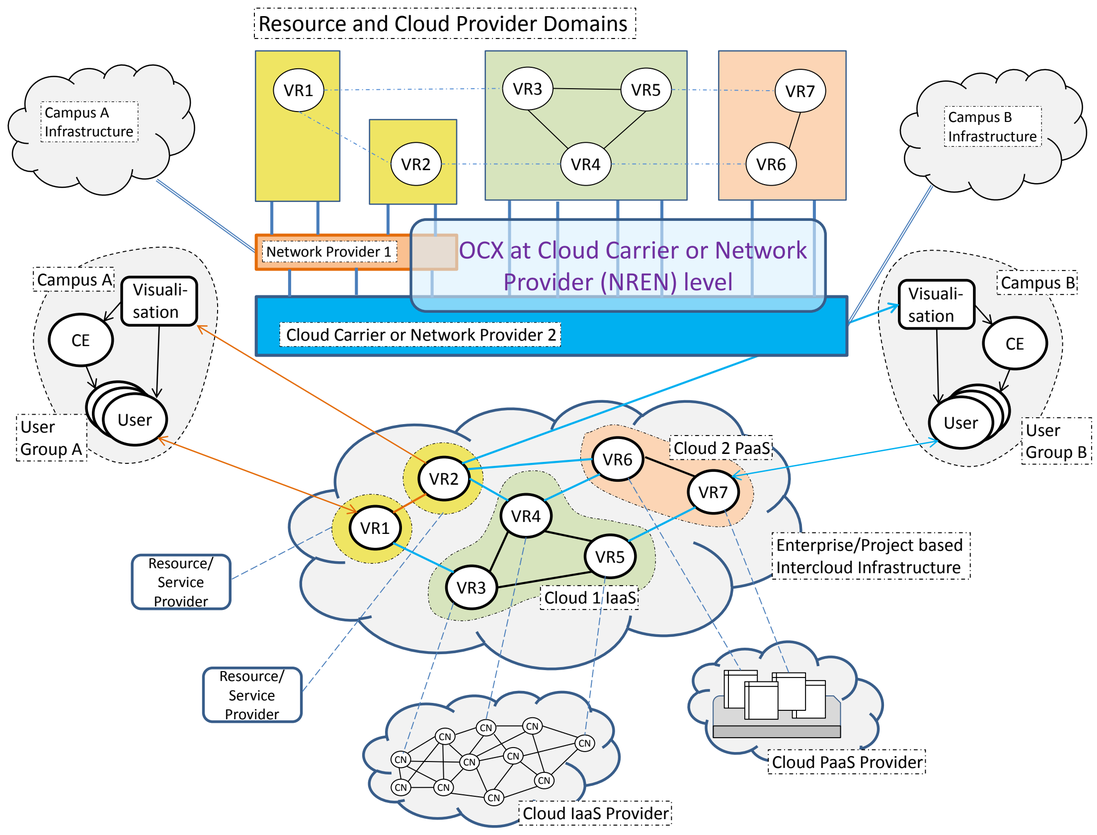
Open Cloud eXchange (OCX): Architecture, Components, and Demo Scenario

Yuri Demchenko, Ralph Koning, Cosmin Dimitru, Cees de Laat (UvA), Migiel de Vos (SURFnet), Tasos Karaliotas (GRNET), Kurt Baumann (SWITCH), Damir Regvart (CARNET), Sonja Filiposka (UKIM)

Intercloud Infrastructure/Services Provisioning

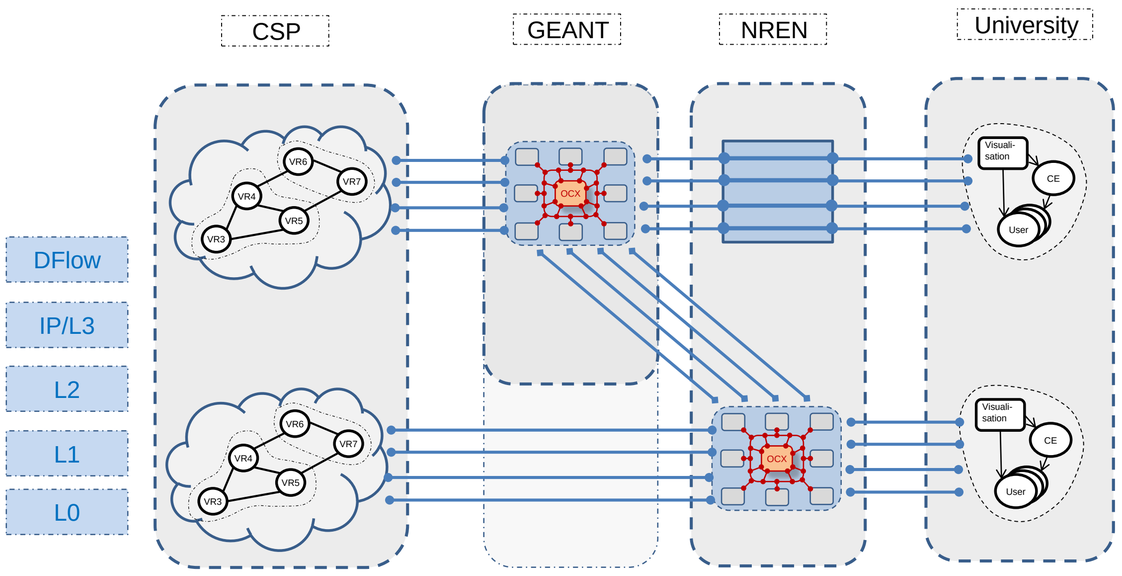
(Enterprise Workflow deployment on heterogeneous cloud infrastructure)



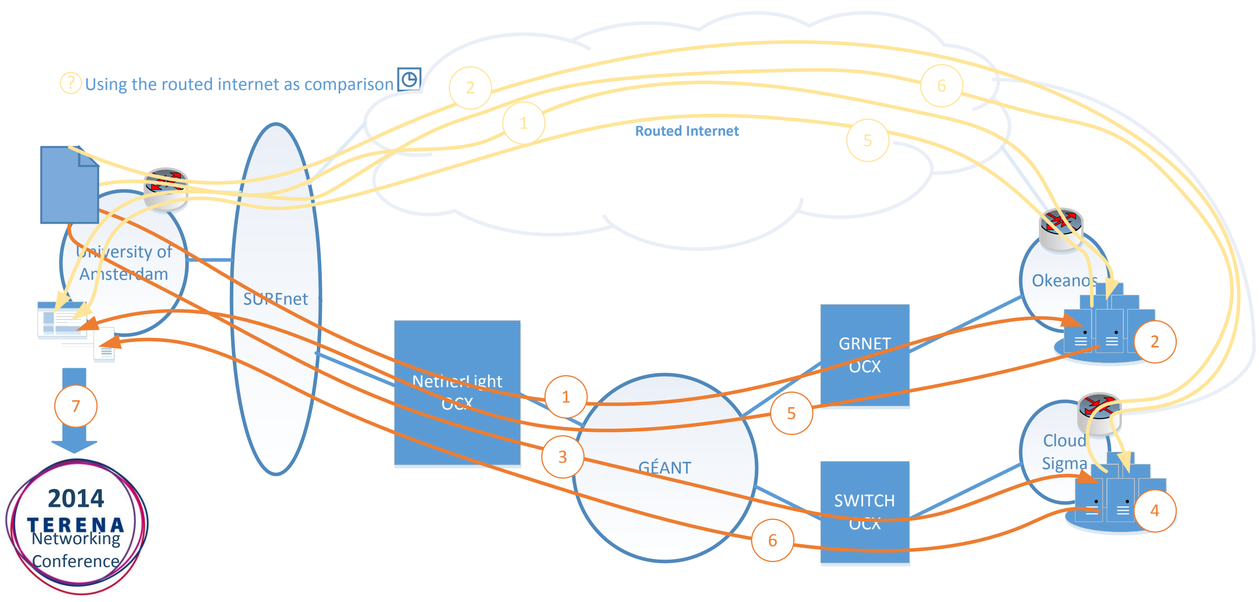
The Intercloud Architecture Framework components

- Multilayer Cloud Services Model (CSM) for vertical cloud services interaction, integration and compatibility that defines both relations between cloud service models (such as IaaS, PaaS, SaaS) and other required functional layers and components of the general cloud based services infrastructure.
- Intercloud Control and Management Plane (ICCMP) for Intercloud applications/infrastructure control and management, including inter-applications signaling, synchronization and session management, configuration, monitoring, run time infrastructure optimization including VM migration, resources scaling, and jobs/objects routing.
- Intercloud Federation Framework (ICFF) to allow independently managed clouds and related infrastructure components federation at the level of services, business applications, semantics, and namespaces.
- Intercloud Operation and Management Framework (ICOMF) includes functionalities to support multi-provider infrastructure operation including business workflow, SLA management, accounting. ICOMF requires support from and interacts with both ICCMP and ICFF.

OCX Implementation: Hierarchical Topology Model



OCX Demo at TNC2014



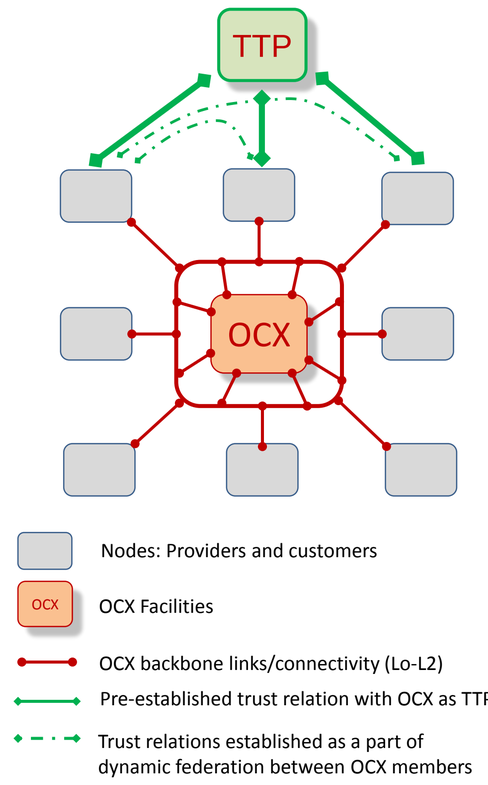
Video Processing Sequence

1 - Spawn VMs at Okeanos and send video frames towards these VMs
2 - Transcoding at Okeanos VMs
3 - More CPU power required; spawn VMs at Cloud Sigma and send video frames towards these VMs
4 - Transcoding at Cloud Sigma VMs
5 - Okeanos VMs send transcoded frames to UvA
6 - Cloud Sigma VMs send transcoded Frames to UvA
7 - Show results at TNC

OCX services and functional components

- Architecturally and functionally the gOCX includes the following services and functional components :
- Physical Point of Presence (PoP) for providers and customers.
- L0-L2 network interconnection facility (optionally also connectivity using dedicated optical links). The associated service should allow topology information exchange between providers and customers in a secure and consistent way.
- Trusted Third Party (TTP) services in order to support dynamic peering, business/service and trust relation establishment between gOCX members. The specific services may include:
  - Trusted Certificates repository and associated Trusted Introducer service in order to allow establishment of dynamic trust associations and/or federations.
  - Trust Broker service supported by either or both the Trusted Introducer and privacy/data security policy Registry or clearinghouse.
- Publish/subscribe Services Directory and Discovery, in order to provide a list of all CSPs and their cloud services offered so that customers can subscribe to chosen services. An SLA clearing-house service can also be provided.
- Optional Cloud Service Broker that will provide service advice and integration for the contracted community.

Open Cloud eXchange (OCX) Definition, Design and Operational Principles



- ***Direct service/inter-member peering***
  - Re-use and leverage Internet eXchange
  - Open collocation services
  - Scalability for growing number of members
  - Controlled network parameters/QoS
- ***No third party (intermediary/broker) services***
  - Transparency for cloud based services
  - No involvement into peering or mutual business relations
- ***Trusted Third Party (TTP) services***
  - To support dynamic service agreements and/or federation establishment
  - SLA Repository and Clearinghouse
  - *Trusted Introducer for dynamic trust establishment*
- May include other special services to support smooth services delivery and integration between CSP and Customer
  - Local policies, service registry and discovery
  - Topology information exchange L0-L2 (L3)
- QoS parameter: bandwidth, speed, latency

Demo Scenario: HD video editing and streaming

The University of Amsterdam (UvA) has some 4K movies that need efficient transcoding. Using their local OCX (NetherLight) the UvA can easily get access to necessary compute resources at different Cloud Service Providers via high performance dedicated network links. In the demo we use Okeanos (connected via GRNET OCX) and Cloud Sigma (connected via SWITCH OCX).

- The UvA created scheduling software that is able to spawn virtual machines at Okeanos or Cloud Sigma.
- The machines are spawned inside the L2-domain of the UvA, which gives the UvA full control.

OCX enabled GEANT infrastructure provides the following benefits

- Allow the R&E community to select from a broad range of cloud services that ensure network service levels and/or have a logical separation from the Internet
- Allow CSPs to deliver their services efficient, using optimized paths, to the R&E community (everyone is welcome, no limitations on “crossconnects”)
- Facilitate transparant connectivity between the R&E community and CSPs (allow jumbo frames, no firewalls/policies, private network, ..)
- Enhance “time-to-market” by using Bandwidth-on-Demand or other Software Defined Networking solutions

Related links

Intercloud Architecture Framework for Interoperability and Integration, Draft version 0.7, 1 July 2013. SNE Technical Report.
http://staff.science.uva.nl/~demch/worksinprogress/sne2012-techreport-12-05-intercloud-architecture-draft07.pdf
Open Cloud eXchange (OCX): Architecture and Functional Components. Proc. The 3rd workshop on Network Infrastructure Services as part of Cloud Computing (NetCloud 2013), 2-5 December 2013, Bristol, UK

Credits: Yuri Demchenko, Migiel de Vos, Ralph Koning, Cosmin Dimitru, Tasos Karaliotas, Kurt Baumann, Damir Regvart, Sonja Filiposka, Cees de Laat
Contact: Yuri Demchenko <y.demchenko@uva.nl>, Migiel de Vos <migiel.devos@surfnet.nl>