

# TERENA TASK FORCE ON NEXT GENERATION NETWORKING

## Summary Report on the 14th TF-NGN meeting

10-11 May 2004

Universiteit van Amsterdam, Amsterdam, The Netherlands

Issue 1, Valentino Cavalli

### Attendees

<u>Name</u>	<u>Organisation</u>	<u>Country</u>
Valentino Cavalli (Secretary)	TERENA	-
Tim Chown	Univ. Southampton	United Kingdom
Larry Dunn	Cisco Systems	-
Jérôme Durand	RENATER	France
Michael Enrico (Chair)	DANTE	-
Marian Garcia Vidondo	DANTE	-
Avgust jauk	ARNES	Slovenia
Dimitrios Kalogeras	GRNET	Greece
Felix Kugler	SWITCH	Switzerland
Olav Kvittem	Uninett	Norway
Yolanda Lamilla	Cisco Systems	-
Roland Leners	WAVIUM	-
Edoardo Martelli	CERN	-
Victor Olifer	UKERNA	United Kingdom
Javier Orellana	UCL	United kingdom
Jan Radil	CESNET	Czech Republic
Erik Radius	SURFnet	The Netherlands
Jürgen Rauschenbach	DFN	Germany
Victor Reijs	HEANet	Ireland
Duncan Rogerson	UKERNA	United Kingdom
Rudolf Roth	Fraunhofer Fokus	Germany
Yves Schaaf	RESTENA	Luxembourg
Christian Schild	JOIN/Univ. Münster	Germany
Jacques Schuurman	SURFnet	The Netherlands
Nicolas Simar	DANTE	-
Trond Skjesol	Uninett	Norway
Miguel Angel Sotos	RedIRIS	Spain
Szymon Trocha	PSNC	Poland
Jean-Marc Uzé	Juniper Networks	France
Stig Venaas	Uninett	Norway
Steve Williams	Univ. Wales/Swansea	United Kingdom

### Apologies

Graça Carvalho	Cisco Systems	-
Tiziana Ferrari	INFN/CNAF	Italy
Carlos Friacas	FCCN	Portugal
Simon Leinen	SWITCH	Switzerland
Janos Mohacsi	NIIF/HUNGARNET	Hungary
Wilfried Wöber	ACOnet	Austria

### Meeting proceedings

Presentations are available online at:

<http://www.terena.nl/task-forces/tf-ngn/presentations14.html>

## 1. GÉANT Update

Marian presented the latest updates in relation to GÉANT. Several backbone circuits were upgraded from 622Mbit/s to 2.5Gbit/s, the one between Austria and Germany was upgraded from 2.5Gbit/s to 10Gbit/s. The access circuits of RENATER, ARNES, CARNET, FCCN and LATNET were upgraded, DFN and SWITCH were planned for early May.

Marian reported on progress in the EUMEDCONNECT project. The new PoP in Catania was operational since 10 May 2004 and a second one in Cyprus was planned to become operational in July 2004. Three countries were already connected: Algeria, Morocco and Tunisia. Syria was confirmed and talks with Egypt were ongoing. There was no progress regarding connection of Jordan, Lebanon and the Palestinian Authority.

Marian updated the audience on the GÉANT year-4 roadmap. Several scenarios of layer2 VPN service were successfully tested. An inter-domain experiment across DFN-GÉANT-GARR was carried out in association with the DataTAG project. The tool developed by DANTE for IP Premium reservation had become operational for APM use in April 2004.

## 2. EGEE

Javier provided an update on the EGEE project, that started on 1 April 2004, by giving a overview of the project and then focusing on the network resource provision (SA2) and network service development (JRA4) activities.

The EGEE activity on network resource provision will define services through the following standard processes: a) gathering Service Level Requests (SLR) from end users and applications, b) defining the Service Level Specifications (SLS) to be implemented by GÉANT and the NRENs in conjunction with JRA4 and c) establish the Service Level Agreements (SLA) between applications, SA2 and GÉANT/NRENs. In addition, this activity will study GÉANT and NRENs NOC procedures in order to gradual integrate them with EGEE Grid Operation Centres (GOC).

The activity on network service development will focus on a) resource reservation and allocation, b) performance monitoring and c) IPv6. Such work will be coordinated with existing and planned developments in the context of GN1, GN2, and the GGF.

The work on resource reservation and allocation requires interfaces between network resources and Grid middleware. Network resources at L1 (lightpaths), L2 (VLAN, MPLS) and L3 (Diffserv based traffic) may be allocated in advance or in real time, across multiple domains, by a set of Bandwidth Brokers operating at core and local levels. This infrastructure will not automatically configure the equipment of the NRENs involved.

EGEE wants to make sure that interfaces between different existing systems are standardised, specifically Domain Mangers and those between Domain Managers and the Performance Measuring Systems. This work will build on existing GGF developments.

The project will produce a report about the investigation into the usefulness of IPv6 for Grids.

Some participants warned about the problems found by all the work done a few years ago in the Diffserv area regarding Bandwidth Brokers.

Other participants remarked that there should be coordination between EGEE and GN2. Talks had already started between UCL and DANTE in this respect.

Asked about the topology considered by EGEE, whether there are point-to-point sites a mesh of peer-to-peer sites, Javier said the latter would be ideal, but need to be studied.

### 3. Performance Monitoring

Nicolas updated the audience about the development of the Perfmonit Domain Tool, the basic tool monitoring data that will be exported by Measurement Points installed at each network domain taking part in the measurement infrastructure.

Some core components of the Perfmonit Domain Tool have been implemented: TTM driver, communication module, data collector and database. The only measurement parameter currently supported is OWD. An additional driver for the DFN IPPM measurement box is being implemented. IPPM is a major tool envisaged in the GN2 project for OWD measurement. DANTE expects the driver implementation to be ready by September 2004.

Nicolas presented the current status of GN1 year4 work particularly on the specifications and implementation of pathfinder. The communication module interface was almost ready, integration of the database was completed. He presented the schedule for the remaining works. This activity was being coordinated with Internet2 PiPEs and with the EGEE project.

The work schedule of GN2 JRA1 has been affected by a budget reduction in the Commission contract. As a result NRENs and DANTE have agreed to bring some activities forward and start to carry out the collection of user requirements and infrastructure state-of-the-art for already in summer 2004.

Rudolf Roth gave an update on measurement-related activities taking place in European Commission funded projects and IETF measurement working groups. On the former side Rudolf describe the MeTeoR Measurement Tools being used in the IST 6QM Demo and NetMate projects. IETF developments reported were the new RFC3763 in the IPPM working group on One-way Active Measurement Protocol (OWAMP) Requirements by S. Shalunov, B. Teitelbaum, and a number of IDs in the IPFIX and PSAMP working groups.

Rudolf introduced to the audience the MOME project, a Coordination Action building a Monitoring and Measurement Cluster, as well as E-NEXT, a Network of Excellence for Emerging Networking Experiments and Technologies.

### 4. IPv6

Jérôme Durand gave an extensive presentation about M6Bone. He focused on the current status of M6Bone, its future evolution and the specific technologies involved.

With 28 networks and 50 sites involved, M6Bone is likely the first example of an IPv6 multicast infrastructure at very large scale, with lots of activities in Europe, thanks to the 6NET project infrastructure as well as several links between Europe, Asia and America.

Jérôme described in detail how to connect to the M6Bone, particularly from networks that do not support Ipv6 multicast. He provided examples of routing and discussed routing policies. A few ISPs provide Ipv6 multicast. However transit networks should announce /48 prefixes from sites not having IPv6 multicast which got the service an ISP. This needs to be done on GEANT too.

M6Bone supports also IPv6 multicast applications and services. There is a public web site with lots of information at <http://www.m6bone.net> and a very active mailing list [m6bone@ml.renater.fr](mailto:m6bone@ml.renater.fr).

Marian provided an update on the status of IPv6 multicast in GEANT, which is expected to become a pilot service by the end of 2004. Some initial tests were carried out with JUNOS 6.1, using Juniper M20 on the GEANT testbed, simulating the GEANT network topology

Future test will regard new features of JUNOS 6.2 and ISIS. UNINETT expressed an interest in getting involved in these future tests.

Jean-Marc presented briefly the IPv6 features of Juniper routers. Netscreen was recently acquired by Juniper Networks and is now totally integrated in the company portfolio, so IPv6 is much more extended and supported.

Stig gave a presentation about XORP and other open source multicast implementations. The XORP project is developing an open source software router ([www.xorp.org](http://www.xorp.org)). Stig went through the history of various open software PIM implementations, mostly based on Pavlin Radoslavov specifications. When Pavlin joined the XORP project in 2001 he implemented a new version of PIM-SM from scratch: this is the only open source dual stack implementation available. The second part of Stig's presentation focused on kernel implementations and support for IPv6 multicast forwarding.

FLUTE stands for "File Delivery over Unidirectional Transport". Tim mentioned that FLUTE is one of several demonstrators selected in the 6NET project. Stig gave a brief overview of FLUTE and MAD-FLUTE, a specific implementation that has been tested in 6NET and is planned to be used for large scale file distribution and mirroring.

Rudolf had the floor again, for a short presentation about SIP support in IPv6 networks. This is also part of the 6NET project activities. Rudolf mentioned the basics of SIP and SIP infrastructure. Most of the reported work is available via <http://www.iptel.org>.

Christian Schild gave a presentation on using a Tunnel Broker with OpenVPN, for dial-in users who have ISDN-xDSL not only connecting to the university but also to other providers. There are many advantages in using OpenVPN, particularly in terms of multi-platform support and robustness.

JOIN have developed scripts that build a number of tunnel broker's features. Documentation is available on the JOIN web site.

Christian gave a second presentation on IPv6 support for Instant Messaging. Jabber is an open source instant messaging solution. An IPv6 Jabber server runs at the University of Muenster. There are over 70 Jabber client implementations, only a few of them IPv6 ready.

## **5. Lightpath Experiences**

Michael reported about a workshop on lightpath concepts and experiences that was held in Ottawa in March 2004. During the two-day workshop participants defined a lightpath as a point-to-point channel which a NIC sees (or experiences) as a dedicated line with a given Service Level Guarantee (deterministic behaviour).

The workshop participants defined and carried out a Trans-Atlantic lightpath demonstration between Los Angeles and Geneva, via StartLight, CA\*Net4, Netherlight and GEANT. The experiment set up was very complex, crossing several administrative domains and using layer1, layer2 and layer3 technologies. The basic lesson was that there is no automatic control plane available at such a level. The Biggest problem was to configure the Tyco link between the US and the Netherlands, specifically slicing 1Gbit wavelength out of 10G SONET, because Tyco was not providing such wavelength transparency to SURFnet.

The lightpath experiment was also used to measure network performance: except detecting packet loss, the result was rather inconclusive. Michael announced that there would be a second workshop later this year.

Victor described a test of international User Controlled Lightpaths (UCLP) between HEANet CA\*Net4 and TWAREN (TaiWan). Because HEANet has a BoP in NYC and TWAREN has one in Seattle the whole experiment took place on North American soil.

The UCLP concept was defined by Bill St. Arnaud. A Lightpath is deterministic, whereas SONET/SDh, WDM, MPLS and IP premium are not deterministic. The most innovative concept of UCLP according to Victor is that a user can trade bandwidth, other users can lease it. Four different implementations of UCLP exist at the moment. The one from the University of Waterloo was chosen for the experiment.

By trading and concatenating several Lightpath Objects (LPO) together the participants obtained one LPO end-to-end.

## **6. GN2 Update**

A session about the developments of the GN2 definition of work was provided. Michael presented an overview of the project structure and of specific activities relevant to TF-NGN: SA3 and the JRAs. The presentations given provided some additional details with respect to the presentations previously given at the Madrid TF-NGN meeting. JRA2 (security) and JRA5 (mobility) were presented by Jaques Schuurman and Jürgen Rauschenbach.

## **7. Optical Network Testbeds**

Jürgen presented two projects for optical testbed involving DFN: VIOLA and MUPPET. MUPPET is a project being currently negotiated with the European Commission. For confidentiality reasons the update on MUPPET is not reported in these minutes.

VIOLA (Vertically Integrated Optical testbed for Large Applications) is a 3-year project for an optical testbed in Germany, with a funding budget of 11M euro, which is expected to start in the second quarter of 2004. At the time of the meeting the project was in the stage of final agreement for funding by the German ministry of Research and Education.

VIOLA is a cooperation of various partners, including equipment manufacturers, telecom operators, research centres and universities, with an associated partner, GasLINE, providing optical fibre for the project testbed. The project is coordinated by DFN.

The goal of VIOLA is to vertically integrate different technologies at different layers. Most of the work focuses on the IP+optical control plane, but some middleware work needed to run the applications is included too. The project will test opto-electronics and GE switches, as well as signalling technologies enabling Bandwidth on Demand and hybrid network architectures. Core network nodes will test multi-vendor multi-technology packet and circuit switching equipment.

The VIOLA testbed will be used in preparation for the next generation production network WiNng (X-Win) of DFN.

Jan Radil provided an updated on experiences carried out by CESNET in the area of 10GE transmission. The work has been focusing on two research areas: defining the maximum span between sender and receiver on 10GE links without in-line amplification (Nothing-In-Line) and All-optical gain-clamped (AOGC). These results had been reported to the ITF meeting at the Internet2 Spring Member meeting. CESNET would like to do more disruptive tests in the future.

## **8. Next Generation NREN Architectures**

Erik Radius gave a presentation about SURFnet6, the next generation of the SURFnet operational network that is going to replace the existing one from 1 January 2006.

SURFnet5 provides static wavelength. Much more flexibility will be provided both in SURFnet6, both in the infrastructure and in the control plane. The new network is made possible by a 40 Million grant from the Dutch government over 5 years.

The first phase, the selection of partners, was concluded successfully. SURFnet6 will be a hybrid network with managed dark fibre and optical transmission equipment from Nortel Networks, and (very few) routers from AVICI Systems. Telindus, the third partner, will provide installation and maintenance services.

Michael Enrico described the options available in GN2 with respect to network architecture.

The hotspots in term of bandwidth hungry applications to be supported in GN2 will be the Netherlands and CERN, where multiple 10Gbit/s may be needed. At the moment this regards particularly requirement of point-to-point service for CERN, DEISA, Grid and eVLBI.

GN2 is also moving to an Hybrid Optical and IP network architecture. A connectivity tender for GN2 has been out for some time now. Even though there is clear emphasis on fibre, there are issues of cost-effectiveness for some locations.

Yolanda Lamilla presented the views of Cisco Systems about next generation architectures. The presentation was initially given to attendees of a Grid network Workshop in March in Geneva. Yolanda presented the solution provided for NLR: three types of networks used over a single fibre plant and discussed the requirements of NRENS, followed by a presentation of lightpaths and a discussion about open issues.

Cees de Laat focused his presentation on research topics about optical networking architectures and models for usage, transport protocols for massive amounts of data, authorization of complex resources in multiple domains and embedding in Grid environments.

## **9. Discussion about TF-NGN Evolution**

Valentino chaired a discussion about the evolution of TF-NGN.

Traditionally, lower-layer research activities have been coordinated at the pan-European level in task forces like TF-TEN, TF-TANT and TF-NGN. Until now these task forces have been undertaking invaluable research on areas of networking at the data and network layers, in connection with the various generations of the European interconnect. In GN2 specific research will be carried out by the European NRENS in the framework of the five joint research activities (JRAs).

TERENA task forces have an essential role in GN2 as means of coordinating RTD by providing forums for discussion of GN2 progress and results with experts from a wider European community and receive their feedback, as well as to generate and discuss plans for new technical development work, which can subsequently be taken up in the GN2 project or in other projects.

There is not a simple one-to-one mapping between JRAs and task forces. The current TF-NGN work areas broadly match with the proposed work of JRA1, JRA3 and JRA4.

When GN2 will start its work TF-NGN will need to renew and refocus its activities. This would be needed also because of a decreasing level of collaboration in the task force in the last year.

The goal of the discussion was to understand the research areas that need refocusing in the next phase of TF-NGN, but unfortunately there was not enough time for a full discussion. The major points that clearly emerged from the questions were: 1) a concern that when JRAs will be in place the NREs will not feel the need to participate in TF-NGN anymore, unless TF-NGN develops an own agenda, which contains the JRAs but goes beyond them and 2) researchers, especially from universities used to be more involved with the past incarnations of TF-NGN; they left the forum some time ago and should be attracted to come back into the task force.

The whole group felt that this discussion was essential and agreed to continue the discussion via email and possibly at informal occasions when the relevant people get together. A formal discussion on new research topics should take place at the next TF-NGN meeting.

## **10. Next Meeting**

The 15<sup>th</sup> Tf-NGN meeting will be held in Lisbon, Portugal on 30 September and 1 October 2004.