Laboratório Interinstitucional
de e-Astronomia

Tutorial de Jupyter Notebook

Infraestrutura necessária

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Junho de 2020

Sobre mim

Carlos Adean

- Graduação em Análise e Desenvolvimento de Sistemas
- Pós-graduado em Administração de Banco de dados
- Certificações LPIC e RedHat
- Colaborador do LIneA desde 2011

Agenda

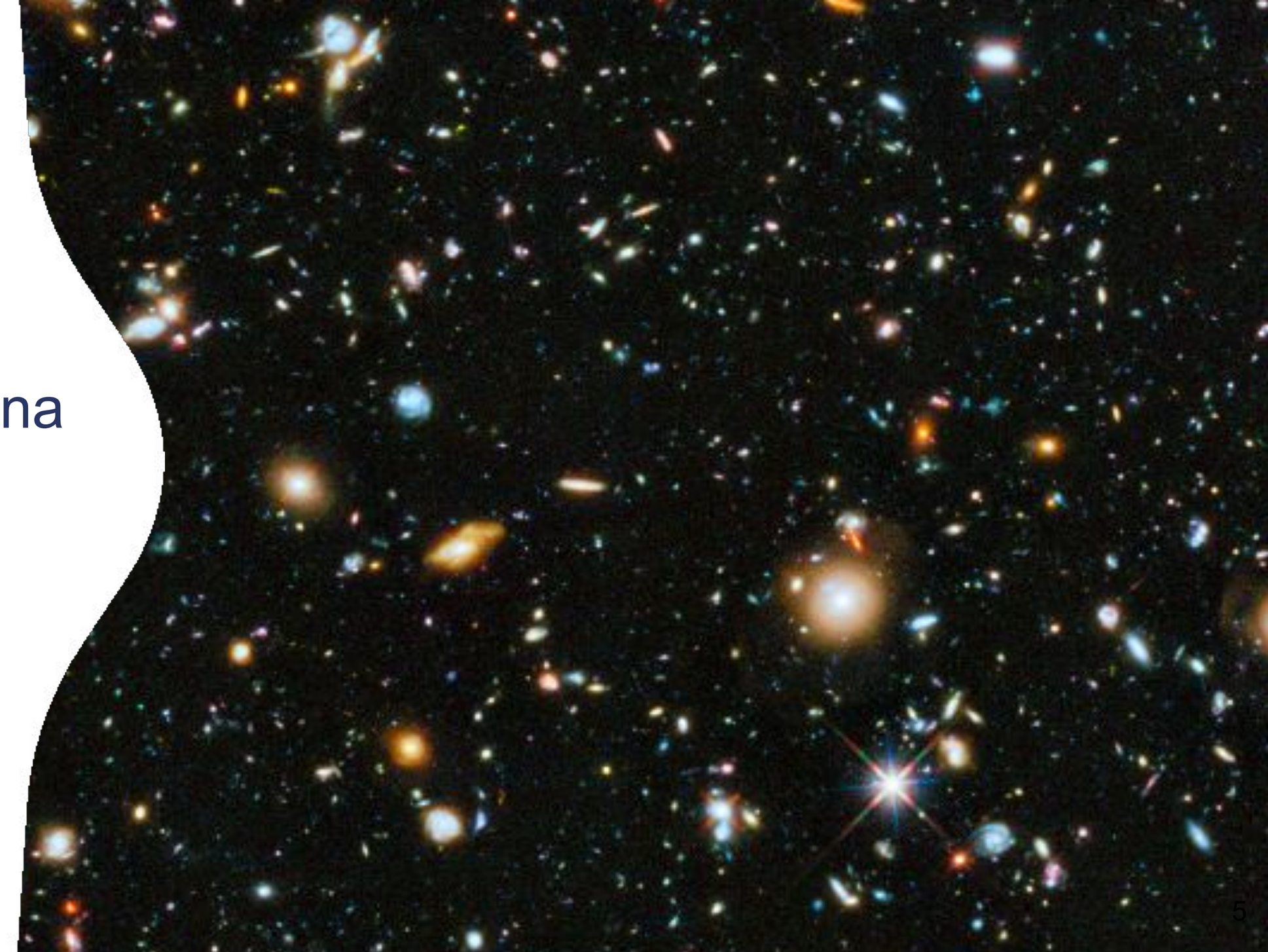
- Como funciona o Jupyter Notebook
- Como instalar no Windows e Linux
- Extensões e widgets
- Servidor JupyterHub

Como funciona o Jupyter Notebook

Dicionário de termos

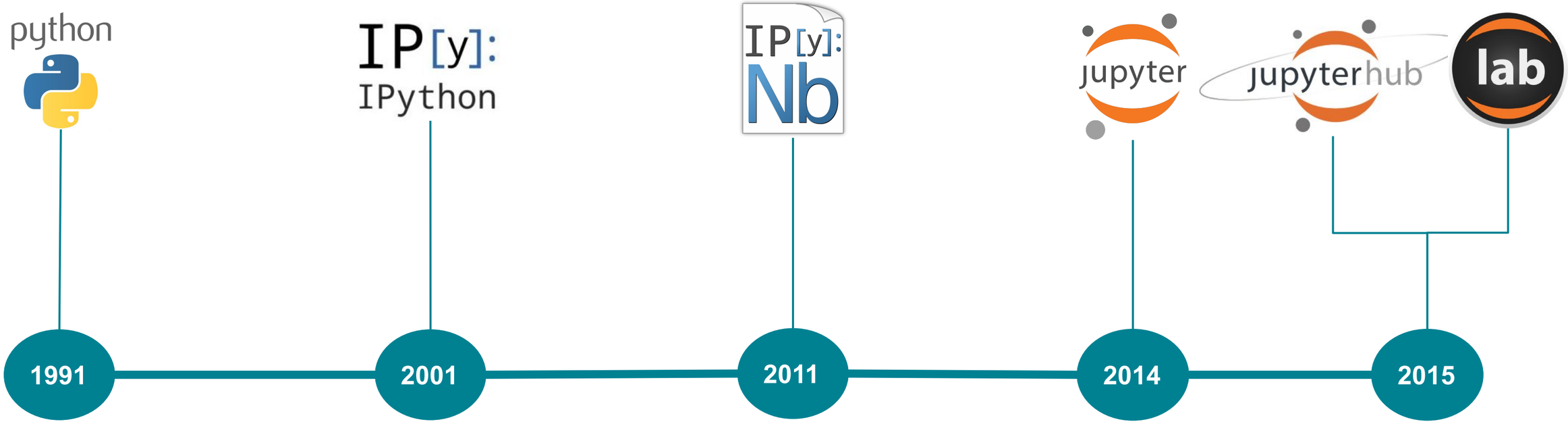
- Servidor Jupyter Notebook ou Servidor Jupyter, tanto faz.
- Servidor Jupyter é um servidor *standalone* e *single-user.*
- JupyterLab é uma nova interface para o Servidor Jupyter.
- Servidor JupyterHub é um servidor multiusuário.
- Notebook é o arquivo que contém o código e as anotações.

Como funciona o Jupyter Notebook



Como funciona o Jupyter Notebook

Histórico



Como funciona o Jupyter Notebook

Terminal IPython

- Terminal interativo para Python
- Interface original do IPython
- Modelo REPL - Read-Eval-Print-Loop
- Utiliza como *backend* o ipykernel (a.k.a kernel IPython)

```
einstein@linea:~$ ipython
Python 2.7.17 (default, Apr 15 2020, 17:20:14)
Type "copyright", "credits" or "license" for more information.

IPython 5.5.0 -- An enhanced Interactive Python.
?         -> Introduction and overview of IPython's features.
%quickref -> Quick reference.
help      -> Python's own help system.
object?   -> Details about 'object', use 'object??' for extra details.

In [1]: import __hello__
Hello world...

In [2]: import antigravity
```

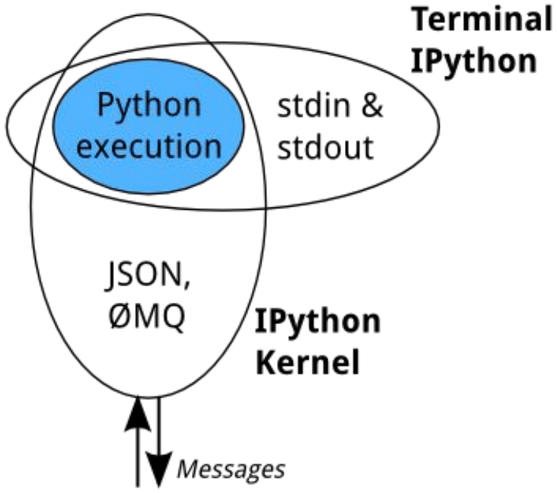
```
while True:
    code = input(">>> ")
    exec(code)
```

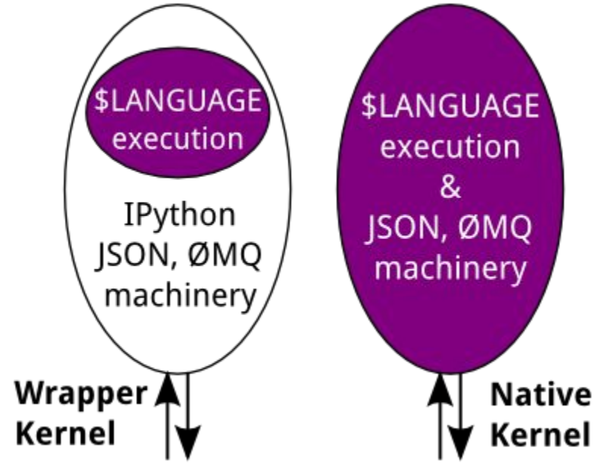
Representação do modelo REPL

Como funciona o Jupyter Notebook

O kernel IPython

- Kernel ‘zero’
- Executar o código e completar comandos
- JSON para troca de mensagens
- Interação do *Frontend* com o kernel é via socket zeroMQ
- *Wrapper kernel* e *Native kernel*



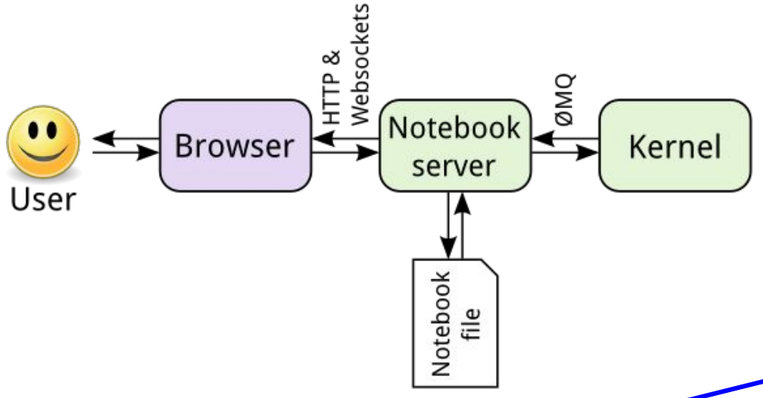


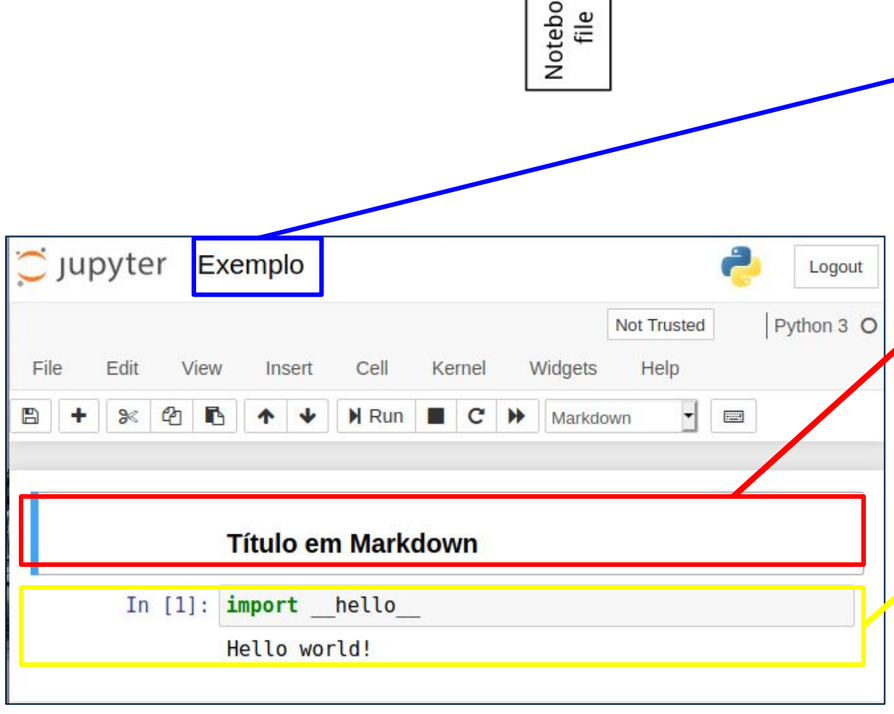
Exemplos de kernel para Go e SSH

Como funciona o Jupyter Notebook

O servidor Jupyter Notebook

- ‘Executa’ os códigos
- Interface flexível e dinâmica
- Armazena o código e sua saída junto com anotações em markdown
- Notebook é um JSON com extensão .ipynb

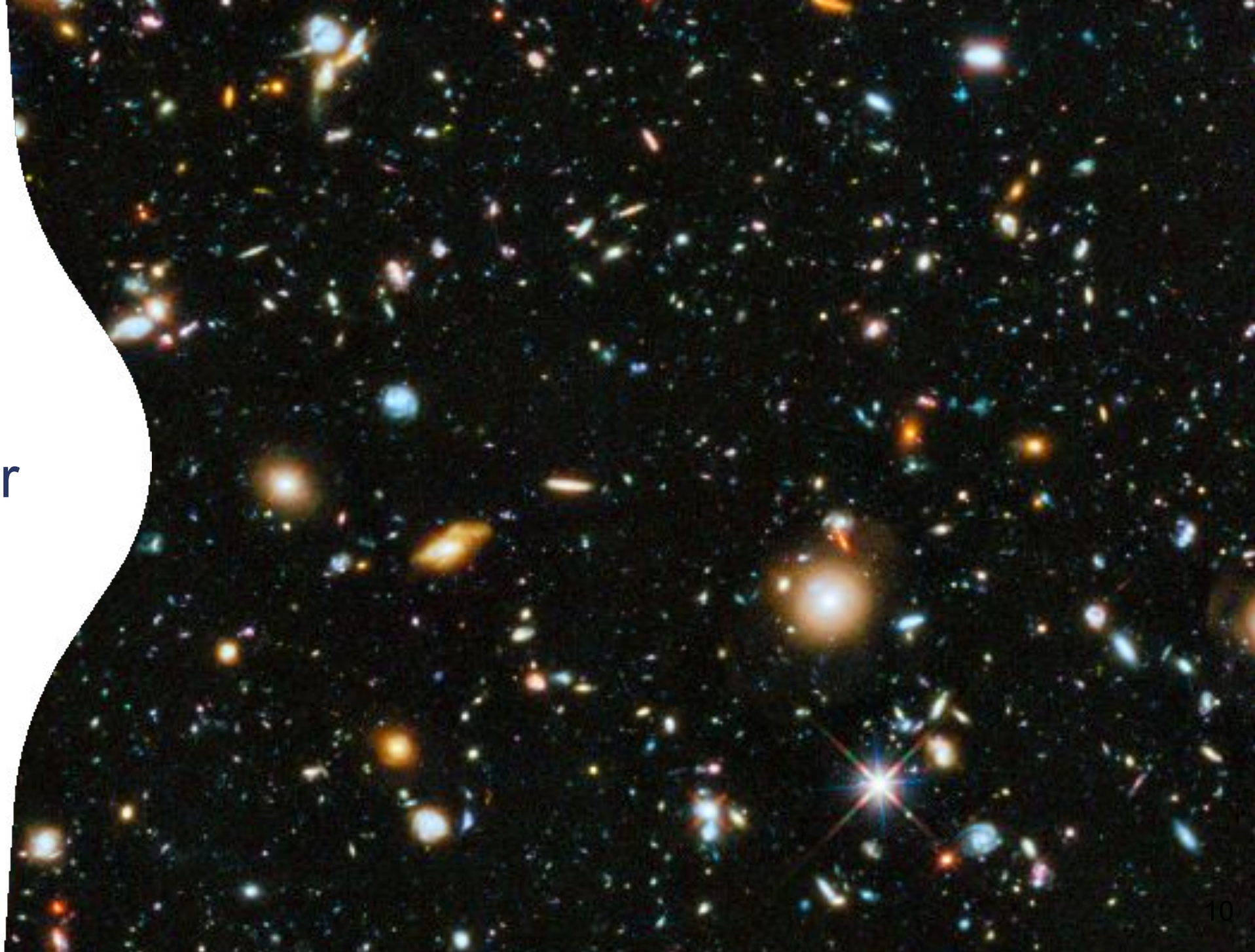




Exemplo.ipynb

```
{
 "cells": [
  {
   "cell_type": "markdown",
   "metadata": {},
   "source": [
    "### Título em Markdown"
   ]
  },
  {
   "cell_type": "code",
   "execution_count": 1,
   "metadata": {},
   "outputs": [
    {
     "name": "stdout",
     "output_type": "stream",
     "text": [
      "Hello world!\n"
     ]
    }
   ],
   "source": [
    "import __hello__"
   ]
  }
 ],
```

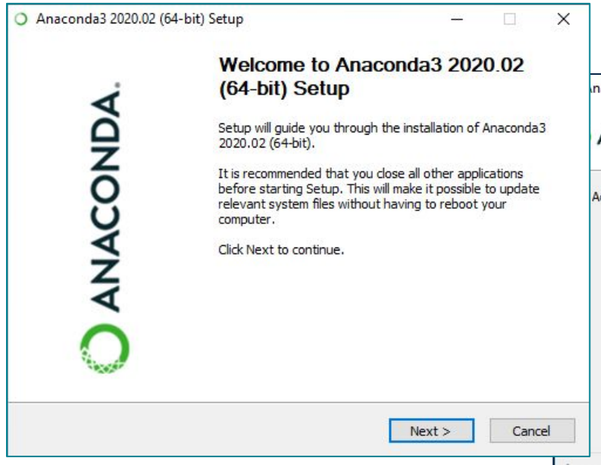
Como instalar

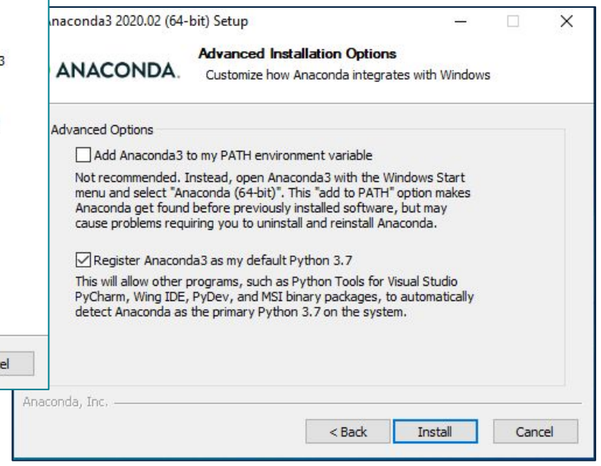


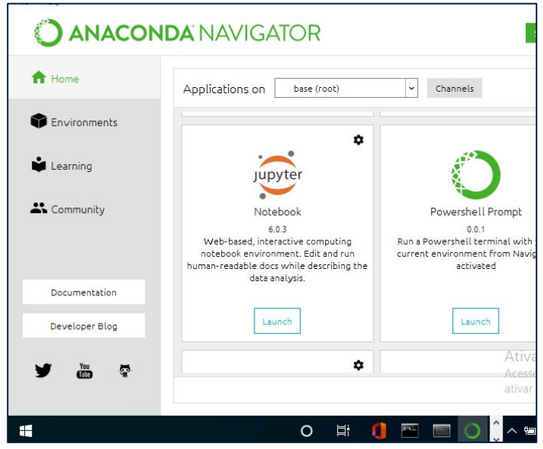
Como instalar

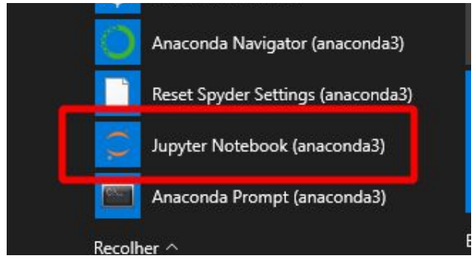
Windows

- Anaconda Individual Edition
- Gerenciador de pacotes
- www.anaconda.com/downloads
- Next > Next > Next > Finish
- Jupyter Notebook instalado por padrão









IPython é o kernel padrão

Como instalar

Linux

Via python-pip, anaconda ou docker

Debian / Ubuntu

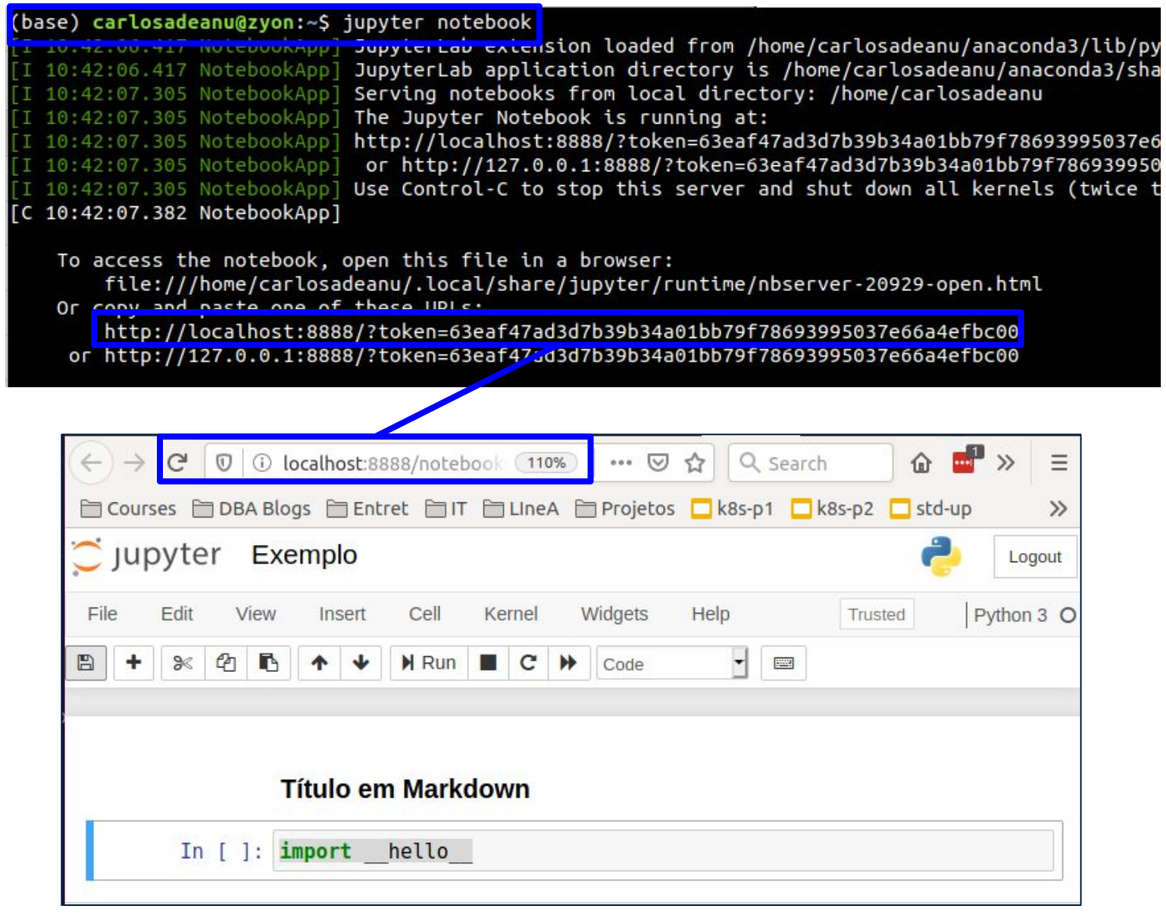
$ sudo apt install python3-pip python3-venv

RedHat / CentOS / Fedora

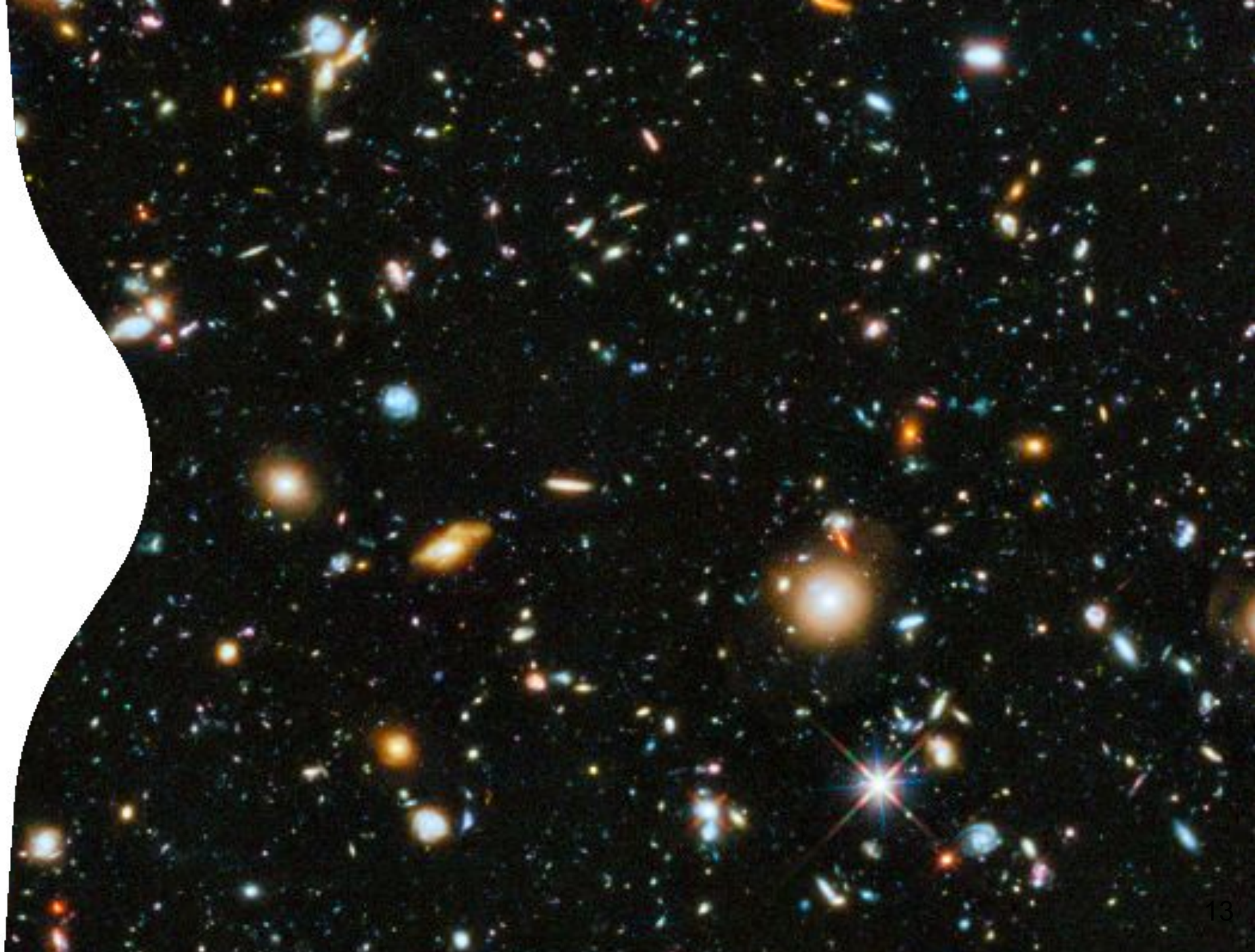
$ sudo yum install python3-pip python3-virtualenv

$ python3 -m venv jupyter-env
$ source jupyter-env/bin/activate
$ pip3 install jupyter

IPython é o kernel padrão



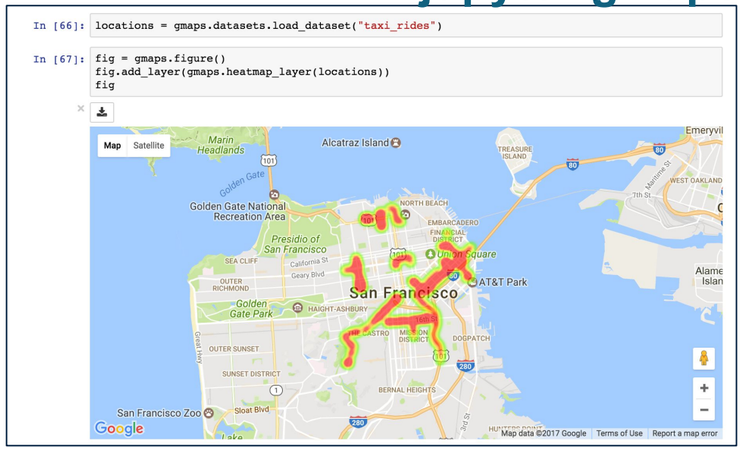
Extensões e widgets



Extensões e widgets

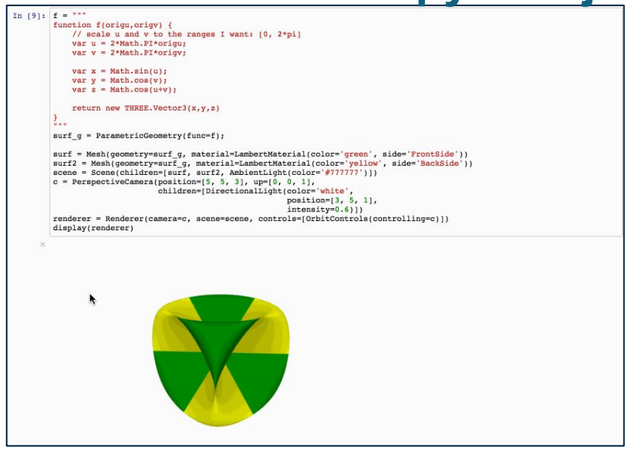
Jupyter widgets

jupyter-gmaps

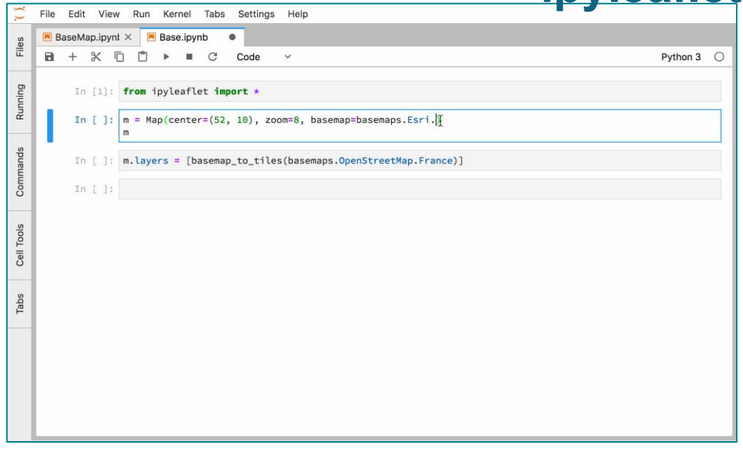


bqplot

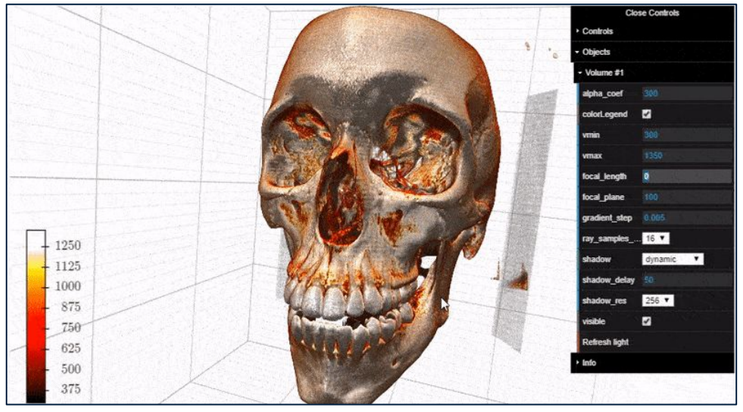
pythreejs



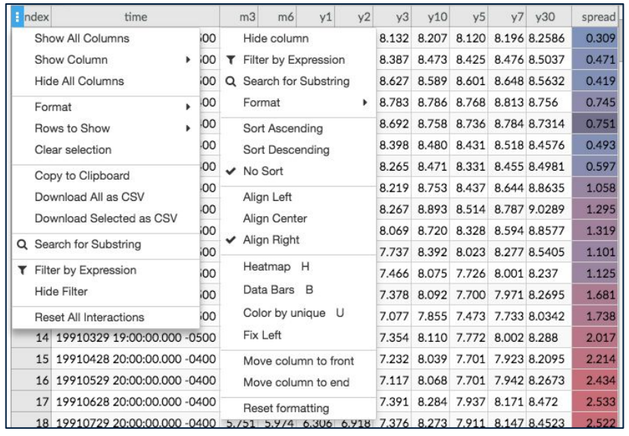
ipyleaflet



k3d-jupyter



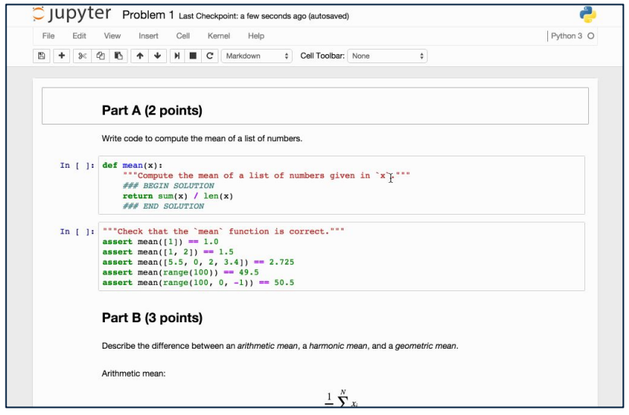
bakerx



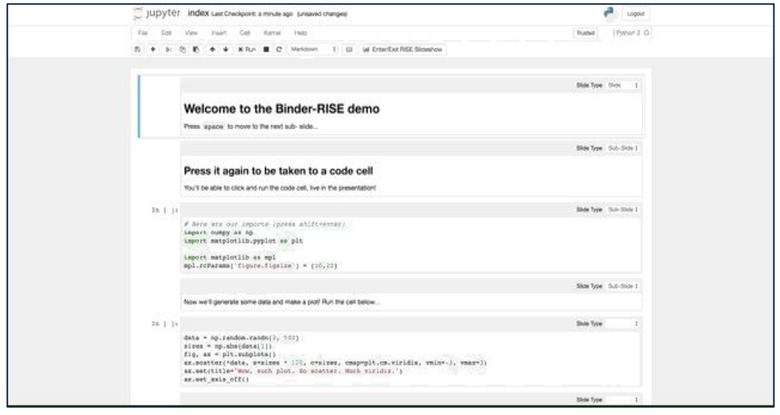
Extensões e widgets

Jupyter extensions

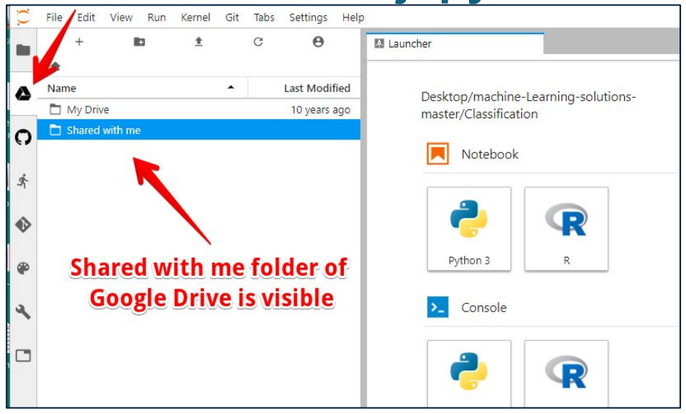
nbgrader

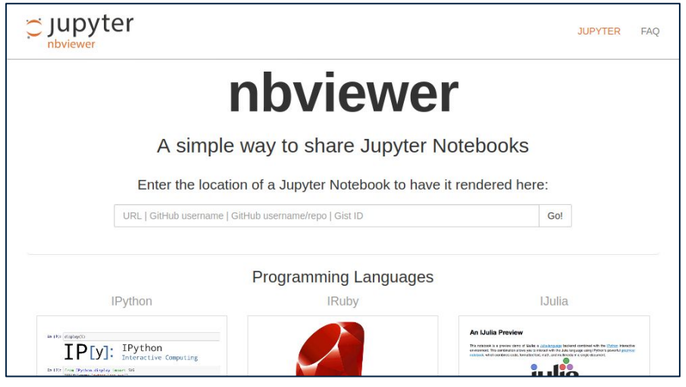


rise (presentation)



jupyter-drive





voilá

Como instalar widgets e extensões

Pode ser instalado via python-pip ou anaconda

Anaconda

Abrir o terminal Anaconda

conda install -c conda-forge <*nome*>

```
conda install -c conda-forge k3d
jupyter nbextension enable k3d
```

Pip

Abrir o terminal

$ source jupyter-env/bin/activate

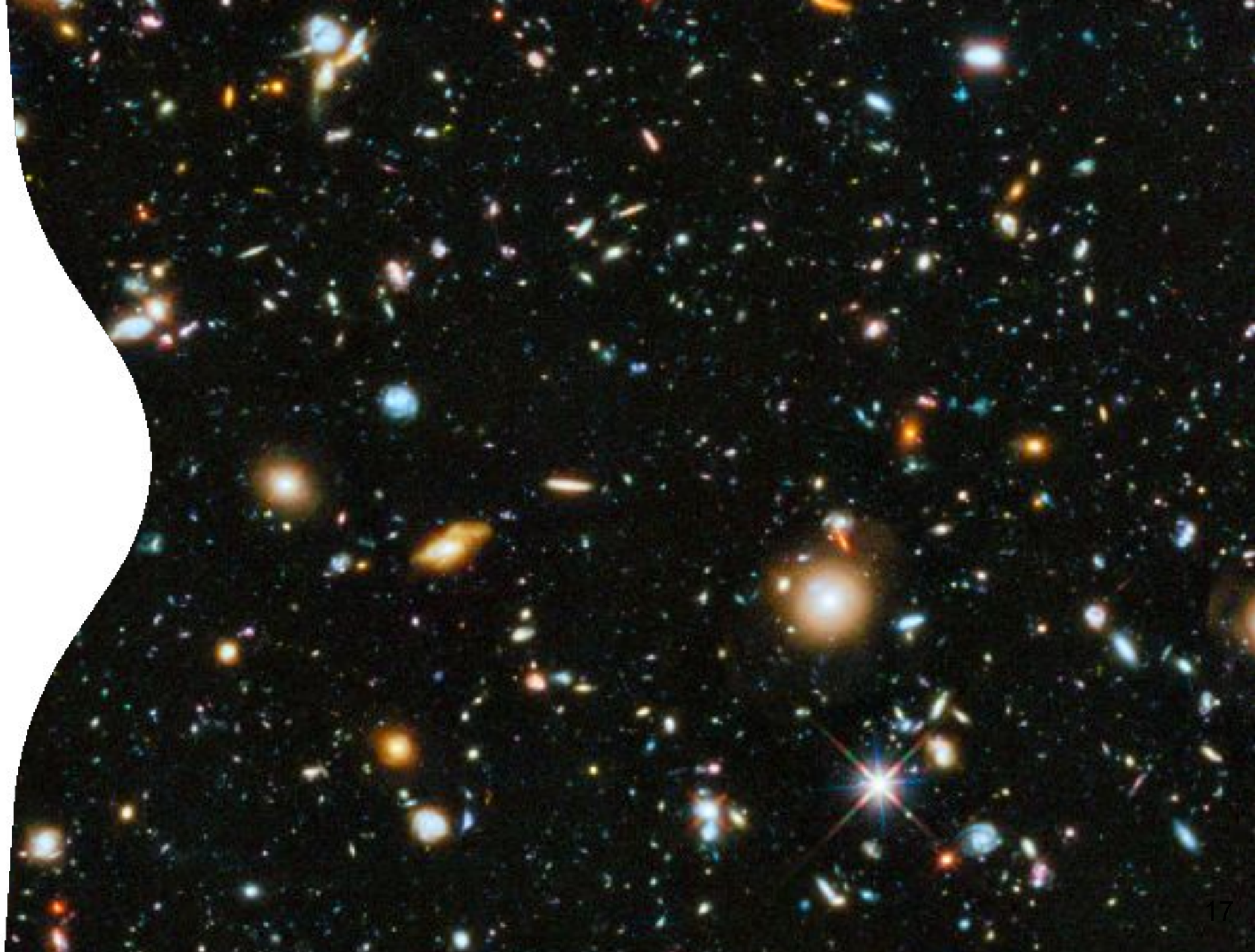
$ pip3 install <*nome*>

```
source jupyter-env/bin/activate
pip3 install k3d
jupyter nbextension enable k3d
```

Para ativar o widget

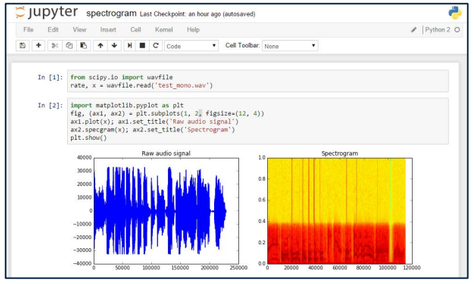
jupyter nbextension enable --py --sys-prefix <*nome*>

Servidor JupyterHub

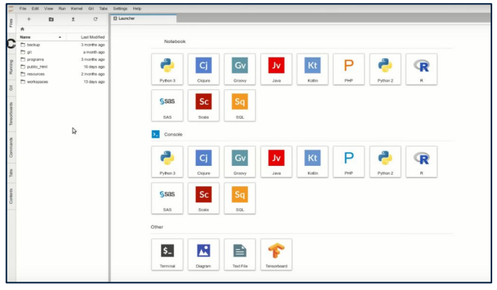


Servidor JupyterHub

Jupyter Notebook vs JupyterHub



http://localhost:8888/



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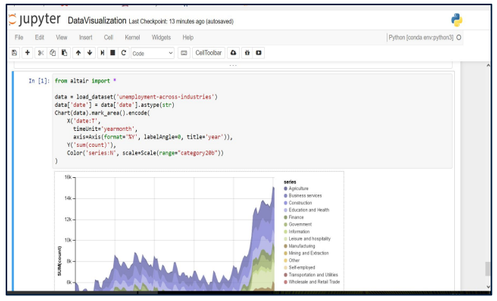

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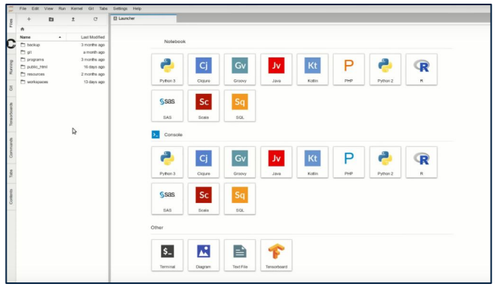
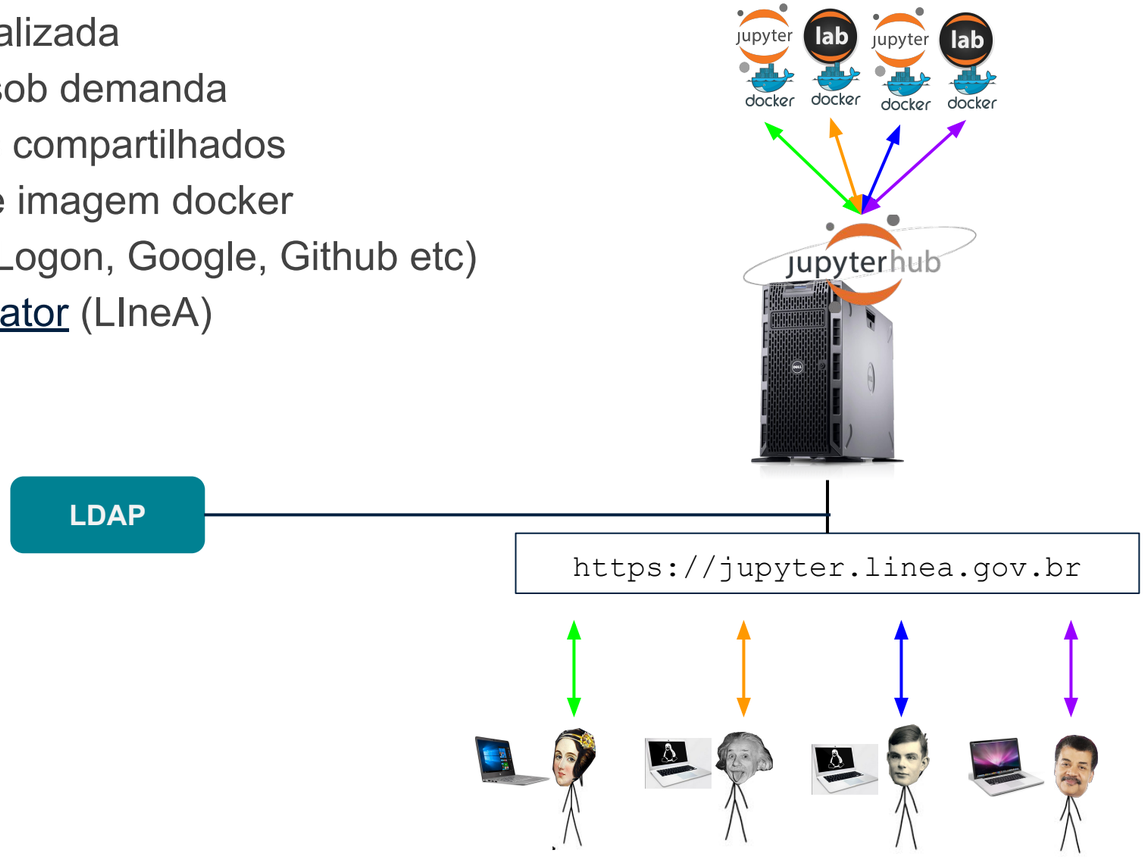


http://localhost:8888/

Servidor JupyterHub

JupyterHub *standalone*

- Servidor Jupyter multiusuário
- Administração centralizada
- Servidores Jupyter sob demanda
- Sistema de arquivos compartilhados
- Diferentes *flavors* de imagem docker
- OAuth providers (CILogon, Google, Github etc)
- Plugin ldapauthenticator (LIneA)



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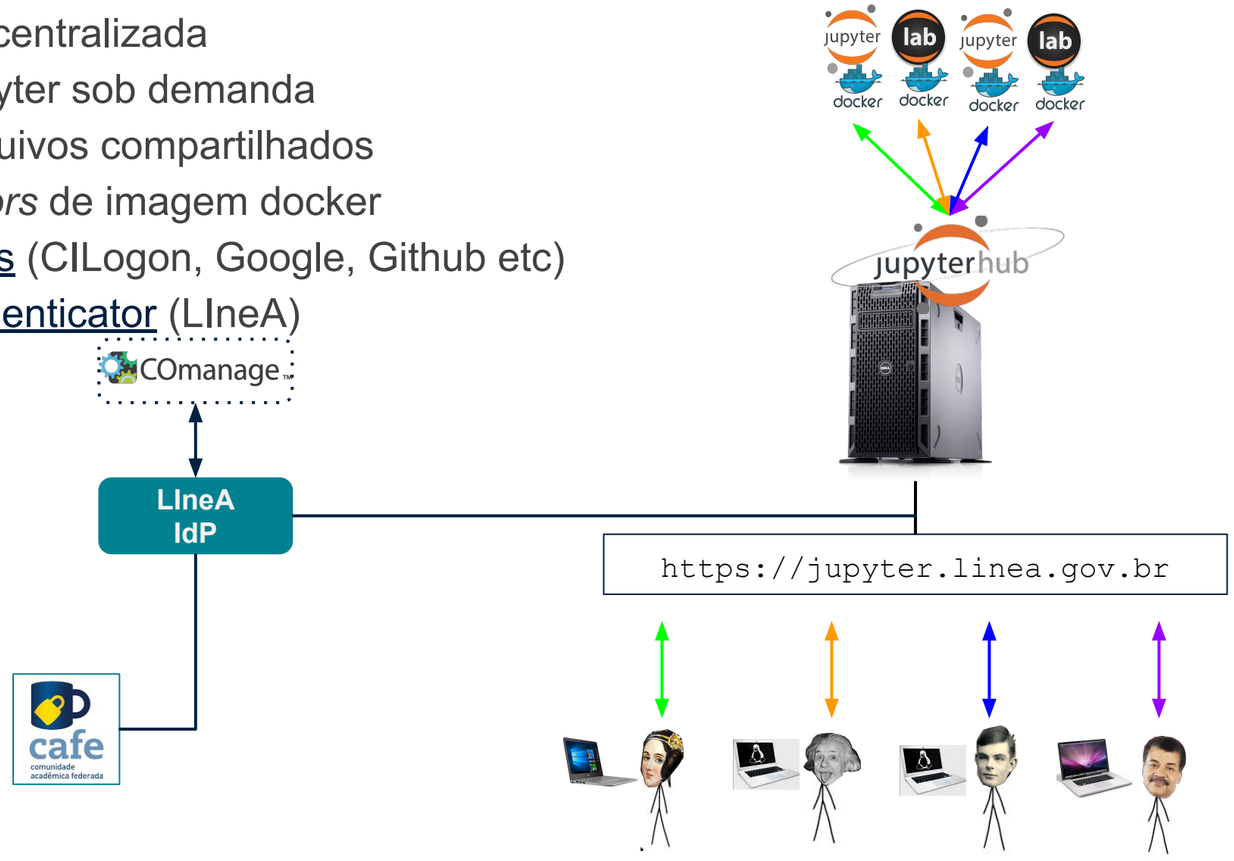

Servidor JupyterHub

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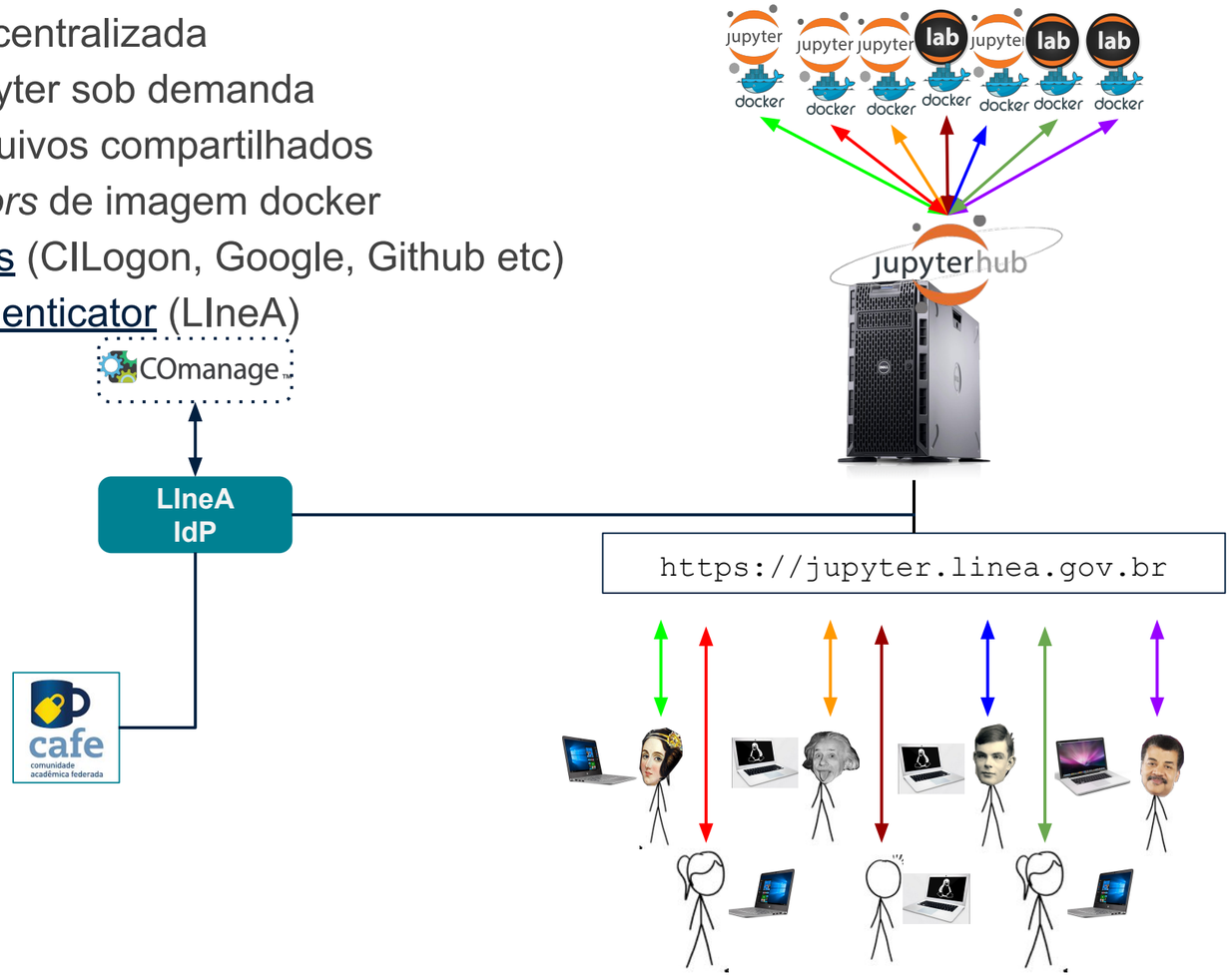
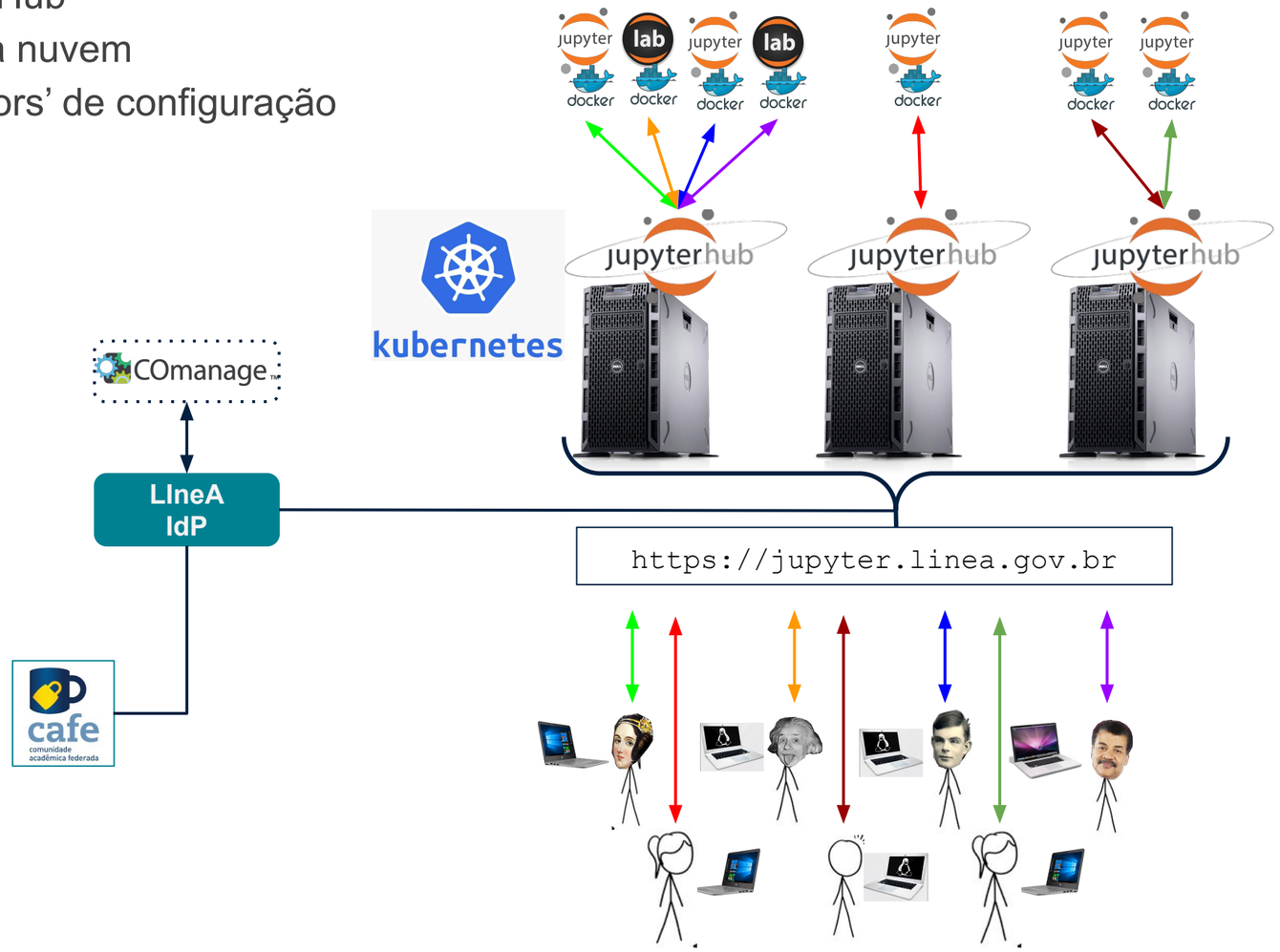


Servidor JupyterHub

JupyterHub + Kubernetes

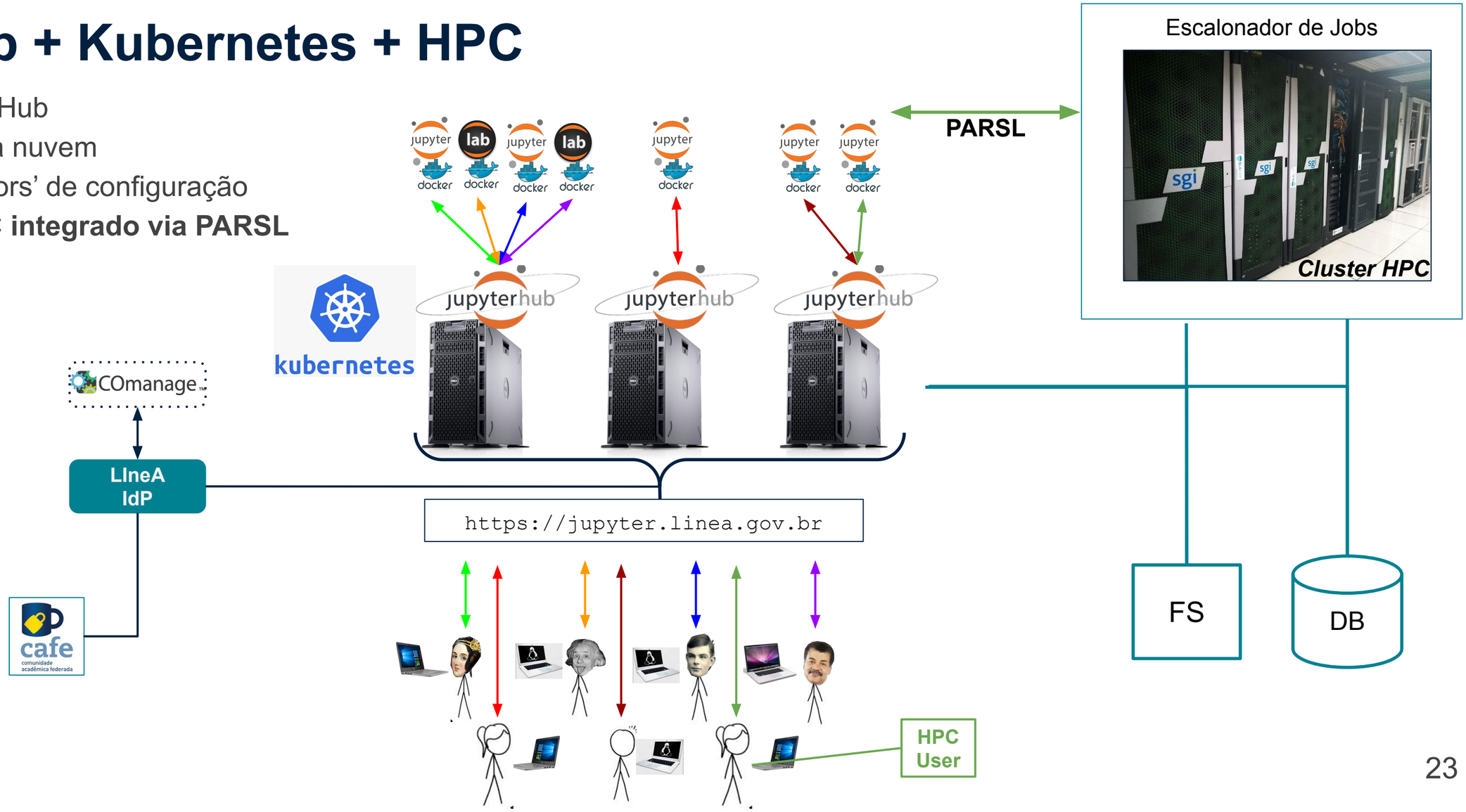
- Cluster JupyterHub
- K8S local ou na nuvem
- Diferentes ‘flavors’ de configuração



Servidor JupyterHub

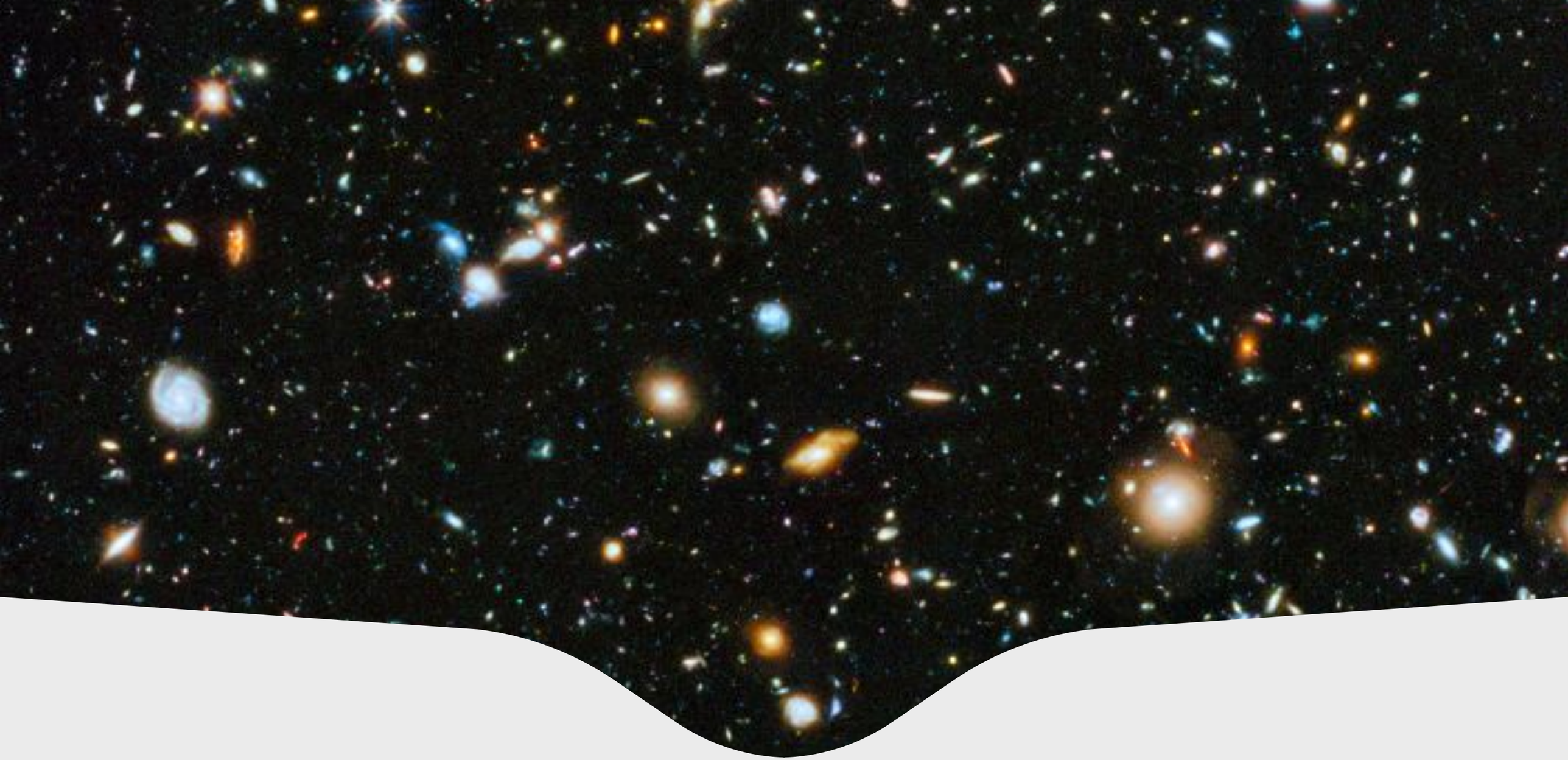
JupyterHub + Kubernetes + HPC

- Cluster JupyterHub
- K8S local ou na nuvem
- Diferentes ‘flavors’ de configuração
- **Ambiente HPC integrado via PARSL**



Links

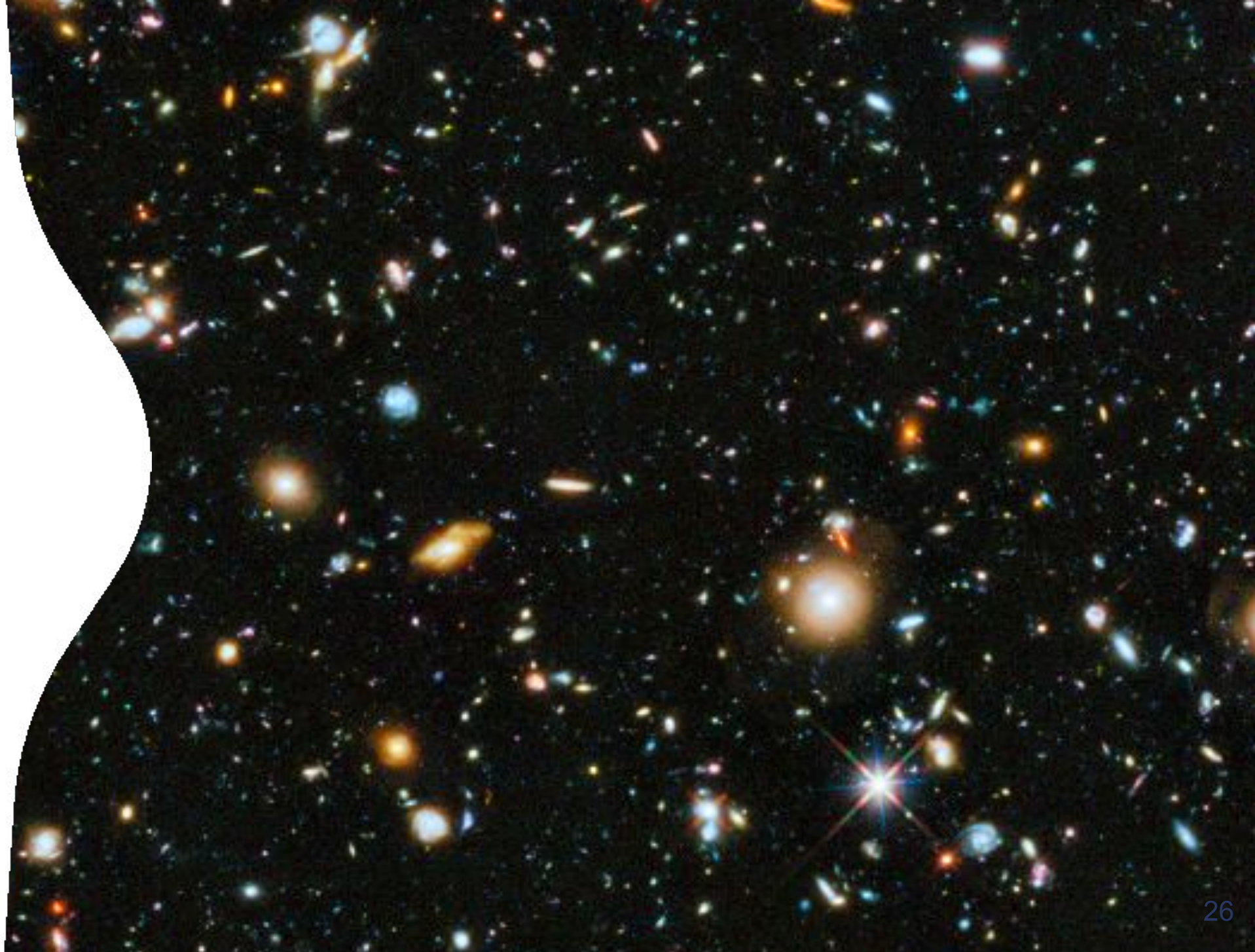
- https://jupyter.org
- https://jupyterhub.readthedocs.io
- https://github.com/jupyter/jupyter/wiki/Jupyter-kernels
- https://en.wikipedia.org/wiki/Project_Jupyter
- https://en.wikipedia.org/wiki/Albert_Einstein
- https://zeromq.org
- https://ipython.org
- https://en.wikipedia.org/wiki/IPython
- https://youtu.be/GExKsQ-OU78
- https://youtu.be/4GJFNQBB26s
- parsl-project.org
- kubernetes.io



Obrigado!

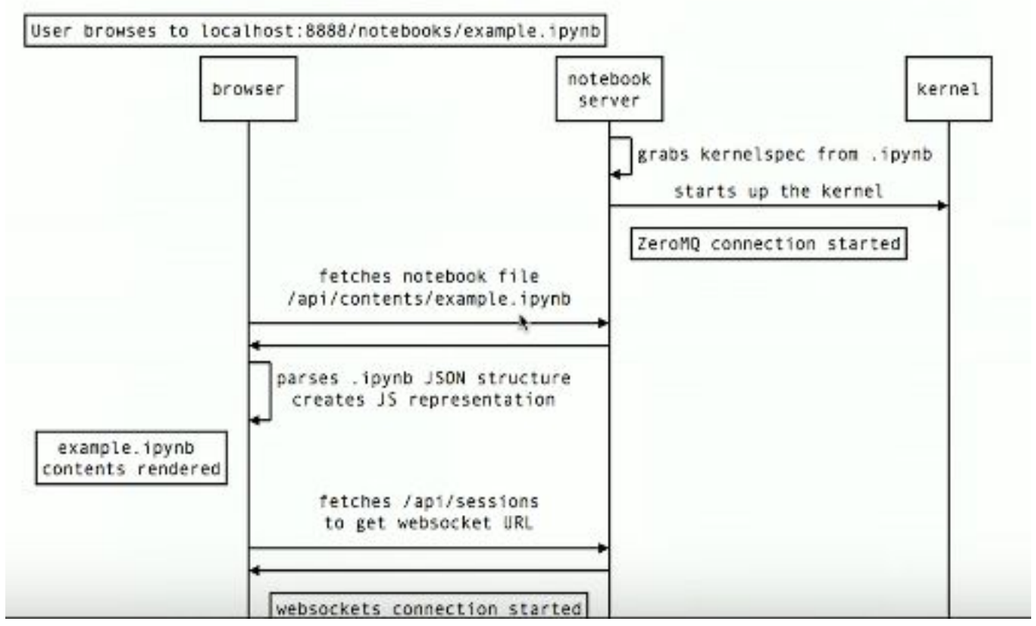
carlosadean@linea.gov.br

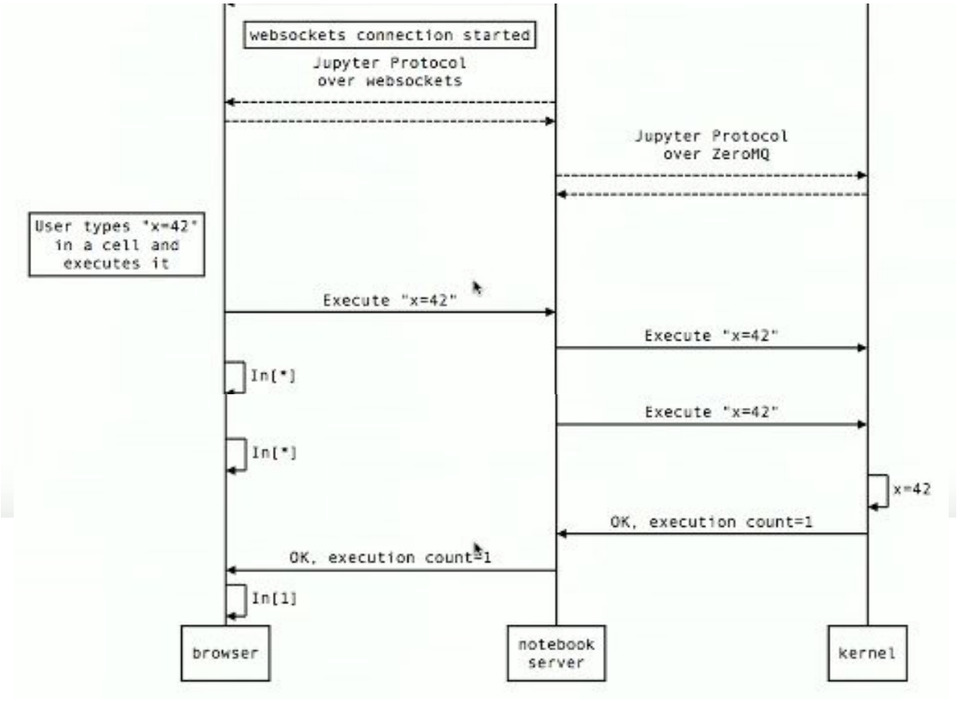
Extras



Como funciona o Jupyter Notebook

Diagrama de sequência de uma requisição





Arquitetura do servidor JupyterHub