Report on the 1st E2E Provisioning Workshop

Monday - Tuesday, 1-2 December 2008
Amsterdam, Netherlands

by Peter Szegedi (TERENA)

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1. Aim of this report

This report provides a brief overview on the workshop, with the aim of enabling a follow up discussion from the community. This report will be available on the workshop website and will be distributed via the 'e2e-announce' mailing list. The list was rapidly populated after the event took place, showing a lot of interest.

The goal of this report is to encourage further discussion to help understanding the main interest of the participants. It would also enable those who could not attend the workshop in person to follow the discussions and express their own view on the mailing list.

The importance of end-to-end interconnections between campus end-users (and applications) is growing. The GÉANT2 pan-European network together with the NRENs offering more and more point-to-point connection services, the physical infrastructure, the networking solutions and the administrative issues raised in the last-mile are becoming more and more challenging. Reaching researchers and other users sitting on the campus networks is a major open issue not only in Europe, but also worldwide. With this report TERENA would like to initiate a broad discussion between NRENs and their users on how to address the above mentioned challenges.

2. Workshop overview

The first TERENA workshop to foster collaborative solutions to end-to-end lightpath provisioning issues took place in Amsterdam this week, on 1-2 December. This event focused on the 'last mile' challenges of establishing end-to-end connections. It attracted more than 60 people from around Europe, including key players from metropolitan, campus and local network operators, universities, research laboratories and national research and education networking organisations (NRENs).

Participants agreed that e-science applications generate huge network traffic flows with strict quality requirements. The needs of such applications are best met by 'traffic engineered' point-to-point circuits, rather than 'best effort' routed networks.

During the first day of the workshop speakers presented the provisioning systems and tools that are available in the NRENs' networks and the pan-European backbone network, GÉANT2. Vendors presented the platforms that make simple lightpath set-up and management functions available in the access, aggregation and core sections of the networks.

The second day of the workshop was more interactive. Researchers, campus network administrators and NREN representatives talked about their experiences with provisioning processes, and technical and administrative challenges. During the afternoon's panel discussion, the speakers clearly stated the major issues faced today in trying to exploit the benefits of end-to-end lightpaths. These are, namely: the unity of future network architectures, the simplicity of provisioning processes, the reduced complexity of tools and software, the availability of lightpath resources in the last mile, the reliability of point-to-point connections and cost issues.

3. List of presentations

Day 1

13:00 - 15:10 Background session

- Welcome and introduction, ***Peter Szegedi (TERENA)***
- AutoBAHN(GN2) - An overview, ***Afrodite Sevasti (GRNET)***
- AutoBAHN(GN2) and GMPLS/G2MPLS(PHOSPHORUS) in PIONIER network, ***Radek Krzywania (PSNC)***
- HARMONY - Advance reservation features for Grids, ***Sergi Figuerola (i2CAT)***
- MANTICORE - IP Network services, ***Victor Reijs (HEAnet)***

15:30 - 17:00 Vendor session

- End-to-End Networking - What Does it Mean for Campus?, ***Jean-Marc Uzé (Juniper)***
- Supporting End-to-End Intelligence in Metro WDM Networks, ***David Bianchi (Cisco)***
- WDM-PON technology - How it can facilitate the last mile, ***Olivier Couderc (Nortel)***

Day 2

09:00 - 11:30 Coordination session I - Country Studies

- Customized Approaches to Fibre-based E2E Services, ***Jan Radil (CESNET)***
- VirtCloud & CoUniverse - On E2E Services for Grids and Multimedia, ***Petr Holub (CESNET/Masaryk)***
- Dynamic Lightpaths in SURFnet and Beyond, ***Bram Peeters (SURFnet)***
- End-to-End Lightpaths in the Smallest University of the Netherlands, ***Maurits van der Schee (UvA)***
- Building a LAN to Support Multiple Lightpath Projects, ***Ronald van der Pol (SARA)***
- Experiences with international lightpaths, ***Paul Boven (JIVE)***

12:00 - 13:20 Coordination session II - Challenges

- Open Architectural Issues for Inter-domain Hybrid Network Protocols, Topologies and Services, ***Jerry Sobieski (NORDUnet)***

- Challenges in the last mile, ***Kurosh Bozorgebrahimi (UNINETT)***
- Lightpaths - Operational procedures and Authorisations, ***David Salmon (JANET(UK))***
- E2E circuits for the Worldwide LHC Computing Grid (WLCG), ***Edoardo Martelli (CERN)***

The workshop presentation slides can be downloaded from the TERENA website: http://www.terena.org/activities/e2e/ws1/programme.html.

4. Notes from the panel discussion

The final panel discussion was chaired by Erik-Jan Bos (SURFnet). The main motivation for this workshop was to address the potential benefits of using point-to-point circuits instead of traditional routed networks for research and e-science applications. Most of the speakers mentioned that e2e lightpaths can satisfy the strict requirements of research applications concerning sufficient bandwidth, high quality of service, safe playground and cost (CAPEX) efficiency. Especially the ever increasing bandwidth and quality requirements of the eVLBI applications cannot be satisfied with the traditional 1 Gig TCP/IP connections anymore.

The panellists remarked that connection oriented services are needed and that Ethernet technology may provide a good platform for them. However, this raised the issue whether point-to-point services will ever be available for the commercial world? The speakers believed that it will. The main issues are not on the technical side but on the administrative level. Admission controls, scheduling as well as the business models behind e2e lightpath provisioning are really challenging topics. In this context, one of the main requirements can be seen clearly; support the NOCs with efficient tools and shorten the provisioning processes' lifecycle. The trend is that not the users (people) but the applications (software) will request e2e connections in the near future, because the application knows (e.g., the grid middleware) where the data is. The emerging web-based services can be tailored not just for point-to-point but for multipoint connections as well.

Currently faster provisioning has highest priority over dynamic provisioning. The motivation behind the increasing importance of the dynamic provisioning is the clear need of fast and automated restoration of the broken connections (like routed networks do the rerouting). Taking into account that the e2e connections usually cover very long distances, the chance of misconfiguration is high and the routing loops and broadcast storms caused are critical for the network operation. This fact leads us into other important areas, namely: security (firewalling) aspects, routing integrity and IP addressing issues.

In the typical case of an e2e lightpath provisioning the campus networks are bypassed (using only the fibre infrastructure in the aggregation (metro) and last mile sections of the campuses), but bypassing the firewalls could be dangerous. Applying virtual machines (virtual firewalls) may solve the issues, but the technology is not mature enough in the campuses yet. The correct IP addressing at both ends of the e2e connection are also extremely important from the routing integrity point of view. NRNEs are in a good position to educate the users about the importance of routing integrity and the potential effects.

The simplicity of the provisioning processes and the reduced complexity of software tools are very important for the high level architectural requirements. Currently there are a number of

architectures proposed by various research projects and other activities all over the world, and clearly there is no one-fits-all solution. Therefore, the major requirement is the unity of the architectural principles. A unified architecture has to provide fast (even dynamic), simple provisioning processes and enhanced reliability for the point-to-point connections (switching over backup paths is usually not available now at long distance).

In general, the network engineers have to work together with the application engineers in close cooperation that could ensure the success in the future. Working out proper business models and cost analyses (including OPEX not just CAPEX aspects) for e2e lightpaths is crucial for transforming the services into production networks.

5. Follow-up activities

Several participants commented on the "great success" of the event, which they felt was "well worth the time". TERENA welcomes the enthusiastic response to this workshop and will consider how best to follow up.

The potential interest areas to be discussed in the future are:

- Unified network architectures for end-to-end circuit provisioning
- Simplicity of the provisioning processes and software tools
- Availability of resources, especially in the last mile
- Reliability of point-to-point circuits
- Business models and cost analyses for end-to-end lightpaths
- Tutorial on the provisioning systems' implementation and usage by the campuses

Any feedback about these issues is very welcomed!

If you are interested in receiving information about any follow-up activities, or providing inputs for the discussions, please sign up to the 'e2e-announce' mailing list here: http://www.terena.org/activities/e2e/mailinglist.

List of Participants

Name	Affiliation
Afrodite Sevasti	GRNET
Alex Reid	AARNet
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Aurelija Gefeniene	Vilnius University
Bernard RAPACCHI	CNRS/UREC
Bram Peeters	SURFnet
Brian O'Hora	Trinity College Dublin
Daniel Dvořák	Institute of Chemical Technology
David Bianchi	Cisco
David Salmon	JANET(UK)
Edoardo Martelli	CERN
Eduardo Jacob	University of the Basque Country (UPV/EHU)
Elenna Dugundji	Universiteit van Amsterdam

Eoin Kenny	HEAnet
Erik-Jan Bos	SURFnet
Frederic LOUI	RENATER
Gerard Jacobs	Nortel
Gerben van Malenstein	SURFnet
Guy Van Den Bergh	BELNET
Hans Bjarkov	UNI-C
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Vytautas Gurevicius	Vilnius university
Willi Huber	SWITCH
Xavier Jeannin	CNRS/EGEE

Picture of the day

1st TERENA E2E Provisioning Workshop - Panel Discussion