DATA COMMUNICATION

MD. AL-AMIN BHUIYAN

As the world's economy grows, more and more data is produced. This has created an ever increasing demand for faster data communications locally, nationally and globally. Data communication thus emerged as a natural result of the development of sophisticated computer systems— it has become the milestone in the field's information explosion age.

1. COMPUTER COMMUNICATION OVER TELEPHONE LINES :

Computers are used to generate and process information. But generated information is not useful in itself. Sometimes it is necessary to transfer this information from one place to another. Data communication is the transfer of data or information between computer devices.

In the middle of nineteenth century data communication used to take place mostly through telegraph cables using Morse Code. However, with the beginning of computer era, the need to send data from one point to another with greater speed and efficiency arose. Also as the computer industry began to grow faster, the better and speedier were the computers. Under this condition, data communication have continued to change dramatically.

tial signals that are either on or off, i.e. in binary form at a speed more than 1MHz. On the contrary, telephone signals are continuously rising and falling, i.e., truly are analog signals in the frequency range of 300 to 3500 Hz. Therefore, some sort of conversion must take place for data to be effectively passed from the computer over the telephone lines and this conversion is performed by two devices— Asynchronous Communication Interface Adapter (ACIA) and 'Modem'.

The ACIA, connected to the outside world via a D-shaped 25-pin connector and built into every computer, takes parallel data from the computer's bus and turns it into serial bit-stream and viceversa. And modem modulates the digital signals at the transmitter, thereby rendering them suitable for transmission over telephone lines and recovers the original digital signals at the receiving end by demodulation.

2. WHAT IS A MODEM?

The name "Modem" has been derived from two words MOdulator and DEModulator. A modem performs the function of modulation and demodulation as the name implies. That is the function of the modem is to convert digital data signals

connection, it is generally recommended that the computers be within 50 meters of each other.

Computers can exchange information over telephone lines by using two modems—one on each side. A calling computer for a terminal contacts a receiving computer through a telephone number, and a communication link is established after control signals have been exchanged between computers and modems.

3. DATA COMMUNICATION SYSTEM :

A data communication system, providing electronic distribution of information from computer to computer consists of five basic components. These basic components are:

(a) The sending or originating computer:
The originating computer or terminal has data to transmit. The data may consists of a file on a disk or may be entered into a keyboard, transmitted as it is typed.

(b) Data Communication device Attached to the sending computer:
The data communication device attached to the sending computer converts the data into a form that can be transmitted.

(c) Communication Channel:
The communication channel (also called a communication link) carries the data being carried from place to place. There are many possible communication channels, including telephone lines, coaxial cables, optical fibre systems or microwave relay systems.

(d) Data Communication Device Attached to the Receiving Device:
The data communication device attached to the receiving computer converts the transmitted data into a form so that the receiving computer can understand.

(e) Receiving Computer:
The receiving computer or terminal receives the data and displays them on a screen, prints them, or stores them in a file.

4. MANAGING THE COMMUNICATION LINK :

All communications between computers are managed by data communication software. The precised procedures used for communication depend on the particular software; some general procedures are listed below:

i. Communication between two Microcomputers :

The procedure used to communicate between two microcomputers is as follows:

(A) Both the microcomputer user start the communication program, which gives them a menu of options.

(B) Each user choose the same options, including the number of start and stop bits, the type of parity checking, the communication rate, full-duplex or half-duplex transmission, and so on.

(C) Before establishing the communication link, the users decide who will originate the telephone number. The originator enters the telephone number. The communi-
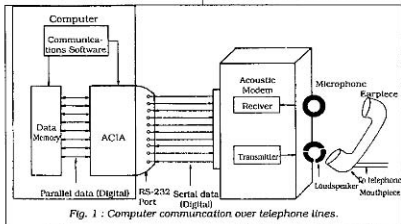

Fig. 1 : Computer communication over telephone lines.

A direct link between the computers could send data between them, but problem arises when the sending and receiving computers are placed at remote distances. Because digital signals, when transmitted over long distances, suffer severe distortion. Also it is an impractical plus very expensive idea to join all sending and receiving computers, via cables. Data may be transferred from one computer to another at remote distances over telephone lines, coaxial cables, wave guides, or even satellite communications. Since telephone lines already have a wide network, the logical choice of transmission medium for data communication becomes the telephone lines. However, data processed by computers are in the parallel form to reduce time and increase speed, whereas, the signal through a telephone line is in serial form. Moreover, computers process data as dig-

to suitable audio signals compatible with transmission lines at the transmitting end, a process referred to as modulation. Also it converts the audio signals back into digital data at the receiving end by demodulation.

If data is to be transmitted over telephone lines, the signals must be converted to reside within the audio frequency spectrum from 300 to 3500 Hz. Modems have been developed to provide this function.

When two computers are communicating, they send information back and forth. If these two computers are within a reasonable distance, they can send and receive information through a direct cable connection, which is sometimes called a null modem connection. The further the distance the signal has to travel, the greater the chance that some information will be lost. For this reason, in a direct cable

cation program then instructs the modem to dial the number, and the program reports the users whether the connection has been established.

(D) After the connection has established, the users can have an on-line conversation. The can type messages back and forth to eachother and also record their conversation.
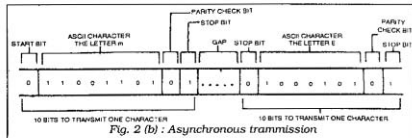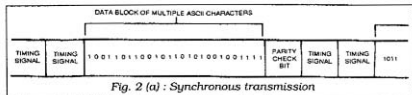
(E) When a user is ready to transfer files, he or she sets his or her computer to send; the called user sets his or her computer to receive. The communication program takes over by reading the information from the disk and sends it through the communication link. The receiving computer stores the incoming information on a disk and also can display on its screen.

(F) When the transfer has been completed, the users say "goodbye" and terminate the connection.

II. Communication between a micro-computer and a Mainframe Computer :

The procedure for communication between a microcomputer and a minicomputer or a mainframe computer is similar. One difference is that the big computers have safe guards that limit access to files and facilities to authorized users. The most common safeguards are user identification number and password.

After the communication link has been established, the receiving computer asks for the user's identification number. The microcomputer user sends the identification number, after which the receiving computer checks whether the identification number is valid. It then asks for the user's password.

A password is a confidential sequence of characters that allows access to the system. It is required for the user to obtain access to the mainframe computer. It also determines exactly which files and facilities the microcomputer user is allowed to read.

5. DATA TRANSMISSION MODES:

Once a communication link has been established between two points, it can be used in one of three equal modes. The modes are Simplex, Half Duplex, and Full Duplex.

Simplex transmission is that transmission which occurs in one direction only. In a simplex transmission mode, one device is

always a transmitter and the other device is a receiver.

Half-duplex transmission permits transmission in either direction; however, transmission can occur in only one direction at a time. Thus at any instant, if one device acts as a transmitter, the other acts as a receiver and vice-versa.

Full-duplex allows data transfer in both

Fig. 2 (a) : Synchronous transmission

Fig. 2 (b) : Asynchronous transmission

devices simultaneously. Thus one device may be transmitting and receiving simultaneously while the other does the same. The two simultaneous transmissions may or may not be related and occur on two sepa-rate and distinct communication channels.

The communication mode to be chosen may be the result of communication medium limitations, hardware usage or programming conventions.

Most of the present day modems offer half-duplex, full duplex or both facilities. Simplex is very seldom used with modems.

6. TRANSMISSION TECHNIQUES:

Data generated by computer is nor-

Synchronous Transmission :

In synchronous transmission, characters are transmitted as groups, preceded and followed by control characters. In synchronous communication, data bytes are sent one after another at regular intervals. The data form as continuous stream of bits spaced at regular intervals, with no space between consecutive characters. A timing mechanism causes the receiving modem to read the stream at precisely the correct frequency. When the the receiving modem has read the required number of bits to make up a character, it sends the character to the receiving computer.

In this type of transmission, since data is sent as a block of characters, both transmitter and receiver need to have buffers for storing block of characters. A major advantage of using this transmission technique is high speed. Since fewer bits are needed to identify the beginning and end of character coding. Again, as there is no gap between characters, precise data space is not wasted. Its chief drawback is inaccuracy; when a receiver goes out of synchronization, losing track of where individual character begin and end, correction of errors takes additional time. Synchronous transmission is used when data rate over 2400 bauds is required.

Asynchronous Transmission :

In asynchronous transmission, each character is transmitted separately, that is, one character at a time. The character is preceded by a start bit, which is always a 'O' (zero) that tells the receiving device where the character coding begins, then five to eight bits-representing the actual information being transmitted, an optional parity bit (even or odd parity) for error detection capability and is followed by 1, 1P(1.2), or 2 stop bits, which tells the receiving device where the character coding ends, after which is an interval of time on the channel. Then the next character is sent, start bit first, character's bits next, stop bit(s) last.

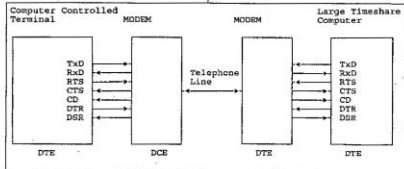The start and stop bits, along with the interval of time between consecutive char-

Fig. 3 : Communication of a terminal with a timeshare computer using MODEM

mally character oriented and is outputed in serial form as a series of equal duration bits. This generated data is transmitted between different communicating points. However, some sort of information is usually requred as to how the data will be transmitted. There are two methods of doing this and these are referred to as synchronous and asynchronous transmission.

acters, allow the receiving and sending computers to synchronize the transmission. This is the most common technique of data transmission worldwide. Its principal advantage is accuracy, while its main draw-back is slow transmission speed caused by the great number of start and stop bits. Asynchronous communication is typically used at communication rates lower than 2400 bauds.

7. SERIAL COMMUNICATIONS PARAMETERS:

There are several parameters governing how serial communications data is formatted. The most common serial communications parameters that will encounter are the baud rate, the number of data bits per word, parity, and the number of stop bits.

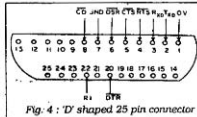**Baud rate:** "Baud rate" is the speed at which data is transmitted. This parameter,

Fig : 4 : 'D' shaped 25 pin connector

also referred to as bits per second, bit rate, or data rate, typically ranges from 300 to 9600 baud.

Number of Data Bits: The "number of data bits" refers to the number of bits that constitutes one data word. In serial communications, each data word is transmitted as a sequence of bits. This word may be immediately preceded or followed by other bits (parity or start and stop bits) that are used for controlling the communication. The number of stop bits is variable; the default is one.

Parity : Parity is a method for detecting errors in data communications. The parity bit is added at the end of the data word. The value of this bit is a function of the rest of the data word. "Even parity" means that the parity bit is set so that the sum of all the bits in the data word (including the parity bit) is even and "odd parity" means that the parity bit is so set that the sum of all bits is

two stop bits are added to the end of a data word, these bits tell the receiver where the end of each data word is.

8. DTE-DCE INTERFACE :

In the world of data communications, equipment that includes terminal and computer ports is referred to as Data Terminal Equipment or DTE. In comparison, modems and other communication devices are referred to as Data Communications Equipment or DCE.

The physical, electrical and logical rules for the exchange of data between DTEs and DCEs are specified by interface standards; the most commonly used is the EIA RS-232C standard. The RS-232C specifies the use of D-shaped 25-pin interface connector.

9. RS-232C SERIAL COMMUNICATION STANDARD :

When one computer communicates with another over long distances, the data are transmitted serially. Internally, computers almost universally use data in parallel form. Therefore, this parallel data must be transferred into a serial form before being sent through telephone lines and after reception the data string must be recomposed into parallel form. Most personal computers, however, has fitted with a serial interface through which modems are used to send serial data.

At present, three types of standard are followed in case of modems. These are:

Bell Standard, EIA (Electronics Industries Association) standard and CCITT standard.

Of these, the RS-232C standard, used by EIA, is perhaps of the most interest to the hobbyist or microcomputer users. It defines all the features of communication, that is, the number of pins in the connection, the dimension and construction of the connector, the signal levels on the pins, the

number. "Mark parity" means that the parity bit is always a 1. "Space parity" means that the parity bit is always a 0. "No parity" means that no parity bit is added to the end of a data word.

Stop Bits : In asynchronous serial communications, either one, one and a half, or

Fig. 5 : RS-232C signal names and pin numbers.

interrelationship between the signals and the procedure for exchanging information. This so-called DB-25 connector is, therefore, widely used for communication purposes. RS-232C is a recommended standard (RS) published by the Electronics Industries Association (EIA) in 1969, with the

number 232 referencing the identification number of one particular communication standard and the suffix C identifies the current revision level. It specifies (among other things) that the marks and spaces that make up the code must be of certain amplitudes.

The RS-232C voltage levels are defined as follows:

Logic 1 (mark) = less negative than -3V
Logic 0 (space) = more positive than + 3V
Any voltage between -3V and + 3V is undefined. Typically, an RS-232C system uses nominal voltages of -12V and +12V for a '1' or '0', respectively, the more positive voltage than +15V and the more negative voltage than -12V is also undefined.

Basically, a serial interface consists of a transmitted signal (pin 2), a received signal (pin 3), and a ground connection (pin 7). This is the barest minimum for bi-directional link. However, handshaking lines are used in addition, but are not essential. In this case, the Request to Send (pin 4), Carrier to Send (pin 5), Data Terminal Ready (pin 20), Data Set Ready (pin 6), Carrier Detect (pin 8), Ring Indicator (pin 22) lines are required, and the remainders are seldom encountered in normal practice.

APPLICATIONS OF DATA COMMUNICATION :

Data communication systems are designed to provide information flow among computers. There are variety of reasons for interlinking computers and peripherals. Some of which are outlined below:

The ability to share and exchange data between systems is a compelling reason for interconnection. Users from different locations can easily transfer information in the preparation of a document or for an analysis.

There are many applications centered on remote accessing of data bases. Simple examples are the information services and financial services available to personal computer user. More sophisticated examples, requiring many interactions between the remote site and the data base and its associated program include remote computerised medical diagnosis and remote computer aided education.

Communication, the transfer of information, is the basis of office automation. Airline reservation system, automated banking system, inventory control systems etc. provide a number of examples.

When one reserves seat on an airplane, the agent enters the reservation on a terminal connected to the airline's computer. Since the computer is usually located far from the agent (sometimes several thousand miles away), data communication must be used to relay data from the terminal to the computer and back from the computer to the terminal.

Most banks now provide a wide range of banking services through automatic teller machines (ATM's). Users can make deposits and withdrawals, check balances, and even pay utility bills through the machines. An automatic teller machine is connected to the bank's main computer, which may be located at another end of the city or even in another state. The transaction request is sent to the computer using a data communication network.

SPECIAL PURPOSE MICROPROCESSORS

Professor Farruk Ahmed

Following the lead of the large computer systems, distributed processing is being applied to microcomputers. The requirements for processing power are outstripping the ability of the central processor to provide all the computation, data transfer and control in the system. Intelligent controllers are being added to the system design to allow the control problem to be partitioned and each part to be executed in parallel with the others.

Parallel processing results in higher system performance and through put by freeing the CPU for other tasks. Also the intelligent controllers are often optimised in architecture or algorithm to execute its tasks in a faster, more efficient more cost-effective manner than the CPU was able to do. Distributed architectures also allow the problem to be developed in a modular fashion. This makes the hardware and software design to be simpler and more easily maintained and upgraded.

Definition of a special purpose processor:

Special purpose processors (SPP) handle many of the same functions that the microcomputer peripheral chips perform. However, the SPP is distinguished by having an especialised instruction set to direct its functions independently of, but concurrently with, the CPU rather than the perpheral chip's software controlled registers which need the direct control of CPU. There are other characteristics which may be employed to describe the various types of SPP. These are the characteristics which may be used to optimise the SPP to its task and its relationship to the host CPU.

There are two general forms of optimisation: architectural and algorithmic. Architectural optimisation is used for a single particular application that may require high performance (e.g., numerical computation, data communication, etc.). Algorithmic optimisation uses a more general architecture to allow the design to be customised to the system needs. Here flexibility rather than performance is important.

The SPP can be run as a slave or a peer with respect to the host processor. The master slave system is a more understandable and

conventional relationship. The slave deals with the real-time front end tasks, leaving the CPU free to handle only the high-level tasks. The peer SPP operates at the same technical level as the host and can share the host CPU's memory and a I/O resources. The mode of communication between the tasks in these shared resources can involve a very high bandwidth. The tighter the coupling between the SPP and the CPU the higher the possible data transfer rates. Tight coupling usually implies a close physical proximity and a parallel bus connection. Loose coupling means a restricted bandwidth and the involvement of a serial data connection over a much wider area. Different types of SPP may be mentioned as follows:

(a) Coprocessors— architectural optimisation for high performance computation and I/O;

(b) Slave processors— algorithmic optimisation for flexibility at a low cost;

(c) Signal processors— a hybrid of both for high speed data analysis, transforms, and correlations.

Coprocessors

Coprocessors are of the form of architecturally optimised SPP. They are especially suitable for mathematically intensive and I/O intensive applications to improve the system performance while relieving the host CPU from doing these tasks. The internal architecture is not similar to a general CPU design, although it is complementary to the CPU's architecture. Most of the coprocessors are actually dual processors: one section handles data and command while the other handles the I/O or mathematics.

The coprocessors are generally tightly coupled to the host CPU to support their high-performance operation. Mathematical coprocessors must be extremely tightly coupled to the CPU as they are expected to act as an architectural extension of the host CPU. But the I/O control coprocessors are able to act independently of the CPU, operating on their own data and commands. These coprocessors can operate either on the CPU's local bus or on a remote bus connected to the CPU through isolating buffers.

The first architectural extension coprocessor was Intel's 8087 Numeric Processor Extension (NPX). The 8087 adds high-performance integer and

floating point mathematics to the 8086 family of microprocessors. Other available numerical processor include the 8070 for Zilog's Z 8000 and Z 80000, the 68881 for Motorola's 68000 etc. In effect 8087 adds 69 new instructions and another eight 80-bit data registers to the host processor. It can execute single-precision multipliers 50 times faster than software routines. The 8087 needs no extra logic to be connected into an 8086 system. The 8087 can perform the processing of varied nature such as business data processing, robotic control etc. The Intel 80287 is the 8087's counter part, is the numerical data processor for the 80286. The 80287 is upward software compatible with the 8087.

Peripheral Support Coprocessing:

Peripheral support coprocessors were developed to expand the I/O processing capabilities of the microprocessor system, reducing the load on the CPU at the same time. These devices may have built-in DMA capability, to speed data transfers and to have high processing power without CPU intervention. They are especially suitable in applications where intensive I/O data communication is involved. They behave very much like a regular processor in the sense they have independent instruction set and data structure. They may be of two types: dedicated support peripheral and general I/O processors.

Intel 82586 LAN controller, the 82730 Text coprocessor CRT controller are well known examples of dedicated type. Each of them have optimized architecture dedicated instruction set and data structures. The 8089 I/O processor (IOP) is an well-known example of general peripheral support I/O processor. The 8089 has two independent channels, each with its own register set and system control signals can execute its own program.

Slave Processors:

Slave Processors are at the other end of the SPP spectrum. They are lower-performance processors based on general purpose architectures and targeted at broad range of applications. The slave processor is always operated in a master-slave relationship to the host CPU. The slave processors are designed to do

the front-end real-time work for the host CPU. The host does the high-level operations, and communicates with the slave through commands and data massages.

The physical interface between the slave processor and the host CPU is always through the registers and/or RAM built into the slave. Apart from data, status and control flag information are also handled. Provisions for DMA requests signal arc sometimes included.

The master slave relationship with the host CPU, certainly, makes the system design to be flexible. There is no memory or I/O resources to be shared, so the slave processor may be connected locally or remotely to the host CPU. Another DMA device can handle the slave processor for the host. In all these cases the nature of coupling between the slave and the host processor is fairly tight.

Signal Processors:

The final type of SPP is the signal processor. These are especially designed processors characterized by high efficiency, complex arithmetic calculations. Signal processors are able to convert data from one format to another format, look for patterns within the data and isolate the particular data from the whole. The speed of operation is mostly high to cope with real-time data processing operations. In order to make the processer faster, the architecture and the algorithm are optimized. It may have on board memory, general purpose ALU and suitable instruction set. The data and instruction may be fetched in parallel without interference. The data paths are often split into parallel buses.

Signal processors may use hardware where general processors use software. The ALU widths up to 32 bits may be needed to maintain the high accuracy of the signal processing calculations. The Intel 2920 is the commonest example of signal processors. It contains four onboards 9 bit A/D and D/A converters.

The Future for SPP :

Development of special purpose processors will continue in all the typcs. In coprocessors new mathematical processors will become faster if more hardware can be dedicated to the problem. Communications, especially LANS,

form the fast-growing field. Slave processors will continue to be developed especially to provide control functions not available elsewhere. The most flourishing field will be the signal processors. The fields of robotics and speech synthesis call for rapid development of signal processors. Speech recognition will be the next step on this path.

The development will, certainly, continue to provide answer to the never ending effort for accomplishing perfect system performance. It is to be borne in mind that a single processor cannot provide that needed performance. The time has now come, to accept the fact that a distributed multiprocessor system can only provide the required system performance.

* **Dr. Faruk Ahmed**
Chairman, Dept. of Applied
Physics & Electronics,
University of Dhaka

IBM Seminar on PC Industry

region drastically), IBM has set up a full fledged warehouse and assembling plant in Singapore. As a result of which IBM PCC is now capable to assemble products as per specification of the customers of this region and supply their desired products in the shortest possible time.

Errol Pereira also assured that the prices of IBM PCs will come down within the range of other branded PC's available here. Competetive price and quick delivery will definetely help IBM PCC to procure a good share of the PC market of this region.

When **Mrs. Lynn Walker**, Emerging Markets Project Manager, another Australian member of the team was asked about the lack of publicity of IBM products in this region specially in Bangladesh. She replied that PC users of this region is going to see a dynamic change in the IBM's marketing policy. To make popular and to let the computer users know in detail about IBM products specially in the PC range. IBM will start doing a lot of publicity campaign very soon.

The IBM authority arranged a lucky draw for the participants of the seminar. Mahboob Sarwar, a programmer of the Prime Minister's office was the lucky person to become the proud owner of a **ThinkPad** note book.

DATA COMMUNICATION

Many retail stores use point of sale terminals instead of cash register. These terminals send records of sales to a central computer, which maintains accounting and inventory records.

Another popular application is the electronic mail. Such a mail can be read, filed, forwarded to other individuals, with added comments or read by the addresses at different locations. Obviously, such a service has many advantages over postal mail interms of delivery speed and flexibility. It has also advantages over voice telephone service interms of providing a record, reducing cost (for long distance calls), and eliminating the need for both users to communicate at the same time.

CONCLUSION :

The proliferation of computers has caused an "information explosion." As time goes by we hear more and more about public services that will make computers and giant data bases available to every home. This information explosion has instigated the computer communication to become one of the most widely expanding field of research area. With technological innovations different types of signals (e.g. computer data, human voice, audio, video, information) are now transmitted through the same communication channel, and computer communications are extensively used for this purpose.

With the wide spread use of computers in Bangladesh, the necessity of communicating and transmitting data from place to place becomes inevitable day by day. There are some Electronics and Computer firms communicating with U.S.A. England, Singapore and Japan, have installed modems with their personal computers. But these modems, however, are very expensive. To overcome this difficulty, modems should be designed and communication software be developed here which could be used in scientific, industrial, educational institutions or in office applications in our country for realizing greater potential of computer usage.

* **MD. AL-AMIN BHUIYAN**
Lecturer, Dept. of Electronics &
Computer Science,
University of Jahangirnagar.

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'IBM PLANS MASSIVE ENTRY INTO THE PC ARENA OF SOUTH ASIA'

— Errol Perira, Regional Marketing Manager, IBM PCC ASEAN/SA

An IBM Seminar on 'The Trends and Directions of IBM and the Personal Computer Industry' was held at a local hotel recently. A four member IBM team consisting of officials from Singapore and Australia were present in the seminar. **Jeremy Pollard**, IBM Technical Consultant outlined the trends and directions adopted by the emergence of the PC market. During the presentation, Mr. Pollard pointed out that the use of computers to meet the business need started in the 1960's when major emphasis were given for strong central management of accounting, record keeping, payroll, etc. During this period of first wave the mainframes were adopted to provide the necessary technological solutions.

Business management trends took a different outlook during the second wave in the 1970's in the wake of increased labour and raw material cost and changing global competition. Importance was given to departmental level processing to handle design and reduce the manufacturing cost and early office automation such as word processing was accepted as the technological solution along with mid-size processors.

The business problems in the 1980's originated the need to manage profit & loss at the individual managerial level. This situation led to the growth of the third wave of computing. Considering cost cutting as key driver spread sheets on stand alone PC were adoped as technological solution during this period.

With the evolution of Network based connectivity including the Internet in the 90's the fourth wave focussed on integrating supplies and more importantly customers into the enterprise which resulted

the organisations to concentrate on increasing growth rather than just reducing costs.

While giving details of the IBM's Fourth Wave Offering he told the audiance that IBM provide value for money solutions for both existing centralised, departmental and stand alone business requirements. Many users both large and small consider these Fourth wave solutions as a significant advantage of keeping in touch with IBM. The IBM solutions for Fourth wave computing include :

* Business consulting.
* IT consulting— distributed Architecture & clear Open Systems migration strategy.
* Applications solutions — IBM or third party.
* Data Management solutions— IBM or third party.
* Networking & Integration expertise— IBM or third party.
* Hardware and operating systems supply — IBM or third party.

During a discussion **Pollard** told the **Computer Jagat** that emerging countries like

The IBM team with the correspondent of Computer Jagai. (From left) Errol Pereira, Kamal Arsalan, Lynn Walker, Ed DeArias and Jeremy Pollard

Bangladesh can cover the last three waves business and technology development in a couple of years and leapfrog by learning from the experience of the more advanced players and by

associating itself with the right technology partner.

He further added that as good technology partnership has become the key for successful business activities today, small countries and companies can go ahead fast similar to large companies. Technology has lowered the barrier for entering into most markets. Now it is possible to sale products and services to any part of the world directly i.e. without taking assistance from an agent or marketing agency.

Another member of the IBM team, **Ed DeArias**, Emerging Markets Director, IBM Worldwide PC Companies informed that IBM has achieved technology leadership having more than 32,000 Patents. In 1993 and 1994 IBM topped all companies in number of patents. More over, in '94 IBM made a record (1,298 patents) by receiving more US patents than any company has received any year. In the PC domain IBM received 124 patents in 93 while Compaq— the company 2nd in the list received 18 patents followed by Intel and Microsoft with 5 & 4 patents respectively. **DeArias** further informed that IBM PC company labs. have received ISO 9001 certification for quality in design and scope of products and IBM manufacturing sets are ISO 9002.

The IBM expert from Singapore **Errol Pereira**, Regional Marketing Manager, PCC ASEAN/SA told **Computer Jagat** that IBM PCC has chalked out agreesive plans for massive entry into the PC arena of the emerging markets of south Asia (India, Nepal, Bangladesh etc.). To shorten the time of delivery of their products in the South Asia

AMA INTERNATIONAL UNIVERSITY — BANGLADESH

CARMEN Z. LAMAGNA

Many of today's job-seekers can improve their chance mostly by acquiring at least some literacy in computer technology. there is a need to lay the foundation for the indigenous information science development. A pioneer in computer education in Asia, AMACC-PHILIPPINES founded by DR. AMABLE M. AGUILUZ V, in 1981 started out as a clear strategy to educate the market.

Although the school's growth as an educational institution has been (a) phenomenal, AMACC management feels that there is a lot more that they could do for the computer professional of the future. From a Bachelor of Science in Computer Science, it has expanded its horizons to Computer Engineering and Electronics and Communication Engineering to Business Administration. AMABLE M. AGUILUZ FOUNDATION had supported hundreds of poor but deserving students. The main strength of the school is its human resource. Everyone believes in the school. Quality must come from within. Teachers are trained from the inside. AMACC have a fulltime Research and Development group that continuously works toward the objective.

In its continuous effort to provide quality computer-based education in other Asian countries, AMA Computer College in a joint agreement with DR. ANWARUL ABEDIN will be establishing AMA INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB). It's main purpose is to produce graduates who will contribute further to the growth and development in Bangladesh.

AIUB is a non-sectarian, non-profit, private educational institution whose community of students and personnels are committed to bring the blessings of information technology to the reach of the masses. It will involve in the advancement of new knowledge, in undertaking research and in extending relevant community service that creatively improve the quality of human life and living, using as tool the fast changing field of computer and engineering technology and also in the business world.

MISSION:

The basic philosophy of the University is to provide computer-based higher education to development-oriented student in order to meet the fast-track changes in industry, government and academe in Bangladesh.

It's mission is to provide a comprehensive, relevant, excellent and quality education in order to produce professionals responsive to the demands of leadership in computer, industry, science and technology both in domestic and international levels for the honor and glory of God almighty.

VISION:

To implement the philosophy and mission, it is envisioned that AIUB will continue to maintain its leadership in computer education, propagate computer literacy among professionals, businessmen and the likes.

IMPLEMENTATION:

In line with such belief, AIUB came up with a curriculum offering that are computer-based and will help the country in its effort of producing manpower that is at pace with the fast changing world of information technology.

The University offers a 4-year program in the following field of specialization:

I. Faculty of Computer Science:
I. B.Sc. computer Science

Graduates of this course are primarily concerned with the design of algorithm, programming languages, memory management, hardware architecture, system software, software tools and application. It will also provide the basic foundation of programming theory and methodology, system architecture, data structures, data base, operating system, computer graphics, data communications and software engineering.

II. Faculty of Engineering:

1. B.Sc. Computer Engineering
2. B.Sc. Electronics and Communications Engineering

These programs cover relevant up-to-date engineering concepts needed to analyze and design advanced computer systems. The student is provided with comprehensive engineering course leading to the mastery of all computer system design vital to all types of hardware and software applications. Using modern instructional methodologies and state-of-the-art equipment, the student learns to develop skills in computers system architecture, software design and programming, cellular/mobile telephony, digital telephony, digital and satellite communication. Graduates of these courses have vast career opportunities in both computer hardware and software fields.

III. Faculty of Business Administration:

1. B.B.A. Business Administration major in Management Information Science (MIS)
2. B.S. Economics

These courses offer a balanced comprehension of the organization of computer machine, management of human behavior, technology of data, organization and structure and nature of corporate organization. It also aims to develop among its students the practical skills in business and industry to meet

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the managerial challenges of the 21st century. Graduates will be professionals in the area of computer technology and the management of the information system.

FACILITIES

AMA INTERNATIONAL UNIVERSITY-BANGLADESH gives a wide range of world-class facilities with the most modern equipment and laboratories. It will have an IBM mainframe 4331, RISC 6000 and the most modern IBM AS 400 Series which are exclusively used for higher education. It will have an extensive hardware and software libraries, digital laboratories, drafting with AUTOCAD and Local Area Network (LAN) laboratories in the putner. All University system will be computerized.

The teaching staff is composed of both full-time foreign and local nationals who are competent, responsible and top caliber experts selected only through rigid screening process.

INTERNATIONAL RECOGNITION:

AIUB has international recognition upon its admission as an accredited member of the American League of Colleges and Universities (ALOCU) with more than 50 members from Australia, Canada, Japan and the United States. With this rated honor, AIUB students can pursue higher learning in affiliated universities all over the world. It has also academic

collaborative arrangements via sister-school relations with Australia, Canada, China and Malaysia. The opening of overseas branches paves the way for academic exchange of methods and materials as well as students with unlimited educational opportunities. AIUB is also a member of the John. F. Kennedy Educational Institute, Tokyo, Japan and the American Chamber of Commerce. Another outstanding achievement is its admission into the International Athletic League (ILL), an inter-collegiate meet in basketball, volleyball, soccer and other sports among school from Asian countries.

Editors Note : The AMA Computer College of Philippines and some Bangladeshi sponsors signed an agreement about a year ago to establish a joint venture private university named "AMA International University, Bangladesh" to provide higher education in Computer Science, Computer Engineering and Business Administration in Bangladesh. The University Grants Commission has already given approval to this university.

The authority of this newly-formed university applied for a telephone connection in November '94. But unfortunately after waiting for long one year they have not yet received the desired phone connection for this IT centre. Though AMA is an institution of higher education formed with foreign investors participation, the T & T authority seems to have paid no attention to the request of this university. If the BT&T authority cannot provide a simple telephone conection to a foreign joint venture project in such a long period of time, will it be possible for us to claim it true with the government's statement that Bangladesh is the best place for investment in South Asia?

P.S. : Computer Jagat published a report on AIUB on Jan. '95 issue.

NEWSWATCH

Microsoft Forms Alliance With Digital

Bill Gates' **Microsoft Corporation** and **Digital Equipment Corporation** joined forces bringing Microsoft-based programs into the arena of enterprise computing. Digital will use networking and itegrating skills to make microsoft's client server software widely accessible to business clients.

In exchange for Microsoft's substantial funding of Digital's support and systems integration business centred around Microsoft solutions, **Digital** promised that it will train at least 1500 new Microsoft-versed engineers within the next 24 months. Digital is also being a part of the Launch Support Team to assist the launch of **Windows 95** in the United States.

Not only that, Digital, which has heavily committed to machines based on its Alpha chip, also is jumping into lower-priced servers based on **Intel**'s chip. ◻

Training On Novell and Compaq

A three day training course on "Compaq/Novell Advanced and Server Management" was held recently at Dhaka Sheraton Hotel. It was arranged for the System Engineers working in the authorized dealers of the South Asia Region. The training was conducted by the Systems Engineer from **Novell** and **Microsoft** and the participants were from **Desktop** and **Flora** of Bangladesh and Engineers from authorized dealer of Nepal. ◻

HP CopyJet Acts as Color Copier and Network Printer

With new **HP CopyJet** system, in addition to making color copies it can be used to print directly from computer or over a network. The CopyJet is 13x23x18 inches (HWD) and 66 pounds in weight. The printer tray holds 180 sheets of plain paper.

The US$ 2,495 HP CopyJet uses four separate, large capacity cartridges for cyan, magenta, yellow and black inks. Its stops if one of the cartridges runs out of ink. CopyJet can use plain or coated paper and transparencies. As a printer it can produce (6 ppm) black text at 600 by 300 dpi, and 300 dpi color print outs. ◻

IBM's New ThinkPad

IBM has released a new model of its ThinkPad notebook family. The $7,948 **ThinkPad 760CD** has quad-speed CD-ROM drive, a 12.1 inch active matrix SVGA display, a 90 MHz Pentium processor (a 120 MHz model will be ready soon). 1.2GB hard disk, 16 MB of RAM, a PCI data bus and lot of new features. The 760CD has a 40-MHz RISC processor for decoding MPEG files. Audio is synchronized and the video picture is sharp. It weighs 8 pounds 3 ounces with CD-ROM drive in place; the floppy disk drive adds 13 ounces to the total. ◻

Digital Keeps Strong Position

Digital Equipment concentrated its sales in the governmental and corporate PC segments, continues its performance well, doubling its revenues for fiscal year ended June 1995, compared to the previous year. According to research firm Dataquest, in both Asia and Singapore, Digital's market share stayed at fifth position for the first half of this year. Compared to 1994, Digital PC and server business grew at 50% and 75% respectively. The company is also among the top three server vendors in the Asia Pacific according to International Data Corp, another market research firm. ◻

Dhaka University
Computer Science M.Sc. Final Year Admission

Applications in prescribed form are invited for admission into M.Sc. final year session 1993-94, department of Computer Science. Dhaka University of Dhaka from those who have passed the degree Honours examinations of 1993, or before, in the following subjects:
a) Applied Physics & Electronics, Physics, Mathematics, Statistics, Accounting, Management, Marketing and Finance & Banking.
b) Any other subjects with subsidiary in Mathematics or Statistics.
The applicants should have at least second division/class in the SSC, HSC and Honours or equivalent examinations and at least 50% marks in the Honours subjects, or appeared in any postgraduate or equivalent examinations.

Application forms and necessary information can be obtained from the Agrani Bank Dhaka University Branch (Curzon Hall Campus) by depositing Tk. 200/= (Taka Two hundred only) between 9 A.M. and 1 P.M. from 08-11-1995 to 25-11-1995. The completed application form with necessary documents should be submitted to the office of the Chairman, Department of Computer Science, Dhaka University during office hours by 01-12-1995. Further information can be obtained from the office of the Department of Computer Science. ◻