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| <b>Abstract:</b><br><br><br><br><br><br><br><br><br><br>This document presents the concept of IPv6 technology and application demonstration and the skeleton scenario that would be available as a permanent Showcase of IPv6 technology.<br><br>In addition there is a description of a “packagable” Showcase set that would be also considered for taking the IPv6 demos to events for dissemination and aware creation. |
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# Executive Summary

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

This document defines a concept of IPv6 Showcase where all issues that will be involved in Eurov6 project can be identified and defined.

Four areas (home, infotainment, business and open areas) are described, and different access and core technologies identified.

Several applications and demonstrations are introduced as examples of those that will be made available in the show room.

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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 we will include:

- Bringing together vendors as 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").

So, with this project the benefits and advantages of usage of the new IPv6 characteristics will be shown.

In order to achieve this objective it is necessary to define a concept of IPv6 Showcase where all issues that will be involved in Eurov6 project can be identified and defined. That is this document aims.

IPv6 Showcase will be located at a few places in Europe and all of them will be demo centers having all means to allow vendors and sponsors to demonstrate their devices, systems and user application all of them IPv6 based. In this demo centers we will try to demonstrate the usage of IPv6 in the following interesting areas:

## Home environment

- In the home environment, one can be in the perfect IPv6 world. For example, you do not have to think of using food before it goes bad: Net refrigerator informs you which food is fresh, how much you have in stock and indeed orders food on your behalf from the supermarket. It also downloads recipes from cooking websites and controls Net microwave ovens and cooking heaters, so a wonderful dinner can be served. Through mobile devices, you can even control room lights, air conditioners and music and video devices. The main advantage of usage of IPv6 here is the network parameters autoconfiguration, which permit users with no technical experience use all devices networked with this protocol.

## Entertainment environment

- More and more frequently users want to have access to Internet to enjoy the new networking applications like networking games, music distribution, radio and television broadcasting, and even application that allow users keeping in touch with friends or relatives like mail list, chat and videoconference tools, etc. All of them are applications that employ an important and useful functionality of IPv6: Multicast.

## Business environment

- There are multiple audio/video and multimedia applications with a peer-to-peer connection without any network and address translation having the features of QoS, security (authentication and encryption), seamless service operation such as multiple access services, sharing of workspace across distributed teams, ... Applications and services such as Voice over IP and Videoconferencing over IP (e.g. the ISABEL system) would constitute prime demonstrators. Even banking applications, which need security in all their remote operations can be demonstrated to show the benefits of usage of IPSec.

### Mobile environment and terminals

- Cars will more and more have Internet connectivity and hence represent a permanent 'always-on' network scenario on the move, so that the virtual office can always be where the person is located. Eurov6 will seek to approach European car manufacturers in order to demonstrate their prototypes. Furthermore different kinds of mobile terminals with IPv6 addresses allocated; mobile IPv6 applications demonstrating real-time features of IPv6 such as 'voice over IP', video and music on demand, etc., besides data applications that are well known.

In the next sections all details about demo areas, specific applications and network infrastructure will be further developed.

All issues regarding the infrastructure, to provide connectivity to all devices will be provided by the Showcase.

## 2. PERMANENT IPV6 SHOWCASE CONCEPT

### 2.1 Demonstration Sections

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

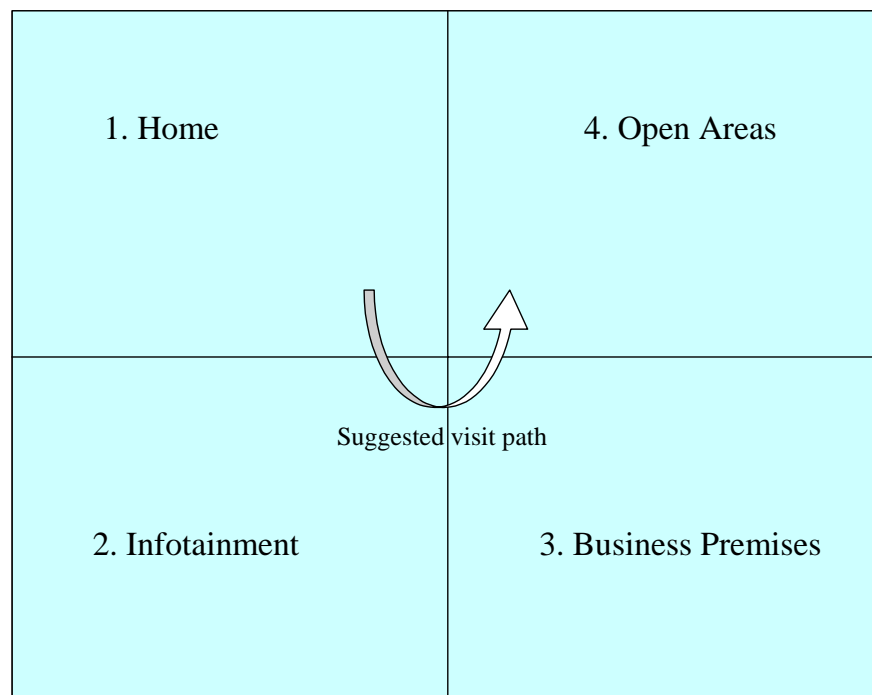
So the Showroom will be divided in these sections:

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

Each section will show specific applications suitable for each environment.

The basic concept is to have user-friendly demos. Every application, concept or technology must be as amazing as possible. Video and sound, that are much more funny than text screens, will make this possible.

The interaction between the Showroom elements must be present wherever it was possible, for example, audio and video between hosts in different sections.



**Figure 2-1: Showroom Demonstration Sections**



### 2.1.1 Home Section

Everything related to the home environment, like home automation devices, can be showed in this area. Even some kind of furniture or appliances (kitchen, living room) to simulate a home would add more “visibility”.

In this environment, the typical network access technologies used could be: xDSL, Cable, WLAN, PLC, FTTH and 3G.

The devices can communicate among them via PLC, WLAN, Bluetooth, IrDA and Ethernet. See the network section for more information on these technologies.

The applications to show would be:

- Home automation: Internet freezer, washing machine, micro-wave oven, coffee maker, etc.
- Security, surveillance, alarms, cameras, video and audio devices.
- Conferencing, distance learning and teleworking.
- Other applications showed in the infotainment section.

See the applications chapter for more information on the applications.

### 2.1.2 Infotainment Section

Network access technologies could be: xDSL, WLAN, PLC, 3G, DVB-T, DVB-S, DVB-C, leased-lines.

Devices can communicate via PLC, WLAN, Bluetooth and Ethernet. See the network section for more information on these technologies.

The applications to show could be:

- Gaming: Network games (i.e., Quake), others.
- Music: v6 Karaoke.
- Image: VoD and iTV.
- Wearable devices/networks.
- P2P applications: Kazaa, e-donkey, messengers, etc.

See the applications chapter for more information on the applications.

### 2.1.3 Business Section

Network access technologies commonly used could be: xDSL, WLAN, PLC, lease-lines and LMDS.

Devices can communicate via PLC, WLAN, Bluetooth and Ethernet. See the network section for more information on these technologies.

The applications to show could be:

- Professional multi-conference.
- Use of Security and Multicast: VPNs.
- Web applications.
- VoIP, FTP, Web, mail, security.

- Databases.
- GRID.

See the applications chapter for more information on the applications.

#### **2.1.4 Open Areas Section**

Network access technologies used could be: WLAN, 3G, Bluetooth and Ethernet.

See the network section for more information on these technologies.

The applications to show could be:

- Video and audio conferencing.
- Public Internet Services (“kiosks”).
- VPN service: Connection to office using secured VPN and QoS.
- AAA.
- Hot spot services include “street”, hotels, cars, trains, airports and planes, information panels, Localization services, maps and all kind of “information” applications, transport tickets booking service, check-in at Hotels and transports.
- Photo-printing services.

See the applications section for more information on the applications.

### **2.2 Demonstration Interaction**

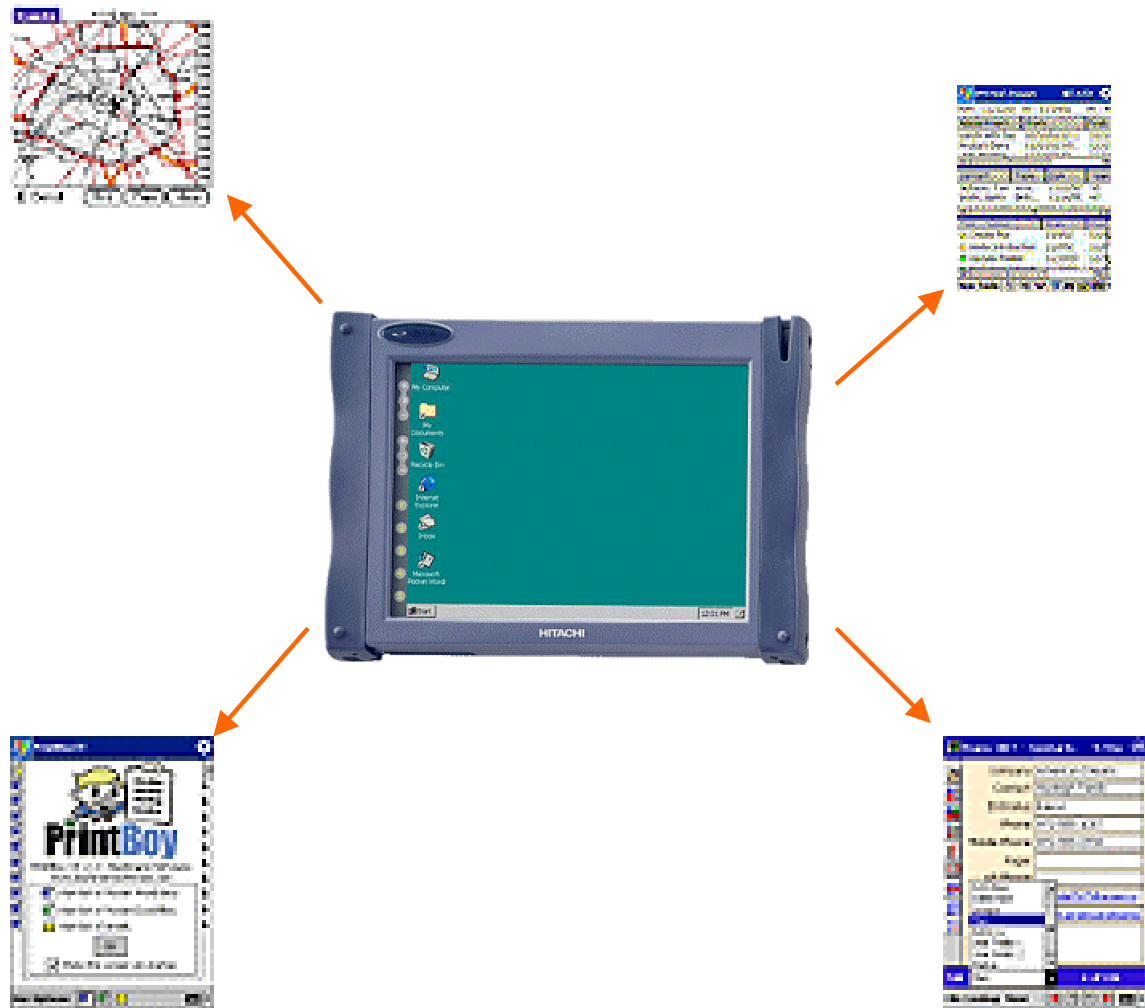
Guest assisting to the Showcase will have the possibility of interact with the devices and applications existing in the demos areas.

We propose two kind of tour. The first one will be carried- out with the help of a PDA device. At this way, we highlight the concept of a Showroom that must be as amazing as possible. The second kind will be carried-out with a traditional interaction where the guest see directly the devices and listen some explication. This kind of tour could be suitable for persons that feel uncomfortable with the use of a PDA.

In the first kind of tour, at the entrance of the Showroom each guest will be able to obtain a lended PDA, table PC or similar appliances, with IPv6 & WLAN or Bluetooth, in order to be guided through each section and demonstrations. The device will have headsets for individual guidance of the visitor.

This device has a double sense: Firstly, as said before and if the current technology permits it, will be a way to allow the users to move, at their own pace, in the Showroom, as a kind of a GPS system. The user does not need anybody to guide him about where he has to go. On the other hand, it demonstrates some of the main functionalities and capabilities of IPv6, since allows the user to interact with other devices existing in the Showroom running specific applications, and totally autoconfigured.

When a guest arrives to a new section, the mobile device will inform him of this fact by means of a voice file, and immediately will show all the interaction possibilities of that section, for example as illustrated in Figure 2-2.



**Figure 2-2: PDA Interaction Screens**

Each section will be represented by a different background color in order to facilitate the identification by the user, so each guest having a PDA will exactly know where he is in every moment, simply having a look at his PDA.

The applications previously commented will dynamically upload a voice and even video file associated with each area or demonstration, that the user could hear for understanding its function and the way of running them. 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 integration state in the real world applications, appliances and services.

### 3. NOMADIC IPV6 SHOWCASE CONCEPT

Keeping as far as possible the concept of the user-friendly demos, the use of application or technology in a amazing way, and the sections of Home, Infotainment, Business premises and Open areas stated before in the Permanent IPv6 Showcase concept section, the idea here is to have a mobile and packagable Showcase subset with IPv6 demonstrations that would be carried to the to events for dissemination and aware creation.

This Mobile subset should be flexible so as to fit in several kinds of technological events. Those focused in IPv6, with an extended range of applications and more in-dept IPv6 technical content. And those non-focused in IPv6 but in IT issues, with more general and amazing IPv6 applications.

It could be further extended to a simple auto-installable CD-ROM and a subset of applications and demonstrations to hand-out to the visitors of very general events, event not related to IPv6 at all, for example, home automation shows, security fairs, or vending machines exhibitions, just to mention a few of them.

## 4. APPLICATIONS

As stated in the Permanent IPv6 Showcase concept section, the possible applications to be demonstrated are a lot, so we will need to make some kind of selection. As some of these applications can be demonstrated in various areas, in this section we enumerate them and indicate in which section they could be fit.

The concept of application in the Showroom includes more than just a piece of code running on a machine. An application is everything that is useful for demonstrating some kind of technology. Also the applications must be as much “glitter” as possible in order to catch the visitor attention.

For example, if you want to show the QoS capabilities of IPv6, you can use a traffic generator with ASCII messages saying that the time taken for packets to arrive to the destination is bigger when you insert high priority traffic with another traffic generator. The user simply will pass through your demo to the next one. But if you use, for example, two video streaming applications, one with a better QoS allocation, the user would be able to see how one of the film’s images get worst when the high priority traffic one starts.

Also sound applications could be used instead of video ones. The goal is to catch the user attention, not assuming they are interested beforehand.

Let’s take another example: If you want to show the benefits and how a VPN implementation works, you could use a sniffer to see the packets with or without encryption. But if you use an audio streaming flow and you try to listen it “in the middle”, you could hear how the music becomes noise when you switch on your VPN.

Also those applications where the user could be more identified are obviously more recommended. For example, when you are in the Open Areas section, you remember that you need to buy food. Then, you can connect with your fridge to know what do you need or even what you have written in your “fridge’s electronic post-it®”, to decide what you would buy.

The inclusion of specific applications will depend on the current availability for the Showroom, from manufacturers, sponsors, ...

Following sections describe a few applications that must be considered at least as starting point.

### 4.1 Home Automation

Used in Home section and includes all the home devices and appliances that are currently being developed by several manufacturers.

The unmanaged functionalities of IPv6 are a key issue here, as the user doesn’t want to configure the freezer, for example.

### 4.2 Security and Surveillance

Used in Home, Business and even Open Areas sections.

Here are included all kind of sensors, video cameras, gas/fire detection, alarm systems and security devices that takes advantage of always-on connectivity. This allows remote monitoring and configuration.

### **4.3 Gaming**

Used in Home and Infotainment sections and maybe in Open Areas. Consider that, for example, you have to wait 5 hours for a delayed flight. Regarding the Open Areas, even a new business case can be developed.

All the existent network games could be demonstrated, but it's possible that a "new generation" of P2P network games appears, allowing for example that some people in the same airport's hot spot start an "ad-hoc" Quake III dead-match play.

### **4.4 Audio**

Used in Home, Infotainment and even Open Areas.

All kind of audio streaming, as commercial radio stations, are included. Everywhere we can find music, news, advertisements, and so on.

Applications like a network Jukebox, that could be free or maybe you have to pay for each song.

### **4.5 Video**

Used in Home, Infotainment and even Open Areas sections.

TV channels, VoD (video on demand) and iDTV (Interactive Digital TV) are included within this kind of applications.

### **4.6 P2P**

It could be used in all sections.

The P2P paradigm would be possible with IPv6. This way, applications like e-donkey and Kazaa and all the new ones that will appear will bring the opportunity to communicate with everyone, no matter where you are, or where you move. Examples could be peer to peer instant messaging, and file sharing applications.

### **4.7 GRID**

Used in Home and Business sections.

This kind off distributed applications will allow the optimization in the utilization of network resources. This idea fits perfectly in the business environment.

IPv6 brings the opportunity of connecting "grid elements" wherever they are and how many they are, no matter where you are, or where you move.

One famous example of GRID is SETI@Home.

## **4.8 VPN**

Used in Home, Business and Open Areas sections.

The use of VPNs in Home and Open Areas will support the teleworkers, enabling secure connection to office so as to carry out tasks that require an access control. The Business world could be enhanced with the use of static and dynamic inter-office VPNs.

## **4.9 AAA**

Used in Business and Open Areas.

The user that makes usage of a public network could be billed for the network utilization.

## **4.10 Hot Spot Services**

Used basically in Open Areas. Maybe they also fit in the Home and Business areas.

All the services that could make the user life easier could be included here. Issues like a place map (airport, rail port, etc.), a city map, transport map, local services (for example, where can I find a soda in the airport and also know which vending machine is not empty), city services and in general all kind of “information services”.

Hotel and ticket reservation service can be included here.

## **4.11 Wearable Devices**

A wide range of networked clothes and wears could be used in all sections.

## **4.12 Sports**

Used in Home, Infotainment and even Open Areas sections.

Sport news, contest results, live event broadcasts in one hand, wearable devices for measure task (for athletes), in the other hand.

## **4.13 Health and Public Safety**

Used in Home Environment, Business Premises and Open Areas sections.

Some ideas that will take into account are related to emergency services. In this kind of services, applications will be able to communicate to hospitals, firemen, police and other security and health entities to notify them any kind of emergency.

These applications take advantage of always on connectivity in order to help users to communicate to local emergency services after disasters occur, either natural (flood, earthquake,

volcanic eruption, tidal wave, hurricane, typhoon, ...) or in relation to major accidents (plane crash, big road accident, train wreck, ...), industrial disasters, terrorism and peacekeeping.



## 5. NETWORK

The set of application within Eurov6 Showcase require a flexible combination of network technologies in term of deployment, scalability, functionality and manageability. In addition, this network must be as complete as possible in term of kind of wire and wireless technologies (Ethernet, WLAN, Bluetooth, IrDA, PLC, xDSL, etc.) so as to show the interaction and performance of IPv6 in a wide range of networks and applications.

To make easy a global vision of all networks and their features that will be considerate, we will distinguish between the following two layers: Access and network layer.

The described networking technologies not necessarily will be deployed in the show room, but the different demonstrations will be made considering these technologies.

### 5.1 Access Layer

#### 5.1.1 Wireless Technologies

Wireless technology is one of the most disruptive and promising IT forces for next years. The main technologies within this area are:

##### 5.1.1.1 Bluetooth

Bluetooth is a technology that use short-range (around 10-100 meters) radio links, intended to replace the cable(s) connecting portable and/or fixed electronic devices. It is envisaged that it will allow for the replacement of the many propriety cables that connect one device to another with one universal radio link. Designed to operate in noisy frequency environments, the Bluetooth radio uses a fast acknowledgement and frequency-hopping scheme to make the link robust. Bluetooth radio modules operate in the unlicensed ISM band at 2.4GHz, and avoid interference from other signals by hopping to a new frequency after transmitting or receiving a packet. Compared with other systems in the same frequency band, the Bluetooth radio hops faster and uses shorter packets.

##### 5.1.1.2 IrDA

IrDA or infrared is designed to support transmission of data between two devices over short-range point-to-point infrared at speeds between 9.6Kbps 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. In fact, IrDA at 4 Mbps is compatible with 9.6 Kbps IrDA. Additionally, the IrDA connector is completely sealed, inexpensive, and available from multiple vendors. IrDA borrows from the well-known and successful client/server connection and programming model defined by the TCP/IP family of protocols.

### 5.1.1.3 WLAN

Wireless takes to the streets, airports and parking. Several Open Areas sector aims to exploit new types of mobile services via WLANs enabling customers to access home LAN, office-LAN via wearable computing devices (laptops, PDAs, cameras, mobile phones, etc).

Wireless LAN technology offers the same flexibility as that afforded by the cellular phone revolution, but is currently restricted to a 45-metre radius (typical) from the transmission hub (access point).

Nowadays there are two wireless LAN standards that are of practical interest. The fastest operates at 11Mbps (IEEE802.11b). The second operates at only 2Mbps but generally achieves a greater range and has the option of 128 bits data encryption.

Latest developments raised the speed up to 54 Mbps., which has been standardized as IEEE802.11a.

### 5.1.1.4 HiperLAN-2

HiperLAN/2 has a high transmission rate, which at the physical layer extends up to 54 Mbps and on layer 3 up to 25 Mbps. To achieve this, HiperLAN/2 makes use of a modularization method called Orthogonal Frequency Digital Multiplexing (OFDM) to transmit the analogue signals. In a HiperLAN/2 network, data is transmitted on connections between the MT and the AP that have been established prior to the transmission using signaling functions. The connection-oriented nature of HyperLAN/2 makes it straightforward to implement support for QoS. Each connection can be assigned a specific QoS, for instance in terms of bandwidth, delay, jitter, bit error rate, etc.

The HiperLAN/2 protocol stack has a flexible architecture for easy adaptation and integration with a variety of fixed networks. A HiperLAN/2 network can for instance be used as the “last hop” wireless segment of a switched Ethernet, but it may also be used in other configurations, e.g. as an access network to third generation cellular networks. All applications, which today run over a fixed infrastructure, can also run over a HiperLAN/2 network.

### 5.1.1.5 GPRS

The General Packet Radio System (GPRS) is a new service that provides actual packet radio access for mobile Global System for Mobile Communications (GSM) and time-division multiple access (TDMA) users.

The main benefits of GPRS are that it reserves radio resources only when there is data to send and it reduces reliance on traditional circuit-switched network elements. The increased functionality of GPRS will decrease the incremental cost to provide data services, an occurrence that will, in turn, increase the penetration of data services among both, consumer and business users.

In addition to providing new services for today's mobile user, GPRS is important as a migration step toward Third-Generation (3G) networks. GPRS will allow network operators to implement all IP-based core architecture for data applications, which will continue to be used and expanded upon for 3G services for integrated voice and data applications. In addition, GPRS will prove a

testing and development area for new services and applications, which will also be used in the development of 3G services.

#### **5.1.1.6 EDGE**

EDGE (Enhanced Data rates for GSM Evolution) is a third-generation radio interface technology that can be introduced into GSM and TDMA networks in order to support data and multimedia services and applications. EDGE supports speeds at 384 Kbps in wide areas and at considerably higher speeds indoors within existing 800, 900, 1800 or 1900 MHz radio spectrum bands. EDGE is fully IMT-2000 compliant. Compared to the data services currently available from TDMA and GSM, EDGE provides significantly higher capacity and always on-line connectivity.

EDGE has important benefits for users, as it is suitable for high-speed access to Internet, multimedia and data services, and the 'always connected' look and feel of the services. Using EDGE, customers will be able to utilize their full suite of services as they travel between TDMA and GSM networks on all frequency band, giving them access to global seamless communications.

#### **5.1.1.7 UMTS**

UMTS (Universal Mobile Telecommunications System) is one of the major new Third Generation mobile (3G) communications systems being developed within the framework, which has been defined by the ITU and known as IMT-2000.

As the subject of intense worldwide efforts on research and development throughout the present decade, UMTS has the support of many major telecommunications operators and manufacturers because it represents a unique opportunity to create a mass market for highly personalized and user-friendly mobile access to tomorrow's "Information Society".

UMTS is conceived as a global system, comprising both terrestrial and satellite components. Multi-mode terminals operating also via 2G systems (e.g. GSM 900 and 1800) will further extend the reach of many UMTS services. With these terminals a subscriber will be able to roam from a private network into a pico-cellular/micro-cellular public one, then into a wide area macro-cellular network (e.g. a 2G network), and then to a satellite mobile one, with minimal break in communication

### **5.1.2 Wired Technologies**

In the Eurov6 project we will consider the possibility of attaching devices and application through several wired technologies, like Ethernet, Fast Ethernet, Gigabit Ethernet, USB, Power Line Communications (PLC), and others.

These wired technologies in conjunction of IPv6 capabilities are already being researched and deployed by other IST projects, like Euro6IX, 6NET, 6POWER, etc.

Eurov6 will maintain a close relationship with these projects.

## 5.2 Network Layer

Eurov6 could not only use the Euro6IX and 6NET networks, but also other networks as GEANT, DANTE, Abilene, WIDE and so on. In this way a number of user groups in European regions and outside could use Showroom facilities so as to see and test the IPv6 characteristics.

In the other hand, Eurov6 IPv6 network must count on hardware and software platforms that support the IPv6 network advantages, as:

- QoS.
- Multicast.
- Security.
- Mobility.
- Autoconfiguration.

These features have been identified as important pieces for the Next Generation Internet by most of the initiatives related to this topic. The IPv6 networks supporting these features will allow Next Generation applications to be offered to users. In this way, the advanced applications will enable more interesting collaboration among people and interactive access to information and resources in a way not possible on today's Internet.

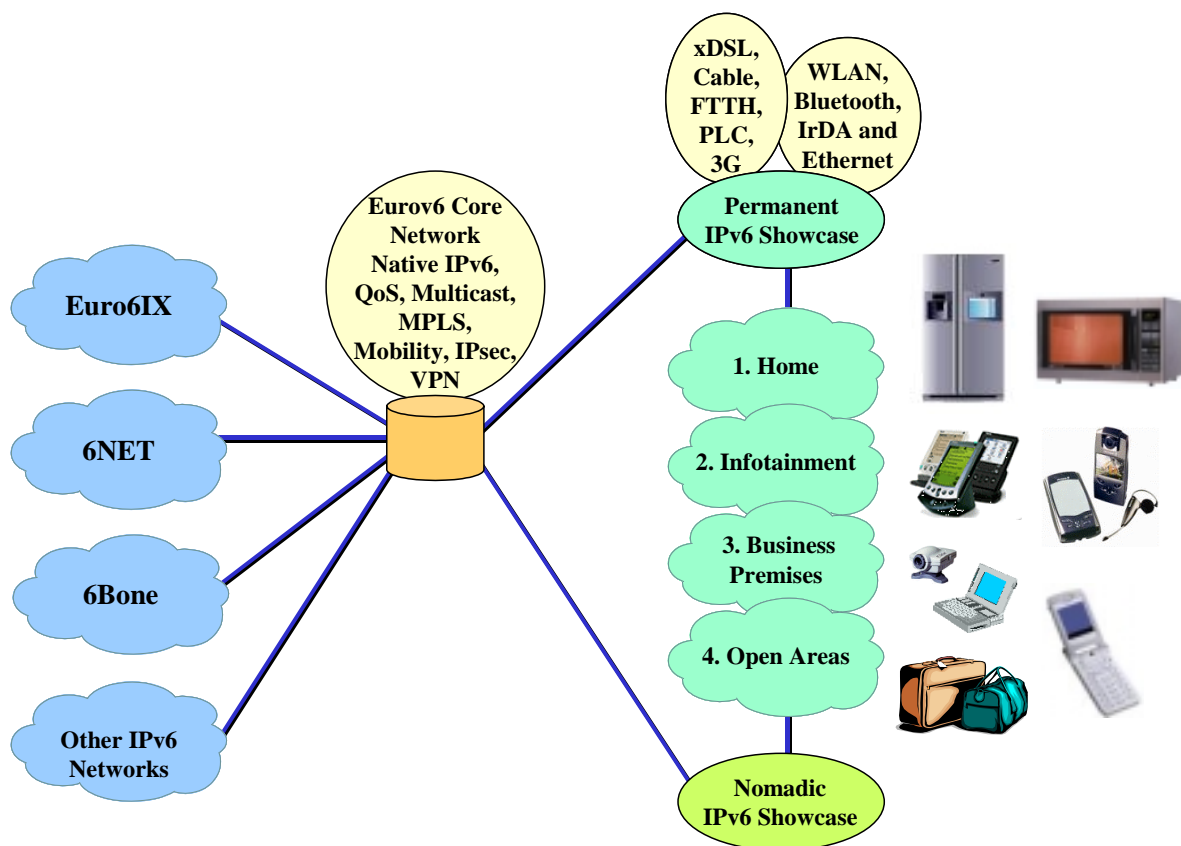


Figure 5-1: Eurov6 Network

## 6. SUMMARY AND CONCLUSIONS

The Eurov6 showrooms will have different demonstration areas, namely home, infotainment, business and open areas.

Several applications and demonstrations, using different access and core network technologies could be made available, depending on the resources gathered from the sponsors.

The user will “touch” these demonstrations and play a proactive role, using an IPv6 enabled PDA or similar device to “tour” in the showroom. This device will have some kind of video and/or audio track to facilitate the visit.