Università
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**Faculty
of Informatics**

High Performance State-Machine Replication

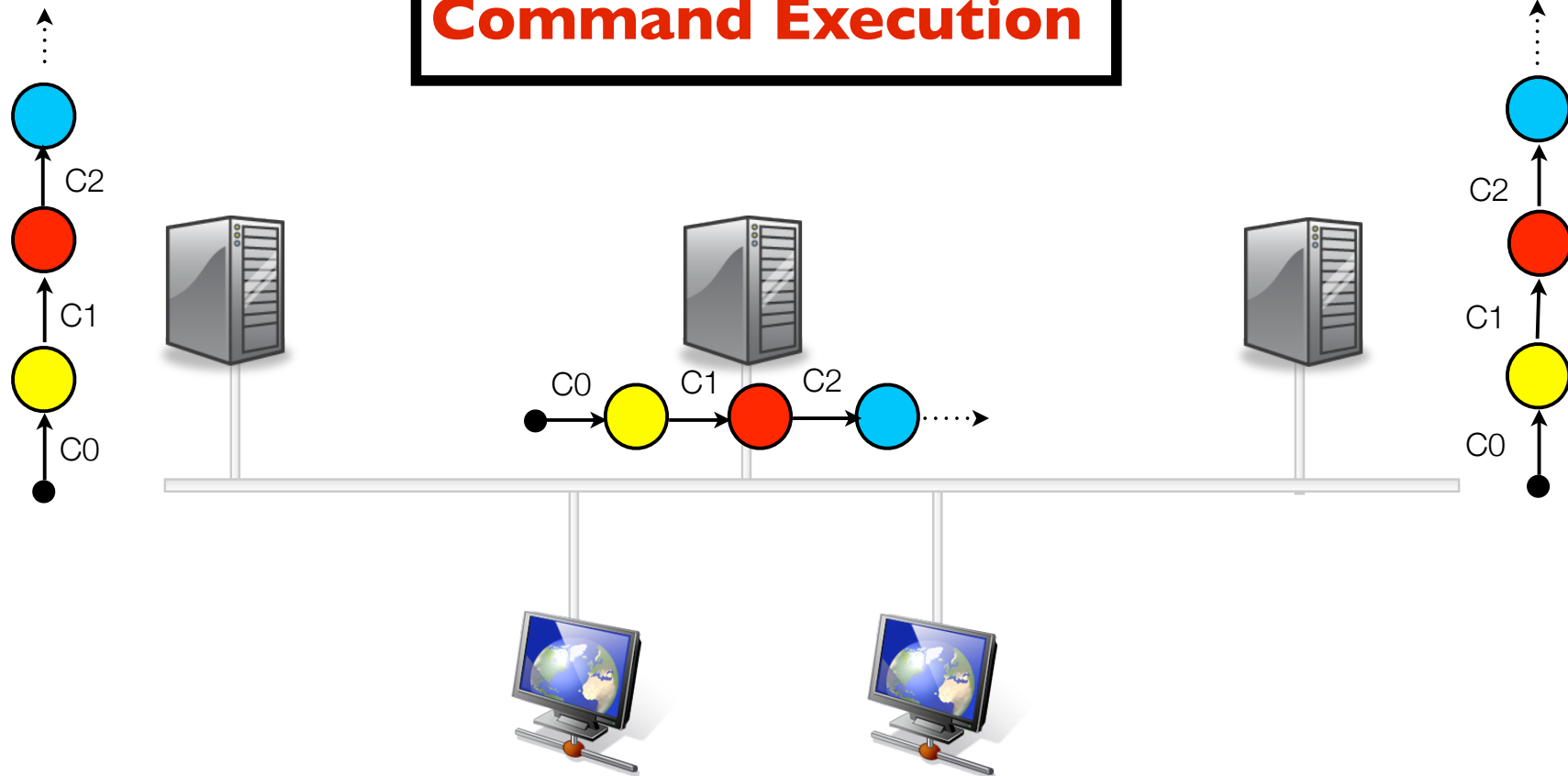Parisa Jalili Marandi
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High Performance State-Machine Replication

- SMR an approach to fault tolerance

- Performance: Throughput and Latency

- High Performance

  - **High Throughput**

  - **Low Latency**

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State Machine Replication (SMR)

**Command Ordering
Command Execution**

Contributions

▶ **Efficient Ordering of Commands**

- **Ring Paxos**

▶ **Inherent limitations of SMR**

1. Ordering increases latency

   - **Speculation**

2. SMR is not scalable

   - **Partitioning**

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Ring Paxos

▸ A high-throughput AB-protocol based on Paxos

▸ Features: ring - multicasting - a majority of acceptors - indirect consensus

▸ **90%** of bandwidth ~ 900 Mb/s in a 1Gb network

▸ Open source

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Speculation & State Partitioning

- ▸ **Speculation**
  - Parallelize Ordering and Execution
  - Improves Latency by **16%**

- ▸ **State Partitioning**
  - Replicas gain network and processing capacity
  - Makes SMR scalable
  - Improves Throughput by **4 times**

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Future Work

- Extend Ring Paxos for x-LAN settings

- Dynamic addition and removal of learners

- Generality of State Partitioning

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