Towards Cloud Application Description Templates Supporting Quality of Service

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Content

- Introduction to COLA
- COLA Architecture
- COLA and TOSCA
- QoS Policies Overview and Structure
Problems in the migration to Cloud

– Intrinsic complexity required to describe:
  – the correlated services,
  – the QoS that describe its execution,
  – the procedures to deploy, undeploy and migrate applications in different IaaS platforms.
The COLA (Cloud Orchestration at the Level of Application) Project

- COLA aims at addressing the previously mentioned difficulties to foster the adoption of cloud computing services.

- The COLA project will provide a reference implementation of a generic and pluggable framework that supports the optimal and secure deployment and run-time orchestration of cloud applications.
The COLA (Cloud Orchestration at the Level of Application) Project

- Applications can then be embedded into workflows or science gateway frameworks to support complex application scenarios from user-friendly interfaces.

- A specific aspect of the cloud orchestration framework developed by COLA is the ability to describe complex application architectures incorporating several services.

- The framework will also support the definition of various Quality of Service (QoS) parameters related to performance, economic viability and security.
Cola Concept

Describe the overall topology.

What is the Application?

Describe the Execution Modalities.

How do I execute the Application?

Execute the Application
COLA Concepts

- Application A
- Application B
- Application C
  
  - Service X
  - Service Y
  - Service Z

Baseline + Variable Resources Requirements

Dynamic Demand and Supply

Cloud Services
The Application Description Architecture

- Application Templates
  - Service Templates
    - Implementation Templates
    - Implementation Templates
    - Implementation Templates
    - Implementation Templates
COLA, MICADO and TOSCA

**MICADO**

- Applications
- Services
- Implementation

**TOSCA**

- Topology Template
- Node Template
- Relationship Template
- Implementation Plans
- Policies
Application Description and Policies

- Policy
- Repository
- Interface (IDE/GUI)
- Policy
- TOSCA Controller
- OCCOPUS
- Policy Keeper
- Swarm
- Other Sources
- Prometheus
- Docker
Application Description and Policies

Topology Policy

Service Policy

[Diagram showing a network topology with nodes and arrows connecting them.]
Application Description and Policies
Policies Parameters

- **Stage**: Deployment, Runtime, Undeployment
- **Topological Layer**: Global (all nodes), Local (single node)
- **Technological Layer** (Target): Service, Operative System, Virtual Machine, etc…
Design Constraints/Guidelines

- **Declarative Model.** The policies description follows the Declarative Model. E.g. they describe a policy but they do not imperatively describe how to implement the policy, which is left to the proper components of the COLA architecture.
– **Pick and Choose Policies.** Users can select policies from a basket of existing policies but cannot create new policies.
Design Constraints

- **Parameter-Based Policies.** Users can define parameters of the selected policies but cannot change the structure of the selected policies.
Design Constraints

- **No Consistency is ensured.** Policies may be contradictive.
- At this stage of the policies description, only a priority level will be offered to the user to define which policy has the highest priority but this priority may not always be respected.
Generic Policy Structure

Policy Super Type

- Policy Sub Type A
- Policy Sub Type B
- Policy Sub Type C

  - Policy Sub Type X
  - Policy Sub Type Y

Property A
Property B
Property C

Value A
Value B
Value C
Generic Policy Structure

- **Name:** A String that represents the name of the Policy
- **Type:** A String that defines the type of the policy, as an example: Authentication, Location, etc...
- **Description:** A textual description of the policy
- **Stage:** Define at which stage the policy applies. As an example, a policy may apply at deployment stage, or execution stage.
- **Priority:** This is an arbitrary integer of 0 to 100 used to define the priority with which the policy will be implemented.
- **Targets:** Targets define the technological element to which the policy has to be applied.
- **Parameters:** Description: Each policy is described by a list of parameters
### Accepted values + Triggers:

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<th>Default Value</th>
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<th>Constraints</th>
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Conclusions and Questions

– First Investigation of the Extension of TOSCA to describe policies will be completed in the summer

– Micado Architecture is in its third iteration and already supports simple policies although not expressed in TOSCA.

– Once the TOSCA extension will be tested, further research could investigate:
  – Solution of policies conflicts beyond simple priorities
  – Extending the trigger data sources namespaces beyond the available services