

# **FINAL REPORT**

## **RAFT CONSENSUS ALGORITHM**

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# 1 Preface

*In this section we will describe and motivate our project idea. We will start out by presenting the Two Generals problem in which two processes try to reach consensus about when to attack the enemy. Then we will relate this problem to modern distributed systems, in which consensus must be achievable in presence of faulty processes.*

## 1.1 Two Generals Problem

## 1.2 Complexity and understandability of current solutions

## **2 Analysis**

*In this section we will come back to the Two Generals problem and further analyse and realize that reaching consensus without a leader/authority, who can issue commands, is impossible. Then we will present Raft as a solution to this problem and compare it to other solutions and discuss why we have chosen it.*

### **2.1 Impossibility of the Two Generals Problem**

### **2.2 Raft as a solution**

### 3 Requirements

The tool we are implementing should serve as an illustration tool, to show how the Raft algorithm works for given scenarios of faulty processes in a distributed system.

- a. The tool must illustrate a scenario of a given set of processes in a distributed system, in which a leader is elected.
- b. The user must then be able to disconnect the leader.
  - a) If a leader is disconnected a new leader must be elected automatically.
- c. The user must be able to add new processes to the system.
- d. The user should be able to input parameters to vary the scenario, such as the number of processes, and the heart rate of the system.
  - a) The system should be able to have the parameters changed at run-time.
- e. The tool must be an implementation of the Raft algorithm.
  - a) The Raft implementation should have the following properties: Safety, availability, timing independence, and that commands complete as soon as a majority has responded.
- f. The tool could be further extended with a visualisation of the given distributed system.

## 4 Design

*In this section we will relate to our requirements of the tool, and from this design the implementation.*

## 5 Implementation

## 6 Tests

- a. Simulation and validation of different scenarios described in the requirements.
  - a) Leader election:
    - i. The system must choose a new leader if the current leader is disconnected.
    - ii. The system must be able to choose a leader if the system is partitioned.
  - b) Timing and availability
    - i. The system must not depend on timing of new elections, thus not producing incorrect results because of unknown events.