**Lecture 8 Notes**

Slide 4

* A procedure to reach in a common agreement in a distributed or decentralized multi-agent platform.
* Important for a message passing system

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* Reliability and fault tolerance in a distributed system
  + Ensure correct operations in the presence of faulty individuals
  + Example:
  + Commit a transaction in a database
  + State machine replication
  + Clock synchronization

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* Consider a message passing system, and a general behaves maliciously

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There can be various types of faults in a distributed system.

* + - **Crash Fault:** A node suddenly crashes or becomes unavailable in the middle of a communication.
    - **Network or Partitioned Faults:** A network fault occurs and the network gets partitioned.
    - **Byzantine Faults:** A node starts behaving maliciously.

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* **Termination**: Every correct individual decides some value at the end of the consensus protocol.
* **Validity:** If all the individuals proposes the same value, then all correct individuals decide on that value.
* **Integrity:** Every correct individual decides at most one value, and the decided value must be proposed by some individuals.
* **Agreement:** Every correct individual must agree on the same value.

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* **Safety:** Correct individuals must not agree on an incorrect value
  + Nothing bad happend
  + **Liveliness** (or **Liveness**)**:** Every correct value must be accepted eventually
  + Something good eventually happens

Slide 11

* Every node has **block of transactions** that has already reached into the consensus (**block of committed transactions).**
* The nodes also has a list of outstanding transactions that need to be validated against the block of committed transactions.