Midterm Review

- When: Mar 14 (Th) 11:00-12:15 pm
- Where: ST 302
- closed-book and closed-notes, you are allowed to bring a one letter page single-sided cheat sheet
Topics

- Overview (chapters 1-2)
- Interprocess communication (chapters 3-5)
- Time and global states (chapter 14)
- Coordination (chapter 15)
Overview

- What Is a Distributed System?
  - A network of processes: the processes interact with one another to achieve a goal
  - no global clock, fail independently, collective objective, ...

- Examples of distributed Systems: Internet, P2P, Cloud, ...

- Challenges: heterogeneity, scalability, transparency, ...
Overview

- Architectural models
  - Communication entities: processes, objects, components, ...
  - Communication paradigms: message passing, multicast, RPC, RMI, ...
  - Client-Server vs. P2P

- Fundamental models
  - Synchronous vs. asynchronous systems
  - Common failure types: crash, omission, byzantine
Interprocess Communication

Applications: HTTP (1.6), DNS (13.2)

Chapter 5
RPC and RMI

Chapter 4
Sockets, multicast support

Chapter 3
Internet protocols (TCP/IP)
Interprocess Communication

- Internet protocols
  - packet switching, four types of delays
  - IP: routing and forwarding, addressing
  - TCP/UDP: sockets, (de)multiplexing, reliable data transfer

- Socket programming and IP multicast

- RPC and RMI
  - marshalling and unmarshalling
  - call semantics of request-reply communication
  - Implementation of RPC and RMI
Time and global states

- Physical time
  - clock drift and skew
  - synchronization: Cristian’s algorithm, Berkeley algorithm (byzantine clocks)

- Logical time
  - modeling distributed systems, global states, happened-before model
  - Lamport logical clocks, vector clocks

- Global state
  - cuts, consistent cuts
  - Chandy and Lamport’s snapshot algorithm (FIFO channels, safety & liveness)
Coordination

- Mutual exclusion
  - safety, liveness, fairness, message complexity, synchronization delay
  - a simple centralized solution, a ring-based solution
  - Ricart and Agrawala’s algorithm, Maekawa’s algorithm

- Leader election
  - safety, liveness, message complexity, turnaround time
  - Chang-Roberts algorithm (asynchronous & no failure)
  - Bully algorithm (synchronous & crash)