



Latest advancements in EGI operations for improved cloud federations

Enol Fernández (EGI Foundation)



eosc-hub.eu

Dissemination level: Public



[@EOSC_eu](https://twitter.com/EOSC_eu)

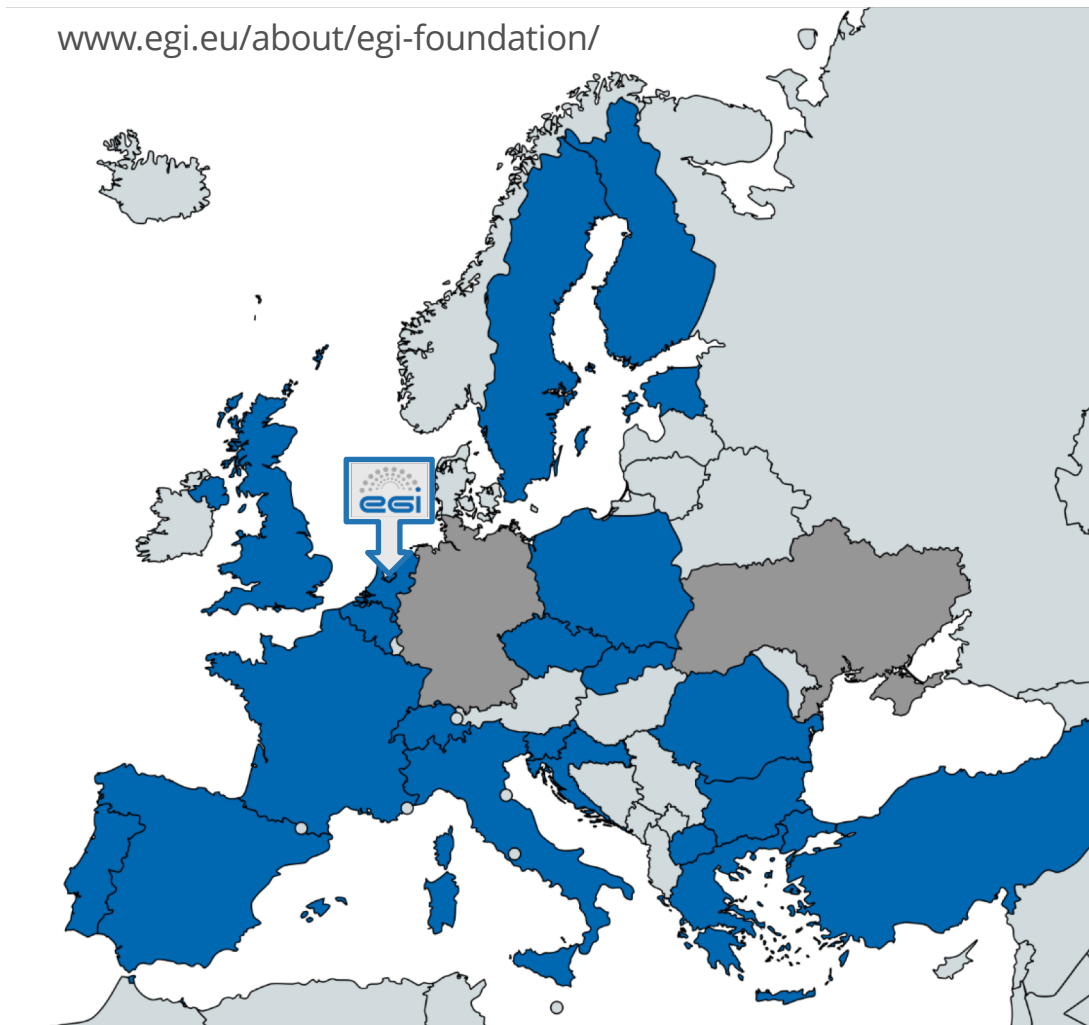




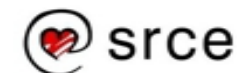
EGI and the EGI Federation

EGI's mission is to create and deliver open solutions for science and research infrastructures by federating digital capabilities, resources and expertise between communities and across national boundaries.

www.egi.eu/about/egi-foundation/



● 23 Countries + 1 EIRO (CERN)



Compute



Cloud Compute

Run virtual machines on demand with complete control over computing resources



Cloud Container Compute BETA

Run Docker containers in a lightweight virtualised environment



High-Throughput Compute

Execute thousands of computational tasks to analyse large datasets



Workload Manager BETA

Manage computing workloads in an efficient way

Applications



Applications on Demand BETA

Use online applications for your data & compute intensive research



Notebooks BETA

Create interactive documents with live code, visualisations and text

Storage and Data



Online Storage

Store, share and access your files and their metadata on a global scale



Archive Storage

Back-up your data for the long term and future use in a secure environment



Data Transfer

Transfer large sets of data from one place to another

Security



Check-in BETA

Login with your own credentials

Training



FitSM Training

Learn how to manage IT services with a pragmatic and lightweight standard



ISO 27001 Training

Learn how to manage and secure information assets



Training Infrastructure

Dedicated computing and storage for training and education

Our internal Service Portfolio

Delivered to the EGI Federation members facilitating collaboration

Coordination



Operations Coordination and Support

Coordinate activities to ensure seamless operations



Community Coordination

A joint approach to user engagement



ITSM Coordination

Ensures professional service management for EGI IT services



Technical Coordination

Progress and innovation through collaboration



Strategy and Policy Development

One federation, one vision, one strategy



Project Management and Planning

A joint approach to planning and management



Security Coordination

Enhance local security for a safer global infrastructure



Communications

Share your successes at a larger scale

Operations



Marketplace BETA

Expose your services to a broader audience



Accounting

Track and report the usage of your services



Collaboration Tools

IT tools for better coordination



Configuration Database

Manage the configuration information of federated e-infrastructure assets and their functional relations



Operational Tools

Integrate resources and operations in a federated ecosystem



Helpdesk

Your point of contact to ask for support at EGI



Service Monitoring

Monitor the performance of IT services



Validated Software and Repository

Benefit from a repository of high-quality software validated for the EGI infrastructure

Security



Check-in

Login with your own credentials



Attribute Management

Manage memberships and groups in communities and virtual organisations

ZERTIFIKAT ♦ CERTIFICATE ♦ 認證證書 ♦ CERTIFICADO ♦ CERTIFICAT



Management Service

CERTIFICATE

The Certification Body
of TÜV SÜD Management Service GmbH
certifies that



EGI Foundation / EGI.eu
Science Park 140
1098 XG Amsterdam
Netherlands

has established and applies
a Quality Management System for

**A management system to deliver all
services covered by the service catalogue.**

An audit was performed, Report No. **707067543**.
Proof has been furnished that the requirements
according to

ISO 9001:2015

are fulfilled.

The certificate is valid from **2018-02-19** until **2020-03-06**.
Certificate Registration No.: **12 100 53643 TMS**.






Product Compliance Management
Munich, 2018-02-19



Management Service

MB01-0719

TÜV SÜD Management Service GmbH • Zertifizierungsstelle • Ridlerstraße 65 • 80339 München • Germany



ZERTIFIKAT ♦ CERTIFICATE ♦ 認證證書 ♦ CERTIFICADO ♦ CERTIFICAT



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EGI Cloud

An operations view

- Multi-cloud IaaS infrastructure with Single Sign-On
- Federation features:
 - Common VM image catalogue
 - Discovery, accounting, SLO monitoring
 - Unified GUI dashboard



Cloud Compute



Online Storage



Applications on Demand **BETA**



Cloud Container Compute **BETA**

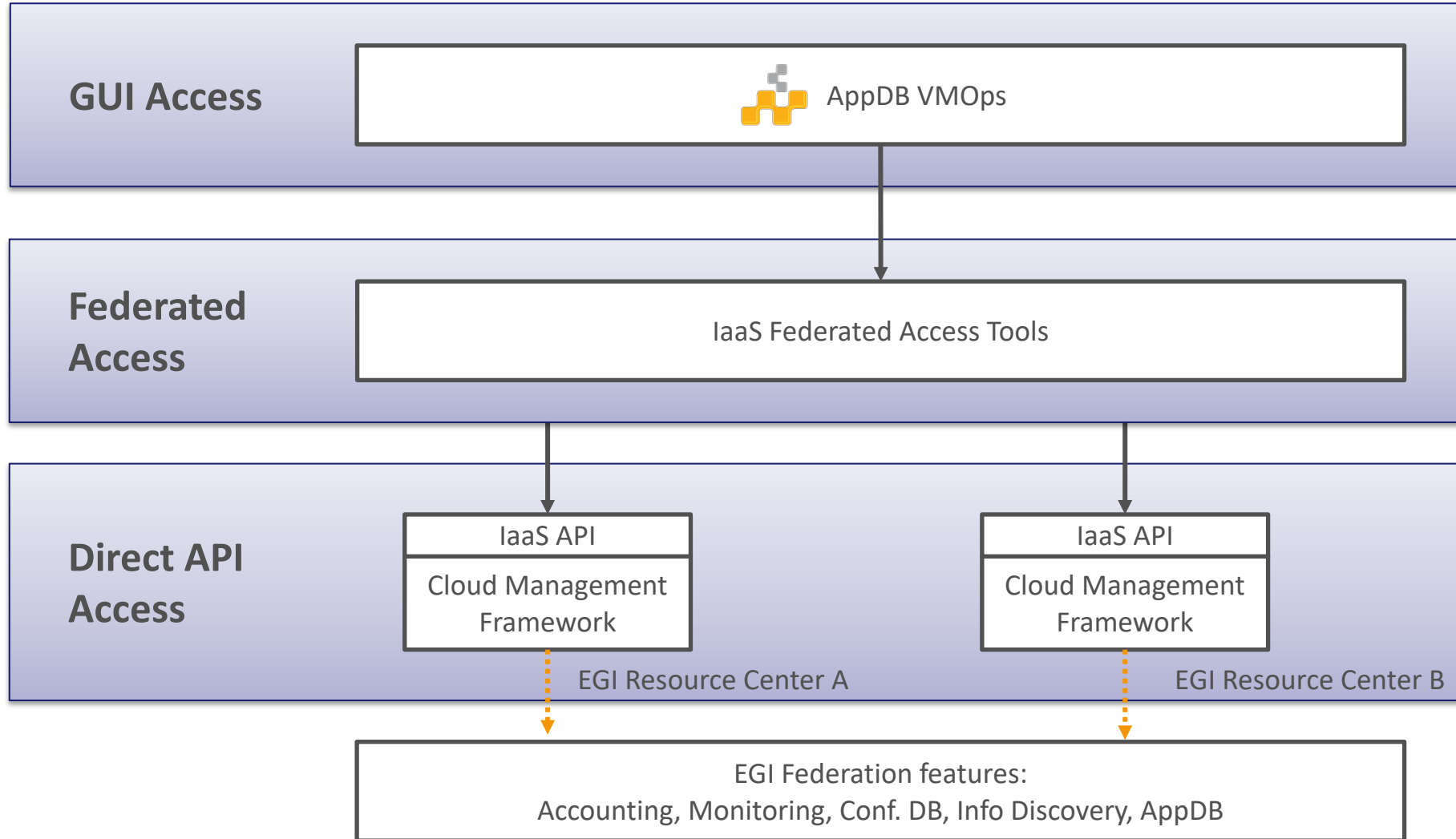


Training Infrastructure

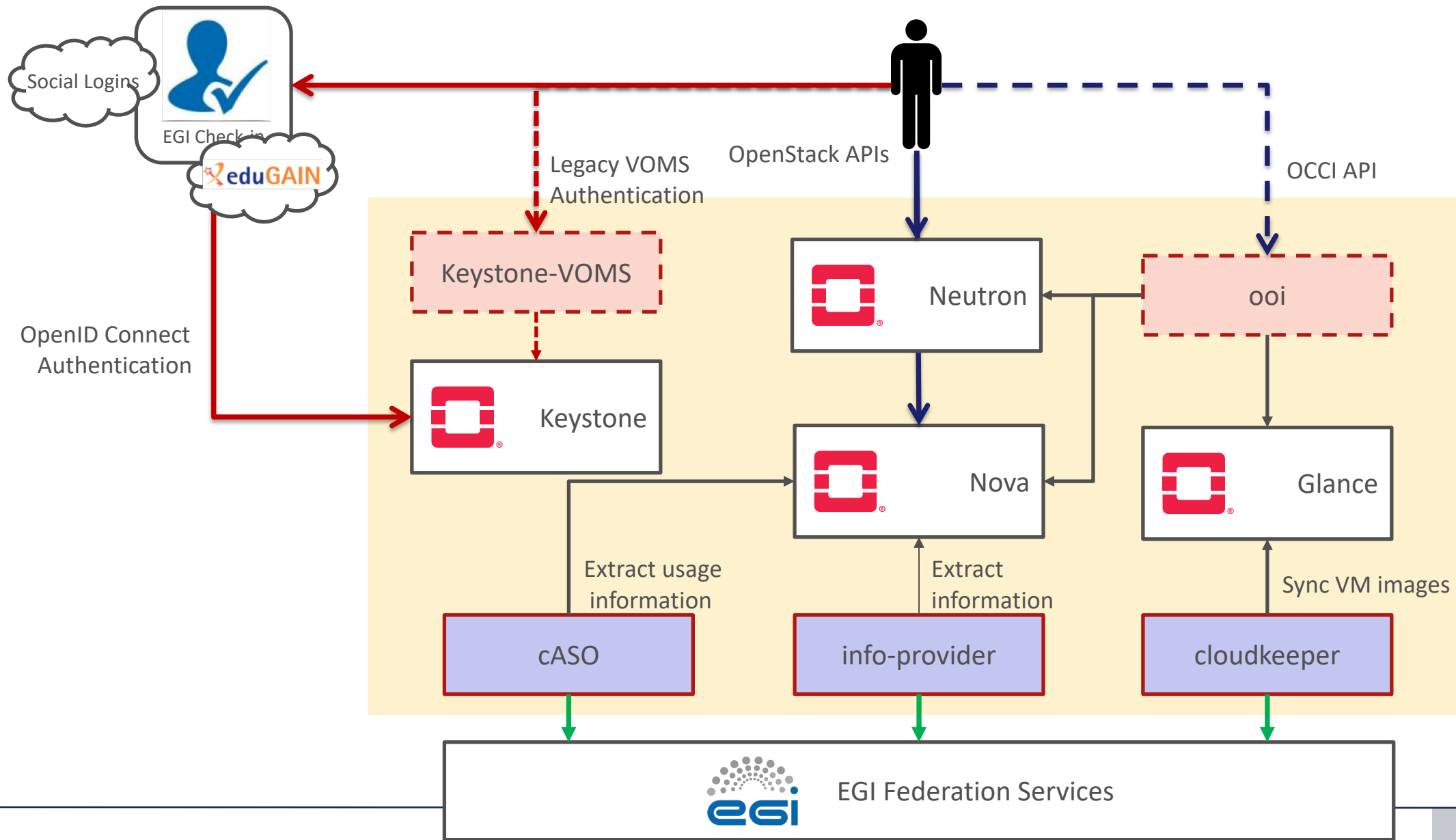


Notebooks **BETA**



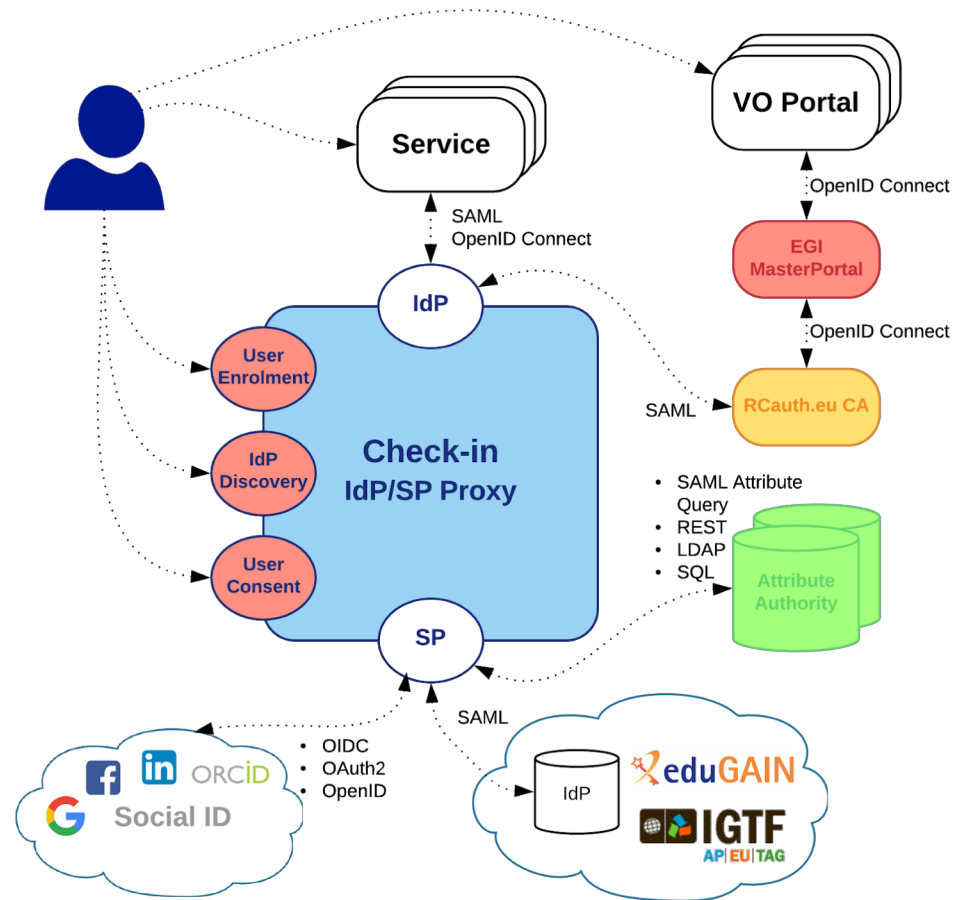


Architecture (site perspective)

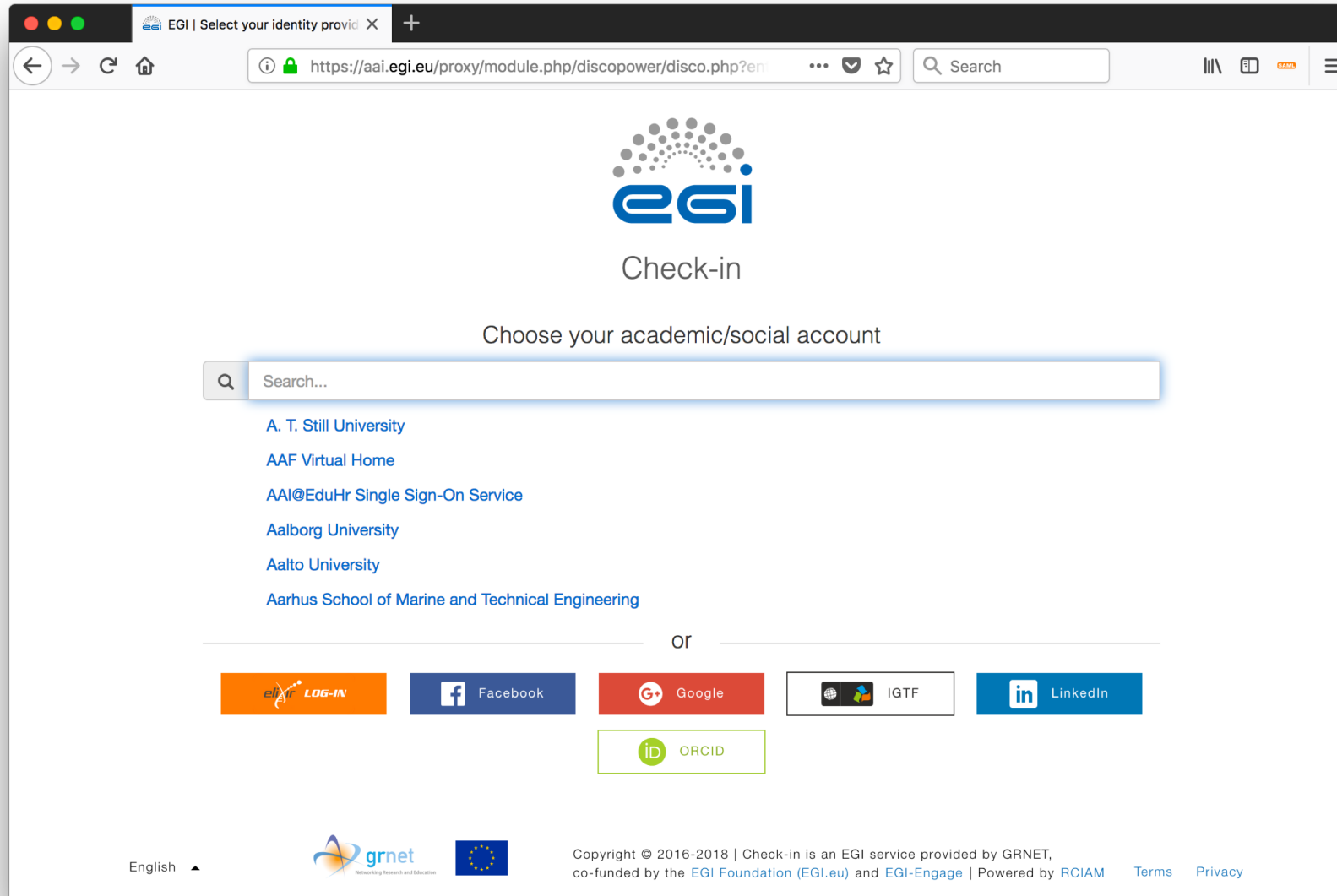




- **Identity and Access Management solution that makes it easy to secure access to services and resources**
 - Single sign-on to services through eduGAIN, social media and other institutional or community-managed identity providers
 - Only one account needed for federated access to multiple heterogeneous (web and non-web) service providers using different technologies (SAML, OpenID Connect, OAuth 2.0, X509)
 - Identity linking enables access to resources using different login credentials (institutional/social)
 - Assurance information associated to each authenticated identity
 - Aggregation and harmonisation of authorisation information (VOs/groups, roles, assurance) from multiple sources



- Implementation of the AARC blueprint architecture
- Registered in eduGAIN as an SP complying with REFEDS Research & Scholarship and Sirtfi
- All community SPs can have one statically configured IdP
- No need to run an IdP Discovery Service on each community SP
- Connected SPs get consistent/harmonised user identifiers and accompanying attribute sets from different IdPs/AAs that can be interpreted in a uniform way for authorisation purposes

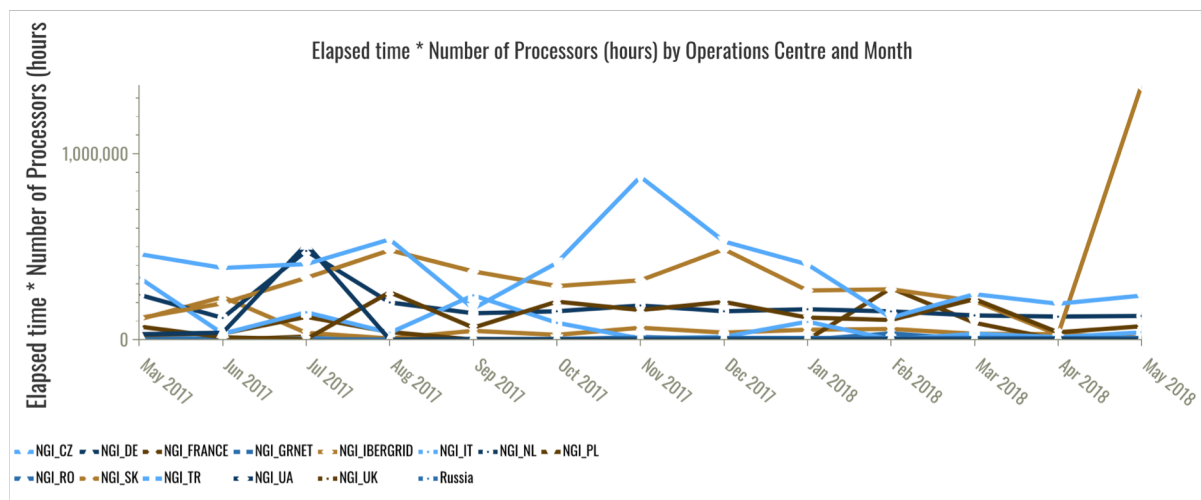
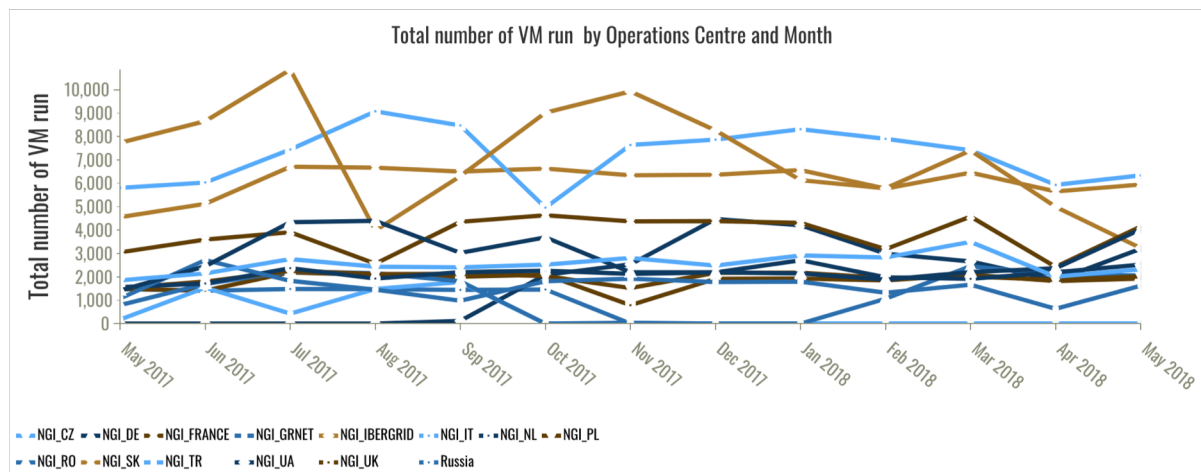


The screenshot shows a web browser window with the URL `https://aai.egi.eu/proxy/module.php/discopower/disco.php?en`. The page features the EGI logo and the text "Check-in". Below this, it says "Choose your academic/social account" and provides a search bar. A list of institutions is displayed, including A. T. Still University, AAF Virtual Home, AAI@EduHr Single Sign-On Service, Aalborg University, Aalto University, and Aarhus School of Marine and Technical Engineering. Below the list, there are buttons for various identity providers: eln LOG-IN, Facebook, Google, IGTF, LinkedIn, and ORCID. The footer contains the text "English", logos for grnet and the European Union, and copyright information: "Copyright © 2016-2018 | Check-in is an EGI service provided by GRNET, co-funded by the EGI Foundation (EGI.eu) and EGI-Engage | Powered by RCIAM". There are also links for "Terms" and "Privacy".

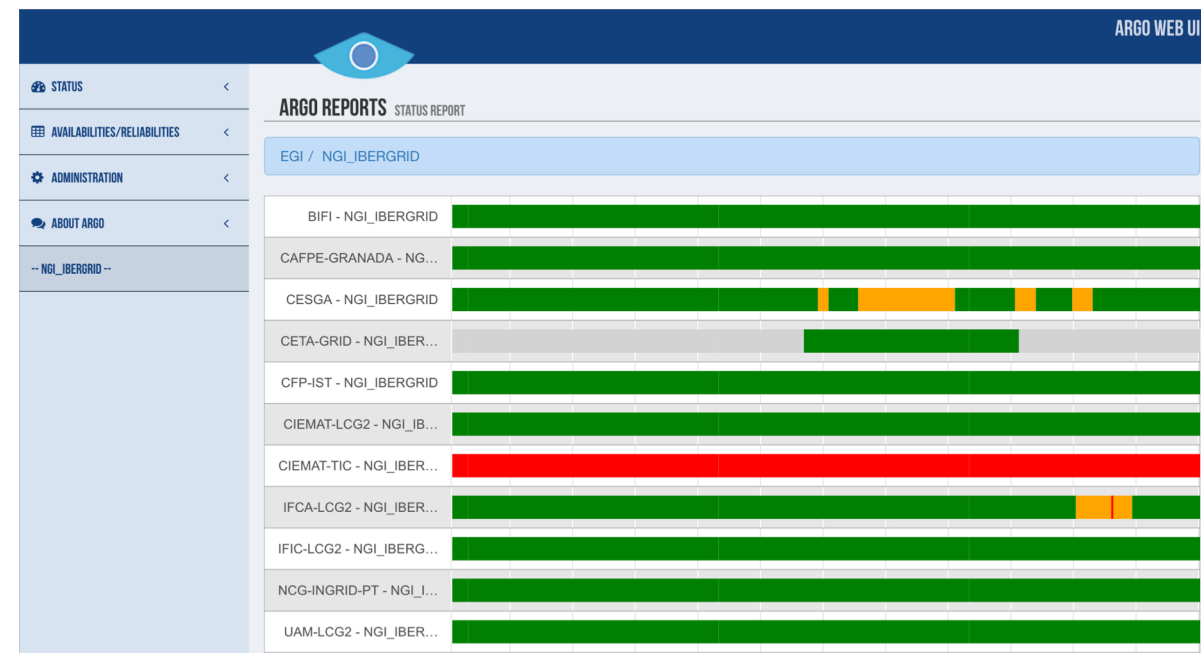
Non-web use cases & delegated access via OpenID Connect/OAuth 2.0

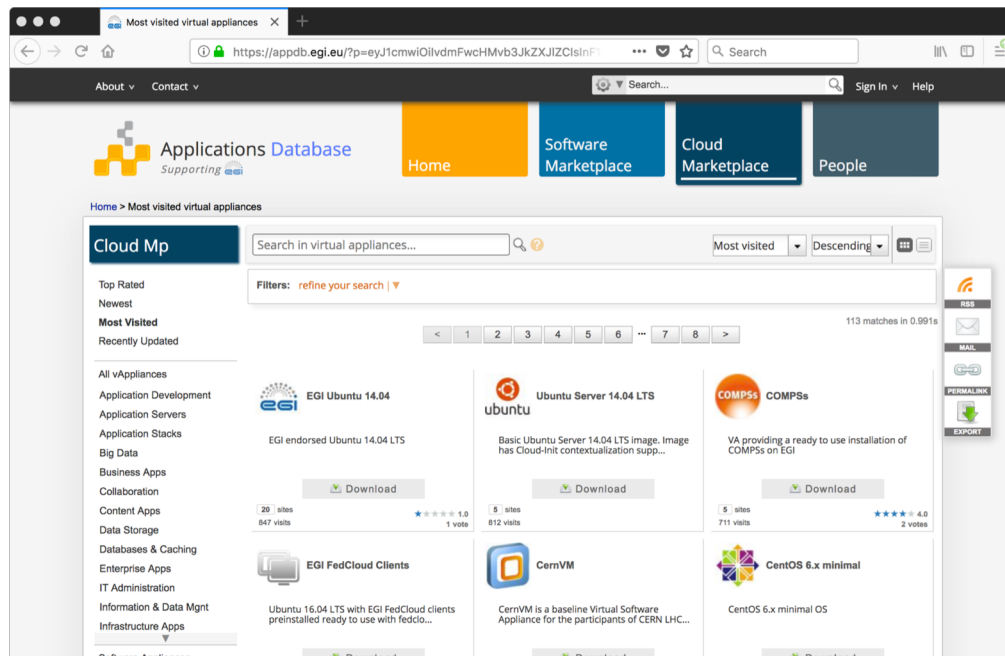
- Friendly UI for managing/testing OpenID Connect/OAuth 2.0 clients
- Provides overview of OpenID Connect/OAuth 2.0 services authorised to access their identity
- Allows users to see the specific permissions (e.g. read email, offline access, etc.) granted to each service
- Enables users to manage access/refresh tokens associated with each service:
 - Revoke access for individual tokens or service as a whole
 - Retrieve access/refresh tokens to be used for federated access to CLI tools/APIs
- Multipath delegation via OAuth 2.0 Token Exchange
 - Support for attenuation of rights/scopes

- Collect, aggregate and display usage information across the whole federation.
- Query native APIs to produce and send accounting records
- Accounting portal for visualization



- Health monitoring of services
 - Automatic discovery of endpoints
- Calculates A/R metrics for SLA/OLAs
- Powered by EGI ARGO
 - <https://argoeu.github.io/>





Registry for virtual appliances (VA)

- ✓ a logical container of versioned image file & metadata bundles

Registry for software appliances (SA)

- ✓ a logical container of VA versions & contextualization scripts bundles

VA distribution medium

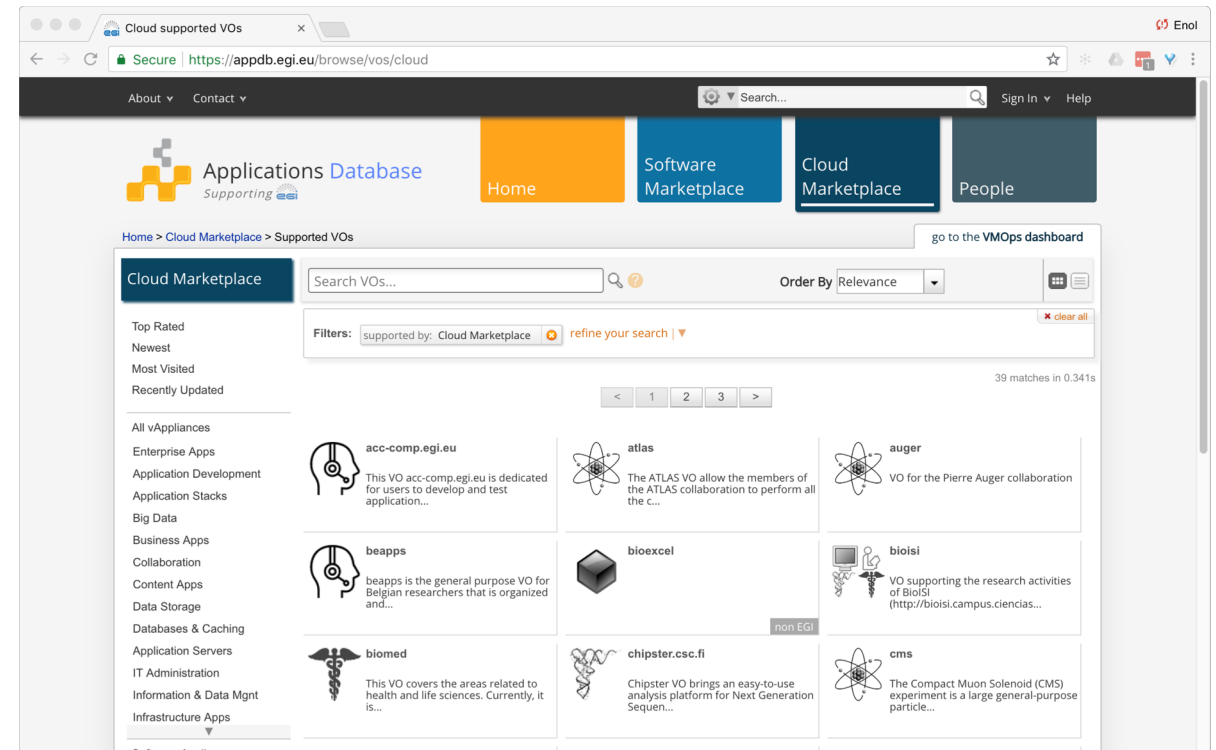
- ✓ distributing endorsed VAs to the resource providers/sites

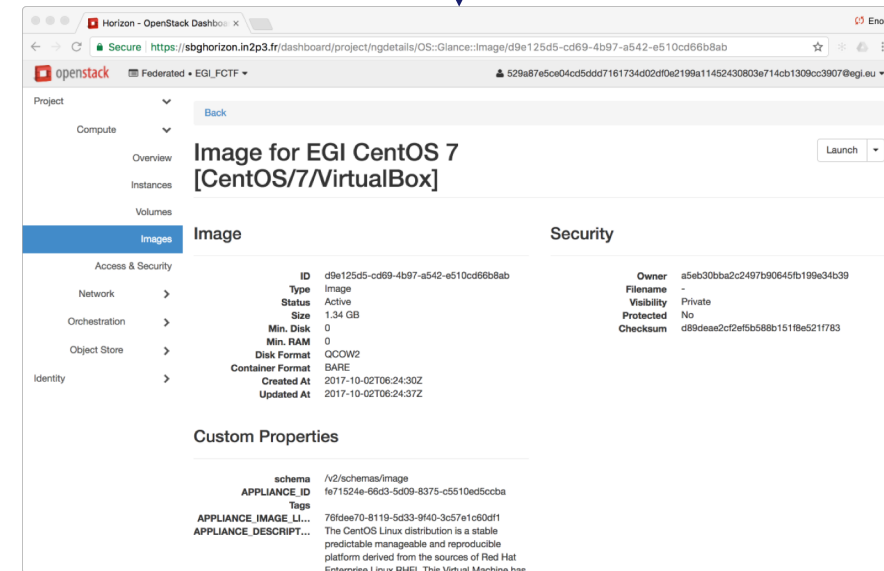
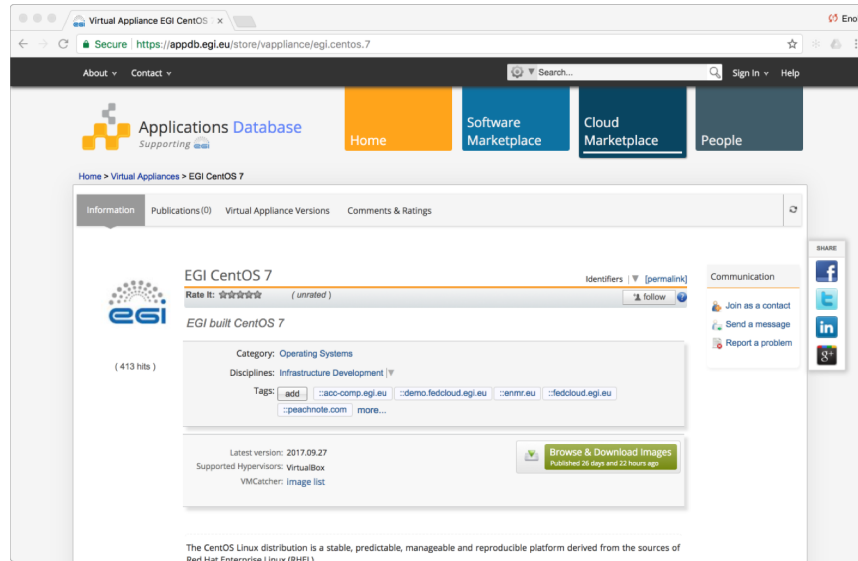
Resource providers catalogue

- ✓ list of the VAs which are available by each site/resource provider

Virtual Organizations (VO) catalogue

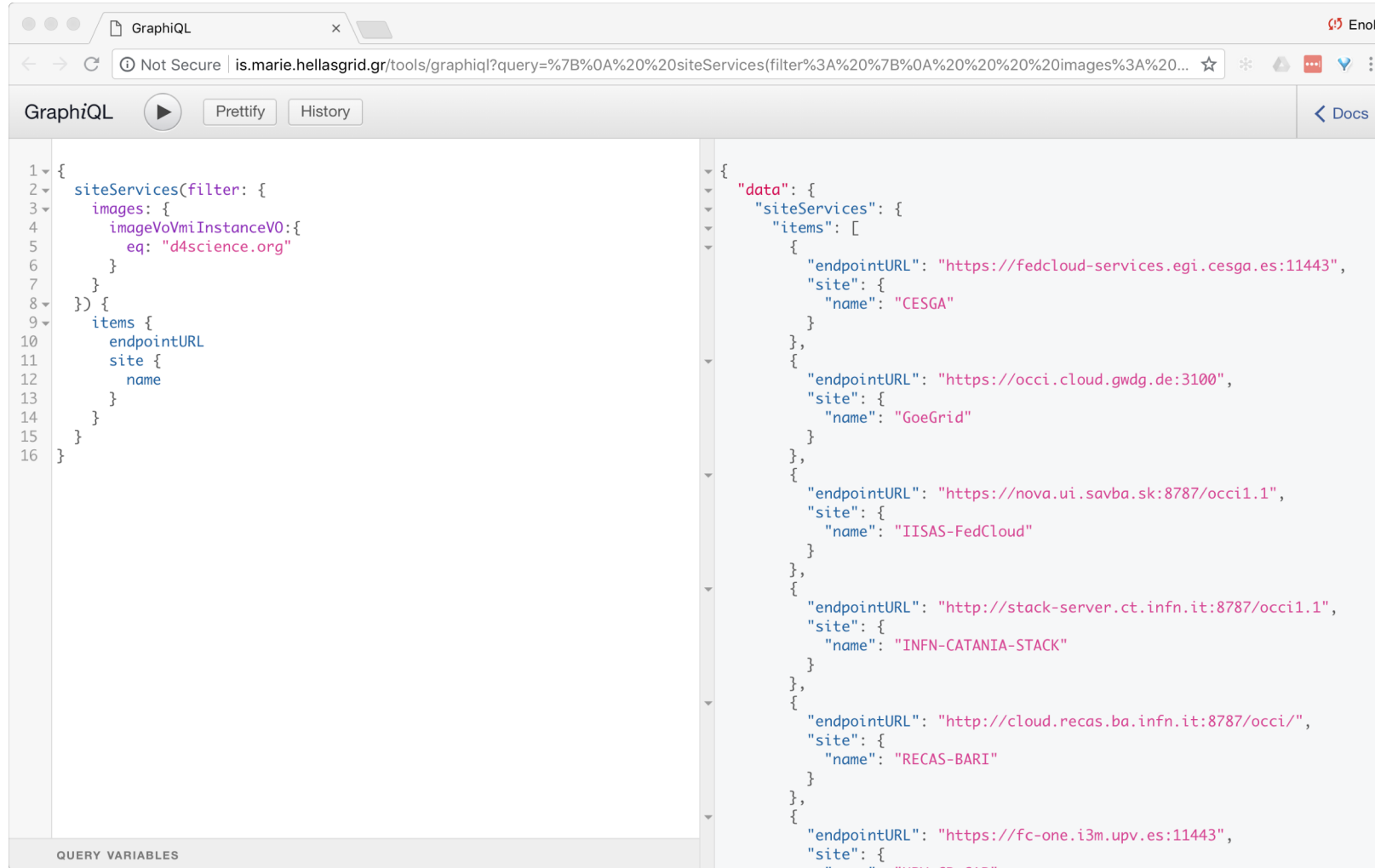
- ✓ list of the VAs which are available for each VO member





cloudkeeper ensures:

- Integrity of images
- Conversion to appropriate formats
- Correct metadata info at the cloud provider



The screenshot shows a GraphQL IDE interface. The left pane contains a query, and the right pane shows the resulting JSON data. The query filters site services by the imageVoVmInstanceVO field with the value 'd4science.org' and requests the endpointURL and site name for each item.

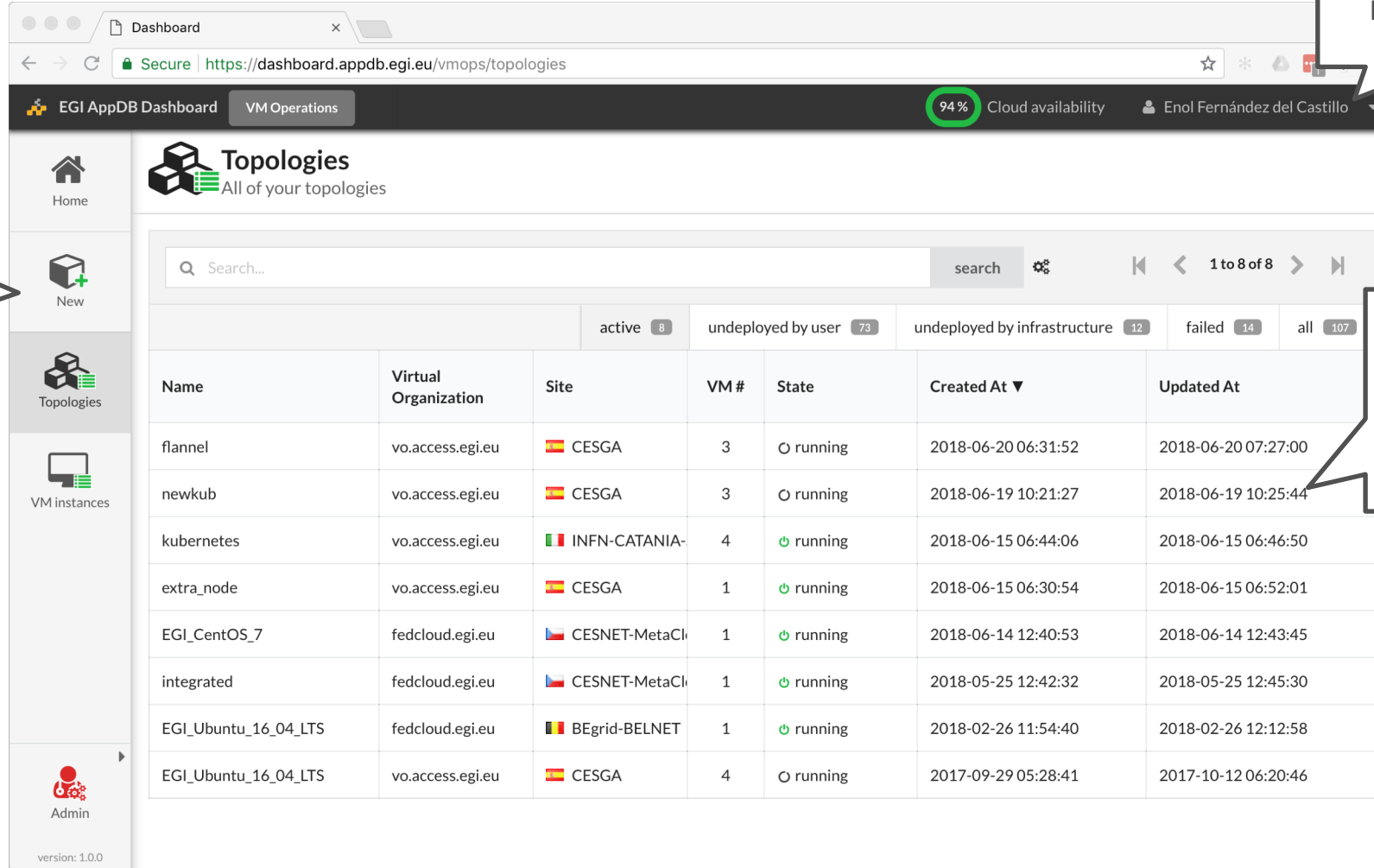
```
1 {
2   siteServices(filter: {
3     images: {
4       imageVoVmInstanceVO: {
5         eq: "d4science.org"
6       }
7     }
8   }) {
9     items {
10      endpointURL
11      site {
12        name
13      }
14    }
15  }
16 }
```

```
{
  "data": {
    "siteServices": {
      "items": [
        {
          "endpointURL": "https://fedcloud-services.egi.cesga.es:11443",
          "site": {
            "name": "CESGA"
          }
        },
        {
          "endpointURL": "https://occi.cloud.gwdg.de:3100",
          "site": {
            "name": "GoeGrid"
          }
        },
        {
          "endpointURL": "https://nova.ui.savba.sk:8787/occi1.1",
          "site": {
            "name": "IISAS-FedCloud"
          }
        },
        {
          "endpointURL": "http://stack-server.ct.infn.it:8787/occi1.1",
          "site": {
            "name": "INFN-CATANIA-STACK"
          }
        },
        {
          "endpointURL": "http://cloud.recas.ba.infn.it:8787/occi/",
          "site": {
            "name": "RECAS-BARI"
          }
        },
        {
          "endpointURL": "https://fc-one.i3m.upv.es:11443",
          "site": {
            "name": "FC-ONE"
          }
        }
      ]
    }
  }
}
```

QUERY VARIABLES

Complete
Check-in
integration

Wizard-like
creation of
VMs



EGI AppDB Dashboard VM Operations 94% Cloud availability Enol Fernández del Castillo

Topologies

All of your topologies

Search... search 1 to 8 of 8

active 8 | undeplied by user 73 | undeplied by infrastructure 12 | failed 14 | all 107

Name	Virtual Organization	Site	VM #	State	Created At	Updated At
flannel	vo.access.egi.eu	ESG CESGA	3	running	2018-06-20 06:31:52	2018-06-20 07:27:00
newkub	vo.access.egi.eu	ESG CESGA	3	running	2018-06-19 10:21:27	2018-06-19 10:25:44
kubernetes	vo.access.egi.eu	INFN-CATANIA	4	running	2018-06-15 06:44:06	2018-06-15 06:46:50
extra_node	vo.access.egi.eu	ESG CESGA	1	running	2018-06-15 06:30:54	2018-06-15 06:52:01
EGI_CentOS_7	fedcloud.egi.eu	CESNET-MetaCl	1	running	2018-06-14 12:40:53	2018-06-14 12:43:45
integrated	fedcloud.egi.eu	CESNET-MetaCl	1	running	2018-05-25 12:42:32	2018-05-25 12:45:30
EGI_Ubuntu_16_04_LTS	fedcloud.egi.eu	BEGrid-BELNET	1	running	2018-02-26 11:54:40	2018-02-26 12:12:58
EGI_Ubuntu_16_04_LTS	vo.access.egi.eu	ESG CESGA	4	running	2017-09-29 05:28:41	2017-10-12 06:20:46

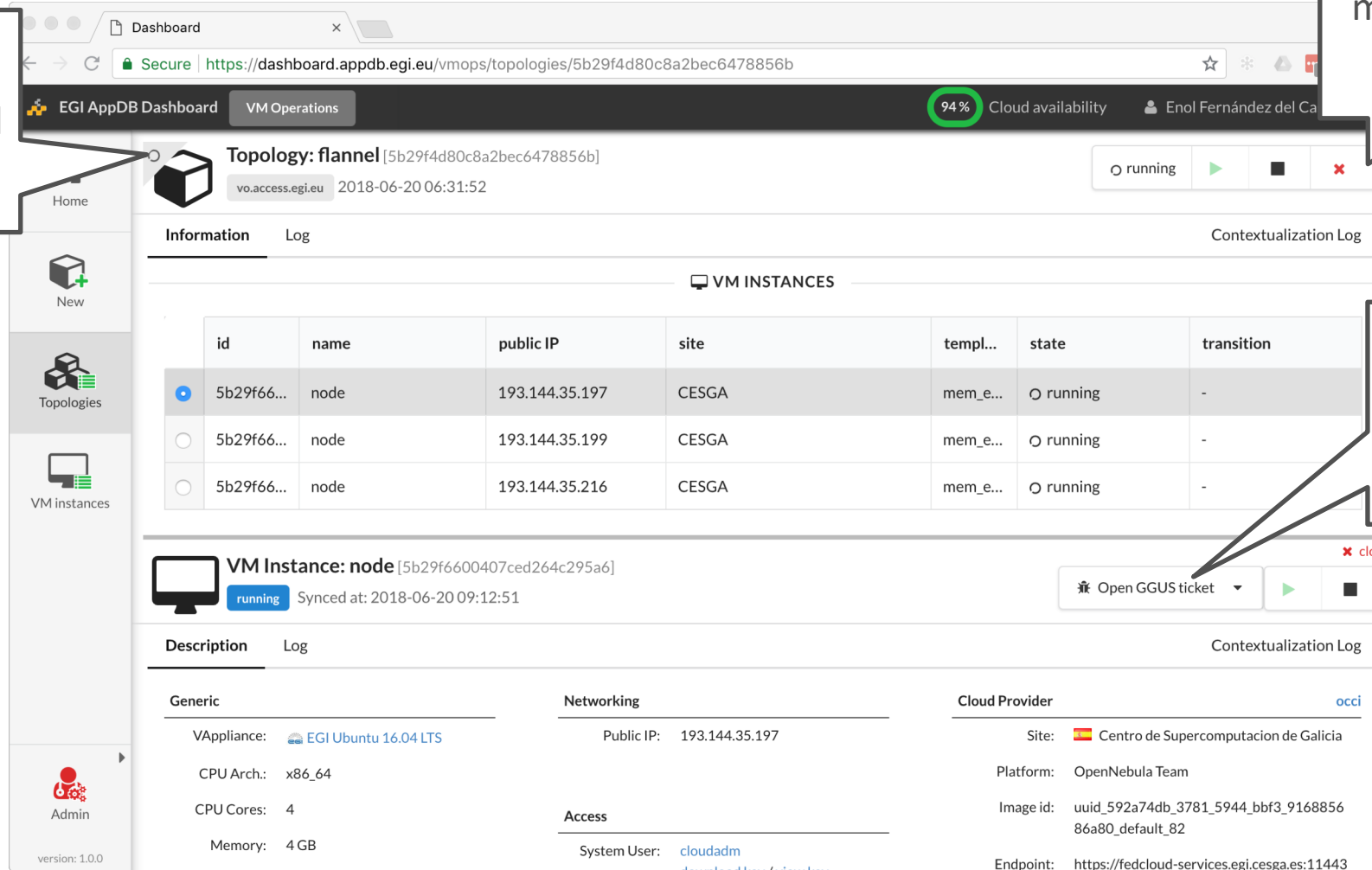
version: 1.0.0

Single
dashboard for
all providers



Topologies are a set of related VMs

Global management of VMs



The screenshot shows the EGI AppDB VM Operations dashboard. At the top, there's a navigation bar with 'EGI AppDB Dashboard' and 'VM Operations' tabs. A '94%' Cloud availability indicator is visible. The main content area displays a topology named 'flannel' with three VM instances. Below the instances table, a detailed view of a 'VM Instance: node' is shown, including its description, networking, and cloud provider information.

id	name	public IP	site	templ...	state	transition
5b29f66...	node	193.144.35.197	CESGA	mem_e...	running	-
5b29f66...	node	193.144.35.199	CESGA	mem_e...	running	-
5b29f66...	node	193.144.35.216	CESGA	mem_e...	running	-

Generic	Networking	Cloud Provider
VApliance: EGI Ubuntu 16.04 LTS CPU Arch.: x86_64 CPU Cores: 4 Memory: 4 GB	Public IP: 193.144.35.197 System User: cloudadm	Site: Centro de Supercomputacion de Galicia Platform: OpenNebula Team Image id: uuid_592a74db_3781_5944_bbf3_9168856_86a80_default_82 Endpoint: https://fedcloud-services.egi.cesga.es:11443

GGUS integration

Individual management of VMs



- EGI Federated Cloud no longer mandates a single API for every provider
 - OCCl still widely supported but sites are moving native APIs (mainly OpenStack!)
- Tools to deal with heterogeneity:
 - IaaS orchestration tools with support for multiple APIs:
 - Infrastructure Manager, Terraform, OCCOPUS, ...
 - https://wiki.egi.eu/wiki/Federated_Cloud_IaaS_Orchestration
 - IaaS libraries with support for multiple APIs:
 - libcloud, jclouds,...
 - See guide on migrating from OCCl to IM on EGI's wiki:
https://wiki.egi.eu/wiki/Federated_Cloud_OCCl_to_IM_Migration

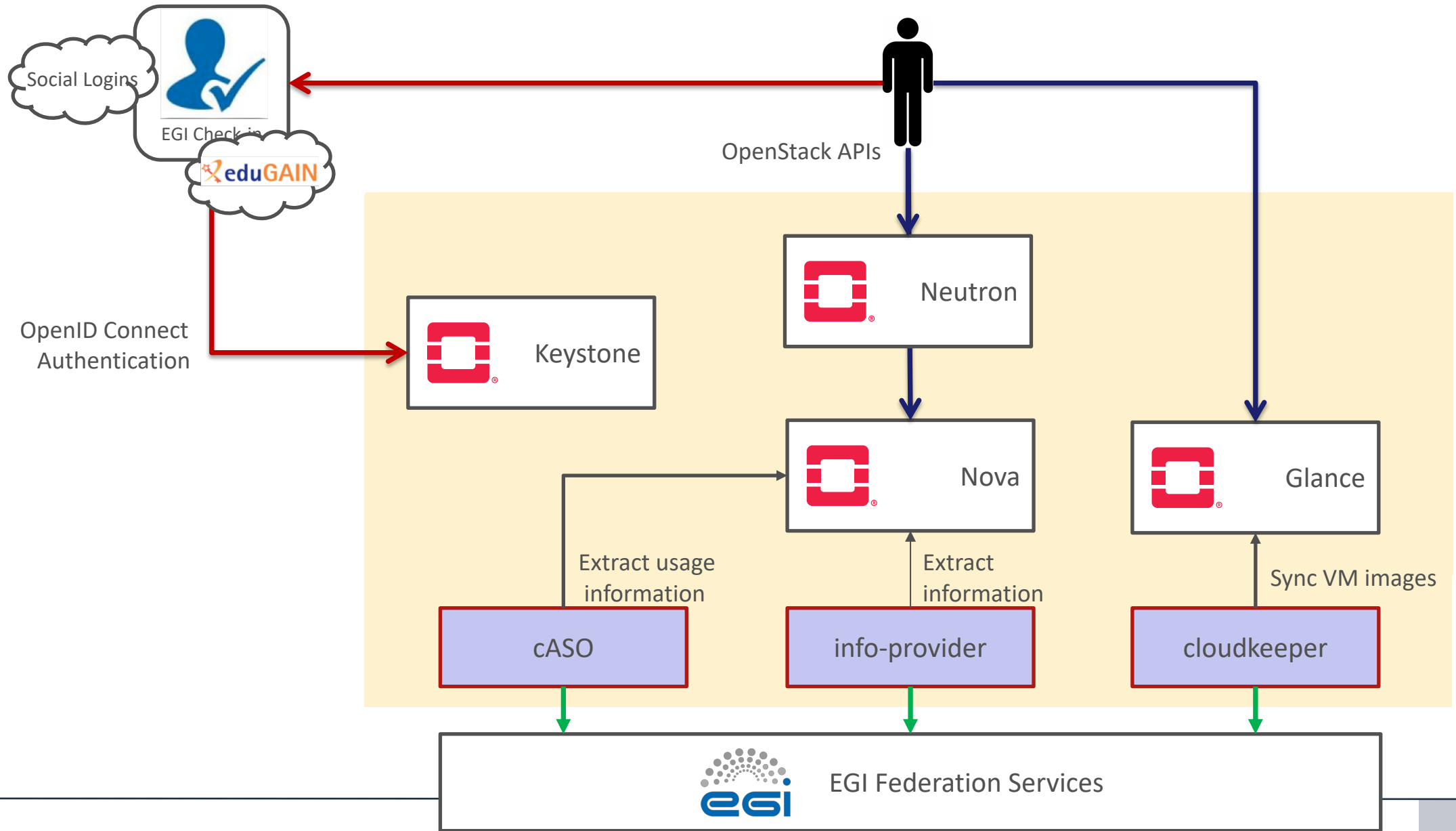
- **Providers keep complete control on their resources**

- Enable access to a Virtual Organisation into local projects with EGI credentials, SLA based → **Integration with EGI Check-in**
- **Operate the set of extra components** using (OpenStack) APIs to retrieve provider information and make it available to EGI services

- **No (major) changes in operational activities**

- Provide support through EGI channels
- Comply with the operational and security procedures. These are based on best practices and common requirements
- Most well-operated providers already have these activities in place, so the additional task for a site manager is to acknowledge to EGI that the task has been performed.

EOSC-hub In progress: catch-all operations



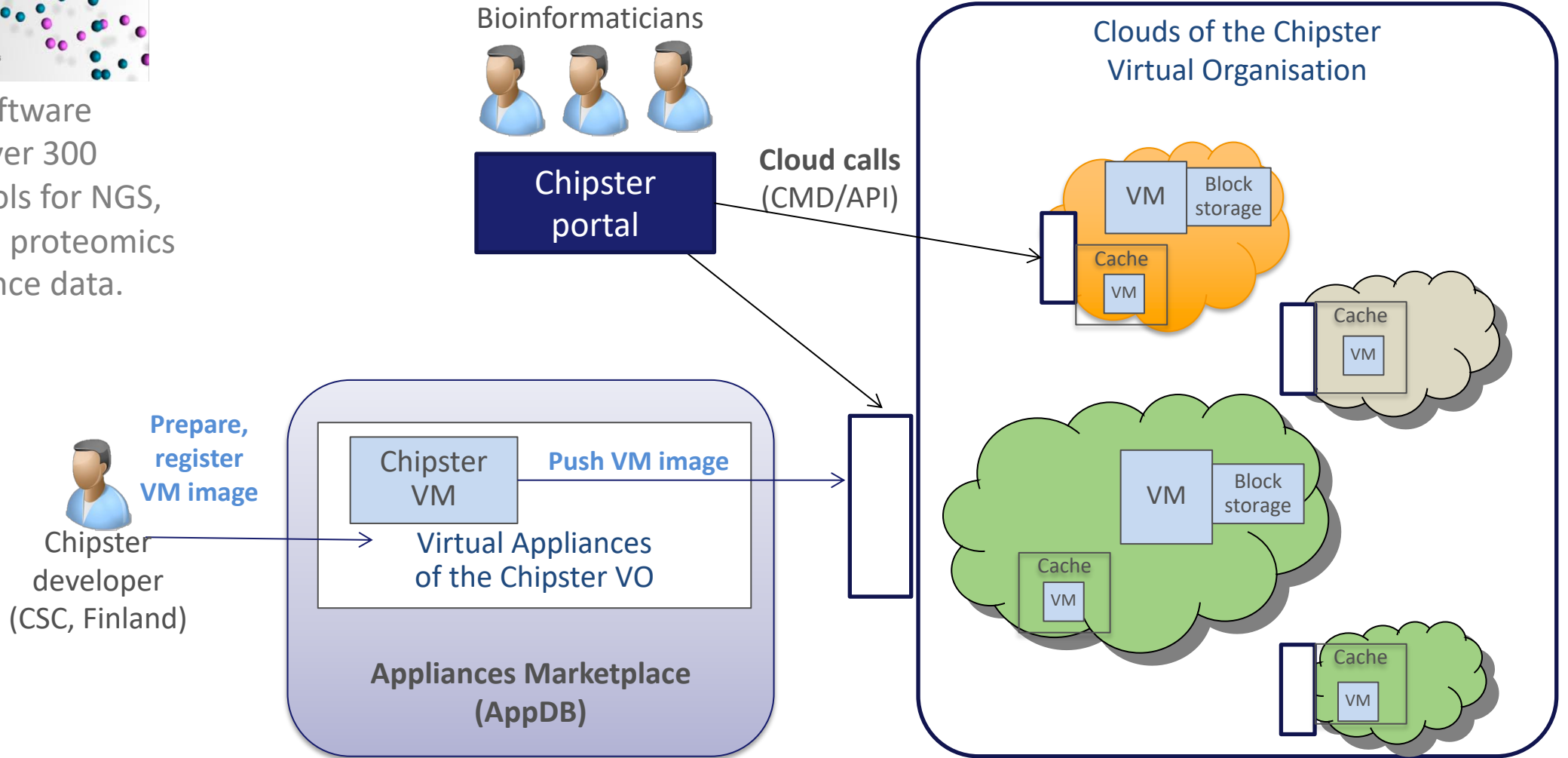


Building on top of EGI Cloud

[Read more...](#)



Analysis software contains over 300 analysis tools for NGS, microarray, proteomics and sequence data.



NBIS: Scalable bioinformatics web-servers powered by cloud computing

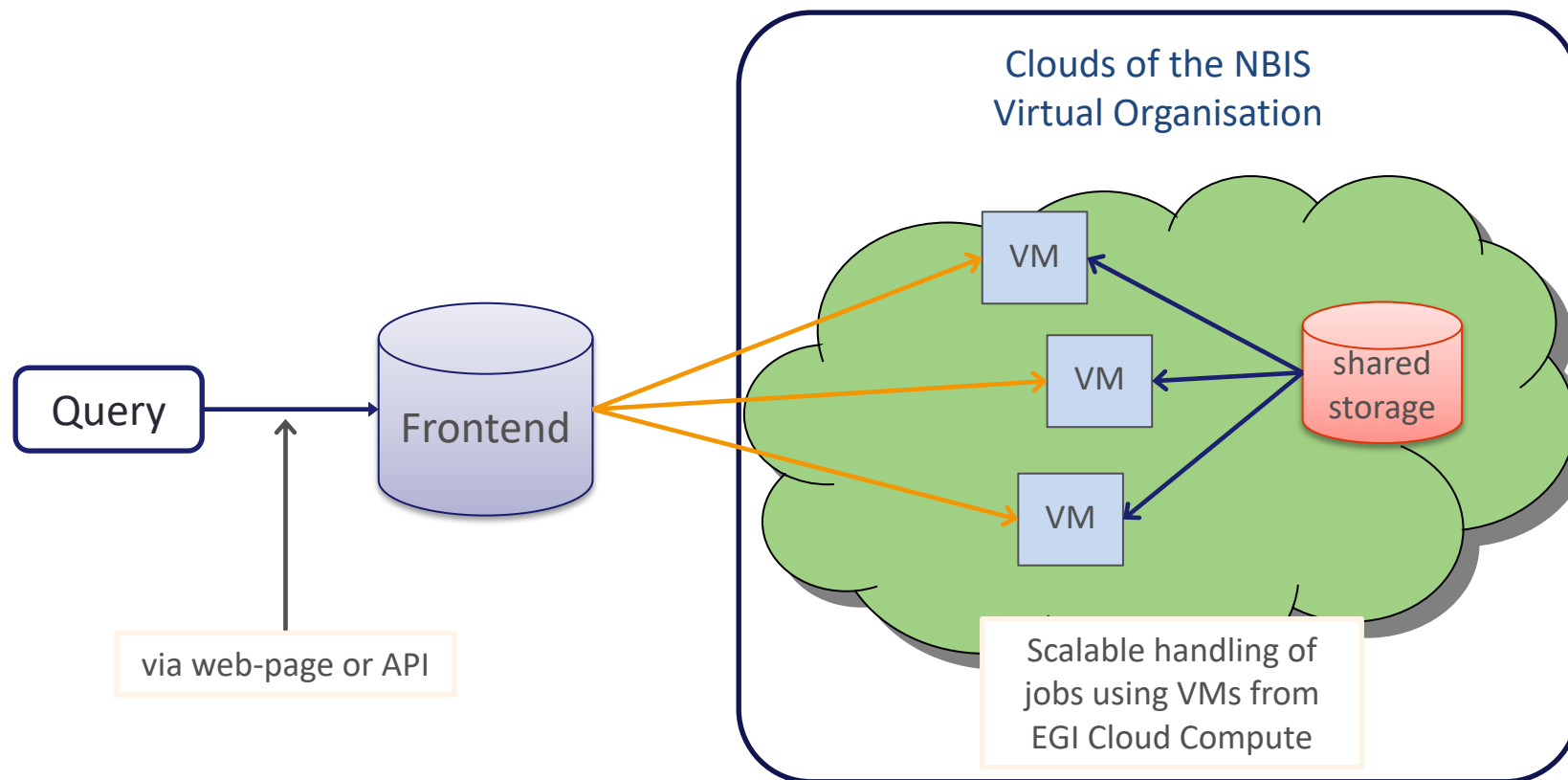


A distributed Swedish research infrastructure providing bioinformatics support to life science researchers.

NBIS Servers powered by EGI:

- Pcons.net
- TOPCONS
- SCAMPI2
- ProQ3
- PconsC2/PconsC3
- BOCTOPUS2

[Read more...](#)



[Read more...](#)



Cloud platform developed and operated by Terradue. It provides a rich set of ready to use EO Data processing services for geohazards analysis and monitoring.

EGI Cloud Compute contributes resources to run near real-time processing of satellite data acquisitions.

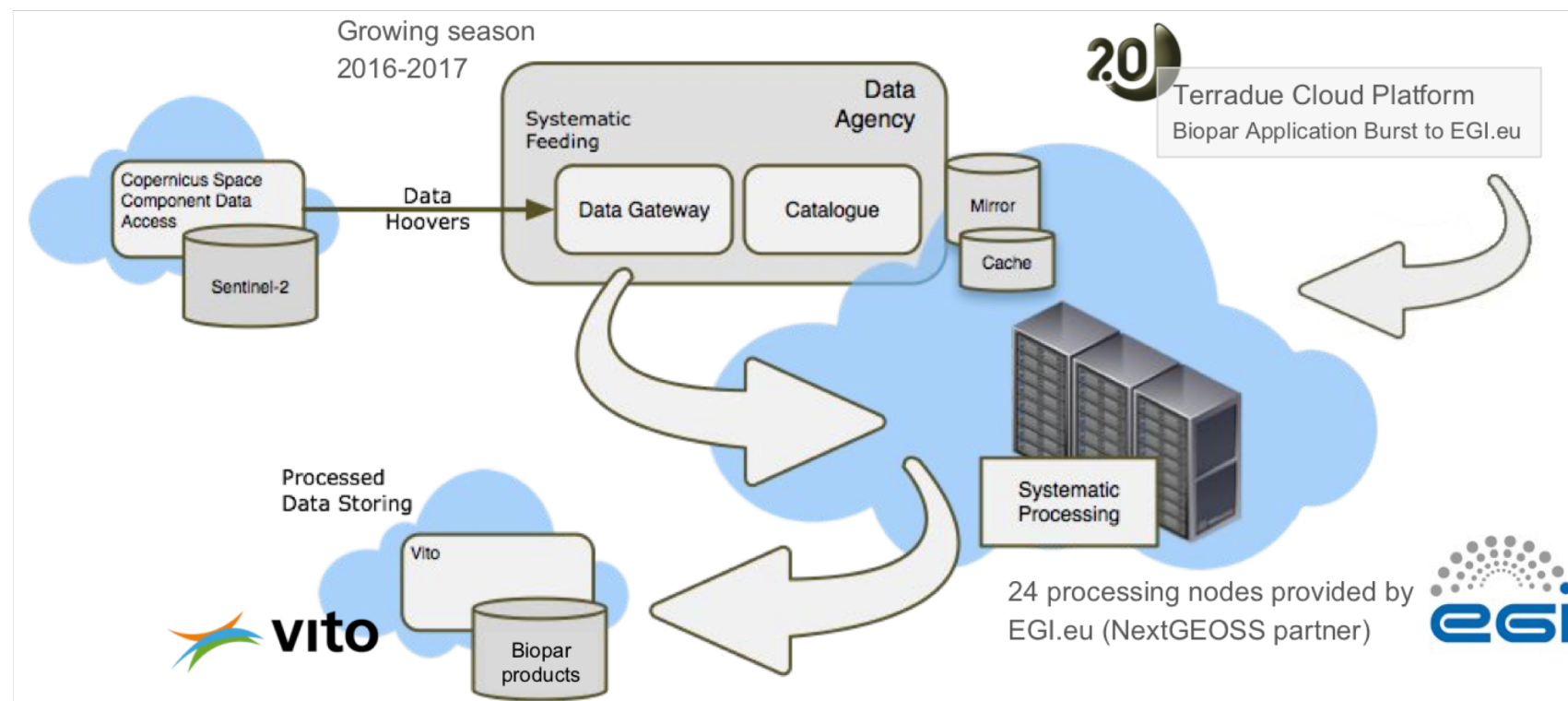
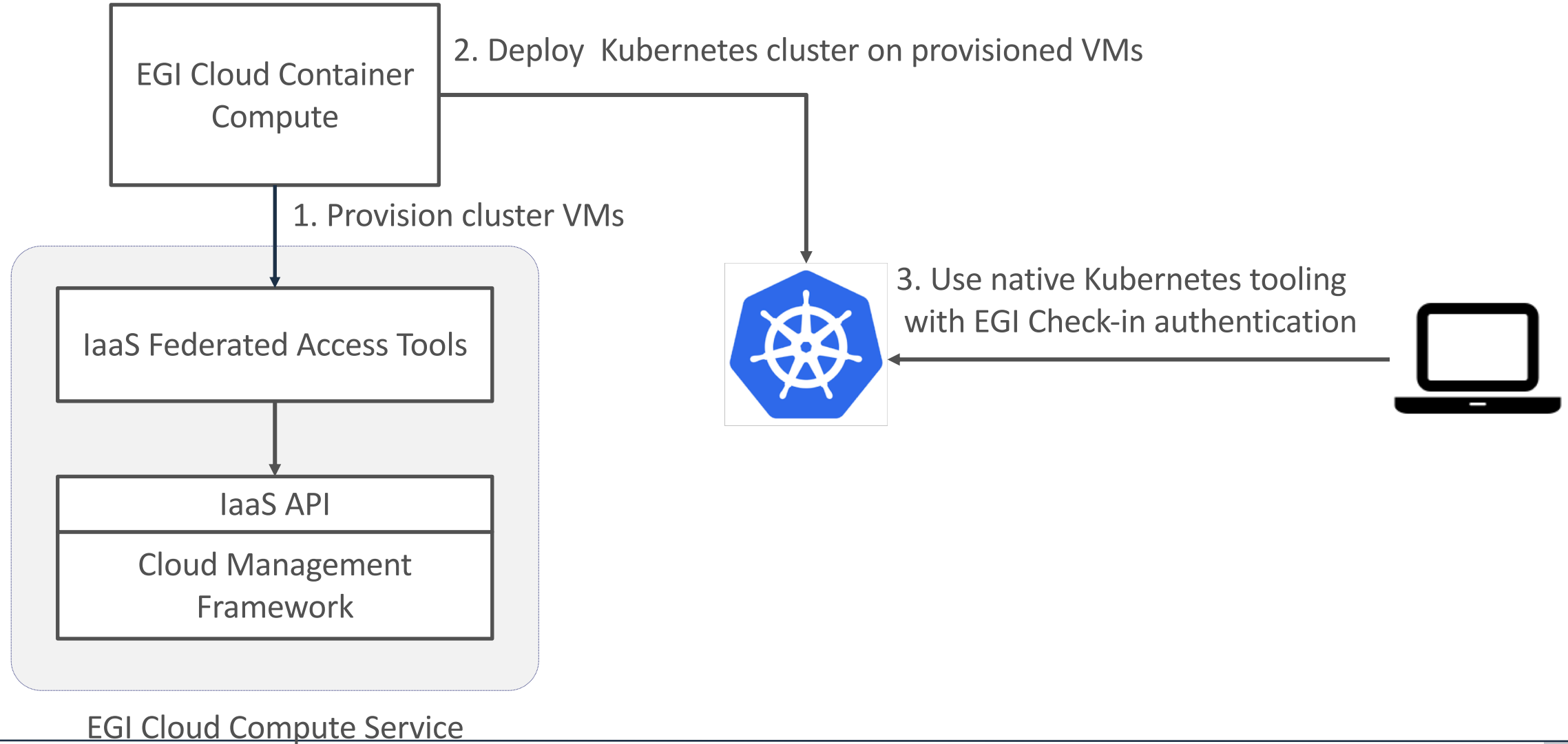
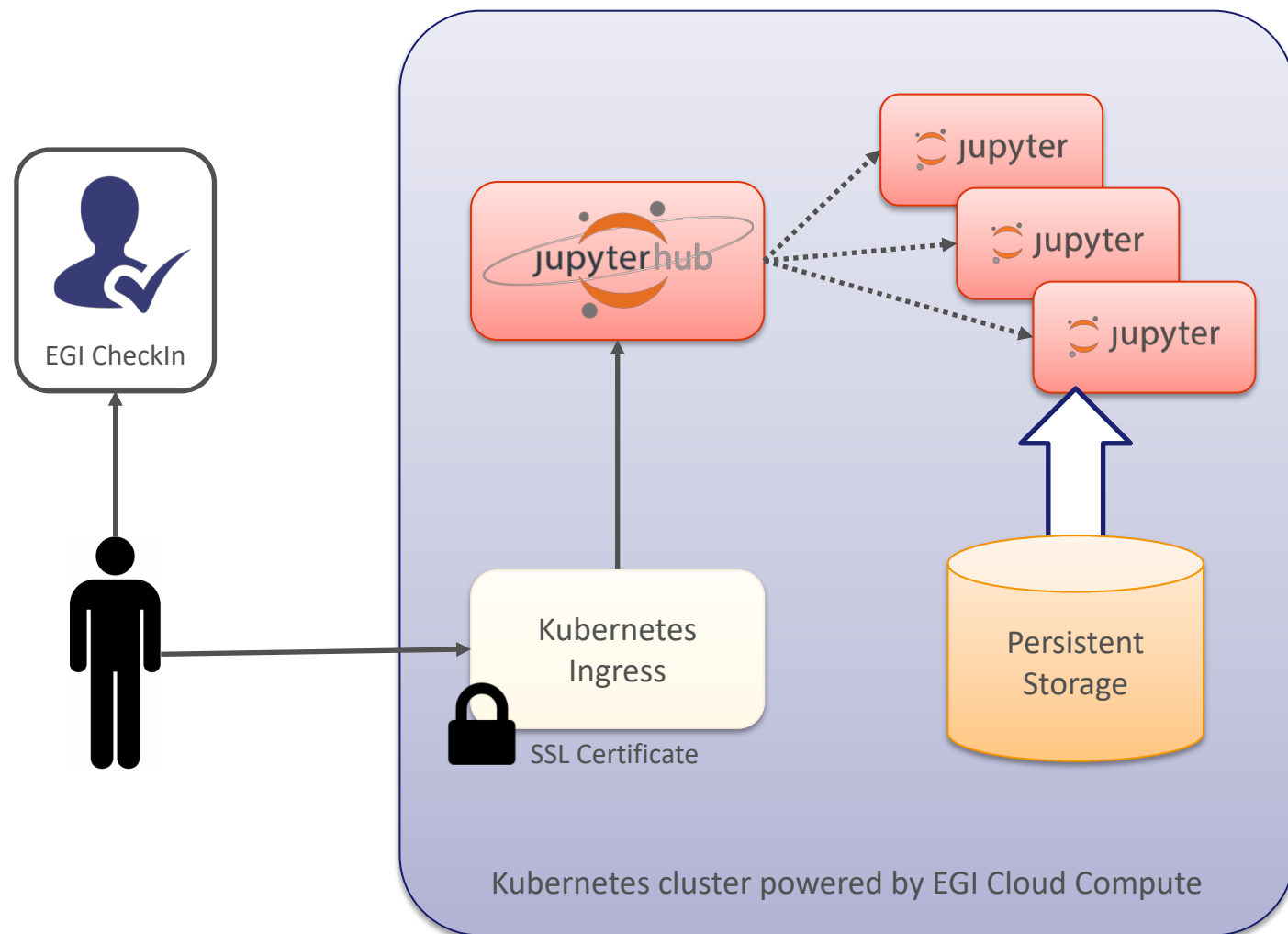


Image taken from slides at <https://indico.egi.eu/indico/event/3455/session/13/contribution/84>



- Run Jupyter notebooks from your browser, access with EGI Check-in
 - Interactive computing
 - Access to other EGI services
- Relies on Kubernetes running on EGI Cloud



- EGI Cloud is a research-oriented IaaS federation
 - Single Sign-On + common VM catalogue
 - Easy for providers to support international communities while keeping control
- Federation tools ready to be used and adapted to your needs
 - Check-in
 - AppDB + cloudkeeper
 - Accounting
 - A/R Monitoring



EOSC-hub

Upcoming events

EGI CONFERENCE 2019



6 - 8 May
Amsterdam, Netherlands



www.egi.eu



 **EOSC-hub**
Week 2019

10-12 April 2019
Prague, Czech Republic

REGISTER NOW!

**Thank you
for your attention!**

Questions?



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