

**ITU Workshop on Tariff Policies, Tariff Models
and Methodologies for the determination of
costs of services provided with NGN
Geneva, September 8, 2008**

**The Architecture of NGN and
ITU-D SG2 Q19-1/2 on
“migration from existing networks to NGN
for developing countries”**

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Presentation Outline

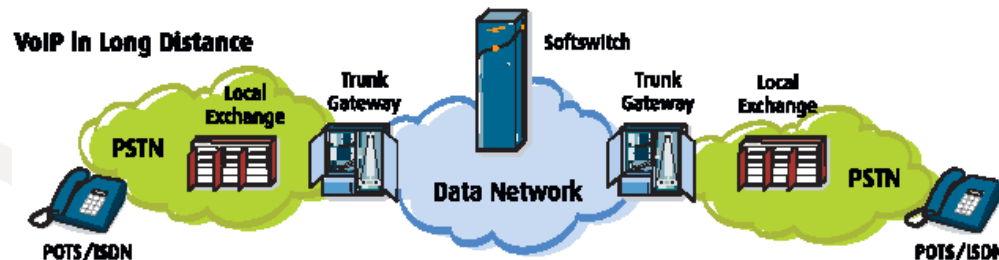
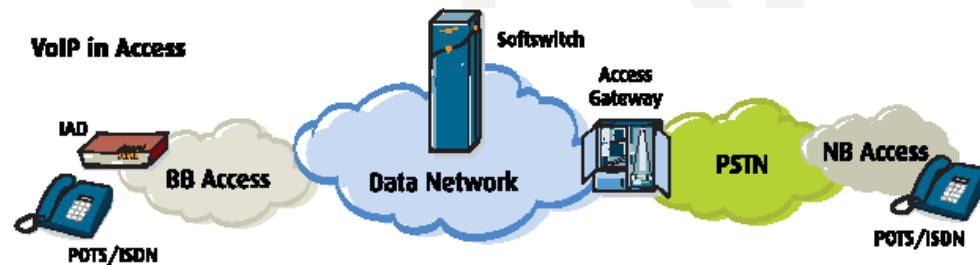
- **NGN and its « building blocks »**
- **A view of ITU-T proposed migration scenarios**
- **Q19-1/2**

Why NGN... After All ?

- NGN *will not* come as a sudden thunder in a blue sky !
- Essential “building blocks”:
 - Voice over IP
 - Broadband access
 - Multiple Services with Broadband access (triple play,...)
 - And...in many developing countries the necessity to have a *national* backbone with enough capability
- NGN architecture is a « natural consequence » of the above building blocks:
 - It systemizes and generalizes the offer of *any service* from a *single* network over *any kind of access* and,..
 - It dramatically improves overall *network efficiency* and reduces OPEX costs

Building Blocks (1): Voice over IP

- Voice over IP is no more a « hacker's gadget » to circumvent « regular » voice service at a cheaper price!
 - Offered with broadband access with the same quality of service and using a legacy numbering plan (E.164)
 - Offered by newcomers as well as incumbents
 - Largely used for long distance traffic
 - Robust SoftSwitch technology



Source: Alcatel

Building Blocks (2): Broadband Access

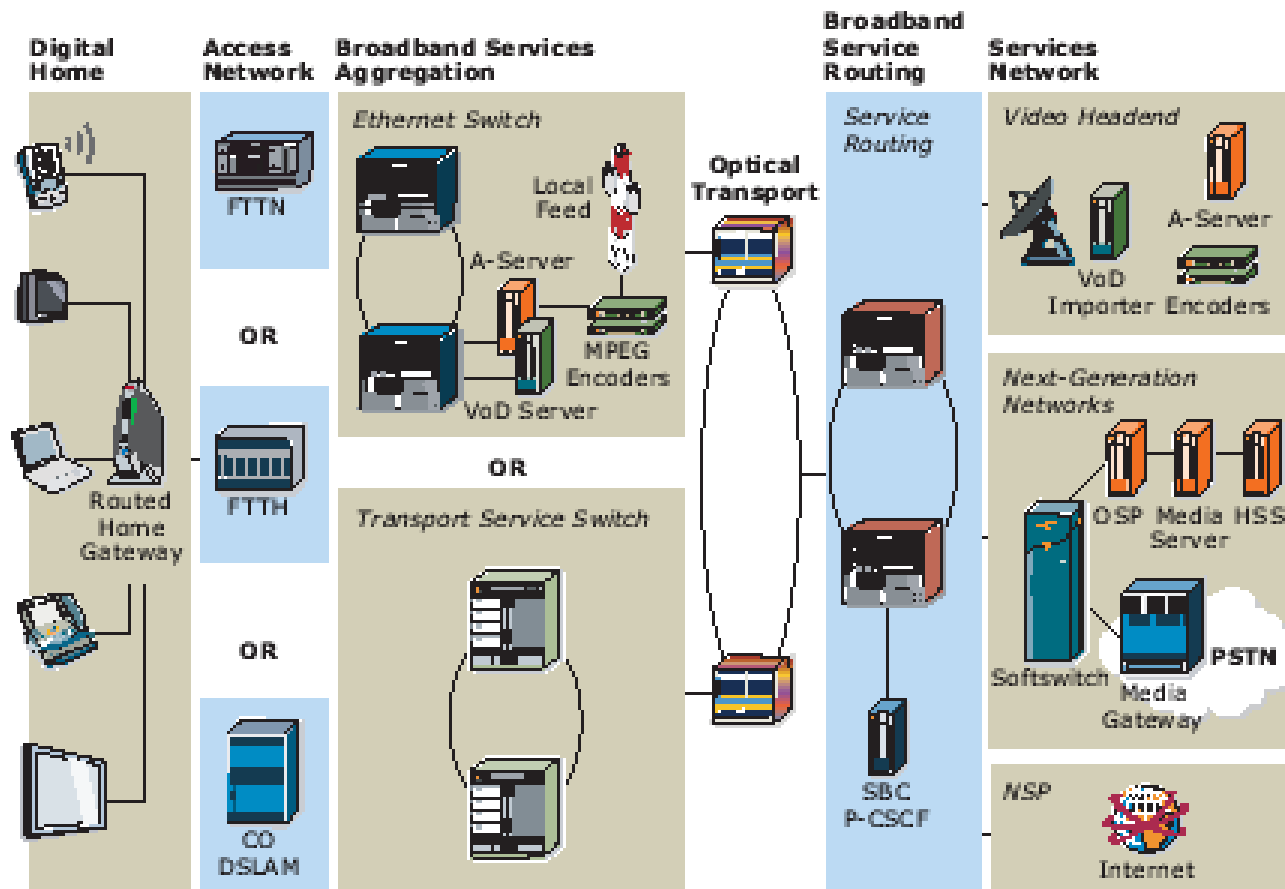
- Universal broadband access is now available in *many* technological flavors:
 - Wireline: DSL, Fiber, Cable
 - Wireless: 2G+, 3G and WiMAX with ultimately LTE 4G
- Do not discard *any* technology !
 - Pragmatic approach adapted to *local needs and context*
 - Wireless for rural/suburban areas but also urban areas for mobile broadband (high-end users)
 - Wireline when copper is available (DSL) but also for new buildings and neighborhoods (Fiber)
- Rule of thumb: at any given time the best wireline access provides 10x bandwidth of the best wireless access
 - Radio is wonderful but it is a limited and scarce resource!

Building Blocks (3.1): Triple play and...more

- **Broadband “access pipe” leveraged to provide TV and Voice in addition to Internet access**
 - Recent development of Quad-play involving mobile access when subscribers leaves his home network
 - And...likely more to come
- **Triple-play is above all an *innovative marketing* to develop broadband take-up among « non-techie » customers seeking a good bargain for their “global telecom bill”:**
 - Example: figure of 29.99€/month all inclusive in France!
- **High Definition TV seen as the lever for FTTH/x**
- **Triple-play is the *first step* towards a multi-service NGN-like architecture**

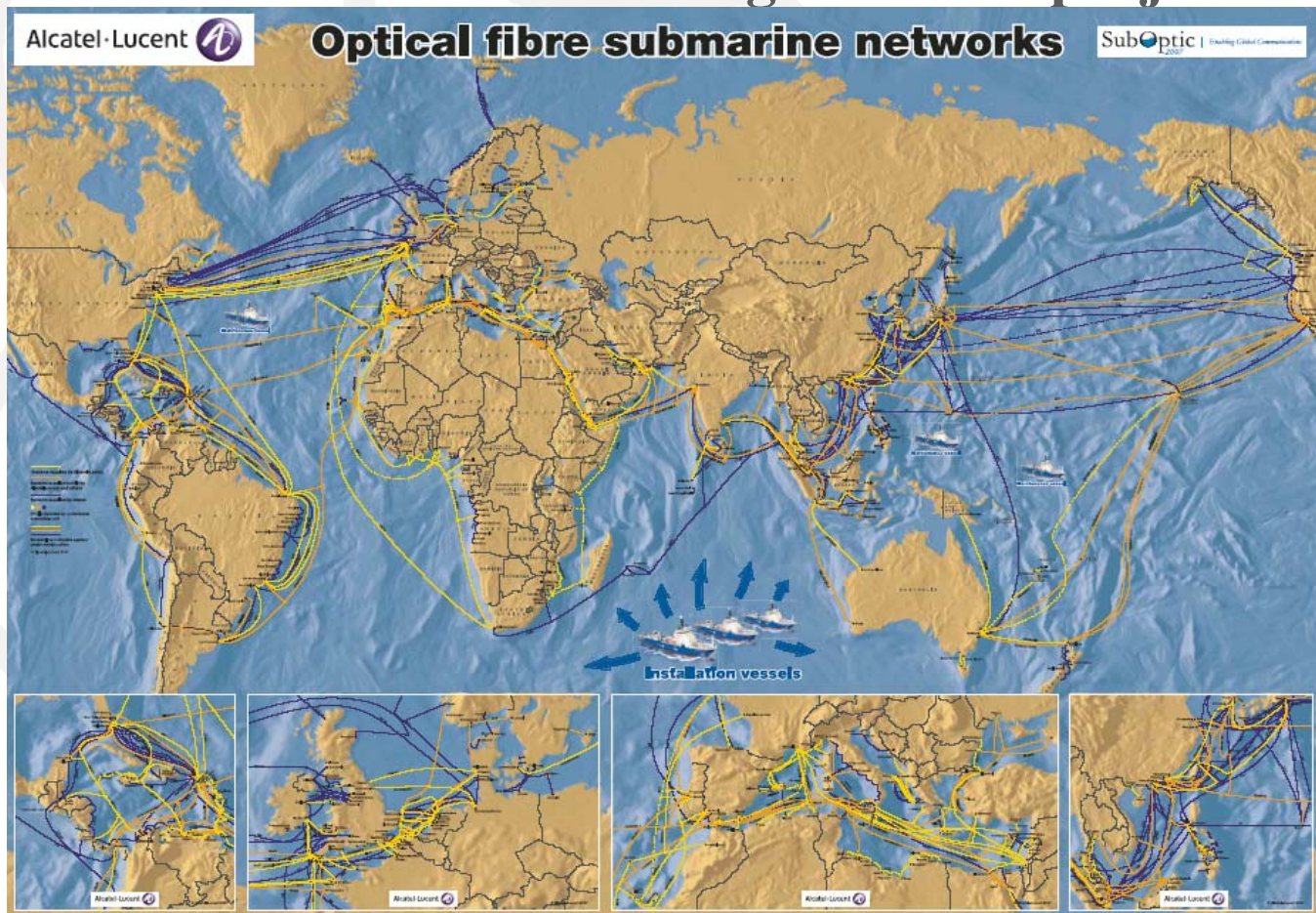
Building Blocks (3.2): Triple play and...more

- Sample technical architecture



Building Blocks (4.1): Backbones

- The planet is full of International Fiber Submarine cables and the sector is booming with new projects!



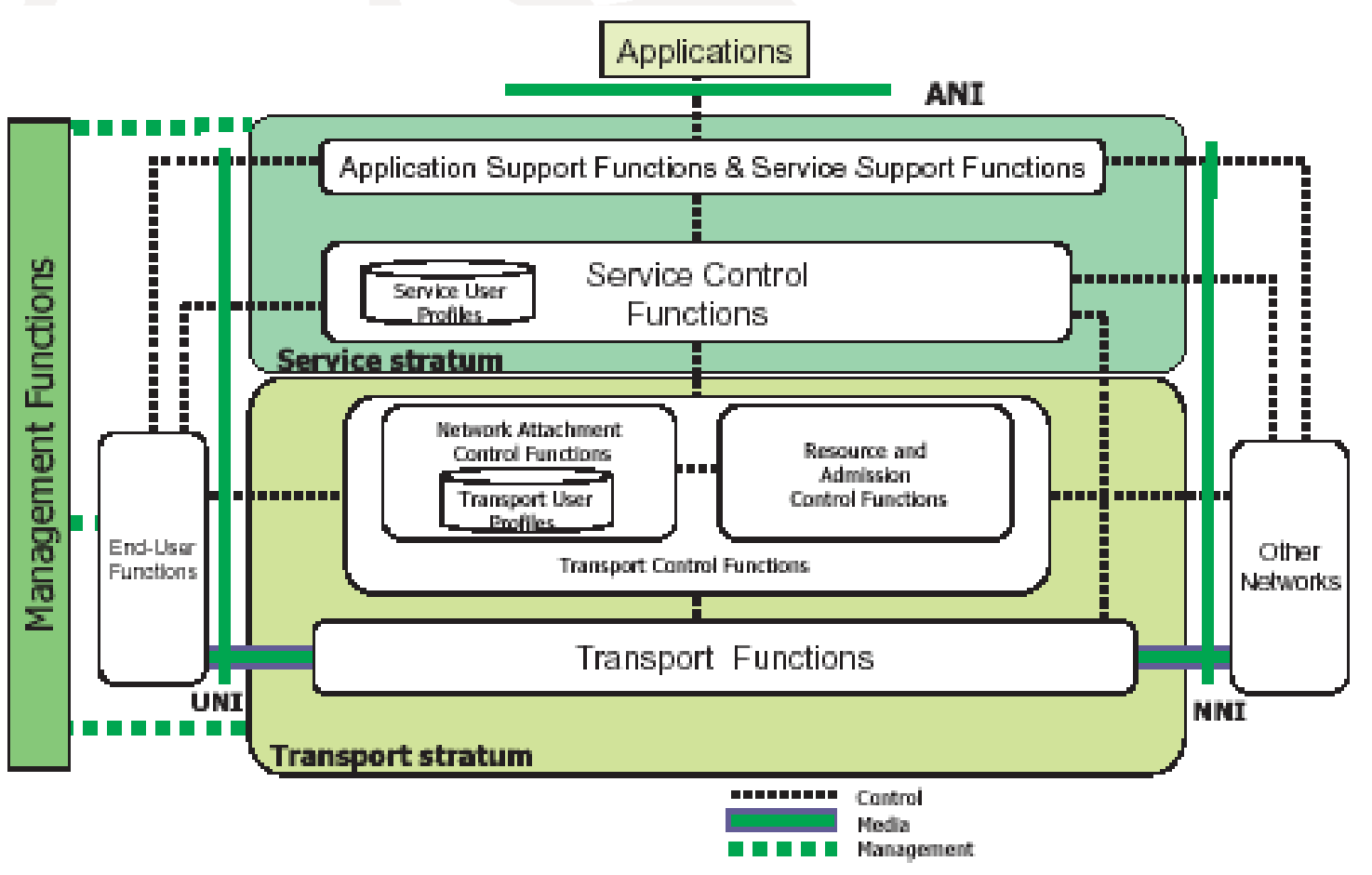
Building Blocks (4.2): Backbones

- But the « devil hides in the details » and the crux is the lack of a *national* (Fiber) Backbone in many developing countries!
- Possible solution:
 - *Infrastructure sharing* on the basis of an “*open access model*” to develop national Fiber Backbone in developing countries
 - Open access means that the *owner* of the “bottleneck facility” *does not* compete in the downstream market
- Sharing could take place at any level of the Fiber:
 - Physical: Ducts, Poles, Dark Fiber, RF Channels
 - Transport: ATM PVC, Ethernet VLANs
 - Services: VPNs
- For more details see discussion paper at ITU’s 8th GSR
 - <http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR08/papers.html> (paper N° 2).

NGN Architecture: A bit of History

- **Introduced first by 3GPP for 3G mobile (UMTS) networks: IP Multimedia Subsystem (IMS).**
 - **Release 5 of UMTS specifications**
- **Extended to xDSL fixed access by ETSI TISPAN architecture**
 - **Release 1 of TISPAN architecture**
- **Work on ITU-T that leverage and generalizes the above efforts with a more ambitious and telecom-minded perspective**
 - **Release 1 of ITU-T NGN architecture**
- **All architectures share the same principles of layered separation between transport and control.**

NGN Architecture: Functional view of ITU-T Release 1



Presentation Outline

- NGN and its « building blocks »
- **A view of ITU-T proposed migration scenarios**
- Q19-1/2

Some Terminology

- **Evolution to NGN:** A process in which *whole* or *parts* of the existing networks are *replaced* or upgraded to the corresponding NGN components providing *similar or better* functionality, while attempting to *maintain* the services provided by the original network and the possibility of *additional capabilities*
 - From ITU-T specification Y.2261: PSTN/ISDN Evolution to NGN.
- **Migration to NGN** synonymous to evolution to NGN
- **SoftSwitch and Call Server** terms synonymous

The NGN Migration Problematic

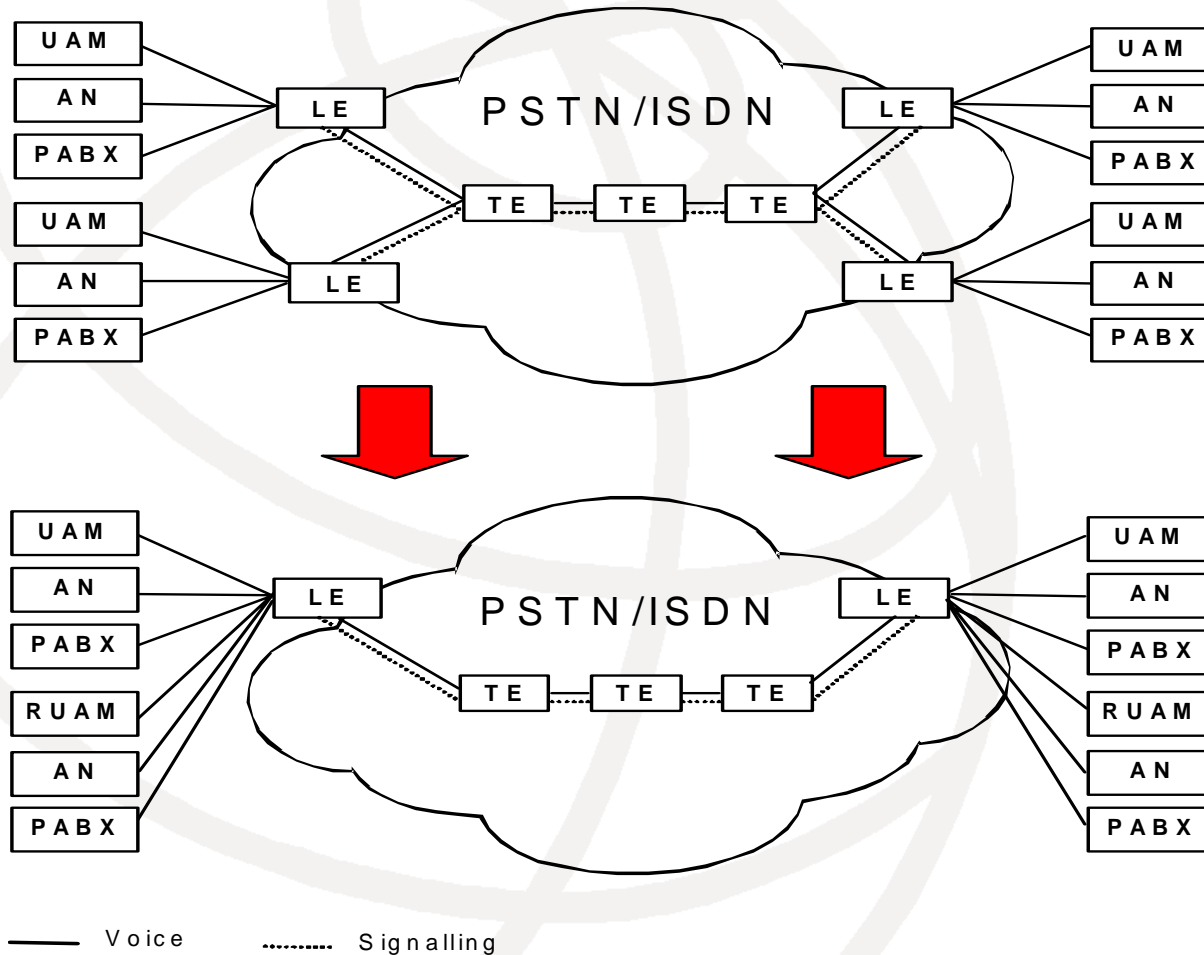
- **Developing countries characterized by:**
 - **Growth of their voice service market**
 - **Dilemma to grow with legacy PSTN/ISDN or with NGN**
 - **Inter-working with existing legacy equipment**
 - **Seamless continuity of services**
- **Plus the possibilities offered through NGN migration to grow new markets (broadband, triple-play) and enrich infrastructure competition between distinct access platforms**
- **Need for a *phased* approach for operators with existing *legacy* equipment**
 - **Example scenarios from specification Y.2261**

Migration Scenarios Envisaged by Y.2261

- **Call Server (SoftSwitch) based approach of the Core network with three variants (scenarios):**
 - **Scenario 1: Migration starts from Local Exchanges (LE)**
 - **Scenario 2: Migration starts from Transit Exchanges (TE)**
 - **Scenario 3: One-step approach**
- **One step evolution of the core network to IP Multimedia Subsystem (IMS)**
- **xDSL Access network evolution to NGN**

Core network consolidation before migration

- Reduce number of LE and transfer of affected user access modules (UAM), Private Automatic Branch Exchanges (PABX) and Access Network to remaining LEs.



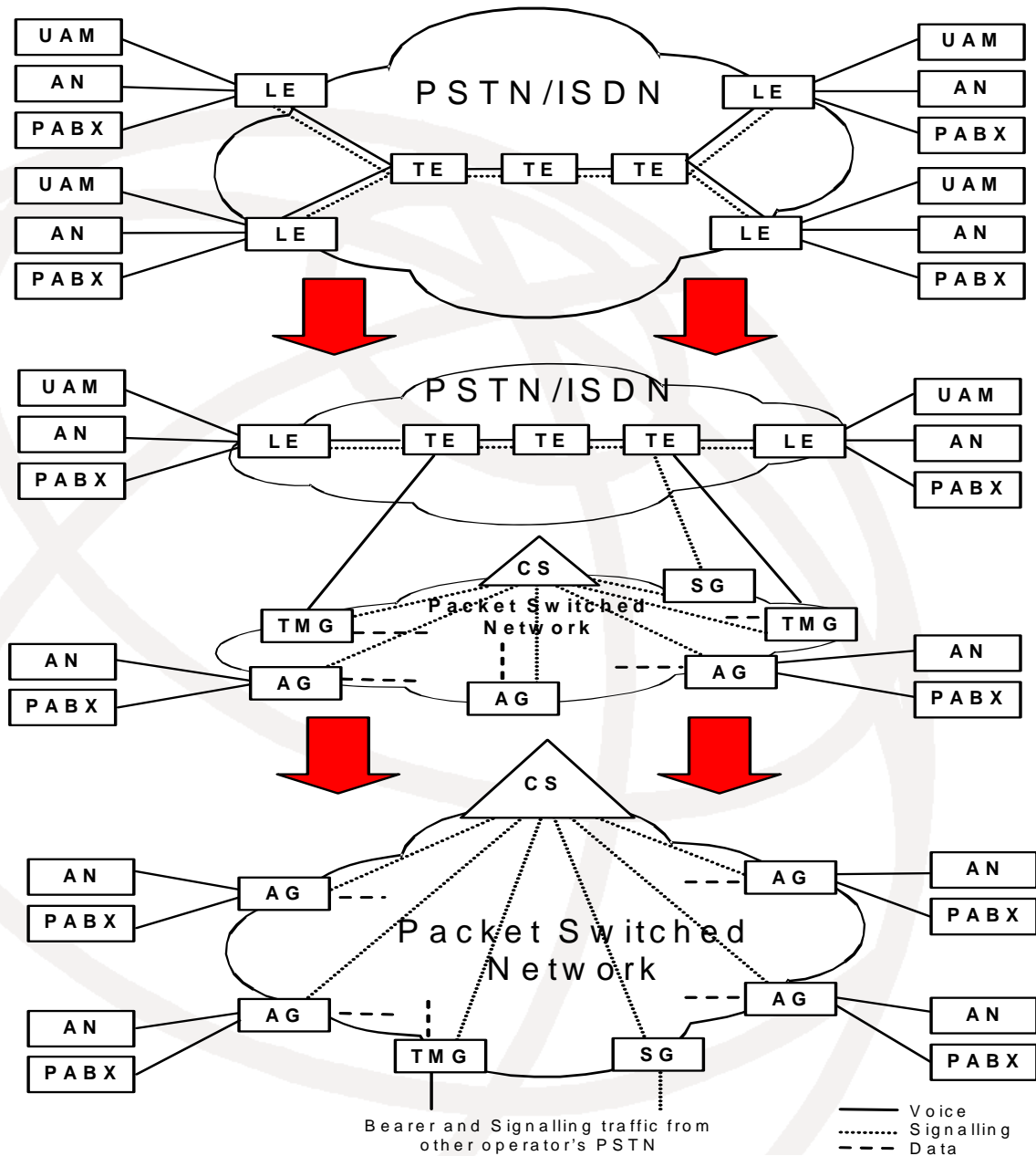
Scenario 1: Migration from LE

■ Step 1

- Some of the LEs are replaced by Access Gateways (AG) controlled by a Call Server (CS).
- Access elements originally connected to the removed LEs, are now directly connected to AGs : PABXs and Access Nodes (AN).
- User Access Modules Functionality (UAM) assumed by AG and CS.
- Trunking Media Gateways (TMG) and Signaling Gateways (SG) are deployed for interconnection between the PSN and the TEs of the legacy network as well as other operators' PSTNs/ISDNs.
- AGs and TMGs are all controlled by the CS.

■ Step 2

- Remaining LEs are replaced by the AGs,
- Transit Exchanges (TE)s are removed and their control functions are performed by CS.
- TMGs and SGs are deployed for interconnection between PSN and other operators' PSTNs/ISDNs.
- AGs and TMGs are all controlled by the CS.



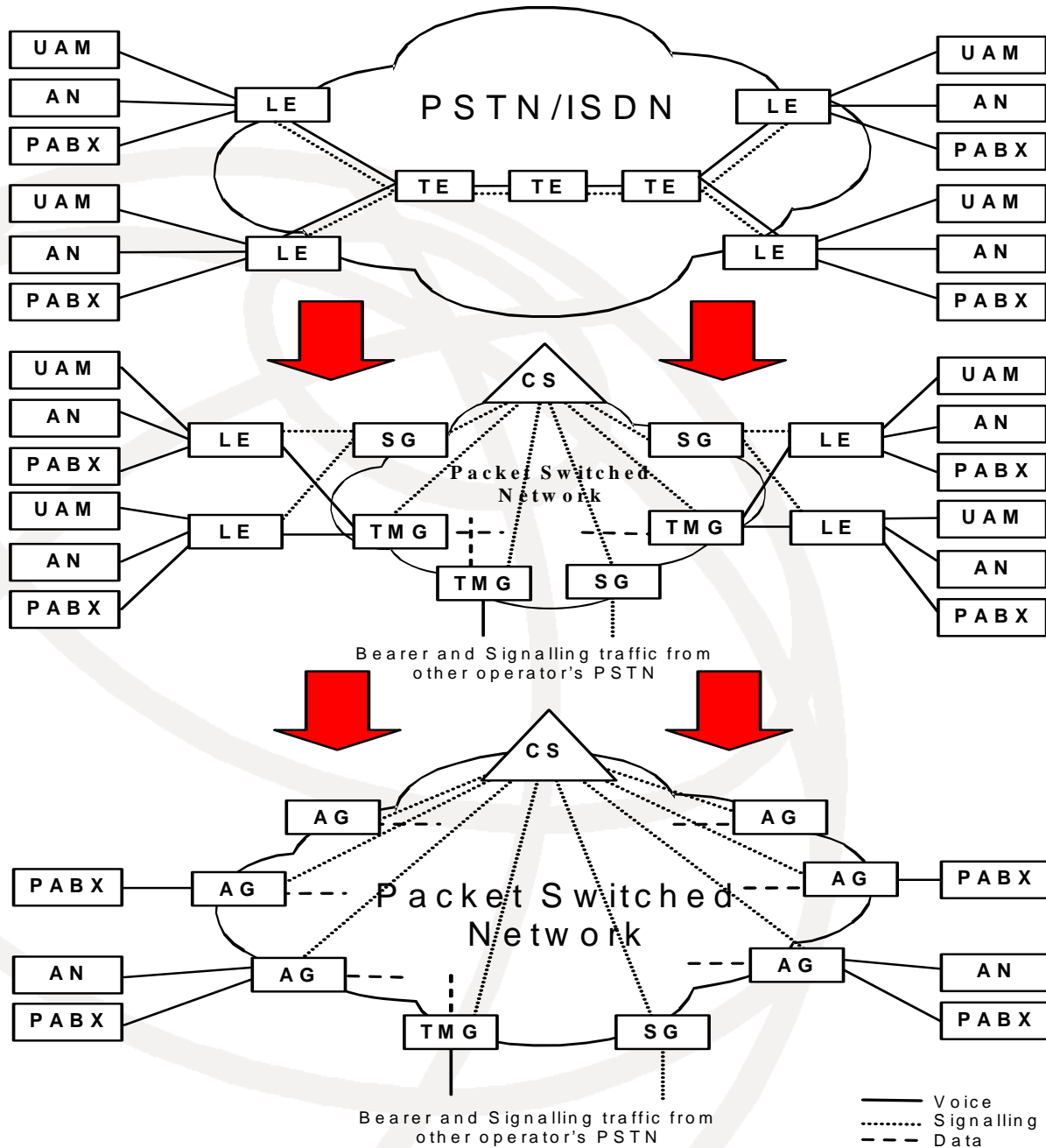
Scenario 2: Migration from TE

■ Step 1

- **All TE functions are performed by the TMGs and the SGs under the control of the CS.**
- **LEs are connected to the Packet Switched Network (PSN) via TMGs and SGs.**
- **TMGs & SGs are deployed for interconnection between PSN and other operators' PSTNs/ISDNs.**
- **AGs & TMGs are all controlled by CS.**

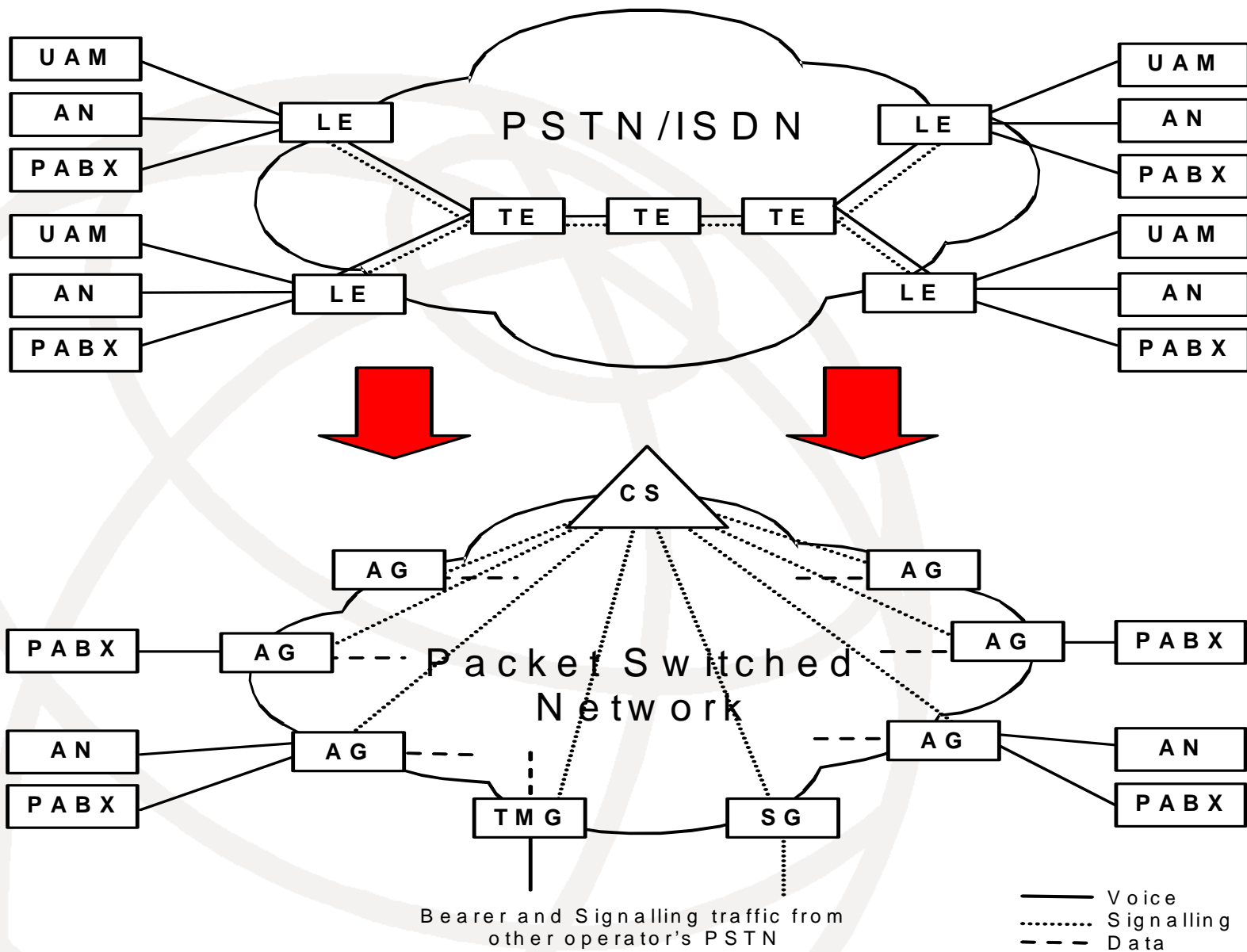
■ Step 2

- **All LEs are replaced by AG controlled by CS**
- **Access elements originally connected to the removed LEs, are now directly connected to AGs : PABXs and Access Nodes (AN).**
- **User Access Modules Functionality (UAM) assumed by AG and CS.**
- **TMGs & SGs are deployed for interconnection between PSN and other operators' PSTNs/ISDNs.**
- **AGs & TMGs are all controlled by CS.**



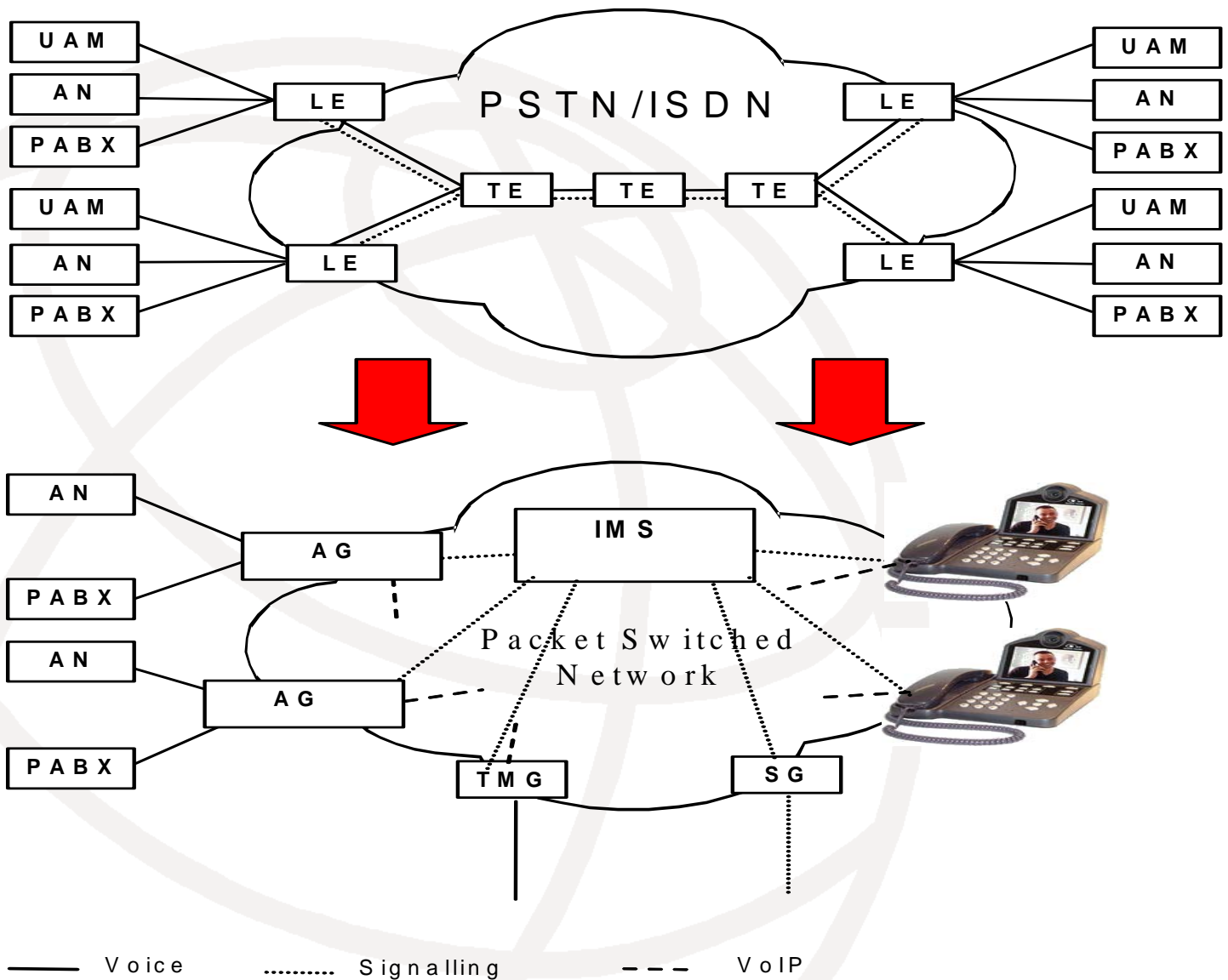
Scenario 3: One-Step Approach

- **LEs are replaced by the AGs and their functions are transferred to the AGs and the 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.**
- **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.**



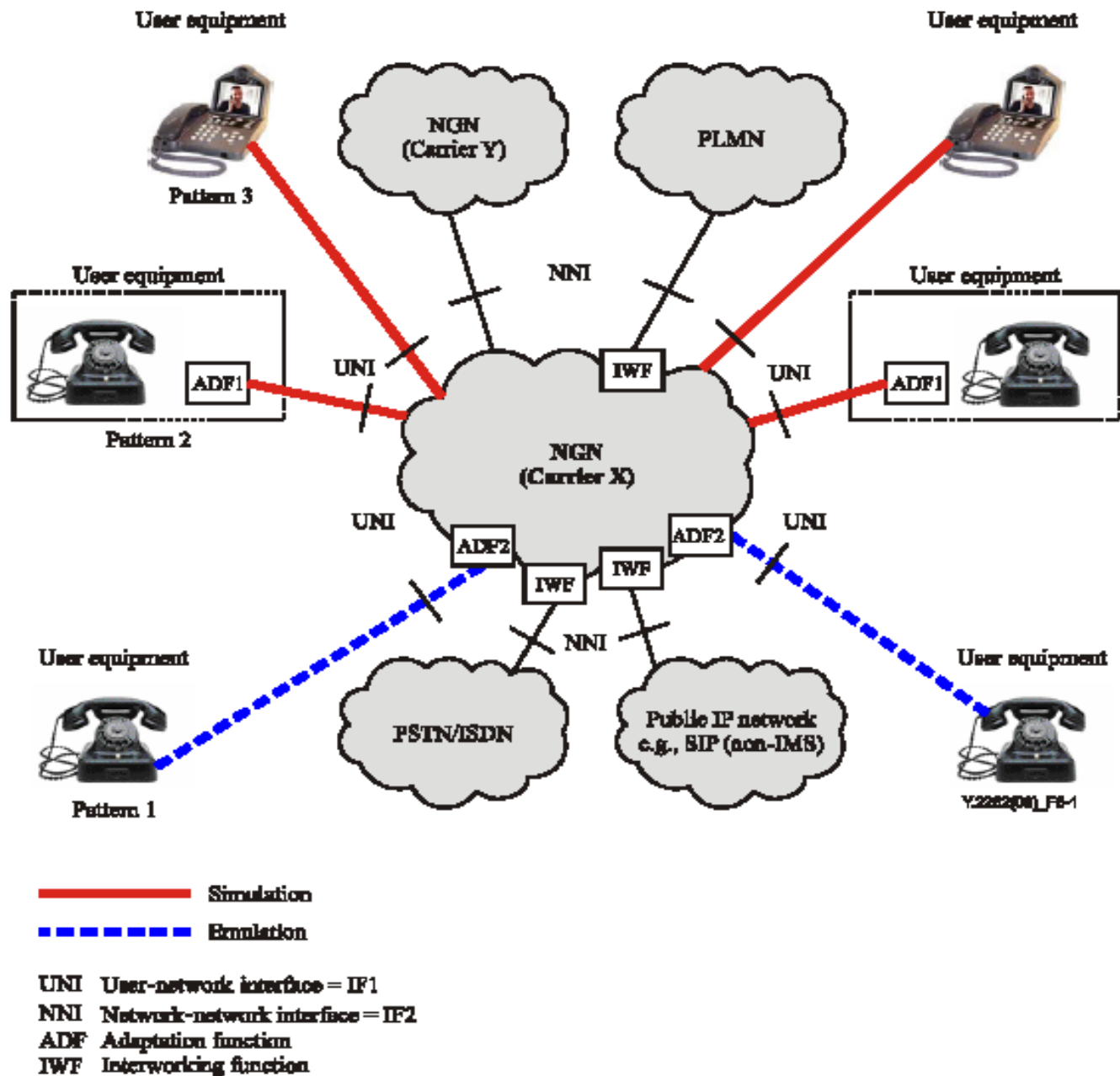
IMS-based evolution to NGN

- PSTN/ISDN evolves directly to a PSN based on the IMS core network architecture.
- End-users access the network using NGN user equipment or legacy user equipment connected via an AG.
- 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 recommendation Y.2261.



What remains of the PSTN/ISDN services: Emulation or Simulation ?

- *Emulation* refers to the Provision of *most of* the existing PSTN/ISDN service capabilities and interfaces using adaptation to an IP infrastructure.
 - Only a *sub-set* of PSTN/ISDN could be supported.
- *Simulation* refers to the same service provision as above but there is *no guarantee* that all features are provided.
 - *New features and capabilities* may be provided with respect to legacy PSTN/ISDN.
- Specification Y.2262 specifies two types of adaptation functions (ADF) for legacy access equipment
 - ADF1 for simulation
 - ADF2 for emulation

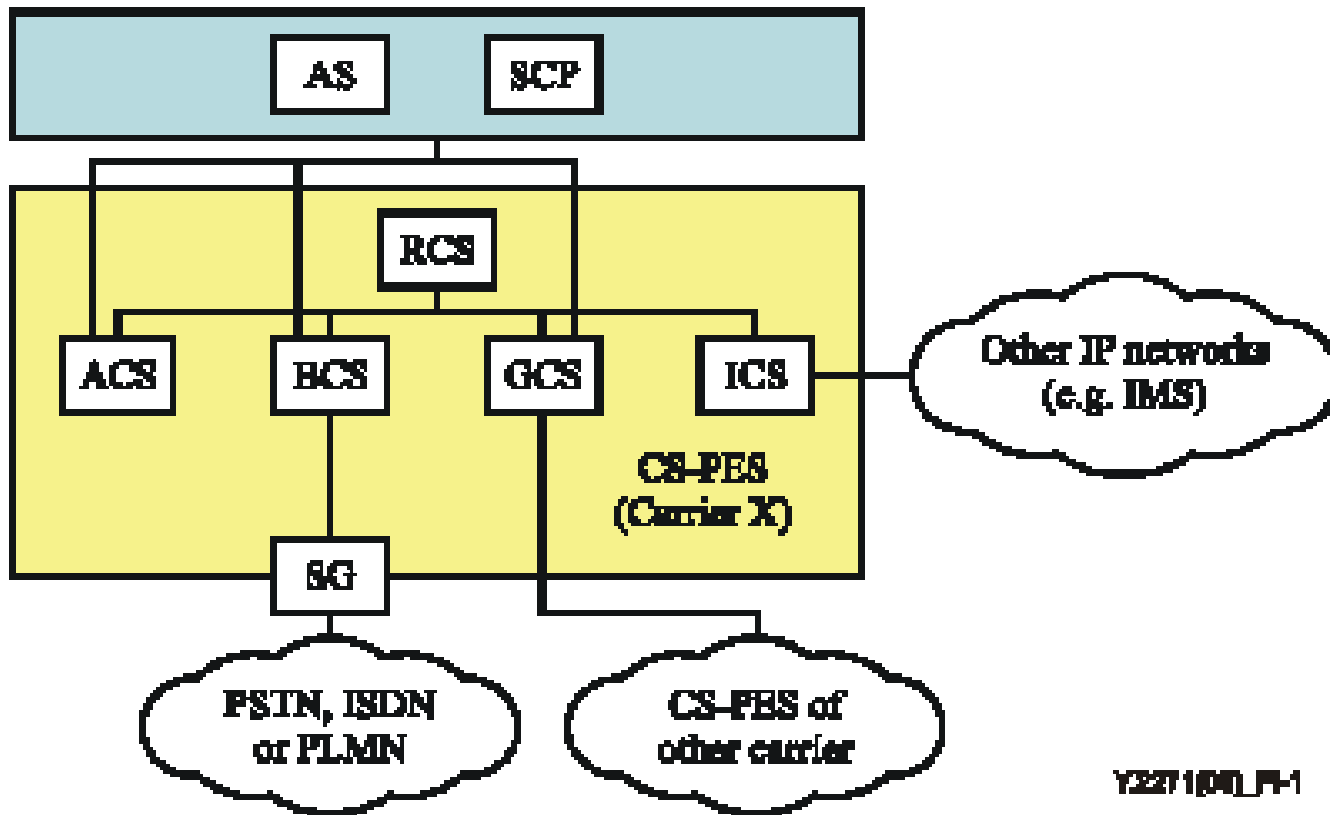


Emulation is complex:

Call Server-based PSTN/ISDN Emulation Service (CS-PES) Components

- **Access Call Server (ACS)**
 - Controls Access Gateways (AG), subscriber registration and call control
- **Breakout Call Server (BCS)**
 - Controls Trunking Media Gateways (TMG) to interwork with PSTN/ISDN
- **IMS Call Server (ICS)**
 - Controls interconnection Border Gateway to interwork with Packet-based networks (NGN, IP Multimedia, Internet)
- **Gateway Call Server (GCS)**
 - Ensures interoperability between among CS-PESs to provide end-to-end services
- **Routing Call Server (RCS)**
 - Provides routing function between call servers

Emulation Call Server



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Question 19: History

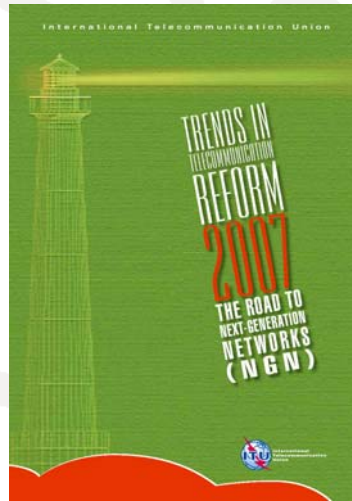
- First established during study period 2002-2006 and re-conducted for the 2006-2010 period
- Renewed interest from ITU member countries:
 - Cross-cutting theme in most of BDT programs (WTDC-06, Doha)
 - Resolutions 101 and GT-PLN/3 at PP-06 in Antalya
- But... dramatic lack of contributions and participation of developing countries delegates to the Question's meetings !
 - Lack of expertise ?!
 - Lack of awareness of the question's urgency ?!
 - Lack of resources allocated to NGN issues ?!
 - Probably a mixture of all of the above !

Question 19: Agenda and Expected Outcomes

- Agenda
 - Trends of Telecommunication networks
 - Examination of NGN technologies
 - Methodologies and Planning
 - Migration solutions to NGN
- Outcomes
 - Yearly progress report
 - Report on methodologies and planning
 - Set of guidelines for migration from existing networks to NGN

Achievements to Date

- **An analysis of NGN technology and migration**
 - **Chapter 3 « NGN technologies » of ITU « Trends in Telecom Reform: The road to Next Generation Networks »**



- **A Questionnaire sent to administrations and sector members**
 - See <http://www.itu.int/ITU-D/CDS/gq/sgq19-1-2.html>

Q19 Questionnaire (Posted April 2008): Broadband Access

- **Broadband DSL:**
 - What is the status of DSL deployment in your country/network (number and geographical distribution) ?
 - Are there any unbundling obligations for the last mile copper access ?
 - Specify type of unbundling: full, line sharing, bit stream
- **Broadband Wireless Access (BWA) and Fiber:**
 - Have you deployed or is there any plan to deploy BWA or Fiber ?
 - If yes, what are the targeted areas for each and nature of end-user services ?

Q19 Questionnaire: VoIP & Triple-Play

- **Is VoIP service legal ?**
 - **If No, are you planning to eventually legalize ?**
- **Are you planning to introduce any sort of explicitly branded VoIP services**
- **What services did you provide through broadband access ?**
 - **Are you providing triple (or more) play services over Broadband access ?**

Q19 Questionnaire: NGN Migration (voice) at Transit (Int'l and National)

- **Are you using or planning to use VoIP for Int'l calls?**
 - **If yes, what percentage of incoming/outgoing Int'l traffic is impacted ?**
- **Are you deploying your own SoftSwitches/media gateways or using those of an international VoIP provider?**
- **Do you have a national IP backbone ?**
- **Are you using or planning to use VoIP for national calls (transit level)? What are the reasons of your choice?**
 - **Availability/Unavailability of an IP backbone?**
 - **Irrelevant/lower prices for national calls?**
 - **New/Obsolete legacy PSTN/ISDN equipment?**
 - **Other?**

Q19 Questionnaire: NGN Migration (voice) at Access and IMS evolution

- **Are you using Loop Emulation Service over a DSL access?**
- **Did you migrate to next generation Multi-Service Access concentration equipment (MSAN) associated with a Class 5 SoftSwitch ?**
 - **If yes, is this because of the obsolescence of your legacy equipment?**
 - **What kind of last mile access (FTTH, FTTx, or copper) are you using with your MSAN**
- **What are your views on the maturity of IMS-like architectures and your willingness to move to them?**
 - **If yes, what drivers: new revenues, migration of new customers, other?**

Concluding Remarks (1)

- **Y.2261, Y.2262 and Y.2271 provides some functional guidelines for NGN migration with a focus on emulating existing PSTN/ISDN network**
 - **Scenarios proposed well adapted to the context of legacy operator willing to move their services *as they exist* to NGN**
 - **But a bit less to new entrants: reality of NGN voice services by new entrants leans towards simulation rather than emulation**
- **Developing countries must contribute more effectively to this standardization effort to take into account their specific conditions**
 - **Legacy PSTN/ISDN infrastructure generally more modern than in developed countries but...**
 - **Growth needs more acute: grow with Emulation, Simulation or...leapfrog to IMS ?**

Concluding Remarks (2)

- **The work of Q19-1/2 is well advanced in the first two terms of its agenda**
 - Trends of Telecommunication networks
 - Examination of NGN technologies
- **We have a lack of contributions for the third**
 - Methodologies and Planning
- **In order to properly finalize the fourth (migration solutions) and establish the main outcome (guidelines for migration) we need developing countries contributions at least through answers to the questionnaire**
- **This question illustrates the fact that developing countries participation not only needed to bridge the standardization gap but also to contribute to pertinent standardization adopted to their needs**
 - **The best experts of developed countries cannot help you if you do not contribute to questions that primarily concerns you!**



Thank you for your attention!

Questions ?

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