# Computer to Computer Communications

Human beings talk to each other to share experience, exchange ideas, share knowledge, etc. Animals communicate with each other roughly for the same purpose. Technology has added a further dimension to the communication abilities of human beings. Global telecommuncation networks allow humans to communicate over distances covering the depth and breadth of the earth. Radio communications allowed astronauts on Apollo 11 to communicate with earth from the surface of the moon.

Today the technology has made it possible for computers to communicate with other computers, much the same way as the humans do. The immediate benefits of such a communication include the exchange of data and sharing of resources.

This is not the first time **technology** has tried to mimic the capabilities of humans. The computer itself is a collection of units, very much similar in functionality to the **brain, memory, input and output** organs of a human being. What is absent in this is the intelligence; the latest efforts by the computer experts are centered around developing machine intelligence.

### Efficiency

This article examines how **computer to computer communications** have helped to increase the efficiency of the office and what technologies are available at present and what is promised for the future.

The main function of an *office* is to *handle or manage information*. Today this information is collected, stored, processed and presented in the following forms.

  Numerical data

  text data

  voice data

  image data

As part of an *Office Automation* strategy using computers, the so called "Office Information Systems" (OISs) have been developed to handle information in the office in a more organised manner. One of the main objectives of this has been to eliminate paper transactions and develop a **paperless office.** Although much has been achieved a completely paperless office has not become possible, primarily because people love to handle information on hard copies.

An OIS handles among other things the office memos, productivity information, documentation, etc. Some of this information is handled in the form of a data base distributed in several OISs and for inter office documentation to be possible, an OIS in any office should be able to talk to, or *more technically communicate with*, the other OISs in the organisation. Today, the technology provides a series of solutions based on **Local Area Network** (LAN) technology to facilitate communication between computers geographically distributed in an area covering a couple of square kilometers.

### Exchange data

The use of a LAN allows an OIS distributed in an office to exchange data and share resources such as printers and storage media. Gateways are provided to handle electronic mail, telex, facsimile, etc which form an integral part of the activities in a modern office. All these have become possible because today the computers can communicate with each other.

Before the proliferation of local area network technology, the data transfer between computers distributed in an office was handled either by using public telephone (PSTN - Public Switched Telephone Network) lines or by using the office PABXs (Private Automatic Branch Exchange). Since PABX are frequently found as an integral part of an office, the use of these for data transfer was favoured. However both these methods had inherent problems resulting in low data transfer rates and poor quality. Today, **Computerised Branch Exchanges (CBXs)** with extensive data communication capabilities are available for use in place of ordinary PABXs.

LAN technology allows the integration of many service elements in a modern office using a communcation medium operating at a higher data transfer rate and having an extremely reliable communication ability when compared with the use of office exchanges and telephone lines. Hundreds of computers distributed over several office floors in a number of buildings scattered over a large area can be connected to from a single network thereby giving the impression to the users that they are all physically next to each other. This has been possible because of the quick response delivered by the network which is a direct result of the high data transfer rate. The commonly used LANs today have a rated data transfer rate of 4 - 10 Mbits/sec (million characters per second, on average). Put in a another way, this is equivalent to the transfer of 250 typed A4 sheets in one second. However it must be remembered that the network is shared by a large number of users and therefore any single user will not get this throughput.

### Developments

The technological developments in the area of optical fibres have been used in the development of a further variety of LANs called **High Speed Local Networks (HSLNs).** Among the primary advantages of the use of optical fibres for computer to computer communication are the very high operational speed and the immunity from environmental noise and disturbances. It has therefore become possible to achieve a data transfer rate of several hundred Mbits/sec (typically 100-400 Mbits/sec) on HSLN using an optical fibre medium. The optical fibre networks of the future are expected to operate in the Gbits/sec range (1 Gbit = 1000 Mbits).

Although the LANs using communication media other than optical fibres are limited to a small geographical area, the use of optical fibres has removed this limitation. Thus these high speed networks can span few hundred kilometers and connect computers spread over a large area at high speeds. Their high data rates have also been useful in connecting large mainframe computers situated in cities separated by large distances. This type of computer networks are now commonly known as **Metropolitan Area Networks (MANs).**

### Large Chunks

The high data transfer rate also means that large chunks of data can be transmitted in a short time.

Therefore it has become possible to also use the same network, initially to transmit still video and more recently to transmit video. As a result of this *conferencing* has become possible using computer netwroks. The immediate impact of this to the modern office is that the management consultative meetings can be held whilst sitting in their own offices, without having to physically move into one location. In the not too distant future the Board of Directors of large multinational corporations will have the opportunity of participating in the Board Meetings whilst being in their own countries.

Technologically this means the integration of services such as data communication, voice communication, video, telex, fax, etc on one network and hence this type of networks are now known as **Integrated Services Digital Networks (ISDNs).**

When the computers belonging to one organisation are separated by distances of more than a few hundred kilometers, the most commonly used

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medium for interconnection is the one provided by the telecommunication authorities. In such situations, a single connection can involve many different transmission technologies, for example, a PSTN line, a satellite link, a microwave or a radio link, all of which are operating in a way which is quite transparent to the user. However, it must be noted that these connections are not specifically designed with data communication in mind and therefore tend to be unreliable and slow when used for these applications.

### Networks

These type of computer networks are called **Wide Area Networks (WANs)** and could normally involve translantic or intercontinental connection to establish a communication session between the computers connected at the two ends.

In many developed countries and in some developing countries Public Data Networks (PDNs), which are purpose built for data communications between computers only, have been setup. These connections are very reliable and operate at consistent data rates because they are designed specifically for this purpose.

In the more recent times, data communication networks based on *packet switching technology* have become popular especially for long distance data communications. These are known as **Packet Switched Data Networks (PSDNs)** and are designed to give very high reliability in operation. Unlike in the case of a PSTN connection, where the user occupies a line during the entire conversation and consequently has to pay for all that time, in a PSDN, a single communication link is shared by many users communicating at the same time. Therefore the users pay only for the number of packets transmitted and not for the connect time.

### Communication

Although the communication technology has made it possible for two computers anywhere on the earth to communicate with each other, the incompatibility between the computers themselves have prevented them from entering into a meaningful communication session. This also means that for two computers to have a meaningful dialogue there are certain prerequisites, which unless satisfied will restrict the chances of getting any computer to talk to any other computer.

Having realised the seriousness of the problem, the International Standards Organisation (ISO) has started work on preparing guidelines which, when adhered to, would allow two different computers to communicate with each other. Conceptually this means that the computers at the two ends are *open* for communication.

The exercise of interconnecting such systems are known as **Open Systems Interconnection** and the work of the ISO has led to the well known *Open Systems Interconnection (OSI) Reference Model.* Today there is a considerable commitment by a number of large computer manufacturers to follow the ISO-OSI guidelines in order to exploit fully the benefits offered by computer to computer interconnection.

Despite the world wide developments in computer networking technology, Sri Lanka has not seriously considered the integration of such technologies into the national economic development programmes in the country. In fact **data communications and computer networking** is an area which has so far been badly neglected.

### Activity

As a reason for the low level of activity in this area, it has always been argued that there is no significant demand for data communications in Sri Lanka which necessitates the setting up of dedicated data networks. On the contrary, it is also true that in many instances, the demand is hidden and a little encouragement from the service providers could lead to explosive growth in demand.

The last few years have seen the emergence of several LANs in both public and private sector organisations in Sri Lanka. If properly exploited, this could lead to improved office environments in these organisations. However, at the present moment, there is very little infrastructure support available to provide either Metropolitan Area Networking or Wide Area Networking in Sri Lanka.

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