# 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

1

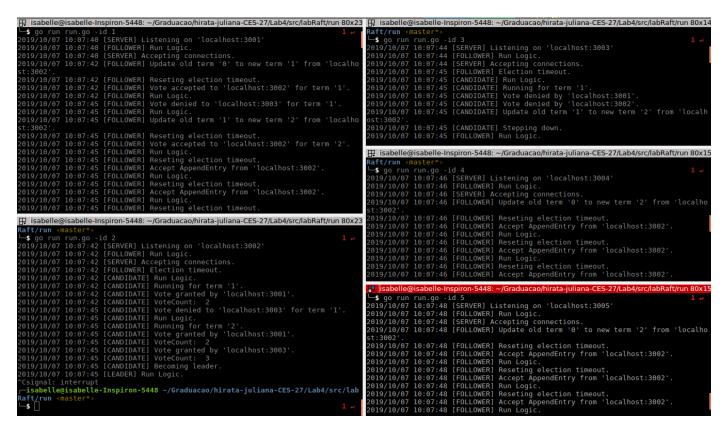


Figura 1. Funcionamento normal para os 5 processos.

Na Figura 2, foi apresentado uma captura de tela de um funcionamento com falha do líder (com outro assumindo a liderança) e retomada do servidor falho (com ele reconhecendo a liderança do outro).

- Server 3 (leader) falha
- Server 2 vira candidate
- Server 2 recebe voto de 1, 4 e 5 (e vira *leader*)
- Server 3 é retomado e recebe AppendEntry de 2 (que é o novo leader) leader

```
🖫 isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 78> 🖫 isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 83x15
                                                                                                                                                                                                                                                                                                                                                              19/10/07 11:14:07 [CANDIDATE] VoteCount: 3
19/10/07 11:14:07 [CANDIDATE] Becoming leader.
19/10/07 11:14:07 [LEADER] Run Logic.
                                                                                                                                  Reseting election timeout.
Accept AppendEntry from 'localhost:3003'
                                             11:14:10 [FOLLOWER]
11:14:10 [FOLLOWER]
11:14:10 [FOLLOWER]
                                                                                                                                  Reseting election timeout.
Accept AppendEntry from 'localhost:3003'
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signal: interrupt
isabelle@isabelle-Inspiron-5448 ~/Graduacao/hirata-juliana-CES-27/Lab4/src/l
                                            11:14:10 [FOLLOWER]
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Accept AppendEntry from 'localhost:3003'.
Run Logic.
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        19/10/07 11:14:11 [FOLLOWER] Update old term '1' to new term '2' from 'local
                                          .
11:14:11 [FOLLOWER] Reseting election timeout.
11:14:11 [FOLLOWER] Vote accepted to 'localhost:3002' for term '2'
11:14:11 [FOLLOWER] Run Logic.
11:14:11 [FOLLOWER] Reseting election timeout.
11:14:11 [FOLLOWER] Accept AppendEntry from 'localhost:3002'.
                                                                                                                                                                                                                                                                                                                                                               st:3002'.
19/10/07 11:14:13 [FOLLOWER] Reseting election timeout.
19/10/07 11:14:13 [FOLLOWER] Accept AppendEntry from 'localhost:3002'.
19/10/07 11:14:13 [FOLLOWER] Run Logic.
                                            11:14:11 [FOLLOWER] Run Logic.
11:14:11 [FOLLOWER] Reseting election timeout.
11:14:11 [FOLLOWER] Accept AppendEntry from 'localhost:3002'
11:14:11 [FOLLOWER] Run Logic.
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019/10/07 11:14:10 [FOLLOWER] Run Logic.
019/10/07 11:14:10 [FOLLOWER] Reseting election timeout.
019/10/07 11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
019/10/07 11:14:10 [FOLLOWER] Run Logic.
019/10/07 11:14:11 [FOLLOWER] Update old term 'l' to new term '2' from 'localhost
                                            11:14:11 [FOLLOWER] Run Log1c.
11:14:11 [FOLLOWER] Reseting election timeout.
11:14:11 [FOLLOWER] Accept AppendEntry from 'localhost:3002'
@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CE5-27/Lab4/src/labRaft
11:14:10 [FOLLOWER] Reseting election timeout.
11:14:10 [FOLLOWER] Run Logic.
11:14:10 [FOLLOWER] Run Logic.
11:14:10 [FOLLOWER] Reseting election timeout.
11:14:10 [FOLLOWER] Run Logic.
11:14:10 [FOLLOWER] Run Logic.
11:14:10 [FOLLOWER] Run Logic.
11:14:10 [FOLLOWER] Run Logic.
11:14:10 [FOLLOWER] Reseting election timeout.
11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
11:14:10 [FOLLOWER] Run Logic.
11:14:10 [FOLLOWER] Run Logic.
11:14:10 [FOLLOWER] Reseting election timeout.
11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
11:14:10 [FOLLOWER] Run Logic.
11:14:10 [FOLLOWER] Reseting election timeout.
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2019/10/07 11:14:11 [FOLLOWER] Reseting 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] Reseting 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] Reseting election timeout.
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                                                                                                                                                                                                                                                                                                                                                                        /10/07 11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
/10/07 11:14:10 [FOLLOWER] Run Logic.
/10/07 11:14:10 [FOLLOWER] Reseting election timeout.
/10/07 11:14:10 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.
/10/07 11:14:10 [FOLLOWER] Run Logic.
/10/07 11:14:11 [FOLLOWER] Update old term '1' to new term '2' from 'localhost:
                                          11:14:10 [FOLLOWER] Run Logic.
11:14:10 [FOLLOWER] Reseting election timeout.
11:14:10 [FOLLOWER] Reseting election timeout.
11:14:10 [FOLLOWER] Run Logic.
11:14:11 [FOLLOWER] Run Logic.
11:14:11 [CANDIDATE] Run Logic.
11:14:11 [CANDIDATE] Run Logic.
11:14:11 [CANDIDATE] Vote granted by 'localhost:3001'.
11:14:11 [CANDIDATE] VoteCount: 2
11:14:11 [CANDIDATE] Vote granted by 'localhost:3005'.
11:14:11 [CANDIDATE] VoteCount: 3
11:14:11 [CANDIDATE] VoteCount: 3
11:14:11 [CANDIDATE] VoteCount: 3
11:14:11 [CANDIDATE] VoteCount: 3
11:14:11 [CANDIDATE] Run Logic.
                                                                                                                                                                                                                                                                                                                                                              02'.
19/10/07 11:14:11 [FOLLOWER] Reseting election timeout.
19/10/07 11:14:11 [FOLLOWER] Vote accepted to 'localhost:3002' for term '2'.
19/10/07 11:14:11 [FOLLOWER] Run Logic.
19/10/07 11:14:11 [FOLLOWER] Reseting election timeout.
19/10/07 11:14:11 [FOLLOWER] Accept AppendEntry from 'localhost:3002'.
19/10/07 11:14:11 [FOLLOWER] Run Logic.
19/10/07 11:14:11 [FOLLOWER] Reseting election timeout.
```

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

```
### Inabelic@isabelic_inspiron-5448 - / Craducaco/intral-pullana-CES-27/Lab4/src/labkaft/nn 703 / 2019/16/97 | 10:2339 | CAMDIDATE | Numing for term '1'.

2019/16/97 | 10:2339 | CAMDIDATE | Vote granted by 'Localhost:2002'.

2019/16/97 | 10:2339 | CAMDIDATE | Vote granted by 'Localhost:2002'.

2019/16/97 | 10:2339 | CAMDIDATE | Vote granted by 'Localhost:2002'.

2019/16/97 | 10:2339 | CAMDIDATE | Vote granted by 'Localhost:2002'.

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2019/16/97 | 10:2339 | CAMDIDATE | Vote granted by 'Localhost:2004'.

2019/16/97 | 10:2339 | CAMDIDATE | Vote granted by 'Localhost:2004'.

2019/16/97 | 10:2339 | CAMDIDATE | Vote granted by 'Localhost:2004'.

2019/16/97 | 10:2339 | CAMDIDATE | Vote granted by 'Localhost:2004'.

2
```

Figura 3. Funcionamento após a falha no leader.

```
| isabelle@isabelle-inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRat 2019/10/07 10:23:43 [FOLLOWER] Accept AppendEntry from 'localhost:3003'. 2019/10/07 10:23:43 [FOLLOWER] Run Logic. 2019/10/07 10:23:43 [FOLLOWER] Run Logic. 2019/10/07 10:23:43 [FOLLOWER] Reseting election timeout. 2019/10/07 10:23:43 [FOLLOWER] Reseting election timeout. 2019/10/07 10:23:43 [FOLLOWER] Run Logic. 2019/10/07 10:23:43 [FOLLOWER] Reseting election timeout. 2019/10/07 10:23:43 [FOLLOWER] Run Logic. 2019/10/07 10:23:43 [FOLLOWER] Run Logic. 2019/10/07 10:23:45 [FOLLOWER] Run Logic. 2019/10/07 10:23:45 [CANDIDATE] Run Logic. 2019/10/07 10:23:45 [CANDIDATE] Run Logic. 2019/10/07 10:23:45 [CANDIDATE] Vote granted by 'localhost:3002'. 2019/10/07 10:23:45 [CANDIDATE] Vote granted by 'localhost:3002'. 2019/10/07 10:23:45 [CANDIDATE] Vote granted by 'localhost:3005'. 2019/10/07 10:23:45 [CANDIDATE] VoteCount: 3 20
🗜 isabelle@isabelle-inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 78> 📳 isabelle@isabelle-inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 83x20
     nal: interrupt
belle@isabelle-Inspiron-5448 ~/Graduacao/hirata-juliana-CES-27/Lab4/src/l
맞 isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 78:
                                      10:23:43 [FOLLOWER] Accept AppendEntry from 'localhost:3003'
10:23:43 [FOLLOWER] Run Logic.
10:23:43 [FOLLOWER] Reseting election timeout.
10:23:43 [FOLLOWER] Accept AppendEntry from 'localhost:3003'
                                      10:23:43 [FOLLOWER] Run Logic.
10:23:45 [FOLLOWER] Update old term '3' to new term '4' from 'loca'
                                                                                                                                                                                                                                                                                                                           st:3004'.

19/10/07 10:23:45 [FOLLOWER] Reseting election timeout.

19/10/07 10:23:45 [FOLLOWER] Vote accepted to 'localhost:3004' for term '4'

19/10/07 10:23:45 [FOLLOWER] Run Logic.

19/10/07 10:23:45 [FOLLOWER] Reseting election timeout.

19/10/07 10:23:45 [FOLLOWER] Accept AppendEntry from 'localhost:3004'.

19/10/07 10:23:45 [FOLLOWER] Run Logic.

19/10/07 10:23:45 [FOLLOWER] Reseting election timeout.

19/10/07 10:23:45 [FOLLOWER] Accept AppendEntry from 'localhost:3004'.
                                      10:23:45 [FOLLOWER] Run Logic
맞 isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 78x
     Isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CE5-27/Lab4/si
19/10/07 10:23:39 [FOLLOWER] Accept AppendEntry from 'localhost
19/10/07 10:23:39 [FOLLOWER] Run Logic.
19/10/07 10:23:41 [CANDIDATE] Votegranted by 'localhost:3004'.
19/10/07 10:23:41 [CANDIDATE] Votegranted by 'localhost:3004'.
19/10/07 10:23:41 [CANDIDATE] Votegranted by 'localhost:3002'.
19/10/07 10:23:41 [CANDIDATE] VoteGount: 2
19/10/07 10:23:41 [CANDIDATE] VoteGount: 3
19/10/07 10:23:41 [CANDIDATE] Becoming leader.
19/10/07 10:23:41 [LEADER] Run Logic.
                                                                                                                                                                                                                                                                                                                           3004'.
2019/10/07 10:23:45 [FOLLOWER] Reseting election timeout.
2019/10/07 10:23:45 [FOLLOWER] Vote accepted to 'localhost:3004' for term '4'.
2019/10/07 10:23:45 [FOLLOWER] Run Logic.
2019/10/07 10:23:45 [FOLLOWER] Reseting election timeout.
2019/10/07 10:23:45 [FOLLOWER] Accept AppendEntry from 'localhost:3004'.
                                                                                                                                                                                                                                                                                                                          2019/10/07 10:23:45 [FOLLOWER]
                                                                                                                                                                                                                                                                                                                                                                                                                                                  Run Logic.
Reseting election timeout.
Accept AppendEntry from 'localhost:3004'.
                                       10:23:41 [LEADER] Run Logic
        ignal: interrupt
sabelle@isabelle-Inspiron-5448 ~/Graduacao/hirata-juliana-CES-27/Lab4/src/l
```

Figura 4. Funcionamento após a falha no próximo leader.

```
⊋ isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 78
     | sabelle@isabelle-inspiron-5448: ~/Graduacao/hirata-jullana-CES-27/Lab4/src/labRaft/run 78
19/910/07 10:28:44 [CANDIDATE] Run Logic.
10/91/00/07 10:28:44 [CANDIDATE] Run Logic.
10/91/10/07 10:28:44 [CANDIDATE] Vote granted by 'localhost:3002'.
10/91/00/07 10:28:44 [CANDIDATE] VoteCount: 2
10/91/00/07 10:28:45 [CANDIDATE] Vote denied to 'localhost:3004' for term 'l'.
10/91/00/07 10:28:45 [CANDIDATE] Run Logic.
10/91/00/07 10:28:45 [CANDIDATE] Run Logic.
10/91/00/07 10:28:45 [CANDIDATE] WoteCount: 2
10/91/00/07 10:28:46 [CANDIDATE] VoteCount: 2
10/91/00/07 10:28:45 [CANDIDATE] VoteCount: 2
10/91/00/07 10:28:45 [CANDIDATE] Vote granted by 'localhost:3002'.
10/91/00/07 10:28:45 [CANDIDATE] VoteCount: 3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Reseting election timeout.
Accept AppendEntry from 'localhost:3003'.
Run Logic.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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] Reseting election timeout.
2019/10/07 10:28:56 [FOLLOWER] Run Logic.
2019/10/07 10:28:56 [FOLLOWER] Run Logic.
2019/10/07 10:28:56 [FOLLOWER] Run Logic.
2019/10/07 10:28:56 [FOLLOWER] Reseting election timeout.
2019/10/07 10:28:56 [FOLLOWER] Reseting election timeout.
2019/10/07 10:28:56 [FOLLOWER] Run Logic.
2019/10/07 10:28:56 [FOLLOWER] Run Logic.
2019/10/07 10:28:56 [FOLLOWER] Reseting election timeout.
2019/10/07 10:28:56 [FOLLOWER] Reseting election timeout.
2019/10/07 10:28:56 [FOLLOWER] Run Logic.
2019/10/07 10:28:59 [CANDIDATE] Run Logic.
2019/10/07 10:29:02 [CANDIDATE] Run Logic.
                                                           10:28:46 [CANDIDATE] VoteCount. 2
10:28:46 [CANDIDATE] Vote granted by
10:28:46 [CANDIDATE] VoteCount: 3
10:28:46 [CANDIDATE] Becoming leader.
         signal: 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 78

         Jajour 10:28:56 [FOLLOWER] Reseting election timeout.

19/10/07 10:28:56 [FOLLOWER] Reseting election timeout.

19/10/07 10:28:56 [FOLLOWER] Accept AppendEntry from 'localhost:3003'.

19/10/07 10:28:56 [FOLLOWER] Run Logic.

19/10/07 10:28:56 [FOLLOWER] Reseting election timeout.

19/10/07 10:28:56 [FOLLOWER] Reseting election timeout.

19/10/07 10:28:56 [FOLLOWER] Run Logic.

19/10/07 10:28:55 [FOLLOWER] Update old term '4' to new term '5' from 'local
            9/10/07 10:28:59 [FOLLOWER] Reseting election timeout.
19/10/07 10:28:59 [FOLLOWER] Vote accepted to 'localhost:3004' for term '5'.
19/10/07 10:28:59 [FOLLOWER] Run Logic.
19/10/07 10:29:02 [FOLLOWER] Update old term '5' to new term '6' from 'local
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaf 019/10/07 10:28:47 [FOLLOWER] Reseting election timeout. 019/10/07 10:28:47 [FOLLOWER] Accept AppendEntry from 'localhost:3001'. 019/10/07 10:28:47 [FOLLOWER] Run Logic. 019/10/07 10:28:47 [FOLLOWER] Run Logic. 019/10/07 10:28:47 [FOLLOWER] Reseting election timeout. 019/10/07 10:28:47 [FOLLOWER] Accept AppendEntry from 'localhost:3001'. 019/10/07 10:28:47 [FOLLOWER] Run Logic. 019/10/07 10:28:47 [FOLLOWER] Run Logic. 019/10/07 10:28:47 [FOLLOWER] Reseting election timeout. 019/10/07 10:28:47 [FOLLOWER] Accept AppendEntry from 'localhost:3001'. 019/10/07 10:28:51 [FOLLOWER] Run Logic. 019/10/07 10:28:51 [FOLLOWER] Run Logic. 019/10/07 10:28:51 [CANDIDATE] Run Logic. 019/10/07 10:28:51 [CANDIDATE] Run Logic. 019/10/07 10:28:51 [CANDIDATE] Vote granted by 'localhost:3003'. 019/10/07 10:28:51 [CANDIDATE] Vote granted by 'localhost:3004'. 019/10/07 10:28:51 [CANDIDATE] Vote granted by 'localhost:3004'. 019/10/07 10:28:51 [CANDIDATE] VoteCount: 2 019/10/07 10:28:51 [CANDIDATE] VoteCount: 3 019/10/07 10:28:51 [CANDIDATE] VoteCo
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ☐ isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 83x20
                         3004'.
10/07 10:29:02 [FOLLOWER] Reseting election timeout.
10/07 10:29:02 [FOLLOWER] Vote accepted to 'localhost:3004' for term '6
10/07 10:29:02 [FOLLOWER] Run Logic.
 🗜 isabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRaft/run 78x
       Jisabelle@isabelle-Inspiron-5448: ~/Graduacao/hirata-juliana-CE5-27/Lab4/st 109/10/07 10:28:53 [FOLLOWER] Accept AppendEntry from 'localhost 109/10/07 10:28:53 [FOLLOWER] Run Logic. 109/10/07 10:28:54 [FOLLOWER] Election timeout. 109/10/07 10:28:54 [CANDIDATE] Run Logic. 109/10/07 10:28:54 [CANDIDATE] Run Logic. 109/10/07 10:28:54 [CANDIDATE] Run Logic. 109/10/07 10:28:54 [CANDIDATE] Vote granted by 'localhost:3004'. 109/10/07 10:28:54 [CANDIDATE] VoteCount: 2 109/10/07 10:28:54 [CANDIDATE] VoteCount: 3 109/10/07 10:28:54 [CANDIDATE] VoteCount: 3 109/10/07 10:28:54 [CANDIDATE] VoteCount: 3 109/10/07 10:28:54 [CANDIDATE] WoteCount: 3 109/10/07 10:28:54 [CANDIDATE] WoteCount: 3 109/10/07 10:28:54 [CANDIDATE] WoteCount: 3 109/10/07 10:28:54 [CANDIDATE] Becoming leader. 109/10/07 10:28:54 [LEADER] Run Logic.
                  0/10/07 10:28:54 [LEADER] Run Logic
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ois/io/o/ 10.2011 (22.002)
Csignal: interrupt
—isabelle@isabelle-Inspiron-5448 ~/Graduacao/hirata-juliana-CES-27/Lab4/src/labRad
```

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