Using OpenAPI for IVOA standards

Lessons learned

Dave Morris
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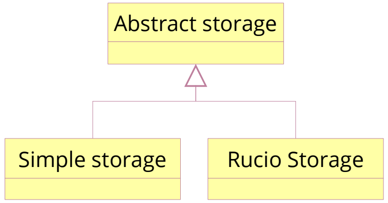
Abstract storage

Simple storage

Rucio Storage

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November 2025

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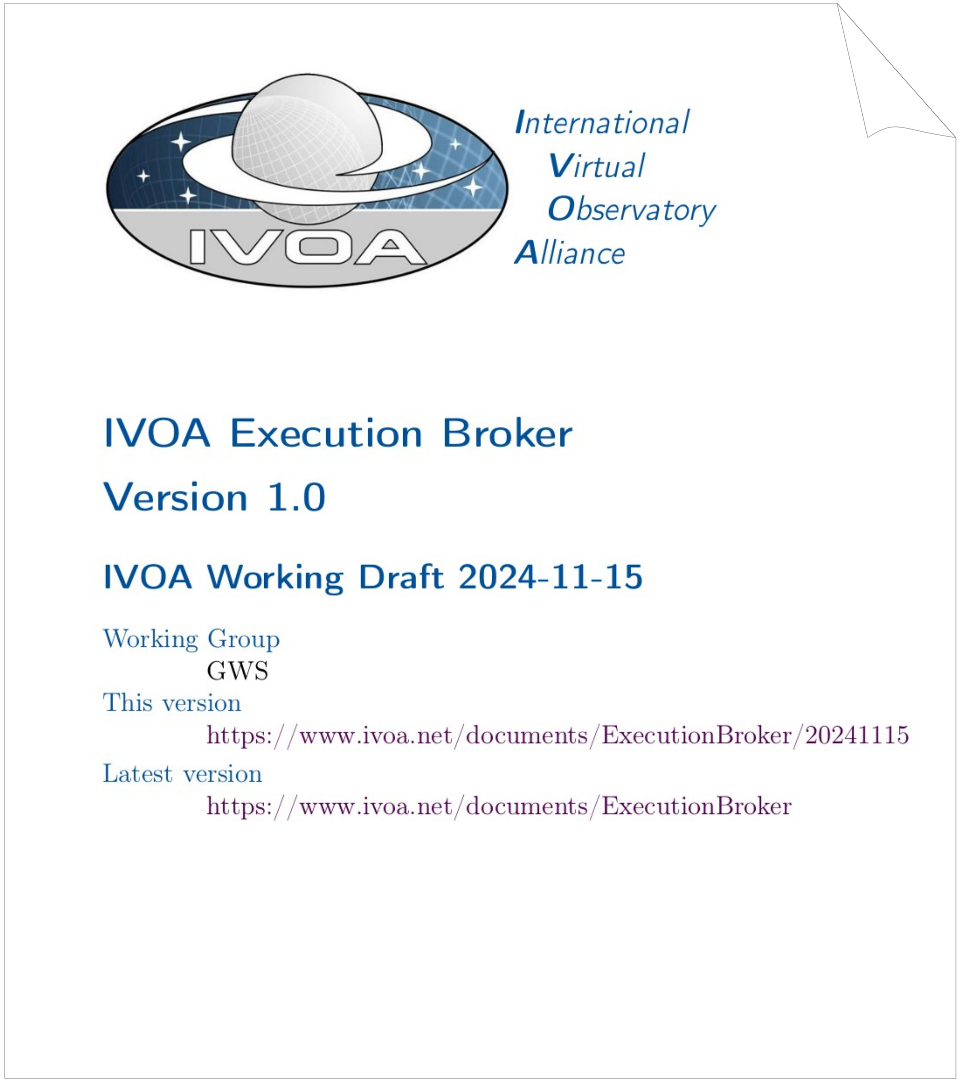
GWS working group

Developing a new standard for remote execution of software.

Moving the code to the data.



International Virtual Observatory Alliance

IVOA Execution Broker
Version 1.0

IVOA Working Draft 2024-11-15

Working Group
GWS
This version
https://www.ivoa.net/documents/ExecutionBroker/20241115
Latest version
https://www.ivoa.net/documents/ExecutionBroker

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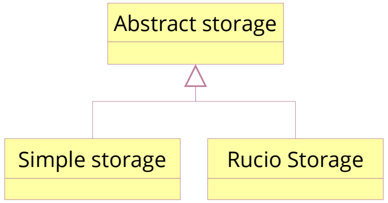
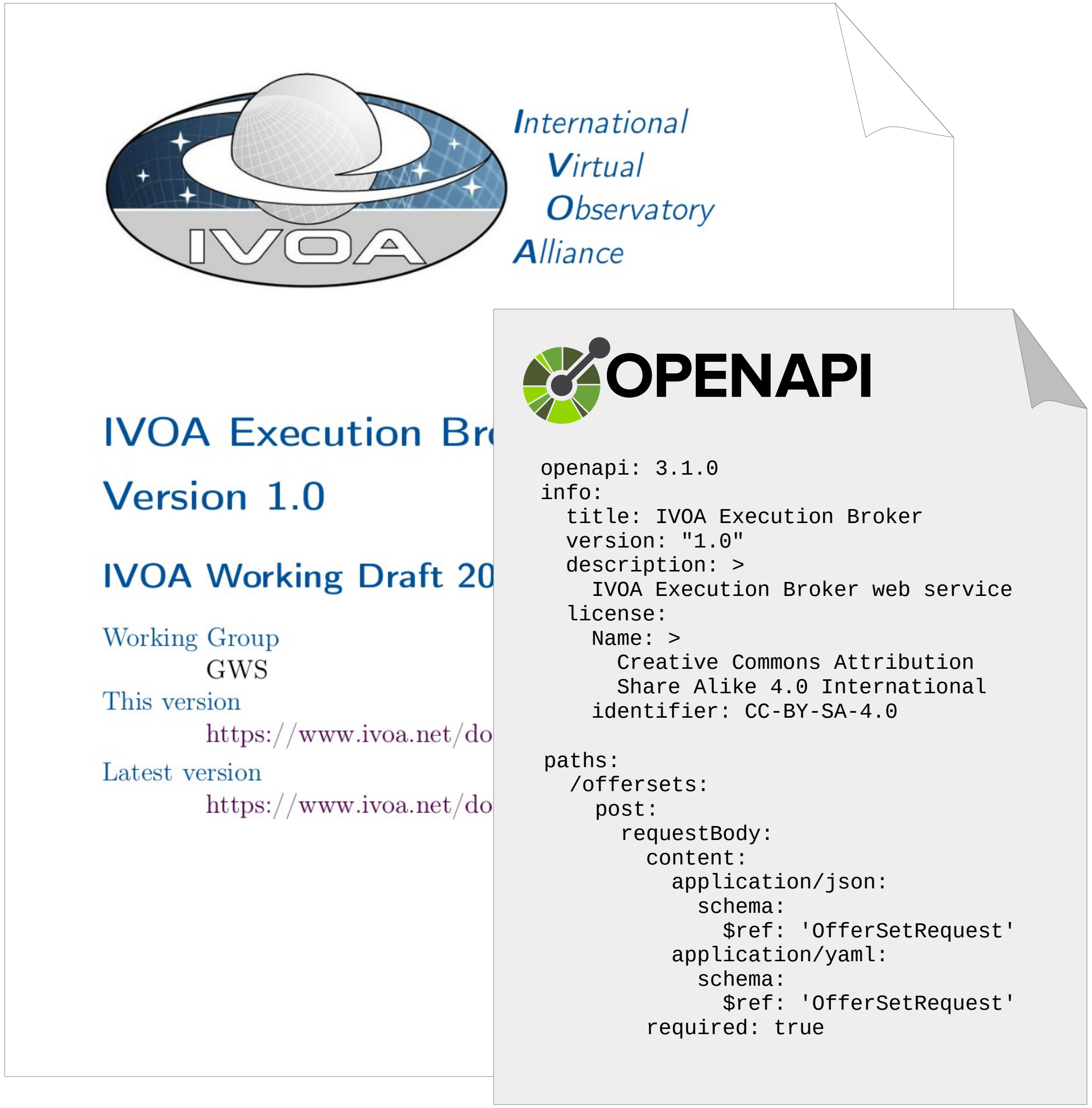
New standard, new document structure.

“This document explains the reasoning behind the design and uses examples to describe the service behavior.”

“The technical details of the data model and web-service API are defined in the OpenAPI specification published alongside this document.”

OPENAPI





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Version 1.0

IVOA Working Draft 20

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GWS

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https://www.ivoa.net/do

Latest version
https://www.ivoa.net/do

OPENAPI

```
openapi: 3.1.0
info:
  title: IVOA Execution Broker
  version: "1.0"
  description: >
    IVOA Execution Broker web service
  license:
    Name: >
      Creative Commons Attribution
      Share Alike 4.0 International
    identifier: CC-BY-SA-4.0

paths:
  /offersets:
    post:
      requestBody:
        content:
          application/json:
            schema:
              $ref: 'OfferSetRequest'
          application/yaml:
            schema:
              $ref: 'OfferSetRequest'
        required: true
```

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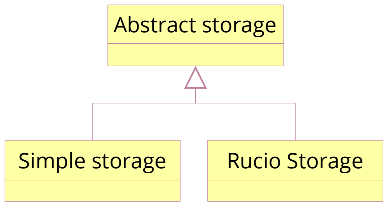
IVOA

Using OpenAPI to specify the data model and web service API.

OPENAPI



What worked

What didn’t work

Would I use it again

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What worked

Using OpenAPI to describe the data model and service API

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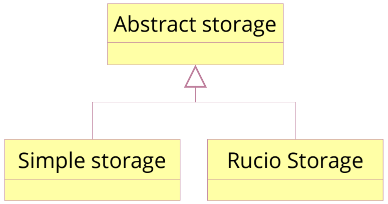


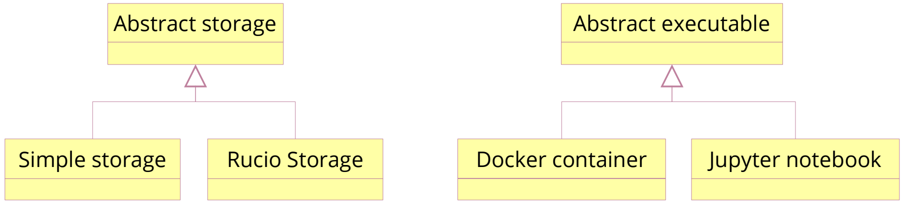
- Shallow learning curve
- Good documentation

- Clear and easy syntax
- Good feature coverage

What worked

Generating Java service code from the OpenAPI specification

Including support for polymorphic types in the message content.



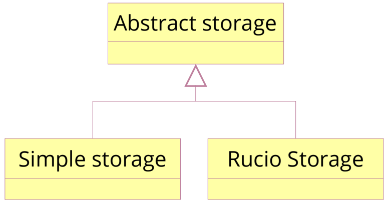
What ~~didn’t work~~ works

Generating Python service code from the OpenAPI specification

Including support for polymorphic types in the message content.

OPENAPI → FastAPI

python™ ✓



`Content-type:`

`Accept:`

Improvements to the code generators in 2025 mean this is no longer an issue

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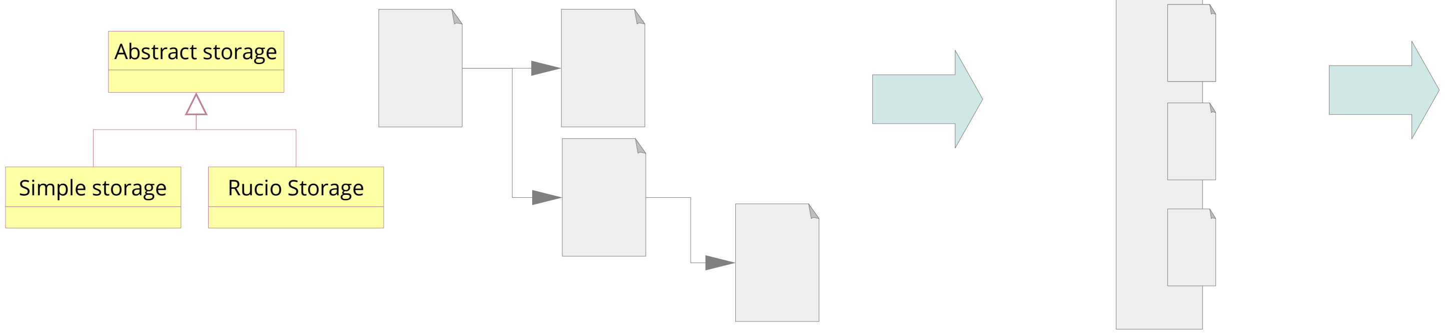
What ~~didn’t work~~ works

Splitting the OpenAPI specification into separate files.

Solved using a pre-processing tool to resolve $ref links



Pre-processor resolves $ref links and puts everything into one large file
https://github.com/ivoa/Calycopis-Isobeon

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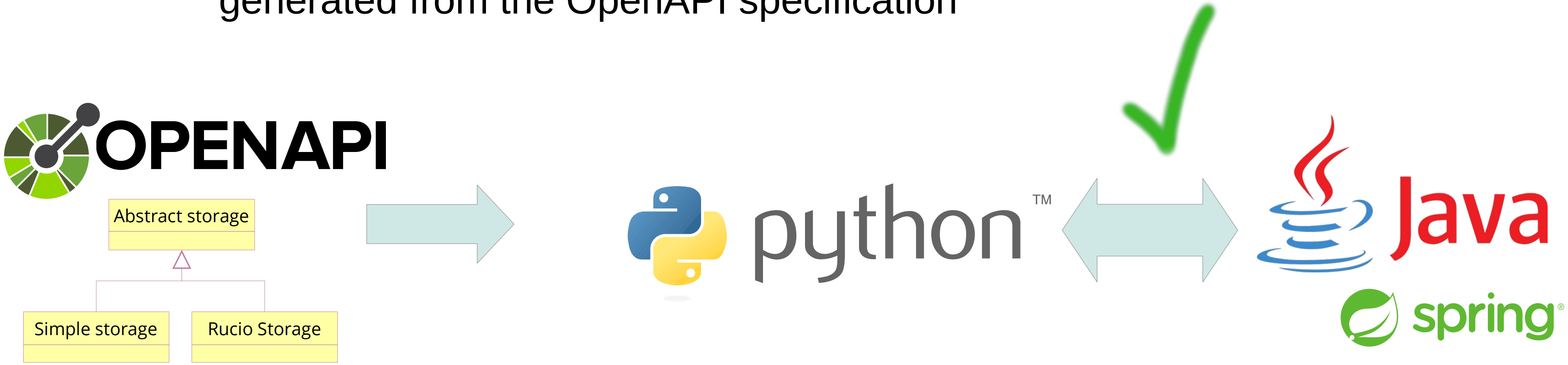
What works

Interoperable Python client and Java server
generated from the OpenAPI specification



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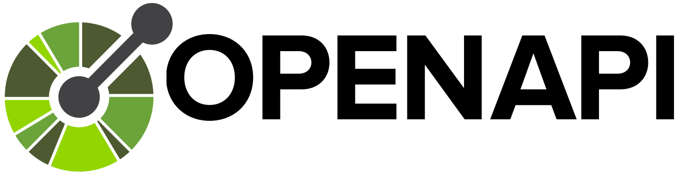
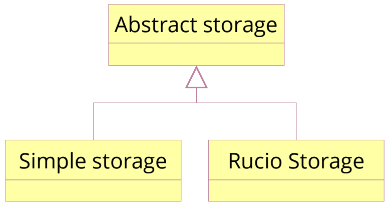
Would I use it again ? YES ✓

Using a structured schema to define the service API is a huge benefit.

Writing clear and precise technical specifications in text is hard.





✓

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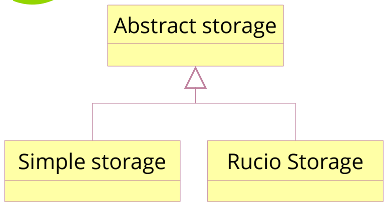
CANFAR Skaha client

Science platform with Python client for astronomers

Already using curl to interact with the service
so creating an OpenAPI spec was easy

```
curl http:… \
   | jq ‘.’
```

Interoperable Java client generated
from an ad-hoc OpenAPI specification



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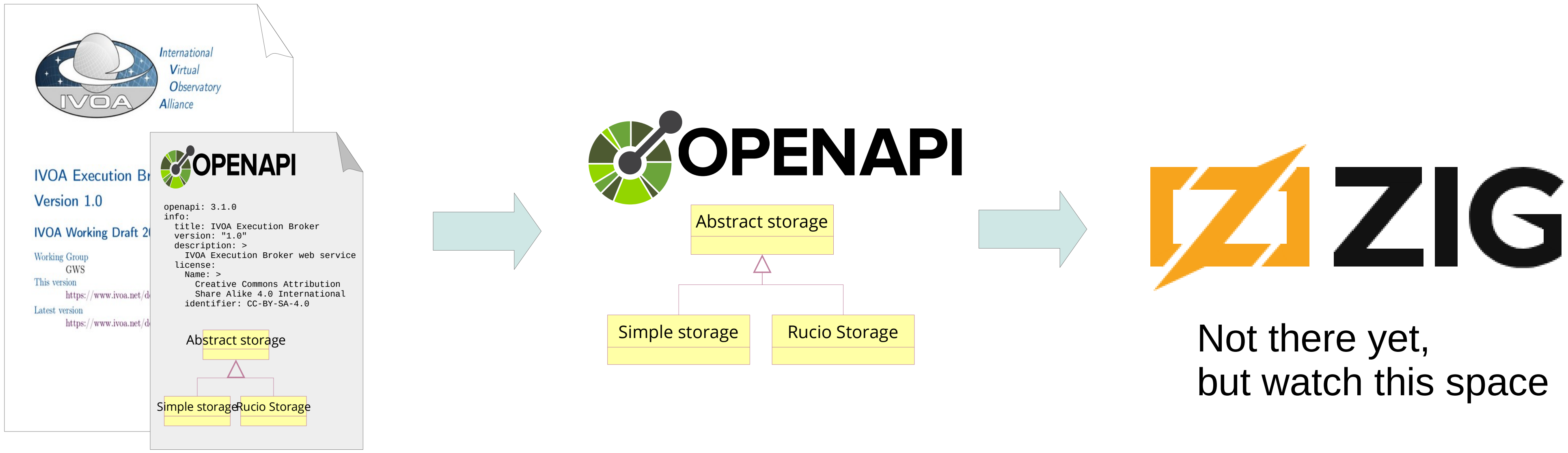
TAP client in Zig

Astronomer working in a new language,
asking about support for IVOA tools.

Unknown language …. but there is an OpenAPI code generator



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  version: "1.0"
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    Name: >
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```

Not there yet,
but watch this space

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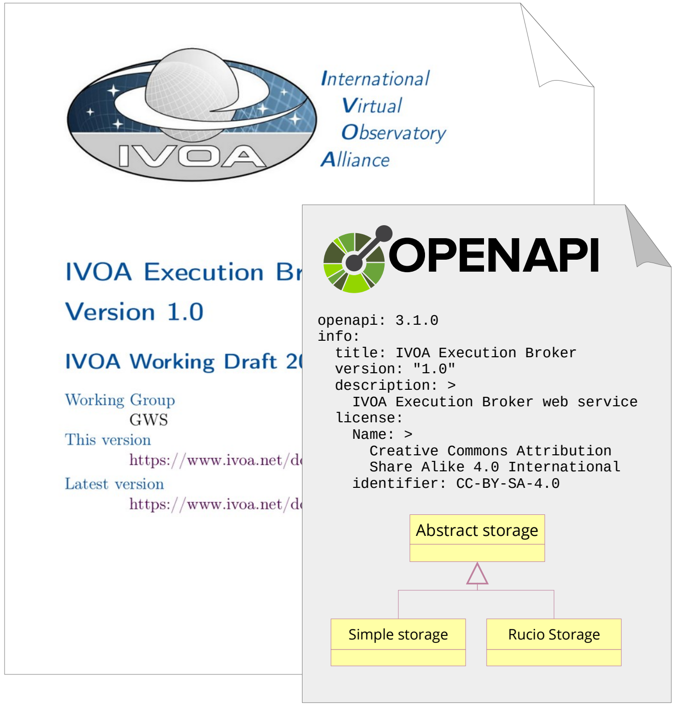
Where next ?

Automatically generate and publish libraries



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IVOA Working Draft 2

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```

Abstract storage

Simple storage

Rucio Storage

GitHub

Automatic CI workflow triggered on commit

Same process as the preview PDFs

Java

spring

Maven™

python™

FastAPI

python™ Package Index

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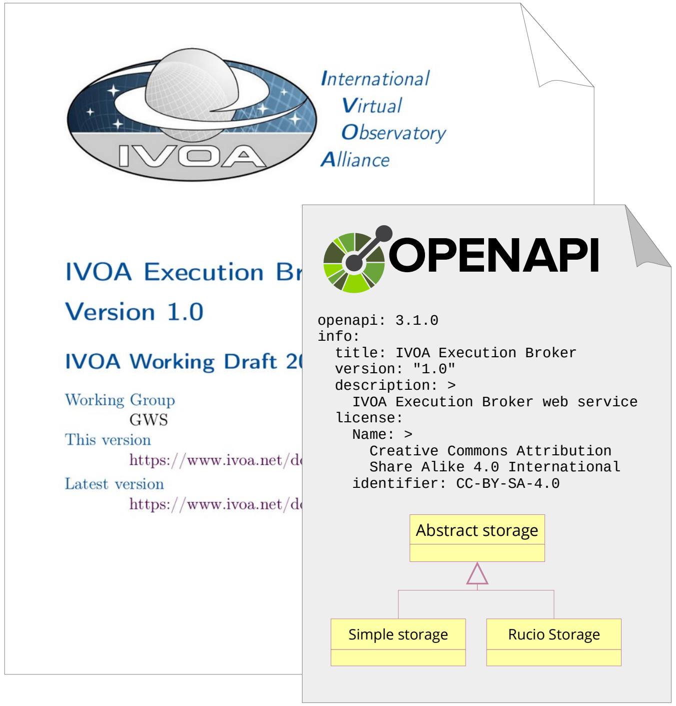
What do we need ?

Permanent URLs to link schema components



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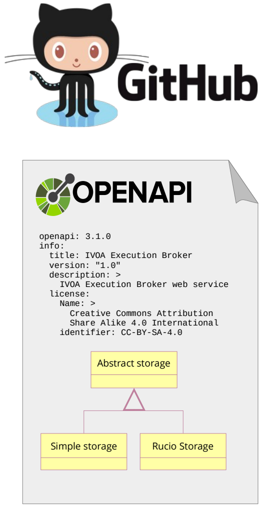
    identifier: CC-BY-SA-4.0
```

www.purl.org works, but is a bit flakey

https://www.purl.org/ivoa.net/EB/schema/



GitHub
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```

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Add IVOA to w3id ?

https://w3id.org/ivoa/

Setup our own ?

https://purl.ivoa.net/

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