

# ENUM for Number Portability at IPX from the GSMA



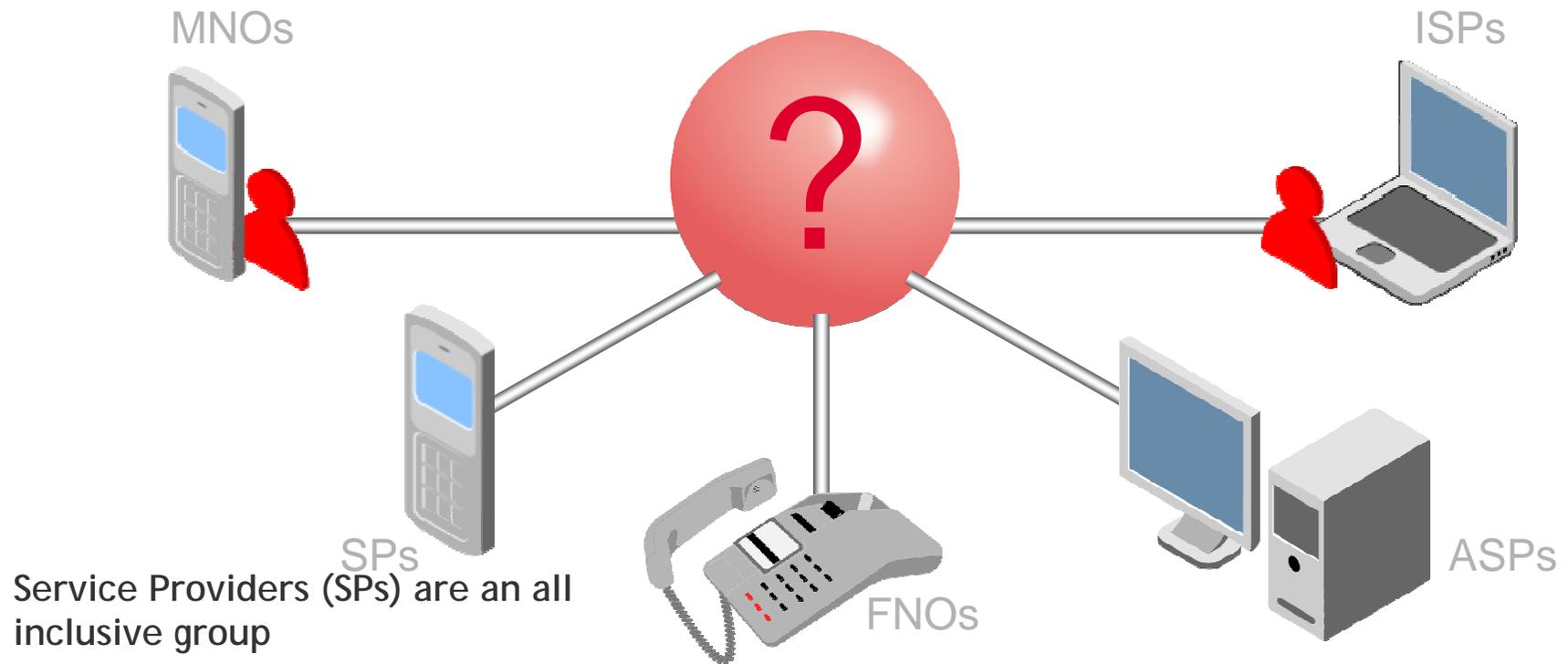
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April 2008

# ENUM - love it, change it or leave it



## Interworking is needed in a Converged World



Service Providers (SPs) are an all inclusive group

- Mobile Network Operators (MNOs)
- Fixed Network Operators (FNOs)
- Internet Service Providers (ISPs)
- Application Service Providers (ASPs)

## IPX overall - GSMA document

### Inter-Service Provider IP Backbone Guidelines 4.2 - 30 October 2007

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An Inter-Service Provider IP Backbone network architecture which connects Mobile Network Operators (MNOs), Fixed Network Operators (FNOs) Internet Service Providers (ISPs) and Application Service Providers (ASPs), from here on in referred to collectively as "Service Providers".

#### Chapter 2.1 In scope

Two possibilities exist for interconnection between Service Providers:

- Establishment of an inter-Service Provider IP Backbone connection via either GRX or IPX Providers , or
- Direct connection between two Service Providers using Leased lines, Internet using IPSec, VPN connectivity.

#### Chapter 4.1 The need for IP Interconnect

## IPX overall - GSMA document

### Inter-Service Provider IP Backbone Guidelines 4.2 - 30 October 2007

**The IPX builds upon and extends the architecture of the GRX by introducing a number of other stakeholders - Fixed Network Operators, Internet Service Providers and Application Service Providers (hereafter termed Service Providers)**

**The IPX introduces the requirement to support Quality of Service features end-to-end. That is, the parties involved in the transport of a service (BG/firewall) are bound by end-to-end Service Level Agreements**

**The IPX uses the same root DNS as the GRX**

**The IPX also introduces IPX Proxy elements. These Proxies may support interworking of specified IP services and make it possible to use cascading interconnect billing and a multilateral interconnect model**

**To assist with the translation of Telephone Numbers to URI the common DNS root database of the IPX will support ENUM capability**

**In the IPX, all user traffic, (that is, UE-to-UE and UE-to-Server), is separated from Server-to-Server traffic. This is to fulfil the requirement of end users not being able to reach or "explore" the IPX network**

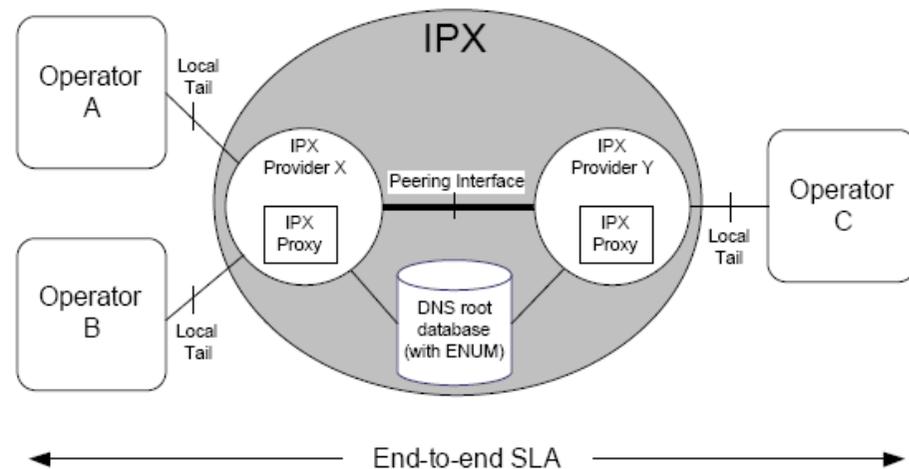
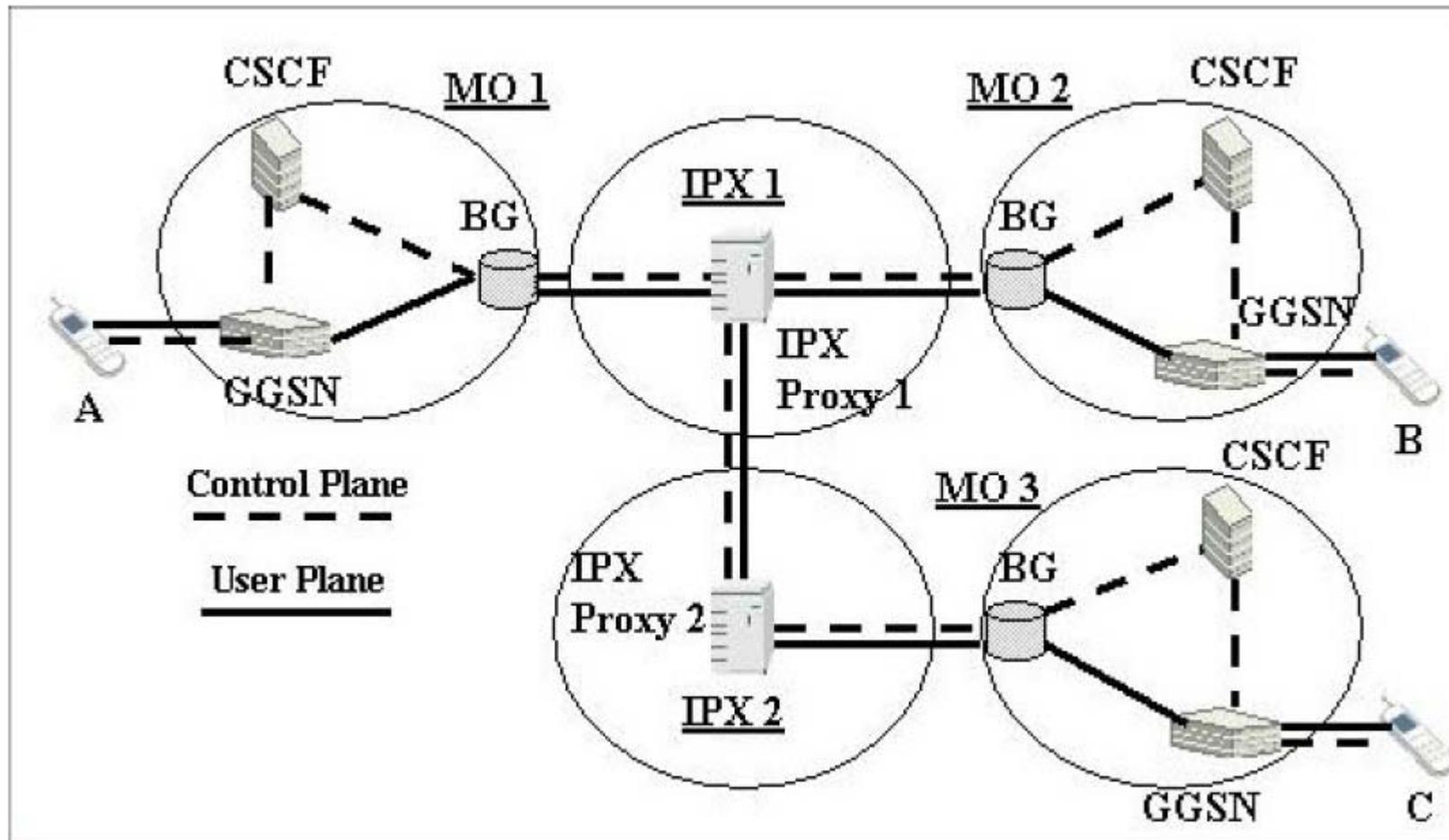


Figure 2 - IPX Model

# TCOM - NGVI Evolution

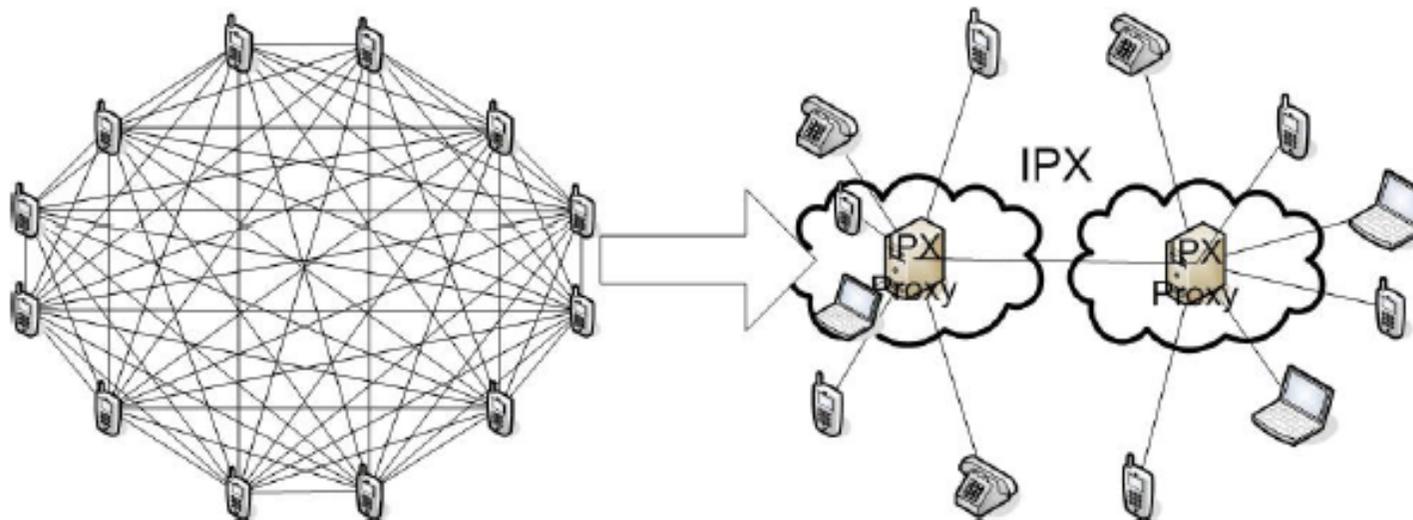
IPX - IP Exchange - the follow on for GRX



## IPX - what is it and the simplified model

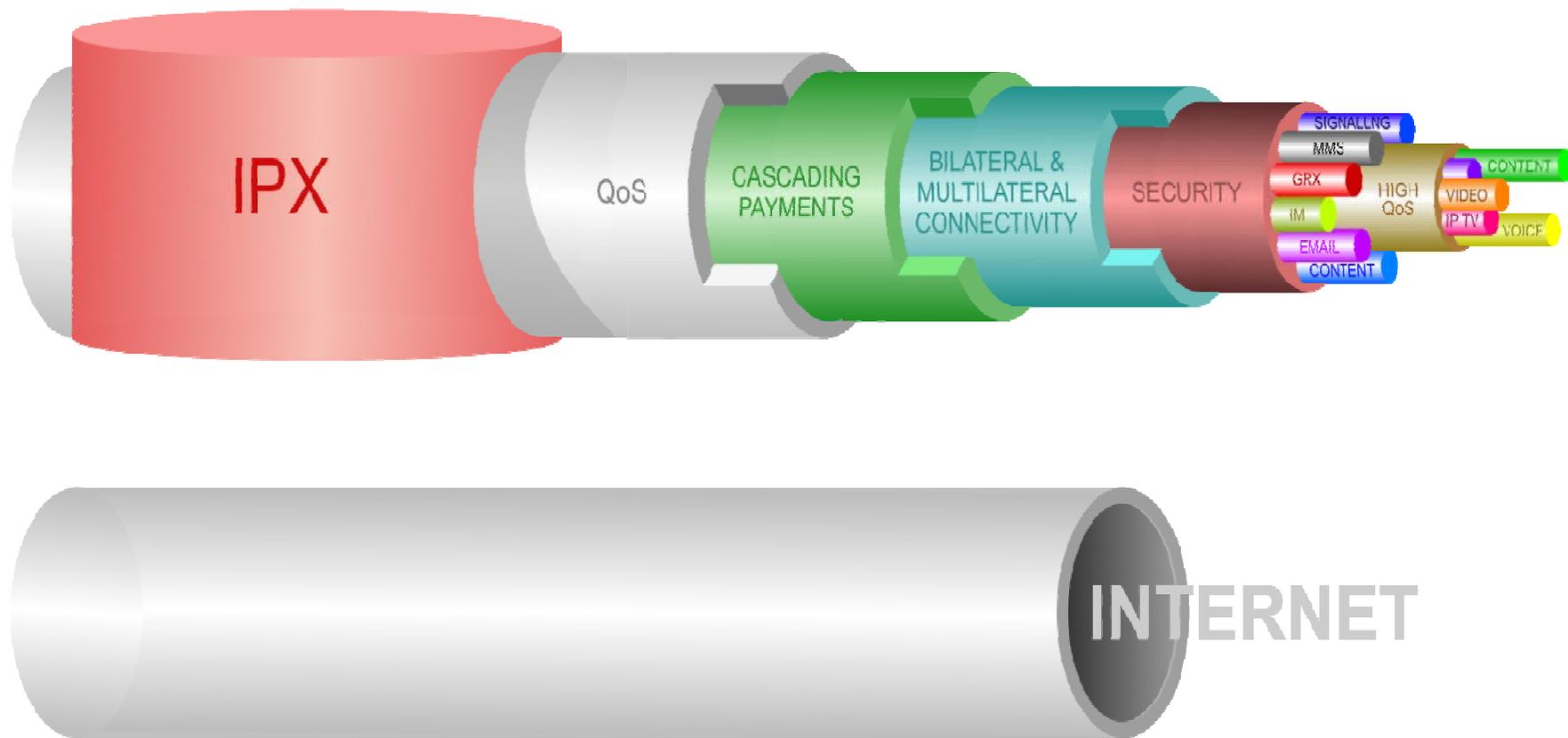
An IPX Proxy acts as a hub between IMS networks and facilitates interworking and interoperability from both technical and commercial perspectives. **An IPX proxy is a SIP proxy with additional functionality** to meet mobile operator requirements, including key functions such as accounting, brokering, security, routing, protocol conversion and the capability of transporting, and mediating where necessary, control plane and user plane packets between different IP multimedia networks.

Figure 1 Bilateral to Multilateral IPX Model

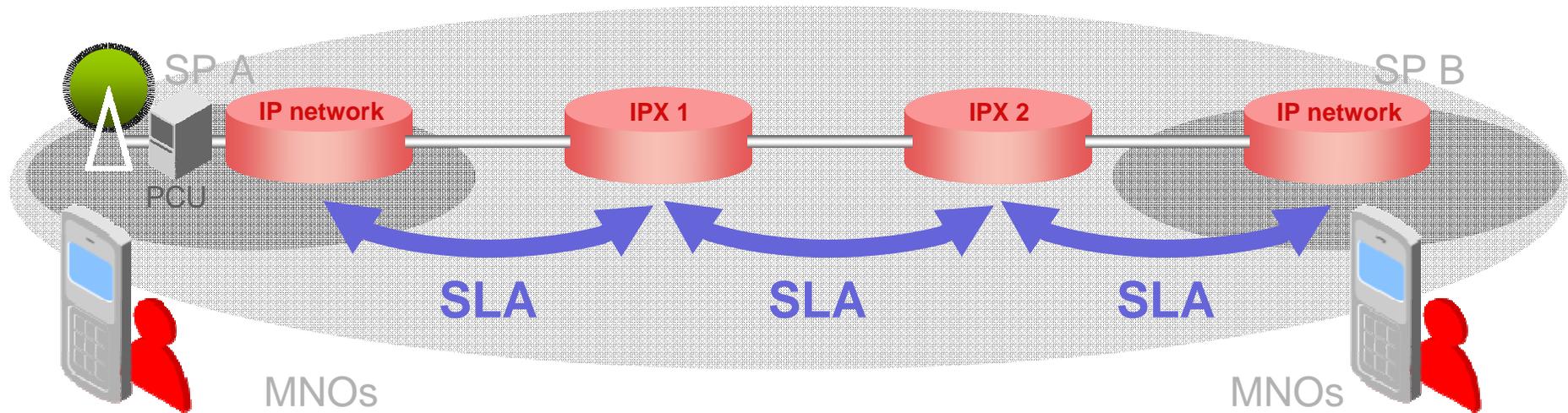


The Multilateral IPX Model – the GSMA's preferred solution for interworking IMS systems.

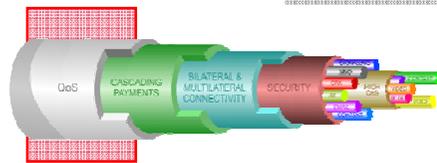
## Added Value Performance from an IPX



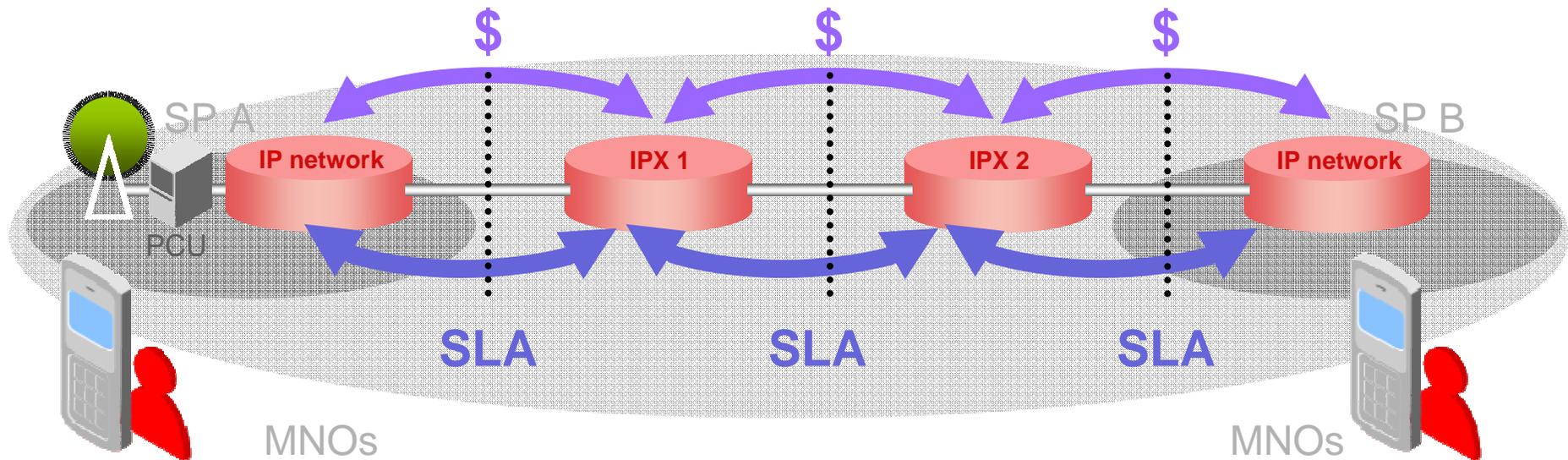
# The power of IPX - QoS



Local Loop (of SPA and SPB)	YES
IPX 1 to Public and Private IPX Peering Location	YES
IPX 1 to IPX 2	YES
IPX 2 to SP B	YES

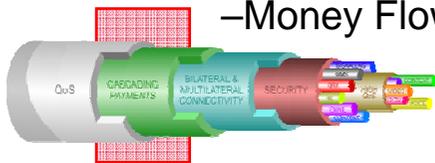


## The power of an IPX - Cascading Payments



### ■ End-To-End SLA & Operational Key Performance Indicators

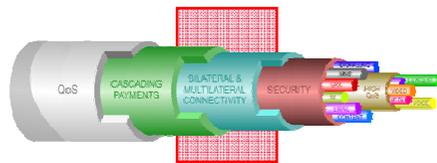
- Commercial agreements cover each stage of the transit chain
- All parties in the value chain are remunerated, obligating them to deliver against SLA
- All entities do accounting
- Service aware network enables parties to pass through appropriate payment
- Money Flows Along the Value Chain (Event Charging)



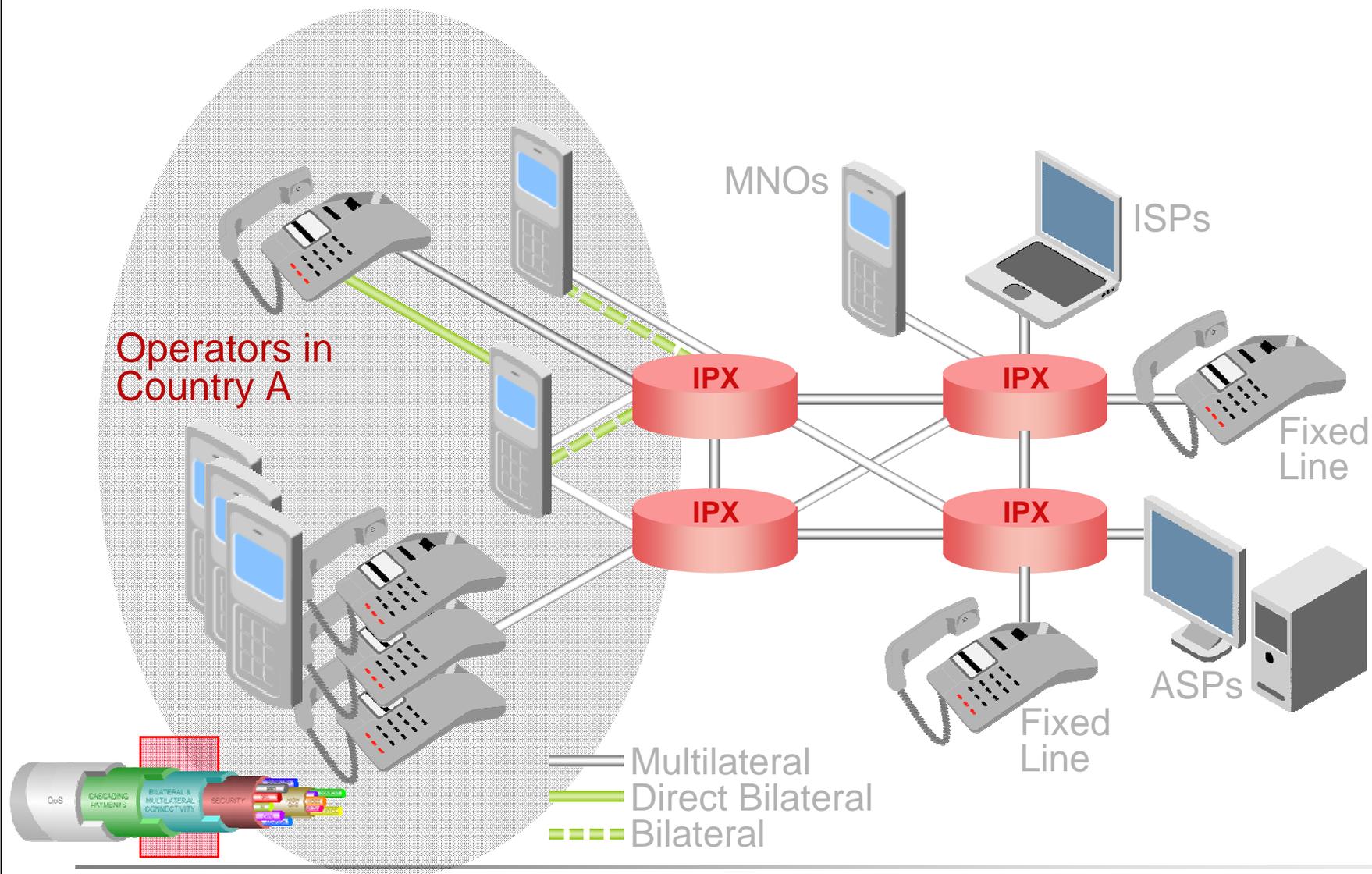
# The power of IPX - Flexible Interconnect Models

IPX supports 3 different types of interconnect model

Interconnect Relationship	IPX Interworking Service	End to End QoS	Cascade Billing	Single Contract/ Connection
Internet		✗	✗	✗
Bilateral	Transport Only	✓	Termination billing takes place directly between Service Providers	Single contract with IPX provider but multiple contracts with connecting Service Providers
Bilateral	Service Transit	✓	✓	Single contract with IPX provider but multiple contracts with connecting Service Providers
Multilateral	Service Hub	✓	✓	✓

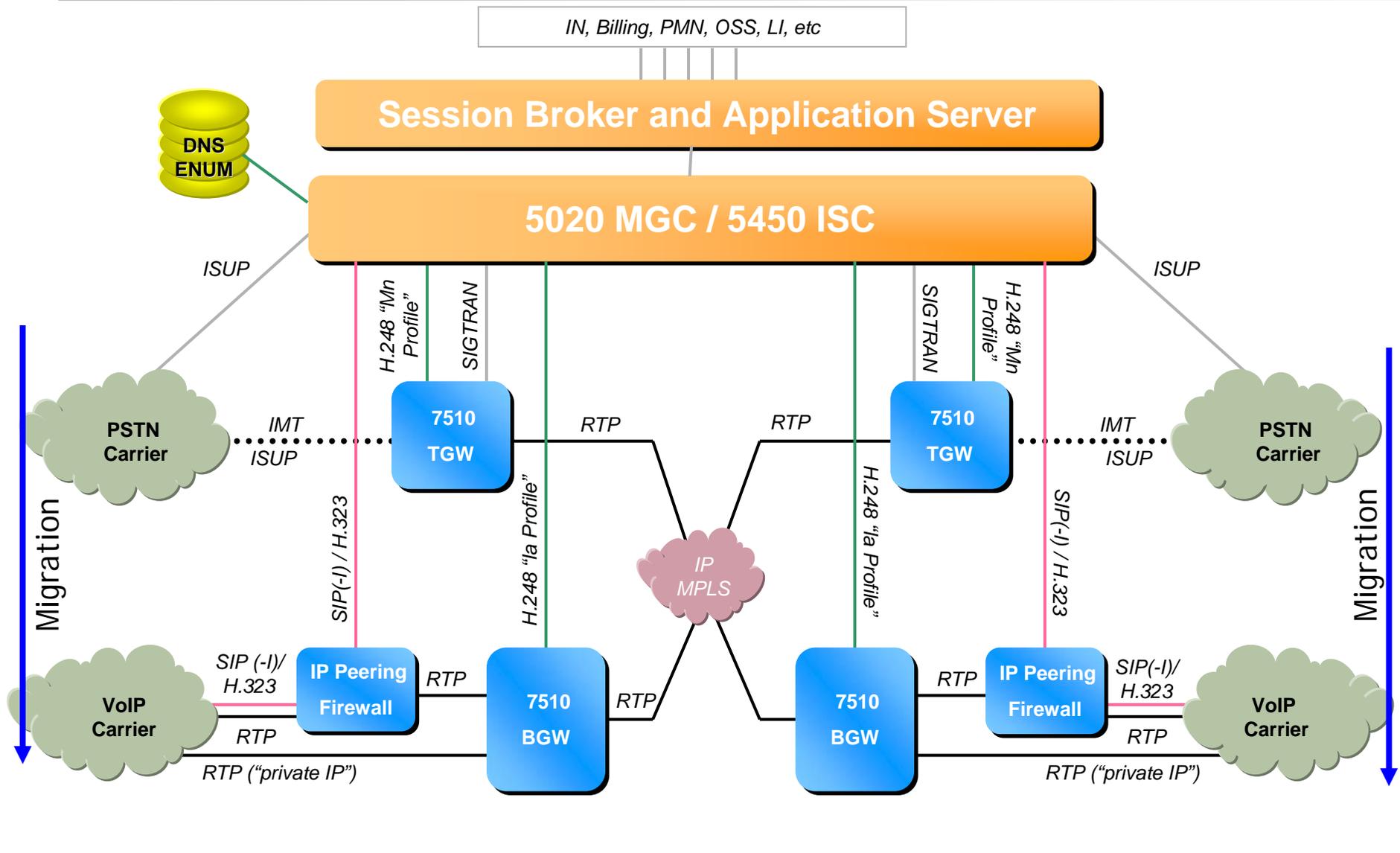


# The power of an IPX - Efficient Connectivity



# VoIP Peering

## Alcatel-Lucent blueprint for Peering Network Architecture



## IPX requirements

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### B2 REQUIREMENTS FOR IPX PROXY

- B2.1 General Deployment Requirements
- B2.2 SIP Requirements
- B2.3 IP Addressing and Routing Requirements
- B2.4 Quality of Service & Experience Requirements
- B2.5 Authentication and Authorization Requirements
- B2.6 Accounting Requirements

Inter-Service Provider IP Backbone Guidelines 4.2 (30 October 2007)

GSM Association - Official Document: IR.34

## ENUM Types as defined by the IPX (GSMA)

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### Public ENUM

- Uses the public DNS infrastructure on the Internet
- Data can be read by anyone
- Uses the "e164.arpa" top level domain
- Intention is to provide an on-line directory service for end users
- Data populated by end users who choose to opt-in
- Data could be out of date because it is up to the end user to keep it up to date
- May contain "personal" data if the user desires. There are privacy concerns but placing this data in ENUM is according to user choice

Who has Read Access

Who has Write Access

### Carrier ENUM

- Uses a private DNS infrastructure on the GRX/IPX
- Intention is to provide a routing enabling technology that is transparent to the end user
- Not reachable by end users or Internet users
- Uses the "e164enum.net" top level domain to avoid any detrimental effects caused by unintended leakage to the Internet caused by mis-configuration in an operator's network
- Data can be read only by those connected to the GRX/IPX (examples: operators, MMS hub providers)
- Data populated by operators
- Data must be kept up-to-date by the owning operator otherwise calls and services will fail.
- Does not contain "personal" data, only data required for call and service routing

## ENUM Domain name

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The domain name "e164enum.net" shall be used for Carrier ENUM on the GRX/IPX. This has been chosen for a number of reasons:

- To ensure there is no conflict with Public ENUM.
- It is registered on the Internet to GSMA
- Neutral between mobile/fixed and standards groups
- Has an indication of its purpose i.e. E164 and ENUM
- The ".net" suffix was felt to be relevant to the use of this domain. From IETF RFC 1032 [25]: *".net" was introduced as a parent domain for various network-type organizations. Organizations that belong within this top-level domain are generic or network-specific, such as network service centres and consortia. ".net" also encompasses network management-related organizations, such as information centres and operations centres.*
- Can support future connection of Fixed & non-GSM/UMTS operators to the GRX/IPX

The IMS ENUM URI domain format is:

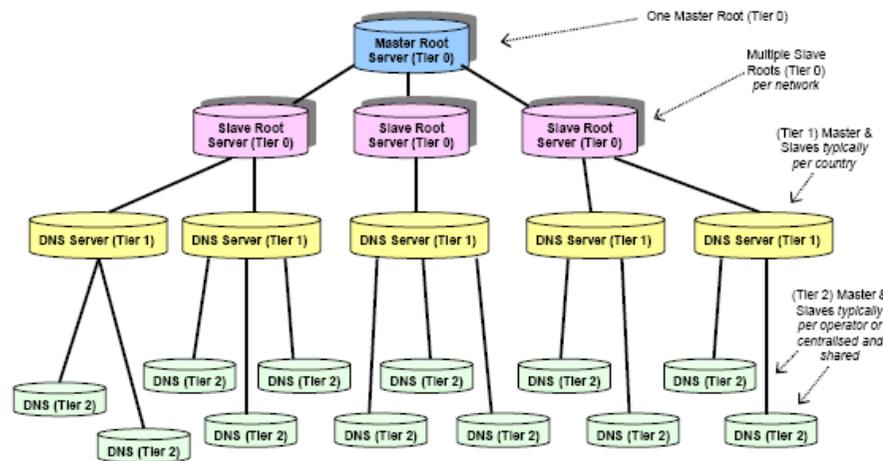
- sip:<MSISDN>@<xxx>.mnc<MNC>.mcc<MCC>.3gppnetwork.org (for SIP phones w/ ISIM)
  - where "<xxx>" can be any characters or null, and <MNC>/<MCC> are the MNC/MCC allocated to the MNO.
- examples are sip:+447700900123@mnc001.mcc234.3gppnetwork.org,  
sip:+447700900123@ims.mnc001.mcc234.3gppnetwork.org,  
sip:+447700900123@imsnetwork.mnc001.mcc234.3gppnetwork.org

## ENUM Delegation Models

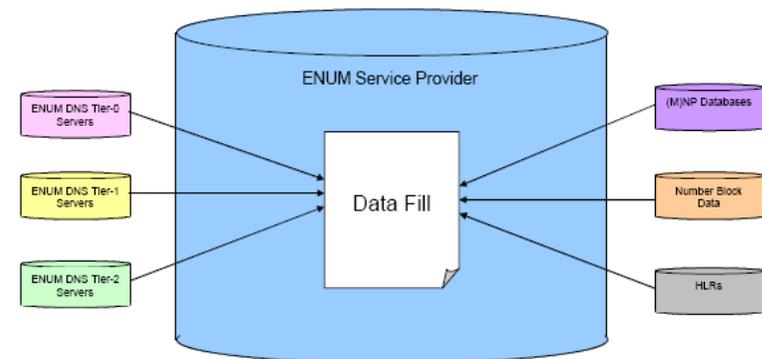
There are three principles which any Carrier ENUM model should support.

- First, there should be a competitive environment, where more than one vendor or service bureau offers Carrier ENUM functionality.
- Second, equal accessibility is required, such that the ENUM data fill is available to all entities who need it.
- Third, accuracy is critical, which means that there exist authoritative databases with the required information.

Note that a competitive environment is dependent upon the open connectivity and accessibility of the ENUM data.



*Single Root Model*



*No Root Model - Authoritative Databases*

## Sources of data for ENUM Service Providers

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### *Number portability database:*

- ENUM server or ESP utilizes an existing authoritative number portability database to determine the destination carrier for a given dialled number. The operator originating the query uses local policy information to provision an appropriate entry-point address for each of its interconnect partners as shown below.

### *Number-block database:*

- ENUM server or ESP utilizes an existing authoritative numberblock assignment database to determine the destination carrier for a given dialled number. This model works in any country that does not support number-portability.

### *MAP SRI for SM query:*

- ENUM server or ESP utilizes existing HLR databases to discover the destination carrier for GSM networks around the world.

## Number Portability with ENUM (option1 and option2)

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If the subscriber whose number is +44-7700-900123 is a subscriber of MNO1 in the UK, his SIP URI (for IMS) could be

"SIP:+447700900123@ims.mnc001.mcc234.3gppnetwork.org"

and would be provisioned in his ENUM record in the central database as follows:

```
$ORIGIN 0.0.7.7.4.4.e164enum.net.
```

```
3.2.1.0.0.9 NAPTR 10 10 "u" "E2U+SIP,"
```

```
"!^.*$!sip: +447700900123@ims.mnc001.mcc234.3gppnetwork.org!
```

If this subscriber then moved/ported over to MNO2 in the UK, then this SIP URI in the central database would simply be modified to be

"SIP:+447700900123@ims.mnc002.mcc234.3gppnetwork.org" thus:

```
$ORIGIN 0.0.7.7.4.4.e164enum.net.
```

```
3.2.1.0.0.9 NAPTR 10 10 "u" "E2U+SIP,"
```

```
"!^.*$!sip: +447700900123@ims.mnc002.mcc234.3gppnetwork.org!
```

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