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Abstract:

This deliverable presents a report from the workshop held in Geneva, Switzerland on 6th - 8th, October, 2010. 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, AP, Training, Testbeds, Modules, 6DISS, 6DEPLOY, 6DEPLOY-2, Hands-on exercises

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Executive Summary

One of the main activities in the 6DEPLOY-2 project is to organise workshops to train 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 deliverable presents a report from a 3-day workshop held at the University of Geneva, Switzerland with an IPv6 Theory introduction held on October 6th - 7th 2010 followed by an IPv6 complementary (optional) practical session held on October 7th - 8th 2010. The training was organized by the University of Geneva, 6DEPLOY-2 and Mandat International with the support of Cisco and UCL. These trainings were provided to support two IPv6-related projects:

- the Smart IPv6 Building project: www.smartipv6building.org
- the European research project HOBNET: www.hobnet-project.eu

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-2 Objectives

Training, establishing centres of IPv6 expertise and giving support for deployments are the key services offered by 6DEPLOY-2. Developing regions (in Europe and abroad) are often the *early adopters* of IPv6, given that they have less legacy IPv4 networks installed. Test cases from these regions will be used to gain valuable practical experience which will be brought back to support deployments within EC e-Infrastructure projects

The following comprise the 6DEPLOY-2 practical objectives:

- to support the deployment of IPv6, in Europe and developing regions
- to sustain the wealth of 6DEPLOY training material (e-learning package with subtitles in national languages, presentation material, exercises, etc.)
- to create a catalyst of global IPv6 expertise through the installation of strategically-placed sustainable IPv6 training labs
- to synchronise with the training schedules of AfriNIC and LACNIC (and also APNIC) to exploit training opportunities cost effectively in Africa, Latin America and Asia
- to revive the IPv6 Cluster
- to describe deployment examples on the project Website
- to exploit the expertise and high quality training material from 6DEPLOY, including presentations, the e-learning course and the available IPv6 Labs, and - whilst continuing to offer professional training to organisations in Europe and developing countries - focus on supporting real deployments
- to maintain and update the 6DEPLOY material and include new training media, and multiply its training effectiveness through courses which educate other trainers about the basics of IPv6, so that they can teach others (“training trainers”)
- to extend to global scale the IPv6 Labs. Sustainability is achieved initially through the careful selection of locations for the installations (e.g. within NRENs) where the connectivity, funding and qualified staff support are all secured
- to support the (human) networking between the Lab managers with regular workshops.

One of the main activities in the 6DEPLOY-2 project is therefore to organise 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-2 Workshop Methodology

The 6DEPLOY-2 methodology relating to the workshops is shown in the diagram below:

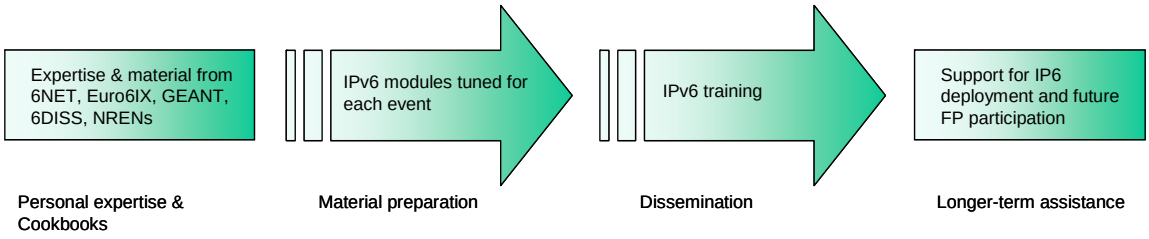

Figure 1-1: 6DEPLOY-2 methodology (diagrammatically)

The approach is to use course material available from 6DEPLOY and elsewhere that relates to IPv6, the e-learning course, and recent IPv6 deployment guidelines. 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-2 to assess the impact of the presentations and to identify any areas that need improvement.

The full set of dissemination material (including the e-learning course and increasing number of managed testbeds) 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 is described in the deliverable D1.1.1: "Report of the available training material and the assignment of partners responsible for maintaining each item".

This deliverable presents a report from the workshop held at the University of Geneva

in Switzerland on October 6th - 8th, 2010. The workshop comprised both slide presentations and hands-on exercises.

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. Chapter 4 identifies opportunities for further collaboration in the region and follow up actions, Chapter 5 summarises 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-2 to transfer information and to build collaboration.

6DEPLOY-2 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 have not been widely accepted, and generally making the most efficient use of the available resources in a region. Partners in 6DEPLOY-2 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-2, facilitate and encourage the participation of their organisations 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, and the workshop schedules, formats and

contents are tailored in conjunction with the local organisers so as to suit the type of participants, the subjects to be addressed, the location, the host organisation, the sponsors, etc.

3. THE 6DEPLOY-2 WORKSHOP IN GENEVA, SWITZERLAND

This IPv6 Workshop was held at the University of Geneva, Switzerland on October 6th - 8th 2010. In the following paragraphs we provide information about the workshop, including the programme outline, and the material that was presented.

Details of the workshop and the training material used can also be found on 6DEPLOY's project web site:

http://www.6deploy.eu/index.php?page=20100610_geneva_switzerland

3.1 Overview

6DEPLOY-2 representatives at the workshop were: Martin Potts (Martel), Socrates Varakliotis (UCL), Olivier Dupont and Andrew Yourtchenko (Cisco). The local organiser was Sebastien Ziegler (Mandat International).

An introduction to IPv6 was given. Specific IPv6 material were presented, including an introduction to basic IPv6, concepts on the transition and coexistence of IPv4 and IPv6, as well as different transition mechanisms, some of which are automatic, that explain the growth of IPv6 traffic that is being observed at global level despite its low level of deployment on the part of ISPs. In addition, hands-on exercises were carried out using hosts on a local network.

3.2 Attendees

Below is the list of participants:

No.	First name	Surname	Affiliation
1	Christine	Vanoirbeek	EPFL
2	Soumaya	Lanouar	EPFL
3	Nikodin	Ristanovic	EPFL
4	Xavier	Barmaz	HEVs
5	Marios	Angelopoulos	Patras University - CTI
6	José	Rolim	University of Geneva
7	Anthony	Gasperin	University of Geneva
8	Marios	Karagiannis	University of Geneva
9	Chantzis	Konstantinos	University of Geneva
10	Pierre	Leone	University of Geneva
11	Zereyakob	Makonnen	University of Geneva
12	Andrianirina	Fanomezana	University of Geneva
13	Renaud	Sauvain	University of Geneva
14	Irene	Guasch Lopez	University of Geneva
15	Marco	Giardina	IEEE
16	René	Beuchat	HEPIA
17	Damien	Piguet	CSEM
18	Laurent	von Allmen	CSEM

19	Peter	van der Stock	Philips lightings
20	Mamadou	Ndiaye	OFADEC
21	Carine	Falhun	CIAT
22	Jean-Philippe	Rey	HEIG VD
23	Rostand	Mitouassiwou	HEIG VD
24	Rosa	Delgado	EuroAndes

Table 3-1: Geneva Workshop list of participants

The participants represented academics and industry employees. They were technical people whose knowledge about IPv6 ranged from almost no knowledge at all to having significant experience with IPv6 deployment. Some had already performed IPv6 experiments or were planning some level of deployment at their institutions. The focus was placed on IPv6 sensor networks, since the HOBNET project is planning a deployment of IPv6 sensors in a United Nations building in Geneva.

3.3 Workshop programme

The agenda was agreed on after close collaboration with the local organiser. The meeting agenda and the related material were submitted in advance so that the local organisers could decide which topics should be prioritized and so manage the logistics accordingly. The programme of the sessions which took place on October 6th - 8th, 2010 is presented in the following tables:

Date	Time	Title of session: Introduction and Theory	Presented by	Affiliation
06/10/2010	9:00	Welcome and Introductions	S. Ziegler	Mandat International
06/10/2010	9:10	Introduction to Hobnet	S. Ziegler	Mandat International
06/10/2010	9:30	Introduction to 6DEPLOY	M. Potts	Martel
06/10/2010	10:00	Introduction to IPv6	A. Yourtchenko	Cisco
06/10/2010	10:50	IPv6 Basics: Protocols and Addressing	A. Yourtchenko	Cisco
06/10/2010	12:00	Associated Protocols	A. Yourtchenko	Cisco
06/10/2010	13:30	Auto-configuration	A. Yourtchenko	Cisco
06/10/2010	14:30	IPv6 Support in the DNS	A. Yourtchenko	Cisco
06/10/2010	15:50	Deployment and Transition mechanisms	A. Yourtchenko	Cisco
06/10/2010	16:30	Security	A. Yourtchenko	Cisco

Date	Time	Title of session: Theory (2) and Practical (1)	Presented by	Affiliation
07/10/2010	9:00	Routing and Addressing (theory). Using the HOBNET network as an example	A. Yourtchenko	Cisco
07/10/2010	10:50	Routing (practical). Configuring routers (local router or remote 6DEPLOY testbed)	A. Yourtchenko	Cisco
07/10/2010	13:30	IPv6 and Sensor networks	S. Varakliotis	UCL
07/10/2010	15:50	Demo of the UCL sensor network	S. Varakliotis	UCL

Date	Time	Title of session: Practical (2)	Presented by	Affiliation
08/10/2010	9:00	IPv6 on clients (Windows and Linux)	A. Yourtchenko	Cisco
08/10/2010	9:45	DNS	A. Yourtchenko	Cisco
08/10/2010	10:50	Other Services (FTP, Web server)	A. Yourtchenko	Cisco

Table 3-2: Geneva Workshop programme

3.4 Presentation material

The following 6DEPLOY-2 material was presented:

Modules	Presented by	Affiliation
IPv6 Basics	A. Yourtchenko	Cisco
IPv6 Startup	A. Yourtchenko	Cisco
Routing and Addressing (theory)	A. Yourtchenko	Cisco
Routing (practical)	O. Dupont	Cisco
DNS Laboratory Exercise	A. Yourtchenko	Cisco
Host Configuration (Windows XP) Exercise	A. Yourtchenko	Cisco
Host Configuration (Linus) Exercise	A. Yourtchenko	Cisco
Stateful Auto-configuration Exercise	A. Yourtchenko	Cisco
DNS and Services	A. Yourtchenko	Cisco
Security	A. Yourtchenko	Cisco
Management Tools	A. Yourtchenko	Cisco

Table 3-3: Geneva Workshop list of modules used

3.4.1 Modules

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

- **IPv6 Basics**: 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 packet header, extensions headers and differences with IPv4 headers. Packet size issues and upper layer considerations are also treated. In addition, 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, were explained. Transition concepts are introduced.
- **IPv6 Startup**: Practice basic IPv6 concepts like addresses, autoconfiguration, neighbor discovery protocol using hosts. In addition, some practice with basic transitions mechanisms using hosts.
- **Routing and Addressing (theory):** This module uses the HOBNET network as an example to present a theoretical approach on IPv6 Routing and Addressing.
- **Routing (practical):** This module presents practical Hand-on knowledge about configuring routers (local router or remote 6DEPLOY testbed) using the Paris lab as an example. Hands-on Routing configuration and commands glossary are also presented.
- **Security:** This module explains the securing of the servers and securing of the network.
- **DNS Laboratory Exercise**: Hands on exercise in the following tasks: Create a forwards zone, insert IPv6 related records, and perform some A and AAAA queries to the server.
- **Host Configuration (Windows XP) Exercise:** Hands on exercise in the following tasks: Activate the IPv6 protocal stack on WinXP PC`s, understand basic IPv6 concepts, and manually add/remove IPv6 addresses on Win XP.
- **Host Configuration (Linux) Exercise:** Hands on exercise in the following tasks: Check for IPv6 support in the running kernel, understand basic IPv6 concepts (NDP), manually add/remove IPv6 addresses on Linux, and use some basic IPv6 related tools.
- **Stateful Auto-configuration Exercise:** Hands on exercise in the following tasks: Minor DHCPv6 client configuration, and experience the usuage of both auto-configuration modes (stateless and stateful).

- **DNS and Services Exercise:** Hands on exercise in the following tasks: Configure and run an IPv6 (virtual) web server, and test services with IPv6 clients (web, ssh).
- **Management Tools Exercise**: Hands on exercise in the following tasks: Install a tool to monitor machines and associated services (argus) and test additional tools (Looking Glass, ASPathTree, etc).

4. OPPORTUNITIES FOR FURTHER CO-OPERATION

In all the workshops, the attendees are informed on how to stay in contact with the 6DEPLOY-2 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.eu 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-2 remote labs and use these.

In a particular follow-up of this workshop, Cisco will provide router equipment for the HOBNET project testbed, which is based in Geneva. 6DEPLOY-2 partners will also assist with the routing and addressing scheme and the subsequent equipment configuration.

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 organisation", etc.

5.1 General questions related to participants and IPv6

About the participants 17 participants were present, 8 questionnaires were returned		
Employment sector	Government	0
	University or other higher education	3
	Schools or further education	0
	Research	4
	Health	0
	Commercial	3
	Other (please specify)	(0)*
Job function	Government Advisor	0
	Senior Manager	3
	IT Manager	0
	Systems Administrator	0
	Network Administrator	1
	Researcher / Postgraduate	2
	Undergraduate	0
	Other (please specify)	(1)*
Usage of IPv6		
Do you use IPv6 yourself?	Yes	1
	No	3
Does your organisation use IPv6?	Yes	
	No, but planned in this year	
	No, but planned in the next year	1
	No, but planned in the longer term	2
	No, and no plans as yet	3

* See the graphics section for more information

Table 3-4: 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
Presentation 1 - IPv6 Introduction	1	3		
Presentation 2 - IPv6 Basics: Protocol and Addressing	1	3	0	0
Presentation 3 - Associated Protocols	2	3	0	0
Presentation 4 - Auto-configurations	2	3		
Presentation 5 - IPv6 Support in the DNS	1	4		
Presentation 6 - Deployment and Transition Mechanisms	2	2	1	
Presentation 7 – Security	1	1		1
Presentation 8 - Routing and Addressing (theory)	2	2		
Presentation 9 - IPv6 and Sensor Networks	1	2	1	
Presentation 10 - Demo of the UCL network	3			
Practice 1 - Configuring Routers)	3			
Practice 2 - IPv6 on Clients (Windows and Linux)	3			
Practice 3 - IPv6 DNS	3			
Practice 4 - Other Services (FTP, Web Server		2	1	
Quality of the presentation	Excellent	Good	Average	Poor
Presentation 1 - IPv6 Introduction		4		
Presentation 2 - IPv6 Basics: Protocol and Addressing		4	0	0
Presentation 3 - Associated Protocols		5	0	0
Presentation 4 - Auto-configurations		5		
Presentation 5 - IPv6 Support in the DNS		5		
Presentation 6 - Deployment and Transition Mechanism	1	4		
Presentation 7 – Security		4	1	
Presentation 8 - Routing and Addressing (theory)		5		
Presentation 9 - IPv6 and Sensor Networks		4		
Presentation 10 - Demo of the UCL network		3		
Practice 1 - Configuring Routers)		3		
Practice 2 - IPv6 on Clients (Windows and Linux)		3		
Practice 3 - IPv6 DNS		3		
Practice 4 - Other Services (FTP, Web Server		2	1	
Familiarity with the topic?	None	Some	Most	All
Presentation 1 - IPv6 Introduction		2	2	
Presentation 2 - IPv6 Basics: Protocol and Addressing		3	1	
Presentation 3 - Associated Protocols		3	1	
Presentation 4 - Auto-configurations	1	2	1	
Presentation 5 - IPv6 Support in the DNS		4		
Presentation 6- Deployment and Transition Mechanism	1	3		
Presentation 7 – Security		3	1	
Presentation 8 - Routing and Addressing (theory)	2	2		
Presentation 9- IPv6 and Sensor Networks		3	1	
Presentation 10 - Demo of the UCL network	2	1		
Practice 1 - Configuring Routers)	2	1		
Practice 2 - IPv6 on Clients (Windows and Linux)	1	2		

Practice 3 - IPv6 DNS	1	2		
Practice 4 - Other Services (FTP, Web Server	2	1		
Quality of the course documentation	Excellent	Good	Average	Poor
	1	3	1	0
General workshop organisation	Excellent	Good	Average	Poor
	3	2	0	0
Recommend to your colleagues?	yes	no		
	4			

Table 3-5: Questions regarding the workshop

5.3 Results graphics

Following are some graphics that represent the above results in a more friendly way, so as to ease their interpretation.

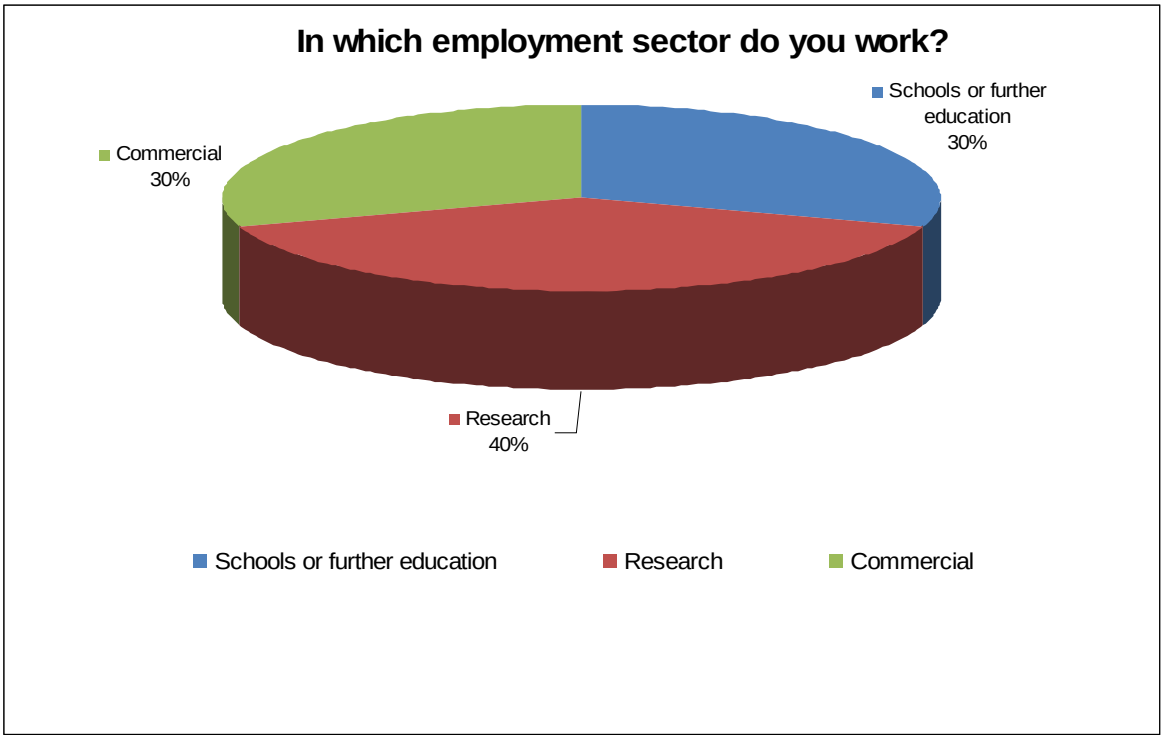

Figure 5-1: In which employment sector do you work?

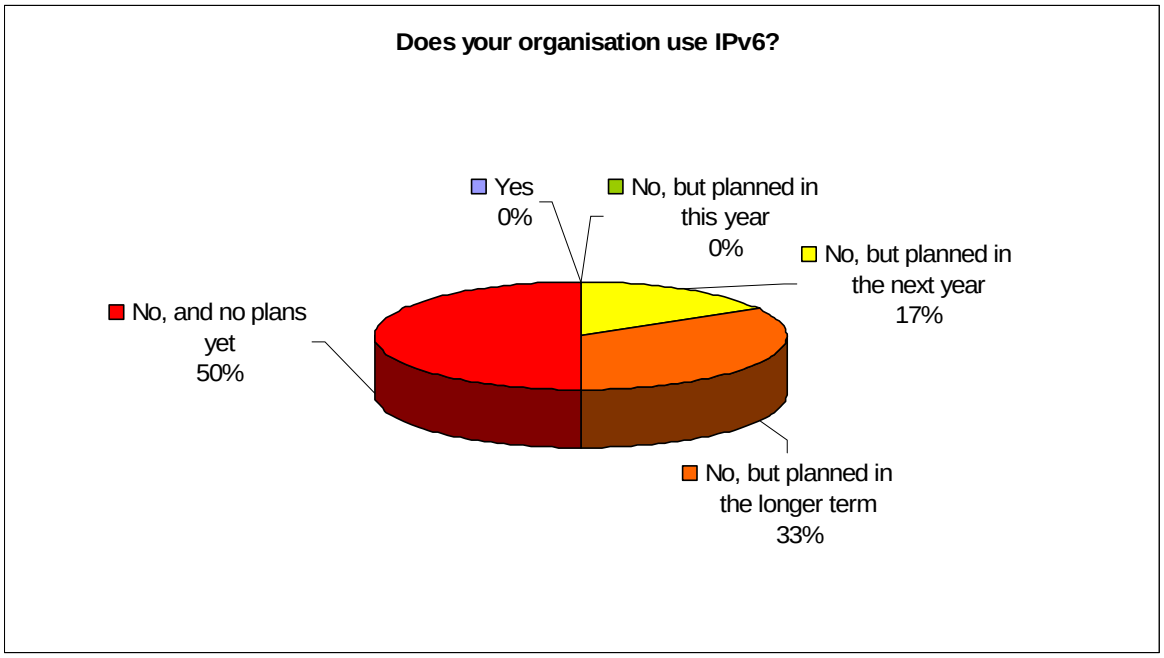

Figure 5-2: Does your organisation use IPv6?

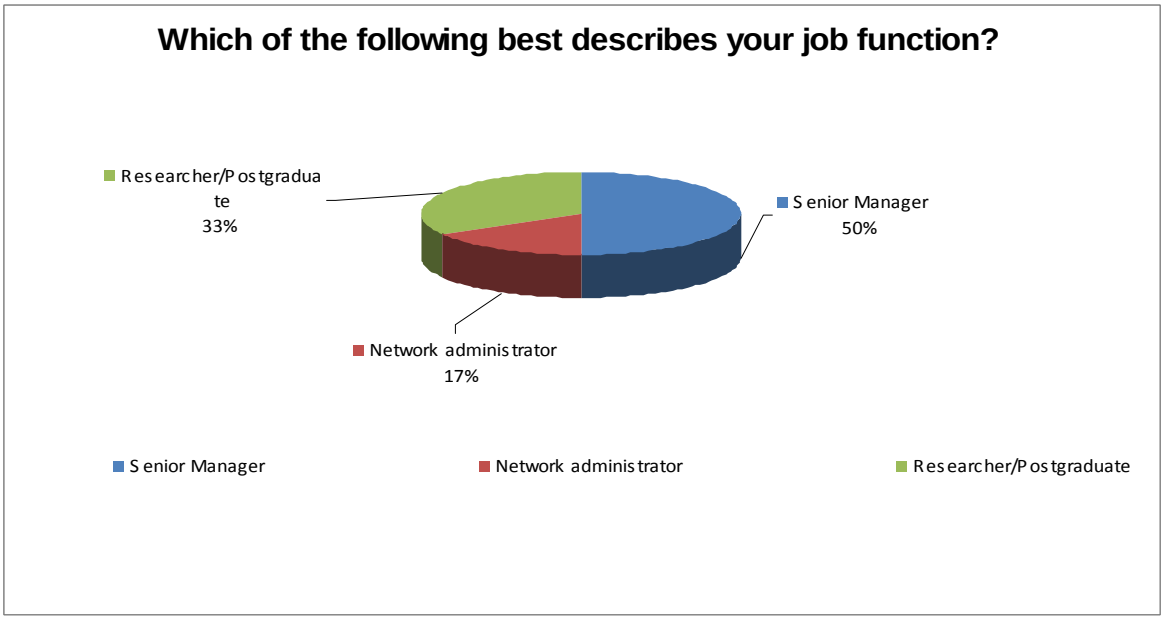

Figure 5-3: Which of the following best describes your job function?

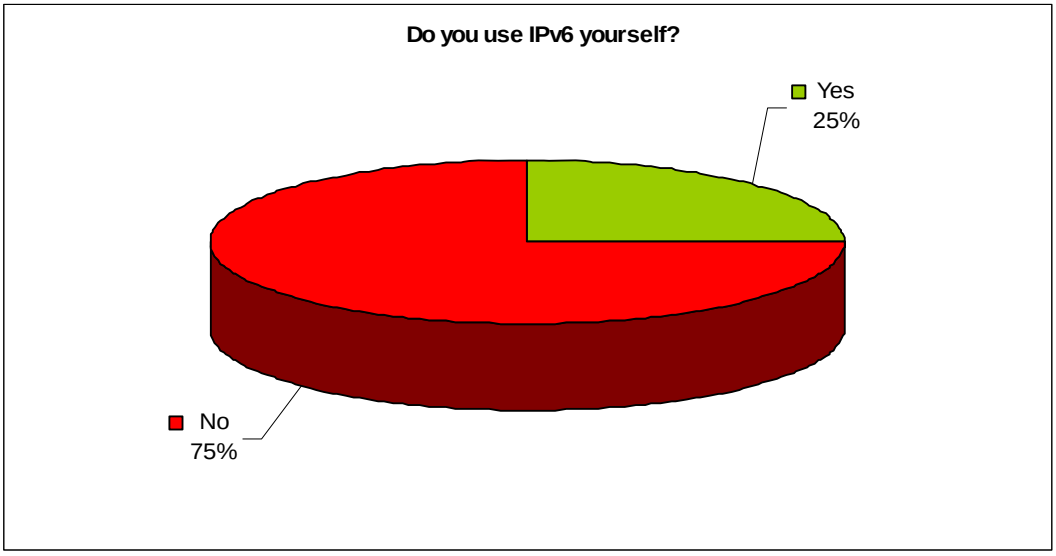

Figure 5-4: Do you use IPv6 yourself?

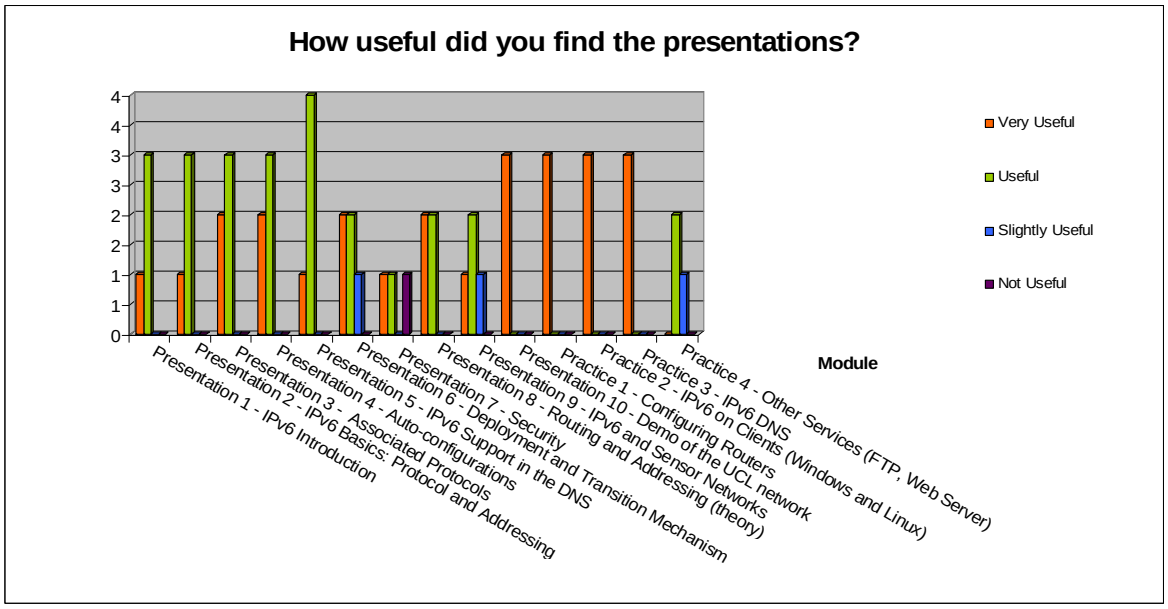

Figure 5-5: How useful did you find the presentations?

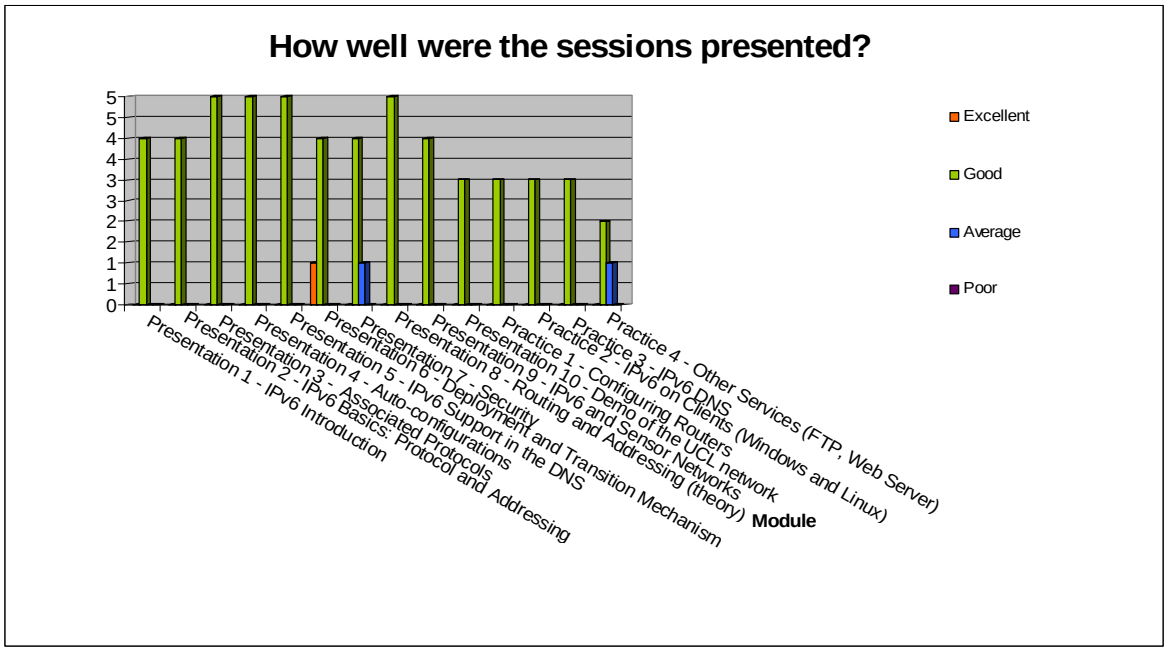

Figure 5-6: How well were the sessions presented?

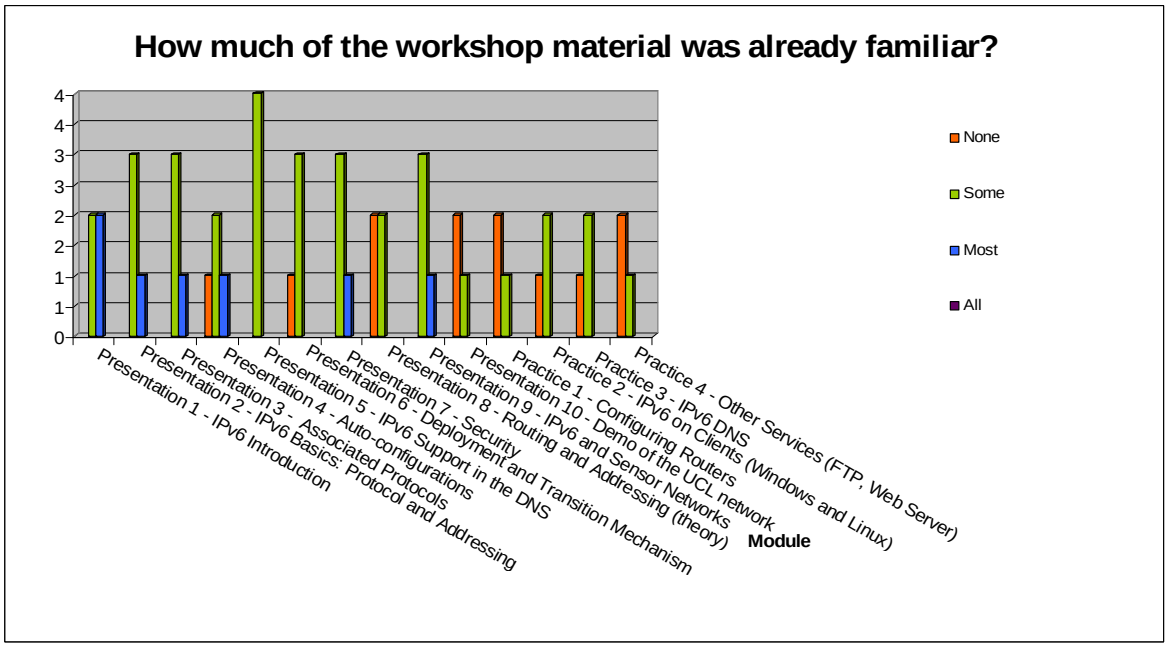

Figure 5-7: How much of the workshop material was already familiar?

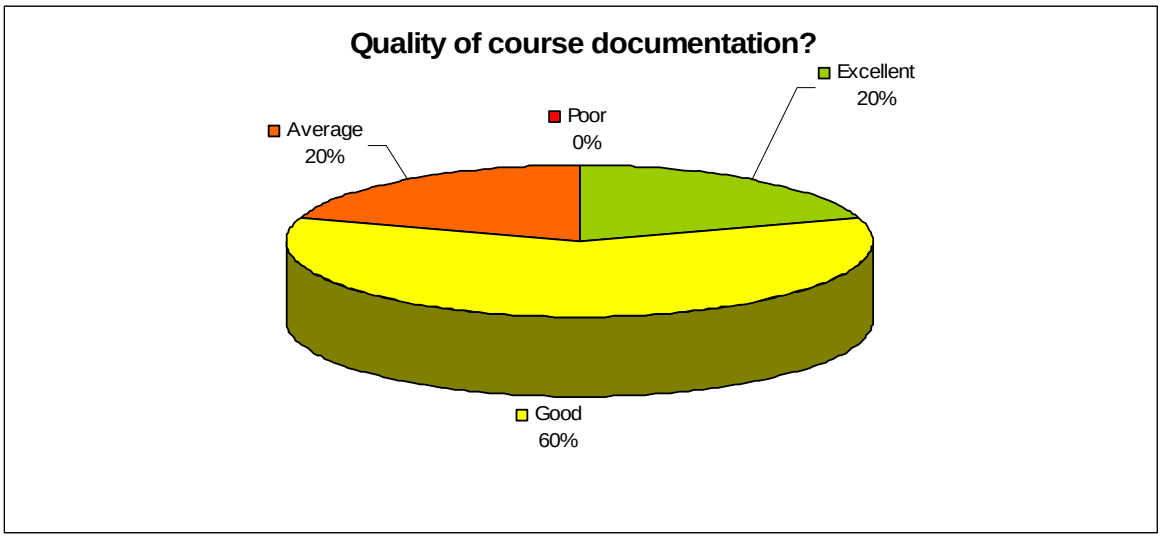

Figure 5-8: Quality of course documentation?

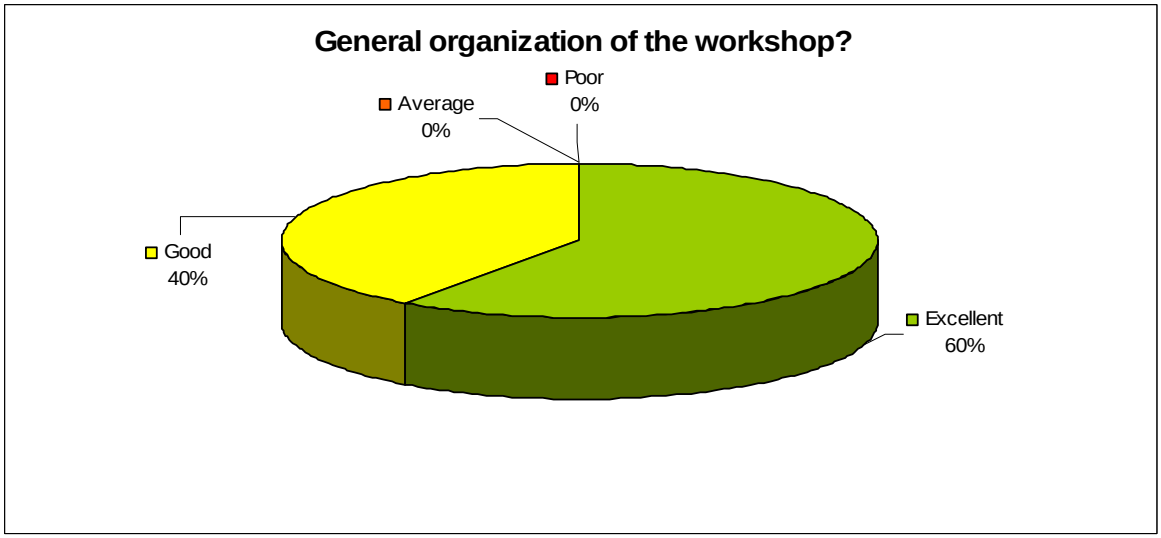

Figure 5-9: General organization of the workshop?

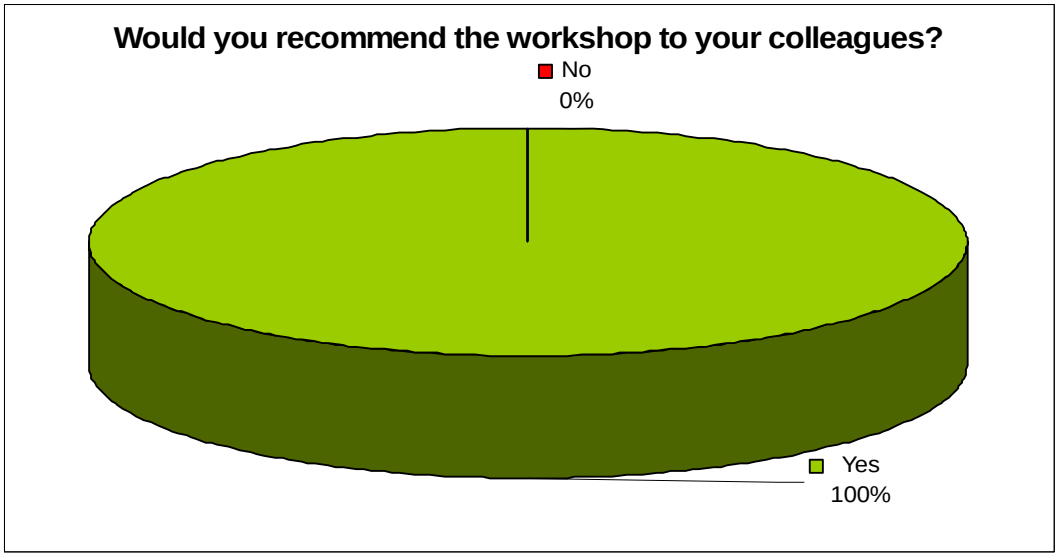

Figure 5-10: Would you recommend the workshop to your colleagues?

5.4 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).

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**?:*

- *Security*
- *Routing and Security*
- *Security, DNS and more deployment exercises*

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

- *Current choices and options for IP providers in general*

*Any **other comments**:*

- *More practicals.*
- *I would like to discuss more about potential commercial applications.*

In particular, the local organized stated that “I take this opportunity to thank you for this excellent workshop! Mandat International expresses its deepest gratitude and congratulations to 6 DEPLOY-2, for the excellent quality and efficiency of the IPv6 workshop organized in Geneva."

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-2 workshop took place in Geneva (Switzerland) on October 6th - 8th, 2010. Thanks to previous projects and training activities, most of the IPv6 education material needed to start 6DEPLOY-2 workshop training was available from the very beginning. The material included most of the issues of Internet deployment and evolution, especially IPv6 introduction, and transition to IPv6.

24 researchers, university level employees, industry employees, network and system administrators participated to at least one of the workshop sessions. The topics presented were selected according to the participants' requirements, trying to accomplish their need for a more practical workshop.

According to the evaluation forms and the comments from the participants at the workshop, it is clear that the workshop was a success, and that there is significant interest in the region for the IPv6 technology. The participants expressed positive comments on the workshop's usefulness and organisation. They also requested that 6DEPLOY organise more workshops in the region.

During the 6DEPLOY-2 lifetime, stakeholders will continue to enhance today's "knowledge database". The reader and interested parties are referred to the 6DEPLOY-2 website to check for new material.

In summary, this workshop should be considered a success with regard to the dissemination of IPv6 in this part of the AP region, though this is only one of many steps towards the deployment of real IPv6 networks and services in the region.

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 organise 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