INAF
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DI ASTROFISICA

ExecutionBroker in Context

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ROYAL OBSERVATORY EDINBURGH

ESCAPE
European Science Cluster of Astronomy & Particle physics ESFRI research Infrastructures

IVOA

OSSR

Software library

requirements

IVOA

Can You Do This ?

yes/no/maybe

Compute platform

kubernetes
openstack.
jupyter
Apache Zeppelin
slurm workload manager
docker
podman

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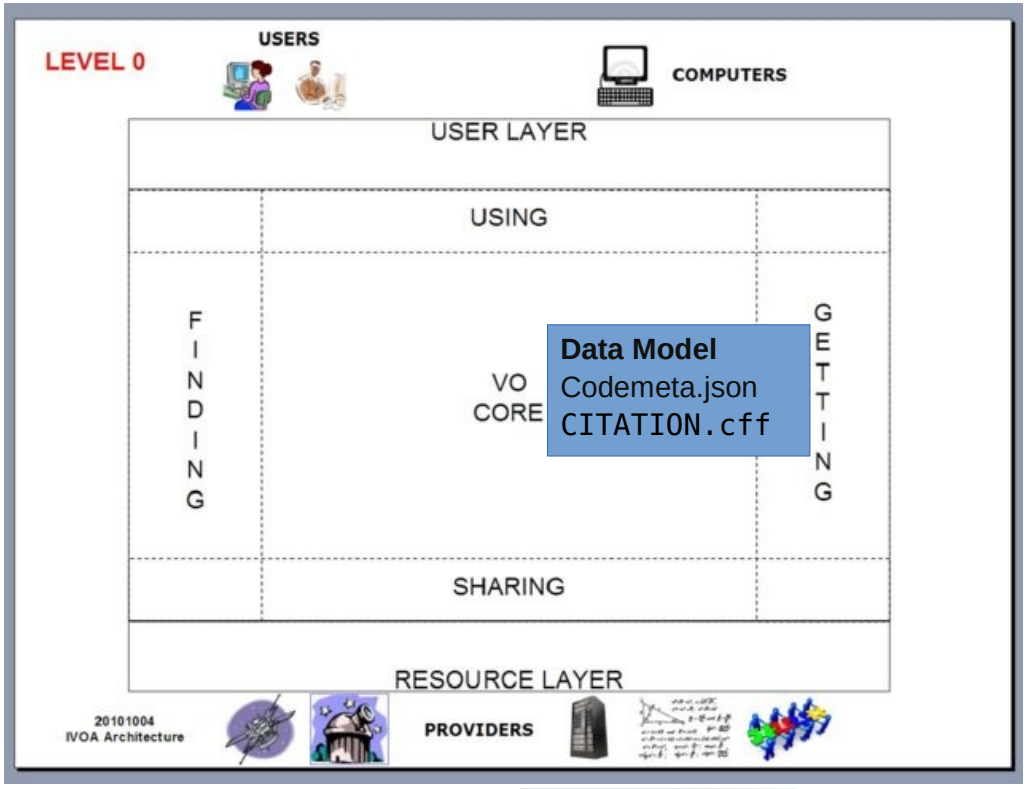
ESCAPE WP4 TechForum
April 2021

Modeling software solutions and computation facilities for FAIR access

ADASS XXXII
Oct 31 - Nov 4 2022

ASCL.net
Astrophysics Source Code Library

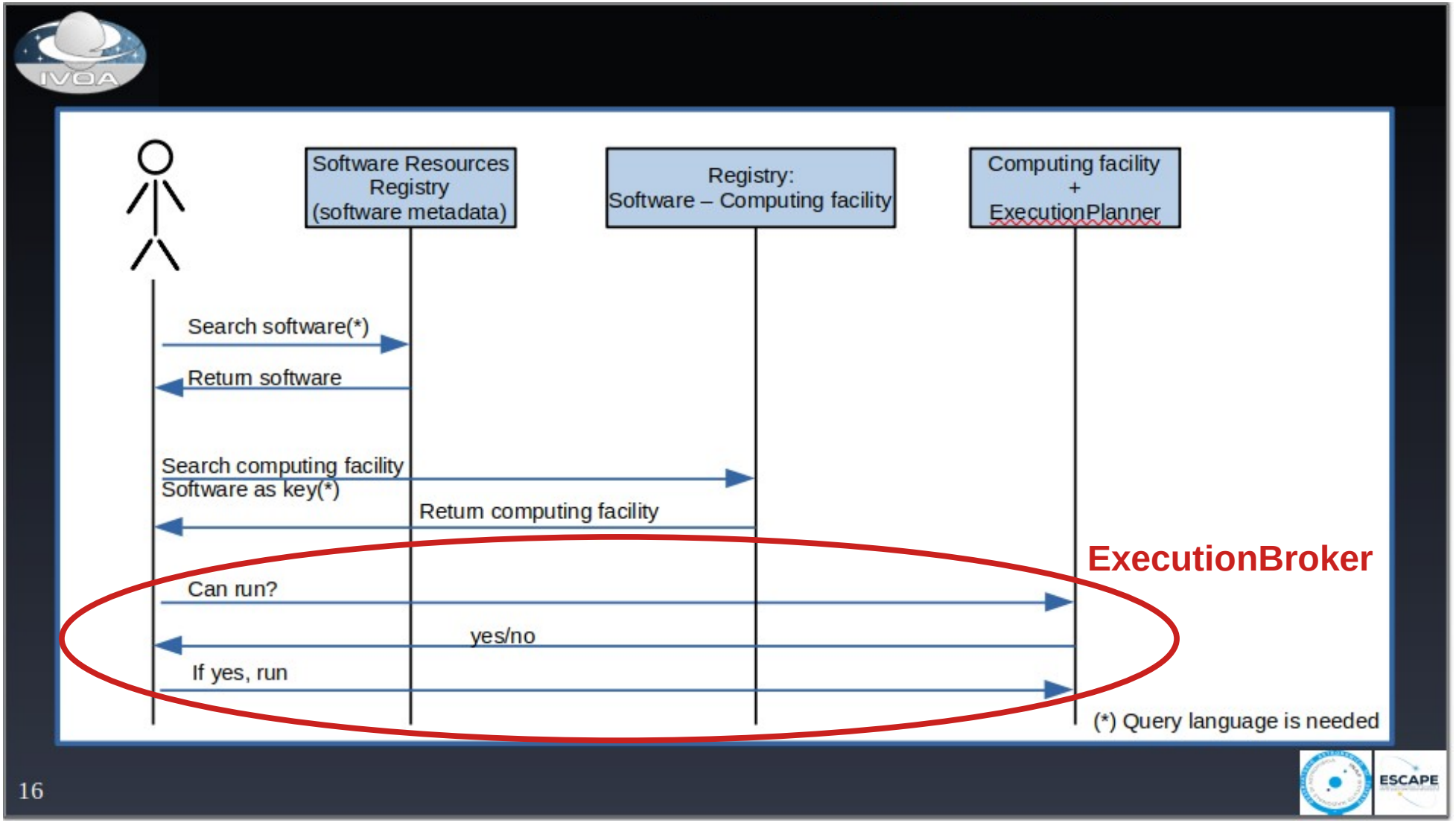


zenodo

GitHub

docker HUB

What about computing facilities?


Software Resources Registry (software metadata)
Registry: Software – Computing facility
Computing facility + ExecutionPlanner
Search software(*)
Retum software
Search computing facility Software as key(*)
Retum computing facility
ExecutionBroker
Can run?
yes/no
If yes, run
(*) Query language is needed
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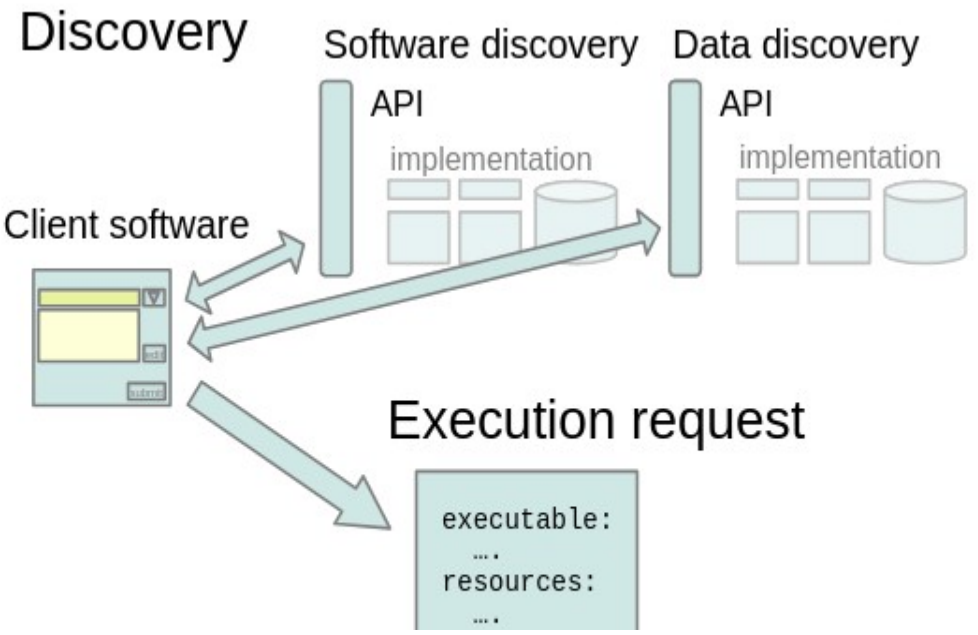
ExecutionBroker in IVOA

The interaction between a user, the client application they are using, and the services available in the Virtual Observatory can be described as a conversation to discover where, how, and when, an executable thing that the user has chosen can be executed.

It is a synthesis of the use case




```
# ExecutionBroker OfferSet request.
executable:
  ....
resources:
  ....
schedule:
  ....
```

```yaml
# OpenAPI schema
AbstractExecutable:
  type: object
  discriminator:
    propertyName: type
    mapping:
      "uri:java-program-1.0":        'JavaPro
      "uri:python-program-1.0":      'PythonP
      "uri:docker-container-1.0":    'DockerC
      "uri:singular-container-1.0": 'Singula
      "uri:jupyter-notebook-1.0":    'Jupyter
      ....
  properties:
    name:
      description: >
        A human readable name, assigned by t
      type: string
    uuid:
      description: >
        A machine readable UUID, assigned by
      type: string
      format: uuid
    type:
      description: >
        The type discriminator.
      type: string
      format: uri
```

```yaml
# OpenAPI schema
DockerContainer:
  description: |
    A Docker or OCI container.
    See https://opencontainers.org/
  type: object
  title: DockerContainer
  allOf:
    - $ref: 'AbstractExecutable'
    - type: object
      properties:
        repository:
          description: >
            The image respository URL.
          type: string
        image:
          description: >
            The image name within the repository.
          type: string
        tag:
          type: string
          description: >
            The image version tag.
        digest:
          description: >
            The image digest checksum, used for verification.
          type: string
        ....
```

Software description

```
  ....
# Details of the resources needed.
resources:

  compute:
    - name: compute-001
      ....
      volumes:
        - name: results-volume
          resource: results-storage ----\
          path: /results                |
          mode: rw                      |
                                        |
  storage:                              |
  - name: results-storage          <----/
    type: uri:persistent-storage
    lifecycle: managed
    lifetime:
      requested:
        min: P1D
    size:
      requested:
        min: 10
        units: TiB
```

```
# Details of the resources needed.
resources:
  ....
  compute:
  - name: "compute-001"
    ....
    volumes:
    - name: "results"
      path: "/results"
      mode: "rw"
  storage:
  - name: "results"
    type: "https://www.purl.org/ivoa.net/storage-types/
 vospace-storage"
    spec:
      endpoint: "http://...."
      path: "/experiment-21/results"
      lifecycle: "unmanaged"
```

Resources description

```
# ExecutionBroker client request.
request:
  # Details of the executable.
  executable:
    ....
  # Details of the resources needed.
  resources:
    ....
    storage:
    - name: "results"
      type: "https://www.purl.org/ivoa.net/storage-types/
   vospace-storage"
      spec:
        endpoint: "http://...."
        type: "container"
        path: "/experiment-21/results"
        lifecycle: "managed"
        lifetime:
```

OfferSet

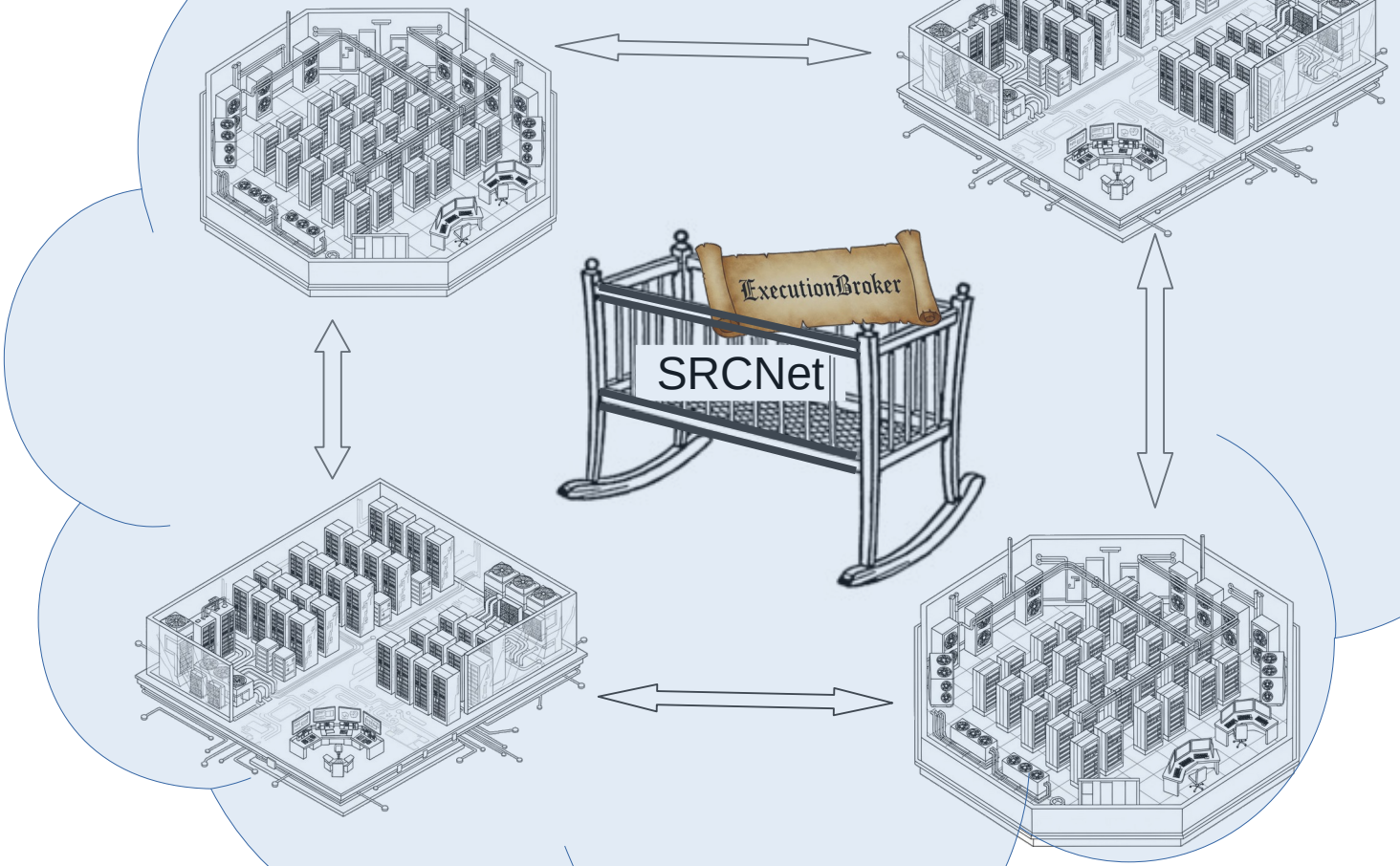
Resources And Time → interactivity

```
# ExecutionBroker OfferSet response.
result: YES
....
offers:

- uuid: "2e164a1b-7ff6-11ef-8412-4bc36fe2face"
  state: 'OFFERED'
  expires: "2023-09-18T07:05:21"
  ....
  executable:
    ....
  resources:
    ....
  schedule:
    ....

- uuid: "2e16bf4c-7ff6-11ef-8412-4bc36fe2face"
  status: 'OFFERED'
  expires: "2023-09-18T07:05:21"
  ....
  executable:
    ....
  resources:
    ....
  schedule:
    ....
```

ExecutionBroker in SRCNet

SRCNet has been a good cradle to grow the ExecutionBroker:

- Use case
- Infrastructure



ExecutionBroker in SRCNet

Frame the ExecutionBroker implementation and usage in SRCNet.

- Only for interactive work ?
- Mix interactive (ExecutionBroker) and batch solutions in the same cluster: reliable?
  - Is monitoring enough?
  - Queuing services?
  - Priority services?

Backup slides

IVOA Interop Groeningen October 2019: DCP session