Agenda.

→ CAP Theorem revision

→ PACELC Theorem

→ SQL (Vs) NoSQL Databases.

⇒ Consistency
Availability
Partition Tolerance.

⇒ Out of Consistency, Availability & Partition tolerance, only 2 can be achieved at a time.

Single m/c : No Partition tolerance.

C ✓
A ✓
P ✗

Distributed System : Partition tolerance.

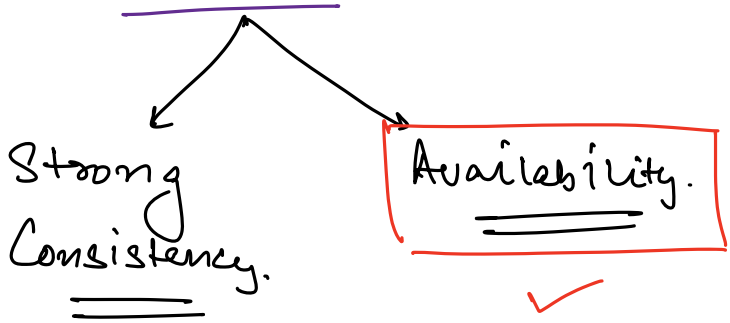
C
A
P ✓

C (OR) A

CP (OR) AP

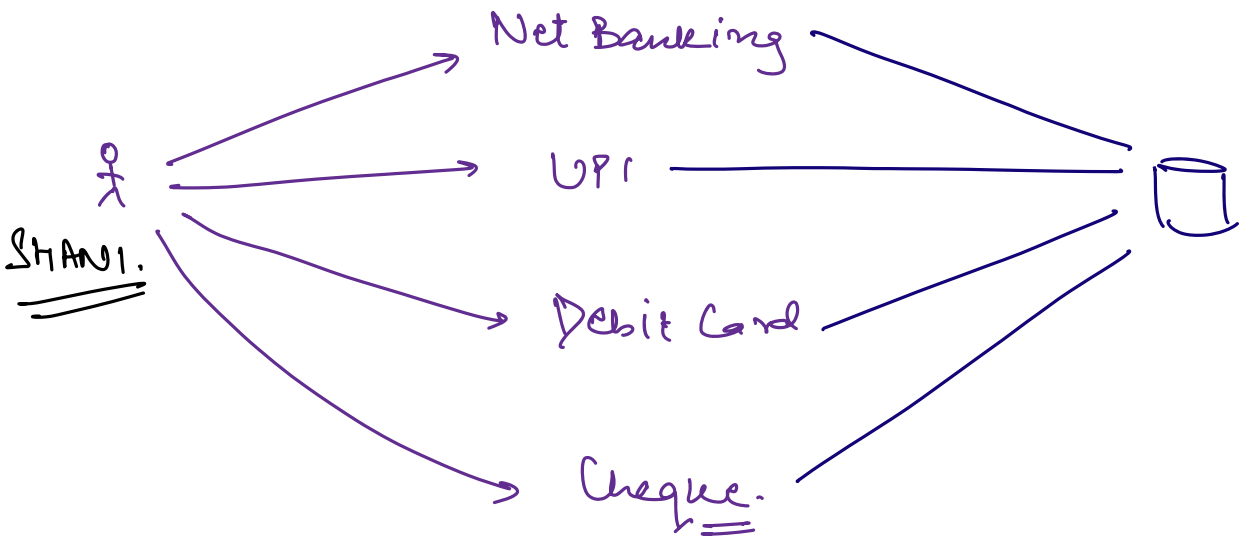
LinkedIn.

↳ CreatePost()



Bank Example.

↳ 100,000.

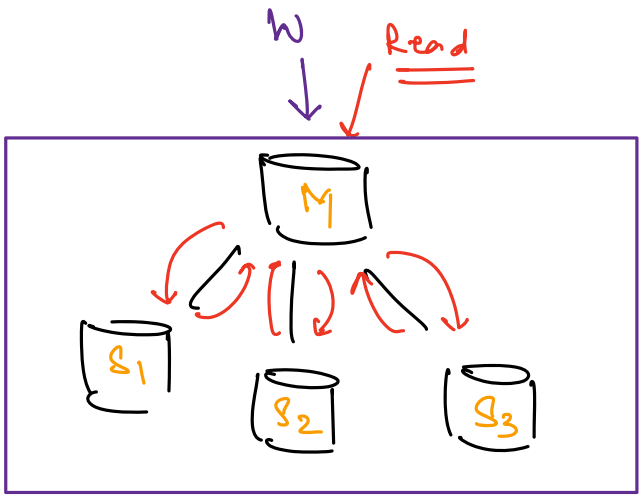


⇒ Strong Consistency.

⇒ Zerodha / AngelOne / Groww.

Stock Broking App.

⇒ Strong Consistency.



PACELC.

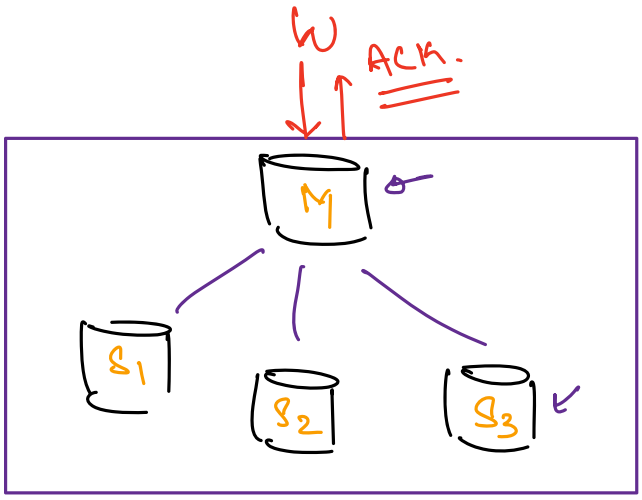
↳ Extension of CAP theorem.

PACELC

Partition → Availability (OR) Consistency

Even Otherwise

Latency (VS) Consistency.



⇒ Eventual Consistency.

⇒ latency ↓↓.

Strong Consistency ⇒ High latency.

SQL Databases.

↓

Query Language.

→ MySQL
→ Oracle
→ PostgreSQL
→ MsSQL.

⇒ Relational Databases.

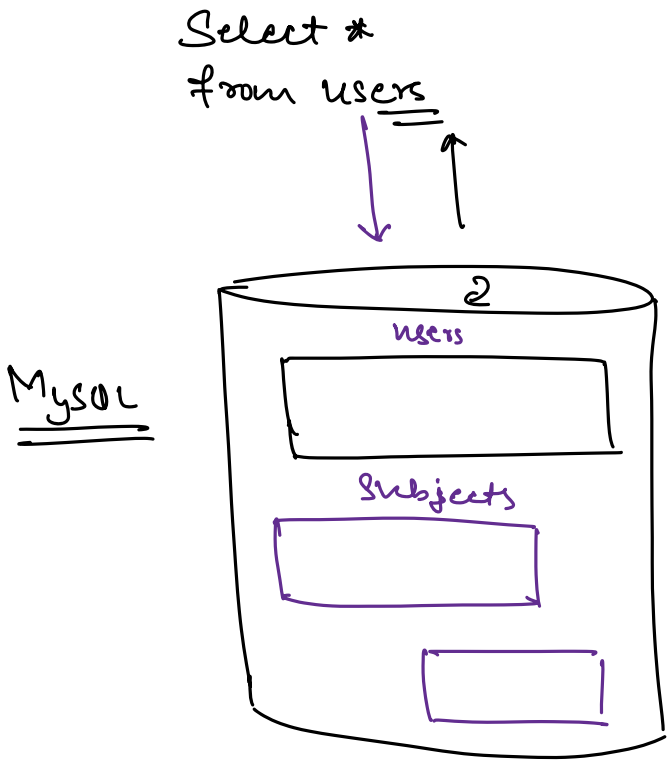
⇒ Organising data into tables.

↓

Collection of Rows | Tuples.

↓

Set of fixed Columns.



Users.

id	name	email	Phone	Address
1	A	a@—	1234	—
2	B	b@—	7854	—

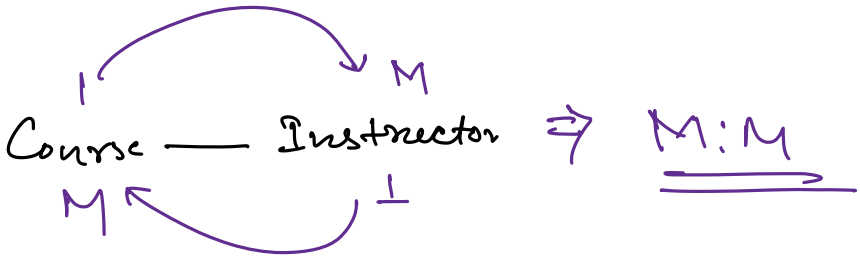
instructors

id	name	email	— . . .
1	Deepak Kalra	—	—
2	—	—	—

Courses.

id	name	duration
1	HLD	
2	LLD	
3	DSA	
4	SQL	

⇒ Relationship b/w Entities.



⇒ M:M

⇒ Mapping table.

Course_instructors.

course_id	instructor_id
1	10
1	20
1	5
2	7
2	8

Q. Get the name of all the Instructors who can take HLD.

↳ JOIN.

⇒ Normalization.

↳ No data redundancy.

⇒ Redundancy can lead to data inconsistency.

Course_instructors.

Course_id	instructor_id	instructor_name	Course_name
1	1	Deepak	
1	20	Anbuman	
1	5	—	
2	7	=	
2	8		

X

```
Select instructor_name
from Course_instructors.
where Course_name = "HLD";
```

No join required.

⇒ Inconsistent.

⇒ For query optimizations, we can preprocess the data.

ACID

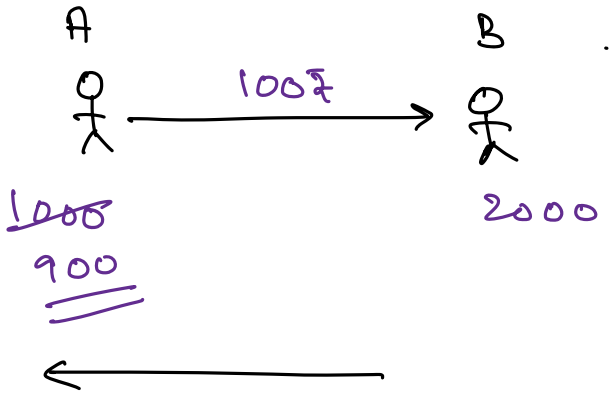
↳ Guarantees provided by SQL DB's.

Atomicity: Each transaction is Atomic in nature. Either the complete transaction will execute or nothing will execute.

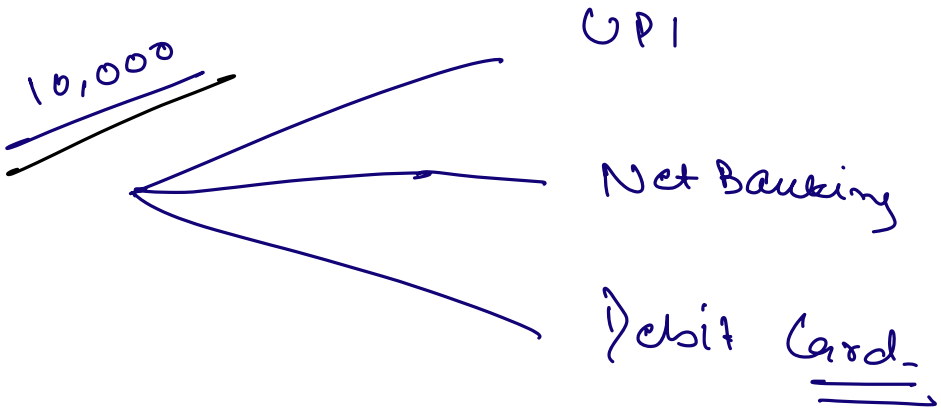
Consistency: All the data validations / constraints must be fulfilled.

Isolation: Transactions should be isolated.

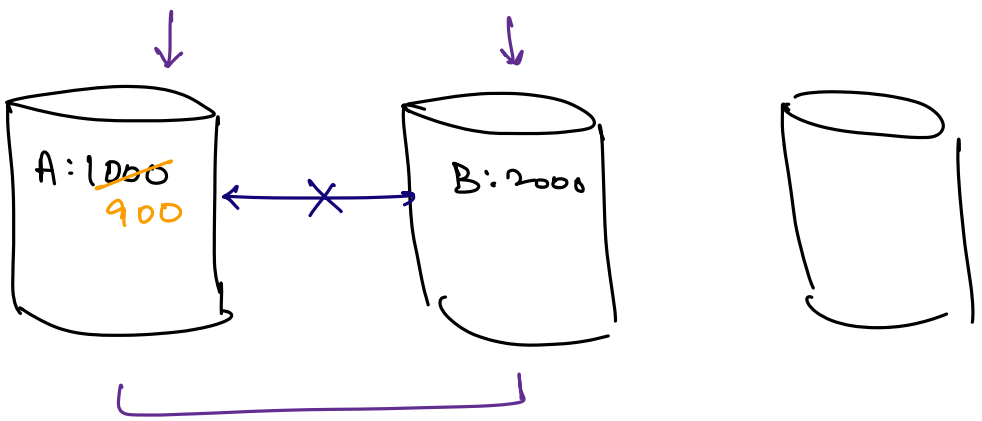
Durability: No data loss.



In case of txn failure, rollback the transaction.

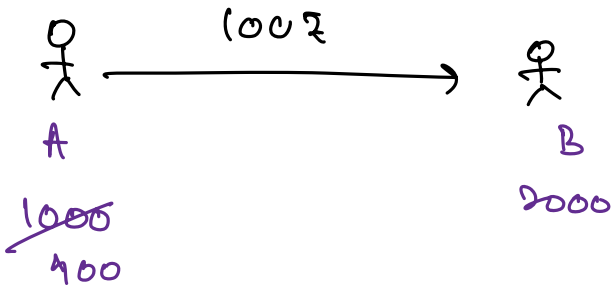


⇒ SQL DBs were designed on a underlying assumption of Single m/c.

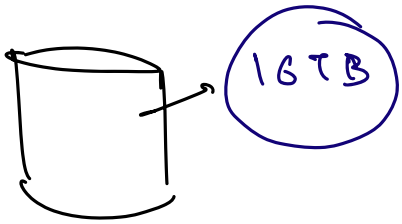


ACID.

X

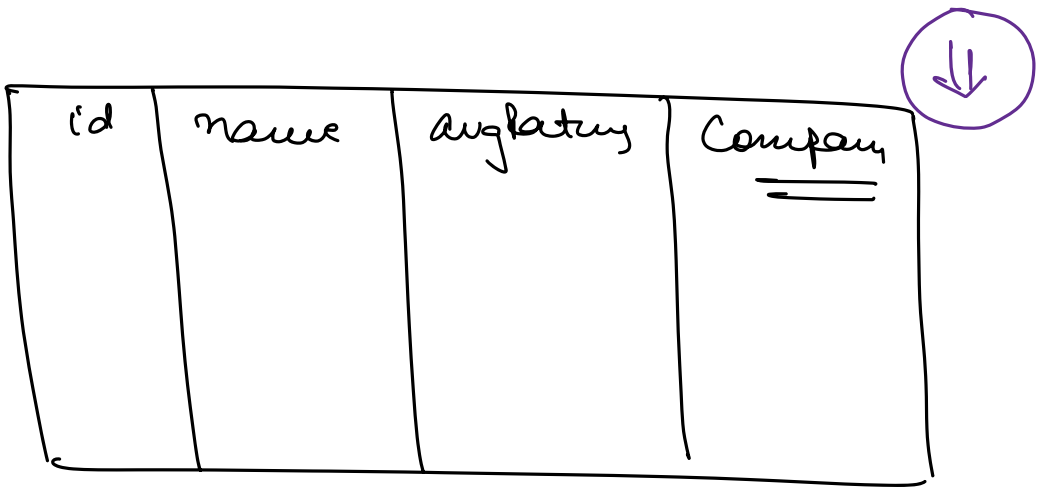


⇒ ACID properties might get compromised if data can't fit into one Single m/c for SQL DBs.



SQL → fixed schema.

↳ Defined table schema.



⇒ Amazon's Product DB.

laptop ←

Mobile ←

Shirt ←

Shoe ←

⇒ NoSQL ⇒ Next Class.