

Project Topics for Distributed Computing

One-page proposal due: Feb. 13 (penalty for late submission: 5% of project grade).

Presentation/Final project: May 1 for all students (penalty for late submission: 5%).

Foundations

1. (Scalability metric)

Amdahl's law and Gustafson law, time-constrained, efficiency-constrained, and memory-constrained scaling.

2. (Parallel/distributed environment)

MPI and PVM.

3. (Parallel/distributed system model)

including criteria to assess their suitability.

4. (Networks of workstations)

with applications.

5. (Distributed simulation)

Petri nets and other related models.

6. (Mobile computing)

routing, checkpointing, and channel allocation.

7. (Information model)

switch-based LANS and internet.

8. (Routing)

Optimal, fault tolerant, and deadlock-free.

9. (Scheduling)

static and dynamic load distribution.

10. (Fault tolerance)

various applications.

11. (Scalable design)

interconnection networks.

12. (Survey)

Database, file, DSM, heterogeneous computing, OS, cloud/ML, AI/ML, etc.

13. (Collective communication)

multicast, broadcast, barrier sync., etc.

14. (RPC and remote message passing)

different approaches.

15. (Consistency models and applications)

different weak consistency models.

Applications

16. (Peer-to-peer networks)

DHT, routing, lookup problems, and peer-to-peer applications.

17. (Social networks)

Graph and structural model: small-world and applications

18. (Cloud computing)

Hypervisor (Xen), Orchestration (Kubernetes), Hadoop and Spark

Amazon AWS vs. Microsoft Azure

19. (Crowdsourcing)

foundation and applications.

20. (Virtual currency)

bitcoin and blockchain.

21. (Blockchain-based decentralized marketplaces)

Ethereum, Lazzoz, OpenBazaar, etc, scalability: level-2 solution and sharding

22. (Data center networks)

Topology and routing, extended TCP protocols

23. (Modern programming languages/library)

Pandas (on Python) and LINQ (Language-Integrated Query)

24. (File storage and object storage)

GPFS, Google file system, NoSQL

26. (ML-based solutions)

Task scheduling and resource allocation, PyTorch and TensorFlow