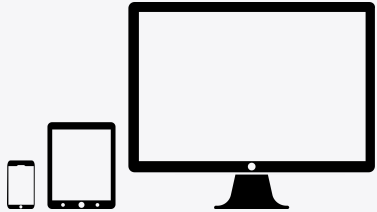# System Design Fundamentals

SQL Vs NOSQL

Client Application

Network Layer

Application Layer

Cache Layer

Database Layer

What is SQL ? (eg: MySQL Postgresql)

Employee info

Employee ID	Name	Address
15115030	Arjun	Krisha house ...
17115143	Sunil	AECS layout ...
15229010	AJ	Gandhi road ...

Employee shifts

Employee ID	Shift start time	Shift end time
15115030	1:00	1:30
15115030	5:00	5:30
15229010	10:00	10:30

What is NOSQL ?

Employee lookup store

Employee ID	Name	Address	Shift start time	Shift end time
15115030	Arjun	Krisha house ...	1:00	1:30
17115143	Sunil	AECS layout ...	5:00	5:30
15229010	AJ	Gandhi road ...	10:00	10:30

Employee connection network
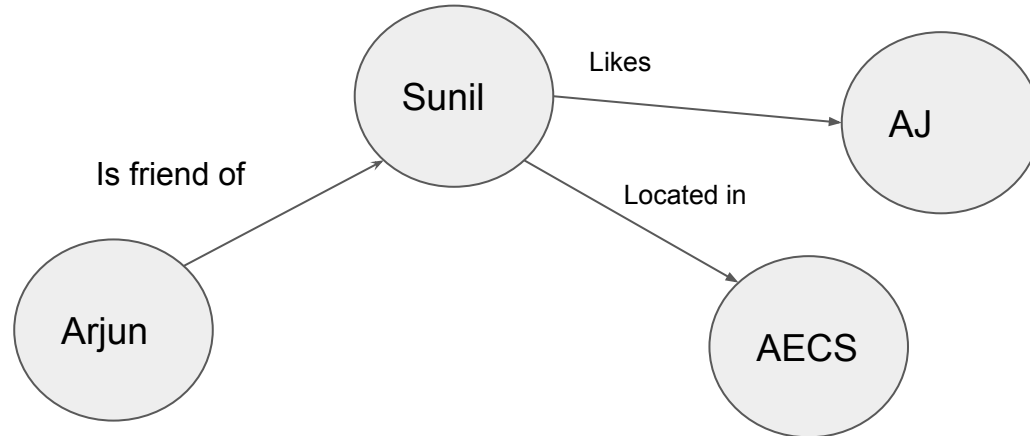
Types of NOSQL

1. **Key-value stores** (eg: Riak, Redis)

2. **Wide-column store** (eg: Cassandra, HBase)

3. **Document databases** (eg: MongoDB)

4. **Graph databases** (eg: Neo4J, HyperGraphDB)

SQL vs NOSQL

1. **Joins**
2. **Size**
3. **Maturity**
4. **Write heaviness**
5. **ACID requirement**

Joins

Select Employee ID from Employee info as EI **join** Employee shifts as ES where EI.Employee ID = ES.Employee shifts && ES.Shift start time > 5:00

Employee info

Employee ID	Name	Address
15115030	Arjun	Krisha house ...
17115143	Sunil	AECS layout ...
15229010	AJ	Gandhi road ...

Employee shifts

Employee ID	Shift start time	Shift end time
15115030	1:00	1:30
15115030	5:00	5:30
15229010	10:00	10:30

Size

- Whole data fits in the RAM ?
- Whole index data fits in the RAM ?

Maturity

- How established should the technology be in sector you operate in ?

Write heaviness

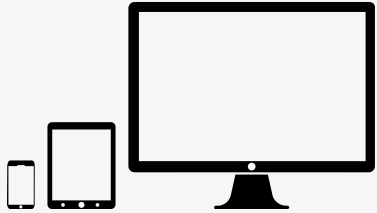- NOSQL databases have faster writes because of logs

ACID requirement

- **Atomicity:** Either *"entire"* transaction succeeds or it fails
- **Consistency:** Transaction can only bring the database from one valid state to another
- **Isolation:** One transaction should be unaware of other simultaneous transaction
- **Durability:** Database should revert to its prior state if a transaction fails

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