ITU Regional Development Forum

Tashkent, 10-11 June 2008

Assisting Developing Countries for developing an NGN strategy

Riccardo Passerini

Telecommunication Development Bureau

International Telecommunication Union

Content of the Presentation

- Migration to NGN
- ITU-D Study Groups Activities on NGN
- BDT Projects on NGN

Migration towards NGN

In markets with a high growth in traditional voice services (which is the case for most developing countries), substantial extensions will be required to the existing telephony network in order to cover the huge need for new lines. Established Service Providers will have to decide on how to extend their networks: using more traditional circuit-switched solutions or implementing a distributed network architecture, with a common, packet-based transport layer for voice and data.

Evolution principles

Evolution to NGN should allow continuation of the existing network capabilities and in addition facilitate implementation of new capabilities.

Evolution to NGN should respect the integrity of services provided by the existing networks and should facilitate introduction of new services.

Considering that provision of NGN is an evolutionary process it is necessary to define a step-by-step approach leading to the NGN as a target network.

Priorities

Network and service providers may choose different evolution path based on their existing and forecasted resources. This approach may encompass different technologies and have different priorities.

Evolution of PSTN/ISDN to NGN

NGN (Next Generation Network) is believed to provide new opportunities for and capabilities to the network and service providers. Considering that existing networks have different life span and vast amount of capital has been spent on them, complete replacement of their components is not considered to be either advisable or possible. So, a phased approach should be considered for evolution of existing networks to NGN.

PSTN/ISDN (Public Switched Telephone Network/Integrated Services Digital Network) being one of the first networks, is considered to be prime candidate for evolution. For PSTN/ISDN evolution to NGN a phased approach is considered

ITU-T Recommendation Y.2261 - PSTN/ISDN evolution to NGN

Describes possible ways of evolving PSTN/ISDN to NGN. **Both IP multi-media sub-system (IMS-based) and call server (CS-based)** are described. It describes aspects, which need to be considered including evolution of transport, management, signalling and control parts of PSTN/ISDN to NGN. Examples of evolution scenarios are also provided in this Recommendation.

Examples: Core Network evolution to NGN

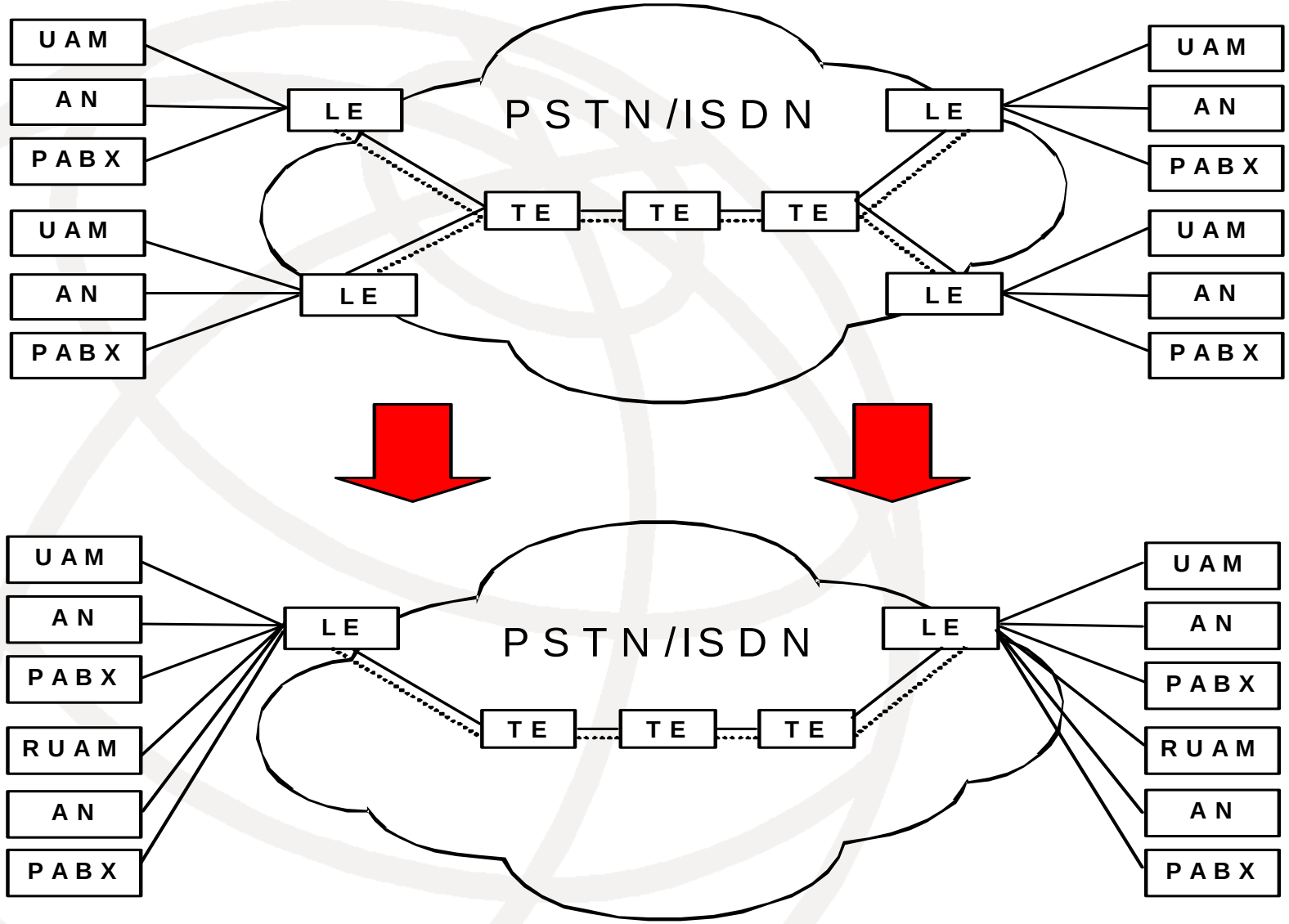
a) CS-based evolution to NGN

The call server (CS) is the core element for PSTN/ISDN emulation. It is responsible for call control, gateway control, media resource control, routing, user profile and subscriber authentication, authorization and accounting. The Call Server may provide PSTN/ISDN basic service and supplementary services, and may provide value added services through service interaction with an external service control point (SCP) and/or application server (AS) in the service/application layer.

Consolidation of local and remote exchanges preparing the evolution to NGN

- In order to prepare the PSTN/ISDN for the evolution to a packet switched network (PSN) and as an initial step some of the local exchanges (LEs) are removed and all their functionalities such as control, accounting, etc. are transferred to those remaining LEs. Affected user access module (UAM), private automatic branch exchange (PABX), and access network (AN) are connected to the remaining LEs. Further consolidation occurs when user access modules (UAM) become remote user access modules (RUAM), which, are connected to the remaining LEs.

Preparation for evolution to NGN



Scenario 1 – PSTN/ISDN and PSN co-exist

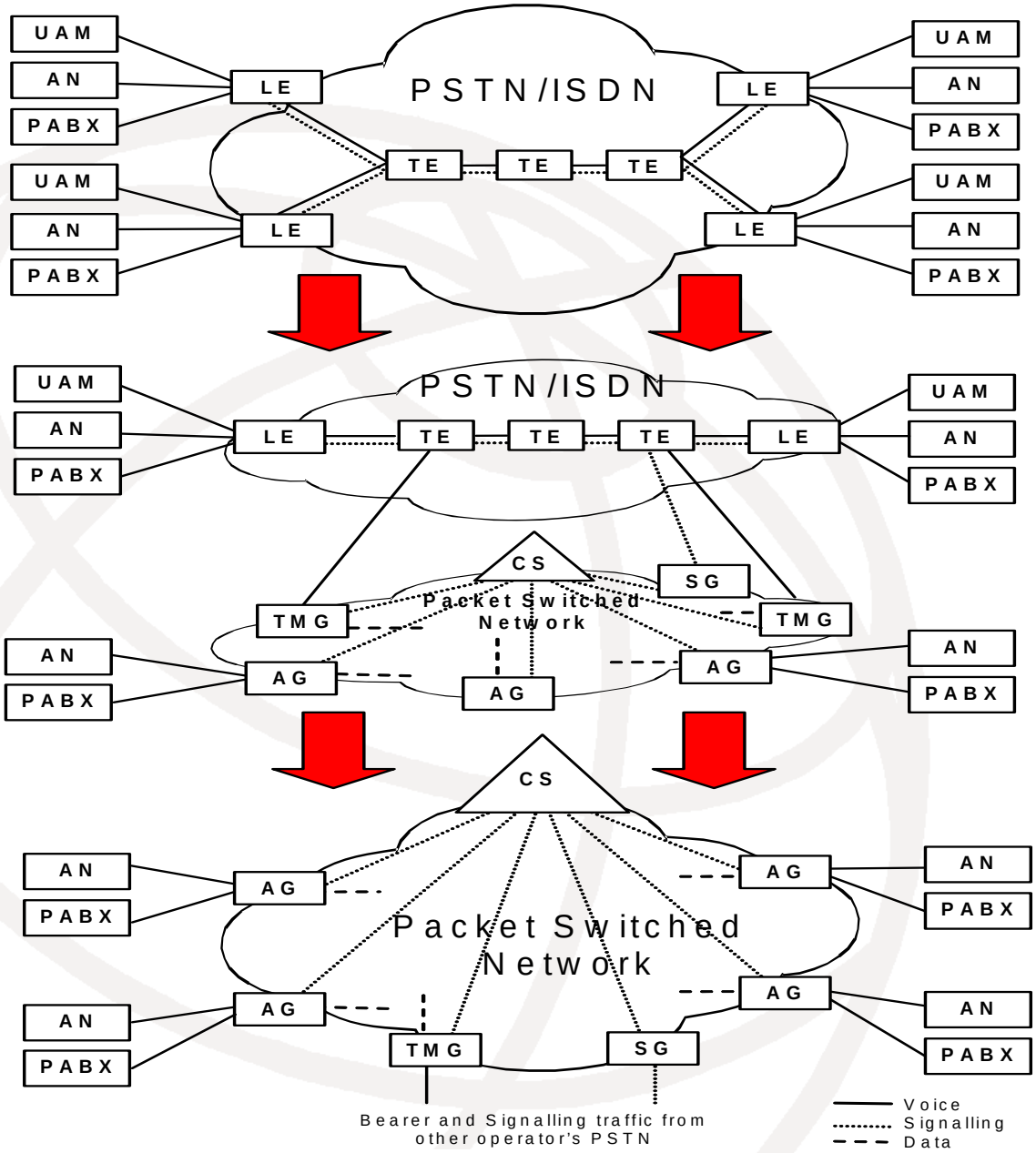
- The most likely initial approach for evolution of PSTN/ISDN to PSN will involve a path that requires the PSTN/ISDN to co-exist with PSN during a transition period. This scenario follows that approach. There are two steps in this scenario.

Scenario 1 – PSTN/ISDN and PSN co-exist

- **Step 1**
- In this step, some of the LEs are replaced by AGs. Functions originally provided by the removed LEs are now provided by the AGs and the CS. In addition, some of the access elements such as UAMs, RUAMs, and PBXs, which were originally connected to the removed LEs, are now directly connected to AGs. Additional AGs may also be deployed to support new subscribers that directly connect to them. The TMGs and SGs are deployed for interconnection between the PSN and the TEs of the legacy network as well as other operators' PSTNs/ISDNs. The AGs and TMGs are all controlled by the CS

- **Step 2**
- In this step, the remaining LEs are replaced by the AGs, and the TEs are removed and their control functions are performed by CS. The TMGs and SGs are deployed for interconnection between PSN and other operators' PSTNs/ISDNs. The AGs and TMGs are all controlled by the CS.

Scenario 1: Co-existence of PSTN/ISDN and PSN

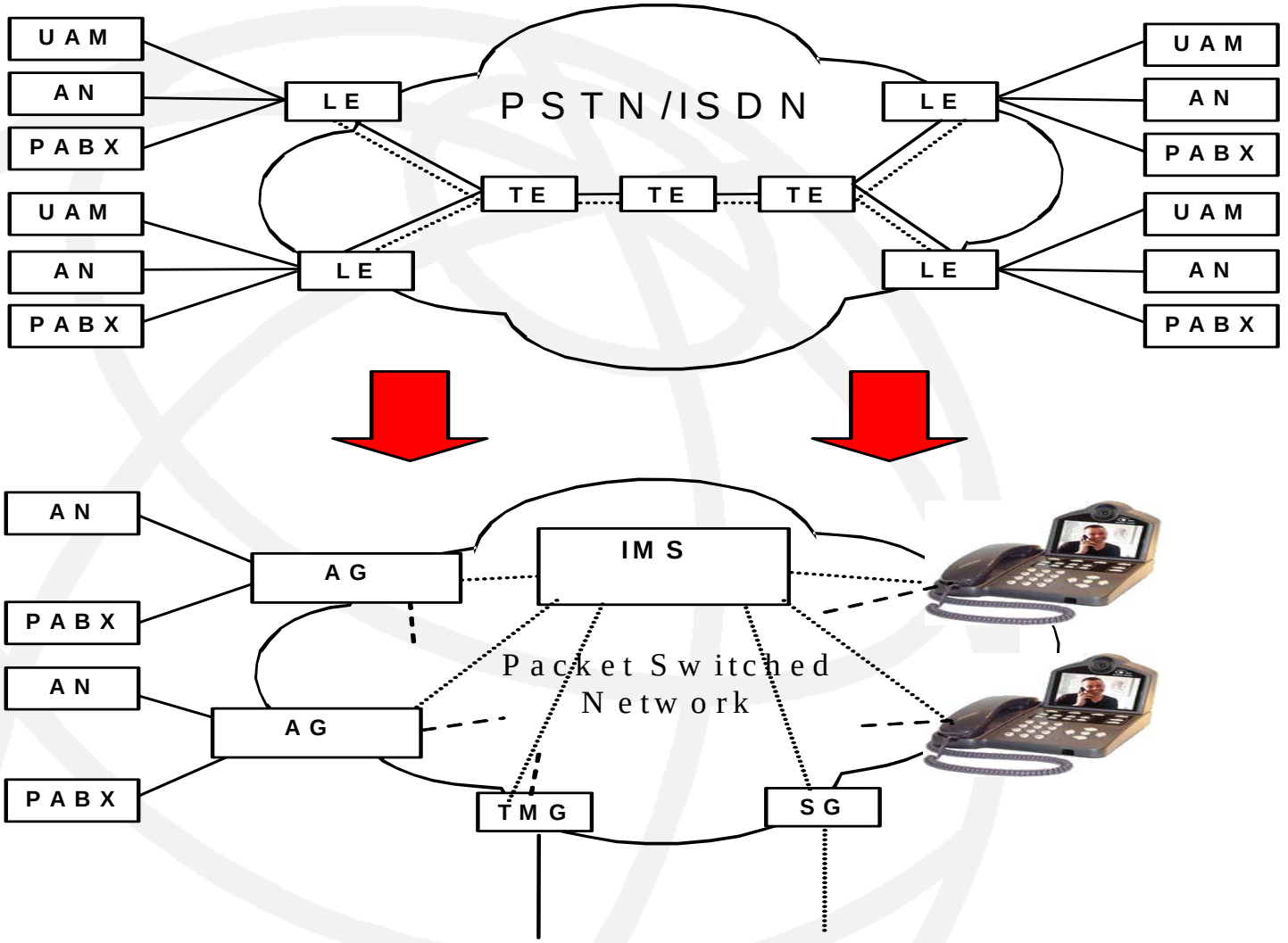


b) IMS-based evolution to NGN

- **In this scenario PSTN/ISDN evolves directly to a PSN based on the IMS core network architecture.** The end-users access the network using NGN user equipment or legacy user equipment connected via an AG. The transit and signalling gateways (TMGs & SGs) are deployed for interconnection between the NGN and other operators' PSTNs/ISDNs.

- **Concurrent CS-based and IMS-based evolution to NGN** implementations can occur when an existing operator deploys a separate IMS-based network for new services and supports the remainder of the services using a CS-based approach. These two types of network implementations need to interoperate. Interoperation is possible if SIP is used, but this is beyond the scope of this Recommendation.

IMS-based PSTN/ISDN evolution to NGN



SG1: Telecommunication Development Strategies and Policies

- **Q 6-2/1:** Regulatory impact of **next-generation networks** on interconnection
- **Q 7-2/1:** Regulatory policies on **universal access** to broadband services
- **Q 10-2/1:** Regulation for **licensing** and authorization of converging services
- **Q 12-2/1:** **Tariff policies, tariff models** and methods of determining the costs of services on national telecommunication networks, including next-generation networks
- **Q 18-1/1:** Domestic enforcement of **telecommunication laws**, rules and regulations by national telecommunications regulatory authorities
- **Q 19-1/1:** Implementation of **IP telephony** in developing countries
- **Q 20/1:** Access to telecommunication services for **people with disabilities**
- **Q 21/1:** Impact of telecommunication development on the **creation of employment**
- **Q 22/1:** Securing information and communication networks: Best practices for developing a culture of **cybersecurity**

SG2: Development and management of telecommunication services and networks

- **Q 9-2/2:** Identification of study topics in **the ITU-T and ITU-R study** groups that are of particular interest to developing countries
- **Q 10-2/2:** Telecommunications for **rural and remote areas**
- **Q 11-2/2:** Examination of terrestrial digital sound and television **broadcasting technologies** and systems, including cost-benefit analyses, interoperability of digital terrestrial systems with existing analogue networks and methods of migration from analogue terrestrial techniques to digital techniques
- **Q 14-2/2:** Telecommunications for **e-health**
- **Q 17-2/2:** Progress on activities for **e-services/applications** in the world
- **Q 18-1/2:** Implementation aspects of IMT-2000 and information-sharing on systems beyond **IMT-2000 for developing countries**
- **Q 19-1/2:** Strategy for migration from existing networks to **next-generation networks** for developing countries
- **Q 20-2/2:** Examination of access technologies for **broadband telecommunications**
- **Q 22/2:** Utilization of ICT for **disaster management** and active and passive space-based sensing systems as they apply to disaster prediction, detection and mitigation
- **Resolution 9 (Rev. Doha, 2006):** Participation of countries, particularly developing countries, in **spectrum management**

Question Q.19-1/2

Strategy for migration from existing networks to next-generation (NGN) for developing countries

Work Plan- list of Tasks to be completed

- **Issues proposed for study under Q.19-1/2**

a) trends of telecommunication networks migration towards NGN

b) examination of NGN technologies (network management, transport networks, access networks, interworking with existing networks, etc..)

c) methodologies for planning, with taking into account the behaviour of different existing networks

d) migration solution to NGN

Work Plan-expected outputs

Expected outputs for Q.19-1/2

i. Yearly progress report on NGN development

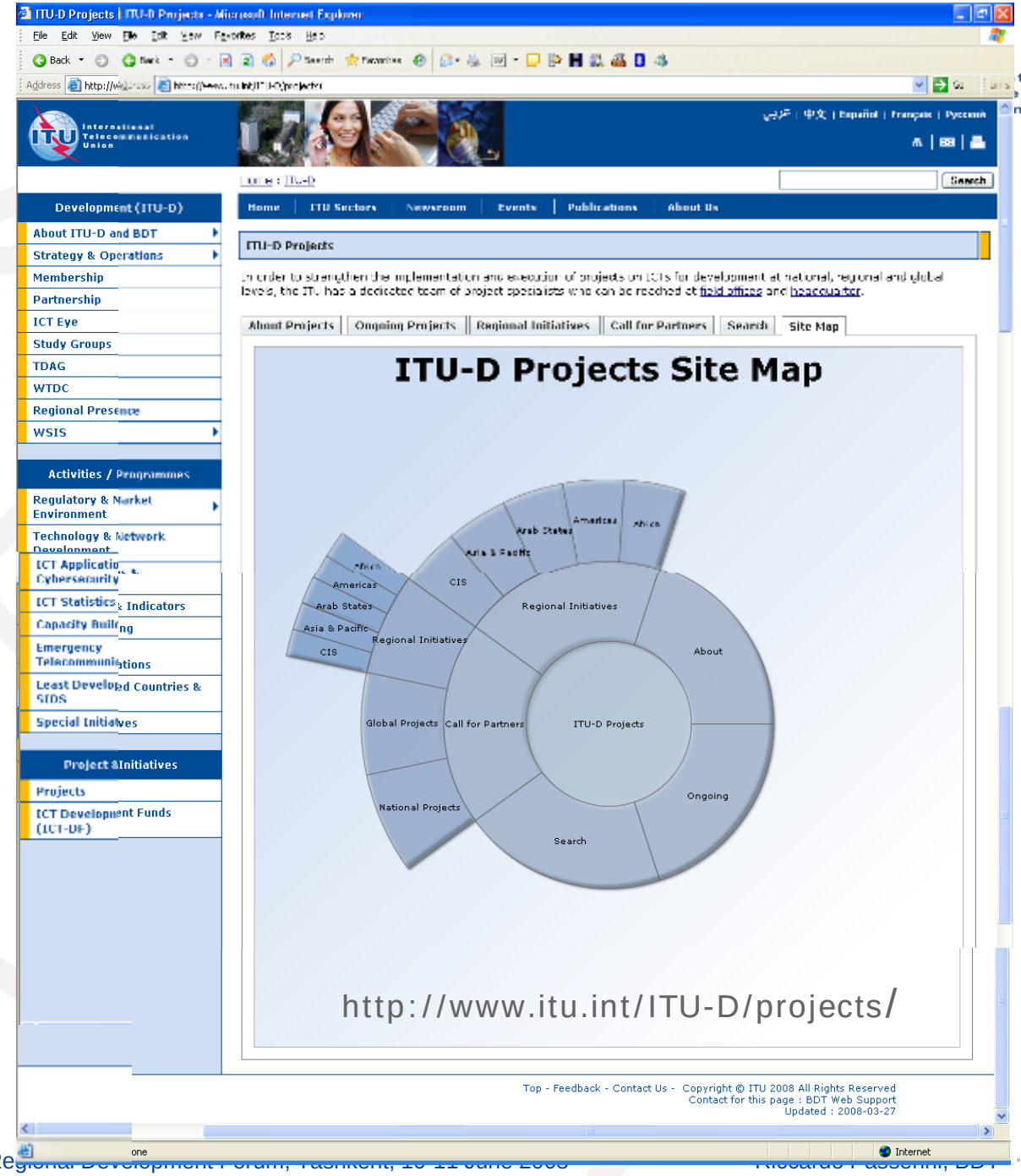
ii. A report of methodologies for planning NGN (multidimension planning process, service demand, forecasting methods, traffic forecasting models, and structure and dimensioning optimization methods.

iii. A set of guidelines for migration from existing network to NGN

Rapporteur's Group meetings

- **Last Rapporteur's Group Meeting: Geneva 18-19 February 2008**
  - **Draft "guidelines for developing countries on migration towards NGN": The objective of these guidelines is to offer guidance for developing countries on the technical issues for consideration when envisaging a migration of their existing PSTN/ISDN networks to NGN.**

    http://web/dms_ties/itu-d/md/06/rgq19.1.2/c/D06-RGQ19.1.2-C-0011!R1!MSW-E.doc
- **Next Rapporteur's Group Meeting: During the next SG2 Meeting,Geneva 15-19 September 2008**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Project: NGN Planning Migration and Applications

- Adopted at **World Telecommunication Development Conference (WTDC, Doha, 2006), the Doha Action Plan include five regional initiatives for Asia-Pacific region. This umbrella project is one of the initiatives and seeks for ITU assistance to developing countries in the region in smooth migration from existing networks into the Next Generation Network (NGN)** by studying specific questions as requested by Member States in order to develop Handbook/Guidelines on applying NGN network planning methodologies, software tools and technologies and migration strategies for NGN. In addition, the project also seeks to launch global network planning initiative to assist migrate, establish and develop NGN applications for benefit of end users utilizing the NGN infrastructure. **The outcome of the project has two components: Component A: Seeks to develop 'Handbook and Case Studies on NGN Migration Strategies and Planning Methodologies using advanced models and software Tools' and Component B: 'To develop Pilot Projects on NGN applications and service deployment under global network planning initiative'.**

Project: International Telecommunication Union - Central Science Research Telecommunication Institute: International Telecommunication Testing Centre

- *Under this project, ITU and ZNIIS will collaborate to create an **International Telecommunication Testing Centre (ITTC)** for new technologies and will train telecom specialists from developing countries. **Methodical testing on Next Generation Networks (NGN)** in particular will be carried out at the ITTC through creating a **model network (ITU-T Rec. Q.3900)** that can simulate different network parameters and use multi-vendor equipment. The results of these tests will be documented and shared. Training material on NGN testing will also be developed together with hands-on laboratories, in order to deliver workshops. This project has been designed in line with the Recommendation of the World Telecommunication Development Conference (WTDC) 2006 in Qatar to establish International Centres for NGN testing*

Thank you for your attention!

Riccardo Passerini
Telecommunication Development Bureau
International Telecommunication Union
Tel.: +41 22 730 5720
Fax: +41 22 730 5484
Email: riccardo.passerini@itu.int
www.itu.int/ITU-D/

Additional information

- Information complementing the main presentation

Migration towards NGN: Evolution principles

- This approach should consider the following objectives:
- Separation of transport, control, management and service functions.
- Reduction of cost for the network infrastructure and its maintenance
- Maximum reuse of the existing resources
- Achieving comparable QoS level as provided in the existing network
- Optimum use of the new technologies
- Rapid implementation of new services and technologies enabling introduction of new applications
- Provision of mechanisms enabling user's full utilisation of the applications and network resources.

Aspects to consider

Network operators will potentially choose a different evolution path depending their actual resources. While considering the evolution path it is essential the following aspects be considered:

- **Simplified analysis of the current networks**
- **Management**
- **Signalling**
- **Bearer services**
- **Billing**
- **Leased line provisioning**
- **Security**
- **Services which are required by regulatory bodies**
- **Supplementary services**
- **Technical aspects of naming, numbering, addressing**
- **Access technology evolution**

Security considerations

Evolution of network security should allow continuation of the existing network security capabilities and in addition provide new resistance capabilities against new security threats.
Several aspects may be considered:

- **Achieving acceptable security level by combination of different layer security methods**
- **Similar user security experience while evolving networks to NGN**
- **No over-provision of security measures.**

ITU-T Recommendation Y.2261 - PSTN/ISDN evolution to NGN

Describes possible ways of evolving PSTN/ISDN to NGN. Both IP multi-media sub-system (IMS-based) and call server (CS-based) are described. It describes aspects, which need to be considered including evolution of transport, management, signalling and control parts of PSTN/ISDN to NGN. Examples of evolution scenarios are also provided in this Recommendation.

Scenario 2 – Immediate use of PSN, initially via SGs and TMGs

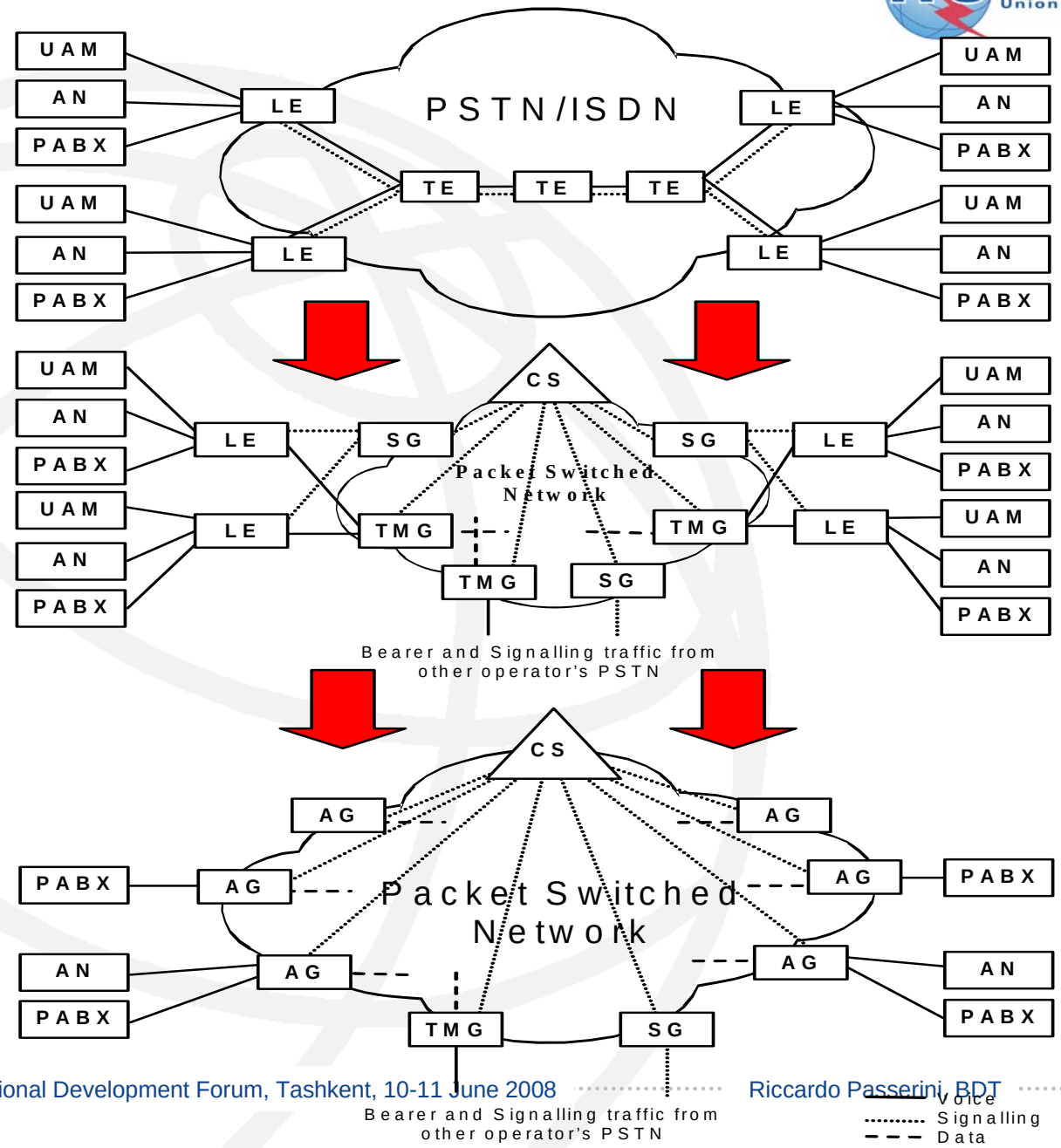
- In this scenario PSTN/ISDN is immediately replaced by the PSN. LEs are connected to SGs and TMGs first, then they are eliminated.

Scenario 2 – Immediate use of PSN, initially via SGs and TMGs

- **Step 1**
- In this step PSTN/ISDN is replaced by PSN and the TE functions are performed by the TMGs and the SGs under the control of the call server (CS). The local exchanges (LEs) are connected to the PSN via transit media gateways (TMGs) and Signalling Gateways (SGs). The Transit and Signalling Media Gateways (TMGs & SGs) are also deployed for interconnection between PSN and other operators' PSTNs/ISDNs.

- **Step 2**
- In this step the local exchanges (LEs) and some of the access elements such as user access modules (UAMs) and remote user access modules (RUAMs) are removed and their functions are provided by the access gateways (AGs) and call server (CS). The private automatic branch exchanges (PABXs) are directly connected to access gateways (AGs). The access networks (ANs) are either replaced by the access gateways (AGs) or are connected to the access gateways (AGs). The transit and signalling gateways (TMGs & SGs) are deployed for interconnection between PSN and other operators' PSTNs/ISDNs. The access and the transit (AGs & TMGs) are all controlled by call server (CS).

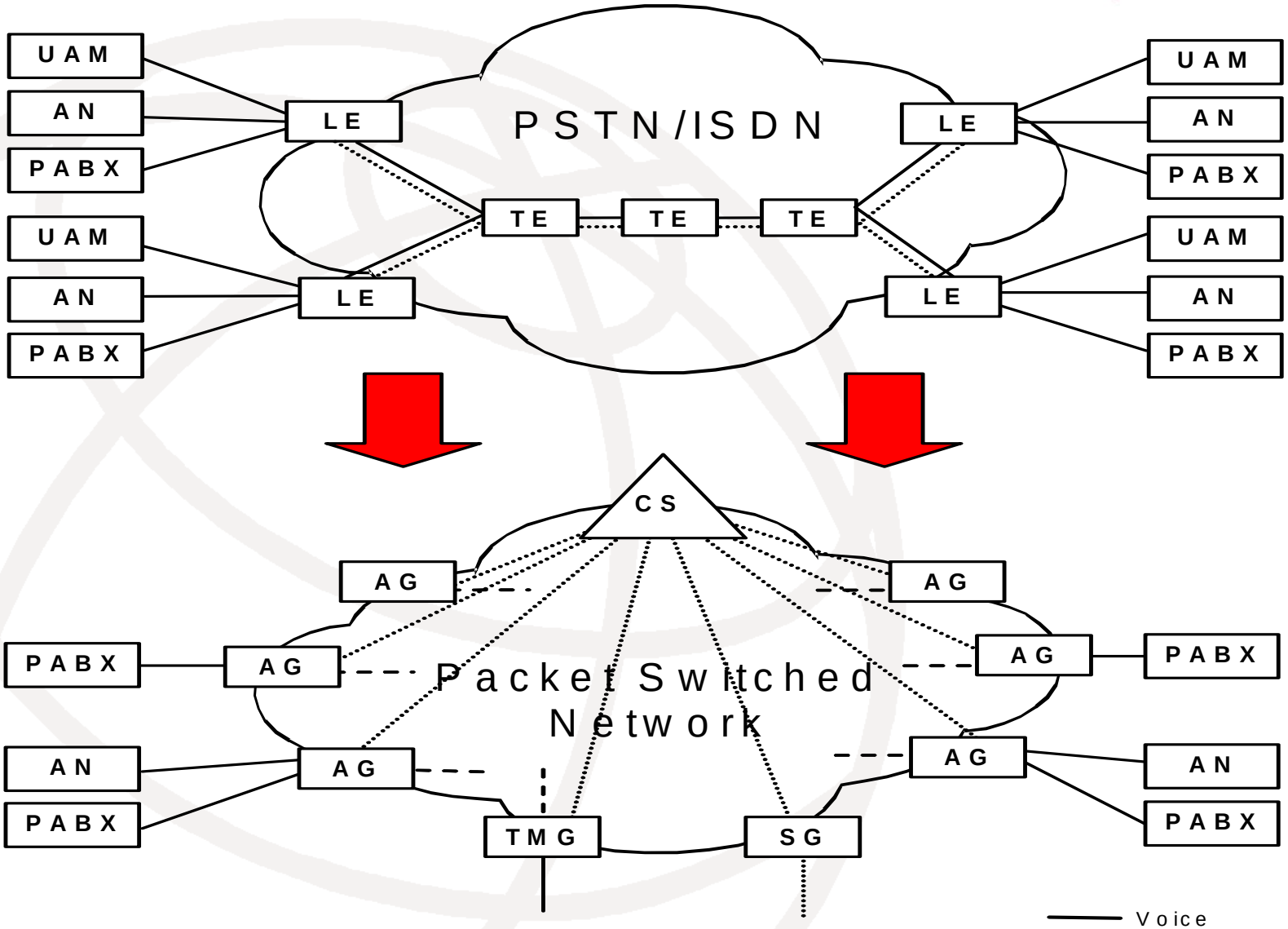
Scenario 2: immediate use of PSN



Scenario 3 – The one-step approach

- In this scenario the PSTN/ISDN is replaced with packet switched network (PSN) in only one step. The local exchanges (LEs) are replaced by the access gateways (AGs) and their functions are divided between the AGs and the call server (CS). Specifically the call control and accounting functions are all transferred to the call server (CS). All access elements such as user access modules (UAMs), remote user access modules (RUAMs), and private automatic branch exchanges (PABXs) are connected to access gateways (AGs). The access networks (ANs) are either replaced by the access gateways (AGs) or are connected to packet based network (PBN) through the AGs. The transit gateways (TMGs) under the control of the call server (CS), and the signalling gateways (SGs), are deployed to replace the TE functions and provide interconnection between PSN and other operators' PSTNs/ISDNs.

Scenario 3: one-step approach



Examples: Access Network evolution

Evolution of xDSL access to NGN

Evolution of Access Network is shown in three possible steps.

Step 1

- Traditional AN/UAM interfaces include: POTS, ISDN and V5.1/2 [G.964] and [G.965]. Such interfaces connect subscribers to the core PSTN/ISDN via LE.
- Legacy voice users may also have access to broadband services for example via xDSL (see [G.995.1]). In this case, the customer-located equipment is an xDSL modem and the service provider equipment is a digital subscriber line access multiplexer (DSLAM). Since xDSL interfaces enable users to connect to the Internet, these interfaces may be utilized to connect such users to NGNs.
- AN, for another user domain with V5.x [G.964] and [G.965] interface can be left as it is shown in Figure I.6 or it can be completely replaced by AG connected to NGN directly.

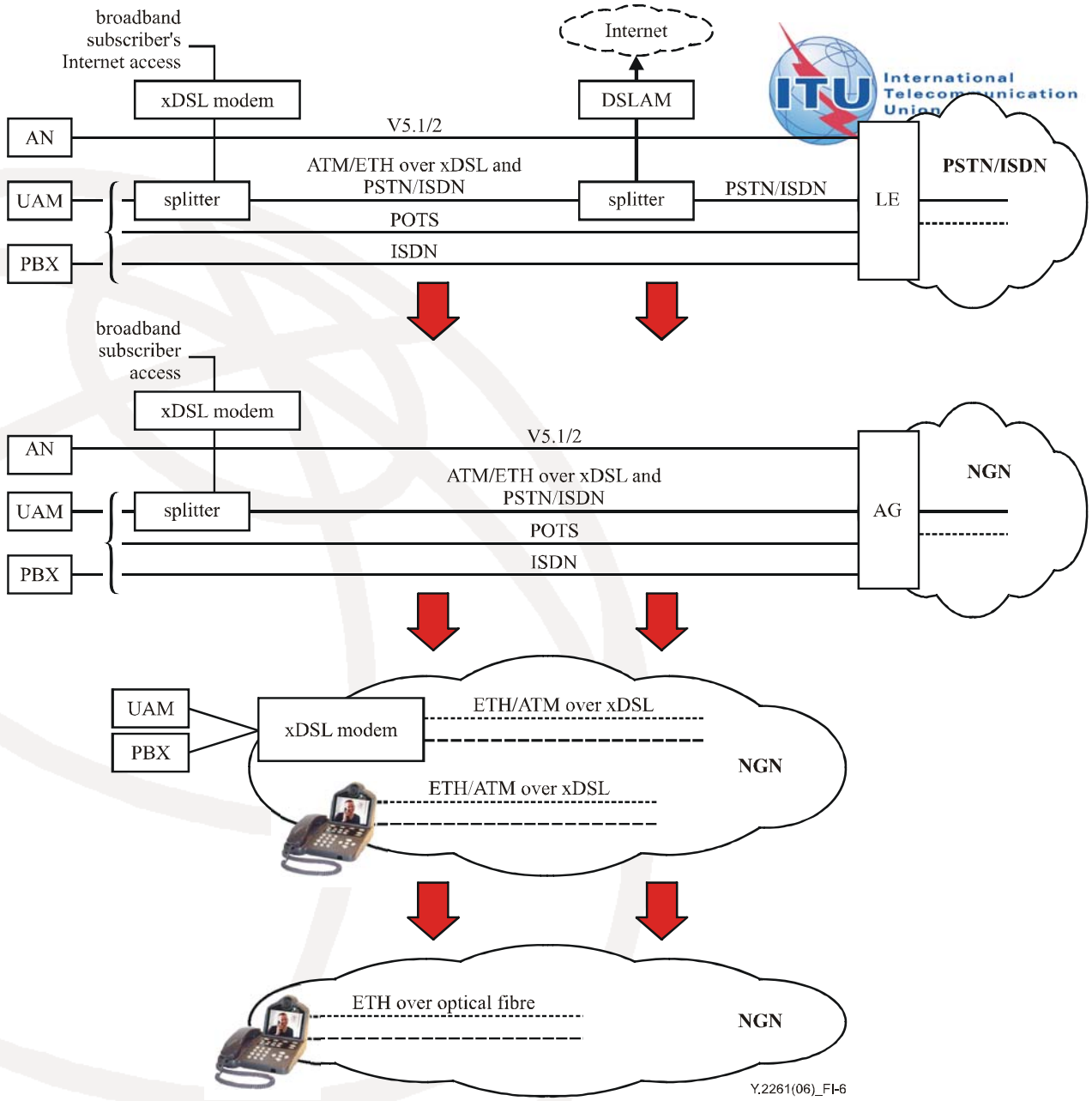
Step 2

- The xDSL modem supports legacy subscribers and may enable them broadband access to NGN. An IP user may also use xDSL interface as the transport medium to an NGN. Protocol for xDSL interface may be Ethernet which enables broadband data flows and services, e.g., VoD, IPTV, VoIP and Internet.

Step 3

- In this step, the legacy end systems are replaced by NGN end systems and twisted copper lines are replaced by optical fibre, either fibre-to-the-curb (FTTC) or fibre-to-the-home (FTTH) to increase transmission speed. Protocol for this transmission medium may be Ethernet.

Evolution of xDSL access to NGN



Definitions and Abbreviations

Terms and Definitions

- **Media Server (MS):** A network element providing the media resource processing function for telecommunication services in NGN.
- **AG:** Access Gateway, that allows end users with various accesses (e.g., PSTN, ISDN, V5.x) connection to the packet node of NGN
- **Remote User Access Module (RUAM**): A unit that physically terminates subscriber lines and converts the analogue signals into a digital format. The RUAM is physically remote from the Local Exchange.
- **User Access Module (UAM):** A unit that physically terminates subscriber lines and converts the analogue signals into a digital format. The UAM is collocated with a Local Exchange, and is connected to the Local Exchange.
- **Trunking Media Gateway (TMG):** A unit that provides interfaces between the packet node of NGN and the circuit-switched nodes (e.g. transit exchange, local exchange, international exchange) of PSTN/ISDN for bearer traffic
- **Signalling Gateway (SG):** A unit that provides out-of-band call control signalling conversion between the NGN and other networks (e.g., between a call server in NGN and an STP or SSP in SS7)

Abbreviations and acronyms

- This draft uses the following abbreviations.
- ACS Access Call Server
- AG Access Gateway
- AS Application Server
- AN Access Network
- ATM Asynchronous Transfer Mode
- BCS Breakout Call Server
- BICC Bearer Independent Call Control
- BTV Broadband TV
- CAS Channel Associated Signalling
- CBR Constant Bit Rate
- CC Content of Communication
- CCS Common Channel Signalling
- CDR Call Detail Record
- CPE Customer Premise Equipment
- CS Call Server
- DSL Digital Subscriber Line
- DSLAM Digital Subscriber Line Access Multiplexer
- ETS Emergency Telecommunications Services
- FTTC Fibre-To-The-Curb
- FTTH Fibre-To-The-Home
- GCS Gateway Call Server
- GoS Grade of Service
- ICS Interworking Call Server
- IMS IP Multimedia Subsystem
- IN Intelligent Network
- INAP Intelligent Network Application Part

Definitions and Abbreviations (cont.)

IP	Internet Protocol
IRI	Intercept Related Information
ISDN	Integrated Service Digital Network
LE	Local Exchange
LEA	Law Enforcement Agencies
LL	Leased Line
MS	Media Server
OSS	Operations Support System
PABX	Private Automatic Branch Exchange
PCM	Pulse Code Modulation
POTS	Plain Old Telephone Service
PRI	Primary Rate Interface
PSAP	Public Safety Answering Point
PSN	Packet Switched Network
PSTN	Public Switching Telephone Network
QoS	Quality of Service
RUAM	Remote User Access Module
SCE	Service Creation Environment
SCP	Service Control Point
SG	Signalling Gateway
SIP	Session Initiation Protocol
SSF	Service Switching Function
SSP	Service Switching Point
STP	Signalling Transfer Point
TDM	Time Division Multiplexing
TDR	Telecommunications for Disaster Relief
TE	Transit Exchange
TMG	Trunking Media Gateway
TMN	Telecommunication Management Network
UAM	User Access Module
VOD	Video On Demand
VoIP	Voice over IP
xDSL	any DSL

Question Q.19-1/2

Strategy for migration from existing networks to next-generation (NGN) for developing countries

Results Anticipated Including Titles of Output Documents and Their Target Dates

The Results and the Target Dates Proposed for the 2006-2010 Period Are Proposed to Be:

DATE	ACTIVITY/EXPECTED OUTPUT	PERSON RESPONSIBLE
September 2007 (SG2 meeting)	a), b), c) and d) first yearly report focusing on case studies and best practices from developing countries as well as developed countries on migration towards NGN	Rappoorteur's Group

Results Anticipated Including Titles of Output Documents and Their Target Dates (Cont'd)

DATE	ACTIVITY/EXPECTED OUTPUT	PERSON RESPONSIBLE
Sep-08	a), b), c) and d) second yearly report with draft guidelines for developing countries on migration towards NGN	Rappoorteur's Group
Sep-09	a), b), c) and d) Draft final report with guidelines for developing countries on migration towards NGN	Rappoorteur's Group
Nov-09	a), b), c) and d) Finalizationof Report with guidelines for developing countries on migration towards NGN (1)	Rappoorteur's Group

Liaison Required With Other Groups

Question 19-1/2 will liaise closely with related BDT programmes, ITU-T in particular SG13 and ITU-R SGs involved in NGN studies, ITU-D Q.10-2/2, Q.18-1/2, Q.20-2/2 and Q.6-2/1, Q.7-2/1, Q.19-1/1.

Virtual or face-to-face meetings will be held at a minimum of once per year in order to accomplish the work plan

Working Methods

- Concerning the expected outputs, status reports will be presented each year to the Study Group 2 Management Team as well as to the Study Group 2 PlenaryMeeting.
- The final Report will be concluded and presented during the September 2009 Study Group Plenary Meeting.

Contributions

- Contributions in response to the work of Question 19-1/2 are invited.
- Contributions should be sent to the Rapporteur's Group.
- Those interested should get in touch with the following; (to have their names included in the distribution list of the Rapporteur's Group) riccardo.passerini@itu.int