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COMPARITIVE ANALYSIS DISTRIBUTED SYSTEM VS PARALLEL SYSTEM

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Abstract— Distributed and Parallel computing best and the fastest system available so far again each other to see which one is better. Distributed systems are groups of networked computers, which have the same goal for their work. In Parallel the processors in a typical distributed system run concurrently in parallel. Parallel computing may be seen as a particular tightly coupled form of distributed computing, and distributed computing may be seen as a loosely coupled form of parallel computing. In parallel computing, all processors may have access to a shared memory to exchange information between processors. In distributed computing, each processor has its own private memory (distributed memory). Information is exchanged by passing messages between the processors. We show in this paper two system individually. Starting with Distributed system since it is the most popular used in telecommunication networks and network applications.

Keywords :- Parallel system, Distributed system, significant difference, message passing, shared memory,

distributed memory, Information, failures.

I. Introduction

1} Distributed System This paper addresses to describe the distribution system and parallel system. A distributed system is a collection of independent computers that appear to the users of the system as a single coherent system [1]. Distributed computing is a model in components of a software system are shared multiple computers to improve efficiency and performance. distributed computing is limited to programs with components shared computers within a limited geographic area.The term, distributed computing means that something is shared among multiple systems which may also be in different locations [2]. A distributed system is located on networked computers communicate and coordinate their actions by passing messages. The components interact with each other in order to achieve a common goal.

Three significant characteristics of distributed systems are :- 1) concurrency of components 2) lack of global clock 3) independent failure of components. The word such as "distributed system", "distributed programming", and "distributed algorithm" referred to computer networks where individual computers were physically distributed in some geographical area. The terms are nowadays used in a much, even referring to autonomous process that run on the same physical computer and interact with each other by message passing [3]. Distributed system different models is or distributed system Workload Allocation to allocated different models like :- Workstation-server model, Processor pool model, Shared-memory multiprocessor, Workstation model, hybrid model. Distributed operating system goals is High performance, Reliability,

Scalability, Consistency, Security[4].

What is a distributed system?

 A collection of autonomous computers linked by a network

 using software to produce an integrated computing facility[4].

Why distributed systems?

 Availability of powerful yet cheap microprocessors (PCs, workstations, PDAs, embedded systems, etc.)

 Continuing advances in communication technology [1].

What size is a distributed system?

 Local Area Network

 Metropolitan Area Networks

 Wide Area Networks[4].

Key characteristics of distributed systems

 Resource sharing.

 Openness.

 Concurrency.

 Scalability.

 Fault Tolerance.

 Transparency.[4]

FAILURE MODES IN DISTRIBUTED SYSTEMS

 Authentification detectable byzantine failures

In this mode a server may show byzantine failures but it cannot lie about facts sent by other servers.

 Performance failures

This is simple to understand. the server is delivering the correct values, they generate at the wrong time, either early or late.

 Omission failures

This is a special case of the previous one. The server is replying “infinitely late”.

 Crash failures

When a server suffers from an omission failure and then stops responding.

 Fail-stop failures

In this mode of failure, the server only exhibits crash failures, but at the same time, we can assume that any correct server in the system can detect that this particular server has failed.[5]

 Byzantine failures

Byzantine failures are also know as arbitrary failures and these failures are genrate across the server of the distributed systems. Output from the server would be inappropriate and there could be chances of the malicious events and duplicate messages from the server side and the clients get arbitrary and duplicate updates from the server due to these failures[6].

Examples of distributed systems

 Intranets, Internet, WWW, email, ...

 DNS (Domain Name Server) – Hierarchical distributed database

 Distributed supercomputers, Grid/Cloud computing

 Electronic banking

 Airline reservation systems

 Peer-to-peer networks

 Sensor networks

 Mobile and Pervasive Computing [7].

Advantage of distributed systems

 Economics

 Speed

 Inherent distribution

 Reliability

 Incremental growth

Disadvantages of distributed systems

 Software

 Network

 More components to fail

 Security

2} Parallel System

Parallel Processing Systems are designed to speed up the execution of programs by dividing the program into multiple fragments and that fragment work to processing simultaneously. This systems also known as tightly coupled systems. Parallel computing is an evolution of serial computing where the jobs are broken into parts that can executed concurrently. Each part is further broken down to a series of instructions.

Instructions from each part execute simultaneously on different CPUs[8].

Advantages of parallel computing

- Speed up.
- Better cost per performance in the long run

Disadvantages of parallel computing

- Programming is difficult.
- Various code tweaking has to be performed for different target architectures for improved performance.
- Communication of results might be a problem.
- Power consumption is huge by the multi core architectures.
- Also, better cooling technologies are required in case of clusters[9].

II. OPRATION

1} Distributed system

Large-scale data processing applications coordinate effort among multiple computers. Distributed computing application is in multiple interconnected but independent computers coordinate to perform a joint computation. Different computers are independent in the sense that they do not directly share memory. They communicate with each other using messages, information transferred from one computer to another in hole a network.

A) Messages

Messages sent between computers are sequences of bytes. The purpose of a message ; messages can request data,

send data. the sending computer must encode information in a way that the receiving computer can decode and correctly interpret. A message protocol is rules for encoding and interpreting messages. Both the sending and receiving computers must agree successful communication. Many message protocols specify message format.

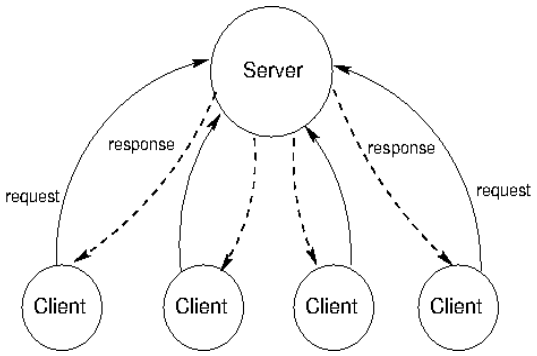
Message protocols aren't just for a particular programs. Instead, they are rules that can be applied by programs, even written in different programming languages. The TCP/IP Protocol :-. On the Internet, messages are transferred from one machine to another using the Internet Protocol (IP), it specify how to transfer the data in IP. it does not assume that any central tracking or monitoring of communication exists. Each packet contains a header . The Transmission Control Protocol is an abstraction defined in terms of the IP that provides reliable, ordered transmission of large byte streams. This improved reliability comes at the expense of latency, the time required to send a message from one point to another.

The TCP breaks a stream of data into TCP segments, each of which includes a portion of the data preceded by a header that contains sequence and state information to support reliable, ordered transmission of data. Some TCP segments do not include data at all, but instead establish or terminate a connection between two computers. Establishing a connection between two computers A and B proceeds in three steps:

A sends a request to a port of B to establish a TCP connection, providing a port number to which to send the response. B sends a response to the port specified by A and waits for its response to be acknowledged. A sends an acknowledgment response, verifying that data can be transferred in both directions. After this three-step "handshake", the TCP connection is established, and A and B can send data to each other. Terminating a TCP connection proceeds as a sequence of steps in which both the client and server request and acknowledge the end of the connection.

B) Client/Server Architecture

In this architecture, clients and servers have different roles. The server's role is to respond to service requests from clients, and a client's role is to issue requests and make use of the server's response in order to perform some task. The diagram shows the architecture.



The most people use of the model is World Wide Web. When a web browser displays the contents of a web page, several programs running on independent computers. This section describes the process of requesting a web page in order to client/server distributed systems.

The web browser application on a Web user's computer has the role of the client when requesting a web page. When requesting the content from a domain name on the Internet, such as www.nytimes.com.

The client step first requests the Internet Protocol (IP) and also address of the computer located at Domain Name Server (DNS). A DNS provides the service of domain names to IP addresses, which are numerical identifiers of machines on the Internet

The Hypertext Transfer Protocol (HTTP) is a protocol implemented using TCP that communication for the World Wide Web (WWW). It assumes a client/server architecture between a web browser and a web server. HTTP specifies the format of messages exchanged between browsers and servers. All web browsers use the HTTP format to request pages from a web server, and all web servers use the HTTP format to send back their responses.

HTTP requests have several types ,GET and POST.

If you have typed in a wrong web address, or clicked on a broken link, you may have seen a message such as this error:

404 Error File Not Found

It means that the server sent back an HTTP header that started:

HTTP/1.1 404 Not Found

A server provides a service, possibly to multiple clients simultaneously, The clients do not need to know the details of how the service is provided, or how the data they are receiving is stored or calculated, and the server does not need to know how its responses are going to be used.

A disadvantages of client/server systems is that the server is a single point of failure. It is the only component with the ability to dispense the service.

C) Peer-to-Peer Systems

The client/server model is appropriate for serviceoriented situations. The term peer-to-peer describe distributed systems in which labor is divided all the components of the system. All the computers send and receive data, and they all contribute some processing power and memory.distributed system increases in size, its capacity of computational resources increases. In a peer-to-peer system, all components of the system contribute some processing power and memory to a distributed computation. peer-to-peer systems need to an organized network structure. The components in these systems cooperate to maintain information about the locations of other components to send messages to destinations.

Many of the systems are not pure peer-to-peer systems, because they have different types of components that serve different functions.

The most common applications of peer-to-peer systems are data transfer and data storage. data transfer, each computer in the system contributes to send data over the network. For data storage, the data set may be too large to fit on any single computer.Each computer stores a small portion of the data, and there may be multiple copies of the same data spread over different computers. When a computer fails, the data can be restored.

example of a data transfer application:- Skype, the voice- and video-chat service, is an with a peer-to-peer architecture. When two people on different

computers are having a Skype , their communications are transmitted through a peer-to-peer network[11].

2} Parallel system

Parallel systems are more difficult to program because the architecture of parallel computers the processes of multiple CPUs must be coordinated and synchronized. The three models that are most commonly used in building parallel computers include 1) synchronous processors each with its own memory, 2) asynchronous processors each with its own memory and 3) asynchronous processors with a common, shared memory. The instructions and in the data streams. These are:

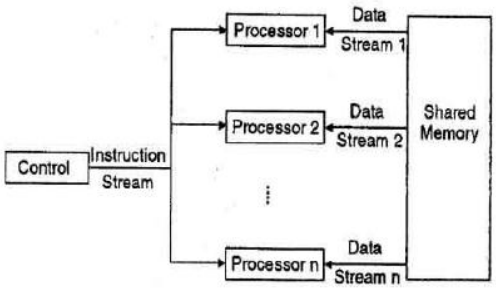
1. Single instruction stream, single data stream (SISD).
2. Single instruction stream, multiple data stream (SIMD).
3. Multiple instruction streams, single data stream (MISD).
4. Multiple instruction stream, multiple data stream (MIMD).

The above classification of parallel computing system is in terms of two independent factors: the number of data streams that can be simultaneously processed, and the number of instruction streams that can be simultaneously processed.

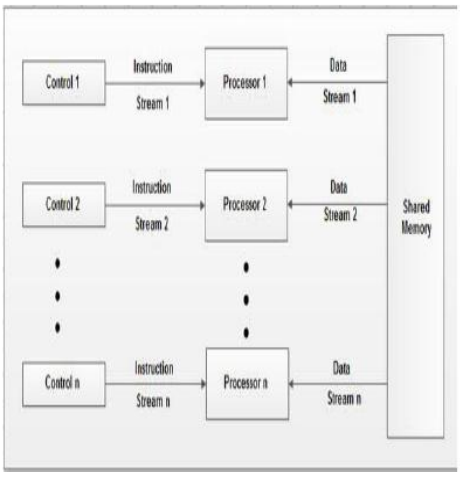
Here 'instruction stream' in algorithm that instructs the computer what to do whereas 'data stream'

The computer 'systems into four types based on parallelism but two type to parallel computers. These are SIMD and MIMD[8].

SIMD computers are consisting of ‘n' processing units receiving a single stream of instruction from a central control unit, Most SIMD computers operate synchronously using a single global clock. The block diagram of SIMD computer is shown below:



MIMD is the most powerful computer system MIMD computers are consisting of 'n' processing units and each with its own stream of instruction.MIMD covers the range of multiprocessor systems. The block diagram of MIMD computer is shown.



A parallel computer is a set of processors that are able to work to solve a computational problem.

A program has to be able to use a variable number of processors and also has to be able to run on multiple processors computer architecture. the computers have to be independent and the software has to hide individual computers to the users. A parallel system uses a set of processing units to solve a single problem A distributed system is used by many users together[8].In simple terms, parallel computing is breaking up a task into smaller pieces and executing those pieces at the same time, Let's look at a simple example.

Y = (4 x 5) + (1 x 6) + (5 x 3)

On a single processor, the steps needed to calculate a value for Y might look like:

Step 1: Y = 20 + (1 x 6) + (5 x 3)

Step 2: Y = 20 + 6 + (5 x 3)

Step 3: Y = 20 + 6 + 15

Step 4: Y = 41

But in a parallel computing scenario, with three processors or computers, the steps look something like:

Step 1: Y = 20 + 6 + 15

Step 2: Y = 41

Now, this is a simple example, but the idea is clear. Break the task down into pieces and execute those pieces simultaneously[10].

III.COMPARISON

1) The processors of distributed operating systems can be placed far away from each other to cover a wider geographic area which is not the case with parallel processing systems.

2) IN the distributed operating system there is an unpredictable communication delays between processors whereas the processors in the parallel processing system share over an interconnection network.

3) Distributed Operating systems are Loosely Coupled systems whereas parallel processing systems are as tightly coupled systems.

4) A Loosely coupled system in which the processors do not share memory and each processor has its own memory whereas in a tightly coupled system there is a single system primary memory shared by all the processors.

5) The number of processors usefully deployed is very small in a parallel processing operating system whereas for a distributed operating system a larger number of processors can be usefully deployed.

6) Global clock is used for controlling SIMD and MIMD in parallel .in distributed no any global clock

[12].

IV. TECHNICAL SUPPORT

Parameter	Parallel Systems	Distributed Systems
Memory	Tightly coupled shared memory UMA, NUMA	Distributed memory Message passing, RPC, and/or used of distributed shared memory
Control	Global clock control SIMD, MIMD	No global clock control Synchronization algorithms needed
Use	Machines connects with dedicated highspeed LANs and switches	Can be connected using public-purpose network, e.g., Internet
Cost	**Cost** Communication cost is assumed to be small	Communication cost and problems cannot be ignored
Processor interconnection	Order of Tbps Bus, mesh, tree, mesh of tree, and hypercube (-related) network	Order of Gbps Ethernet(bus), token ring and SCI (ring), myrinet(switching network)
Database	database that can do multiple tasks in parallel allowing the database to make use of multiple CPU cores and multiple disks that are standard for modern database servers[13].	database where data is distributed across multiple hosts[13].
Main focus	Performance Scientific computing	Performance(cost and scalability) Reliability/availability Information/resource sharing

V. CONCLUSION

Parallel computing is a usually used in the area of High Performance Computing (HPC). It specifically refers to performing calculations or

simulations using multiple processors. Supercomputers are designed to perform parallel computation. These system do not necessarily have shared memory. Distributed computing is a actually is more general than parallel computation Distributed computing deals with additional aspects other than concurrency. Distributed computing deals with additional capabilities that may include consistency, availability and partition tolerance. These deal with the properties of a distributed system in the event of different kinds of failures Parallel computing means that different activities happen at the same time. The machinery involved here is typically much looser coupled, and the activities in a distributed system are typically far less synchronized Parallel typically means contained within the same computer while distributed spans multiple computers. While in a distributed model, operations could be done in parallel, the time it takes to pass messages between processes is vastly greater than that of the parallel model.

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