High Performance State-Machine Replication

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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
State Machine Replication (SMR)

Command Ordering
Command Execution

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Contributions

- Efficient Ordering of Commands
  - Ring Paxos
- Inherent limitations of SMR
  1. Ordering increases latency
  - Speculation
  2. SMR is not scalable
  - Partitioning
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
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
Future Work

- Extend Ring Paxos for x-LAN settings
- Dynamic addition and removal of learners
- Generality of State Partitioning