27-04-2011

Deliverable DN3.4.1,2: Annual report on Campus Best Practices

Deliverable DN3.4.1,2

Contractual Date:	31-03-2010
Actual Date:	27-04-2011
Grant Agreement No.:	238875
Activity:	NA3
Task Item:	T4
Nature of Deliverable:	R (Report)
Dissemination Level:	PU (Public)
Lead Partner:	UNINETT
Document Code:	GN3-11-132
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Abstract

'Campus Best Practice' is the title of one of the Tasks (Task 4) in the Networking Activity 'Status and Trends' (NA3) of the GN3 project. The overall objective of the Task is to address key challenges for European campus networks, organise working groups and provide an evolving and to-the-point set of best-practice documents for the community. The current GN3 deliverable reports on the work carried out in the Task during the second year of the GN3 project (April 2010 – March 2011) and the results of that work.

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Executive Summary

'Campus Best Practice' is the title of one of the Tasks (Task 4) in the Networking Activity 'Status and Trends' (NA3) of the GN3 project. The overall objective of the Task is to address key challenges for European campus networks, organise working groups and provide an evolving and to-the-point set of best-practice documents for the community. The current GN3 deliverable reports on the work carried out in the Task during the second year of the GN3 project (April 2010 – March 2011) and the results of that work.

The working methods in the Task build on the experiences from UNINETT's GigaCampus project (2006-2009). As part of that project, UNINETT organised a number of working groups in Norway dealing with campus issues in different technical areas. Participants from the relevant technical units at the universities were invited to participate in the working groups, which work to propose recommendations in best-practice documents.

Four pilot NRENs are participating in the Task, namely UNINETT from Norway, CSC/Funet from Finland, CESNET from the Czech Republic and AMRES from Serbia. The Task team organised working groups in each country and these working groups produced a number of campus best-practice documents. The technical areas of focus are procurement, physical infrastructure, audio visuals, lightpath service, LAN infrastructure and IPv6, wireless, network monitoring, SIP and IP telephony, and security. Not every pilot NREN is involved with every focus area, but there is a good overlap.

The best-practice documents are subject to an open hearing in their country before they are approved as a national best-practice document. They are then translated into English and published at the TERENA and GN3 websites. An open email distribution list is used to announce new publications. So far a total of 25 best-practice documents and eight reports have been published. In addition, AMRES published six documents in Serbian. More documents are scheduled for the third GN3 year.

The Task team prepared a poster and leaflets for dissemination of results at the TERENA Networking Conference 2010 in Vilnius and the EUNIS 2010 Conference in Warsaw. The Team organised a total of 20 workshops at the national level. In addition, two European workshops were arranged, one in Prague in April 2010 on IP Telephony and one in Espoo in March 2011 on IPv6. Both workshops attracted approximately 50 participants from ten different countries.

The Task team conducted a thorough planning process for the last two years of the project. In order to concentrate more on achieving sets of results that can be used Europe-wide, the team decided to reduce the number of technical focus areas from nine to six, starting from Year 3. The dissemination efforts will be substantially strengthened. Six dimensions to the dissemination efforts were identified and the following overall goals have been set for the third year:

1. work to get at least eight talks accepted at European/national conferences;
2. approach the management of at least two NRENs regarding the organisational setup;
3. organise at least two workshops at the European level;
4. conduct at least two training courses.

Given the significant amount of best practices available at this stage, the Task team has a good foundation for the important dissemination work ahead.

1 Introduction

'Campus Best Practice' is the title of one of the Tasks (Task 4) in the Networking Activity 'Status and Trends' (NA3) of the GN3 project. The overall objective of the Task is to address key challenges for European campus networks, organise working groups and provide an evolving and to-the-point set of best-practice documents for the community.

The Task aims to challenge individual National Research and Education Networking organisations (NRENs) to reinforce their national efforts in promoting best practices in campus networking. Better synchronisation of campus-directed efforts at the national level of research networking and on campus itself is essential for viable end-to-end services. Another target is to find the means to develop and maintain national best-practice recommendations.

The working methods in the Task build on the experiences from UNINETT's GigaCampus project (2006-2009). As part of that project, UNINETT organised a number of working groups in Norway dealing with campus issues in different technical areas. Participants from the relevant technical units at the universities were invited to participate in the working groups, which work to propose recommendations in best-practice documents.

Four pilot NRENs are participating in this Task of the GN3 project, namely UNINETT from Norway, CSC/Funet (hereafter Funet) from Finland, CESNET from the Czech Republic and AMRES from Serbia.

This deliverable reports on the second year of the GN3 project. See deliverable DN3.4.1,1 for a report on the first year.

Vidar Faltinsen from UNINETT is the Task Leader. He reports to the NA3 Activity Leader, Karel Vietsch from TERENA. The leading coordinators from the other pilot NRENs are Mara Bukvic (AMRES), Jiri Navratil (CESNET) and Wenche Backman (Funet). At the end of the second year, the Task team had nineteen participants from the four contributing NRENs. They have a key role in organising and leading working groups and producing best-practice documents. To achieve good results it is crucially important to attract a wide set of participants in the working groups organised at national level. These include participants from the NREN itself and from universities and colleges.

A high-level management commitment of the NRENs involved is considered essential. In order to succeed with this work the NREN must be willing and dedicated to get involved with addressing the issues and problems at the campuses of its prime customers.

2 Approach

2.1 Technical focus areas

In the first year, the Task team identified an initial set of nine technical focus areas. Together with the management and dissemination work they formed the subtasks of the 'Campus Best Practice' Task in the first two years of the project. During the first year each country established working groups at the national level covering the areas shown in Table 2.1. The working groups continued their work in the second year.

	Subtask / area	UNINETT	AMRES	CESNET	Funet
0	Task management and dissemination	X	X	X	X
1	Procurement	X			
2	Physical infrastructure[1]	X	X		
3	Audio Visual (AV)	X			
4	Lightpath service				X
5	LAN infrastructure and IPv6	X		X	X
6	Wireless	X			X
7	Network monitoring	X	X	X	X
8	SIP and IP telephony	X		X	
9	Security	X	X		
	Number of technical focus areas:[2]	**8**	**3**	**3**	**4**

Table 2.1: Subtasks/areas in the first and second year

[1] In deliverable DN3.4.1,1 the term "Basic infrastructure" was used instead.
[2] Not counting subtask 0 (task management and dissemination).

For a complete list of working groups and working group leaders, see Appendix A.

2.2 Best-practice document development process

The development process for the best-practice documents follows the flow shown in Figure 2.2. Initially the working group agrees on topics for new best-practice documents. The selection will be based on current challenges in areas where one or more universities have achieved significant results and would like to share these with the community. Problems that were acknowledged and solved within the working group can also serve as a starting point for a best-practice document.

The promoters will write the initial version of the document. The language will most often be the local language, or English. The initial version will be circulated and in turn presented at a working group meeting to generate discussion. This will trigger a new version and then working group members will iterate until consensus is reached and a final draft is put forward. The draft will be on open hearing in the higher-education community in the country for a period of 3-4 weeks. The hearing will be announced on a mailing list reaching all higher-education IT directors.

After the hearing period, all received comments and suggestions will be considered by the working group and changes will be made when appropriate. The document will then have reached the status of a national approved best practice and will be published at the national level.

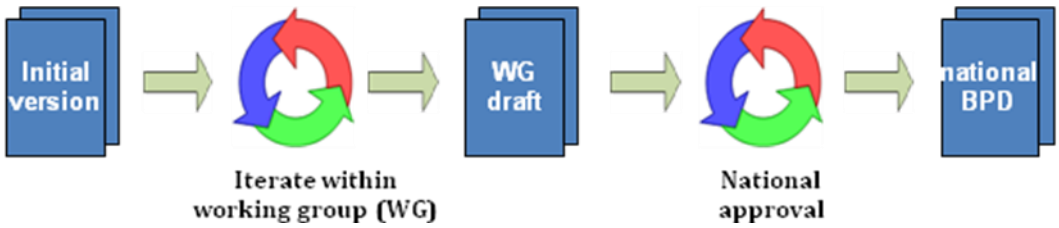

Figure 2.2: Best-practice document development process

The Task team is now halfway the project and has gained quite a bit of experience with these working methods. At a Task team meeting in Copenhagen in September 2010, each of the four countries contributing to the task presented their experiences and common challenges were discussed. When other NRENs would like to engage in this work, the following lessons learned should be taken into account:

- ✓ Community building takes time.
- ✓ The working group leader should be motivated and able to motivate.
- ✓ Use the phrase ‘participant’ rather than ‘member’ in working groups. ’Participant’ is a more active term than ‘member’.
- ✓ Since participants typically contribute as volunteers in their own institution’s time it can be challenging for the working group leader to enforce progress.
- ✓ The key experts are usually very busy and have no time to write. If they are willing to write than that is the best solution. Anyway, it is important to have them in the group, contributing to discussions.
- ✓ Establish an inner core of participants/contributors, but allow ‘hang-arounds’ (open membership).
- ✓ Initially the NREN should pick best-practice topics. As the working group matures, the group should discuss and decide on new best-practice topics themselves.
- ✓ Draft best-practice documents should be prepared in advance of meetings for best discussion.
- ✓ Do not write textbooks. Write to the point about lessons learned. Too long documents are hard to maintain and fewer people will read them.
- ✓ The working group meeting grounds are highly valuable for informal talks and discussions on related topics.

2.3 Translation to English and web publishing

In the first year the Task team ran a tendering process for Norwegian-to-English and Czech-to-English translators. Similar processes have been run in the second year for Finnish-to-English translators (completed June 2010) and Serbian-to-English (completed January 2011). The budget for hiring professional translators is part of TERENA's share in the overall budget of the GN3 project. Translators are therefore sought by way of open calls for tender published by TERENA.

All four countries started the process of translating national best-practice documents to English. So far 25 documents have been published; see Section 3.4 for an overview. All documents use a common template with acknowledgements, copyright statement and a common cover page with the GEANT logo.

The documents are published at the TERENA and GN3 websites:

- www.terena.org/campus-bp
- www.geant.net/About_GEANT/Campus_Best_Practice/

An open email distribution list, campus-bp-announcements@terena.org, is used for announcing new documents when available.

2.4 Task management

At the start of the project the Task team agreed on a plan for the two first years. The plan defined a number of milestones within each area of focus. Appendix A of the first-year report (DN3.4.1,1) lists all milestones achieved in the first year (45 in total). In the second year, the Task team continued its work according to plan. There has been a strong emphasis on producing best-practice documents, translating them to English and publishing the results. Appendix B of this report lists all milestones achieved in the second year (67 in total), whereas Chapter 3 summarises these results.

The Task team mainly uses email for its internal communications. In addition, the team has meetings by videoconference every month, and the minutes of those meetings are made available to the team. Before each meeting, every pilot NREN reports on the activities in the previous month and in particular on the status of milestones. These monthly reports are used as the basis for quarterly reports to the NA3 Activity Leader, who in turn uses those for his contribution to the quarterly progress reports of the GN3 project as a whole that are submitted to the European Commission.

The Task team has initiated the planning process for the last two years of the project. Focus will shift gradually from producing best-practice documents to dissemination to other countries. The current report elaborates on this in Chapter 4.

2.5 EU reviewers' suggestions

As part of the review of the first year of the GN3 project, the independent external reviewers appointed by the European Commission made the following comments:

- We recommend tracking the Operating System type as it may impact the support of advanced services.
- We recommend tracking new kind of devices (tablet, smart phones), which may impact the support of advanced services.

- With few months before the end of the IPv4 address space, it may be great to start tracking the IPv6 deployment at campus level feeding data to EU officer in charge of IPv6 promotion.
- Should wireless start including FemToCell deployment, or other wireless technology?
- Consider adding best practices on environmental assessment.
- We recommend to establish a liaison with the EduConf Task Group on Audio-Video

The Task team agrees that all these items are important issues and it made the following assessments:

- In the planning process for Year 3 and Year 4 (see Chapter 4) the Task team has agreed to strengthen the focus on resolving challenges related to IPv6 deployment on campus. UNINETT has already a system in place for tracking the deployment of IPv6 in the higher-education sector in Norway. The framework and setup has been documented in Year 2 [1] and can be implemented in other countries.
- The Task team regards the challenges of supporting tablets and smart phones on the wireless campus networks as a key issue. A best-practice document for radio planning and provisioning of new wireless devices is considered for the third year.
- The Task team regards FemToCell deployment as an important topic to follow, but the team feels that it is too early to implement a best practice. More experience is needed first. The team has passed this important topic on to the TERENA Task Force on Mobility and Network Middleware.
- Best practices on environmental assessment are definitely of interest. It will require some known use cases in our campus communities. A liaison with Task 5 of Activity NA3 will be an adequate measure in this case.
- As reported in Chapter 4, although important, the Task team will not pursue work in the area of Audio Visuals. This makes liaison with EduConf something outside the scope of the Task.

It is important to keep in mind that the Task team has limited resources. Potentially the scope might be indefinitely large. In the planning process that was conducted for the last two years of the project (see Chapter 4) the team decided to concentrate (and not to broaden) work efforts in order to best reach the main objectives.

3 Results

3.1 Dissemination

By the start of the second year it had become apparent that the Task team needed a well accessible, future-proof public website for publishing best-practice documents and other results. The website would most suitably be hosted by a European organisation rather than at one of the NRENs involved. At the time, the public GN3 website could not offer that publication facility yet. TERENA then kindly offered to host the documents and the website was made operational in May 2010, prior to the planned dissemination efforts at the TERENA Networking Conference 2010 (see below). The index page is www.terena.org/campus-bp and it links to several subpages:

- A page publishing all the best-practice documents (currently 25 documents).
- A page publishing reports, currently containing:
  - UNINETT's GigaCampus 2006-2009 final report.
  - Finnish reports that summarise several campus surveys they have conducted.
- Announcement page for workshops and links to past workshops with agenda and online presentations.
- Contact information.
- A leaflet that in a concentrated manner promotes the Task's work. The leaflet is based on the poster the team prepared for the TERENA and EUNIS conferences (see below).

In March 2011, the same information with the same structure was published at the GN3 website at www.geant.net/About_GEANT/Campus_Best_Practice/.

In the last two years of the project, the Task team will publish results in parallel at both sites. The established announcement mailing list, campus-bp-announcements@terena.org, will continuously be used for announcing new results.

As another dissemination action, the Task team prepared a poster (see Figure 3.1 on the next page) and leaflet that presented the Task's objective, efforts and results. The poster was accepted for and presented at both the TERENA Networking Conference (TNC) in Vilnius in May-June 2010 and the EUNIS conference in Warsaw in June 2010. Leaflets were handed out on both occasions.

Throughout the second year, the Task team also sent the Campus Best Practices leaflets to national networking conferences organised by NRENs across Europe.

3.2 Workshops

An important way of disseminating results is to organise workshops where best practices are presented and discussed. There have been many such workshops at the national level in each of the four participating countries; see Appendix C. In addition, the team organised two open European workshops:

- A workshop on IP Telephony in Prague on 29-30 April 2010.
  There were 50 participants from ten countries (Czech Republic, Norway, Finland, Serbia, Portugal, Croatia, Sweden, Slovakia, Poland, Netherlands).

- A workshop on IPv6 in Espoo, Finland on 24-25 March 2011.
  There were 51 participants from ten countries (Finland, Czech Republic, Norway, Poland, Denmark, Hungary, Switzerland, Germany, Ireland, Netherlands). In addition, 117 people followed the live web stream.

Appendices D and E give further details on the agendas and presentations from these two workshops.

Figure 3.1: The NA3/T4 poster presented at TNC and EUNIS in 2010[3]

[3] Available in full size PDF format at https://ow.feide.no/geantcampus:start#poster_and_leaflet

3.3 Working group results

The working groups in each country have been very active in the second year. This section summarises the results obtained in each technical focus area. The working groups from the NRENs contributing to each subtask are listed in parenthesis. In the text there are references to documents that have been produced. A complete list of documents can be found in Section 3.4.

3.3.1 Procurement (UNINETT)

UNINETT worked on a best-practice document that summarises the experiences with organising common procurement processes for the benefit of the entire higher-education community in Norway. During the GigaCampus project (2006-2009), 30 contracts were concluded in ten distinct areas, and this work continued in 2010 and 2011. The procurement best-practice document will be completed in May 2011.

3.3.2 Physical Infrastructure (UNINETT, AMRES)

This subtask deals with producing, developing and maintaining best-practice documents in the area of physical infrastructure (generic cabling, power supply, cooling etc. in ICT rooms). In the second year, UNINETT published the initial five documents in this area (the documents were revised and translated in the first year). UNINETT also completed a sixth document: Guidelines for the Design of HE Buildings, ICT and AV Infrastructure. The document was translated and published in July 2010.

AMRES has an active working group in the area. They worked on three documents in the second year, which all have reached the status of national best-practice documents. The documents are “Requirements for cabling” (September 2010), “Requirements for data centers and network rooms” (February 2011) and “Requirements for power supply (incl. UPS and generators)” (March 2011). All documents are written in Serbian[4] and they are published at the AMRES Campus Best Practices public wiki [2].

3.3.3 Audio Visual (UNINETT)

UNINETT prepared and translated two documents in the area of Audio visual (AV) infrastructure in the first year. These documents were both published in the second year. Furthermore, UNINETT has been working on a third document, “Operational support systems and audiovisual transmission”. The document was approved at the national level, translated to English and published in March 2011.

3.3.4 Lightpath service (Funet)

In the first year Funet conducted a national survey to establish the current status of lightpaths in Finland. The report that summarises the survey was translated to English in the second year. The results of the survey enable the planning of future Funet lightpath operations on campus. Documentations of two implementations have already been produced (in Finnish). A best-practice document on how to use lightpaths in campuses is scheduled for the third year.

[4] Corresponding best-practice documents from Norway, which are available in English, formed the basis for these three documents. It is therefore planned to translate not the entire Serbian documents to English in the third year, but only the additions to the versions from Norway.

3.3.5 LAN infrastructure and IPv6 (UNINETT, CESNET, Funet)

In the second year there has been a particular emphasis on IPv6 deployment on campus. Funet organised a national workshop on IPv6 in July. UNINETT and CESNET held national workshops covering IPv6 in November. Funet organised an IPv6 workshop at the European level in Espoo in March 2011; the agenda is in Appendix E.

CESNET is in the process of publishing a series of ten articles in the electronic journal Lupa [3] to raise awareness of IPv6 challenges in the Czech Republic (eight articles published in Year 2). CESNET also produced and published a BPD titled "IPv6 configuration on HP ProCurve Switches". UNINETT developed a framework for visualisation of IPv6 client penetration at the campus level. The solution is implemented for the Norwegian HE sector. CESNET has implemented a flow-based solution to gather IPv6 traffic statistics.

CESNET published a best-practice document on recommended resilient campus network design. An article based on the document was published in the Czech electronic journal Connect! [4] in July. UNINETT prepared a Norwegian document on resilient campus networking. It will be translated and published in the third year. UNINETT are also preparing a document on recommended multicast setup on campus. CESNET published a cookbook for setting up HP ProCurve devices in a campus environment.

Funet published a report that summarises the network equipment used on Finnish campuses. Funet also conducted two surveys (2009 and 2010) that map the current capacity in the Finnish campus networks. Based on these results Funet is working on a recommendation about which network equipment to deploy on campus.

UNINETT has been running a national procurement process on network equipment in the second year. The requirement specification is based on the established national best practices.

3.3.6 Wireless (UNINETT, CESNET, Funet)

In the second year Funet published two documents in the area: "WLAN information security" and "WLAN network planning". CESNET published a cookbook on configuring HP wireless equipment, while UNINETT published a document on recommended IEEE 802.1X setup on campus, and another on how to set up a Cisco controller in an eduroam environment.

Team members attended several meetings of the TERENA Task Force on Mobility and Network Middleware and presented results there. Funet organised a joint Finnish–Norwegian workshop in October with wireless experts from major universities in the two countries presenting results and experiences.

3.3.7 Network monitoring (UNINETT, AMRES, CESNET, Funet)

AMRES translated and published their first best-practice document titled "Network Monitoring and Management Recommendations". UNINETT completed the final draft of a document defining requirements for campus network monitoring. AMRES produced another document that has been approved at the national level (available in Serbian). It is a cookbook for configuring an NMS tool in a campus network.

CESNET published a best-practice document on flow-based monitoring on campus. They also organised a national campus network monitoring workshop in November 2010, while UNINETT did the same in Norway in March 2011. Funet conducted a survey on the use of network monitoring tools on Finnish campuses. A report has been published and a follow-up best-practice document is expected in May 2011.

3.3.8 SIP and IP Telephony (UNINETT, CESNET)

In April, CESNET organised a two-day workshop on IP Telephony with 50 participants from ten countries. See Appendix D for the agenda and a link to the presentations. Based on material from the workshop and follow-up work, CESNET published a best-practice document on IP telephony with experiences from several European NREN environments. CESNET also published a separate document on experiences from Czech academic institutions. Yet another document on SIP penetration testing has been published.

UNINETT puts a lot of emphasis on SIP and is implementing a national SIP infrastructure for the Norwegian academic sector[5]. The infrastructure was in operation by the end of the second year and the process of migrating customers from ISDN to the new SIP and ENUM-based solution will start in the third year. A document on the experiences will be produced in the fourth year of the project.

3.3.9 Security (UNINETT, AMRES)

UNINETT worked on two best-practice documents in the area of security and they have both been published. The first document describes recommended security architecture for campus networks. The second document is based on the work done in the higher-education sector in Norway with assisting universities and university colleges in getting their security policy in place. During the second year, UNINETT organised numerous on-site workshops. These workshops include the development of a local security policy. The best-practice document contains a template security policy that has been used in this work and it elaborates on the importance of getting top-level management involved in and responsible for the information security processes. An extended abstract based on UNINETT's experiences has been prepared and accepted for the TERENA Networking Conference 2011.

AMRES also developed two best-practice documents in this area, both published in Serbian on the AMRES Campus Best Practices public wiki [2]. The first document gives recommendations in relation to packet filtering. The other document is a cookbook on how to secure service access with digital certificates. AMRES also organised a one-day workshop in February with 37 participants from Serbian universities; the presenters included an invited speaker from GRNET.

3.4 Best-practice documents

As mentioned in Section 3.1, the websites for publishing best-practice documents were established in May 2010 (TERENA) and March 2011 (GN3). At the launch of the TERENA website, eight documents were published. They had all been prepared and translated in the first year (some documents were produced in the Norwegian GigaCampus project prior to GN3). Throughout the second year more documents were published. At the end of Year 2, a total of 25 documents are published on both websites. The documents are listed in Table 3.1 below.

Legend

Year.prod.: The year of the GN3 project in which the document was produced. Year 0 means prior to GN3.

Finance: what is paid from the GN3 project budget:

Tr = translation only
UpTr = update of national best-practice document and translation
All = all the work
Part = partly paid from GN3 budget, partly by the NREN

[5] Not part of GN3, financed by UNINETT.

	Document	NREN	Area	Year prod.	Finance	Lang.
1	Requirements for generic cabling systems	UNINETT	2	0,1	UpTr	English
2	Requirements for the design of ICT rooms	UNINETT	2	0,1	UpTr	English
3	Power supply requirements for ICT rooms	UNINETT	2	0,1	UpTr	English
4	Ventilation and cooling requirements for ICT rooms	UNINETT	2	0,1	UpTr	English
5	Fire protection requirements for ICT rooms	UNINETT	2	0,1	UpTr	English
6	Guidelines for the Design of HE Buildings, ICT and AV Infrastructure	UNINETT	2	1,2	All	English
7	Functional description of AV equipment in lecture halls and meeting rooms	UNINETT	3	0,1	Tr	English
8	Technical and functional system requirements for AV equipment	UNINETT	3	0,1	Tr	English
9	Operational support systems and audiovisual transmission	UNINETT	3	1,2	Part	English
10	Recommended resilient campus network design	CESNET	5	1	All	English
11	Configuration of HP Procurve Devices in a Campus Environment	CESNET	5	1	All	English
12	Recommended configuration of switches in campus networks	UNINETT	5	0,1	Tr	English
13	IPv6 Configuration on HP ProCurve Switches	CESNET	5	2	All	English
14	WLAN information security	FUNET	6	1,2	All	English
15	Recommended security system for wireless networks, implementation of IEEE 802.1X	UNINETT	6	0,1	Tr	English
16	Cookbook for configuration of HP wireless equipment	CESNET	6	1	All	English
17	Guide to configuring eduroam using a Cisco wireless controller	UNINETT	6	1,2	Part	English

	Document	NREN	Area	Year prod.	Finance	Lang.
18	WLAN network planning and setup	FUNET	6	2	All	English
19	Network monitoring based on IP Data flows	CESNET	7	1,2	All	English
20	Recommended network management architecture	AMRES	7	1	All	English
21	IP Telephony Review from Czech academic environment	CESNET	8	1,2	Part	English
22	SIP Penetration testing in CESNET	CESNET	8	1,2	All	English
23	Set of IP Telephony Best Practices in National Research Networks in EU	CESNET	8	2	All	English
24	Information Security Policy	UNINETT	9	2	UpTr	English
25	Recommended ICT Security Architecture in the Higher Education sector	UNINETT	9	2	UpTr	English

Table 3.1: Published best-practice documents

In addition, the following best-practice documents were approved and published at the national level in Serbia[6] [2] during the second year:

	Document	NREN	Area	Year prod.	Finance	Lang.
26	Requirements for generic cabling systems	AMRES	2	1,2	All	Serbian
27	Requirements for the design of ICT rooms	AMRES	2	2	All	Serbian
28	Power supply requirements for ICT rooms	AMRES	2	2	All	Serbian
29	Cookbook for configuration NMS tool in campus network	AMRES	7	2	All	Serbian
30	Best practice for packet filtering	AMRES	9	1,2	Part	Serbian
31	Cookbook for securing service access with digital certificates	AMRES	9	1,2	Part	Serbian

[6] Corresponding best-practice documents from Norway, which are available in English, formed the basis for the first three documents. It is therefore planned to translate not the entire Serbian documents to English in the third year, but only the additions to the versions from Norway. The other three documents will be translated to English in the third year.

Table 3.2: Approved best-practice documents available in native language only

The following best-practice documents were according to the Task team's original internal plan scheduled to be completed in the second year. They are currently in their final stage of preparation and are expected to be approved at the national level and translated to English in the first half of the third year:

	Document	NREN	Area	Year prod.	Finance	Initial lang.
32	Procurement process BPD	UNINETT	1	2,3	All	Norw.
33	How to use lightpaths in campuses	FUNET	4	2,3	All	Finnish
34	Requirements for LAN edge devices	FUNET	5	2,3	All	Finnish
35	Resilient campus network	UNINETT	5	2,3	All	Norw.
36	WLAN infrastructure	FUNET	6	2,3	All	Finnish
37	Requirements to network monitoring systems on campus	UNINETT	7	2,3	All	Norw.
38	Network monitoring best practices	FUNET	7	2,3	All	Finnish

Table 3.3: Best-practice documents almost completed in the second year.

3.5 Published reports

In addition to the best-practice documents, a number of reports were published in the second year:

	Document	NREN	Area	Year prod.	Finance	Lang.
1	GigaCampus 2006 -2009 Final report	UNINETT	0	1	Tr	English
2	Report on current status of lightpaths on campuses in Finland	FUNET	4	1,2	All	English
3	Report on network hardware used on Finnish campus networks	FUNET	5	1,2	All	English
4	Finnish national E2E performance survey 2009	FUNET	5	1,2	All	English
5	Finnish national E2E performance survey	FUNET	5	2	All	English

	Document	NREN	Area	Year prod.	Finance	Lang.
	2010					
6	Monitoring and ensuring wlan performance	FUNET	6	1	All	English
7	Report on current status of WLAN networks at Finnish campuses in 2010	FUNET	6	1	All	English
8	Report on network monitoring of Funet member organisations	FUNET	7	2	All	English

Table 3.4: Published reports

3.6 Work not completed in the second year

Table 3.3 lists seven documents that according to the Task team's internal plan should have been completed in the second year, but are postponed to the first half of the third year. Appendix B gives an overview of all milestones that where reached (67 in total) and also details on milestones where the team has shifted the original deadline set in the Task team's internal plan (12 in total).

There are many factors that influence if best-practice documents can be delivered on time. For example, there may be an unforeseen amount of discussion in the working group during the process of drafting the document. Or there may be many suggestions for improvements during the open hearing period, which means that many changes need to be made. Furthermore, the responsible NREN may have made a change of priorities and thus postponed the delivery of the document.

The Task team concludes that in spite of some postponements the amount of results produced in the second year is very satisfactory.

4 Plans for Year 3 and Year 4

In the last half of 2010, the Task team conducted a thorough planning process for the last two years of the project. The planning process was initiated at a full-day meeting in Copenhagen in September and continued at a full-day meeting in November at the GN3 Symposium in Vienna.

The Task team is planning an even stronger emphasis on dissemination in the last two years of the project, with the aim to promote the implementation of campus best practices across Europe. Ideally this work should continue after the end of the project.

4.1 Concentrating work efforts

In the planning process the Task team found it instrumental to its cause to reduce the number of technical focus areas and thus concentrate more on results. As shown in Table 4.1, the number of areas will be reduced from nine to six, starting from Year 3 (compare this with Table 2.1). The '(X)' notation in the table means that this is not a main contribution area for the NREN in question, but some work is conducted.

	Subtask/area	UNINETT	AMRES	CESNET	Funet
0	Task management and dissemination	X	X	X	X
2	Physical infrastructure	X	X		
5	Campus Networking	X	(X)	X	X
6	Wireless	X	(X)	(X)	X
7	Network monitoring	X	X	X	(X)
8	Real-time communications	X		X	
9	Security	X	X		
	Number of technical focus areas:[7]	**6**	**3 (5)**	**3 (4)**	**2 (3)**

[7] Not counting subtask 0 (task management and dissemination).

Table 4.1: Subtasks/areas in Year 3 and 4

This means the Task will not produce any new results after the second year in the areas of Procurement (1) and Audio Visuals (3). Work regarding lightpaths on campus (4) and IPv6 deployment on campus (5) will be part of the Campus Networking area (5). Area 8 continues, but is renamed “Real-time communications”. The Campus Best Practice web pages are already updated to reflect the new naming and the reduced number of areas.

The areas that the Task now concentrates on will cover what the team considers to be the current hot campus networking challenges. In particular:

- The urgent necessity to roll out IPv6 on campus (area 5).
- The numbers of tablets and smart phones “exploding” on campuses, challenging the wireless/eduroam infrastructures (area 6).
- The transition from PSTN to VoIP services and the emerging needs for unified communication solutions (area 8).
- The ever increasing demand for network services, in particular the trend of centralised services, cloud services and the impact of organisational changes (the merging of geographically dispersed institutions). This implies:
    - A robust and resilient physical infrastructure becomes even more mission critical (area 2).
    - A growing demand for end-to-end light paths between campuses (area 5).
    - Need for proactive monitoring of network operations, performance and capacity (area 7).
    - The traditional zone-based security model is severely challenged (area 9).

Note that the two first items above were also suggested by the external reviewers of Year 1 of the GN3 project (see Section 2.5).

4.2 Dissemination strategies

The ultimate goal of the Task is to spread the experiences and best practices addressing key issues on campus, and further encourage more NRENs to get involved with this work. The team identified six important dimensions to the dissemination efforts:

#	Category	Means	Target group	Objective
1	Organisational talk	Conference	NREN management (and general IT public)	NREN starts working groups
2	Organisational approach	Meeting	NREN management	NREN starts working groups
3	Technical overview talk	Conference	General IT public	Raise awareness
4	Technical detailed talk	Conference	IT staff at universities / NREN staff	Get best practice adopted
5	Experts meet experts	Workshop	University experts	Collect best practices
6	Knowledge transfer	Classroom	IT staff at universities	Get best practice implemented

Table 4.2: Ways of dissemination

The first category is about giving talks at conferences at the European level primarily to target NREN managers and then to explain the Task's organisational setup with campus area working groups at the national level, managed by the NREN, where the NREN recruits experts from the universities to contribute.

The second category has the same objective but is directed towards a specific NREN with a meeting at their premises. In this important dissemination area the Task team will start working with motivated NRENs. The team also believes in the neighbour approach. Countries of similar culture relate easier, i.e., dissemination in the Baltic countries is best done by Funet and dissemination in southeast Europe is best done by AMRES. AMRES has in fact initiated their dissemination efforts during the second year and conducted talks with Croatia, Montenegro and Greece.

The Task will continue the work on raising awareness of the campus best-practice results. The more people that stop by the Task's webpages, the better. Leaflets and posters will point in that direction. Technical overview talks at conferences (3) can be even more effective. The team should give talks both at the national level, i.e., NREN conferences, and at the European scene, i.e., TNC, EUNIS, etc. Task team members and/or authors of best practice documents should also give detailed technical talks (4) that present the results of a particular best practice (or of a particular area). The main target group will then be IT staff at the university level and the objective will be to get the best practices adopted.

Workshops (5) are also important means of dissemination. Workshops are of a different nature. They are arenas for experts to meet and discuss. This is where ideas and experiences are presented, exchanged, discussed and elaborated. Workshops serve as fruitful meeting places for maturing best practices, challenging the findings at one university with experiences from others. Workshops are important at the national level, where one can take advantage of a common, native language, and at the European scene, creating a larger-scale dissemination effect.

A last dissemination category is training sessions (6) where the setting is teaching, or knowledge transfer. The main challenge here is resources. It requires a lot of preparation to conduct a good training course. An advantage is that the same course can be repeated many times in different countries.

In the various dissemination processes, the Task team should consider liaisons with other GN3 activities and tasks, i.e., NA1 (training), NA2/T2 (promoting uptake of services) and NA4/T5 (addressing the digital divide).

At the wrap-up of the second year, the Task team already defined the overall goals for dissemination for the third year. In Year 3, the Task team will:

1. work to get at least eight talks accepted at European/national conferences;
2. approach the management of at least two NRENs regarding the organisational setup;
3. organise at least two workshops at the European level;
4. conduct at least two training courses.

Given the significant amount of best practices available at this stage, the Task team has a good foundation for the important dissemination work ahead.

5 Appendices

5.1 Appendix A: Working groups and their leaders

A list of active working groups in each country is given below. Working group leaders whose names are marked with an asterisk in the tables below are not a member of the NA3/T4 Task team. This means that the costs of their work are not charged to the GN3 project budget but are borne entirely by NREN (or by the Technical University of Brno in the case of Petr Lampa). All working group leaders are the same as in the first year, except for the Finnish AccessFunet group, which now is led by Janne Oksanen (succeeding Janne Niemi from Year 1).

5.1.1 UNINETT

Area	Group	Current leader	Founded
1	Procurement	Lars Skogan *	Jan 2006
2	Physical infrastructure	Roald Torbergsen *	Jan 2006
3	AV	Magnus Strømdal *	Mar 2008
5	Network architecture	Gunnar Bøe	Jan 2006
6	Mobility	Tore Kristiansen	Dec 2006
7	Network monitoring	Vidar Faltinsen	Jun 2005
8	Person-to-person communication (SIP)	Jardar Leira	Jan 2006
9	Security	Gunnar Bøe	Jun 2008

Table 5.1: Norwegian working groups

5.1.2 AMRES

Area	Group	Current leader	Founded
2	Physical infrastructure	Esad Saitovic	Nov 2009
7	Network monitoring	Slavko Gajin *	Sep 2009
9	Security	Mara Bukvic	Sep 2009

Table 5.2: Serbian working groups

5.1.3 CESNET

Area	Group	Current leader	Founded
5	IPv6	Petr Lampa *	Jan 2010
7	Network monitoring	Tomas Podermanski	Nov 2009
8	IP Telephony	Jan Ruzicka *	Nov 2009

Table 5.3: Czech working groups

5.1.4 Funet

The AccessFunet group is covering several areas; lightpath service (4), network monitoring (7), LAN infrastructure and IPv6 (5).

Area	Group	Current leader	Founded
4, 5, 7	AccessFunet	Janne Oksanen	Feb 2010
6	MobileFunet	Wenche Backman	May 2009

Table 5.4: Finnish working groups

5.2 Appendix B: Second-year milestones

	2010			2011
	A M J	J A S	O N D	J F M
Subtask 0: Task management and support				
T0.1: Face-to-face meeting on working group experiences		T		
T0.2: GN3 Symposium + Y3&4 task team planning meeting			T	
T0.3: Dissemination @ TNC 2010	T			
T0.4: Dissemination @ EUNIS 2010	T			
A0.1: Disseminate at the YuInfo national IT conference				A
A0.2: Procured Serbian to English translation service				A
C0.1: Disseminate BPDs in Czech journal DATAGRAM				
C0.2: Promote national BPDs on regular meeting of CESNET RP	C			
C0.3: NA3/T4 workshop on IP telephony in Prague	C			
F0.1: Procured Finnish to English translation service	C			
F0.2: NA3/T4 workshop on IPv6 in Espoo, Finland	F			F
Subtask 1: Procurement				
U1.1: Initial draft of procurement Process BPD		U		
Subtask 2: Physical infrastructure				
U2.1: BPD on the Design of HE Buildings, ICT and AV Infra (Eng)		U		
A2.1: Draft available: "Requirements for cabling"	A			
A2.2: National BPD: "Requirements for cabling"		A		
A2.3: Draft avail: "Requirements for data centers and netw rooms"		A		
A2.4: National BPD: "Requirements for data centers and …"				A
A2.5: Draft avail: "Req. for power supply in data centers"				A
A2.6: National BPD: "Req for power supply in data centers"				A
Subtask 3: AV				
U3.1: BPD: Technical and functional requirements for AV equipm	U			
U3.2: BPD: Support system for transmission of sound and picture				U
Subtask 4: Lightpath service				
F4.1: Report on status of lightpaths on campuses in Finland			F	
F4.2: Initial draft of BPD: how to use light paths in campuses			F	
Subtask 5: LAN infrastructure and IPv6				
U5.1: Framework for IPv6 client penetration visualisation		U		
U5.2: Initial draft of BPD: redundant campus network				U
U5.3: Initial draft of BPD: campus multicast setup				U
C5.1: Resilient campus network BPD in Czech journal Connect!		C		
C5.2: IPv6 working group meetings	C		C	C
C5.3: BPD: "Cookbook for IPv6 configuration of HP devices"			C	
C5.4 A series of 12 articles on IPv6 in Czech journal Lupa				C C
F5.1: Report on Finnish national E2E performance survey - 2009			F	
F5.2: Initial draft of BPD: what kind of devices to use at LAN edge			F	
F5.3: Report on Finnish national E2E performance survey – 2010				F
F5.4: National IPv6 workshop		F		
Subtask 6: Wireless				
U6.1: Norw: Setup of a cisco controller with 802.1X / eduroam		U		
U6.2: Eng: Setup of a cisco controller with 802.1X / eduroam			U	
C6.1: Published cookbook on configuring HP wireless (Eng)		C		
F6.1: Final version of WLAN security BPD (Eng)	F			
F6.2: Finnish - Norwegian workshop on wireless			F	
F6.3: Final version of WLAN network planning BPD (Finnish)			F	

	2010			2011
	A M J	J A S	O N D	J F M
F6.4: Final version of WLAN network planning BPD				F
F6.5: Initial draft of WLAN infrastructure BPD		F		
F6.6: MobileFunet –meeting		F	F	
F6.7: Topics gathered for next set of WLAN BPDs			F	
Subtask 7: Network monitoring				
U7.1: Final draft: Requirements for campus network monitoring				U
A7.2: Draft : Cookbook for config of NMS tool in campus network	A			
A7.3: BPD: Cookbook for config of NMS tool in campus network		A		
A7.4: Eng: Network Monitoring and Management Recomm.				A
C7.1: Eng: BPD131: “Flow based monitoring in the campus”		C		
C7.2: Campus Monitoring workshop (CESNET + Universities)			C	
F7.1: Report on network monitoring tools of Funet members (Eng)				F
F7.2: Initial draft of network monitoring BPD				F
Subtask 8: SIP and IP telephony (IPT)				
U8.1 Requirements and test protocol in English			U	
C8.1: Set of IPT implementation in Czech academic institutions		C		
C8.2: Set of IP Tel. best practices in research networks in EU				C
C8.3: BPD: SIP penetration testing in CESNET			C	
Subtask 9: Security				
U9.1: Security Policy template BPD (Eng)				U
U9.2: Eng: Recommended Security Architecture BPD				U
A9.1: National BPD: “Best practice for packet filtering”	A			
A9.2: Draft: Securing service access with digital certificates		A		
A9.3: N. BPD: Securing service access with digital certificates			A	
A9.5: Security workshop (national in Serbia, GRNET invited)				A

Legend: A = AMRES, C = CESNET, F = Funet, U = UNINETT, T = Task team

Table 5.5: Internal milestones achieved in the second year.

The following milestones from the original internal Task team Year 2 plans have been postponed and will be completed in the first half of the third year (these are also mentioned in Table 3.3):

1. Procurement process BPD, UNINETT
2. BPD on how to use light paths in campuses, Funet
3. BPD on requirements for LAN edge devices, Funet
4. BPD on resilient campus network, UNINETT
5. BPD on WLAN infrastructure, Funet
6. BPD on requirements for network monitoring systems on campus, UNINETT
7. BPD on Network monitoring best practices, Funet
8. BPD on requirements for ventilation and cooling, AMRES[8]

The following milestones from the original internal Task team Year 2 plans have been postponed and are now targeted for the second half of the third year:

9. Best practice on campus multicast setup, UNINETT
10. Cookbook on network services virtualisation at campus, CESNET

The following milestones from the internal Task team Year 2 plans are postponed to the fourth year due to change of priorities:

11. BPD on the Norwegian IPv6 transition experiences, UNINETT
12. BPD summarising the Norwegian SIP experiences, UNINETT

[8] In Serbian, and therefore not mentioned in Table 3.3.

5.3 Appendix C: Workshops organised at the national level

The following workshops were organised at the national level in the second year:

	Date	Area	Topic	Country	#days	partici pants
1	June 2010	5	IPv6	Finland	1	15
2	July 2010	5	IPv6	Czech Republic	1	27
3	August 2010	6	Wireless	Finland	½	4
5	October 2010	6	Wireless	Finland and Norway	1	17
6	November 2010	5,9	Campus network, IPv6, security	Norway	2	40
7	November 2010	5	IPv6	Czech Republic	1	35
8	November 2010	7	Network monitoring	Czech Republic	4	28
9	December 2010	4,5,7	Campus network, light path, network monitoring.	Finland	½	16
10	December 2010	6	Wireless	Finland	½	7
11	December 2010	3	Audio Visual	Norway	1	20
12	February 2011	5	IPv6	Czech Republic	1	25
13	February 2011	9	Security	Serbia	1	37
14	March 2011	6	Wireless	Norway	1	26
15	March 2011	7	Network monitoring	Norway	1	29
16	March 2011	4,5,7	Campus network, light path, network monitoring.	Finland	½	14
17-20 [9]	April 2010 – March 2011	9	Security	Norway	4x1	15 avg

Table 5.6: Workshops organised at the national level

[9] These are Information Security Policy workshops conducted at HE institutions in Norway. Each workshop is a one-day event and the number of participants has been around 15 on average.

5.4 Appendix D: IP Telephony workshop for NA3/T4

The Task team organised a two-day workshop on 29-30 April 2010 in Prague. There were 50 participants from ten countries (Czech Republic, Norway, Finland, Serbia, Portugal, Croatia, Sweden, Slovakia, Poland, Netherlands).

The slides of the presentations are available at http://www.ces.net/events/2010/ipt-workshop/

The agenda of the workshop was as follows:

29 April 2010		
09:30	Czech National Research and Education Network—Future and Perspectives	Jan Gruntorad, CESNET
10:00	GN3 NA3-T4 Campus Best Practices—The goals and plans	Vidar Faltinsen, UNINETT
10:30	Coffee break	
11:00	ENUM Best Practices	Lukas Macura, CESNET
11:00	TERENA Community: Open up your eyes, codes and networks	Peter Szegedi, TERENA
11:30	IP Telephony in CESNET	Jan Ruzicka, CESNET
12:00	Lunch break	
13:30	Status and plans for a national SIP infrastructure for the Norwegian universities	Jardar Leira, UNINETT
14:00	Migrating 12,000 users to VoIP	Kjetil Otter Olsen, Oslo University
14:30	Switching to VoIP for a multicity university with multiple legacy systems	Ulf Tigerstedt, Abo Akademi
15:00	Coffee break	
15:30	VoIP@RCTS project	Marco Mouta, FCCN
16:00	Migration from Legacy PBX to open-source IP telephony	Michal Petrovic, ZCU Plzen
16:30	Building the educational VoIP cloud in Croatia	Branko Radojevic, CARNET
30 April 2010		
09:00	New challenges for VoIP platforms	Olle E. Johansson, Edvina.net, member of the Asterisk dev. Team
09:30	Building NGN and VoIP Services on Open Technologies	Ivan Kotuliak, Tomas Kovacik STU Bratislava
10:00	Security risks in IP telephony	Miroslav Voznak, CESNET
10:30	Coffee break	
11:00	Issues of Speech quality in IP telephony	Miroslav Voznak, CESNET
11:30	OpenStage—Experience with IP phone development	Leos Vojir, Mitko Mitev, iSEC—IT Services and Enterprise Comm.
12:00	Automatic switchboard operator	Lubos Smidl, Tomas Valenta, ZCU Plzen
12:30	HiPath 4000 IP Distributed Architecture	Pavel Novotny, Jiri Kolek, iSEC—IT Services and Enterprise Comm.
13:00	Lunch break	
14:00	Workshop closing session	Jiri Navratil, Vidar Faltinsen

Table 5.7: Programme of Prague workshop on IP Telephony

5.5 Appendix E: IPv6 workshop for NA3/T4

The Task team organised a two-day workshop on 24-25 March 2011 in Espoo, Finland. There were 51 participants from 10 countries (Finland, Czech Republic, Norway, Poland, Denmark, Hungary, Switzerland, Germany, Ireland, Netherlands). In addition, 117 people followed the live web stream.

The slides of the presentations are available at http://www.csc.fi/csc/kurssit/arkisto/gn3_ipv6_ws2011

The agenda of the workshop was as follows:

24 March 2011		
13:00	Opening and welcome	Juha Oinonen CSC/Funet Vidar Faltinsen, UNINETT
	Theme: IPv6 in the IPv4 internet	
13:15	"How we did it" - practical approach to IPv6 deployment on campus	Jani Myyry, Aalto University Student Union
13:45	Security concerns and solutions with IPv6	Tomas Podermanski (CESNET)
14:15	Coffe break	
	Theme: Transitioning out of IPv4	
14:45	Addressing and address management	Janos Mohacsi (NIIF)
15:15	IPv6 gateways	Mariusz Stankiewicz (Gdansk University of Technology)
15:45	Practical experiences on the use of transition mechanisms	Trond Skjesol (UNINETT)
16:15	Coffee break	
	Theme: The future with IPv6 only (M8)	
16:45	A strategic approach to IPv6	Dave Wilson (HEANET, vconf)
	(cancelled) IPv6 only networking	Ari Keränen (Ericsson)
25 March 2011		
09:00	Opening and welcome: introduction to the 2nd day	
09:15	Lightning talks (15 min) from the audience • IPv6 only network at the TERENA office, Dyonisius Visser (TERENA) • Fake router detection - practical experience, Matej Gregr (Brno University of Technology) • Monitoring the developement of academic IPv6 networks in Czech Republic, Martin Pustka (CESNET) • Tracking the deployment of IPv6 in the Higher Education sector, Morten Brekkevold (UNINETT) • Future Internet Engineering project, Bartek Gajda (PSNC) • Inititatives@SURFnet - adopting IPv6 at campus infrastructures, Maurice van den Akker (Surfnet) • IPv4 to IPv6 multicast translator, Teemu Kiviniemi (CSC)	
11:00	Lunch	
12:00	Panel on practical deployment: Dual stack or IPv6 only?	1st day speakers (panelists), Pekka Savola (CSC, chair)
13:00	Meeting on the practical advancement of IPv6 on campuses • What is needed for the universities to make more progress on deployment? • Do we have all the documents/good practices needed? • What reasons are used for not deploying? Can we remove more obstacles?	Gunnar Bøe (GN3 project)
13:50	Wrap-up and farewell	Jari Miettinen (CSC)
14:00	Free discussion with coffee	
15:00	The reception closes	

Table 5.8: Programme of the Espoo workshop on IPv6

References

[1] http://metanav.uninett.no/ipv6
UNINETT's implemented framework for tracking the deployment of IPv6 in the Higher Education sector in Norway.

[2] https://www.bpd.amres.ac.rs/
AMRES Campus Best Practices public wiki.
Serbian Best Practice Documents (written in Serbian) are published here.

[3] http://www.lupa.cz/n/ipv6/
A series of 10 articles published in the Czech electronic journal Luca to raise awareness of IPv6 in the Czech Republic. The articles are an NA3/T4 result produced by CESNET.

[4] http://www.zive.cz/archivcasopisu/connect.asp?MID=897
Czech journal Connect!, number 04/10. Page 18-20.
Article based on the results from the CESNET produced NA3/T4 best practice on recommended resilient campus network design (CBPD114).

Glossary

AV	Audio Visual
BP	Best Practice
BPD	Best-Practice Document
E2E	End-to-End
ENUM	E.164 NUmber Mapping
EU	European Union
Gb/s	Gigabits per second
GN3	Multi-Gigabit European Research and Education Network and Associated Services
HE	Higher Education
HP	Hewlett-Packard Company
ICT	Information and Communication Technologies
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
IPT	IP Telephony
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISDN	Integrated Services Digital Network
IT	Information Technology
LAN	Local Area Network
Mb/s	Megabits per second
NA	Networking Activity
NGN	Next Generation Network
NMS	Network Management Station
NREN	National Research and Education Networking organisation
SIP	Session Initiation Protocol
TNC	TERENA Networking Conference
UPS	Uninterruptible Power Supply
VoIP	Voice over Internet Protocol
WG	Working Group
WLAN	Wireless Local Area Network