

Nonnormalization: process of organizing data in database.

used to remove or reduce redundancy from a relation.

col-row redundancy

Anomaly:

3 type

1) Insert 2) Update 3) Delete

missing data
data inconsistency
inconnect data

<u>Emp id</u>	<u>Name</u>	<u>Contact No</u>	<u>Dept</u>	<u>Dept mgmt</u>
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PK

Soln:

<u>Emp id</u>	<u>Name</u>	<u>contact</u>	<u>Deptid</u>
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↓
PK

table 1

<u>Name</u>	<u>contact</u>	<u>Deptid</u>
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↓
FK

<u>dept id</u>	<u>Name</u>	<u>mgmt</u>
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PK

- solve 3 anomaly

1NF: an attribute of a relation can't hold multiple values.

②
row not same

- ①
- No multi-valued attributes.
- attribute domain (type) \rightarrow same
data type
- every column \rightarrow unique name
- order data doesn't matter.

2NF:

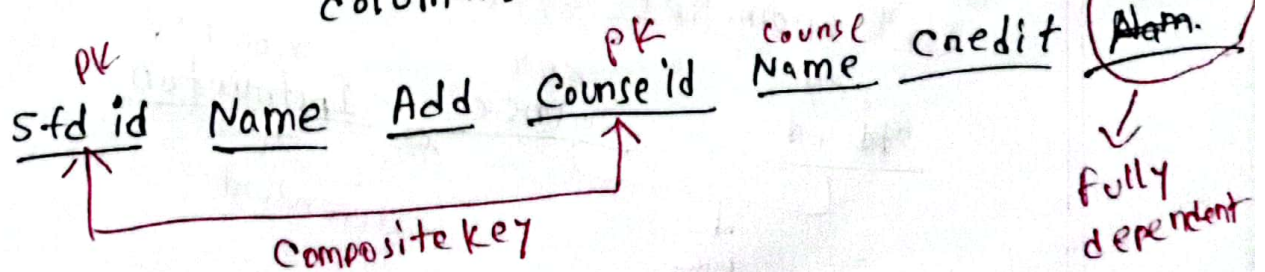
1) follow 1NF

2) Single column primary key can't depend \rightarrow partially on any subset of candidate key relation.

partial dependency should be removed.

in case of composite key,

- all columns (non-key column) should depend on each of key columns.



3NF:

1) 2NF follow

2) Transitive dependency - not allowed

↓
- જો non-key col એ non-key col નો transitive dependent હોય

Course Name Teacherid Iname Credit
PK non-key non non
key col transitive dependency

Soln: C Name Tid Credit Table 1
PK PK → Table 2
Tid Iname

3.5

BCNF → Boyce-Codd

1) 3NF follow

2) key col, non-key col નો transitive dependent નહીં.

solve

still anomalies after 3NF

std id Course Instruction
key key non-key
↓ ↓ ↑
PK PK dependent

4NF:

1) 3.5 NF follow

2) no multi-valued dependency

<u>couse</u>	<u>Inst</u>	<u>Supervision</u>
C	Fanhan Hossan	S1 S2
DBMS	Mawa suma	S3

5NF:

1) 4 NF follow

2) table can't be decomposed into any no. of smaller tables without loss of data.

6NF:

not standandized

1NF

- no multivalued attri
- unique row

<u>Roll</u>	<u>Course</u>
1	C, C++
2	C, Java

2NF

- 1NF
- no partial dependency

AB C

com
posite
key
candidate

Partial $\left\{ \begin{array}{l} B \rightarrow C \quad \times \\ A \rightarrow C \quad \times \end{array} \right.$

3NF

- 2NF
- no transitive dependency

monkey
monkey
dependency

key not
depend on
non-key

C Name Tid Tname
credit

3.5NF

- 3NF
- key not depend on non-key

std id Course
Instn.

4NF

- 3.5NF
- no multivalued dependency

5NF

- 4NF
- lossless decom position

centralized DBS

(embedded) single sys. user multi user (server sys.)

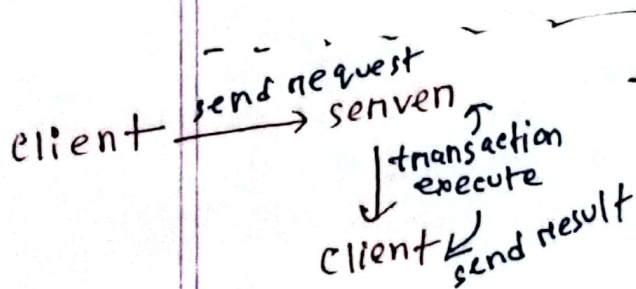
coarse grained parallelism (upto 10 processes)
Fine grained parallelism (large no. of CPU)
- data center

server system

transaction server
RDBMS

data server

- high performance
- transaction processing



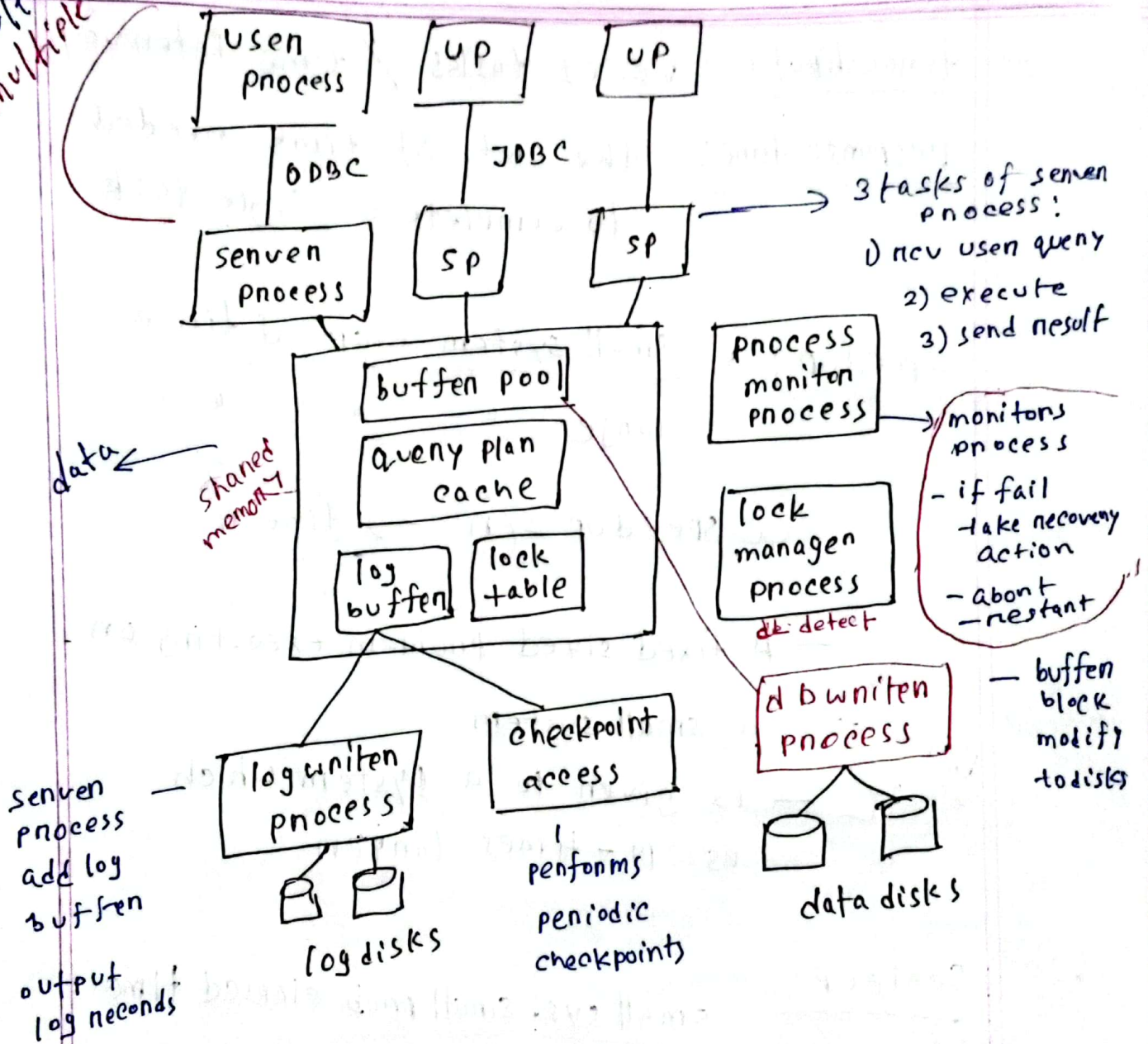
trans
local global

transaction server → query server
SQL "

- requests : SQL
- communication mechanism:
RPC
- Remote Procedure Call
- APIs : ODBC
JDBC

multithreaded
multiple process (concurrently exe.)

trans. sys pno



throughput: no. of tasks / time interval

response time: the amt. of time needed
to complete a single task

speedup: $\frac{\text{small system elapsed time}}{\text{large " " " "}}$

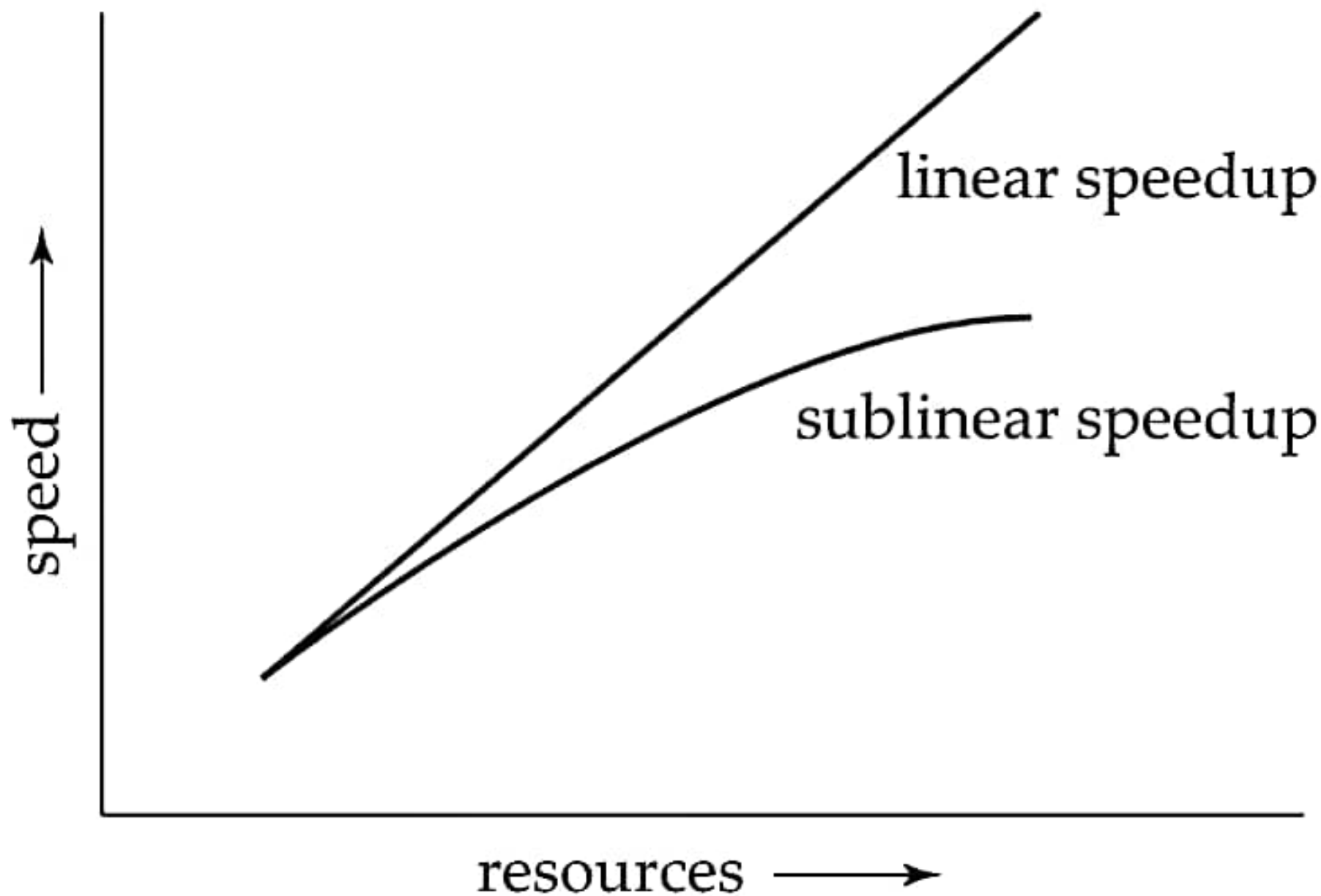
✓ speedup = $(n) \rightarrow \text{linear}$

Def: {
— A fixed sized problem executing on
a small system
— is given to a system which
is N-times larger

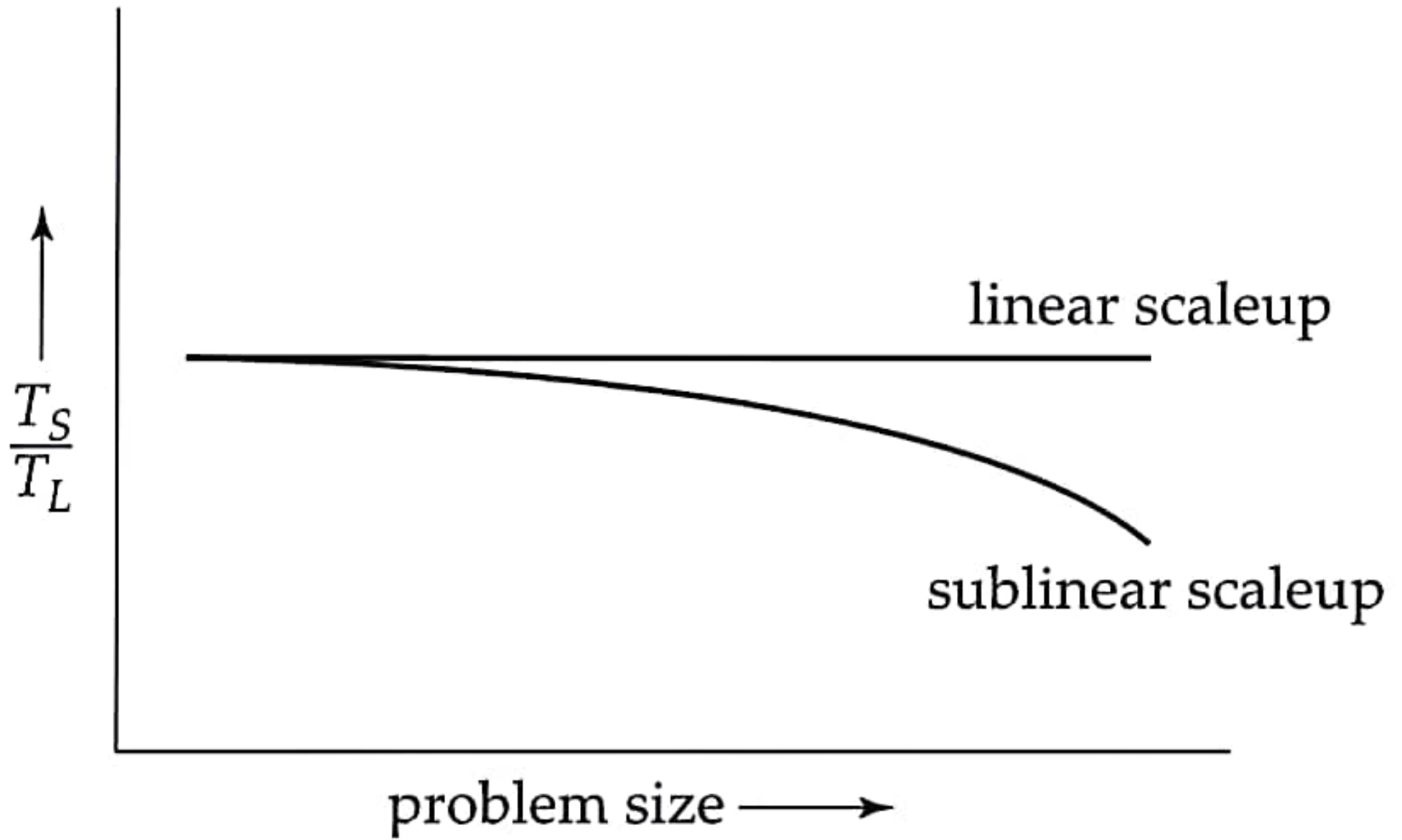
Scaleup: $\frac{\text{small sys. small prob elapsed time}}{\text{big " big " " "}}$

✓ scaleup = $(1) \rightarrow \underline{\underline{\text{linear}}}$

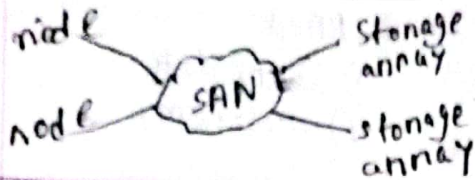
Speedup



Scaleup



modern
share disk
Anch:



SAN - Storage Area Network

(m, v_1, v_2)

Atomic:

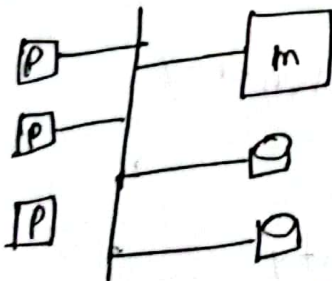
Test and Set

- 1) mem-loc = 0
- 2) mem-loc = 1, not old value
 - a) 0 → process acquired mutex
 - b) 1 → someone is holding mutex, try again
 - c) release of mutex
m = 0

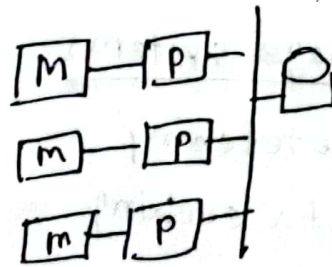
CAS Compare and Swap

- 1) a) if $m = v_1$,
set $m = v_2$
ret success
b) else ret failure
- 2) CAS(m, 0, id)
id - tid
- pid
t/p - has mutex

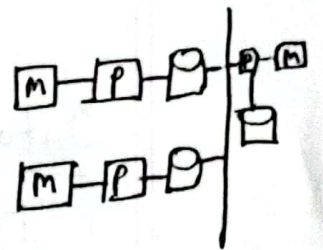
Parallel DB anch:



shared memory
(P and disc have common mem)
- bus connection

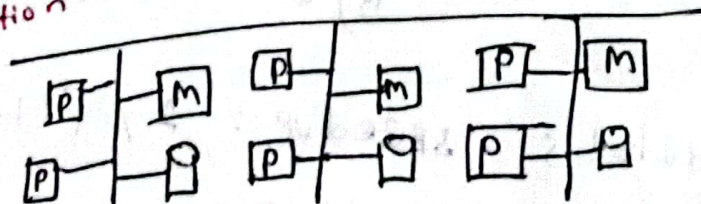


shared disk



shared nothing
- costly

top level - SN/SM
each node - SM/SN



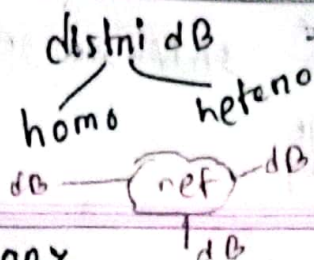
Hierarchical (lots of shared mem)

- combines characteristics of rest
3

memory
banning

stone
ban.

load ban.



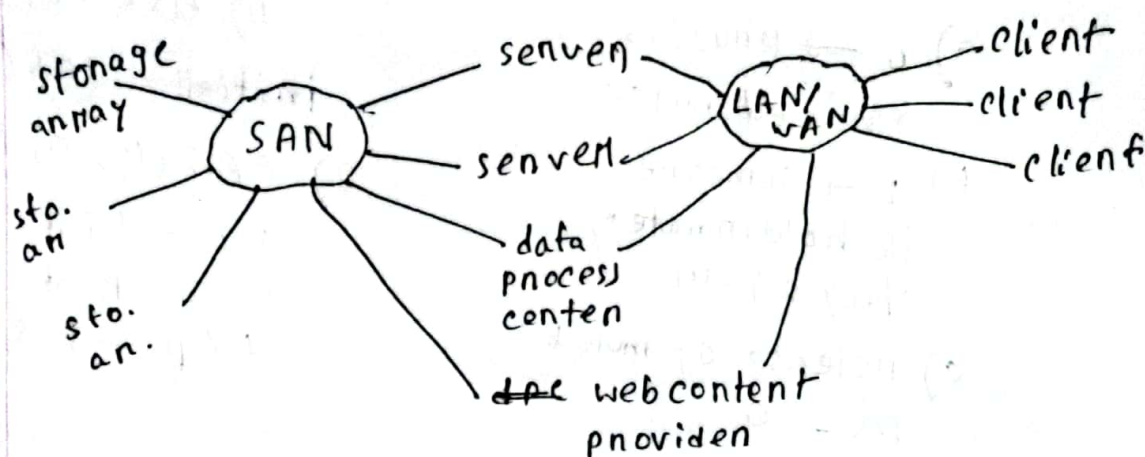
- pros
- 1) share data
 - 2) autonomy

Shared Memory

NUMA - Non-uniform
memory
archi

Shared Nothing

RDMA - Remote
Direct Memory
Access



Data storage systems

- 1) Prefetching
- 2) Data caching → cache coherency
- 3) Lock
- 4) Adaptive lock granularity
 - a) " " escalation
 - b) " " de-escalation

Amdahl's speedup: $1 / [(1-p) + (p/n)]$

Mustafson's scaleup: $1 / [n(1-p) + p]$