Federating OpenStack Powered Supercomputers

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StackHPC

CORONA
BRASS

Why Federate a Supercomputer?

IRIS: e-Infrastructure for STFC Science

STFC: UK Science and Technology Facilities Council

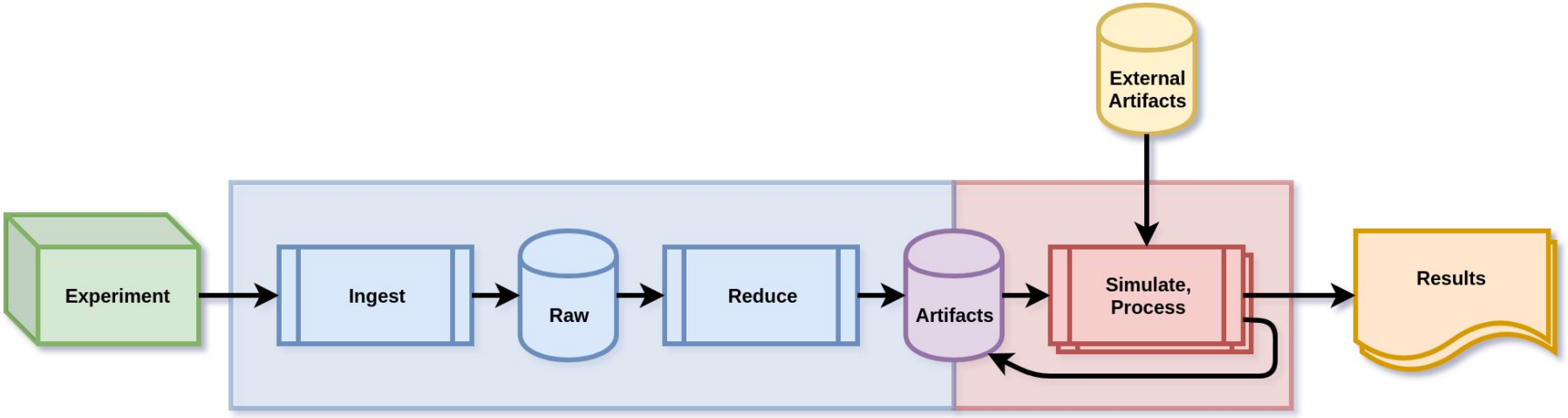
Understand requirements for a UK-wide e-Infrastructure for Science

Quicker, easier and more efficient access to infrastructure

Encourage projects to share:

- Infrastructure
- Expertise
- Software

Scientific Computing



Compute Requirements

What

- Scale
  - Part of a host
  - Many small jobs
  - Multiple hosts together
- Large memory, Shared Scratch, GPU
- Receive live data feed

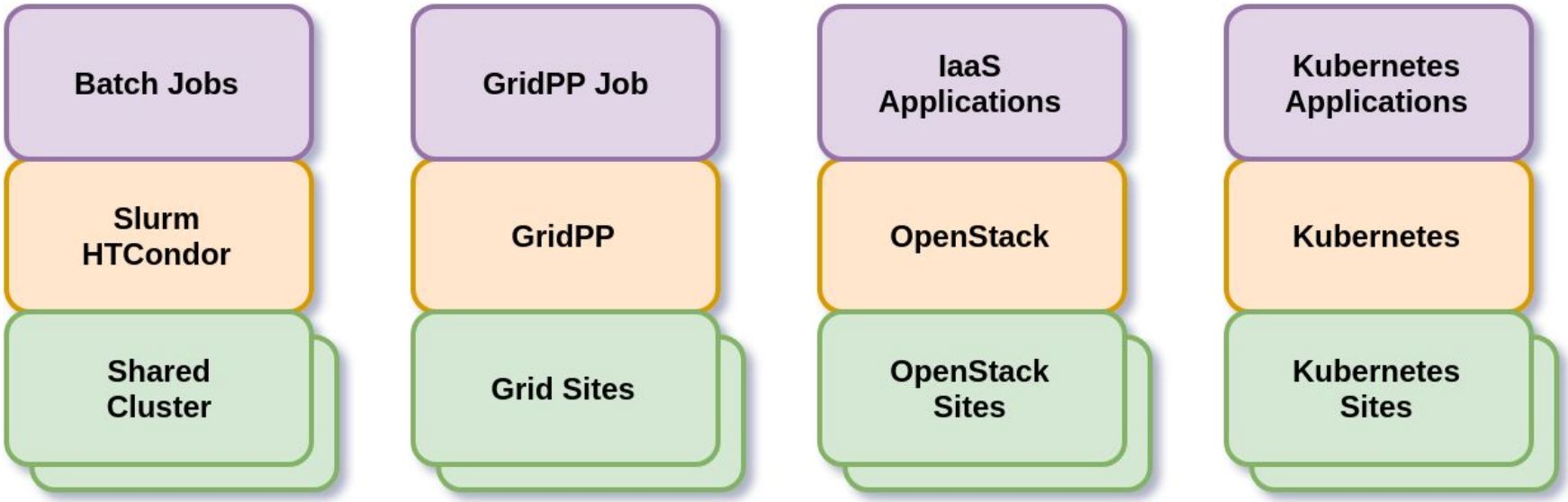
When

- Submit a Job
- Interactive
  - Scheduled
  - On-demand
- Web Service

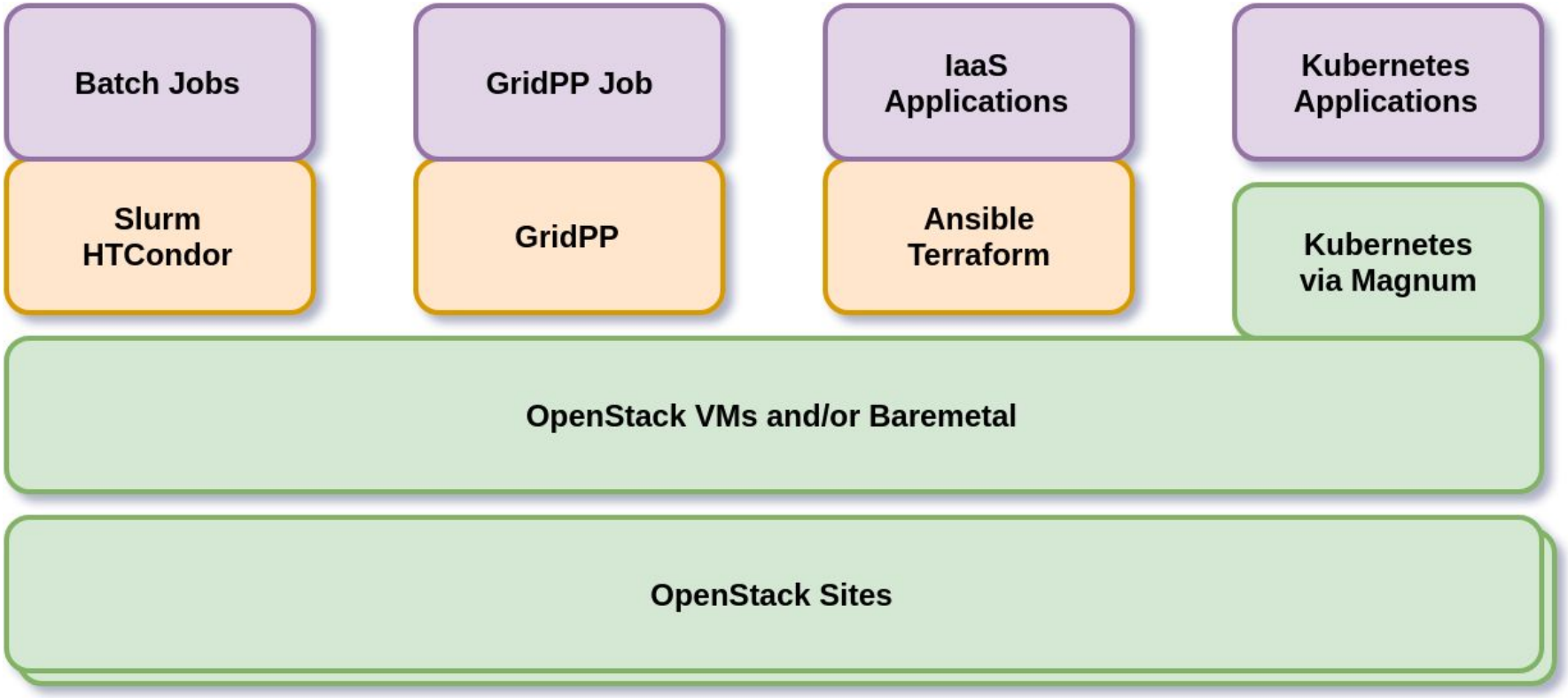
Resource Sharing Opportunity

- Facility
  - Large demand spikes for interactive processing
- Shared
  - Demand grows beyond availability
  - Inflexible
- Dedicated
  - Hard to predict required size

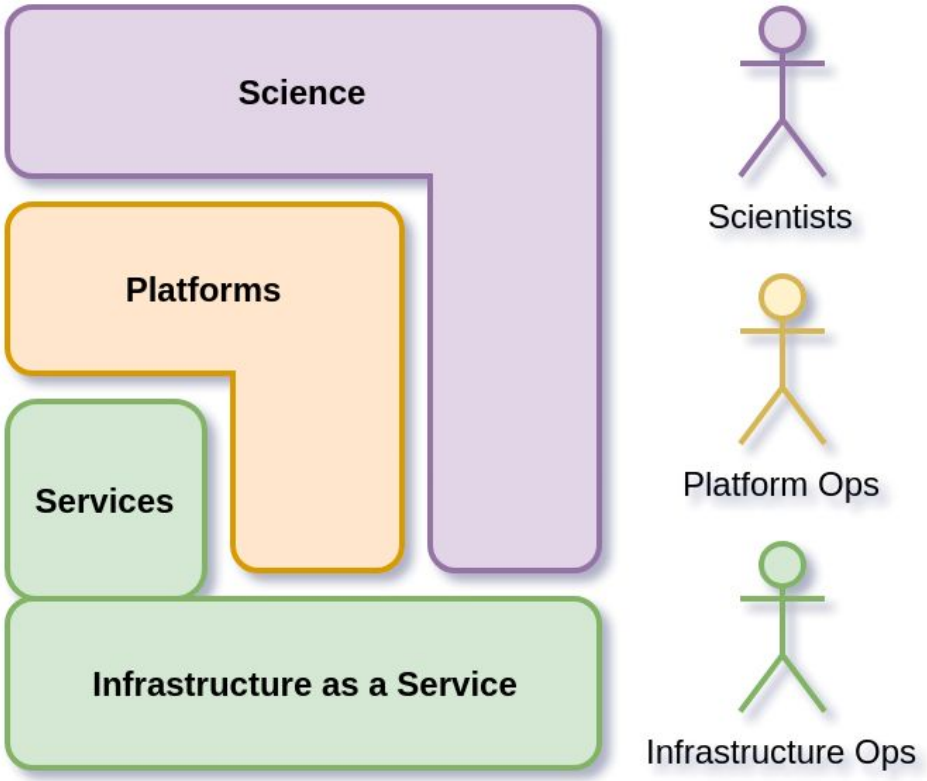
Today: Siloed Infrastructure Sites



Remove Silos

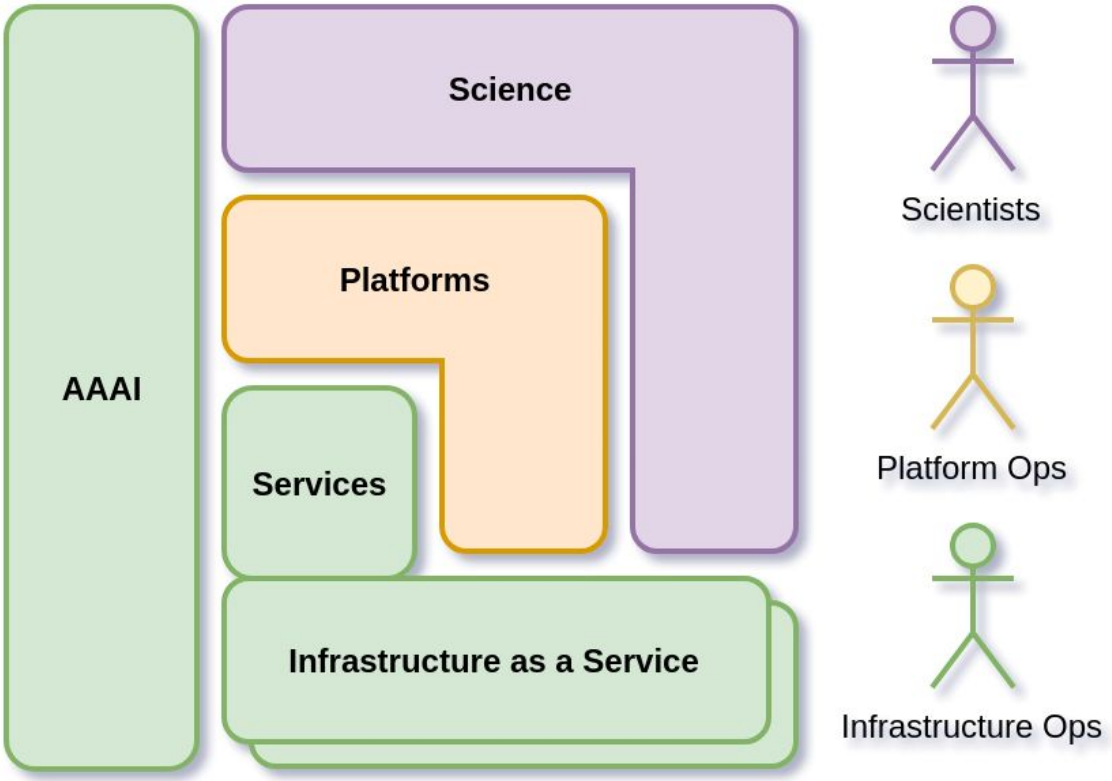


OpenStack Powered Supercomputer



What does “**Federated**” mean?

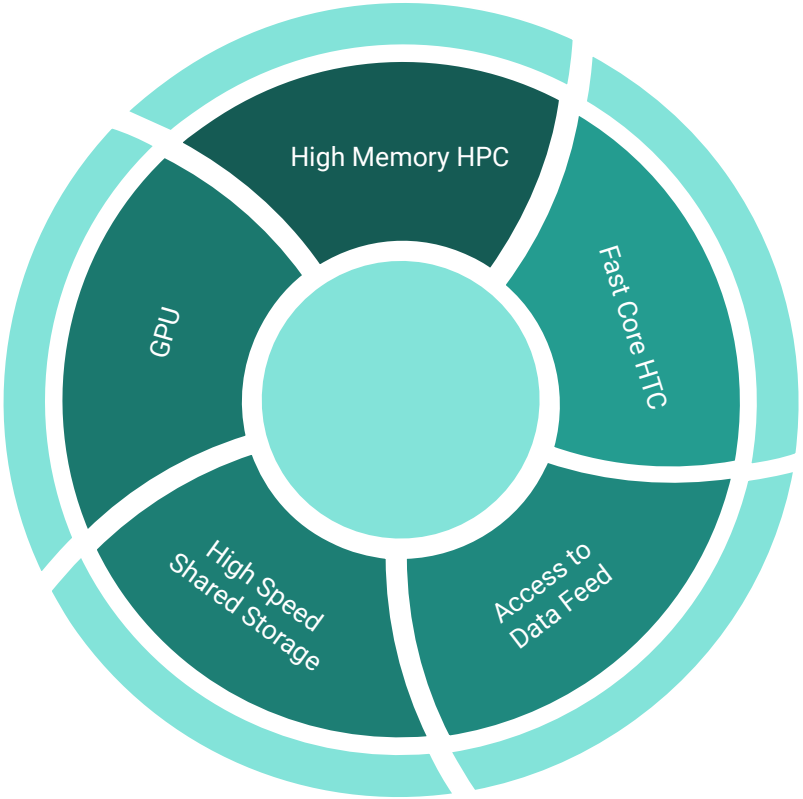
Federated OpenStack Powered Supercomputer



IRIS Compliance Tests

- Built on OpenStack Interoperability Tests
- Add extra optional Manila and Magnum tests
- Make Cinder optional

Best Fit Resources



Location Transparency

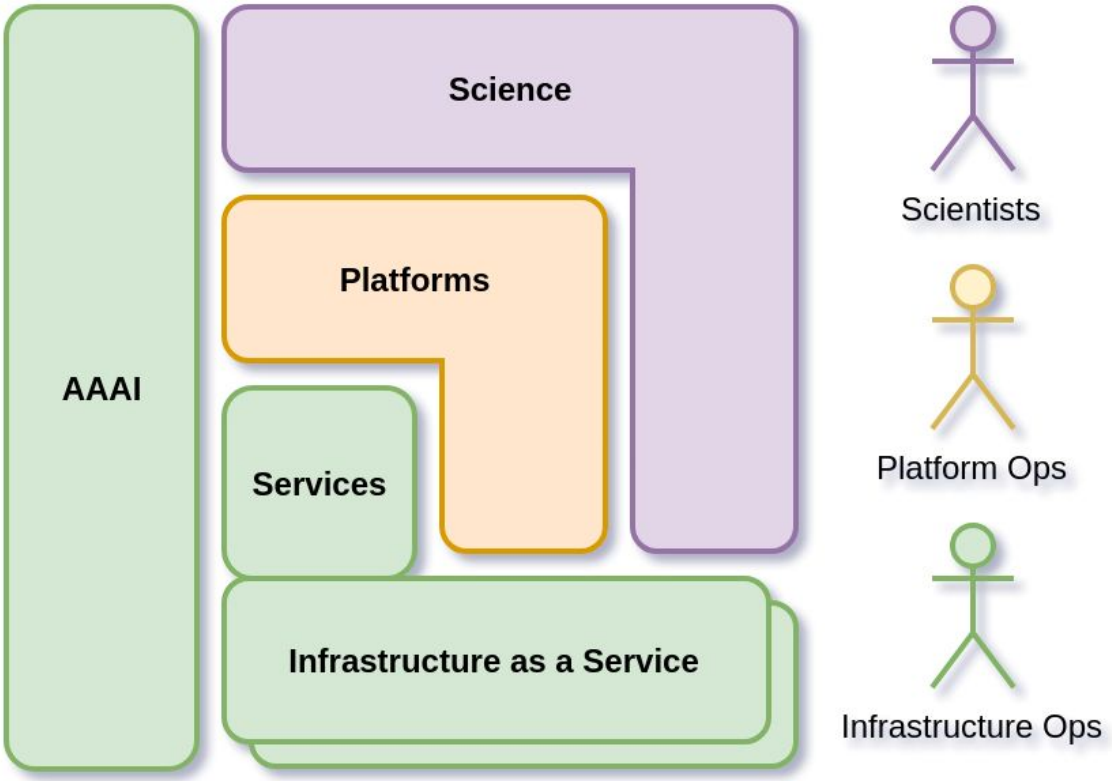
Workflow — Describe required processing steps

Platform — Choses Region, Optimises Data Flow, Orchestrates workflows

OpenStack — Infrastructure split between Regions

What is “AAAI”?

Federated OpenStack Powered Supercomputer



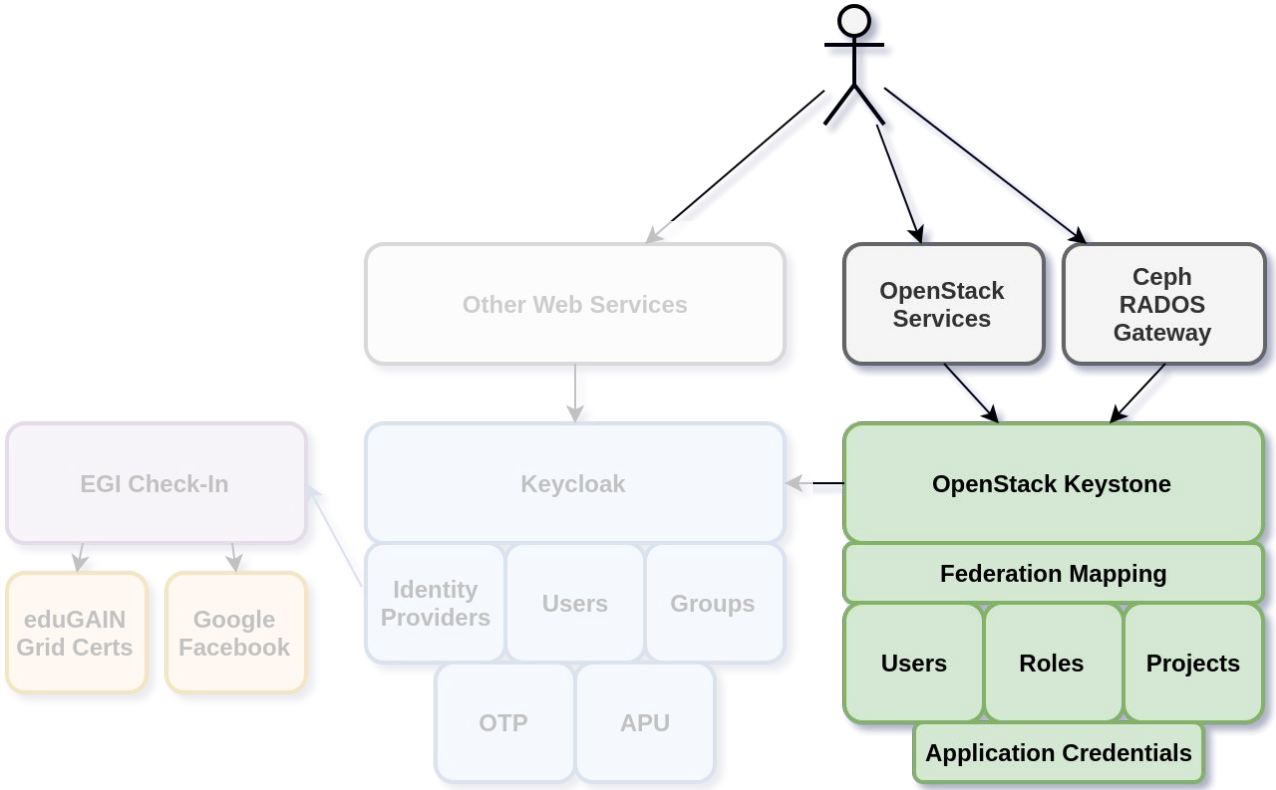
Authentication and Authorization

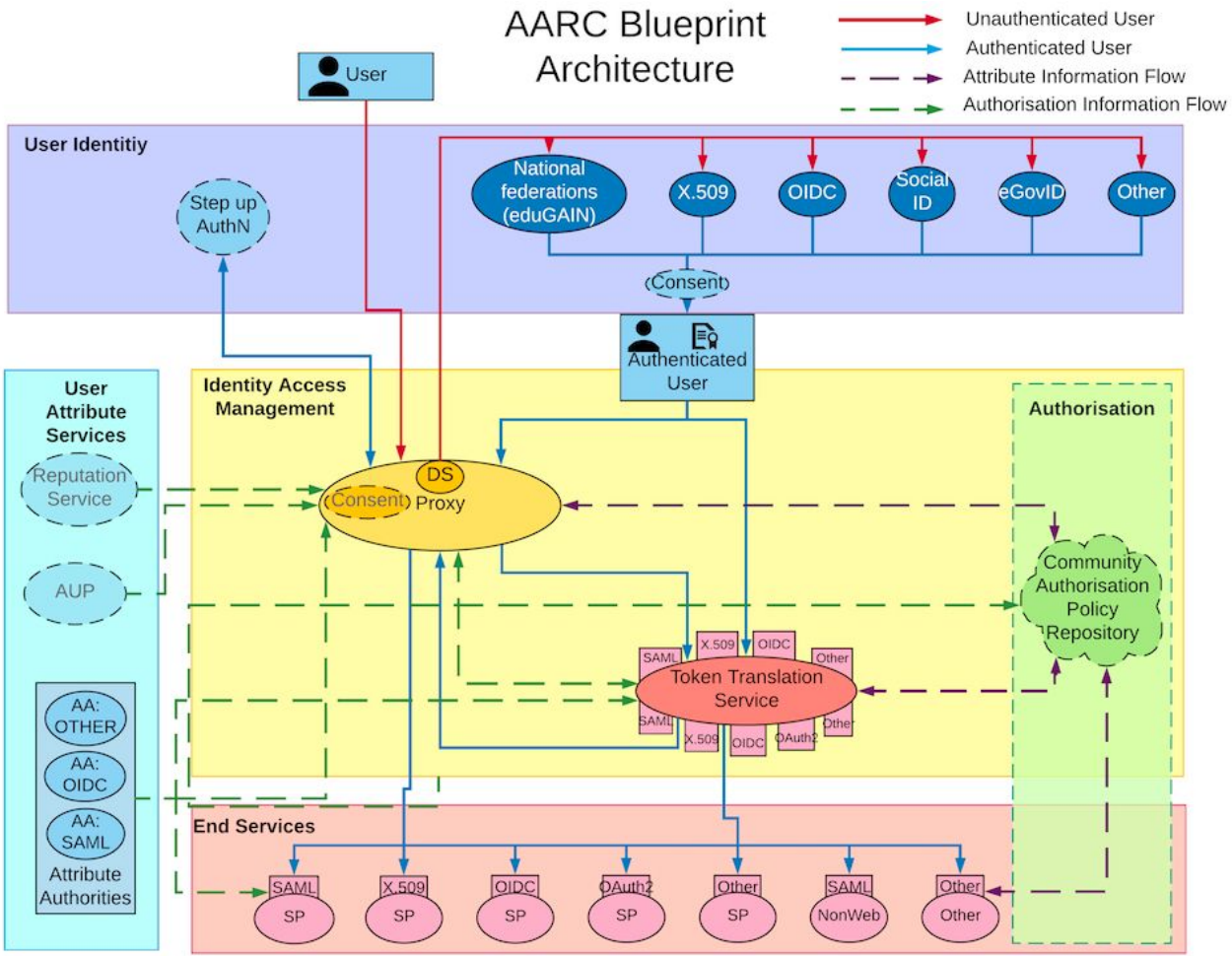
Non-Interactive Authentication

Building Blocks of Federated Identity

- Authenticate via OIDC
  - Keycloak OIDC to EGI Check-in
  - Indigo IAM
- Authorisation via Federation Mapping
  - Concrete users and roles
  - Avoid Groups
- Application Credentials
  - Non-interactive authentication for Keystone

Keystone Federation




AARC Blueprint Architecture
Unauthenticated User
Authenticated User
Attribute Information Flow
Authorisation Information Flow
User
User Identitiy
Step up AuthN
National federations (eduGAIN)
X.509
OIDC
Social ID
eGovID
Other
(Consent)
Authenticated User
User Attribute Services
Reputation Service
AUP
AA: OTHER
AA: OIDC
AA: SAML
Attribute Authorities
Identity Access Management
DS
(Consent) Proxy
Token Translation Service
SAML
X.509
OIDC
Other
OAuth2
Authorisation
Community Authorisation Policy Repository
End Services
SAML SP
X.509 SP
OIDC SP
OAuth2 SP
Other SP
SAML NonWeb
Other Other

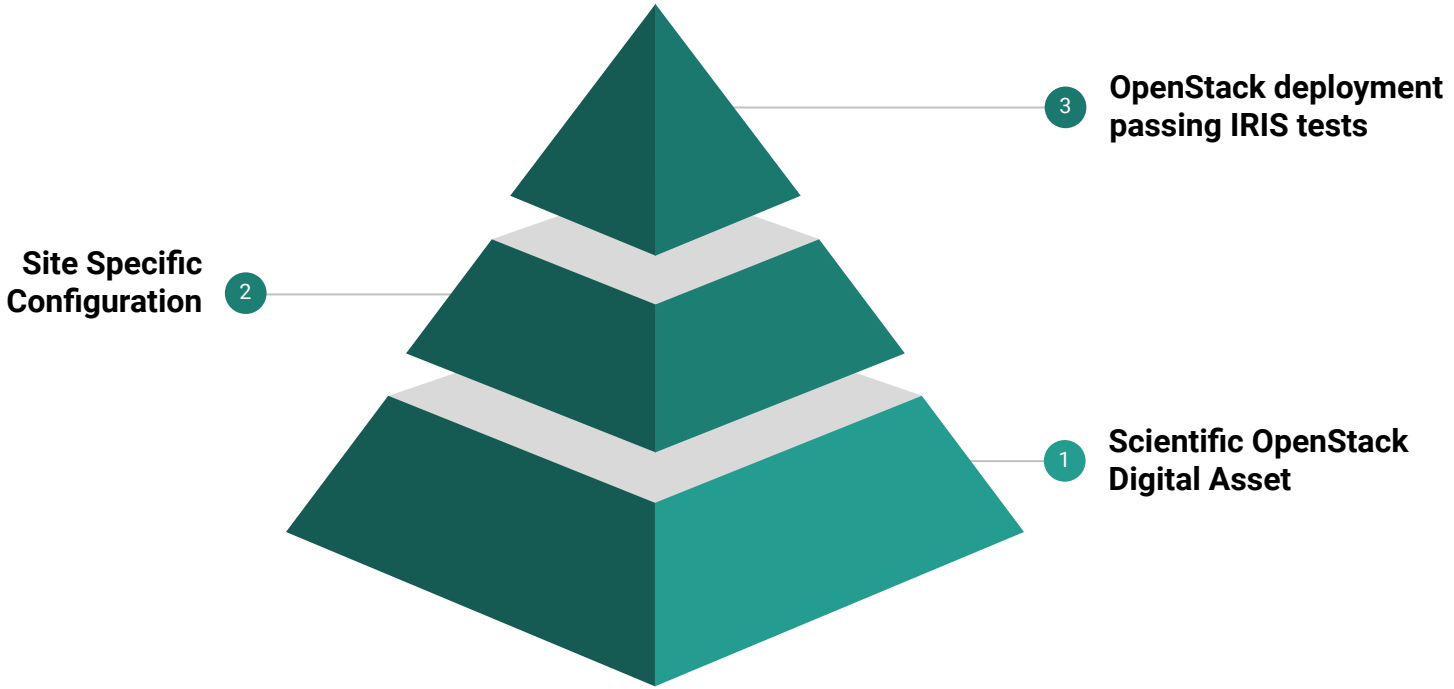
Accounting

- Focus on Traceability

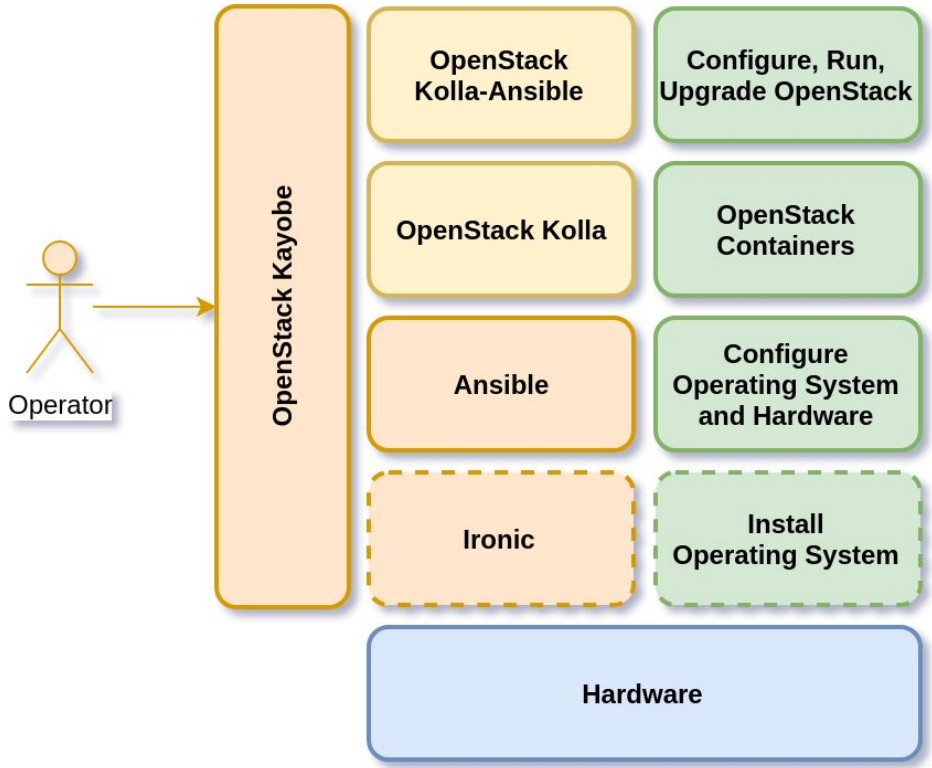
- Usage: cASO sends to Fluentd (and APEL)
- Quota: limit maximum concurrent usage
- Allocation: allowed usage over given duration

How to pass IRIS compliance tests?

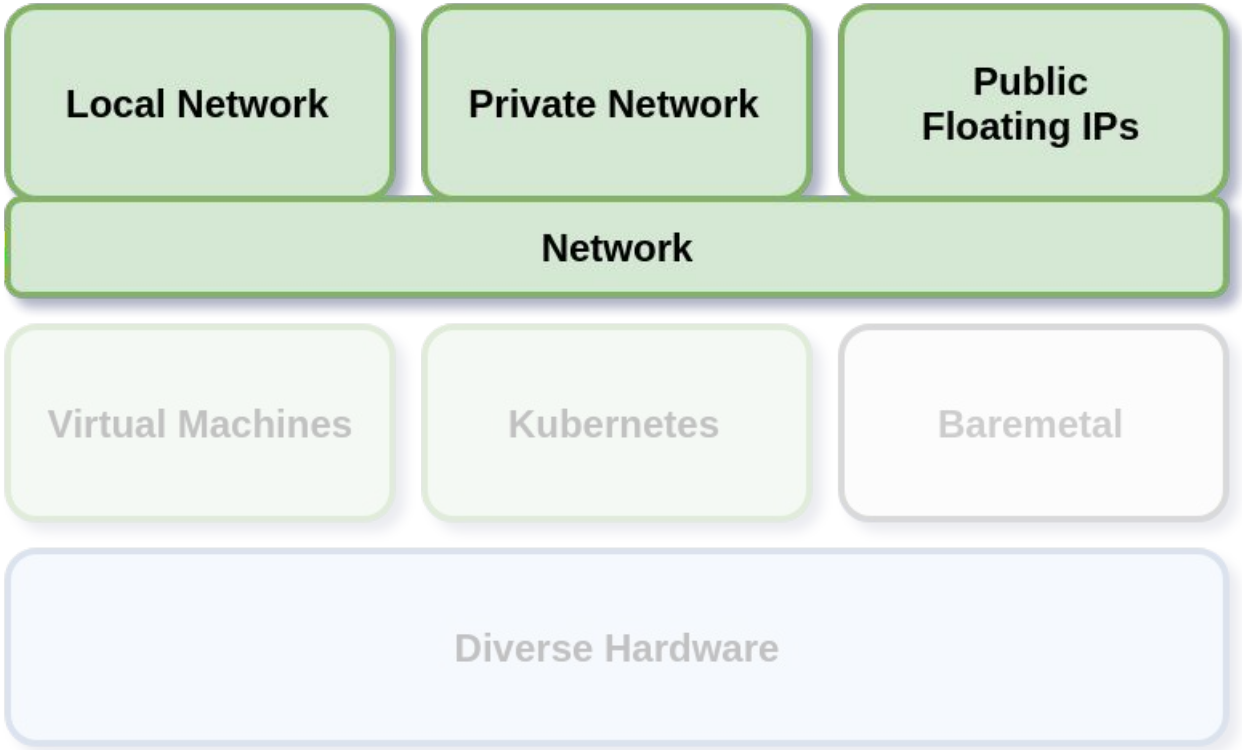
Shared Operational Tooling



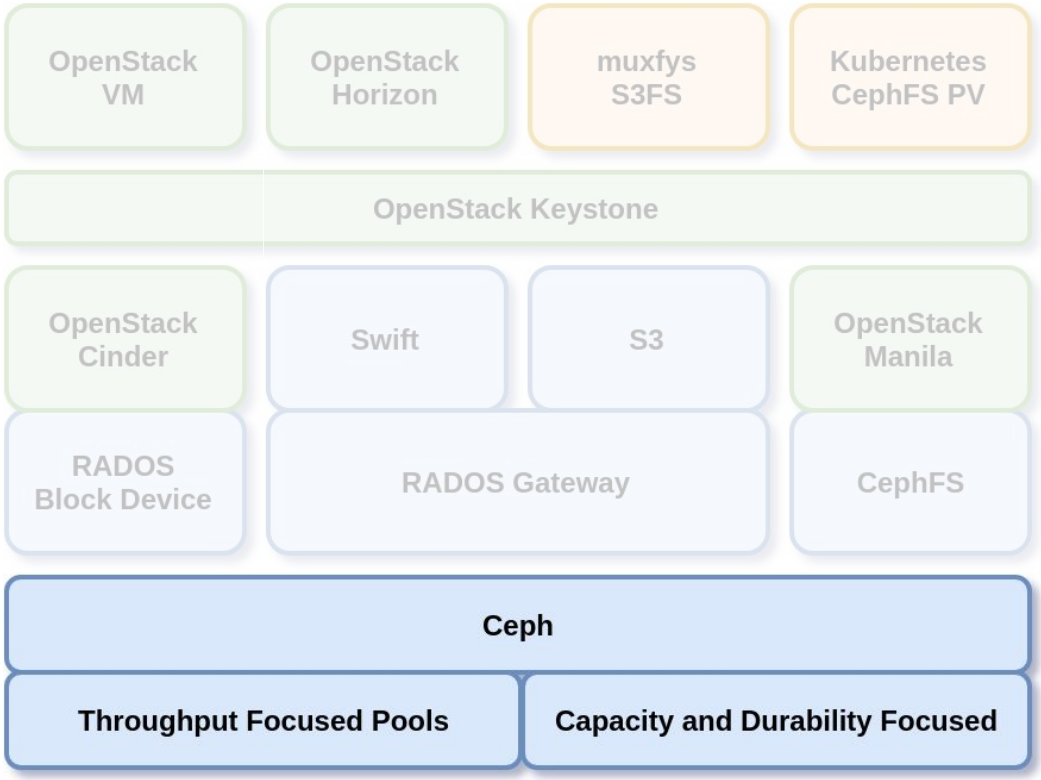
OpenStack Deployment



Scientific OpenStack Compute



Scientific OpenStack Storage



Any unsolved problems?

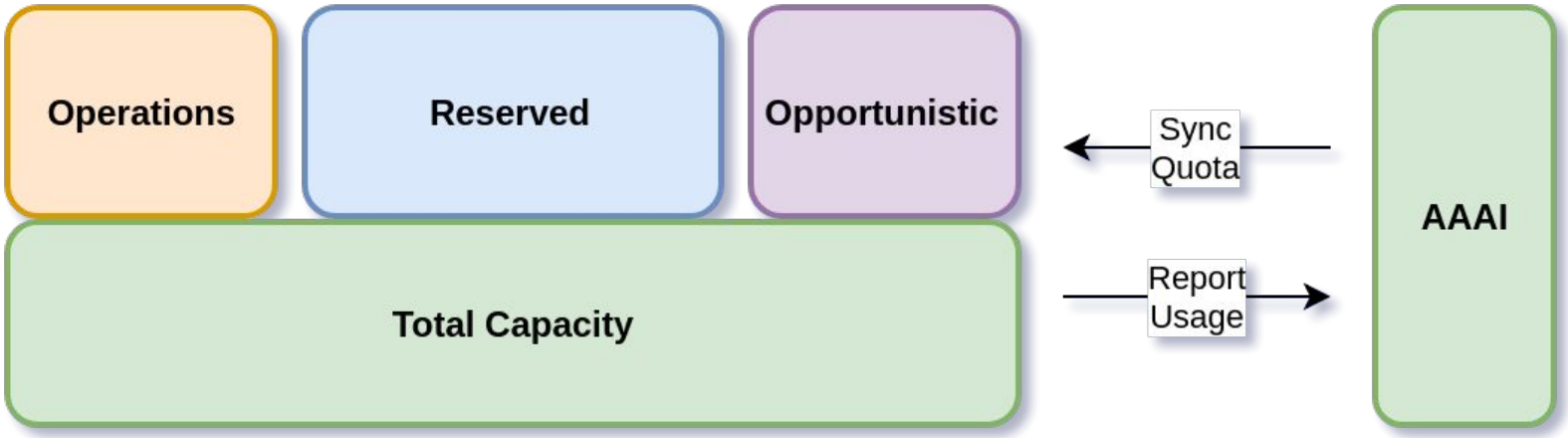
Authorization of Federated Identity

FIM4R

“Every researcher is entitled to focus on their work
and not be impeded by needless obstacles
nor required to understand anything about the FIM
infrastructure enabling their access to research services.”

FIM4R version 2: https://fim4r.org

Improve Resource Sharing



Lessons Learned?

(1) Building a Community Matters

(2) Federated OpenStack works

(3) Application Credentials can work

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