
NGN PLANNING AND MIGRATION PATHS FOR DEVELOPING COUNTRIES

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CONTENTS

- ITU-D Activities in NGN
- Policy for NGN development
- Regulatory challenges
- Migration Scenarios from ITU-D SG 2 Guidelines
- Example: Telecom Serbia

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ITU-D ACTIVITIES

□ **SG 1: Telecommunication development strategies and policies**

National telecommunication policies and regulatory strategies which best enable countries to benefit from the impetus of telecommunications as an engine of economic, social and cultural development.

Finance and economics, including World Trade Organization (WTO) issues, tariff policies, case studies, application of accounting principles as developed by ITU-T Study Group 3, private-sector development and partnership.

□ **SG 2: Development and management of telecommunication services and networks and ICT applications**

Methods, techniques and approaches that are the most suitable and successful for service provision in planning, developing, implementing, operating, maintaining and sustaining telecommunication services which optimize their value to users. This work will include specific emphasis on telecommunication network security, mobile communication and communications for rural and remote areas, with particular focus and emphasis on applications supported by telecommunications

The implementation and technical application of information and communication technology, using studies by the others Sectors, taking into account the special requirements of the developing countries

http://www.itu.int/ITU-D/study_groups/index.html

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ITU-D SG 1 and NGN

□ **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

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ITU-D STUDY GROUP 2 NGN ISSUES

- **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 20-1/2: Examination of access technologies for broadband telecommunications**

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Guidelines on migration of existing networks to Next-Generation Networking (NGN) for developing countries

- **Question 19-1/2** of ITU-D Study Group 2 (Study Period 2006-2010)
- Migration to NGN is a complex issue and it is not expected that these guidelines provide any comprehensive technical tutorial on this subject.
- It will offer basic principles to support the path to full NGN

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Trends in Telecom Reform

- 2007: "The Road to Next-Generation Networks (NGN)" includes:
 - Ch 1: Market trends
 - Ch 2: NGN-A regulation overview
 - Ch 3: NGN Technology
 - Ch 4: FMC
 - Ch 5: Interconnection in an IP-based environment
 - Ch 6: International interconnection, NGN and ICT development
 - Ch 7: NGN and US
 - Ch 8: Consumer Protection and QoS
 - Ch 9: Enabling environment for NGN
 - Ch 10: Why NGN, Why Now

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Best Practice Guidelines for Next-Generation Networks (NGNs) Migration

- Global Symposium for Regulators (GSR), Dubai, February 2007 refers to:
 - An enabling regulatory regime that fosters innovation, investment and affordable access to NGNs and facilitates migration to NGNs
 - Innovative Regulatory Policies Must Be Developed To Facilitate NGNs

<http://www.itu.int/ITU-D/treg/bestpractices.html>

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Best Practice Guidelines on Innovative infrastructure sharing strategies to promote affordable access for all

- **Global Symposium for Regulators (GSR) , Pattaya, Thailand, March 2008**
 - **A. Promoting an enabling environment**
 - 1. Appropriate Regulatory framework
 - 2. Competition and investment incentives
 - **B. Innovative regulatory strategies and policies to promote infrastructure sharing**
 - 1. Reasonable terms and conditions
 - 2. Pricing
 - 3. Efficient use of resources
 - 4. Scarce resources
 - 5. Licensing
 - 6. Conditions for sharing and interconnection
 - 7. Establishing an infrastructure sharing one-stop-shop
 - 8. Improving transparency and information sharing
 - 9. Dispute resolution mechanism
 - 10. Universal access
 - 11. Sharing with other market players and industries
- <http://www.itu.int/ITU-D/treg/bestpractices.html>

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Other useful information

- The 2007 Global Symposium for Regulators Best Practice Guidelines on Next Generation Networks migration, available at <http://www.itu.int/ITU-D/treg/bestpractices.html> and also a contribution to ITU-D Question 19-1/2 in Document 1/090.
- GSR Discussion Paper on NGN Interconnection and Access, prepared by Scott Marcus, available online at http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR07/discussion_papers/JScott_Marcus_Interconnection_IP-based.pdf
- Scott Marcus presentation to GSR 2007 http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR07/Documents_presentations/Session_III%20Scott%20Marcus_interconnect.pdf
- [Workshop on NGN Interconnection in the Arab Region](http://www.itu.int/ITU-D/treg/Events/Seminars/2007/Bahrain/agenda.html), Manama, Bahrain, May 2007, all presentations available at <http://www.itu.int/ITU-D/treg/Events/Seminars/2007/Bahrain/agenda.html>
- TREG link to NGN resources at <http://www.itu.int/ITU-D/treg/related-links/links-docs/NGN.html>
- Other Resources on NGN Interconnection
- The European Regulators' Group Opinion on Regulatory Principles of Next Generation Access http://erg.ec.europa.eu/doc/publications/erg07_16rev2_opinion_on_nga.pdf
- The Future of IP Interconnection, 29 January 2008, WIK Consulting, http://ec.europa.eu/information_society/policy/ecomm/doc/library/ext_studies/future_ip_intercon/ip_intercon_study_final.pdf
- NGN UK website <http://www.ngnuk.org.uk/>

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NGN STAKEHOLDERS' EXPECTATIONS

□ OPERATOR AND SERVICE PROVIDERS

■ Want that:

- Investment is optimized, OPEX is cut
- NGN architecture leads to satisfactory QoS across multiple interconnected NGN
- Continuity of services offered to end-users
- Improvements in network architectures , easy maintenance.
- Simplification and harmonization of services through single interface/multiple devices
- Quick time to market for new service

□ USERS

- Will benefit from the ability of network operators and service providers to provide guaranteed QoS of voice services on NGN
- New services
- Cost reduction by sourcing voice and data
- Want to switch between different communication devices

□ MANUFACTURERS

- Want to know that currently available terminals are suitable for use with NGN services
- Confirmation of network architecture suitability will give guidance of the required performance of routers and media gateways.

□ REGULATOR

- Want to have a better assurance that users are not adversely affected as PSTN services migrate to NGN
- Preserve competition

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BUILDING ELEMENTS FOR NGN DEVELOPMENT

□ COUNTRY'S POLICY AND STRATEGY FOR BROADBAND

□ REGULATORY POLICY

- MACRO AND MICRO
- LEGACY REGULATION?

□ OPERATORS BUSINESS MODELES

- MIGRATION OF FIXED/MOBILE NETWORKS OR BOTH TOWARDS NGN
- USER DATA BASE AND USER'S DEMANDS
- BUSINESS CUSTOMERS
- INTERNATIONAL TRAFFIC AND VoIP

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REGULATORY CHALLENGES

□ Macro and Micro

- Macro- policy and structural issues
 - Legacy regulatory questions FROM VERTICAL TO HORIZONTAL; Regulatory lag and capacity; Affordability; **Access regimes**; Fostering competition and investment; Regulatory transparency
- Micro-implementation:
 - **Competition**, licensing, spectrum assignment, numbering, interconnection, consumer protection, universal services and access, standards and interoperability

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NGN AND REGULATIONS

- The emergence of Next Generation Networks (NGNs) raises **profound challenges** for regulators everywhere
- Different regulatory authorities have approached these problems in strikingly different ways depending:
 - in part on the overall regulatory policy,
 - in part on the nature of the NGN migration envisioned by major market players
 - NGN core network raises significantly different issues from those of the NGN access network.
 - in part on the nature of market power

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The nature of market power

- ❑ As regards market power, very often it is claimed that the evolution of the traditional networks to NGN based networks will eliminate the need to consider market power;
- ❑ The reality is considerably more complex
- ❑ There are aspects of market power that are unlikely to change much for the foreseeable future and
- ❑ There are credible risks that new, troublesome forms of market power might emerge
- ❑ What about access networks?
- ❑ It is impossible to predict at this stage which of effects will predominate, but it is clearly premature to assume that market power will no longer be a concern
- ❑ It could decline over time;

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NGA (New Generation Access) REGULATION

- ❑ Many national regulators-NRA are at an early stage for this regulation
- ❑ NRA could consider NGA as economic bottleneck, which needs a regulation,
- ❑ NRA promotes investments
- ❑ From another side NGA operators need regulatory freedom to meet end user needs and ensure their investment
- ❑ Survey on a number of OECD countries (DSL networks in all these countries except the USA, are subject to **ACCESS REGULATION**) shows that the regulatory discussion centers on three regulatory models for high-speed networks:
 - (1) **Access holidays or deregulation**, e.g., in the USA and Germany,
 - (2) **Access regulation**, e.g., in the Netherlands, the Republic of Korea, Japan, Belgium, and
 - (3) **Structural separation**, e.g., in the UK, Australia.

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NGA REGULATORY MODELS (1)

- ~~(1) Temporary or permanent deregulation~~
 - the removal of sector-specific rules and regulations,
 - PROS: Deregulation increases investment incentives as it overcomes the "truncating problem" and allows above-normal profits (GANS & KING, 2003).
 - CONS: However, under limited competition or threat of entry into the upstream market - that is, in the absence of alternative infrastructures or in areas of low population density - an integrated incumbent may leverage its market power to competitive downstream segments
- (2) **Regulated access-mandated access**
 - the obligation to grant access to bottleneck facilities at regulated price and quality
 - reduces uncertainty and protects competition in the downstream market while the effects on investment depend on the allowed margin
 - regulated access to cable ducts
 - physical unbundling becomes increasingly difficult with the rollout of fiber-to-the-home (FTTH) deployments

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NGA REGULATORY MODELS

- (3) Structural separation
 - separation supplements access regulation though the disintegration of the monopolist and the introduction of a "bright line of equivalence" that ensures equal treatment of access seekers
 - The functional separation of BT's access division "openreach" creates transparency and decreases openreach's incentives to discriminate against competitors on the downstream retail market (F. Kirsh, Ch. Hirschhausen, Regulation of NGN: Structural separation, Access regulation or No Regulation at all, 2008)

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Regulatory approach to enable competition

- Depend on country regulatory policy
 - General principles: light touch, targeted, proportional
- Introduction of mandatory reporting of QoS figures
 - already started in some EU countries, must be improved to be meaningful for users
- Regulate for market abuse/ dominance, concentration
- Distinguish between core NGN (effectively competitive) and **NG Access -NGA**
- Define the types of investment that regulator may give regulatory "holidays" (e.g. high speed access)
- Dominance should not be exempted as a result of NGN investment
- Despite NGN has the potential to increase competition, certain conditions of significant market power may still resist or some new troublesome forms might emerge.

Promote effective competition *and*
not existing competitors

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NETWORK OPERATORS, SERVICE PROVIDERS, CONTENT DEVELOPERS

□ BUSINESS OPPORTUNITIES

- NGN remains the only way to preserve gradually declining revenues
- Foster innovation dynamic
- New services/substitution and service differentiation
- Market share protection and possible growth
- Saving on network maintenance, personnel, IT and power consumption (ITU figures: Network maintenance ~30%, Personnel ~30-40%, IT cost ~40%, Power consumption ~40%)
- Network consolidation requires less physical assets (e.g. real estate ~40% saving)
- Economies coming from IP

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**NETWORK OPERATORS, SERVICE PROVIDERS,
CONTENT DEVELOPERS,
-Business risk-**

- High investment required:
 - core – justified by cost savings and relatively low risk
 - access –big demand uncertainties, major investment before demand are clear, type of regulation
- Simultaneous investment in NGN in fixed and mobile
- Uncertainty about business model
- Entrance of third party may diminish incumbent revenues
- Technical challenges
- New legal environment and return of investment

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PLAN FOR MIGRATION

- CORE NETWORK DOMAIN
 - rather easy to set up the migration plan
- ACCESS NETWORK DOMAIN
 - complex
 - impact of the service provision
 - not recommended to choose one specific technology to replace any legacy access network systems

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NETWORK OPERATORS/ SERVICE PROVIDERS,

- Where and how to start?-

- PSTN optimization and consolidation?
- From NGNs drivers?
 - CAPEX and OPEX reduction
 - Revenue generation and protection
 - FMC
 - IMS
 - NG Access.
- Have EVOLUTIONARY OR REVOLUTIONARY APPROACH?
- Have TOP-DOWN or BOTTOM-UP APPROACH
- FOLLOWING EXAMPLES FROM DEVELOPED COUNTRIES?

Government's role

- Observer (USA, Germany)
- Stimulus policy (Sweden, Norway)
- Building driver (Japan, South Korea)

NGN DEVELOPMENT IN DEVELOPING COUNTRIES

- NGN development is linked to national broadband policy
 - *More broadband, better NGN*
 - *Denmark, N. Korea, Iceland*

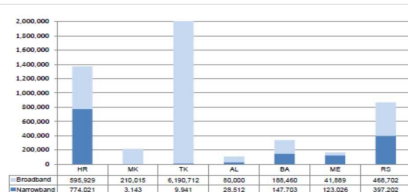
- Lacking in many developing countries
 - *Low penetration rates*
 - *Incumbent dominance*
 - *Economy is not ICT based*

- Evolutionary paths different in developing and developed countries:
 - *Affordability and access*
 - *Degree of competition*
 - *Pace and manner of reform*

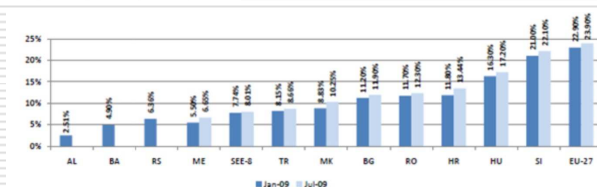
- Leverage opportunities?
 - *Who will be driver: Government, Policy makers, Regulator, Operators, Customers*

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Enlargement Countries (some SEE countries)



Number of fixed Internet connections

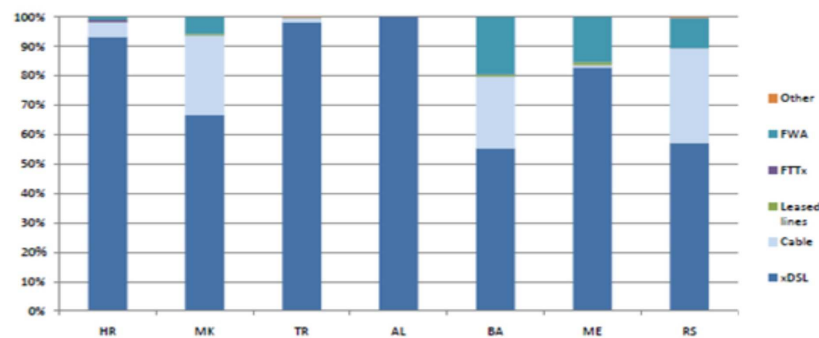


Broadband penetration rate, January – July 2009

Source: Cullen Int. Enlargement Countries
Monitoring Report III – March 2010

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Fixed retail broadband connections by technology



Source: Cullen Int. Enlargement Countries Monitoring Report III – March 2010

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Differences between DCs and DevCs

- Economy
- Country policy and strategy
- Government intervention
- Regulation policy
- Time frame for NGN
- Existing penetration
- Customer behavior
- ARPU
 - DC – developed country
 - DevC – developing countries

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ITU-D SG 2 Q.19-1/2: Guidelines for Migration of Existing Networks to Next-Generation Networks (NGN) for Developing Countries

Doc: ITU-D/2/190Rev.2-E

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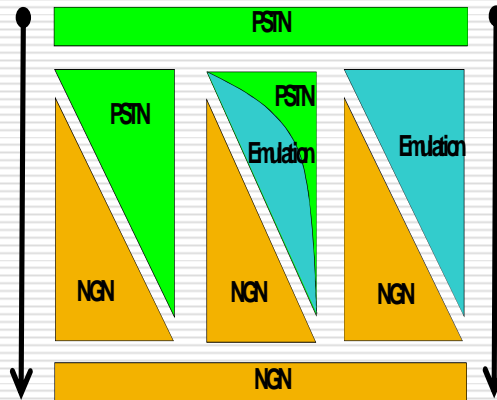
To consider following procedure for building migration plan

- Provision of new communication services to broadband users in addition to existing network.
- A significant portion of users switches to those services. Reduction of true PSTN / ISDN usage visible.
- Cost of maintaining both systems in parallel becomes a factor. **Decision to begin replacement of infrastructure.**
- Replacement of part of the infrastructure (e.g. local switch) by new infrastructure, **without forcing all users to migrate.**
- Full change to new infrastructure.
- Migrate remaining users to NGN.

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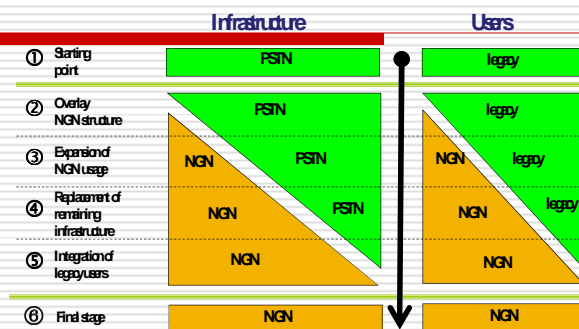
MIGRATION SCENARIOS

- Using emulation and/or simulation of NGN, there are various ways of migration from legacy network to NGN. This should be decided according to the each country or provider situation.
- Three different types of migration scenarios are introduced as a framework consideration but other possibility should not be limited:
 - **Overlay Scenario**
 - **Replace Scenario**
 - **Mixed Scenario**



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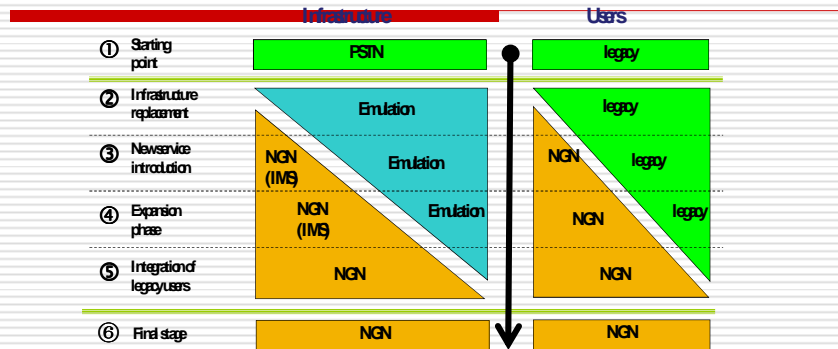
OVERLAY SCENARIO



- NGN will be deployed and operate jointly with PSTN/ISDN. NGN will occupy more portions while PSTN/ISDN will continuously decrease and finally migrate to NGN.
- Useful in the case of country or operator who have well stable or new PSTN/ISDN infrastructure

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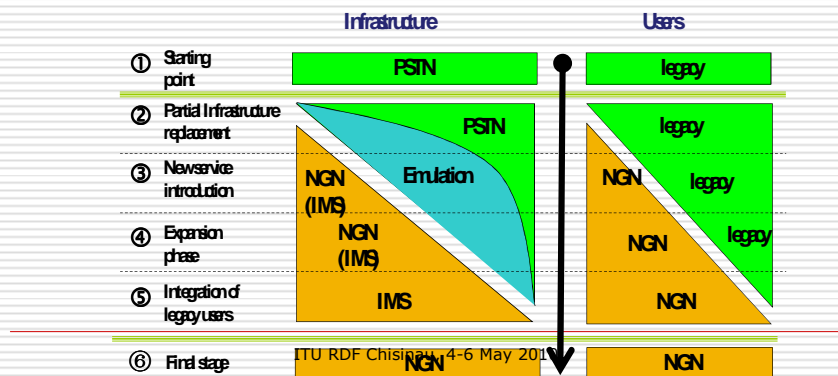
Infrastructure Replacement Scenario



- NGN emulation will widely use to support voice oriented services but keeping the legacy terminal such as black phone. So end user could not recognize the change of technology behind their terminal.
 - Useful in the case of country or operator who does not have enough PSTN/ISDN infrastructures, so it is already lack of connectivity to support voice services
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Mixed Scenario

- Uses both overlay and emulation, so at the beginning some of PSTN user connection will replace by NGN emulation while other PSTB users will keep their PSTN connections
- Useful in the case of country or operator who place in the middle stage which means some parts of PSTN/ISDN need to replacement but other parts of PSTN/ISDN still good status such as well stable or with new PSTN/ISDN infrastructure



EXAMPLES

Shenzhen Telecom

- **Shenzhen NGN commercial pilot network** represents the largest achievement in bringing about the evolution of PSTN from its current state, to that of NGN. In this network, the softswitch acts as the control center, the SHLR acts as the data center, and the ENIP acts as the unified service platform. The overall capacity of the entire network reaches up to 600,000 lines/300,000 trunks, with 150,000 actual subscribers accessed through AGs. Some of the reasons to be proud would include the following:
 - It greatly improves network performance.
 - At present, it gives birth to the largest NGN end office (33,000 lines).
 - It breaks Shenzhen Telecom's current record of PSTN end office cutover efficiency. Two end offices (42,000 lines in total) were cut over with high QoS in two consecutive days. From equipment installation to operation after cutover, it takes less than 20 days.
 - It boasts the largest commercial IP Centrex group in the world. Only, RBT, UC, and Real-Time multimedia services exhibit similar vitality.
 - As an intelligence platform, it provides new intelligent phone call services and other value-added services for its three million AND subscribers in the network.
- THE PROJECT STARTED IN 2002 by China Telecom and finished in 2005. (**Huawei Service, Multimedia library, Issue 20, 2005**).

NGN DEPLOYMENT (Shenzhen Telecom)

- On September 18, 2004 the first NGN end office was established in Fuyong. Some 15,000 subscribers from the original TDM switch were transferred to the NGN network in a matter of minutes. Although the cutover lasted less than 10 minutes, it was a historical moment in the development of the China telecommunications network, because it marked the first time that NGN was able to replace the TDM end offices in the PSTN
- Three more end offices (the Boling office - 16,400 lines, Nanyou office - 26,000 lines, and Huangmugang office - 33,000 lines) were cutover within half a year.
- The cutover of these four offices were quick and orderly, and perhaps are best exemplified by the idea -- "from suburb to downtown" and "from small to large".
- By April 2005, Shenzhen Telecom successfully established a commercial NGN that accommodates more than 150,000 subscribers

Results (Shenzhen Telecom)

- While rebuilding the end office, the idea of NGN to separate call control from media bearer was brought into actual play.
- For the first time, high-capacity AGs were put into the original TDM switch room. As a result, subscribers under the original TDM switch were successfully transferred to the AGs within a matter of minutes.
- Furthermore, the AGs inherited all the access modes of the traditional TDM network such as; ordinary subscriber line, long-distance subscriber line, polarity reversal subscriber line, ISDN subscriber line, analog PBX trunk, digital PBX trunk, and V5 trunk.
- Also, the end users were shielded so that they were not aware of any changes in the core network. As for operation and maintenance, the distributed client mode was adopted in order to retain the original maintenance habit.

EFFECTS (Shenzhen Telecom)

□ Shenzhen Telecom

- **“Improved network operation quality:** Operation records from the four NGN end offices of Shenzhen Telecom are convincing proof of an improved network operation quality. For instance, the 33,000-line Huangmugang office (the NGN end office with the largest capacity) serves as a good example. The operation indices from the NGN end office are much better than those of the original office, and the **call completion rate showed an increase of 12%**. Even with an increase in traffic, the softswitch system continued to run stably and the indices were much improved.
- **Lower maintenance cost:** After the original end office was converted into an NGN end office, indices like integrity, occupied space, and power consumption of the NGN equipment proved to be superior to those of the original TDM switch. After rebuilding, **the occupied space was reduced by 40%, and power consumption by 63%**. Hence, in a large-scale NGN, the maintenance cost will obviously be much lower. With its innate advantages in services like, IP Centrex and video services, NGN will quickly become the first choice in the rebuilding of the TDM network.” (Huawei Service, Multimedia library, Issue 20, 2005).

CHINA NETCOM

□ China Netcom's Beijing Branch (Beijing Netcom) - April 2007

- First commercial IMS network in China
- Includes IP-Centrex solution
- IMS multimedia telephony system provides value-added services with the main focus on IP-Centrex targeting enterprise customers

Beijing Netcom: IP Centrex

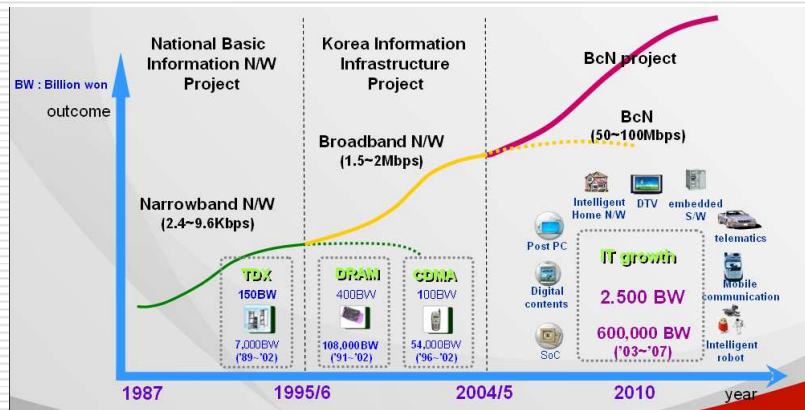
- Beijing Netcom:
 - To provide telecom-quality cost-efficient IP multimedia services addressing the needs of high-end enterprise users in Beijing area now and in the future.
 - Supports introduction of new multimedia services (voice, data, audio, video) to enhance user experience in Beijing area, including visitors and participants in the 2008 Olympic Games
-

KOREA

- Korea can serve as a good example for developing countries in whole or in part in this arena as it is in the midst of migrating to its own next generation network referred to as BcN or Broadband Convergence Network.
 - The key drivers of deploying NGN
-

KOREA DEVELOPMENT

(P:\STG\4StudyPeriod\SG2\200\2009\0277E.doc 09/11/2009;
26.08.2009)



Source: National Information Society Agency (NIA)

KOREA ROADMAP

- The BcN Roadmap shows the different phases in the different networks that incorporate the whole BcN.
 - From 2004 and 2005, four consortiums were formed (made up of major telecom companies and local cable companies who all had a stake in nurturing the market) and first set up pilot projects/test beds in order to test potential applications and business models of convergence services including video phones, IPTV, VoIP, wireless sensor networking, etc.

- A public-private-partnership (PPP) model has been activated in the implementation of the BcN. This basically means the private sector builds and commercializes networks and services, whereas the government arranges laws, policies and the necessary standardization conditions for new services.

	Phase I ('04-'05)	Phase II ('06-'07)	Phase III ('08-'10)
Subscriber N/W	<ul style="list-style-type: none"> Wired 2.5 Million, Wireless 0.56 Million - VDSL, LAN - WLAN 	<ul style="list-style-type: none"> Wired 5.7 Million, Wireless 2.5 Million - FTTH, DOCSIS3.0 - WiBro, HSDPA 	<ul style="list-style-type: none"> Wired 10 Million, Wireless 10 Million - Upgrade subscriber N/W in connection with u-City etc.
Delivery N/W	<ul style="list-style-type: none"> Construct hundreds of Gbps level back bone N/W Construct sample security monitoring system 	<ul style="list-style-type: none"> Construct hundreds of Tbps level back bone N/W IP-MPLS Network security & certification WiBro delivery N/W 	<ul style="list-style-type: none"> Construct Pbps level back bone N/W Build integrated security platform Full support QoS & IPv6
Service & Control N/W	<ul style="list-style-type: none"> Develop platform controls voice and data Develop open service technology 	<ul style="list-style-type: none"> Integrated control platform of wired & wireless Integrated open service network of wired & wireless 	<ul style="list-style-type: none"> Construct control platform and open infra for Home/USN and convergence of communication & broadcasting

Source: National Information Society Agency (NIA)

EXAMPLE- TELECOM SERBIA

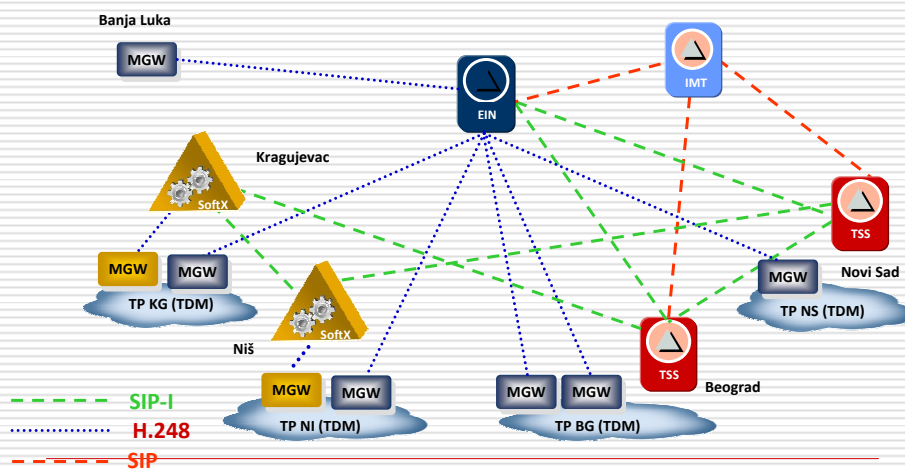
TELECOM SERBIA IS INCUMBENT OPERATOR IN SERBIA

HAS REGIONAL PRESENCE IN B&H (TELECOM SRPSKE) AND MONTENEGRO (m-tel)

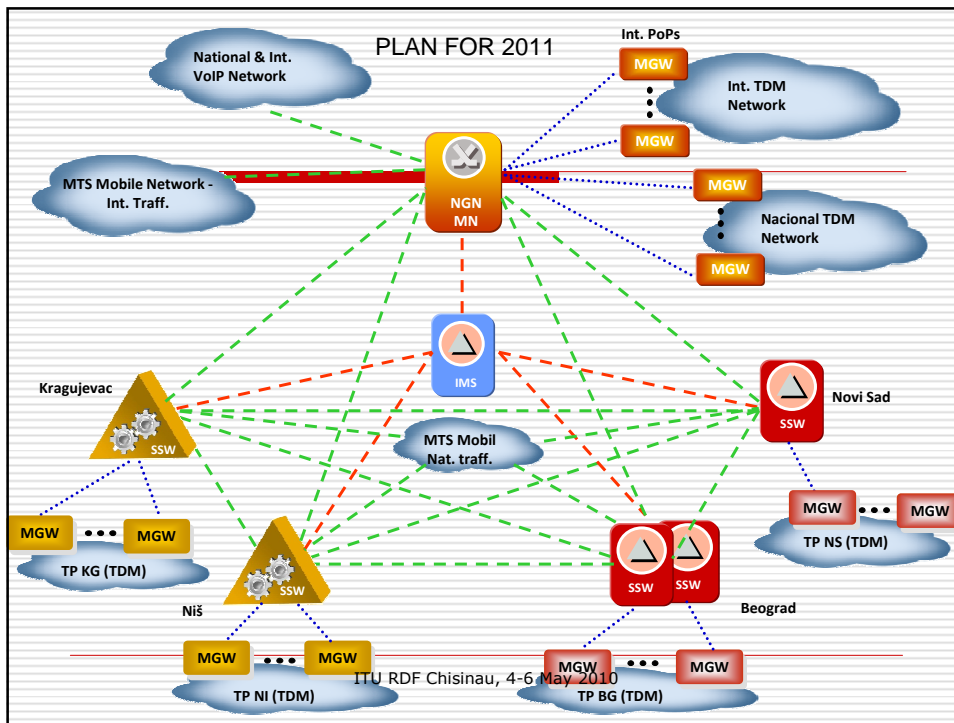
OPERATES BOTH FIXED AND MOBILE NETWORKS

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NGN existing situation



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Instead of conclusion

- ❑ Developing countries should be encourage to take a part in international effort to develop best migration path to NGN.
- ❑ **Mr. Roberto Viola, General Director of the Italian Regulator (AGCOM)**
 - *"If we wait for private capital to flow in the direction of NGN we might wait in certain parts of Europe for decades. The question that rises is whether you should wait for the car makers to build the highways. Telecom operators might for example leverage from regional governments and municipalities investing in optical fibers and other basic infrastructures". (EETT NEWSLETTER, ISSUE N° 17 \ JULY 2008)*

**THANK YOU FOR YOUR
ATTENTION!**

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