DISTRIBUTED SYSTEMS

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[ASHISH GUPTA]

- What is Distributed S/y ?
- Characterstics of a Distributed S/y.
- Basic Concepts.
- Motivation to Use Distributed S/y
- Types of Distributed S/y.

What is Distributed System ?

— Collection of Separate and independent Software / hardware components known as nodes.

↳ These nodes / components are networked and work together coherently to fulfill One end goal.

For Example:

Youtube or Google itself are great example of distributed System.

How ?

→ Servers to receive user's request either to watch or upload a video

→ There will be processing Queue to process the requests

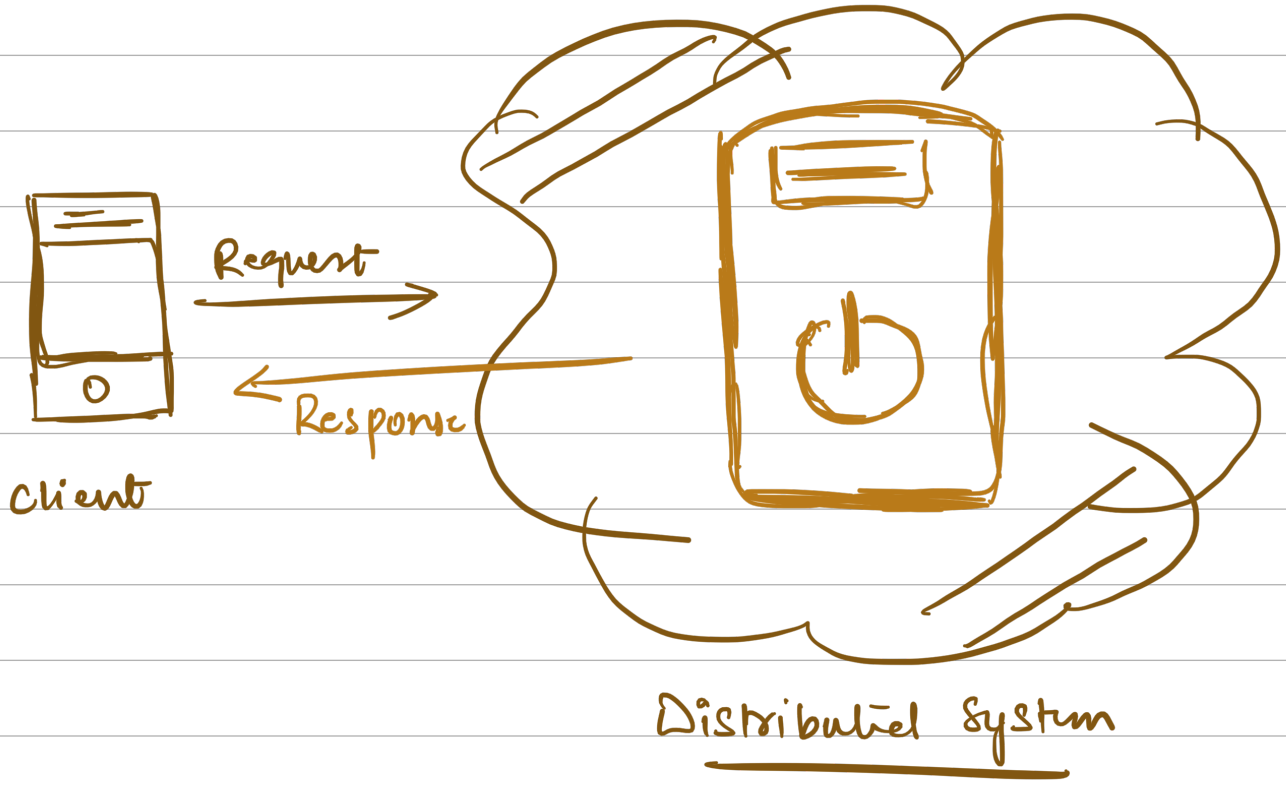
→ There will be Encoders to encode the videos.

→ User Databases, Metadata Databases Video / Thumbnail Storage etc etc.

All these components work together and create a single system called Youtube.

* However for the client (user or device), these internal complexities are hidden.

* For user it appears as single system that serves the purpose of watching videos.



* Characterstics of a Dist S/y :

- **No Shared Clock :** Logical clock is achived by Synchronization.

Like if suppose Client and Server both running on local compute will not be considered as distributed.

No Shared Memory : State is distributed

↳ Nearly each proces or component must have its independent memory.

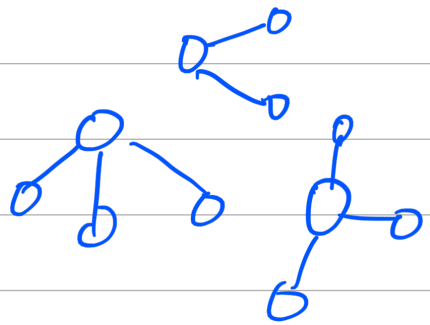
Concurrency : tasks are getting done parallely.

Loose coupling : Different Operating Systems and technologies

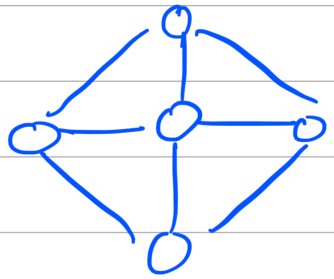
↳ not must but good to have.

* Basic Concepts and Terminologies

* **Node** :
  - hardware
  - Software
  - Open or closed groups



Open network



Closed Network

* **Resource** : → Kind of Asset
  - File
  - Service
  - Other Network etc

Basically Anything from which a Node get advantage.

* **Abstraction** : Hide max possible from users.

Like: Distribution of Resources
Replication
Migration operations etc.

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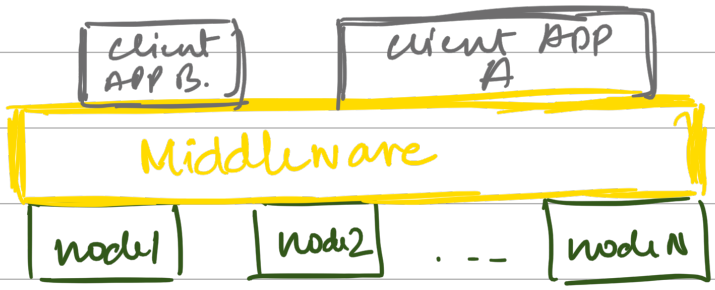
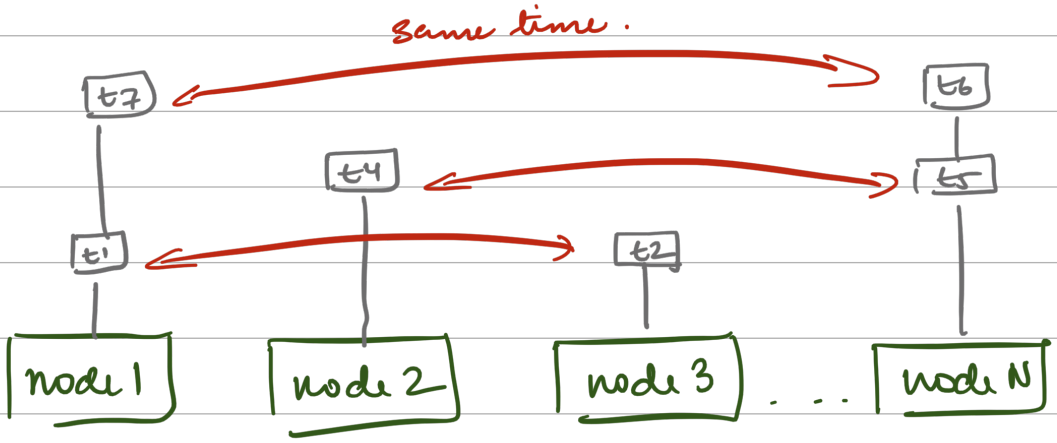
* **Middleware**: Logical layer on top of nodes

Manages
- communication and security services.
- Handle failures and other complexities



* **Concurrency**: Multiple operations parallely.



* **Coordination and Synchronization**:

coordination: Smooth collab b/w operations and Events.

Synchronization: Ordering of Events, controls access to resources.

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* **Architectural Model :**

  - how nodes / servers are organised
  - how Nodes communicate and interact

Really important for smooth and better management of complexities.

** Defines the overall Structure of System.

* **Global State :** combination of states of separate processes.

  - Kind of Global View of entire System.

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* Motivation to Use Distributed S/y :

{ Why do we have overhead of several components and servers etc ??

1. Resource sharing.
   - ↳ Distributed file systems etc
   - » Databases.

2. Scalability

3. Replication

4. Availability

5. Reliability.

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* Types of Distributed Systems :

1. Cluster Computing :

- These are Centralized
- High performance
- Minimum downtime

HOMOGENEOUS

2. Grid Computing :

Heterogeneous
Decentralized
Lot of computing power is Required.