DTU Compute
Institut for Matematik og Computer Science

Project Poster
02228 - Fault-Tolerant Systems

Raft as a solution to the consensus problem

Consensus:

To decide on a common value amongst several processes in a distributed system.

Current solutions:

Suffer from complex specifications and variations resulting in buggy implementations.

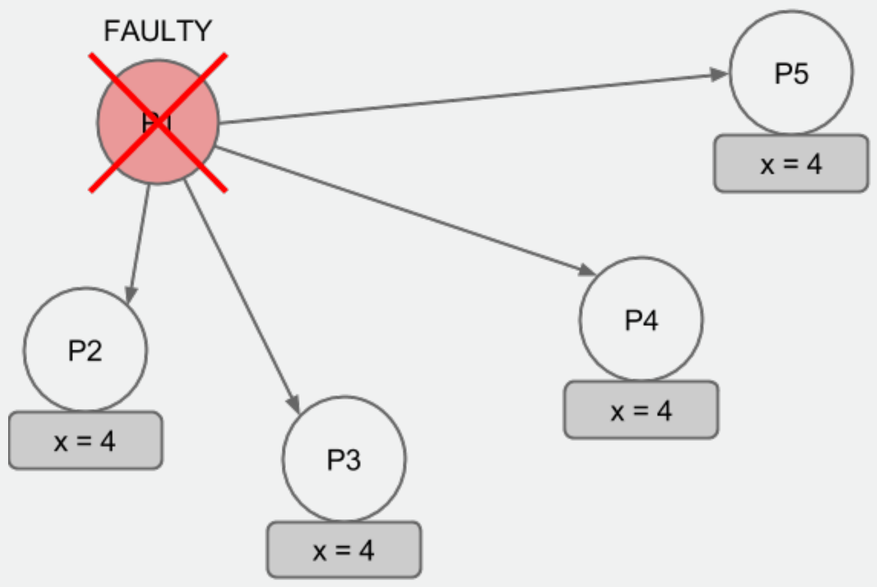
Two Generals Problem

Relation to consensus:

Two generals want to agree on when to attack the enemy.

Impossibility:

The generals will never reach an agreement since they are not sure about the messenger's reliability.



An example of a distributed system containing a faulty leader, which would cause the system to become unavailable.

Safety

- There can only be at most one leader.
- If a leader crashes a new leader is elected.
- If a faulty process wakes up the leader ensures that their log is updated.

Test and Behavioural Driven Development

- The algorithm is mainly described by its behaviour without any formal specification or pseudo code.
- From this tests were derived during the implementation. Each test was served as an implementation step.

Results

- Raft is showcased in an visualised implementation, describing its fault tolerance features in a nice and concise manner.
- The user is able to provide the program with various parameters for testing different heart beat timers, election timeouts etc.

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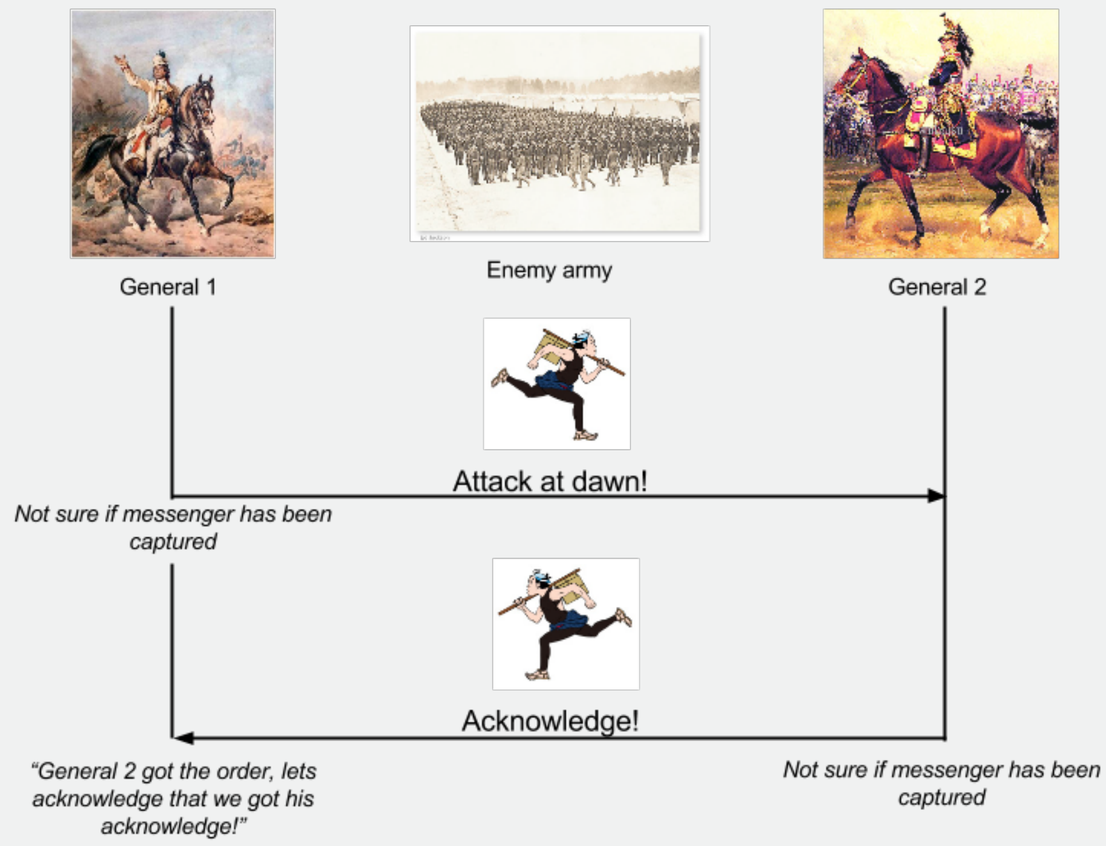
GitHub: https://github.com/anderslime/ft-raft



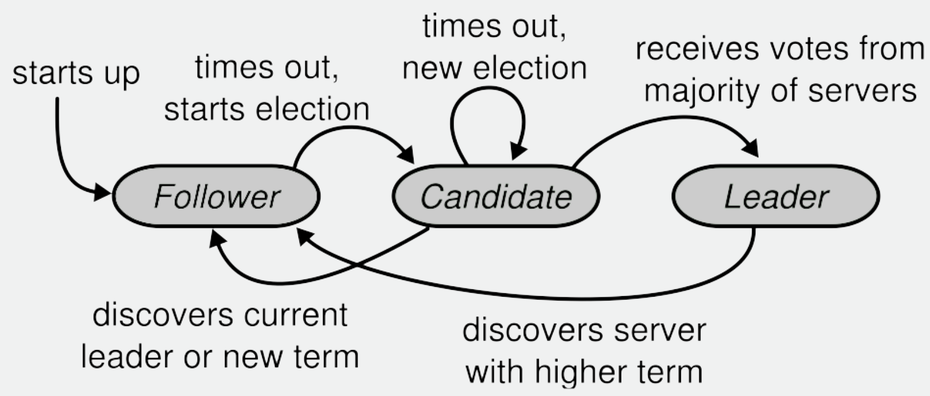
The Two Generals problem illustrated.

Leader Election

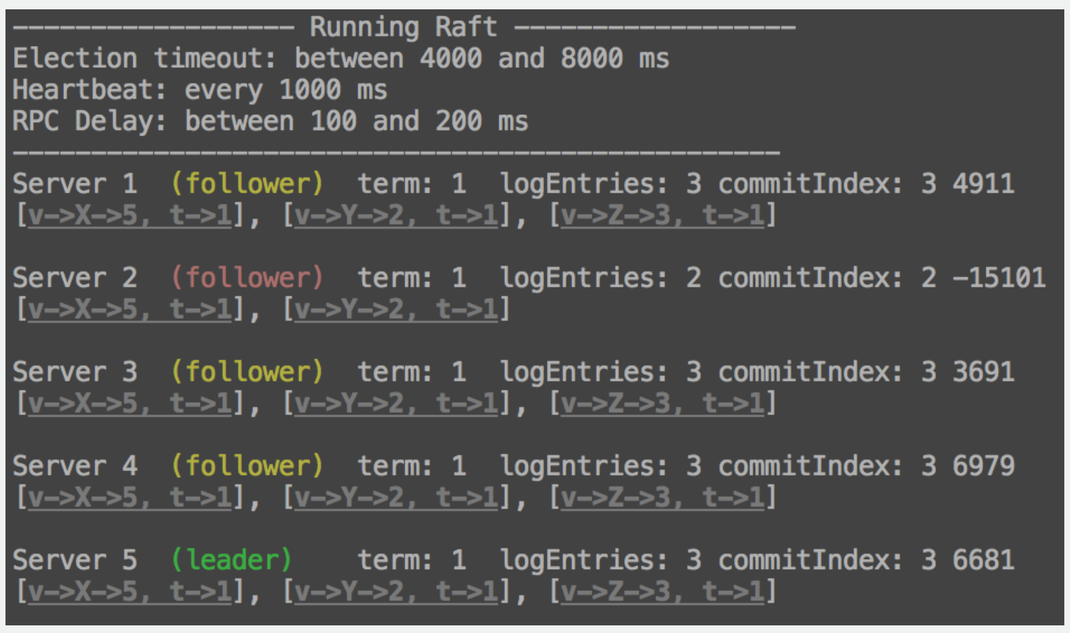
- A leader is elected to be the link between the client and the rest of the network.
- The leader frequently sends out heart-beat (empty) messages in order to keep track of faulty processes.

Log Replication

- Commands issued by a user through a client is replicated throughout the system.



A state machine showing the state a process can be in.
From the Raft paper - "In Search of an Understandable Consensus Algorithm".



Screenshot of the program running in a console.