

The 3C's - Convergence of Computers, Communication and Content (Multimedia)

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ABSTRACT

We are moving from a physical world based on atoms to a digital world based on bits. Today new techniques of Information packaging and delivery ensure its availability at the point of demand instantly. This is achieved by exploiting the technologies provided by telecommunications, computer networking and broadcasting media. Some major Value-Added Services like E-mail & the WWW (World Wide Web) , Cable TV and Internet Access, Education via Internet E-business, Telebanking , Radio and Television Broadcast on the Internet are a result of this convergence bringing up various *Security and Cryptography aspects* . Internet telephony reflects the beginning of a new communication era, which is characterized by running real-time applications over Internet/Intranet based computer communication infrastructure. Mobile communications and Internet based computer communications are the two fastest growing areas of communications indicating an enormous potential in the intersection of these two domains. Emerging trends are 4G, the Wireless Broadband Access which gives way to applications like Virtual Navigation, Tele medicine, Tele-geoprocessing applications, Crisis management applications and Virtual Laboratories. The interaction between human and the 3C's (Computer + Communication + Content (Multimedia)) is becoming a daily staple as we witness powerful computers uniting in a networked environment where wired and wireless communications enjoy broadening bandwidths that permit the transmission of multimedia content.

KEYWORDS: Internet, Multimedia, Blue tooth, Cryptography, Broadband Access

0. INTRODUCTION

We are moving from a physical world based on atoms to a digital world based on bits - that is, binary digits or the Os and Is of computer language.

A bit has no colour, size or weight, and it travels at the speed of light. A bit can be a telephone call, an e-mail message, a radio channel,

a television picture, or virtually any form of information or communication. As far as the computer or the communications network is concerned, once something is in digital form the precise nature or content of the message is irrelevant. Bits are bits.

Digital signals can reproduce information perfectly which is why compact discs sound so good; digital messages can be broken up and reconfigured easily which is why the Internet is so effective; and digital data can be compressed, enabling television pictures, for instance, to be sent down telephone lines.

Bits can be mixed very easily. This means that we can mix audio, video and data to create new multimedia products and services.

The implications of all this are truly global. Bits will be borderless, stored and manipulated with absolutely no respect to geopolitical boundaries. When information can travel round the globe in a matter of seconds, distance has little meaning and it is literally a whole new world.

We are living in an age where Information pervades all aspects of our daily life...Earlier, we were getting information through printed media and using it for enhancing our knowledge. Today new techniques of Information packaging and delivery ensure its availability at the point of demand instantly. This is achieved by exploiting the technologies provided by telecommunications, computer networking and broadcasting media.

1. INFORMATION SOCIETY

The term "information society" has entered common usage in recent years. We talk about wired societies, many of us work in network environments and we communicate electronically with our colleagues and partners inside and outside workplaces; in fact these same workplaces now extend to all parts of the world. The whole notion of a workplace is changing from one rather finite entity to a potentially very extensive network. A generation ago cellular telephones, email and hand-held computers belonged, if not to the realm of science fiction, at least to something very sophisticated and very distant. Today they are everyday tools for those who work in the information economy.

2. COMMUNICATIONS AND COMPUTERS

Today we can *communicate in different modes*:

orally-- communicate symbolic experiences

written -- record symbolic experiences

on paper – portability

in print -- mass distribution

by telegraph -- remote narrow communication

by telephone -- remote analogue/digital communication

radio – analogue broadcasting of sound

television – analogue A/V broadcasting

internet -- email, online-chat, internet-telephonyetc

The concept of the "Computer Centre" as a large room with a large computer to which users brought their work for processing has

become obsolete. Owing to the merging of computers and digital communications, this old model has been replaced by one in which a large number of separate but interconnected computers do the job. These systems are called computer networks. A computer network interconnects a collection of autonomous computers. This helps in resource sharing and the goal is to make all programs, equipment and especially data available to anyone on the network without regard to physical location of resource and the user.....an end to the tyranny of geography.

The connection of two or more computer networks recursively is called internetworking..... **INTERNET**.....the world-wide network of computers.

3. **INTERNET**

The use of internet has developed from basic concepts such as e-mail, file transfer, remote procedure calls and accessing web-sites to a variety of purposes like Internet Telephony, Video on Demand, Video Conferencing, Online Learning, Multimedia, E-Commerce etc.

Each computer connected to the Internet has a unique Internet Protocol (IP) address. In Ipv4, this is a four part number; for example 192.50.45.91. Because these addresses communicate no information about the site content and are inconvenient to remember, the Internet uses Domain names – example, www.ibsindia.org - as an easier way to identify and remember computer addresses. These two addresses are in one-to-one correspondence with each other and a “Web Browser” along with the “Name Server”, translates domain names into their specific IP address and transports a view to that site while browsing.

Computer and Data Communications technologies are continuing to develop at a rapid rate, providing higher performance while reducing both the cost and size of system components. As prices decline, users will increasingly employ powerful computer workstations, which will be equipped with high-resolution displays and high-capacity magnetic and optical storage units. Information in many media formats will be stored in digital form, and improved, cost-effective methods of converting older materials in non-digital formats will be developed. As the necessary network infrastructure is put in place and the problems associated with interconnecting heterogeneous computer networks are solved, workstations will become linked to a growing number of institutional and external networks. Computer messaging and conferencing systems will be increasingly important sources of information in the networked environment.

4. **MULTIMEDIA (CONTENT)**

What do we mean by the popular term Multimedia (Content)? We mean the mixing of different media on the same screen in a form with which the user can interact. The different media includes text, sound, graphics, pictures and even film. The screen is probably a personal computer or a television set or games console or a mobile display screen but in future could be some sort of multipurpose terminal. Interactivity enables the user to manipulate the contents of whatever is on the screen.

A multimedia computer system is a computer system that can create, import, integrate, store, retrieve, edit, and delete two or more types of media materials in digital form, such as audio, image, full-motion video, and text information.

Networked multimedia computer systems can transmit and receive digital multimedia materials over a single computer network or over any number of interconnected computer networks. As multimedia computer systems evolve, they may become intelligent systems by utilizing expert system technology to assist users in selecting, retrieving, and manipulating multimedia information.

Multimedia software and its applications provide a direct interactive environment for users. End users can enjoy multimedia using a computer equipped with multimedia facilities, such as a sound input/output interface, speakers, a camera, a CD-ROM or a DVD.

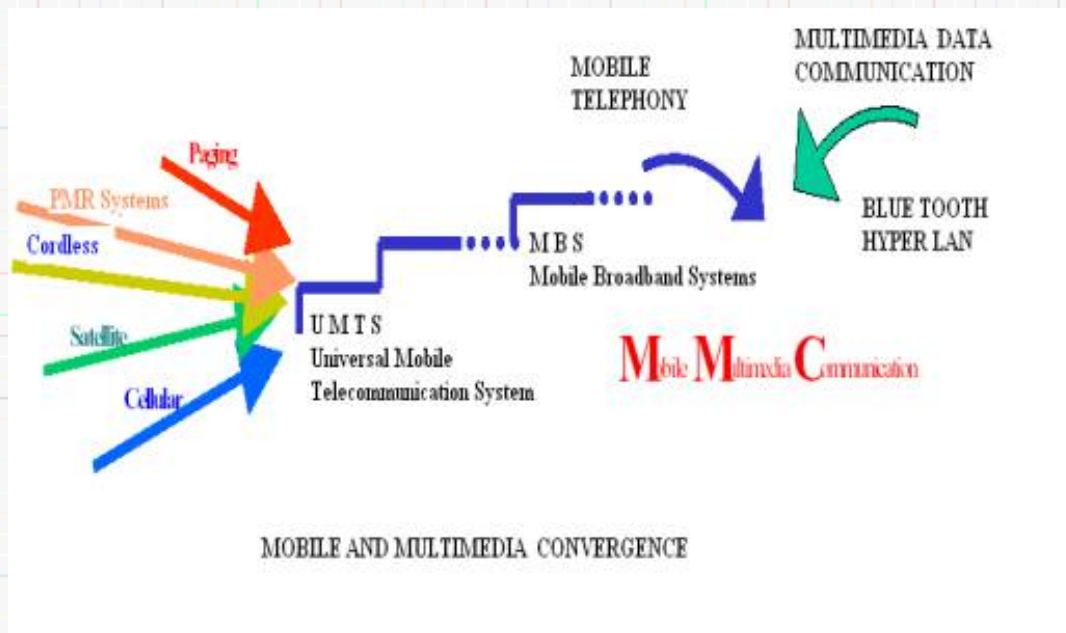
Many multimedia services such as video on demand (VoD), distance learning and digital libraries need to have high volume of storage facilities that are updated frequently. Whenever a computer requires multimedia information from remote computers or servers, this information must travel through computer networks. Since the amount of information is substantial, it must be compressed before it can be sent through the network in order to reduce the inherent communication delay. The retrieved information must be decompressed before it can be composed for replay and interactivity. MPEG-2 is the standard for compressing and packetizing high quality video. MPEG-4 is appropriate for mobile access because it is robust to channel errors.

Mobile communications and Internet based computer communications are the two fastest growing areas of communications indicating an enormous potential in the intersection of these two domains. The current trend of network evolution implies that the Internet will serve as a core for future service provision, whereas traditional telecommunication networks offer access paths to those services. Internet telephony reflects the beginning of a new communication era, which is characterized by running real-time applications over Internet/Intranet based computer communication infrastructure.

5. A REVOLUTION IS TAKING PLACE IN THE TELECOM INDUSTRY – MOBILE INTERNET

There is more and more demand for getting data and even video on the cellular mobile telephone. This convergence is made possible by what is called the Third Generation 3G wireless system. The General Packet Radio Service (GPRS) is the first move towards implementing 3G networks. It is a service that allows information to be sent and received across a mobile telephone network. GPRS is the current enhancement in the Global System for Mobile Communication (GSM) cellular infrastructure, capable of handling Internet Protocol (IP) traffic for cellular mobile computing and communication.

Mobile networks - Bluetooth is a new dimension in wireless communication. A world where all electronic devices talk spontaneously. Where connectivity between computers, mobile phones and portable devices is as simple as switching on the lights. Bluetooth™ wireless technology revolutionizes the personal connectivity market by providing freedom from wired connections - enabling links between mobile computers, mobile phones, portable handheld devices, and connectivity to the Internet.



6. CONVERGENCE OF TELECOMMUNICATIONS, COMPUTER NETWORK TECHNOLOGIES AND BROADCASTING HAS BROUGHT ABOUT SOME MAJOR VALUE-ADDED SERVICES

Email & the WWW (World Wide Web): E-mail is the most widely used application of Internet for communication between individuals.

Cable TV and Internet Access: is likely to be an important issue considering large penetration into semi urban and rural areas..... They will require high bandwidth connectivity and a Fibre Optic Back Bone

Education via Internet: For developing countries like India, distance education is a high priority application. The Networking of Universities and R&D establishments establishment of primary & high school education to remote locations is now soon becoming possible.

E-business: describes a market place where businesses are using internet technologies and network computing to transform their internal business processes (intranets) and the buying and selling of goods, services and information. Internet access, E-mail and Web browsing are all the initial small steps which lead the way to e-business.

Telebanking – Banking sectors have already computerized their internal operations, Automatic Teller Machines, Net-banking services are now being made available at a lot of banks.

Radio and Television Broadcast on the Internet – With multimedia computer terminals being available, and program editing possible on digitized studios, the only constraint on Internet broadcasting is transmission media. With the introduction of video compression standards like MPEG II and high bandwidth cable media being used....the distinction between television and personal computer will slowly disappear.

7. SECURITY AND CRYPTOGRAPHY ASPECTS

When Internet is used as a vehicle of commerce, issues of protecting information naturally arises. Methods of protecting the informationsecurity overlay with different grades for different transactions become an important issue. Cryptography facilities, distributed security administration, access-control, firewalls, secure web serversetc are some relevant technologies. Cyber Laws....Digital signatures have to be enacted to legalise electronic transactions.

Emerging Trends

Today's converging communication networks , both wired and wireless reveals an intricate infrastructure that has evolved from circuit switched technology handling mostly, POTS, or "plain old telephone service", to a complex circuit and packet switched information-transport environment carrying both voice and data.

Another increasingly important component of this mix is video. To efficiently handle this three dimensional mix of traffic, a number of copper based broadband network solutions (DSL) continues to evolve and are being implemented worldwide. Technological innovations are helping to bring broad-band network access over digital subscriber lines (DSL's) to consumers and small businesses.

Third Generation or 3G mobile systems are the further direction for mobile communications all over the world.

The Third Generation (3G) wireless communication paves a way for the coming Fourth Generation (4G) wireless mobile communication.

8. 4G THE WIRELESS BROADBAND ACCESS

4G mobile systems will consist of

- Entirely packet-switched networks.
- All network elements are digital.
- Higher bandwidths to provide multimedia services at lower cost (up to 100Mbps).
- Tight network security.

and are expected to offer advanced features like

- Support interactive multimedia services: teleconferencing, wireless Internet, etc.
- Global mobility and service portability.
- Low cost.
- Scalability of mobile networks.

This will enable applications not possible with current and previous wireless mobile systems such as :

Virtual Navigation – A remote database contains the graphical representation of streets, buildings and physical characteristics of a large metropolis. Blocks of this database are transmitted in rapid sequence to a vehicle, where a rendering program permits the occupants to visualize the environment ahead.

Tele medicine – The paramedics assisting the victims of a traffic accident in a remote location must access medical records (e.g. X-rays) and may need video conference assistance from a surgeon for an emergency intervention. The paramedic may also need to relay back to the hospital the victim's x-rays taken locally.

Tele-geoprocessing Applications – The combination of geographical information systems (GIS) , global positioning systems (GPS) and high capacity wireless mobile systems will enable this new type of application.

Crisis management Applications – As a result of natural disasters (like the Gujarat Earthquake in Jan 2001) where the entire communication infrastructure is in disarray, restoring the communication quickly is important. With 4G, limited and even total communication capability, including internet and video services , could be setup in hours , instead of days/weeks/months required for restoration of wireline communication.

Virtual Laboratory - A laboratory created in virtual space by sharing an actual laboratory infrastructure among users in different locations. An example would be sharing an electronic microscope studies on internet.

9. CONCLUSION

The fusion of computing, communication and media technologies has broken the bounds of cost, time, distance and launched an era of global Info-Com networking, changing economic competition, empowerment and culture, inspiring global conversation and transactions, with the fastest penetrating factor, making the speed and cost advantage clear.

The 3 C's gives way to the 4 Cs - **Computer, Communication, Content, and Consumer Electronics** . The Third Generation (3G)

wireless communication paves a way for the coming Fourth Generation (4G) wireless mobile communication.

The challenge is to enhance technology and innovate with it ahead of competition. Competitive issue is the value creation and the new break-through products/services is the need of the hour. Seven goals such as Connectivity, Community, Capacity, Content, Creativity, Collaboration and Cash will transform the society to an Information Society.

A kind of 'techno continuum', a multiple mode, densely interconnected communications and information network is evolving which ties television, internet, telephone, mobile-phones, video, games, audio, photography etc., together. Today's leading-edge consumers are constantly on the run for interacting and converging items of telecommunication, multimedia, TV etc. They might have a DVD player, DSS satellite receiver or cable decoder box, video game system, and WebTV-type device, a cellular phone and an electronic bank account, and they are looking for possibilities to further integrate the various networks and platforms.

Digital fusion - multimedia* - desktop media - is described as the convergence of computing, television, audio, printing and telecommunications. Each of the components has been significant. Bringing them together results in the whole having greater impact than each individual part and is one of the industry's most significant developments. The convergence of digital technologies and their use will impact the future of teleconferencing, distance education and business now.

Many networking experts feel that the next big revolution in data networking will be the development of Quality of Service (QoS) networks with the ability to guarantee the delivery of time sensitive data. Such networks would be used to deliver voice and video over data networks like the Internet and ultimately to deliver advanced interactive multimedia services that have been promised to us for so many years

The interaction between human and the 3C's (Computer + Communication + Content (Multimedia) is becoming a daily staple as we witness powerful computers uniting in a networked environment where wired and wireless communications enjoy broadening bandwidth's that permit the transmission of multimedia content.

“The desire to share experiences will be the motivating factor in the development of exciting 3C technology in the foreseeable future.”

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