Migration from legacy networks to NGN

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1. Legacy Networks (LNs)

**Definition and scope of LNs**

- **Definition of LNs (Not formal):**
  a network based on older, out-dated protocol that is not based on the IP (TCP/IP) protocol. IPX, SNA, AppleTalk and DECnet are examples of legacy networks.

- **Scope of LNs:**
  - Public Switched Telephone Networks (PSTN)
  - Packet Switched Data Networks (PSDN)
  - Integrated Services Digital Networks (ISDN)
1. Legacy Networks (LNs)

PSTN

- **Features of PSTN:**
  - the oldest and widest popular network
  - voice-band services (voice and 3.1 kHz Audio-band data services)
  - the channel remains reserved and not allow to use for competing users (full dedicated)
  - provides continuous transfer without the overhead
  - a dedicated path persisting between two communicating parties or nodes
  - the constant bit delay during a connection
  - guaranteed a QoS of the circuit (channel), so no degradation of QoS by competing users
1. Legacy Networks (LNs)

PSTN

- Architectures and Configurations of PSTN
1. Legacy Networks (LNs)

**PSDN**

- **Features of PSDN:**
  - Packet means a small container or a pouch, such as a formatted block of data.
  - Physical layer: specifies the physical, electrical, functional and procedural characteristics to control the physical link between a DTE and a DCE (e.g. X.21).
  - Data link layer: link access procedure for data interchange on the link between a DTE and a DCE (LAPB) that manages a communication session and controls the packet framing including error correction & orderly delivery.
  - Packet layer: exchanging control and user data packets to form a packet-switching network.
1. Legacy Networks (LNs)

**ISDN**

- **Features of ISDN:**
  - Circuit switching: Provide 64 kb/s including bigger than 64 kb/s (rate adapted to 64 kb/s for less than 64 kb/s rate)
  - Packet switching: Provide number of packet mode bearer services based on two types;
    - packet handling functions: handling of packet calls within the ISDN;
    - interworking functions: interworking between ISDN and PSDN;
  - Frame mode: Provide the order preserving bidirectional transfer of service data units (L2 frames) on the basis of an attached label
  - Signalling capability: carried by the D-channel
1. Legacy Networks (LNs)

**ISDN**

- Functional architecture of ISDN
1. Legacy Networks (LNs)

**ISDN**

- Functional configuration of ISDN
Definition of NGN

Next Generation Network (NGN): a packet-based network able to provide telecommunication services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies.

It enables unfettered access for users to networks and to competing service providers and/or services of their choice. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users.
Practical meaning of NGN

NGN is a Broadband Managed IP-based Network

- NGN got benefits from today’s broadband capabilities; over fixed, over mobile and over wireless
- NGN has capabilities to support managed features of IP based network, especially QoS, Security and Mobility
2. Summary of NGN

**Summary features of NGN**

- **Packet-based transfer**;
- **Separation of control functions**;
- **Decoupling of service provision from transport**;
- Support for a wide range of services based on service building blocks;
- **Broadband capabilities** with end-to-end QoS;
- **Interworking with legacy networks** via open interfaces;
- **Generalized mobility**;
- **Unfettered access by users** to different service providers;
- A variety of identification schemes;
- **Converged services between fixed/mobile**;
- Support of multiple last mile technologies;
- Compliant with all regulatory requirements (e.g. emergency, privacy, lawful interception, etc.)
2. Summary of NGN

**Capability requirements of NGN (1)**

- **Transport connectivity**
  - Use of IPv4 and IPv6;
  - real time and non-real time comm.
  - One-to-one and one-to-many connectivity

- **Communication modes**
  - One-to-one, one-to-many;
  - Many-to-any, many-to-one

- **Media resources management**
  - Support various media resources and its managements;
  - Media recording, DTMF/advanced speech recognition, media conversion, transcoding, bridging, duplication and insertion

- **Codecs**
  - Transcoding should be avoided wherever possible;
  - Shall support end-end codec negotiation;
  - Supporting G.711 for interworking with other networks
2. Summary of NGN

Capability requirements of NGN (2)

- **Access network and network attachment**
  - Shall support diverse access transport technologies;
  - Capable of providing IP connectivity;
  - Support registration & re-config. at the access network;
  - User access authen. data/inf. in user profile used for access configuration

- **User networks**
  - support access to the NGN via a user network with NAT/NAPT/Firewalls;
  - simultaneous use of multiple types of access transport functions by a single terminal

- **Interconnection and Interworking**
  - Connectivity-oriented and service-oriented interconnection;
  - support interworking with PSTN/ISDN and other networks
2. Summary of NGN

NGN Basic Reference Model

- Separation Transport (Access and Core) from Services
- But keeping 3 Planes for basic function: User, Control and Management
2. Summary of NGN

Overall NGN Architecture
3. Gaps

**Technical Gaps between NGN and LNs**

**Legacy Networks**

- **PSTN**
  - Voice & Voiceband Data (telephony)
  - Circuit (64kbit Channel)
- **PSDN**
  - Data (Non Real-time)
  - Packet (X.25)
- **internet**
  - Information
  - Packet (IP)

**NGN**

- Integrated Multimedia Services (real/non real-time)
- IP

**Technical Gaps**

- QoS/Security
- Packet adaptation/Addressing/Accounting
- PAD/Numbering/Accounting & charging/Echo Cancellation
3. Gaps

Gaps on Architectural aspects

Vertical views

Horizontal views

* TWP: Twisted Pair Cable, DSL: Digital Subscriber Loop, PDH: Plesiochronous Digital Hierarchy
WDM: Wavelength Division Multiplexing, PONs: Passive Optical Networks
4. For Migration

**PSTN/ISDN Emulation & Simulation**

- Emulation: Provision of PSTN/ISDN service capabilities and interfaces using adaptation to an IP infrastructure
  - An encapsulation process
  - All services available to PSTN/ISDN users
  - User experience not changed

*ADF: Adaptation Function*
4. For Migration

PSTN/ISDN Emulation & Simulation

- Simulation: Provision of **PSTN/ISDN-like service capabilities** using session control over IP
  - PSTN/ISDN-like services available
  - Availability of possible new services
  - User experience is changed by the network transformation
4. For Migration

Overall Configuration

UNI = User Network Interface = IF1
NNI = Network Node Interface = IF2

ADF = Adaptation Function
IWF = Interworking Function

Simulation

Emulation

NGN (Carrier Y)
PLMN
NGN (Carrier X)
PSTN/ISDN
Public IP Network, e.g. SIP (non-IMS)
4. For Migration

**Overlay Migration Scenario**

- deploy NGN overlay to the existing LNs
- two infrastructures both NGN and LNs exist together
- NGN provides advanced services while LNs keep existing services
4. For Migration

Replacement Migration Scenario

- Use mixed simulation and emulation together
- Simulation: for PSTN/ISDN-like services to the NGN users with advanced NGN features
- Emulation: for voice oriented services keeping the legacy terminal
5. Conclusion

- Handbook on “Migration Scenarios from Legacy Networks to NGN in developing countries” has been approved at the February 2013 SG13 meeting

Thank you for your attention !!!