
Notebooks Forge Documentation

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A project dedicated to build and provide `Notebooks` servers for `Defensive` and `Offensive` operators to:

- Design playbooks
- Demonstrate how techniques can be used
- Showcase when and why an operator would want to use a technique
- Document engagements procedures
- Prototype new ways to analyze data extracted from endpoints in a more dynamic, flexible and language-agnostic way.

This project supports two notebook server types such as [Jupyter](#) and [Zeppelin](#).

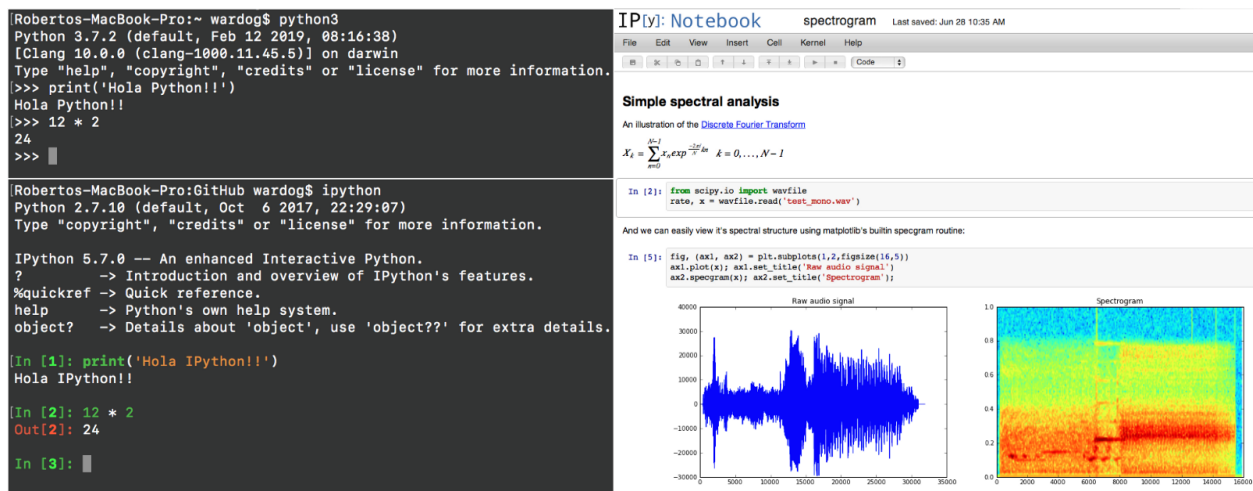
What is a Notebook?

Think of a notebook as a document that you can access via a web interface that allows you to save input (i.e live code) and output (i.e code execution results / evaluated code output) of interactive sessions as well as important notes needed to explain the methodology and steps taken to perform specific tasks (i.e data analysis).

1.1 Jupyter Notebook

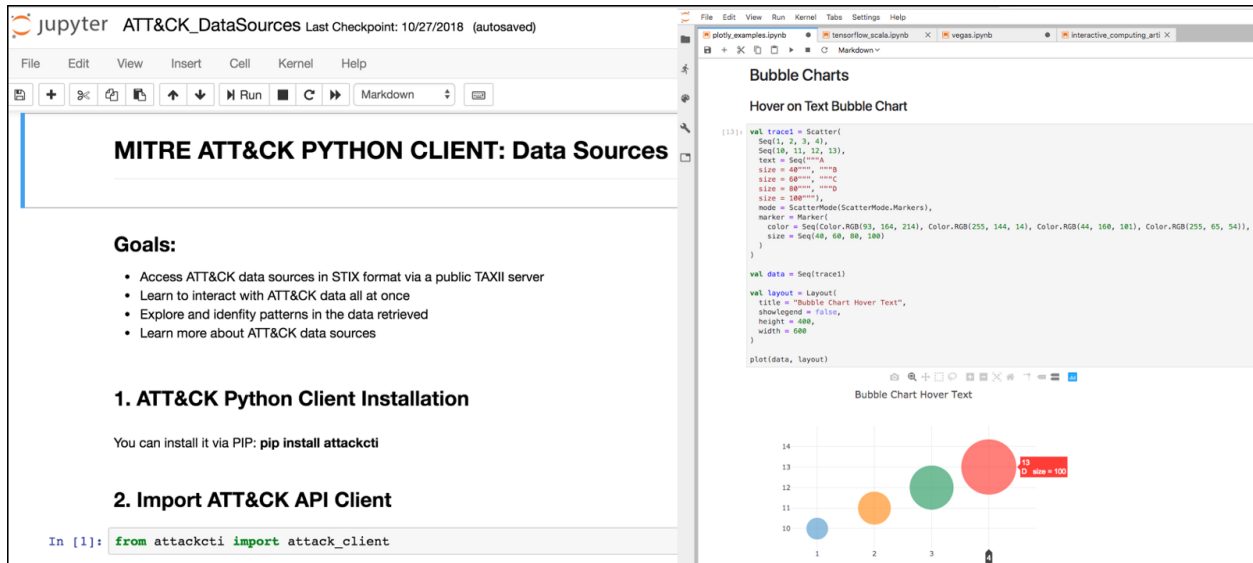
The Jupyter Notebook is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations and narrative text. Uses include: data cleaning and transformation, numerical simulation, statistical modeling, data visualization, machine learning, and much more.

The Jupyter Notebook project is the evolution of the IPython Notebook library which was developed primarily to enhance the default python interactive console by enabling scientific operations and advanced data analytics capabilities via sharable web documents.



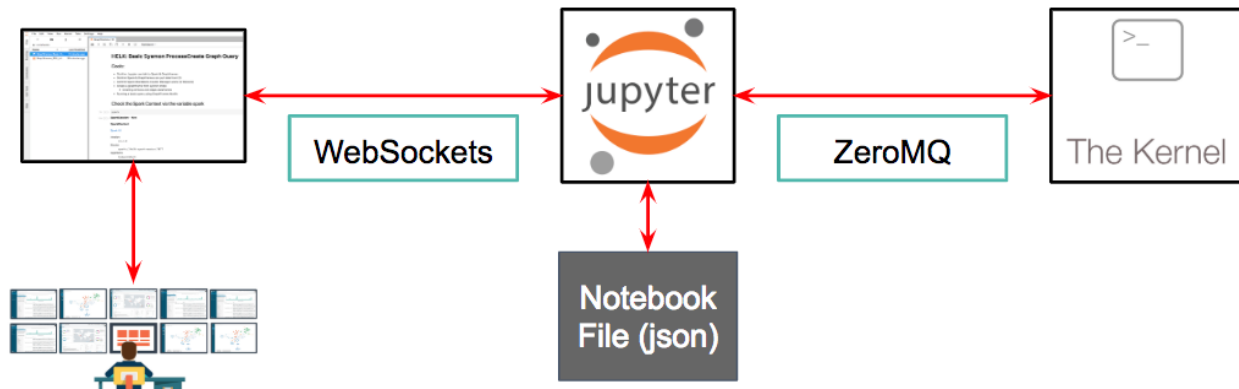
Nowadays, the Jupyter Notebook project not only supports Python but also over 40 programming languages such as R, Julia, Scala and PySpark. In fact, its name was originally derived from three programming languages: Julia, Python

and R which made it one of the first language-agnostic notebook applications, and now considered one of the most preferred environments for data scientists and engineers in the community to explore and analyze data.



1.1.1 How do Jupyter Notebooks Work?

Jupyter Notebooks work with what is called a two-process model based on a kernel-client infrastructure. This model applies a similar concept to the [Read-Evaluate-Print Loop \(REPL\)](#) programming environment that takes a single user's inputs, evaluates them, and returns the result to the user.



Based on the two-process model concept, we can explain the main components of Jupyter the following way:

Jupyter Client

- It allows a user to send code to the kernel and it could be in a form of a [Qt Console](#) or a browser via notebook documents.
- From a REPL perspective, the client does the read and print operations.
- Notebooks are hosted by the Jupyter web server which uses Tornado to serve HTTP requests.

Jupyter Kernel

- It receives the code sent by the client, executes it, and returns the results back to the client for display. A kernel process can have multiple clients communicating with it which is why this model is also referred as the decoupled two-process model.
- From a REPL perspective, the kernel does the evaluate operation.
- kernel and clients communicate via an interactive computing protocol based on an asynchronous messaging library named [ZeroMQ](#) (low-level transport layer) and WebSockets (TCP-based)

Jupyter Notebook Document

- Notebooks are automatically saved and stored on disk in the open source JavaScript Object Notation (JSON) format and with a .ipynb extension.

1.1.2 Jupyter Notebooks Servers

Jupyter Spark Server

A notebook server built for any operator looking to leverage advanced analytics provided by Apache Spark.

Jupyter Python Libraries

Pandas

[Pandas](#) is an open source, BSD-licensed library providing high-performance, easy-to-use data structures and data analysis tools for the Python programming language.

Jupyter Kernels Available

IPython Kernel (Python)

The Jupyter team maintains the [IPython kernel](#) since the Jupyter notebook server depends on the IPython kernel functionality. Many other languages, in addition to Python, may be used in the notebook.

PySpark Kernel (Python)

A python Kernel to enable [Apache Spark for python](#). Writing PySpark Applications is really no different than writing normal Python applications or packages. It's quite similar to writing command-line applications in particular. Spark doesn't have a build concept, just Python scripts, so to run an application, you simply execute the script against the cluster.

Syplon Kernel (Scala/Python)

A Scala kernel for Apache Spark that uses [metakernel](#) in combination with [py4j](#).

R Kernel (R)

An R kernel for [Apache SparkR](#). SparkR is an R package that provides a light-weight frontend to use Apache Spark from R. In Spark 2.4.1, SparkR provides a distributed data frame implementation that supports operations like selection, filtering, aggregation etc. (similar to R data frames, dplyr) but on large datasets. SparkR also supports distributed machine learning using MLlib.

Jupyter Hunt Server

A notebook server built for defensive operators with several tools to connect to known SIEMs and be able to analyze data to find potential adversaries in the network. This server is built on the top of the *Jupyter Spark* server available in this repo in order to provide advanced analytics capabilities via Apache Spark.

Jupyter Python Libraries

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Altair

[Altair](#) is a declarative statistical visualization library for Python. With Altair, you can spend more time understanding your data and its meaning. Altair's API is simple, friendly and consistent and built on top of the powerful [Vega-Lite](#) JSON specification.

S3Fs

[S3Fs](#) is a Pythonic file interface to S3. It builds on top of [boto3](#). The top-level class `S3FileSystem` holds connection information and allows typical file-system style operations like `cp`, `mv`, `ls`, `du`, `glob`, etc., as well as `put/get` of local files to/from S3.

Elasticsearch-DSL

[Elasticsearch DSL](#) is a high-level library whose aim is to help with writing and running queries against Elasticsearch. It is built on top of the official low-level client ([elasticsearch-py](#)). It provides a more convenient and idiomatic way to write and manipulate queries. It stays close to the Elasticsearch JSON DSL, mirroring its terminology and structure. It exposes the whole range of the DSL from Python either directly using defined classes or a queryset-like expressions.

Matplotlib

[Matplotlib](#) is a Python 2D plotting library which produces publication-quality figures in a variety of hardcopy formats and interactive environments across platforms. Matplotlib can be used in Python scripts, the Python and IPython shell (à la MATLAB or Mathematica), web application servers, and various graphical user interface toolkits.

Scikit-learn

[Scikit-learn](#) is a Python module for machine learning built on top of SciPy and distributed under the 3-Clause BSD license.

KSQL-Python

[KSQL-Python](#) is a python wrapper for the KSQL REST API. Easily interact with the KSQL REST API using this library.

Confluent-Kafka-Python

[Confluent-kafka-python](#) is Confluent's Python client for [Apache Kafka](#) and the [Confluent Platform](#).

Splunk-SDK

The [Splunk Software Development Kit \(SDK\)](#) for Python contains library code and examples designed to enable developers to build applications using Splunk.

Kqlmagic

The [Kqlmagic](#) magic extension enables notebook experience, exploring Microsoft Azure Monitor data: Azure Data Explorer (Kusto), ApplicationInsights, and LogAnalytics data, from Jupyter notebook (Python3 kernel), using kql (Kusto Query language).

Neo4j

The official [Neo4j driver for Python](#) supports Neo4j 3.0 and above and Python versions 2.7, 3.4, 3.5, 3.6, and 3.7. It connects to the database using the binary protocol. It aims to be minimal, while being idiomatic to Python.

Networkx

[NetworkX](#) is a Python package for the creation, manipulation, and study of the structure, dynamics, and functions of complex networks.

Nxviz

[Nxviz](#) is a graph visualization package for NetworkX. With nxviz, you can create beautiful graph visualizations by a declarative API.

Jupyter Kernels Available

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Jupyter Red Team Operations (RTO) Server

A notebook server built for offensive operators with a few libraries to connect to known tools such as Bloodhound and Cobalt Strike.

Jupyter Python Libraries

Neo4j Pytho Driver

Neo4j [Bolt driver](#) for Python

PyCobalt

[PyCobalt](#) is a Python API for Cobalt Strike

Jupyter Kernels Available

IPython Kernel (Python)

The Jupyter team maintains the [IPython kernel](#) since the Jupyter notebook server depends on the IPython kernel functionality. Many other languages, in addition to Python, may be used in the notebook.

1.2 Zeppelin Notebook

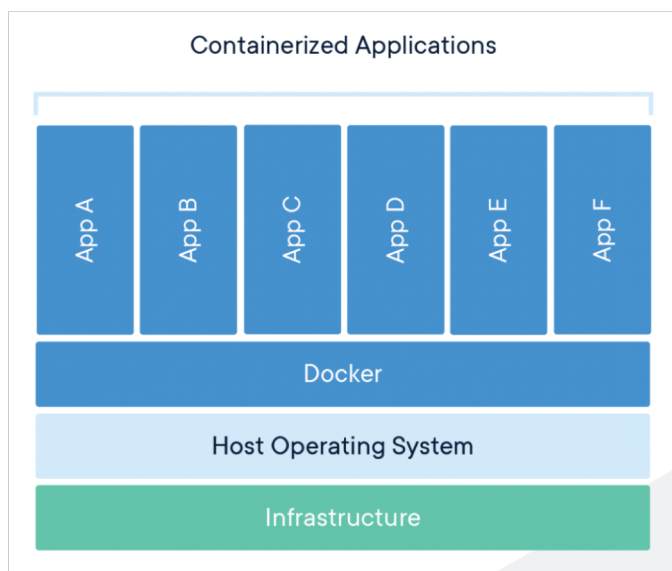
Coming soon..

1.3 Docker Notebook Deployments

Docker technology allows the project to package notebook applications with all its libraries and dependencies in “containers” and make them portable among any operating system. This allows security analystst to deploy the notebook servers on any system they use daily for hunting research.

1.3.1 What are Docker Containers?

According to [Docker docs](#), a container is a standard unit of software that packages up code and all its dependencies so the application runs quickly and reliably from one computing environment to another. A Docker container image is a lightweight, standalone, executable package of software that includes everything needed to run an application: code, runtime, system tools, system libraries and settings.



There are two notebook environments being supported by the project.

1.3.2 Jupyter Notebooks Install

Requirements

- **Git** : Git is a free and open source distributed version control system designed to handle everything from small to very large projects with speed and efficiency.
- **Docker CE** : Docker Community Edition (CE) is ideal for developers and small teams looking to get started with Docker and experimenting with container-based apps.
- **Docker Compose** : a tool for defining and running multi-container Docker applications.

Steps

Git clone the [Notebooks Forge project](#) and change your current directory to the projects directory.

```
$ git clone https://github.com/Cyb3rWard0g/notebooks-forge.git
$ cd notebooks-forge/
```

Change your current directory to the specific notebook you want to work with (`jupyter-hunt` or `jupyter-rto`)

```
$ cd jupyter-hunt/
```

Run `docker-compose` pointing to the default compose file available in the folder.

```
$ sudo docker-compose -f docker-compose.yml up --build -d
```

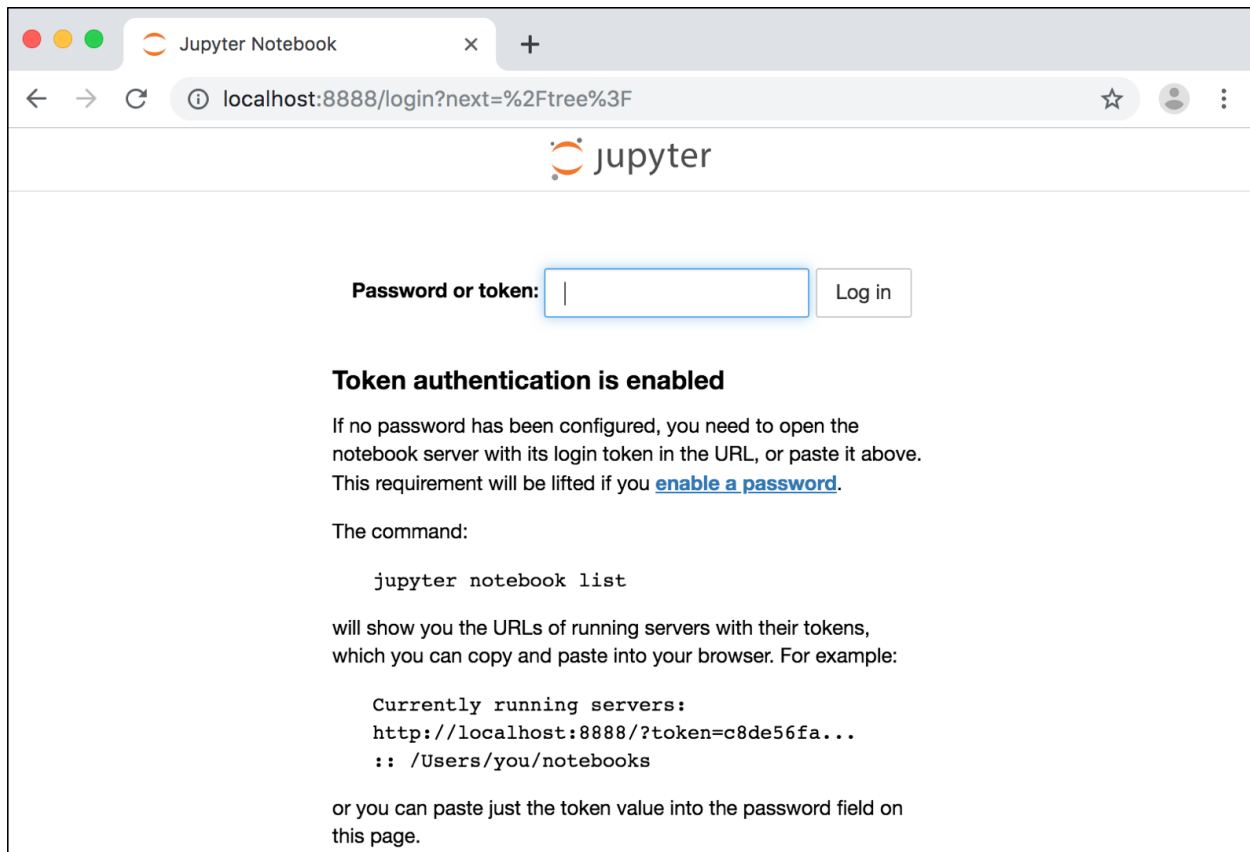
Once your container gets downloaded/run, you can check it if is running or not with the following commands:

```
$ sudo docker ps
```

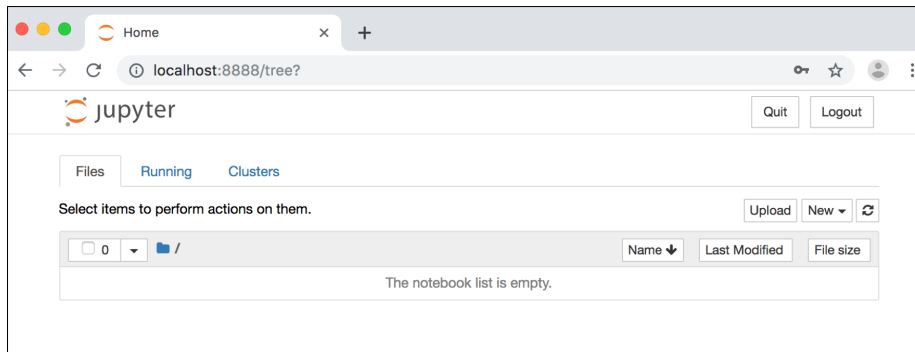
Before accessing the Jupyter notebook server via your favorite web browser, you will have to get the access token the application initialized with. You can get it with the following command:

```
$ sudo docker exec -ti jupyter-hunt jupyter notebook list | grep "token" | sed 's/.  
->*token=\([^\ ]*\).*\/\1/'
```

Open your favorite browser at `http://<notebook IP address>:8888``. You will then be prompted with a login box to enter the token.



That's it! You are now ready to use your Jupyter Notebook server.



1.3.3 Zeppelin Notebooks Install

Requirements

- **Git** : Git is a free and open source distributed version control system designed to handle everything from small to very large projects with speed and efficiency.
- **Docker CE** : Docker Community Edition (CE) is ideal for developers and small teams looking to get started with Docker and experimenting with container-based apps.
- **Docker Compose** : a tool for defining and running multi-container Docker applications.

Steps

Coming soon..

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