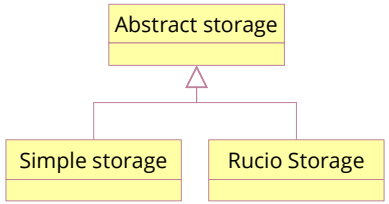
Using OpenAPI for IVOA standards

Lessons learned



Dave Morris
Manchester
University

Astro-CC meeting
Trieste,
October 2025

Dave Morris
dave.morris@manchester.ac.uk

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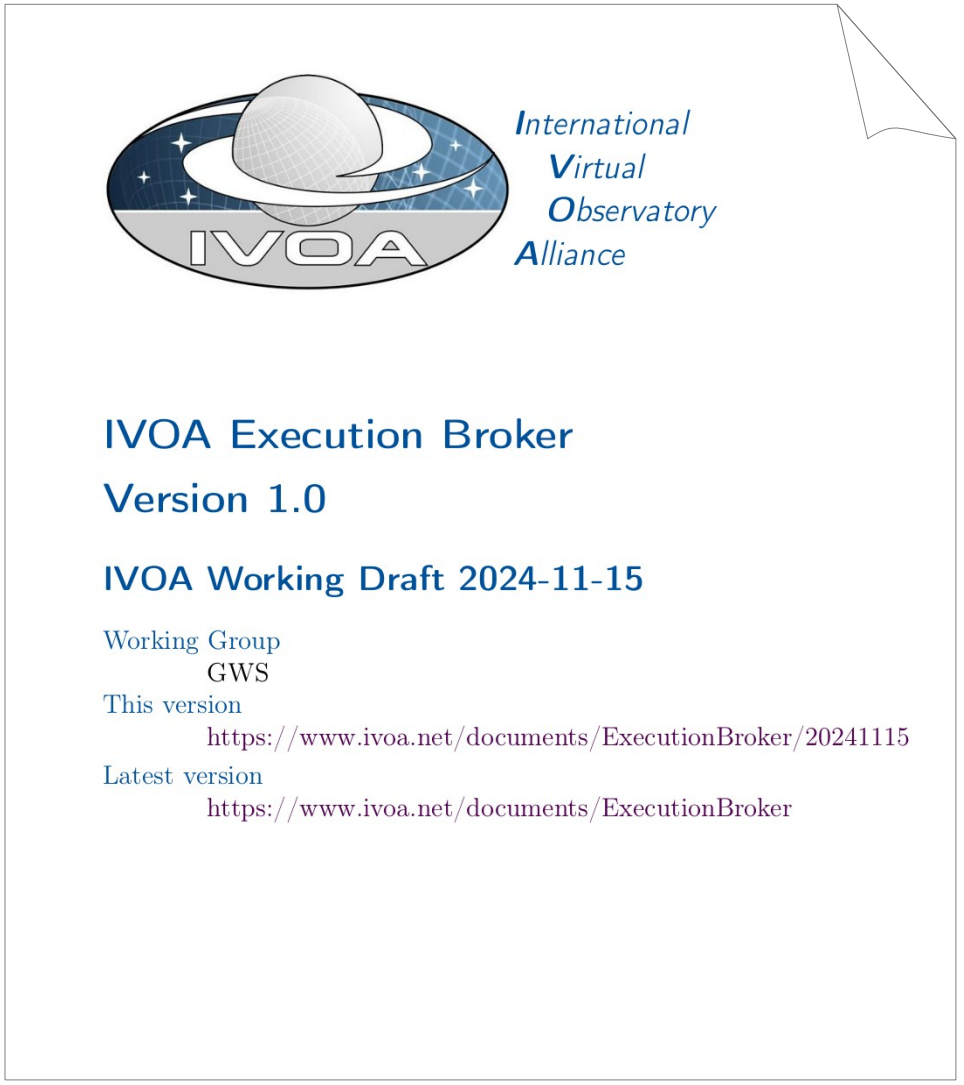
GWS working group

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

Dave Morris
dave.morris@manchester.ac.uk

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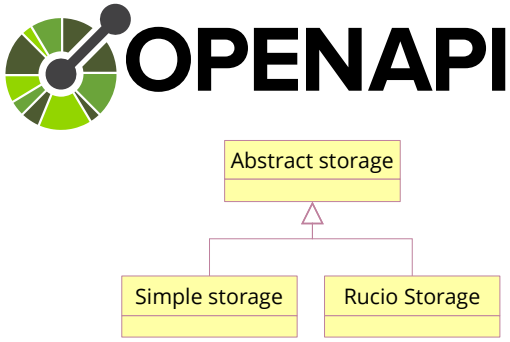
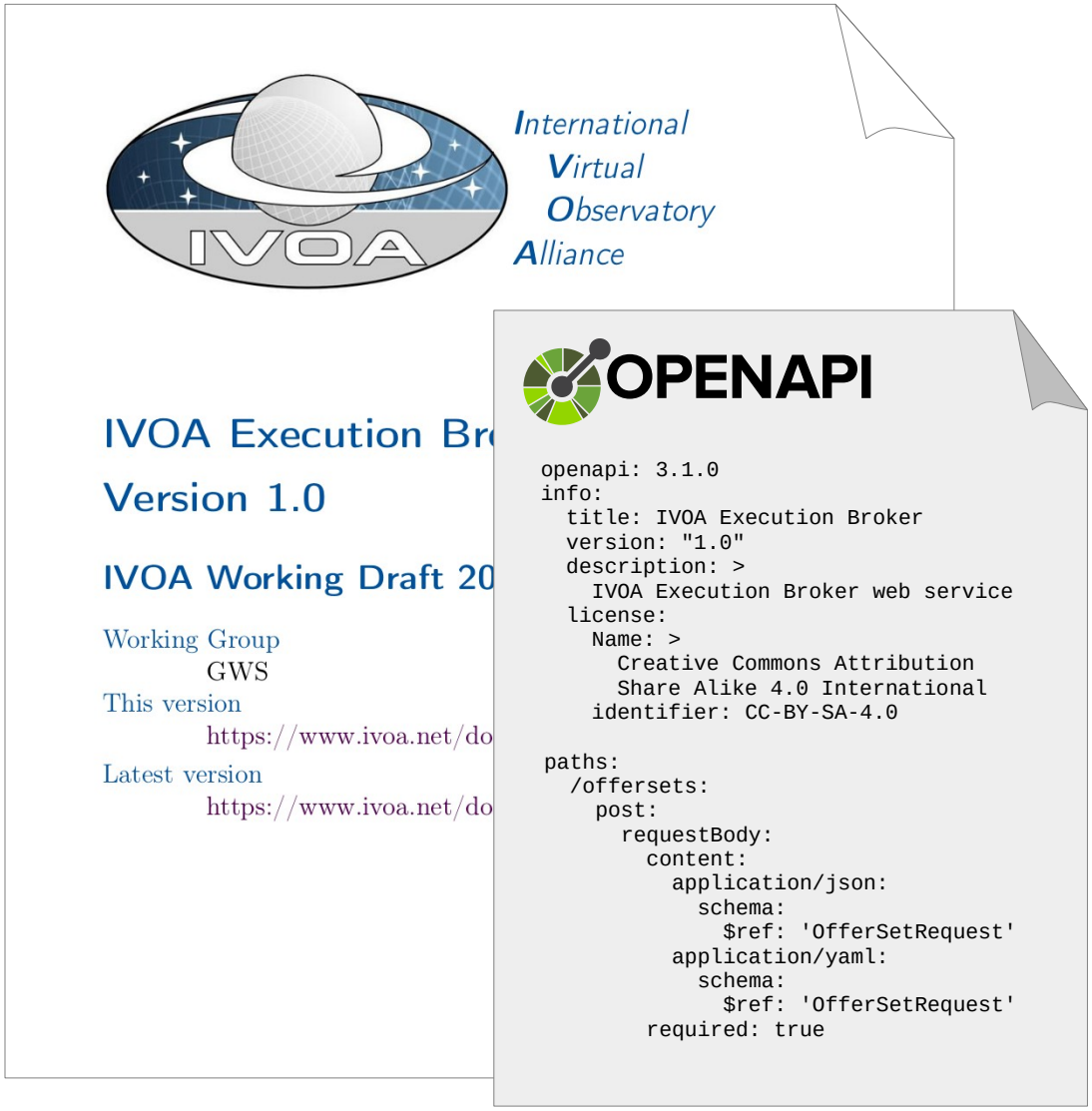
New standard, new document structure.

“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.”





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dave.morris@manchester.ac.uk

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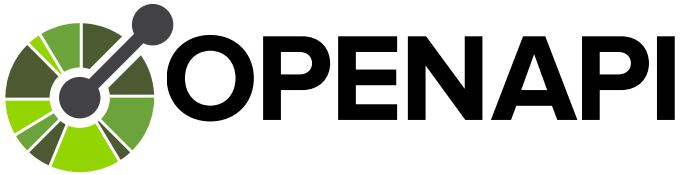
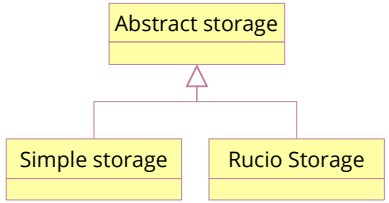
Using OpenAPI to specify the data model and web service API.





What worked

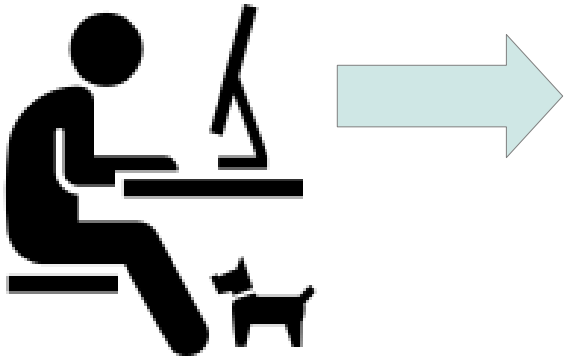
What didn’t work

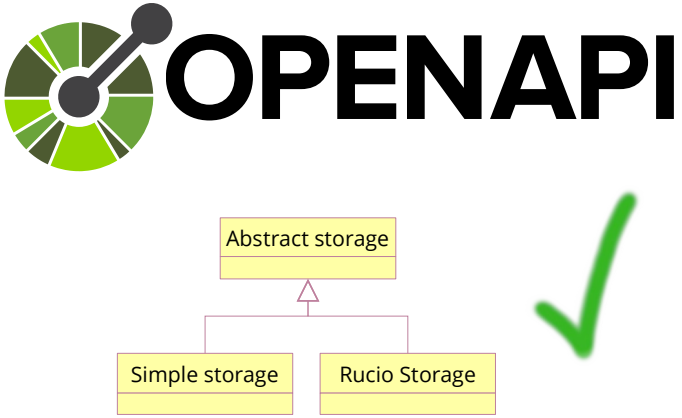
Would I use it again

Dave Morris
dave.morris@manchester.ac.uk

What worked

Using OpenAPI to describe the data model and service API





- Shallow learning curve
- Good documentation

- Clear and easy syntax
- Good feature coverage

Dave Morris
dave.morris@manchester.ac.uk

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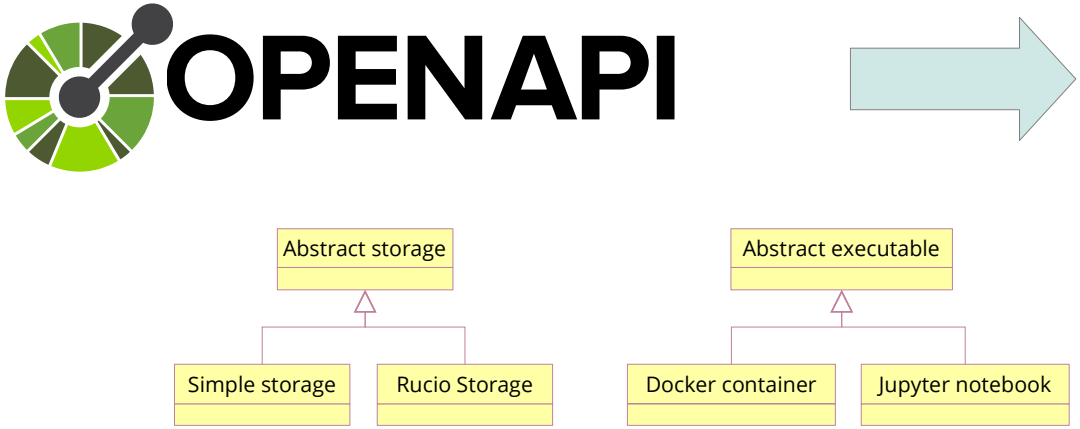
What worked

Generating Java service code from the OpenAPI specification

Including support for polymorphic types in the message content.



Dave Morris
dave.morris@manchester.ac.uk

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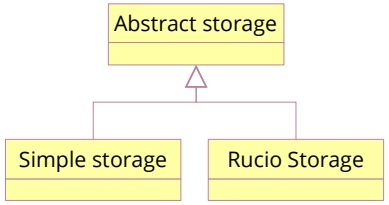
What ~~didn't work~~ works

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

(*) Generated Python code supports JSON only, YAML and XML are not supported

Dave Morris
dave.morris@manchester.ac.uk

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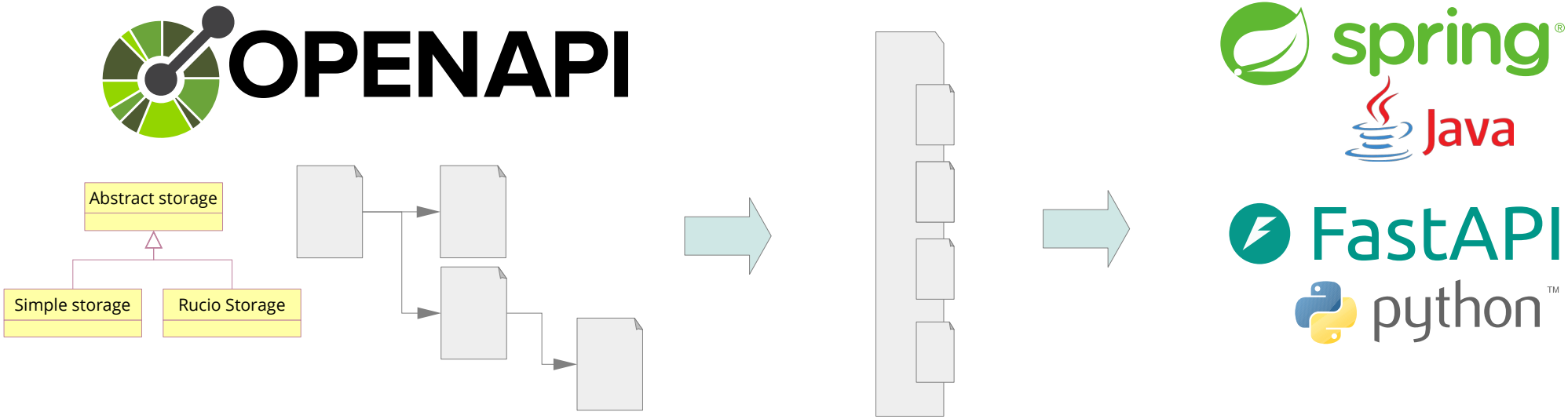
What ~~didn't work~~ works

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 YAML file

https://github.com/ivoa/Calycopis-Isobeon

Dave Morris
dave.morris@manchester.ac.uk

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What works

Interoperable Python client and Java server
generated from the OpenAPI specification

(*) Generated Python code supports JSON only, YAML and XML are not supported

Dave Morris
dave.morris@manchester.ac.uk

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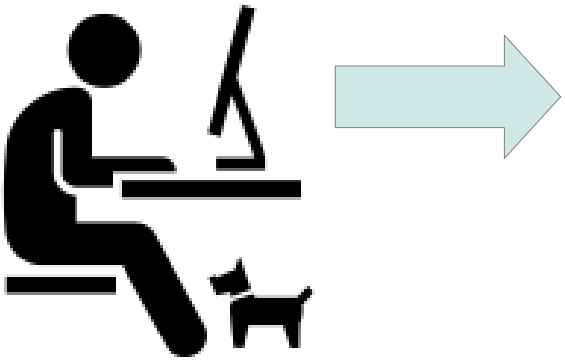
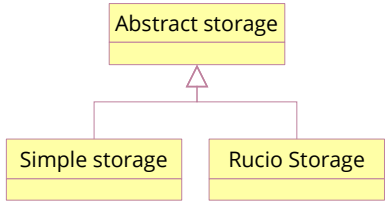
Would I use it again ? YES

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

Writing clear and precise technical specifications in text is hard.



OPENAPI



- Shallow learning curve
- Good documentation

- Clear and easy syntax
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Dave Morris
dave.morris@manchester.ac.uk

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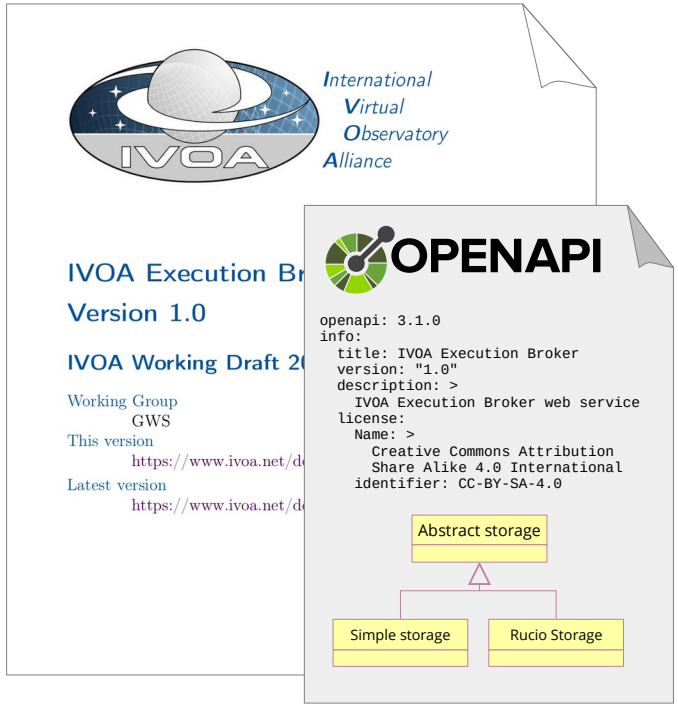
Where next ?

Automatically generate and publish libraries



GitHub

Automatic CI workflow triggered on commit

Same process as the preview PDFs

Java
spring
Maven
python
FastAPI
python Package Index

Dave Morris
dave.morris@manchester.ac.uk

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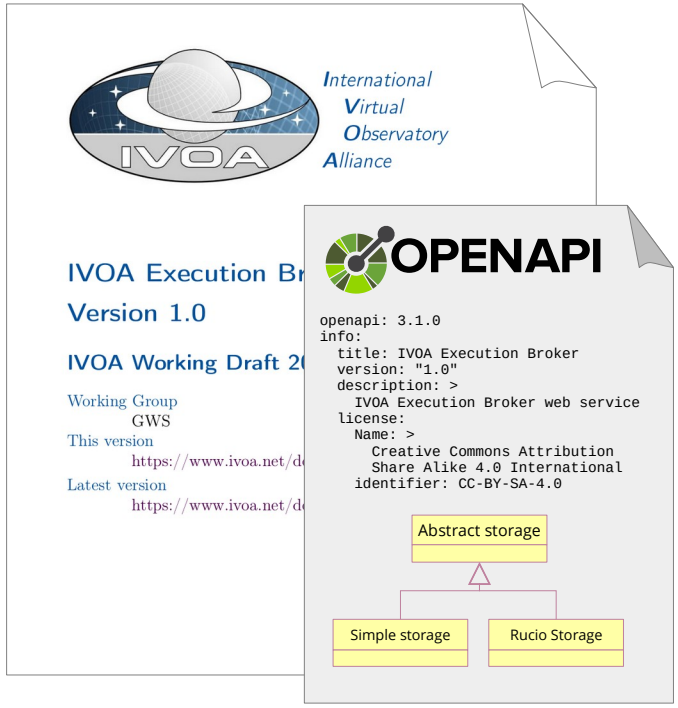
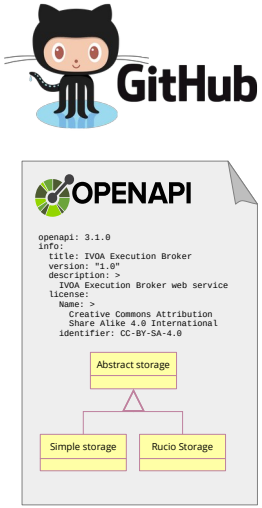
What do we need ?

Permanent URLs to redirect to schema code



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

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



Add IVOA to w3id ?

https://w3id.org/ivoa/

Setup our own ?

https://purl.ivoa.net/

Dave Morris
dave.morris@manchester.ac.uk