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Services and Protocols for Advanced Networks (SPAN) - Interworking - IP Federating Network (IPFN) architecture

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Foreword

This ETSI Guide (EG) has been produced by ETSI Technical Committee Services and Protocols for Advanced Networks (SPAN).

Introduction

The present document deals with the IP Federating Network (IPFN), an intelligent open interworking platform utilizing IP technology, allowing interconnection of existing and future networks. The networks interconnected may be fixed or mobile, 2G or 3G, IP or non-IP, public or private. The IPFN is composed of a set of functional subsystems, enabling users and applications of these networks to interoperate in fixed and mobile environments, and allowing for provision of value added services. From the users requirements and scenarios, a functional model is established, an architecture is defined based on the harmonization and evolution of existing architectures, reference points are identified, so as to list the existing protocols, identify the need for any protocol extensions and interworking specifications.

Levels of internetworking are defined depending on the Services offered like Security, Quality of Service, Supplementary Services and Data facilities.

Data may be exchanged, collected or shared between users.

New Services like global addressing, internetwork broadcast, multileg communications, etc, which are not yet available on the actual network to which the user is connected, may be offered.

Security will be an intrinsic capability of the architecture.

From this a set of recommendations is made in annex B, in order to help identifying the work in the different areas.

1 Scope

The present document identifies the services requirements from the users perspective. It then defines the functions necessary for interoperability required to establish an "IP Federating Network (IPFN)". It identifies the architecture and the reference points that are sufficient to meet the user's requirements in order to:

- allow Voice, Video and Data or combination of this (Multimedia) interworking between users on heterogeneous interconnected Networks;
- allow users to roam between networks, i.e. to allow the users to change network point of attachment;
- ensure secured communication when required by the users;
- maintain all or some Services (Supplementary Services, Data facilities, etc.) to the users;
- offer new Services like global name/addressing, internetwork broadcast, multileg communications, etc. which are not yet available on the actual network to which the user is connected;
- ensure lossless Data exchange between users of different Networks and between Databases, if required;
- provide extended addressing and naming capabilities;
- allow desirable feature interaction between applications that interwork across different networks;
- offer scalability of network interconnection;
- ensure some corresponding levels of Priority, Quality of Service;
- provide necessary network and service management capabilities for all of the above.

The present document aims to provide an analysis of the status of the subject, make recommendations for future work.

The objective is not to redefine existing standards when they can be reused (see note), but in a global analysis to review standards applicable, their limitations and the rules for implementing interoperability. For example a list of candidate protocols are SIP for interworking between gateways, Mobile IP, LDAP, IPSec, HTTP, XML.

NOTE: The standards referred to here are developed by ETSI, WWRF, IETF, IPv6 Forum and W3C, details of which are available in the Bibliography (annex C).

Levels of interworking will be investigated when appropriate in the context of the IPFN.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

[1] IST 2000-28345 EGERIS: "European Generic Emergency Response Information System".

[2] ETSI TS 101 314: "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); Network architecture and reference configurations; TIPHON Release 2".

[3] ITU-T Recommendation F.16: "Global virtual network service".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

IP Federating Network: intelligent, open interworking platform utilizing IP technology, allowing interconnection of any kind of existing and future networks

user: any entity that actually uses a service. Examples of users in the context of the present document are as follows:

public users;

regulators;

services providers;

emergency authorities;

corporate users;

utilities;

agents/applications.

interworking: ability of equipments to communicate together from different systems and with similar services

interoperability: ability of equipments from different manufacturers (or different systems) to communicate together on the same infrastructure (same system), or on another while roaming

location based services: specific services offered depending on the user geographical location like mapping services, points of interest, routing services

portability: ability of an entity or element to be used in different systems or environments

roaming: process of changing the network access point from one location area network or domain to another within one system or between different systems

agent: application program that performs management operations in response to received management messages or that sends notifications

client: application program that sends request

gateway: interface, between two (or more) systems that have similar functions but dissimilar implementations, enabling users on one network to communicate with users on the other

proxy, proxy server: intermediary program that acts as both a server and a client for the purpose of making requests on behalf of other clients

redirect server: server that accepts requests, maps the address into zero or more new addresses and returns the requests with the new addresses to the client

server: application program that accepts requests in order to service those requests and send back responses to those requests

user agent client: client application that initiates requests on behalf of a user

user agent server: server application that contacts the user when a request is received

user agent: application that contains both a user agent client and user agent server

3.2 Abbreviations

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

AAA	Authentication, Authorisation and Accounting
ABM	Asynchronous Balance Mode
API	Application Programming Interface
BICC	Bearer Independent Call Control
CLIP	Calling Line Identification Presentation (supplementary service)
CR	Call Reference
DNS	Domain Name Server
EP	ETSI Project
FG	Functional Grouping
GERAN	GSM EDGE Radio Access Network
GIS	Geographical Information System
GSM	Global System for Mobile communications
GVNS	Global Virtual Network Service
GW	GateWay
HLR	Home Location Register
HTTP	Hyper Text Transfer Protocol
IETF	Internet Engineering Task Force
IIP	Intelligent Interworking Plane
IP	Internet Protocol
IPFN	IP Federating Network
IPSec	IP Security
ISP	Internet Service Provider
ISSI	Inter Sub System Interface
IST	Information Society Technologies
ISTAG	IST programme Advisory Group
ISUP	ISDN User Part
IT	Information Technology
ITEA	Information Technology for European Advancement
LAN	Local Area Network
LDAP	Light Directory Application Protocol
MCU	Media Conferencing Unit
MESA	Public Safety Partnership Project (Project MESA)
MG	Media Gateway
MGC	Media Gateway Controller
NAT	Network Address Translation
NSB	Network Service Broker
OSI	Open System Interconnection
PDA	Personal Digital Assistant
PIM	Presence and Immediate Messaging
PKI	Public Key Infrastructure
PMR	Private Mobile Radio
PSTN	Public Switched Telephone Network
PTN	Private Telecommunications Network
QoS	Quality of Service
RFC	Request For Comment
ROBO	Remote Office Branch Office
SCF	Service Control Function
SDF	Service Data Function
SG	Signalling Gateway
SIM	Subscriber Identity Module
SIP	Session Initiation Protocol
SLA	Service Level Agreement
SMS	Short Message Service
SOHO	Small Office Home Office
QoSPE	Quality of Service Policy Element
UMTS	Universal Mobile Telecommunications System
URL	User Requirements Language

UTRAN	UMTS Terrestrial Radio Access Network
V+D	Voice plus Data
VHE	Virtual Home Environment
VoIP	Voice over IP
VPN	Virtual Private Network
WAP	Wide Area Paging
WLAN	wireless local area network
XML	X Modelling Language

4 Background information

It is a fact that wireless and wireline technologies are diverse with their specific adaptations to different markets. There is an increasing need to interconnect these public and private networks to provide Multimedia, not only a discrete Voice, Video and Data interworking, but also including global Name/addressing, Mobility, Value Added Services, Security.

IP based networks, by connecting functional subsystems, can federate those different wireless and wireline technologies for the users and for applications enabling implementations of new cross technology services and new business models between networks. These IP Core networks can use a common IP transport network for wireless and wireline subscribers and are independent from the access networks. Multiple access technologies should include: UTRAN, GERAN, Hiperlan2, etc. This will include wireline access in addition to the existing radio accesses, i.e. MESA.

Also, this convergence between wireline and wireless technologies should be seen as a key area of alignment, both at the network and service layers. It is important to derive common mobility requirements that could be adopted for wireless and fixed IP technologies, based on the study and review of mobility solutions of already evolving mobile networks (i.e. the Release 4 and beyond) and fixed networks (e.g. WLAN networks).

This is actually needed to identify: mobility, security, multimedia call control and service control requirements before progressing the work on harmonized networks solutions for IPFN. It is also needed to ensure true seamless roaming and efficiency between wireless and fixed technologies. This includes the concept of VHE that has been developed in different fora.

The overall objective of the IPFN is to provide an interworking architecture (with harmonized facilities) for the support of Voice, Video, Data and any combination resulting applications (i.e. Multimedia). However, it is important to note here, that interworking with many different types of legacy networks and access systems is very complex. Therefore, interworking schemes shall be harmonized to as great extent as possible, and where possible avoided.

No assumptions about the physical architecture of the connected networks will be made during the study. Nevertheless, allocation of resources and functionalities may be required as is feasible in the connected network.

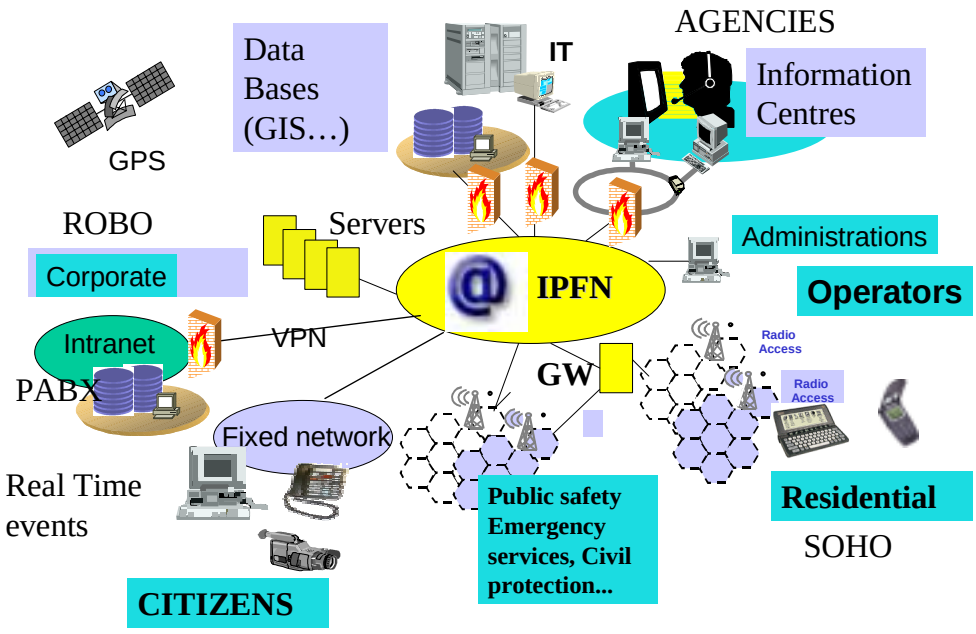

Figure 1: Global configuration

5 Users requirements

5.1 Market requirements

The market requirements taken here are those given by the EC from their global analysis and ongoing projects with industrials and users in the **Information Society Technologies programme** (IST), **Ten Telecom** business program and **Information Technology for European Advancement** (ITEA) programme. Some extracts of such reports are listed below:

IST new organizations and markets (EC Directorate- General):

> "Smart organization is knowledge driven, adaptable and **internetworked**"…"IST enables public agencies to make the delivery of public services more citizen centric"…

Referring to the IST Information Society Technologies programme (2000 workprogram-/2000/350):

> "the emphasis is on citizen-centred approach with significant support for standardization, **interoperability** and market stimulation"…"disseminate information"…"users will be able to access data with **ubiquity**"… (Intelligent environment management).
>
> "Effective collaboration requires standardization, concerning how the data is collected and stored, and **interoperability** in the solutions applied". (Health services).

Draft synopsis of 2001 program ISTAG key enabling technologies:

> "To develop middleware, distributed systems, multi-layered architectures and agent based systems to enable **interoperability, interworking**, openness and integration of applications and services across platforms"…"To emphasize trust and **security** "…

Trans European Telecommunications Networks (2000/C299) in its business plans and market validations quotes the need to "help improving the overall accessibility to the Services and to ensure that customers of equivalent services from different providers can communicate and **work together** transparently"…