

# THE MULTIMEDIA TECHNOLOGY AND SERVICES AND ITS RECENT ADVANCEMENTS

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*The Multimedia technology, which integrates voice, video, and data services, is the next wave of the future and will be ubiquitous in developed countries within the end of this century. The initial thrust of multimedia is to build a network infrastructure so that the stand alone technology and services in telecommunications, computers, and video entertainment industries can be integrated together for end customers. This ultimate phase of the Information revolution that the developed nations are presently living through will bring such revolutionary impacts in peoples lives that are now unthinkable. This paper will provide an overview of multimedia technology and services, discuss recent advancement in this field, and provide a perspective of the related industry activities and their action plans.*

## **Multimedia Field Trial Demonstration**

A TV set appeared with a set of choices (menu) in computer-like fashion on a window of each viewer's TV set which was tuned to NBC Morning Show one morning in late last year. A few of the menu items were Interactive TV, Video Telephony, Home Shopping, Network News, Virtual Reality and Miscellaneous. The TV set with the menu also had a keyboard and a mouse. The host of the NBC Morning Show was eager to see what the guest has to offer to the nationwide audience. The guest pointed the mouse pointer to one of the menu items and selected video telephony. The guest was Winnie Grosso, an AT&T officer, who was demonstrating to the US audience the Multimedia Field Trial in California that AT&T and ViaCom was jointly working on. Mr. Grosso sitting in a New York TV station called another AT&T officer in Castro Valley, California and demonstrated a real video conversation.

After terminating the video call Mr. Grosso browsed through the other menu items and demonstrated the capability in each of the items. To say simply, it was impressive and mind-boggling when one thinks about the implication of this new technology, which will revolutionize our existing ways of life.

In this paper, we will elaborate on what these multimedia services are in a very high-level fashion, describe the technology behind the services and related industry activities.

## **Video Telephony**

Video telephony (VT) is the form of communication where one can hear and see the other party simultaneously. The video telephony exists in a few forms today. One is the video-conferencing services that the corporate customers use as a special service. It is expensive and not available for home consumers. For home consumers, however, terminals like AT&T 2500 Video Phones are available, which can be used to have a perceived video telephony conversation but not a real one, in the sense that it is over the

existing voice trade telephone lines, and the quality is not very good. The terminals are transparent to the service provider and therefore, there is no video service from provider's perspective.

To provide the real video telephony service, the network and the network elements such as switches and servers need to be aware of video service end terminals. The existing switches and the network must be upgraded as well.

The video telephony service can stand alone as a separate service, but may not be cost effective that way. Therefore, the existing industry plan is to integrate the VT in multimedia service and provide VT as part of the integrated package.

## **Interactive TV**

The ITV or interactive TV is one more step beyond the conventional one way Broadcast TV system in the sense that in the Broadcast TV system, consumers participation is limited to being only captive viewers without any other choices beside changing channels or turning the TV off. In ITV, however, the communication is bidirectional. The consumer chooses when to see a movie, what movie he or she will see, pause and resume at will, terminate half way and not be charged, get on to a broadcast channel for coarse with the permission of a moderator, and many more. This is like bringing the TV camera to home and dynamically broadcasting from each home.

## **Home Shopping**

Since a Home TV is going to be bidirectional with video, voice and data all integrated, the existing home shopping services can be provided with a real ease. The way the present home shopping works is the following. There are TV channels dedicated for home shopping where goods and merchandise are continuously displayed. An 800 phone number is usually provided which allows customers to call free of charge to order any products. The customers tunes to the channel, chooses product, orders it using a credit card, and the product is automatically delivered. With multimedia,

customer will be able to focus on a product in more details, get assistance on line, or select the product without any assistance, transfer the money from the bank dynamically to the shop owner's account, order the product, and get it at home without leaving the house at all.

## **Virtual Reality**

Usually people have two kinds of experiences: real experiences and imaginary experiences. Earth is flat and the sun rotates around the earth are the beliefs of imaginary experiences of people, let's say, of 4th century A.D. These imaginary experiences are so powerful that they are perceived to be real in real peoples mind.

Using modern techniques our senses and brain processes are stimulated in such ways that an unreal or virtual event can create impressions to be real event in our mind and memory - which we call virtual reality. This can range from travelling in space and under the ocean, travelling through the earth, flying a F-16 or a simple car for that matter and getting those experiences as it is really happened although in reality it did not. We perhaps sat in our own chair in front of a screen and the sound and special effect did it all. Experiencing virtual reality in networking environment is one of the services of multimedia.

## **Network News**

The service to accessing electronic news paper through a terminal has been around for decades. The major news papers such as Wall Street Journals can be read through a terminal connected to the appropriate data network. Information Bulletin Board are services provided by public data network services like CompuServe and Internet.

## **Miscellaneous Services**

Multimedia technology is like opening a Pandora's box. There will be so many new doors of services opened for this new world that are now unheard of and unthinkable. One of the medical applications may allow doctors to perform remote operations. Video conferencing will allow a person to do office meeting from home. Video games

In multimedia environment will bring more fun. Library services, Airline Reservations, Home Education are only a few to name among the myriads of multimedia services. And people always innovate new services like 900 services, given the flexibility in the system.

#### **Multimedia Technology**

The stand alone technology for services like Telephone, Faxes Broadcast TV, Computer Applications have matured in isolation over the years.

The objective of multimedia is to integrate these all, both from the perspective of customers who own intelligent terminals which can be hooked to a network, and from the perspective of the service providers who own the intelligent networks and its elements. The network, network elements, and the terminals all have become intelligent enough and such significant advancement has occurred in all these areas that the integrations of services are now possible.

#### **End Terminals**

Such sophistication exists in today's end terminals namely personal computers that they are beyond the needs of simple multimedia service such as VT. For a VT service, a video premises equipment consisting of a video camera, a microphone, a TV set, a set top box - an interface unit to the network - are enough. The first three has already been integrated into one unit by different vendors. The set top boxes also exist, but they will not fly unless an industry agreement is reached regarding the functions and interfaces of these set top boxes. A consortium with industry leaders has been formed to standardize the set top box.

The issues of cost versus functionality, different visions and different technical solutions provided by the consortium members, vested interest and politics are some of the bottlenecks for progress in reaching consensus but progress is always there at the end where activities and dynamic behavior prevails.

The stand alone multimedia technologies for end terminals are already in use. Sound cards, video cards, built-in modem, fax card, CD Rom drive, sophisticated window interfaces all are part of a stand alone multimedia PC these days. But these PC's are not for the kind of multimedia services in network environment that I discussed in this paper.

#### **Network and Network Elements**

Networks and its elements have undergone tremendous evolution over the last couple of decades. The original networks were designed to provide only voice grade services with low bandwidth requirements. These net-

works were basically all analog. With the advent of digital technology, networks all over the world are being changed to digital from analog. AT&T has already changed its facilities and switches to all digital early 1990s. ISDN technology has allowed the network to evolve to be more intelligent and to provide more sophisticated services to the customers.

In the data networking worlds, the improved quality of transmission facility demanded simpler protocols to be used. Frame relay over X.25, TCP/IP over OSI are, therefore, getting dominant in market place.

Echo cancellation, video compression techniques, encoding decoding algorithms, client-server models of computing are some technologies which are being used in the network elements.

Bandwidth is one of the critical attributes in a network that a network provider is concerned of. Since circuit switching is notorious for network resource hogging while the bandwidth is not effectively utilized in a typical voice call, packet switching is a viable alternative. But packetized voice and video suffers degraded quality for nodal delay for processing packets at each node in store and forward network. Increased processing speed of microprocessors and the new switching technology such as ATM (Asynchronous Transfer Mode) is making it possible to use store and forward network for all traffic-voice, data, and video. An ATM switch can also simulate DS1 and DS3 and European counterpart of these signal rates as provided in circuit switching. This is why ATM switches are getting so popular for multimedia services.

In this scheme, the whole information package is divided into packets of size 53 bytes, 48 bytes of which are actual information payload and 7 bytes are header overhead. Vendors are fiercely competing to make ATM switches these days.

#### **Industry activities**

Multimedia vendors are also fiercely active to position and realign themselves to tap into this multi-billion dollar industry. Major computer vendors including IBM, Apple; telecommunications vendors AT&T, MCI, ViaCom, most of the Bell regional companies; Hollywood Program Producing companies, and many others are active in this most recent technological euphoria. And all these companies know very well that multimedia is the real future. The US Government has taken initiatives in this regard. The US vice-president Gore has shown personal commitment and is leading task forces to setup an infor-

mation super highway for the nation. This is vital to the US national interest, he repeatedly mentioned.

There is a task force consisting leaders of industries to study the feasibility and produce plan to create the super highway. AT & T is also a member of this task force.

Multimedia services will be reality in couple of years in some form as presented in this paper, and ubiquitous within continental US before the end of this century.

In conclusion, I tried to provide an understanding of what these multimedia services mean, technology behind these services, and the related industry activities regarding multimedia. ☉

## **COMPUTER SEMINAR IN DHAKA UNIVERSITY**

The Business Study Club, a students' club of the faculty of commerce of Dhaka University, has organized a seminar on the Application of Computer in Business and Commerce. The function took place at Commerce Faculty Auditorium on 13th April, 1994.

The key note paper of the seminar was presented by Mr. K.A.M. Morshed, who is the System Analyst of The Developer's Computer System (DCS) and a frequent contributor of The Computer Jagat. Dr. Lutfur Rahman, the Chairman of Computer Science Department of DU and Dr. I. M. Habibullah, ex-dean of the faculty of commerce took part in the discussion.

In his key note paper, Mr. Morshed had pointed out the potential application of computer that could be implemented easily in our country at a reasonably low-cost. He also mentioned the glorious role that is being played by our computer magazines in creating awareness among the potential users and stressed the need for governmental incentives by way of advertisement to these magazines.

Taking part in the discussion, Dr. Lutfur Rahman made a summary on what computer is doing and will do in the future. He also demanded total computerization of the university administration and expansion of the computer facilities for the students. Dr. Habibullah, in his speech, has also reiterated Dr. Rahman's demand. After the first session, the participants, mostly from the DU and BUET, has taken part in a lively question-answer session. Mr. Morshed and Mr. Akhlaqur Rahman of the DCS has conducted the session. In the last session, DCS has arranged a computer show for the participants. ☉

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# Real-time Computer Control

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## 1. Introduction

The term 'real-time' refers to need to compute the whole of the given control algorithm within the certain sampling time. So the real-time systems are those in which :

- the order of computation is determined by the passage of time or by events external to the computer or controller ; and
  - the results of the particular calculation may depend upon the value of the variable 'time' at the instant of execution of the calculation or the time taken to execute the computation.
- Young (1982) defines a real-time system to be :

*any information processing activity or system which has to respond to externally-generated input stimuli within a finite and specified period.*

Real-time systems can be divided into two categories based on a definition of the system functioning correctly :

type-1 : the system must have mean execution time measured over a defined time interval which is lower than a specified maximum.

type-2 : the computation must be completed within a specified maximum time on each and every occasion.

The second category is obviously a much more severe constraint on the performance of the system than the first. It is typical of the so-called 'embedded system' that is system in which the computer is (or computers are) an integral part of some machine. Such systems present a difficult challenge both to hardware and software designers.

## 2. Characteristics

Real-time control system possesses many special characteristics, which are as follows :

1. Reasonable in size and complexity both for the case of hardware and software development.
2. Capable to manipulate the real-numbers.
3. Possesses good reliability and safety factor.
4. Capable of concurrent control of separate system component.
5. Possesses real-time facilities both in hardware and software.
6. Efficient implementation for control.

## 3. Classification of real-time control system

There are three different classes of real-time control system, which are

briefly described below :

### Clock-based Control Systems

A process plant operates in real-time and thus it is required to describe about plant time-constant; these may be measured in hours for some chemical processes or in milliseconds for an aircraft system, for instance. For feedback control the required sampling rate will be dependent on the time-constant of the process to be controlled. The shorter the time-constant of the process, the faster the required sampling rate. The computer or controller which is used to control the plant must therefore be synchronised to real-time and must carry out all the required operations measurements, control and actuation within each sampling interval. The completion of the operation within the specified time is dependent on the number of operations to be performed and the speed of the controller. Synchronisation is usually obtained by adding to the computer system a clock-normally referred to as a 'real-time' clock-and using a signal from this clock to interrupt the operations of the computer at some predetermined fixed time interval.

### Sensor-based Control System

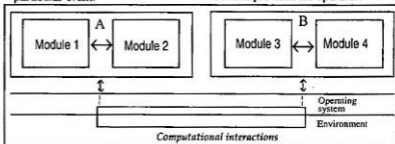
There are many system, where actions have to be performed, not at particular times or time intervals, but in response to some event. Typical examples are : turning off a pump or closing a valve when level in a liquid tank reaches a predetermined value ; or switching a motor off in response to the closer of a micro switch indicating that some desired position has been reached. Sensor-based systems are also used extensively to indicate alarm actions, e.g. as an indication of too high a temperature or too high a pressure. The specification of sensor based systems usually includes a requirement that the system must respond within a given maximum time to a particular event.

### Interactive Control Systems

Interactive systems represent the largest class of real-time systems and cover such systems as automatic bank tellers, reservation systems for hotels, airlines and car rental companies, computerised tills, etc. The real-time requirement is usually expressed in terms of average response time not exceeding a specified value. For example, an automatic bank teller system might require an average response time not exceeding 20 seconds. Although this type of system superficially seems similar to the sensor based system-that is it apparently responds to signal from the plant (in this case a person) -it is different in that it responds at a time determined by the internal state of the computer. An automatic bank teller is not interested in the fact that the person is about to miss a train or that it is raining hard and he is getting wet ; this is irrelevant to its response. Many interactive systems give the impression that they are clock-based in that they are capable of displaying the data and time ; they do indeed have a real time clock which enables them to keep track of time.

### 4. Real-time Hardware

Although almost any digital computer can be used for real-time control and other real-time operations, they are not all equally easily adapted for such work. A process control computer has to communicate both with plant and personnel : this communication must be efficient and effective and the processor must be capable of rapid execution to provide for real-time control action. A characteristics of computers used in control systems in that they are modular ; they provide the means of extra units, in particular, specialised input and output devices, to a basic unit. The capabilities of basic unit, in terms of its processing power, storage capacity, input/output bandwidth and interrupt structure, determine the over-all performance of the system. Of equal importance in a control computer are the I/O channels which provide a means of connecting process instrumentation to the computer, and also displays and input devices provided for operator.



## 5. Real-time Program

A real-time program differs from the sequential & multitasking type in that, in addition to its actions not necessarily being disjoint in time, the sequence of some of its actions is not determined by the designer but by the environment (that is, by events occurring in outside world; events which occur in real-time and without reference to the internal operations of the computer). Such events cannot be made to conform to the inter-task synchronisation rules. A real-time program can still be divided into a number of tasks, but communication between the tasks cannot necessarily wait for synchronisation signal: the environment cannot be delayed. In real-time programs, in contrast to the other two types of program, the actual time taken by an action is an essential factor in the process of validation.

Consideration of the type of reasoning necessary for the validation of programs is important, not because of seeking method of formal proof, but because to understand the factors which need to be considered when designing real-time software. It has been found that the design of real-time software is significantly more difficult than the design of sequential software. The problems of real-time have not been helped by the fact that the early high level languages were sequential in nature and they did not allow direct access to many of the detailed features of the computer hardware. As a consequence, real-time features had to be built into the operating system which was written in assembly language of the machine by the teams of specialist programmers. The cost of producing such operating system was high and they had therefore to be general purpose so that they could be used in a wide range of applications in order to reduce the unit cost of producing them. These operating systems could be 'tailored', i.e., they could be reassembled to exclude or include certain features, to change the number of tasks which could be handled, or to change the number of I/O devices and types of device for example. Such changes could usually only be made by supplier.

Interactions with other executing programs, with which the program shares data or resources, may violate constraint. Fig. 1 illustrates these interactions. Current techniques allow correctness verification of concurrent modules, say module 1 and module 2 in a parallel program A. However, these techniques ignore the effects of module 3 and module 4 in program B on the execution of program A. Such effects are due to interactions with the operating system and the execution environment, which share resources and control mechanisms with the modules.

(To be continued).

## AT&T Shipped 26,199 Self-Service Systems in 1993

AT&T Global Information Solutions shipped industry leading 26,199 self-service system worldwide in 1993, for outpacing their nearest competitors. Shipments in the United States were 54 percent over the previous year. In Central and South America, jumping more than 500 and 300 percent respectively. ☉

## AT&T's Radio Link Gives Power To The Powerhouse Museum

A wireless radio link relying on an AT & T Global Information Solutions' WavePOINT bridge has won a major prize at the Government Technology Productivity Awards in Australia. The wireless link was installed at the Sydney Powerhouse Museum last August to connect the museum's computer network between its two major buildings, the Powerhouse Museum and its

administration building — two blocks away. The wireless link is the first of its kind in Australia and the world. The Powerhouse Museum relies heavily on its computers to maintain the collection database, and to manage the financial and administrative systems, along with day-to-day operations. ☉

## System 3555 Achieves World Class Performance

System 3555 server achieved record results for the on-line transaction processing (OLTP) benchmark, TPC Benchmark C. The benchmark demonstrates AT&T Global Information Solution' sustained industry leadership for world class price/performance.

The System 3555, with four Intel Pentium processors running INFORMIX-OnLine and TOP END, achieved a peak performance of 1296.03 transactions per minute (tpmc). ☉

## Certificate in ORACLE Training Distributed

Certificate awarding ceremony of ORACLE Training Course for Senior Executives of Bangladesh Water Development Board was held on Monday April 11, 1994 at the premise of IBCS-PRIMAX Software (Bangladesh) Ltd. House # 5D, Road # 11 (New) Dhanmondi R/A., Dhaka. The training course was sponsored by UNDP and conducted by IBCS-PRIMAX Software (Bangladesh) Ltd. Mr. M. Majidul Islam, Chairman Bangladesh Water Development Board was the chief guest and distributed certificates to the participants. The chief guest in his address congratulated the participants for their sincere efforts in acquiring this new technology and hope that they would be able to use their knowledge in water resource management of Bangladesh Water Development Board.

Mr. A. Towhid, Executive Director of IBCS-PRIMAX, Col. (Retd.) M. Azizur Rahman, Ex-Executive Director of BCC, Mr. A.K.M. Shamsul Haque, Chief Engineer, BWDB, Mr. A.H.M. Aminul Islam Bhuiyan, Member Administration, BWDB, Mr. Karoly Futaki, Chief Technical Adviser, UNDP, and Mr. Saquib Iqbal, Territory Manager, ORACLE Corporation USA, spoke on the occasion. Mr. A. Gaffur, Training Manager of IBCS-PRIMAX presided over the function. ☉



Participants of the ORACLE Training Course are seen with the guests and executives of IBCS-PRIMAX

## NEW DELL ADVANCED SYSTEMS

Dell recently announced three highly refined server lines and sophisticated mass storage options to meet almost any network requirement. The PowerEdge™ SP and PowerEdge XE are new additions to Dell's network server line. The second member in the Dell OmniPlex™ server and workstation family is the OmniPlex™ 4XX. The Power Edge SP has power and plenty of room to grow. The PowerEdge family services all levels of the most demanding server customers who desire advanced 486 or Pentium™, EISA/PCI, and SCSI performance; logical growth path, unparalleled ease of service and maintenance, reliable brand, and full functionality. These systems offer state of the art bus performance with fully optimized system architectures.

Customers may choose an upgradeable 1486™ based server for smaller work group environments, or they may select a high-performance Pentium processor based file server for more demanding networks. Either way, the PowerEdge SP is a perfect match between expandability and cost-efficiency. The Dell PowerEdge SP is aimed at business-critical applications in small to medium size or-

ganizations and can serve as an ideal resource-sharing platform for work groups of 25 to 100 users.

The PowerEdge XE is designed for a demanding, growing, mission-critical network and targeted at MIS managers in mid-size to large organizations. It is an ideal file, database or application server for networks of 25 to 500 users on a network. The PowerEdge XE 560 and 566 Pentium powered systems are high-performance systems with maximum expansion potential.

The PowerEdge family is not only a replacement for the 4000/XE series currently offered, but also offers a new level of performance, reliability, upgradeability, expansion, extensive drive capacity.

Both the PowerEdge SP and XE families offer range of processors, from the 33.50 and 66MHz Intel 486DX processors to the top-of-the-line 60 and 66MHz Pentium Processor. The two product families share a variety of components to reduce the cost of parts and service calls.

Dell's PowerEdge servers will support the industry's almost all leading network operating systems. ◉

## Digital Launches Second Client

Digital launched a new family of networking products that brings many of the benefits of client/server computing. This focuses on integrated products that providing open client/server solutions.

Digital's mobile/wireless products extend the boundaries of communication, increase productivity and reduce operational costs. Digital currently offers four wireless local area connectivity products: RoamAbout Access Point, RoamAbout PCMCIA Network Adapter, WaveLAN/WaveLAN International network interface cards, and the Remote Connect Solution. ◉

### Correction:

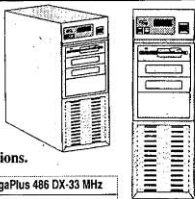
In the article "Compaq Shares The Best Ownership Experience In Bangladesh" published in the April '94 issue of Computer Jagat, the brand name of Compaq Server and name of Compaq's New Market Managing Director was inadvertently printed as "Prolant" and "Tan Kok Him" respectively. The correct name will be "Proliant" and "Tan Kok Hin". We regret the mistakes.

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