



Grid y Computación
de Altas Prestaciones

GRyCAP

INFRASTRUCTURE MANAGER (IM)



Infrastructure
Manager



UNIVERSITAT
POLITÈCNICA
DE VALÈNCIA



- IM is a service that **deploys virtual infrastructures** on top of Cloud resources.
- It uses **RADL** or **TOSCA** files to describe the infrastructure.
 - Infrastructure as code (**IaC**)
- The IM **automates** the deployment, configuration, software installation, monitoring and update of virtual infrastructures.
- It supports a wide variety of back-ends, thus making user applications **Cloud agnostic**.

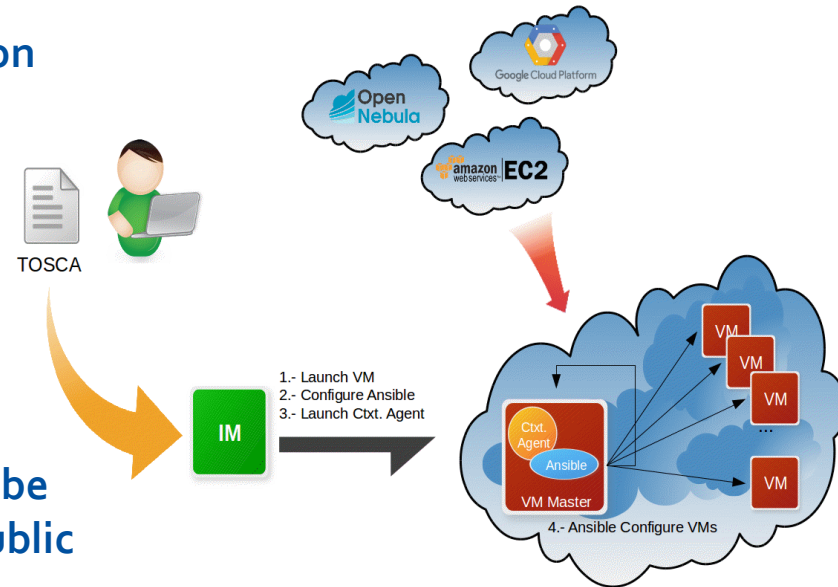


- It features **DevOps** capabilities.
 - Based on **Ansible**.
 - Provides recipes for common deployments.
 - Also supporting cloud-init scripts.
- IM works as a service that offers several interfaces:
 - XML-RPC and **REST** APIs.
 - Command-line application.
 - 2 Web-based GUI.
- It is distributed under the GNU **GPL v3.0** open source license and its source code is available on **GitHub**.

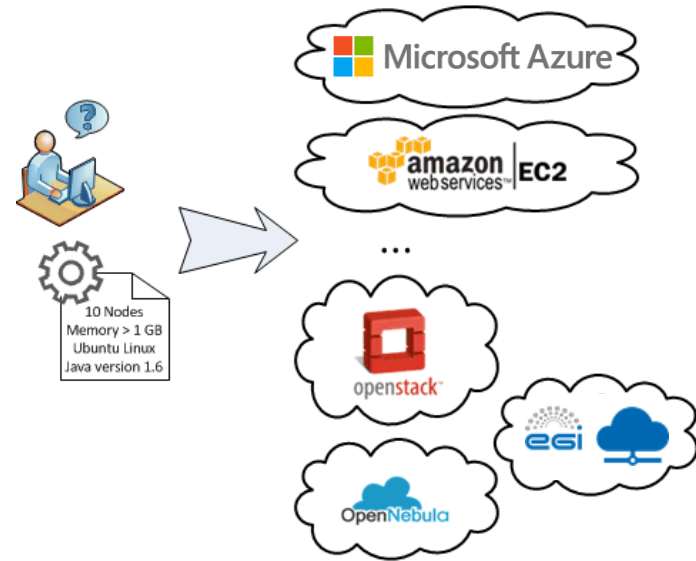


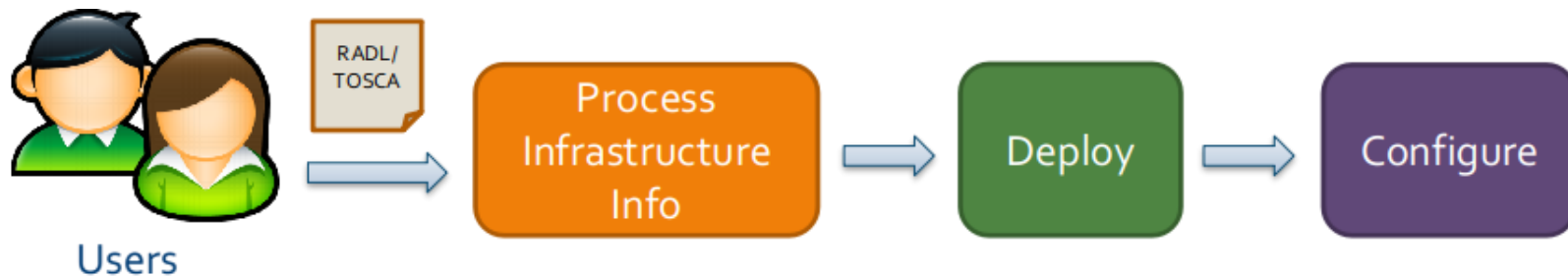
<https://github.com/grycap/im>

- General platform to deploy on demand **customizable** virtual computing infrastructures.
 - With the **precise software configuration** required.
 - Allow to deploy any kind of complex infrastructure.
 - Hybrid ones.
 - Share Infrastructure descriptions.
 - **No need of pre-packaged VMIs.**
 - Enable re-using of VMIs.
 - **The same complex infrastructure can be deployed both on-premise and in a public Cloud.**



- It supports a **wide range of cloud providers** and other computing back-ends :
 - **Public:** Amazon Web Services, Google Cloud Platform, Microsoft Azure, T-Systems OTC, Exoscale, Linode and Orange.
 - **On-premises:** OpenNebula, OpenStack, CloudStack, VMWare, libvirt.
 - **Federated:** EGI FedCloud (OCCI and OpenStack), FogBow.
 - **Containers:** Docker, Kubernetes
 - The list above can be **easily extended** by plugins.

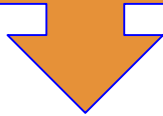




- The user can provide a RADL or TOSCA documents as input to the IM, describing the infrastructure:
 - **RADL: Resource and Application Description Language.**
 - High level Language to define virtual infrastructures and Specify VM requirements.
 - **TOSCA (YAML spec 1.0): OASIS Standard**
 - Open standard language to model application architectures to be deployed on a Cloud.



Let's access the IM Dashboard!!



<https://www.grycap.upv.es/im>

<https://appsgrycap.i3m.upv.es:31443/im-dashboard/>

<https://marketplace.eosc-portal.eu/services/infrastructure-manager-im>

See full demo video at:

- <https://youtu.be/vmtzGOZxiUg>



**Infrastructure
Manager**

An RADL document has the following general structure:

The keywords **ansible**, **network**, **system** and **configure** assign some features or recipes to an identity **<id>**. The features are a list of constraints separated by **and**, and a constraint is formed by **<feature name> <operator> <value>**.

```
ansible <ansible_host_id> (<features>)
```

```
network <network_id> (<features>)
```

```
system <system_id> (<features>)
```

```
configure <configure_id> (<Ansible recipes>)
```

```
contextualize [max_time] ( system <system_id>
```

```
configure <configure_id> [step <num>] ... )
```

```
deploy <system_id> <num> [<cloud_id>]
```




- In this example
 - A node type named “node” with 1 CPU and 512MB of RAM is defined.
 - Connected to a public network
 - In the configuration a user named “user1” is created.
 - 1 node of type “node” is deployed

```
network net (outbound = 'yes')
system node (
  cpu.count = 1 and
  memory.size >= 512M and
  net_interface.0.connection = 'net'
)
configure node (
@begin
---
- tasks:
  - user: name=user1 password=1234
@end
)
deploy node 1
```

- Topology and Orchestration Specification for Cloud Applications
 - OASIS Standard
 - TOSCA Simple Profile in YAML Version 1.0
 - Standard to specify Cloud Topologies
 - Defines the interoperable description of services and applications hosted on the cloud
 - Including their components, relationships, dependencies, requirements, and capabilities
 - Enabling portability and automated management across cloud providers

TOSCA Example

```
tosca_definitions_version:
tosca_simple_yaml_1_0

imports:
  - types:
https://../custom_types.yaml

description: Deploy instance for
Kepler

topology_template:

  inputs:

    memory_size:
      type: scalar-unit.size
      description: RAM memory
      default: 1 GB

  node_templates:

    kepler:
      type: tosca.nodes.indigo.Kepler
      requirements:
        - host: kepler_server
```

```
kepler_server:
  type: tosca.nodes.indigo.Compute
  capabilities:
    endpoint:
      properties:
        network_name: PUBLIC
      ports:
        vnc_port:
          protocol: tcp
          source: 5900

  host:
    properties:
      num_cpus: 1
      mem_size:
        get_input: memory_size

  os:
    properties:
      type: linux
      distribution: ubuntu
      version: 18.04
```

```
outputs:
  instance_ip:
    value:
      get_attribute:
        - kepler_server,
        - public_address
        - 0

  instance_creds:
    value:
      get_attribute:
        - kepler_server,
        - endpoint
        - credential
        - 0
```

```
Usage: im_client.py [-u|--xmlrpc-url <url>] [-r|--restapi-url <url>] [-v|--verify-ssl] [-a|--auth_file <filename>] operation op_parameters
```

Operation:

list

create <radl_file> [async_flag]

destroy <inf_id>

getinfo <inf_id> [radl_attribute]

getradl <inf_id>

getcontmsg <inf_id>

getstate <inf_id>

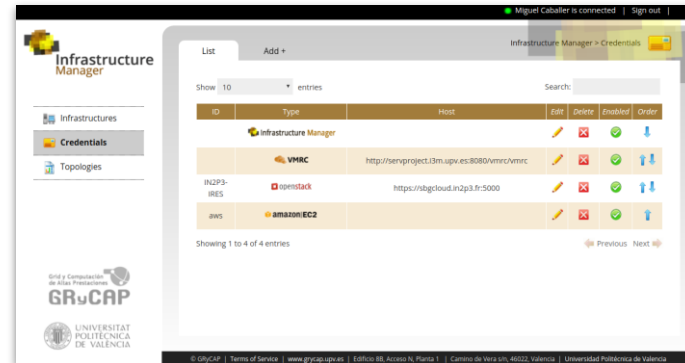
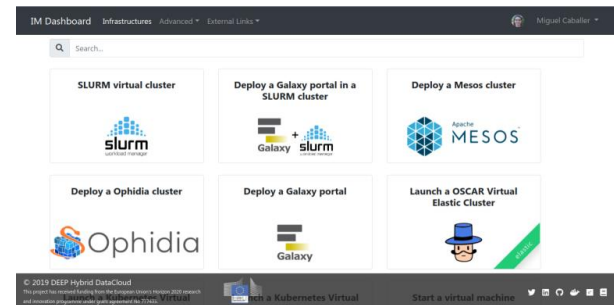
getvminfo <inf_id> <vm_id> [radl_attribute]

getvmcontmsg <inf_id> <vm_id>

addresource <inf_id> <radl_file> [ctxt flag]

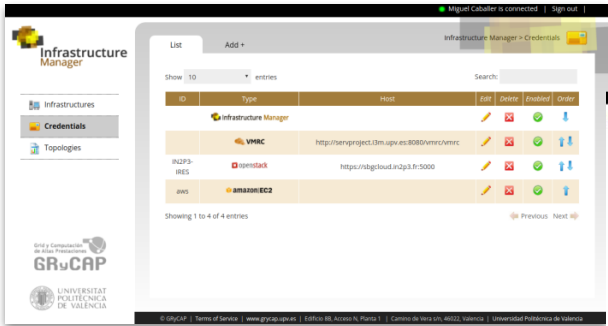
...

- Two publicly-available web interface (also open-sourced).
 - <https://appsgrycap.i3m.upv.es:31443/im-dashboard/>
 - For non advanced users
 - <https://appsgrycap.i3m.upv.es:31443/im-web/>
 - More functionality
 - Easily deploy infrastructures from a web browser
 - Also on GitHub:
 - <https://github.com/grycap/im-web>
 - <https://github.com/grycap/im-dashboard>



Client-SIDE Tools: Web Portal

- Full featured Web interface
 - For advanced users
 - Enable to define and share your own topologies
 - TOSCA o RADL



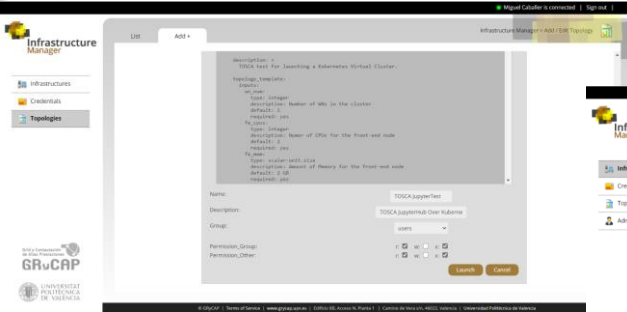
Infrastructure Manager > Credentials

Show 10 entries

ID	Type	Host	File	Owner	Enabled	Order
vmrc	VMRC	http://vmsproject.3im.upv.es:8080/vmrc/vmrc			<input checked="" type="checkbox"/>	
in2p3	IBES	https://ibp.cloud.in2p3.fr:5000			<input checked="" type="checkbox"/>	
aws	AMAZONEC2				<input checked="" type="checkbox"/>	

Showing 1 to 4 of 4 entries

© GRuCAP - Terms of Service | www.grycap.upv.es | Dificio 3B, Avda 9, Planta 1 | Campus de Burjassot, 46100, Valencia | Universidad Politécnica de Valencia



Infrastructure Manager > Topologies

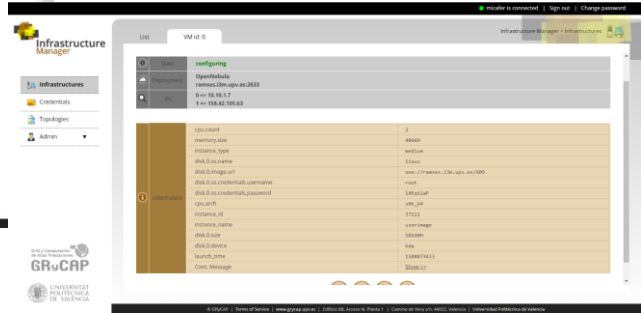
```
description: >
  This test for searching a Kubernetes Cluster.
topology: yaml/text
  name: test
  kind: cluster
  apiVersion: kubernetes.io/v1beta1
  metadata:
    name: test
  spec:
    nodes:
      - kind: cluster
        apiVersion: kubernetes.io/v1beta1
        metadata:
          name: test
        spec:
          containers:
            - name: test
              image: busybox
              command:
                - /bin/sh
                - -c
                - echo $(cat /dev/urandom | tr -dc 'a-z0-9' | fold -w 64 | xargs | sha1sum)
          restartPolicy: Never
```

Name: TOSCA:googleTest
Description: TOSCA:googleTest Over Kubernetes
Group: users

Permission_Owner: users

Search Cancel

© GRuCAP - Terms of Service | www.grycap.upv.es | Dificio 3B, Avda 9, Planta 1 | Campus de Burjassot, 46100, Valencia | Universidad Politécnica de Valencia



Infrastructure Manager > VMs

VM ID: 0

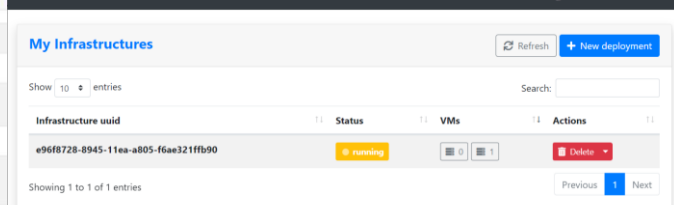
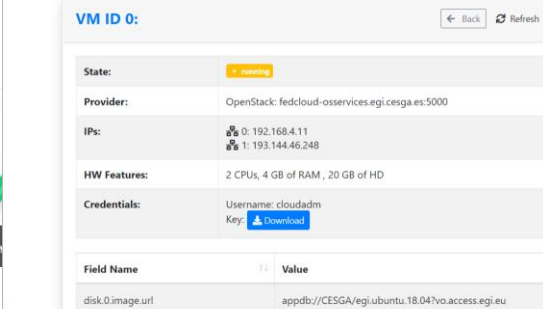
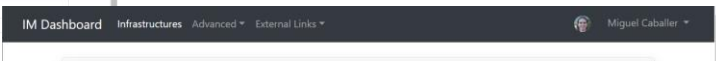
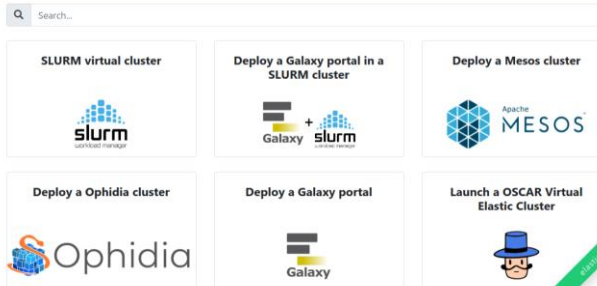
```
configuring
OpenNebula
name: 0
id: 0
ip: 192.168.1.1
```

Resource	Value
cpu	1
memory_size	4096m
memory_type	main
disk_size_name	100mb
disk_image_uri	http://vmsproject.3im.upv.es:8080
disk_credentials_username	root
disk_credentials_password	root
cpu_arch	x86_64
memory_size	4096m
memory_type	main
disk_size	100mb
disk_image	root
disk_credentials_username	root
disk_credentials_password	root
cpu_arch	x86_64

© GRuCAP - Terms of Service | www.grycap.upv.es | Dificio 3B, Avda 9, Planta 1 | Campus de Burjassot, 46100, Valencia | Universidad Politécnica de Valencia

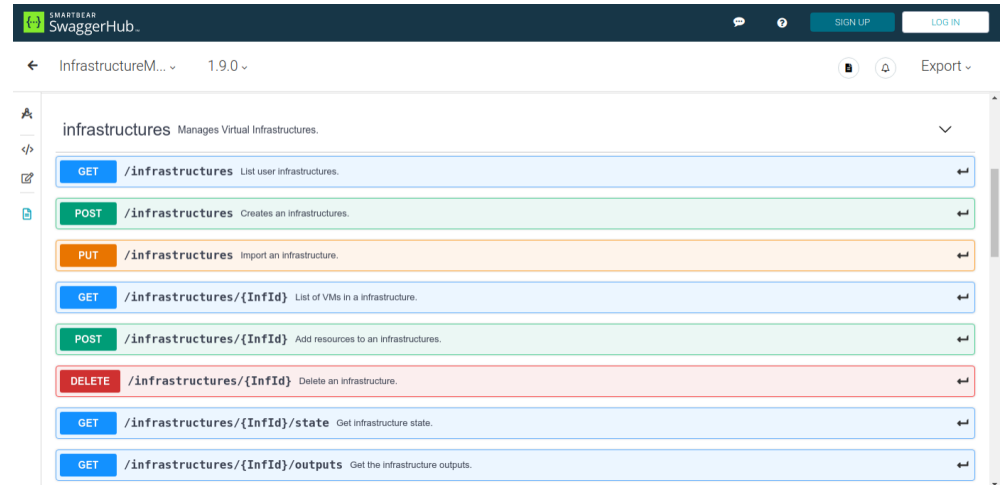
Client-SIDE Tools: Web Dashboard

- Easy interface
 - For non advanced users
 - Easily deploy infrastructures from a web browser
 - Select it from a list of configurable list of templates.



APIs to be consumed by Clients

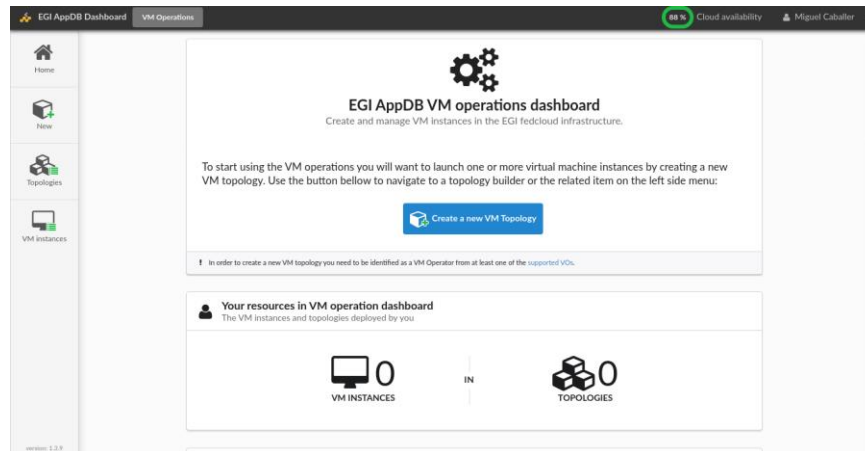
- XML-RPC API
 - API that follows the XML-RPC specification.
- REST API
 - IM Service can be accessed through a REST(ful) API
 - Follows the **OpenAPI** Specification



More info: <http://www.grycap.upv.es/im/documentation.php>

Where is the IM used?

- The IM is used in the VMOps Dashboard of EGI.
 - As the OpenStack communication layer to create VM topologies.
 - <https://dashboard.appdb.egi.eu/vmops>
 - https://wiki.egi.eu/wiki/Federated_Cloud_AppDB_VMOps_Dashboard



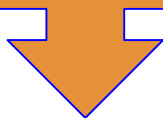
Where is the IM used?

- In the **INDIGO PaaS Orchestrator**:
 - <https://indigo-paas.cloud.ba.infn.it/>
 - Used at the PaaS Core to provide deployment of infrastructures to Cloud providers.
- In (Elastic Cloud Computing Cluster) **EC₃**:
 - <https://servproject.izm.upv.es/ec3-ltos/>
 - The IM is the Cloud orchestrator that deploys the virtual infrastructures.





Go back to the IM Dashboard!!



<https://www.grycap.upv.es/im>

<https://appsgrycap.i3m.upv.es:31443/im-dashboard/>

<https://marketplace.eosc-portal.eu/services/infrastructure-manager-im>

See full demo video at:

- <https://youtu.be/vmtzGOZxiUg>



**Infrastructure
Manager**

More Information



GRyCAP
Grid y Computación de Altas Prestaciones
www.grycap.upv.es

Video demos in YouTube:

https://www.youtube.com/playlist?list=PLgPH186Qwh_37AMhEruhVKZSfoYpHkrUp

EOSC Marketplace Entry:

<https://marketplace.eosc-portal.eu/services/infrastructure-manager-im>

IM image in Docker Hub:

<https://hub.docker.com/r/grycap/im/>

Source Code in GitHub:

<https://github.com/grycap/im>

IM Info Web:

<http://www.grycap.upv.es/im>



**EUROPEAN OPEN
SCIENCE CLOUD**



Questions?

