

# Aplicativo web de auxílio à navegação aérea

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Departamento de Informática  
PUC-Rio

Dezembro 2024

# Outline

**1** Introdução

**2** Arquitetura

**3** Projeto

**4** Teste de carga

**5** Conclusão

# Introdução

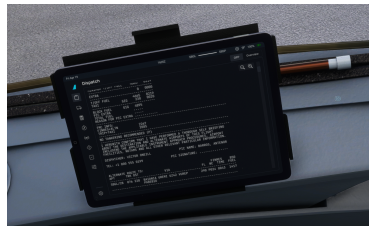


**Figure:** Electronic Flight Bag  
(David Guimarães)

# Introdução



**Figure:** Electronic Flight Bag  
(David Guimarães)



**Figure:** Electronic Flight Bag  
(MSFS2020 / FlyByWire  
Simulations)

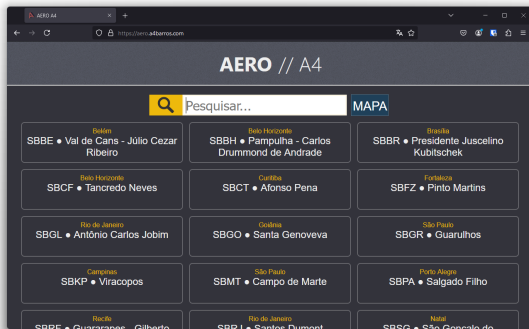
# Introdução

## ■ Simulação de voo

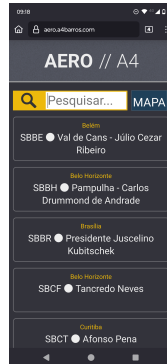
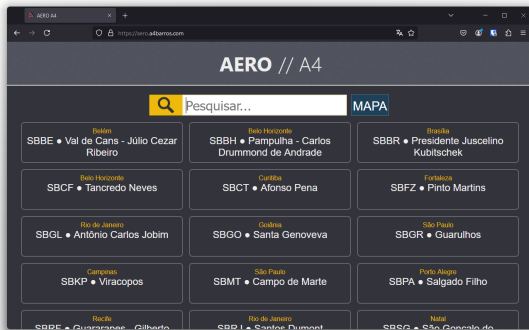
# Introdução

- Simulação de voo
- AISWEB, METAR-TAF, SIGMET

## UI



## UI





# Servidor

You are using a free Tier account. To access all services and resources, [upgrade](#) to a paid account.

ORACLE Cloud [Cloud Console](#) Search resources, services, documentation, and Marketplace Brazil East (Sao Paulo)

## Compute

Instances in a4server (root) compartment

An [instance](#) is a compute host. Choose between virtual machines (VMs) and bare metal instances. The image that you use to launch an instance determines its operating system and other software.

[Create instance](#) [Actions](#)

<input type="checkbox"/>	Name	State	Public IP	Private IP	Shape	OCPUs count	Memory (GB)	Availability dom
<input type="checkbox"/>	<a href="#">af3afad</a> <a href="#">View details</a>	Running	167.234.237.41	10.0.1.130	VM.Standard.E2.1.Micro	1	1	AD-1
<input type="checkbox"/>	<a href="#">af8f8f8</a> <a href="#">View details</a>	Running	164.152.43.215	10.0.0.94	VM.Standard.E2.1.Micro	1	1	AD-1

0 selected Showing 2 items < 1 of 1 >

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# Servidor

The screenshot shows the Oracle Cloud console interface. At the top, there's a navigation bar with the Oracle Cloud logo, a search bar, and the region 'Brazil East (Sao Paulo)'. Below this, the 'Compute' section is active, displaying 'Instances in a4server (root) compartment'. A sidebar on the left lists various navigation options like Overview, Instances, Instance Maintenance, etc. The main content area shows a table of instances. Two instances are listed: 'af4server' and 'af4server', both in a 'Running' state. The table columns include Name, State, Public IP, Private IP, Shape, OCPU count, Memory (GB), and Availability domain. Below the table, it indicates '0 selected' and 'Showing 2 items'. At the bottom, there are links for 'Terms of Use and Privacy' and 'Cookie Preferences', and a copyright notice for 2024 Oracle and/or its affiliates.

<input type="checkbox"/>	Name	State	Public IP	Private IP	Shape	OCPU count	Memory (GB)	Availability dom
<input type="checkbox"/>	af4server <small>Instance name</small>	Running	167.234.237.41	10.0.1.130	VM.Standard.E2.1.Micro	1	1	AD-1
<input type="checkbox"/>	af4server <small>Instance name</small>	Running	164.152.43.215	10.0.0.94	VM.Standard.E2.1.Micro	1	1	AD-1

- **CPU:** AMD EPYC 7551 (2 cores) @ 1.996GHz

# Servidor

The screenshot shows the Oracle Cloud console interface. At the top, there's a navigation bar with the Oracle Cloud logo, a search bar, and the region 'Brazil East (Sao Paulo)'. Below this, the 'Compute' section is active, displaying 'Instances in a4server (root) compartment'. A sidebar on the left lists various compute-related options like Overview, Instances, Instance Maintenance, etc. The main area shows a table of instances. Two instances are listed: 'af4sdl' and 'af4sdlv', both in a 'Running' state. The table columns include Name, State, Public IP, Private IP, Shape, OCPU count, Memory (GB), and Availability domain. Below the table, it indicates '0 selected' and 'Showing 2 items'. At the bottom of the console view, there are links for 'Terms of Use and Privacy' and 'Cookie Preferences', and a copyright notice for 2024 Oracle and/or its affiliates.

<input type="checkbox"/>	Name	State	Public IP	Private IP	Shape	OCPU count	Memory (GB)	Availability domain
<input type="checkbox"/>	af4sdl <small>Instance name</small>	Running	167.234.237.41	10.0.1.130	VM.Standard.E2.1.Micro	1	1	AD-1
<input type="checkbox"/>	af4sdlv <small>Instance name</small>	Running	164.152.43.215	10.0.0.94	VM.Standard.E2.1.Micro	1	1	AD-1

- **CPU:** AMD EPYC 7551 (2 cores) @ 1.996GHz
- **RAM:** 1GB

# Servidor

You are using a free Tier account. To access all services and resources, [upgrade](#) to a paid account.

**ORACLE Cloud** Cloud Catalog Search resources, services, documentation, and Marketplace Brazil East (Sao Paulo)

### Compute

Instances in **a4server (root) compartment**

An **instance** is a compute host. Choose between virtual machines (VMs) and bare metal instances. The image that you use to launch an instance determines its operating system and other software.

[Create instance](#) [Actions](#)

<input type="checkbox"/>	Name	State	Public IP	Private IP	Shape	CPU count	Memory (GB)	Availability dom
<input type="checkbox"/>	<b>a4server</b> <a href="#">Instance Details</a>	Running	167.234.237.41	10.0.1.130	VM.Standard.E2.1.Micro	1	1	AD-1
<input type="checkbox"/>	<b>a4server</b> <a href="#">Instance Details</a>	Running	164.152.43.215	10.0.0.94	VM.Standard.E2.1.Micro	1	1	AD-1

0 selected Showing 2 items < 1 of 1 >

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- **CPU:** AMD EPYC 7551 (2 cores) @ 1.996GHz
- **RAM:** 1GB
- **Armazenamento:** 25GB

# Servidor

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**ORACLE Cloud** Cloud Console Search resources, services, documentation, and Marketplace Brazil East (Sao Paulo)

### Compute

Instances in a4server (root) compartment

An [instance](#) is a compute host. Choose between virtual machines (VMs) and bare metal instances. The image that you use to launch an instance determines its operating system and other software.

Create instance Actions

<input type="checkbox"/>	Name	State	Public IP	Private IP	Shape	OCPU count	Memory (GB)	Availability dom
<input type="checkbox"/>	a4server	Running	167.234.237.41	10.0.1.130	VM.Standard.E2.1.Micro	1	1	AD-1
<input type="checkbox"/>	a4server-1	Running	164.152.43.215	10.0.0.94	VM.Standard.E2.1.Micro	1	1	AD-1

0 selected Showing 2 items < 1 of 1 >

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- **CPU:** AMD EPYC 7551 (2 cores) @ 1.996GHz
- **RAM:** 1GB
- **Armazenamento:** 25GB
- **SO:** Ubuntu 22.04.4 LTS

# Arquitetura

## ■ Docker/Docker Compose

# Arquitetura

- Docker/Docker Compose
- Banco: MariaDB

# Arquitetura

- Docker/Docker Compose
- Banco: MariaDB
- Backend: ~~Flask~~ FastAPI



# Arquitetura

- Docker/Docker Compose
- Banco: MariaDB
- Backend: Flask FastAPI
- Frontend: Jinja2

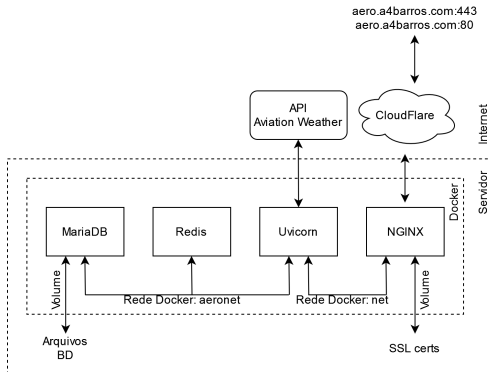
# Arquitetura

- Docker/Docker Compose
- Banco: MariaDB
- Backend: Flask FastAPI
- Frontend: Jinja2
- Observabilidade: GoAccess

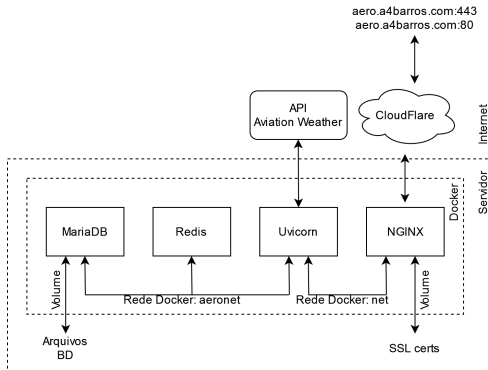
# Arquitetura

- Docker/Docker Compose
- Banco: MariaDB
- Backend: Flask FastAPI
- Frontend: Jinja2
- Observabilidade: GoAccess
- Outros subdomínios

# Diagrama da arquitetura

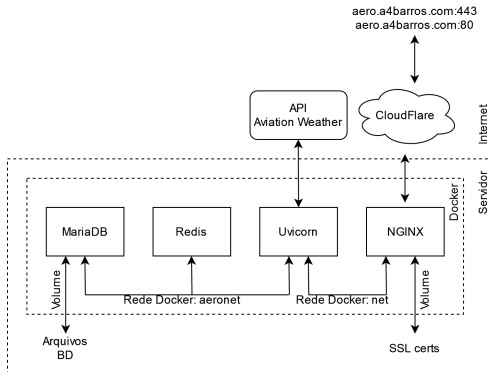


# Diagrama da arquitetura



## ■ Uso de Docker network

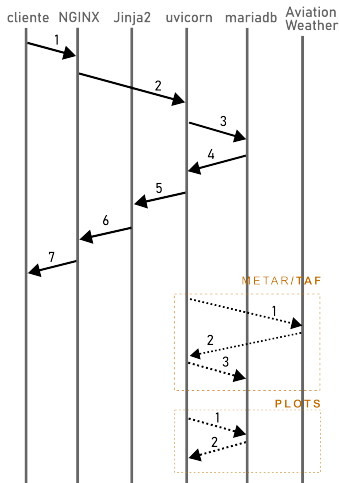
# Diagrama da arquitetura



- Uso de Docker network
- Uso de volumes

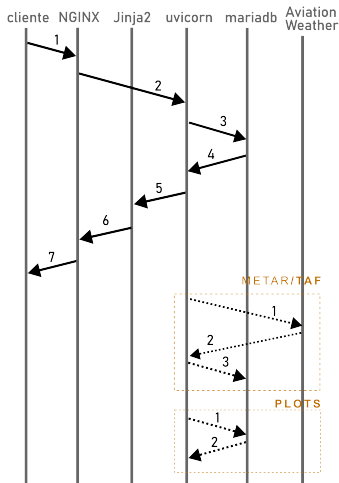
# Diagrama de tempo

# Diagrama de tempo

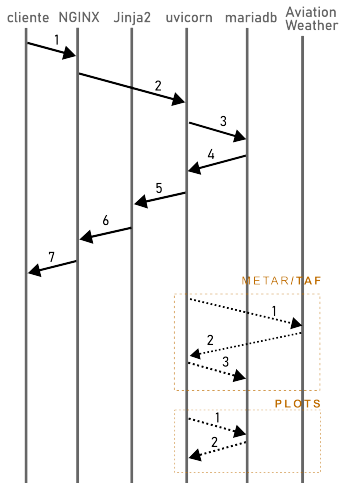




# Diagrama de tempo

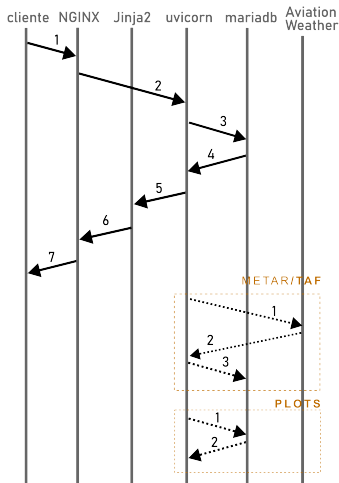


# Diagrama de tempo



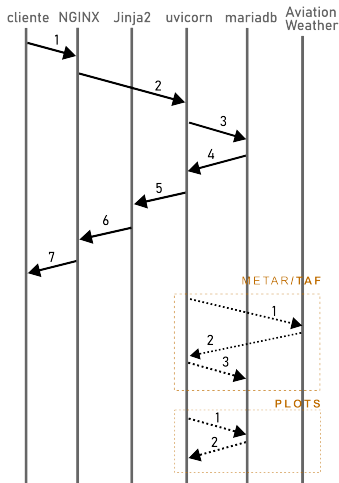
## ■ Tarefas síncronas

# Diagrama de tempo



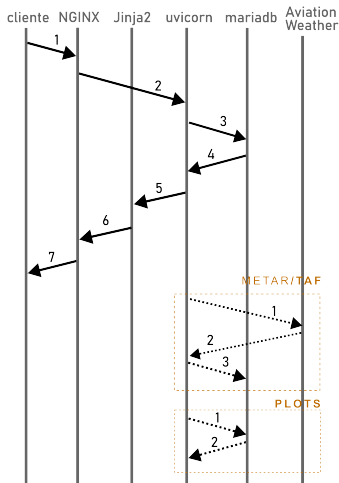
- Tarefas síncronas
  - Rotas

# Diagrama de tempo



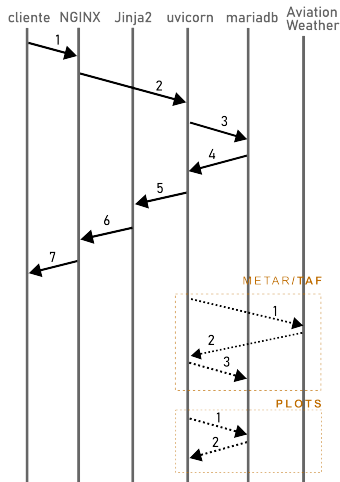
- Tarefas síncronas
  - Rotas
- Tarefas assíncronas

# Diagrama de tempo



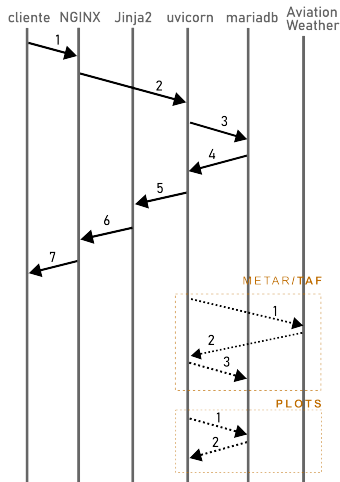
- Tarefas síncronas
  - Rotas
- Tarefas assíncronas
  - METAR

# Diagrama de tempo



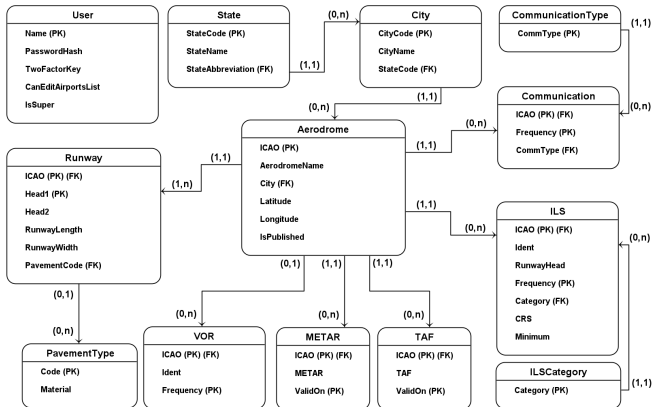
- Tarefas síncronas
  - Rotas
- Tarefas assíncronas
  - METAR
  - TAF

# Diagrama de tempo



- Tarefas síncronas
  - Rotas
- Tarefas assíncronas
  - METAR
  - TAF
  - Plots

# Tabelas





# METAR

## ■ Separação nos espaços

# METAR

- Separação nos espaços
- Regex

# METAR

- Separação nos espaços
- Regex
- Lista de tuplas

# METAR

- Separação nos espaços
- Regex
- Lista de tuplas
- Ferramenta de templating

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# METAR

- Separação nos espaços
- Regex
- Lista de tuplas
- Ferramenta de templating

251600Z 22011KT 9999 BKN023 OVC035  
21/16 Q1012

# METAR

- Separação nos espaços
- Regex
- Lista de tuplas
- Ferramenta de templating

```
251600Z 22011KT 9999 BKN023 OVC035  
21/16 Q1012
```

```
[  
  ('251600Z', 'METAR válido para dia 25 as 16:00 (UTC)'),  
  ('22011KT', 'Vento proa <b>220</b>º com velocidade <b>11</b>  
nós (kt).'),  
  ('9999', 'Visibilidade ilimitada'),  
  ('SCT017', 'Nuvens espalhadas (3/8 a 4/8 do céu com nuvens) em  
<b>1700</b> pés de altitude. '),  
  ('BKN023', 'Nuvens broken (5/8 a 7/8 do céu com nuvens) em  
<b>2300</b> pés de altitude. '),  
  ('OVC035', 'Totalmente encoberto em <b>3500</b> pés de altitude. '),  
  ('21/16', 'Temperatura <b>21</b>ºC e ponto de orvalho <b>16</b>  
</b>ºC. '),  
  ('Q1022', 'O altímetro deve ser ajustado para <b>1022</b> hPa  
(30.18 inHg)')  
)
```

# TAF

```
220859Z 2212/2312 06006KT 9999 SCT040 TX34/2217Z TN24/2309Z  
BECMG 2215/2217 34013KT SCT040 FEW045TCU  
TEMPO 2220/2222 TS SCT030 FEW035CB  
BECMG 2222/2224 04008KT CAVOK  
BECMG 2310/2312 SCT020 RMK PGX
```

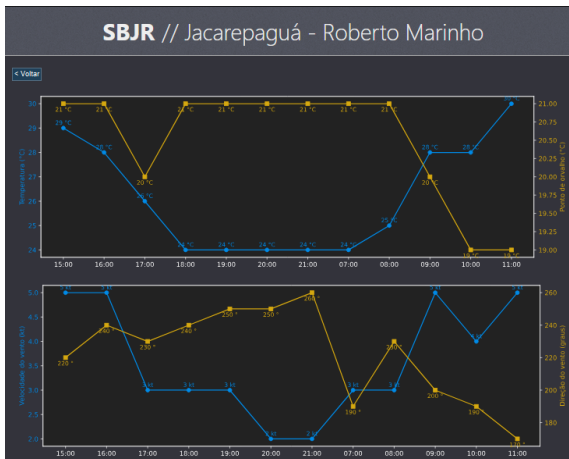
220859Z	Disponibilizado em 08:59Z no dia 22
2212/2312	Válido do dia 22 as 12:00Z até dia 23 as 12:00Z
06006KT	Vento proa <b>060°</b> com velocidade <b>06</b> nós (kt).
9999	Visibilidade 9999 metros
SCT040	Nuvens espalhadas (3/8 a 4/8 do céu com nuvens) em <b>4000</b> pés de altitude.
TX34/2217Z	A temperatura máxima é de 34°C prevista de ocorrer dia 22 as 17:00 (UTC)
TN24/2309Z	A temperatura mínima é de 24°C prevista de ocorrer dia 23 as 09:00 (UTC)
<b>BECMG 2215/2217</b> ▲	Condições previstas do dia 22 as 15:00 (UTC) até dia 22 as 17:00 (UTC)
34013KT	Vento proa <b>340°</b> com velocidade <b>13</b> nós (kt).
SCT040	Nuvens espalhadas (3/8 a 4/8 do céu com nuvens) em <b>4000</b> pés de altitude.
FEW045TCU	Poucas nuvens (1/8 a 2/8 do céu com nuvens) em <b>4500</b> pés de altitude. <b>Atenção:</b> nuvens de grande extensão vertical.
<b>TEMPO 2220/2222</b> ▼	Condições temporárias previstas do dia 22 as 20:00 (UTC) até dia 22 as 22:00 (UTC)



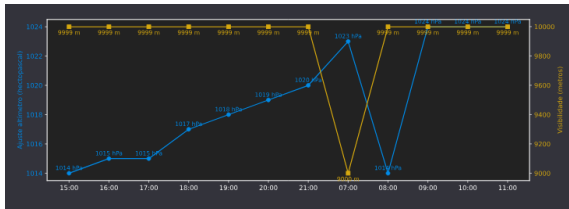
# Histórico

wind_direction	wind_speed	temperature	dew_point	qnh	visibility	clouds_few	clouds_scattered	clouds_broken	clouds_overcast	timestamp
150	6	21	19	1012	9999					2024-10-17 03:00:00
160	4	21	19	1012	9999					2024-10-17 04:00:00
100	5	20	19	1012	9999	4000	10000			2024-10-17 05:00:00
		21	20	1011	9999	4000	8000			2024-10-17 06:00:00
140	3	20	19	1011	9999					2024-10-17 07:00:00
140	4	20	19	1012	9999	500	10000			2024-10-17 08:00:00
0	0	21	19	1013	9999	2000	10000			2024-10-17 09:00:00
80	2	22	20	1014	9999	2000	10000			2024-10-17 10:00:00
30	5	23	20	1014	9999					2024-10-17 11:00:00
60	4	25	20	1014	9999	3000				2024-10-17 12:00:00
140	6	26	20	1014	9999	3000				2024-10-17 13:00:00
160	11	26	19	1014	9999	3000				2024-10-17 14:00:00

# Histórico



# Histórico



# Uso de recursos

- 500 acessos simultâneos (usando Locust)

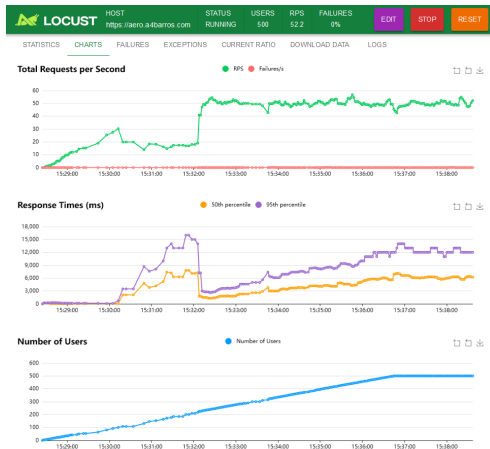
```
0[|||||] 41.5% Tasks: 60, 220 thr, 79 kthr; 2 running
1[|||||] 100.0% Load average: 0.17 0.09 0.16
Mem[|||||] 566M/957M Uptime: 4 days, 00:49:36
Swp[|||||] 0K/0K

  PID USER      PRI  NI  VIRT   RES   SHR  S  CPU% MEM%  TIME+  Command
151468 root        20   0  295M  130M 14464  S   0.0  13.7   0:15.41 /opt/venv/bin/python3 -u -m fastapi run server.py --h
151647 root        20   0  295M  130M 14464  S   0.0  13.7   0:00.16 /opt/venv/bin/python3 -u -m fastapi run server.py --h
151651 root        20   0  295M  130M 14464  S   0.0  13.7   0:00.00 /opt/venv/bin/python3 -u -m fastapi run server.py --h
151652 root        20   0  295M  130M 14464  S   0.0  13.7   0:00.00 /opt/venv/bin/python3 -u -m fastapi run server.py --h
151653 root        20   0  295M  130M 14464  S   0.0  13.7   0:00.00 /opt/venv/bin/python3 -u -m fastapi run server.py --h
151654 root        20   0  295M  130M 14464  S   0.0  13.7   0:00.00 /opt/venv/bin/python3 -u -m fastapi run server.py --h
151655 root        20   0  295M  130M 14464  S   0.0  13.7   0:00.00 /opt/venv/bin/python3 -u -m fastapi run server.py --h
151735 root        20   0  295M  130M 14464  S   0.0  13.7   0:00.00 /opt/venv/bin/python3 -u -m fastapi run server.py --h
151910 root        20   0  295M  130M 14464  S   0.0  13.7   0:00.18 /opt/venv/bin/python3 -u -m fastapi run server.py --h
151911 root        20   0  295M  130M 14464  R  81.9  13.7   0:39.84 /opt/venv/bin/python3 -u -m fastapi run server.py --h
151194 lxd         20   0 1375M 90456 10112  S   0.0   9.2   0:00.73 mariadb
151548 lxd         20   0 1375M 90456 10112  S   0.0   9.2   0:00.18 mariadb
151549 lxd         20   0 1375M 90456 10112  S   0.0   9.2   0:00.00 mariadb
151550 lxd         20   0 1375M 90456 10112  S   0.0   9.2   0:00.00 mariadb
151551 lxd         20   0 1375M 90456 10112  S   0.0   9.2   0:00.04 mariadb
151556 lxd         20   0 1375M 90456 10112  S   0.0   9.2   0:00.00 mariadb
151557 lxd         20   0 1375M 90456 10112  S   0.0   9.2   0:00.00 mariadb
151623 lxd         20   0 1375M 90456 10112  S   0.0   9.2   0:00.01 mariadb
151650 lxd         20   0 1375M 90456 10112  S   0.0   9.2   0:01.49 mariadb
151912 lxd         20   0 1375M 90456 10112  S   0.0   9.2   0:00.00 mariadb
151913 lxd         20   0 1375M 90456 10112  S   0.0   9.2   0:00.00 mariadb
151916 lxd         20   0 1375M 90456 10112  S   0.0   9.2   0:00.00 mariadb

F1Help F2Setup F3Search F4Filter F5Tree F6SortBy F7Nice F8Nice F9Kill F10Quit
```

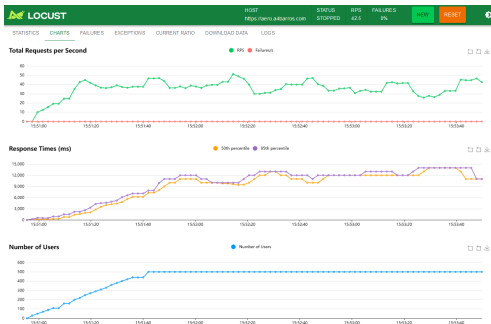
# Sem cache

## ■ Modo desenvolvedor CloudFlare

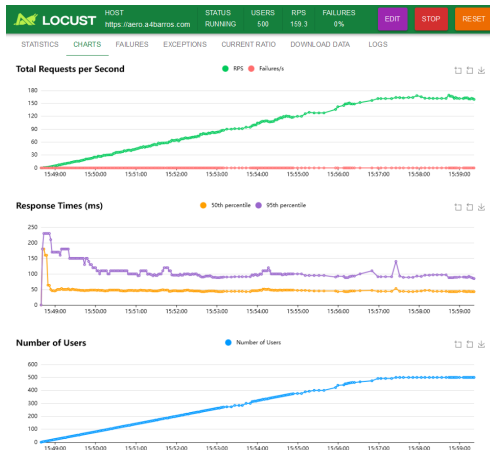


# Cache Redis

## ■ Decorator implementado: cache\_it



# Cache NGINX



# Demonstração

`https://aero.a4barros.com`



# Obrigado

# Obrigado!

Perguntas?