Distributed Systems – Fault Tolerance

Lab 3

2021/2022

Raft consensus

Use Raft consensus for fault-tolerant replication with the `lin-kv` service according to Figure 2 of the Raft paper.[1] Assume that commands entered in the Raft log are `lin-kv` client request messages; and that only the leader handles requests while others reply with error 11.

Steps

1. Implement the log replication protocol with the `AppendEntries` RPC. Omit `RequestVote` RPC (assume a fixed known leader, e.g., `node_ids[0]`) and timeouts (assume reliable channels and no crashes).
2. Add timeouts and periodic transmission of the `AppendEntries` RPC to recover from lost messages and to monitor the leader.
3. Add leader election with the `RequestVote` RPC.
4. Test with `--latency` and with `--nemesis partition`.

Learning Outcomes Apply consensus protocols for state machine replication. Discuss the relevance of different protocol mechanisms for liveness and safety.

[1] `https://www.usenix.org/system/files/conference/atc14/atc14-paper-ongaro.pdf`