



EOSC Compute Platform

Status and Way Forward

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EOSC Symposium - 14-17 November 2022, Prague



EGI-ACE receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 101017567.

Outline of this session



- **Project overview**
 - Smitesh Jain, Innovation Management Specialist, EGI Foundation
- **User engagement and impact**
 - Giuseppe La Rocca, Community Support Lead, EGI Foundation
- **User experience stories:**
 - *Building a Climate indices dataset for climate change impacts assessment*
 - Chrisitan Pagé Research Engineer and Project Management, CERFACS
 - *Bring-your-own-resources: How the NEANIAS project became compatible with EGI computing services and introduced a new resource utilization approach*
 - Jozsef Kovacs, Senior Research Fellow, SZTAKI
- **HPC services in the EOSC Compute Platform**
 - Hakan Bayındır, Senior Researcher, TUBITAK ULAKBIM



HPC services in the EOSC Compute Platform

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Task 7.3 - HPC integration in EGI-ACE

Objective: *Provide interoperability guidelines for HPC systems with the EOSC Compute Platform delivered by EGI-ACE*

Explore the usage and integration of HPC guided by 4 scientific pilot use cases with combined cloud and HPC needs, focusing on the areas of:

1. **Access federation:** Federated Authentication and Authorization
2. **Application federation:** Portable execution of container-based workloads
3. **Data federation:** Data transfers between systems
4. **Operation federation:** Presence in EOSC Portal, A/R monitoring, Usage accounting, Resource allocation, CRM...

- **ELI-NP (IFIN-HH)**: deployment of HPC-capable systems on IaaS clouds (HPC as a Service)
- **HEP (CERN)**: benchmarking, data transfer and execution of codes using federated authentication
- **ENES (CMCC)**: execution of container-based climate data analytics and visualization jobs on HPC
- **PROMINENCE (UKAEA)**: facilitate running containerised workflows on HPC resources from the PROMINENCE service

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Who we are, what we do?

- **National Research Network:** Operator and administrator of nationwide academic research network.
- **National HPC Center:** 25K Cores, 216 GPUs (P100, V100, A100), 14PB of storage, 4000+ users with ~350 active users any given time.
- **EGI-ACE Participant:** TR-FC1-ULAKBIM Federated Cloud site, with integrated pilot HPC site. SSH-OIDC testing & feedback.
- **Long Term Project Partner:** Participating in the ecosystem since SEE-GRID (2005).

Integration Scenarios

1. HPC as a Service

Build elastic virtual HPC clusters on demand, with access to specialized hardware (e.g. infiniband). Integration as part of the EGI Cloud

2. Access via ssh + federated identity

Enable use of OpenID Connect to access ssh login nodes of HPC systems + integration of accounting and monitoring

3. HTC middleware/Gateways

Reuse HTC middleware so HPC systems can be integrated into existing research workloads.

HPC as a Service

Use existing cloud APIs to create virtual infrastructures with HPC Capabilities

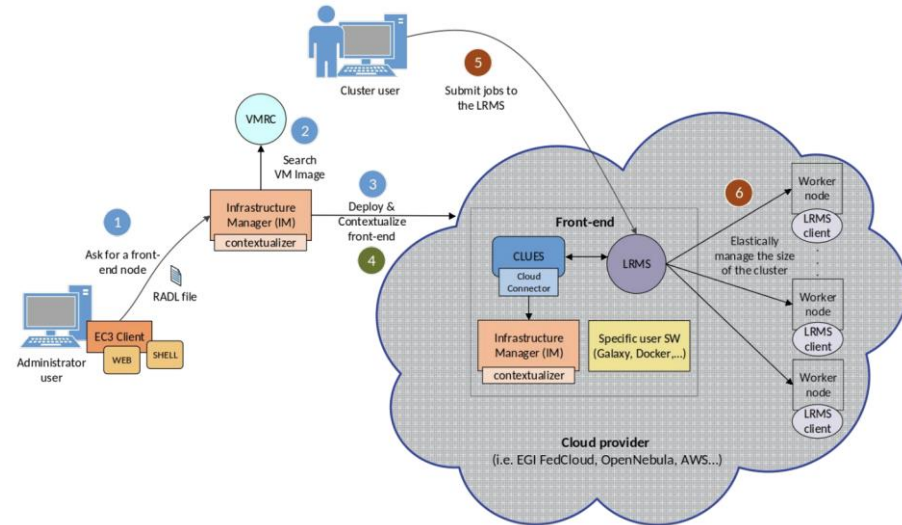
- PCI Passthrough for specialised hardware like GPU and infiniband
- Tools developed for proper configuration of devices at nodes

Deploy elastic clusters with EC3

- SLURM + shared filesystem
- Automatic elasticity of worker nodes based on load (e.g. number of pending jobs)

Ideal for testing & development, training environments

Fine tuning requires expertise!



EC3 <https://servproject.i3m.upv.es/ec3/>

Access via SSH + federated identity

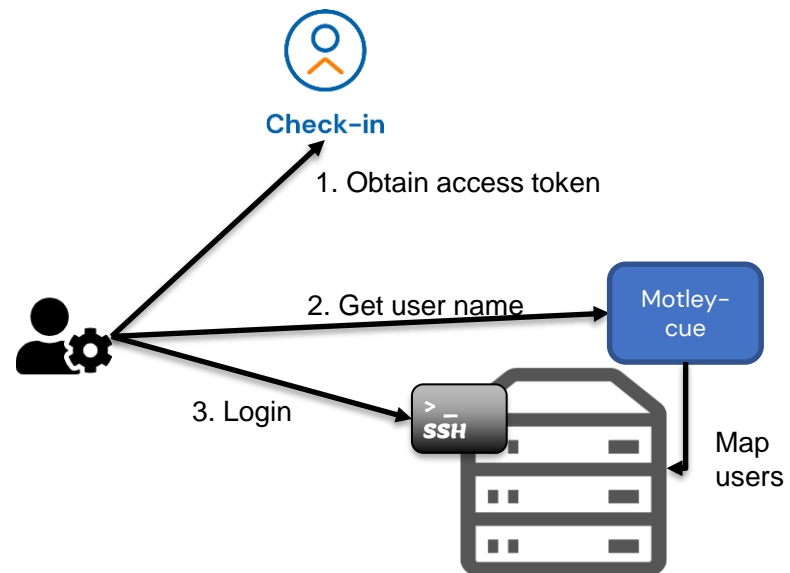
ssh-oidc: use ssh with OIDC access tokens

- Login to HPC (and VMs) with existing AAI
- Don't modify ssh or sshd
- Architecture discussed (and approved) by security experts

Straightforward authorisation model

- Allow members of supported Virtual or individual users
- Automatic user creation available
- VOs are mapped to Unix Groups

No need for user passwords or ssh keys

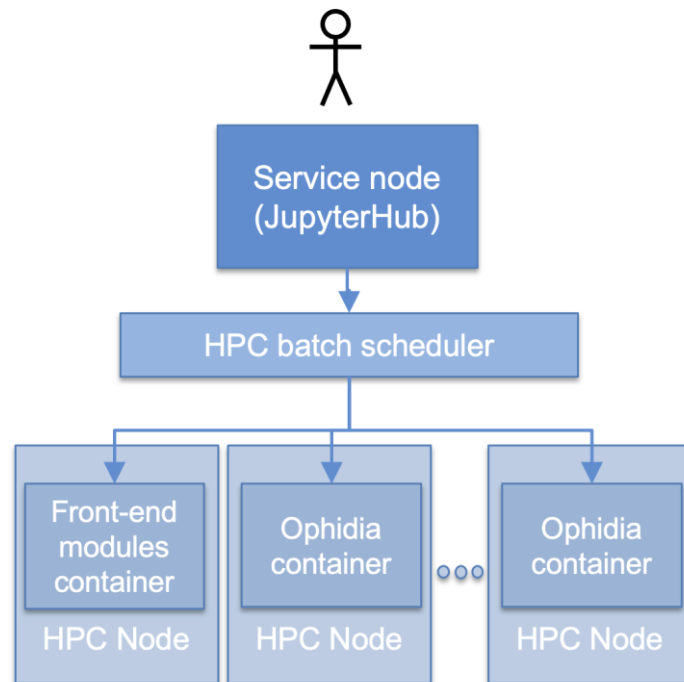


<https://github.com/EOSC-synergy/ssh-oidc>

ENES HPC pilot

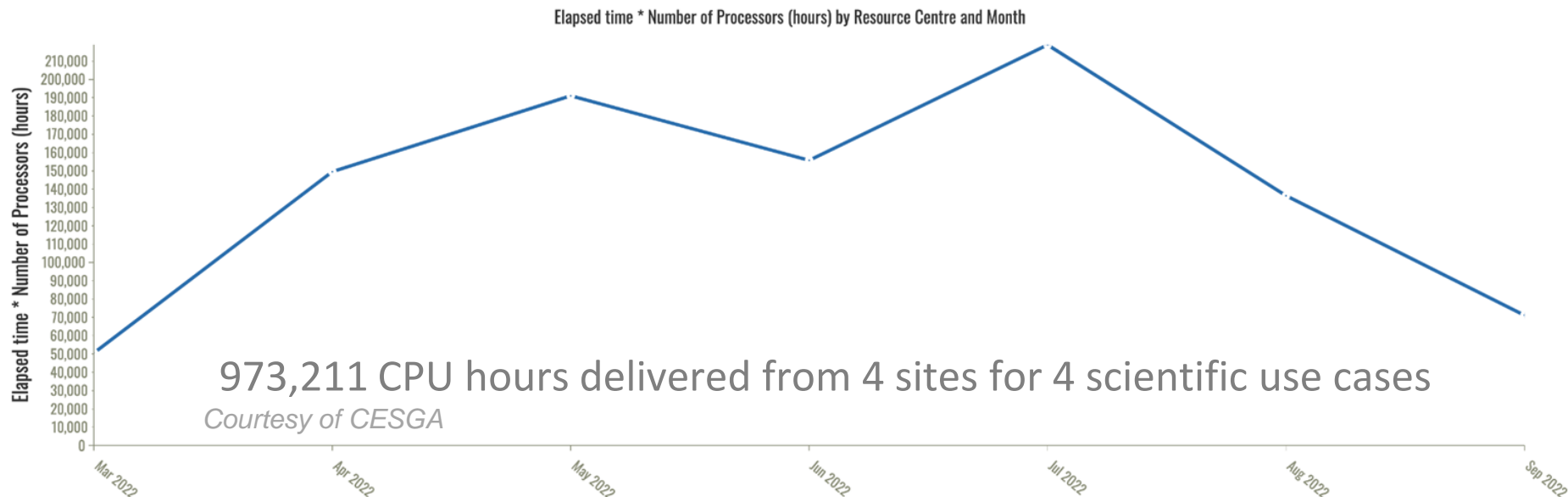
Portability on HPC infrastructures

- The **ENES HPC pilot** aims to address services and usage scenarios relevant to the **European Network for Earth System modelling** (ENES) community
- Use of **containers** as a layer to enhance **HPDA applications** portability and usage across different infrastructures:
 - **easy** and **transparent** portability and deployment of the Ophidia framework on **HPC** (Singularity and udocker) and **Cloud** (Docker)
 - ready-to-use **integration** of the framework **computing** components and **high-level** software (PyOphidia, Jupyter, visualization libraries) for user **productivity**
 - execution of container-based **climate data analytics** and **visualization** jobs on **HPC**
- Leading to novel service models: **HPDA as a Service**



Federated HPC resources in EGI

Accounting can be also obtained from HPC resources



HPC Integration handbook:

<https://zenodo.org/record/6968509#.Yv9NZHYzaBI>

EGI Accelerated Cloud



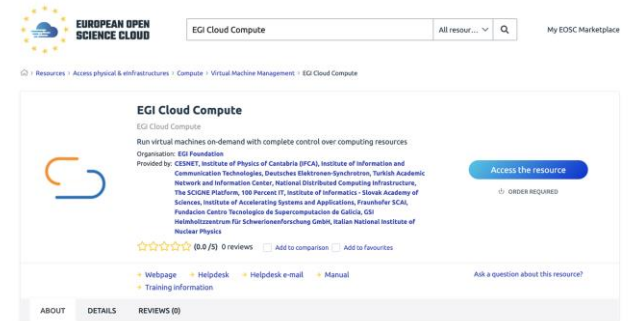
New service offer to be added to the EOSC Portal

Offer access to cloud IaaS infrastructures + HPC

- Hosting long-running services as cloud VM, data transfer using cloud storage, spawning jobs to HPC as needed

4 initial providers:

LIP/INCD (PT), CESGA (ES), TUBITAK (TR), IICT-BAS (BG)



Looking Forward on the Technical Side

What can be done to improve quality of life?

- **Libraries for ease of access:** Wrappers around file operations and job submissions can make life easier.
- **REST API Support:** SLURM has a REST API for job submission. Maybe this can be leveraged for job submission and state check.
- **Crossbar for Global Access:** A thin layer can be developed to allow any FedCloud site to use any HPC accelerator in the federation.

These ideas are just speculations and starting points.

Learn More

Experience of the HPC integration is available as *D7.3 – Final version of the HPC integration handbook*

<https://go.eji.eu/hpc-integration/>

TOC:

- Requirements from pilots
- Access to HPC Systems
- HPC security guidelines
- Operational integration
- Data Transfers
- Application support
- EOSC Marketplace integration



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Communities

August 1, 2022

Project deliverable Open Access

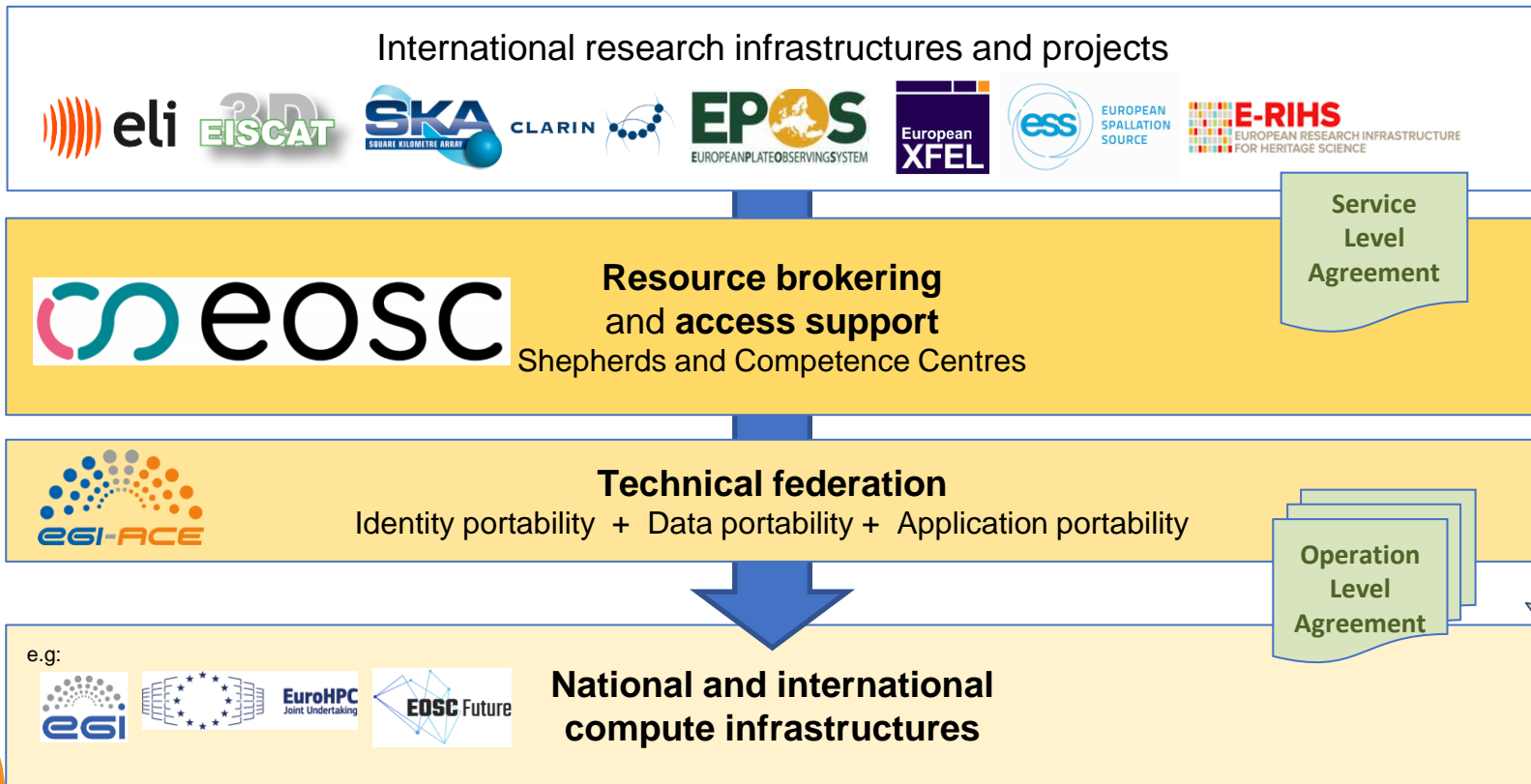
D7.3 Final version HPC integration Handbook

Enol Fernández; Fabrizio Antonio; Hakan Bayindir; Iván Díaz; Mihnea Dulea; Carlos Fernández; Jorge Gomes; Andrew Lahiff; David Southwick; Daniele Spiga; Teo Tanin; Gergely Sipos

The HPC integration handbook describes how HPC systems can be incorporated into the EOSC Compute Platform delivered by the EGI-ACE project. This handbook is the result of the piloting activities with use cases and providers supporting workflows that run on combined Cloud, HTC and HPC resources. In this document we detail the integration mechanisms used in the pilots and provide information for providers on how to integrate HPC systems into the EOSC Compute Platform, and for users on how to use these HPC systems via EOSC for running container-based workloads.



Our vision for a 'Collaborative Compute Continuum'



Aligned science and compute priorities



Experiences and the Future of the EOSC Compute Platform

Smitesh Jain, Innovation Management Specialist, EGI Foundation

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Thank you!

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