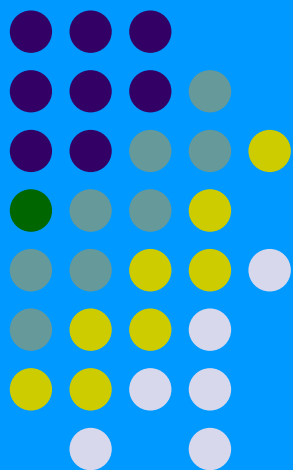
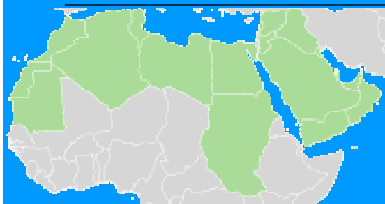




ITU-T



“Bridging the ICT Standardization Gap  
in Developing Countries”

# Numbering, Naming and Addressing (NNA) Issues

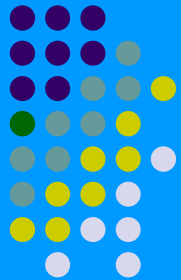
**Sherif Guinena**

Vice Chairman of SG2

ITU Arab Regional Development Forum 2008,

Damascus, Syria.

20-22(AM) July 2008



# Outline

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- **General Requirement for Numbering, Naming and Addressing.**
- **More on Numbering.**
- **Samples of SG2 Activities in NNA.**
- **Challenges of NNA in a converged environment:**
  - **Evolution of the ENUM.**
  - **Future of Numbering.**



## General Requirement for Numbering Naming and Addressing (NNA)

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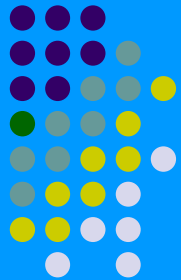
- ITU-T Recommendation E.190 defines the terminology for the “identifiers” used in PSTN/ISDN, GSM-based PLMNs and the Internet.



## Numbering for PSTN/ISDN

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- In the PSTN the ID is the **E.164** number and that number is used for identifying and routing the call to the subscriber/user or services.
- For services based on non-geographic numbers and number portability, the function of the number is split between:
  - a name role for identifying the user or service, and
  - an address role to indicate how to route the call to the subscriber's network termination point.



## Numbering for GSM based PLMN

---

- In GSM-based PLMNs the E.164 number is often called an **MSISDN** (to indicate that the E.164 number is used for mobile services).
- Another ID used in GSM networks is the **IMSI**; it provides a unique identifier of the mobile subscription for registration purposes.
- The IMSI is based on ITU-T Recommendation **E.212**.



## Addressing in Circuit Switched Networks

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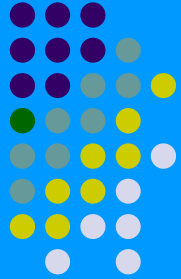
- For circuit switched networks, some network functions **Signalling Point Codes (SPC)** are used to address networks, e.g. ITU-T Signalling System No.7 (SS7).
- In the international signalling network, Some of the signalling point codes (**ISPCs**) are used according to ITU-T Recommendation **Q.708**, and some are used as National SPCs (NSPC) between national networks.



## Naming in the IP based Networks

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- For packet switched networks like the Internet and other IP based networks, identifiers are names used in the form of **Domain Names** according to RFC 1035 .
- The Domain Name is used to identify the **user/host** and the **IP address** used for routing to the *interface* to which the host is connected.



# Agenda

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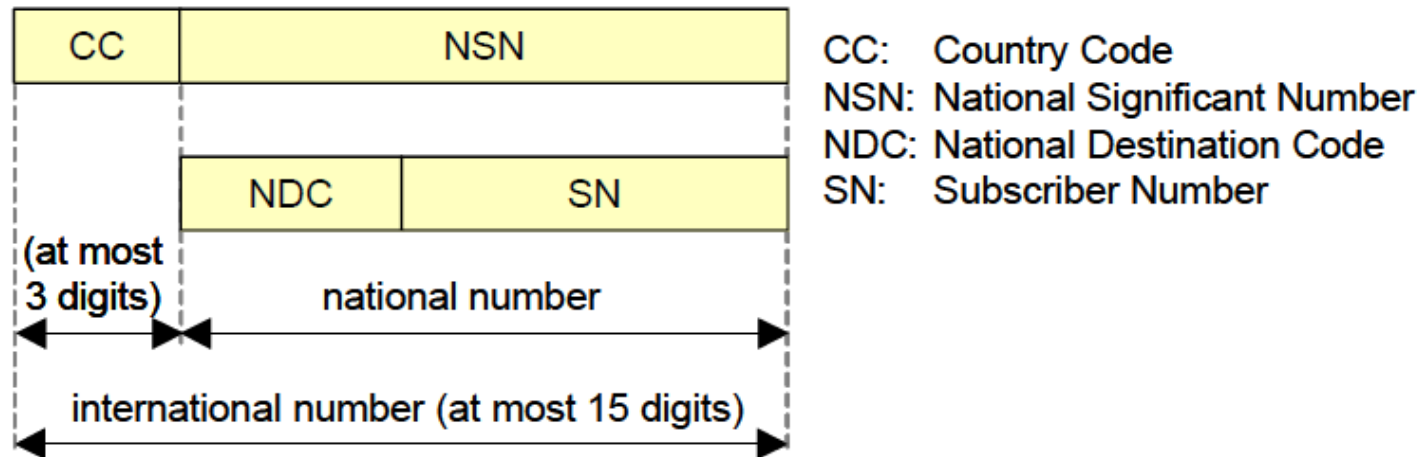
- General Requirement for Numbering, Naming and Addressing.
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# E164 Geographic Number

- To dial a destination in another country a user normally starts with the international prefix usually 00 (perhaps accompanied by a carrier selection code), and the Country Code (CC).
- All the rest of the digits constitute the National Significant Number (NSN).

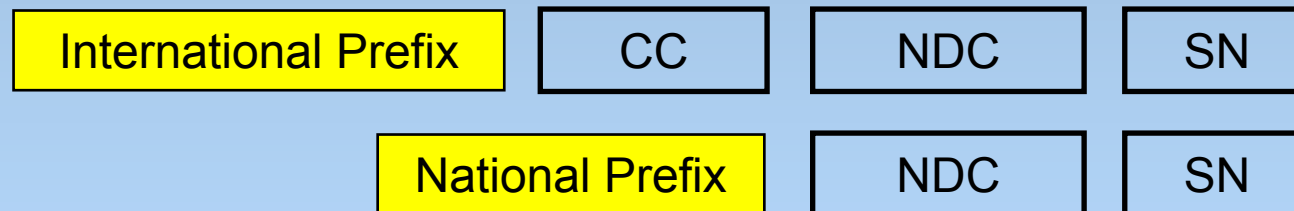


- ITU-T is responsible only for assigning the CC.
- The rest is a national matter for a geographic area (e.g. Egypt, Syria, ...).



# Dialing Prefixes

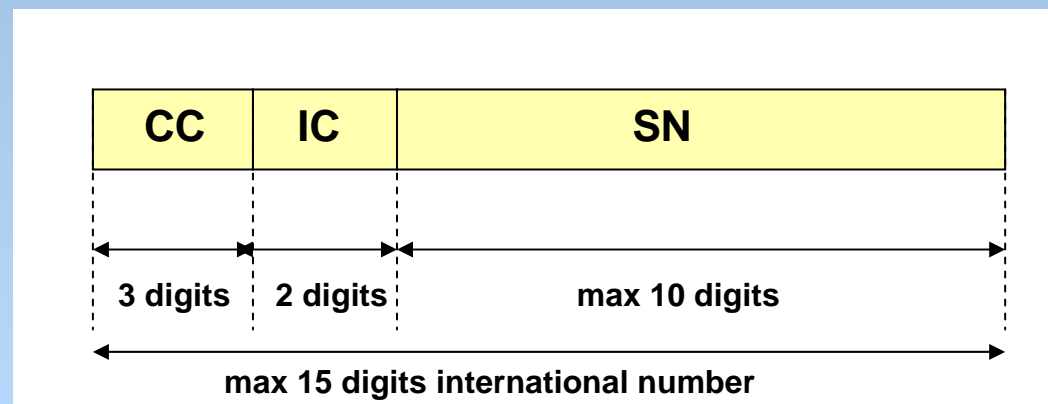
- ITU-T terminology “prefix” is not part of “E.164 number”.
- Prefix permits access to international networks (mostly 00) and national networks (mostly 0).





# E164 Number for Networks

- Identifies that the code is shared by multiple global networks.
- The IC (Identification Code) identifies the specific network.
- The Subscriber Number format and function are determined by the network operator.

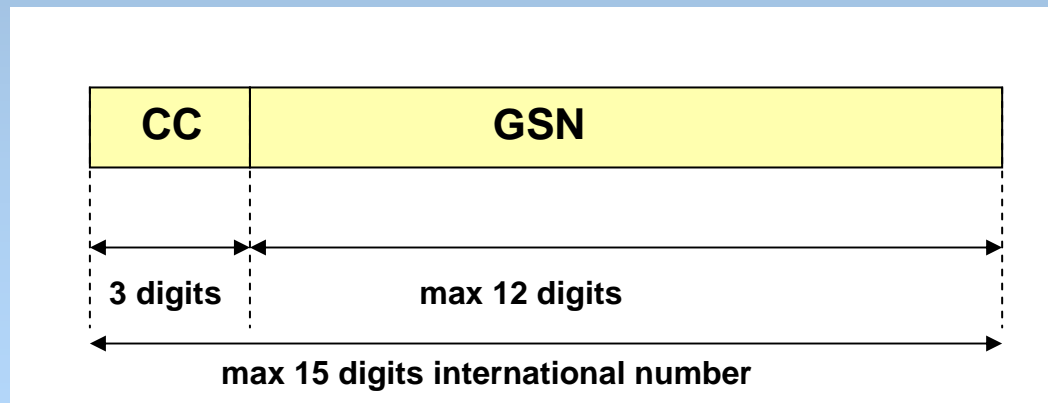


- ITU-T is responsible for assigning the CC and the IC. The SN is the responsibility of the Network Operator.



# E164 Global Number

- Identifies that the code is shared by multiple global networks.
- The IC identifies the specific network.
- The Global Subscriber Number (GSN) format and function are determined by the network operator.

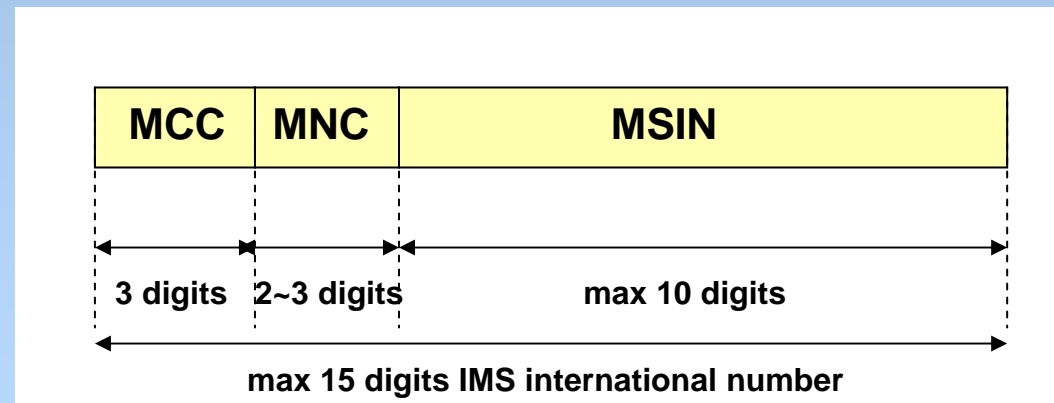


- ITU-T is responsible for assigning both of the CC and the GSN.



# E212 International Mobile Subscriber Identity (IMSI)

- ITU-T Rec. E.212 describes a plan for unique international identification of mobile terminals and mobile users in order to enable these terminals and users to roam among public networks that offer mobility services.
- MCC identifies the country.
- The MNC identifies the specific network.
- The MSIN assignment is determined by the network operator.



- **ITU-T is responsible for assigning the MCC and the MNC. The MSIN is the responsibility of the Network Operator.**



# CC Assignments

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- Country code CC identifies each country for International direct dialing.
- Country Codes have 1, 2 or 3 digits.
- 1-digit country codes :
  - 1 for the North American Numbering Plan and
  - 7 for the former Soviet Union).
- 2-digit country codes : There are only 44 2-digit country codes, belonging in general to the more industrialized or more populous countries, including 16 in Europe.
- The remaining allocated CCs all have 3 digits.



# Demand for CC

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- Demands for “country codes” have increased greatly, due to:
  - **New countries.** Typically new countries do not want to share country codes with others for economic/sovereignty reasons.
  - **New global services,** for universal international freephone services (allocated +800), universal international shared cost services (allocated +808), universal personal telecommunications (allocated +878), and international premium rate services (allocated +979), and recently UN for TDR operations (allocated +888).
  - **New global networks,** for satellite networks (using +881) and other networks (using +882).
  - **New groups of countries.** The European Union (EU) has been allocated +3883 to use throughout Europe for special European services (ETNS).

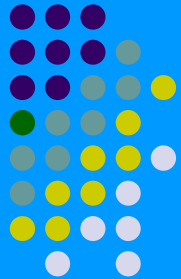


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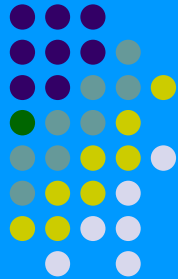
## SG2 Numbering Responsibilities

- Resolve requests for Numbering Resources
- Develop New Recommendations
- Consultant to the ITU-TSB (Resource Registrar)
  - Numbering Coordination Team (NCT)
- Assignment Guidelines and Procedures for Global Resources.
- Global Numbering Resource Management.
- Lead ITU Study Group (SG2) for Numbering matters (Res. 20).



# Sample Recommendations for NNA Developed by SG2

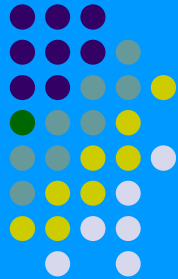
- **Development, Maintenance, and Application of E-Series Numbering, Naming and Addressing Recommendations**
  - **E.164**
    - **E.164.1** - *Criteria & Procedures for the Reservation, Assignment & Reclamation of E.164 CCs and ICs*
  - **E.168** - *Application of E.164 for UPT*
  - **E.169** - *Application of E.164 Numbering Plan for UIFN*
    - **E.169.2** - *Application of E.164 Numbering Plan for UIPRN*
    - **E.169.3** - *Application of E.164 Numbering Plan for UISCN*
  - **E.190**
  - **E.191** - *B-ISDN Numbering and Addressing*
    - **E.191.1** - *Criteria & Procedures for ITU-Defined AESAs*
  - **E.193** - *E.164 Country Code Expansion*
  - **E.195** - *ITU Global Numbering Resource Administration*
  - **E.212** - *International Identification Plan for Mobile Terminals and Mobile Users*



## Some SG2 activities in NNA

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- ENUM.
- IPv4 and IPv6.
- Telecommunications for Disaster Relief (TDR), Emergency Telecommunication Service (ETS) and Interconnection Framework for National Implementation of ETS.
- Cell Broadcast Message Identifier.
- Child Helplines use of international or national numbering resources.
- Identifiers and Identity Management.
- CPND, Misuse and Extraterritorial use of E.212 , .....



## SG2 activities in ETS

- The Jan 2007 SG 2 meeting approved Recommendation **E.ETS (E.107)** *"Emergency Telecommunications Service (ETS) and Interconnect Framework for National Implementations of ETS"*.
- It provides guidance that will enable telecommunications between one ETS National Implementation (ENI) and another ENI, in addition to providing a description of ETS.
- It considers a potential for bilateral/multi-lateral agreement between cooperating countries/Administrations to link their respective ETS systems.



## SG2 activities in TDR/EW

- SG2 is **considering new recommendation E.TDR** that addresses service and operational numbering aspects of the implementation of telecommunication with and within a disaster area.
- It provides recommendation on:
  - Naming and Addressing Provisioning for TDR operations;
  - TDR Operating Entities;
  - Global Network Conditioning/Configuration for TDR;
  - Potential TDR Scenario and;
  - Implementation Sequence for TDR operations.
- SG2 is also in liaison with other ITU-T and ITU-D SGs to discuss, determine then approve this recommendation.



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## Challenges of NNA in a converged environment.

---

- Telephone numbers remain a key identification mechanism.
- How Numbering is assigned for converged services (VoIP, Triple and Quadra play,.....)?
- Can a user reaches another user using a Telephone Number for these converged services?
- How can an Operator find an **IP** route to the destination user served by another Operator using a **Telephone Number**?
- With convergence, there are more ways to identify a user – email address, URL, IP FAX, IM buddy name,...

Should I know all user identifiers?

Terminals linked to communication types

User identifier schemes linked to communication type

What is the most successful way to communicate?

Work Telephone  
+202 353 44 240

Some user identifiers linked to terminals

Home Telephone (shared)  
+202 353 44 240

Work FAX  
+202 353 44 155

Some user identifiers linked to provider – (email)

Home FAX  
+202 229 1234



Work mail  
name.initial@enterprize.com



Mobile  
+2010 7654321



PDA/Mobile/WiFi  
+2015 1234567



Pager  
1234567



Home mail  
my\_name@mail.com

With convergence, there are more ways to identify a user, and more choices for user to communicate.





# ENUM

---

- ***ENUM in a nut shell :***

- Widely possible to originate calls from IP address-based networks to other networks.
- To terminate calls from other networks to IP address-based networks (i.e. to access a subscriber on the internet), global addressing scheme across PSTN and IP address-based networks is needed.
- ENUM allows using E.164 number to let network elements (gateways, SIP servers (VoIP),... etc) find services on the Internet (such as mailto, fax, SIP, mobility,... etc.).
- Put domain names derived from telephone numbers in the global Domain Name System (DNS) as follows:
- **+202 353 44 240    ⇨    0.4.2.4.4.3.5.3.2.0.2.E164.TLD**
- **TLD is unique for ENUM, by RFC3761 :    **E164.arpa****



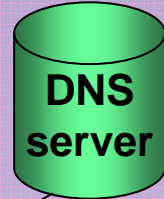
# ENUM

## Enabled Applications:

- VoIP
- Unified messaging
- Instant messaging
- IP fax
- Personal web pages...

Internet domain name addresses

SIP Server



DNS server

SIP Client

IP-based Network

CSN

Gateway

Internet  
PSTN

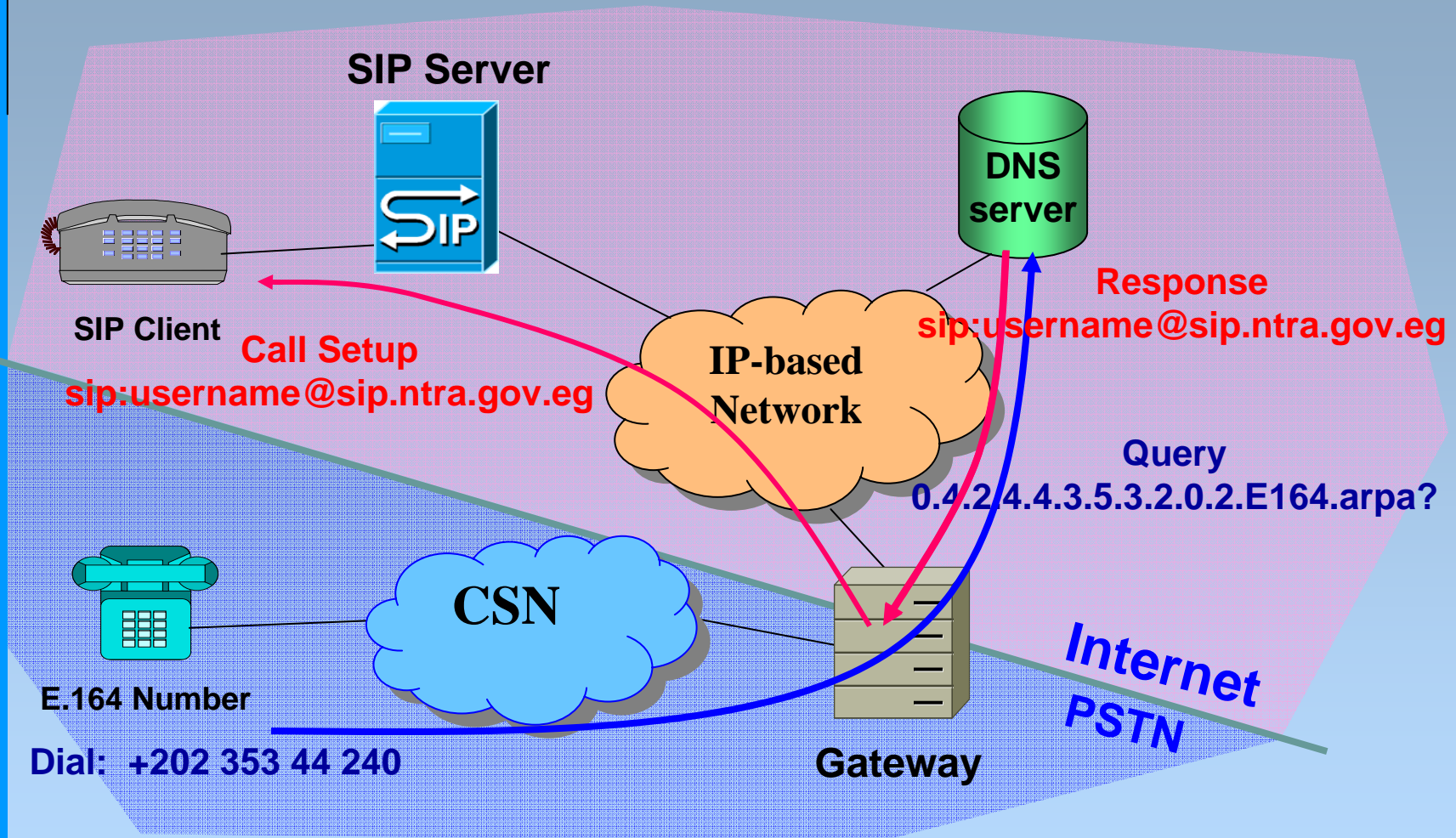
## E.164 Number:

One number mapped to many applications or services

E.164 Number



# PSTN to IP using ENUM

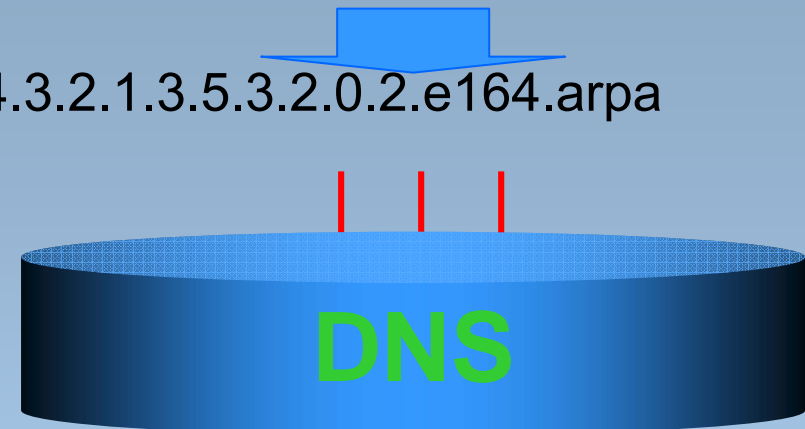




# Mapping an E164 number to IP(s)

- E164 telephone number +202 353 12345
- Turn into Domain Name : 5.4.3.2.1.3.5.3.2.0.2.e164.arpa
- Query the DNS: Use NAPTR protocol to find all user URIs  
(Uniform Resource Identifier)

- DNS Returns list of URIs :  
Allows use of telephone numbers in various communication media and services (e.g. e-mail, VoIP,...)



mailto:my\_namemail@enterprise.com

sip:my\_namephone@entrprise.com

.....@.....

**Example: if no answer then send an e-mail**



# ENUM Interim Procedures

---

SG2 has approved the ENUM interim procedures in May 2008:

- The domain *e164.arpa* delegated to *RIPE NCC*\*
- *RIPE NCC* appointed by the *Internet Architecture Board (IAB)* according to RFC 2916.
- The *RIPE NCC* provides DNS operations for *e164.arpa* zone (ENUM) in accordance with the Instructions from the *IAB*.
- The *RIPE NCC* will pass all requests for ENUM delegation to *ITU-T TSB* for evaluation.
- The *RIPE NCC* will only evaluate the technical set-up of a request only after *ITU-T TSB's* approval.

\* (RIPE NCC) Réseaux IP Européens Network Coordination Centre : As the Regional Internet Registry (RIR) for Europe, the Middle East and parts of Central Asia, the RIPE NCC provides Internet number resources, such as IPv4 and IPv6 address space and Autonomous System Numbers (ASNs), to its members.



# ENUM Issues

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- Resolution 49 of WTSA 04 noted the unresolved issues concerning *“administrative control of the highest level Internet domain which will be used for ENUM”*.
- Res. 49 instructs SG2 to study *“how ITU could have administrative control over changes that could relate to the international telecommunication resources including (NNAR) used for ENUM”*.
- Till the moment the question, raised by the above instruct in Res.49, has not been yet answered in consideration to the views of most developing countries.



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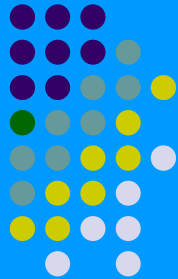


# “Future of Numbering”

---

- Difficulties recognized at the numbering resource management criterion, due to the rapidly changing network operation environment of IP based services and *Fixed-Mobile-Broadcasting* convergence technologies.
- Efforts is exerted to conceptualize evolution model of numbering system, in the name of “Future of Numbering”.





## Telecom Systems Operational Domains\*

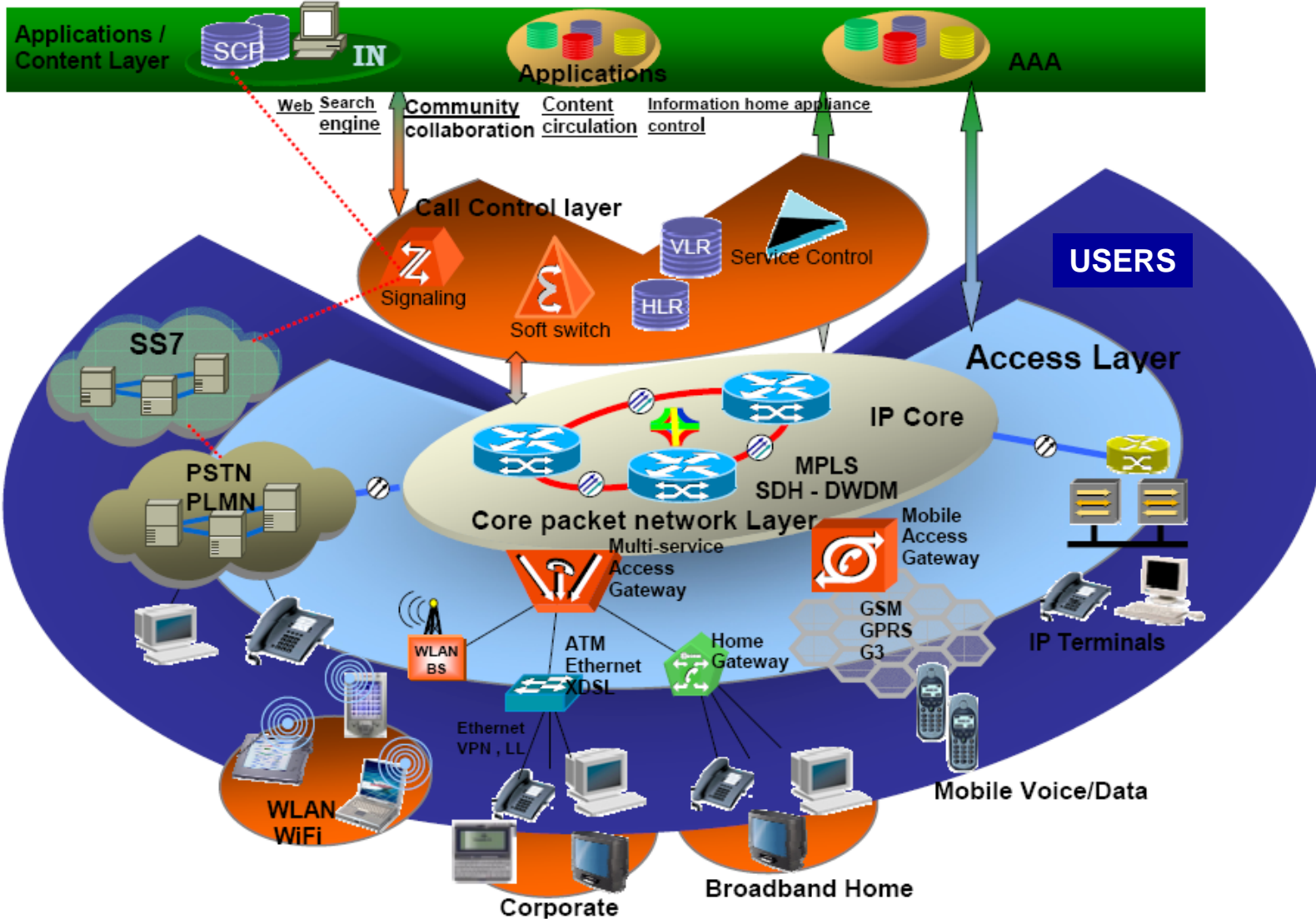
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- The changes in the numbering system rise from the **individualization** of three basic domains composing the operation of telecommunication system:
  - User domain.
  - Network domain
  - Application/Service provider domain.
- Those, shared the E.164 based identification system in traditional service provisioning.
- The emerging NGN architecture supported the conceptualization of the three domains model to envisage the future of numbering.

*•Source: ETRI Korea, SG2 C57 (chosen as a representative of one of the views on Future of Numbering. Other views exist as well and are under discussion in SG2).*



# Conceptual Architecture of NGN

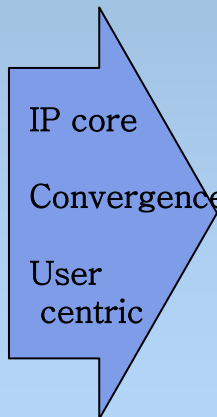
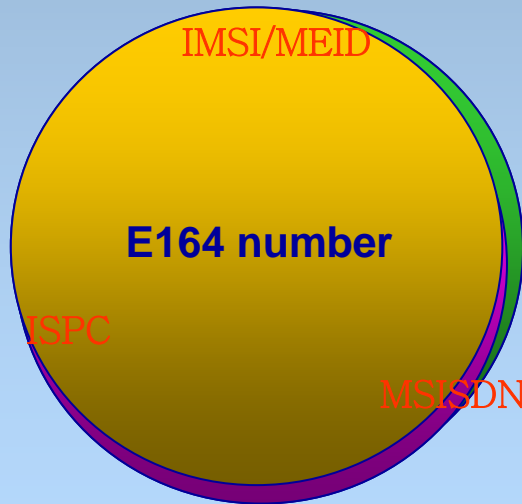




# Individualization to three domains -1

The domains that shared the E.164 based identification system in traditional service provisioning, are getting separated to become mutually independent in view of operation and management .

User = Terminal = subscriber  
Subscription = PSTN/PLMN operator



User mobility across Multiple access

User Domain

Number Portability

E164 number

Network Domain

Application/Service Domain

Network = Switched network with signaling

Access# = Geographical, Access lines

Application = IN , Supplementary Services

Service = Voice calls

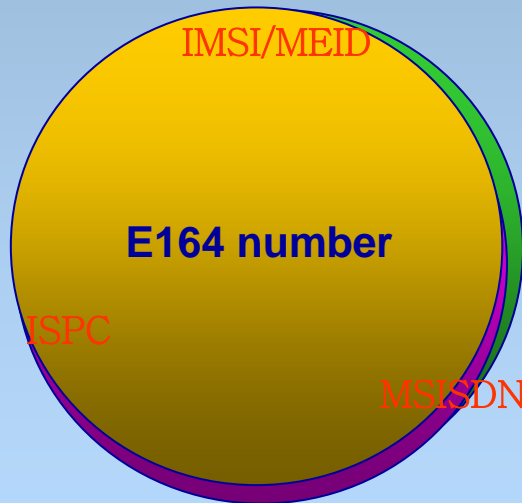
Layered Architecture of NGN



# Individualization to three domains -2

These that shared the E.164 based identification system in traditional service provisioning, are getting separated to become mutually independent in view of operation and management .

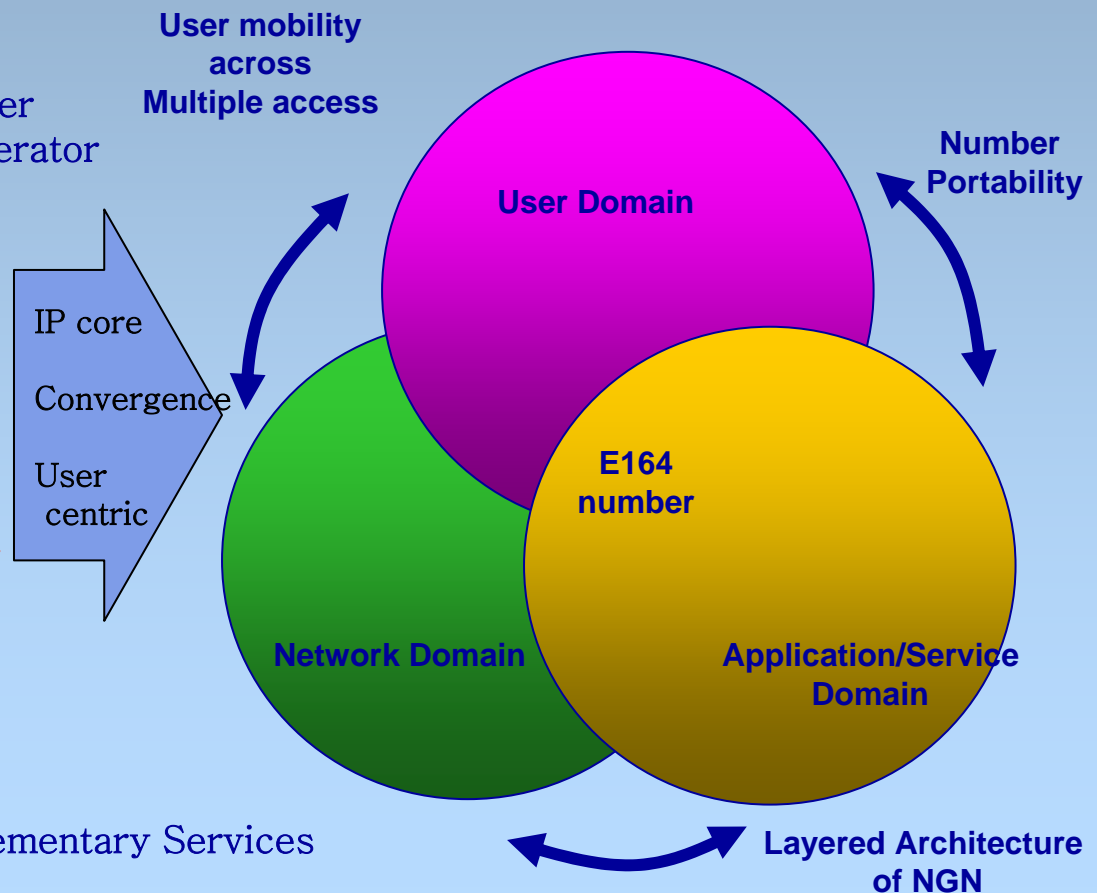
User = Terminal = subscriber  
Subscription = PSTN/PLMN operator



Network = Switched network with signaling

Access# = Geographical, Access lines

Application = IN , Supplementary Services  
Service = Voice calls





# Drivers for the three domains model -1

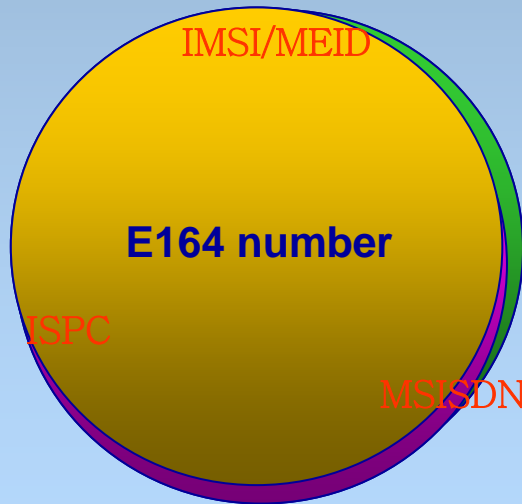
Increased user's freedom on the choice of various access, more needs on authentication

Non-geographic allocation of service & numbers

Release of users from subscriptions

become mutually independent view of operation and management .

User = Terminal = subscriber  
Subscription = PSTN/PLMN operator



Network = Switched network with signaling

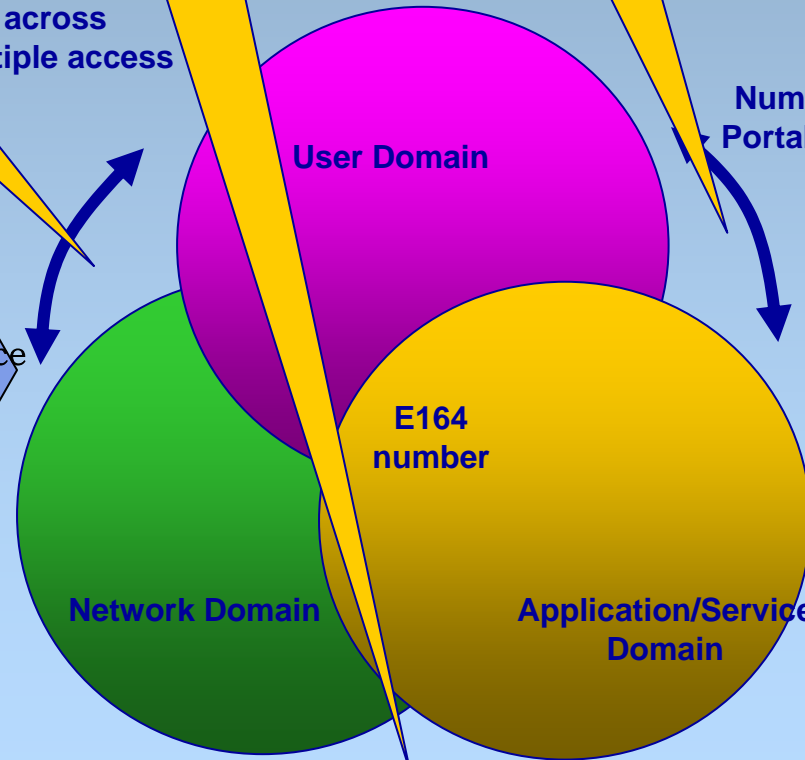
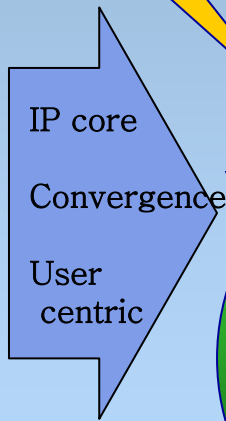
Access# = Geographical, Access lines

Application = IN , Supplementary Services

Service = Voice calls

User mobility across Multiple access

Number Portability





# Drivers for the three domains model -2

Users like to have more freedom & choice for the selection of service  
 Users like to have more control or information on his/her transaction  
 Users like to keep & use their IDs in easier and safer way, at a low expense

become mutually independent  
 management .  
 User mobility across  
 Multiple access

## Newly created business opportunities

- new IDs req.
- Newly created market behind the layers
- Emerging multimedia services

## New market on roaming users:

- More authentication?
- New IDs?

## Newly created business opportunities:

- new IDs required
- Newly created market up on the layers

## Emerging multimedia services

## Competition on NP:

- How to keep the subscribers ?
- How to authenticate?

Network

signaling

Access# = Geographical, Access lines

Application = IN , Supplementary Services

Service = Voice calls

Network

Application/Service Domain

Layered Architecture of NGN



شكراً

Thank you