Scalable and Adaptive Log Manager in Distributed Systems

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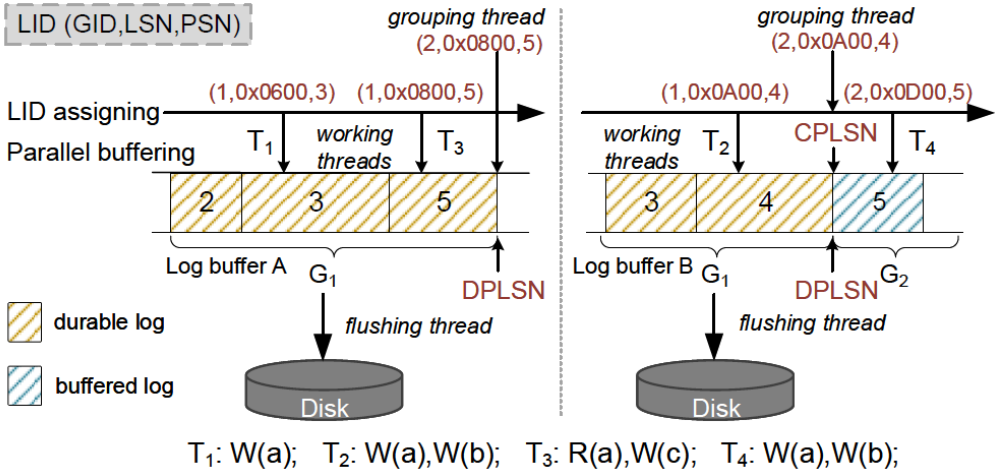
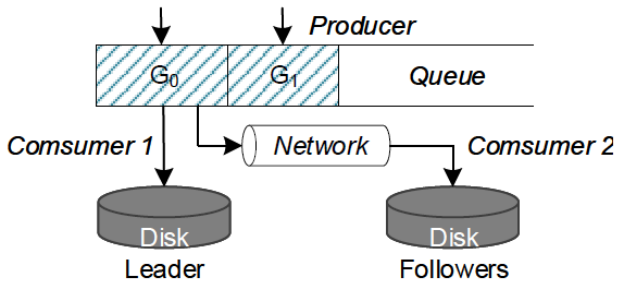
Problems & Ideas

- Problems of traditional log manager in distributed database systems:
  - The centralized design of transaction logging limits scalability.
  - The constant trigger condition of log replication can not always maintain optimal performance under dynamic workloads.
- Ideas: scalable logging and adaptive replication
  - Centerpieces of scalable logging are lightweight LSN assigning, parallel log buffering and adaptive group commit.
  - Based on producer-consumer model, the adaptive replication dynamically adjusts the trigger condition of log persisting and log transmitting.



T_1: W(a); T_2: W(a),W(b); T_3: R(a),W(c); T_4: W(a),W(b);

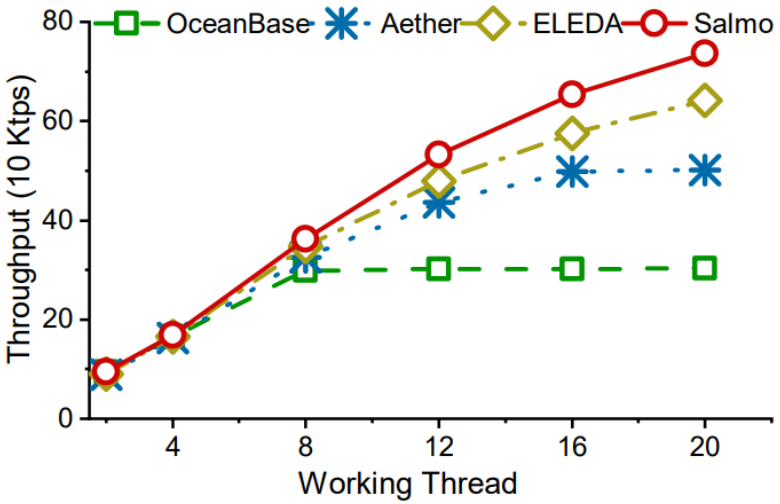
The architecture of decentralized design for scalable logging



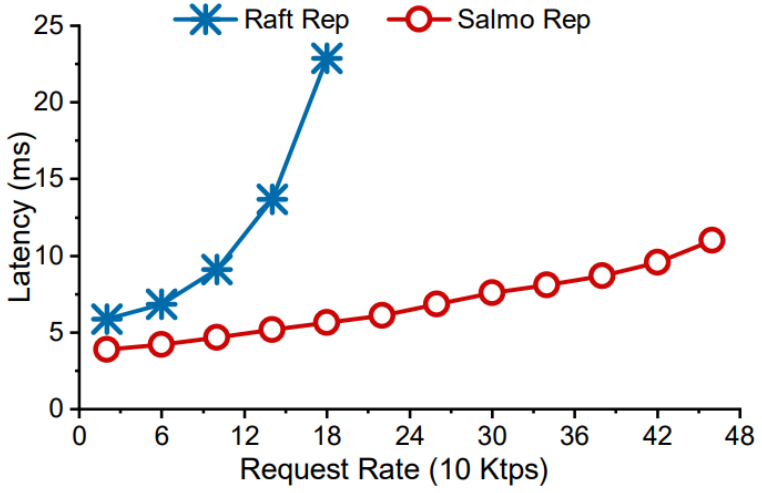
The producer-consumer model for transaction processing in distributed database systems

Main Contributions

- Contributions:
  - The scalable logging shows significant improvements regardless of logging architecture;
  - The adaptive replication obtains higher throughput and lower latency over Raft's log replication.
  - The new log manager (Salmo) maintains efficient and stable performance under dynamic workload all the time.



Scalable logging (Salmo) shows scalability



Adaptive replication (Salmo Rep) shows has lower latency