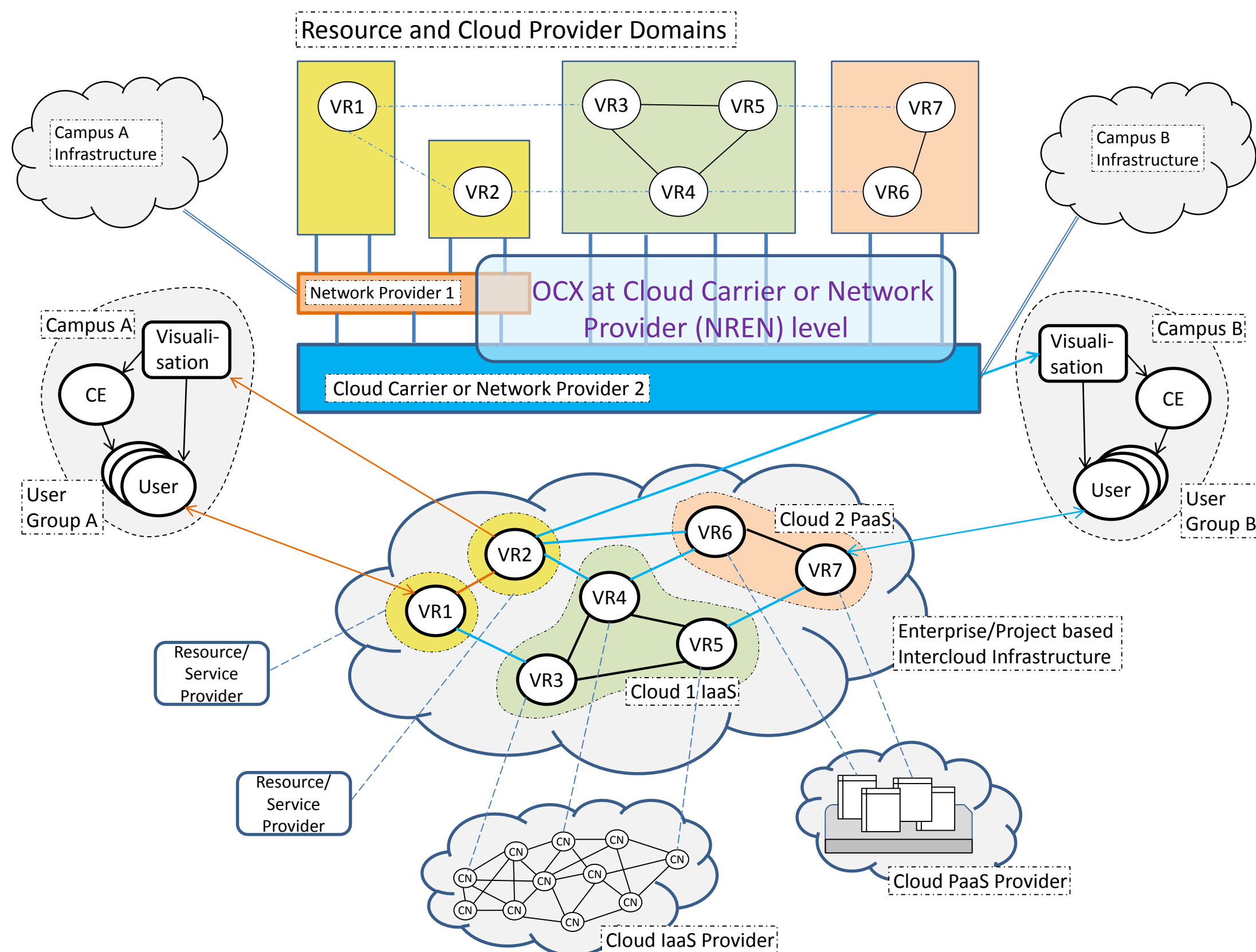


GEANT Open Cloud eXchange (gOCX): Architecture, Components, and Demo Scenario

Yuri Demchenko, Cosmin Dumitru, Ralph Koning, Cees de Laat (UvA), Migiel de Vos (SURFnet), Damir Regvart (CARNET), Tasos Karaliotas (GRNET), Kurt Baumann (SWITCH), Daniel Arbel (IUCC), Sonja Filiposka (UKIM), Taras Matselyukh (Opt/Net)

Intercloud Infrastructure/Services Provisioning

(Enterprise Workflow deployment on heterogeneous cloud infrastructure)



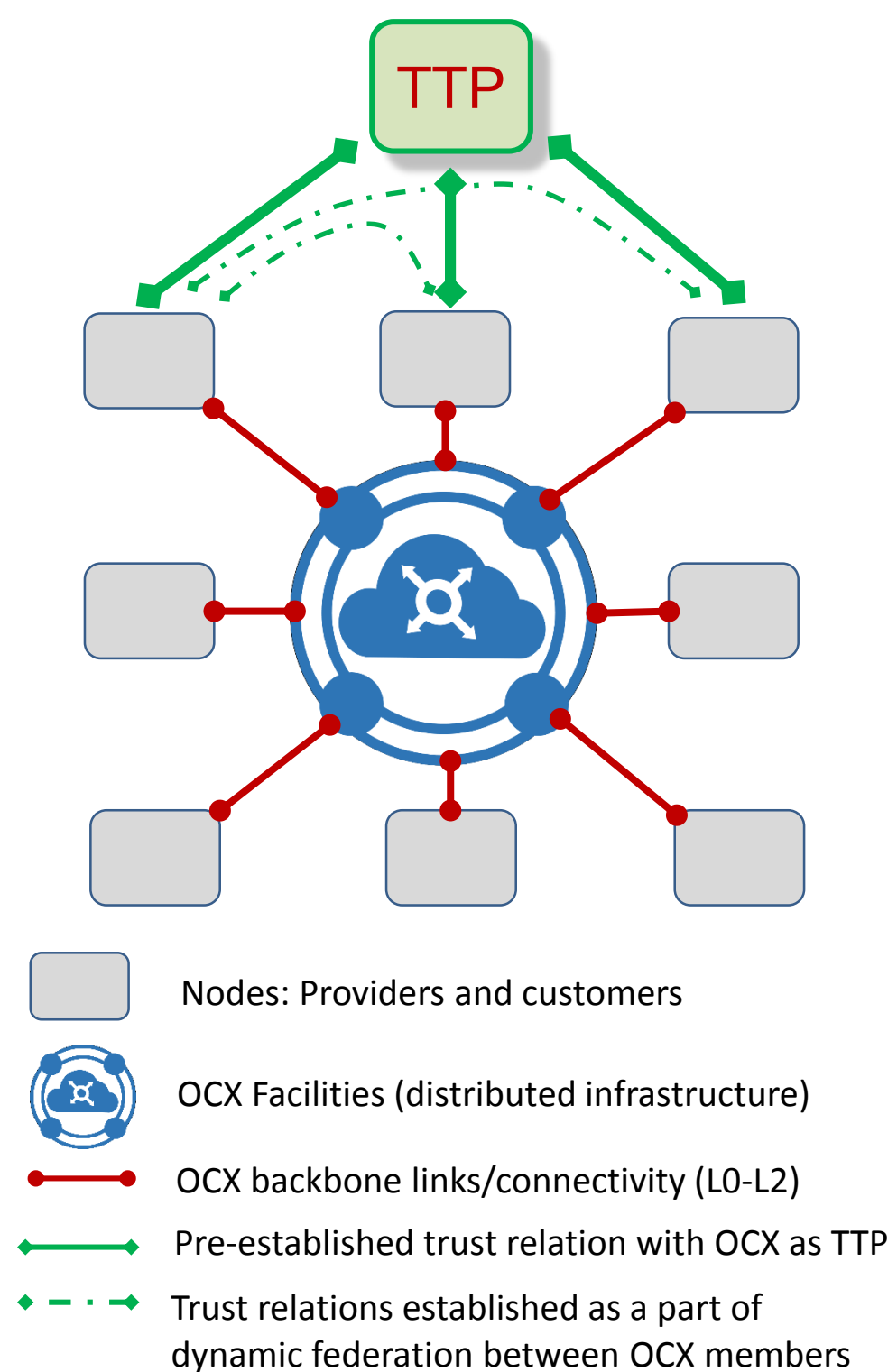
gOCX enabled GEANT infrastructure benefits

- Allow the R&E community to select from a broad range of cloud services that ensure network Quality of Service (QoS) 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 transparent 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

Data Intensive Application: Bag of Task Scheduler and Optimiser

- Vampires [ref] is a cloud scheduler and execution engine for data-intensive bags-of-tasks applications.
- Bags-of-tasks is a type of workload which consists of independent tasks which can be executed in any order.
 - The demo uses near real time 4K video images processing as a batch tasks
 - jclouds Java based provisioning component provides a common API for multiple cloud providers
 - The user-specified resources from the few bidding cloud providers are preliminary tested for compliance with the requirements and then the application is deployed on the selected set of providers to match cost and performance criteria.

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



- **Direct service/inter-member peering**
 - L0-L2 network interconnection
 - Controlled network parameters/QoS
 - Scalability for growing number of members
 - Re-use and leverage Internet eXchange experience
- **No third party (value-added) 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

OCX is a component of the Intercloud Federation Framework Architecture

gOCX Services and Functional Components

Architecturally and functionally the gOCX includes the following services and functional components

- **gOCX Points of Presence (PoP)** for providers and customers.
- **L0-L2 network interconnection facility** (optionally also connectivity using dedicated optical links and L3 tunnelling).
 - The associated service should allow topology information exchange between providers and customers in a secure and consistent way.
- **Trusted Third Party (TTP) service** in order to support dynamic peering, business/service and trust relation establishment between gOCX members
 - Trust Broker service supported by either or both the Trusted Introducer and privacy/data security policy Registry or clearinghouse.
 - GEANT Federation services eduGAIN and NREN's FedIDPs
- **gOCX Marketplace** to support cloud services brokering for participating Cloud Service Providers
 - Publish/subscribe Services Directory and Discovery, including SLA clearing-house service
 - Optional Cloud Service Broker that will provide service advice and integration for the contracted community.

gOCX Demo at SC14

Demo Scenario: HD Video Editing and Streaming

Several institutions (University of Amsterdam (UvA), Croatian NREN (CARNET) and the NREN from Israel (IUCC)) are collaborating on efficient transcoding and streaming of 4K movies stored at UvA.

Due to the big amount of data that is to be transcoded a number of VMs need to be spawned at different CSPs (Okeanos connected via GRNET gOCX, Cloud Sigma connected via SWITCH gOCX, Kentis connected via SURFnet).

- The UvA scheduling software spawns the virtual machines and starts the transcoding
- All collaborating parties are simultaneously receiving the transcoding results directly from the CSPs
- UvA and CARNET are connected to their local gOCX thus getting easy access to the necessary resources via high performance dedicated network links
- The user at IUCC represents the traditional approach to the problem using Amazon Web Services and Microsoft Azure connected via Internet at the closest GEANT PoP

OCX infrastructure monitoring and visualization service

- Performance information is collected from the end-nodes
- OptOSS NGCMS visualisation App by Opt/Net provides near real-time visibility into managed networks of the inert-cloud infrastructure

Acknowledgement

This project is supported by the Amazon Web Services grant “Open Cloud eXchange (OCX) and Inter-cloud Service Delivery Infrastructure: Proof of concept and demo”
This project is supported by the Microsoft Azure trial service for academic and research community via SURFMarket (NL)

References

- Cosmin Dumitru, et al. A queueing theory approach to pareto optimal bags-of-tasks scheduling on clouds. In Euro-Par 2014 Parallel Processing, pages 162–173. Springer, 2014.
Yuri Demchenko, et al, Open Cloud eXchange (OCX): Bringing Cloud Services to NRENs and Universities, TERENA Networking Conference 2014 (TNC2014), 19-22 May 2014, Dublin, Ireland [online] <https://tnc2014.terena.org/core/presentation/21>

