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Network Architecture in the evolution of NGN and OSS/BSS

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Network Architecture towards NGN

Content

• Key factors for the evolution towards NGN
  • Services and revenue motivations.
  • Requirements and issues

• Network architecture consolidation at transit, local and access levels
  • Topology and architecture migration

• OSS/BSS evolution
Network Architecture towards NGN

Key Factors: Motivation

- **New services and revenue** increase with multimedia services:
  - Compensate voice revenue reduction and increase BB related business

- **Cost reductions** by sharing network infrastructure and systems
  - Savings are a function of network scenario, equipment modernization status and customers grow speed

- **Simplification of O&M**, thus lowering OPEX
  - Integrated operation platforms, maintenance and training
Network Architecture towards NGN
Key Factors: Operator Requirements (I)

- **Business continuity** required to maintain ongoing dominant services and customers that require carrier-grade service

- **Flexibility** to incorporate existing new services and react quickly to the ones that appear on real time (main advantage of IP mode)

- **Profitability** to allow feasible return on investments and in the best practices market values
Network Architecture towards NGN

Key Factors: Operator Requirements (II)

- **Survivability** to allow service assurance in case of failures and external unexpected events

- **Quality of Service** to guarantee the Service Level Agreements for different traffic mixes, conditions and overload.

- **Interoperability across networks** to allow to carry end to end services for flows in different network domains
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Architecture Consolidation: Topology

Topological changes impact on infrastructure and are slower to implement than technology substitution

• **Less network nodes and links** due to the higher capacity of systems (one order of magnitude).

• **Same capillarity** at access level due to identical customer location

• Topological **connectivity higher** for high capacity nodes and paths due to security

• **High protection** level and diversity paths/sources in all high capacity systems, both at functional and physical levels
Network Architecture towards NGN

Existing networks and architecture

- 5 different network types to handle telecom services
- TDM for fixed and mobile networks working in circuit mode with end to end reserved paths
- SS7 and IN network working with message switching mode
- Data network working with leased lines and packet mode with different and conventional IP protocols
Network Architecture towards NGN

Existing networks and architecture

- Hierarchical topology with 4 to 5 layers, connectivity to the upper next layer and within each layer as a function of economical optimization
- Number of nodes as a function of O/D traffic and nodes capacity
- Service handling for media, signaling and control at all exchange nodes
- Carrier grade quality with well defined QoS criteria and standardized engineering rules
Network Architecture towards NGN

Architecture: NGN Layers

- Legacy Network Signaling/Service
- Legacy Network Media
- Network Service Layer
- Control Layer
- Media Layer
- Access and Transport Layer
- Network Independent Services
- Enterprise Customer
- Remote Offices/ SOHO
- Residential Users
Network Architecture towards NGN

Architecture migration: Topology

What changes from current scenario towards target network?
Network Architecture towards NGN
Architecture Consolidation: Topology

Structure
Simplification
Network Architecture towards NGN

Architecture Consolidation: Access

Access dominated by physical infrastructure cost and deployment time

- 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
Network Architecture towards NGN
Architecture Consolidation: Local

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
Network Architecture towards NGN
Architecture Consolidation: Local

Softswitches/ MGCs located in few sites

Packet mode network

Trunking gateway

Access gateway

LEX Layer

TEX Layer

Exchange A

Exchange A subscriber “Growth”

Access gateway

IP links

Trunking gateway

Access gateway
Network Architecture towards NGN
Architecture Consolidation: Core

Dominated by high capacity and protection level

- Overlay deployment for full coverage in all regions
- Quick deployment needed for homogeneous end to end connections
- Strong requirements for high quality, protection and survivability
- Importance of the optimization for location and interconnection
Network Architecture towards NGN

Architecture Consolidation: Core

- Softswitches /MGCs in few sites
- Trunking gateway in each regional site

Regional Level

Packet mode network

LEX Layer

IP links short distance

Local Exchanges

Remote Units

Trunking gateway in each regional site

Packet mode network
Network Architecture towards NGN

Architecture Consolidation: Core

- Local Exchanges
- Softswitches/MGCs located in few sites
- IP links
- Long distance

LEX Layer
- Trunking gateway in each local site

Regional layer
- Packet mode network
Network Architecture towards NGN
Architecture Consolidation: Combined Segments

Where to start and how to co-ordinate migration?

- Network “consolidation”
  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
Network Architecture towards NGN
Architecture Consolidation: Combined Segments

Overall impact of evolution on network CAPEX and OPEX

**CAPEX**
- TDM and NGN CAPEX are close
- NGN CAPEX in the first years driven by geographic coverage
- Access systems represent a large part of CAPEX
  - similar values in TDM and NGN

**OPEX**
- OPEX in NGN trends to be lower
- Migration scenarios will have a mix of TDM OPEX (installed base) and NGN OPEX (substitution and growth)
- Significant impact of manpower cost due to convergence in operations

**Key factors for the evaluation:** Geo-scenarios, Network grow rates, Aging of equipment, New services
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• OSS/BSS evolution
Network Architecture towards NGN
Evolution to converged OSS BSS: New 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
Network Architecture towards NGN
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 interdomain operational activities
- Managing functionalities for the coexistence of legacy and new technologies
- Implementing new business procedures associated to bundled offers
- Service Level Agreements (SLA) management,
- Churn and customer attraction management,
- Customer equipment inventory,
- Fraud management,
- Service upgrading management,
- Focus on common processes to all support functions, etc.
Network Architecture towards NGN
Evolution to converged OSS BSS: Phases

Migration from legacy support systems in vertical piles towards integrated OSS/BSS in an IT platform per network type
Network Architecture towards NGN
Evolution to converged OSS BSS: Phases

Migration from IT platforms per network type towards New Generation OSS/BSS for an NGN multiservice network with IMS functionality
Network Architecture towards NGN
Evolution to converged OSS BSS: Phases

Convergence to NGN infrastructure

End to End NGN

NGN IP core

PSTN

PSTN Architecture

- Open Service Architecture
- Integration of OSS and BSS functionalities

Pre - IMS
Coexistence for PSTN and NGN

Full IMS “SIP” Services
- NGSS based on “SOA”
- Incorporation of new operations for IMS new services

Convergence to Integrated OSS/BSS

Separated OSS and BSS platforms for PSTN, Mobile, & Data

OSS/BSS Integration for PSTN and Data

Full Integrated platform
Fixed + Mobile & federated with IMS
Converged OSS/BSS applications will provide a series of benefits similar to the ones obtained by the IMS within the network but related to the overall company operational activities external to the network:

- **Short time reaction** to new services introduction
- **Labor force reduction** for the operation
- **Common look & feel** for the support services with easier training
- **New facilities** for agile reaction to business competitive forces
- **Profitability increase** due to advance in the revenues and decrease of Opex
- **Quick reaction** to contract updates, customer care and SLA requirements
Network Architecture towards NGN
Summary of Key Evolution Factors

- Plan a **phased approach** for the network migration based on business evaluation per scenario type.

- Implement **pilot cases** before network migration due to the many new technical issues.

- Start at **core** network segment and **OSS/BSS**

- Ensure continuity of OSS/BSS functionality in the integration towards an NGSS to increase **customer response profitability**