

Develop data-centric web apps in Jupyter with Voilà and VOIS

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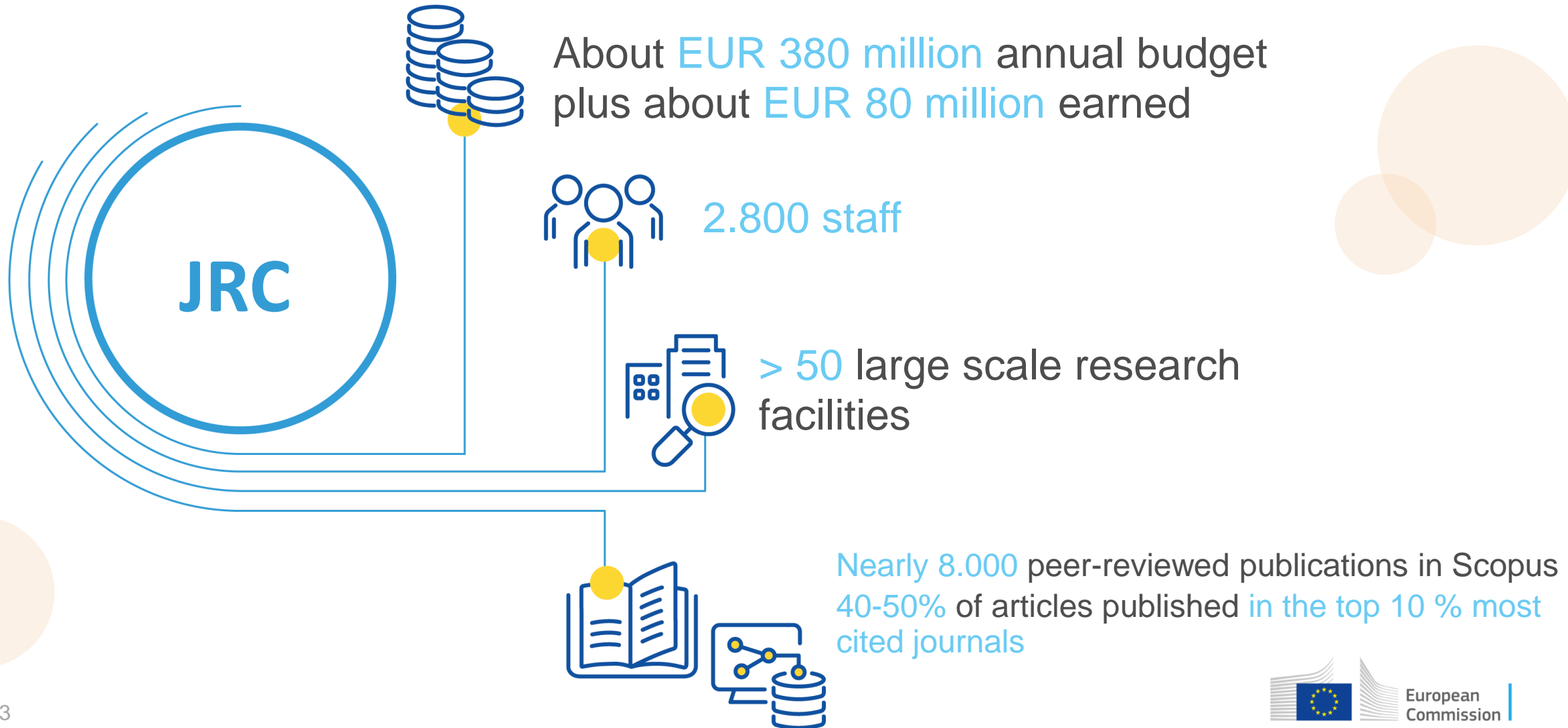
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Agenda

- Voilà in JRC BDAP
- Vois library
- Development
- Applications
- Live Demo
- Deployment in free and commercial cloud platforms

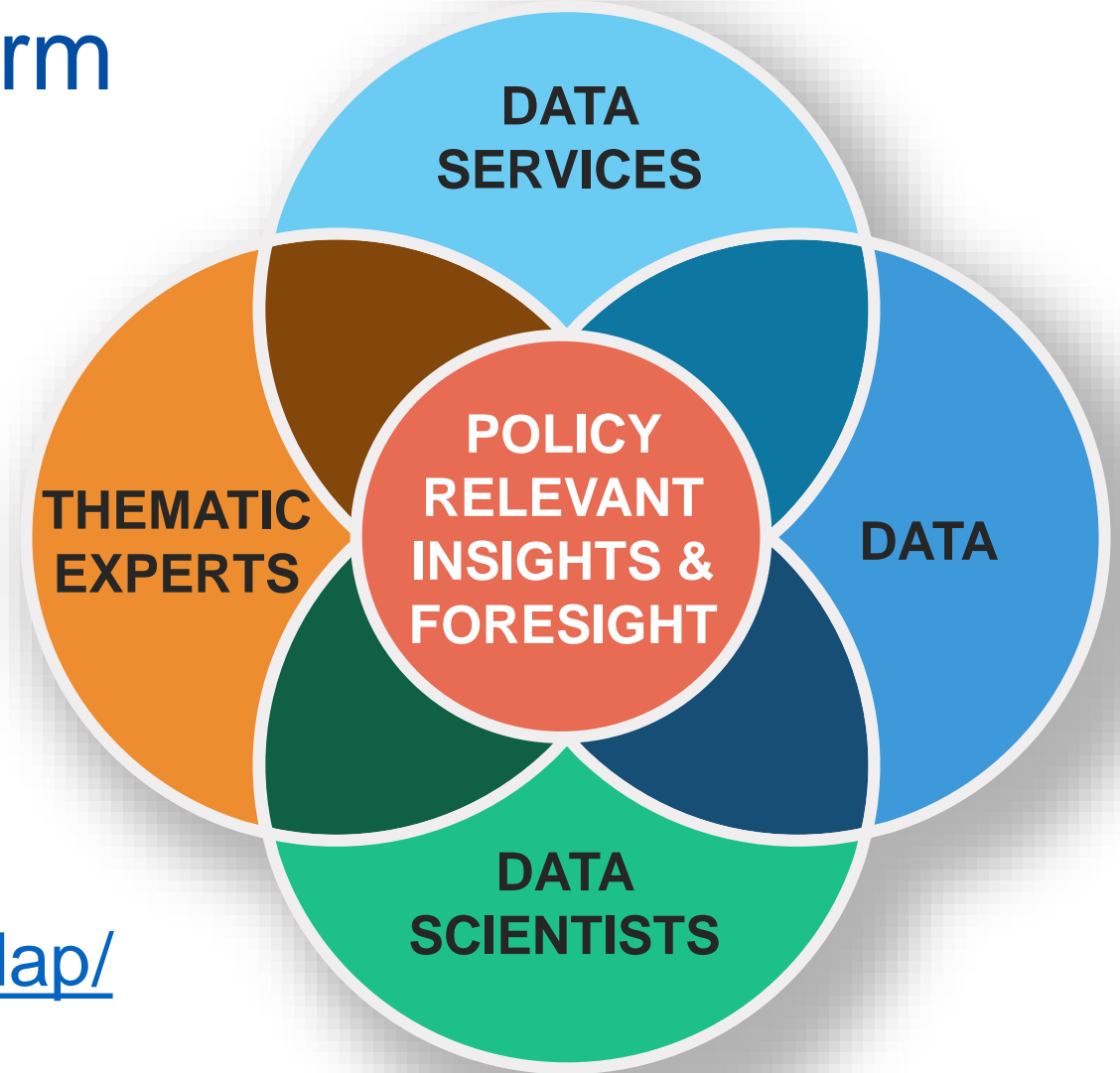
JRC – Facts and figures



Big Data Analytics Platform

The BDAP aims at linking data, data services, data scientists, and thematic experts to generate policy relevant insights and foresight

<https://jeodpp.jrc.ec.europa.eu/bdap/>



Voilà

voilà

- A Jupyter notebook extension to automatically create standalone data-centric applications and dashboards.
- Notebooks are rendered by showing only the output of the cells, while the code is hidden.
- Suitable for non-technical experts for communicating insights and foresight to a wider audience.
- Single environment for full data analytics workflows from research and innovation to outreach engaging policy makers and citizens.
- It is not a click&drag tool: programming capabilities are needed!

VOIS library



- **VOI**là Simplification library
- Its goal is to make life easier for the creation of impactful Voilà dashboards using Python
- Partially developed in the context of the CS3MESH4EOSC Horizon2020 project lead by CERN
- Published as open source on the <https://code.europa.eu> following European Commission Decision of 8 December 2021 on the open source licensing and reuse of Commission software 2021/C 495 I/01.
- Code: <https://code.europa.eu/jrc-bdap/vois>
- Documentation: <https://vois.readthedocs.io/>



Dependencies

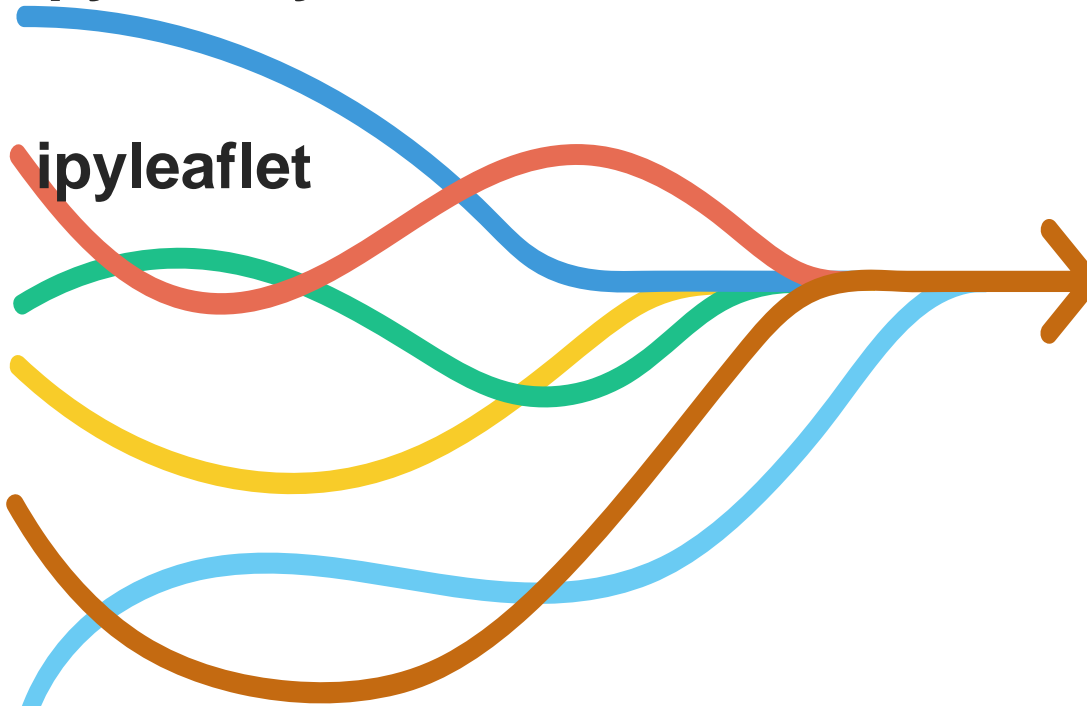
vuetifyjs  **ipyvuetify**

leafletjs  **ipyleaflet**

SVG 
CSS3 

ipyevents 

Plotly 



Vois objectives

- **Facilitate** full exploitation of ipyvuetify/vuetify.js components with less code
- **Consistent** usage of widgets variants/colours/themes
- Allows for **full screen** applications, possibly avoiding scrollbars
- Support multiple screen resolutions: **responsiveness**
- **Compound elements** created from groups of widgets
- **Layered** components: popup-menus, dialog-boxes, etc.
- **Multipage** applications (!)
- Advanced **geo-spatial** visualizations
- Custom interactive **charts** with SVG drawings and events management
- **Cloud ↔ local system** data exchange

Easy start web application development

Vois helps developer in the creation of the application framework, for instance providing a multipage web-app with few lines of code:

```
from vois.vuetify import mainPage
import geoPage, textPage, resources

def onclickGeographicSearch():
    p = geoPage.geoPage(output)
    card = p.create(debug=False)
    p.open()

def onclickTextSearch():
    p = textPage.textPage(output)
    card = p.create(debug=False)
    p.open()

m = mainPage.mainPage(title='EMBAL validator',
                      subtitle='European Monitoring of Biodiversity in Agricultural Landscapes',
                      credits="D.5 Food security - T.4 Data Governance And Services",
                      applogo_url=resources.logoEMBAL,
                      applogo_widthpercent=7,
                      titlebox_toppercent=10, titlebox_widthpercent=46,
                      vois_show=False, vois_opacity=0.1,
                      buttonbox_toppercent=46, button_widthpercent=23,
                      background_image='https://JRC/EMBAL/Background1.jpg',
                      creditbox_toppercent=76, creditbox_opacity=0,
                      text_color='#222222')

m.addButton('Geographic search',
            subtitle='Search EMBAL plots from a overall EU map',
            tooltip='',
            image=resources.getLocalImageURL('./Graphics/geo.png'),
            onclick=onclickGeographicSearch)
```

Multipage web-apps

EMBAL validator

European Monitoring of Biodiversity in Agricultural Landscapes



Geographic search

Search EMBAL plots from a overall EU map



Textual search

Search EMBAL plots by country and textual description



Check and validate plots

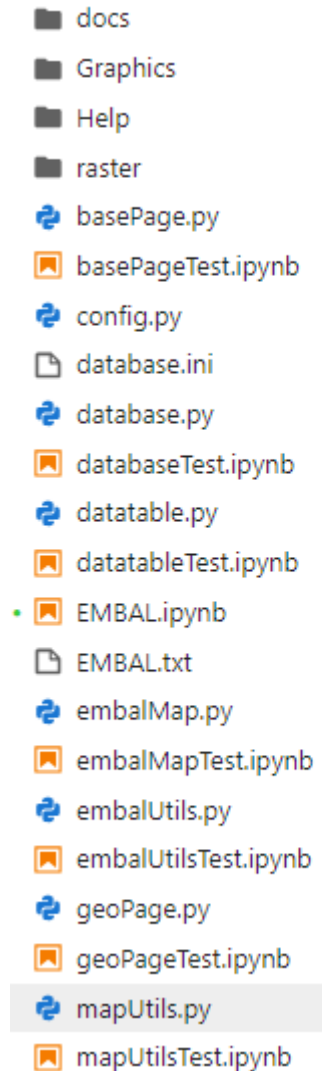
Validate EMBAL plot data by inserting annotations and comments



Development

Jupyter is not a classical framework for software development, but with some tricks, it can become a productive development environment. Here some tips:

1. Modular development (divide code in self-contained modules)
2. Object-oriented programming
3. Less code possible in the main .ipynb file
4. Create a test notebook for each module/class
5. Document modules content and relationships in a formal way (UML, etc.)



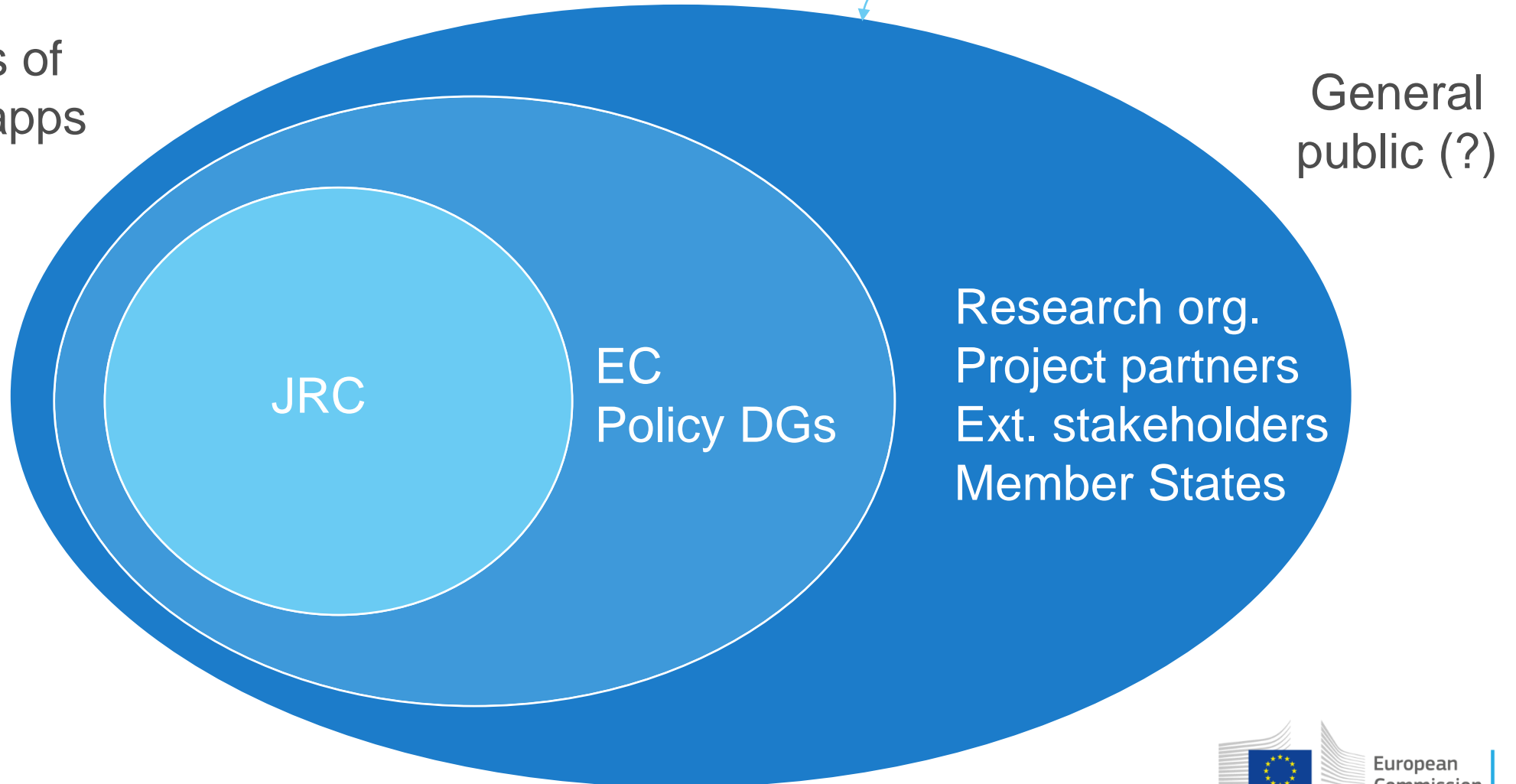
Application types

- All are solutions based on data (data-centric apps)
- Many use geospatial datasets or data that is linked to a location
- Tools to ease the discovery and usage of complex datasets or to link/merge multi-media datasets
- Communication of project and research results to (non-expert) hierarchy
- Dashboards to let readers of a scientific paper experiment with the data, replicate the results, test the derived products
- Demo applications for promoting projects, ideas, engage stakeholders
- Open data, open access → Open applications

Application targets



The users of our web-apps are:



Live demos

- JRC:
 - ❖ Pubsy mining (smart AI search on all JRC publications)
 - ❖ Collections Explorer (browse the STAC collections catalogue and GIS overlay of datasets)
- EC Policy DGs
 - ❖ LUCAS (Eurostat: Land use and land cover across the European Union)
 - ❖ EMBAL (DG-Agri - European Monitoring of Biodiversity in Agricultural Landscapes)
- External partners
 - ❖ SHERPA (Screening for high emission reduction potential on air)
 - ❖ FAIRMODE (Forum for Air quality Modeling)

Fully public Voilà web apps: Huggingface Spaces

Tested <https://huggingface.co/spaces> for free Voilà dashboard deploy

The screenshot shows the Hugging Face Spaces interface for a repository named 'voila' by user 'DavideDeMarchi'. The repository is currently 'Running' and has 0 likes. The interface includes a search bar, navigation links (Models, Datasets, Spaces, Posts, Docs, Solutions, Pricing), and a file list with commit history.

File/Folder	Size	Commit Message	Time Ago
Upload TestRasterAPI.ipynb	c5077b1		5 months ago
.github		Duplicate from giswqs/voila-geospatial	9 months ago
notebooks		Upload TestRasterAPI.ipynb	5 months ago
.gitattributes	1.56 kB	Upload 17 files	9 months ago
.gitignore	1.81 kB	Duplicate from giswqs/voila-geospatial	9 months ago
Dockerfile	685 Bytes	Update Dockerfile	6 months ago
README.md	477 Bytes	Updates	9 months ago
requirements.txt	56 Bytes	Update requirements.txt	5 months ago
run.sh	217 Bytes	Update run.sh	5 months ago

Fully public Voilà web apps: Ploomber Cloud

Applications / Create

Overview

Choose the project where the application will be deployed

Select project










Create new project

Set project name

Set labels

Framework

The framework used by your application

 Voilà	 Docker	 Panel
 Solara	 Streamlit	 Shiny (R)
 Dash		

Other (free) deployments

Voici is a tool for generating static dashboards from Jupyter Notebooks. It can be used as a drop-in replacement for [Voilà](#) and it has the same commands and supports most of Voila's configuration options.

Voici uses [WebAssembly](#) (Wasm) kernels to render notebooks in the browser, making the resulting dashboard entirely self-contained and distributable.

<https://github.com/voila-dashboards/voici>

A static dashboard created with Voici can be deployed, for instance, in [Gitlab Pages](#)

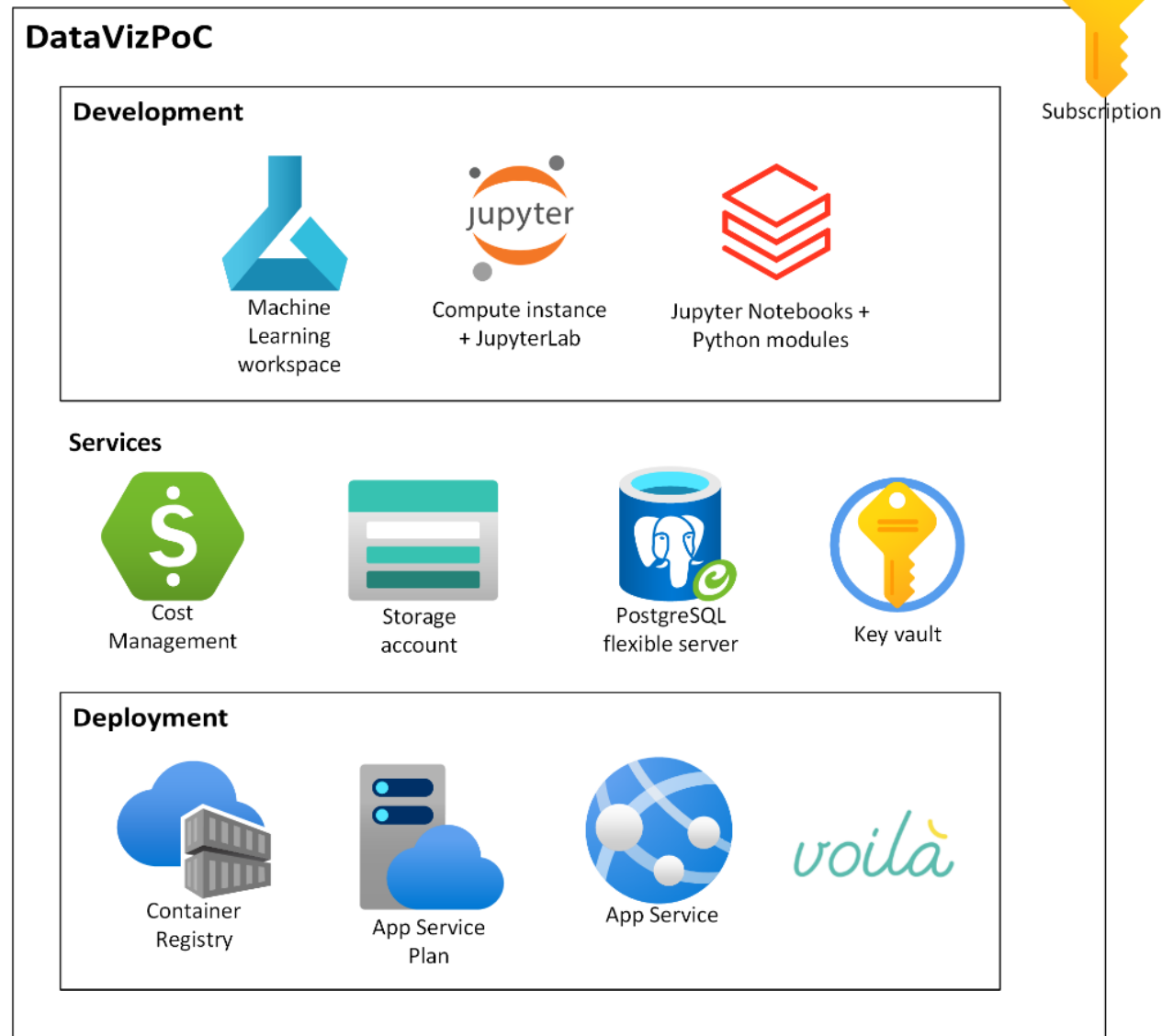
MS Azure DataViz PoC

JRC started a Proof of Concept (feasibility study) with [Avanade](#) to test the creation of Voilà web applications in the Azure Cloud platform:

- Access to data
- Open to the public

An excellent tutorial:

<https://medium.com/microsoftazure/from-jupyter-notebook-to-azure-web-app-in-5-easy-steps-2783f8fd847d>



Takeaway

- Voilà demonstrates its versatility in both allowing for quick&dirty notebook conversion and in the creation of fully fledged data-centric web applications
- It is a powerful visualization and communication tool that is deeply nested into the Jupyter data science environment (needs programming skills!)
- VOIS library is used inside the JRC BDAP Cloud Platform to communicate scientific results to a wider audience and to allow for easy interaction with complex datasets (open source from <https://code.europa.eu/jrc-bdap/vois>)
- Voilà and vois library can be used in many commercial cloud environments even with free accounts
- We see a near future where an Hybrid Cloud infrastructure can provide Voilà development, deploy and data access services through APIs

EU Solidarity with Ukraine

The EU stands united with Ukraine



Thank you!



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