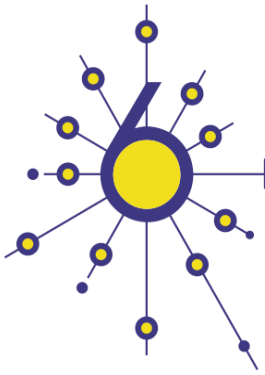
e-infrastructure



deploy

Title:	Document Version:
Deliverable D1.15 **Report from the 14th Workshop**	1.0

Project Number:	Project Acronym:	Project Title:
223794	6DEPLOY	IPv6 Deployment Support

Contractual Delivery Date:	Actual Delivery Date:	Deliverable Type* - Security**:
31/7/2010	6/5/2010	R – PU

* Type: P – Prototype, R – Report, D – Demonstrator, O – Other

** Security Class: PU- Public, PP – Restricted to other programme participants (including the Commission Services), RE – Restricted to a group defined by the consortium (including the Commission Services), CO – Confidential, only for members of the consortium (including the Commission Services)

Responsible and Editor/Author:	Organization:	Contributing WP:
Alvaro Vives	Consulintel	WP1

Authors (organisations):

Abstract:

This deliverable presents a report from the workshop held in Bogota (Colombia) from 21st to 25th September 2009. The presentation material is listed, the attendees and their affiliations are given, the feedback questionnaires from the participants are analysed, 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	13/04/2010	Document creation	Alvaro Vives (Consulintel)
V1.0	27/04/2010	Editing and review of document	Alicia Higa, 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 deliverable presents a report from the workshop held in Bogota (Colombia) from 21st to 25th September 2009. 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.

Table of Contents

Figure Index

Table Index

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 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 Workshop Methodology

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

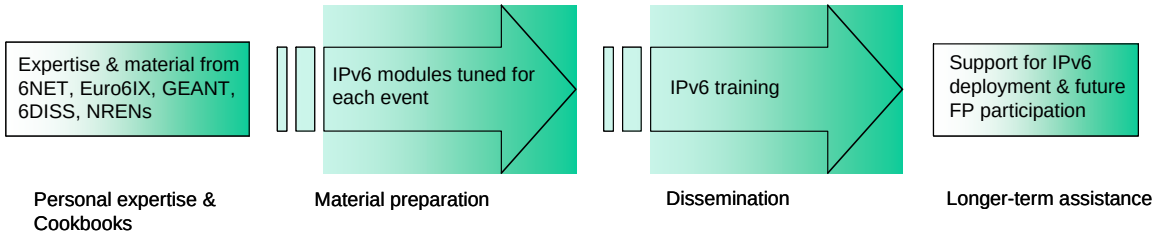


Figure 1-1: 6DEPLOY methodology (diagrammatically)

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 Bogota (Colombia) from 21st to 25th September 2009. The workshop comprised both slide presentations and

hands-on exercises (using local equipment and the remote 6DEPLOY testbeds in Paris and Sofia).

Chapter 2 of this document explains the general motivation for running IPv6 workshops. Chapter 3 describes 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 remote testbeds in Paris and Sofia. 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 completed 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 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 WORKSHOP IN BOGOTA (COLOMBIA)

This IPv6 Workshop was held in Bogota (Colombia) from 21st to 25th September 2009. This workshop was part of WALC2009 Event organized by EsLaRed (Latin American Networking School Foundation). 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 could be found on 6DEPLOY's project web site:

http://www.6deploy.eu/index.php?page=20090921_bogota_colombia

3.1 Overview

Individuals present at the workshop included Alvaro Vives and Cesar Olvera, from Consulintel representing 6DEPLOY, and Juan Carlos Alonso from LACNIC.

The first morning of the workshop which took place during the WALC2009 event included speeches from various representatives and also from LACNIC.

Figure 3-1: WALC2009 Opening

Shown in the picture above, from left to right, are: Martha Giraldo (RENATA), Eduardo

Botero (Ministry of Information and Communications), Luis F. Martínez (Universidad Javeriana), Doris Reníz (Universidad Javeriana), Edmundo Vitale (Eslared, WALC Coordinator), and Julian Casabuenas (COLNODO).

Parallel workshops began on the first day of the event, including the IPv6 Workshop which included several IPv6 related issues, both theoretical and practical.

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

3.2 Attendees

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

No.	Surname	First name	Affiliation
1	Espinal Santana	Albert Giovanny	ESPOL
2	Montero Lucio	Carlos Alberto	Telconet
3	Molina Uzcátegui	Heidy Coromoto	CPTM
4	Enriquez Alvarado	José Alfredo Miguel	Grupo La Norteñita
5	Matos Rojas	Juan Antonio	
6	Becerra Chaparro	Leonardo	ERT ESP
7	Quitiaquez Segura	Luis Alberto	I.U. CESMAG - RENATA
8	Estévez Cumbal	Luis Fabian	Telconet
9	Martínez Ballesteros	Luis Guillermo	U.S.A.
10	Jeréz Rodríguez	Marxjhony	CNE
11	Barbosa Urrego	Nicolas	NEW SOLUCIONES LTDA
12	Palaguachi Gordillo	Patricia Rocio	Telconet
13	Regis Dos Santos	Rodrigo	NIC.br
14	Buitrago Bravo	Ronald Yesid	Iniv. Francisco Jose Caldas
15	Gómez Gil	Saúl Fernando	EDATEL
16	Alvarez Castillo	Victor Hugo	Telconet
17	Lozada Moreno	William Alfredo	NEW SOLUCIONES LTDA

Table 3-1: Bogota (Colombia) 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 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 so manage the logistics accordingly. The program of the workshop is presented in the following table:

Date	Time	Title of session
21/09/2009	7:00	Registration
	09:00	Event Opening (Words from different representatives)
	11:00	Administración de los recursos numéricos de internet, marco global y local
	12:30	Lunch
	14:00	Introducción a IPv6
	15:00	Formatos de cabeceras y tamaño de paquetes
	15:40	Coffe Break
	16:00	Formatos de cabeceras y tamaño de paquetes (cont.)
	16:30	Direccionamiento IPv6
	18:00	End of First Day
22/09/2009	8:00	ICMPv6, Neighbor Discovery y DHCPv6
	9:40	Coffe Break
	10:00	ICMPv6, Neighbor Discovery y DHCPv6 (cont.)
	10:30	Seguridad IPv6
	12:30	Lunch
	14:00	Presentación LACNIC
	14:45	Mecanismos de Transición
	15:40	Coffe Break
	16:00	Mecanismos de Transición (cont.)
	16:30	Prácticas con Hosts
	18:00	End of Second Day
23/09/2009	8:00	Prácticas con Hosts (cont.)
	9:40	Coffe Break
	10:00	Movilidad IPv6
	10:45	Encaminamiento con IPv6
	12:30	Lunch
	14:00	Encaminamiento con IPv6 (cont.)
	14:45	Calidad de Servicio (QoS)
	15:40	Coffe Break
	16:00	Multicast
	18:00	End of Third Day
24/09/2009	8:00	Multi-homing
	9:00	Porting de aplicaciones
	9:40	Coffe Break
	10:00	Prácticas con Hosts
	12:30	Lunch
	14:00	Gestión SNMP sobre IPv6
	14:30	IPv6 sobre MPLS
	15:00	DNS IPv6
	15:40	Coffe Break
	16:00	Práctica Servidores IPv6
	18:00	End of Fourth Day
25/09/2009	8:00	Prácticas Routing
	9:40	Coffe Break
	10:00	Prácticas Routing (cont.)
	12:30	Lunch
	14:00	Prácticas Routing (cont.)
	15:40	Cofee Break
	16:00	Prácticas Routing (cont.)
	18:00	End of Fifth Day

Table 3-2: Bogota (Colombia) Workshop program

3.4 Presentation material

The following material was presented:

Modules	Presented by	Affiliation
Introducción a IPv6	Alvaro Vives	Consulintel
Formatos de cabeceras y tamaño de paquetes	Alvaro Vives	Consulintel
Direccionamiento IPv6	Alvaro Vives	Consulintel
ICMPv6, Neighbor Discovery y DHCPv6	Alvaro Vives	Consulintel
Seguridad IPv6	Alvaro Vives	Consulintel
Mecanismos de Transición	Cesar Olvera	Consulintel
Prácticas con Hosts	Alvaro Vives, Cesar Olvera	Consulintel
Movilidad IPv6	Alvaro Vives	Consulintel
Encaminamiento con IPv6	Cesar Olvera	Consulintel
Calidad de Servicio (QoS)	Cesar Olvera	Consulintel
Multicast	Cesar Olvera	Consulintel
Multi-homing	Alvaro Vives	Consulintel
Porting de aplicaciones	Alvaro Vives	Consulintel
Gestión SNMP sobre IPv6	Cesar Olvera	Consulintel
IPv6 sobre MPLS	Cesar Olvera	Consulintel
DNS IPv6	Alvaro Vives	Consulintel
Práctica Servidores IPv6	Alvaro Vives	Consulintel
Prácticas Routing	Alvaro Vives, Cesar Olvera	Consulintel

Table 3-3: Bogota (Colombia) Workshop list of modules used

3.4.1 Modules

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

- **Introducción a IPv6:** This module explains why a new version for IP, IPv6, has been developed. A brief history of IPv6, its motivation and benefits are explained.
- **Formatos de cabeceras y tamaño de paquetes:** This module describes IPv6

packet header, extensions headers and differences with IPv4 headers. Packet size issues and upper layer considerations are also treated.

- **Direccionamiento IPv6:** 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.
- **ICMPv6, Neighbor Discovery y DHCPv6:** This module describes new protocols associated with IPv6: e.g. Neighbour Discovery Protocol, SEND, ICMPv6, MLD, DHCPv6, etc.
- **Seguridad IPv6:** Several issues are covered such as the IPsec model, privacy extensions, ND threats, IPv4 vs. IPv6 Threat Analysis, IPv6 security issues, practical IPv6 security issues and firewalling IPv6. The distributed security model is introduced. Security issues from transition and coexistence point of view are also provided.
- **Mecanismos de transición:** 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).
- **Movilidad IPv6:** This module describes IPv6 mobility and news features compared to IPv4 mobility.
- **Encaminamiento con IPv6:** This module mainly describes the differences between IPv4 and IPv6 routing protocols for OSPFv3, EIGRP, RIPng, BGP4+, ISIS and MPLS.
- **Calidad de Servicio (QoS):** This module describes how to implement IPv6 QoS with Classes of Services (configuration examples, performance tests) and discusses IPv6 Flow Label usage.
- **Multicast:** After giving some multicast concepts the following topics are covered: multicast addresses, Multicast Listener Discovery (MLD) protocol, multicast routing, PIM-ASM and PIM-SSM. Some practical issues are included as well.
- **Multi-homing:** This module introduces the multi-homing issue with IPv6, how it is solved in IPv4 and the proposed solutions to be used with IPv6.
- **Porting de Aplicaciones:** This module describe things that have changed with the introduction of IPv6 from the programming point of view, and points to be taken into account in order to add IPv6 support to an IPv4-ready application.
- **Gestión SNMP sobre IPv6:** This module explains how to manage an IPv6

network using SNMP. The different ways to retrieve management information are described (MIBs).

- **IPv6 sobre MPLS:** This module describes different options to deploy IPv6 in a network with MPLS.
- **DNS IPv6:** This module describes new Resource Records for IPv6 DNS, availability of IPv6 in the root servers zone and CC-TLDs, etc.

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 exercises has been designed, known as 'hands-on modules'. These exercises are performed both on local equipment and on remote testbeds, some of which were originally established in the 6DISS project, thanks to a Cisco donation. These labs are installed in Paris (RENATER premises) and Sofia (BREN premises).

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

- **Prácticas con hosts:** Exercises illustrate how to install IPv6 on several platforms, mainly Linux, Vista, and Windows XP operating systems. Use of link-local addresses, ping and traceroute. Configuration of static addresses. Concepts like addresses, autoconfiguration, and neighbor discovery protocol using hosts.
- **Práctica Servidores IPv6**: Practice to install and configure IPv6-capable DNS and web servers.
- **Prácticas Routing**: IPv6 routing protocols are configured by the trainees on the testbed routers. Internal Gateway Protocol (OSPF) and External Gateway Protocol (BGP) are tested.

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.

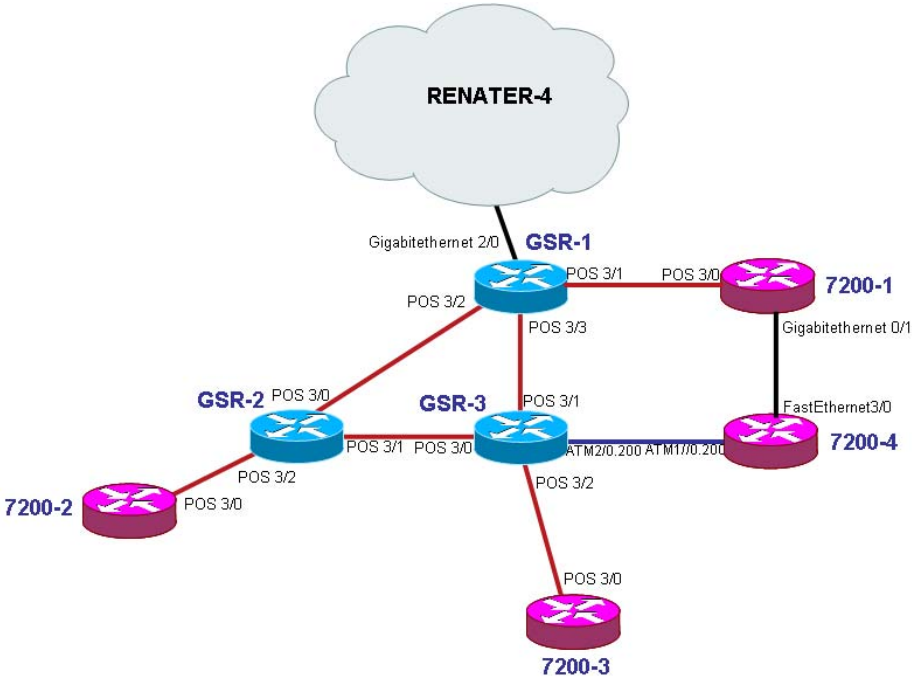


Figure 3-2: Paris testbed

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.

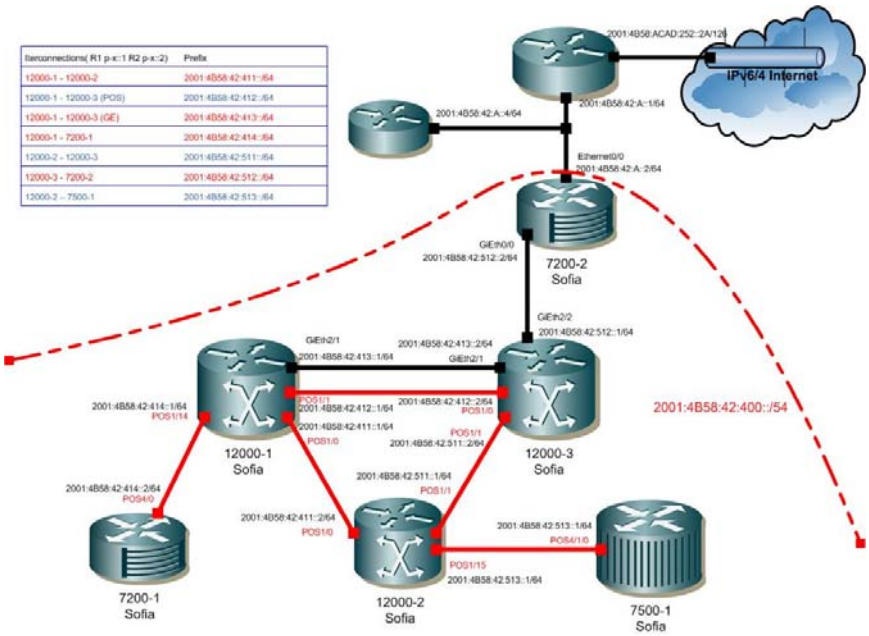


Figure 3-3: Sofia testbed

3.4.2.3 Common tasks

Attendees were assigned one router each with only a few attendees grouped together.

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.

3.5 Photographs taken at the event

Figure 3-4: Attendees to the workshop

Figure 3-5: Attendees to the workshop

Figure 3-6: Cesar Olvera (Consulintel) Presenting

Figure 3-7: Alvaro Vives (Consulintel) Presenting

Figure 3-8: IPv6 Workshop Group Photo

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 obtaining 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 solicit 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 organisation.

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 17 participants were present, 15 questionnaires were returned		
Employment sector	Government	1
	University or other higher education	4
	Schools or further education	0
	Research	0
	Health	0
	Commercial	5
	Other (please specify)	Several (5)*
Job function	Government Advisor	0
	Senior Manager	1
	IT Manager	0
	Systems Administrator	3
	Network Administrator	6
	Researcher / Postgraduate	2
	Undergraduate	1
	Other (please specify)	Several (2)*
Usage of IPv6		
Do you use IPv6 yourself?	Yes	4
	No	11
Does your organisation use IPv6?	Yes	5
	No, but planned in this year	4
	No, but planned in the next year	2
	No, but planned in the longer term	3
	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
Presentation 1 - Basic Introduction to IPv6	6	9	0	0
Presentation 2 - Header Formats & Packet Size Issues	8	6	1	0
Presentation 3 - IPv6 Addressing	13	2	0	0
Presentation 4 - ICMPv6, Neighbor Discovery & DHCPv6	11	4	0	0
Presentation 5 - IPv6 Security	8	7	0	0
Presentation 6 - IPv6 Routing	8	7	0	0
Presentation 7 - Transition and Coexistence	12	3	0	0
Presentation 8 - IPv6 Mobility	4	6	5	0
Presentation 9 - Quality of Service (QoS)	7	8	0	0
Presentation 10 - Multicast	8	6	1	0
Presentation 11 - Multi-homing	5	7	3	0
Presentation 12 - Application Porting Issues	4	6	4	0
Presentation 13 - SNMP with IPv6	6	8	1	0
Presentation 14 - IPv6 over MPLS	6	8	1	0
Presentation 15 - IPv6 DNS	8	7	0	0
Practice 1 - IPv6 with Hosts	10	4	1	0
Practice 2 - Routing	9	4	2	0
Quality of the presentation	Excellent	Good	Average	Poor
Presentation 1 - Basic Introduction to IPv6	8	7	0	0
Presentation 2 - Header Formats & Packet Size Issues	7	8	0	0
Presentation 3 - IPv6 Addressing	9	6	0	0
Presentation 4 - ICMPv6, Neighbor Discovery & DHCPv6	6	8	1	0
Presentation 5 - IPv6 Security	4	9	2	0
Presentation 6 - IPv6 Routing	5	8	2	0
Presentation 7 - Transition and Coexistence	7	7	1	0
Presentation 8 - IPv6 Mobility	4	10	1	0
Presentation 9 - Quality of Service (QoS)	7	6	2	0
Presentation 10 - Multicast	7	6	2	0
Presentation 11 - Multi-homing	3	11	1	0
Presentation 12 - Application Porting Issues	5	8	2	0
Presentation 13 - SNMP with IPv6	5	9	1	0
Presentation 14 - IPv6 over MPLS	5	9	1	0
Presentation 15 - IPv6 DNS	7	7	1	0
Practice 1 - IPv6 with Hosts	5	8	2	0
Practice 2 - Routing	8	6	1	0
Familiarity with the topic?	None	Some	Most	All
Presentation 1 - Basic Introduction to IPv6	0	9	3	3
Presentation 2 - Header Formats & Packet Size Issues	1	7	5	2
Presentation 3 - IPv6 Addressing	1	11	2	1

Presentation 4 - ICMPv6, Neighbor Discovery & DHCPv6	5	9	0	1
Presentation 5 - IPv6 Security	5	9	0	1
Presentation 6 - IPv6 Routing	4	5	5	1
Presentation 7 - Transition and Coexistence	5	6	3	1
Presentation 8 - IPv6 Mobility	9	5	0	1
Presentation 9 - Quality of Service (QoS)	2	11	2	0
Presentation 10 - Multicast	1	11	3	0
Presentation 11 - Multi-homing	7	7	1	0
Presentation 12 - Application Porting Issues	5	9	0	1
Presentation 13 - SNMP with IPv6	3	9	3	0
Presentation 14 - IPv6 over MPLS	3	7	5	0
Presentation 15 - IPv6 DNS	3	9	2	1
Practice 1 - IPv6 with Hosts	3	8	3	1
Practice 2 - Routing	2	6	6	1
Quality of the course documentation	Excellent	Good	Average	Poor
	4	11	0	0
General workshop organisation	Excellent	Good	Average	Poor
	5	9	1	0
Recommend to your colleagues?	yes	no		
	15	0		

Table 5-2: Questions regarding the workshop

5.3 Results graphics

Following are charts that represent the above results for a more suitable interpretation.

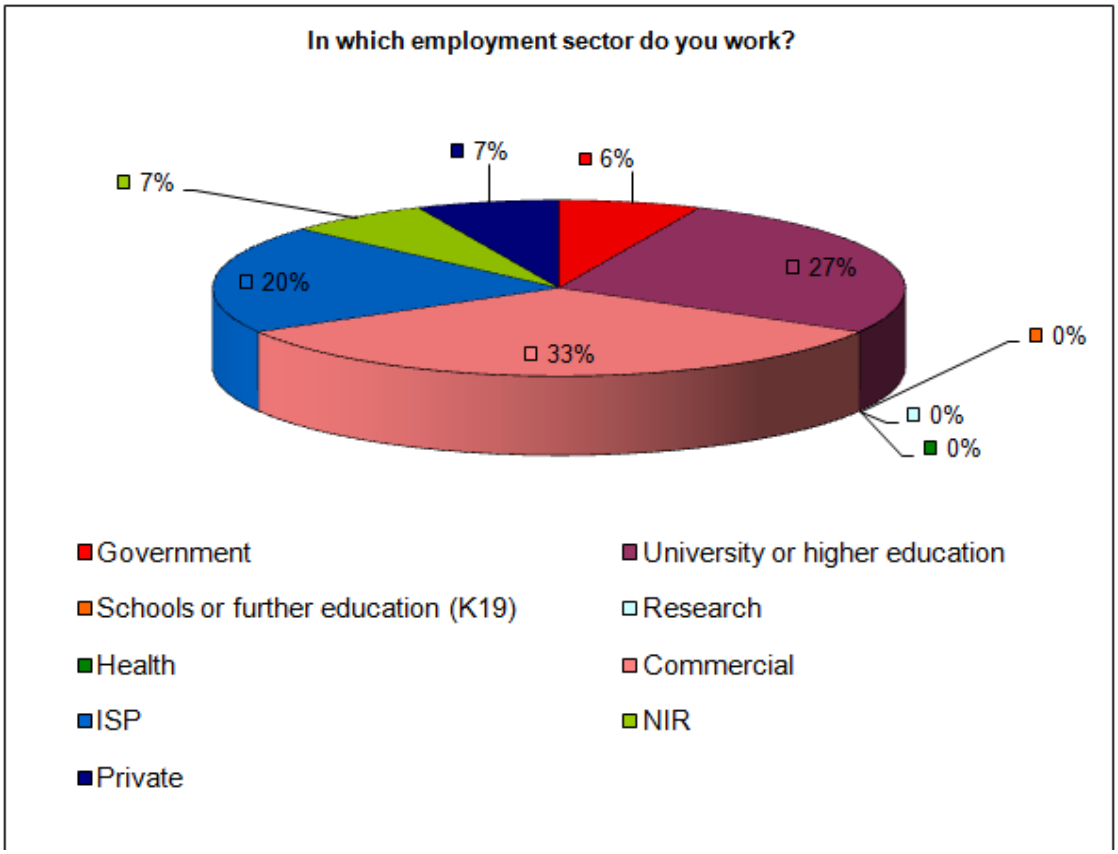


Figure 5-1: In which employment sector do you work?

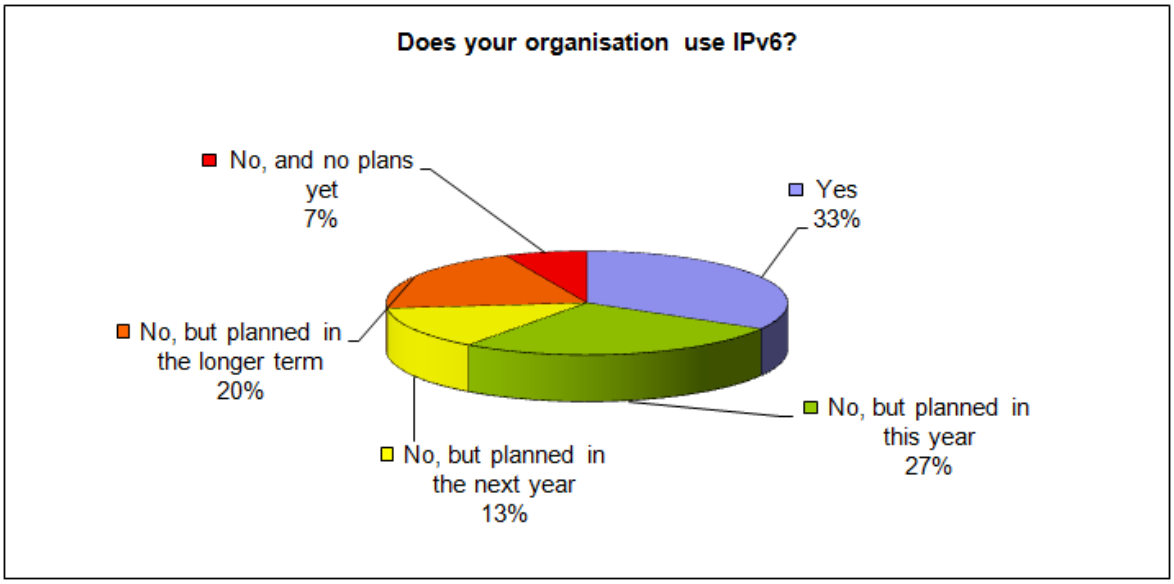


Figure 5-2: Does your organisation use IPv6?

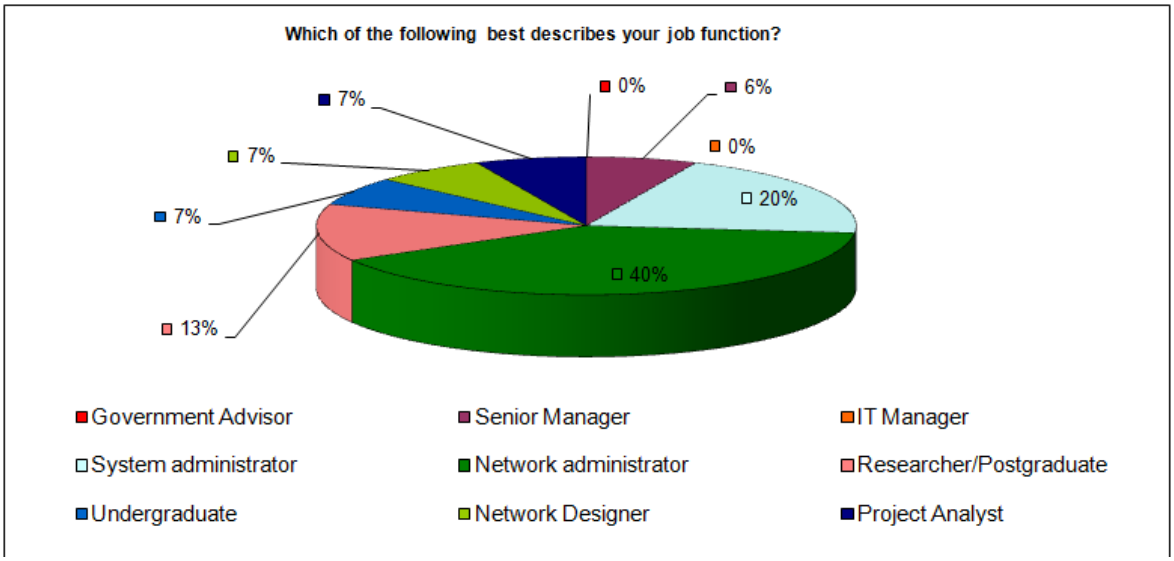


Figure 5-3: Which of the following best describes your job function?

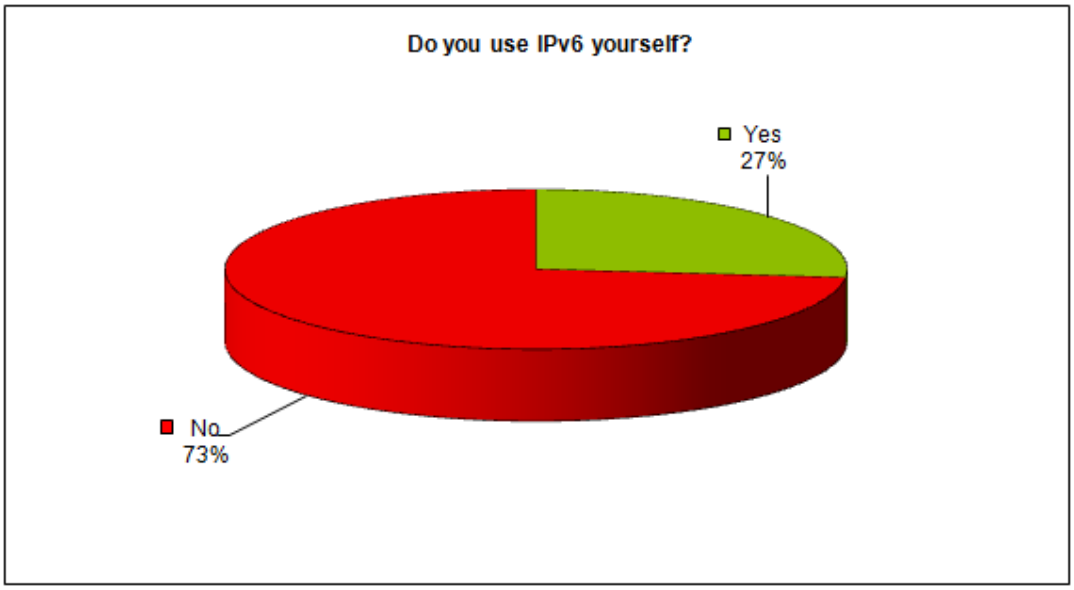


Figure 5-4: Do you use IPv6 yourself?

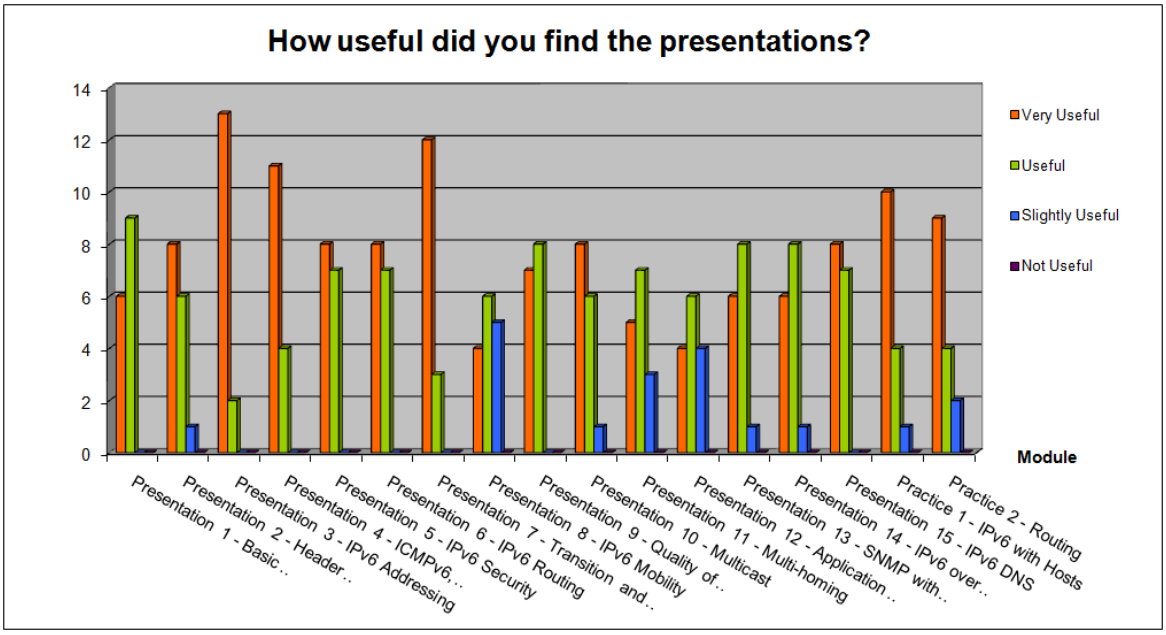


Figure 5-5: How useful did you find the presentations?

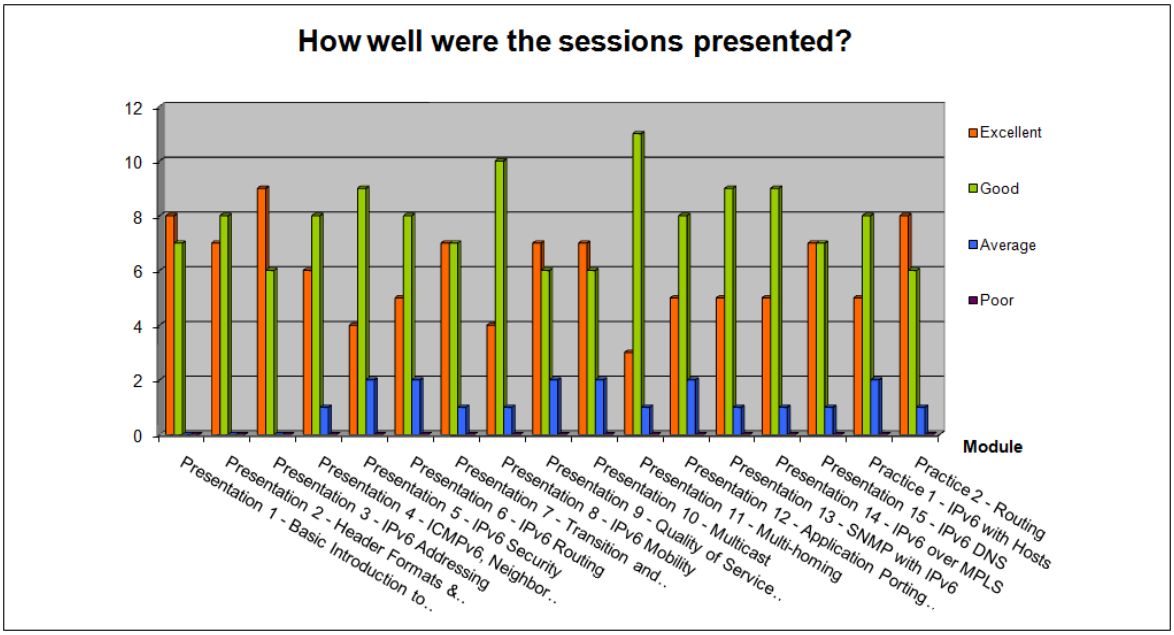


Figure 5-6: How well were the sessions presented?

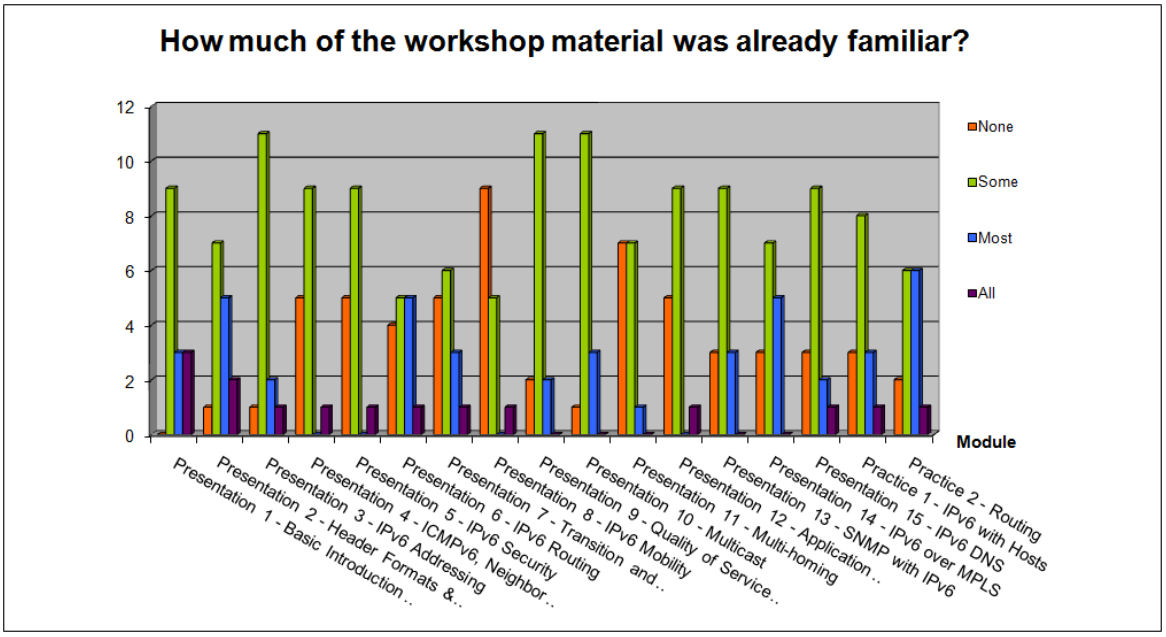


Figure 5-7: How much of the workshop material was already familiar?

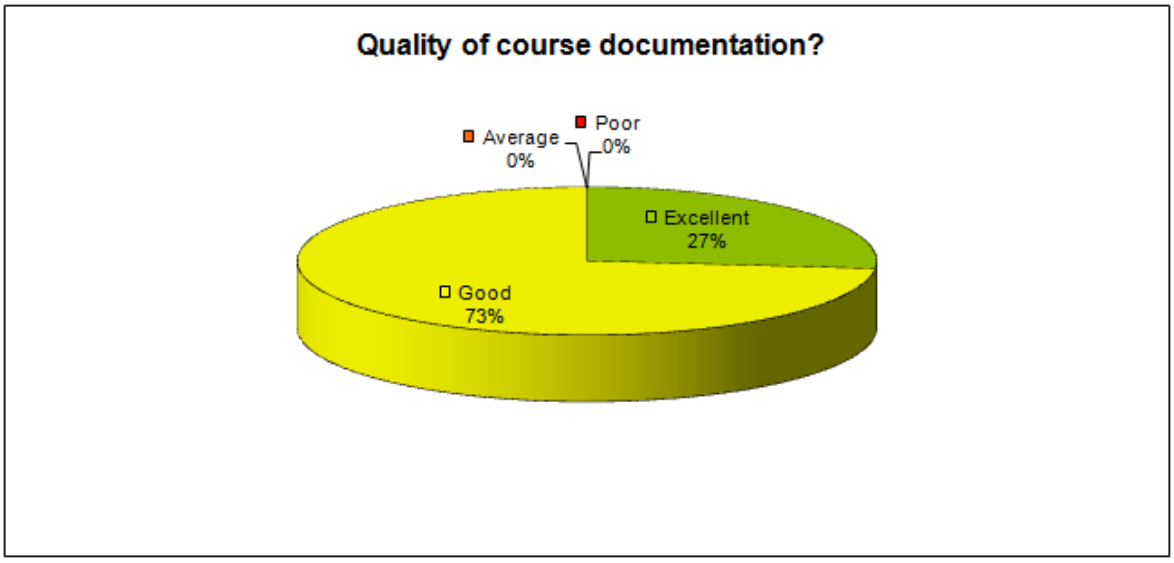


Figure 5-8: Quality of course documentation?

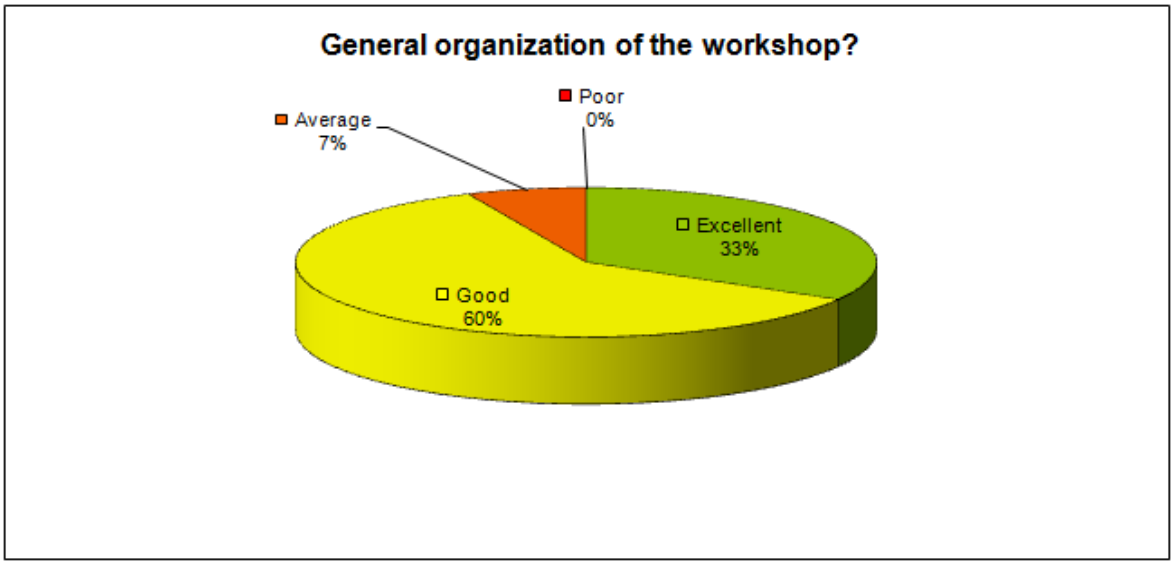


Figure 5-9: General organization of the workshop?

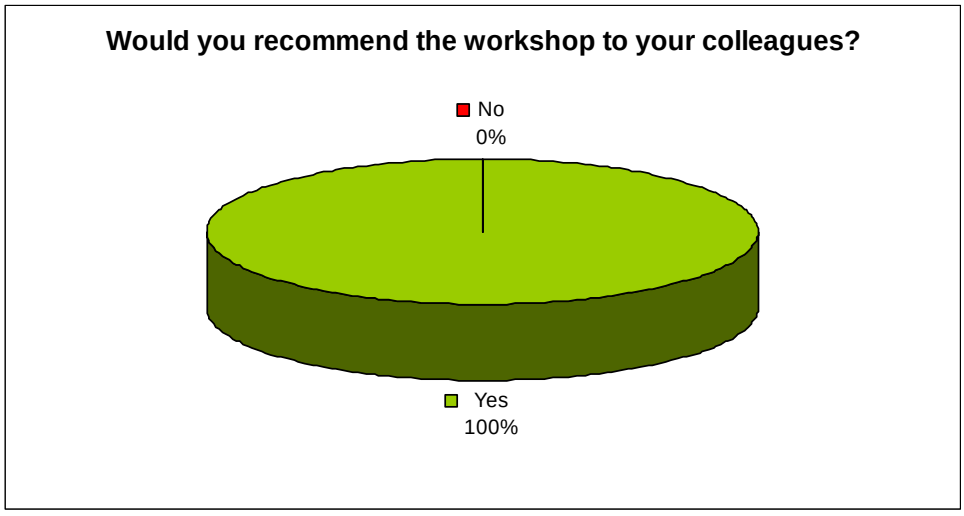


Figure 5-10: Would you recommend the workshop to your colleagues?

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). 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 entered between parentheses).

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

- *(2) IPv6 Multihoming.*
- *(2) Quality of Service (QoS).*
- *(2) Services Configuration.*
- *(1) Other transition mechanisms present on literature: 6over4 and ISATAP.*
- *(1) IP Mobility.*
- *(1) Routing.*
- *(1) Multicast.*
- *(1) Application porting issues.*
- *(1) IPv6 Subneting.*
- *(1) More practical experiences, real deployments issues.*
- *(1) Management over IPv6.*
- *(1) Tunnelling.*

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

- *(2) IPv6 Multihoming.*
- *(1) Cisco.*

*Any **other comments**:*

- *(1) Revise network configuration and state in order to have more successful practices.*
- *(1) Prepare beforehand the laboratory PCs.*
- *(1) Have equipment for a better laboratory.*

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 workshop took place in Bogota (Colombia) from 21st to 25th September 2009 at the WALC2099 event. Consulintel led this workshop, which was targeted for the Latin America / Caribbean Region; and was supported by LACNIC. Based on previous projects and training activities, most of the IPv6 education material needed to start 6DEPLOY workshop training was available from the very beginning. The material included most of the issues of Internet deployment and evolution, especially IPv6 introduction, IPv4-IPv6 transition/co-existence strategies, DNS, Autoconfiguration, Routing and Applications. 6DEPLOY Paris and Sofia testbeds were used for practical routing exercises.

Approximately 17 network engineers, system administrators, and regulators participated in the workshops. The topics presented were selected according to the participants' requirements.

According to the evaluation forms and the comments from the participants at the workshop, it is clear that there is significant interest in the region for IPv6 technology. Since the project inception, there are more people that know about and/or have used IPv6. The participants expressed positive comments on the workshop's usefulness and organisation. They also requested that 6DEPLOY organise more workshops in the region with more specific technical subjects.

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

In summary, this workshop should be considered a success with regard to the dissemination of IPv6 in the Latin America / Caribbean region, although this is only the first 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