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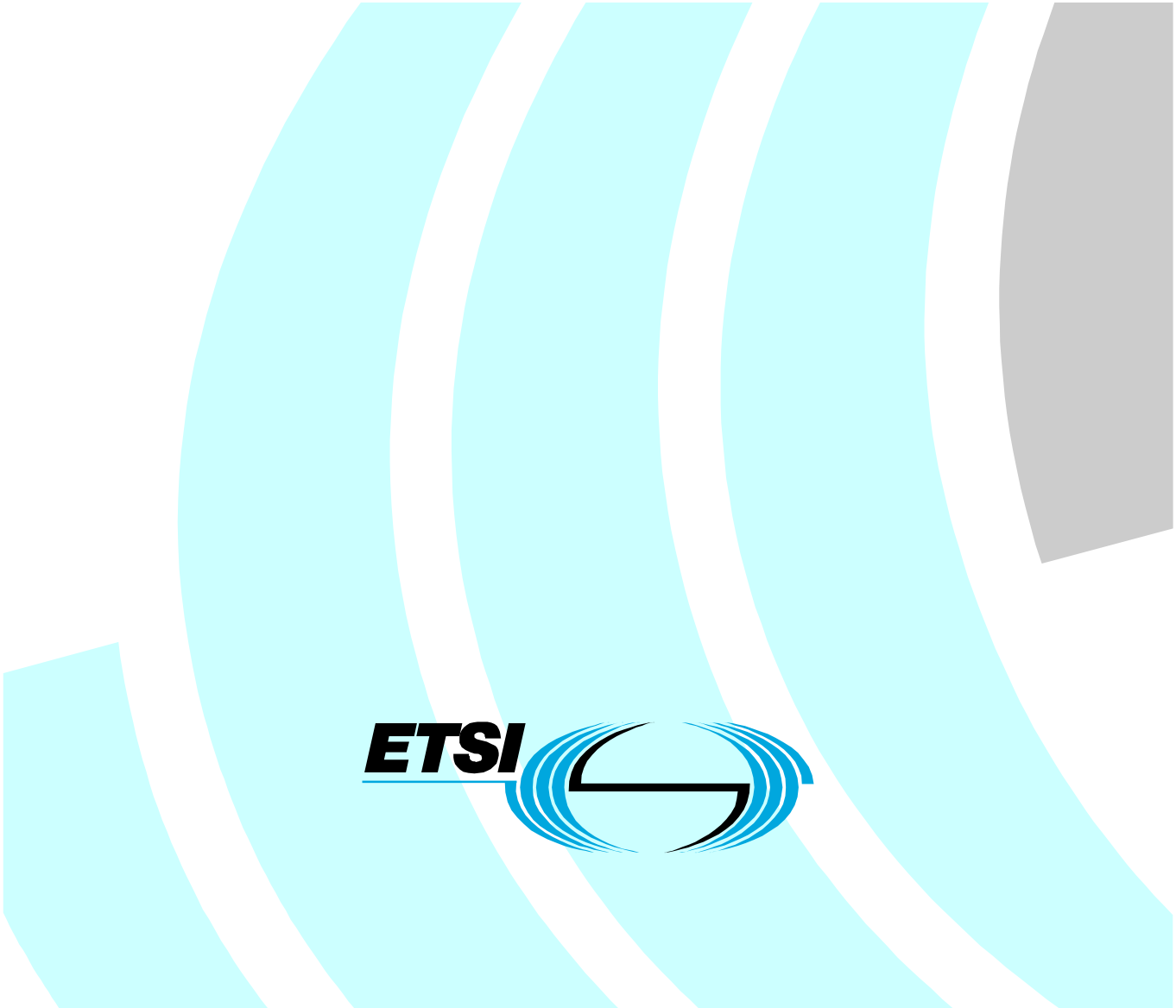
Technical Report

Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Services Capabilities, Requirements and strategic direction for NGN services



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Contents

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

Introduction

The information on novel services was obtained by consulting the publicly available information from Eurescom, IST, and CELTIC (annex B). This information was then condensed into a list of potentially interesting services for definitions beyond NGN Release 1.

In addition, information on Virtual Private Networks and User Profile Management were also investigated for potential capabilities required from future NGNs.

Although it was expected that Service Providers in the Asian region may have different requirements for network capabilities beyond NGN Release 1, little information could be gathered. Annex D contains some of the information obtained.

1 Scope

The present document provides the results of an analysis of the current work and strategic direction of relevant SDOs (ITU-T, FGNGN, IETF, etc.) and other fora (EURESCOM, CJK, ATIS, etc.) in relation to services and network requirements to support ETSI TISPAN. The purpose of this analysis is to ensure synthesis of the current studies on NGN services. The present document enables ETSI to identify strategic directions for standardization of NGN services and service requirements beyond Release 1.

A catalogue of existing and proposed service documents is given in annex B. This catalogue does not provide any prioritization.

2 References

For the purposes of this Technical Report (TR), the following references apply:

[1] ETSI TS 181 001: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Videotelephony over NGN; Stage 1 service description".

[2] ETSI TS 181 002: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Multimedia Telephony with PSTN/ISDN simulation services".

[3] ETSI EG 202 325: "Human Factors (HF); User Profile Management".

[4] ITU-T Recommendation Y.1311: "Network-based VPNs - Generic architecture and service requirements".

[5] Draft ITU-T Recommendation Y.1314: "Virtual Private Network functional decomposition".

[6] ITU-T Recommendation Y.1241: "Support of IP-based services using IP transfer capabilities".

[7] ETSI TS 181 005: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Services and Capabilities Requirements".

[8] ITU-T Recommendation G.805: "Generic functional architecture of transport networks".

[9] ITU-T Recommendation G.809: "Functional architecture of connectionless layer networks".

[10] IETF RFC 2236: "Internet Group Management Protocol, Version 2".

[11] IETF RFC 3376: "Internet Group Management Protocol, Version 3 ".

[12] IETF RFC 1112: "Host extensions for IP multicasting ".

[13] ETSI TS 181 013: "Telecommunications and Internet Converged Services and Protocols for Advanced Networking (TISPAN); Service Requirements and Network Capabilities for Release 2".

[14] ETSI TS 181 006: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); TISPAN NGN Release 2; Direct Call; Stage 1 Service Description".

[15] ETSI TS 122 140: "Universal Mobile Telecommunications System (UMTS); Multimedia Messaging Service (MMS); Stage 1 (3GPP TS 22.140)".

[16] ETSI TS 122 340: "Universal Mobile Telecommunications System (UMTS); IP Multimedia Subsystem (IMS) messaging; Stage 1 (3GPP TS 22.340)".

[17] ETSI TS 122 141: "Universal Mobile Telecommunications System (UMTS); Presence service; Stage 1 (3GPP TS 22.141)".

[18] ETSI ES 282 001: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Functional Architecture Release 1".

3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

3D	Three Dimensional
3G	Third Generation
3GPP	Third Generation Partnership Project
AAA	Authentication, Authorization and Accounting
ACR	Anonymous Communication Rejection
ADSL	Asymetrical Digital Subscriber Line
AmI	Ambient Intelligence
AO	Always-On
AoC	Advice of Charge services
AoC-E	Advice of Charge: charging information at the End of the communication
AoC-S	Advice of Charge: charging information at Communication set-up time
ATM	Asynchronous Transfer Mode
ATM VCC	Asynchronous Transfer Mode Virtual Channel Circuit
BDN	Broadband Delivery Network
BGW	Border GateWay
BMDP	Broadband Media Distribution Protocol
B-RAS	Broadband Remote Access Server
BUSY	user BUSY
CAC	Connection Admission Control
Caller ID	Caller IDentification
CAMEL	Customized Application Mobile Enhanced Logic
CAP	Camel Application Part
CB	Communication session Barring
CCBS	Completion of Communications to Busy Subscriber
CD	Communication Deflection
CDIV	Communication DIVersion
CDN	Content Delivery Network
CE	Customer Edge
CFB	Communication Forwarding on Busy user
CFNL	Communication Forwarding on Not Logged-in
CFNR	Communication Forwarding on No Reply
CFU	Communication Forwarding Unconditional
CGW	Corporate GateWay
CHAT	CHAT room service
CL-PS	ConnectionLess Packet-Switched
CO-CS	Connection - Orientated Circuit-Switched
CONF	CONFerence
CO-PS	Connection-Orientated Packet-Switched
COSPAS - SARSAT	Satellite system designed to provide distress alert and location data to assist search and rescue operations
CS	Commercial Service
CW	Communication Waiting
DHCP	Dynamic Host Configuration Protocol
DivX	video codec created by DivXNetworks
DLCI	Data Link Connection Identifier
DLMS	Digital Library Management Systems
DRM	Digital Rights Management
DSL	Digital Subscriber Line
DSLAM	Digital Subscriber Line Access Multiplexer
DUS	Device Unify Service
DVD	Digital Versatile Disk
DVR	Digital Video Recorder
ECT	Explicit Communication Transfer
EGP	Exterior Gateway Protocol
EPG	Electronic Programming Guide
FTTB	Fibre To The Building
FTTH	Fiber To The Home

FTTN	Fiber To The Node
GEPON	Gigabit Ethernet PON
GNSS	Global Navigation Satellite System
GPON	ATM-based Gigabit PON
GPRS	General Packet Radio Service
GPS	Global Positioning System
GPS_1	Global Positioning System
GPS_2	Galileo Positioning System
HDTV	High Definition TeleVision
HOLD	communication HOLD
IC	Integrated Circuit
ICB	Incoming Communications Barring
IETF	Internet Engineering Task Force
IGMP	Internet Group Management Protocol
IGP	Interior Gateway Protocol
IM	Instant Messaging
IMS	IP Multimedia Subsystem
IN	Intelligent Network
INAP	Intelligent Network Access Protocol
IP	Internet Protocol
IPTV	Internet Protocol TeleVision
ISDN	Integrated Services Digital Network
ISIM	IMS Subscribers Identity Module
IST	Information Society Technology
ISTAG	IST Advisory Group
iVoD	interactive Video on Demand
J2EE	Java 2 platform, Enterprise Edition
J2ME	Java 2 platform, Micro Edition
LAN	Local Area Network
LBS	Location Based Services
LSP	Label Switching Path
MAC	Media Access Control
MCID	Malicious Communication IDentification
MExE	Mobile station application Execution Environment
MM	Multimedia Message
MMS	Multimedia Message Service
MoD	Music on Demand
MPEG	Motion Picture Experts Group
MPLS	MultiProtocol Label Switching
MUX	MUltipleXor
MWI	Message Waiting Indication
NEMOGS	New Market Opportunities by Galileo Satellite services
NGN	Next Generation Network
NGS	Next Generation Services
NGSC	Next Generation Service Concept
NGSP	NGS Principles
nVoD	near Video on Demand
OAM	Operations, Administration, Maintenance
OCB	Outgoing Communications Barring
OIP	Originating Identification Presentation
OIR	Originating Identification Restriction
OLTs	Optical Line Terminals
OS	Open Service
OSA	Open Services Architecture
PA	Personal Assistance
PC	Personal Computer
PCM	Puls Code Modulation
PE	Provider Edge
PIM	Protocol Independent Multicast
PLMN	Public Land Mobile Network
PMJ	Personal Media Jockey
PON	Passive Optical Network

POTS	Plain Old Telephone System
PPV	Pay Per View
PRS	Public Regulated Service
PSTN	Public Switched Telephone Network
PVR	Personal Video Recorder
QoS	Quality of Service
RCEF	Resource Control and Enforcement Function
RFC	Request For Comments
SAR	Search And Rescue service
SDH	Synchronous Digital Hierarchy
SIP	Session Initiation Protocol
SMS	Small Message Service
SoHo	Small office and Home network
SoL	Safety of Life service
TCP	Termination Connection Point
TFP	Termination Flow Point
TGW	Trunking GateWay
TIP	Terminating Identification Presentation
TIR	Terminating Identification Restriction
TTI	Trail Trace Identifier
TV	TeleVision
UMTS	Universal Mobile Telecommunication System
UNI	User Network Interface
USIM	Universal Subscribers Identity Module
VC-1	Virtual Container-1
VCI	Virtual Circuit Identifier
VDSL	Very high data Digital Subscriber Line
VHE	Virtual Home Environment
VLAN ID	VLAN Identification
VLAN	Virtual Local Area Network
VoD	Video on Demand
VoIP	Voice over IP
VP6	Video codec developed by On2 Technologies
VPN	Virtual Private Network
VSN	Virtual Service Network
VTN	Virtual Transport Network
WDM	Wave Division Multiplexing
WIMAX	Worldwide Interoperability for Microwave ACCess
WLAN	Wireless LAN
WMAN	Wireless Metropolitan Areas Network
xVid	A new video codec being developed as an open source project

4 Services identified

The services identified can be found in annex B with detailed information. This clause provides an executive summary for these services.

4.1 Services from Eurescom projects

4.1.1 Meet Me service

From P1341 NGN Service Concepts project (see clause B.1.8).

The Meet Me Service Concept should enable the encounter between two or more persons sharing similar and/or compatible interests. This Service Concept would take advantage on service components as Context Awareness (including Presence, Status and Localization and User Profiles. It may be applied on different areas, like:

- Individual relationships including friendships and dating (e.g. boy/girl seek girl/boy);

- Enterprise relationships in situations such as human resource management and outsourcing; or
- Individual - Enterprise relationships in situations such as the management of broken cars and domestic disasters.

EXAMPLE: Our car is broken and we are looking for a mechanist that is open on Sunday and who is specialist on brakes and it belongs to a special company.

NOTE: These are only few examples, but this service could be extended to a lot of different areas. Having information about the context and the user profile, dedicated actions can be easily carried out.

4.1.2 Sweet home Service

From P1341 NGN Service Concepts project (see clause B.1.8).

The Sweet Home Service Concept aims to leverage security and confidence feelings about home with home networking technologies (i.e. residential gateways) as an extension of network services including personal data storage, unified mailboxes, cameras, etc.

4.1.3 Community Cooperation

From P1341 NGN Service Concepts project (see clause B.1.8).

The Community Cooperation Service Concept should be applied to enhance collaboration between different people for work, for education, for leisure and for inter-social relationships.

This concept should provide support to Communities, i.e. people with similar interests, identities, commitment to ideals and beliefs. Communities can be geographically defined (like the Community Communication Networks, City Nets or Digital Cities), or can be Virtual Communities like the Internet Communities. Community Cooperation should provide the means to share resources and information within communities by enabling a more effective way that people can:

- Work together.
- Play together.
- Help each other.
- Teach each other.
- Worship together.
- Do business together.
- Campaign together.
- Argue together.
- Debate with one other.

4.1.4 Give me money

From P1341 NGN Service Concepts project (see clause B.1.8).

The Give Me Money Service Concept should be applied to promote business opportunities to application subscribers. For example, subscribers can provide their own applications by taking advantage of NGS openness and its programmable interfaces. In such cases, subscribers would be able to apply their creativity to develop and sell their own applications; the Service Provider would play a kind of broker role.

4.1.5 Personal Assistance

From P1341 NGN Service Concepts project (see clause B.1.8).

The Personal Assistance (PA) Service Concept should follow the Virtual Personal Assistant metaphor where each subscriber is the owner of a Virtual Entity - its Personal Assistant - existing somewhere in the network. Such an Assistant is:

- Accessible from any terminal.
- Accessible at any time.
- Accessible from anywhere.
- Always available to satisfy the client needs according to his profile.

The Personal Assistant should act on behalf of its owner in an autonomous way to:

- Manage communications.
- Manage the user's agenda and contact list.
- Manage the user's electronic shopping.

The Personal Assistant Concept may be applied to non-individual entities, e.g. Families, Enterprises and Social Communities. In these cases, the assistant would be always available to satisfy family, enterprise or social community needs according to a particular profile.

4.1.6 Financial Assistance

From P1341 NGN Service Concepts project (see clause B.1.8).

The Financial Assistant would be a more specific Personal Assistant that would give the user assistance in financial matters. It could offer a wide variety of assistance functions, e.g.:

- Using fixed or mobile terminals to check accounts, transfer money and pay for goods and services.
- Supporting Authentication, Authorization and Accounting (AAA) features for signing transactions.
- Support links into software for buying and selling stocks.
- Obtaining statistics and/or professional advice concerning whether to bind the loan interest rate or not, when to buy or sell stocks, etc.

4.1.7 Virtual presence

From P1341 NGN Service Concepts project (see clause B.1.8).

Virtual Presence enables the user to be virtually present at another location, or receive information that is presented in a way augmenting the perception of the situation the user is in or the task the user is performing.

Scenarios where the user is virtually present at another location may have a one-way or two-way direction, and the other location may be in the real world or in the virtual world. In one-way scenarios the user may see or get other sense impressions from the other location, and may navigate and "move around" to do inspections, etc. In two-way scenarios the user in addition may cause changes in the other location.

Scenarios where the user's perception is augmented may be implemented with computer graphics superimposed with the real world. In this way it seems to the user that the real and virtual objects coexist.

Concepts known from the Virtual Reality and Augmented Reality areas are included in the Virtual presence service concept, and examples of use may be:

- Videoconferences.

- Telemedicine. For instance specialists following an operation, or performing real-time actions using remotely controlled equipment.
- Inspection of installations hardly accessible, for instance subsea oil installations.
- Advanced games.
- Real-time multimedia intelligence briefings.
- Command and control communications.
- Theatre meetings.
- Training.
- Distance learning.
- Information dissemination for real-time emergency management preparedness.
- Command, control and coordination for real-time emergency management response.
- Other federal, state and local government collaborative work.

4.1.8 Device Unify Service (DUS)

From P1101 Always on - Device Unified Services (DUS) project (see clause B.1.1).

The Device Unify Service (DUS) has been defined within the project. It represents a commercial service that will provide value and revenue potential to different types of operators and service providers. For Mobile operators or Mobile Service providers it will provide a very user-friendly interface for their customers. For fixed network operators or service providers it will generate a bridge between fixed and mobile devices.

From the technological point of view, DUS has immeasurable value since it provides an opportunity to experiment with service delivery over an integrated set of major technologies, such as IP, wireless communications, agent concepts and short-range radio link technology.

DUS helps the users to unify all their computing and communication devices in such a way that they can behave as one device with multiple input and output capabilities.

4.1.9 Residential broadband entertainment

From ERNIE project (see clause B.1.2).

The provision of residential broadband entertainment and new interactive services (like traditional TV, upcoming Interactive TV services) via IP-based networks (especially over DSL access) focussing on acceptability and quality aspects compared to traditional TV services. Services include:

- Radio.
- On demand services (video and music) with PVR functionality, online storage and archive function (whereas life events, linear broadcast TV and radio are still important in comparison to on-demand content).
- Near Video on demand services as Time shifted TV.
- Interactive information services.
- Video communication services.
- Internet access.
- Transaction services and E-commerce functionality's.
- A TV broadcast navigation system and EPG (Electronic Programming Guide).

- Individually tailored service and content bundles according to:
  - the users interests; and
  - time flexible access.

The content provided by the services include:

- A broad spectrum of quality content.
- News.
- Movies / TV.
- Sport.
- Entertainment.
- Music.
- Etc.

NOTE: A commonality with IST NM2 is visible, but the services considered are not exactly the same, IST NM2 is oriented more concretely to interactive action between TV viewers and producers.

4.1.10 Location

From LOCAWA project (see clause B.1.3).

The project focus is on location-based services as information services accessible through mobile phones, PDA and other mobile appliances that revolve around the known position of a user in space, which is either provided by a telecom operator or by a GPS enabled handset. Applications include emergency services, location of emergency calls, navigation information, location sensitive information screening, lost traveller support, track and trace of people/objects, mobile workers support and schedule, and many others.

The project identifies four categories of location-based services:

- Safety: roadside emergency, accident emergency, fire fighting, public safety vehicle management.
- Billing.
- Information: geo-coding, routing service, mapping, subscription and event notification.
- Tracking: People or animal tracking, vehicle theft localization and recovery, public transport scheduling, and packets and fleet tracking.

4.1.11 Connectivity services

From E-TRACS project (see clause B.1.4).

The project focus is on the connectivity services. The generic term connectivity services covers telecommunication products and services, ranging from low level products like dark fibre and bandwidth to more elaborated and complex products like voice traffic and IP-transit. This term includes more or less all the bandwidth and voice products and services and can also be referred to as telecommunication capacity.

As no uniform scheme for the categorization of connectivity services and bandwidth products exists, we will present two complementary approaches. One that looks at the products and services from a purely technological angle and another that puts the emphasis on the splitting of the responsibility between buyer and seller of a service and the added value the buyer gets beyond plain connectivity. As products and services are closely linked - connectivity services make use of bandwidth products and bandwidth products can be upgraded to connectivity services and there is no clearly defined separation anyway - we will use these categorizations in parallel in the project.

4.2 Services from IST projects

4.2.1 "On-line" guide for tourists

From AGAMEMNON project (see clause B.2.1).

The development of an advanced 3G mobile application, that will act as an "on-line" guide thanks to the new multi-media capabilities of the cellular phones. Visitors will be provided with enriched and personalized information on monuments and places of interest. Agamemnon will drive them through a personalized itinerary, created according to their interests and time available. The system will be also capable of recognzing specific monuments through the pictures taken by visitors with their mobile phones cameras. Agamemnon will also contribute to optimize the visit path (avoid over-crowding situations) and to the preservation of the site by sending images taken by visitors to site guardians.

The final prototype, available at mid 2006, will be capable of:

- Relay on existing 3G phones and networks (i.e. UMTS, GPRS, etc.).
- Image analysis technology to identify users attention.
- Personalized information delivery based on users attention and profile, leveraging on 3G services.
- Advanced user profiling based on static questionnaires and unobtrusive dynamic human behaviour/preferences analysis.
- Profile-based, adaptive and proactive visit scheduling, also considering overcrowding avoidance analysis.
- Voice-based commands interaction.
- Active role played by the visitors in preserving the cultural heritage through specifically tagged pictures taking.

NOTE: This service has commonalities with "Meet me" (see clause 4.1.1); instead of looking for a car mechanic you are looking for a monument.

4.2.2 Virtual Science Thematic Park

From CONNECT project (see clause B.2.2).

The goal is to connect informal with formal learning by exploiting the huge and concentrated knowledge stored in museums, "break" the walls of the science park or the museum and virtually transfer the museum into the classroom and vice versa. Furthermore, the visit to a museum will be more personalized to the exact profile, knowledge level and personal interests of the visitor. The above will be achieved by the usage of innovative technologies which will allow the real and the virtual visitor to a museum to wonder around the exhibits enriching his/her learning experience with his/her own personal selections in an information rich environment.

An advanced learning environment will be developed, the CONNECT Virtual Science Thematic Park, in order to act as the main "hub" of all resources available in the CONNECT network of science parks, science museums and research centres. The Virtual Science Thematic Park will serve as distributor of information and organizer of suitable educational activities. It will incorporate all the innovative use of the technology for educational purposes and will also interconnect all the members of the network. It will also organize the procedure of students" both virtual and conventional visits to the science museums and thematic parks. These visits will fulfil (through an informal but yet structured way) main pedagogical aims of the official curriculum. The Virtual Science Thematic Park will include two major components:

- the mobile Augmented Reality (AR) system (mobile unit) which the visitor will wear during his/her visit; and
- the CONNECT platform which will facilitate the virtual visits to the museums and science parks.

NOTE: Also this project shows commonality with "Meet Me".

4.2.3 Digital Libraries

From DELOS project (see clause B.2.3).

Digital Libraries have been made possible through the integration and use of a number of IC technologies, the availability of digital content on a global scale and a strong demand for users who are now online. They are destined to become essential part of the information infrastructure in the 21st century.

The DELOS network intends to conduct a joint program of activities aimed at integrating and coordinating the ongoing research activities of the major European teams working in Digital Library - related areas with the goal of developing the next generation Digital Library technologies. The objective is to:

- define unifying and comprehensive theories and frameworks over the life-cycle of Digital Library information; and
- build interoperable multimodal/multilingual services and integrated content management ranging from the personal to the global for the specialist and the general population. The Network aims at developing generic Digital Library technology to be incorporated into industrial-strength Digital Library Management Systems (DLMSs), offering advanced functionality through reliable and extensible services.

The Network will also disseminate knowledge of Digital Library technologies to many diverse application domains. To this end a Virtual Digital Library Competence Centre has been established which provides specific user communities with access to advanced Digital Library technologies, services, testbeds, and the necessary expertise and knowledge to facilitate their take-up.

Other important objectives are:

- to network and structure European Digital Library - related research in order to consolidate an emerging community;
- to provide a forum where researchers, practitioners, and representatives of interested applications and industries can exchange ideas and experiences;
- to promote an exchange programme towards improving international cooperation in Digital Library research areas.

4.2.4 Exchanging audio-visual content

From ePerSpace project (see clause B.2.4).

The services identified in ePerSpace are:

- The exchange audiovisual content between user terminals and home equipment.
- Innovative seamless access by sharing user profiles in a secure manner.
- Home and Personal Devices building unified personal environments.
- Rich Media Object Management supplying the tools for content creators to make optimal use of the infrastructure.

4.2.5 New media for new millennium

From NM2 project (see clause B.2.5).

New forms of storytelling to develop that are uniquely suited to the characteristics of digital distribution via broadband. By utilzing the unique characteristics of digital broadband networks, the new media will engage our attention in original and compelling ways.

NM2 is about creating a variety of new media genres using all of the facilities of modern broadband communication and interactive terminals. The project will create new production tools for the media industry that will allow the easy production of non-linear broadband media that can be personalized to suit the preferences of the individual user. Viewers will be able to interact directly with the medium and influence what they see and hear according to their personal tastes and wishes.

4.2.6 Dynamic and configurable harmonized services for the mobile user

From MobileIn project (see clause B.2.6).

Among the objectives of the MobileIN project we can find:

- To define and develop a novel set of advanced, future-proof, dynamic and configurable harmonized services for the mobile user and worker by taking full advantage of heterogeneous service infrastructures (Intelligent Network Services, Mobile Network Services, VoIP Services) and architectures (SIP, VoIP, VHE, etc).
- To specify, implement and demonstrate standardized, but to date, unrealized PSTN and PLMN services (e.g. CS2-4).
- To specify, design and develop mobile terminal applications for the MobileIN services utilzing state-of-the-art technologies like J2ME/J2EE, Symbian O/S, Windows CE, MExE, etc.
- To specify, design and develop an open service creation and execution framework enabling the provision, execution and discovery of MobileIN services across several domains and the coordination of MobileIN application servers and Open Access Gateways.
- To analyse existing PSTN/IN and PLMN/CAMEL infrastructures, protocols and services, and identify essential but at the same time, minimum enhancements needed to boost the deployment of unrealized services from Capability Sets 2-4 at minimum cost and time. Also, to accommodate the provisioning of new harmonized ones for heterogeneous domains. To enhance existing services with new features to accommodate emerging technologies and networks (SIP, VoIP, VHE, etc.).
- To analyse the status of OSA APIs and respective mappings from 29.198-x and 29.918-x series related to IN and CAMEL protocols (INAP, CAP, etc.). To propose enhancements and additions to existing APIs and contribute towards the definition, specification and standardization of OSA/Parlay mapping documents for IN and CAMEL networks.

4.3 Services from Celtic projects

4.3.1 Tele Immersion service

From Tifanis project (see clause B.3.1).

The development of a tele-immersion application which will permit users to have the realistic feeling of being physically in front of each other, interacting in a natural way and having both the possibility of handling, in addition, 3D objects or visualizing a 3D animation embedded in their virtual environment, or having other advanced possibilities such as interacting with labs tools.

4.3.2 Automation/supervision as a continuous integrated service

From EURO_HOME project (see clause B.3.4).

EURO_HOME defines home automation/supervision as a continuous integrated service rather than a set of standalone applications and provides the framework and the essential components for the creation of such a service and its adaptation to specific client environments and requirements.

EURO-Home's platform will have the following novel features:

- It will be independent user equipment and of access and core network technologies.
- It will allow users easy access to their residential services even while they are away from home - travelling or in a new environment.
- It will facilitate the creation and flexible deployment of a wide variety of services, both present and future.

EURO-Home's service platform will able to host a large variety of complex services.

EURO-HOME will use state of the art techniques such as intelligent agent, semantic web and GRID technologies, to more forward decisively from the work of other EU-IST and EUREKA projects in order to meet the rapidly rising expectations of the residential consumer for flexible, easy to use services. EURO-HOME expects to make a strong contribution to emerging standards for residential networks.

4.3.3 High bandwidth gateway for emergency services

From Dehigate project (see clause B.3.5).

The project will develop a deployable high bandwidth gateway for emergency services accompanied with applications. The gateway will extend high capacity data communication through the use of existing radio technology. The deployable gateway will be used in addition to the low bandwidth voice and data systems already deployed by the emergency services. The innovative aspects will be in terms of the applications, control, management and security for the communication resources. From a service perspective, the innovative aspects will be ability to thoroughly demonstrate and pilot high capacity services for the emergency services.

The foundation for the project is interaction with user communities, so the functional requirement for the overall architecture and for the gateway itself is based on their needs. The usability of the concept will be demonstrated with trials aimed at the user community. The project will utilize and interact with other existing European projects within the emergency services, in particular the Widens and the Oasis project. Several of the project partners participate in one or more of these, and the will extend the knowledgebase from these project. In addition, public available demonstrators from the Widens projects will be extended in the planned demonstrations.

4.3.4 Multimedia Communication Service

From MACS project (see clause B.3.6).

The project targets the development of an integrated solution for multimedia conversational services, focusing on end to end delivery to the user. The project will handle three main aspects:

- Services: the target is to build a platform which allows seamless usage of new increased services addressing the needs of interpersonal communities, such as Videotelephony, Presence and Reachability Management, Local and Network Address Book or Multimedia Messaging.
- Terminals: in order to address the residential market, simple and affordable multimedia terminals are needed. They must interoperate with the Next Generation Networks (NGN) architecture and protocols. Key functions need to be implemented in order to offer the services described above with the adequate quality and sufficient ergonomics.
- Terminals will be SIP (Session Initiation Protocol) based.
- Network: in parallel to the growing demand for multimedia services, the different actors involved in the model will face very important issues, such as guaranteed quality of service, resource management, security, privacy, regulations constraints or nomadic communication, which allows a user to activate.

4.3.5 Adaptative Portals in the fixed and mobile environments

From ADPO project (see clause B.3.8).

Dynamic personalized and customizable portal in the fixed and mobile environments where the user can benefit from multiple content and web services can interact and spawn new services or content.

5 Virtual Private Networks (VPN)

5.1 Introduction

The present document has considered two ITU-T Recommendations specifying the VPNs:

- ITU-T Recommendation Y.1311: "Network-based VPNs - Generic architecture and service requirements" [4]; and
- Draft Recommendation Y.1314 [5].

While ITU-T Recommendation Y.1311 [4] describes a number of generic architectural aspects and specifies a number of generic service requirements involved in the provision of network-based Virtual Private Networks (NB VPNs), the Draft Recommendation on VPN functional decomposition (Y.VPN-Decomp) describes the set of functions required to establish, operate and maintain client/server and peer level Virtual Private Networks (VPN).

5.2 ITU-T Recommendation Y.1311

This recommendation describes a number of generic architectural aspects and specifies a number of generic service requirements involved in the provision of network-based Virtual Private Networks (NB VPNs).

Network-based VPNs have a common set of requirements and are related through the use of a common set of mechanisms. This Recommendation describes NB VPN service definitions, framework and requirements.

The scope of this Recommendation covers the various core implementations of an NB VPN, as well as the services offered to the customer at the access interface.

The scope is also illustrated in figure 1, which depicts the principles arrangement between services and implementation approaches.

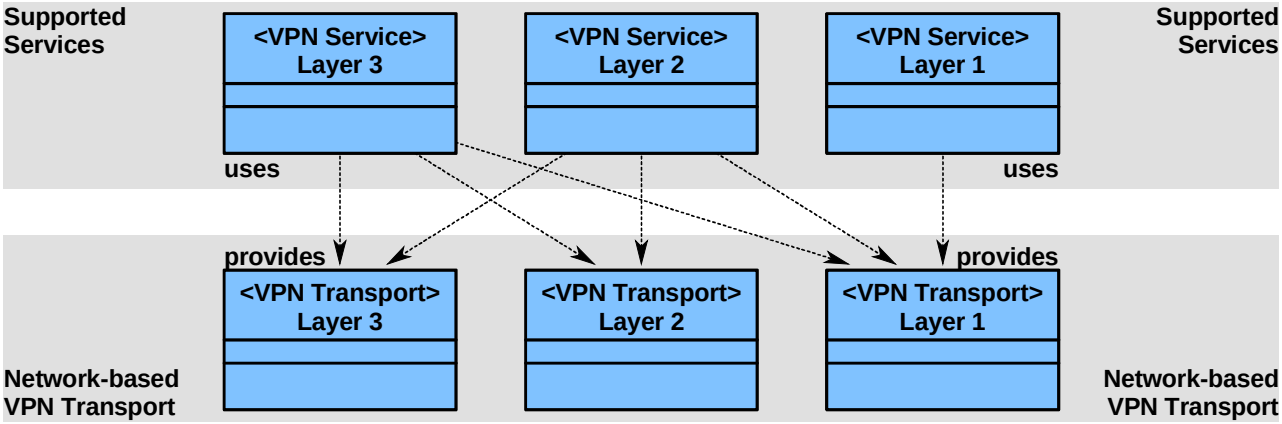


Figure 1: General Scope

NOTE 1: The examples shown above are non-exhaustive.

NOTE 2: Not all combinations of elements shown in figure 1 are feasible, or are within the scope of this Recommendation.

5.2.1 Service definition and service types

The following three types of service are identified.

5.2.1.1 Layer 1 VPN service

In a layer 1 VPN service the customer edge device is connected to the network provider via one or more links, where each link may consist of one or more channels or sub-channels (e.g. wavelength, or wavelength and timeslot respectively, or just timeslot). The customer edge device and the provider edge device are peered to each other only at the physical link layer across the access network.

A link has two end-points:

a) one on the Customer Edge (CE) device, known as the port.

b) one on the provider edge device, known as the Provider Edge (PE) port.

The scope of a layer 1 service is related to port-based VPNs only.

5.2.1.2 Layer 2 VPN service

In a layer 2 VPN service, customer edge device receives data link layer (i.e. layer 2) service from the network provider. The customer edge device and the provider edge device are peered to each other at the data link layer across the access network. The network performs forwarding of user data packets based on information in the packets" data link layer headers, such as a for example frame relay DLCI, ATM VCC, or 802.1q VLAN tag.

5.2.1.3 Layer 3 VPN service

In a layer 3 VPN service, customer edge device receives network layer service (typically in the form of IP packets) from the network provider. The customer edge device and the provider edge device are peered to each other at the network layer across the access network. The network performs forwarding of user data packets based on information in the IP layer header, such as an IPv4 or IPv6 destination address. The customer sees the network as a layer 3 device such as an IPv4 or IPv6 router.

The VPN is considered to be comprised of the VSN (Virtual Service Network) and the VTN (Virtual Transport Network) components (as depicted in figure 2).

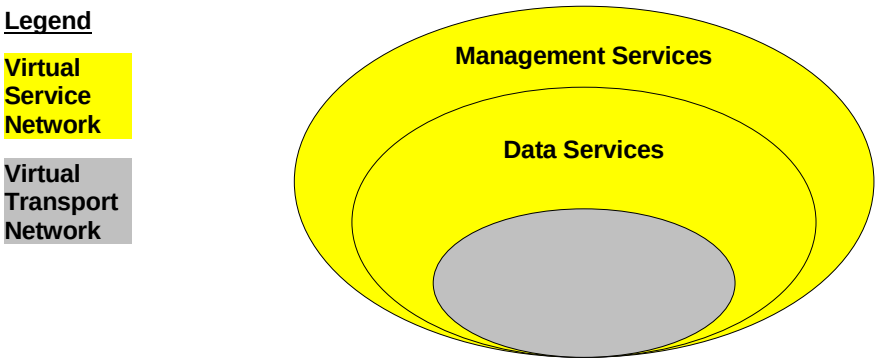


Figure 2: VSN/VTN Model

The VSN comprises a number of service delivery platforms, which deliver services to the carrier's customer. The service delivery environment includes the network and policy management elements that facilitate personalization and customization capabilities for both customers and applications.

The VSN component will offer one or more of the following carrier managed services:

- Managed Layer 1 Services.
- Managed Layer 2 Services.
- Managed Layer 3 Services (Internet Access, Intranet Services, Extranet Services).
- Managed Remote Access Services.
- Managed Security Services.

The VTN is the transport infrastructure itself, viewed as the virtualization of the carrier backbone.

The provision and nature of a VPN requires the separation and isolation of said VPN traffic from the traffic of other VPNs and from the public traffic. These requirements necessitate some form of tunnelling mechanism, where the data payload formats and/or addressing used within a given VPN is unrelated to those used to convey the tunnelled data across the backbone.

The VTN component will offer one or more of the following carrier managed transports:

- Backbone Virtualization:
  - Transport for VSN at Layer 1, 2 or 3.
- Access Virtualization:
  - Subscriber Access into VSN at layer 1, 2 or 3.

VTN approaches for particular VPN types are described in other Recommendations on NB VPNs in the Y.1311 series.

5.2.2 Service requirements

Both, the VSN as well as VTN components can be regarded as having identifiable service requirements, representing the user aspects and the network operator aspects respectively.

5.2.2.1 Service requirements for Virtual Services Network

- General VSN service requirements:
  - means for user to define VPN membership;
  - accommodation of user-defined VPN address schemes;
  - transparency to user data;
  - means for single customer site to belong concurrently to more than one VPN;
  - provision for arbitrary user defined VPN topologies (ranging, for example, from hub-and-spoke, partial mesh to full mesh);
  - provision for multi-protocol support;
  - provision of multi-homed user sites;
  - support for fixed and mobile users;
  - provision of standards-based interfaces (independent of user's supplier of device);
  - support for wide range of routing protocols between CE and PE routers;
  - means to support a variety of user's traffic (QoS) requirements as defined by the user;
  - means of supporting different modes of communication such as any-to-any (1:1), multicast (1:N, M:N), and broadcast (1:All);
  - means to offer, support and maintain agreed levels of service (e.g. via Service Level Agreements);
  - means to meet user's security requirements;
  - provision of VPN members with secure dynamic access to VPN (e.g. via dial-up);
  - provision of appropriate VPN management services (e.g. configuration, fault, performance, security, etc.);
  - accommodation for growth of given VPN or number of VPNs;
  - configuration management;

- use of user-defined service templates to capture VPN site and route characteristics;
- consistency and coherence verification of user configuration information;
- ability to easily change topology;
- ability to easily add, remove or change devices, sites, routes, traffic, etc.;
- ability to accommodate growth requirements for devices, sites, routes, traffic, etc.;
- Fault management;
- information to customer in event of service disruption and restoration;
- dynamic "hidden" recovery (non-disruptive) as far as possible;
- provision of relevant incident reports and summaries;
- performance management;
- maintenance of performance consistent with Service Level Agreements (SLAs);
- provision of performance information, statistics, etc.;
- ability to demonstrate performance to customer;
- prediction of trends, likely problems and/or recommendations in relation to current SLAs, traffic patterns, QoS, etc.

- Accounting:
  - provision to customer/users of itemized bills;
  - customized breakdown of billing information;
  - correlation to QoS and/or Service Level Agreements;
  - correlation to performance and fault management information.
- Security:
  - access control;
  - authentication;
  - data privacy.
- Service Level Agreements and QoS.
- Service Level Agreements, per VPN and/or per VPN site, and/or per VPN route should include:
  - Service Level Objectives comprising some or all of:
    - data transfer capability;
    - qos parameters;
    - availability;
    - reliability;
    - delivery confirmation;
    - mobility and portability support;
    - security;
    - bandwidth;

        - priority;
        - authentication;
        - protocols supported;
        - flexibility - scaling and connectivity;
        - life of the SLA.
    - Service monitoring objectives:
        - QoS monitoring - comparison against objectives;
        - flow tracking;
        - reports as necessary.
        - financial compensation objectives:
        - billing option;
        - penalties;
        - pricing;
        - early termination charges.

NOTE: General SLA requirements are more fully described in ITU-T Recommendation Y.1241 [6].

5.2.2.2 Service requirements for Virtual Transport Network

- General service provision
    - means of assigning globally unique VPN identifier to each VPN;
    - means of VPN membership determination;
    - ability to accommodate overlapping address space(s) amongst VPNs;
    - ability to learn stub link reachability information from user site and disseminate to appropriate peer edge routers;
    - means of distribution of intra-VPN reachability information;
    - means to construct tunnels to other devices required to support a given VPN;
    - accommodate VPNs spanning multiple provider networks;
    - use of standards-based interfaces for intra-VPN interoperability;
    - use of scalable solutions to permit growth of given VPN or number of VPNs;
    - means to detect loop traffic in a given VPN;
    - means to prevent loop traffic in a given VPN;
    - means to mitigate loop traffic in a given VPN.
- Configuration management
    - automatic derivation of configuration information from user information;
    - automated configuration of network facilities;
    - use of auto-discovery mechanisms for user's external reachability;
    - use of auto-discovery mechanisms for intra-VPN reachability;

  - comparison with SLAs.

- Fault management
  - automatic detection of faults (via alarms, incident reports, events, threshold violations of QoS and SLAs, etc.);
  - automatic fault localization (via analysis of alarms, reports, diagnoses, etc.);
  - provision of fault information to customer;
  - incident recording, logs (creation and tracking of trouble tickets);
  - automated corrective action (for re-establishment of required traffic, routing, resources, etc.);
  - comparison with SLAs.
- Performance management
  - automatic monitoring of VPN behaviour, including:
  - real-time performance measurements;
  - real-time monitoring of resources and VPN elements status;
  - activation of monitoring mechanisms and metrics appropriate to SLA and QoS requirements;
  - analysis of information (e.g. bandwidth, response time, availability, packet loss, etc.);
  - evaluation of performance in relation to Service Level Agreements (SLAs);
  - production of statistics and trends based on collected information;
  - analyse of performance information for use in customer reports.
- Accounting
  - measurement of utilization of various applicable resources;
  - quota/SLA utilization's (accumulated consumption, authorizations, etc.);
  - long-term storage of accounting information (file creation/administration);
  - parameterized processing of accounting information to produce customer defined billing itemization;
  - means to correlate accounting information with fault and performance management information;
  - comparison with SLAs.
- Security
  - mechanisms for controlling access to the VPN;
  - mechanisms for authentication of users accessing VPN;
  - mechanisms for ensuring the privacy of data being transported by the VPN;
  - comparison with SLAs.

5.3 Draft Recommendation Y.1314

NOTE: The information in this clause is derived from a draft ITU-T Recommendation Y.1314 [5] that is expected to be published as Y.1314 in January 2006. Abbreviations in this clause that are not listed in clause 3.1 can be found in the draft recommendation.

The Draft Recommendation on VPN functional decomposition (Y.VPN-Decomp) as output of Q.2/13 Geneva, August 29 - September 09 2005 meeting describes the set of functions required to establish, operate and maintain client/server and peer level Virtual Private Networks (VPN). The network functionality is described from a network level viewpoint, taking into account the VPN network layered structure, client characteristic information, client/server associations, networking topology and layer network functionality. The functional models are described using the network technology independent modelling methodology described in ITU-T Recommendations G.805 [8] and G.809 [9].

This recommendation specifies the following definitions.

Table 1

Term	Explanation
VPN client layer network	A topological component in a client/server VPN that represents the set of access points of the same type associated for the purpose of transferring VPN client layer characteristic information.
VPN server layer network	A topological component in a client/server VPN that represents the set of access points of the same type associated for the purpose of transferring adapted VPN client layer information.
VPN peer layer network	A topological component that represents the set of access points of the same type associated for the purpose of transferring VPN peer layer characteristic information.

5.3.1 Client/server VPNs

Client/server VPNs have a two-layer hierarchy in which a VPN server layer network is used to support one or more VPN client layer networks. ITU-T Recommendation Y.1311 [4] describes client/server VPNs in terms of VPN service types and VPN transport types:

- VPN service type refers to the VPN client layer.
- VPN transport type refers to the VPN server layer.

The different VPN service (client) and transport (server) types are classified in Y.1311 as described in table 2.

Table 2

Service Type	Description
Layer 1	Provides a physical layer service between customer sites belonging to the same VPN. Connections can be based on physical ports, optical wavelengths, SDH/SONET VCs, frequency channels, or timeslots.
Layer 2	Provides a data link layer service between customer nodes belonging to the VPN. Forwarding of user data packets is based on information in the packets" data link layer headers, e.g. DLCI, ATM VCI/VPI, or MAC addresses
Layer 3	Provides a network layer service between customer nodes belonging to the VPN. Forwarding of user data packets based on information in the Layer 3 header, e.g. IPv4 or IPv6 destination address.

There are some drawbacks with the respect to the method of classification used in Y.1311:

- MPLS does not fit into any of these categories and must therefore be treated as a unique layer network technology.
- Network technologies within the same layer can have very different characteristics and requirements from a functional viewpoint. (For example, Ethernet and ATM are both Layer 2 technologies, however Ethernet is a broadcast based connectionless technology whereas ATM is a connection orientated non-broadcast technology).

An alternative method to classify network technologies is to classify them by the network mode they belong to. All network technologies can be mapped to one of three modes: ConnectionLess Packet-Switched (CL-PS), Connection-Orientated Packet-Switched (CO-PS), and Connection-Orientated CIrcuit-Switched (CO-CS). The functional requirements for each mode are different as each mode has different characteristics. Table 3 shows examples of VPN network layer technologies and which mode they belong to:

Table 3

Mode of operation	Examples
Connectionless packet-switched	IP, Ethernet, MPLS MP2P (see note 1)
Connection-orientated packet-switched	Frame Relay, MPLS P2P/P2MP (see note 2), ATM
Connection-orientated circuit-switched	SDH/SONET, TDM
NOTE 1: MPLS multipoint-to-point (MP2P) LSPs established using LDP in downstream unsolicited or ordered control mode traversing directly adjacent LDP peers.	
NOTE 2: MPLS point-to-point (P2P) or point-to-multipoint (P2MP) LSPs established using RSVP-TE traversing RSVP-TE peers, or P2P LSPs established using targeted/directed LDP between non-adjacent LDP peers.	

There are nine possible client/server combinations based on the three network modes, although some combinations are more compatible than others. Table 4 describes the client/server combinations possible and provides some information on their compatibility.

Table 4

	CL-PS VPN client layer	CO-PS VPN client layer	CO-CS VPN client layer
CL-PS VPN server layer	- Ideal, although providing per flow delivery guarantees introduces scaling challenges - A common approach is to use over provisioning and class based priority queuing (to manage any-to-any bursty traffic and congestion), which does not provide per flow delivery guarantees *E.g. An Ethernet server layer supporting an IP client layer*	- Providing per flow delivery guarantees introduces scaling challenges - A common approach is to use over provisioning and class based priority queuing, which does not provide per flow delivery guarantees - VPN client layer must be able to recover from out of sequence traffic units (due to the possibility of server layer packet re-ordering) *E.g. An IP server layer supporting an ATM client layer*	- Providing per flow delivery guarantees introduces scaling challenges - A common approach is to use over provisioning and class based priority queuing, which does not provide per flow delivery guarantees - Recovering clock timing is technically challenging - VPN client layer must be able to recover from out of sequence traffic units (due to the possibility of server layer packet re-ordering) *E.g. An IP server layer supporting a TDM client layer*
CO-PS VPN server layer	- Cost associated with maintaining connection state for on demand VPNs with short hold times, i.e. SPVCs *E.g. An ATM server layer supporting an IP client layer*	- Ideal *E.g. A P2P MPLS server layer supporting an ATM client layer*	- Recovering clock timing is technically challenging *E.g. An ATM server layer supporting a TDM client layer*
CO-CS VPN server layer	- No statistical multiplexing between aggregates - Bandwidth assigned permanently in course increments resulting in poor network utilization - Slow connection setup response times for on demand VPNs with short hold times *E.g. An SDH server layer supporting an Ethernet client layer*	- No statistical multiplexing between aggregates - Bandwidth assigned permanently in course increments resulting in poor network utilization - Slow connection setup response times for on demand VPNs with short hold times *E.g. An ATM server layer supporting a TDM client layer*	- Ideal *E.g. An optical server layer (e.g. a DWDM channel) supporting and SDH/SONET client layer*

5.3.2 Peer level VPNs

Not all VPN topologies are based on the client/server model. VPNs can also be provided using CL-PS network technologies based on a model in which VPN reachability isolation within a shared domain is achieved via some means other than client/server encapsulation. This recommendation refers to this type of VPN as a peer level VPN. The term peer level refers to the fact that the provider transports the customers VPN packets across its shared infrastructure at the same network layer at which it receives the packets from the customer. It does not refer to customer/provider control plane peering, the customer and provider may peer with each other in the control plane regardless of the type of VPN. Only the CL-PS network mode supports this type of VPN because in the CO-PS and CO-CS cases the connection-orientated nature of the technology enforces reachability isolation, i.e. NEs (Network Entities) can only communicate with NEs that belong to the same P2P or P2MP connection.

In order to support VPNs across a shared domain the network technology used must have some means of providing VPN isolation, i.e. NEs must only be able to communicate with other NEs belonging to the same VPN or be able to decrypt packets from NEs belonging to the same VPN.

5.3.3 Functions required for client/server VPN establishment

In establishing a client/server VPN there is a strict ordering of events that must take place. VPN client layer flows/connections cannot be established until the VPN server layer flows/connections have been established. Likewise, the VPN server layer flows/connections cannot be established until the server layer connections/flows (for which the VPN server layer is a client) have been established. This ordering of flow/connection establishment is due to the fact that a client layer topology is determined by the topology of the underlying server layer, which is recursive right down to the duct.

5.3.3.1 VPN server layer establishment

Assuming that the underlying server layer topology has been established and the VPN server layer TCP (Termination Connection Point) / TFPs (Termination Flow Point) and CPs (Connection points) / FPs (Flow Point) have been configured with addresses, there are three main steps involved in establishing VPN server layer connectivity between VPN client layer members:

Step 1: Discover VPN members and store VPN membership information.

Step 2: Calculate routes between VPN members at the VPN server layer.

Step 3: Establish connections/tunnels/VLANs between VPN members at the VPN server layer.

Each of the functions required to support VPN server layer establishment and maintenance along with the individual functional entities are described in table 5.

Table 5

Function	Functional entities	Network elements	VPN server layer mode
VPN membership discovery	Discovery of VPN members (VPN client layer CPs/FPs belonging to the same VPN)	PE (Provider Edge)	All
	Distribution/collection of VPN membership information (including joins, leaves, availability)	PE	All
	VPN membership information maintenance	PE	All
	Mapping of VPN client layer CPs/FPs to VPN server layer APs	PE	All
VPN server layer routing	Distribution/collection of VPN server layer reachability/topology/resource information	PE (Provider Edge), P (Provider)	All
	Maintenance of VPN server layer reachability/topology/resource information	PE, P	All
	Calculation of the best route(s) between VPN server layer APs	PE, P	All
VPN server layer tunnel/connection establishment	Connection admission control (CAC)	PE, P	All
	Notification of success/failure of connection/tunnel request	PE, P	All
	Assignment and configuration of VPN server layer de-multiplexing fields	PE, P	All
	Distribution of connection/tunnel information, e.g. QoS, de-multiplexing fields, bandwidth, etc.	PE, P	All

5.3.3.2 VPN client layer authentication/configuration

The functions required to establish connectivity between CE (Customer Equipment) and PE (Provider Edge) nodes at the VPN client layer may be performed using static provisioning or by using dynamic protocols. Static provisioning may be performed via manual configuration or via automated network management systems. The functional entities involved in establishing VPN client layer connectivity are shown in table 6.

Table 6

Function	Functional entities	Network elements	VPN client layer mode
CE/user Authentication, Authorization, and Accounting (AAA)	Authentication: Identification of the CE/user based on the authentication parameters, e.g. a valid username and password	CE, PE	All
	Authorization: Grant or deny access to the VPN client layer network resources/services	CE, PE	All
	Accounting: Measurement of resources/services used	CE, PE	All
VPN client layer network element configuration	Assignment and configuration of VPN client layer network addresses across VPN client layer CPs/FPs and TCPs/TFPs	CE, PE	All
	Assignment and configuration of VPN identifiers across VPN client layer CPs/FPs belonging to the same VPN	PE	All
	Configuration of per VPN profiles and policies	CE, PE	CO-PS, CL-PS

5.3.3.3 VPN client layer routing and signalling functions

The VPN client layer routing and signalling functions along with the individual functional entities are described in table 7.

Table 7

Function	Functional entities	Network elements	VPN client layer mode
VPN client layer routing	Distribution/collection of VPN client layer reachability/topology/resource information	CE, PE	All
	Maintenance of VPN client layer reachability/topology/resource information	CE, PE	All
	Calculation of the best route(s) between VPN client layer APs	CE, PE	All
VPN client layer tunnel/connection signalling	Connection Admission Control (CAC)	PE, P	CO-CS, CO-PS
	Notification of success/failure of connection/tunnel request	PE, P	All
	Assignment and configuration of VPN client layer de-multiplexing fields	PE, P	All
	Distribution of VPN client layer connection/tunnel information, e.g. QoS, de-multiplexing fields, bandwidth, etc.	PE, P	All

5.3.4 Functions required for peer level VPN establishment

Assuming that the underlying server layer topology has been established and the VPN peer layer TFPs and FPs have been configured with addresses, there are three main steps involved in establishing VPN peer layer connectivity between VPN members:

Step 1: Discover and authenticate VPN members and store VPN membership information.

Step 2: Calculate routes between VPN members at the VPN peer layer.

Step 3: Configure VPN peer layer network elements to provide VPN isolation.

Each of the functions required to support VPN peer layer establishment and maintenance along with the individual functional entities are described in further detail in table 8.

Table 8

Function	Functional entities	Network elements
VPN membership discovery	Discovery of VPN members	CE/PE
	Distribution/collection of VPN membership information (including joins, leaves, availability)	CE/PE
	VPN membership information maintenance	CE/PE
CE/user Authentication, Authorization, and Accounting (AAA)	Authentication: Identification of the CE/user based on the authentication parameters, e.g. a valid username and password	CE, PE
	Authorization: Grant or deny access to the VPN client layer network resources/services	CE, PE
	Accounting: Measurement of resources/services used	CE, PE
VPN peer layer routing	Distribution/collection of VPN peer layer reachability/topology/resource information	CE, PE, P
	Maintenance of VPN peer layer reachability/topology/resource information	CE, PE, P
	Calculation of the best route(s) between VPN peer layer APs	CE, PE, P
VPN peer layer network element configuration	Configuration of per VPN packet filters	PE
	Configuration of per VPN route filters	PE
	Configuration and exchange of per VPN/CE encryption keys	ES, CE, PE
	Assignment and configuration of VLAN IDs	CE, PE, P

5.3.4.1 VPN OAM functions

OAM tools and functions are essential in maintaining operational efficiency in large scale networks. Examples of important network connection/flow characteristics conveyed via OAM functions include quality, integrity and validity. If a layer network does not support OAM or has some missing OAM functionality, then that particular layer network is functionally deficient with regards to that OAM functionality. Higher/lower layer OAM functions/tools cannot be used as a replacement/substitute to provide the same functionality, particularly when it comes to fault localization. This is not to say that it is not possible to provide VPN services using network technologies that have OAM functions missing. However, missing OAM functionality is likely to significantly increase operating costs and complexity.

Table 9 presents some of the key OAM functions and identifies which network elements should support the associated functions.

Table 9

Function	Functional entities	Network elements
VPN client layer OAM	VPN client layer fault detection/management	CE, PE
	VPN client layer performance monitoring	CE, PE
	VPN client layer OAM activation and deactivation	CE, PE
VPN server layer OAM	VPN server layer fault detection/management	PE, P
	VPN server layer performance monitoring	PE, P
	VPN server layer OAM activation and deactivation	PE, P
VPN peer layer OAM	VPN peer layer fault detection/management	CE, PE, P
	VPN peer layer performance monitoring	CE, PE, P
	VPN peer layer OAM activation and deactivation	CE, PE, P

5.3.5 Service scenarios

Mapping VPN service requirements to the functions described in this recommendation allows network operators to select the most appropriate network technologies and mechanisms required to provide the VPN services they wish to offer. Selecting the best of breed mechanisms/protocols for each function allows individual functional components to evolve independently. This approach also supports the reuse of common mechanisms/protocols across different VPN network technologies (where appropriate) to reduce costs and complexity.

5.3.5.1 Client/server VPN services scenarios

The functions (and therefore mechanisms/protocols) required to support client/server VPNs are dependant on the client/server network modes as well as the actual VPN service being offered. For example, some customers may want to be able to set up on-demand SVCs between multiple sites as and when they are needed, whilst other customers may just want permanent connections based on a known static topology. As another example, some customers may want to use per user/CE authentication to increase security whilst other customers may believe restricting physical access to network infrastructure is adequate. Tables below provide some examples of different service scenarios and identify some example mechanisms/protocols that can be used to provide the functions required.

5.3.5.1.1 Scenario 1

Table 10

	Layer 1 SDH VPN service over OTN	Layer 1 TDM VPN service over MPLS	Layer 2 ATM VPN service over SDH
VPN client layer	SDH (e.g. STM-16)	TDM (e.g. E1)	ATM
VPN server layer	Lightpath / Optical Channel (OCh)	MPLS PW	SDH (e.g. VC-4)
VPN membership discovery	G.7714.1, Manual, NMS	RADIUS, BGP, LDP, Manual, NMS	Manual, NMS
VPN server layer routing	GMPLS/ASON routing protocols, manual, NMS	IGP, BGP, manual, NMS	GMPLS/ASON routing protocols, manual, NMS
VPN server layer tunnel/connection establishment	GMPLS/ASON signalling protocols, manual, NMS	LDP, BGP, Manual, NMS	GMPLS/ASON signalling protocols, manual, NMS
CE/user Authentication, Authorization, and Accounting (AAA)	GMPLS/ASON protocols, SNMP, NMS	RMON, SNMP, NMS	ATM PNNI/UNI 4.0 security, RMON, SNMP, NMS
VPN client layer network element configuration	NMS, Manual	NMS, Manual	ATM UNI, Manual, NMS
VPN client layer routing	GMPLS/ASON routing protocols, manual, NMS	Manual, NMS	Manual/static, NMS, PNNI
VPN client layer tunnel/connection signalling	GMPLS/ASON signalling protocols, manual, NMS,	Manual, NMS	Manual, NMS, PNNI
VPN client layer OAM	SDH overhead, e.g. J0/J1/J2 trace bytes, G1 path status byte	G.775 AIS/LOS	F4 and F5 fault management, loopback, and Continuity Check (CC)
VPN server layer OAM	OCh overhead, e.g. Trail Trace Identifier (TTI) used in path/section monitoring (PM/SM)	Y.1711, Y.1713, MPLS VCCV BFD/LSP ping	SDH overhead, e.g. J0/J1/J2 trace bytes, G1 path status byte

5.3.5.1.2 Scenario 2

Table 11

	Layer 2 Frame Relay service over MPLS	Layer 2 Ethernet VPWS service over IP/L2TPv3	Layer 3 RFC2547 IP VPN service
VPN client layer	Frame Relay	Ethernet	IP
VPN server layer	MPLS PW	IP/L2TPv3	MPLS
VPN membership discovery	RADIUS, BGP, Manual, NMS	RADIUS, BGP, LDP, RSVP-TE, Manual, NMS	BGP
VPN server layer routing	IGP, BGP, manual, NMS	IGP, BGP, manual, NMS	BGP
VPN server layer tunnel/connection establishment	LDP, BGP, Manual, NMS	L2TPv3 signalling	BGP
CE/user Authentication, Authorization, and Accounting (AAA)	RADIUS, 802.1X, RMON, SNMP, NMS	RADIUS, 802.1X, RMON, SNMP, NMS	CE-PE routing protocol (e.g. EBGP with MD5), RMON, SNMP, NMS
VPN client layer network element configuration	NMS, manual	NMS, manual, E-LMI	DHCP, NMS, Manual
VPN client layer routing	NMS, manual	MAC address learning	EBGP, OSPF, manual/static
VPN client layer tunnel/connection signalling	NMS, manual	Non required as the client is CL-PS	Non required as the client is CL-PS
VPN client layer OAM	Frame Relay LMI	802.1ag, E-LMI, 802.3ah, Y.17ethoam	IP Ping/traceroute
VPN server layer OAM	Y.1711, Y.1713, MPLS VCCV BFD/LSP ping	IP ping/traceroute	Y.1711, Y.1713, LSP Ping/traceroute

5.3.5.2 Peer level VPN service scenarios

The functions required to support peer level VPNs are dependant on the peer layer network technology and the type of VPN service being offered. For example, authentication in the encryption based VPN case is mandatory in order to use the correct keys whereas in the Ethernet VLAN based VPN case authentication (e.g. using 802.1X) provides extra security but is not essential. Table 12 provides some examples of different service scenarios and identifies some example mechanisms/protocols that can be used to provide the functions required.

Table 12

	IPsec VPN over the Internet	Ethernet VLAN VPN
VPN peer layer	IP	Ethernet
VPN membership discovery	Manual, NMS	Manual, NMS, RADIUS
CE/user Authentication, Authorization, and Accounting (AAA)	IKE primary authentication (based on pre-shared keys or digital signatures), RMON, SNMP, NMS	802.1x, RADIUS, RMON, SNMP, NMS
VPN peer layer routing	IGP routing protocols (e.g. ISIS, OSPF, RIP), BGP, manual, NMS	STP topology pruning and data plane address learning (transparent bridging)
VPN peer layer network element configuration	Configure the shared key, or request a certificate from the certification authority	Configure VLANs using manual configuration, NMS, or dynamic protocols
VPN peer layer OAM	IP ping, traceroute	802.1ag, E-LMI, 802.3ah, Y.17ethoam

6 Service capabilities identified

The services capabilities are derived from the service descriptions in annex B. This clause provides a definition for these services capabilities.

6.1 Services capability 1

Void

7 Service requirements

7.1 IPTV network requirements

The services with different network requirements are probably those related to IPTV (see clause 4.1.9).

IPTV, Internet Protocol Television, is broadcast-quality television and/or video signals that are delivered to subscribers or viewers using a broadband connection over Internet Protocol (IP). While IP stands for Internet Protocol, it does not actually mean the television content is streaming over the Internet. IP is simply the same method, protocol, or technology that enables you to access the Internet and IP-delivered television content is utilizing the same technology for delivery.

IPTV operates on a different premise than traditional satellite or cable television in that only selected programming and on-demand content are delivered to the consumer. With Satellite and cable, all channels are being pushed all the time to the consumer's home rather than a per-selection basis. IPTV's ability to provide two-way communication (you request a program from the TV guide and the program is delivered to you) offers true interactivity for the customer with the environment. HDTV, movies, past TV shows, and all other content can be distributed on demand and service providers can tailor the requested content and advertzing based on customer preference.

The minimum bandwidth needed for full screen IPTV and video: typically video broadcast as MPEG-2 (the current standard for digital television and DVD) takes 4-6Mbit/s, whereas newer, advanced codecs (e.g. MPEG-4 H.264, VP6, VC-1) are designed to consume 1-2.5Mbit/s. Generally, the lower the bandwidth, the lower the video quality is.

IPTV also has other network implications, channels can only be delivered over IP networks as multicast, and so if you want to deliver live television, your network (from DSLAM to peering hub access) must be multicast-enabled from end to end. Live TV cannot be delivered by uni-cast, and multicast also enables the most efficient delivery of video data and the smoothest channel changing speed. Using dynamic technologies such as PIM (Protocol Independent Multicast) can help to reduce network overhead by only relaying the channels that have been specifically requested.

We cannot send video through Wi-Fi, it is unacceptable for most video applications, although they are fine for simple computer networking. Trying to send MPEG-4 (even simple and advanced profiles such as DivX and xVid) is extremely difficult and unreliable. Newer technologies such as WiMax have yet to prove stable enough in a commercial setting even for PC connectivity.

NOTE 1: Reference: www.iptvinformation.net.

Further requirements:

- User profile management network requirements.
- Context aware management network requirements.
- Location network requirements.

Core network capabilities:

- End-to-end QoS guaranty (sometimes it is also a terminal requirement).
- Resource management: bandwidth management, lifetime of the established connections, traffic profile and a complete set of network parameters.

- Security.
- Privacy/identity.
- AAA: authentication, authorization and accounting, necessary mechanisms to guarantee secure network transactions.
- Regulations constraints.
- DRM (Digital Rights Management).
- Network flexibility: whenever a subscriber requests a program that is already being delivered to other subscriber(s), that request will result in shared distribution of that program (the subscriber joins the appropriate multicast group). This will conserve bandwidth by eliminating the Protocol (IGMP) [IGMPv1, RFC 1112 [12]; IGMPv2, RFC 2236 [10], IGMPv3 RFC 3376 [11] tries to solve this dilemma. IGMP protocol enables DSLAMs, PON Optical Line Terminals (OLTs), and routers to need for identical instances of a program to traverse the network. The Internet Group Management passively "snoop" subscriber traffic in order to identify and properly assign multicast group membership.
- Billing.
- Content storage and distribution mechanism (e.g. Content segmentation at the edge, coupled with innovative protocols like Broadband Media Distribution Protocol (BMDP, which represents the UTStarcom solution), which enable the IPTV system to adjust storage and distribution heuristically according to trends in subscriber behaviour).

NOTE 2: Reference: http://www.iptvmagazine.com/2005_10/iptvmagazine_2005_10_new_iptv_requirements.htm.

Other requirements are related to the technologies used in the access. There are multiple options for delivering the IPTV to the home:

- Digital Subscriber Line Access Multiplexer (DSLAM) platforms must accommodate current bandwidth requirements while simultaneously providing a path for future growth. This means providing a backplane sufficient to support both today's and tomorrow's highest speed DSL variants. These include ADSL2+ (here today, with up to 26 megabytes downstream and 3-6 megabytes upstream), and VDSL2 (already in trials, with up to 100 megabytes downstream and 50-100 megabytes upstream).
- Next-generation DSL standards are an important consideration for carriers in their selection of appropriate DSLAM platforms. Equally worthy of consideration is DSL's inherent distance limitations and the potential for new technologies to provide remedies. Environmentally hardened DSLAM platforms designed for outdoor deployment are now available. These DSLAMs incorporate the latest DSL technologies in hermetically sealed, line-powered enclosures that enable carriers to effectively deploy DSL to subscribers and communities via 3kft and shorter copper loops, enabling data rates in excess of 50 Mbps.
- Passive Optical Network (PON) technology provides a compelling complement to DSL for Fiber-to-the-Node (FTTN) applications, and/or a compelling alternative, in the case of Fiber-to-the-Home/Business (FTTH/FTTB) applications. PONs combine the high capacity of fiber with the scalability of point-to-multipoint network topologies. Two PON variants stand to play an important role in access networks serving digital homes: Gigabit Ethernet PON (GEPON) is available today and ATM-based Gigabit PON (GPON) will be avail able in the future. The currently available GEPON variant enables a single Gigabit Ethernet uplink to be split between 32 subscribers, affording 30 megabytes of symmetrical bandwidth to each connected digital home.

A set of examples for IPTV DSLAM-centric requirements is shown in table 13.

NOTE 3: Reference: HEAVY READING | VOL. 3, NO. 9, JUNE 2005 | IPTV AND THE FUTURE OF TELECOM VIDEO NETWORKS.

Table 13: IPTV DSLAM-centric requirements

Requirement	Details
Gigabit Ethernet Network-Side Interface Variations	Various network-side interfaces will be required depending on the location of the DSLAM: CO-based DSLAMs will require short-haul interfaces, while remote DSLAMs will demand long-haul and/or passive WDM interfaces.
Ethernet Switching Functionality	A full suite of Ethernet switching functions will be required, including: splithorizon forwarding, virtual MAC, support for multiple-transmission media, congestion management, link aggregation, Ethernet OAM, broadcast-rate limiting, loop detection, accounting, Ethernet-ATM interworking, etc.
IP Routing Functionality	Key IP routing requirements include: address allocation and aggregation, robust IP protocol support, static routing, routing protocol redistribution, IP packet filtering, IPv4/IPv6 support, various MPLS functions, access control, QOS, and high availability. Some vendors are pushing enhanced IP routing support on the DSLAM, but the primary requirement is IP multicast.
Distributed B-RAS Functionality	As architectures warrant, the DSLAM will support distributed B-RAS (Broadband Remote Access Server) functionality, including AAA and other relevant B-RAS functions. While this may be supported by some IP DSLAM vendors, it seems this function will continue to be centralized further back in the network.
Video Processing/ Multicast	IGMPv3 support per RFC 3376 [11], implementing multicast by providing the functionality of an IGMP router or IGMP proxy.
SIP-IGMP Translation	The use of SIP as a means to establish an IPTV session may be deployed in certain network architectures; as a result, the DSLAM will be required to support SIP-IGMP translation of SIP messages to IGMP messages.
Access Control for Ethernet Switching, IP Routing	Enables the operator to control multiple parameters for subscriber access, including MAC address authentication, port and/or VLAN ID authentication, 802.1x Ethernet authentication, DHCP request forwarding, Radius, DHCP, policy control, etc.
Segmentation for Ethernet Switching, IP Routing	Closed user group support will enable the Ethernet switching component to separate the data of one customer or group from that of another customer or group. Segmentation capabilities for integrated IP routing functions include such features as virtual router support and pseudo-wire support.
Differentiated Services for Ethernet Switching, IP Routing	Differentiated services will enable the operator to apply different policies and services to different subscriber based on their attributes. Differentiated services can be supported via port or VLAN ID, MAC address, 802.1p, and 802.1x for Ethernet switching capabilities. IP routing QOS, as outlined above, will also be required if integrated.
Scaleability and Performance	Some critical issues here involve both the Ethernet switching architecture and the IP routing architecture, e.g.: line-rate forwarding on all ports, port/fabric oversubscription, head-of-line blocking management, highly scaleable VLAN support, scaleable IGP (Interior gateway Protocol)/EGP (Exterior Gateway protocol)/multicast support, rapid LSP (Label Switching Path) setup rates, etc.
High Availability	Hardware, software and protocol high-availability support is required for hitless switchover in the case of hardware and/or control plane failures.
Evolution Requirements	Evolution requirements may revolve around the migration away from ATM on the customer-facing DSL interfaces and/or the evolution of the DSLAM to support fiber access, as fiber is pushed deeper into the access network.

7.2 VPN network requirements

Network requirements for client/server VPN establishment are as follows:

- VPN server layer establishment which includes:
  - VPN membership discovery.
  - VPN server layer routing.
  - VPN server layer tunnel/connection establishment.
- VPN client layer authentication/configuration which includes:
  - CE/user Authentication, Authorization, and Accounting (AAA).
  - VPN client layer network element configuration.

- VPN client layer routing and signalling functions which includes:
  - VPN client layer routing.
  - VPN client layer tunnel/connection signalling.

NOTE 1: For more details refer to clause 5.3.3.

Network requirements for peer level VPN establishment are as follows:

- VPN membership discovery
- CE/user Authentication, Authorization, and Accounting (AAA).
- VPN peer layer routing.
- VPN peer layer network element configuration.

NOTE 2: For more details refer to clause 5.3.4.

The network requirements for the VPN service and the corresponding functions (mechanisms/protocols) to support client/server VPNs are dependant on the client/server network modes as well as the actual VPN service being offered.

Some examples of different service scenarios and some example mechanisms/protocols that can be used to provide the functions required for client/server VPN services are provided in clause 5.3.5.1.

The functions required to support peer level VPNs are dependant on the peer layer network technology and the type of VPN service being offered. Some examples of different service scenarios and some example mechanisms/protocols that can be used to provide the functions required for peer level VPN services are provided in clause 5.3.5.2.

8 Options for strategic directions

8.1 Location

The location in this clause concerns the location of a mobile terminal or the nomadic use of a fixed or mobile terminal. The conclusion of the location of a person can be derived only after other data, e.g. authentication, are combined with the location information.

8.1.1 Accuracy "City Blocks"

8.1.1.1 Service

The accuracy of the location in the range of city blocks (urban areas) or a few square kilometers (rural areas) coincides with the deployed location information of mobile services. Fixed networks usually provide more accuracy.

Eurescom's "Meet Me" service (see clauses 4.1.1 and B.1.8) does not require more accuracy. The services described can be achieved by augmenting directory services.

NOTE 1: Such directory services can be specialized for specific applications. The example in clause 4.1.1 reflects the traditional assistance service.

NOTE 2: The accuracy "City Blocks" is also sufficient for the services envisaged in Eurescom's Community Cooperation project (see clauses 4.1.3 and B.1.8).

8.1.1.2 Considerations

Privacy: Location information on users and terminals, whether current or not, is very privacy sensitive. Telecommunication Service Providers need to keep location information until location based charges have been settled. On the other hand, legal requirements to trace the location of persons (through the location of mobile terminals) require Telecommunication Service Providers to store location information up to a period set by local laws (in Europe between 6 months and 2 years) and reveal them to authorities upon judicial request.

Correctness: It might be difficult to maintain correct information in the directory to enable this service to function reliably. For example in the assistance case, working hours of establishments would need to be updated continuously especially over time periods with many variations to the regular scheme as summer holiday or Christmas seasons.

NOTE: This directory service could be provided independent of the Telecommunication Service Providers.

8.1.2 Accuracy "a few meters"

8.1.2.1 Service

The accuracy of the location in the range of a few meters coincides with the requirement location information for emergency services. For mobile terminals, such accuracy probably can only be achieved by smaller "real" cells (no macro-cells for instance) or the use of GPS_1 (Global Positioning System) or GPS_2 (Galileo Positioning System).

NOTE: This service is the common base service for the service options defined in clauses 8.1.3 and 8.1.4.

8.1.2.2 Considerations

Privacy 1: Location information on users and terminals, whether current or not, is very privacy sensitive; more so when GPS-precise location is disclosed. Telecommunication Service Providers do not need to keep such accurate location information for location based charges. On the other hand, future legal requirements to trace the location of persons (through the location of mobile terminals) require Telecommunication Service Providers to store GPS-precision location information for a period period set by local laws and reveal them to authorities upon judicial request.

Privacy 2: GPS enabled mobile terminals might be required to implement a method to turn on and off the disclosure of GPS position information in an easy way, e.g. similarly easy as to turn on and off silent alarm or even with an extra button for emergencies. Network functionality might need to be developed to force the revelation of a GPS-precise location (if available) when calling emergency institutions.

8.1.3 Accuracy "a few meters" and attention

8.1.3.1 Service

A relatively precise location with a direction of attention is required for the IST's Agamemnon project that caters for "on-line guides for tourists". Most likely, such services are deployed first by the rental of special devices that can be pointed at Monuments, palaces, etc. and that play information to the devices ear-phone. On the other hand, together with the GPS location information (see clause 8.1.2) and an MMS with the monument's picture in it could serve the same purpose.

In both instances (special device or GPS enabled mobile terminal), pattern recognition of images in comparison with templates from a monument picture database would be required. Also selection of depth of information is the same in both cases.

NOTE: Face recognition software behind public cameras could correlate face and terminal identity. Determining also the direction of attention might be a futuristic alternative to sending MMSs. Whether such techniques would be publicly acceptable is a different matter (although there exists a certain fear that the public does not have the last say in this matter).

The service is not limited to tourist guides, though. Strolling through an unknown area, e.g. after a meeting in a foreign town, and succumbing to a pang of hunger, there might be a commercial incentive to present (video, audio, or both) the menus of the restaurant the visitor is currently looking at. Of course, the display of information from any store that caught the visitor's interest is possible. This may even lead to commerce at flexible street price levels through price tags that may shift with time (also applicable to restaurants).

8.1.3.2 Considerations

Privacy: See clause 8.1.2.

Attention 1: Granularity might be an issue to be solved also. Just consider an art gallery that also features a restaurant; what is the attention on the gallery, its architectural style and its history or the offerings of the restaurant within.

Attention 2: The attention might also be on a taxi directly in front of the art gallery and the intention is to board this taxi. Considering this scenario, the taxi might be able to indicate an approximate (or fixed) price for the transport to a particular hotel.

8.1.4 Accuracy "a few meters" and intention

8.1.4.1 Service

A traveller's intention is to take a train to the airport and bored a plane there. If this intention is known to the "system" the delay of the train might trigger an alarm to the traveller already at the starting station of the voyage. The "system" might also be aware that the plane is also delayed and a late arrival of the train at the airport is tolerable.

NOTE: The service was described as a research program in Informatik Spektrum.

8.1.4.2 Considerations

Intention: It is questionable whether customers entrust their intentions to Telecommunication Service Providers; such knowledge might stay within a private system. This system, though, would need to keep track of the traveller.

Location: GPS enabled location serves fine when the mobile terminal is carried by foot or in a car. This might not be the optimum when the terminal is carried on a train. Although correlation of GPS information and GPS information of trains might be possible, a more direct information could be the train indication, e.g. as «country, train company, train number». Train delays, re-routes, etc. can be derived much easier this way.

In addition, already general indications as "in car", "in public place", "in train", etc. may assist with User Profile Management (see clause 8.2).

NOTE: Besides GPS-precise location, a «country, train company, train number» information also can provide ETA (Estimated Time of Arrival) in addition to STA (Scheduled Time of Arrival). Information about the estimated time of arrival of the train at the airport is crucial to provide the example service sketched above.

8.2 Personal Assistance

Eurescom's Personal Assistance Service Concept (see clauses 4.1.5 and B.1.8.4.6) suggests that the Personal Assistant should act on behalf of its owner in an autonomous way to:

- Manage communications.
- Manage the user's agenda and contact list.
- Manage the user's electronic shopping.

8.2.1 Manage Communications

8.2.1.1 Service

The concept of managing a user's communication coincides well with the User Profile Management (see annex E and EG 202 325 [3]). Four type of Profile Agents are described:

- Storage Agents.
- Processing Agents.
- Activation Agents.
- Viewing/editing Agents.

8.2.1.2 Considerations

Agents — Telecommunication Service Providers might provide processing agents and activation agents as many of the events that influence User Profile Management have their origins as events within telecommunication networks. In addition, location - including information like "in car", "in meeting", etc. - is readily available within the network.

8.2.2 Manage Agenda and Contacts and electronic Shopping

Agenda and maintenance of Contacts is usually done via Business and Office Software; there probably is not much value for Telecommunication Service Providers to enter this market; the same is true for shopping assistance.

8.3 IP Television

IPTV may be one of the options for strategic decisions. IPTV has now become one of the most promising new services in telecommunications, as delivering video over IP represents as a means to complete telecom operators their triple-play service bundles.

IPTV should provide the same service and content as cable networks, including broadcast television, premium channels, pay per view and music - anything which can be sent from a single source to many subscribers. This includes the basic services as:

"Basic IPTV", which is similar to the service offered by cable operators, and includes the access to one or more of the following:

- National channels.
- Premium channels.
- Local channels.
- Music channels.

HDTV can provide an additional revenue opportunity. Available high definition content includes:

- Local channels which broadcast high definition content.
- Networks and premium channels showing only digital programming.
- Channels dedicated to showing only high definition content.

These channels are more aptly described as digital television. While all content is digital, not all programming is necessarily high definition.

Apart from "Basic IPTV", there is a wide variety of other personalized services.

Pay Per View (PPV) programming requires that the subscriber pay an additional fee to view specific content.

Near Video on Demand (nVoD) is similar to PPV. While PPV service starts the movie every two hours, nVoD service shows the same movie on several channels, each starting as little as 15 minutes apart.

Video on Demand (VoD) allows the subscriber to view content whenever he/she wants, from a library of stored content. Unlike near VoD, true VoD allows the subscriber to immediately begin viewing the content.

Time-shifted viewing allows content to be viewed at a time which is more convenient to the subscriber. The ability to "time-shift" television viewing is provided by Digital Video Recorders (DVRs). Initially developed as standalone boxes, DVR capability is being integrated into the set-top box. An alternative model, called network DVR, allows the user to store recorded programs using storage located in the telecom operator network rather than in the set-top box. DVRs are also called Personal Video Recorders (PVRs).

Integrating television and telephony and data enables a set of new services. Some of examples are listed below:

- TV Telephony including Caller ID on TV, Call Routing with the possibility to pre-define some actions by the subscriber, Click-to-Call, Video calling and conferencing, etc.
- TV Data including Web access from the TV, access to a third-party content provider, etc.
- Web and e-mail on TV.
- Music on Demand (MoD).
- Gaming on Demand.
- IM and presence.
- Additional TV data services as Local dating services, View TV on a PC, etc.

NOTE: The services above might be more Application Services than Network Services.

8.4 Virtual Private Networks

With the widespread adoption of broadband access technologies, distributed organizations are seeking ways to support broadband access at branch locations, secured by VPN technology. The challenge is to provide flexibility and high-speed access at the branches and maintain centralized control. Thus, VPN may be another option for strategic decisions.

Based on Draft ITU-T Recommendation Y.1314 [5] on VPN functional decomposition provided in clause 5.3, the possible client/server combinations for VPN provided within the TISPAN NGN are as follows:

- Client/server VPN with a CL-PS VPN server layer and a CL-PS VPN client layer (e.g. An Ethernet server layer supporting an IP client layer).
- Client/server VPN with a CO-PS VPN server layer and a CL-PS VPN client layer (e.g. An ATM server layer supporting an IP client layer).
- Client/server VPN with a CO-CS VPN server layer and a CL-PS VPN client layer (e.g. An SDH server layer supporting an Ethernet client layer).

Another option is to provide a peer level VPN. A peer-level VPN can be provided by the CL-PS network mode only.

9 Corporate and «SoHo» access scenarios

A first analysis of access scenarios for corporate and Small office and Home networks (SoHo) can be found in annex C; however, further work is required on this topic.

Annex A:
Service Capabilities derived from TISPAN release 1

A.1 Introduction

TISPAN Release 1 documents call for a large number of service capabilities; they are specified in the following documents:

- TS 181 001 [1]: "Videotelephony over NGN";
- TS 181 002 [2]: "NGN Basic Supplementary services; General aspects";
- TS 181 013 [13]: "Presence Service Capabilities"; and
- TS 181 006 [14]: "Services and Capabilities Requirements for TISPAN NGN Release 1".

This clause highlights the service capabilities identified in these deliverables.

A.2 Multimedia Telephony with PSTN/ISDN simulation services

The definitions of the supplementary services below was taken from TS 181 002 [2]. This list of supplementary services indicates the desired behaviour of the service capabilities.

- Originating Identification Presentation (OIP).
- Originating Identification Restriction (OIR).
- Terminating Identification Presentation (TIP).
- Terminating Identification Restriction (TIR).
- Malicious Communication IDentification (MCID).
- Anonymous Communication Rejection (ACR).
- Communication DIVersion (CDIV).
- Communication Forwarding Unconditional (CFU).
- Communication Forwarding on Busy user (CFB).
- Communication Forwarding on no Reply (CFNR).
- Communication Forwarding on Not Logged-in (CFNL).
- Communication Deflection (CD).
- Communication session Barring (CB).
- Outgoing Communications Barring (OCB).
- Incoming Communications Barring (ICB).
- Communication Waiting (CW).
- Advice Of Charge services (AOC).

- Advice of Charge: charging information at communication Set-up time (AOC-S).
- Advice of Charge: charging information During the communication (AoC-D).
- Advice of Charge: charging information at the End of the communication (AOC-E).
- Completion of Communications to Busy Subscriber (CCBS).
- Communication HOLD (HOLD).
- CONFerence (CONF).
- Message Waiting Indication (MWI).
- Explicit Communication Transfer (ECT).
- Reverse Charging.

A.3 Video Telephony Service description

A.3.1 Introduction

The video telephony service description extensively references WI 01002 on the PSTN/ISDN simulation service and can be regarded as a straight extension of this service. The one difference is the addition op a video stream to the service.

A fallback mode is foreseen to audio only where the video stream may not be available at the remote terminal.

NOTE: This WI already assumes IMS implementation.

The following service capabilities have been identified in TS 181 001 [1].

A.3.2 CONFerence (CONF)

In addition to the principles of the corresponding PSTN/ISDN simulation service defined in TS 181 002 [2] the following shall also apply.

A videotelephony service shall allow a conference service. If a correspondent's terminal does not allow videotelephony service, this conference shall be an audio conference for this correspondent and a video + audio conference for the other correspondents.

A user shall be able to create a videoconference at any time during a communication.

If a video-stream is made available from the user who is talking, this video-stream should be made available to all other correspondents. Sharing documents should be allowed during a videoconference.

A.3.3 Video quality

Four profiles are defined. Other enhancement or additional functions can be added.

Table A.1: Video quality profile

Profile	Description
A	Basic Videotelephony: PCM or equivalent telephony audio, QCIF or CIF video with limited movements capability.
B	Enhanced Videotelephony: wideband audio, CIF video. The service should be usable for sign language and lip-reading and should provide adequate representation of the fluid movements of a person displayed in head and shoulders view. Facial expressions shall be clearly recognized.
C	Television Broadcasting quality.
D	High Definition Television quality.

Following parameters shall be taken into account: Overall Delay, Delay Variation, Differential Delay between sound and image, Sound Quality, Image Quality, Echo Cancellation, Sensitivity to Packet Loss, etc.

A.3.4 Service Capabilities identified

This service capability seems to call for a simple extension of the basic telephony service capability but with the ability to add multiple media streams.

This means that a new capability is needed:

- Video bearer.

The following capabilities may be extended for this service.

- Communication control: needs to be extended to drive the video bearer and control the adding and removal of bearer instances to and from calls.
- A version of the CONF bridge needs to be available for video bearers.

Terminal capabilities identified:

- Video Media presentation.
- Video Communication initiation.
- Video Communication termination.

A.4 Messaging

A.4.1 MMS

TS 122 140 [15] defines MMS in IMS.

This TS defines the requirements for MMS to be understood as a framework to enable non real-time transmissions for different types of media including such functionality as:

- multiple media elements per single message;
- individual handling of message elements;
- different delivery methods for each message element;
- negotiate different terminal and network MM capabilities;
- notification and acknowledgement of MM related events (e.g. delivery, deletion, etc.);
- handling of undeliverable MM;
- personalized MMS configuration;

- flexible charging.

This deliverable identifies the following service capabilities:

- MMS-storage.
- MMS-delivery (push).
- MMS-delivery (pull).
- MMS-delivery (streaming).
- MMS-submission.
- MMS-type conversion.
- MMS-format conversion.
- MMS bearer.
- MMS-forwarding.
- Management control: so the operator may disable/enable MMS delivery.
- Terminal-capabilities detection: the network shall be able to detect if the terminal has this capability.
- MMS-user profile.
- MMS-cancellation/replacement/timeout.
- MMS mass delivery.
- MMS-notification.
- MMS-user agent.
- MMS accounting.

And the following terminal capabilities:

- Terminal/USIM storage of MMS-user profile.
- MMS-Delivery control.
- MMS-creation.
- MMS-presentation.
- MMS-storage.
- MMS-notification presentation.

A.4.2 IM and Session based messaging

TS 122 340 [16] defines IM and session based messaging in IMS.

Messaging can be divided to two different main classes based on the expectation of the sender. The sender either expects the message to be delivered immediately or he does not care so much whether the message is delivered immediately or later.

The immediate case can be further divided to two different sub-classes based on the actions required form the user before he can engage in a communication. The user can both send and receive messages without any prior actions or he may be required to join to a messaging session before the message exchange can take place.

The messaging types considered in the present document are:

- **Instant Messaging (IM):**
  Typically, sender is aware of the availability of the recipient(s) (possibly through the use of the Presence service) before sending this type of message as, if the recipient is not available, the message may be discarded or deferred. An immediate message may be deferred by the recipient's network based on the message filtering settings defined by the recipient or by the recipient's IMS service provider.

- **Session based messaging (CHAT):**
  The sender and recipient expect near real time message delivery. Typically, recipients of the session based messaging that are not joined to a group or are not available will not receive the messages. Typically, a sender may send a message to all participants in the messaging session without addressing them individually.

This deliverable identifies the following service capabilities:

- IM-delivery.
- IM-storage (user requested).
- User presence storage (presentity).
- User presence delivery.
- Management control: so the operator may disable/enable IM delivery.
- User control: so the user may disable/enable IM delivery.
- IM sender ID identification and restriction.
- IM message filtering (based on receiving user profile).
- IM user profile.
- IM accounting.
- CHAT group control.
- CHAT session control.
- CHAT user profile.
- CHAT private messaging.
- Management control: so the operator may disable/enable CHAT delivery.
- User control: so the user may disable/enable CHAT delivery.
- CHAT sender ID identification and restriction.
- CHAT message filtering (based on receiving user profile).
- CHAT storage (user requested).
- CHAT storage (system).
- CHAT accounting.

And the following terminal capabilities:

- Terminal/ISIM storage of IM-user profile.
- IM-creation.
- IM-presentation.
- IM-storage.

- IM-notification presentation.
- IM stored message manipulation (retrieval/deletion/forwarding/etc.).
- CHAT session establishment/joining/invite handling/leaving.
- CHAT session presentation.
- CHAT message creation.
- CHAT invitation creation.
- CHAT group creation.
- CHAT stored message manipulation (retrieval/deletion/forwarding/etc.).

A.5 Presence

TS 122 141 [17] defines presence in IMS.

The present document defines the requirements for the support of the presence service. The presence service results in presence information of a user and information on a user's devices, services and services components being managed by the wireless network. Together, user, these devices, services and services components are termed presentity (presence entity).

The present document identifies the following service capabilities:

- User presence storage (presentity).
- User presence delivery (watcher).
- User Presence profile.
- Presence accounting.
- User location storage (part of presentity?).
- User location delivery (watcher).

The present document identifies the following terminal capabilities:

- User presence profile editing.
- User presence setting.
- User location setting.

A.6 Services and Capabilities Requirements for TISPAN NGN Release 1

TS 181 005 [7] does not identify new service capabilities but describes behaviour of capabilities already identified.

Annex B:
Service definitions considered for the analysis

The information in this annex is either publicly available on the Web page or has been explicitly provided by Eurescom, IST, or CELTIC (see annex F).

B.1 Eurescom service definitions

B.1.1 P1101 Always on - Device Unified Services (DUS)

B.1.1.1 What is this Project about?

The Project is focusing on concepts for adding value to future broadband Always-On (AO) mass-market services - with particular focus on how these new services can be delivered to multiple heterogeneous devices. The project tries to understand the characteristics of these services (building on previous EURESCOM projects such as P1003) and will design and develop a prototype for a DUS (Device Unify Service). The DUS will aim to exploit the characteristics of AO and provide access to online services from multiple devices (e.g. phone, PDA, PC, TV, etc.) and from any location. DUS unifies all the user's devices such that they together constitute a big "virtual" terminal, so that a session may begin on one terminal and continue on another. This prototype will then be examined in user trials to understand the commercial and usability implications.

B.1.1.2 What are the main objectives of this Project?

- Identify new mass-market device-independent AO services.
- Prototype innovative AO applications with a DUS as interface to the user.
- Identifying the requirements for realizing DUS - focusing on the AO characteristic of the new network services and devices.
- Identifying the technology issues and gaps that need to be resolved.
- Provide an overall architecture and models for DUS.
- Develop a DUS prototype.
- Trial these service in a number of different market segments.
- Produce usability guidelines for device independent portal services.
- Identify the business implications for Telecommunication Service Providers.
- Address the issue of providing continuity and consistency when switching from one device to another.
- Study the problematic of avoiding the tromboning between homogeneous domains.

B.1.1.3 What are the key-results for this Project?

The key-results from the project will be the development of design guidelines for new AO device independent portal services based on a series of trials in different countries and on top of a DUS prototype. This will enable the Eurescom partners to better compete in the competitive broadband marketplace by exploiting the characteristics of these networks. It is predicted that Multi-service bundles will boost Telecommunication Service Providers revenue by more than 400 % - exploiting AO and multiple devices will be a key part in defining these multi-service bundles. The added value of the project will therefore be in the areas of competitive advantage and market share (in the long term).

B.1.1.4 Services identified within the project

The Device Unify Service (DUS) has been defined within the project. It represents a commercial service that will provide value and revenue potential to different types of operators and service providers. For Mobile operators or Mobile Service providers it will provide a very user-friendly interface for their customers. For fixed network operators or service providers it will generate a bridge between fixed and mobile devices.

From the technological point of view, DUS has immeasurable value since it provides an opportunity to experiment with service delivery over an integrated set of major technologies, such as IP, wireless communications, agent concepts and short-range radio link technology.

B.1.1.4.1 Main features of DUS

B.1.1.4.1.1 Unifying different devices

DUS helps the user unify all his/her computing and communication devices in such a way that they can behave as one device with multiple input and output capabilities. This, for example, can provide the user with an optimal multimedia session using only a number of simple single-media devices. These devices should be co-ordinated and have the possibility to be used together in the same session even if they are connected to different types of networks. The unification of the devices into a single virtual terminal is depicted in figure B.1.

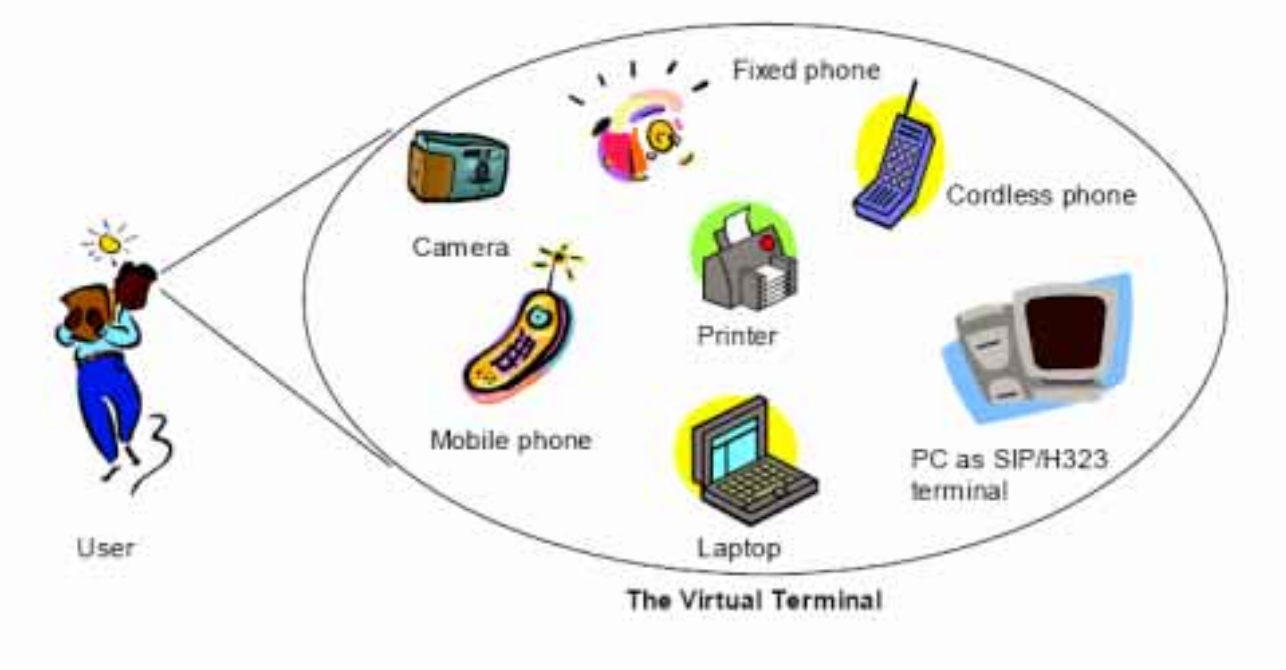


Figure B.1: The Unification of Different Terminals into a Single Virtual Terminal

B.1.1.4.1.2 Unique User Profile

The DUS will handle the management of the different devices and the different terminal profiles. For example, if a user updates the address-book on one device, it will automatically be updated on all other devices he/she has access to. The DUS will likewise allow the user to set up and modify preferences for all devices from any terminal that can support a DUS user interface.

B.1.1.4.1.3 Communication Service Customization

DUS allows the end user to customize their communication service (such as when they want to be called, on what device, under what condition, by whom etc.). It also allows both the caller and callee to control how the service will be served. With customizable redirection of incoming services, a user may, for example, specify that all calls during daytime should be redirected to the office phone and thus be handled through a secretary. Based on user preference profiles, a specific conference call could be redirected, to the desktop beside his/her fixed phone. At night a user may wish to receive all calls as voice-mail - except for urgent calls such as from his/her boss. Or in the evening, all incoming calls could be received at his/her home phone. Alternatively, a particular conference call that includes video could be directed to the home PC, while all voice services received while travelling could be delivered at his/her cellular phone.

B.1.1.4.1.4 Static, dynamic or automatic configuration and reconfiguration

There are different alternatives to how the user can configure his/her virtual terminal. It can be a static configuration where; for example; all devices that are to be used in future sessions are predefined and; therefore; known by the DUS. A static configuration can also include a timetable or location-table that decides; which devices should be used where and when. The configuration can also be dynamic, allowing new, unknown devices to be added to the DUS as they are needed. Finally, it can be done automatically, this would require a service discovery mechanism that would be able to recognize nearby services and devices and report them to the DUS.

B.1.1.4.1.5 User centric

This is an important feature of DUS. The situation today is that one can contact a person by selecting to communicate with a single device. We could say that today's telephony service is device centric. One might try to reach a person by successively dialling a home telephone, an office telephone, a cellular phone or whatever other phones/devices might be associated with the person you want to contact. Success is completely depended on whether or not the right telephone is dialled. Very often one will unintentionally disturb other people e.g. husband/wife, colleagues etc, before the desired person is reached. On the contrary, the DUS will offer a service that is truly user centric in that one will be able to address a person directly.

B.1.1.4.1.6 Using Stationary Services at Visiting Sites

DUS will make it easy and straightforward to borrow stationary devices at visiting sites, which may offer better input and output capabilities than the mobile devices the user is carrying. This would depend on the owner of the stationary devices allowing such use.

B.1.1.4.1.7 Mobility

DUS should support personal and session mobility in addition to the terminal mobility, which is supported by the underlying network like GSM, UMTS, etc. By combining these three types of mobility one could provide more flexible communication services for the user. With personal mobility it is meant that communication services treat people rather than devices as communication endpoints. Personal mobility should give the callee the total control over how he can be reached. While session mobility is the mobility across different devices in the middle of a service session (for example seamless switching from a cell-phone to an IP-Phone in the middle of a conversation). With total mobility the user will have more flexibility while using communication services and the user can make use of his/her mobile devices and also stationary devices at visiting sites. The user could also move the input and output of a session from a set of devices to another one. For example, he can move visual output from a mobile device with small display to a larger and better stationary screen. In other words the user may manage his/her own and available devices in a more flexible way than what the existing networks is offering.

B.1.1.4.1.8 Dynamic Multi-party Communication

Both caller and callee may add or remove one or more new devices/parties to the ongoing service session independent of the kind of access networks they are connected to.

B.1.1.4.1.9 Using services on multiple devices successively

DUS provides the possibility for the user to dynamically redirect both communication and data sessions and hence use multiple devices during one and the same session. For instance a user could receive a mobile phone call while driving to the office. As he/she arrives at the office and walks towards the desk the session could be transferred to the users fixed phone.

B.1.1.4.1.10 Using Services on Multiple Devices Simultaneously

DUS also provides the opportunity for the user to split and multiply streams and hence use multiple devices at the same time. New devices should always be able to be added to the service session in a dynamic way, and released likewise.

B.1.1.4.1.11 User Activity-Driven Service

DUS could support a new kind of communication service based on user activity. This type of service generalizes the location-based services that have appeared in many other systems. Instead of customzing the communication service based on the current user location alone, DUS should allow the current user behaviour (such as "I am talking to an important person") to be tracked and used for customization. The users control what behaviours are tracked as a way to control privacy. DUS should allow users to control privacy policies, such as, which information is tracked and to whom the information can be released.

B.1.2 P1201 ERNIE - Entertainment and new interactive services via DSL

B.1.2.1 What is this Project about?

The transmission of broadband entertainment services (like traditional TV and upcoming Interactive TV services) via DSL access networks will be a hot topic, having in mind the desired separation of cable operators from Telecommunication Service Providers.

In the framework of this project, the feasibility of provisioning TV and iTV services via IP-based networks (especially over xDSL access) will be examined and demonstrated. The project will choose an user-centric approach focussing on acceptability and quality aspects compared to traditional DVB-based or analogue TV services.

Customer requirements will be collected and assessed. These requirements will form the basis for the concept of a showcase demonstrator. This demonstrator will prove the feasibility of TV via DSL as well as current limitations. An extensive study and comparison of available codecs, DSL-STB implementations and middleware will be made.

Interviews with users and an extensive market analysis will give answers on the expected economic success and user acceptance of TV via DSL.

The project will examine and evaluate the mass-market suitability as well as the economic perspectives.

B.1.2.2 What are the main objectives of this Project?

- Gather the user requirements (both end-users and content provider) and the market perspectives for residential broadband entertainment services via DSL.
- Show how Telecommunication Service Providers can create additional revenues from their existing infrastructure by introducing business models for broadband entertainment services over DSL.
- Evaluate and assess access network configurations for different applications and services (e.g. at different quality levels, unicast and multicast, on-demand and real-time).
- Evaluate the expected economic success and user acceptance of such interactive services via DSL.

B.1.2.3 What are the key-results for this Project?

The key-results will focus on optimzing the interactive service delivery platform by choosing the right delivery mechanism and middleware will enable the Telecommunication Service Providers to generate higher revenue sooner and secure greater return on investment. Assessment of required features and functionality for the delivery of interactive services, as well as cost and complexity of the various options related to the service delivery platform, should facilitate such optimization.

B.1.2.4 Services identified within the project

The major goals of project ERNIE were the definition of suitable broadband entertainment services, the development of an appropriate overall systems concept and the set-up of a demonstrator in order to investigate technical aspects and to carry out realistic user tests. This article describes a network architecture as part of an overall system concept to meet the various requirements, which was developed during the ERNIE project.

A system concept and the resulting network architecture strongly depend on the different services that have to be offered to the customer. The following major services have been analysed from the functional and technical perspective and are integrated in the ERNIE demonstrator considering the different user aspects:

- **Live Streaming:** From the end-user's point of view, live video streaming is very similar to TV broadcasting - in contrast to on-demand streaming. The same content is distributed simultaneously to a large audience of users. Live video streaming can be seen as a modified replacement of conventional television where the Internet replaces the transmission channel.

- **Video on demand:** The essence of Video on Demand (VoD) is that users can view the offered content at any time they like. Interactive Video on Demand (iVoD) is an enhanced version of the VoD service where viewers watching the videos may use functionalities similar to those of video recorders (forward, rewind, pause, slow). An iVoD system consists of three major components: At the customers side the set-top box or PC, containing the video client (software), the distribution network and the (video) server at the provider side. All iVoD connections require bi-directional communication between server and client. A system of an appropriate design must be able to manage several hundred or even thousands of requests simultaneously.

- **Navigation and electronic program guide:** Navigation and electronic program guide (EPG) support the user with an interface to the system. It must be easy to understand and easy to use and should provide all expected functionality to use the available services. Design and "look and feel" are as critical for successful services as the content itself. Design of presentation pages for the TV screen is different from the design for a PC because of the limited resolution, the larger viewing distance, and the limited control device (remote control instead of mouse and keyboard).

In order to provide and run the required services, an end-to-end network architecture has to be developed and integrated into the existing telecommunications infrastructure. The figure shows an overview of such an architecture. The various components can be clustered into several functional areas.

Content network with the so-called Head End is a part of a network, where the selected TV content (programs) is taken from the Broadband Delivery Network (BDN) by a satellite dish. Depending on the received formats, the content needs to be encrypted and decoded. In a next step the content has to be encoded into the right format and encapsulated into IP packets.

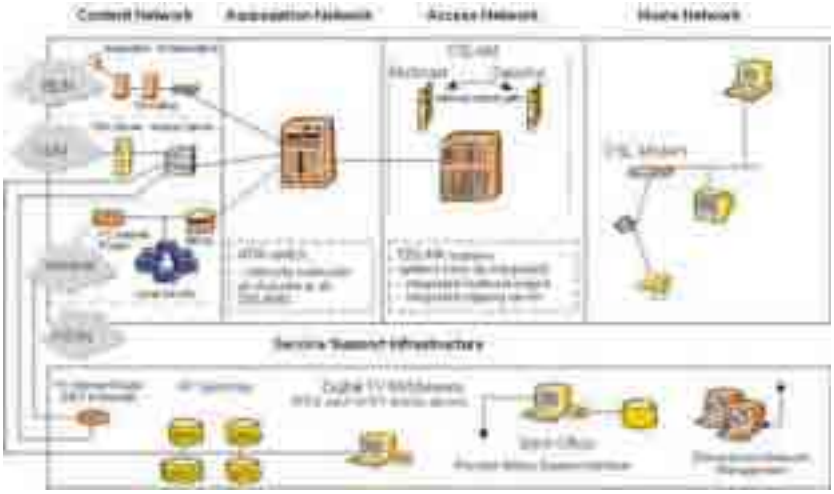
Content Delivery Network (CDN) serves for the on-demand services. Since the content for VoD is received in various formats including analogue formats such as BetaSP, and digital formats such as DVDs, it needs to be encoded at the right bit rates, suitable for transmission over DSL lines. In case of encryption the content is passed through encrypting devices before being stored on a storage-server. When they are requested by the user the videos are played out by several video-server(s). Each VoD content must be also associated with the related metadata (e.g. rating, pricing policy and price). Broadband access to the Internet and access to the PSTN completes this module.

In the Aggregation network all data coming from the content and services network is aggregated and lead to an ATM switch infrastructure. Moreover this network module transports content and data to the different access networks and their DSL Access Multiplexors (DSLAMs). These are usually located in the central offices of the Public Switched Telephone Network (PSTN).

Access network: The proposed architecture supports conventional analogue POTS (Plain Old Telephone System) and where available digital ISDN service. The voice or telephony service is assumed to exist prior to deployment of the broadband entertainment service. This existing telephony service is not changed in any way by the addition of the overlay broadband entertainment services. The telephony service continues to be provided by the Public Switched Telephone Network (PSTN). The access network is where baseband voice signals and physical layer DSL signals are combined. This is performed by a POTS splitter, which is generally integrated into the DSLAM. Achievable service rates depend largely on the length and the quality of the copper wire from the DSLAM to the customer premises. At the other end of the wire, a POTS splitter within the home network separates the voice signal from the combined DSL and voice signal. From this splitter onward the voice and DSL signals are run on separate wires within the end users" home. The PSTN/ISDN number (account) is transparent to the DSLAM and it still is within the responsibility of the Central Office PSTN/ISDN switch.

In the Home network the copper line ends and a device called "splitter" separates the low-frequency voice signal from the digital broadband signal. The voice signal still goes to the telephone, whereas the digital signal is brought to the DSL-modem, which is interacting with the DSLAM on the central office side. Connected to the DSL-modem are the end devices, usually a set-top box for the TV set and one or more PCs. These network components are connected via Ethernet or - more conveniently - via wireless technologies.

Service support infrastructure:



NOTE: http://www.eurescom.de/message/messageMar2004/Entertainment_via_DSL.asp

Figure B.2: ERNIE end-to-end network architecture

Service support infrastructure provides some supporting basic functionality in order to run the new services from the operator side. They include:

- Service management.
- Subscriber management.
- Content management.
- Billing.

B.1.3 LOCAWA - P1208 Location Awareness

B.1.3.1 What is this Project about?

Location Awareness denotes a group of services that can calculate the current position of mobile devices, this in turn presenting the location information of mobile users. This project will start with a short, segmented market analysis to evaluate emerging Location Based Services (LBS) and implement the most feasible ones in a trial phase. One of the key aspects on this project is to analyse how location-based information can be presented to the user and how the user can be assured privacy.

The results of this will be evaluated in the final phase of prototype development and testing. Available positioning technologies such as CELL-ID, GPS and new emerging technologies will be studied in order to consider their performance and QoS into the design of both user interface and LBS.

B.1.3.2 What are the main objectives of this Project?

- Identify and analyse existing and future mass market location-based services.
- Identify the requirements for realizing location awareness (privacy issues, etc.).

- Identify the technology issues of positioning and their QoS-related capabilities and their impact on location-based-services.
- Identify how to best present location-based information to the user (taking into account individual user profiles, preferences and devices).
- Provide an architecture and interfaces for the further use for location-aware services: Interfaces towards mobile service providers/operators and positioning systems, for providers of location related data, user Interfaces with the features of different end-devices.
- Develop a prototype and carry out a field trial with representative users and analyse the results.
- Define best practice and usability guidelines for dealing with location awareness in new location based services.

B.1.3.3 What are the key-results for this Project?

Expected key-results are in-depth knowledge about the future design of user-friendly location based services and recommendations for future concepts of LBS.

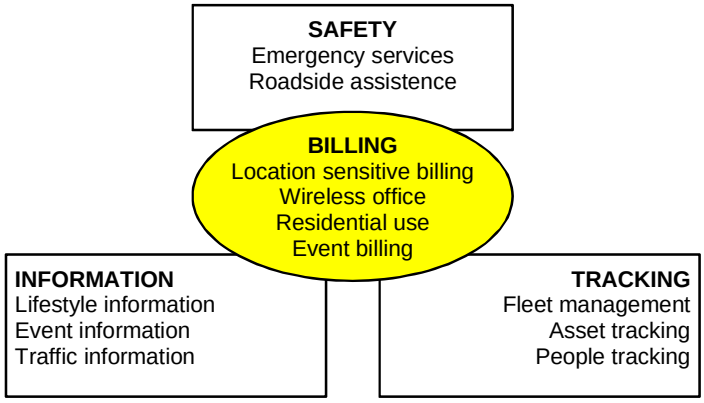
This will be evaluated in a field trial to test the concepts developed in the project. In addition, expected user acceptance barriers concerning privacy and security of data in LBS will be closely analyzed. The knowledge gained from this project will help EURESCOM members to prepare the roll-out of next generation location based services geared for the promising user market. Properly designed LBS will certainly increase acceptance of the new offered services, especially if offered in multi-service bundles.

B.1.3.4 Services identified by the project

The project focus is on location-based services as information services accessible through mobile phones, PDA and other mobile appliances, that revolve around the known position of a user in space, which is either provided by a telecom operator or by a GPS enabled handset. Applications include emergency services, location of emergency calls, navigation information, location sensitive information screening, lost traveller support, track and trace of people/objects, mobile workers support and schedule, and many others.

The project identifies four categories of Location-based services (see figure B.3) [http://www.mobileIN.com]:

- Safety.
- Billing.
- Information.
- Tracking.



NOTE: http://www.mobilePositioning.com

Figure B.3: Four major categories of LBS and their application

B.1.4 P1301 E-TRACS - E-Commerce Trading of Connectivity Services

B.1.4.1 What is this Project about?

Constructed correctly, an e-marketplace for connectivity services will create a more flexible means of purchasing and selling compared to conventional bilateral agreements. The effective pooling of resources in the market place should lead to their more efficient use, benefiting all concerned from an economic point of view. Network expansion could be more effectively and efficiently managed. The ability to buy additional capacity at short notice may enable participants to accept business they normally would have turned away. New markets could be created with applications that require significant amounts of bandwidth over relatively short periods of time such as video conferencing, large database backups etc. The market, in theory, could be extended to include derivative products such as options and more exotic contractual arrangements such as swaps. These additions would improve flexibility and control over risk management in network investments. In order to achieve these benefits, a good understanding of the technical and economic issues surrounding a market in connectivity services is required. Gaining this understanding is the aim of this project.

B.1.4.2 What are the main objectives of this Project?

The project aims to advance the state-of-the-art in electronic trading of complex connectivity services by designing, specifying, implementing and testing advanced functions for an innovative e-marketplace for commoditised connectivity services.

First an overview of connectivity services, of existing markets for them and mechanisms for their trading will be given. Existing services that are already traded and additional ones that could be suitable for trading on e-marketplaces will be identified. From this, a scheme for their categorization and commoditization will be developed.

Existing trading mechanisms will be analysed and new ones developed. Market players will be examined and potential market scenarios conceived. The possibility of the development and use of derivative instruments, based on tradable commoditised connectivity services, will be investigated.

Based on the analysis of existing e-marketplaces, additional functionalities and interfaces will be specified that enable advanced trading of sophisticated connectivity service, involving the services and trading mechanisms mentioned above. The feasibility of implementing the new functionalities and potential technical constraints will also be considered. After the implementation of some enabling e-marketplace functionality for the trading of connectivity services the platform will be tested. The trial scenarios will be defined from the results of the analysis of market players, trading mechanisms and scenarios from earlier in the project.

B.1.4.3 Services identified by the project

The project focus is on the connectivity services. The generic term connectivity services covers telecommunication products and services, ranging from low level products like dark fibre and bandwidth to more elaborated and complex products like voice traffic and IP-transit. This term includes more or less all the bandwidth and voice products and services and can also be referred to as telecommunication capacity.

As no uniform scheme for the categorization of connectivity services and bandwidth products exists, we will present two complementary approaches. One that looks at the products and services from a purely technological angle and another that puts the emphasis on the splitting of the responsibility between buyer and seller of a service and the added value the buyer gets beyond plain connectivity. As products and services are closely linked - connectivity services make use of bandwidth products and bandwidth products can be upgraded to connectivity services and there is no clearly defined separation anyway - we will use these categorizations in parallel in the project.

B.1.5 P1302 PROFIT: Potential pRofit Opportunities in the Future ambient InTelligence world

B.1.5.1 What was this Project about?

The radical changes of the Information Society driven by the boost in information and communication technologies and its adoption has opened a fast path towards the vision of "Ambient Intelligence" (AmI). This offers tremendous business opportunities and challenges to telecommunications operators and service providers. Also the user roles and identities are changing dramatically. It is important to analyse the new scenarios, roles and identities, and to identify the opportunities and challenges for Telecommunication Service Providersarising from this.

The concept of Ambient Intelligence (AmI) provides a vision of the Information Society where the emphasis is on greater user-friendliness, more efficient services support, user-empowerment, and support for human interactions. People are surrounded by intelligent intuitive interfaces that are embedded in all kinds of objects and an environment that is capable of recognzing and responding to the presence of different individuals in a seamless, unobtrusive and often invisible way.

During the last years the Information Society has changed dramatically. We are fast moving towards the vision of "Ambient Intelligence" (AmI). Mobile telephony had its great breakthrough and Internet has become a commodity to most people. Broadband access is widely available though not very widely used. In the next few years we are expecting a big boost in the Information Society mainly based on the following facts:

- Deployment of mobile systems of the third generation and beyond (UMTS, wireless LAN, Bluetooth, etc.) provide ubiquitous access to multimedia services anytime from anywhere.
- Broadband access will become a commodity.
- Internet access has reached its critical mass and electronic commerce will become a normal way of doing business. Appropriate security systems will soon be available.
- Progress in Information Technology (processors, storage, displays, etc.) will provide pervasive computing. Through networking ever present computing devices we will see a revolution of Ambient Intelligence around us.

This project has tackled socio-economic and business issues related to AmI through two approaches:

- Roles and Identities in an AmI world through fieldwork (focus on work/home boundaries).
- Socio-economic and business analysis of AmI scenarios.

B.1.5.1.1 Roles and identities in an AmI world

Europeans have a multiplicity of different social identities they want to create, support and communicate. The more mobile people get, the more complex their social relations become and the more they use communication technologies to create and support their social identities. People build and maintain more and more relationships through information and communication applications and devices. It is necessary to investigate the relationships between people's social identities and the adoption of ICT services to be able to maximize the offer and use of modern Information Society Technology. To achieve this goal, PROFIT has performed fieldwork, i.e. it interviewed real users in UK, Finland, Norway and Hungary to find out wishes, unmet requirements, concerns and barriers related to AmI services. The focus of the fieldwork was on work/home boundaries.

B.1.5.1.2 Socio-economic analysis of AmI

The IST Advisory Group (ISTAG) has developed a vision of Ambient Intelligence (AmI, Pervasive Computing, ubiquitous computing). This vision of pervasive intelligent objects and seamless communication between themselves and people has enormous implications for all involved in the ICT industry, but particularly those providing infrastructure and services. The AmI concept has promoted a great deal of interest and activity on the underlying technologies, but other, potentially complex issues surrounding the adoption of these technologies remain unexplored. It is important to examine the social and economic issues that will arise as the AmI vision develops. PROFIT has analysed 14 scenarios from various sources to find out the relevant socio-economic issues in an AmI environment.

B.1.5.2 What were the main objectives of this Project?

- Quick review and identification of the state of the art of value creation concepts, Information Society business models, Ambient Intelligence scenarios and identities and roles in the Information Society.
- Fieldwork preparation and analysis to compare and contrast the "identity/role management" behaviour, practices and needs of selected groups in an AmI environment.
- Selecting appropriate scenarios for describing the emergence of AmI.
- Deconstructing these scenarios to cover the most important AmI issues and to analyse their socio-economic effects including migration paths.
- Investigation of business models underpinning the Ambient Intelligence vision.
- Identification of risks and benefits in investing in an infrastructure to support Ambient Intelligence, including the emerging business models.
- Recommendations concerning the AmI vision and the migration paths to Eurescom members, industry, regulators and government.

B.1.5.3 What are the key-results for this Project?

- Thorough knowledge of roles and identities in an AmI environment.
- Fieldwork analysis on work/home boundaries as practical input to a new grounded scenario and service and business recommendations (see rationale for fieldwork).
- Business models underpinning the scenarios and migration paths.
- A new grounded scenario describing the most relevant issues in an AmI environment around the year 2010.
- Recommendations for actions to be taken by Telecommunication Service Providers, industry, regulators, government to achieve the identified goals.

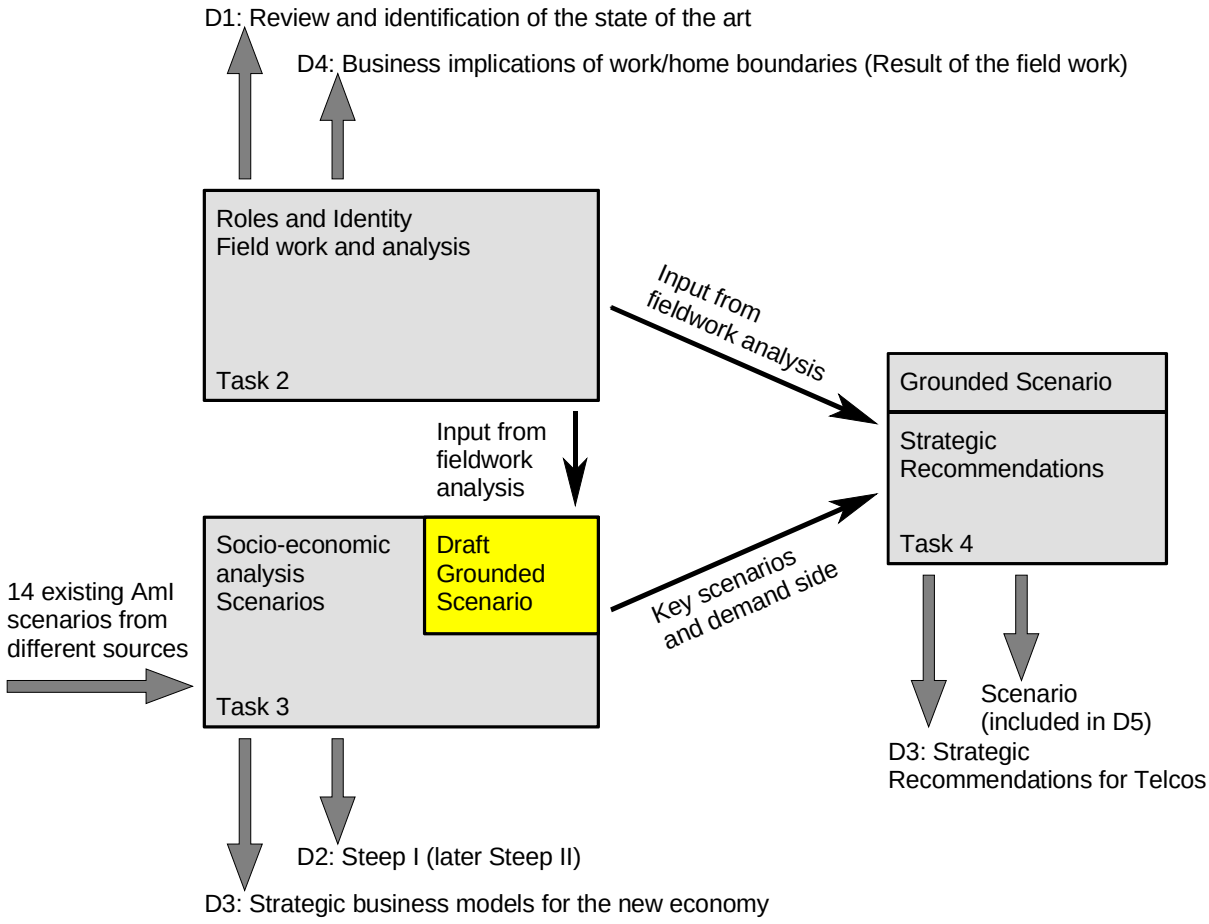


Figure B.4: P1302 PROFIT project structure

B.1.6 P1304 CENTS - Cost Effective migration to FTTx-Networks for Tomorrow's Services

B.1.6.1 What is this Project about?

Currently operators offer broadband services via DSL, mainly ADSL. The deployment of these systems represents a natural evolution of the copper access plant, but it is certain that these technologies represent an intermediate step only, because of the serious transmission limitation of copper lines that restrict the range of broadband services that can be supported. It is beyond question that "true" broadband access requires a fibre based infrastructure in order to overcome the bandwidth bottleneck.

EURESCOM Project P1117 FAN has shown that with the emergence of IP and associated concepts the traditional access network view needs to be revised in terms of topology, architecture and functions. Network flexibility is an important aspect and driver, and unlike in the past, routing and/or switching will become a function of the access network and there will be "intelligent" active nodes in the access. Furthermore, network topologies like mesh and ring will be used in the access network to provide the cost effective flexible connections needed, and fibre is a key enabling factor of this access network evolution. In summary, functions and architectures originally developed for core networks will appear in next generation access networks. This process will be accompanied and supported by a cost reduction of the technologies in question.

This evolution and change means that established access network design and engineering rules have to be changed, and new ways have to be explored that allow next generation access network concepts. Cost effective optical solutions represent the main challenge.

NOTE: No specific services have been identified.

B.1.6.2 What are the main objectives of this Project?

The main objective of this project is to help operators further develop their access network into Next Generation Optical Access Networks, by:

- Analysing the cost structure in today's access networks and assessing the cost optimization potential.
- Identifying novel system concepts and network component/equipment alternatives for hybrid fibre architectures.
- Demonstrating the new concepts and technologies in laboratory and field tests.
- Providing a techno-economic evaluation of the novel access network concepts in realistic deployment scenarios.

B.1.6.3 What are the key-results for this Project?

- New access network concepts that combine several cost saving potentials.
- Evaluation and analysis of new deployment techniques, alternative components, installation methods and technologies in laboratory and field test environments.
- Techno-economic evaluation of novel access network concepts applied in realistic deployment scenarios.
- Deployment and migration strategies for Next Generation Access Networks including recommendations and guidelines.

B.1.7 P1308 FRAPESA - Framework for personalization of services and applications in next generation services

B.1.7.1 What is this Project about?

The number of new services that combine several forms of media increases day bay day. Mobile terminal vendors are improving mobile devices by enriching functionalities that can present textual, audiovisual and linguistic information. Mobile terminal vendors are improving mobile devices by enriching functionality. The latest achievement is built-in cameras. Service providers follow that by enabling a variety of SMS, MMS and Internet based services for mobile use. Mobile e-mail is also used more frequently to send business information to users and is more and more often related to hectic working environment.

The current problem of the user is to access rapidly the information and the service she/he is interested in. Surfing through the service (using mobile or smart phones) to get the information is costly, and very often inconvenient. The assistance is needed for crucial business activities, as travelling, booking, payment etc. Besides nomadism means that the user might be in a foreign country and does not know the service environment, so the services need to be presented in a self-explaining way.

For the service provider it is important to analyze and to classify the content inside a flexible production and distribution environment that supports the automatic acquisition of content, its content-adapted preparation and its enrichment by metadata.

By using more advanced querying techniques, various profiles and personalization mechanisms, ontological analysis of the query, we can improve the precision of the information service and the ease of use of the service.

B.1.7.2 What are the main objectives of this Project?

Objectives are the following:

- Study of personalization methods and techniques.
- Study of information retrieval techniques for new generation multimedia services.
- Practical evaluation of available technology and dissemination of the information to Eurescom members.

- Design and implementation of the architecture for intuitive-to-use, context-based, personalized information services.
- Contribution to research and standardization efforts, aimed to improving the interaction among all the actors in business cases with the user in the central role.

B.1.7.3 What are the key-results for this Project?

The main result is the Framework for personalization of services and applications in next generation information services. This framework will take into account the provision of precise and situation-based information and its easy and intuitive access while considering the personal wishes of the service users.

Except practical results, which are materialized in the platform, new knowledge about technological model and business model, as well as about user aspects (personalization and privacy) will be generated.

By continual considerations of the business model, the roles of actors and processes of their interaction in next generation networks will be analysed. Knowledge on such processes will be obtained and will be an input for improvement of the collaboration between the different actors.

At the same time the personalization process and the content preparation process will be considered to find out the mechanisms, which give the most to the user and at the same time protect her/his privacy (and minimize the chances for misuse).

B.1.8 P1341 NGN Service Concepts

B.1.8.1 What is this Project about?

Current Eurescom shareholders are facing similar challenges due to heavy financing loans and market instability. New investments on network infrastructure like NGN/3G have to be carefully justified. So far, only rationales based on infrastructure costs saving have been used. However, the growth of network traffic and number of users is reaching its saturation levels. In some cases is even decreasing. In such context cost savings rationales are not sufficient. New revenues coming from new and innovative applications are becoming more business mission critical. However, persuasive studies on such subject are still missing. The current study aims to fill this gap in a collaborative way by joining together different capabilities from Eurescom shareholders to develop significant results.

B.1.8.2 What are the main objectives of this Project?

This study aims to analyze new service concepts, here called Next Generation Service Concepts (NGSC), which may only be provided by NGN/OSA networks enabling the emergence of new revenues for Service Providers. The study evaluates how new NGN/OSA characteristics, like access independence, convergence and openness, can promote the emergence of new NGSC concepts, and lead to new business opportunities and models and so new revenue streams.

One NGSC example is the ability for the user to make business by providing his/her own applications, i.e. the user may develop and sell her/his own NGN/OSA Applications. In this case the Service Provider would play a kind of Brokering role.

The study should take into account some constraints including business environment, market segmentation and social impacts.

Possible drawbacks from current technologies for the implementation of the service concepts are identified. Some business cases illustrating the service concepts use are given. At the end, an experimental validation of such concepts is discussed for future work.

B.1.8.3 What are the key-results for this Project?

The current study aims to provide some:

- Guidelines to help on the decision to invest on NGN/3G infrastructure?
- Analysis of enabling unique NGN/3G characteristics for the generation of revenues from new applications.

- Analysis of current major business constraints and users requirements to be fulfilled by Next Generation applications.
- Identification of catalysing concepts and principles (NGSP) to generate new revenues from Next Generation applications.
- Analysis of business models and business cases enabled by NGSC.

B.1.8.4 Services identified by the project

Several service concepts are defined within the Deliverable D1 of the project: the minimum necessary to cover the requirements and user scenarios.

B.1.8.4.1 Meet Me: Meet the Right Person at the Right Time

Meet Me enables the encounter between two or more persons sharing compatible interests, taking advantage of service components like Context Awareness (including Presence, Status and Localization) and user profiles. Meet Me facilitates, for instance, the meeting between girls and boys; between consumers and merchants; or between employers and employees.

B.1.8.4.2 Sweet Home: Security, Confidence and Comfort at Home

The Sweet Home Service Concept aims to leverage security and confidence feelings about home with home networking technologies (i.e. residential gateways) as an extension of network services including personal data storage, unified mailboxes, cameras, etc.

B.1.8.4.3 Fashion, Emotion, Art

The Fashion, Emotion and Art Service Concept are about making Next Generation Services fashionable, emotional and attractive. The conceptions of today's Mobile Terminals are already following these concepts.

Fashion, Emotion and Art seeks to make Next Generation Services fashionable by, for example, enabling to reach and maintain a certain social status; an emotional experience introducing unexpected interactions with users causing surprise, raising adrenaline; as objects of art that look attractive to clients, designed in cooperation with artists. One example is PMJ, the Personal Media Jockey, which combines an always-on, personal entertainment channel with interactive music, Web pages, movies, video clips - accessible from all active devices.

B.1.8.4.4 Community Cooperation

The Community Cooperation Service Concept should be applied to enhance collaboration between different people for work, for education, for leisure and for inter-social relationships.

The Community Cooperation Service would enhance collaboration between different people for work, for education, for leisure and for inter-social relationships. An example would be musicians located in different places playing together for the composition and recording of songs.

B.1.8.4.5 Give Me Money: Promote Business opportunities to Clients

The Give Me Money Service Concept should be applied to promote business opportunities to application subscribers. For example, the subscriber can provide his/her own applications by taking advantage of NGS openness and its programmable interfaces. In such case, subscribers would be able to apply her/his creativity to develop and sell her/his own Applications. In this case the Service Provider would play a kind of Brokering role.

B.1.8.4.6 Personal Assistance (Family, Enterprise, Community)

Personal Assistance is where each subscriber is the owner of a Virtual Entity - the Personal Assistant - living somewhere in the network. Such an assistant is accessible from any terminal, any time, anywhere, always available to satisfy the client needs according to his profile. The same concept may be applied to collective entities including families, enterprises and communities.

B.1.9 P1448 Opportunities offered by Carrier Grade Multipoint Services

B.1.9.1 What is this Project about?

A multipoint technology allows a user to reach multiple destinations through a single physical or logical connection. The definition of a multipoint network service is one that allows each Customer Edge (CE) end point or node to communicate directly and independently to all other CE nodes.

Multipoint Services (e.g. Transparent LAN Services or Virtual Private LAN Services) provide a functionality, which is virtually identical to a corporate LAN. With Multipoint Services a customer domain can be extended across an operator backbone, and corporate users are able to benefit from the simplicity and familiarity of a LAN regardless of the physical location of their sites.

Currently many providers are offering L3 Multipoint Services (L3 VPN) which are used by a large number of customers. This solution has some limitations (e.g. scalable support for IP-Multicast transport, control of customer routing) which has to be addressed and solved in the future to provide even more attractive services.

A Multipoint Service is attractive because fewer physical connections are required to achieve full connectivity between multiple points. An equivalent level of connectivity based on a point-to-point technology requires a much larger number of connections or the use of non-optimal packet forwarding.

With IP multicast support over layer 2/3 Multipoint Services an operator can provide the customer with support for running IP multicast services inside the VPN network in an efficient and scalable manner. This requires scalable mechanisms for set-up of multicast replication trees inside the core network.

The study will analyse Multipoint Services from the operator's perspective. It will assess existing solutions and new technologies. The study focuses on IP-Multicast as one service on top of different Multipoint solutions and will analyse the pros and cons. It will also propose a roadmap for the deployment of Multipoint Services.

B.1.9.2 What are the main objectives of this Project?

- Describe characteristics of Multipoint Services which are important to customers and summarize what changes they bring to the traditional data services model.
- Compare new emerging approaches for realzing Multipoint services (e.g. Virtual Private LAN Services) with existing solutions (e.g. layer 3 multipoint solutions that are already implemented) and take the approaches of the different standardization bodies (IEEE, ITU, IETF, MEF) into account.
- Identify the main obstacles to provide Multipoint Services in a scalable and reliable way and how to avoid or overcome existing problems, whenever possible. Characterize the available technical solutions (802.1ad, MACinMAC, VPLS, etc.) and compare the respective strengths and shortcomings.
- Evaluate IP-Multicast as one service example on top of different Multipoint solutions. Compare the pros and cons regarding to the underlying Multipoint technologies and take new approaches as e.g. RSVP-TE extensions for P2MP LSP into account.
- Suggest a roadmap for the deployment of these services and recommend directions to operators in this area.
- Give input to the corresponding IETF working groups (l3vpn, l2vpn) to provide an ISPs/carriers point of view. This should help the IETF to come up with solution fulfilling the service requirements of an ISP or carrier.

NOTE: This is the extent of the information available on this project.

B.1.10 P1401 OSIAN - Operators Strategy, business models and demonstrations for using Innovative home services to increase the ARPU in the fixed Network

B.1.10.1 What is this Project about?

The background for this project:

Operators are experiencing the following trends: decreased ARPU in the fixed network, part of fixed telephony services moved to mobile, data traffic moves over to ADSL and shared ADSL connections are taking the profit from Telecommunication Service Providers. In order to increase revenue from the fixed network again, new services have to be introduced in the private homes.

Previously new services were always connected to new infrastructure, e.g. the ISDN or ADSL modem. Customers are not longer willing to invest in new infrastructure, if they do not see the value from services coming through it. Examples of smart houses have been established across the world, and (remote) control of home devices is available now. Advanced energy management has reached the market, and is implemented in new building blocks already. Wireless technology is mature to enable interworking of home equipment without new wires.

Time has come for operators to define their role: "Up to the door or under the blanket? To which extend shall we involve ourselves in the private homes?"

The study addresses the home market, products and developments going on, and it will suggest a roadmap when certain products will arrive in the market. The study will analyse the needs of customers for a system integrator or a service aggregator, suggest potential roles of Telecom operators, and provides a strategy for operators entering the private home.

B.1.10.2 Why should the proposed work be done by EURESCOM now?

This work will enable both EURESCOM and thus the shareholders to be proactive with respect to investments in the home market. It will address the different starting points of bringing services into the home, from PSTN, ISDN, xDSL, Broadcast, Cable TV or other networks. Eurescom is the unique place where operators can discuss openly their strategies, and match their arguments with qualified colleagues all around Europe.

B.1.10.3 What is the focus of the work?

The focus is on the analysis of finding "the best way" for service delivery into the private homes. Different strategies might be necessary in order to satisfy the specific requirements of the various user groups.

EXAMPLE: A teenager has other expectations to the home infrastructure and the services in the home ("I only need my mobile phone and the broadband Internet connection"), while technology-lost people will prefer an easy service provision. There are three major aspects to be taken into account: The user needs of the different users in the home, the infrastructure and the potential services.

B.1.10.4 What are the main objectives of this Project?

The main objectives of this proposal are to:

- Identify the upcoming (potential) home infrastructure, e.g. wireless, media adapter, interconnectivity, gateway, etc.
- Identify the users and the user needs, e.g. early adapters, technology-lost people.
- Analyse Telecommunication Service Providers situation today, e.g.: What are conditions for return on investment? What is the willingness to risk?
- Treat the home as a collection of 'service modules", e.g. entertainment, communication and find appropriate infrastructure to satisfy service provisioning.
- Analyse experiences and results from trials/future homes.

- Develop a strategy for Operators, depending on the position in the market, e.g. fixed, mobile, ISP, incumbent.
- Establish roll-out scenarios to ensure service provision for the different service modules.
- Identify the business potential of the roll-out scenarios.

B.1.10.5 What are the key-results for this Project?

Results of the project will address:

- A systematic approach on user requirements in the future home.
- A state-of-the-art overview on potential infrastructure to supply home services.
- An analysis of user requirements for the various user-groups in the future home.
- An summary of experiences and results from future-home trials.
- Guidelines for operators how to approach the different home market segments.

NOTE: This is the extent of the information available on this project.

B.1.11 P1442 NEw Market Opportunities by Galileo Satellite services (NEMOGS)

B.1.11.1 What is this Project about?

The European Satellite Navigation system GALILEO is under development and will be fully operational in 2008. The system represents an investment of 3,5 billion Euro. It may work in conjunction with GPS and adds some important features not available by the latter. Studies from EC and ESA state a push of 100.000 jobs and economic spin offs worth 9 billion Euro/year for the next 10 years after the system roll-out.

This Galileo European program has two major tasks: one is the design and construction of the system itself, the other is to exploit the system Europe- and world-wide to gain the highest technological and economical benefit out of it.

"Building Galileo" is a midterm activity: the development will be finished in 2006 and the deployment of the 30 satellites will be completed until 2008. From this moment, the system may be used commercially.

For companies that are willing to develop innovative and attractive new services, as well as new applications or even devices, this schedule is tight. It is necessary to start now to be prepared and ready to fully use the new opportunities when the system is ready and thus meeting the users expectations.

B.1.11.2 What are the main objectives of this Project?

The main objectives of this Study are to:

- Identify Galileo characteristics that are key factors for Telecommunication Service Providers opportunities.
- Identify potential applications and service areas.
- Draft business opportunities.
- Give recommendations for further activities.

B.1.11.3 What are the key-results for this Project?

- Technological analysis of Galileo and its relevance for Telecommunication Service Providers.
- New and enhanced applications using Galileo.
- Draft business cases for promising services.

- Roadmap and recommendations for Galileo usage by Telecommunication Service Providers.

B.1.11.4 Services identified by the project

Based on different sources (GJU, EU, Studies from FandS and PWC, projects of partners involved) four main areas have been identified as the most promising ones. The applications described in this clause will not be in every detail the ones that will be realized in the future. But in general, they cover most aspects of Galileo enriched location aware services. Most existing or planned services have been analysed to see in which area they belong or if more areas are The Galileo system will offer several services, available worldwide.

The Open Service (OS) results from a combination of open signals, free of user charge. It provides position and timing performances competitive with other satellite navigation systems (GNSS).

The Safety of Life service (SoL) provides, in addition, timely warnings to the user when it fails to meet certain margins of accuracy (integrity). A service guarantee may be provided for this service.

The Commercial Service (CS) provides access to two additional signals, to allow for a higher data rate throughput and to enable users to improve accuracy. A service guarantee will be provided for this service. This service also provides a limited broadcasting capacity for messages to users.

The Public Regulated Service (PRS) provides position and timing to specific users requiring a high continuity of service, with controlled access like police, fire-fighters, or civil protection.

The Search And Rescue service (SAR) broadcasts globally the alert messages received from distress emitting beacons. It will contribute to enhancing the performance of the international COSPAS-SARSAT search and rescue system.

B.1.12 P1551 Applications and services for ADSL2+ and beyond

B.1.12.1 What is this Project about?

Most DSL providers in Europe will soon implement ADSL2 and ADSL2+ in their access networks, allowing them to offer higher bandwidth to their customers, larger distance between customer and the ADSL access node, and also lower energy consumption.

Telecommunication Service Providers need to decide soon if there is in the near future a need for DSL-bandwidth beyond what will be offered by ADSL2 and ADSL2+.

This study will identify advanced applications and services, which will make use of such features, and might even require higher bandwidth and better QoS than that offered by ADSL2 and ADSL2+ in order to increase the revenue flow of network operators and service providers. The resulting requirements to enhance the access and core networks of Telecommunication Service Providers will be analyzed, as well as the potential impact on service platforms.

Potential applications and services will be analyzed concerning their revenue and profit potential. Initial business models will also be developed and a roadmap to describe an evolutionary way from today's situation to the near future.

B.1.12.2 What are the main objectives of this Project?

The main objectives of this Study are to:

- Analyze which applications and services have a need for the bandwidth of ADSL2/ADSL2+ and VDSL/VDSL2 and beyond that (bandwidths higher than 20 Mbit/s, and maybe even FTTH).
- Investigate the need for higher uplink data rates, i.e. more symmetric services.
- Derive for such applications and services their needs concerning bandwidth and QoS.
- Analyze how do the access and core networks of Telecommunication Service Providers need to be enhanced to cope with these requirements.
- Check the means to integrate such services into the existing service platforms (investigate the impact on APIs and their standardization, and middleware requirements).

- Find initial business models for such advanced applications and services.
- Develop a roadmap.

B.1.12.3 What are the key-results for this Project?

The project is expected to support operators in the roll-out of new, higher bandwidth and real time services.

The project outputs are scheduled for August 2005.

B.2 IST service definitions

B.2.1 AGAMEMNON

B.2.1.1 What is this Project about?

The project will lead to the development of an advanced 3G mobile application, that will act as an "on-line" guide thanks to the new multi-media capabilities of the cellular phones. Visitors will be provided with enriched and personalized information on monuments and places of interest. Agamemnon will drive them through a personalized itinerary, created according to their interests and time available. The system will be also capable of recognzing specific monuments through the pictures taken by visitors with their mobile phones cameras. Agamemnon will also contribute to optimize the visit path (avoid over-crowding situations) and to the preservation of the site by sending images taken by visitors to site guardians.

B.2.1.2 What are the main objectives of this Project?

The final prototype, available at mid 2006, will be capable of:

- Relay on existing 3G phones and networks (i.e. UMTS, GPRS, etc.).
- Image analysis technology to identify users attention.
- Personalized information delivery based on users attention and profile, leveraging on 3G services.
- Advanced user profiling based on static questionnaires and unobtrusive dynamic human behaviour/preferences analysis.
- Profile-based, adaptive and proactive visit scheduling, also considering overcrowding avoidance analysis.
- Voice-based commands interaction.
- Active role played by the visitors in preserving the cultural heritage through specifically tagged pictures taking.

B.2.1.3 Services identified within the project

- Advanced 3G mobile application that will act as an "on-line" guide thanks to the new multi-media capabilities of the cellular phones.
- Profile-based, adaptive and proactive visit scheduling, also considering overcrowding avoidance analysis.
- Voice-based commands interaction.

B.2.2 CONNECT - Designing the classroom of Tomorrow by using advanced technologies to connect formal and informal environments

B.2.2.1 What is this Project about?

The CONNECT project will create an advanced learning environment, the virtual science thematic park, using advanced ICT to connect informal learning strategies and formal curricular activities in science education. To achieve this the CONNECT project will explore, test, refine and demonstrate an innovative approach that crosscuts the boundaries between schools and museums/science centers, involving students and teachers in extended episodes of playful learning. This enhanced collaboration scheme exploits the potential of cutting edge ICT and in particular the evolution from the wired to virtual wireless learning environments to support the integration of everyday "free-choice" activities with the formal science curriculum map.

B.2.2.2 What are the main objectives of this Project?

The virtual science thematic park will be the main "hub" of resources available in the developed network and will serve as distributor of information and organizer of suitable educational activities. It will incorporate innovative uses of the technology for educational purposes, interconnecting all the members of the network, organizing virtual and conventional visits to the science museums and science centres. These visits will serve (through an informal but yet structured way) educational aims of the official curriculum.

The CONNECT project mobilizes a multidisciplinary group of leading experts from the fields of learning technologies, cognitive science, psychology, information and communication technologies and science education. From an organizational point of view it brings together research centres in several countries, a European network of science museums and a multinational group of secondary schools supported by the appropriate educational bodies. These are indispensable actors to assess and to demonstrate the effectiveness of the CONNECT approach. They will also contribute to identify the critical success factors for a more widespread adoption, an essential step to maximize the impact of CONNECT in science learning.

B.2.2.3 Services identified within the project

An advanced learning environment, the virtual science thematic park, using advanced ICT to connect informal learning strategies and formal curricular activities in science education. It will incorporate innovative uses of the technology for educational purposes, interconnecting all the members of the network, organizing virtual and conventional visits to the science museums and science centres.

B.2.3 DELOS Network of Excellence on Digital Libraries

B.2.3.1 What is this Project about?

Digital Libraries (DL) have been made possible through the integration and use of a number of IC technologies, the availability of digital content on a global scale and a strong demand for users who are now online. They are destined to become essential part of the information infrastructure in the 21st century.

The DELOS network intends to conduct a joint program of activities aimed at integrating and coordinating the ongoing research activities of the major European teams working in Digital Library - related areas with the goal of developing the next generation Digital Library technologies.

B.2.3.2 What are the main objectives of this Project?

The objective is to:

- define unifying and comprehensive theories and frameworks over the life-cycle of Digital Library information;

- build interoperable multimodal/multilingual services and integrated content management ranging from the personal to the global for the specialist and the general population. The Network aims at developing generic Digital Library technology to be incorporated into industrial-strength Digital Library Management Systems (DLMSs), offering advanced functionality through reliable and extensible services.

The Network will also disseminate knowledge of Digital Library technologies to many diverse application domains. To this end a Virtual Digital Library Competence Centre has been established which provides specific user communities with access to advanced Digital Library technologies, services, testbeds, and the necessary expertise and knowledge to facilitate their take-up.

Other important objectives are:

- to network and structure European Digital Library - related research in order to consolidate an emerging community;
- to provide a forum where researchers, practitioners, and representatives of interested applications and industries can exchange ideas and experiences;
- to promote an exchange programme towards improving international cooperation in Digital Library research areas.

B.2.3.3 Services identified within the project

Interoperable multimodal/multilingual services and integrated content management ranging from the personal to the global for the specialist and the general population.

B.2.4 ePERSPACE Towards the era of personal services at home and everywhere

B.2.4.1 What is this Project about?

The main objective of the ePerSpace project is to significantly increase the user acceptance of networked audiovisual systems and applications at home and virtually anywhere by developing innovative interoperable value-added networked services. From an industrial perspective, ePerSpace aims at creating a mass-market adoption of such advanced services thanks to this significantly increased user acceptance.

B.2.4.2 What are the main objectives of this Project?

To address this challenge in audiovisual and home systems ePerSpace will concentrate on technical, social and business objectives:

Social and business aspects: develop and enhance the business aspects of the ePerSpace services, analyzing issues of major importance to the mass-market adoption, and hence the potential for economically sound business solutions. The analysis will result in generic business models, and techno-economic analysis based on dissemination activities including trials and user surveys.

Technical objectives: develop an open, trusted and interoperable integration framework to show how various network enabled audiovisual systems and home platform products can seamlessly work together, thus solving existing interoperability problems in the exchange of personalization data, service and context adaptation, and management of service platforms. Interoperability and global network integration will be achieved by addressing adequate authentication procedures at home and elsewhere in an open access network. Seamless and intuitive access to services will be enabled through distributed personalization data.

B.2.4.3 Services identified within the project

The services identified in ePerSpace are:

- The exchange audiovisual content between user terminals and home equipment.

- Innovative seamless access by sharing user profiles in a secure manner.
- Home and Personal Devices building unified personal environments.
- Rich Media Object Management supplying the tools for content creators to make optimal use of the infrastructure.

B.2.5 NM2 New media for new Millennium

B.2.5.1 What was this Project about?

NM2 is a collaborative research project which unites leading creative and technology experts from across Europe to address a great opportunity for businesses and consumers: how to develop compelling new media forms which take advantage of the unique characteristics of broadband networks.

NM2 is about creating a variety of new media genres using all of the facilities of modern broadband communication and interactive terminals. The project will create new production tools for the media industry that will allow the easy production of non-linear broadband media that can be personalized to suit the preferences of the individual user. Viewers will be able to interact directly with the medium and influence what they see and hear according to their personal tastes and wishes.

B.2.5.2 What were the main objectives of this Project?

The nm2 project will create both technologies and pilots for the new media. Specifically, nm2 will create:

- Robust and easy-to-use production tools that can be integrated in today's production environments.
- Delivery systems targeted towards widely available consumer entertainment platforms, including set-top boxes, PCs and games consoles.
- Seven productions covering a wide scale of forms and formats, which will provide tested models.
- A software language for expressing and generating meaningful interactive narratives.

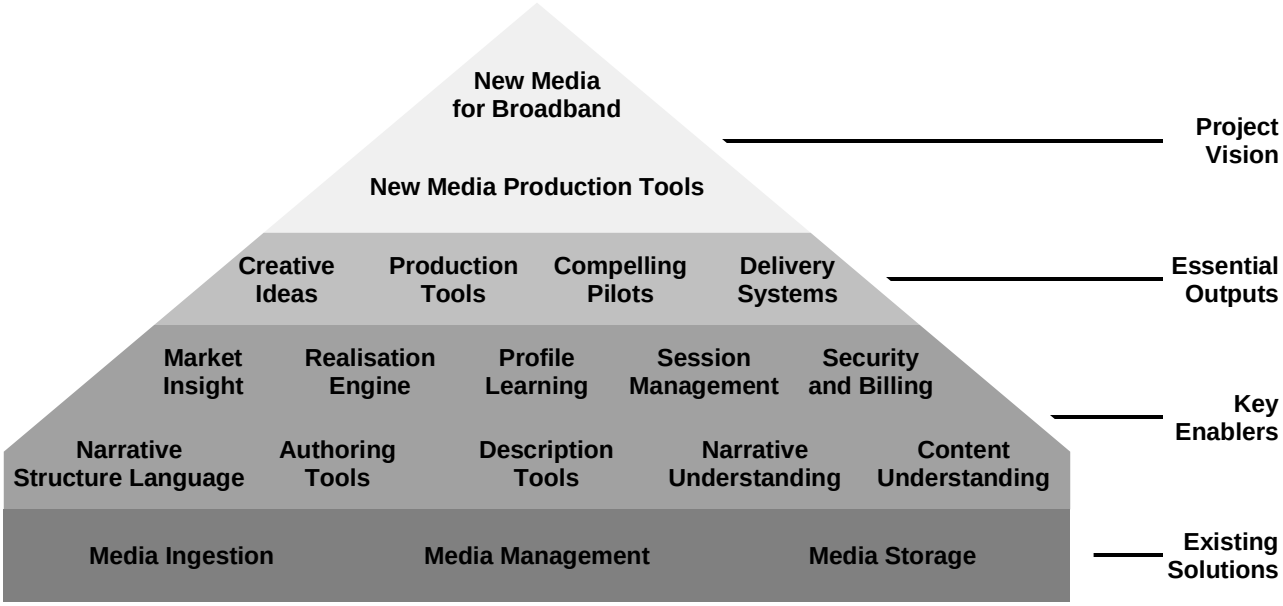


Figure B.5: NM2 project overview

B.2.5.3 Services identified within the project

New forms of storytelling to develop that are uniquely suited to the characteristics of digital distribution via broadband. By utilzing the unique characteristics of digital broadband networks, the new media will engage our attention in original and compelling ways.

B.2.6 MOBILEIN Harmonized Services over Heterogeneous Mobile, IN and WLAN Infrastructures

B.2.6.1 What is this Project about?

The main objective of the MobileIN project is to define and develop a novel set of advanced, future-proof, personalized harmonized services for the mobile user and worker by taking full advantage of heterogeneous service infrastructures (Intelligent Network Services, Mobile Network Services, VoIP Services). The project builds on operators" needs to preserve and enhance existing services infrastructures (IN, CAMEL, LBS), which is already a major source of income, integrated with new, emerging ones (IP, VoIP, SIP, etc.) that will provide operators and 3 RD party application developers with access to unrealized revenue streams.

The major objectives of MobileIN are the following:

- To define and develop a novel set of advanced, future-proof, dynamic and configurable harmonized services for the mobile user and worker by taking full advantage of heterogeneous service infrastructures (Intelligent Network Services, Mobile Network Services, VoIP Services) and architectures (SIP, VoIP, VHE, etc.).
- To specify, implement and demonstrate standardized, but to date, unrealized PSTN and PLMN services (e.g. CS2-4).
- To specify, design and develop mobile terminal applications for the MobileIN services utilzing state-of-the-art technologies like J2ME/J2EE, Symbian O/S, Windows CE, MExE, etc.
- To specify, design and develop an open service creation and execution framework enabling the provision, execution and discovery of MobileIN services across several domains and the coordination of MobileIN application servers and Open Access Gateways.
- To analyse existing PSTN/IN and PLMN/CAMEL infrastructures, protocols and services, and identify essential but at the same time, minimum enhancements needed to boost the deployment of unrealized services from Capability Sets 2 to 4 at minimum cost and time. Also, to accommodate the provisioning of new harmonized ones for heterogeneous domains. To enhance existing services with new features to accommodate emerging technologies and networks (SIP, VoIP, VHE etc.).
- To analyse the status of OSA APIs and respective mappings from 29.198-x and 29.918-x series related to IN and CAMEL protocols (INAP, CAP, etc.). To propose enhancements and additions to existing APIs and contribute towards the definition, specification and standardization of OSA/Parlay mapping documents for IN and CAMEL networks.

B.2.6.2 Services identified within the project

A novel set of advanced, future-proof, dynamic and configurable harmonized services for the mobile user and worker by taking full advantage of heterogeneous service infrastructures (Intelligent Network Services, Mobile Network Services, VoIP Services).

B.3 Celtic service definitions

B.3.1 TIFANIS Tele-Immersion For Applications supporting New Interactive Services

B.3.1.1 What is the project about?

The major objective of the project is to provide the users with a Tele-Immerson application. Tele-Immersion is, perhaps, the most relevant new multimedia application being currently demonstrated in the US within the Internet2 initiative. It basically consists of putting two partners into contact in such a way that both of them will have the realistic feeling of being physically in front of each other, interacting in a natural way and having both the possibility of handling, in addition, 3D objects or visualizing a 3D animation embedded in their virtual environment, or having other advanced possibilities such as interacting with labs tools.

The TI application will suit to two different environments: RandD collaborative work in a bio-engineering environment and remote lab instruments and tools handling in a RandD environment, based upon the real experience of the users concerning the actual usefulness of the application in their fields of work.

The project approach is to focus the efforts in the application designing process and in the field testing, based on a realistic use conditions. The project will use off-the-shelves platforms or components whenever available from the market and to concentrate in those components specifically suited by the special application requirements.

Therefore, in a few words, the project has a whole system approach implementation guidelines that will ensure the proper performance, usability and usefulness from a global viewpoint.

B.3.1.2 Services identified within the project

The development of a tele-immersion application which will permit users to have the realistic feeling of being physically in front of each other, interacting in a natural way and having both the possibility of handling, in addition, 3D objects or visualizing a 3D animation embedded in their virtual environment, or having other advanced possibilities such as interacting with labs tools.

B.3.2 IMAGES Integrated Multi-service Architectures for next Generation Services

B.3.2.1 What is the project about?

Moving towards NGN (Next Generation Networks), a great deal of limitations, related to QoS (Quality of Service) requirements, bandwidth availability and, generally, to enhanced services interoperability, remains unsolved and constitutes a serious drawback for the quick deployment of the new technologies.

IMAGES is based on a unified convergent approach taking into account IP (Internet Protocol) multimedia on fixed networks as well mobile and future wireless services.

The project aims at analyzing also the convergence between "session-based" and "content-based" services. Therefore, a specific effort is devoted to the technology for enabling Broadband IP Television over NGN.

The main achievements and main results to be expected from the project will be related to the design and prototyping of an intermediate "network resource control" level, in order to manage, from the service domain, the transport domains. This will allow specifying and monitoring the required bearer QoS classes.

Particularly IMAGES is aimed to design and prototype session control politics with the following objectives:

- bandwidth management with the ability to determinate if a new session can be established, according to QoS requirements supporting mechanisms to determine if the end to end QoS classes preferences can be fulfilled given the present level of resource availability;

- QoS signalling mechanism through inter-softswitch message exchanging, capable to cover inter-domain environments considering both a per call/session basis approach and per SLA and static pre-provisioning;
- session control signalling inter-working and adaptation (with reference to SIP and H.323 video communications in separate service/transport domains);
- inter-working mechanisms with "network resource control" level (control mechanism for middle-box, control mechanism for QoS control).

Besides, the project will define and prototype the Traffic Engineering and QoS routing techniques needed to achieve the desired optimization in network resources usage, while respecting the QoS requirements.

B.3.2.2 Services identified within the project

No service identified in the project. Probably there will be the development and prototype of a Rich Presence service to verify that the developed platform works, but this is not still defined.

B.3.3 W3GCREATES Creation environment for 3G and WxAN telecom services

B.3.3.1 What is the project about?

The key idea of this project is to specify and prototypically realize a creation environment for 3G and WxAN telecommunication services and to apply it to end-to-end services scenarios. This creation environment will integrate different techniques and tools - from brainstorming, requirement capturing, service design, software component construction to simulation/validation and deployment. These techniques and tools are applied for different tasks in the creation process of a telecom service. All tools will be embedded in a service creation infrastructure managing the assets and artefacts resulting from the service creation process. The Model Driven Architecture inspired key asset of transforming the results of the work with one technique into an input to further work with another technique will be applied within the W3G CreaTeS infrastructure to automate the service creation process.

As use and demonstration case, this service creation environment will be applied to construct secure end-to-end 3G and WxAN services. To fulfil this aim, the W3G CreaTeS service creation environment will support the construction of a mobile service seamlessly from service idea over requirements capturing, service design and implementation down to the deployed software components. In the W3G CreaTeS project it will be measured, to what extend this environment automates the creation process. These services will be deployed into 3G/UMTS and WLAN/WMAN testbeds and networks at the partners.

The results of the project are of benefit to different categories of stakeholders. Network operators profit from the possibility to very quickly offer services in the network. Service providers can offer a bunch of services to different network operators. People who just develop service ideas are tightly coupled to the teams realizing the service.

B.3.3.2 Services identified within the project

The project do not create services themselves but an environment for 3G and WxAN telecom E2E services.

B.3.4 EURO-HOME Enabling future services to the home

B.3.4.1 What is the project about?

EURO-HOME will create and deploy a novel distributed and generic service platform for the residential customer. A key EURO-HOME innovation is to give the customer an intelligent facility - based on novel scalable intelligent agent technology - that allows him or her to make an optimal choice of telecommunication and information services, based on parameters such as personal preferences, context, QoS and cost.

Furthermore EURO-HOME defines home automation/supervision as a continuous integrated service rather than a set of standalone applications and provides the framework and the essential components for the creation of such a service and its adaptation to specific client environments and requirements.

EURO-Home's platform will have the following novel features:

- It will be independent user equipment and of access and core network technologies.
- It will allow users easy access to their residential services even while they are away from home - travelling or in a new environment.
- It will facilitate the creation and flexible deployment of a wide variety of services, both present and future.

EURO-Home's service platform will able to host a large variety of complex services. To show this it will be launched in field trials with real life users, using four innovative services, implemented by the EURO-HOME project itself, and drawn from the areas of e-Care/e-Inclusion, entertainment, e-Learning and home automation. Furthermore EURO_HOME defines home automation/supervision as a continuous integrated service rather than a set of standalone applications and provides the framework and the essential components for the creation of such a service and its adaptation to specific client environments and requirements.

EURO-HOME will use state of the art techniques such as intelligent agent, semantic web and GRID technologies, to more forward decisively from the work of other EU-IST and EUREKA projects in order to meet the rapidly rising expectations of the residential consumer for flexible, easy to use services. EURO-HOME expects to make a strong contribution to emerging standards for residential networks.

B.3.4.2 Services identified within the project

EURO-HOME defines home automation/supervision as a continuous integrated service rather than a set of standalone applications and provides the framework and the essential components for the creation of such a service and its adaptation to specific client environments and requirements.

B.3.5 DEHIGATE Deployable high capacity gateway for emergency services

B.3.5.1 What is the project about?

The project will develop a deployable high bandwidth gateway for emergency services accompanied with applications. The gateway will extend high capacity data communication through the use of existing radio technology. The deployable gateway will be used in addition to the low bandwidth voice and data systems already deployed by the emergency services. The innovative aspects will be in terms of the applications, control, management and security for the communication resources. From a service perspective, the innovative aspects will be ability to thoroughly demonstrate and pilot high capacity services for the emergency services.

The foundation for the project is interaction with user communities, so the functional requirement for the overall architecture and for the gateway itself is based on their needs. The usability of the concept will be demonstrated with trials aimed at the user community. The project will utilize and interact with other existing European projects within the emergency services, in particular the Widens and the Oasis project. Several of the project partners participate in one or more of these, and the will extend the knowledgebase from these project. In addition, public available demonstrators from the Widens projects will be extended in the planned demonstrations.

B.3.5.2 Services identified within the project

A deployable high bandwidth gateway for emergency services accompanied with applications. The innovative aspects will be in terms of the applications, control, management and security for the communication resources. From a service perspective, the innovative aspects will be ability to thoroughly demonstrate and pilot high capacity services for the emergency services.

B.3.6 MACS Multimedia Communication Service

B.3.6.1 What is the project about?

The goal of the Multimedia Communication Service (MaCS) project is to develop and experiment the new generation of Broadband Telephony Service for the residential market.

This service-driven project will develop, experiment and assess user acceptance of new Multimedia Communication Services such as Videotelephony, Presence and Reachability Management, Local and Network Address Book, Multimedia Messaging, etc. and provide business relevance analysis for Next-Generation-Network based Multimedia Communication Services.

For the network aspect, the MaCS project will rely on emerging Next Generation Network infrastructures. The NGN is a converged packet network currently under standardization in ETSI and ITU, with an open standard layered architecture, guaranteed Quality of Service, security, mobility, flexible service platform, etc.

For the terminal aspect, the MaCS project will foster the development of pre-competitive multimedia terminals such as videophones, videobox, Webtabs, PDAs and soft clients for PCs.

The MaCS project will use an end-to-end NGN solution, and will set up and operate a pan-European service lab, where services are developed, tested and submitted to human factors analysis. This pan-European Lab, includes major European operators, network and terminal providers, and will handle interoperability issues and therefore hasten market maturity with the emergence of pre-competitive interoperable network infrastructures and terminal equipments.

Finally, the MaCS project will foster a consensus view in the European industry, will provide inputs to standardization and will create the technical and business momentum for Multimedia Communication Service mass market commercialization in 2006 and beyond.

B.3.6.2 Services identified within the project

To develop and experiment the new generation of Broadband Telephony Service for the residential market, which allows seamless usage of new increased services addressing the needs of interpersonal communities, such as Videotelephony, Presence and Reachability Management, Local and Network Address Book or Multimedia Messaging.

B.3.7 DESYME Development System for Mobile Services

B.3.7.1 What is the project about?

DESYME is intended to cover the existing gap between the potential of services over mobile networks and user needs. It shall enable users to design mobile services to suit their requirements in an easy way.

The users who will benefit from the development of DESYME have the following basic profile:

- they are identified as an Small Medium Enterprises (SME) or Small office Home office (SoHo);
- they use Information Technology (IT) facilities in their activities; and
- they are confident that mobile services can be an answer to their business or personal needs.

However, in the current scenario they face with these two main obstacles:

- Application Services Providers (ASP) and/or Mobile Network Operators (MNOs) launch services targeting a wide audience, making it difficult to customize such services for specific requirements;
- Specific developments are not available for SMEs due to the high investment and specific knowledge required.

DESYME concept is an open development and run time environment that makes possible to SMEs design, develop, validate and execute services over mobile networks. This is achieved by means of:

- an intuitive, graphical and multi-platform user interface which makes accessible the service building blocks and the programming logic to the user;

- a Web Services based communication between the user domain and the ASP;
- an interoperable middleware (Framework) which accesses the functions available from the mobile network; and
- the capability of an ASP to negotiate a Service Level Agreement (SLA) with different MNOs, communication via Parlay/X.

DESYME project will develop an environment based on open, interoperable and flexible technologies that will allow the easy development of new applications based on mobile services and the access to them.

DESYME can contribute crucially to the fast development and adoption of services over mobile networks (2G, 2,5G, 3G) and other new comers networks such as WiFi, Bluetooth, etc.

B.3.7.2 Services identified within the project

DESYME project will develop *an environment* based on open, interoperable and flexible technologies that will allow the easy development of new applications based on mobile services and the access to them but they do not propose new services.

B.3.8 ADPO Personalized Adaptative Portals Framework

B.3.8.1 What is the project about?

The ADPO project focuses on the development of a continuity framework for a dynamic personalized and customizable portal in the fixed and mobile environments where the user can benefit from multiple content and web services can interact and spawn new services or content.

The project will specifically focus on the tools and environment to support such a concept leading to a framework for the development and deployment of a dynamic portal, based on web services consumption and utilization and displaying some intelligence. Additionally, the project will study the evolution of the portal in terms of functionalities and portability of services and user experience in different environments.

Additional focus will be on understanding the complexity of a sustained value chain and business model for content consumption based around web service and the production of content from the mediation and orchestration of web services across a multi platforms and multi networks emanating for the portal or web interface. The high level focus areas within the scope of the project will cover areas detailed below. We expect such a concept to develop a community of users virally consuming such services within the portal or across multi access, multi application environments.

- Content and publication.
- Security, Authentication, Authorization.
- Presentation and User experience. It has clearly appeared that the User Experience is key to the adoption of services by a large number of customers.
- User Profiling. Dynamically adapting the content based on gathered information, environmental conditions or users past activities, delivering the right information at the right moment can facilitate a greater user experience, and also contribute to the demise of a service being perceived as an autocratic and doctorial environment.
- Business models and Value chains.
- Current and future maturity of Standard.

The ADPO project deals with service continuity using an open platform to plug services. The main output of the ADPO project will be an open platform for service continuity that will support several access network types. This platform will act as a proxy between the end-user device and the service(s) provider(s). Two usage scenarios will be developed. Moreover, the specification necessary to develop a "compatible" Web Service will be available in the first months of the project. As such, the ADPO platform could be an element of the CELTIC "Pan-European Lab". More demonstration could easily been done relying on Web Service publicly available or developed in other CELTIC projects. Moreover, the ADPO platform will allow quickly and easily to create new services by combining several services completely different, and at the same time providing this combine service to the user continuously across several network technologies. The end-user will not even notice that the service is in fact a combination of several services because of the choreography capabilities of Web Services.

B.3.8.2 Services identified within the project

Dynamic personalized and customizable portal in the fixed and mobile environments where the user can benefit from multiple content and web services can interact and spawn new services or content.

B.3.9 DB Wireless Festival

B.3.9.1 What is the project about?

The project will study, prototype and evaluate solutions for large-scale events, to assess the business, user, service and communication aspects.

The business models and value chains for traditional telecom services are based on a long-term view to justify the necessary huge investments. The value constellations for short-term, large-scale events have different priorities, as time for generating value is short. It is not unthinkable that we find opportunities for companies similar to "light and sound" companies that rent out and manage equipment during events. The market for high level "facilitation management" is expanding rapidly, as is the market for outsourcing.

Understanding the needs and behaviour of users are keys to the success of our project. This includes work before the events to clearly define the target segment and its sub-structures.

Based on that understanding, we will prepare and conduct user studies for three major events. An ethnographic approach will be used for our user studies in order to gain a deep understanding of our customers" explicit needs (including users, organizers and suppliers) as well as their implicit desires in relation to our ideas for new products and services.

The first target event that the consortium will study is the Hultsfred Rockfestival 2004 to assess the necessary background for two major follow-up field trials in 2005 and 2006.

The Hultsfred Rockfestival in Sweden has attracted as many as 30 000 visitors per event over the last four years. Since SMS and MMS systems during the festival are often overloaded and voice services are difficult to use due to loud noise, the festival organizers rely on human runners with small notes to contact one of their 5 000 voluntary helpers. Runners can be regarded as a communication channel with poor throughput and long delays but offering the only reliable alternative so far in a demanding environment.

There is an already identified need for improved logistics solutions. The project has full access to all results generated by an independent project run by Blekinge Institute of Technology (BTH). BTH will test new concepts for wireless logistic support at the Hultsfred festival 2004, which we will extend for Hultsfred 2005. A last major trial in 2006 will focus on on-site and off-site visitors, and possibly involve a new type of event, e.g. the Gothia Cup 2006.

B.3.9.2 Services identified within the project

Solutions for large-scale events, to assess the business, user, service and communication aspects.

Annex C:
Corporate and «SoHo» access scenarios

C.1 Introduction

When connecting CPEs or "customer networks" to the NGN core network, two aspects need to be considered:

- The network attachment, which mainly deals with IP connectivity.
- The service attachment, which mainly deals with service registration.

Taking into account the general requirements for "customer networks" regarding IP connectivity, and taking into account already existing topologies it can be concluded that the following configurations need to be supported:

- Corporate networks (Network attachment and Service attachment).
- Small office and Home networks (Network attachment and Service attachment).

C.1.1 Corporate networks

C.1.1.1 Network attachment

For Corporate networks the most likely method for network attachment (IP connectivity) is a private LAN with permanent IP connectivity to the public core network. This permanent connection uses one or more public IP address and performs NAPT. The end devices in the LAN receive a (private) IP address from a customer sited equipment (e.g. DHCP server in the corporate LAN).

It is clear that this network attachment deviates significantly of what is currently understood by network attachment via the NASS. However it is not sure that this will impact the current NASS architecture.

C.1.1.2 Service attachment

With respect to service attachment basically two configurations are possible:

a) Each end device attaches individually to the service. This results in a direct interaction between the terminals and the NGN core network. A special case of this is sometimes referred to as hosted IP PBX or IP Centrex. In this case service attachment is not different than for an individual user.

b) The end devices attach to a customer sited intermediate (call and service control) function, which performs a service attachment proxy (it attaches to the service on behalf of the end device) This results in indirect interaction between the individual terminals and the NGN core network. The intermediate (customer sited) function is often called an IP PBX.

C.1.2 Small office and Home networks

C.1.2.1 Network attachment

For Small office and Home networks there are two main methods for network attachment (IP connectivity):

- The first one is the same as for corporate networks.

- The second one is a private LAN with non-permanent IP connectivity to the public core network. This non-permanent connection uses one or more public IP address and performs NAPT. The end devices in the LAN receive a (private) IP address from a customer sited equipment (e.g. DHCP server in the SoHo LAN). This set-up of the non-permanent connection relates to the current network attachment via the NASS. It is expected that this will not impact the current NASS architecture.

C.1.2.2 Service attachment

With respect to service attachment basically two configurations are possible:

a) Each end device attaches individually to the service. This results in a direct interaction between the terminals and the NGN core network. A special case of this is sometimes referred to as hosted IP PBX or IP Centrex.

b) The end devices attach to a customer sited intermediate (call and service control) function, which performs a service attachment proxy (it attaches to the service on behalf of the end device) This results in indirect interaction between the individual terminals and the NGN core network. The intermediate (customer sited) function is often called an IP PBX.

C.2 Scenarios

C.2.1 Corporate networks, case 1

NOTE 1: Figures C.1 to C.7 need to be revisited.

Figures C.1 and C.2 illustrate a possible realization of the TISPAN NGN functional architecture, with a corporate network access permanently connected to the "public" network. Service attachment is done by each end device separately.

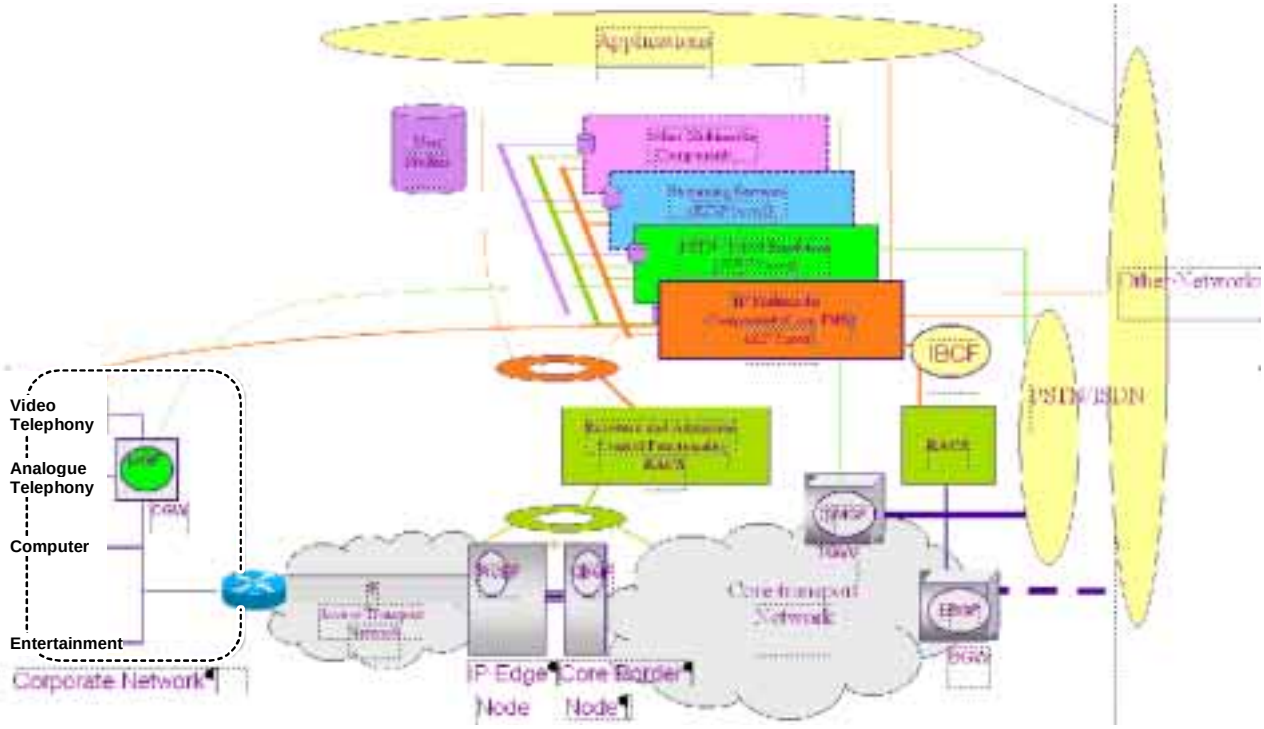


Figure C.1: Example overall architecture for Corporate network interconnect

This configuration assumes the following:

- A Border Gateway Function (C-BGF) is implemented in a Core Border Node sitting at the boundary between the corporate (access) network and a core network, at the core network side; and

- A Resource Control and Enforcement Function (RCEF) is implemented in an IP Edge node sitting at the boundary between the corporate network and the core network, at the access side.

Additionally the following assumptions are made:

- A Border Gateway Function (I-BGF) is implemented in a Border GateWay (BGW) sitting at the boundary with other IP networks;
- A Media Gateway Function (T-MGF) is implemented in a Trunking GateWay (TGW) at the boundary between the core network and the PSTN/ISDN; and
- A Media Gateway Function (MGF) is implemented in a Corporate GateWay (CGW) located in the customer premises.

NOTE 2: These assumptions are similar to the ones for the xDSL case, see ES 282 001 [18].

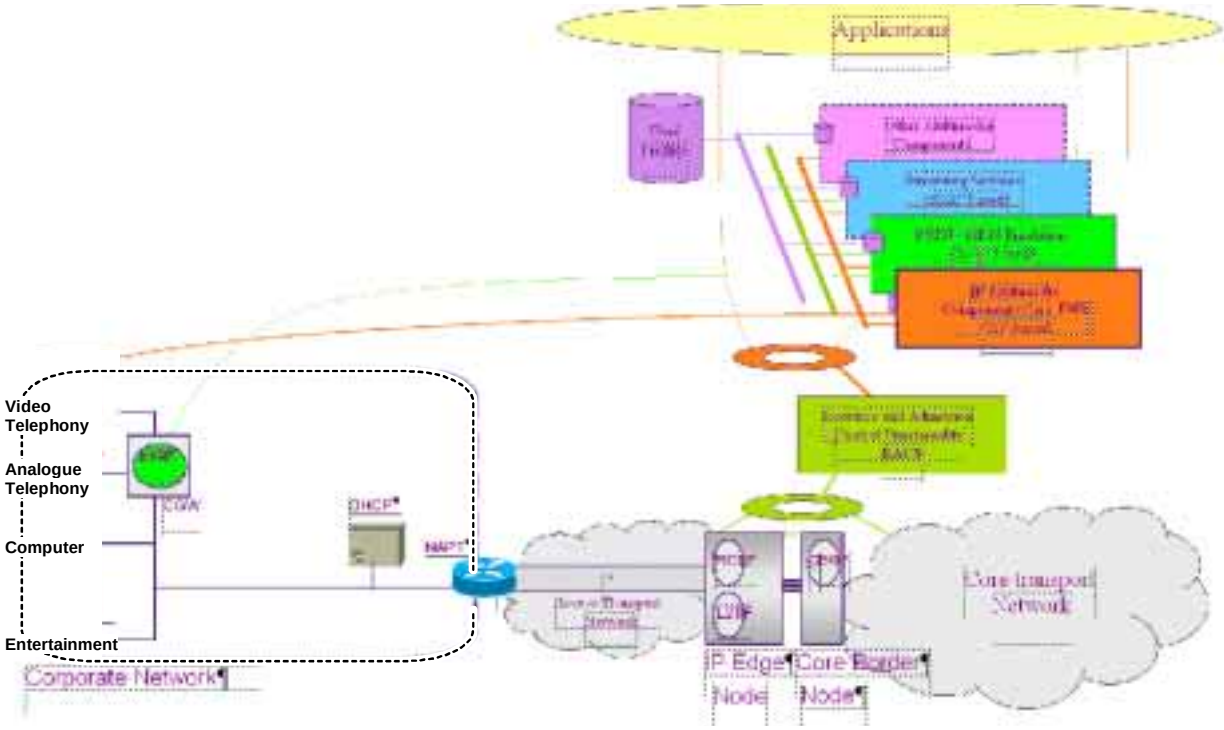


Figure C.2: Example detailed architecture for Corporate network interconnect

The network attachment of the end devices located in the corporate network "bypasses" the NASS. The following assumptions are made regarding the functions normally performed by the NASS:

- Dynamic provision of IP addresses and other terminal configuration parameters is done through dedicated equipment in the corporate network (e.g. DHCP server).
- Authentication taking place at the IP layer, prior or during the address allocation procedure is taken care of by the corporate network for what the end devices are concerned. The complete corporate network is considered to be authenticated permanently by the "public" NGN.
- Authorization of network access based on user profiles is taken care of by the corporate network for what the end devices are concerned. The complete corporate network is considered to have permanent authorization by the "public" NGN. Remark: as the NASS is bypassed, the public network does not necessarily have a user profile for each individual user. It may have a user profile for the complete corporate network.
- Access network configuration based on user profiles is a matter for the corporate network. The permanent IP connectivity between the corporate network and the "public" network is static and needs to be properly engineered. Remark: as the NASS is bypassed, the public network does not necessarily have a user profile for each individual user. It may have a user profile for the complete corporate network.

- Location management taking place at the IP layer is a matter of the corporate network with regard to the end devices. From a "public" network point of view no (dynamic) location management is needed because of the permanent nature of the IP connectivity.

The service attachment is assumed to be done individually per end device and should not differ from the service attachment for individual users. However, the users of a corporate network will probably use a different AS (e.g. an IP centrex server).

C.2.2 Corporate networks, case 2

Figures C.3 and C.4 illustrate another possible realization of the TISPAN NGN functional architecture, with a corporate network access. Service attachment is done by a customer sited intermediate functional entity (e.g. IP PBX).

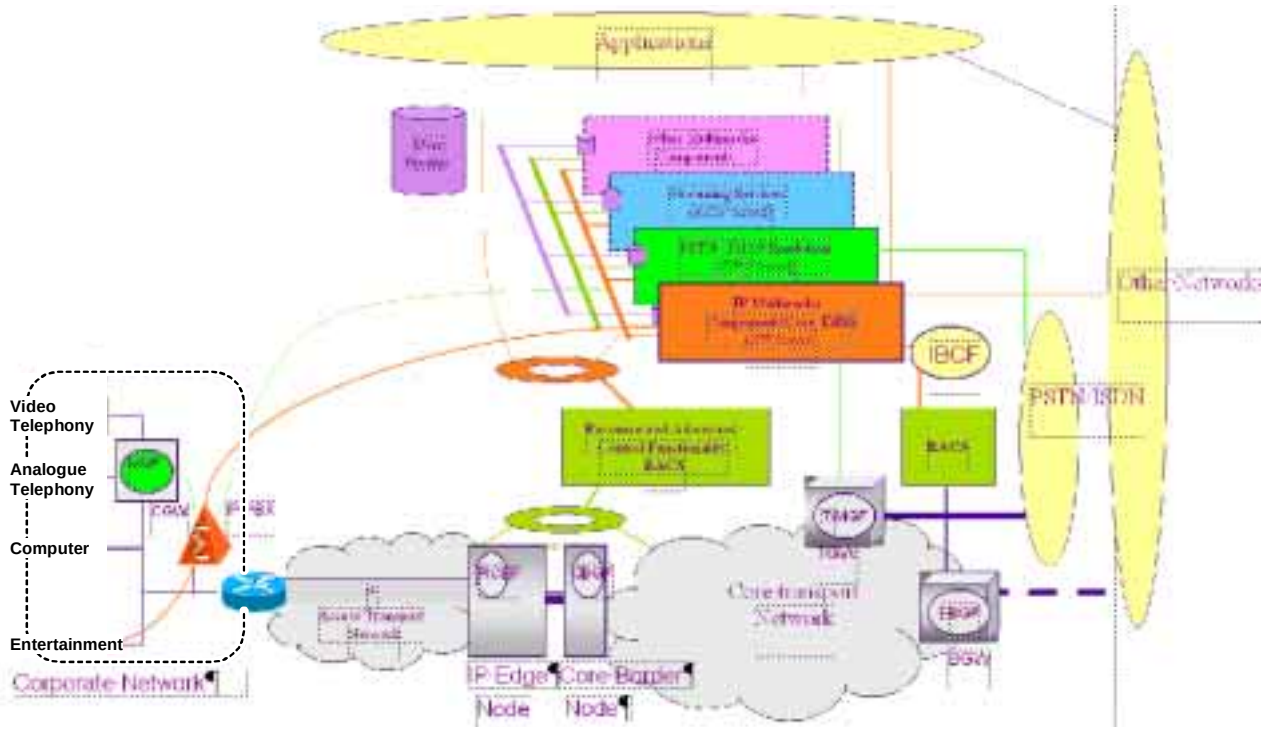


Figure C.3: Example overall architecture for Corporate network interconnect

This configuration has the same assumptions as above.

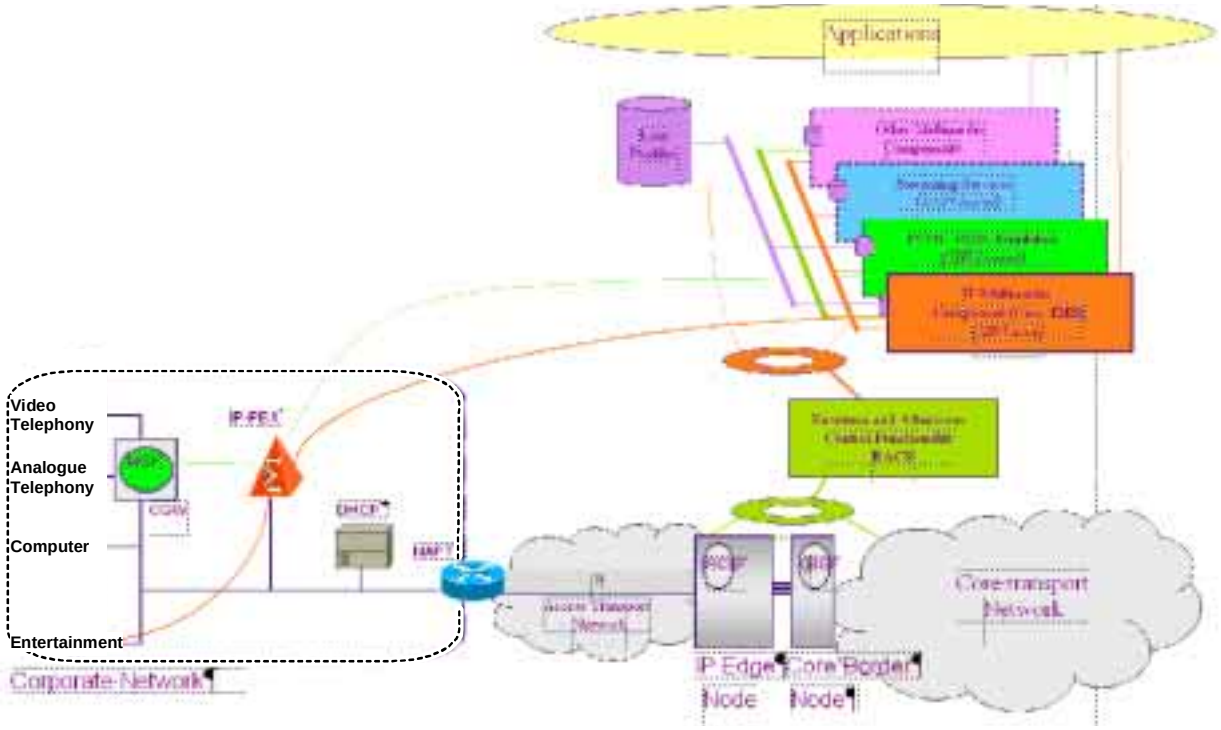


Figure C.4: Example detailed architecture for Corporate network interconnect

The network attachment of the end devices located in the corporate network "bypasses" the NASS. The same assumptions as in the case above are made regarding the functions normally performed by the NASS.

The service attachment of the individual end devices is done towards the customer sited IP PBX. This IP PBX "performs" service attachment on behalf of it's end devices to the "public" network. Whether this is done using signalling, or through configuration in the "public" network remains an open issue. In the latter case the service attachment has a rather permanent character, the "public" network is not aware of the presence of a particular user.

NOTE: The method how network attachment and service attachment work in cases of a corporate network user "roaming" outside the corporate network is not detailed in this annex.

C.2.3 Small office and Home networks, case 1

The cases described above for corporate networks also apply for "Small office and Home networks" having a permanent IP connectivity to the "public network". In the case of non-permanent IP connectivity the cases 1 and 2 apply.

Figures C.5 and C.6 illustrate a possible realization of the TISPAN NGN functional architecture, with a "Small office and Home" network access, not permanently connected to the "public" network. Service attachment is done by each end device separately.

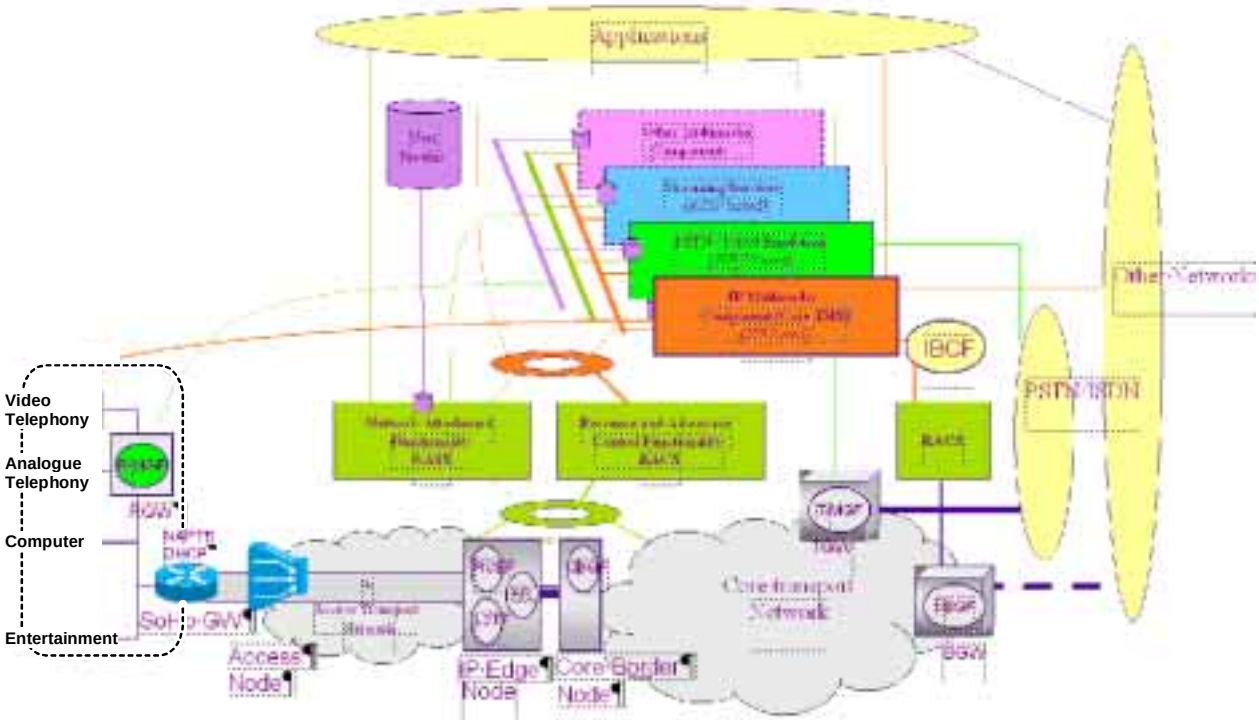


Figure C.5: Example overall architecture for Small office and Home network interconnect

This configuration assumes the following (same as for the xDSL case, see ES 282 001 [18]):

- A Border Gateway Function (C-BGF) is implemented in a Core Border Node sitting at the boundary between the small office and home (access) network and a core network, at the core network side.
- A Resource Control and Enforcement Function (RCEF) is implemented in an IP Edge node sitting at the boundary between the small office and home network and the core network, at the access side. This node also implements the L2TF and ARF functional entities.
- A Border Gateway Function (I-BGF) is implemented in a Border Gateway (BGW) sitting at the boundary with other IP networks.
- A Media Gateway Function (T-MGF) is implemented in a Trunking Gateway (TGW) at the boundary between the core network and the PSTN/ISDN.
- A Media Gateway Function (MGF) is implemented in a Residential Gateway (RGW) located in the customer premises.

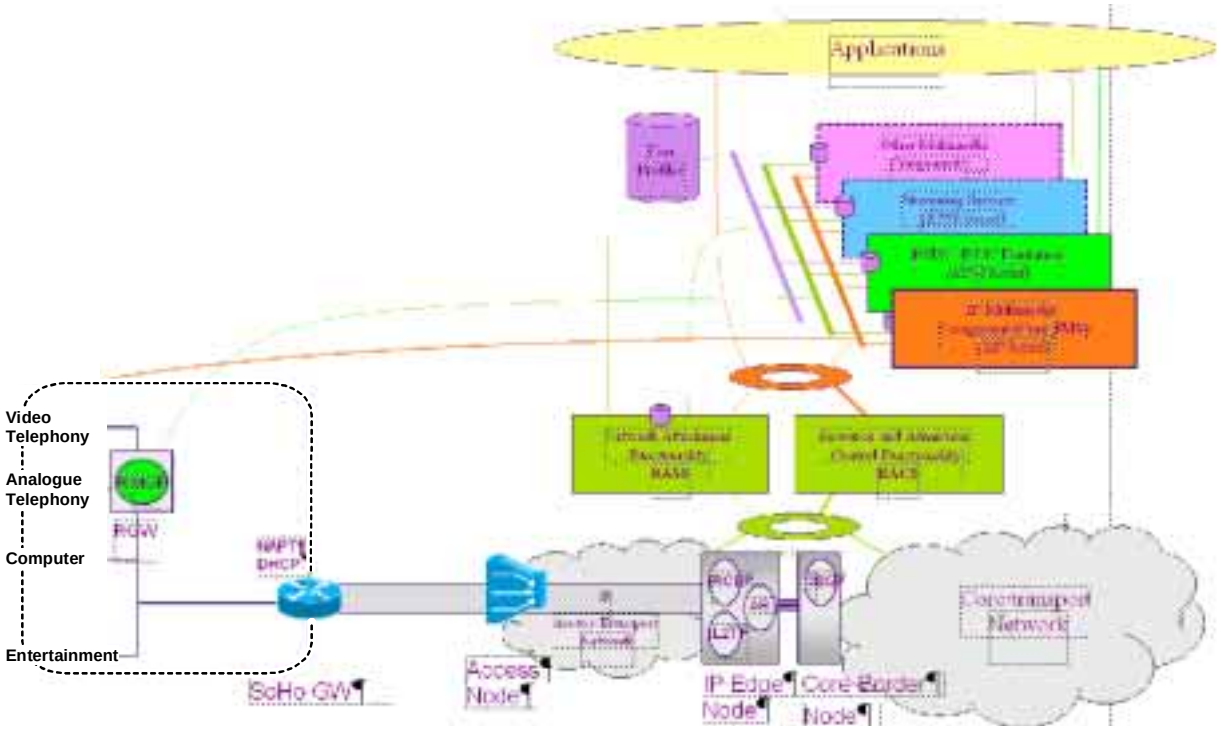


Figure C.6: Example detailed architecture for SoHo network interconnect

The network attachment of the end devices located in the small office and home network "bypasses" the NASS. However, the SoHo GW uses the NASS to attach the whole "Small office network and Home" to the core network. The following assumptions are made regarding the functions normally performed by the NASS:

- Dynamic provision of IP addresses and other terminal configuration parameters: The SoHo GW receives an IP address and other configuration parameters from the NASS at his public network side. It provides (private) IP address and configuration parameters to the end devices at its small office and home network side.
- Authentication taking place at the IP layer, prior or during the address allocation procedure: the Home GW is authenticated by the NASS. Whether the end devices authenticate towards the Home GW is a Small office and Home matter.
- Authorization of network access based on user profiles: The NASS performs this function for all traffic coming from the Home GW.
- Access network configuration based on user profiles: is performed by the NASS as currently described. However, individual users are not known by the NASS, only the SoHo user (group account) is known.
- Location management taking place at the IP layer is performed by the NASS as currently described.

The service attachment is assumed to be done individually per end device and should not differ from the service attachment for individual users. However, the users of a Small office and Home network will probably use a different AS (e.g. an IP centrex server).

NOTE: The method how network attachment and service attachment work in cases of a small office and home network user "roaming" outside the small office and home network is not detailed in annex C.

C.2.4 Small office and Home networks, case 2

Figures C.7 and C.8 illustrate a possible realization of the TISPAN NGN functional architecture; with a "Small office and Home" network access, not permanently connected to the "public" network.

Service attachment is done by a customer sited intermediate functional entity (e.g. IP PBX).

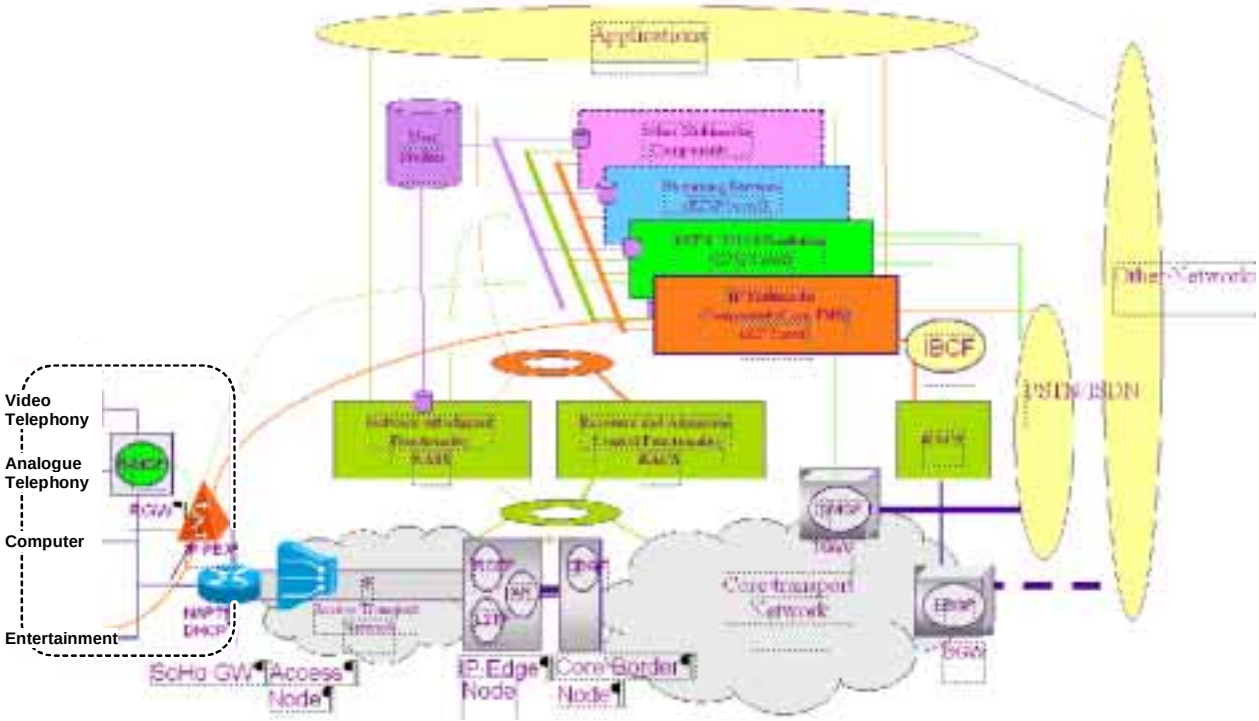


Figure C.7: Example overall architecture for Small office and Home network interconnect

This configuration assumes the following:

- A Border Gateway Function (C-BGF) is implemented in a Core Border Node sitting at the boundary between the small office and home (access) network and a core network, at the core network side.
- A Resource Control and Enforcement Function (RCEF) is implemented in an IP Edge node sitting at the boundary between the small office and home network and the core network, at the access side. This node also implements the L2TF and ARF functional entities.
- A Border Gateway Function (I-BGF) is implemented in a Border Gateway (BGW) sitting at the boundary with other IP networks.
- A Media Gateway Function (T-MGF) is implemented in a Trunking Gateway (TGW) at the boundary between the core network and the PSTN/ISDN.
- A Media Gateway Function (MGF) is implemented in a Residential Gateway (RGW) located in the customer premises.

NOTE 1: This is the same as for the xDSL case, see ES 282 001 [18].

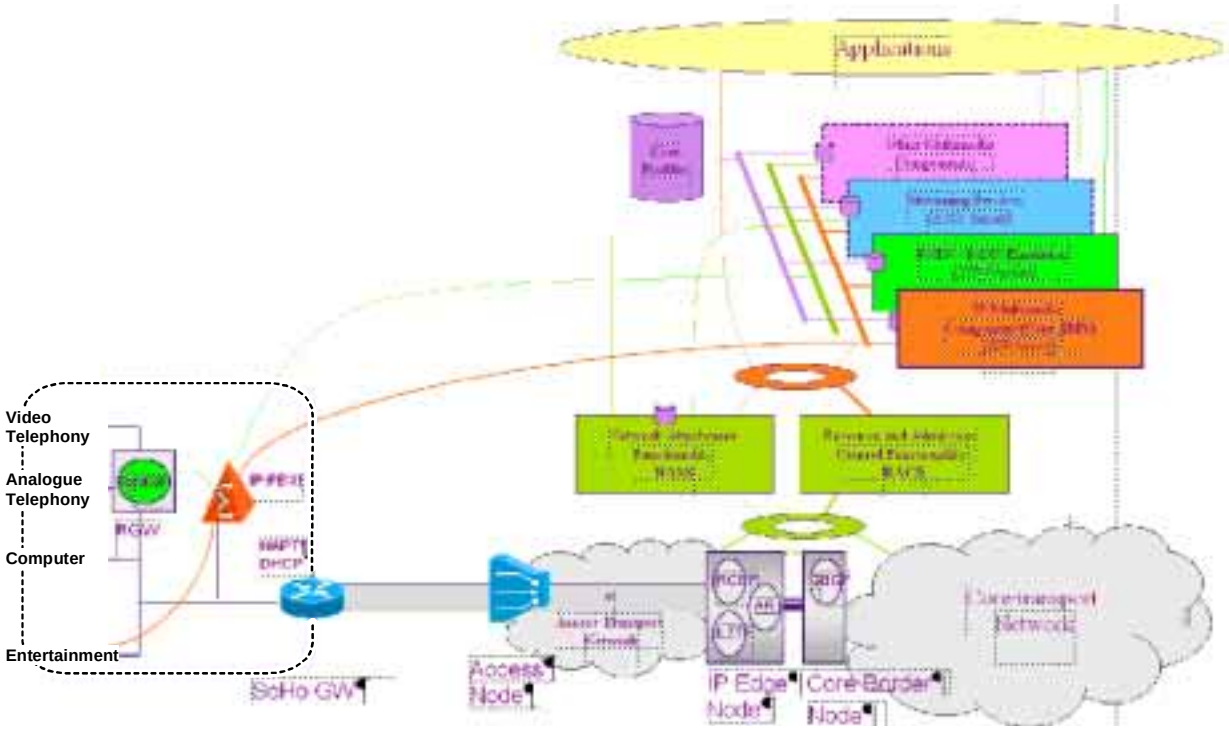


Figure C.8: Example detailed architecture for SoHo network interconnect

The network attachment of the end devices located in the small office and home network "bypasses" the NASS. However, the SoHo GW uses the NASS to attach the whole "Small office and Home network" to the core network. The same assumptions as above, regarding the functions normally performed by the NASS are made.

The service attachment of the individual end devices is done towards the customer sited IP PBX. This IP PBX "performs" service attachment on behalf of its end devices to the "public" network. Whether this is done using signalling, or through configuration in the "public" network remains an open issue. In the latter case the service attachment has a rather permanent character, the "public" network is not aware of the presence of a particular user.

NOTE 2: The method how network attachment and service attachment work in cases of a SoHo network user "roaming" outside the SoHo network is not detailed in this annex.

Annex D:
Asian Regional Aspects

D.1 Introduction

During two luncheons at the recent April/May meeting of ITU-T Recommendation SG 13 and the co-located meeting of the Focus Group NGN, information was exchanged with representatives of Japan and South Korea on the evolution of telecommunication networks and the evolving new services. The results are summarized below.

D.2 Input from TTC

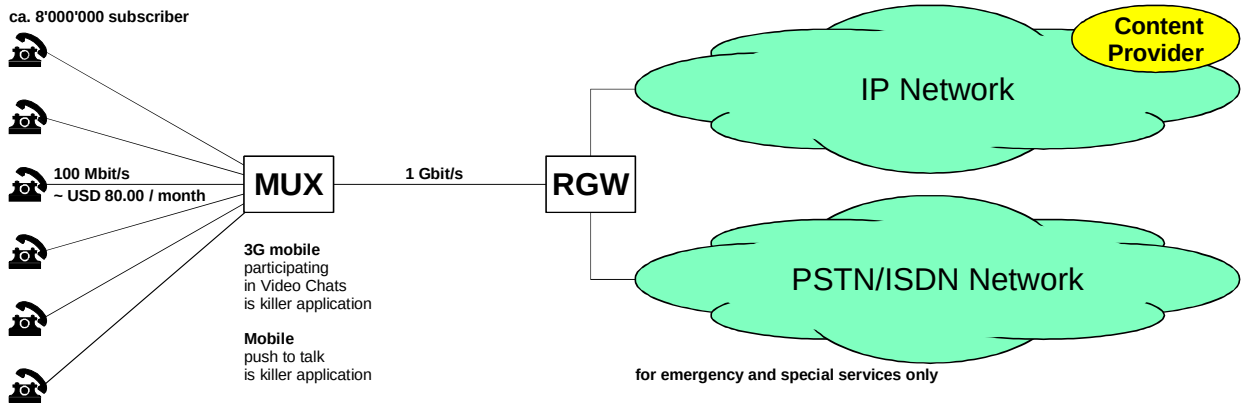


Figure D.1: Network aspects in Japan

PSTN/ISDN network only for emergency and priority calls.

Content provider is critical; revenue from transport becomes marginal.

D.3 Input from ETRI

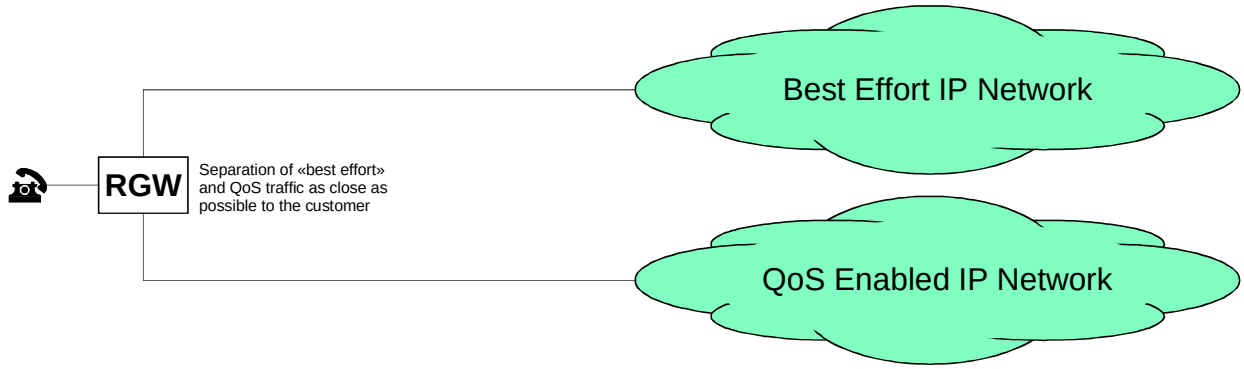


Figure D.2: Network aspects in Korea

Early separation of "best effort" traffic from QoS enabled traffic.

QoS, Security, Single Sign On (ID management) enabler for.

- Entertainment Services (e.g. VoDemand, IP-TV, Games, etc.).

- Communication Services (e.g. VoIP, Video Telephony, Video Phonebanking, etc.).
- Education Services (e.g. servicing high quality educational contents, etc.).
- Home Care Services (e.g. Child monitoring, Home monitoring, alarm and dispatch services, etc.).

(see also the slides reachable via the link below).

http://portal.etsi.org/docbox/STF/STF291_TISPAN_GloblServ_NGNcapab/Public/octave%20service.ppt

D.4 1st Clustering Workshop on Cross-Media European Projects

Also during the Geneva meeting, the invitation reachable via the link below to a workshop was made available. The workshop presentations and/or the workshop results might be a source to study new services.

http://www.inccom.org/index.php?option=com_contentandtask=viewandid=58andItemid=112.

Annex E:
User Profile Management

E.1 Introduction

The concept of a user profile usually refers to a set of preferences, information, rules and settings that are used by a device or service to deliver a customized version of capabilities to the user. In practice, most devices and services already contain profiles specific to that product and unrelated to any other. These profiles are frequently sub-divided into a number of profile components.

Commercial and technical constraints currently dictate having profile components associated with each device or service, and is likely to remain a common model for profiles. This model is reflected in proposed system architectures such as the 3GPP GUP.

There will be a number of user characteristics and preferences that will apply independently of any particular product (e.g. a user's preferred language or their need for enlarged text). The guidance given in this present document reflects one key objective, that users should not be required to provide this information more times than is necessary.

Users move from one situation to another throughout the day (e.g. at home, driving, working). In each of these situations, users will have different needs for how they would like their ICT resources arranged. At present, an increasing number of products already provide the user with ways of tailoring their preferences to these different situations. EG 202 325 [3] identifies and suggests ways which make it easy for users to specify their situation dependent needs in ways that require the minimum need to understand the wide range of products that contain unique situation dependent preferences and access methods.

In addition, common user profile management holds the promise of improving the uptake of new technologies and allowing greater access to the benefits of technologies. EG 202 325 [3] focuses on presenting guidelines to service providers and manufacturers in shaping their product requirements in ways to maximize human and social benefits.

E.2 User Profile Concept

E.2.1 General

Users request to have the behaviour of devices or services personalized to their requirements; this implies that a profile will be required. A profile may apply to a single simple device or service, more complex devices or services, or any combination that the user may wish to use. The entire set of this information, preferences, rules and settings a user wants to apply is the "user profile".

Profiles may be related to the various situations that a user experiences in their lives. Users view these situations in a hierarchical way; it must therefore be possible for users to have a hierarchy of profiles that reflect the relationship between these hierarchical situations.

NOTE: For example, a user may have a number of profiles related to different work situations such as "Work meeting" and "In my office". A general "At work" profile at the top of this hierarchy of work related profiles applies if none of the other more specific situations applied.

Where profiles are organized in a hierarchical way the lower level profiles can inherit profile data from the higher-level ones.

E.2.2 Generic settings and preferences

The user can express a wide range of preferences that are applicable when using a number of different devices and services. These include:

- Generic service preferences (e.g. people with hearing difficulties may express a preference for receiving information and communications in a text format or have it presented in an elevated setting of the volume).
- Time-dependent preferences (e.g. not accepting voice communications between 23:00 and 07:00).
- Location and situation based preferences (e.g. requirements related to communications when driving a car).
- Combinations of service, location and time preferences depending on the context of use (e.g. wanting text information translated to voice when driving a car to and from work).
- Affinity based preferences provided by an organization (e.g. an institution such as the Royal National Institute of the Blind lists a wide range of default preferences that have been shown to be suitable for people with visual disabilities).

E.2.3 Service and device specific data

Dependent on the complexity of the device or service there may only be a few user settable parameters or there may be a very large number. Examples of some of the very wide range of device/service parameters that may need to be set include:

- The loudness of a telephone ring tone.
- Which of a number of telephone ring tones is used to indicate a call from a particular category of users.
- The frequency with which new email message delivery is checked.
- The communication method used for mobile data services.

In the majority of cases, the range of parameters that can be set by users and the values that may be set will not be consistent between different devices or services. Where such diversity exists it is impossible to transfer the settings that have been set for one device or service to another similar device or service in a way that ensures that the same outcome will be achieved. This problem could be overcome by standardization.

E.3 Profile types

E.3.1 Base or generic profiles

A base profile contains rules and settings that are always active such as users" name and birth date. It will typically contain descriptive information and some categories of generic settings and preferences.

Generic profiles are applicable for a number of different devices and services for which the user wishes to express a range of preferences.

E.3.2 Device and service profiles

Profile data that only relates to a specific device or service is contained in a device or service profile. Frequently, the profile data may be closely associated with the device or service (i.e. it may be stored within the device or service). Also one device or service profile may contain a hierarchy of related profiles for sub-elements of that device or service. For example, the profile for a mobile phone may contain profiles for the mobile phone calendar, the mobile phone email application, etc.

E.3.3 Shared profiles

There may be devices or services that are shared between a number of users. For example, both the fixed telephones and the fixed telephony service in a family home will be shared between all members of that family. Each person who makes use of these shared devices or services may incorporate the shared device/service profiles as part of their own user profile. A profile for a shared device or service, associated with more than one person's profiles would raise issues such as conflicting preferences when used simultaneously by several people.

For intelligent homes or offices, the home or office could be considered to be a shared device that may be used in the profiles of the family members or the employees.

E.3.4 Active/inactive profiles

A profile (and its dependent lower hierarchical levels) can either be currently unused (an "inactive profile") or it can be in current use (an "active profile"). EG 202 325 [3] assumes that a separate profile may be used for each common user situation (e.g. "At home", "In the car"). When the situation changes the required behaviour is that a new situation-dependent profile is activated and the previous one is de-activated.

Notification that a situation requiring the deactivation of currently active profiles and activation of appropriate profiles applies can occur in two ways:

- Manual activation:
  The user specifies that the situation is occurring (e.g. by pressing an appropriate key or making an appropriate menu selection); and

- Automatic activation:
  A device or service detects that the situation is occurring (e.g. because a phone has been put in a car handsfree unit or because a user's location is detected inside the user's home).

In either case, where one device or service has information that a specific situation is now occurring, this information needs to be made available to every device or service that may be involved with the particular profile.

E.4 Profile Agents

E.4.1 Storage Agents

The profile storage agent is the entity that stores information about the profile data and the locations of data repositories of profile data related to users, which might be compared to 3GPP GUP server. In general, there exist multiple profile storage locations, e.g. profiles that apply to a device or service.

Users require the data to be stored in a secure manner with user agreed levels of privacy applied to the availability and distribution of that data. Ideally, profile data should always be available, over all networks, from all supported devices and services, including fixed and mobile services allowing service continuity and the optimal user experience. Changes of data at different locations must be consistent, which may be ensured by synchronization of data and transaction security.

E.4.2 Processing Agents

In order that the rules for automatic activation/deactivation of profiles can be translated into the desired behaviours, it is necessary for the profile processing agent to interpret the rules. The profile processing agent is responsible for ensuring that all the operations required by the profile rules are carried out. The profile processing agent initiates operations on a variety of devices and services referred to in the profile.

In the case of shared devices, the device settings are automatically set for the user who is currently logged into the device or service.

E.4.3 Activation Agents

The activation agent is responsible for the activation and deactivation of profiles. Activation or deactivation of profiles is instigated by:

- Events that trigger the evaluation of rules, the evaluation may result in activation and/or deactivation of profiles.
- Events with implicit rules (e.g. power on/off of a device, logon/logoff at a service, etc.).
- User requested (i.e. the user specifically requests the activation and/or deactivation of profiles).

E.4.4 Viewing/editing Agents

Users will be provided with a single mechanism to view or edit all or part of their profile. To achieve this, profile information will need to be transmitted through different networks and be used on different devices and services in a way that is transparent to the user.

NOTE: There may be components of profiles that are not accessible to the user, e.g. restrictions in the use of a device or a service.

Annex F: Bibliography

The information presented in annex B was taken from:

F.1 Eurescom Projects

- P1101: Always on - Device Unified Services (DUS): http://www.eurescom.de/public/projects/P1100-series/p1101
- P1201: ERNIE - Entertainment and new interactive services via DSL: http://www.eurescom.de/Public/Projects/P1200-series/P1201
- P1208: LOCAWA - Location Awareness: http://www.eurescom.de/public/projects/P1200-series/p1208
- P1301: E-TRACS - E-Commerce Trading of Connectivity Services: http://www.eurescom.de/public/projects/P1300-series/p1301
- P1302: PROFIT - Potential pRofit Opportunities in the future ambient InTelligence world: http://www.eurescom.de/public/projects/P1300-series/p1302
- P1304: CENTS - Cost Effective migration to FTTx-Networks for Tomorrow's Services: http://www.eurescom.de/public/projects/P1300-series/p1304
- P1308: FRAPESA - Framework for personalization of services and applications in next generation services: http://www.eurescom.de/public/projects/P1300-series/p1308
- P1341: NGN Service Concepts: http://www.eurescom.de/public/projects/P1300-series/p1341
- P1448: Opportunities offered by Carrier Grade Multipoint Services: http://www.eurescom.de/public/projects/P1400-series/p1448

Further information on other Eurescom projects can be found at:

- http://www.eurescom.de/public/projects/Projecttables/running_projects.asp
- http://www.eurescom.de/message/messageDec2003/Next_Generation_Service_Concept.asp

F.2 IST Projects

- AGAMEMNON: http://services.txt.it/agamemnon/
- CONNECT: http://www.connect-project.net/
- DELOS: http://www.delos.info/
- ePERSPACE: http://www.ist-eperspace.org/
- NM2: http://www.ist-nm2.org/
- MOBILEIN: http://www.ist-mobilein.org/

Further information on other IST projects can be found at: http://www.cordis.lu/ist/projects/projects.htm

F.3 CELTIC Projects

- TIFANIS: http://cm.tid.es/tifanis/
- IMAGES: http://projects.celtic-initiative.org/IMAGES/
- W3GCREATES: http://www.celtic-initiative.org/Projects/W3GCREATES/abstract.asp
- EURO-HOME: http://www.celtic-initiative.org/Projects/EURO-HOME/abstract.asp
- DEHIGATE: http://www.celtic-dehigate.org/
- MACS: http://projects.celtic_initiative.org/macs/ and deliverables from the project: EMCS_stage1_specification v1-4.doc and MaCS SICS v1-1.docs
- DESYME: http://www.celtic_initiative.org/~pub/Project-leaflets/Webquality/desyme-lq.pdf
- ADPO: http://adpo.nta.no/index.php
- DB Wireless Festival: http://www.wirelessfestival.com/

Further information on other CELTIC projects can be found at: http://www.celtic-initiative.org/Projects/project-info.asp

- http://www.celtic-initiative.org/Projects/project-info.asp

History

Document history		
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