

DISTRIBUTED COMPUTING SYSTEM VS COMPUTER COMMUNICATION SYSTEM

DR MANISHA SHARMA

Distributed system is a common place in nowadays. It is one of the most important and extremely laborious area of research. This is partly explained by variant aspects of such systems and the inherent difficulty to separate these aspects from one another. This paper presents a brief overview of dissimilarities between distributed systems and computer communication systems: their definitions, objective of their designs and some of the most usual types.

Keywords: *Distributed computer system, Computer communication system, CPU, Network.*

INTRODUCTION

The speed at which the different changes occur in computer systems over last many decades is overwhelming. The computer systems were large in size and highly expensive during the period from 1945 to 1985. Moreover, it was highly difficult to handle them remotely as well as collectively. However, this situation began to change with two tremendous advances in technology: one in form development of powerful micro-processors with 64-bit CPUs and second in form of high-speed networks.

In case of high-speed networks local area networks (LANs) and wide area networks (WANs) are two popular categories. LANs enables the establishment of connection between thousands of computing machines within a building to transfer the small amount of information in a few microseconds. With this network facility large amount of data is possible to be moved among the connected machines at rate of *billions of bits per second (bbps)*. WANs enables the connection among millions of machines all over the universe among which large amount of data can be transferred at rates of *millions of bits per second (mbps)* and sometimes faster than it.

Besides the development of high-speed computer systems as well as networks the invention of smart phones is witness of the most impressive outcome. This device can be declared as full-fledged mini computers marked by sensors, lots of memory and a powerful CPU. Nano computers and plug computers are also finding their way in this market. These are small computers with a small size powerful adapter that can be plugged into the outlet directly and performs similar to desktop.

Development of these technologies has not only raised the feasibility of computers but also enabled the handling of large size computer systems connected together. Generally, these computers are geographically dispersed, therefore, these are usually considered to form the distributed system. The size of these distributed systems

* Department of Panjab University, Chandigarh, Email: manishatewaripu@gmail.com

may vary from small number of devices to millions of computers. The connection between all these may be wired, wireless or a combination of both. Moreover, distributed systems are generally dynamic which implies that computers can easily join and leave with certain topology as a result of which performance of underlying network changes continuously.

This paper provides the brief review of difference between computer communication and distributed systems.

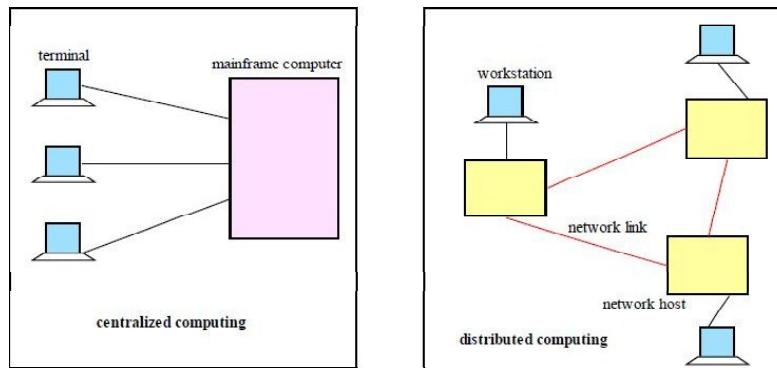
DEFINITION: DISTRIBUTED SYSTEM AND DISTRIBUTED COMPUTING

Distributed system may be defined as a collection of independent computer systems that acts as single coherent system to work on a particular task. It may consist of multiple computers that can communicate through computer networks. some examples of distributed systems include:

- Local area network and internet
- Database management system
- Automatic teller machine network
- Internet or world wide web
- Mobile and ubiquitous computing

In distributed system all the connected computers interact with each other to meet certain goals. A computer program that runs in the distributed system is called as distributed program whereas the process of writing these special programs is known as distributed programming. Further, the field of computer science that deals with distributed systems is known as distributed computing. It depicts the use of distributed systems to solve the computational problems. A certain problem can be divided into many tasks in distributed computing where each of the tasks is solved either by single computer or by multiple computers. The large-scale advances in cheaper and fast, machines and networks has raised the popularity of distributed computing.

Centralized vs. Distributed Computing



Advantages of Distributed Systems over Centralized System

Economically better price as well as comparatively better performance is offered by microprocessors over mainframes. Low price/performance ratio: cost effective way to incense of large number of personal computers, the need for people to collaborate and share information.

Advantages of Distributed Systems over Independent PCs

- Raise computing power.
- In comparison to a mainframe, a distributed system may have more total computing power.
- Some applications are infaceably distributed. eg. a supermarket chains.
- Comparatively High availability and improved reliability. In case one machine crashes, the system as a whole can still survive.
- Computing power can be added in small increments.
- Allows multiple users to share same data

Definition: Computer Communication Network

Communication is highly beneficial for the human race as it enables the sharing of information including past experience, current affairs, predictions of the future from all the available resources. Also, by communicating with different people, both resources as well as expertise can be shared. Only hermits are able to live satisfactorily in the absence of any communication with other people. In same direction individual computers are capable of gathering, processing, storing and distributing information. There are three main areas where benefits can be expected if one computer is able to communicate with others:

- it enables sharing the information, stored by other computers;
- it enables the other computers to do specialized work; and
- it enables the communication with humans that use other computers.
- The benefits are not only unidirectional. It also enables the particular computer to export its own information, its specialized abilities and access to its human users. The outcome is a beneficial sharing of resources.

At present, it is usually the case that computers inside personal items like wristwatches, or inside domestic equipment like microwave ovens, do not communicate with others. However, this situation is on the point of variation. Moreover, the communication between the more recognizable types of computers has proved to be very useful and that appropriate communication technologies are becoming available. It might also seem that a conventional home computer, or a single computer tucked into a musty office, is island-like, cut off from the world community of computers. However, this is a delusion, since such computers usually

have an obliging communication mechanism: human beings transferring the latest fruits of the computing trade on floppy disk or compact disk.

computer communications deals with direct communication among the computers.

Although human participation in the role of intermediary is being eliminated, it should not be forgotten that computers only communicate because humans have instructed them to communicate.

Uses of Computer Communication

The convergence between computer centered and human oriented worlds have raised the importance of computer communications. In computer-centered world, only the computers existed and it became convenient to inter-connect them. Whereas in human-oriented world communication facilities existed and it became convenient to computerize these facilities. In the later world, there was also convergence between telecommunications facilities largely used for interpersonal communication, such as the telephone, and broadcasting facilities largely used for entertainment, such as television. It is interesting to note that, when this phrase was coined by Marshall McLuhan (1964), coined the phrase "fruits of this general convergence is the global village" that was based on an extrapolation of existing human oriented facilities and did not envisage the future involvement of computer communications. However, it is still equally important to embrace computer-based facilities. The technology shift is captured in another, more modern term: the information superhighway. This refers to the collection of communication technology and information technology that will be used to underpin the global village of the future. Just as roads underpin the movement of people and goods, so the information superhighway will underpin the movement of information. To understand the current uses made of computer communications, and to point ahead to future developments, it is useful to conduct a brief historical survey of how different communication systems emerged and then converged. This follows in the next three subsections, which cover developments on the computer front, on the telecommunications front, and on the broadcasting front, respectively. A central concern is the demands that are made by these differing types of systems if they are to be realized using computer communication facilities.

The computers might be able to cope with the communication of 1 gigabit (1 000 000 000 bits) per second nowadays. When pushed to one extreme, a collection of communicating computers can be placed into one box, with high o quantify these demands, time can be measured as usual, in seconds, or in fractions or multiples of seconds. Information can be measured using bits (short for 'binary digits'). The quantity of information available in one bit is that required to distinguish between two possible values. For example, one bit of information is enough to distinguish between 'on' and 'off', 'black' and 'white' or 'yes' and 'no'. A more precise definition of both information, and the bit as a measure of information, is given in Chapter 2. The bit is like any other unit, so it is convenient to talk of the kilobit (kbit), which is 1000 bits, and the megabit (Mbit), which is 1 000 000 bits.

Motivation for Computer Network Applications

- Motivation for business network applications:
 - Resource sharing: Data, programs, equipment are available to users regardless of their physical location.
 - High reliability: Files and databases could be duplicated on multiple machines. Multiple CPUs prevent total system loss.
 - Economically sound: Networked micro computers using the client- server model offer better price/performance ratio than mainframes.
- Motivation for personal network applications:
 - Access to remote information: Financial information, database access, the Web, newsgroups.
 - Person to person communication: Email, voice, videoconferencing. Interactive entertainment: Video on demand, interactive TV, networked games.

Classification of Computer Networks

Based on transmission mode: – Broadcast networks:

- Use a single communication channel shared by all the computers in the network
 - Short messages(packets)are sent by any machine and received by all other computers on the network
 - An address is used in the message to select the target machine.
 - Most Localized Networks Are Broadcast Networks Point-to-point-networks:
 - Consist of Many Connections Between Individual Pairs Of machines.
 - A message packet may have to visit one or more intermediate machines before reaching its intended target.
 - Routing Algorithms Playa Important Role.
 - Most Large Area Networks Are Point-to-point networks.
- 1 Local area networks (LANS): room, building, campus
 - Broadcast-based using a bus (Ethernet) oaring topology (Token Ring).
 - At any instant only one machine can transmit successfully (unless switches are used to segment the network).
 - Conflict arbitration is usually used (Ethernet)
 - Operate at 10Mbps (Ethernet),100Mbps (Fast Ethernet), 1000 Mbps (Gigabit Ethernet).
 - 2 Metropolitan area networks (MANS): city

- Uses Distributed Queue Dual Bus (DQDB)
 - Traffic destined to the right of the computer uses the upper bus while traffic destined to the left uses the lower bus.
- 3 Wide area networks (WANS): Large geographical areas
- Consists of Hosts (machines intended to run applications).
 - Hosts and their LANS are connected by a communication subnet which carries messages from host to host.
 - Subnet Consist Of:
 - Transmission lines (circuits, channels, trunks).
 - Switching elements: Specialized computers used to connect two or more transmission lines. These elements are also called routers.
 - Subnets are usually packet-switched (use point-to-point communication and routing algorithms).
 - Each host and its associated LAN are connected to the subnet using one or more routers.
 - The router inter connection topology is an important issue in WAN design

In distributed systems, it is fairly common for the computers involved to take on server and client roles. Servers have special capabilities, for example, storing particular information, performing particular processing of information, or having particular input or output devices attached. Clients can make use of servers by issuing requests, and by getting responses back. Overall, this is similar to the ways that humans directly interact with computers. However, in a distributed system, the computer client-server relationships are hidden from human users. The World Wide Web (WWW) reports depict the illusion of a world of information to a user. In fact, the user's computer acts as a client, and computers throughout the world that store particular WWW pages of information act as servers for this client.

In summary, the evolution of computer-oriented communications has gone from a situation where a terminal was connected to a computer via a physical cable to a situation where a computer can be connected to numerous other computers via indirect channels supplied by complex communication systems. The types of information shared are more complex and the quantities are potentially huge. The speeds are related to computer rates rather than human rates. Early terminal links required the communication of only 300 bits per second. Two high speed electronic interconnections, to form a supercomputer: a new, high speed computer consisting of many individual computing elements. This is the point at which computer communications meets the subject area of parallel computation.

We can summaries uses of computer communications as, From the point of view of a user, the interface to the converged world of computer communications, telecommunications, radio and television should allow easy access to information, communication facilities and entertainment. These will be underpinned by the

techniques associated with computer communications today. Indeed, already, devices such as telephones and television sets are really just special-purpose computers from a technical communications point of view.

COMPUTERS IN COMMUNICATION INFORMATION SIZES (IN BITS)

Table 1.1 summarizes some approximate minimum information sizes, many of them quoted earlier in this section.

Type of information	Number of bits
Tele text page	7000
One second of speech	10000
Computer-stored page of text	12 000
Character-based video screenful	15000
One second of hi-fi audio	100000
Typical faxed page	200000
One second of quality videophone	1500000
Color photograph	4000000
One second of entertainment video	15000000

From a time, point of view, ideally communications must happen quickly enough that there is no unacceptable delay to a user (for example, within half a second for speech over a telephone) and then continue at a fast-enough rate to ensure high quality. From a space point of view, ideally any computer-based device in the world should be able to communicate with any other, and adequate channels must be available to support these communications. Most of this is technically feasible, but only at extortionate cost. Therefore, the practical decision is on what facilities can be provided at a reasonable cost.

Finally, we conclude that,

What is the difference between a computer network and distributed system?

1. A computer network is an interconnected collection of autonomous computers able to exchange information.
2. A computer network usually requires users to explicitly login onto one machine, explicitly submit jobs remotely, explicitly move files/data around the network.
3. A distributed system is the existence of multiple autonomous computers in a computer network is transparent to the user.
4. The operating system automatically allocates jobs to processors, moves files among various computers without explicit user intervention.

References

A. Ernst, H. Hyang, M. Krishnamoorthy, "Mathematical programming approaches for solving task allocation problems", Proc. of the 16th National Conf. of Australian Society of Operations Research, 2001.

C.H. Lee, K.G. Shin, "Optimal task assignment in homogeneous networks", IEEE Trans. on Parallel and Distributed Systems, vol. 8, pp.119-129, 1997.

- Coulouris, George; et al. (2011), *Distributed Systems: Concepts and Design* (5th Edition), Addison-Wesley ISBN 0-132-14301-1 Tel, Gerard (1994), *Introduction to Distributed Algorithms*, Cambridge University Press
- D. Fernandez- Baca, "Allocating modules to processors in a distributed system," *IEEE Trans. Software Eng.* SE-15, 11, Nov. 1989, pp. 1427-1436.
- Garg, Vijay K. (2002), *Elements of Distributed Computing*, Wiley-IEEE Press ISBN
- K. Li, "Optimal load distribution in nondedicated heterogeneous cluster and grid computing environments", *J. of Systems Architecture*, vol. 54, pp. 111-123, 2008.
- Ghafoor and J. Yang, "A Distributed Heterogeneous Supercomputing Management Systemised Computer, 6, Jun. 1993, pp. 78-86.
- Keidar, Idit; Rajsbaum, Sergio, eds. (2000-2009), "Distributed computing column", *ACM SIGACT News*.
- M.P.Singh, P.K.Yadav, Harendra Kumar "A Tasks Allocation Model for Efficient Utilization Of Processor's Capacity in Heterogeneous Distributed Systems" in. 9th Conference of International Academy of Physical Sciences, held at Agra University Agra, during Feb.-03-05, 2007.
- Optimal Tasks Assignment for Multiple Heterogeneous Processors with Dynamic Re-assignment, Harendra Kumar, M.P.Singh, Pradeep Yadav, *International Journal of Computers & Technology*, Volume 4 No. 2, March-April, 2013, ISSN 2277-3061
- S.H.Bokhari "Assignment Problem in Parallel and Distributed Computing" *Kulwer Academic Publishers*, 1987.



This document was created with the Win2PDF "print to PDF" printer available at <http://www.win2pdf.com>

This version of Win2PDF 10 is for evaluation and non-commercial use only.

This page will not be added after purchasing Win2PDF.

<http://www.win2pdf.com/purchase/>