International Telecommunication Union

Next Generation Networks and Telecommunication Regulations

NGN related activities in 3GPPs, IETF and ITU-T SG13

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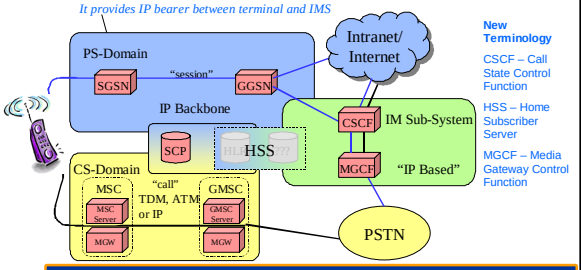
What is IMS?

- IMS translation: IP Multimedia Subsystem
- Provides multimedia solution for UMTS operators
  - Reflects "carrier" requirements for IP multimedia
- Uses IETF protocols with 3GPP extensions and profiling
- Introduced in 3GPP Release 5 (approved June 2002) specifications. Enhanced in Release 6 (target approval Sept-Dec 2004)
- Originally developed for UMTS/GPRS access but system design enabled evolution towards access independence in Release 6
- Support for inter-operator and international roaming
- Supports deployment of multivendor systems through well defined open interfaces
- Support for IPv6 is mandated within the IM Subsystem
- Does not provide service equivalence to the Circuit Core
  - Transition of mass market voice to IMS is a very long term proposition

Advanced multimedia for UMTS and GPRS

IMS position in 3GPP system

Example of an "IP-Connectivity Access Network" (IP-CAN)
It provides IP bearer between terminal and IMS



IMS is an overlay to an IP-enabled access network

Importance of IMS

- Step-change in the technology used in GSM/UMTS networks
- Open, standardised framework for multimedia services
- Opportunities for new services and improved service creation
- IMS is being adopted outside GSM/UMTS:
  - 3GPP2 (CDMA) uses IMS in their standards
  - Fixed operators are already planning to use IMS as their Next Generation Network (NGN) platform

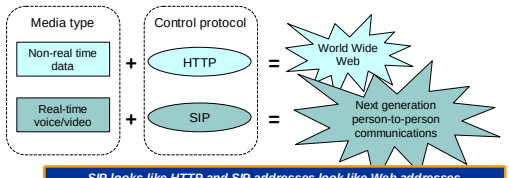
BUT:

- New services can be enabled by approaches other than IMS
- Using IMS for conversational (real time) services over GSM/UMTS presents major challenges
- Terminals and migration of legacy services are big unknowns

Making IMS deliver its promised value is the challenge

IP Multimedia and Session Initiation Protocol (SIP)

- SIP – Internet Engineering Task Force (IETF) defined protocol for session based real-time multimedia
- IP Multimedia provides a framework for a wide range of services developed and deployed using Internet techniques
- Ubiquitous access (any time, any place, any device, any bearer)
- SIP allows integration of voice and video services



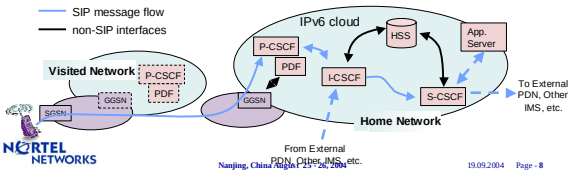
SIP looks like HTTP and SIP addresses look like Web addresses
SIP controls media for all types of service, non real time and real time, and provides a common framework to integrate those

Value of SIP Protocol

- Abstracts media type
  - SIP does not care which type of media is used (voice, video, data, etc.)
  - Value => common set of services for all media types
- Utilises Internet-style service creation
  - SIP and HTTP are part of the same family of protocols
  - Application server rather than IN model
  - Value => fast and innovative real-time services
- Services at the edge
  - Services can be deployed end-to-end via client
  - Can also provide network based services
  - Value => fast and innovative real-time services
- Extensible
  - SIP is text based (like HTTP), very easy to add extensions
  - Value => reduced churn in the network to deploy services
- Flexible
  - SIP does not define the whole vertical solution (unlike H.323)
  - Value => deployed infrastructure can adapt to future service types
- Scalable
  - SIP architecture is designed to scale and expand easily
  - Value => network expansion and management is straightforward

IMS – Key Elements

- CSCFs ("Call State Control Functions") provide handling of SIP signalling in network
  - Three flavours of CSCF
    - "Proxy-CSCF" – manages access to IMS local to the IP anchor point
    - "Interrogating-CSCF" – finds the right Serving-CSCF
    - "Serving-CSCF" – provides user services
- HSS ("Home Subscriber Server") provides centralised database of subscription and service information
- PDFs ("Policy Decision Function") manages policy for handling IP flows in network
  - Release 5: PDF is in P-CSCF, Release 6: PDF can be separated
- Application Server – Provides value added applications on top of IMS framework



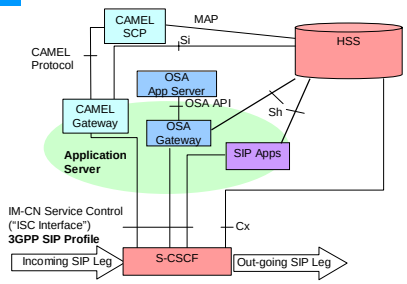
IMS services

3GPP standardizes IMS Service Capabilities NOT Services

- 3GPP defines mechanisms for services based on Presence, MMS, Streaming, but those services that would use these are not defined
- Services are implemented in Home Network
  - Service knowledge not required in visited network but may exist
- Examples of Services that can be built on IMS
  - Point to point and conferenced multimedia
  - Presence
  - Instant Messaging
  - Streaming
  - Combinations and integration of these
- Services may be included in the S-CSCF or in to an application server
- Three IMS Service Platforms (Application Servers)
  - CAMEL (IMS-SSF) – provides transition for legacy services
  - OSA – Open Service Access (OSA-SCS) – provides "web services" like API
  - SIP (SIP-AS) – provides service creation for SIP infrastructure
- S-CSCF communicates with the three types of Application Servers via the IP multimedia service control (ISC) interface. The ISC interface is SIP-based.

Open architecture for services

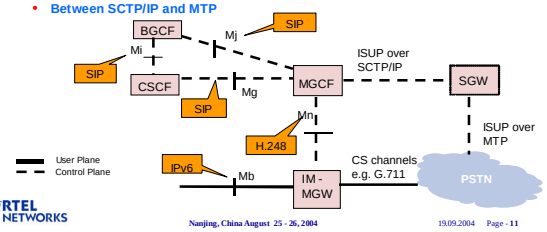
Services Architecture



Diverse service environment mapped in to common interface

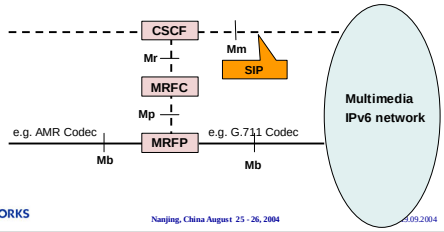
Interworking to PSTN

- The Breakout Gateway Control Function (BGCF) finds out in which network to break out to the CS domain/PSTN
  - It can then drop out of the signalling
- The Media Gateway Control Function (MGCF) provides interworking between SIP and BICC or ISUP
- The IM Media Gateway (IM-MGW) interworks the user plane
- The Signalling Gateway (SGW) provides transport interworking
  - Between SCTP/IP and MTP



Interworking to non-IMS SIP networks (and media functions)

- Media Resource Function Controller (MRFC) – manages in-band resources
- Media Resource Function Processor (MRFP) – handles in-band functions like transcoding, conferencing
- Used for interworking or providing media functions as part of a service



IPv6 and IPv4

- 3GPP IMS specs require IPv6 on the IMS interfaces
- Why?
  - Partly political – some manufacturers had invested heavily in IPv6 platforms
  - Partly capacity – many operators will lack sufficient IPv4 addresses to provide a unique address to each IMS user
- IPv6 requirement includes all SIP interfaces and IPv6 must be supported in the IMS access
- In 2004, 3GPP has finally acknowledged that not all IMS implementations will use IPv6
  - Report on "early IMS implementations" using IPv4 created
  - Detailed study on interworking scenarios
- 3GPP2 version of IMS already allows IPv4

Good IPv6 roadmap for IMS is important

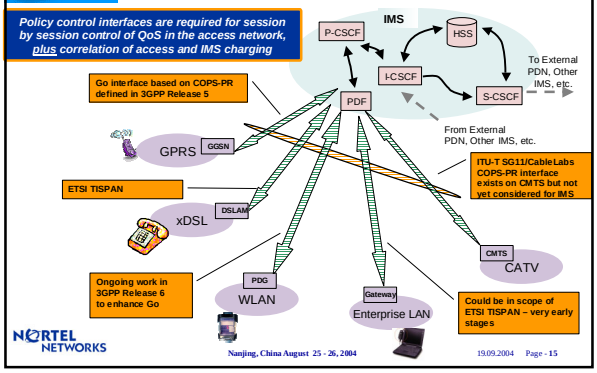
IMS access independence

- The Core IP Multimedia Subsystem is intended in principle to be able to offer service to terminals on any kind of access that supports IP
  - UMTS/GSM using GPRS
  - CDMA
  - Wireless LAN
  - Ethernet/xDSL
  - Etc.
- Work is not yet complete:
  - Release 5 IMS documentation focuses on UMTS/GSM
  - Release 6 IMS split out the 'access independent' parts, but does not explicitly address other access systems
  - Some work in 3GPP Release 6 on WLAN access to IMS - incomplete
  - 3GPP2 MMD (Multimedia Domain) uses IMS core subsystem over CDMA
- ETSI TISPAN has decided to use IMS core for 'Next Generation Network' within wireline standards
- ITU-T is developing global NGN specs in a similar framework (IMS is a starting point)

IMS architecture fits with access independence concepts

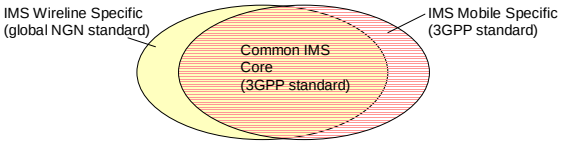
Multiple access architecture

Policy control interfaces are required for session by session control of QoS in the access network, plus correlation of access and IMS charging



IMS in Next Generation Networks

- IMS is agreed as a key component of the "Release 1" global NGN standard
- Cooperation required with 3GPP
- Goal : a common IMS core with access-specific extensions



Interest to achieve maximum commonality

IMS for carrier applications

Some areas where IMS deltas may be needed (recent TISPAN/3GPP discussions) :

- Security requirements (3GPP IMS only supports smart-card based security)
- Requirements for support of IPv4
- SIP Profile requirements for xDSL access to IMS
- Gq extensions for NGN (e.g. for NAT control)
- QoS classes and end to end QoS interworking
- Emergency call and regulatory service support
- Default codec support

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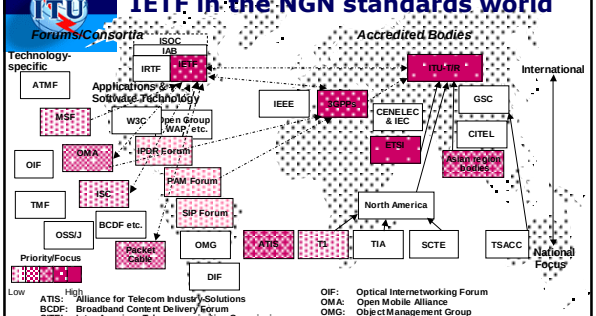
- **IP multimedia in IETF**
- NGN developments in ITU-T SG13 (JRG-NGN)

IETF in the NGN standards world



IP Multimedia topics

- SIP Protocol
- SIP Services Infrastructure and Building Blocks
- Basic Services and Service Building Blocks
  - Transfer, Conference, Emergency calls, Lawful Intercept
  - Media Services (IVR, TTS, etc.)
  - Data Manipulation
- Applications:
  - Presence, IM
  - Application Sharing
  - APIs
  - Unified Messaging (voicemail, email, IM, etc.)
- Key infrastructure:
  - QoS, Security, Device configuration, Policy, Billing/AAA, IPv6
- Interworking (networks and numbers)
  - PSTN Interworking, TRIP, ENUM

SIP

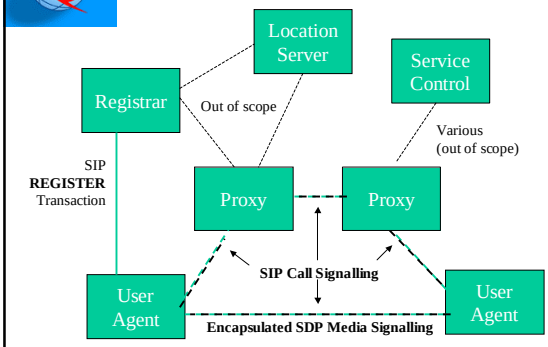
- SIP was proposed around 1995, and RFC 2543 published in 1999
- The current reference specification: RFC 3261 – June 02 (it replaced RFC 2543)
- SIP is an application-layer control (signalling) protocol for creating, modifying, and terminating sessions with one or more participants. These sessions include Internet telephone calls, multimedia distribution, and multimedia conferences.
- SIP invitations are used to create sessions, carry session descriptions that allow participants to agree on a set of compatible media types.
- SIP makes use of elements called proxy servers to help route requests to the user's current location, authenticate and authorize users for services, implement provider call-routing policies, and provide features to users.
- SIP also provides a registration function that allows users to upload their current locations for use by proxy servers.
- SIP can run on top of several different transport protocols.

SIP major features

- User Location
  Determination of the end system to be used for communication
- User Capabilities
  Determination of the media and media parameters to be used
- User Availability
  Determination of called party's willingness to engage in communication
- Call Setup
  "Ringing", establishment of call parameters at both called and calling party
- Call Handling
  Including transfer and termination of calls

Further information in IETF SIP WG page:
http://www.ietf.org/html.charters/sip-charter.html

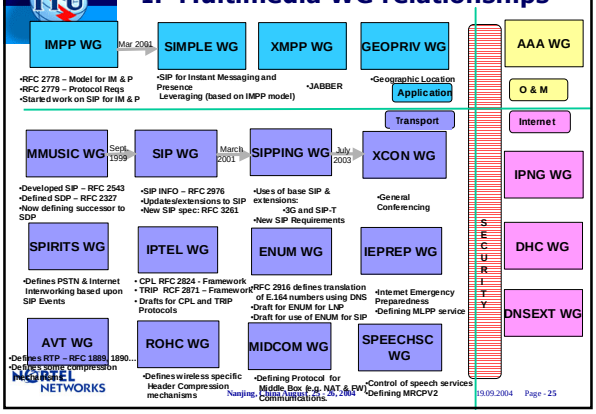
SIP Architecture



IETF IP Multimedia WGs

- The SIP protocol was originally developed in the MMUSIC WG, but its dependencies now span multiple Working Groups:
  - SIP WG focuses on foundations for the protocol and include security, extensions (e.g. REFER), etc.
  - SIMPLE WG established to define SIP for Presence and Instant Messaging based on IMPP WG.
  - SIPPING WG focuses on protocols that make use of the enablers provided by SIP (e.g. Call Transfer (using REFER), 3GPP, SIP-T, H.323 Interworking, etc.).
  - In addition, the SIPPING WG develops and approves requirements for new additions to SIP per the SIP change process defined in RFC 3427 (BCP 67).
    - Guidelines for proposing extensions to SIP described in draft-ietf-sip-guidelines (whose Last Call has been completed).

IP Multimedia WG relationships



SIP status

- Progress on SIP has been accelerated by 3GPP pressure
- **Major step forward with RFC 3261 approval** in June 02
  - media session negotiation procedures greatly clarified
  - security greatly strengthened
  - many other improvements
- Next step intended to be advancement to Draft Standard
- Steady progress on extensions for additional services
- Resource pre-negotiation (e.g. QOS coordination) reframed to be special case of media session negotiation

- **Disalignment exists between SIP-T and SIP-I (ISUP interworking)**
  - SIP-T developed in IETF since 1998 (framework, SIP-ISUP mapping and procedures)
  - ITU-T SG11 started more detailed work in 2001 (SIP-I)
    - aiming for "ISUP basic call" interworking specification
    - new Recommendation Q.1912.5 (generally supported by carriers)

IM and Presence

- The IMPP WG is responsible for defining a protocol for Presence
  - RFC 2778: Model for presence and instant messaging
  - RFC 2779: Requirements for presence and instant messaging
- The SIMPLE WG is developing SIP for Instant Messaging and Presence
  - The IETF has committed to producing an interoperable standard for these services compatible with requirements in RFC 2779 and in the Common Presence and Instant Messaging (CPIM) specification
  - Current WG draft for Session based IM (draft-ietf-simple-message-sessions) defines MSRP (Message Session Relay Protocol)
  - New SIP method, MESSAGE, has been defined in SIP WG to support chat (one-time, non-session) based IM (RFC 3428)
- Jabber is an open, XML-based protocol for instant messaging and presence, which is widely deployed (it is progressing, together with the related IMP extensions, as an Informational RFC)

Initial steps in other key NGN topics

- **Emergency calls : standardization is very preliminary**
  - drafts on requirements, architecture, Universal Emergency Address for SIP-based Internet Telephony, scenarios (SIPPING)
  - architecture employs standard SIP features and no new protocols
  - DNS used to map civil/geospatial locations to the appropriate call center
- **Emergency Telecommunication Services (ETS)**
  - requirements (RFC 3689/3690), framework (IEPREP)
- **Lawful Intercept : standardisation is non-existent at this time**
  - but draft-iab-arch-changes-00 recognized need to work on (the original RFC 2804 said « no IETF involvement »)
- **QoS : work is still fairly immature with regards to VoIP (as well as policy and billing/AAA)**
  - RFC3312 (Integration of Resource Management and SIP) is the basis for 3GPP QoS model
  - Generic QoS : NSIS WG was initially targeted to resolve this problem, but has modified its focus on the way
  - Other minor proposals (in MMUSIC : to use SDP to negotiate QoS)

Other areas of interest in IETF

- **Mobility related WGs**
  - user mobility and service ubiquity
  - relationship with ITU, 3GPP, etc.
- **MPLS (Multi Protocol Label Switching) and CCAMP (Common Control And Measurement Plane) WGs**
  - next generation packet-based "Transport Network" (user and control planes)
  - relationship with ITU-T (SG13, SG15, FG NGN, etc.)

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ITU-T SG13 and JRG-NGN

- **ITU-T Study Group 13**
  - Multi-protocol and IP-based networks and their internetworking
  - Lead Study Group for IP related matters, B-ISDN, Global Information Infrastructure and satellite matters
- **JRG-NGN**
  - Next Generation Networks are a key area of interest for the whole ITU in the next study period
  - SG13 decided to set up a Joint Rapporteur Group on NGN in October 03 to speed up the development of foundational NGN recommendations
  - JRG-NGN has met 4 times and has ended its work in June 2004
  - Deliverables : 2 consented Recommendations (Y.2001 and Y.2011), a number of draft documents given as input to the new ITU-T Focus Group on NGN (-> Mr. Knight's presentation)
- **The ITU-T NGN project will continue via**
  - the Focus Group on NGN - mandated to complete its work within 12 months (focused work items)
  - the NGN related Study Groups issued by the October 04 WTSA – milestones to be defined according to respective work scopes and objectives

Recommendations developed by the JRG-NGN

- **Y.2001** "General overview of NGN" (currently under AAP)
  - Background information to assist the development of Recommendations, Standards and implementation guidelines for the realisation of NGN.
  - Overview of what constitutes and defines a NGN (fundamental characteristics and capabilities that an NGN should be able to support).
- **Y.2011** "General principles and general reference Model for NGNs" (currently under AAP)
  - General principles and a Reference Model for NGNs, based on the generic foundations laid down under the Global Information Infrastructure (GII) in Y.100 and Y.110, and basic communication architecture principles specified in X.200
  - The model should enable the support of the overall NGN characteristics as given in Y.2001:
    - neutral with respect to specific protocols and technologies
    - more flexible than X.200 (OSI basic model) with respect to the positioning of functionality and not constrained to specific hierarchical ordering of protocol layers

The other JRG-NGN deliverables

Y.NGN-GRQ	General requirements for NGN **-> FG NGN WG1**
Y.NGN- FRM	Functional requirements and architecture of the NGN **-> FG NGN WG2**
Y.NGN-CONV	Next Generation Networks – Convergence scenarios
Y.NGN-MOB	Mobility management requirements and architecture for NGN **-> FG NGN WG1**
Y.NGN-CMIP	Customer manageable IP network
Y.NGN-MIG	Migration of networks to NGN **-> FG NGN WG7**
Y.PSTN-NGN	PSTN migration to NGN **-> FG NGN WG7**
Y.NGN-QoS	General aspects of QoS and network performance in the NGN **-> FG NGN WG3**
Y.e2eqos.1	Requirements and framework for end-to-end QoS architecture for NGN **-> FG NGN WG3**
Y.e2eqos.2	An end-to-end QoS architecture based on centralized resource control for IP networks supporting NGN services **-> FG NGN WG3**
Y.123.qos	A QoS architecture for Ethernet-based IP access network **-> FG NGN WG3**
Y.ipaqos	A QoS Framework for IP based access networks **-> FG NGN WG3**
Y.NGN-NHNperf	Network performance of hybrid networks in NGN

Pointers to relevant information

3GPP/3GPP2

- http://www.3gpp.org
- http://www.3gpp2.org
- Membership fees
- Email exploder : follow indications in the specific WG page for WG subscription

IETF

- IETF home page : http://www.ietf.org
- Relevant WG pages (charter, pointer to mailing list archive)
- No membership fees (only individual fees to attend meetings)
- Email exploder : follow indications in the specific WG page for (unrestricted) WG subscription