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Abstract:

This document presents the Eurov6 Fix Showcase scenario and possible enhancements. It explains the integration of System concept, devices, applications and services in the Fix Scenario, and gives a reference for detail report of the exact configurations in order to be easily reproduced in similar environments.

Keywords:

Eurov6 Fix Showcase, IPv6 Applications, IPv6 Configurations, IPv6 Devices, IPv6 Services.

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Revision History

The following table describes the main changes done in the document since it was created.

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v1.1	04/02/2003	Network content updated	César Olvera (Consulintel)
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Executive Summary

The Eurov6 project has as main objective to show the usage of IPv6 products and services and their impact to anybody at anytime.

This document describes Eurov6 Fix showroom scenario and possible enhancements, explaining the integration of System concept, devices and networks, applications and services in the Fix Scenario, and gives a web reference of detailed reports of the exact configurations in order to be easily reproduced in similar environments.

Among the applications, the showroom includes multimedia applications, video/audio streaming, games, peer-to-peer file sharing, remote interaction, home networking, etc.

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1. INTRODUCTION

The main objective of Eurov6 project is to show the usage of IPv6 products and services and their impact to anybody at anytime. Realizing this objective will include:

- Bringing together vendors and sponsors to demonstrate and test their devices and systems.
- Showing various users applications based on IPv6 products and services, permanently at a few locations in Europe ("Fixed Showcase"), which can be visited physically or accessed remotely through telematic means.
- Organizing temporally demonstrations at different locations and/or significant telecommunication industry events (concept of "Nomadic Showcase").

The aim in this document is to show the current Eurov6 Fix Showcase scenario and possible future enhancements, explaining the integration of System concept, devices, networks, services and applications running in the Fix Scenario.

Note on exact device configurations

As the exact configuration on hosts, routers and devices tends to change very fast as newer IPv6 implementations get out to the public, it has been decided not to include these configurations here as they will become obsolete very soon.

Instead, a kind of "Eurov6 Configuration Cookbook" information will be produced permitting to partners to:

- Access to updated configuration material in order to easily reproduce the showroom demonstrations in both new Fix and Nomadic Showcases.
- Upgrade periodically the configuration of the devices integrated in the showroom in order to cover the new IPv6 implementations.

This information will be available to interested parties "as is" on request.

2. INTEGRATION OF SYSTEM CONCEPT

Currently Eurov6 deployed a few Fix showrooms, where the demonstrations will be generally available round the year and special demos targeted to particular types of visitors that can be arranged at short notice. The venues of these Fix showrooms are Basel, Brussels and Madrid and are maintained by the Telscom, University of Brussels and Consulintel respectively.

The Basel and Brussels rooms (MClab and EuroDemo) have already a certain history, linked in particular to the NGN-LAB project activities. The present configurations, as well as the applications and services set-up, appear in several sections in this document.

The Eurov6 Showcase centers have been deployed following the design principles shown in Eurov6 D2.2 deliverable. Basically, four sections compose it. These allow the final users to interact with the demonstration and evaluate all the devices and applications that will be supplied by vendors and sponsors.

As stated in the deliverable the showroom is structured in these sections:

1. Home.
2. Infotainment.
3. Business premises.
4. Open areas.

Each section shows specific applications suitable for each environment. D2.2 deliverable described a wide range of applications, including Home automation, Security and surveillance, Gaming, Audio, Video, P2P, GRID, VPN, AAA, Hot Spot Services, Wearable devices, Sports, Health and Public Safety, etc.

3. DEVICES

This section gives a brief description of devices integrated and used in the different Fix showrooms.

3.1 Hosts

Several PC hosts are used in the demonstrations, these PCs ranging from desktop and laptop to pocket kind, are configured with several IPv6 enabled operating systems with different distributions and versions of Linux, FreeBSD, and Windows.

3.2 Routers

Several routers with different capabilities are used in the Showcase. IPv6 enabled routers came from both Eurov6 sponsors and common use vendors. 6WIND, Cisco and Hitachi are the main routers that have been integrated in the Fix showroom and they give infrastructure support for IPv6 networked applications.

3.3 Mobile Devices

Several pocket/wireless devices also augment the general network infrastructure of Eurov6 showroom, such as:

- Compaq iPAQ 3870 with Linux (Familiar 0.5.2 distribution + BlueZ stack) and Bluetooth.
- Compaq iPAQ 3660 with Bluetooth/CF expansion pack.
- Ericsson T39m with GPRS, Bluetooth and IrDA.
- Bluetooth PCMCIA card from 3Com.
- Bluetooth USB interface from 3Com.
- Wireless LAN cards from Compaq.

This equipment forms the basis for showing wireless access on pocket devices. Several usage scenarios have been prepared and tested. One of the typical scenarios is shown in Figure 3-1.

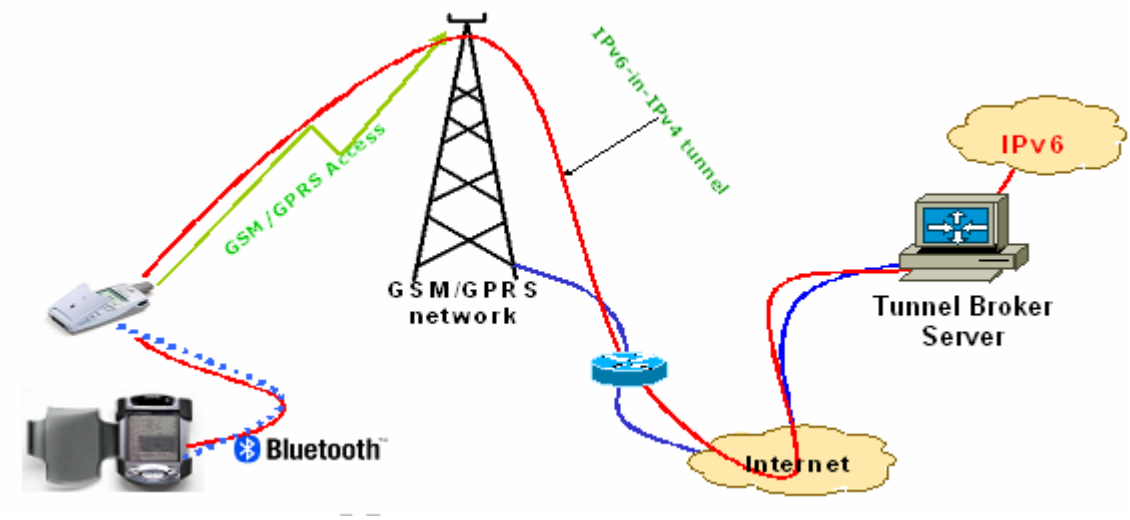

Figure 3-1: IPv6 Access Using a GPRS Connection

The iPAQ handheld uses Bluetooth to establish a wireless connection with the GPRS phone. The GPRS phone is used as a modem to cross the GSM network and connect to the router. After establishing the (PPP) connection, the iPAQ receives IPv4 address and is ready to connect to the Internet. After establishing the IPv4 connection to the network, the client requests an IPv6 address using a tunnel broker service. The project used mainly the one developed by Consulintel available at http://tb.consulintel.euro6ix.org. In Europe there are several other available, including: BT Exact (https://tb.ipv6.btexact.com), Dolphins Network Systems (http://tunnelbroker.as8758.net), XS26 Project (http://www.xs26.net), Telecom Italia (https://tb.ngnet.it) and 6SOS Project (http://www.6sos.org).

Bluetooth

Many portable devices are nowadays equipped with a Bluetooth interface, thus allowing them to be used as wireless connections to devices like phones or modems, and also directly as an Internet access technology. For this purpose, an access point device is needed; there exists commercial solutions for this kind of connectivity ranging from dedicated Bluetooth access point to PC computer with a USB dongle serving as access point.

WLAN

Wireless LAN extends the regular, wire-based Ethernet LAN access. It is easily deployed through the installation of an access point. In the showroom the WLAN access points are used in order to provide connectivity to mobile devices. WLAN supports both IPv4 and IPv6 connectivity and is also used for demonstrating some of interworking issues across fixed wireless networks.

GPRS

Since the GPRS service is available in most GSM networks nowadays, it can be useful in remote places where no other Internet access technology is available. For example a handheld computer can use Bluetooth to establish a wireless serial connection with the GPRS phone. In this way, the phone can be left in the pocket or put in the place where GSM coverage is better. The GPRS phone can be used as a modem to cross the GSM network and connect to the router. This process is very fast (about 1-2 seconds), and comparable to ISDN modems. After establishing the (PPP) connection, the handheld computer receives an IPv4 address and is ready to connect to the Internet. After establishing the IPv4 connection to the network (for example, using Bluetooth for

a link between mobile device and a phone), the client requests an IPv6 address using (for example) a tunnel broker service.

3.4 PLC Devices

In order to show the PLC (Power Line Communication) technology, a basic PLC network was installed in the showrooms. The PLC devices used in the Madrid showroom are one HE (Head-End) and one CPE (Customer Premises Equipment). The devices used are from DS2, http://www.ds2.es, who participates in the IST's 6POWER project http://www.6power.org.

The CPE is intended to be at the user premises (for example, in the home), giving network connectivity. Several CPEs will depend on one HE, which will give network access to the CPEs by means of the power line.

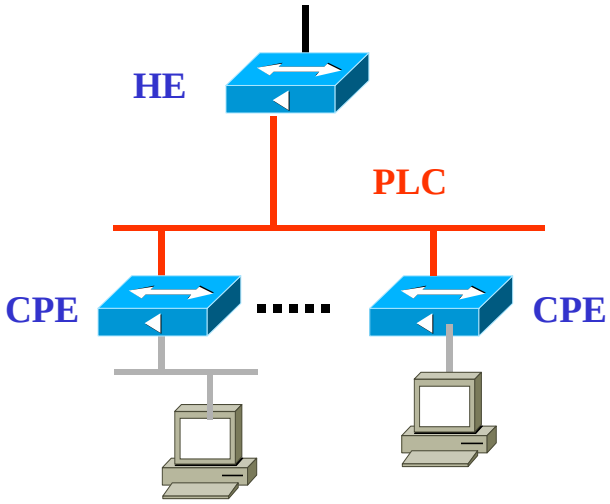

Figure 3-2: Basic PLC Topology

3.5 Home Network devices

Basel showroom has implemented Home automation based on IPv6 networks. It uses commercially available X.10 devices for electric appliances control and Spitfire devices to control the infotainment services. The implementation is based on OSGi platform and in close collaboration with Future Home project http://future-home.org.

The configuration implemented:

- Consist in remote controlling of devices sitting at home.
- Possible IPv6 killer application because it allows the delivery of unlimited services each of which adds value to the network and is a revenue source.
- IPv6 versus IPv4:
    - Direct connection possible due to wider range of addresses; this allows moving of server functionalities outside home (e.g. at the provider's site) making the service user-friendlier.
    - User-friendlier services provided thanking to auto configuration protocols.
    - Security at the connection level embedded (the same "firewall-style" level of security of IPv4 can be reached at the application level).
    - Easier and wider range of services deployable due to inbuilt QoS features.

IPv6 protocol drives some basic issues in home networking: with its enlarged address scheme, it allows for direct connection with all the devices capable of holding an address; with its embedded security, it allows for an improved service in this delicate area; finally, with its enhanced auto-configuration protocols, it increases transparency and usability for the end user.

The scenario implemented is as shown in the figure below:

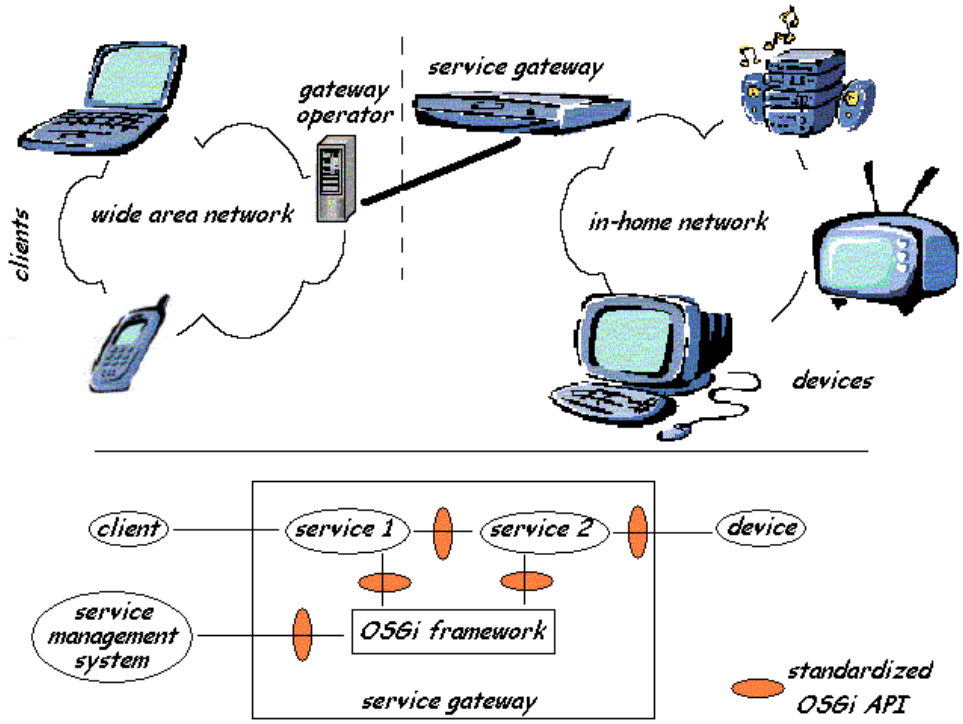

Figure 3-3: Home Networking Concept

3.6 Other Devices

In addition to “traditional” network devices, the aim is to show new devices that are being integrated into the networked world. The following gives an idea of the kind of devices that may be available in the showrooms.

- Internet freezer, washing machine, microwave oven, coffee maker, etc.
- Security, surveillance, gas/fire detection, alarm systems.
- Cameras, telephone, video and audio devices.
- Game consoles.
- Wearable devices.

The inclusion of specific devices will depend on the current availability for the showrooms, from manufacturers, sponsors, etc.

4. APPLICATIONS

There are several applications installed in the permanent IPv6 Showcase. The selection was made thinking on the way of catching the visitor attention. In the showroom, there are common IPv6 applications as base of several attractive IPv6 applications.

Furthermore, the goal with the installed applications is to support the idea that the user projects can benefit from the testing platform to validate their development work and make international IPv6 demonstrations.

The applications installed try to show the "state of the art" in the IPv6 field in the different areas that were identified in Eurov6 D2.2.

4.1 Basic IPv6 Applications

The following applications are available in the Showcase and they are the support for the more elaborate and "amazing" applications.

4.1.1 HTTP Client

There are several web browsers with IPv6 capability. Mozilla (v0.9) for Linux and Internet Explorer (v6 and SP3) for Windows are common examples.

To test if it is working with IPv6 protocol, call the URL: http://www.ipv6forum.com. This site was built with the feature that if a user uses the IPv4 backbone to open the site, the browser would not able to show the earth logo rotating. Some web sites indicate from which IPv4/IPv6 address are the user visiting the site: http://www.euro6ix.org, http://www.kame.net, etc.

4.1.2 HTTP Server

A package that builds an IPv6 capable HTTP server is Apache. The Eurov6 showroom IPv6 site is at http://www.eurov6.org The server supports both IPv4 and IPv6, which means that depending upon the protocol used by the client, the URL is resolved as either an IPv4 or an IPv6 address, transparently to the client.

4.1.3 FTP

FTP (File Transfer Protocol), is the simplest way to exchange files between computers on the Internet. It is commonly used to download programs and other files to one computer from other servers. In particular for the IPv6 protocol, LFTP (version 2.3.0) was used. This is a sophisticated file transfer program. LFTP can handle six file access methods: ftp, ftps, http, https, hftp and file.

4.1.4 Mail Transport agent (Sylpheed)

Sylpheed is a mail transport agent that is IPv6 capable. The version configured is Sylpheed-0.4.9.tar.gz.

To check the mailbox, the command to run is: $ sylpheed, which results in a user-friendly interface very similar to Outlook Express for Windows.

4.2 Main IPv6 Applications

The following applications are available in the Fix Showcase and they are intended to show in a more elaborate and "amazing" way the IPv6 applicability.

4.2.1 ISABEL Multimedia Videoconference

The ISABEL application supporting both IPv4 and IPv6 has been developed by UPM, http://isabel.dit.upm.es. ISABEL CSCW application is a group communication tool for the Internet, based on advanced videoconferencing features, using an innovative service concept, which adapts the collaboration sessions to the user needs. It includes service definitions for different usage scenarios. Each service will support the specific behaviors and characteristics of a given set of users. For example a service for distributed meetings, another one for distributed lectures, another one for distributed congresses, etc. ISABEL IPv6 version installed in the Showcase is used for video/audio demonstrations and interactions with international users.

Eurov6 have installed in the Showrooms the latest version (4.6) of ISABEL software in a multimedia Linux PC with audio and video interface.

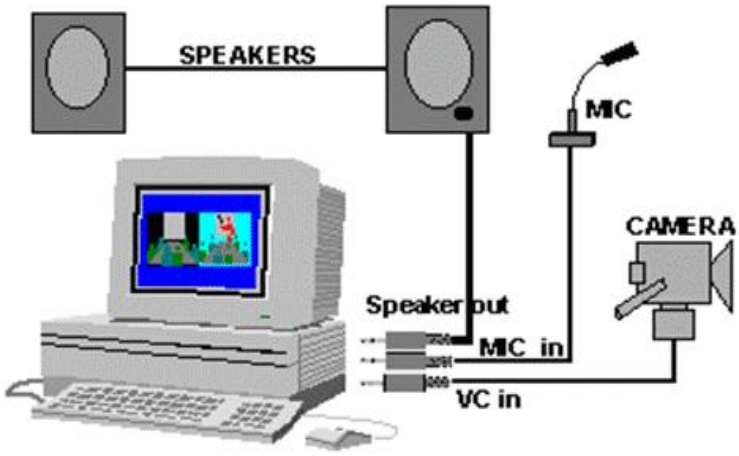

Figure 4-1: The ISABEL Videoconference Terminal

This platform permits to attend a number of events distributed with ISABEL including the NGNI-ISABEL workshop and Madrid 2003 Global IPv6 Summit.

4.2.2 Multicast Videoconference tools

In Eurov6 are installed the multimedia applications developed by UCL such as RAT (audio), VIC (video), NTE (shared text editing) and SDR (Session Directory Tool).

Robust Audio Tool RAT

RAT can be used for VoIP. Voice over IP means that voice is transmitted over an IP network such as the Internet, rather than the familiar public switched telephone network (PSTN). The RAT application was chosen because of its simplicity. This application supports IPv6 and multicast also.

Video Conferencing Tool VIC

VIC is a simple application for sending video streams over IPv4 or IPv6. It works on many platforms, such as Linux, Solaris, Windows, FreeBSD and uses RTP (real-time transmission protocol) to send the stream. This application supports IPv6 and multicast also.

Session Directory Tool SDR

SDR is a session directory tool designed to allow the advertisement and joining of multicast conferences on the M6Bone (http://www.m6bone.net).

These software tools are all open sources and can be downloaded for free. As Eurov6 has a full IPv6 multicast infrastructure (see Network infrastructure section), the visitor can receive the conference sessions through SDR and receive video and audio through VIC and RAT respectively.

Figure 4-2 shows a multicast conference session directory after launching the SDR.

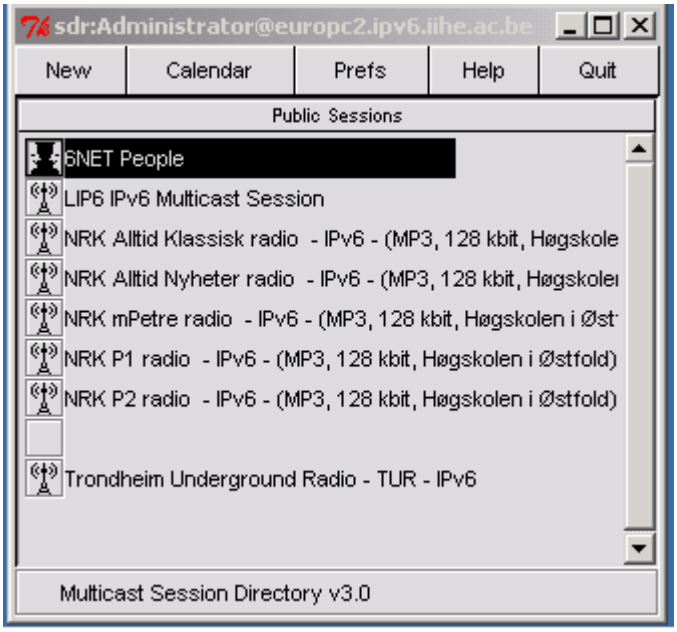

Figure 4-2: Multicast Session Directory Window after Launching

In order to join one of conference session and transmit the video from a site, it is necessary to launch VIC with the proper group address/port number and enable transmission on the join window. Figure 4-3 shows that Brussels Showroom (EuroDemo) joins the 6NET People conference session.

Figure 4-3: Brussels Room Join the 6NET People Session

VIC and RAT are also installed on the iPAQ Linux machine. In one of scenarios shown in Figure 4-4, the laptop serves as the Access Point with proxy-arp enabled. All of the machines have VIC and RAT installed and communication between them has been tested over both IPv4 and IPv6 protocols.

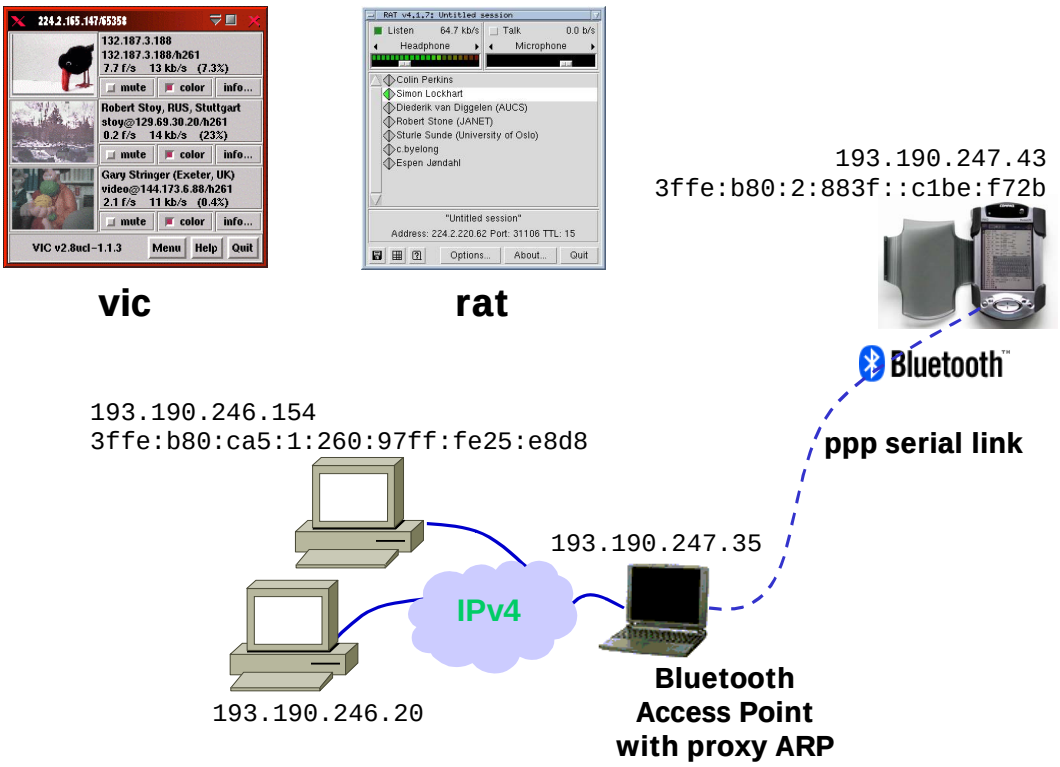

Figure 4-4: VIC/RAT on IPAQ over IPv6

4.2.3 VoIP with SIP

A more complex VoIPv6 application was developed at Telscom. They opted for a Session Initiated Protocol (SIP) based implementation, because it is a lightweight protocol, based on HTML, and designed by IETF. SIP is developed by the Multiparty Multimedia Session Control (MMUSIC) working group. It was originally designed for multimedia conferencing on the Internet. SIP is independent of the environment and can be used with several protocols. In fact any datagram, or stream protocol that delivers a whole SIP request or response in full, can be used. Such protocols are UDP and TCP in the Internet.

4.2.4 VideoLAN

VideoLAN is a project at the École Centrale de Paris, http://www.videolan.org. Its purpose is to set up and exploit a very high throughput network, in order to broadcast digital video and Video on Demand within the campus. Possible inputs include DVDs, DVB-S satellite streams, MPEG-1 or MPEG-2.

VideoLAN Server and Client have been installed in a number of PCs at Eurov6. In special Brussels Showroom have been using VideoLAN to do DiffServ test and join-test with Alcatel core router A7770 OBX.

4.2.5 MPEG4IP

MPEG4IP provides an end-to-end system to explore MPEG-4 multimedia. The package includes many existing open source packages and the "glue" to integrate them together. This is a tool for

streaming video and audio that is standards-oriented and free from proprietary protocols and extensions.

MPEG4IP is a project within Sourceforge, which allows the transmission of MPEG4 streams over both IPv4 and IPv6. MPEG4IP consists of the following elements:

- mp4live - provides live streaming from any video4linux source (webcam, tv tuner), encoding the stream to mpeg4 format. The destination address may be multicast, unicast, both IPv4 and IPv6.
- mp4player - player for the MPEG4 streams/files
- dss - Darwin Streaming Server. This RTSP server has been patched for IPv6 compatibility and may be used both to stream from a file or as a reflector for streams created with mp4live.

This package is a very good solution for distributing high quality video with reasonable bandwidth requirements.

The live streaming can be configured either in unicast or multicast model. In order to receive the live streaming service, the client PC should get a copy of live.sdp file generated by the streaming server and mp4player should be launched at the client side (such as mp4player live.sdp).

4.2.6 The Darwin Streaming Server

The Darwin Streaming Server (DSS) is a product of the Apple Corporation and has been installed successfully in Brussels Showroom. It is a full-featured version of the QuickTime Streaming Server with source code. This product has been patched by Telematica Instituut to support IPv6, but future versions should support it directly. It is designed to work with the QuickTime player, but as it supports the Real-Time Streaming Protocol (RTSP), it can interoperate with any compatible software, including mp4player or gmp4player.

DSS may be used both for video-on-demand over IPv4/IPv6 Network, serving already available content from files on the hard disk, or streaming from a live source. DSS can be used as a repeater, and thus may distribute the same stream to many clients.

This product has very advanced features, an administration and management interface and it is a very good solution for both educational (eg. distant learning) or entertainment purposes.

4.2.7 Windows Media Services and Media Encoder 9 Series

Windows Media Services 9 Series is the server installable in Windows Server 2003 family of the Windows Media 9 Series platform, which supports IPv6, and it can work alone or in conjunction with Windows Media Encoder to deliver audio and video content to clients over the Internet or an intranet. These clients might be other computers or devices that play back the content using a player, such as Windows Media Player.

Windows Media Services can deliver a live stream or preexisting content, such as a digital media file. It can be configured for doing broadcasting or for streaming on-demand of media files. Furthermore, it can work in conjunction with Windows Media Encoder Series 9 for broadcasting a stream live content.

Windows Media Encoder is capable of compressing a live stream into a format supported by the server. It can also stream encoded contents by itself, although it presents worse performance than

Windows Media Services 9 Series for doing streaming. Windows Media Encoder 9 Series is supported on Windows XP and Windows 2000 also.

Eurov6 had installed Windows 2003 Streaming Server at each Showroom enabling the streaming service over IPv6 networks. The service is available both locally and remotely between the different Showcases.

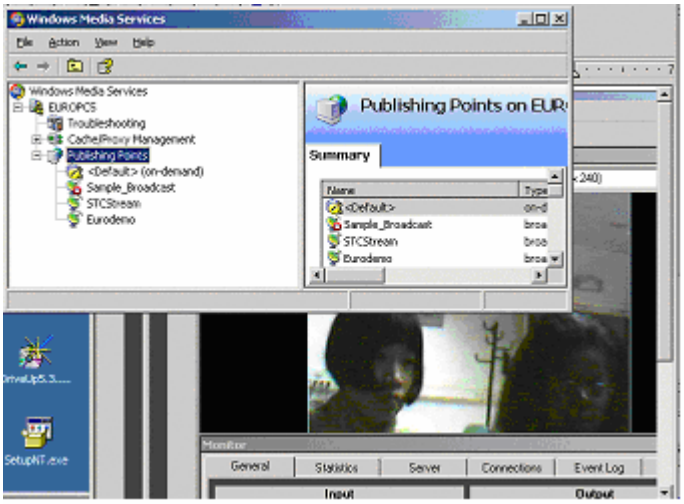

Figure 4-5: Windows 2003 Streaming Server

4.2.8 Windows Media Player 9 Series

Windows Media Player 9 Series is the component that can receive and play the audio and video streams that either Windows Media Service or Windows Media Encoder 9 Series can stream. This component also supports IPv6 and can be downloaded from http://www.microsoft.com/windows/windowsmedia/9series/player.aspx for Windows .NET XP, 98 SE, ME and 2000.

To receive the live streams is just simply open Window Media Player 9 and put the streaming server address and program name on URL.

Figure 4-6: Receiving Video Streams with Window Media Player 9

4.2.9 Tetrisnet

This is a network version of the popular Tetris game. There is not only IPv4 version to this game but also IPv6. The goal in this game is to try to fit all falling pieces in a proper way so that no blank spaces remain among them. In this network version you must connect to a tetrisnet server, which gives the permission to start to play. By means of the server, other players' games can be shown and the strategy of each player can affect to final result of the all other players.

The version installed is based on Linux and can be found in http://matrix.it.uc3m.es/~mobydick/moby.

A possible server to connect can be the following: tetris6.uc3m.ist-long.com (at 2001:720:410:1001:2c0:26ff:fea3:68f4).

There is also a complete list of servers located at http://www.tetrinet.org.

4.2.10 "Quake" Game (Client for Windows)

The Quake-Client binary file for Windows2000, named qw-client-win.exe, was downloaded from http://www.viagenie.qc.ca/en/ipv6/quake/ipv6-quake.shtml.

To play "on-line" using the IPv6 protocol, one should type:

connect quake.ipv6.viagenie.qc.ca (the IPv6 address is 3ffe:b00:c18:1::666)

4.2.11 Instant Messaging

Within the Euro6IX project, nGn has developed an on-line Instant Messaging tool to send and receive, in real time, messages among devices such as PCs, PDAs, cell telephones, and even devices belonging to home automation. Each user of these tools will have its listing of connected partners (with a fixed IP address) and will be able to interchange with them by means of the formula of shared folders, any type of files. A beta version has been tested and installed for Eurov6 demonstrations.

4.2.12 Three Degrees (Peer to Peer Application)

The new IPv6 application that Microsoft just brought out is Three Degrees, http://www.threedegrees.com, that works exclusively with IPv6. By installing it, it automatically enables IPv6, or updates automatically Windows to IPv6. This is the new kind of peer-to-peer application that runs only with IPv6 and would fail in networks built with NAT and Firewalls. Three Degrees connects people in small groups and they can share several kinds of files. The Eurov6 showroom had this application included in its demonstrations.

4.2.13 Home Portals

VTT in Finland recently converted from Linux to Microsoft its Home portal http://homeportal.ipv6.willab.fi. In this way, using Windows Media Player 9 Series, which supports now IPv6, the visitor to Eurov6 showroom can remotely visit the VTT Home portal to enable:

- connection to an IPv6 Webcam.
- switch on and off the lamp, TV, Video recorder.

This kind of application will exist in zillions when IPv6 is widely accepted by 2005 and onwards.

Similar remote interaction can be used with TV and lamp switching accessing to Galleriav6 in Japan.

5. SERVICES

The aim of this section is to give a brief description of network services that support the demonstrations of the showroom.

5.1 Network Services

5.1.1 Mobility

Mobility over IPv6 (MIPv6) is the service allowing a node to have IPv6 layer-3 connectivity when it is away from home-network. In this way, the node can be reachable by others when it has a new IPv6 address belonging to the foreign network where it is attached.

This service is still a work in progress in the IETF Mobility Working Group and no RFC is yet published. However it is in a very advanced status in the latest drafts, which indicates that no important changes will appear in the final version. That lets us implement a general mobile scenario with all necessary nodes involved in it for showing how this service works.

The scenario consists of the latest IPv6 Mobility release for Linux (MIPL), http://www.mipl.mediapoli.com, which implements all required functionalities: Home Agent, Mobile Node and Correspondent Node. It was originally developed in the HUT Software Project. MIPL Mobile IPv6 for Linux has been released under GPL and is available to anyone for free.

This implementation makes several modifications in the kernel to let an application be reachable when the node is away from its home network.

Furthermore, depending on software supporting MIPv6 for pocket devices (PDA, Palm, etc), this service could be used by the previously mentioned PDA, showing to the Showcase visitors' information about all applications located in the scenarios of the showroom.

5.1.2 Multicast

The multicast concept was thought to let applications save bandwidth in data networks. Multicast is a default feature of IPv6, but its deployment is still in the early stage. To expedite this process, the M6Bone initiative has been set up by RENATER, http://www.m6bone.net. M6Bone is an IPv6 test-bed network specifically deployed to make tests in the IPv6 multicast field. The network architecture is in the form of a star, where all sites are connected to RENATER. An IPv6 tunnel achieves the connection over either IPv4 or IPv6, using a FreeBSD system and PIM-SM daemon. The main purpose of the multicast service is the transmission of multimedia streams.

Within Eurov6, a connection has been made with the M6Bone by means of an IPv6 tunnel and applications as RAT or VIC has been used to make tests.

5.1.3 Security/VPN

As is well known, IPv6 provides security at layer 3 using IPSec. In this way common security services as connectionless integrity, datagram origin authentication, protection against replays and traffic flow confidentiality are provided for making secure connections.

These services can be used in order to implement VPNs among several hosts.

5.1.4 PKI

The goal of a PKI (Public Key Infrastructure, RFC 3280) is to provide a PKC (Public Key Certificate) management to the group of security protocols designed to protect Internet. These protocols, as IPSec, SSL, TLS (Transport Layer Security) or S/MIME (Secure Multipurpose Internet Mail Extensions) use public key cryptography to provide services such as confidentiality, data integrity, data origin authentication and non-repudiation. Users of public key based systems must trust a PKC. It is a data structure, which binds a public key to the user. This binding is achieved by having a trusted CA that verifies the subject identity and digitally signs each certificate.

PKIv6 developed in the Euro6IX project is based on a basic PKI developed in the University of Murcia; this original PKI has been extended with several services and, of course, with IPv6 support. The PKIv6 test-bed set-up in UMU is a complete system, which can offer certification services to final users and VPN devices, such as an IPSec router. Final users, including Eurov6 users, can reach PKIv6 through a web browser, https://pki.umu.euro6ix.org, and VPN devices should use the SCEP protocol or 6WIND SCP method to get PKCs. Moreover, users can use smart cards to store their public and private keys. This PKI is also accessible through the IPv6 6Bone network.

5.1.5 QoS

QoS is a desired feature within a network transporting audio and video traffic such as either real-time audio and videoconference or audio and video streaming. Even more, elastic traffic such as http, or ftp, could request QoS for demanding users.

In the Fix showroom, QoS is provided by:

- QoS Traffic Class enabled routers/hosts using this field for DiffServ specification, outgoing priority control levels, discard control classes, incoming bandwidth control and outgoing bandwidth control. The basic idea for showing how QoS can affect the performance of an application is to compare two streaming player applications. One of them will be in a network with QoS support, whereas the other one will be in a network without it. Between them and the streaming server a DiffServ router will be in charge of giving the proper priority to the streaming packets that are being forwarded through it according to the policies previously specified.
- QoS Flow Label enabled implementation. The flow label in the IPv6 header is a new feature, whose usage is currently being defined. Through Telscom, Eurov6 has one of the first implementations of the use of this field for controlling QoS. The sending end system chooses the type of flow that is going to be forwarded, in terms of real-time performance. Depending upon the type chosen, the software marks the flow label field with a value according to an association table in which the associations between the service and the flow label field are stored.

Regarding IPv6 DiffServ, Eurov6 trough EuroDemo have installed Redhat7.3 on six PCs. 3 PCs are acting as IPv6 DiffServ routers and they are called diffserv1, diffserv2 and diffserv3 in the following figure.

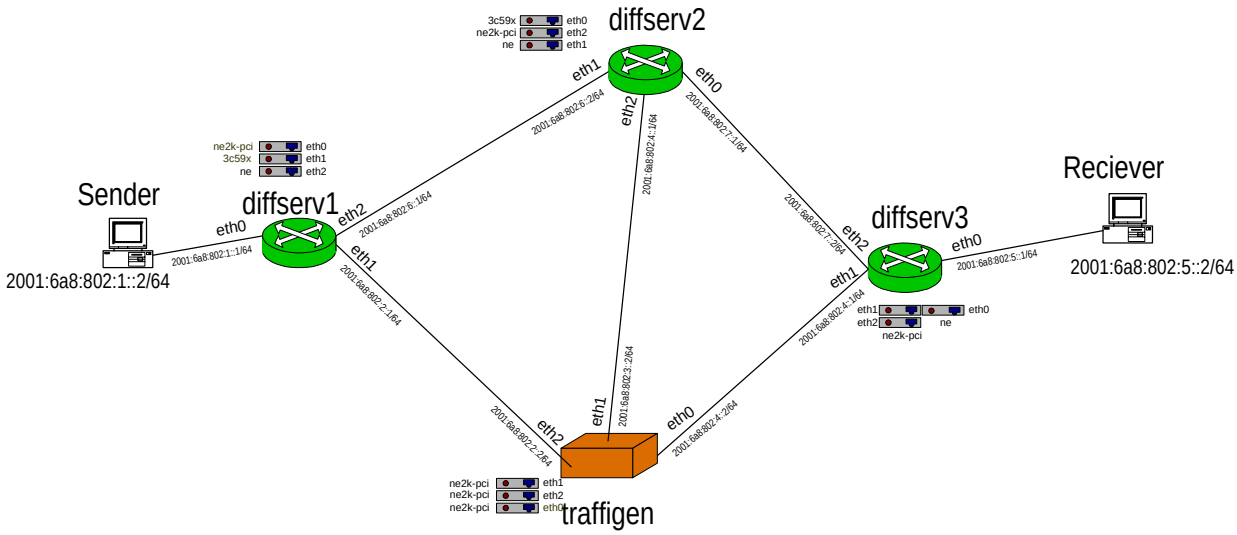

Figure 5-1: IPv6 DiffServ Test-bed

One PC called traffigen is a traffic generator to inject traffic to DiffServ routers. For the rest of two PCs, one is sender and another is receiver. The DiffServ test is successful and will be reused for the ETSI Plugtests study.

5.1.6 DNS

DNS is one of the most important services in the Internet. To support IPv6 addresses new AAAA records are used. Bind (DNS daemon) supports them from version 9. Since the IPv6 network is not universally available, requests can be issued and answered both over IPv4 and IPv6, allowing passing between IPv6 islands.

A DNS server is installed for both demonstration purposes and being used inside the showroom. In order to have showroom machines identified by a name, the DNS server is used.

The domains available for the project are: eurov6.org, eurov6.com, eurov6.net, eurov6showcase.org, eurov6showcase.com, eurov6showcase.net, ist-eurov6.com, ist-eurov6.net and ist-eurov6.org.

One important issue is the lack of IPv6 accessible root and TLD DNS servers. This means that IPv4 connectivity in our network is needed for recursive DNS lookups. If we deploy an IPv6 native network, with no IPv4, then we won't have "global DNS resolution", but "local IPv6 DNS resolution" of the local zones. One possible solution is to use a forwarder DNS server with dual stack.

5.2 Network Infrastructure

5.2.1 Network Connectivity

The Eurov6 project interconnects three operative showrooms in Brussels (University of Brussels), Telscom (Basel) and Consulintel (Madrid) via native IPv6 or tunneled IPv6 connections. Connectivity is extended worldwide via Euro6IX, GÉANT and 6Bone and multicast links to the M6Bone multicast project. This infrastructure allows distributing demonstrations among showrooms and other remote sites.

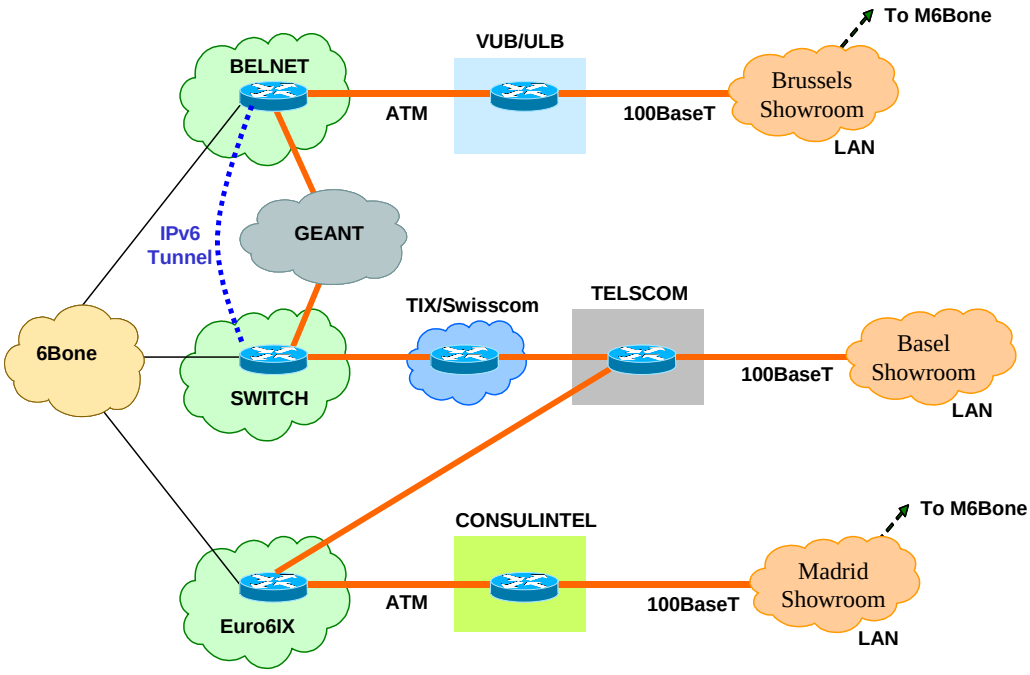

Figure 5-2: Eurov6 Showrooms Interconnection

EuroDemo makes use of the infrastructure developed by the NGN-LAB project, which inter-connects two operative test-beds in Brussels and Basel via tunneled IPv6 connections. EuroDemo connects 6Bone and 6NET through a tunnel to SWITCH. BELNET dedicates the bandwidth of 100 Mbps for the tunneled IPv6 traffic. In the context of Eurov6 project, Alcatel in Antwerpen connects its core router A7770 OBX with EuroDemo network. 6WIND offered two routers for testing: One for EuroDemo and one for Basel.

Madrid Showroom connects European and Worldwide IPv6 network through a native IPv6 link over ATM to Euro6IX. The main router here is a Hitachi GR2000-10H with hardware support for IPv6.

IPv6 multicast connectivity is implemented through a FreeBSD multicast router tunneling to RENATER.

5.2.2 Wireless Access

Within the showrooms exist several wireless points of access exploiting the functionalities of the main wireless technologies.

Bluetooth

The Bluetooth technology, with speeds of up to 721 kbps is well suited for most Internet applications, including low-requirement multimedia transfers such as audio and video streaming/conferencing. Low power consumption is an important advantage over Wireless LAN, especially with mobile devices, where battery life is crucial.

IrDA

IrDA or Infrared Device Access is designed to support transmission of data between two devices over short-range point-to-point infrared links at speeds between 9.6 kbps and 4 Mbps. IrDA is suited to ad-hoc point-to-point networking, due to the fact that its speed and configuration

parameters are transparently negotiated at connect time and a common set is used for the connection.

WLAN

WLAN (802.11b) technology offers access at 11 Mbps, which is enough even for demanding multimedia applications. Common applications for streaming/conferencing such as VIC and RAT and rat can be used without any problems. Within the Showcases, WLAN access for IPv6 worked with the automatic settings for several mobile devices. This shows the advantage of IPv6 Autoconfiguration over DHCP in IPv4, which has to be invoked.

GPRS

GPRS offers speeds theoretically up to 115 kbps, but in practice the achievable bandwidth is about 40 kbps downlink (3-4 slots) and 10 kbps uplink (1 slot). This is enough for services like e-mail, web browsing or chatting but too little for multimedia services like audio or video transfer.

5.2.3 Transition Mechanisms

When IPv6 hosts need to communicate with either a IPv4 host or a IPv6 through IPv4 networks they have to use IPv4 protocol in some way. Therefore some transition mechanism is needed to solve this situation. Several of them have been developed presenting different features for best fit in each specific case. Following are the main mechanisms tried and used, for either Fix or Nomadic Showcase, permitting an IPv4-IPv6 communication.

Dual Stack

Each host with an IPv6 stack also has an IPv4 stack in order to communicate properly with an only IPv4 host.

Stateless IP/ICMP Translation Algorithm (SIIT)

This mechanism translates packet headers between IPv4 and IPv6 (including ICMP headers) in order to enable a communication between IPv4 and IPv6 hosts. However some restrictions have been presented with this mechanism. Specifically, neither Flow Info nor Traffic Class can be translated. Furthermore, SIIT does not support the translation of IPv6 Routing Header, IPv6 Hop-by-Hop Extension Header and IPv6 Destination Options Header; other issues with IPSec and multicast translations have been identified.

NAT-PT

The ULTIMA system implements this transition mechanism, which has been tested for support of demonstration tasks.

ISATAP

With this mechanism an IPv6-in-IPv4 tunnel can be used for allowing communication between IPv6 hosts through IPv4 networks. ISATAP consists in a server part, which work as router, and a client part, which is the host that wants to be connected through the IPv4 network.

Tunnel Broker

This is another way to get connection to an IPv6 network through an IPv4 network. The tunnel broker is located in the border IPv4-IPv6 router and creates a static IPv6-over-IPv4 tunnel against the IPv4 address of the IPv6 host that wants to be connected to the IPv6 network.

There are two operative internetworking facilities between IPv4 and IPv6 at EuroDemo: one is the FreeBSD-based NAT-PT implemented by BTexact and another is the router-based NAT-PT implemented by 6WIND. Both are fully tested at EuroDemo. Users can access IPv6 resources on the IPv6-only network through the Internet and vice versa.

5.2.4 PLC Network

As said above, a basic PLC network is present in the showroom. It's a part of the network deployment inside the 6POWER project, and it's connected to Euro6IX project's backbone. This infrastructure is used with IPv6 for demonstration with audio/video applications because of the bandwidth that can drive the installed PLC devices.

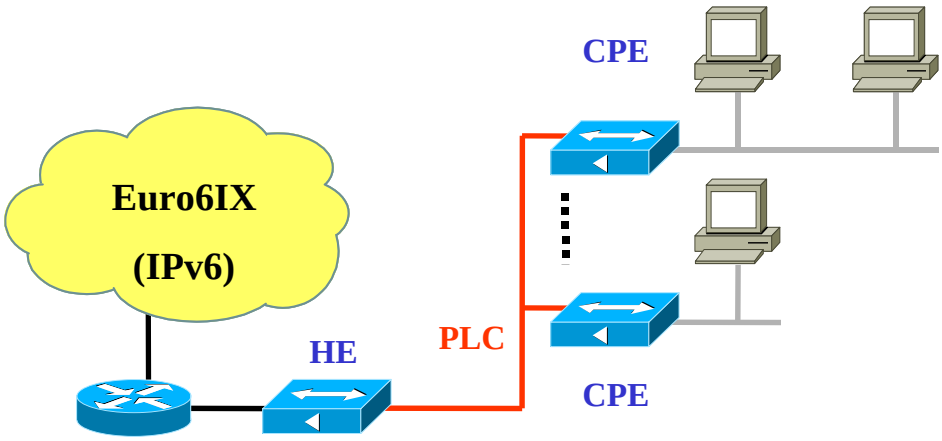

Figure 5-3: PLC Network for Demonstrations

6. ENHANCEMENTS

Beyond the current status of the devices, applications and services integrated in the Showcase, the planned enhancements include:

- More complete Mobile IPv6 implementation and connectivity to the GPRS network.
- Installation of an advanced version of the security package.
- Enhancement of the QoS features.
- Test interworking and interoperability.

Specifically Eurov6 are working on:

IPsec VPN

IPsec VPN over IPv6 between Brussels and Basel will be soon setup and tested. The two sites will be in the same virtual LAN.

Mobistar

In the current state, a PDA can only be connected to the IPv4 Internet through GPRS. In order to connect it to the IPv6 network is necessary to build a tunnel by using the obtained IPv4 public address. Nokia has developed a solution that enables a PDA to build a IPv6 link directly. The IPv6 feature is implemented in GGSN. Mobistar has a plan to test the IPv6 feature on Nokia GGSN node and will soon make a join-test with EuroDemo. As Mobistar has no IPv6 connectivity, they will connect their GGSN to EuroDemo through the tunnel. The architecture of the joint-test-bed is shown in Figure 6-1. In a first phase, the aim is to run some streaming applications over the network.

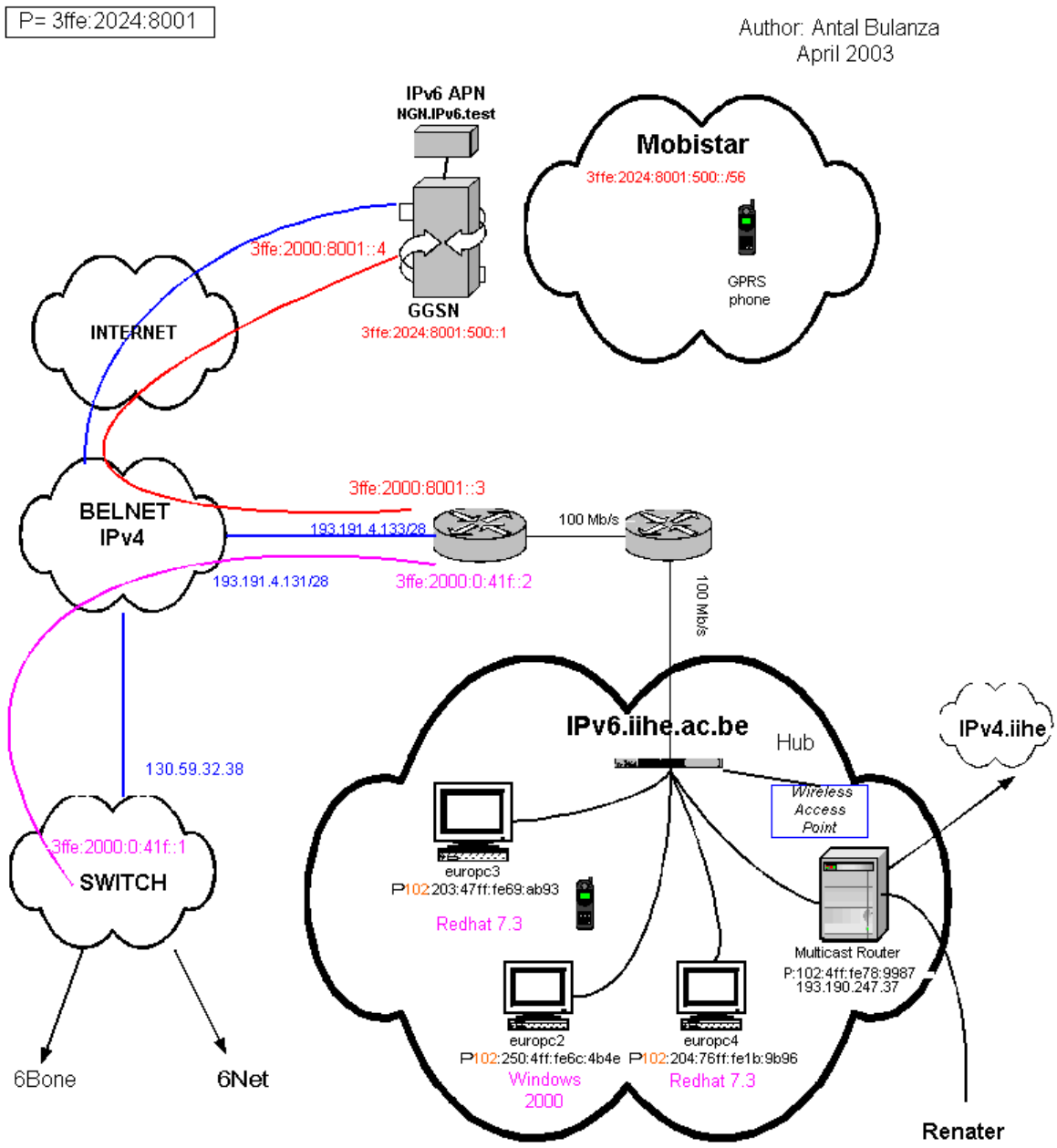

Figure 6-1: Mobistar and EuroDemo Join test-bed

Regarding the Eurov6 interaction system, it is necessary to do a fine set up of the interaction system between the guest and the devices and applications existing in the demos areas of the Showcase. As stated in deliverable D2.2, that interaction system will dynamically upload a voice and even video file associated with each area or demonstration, so that the users could hear an explanation associated to each area. At this way, we allow a user to realize tasks such as real time connections between different kinds of devices (fixed and mobile), video and audio conferencing over IPv6, etc. With this "tour", the final user will get a major knowledge of the IPv6 protocol capabilities, as well as its current state of integration in the real world applications, appliances and services.

Another future enhancement is about the increment of remote interactions from Eurov6 showrooms to external worldwide IPv6 demonstrators. For example:

- Remote use of IPsec in showing encryption when accessing confidential patient files from 6WINIT.

- Hitachi in Japan has a cool location-based roaming from cell to wire.
- NTT DoCoMo has a cool hand-off from WiFi to 2.5G.

In addition, the Fix Showcase concept is been extended to the Nomadic Showcase by implementing a Mobile kit that can be moved in short notice to a remote places to set up moving IPv6 Showcases in spaces as trucks, events, shows, conferences, and similar situations. A following Eurov6 D2.4 Deliverable “Nomadic showroom scenario and possible enhancements” will give details about the Nomadic Showcase.

7. SUMMARY AND CONCLUSIONS

This document presents the Eurov6 Fix Showcase scenario and possible future enhancements. It explains the integration of System concept, devices, applications and services in the Fix Scenario, and gives a reference for detail report of the exact configurations in order to be easily reproduced in similar environments.