

Midterm Preparation Guide

ECE428 Distributed Systems

Note

- you are allowed to bring one page A4 paper with handwritten or printed notes (from both sides)

Lecture 2

- define and characterize basic properties of distributed systems (message latency, bandwidth)
- synchronous vs. asynchronous systems
- failure detection, timeouts, completeness, accuracy, failure detection time

Lecture 3

- received vs. delivered messages, FIFO message channel
- two-general problem
- types of failures, failure detection for multiple processes (centralized, ring, all-to-all)
- clocks skew and drifts
- clock synchronization: internal and external, bounds for client-server synchronization
- Cristian algorithm, Berkeley algorithm, NTP

Lecture 4

- event types and their ordering, happened before relationship, concurrent events
- Lamport's logical timestamps and vector logical clocks

Lecture 5

- local and global states, state changes as events
- global snapshot in asynchronous systems
- cut of events history, event history frontier, consistent and inconsistent cuts

Lecture 6

- applying Chandy-Lamport algorithm
- event history run and linearization
- global state transitions and reachability, stability
- safety and liveness as global state predicates

Lecture 7-9

- unicast vs. multicast
- basic and reliable multicast protocol
- three types of multicast ordering and their implementation including centralized sequencer, ISIS algorithm
- (spanning) tree-based multicast including flooding and gossip

Lecture 9-11

- mutual exclusion problem in single OS and distributed systems, critical section, deadlock, race conditions
- central server algorithm, ring-based algorithm, Ricart-Agrawala algorithm, Maekawa algorithm including their liveness, safety, ordering, bandwidth, client and server delays, breaking deadlock in Maekawa algorithm

HW1 and HW2

- ring-based failure detection
- client-server failure detection via heartbeat protocol
- clock synchronization between processes
- logical timestamps, Chandy-Lamport algorithm, event cuts
- FIFO, causal and total orderings in basic and reliable multicasts
- mutual exclusion among multiple processes using different algorithms