

JupyterHub 介绍与使用

Ding Zhang¹

¹School of Computer Science
Wuhan University

79770999@qq.com

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Overview

1 JupyterHub

- Project Jupyter
- Jupyter Notebook
- JupyterHub 介绍
- JupyterHub 安装
- JupyterHub 使用

2 Demo



Outline

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What is Project Jupyter



Project Jupyter exists to develop open-source software, open-standards, and services for interactive computing across dozens of programming languages.



Projects



- *IPython*
- *Jupyter Notebook*
- Jupyter Lab
- NBViewer
- *JupyterHub*



Projects



- **IPython**
- *Jupyter Notebook*
- Jupyter Lab
- NBViewer
- *JupyterHub*



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IPython

IP[y]: IPython
Interactive Computing

IPython provides a rich architecture for interactive computing with:

- A powerful interactive shell.
- A kernel for Jupyter.
- Support for interactive data visualization and use of GUI toolkits.
- Flexible, embeddable interpreters to load into your own projects.
- Easy to use, high performance tools for parallel computing.



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Jupyter Notebook



Files

Running

Clusters

To import a notebook, drag the file onto the listing below or **click here**.

New ▾



/ examples



..



Builtin Extensions



Customization



Embedding



IPython Kernel



Interactive Widgets



Notebook



Parallel Computing



images



utils



Index.ipynb



Jupyter Notebook

The Jupyter Notebook is an interactive computing environment that enables users to author notebook documents that include:

- Live code
- Interactive widgets
- Plots
- Narrative text
- Equations
- Images
- Video



Jupyter Lab

File Edit View Run Kernel Tabs Settings Help

Files

- + -
- home > notebooks

Name	Last Modified
Data.ipynb	an hour ago
Fasta.ipynb	a day ago
Julia.ipynb	a day ago
Lorenz.ipynb	seconds ago
R.ipynb	a day ago
iris.csv	a day ago
lightning.json	9 days ago
lorenz.py	3 minutes ago

Running

Commands

Cell Tools

Tabs

Lorenz.ipynb x Terminal 1 x Console 1 x Data.ipynb x README.md x Python 3

In this Notebook we explore the Lorenz system of differential equations:

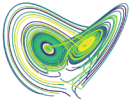
$$\begin{aligned}\dot{x} &= \sigma(y - x) \\ \dot{y} &= \rho x - y - xz \\ \dot{z} &= -\beta z + xy\end{aligned}$$

Let's call the function once to view the solutions. For this set of parameters, we see the trajectories swirling around two points, called attractors.

In [4]: `from lorenz import solve_lorenz
t, x_t = solve_lorenz(N=10)`

Output View x lorenz.py x

sigma 10.00
beta 2.67
rho 28.00



```

9 def solve_lorenz(N=10, max_time=4.0, sigma=10.0, beta=8./3, rho=28.0):
10     """Plot a solution to the Lorenz differential equations."""
11     fig = plt.figure()
12     ax = fig.add_axes([0, 0, 1, 1], projection='3d')
13     ax.axis('off')
14
15     # prepare the axes limits
16     ax.set_xlim((-25, 25))
17     ax.set_ylim((-35, 35))
18     ax.set_zlim((5, 55))
19
20     def lorenz_deriv(x,y,z, t0, sigma=sigma, beta=beta, rho=rho):
21         """Compute the time-derivative of a Lorenz system."""
22         x_dot, y_dot, z_dot = x*y, y*(rho - z) - y, x*(beta - z)
23         return [sigma*(y - x), x*(rho - z) - y, x*(beta - z)]
24
25     # Choose random starting points, uniformly distributed from -15 to 15
26     np.random.seed(1)
27     x0 = -15 + 30 * np.random.random((N, 3))
28

```



NBViewer





nbviewer

A simple way to share Jupyter Notebooks

Enter the location of a Jupyter Notebook to have it rendered here:

Programming Languages

IPython



IRuby



IJulia



JupyterHub



A multi-user version of the notebook designed for companies, classrooms and research labs.



JupyterHub



JupyterHub, a multi-user Hub, spawns, manages, and proxies multiple instances of the single-user Jupyter notebook server. JupyterHub can be used to serve notebooks to a class of students, a corporate data science group, or a scientific research group.



JupyterHub

Attention

- Python 3 Only
- Linux Only

- Pluggable authentication (PAM, OAuth, etc.)
- Centralized deployment
- Container friendly
- Code meets data



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Components

The Jupyter Notebook combines three components:

- The notebook web application
- Kernels
- Notebook documents



The Notebook web application

The notebook web application enables users to:

- Edit code in the browser
- Run code from the browser
- Rich media representations
- Interactive JavaScript widgets
- Markdown
- Mathematical equations (LaTeX syntax)

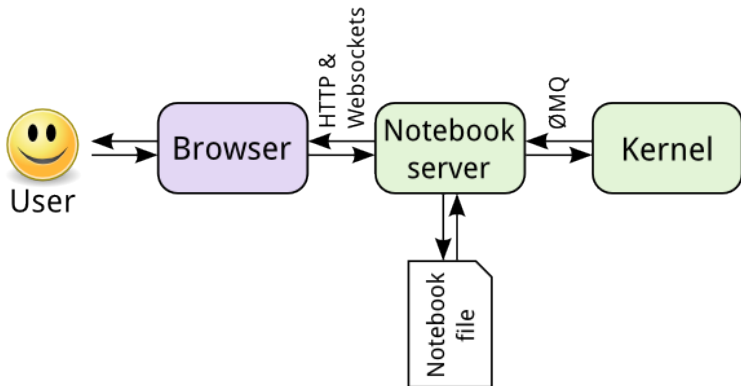


Kernels

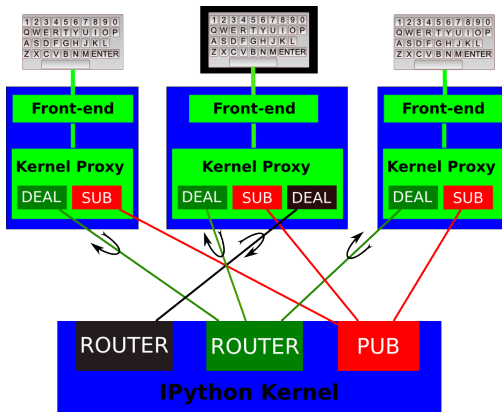
kernels communicate with the notebook web application and web browser using a JSON over ZeroMQ/WebSockets message protocol.



Kernels



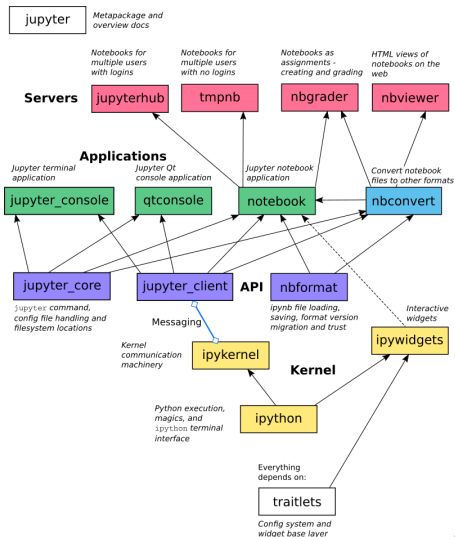
Kernels



- Kernel raw_input
- Requests to kernel
- Kernel output broadcast
- Request/Reply direction



Kernels

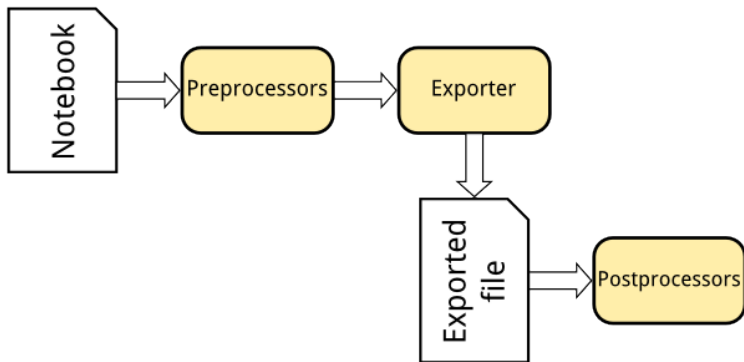


Notebook documents

基于 JSON 的开放文档格式，完整地记录用户的会话 (sessions) 和代码、说明性的文本、方程以及富文本输出。



Notebook documents



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Key features

- Customizable
- Flexible
- Scalable
- Portable



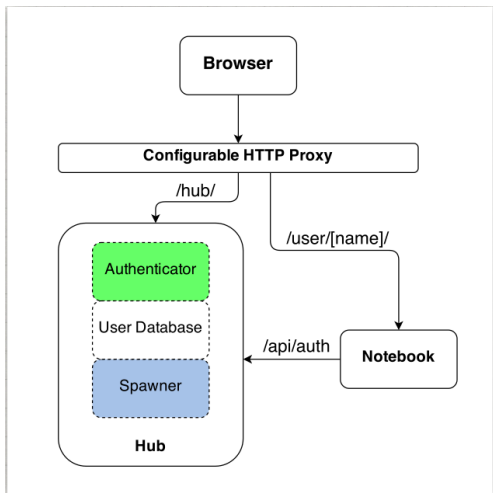
Subsystems

Three subsystems make up JupyterHub:

- a multi-user Hub (tornado process)
- a configurable http proxy (node-http-proxy)
- multiple single-user Jupyter notebook servers (Python/IPython/tornado)



Subsystems



Running Sequence

JupyterHub performs the following functions:

- 1 The Hub launches a proxy
- 2 The proxy forwards all requests to the Hub by default
- 3 The Hub handles user login and spawns single-user servers on demand
- 4 The Hub configures the proxy to forward URL prefixes to the single-user notebook servers



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Prerequisites

- Linux/Unix based system
- Python ≥ 3.5
- nodejs / npm
 - If you are using conda, the nodejs and npm dependencies will be installed for you by conda.
 - If you are using pip, install a recent version of nodejs/npm. For example, install it on Linux (Debian/Ubuntu) using:

```
sudo apt-get install npm nodejs-legacy
```

The nodejs-legacy package installs the node executable and is currently required for npm to work on Debian/Ubuntu.

- TLS certificate and key for HTTPS communication
- Domain name



Install packages

- Using conda
 - To install JupyterHub along with its dependencies including nodejs / npm:

```
conda install -c conda-forge jupyterhub
```

- If you plan to run notebook servers locally, install the Jupyter notebook or JupyterLab:

```
conda install notebook  
conda install jupyterlab
```



Install packages

- Using pip
 - JupyterHub can be installed with pip, and the proxy with npm:

```
npm install -g configurable-http-proxy  
python3 -m pip install jupyterhub
```

- If you plan to run notebook servers locally, you will need to install the Jupyter notebook package:

```
python3 -m pip install --upgrade notebook
```



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Generate a default config file

JupyterHub will look by default for a configuration file, `jupyterhub_config.py`, in the current working directory.

To generate a default config file, `jupyterhub_config.py`:

```
jupyterhub generateconfig
```

Recommend : `/etc/jupyterhub`



Default config

- Authentication: PAM
- Spawning: Local users
- Hub must run as root



Authenticators

Authenticator	Description
PAMAuthenticator	Default, built-in authenticator
OAuthenticator	OAuth + JupyterHub Authenticator = OAuthenticator
Idapauthenticator	Simple LDAP Authenticator Plugin for JupyterHub
kdcAuthenticator	Kerberos Authenticator Plugin for JupyterHub



Spawners

Spawner	Description
LocalProcessSpawner	Default, built-in spawner starts single-user servers as local processes
dockerspawner	Spawn single-user servers in Docker containers
kubespawner	Kubernetes spawner for JupyterHub
sudospawner	Spawn single-user servers without being root
systemdspawner	Spawn single-user notebook servers using systemd
batchspawner	Designed for clusters using batch scheduling software
wrapspawner	WrapSpawner and ProfilesSpawner enabling runtime configuration of spawners

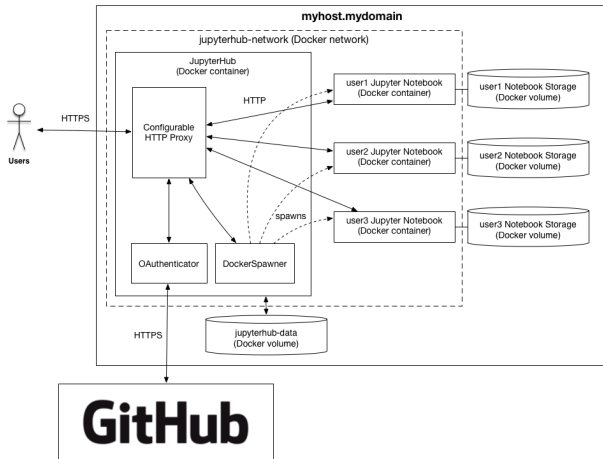


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Deploy JupyterHub with Docker



Deploy JupyterHub with Docker

Deploy JupyterHub with Docker

<https://github.com/jupyterhub/jupyterhub-deploy-docker>



References



Jupyter 官网

<https://jupyter.org/>



Jupyter Architecture

<https://jupyter.readthedocs.io/en/latest/architecture/content-architecture.html>



Messaging in Jupyter

<https://jupyter-client.readthedocs.io/en/latest/messaging.html>



Docker 官网

<https://www.docker.com/>



Deploy JupyterHub with Docker

<https://github.com/jupyterhub/jupyterhub-deploy-docker>



Thanks

