**ITU-D Regional Development Forums 2010 on
NGN and Broadband for the Arab Region**
*"NGN and Broadband, Opportunities and
Challenges"*

**NGN Migration Strategies and Scenarios per
Network Segment**

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Agenda

- **Technology migration issues**

- **Migration strategies per network segment**

- **Main steps for IMS and NGSS**

NGN Migration Strategy
Issues for migration planning

• **Where to start migration?**

• **Which topologies and connectivity are required?**

• **How network segments change in access , local and core?**

• **Which level of protection to assure?**

• **Where to locate new functionalities?**

• **How to ensure service continuity?**

• **Others .....**

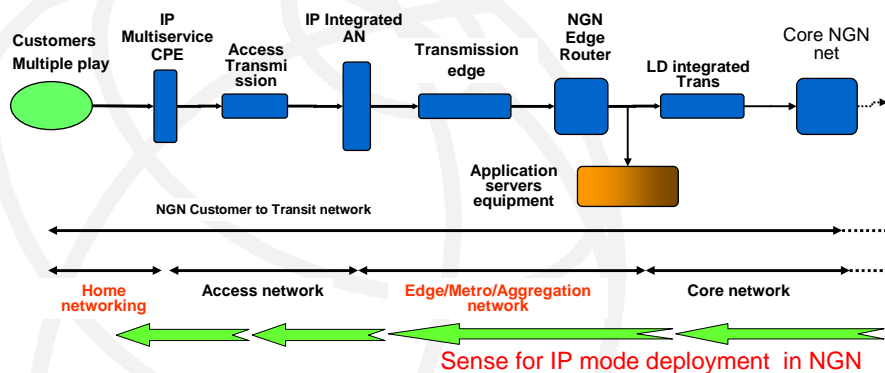## NGN Migration Strategy
Modeling issues for NGN design

➜ **New models needed to represent multiservice flows**

➜ **New dimensioning methods for resources handling multimedia services with QoS**

➜ **New measurement procedures for aggregated multi-service traffics**

➜ **New procedures to ensure interoperability and end-to-end performance across multiple domains**

➜ **Redefinition of network segments at the new structure and for QoS quota assignment**

➜ **New units to define dimensioning and costing for interconnection**

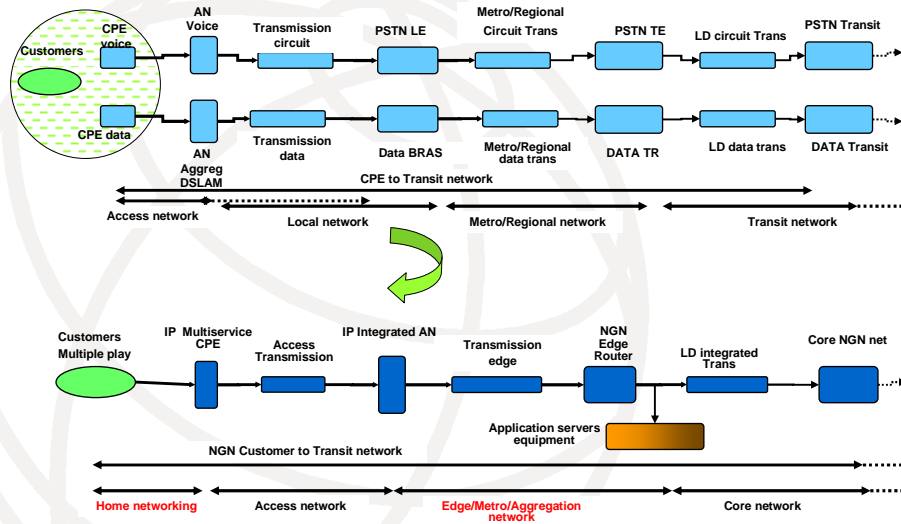# Network segments: Historical reference configurations
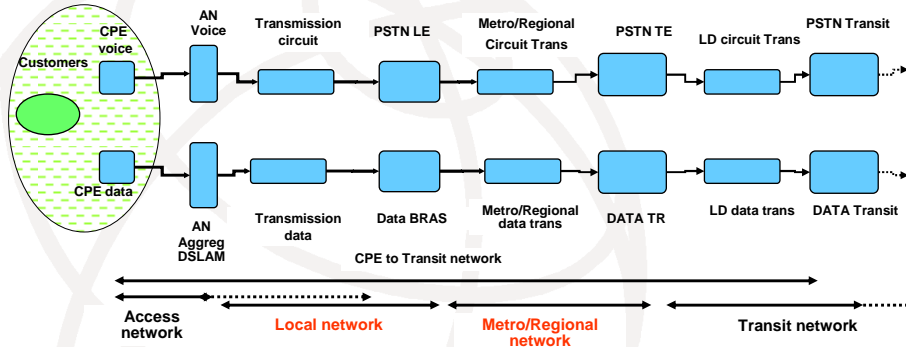
- Double network in circuit and packet modes
- Frequently with separated physical media, transmission and energy

Network segments: Target full NGN reference configurations

Sense for IP mode deployment in NGN

- Integrated network at all layers NGN based on IPv6 network with carrier grade QoS

**Network segments: Migration from historical to target NGN**

Customers
CPE voice
CPE data

AN Voice
AN Aggreg DSLAM

Transmission circuit
Transmission data

PSTN LE
Data BRAS

Metro/Regional Circuit Trans
Metro/Regional data trans

PSTN TE
DATA TR

LD circuit Trans
LD data trans

PSTN Transit
DATA Transit

CPE to Transit network

Access network — Local network — Metro/Regional network — Transit network

Customers Multiple play

IP Multiservice CPE
Access Transmission
IP Integrated AN
Transmission edge
NGN Edge Router
LD integrated Trans
Core NGN net

Application servers equipment

NGN Customer to Transit network

Home networking — Access network — Edge/Metro/Aggregation network — Core network

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Architecture migration: Topology

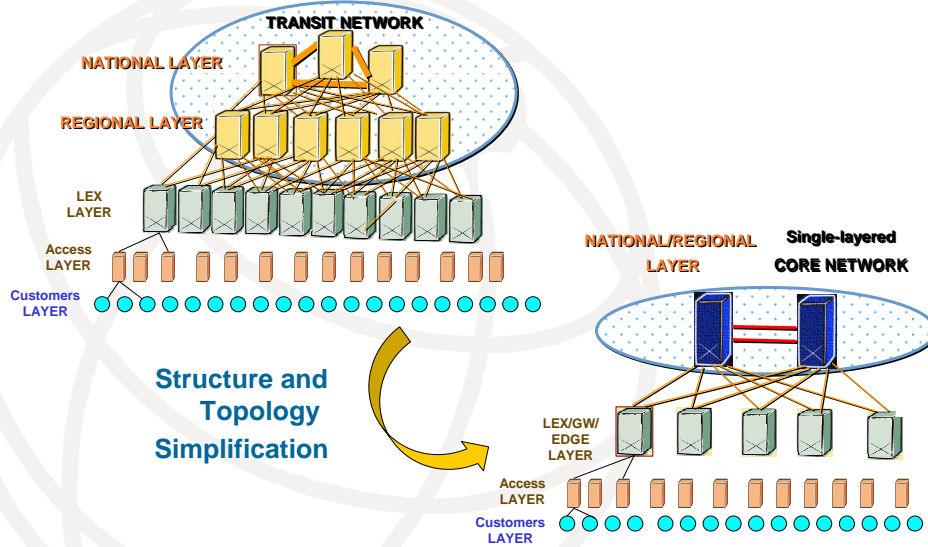**What changes from current scenario towards target network ?**
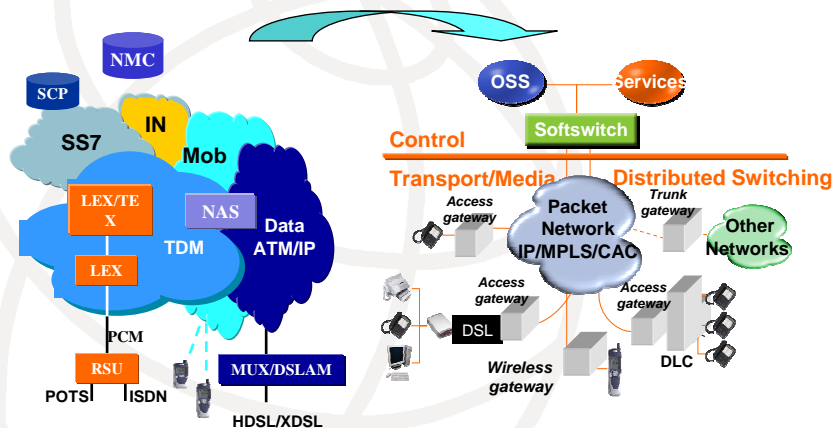
NGN: Topology migration strategies

Network topology change is more difficult and needs more time that just system substitution
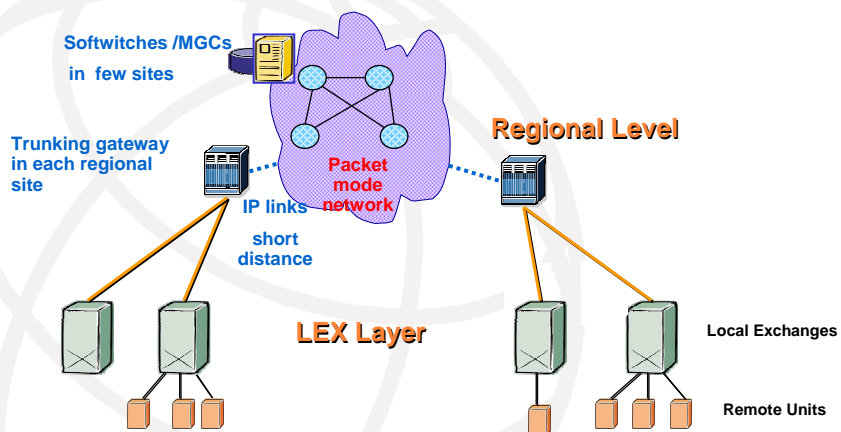
- **Migration in overlay** :
    - At transit and international levels
    - At local level
    - At access level

- **Migration in island** (substitution/extension)

    - At transit and international levels
    - At local level
    - At access level

- **Hybrid migration:** overlay and island combination:
    - By network levels
    - By geographical regions
    - By obsolescence level

Network Architecture towards NGN
Architecture Consolidation: Topology

TRANSIT NETWORK

NATIONAL LAYER

REGIONAL LAYER

LEX LAYER

Access LAYER

Customers LAYER

Structure and Topology Simplification

NATIONAL/REGIONAL LAYER

Single-layered CORE NETWORK

LEX/GW/ EDGE LAYER

Access LAYER

Customers LAYER

Topology reconfiguration for Core

Softwitches /MGCs in few sites

Trunking gateway in each regional site

IP links short distance

Packet mode network

Regional Level

LEX Layer

Local Exchanges

Remote Units

Topology reconfiguration for Core

Softswitches/MGCs located in few sites

National Regional layer

Packet mode network

IP links Long distance

Trunking gateway in each local site

LEX Layer

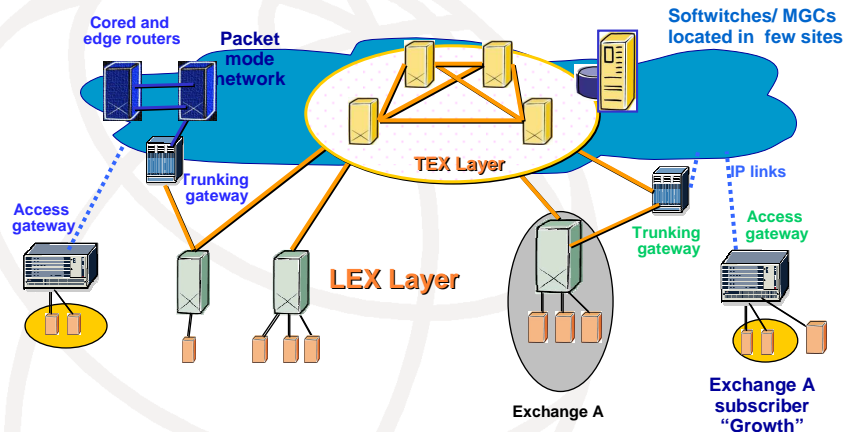**Local Exchanges**
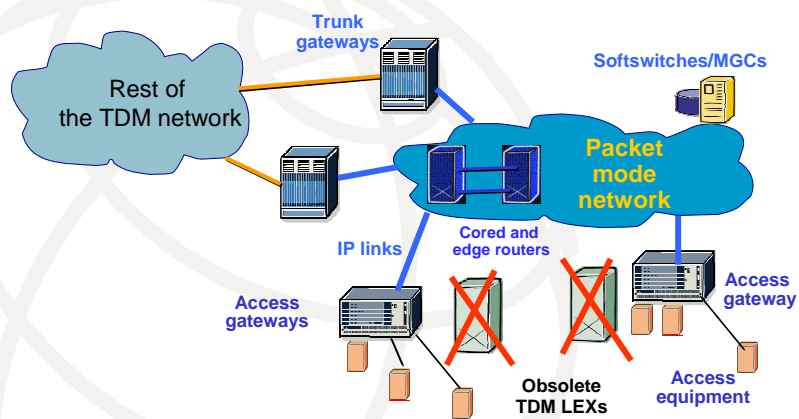
Remote Units

Core: migration strategy

Dominated by high capacity and protection level

• Overlay deployment for full coverage in all regions

• Quick deployment needed for homogeneous end to end connections (2 to 3 years)

• Strong requirements for high quality, protection and survivability

• Importance of the optimization for location and interconnection

Local/Edge level migration: grow with NGN

Cored and edge routers

Packet mode network

Softwitches/ MGCs located in few sites

Access gateway

Trunking gateway

TEX Layer

IP links

Trunking gateway

Access gateway

LEX Layer

Exchange A

Exchange A subscriber "Growth"

Local/Edge level migration: substitute with NGN

Trunk gateways

Softswitches/MGCs

Rest of the TDM network

Packet mode network

IP links

Cored and edge routers

Access gateways

Access gateway

Obsolete TDM LEXs

Access equipment

Metro-Ethernet

- Vision by the Metro Ethernet Forum **METRO** Ethernet Forum for LAN to LAN network:

Traditional Telco Network
Voice-oriented connectivity

Customer's Ethernet LAN — Copper Serial Input — Copper Local Loop — CSU/DSCs — Routers — Telco Central Office — ATM — MUX — Sonet ADM — Sonet ADM — MUX — ATM — Telco Central Office — CSU/DSCs — Routers — Copper Local Loop — Copper Serial Input — Customer's Ethernet LAN

Optical IP Network
Optical Gigabit Ethernet throughput

Managed Switch — Metro Fiber Ring — GB WAN Router — Long Haul Fiber — GB WAN Router — Metro Fiber Ring — Managed Switch located in building telco closet — Customer's Ethernet LAN
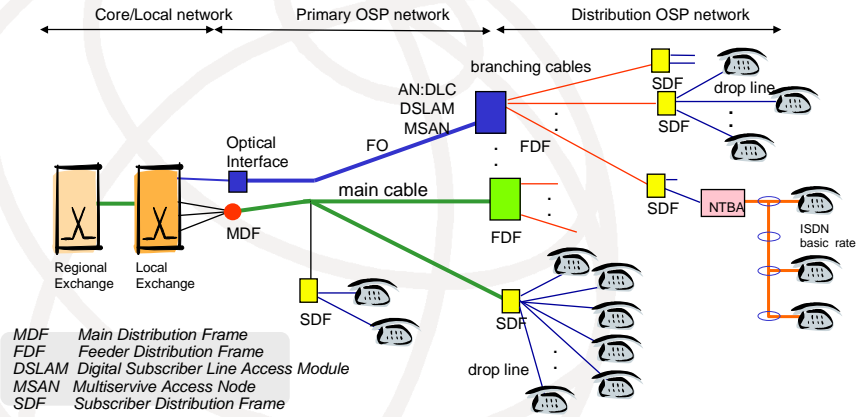

Local/Edge network migration

Dominated by functions migration investment and interoperability

- Move from joint switching and control to separated control and media GW

- Introduce Multimedia Services at all areas

- Optimize number, location of nodes and interfaces among existing and new network

- Requires longer time and higher investments due to variety of geo- scenarios and geographical distribution
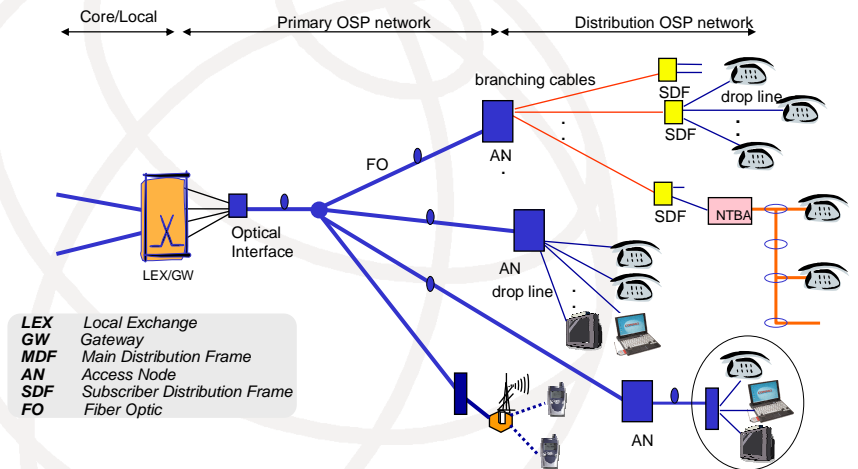
Access Network Migration: Physical network today

Structure of the OSP Access Network in most scenarios

Core/Local network — Primary OSP network — Distribution OSP network

branching cables

AN:DLC DSLAM MSAN

Optical Interface

FO — main cable

MDF

FDF

FDF

SDF — drop line

SDF

SDF

NTBA — ISDN basic rate

Regional Exchange — Local Exchange

SDF

SDF — drop line

MDF — Main Distribution Frame
FDF — Feeder Distribution Frame
DSLAM — Digital Subscriber Line Access Module
MSAN — Multiservive Access Node
SDF — Subscriber Distribution Frame

Access Network Migration: Physical network evolution

Typical trend for Access Network infrastructure evolution

Core/Local — Primary OSP network — Distribution OSP network

branching cables

SDF — drop line

SDF

FO — AN

Optical Interface

LEX/GW

AN
drop line

SDF

NTBA

AN

LEX — Local Exchange
GW — Gateway
MDF — Main Distribution Frame
AN — Access Node
SDF — Subscriber Distribution Frame
FO — Fiber Optic

Network Architecture towards NGN

Architecture Consolidation: Access

Access dominated by physical infrastructure cost and deployment time:

"*first to start and later to finish*"

- Quick deployment of DSL and Multimedia Services

- FO closer to customer when implementing new outside plant or renovating existing one

- New Wireless technologies for low density customer scenarios

- Shorter LL length than classical network to be prepared for high bandwidth Multimedia services

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Topology migration: combined segments

Where to start and how to co-ordinate migration?

Network "consolidation" for topology
Cost Optimisation of the network
- Reducing nodes and increase their capacity
- Deployment of ADSL and multiservice access

Network expansion
NGN solution :
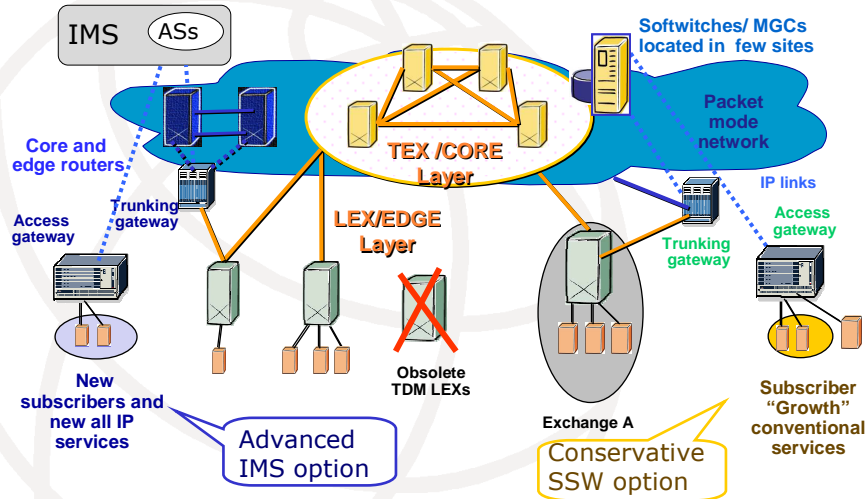- Cap and Grow; this means keeping the existing PSTN network as it is, and grow demand with NGN equipment
Network replacement
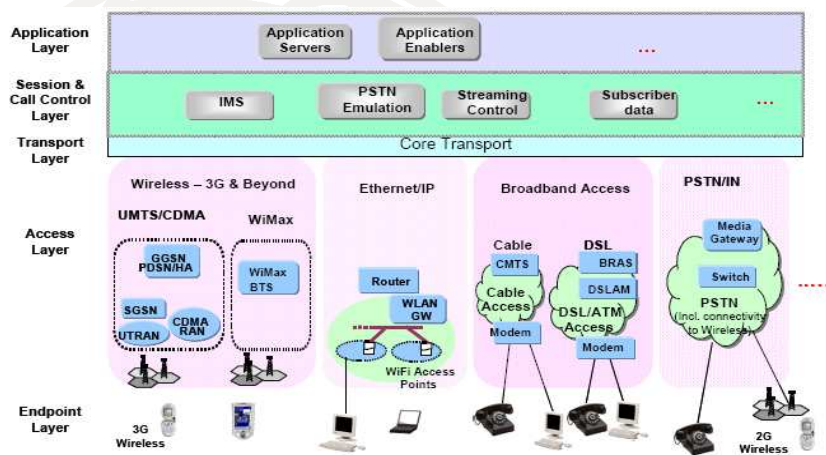Replacement of out-phased (end of life) TDM equipment
- gradual replacement : this means coexistence of the two technologies
- full accelerated replacement with a short transition period

Need to optimize overall network evolution: technically and economically

Local/Edge level/Core migration: Cap & grow with NGN

IMS   ASs

Softwitches/ MGCs located in few sites

Core and edge routers

Packet mode network

TEX /CORE Layer

Access gateway

Trunking gateway

LEX/EDGE Layer

IP links

Access gateway

Trunking gateway

New subscribers and new all IP services

Obsolete TDM LEXs

Advanced IMS option

Exchange A

Conservative SSW option

Subscriber "Growth" conventional services

Overall Network Structure Architecture at transition stage

Application Layer

Application Servers   Application Enablers   ...

Session & Call Control Layer

IMS   PSTN Emulation   Streaming Control   Subscriber data   ...

Transport Layer

Core Transport

Access Layer

Wireless – 3G & Beyond   Ethernet/IP   Broadband Access   PSTN/IN

UMTS/CDMA   WiMax

GGSN PDSN/HA   WiMax BTS

SGSN   CDMA RAN   UTRAN

Router   WLAN GW

WiFi Access Points

Cable   DSL

CMTS   BRAS

Cable Access   DSLAM

Modem   DSL/ATM Access   Modem

Media Gateway

Switch

PSTN (incl. connectivity to Wireless)

Endpoint Layer

3G Wireless   2G Wireless

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- **Main steps for IMS and NGSS**

Network Architecture towards NGN: IMS Architecture
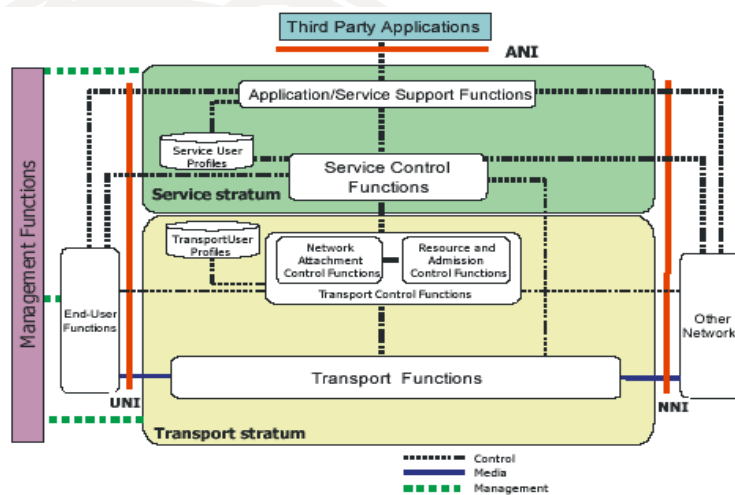
Network Architecture towards NGN: IMS Benefits

- **First advantage is the higher flexibility of the IMS functionality to adapt to the customer services**, irrespective of the technology they use and the access method to reach the network.

- **Saving in effort and time for the development and deployment** of a new service is considerably reduced once the architecture is ready at the network, implying economic savings and better Time to Market for a given service provider in a competitive market.

- **Efficient introduction on new services at a lower cost** will increase the service provider revenues and ARPU which is the major business driver for the healthy operation, market grow and financial results.

- **Higher utilization of services and better personalization** of functions to specific requirements from the end customers' point of view, a common use and feel for all services and applications

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Evolution to IMS: Phases
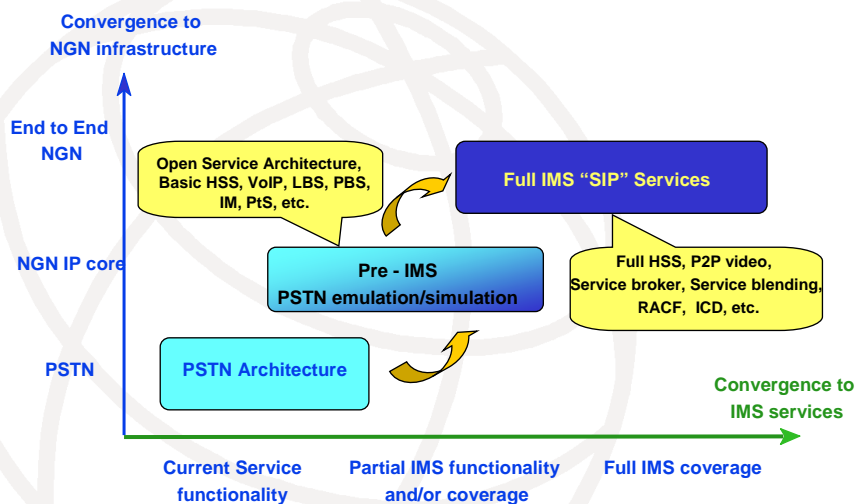
Evolution to converged OSS/BSS: Classical requirements

Typical functions for the OSS and BSS imply a vast set of activities in current networks like:

- Inventory management,
- Network engineering,
- Order management,
- Network elements supervision,
- Application monitoring,
- Traffic measurement and post processing,
- Capacity augmentation,
- Routing planning,
- Trouble ticketing,
- Repair management,
- Workforce management,

- Service activation,
- Service creation,
- Customer Relations Management (CRM),
- Rating,
- Billing,
- Invoicing,
- Performance supervision,
- Accounting management,
- Pricing agreements,
- SLA management
- Support to Marketing & Sales, etc

Evolution to converged OSS/BSS: New requirements

- **In addition to conventional typical functions, new requirements and higher relevance for existing tasks are needed in the NGN IP mode technology as follows:**

- Managing support to multimedia services with voice, data, video and multiple play
- Security policy management,
- Content management,
- Managing inter-domain operational activities
- Managing functionalities for the coexistence of legacy and new technologies
- Implementing new business procedures associated to bundled offers
- Manage multimedia/multiparty charging application
- Service Level Agreements (SLA) management,
- Service creation and upgrading management,
- Focus on common processes to all support functions and technologies
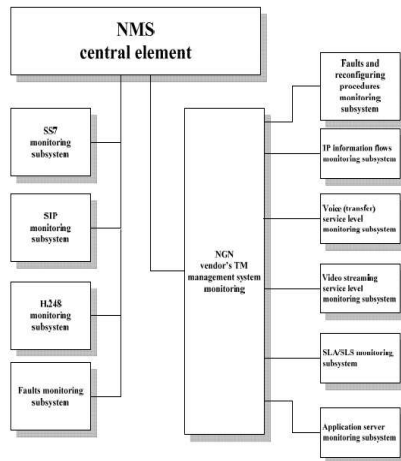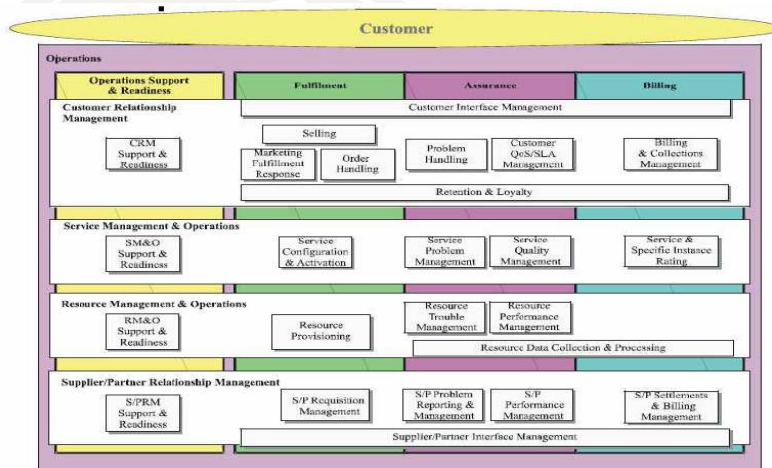
ITU specs for the NMS functions in NGN

NMS central element

SS7 monitoring subsystem

SIP monitoring subsystem

H.248 monitoring subsystem

Faults monitoring subsystem

NGN vendor's TM management system monitoring

Faults and reconfiguring procedures monitoring subsystem

IP information flows monitoring subsystem

Voice (transfer) service level monitoring subsystem

Video streaming service level monitoring subsystem

SLA/SLS monitoring subsystem

Application server monitoring subsystem

Figure 1   Basic architecture of NMS

4   NGN monitoring system requirements

NMS has to work in all stages of NGN evolution. Basically NMS realizing have to begin from hybrid environment — co working CS and PS networks. In this case networks will be include wide set of different types of technical means. In accordance with ITU-T Recommendations Q.3900 [5] the set of TM have to include:
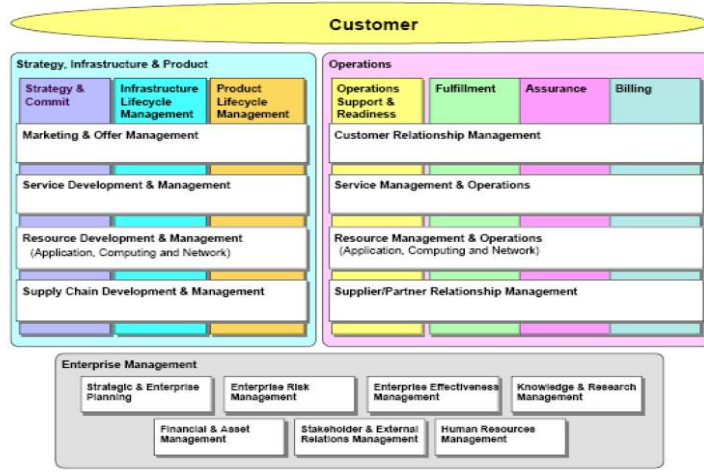- Call Session Control System
  - Media Gateway Controller (MGC)
  - Proxy Server SIP (PS)
  - IP Multimedia Subsystem (IMS)
- Voice and signaling transmit system
  - Media Gateway (GW)
  - Signaling Gateway (SG)
  - Transport Network Environment (TNE)
- Application servers
  - Application Server (AS)
  - Media server (MS)
  - Messaging Server (MeS)
  - Application Creation Environment (ACE)
- Management and billing system
  - Management System (MS)
  - Billing system (BS)
- Access Environment
  - NGN Integrated Access Devices (NGN-IAD)
  - Media gateway for Legacy Terminal Equipment (GW-LTE)
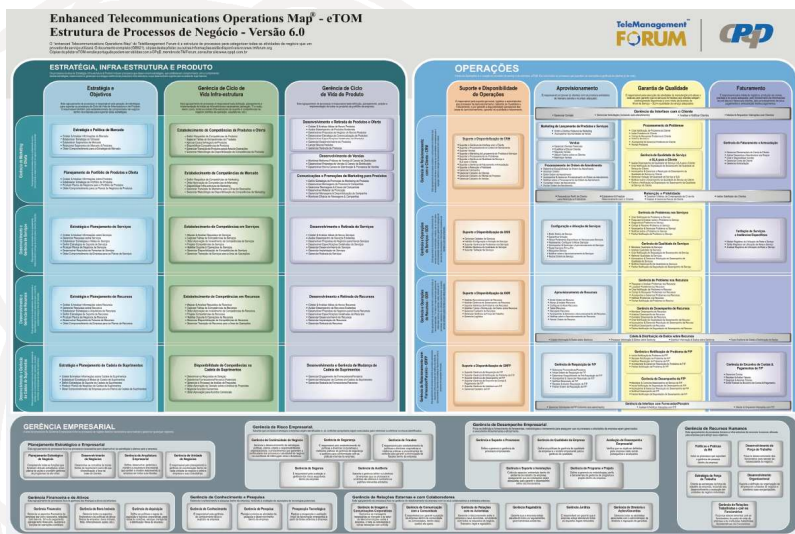
Generic eTOM architecture: operations

Customer

Operations

Operations Support & Readiness	Fulfillment	Assurance	Billing

Customer Relationship Management

Customer Interface Management

CRM Support & Readiness

Selling

Marketing Fulfillment Response

Order Handling

Problem Handling

Customer QoS/SLA Management

Billing & Collections Management

Retention & Loyalty

Service Management & Operations

SM&O Support & Readiness

Service Configuration & Activation

Service Problem Management

Service Quality Management

Service & Specific Instance Rating

Resource Management & Operations

RM&O Support & Readiness

Resource Provisioning

Resource Trouble Management

Resource Performance Management

Resource Data Collection & Processing

Supplier/Partner Relationship Management

S/PRM Support & Readiness

S/P Requisition Management

S/P Problem Reporting & Management

S/P Performance Management

S/P Settlements & Billing Management

Supplier/Partner Interface Management

Generic eTOM architecture

Overall eTOM architecture

Evolution to converged OSS/BSS: Phases
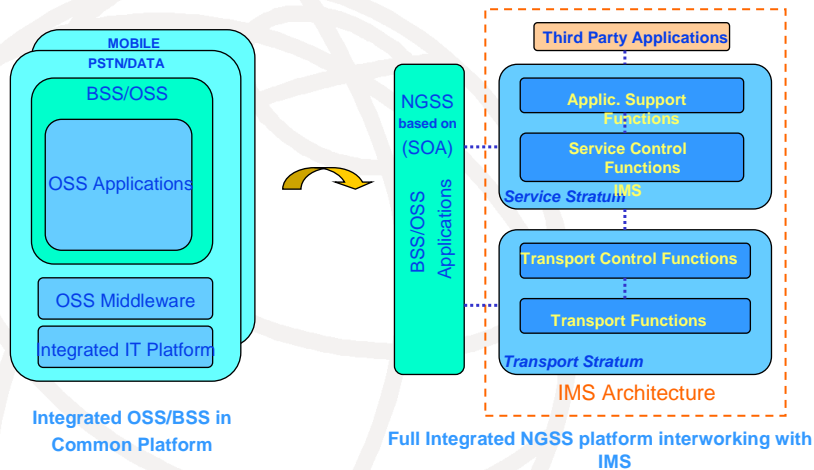
Separated OSS, BSS and Platforms

**Integrated OSS/BSS in Common Platform**
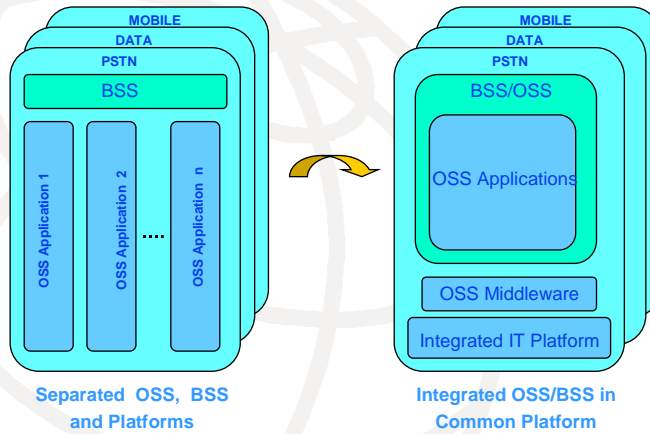
Migration from legacy support systems in vertical piles towards integrated OSS/BSS in an IT platform per network type

Evolution to converged OSS/BSS: Phases

Integrated OSS/BSS in Common Platform

Full Integrated NGSS platform interworking with IMS

Migration from IT platforms per network type towards New Generation OSS/BSS for an NGN multiservice network with IMS functionality

Matching evolution to NGN, IMS and NGSS
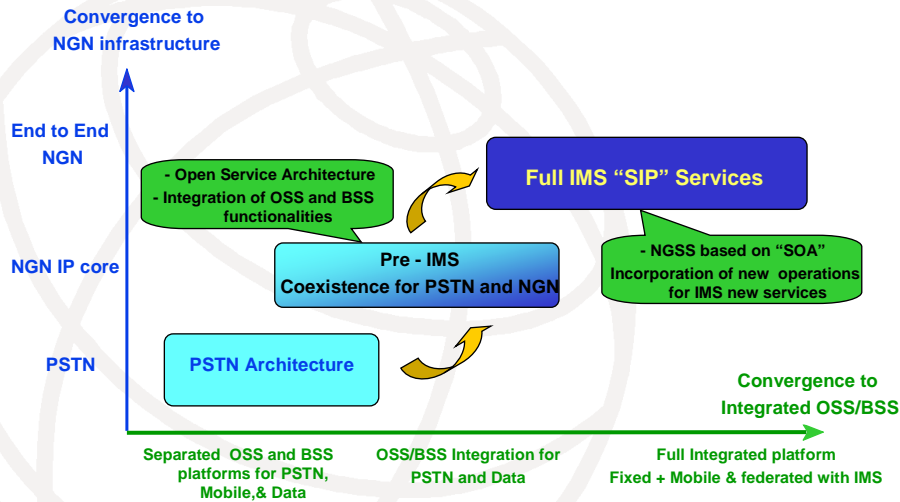
NGN Migration Strategy: Conclusions

➡ **Network Topology migration is the base for architecture modernization and requires an overall re-design**

➡ **Different timings apply to 5 network areas: Access, Core, Local/Edge, Services and OSS/BSS**

➡ **Per country coordination is required for Migration at each area: Migration Operation Center**