

# Relatório da Atividade 4: Raft

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## Resumo

Esse relatório documenta um trabalho com o protocolo Raft para consenso distribuído. Não será trabalhado com *log replication*.

## Index Terms

Raft, Golang, sistema distribuído

## I. IMPLEMENTAÇÃO

### A. Ao receber um *AppendEntry* (*heartbeat*)

Subsection text here.

- 1) *Follower*:
- 2) *Candidate*:
- 3) *Leader*:

### B. Ao receber um *RequestVote*

Subsubsection text here.

- 1) *Follower*:
- 2) *Candidate*:
- 3) *Leader*:

### C. Ao receber um *Reply*

Subsubsection text here.

- 1) *Follower*:
- 2) *Candidate*:
- 3) *Leader*:

## II. RESULTADOS E CONCLUSÕES

Na Figura 1, foi apresentado uma captura de tela de um funcionamento com todas instâncias funcionando.

- Server 2 vira *cadidate*
- Server 2 recebe voto de 1
- Server 3 vira *candidate*
- Server 1 nega voto para 3 (já votou em 2)
- Server 2 nega voto para 3 (já é *candidate*)
- Server 2 recebe voto de 4 e 5 (e vira *leader*)
- Server 3 não consegue maioria dos votos
- Server 3 faz *Step Down*
- Server 1, 3, 4 e 5 continuam como *follower* indefinidamente, pois 2 é *leader*

```

isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 80x23
└─$ go run run.go -id 1
2019/10/07 10:07:40 [SERVER] Listening on 'localhost:3001'
2019/10/07 10:07:40 [FOLLOWER] Run Logic.
2019/10/07 10:07:40 [SERVER] Accepting connections.
2019/10/07 10:07:42 [FOLLOWER] Update old term '0' to new term '1' from 'localhost:3002'.
2019/10/07 10:07:42 [FOLLOWER] Resetting election timeout.
2019/10/07 10:07:42 [FOLLOWER] Vote accepted to 'localhost:3002' for term '1'.
2019/10/07 10:07:42 [FOLLOWER] Run Logic.
2019/10/07 10:07:45 [FOLLOWER] Vote denied to 'localhost:3003' for term '1'.
2019/10/07 10:07:45 [FOLLOWER] Run Logic.
2019/10/07 10:07:45 [FOLLOWER] Update old term '1' to new term '2' from 'localhost:3002'.
2019/10/07 10:07:45 [FOLLOWER] Resetting election timeout.
2019/10/07 10:07:45 [FOLLOWER] Vote accepted to 'localhost:3002' for term '2'.
2019/10/07 10:07:45 [FOLLOWER] Run Logic.
2019/10/07 10:07:45 [FOLLOWER] Resetting election timeout.
2019/10/07 10:07:45 [FOLLOWER] Accept AppendEntry from 'localhost:3002'.
2019/10/07 10:07:45 [FOLLOWER] Run Logic.
2019/10/07 10:07:45 [FOLLOWER] Accept AppendEntry from 'localhost:3002'.
2019/10/07 10:07:45 [FOLLOWER] Run Logic.
2019/10/07 10:07:45 [FOLLOWER] Resetting election timeout.

isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 80x23
Raft/run <master>
└─$ go run run.go -id 2
2019/10/07 10:07:42 [SERVER] Listening on 'localhost:3002'
2019/10/07 10:07:42 [FOLLOWER] Run Logic.
2019/10/07 10:07:42 [SERVER] Accepting connections.
2019/10/07 10:07:42 [FOLLOWER] Election timeout.
2019/10/07 10:07:42 [CANDIDATE] Run Logic.
2019/10/07 10:07:42 [CANDIDATE] Running for term '1'.
2019/10/07 10:07:42 [CANDIDATE] Vote granted by 'localhost:3001'.
2019/10/07 10:07:42 [CANDIDATE] VoteCount: 2
2019/10/07 10:07:45 [CANDIDATE] Vote denied to 'localhost:3003' for term '1'.
2019/10/07 10:07:45 [CANDIDATE] Run Logic.
2019/10/07 10:07:45 [CANDIDATE] Running for term '2'.
2019/10/07 10:07:45 [CANDIDATE] Vote granted by 'localhost:3001'.
2019/10/07 10:07:45 [CANDIDATE] VoteCount: 2
2019/10/07 10:07:45 [CANDIDATE] Vote granted by 'localhost:3003'.
2019/10/07 10:07:45 [CANDIDATE] VoteCount: 3
2019/10/07 10:07:45 [CANDIDATE] Becoming leader.
2019/10/07 10:07:45 [LEADER] Run Logic.
^Csignal: interrupt
isabelle@isabelle-Inspiron-5448 ~/Graduacao/hirata-juliana-CES-27/Lab4/src/Lab
Raft/run <master>
└─$

```

Figura 1. Funcionamento normal para os 5 processos.

```

isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 83x14
2019/10/07 11:14:10 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 11:14:10 [FOLLOWER] Run Logic.
2019/10/07 11:14:10 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 11:14:10 [FOLLOWER] Run Logic.
2019/10/07 11:14:10 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 11:14:10 [FOLLOWER] Run Logic.
2019/10/07 11:14:11 [FOLLOWER] Update old term '1' to new term '2' from 'localhost:3002'.
2019/10/07 11:14:11 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:11 [FOLLOWER] Vote accepted to 'localhost:3002' for term '2'.
2019/10/07 11:14:11 [FOLLOWER] Run Logic.
2019/10/07 11:14:11 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:11 [FOLLOWER] Accept AppendEntry from 'localhost:3002'.
2019/10/07 11:14:11 [FOLLOWER] Run Logic.
2019/10/07 11:14:11 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:11 [FOLLOWER] Accept AppendEntry from 'localhost:3002'.
2019/10/07 11:14:11 [FOLLOWER] Accept AppendEntry from 'localhost:3002'.

isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 78x
2019/10/07 11:14:10 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 11:14:10 [FOLLOWER] Run Logic.
2019/10/07 11:14:10 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 11:14:10 [FOLLOWER] Run Logic.
2019/10/07 11:14:10 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 11:14:10 [FOLLOWER] Run Logic.
2019/10/07 11:14:10 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 11:14:10 [FOLLOWER] Run Logic.
2019/10/07 11:14:10 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 11:14:10 [FOLLOWER] Run Logic.
2019/10/07 11:14:10 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 11:14:10 [FOLLOWER] Run Logic.
2019/10/07 11:14:11 [FOLLOWER] Election timeout.
2019/10/07 11:14:11 [CANDIDATE] Run Logic.
2019/10/07 11:14:11 [CANDIDATE] Running for term '2'.
2019/10/07 11:14:11 [CANDIDATE] Vote granted by 'localhost:3001'.
2019/10/07 11:14:11 [CANDIDATE] VoteCount: 2
2019/10/07 11:14:11 [CANDIDATE] Vote granted by 'localhost:3005'.
2019/10/07 11:14:11 [CANDIDATE] VoteCount: 3
2019/10/07 11:14:11 [CANDIDATE] Becoming leader.
2019/10/07 11:14:11 [LEADER] Run Logic.

isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 83x14
2019/10/07 11:14:07 [CANDIDATE] VoteCount: 3
2019/10/07 11:14:07 [CANDIDATE] Becoming leader.
2019/10/07 11:14:07 [LEADER] Run Logic.
^Csignal: interrupt
isabelle@isabelle-Inspiron-5448 ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run «master»
$ go run run.go -id 3
2019/10/07 11:14:13 [SERVER] Listening on 'localhost:3003'
2019/10/07 11:14:13 [FOLLOWER] Run Logic.
2019/10/07 11:14:13 [SERVER] Accepting connections.
2019/10/07 11:14:13 [FOLLOWER] Update old term '0' to new term '2' from 'localhost:3002'.
2019/10/07 11:14:13 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:13 [FOLLOWER] Accept AppendEntry from 'localhost:3002'.
2019/10/07 11:14:13 [FOLLOWER] Run Logic.

isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 83x14
2019/10/07 11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 11:14:10 [FOLLOWER] Run Logic.
2019/10/07 11:14:10 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 11:14:10 [FOLLOWER] Run Logic.
2019/10/07 11:14:11 [FOLLOWER] Update old term '1' to new term '2' from 'localhost:3002'.
2019/10/07 11:14:11 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:11 [FOLLOWER] Vote accepted to 'localhost:3002' for term '2'.
2019/10/07 11:14:11 [FOLLOWER] Run Logic.
2019/10/07 11:14:11 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:11 [FOLLOWER] Accept AppendEntry from 'localhost:3002'.
2019/10/07 11:14:11 [FOLLOWER] Run Logic.
2019/10/07 11:14:11 [FOLLOWER] Resetting election timeout.

isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 83x14
2019/10/07 11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 11:14:10 [FOLLOWER] Run Logic.
2019/10/07 11:14:10 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 11:14:10 [FOLLOWER] Run Logic.
2019/10/07 11:14:11 [FOLLOWER] Update old term '1' to new term '2' from 'localhost:3002'.
2019/10/07 11:14:11 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:11 [FOLLOWER] Vote accepted to 'localhost:3002' for term '2'.
2019/10/07 11:14:11 [FOLLOWER] Run Logic.
2019/10/07 11:14:11 [FOLLOWER] Resetting election timeout.
2019/10/07 11:14:11 [FOLLOWER] Accept AppendEntry from 'localhost:3002'.
2019/10/07 11:14:11 [FOLLOWER] Run Logic.
2019/10/07 11:14:11 [FOLLOWER] Resetting election timeout.

```

Figura 2. Funcionamento após a falha no *leader*, seguido de retomada do processo.





```

isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 78x
2019/10/07 10:28:44 [CANDIDATE] Run Logic.
2019/10/07 10:28:44 [CANDIDATE] Running for term '1'.
2019/10/07 10:28:44 [CANDIDATE] Vote granted by 'localhost:3002'.
2019/10/07 10:28:44 [CANDIDATE] VoteCount: 2
2019/10/07 10:28:46 [CANDIDATE] Vote denied to 'localhost:3004' for term '1'.
2019/10/07 10:28:46 [CANDIDATE] Run Logic.
2019/10/07 10:28:46 [CANDIDATE] Running for term '2'.
2019/10/07 10:28:46 [CANDIDATE] Vote granted by 'localhost:3003'.
2019/10/07 10:28:46 [CANDIDATE] VoteCount: 2
2019/10/07 10:28:46 [CANDIDATE] Vote granted by 'localhost:3002'.
2019/10/07 10:28:46 [CANDIDATE] VoteCount: 3
2019/10/07 10:28:46 [CANDIDATE] Becoming leader.
2019/10/07 10:28:46 [LEADER] Run Logic.
^Csignal: interrupt
isabelle@isabelle-Inspiron-5448 ~/Graduacao/hirata-juliana-CES-27/Lab4/src/L

isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 78x
2019/10/07 10:28:56 [FOLLOWER] Resetting election timeout.
2019/10/07 10:28:56 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 10:28:56 [FOLLOWER] Run Logic.
2019/10/07 10:28:56 [FOLLOWER] Resetting election timeout.
2019/10/07 10:28:56 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 10:28:56 [FOLLOWER] Run Logic.
2019/10/07 10:28:59 [FOLLOWER] Update old term '4' to new term '5' from 'localhost:3004'.
2019/10/07 10:28:59 [FOLLOWER] Resetting election timeout.
2019/10/07 10:28:59 [FOLLOWER] Vote accepted to 'localhost:3004' for term '5'.
2019/10/07 10:28:59 [FOLLOWER] Run Logic.
2019/10/07 10:29:02 [FOLLOWER] Update old term '5' to new term '6' from 'localhost:3004'.
2019/10/07 10:29:02 [FOLLOWER] Resetting election timeout.
2019/10/07 10:29:02 [FOLLOWER] Vote accepted to 'localhost:3004' for term '6'.
2019/10/07 10:29:02 [FOLLOWER] Run Logic.

isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 78x
2019/10/07 10:28:53 [FOLLOWER] Accept AppendEntry from 'localhost:3005'.
2019/10/07 10:28:53 [FOLLOWER] Run Logic.
2019/10/07 10:28:54 [FOLLOWER] Election timeout.
2019/10/07 10:28:54 [CANDIDATE] Run Logic.
2019/10/07 10:28:54 [CANDIDATE] Running for term '4'.
2019/10/07 10:28:54 [CANDIDATE] Vote granted by 'localhost:3004'.
2019/10/07 10:28:54 [CANDIDATE] VoteCount: 2
2019/10/07 10:28:54 [CANDIDATE] Vote granted by 'localhost:3002'.
2019/10/07 10:28:54 [CANDIDATE] VoteCount: 3
2019/10/07 10:28:54 [CANDIDATE] Becoming leader.
2019/10/07 10:28:54 [LEADER] Run Logic.
^Csignal: interrupt
isabelle@isabelle-Inspiron-5448 ~/Graduacao/hirata-juliana-CES-27/Lab4/src/L

isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 83x26
2019/10/07 10:28:56 [FOLLOWER] Run Logic.
2019/10/07 10:28:56 [FOLLOWER] Resetting election timeout.
2019/10/07 10:28:56 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 10:28:56 [FOLLOWER] Run Logic.
2019/10/07 10:28:56 [FOLLOWER] Resetting election timeout.
2019/10/07 10:28:56 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 10:28:56 [FOLLOWER] Run Logic.
2019/10/07 10:28:56 [FOLLOWER] Resetting election timeout.
2019/10/07 10:28:56 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 10:28:56 [FOLLOWER] Run Logic.
2019/10/07 10:28:56 [FOLLOWER] Resetting election timeout.
2019/10/07 10:28:56 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 10:28:56 [FOLLOWER] Run Logic.
2019/10/07 10:28:56 [FOLLOWER] Resetting election timeout.
2019/10/07 10:28:56 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 10:28:56 [FOLLOWER] Run Logic.
2019/10/07 10:28:56 [FOLLOWER] Resetting election timeout.
2019/10/07 10:28:56 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
2019/10/07 10:28:56 [FOLLOWER] Run Logic.
2019/10/07 10:28:59 [FOLLOWER] Election timeout.
2019/10/07 10:28:59 [CANDIDATE] Run Logic.
2019/10/07 10:28:59 [CANDIDATE] Running for term '5'.
2019/10/07 10:28:59 [CANDIDATE] Vote granted by 'localhost:3002'.
2019/10/07 10:28:59 [CANDIDATE] VoteCount: 2
2019/10/07 10:29:02 [CANDIDATE] Election timeout.
2019/10/07 10:29:02 [CANDIDATE] Run Logic.
2019/10/07 10:29:02 [CANDIDATE] Running for term '6'.
2019/10/07 10:29:02 [CANDIDATE] Vote granted by 'localhost:3002'.
2019/10/07 10:29:02 [CANDIDATE] VoteCount: 2

isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 83x20
2019/10/07 10:28:47 [FOLLOWER] Resetting election timeout.
2019/10/07 10:28:47 [FOLLOWER] Accept AppendEntry from 'localhost:3001'.
2019/10/07 10:28:47 [FOLLOWER] Run Logic.
2019/10/07 10:28:47 [FOLLOWER] Resetting election timeout.
2019/10/07 10:28:47 [FOLLOWER] Accept AppendEntry from 'localhost:3001'.
2019/10/07 10:28:47 [FOLLOWER] Run Logic.
2019/10/07 10:28:47 [FOLLOWER] Resetting election timeout.
2019/10/07 10:28:47 [FOLLOWER] Accept AppendEntry from 'localhost:3001'.
2019/10/07 10:28:47 [FOLLOWER] Run Logic.
2019/10/07 10:28:47 [FOLLOWER] Resetting election timeout.
2019/10/07 10:28:47 [FOLLOWER] Accept AppendEntry from 'localhost:3001'.
2019/10/07 10:28:47 [FOLLOWER] Run Logic.
2019/10/07 10:28:51 [FOLLOWER] Election timeout.
2019/10/07 10:28:51 [CANDIDATE] Run Logic.
2019/10/07 10:28:51 [CANDIDATE] Running for term '3'.
2019/10/07 10:28:51 [CANDIDATE] Vote granted by 'localhost:3003'.
2019/10/07 10:28:51 [CANDIDATE] VoteCount: 2
2019/10/07 10:28:51 [CANDIDATE] Vote granted by 'localhost:3004'.
2019/10/07 10:28:51 [CANDIDATE] VoteCount: 3
2019/10/07 10:28:51 [CANDIDATE] Becoming leader.
2019/10/07 10:28:51 [LEADER] Run Logic.
^Csignal: interrupt
isabelle@isabelle-Inspiron-5448 ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft

```

Figura 5. Funcionamento após a falha no terceiro *leader*. Note que o sistema não consegue mais decidir por um novo *leader*.