

Application of Grid Technologies to Next Generation Telecom Services

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Abstract

- The goal of this presentation is to provide a candidate for deliverables of NSI, especially focused on the use case from the viewpoint of telecom carriers.

Title: Network Service Interface use cases

Deliverable 1. A informational document describing the key use cases and user requirements.

- *Use cases describing requirements of a variety of users, including Grid Middleware, Grid Applications, and by other Network service providers*
- *Identification of requirements for users and network service providers.*

(Draft charter for NSI-WG, 21th Aug, 2008)

■ Agenda


- Requirement for network resource management technologies on telecom carrier networks
- Demonstrations of resource management using GNS-WSI-based technologies
- Conclusion




Network resource management technologies for telecom carriers

- Paradigm shifts in network operator businesses
 - Network provider -> Multi service provider (e.g. Voice, Video, VPN)
 - “Open” environments pushed by NGN (e.g. Parlay X, MDS*)

*MDS: Managed Delivery Service

- 
- Propositions on operations and management
 - Meet **various QoS requirements** over a common infrastructure
 - Shorten **time to market** even further
 - Support creation of **new services**

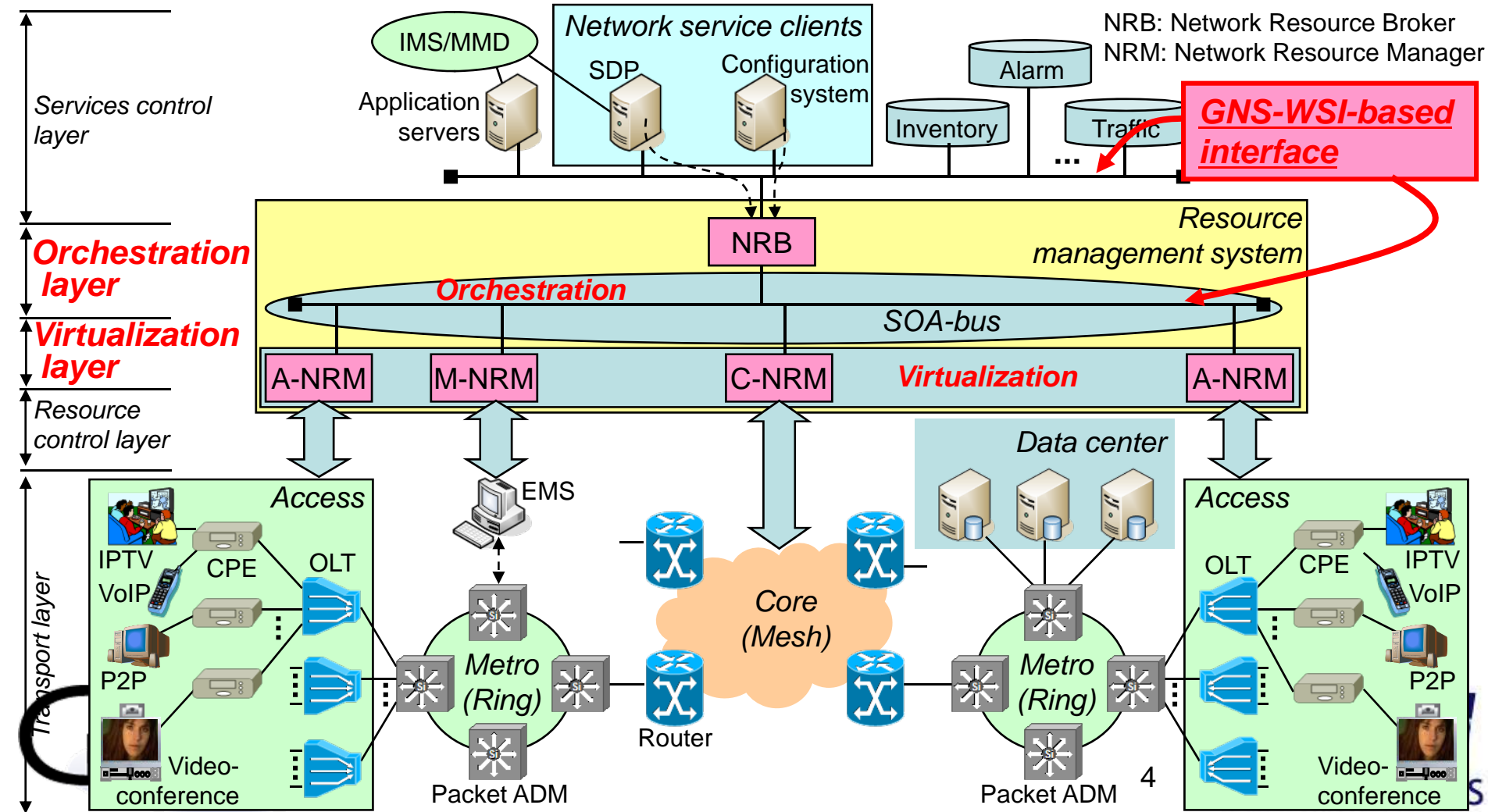
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- E2E network resource management is required, **but...**
 - Network is heterogeneous : **Different mechanisms** (QoS, control plane, resource handling, API) **must be smoothed out.**

Possible approach to “E2E resource management/control”

- **Virtualization** middleware to hide underlying technologies
- **Layered SOA** for distributed and scalable resource orchestration
- **Time-schedulable** E2E resources to create new services

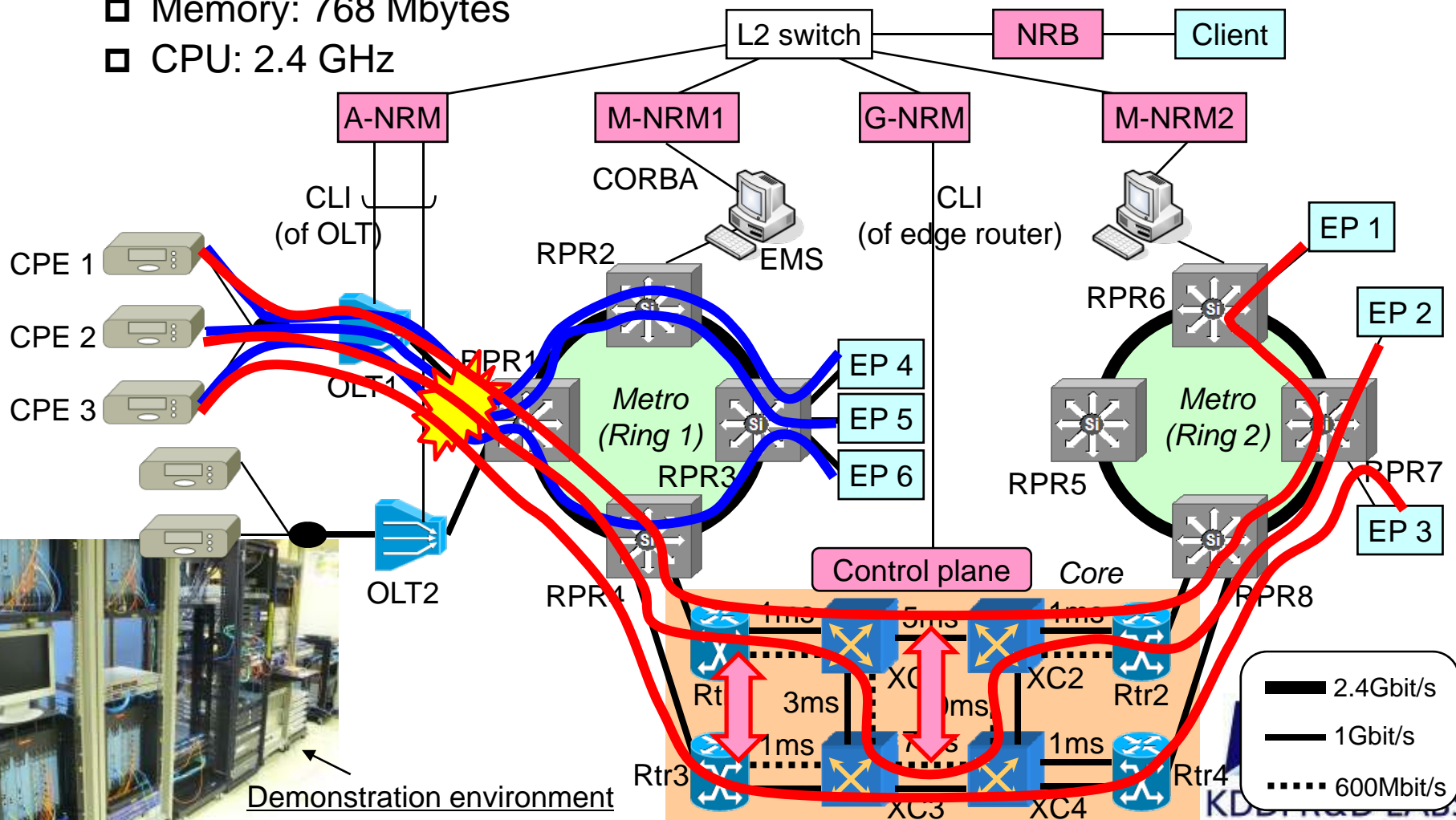
Proposed system in a big picture

- NRB: **Single point of contact** to service control layer
- NRMs: **Distributed** management to **cover E2E**
- NRB and NRMs are **orchestrated** via SOA-bus using **GNS-WSI-based interfaces**



Demonstration

- Southbound implementation of NRMs
 - A-NRM: CLIs of OLT, C-NRM: CLI of router, M-NRM: CORBA of EMS
- Typical server platforms for NRB and NRMs
 - Memory: 768 Mbytes
 - CPU: 2.4 GHz

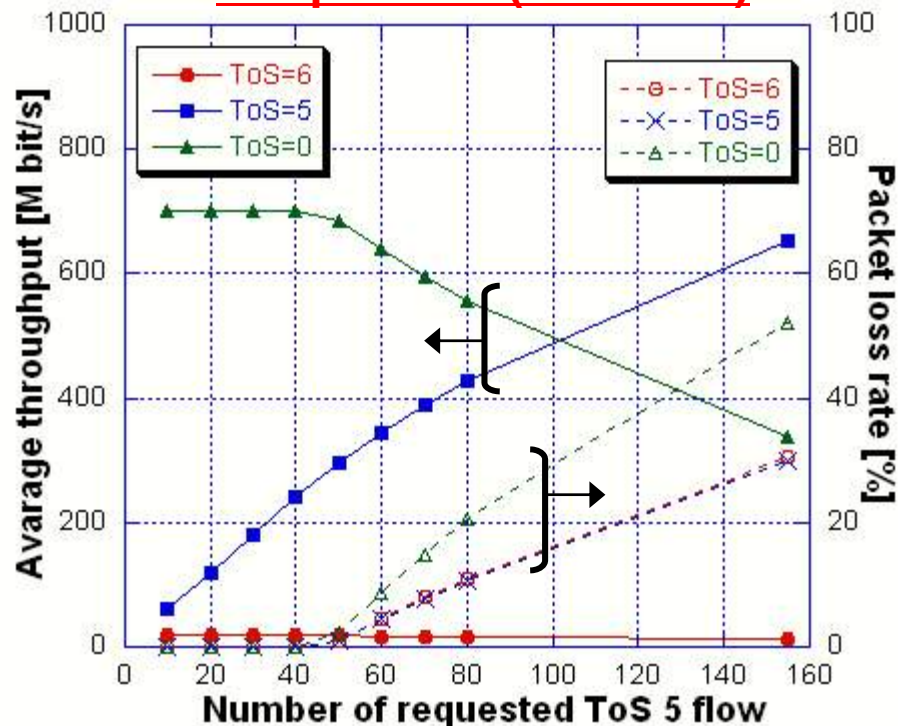


E2E quality under congestion

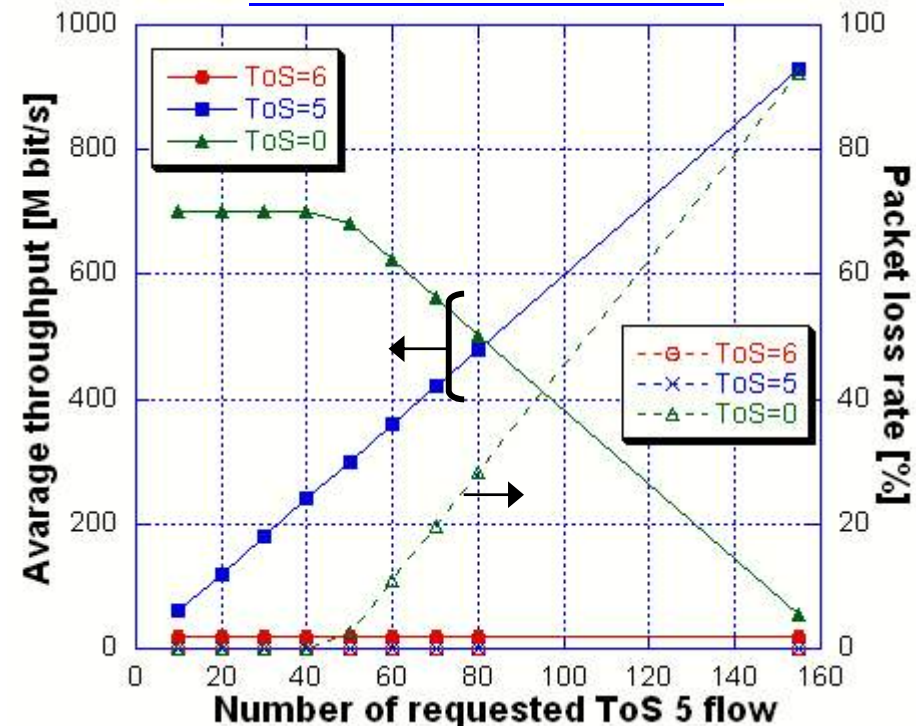
- Pre-planned (DiffServe-based)
 - Entire services are degraded without admission control and BW management
 - Degradation of entire video services
- NRM/NRB-controlled
 - E2E CIR is assured on-demand
 - Voice and video services are preserved

| Traffic | Typical service | BW profile |
|---------|-----------------|--------------------|
| ToS=6 | Voice | 90kbps*(200 flows) |
| ToS=5 | Real-time video | 6Mbps*(N flows) |
| ToS=0 | Data | 5Mbps*(140 flows) |

Pre-planned (DiffServe)



NRM/NRB-controlled



Resource scheduling & allocation

- **Successful** hierarchical path computation and scheduling
 - Detailed **route adaptation** by C-NRM (Request 3)
 - Abstracted rerouting by **roll back** operation of NRB (Request 4)

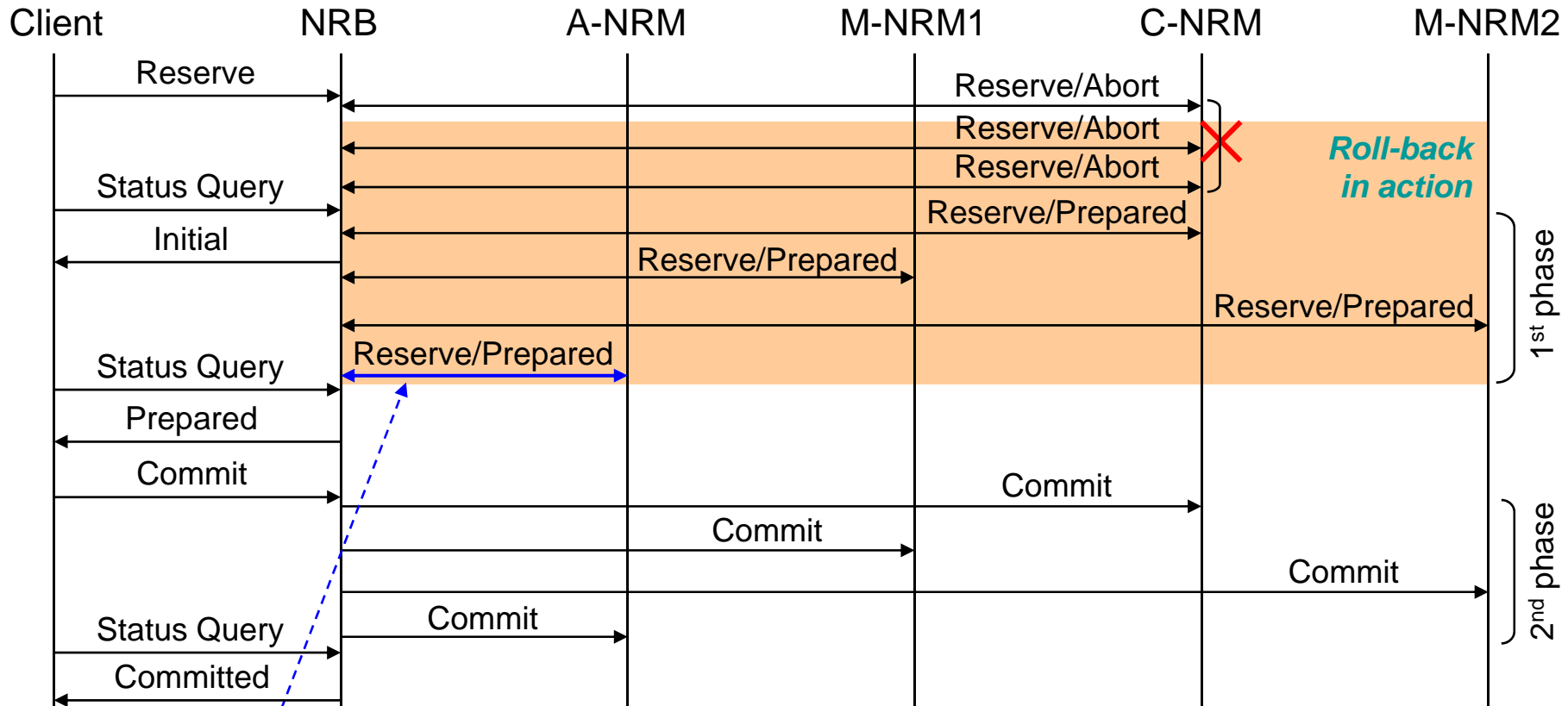
| Request # | EP 1 | EP 2 | Bandwidth (M bit/s) | Latency (ms) | Scheduled time frame | | | | | | | |
|-----------|------|------|---------------------|--------------|----------------------|-------|-------|-------|-------|-------|-------|-------|
| | | | | | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00 |
| 1 | Rtr1 | Rtr2 | 500 | 8 | | | | | | | | |
| 2 | CPE1 | EP1 | 300 | 10 | | | | | | | | |
| 3 | CPE2 | EP2 | 300 | 22 | | | | | | | | |
| 4 | CPE3 | EP3 | 350 | 10 | | | | | | | | |
| 5 | CPE3 | EP1 | 300 | 7 | | | | | | | | |



| Request # | Initial route selected by NRB | Final assigned route (w/ assist of NRMs) |
|-----------|---|---|
| 1 | Rtr1-Rtr2 | Rtr1-XC1-XC2-Rtr2 |
| 2 | CPE1-OLT1-RPR1-RPR4-Rtr1-Rtr2-RPR8-RPR6 | CPE1-OLT1-RPR1-RPR4-Rtr1-XC1-XC2-Rtr2-RPR8-RPR6 |
| 3 | CPE2-OLT1-RPR1-RPR4-Rtr1-Rtr2-RPR8-RPR7 | CPE2-OLT1-RPR1-RPR4-Rtr1-XC1-XC3-XC4-XC2-Rtr2-RPR8-RPR7 |
| 4 | CPE3-OLT1-RPR1-RPR4-Rtr1-Rtr2-RPR8-RPR7 | CPE3-OLT1-RPR1-RPR4-Rtr3-XC3-XC4-Rtr4-RPR8-RPR7 |
| 5 | CPE3-OLT1-RPR1-RPR4-Rtr1-Rtr2-RPR8-RPR6 | CPE3-OLT1-RPR1-RPR4-Rtr1-XC1-XC2-Rtr2-RPR8-RPR6 |

Distributed messaging flow

■ Successful roll back with two-phase commit (request #4)



Observed SOAP message (Reserve message from NRB to A-NRM)

```
2007-10-06 14:46:49 NetResourceReservationRequest@f2f973[singleReservationRequests=
{SingleReservationRequests[0]=jp.kddilabs.nrm.transport.common.reservation.types.SingleReservationRequest@1d6fad7[aPoi
nt=<mdNm>ANR#1</mdNm><mlsnNm>GE-PON</mlsnNm><meNm>OLT</meNm><ptpNm>/slot=1/port=0</ptpNm>
<ctpNm>/onu=192.168.1.3</ctpNm>,zPoint= <mdNm>ANR#1</mdNm><mlsnNm>GE-PON</mlsnNm><meNm>OLT
</meNm><ptpNm>/slot=1/port=1</ptpNm> <ctpNm>/cvlan=3</ctpNm>,bandwidth=350000,qos=0,availability=0,
latency=10,startTime=2007/10/07-13:00:00,endTime=2007/10/07-16:00:00]]}
```


Conclusion

- **NSI is the possible interface** to be applied to resource management architecture for the next generation networking and services in telecom carriers
 - GNS-WSI-based end-to-end network resource management was **successfully** demonstrated
 - **Preserved E2E quality** of video and voice service flows
 - **Schedulable orchestration** of E2E network resources
 - **Roll back operation** and **two phase commit** handling
- ➡ Considerable use case in telecom carrier networks

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Thank you.

