ITU-T IP Project Description

Version 9

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Contact persons for the IP Project updating:

TSB Secretary to Study Group 13

Mr. Georges Sebek

International Telecommunication Union (ITU)
Place des Nations
1211 Geneva 20
Switzerland
Tel: +41 (0)22 730 5994
Fax: +41 (0)22 730 5853
E-mail: sebek@itu.int

Study Group 13 Vice-Chairman

Mr. Jean-Yves Cochennec

France Telecom
FTR&D / DAC / NGN
2 Avenue Pierre Marzin
22300 Lannion France
Tel: +33 (0)2 96 05 20 22
Fax: +33 (0)2 96 05 14 70
E-mail: jeanyves.cochennec@rd.francetelecom.com

1 Background

The explosive growth of the Internet, and other IP based networks, and with it the ever increasing demand for higher bandwidth/capacity, has network operators and manufacturers alike reconsidering their services, network structures, products etc. Information technology and the use of IP based networks and applications (e.g. E-Commerce) have become critical factors in the development of telecommunication networks.

Data traffic is growing at more than ten times the rate of voice traffic and it is estimated that in the near future data will account for 80% of all traffic carried by telecommunications networks. Therefore with this rapid change the past concept of telephone networks, which also carry data, will be replaced by the concept of data networks that also carry voice. In this regard, seamless interworking between IP based networks and telecommunications networks and interoperability of their respective applications/services is essential to meet the burgeoning business requirements placed on modern communications networks.

Another important trend in telecommunications networks is the emergence of mobile networks and a significant increase of customers subscribing to them. The work on the 3rd generation mobile networks performed by ITU under the name of the IMT-2000 has, as its main features, an increased data speed of 384 kbit/s up to 2 Mbit/s, a global roaming capability and the virtual home environment (enabling users to move seamlessly between fixed and mobile networks). These features will provide an additional infrastructure for the IP-based network services with fast, ubiquitous access through the global roaming capability.

Dramatic changes have also been taking place in the satellite industry that are driven by the growth of wireless and internet traffic. Many new systems have been and are being planned, designed, and deployed to offer services such as integrated voice/data/video, internet access, and wireless access, etc. Services offered by satellite networks are also moving quickly towards the end-users by providing them direct high-speed access.

In short, business directions are changing across the telecommunications industry. Consequently standards organizations, forums and consortia are facing new challenges in terms of work direction and focus. We are also seeing the emergence of new bodies to address related areas e.g. the ETSI TIPHON (Telecommunications and Internet Protocol Harmonization over Networks; IMTC (International Multimedia Teleconferencing Consortium) Voice over IP Forum (VOIP).

Not only are we facing major changes to the telecommunications network, but also these changes are developing in ever-shorter time intervals, along with reduced development intervals and corresponding shorter life cycles for services and products. Standards bodies must be able to change their focus and work direction to produce necessary standards in much shorter intervals.

Interoperability of networks and of applications is becoming an increasingly important aspect. The interaction of IP based networks and telecommunications networks for the purpose of gaining access to Internet, or other IP network applications, and the need for the interoperability of IP-based services and telecommunication services means providing real time Internet or other IP based multimedia services with the speed, capacity, ease of use, reliability and integrity of the public telephone networks in use around the world. These are aspects of telecommunication network standardization in which the ITU-T has an excellent track record.

Although the ITU-T and the Internet Engineering Task Force (IETF) are collaborating in a number of areas, given the new industry emphasis on Internet and IP structured signals, it is our view that this collaboration must be strengthened within the context of changes in work emphasis and direction within the ITU-T on IP based networks. Both the ITU-T and the IETF will play key roles. However, in our view neither the IETF nor the ITU-T will be able to adequately address this area independently. For example, the IETF strength lies in the protocol and application areas, whereas the

ITU-T has a great deal to offer in the areas of architectural, network interworking and network evolution.

These aspects have been considered by PP-98 in adopting Resolution 101 (Minneapolis, 1998) (Internet Protocol (IP)-based networks). The Resolution 101 considers:

- that advances in the global information infrastructure, including the development of Internet Protocol (IP)-based networks and especially the Internet, are an issue of crucial importance for the future, as an important engine for growth in the world economy in the twenty-first century;
- that the increased use of the Internet is replacing existing services and introducing new ones based on its highly advanced technology;
- that studies have already started in ITU-T on IP-based network issues, including service interoperability with other telecommunication networks, numbering, signalling requirements and protocol aspects, security and infrastructure component costs;
- that general cooperation arrangements between ITU-T and the Internet Society (ISOC) and its Internet Engineering Task Force (IETF) have recently been established which encourage the ITU-T to continue its collaborative activities on IP-based networks with ISOC/IETF."

In this respect the WTSA has expressed its view that the telecommunications environment have already moved towards making IP-based technology a key part of the network infrastructure.

According to the Resolution 2 of WTSA, which was held in Montreal from 27 September to 6 October 2000, the SG 13 is responsible for studies relating to interworking of heterogeneous networks encompassing multiple domains, multiple protocols and innovative technologies with a goal to deliver high-quality, reliable networking. Specific aspects are architecture, interworking and adaptation, end-to-end considerations, routing and requirements for transport.

The Study Group 13 is the lead Study Group for IP-related matters, B-ISDN, Global Information Infrastructure.

The ITU-T is maintaining its leadership role in the development of global standards in the world rapidly changing telecommunication environment and of high-speed network evolution.

Plenipotentiary Conference 98 Resolution 101 encourages ITU-T to continue its collaborative activities on IP-based networks and as the result of such activities the ITU-T IP – Project sees its further development.

2 Scope of the project

Based on an analysis of the input material outlined in section 1 the following thirteen work areas have been identified as being of current major concern to the ITU-T:

Area 1 - Integrated architecture

Area 2 - Impact to telecommunications access infrastructures of access to IP applications

Area 3 - Interworking between IP based network and switched-circuit networks, including wireless based networks

Area 4 - Multimedia applications over IP

Area 5 - Numbering and addressing

Area 6 - Transport for IP-structured signals

Area 7 - Signalling support, IN and routing for services on IP-based networks

Area 8 - Performance

Area 9 - Integrated management of telecom and IP-based networks

Area 10 - Security aspects

Area 11 - Network capabilities including requirements for resource management

Area 12 - Operations and Maintenance (OAM) for IP

Area 13 - Utilization of IPv6 in telecommunication networks

The following is a schematic representation of the scope of the Project.

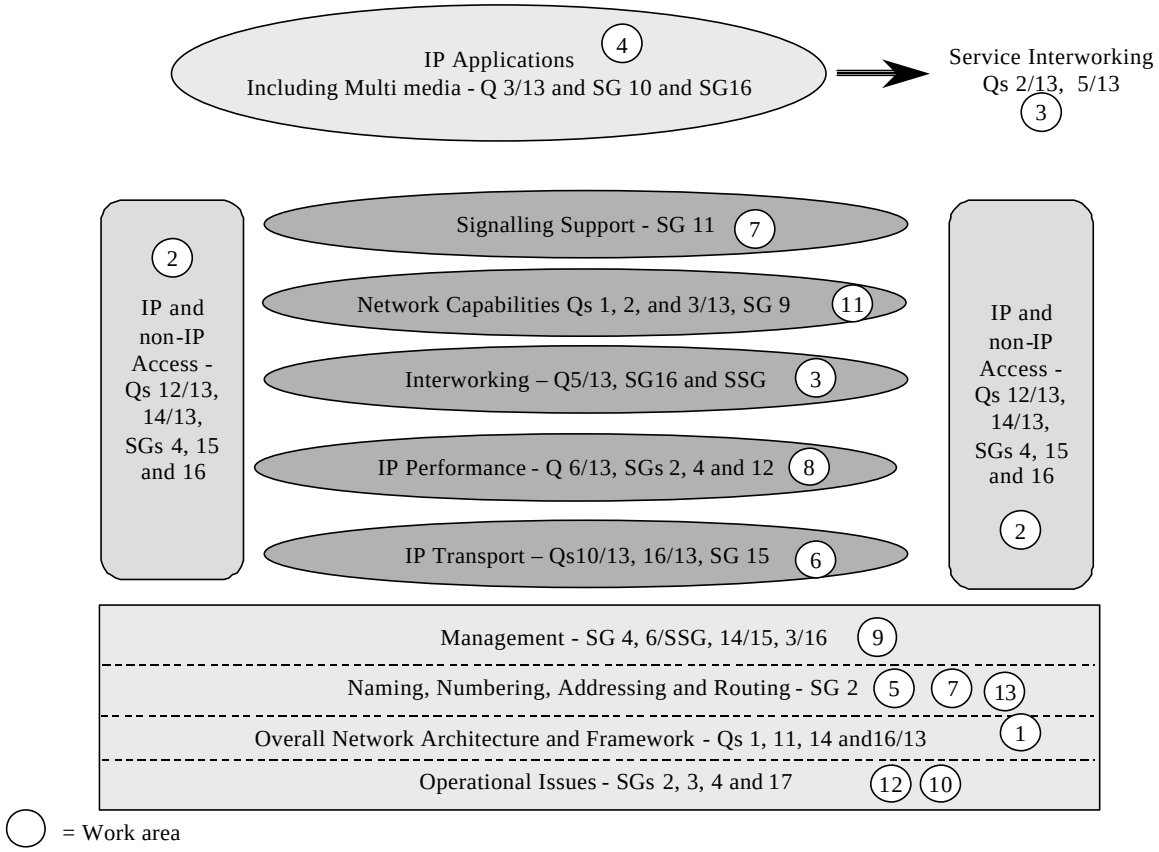

FIGURE 1: Scope of the ITU-T IP Project

For each of these areas the following sections describe the scope and focus of the work area, the issues, the current work in the ITU-T Study Groups and related work in the IETF. In some cases the information is not yet complete and further work is necessary to expand the information. Particularly in relation to the IETF work an analysis of the IETF Working Group Charters is currently being undertaken to identify areas of potential overlap and areas where the ITU-T could collaborate with the IETF.

The IP project will be continuously updated thereby reporting on major deliverables from the various Study Groups in terms of Recommendations approved or planned.

Concerning the publication of IP related Recommendations it is proposed that the Y. Series is renamed as “Global Information Infrastructure and Internet Protocol Aspects”. The Y.100- to Y.999-series will continue to be used for GII Recommendations and the Y.1000- to Y.9999-series will be

used for IP related Recommendations. The other Study Groups will continue to use their series as appropriate for IP-related matters.

Structure of the ITU-T Y-series Recommendations

Global Information Infrastructure and Internet Protocol Aspects

Global Information Infrastructure

Y.100 - Y.199	General
Y.200 - Y.299	Services, applications and middleware
Y.300 - Y.399	Network aspects
Y.400 - Y.499	Interfaces and protocols
Y.500 - Y.599	Numbering, addressing and naming
Y.600 - Y.699	Operation, administration and maintenance
Y.700 - Y.799	Security
Y.800 - Y.899	Performance

Internet Protocol Aspects

Y.1000 - Y.1099	General
Y.1100 - Y.1199	Services and applications
Y.1200 - Y.1299	Architecture, access, network capabilities and resource management
Y.1300 - Y.1399	Transport
Y.1400 - Y.1499	Interworking
Y.1500 - Y.1599	Quality of service and network performance
Y.1600 - Y.1699	Signalling
Y.1700 - Y.1799	Operation, administration and maintenance
Y.1800 - Y.1899	Charging

Y-series Recommendations

Y.100	General overview of the Global Information Infrastructure standards development
Y.101	Global Information Infrastructure terminology: Terms and definitions
Y.110	Global Information Infrastructure principles and framework architecture
Y.120	Global Information Infrastructure scenario methodology
Y.130	Information communication architecture
Y.140	Global Information Infrastructure (GII): Reference points for interconnection framework
Y.140.1	*Global Information Infrastructure (GII) - Guideline for attributes/requirements for interconnection between public telecommunication network operators and service providers involved in provision of telecommunications service*
Y.800	*General aspects of QoS and NP in the GII*
Y.801	(I.351/Y.1501) Relationships among ISDN, Internet protocol, and GII performance recommendations
Y.1001	IP Framework - A framework for convergence of telecommunications network and IP network technologies
Y.1221	Traffic control and congestion control in IP based networks
Y.1231	IP Access Network Architecture
Y.1241	Support of IP based Services Using IP Transfer Capabilities
Y.1242	Circuit Multiplication Equipment optimized for IP-based networks
Y.1251	General architectural model for interworking
Y.1261	Service requirements and architecture for voice services over Multi-Protocol Label Switching
Y.1271	*(formerly Y.roec) Framework(s) on network requirements and capabilities to support emergency communications over evolving circuit-switched and packet-switched networks*
Y.1281	(formerly Y.MIPoMPLS) Mobile IP over MPLS
Y.1291	*(formerly Y.qosar Rev. 3) An architectural framework for support of Quality of Service (QoS) in packet networks*
Y.1301	(G.871) Framework of Optical Transport Network Recommendations
Y.1302	(G.807) Requirements for Automatic Switched Transport Networks (ASTN)
Y.1303	(G.7041) Generic framing procedure (GFP)
Y.1304	(G.8080) Architecture for the automatically switched optical network (ASON)
Y.1305	(G.7042) Link capacity adjustment scheme (LCAS) for virtual concatenated signals
Y.1306	*(G.8010) (formerly G.ethna) Ethernet layer network architecture*
Y.1307	*(G.8011) (formerly G.ethsrv) Ethernet service characteristics*
Y.1308	*(G.8012) (formerly G.eota) Ethernet over transport architecture*
Y.1309	*(G.8013) (formerly G.esm) Ethernet service multiplexing over transport network architecture*
Y.1310	Transport of IP over ATM in public networks
Y.1311	Network Based VPNs - Generic Architecture and Service Requirements
Y.1311.1	Network-based IP VPN over MPLS architecture
Y.1312	(formerly Y.l1vpnsdr) Layer 1 Virtual Private Network Generic requirements and architectures
Y.1313	*(formerly Y.l1vpnarch) Layer 1 Virtual Private Network service and network architectures*
Y.1321	(X.85) IP over SDH using LAPS
Y.1322	(G.707) Network node interface for the Synchronous Digital Hierarchy (SDH)
Y.1323	(X.86) Ethernet over LAPS

Y.1331	(G.709) Interfaces for the optical transport network (OTN)
Y.1332	*(G.7010) (formerly G.euni) Ethernet user-network interface*
Y.1401	General requirements for interworking with Internet protocol (IP)-based networks
Y.1402	(X.371) General arrangements for interworking between Public Data Networks and the Internet
Y.1411	ATM-MPLS network interworking – Cell mode user plane interworking
Y.1412	(formerly Y.atmplsF) ATM-MPLS network interworking – Frame mode user plane interworking
Y.1413	*(formerly Y.tdmpls) TDM-MPLS network interworking - User plane interworking*
Y.1501	(I.351/Y.801) Relationships among ISDN, Internet protocol, and GII performance recommendations
Y.1530	*Call processing performance for voice service in hybrid IP networks*
Y.1540	(ex. I.380) Internet protocol data communication service - IP packet transfer and availability performance parameters
Y.1541	Network performance objectives for IP-based services
Y.1560	(formerly Y.TCPperf) Parameters for TCP connection performance in the presence of middleboxes
Y.1561	*(formerly Y.MPLSperf) Performance and Availability Parameters for MPLS Networks*
Y.1701	(G.7710) Common equipment management function requirements
Y.1703	(G.7712) Architecture and specification of data communication network
Y.1704	(G.7713) Distributed call and connection management (DCM)
Y.1704.1	(G.7713.1) Distributed Call and Connection Management (DCM) based on PNNI
Y.1704.2	(G.7713.2) Distributed Call and Connection Management: Signalling mechanism using GMPLS RSVP-TE
Y.1704.3	(G.7713.3) Distributed Call and Connection Management: Signalling mechanisms using GMPLS CR-LDP
Y.1705	(G.7714) Generalized automatic discovery techniques
Y.1705.1	(G.7714.1) Protocol for automatic discovery in SDH and OTN networks
Y.1706	(G.7715) Architecture and Requirements for Routing in the Automatic Switched Optical Networks
Y.1707	*(G.7716) (formerly G.lcs) Link management for automatically switched optical network*
Y.1708	*(G.7717) (formerly G.cac) ASTN connection admission control*
Y.1710	Requirements for OAM functionality for MPLS networks
Y.1711	Operation & Maintenance mechanism for MPLS networks
Y.1712	(formerly Y.17iw) OAM functionality for ATM-MPLS interworking
Y.1713	*(formerly Y.fec-cv) Misbranching detection for MPLS Networks*
Y.1720	Protection switching for MPLS networks
Y.1730	(formerly Y.17ethreq) Requirements for OAM functions in Ethernet-based networks

Note: Titles appearing in italics are under development or approval process.

Area 1 - Integrated architecture

Scope and focus of the work area

The advent of IP networks and their integration into telecommunications networks provides substantial new thinking for the evolution of both networks. For example the separation of service provision from transport, a key element in IN development and in Internet applications, changes much of the basic telecommunications architecture.

Also, control systems, which in telecommunications networks have evolved to out-band SS7 and ISDN signalling systems as opposed to in-band approaches in an IP based network, provide opportunities for new developments. One example under consideration is to use an IP overlay as a control structure for both telecommunications and Internet type networks.

The future of the IP protocol also requires analysis. With new approaches for integrating connectionless services with traditional telecommunications services and with new applications and business coming into use, it is likely that a new IP protocol, meeting all the new needs, including additional control requirements will be developed. The architectural implications of this have yet to be determined.

This work will be coordinated with the approaches already under action under Question 16/13.

The initial focus is to identify the new network concepts and to propose architectural approaches that meet the challenging future needs of data, video and voice as well as multi-media applications.

Concerns of IP related work and ITU perspective

Perspectives of moving trend of user requirements (Markets)

Before defining specific IP related questions from architectural point of view, it would be appropriate to look at the current and near future and long-term future trend of the users' requirements in the utilization of the specific applications. From this consideration, IP based applications, which have very strong capabilities for client-server applications (e.g. information retrieval, mailing etc.), are expected to be a dominant choice, currently as well as in the near future, for acquiring acceptance in the market. But in the long term future, the non-IP based applications have every possibility of taking over an important role for the interactive multimedia requirements (i.e. end-to-end interactive multimedia applications) due to intrinsic nature of IP based network. The following figure 2 illustrates this possibility of the requirements of IP based and non-IP based applications in the current and near future and long-term future, and also another possibilities of transfer from IP centric to non-IP centric. From the architectural point of view, the direction or the focus area will have to be identified to set up the scope and the plan for the development of related architectural standards. In view of submission made above, it is suggested that in our work the IP centric environment will be touched as a short term and non-IP centric will be taken as a long-term target.

Diverse roles of IP based network (or IP protocol)

As the application of the IP protocol into the telecommunication environment is expanding, the functions provided by the IP based network might be diverse, and quite different from the current fixed single usage. In fact, the IP based network may provide integrated control and management functions within various network interworking situation in order to provide IP based application, as opposed to the current use of the telecoms networks for information transport only. Thus, in future, IP based network may have three roles viz. IP based multimedia network (e.g. Multimedia over IP), integrated control network (e.g. IP Dial tone) and integrated management network (e.g. IP based

management). These three roles may be combined in some cases or may not be. Anyway, from the architectural point of view, direction or priority will be defined.

For meeting the requirement of users expecting advanced IP services (e.g. IN like IP based services) and for providing proper standards to fill up missing points, control and management aspects will be preferred rather than transport aspects which have already a lots of standards. Figure 3 exhibits the three diverse roles of IP based network (or protocol). It may be mentioned that the C-function, the U-function and the M-function as shown in this figure are logically separated and not physically.

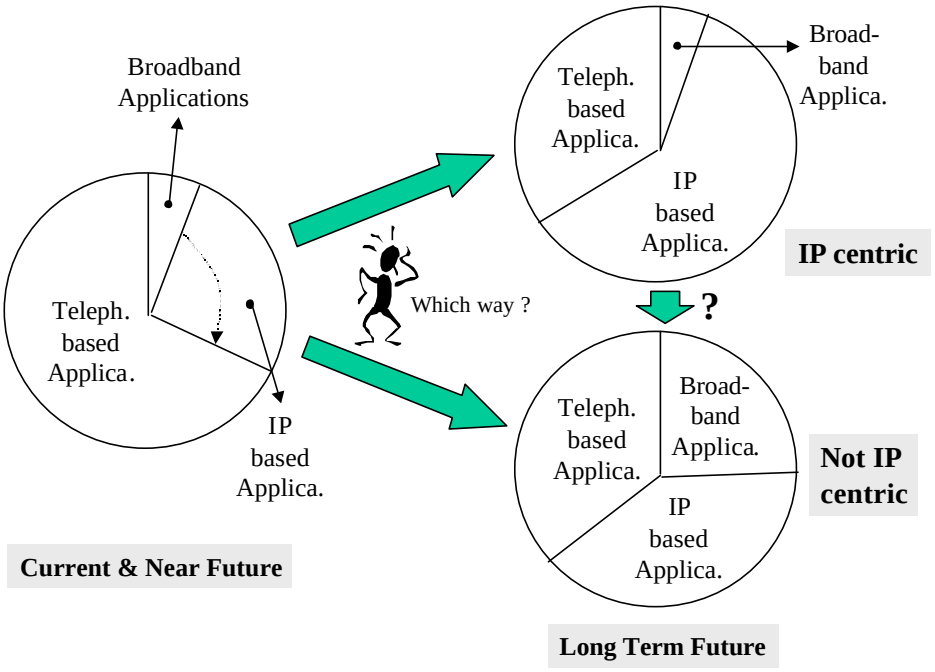

FIGURE 2: Future trends of IP / non-IP based applications

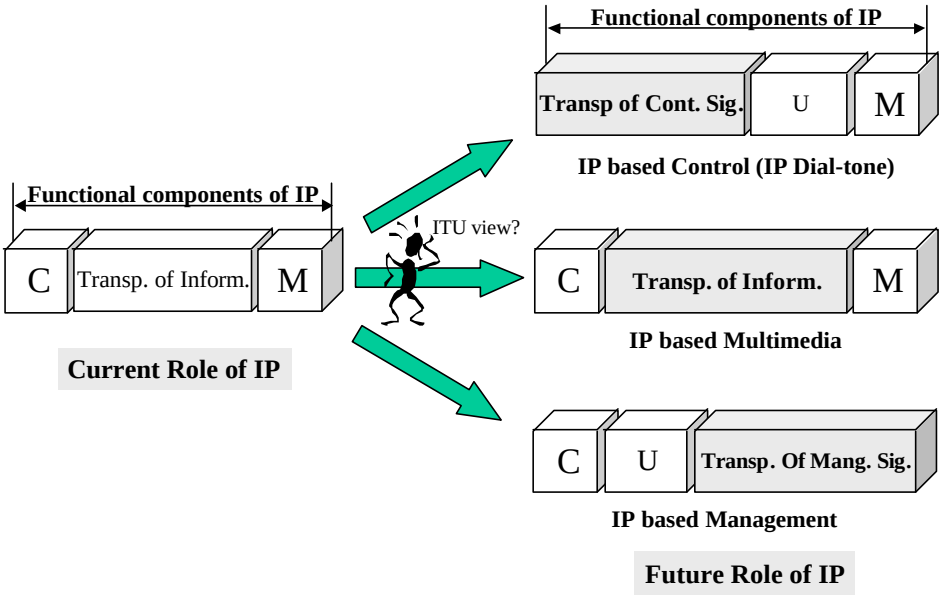

FIGURE 3: Variable role of IP based network (or protocol)

Evolution of IP based network with telecommunication environments

There are many views concerning the evolution of IP based network. However, here the scope of IP based network evolution is limited in the context of its relation with telecommunication environments for extracting technical work areas and not from the point of view of IP based network. IP related works have a crucial role to play in leading GII to the market. It provides a bridge between the present and the future. The work beyond IP for future developments will have to be handled under the GII project.

Presently, there is some consensus to accept IP protocol as a dominant L3 protocol, therefore, this will give a chance to make integrated L3 layer network that has a crucial role to play in providing unique access interface to various applications with independence of physical interface. But there will be limitation of supporting various multimedia services in the future like interactive multimedia applications that will need real-time, high speed and broadband interactivity between end-to-end. For supporting such kind of applications, more powerful platform (e.g. GII platform?) would be required in future. The following figure 3 exhibits possible evolutionary steps of IP based network in regard to telecommunication environments.

Note: Following comment from SG16 to be discussed and changes to apply as appropriate:
"the suggestion is made that IP cannot cope with high-speed, broadband interactivity. It is unclear what problems with IP would prevent these kinds of applications from being used, given the existence of an underlying QoS aware transport network. Advanced IP networks are commonly being deployed either over ATM switch/routers, or using QoS aware routers, both typically with direct SONET interfaces. With such infrastructure, it is unclear what additional protocols are needed as an alternative to IP, given that ATM already exists."

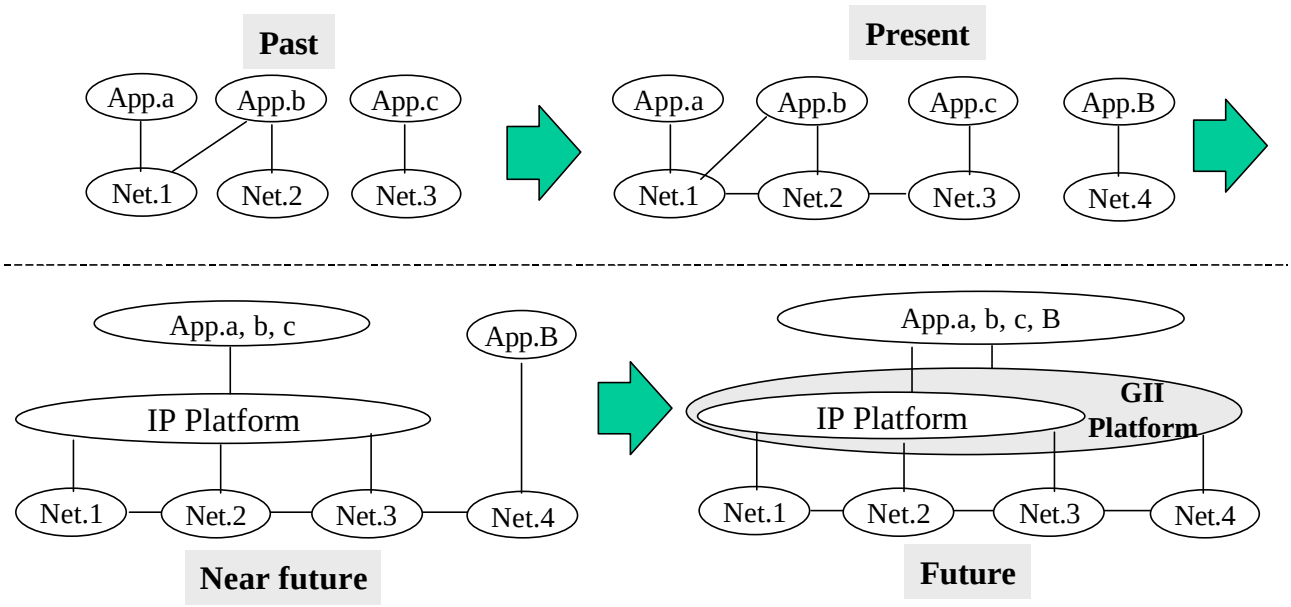

FIGURE 4: Possible evolution scenario of IP based network in telecommunication environments

Issues

- Terms and definitions between IP and telecommunications
- IP framework architecture in the telecommunication environment
  - Reference model of IP based network and its overall configuration

  - General functional model of IP based network
  - Configuration of sub-network with refer to the IP layer network

- Networking architecture of IP based network
  - Configuration of Sub-Network to support IP routing
  - Connection extension architecture and its functionality
  - Requested Gateway architecture and reference configuration

- Telecommunication Architecture for evolving environments
  - Overall integrated architecture (e.g. ICA) of IP centric and not-IP centric
  - Functional architecture and requirements of future integrated common platform
  - Evolution scenario from IP centric architecture to integrated architecture
  - Location of intelligence, TE, edge node, network node, etc.
  - Compatibility of layer and object-oriented approaches and on preference of which
  - Application of satellites, wireless, cable TV in the network environment
  - IP on everything, everything on IP
  - Architecture requires context, e.g. service, transport, and protocol
  - Move to data centric networks carrying voice
  - Personal and terminal mobility, initially being focused on IMT-2000
  - Changing regulatory environments
  - Adoption of ODP, OMG, TINA-C
  - Open programmable platforms
  - Separation of and integration of, service, transport, access, networks
  - Support of Mobile IP

Current work within ITU-T

Question/SG	**Rapporteur**	**Deliverable**	**Timing info**	**Related IETF activity (chair)**	**ITU Contact person**
Q.1/13 Principles, requirements, frameworks and architectures for an overall heterogeneous network environment	K. Knightson	Y.100 GII Y.110 GII Y.1001 Y.1241 Y.140		none	
Q.15/13 General network terminology including IP aspects	I. Faynberg	Terms / Definitions			

Q.16/13 Telecommunication architecture for an evolving environment	Hui Lan Lu	TAEE/ICA	2001	none	
Q.B/16 Multimedia architecture	J. Vandenameele	H.nmmarch	2002		P.A.Probst

Related work within IETF

None identified

Related Engineering Committee/Subcommittee Work Area(s) within TIA:

TR-34.1, communications and interoperability

TR-41.4, IP telephony gateways and infrastructures (terminology)

TR-42.1, commercial building telecommunications cabling (specifically, TR-42.1.1, network distribution nodes)

Area 2 - Impact on telecommunications access infrastructures of access to IP applications

Scope and focus of the work area

The key objective is to identify the key access network interface requirements and access configurations to provide an effective gateway from telecommunications access networks and telecommunications access components to IP networks.

The project will address the issues (including interfaces, protocols, network management, etc.) related to access to IP applications via an IP based network Points of Presence (POPs), using the access networks and/or technologies including:

- modems;
- "xDSL" (based on digital subscriber line technologies such as ADSL, HDSL, VDSL);
- HFC/CATV (based on cable modem technology);
- ISDN D-channel access - AO/DI (Always On/Dynamic ISDN);
- wireless (radio, mobile, satellite);
- optical (.e.g. PON);
- LANs (including radio LANs)/WANs supporting connectionless (BCDBS) and/or Frame Relay services.

Some access networks, such as cable TV networks and broadcast satellites, were only designed to broadcast signals to the home, not to carry data back towards the core network. One-way access systems have to be enhanced to two-way capability or used in combination with other techniques (e.g. upstream modem/phone line configurations) to support bi-directional communication, for example, in client-server applications.

In addition, problems related to traffic management (see below) in the case of switched access to Internet over PSTN/ISDN may require the development of dedicated functions and interfaces on voice switches to re-route data traffic on dedicated points-of-presence as close as possible to the source.

The initial focus will be on terminal interfaces from PSTN and ISDN (e.g. ADSL) and on access network interfaces (e.g. V interfaces) to determine changes necessary to accommodate additional requirements for access to IP based applications.

Issues

Issues related to this area relate to how to enhance the current infrastructure in order to improve the access to IP related services. Hence they concern:

- higher speeds
- improved access from the service point of view - e.g. Authentication/Authorization
- reuse of / better combination with existing protocols.

Several aspects have to be addressed:

- Medium related – Wired

- The need for new, higher speed modem types. This is covered in Q.11/16
- Specification of transceivers for subscriber access - ADSL/VDSL/HDSL. This is covered in Q.4/15

- Identification of new requirements for Optical systems in local access networks. This is covered by Q.2/15
  - Medium related – Wireless
- Interfaces for IMT2000. This is covered in SSG Q.1
- New requirements on the radio interfaces. This is covered by ITU-R
  - Service related aspects
- Upgrades to DSS1 (Q.931) signalling, i.e. by encapsulation or enhancements to bearer capabilities. This is covered by SG11
- Management of access infrastructures. This is covered by Q.14/4
- Provision of Webcasting services, i.e. the interactive distribution of sound and TV programs within an IP based network. This is addressed by Qs.7/9 and 15/9
- Achievement of the work currently carried out in SG 13, Q.14 should be considered. The work of this Question includes IP access with two general items for study: integrated access architecture principles and access architecture features.

Note: Activities related to IPCablecom within SG 9 appeared to be not in line with related activities carried out within SG 11 and SG 16. A coordination between these activities permitted to solve the problem.

Current work within ITU-T

Question/SG	**Rapporteur**	**Deliverable**	**Timing info**	**Related IETF activity WG(chair)**	**ITU Contact person**
Q.3/4	L. Mak	M.2301 (ex-M.23ip)	2002	ifmib, ipcdn, ppvpn	D. Sidor
Q.4/4	W. Miller	New Rec. O.iptest test instrumentation to assess performance of transmission systems supporting IP	2003	ifmib, ipcdn, ppvpn	D. Sidor
Q.14/4	Ms. Raman	Q.834.3 Q.834.4 New Rec. Q.ip21 access IP and IP over ATM Epon SDHDCL	2003 2003 2004 2004 2004	adslmib, atommib, snmpconf	D. Sidor
Q.6/9 Conditional access	R. Green / C Sandbank (provisional)	New Recommendations	2003		R. Green
Q.7/9 Webcasting	S. Miyagi	J.120	05/00		R. Green

Q.12/9 CATV delivery of services	R. Green	New Recommendations to specify the open protocol recommended for use in the secondary distribution of the desired IP-based data services and applications via the digital CATV infrastructure	2003		R. Green
Q.14/13 Access architecture principles and features at the lower layers for IP-based and other systems	Mr. Cooper	G.902 Y.ipan G.apf Y.ipbypass	2001 2001 2001 2002		
Q.1/15 Access network	R. Fiegel	ANT co-ordination			
Q.2/15 Optical systems in access	D. Faulkner	G.983.1 Amendment 1 G.983.2 Amendment 1 G.983.2 Amendment 2 G.983.4 (new) G.983.5 (new) G.983.7 (new) G.983.omci.sur (new) G.983.omci.ns (new) G.983.2 (revision) G.983.3 (revision)	10/2001 10/2001 10/2001 10/2001 10/2001 10/2001 05/2002 05/2002 05/2002 05/2002		Peter Wery
Q.4/15 Transceivers for customer access	R. Stuart	G.989.2 (new) G.991.2 Amendment 1 G.992.1 Corrigendum 1 G.993.1 (new) G.995.1 Amemdment 1 G.shdslbis (revision) G.dmtbis (new) G.litebis (new) G.vdsl.1 (new) G.pnt.if (new)	10/2001 10/2001 10/2001 10/2001 10/2001 05/2002 05/2002 05/2002 05/2002 05/2002		Peter Wery

Q.2/16 Multimedia over packet networks using H.323 systems	Mr. P. Jones	H.460 Annex B H.323 Annex I H.323 Annex N H.460.cdor H.460.10 H.460.11 H.460.12 H.460.13 H.460.14 H.460.15 H.460.tppr H.presence H.sms H.323 H.225.0	01/2004 11/2004 2005 11/2004 01/2004 01/2004 01/2004 01/2004 01/2004 01/2004 11/2004 11/2004 11/2004 07/2003 07/2003		
Q.3/16 Infrastructure and interoperability for Multimedia over packet networks	C. Groves	H.239 H.241 H.248.1v3 H.248.2v2 H.248.3 H.248.6 H.248.7 H.248.10 H.248.11 H.248.13 H.248.14 H.248.16 H.248.17 H.248.18 H.248.19 H.248.20 H.248.21 H.248.22 H.248.23 H.248.24 H.248.25 H.248.26 H.248.27 H.248.28 H.248.29 H.248.30 H.248.31	05/2003 05/2003 11/2004 11/2004 11/2000 11/2000 11/2000 07/2001 10/2002 03/2002 03/2002 10/2002 10/2002 10/2002 01/2004 10/2002 01/2004 05/2003 05/2003 05/2003 05/2003 05/2003 05/2003 01/2004 11/2004 01/2004 01/2004		
Q.11/16 Voiceband modems	L. Brown	V.8bis rev. V.moip V.90 Issue 2	2001 2002		P-A Probst
Q.1/SSG Service and network requirements	E. Chien	Develop network capab. requirts. for realizing "IMT-2000 and Beyond" service requirements. Draft a new Rec. Develop the long-term high-level network architecture for beyond IMT-2000 systems	 2002		

Related work within IETF

WG pppext	Point-to-point Protocol extensions
WG ipcdn	IP over Cable Data network
WG ipfc	IP over Fiber Channel

Related Engineering Committee/Subcommittee Work Area(s) within TIA:

TR-30.1, modems

TR-34.1, communications and interoperability

TR-41.4, IP telephony gateways and infrastructures

TR-45.2, wireless intersystem technology (wireless transmission/interfaces)

TR-45.3, time division digital technology (wireless transmission/interfaces)

TR-45.4, radio to switching technology

TR-45.5, spread spectrum digital technology

TR-45.6, adjunct wireless packet data technology

Area 3 - Interworking between IP based network and switched-circuit networks, including wireless based networks

Scope and focus of the work area

The primary objective is to identify and analyze potential network configurations and network interface requirements (for both fixed and mobile networks) to ensure mutually effective IP and telecommunications network support to the burgeoning business requirements encompassing both technologies.

Concerning network interworking the area will address interworking (including network management capabilities) between IP-based networks (Intranets, the Internet, etc.) and a number of typical core networks. The project will also consider related issues, such as traffic management. For example networks supporting Internet traffic have different traffic characteristic from telephony and solutions must be developed to ensure efficient management of processing power, network capacity and memory resources. The initial focus is the identification and analysis of alternative inter-related architectures to determine the key interface requirements between IP network and telecommunications network components.

The project will also include study of the various voice over IP scenarios and the support of the integration of PSTN services (e.g., a telephone call) with those offered by an IP based network through the World Wide Web. Examples of such services are Click-to-Dial, Click-to-Fax, and Voice access to content. The initial focus is on identification and preliminary definition of interactive services for which functional and architectural requirements will be determined for input to the Access and Interworking considerations.

Network Interworking

The area will address interworking (including network management capabilities) between IP-based networks (Intranets, the Internet, etc.) and the following typical core networks:

- PSTN/N-ISDN;
- ATM/B-ISDN;
- digital mobile network;
- packet switched data networks (e.g. X.25);
- WAN/MANs (including radio) supporting connectionless (BCDBS) and/or Frame Relay services.

The Project will also consider related issues, such as traffic management. For example, whereas a typical phone call, as modelled for traffic management, lasts approximately 3 minutes, calls via the Internet may occupy lines for hours. Networks supporting Internet traffic therefore may have different traffic characteristic from telephony. Solutions must be developed to ensure efficient management of processing power, network capacity and memory resources.

The Quality of Service issues are currently under analysis under Question 6/13.

Interworking aspects will be coordinated with the ongoing work under Questions 5/13.

The initial focus is the identification and analysis of alternative inter-related architectures to determine the key interface requirements between IP network and telecommunications network components.

Application/Service interworking

Until recently telecommunications services and Internet services/applications have operated independently. Telecommunications users accessing the Internet have typically used the telecommunications portion of the connection merely for transport.

However, there is growing recognition in telecommunications and IP business that interaction between telecommunications and Internet services can provide substantial user benefits. Also therefore, additional revenue sources for both industries.

Typical examples of emerging service interactions include:

- End User Service Data Customization via an IP based network
- End User Service Logic Customization via an IP based network
- Click-to-Dial
- Click-to-Fax
- Click-to-Fax-Back
- Voice-Access-to-Content
- IP-to-E.164 Address Translation

Another example of a case covered by area 3 is the Interworking between Voice over IP and the telephony services offered on the Global Switching Telephone Network (GSTN).

Four different scenarios may be distinguished:

1. A voice call from an IP terminal connected to an IP-based network to a GSTN phone
2. A voice call from a GSTN phone to an IP terminal connected to an IP-based network.
3. A voice call from a GSTN phone to another GSTN phone via an IP network
4. A voice call from an IP terminal connected to an IP-based network to another IP terminal connected to an IP-based network via the GSTN.

This area of the project includes types of interconnection that involve only an Internet application, the TCP/IP suite being the only transport means considered. Many such types of interconnections are possible. One example under consideration is based on the interaction between the Intelligent Network (IN) and an IP based network.

Specifically, the project addresses the two cases, where the services on the IP based network and the PSTN services are provided by different network providers and where Internet and PSTN services are provided by the same network provider.

The project includes support of the integration of PSTN services (e.g., a telephone call) with those offered by an IP based network through the World Wide Web. Examples of such services are Click-to-Dial, Click-to-Fax, and Voice access to content, and they can be briefly described as follows:

- With the Click-to-Dial services, a Web user can initiate a PSTN call by clicking a button during a Web session. Such a call can be either incoming or outgoing. (An example of the former is when a user, while browsing through a catalogue, clicks the button inviting a sales representative to call.)
- With the Click-to-Fax service, a Web user can request (and subsequently receive) a fax by clicking a button during a Web session

- With the Voice-access-to-content service, a Web user can have access to the Web content by telephone. The content is converted to speech and transmitted to the user on a telephone line.

Issues

- Identify the most urgent interworking issues, where the ITU can add value
- Network interworking
  - Network component interworking/interoperability
  - Current and future evolution interworking
- Service/application interworking
  - IP applications on telecommunications networks
  - Telecommunications services on IP
  - IP/Telecoms service interaction ensure service interworking providing backward compatibility with those on the existing networks
- Utilize the existing network infrastructure through interworking to support all IETF defined applications
- Encourage IETF to develop applications which capitalize on the evolving infrastructure
- Key interworking areas include, addressing, routing, transport, resource management, charging/accounting, QoS
- How to use interworking to help to carry better than best effort.

Current work within ITU-T

Question/SG	**Rapporteur**	**Deliverable**	**Timing info**	**Related IETF activity (chair)**	**ITU Contact person**
Q.1/2 Application of Numbering, Naming and Addressing for Fixed and Mobile Services	G. Richenaker	Interworking E.164 – IP address	2001-2003	Mapping E.164 numbers in Internet Domain Name System (DNS) – Supplement	H. Burrows VC WP1/2
Q.2/2 Routing and interworking	J. Ash	E.351	2001		
Q.3/2 Management and development	L. Homan	Supplement No 1 to Rec E.370	2001		
Q.3/2 Management and development	S. Lind	E.callflows	2002		
Q.2/17 Network performance and quality of service in data communication networks	G. Couch	X.14frip on the performance of IP carried over a Frame Relay network	September 2003		G. Couch

Q.4/17 Access and interworking procedures	M. Berlant	X.42 X.371 (formerly X.3ip)	Approved 2000 Approved 2001		Mr. M. Berlant
Q.5/17 Interfaces and signalling applicable to DTEs and public networks using or providing frame relay services		X.36 revised X.76 revised X.84 (X.fr-mpls)	Approved 2003 Approved 2003 September 2003		
Q.1/13 Principles, requirements, frameworks and architectures for an overall heterogeneous network environment	K. Knightson	I.31y. I.31y.1 I.31y.2 Y.100 GII Y.110 GII Y.1001 Y.140 Y.1241	01/01/02 01/01/02 01/01/02 06/98 06/98 11/00 11/00 03/01		
Q.5/13 Network interworking including IP multiservice networks	G. Koleyni	I.5bp	05/25/01		
Q.11/13 Mechanisms to allow IP-based services using MPLS to operate in public networks	M. Carugi	Y.1311.1 Y.1311 Y.1311.x	2001 2002 2002 - 2003		
Q.7/15 Voice gateway equipment	T. Brown	Complete G.799.1 Update: G.776.1	05/2002		Peter Wery
Q.2/16 Multimedia over packet networks using H.323 systems	P. Jones	H.225.0 H.323 H.323 Annex I H.323 Annex N H.460.14 H.GEF.x	07/2003 07/2003 11/2004 2005 01/2004		P-A Probst

Q.3/16 Infrastructure and interoperability for multimedia over packet networks	C Groves	H.248 H.246 Annex C H.248.1v3 H.248.2v2 H.248.3 H.248.4 H.248.5 H.248.6 H.248.7 H.248.8 H.248.9 H.248.10 H.248.11 H.248.12 H.248.12 annex A H.248.13 H.248.14 H.248.15 H.248.16 H.248.17 H.248.18 H.248.19 H.248.20 H.248.21 H.248.22 H.248.23 H.248.24 H.248.25 H.248.26 H.248.27 H.248.28 H.248.29 H.248.30 H.248.31	02/2000 11/2004 11/2004 11/2004 11/2000 11/2000 11/2000 11/2000 11/2000 03/2002 03/2002 07/2001 10/2002 07/2001 10/2002 03/2002 03/2002 03/2002 10/2002 10/2002 10/2002 01/2004 10/2002 01/2004 05/2003 05/2003 05/2003 05/2003 05/2003 05/2003 01/2004 11/2004 01/2004 01/2004		P-A Probst

Q.7/SSG Convergence of fixed and existing IMT-2000 systems		Develop a Rec. on principles and requirements for convergence of fixed and IMT-2000 networks. Develop a new Rec. on network architecture and interface requirements to facilitate evolution of existing fixed networks towards converged core network, supporting IMT-2000 capabilities, in close cooperation with other relevant SGs and SDOs. Develop new or enhance existing access network interface requirements for utilizing IMT-2000 RTT to be used as FWA with existing fixed networks. Develop architectural and network interface requirements for converged core network consistent with the long term network architecture as delivered by Q.1/SSG to ensure capture of the convergence requirements. Develop a migration path for network convergence	2002 2003 2003 2004 2004		

Related work within IETF

WG ion Internetworking over NBMA

WG pint PSTN and Internet Internetworking

Related Engineering Committee/Subcommittee Work Area(s) within TIA:

TR-34.1, communications and interoperability

TR-41.3, analog and digital wireline terminals

TR-41.4, ip telephony gateways and infrastructures

TR-45.2, wireless intersystem technology

TR-45.3, time division digital technology

TR-45.4, radio to switching technology

TR-45.5, spread spectrum digital technology

TR-45.6, adjunct wireless packet data technology

Area 4 - Multimedia applications over IP

Scope and focus of the work area

There is a growing market for real-time multimedia communication over IP-based networks and for extending this over existing and future telecommunications networks. The objective of this project is to support this market through the coordination of ITU-T activities, and ensure interoperation for a variety of scenarios.

This area includes voice over IP, fax over IP, multimedia conferencing, multicasting, narrowcasting, webcasting and broadcasting over IP, media stream coding, and electronic business applications.

Issues

This area of the project will address a number of issues, including:

- requirements for interoperability between IP networks and telecommunications networks;
- service definitions;
- requirements for service interoperability;
- reference configurations and functional models;
- multimedia coding;
- call control procedures, information flows and protocols, including middleware for supporting interoperability and quality of service;
- QoS negotiation;
- multimedia mobility;
- end-to-end quality of service aspects, including transcoding and echo-cancellation, and tests methods applied to such equipment;
- multimedia themes - personal profile control;
- billing for multimedia content;
- supplementary services for IP network-based Voice Services;
- provision of IP-based Virtual Private Networks.

In addition this area of the project should provide requirements on numbering & addressing, charging and billing and security to the relevant areas of the project.

Current work within ITU-T

Question/SG	Rapporteur	Deliverable	Timing info	Related IETF activity (chair)	ITU Contact person
Q.6/9 Interactivity in TV distribution	R. Green / C. Sandbank (provisional)	J.110 to 116	1999		R. Green

Q.7/9 Requirements and methods for sound-programme and TV "webcasting" services	R. Green / C. Sandbank (provisional)	J.120 New Rec.	2000 2002		R. Green
Q.12/9 Multimedia data on CATV	R. Green / C. Sandbank (provisional)				R. Green
Q.14/9 Extension of cable-based services over broadband in-home networks	R. Green / C. Sandbank	J.hnwr	12/2001		
Q4/12 Telephonometric methodologies for hands-free terminals and speech enhancement devices (including acoustic echo cancellers and noise reduction)	V. Gautier-Turbin	P.330 (Speech processing devices for acoustic Enhancement)	2003		Dvorak
Q.7/12 Methods, tools and test plans for the subjective assessment of speech and audio quality	P. Usai	New P.NSA (Evaluation of Noise Suppression Algorithms) New P.SQSDS (Subjective Quality evaluation of Telephone Services Based on Spoken Dialogue Systems)	2003 2004		Dvorak
Q.11/12 Speech transmission planning for multiple interconnected networks	J. Pomy	G.108.2 (Transmission Planning Aspects of Echo Cancellers)	01/2003		Dvorak
Q.1/16 Multimedia systems, terminals and data conferencing	P. Luthi				
Q.2/16 Multimedia over packet networks using H.323 systems	P. Jones	H.presence H.sms H.323 H.225.0	11/2004 11/2004 07/2003 07/2003		
Q.3/16 Infrastructure and interoperability for multimedia over packet networks	C Groves	H.239 H.241 H.248.9 H.248.12 H.248.12 annex A H.248.19 H.248.20	05/2003 05/2003 03/2002 07/2001 10/2002 01/2004 10/2002	MMUSIC, IPTEL, PINT, AVT, MEGACO	P-A Probst

Q.4/16 Video and data conferencing using Internet-supported services	S. Okubo	H.350 H.350.1 H.350.2 H.350.3 H.350.4 H.350.5 H.350.6	08/2003 08/2003 08/2003 08/2003 08/2003 08/2003 03/2004		P-A Probst
Q.5/16 Mobility for multimedia systems and services	L. Lehmann	H.501 H.510	03/2002 03/2002		
Q.6/16 Video coding	G. Sullivan	H.26L	2002		P-A Probst
Q.7/16 Wideband speech coding	R. Drogo de Iacovo	G.WB16k	2001		P-A Probst
Q.8/16 Speech coding at 4 kbit/s	P.Barrett	G.4kbit	2001		P-A Probst
Q.9/16 Variable bit rate coding of speech	Yushi Naito	G.VBR	2002		P-A Probst
Q.10/16 Speech coding below 16 kbit/s	S.Campos-Neto (Acting)	Maintenance of G.72x Recs.	Ongoing		P-A Probst
Q.15/16 Distributed speech recog. & speaker verif.	S.Campos-Neto (Acting)	G.DSR G.DSV	2002		P-A Probst
Q.C/16 Multimedia services and applications	F. Lucas		Ongoing		P.A. Probst
Q.8/17 End-to-end QoS multicast communications	S. G. Kang	X.601 X.605 X.606 X.606.1 X.gmp X.rmcp	approved approved approved approved 2003 March 2004 March 2004	RMT	S. G. Kang
Q.27/17		Z.600	Work discontinued		

Related work within IETF

WG iptel IP Telephony

WG megaco Media Gateway Control Protocol

WG rmt Reliable Multicast Transport

WG pilc Performance Implications of Link Characteristics

WG fax Internet fax

WG mmusic Multiparty Multimedia Session Control

WG avt Audio/Video Transport

WG sigtran Signalling Transport

WG pint	PSTN and Internet Interworking
WG sip	Session Initiation Protocol

Related Engineering Committee/Subcommittee Work Area(s) within TIA:

TR-30.5, facsimile terminal equipment and systems

TR-34.1, communications and interoperability

Area 5 - Numbering and addressing

Scope and focus of the work area

The increasing demand to extend the capabilities afforded by provision of an IP based telecommunications infrastructure which provides the flexibility and capacity required to satisfy the growing international multimedia needs has resulted in urgent commercial necessity to enable ***interworking*** with conventional telecommunication networks e.g. PSTN/ISDN and PSPDN.

The project should also work on proposals for a ***long-term identification scheme*** to be used by end-user of electronic services in order to identify the recipient(s) of a telecommunication instance (call), regardless of the systems or protocols used.

Issues

Interworking

- Accommodate E.164 Number Portability

  This issues relates to the three types of portability:
  - Service Provider
  - Location
  - Service

- Transfer of Caller and Called Party information

  The transfer of Caller and Called Party involves only one layer. Transfer of Caller and Called Party information between both parties

- E.164 Number for IP based End-User

  The allocation of E.164 resources to IP based users

- E.164-DNS Interworking
  - Collaboration on the identification of specific issues and appropriate work parameters related to E.164 – DNS interworking (such as interworking concepts and principles, administrative and operational aspects, identification of other relevant aspects.)
  - Direct exchange between directories

- Carrier Selection/Preselection

  Originating networks often have to support ability of customer to decide, e.g., “send all my international calls via operator X.” As such, where the originator is IP-based, the “E.164-IP Resolution Process” will have to determine a result, e.g., egress gateway based on the combination of destination E.164 number and user preference/CLI, i.e., the answer may vary according to context and there may be no universal answer for a given E.164 number.

- E.164, URL’s and ”Telephony”

  Wide range of E.164 “telephony” issues raised in Internet drafts proposing URLs, e.g.,
  - Tel/fax/modem
  - Global/local
  - Dialing & post dialing

- Options & features; and meta-issue of process (individual's drafts vs. those associated with Working Groups)

- E.212 – IMSIs & mobility with IP

  In IETF documents, IMSI's are mentioned but ITU-T Rec. E.212 is not often referenced. A review of the IETF documents is needed to ensure that the appropriate use of the term IMSI is used.

- Administration of E.164 numbers in domain name servers

  How are numbers distributed among domain name servers in different situations? An example, a DNS rule is one authoritative server per telephone number. What if two SPs wish to list information on a telephone number?

- How changes get propagated throughout the proposed ENUM DNS service

  One example, if an Area Code changed – propagation must be timely (within expected range)

- ENUM protocol is the result of work of the Internet Engineering Task Force (IETF) Telephone Number Mapping working group. The Charter of the ENUM group was to define a Domain Name System (DNS) – based on architecture and protocol for mapping an E.164 telephone number to what are known as Uniform Resources Identifiers. The most commonly known type of URIs are Uniform Resource Locators (URL) that are used to locate resources using the World Wide Web. One of the exciting possibilities of ENUM is the potential for creative E.164 based lookup services

  One particular application of ENUM deserves special mention: IP telephony. Although a lot of technical Voice over IP (VoIP) standards work has been done in the ITU-T and IETF on voice gateways (e.g. H.323, SIP) and call agents (e.g. media gateway controllers such as H.248/MEGACO, MGCP), one of the remaining challenges in interpretation of addressing systems between E.164 numbers used in the PSTN and DNS or IP addresses

  ENUM can potentially provide this mapping between distinct addressing systems (e.g. mapping an E.164 number to a SIPURI). However, a global administrative framework is necessary to secure consistency of mapping between the E.164 dial plan and the parallel DNS structure needed in ENUM

- DNS/ENUM Service logic

  How does DNS/ENUM resolve whether service logic is needed, e.g., via TRIP protocol, for a particular E.164 name lookup?
  What is the response to a user if service logic is needed (DNS/ENUM protocol issue)?

- Tracking of Routing Address

  Support tracking of E.164- name to IP-address (or international network routing address, etc.) for wireless and portable terminals

- Interworking of routing addresses and IP names/addresses

  ITU are defining an "international" routing address plan, e.g., for use in the portability of [global] E.164 numbers, and routing of calls to potential regional country codes (ETNS). There may be a need to interwork routing addresses with IP Technologies.

Long-term identification scheme

- Establish a long-term vision of a global entity (e.g. person, legal entity, device, equipment) naming scheme for all communications needs

- Define the requirements for the means by which an end-user of telecommunication services identify the recipient(s) of a telecommunication instance (call). These requirements should be truly long term, and not constrained by the short-term issues presently being addressed by many Standards Development Organizations and similar bodies. The issues should be considered exclusively from the perspective of the user, and not the network operator

- Analyze identification schemes and propose one that meets the requirements.

Current work within ITU-T

Question/SG	**Rapporteur**	**Deliverable**	**Timing info**	**Related IETF activity (chair)**	**ITU Contact person**
Q.1/2 Application of numbering, naming and addressing for fixed and mobile services	G. Richenaker	Interworking E.164 – IP address E.164 Interim Procedures for the delegation of E.164 country codes and E.164 CC +ICs and E.164 country codes and GICs into the DNS	2001-2003 2002		G. Richenaker
Q.2/2 Routing and interworking	J. Ash	E.351 E.352 E.353	Approved Approved 02/01		
Q.3/17 Numbering and routing for PDNs	P. Hicks	X.126	September 2003		P. Hicks
Q.11/17 Revision of mature Open Systems Interconnection (OSI) Recommendations		X.650			

Related work within IETF

WG enum	Telephony Number Mapping
WG int	Internationalized Domain Name
WG nat	Network Address Translators
WG msdp	Multicast Source Discovery Protocol

WG seamoby Seamless Mobility

Area 6 - Transport for IP-structured signals

Scope and focus of the work area

Currently IP traffic is transported largely over telecommunications facilities, using telecommunications channels to support IP protocols and applications. Depending on the tariffs and other cost considerations, IP network traffic is moving to dedicated transport, independent of the telecommunications networks. If this trend continues, the Internet could eventually overlay the telephone network, removing much of the data traffic from telecommunications networks, causing severe decline in telecommunications business. On the other hand it is axiomatic that joint use of networks for voice and data provides more efficient use of precious resources.

The focus of this part of the project deals with evolutionary aspects of the transport used for IP-based networks. This includes the optimization for the direct transport of IP traffic over Synchronous Digital Hierarchy (SDH) and Optical Transport Network (OTN). One example is their possible evolution towards integration with ATM Networks.

ATM has become the chosen technology for the B-ISDN within traditional telecommunication networks. As such it is ideally suited to fulfill the needs of large multi-function networks requiring high-speed connections in the backbone and access segments. In addition, ATM provides defined quality of service parameters, in contrast to the current "best effort" of the Internet. Thus ATM can support the foreseen evolution towards a highly reliable and highly available Internet, with defined qualities of service. ATM may also make use of SDH and optical network infrastructures.

The objective of this section of the project is to determine approaches to share network resources to the mutual benefit of both IP and telecommunications networks, and their users.

Main topics

The main topics for consideration for IP transport include:

- IP over ATM
- IP over SDH
- IP over OTN

A large conglomeration of multiple networks, i.e. the concatenation of networks forming an integrated larger telecommunication system, supporting communication between any of its hosts or any of its component networks, is most likely composed of different media. A particular example is in fact the Internet.

The initial focus will address the harmonization of the IP-based networks and ATM, SDH and OTN.

Integration of ATM and IP networking

A number of concepts for IP transport over ATM exist, or are in progress. The ATM Forum has specified "LAN-Emulation" (LANE). The IETF’s work on standards for routing and forwarding IP packets over ATM sub-networks has brought forward a concept called "Classical IP over ATM": within an IP-subnet any network technology (ATM, Frame Relay, Ethernet etc.) can be used, whereas IP-subnets can be connected only via IP-routers. IETF has also defined the "Next Hop Resolution Protocol" (NHRP) to extend address resolution over so-called "Non Broadcast Multiple Access" (NBMA) networks (e.g. ATM-based or ISDN) beyond the boundaries of a single IP-subnet.

A new concept to realize efficiently large scale and wide area IP networking over ATM functions is now under study under Q.11/13 in ITU-T SG 13.

The ATM Forum is currently working on a "Multiprotocol over ATM" (MPOA) specification to allow end-to-end internetworking connectivity across an ATM infrastructure, comprising LAN-Emulation, Classical IP over ATM, and NHRP in a unified architecture. Other concepts under study, such as the Integrated PNNI (see also below) also provide for close IP/ATM integration.

The IETF is also considering techniques such as "label-switching" that closely interact between a switching technology (ATM is an example among other possibilities) and the IP routing. This approach also allows a unified IP and ATM based architecture but may have significant impact on the existing ATM control protocols, addressing and architecture.

Signalling and routing

Both the ITU and the ATM Forum have specified feature-rich protocol stacks and procedures (e.g. user-to-user bandwidth and service negotiation, supervision, etc.) to be used at the UNI and NNI (Network-node interface). According to the ITU-T, the B-ISUP (Broadband ISDN User Part) at the NNI is to be used in public ATM networks; the ATM Forum, aiming mostly at private ATM networks, has developed a specification for signalling and routing protocols between ATM nodes, the P-NNI (Private Network Node Interface). The ongoing studies are looking for solutions to the overall issue of network configuration and control that should be powerful and at the same time efficient and as streamlined as possible.

The first tasks of this section, coordinated with the ongoing work under Question 20/13, are to analyze the IP over ATM alternatives, and to compare, as appropriate, with IP directly on SDH. The objective is to identify the likely preferred business directions and develop standards as necessary to support business and user evolution.

Issues

- **IP over ATM**
  - Analyze current approaches for IP over ATM and conclude which is most suitable for application to current telecommunications networks to support services on the IP-based network
  - Define IP layer functions and IP over ATM mechanisms for ATM equipment
  - Efficient ATM layer multicasting over multicast capable physical layers (e.g. shared media environment such as satellite).

- **IP over SDH and Optical Transport Network (OTN)**
  - Multilayer protection and survivability
  - Synchronization layer functions
  - Client signal adaptation, e.g. direct mapping of IP over OTN
  - Transport signal structures
  - Management (functions, modelling) of transport systems and equipment
  - Physical interface characteristics
  - Evolution of optical transmission technology towards OTN

- **Support for Multicast**

– Multicast services can consume large amounts of network resources unless carried in an efficient manner

– Definition and specification for usage for transport-based multicast services will provide an efficient basis for IP multicast services

Current work within ITU-T

Question/SG	Rapporteur	Deliverable	Timing info	Related IETF activity (chair)	ITU Contact person
Q.7/17 IP-related lower layer protocols and service mechanisms	S. Yu	X.85/Y.1321 Amendment to X.85/Y.1321 X.86/Y.1323 Amendment to X.86/Y.1323 X.msr-rpr	03/2000 09/2003 02/2001 09/2003	Transport area	Shaohua Yu
Q.10/13 Core network architecture and interworking principles	N. Morita	G.cls G.gps	2002 2002		
Q.11/13 Mechanisms to allow IP-based services using MPLS to operate in public networks	M. Carugi	Y.1310 Y.1311.1 Y.1311 Y.1311.x	03/00 2001 2002 2002 - 2003		
Q.5/15 Circuit multiplication equipment	Y. Naito	G.ipcme	05/2002		
Q.7/15 Voice gateway equipment	T. Brown	Complete G.799.1 Update: G.776.1	05/2002		Peter Wery
Q.7/15 Voice gateway equipment	J. Skene	Revise: G.799.1 Update: G.776.1			
Q.9/15 Protection / restoration	Ghani Abbas	Revise: G.781 G.841 G.842 Complete: G.798	2001		

Q.10/15 ATM and IP equipment	Vacant	Rev. I.731 and I.732 New Rec. for a library of IP layer atomic functions. New Rec. for a library of IP/ATM and ATM/OTN functions. New Rec. for a library of IP/OTN (and IP/SGH) functions	2002 2002 2002 2002		
Q.11/15 Signal structures, interfaces and interworking for transport networks	G. Joncour	G.707/Y.1322 Corrigendum 1 to G.707/Y.1322 Corrigendum 2 to G.707/Y1322 Addendum 1 to G.707/Y.1322 G.709/Y.1331 Addendum 1 to G.709/Y.1331 G.7041/Y.1303 G.7042/Y.1305	04/2000 02/2001 10/2001 10/2001 2/2001 10/2001 10/2001 10/2001		
Q.14/15 Network management	K. Lam	G.ipm	2003	Transport area, Operations and management area	Kam Lam
Q.19/15 Characteristics optical networking	M. Jones	Revise: G.871	2002		

Related work within IETF

WG ion	Internetworking over NBMA
WG ipfc	IP over Fibre Channel
WG gsmp	General Switch Management Protocol
WG mospf	Multicast Extensions to OSPF
WG rohc	Robust Header Compression
WG tsvwg	Transport area working group
WG ipo	IP over optical
WG iporpr	IP over resilient packet ring

Related Engineering Committee/Subcommittee Work Area(s) within TIA:

TR-34.1, communications and interoperability

TR-41.1, multiline terminal systems

TR-41.4, ip telephony gateways and infrastructures

TR-42.1, commercial building telecommunications cabling (specifically, TR-42.1.1, network distribution nodes)

TR-45.2, wireless intersystem technology

Area 7 - Signalling support, IN and routing for services on IP-based networks

Scope and focus of the work area

This area of the project will address at least the following topics:

- Efficiently identifying and routing traffic destined for Internet Service Providers (ISPs) to minimize negative impact upon the Public Switched Telephone Network (PSTN), which has been engineered for relatively short holding time calls;

- Defining signaling support for new, value added services that may enable public network operators, as well as ISPs, to capitalize on the growing demand for Internet based and Intelligent Network (IN) based capabilities;

- Serving the need of ISPs, Internet Access Providers, and "Internet users" to flexibly manage dynamic bandwidth and quality of service demands from a public network;

- Defining mobile wireless access to services over an IP based network, e.g., virtual private networks, provided by either ISPs or public network operators; and

- Signaling support for Service Interworking of both dial-up Internet access data applications and Voice over IP applications with traditional telecommunication services, including support of signaling applications and user parts over IP based networks.

Issues

- Signalling procedures to implement QoS sensitive sessions (destination controlled sessions)?
- Interactions among application level multicast, IP level multicast and ATM level multicast capabilities
- Signalling requirements for the support of Network Access Servers by public networks
- Protocol and procedures are needed to support the new Broadband Bearer Class for IP traffic
- Scenarios to be included in the IN for the interface between Service/Media Gateways and Call/Bearer Gateway Functions need to be identified, given that there are no current plans for additional IN Capability Sets.
- Address formats to be supported in voice services for endpoints attached to IP-based networks
- Study the need for service control involving H.323-based terminals
- Determine which procedures in DSS2/BISUP are appropriate to convey destination controlled sessions, e.g. RSVP
- Study development of recommendations concerning appropriate network facilities for the carriage of IP control protocol information
- Investigate the provision of IP based Virtual Private Networks based on partitioning at layer 1 and/or 2

- Study the need for special provision in signalling systems to accommodate IEPS (International Emergency Preference Scheme).

Current work within ITU-T

Question/SG	Rapporteur	Deliverable	Timing info	Related IETF activity (chair)	ITU Contact person
Q.1/11 Signalling requirements for signalling support for new, value added, IP-based and IN based service	J. Dobrowolski	Q.1231 (IN CS-3 introduction) Revision Q.1241, Q.1244Q.1231 (IN CS-3 introduction) Revision Q.1241, Q.1244 No further plans	Decision 1999 Decision 1999 Decision 2001	PINT, PIN BOF (primary activity) MEGACO SIGTRAN DIFFSERV, MPLS, POLICY, IPTEL, MMUSIC (secondary activity)	G. Ratta
Q.6/11 Signalling requirements for signalling support for service interworking of both dialup Internet access and voice, data and multimedia communications over IP-based networks	K. Mainwaring	New Recs and additions to existing Rec. to specify signalling requirements for service interworking of both dialup Internet access and voice, data and MM communications over IP-based networks	2001/2002	SIGTRAN IPTEL	G. Ratta
Q.7/11 Signalling requirements for signalling to efficiently identify and direct traffic destined for ISPs	K. Kenyoshi	TRQ.IP.TEL	TBD	MEGACO SIGTRAN	G. Ratta
Q.10/11 Signalling requirements for control of signal processing equipment and of remote transmission nodes	P. Goldstein	Q.115.0 Q.115.1	March 2002 Nov 2002	MEGACO	G. Ratta
Q11 /11 Protocols for the support of BICC applications	S. Norreys	Q.1902.1 Q.1902.2 Q.1902.3 Q.931 rev	Decided 12/2000 Appvd 7/2001 Decided 2002 Decided 5/98	MEGACO	G. Ratta

Q.13/11 Common Transport Protocols	P. Schicker	Q.27int BISUP - SoI	1999 Determined1999 Determined	MPLS IONMPLS ION	G. Ratta
Q.F/16 Quality of service and end to end performance in multimedia systems	T. Taylor	Annex N/H.323			P-A Probst
Q.2/16 Multimedia over packet networks using H.323 systems	P. Jones	H.460.10 H.460.13 H.460.14	01/2004 01/2004 01/2004		
Q.3/16 Infrastructure and interoperability for multimedia over packet networks	C. Groves	H.239 H.241 H.248.4 H.248.5	05/2003 05/2003 11/2000 11/2000	MEGACO	P-A Probst
Q.5/16 Mobility for multimedia systems and services	L. Lehmann	H.501 H.510	03/2002 03/2002		

Related work within IETF

WG diffserv Differentiated services

WG sigtran Signalling transport

WG pint PSTN and Internet interworking

WG policy Policy framework

WG megaco Media Gateway Control

WG mmusic Multiparty Multimedia Session Control

WG mpls Multiprotocol Label Switching

WG iptel IP Telephony

WG ion Internetworking overNBMA

WG spirits Service in the PSTN/IN Requesting InTernet Service

Related Engineering Committee/Subcommittee Work Area(s) within TIA:

TR-41.1, multiline terminal systems

TR-41.4, IP telephony gateways and infrastructures

TR-42.1 (specifically, TR-42.1.1, network distribution nodes)

Related Technical Subcommittee Work Area(s) within Committee T1:

T1S1 projects:

T1D1-23 Specification of Broadband Aspects of ISDN
T1D1-24 Descriptions for ISDN services
T1S1-02 Network Architecture and Interworking Aspects of ISDN
T1S1-03 Service Aspects of ISDN
T1S1-06 Standards Project for DSS1 Basic Circuit Mode Call Control Protocols
T1S1-08 Standards Project for DSS1 Supplementary Services Protocols

T1S1-09 Standards Project for DSS1/SS7 Interworking
T1S1-12 Call and Connection Signaling Protocols for Broadband ISDN
T1S1-13 Intelligent Network
T1S1-15 DSS1 Data Link, Packet Mode, and Frame Relay Signaling Protocols
T1S1-16 Standardization of NII/GII
T1S1-17 Number Portability
T1S1-18 Program Management for packet voice
T1S1-19 Program Management for Access Architectures
T1X1-02 Common Channel Signaling, ISUP SWG

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Area 8 – Performance

Scope and focus of the work area

Performance Recommendations for IP-based networks and services, interpreted broadly to include IP based networks and affiliated technologies (e.g., World Wide Web) are being developed by a number of Study Groups. The planned work will:

- Build upon and specialize ongoing GII performance studies
- Apply and revise the existing ITU-T Recommendations that establish performance and quality requirements for end-user services in light of the unique performance issues of IP-based networks and services
- Develop new performance-related ITU-T Recommendations (i.e., define performance parameters and objectives) for IP-based networks and services
- As necessary, revise or develop ITU-T Recommendations addressing the performance of the lower layer networking ("layer 2 networking") to support the transport of IP networking ("layer 3 networking"), e.g., timing and synchronization issues as they relate to IP-based networks and services
- Address a broad range of performance issues, including IP-network interworking with and integration with other telecommunications services and networks (e.g., public switched telephone network, Integrated Services Digital Networks, radio/mobile telecommunications networks, broadcast/cable networks, SDH, ATM, frame relay).

The initial focus is on the definition of quantitative quality-of-service (QoS) commitments applicable to well-defined IP-based services and meeting performance needs of end-users for real-time IP-based services (e.g., telephony, multimedia) while continuing to support conventional best-effort IP communication services.

Issues

A primary management issue is the coordination of ITU-T technical activities in this project area, externally and internally. Specific issues include:

- Articulation of quantitative QoS requirements that can shape the development of IP telephony and other real-time services provided by IP networks. Development of corresponding IP packet transfer performance parameters, objectives, and QoS classes;
- Promotion, contribution and support of elaboration of network mechanisms (e.g., IETF Intserv, Diffserv, MPLS) that could enable the delivery of services differentiated by QoS characteristics;
- Provision of recommendations for co-operative implementation of QoS assurance mechanisms in interconnected IP network domains (e.g., policy management among service providers, traffic engineering guidelines). Study the introduction of dynamic bandwidth reservation/protection mechanisms such as "shaping" and "policing";
- Development of recommendation covering the reliability and availability of IP networks and of services supported by IP networks. Fulfill the emergency service requirements (e.g. recommendation E.106 on International Emergency Preference Service).

Current work within ITU-T

Question/SG	Rapporteur	Deliverable	Timing info	Related IETF activity WG (chair)	ITU Contact person
SG 2		E.106	Determined		
Q.2/2 Routing and interworking	J. Ash	E.351 E.352 E.353 E.353.1 E.TE.1-E.TE.7	Approved Approved 02/01 2002 2002		
Q.3/2 Management and development of voice and non-voice based telecommunication services	L. Homan	E. callflows Supp. No 1 to Rec. E.370	2002 2001		
Q.5/2 Service quality of networks	B. Linick	E.QOS-VOIP	1/2001		
Q.7/2 Traffic engineering for personal communications	D. Grillo	E.772 E.780	2003 2003	tewg	W. Lai
Q.8/2 Traffic engineering for SS7 and IP-based signaling networks	M. Tüxen	E.IP	2003	tswg sigtran rserpool	
Q.9/2 Traffic engineering for networks supporting IP services	Wai-Sum Lai	E.ipvpn E.681 E.MIP E.CDIP	2002 2001 2002 2002	Tewg ccamp mpls diffserv ppvn ippm	W. Lai
Q.3/4	L. Mak	Maintain the relationships between performance limits and objectives and consider their impact on QoS and SLA. M.2301 (ex- M.23ip) New Rec. M.24otn provisioning and maintenance of the OTN	2002 2003	bmwg, ccamp, diffserv, ipo ippm(W. Leland, M. Zekauskas), mpls, rmonmib, tewg	D. Sidor
Q.4/4	W. Miller	New Rec. O.iptest test instrumentation to assess performance of transmission systems supporting IP	2003	Bmwg, ippm (W. Leland, M. Zekauskas)	D. Sidor

Q.5/4	D. Wolaver	Rec. O.172 revised New Rec. O.173 jitter and wander testing for the OTN	2003	bmwg, ippm (W Leland, M. Zekauskas)	D. Sidor
Q.9/4	K. Smith	New Rec. M.3341 requirements for QoS/SLA management over the TMN X-interface	2003	bmwg, ippm (W. Leland, M. Zekauskas)	D. Sidor
Q.6/9 Conditional access methods and practices	R. Green / C. Sandbank (Provisional)	New Rec. providing specification and recommended operating practices	2003		R. Green
Q.7/9 Requirements and methods for sound-programme and TV "webcasting" services	R. Green / C. Sandbank (Provisional)	New Rec. applicable to the interactive delivery of sound programme and TV programme to the public over Internet	2002		R. Green
Q.12/9 CATV delivery	R. Green / C. Sandbank (Provisional)	New Rec. that will fully specify the open protocols recommended for use in the secondary distribution of the desired IP-based and/or packet-based data services and applications via the digital CATV infrastructure	2003		R. Green
Q.2/12 Speech transmission characteristics / Transmission characteristics of speech terminals	Acting Rapporteur P. Coverdale	New Rec. P.VoIP (Transmission characteristics for telephone band VoIP Phones) New Rec. GTWY (Transmission characteristics for telephone band VoIP Gateway)	2003 2004		Dvorak
Q.7/12 Methods, tools and test plans for the subjective assessment of speech and audio quality	P. Usai	Handbook on STP (Subjective Testing practical procedures)	2003		Dvorak
Q.8/12 Extension of the E-Model	U. Jekosch, S. Moeller	Rev. G.107 (The E-Model, a computational model for use in transmission planning)	early 2003		Dvorak
Q.9/12 Objective Measurement of Speech Quality under conditions of Non-linear and Time-variant processing	J. Berger	P.AAM (Acoustic Assessment Model) P.SEAM (Single Ended Assessment Model) Rev P.862 (PESQ)- Annex A	2003 2003 2003		Dvorak
Q.10/12 Transmission planning for voiceband, data and MM services	V. Sypli	Rev.G.101 (The Transmission Plan) Frequent update Appendix I to G.113 Rev. G.114 (One-way transmission time)	2003 2003		Dvorak

Q.11/12 Speech transmission planning for multiple interconnected networks	J. Pomy	Rev. G.177 (Transmission planning for voiceband services over hybrid Internet/PSTN connections)	2003		Dvorak
Q.12/12 Transmission performance considerations for voiceband services carried on networks that use IP	D. Mustill	G.IPP (Transmission performance parameters fo IP networks affecting perceived speech quality and other voiceband services)	2004	ippm	Dvorak
Q.13/12 MM QoS/performance requirements	P. Coverdale	New G.MMPERF (Multimedia performance requirement)	2004		Dvorak
Q.14/12 Effects of interworking between multiple IP domains on VoIP speech transmission performance	D. Mustill	G.TrIP-Islands (Transmission Planning for Interconnected IP-Based Networks Supporting PSTN and VoIP Services)	2004		Dvorak
Q.16/12 INMD of voice transmission performance on non-linear systems	V. Barriac	Rev. P.561 (update for Class D devices and new parameters) New P.VTQ (Derivation of voice transmission quality from non-intrusive IP protocol analysis) New Rec (Non Intrusive measurement of speech quality based on audio parameters)	Recently approved 2003 2004	ippm	Dvorak
Q.6/13 Performance of IP-based networks and the emerging GII	Hyung-soo KIM	Y.1540 Y.154-1 Y.800 Updates I.350 Updates, as appropriate, Rec. I.351/Y.801/ Y.1501	February ’99 Spring 2001 2002 2004	IPPM (W. Leland, M. Zekauskas)	N. Seitz
Q.7/13 B-ISDN/ATM cell transfer and availability performance	D. Mustill	Enhancements to Rec. I.356 and review of its provisional aspects I.35aal I.35aal2 I.35av Rev. Rec. I.357	2002 2001 2002 2001/2002 2002		N. Seitz

Q.8/13 Transmission error and availability performance	G. Garner	New version G.821.1 Rev. G.826 Rev. G.827 Rev. G.827.1 Rev. G.828 Rev. G.829 G. optperf	2001 2002 2002 2002 2003 2003 2002		N. Seitz
Q.9/13 Call processing performance	T. Shinomiya	I.38ipcp Rev. I.358 Rev. I.359 Rev. I.352 Rev. I.354	2001 2002 2002 2003 2003		N. Seitz
Q.11/13 Mechanisms to allow IP-based services using MPLS to operate in public networks	M. Carugi	IP-VPN over MPLS (Y.1311.1) IP/MPLS Transport and Control Protocols (Y.1311) IP-based service "x" over MPLS (Y.1311.x)	2001 2002 2002 - 2003		Y. Maeda
Q.7/15 Voice gateway equipment	T. Brown	Complete G.799.1 Update: G.776.1	05/2002		Peter Wery
Q.9/15 Transport equipment and network protection/restoration	G. Abbas	Rev. G.781 Rev. G.841 Rev. G.842 Complete G.798	 2001		
Q.10/15 ATM and IP equipment	Vacant	Rev. I.731 and I.732 New Rec. for a library of IP layer atomic functions. New Rec. for a library of IP/ATM and ATM/OTN functions. New Rec. for a library of IP/OTN (and IP/SGH) functions	2002 2002 2002 2002		

Q.C/16 Multimedia applications and services	F. Lucas	Production of an initial map of MM services and applications. Production of the scope and requirements capture for the MM services and applications. F.MRS F.MDS F.MMS F.MCLS F.EMS F.Ecom F.TM Enhancements and improvements of existing Rec.: T.100; T.101; T.102; T.103; T.104; T.105; T.106; T.107; T.171; T.172; T.173; T.174; T.175; T.176; T.504; T.523; T.541; T.564	2001 2001 2002 2002 2002 2002 2002 2002 2002		
Q.F/16 Quality of service and end-to-end performance in Multimedia systems	M. Buckley	H.360 (ex-H.qosarch)	01/2004		
Q.2/17 Network performance and quality of service in data communication networks	G. Couch	X.14frip on the performance of IP carried over a Frame Relay network X.fra	09/2003 09/ 2003		G. Couch

Related work within IETF

With respect to Area 8, the IETF's principal group addressing IP and Internet performance issues is the Internet Protocol Performance Metrics (IPPM) working group. The IPPM WG is focused on developing measurement methods for assessing IP and Internet performance. Other work on measurements is being done in the BMWG and the RTFM working groups.

New protocols and services are being considered by the IETF working groups Diffserv, Intserv (RSVP), MPLS, QoS routing and these are expected to have a major impact on the ability to offer and manage QoS.

WG diffserv	Differentiated services
WG bridge	Bridge MIB
WG intserv	Integrated services
WG ippm	IP Performance Metrics
WG mpls	Multiprotocol Label Switching
WG rsvp	Resource Reservation Setup Protocol
WG rtfm	Realtime Traffic Flow Measurement

Related Engineering Committee/Subcommittee Work Area(s) within TIA:

TR-34.1, communications and interoperability

TR-41.1, multiline terminal systems

TR-41.3, analog and digital wireline terminals

TR-41.4, IP telephony gateways and infrastructures

TR-42.1, commercial building telecommunications cabling (specifically, TR-42.1.1, network distribution nodes)

Area 9 - Integrated management of telecom and IP-based networks

Scope and focus of the work area

Integrated remote management is expected to be essential to gain the full benefits of integrating IP with traditional telecom technologies. Currently management of IP-based networks is focused on the use of IETF and some ITU-T management standards while the management of traditional telecom networks is supported by ITU-T TMN Recommendations. Thus there is a need to understand the management needs of both domains in order to develop an integrated perspective. It is expected that as the distinction between these two network domains blurs, the convergence of their management approaches will naturally follow. During this convergence period and in part to ensure its success, integrated remote management will be needed and will focus on the creation of an integrated set of management architecture, requirements, information, and protocols.

TMN's strength is in integrated management, managing via a common infrastructure the major technologies standardized by the ITU-T. The TMN provides support for a multi-paradigm management environment, e.g., the revised architecture will be paradigm-neutral and protocol/modelling choices are expanding. TMN mediation and adaptation, which are concerned with translating between paradigms, will play a key role for integrating technologies.

IETF and ITU-T IP-related management functionality has been focused on element management, primarily on managing IP network devices, but emerging work is expected to impact network and service management, e.g., policy, accounting, and SLA management. This includes the management of network performance and QoS by ensuring adequate network resources (bandwidth, routing etc.) are assigned to support negotiated QoS classes.

Status

The issue of integrated hybrid packet/circuit management has been addressed by

- M.3017 "Framework for the Integrated Management of Hybrid Circuit/Packet Networks"
- Q.811 "Lower layer protocol profiles for the Q and X interfaces" [going to consent November 2003]
- Q.812 "Upper layer protocol profiles for the Q and X interfaces" [going to consent November 2003]

Study group 4 has been enjoying a close working relationship with the disman working group in the IETF on the issue of SNMP-based Alarm Management based on TMN specifications.

Issues

Three issues have been identified and are being worked in Q.10/4. Other current issues include the method of accommodating SNMP and associated MIBs.

A fourth key issue being worked on jointly by Q.3/4 and Q.9/4 is managing the performance and QoS allocation across multiple Service Providers that constitute the service supply chain. This issue is taking account of complementary work being done in ETSI, Eurescom, IETF, 3GPP and TM Forum.

Recently in October 2003, there was a joint meeting of SG 4 and SG 15 on the subject of Network Management, where, among other topics IP management was discussed. The relationship between Q.811, developed by Q18/4, and G.7712, developed by Q14/15, is now better understood and a plan is in the works to resolve any potential gaps and overlaps. In addition, it was noted that there were

terminology discrepancies between M.3017 and Q.811/Q.812, which has been identified as an area for future study.

Current work within ITU-T

Question/SG	Rapporteur	Deliverable	Timing info	Related IETF activity WG (chair)	ITU Contact person
Q.4/2	M. Ahman	E.41IP Network mangmt for IP services	01/2001		M. Ahman
Q.2/4	P. Levine	New Rec. M.fides formalised interconnection designations	2003	edint, enum, idn	
Q.3/4	L. Mak	M.2301 (ex-M.23ip)	2002	agentx, bmwg, ccamp, ipo, ippm (W. Leland, M. Zekauskas), iptel, itrace, ipv6, mpls, pilc, tewg	D. Sidor
Q 7/4	P. Dini	M.3010 M.3013	complete	sming, snmpv3	D. Sidor
Q 9/4	K. Smith	M.3030 (ex-M.tml) New Rec. M.3341 requirements for QoS/SLA management over the TMN X-interface. New Rec. M.3350 requirements for ETS management over the TMN X-interface	2002 2003 2003	edint, ippm (W. Leland, M. Zekauskas), xmldsig, mpls	D. Sidor
Q 10/4	T. Grim	New Rec. M.3017 (ex-M.hcpn) integrated management framework.	2003	All listed WGs for SG 4, mpls	D. Sidor
Q 12/4	K. Johannessen	M.3020 Revised M.3120 Amd1	2003 2002	atommib, snmpconf	D. Sidor
Q 13/4	T. Yoshida	New Rec. G.85grcc generic recovery connection configuration	2003	Snmpconf, mpls	D. Sidor
Q 14/4	L. Raman	Q.834.4	2003	adslmib, atommib, snmpconf	D. Sidor

Q 16/4	G. Caryer	New Rec. M.3210.imtacc IMT-2000 accounting management requirements	2003	aaa, policy	D. Sidor
Q 18/4	D. Matthews	Q.811/Q.812 Revised	2003	ldapbis, ldapext, ldup, pkix, sming, snmpv3,	D. Sidor
Q 19/4	C. Pontailler	Potential extensions to alarm probable cause	2004	aaa, disman, gsmp, pkix, policy, rap	D. Sidor
Q.8/11	S. Hussain				
Q.13/15	P. Lamy	G.ipm	2003	Transport area Operations and Management area	Kam Lam
Q.14/15	K. Lam			Transport area Operations and Management area	Kam Lam
Q.3/16 Infrastructure and interoperability for multimedia over packet networks	C.Groves	H.341	05/1999		
Q.F/16 Quality of service and end-to-end performance in Multimedia systems	M. Buckley	H.360 (ex-H.qosarch)	01/2004		

Related work within IETF

WG aaa	Authentication, Authorization, and Accounting
WG agentx	SNMP Agent Extensibility
WG adslmib	ADSL MIB
WG snmpconf	Configuration management for SNMP
WG disman	Distributed management
WG policy	Policy Framework
WG radius	Remote Authentication Dial-In User Service
WG snmpv3	SNMP Version 3
WG atommib	AtoM MIB
WG sming	Structure of Management Information Next Generation
WG ldapv3	LDAP Version 3
WG pkix	Public Key Infrastructure (X.509)
WG gsmp	General Switch Management Protocol
WG rap	Resource Allocation Protocol

Related Engineering Committee/Subcommittee Work Area(s) within TIA:

TR-42.1, commercial building telecommunications cabling (specifically, TR-42.1.1, network distribution nodes)

Area 10 - Security aspects

Scope and focus of the work area

The types of communications considered here seem far too restrictive, should it be possible to be more generic There are many interworking scenarios with existing telecommunication networks and IP-based networks. Due to the fact that the structure of the IP-based networks and the associated security aspects are completely different to those of telecommunication networks, the security aspects have to be analyzed in relation with interworking between telecommunication and IP-based networks. Requirements have to be developed for these scenarios, especially for:

- A voice call from an IP terminal connected to an IP-based network to a GSTN phone
- A voice call from a GSTN phone to an IP terminal connected to an IP-based network
- A voice call from a GSTN phone to another GSTN phone via an IP network
- A voice call from an IP terminal connected to an IP-based network to another IP terminal connected to an IP-based network via the GSTN.

When the word “security” is used without qualification there are usually many interpretations of the term. Hence it is useful to provide a taxonomy of security-related issues so that a common understanding can be more quickly reached. Within a telecommunications context there are four roles, each with a different set of security related concerns. These are users, network operators, third parties and governments. These roles are not mutually exclusive and any given individual or organization may assume two or more of the roles. For example, a third party is inevitably also a user, and a network operator may assume a government role.

There are ranges of security concerns. Some are of interest to a single role, and some to several. These include end-to-end privacy of data, user identification, anonymous access, access control intrusion detection, non-repudiation, secure time-stamping and lawful intercept.

Issues

Communication system security

a) How should a complete, coherent communications security solution be defined?

b) What are the architectural underpinnings for security?

i) What is the security architecture of emerging technologies?

ii) What technical security architectures are required? For example:

- What is the open systems security architecture?
- What is the Internet security architecture?
- What is the ATM security architecture?

iii) How should the upper and lower layer security model Recommendations be modified to adapt them to the changing environment?

iv) How should architectural standards be structured with respect to Recommendation X.800?

c) How should the security framework Recommendations be modified to adapt them to emerging technologies?

d) How are security services applied to provide security solutions? What security Recommendations are required to describe, for example:

i) Application and Network security.

ii) Security Application Program Interfaces (SAPIs).

iii) Security Associations.

iv) Security Labelling.

v) Key Management.

Electronic business and packet-based network security

a) How should compression, encryption, and secure compression be extended to packet-based protocols?

b) How should the security architecture in the lower layer protocols interplay with the upper layer security protocols such as Key Management, etc.?

c) What API should the link security protocol be required to have to interface with the upper-layer-security protocol services?

d) How should efficiency of the security payload be addressed such that quality-of-service is not negatively impacted?

e) How does the efficiency of the transport be maintained or minimally impacted such that in a lossy medium it does not cause catastrophic failure of multi-media streaming when compression, encryption, or secure compression is applied?

Current work within ITU-T

Question/SG	**Rapporteur**	**Deliverable**	**Timing info**	**Related IETF activity (chair)**	**ITU Contact person**
Q.10/17 Security services, mechanisms and protocols	H. Ohno	X.841 X.842 X.843 X.css X.ism X.msec X.tb	Approved 10/2000 Approved 10/2000 Approved 10/2000 March 2004 March 2004 March 2004 March 2004		
Q.2/16 Multimedia over packet networks using H.323 systems	P. Jones	H.323 Annex J	11/00		
Q.G/16 Security of multimedia systems and services	M. Euchner	H.235v3 H.235v3 Amd1 H.235 Annex F corr H.235 Annex G H.235 Annex H H.530 corr H.323 Annex J	08/2003 01/2004 05/2003 01/2004 01/2004 05/2003 11/2000		

Current work within ITU-R

WP 7A - Rapporteur : Mr Gerrit de Jong - Deliverable : Q.238/7 (Trusted time sources)

Related work within IETF

WG tls Transport layer security

WG wts Web Transaction Security

Related Engineering Committee/Subcommittee Work Area(s) within TIA:

TR-41.1, multiline terminal systems

TR-41.4, IP telephony gateways and infrastructures

TR-45.2, wireless intersystem technology

Area 11 - Network capabilities including requirements for resource management

Scope and focus of the work area

In general, resource management is necessary in order for a network to work appropriately, in case where a network provider could not provide resources sufficiently enough for all users at any time. The project should address those issues and especially the issues related to IP-based networks and the combination with the ITU-T specified telecommunications networks.

Issues

- Service definition and specification of end-to-end network parameter objectives;
- Traffic modelling, traffic engineering and network planning taking into account the new requirements related to the use of best-effort networks;
- Defining mechanisms to achieve the end-to-end objectives covering an environment with multiple networks.

Current work within ITU-T

Question/SG	Rapporteur	Deliverable	Timing info	Related IETF activity (chair)	ITU Contact person
Q.7/2 Traffic engineering for personal communications	D. Grillo	E.772 E.780	2003 2003	tewg	W. Lai
Q.8/2 Traffic engineering for SS7 and IP-based signaling networks	M. Tüxen	E. IP	2003	tsvwg sigtran rserpool	M. Tüxen
Q.9/2 Traffic engineering for networks supporting IP services	Wai-Sum Lai	E. ipvpn E.681 E. MIP E. CDIP	2002 2001 2002 2002	tewg ccamp mpls diffserv ppvn ippm	W. Lai
Q.1/3 Development of charging	L. J. Martinkovics				
Q.4/13 Broadband and IP-Related Resource Management	S. Yoneda	New Rec. on IP traffic control (release 1) (release 2) Rev. I.371	 20012003 2002		
Q.3/16 Infrastructure and interoperability for multimedia over packet networks	C. Groves	H.245	11/2004		

Related work within IETF

to be added.

Area 12 - Operations and maintenance (OAM) for IP

Scope and focus of the work area

Work on OAM facilities for IP-based networks is being carried out in Study Groups 4, 13 and 15. Study Group 13 is developing OAM network techniques that can be used to control and manage IP layer functions required in operations and maintenance, e.g. the Y.17xx Recommendations on MPLS. Study Group 15 is responsible for defining the implementation of these functions in IP network equipment, although much of this work is being done by IETF. Study Group 4 makes use of these OAM facilities to carry out management functions in the transport plane and control plane in concert with the TMN management capabilities. In an IP-based network environment, the distinction between control plane, signalling plane and management plane (TMN) is blurring.

Issues

Issues to be looked at include:

- Supporting mechanisms for collection of information which can be used for charging users of the resources, specifically the end users of the services
- Supporting mechanisms for collection of information which can be used for the Settlement between users of the resources, specifically between Network Operators and/or Service Providers
- Supporting mechanisms for collection of performance and QoS information that can be used to support management of QoS and SLAs.

Current work within ITU-T

Question/SG	Rapporteur	Deliverable	Timing info	Related IETF activity (chair)	ITU Contact person
Q 3/4	L. Mak	M.2301 (ex-M.23ip)	2002	bmwg, ccamp, diffserv, ifmib, ipcdn, ipo, ippm (W. Leland, M. Zekauskas), ppvpn, rmonmib	D. Sidor
Q.4/4	W. Miller	New Rec. O.iptest test instrumentation to assess performance of transmission systems supporting IP.	2003	bmwg, ifmib, ipdcn, ipo, ippm (W. Leland, M. Zekauskas), ppvpn	D. Sidor
Q.5/4	D. Wolaver	Rec. O.172 revision. New Rec. O.173 jitter and wander testing of the OTN	2003 2003	bmwg, ippm (W. Leland, M. Zekauskas)	D. Sidor
Q.3/13 OAM and IP related resource management	H. Ohta	Y.1710 Y.1711 Y.1720	AAP 2001 2002 2002	mpls	
Q.9/15					
Q.11/15					

Related work within IETF

to be added

Area 13 : Utilization of IPv6 in telecommunication networks

Scope and focus of the work area

The ITU-T and the Internet Engineering Task Force (IETF) are collaborating in a number of areas, taking account of the industry emphasis on Internet and IP structured signals. This collaboration is now well established concerning the current version (Version v4) of the IP protocol. Thus, a mapping already exists between the main Questions of different ITU-T Study Groups involved in the development of Recommendations in IP areas of the IP project and the different Work Groups of IETF.

However, no activity exists so far in ITU-T concerning the version 6 of IP protocol (IPv6). This lack must be rapidly filled regarding the market expectations on future advanced services based on IPv6 technology which are recognized as the future drivers by all the IPv6 actors (operators, ISPs, industry, users, academic world…). ITU-T has an important role to play to guarantee a large development of IPv6 networks and services.

Bearing in mind that foundations of IPv6 are already defined, the role of ITU-T is to extend to IPv6 protocol the activities currently conducted in the twelve areas of the IP project. As a result, Area 13 should have a transverse scope, and it will impact some of the other areas.

Due to the rapid evolution of the work related to IPv6 development in the world and to the growing interest for this technology, ITU-T must capitalize on the activities and on the experience achieved by standardization bodies and foras specialized on IPv6 such as IPv6 Forum, European IPv6 Task Force, Japanese IPv6 Promotion Council, North America IPv6 Task Force, etc. Consequently area 13 will maintain a list of these standardization bodies and foras in order to establish relevant collaborations with them. The objective is to accelerate the work in different ITU-T Questions involved in IP technology (networking, interworking, interoperability, services, management, QoS, security, mobility) towards IPv6 protocol. Table 1 provides a list of relations between main bodies involved in IPv6 technology.

Besides, when mapping activities related to IPv6 conducted in these bodies to similar activities in ITU-T Questions, some issues that are not yet addressed or that need further study could be identified. The result could be the identification of new ITU-T recommendations to be developed, based on the work and the knowledge that could be imported and shared with IETF and with other bodies and foras to meet rapidly the market expectations in IPv6 domain.

Organization	**Background in IPv6**	**Objective**	**Main scope & results**	**Contact**
ITU-T	New area in IP Project in SG13 (March 2002)	* Introduction of IPv6 as an item to be addressed in the ITU-T SGs *Consider the impact of IPv6 on the 12 areas of the IP project	Many SGs must be impacted : SG4, SG9, SG11, SG13, SG15, SG16, SSG	TSB Secretary to SG13 : Georges Sebek WP 1/13 Chairman: Jean-Yves Cochennec
IETF	Initiated the work in 1992. WGs : IPng, ngTrans	Standardization of IPv6 protocol	A large number of RFCs WG IPng, ngTrans	
IPv6 Forum	Since 1999 + 140 members	Promotion of IPv6 through the world	Proceedings, dissemination	President : Latif Ladid Technical Directorate : Jim Bound

UMTS Forum	Promotion of UMTS & 3G	* IPv6 is a main topic	Dissemination	
GSM Association		* IPv6 is a main topic	Dissemination	
3GPP	Main body in standardization of 3G technology	UMTS R5, 6, 7,.. IMS domain IPv6 mandatory	IPv6, SIP mandatory in ISM	
ETSI		IPv6 interworking tests campaigns	Validation of IPv6 vendors implementations	Manager Philippe Cousin
OIF	Tampa OIF meeting in January 2001	Recommendations on Addressing of Optical Network (ONA) IPv4 and ONA to IPv6 Transition	Partnership with IPv6 Forum on 2001, IPv6 Strategy	
ISOC	Supervision of Internet activities (IETF, …)		Dissemination Collaboration ISOC(IETF)/ITU-T	Chairman Brian Carpenter
ICANN	Elaboration of early rules of management of IPv6 addressing space	Management of IPv6 addressing space and supervision of RIRs. Improvement and adaptation of the existing rules	IPv6 space allocation rules to RIRs	
ARIN	Experimentation of early rules of management of IPv6 addressing space	Management of IPv6 addressing space and supervision of RIRs. Improvement and adaptation of the existing rules	IPv6 space allocation rules to LIRs in American Region	
APNIC	Experimentation of early rules of management of IPv6 addressing space	Management of IPv6 addressing space and supervision of RIRs. Improvement and adaptation of the existing rules	IPv6 space allocation rules to LIRS in Asia-Pacific region	
RIPE-NCC	Experimentation of early rules of management of IPv6 addressing space	Management of IPv6 addressing space and supervision of RIRs. Improvement and adaptation of the existing rules	IPv6 space allocation rules to LIRS in Europe region	
European IPv6 Task Force	03/2001-15/01/2002 4 WGs	Acceleration of development of IPv6 in Europe	Recommendations for *European Commission *Member States *Industry IST IPv6 Projects	President : Latif Ladid
Japan IPv6 Promotion Council		Acceleration of development of IPv6 in Japan	Recommendations to *Government *Industry *Academic world	Chairman Pr Jun Murai
North America IPv6 Task Force	First meeting 12/2001	Acceleration of development of IPv6 in USA	Recommendations	President : Michael Brig

Table1 : ITU-T and other standardization bodies and foras involved in IPv6

Issues

Several aspects have to be addressed. A list of main issues to be addressed is provided hereafter, following an arbitrary classification of these issues in two major classes.

IPv6 Architecture/ Interworking/ Interoperability /Transition

- Addressing/ Numbering/ Naming
- Routing
- Transition IPv4/ IPv6 and migration
- IPv6 Core/ Transport Networks
- IPv6 ADSL and Optical access Networks
- GPRS/ UMTS IPv6/ IMT-2000 mobile access and core network
- WLAN MIPv6 access networks
- IPv6 satellite access network
- IPv6 optical networks (OTN, ASON)
- Home networking

IPv6 services and applications

- VPN v6
- DNSv6
- AAAv6/ Security v6
- IPv6 Multicast
- IPv6 Game on line
- VoIPv6
- Video/ IPv6
- Stream audio/Video
- Web v6
- Servers v6
- Mobility v6
- Management SNMP v6
- IPv6 QoS Measurement/ IPv6 performance

Current work within ITU-T

Decision to introduce a new area 13 in the IP Project has been taken in March 2002 SG13 meeting. Technical description and relations of this area are to be provided in November 2002 SG13 meeting.

Q.812 "Upper layer protocol profiles for the Q and X interfaces" developed in Q18/4 has recently gone to consent and includes IP profiles for IPv6.

Related work within IETF

The collaboration between ITU-T and IETF in IPv4 is already in place, it should be extended to IPv6 protocol and increased with the context of the acceleration of IPv6 activities and the corresponding interest for IPv6. Besides, ITU-T activities should benefit from experience obtained by specialized IPv6 Working Groups (IPng, ngTrans) during the 10 last years through experimentations (e.g. 6Bone the first experimental worldwide IPv6 network, and experimentations conducted in regions or countries). Moreover, as IETF has established collaborations and cooperation with other bodies and foras involved in the development and the promotion of IPv6, the ITU-T will also benefit from results of these collaborations.

IETF and ITU-T have their respective action fields : the IETF strength lies in the protocol and application areas (it is also true for IPv6), whereas the ITU-T has a great deal to offer in the areas of architectural, network interworking and network evolution (it will be the case for IPv6). There is an opportunity for ITU-T to give a new dimension to IPv6 protocol regarding the deployment issue on a large scale.

Table 2 provides a mapping of issues already mentioned to existing ITU-T Questions, with corresponding IETF Working Groups.

Question/ SG	Adressing Numbering Routing DNS	Security AAA	QoS Measurement Performance Management	IPv6 Mobility UMTS/ WLAN 3G-IMT-2000	Transport Equipment Interworking Interoperability Transition v4/v6	Access Networks: ADSL, Cable, Fibre	IPv6 Multimedia Services Applications
ITU-T	Q.1/2 Q.2/2 Q.10/4 Q.3/17 Q.2/16 Q.3/16 Q.7/SSG	Q.10/17 Q.7/4 Q.10/4 Q.18/4	Q.5/2 Q.9/2 Q.3/4 Q.4/4 Q.5/4 Q.9/4 Q.10/4 Q.13/12 Q.6/13 Q.8/13 Q.18/4 Q.8/17 Q.13/15 Q.14/15 Q.2/17	Q.1/SSG Q.10/4	Q.10/4 Q.9/15 Q16/15 Q10/15 Q.3/16 Q.10/13 Q.11/13 Q.11/15 Q.3/17 Q.7/17	Q.10/4 Q.2/15	Q.10/4 Q.C/16 Q.8/17 Q.1/16 Q.2/16 Q.6/9 Q.7/9 Q.1/16 Q.4/16 Q.6/16 Q.7/16 Q.9/16 Q.10/16 Q.15/16 Q.8/16
IETF	enum nat msdp int seamoby	Aaa tls wts pkix	ippm tewg ccamp mpls diffserv ppvn snmpv3sming , idapv3	seamoby	pint ION ipfc gsmp mospf rohc tsvwg ipo iporpr	ppext Ipcdn ipfc	iptel avt sip
IETF (IPv6)				**IPv6 Working Groups (IPng, ngTrans) +40 RFCs & Drafts**			

Table 2 : Mapping between ITU-T Questions and IETF WGs

It is generally accepted that the major commercial drivers of IPv6 will be those that "consume" a large number of address space and that support the "always-on" services such as:

- 3G wirelesss networks & services
- ADSLv6
- Game on line
- Home networking

The rapid growth of cellular devices and the potential lack of IPv4 addresses make inevitable the deployment of IPv6 addressing plans. 3GPP has already chosen in its Release 5 that IPv6 and SIP be mandatory protocols for IMS (Internet Multi-media Subsystem). This IMS will open a significant

number of new business opportunities. In fixed networks SIP and IP are used to offer multimedia services and the migration towards IPv6 of these services is a new issue which needs to be solved by operators and ISPs. The same scheme goes for the three other IPv6 drivers afore-mentioned. In these conditions, ITU-T is expected to play a major role regarding interworking, interoperability and migration issues.

Main features of IPv6 are recalled below:

- Addressing, Naming & Numbering

With IPv6, there is no address space exhaustion. This principle will permit to operators to design network architectures less complex and cost effective, because there is no need to deploy NATs, and the renumbering becomes an automatic operation thanks to the hierarchical structure of the IPv6 address scheme.

- Routing

IPv6 is designed on routing hierarchy with aggregation, thus it will reduce routing tables.

- Management

IPv6 is based on plug and play thanks to an auto-configuration scheme. A reduction of the management costs of IPv6 networks and services is expected.

- Mobility

With the help of auto-configuration and IPv6 Neighbour Discovery, the host will operate in any location. Moreover, optimization of traffic and security associated to the update messages of mobile IPv6 protocol, between the mobile and its correspondent and with its Home Agent, are achieved and guaranteed.

- Security

With IPv6, the support of IPsec protocol becomes mandatory. Then, it allows end to end applications and especially those security-sensitive to operate in easier way and without NATs.

IETF RFCs and Drafts

Near 40 RFCs and Drafts are related to Ipv6. Some of them are mentioned below

- RFC 2460 : Internet Protocol, Version 6 (IPv6) Specification
- RFC 2461 : Neighbor Discovery for IP Version 6 (IPv6)
- RFC 2462 : IPv6 Stateless Address Autoconfiguration
- RFC 2463 : Internet Control Message Protocol (ICMPv6)
- RFC 2373 : IP Version 6 Addressing Architecture
- RFC 2374 : An IPv6 Aggregatable Global Unicast Address Format
- RFC 2375 : IPv6 Multicast Address Assignment
- RFC 2464 : Transmission of IPv6 Packets over Ethernet Network
- RFC 2472 : IP Version 6 over PPP
- RFC 1933 : Transition Mechanisms for IPv6 Hosts and Routers
- RFC 2766 : Network Address Translation - Protocol Translation

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