



# eFlows4HPC

## Part 1.4: TOSCA Orchestration and HPCWaaS

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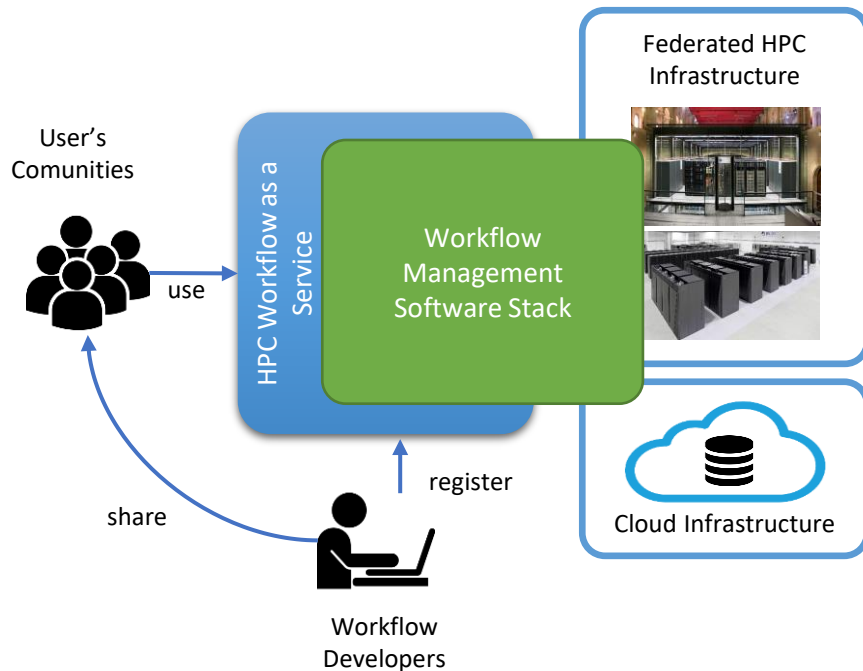
This project has received funding from the European High-Performance Computing Joint Undertaking (JU) under grant agreement No 955558. The JU receives support from the European Union's Horizon 2020 research and innovation programme and Spain, Germany, France, Italy, Poland, Switzerland, Norway. MCIN/AEI/10.13039/501100011033 and the European Union NextGenerationEU/PRTR (PCI2021-121957)

# Recap

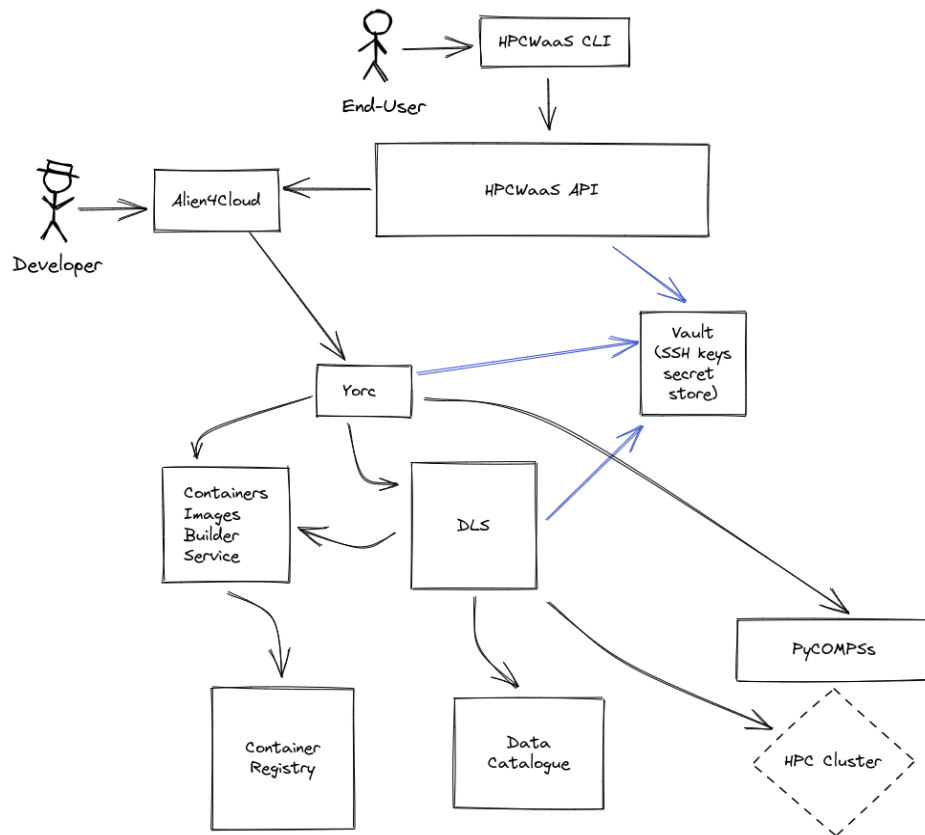
- **Part 1: Implementing computation**
- **Part 2: Create containers**
- **Part 3: Dealing with data logistics**
- **Let's see how to orchestrate all together**

# eFlows4HPC approach

- **Require a description for the workflow lifecycle management**
  - TOSCA:
    - Model to describe cloud application topologies and the lifecycle orchestration
- **Interface for deploying and running the workflows**
  - HPCWaaS:
    - Deployment (Alien4Cloud)
    - Execution (HPCWaaS API)



# Overview

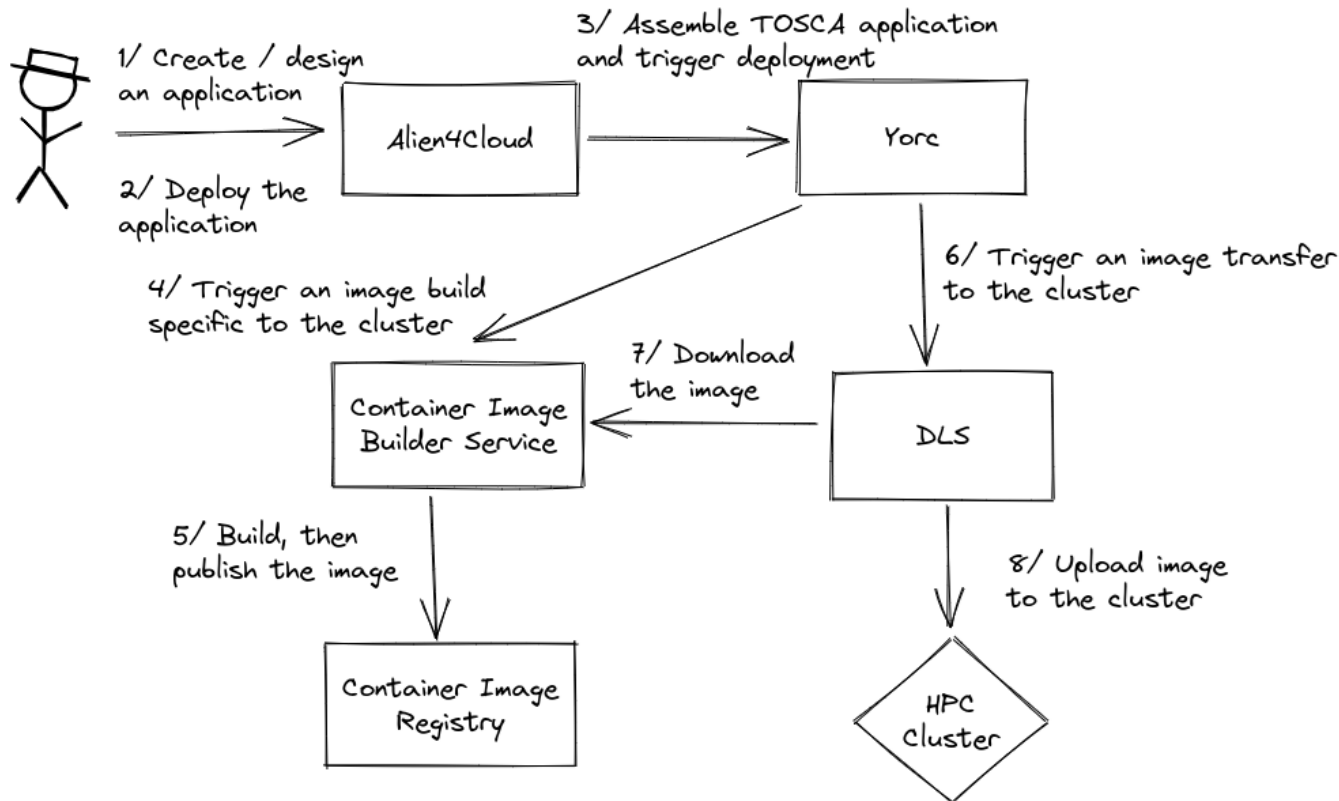


- HPCWaaS API:
  - control workflow executions
- Alien4Cloud:
  - design & deploy workflows
- Yorc:
  - high level orchestration engine
- Vault:
  - securely store credentials
- Container Image Builder service:
  - build container images
- DLS:
  - data movements engine
- PyCOMPSs:
  - Runtime engine for computations
- Container registry:
  - store container images
- Data Catalogue:
  - Registry for datasets locations



# DEVELOPER POINT OF VIEW

# Minimal Workflow - seen as Developer

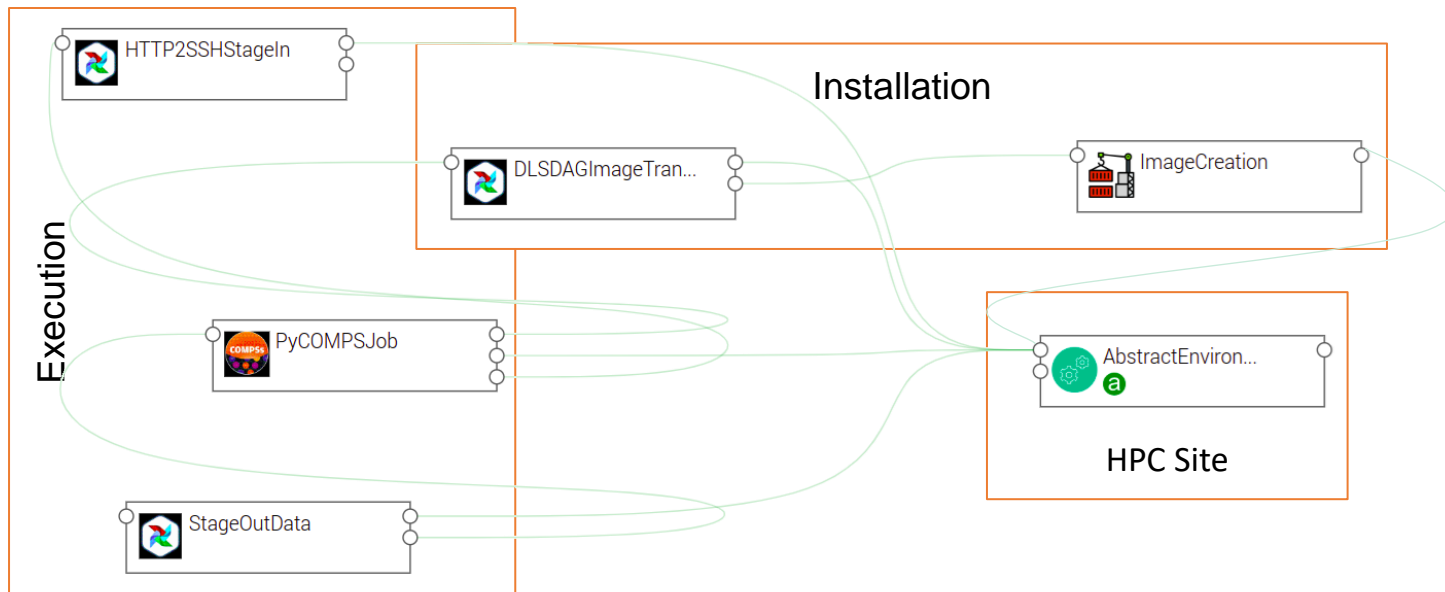


# eFlows4HPC TOSCA Components



# TOSCA Modelization

Topology of the different components involved in the Workflow lifecycle





# Workflow Deployment (done once per HPC site)



- Set deployment input parameters (user, credential, select HPC location)

Applications Catalog

pillar\_1 Environment Inputs

Undeployed

Home Prepare next deployment 0.1.0-SNAPSHOT Manage current deployment

Version Topology Inputs Locations Matching Review & deploy

Input properties

debug	✓ *	
user_id	bsc19611	
vault_id	eba73c03-470e-430a-bd0e-671...	
container_image_transfer_directory	/gifs/projects/bsc44/images	
mid	71e863ac-ae6-4680-a57c-dc3...	
register_result_in_datacat		

Preconfigured input properties

No data available.

Applications Catalog

pillar\_1 Environment Matching

Undeployed

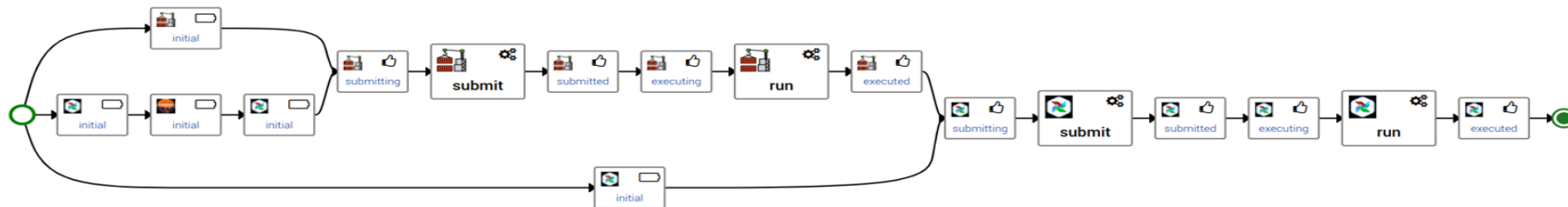
Home Prepare next deployment 0.1.0-SNAPSHOT Manage current deployment

Version Topology Inputs Locations Matching Review & deploy


Policies matching Nodes matching

AbstractEnvironment

Name	Type
bsc_nord3.1.0.0	eflows4hpc.env.nodes.AbstractEnvironment
bsc_amd.1.0.0	eflows4hpc.env.nodes.AbstractEnvironment



# Publish workflow and authorize users

 Applications Catalog

pillar\_1

Drop an image file, or [browse](#).

## pillar\_1

[description](#)

ID Pillar1

Creation date Thu, May 4, 2023 12:05 PM

Update date Thu, May 4, 2023 12:05 PM

Versions




Environments

Variables

Users and Groups

Delete

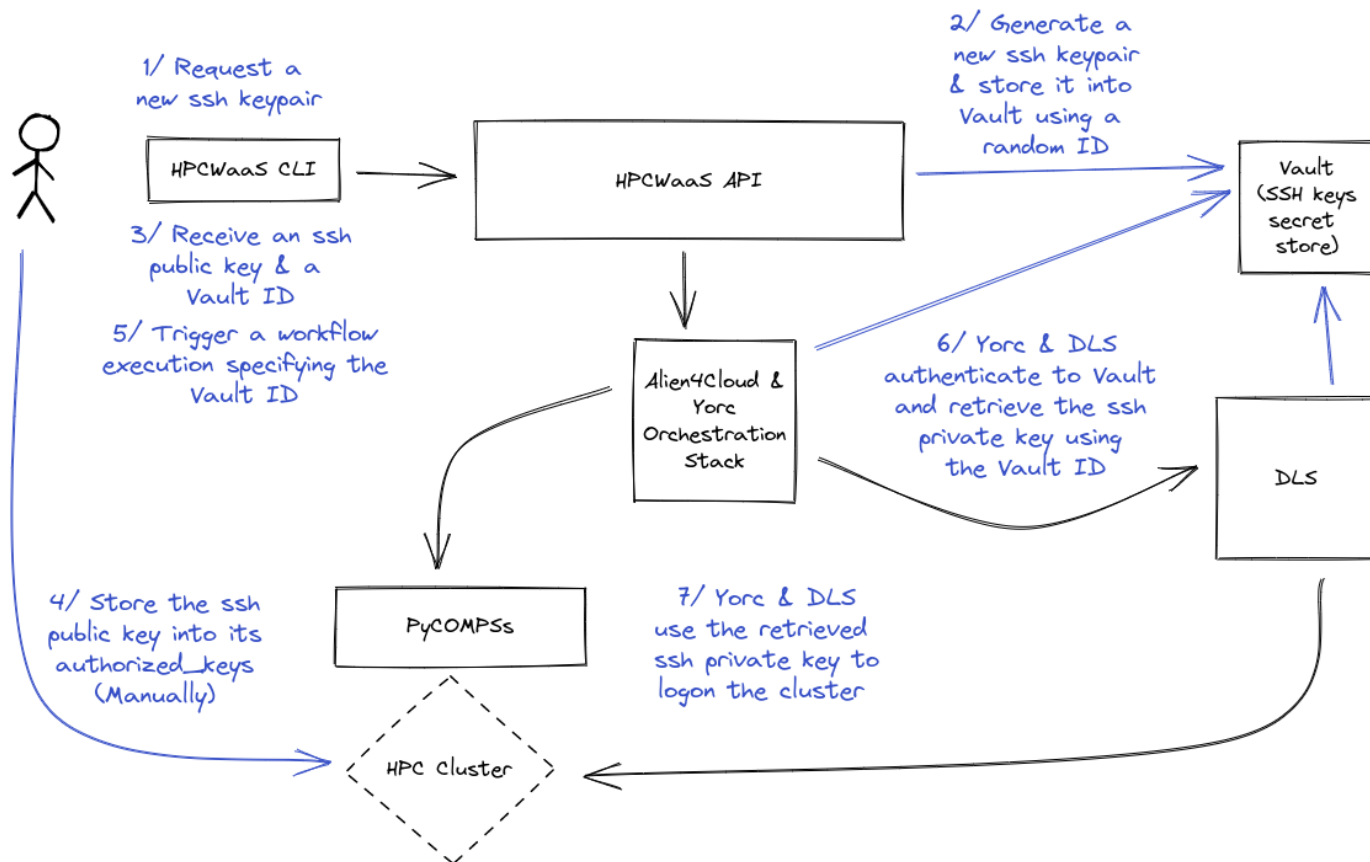
Tags

hpcwaas-workflows	<a href="#">exec_job</a>	
hpcwaas-authorized-users	<a href="#">jorge, loic.jedrzej</a>	
<input type="text"/>	<input type="text"/>	



# **END-USER POINT OF VIEW**

# Workflow Execution End user



# HPCWaaS main CLI commands

- **waas ssh\_keys key-gen**
- **waas workflows list**
- **waas workflows trigger**
- **waas executions status**
- **waas executions cancel**

# SSH Key Generation

```
./waas --api_url https://eflows4hpc.bsc.es/waas -u <user>:<password> ssh_keys  
key-gen
```

INFO: Below is your newly generated SSH public key.

INFO: Take note of it as you will not see it again.

INFO: You are responsible for adding it to the `authorized_keys` file on the systems you want to run your workflows.

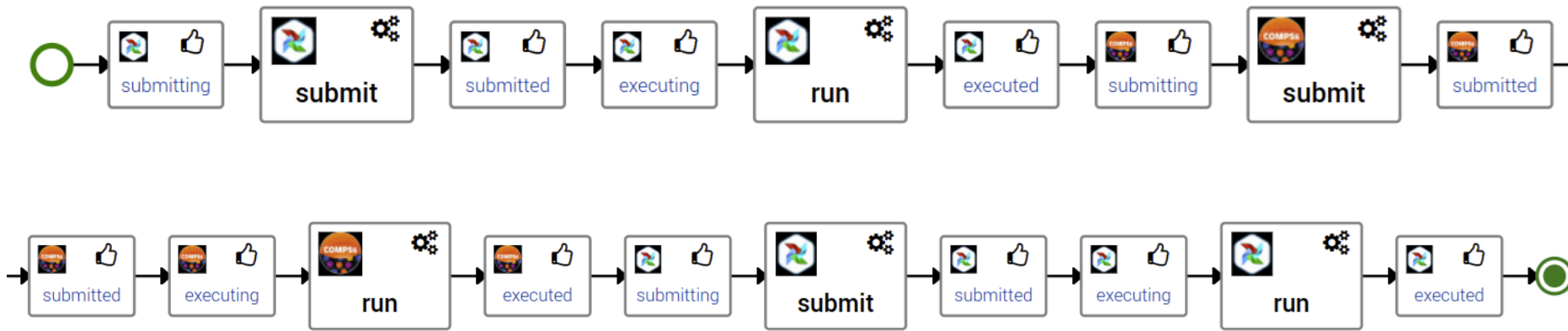
INFO: SSH key ID:       31...3f

INFO: SSH Public key: ssh-rsa AAA...mH

- SSH Key ID submitted to the workflow execution
- SSH Public Key must be added by the user in their authorized keys

# Workflow Execution

```
./waas --api_url https://eflows4hpc.bsc.es/waas -u <user>:<password> workflows  
trigger -f -i user_id=<username> -i vault_id=<SSH_KEYPAIR_ID> -i  
oid=2c2463377aac4aa59381c6b06fe800f3 -i  
target_path=/home/nct01/<username>/data/inputs -i  
source_path=/home/nct01/<username>/data/results -i num_nodes=2 <workflow_id>
```



# Conclusion

- **HPC Workflow as a Service**
  - Alien4Cloud: Describe and deploy HPC workflow as a TOSCA Application
  - Execution API: Manage SSH credentials and execution of deployed workflows





# eFlows4HPC

Enabling dynamic and Intelligent workflows  
in the future EuroHPC ecosystem

[www.eFlows4HPC.eu](http://www.eFlows4HPC.eu)



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eFlows4HPC Project



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