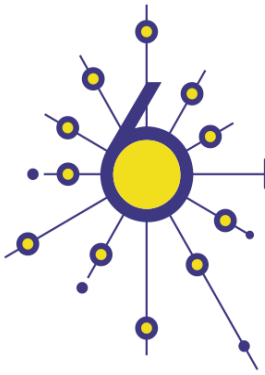
e-infrastructure



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Abstract:

This deliverable presents a report from the workshop held in Tbilisi (Georgia) from 15th to 17th December 2009. The presentation material is listed, the attendees and their affiliations are given, and the opportunities for further co-operation and follow-up actions are described.

Keywords:

IPv6, Support, Training, Testbeds, Modules, 6DISS, 6DEPLOY, Hands-on exercises

Disclaimer

Revision History

The following table describes the main changes to the document since created.

Revision	Date	Description	Author (Organization)
v0.1	11/05/2010	Document creation, added content provided by Peter Kirstein (UCL)	Alvaro Vives (Consulintel)
V1.0	23/05/2010	Final review	Alicia Higa and Martin Potts (Martel)

Executive Summary

One of the main activities in the 6DEPLOY project is to organise workshops to train the different Internet communities in the areas of IPv6 deployment, configuration, and usage. This project is a follow up of previous project activities within and outside the Framework Programmes of the European Commission.

This report details the IPv6 lab opening and the workshop at GRENA offices in Tbilisi (Georgia) from the 15th to 17th December 2009. The opening was attended by government and local officials, whilst the workshop was attended by technical staff from Georgia, Azerbaijan, and Armenia.

The following workshop details are described in this report: a) the workshop attendees and their affiliations, b) the programme outline, c) the material presented, d) an assessment of the opportunities for further co-operation and follow-up actions planned, and e) an analysis of the feedback questionnaires from the participants.

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1. INTRODUCTION

1.1 6DEPLOY Objectives

The following comprise the 6DEPLOY objectives:

- organize workshops for the e-Infrastructure community and give practical advice and hands-on support for deploying IPv6 in their environments;
- work on deployments in Europe and in developing countries, exchanging experiences and best practices;
- improve the competitiveness of European industry by sharing experiences from IPv6 deployments in other regions;
- gain expertise with which to support *more commercial* deployments in European industries (e.g. Emergency Services, Health, Broadcast, Transport, Schools, Environment, Gaming, etc.);
- help to build consensus between European researchers by enabling and exploiting synergy among related projects (e.g. GÉANT-2, SEEREN-2, SEE-GRID, EUMEDCONNECT, CLARA, ALICE);
- encourage and enhance the effectiveness of the coordination between National and pan-European e-Infrastructure initiatives by being a focal point for IPv6 activities, giving IPv6 training, and supporting IPv6 deployments;
- open up the ICT programme to the participation of third country organizations in International Cooperation Partner Countries, including countries in Africa, Asia, and Latin America, by involving organizations that influence e-Infrastructures on those continents;
- improve scientific cooperation between Europe and the declared target regions (Africa, Asia, and Latin America) by exchanging knowledge and experiences through direct practical support for deployment, training events, etc. The project therefore also helps support other Community policies, most notably the development policy. Telecommunications infrastructures and the capability to access information worldwide are key measures of a country's progress. IPv6 has been a cornerstone of European Internet policy for several years; and
- support interoperability and standards by sharing information on the latest IPv6 standards, equipment hardware and software releases, and IPv6 policies (RIRs).

One of the main activities in the 6DEPLOY project is therefore to organize workshops to

train the different Internet communities in the areas of IPv6 deployment, configuration, operation, and management. This activity is a follow up of previous project's activities within and outside the Framework Programmes of the European Commission.

1.2 6DEPLOY Workshop Methodology

The 6DEPLOY methodology relating to the workshops is shown in the diagram below:

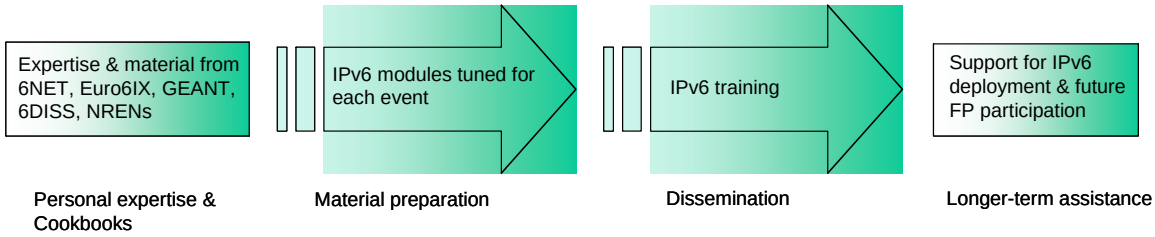

Figure 1-1: 6DEPLOY methodology (diagrammatically)

The approach is to use course material available from 6DISS and elsewhere that relates to IPv6, the e-learning course, and the 6NET IPv6 Deployment Guide book, together which will form the basis of the training material. This training material is supplemented with knowledge from partners' participation in events such as IPv6 Forum meetings, IPv6 Task Force meetings, Internet2 meetings, and the IETF, and from the experience of similar activities brought to the project by the representatives of the Internet Registries in North and South America, the Asia-Pacific region, Africa, and Europe. The knowledge is disseminated through training sessions that, for practical reasons, are often held in conjunction with AfriNIC, LACNIC, APNIC, AfNOG, APRICOT, and ISOC meetings.

After each workshop, feedback reports are collected from the participants, enabling 6DEPLOY to assess the impact of the presentations and to identify any areas that need improvement.

The full set of dissemination materials (including the e-learning course and 2 managed testbeds) is available from 6DISS and partners´ own sources. This includes presentation slides on all issues of Internet deployment and evolution; especially IPv4-IPv6 transition strategies, DNS, DHCP, routing, QoS, MobileIP, multicast, renumbering, auto-configuration, security, monitoring and management tools, and applications. This material was described in the deliverable D1.1: "IPv6 training material and related usage procedures".

This deliverable presents a report from the workshop held in Tbilisi (Georgia) from the 15th to 17th December 2009. The workshop comprised both slide presentations and

hands-on exercises (using local equipment and the new 6DEPLOY testbed).

Chapter 2 of this document explains the general motivation for running IPv6 workshops, and chapter 3 describe the specific details of this workshop, in terms of the attendees, the modules that were presented, and the “hands-on” exercises that were performed, using both local equipment and the local testbed. Chapter 4 identifies opportunities for further collaboration in the region and follow up actions, Chapter 5 summarizes the analysis of the feedback questionnaires that were filled in by the participants, and Chapter 6 provides some general conclusions.

2. THE WORKSHOPS (GENERAL)

Workshops are one of the main mechanisms used by 6DEPLOY to transfer information and to build collaboration.

6DEPLOY is structured to provide an ideal platform for the discussion of deployment scenarios and the exchange of best practices, thereby avoiding duplication of effort, by preventing the waste of time on techniques that are known not to have been deprecated, and generally making the most efficient use of the available resources in a region. Partners in 6DEPLOY have deployed IPv6 on a production basis in their own NRENs and University networks, and have documented their experiences in Cookbooks and in IETF informational/best common practice RFCs. The manufacturer in the consortium is building IPv6 products.

The workshops are not only intended to lead to an improved quality of the Internet infrastructure in developing countries, but will also raise the competence of the attendees and, in exploiting the personal contacts made through 6DEPLOY, facilitate and encourage the participation of their organizations in future FP7 calls and beyond.

Impacts from the workshops will include:

- a positive effect towards preventing the “brain drain” from developing countries by bringing interesting and state-of-the-art activities into these regions, thus making information and knowledge resources accessible to scholars both locally and globally;
- an expansion of the conditions for growth by enabling the exchange of ideas, launching joint experiments and projects, disseminating RTD results, and activating market forces; all of which are substantial elements in the process of regional development;
- making European research and industrial concerns aware of the highly skilled personnel who can contribute to the urgently needed improvement of ICT infrastructures, resulting in an increase of the demand for specialized services provided by the highly skilled academics and researchers of the region; and
- the identification of IPv6 deployment activities in the region and an exchange of information about deployment experiences.

While IPv6 standards and services are quite stable, regional variations in practices and operations will require slightly different approaches for collaboration and dissemination. Therefore, the material for these workshops was collected, and the workshop

schedules, formats, and contents were tailored in conjunction with the local organizers so as to suit the type of participants, the subjects to be addressed, the location, the host organization, the sponsors, etc.

3. THE 6DEPLOY WORKSHOP IN TBILISI (GEORGIA)

This workshop was held in the GRENA offices in Tbilisi from December 15th to 17th 2009 and was organized by UCL, NIIF and Cisco Systems with local support from GRENA, the Georgian NREN and the local Cisco Academy at GRENA. The workshop is described below, including descriptions of the attendees and their affiliations, the programme outline, and the material that was presented. The workshop received press coverage on Georgian Television, and in the Cisco newsroom.

The workshop was deliberately combined with two other events. First, there was the official opening of the IPv6 laboratory donated by Cisco, marking the first IPv6 activity in the Caucasus. Second, it was also the opportunity to review the progress of another donation made by the Chairman-emeritus of Cisco, who had donated $1,000,000 of Cisco equipment towards the formation of a Georgian government network following their peaceful revolution the year before. As a result, the workshop was given a political significance and there was a high-level attendance at the formal opening session.

To mark the occasion, the Georgian Research and Education Network (GRENA) held a dinner with several distinguished guests and visitors in attendance as well as the workshop lecturers and organizers. These guests included the Deputy Minister of Science and Education (Dr. Nodar Surguladze), the Cisco Vice President of Emerging Markets (Mr. Kaan Terzioglu), the CEO of Magticom (who implemented the Georgian Government Network) and many of their respective staff.

In the following paragraphs we provide information about the workshop, including the programme outline, and the material that was presented.

3.1 Overview

The workshop itself was preceded, on the morning of the 15th December, by the formal opening session. The physical attendees included most of the guests and visitors at the dinner the evening before, and also remote participation by the ex-CEO of Cisco (John Morgridge) from San Jose, and the Head of the Cisco consultants (Jane Butler) from London. The remote participation was made possible by utilising a Cisco Telepresence system, prepared by Bertus Habraken of Cisco.

The formal session was divided into two one-hour slots. One was the formal opening of the IPv6 training lab; the second was a session on the Georgian Government Network.

The IPv6 workshop lasted 2.5 days, from the 15th to 17th December. The whole event

was organized with the local support of Ramaz Kvatadze Executive Director of GRENA and his staff.

Individuals present at the workshop included Prof. Peter Kirstein (UCL), Piers O'Hanlon (UCL), Socrates Varakliotis (UCL), János Mohácsi (NIIF/Hungarnet), and Bertus Habraken (Cisco) representing 6DEPLOY.

3.1.1 Formal Lab Opening

During the formal opening there were several presentations regarding the importance envisaged by the adoption of IPv6 and the usefulness of the laboratories and other donations. It was also suggested that the network should now be seen as the 'fourth utility'.

The agenda of this first part was as follows:

Date	Time	Title of session
15/12/2009	09:30	Welcome – Georgian Government representative (Dr. Nodar Surguladze - Deputy Minister, Ministry of Education and Science of Georgia)
15/12/2009	09:40	IPv6, the 6DEPLOY IPv6 laboratories, how this laboratory fits in (Prof. Peter Kirstein, University College London)
15/12/2009	10:00	Cisco Systems and the Caucasus (Mr. Kaan Terzioglu, Vice President Emerging Markets, Cisco Systems)

Table 3-1: Tbilisi Workshop Lab Opening Agenda

3.1.2 The Government Network

This session involved mainly the local participants and John Morgridge via Telepresence. The agenda was the following:

Date	Time	Title of session
15/12/2009	10:30	The Cisco donation (Mr. John P. Morgridge, Chairman Emeritus, Cisco Systems)
15/12/2009	10:40	The Government response (Government representative)
15/12/2009	10:55	The description of the network (Magticom representative)
15/12/2009	11:10	The impact of the network (User)

Table 3-2: Tbilisi Workshop Government Network Agenda

3.1.3 The IPv6 Workshop

The IPv6 workshop consisted of a number of presentations, interspersed with practical sessions enabling the students to have hands-on IPv6 experience, based upon the material from the lectures.

GRENA hosted the workshop and provided local computers with access to the IPv6 router lab, and the Internet via GEANT. Additionally, the lab was connected into the IPv6 Internet via a tunnel from UCL. The workshop was conducted by Peter Kirstein, Piers O'Hanlon, Socrates Varakliotis (UCL), János Mohácsi (NIIF/Hungarnet) and Bertus Habraken (Cisco).

All the presentations were given in English.

3.2 Attendees

Below is a list of people that attended at least one session:

No.	Name	Affiliation	Position
1	Gurgen Petrosyan	Presidium of NAS RA	Network Administrator
2	Sergey Petrosyan	Institute for Informatics and Automation Problems (IIAP) of NAS RA	Network Administrator
3	Armen Khachatrya	ARENA	Network Administrator
4	Armenak Ayvazyan	ARENA	Network Administrator
5	Mammadov Mammad	AzRENA	IT specialist
6	Timur Rotkin	AzRena, AzEduNet	Network Manager
7	Kamil Hajiyev	AzRENA	Network Engineer
8	Babek Nabiyev	Institution of Information Technologies	Programmer
9	Nika Elbakidze	GRENA	Network Administrator
10	Nino Tsulaia	GRENA	Cisco Academy Instructor

Table 3-3: Tbilisi (Georgia) Workshop list of participants

The attendees' technical background with IPv4 networking was rather heterogeneous. As a result some of the participants experienced difficulty in completing a number of the hands-on exercises. More details may be found in section 5.1 regarding the attendees, based on their answers to the questionnaire.

3.3 Workshop programme

The agenda was agreed upon in close collaboration with the local organizers. The meeting agenda and the related material were submitted in advance so that the local organizers could decide which topics should be prioritized and thus manage the logistics

accordingly. The programme of the workshop is presented in the following table:

Date	Time	Title of session
15/12/2009		**Lecture Session 1**
	11:30	Why IPv6 is important
	11:45	Introduction to IPv6
	12:45	Lunch
		Lecture Session 2
	14:00	IPv6 Basics: Protocol and Addressing
	15:00	Associated Protocols
	15:45	Auto-configuration
	16:30	Coffee Break
		Lab Session 1: Host and Auto-configuration
	16:45	Lab Session 1: Host and Auto-configuration
	18:15	End of First Day
16/12/2009		**Lecture Session 3**
	10:00	IPv6 Support in the DNS
	11:00	Transition mechanisms
	12:00	Coffee Break
	12:20	Sensor networking
		Lab Session 2: DNS
	13:20	Lab Session 2: DNS
	14:20	Lunch
		Lecture Session 4
	15:30	Mobile IPv6
	16:30	Applications: Grid, VOIP, and Conferencing Case Studies
	17:30	Coffee Break
		Lab Session 3: Applications
	17:50	Lab Session 3: Applications
	18:50	End of Second Day
17/12/2009		**Lecture Session 5**
	10:00	Routing Protocols for IPv6
	11:45	Coffee Break
		Lab Session 4: Routing Configuration (LAB)
	12:00	Lab Session 4: Routing Configuration (LAB)
	13:30	Lunch
		Lecture Session 6
	15:00	Security
	16:00	Feedback Form
	16:00	End of Workshop

Table 3-4: Tbilisi Workshop programme

3.4 Presentation material

The following 6DEPLOY modules were updated before the workshop and presented:

Modules	Hands-on exercises	Presented by	Affiliation
Introduction to IPv6		Peter Kirstein	UCL
IPv6 Basics: Protocol and Addressing		Piers O'Hanlon	UCL

Associated Protocols		Piers O'Hanlon	UCL
Auto-configuration		Socrates Varakliotis	UCL
Host and Auto-configuration lab	LAB1	All	
IPv6 Support in the DNS		János Mohácsi	NIIF/Hungarnet
Deployment and Transition mechanisms		János Mohácsi	NIIF/Hungarnet
Sensor networking		Socrates Varakliotis	UCL
DNS lab	LAB2	All	
Mobile IPv6		Bertus Habraken	Cisco
Applications: Grid, VOIP, and Conferencing Case Studies		Piers O'Hanlon	UCL
Applications lab	LAB3	All	
Routing		János Mohácsi	NIIF/Hungarnet
Routing lab	LAB4	All	
Security		Piers O'Hanlon	UCL

Table 3-5: Tbilisi Workshop list of modules used

3.4.1 Modules

Below is a brief description of each module's content:

- **Introduction to IPv6:** This module explains why a new version for IP, IPv6, has been developed. A brief history of IPv6, its motivation and benefits are given.
- **IPv6 Basics: Protocol and Addressing:** This module describes IPv6 packet header, extensions headers and differences with IPv4 headers. Packet size issues and upper layer considerations are also treated. In addition, this module explains the IPv6 addressing architecture, the different types of addresses (unique local IPv6 addresses, interface IDs, multicast addresses), their textual representation, how these are built and related to a layer 2 address.
- **Associated Protocols:** This module describes new protocols associated to IPv6: e.g. Neighbour Discovery Protocol, SEND, ICMPv6, MLD, DHCPv6, etc.
- **Auto-configuration:** This module describes stateful (DHCPv6) and stateless (Router Solicitation/Router Advertisement) autoconfiguration mechanisms.
- **IPv6 Support in the DNS:** This module describes new Resource Records for

IPv6 DNS, availability of IPv6 in the root servers zone and CC-TLDs, etc.

- **Deployment and Transition mechanisms:** This module explains different approaches to deploy IPv6 in an IPv4 environment. Transition concepts are introduced and several transition mechanisms are covered: Dual Stack, tunnels, tunnel broker, 6to4, Teredo, Softwires and translation (at various layers).
- **Sensor networking:** This module explains the 6LoWPAN protocol and shows some examples of sensor networks.
- **Mobile IPv6:** This module describes IPv6 mobility and news features compared to IPv4 mobility.
- **Applications: Grid, VOIP, and Conferencing Case Studies:** This module describes services and applications available for IPv6.
- **Routing:** This module mainly describes the differences between IPv4 and IPv6 routing protocols for OSPFv3, EIGRP, RIPng, BGP4+, ISIS and MPLS.
- **Security:** Several issues are covered like the IPsec model, privacy extensions, ND threats, IPv4 vs. IPv6 Threat Analysis, IPv6 security issues, practical IPv6 security issues and firewalling IPv6. Security issues from transition and coexistence point of view are also provided.

3.4.2 Hands-on exercises

To help ensure that the workshop attendees will be able to install IPv6 in their own environment after the course is over, a set of practical exercises, known as hands-on modules, have been designed. These exercises were performed on local equipment provided for the workshop (PCs), participant laptops, and the newly installed IPv6 router lab. Most of the trainees used their own laptop to perform hands-on modules.

The local PC lab consisted of one PC per trainee and was used for exercises on hosts and servers. Linux (Ubuntu) and Windows 7 were used to support the exercises related to basic IPv6 configuration, standard network services, security and management tools.

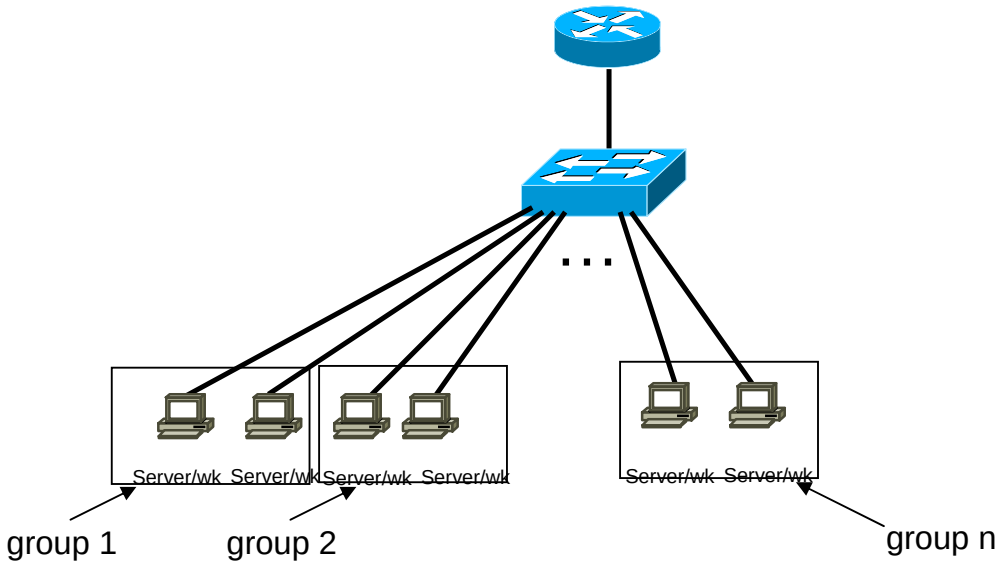

Figure 3-1: Hands-on Local Network at Tbilisi, Georgia

The IPv6 lab – as was the case for other 6DEPLOY workshops - was used for external (BGP) and internal (OSPFv3) routing protocols exercises.

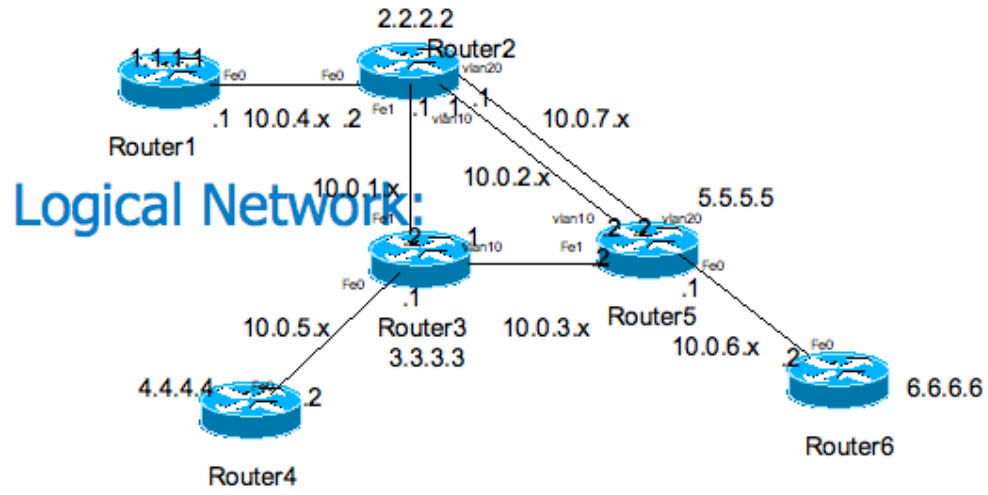

Figure 3-2: Router Lab at Tbilisi, Georgia

3.5 Photographs taken at the event

Figure 3-3: Lab opening - government network discussion

Figure 3-4: Attendees of Tbilisi workshop

Figure 3-5: Presenting the workshop material

4. OPPORTUNITIES FOR FURTHER CO-OPERATION

In all the workshops, the attendees were informed on how to stay in contact with the 6DEPLOY partners in case they have questions regarding IPv6 deployment, addressing plans, etc. In this respect, the role of the *helpdesk* was explained as being the way to submit questions. An e-mail to helpdesk@6deploy.org will be distributed to a mailing list composed of volunteers who are available to answer (or forward) any kind of questions, requests, etc. Also a web form can be used to send requests to the project.

Additionally, the attendees (and trainers from the region) can follow the e-learning course and/or check the availability of the 6DEPLOY remote labs and use these.

5. ANALYSIS OF THE FEEDBACK QUESTIONNAIRES

A questionnaire has been specially designed for the purpose of getting feedback from the participants regarding the suitability of the course material, and the presenters´ ability to convey information, and the relevance of the information to the expectations of the attendees.

Personal information was not mandatory, so as to allow for anonymous responses.

Each participant was first asked to indicate:

- his/her organization and job responsibilities, and
- his/her plans for IPv6 deployment in his/her organization.

Then, for each theoretical presentation and "hands-on" session, each participant was requested to assess "usefulness", "quality of presentation", "familiarity with the topic", "quality of the course documentation", "general organization", etc.

5.1 General questions related to participants and IPv6

About the participants 10 participants were present, 7 questionnaires were returned		
Employment sector	Government	2
	University or other higher education	1
	Schools or further education	1
	Research	1
	Health	0
	Commercial	1
	Other (please specify)	1 (research and education)
Job function	Government Advisor	0
	Senior Manager	0
	IT Manager	1
	Systems Administrator	1
	Network Administrator	2
	Researcher / Postgraduate	1
	Undergraduate	1
	Other (please specify)	1 (CCNA instructor)
Usage of IPv6		
Do you use IPv6 yourself?	Yes	0
	No	7
Does your organization use IPv6?	Yes	0
	No, but planned in this year	0
	No, but planned in the next year	2
	No, but planned in the longer term	4
	No, and no plans as yet	1

* See the graphics section for more information

Table 5-1: General questions related to participants and IPv6

5.2 Questions regarding the workshop

About the Workshop				
Usefulness of the topic	Very useful	Useful	Slightly useful	Not useful
Introduction to IPv6	5	1	0	0
IPv6 Basics: Protocol and Addressing	6	1	0	0
Associated Protocols	4	4	0	0
Auto-configuration	6	1	0	0
Host and Auto-configuration lab	6	1	0	0
IPv6 Support in the DNS	5	3	0	0
Deployment and Transition mechanisms	5	3	0	0
Sensor networking	3	3	0	0
DNS lab	5	1	0	0
Mobile IPv6	4	4	0	0
Applications: Grid, VOIP, and Conferencing Case Studies	5	3	0	0
Applications lab	5	3	0	0
Routing	6	1	0	0
Routing lab	6	1	0	0
Security	5	1	0	0
Quality of the presentation	Excellent	Good	Average	Poor
All Sessions	6	1	0	0
Quality of the course documentation	Excellent	Good	Average	Poor
	6	1	0	0
General workshop organization	Excellent	Good	Average	Poor
	5	1	1	0
Recommend to your colleagues?	yes	no		
	7	0		

Table 5-2: Questions regarding the workshop

5.3 Participants comments

It should be noted that the participants had different technical backgrounds. For example, some were network engineers (and therefore more interested in routing protocols and troubleshooting practices) while others were system administrators (and therefore more interested in applications and monitoring tools). Depending upon their background, some participants would have preferred to spend more time on Management, Applications, “hands-on”, or to have a “hands-on” session related to security issues.

Within the questionnaire there were three open questions where the trainees could give their feedback on the workshop. Below are almost all of the responses. Note that some are repeated (number put between parentheses).

Here are some comments provided by the trainees:
== Begin of the excerpts
*What topics would you have liked to **hear more about**?:*

- *(3) Mobile IPv6.*
- *(2) Sensor networking.*
- *(2) routing/routing protocols.*
- *(2) DNS.*
- *(1) IPv6 support in DNS.*
- *(1) VoIP.*
- *(1) Applications.*
- *(1) Security.*

*What topics would you have liked to **hear less about**?*

- *(2) Mobile IPv6.*
- *(1) Sensor networking.*
- *(1) Introduction.*
- *(1) IPv6 Basics.*

*Any **other comments**:*

- *(2) Excellent lectures, thanks!*

End of the excerpts ==

6. CONCLUSIONS

Workshops are a key mechanism through which information, knowledge, and know-how are transferred to less experienced countries and participants. The workshops enable us to build constituencies and raise awareness; disseminate, benchmark, and validate the research results from the EU's Framework Programmes; promote European technologies; exchange best practices; and offer information related to standards and interoperability issues.

The 6DEPLOY workshops provide an important role of informing and enabling the adoption of IPv6. With particular emphasis on the technical aspects of IPv6 the workshops enable participants to go out and deploy IPv6 in their networks and services.

This workshop saw the deployment of the first IPv6 lab in the region providing a key building block to enable adoption. Georgia has a keen interest in being involved in IPv6 and we identified the steps necessary to enable their and other networks to enable IPv6.

The feedback from workshop was very positive and the attendees felt they had gained a lot from the presentations and practical sessions. All participants would recommend the workshop to others, and we expect it to result in the continued advancement of both the Internet and of IPv6 in the region.

The impact of the workshop and associated Cisco activities attracted good interest from government and national press.

7. REFERENCES

6DEPLOY website: http://www.6deploy.eu

6DISS website: http://www.6diss.org

Hands-on modules: http://www.6deploy.eu/index.php?page=hands-on

How-to organize an IPv6 workshop:
http://6diss.6deploy.eu/workshops/workshop-guidelines.pdf

Training the trainers workshop: http://6diss.6deploy.eu/workshops/ttt/

e-learning package: http://www.6deploy.eu/index.php?page=e-learning

6DEPLOY Workshops Agenda and detailed information:
http://www.6deploy.eu/index.php?page=workshops