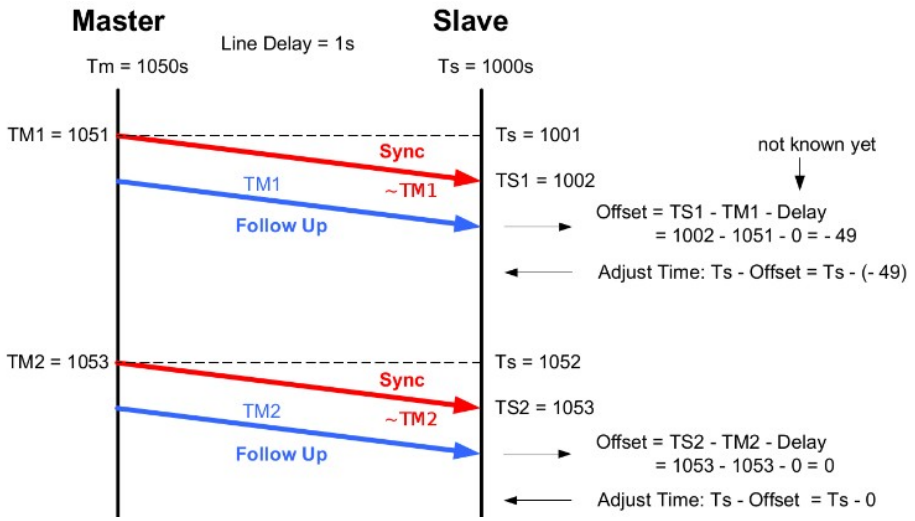
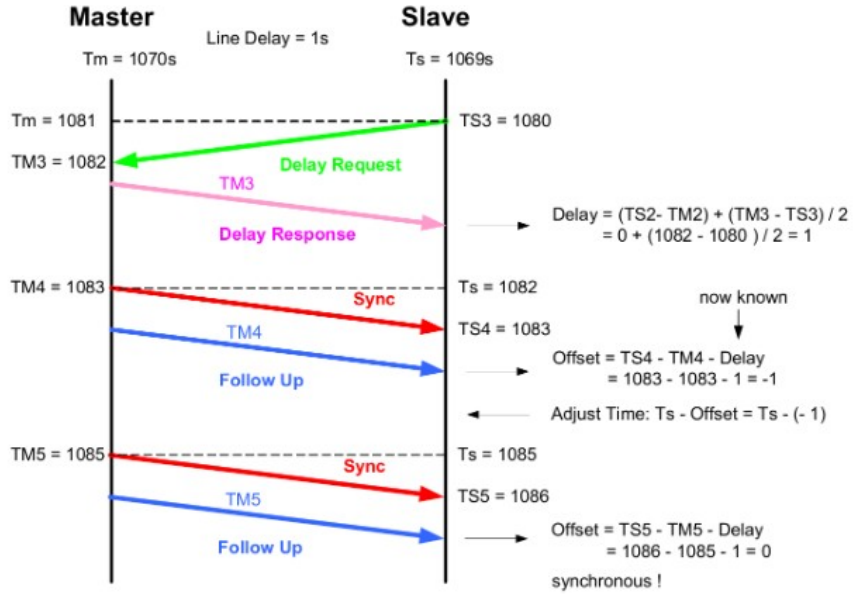
Motivation

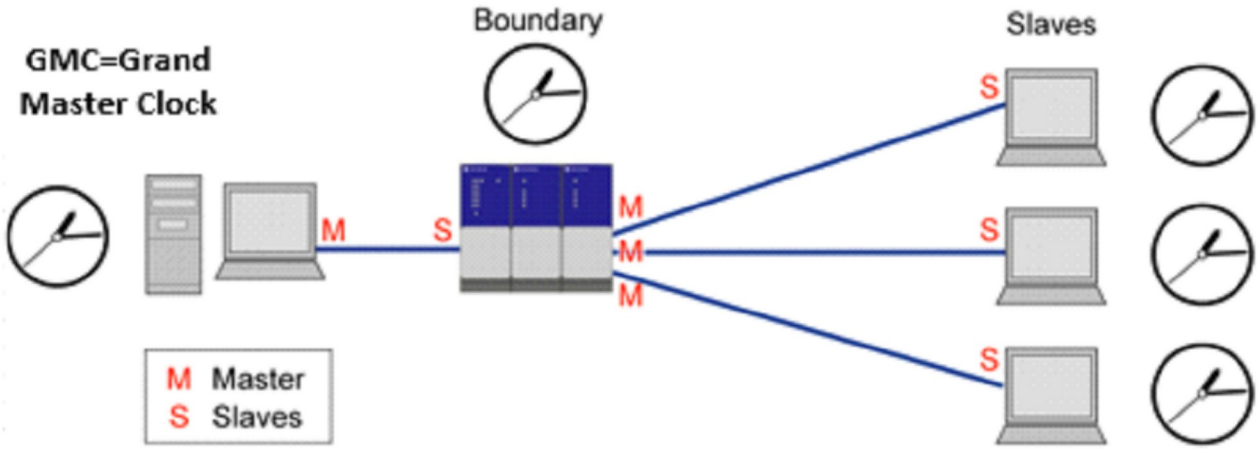
- Distributed System challenges
- Common notion

Techniques (Real)

- Challenges
- Precision Time Protocol
  - Timestamp







Techniques (Logical)

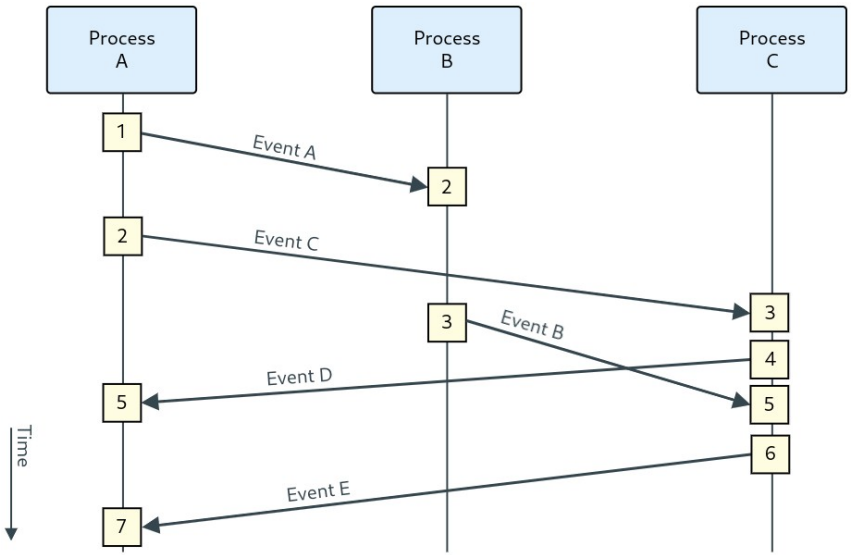
- Challenges
- Lamport time-stamps
- Vector Clocks

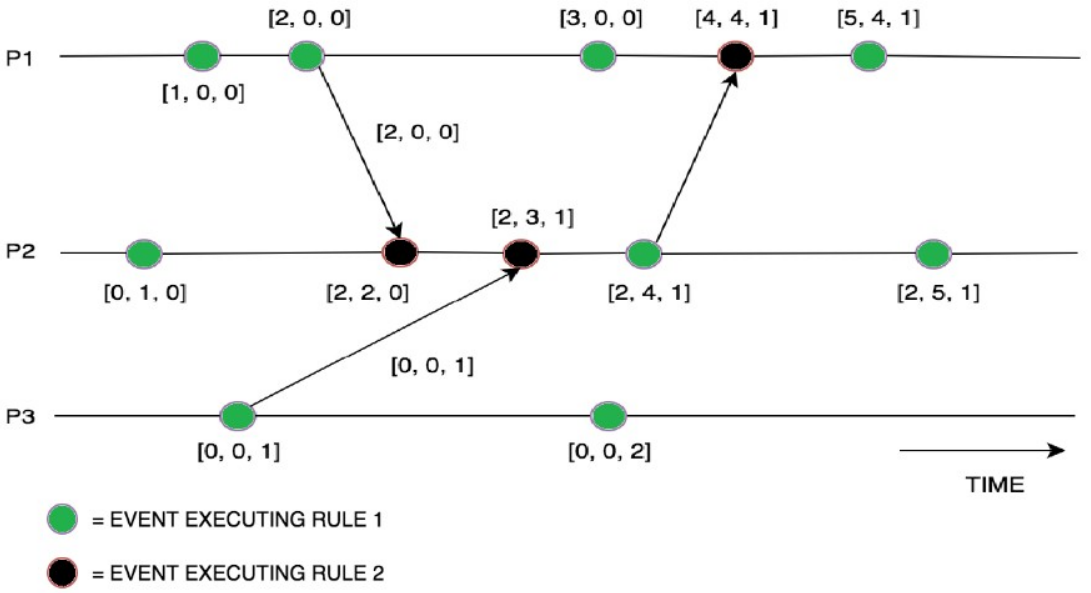
$$e_1 \rightarrow e_2 \Rightarrow C(e_1) < C(e_2)$$

thus, if $C(e_1) \not< C(e_2)$ then $e_1 \not\rightarrow e_2$

$$e_1 \rightarrow e_2 \Leftrightarrow C(e_1) < C(e_2)$$

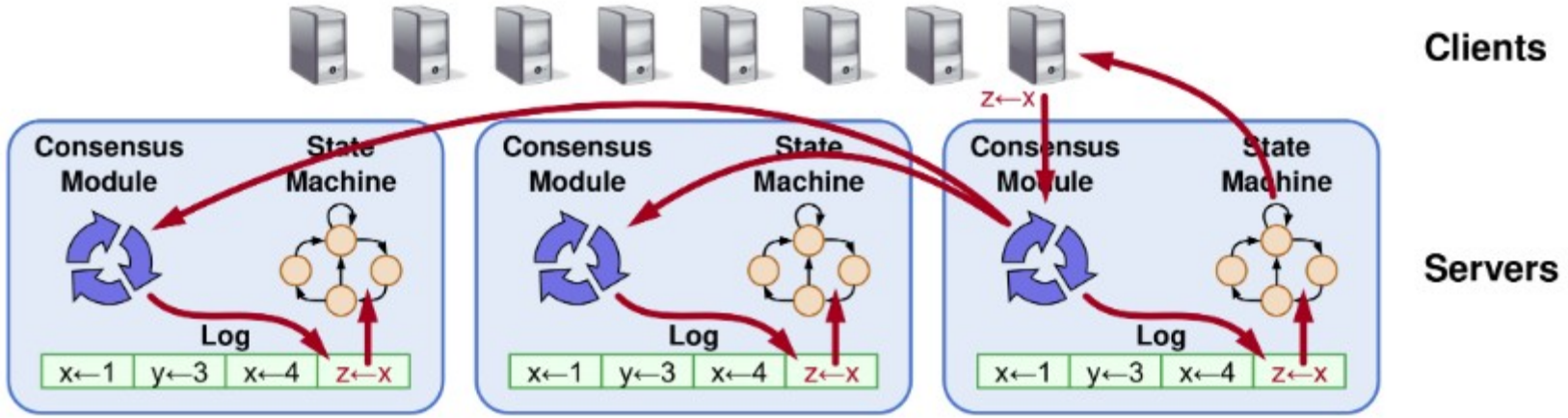
$C(e_1) < C(e_2)$ **even if** $(e_1 \not\rightarrow e_2 \wedge e_2 \not\rightarrow e_1)$ (concur. events)

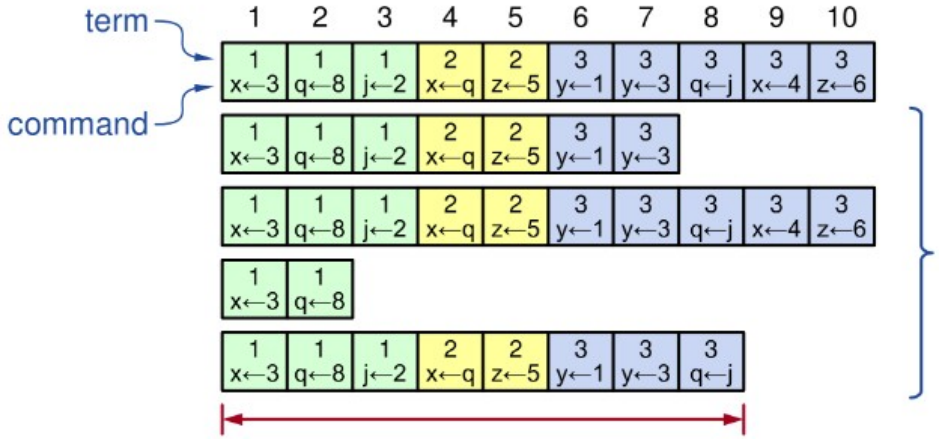




Perspectivation

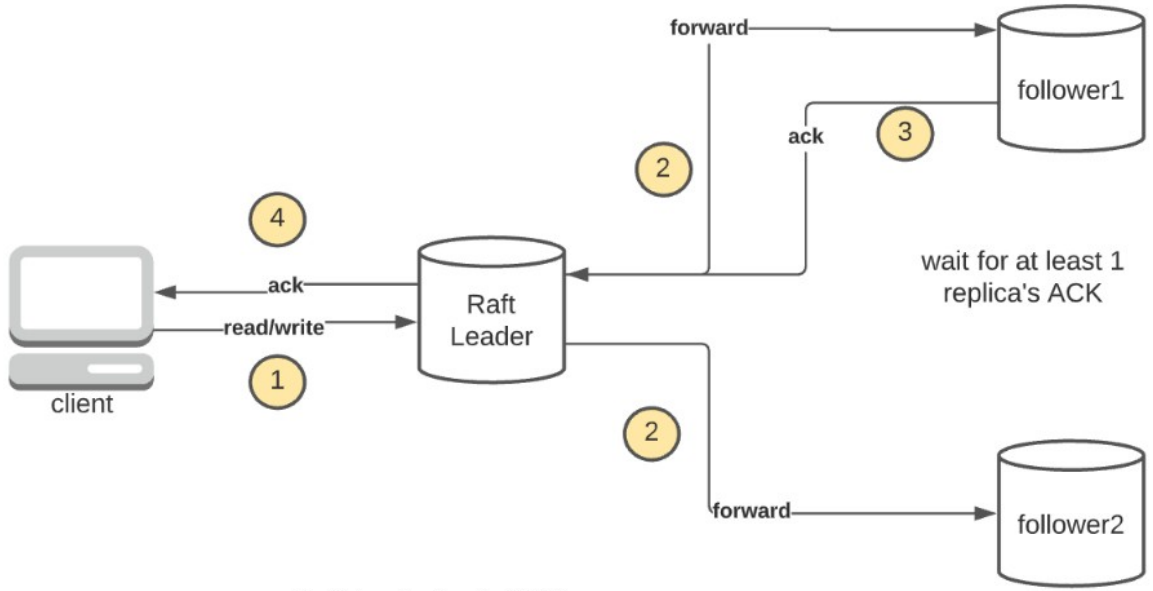
- RAFT

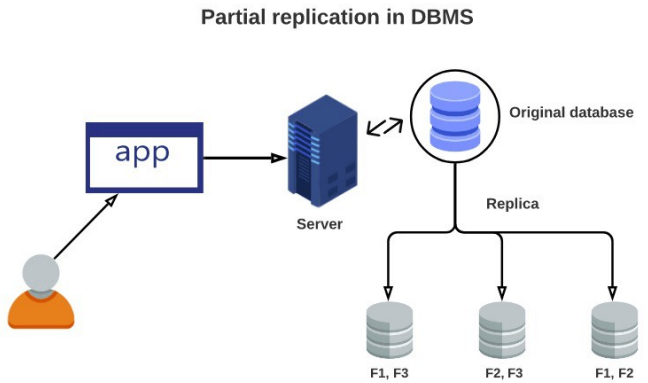




Motivation

- Leader Election
  - Data & Div./Conq.
- Consistency
  - Replication → Troubles





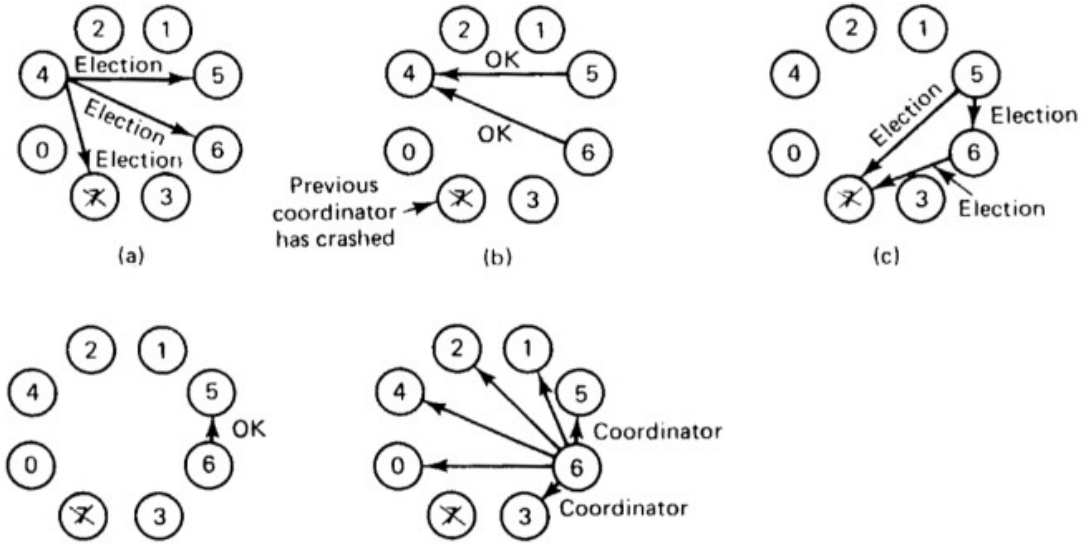
[FI, F2, F3 are the different fragments of the main database]

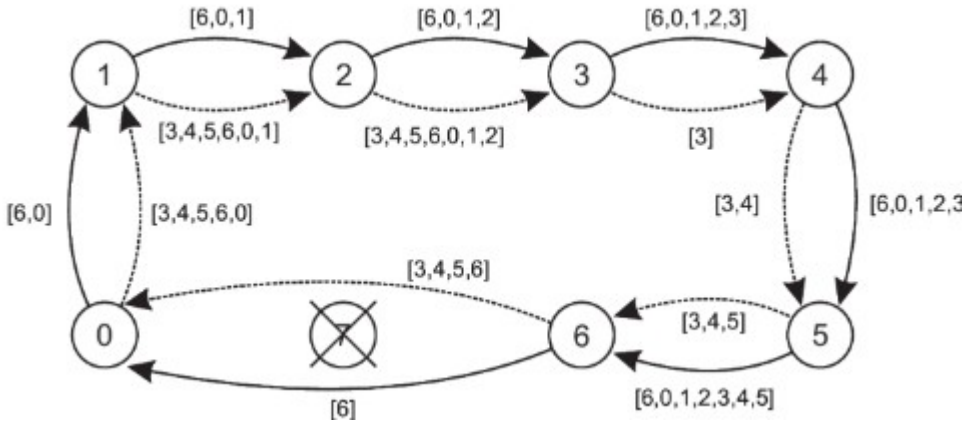
Leader Election

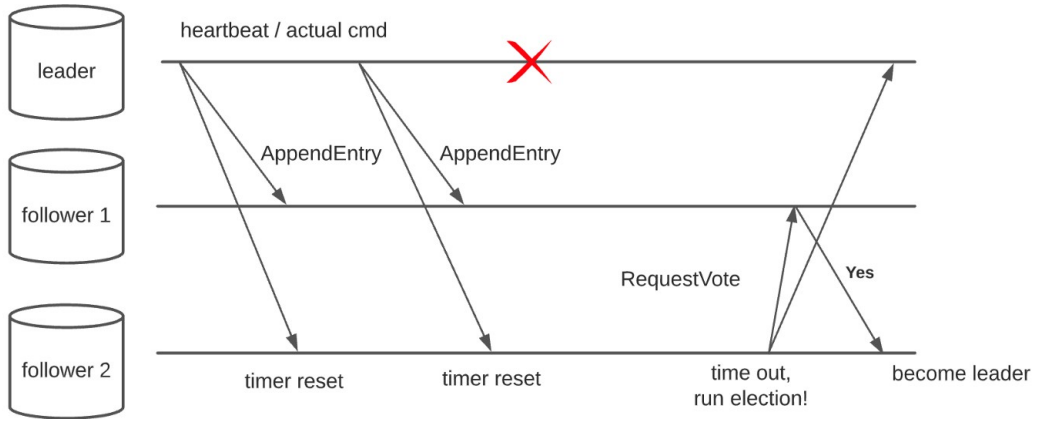
- Prerequisites
- When?
- Approach
- Technique Comparison

Techniques

- Bully
- Ring-based: Chang and Roberts
- RAFT

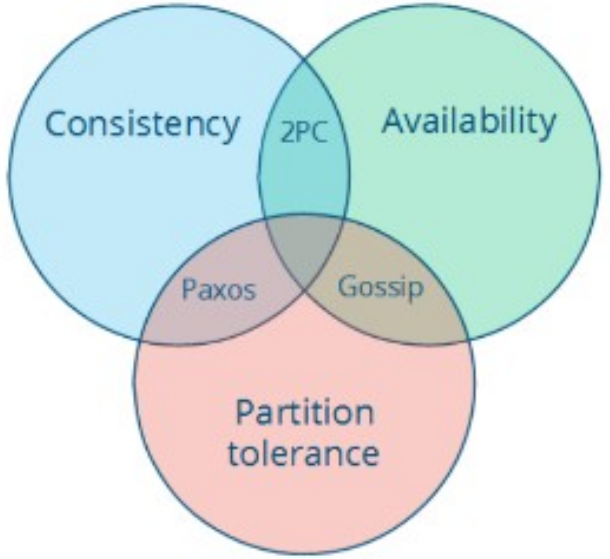


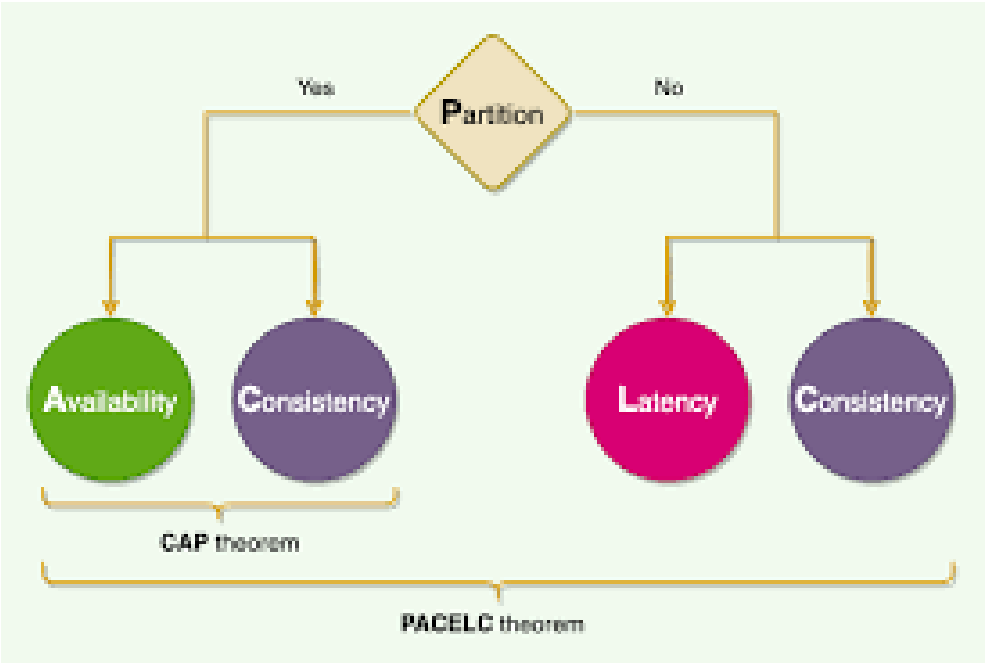




Consistency

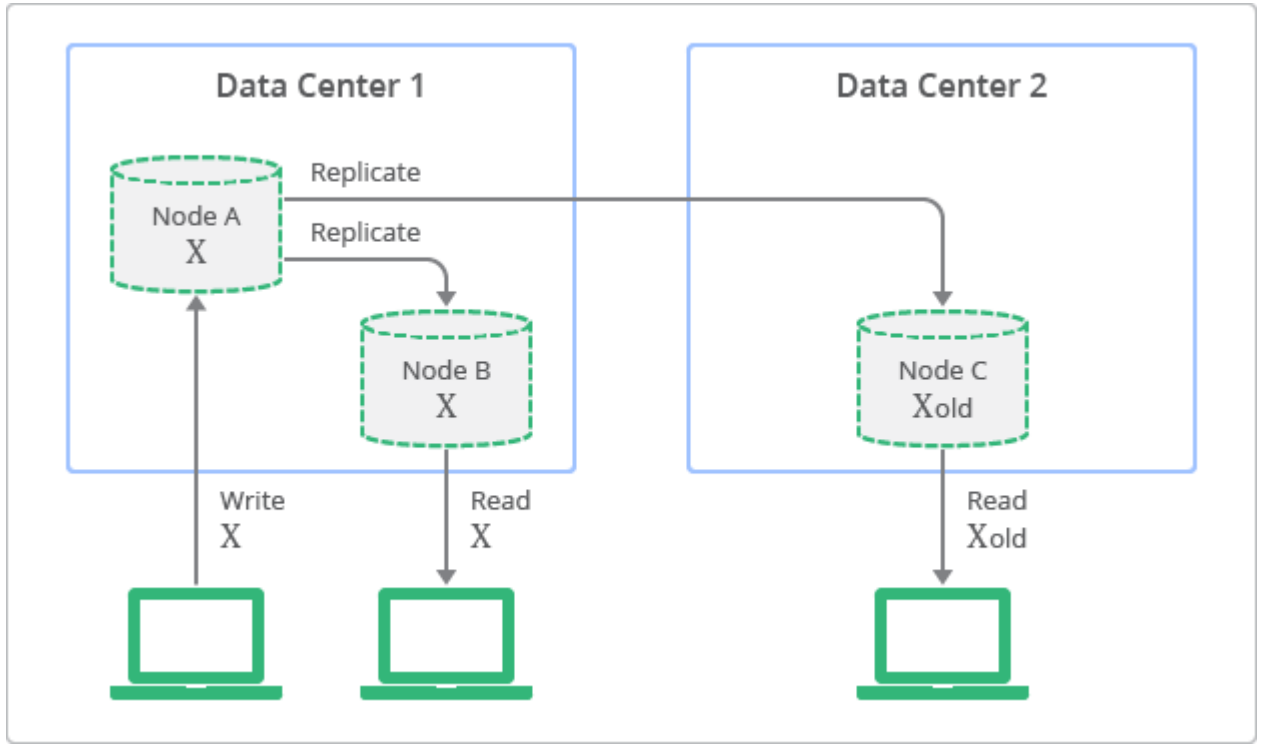
- CAP





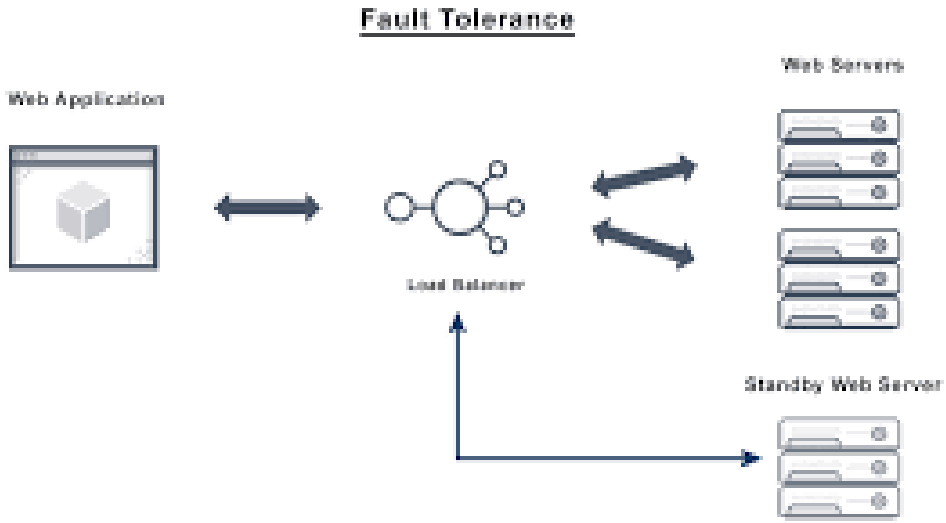
Consistency models

- Strong Consistency
- Weak Consistency
- Eventual Consistency
- Casual/read-writes....



Motivation

- Fault Tolerance
  - Failures?
- Consensus
  - Coherency

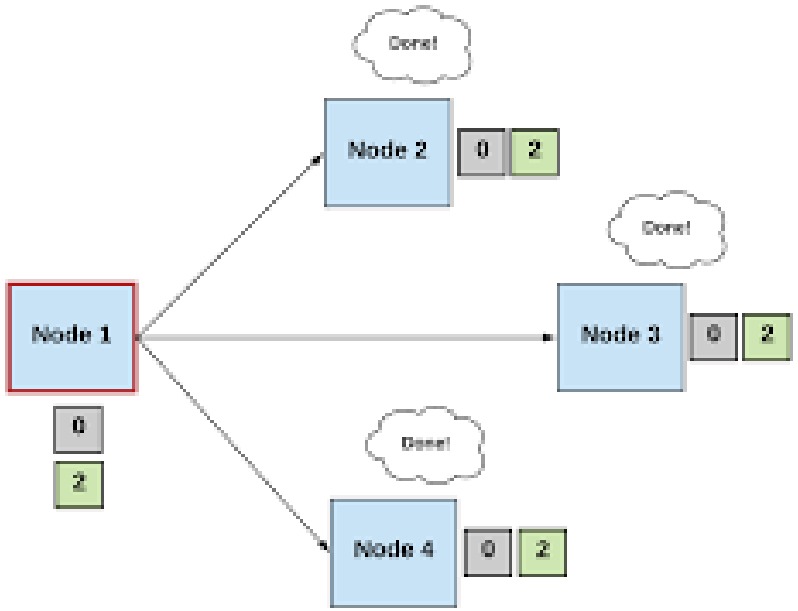


Terminology

- Failures:
  - Crash, Arbitrary...
- Fault consequences

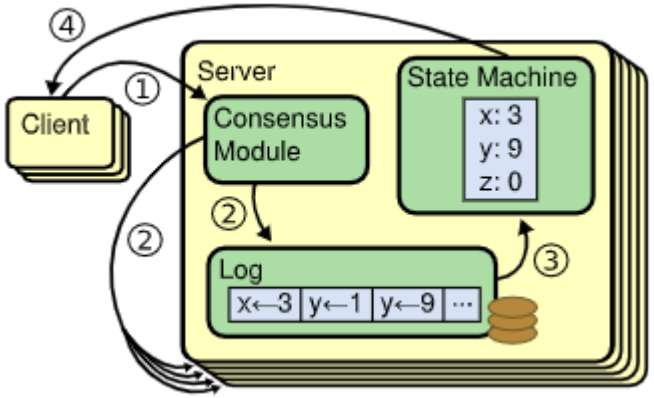
Consensus

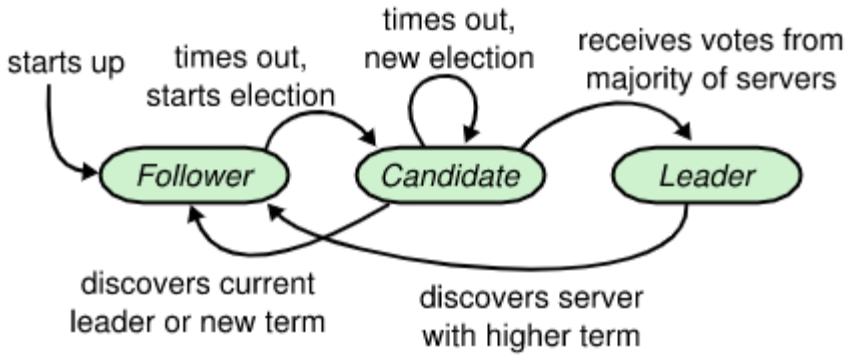
- What?
  - Fault consequences
- Approaches
  - State machine replication
  - Limited processes
- Paxos, Zoo Keeper, RAFT

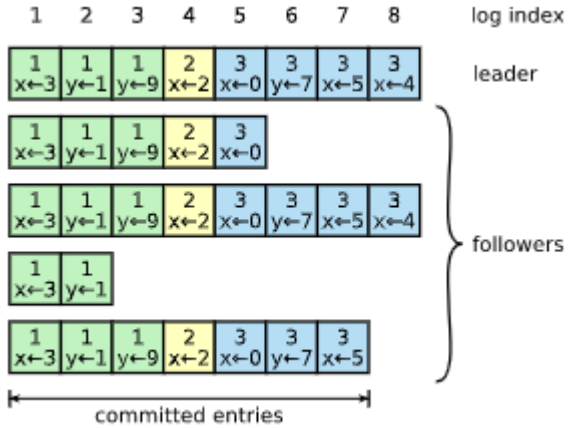


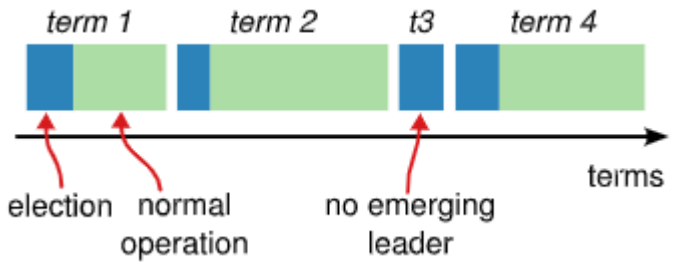
RAFT

- Basics
- Leader Election



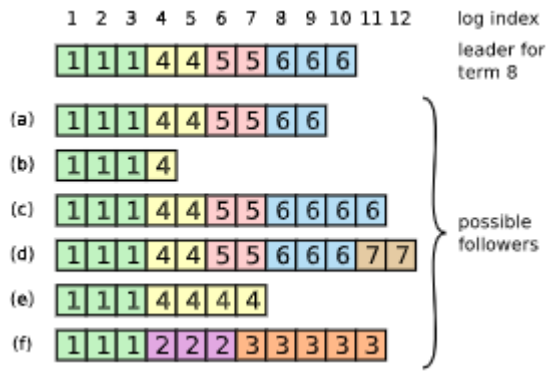


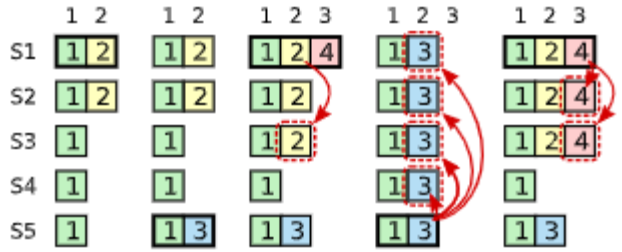




RAFT

- Log Replication
- Election Restriction (Safety)





Motivation

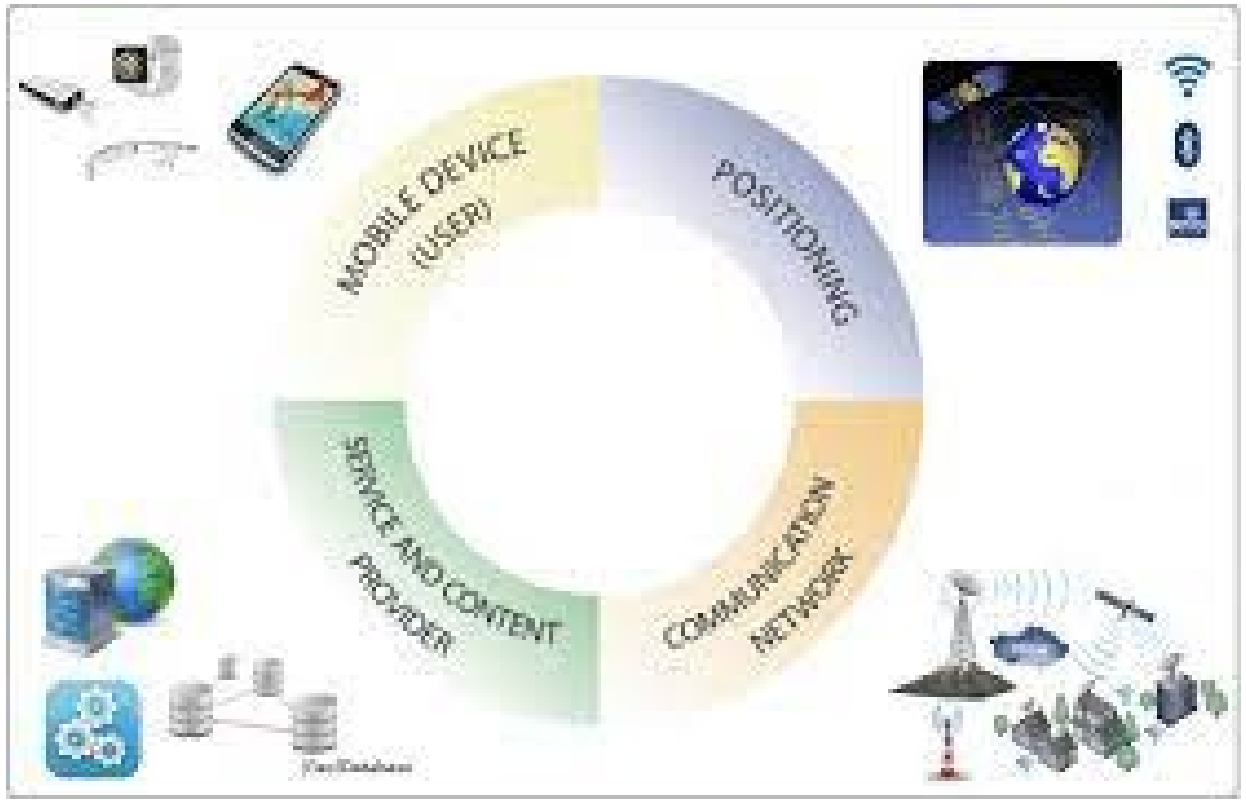
- Navigation
- Tracking/locating
- Firefighters

Challenges

- Technologies
- Privacy
- Interoperability

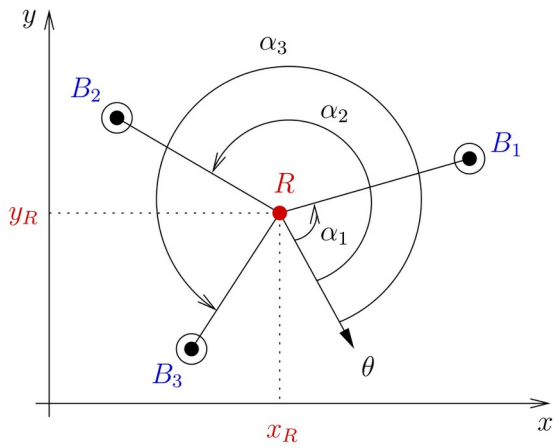
Concepts

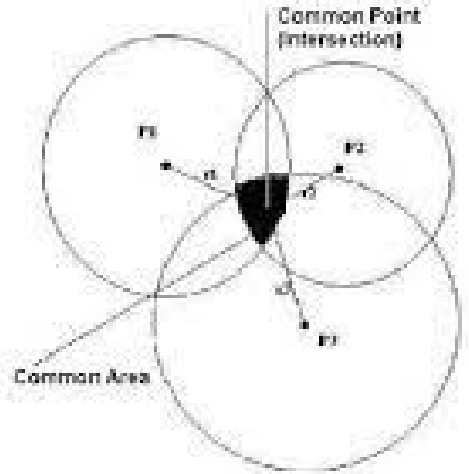
- Position
  - Absolute/Relative
- Location
- Location Service
- Location Based Service

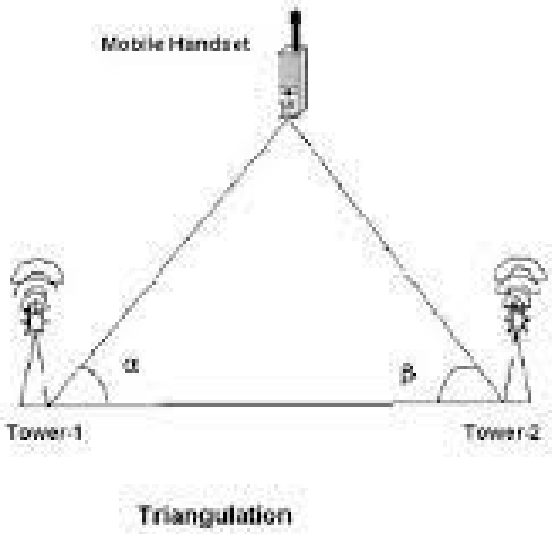


Absolute Positioning

- Triangulation (ToTal)
- Trilateration

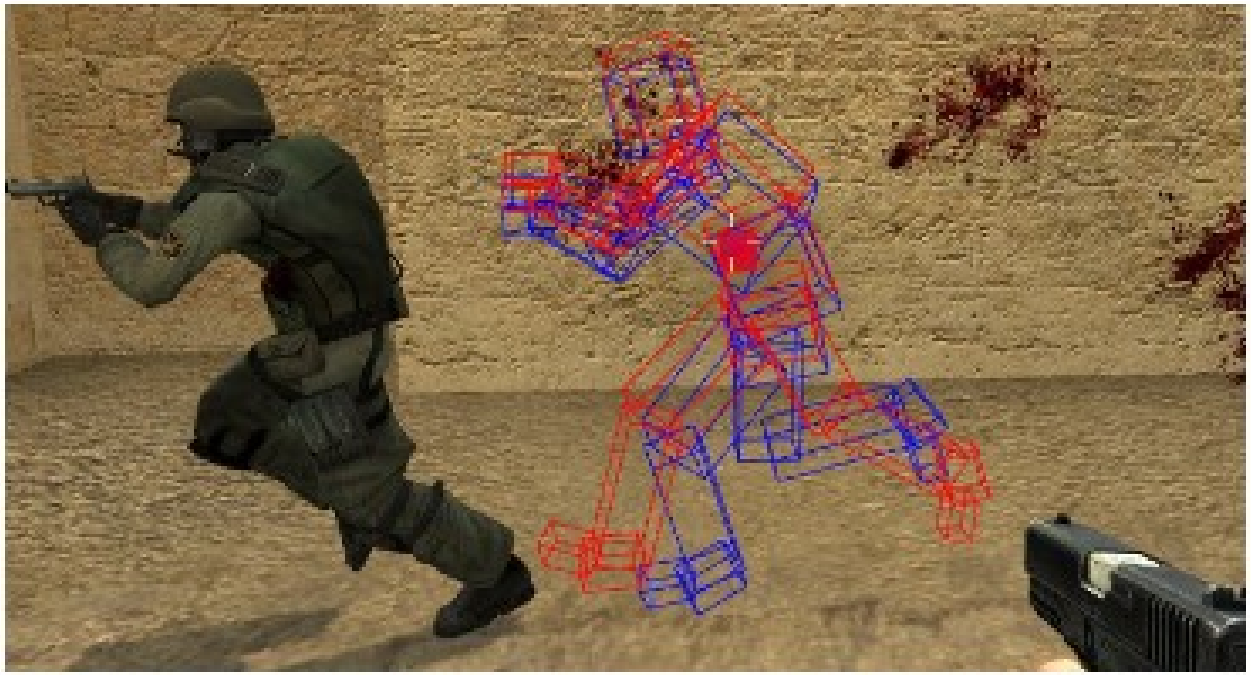






Relative Positioning

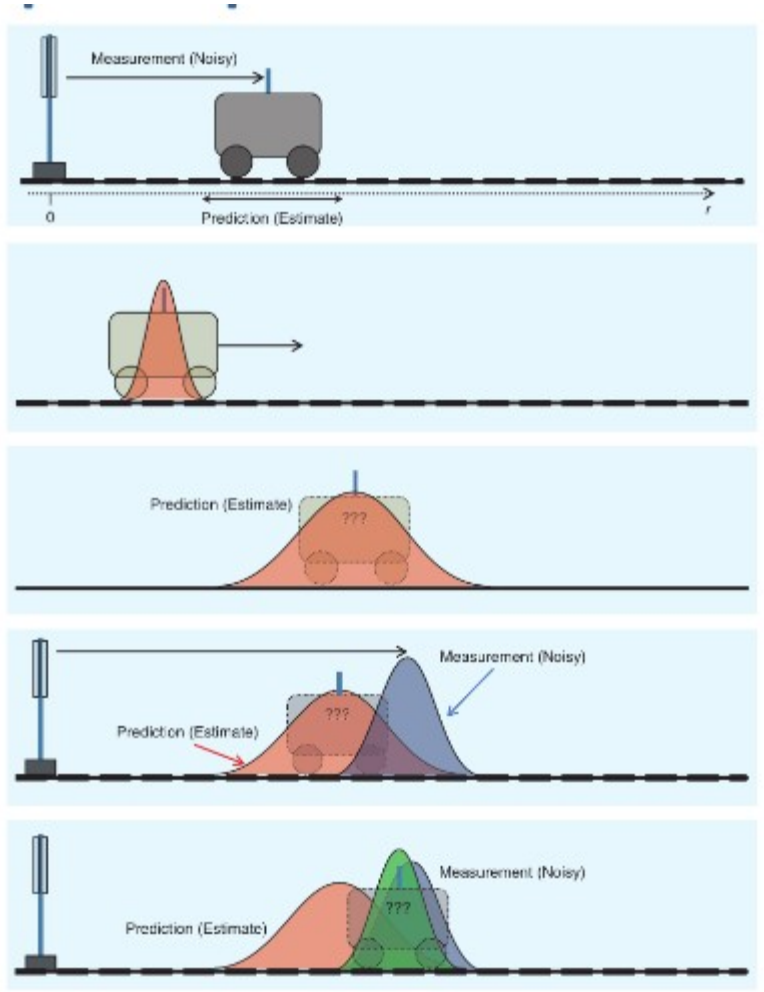
- Dead Reckoning



Hybrid Positioning

- Sensor Fusion

- Kalman filters
  - Guassian multiplication
  - Predict and correct



Perspectivation

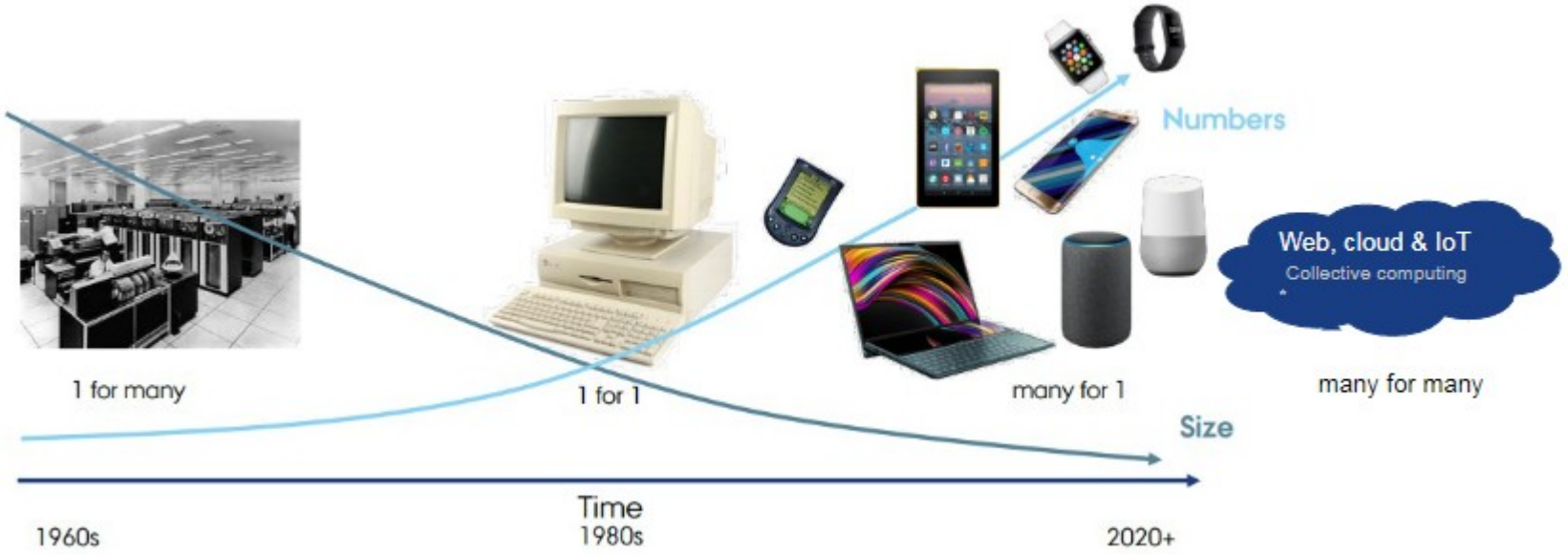
- Pervasive systems

5. Pervasive computing (background, methods, enabling tech.)

Background

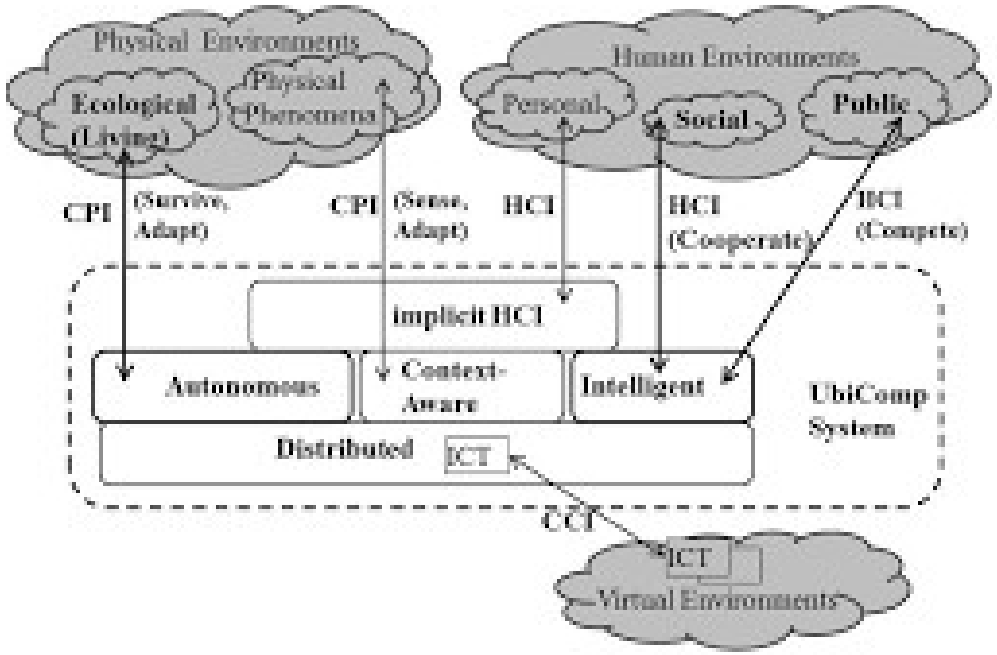
- Weiser – XEROC PARC
- → Cloud, Crowd and Shroud

Ubicomp Technologies
Tabs, Pads, Boards



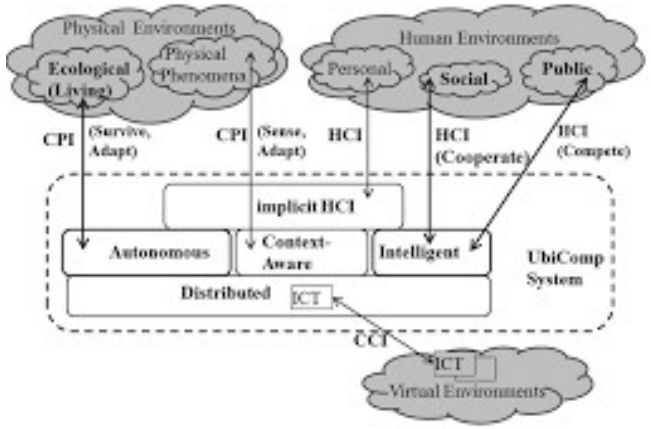
Properties

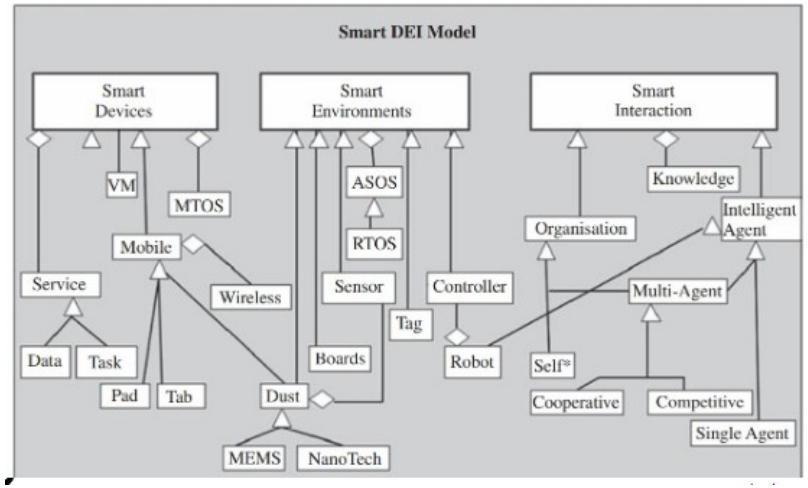
- Ubiquitous
- Transparent
- Openness

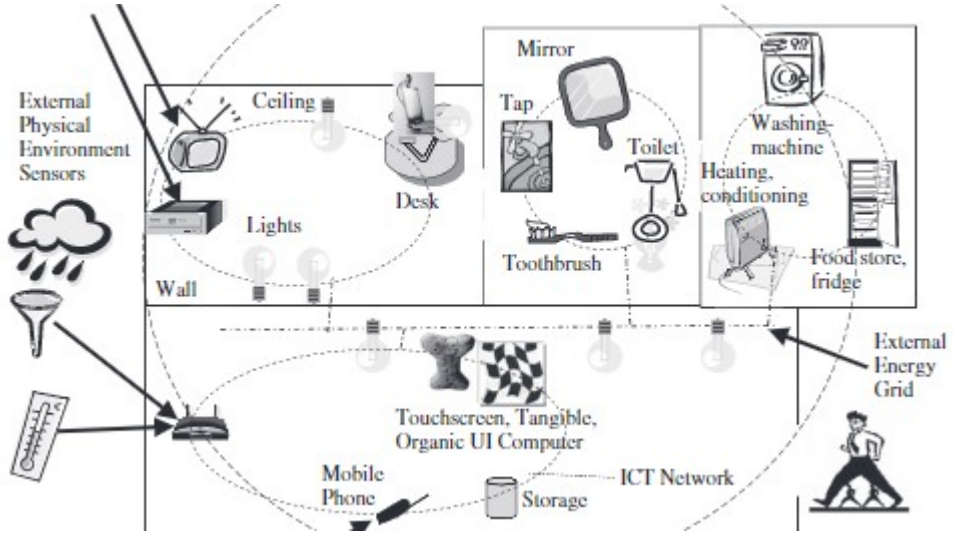


Pervasive Computing Concepts

- Awareness
- Interaction
- Smart X
- Calm Tech.



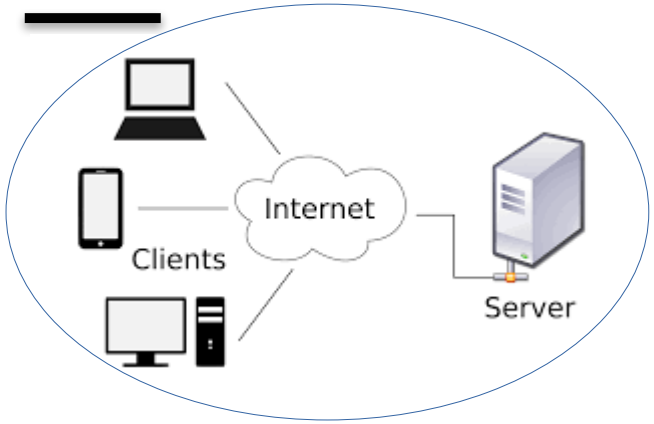


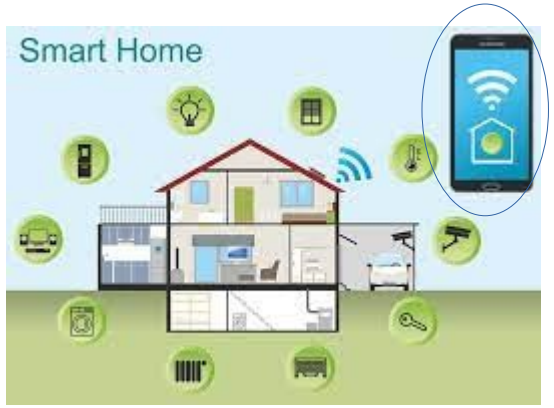


Methods

- ???

Enabling Technologies



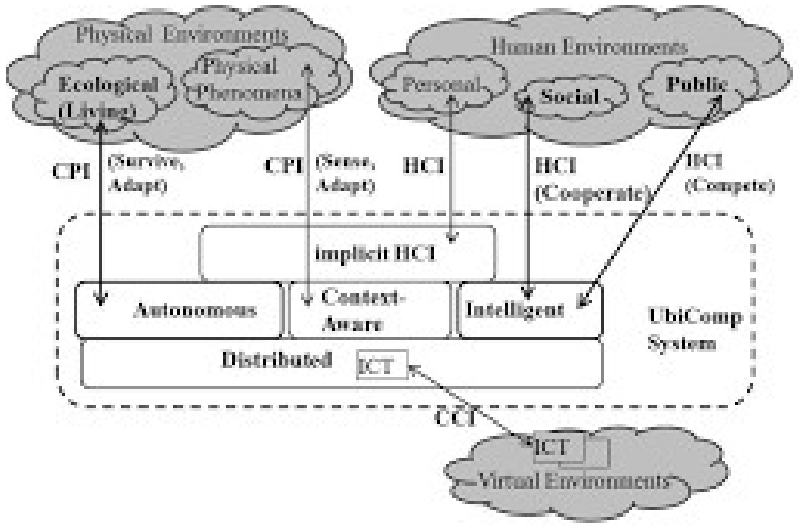


MQTT

6. Context awareness using smart devices, smart environments and smart interaction (towards intelligent environments)

Context Aware System

- Situation
- What, Where, When, How, Who and Why
- Sensor Fusion

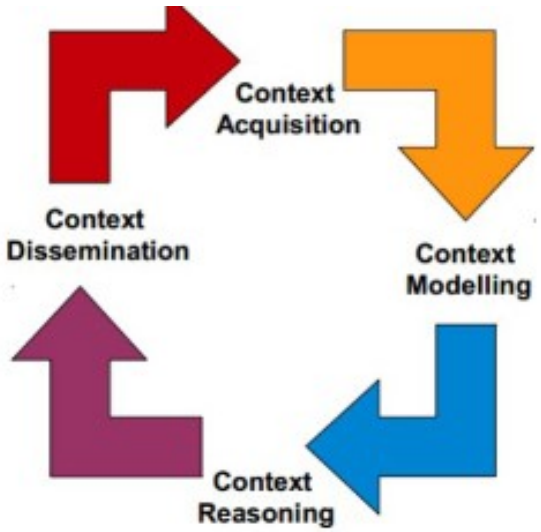


Challenges

- User Context
- Environment Context
- Privacy
- Accuracy vs. Cost

Lifecycle

Data Sources

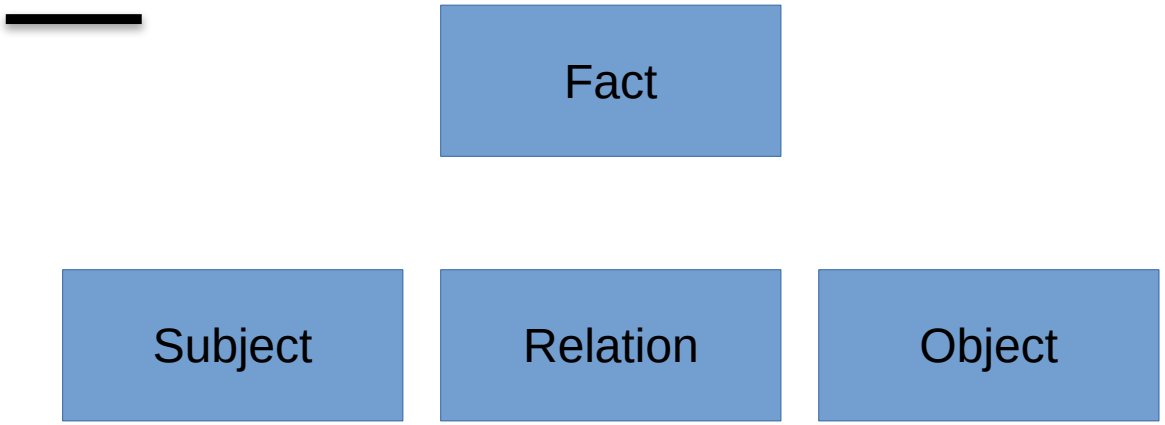


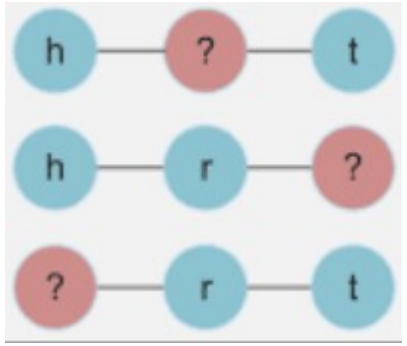
Management
- Querying

KB/KBG -
Ontology
Based

Ontology Based
→ Adaption
(passive/active)

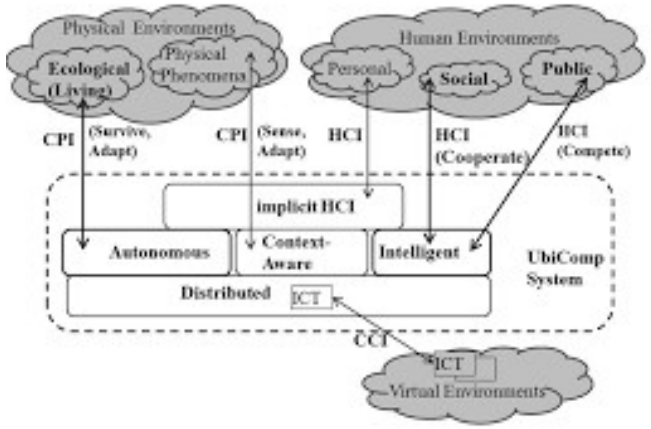
Example

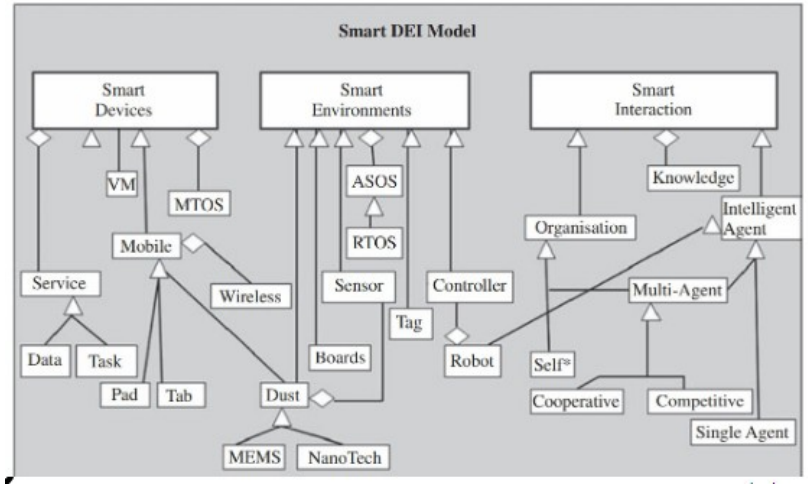




Smart X

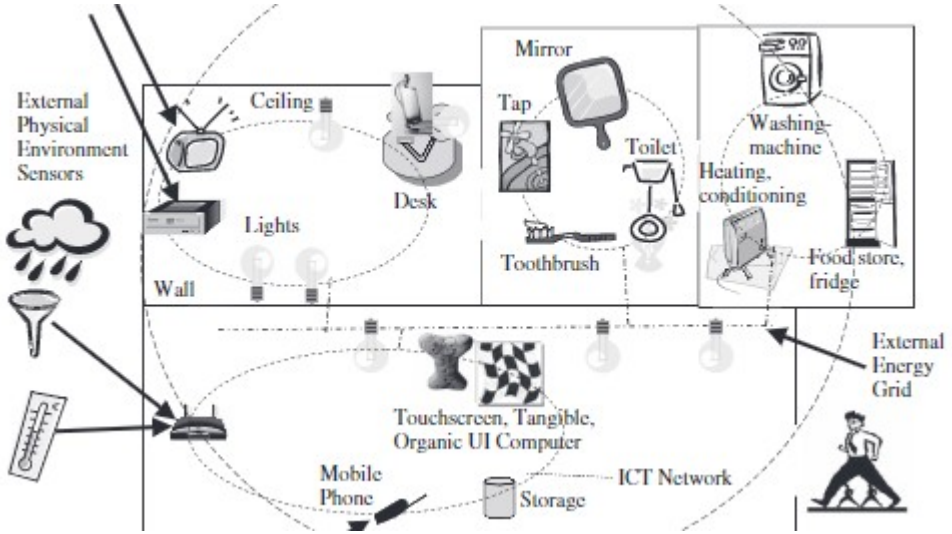
- Combination → Intelligent Environment





Intelligent Env. Example

- Distributed
- Smart Environment
- Smart Interaction
- Zero Conf.

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