ISOD BCP Document Discussion and Recommendations

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Outline

- BCP document overview and suggestions
- Discussion on remaining issues and possible next steps

OGF BCP Document TOC

On-Demand Infrastructure Services Provisioning Best Practices

1. Introduction
2. Infrastructure Services definition
3. Network Resources Provisioning Systems (NRPS)
4. General and Cloud Oriented Network Infrastructure Services Provisioning
5. Provisioning Infrastructure services in Clouds
6. Existing Standards
7. Existing Cloud Middleware for Infrastructure Services Provisioning
8. Summary

50 pages

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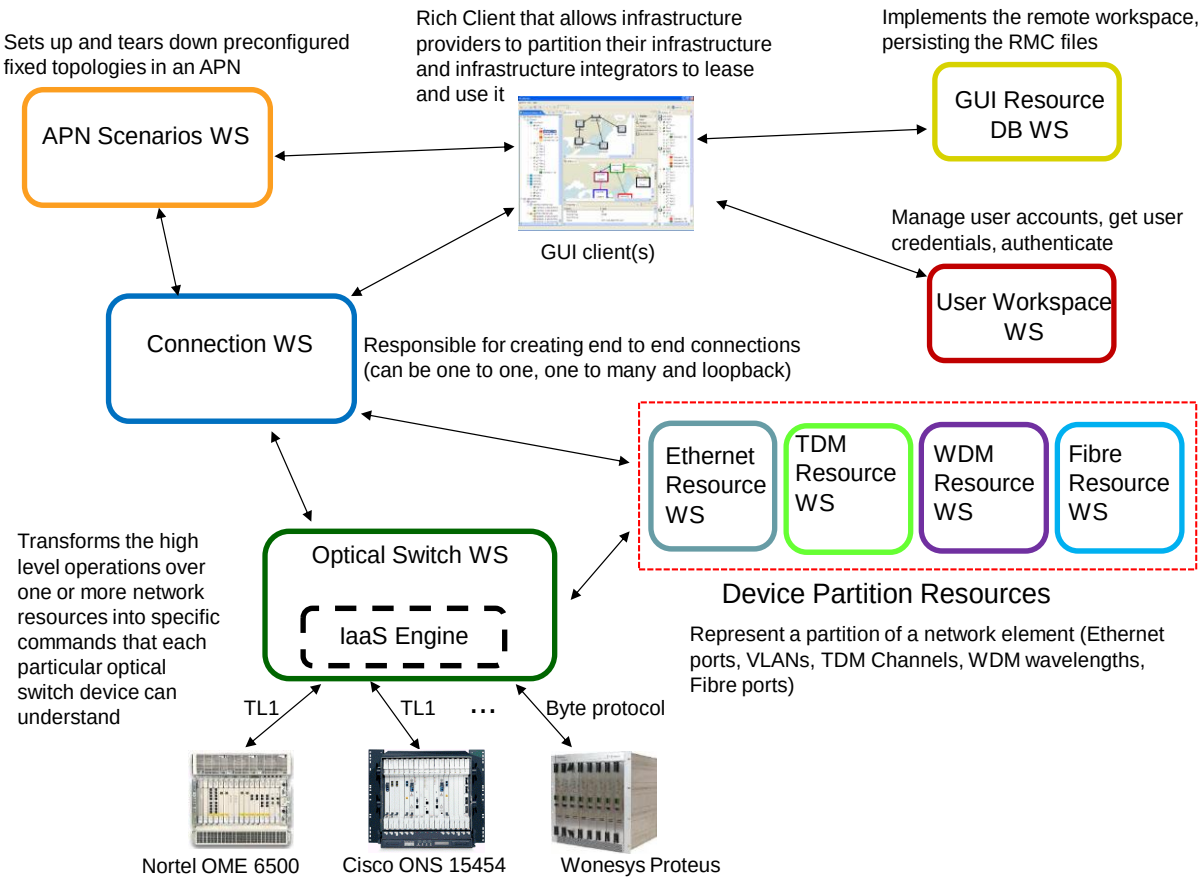
OGF BCP Document Overview (1)

1. Introduction

2. Infrastructure Services definition
2.1 General Infrastructure Definition
2.2 Infrastructure services definition in the context of this document

3. Network Resources Provisioning Systems (NRPS)
3.1 Argia
3.2 AutoBAHN
3.3 G-lambda and GridARS
3.4 OSCARS

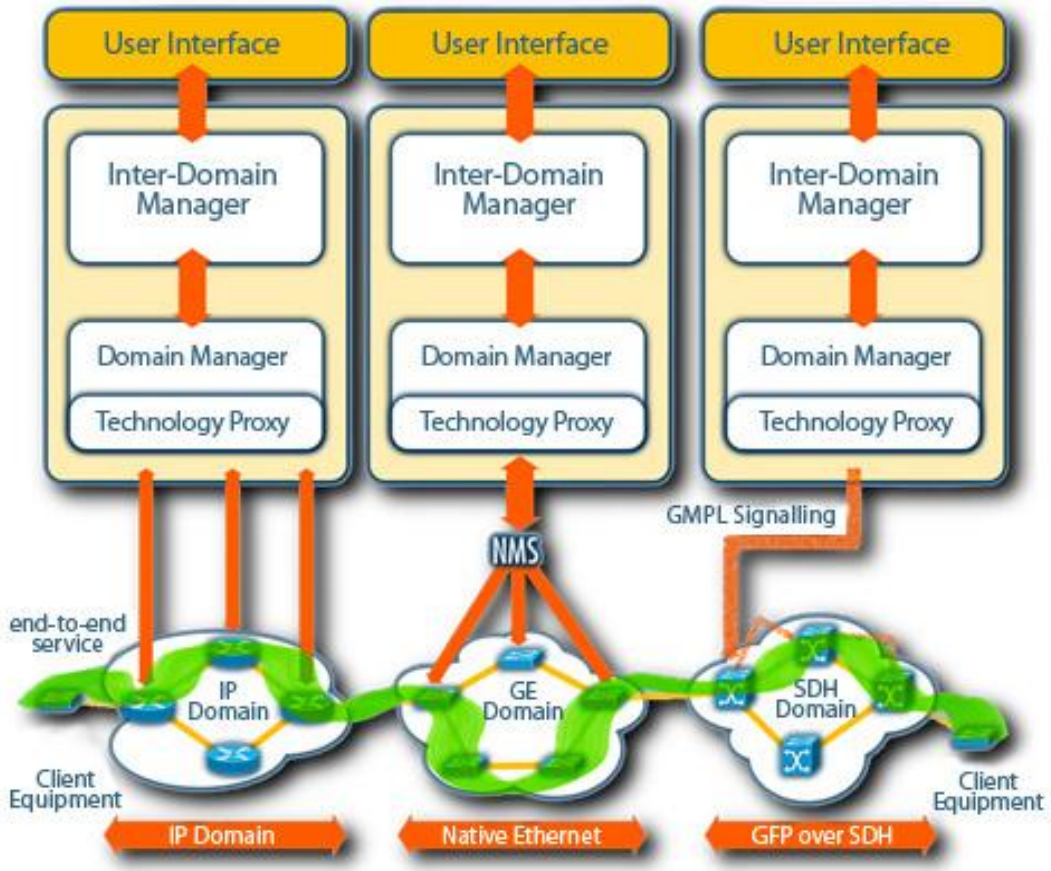
Argia



- Argia is an IaaS framework for provisioning optical network infratsructures as a cloud IaaS

- Argia is the evolution of the UCLP CE software
  - Ongoing effort towards creating a commercial product that can be deployed in production optical networks.

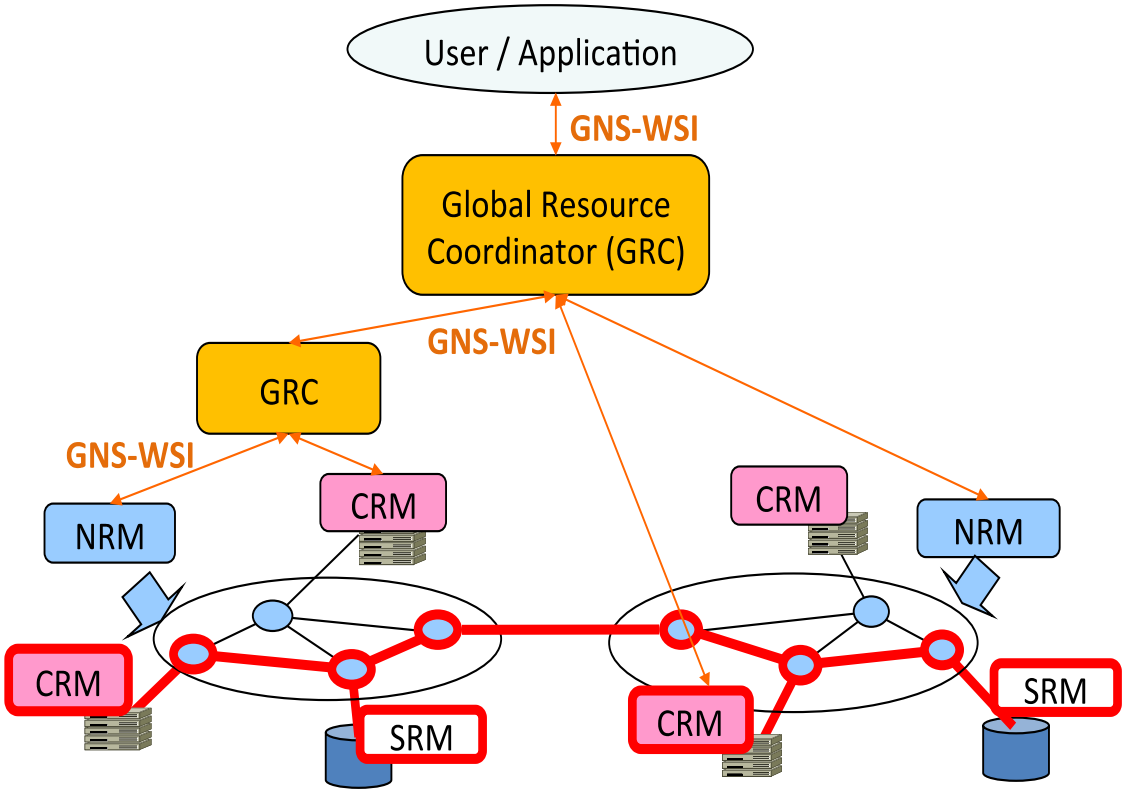
AutoBANH



- AutoBAHN is the GÉANT Bandwidth on Demand (BoD) Service for NREN's
- AutoBHAN is implementing the OGF NSI CS protocol to support wider interoperability and integration

- Ongoing development to include enhanced functionality: advanced user authorisation, new technologies and vendors support, accounting, resiliency

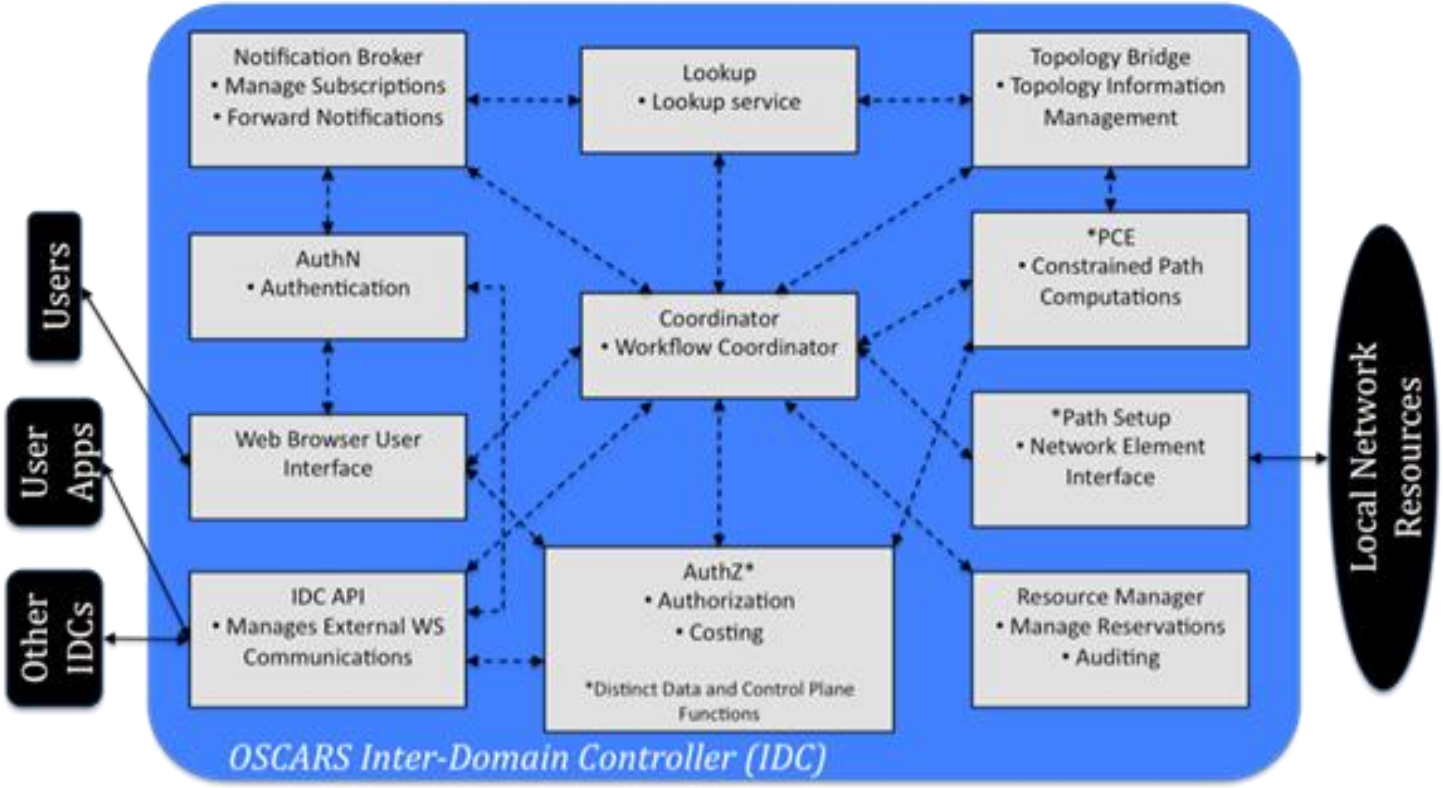
G-Lambda and GridARS



- G-lambda project is a collaboration between Japan's industrial and governmental laboratories, KDDI R&D Laboratories, NTT, NICT and AIST

- Defines a Web service-based network service interface GNS-WSI (Grid Network Service - Web Service Interface) that allows requesting end-to-end bandwidth-guaranteed connections

OSCARS - On-demand Secure Circuits and Advance Reservation System



- Defines a Web service-based network service interface GNS-WSI (Grid Network Service - Web Service Interface) that allows requesting end-to-end bandwidth-guaranteed connections

OGF BCP Document Overview (2)

4. General and Cloud Oriented Network Infrastructure Services Provisioning

4.1 GENI-ORCA: A Networked Cloud Operating System for Extended Infrastructure-as-a-Service (IaaS)

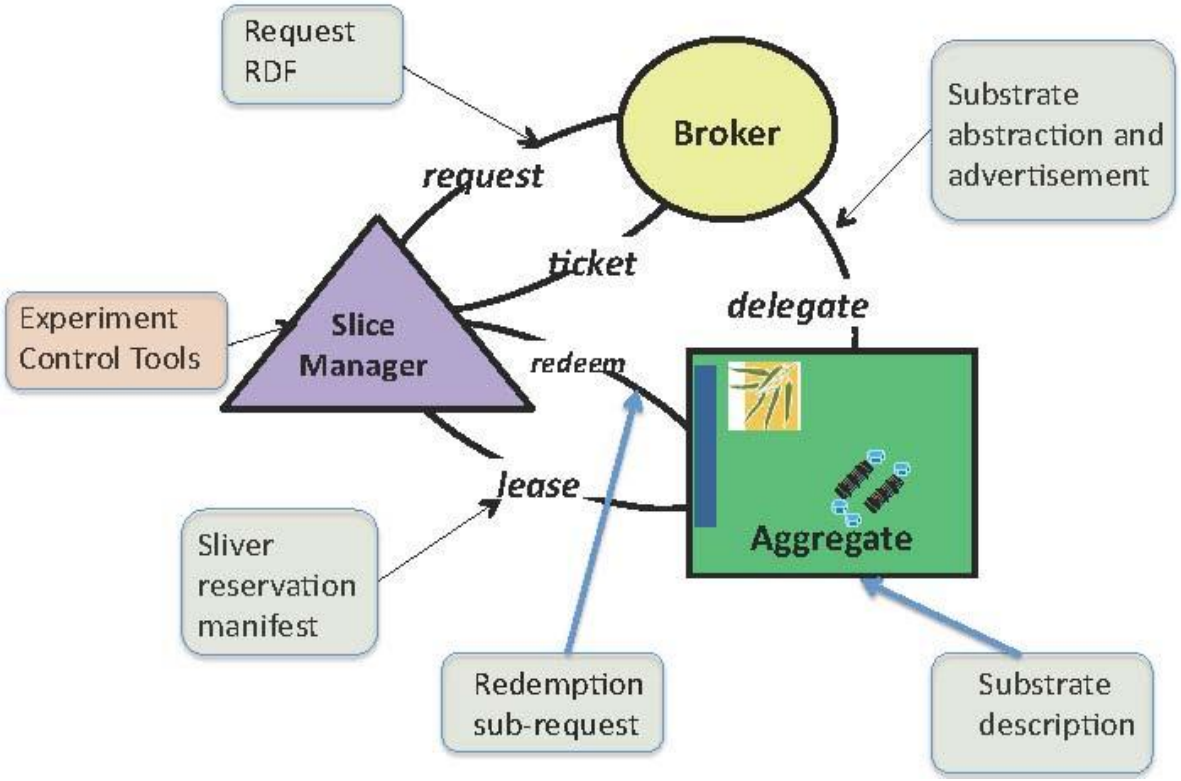
- 4.1.1 ORCA Architecture and Information Model
- 4.1.2 NDL-OWL: Ontology-Based Cloud Resource Representation
- 4.1.3 IaaS Service Interface for Infrastructure Control
- 4.1.4 Cross-aggregate Stitching

4.2 GEYSERS Generalised Infrastructure Services Provisioning

- 4.2.1 GEYSERS Architecture
- 4.2.2 Physical Infrastructure
- 4.2.3 Logical Infrastructure Composition Layer (LICL)
- 4.2.4 Network + IT Control Plane (NCP+)

4.3 OpenNaaS: An Open Framework for Networking as a Service

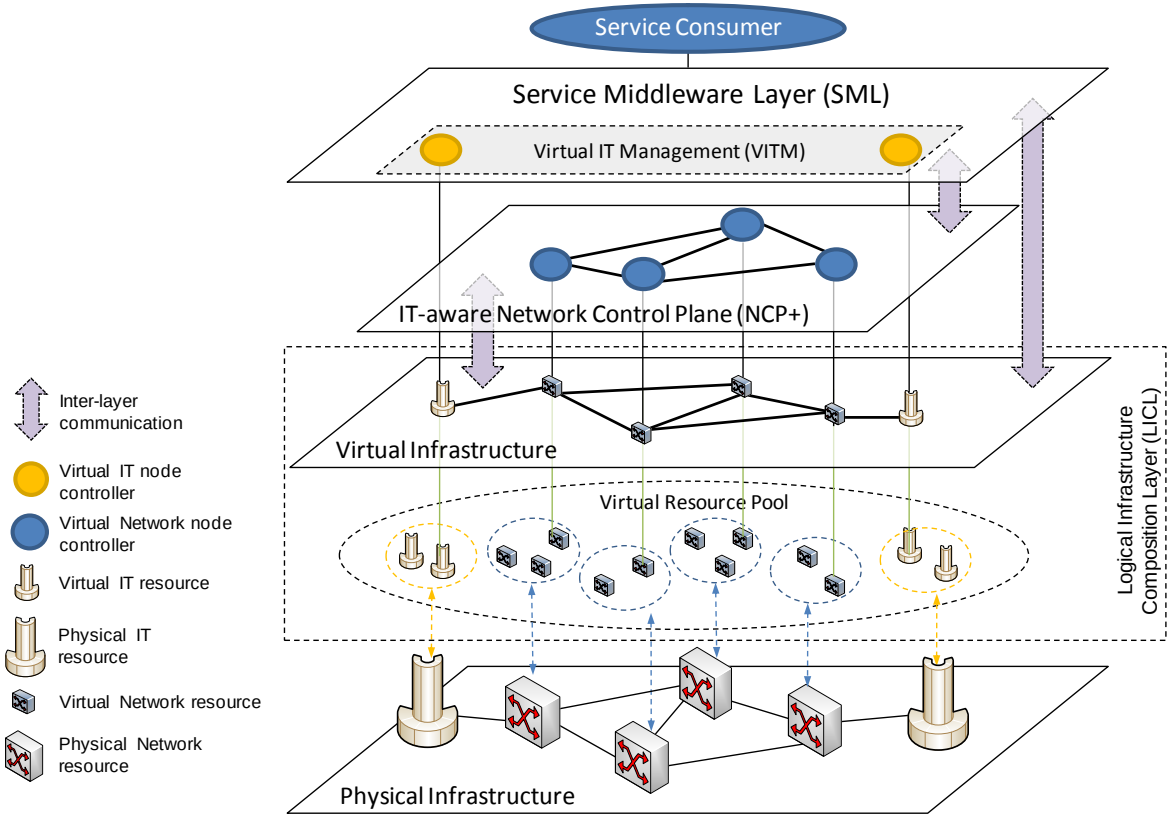
GENI-ORCA



- ORCA is one of the GENI Control Frameworks
- ORCA can be regarded as an operating system for orchestrated provisioning of heterogeneous resources across multiple federated substrate sites and domains

- ORCA uses NDL-OWL: Ontology-Based Cloud Resource Representation as a set of unified semantic schemas (ontologies) for representing resources data models
- NDL-OWL developed as an extension of the Network Description Language (NDL)

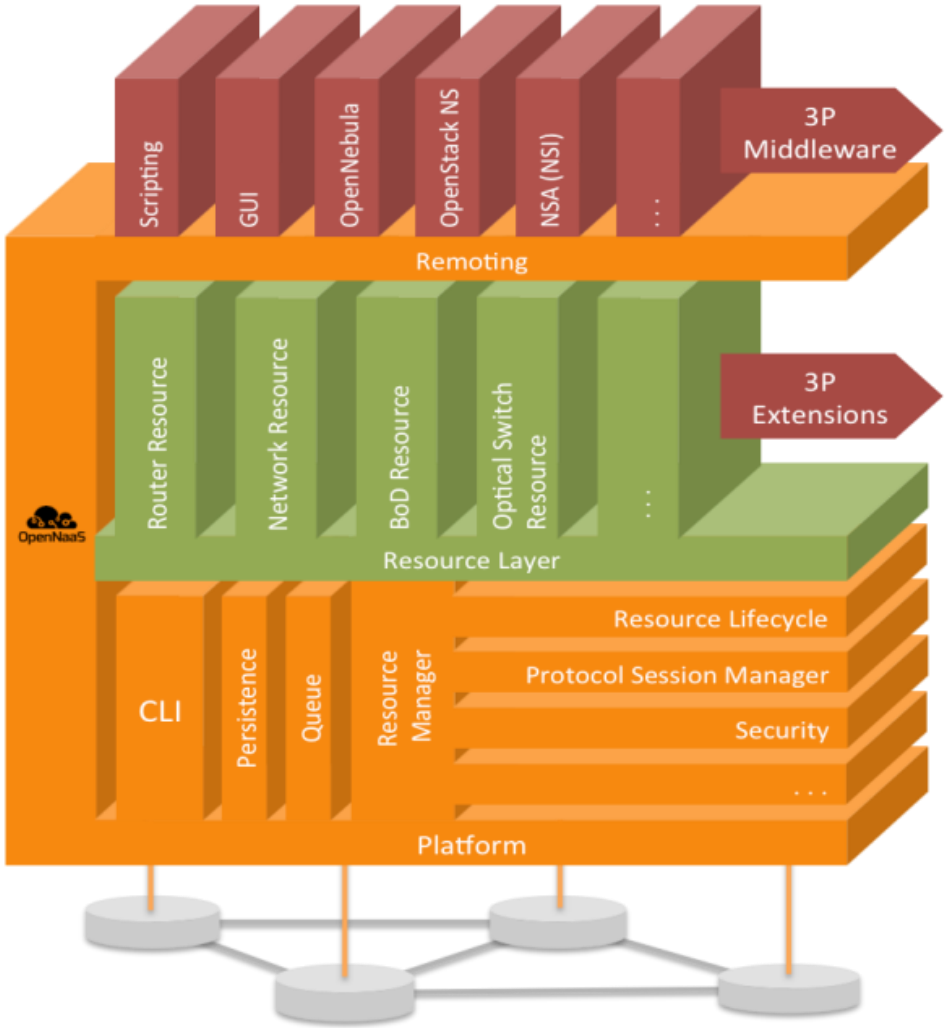
GEYSERS Generalised Infrastructure Services Provisioning



- GEYSERS architecture re-qualifies the interworking of legacy planes by means of a virtual infrastructure representation layer for network and IT resources
- Introduces advanced resource provisioning mechanisms

- Logical Infrastructure Composition Layer (LICL) allows creation and maintenance of virtual resources as well as virtual infrastructures
- Network + IT Control Plane (NCP+) operates over a virtual infrastructure, composed of virtual optical network and IT resources, located at the network edges

OpenNaaS



- OpenNaaS offers a versatile toolset for the deployment of NaaS oriented services
- Virtualise network components: routers, switches, links or provisioning systems
- Delegate management permissions over the infrastructure resources
- At tool for infrastructure integrators

OGF BCP Document Overview (2a)

3. Network Resources Provisioning Systems (NRPS)

3.1 Argia

3.2 AutoBAHN

3.3 G-lambda and GridARS

3.4 OSCARS

4. General and Cloud Oriented Network Infrastructure Services Provisioning

4.1 GENI-ORCA: A Networked Cloud Operating System for Extended Infrastructure-as-a-Service (IaaS)

4.2 GEYSERS Generalised Infrastructure Services Provisioning

4.3 OpenNaaS: An Open Framework for Networking as a Service

Recommendation:

Provide short, once sentence definition of the system/tool

OGF BCP Document Overview (3)

5. Provisioning infrastructure services in Clouds

5.1. Amazon Web Services (AWS)

5.1.3 Network and IP Addresses Management in AWS

- Elastic IP address, a public IP address associated with user's EC2 account
  - A user can associate this IP address to any particular EC2 instance rented with that account
- Intelligent DNS based load balancing for applications using Amazon Route 53 DNS service and Latency Based Routing (LBR)
  - To route application users to AWS end-points (EC2 instance) which have the best performance

5.2 RackSpace

5.2.2 RackSpace Network Service

- No specific service to control network performance or topology
- Instead RackSpace provides an advanced internal network infrastructure with dedicated links and advanced network management

OGF BCP Document Overview (4)

6. Existing infrastructure related standards

6.1 NIST Cloud Computing related standards

6.2 IEEE Intercloud Working Group (IEEE P2302)

6.3 IETF Reference Cloud Framework

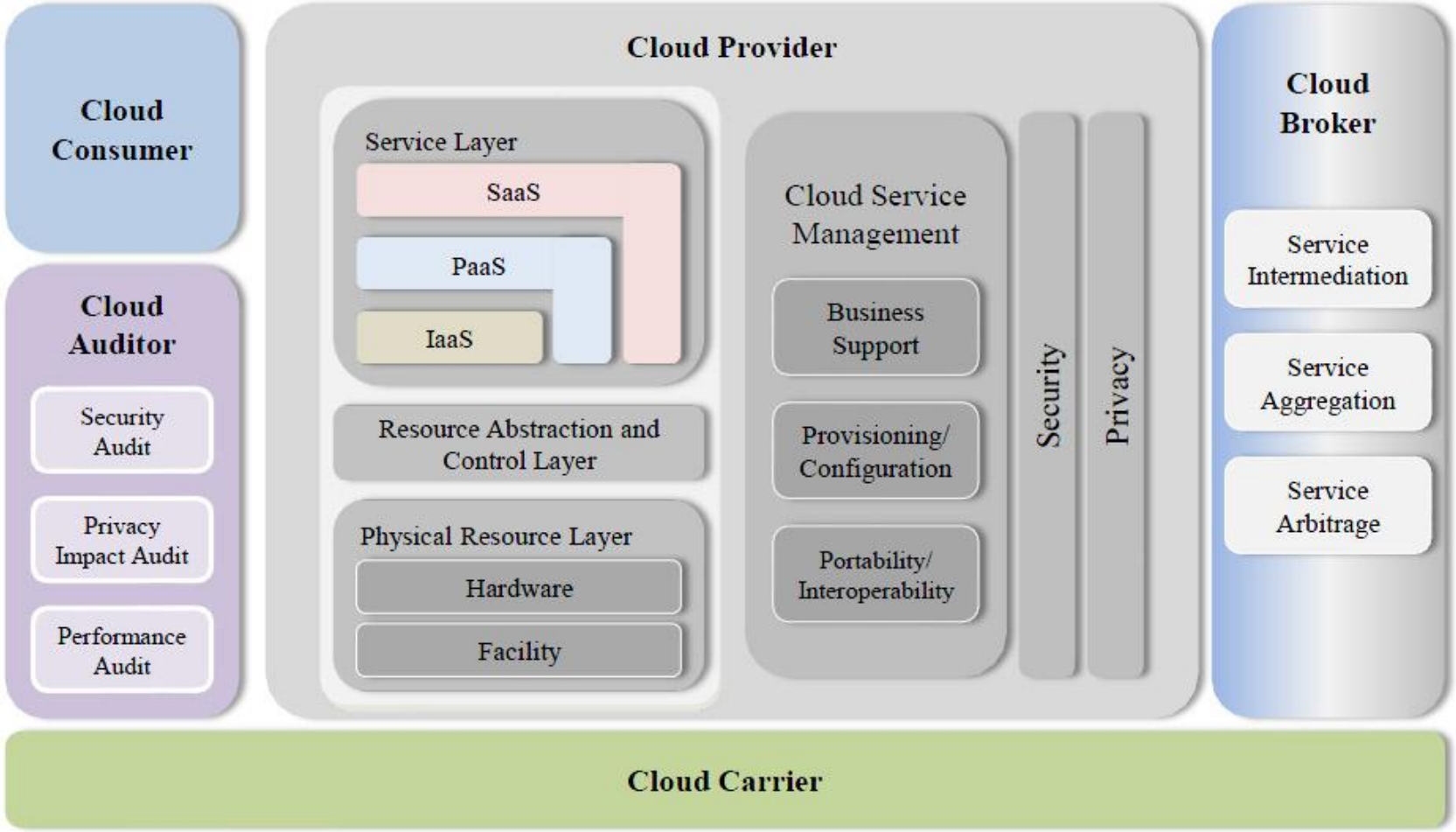
- 6.3.2 Cloud Reference Framework
- 6.3.3 Cloud Service Broker

6.4 ITU-T Focus Group Cloud Computing

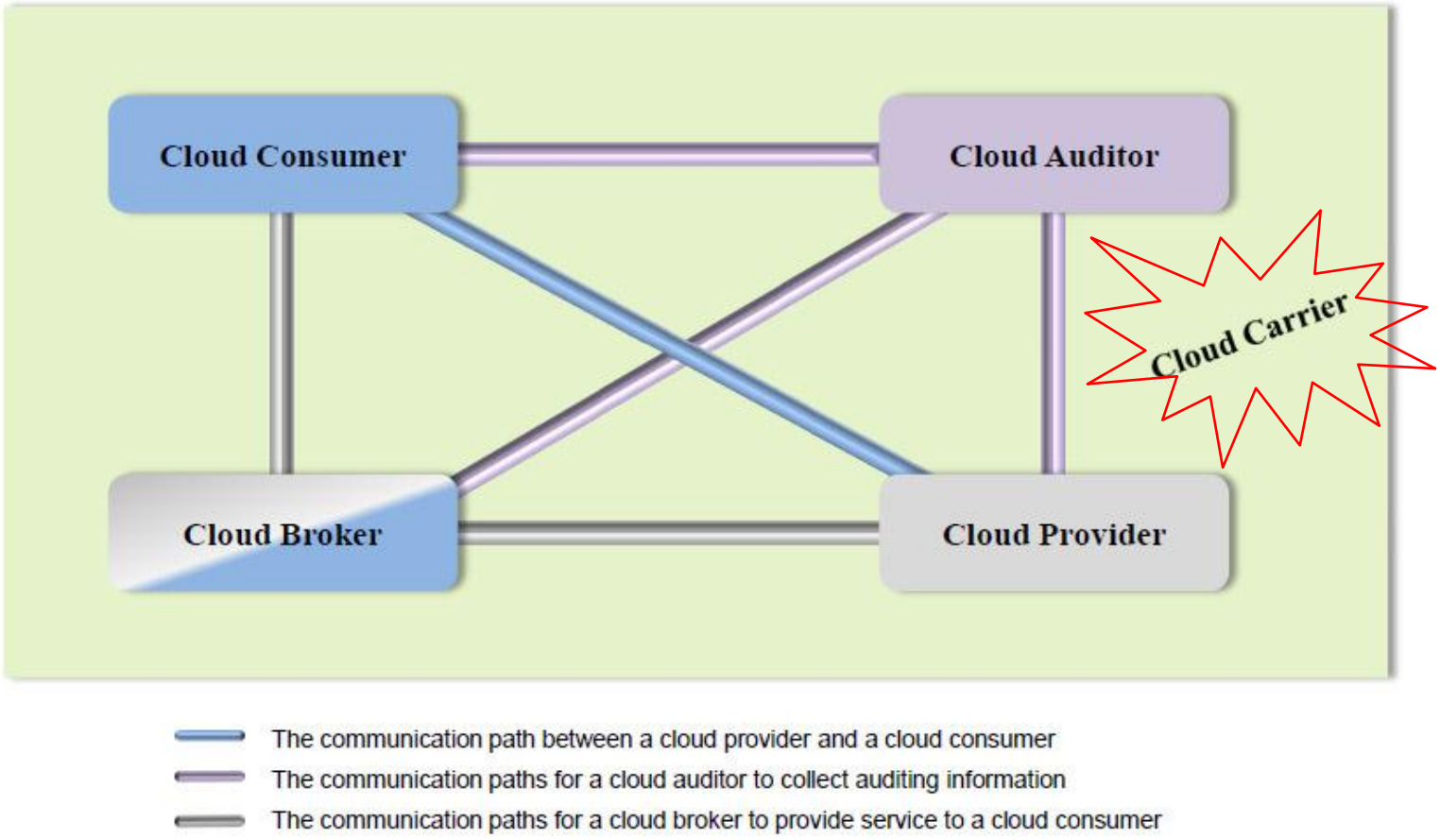
6.5 Related activities at OGF

- 6.5.1 OCCI – Open Cloud Computing Interface
- 6.5.2 Network Service Interface Working Group (NSI-WG)
- 6.5.3 Network Markup Language Working Group (NML-WG)

NIST Cloud Computing Reference Architecture (CCRA) 2.0 (1)



NIST Cloud Computing Reference Architecture (CCRA) 2.0 - Main Roles (1)



- Cloud Carrier as a role to accommodate telecom companies interest

IETF I-Draft "Cloud Reference Framework" (Version 0.3, 29 June 2012)

http://tools.ietf.org/html/draft-khasnabish-cloud-reference-framework-03.txt

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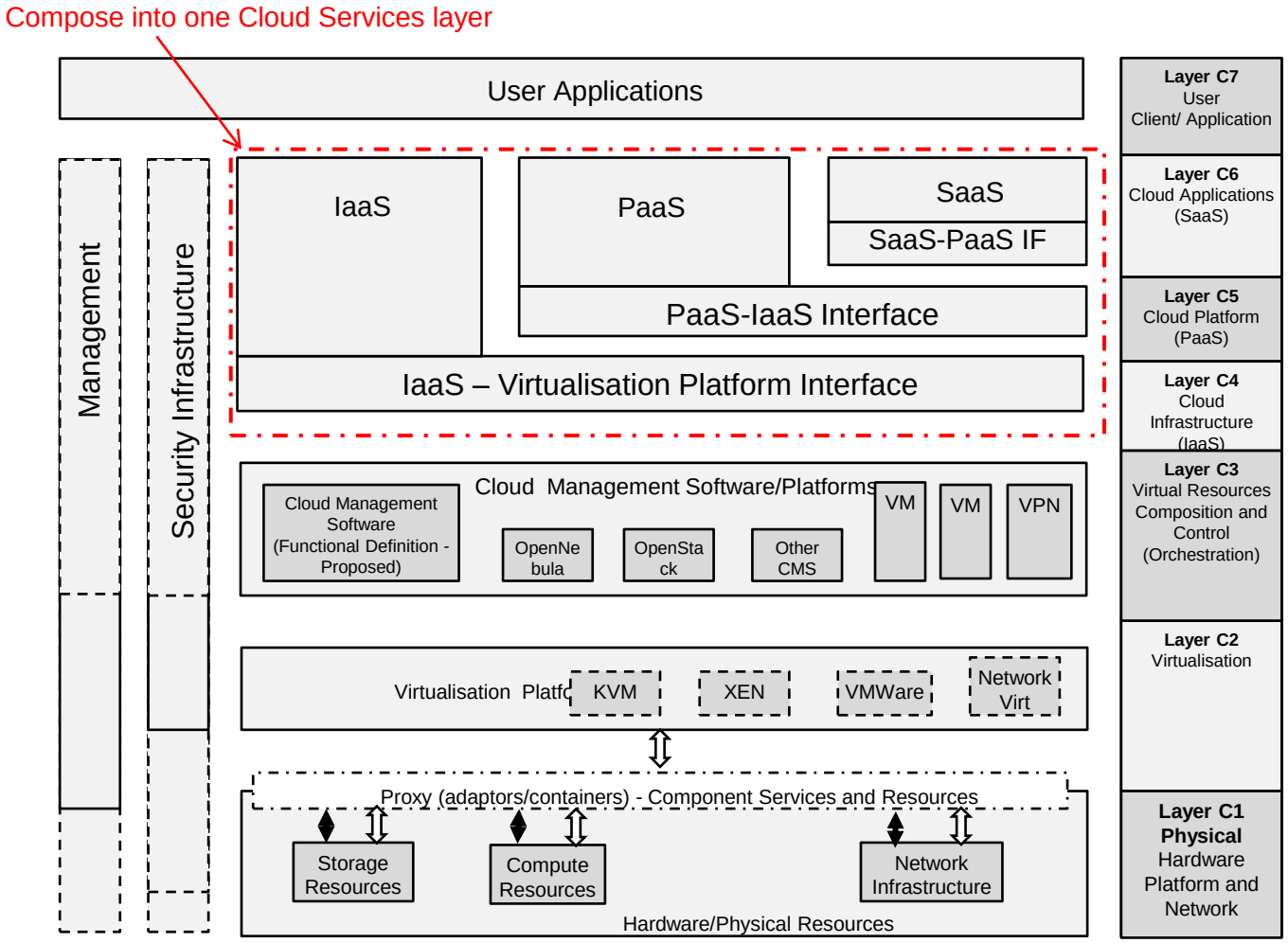
Version 0.3 – 29 June 2012
Version 0.4 – End July 2012
Version 0.5 – October 2012
(To be considered)

www.ogf.org

InterCloud Architecture components

- Multi-layer Cloud Services Model (CSM)
  - Combines IaaS, PaaS, SaaS into multi-layer model with inter-layer interfaces
  - Including interfaces definition between cloud service layers and virtualisation platform
- InterCloud Control and Management Plane (ICCMP)
  - Allows signaling, monitoring, dynamic configuration and synchronisation of the distributed heterogeneous clouds
  - Including management interface from applications to network infrastructure and virtualisation platform
- InterCloud Federation Framework (ICFF)
  - Defines set of protocols and mechanisms to ensure heterogeneous clouds integration at service and business level
  - Addresses Identity Federation, federated network access, etc.
- InterCloud Operations Framework (ICOF)
  - RORA model: Resource, Ownership, Role, Action
    - RORA model provides basis for business processes definition, SLA and access control
  - Broker and federation operation

Multilayer Cloud Services Model (CSM)



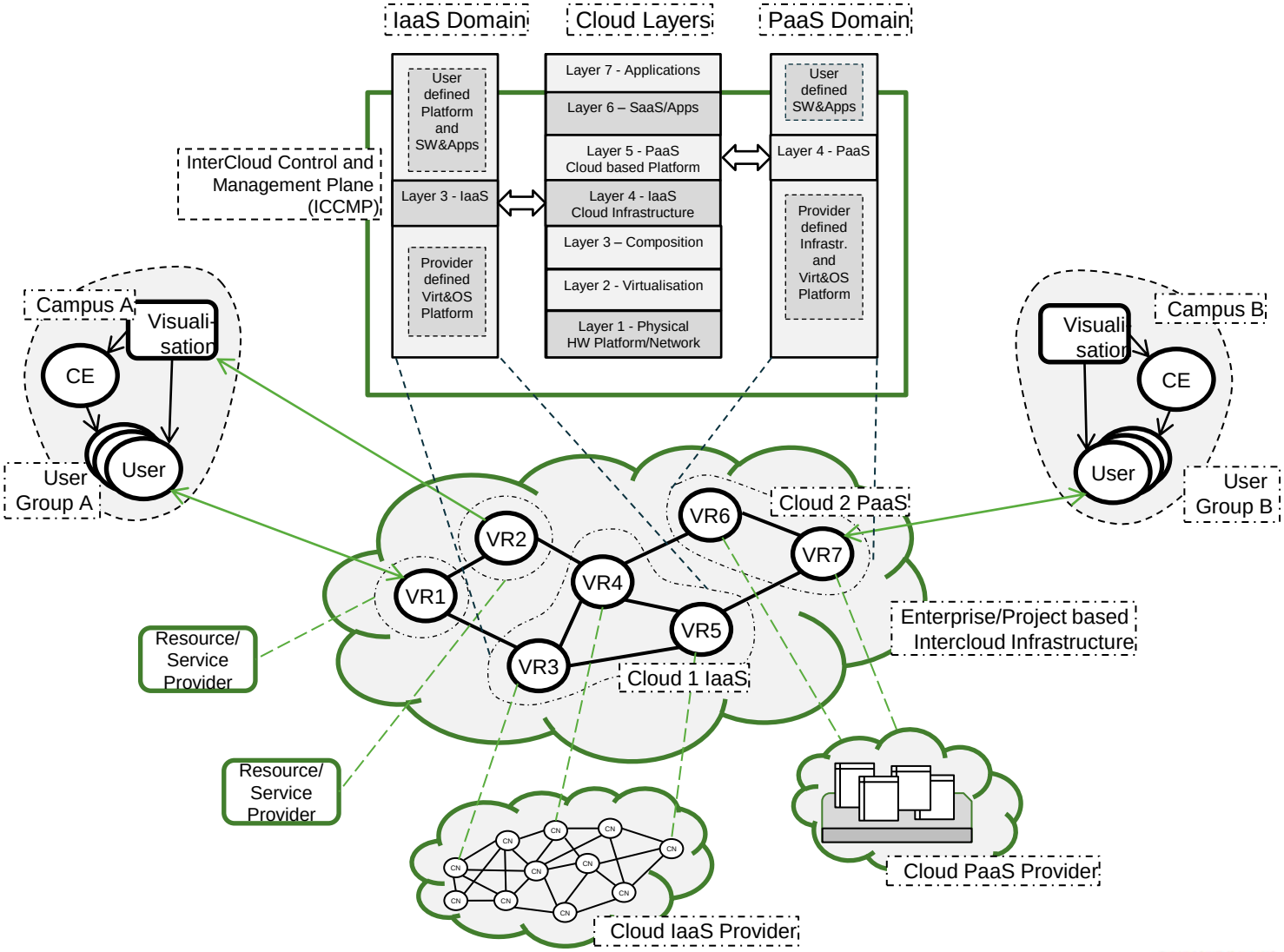
CSM layers

(C7) User Client/Application
(C6) Cloud Application (SaaS)
(C5) Cloud Platform (PaaS)
(C4) Cloud Infrastructure (IaaS)
(C3) Virtual Resources Composition and Orchestration
(C2) Virtualisation Layer
(C1) Hardware platform and dedicated network infrastructure

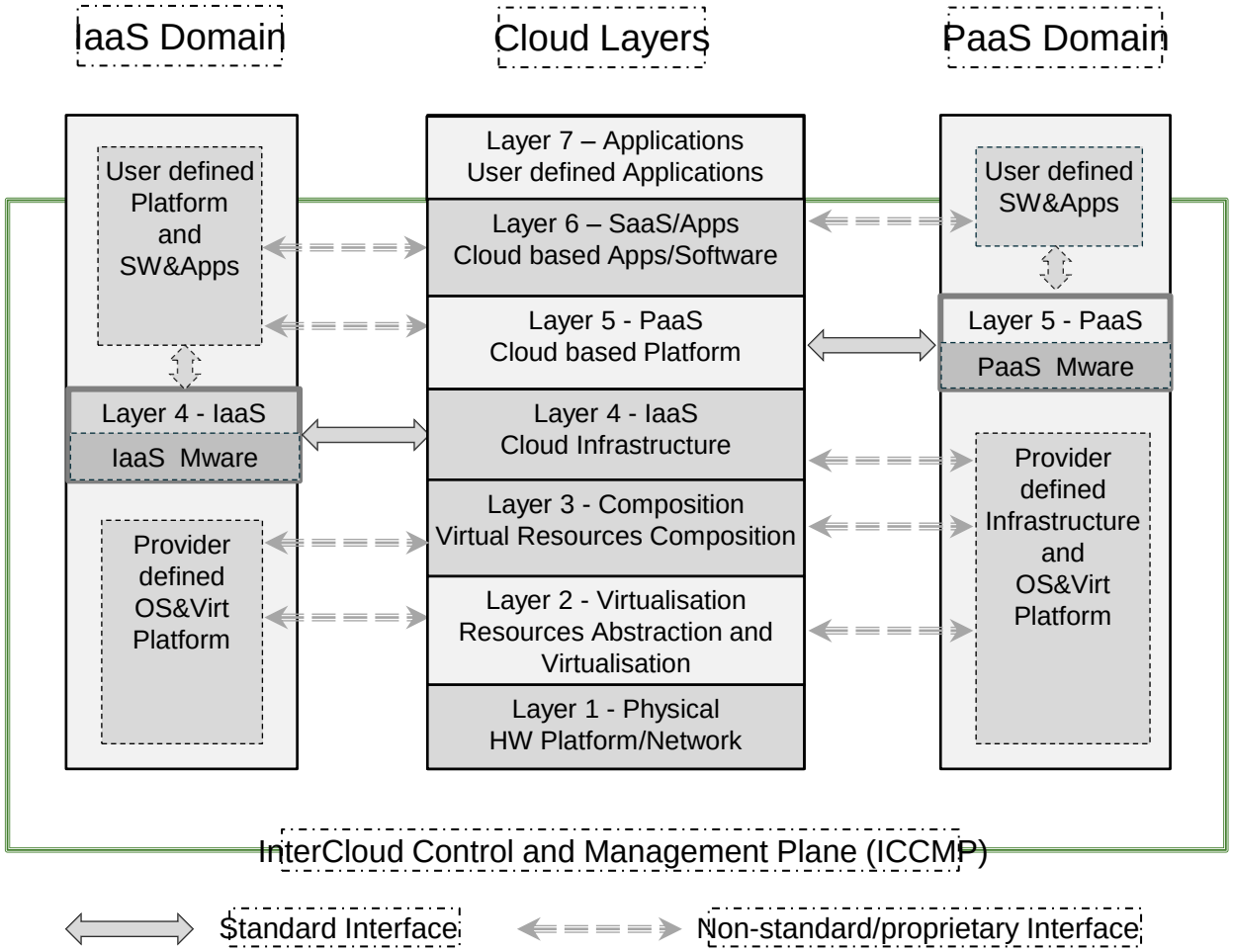
Control/ Mngt Links

Data Links

Intercloud Control and Management Plane (ICCMP) (1)



Intercloud Control and Management Plane (ICCMP) (2)



OGF BCP Document Overview (5)

7. Existing Cloud Middleware for Infrastructure Services Provisioning

7.1 OpenNebula

- 7.1.1 Network Management in OpenNebula
- 7.1.2 Load-balancing in OpenNebula

7.2 OpenStack

- 7.2.1 Network management in OpenStack
- 7.2.2 Load Balancing in OpenStack

7.3 Eucalyptus

- 7.3.1 Network Management in Eucalyptus
- 7.3.2 Load-balancing in Eucalyptus

Network Management in OpenNebula

- OpenNebula manages network connections for its virtual machines by means of virtual networks
- VN consists of a separate set or range of MAC/IP addresses which can be assigned to a new virtual machine instance
  - This network is associated with a physical network using a network bridge
- Simulate to EC2, the OpenNebula can attach each VM to both a private network with no Internet connectivity and a public network with Internet connectivity
  - This gives each virtual machine instance one public and one private IP address

Network Management in OpenStack

- New OpenStack release Folsom added Quantum Network mngnt component
- Quantum/Nova logically supports two types of IP address:
  - *Fixed* associates fixed IP with VM at creation and remain associated till termination
  - *Floating* can be dynamically attached/detached IP to/from a running VM at run-time
- Quantum/Nova network models supported for fixed IPs
  - *Flat* mode: each VM instance with a fixed IP is associated with a default network bridge
  - *Flat DHCP* mode: additionally a DHCP server is provided to manage fixed IPs
  - *VLAN DHCP* Mode (default networking mode): VLAN is created and bridged for each project
- The Quantum network manager adds the following new functionalities
- API to build rich networking topologies, and configure advanced network policies in the cloud; e.g. create multi-tier web application topology
- Allows adding new plugins (open and closed source) e.g.
  - Use L2-in-L3 tunneling to avoid VLAN limits, provide end-to-end QoS guarantees, used monitoring protocols like NetFlow
- Allows building advanced network services (open and closed source) that plug into Openstack tenant networks e.g.
  - VPN-aaS, firewall-aaS, IDS-aaS, data-center-interconnect-aaS.

ISOD-RG: Remaining issues and possible next steps

- ISOD-RG Charter: Deliverables and timeline
  - Next steps with the current document
- Possible extensions and spin-off's
- New document on ISOD case study

ISOD RG Deliverbles

- **Deliverable 1,2** - BCP/taxonomy in existing and on-demand resources/services provisioning technologies
  - Including existing Network Resource Provisioning Systems (NRPS) systems and virtualisation platforms
  - Including definition of basic terms in infrastructure services
  - Use cases for On-demand Infrastructure Services provisioning
- **Deliverable 3** - Requirements to On-demand Infrastructure Services provisioning
  - Delivered in two deliverables as an initial requirements set and updated based on the feedback from contributing projects and activities Expected deliverables (to be reviewed depending on the progress and community interest)
- **Deliverable 4** – Generic Infrastructure as a Service (IaaS) provisioning model
- **Deliverable 5** – Services Lifecycle Management in On-demand Infrastructure Services provisioning (overview existing frameworks and practices)

ISOD RG Timetable

- OGF 31 (Winter/Spring 2010)
  - Official start of working group
  - Outline and author list of deliverables
- OGF 32 - OGF33 (Summer - Autumn 2011)
  - First draft of Deliverable 1/2
- OGF 34 (Winter/Spring 2012)
  - Feedback and discussion on Deliverables
  - Review drafts of Deliverable 1/2
- OGF 35 (Summer 2012)
  - Submission of Deliverable 1/2
  - Feedback and discussion on Deliverables 1/2, 3
  - First draft and discussion of Deliverable 4 and/or 5 (depending on progress with other deliverables)
- OGF 36 (Autumn 2012)
  - Review draft and submit Deliverable 1/2
  - Submission of Deliverable 3
  - Feedback and discussion on Deliverables 4, 5
  - Overall RG progress review and next plans

OGF BCP Document: Possible extensions and spin-off's

1. Introduction
2. Infrastructure Services definition
3. Network Resources Provisioning Systems (NRPS)
4. General and Cloud Oriented Network Infrastructure Services Provisioning
5. Provisioning Infrastructure services in Clouds
6. Existing Standards -> Standardisation Overview (Cloud and Network)
7. Existing Cloud Middleware for Infrastructure Services Provisioning
8. Taxonomy and Analysis -> ISOD case study with existing middleware
9. Recommendations -> Based on case study
10. Summary

ISOD case study on Infrastructure Services provisioning

- New deliverable “Infrastructure Services provisioning with existing middleware”
- Will include deeper analysis of the major Cloud middleware: Amazon, OpenStack, OpenNebula
- Testbed and experimentation
  - E.g. at high performance network and cloud testbed at SNE/UvA
  - Projects, e.g. GEYSERS, GEANT, Helix-Nebula
- Contact with and involvement of related developer groups

Discussion

- Any other topics and ideas

Infrastructure Services definition

- Infrastructure definition in the context of Cloud based and general virtualised services, in addition to standard IT infrastructure, should include such components as
  - Virtual Machines (VM), Storage, Utilities, Network
  - Global distributed centers by Cloud providers
- Cloud infrastructure may be multi-layer, including
  - Internal Cloud provider infrastructure which is provided as a services, and
  - External or inter-Cloud infrastructure that can be provided by either Cloud operator/integrator or network services provider
- The provisioned infrastructure services must be characterized and include the following features:
  - Topology definition for infrastructure services that encompass compute, storage, and network resources
  - Infrastructure/topology description formats or schemas
  - Related topology features or characteristics, and transformation operations (homomorphic, isomorphic, QoS, energy aware etc.)