Open Cloud Computing Interface (OCCI)

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Presentation Overview

- Access the FGCloud resources using the OCCI client
  - Credentials management
  - Resource discovery
  - Create and access compute resources
- Launch an application on FGCloud
  - Launch the Mandelbrot application
  - Data access using SSHFS

OCCI Introduction

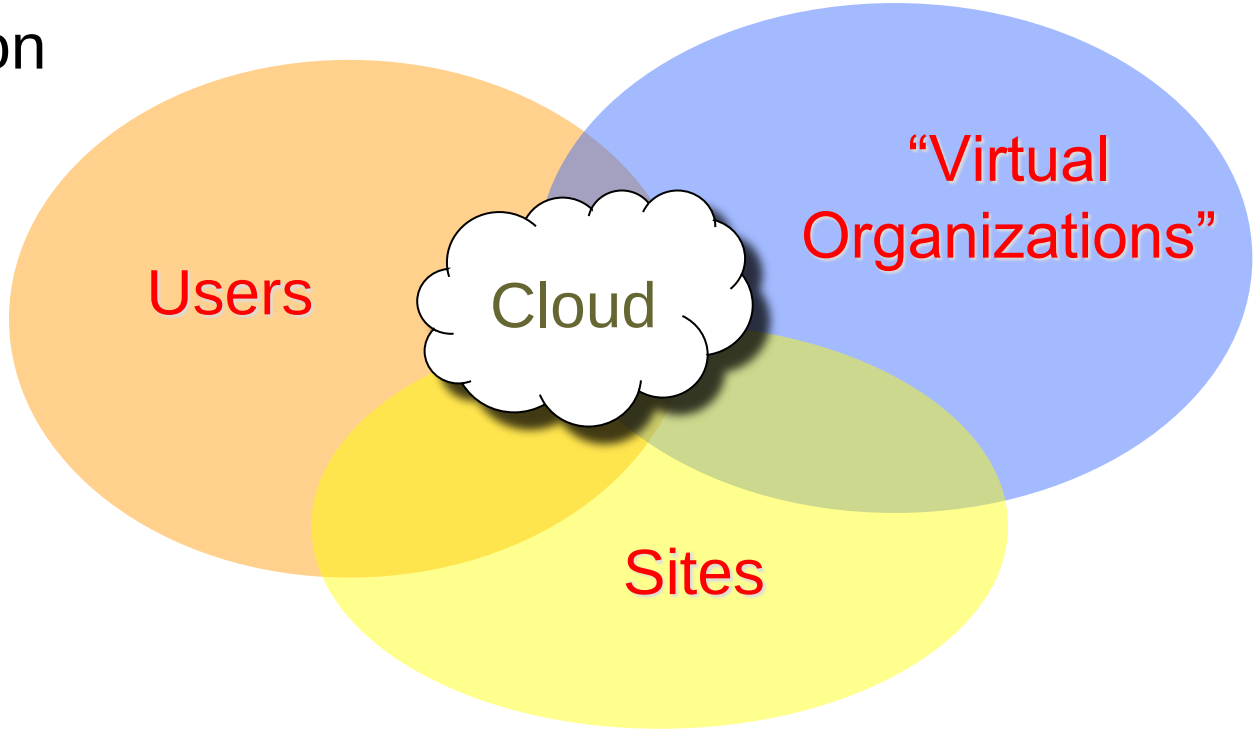
- A set of open specifications delivered through the Open Grid Forum for cloud computing
- OCCI has a set of implementations (e.g. rOCCI) that act as proofs of concept
- The focus was on Infrastructure-as-a-Service (IaaS), but can be extended to support Platform and Software as a Service as well
- rOCCI client provides a command line client that you can use directly from the shell to interact with OCCI endpoints of the FGCloud.

Access to Resources (I)

- **Authentication** – How do you identify a user?
  - X509 PKI infrastructure
  - Personal certificate (“Grid Passport”) issued by a Certification Authority
- **Authorization** – What is the user allowed to do?
- **Virtual Organization (VO)**
  - A dynamic set of individuals or institutions defined around a set of resource-sharing rules and conditions

Access to Resources (II)

- Personal certificate
- VO Registration
- Proxy creation



Hands-on

- Online documentation
  - https://wiki.egi.eu/wiki/HOWTO11_How_to_use_the_rOCCI_Client
  - https://wiki.egi.eu/wiki/HOWTO10_How_to_port_application_into_EGI_Federated_Cloud

Cloud Credentials

- In your CentOS 6 VM (VirtualBox)
  - `mkdir .globus`
  - `cp cert.p12 .globus/`
  - `cd .globus`
  - `openssl pkcs12 -nocerts -in cert.p12 -out userkey.pem`
  - `openssl pkcs12 -clcerts -nokeys -in cert.p12 -out usercert.pem`
  - `chmod 400 userkey.pem`
  - `chmod 644 usercert.pem`
  - `voms-proxy-init --voms vo.formation.idgrilles.fr -rfc`

Resource Discovery

- `ldapsearch -x -H ldap://lcg-bdii.cern.ch:2170 -b GLUE2GroupID=grid,o=glue GLUE2EndpointInterfaceName=OCCI | grep GLUE2EndpointURL`
- `export ENDPOINT=https://sbgcloud.in2p3.fr:8787/occi1.1`
- `export X509_USER_PROXY=`voms-proxy-info -path``
- `occi --endpoint $ENDPOINT --auth x509 --user-cred $X509_USER_PROXY --voms --action describe --resource os_tpl`
- `occi --endpoint $ENDPOINT --auth x509 --user-cred $X509_USER_PROXY --voms --action describe --resource resource_tpl`

Create Login Context File

- https://www.creatis.insa-lyon.fr/~camarasu/fg/create_tmpfglogin.sh
- In order to login into the server, you need a set of SSH keys
  - `ssh-keygen -t rsa -b 2048 -f tmpfg`
- Specify keys for user centos with a contextualization script

```
cat > tmpfg.login << EOF
#cloud-config
users:
  - name: ui-user
    sudo: ALL=(ALL) NOPASSWD:ALL
    lock-passwd: true
    ssh-import-id: ui-user
    ssh-authorized-keys:
      - `cat tmpfg.pub`
```

Create and Access Compute Resources

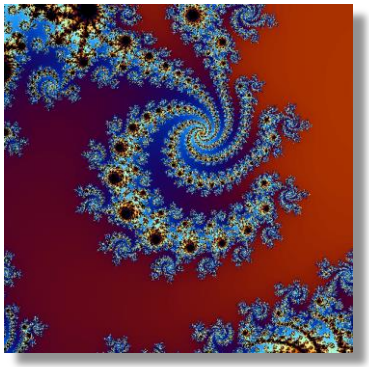
- Create resource (CentOS 7 VM)
  - ```
    occi -e $ENDPOINT  --auth x509 --user-cred $X509_USER_PROXY --
    voms -a create -r compute --mixin resource_tpl#2 --mixin
    os_tpl#74f127bc-d294-45ca-ab19-63fd9addd5e9 --attribute
    occi.core.title=centOS7 --context
    user_data=file:///`pwd`/tmpfg.login
    ```
- Link to public IP address
  - ```
    occi -e $ENDPOINT --auth x509 --user-cred $X509_USER_PROXY --
    voms -a link -r $VM_ID --link
    https://sbgcloud.in2p3.fr:8787/occi1.1/network/floating
    ```
- SSH login on created VM
  - ```
    eval `ssh-agent`
    ```
  - ```
    ssh-add tmpfg
    ```
  - ```
    ssh -i tmpfg ui-user@$VM_IP
    ```
    ```

Other rOCCI Commands

- List VMs
  - `occi -e $ENDPOINT --auth x509 --user-cred $X509_USER_PROXY --voms --action list -r compute`
- Delete VM
  - `occi –e $ENDPOINT --auth x509 --user-cred $X509_USER_PROXY --voms --action delete -r https://sbgcloud.in2p3.fr:8787/occi1.1/compute/9986ab6e-8e81-40eb-964b-91d6066f995d`

Mandelbrot Quest on FGCloud

- The Mandelbrot set definition
  - http://en.wikipedia.org/Mandelbrot
- Our goal: find a new interesting and beautiful area in the Mandelbrot set vicinity



Credits: Andrei Tsaregorodtsev

- In the quest we will be using the *mandelbrot* application
  - Available at: http://dirac.france-grilles.fr/demo/mandelbrot
  - Builds a fractal image around a chosen C point
  - **mandelbrot -W 600 -H 600 -X -0.46490 -Y -.56480 -P .000002 -M 500**
    - Find an interesting seed point C
    - Build a series of images with an increasing zoom level centered around the seed point C
    - Build a movie out of the .bmp images (convert *.bmp movie.gif)
    - Retrieve the result

Data Access

- SSHFS (SSH Filesystem) is a client used to mount and interact with directories and files located on a remote server over ssh
- Accounts have been created for you on the server

lupmstrat-073.msfg.fr

- On your CentOS 6 VM (VirtualBox)
  - Configure SSHFS : https://www.creatis.insa-lyon.fr/~camarasu/fg/config_sshfs.sh
  - `mkdir shared_dir`
  - `eval `ssh-agent``
  - `ssh-add $HOME/.ssh/clef_sshfs`
  - `sshfs formation@lupmstrat-073.msfg.fr:/home/formation/userXX ./shared_dir`
  - `[…]`
  - `fusermount -u ./shared_dir`

Contextualization

- An OS image may be personalized at start-up by running a custom configuration script.
- Build a contextualization script
  - https://wiki.egi.eu/wiki/HOWTO10_How_to_port_application_into_EGI_Federated_Cloud#Step_5._Build_a_contextualization_script
- Customize the contextualization script
  - Install fuse-sshfs and add key to access storage resources
  - https://www.creatis.insa-lyon.fr/~camarasu/fg/tmpfg.context
- Run the Mandelbrot Quest
  - Could you split it among available resources (multiple VMs) ?

Wrap-up

- We used X509 certificates to authenticate
- We accessed the FGCloud through the rOCCI client
- We used contextualization for login and further VM configuration
- We used SSHFS for data access
- We executed the Mandelbrot application on (multiple) cloud resources
- Further info on running applications in the FGCloud
  - Interface SaaS (tomorrow's morning session)

Thank you
for your attention!

Questions ?