

The EGI Federated Cloud

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- **Concept of the EGI Federated Cloud: vision**
 - as a technology to build community-clouds
 - as an infrastructure deployed on NGI resources
- **EGI Federated Cloud: state-of-the-art and technologies**
 - VM Management, Appliances Marketplace, Data management, Information discovery, Accounting, Security
- **High level tools with main capabilities (PaaS, SaaS)**
- **Typical setups and use cases - through examples**
 - Usage Models: deployment of services, heavy computation, heavy memory applications, big data, etc.
- **Plans, next steps**
- **User support**
- **Next steps to become an user**

Concept of the EGI FedCloud Vision

Growth of Providers

- **High Throughput Platform:** academic resource providers
- **Federated Cloud Platform:** diversity of resource providers

Growth of Research Communities



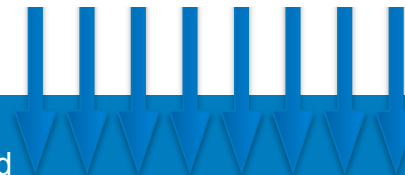
**Tens of
1000's**

Few related use cases
Single application model



Millions

Many diverse use cases
& application models



The EGI Federated Cloud is federation of institutional private Clouds, offering Cloud Infrastructure as a Service to scientists in Europe and worldwide.

EGI Federated Cloud is based on:

- **Standards and validation:** federation is based on common **Open-Standards** – OCCI, CDMI, OVF, GLUE, etc...
- **Heterogeneous implementation:** no mandate on the cloud technology, the only condition is to expose the chosen interfaces and services.



The EGI Federated Cloud is **providing access to digital resources on a flexible environment.**

Cloud resources

- Computing intensive experiments
- Data intensive experiments
- Hosting services

Integrated in EGI infra

- AAI & monitoring
- Accounting & information discovery
- Service registry

Standard based

- Heterogeneous implementation
- OCCI, CDMI, GLUE2, OVF, etc.

VM Catalogue

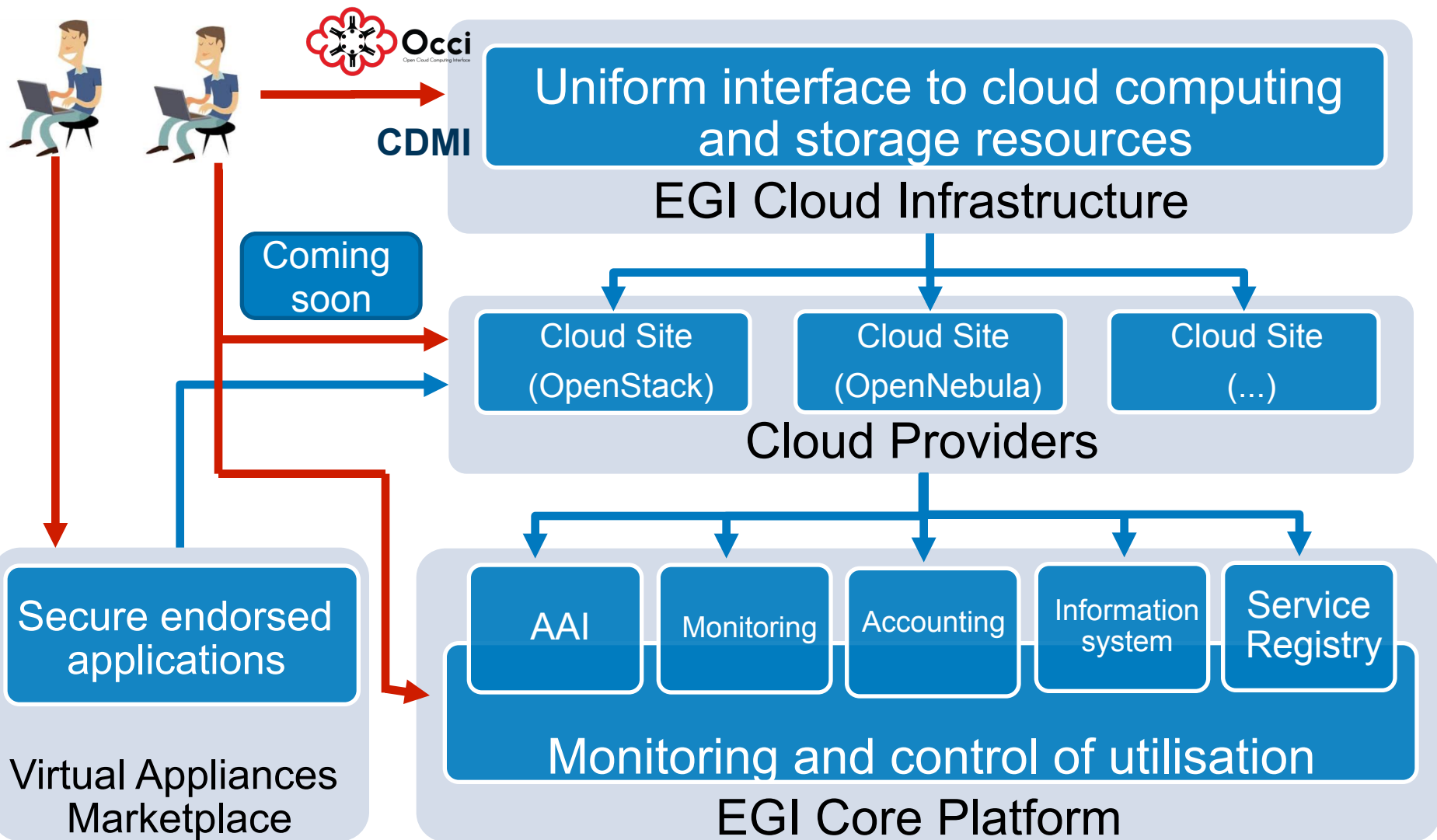
- EGI Certified and Secure endorsed VMs
- Register your VMs
- Re-use public VMs

Single system

- Set of independent cloud services
- Uniform interfaces

Target groups

- Individual researchers
- Larger research communities or groups



Overview of the cloud services

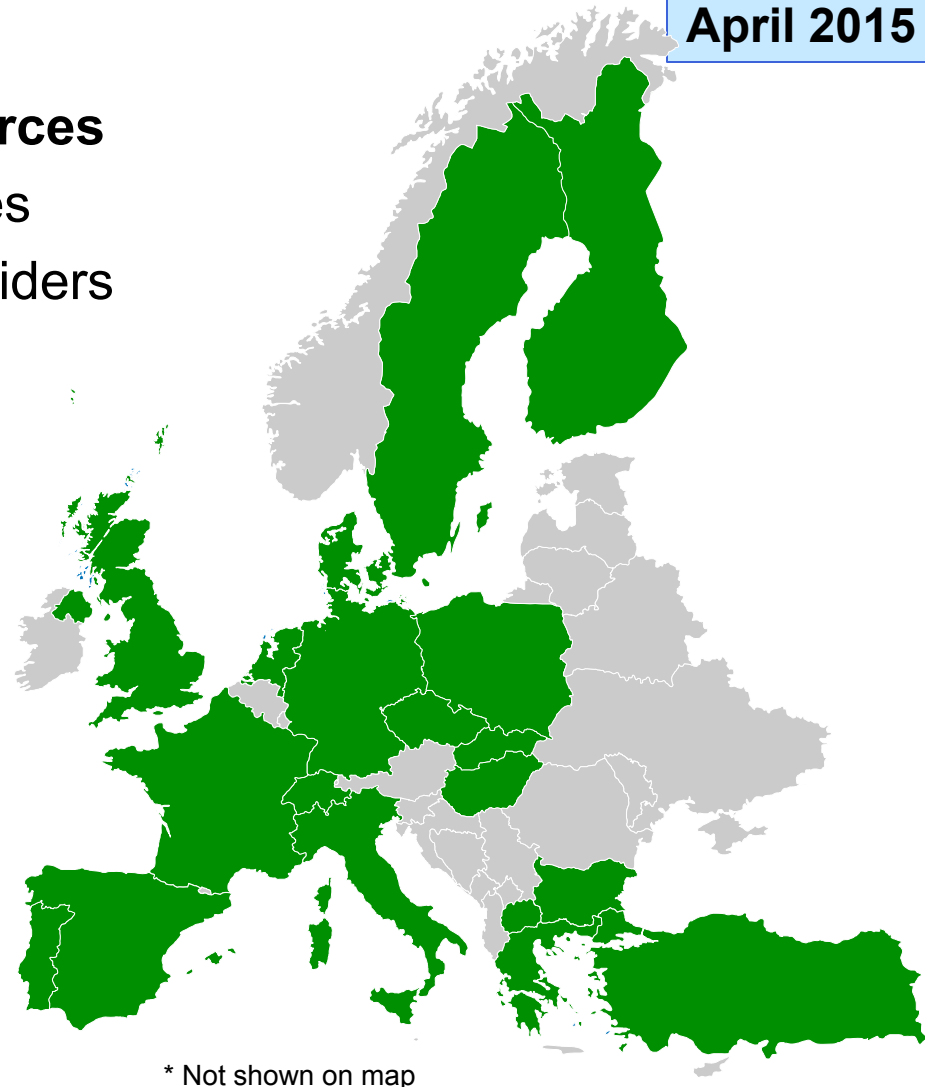
Features/CMFs	OpenStack	OpenNebula	Synnefo	AWS	MS Azure
OCCI Compute Management	Yes	Yes	Yes	Yes	Coming Soon
OCCI Storage Management	Yes	Yes	Yes	Yes	Coming Soon
OCCI Basic Network Management	Yes	Yes	Yes	Yes	Coming Soon
OCCI FedCloud Contextualisation	Yes	Yes	Yes	Yes	Coming Soon
CMFs Native Interface	Coming Soon	TBD	TBD	No	No
CDMI	Coming Soon	No	Yes	No	No
Cloud-Init	Yes	Yes	Yes	Yes	Coming Soon
Integrated in EGI Core Platform	Yes	Yes	Yes	TBD	TBD

Resources

- **13 NGIs provide 22 certified resources**
- 4 NGIs currently integrating resources
- 5 NGIs with interested resource providers
- Worldwide interest & integration
 - Australia* (NeCTAR)
 - Africa* (SAGrid)
 - South Korea* (KISTI)
 - United States* (NIST, NSF)

Usage – May/Dec 2014

- 244,913 (397,128) VMs certified (uncertified)
- 10.6M (12.3M) CPU hours (wall time)



* Not shown on map

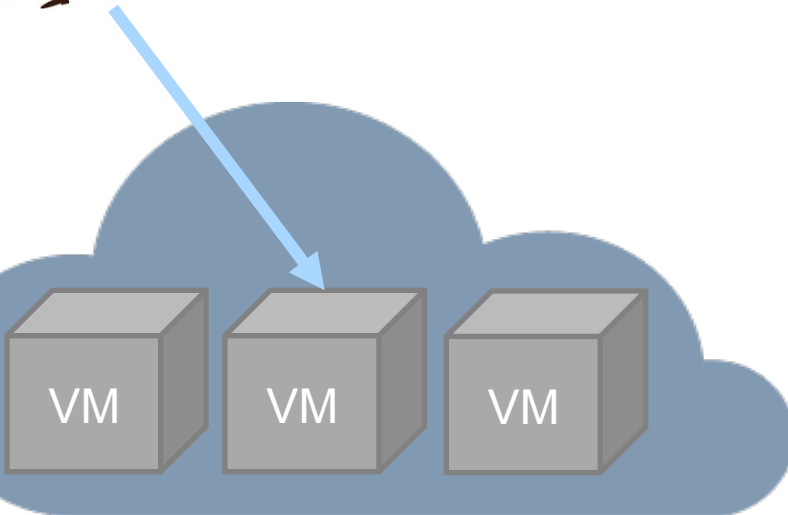
EGI Federated Cloud State-of-the-art & Technologies

Uniform interface to cloud
computing and storage resources

EGI Cloud Infrastructure

OCCI standard tools to easily manage VMs:

- Start, Suspend, Stop, Destroy, etc.



Simple usage

- OCCI standard
- rOCCI CLI client
- jOCCI – JAVA API

Scale to your needs

- Number of CPU cores
- Amount of RAM
- Local Disk

Contextualisation

- Configure your VM at startup
- Install SW at startup
- Complex deployment

3 solutions available:

- VM Disk Space
- Block Storage (OCCI standard)
- Object Storage (CDMI standard)

VM Disk Space

- Disk stored in the VM image (<100 GB)

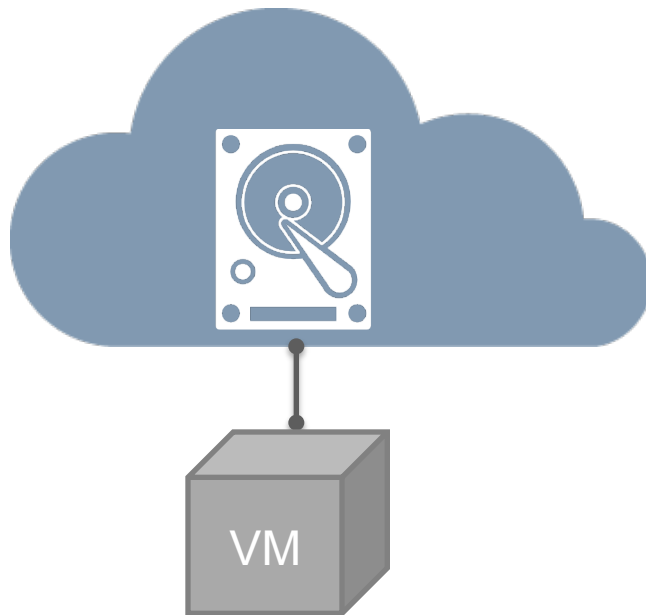
Block Storage

- Disk attached to a running VM (any size)

Object Storage

- External storage system
- Access through REST API

Persistent block level storage to use with VMs



Simple usage

- Use as any other block device from VMs
- Snapshotable

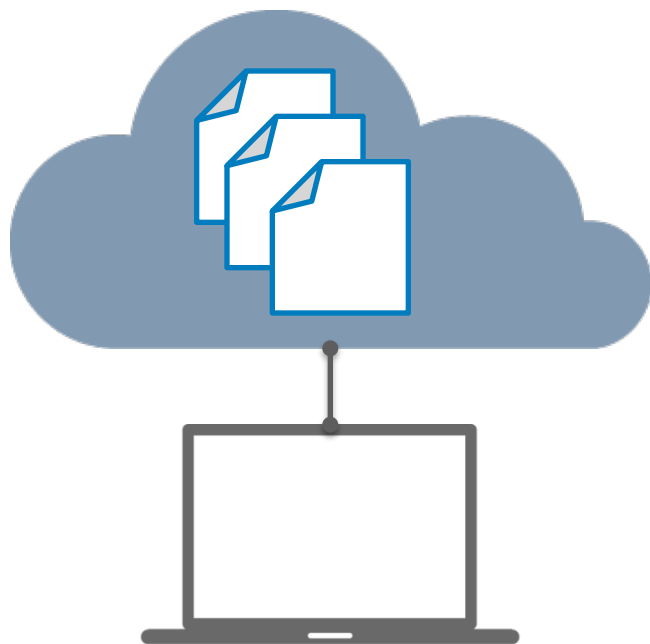
High Performance

- Consistent and low-latency performance
- SSDs (in some sites)

Scale to your needs

- From GB to TB
- Create and attach to VMs on demand

Data storage infrastructure for storing and retrieving data from anywhere at any time



API Access

- Simple REST APIs for managing and accessing data

Scalable

- Store as much data as needed.
- Get accounted only for the space used.

Sharing

- Define ACLs on each object, share publicly your data

Secure endorsed
applications

Virtual Appliances
Marketplace

Web-based VM image catalogue with automatic deployment on the EGI Federated Cloud sites

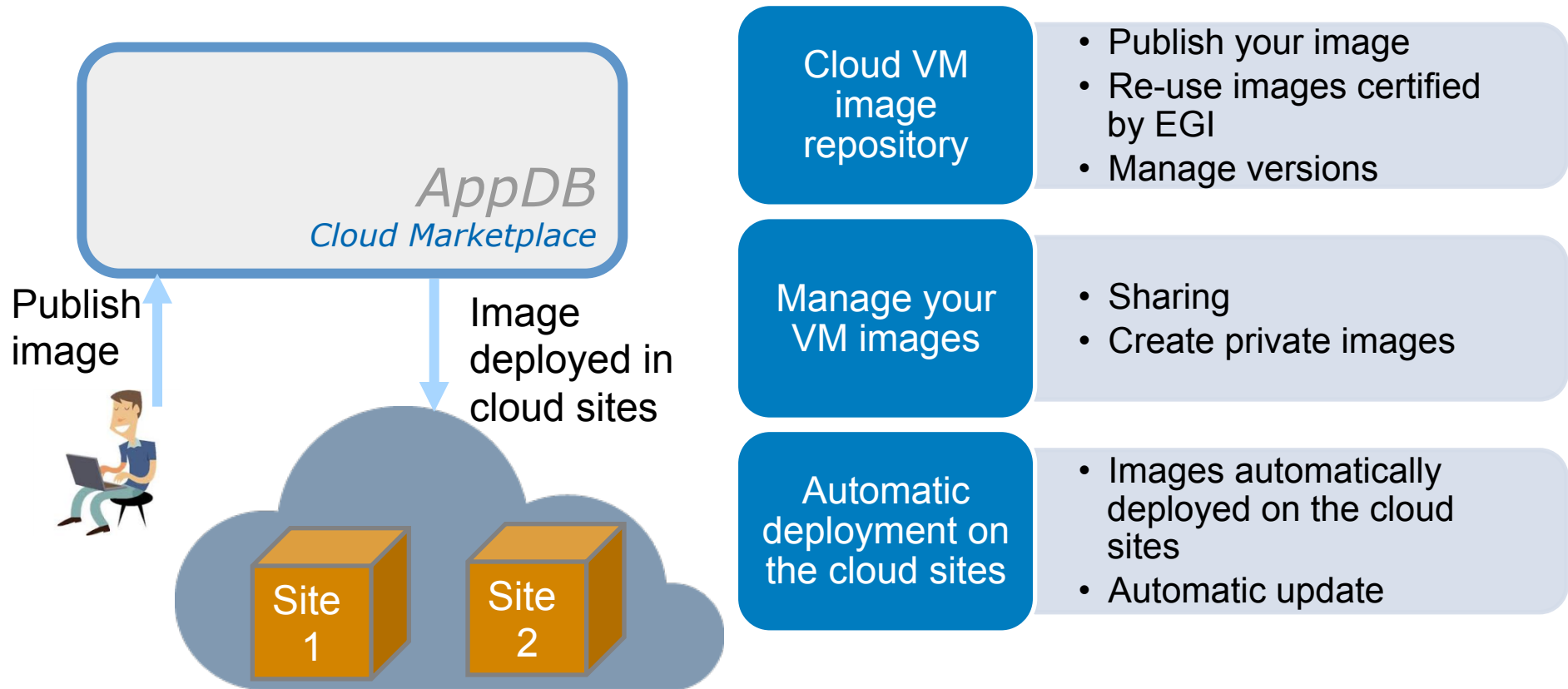
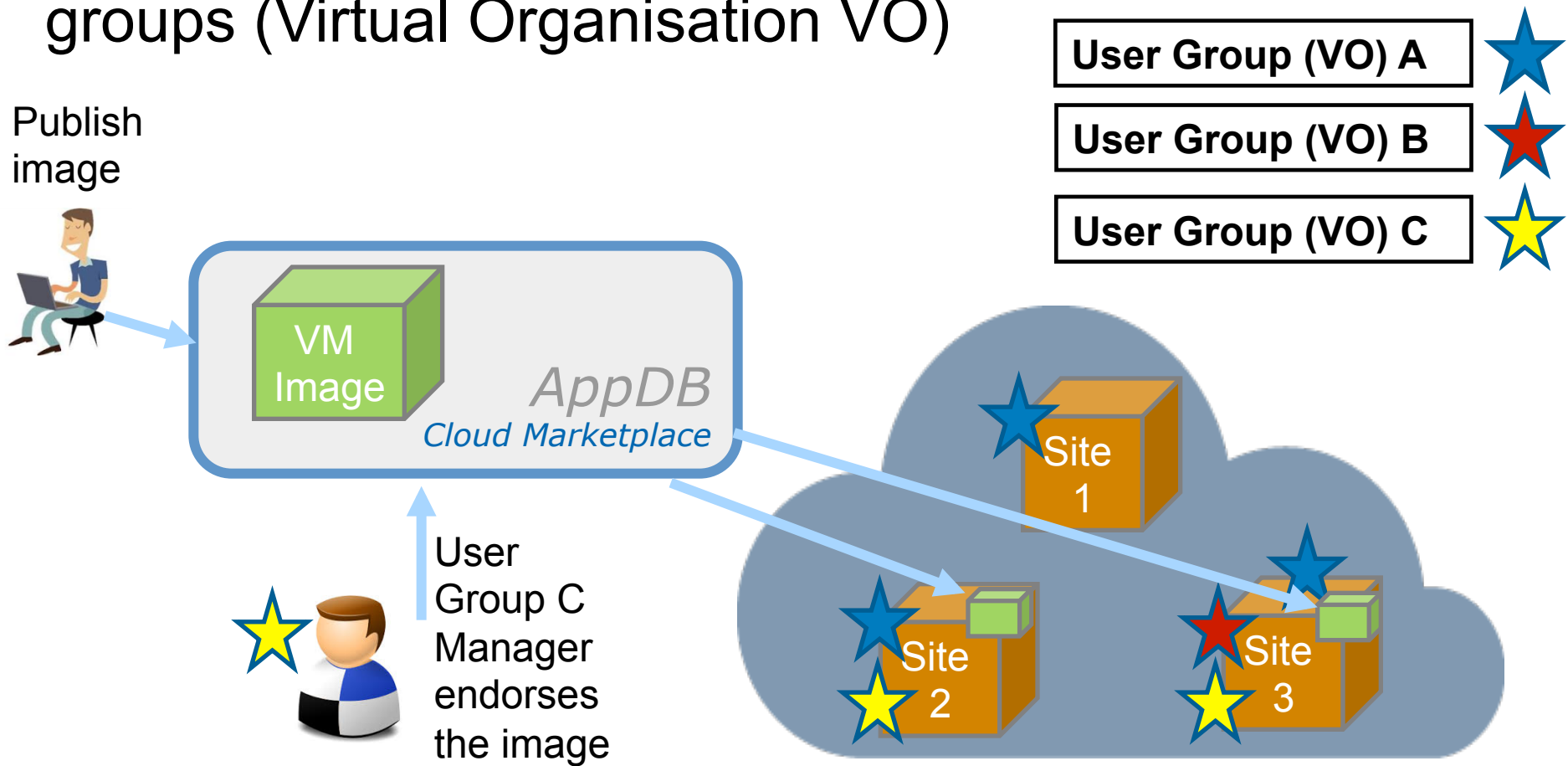
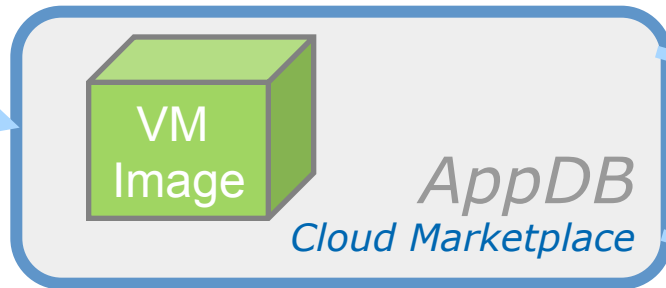


Image distribution on the cloud based on user groups (Virtual Organisation VO)



Incubator user group/VO for application prototyping and validation for any new users

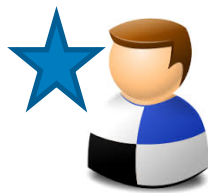
Publish
image



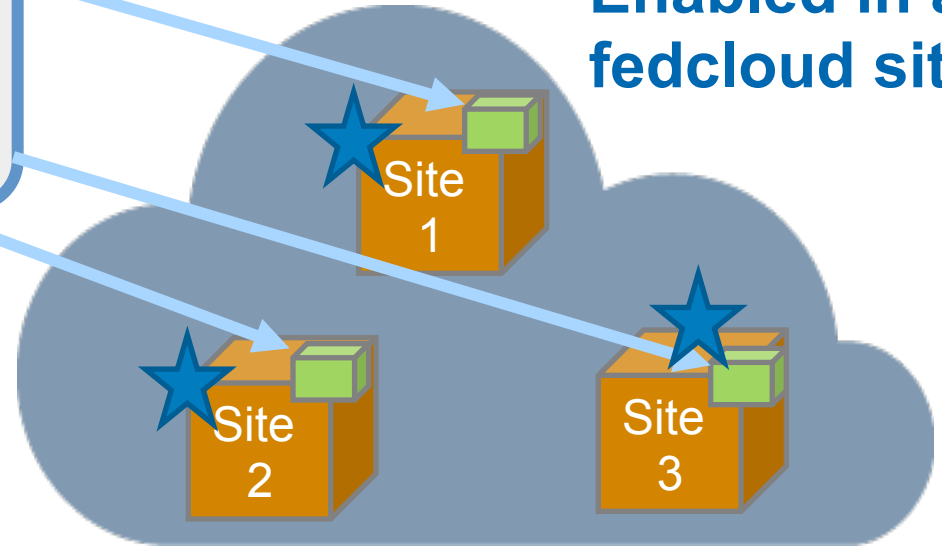
Incubator User Group
fedcloud.egi.eu



Enabled in all
fedcloud sites!



Fedcloud
manager
endorses
the image



Cloud Mp

Search virtual appliances...

Date Added Descending

Filters: [refine your search](#) |

Top Rated

News

Most V

Recent

All vAp

Applica

Applica

Big Da

Enterp

IT Adm

Infrastr

Manag

Operat

Other

Virtual

Sites /

Brows

by Cate

by Dis

Information | Publications (0) | Virtual Appliance Versions | Comments & Ratings |

Biovel OpenRefine |

Availability & Usage

Technical Details

Projects & Organizations

Additional Info

Endorsed by VO: 1 image available ([view VO details](#))

Site: CESNET-METACLOUD (CZ)

Image: ver.20140607.1 Ubuntu 14.04 LTS / x86_64 / QEMU-KVM

Memory	Logical//Physical CPUs	Connectivity In//Out	OS Family	
16384	4/4	yes/yes	linux	get IDs
8192	4/4	yes/yes	linux	get IDs
2048	1/1	yes/yes	linux	get IDs
4096	2/2	yes/yes	linux	get IDs
32768	8/8	yes/yes	linux	get IDs
65536	16/16	yes/yes	linux	get IDs

Cloud Mp


 Order By



Filters:

[refine your search](#) | ▼

[✖ clear all](#)

12 matches in 4.085s



BIFI

[\[permalink\]](#)
[Contact Information](#)

Country:

 Spain 

(id:341G0)

Name:

Instituto de Biocomputacion y Fisica de Sistemas Complejos

contact: egee-admin@bifi.es

contact: +34 876555405

Description: n/a

[Home](#) | [+ GOCDDB Portal](#)

 Offers: **VM Images**

 Filter By:

[clear all](#)

9 images



BioSTIF

20140617 Scientific Linux Scientific Linux 6.5 / x86_64 / QEMU-KVM



BioVeL Portal

20140227 Ubuntu Ubuntu 12.04 / x86_64 / QEMU-KVM



CentOS 6.x minimal

20141029 CentOS 6.6 / x86_64 / KVM

- Top Rated
- Newest
- Most Visited
- Recently Updated

- All vAppliances
- Application Development
- Application Servers
- Big Data
- Enterprise Apps
- IT Administration
- Infrastructure Apps
- Management
- Operating Systems
- Other

- Virtual Organizations
- Sites / Resource Providers

[Browse graphically](#)

- by Category
- by Discipline

Secure endorsed application and service deployment



EGI CSIRT

**Computer Security Incident
Response Team**

Web page

**EGI VM
Images**

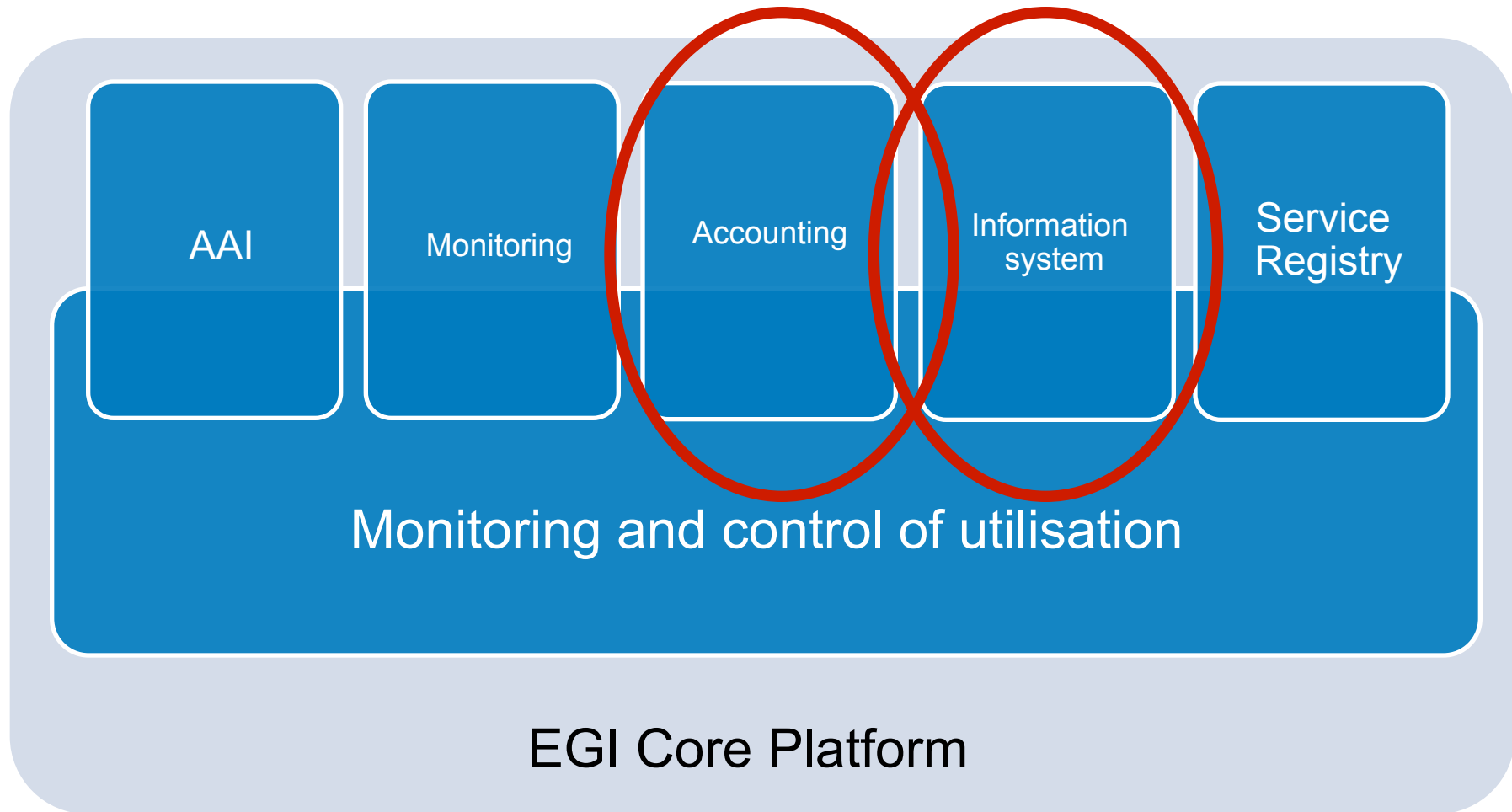
- Endorsed by the EGI security team
- Periodically updated

**User VM
Images**

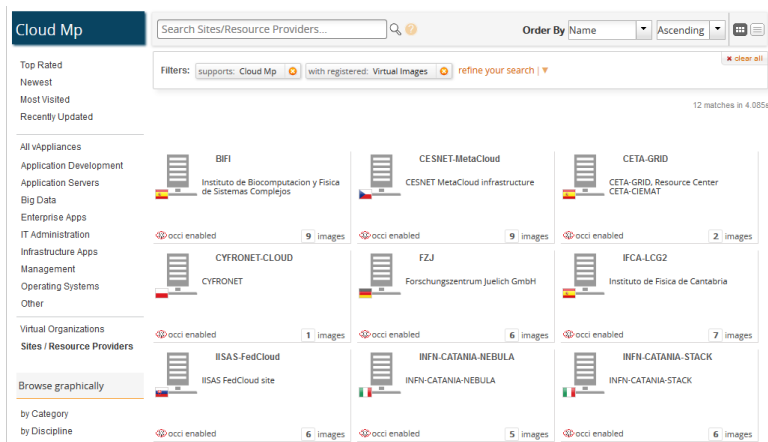
- Guidelines to create secure images
- Each user can ask for an EGI endorsement

**Security
monitoring**

- Continuous monitoring of the running VMs
- Alarms and immediate actions in case of security issues



Information about the available resources and their current status



The screenshot shows the 'Cloud Mp' interface. At the top, there is a search bar and a filter section with 'supports: Cloud Mp' and 'with registered: Virtual images'. Below this is a grid of site cards. Each card displays a site name, a logo, and the number of images available. For example, 'BIFI' has 9 images, 'CESNET-MetaCloud' has 9 images, and 'CETA-GRID' has 2 images. The interface also includes a sidebar with navigation options like 'Top Rated', 'Newest', and 'All vAppliances'.

Sites

- List of the certified EGI Federated Cloud sites

VM images

- List of images available on each site
- Get IDs to be used with the rOCCI client

Views

- High level view for final users (VA marketplace)
- Advanced view for expert users through LDAP

```

+-- GLUE2DomainID=NIKHEF-ELPROD
+-- GLUE2DomainID=NO-NORGRID-T2
+-- GLUE2DomainID=QBSPM
+-- GLUE2DomainID=pic
+-- GLUE2DomainID=PK-CIIT
+-- GLUE2DomainID=prague_lcg2
+-- GLUE2DomainID=prague_cesnet_lcg2
+-- GLUE2DomainID=PRISMA-INFN-BARI
  +-- GLUE2ContactID=general.contact.PRISMA-INFN-BARI
  +-- GLUE2ContactID=security.contact.PRISMA-INFN-BARI
  +-- GLUE2ContactID=sysadmin.contact.PRISMA-INFN-BARI
  +-- GLUE2ContactID=usersupport.contact.PRISMA-INFN-BARI
  +-- GLUE2GroupID=cloud
    +-- GLUE2ServiceID=https://prisma-cloud.ba.infn.it:5000/v2.0_cloud.compute
    +-- GLUE2ServiceID=https://prisma-swift.ba.infn.it:8080_cloud.storage
    +-- GLUE2ServiceID=network-controller_cloud.storage
    +-- GLUE2ServiceID=wn-recas-uniba-18.ba.infn.it_cloud.storage
  +-- GLUE2GroupID=resource
  +-- GLUE2LocationID=location.PRISMA-INFN-BARI
+-- GLUE2DomainID=PSNC
  
```


Data about usage of the FedCloud resources

The following table shows the distribution of Total number of VM run grouped by SITE and DATE.

SITE	Total number of VM run by SITE and DATE							Total	%
	Nov 2014	Dec 2014	Jan 2015	Feb 2015	Mar 2015	Apr 2015			
100IT	716	795	746	675	743	45	3,639	1.00%	
BIFI	11,113	15,293	18,209	42,974	47,682	0	135,271	40.00%	
CERN-PROD	13,310	165	437	8,085	171	34	22,222	6.57%	
CESGA	1,726	929	0	1	556	52	3,264	0.97%	
CESNET-MetaCloud	1,258	1,407	792	837	770	49	5,113	1.51%	
CETA-GRID	153	99	2,307	227	454	45	3,285	0.97%	
CYFRONET-CLOUD	456	0	0	235	751	47	1,489	0.44%	
FZJ	5,530	17,979	10,385	21,145	3,088	47	58,174	17.20%	
GoeGrid	1,504	798	751	681	752	49	4,535	1.34%	
HG-09-Okeanos-Cloud	493	229	241	185	179	0	1,327	0.39%	
IFA-LCG2	4,428	650	621	539	537	35	6,680	2.01%	
IN2P3-FedCloud	2,970	6,014	5,367	2,786	3,435	207	20,749	6.13%	
IN2P3-IRE5	0	0	0	188	729	44	961	0.28%	
INFN-CATANIA-NEBULA	663	765	779	672	787	49	3,635	1.07%	
INFN-CATANIA-STACK	115	202	847	697	774	47	2,682	0.79%	
INFN-PADOVA-STACK	5,482	8,652	13,131	11,162	7,683	1,075	47,185	13.95%	
MK-04-FINNICLOUD	284	344	749	688	227	0	2,292	0.68%	
NCG-INGRID-PT	667	674	712	593	714	30	3,390	1.00%	
PRISMA-INFN-BARI	2,460	753	791	208	212	1	4,425	1.31%	
SZTAKI	551	572	487	707	31	0	2,348	0.69%	
TR-FC1-ULAKBIM	157	147	752	707	499	28	2,290	0.68%	
UPV-GRYCAP	756	574	257	888	600	49	3,124	0.92%	
Total	64,790	66,915	58,353	94,860	71,354	1,936	338,208		
Percentage	16.20%	16.83%	17.25%	28.65%	21.10%	0.57%			

Groups (VO) and users

- N. of VMs created for each group (VO) or user
- Total CPU times
- Total RAM, etc.

Sites

- N. of VMs
- Total CPU times
- Total RAM
- Disk size, etc.

VO Group/Role:	fedcloud.egi.eu - ALL Groups and Roles
ROC/Country:	ALL ROCs
Infrastructure:	Cloud
Order by:	Number of VMs
Period:	Start year: 2014 Start month: 3 End year: 2015 End month: 2

Refresh

VO (ALL Groups and Roles) Users Information
Mar 2014 - Feb 2015

The following table shows the Usage of the Users ordered by Total number of jobs and the Total Usage of the Other Users. A detailed view can be obtained by selecting an individual user.

#	User	Jobs		CPU time		Norm. CPU time		WCT		Norm. WCT		Monetary Cost		CPU Efficiency		Avg. CPU time		Avg. WCT	
		#	%	Hrs	%	Hrs	%	Hrs	%	Hrs	%	€	%	%	%	Hrs	%	Hrs	%
1	User 1	34,758	76.8%	102,855,939	5.4%	0	0.0%	4,359,851,264	64.5%	0	0.0%	166,977,133	15.5%	100.0	3011.18	127637.78			
2	User 2	2,640	4.6%	79,340,745	4.2%	0	0.0%	79,340,745	1.2%	0	0.0%	80,398,622	7.4%	100.0	38892.52	38892.52			
3	User 3	7,628	4.7%	2,154,330	0.1%	0	0.0%	2,154,330	0.0%	0	0.0%	0	0.0%	100.0	1179.81	1179.81			
4	User 4	1,158	2.6%	324,439,069	17.1%	0	0.0%	324,439,069	4.8%	0	0.0%	258,438,790	23.9%	100.0	285095.84	285095.84			
5	User 5	566	1.2%	64,898,295	3.4%	0	0.0%	137,729,798	2.0%	0	0.0%	54,738,970	5.1%	100.0	119079.44	252715.20			
6	User 6	539	1.2%	126,928,755	6.7%	0	0.0%	148,890,624	2.2%	0	0.0%	998,313	0.1%	86.4	235489.34	272523.24			
7	User 7	403	0.9%	151,702,037	8.0%	0	0.0%	268,360,390	4.0%	0	0.0%	105,699,879	9.8%	58.5	376431.85	665906.67			
8	User 8	293	0.7%	22,456,541	1.2%	0	0.0%	22,456,541	0.3%	0	0.0%	22,273,052	2.1%	100.0	76643.48	76643.48			
9	User 9	227	0.5%	122,210,586	6.4%	0	0.0%	167,553,207	2.5%	0	0.0%	95,657,993	8.9%	72.9	538732.54	738119.85			
10	User 10	193	0.4%	28,527,866	1.5%	0	0.0%	116,496,393	1.7%	0	0.0%	24,333,168	2.2%	100.0	947912.78	603608.25			
11	User 11	177	0.4%	2,859,069	0.2%	0	0.0%	2,859,069	0.0%	0	0.0%	2,897,190	0.3%	100.0	16152.93	16152.93			
12	User 12	120	0.3%	8,908,708	0.5%	0	0.0%	9,296,073	0.1%	0	0.0%	2,742,557	0.3%	99.8	74239.23	77467.28			
13	User 13	773	0.3%	4,134,284	0.2%	0	0.0%	4,150,007	0.1%	0	0.0%	538	0.0%	99.8	36586.58	36725.73			

VMs

- N. of cores
- RAM
- Disk size
- VM image, etc.

High level tools with main capabilities (PaaS, SaaS)

- Extend the IaaS capabilities of the EGI cloud
 - 'Alternatives' of the OCCI client and API
 - More than OCCI
- External contributions (→ support many other clouds too)

Catania
Science
Gateway

- SaaS
- Identity Federation

VMDIRAC

- Abstraction on top of various HPC/HTC/cloud

Slipstream

- PaaS for automating deployments
- Helix Nebula

WS-
PGRADE

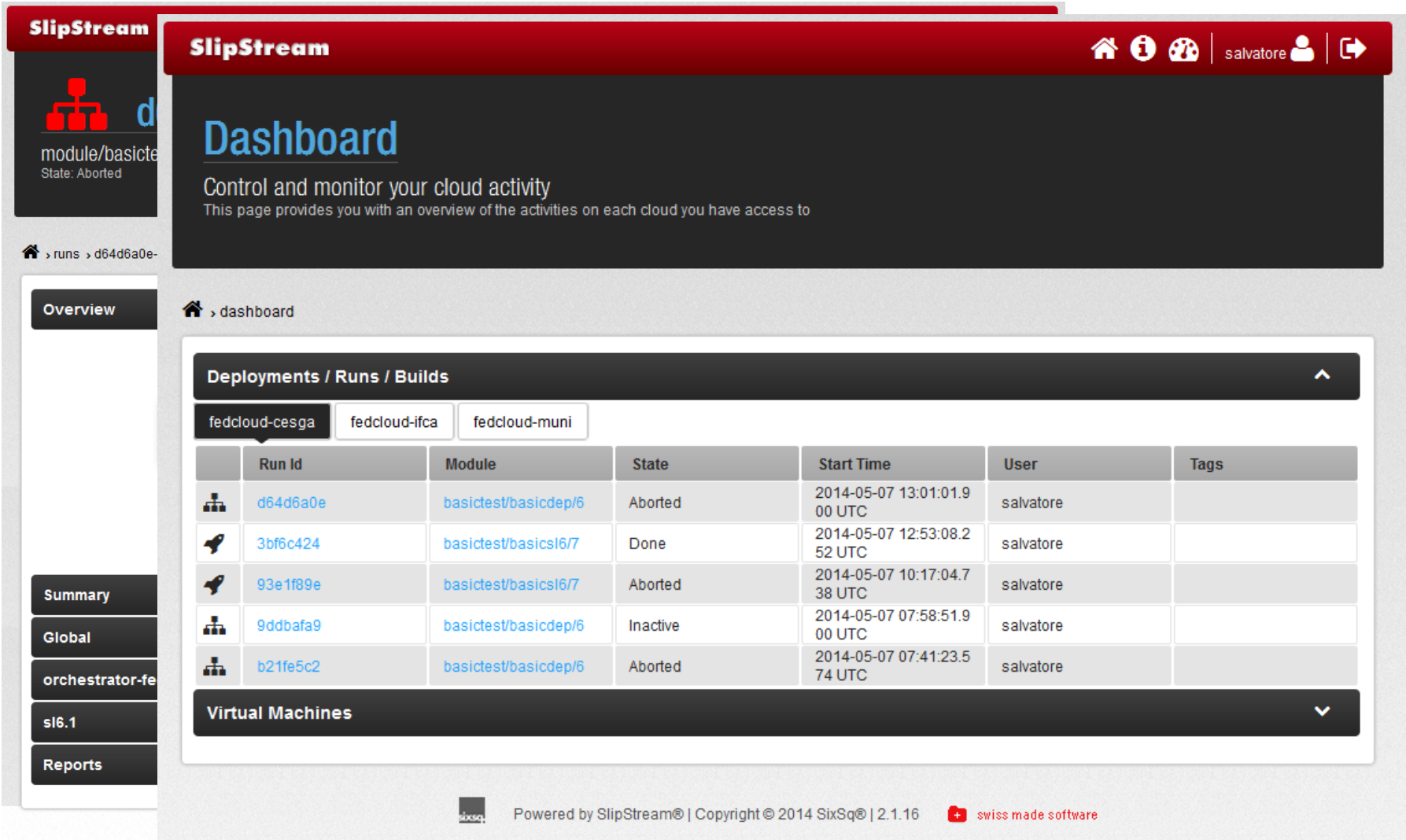
- Workflow development and enactment

COMPSs

- Programming framework for auto-parallelisation

Vcycle

- VM lifecycle manager



SlipStream | Home | Info | Help | salvatore | Logout

Dashboard

Control and monitor your cloud activity
This page provides you with an overview of the activities on each cloud you have access to

Overview

Dashboard

Deployments / Runs / Builds

fedcloud-cesga | fedcloud-ifca | fedcloud-muni

	Run Id	Module	State	Start Time	User	Tags
	d64d6a0e	basictest/basicdep/6	Aborted	2014-05-07 13:01:01.900 UTC	salvatore	
	3bf6c424	basictest/basicsl6/7	Done	2014-05-07 12:53:08.252 UTC	salvatore	
	93e1f89e	basictest/basicsl6/7	Aborted	2014-05-07 10:17:04.738 UTC	salvatore	
	9ddbafa9	basictest/basicdep/6	Inactive	2014-05-07 07:58:51.900 UTC	salvatore	
	b21fe5c2	basictest/basicdep/6	Aborted	2014-05-07 07:41:23.574 UTC	salvatore	

Virtual Machines

Powered by SlipStream® | Copyright © 2014 SixSq® | 2.1.16 swiss made software

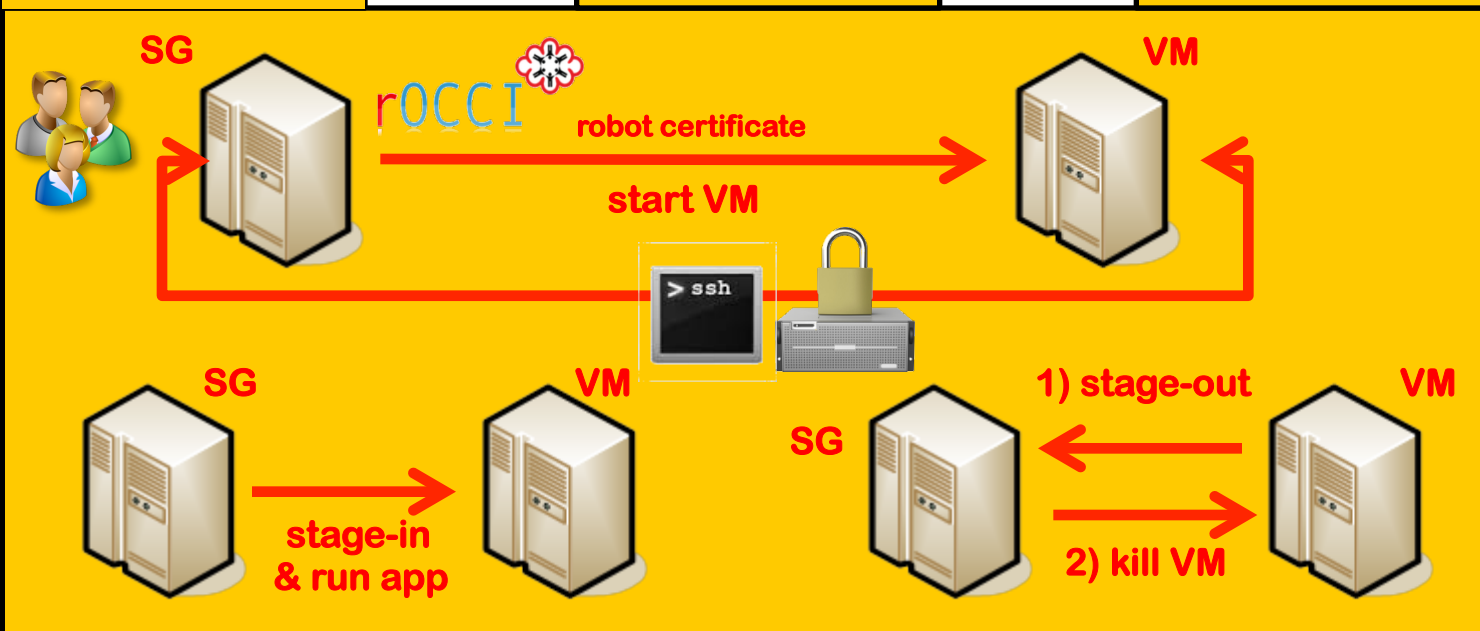
Science Gateway GUIs

Catania Grid/Cloud Engine

Security context


Job management

Stage-in/out



3 Specify the VM Settings

Please, use the drop-down list to choose the VM profile you wish to deploy on the cloud

Notification 

Advanced Settings ▶


Configure advanced settings (if any) for the selected VM

Upload your macro ASCII file (*.m) for OCTAVE (Max 2,5MB) *

Insert here the macro to be processed *

```

# [ Octave demo ]
# This is a macro demo that produces
# a simple bidimensional graph of the
# function: r=sqrt(x^2+y^2); sin(r)/r
# The output will be stored into an eps
    
```



Select the VM profile

Enable e-mail notification

Octave-specific settings

Start VM

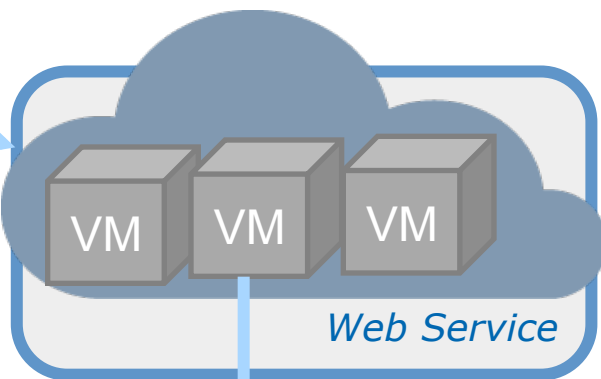
Select the VM template

'Job' description

Typical setups and use cases

Examples

The EGI Federated Cloud is able to support different use case models



Compute & Data intensive

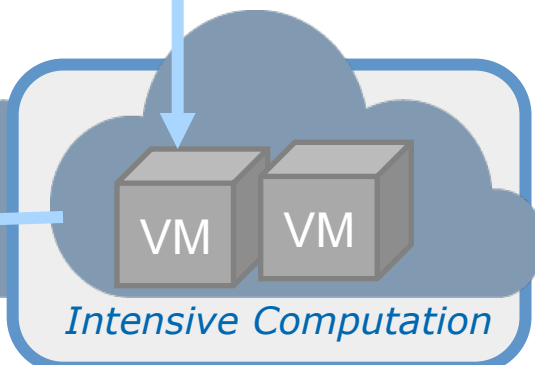
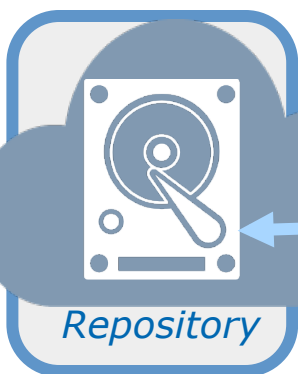
- Heavy computation
- Large Memory

Datasets Repository

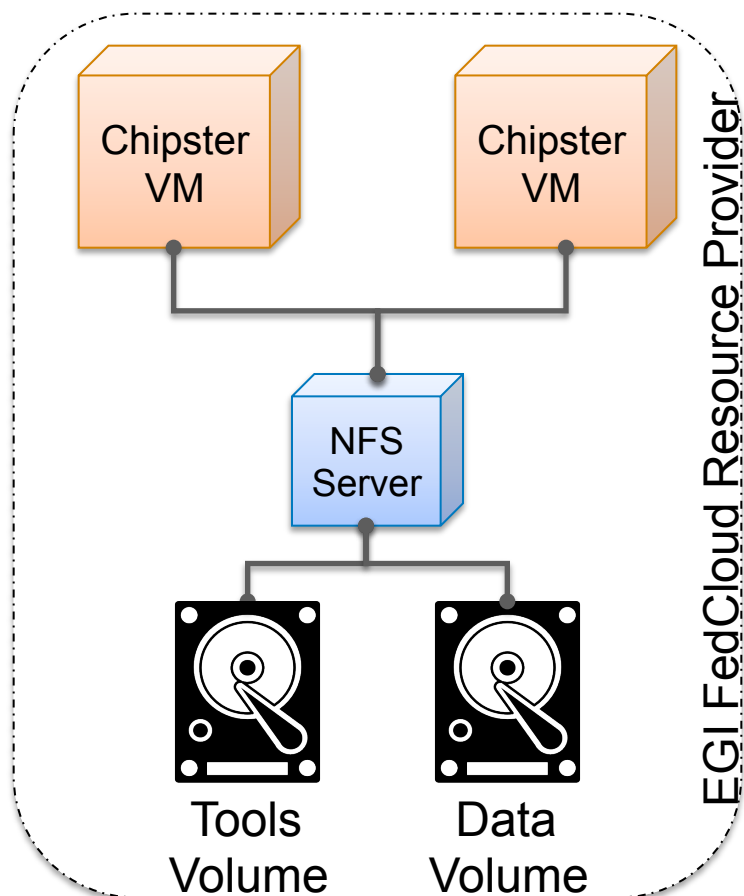
- Store & manage large datasets

Web Services

- Hosting web-sites, web services, portal, etc.
- Exploit cloud features as elasticity



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



Usage Model

- Web service
- Heavy computation and large memory
- Manage large datasets

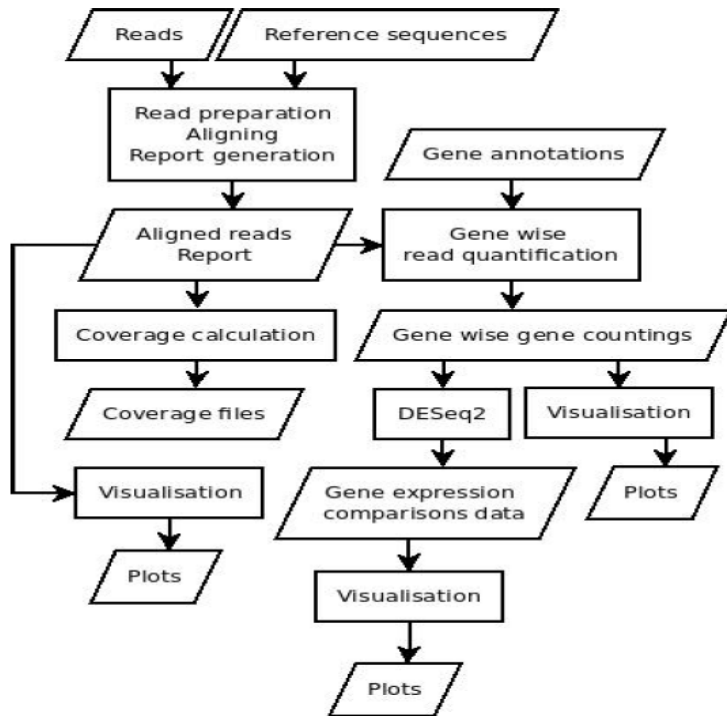
Scientific Disciplines

- Bioinformatics

Deployment in the FedCloud

- Complex deployment through contextualisation
- shared block storage exported as NFS up to 1 TB

Pipeline for the computational evaluation of RNA-Seq. data



Usage Model

- Heavy computation
- Large Memory

Scientific Disciplines

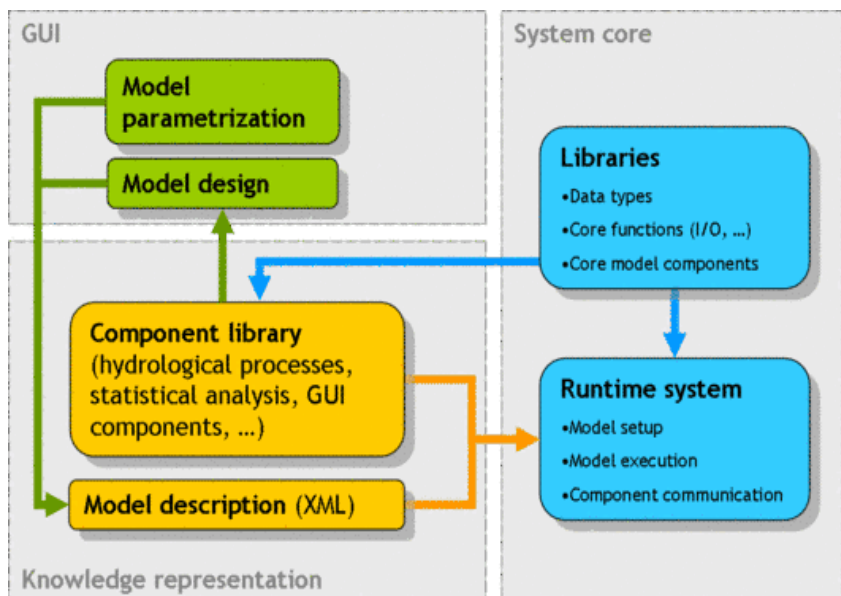
- Bioinformatics

Deployment in the FedCloud

- VMs with 24 cores, 128 GB of RAM
- Block storage up to 3 TB

Source: Konrad U. Förstner

Platform for process-based hydrological model development



Usage Model

- Web Service
- Heavy computation
- Large Memory

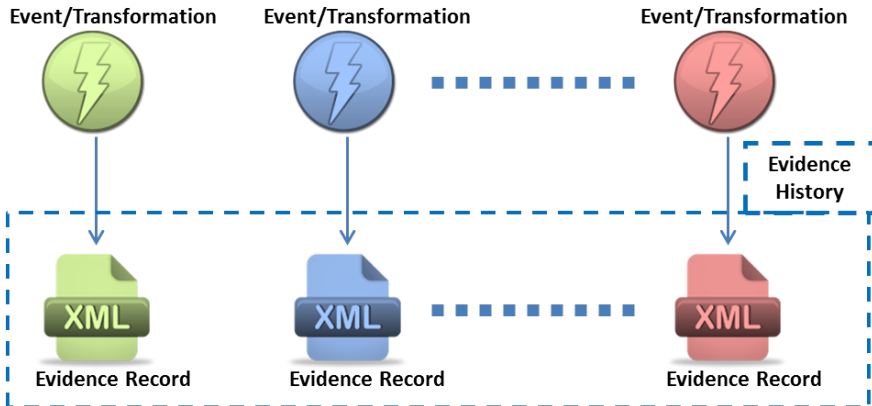
Scientific Disciplines

- Hydrology

Deployment in the FedCloud

- VMs with > 8 cores, > 16 GB of RAM
- Image available in the marketplace

Supports the archive manager and curator to capture and manage part of the Preservation Descriptive Information



Usage Model

- **Web Service**

Scientific Disciplines

- **Digital Archives**

Deployment in the FedCloud

- **VMs with 2 cores, 4 GB of RAM**
- **Block Storage**

Plans & next steps

The **EGI Federated Cloud Task Force** continue to work to evolve and improve the Cloud Infrastructure

Compute

- OCCI 1.2
- MS Azure
- Native CMF interfaces

High level tools

- More PaaS and SaaS integrated in the FedCloud

Storage

- OCCI advanced for Block Storage
- CDMI for OpenStack
- Native CMF interfaces

Network

- Advanced network management

User Support

Dedicated technical consultancy for each community
(support@egi.eu)

F2F/Web Meetings

- Initial requirements
- Allocation of technical experts
- Milestones

Doc

- Step by step guides
- Tutorials
- Examples

Continuous tracking and support

- Technical integration support from EGI/NGI team
- Periodic meetings

Basic VM Images

- Main OS available
- Secure endorsed
- Contextualisation

Incubator VO

- Resources for application prototyping
- Enabled in all sites
- Up to 6 months (renew)

Migration into production


- Resource providers commitment
- Support to create a production VO

EGI Federated Cloud User Support doc. entry page:

- https://wiki.egi.eu/wiki/Federated_Cloud_user_support

Federated Cloud user support

Main	Roadmap and Innovation	Technology	For Users	For Resource Providers	Media
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Technical support is available via the [EGI.eu Support Team](#) 

Users of the EGI Federated Cloud are scientists working in many fields, who can benefit of a flexible environment for running their workloads. Also, the EGI cloud is suitable to projects aiming to provide services and platforms to the scientific community.

Concept [\[edit\]](#)

The EGI Federated Cloud is a seamless grid of academic private clouds and virtualised resources built around open standards and focusing on the requirements of the scientific community. The result is a new type of research e-infrastructure based on the mature federated operations services that make EGI a reliable resource for science. When using EGI Federated Cloud resources, researchers and research communities can count on:

- Total control over deployed applications
- Elastic resource consumption based on real needs
- Immediately processed workloads – no more waiting time
- An extended e-Infrastructure across resource providers in Europe
- Service performance scaled with elastic resource consumption
- Single sign-on at multiple, independent providers

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 - 3.2.2 Customized Virtual Appliances
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- 4 Technical background
 - 4.1 EGI Federated Cloud Sites
 - 4.2 Interfaces and protocols
- 5 User support
 - 5.1 Technical support
 - 5.2 Helpdesk
 - 5.3 Feedback and open issues

Next steps to become an user

Different way to access the EGI Federated Cloud

Basic info

Start date * ⓘ

End date * ⓘ

User Community/Project * ⓘ

Virtual Organization Documentation * ⓘ

Description of the activity * ⓘ

[Cloud] Computing ⓘ

Virtual Machines (maximum) * ⓘ

Small Virtual Machines ⓘ

Medium Virtual Machines ⓘ

Large Virtual Machines ⓘ

Other Virtual Machines ⓘ

Number of virtual cores ⓘ

RAM [GB] ⓘ

Scratch/ephemeral storage [GB] ⓘ

Level of utilization *

User want to access resources

- Join one of the existing groups/VOs
- Find relevant VO in the Ops Portal

Allocation on the EGI RPs

- Dedicated resources
- Submit request via e-Grant: <https://e-grant.egi.eu>

Join FedCloud as RPs

- Turn your site into a community federate cloud
- Contact EGI Operations: operations@egi.eu

e-Grant Resource Allocation

EGI Federated Cloud resources

- Wiki site: <http://go.egi.eu/fedcloud>
- User support:
https://wiki.egi.eu/wiki/Federated_Cloud_user_support
- User support e-mail: support@egi.eu
- Federated Cloud Communities:
https://wiki.egi.eu/wiki/Federated_Cloud_Communities

Related Standards:

- OCCl: <http://occi-wg.org>
- CDMI: <http://cdmi.sniacloud.com/>



Questions ?