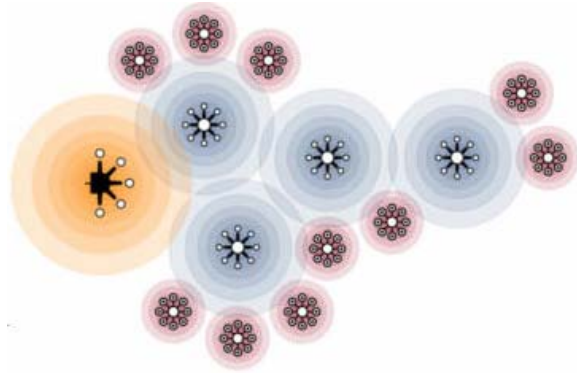


Technical Issues and Challenges in Next Generation Networks (NGN)

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Outline of the Presentation



Outline

- Introduction
- NGN Service characteristics
- NGN Service Architecture
- NGN and Service Providers
- Softswitch
- Multi Protocol Label Switching (MPLS)
- Convergence Issues
- NGN Bottlenecks
- Open Questions



Introduction

- NGN will **seamlessly** blend the Public Switched Telephone Network (**PSTN**) and Packet Switched Data Network (**PSDN**).
- NGN can be thought of as a packet-based network where the packet switching and transport elements (e.g., routers, switches, and gateways) are **logically and physically separated** from the service/call control intelligence.
- The NGN architecture would possibly push Central Office functionality to the **edge of the network**.
- **IP, ATM, TDM** and **MPLS** Networks will co-exist in a complementary fashion for the next few years.
- *“Making predictions is risky, especially when it involves the future.”* - N. Bohr

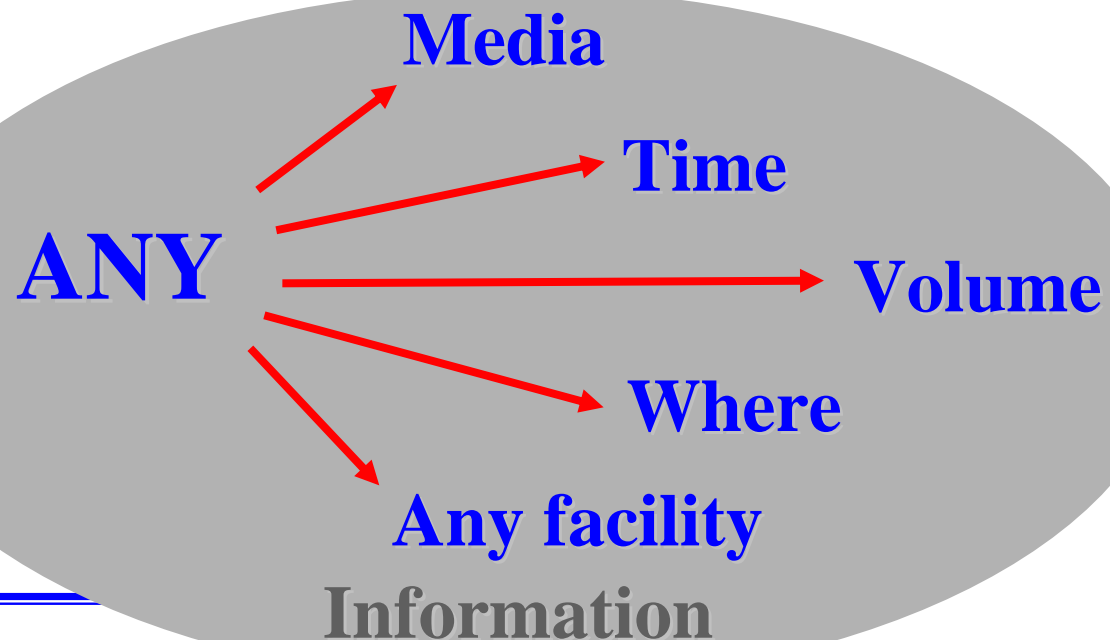


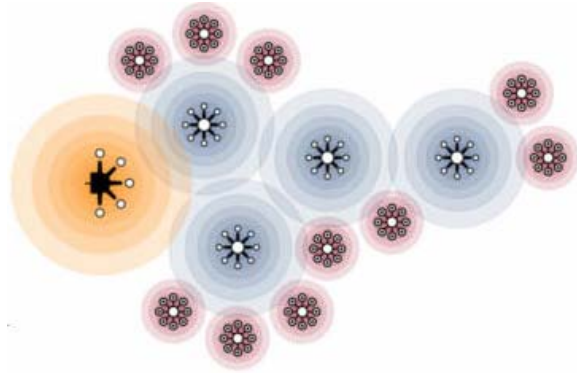
What can we predict



- The next generation **services** and **killer applications** will be prime enablers for the NGN.
- The primary goal will be to enable users to get the information content they want, in **any** media/format, over **any** facilities, **anytime**, **anywhere**, and in **any** volume.

**The Many
ANY model**





NGN Service Characteristics



Service Characteristics for NGN Environment (1/2)

- **Ubiquitous**, real-time, multi-media communications
- More “**personal intelligence**” distributed throughout the network (intelligent agents)
- More “**network intelligence**” distributed throughout the network (management agents)
- More **simplicity** for users
- Personal service **customization** and management
- Intelligent **information management** (calendar, contact list, personal database)



Service Characteristics for NGN Environment (2/2)

- **Emerging and new services** are likely to be the strongest drivers for NGN.
- **Business Strategy:**
 - Most of the initial NGN profits will result from the bundling of **traditional services**.
 - The **emerging services** will fuel the growth.
- Thus, **bundled traditional services** will pay for the network during initial phase of NGN.



The traditional services for NGN

- Initial NGN profits will result from the **bundling** of traditional services
- Most **traditional services** relate to
 - Basic access
 - Transport
 - Routing/switching services,
 - Basic connectivity/resource
 - Session control services,
 - Various value-added services.

Next Generation flavour



The Emerging Services for NGN (1/2)

The emerging services would be of the form:

- **Specialized resource services** (e.g., provision and management of transcoders, multimedia multipoint conferencing bridges, media conversion units, voice recognition units, etc.)
- **Processing and storage services** (e.g., provision and management of information storage units for messaging, file servers, terminal servers, OS platforms, etc.)
- **Middleware services** (e.g., naming, brokering, security, licensing, transactions, etc.)
- **Application-specific services** (e.g., business applications, e-Commerce applications, supply-chain management applications, interactive video games, etc.)



The Emerging Services for NGN (2/2)

- **Content provision services that provide or broker information content** (e.g., electronic training, information push services, etc.)
- **Interworking services** (for interactions with other types of applications, services, networks, protocols, or formats)
- **Management services** to maintain, operate, and manage communications/computing networks and services.



Possible array of NGN services



**Voice
Telephony**

**Data
Services**

**Multimedia
Services**

**Virtual
Private
Networks**

**Public
Network
Computing**

**Unified
Messaging**

**Information
Brokering**

**Electronic
Commerce**

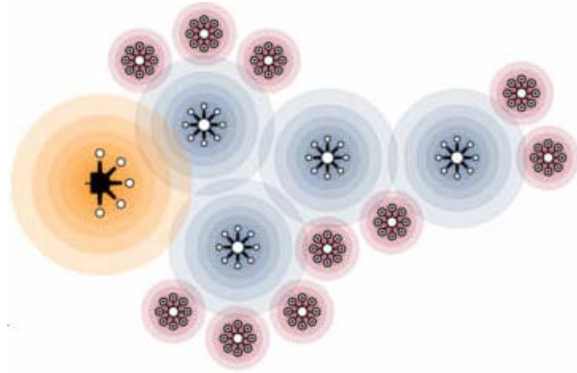
**Call Center
Services**

**Interactive
Gaming**

**Distributed
Virtual
Reality**

**Home
Manager**





Service Architecture



Next Generation Service Architecture

Motivation

- As the number of **applications** and types of **transport** increases, the “stovepipe” approach can become quite inefficient.
- For a large sample of applications over a larger number of transport types, there are more similarities than differences in the **types of support** required (e.g., billing, security, setting up connections, signaling protocols, etc.).
- As the number of supported applications increases, it becomes quite inefficient to provide **specialized mechanisms** for session control, connectivity control, middleware, signaling, interworking, etc



Next Generation Service Architecture

- One of the primary goals of NGNs is to provide a
 - Common control environment
 - Unified control environment
 - Flexible control environment
- Can support multiple types of services and management applications over multiple types of transport.



Next Generation Service Architecture – Characteristics (1/3)

Architectural layering:

- Separate **service/session control** from the underlying transport elements.
- Choose (for their particular situations) the “best-in-breed” **transport elements** independent from the “best-in-breed” **control software**.
- **Service developers** will no longer need to know anything about the type of transport used for the services they are developing.



Next Generation Service Architecture – Characteristics (2/3)

Open Architecture and Open Services Interfaces

- Open **development environment** based on an Application Programming Interface (API)
- Will enable service providers, third party application developers, and potentially end users to create and **introduce applications quickly and seamlessly.**
- Will speed the introduction of new services by giving service providers more control over the **service introduction process**
- Will allow the **reuse of existing application components.**
- Will also open the opportunities for creating and delivering services to a **broader audience.**
- The ability to offer new and creative services will only be limited by our **imagination !**

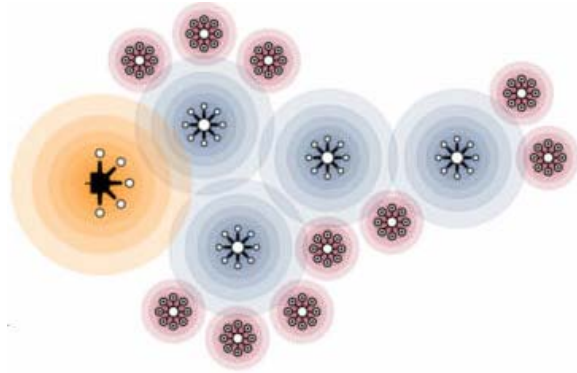


Next Generation Service Architecture – Characteristics (3/3)

Distributed Network Intelligence

- Will allow a much **richer variety** of services
- Distributed Processing Environment (DPE) will **uncouple** this network intelligence from physical network elements.
- Network intelligence can be distributed to the **most suitable locations** in the network or, if appropriate, to the CPE.
- **Network intelligence** could reside on
 - general purpose servers running the components needed for a particular service,
 - Servers that perform specific functions e.g., Service Control Points (SCPs),
 - Intelligent Peripherals,
 - Edge devices close to the consumer.
- Functional capabilities will no longer be coupled with the physical network elements.
- Cheaper, more versatile avatar – the **Softswitch** !





NGN and Service Providers



NGN and Service Providers (1/2)

Model 1: The “intelligence” should be pushed out to the edges of the network.

- Next generation services will execute at the **end systems**.
- Enterprise, computing, and software companies will develop the **applications**
- Users can download them over the Internet to their **smart Customer Premise Equipment (CPE)**.
- All we need from the public network carriers/service providers is reliable, high-bandwidth **transport**.



NGN and Service Providers (2/2)

Model 2: Network-based next generation services

- The **network** is the computer!
- It is possible to provide **user-specific services** (since one size doesn't fit all)
- It is more difficult to support service and user mobility with CPE-based approaches.
- With network-based services, users can authenticate themselves from wherever they are and gain access to their **complete suite** of services on the move.
- **Customer care**, billing, configuration management, provisioning, and other management concerns are more easily handled with network-based solutions.
- Possibly **cheaper** because of economy of scales.



The characteristics of a softswitch (1/3)

- Softswitch is the concept of **separating** the network hardware from network software.
- In traditional circuit switched networks, hardware and software is not independent.
 - Circuit switched networks rely on dedicated facilities for inter-connection and are designed primarily for voice communications.
 - The more efficient packet based networks use the Internet Protocol (IP) to efficiently route voice and data over diverse routes and shared facilities.
- An **example of de-coupling**: Special gateway and mediation equipment that is deployed to connect IP based networks to circuit based networks for VoIP.



The characteristics of a softswitch (2/3)

- One of the **goals of a Softswitch**: It does not have the hard constraints that traditional switches have, including
 - the need for circuit based switching and transport,
 - intelligent network triggers and mechanisms, and
 - service logic.
- A Softswitch is one in which these functional entities reside in various **distributed** physical components.
- The benefit of Softswitch will be dictated by the extent to which network control and service logic also **migrate away** from the switch.

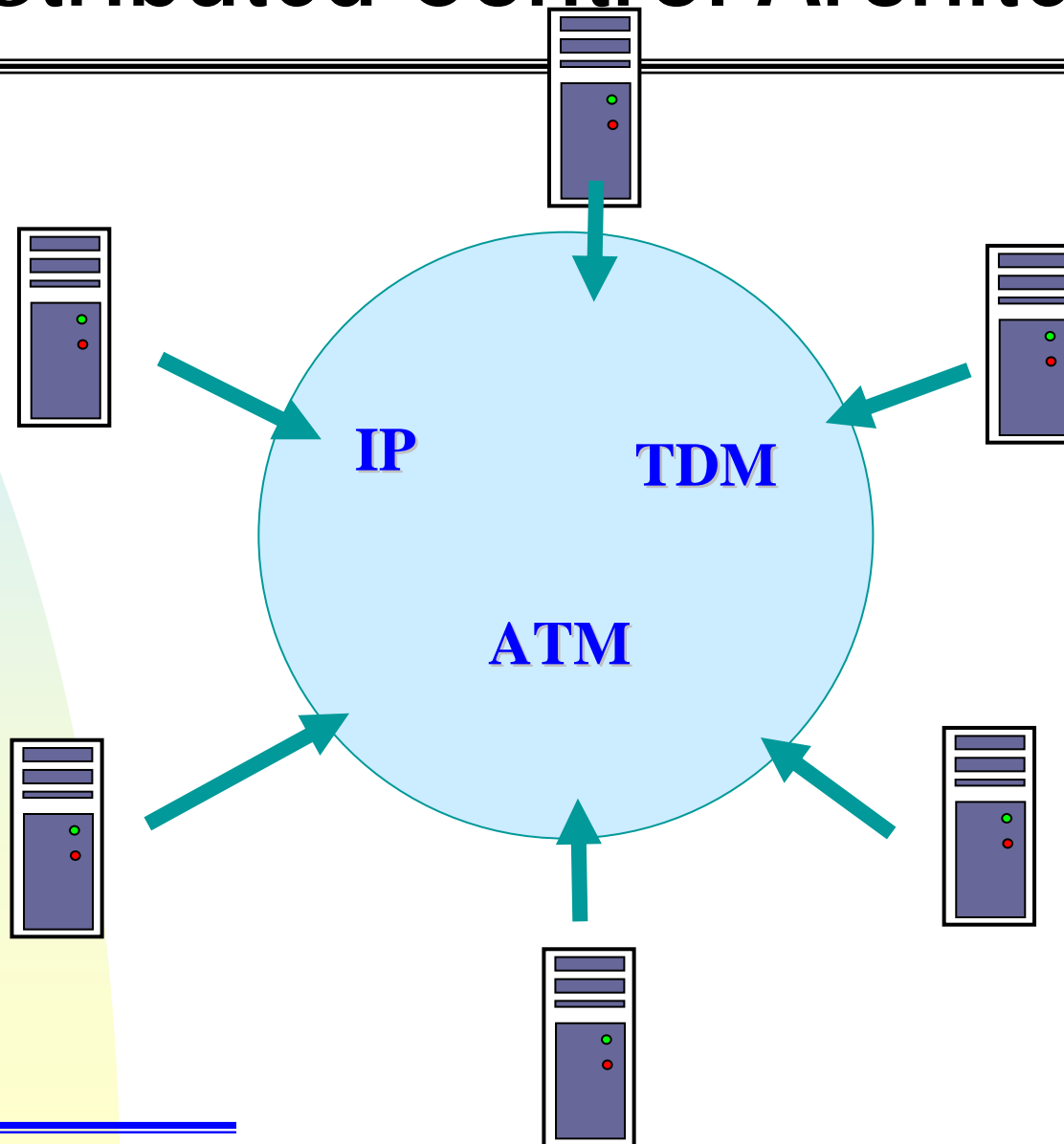


The characteristics of a softswitch (3/3)

- This **distribution of functionality** will enable the benefits of improved feature development and delivery as well as lower costs.
- Distributing functionality means that switches will be **simpler, more efficient, and cheaper**.
- **Switches will be able to focus on switching**, allowing other components to provide network control and service logic.
- **Distributed service logic** means that application development will not be constrained to centralized creation, control, and delivery of services.
- Services can be **created** and **deployed** at various places through an extended network.
- Hence **high scalability!**



Open Distributed Control Architecture



Hurdles for softswitch

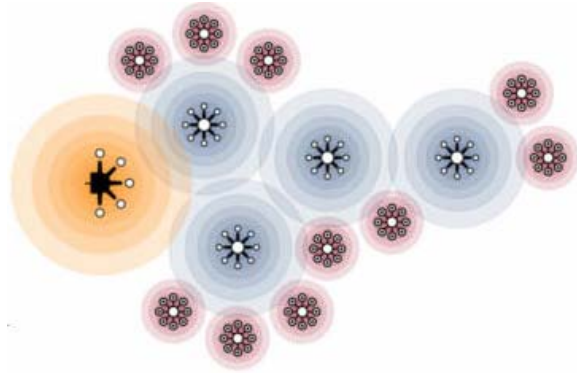
- **Cost of conversion and inertia**
 - Vested interest of some parties in perpetuating traditional networks,
 - Some infrastructure providers are hesitant to cooperate with the Softswitch initiative.
- **Integration** of Softswitch with traditional networks will be required as Softswitch deployment will not happen everywhere all at once.
- Need for **special mediation** between disparate networks.
- These needs go beyond mere protocol conversion requirements and include such things as authentication and authorization of network elements and applications.
- In traditional networks, well-established processes and protocols such as SS7 handle these mediation functions. These procedures will certainly be more complicated in the hybrid networks of the future.



Multi Protocol Label Switching (MPLS)

- IP-based Networks typically lack the **quality-of-service** features available in circuit-based networks, such as ATM.
- MPLS brings the **sophistication** of a connection-oriented protocol to the connectionless IP world.
- Based on simple improvements in basic IP routing, MPLS brings **performance enhancements** and **service creation** capabilities to the network.
- MPLS will be an **enabler for NGN**.





Convergence Issues



Convergence for NGN

Network convergence

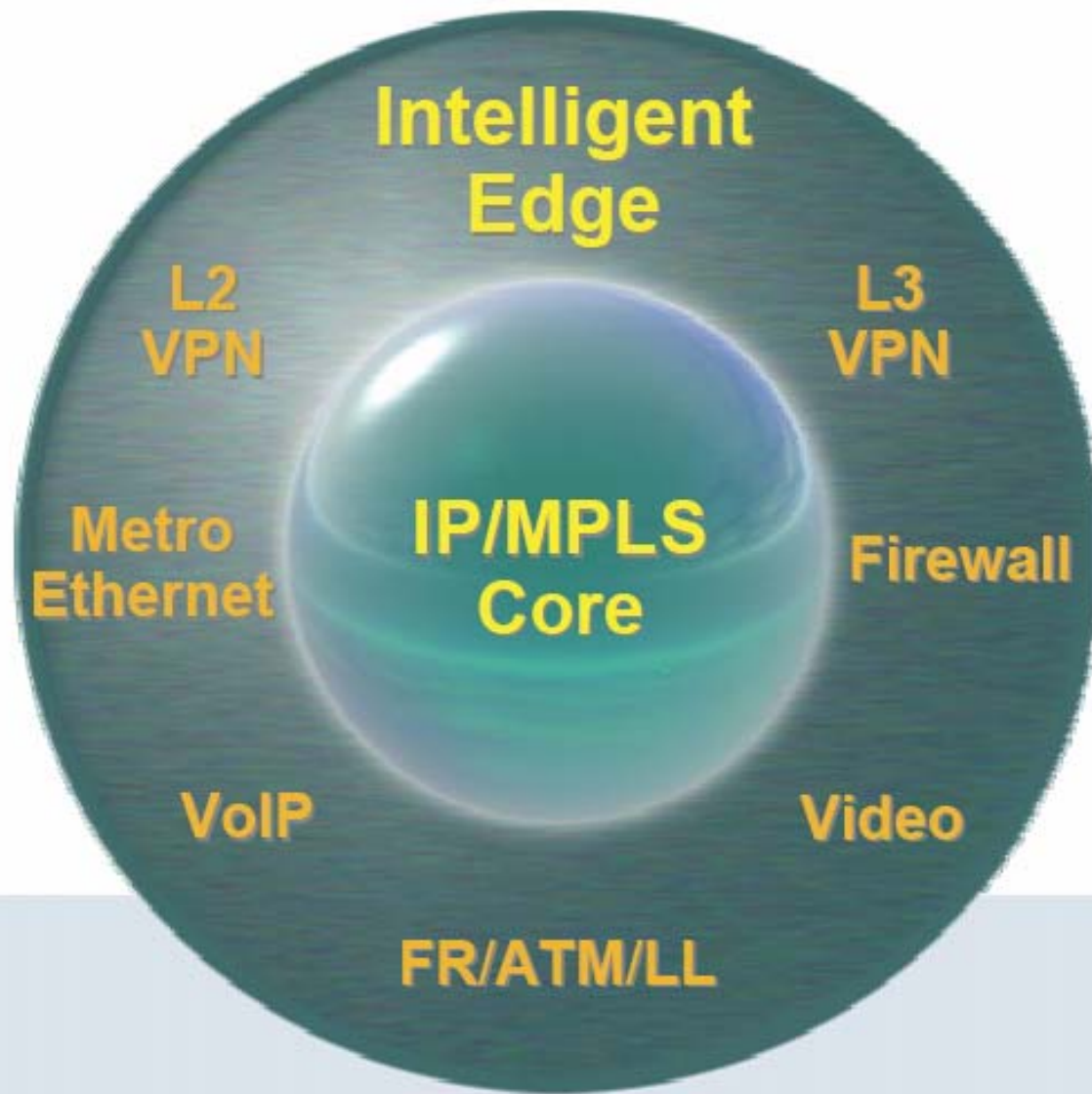
- **Disparate networks** are converged over a more efficient and cost-effective common core based infrastructure.
- **All services** on a single IP/Multi-Protocol Label Switching (MPLS) based network.

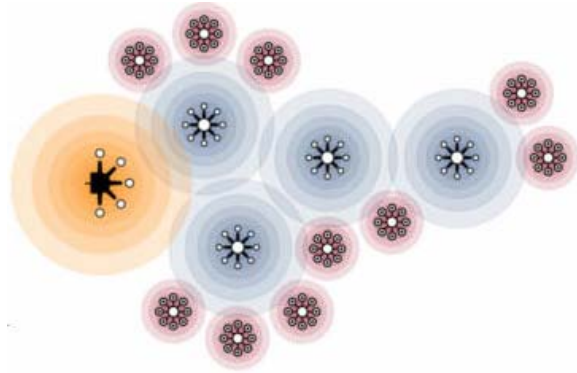
Service convergence

- Increased **application level control**.
- **Subscriber-level** service control intelligence
- **Efficient** and **profitable** delivery of voice, video, data and mobility services for wire-line and wireless convergence.



Convergence





Bottlenecks for NGN



Bottlenecks for NGN

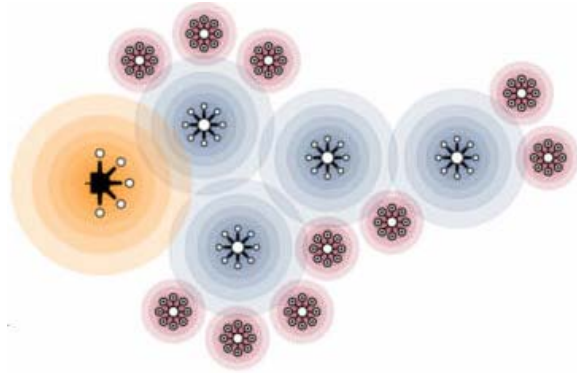
- The **existing architecture** hampers the service providers from creating and deploying new services.
- The **traditional (expensive) switch technology** has deterred providers from changing the cost model.



Open Questions for NGN

- What **type of access** will be supported (e.g., Hybrid Fiber Coax (HFC), Asymmetric Digital Subscriber Loop (ADSL), Broadband Wireless Access (BWA), etc.?)
- How will the **backbone transport network** be designed (e.g., based on Internet Protocol (IP), Asynchronous Transfer Mode (ATM), Time Division Multiplexing (TDM), Multi Protocol Label Switching (MPLS))?
- How will **operations** and **management** be handled in this new environment?
- What would be the new **NGN services** and how they can be realized in an NGN environment.





End of the Talk

Thank you for your attention !!!

Questions ?

