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Abstract:

This deliverable presents a report from the workshop held in Madrid (Spain) on 12th November 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, Training, Testbeds, Modules, 6DISS, 6DEPLOY, 6DEPLOY-2

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Executive Summary

One of the main activities in the 6DEPLOY-2 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 deliverable presents a report from the workshop held in Madrid (Spain) on 12th November 2010. 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) hands-on exercises, e) an assessment of the opportunities for further co-operation and follow-up actions planned, and f) an analysis of the feedback questionnaires from the participants.

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1. INTRODUCTION

1.1 6DEPLOY-2 Objectives

The following comprise the 6DEPLOY-2 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:
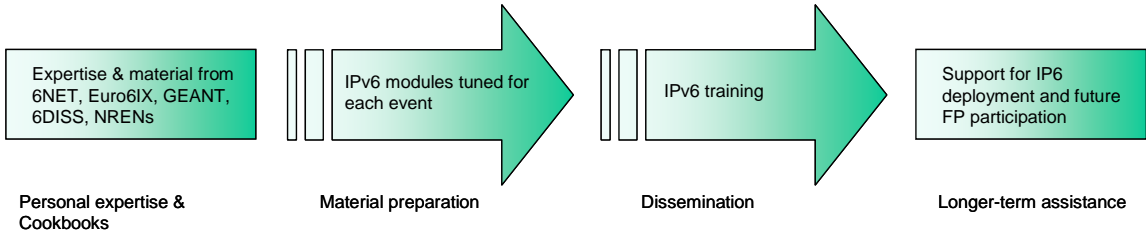

Figure 1-1: 6DEPLOY-2 methodology (diagrammatically)

The approach is to use course material available from 6DEPLOY and elsewhere that relates to IPv6, the e-learning course, and 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-2 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 6DEPLOY 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 D1.1.1: "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 in Madrid (Spain) on 12th November 2010. The workshop comprised both slide presentations and hands-on exercises using remote testbeds for routing 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 are known not to have been deprecated, 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 was collected, and the workshop

schedules, formats, and contents were 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 MADRID (SPAIN)

This IPv6 Workshop was held in Madrid (Spain) on 12th November 2010, in conjunction with the GORE-6 event. 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 in 6DEPLOY's project web site:

http://www.6deploy.eu/index.php?page=20101112_madrid_spain

3.1 Overview

The 6DEPLOY-2 representative at the workshop was: Alvaro Vives, from Consulintel.

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.

Some details about addresses, addressing plans and address management were given, being completed with a small addressing exercise where the attendees had to practice with subnetting and assigning prefixes to a theoretical network topology.

In addition, IPv6-related routing concepts and changes from IPv4 were included in the theory part, to prepare for the routing hands-on exercises carried out using two remote 6DEPLOY-2 testbeds.

The presentations were conducted in Spanish, in order to accommodate the local audience.

3.2 Attendees

Below is a list of people that attended:

No.	Name	Affiliation
1	Luis Andres Arias	Jazztel
2	Jesus Cea	Argo RST, S.A.
3	Eduardo Collado Cabeza	Acens
4	Antonio Javier Garcia Martinez	Telefonica
5	Fernando Gozalo	UNED
6	David Hernandez Campo	ONO

7	Juan Miguel Jimenez Morillas	Telefonica
8	Victor Lopez	UAM
9	Cristobal Lopez Cañas	ESPANIX
10	Miguel Angel Marchante Hidalgo	Telefonica
11	Fco. Javier Martin de Ana	Jazztel
12	Victor Moreno Martinez	UAM
13	Pedro Onrubia Delgado	UAM
14	Iñigo Ortiz de Urbina	UPV
15	Susana Pecharroman Balbas	Jazztel
16	Javier Ramos de Santiago	UAM
17	Roberto Rica Gutierrez	IBERCOM
18	Juan Enrique Sanchez Aretio	NEXICA
19	Daniel Salamanca Dominguez	COMVIVE
20	Ruben Tripiana Martin	Roche Farma S.A.
21	Javier Vazquez	Ibercom
22	Mariano Valdenebro Minguela	Jazztel
23	Carlos Zarco Rico	Cogent Communications

Table 3-1: Madrid (Spain) Workshop list of participants

The participants represented a wide range of the ICT community. 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.

3.3 Workshop programme

The agenda was agreed on after close collaboration with the local organisers. The meeting agenda and the related material were submitted in advance so that the local organisers could decide which topics should be prioritised and so manage the logistics accordingly. The program of the workshop is presented in the following table:

Date	Time	Title of session
12/11/2010	9:30	IPv6 Introduction, IPv6 Addressing, Transition and coexistence, and IPv6 Routing
12/11/2010	10:40	Addressing Practice: Subnetting
12/11/2010	11:30	IPv6 Routing Practice

Table 3-2: Madrid (Spain) Workshop program

3.4 Presentation material

The following material was presented:

Modules	Presented by	Affiliation
IPv6 Introduction, IPv6 Addressing, Transition and coexistence, and IPv6 Routing	Alvaro Vives	Consulintel
Addressing Practice: Subnetting	Alvaro Vives	Consulintel
IPv6 Routing Practice	Alvaro Vives	Consulintel

Table 3-3: Madrid (Spain) Workshop list of modules used

3.4.1 Modules

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

- **IPv6 Introduction, IPv6 Addressing, Transition and coexistence, and IPv6 Routing**: This module was a summary of different issues, just to refresh and introduce some useful content to be used in practices. Briefly 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. 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.

- **Addressing Practice: Subnetting**: Small practice to get used with IPv6 addresses and to do some practical exercises with subnetting in IPv6. An example topology is introduced and the attendees have to divide the assigned /32 prefix for each part of the network.

3.4.2 Hands-on exercises

To help ensure the workshop attendees will be able to install IPv6 in their own environment after the course is over, a set of practical routing exercises has been designed, known as 'hands-on modules'. These exercises are performed on remote testbeds, some of which were originally established in the 6DISS and 6DEPLOY projects, thanks to a Cisco donation. These labs are installed in Paris (RENATER premises) and Sofia (BREN premises).

It was a specific request from organizers that the workshop should include as much

practical content as possible and centred on routing.

Below is a brief description of the hands-on exercises that were performed:

- **Routing Lab: Addressing, OSPF, BGP**: IPv6 routing protocols are configured by the trainees on the testbed routers. Internal Gateway Protocol (OSPF) and External Gateway Protocol (BGP) are tested.

Following are more details about the routing lab, with a brief description of the testbeds used and the exercises carried out.

3.4.2.1   Hands-on exercises using the IPv6 Testbed in Paris

Routers were configured beforehand to accept telnet connections from the training location. The IPv6 prefix which was then used to configure the testbed was 2001:660:3008::/48.
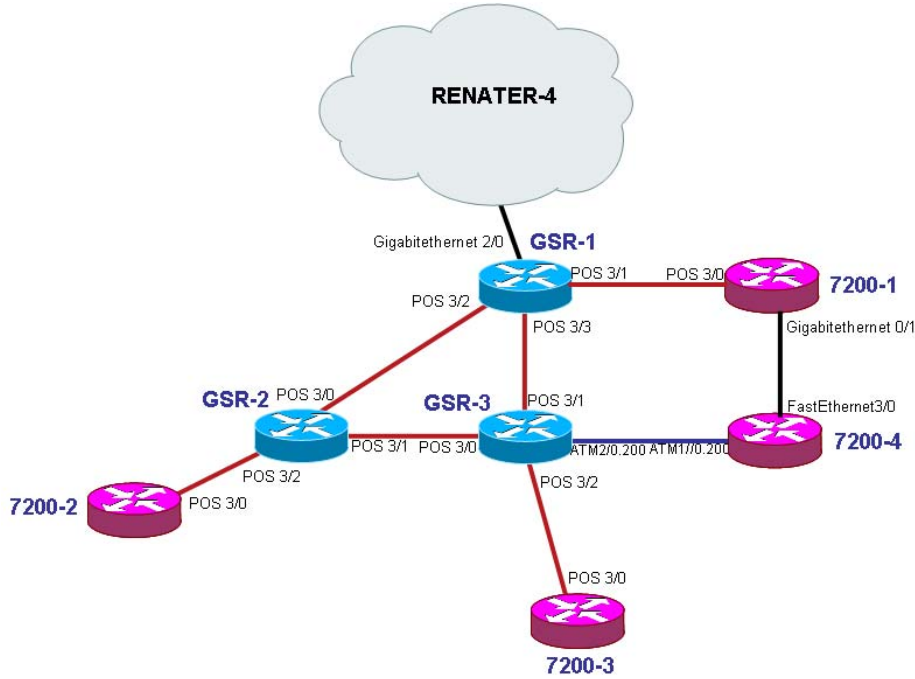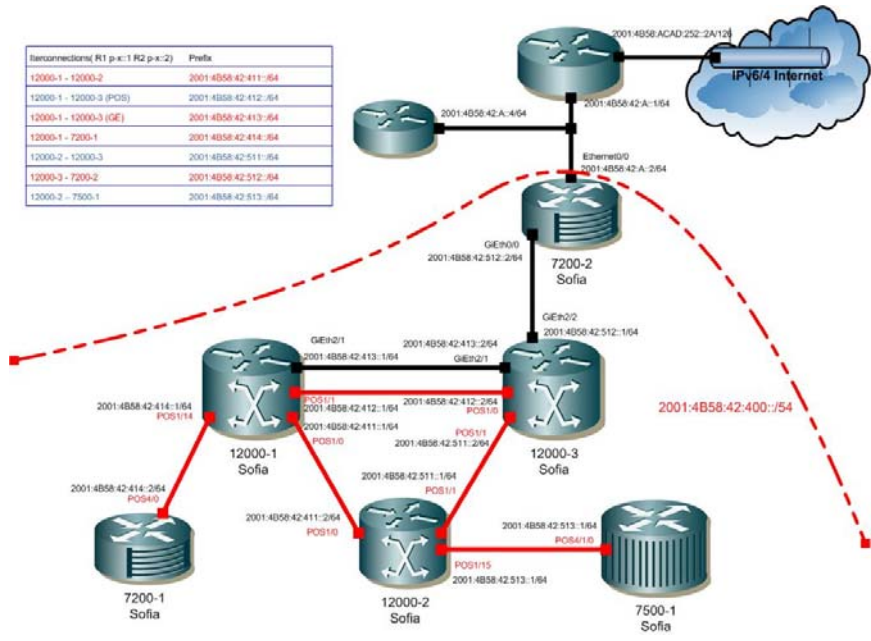

Figure 3-1: Paris testbed

3.4.2.2   Hands-on exercises using the IPv6 testbed in Sofia

The Sofia IPv6 installation more or less mirrors the procedures and functionality of the Paris testbed. Routers were configured beforehand to accept telnet connections from the training location. The IPv6 prefix which was then used to configure the testbed was 2001:4B58:42:400::/54.

Figure 3-2: Sofia testbed

3.4.2.3 Common tasks

More than one router could be assigned to each attendee.

Three main tasks were proposed within the routing labs:
- Task 1: Configure Loopback and interfaces IPv6 addresses.
- Task 2: Configure OSPF routing.
- Task 3: Configure BGP routing.

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.

Consulintel participates in all the GORE meetings and organises an IPv6 training workshop.

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

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		
23 participants were present, 9 questionnaires were returned		
Employment sector	Government	0
	University or other higher education	4
	Schools or further education	0
	Research	1
	Health	0
	Commercial	1
	Other (please specify)	(3)*
Job function	Government Advisor	0
	Senior Manager	1
	IT Manager	2
	Systems Administrator	1
	Network Administrator	6
	Researcher / Postgraduate	2
	Undergraduate	0
	Other (please specify)	0
Usage of IPv6		
Do you use IPv6 yourself?	Yes	1
	No	8
Does your organisation use IPv6?	Yes	0
	No, but planned in this year	1
	No, but planned in the next year	3
	No, but planned in the longer term	2
	No, and no plans as yet	3

* 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
Presentation 1 - IPv6 Introduction	3	4	2	0
Presentation 2 - IPv6 Addressing	5	3	1	0
Presentation 3 - Transition	3	5	1	0
Presentation 4 - IPv6 Routing	5	4	0	0
Practice 1 - Routing	7	2	0	0
Quality of the presentation	Excellent	Good	Average	Poor
Presentation 1 - IPv6 Introduction	5	4	0	0
Presentation 2 - IPv6 Addressing	5	4	0	0
Presentation 3 - Transition	5	3	1	0
Presentation 4 - IPv6 Routing	5	4	0	0
Practice 1 - Routing	6	3	0	0
Familiarity with the topic?	None	Some	Most	All
Presentation 1 - IPv6 Introduction	1	0	5	3
Presentation 2 - IPv6 Addressing	2	4	3	0
Presentation 3 - Transition	4	3	1	1
Presentation 4 - IPv6 Routing	3	2	4	0
Practice 1 - Routing	4	4	1	0
Quality of the course documentation	Excellent	Good	Average	Poor
	4	5	0	0
General workshop organisation	Excellent	Good	Average	Poor
	3	5	0	0
Recommend to your colleagues?	yes	no		
	9	0		

Table 5-2: 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.
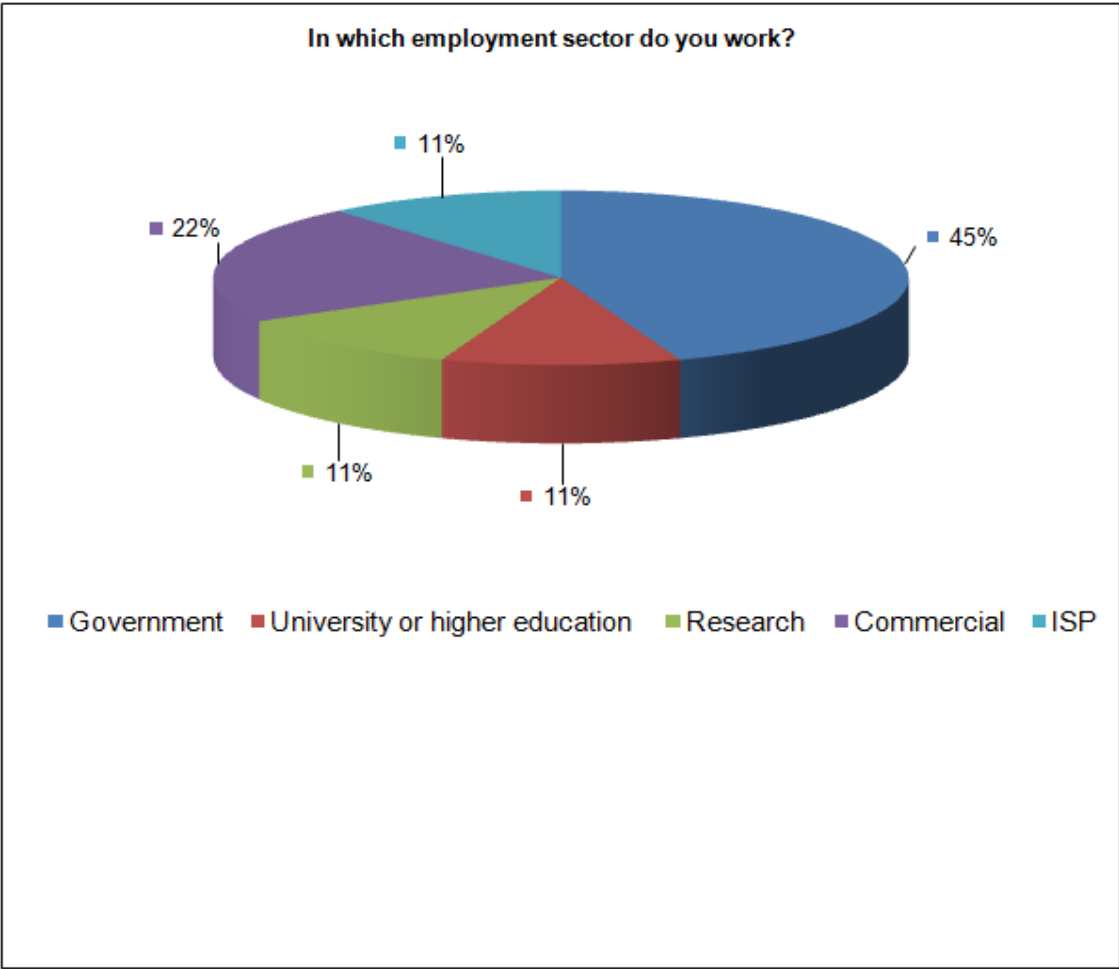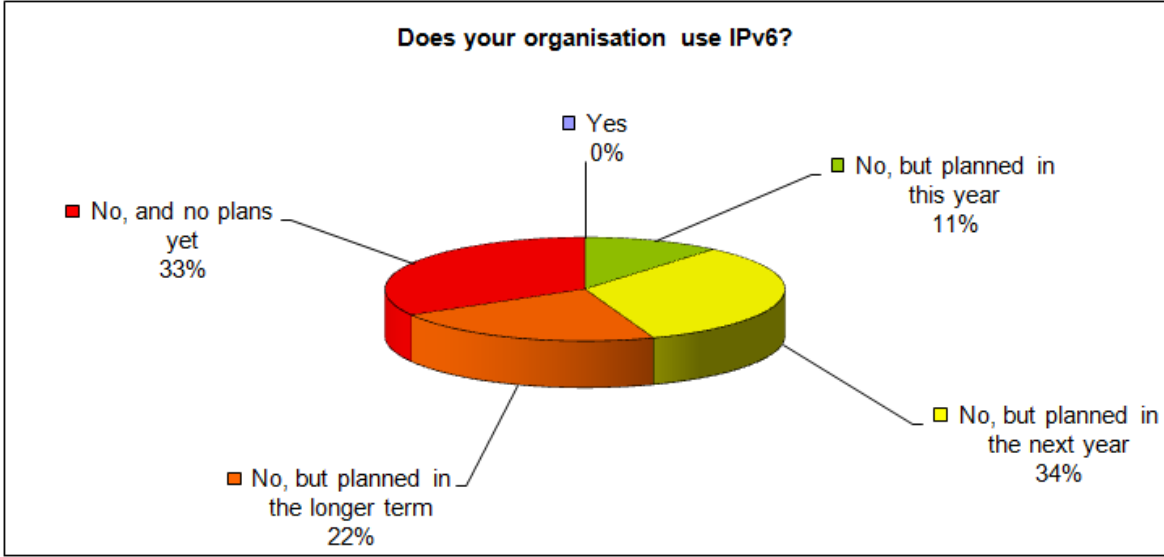
Figure 5-1: In which employment sector do you work?

Figure 5-2: Does your organisation use IPv6?

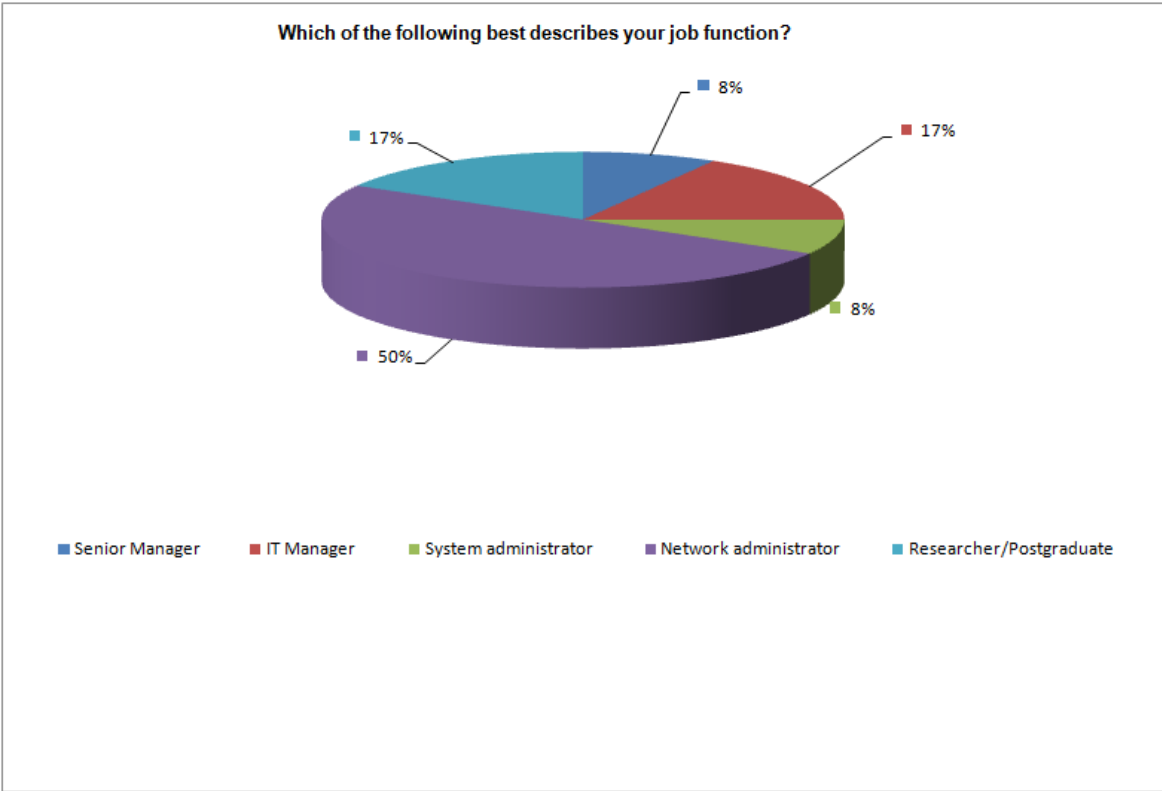**Which of the following best describes your job function?**

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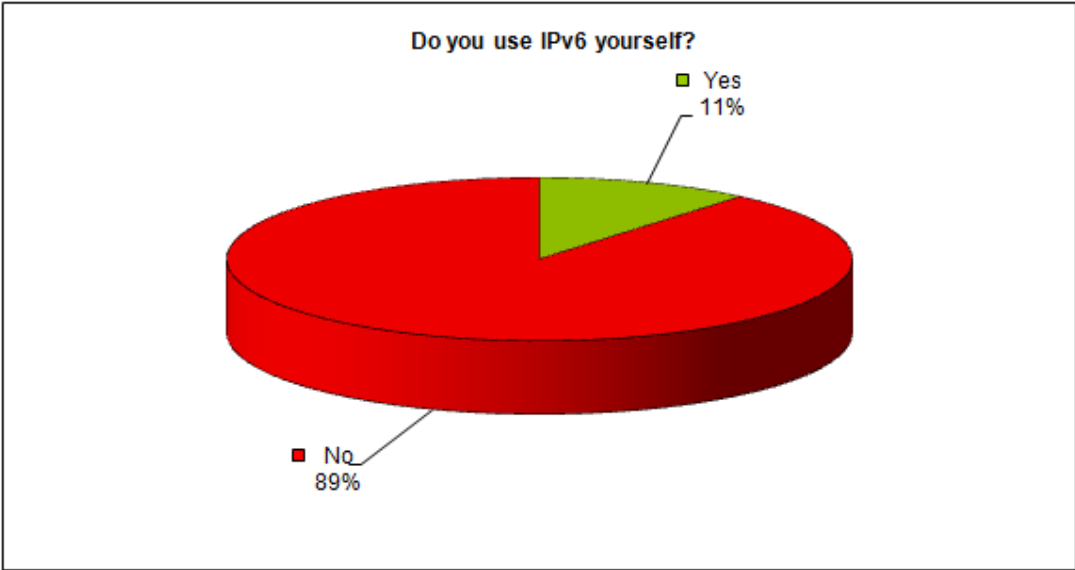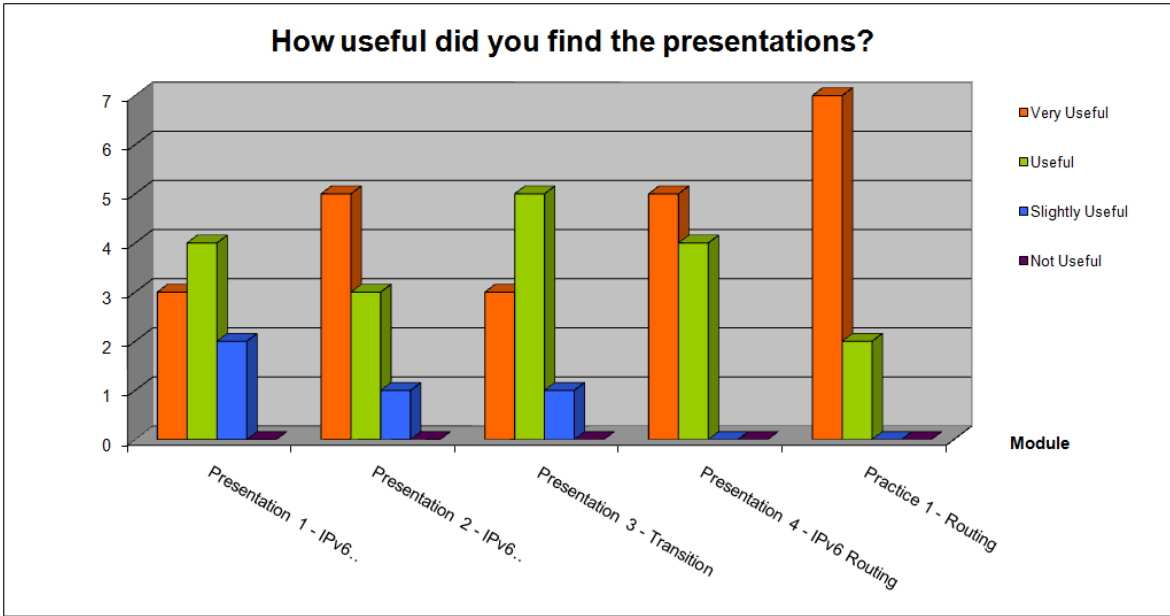

Figure 5-4: Do you use IPv6 yourself?

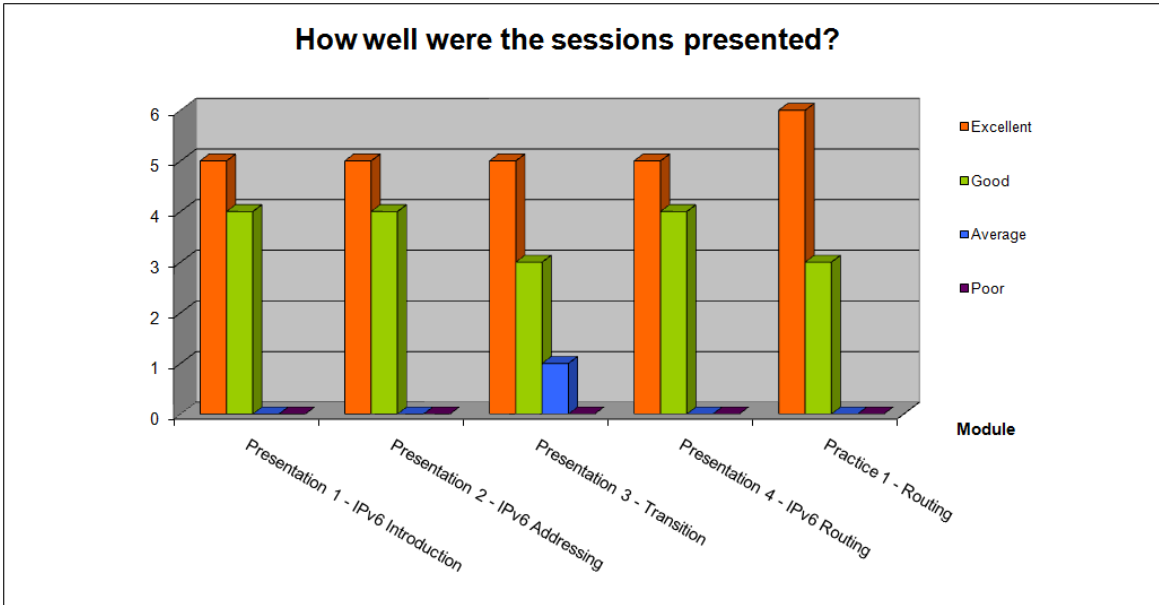**Figure 5-5: How useful did you find the presentations?**
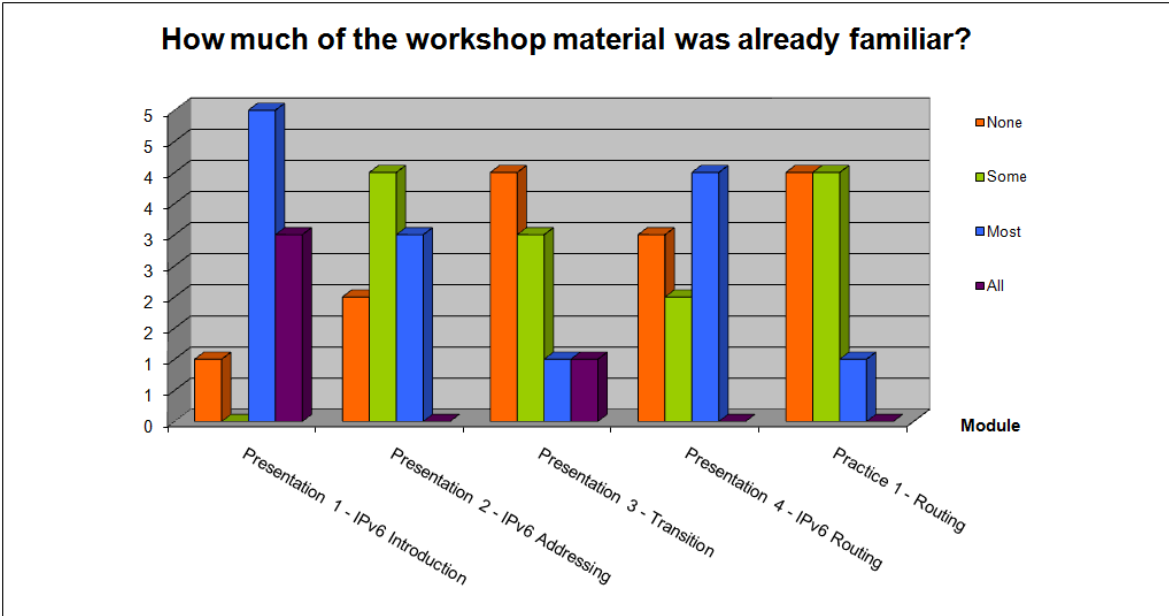

Figure 5-6: How well were the sessions presented?

How much of the workshop material was already familiar?

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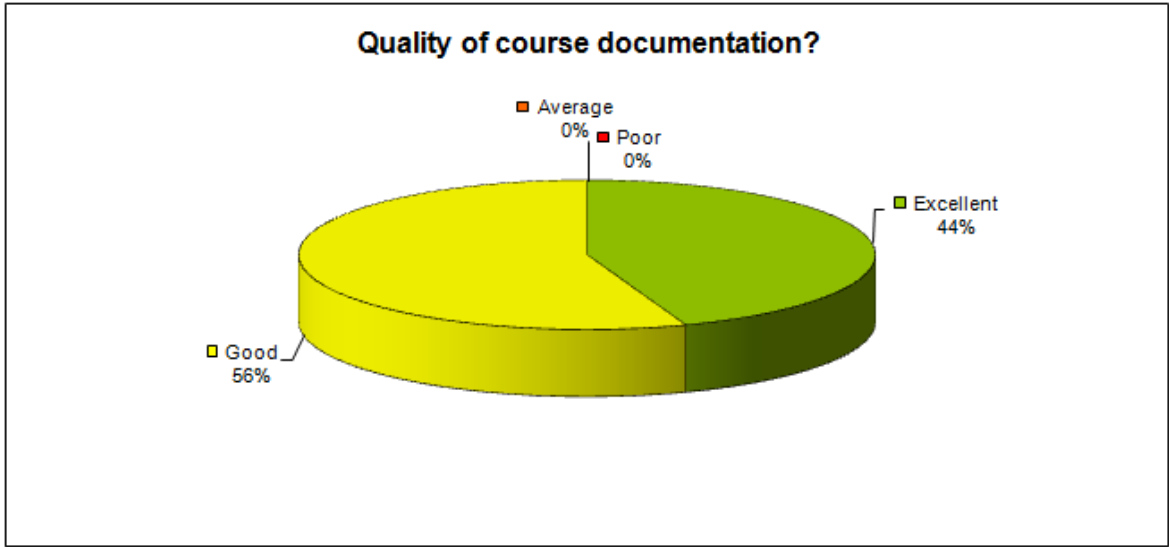
Quality of course documentation?

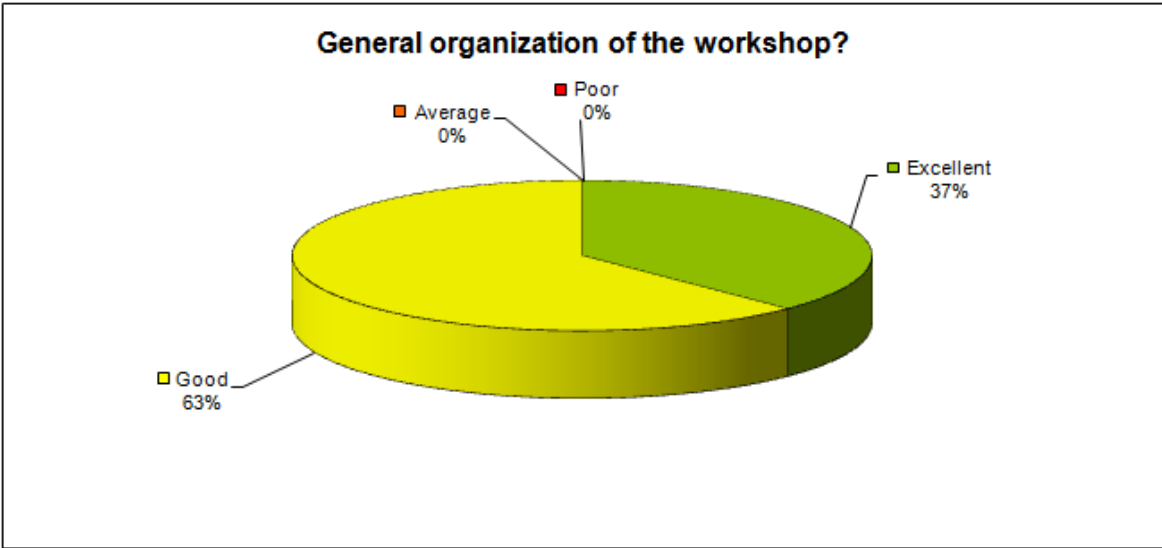**Figure 5-8: Quality of course documentation?**

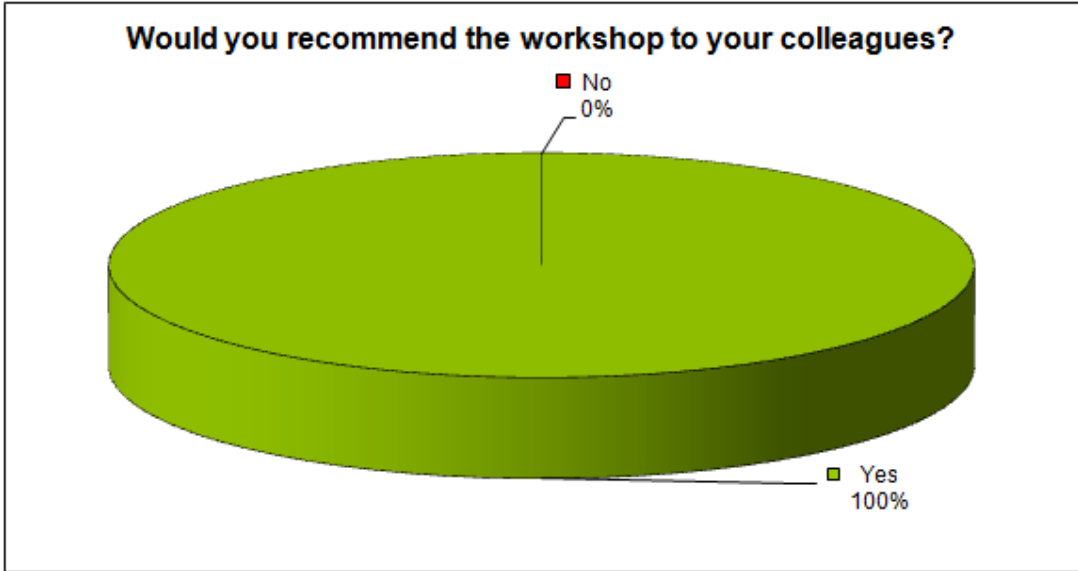**Figure 5-9: General organization of the workshop?**

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). 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)   IPv6 Transition and coexistence.*
- *(2)   Addressing plan, more practical.*
- *(1)   IPv6 implementation steps and guidelines.*

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

- *(2)   IPv6 Introduction.*
- *(1)   IPv6 address assignment and masks.*

*Any **other comments***:

- *(1)   Fantastic and pleasant.*
- *(1)   Good work, thanks a lot!*
- *(1)   Join addressing plans for specific cases (DSL provider, hosting) with the lab.*

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 Madrid, Spain, on November 12th 2010. This Workshop was held in collaboration with the GORE/ESNOG (www.esnog.net) organization who organized everything so that the workshop could be held following their 6th meeting. Consulintel led this workshop. Thanks to previous projects and training activities, most of the IPv6 education material needed to start the 6DEPLOY-2 training workshop was available from the very beginning. The material included some of the issues of Internet deployment and evolution, especially IPv6 introduction, addressing, transition, and routing. 6DEPLOY testbeds in Paris and Sofia were used for the practical routing exercises.

Approximately 23 network engineers, system administrators, and regulators participated in the workshops. The topics presented were selected according to the participants' requirements, trying to accomplish their need of a more practical IPv6 routing 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 more practical issues. The participants expressed positive comments on the workshop's usefulness and organisation.

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.

7. REFERENCES

6DEPLOY-2 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-2 Workshops Agenda and detailed information:

> http://www.6deploy.eu/index.php?page=workshops2