Title:	Document Version:
Deliverable D1.17 **Report from the 16th Workshop in Santo Domingo**	1.0

Project Number:	Project Acronym:	Project Title:
261584	6DEPLOY-2	IPv6 Deployment Support

Contractual Delivery Date:	Actual Delivery Date:	Deliverable Type* - Security**:
Not planned in DoW	22/01/2012	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):

Alvaro Vives, Consulintel

Abstract:

This deliverable presents a report from the workshops held in Santo Domingo (Dominican Republic) from 28th - 30th November 2011. 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, LAC, Testbeds, Modules, 6DEPLOY, 6DEPLOY-2

Disclaimer

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 Santo Domingo (Dominican Republic) from 28th - 30th November 2011. 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.

Table of Contents

Figure Index

Table Index

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:

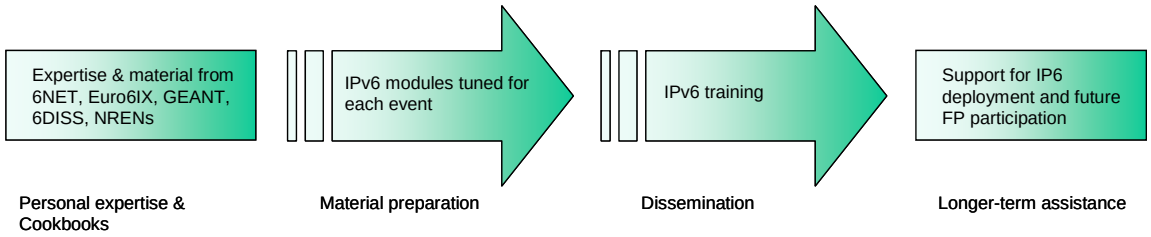

Figure 1-1: 6DEPLOY-2 methodology (diagrammatically)

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 an increasing number of 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 Santo Domingo (Dominican Republic) from 28th - 30th November 2011. 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 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. 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 SANTO DOMINGO

This IPv6 Workshop was held in Santo Domingo (Dominican Republic) from 28th - 30th November 2011. 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 be found in 6DEPLOY's project web site:

http://www.6deploy.eu/index.php?page=20111128_santo_domingo

3.1 Overview

The 6DEPLOY-2 representatives at the workshop were Jordi Palet, from Consulintel and Sofia Silva, from LACNIC.

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 and IPv6 DNS.

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 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 who attended:

No.	Name	Affiliation
1	Ariel Antigua	APEC
2	Eddgar Rojas	APEC
3	Eddy Alcántara	APEC
4	Moisés Gómez Fernández	ASYSTEC
5	Carolin M. Santos Francisco	CIRSA
6	Chrystian Vásquez	CLARO-CODETEL
7	Hector Joel Feliz	CLARO-CODETEL
8	Jairo Ezequiel Feliz Capellán	CLARO-CODETEL
9	Kelvin Vargas	CODETEL
10	Timoteo Perez	CLARO-CODETEL
11	Ariadna Rodriguez	CLARO-CODETEL

12	Miguel Sobrino	CLARO-CODETEL
13	Joel Dolores	CLARO-CODETEL
14	Yesenia Collado	CLARO-CODETEL
15	Edward Rojas	Columbus Networks
16	Aydalina Catrain	Columbus Networks
17	Jose Raúl Madera	INDOTEL
18	Nelson Guillén	INDOTEL
19	Brian Rosado	INDOTEL
20	Gregory Nicolás Rodríguez Coste	INDOTEL
21	Juan Ant. Matos Rojas	Instituto Dominicano de Aviación Civil (IDAC)
22	Wanda M Pérez Peña	IPv6 Task Force República Dominicana
23	Willy Marcelo Maurer	MESCYT
24	José Antonio Upia	NAP del Caribe
25	Samuel Cornielle Beltran	NAP del Caribe
26	Daniel Monegro	PUCMM
27	Noe Luzón	PUCMM
28	Leandro Gómez	TRICOM
29	Darwin Santana	TRICOM
30	Amaurys Rodriguez	TRICOM
31	Kaking Choi	UNICARIBE
32	Agustina De los Santos	UASD
33	Eugenio Delgado	UASD
34	Francisco Lopez	UASD
35	Ekel Montero	UASD
36	Edwin Salazar	INTEC
37	Fabricio Cabrera Bentz	INTEC
38	Julio Cesar Lara	Regional CISCO INTEC
39	Victor Alvarez	
40	Eddysson Sanchez	WIND TELECOM
41	Jose Tejada	WIND TELECOM
42	Carlos Tenas	WIND TELECOM
43	Danelson Perez Flores	WIND TELECOM
44	Nelson Calderon Tejeda	LOYOLA
45	Eddy Pérez Norberto	LOYOLA
46	Wilfrido Calderón	UCE
47	Juan Carlos Rosario	UCE
48	Ruth Ramirez	UCE
49	José García	UCE
50	Edwin Elizer Rosa Muñoz	UCE
51	Ana Rosalia Báez Marmolejos	Colegio
52	Héctor Ricardo Taveras Vargas	WIND TELECOM
53	Danny Almonte Mora	Oficina Nacional de Estadistica (ONE)
54	Hugo Diaz Nuñez	Oficina Nacional de Estadistica (ONE)
55	Euclides Medici	Grupo Corripio
56	Luis Joel Quezada Santos	Grupo Corripio

57	Elaine E. Cruz Heyer	Universidad Dominicana O&M
58	Fausto Batista	Black Cube Technologies
59	Victor Ortiz Méndez	Hospital General Plaza de la Salud
60	Eripson Olivier	Universidad del Caribe
61	Juan Anibal Perez Guzman	Estudiante
62	Ramiro Ramirez	Docente Politecnico Santa Ana
63	Hayser Beltre	UNAPEC
64	Carlos Aquino	GroupCard
65	Santos Navarro	UNAPEC
66	Benjamin Alcantara	UNIBE
67	José Joaquin Olivo	UNAPEC
68	Freddy Jiménez	UNAPEC
69	Margaret Mirabal	UKRAM TECH
70	Alberto Sánchez	UKRAM TECH
71	Carlos Soriano	UKRAM TECH

Table 3-1: Santo Domingo Workshop list of participants

The participants represented a broad sector of the ICT community. They were mainly technical people, but 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 programme of the workshop is presented in the following table:

Date	Title of session
28/11/2011	Introducción a IPv6
	Practicas con hosts
	Mecanismos de transición
	Practicas de transición
29/11/2011	Seguridad IPv6
	DNS IPv6
	Routing con IPv6

30/11/2011	Routing LAB: Addressing, OSPF, BGP

Table 3-2: Santo Domingo Workshop programme

3.4 Presentation material

The following material was presented:

Modules	Presented by	Affiliation
Introducción a IPv6	Jordi Palet	Consulintel
Practicas con hosts		
Mecanismos de transición		
Practicas de transición		
Seguridad IPv6		
DNS IPv6	Sofía Silva	LACNIC
Routing con IPv6		
Routing LAB: Addressing, OSPF, BGP		

Table 3-3: Santo Domingo Workshop list of modules used

3.4.1 Modules

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

- **Introducción a IPv6**: This module is a summary of different issues, to refresh and introduce some useful content to be used in the "hands-on" exercises. It 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 from 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, are explained.
- **Mecanismos de transición**: Transition concepts and mechanisms are introduced.
- **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.
- **DNS IPv6**: This module describes new Resource Records for IPv6 DNS, availability of IPv6 in the root servers zone and CC-TLDs, etc. In addition DNS64/NAT64 concepts are presented.

- **Routing con IPv6**: This module mainly describes the differences between IPv4 and IPv6 routing protocols for OSPFv3, EIGRP, RIPng, BGP4+, and ISIS.

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 on remote testbeds, which were established in the 6DISS, 6DEPLOY and 6DEPLOY-2 projects, thanks to Cisco donations.

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

- **Prácticas con hosts**: These 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.
- **Practicas de transición**: Some transition concepts and mechanisms were used, mainly tunnel-based ones.
- **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.

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.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 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 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 71 participants were present, 35 questionnaires were returned		
Employment sector	Government	2
	University or other higher education	13
	Schools or further education	2
	Research	1
	Health	1
	Commercial	9
	Other (please specify)	(8)*
Job function	Government Advisor	1
	Senior Manager	3
	IT Manager	4
	Systems Administrator	11
	Network Administrator	21
	Researcher / Postgraduate	2
	Undergraduate	2
	Other (please specify)	(4)*
Usage of IPv6		
Do you use IPv6 yourself?	Yes	7
	No	25
Does your organisation use IPv6?	Yes	4
	No, but planned in this year	5
	No, but planned in the next year	11
	No, but planned in the longer term	7
	No, and no plans as yet	5

* 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
Presentación 1 – Introducción a IPv6	24	5	1	0
Presentación 2 – Mecanismos de Transición	24	5	1	0
Presentación 3 - Direccionamiento IPv6	26	2	2	0
Presentación 4 - Seguridad IPv6	21	7	1	0
Presentación 5 - DNS IPv6	21	5	3	0
Presentación 6 - Routing con IPv6	21	3	5	0
Práctica 1 – Prácticas con Hosts	16	8	1	0
Práctica 2 – Práctica Mecanismos de Transición	16	4	0	0
Práctica 3 - Routing LAB: Addressing, OSPF, BGP	19	5	1	0
Quality of the presentation	Excellent	Good	Average	Poor
Presentación 1 – Introducción a IPv6	25	4	1	0
Presentación 2 – Mecanismos de Transición	22	7	1	0
Presentación 3 - Direccionamiento IPv6	23	6	1	0
Presentación 4 - Seguridad IPv6	19	9	1	0
Presentación 5 - DNS IPv6	16	10	3	0
Presentación 6 - Routing con IPv6	16	11	1	1
Práctica 1 – Prácticas con Hosts	16	5	3	0
Práctica 2 – Práctica Mecanismos de Transición	14	4	2	1
Práctica 3 - Routing LAB: Addressing, OSPF, BGP	15	8	1	1
Familiarity with the topic?	None	Some	Most	All
Presentación 1 – Introducción a IPv6	1	13	11	0
Presentación 2 – Mecanismos de Transición	6	14	7	2
Presentación 3 - Direccionamiento IPv6	4	13	9	4
Presentación 4 - Seguridad IPv6	8	15	5	1
Presentación 5 - DNS IPv6	8	16	2	2
Presentación 6 - Routing con IPv6	5	11	8	4
Práctica 1 – Prácticas con Hosts	3	15	3	2
Práctica 2 – Práctica Mecanismos de Transición	3	13	3	1
Práctica 3 - Routing LAB: Addressing, OSPF, BGP	2	11	8	2
Quality of the course documentation	Excellent	Good	Average	Poor
	18	10	1	0
General workshop organisation	Excellent	Good	Average	Poor
	18	11	0	0
Recommend to your colleagues?	yes	No		
	30	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.

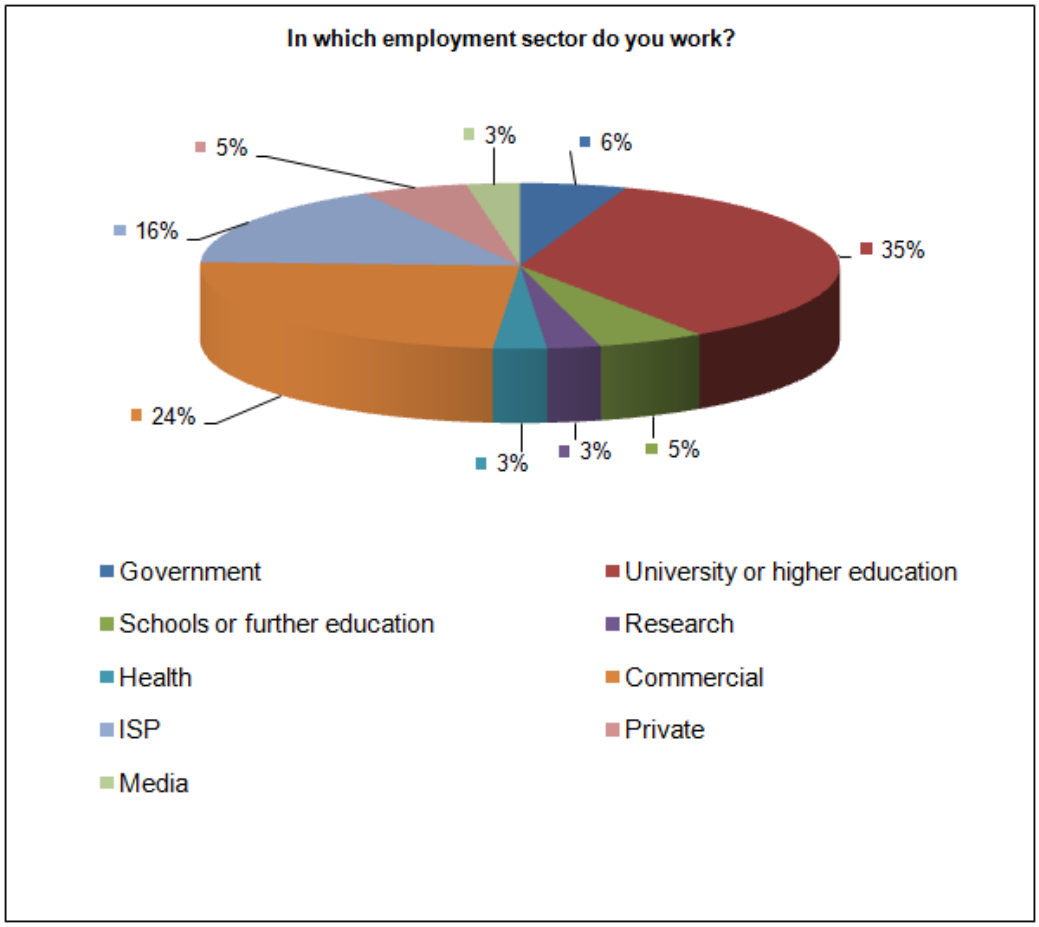

Figure 5-1: In which employment sector do you work?

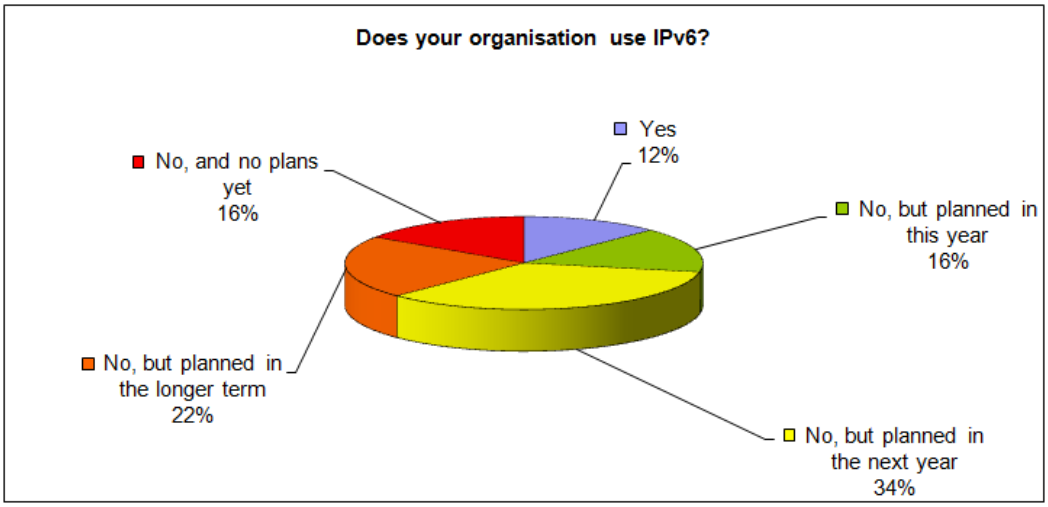

Figure 5-2: Does your organisation use IPv6?

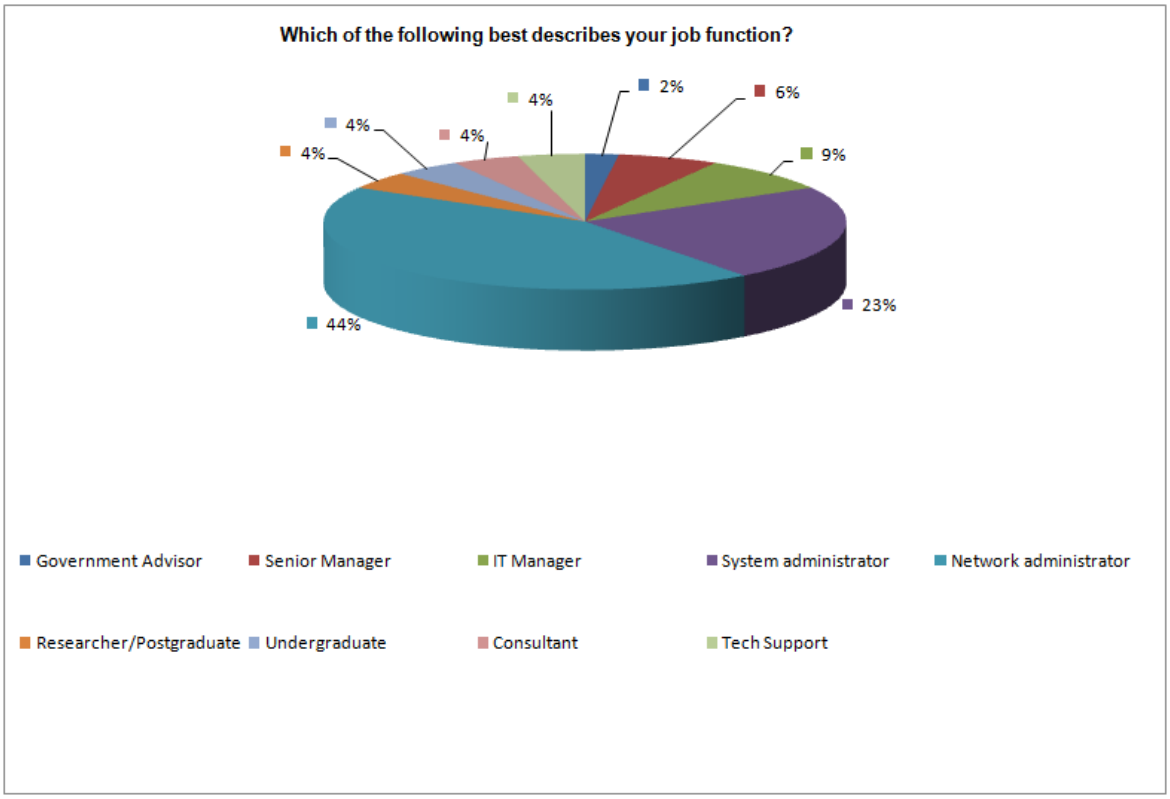

Figure 5-3: Which of the following best describes your job function?

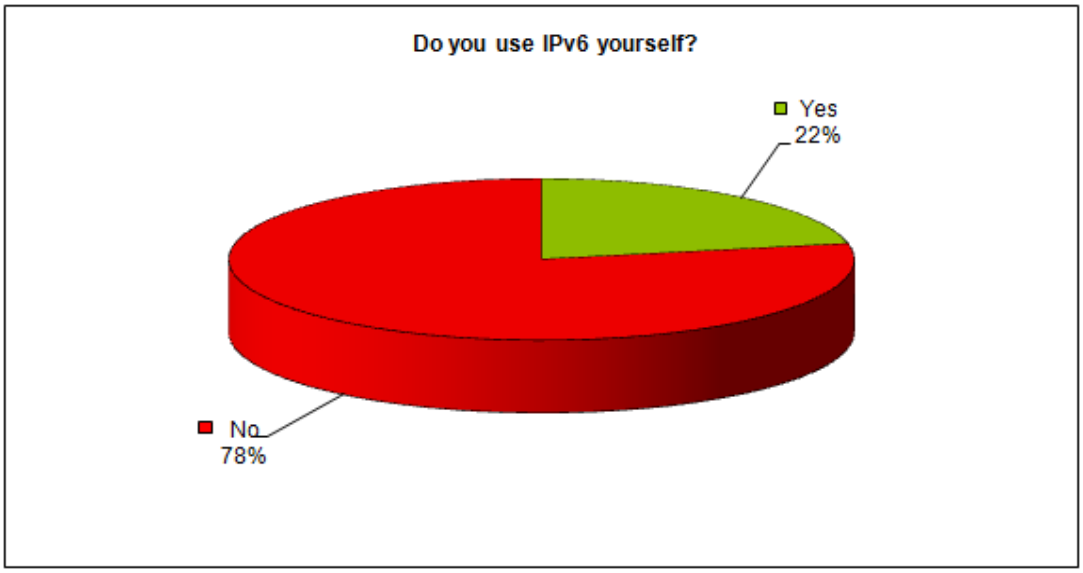

Figure 5-4: Do you use IPv6 yourself?

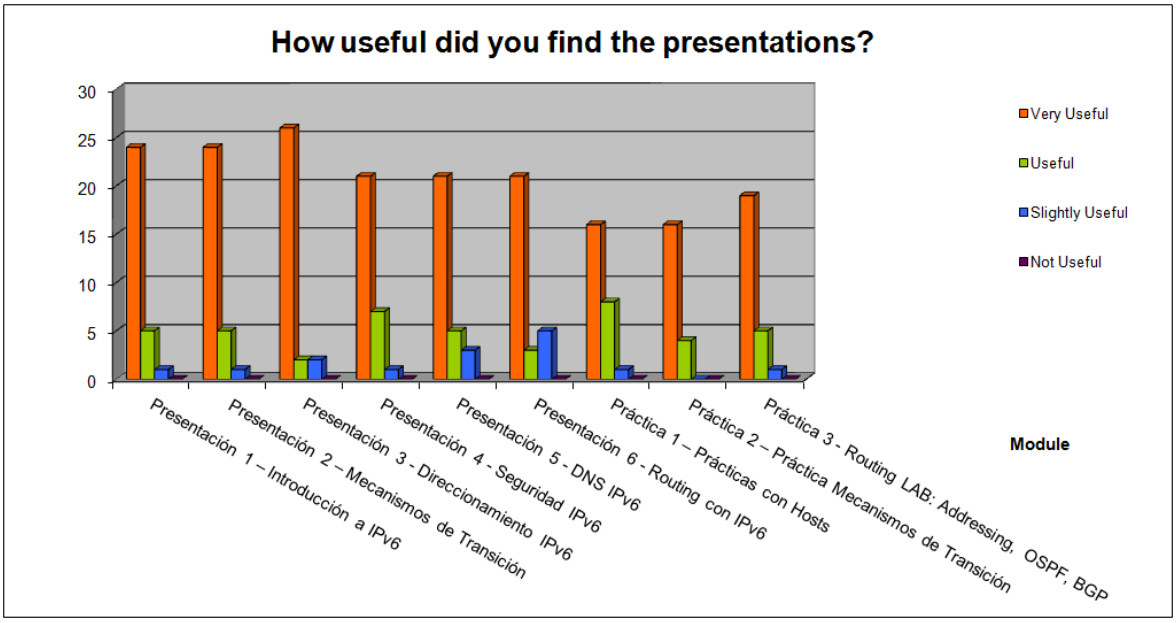

Figure 5-5: How useful did you find the presentations?

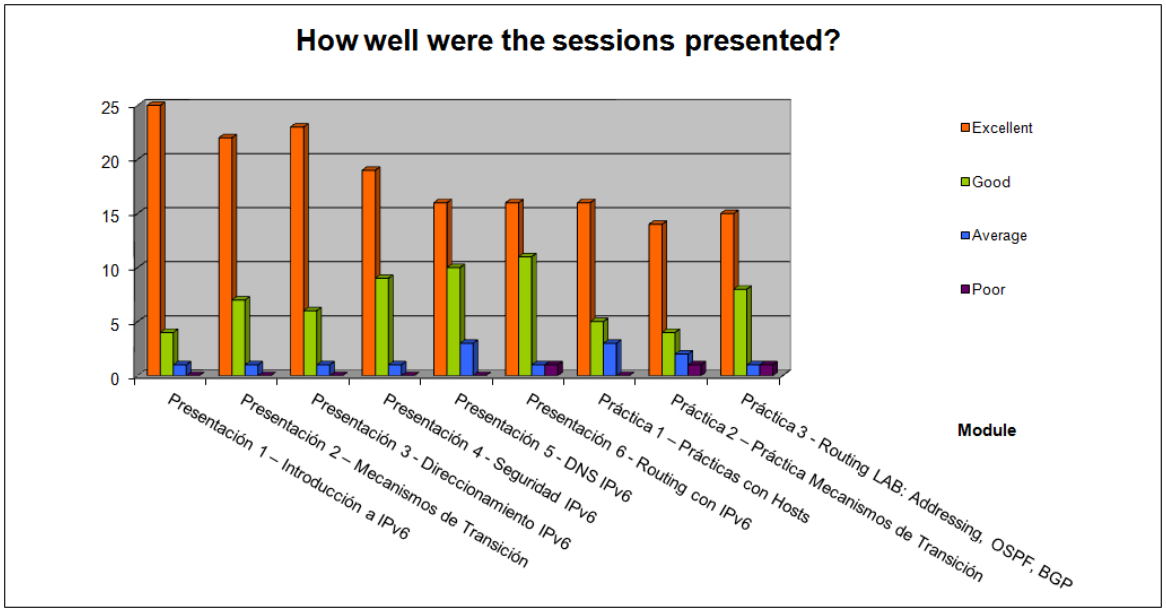

Figure 5-6: How well were the sessions presented?

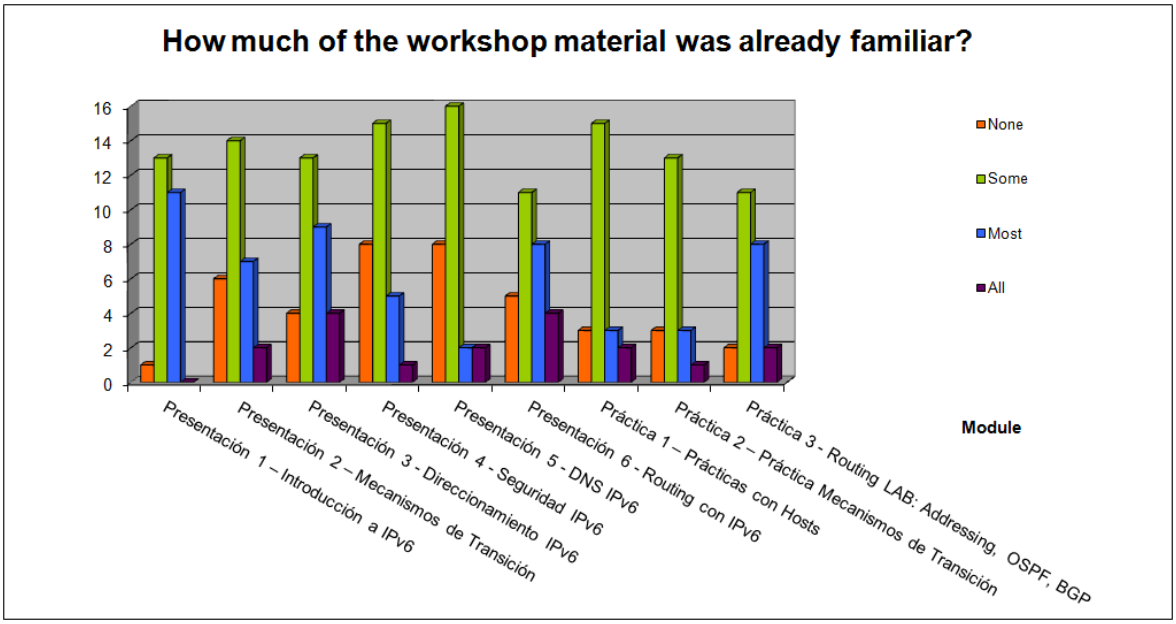

Figure 5-7: How much of the workshop material was already familiar?

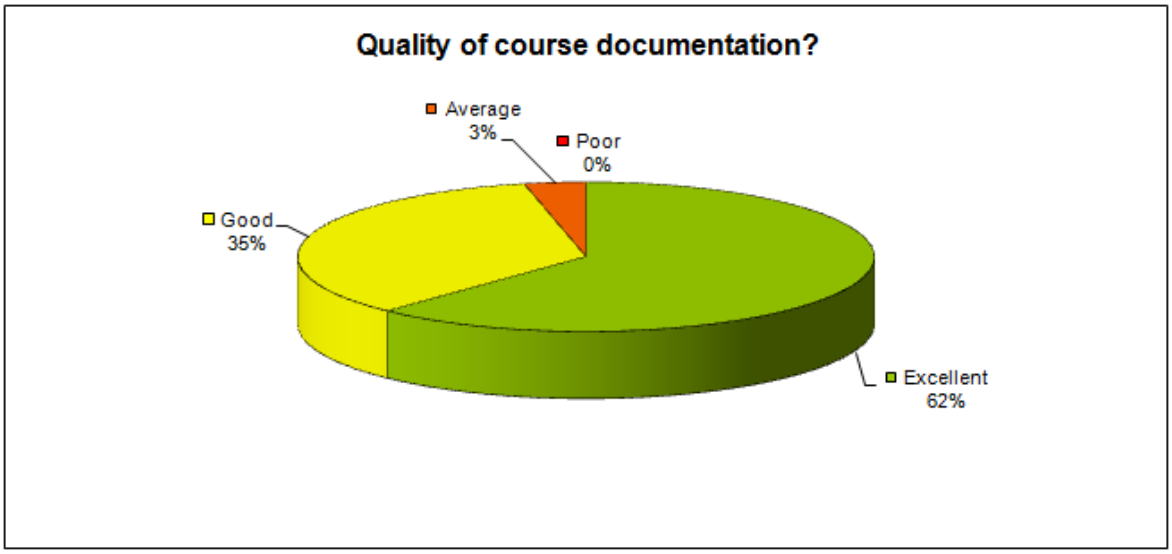

Figure 5-8: Quality of course documentation?

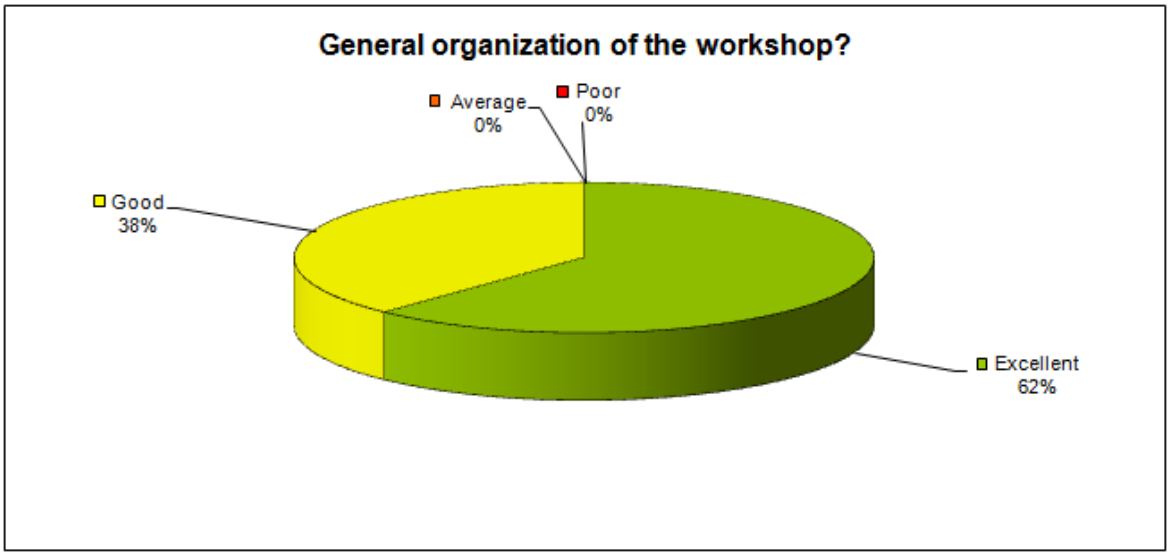

Figure 5-9: General organization of the workshop?

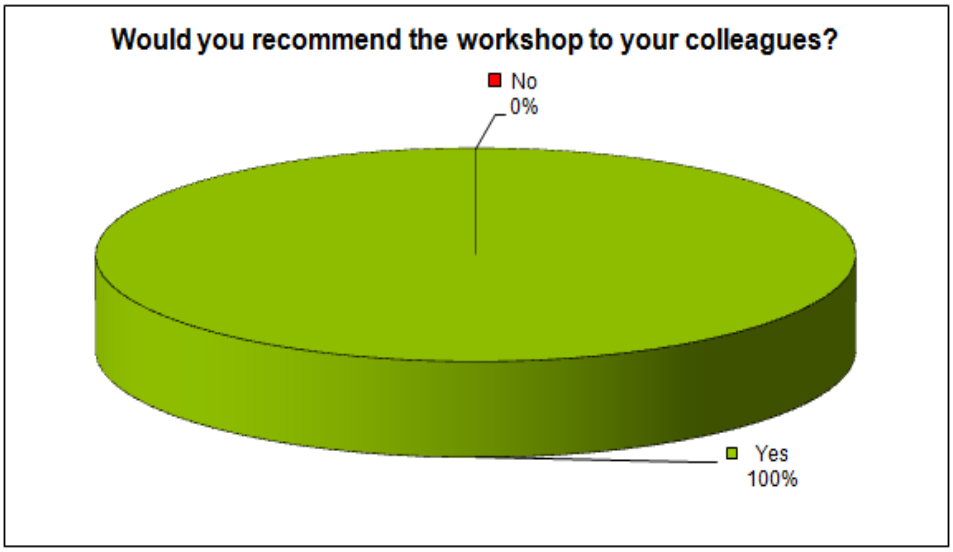

Figure 5-10: Would you recommend the workshop to your colleagues?

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 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**?:*

- *(1) DNS IPv6.*
- *(5) Transition techniques and mechanisms.*
- *(2) IPv6 over MPLS.*
- *(1) DNS64 NAT64.*
- *(7) Routing.*
- *(1) CPE's change in an ISP to support IPv6.*
- *(7) Security.*
- *(2) IPv6 Addressing scheme and subnetting.*
- *(1) Practice IPv6.*
- *(1) IPv6 Basics.*
- *(1) IPv6 on PLC(Power Line Communication).*
- *(1) M2M with IPv6 (Machine-to-machine).*
- *(1) Domotics/Home automation with IPv6.*
- *(1) IPv6 on LTE.*
- *(1) IPv6 on WiMAX.*

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

- *(1) IPS.*

*Any **other comments**:*

- *(1) More practice and labs.*
- *(1) Include transition practice on labs.*
- *(6) Excellent workshop, should try to provide it to more people. Excellent teachers.*
- *(2) Longer workshops and more days for practice.*
- *(1) This kind of events are good to improve networking knowledge.*
- *(1) IPv6 routing more in depth.*
- *(1) This initiative is very fruitful. I have learned a lot from the teachers and will transmit this knowledge to me colleagues to support IPv6 protocol adoption*

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 Santo Domingo, Dominican Republic, on November 28th - 30th 2011. 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 some of the issues of Internet deployment and evolution, especially IPv6 introduction, addressing, transition, and Routing.

Approximately 71 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.

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

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