHz of spectrum results in very high data rates, up to 5 gigabits per second to users within an Indoor environment, usually within a range of 10 metres.[2] Some press reports called this "GiFi".[3][4] It was developed by Melbourne University-based laboratories of NICTA (National ICT Australia Limited), Australia's Information and Communications Technology Research Centre of Excellence.[3] In 2009, the Wireless Gigabit Alliance was formed. It used the term "WiGig" which avoided trademark confusion. The benefits and features of this new technology can be helpful for use in development of the next generation of devices and places. In this paper, the comparison is perform between Gi-Fi and some of existing technologies with very high speed large files transfers within seconds it is expected that Gi-Fi to be the preferred wireless technology used in home and office of future [5].

II. Background Study Of Research

The S. Dheeraj and S. Gopichand et.al, 2002 proposed a model in which they implement a technology which gain flexibility of infrastructure, reduce capital expenditure, gain advantages over competitors and to solve business problems. Gowtham S Shetty et.al, 2006 [2] proposed that wireless dual band router and wireless dual band USB adapter are based on the next generation Wi-Fi**.** The Paper [11] by Jyoti Tewari, Swati Arya discuss a basic idea about New Technology, “Gi-Fi” that is based on integrated wireless transceiver chip. Within five years, this technology would be able to replace the other existing wireless technologies based on some parameters. The GiFi chip has brought good news for personal area networking because there is no internet infrastructure available to cope with it. The Paper [12] by Desai Vaishali J., Ramani Shrusti K.2 focus on advantages of Gi-Fi technology over

other technologies. Gi-Fi technology is able to remove need for cables to connect consumer electronics devices and all the devices can be connected in order to transmit the data wirelessly. Moreover, it ensures privacy and security of content. Gi-Fi has many features that make it suitable for the use in many places and devices.

III. Architecture of Gi-fi Technology

There are many usage scenarios that can be addressed by Gi-Fi. The following are some mobility usage applications of Gi-Fi.

1. In wireless pan networks:

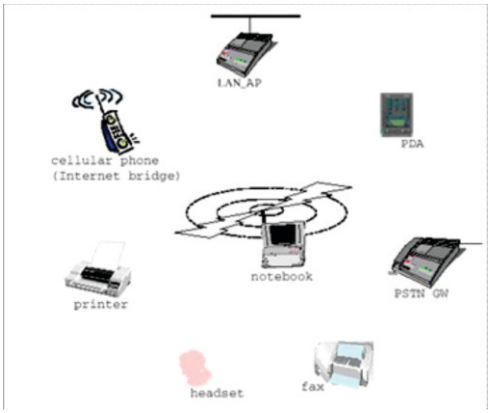


Figure 1: Wireless pan networks:

Figure 2:Inter-vehicle communication system

Huge data file transmission:

It will transfer gigabits of information within seconds broadcasting video signal transmission system in sports stadium :

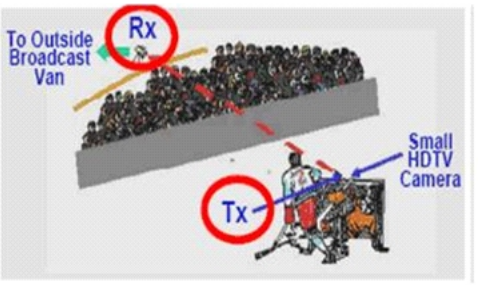


Figure 3: Huge data file transmission

Ad-hoc information distribution with Point-to-Point network extension:

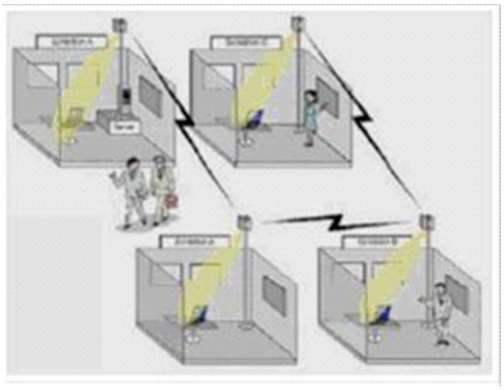


Figure 4:Point-To-Point Network Extension

Media access control (MAC) and imaging and others:

Figure 5: MAC and Imaging

IV. Features of Wi-Fi

4.1 Gigabit Wireless Features

This Gi-Fi technology allows wireless uncompressed high definition content and operates over a range of 10 meters without interference. Gi-fi chip has flexible architecture. Itis highly portable and can be constructed in everywhere. Entire transmission system can be built on a cost effective single silicon chip that operates in the unlicensed, 57-64 GHz spectrum band. Gi-Fi technology also enables the future of information management, is easy to deployment with the small form factor.

4.2 Capacity of High Speed Data Transfer

The data transfer rate of Gigabit wireless technology is in Gigabits per second. Speed of Gi-Fi is 5 Gbps; which is 10 times the data transfer of the existing technologies. Providing higher data transfer rate is the main invention of Gi-Fi. An entire High-Definition (HD) movie could be transmitted to a mobile phone in a few seconds, and the phone could then upload the movie to a home computer or screen at the same speed.

4.3 Interference in Data Transfer

It uses the 60GHz millimeter wave spectrum to transmit the data, which gives it an advantage over Wi-Fi. Wi-Fi's part of the spectrum is increasingly crowded, sharing the waves with devices such as cordless phones, which

leads to interference and slower speeds. But the millimeter wave spectrum (30 to 300 GHz) is almost unoccupied, and the new chip is potentially hundreds of times faster than the average home Wi-Fi technology.

4.4 Power Consumption

Power consumption of the present technologies such as Wi- Fi and Bluetooth are 5mili watts and 10mili watts but chip of Gi-Fi uses a tiny one-millimeter-wide antenna and it has less than 2mili watts of power consumption that in compare to the current technologies is very less.

4.5. Provides High Security

Gi-Fi technology is based on IEEE 802.15.3C and this standard provides more security since it provides optional security in the link level and service level. Point-to-point wireless systems operating at 60 GHz have been used for many years by the intelligence community for high security communications and by the military for satellite to satellite communications.

V. Applications of Gi–fi Technology

1) Gi-Fi technology has many attractive features that make it suitable for use in many places and devices. Gi-Fi technology offering reduced the chip size and power consumption, can be used to send and receive large amounts of data in a variety of applications For example, it is intended for use in a wide range of devices including personal computers, tablets, and smart phones. The technology's fast data-synchronization rates enable the rapid transfer of video, bringing the wireless office closer to reality.

2) This technology can be effectively used in wireless pan networks, Inter-vehicle communication systems, Ad-hoc information distribution with Point-to-Point network extension, media access control (MAC), imaging and other applications.

3) Gi-Fi technology is able to transfer gigabits of data within seconds and therefore it can be used for huge data file transmission and it is expected that this chipset replaces HDMI cables and

could develop wireless home and office of future.

4) Gi-Fi technology also can be used in broadcasting video signal transmission system in sports stadiums and mm-Wave video video-signals transmission systems. The technology could also be used for beaming full HD video in real-time and could be used by notebooks and other computers to wirelessly connect virtually all the expansion needed for a docking station, including a secondary display and storage.

VI. Conclusion

The conclusion of this research paper Gi-Fi technology within five years, we expect Gi-Fi to be the dominant technology for wireless networking. By that time it will be fully mobile, as well as providing low-cost, high broadband access, with very high speed large files swapped within seconds which will develop wireless home and office of future. If the success of Wi-Fi and the imminent wide usage of WiMAX is any indication, Gi-Fi potentially can bring wireless broadband to the enterprise in an entirely new way.

VII. References

[1]Gigabit Wi-Fi looms large: But 'Gi-Fi' pointless without robust security". The register. November 19, 2004. Retrieved May 30, 2013.

[2]NICTA develops a world first in semiconductor technology for the wireless home and office of the future". News release (NICTA). Retrieved May 30, 2013.

[3] Nick Miller (February 22, 2008). "$10 chip puts Australia on the fast track". The Age. Retrieved May 30, 2013.

[4]GiFi-Latest Research In Wireless Technology Looks Promising". TechLivez. February 22, 2008. Retrieved May 30, 2013.

[5] Marguerite Reardon (May 7, 2009). "Tech giants back superfast WiGig standard". CNet. Retrieved May 30, 2013.

[6]Marzieh yazdanipour, Mina Yazdanipour, Afsaneh Yazdanipour, Amin Mehdipour," Evaluation of Gi-Fi Technology for Short-Range, High-Rate Wireless Communication" UACEE International Journal of

Advances in Computer Networks and its Security- Volume 2: Issue 3 [ISSN 2250 - 3757].
[7] GI-FI technology “Wikipedia”
[8] J.Santhan Kumar Reddy “GI-FI TECHNOLOGY” Gokula Krishna College of Enginnering.
[9] Report on “GI-FI Technology “.
[10] YP Kosta, Upena D Dalal, Rakesh Kumar Jha (2010). Security Comparison of Wired and Wireless Network with Firewall and Virtual Private Network (VPN). Recent Trends in Information, Telecommunication and Computing (ITC). International Conference on IEEE (pp. 281-283)
[11] Jyoti Tiwari, Swati Arya (2013). Evolution of Gi-Fi Technology over other Technologies. IJCSN International Journal of Computer Science and Network, June 2013 (vol. 2, issue 3, pp. 5-8).

TRUST MANAGEMENT ISSUES IN CLOUD COMPUTING ENVIRONMENT

Prasann Pradhan
Research Scholar Shri Venkateshwara University
NH-24, Rajabpur Gajraula – 244236 Distt:- J.P. Nagar, U.P, India
Email: prasannpradhan@yahoo.com
Dr. Vikas Kumar
Asia-Pacific Institute of Management 3&4
Institutional Area, Jasola, Sarita Vihar, New Delhi – 110025
Email: prof.vikaskumar@gmail.com

Abstract

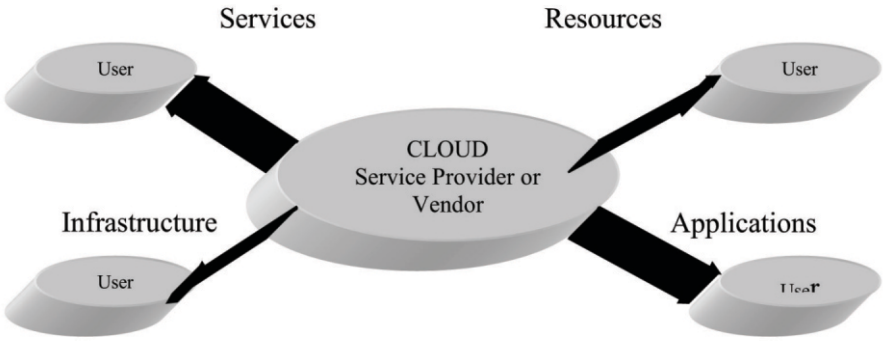
Cloud computing paradigm offers the various computing services via SaaS, IaaS, PaaS service models. However, the services are being offered and managed online with minimal physical intervention and hence the management of trust between the user and the vendor becomes an important aspect for large scale proliferation of the cloud services The present work discusses the various issues and challenges in managing the trust between the cloud provider and the customers. The issues include the governance, compliance, availability, risks, policies processes and security etc. The need of the trust and its implications has been highlighted from a multi-vendor and multi-user perspective. Challenges for the sensitive data have also been discussed from a trusted security perspective along with the future implications.

Keywords: Cloud Computing, Trust Management, Governance, Compliance.

1. Introduction

Cloud Computing is a utility based computing paradigm in which the dynamically scalable resources are provided as services to the users on a pay per usage model. It offers the delivery of computing as a "service" rather than a product, whereby shared resources, software, and information are provided to the users via over the internet based media. It allows the users to access these services from the internet without knowledge of, expertise in, or control over the

technology that supports them .Users access these services as they require and pay for only what they use in a monthly or a rental subscription. As shown in Figure 1, cloud vendors or service providers offer various types of services to the users. Cloud services may be Applications, hardware or software resources, operating systems, storage, etc. The cloud service provider or vendor, provides services to the user"s demand basis.. These services are measurable and accountable in the sense that how much the consumer consumes and how much the provider provides.



1.1 The NIST Definition of Cloud Computing

According to NIST (National Institute of Standards and Technology) [1], Cloud computing is a model for enabling ubiquitous, 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.

As per the NIST definitions, following are the essential characteristics for the cloud computing services.

(i) On-demand self service
(ii) Broad network access
(iii) Resource Pooling
(iv) Rapid Elasticity
(v) Measured service

1.2 Deployment Models

We have the following deployment models in the cloud computing environment.

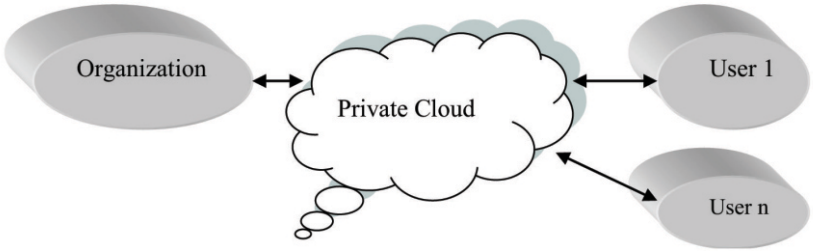


Figure 2. A Private Cloud operated by a single organization.

***(I)*Private Cloud** As shown in above figure 2, A private cloud infrastructure operated solely for a single organization, whether managed internally or by a third-party and hosted internally or externally. It may be owned, managed, and operated by the organization, a third party, or some combination of them, and it may exist on or off premises.

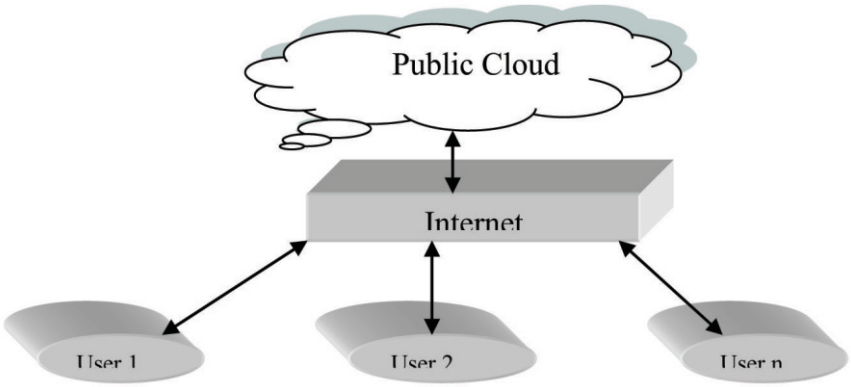


Figure 3. Public Cloud deployment model of cloud computing

(ii) Public Cloud

As shown in above figure 3. public cloud deployment model of cloud computing in which users accessing the services via the internet only.Public cloud is the type of deployment model, in which the service provider providing resources, such as applications and storage facilitty to the general public over the Internet. Public cloud services may be free or offered on a pay-per-usage model. It may be

owned, managed, and operated by a business, academic, or government organization, or some combination of them.

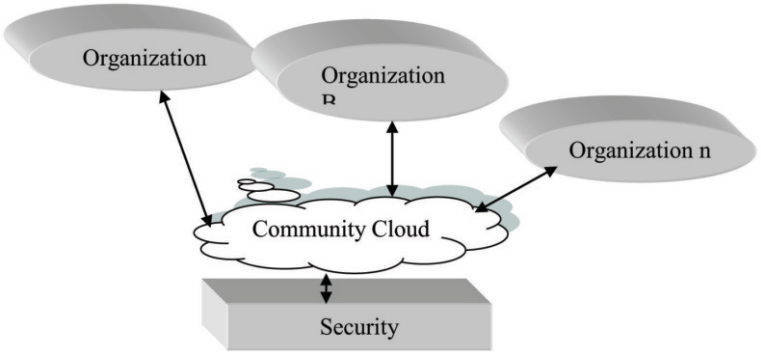


Figure 4. An example of Community Cloud deployment model sharing infrastructure under specific security concerns.

(iii) Community Cloud

Community cloud deployment model shares infrastructure between several organizations from a specific community with common concerns (security requirements, compliance, jurisdiction, etc.), whether managed internally or by a third-party and hosted internally or externally. The costs are spread over fewer users than a public cloud (but more than a private cloud), so only some of the benefits of cloud computing are realized.

It may be owned, managed, and operated by one or more of the organizations in the community, a third party, or some combination of them, and it may exist on or off premises. Figure 4 above shows an example of community cloud deployment model sharing infrastructure under specific security community concerns by several organizations.

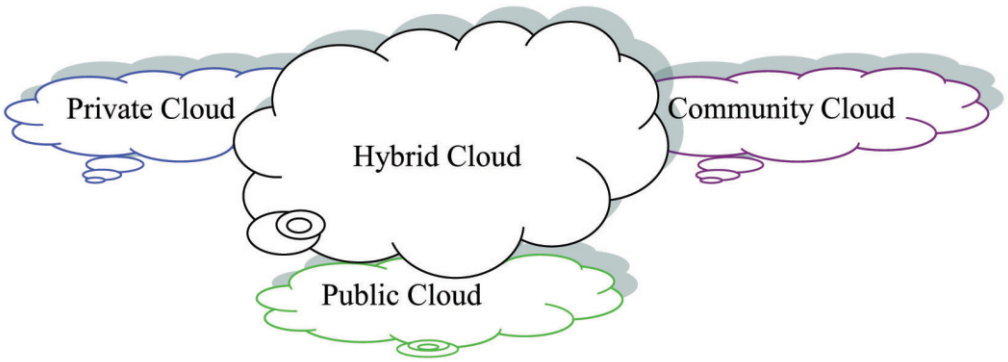


Figure 5. Hybrid Cloud deployment model of cloud computing

(iv) Hybrid Cloud

Figure 5. above shows the hybrid cloud deployment model of cloud computing. Hybrid cloud is a composition of two or more clouds (private, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability (e.g., Cloud bursting for load balancing between clouds), offering the benefits of multiple deployment models. It can also be defined as multiple cloud systems that are connected in a way that allows programs and data to be moved easily from one deployment system to another.

1.3 Current Service Offerings in Cloud In cloud computing where services are provided by a service provider to the consumer, the following are the major service offering in cloud computing environment as shown in figure 6 below.

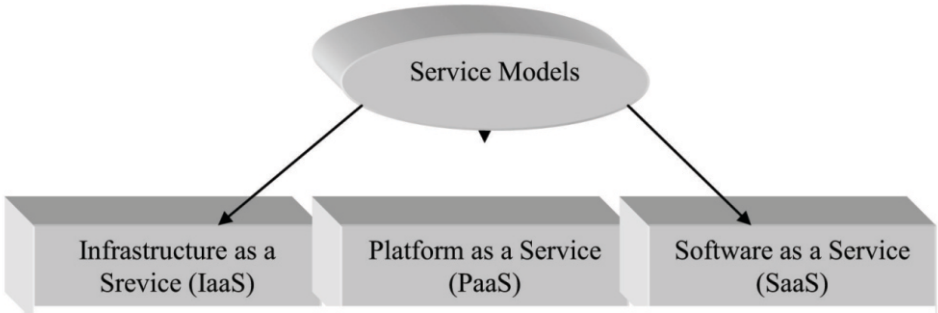


Figure 6. Different service models in cloud computing environment

(I) Infrastructure as a Service (IaaS) IaaS, deliver computer infrastructure – typically a platform virtualization environment – as a service, along with raw storage and networking. Rather than purchasing servers, software, data-center space or network equipment, clients instead buy those resources as a fully outsourced service [2]. Cloud providers typically bill such services on a utility computing basis; the amount of resources consumed (and therefore the cost) will typically reflect the level of activity. The consumer does not require to manage or to control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications. Zenith Info Tech and Net magic Solutions are two examples of Indian Companies offering the IaaS services.

- IaaS provider uses the latest technology for infrastructure equipments such as hardware for storage or networking.
- It reduces time cost and complexityin adding new features or

capabilities.

• It reduces the costs that allow expensing service costs instead of making capital investments. For example Amazon Elastic Cloud(Amazon EC2) is a web service that provides resizable computing capacity in the cloud. It changes the economics of computing by allowing users or customers to pay only for what capacity or infrastructure they actually use.

• Amazon S3 (Amazon Simple Storage Service), provides a web service interface that allows users to store and retrieve any amount of data from the internet at any time, any place and gives developers direct access to the same highly scalable, reliable, fast, in expensive data storage infrastructure.

(ii) Software as a Service (SaaS)

SaaS deliver software as a service over the Internet, eliminating the need to install and run the application on the customer's own computers and simplifying maintenance and support. The applications can be accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. The consumer does not require to manage or to control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings. Wipro Technologies ,Infosys Technologies and Synge are the Indian companies offering SaaS services.

• SaaS is also often associated with pay-as-you-go subscription licensing model.

• The SaaS model helps enterprises ensure that all locations are using the correct application version and therefore the format of the data being recorded and conveyed is consistent, compatible, and accurate.

• It also ensures the availability of applications to global locations.

• SaaS providers update theirapplications and operating systemsdynamically.

• SaaS providers like Sales force provide customer relationship management (CRM) service to its customers or users.

(iii) Platform as a Service (PaaS)

PaaS, deliver a computing platform as a service, often consuming cloud infrastructure and sustaining cloud applications.It facilitates deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers.Platforms let developers write certain applications using programming languages, libraries, services, and tools supported by the provider that can run in the cloud, or even use services provided by the cloud. The consumer does not require to manage or to control the underlying cloud infrastructure including network, servers, operating systems, or

storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment. Wolf Frameworks and the Orange scape the Indian companies offering PaaS solutions.

PaaS allows anyone with internet connection can build powerful applications and easily deploy them to users globally.

It includes the services to develop, test, deploy, host and manage applications.

- It offers a faster, more cost effective model for application development and delivery.
- PaaS providers provides a compete infrastructure needed to build, run and deploy applications over the internet. For example Amazon, Microsoft and Google are the leading companies that offer these facilities.
- Google App Engine provides web applications on Google "sinfrastructure. When using this Google App Engine there are no servers to maintain and manage, the organizations just uploads its applications to serve users.

1.4 End-User Access to Cloud

Following are the certain examples of end user can access to cloud computing services through internet.

- *You Tube* is widespread used as amedium for sharing and watching online videos through websites, mobile devices, blogs, and email. You Tube allows people to easily upload and share video clips on the You Tube website. It was started in February 2005 and launched in Dec. 2005.
- Zimbra Desktop is a free open source email and calendar client which runson any Windows, Apple, or Linux desktop computer .It provide software for email and collaboration, including email, group calendar, contacts, instant messaging, file storage, and web document management and it can be d eployedon- premises or as a hosted email solution and imposes no limit on thesize of email storage.
- Facebook is a leading free accesssocial networking website and its company Facebook, Inc. , located in the heart of silicon valley. It was formerly called The Facebook. This is the most popular free social networking site on internet.
- Dim Dim Collaboration this free ervice lets anyone can be communicate using rich media in realtime. It does not require user to install software on their computers in order to attend a web meeting. Usercan start or join meetings using onlya few mouse clicks. It is available asopen source software in cloudcomputing.

2. Needfor Trust Management

Considering the online nature of the cloud computing paradigm, the need for the trust management is inherent in the cloud computing paradigm. Thus, it becomes necessary to understand the trust and the trust management. **2.1 Trust and Trust management** What "Trust" means? Trust means an act of faith, confidence, truth ness, and reliance in something that"s expected to behave or deliver as promised. Trust

revolves around „assurance" and confidence that people, data, entities, information or processes will function or behave in expected ways. It"s a belief in the competence and expertise of others, such that you feel you can reasonably rely on them to care for your valuable assets. Trust is often described as the subjective belief of someone in the character, ability, strength, reliability, honesty or truth of someone or something [3] [4]. The concept of trust implies on the parties involves in transaction in cloud computing environment can be expressed as like an one individual A, is considered to trust on another individual B, when the individual A believes that individual B will behave exactly as expected. Many definitions of trust exist within the computing environment and social science. According to Gambetta [5][6] which defines, "trust is the subjective probability by which an individual A, expects that another individual B, performs a given action on which its welfare depends". Mayer et al. [7], said that "trust refers to the willingness of a party to be vulnerable to the actions of another party based on the expectations that the other will perform a particular action important to the trust or, irrespective of the ability to monitor or control that other party" According to Mc Knight et al. [8] defined trust to an individual beliefs about the extent to which a target is likely to behave in a way that is „benevolent, competent, honest, and predictable in a situation". Since, different researchers may defined trust differently in their words, one may defined as honesty, others may defined in terms of probability, believes, confidence, security, expectations, and so on. For Managing and maintaining a trust between the parties involved in electronic transactions over internet, a need for Trust Management is required in cloud computing. Even if different disciplines and researchers look at trust from different angles, it is possible to identify some common key factors that are required for the need for trust management.

- Trust management is requires to meet the customer or users expectations, vendor or provider expectations, organization expectations.
- Trust management is requires only when the environment uncertain and risky.
- Trust management is requires basedon which certain decisions are madein business organizations.
- Trust is built between the parties using prior knowledge and past transactions experiences.
- Trust is a subjective notion based on opinion and values of an individual.
- Trust management required up datable changes with time, new knowledge and experience will have overriding influence over the old ones.
- Trust is context-dependent.

2.2 Background of Trust

The trust and reputation have their origin in the social sciences that study the nature and behavior of human societies. Trust has been studied by researchers in diverse fields such as psychology, sociology, and economics. Psychologists study trust as a mental attitude and focus on what happens in a person"s mind when he trusts or distrusts someone. Sociologists approach to trust is as a social relationship between people .Social context of trust has been commonly employed in multi agent systems and social networks .The similarity between the multi agent system and a social network are exploited in these works as agents and people behave in a similar fashion interacting with, gathering information from and modeling each other for developing trust on each other. Economists perceive trust in terms of utility. Researchers in computing environments can take benefits from all of these studies as they give important information towards human behavior under various circumstances and different conditions. The role of trust and reputation in open, public distributed systems like e-commerce, peer to peer networks, grid computing, semantic web, web services, and mobile networks have been studied by many researchers. We are here for finding the role of trust in cloud computing environment.

2.3 Types of Trust

We broadly categorizes the types of trust in cloud computing environment are as following.

- Trust may be human to human for e.g. Relationship and Friendship Machine to Machine for e.g. handshake protocols negotiated within certain protocols.
- Human to Machine for e.g. when aconsumer reviews a digital signature advisory notice on a website.
- Machine to Human for e.g., when a system relies on user input and instructions without extensive verification. At a deeper level, trust might be regarded as a consequence of progress towards security or privacy objectives.

2.4 Trust Requirements for Trust Management Systems

The Trust Management System in a cloud computing environment has been depicted in Figure 7. The trust requirements such as compliance, governance, etc. are analyzed in the trust management systems for the basis of trust level between the user and the vendor or the service provider. The level of trust, vendor expects from the particular user in cloud computing environment and vice versa becomes very much important. Trust is established between the user and the vendors or service providers based on

prior dealings or past experience transactions in cloud computing environment based on that trust and past transactions builds a trustworthy relationship between them. The level of trust between them is managed and controlled by a trust management system in cloud computing environment. Lack of trust between any of them results migrating users to the next vendor or service providers which gives decrease in business profits. Since we have to require a trust management systems in cloud computing.

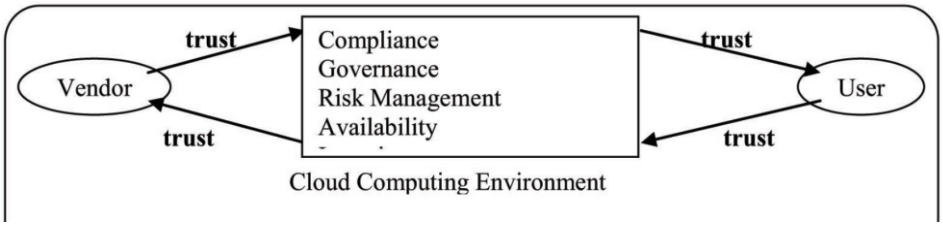


Figure 7. Trust Management System in cloud computing environment.

Trust in cloud computing is more complex than in traditional IT scenario where the information owner owns his own computer [9]. For creating a trusted cloud computing environment, the enterprises have the following sets of requirements (which are shown above in figure 7.) to fulfill.

(I) Compliance

Conformance with required regulatory, legal, and general industry requirements e.g., governing the management and sometimes physical location of information and can comply with some industry standards and rules e.g. ISO (International Standard Organization), PCIDSS (Payment Card Industry Data Security Standard). Then implement these requirements whether legal, industry-wide, or contractual, in management processes and in code to ensure both enforcement and demonstration of that enforcement. It also include monitor how requirements change, especially as they become more cloud specific.

• Cloud vendors and users (customers)are required to comply with well established laws that are applicable for different jurisdictional areas regarding their data storage, security and privacy issues. Since, cloud user may belong any where in the world and their local area law may be different from that service provider area of law, so a proper well establish and standard law is requires that can solve these types of problems.

• Parties should be required to comply with laws that will be applicable in a equally balance form. So, that both parties involved in it, may

get right justifications for their problems. For example historically, service providers or vendors have faced difficulties withtheir users or customers in negotiating information assurance requirements particularly regarding regulatory compliance verification. This problem becomes more complicated in cloud computing environment, where the physical resources can be any where in the world, dynamic in nature and regulatory landscape is vast.

Since, a proper standard law is requires for between the user and the vendor. So that parties involves in transactions can comply that standard law and may get right justification of their problems.

(ii)Governance

Governance is evolved as a new cloud management tools that provide greater functionality and transparency between the cloud provider and the customer. Governance in cloud computing means to govern properly such as monitoring and reporting cloud operations including trust related rules, policies and their enforcement. Make accountabilities explicit for information-related process and educate staff on self service and effective use of cloud services. It describe who can take what actions with what information, and when, under what circumstances, using what methods.

- For proper governance requires, aproper legal framework is need to bees tablish. So, that fair and law ful processing may be done between the parties involved in it.
- Governance also needs to train and educate the staffs, so that proper control and monitor the cloud operations. Training and education must requires for the staff for getting the effective governance because trained and educated staff can better handle and responds, the problems that their user or customers faced in cloud computing environment then the untrained staff. So trained and educated staff may also help customer or user to retain their trust on their respective organizations or vendors.
- It also requires in cloud computing is o accept new rules and polices for better controlling the cloud operations. Cloud computing is dynamic in nature, technology is changing with time very frequently, so rules and policies must also change for better governance in cloud computing operations.
- It should also clearly assigns the role and responsibilities of the staff and if require adapt or create new methods for it. For effective governance, it must require that an individual in an organization may know their role and responsibility. So that every individual may better respond for their duty.
- It also requires that adapted policies and rules should be update with time, technology and law. Since technology is changing, law requirements will also change, new policies and rules should be update with time.

(iii))Risk Management

Risk management in cloud computing environment means the risk may be a direct threats (e.g., intrusion, hacking), business interruption (e.g., when an enterprise"s own systems or the networked systems of business partners are unavailable) or some kind of the financial, reputational, and legal repercussion of information loss or theft or it may be a technological change or unfamiliarity with cloud computing.

- To manage and to deal that risk is involve in cloud adapters must carefully assess the performance and viability of vendors. Cloud adapters is require to read the views of their associated partners, organizations and users regarding their performance and viability of that cloud vendor and based on that views cloud adapter may make their decision whether adapt or not.
- Cloud adapters need to carefully read terms and conditions before adapt any cloud vendor services and discloses his business secrets to them. A great degree of risk is involved in it. Cloud adapters must require to understand the contract terms and conditions before signing the contract. They also require to do some research on cloud vendor reputation in the market.
- Lack of a third-party risk management program may result in damage to the provider"s or vendor"s reputation. Since, most of the vendor"s or provider"s uses third parties for the storage and processing of their customer or user data, there is a higher expectation that the cloud vendor will effectively manage the security risks with third parties. If security leaks by third parties results loss in the vendor reputation.
- Risk management is increased by varying factors such as technology change, unfamiliarity in cloud computing and uncertainties it introduces, etc. New technology replaces old technology so fast in this computing environment which brings some uncertainties for their users or customers who are familiar with old technology, the time he recovers with this new technology another latest technology came and replaces this which brings unfamiliarity in cloud computing. So a great degree of risk is come in cloud computing environment.

(iv)Availability

Availability in cloud computing environment is refers to the requested service or system being accessible when ever a demand from an authorized party. Availability of resources is endangered if the requested server or service is spoofed, penetrated or suspended and can"t operate as expected. Cloud provider must include strong methods for resiliency and recovery which can include seamless rollovers and warm systems ready to go live in the comprehensive system failure. Maintaining availability, however, is complicated by the proliferation of

resources, users, and access methods including mobile devices. Cloud providers also ensure that the cloud solutions provide adequate scalability and performance. Cloud computing models help availability in the following ways.

• Effective methods are employ for hardware failures, protect against software failures. As number of user are increasing in cloud computing environment, it will be require for service provider to available resources to all the users. Since every user accessing the instances of application which runs on virtual server which may runs on some physical server. If any fault came with in hardware or software application, the whole network traffic is shifted towards another server which gives some type of automatic fault tolerance capability. New and effective methods will be needed to recover from hardware or software faults.

• Service response time modeling will require for greater the availability of resources. Response time should be less for greater the availability of resources. Cloud vendors should use the methods by which the response time will be very less.

• Update applications and operating systems regularly or periodically with no or very less in down time consumption. Cloud vendor or providers should adapt new methods through which applications and operating systems will be update in less time, so that user or customer may not suffer the problem of lack of availability of resources.

• New techniques should use for resource provisioning overhead. Resource provisioning overhead is the time between issuing an HTTP request and receiving the HTTP response.

• Resources must be always accessible even on the occasions where there is a network failure or a whole data center has gone offline. Cloud vendors or providers should use such type of mechanism by which they have guaranteeing their users for the availability of resources at any failure.

(v) Integrity

In cloud computing environment, the users data is stored on remote machines which is operate by various service providers, the users have very little control over their data processing and storage. Because this data is unencrypted form, there is a more chance that service providers or malicious users could disclose or destruct or replays or delays or copies it. Cloud provider must employ new data encryption techniques, access control and methods to ensure the completeness of transactions under network or system failure or malicious users attacks. Whenever possible, embed and employ rules for access and use into sensitive data sets. Take special attention to security and transparency in a multi-tenant environment. The following points describe how integrity issue is helpful in trust building for their users.

• Cloud computing vendors should provide assurances on data backup to

an offsite location and maintain a resilient incident response model to ensure business continuity for their customers[10].

- Integrity means in cloud computing that cloud vendors must guaranteeing their users that only authorized users can access the information and applications. Unauthorized users cannot access their information and application.
- Cloud vendors should provide specific assurances to their users (clients)regarding their data storage, backups and recovery plans of their data in case of disasters like network traffic or earth quake, etc. Cloud vendors should provide visible security certification or clear mechanism about this to their users.
- Customers or users should also have some kind of mechanism for per forming integrity checks on their own data. Cloud vendors should provide such type of mechanism to their users.
- Cloud vendors should adapt new encryptions techniques for satisfying their users to their data security and assure that the user"s stored data won"tbe corrupted. Cloud vendors will also requires adapting some methods for integrity controls and assures the users the original data should be returned when a backup is restored.

(vi) Confidentiality / Privacy

Confidentiality / Privacy refers in cloud compuiting as protection of users personal or confidential data and information. The cloud model has been criticized by privacy advocates for the greater ease in which the companies hosting the cloud services control, thus, can monitor at will, lawfully or unlawfully, the communication and data stored between the user and the host company. Cloud computing places privacy concerns basically, because the service provider at any point in time, may limiting information access to authorized parties requires strong identity management, key and password controls, physical and logical authentication and strong controls over the movement of data between systems. Ensure physical segmentation of data where required. Also take a life cycle approach to data management, including the timely destruction of data.

To protect data confidentiality and privacy, the cloud vendor prevent certain attacks and give users the ability to assess whether the necessary mechanisms are in place, instead of simply trusting the cloud provider. According to Ziss is et al.(2011),confidentiality refers to only authorized parties or systems having the ability to acess protected data and Privacy is the desire of person to control the disclosure of personal information.

Lack of strong authentication can lead to unauthorized access to users account on a cloud, leading to breach in privacy. When privacy leaks leading touser or customer trust decreases in contrasts to that particular vendor or provider, which results their customers or users seeing towards another

vendors or provider who give more assurance about privacy. \

- To prevent user or consumer trust, cloud provider must engage strong and effective methods for their privacy and confidentiality protection. Cloud providers must assure their
- user that at any cost his/her privacy and confidentiality could not disclose without his/her concerns. Organizations that are shifted towards cloud computing model, they must satisfy these trust issues which are discussed above. There is a need fors pecific actions will be taken for both technological and organizational pointof view, so that together they comprise a comprehensive solution to trustworthy cloud deployment.

3. Cloudcomputing And Sensitive Data

The important trust issue in cloud computing is data level security, and sensitive data is the domain of the enterprise or business organizations, not the cloud computing provider or vendor. Security will need to move to the data level so that enterprises can be sure their data is protected where ever it goes. It can also force encryption of certain types of data, and permit only authorized users to access the data. Security plays a crucial role in building up trust .Since a third party is involves in cloud computing to stores your data, you don"t know what"s going on with it. It"s easy to worry about the security risks of a cloud solution, but let"s not overlook the inherent security benefits, as well. For example cloud provider or vendor (or may be a third party) will be saving your data and your competitor data may be on the same server or location, any type of mistake or leaks may rise to serious loss in yours business such as money or reputation loss. So, it must be very important that security should be developed at data level. Where and how to apply security is core to delivering security for the cloud. Security itself can be delivered from within the cloud. Elements such as Event and Log Management, Identity Management, End Point Protection and Application Security are increasingly delivered as cloud security services. Cloud security can be delivered as part of the cloud service and also as specific components added in to enhance security. Depending on your cloud provider it may be that a combination of both of these approaches is necessary. Cloud computing offers to change the way we use computing with the promise of significant economic and efficiency benefits. The speed of adoption depends on how trust in new cloud models can be established. Trust needs to be achieved, especially when data is stored in new ways and in new locations especially by third parties, including for example different countries. There is requirement for trust that some specific actions needs to be taken in this environment such as. Cloud consumers will expect cloud providers to secure their data in the cloud and the data should be readily

accessible when needed and protected from unauthorized viewing and changes. If consumers are not confident about security the growth of establishing trust will be slowed.

- Cloud provider will assure their users about data secrecy and privacy. For example cloud vendor must satisfy their user that their enterprise data could not go to the outside the country or boundary without his permission. Cloud vendor must assure this to their user by showing some type of encryption mechanism for that and also tell what legal actions does customer or user can take if any thing goes wrong from their side. So that user"s trust among that vendor will be increase.

Cloud provider or vendor will be requires to engage methods for the destruction of their user data when the user had gone or expire and maintain their trust relationships with the other users. Cloud provider or vendor must assure their user that their private data could not be gone anywhere and safely destruct even if he/she terminate his/her account. This point for safely destruction of data of their expire user, may attract new customers or users towards that vendor or provider side and may be also increases the trust of their old and current users. Users or consumers retains if he/she satisfied by the cloud provider or vendor services.

- Cloud vendor will also be requires to shows some types of transparency mechanism to their user for the storage location of their data. User must know where his sensitive data is saving and going. Logs files will clearly indicate who or what accessed any data [11].User must have the ability to see this file. It may increase the trust of a user to that vendor or provider.

4. Challenges For Future Generation Services

With the evolution of cloud computing platforms, a large number of cloud computing services are being launched by different vendors. However, with the high expected growth in the future, the management of the trust is going to be more and more complicated. In this scenario, two most important challenges issues are the design of the service level agreements and the management of large number of entities to take care of the user-vendor trust.

(a) Service Level Agreements

The SLA is a formal commitment between the user (consumer) and the vendor (provider) in cloud computing environment. Since, in this environment the physical interaction between the user and the vendor is likely to be very minimum. So, that SLA is the only legal agreement between the cloud vendor and the cloud user, which makes it a as a one main aspects toward trust building in this environment. Meeting SLA requirements from users and vendors pint of view is require a detail research over this SLA contact for trust establishment. SLA is one of the future perspectives of trust in cloud computing environment.

(b) Identity Management

Identity and trust are concepts that lie at the basis of our existence and have been exercised through physical recognition and face to face communication. When transformation to digital world, it is important to understand how the mechanism of trust and identification will be maintain and manage. Identity management is commonly referred to as the set of processes and tools that serve to establish the identity of a user for e.g. enroll an employee, customer, contactor, student etc. in a system [12]. Trust and identity will affect the human business transactions and economic activities in digital environment. A long deep analysis is required in this area from next generation research perspective.

5. Conclusion

Cloud computing brings new revolution in the field of online access and the computing services. These services may be of any type like: software, hardware, security, infrastructure, so on, however the management of trust between the user and vendor is very much important for the success of the cloud computing environment, Various issues of the trust management have been discussed in the present work. This will help in providing a basic assurance to users regarding the security and privacy of their online data, and the issues will also help the vendors to build the trust and confidence among users. Trust between both the parties is essential for the success of this paradigm. The present work is an attempt to provide an overview of the challenges in trust management and ways to address these challenges in securing and maintaining trust in cloud computing.

6. References

[1]. P. Mell and T. Grance (2011), "The NIST definition of Cloud Computing", *Computer Security Division*, Information Technology Laboratory, National Institute of Standards and Technology, Gaithersburg, Special Publication, pp. 100-145.

[2]. J. W. Ritting house and J. F. Ransome (2010),Cloud Computing, Implementation, Management and Security, *CRC Press*.

[3]. A Gutscher (2007), "A Trust Model for an Open Decentralized Reputation System", *in IFIP International Federation for Information*

[4]. *Processing*, Trust Management, Vol. 238, pp. 285-300.

[5]. T. Grandison and M. Sloman (2000), "A survey of trust in internet application", *IEEE Communications Surveys & Tutorials 3*, Vol. 4.

[6]. D. Gambetta (1990), "Trust: Making and Breaking Cooperative Relations", Basil Blackwell.

[7]. J. M. Such, A. Espinosa, A. Garci-Fornes and V. Botti (2011), "Partial Identities as foundation for trust and reputation", *Engineering Applications of Artificial Intelligence"*, Elsevier Ltd., pp.1-9.

[8]. R. C. Mayer, J. H. Davis and F. D. Schoorman (1995), "An integrative

model of organizational trust", *Academy of Management Review*, Vol. 2, pp. 709-734.
[9]. D. H. McKnight and N.L. Chervany (2006), "What is trust? A Conceptual

Analysis and an Interdisciplinary Model", *the Sixth America's Conference on Information Systems*, Long Beach, CA, pp. 827-833
[10]. F. J. Krautheim, D. S. Pathak and A. T. Sherman (2010), "Introducing the Trusted Virtual Environment Module: A New Mechanism for Rooting Trust in Cloud Computing", *TRUST 2010*, LNCS, Vol. 6101, pp. 211-227.
[11].R. Chakraborty, S. Ramireddy, T. S. Raghu and H. R. Rao (2010), "The Information Assurances Practices of Cloud Computing Vendors", *Cyber Security*, IEEE Computer Society, pp. 29-37.
[12].D. Song, E. Shi, I. Fischer and U. Shanker (2012), "Cloud Data Protection for the Masses", *Cover Feature*, IEEE Computer Society, pp. 39-45.
[13]. P. D. Hert (2008), "Identity management of e-ID, privacy and security in Europe. A human rights view", *Information Security and Technical Report*, Elsevier Ltd., Vol. 13, pp.71-75.
[14]. A. Samba (2012), "Logical Data Models for Cloud Computing Architectures", *Cloud Computing*, IEEE Computer Society, pp. 19-26.
[15].B. Grobauer, T. Walloschek and E. Stocker (2011), "Understanding Cloud Computing Vulnerabilities", *Cloud*
[16].*Computing*, IEEE Computer and Reliability Societies, pp. 50-57.
[17]. S. S. Yau and Ho. G. An (2011), "Software Engineering Meets Services and Cloud Computing", *Cover Feature*, IEEE Computer Society, pp. 47-53.
[18].H. Takabi, J.B. D. Joshi and G. Ahn (2010), " Security and Privacy Challenges in Cloud Computing", *Cloud Computing*, IEEE Computer and Reliability Societies, pp.24-30.
[19].K. Ferguson-Boucher (2011), "Cloud Computing: A Records and Information Management Perspective", *Basic Training*, IEEE Computer and Reliability Societies, pp. 63-65.
[20]. F. Rocha, S. Abreu and M. Correia (2011), "The Final Frontier: Confidentiality and Privacy in Cloud", *Cover Feature*, IEEE Computer Society, pp.44-50.
[21].A. A. Nyre and M. G. Jaatun (2009), "Privacy in Semantic Cloud: What"s Trust Got to Do with It?", *Cloud Com 2009*, LNCS, Vol. 5931, pp. 107-118.
[22].A. Josang, R. Ismail and C. Boyd (2007), "A survey of trust and reputation systems for online service

provision", *Decision Support System* 43, Vol. 2, pp. 618-644.
[23].http://smartdatacollective.com/joemckendrick/47533/nist-definition-cloud-computing-doesnt-go-far-enough.
[24]. L. Rasmusson and S. Jansson (1996), "Simulated social control for secure internet commerce", *in Proceedings of Workshop on New Security Paradigms (NSPW'96)*, ACM, New York, USA, pp. 18-25.
[25].A. Josang and J. Golbeck (2009), "Challenges for robust of trust and reputation systems", *in Proceedings of Fifth International*
[26].*Workshop on Security and Trust management (STM 2009)*, Saint Malo, France, pp. 24 – 25.
[27]. http://aws.amazon.com/s3.
[28].http://code.google.com/appengine.
[29]. http://csrc.nist.gov.
[30]. http://www.microsoft.com.
[31].http://www.netmagicsolutions.com
[32]. http://www.zenithinfotech.com.
[33]. http://www.wipro.com
[34]. http://www.infosys.com.
[35]. http://www.salesforce.com.
[36]. http://www.synage.com
[37].http://www.wolfframeworks.com
[38]. http://www.orangescape.com.
[39]. http://www.ibm.com.

A CASE FOR THE "PROPORTIONAL TECHNOLOGIES" PARADIGM: ADAPTING MOBILE PHONE DEVICES FOR AFRICAN NEEDS

Osée Kamga
Département d'Études journalistiques
University of Sudbury 935 Ramsey
Lake Road Sudbury, ON, P3E 2C6,CANADA
E-mail:-okamga@gmail.com

Abstract

This paper is part of a work in progress that attempts to articulate a more pertinent framework for understanding information technology (IT) practices in developing world, and more specifically in Africa. We argue that the appropriation research paradigm has reached its limits in the continent and cannot account for some of the most significant IT development there. For instance, Africans are increasingly influencing the production process of mobile phone devices designed for their market. The broader framework of proportional technologies opens the way to identify and account for the ways of such influence.

Introduction

The objective of this research is to investigate how information technology (IT) practices in developing countries are shaping the technological device, and to analyze the impact of such transformations on social structures, national policies and even international relations. And ultimately, we want to articulate a conceptual framework within which IT practices in Africa and more widely in developing countries can e analysed. If the growth of IT in the developing world is facilitated by more and more affordable technologies, its sustainability appears to depend on how the technology as a device is shaped by a transforming society. Based on this basic assumption we articulated the concept of proportional technologies, which we presented in an international conference held in Bangkok (2010)1. We argued that the appropriation paradigm was saturated, and therefore unable to account for some of the technological practices taking place in Africa, unable to account for the variety of trajectories

that IT practices have been taking in African countries. By appropriation paradigm, we mean every approach that focuses on socioeconomic and cultural context as a way to understand technological practices in a given environment. Here, the works of Silverstone have been significant, notably with his concept of domestication, which ―describes the process whereby advanced information and communication technologies are appropriated by users through their consumption‖, and ―implies a politics of meaning and practice which engages consumers throughout the _careers' or life-cycles of these technologies‖ (Silverstone and Haddon, 1996: 9). In this paper we will more specifically discuss mobile telephony as a technological device and Africa as the context in which this reflection is anchored. On the one hand, this technology has experienced tremendous growth around the continent (we went from 4 million mobile phones in 1998 to about 700 million at the end of 2012 according to the latest figures from the ITU). On the other hand, influenced by local practices, mobile phone models are experiencing significant changes, with repercussions of which the scope is yet to be understood. And finally, a number of studies on IT in the continent have been devoted to mobile phones. Such studies are undeniably relevant, but they remain somewhat trapped in a conceptual framework inherited from decolonization. This paper addresses three points: 1) significant developments in the field of mobile telephony in Africa. More specifically, it will focus on mobile banking; 2) how these developments highlight the limits of the appropriation paradigm, the conceptual framework that currently dominates IT research around the continent; 3) the concept of proportional technologies, which we believe is more analytical than that of appropriation.

When The Device Is Reshaped By The Context

The methodology to identify and analyze the way in which IT practices in Africa are contributing to shape the technological devices sold in the African market remains to be articulated. However, in the meantime, we can point out some concrete cases of technological adjustment in the continent. In the recent years for example, Dual and multiple SIM mobile phones designed specifically to deal with the high cost of networks interconnection have entered African markets. Before their introduction, the custom for users was to posses multiple phones or to remove and install a different SIM as required. A user can now have subscriptions with more than one operator without the need to carry different phones or to keep the other SIM in his pocket as was previously the case. In Kenya, an operator has developed a service that provides the ability to call someone and let his phone ring long enough for

him to understand that he should call back. This development has been inspired by the practice of beeping common among Africans. The technique of ―beeping,‖ consists of calling two or three times and hanging up each time before the correspondent has had a chance to pick up the phone. He then traces the call and calls back. What is noteworthy with the emergence of such user-centered technological development is that it is inspired by contextual practices it seeks to facilitate. The trend is there to stay, since manufactures such as Nokia, Samsung and Motorola have set up regional offices in Africa aiming to ―facilitate local development of new features in phone models.2‖ We can therefore anticipate that ICTs in Africa will remain in step with social transformation.The propensity to develop applications to address local concerns is particularly manifest in the mobile banking sector. The fact is that the banking system in many African countries is weak, and many cannot access it. Such context posed many challenges to financial transactions. For instance, transferring money was particularly expensive, since it was done through money transfer institutions, which charge high service fees. It is noteworthy that the economy and even the survival of some regions depend largely on such transfers, even if they are generally of small amounts. In this context mobile banking appeared as a practical solution. In 2007 in Kenya, the mobile operator Safaricom and Vodafone launched M-Pesa, a mobile banking service that allows users to store money on their mobile phones. This can then be used to pay utility bills, to spend in participating stores and make money transfers. In 2010, M-pesa transfers accounted for 11% of the Kenyan GDP. Mobile banking is fast growing in Africa. There is also Mobicash Morocco, Mauritius and Congo - Brazzaville, Inova Pay in Burkina Faso, and Wontanara in Guinea. The same developments are happening across Africa. In January 2009 the GSMA (the GSM Africa) recorded 19 mobile operators in mobile banking. Today, there are over a hundred. The SISIT group report indicated that between 2011 and 2012, the number of Mpaiement operators doubled in Africa, with a network of users numbering more than 180 million. The implications of such developments are manifold. On the economic front, "Mobile wallets" are created throughout Africa. That is to say that people have financial assets that they manage from their mobile accounts. Economic alliances are being formed to provide new services: in South Africa, for example, Vodacom and Net bank teamed up to offer money transfer service through mobile phones; in Ghana, Hollard Insurance and Mobile Financial Services Africa joined MTN to launch mi-Life, a "micro-insurance" insurance managed by mobile phone, as well, Eco bank has established a national network of mobile money transfers in the country, through a partnership with the four main mobile

operators; some manufacturers like Nokia, Samsung, Motorola have open regional offices in Africa to facilitate the development of new features for their local phone models. International financiers are investing in major IT projects. For example, Kenya has built a huge technology park dedicated to IT, the Konza Technology City, which some have called the Silicon Valley of Africa. The park covers an area of over 2,000 hectares. The cost of 10 billion dollars was covered by the International Finance Corporation, an institution of the World Bank Group. On the national policy front, the liberalization of the telecommunications sector continues in many countries, with the goal of attracting foreign investors and promoting free competition. In the mean time, laws and regulations are being readjusted to ensure the safety and reliability of international money transfers. All these developments, sparked by practices of local inspiration, remain largely unexplored. They present theoretical issues with various ramifications, particularly related to the globalization of the market and practices, the relationship between local and global, between cultural values and modernity, whose analysis requires the mobilization of various theoretical approaches, of various disciplinary traditions.

The Appropriation Paradigm And Its Limits

Appropriation approaches gives ntral role to how cultural practices and values, as well as socioeconomic context determine the appropriation process. With regard to domestication, one of the key concepts in the appropriation paradigm, Haddon (2001:5) noted that one of its themes is that while the relationship between individuals and ICTs is obviously a key interest, considerable attention is paid to those individuals in context. It recognises that beyond _end users', others make some contribution to the whole experience of ICTs. [...] So in general, individual use and individual strategies of control take place in a context where various household members have commitments, routines and general demands on time and space as well as values, hopes and concerns which all interact and in so doing shape consumption. Studies in such paradigm think of technology users in Africa as consumers who, at most, developed ―tactics‖ (de Certeau, 1991) or authentic modes of consumption. The hypothesis of ―art de faire‖ or the art to do with by which Michel de Certeau (1991) have been very influential in this tradition. It examines the inventiveness of regular people in their day-to-day routines and suggests that no matter what level of constraint an individual is subjected to, he will still find the way to ―poach‖ with the system in order to accomplish a self-fulfilment. Madeleine Akrich (1993) articulated this view in terms of

the user's ―frameworks of action‖, which suggests that even if the designer anticipated the framework in which the user will exploit his/her device, the environment of the usage always offers specific circumstances, specific conditions of appropriation. Flichy (1995) describes this in terms of the adjustment of the user to the technical object, which goes beyond technical performances. The assumption in the appropriation paradigm is that what matters is not the technology per se, but practices developed around it, and these practices depend on a whole range of social values, economic and intellectual resources users bring to the table, as well as on the existing power struggle in a given situation. From the works of Silverstone and Haddon, Ling (2004) identifies five stages of the domestication process: imagination, appropriation, objectification, incorp oration and conversion. Each of these stages deals with the psychological component of the appropriation process, as well as the forms of usage that take place. For instance, imagination occurs when a person is aware of the existence of a technological object and thinks of getting it; incorporation deals with the ways in which technologies are used, their functionalities, as well as the purpose they serve, whereas conversion refers to how the technology transforms its owner's social status. It is noteworthy that in this paradigm, the technological device itself is not envisaged as evolving. In each of the above stages, new perceptions and attitudes toward the technology and its owner may appear, new usages may take place, but the device itself does not evolve, it remains unchanged. This is where the insufficiency of the appropriation framework is made more apparent, especially given what we have been observing in the African context since the introduction of the mobile phone technology. In this approach, the user always appears at the end of the technological development process. The paradigm does not take into account the important work done by theorists of socio constructivism who argue that each technological device is socially constructed; that it results from a ―technological framework‖ (Pinch and Bijker), namely ―the social and cognitive environment within which constructors and users conceive and use the technical object.‖ (Flichy, 1995: 85) The limit of the appropriation framework is primarily epistemological. If we do not consider users in Africa as part of the technological device process, we are discarding even the possibility of analysing their relationship to technology through social constructivist approaches. Works, such as those of Orlikowski (2000), which suggest a ―recursive‖ approach to understanding the technology / society

relationship, are overlooked. Orlikowski calls into question the very notion of appropriation and argues that humans simply exhibit technological practices embedded in them. The works of the School of translation, notably that of actor-network proposed by Bruno Latour and Michel Callon, who argue that the emergence of an innovation is the result of a compromise between various actors of the network, are never exploited in IT researches in Africa. Thus, because we do not mobilize these theories and concepts to analyze IT practices in the continent, our bank of knowledge is lacking. Also, if local innovations deserve the continued mobilization of theories in sociology uses in analyzing them, their impact on other fields of activity also deserve to be identified and studied. The increasing business possibility has made the African continent a trading crossroads. Economic and cultural actors from all over the world, American, European, Japanese or Chinese are committed to the fight for positioning, where everyone is trying to carve a share in a market game where political interference is never far away. Therefore, it seems relevant to try to understand how cultural codes of actors with different backgrounds, interplay to create a space where various forms of exchange (commercial, cultural, knowledge) take place. In this regard, the works of Edward T. Hall (1990, 1994) on cultural differences in business relationships would be useful. It seems equally relevant to understand how cultural values, technical knowledge, and even political decisions contribute to the production of specific signifiers, which are specific mobile phone devices. Moreover, understanding the economic structures of their production and distribution, as well as analyzing the national, regional and even international repercussions appear highly promising to us. In sum, international communications, which focus on processes of mutual understanding, cultural studies, which examine how meaning is socially produced, the sociology of uses, are among disciplines that this project will mobilize. In other words, the project is radically inter disciplinary. The appropriation paradigm is also limited in terms of practical policies. The fact is that major development agencies (USAID, CIDA, UNDP, World Bank, UNESCO, etc.) often have development funding strategies which lean on IT appropriation concepts. However, the results are often mixed. For instance, in his doctoral thesis, Christian Agbobli (2006) analyses the example of telecentres in the Senegalese capital funded by the Canadian International Development Agency (CIDA). It is noteworthy that these telecentres were a manifestation of the "pooling" of resources that CIDA funding precisely meant to encourage. Yet Agbobli shows that

rather than promoting IT education, these centers became mere meeting places where young people met to chat. Moreover, when CIDA's funding dried up, it was the end of the centres. It appears to us that such funding strategies do not sufficiently take into account the context, or more precisely, its evolving nature. We understand context in the sense applied by Lawrence Grosberg (2010), which goes beyond socio-structural determinism. For Grosberg, the concept of context refers to something radically contingent, to the articulation of discourses, practices, and modes of existence in a given space and time. Therefore, the analysis of a context is only valid for that given context and cannot provide either model, or operational concepts useful outside of the context. What is valid in Yaoundé is not necessarily in Dakar or Bujumbura, albeit African capitals. What is valid today in Kinshasa will probably not be valid tomorrow. Because in time everything changes, nothing remains in the same state. Thus, it seems to us that the alternative development policies can only be based on alternative concepts that take into account a deeper understanding of the very notion of context.

The paradigm of proportional technologies

In a previous paper (Kamga, 2006), we articulated how the uses of the mobile phone in the continent go beyond the standards set by the structures of determination, i.e. the developers, promoters and suppliers of the technology and the related services. Our focus then was on users' ability to ―poach‖ (de Certeau, 1991) the systems put in place by the structures of determination, using their mobile phone and the operators' networks for purposes not anticipated upstream. It eventually appeared to us that this form of analysis, undertaken within the framework of appropriation, wasn't taking into account social ICT practices where the technological device itself was simply incidental. Haddon (2001:6) rightly recognizes that ―there are other levels of analysis derived from those studies which go beyond the type of observations made about domestication.‖ It is with such observation that we attempted to articulate a new framework, that of proportional technologies, which refers to ―fitting practices, born within a given context and consistent with other established useful practices of the context.‖ (Kamga and Cishahayo, 2010) In many African countries, booth practices3 for instance, initiated by users, forced the service providers to implement structural adjustments, bringing them to totally change their economic model, and became a constitutive part

of the mobile phone landscape. The operators first introduced the prepaid phone, and then the possibility to transfer phone credit between customers. Also, the practice of transferring money via mobile phone first started with booths owners and quickly multiplied before the operators figured out programs and procedures to integrate this specific service in their offer. Today, in Côte d'Ivoire, for instance, any subscriber can open a financial account with major operators and make a money transfer from his phone. Africa is leading in the so called mobile money practice. *The Economist* (April 28th, 2012) reported that a survey of global financial habits by the Gates Foundation, the World Bank and Gallup World Poll found that of the 20 countries in which more than 10% of adults used mobile money in 2011, 15 were African. It then noted: ―If you think of banking by phone as just a way of using financial services, then these African countries—where people sometimes live several days' walk from the nearest branch—are much more financially literate than you might think, just by looking at how many banks they have.‖ The proportional technologies paradigm insists on the organic character of emerging communicational practices, that is, their emergence as an intrinsic component of the social fabric, as a more secure way to sustainability. The concept of proportional technologies ―entails the recognition that a technological practice may change trajectory in an evolving social system, as well as the suggestion that both (the practice and the system) have to remain in constant adequacy for tangible results to be sustainably produced.‖ (Kamga and Cishahayo, 2010) In this sense, the transformation of the technological device itself becomes part of the process. Such framework blows away the them-producers/us-consumers dichotomy, as well as the separation between here and elsewhere, and installs technological production and consumption (that is the whole technological process) in a circular relationship where location does not matter anymore. This distancing with the here/there dichotomy is all the more necessary in a global world where socio-economic and even technological issues no longer know boundaries. Global and local issues interplay indistinctively in a given context. The world is global in its problems, but also in its ideas. The neologism *glocal*, it seems, was created precisely to reflect this reality. The term "proportional" comes from the field of mathematics. It suggests both change and constancy. In mathematics, when two quantities

vary, yet one remains a multiple of the other, the two quantities are deemed "proportional". Thus, as we articulated in a previous paper, ―the concept of proportional technologies entails the recognition that a technological practice may change trajectory in an evolving social system, as well as the suggestion that both (the practice and the system) have to remain in constant adequacy for tangible results to be sustainably produced." (Kamga and Cishahayo, 2010)

Conclusion

As discussed above, the paradigm of appropriation is a research paradigm that essentially tries to understand how the cultural, socioeconomic, political, as well as skills and individual circumstances influence or affect the dynamics of technology appropriation. It attempts to articulate socio-structural determinism and individual freedoms. It is also a research paradigm in which the user in developing countries is not considered as part of the technology process. Here, researches mainly focus on insertion modes. The works of Africa'NTI are significant in this regard. Africa'NTI is an observatory which studies the modes of IT insertion in African countries, founded in 1998 by Annie Cheneau-Loquay. Their works highlighted what Cheneau-Loquay (2004) calls the "pooling" of resources. The concept refers to the fact that the scarcity of technology moves local people to develop strategies of joint exploitation. This perspective has been dominated with works inspired by the sociology of uses, where concepts such as adoption, adaptation, adjustment to the technical object, etc. Here, works examine how technical devices imported from developed countries are invested with new meanings thanks to innovative practices. The hypothesis of Michel de Certeau (1991), which suggests that users always have a measure of freedom and control, served as a keystone to this thinking. This paradigm is actually the legacy of the diffusion model that emerged in the early 60' with modernization theorists. The hypothesis articulated by diffusion theorists (Lerner, 1958; Rogers, 1962; Schramm, 1966) will serve as a base for the policies of technology transfer. Over time, a closer look will be taken at how the transferred technologies were actually used. We would argue that the questioning of the behavioristic psychology embedded in the diffusion model paved the way for the emergence of the appropriation paradigm. However, just as in the diffusion model, the user in the paradigm of appropriation is conceived as dealing with objects that are not his. It is with those limits in mind that we are we exploring the concept of proportional technologies, which marks the ideological distance with the paradigm of appropriation. The concept of proportional

technologies, though a theoretical framework, is also ideologically driven; ideological because it was also formulated as a way to get around the condescending attitude of Western theorists toward people of the Third World, which is reflected in appropriation approaches. These theorists view technological innovation as preceding appropriation. From such a standpoint, Africans are always placed at the end of the spectrum as recipients, not as contributors to the processes of technological development itself. Such perspective has been lacking in analyzing the increasing input Africans have in shaping the technologies they are now using. In other words, if appropriation approaches recognize the inventiveness of users, they fail to acknowledge that such inventiveness is increasingly finding its way into the device itself. The proportional technologies paradigm addresses such limitation and, on the epistemological level, opens the way to new questions in the field of ITs for development research.

References

[1]. AFRICA BUSINESS PAGES, ―The Market For Mobile Phones In Africa‖, http://www.africa business.com/features/ mobile_phones_africa.html

[2]. M Akrich (1993), «Les objets techniques et leurs utilisateurs, de la conception à l'action», *Raisons pratiques,* n°4 « *Les objets dans l'action »*, pp. 35-57.

[3]. M Callon (1986), ―Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay‖, In John Law (ed.), *Power, Action and Belief: A New Sociology of Knowledge* (London: Routledge & Kegan Paul)

[4]. M Certeau (de) (1991), *L'invention du quotidien 1. Arts de faire*, Gallimard, Paris.

[5]. P Flichy (1995). *L'innovation technique. Récents développements en sciences sociales. Vers une nouvelle théorie de l'innovation*, La Découverte, Paris.

[6]. L Haddon (2003), ―Domestication and Mobile Telephony‖, in *Machines that Become Us: The Social Context of Personal Communication Technology*, (J Katz, Ed), Transaction Publishers, New Brunswick, New Jersey, pp.43-56.

[7]. O Kamga (2006), « Mobile phone in Côte d'Ivoire: Uses and Self-fulfilment», *Proceedings of the International Conference on Information and Communication Technologies and Development*, (ICTD, 2006) Berkeley, CA. pp. 184 –192.

[8]. O Kamga, F Cishahayo, Information And Communication Technologies For African Development: Proportional Technologies And An Ethics Of Uses, Http://203.131.210.100/Conference/

Wp-Content/Uploads/2011/06/11-03-Kamga-Cishahayo-Information-And-Communication-Technologies-For-African-Development.Pdf.
[9]. B Latour (2005), *Reassembling the Social: An Introduction to Actor-Network-Theory*, Oxford, Oxford University Press.
[10]. R Ling (2001), "It is _in.' It doesn't matter if you need it or not, just that you have it: Fashion and the domestication of the mobile telephone among teens in Norway", At the conference: Il corpo umano tra tecnologie, comunicazione emoda" (The human body between technologies, communication and fashion). January 2001 at Triennale di Milano, Milano, January, 2001.
[11]. R Ling (2001), "We release them little by little: Maturation and gender identity as seen in the use of mobile telephony", *Personal and Ubiquitous Computing*, 5, pp. 123-136.
[12]. R Ling (2004), *The Mobile Connection: The Cell Phone's Impact on Society*, Morgan Kaufman Publishers, San Francisco.
[13]. W Orlikowski (2000), ―Using Technology and Constituting Structures: A Practice Lens for Studying Technology in Organizations, in *Organization Science*, 11, 4, pp. 404-428
[14]. R Silverstone, L Haddon (1996), "Design and the Domestication of Information and Communication Technologies: Technical Change and Everyday Life" in *Communication by Design. The Politics of Information and Communication Technologies*, (R Silverstone, R Mansell, Eds), Oxford University Press, Oxford, pp. 44-74.

Instructions for Authors

Essentials for Publishing in this Journal

- Submitted articles should not have been previously published or be currently under consideration for publication elsewhere.
- Conference papers may only be submitted if the paper has been completely re-written (taken to mean more than 50%) and the author has cleared any necessary permission with the copyright owner if it has been previously copyrighted.
- All our articles are refereed through a double-blind process.
- All authors must declare they have read and agreed to the content of the submitted article and must sign a declaration correspond to the originality of the article.

Submission Process

All articles for this journal must be submitted using our online submissions system. http://enrichedpub.com/ . Please use the Submit Your Article link in the Author Service area.

Manuscript Guidelines

The instructions to authors about the article preparation for publication in the Manuscripts are submitted online, through the e-Ur (Electronic editing) system, developed by **Enriched Publications Pvt. Ltd**. The article should contain the abstract with keywords, introduction, body, conclusion, references and the summary in English language (without heading and subheading enumeration). The article length should not exceed 16 pages of A4 paper format.

Title

The title should be informative. It is in both Journal's and author's best interest to use terms suitable. For indexing and word search. If there are no such terms in the title, the author is

strongly advised to add a subtitle. The title should be given in English as well. The titles precede the abstract and the summary in an appropriate language.

Letterhead Title

The letterhead title is given at a top of each page for easier identification of article copies in an Electronic form in particular. It contains the author's surname and first name initial .article title, journal title and collation (year, volume, and issue, first and last page). The journal and article titles can be given in a shortened form.

Author's Name

Full name(s) of author(s) should be used. It is advisable to give the middle initial. Names are given in their original form.

Contact Details

The postal address or the e-mail address of the author (usually of the first one if there are more Authors) is given in the footnote at the bottom of the first page.

Type of Articles

Classification of articles is a duty of the editorial staff and is of special importance. Referees and the members of the editorial staff, or section editors, can propose a category, but the editor-in-chief has the sole responsibility for their classification. Journal articles are classified as follows:

Scientific articles:

1. Original scientific paper (giving the previously unpublished results of the author's

own research based on management methods).

2. Survey paper (giving an original, detailed and critical view of a research problem or an area to which the author has made a contribution visible through his self-citation);
3. Short or preliminary communication (original management paper of full format but of a smaller extent or of a preliminary character);
4. Scientific critique or forum (discussion on a particular scientific topic, based exclusively on management argumentation) and commentaries.

Exceptionally, in particular areas, a scientific paper in the Journal can be in a form of a monograph or a critical edition of scientific data (historical, archival, lexicographic, bibliographic, data survey, etc.) which were unknown or hardly accessible for scientific research.

Professional articles:

1. Professional paper (contribution offering experience useful for improvement of professional practice but not necessarily based on scientific methods);
2. Informative contribution (editorial, commentary, etc.);
3. Review (of a book, software, case study, scientific event, etc.)

Language

The article should be in English. The grammar and style of the article should be of good quality. The systematized text should be without abbreviations (except standard ones). All measurements must be in SI units. The sequence of formulae is denoted in Arabic numerals in parentheses on the right-hand side.

Abstract and Summary

An abstract is a concise informative presentation of the article content for fast and accurate Evaluation of its relevance. It is both in the Editorial Office's and the author's best interest for an abstract to contain terms often used for indexing and article search. The abstract describes the purpose of the study and the methods, outlines the findings and state the conclusions. A 100- to
250- Word abstract should be placed between the title and the keywords with the body text to follow. Besides an abstract are advised to have a summary in English, at the end of the article, after the Reference list. The summary should be structured and long up to 1/10 of the article length (it is more extensive than the abstract).

Keywords

Keywords are terms or phrases showing adequately the article content for indexing and search purposes. They should be allocated heaving in mind widely accepted international sources (index, dictionary or thesaurus), such as the Web of Science keyword list for science in general. The higher their usage frequency is the better. Up to 10 keywords immediately follow the abstract and the summary, in respective languages.

Acknowledgements

The name and the number of the project or programmed within which the article was realized is given in a separate note at the bottom of the first page together with the name of the institution which financially supported the project or programmed.

Tables and Illustrations

All the captions should be in the original language as well as in English, together with the texts in illustrations if possible. Tables are typed in the same style as the text and are denoted

by numerals at the top. Photographs and drawings, placed appropriately in the text, should be clear, precise and suitable for reproduction. Drawings should be created in Word or Corel.

Citation in the Text

Citation in the text must be uniform. When citing references in the text, use the reference number set in square brackets from the Reference list at the end of the article.

Footnotes

Footnotes are given at the bottom of the page with the text they refer to. They can contain less relevant details, additional explanations or used sources (e.g. scientific material, manuals). They cannot replace the cited literature.
The article should be accompanied with a cover letter with the information about the author(s): surname, middle initial, first name, and citizen personal number, rank, title, e-mail address, and affiliation address, home address including municipality, phone number in the office and at home (or a mobile phone number). The cover letter should state the type of the article and tell which illustrations are original and which are not.