Composition and Deployment of Complex Container-Based Application Architectures on Multi-Clouds

DI4R
Lisbon, Portugal
October 2018

Andy S. Alic[1], Marica Antonacci[2], Ignacio Blanquer[1], Miguel Caballer[1], Giacinto Donvito[2], Álvaro López[3], Germán Moltó[1]

[1]Universitat Politècnica de València
[2]Istituto Nazionale di Fisica Nucleare
[3]Consejo Superior de Investigaciones Científicas

DEEP-Hybrid-DataCloud funded by the EU Horizon 2020 Framework Programme; grant agreement 777435

The Problem. The Why.

Hybrid DataCloud

- Universal infrastructure support
  - Or at least close to
  - Bare clouds, Kubernetes clusters, **Mesos/Marathon** clusters, Docker Swarm
- Let's speak the same (descriptive) language
- Academia+industry standard
- Extensible
- Approachable to non-IT fellows

TOSCA

- **T**opology and **O**rchestration **S**pecification for **C**loud **A**pplications
- Standard created by the OASIS Consortium

TOSCA main web page: https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=tosca#overview
Committee full list: https://www.oasis-open.org/committees/membership.php?wg_abbrev=tosca

TOSCA template general skeleton

Hybrid DataCloud

```
tosca_definition_version: tosca_simple_yaml_1_0

description: Insert your description here

imports:
    # List your imports, each on a new line, each line starting with a hyphen

topology_templates:
    inputs:
        # List your inputs, each on a new line

    node_templates:
        # List your nodes, each on a new line

    outputs:
        # List outputs, each on a new line
```

TOSCA example

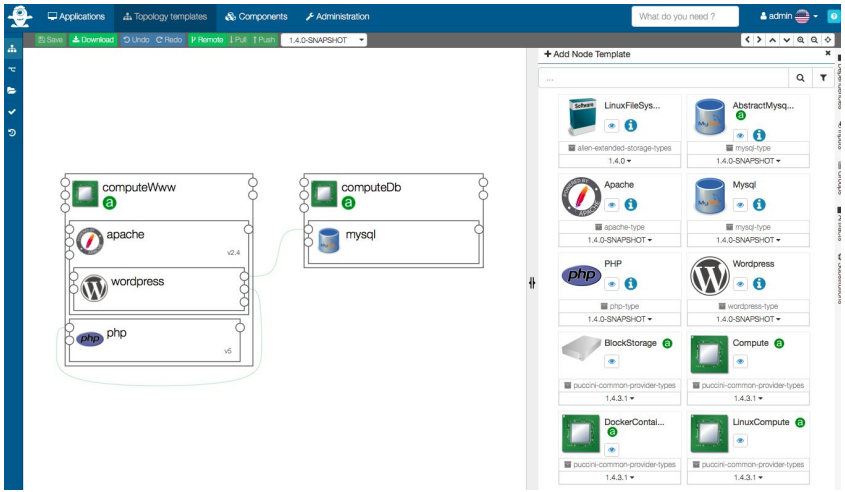
```
node_templates:
    mesos_master_server:
      type: tosca.nodes.indigo.Compute
      capabilities:
        scalable:
          properties:
            min_instances: 1
            max_instances: 1
            count: 1
            default_instances: 1
        os:
          properties:
            gpu_driver: true
            cuda_support: true
            image: "ubuntu-16.04"
            instance_type: "g5.large"
        endpoint:
          properties:
            dns_name: mesosserverpublic
            private_ip: true
            ports:
              marathon_port:
                protocol: tcp
                source: 8443
            secure: false
            network_name: PUBLIC
        host:
          properties:
            num_gpus: 1
            mem_size: "2 GB"
            Num_cpus: 2
        properties
```

Topology building/composing

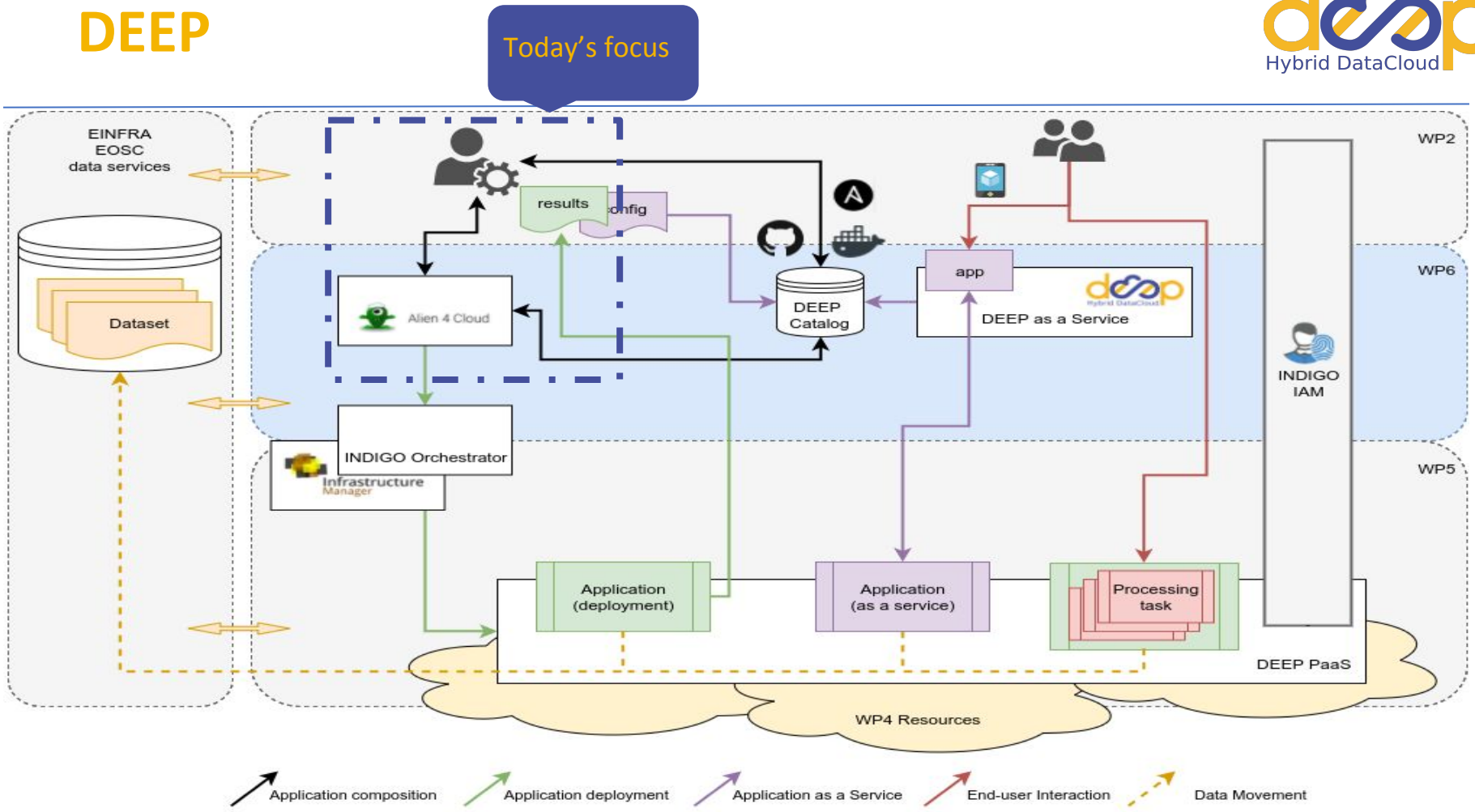
- One can use
  - A simple text editor
    - Even Notepad would do
  - A GUI
    - Eclipse Winery
    - OpenTosca
    - Cloudify
    - Alien4Cloud

Alien4Cloud

- Portal to graphically edit YAML-based TOSCA templates
- Built in Java + HTML5 (Spring Boot, Angular)
- Open - Source on Github; Apache 2.0
  - https://github.com/alien4cloud
- Extensible - Plugin based
  - Easy to add new orchestrators
    - An orchestrator creates the actual infrastructure using a TOSCA topology Defined by the user



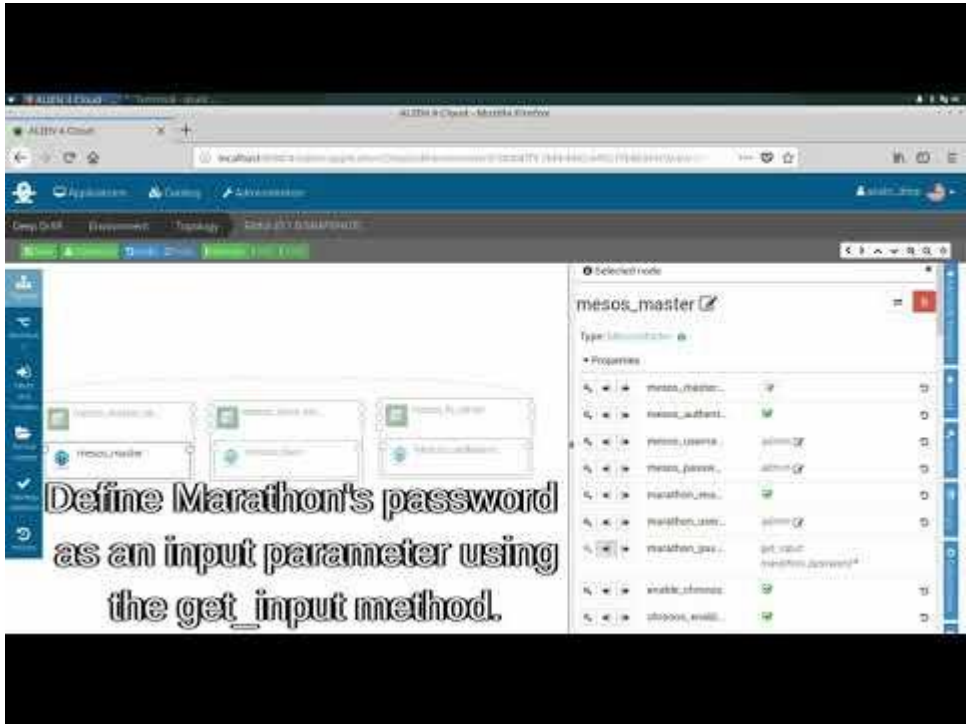
DEEP


Today's focus
EINFRA
EOSC
data services
Dataset
results
config
Alien 4 Cloud
DEEP
Catalog
app
DEEP as a Service
INDIGO
IAM
WP2
WP6
WP5
INDIGO Orchestrator
Infrastructure
Manager
Application
(deployment)
Application
(as a service)
Processing
task
DEEP PaaS
WP4 Resources
Application composition
Application deployment
Application as a Service
End-user Interaction
Data Movement

Alien4Cloud in DEEP

- User's entry point
- Plugin to communicate with our Orchestrator
- Freely at (as bundle Alien4Cloud + plugin, under Apache 2.0)
  - indigo-dc/alien4cloud-deep on 
  - indigodatacloud/alien4cloud-deep on 
- Next, video deployment **Jupyter+Tensorflow** on **Mesos/Marathon**
  - Use **GPU**s
  - 3 x Virtual Machines
    - 1 x **Mesos Master** to control (running **Marathon** too)
    - 1 x **Mesos Slave** doing the hard work
    - 1 x **Load Balancer** - **Marathon-LB (HAProxy)** exposed to internet

Alien4Cloud in action



Thank you!

Want more? Check us on:

 → https://deep-hybrid-datacloud.eu/

 → @DEEP_eu

DEEP-Hybrid-DataCloud funded by the EU Horizon 2020 Framework Programme; grant agreement 777435

What's the idea

Hybrid DataCloud

- Standardizes the language to describe:
  - The structure of an IT Service (its topology model)
  - How to orchestrate operational behavior (plans such as build, deploy, patch, shutdown, etc.)
  - Declarative model that spans applications, virtual and physical infrastructure