Authoring and sharing reusable interactive widgets with anywidget

Trevor Manz

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@trevmanz
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July 11, 2024

SciPy 2024

The gateway to "just enough" JavaScript

~~Authoring and sharing reusable interactive widgets with~~ anywidget

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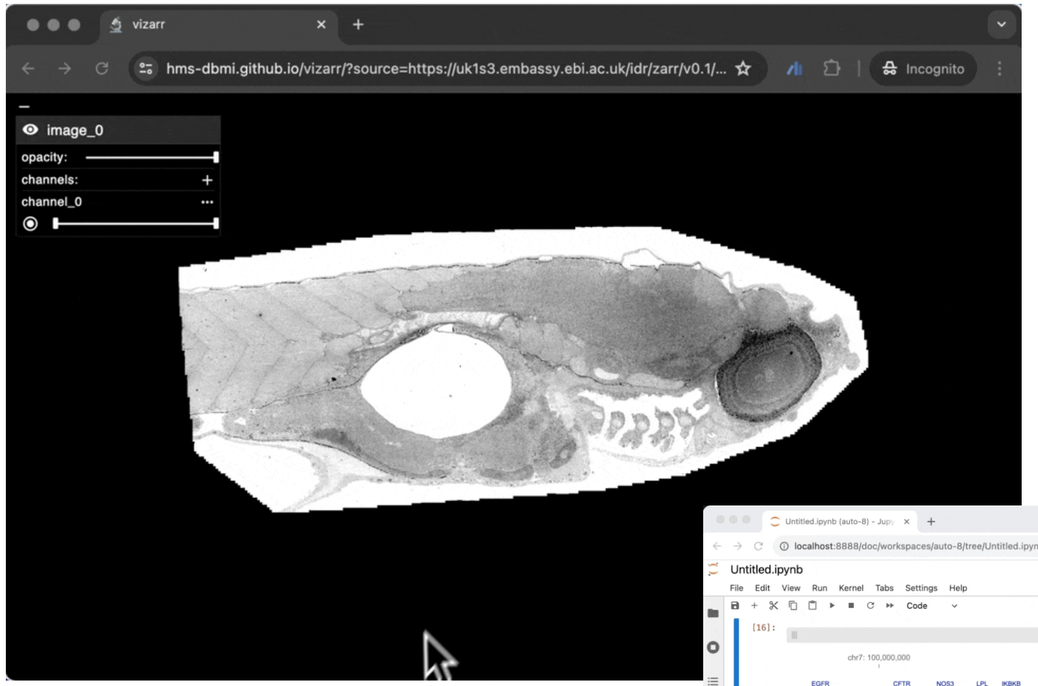
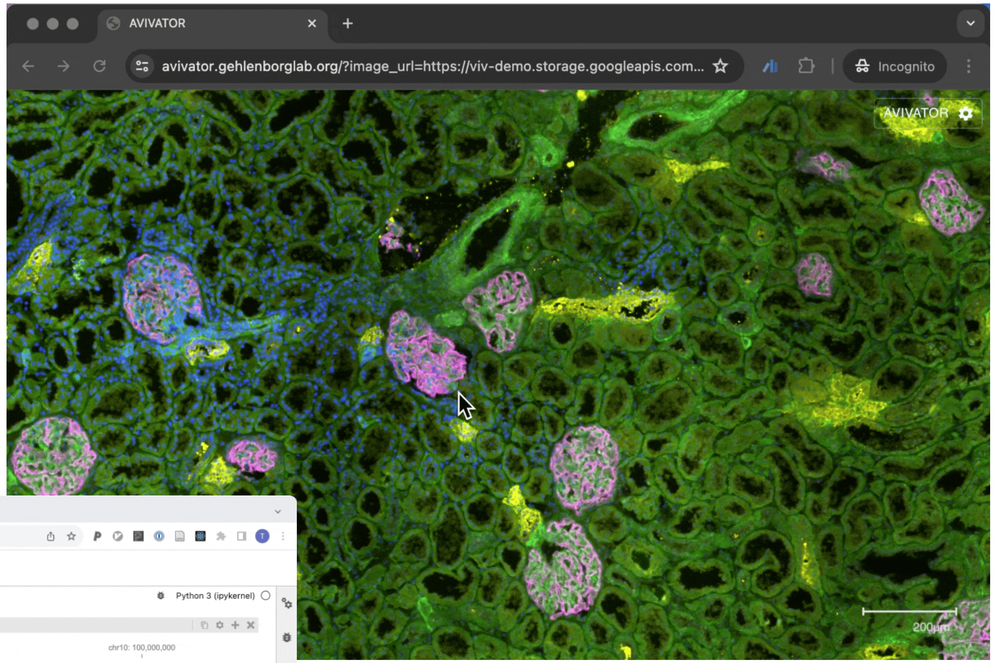
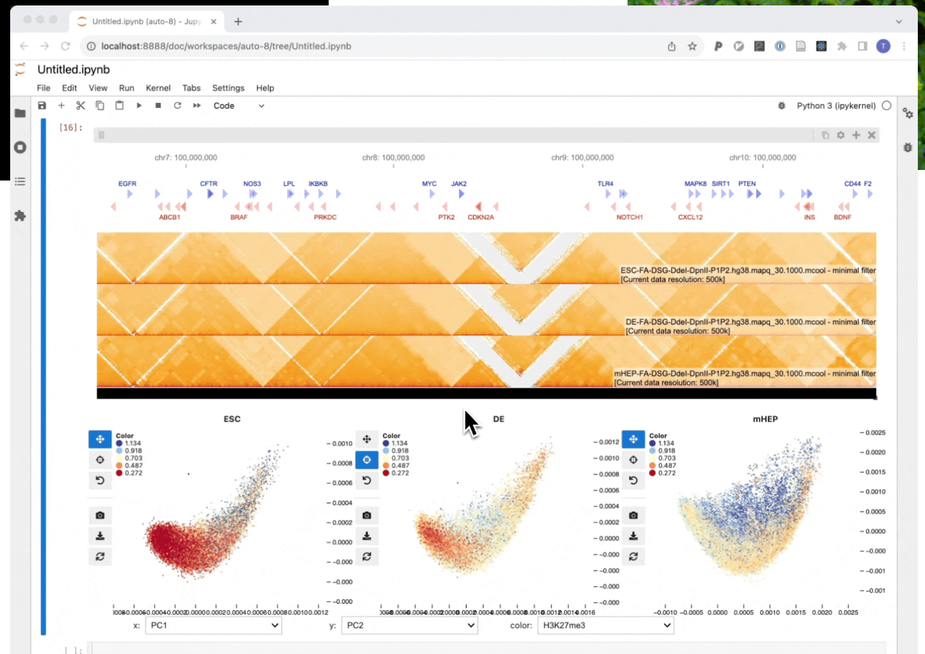
whoami

- Hi, I'm Trevor 👋
- PhD Student at Harvard Medical School
- Open-source enthusiast

I build interactive visualization tools







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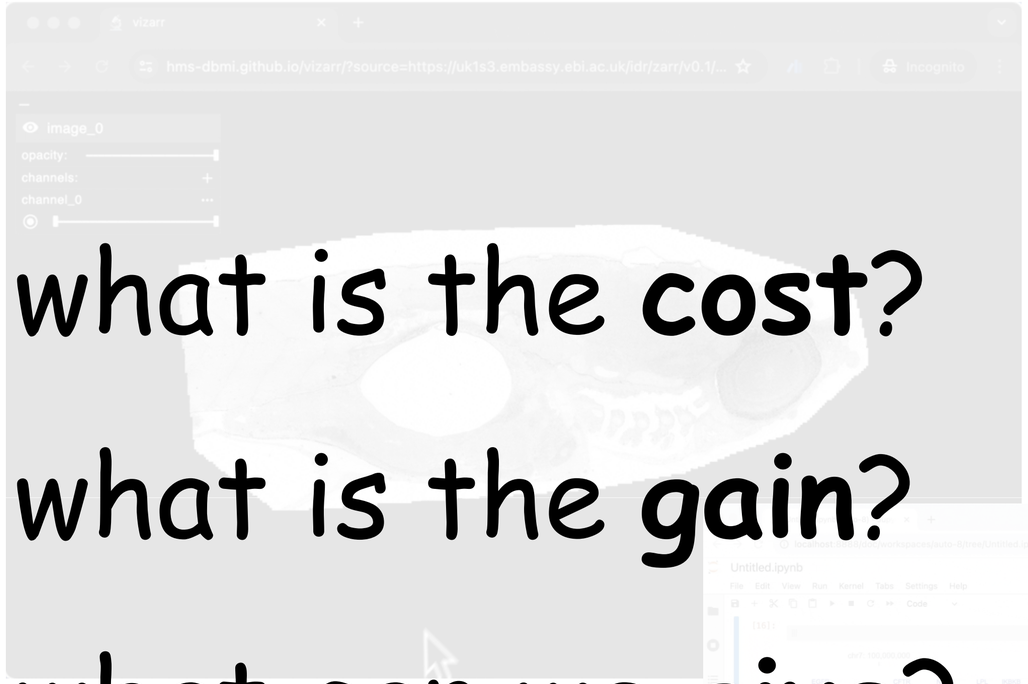

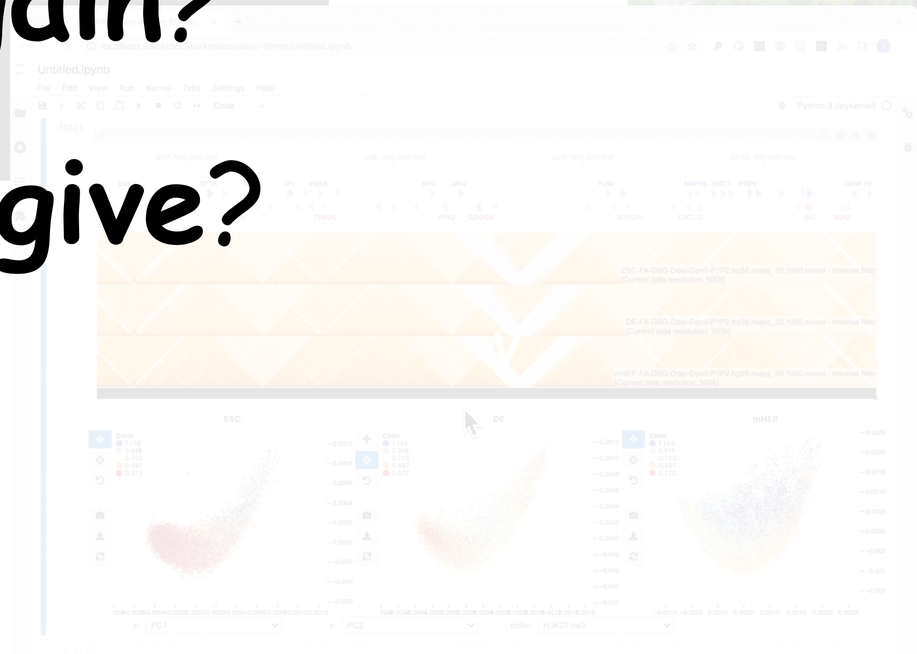

what is the **cost**?

what is the **gain**?

what can we **give**?

I build interactive visualization tools

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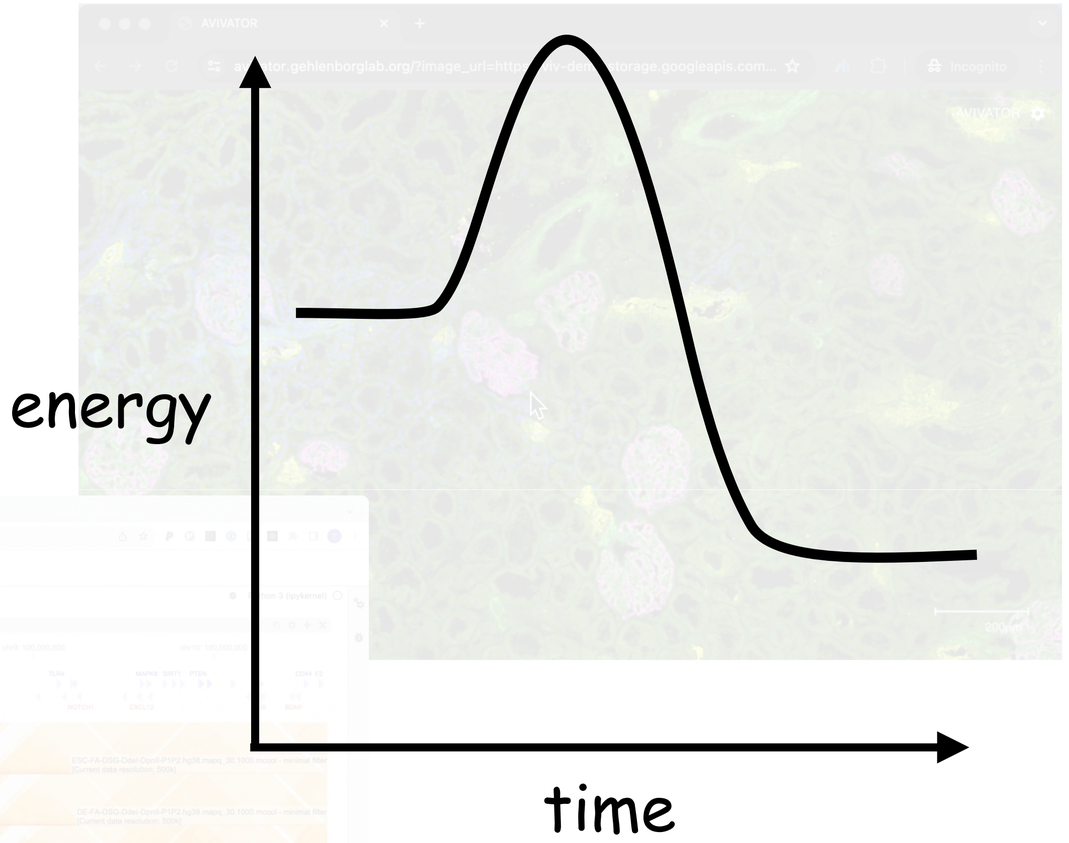

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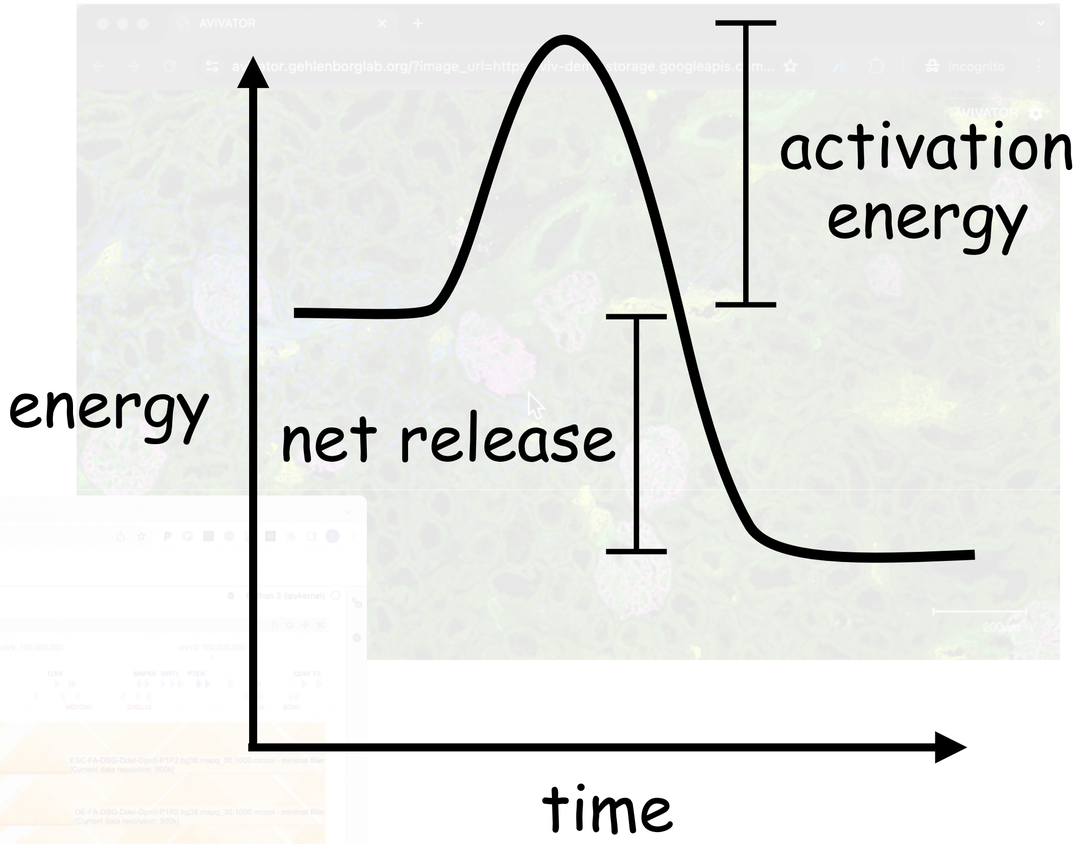

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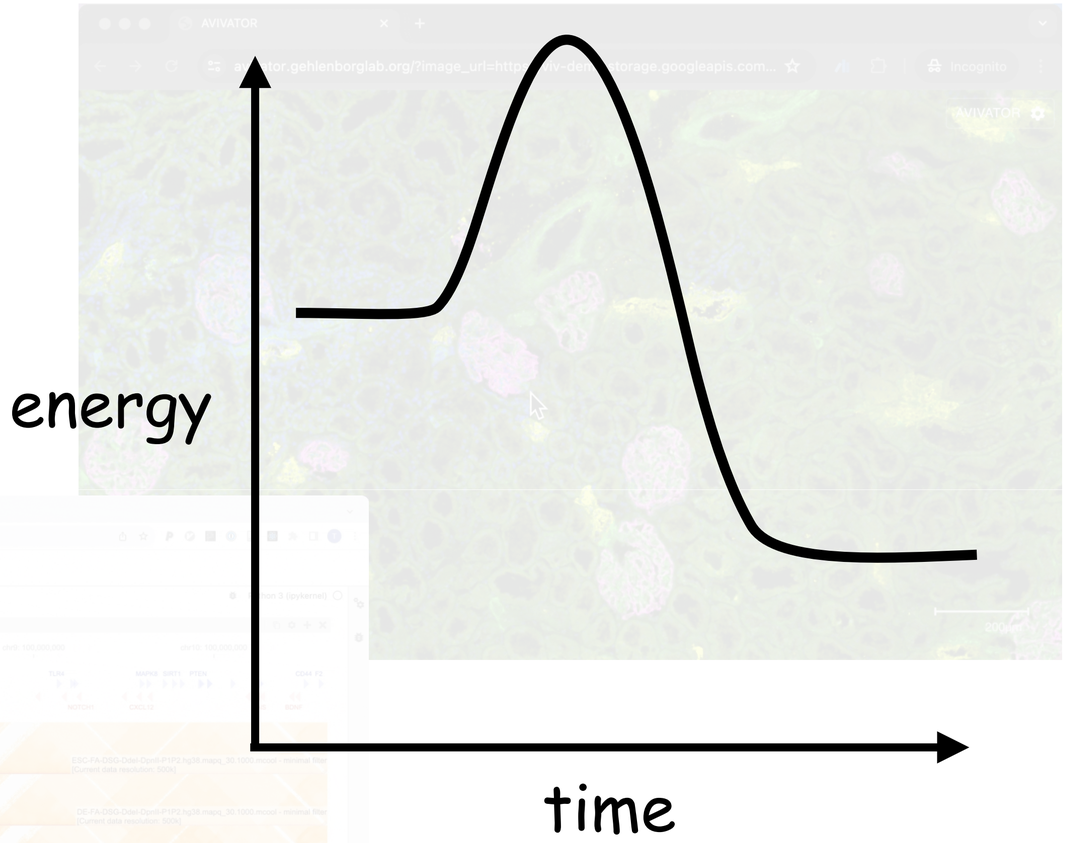

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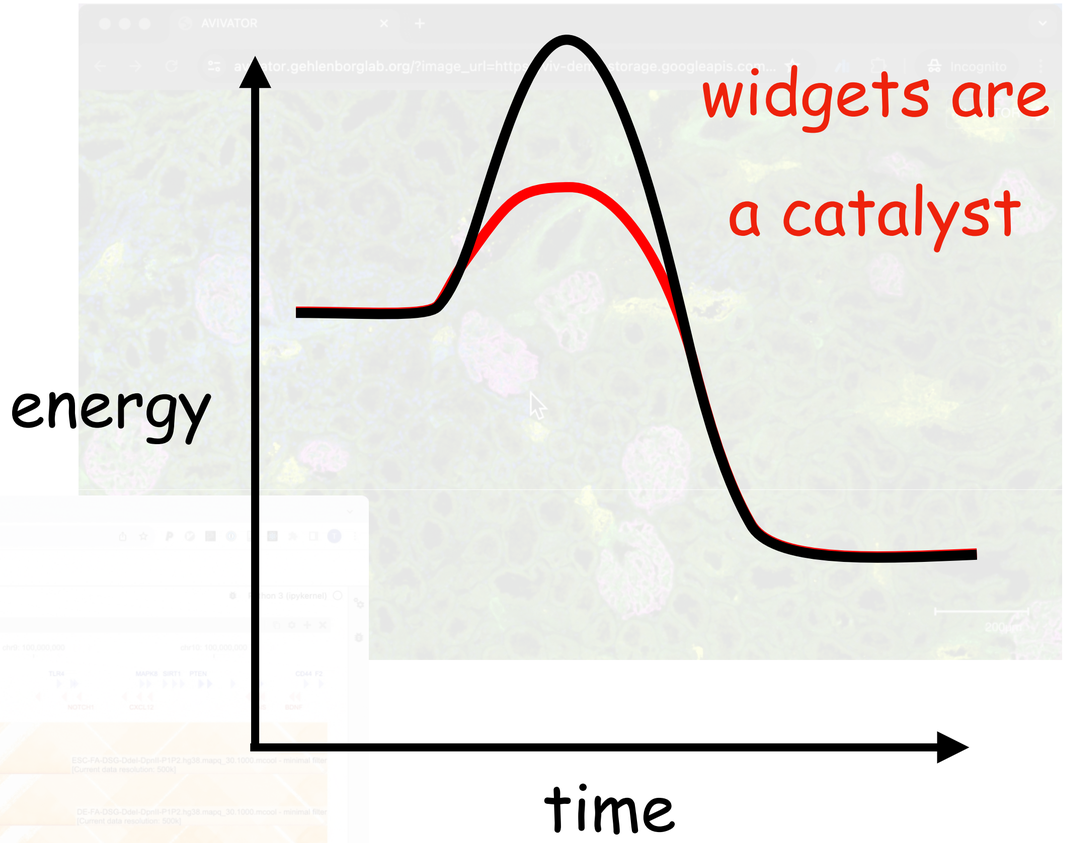

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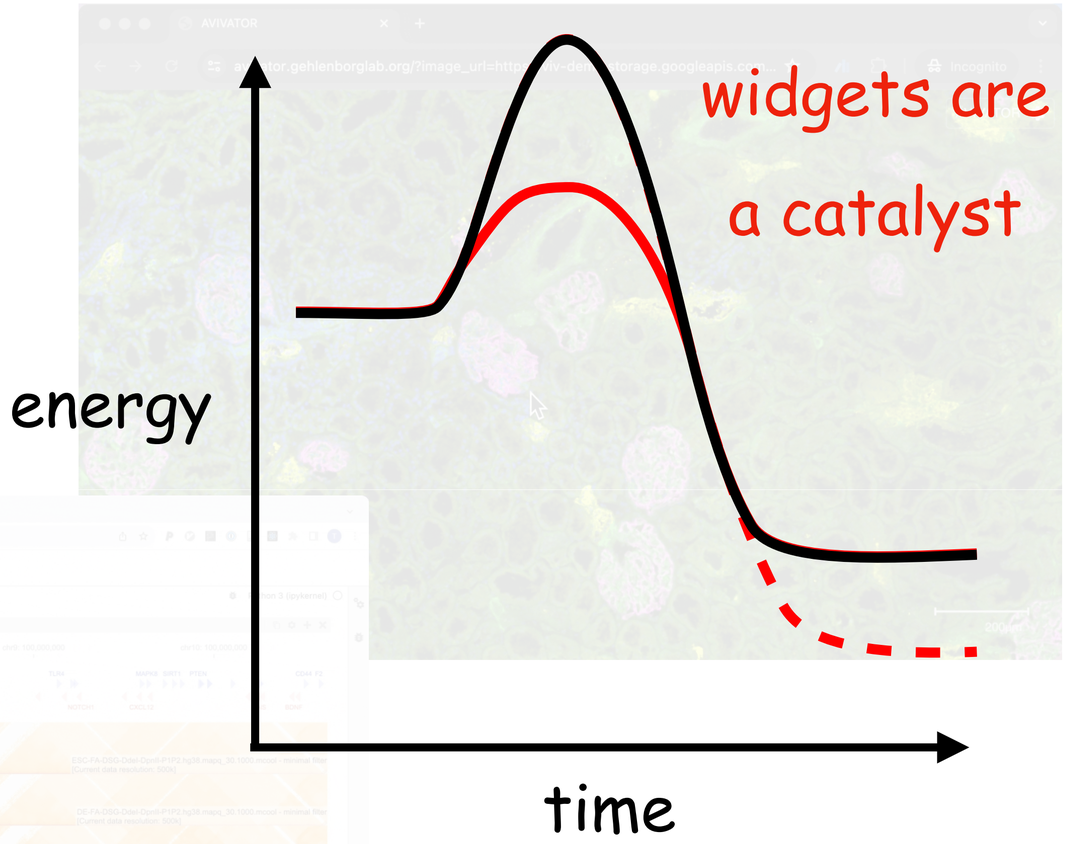


Perspective

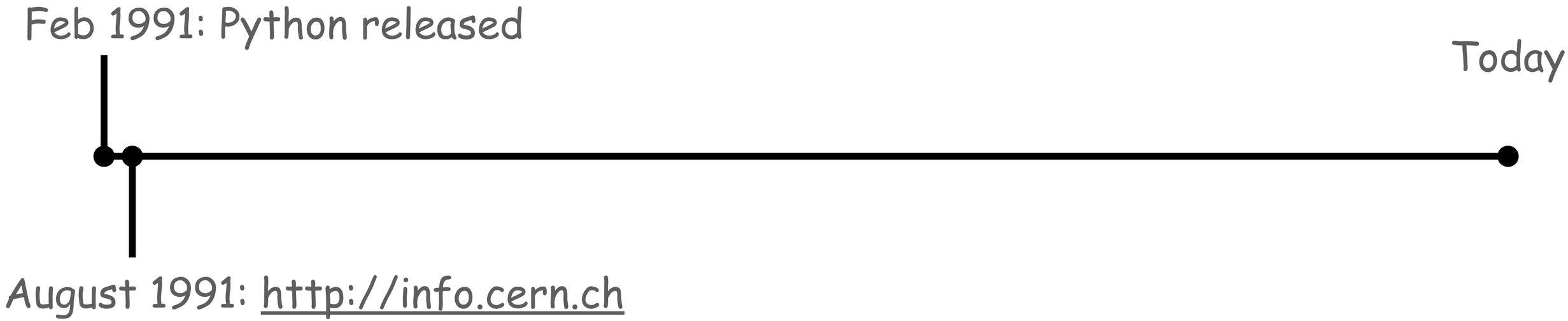
Feb 1991: Python released

Perspective

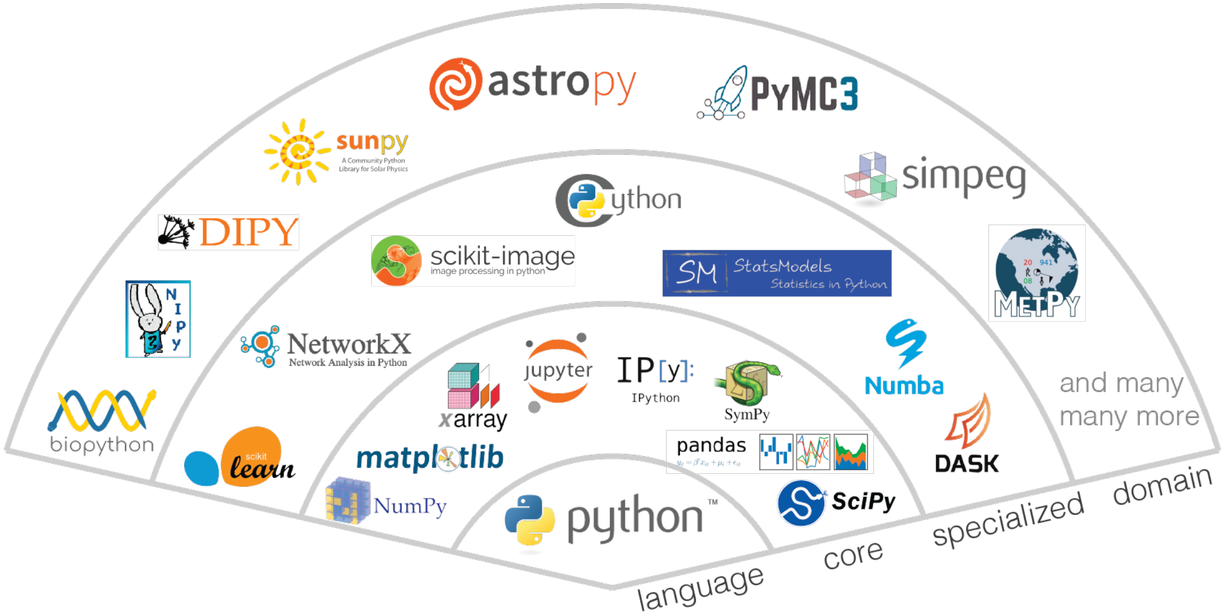
Feb 1991: Python released

August 1991: http://info.cern.ch

Perspective



Perspective

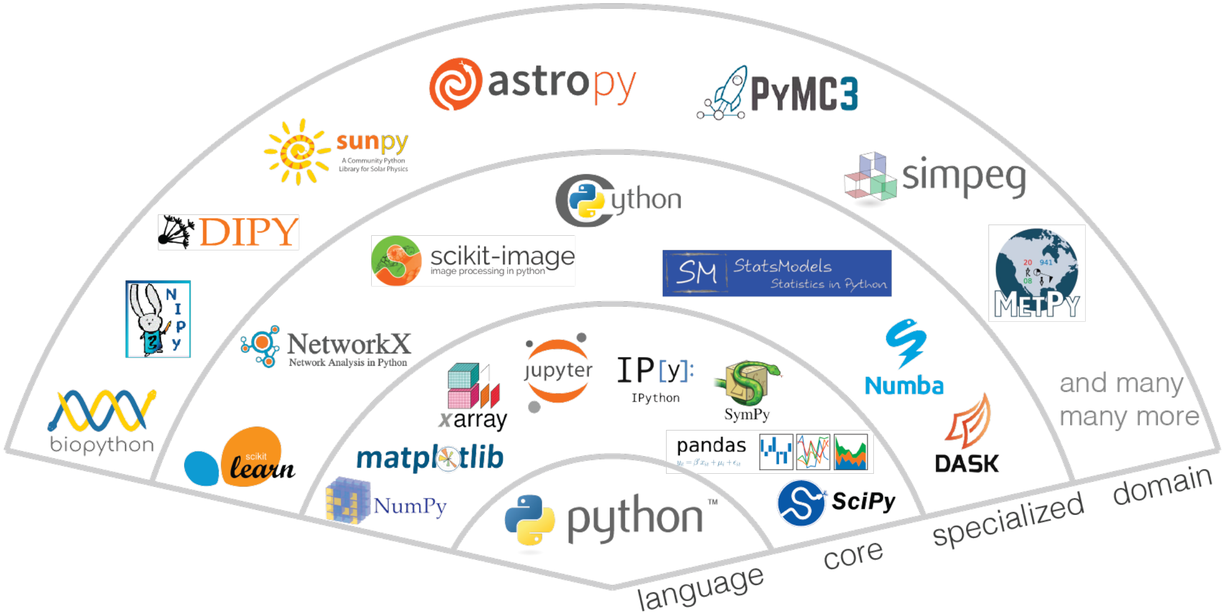


Feb 1991: Python released

Today

August 1991: http://info.cern.ch

Perspective



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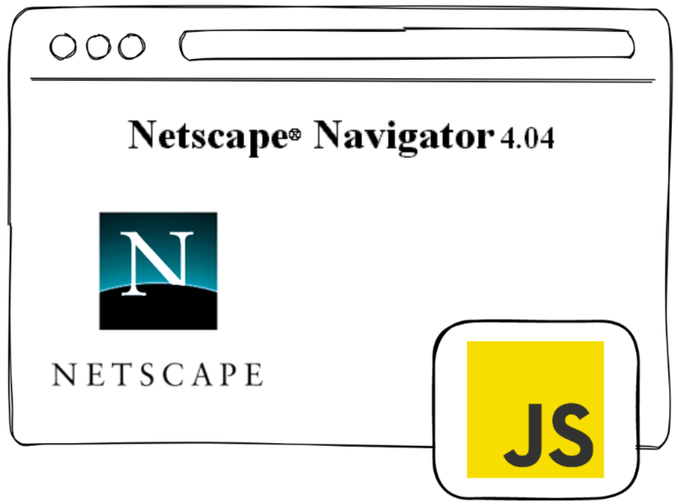
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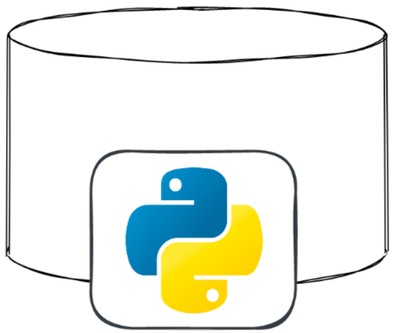
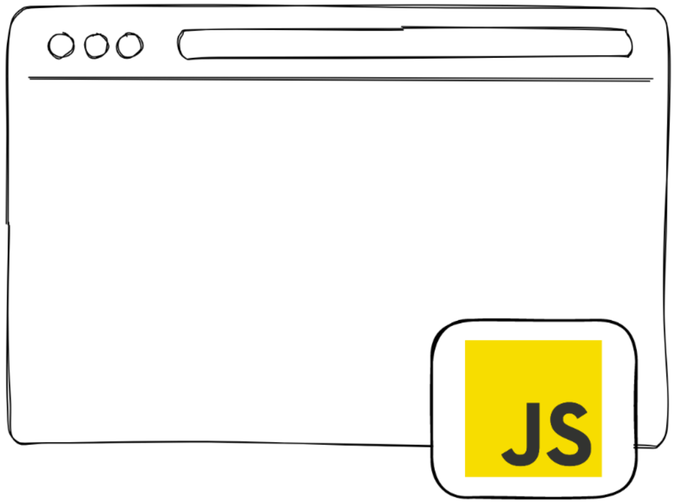
NETSCAPE
JS

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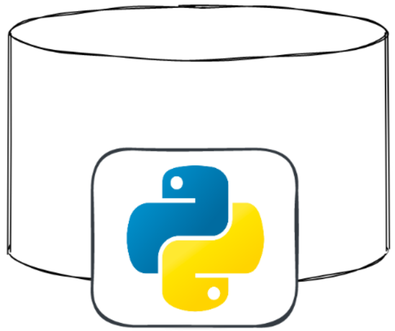


WebGPU
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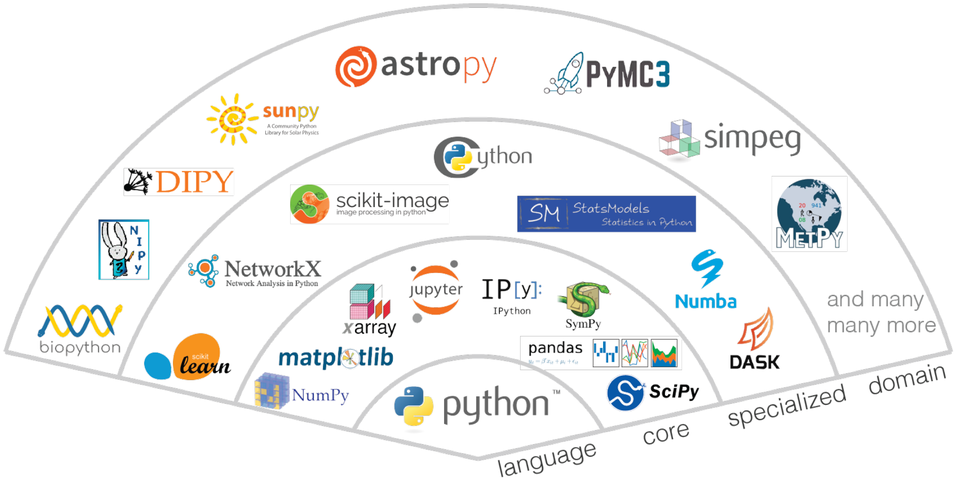
deck.gl
three.js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simpeg
DIPY
scikit-image
StatsModels
NetworkX
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IP[y]:
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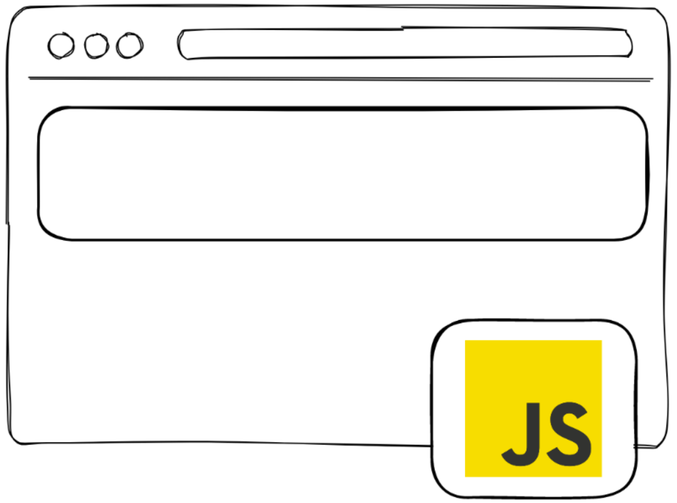
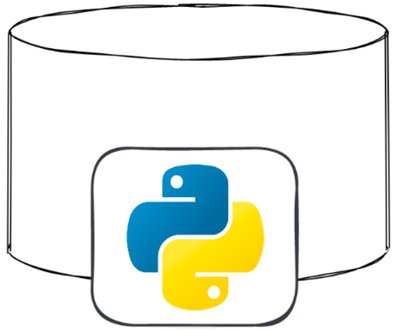
SymPy
Numba
MetPy
biopython
xarray
pandas
DASK
matplotlib
NumPy
SciPy
and many
many more
python
language
core
specialized
domain


JS


Jupyter

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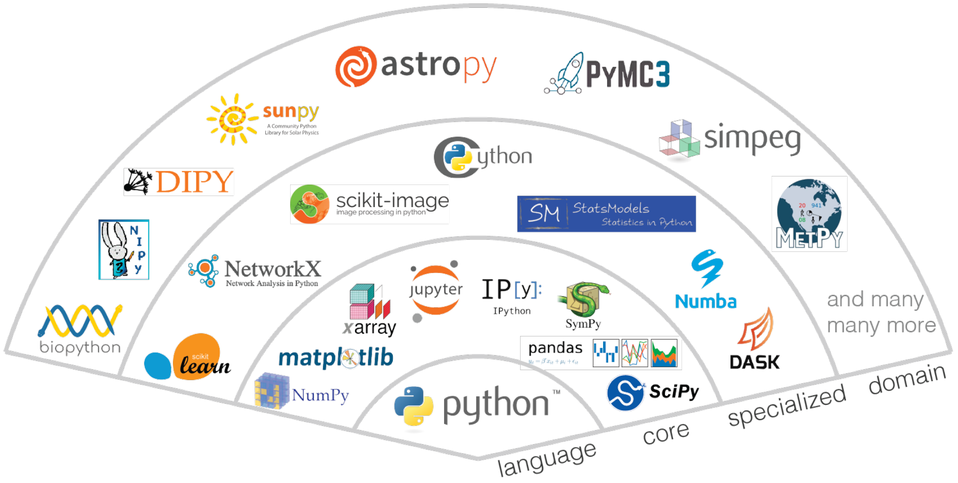
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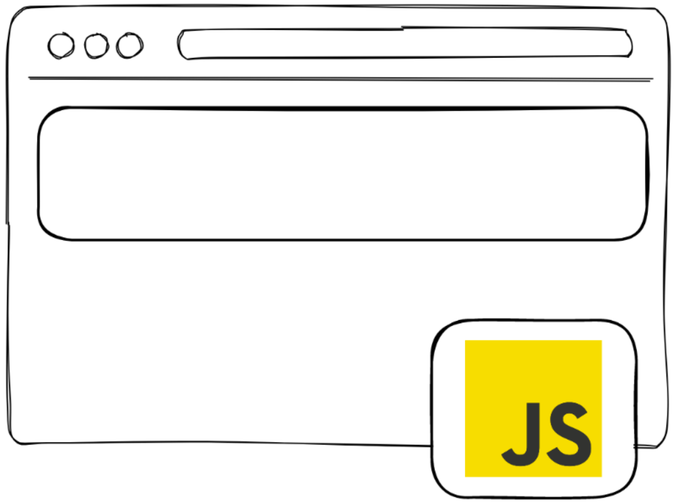
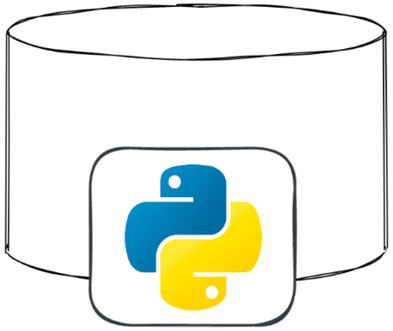
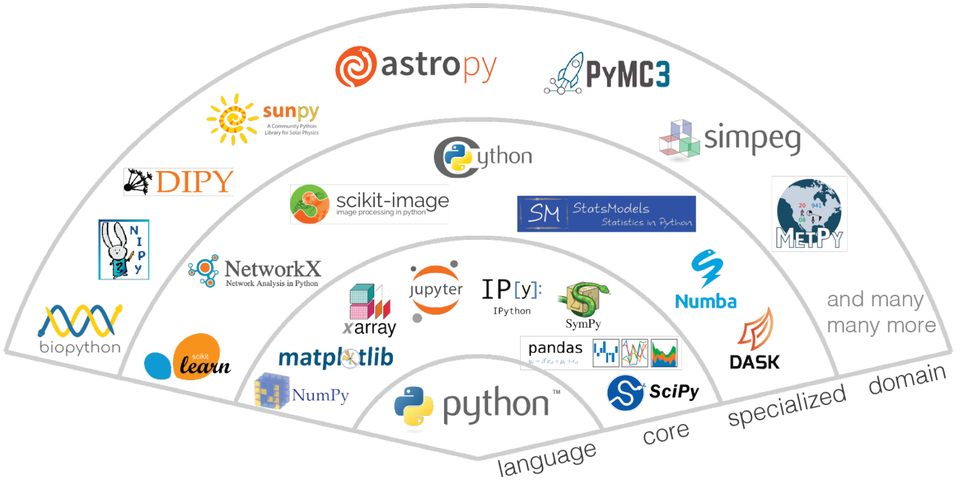
sunpy
simpeg
DIPY
scikit-image
StatsModels
NetworkX
jupyter
IP[y]:
Numba
xarray
SymPy
biopython
pandas
DASK
matplotlib
NumPy
SciPy
and many
many more
python
language
core
specialized
domain

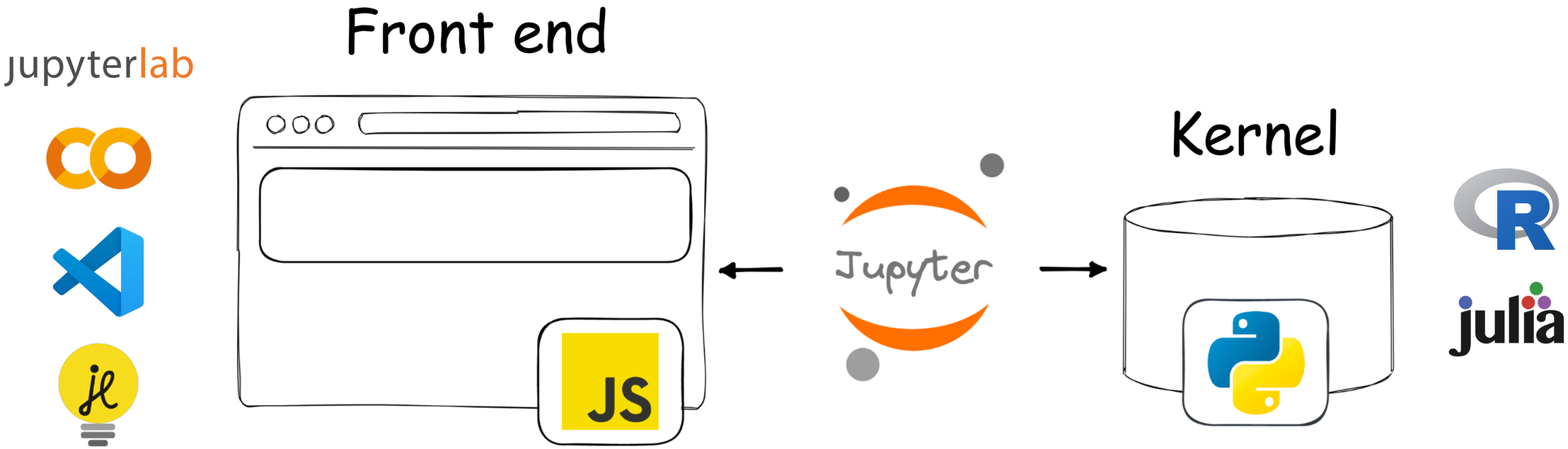
Front end

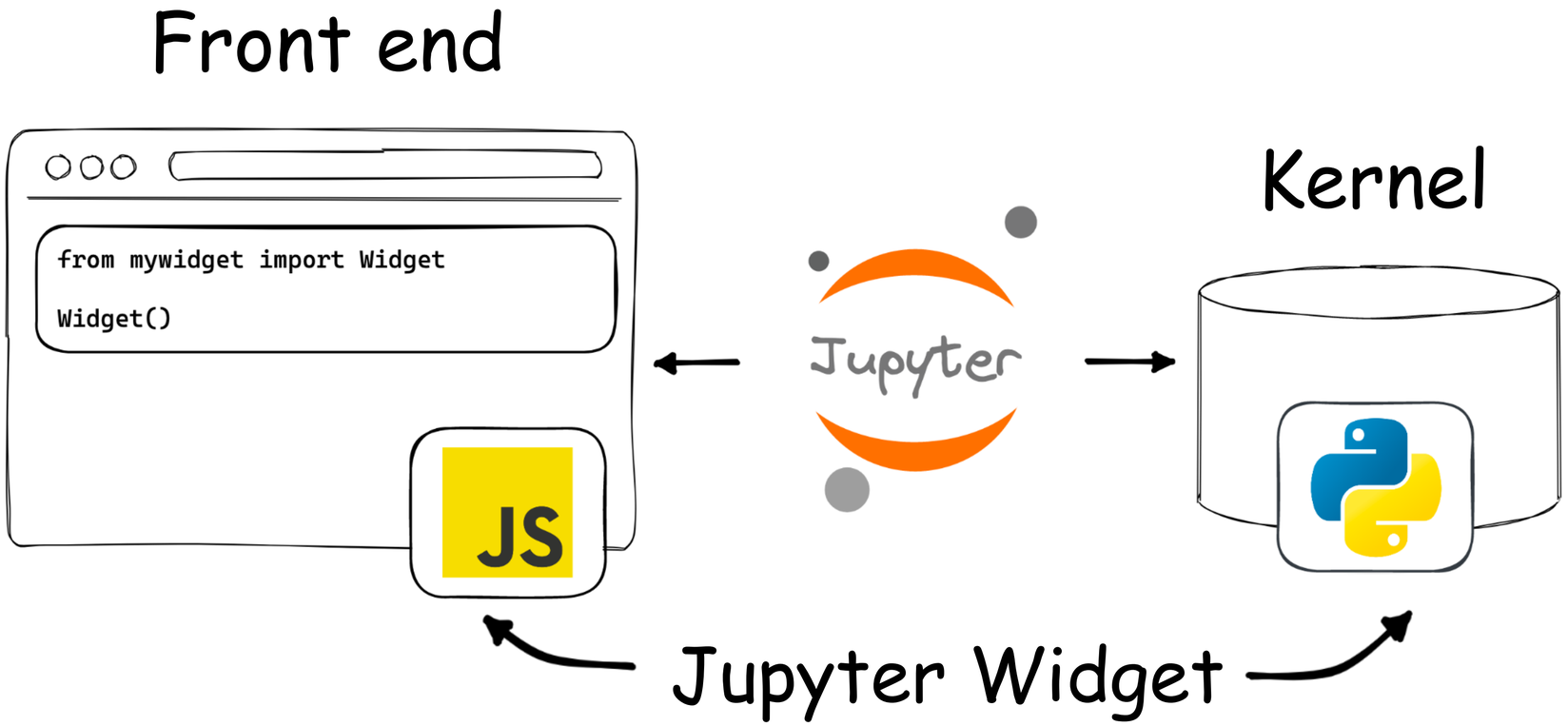


Kernel






jupyterlab
Front end
JS
Jupyter
Kernel
R
julia


Front end
from mywidget import Widget
Widget()
JS
Jupyter
Kernel
Jupyter Widget

“[Widgets] really add a lot of 

to what you can do.”

- Vincent D. Warmerdam

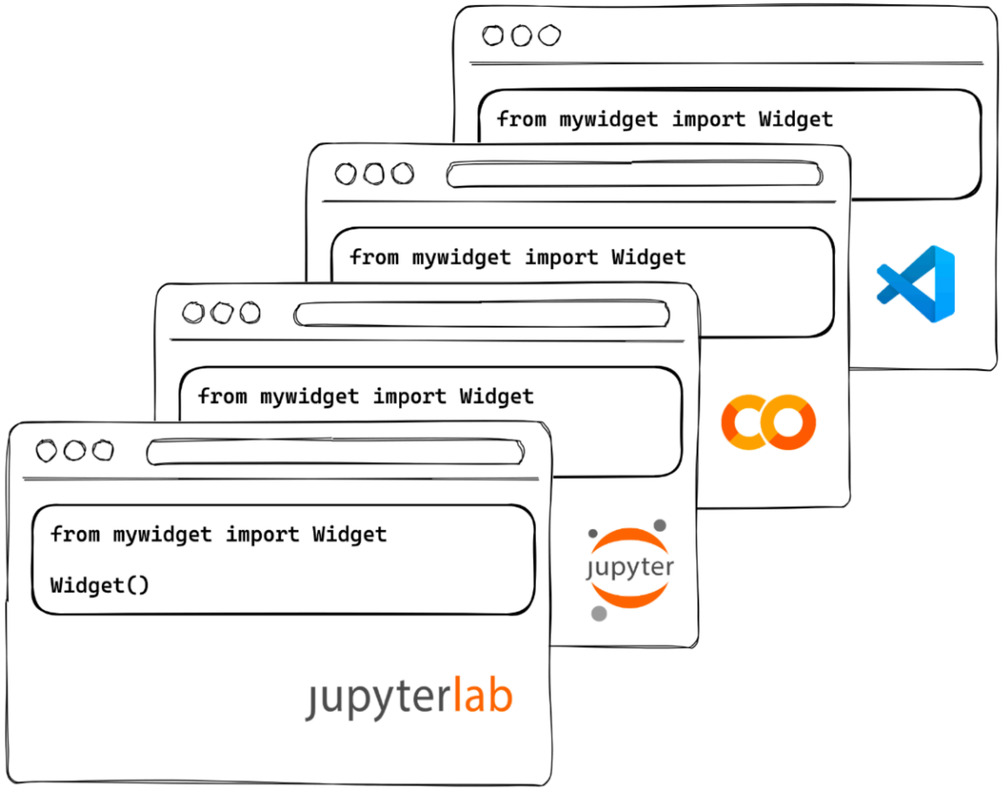
https://x.com/fishnets88/status/1800247148719587607

You can make **new** lego bricks  ,

or find new ways to **click** lego bricks together  .

Why widgets are HARD

Tight coupling with (many) platforms



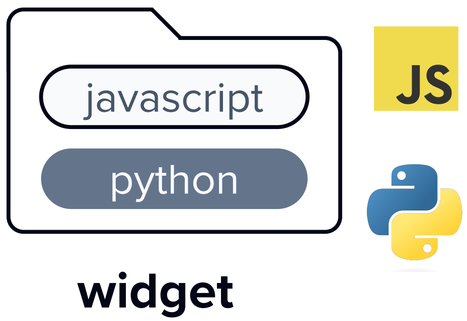
binder

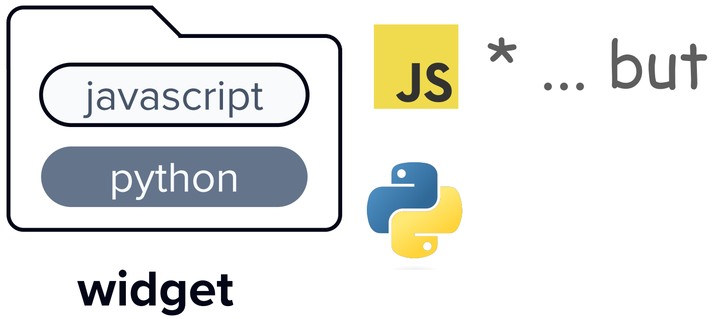
SOLARA

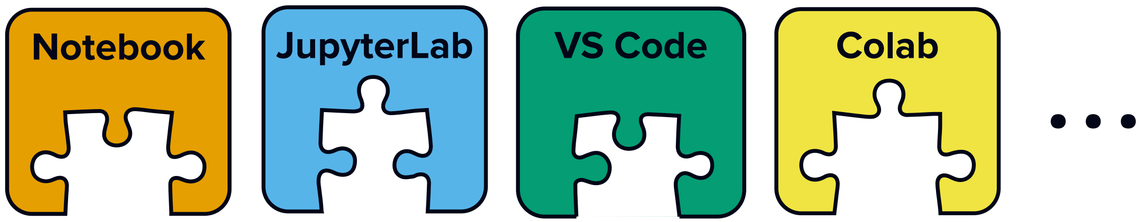
jupyterlite

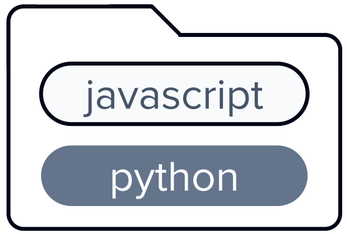
Panel

Shiny for Python


javascript
python
JS
widget


javascript
python
widget
JS
* ... but





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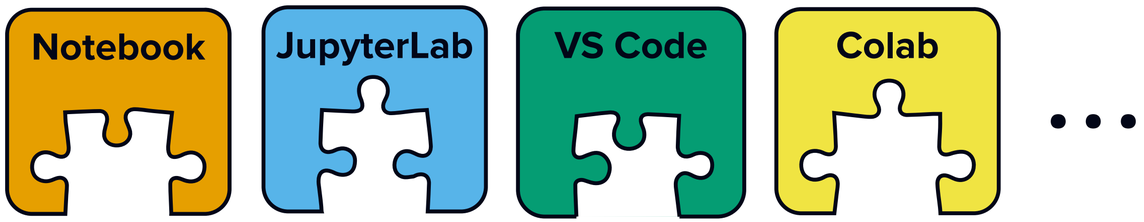
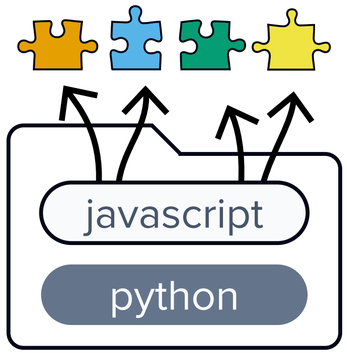

Notebook
JupyterLab
VS Code
Colab


node
yarn
webpack
BABEL
Jest
ESLint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python

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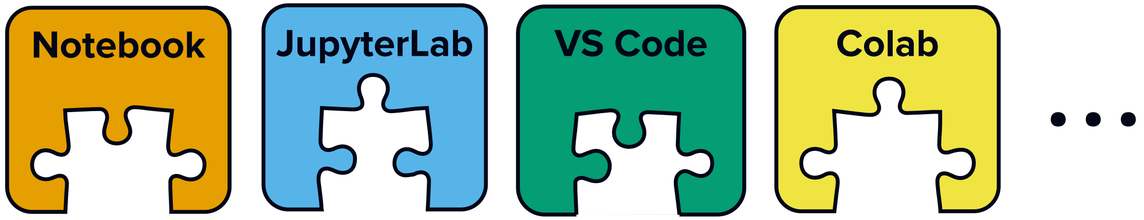
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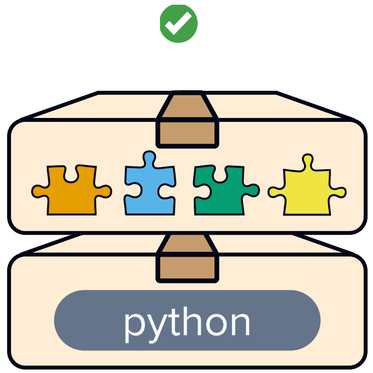
VS Code
Colab


python
Package
Index


npm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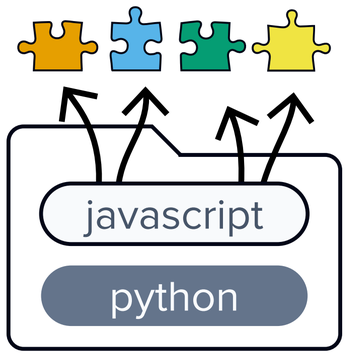
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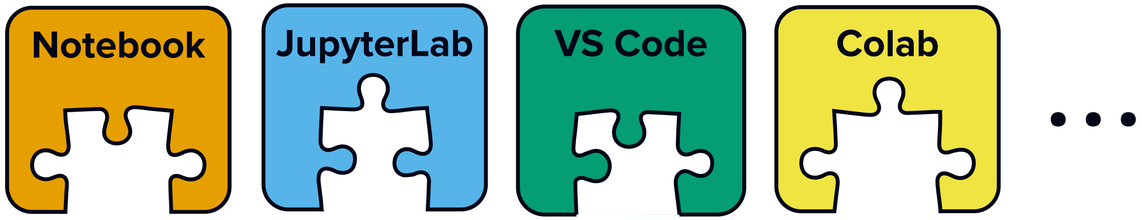
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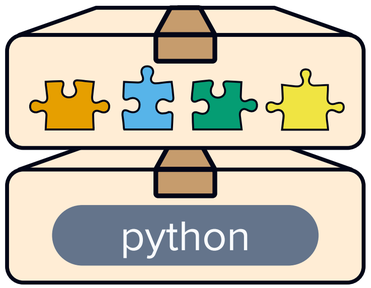
Package
Index

npm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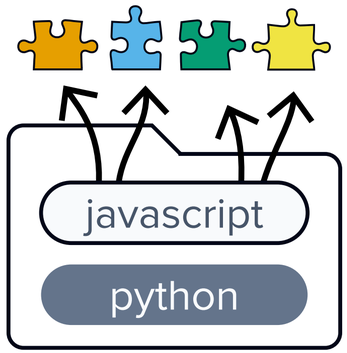
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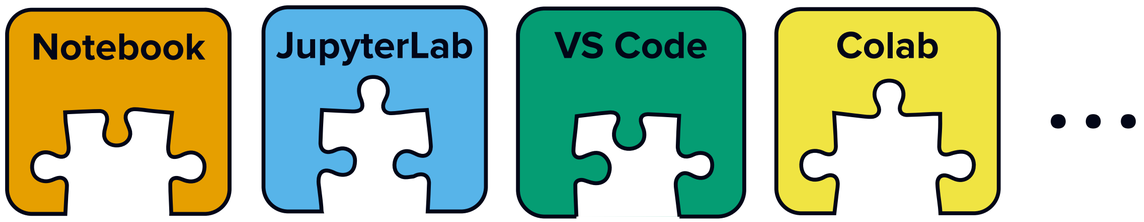
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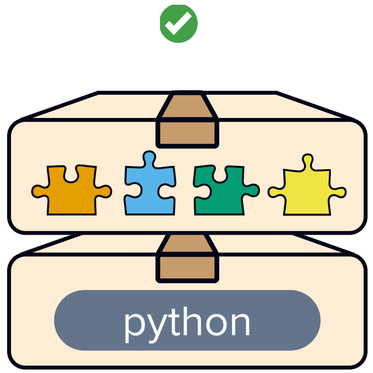
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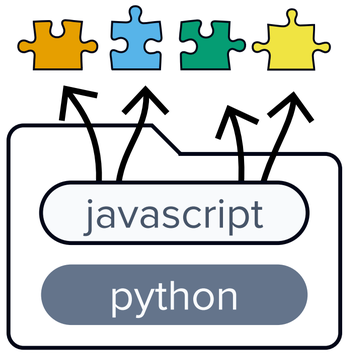
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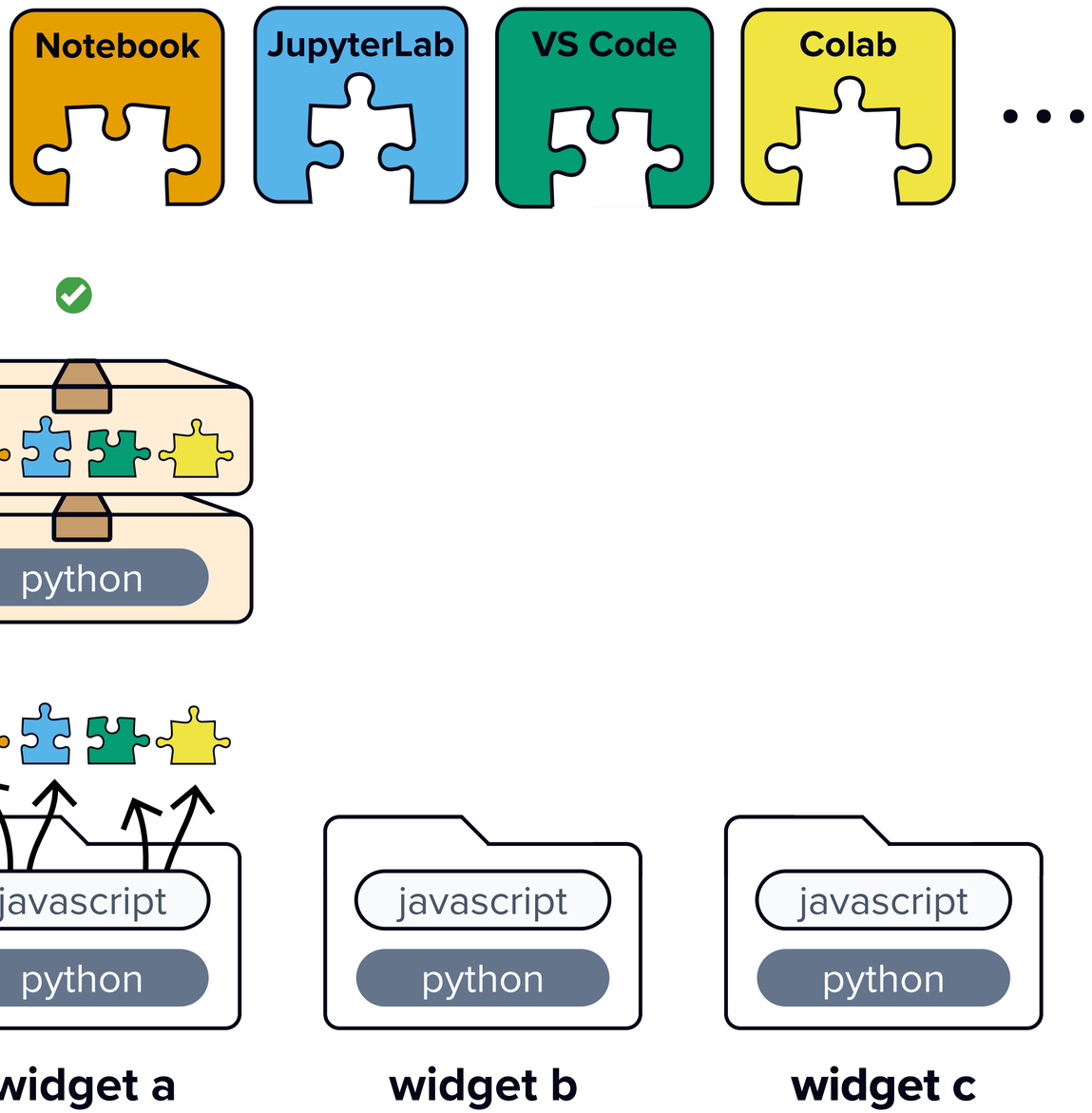
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VS Code
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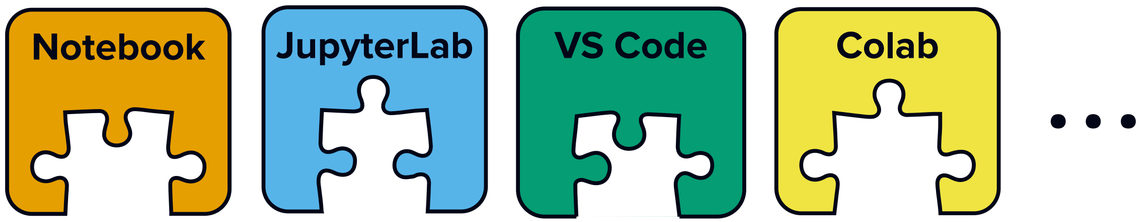
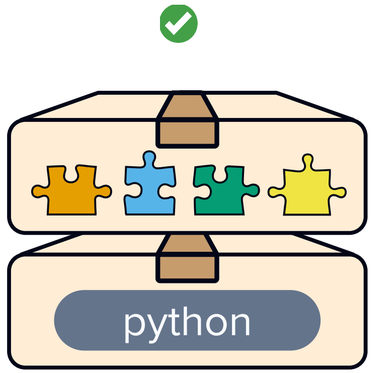
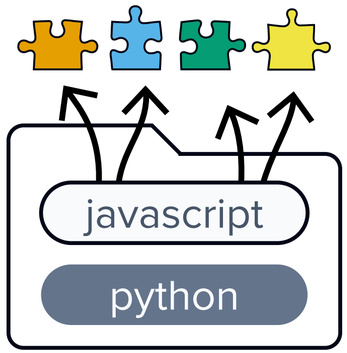
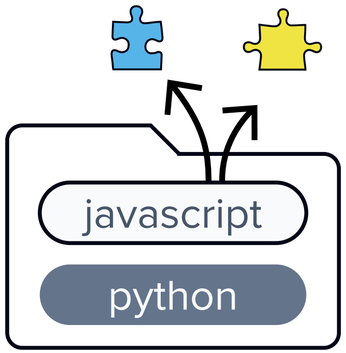
widget b
widget c







widget a



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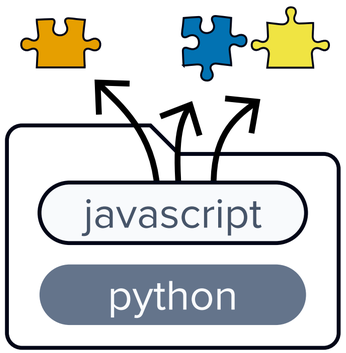

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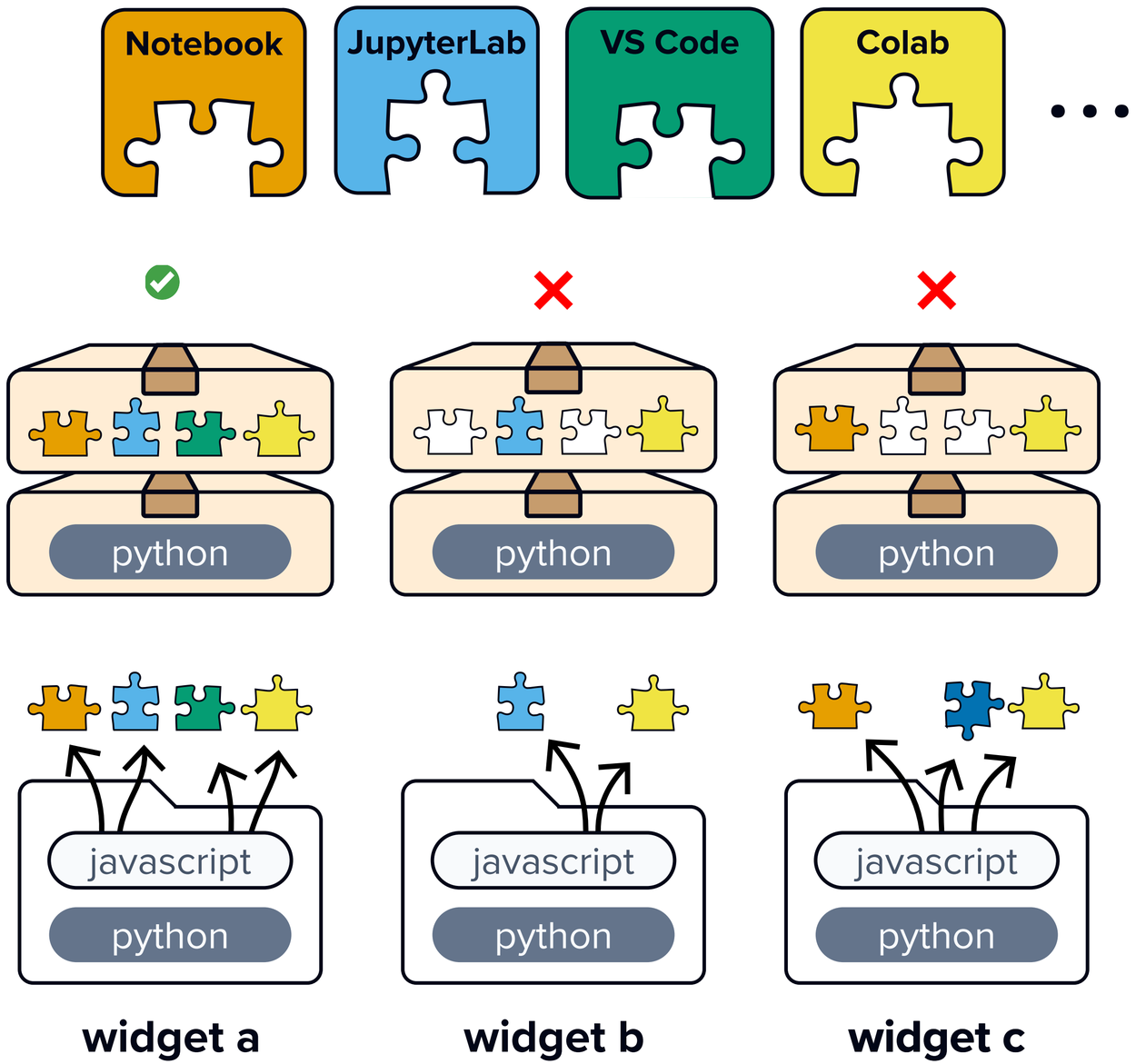
Notebook
JupyterLab
VS Code
Colab
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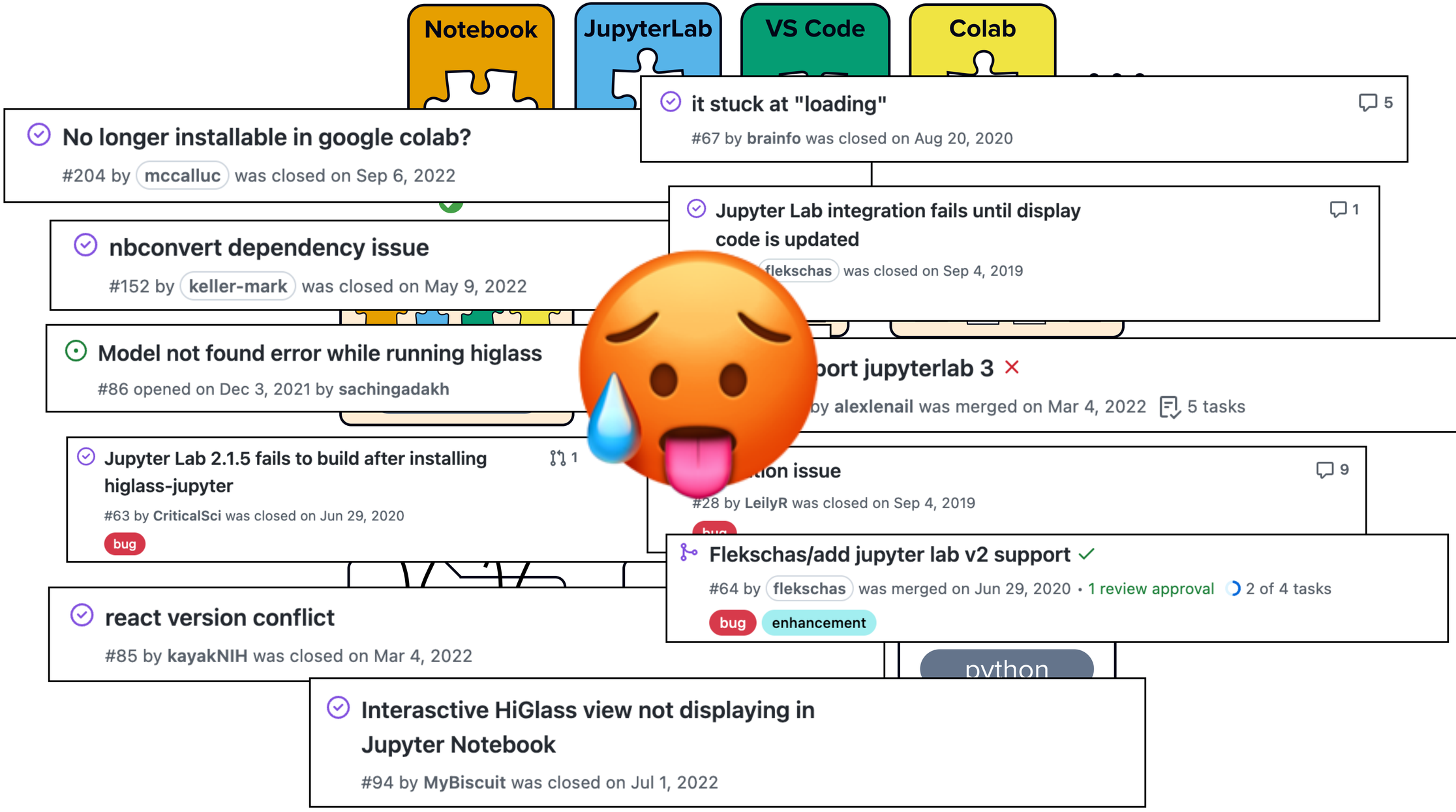
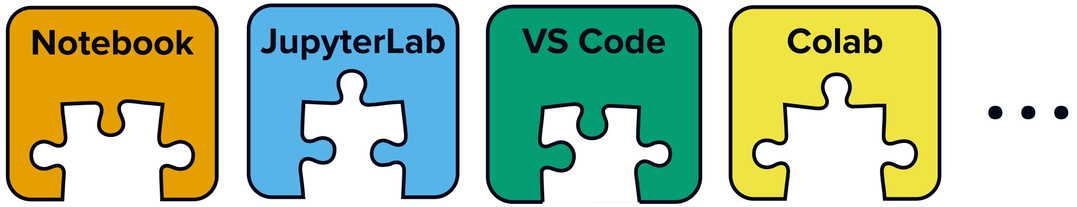

Notebook
JupyterLab
VS Code
Colab
No longer installable in google colab?
#204 by mccalluc was closed on Sep 6, 2022
it stuck at "loading"
5
#67 by brainfo was closed on Aug 20, 2020
nbconvert dependency issue
#152 by keller-mark was closed on May 9, 2022
Jupyter Lab integration fails until display code is updated
1
flekschas was closed on Sep 4, 2019
Model not found error while running higlass
#86 opened on Dec 3, 2021 by sachingadakh
ort jupyterlab 3
by alexlenail was merged on Mar 4, 2022
5 tasks
Jupyter Lab 2.1.5 fails to build after installing higlass-jupyter
1
#63 by CriticalSci was closed on Jun 29, 2020
bug
ion issue
9
#28 by LeilyR was closed on Sep 4, 2019
Flekschas/add jupyter lab v2 support
#64 by flekschas was merged on Jun 29, 2020 • 1 review approval
2 of 4 tasks
bug
enhancement
react version conflict
#85 by kayakNIH was closed on Mar 4, 2022
python
Interasctive HiGlass view not displaying in Jupyter Notebook
#94 by MyBiscuit was closed on Jul 1, 2022

A specification



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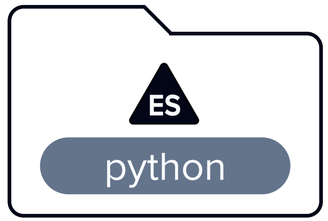

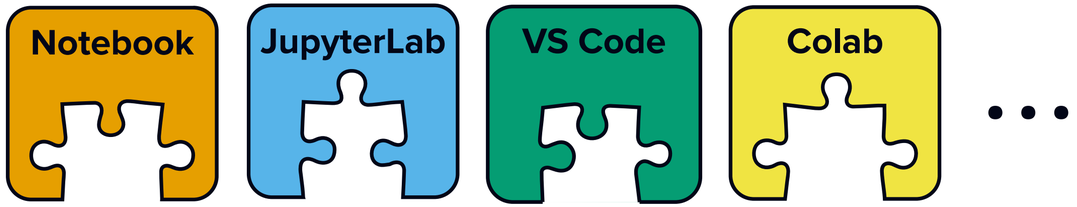

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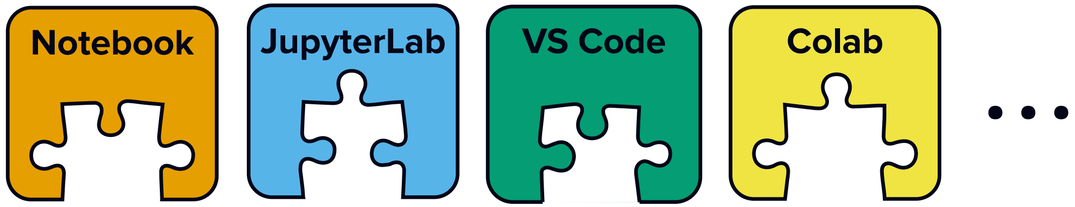

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ECMAScript® 2022 Language Specification

ecma INTERNATIONAL

About this Specification

The document at https://tc39.es/ecma262/ is the most accurate and up-to-date ECMAScript specification. It contains the content of the most recent yearly snapshot plus any finished proposals (those that have reached Stage 4 in the proposal process and thus are implemented in several implementations and will be in the next practical revision) since that snapshot was taken.

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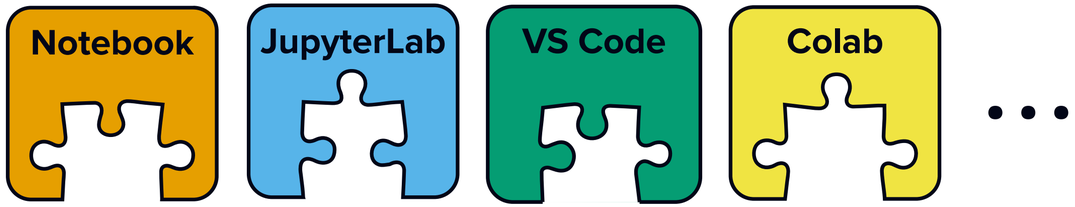
ES



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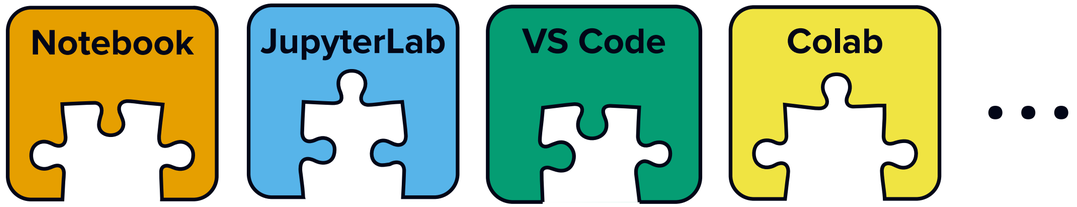
```
export default {
  initialize({ model }) {
    // setup (optional)
  },
  render({ model, el }) {
    // display the widget
  },
}
```



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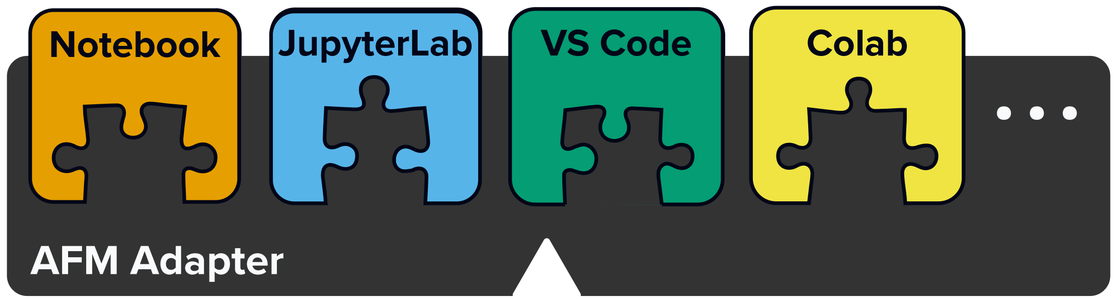

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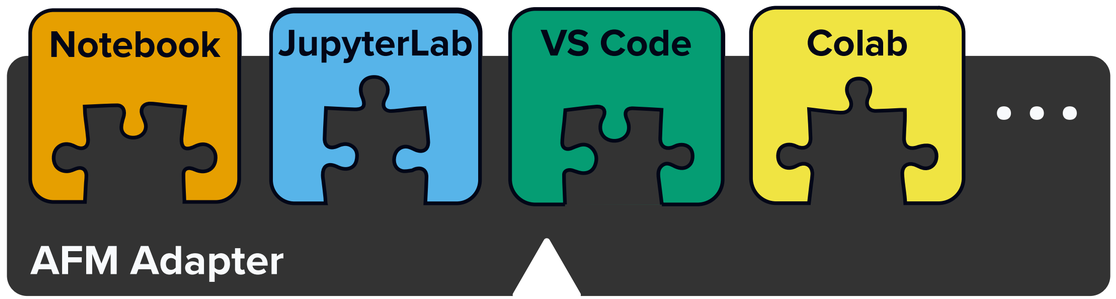

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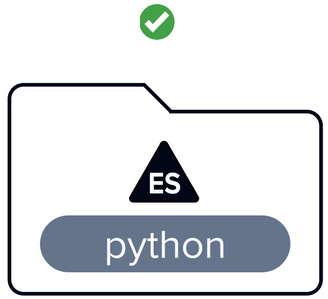

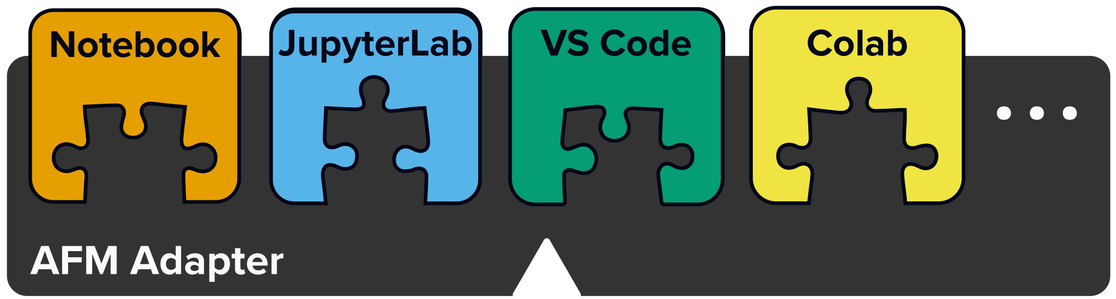
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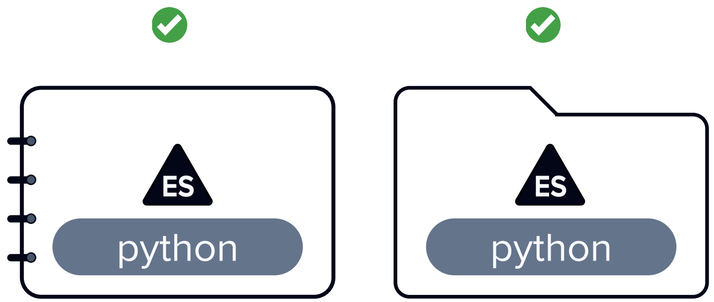
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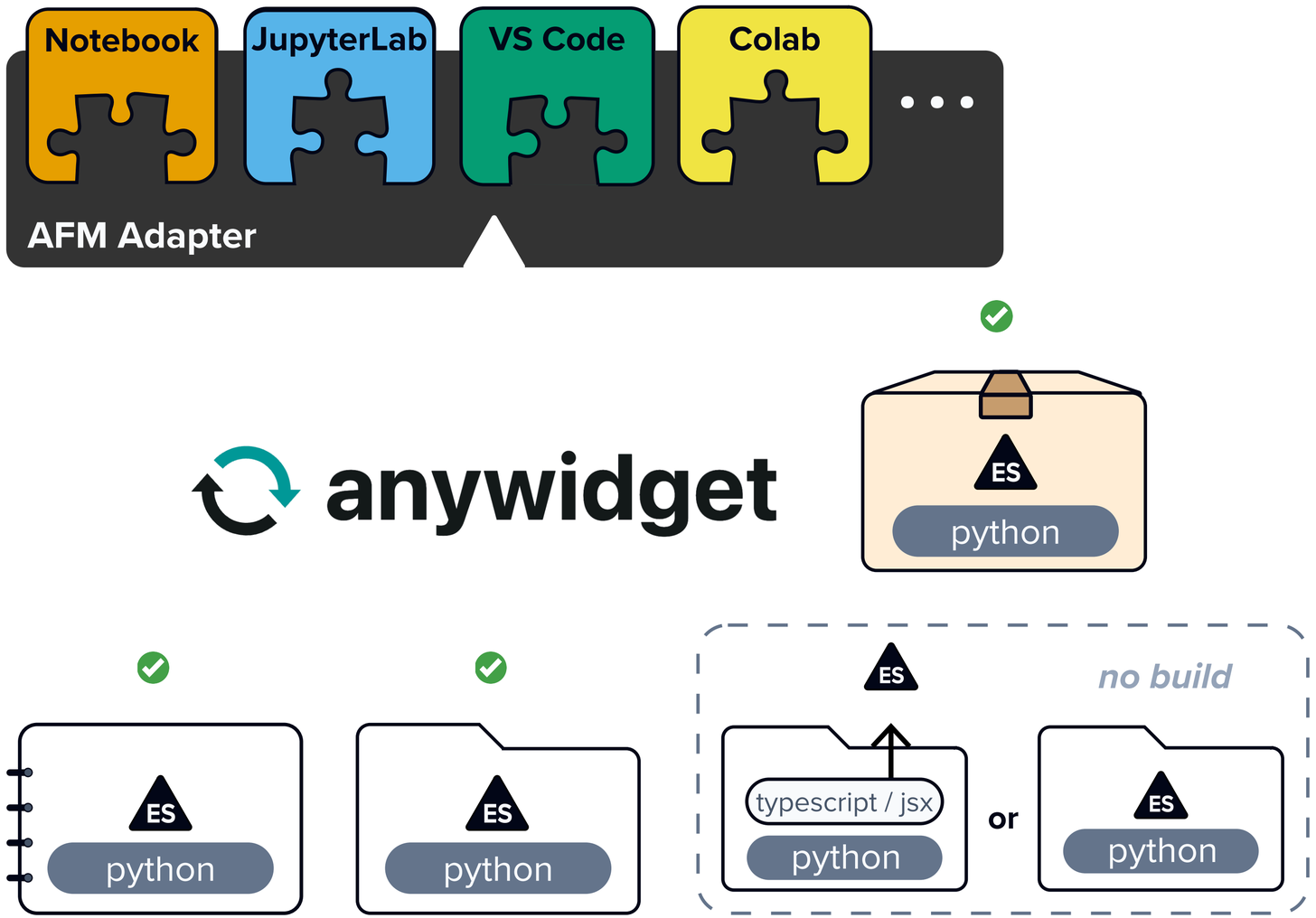
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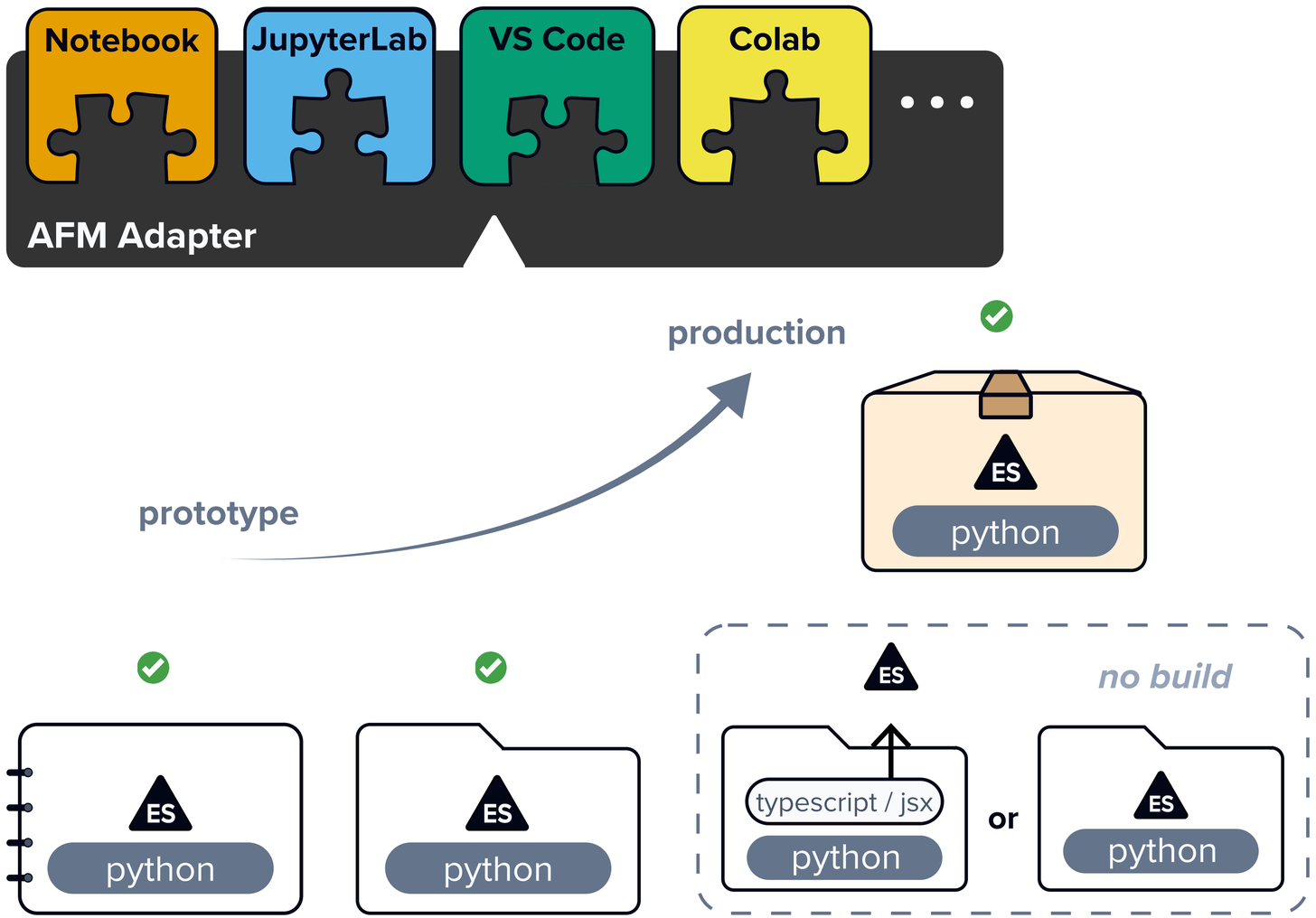
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ES
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ES
no build
typescript / jsx
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or
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A toolkit, for Jupyter and beyond

Authoring Tools (optional)

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`@anywidget/svelte`

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Marimo

Panel

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binder

jupyter

CoCalc

Project Template CLI

```
$ npm create anywidget ipyfoo
```

```
ipyfoo/
├── src
│   └── ipyfoo
│       ├── __init__.py
│       └── AFM
├── example.ipynb
├── pyproject.toml
└── README.md
```

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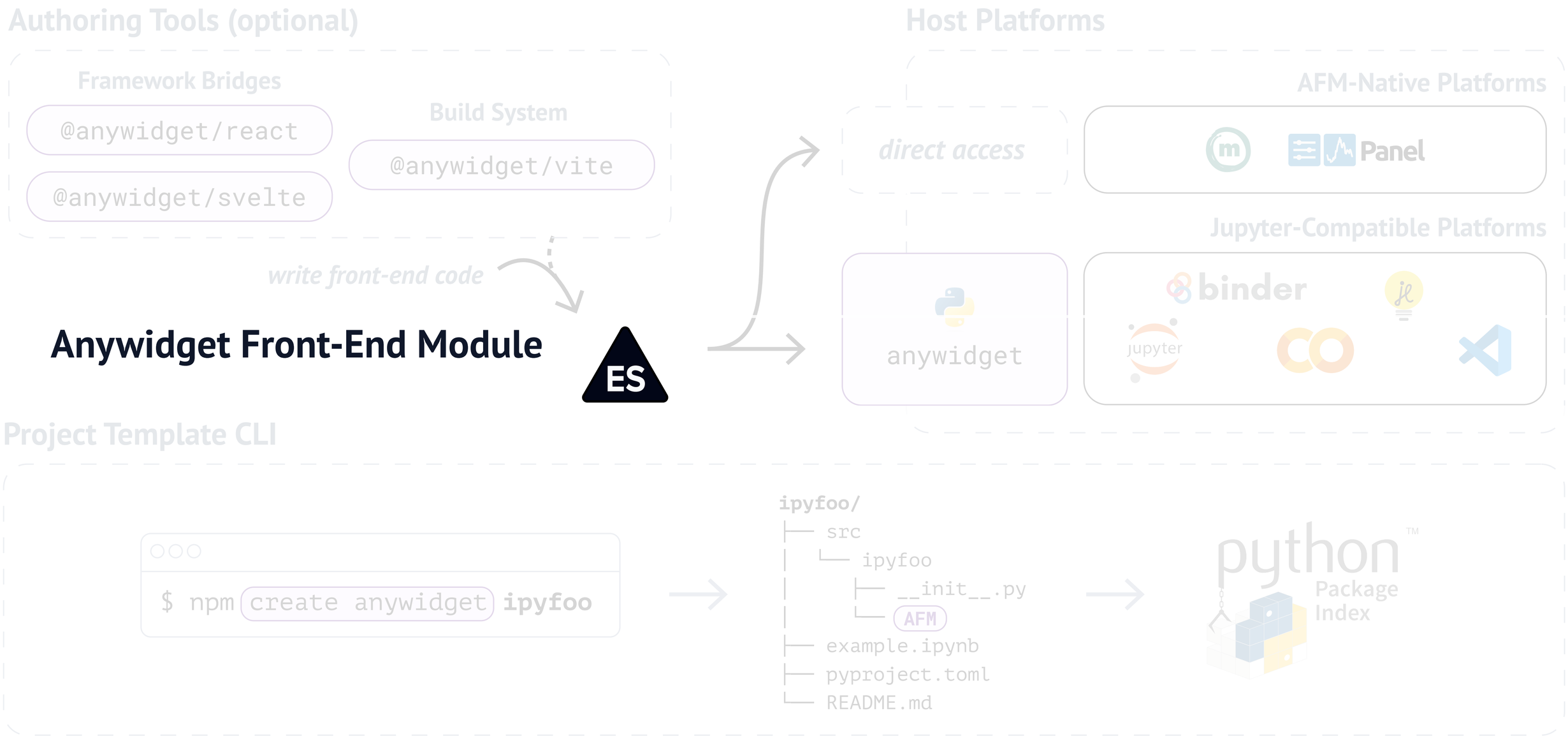
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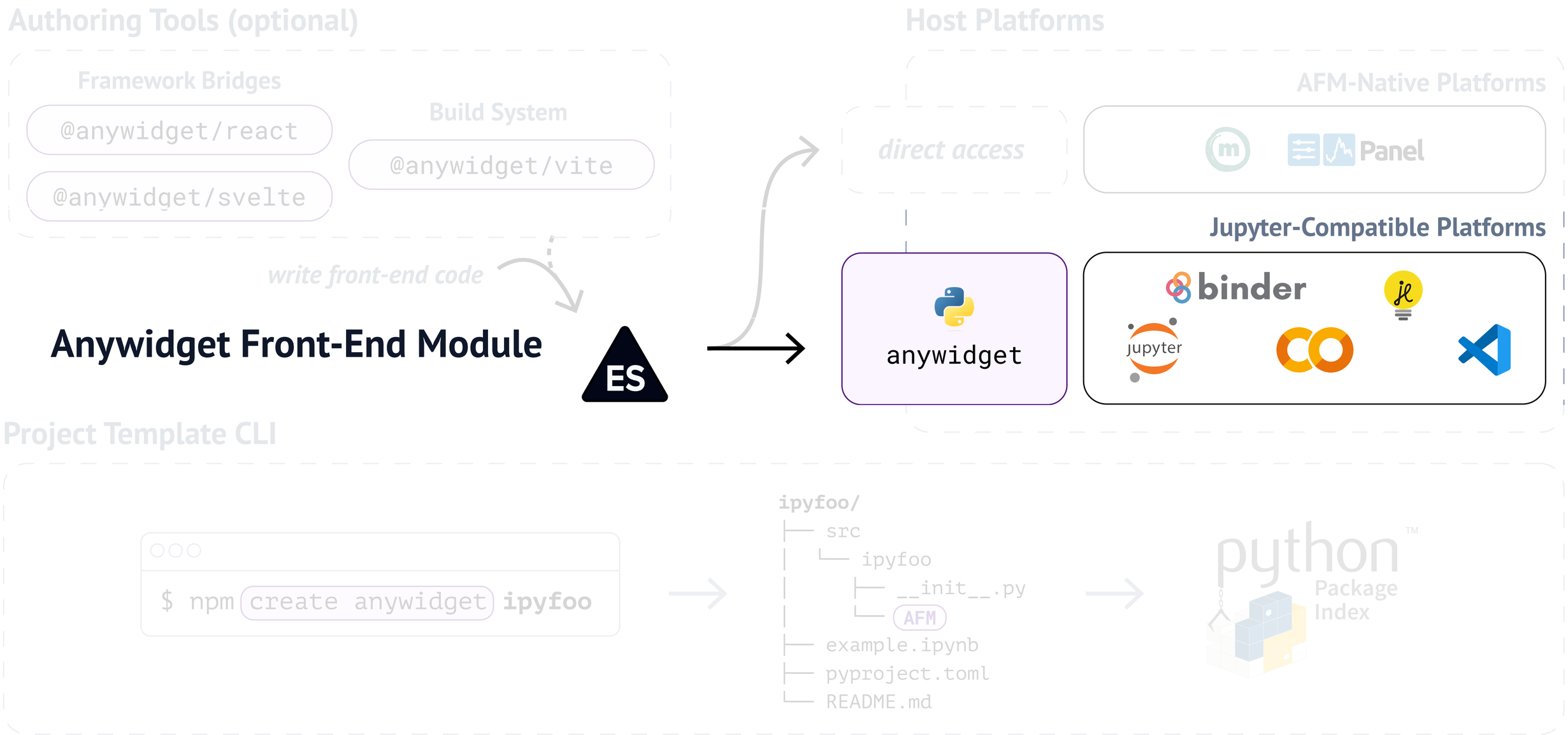
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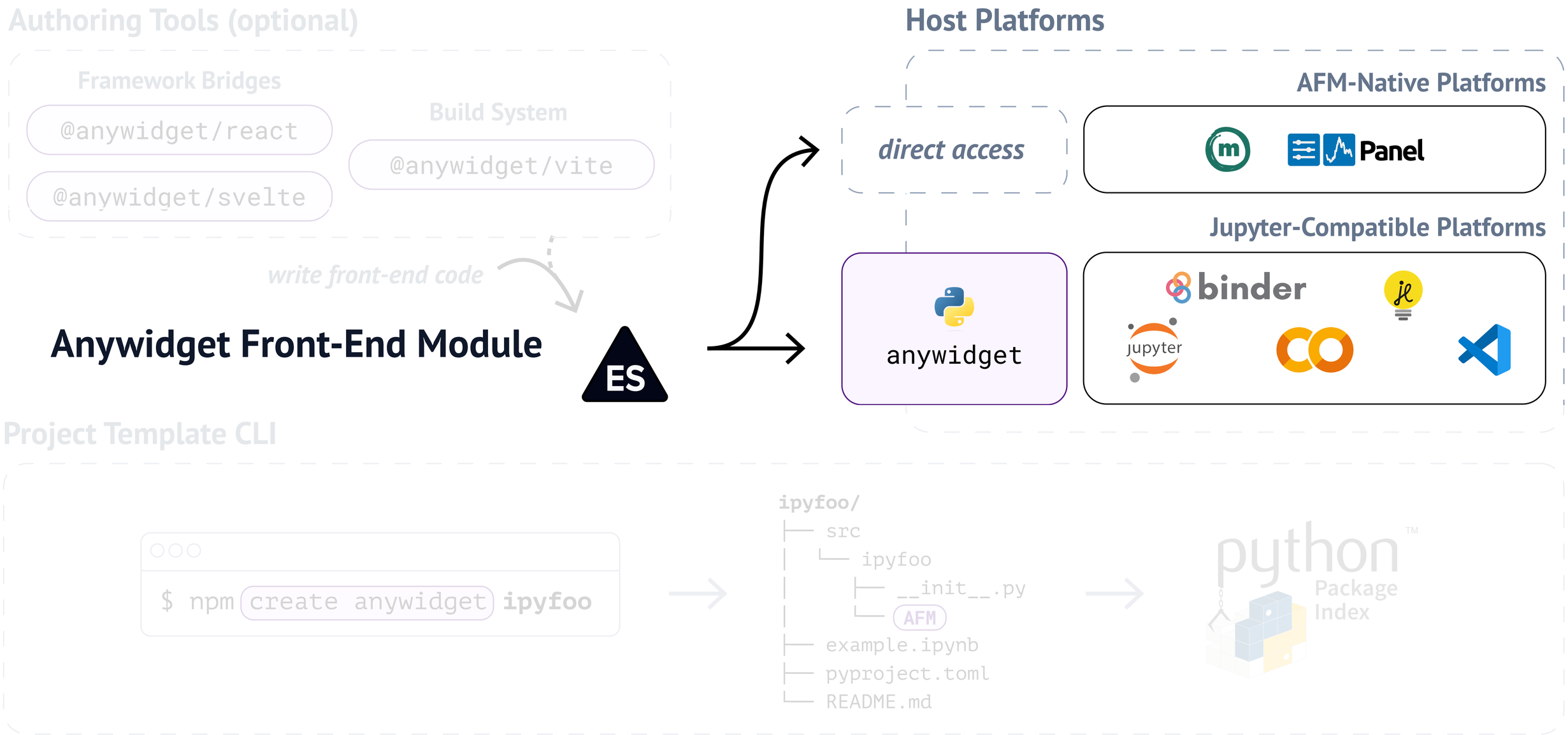
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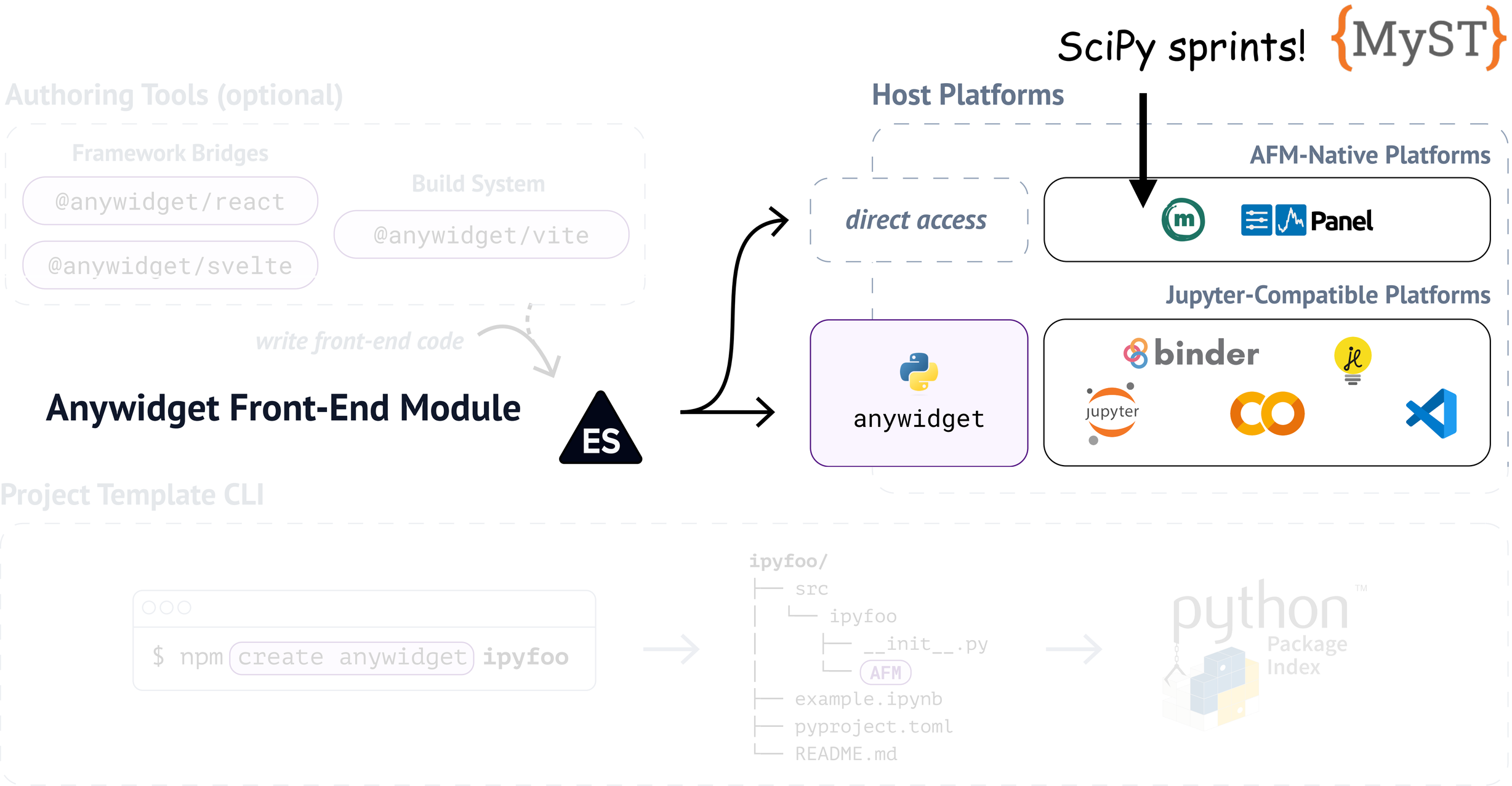
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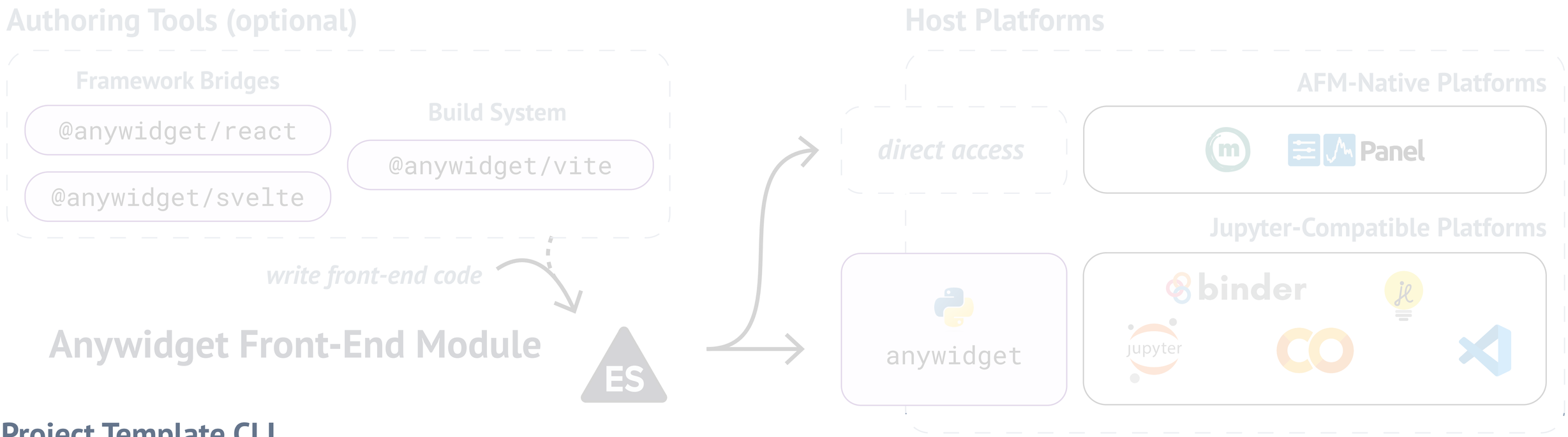

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Humans in **Data Integration** / **Visualization** / **Exploration**

Nezar Abdennur
Asst. Prof, UMass Medical School

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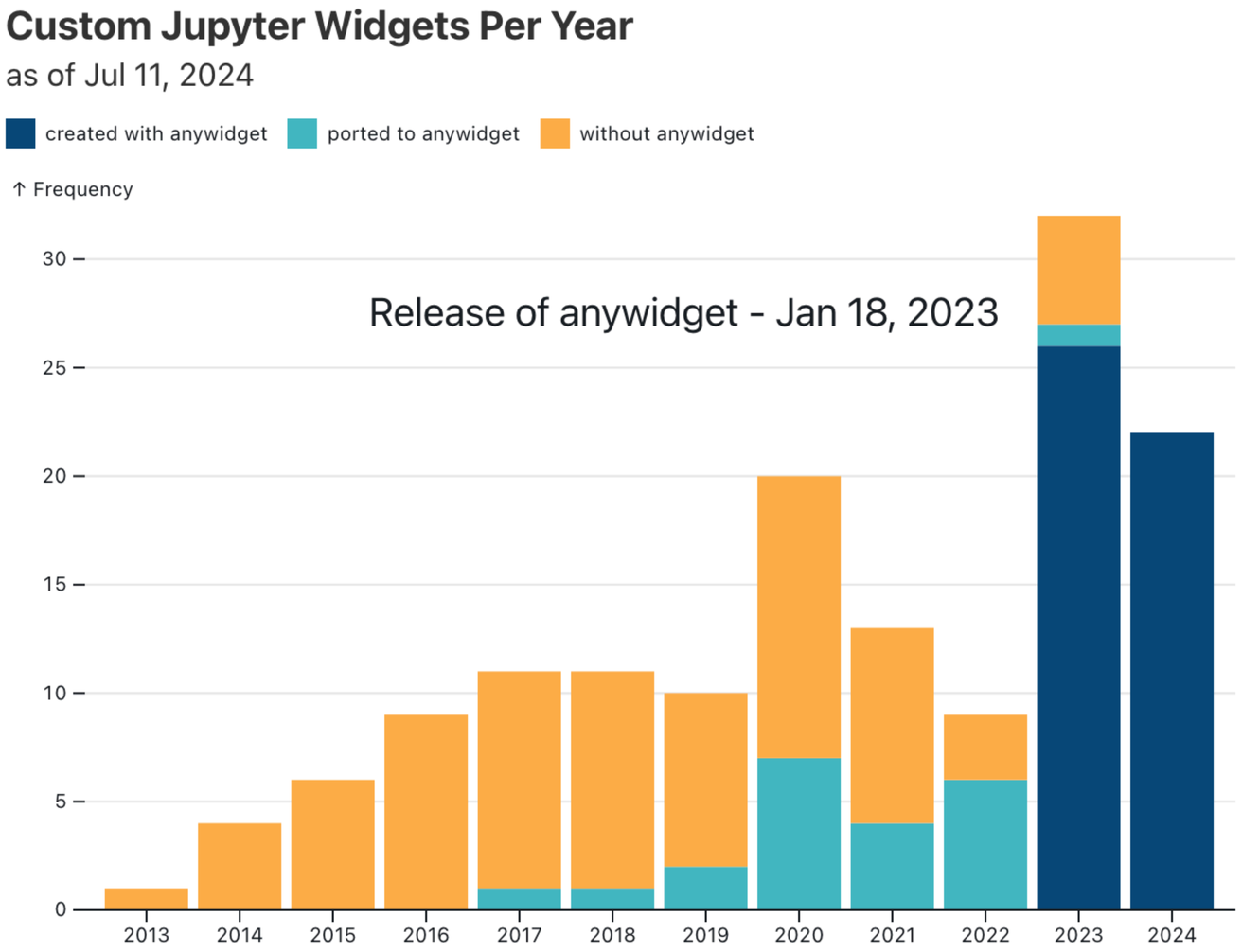
- Discord: https://discord.gg/W5h4vPMbDQ
- Gallery: https://anywidget.dev/en/community/

pip install anywidget



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