CS 5412 - Cloud Computing
Recitation 02/07: CAP Theorem

Sagar Jha    Theo Gkountouvas

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Sorry, something went wrong.

We're working on it and we'll get it fixed as soon as we can.

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Availability

- The system should be up and running
- Defined as the total uptime divided by the total time
- Example: If the system ran for 30 days in which it was down for one hour, availability is $1 - \frac{1}{(24 \times 30)} = 99.86\%$
Consistency

- Properties about the behavior of the system in terms of its operations
- There are various notions of consistency
- Why is consistency important?
Fault tolerance

- Everything is prone to failures
- Tolerating faults is vital for both availability and consistency
CAP - Can we guarantee availability and consistency with failures?

- There is a tradeoff between consistency, availability and partition-tolerance
- Focuses on more concrete notion of these properties
  - Consistency - every read receives the most recent write or an error
  - Availability - every request receives a (non-error) response without guarantee that it contains the most recent write
  - Partition tolerance - the system continues to operate despite an arbitrary number of messages being dropped (or delayed) by the network between nodes
- CAP theorem says that it is impossible to simultaneously satisfy all the three
Proof
Pitfalls of CAP

- CAP does not force you to choose between consistency and availability
- Why only network partitions? What if all nodes fail (the world comes to an end)?

Take CAP as a guideline and make your system as robust as possible!