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P&DC

MV Steen, Prentice Hall, 2nd Edition 2007

Parallel Computing :-
A system is said to be a parallel system in which multiple processor have direct access to shared memory which forms a common address space.

Parallel computing Advantages :-
Provide concurrency
cost and time saving
Provide user-friendly programming

- Distributed System :-
A System composed of several system that require explicit communication among the components having a common goal set.

- A distributed System is a piece of software that ensures :-
A collection of independent computer that appears to its users as a single coherent system.



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middle layer is a software ~~layer~~ hai jo Hide krta hai

Goal

Making Resources Accessible :-

The main goal of a distributed system is to make it easy for the users (and applications) to access remote resources, and to share them in a controlled and efficient way. Resources can be just about anything, but typical examples include

Goals of Distributed system :.

Making resources available

Distribution Transparency.

Access Transparency :.

Hides differences by data representation.

Location Transparency :-

Hide location of the resources.

Migration :.

Hides migration of data.

Relocation :-

Hides migration of data while in use



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Replication :-
Hides that the resource is replicated.

Concurrency :-
Hides the concurrent use of resources.

Goals
Making resources available
Distributed transparency.
- Access
- location
- Migration
- Relocation
- Replication
- concurrency

Openness
Scalability.



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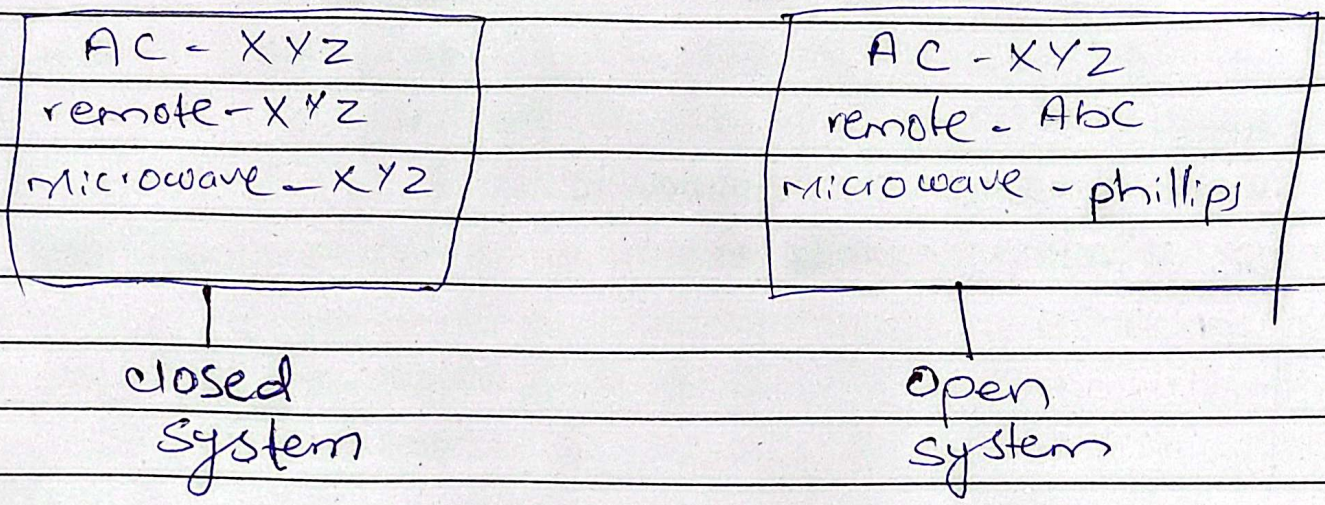
## Openness :-

XYZ - brand




## Scalability :-

Size ~~scabi~~ scalability :-

Num of uses / processes increased, programming wouldn't decreased.

## Geographical scalability :-

Distance blw nodes increased but it wouldn't effect the performance.



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Distribution :-

Q Which application does not support updates or they are inconsistent.



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Name: M. Abdullah Nadeem
SID: 14414

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1) Netflix:-

Access:-
User plays the video without knowing the nearest server

Location:-
Movie plays smoothly matter where you are.

Failure:-
User ~~rarely~~ rarely notices downtime

2) Whatsapp:-

Replication:-
Even if a server falls your message are safe

Concurrency:-
The conversation stays readable and consistent

Access:- The app handles the complexity.

3) Facebook:-

Replication:- just open app and your data is there.

Location:- Your friends can see your data in matter where they are.

Concurrency:- Feed updates consistently.



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Grid computing System:-

An Example Architecture :-

SMP layers type

Cloud Computing System:,

Transaction Processing System (TPS)
acid => Transaction hoga

1) Atomic
2) Consistent
3) Isolated: DOnot share other information with me
4) Durable :- Doubling issue.

Nested Transaction:-
Realizing Transaction:-
Enterprise Application Integration:-



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# Wireless Sensor Networks :-

## Distributed system Architecture :-

### Architectural Styles :-

widely adopted by the Networking community

## Object Based Architecture :-

This doesn't have any specific architecture unlike the layered one

## Event-Based Architecture :-

Communicate through the propagation of events, decoupled in pace.

## Data centered Architecture :-

- Communicate through a common repository.

will only be shared, when requested & the repository is active

### System Architecture :-

- Centralized architecture :-

It is where one central server and multiple clients.



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imp ~~short~~ ~~caid~~ Chord
2d IO routing

Date

## Two-tiered Architecture:

The simplest way to place a client server application is

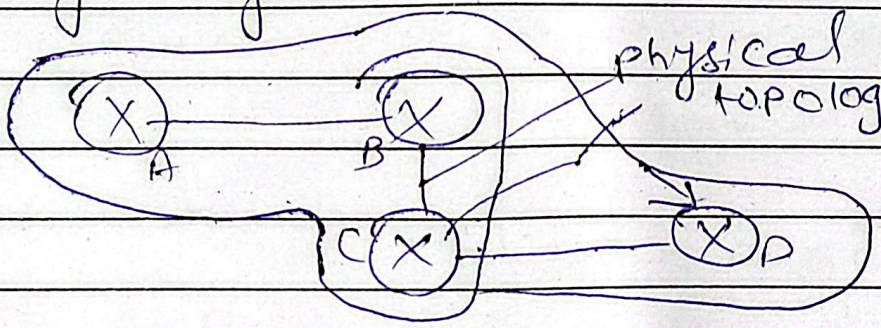
- A client machine that only implement (part of) the user interface-level
- A server machine implement the rest, i.e the processing and data levels.
- This is so called Two tier arch

## Three-Tiered Architecture:-

## ✗ Decentralized Architecture:-

## ✗ Structure P2P Systems.

Overlay — logical network -> same hai



Date _____ ose start is talk

jo available nhi hoga agar bas value no woh agay jayga mode 256 257 1

Chord :-

imp | Size = 2^m |

Finger table

$(n+2^{i-1}) \bmod 2^m$

m = 16

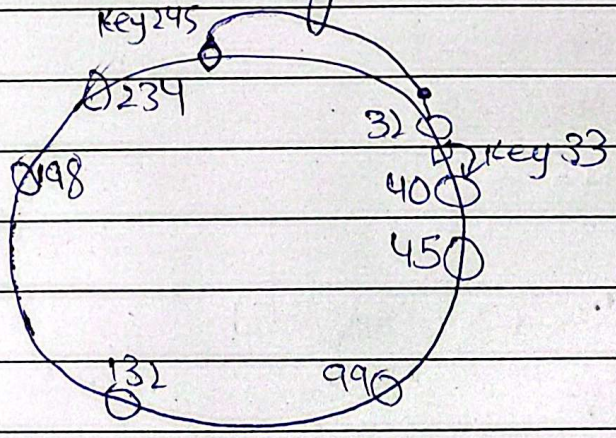
Size = $2^m$

$2^4$ = 16 Nodes

m = 4

Chord

2 Suppose these are computed with the following IDs : in the network (32, 40, 45, 99, 132, 198, 234) Their distribution on the ring look like this.




SOLO

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2 Now node 45 wants to find out where Key 33 is located?

Finger table

$(n+2^i) \bmod 2^m$

$n = 45$

$i = 0 \rightarrow m-1$

$i = 0 - 8-1 = 0-7$

$i = 0-7$

$n + 2^i$

$= 45 + 2^0 = 46$

$45 + 2^1 = 47$

$45 + 2^2 =$

$45 + 2^3 =$

$45 + 2^4 =$

$45 + 2^5 =$

$45 + 2^6 =$

$45 + 2^7 =$

$198 + 2^0 = 199$

$198 + 2^1 = 200$

$198 + 2^2 =$

$198 + 2^3 =$

$198 + 2^4 =$

$198 + 2^5 =$

$198 + 2^6 =$

$198 + 2^7 =$



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Content Addressable Network:

To add a new region split the region.

2D CAN Routing Example:

$$\sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$$

$(0.2, 0.3) \rightarrow (0.9, 0.6)$

| | $x_1$ $y_1$ | $x_2$ $y_2$ | $x_2$ $y_2$ |
|---|---|---|---|
| $r_1 \rightarrow$ | $(0.2, 0.3)$ | $(0.6, 0.7)$ | $(0.9, 0.6)$ |
| $r_2 \rightarrow$ | $(0.2, 0.3)$ | $(0.7, 0.2)$ | $(0.9, 0.6)$ |

$$\sqrt{(0.6-0.2)^2 + (0.7-0.3)^2}$$

$$= 0.5656$$

$$\sqrt{(0.9-0.6)^2 + (0.6-0.7)^2}$$

$$= 0.3162$$

$$= 0.5656 + 0.3162$$

$$r_1 = 0.8818$$

Date _____ chord and 2D CAN IMP

$\sqrt{(0.7-0.2)^2 + (0.2-0.3)^2}$

$= 0.5099$

$\sqrt{(0.9-0.7)^2 + (0.6-0.2)^2}$

$= 0.4472$

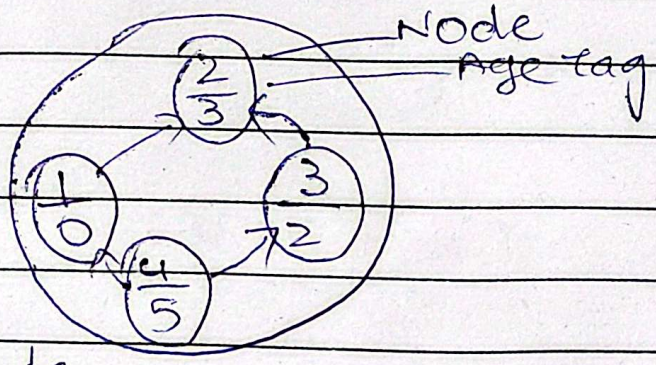
$r_2 = 0.5099 + 0.4472$

$r_2 = 0.9571$

we choose $r_1$ because it is shortest

Unstructured P2P Architectures :-

Age Tag : defines lifeline of Nodes




Search data

if our term 2

Choice we 4 → 3 → (2)

starting from: 4 - 1 → (2)

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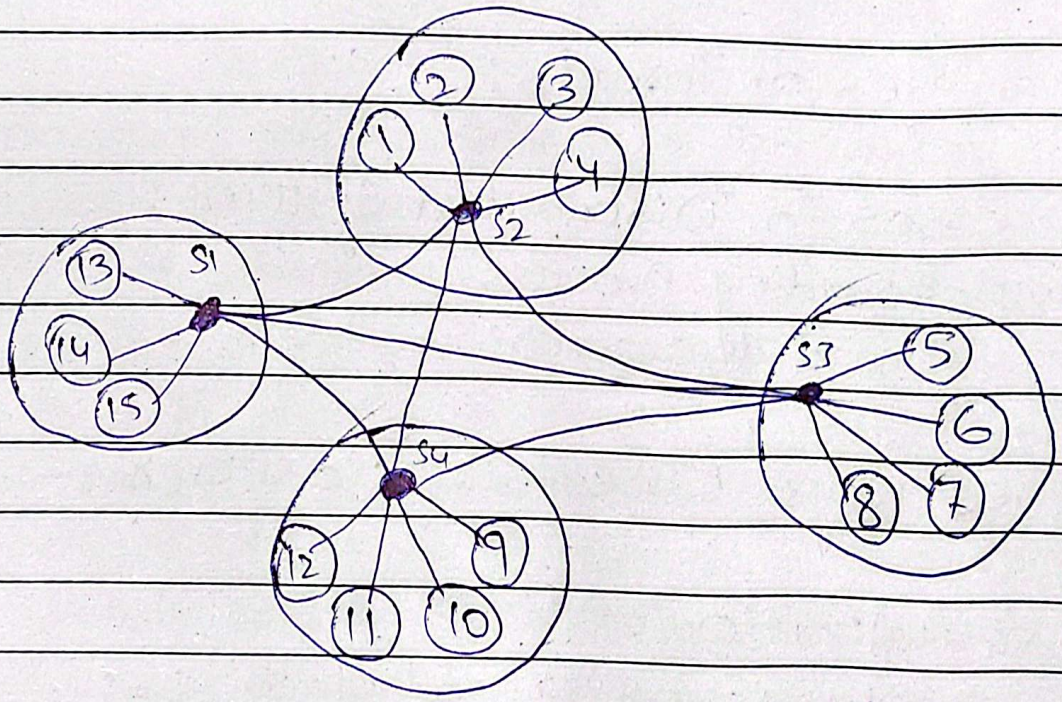
An Example of superpeer Networks :




| Node | Age tag |
|---|---|
| 12 | 1 |
| 11 | 3 |
| 10 | 0 |
| 9 | 4 |

→ Hybrid Architecture :-
Edge-server Systems :-

↳ Both centralized and decentralized both architecture.
e.g Bit Torrent

SOLO

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Threads:-

Advantages of Threads:-

Processes in Distributed Systems:-
Multi-threading Process
Multithreaded servers

Three Ways to construct a server:-

Virtualization:-
Architectures of Virtual Machines:-
Logic view of Four Interfaces
Application
Library
operating System
Hardware

Thin client approach
Other client-side Tasks
Server-side Processes
Server organization
IMP Server State:-



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# Communication

## Types of communication :-

Persistent :-
once sent, the sender can stop executing

Asynchronous :-
Synchronous => chatgpt

Messaging combinations :-

1) Persistent Asynchronous communication
message is stored (until delivered)

2) Persistent synchronous communication
A is blocked until message is stored in B's buffer.

3) Transient Asynchronous Communication :-
message is stored in A's buffer if B is not running, message is dropped
e.g UDP, one-way RPC

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4a Transient Synchronous Communication :-
Sender is blocked until the message is stored in receiver's local buffer.

4b Transient Synchronous Communication :-
sender is blocked until the message is delivered to the receiving application for further processing.
Moderate Message-Delivery-Based
e.g Asynchronous RPC

4c Transient Synchronous Communication :-
Sender is blocked until a response is received from the receiver.
Strongest Message-Response-Based
e.g RPC & RMI

Remote Procedure call (RPC) :-
A high-level network communication interface.

Client request is formulated as a procedure call to a function on the server.
Server's Reply is formulated as function return



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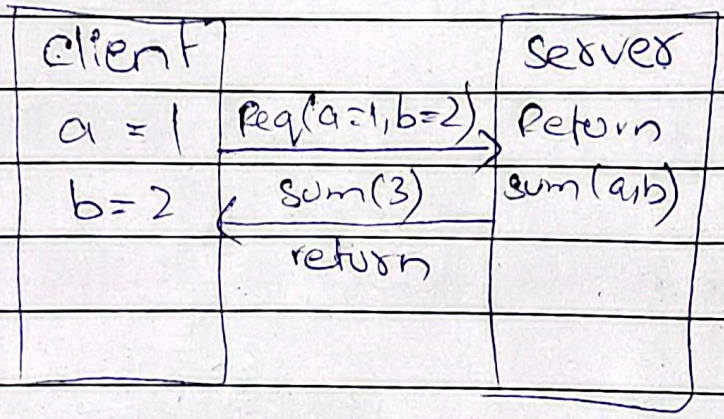


SMP RPC Flow

Client side :

1 Time per call = = calculate arguments → 6ms
2 client stub - Marshalling → 5ms
3 client OS send time → 3ms
4 Message transmission → 10ms
11 client OS receive → 4ms
12 client unmarshal Arguments → 5ms

Server side

5 Server os receive time → 4ms
6 Unmarshall Arguments → 5ms
7 Execute server procedure → 2ms
8 Marshall results → 5ms
9 Server os send time → 3ms
10 Message transmission. → 10ms

6+5+3+10+4+5

+) +5+3+10+4+5

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RPC - Issues

Call by copy / Restore

Lecture #7

Multicast Communication :

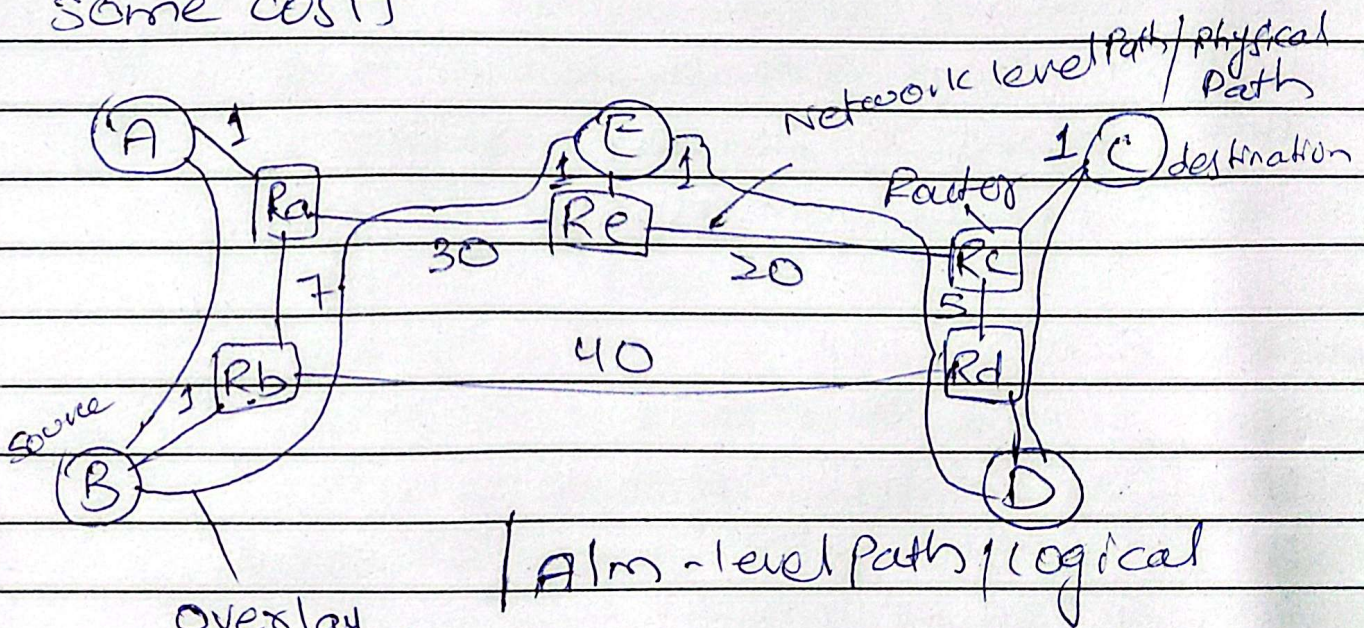
Application - level multicasting

Link stress

Stretch (RDP)

Link cost

some costs




overlay network

Stretch

Network Path = 1 + 40 + 5 + 1 = 47

ALM = 1 + 7 + 30 + 1 + 1 + 20 + 5 + 1 + 1 + 5 + 1 = 73

73 / 47

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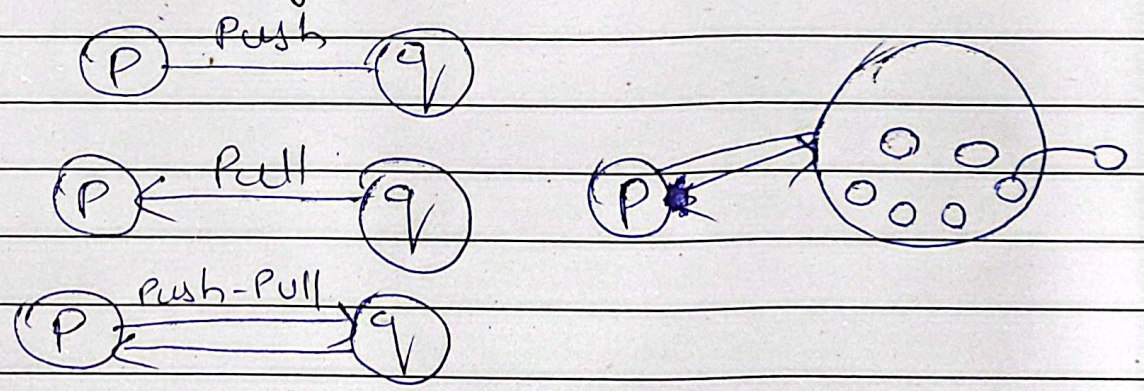
stress = {Re, Rd, RdC}

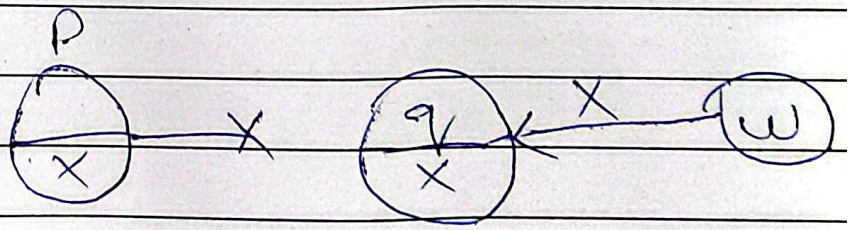
Epidemic Protocols :-

Epidemic protocols as infection diseases, rapidly propogate information.

Anti-Entropy Model




Gossip-based Data Dissemination :-



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