CS60002: Distributed Systems
Term Paper Topics

Note that the serial no.s against each topic is NOT any group no. The assignment of topic to groups is sent separately.

1. Efficient Implementations of vector clocks
    a. Singhal-Kshemkalyani
    b. Fowle and Zwaenepoel
    c. Jard and Jourdan algorithm
    d. Practical applications of logical clocks (Lamport's/vector clock)

2. Clock Synchronization
    a. Lamport and Mellier-Smith fault tolerant algorithm (JACM 1985)
    b. Network Time Protocol (NTP)
    c. IEEE 1588 Precision Time Protocol
    d. TPSN (Ganeriwal, Kumar and Srivastava, ACM Sensys, 2003)

3. Synchronous/Coordinated Checkpointing and Recovery Protocols
    a. Types of checkpointing and recovery protocols and their comparison
    b. Koo and Toueg algorithm (IEEE TSE 1987)
    c. Cao and Singhal algorithm (IEEE TPDS 1998)
    d. Cao and Singhal mutable checkpoint algorithm (IEEE TPDS 2001)

4. Asynchronous/Uncoordinated Checkpointing and Recovery Protocols
    a. Types of checkpointing and recovery protocols and their comparison
    b. Juang Venkatesan Algorithm (ICDCS 1994)
    c. Netzer and Xu (IEEE TPDS 1995)
    d. Manivannan, Netzer, and Xu (IEEE TPDS 1997)

5. Message Logging Protocols for Rollback Recovery
    a. Alvisi (IEEE TSE 1998)
    b. Rao, Alvizi, and Vin (IEEE TKDE 2000)
    c. Any two other papers taken from Elnozahy, Alvizi, Wang, and Johnson's survey paper (ACM Computing Survey 2002)

6. Distributed Algorithms for Minimum Spanning Tree
    a. Gallaghar, Humblet, and Spira (ACM TOPLAS 1983)
    b. Awerbach (ACM STOC 1987)
    c. Garay, Kutten, and Peleg (IEEE FOCS 1993)

7. Distributed Algorithms for Dominating Set
    a. Types of dominating sets and their applications
    b. Distributed greedy algorithms (variation of sequential greedy)
    c. Alzoubis's algorithm for connected dominating set (HICSS 20012)

    d. Wan, Alzoubi, and Frieder's algorithm for connected dominating sets (IEEE INFOCOM 2002)

8. Distributed Algorithms for Shortest Paths and Related Problems
    a. Awerbach (ACM STOC 1989)
    b. Frederickson (Information and Computation 1990)
    c. Distributed versions of Bellman-Ford, Floyd-Warshall
    d. Distributed algorithms for centers and medians

9. Ordered Broadcasts
    a. Types of ordered broadcasts
    b. Chang and Maxemchuk (ACM TCS 1984)
    c. ABCAST protocol for causal atomic broadcast
    d. Any one protocol for timed reliable broadcast
    e. Reduction of atomic broadcast to consensus (Chandra-Toueg's result)

10. Impossibility Results in Distributed Systems
    a. Fisher-Lynch-Patterson result
    b. Election in uniform anonymous rings
    c. Any two other impossibility results

11. Distributed Mutual Exclusion
    a. Agarwal and El-Abbadi (ACM TOCS 1991)
    b. Lodha and Kshemkalyani (IEEE TPDS 2000)
    c. Walter, Welch, and Vaidya (Wireless Networks 2001)

12. Distributed k-Exclusion
    a. Bulagannawar and Vaidya (IEEE ICDCS 1995)
    b. Kakugawa, Fujita, Yamashita, and Ae (Information Processing Letters 1994)
    c. Walter, Cao, and Mohanty (POMC 2001)

13. Self-Stabilization
    a. Dijkstras's token passing algorithms (k-state and 3-state, including proof of the k-state algorithm)
    b. Ghosh and Karaata's planar graph coloring algorithm (Distributed Computing 1993)
    c. Israeli and Jalfon's ring orientation algorithm (Information and Computation 1993)
    d. Limitations of self-stabilization

14. Leader Election
    a. Petersen algorithm for unidirectional rings
    b. Lower bound on message complexity for asynchronous rings (Frederickson and Lynch, JACM 1987)
    c. Malpani, Welch, and Vaidya (ACM Dial M Workshop 2000)

d. Vasudevan, Kurose, and Towsley (ICNP 2004)

15. Consensus
    a. Any one algorithm for the consensus problem not covered in class
    b. Any one algorithm for the k-set consensus problem
    c. Any one algorithm for approximate agreement

16. Distributed Data Structures
    a. Distributed heaps
    b. Distributed hash tables (Chord, Pastry, and applications to P2P systems)
    c. Techniques for storing large graphs in a distributed manner

17. Distributed Set Operations
    a. Distributed sorting
    b. Distributed selection

18. Termination Detection
    a. Dijkstra-Scholten (Information Processing Letters 1980)
    b. Huang (ICDCS 1989)
    c. Mattern (Distributed Computing 1987)

19. Distributed Deadlock Detection
    a. Knapp's classification
    b. Mitchell and Merit (ACM PODC 1984)
    c. Kshemkayani and Singhal (IEEE TSE 1994)
    d. Chandy, Mishra, and Haas (ACM TCS 1983)