Cloud Environment Automation: from infrastructure deployment to application monitoring

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Overview

• Open City Platform (OCP) project
• OCP platforms’ architecture
• OCP IaaS installation scenarios and Automation
• OCPs Cloud Environment Automation Architecture
• Conclusion & Future Work
OpenCityPlatform (OCP) project

- **Industrial research project**
  - Funded by the Italian Ministry of University and Research (MIUR)
    - Started in 2014
    - Duration 42 months (1 Jan. 2014 – 30 June 2017)
  - Participants
    - 7 partners
    - 20 beneficiaries
    - 2 Universities/research institutes
    - 3 big private companies
- Project intends to research, develop and test
  - **new technology solutions**
    - open,
    - interoperable and usable on-demand on the Cloud,
  - **innovative organizational models**
    - sustainable over time
  - **delivery of services**
    - from Local Government and Regional Administrations to Citizens and Companies
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OCP platforms’ architecture

Amministrazione  | Sviluppo servizi ed applicazioni  | Fruizione servizi, applicazioni e gestione

IaaS / PaaS Management Portal  

App store

Citizen’s Marketplace

Reusable components

Open Data Services

TOSCA enabled interface

OCP Platform engine

iPaaS integration Layer

TOSCA/AWS IaaS adapter layer

Open Data Layer

TOSCAAWS PaaS adapter layer

TOSCA/AWS Commercial IaaS adapter layer

API

Recipe HEAT/TOSCA

API

Openstack Native API

API

API

API

Microsoft/VMWARE Native API

IAAS resources management

Abstraction Layer: KVM, XEN, CEPH, Gluster FS, Open VSwitch

Physical Environment (Infrastructure, HW, network)
OCP platforms’ architecture – IaaS layer

- **IaaS layer**
  - Amministrazione
  - Sviluppo servizi ed applicazioni
  - Fruizione servizi, applicazioni e gestione

- **App store**
  - Citizen’s Marketplace
  - Reusable components
  - Open Data Services

- **TOSCA enabled interface**
  - OCP Platform engine

- **iPaaS integration Layer**
  - TOSCA/AWS
  - IaaS adapter layer
  - API
  - Recipe
  - HEAT/TOSCA

- **Open Data Layer**
  - Open data engine
  - ckan

- **PaaS adapter layer**
  - TOSCA/APPWS
  - OCP Platform engine

- **Commercial IaaS adapter layer**
  - Microsoft/VMWARE
  - Native API

- **Abstraction Layer**
  - KVM, XEN, CEPH, Gluster FS, Open VSwitch
  - Physical Environment (Infrastructure, HW, network)
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IaaS installation scenarios

• **Manual installation and configuration (“hardcore”)**
  • **Pros**
    • better understanding of OpenStack dependencies between components
    • more control over configurations
  • **Cons**
    • requires basic knowledge of Linux OS, bash and network configuration
    • error-prone and time-consuming

• **Full-automated installation via Fuel**
  • **Pros**
    • Easy installation through the graphical interface
    • Enables subsequent changes and new deployments
  • **Cons**
    • Initial configuration cannot be changed
    • Custom configuration difficult to be applied.
“Automation make it better”

- A semi-automatic installation method
  - Designed to take the advantages of the methods presented
    - More control over configurations
    - Easy installation through the graphical interface
  - Flexible
    - to meet the architectural requirements of Data Centers

- Leverage on automation tools
  - Foreman and Puppet
Automation Tools

• Puppet
  • Framework open source for the management and configuration of ICT systems
    • Roles and profiles model
      • based on a similar module of Quentin Machu
    • Profiles: technology-specific wrapper classes
      • Database, Horizon, Keepalived, Nova-compute, ...
    • Roles: business-specific wrapper classes
      • Every node is classified with one role!

• Foreman
  • Framework for the lifecycle management of virtual and physical server
    • Rapid deployment of services and applications
    • Easy automation of repetitive actions
    • Proactive Management of servers
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Cloud Environment Automation Architecture

**Master Node – Configuration Management & Monitoring**

- CM
  - Foreman
  - Puppet
  - DNS

- Monitoring
  - Zabbix

**Node01,02,03 – Services (RHMK)**

- HAProxy
- Keepalived
- Percona/MySQL
- RabbitMQ
- MongoDB
- Zookeeper

**Node07,08 – Controller**

- IDENTITY
  - Keystone

- DASHBOARD
  - Horizon

- IMAGE
  - Glance

- TELEMETRY
  - Ceilometer

- BLOCK STORAGE
  - Cinder

**Node09,10 – Network**

- NETWORKING
  - Neutron agents

- COMPUTE
  - Nova

**Node11,12 – Compute**

- COMPUTE
  - Nova compute

- NETWORKING
  - Neutron ovs agents

**Node04,05,06 – CEPH**

- Distributed FS
  - Ceph
Network Architecture
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Conclusions & Future Work

• Cloud Environment Automation
  • A new semi-automatic method for IaaS installation and configuration
  • Developed in the OCP industrial research project
  • Addresses the different requirements and realities
    • Flexible IaaS configuration and management
    • High Availability and Network management support
    • Ceph adopted as block and object storage backend
    • Fine grain variable configuration
    • Graphical User Interface support
Conclusions & Future Work

• New Features
  • Full support to the OpenStack Identity API v3
  • Automatic upgrade of the OCP-IaaS layer to a new OpenStack version
  • Automatic methods and tools for the installation and configuration of the PaaS layer
    • CloudFormation as a Service