RESERVOIR's VMI
VEE (Virtual Execution Environment) Manager Interface

OGF25 Cloud Computing API BoF

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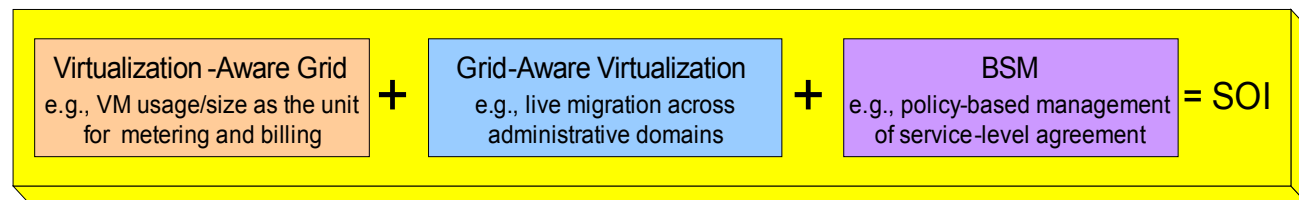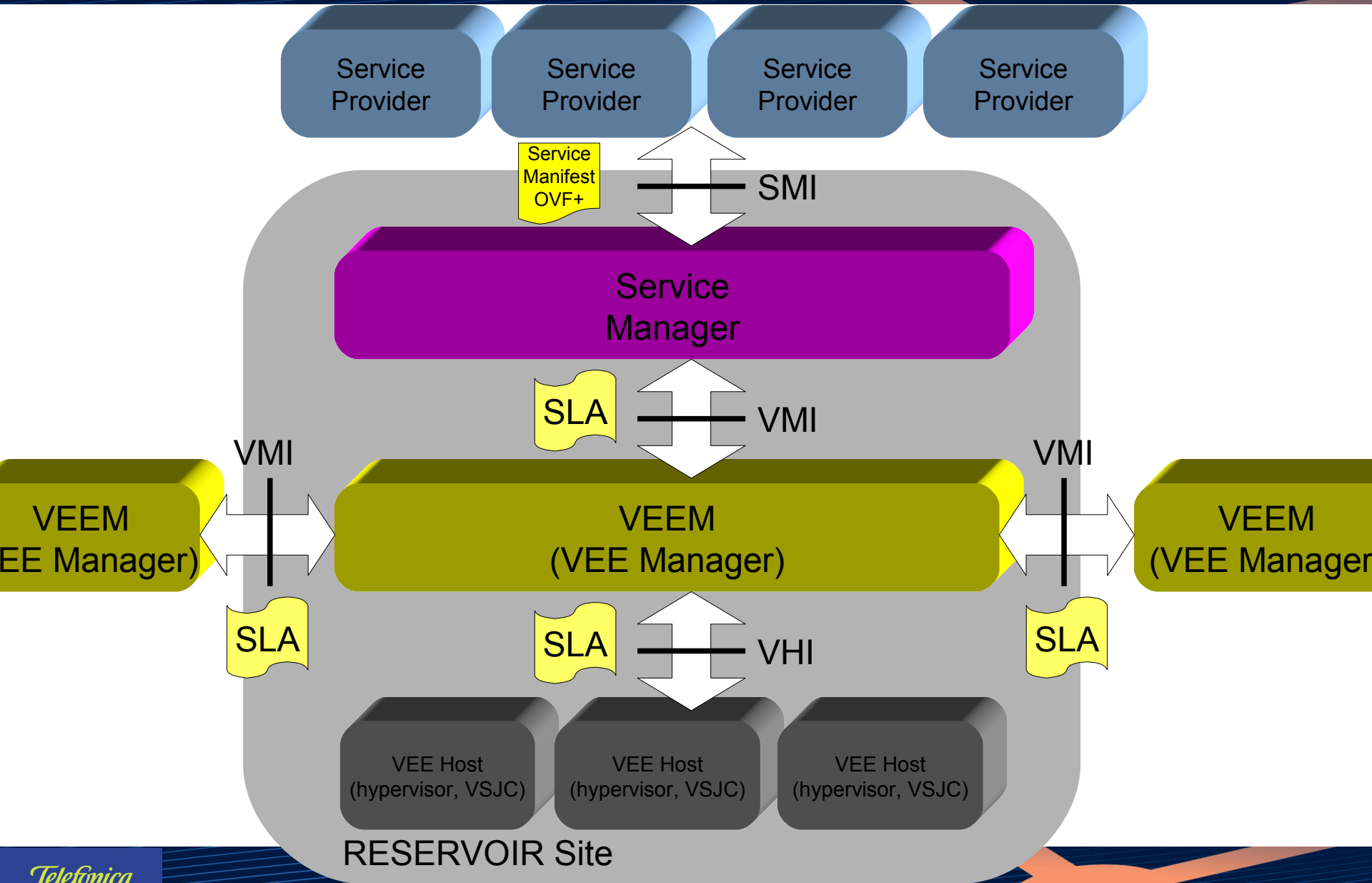Telefónica I+D

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Project Overview

- Focus on technologies that enable to build cooperating computing clouds
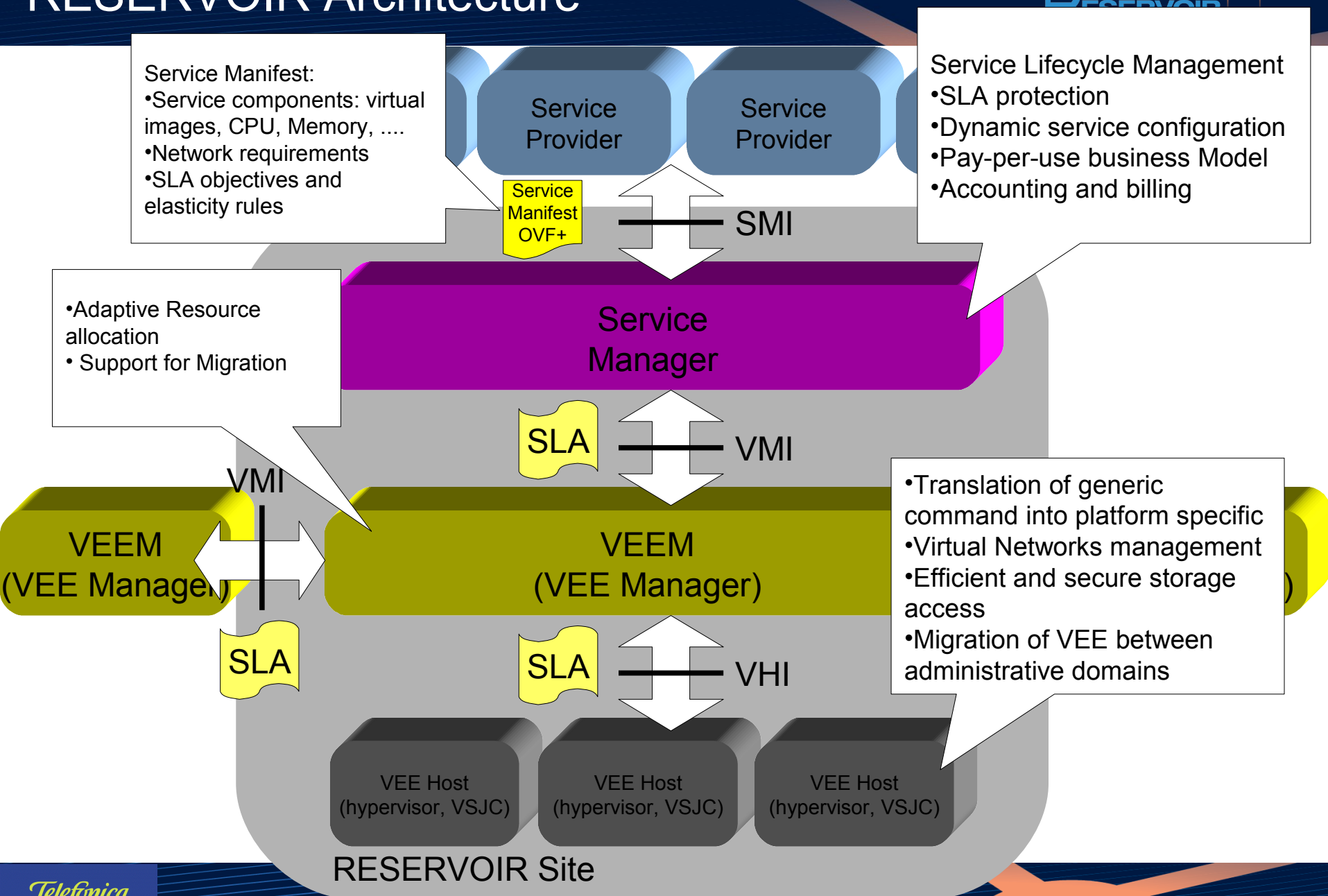 - Connect computing clouds to create an even bigger cloud
- Integration of virtualization technologies with grid computing driven by new techniques for business service management. The Service Oriented Infrastructure (SOI) equation:

| Virtualization -Aware Grid e.g., VM usage/size as the unit for metering and billing | + | Grid-Aware Virtualization e.g., live migration across administrative domains | + | BSM e.g., policy-based management of service-level agreement | = SOI |

- Building on this equation we will architect and implement a platform for supporting complex services, which
  - Enables dynamic deployment of <u>complex multi-tier services</u> across <u>heterogeneous administration domains</u>
  - Uses <u>virtualization of servers, storage and network</u> to allow migration without borders
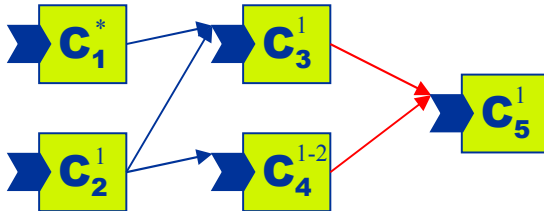 - Supports service definition, SLA management, accounting and billing

RESERVOIR Architecture

RESERVOIR Architecture

Service Manifest:
- Service components: virtual images, CPU, Memory, ...
- Network requirements
- SLA objectives and elasticity rules

Service Lifecycle Management
- SLA protection
- Dynamic service configuration
- Pay-per-use business Model
- Accounting and billing

Service Provider

Service Provider

Service Manifest OVF+

SMI

Service Manager

- Adaptive Resource allocation
- Support for Migration

SLA

VMI

VMI

VEEM
(VEE Manager)

VEEM
(VEE Manager)

- Translation of generic command into platform specific
- Virtual Networks management
- Efficient and secure storage access
- Migration of VEE between administrative domains

SLA

SLA

VHI

VEE Host
(hypervisor, VSJC)

VEE Host
(hypervisor, VSJC)

VEE Host
(hypervisor, VSJC)

RESERVOIR Site

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Service Manager deployment

Service Manifest

Logical Architecture

Service Elasticity Rules

C1 (2 CPU, 1 Gb, 10 GB disk)
Load(C3) = 3* Load(C1)
CPU(C1) = Users(C1)/1000
Replicas(C1) = RequestPerSecond(C1) /500
….

SLA Definition

SLA(C1) = Gold
SLA(C2) = Bronze
Users (C1) = 1000
….
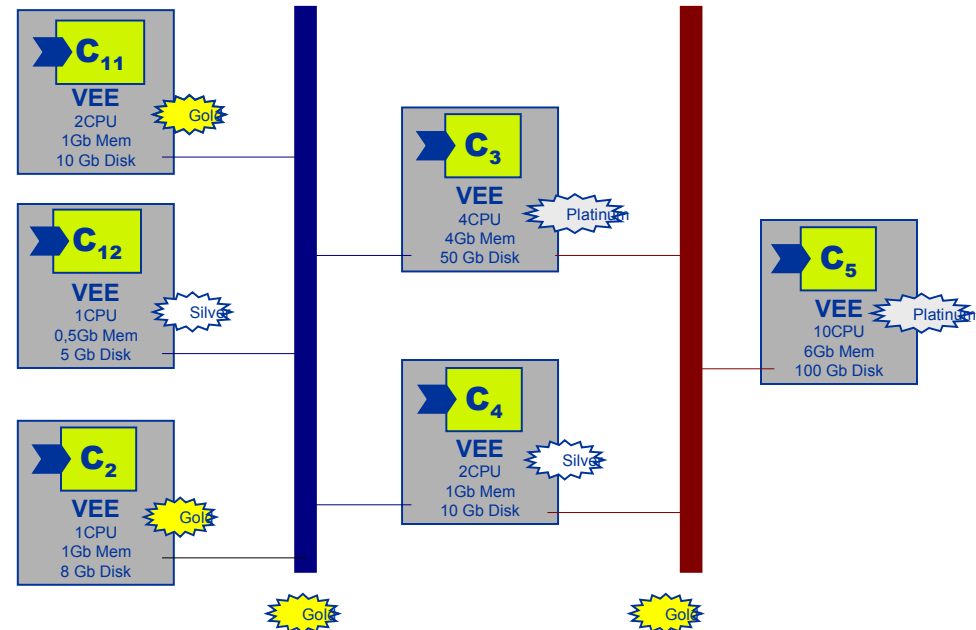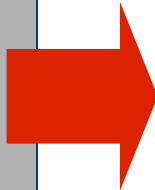
+ Deployment Directives

Deploy(C11)= { Domain1, Domain 3, Domain z}
SLA(RED) = GOLD
CPU(C11) = 2
SPEED(RED) = 5MBS

- # Deploy, control and monitor VEEs
  - VEEs Submission Interface (InitializeVEE, SubmitVEEs)
  - VEE Control Interface (VEEUpdate)
    - ACTIVATE, PAUSE, SUSPEND, SHUTDOWN, DESTROY
  - VEE Accounting Interface (ReceiveAccountingInfo, Register/DeregisterAccountingInformationListener)
  - VEE Monitor Interface (MonitoringInformation, PutMonitoringInformation)
- # Monitor and Control VEEM Sites
  - VEEM Site Monitoring Interface
  - VEEM Site Migration Interface

Wide Variety of IaaS Cloud Providers:
- Different access interfaces.
- Lack of interoperability.
- Possible vendor lock-in.
- Difficult deployment and migration across clouds.

Amazon EC2 Interface: The *de facto* Standard

RESERVOIR

- Users can register, unregister images and offer them to third parties. Images format is AMI.
- There are predefined images available.

Image Treatment

- Deploy/undeploy instances. EC2 allows to define 1) min, max instances 2) deployment zone 3) key pair and security group.
- Hw conf is limited to a set of options.

Instances Deployment

- Define security groups for instances communication.
- Define key pairs for access to instances.

Security

- Allocate and release static IPs.
- Associate and diassociate allocated IPs to instances.

Network/ Elastic IPs

- Define storage blocks.
- Attach them to devices of instances.

Storage/ESB

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The RESERVOIR Cloud Interface

- Users can register/unregister images.

Image Treatment

- Deploy/undeploy Virtual Machines (~ instances). Memory, CPU, disks, network interfaces and hypervisor are configurable.
- Two steps: configuration definition and activation.
- VMs state can be controlled: *DEFINED, ACTIVE, PAUSED, SUSPENDED, DESTROYED*.

VMs configuration and control

- Each network interface can be attached to a network ('red network'), each network represents a LAN.
- Special network for public IPs ('public network').

Network

- Monitoring (hw and services) and accounting information can be received from the platform or services probes.

Monitoring/ accounting

RESERVOIR and Amazon comparison

RESERVOIR

AMAZON

| Image Treatment | Diffs: Amazon lets offer images to third parties, and has predefined images. Only accepts AMIs. | Image Treatment |

| VMs configuration and control | Diffs: RES allows to define the VM hw and to control its state. | Instances Deployment |

| Network | Diffs: Amazon manages public IPs separately. RES allows to define separate LANs per service. | Network/ Elastic IPs |

| Monitoring/ accounting | Not clear mapping... | Security |
| | | Storage/ESB |

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- There are basic shared functionalities.
- There are inherent differences, though:
  - Definition of VMs.
  - Network management.
  - Security management.
  - Monitoring, accounting.
- Amazon can be deemed as the de facto standard that can be extended with RESERVOIR's contribution