



Distributed System and its Role in HealthCare System

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Abstract – Distributed System today arising dynamically in terms of new applications, hardware and network components, users, workload changes and in various research applications. A distributed dataset is having its importance to provide the data from various sources. This paper aims at giving an overview in this area, evaluating the current status of field and envisioning possible future trends in this field.

Keywords - Distributed System, HIT, HealthCare System

I. INTRODUCTION

It is seen that, the organizations have been interested in the decentralization of processing while achieving the integration of the information resources within their geographically distributed systems of database, applications and users. Web based systems and applications (called WEBAPPS) have evolved into sophisticated computing tools that not only provide standalone function to the users, but also have been integrated with corporate databases and real world applications.

The world is changing at fast pace and it is the need of the time to connect all the rural and remote places with the help of wireless technology .i.e. Internet using mobile phone. In the last few years of the nineteenth century and early few years of the twentieth century, medical benefits were quickly utilized by means of the progress made in the field of analogue telephony. Individuals, through this advancement, were able to call the doctor when in need. Hospitals also utilized it by transmitting electrocardiograms over telephone lines. These were the early days of “tele”- medicine or medical care delivered remotely. With every advantage comes the disadvantage, Limited bandwidth, low rate of data transfer over copper wires which were used,

coupled with interference and various noises put a brake on the centralized expansion of these techniques. Since then, data digitization, computerization and digital networks have moved beyond telemedicine to a multiplicity of e-health applications.

Primary Health Centers (PHC) are dispersed throughout the region and it is observed that, the communication techniques used today are not optimum and having lot of limitations. It is observed that, the health care(HC) environment in rural areas are inadequate in all aspects and the HC practitioners are more involved in collecting, preparing requisite reports rather than consulting the patients which is their main role. Due to their more involvement in administration, it is difficult to provide better services, consultation and provision of basic HC. Hence the Distributed web based model be setup for such organizations in. So we treat each PHC as one client node and we can design and develop distributed system models for such system. We expect, these models will be useful. The models can be user friendly, portable and self-computing clients with server using network.

Today in healthcare system, telemedicine provide the good role. The advantages of telemedicine are providing improved health care to the people in inaccessible areas. It reduces cost and improves quality of health care. It mostly reduces the isolation of users viz. specialists, nurses and allied health professionals. The term tele-medicine means the use of telecommunication and computer information technologies with medical expertise to facilitate by providing information for remote health care delivery, medical services to remote areas or across great distances on the globe.

II. DISTRIBUTED SYSTEM

Distributed System consists of multiple autonomous computers that communicate through a computer network. These computers interact with each other in order to achieve a common goal. The computer application or program which runs on a distributed system is called distributed program. The process of writing the distributed program is called Distributed Programming. It is a system where the information processing is distributed over several computers rather than confined to single machine. Distributed systems are the internet based applications which have two types of computer systems- Server node and Client node.

Traditional Systems versus Distributed Systems for Communication

Early database systems moved towards centralization and resulted into complex databases. The database systems are single user, multi user with centralized computing at server side only. These systems are traditional systems viz. single tier or host systems and two tier Architecture viz. Traditional systems having no. of limitations. Today the need of users are not limited and not based upon single location but the user wants to have the global information access and to update regularly. In the traditional systems, information is only read by the users. In these Client side computing environment can not be made available logically to server side through networks globally or remotely.

A) Traditional Systems

Traditional Systems are Database Management Systems, Relational database Management systems. These systems are centralized systems which does not support Internet applications for the data processing and decision making tasks. Hence these systems can not share the resources globally for healthcare communication. There are some limitations of traditional system-

- Very expensive hardware wise.
- Software applications tend to be extremely high.
- Difficult to share information.
- Separate licensing is not economical.
- Read operations are allowed only from client terminals.

These are non distributed systems which have two tier systems. The block diagram is shown in fig. 2.1

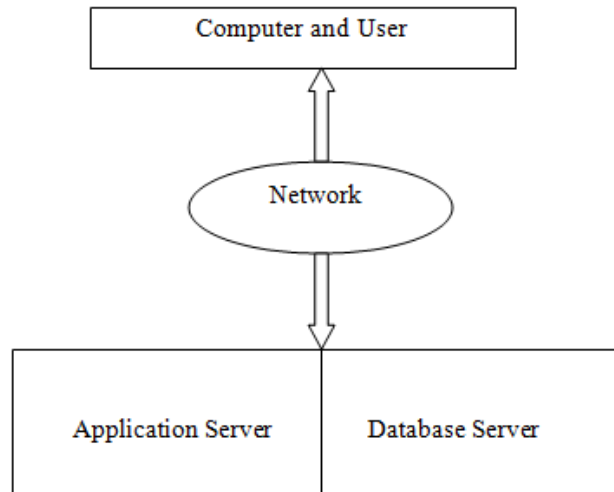


Fig 2.1 : Two tier Architecture

B) Distributed Systems

Distributed Systems are the web based applications or the systems. These are supported by the internet. They share the resources locally as well as globally. Today internet is a fastest growing technology for the data transfer operations. The client server Architecture of distributed system is shown in fig 2.2

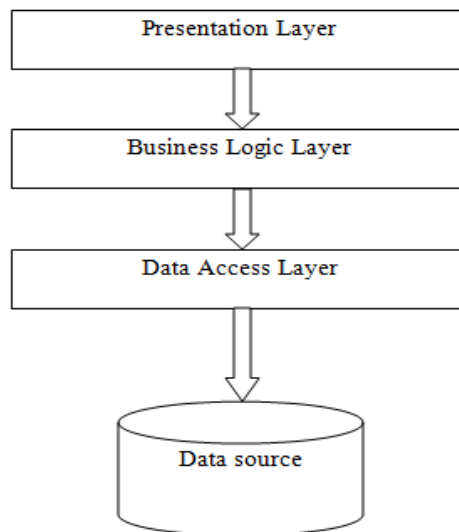


Fig 2.2: Client Server Architecture: Three tier Architecture

As compared to the traditional systems, this system performs the better task. So in healthcare application these system play a vital role.

The important merits of distributed systems are:

- Openness
- Resource sharing

- Concurrency
- Fault tolerance
- Scalability

Some disadvantages of distributed system are:

- Security
- Complexity
- Unpredictability
- Manageability

C) Architectures of Distributed Systems

Distributed System has following types of architectures:

1) Peer to peer Architecture (P2P)

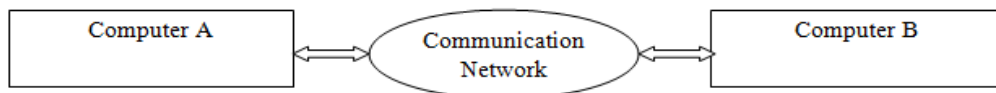


Fig2.3: P2P Architecture

2) Client–Server Architecture

It is a computer architecture which has two types of computers: Client(Requester/Sender) and Server(Receiver) which uses standard communication method such as TCP/IP for communication purposes.

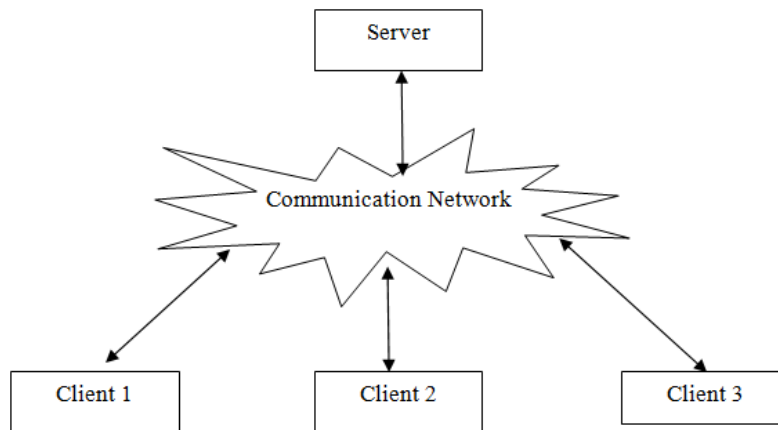


Fig.2.4: Client-Server Architecture

In addition to above architectures, there are some other types of architectures such as Distributed Object architecture, Multiprocessor architecture.

III. HIT (HEALTH INFORMATION TECHNOLOGY)

Health information technology provides the umbrella framework to describe the comprehensive management of health information across computerized systems and its secure exchange between consumers, providers, government and quality entities, and insurers. Health information technology (HIT) is in general increasingly viewed as the most promising tool for improving the overall quality, safety and efficiency of the health delivery system (Chaudhry et al., 2006). Broad and consistent utilization of HIT will:

- Improve health care quality
- Prevent medical errors
- Reduce health care costs
- Increase administrative efficiencies
- Decrease paperwork
- Expand access to affordable care

IV. HEALTHCARE SYSTEM

A health system, sometimes referred to as health care system, is the organization of people, institutions and resources that deliver health care services to meet the health needs of target populations.

The recent advances in the growth of medical sciences, engineering studies, communications and information technologies have been supported by the growth of internet technology. Internet technology provides us effective, efficient and improved health care information about the patients and their health related problems. In healthcare field, face to face meetings between patients and doctors, doctors and doctors are essential and important. The situations where these meetings are not possible, there the designed models play a very important role in obtaining information about better treatments and care. It also covers all forms of communication between users: patients and health workers through electronic equipment from remote locations and areas.

A) Interoperability in healthcare System

Interoperability is the ability of two or more components, applications or systems to exchange and use information. There is currently a major challenge for the healthcare industry in achieving interoperability among applications provided by different vendors each hospital department or medical clinic may use multiple applications to share clinical and administrative information among applications.

For health professionals, it improves access to health record data and health information anytime, anywhere. For patients, quality and safety of care is improved by improving data exchange, quality of data flow and access of patients' information by health professionals. For health managers, data collection is improved and statistical and economic analysis is facilitated. For health researchers, availability of medical data is increased.

B) Distributed Patient Record

Distributed systems have a great importance in handling distributed patient records. The patient record has a distributed architecture and each client computer have local database. In distributed database architecture the data is not stored entirely at a single physical location instead it is spread across a network of computers and connected via communication links. We have

therefore a large database capacity, reliable, available and flexible database. The most important advantage is that a distributed database allows faster local queries and can reduce network traffic.

C) Important Processes of Healthcare and Use of Distributed Systems

It is observed that, the information is collected on paper and used at healthcare centers i.e. PHC (Primary Health Centers), THO (Tahsil Health Officer) and DHO (District Health Officer) units and its allied units. The important processes carried out at each unit are listed below:

PHC Processes:

PHC's are located at villages. The PHC is a small hospital cum healthcare assistance office. The responsibilities of PHC's are:

- To store past history in the form of medical records.
- To provide information as the help assistance by using healthcare record.
- To communicate the information for implementation of schemes for healthcare development.
- To perform medical checkups and maintain records of patients in the vicinity of PHC.
- To educate, motivate and train the villagers about best practices for prevention of diseases.

THO Processes:

THO is an important office authority who is working at Panchayat Samiti at Tahsil level. THO works at the mediator between PHC's and DHO's for the rural development. The main responsibilities of THO's are:

- To collect, compile, record and maintain various datasheets submitted by PHC's.
- To visit the PHC centers and take overview of the activities and record them.
- To communicate the data and information received from DHO's and vice versa.

DHO Processes:

DHO is an important office authority which is working at Zila Parishad at District place. The authorities works as the mediator between THO's and divisions for the healthcare development. The main responsibilities of DHO's are:

- To perform monitoring of the activities within district and provide better environment for the citizens by giving hints.
- To collect, compile, record and maintain various datasheets submitted by THO's and PHC's.
- To implement the schemes at District level & promote different healthcare related schemes through THO and PHC.

In the view of role and responsibilities performed by these authorities, it seems that Distributed Web Based model in the form of Distributed Web Based System is one of the suitable computing solution which is helpful in many applications like creation of database, deletion of databases and any specific entries, modifications with in the existing data, searching specific data items etc.

V. CONCLUSION AND FUTURE SCOPE

In this paper, we presented a research perspective on distributed system in healthcare sector. By the survey it is seen that, the current operations of health services are inadequate due to lack of communication facilities between them. Also the present data recording procedures in most of health centers leave much to be desired. Manual systems employed are inaccurate requires time, space and cost. Due to lack of well computing facilities, unavailability of current data and recent information, we felt there is a great need of modern communication system that reduces wastage of resources, time and cost. In order to minimize these drawbacks, we have to develop distributed system based on network technology, logger methodology and web based technology.

Designing of Distributed System based on Network technology, solution in the form of computing tool, providing solution to handle different query issues with healthcare system remains future work.

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