

# CSC-27 – Computação Distribuída

## Laboratório 1: Algoritmo de Ricart-Agrawala para exclusão mútua

**Nomes:** Daniel Araujo Cavassani | Caue Marçal Guimarães | (COMP 25)

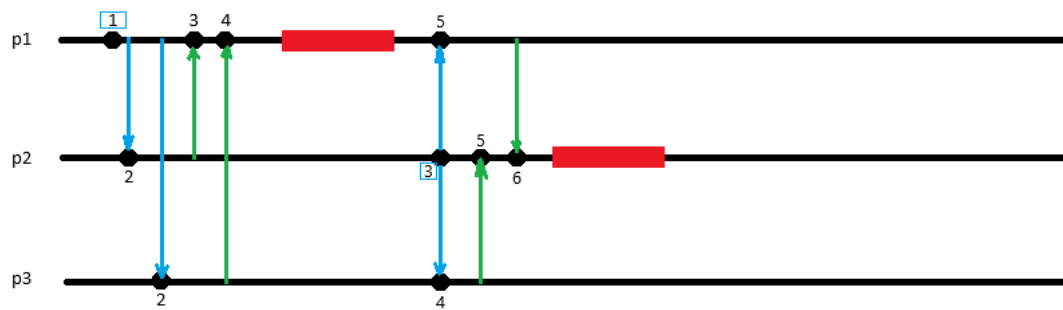
**Data:** 15/09/2024

### Testes Realizados

Para validar o funcionamento correto do algoritmo de Ricart-Agrawala, realizamos uma série de testes com três processos simultâneos. Os cenários abaixo demonstram como o algoritmo lida com diferentes situações de requisição e liberação da seção crítica (Critical Section - CS).

## Caso 1: Um processo solicita a CS. Após liberá-la, outro processo solicita a CS.

- P1 solicita a CS.
- P1 usa a CS e depois a libera.
- P2 usa a CS e depois a libera.



```
Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academics\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\SharedResource> .\SharedResource.exe
Processo 1 (127.0.0.1:64050) enviou a mensagem "Hello, CS!" com clock 1

Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academics\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\Process> .\Process.exe 1 :10002 :10003 :10004

+-----+
| RELEASED |
+-----+
x

+-----+
| WANTED   |
+-----+
Requesting access to the critical section (sending requests)... | Clock: 1
Reply received from process 3 | Total replies: 1
Reply received from process 2 | Total replies: 2

+-----+
| HELD     |
+-----+
Entering critical section through port 64050

+-----+
| RELEASED |
+-----+
Releasing the critical section...

Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academics\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\Process> .\Process.exe 2 :10002 :10003 :10004

+-----+
| RELEASED |
+-----+
Received 'request' from process 1 with clock 1 | Current clock: 2
Sending immediate reply to process 1

Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academics\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\Process> .\Process.exe 3 :10002 :10003 :10004

+-----+
| RELEASED |
+-----+
Received 'request' from process 1 with clock 1 | Current clock: 2
Sending immediate reply to process 1
```

Windows PowerShell

PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academics\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\SharedResource> .\SharedResource.exe  
Processo 1 (127.0.0.1:64050) enviou a mensagem "Hello, CS!" com clock 1  
Processo 2 (127.0.0.1:64053) enviou a mensagem "Hello, CS!" com clock 3

Windows PowerShell

PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academics\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\Process> .\Process.exe 1 :10002 :10003 :10004  
  
+-----+  
| RELEASED |  
+-----+  
x  
  
+-----+  
| WANTED |  
+-----+  
Requesting access to the critical section (sending requests)... | Clock: 1  
Reply received from process 3 | Total replies: 1  
Reply received from process 2 | Total replies: 2  
  
+-----+  
| HELD |  
+-----+  
Entering critical section through port 64050  
  
+-----+  
| RELEASED |  
+-----+  
Releasing the critical section...  
Received 'request' from process 2 with clock 3 | Current clock: 4  
Sending immediate reply to process 2

Windows PowerShell

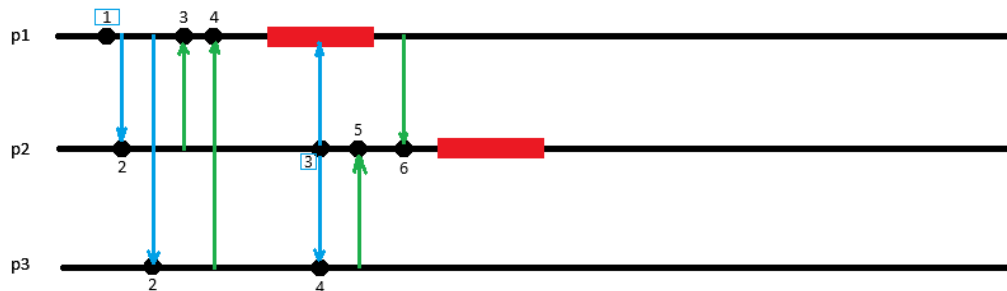
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academics\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\Process> .\Process.exe 2 :10002 :10003 :10004  
  
+-----+  
| RELEASED |  
+-----+  
Received 'request' from process 1 with clock 1 | Current clock: 2  
Sending immediate reply to process 1  
x  
  
+-----+  
| WANTED |  
+-----+  
Requesting access to the critical section (sending requests)... | Clock: 3  
Reply received from process 3 | Total replies: 1  
Reply received from process 1 | Total replies: 2  
  
+-----+  
| HELD |  
+-----+  
Entering critical section through port 64053  
  
+-----+  
| RELEASED |  
+-----+  
Releasing the critical section...

Windows PowerShell

PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academics\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\Process> .\Process.exe 3 :10002 :10003 :10004  
  
+-----+  
| RELEASED |  
+-----+  
Received 'request' from process 1 with clock 1 | Current clock: 2  
Sending immediate reply to process 1  
Received 'request' from process 2 with clock 3 | Current clock: 4  
Sending immediate reply to process 2

## Caso 2: Um processo solicita a CS enquanto outro processo está usando a CS

- P2 solicita a CS enquanto P1 está utilizando a CS



Aqui, podemos verificar que o request de P2 chega em P1 enquanto o P1 está HELD (usando a CS)

```
Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academica\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\SharedResource> .\SharedResource.exe
Processo 1 (127.0.0.1:55432) enviou a mensagem "Hello, CS!" com clock 1

Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academica\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\Process> .\Process.exe 1 :10002 :10003 :10004

+-----+
| RELEASED |
+-----+
x

+-----+
| WANTED |
+-----+

Requesting access to the critical section (sending requests)... | Clock: 1
Reply received from process 2 | Total replies: 1
Reply received from process 3 | Total replies: 2

+-----+
| HELD |
+-----+

Entering critical section through port 55432
Received 'request' from process 2 with clock 3 | Current clock: 4
Queuing request from process 2 (clock = 3)

Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academica\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\Process> .\Process.exe 2 :10002 :10003 :10004

+-----+
| RELEASED |
+-----+

Received 'request' from process 1 with clock 1 | Current clock: 2
Sending immediate reply to process 1
x

+-----+
| WANTED |
+-----+

Requesting access to the critical section (sending requests)... | Clock: 3
Reply received from process 3 | Total replies: 1

Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academica\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\Process> .\Process.exe 3 :10002 :10003 :10004

+-----+
| RELEASED |
+-----+

Received 'request' from process 1 with clock 1 | Current clock: 2
Sending immediate reply to process 1
Received 'request' from process 2 with clock 3 | Current clock: 4
Sending immediate reply to process 2
```

Após sair de HELD, ele consulta sua queue e da reply para o request de P2, permitindo P2 a entrar na CS

```
Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academics\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\SharedResource> .\SharedResource.exe
Processo 1 (127.0.0.1:55432) enviou a mensagem "Hello, CS!" com clock 1
Processo 1 (127.0.0.1:55435) enviou a mensagem "Hello, CS!" com clock 3

Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academics\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\Process> .\Process.exe 1 :10002 :10003 :10004

+-----+
| RELEASED |
+-----+
x

+-----+
| WANTED   |
+-----+
Requesting access to the critical section (sending requests)... | Clock: 1
Reply received from process 2 | Total replies: 1
Reply received from process 3 | Total replies: 2

+-----+
| HELD     |
+-----+
Entering critical section through port 55432
Received 'request' from process 2 with clock 3 | Current clock: 4
Queuing request from process 2 (clock = 3)

+-----+
| RELEASED |
+-----+
Releasing the critical section...
Sending reply to process 2

Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academics\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\Process> .\Process.exe 2 :10002 :10003 :10004

+-----+
| RELEASED |
+-----+
Received 'request' from process 1 with clock 1 | Current clock: 2
Sending immediate reply to process 1
x

+-----+
| WANTED   |
+-----+
Requesting access to the critical section (sending requests)... | Clock: 3
Reply received from process 3 | Total replies: 1
Reply received from process 1 | Total replies: 2

+-----+
| HELD     |
+-----+
Entering critical section through port 55435

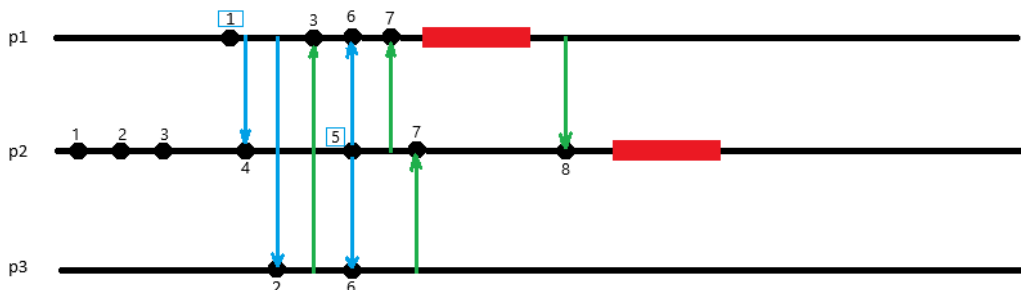
+-----+
| RELEASED |
+-----+
Releasing the critical section...

Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academics\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\Process> .\Process.exe 3 :10002 :10003 :10004

+-----+
| RELEASED |
+-----+
Received 'request' from process 1 with clock 1 | Current clock: 2
Sending immediate reply to process 1
Received 'request' from process 2 with clock 3 | Current clock: 4
Sending immediate reply to process 2
```

### Caso 3: Processo com requisição anterior tem preferência para acessar a Seção Crítica

- P1 solicita a CS (está WANTED)
- P2 também solicita a CS (está WANTED)
- P3 da REPLY para ambas as requisições
- Como P1 fez a solicitação com menor clock, ele entrará na CS primeiro, e logo após, o P2 entrará.



P1 e P2 entram em WANTED ao mesmo tempo. Note que P1 recebe de P2 um request com clock 5, sendo que o clock que ele tinha quando mandou request para a CS era 1... logo ele tem preferência e da enqueue no request recebido. Já P2, recebe de P1 o request de clock 1, sendo que enviou um request com clock 5... logo, ele sabe que não tem prioridade.

```
Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academics\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\Process> .\Process.exe 1 :10002 :10003 :10004
Processo 1 (127.0.0.1:55674) enviou a mensagem "Hello, CS!" com clock 6

Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academics\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\Process> .\Process.exe 2 :10002 :10003 :10004
Processo 2 (127.0.0.1:55674) enviou a mensagem "Hello, CS!" com clock 5

Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academics\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\Process> .\Process.exe 3 :10002 :10003 :10004
Processo 3 (127.0.0.1:55674) enviou a mensagem "Hello, CS!" com clock 6
```

Após sair da CS, o P1 consulta sua queue de requests e da reply em todos eles. O P2, então, pode entrar na CS com este reply que estava faltando

```
Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academicos\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\SharedResource> .\SharedResource.exe
Processo 1 (127.0.0.1:55674) enviou a mensagem "Hello, CS!" com clock 6
Processo 2 (127.0.0.1:59450) enviou a mensagem "Hello, CS!" com clock 5

+-----+
| RELEASED |
+-----+
x

+-----+
| WANTED   |
+-----+
|
Requesting access to the critical section (sending requests)... | Clock: 1
Reply received from process 3 | Total replies: 1
Reply received from process 2 | Total replies: 2
Received 'request' from process 2 with clock 5 | Current clock: 6
Queuing request from process 2 (clock = 5)

+-----+
| HELD     |
+-----+
|
Entering critical section through port 55674

+-----+
| RELEASED |
+-----+
|
Releasing the critical section...
Sending reply to process 2

Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academicos\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\Process> .\Process.exe 1 :10002 :10003 :10004

+-----+
| RELEASED |
+-----+
x

+-----+
| WANTED   |
+-----+
|
Received 'request' from process 1 with clock 1 | Current clock: 2
Sending immediate reply to process 1
Received 'request' from process 2 with clock 5 | Current clock: 6
Sending immediate reply to process 2

+-----+
| HELD     |
+-----+
|
Entering critical section through port 59450

+-----+
| RELEASED |
+-----+
|
Releasing the critical section...

Windows PowerShell
PS C:\Users\danie\OneDrive\DanxC-Notebook-1\Documentos\Academicos\ITA\8º Sem (4º COMP)\CSC-27 (Distributed Computing)\Go Labs and Activities\Lab 2\Process> .\Process.exe 3 :10002 :10003 :10004

+-----+
| RELEASED |
+-----+
x

+-----+
| WANTED   |
+-----+
|
Requesting access to the critical section (sending requests)... | Clock: 5
Reply received from process 3 | Total replies: 1
Reply received from process 1 | Total replies: 2

+-----+
| HELD     |
+-----+
|
Entering critical section through port 59450

+-----+
| RELEASED |
+-----+
|
Releasing the critical section...
```