IP TAX in BSNL
Class 4 Services

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NGN Concept
Each vertical on the left has to be split into Network Elements that map onto each horizontal on the right.
NGN Architecture

• NGN Concept
  – A unified packet transport layer for all types of services
  – A session based control architecture
    • For user to user voice, video and data services over the packet infrastructure
  – A common Service delivery platform

• Expectations from NGN
  – Generate new revenue streams by having fast roll out of new multimedia services
  – Secure voice revenue stream by integrating PSTN infrastructure with NGN
  – Provide solution to cater to PSTN obsolescence wherever applicable
Requirements for NGN Implementation

• Equipment and Network Interoperability between various Operators
  – A standards based functional architecture
  – Standard interfaces and protocols

• Ability to serve Fixed (Copper and fibre), Wireless and Mobile Networks

• Open Services Architecture
  – Standard interfaces open to third party application service providers

• QoS Control Mechanism
  – Important for voice and video services
  – Requires bandwidth allocation mechanism at access level as it is shared between various services
Requirements for NGN Implementation

- Need to share management functions like provisioning, metering, billing, QoS monitoring

- Provide Generalized Mobility features
  - Mobility features at the fixed access, nomadism
  - Provide service continuity between fixed and mobile access leading to convergence

- Common technology for transport layer
  - IP/MPLS has emerged as the most suitable technology for this layer
NGN Definition

• ITU-T definition for NGN:
  – A Next Generation Network (NGN) is a packet-based network able to provide services including Telecommunication Services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies. It offers unrestricted access by users to different service providers. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users.
Service Layer

Control Layer

Access Layer

Open interfaces

Separated control

Service X
Service Y

NB Wireless
BB Wireless
BB Wireline

IP/MPLS Transport Core

Management

SIP
H.248

QoS Mechanism

Usage Measurement

FMC
Network Evolution
Steps
**Circuit Switching (CAS)**

**Local Exchange**
- Call Control
- Switching
- Interfaces

**Transit**
- Call Control
- Switching
- Interfaces

**Local Exchange**
- Call Control
- Switching
- Interfaces

Signaling & Bearer

**Bearer is a voice channel**
Circuit Switching (CCS)
Circuit Switching (CCS)
Soft Switching Transit Architecture

Local Exchange
- Call Control
- Switching
- Interfaces

Transit
- Soft switch

Local Exchange
- Call Control
- Switching
- Interfaces

Common IP MPLS Transport
- TMG
- SGW
- Bearer

Signaling
PSTN to NGN Mapping

PSTN Switch
- Call Control
- Switching
- Interfaces

NGN Components
- Call Server / Soft Switch
- Routers of IP/MPLS Network
- Gateways
- Common IP MPLS Transport

TDM Transport Network

PSTN to NGN Mapping

SG / TMG / LAG
Scope of IP TAX Project

- Setting up Two Soft Switches at New Delhi and Chennai and Signalling Gateways at New Delhi, Chennai, Kolkotta and Bangalore

- Providing Trunk Media Gateways (TMGs) at 21 Level-1 locations

- Providing one Announcement Servers in each IP domain

- Billing interface to Centralized Billing Server

- NMC
What is Session

- It is a temporary communication relationship among a group of objects in the service stratum that are assigned to collectively fulfill a task for a period of time
- A state of a session may change during its lifetime
- Session based communications may be one-to-one, one-to-many, many-to-one or many-to-many
SIP Overview

- SIP (Session Initiation Protocol) is a control protocol that defines how sessions are to be set up and torn down.
- SIP can establish, modify, and terminate multimedia sessions with one or more participants.
- It can also invite participants to already existing sessions, such as multicast conferences.
- It supports name mapping and redirection services, which supports personal mobility - users can maintain a single externally visible identifier.
- Innovative services, such as voice-enriched e-commerce, web page click-to-dial, Instant Messaging with buddy lists, and IP Centrex services become feasible.
SIP Overview

• SIP is a request-response protocol resembling internet protocols like HTTP (for www) and SMTP (for e-mail)

• SIP reduces telephony to another web application that can be integrated into other internet services
IP TAX Components

• Soft Switch (or Call Agent or Telephony Server or Media Gateway Controller)
  – Based upon Open Architecture
  – Should preferably be developed on Commercially Available Hardware and Software Platforms
  – Should be able to provide all existing services available in TDM network
  – Performs Media Gateway Control Function
  – Performs Call control, signalling and interworking, Traffic measurement and recording functions
  – Provides Addressing, Analysis, routing and charging facilities
  – Interacts with Application Server to supply services not hosted on Softswitch
IP TAX Components

• Signalling Gateway
  – Provides interworking function between SS7 network and IP network
    • This involves providing various types of User Adaptations so that the SS7 signalling can be terminated in SGW and can be translated and messages transported over IP Network
  – Performs Packetization of signalling and ensures its transport through IP network
IP TAX Components

• Trunk Media Gateway
  – Performs the functions of
    • Voice encoding & Compression
    • Packetization of voice channels
    • CNF (Comfort Noise Generation)
    • VAD (Voice Activity Detection)
    • Echo Cancellation
    • May provide the edge functionality and act as CE
Access Network

BSNL’s MPLS Core

Soft switch (MGC)
AS
EMS
SG
Existing STP N/w

LE/TAX/MSCs
E1s

E1

IP Clients
DSLAM
Copper wires
DSL Modem

Other operators POI
Next Generation Switching
Next Generation Switching Architecture

- Application Server
- Soft switch
- SBC
- Line Access Gateway
- Access Gateway
- SHDSL
- 2B+D
- ADSL/ADSL2+
- Common IP MPLS Transport
- SBC
- TMG
- SSTP Network
- Local / Rural Exchanges
- PRI
- V5.2
- AN
- RSU
Below SDCA Level IP Network
A case of Metro City

Local / Rural Exchanges

BLC

MG

PE

AGW

LAG

Metro Backbone

2B+D

ADSL/ADSL2+

SHDSL

E1

E1

V5.2

PRI

RSU
Below SDCA Level IP Network
A case of Normal SDCA
THANK YOU
Does Network Evolution lead to NGN?

- Hyper competitive telecom environment
  - Tariffs continuously on decline
  - Quick returns on investment required
  - Need to keep network costs as low as possible

- Traffic trends
  - Fixed PSTN traffic showing almost no growth
  - Mobile traffic showing growth and is now shared between various operators

- Data traffic showing fast growth
  - It started with dial up internet access
  - Now being driven by Broadband access which is slowly emerging as the key demand on all type of user terminals

There is a need of a platform that can roll out new services, meeting customer expectations, quickly and yet keep the network costs minimal
Advantages of NGN

• Bandwidth Saving
  – Up to 1:4

• Reduced Energy Consumption
  – Up to 1:3 saving

• Reduced Operational Costs

• Reduced spare & repair costs
  – Up to 90% saving

• Reduced accommodation costs
  – Up to 1:5

• Network Consolidation & Trunk optimization

• Capability to provide all services including Network Wide Services
Each of the MPLS routers (in the second layer) at all the other LDCCs interconnect with the Level –I TAX routers on two different paths.
MPLS Core, LDCC & SDCC Network

SDCCs routers are connected to respective LDCC on two different paths
Mesh network
Connecting all Level-1 TAXs at 2.5G λ / 10G λ
Functions of NEs
Class 5 Components

• Application Server (or Feature Server)
  – Provides service logic and execution of user (or customer) services that are not directly hosted on Softswitch
  – Due to open architecture and standards it can be a third party product
Class 5 Components

- Session Border Controller (SBC)
  - Deployed at edge (IP-IP network border as between service provider and customer / enterprise network) and core (IP-IP network border as between two service providers) of service provider’s network to control signaling and media streams as they enter / exit the network
  - Provides security, denial of service attacks, overload control, Network Address Translation and Firewall Traversal, Lawful Interception, QoS management, Protocol Translation, call accounting
Class 5 Components

• Access Gateway
  – Performs the functions of
    • Media conversion
    • Codec Negotiation
    • Termination of line side interfaces like phones, devices and PBXs
    • Echo Cancellation
    • VAD (Voice Activity Detection and Comfort Noise Generation)
    • Providing edge functionality and act as CE router
<table>
<thead>
<tr>
<th>Network Function</th>
<th>Role</th>
<th>Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Call Session Control Function (CSCF)</td>
<td>Handles registration of endpoints, routing of SIP signaling messages</td>
<td>SIP Proxy Servers, Developed from scratch</td>
</tr>
<tr>
<td>Home Subscriber Server (HSS)</td>
<td>One-stop database for user information</td>
<td>HLR from mobile network</td>
</tr>
<tr>
<td>Media Gateway Control Function (MGCF)</td>
<td>Softswitch Media Gateway Control</td>
<td>Softswitch</td>
</tr>
<tr>
<td>Application Server (AS)</td>
<td>Provide service logic for applications</td>
<td>Feature Servers, Feature sets from Softswitches</td>
</tr>
<tr>
<td>Policy Decision Function (PDF)</td>
<td>Provides QoS</td>
<td>Existing Policy Managers, from scratch</td>
</tr>
</tbody>
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Migration Path to IMS

- **Step 1 – Telephony Softswitch solution**
  - **Introduction Telephony Softswitches**
    - Cost reduction through the modernization of the ageing circuit switched network.
    - Separates call control from connectivity.
    - Lowers CAPEX and OPEX.

- **Step 2 – Softswitch / IMS solution**
  - **Roll out of IMS**
    - Introduces IMS alongside Softswitch.
    - Allows introduction of new SIP based services.
    - Increases services revenues and customer base.

- **Step 3 – Full IMS telephony solution**
  - **Introduction of IMS Access Gateways**
    - Softswitches upgraded to telephony servers to enable full-IMS.
    - Introduction of IMS telephony gradually to replace legacy.
Deployment Steps
Migration Steps (PSTN Evolution)

- Introduce IP in Transit network at Level-1 TAX locations (IP TAX Project)
- Extend IP network to Level-2 TAXs and large scale implementation in Access Network
- Develop MPLS core at Circle and LDCA Level
- Offer Voice and Multimedia services to Broadband Subscribers using DSL, Optical Ethernet technologies
Step-1: IP TAX – Class 4 NGN
Step 2: IP TAX and Access in NGN
Essential Features of Public Network

• Requirements
  – QoS guarantee
  – High availability
    • Equipment hot-swappable hardware
    • 99.999% availability
    • On-line software upgrades
  – Scalability
  – Based on global (open) standards
  – Support for a new range of applications
Need for NGN

• Traditional public networks:
  – typically comprise of individual voice & data networks

• Separate networks mean:
  – Low Return on investment
  – High O&M costs due to separate networks
  – Low capability of services integration
  – Less Flexibility - High cost
NGN Definition
ETSI NGN Vision

- Mobile/Fixed Convergence, based on the “IMS” platform
- A multi-service, multi-protocol, multi-access, IP based network - secure, reliable and trusted
- Multi-services: delivered by a common QoS enabled core network.
- Multi-access: diverse connectivity networks; fixed and mobile terminals, (Mobile, xDSL, etc)
- Not one network, but different networks that interoperate seamlessly
- Mobility of both users and devices
- “My communications services”
  - anywhere, any terminal

>>> all of this leads to a true Next Generation Network
Next Generation Network (NGN) provides a framework for network evolution, as defined by the ITU-T (Rec. Y.2001)

- Key Characteristics
  - Packet-based network [generally Internet Protocol or IP]
  - Independence of service-related functions from underlying transport technologies
  - Interworking with legacy networks via open interfaces
  - Generalized mobility
  - Unrestricted access by users to different services and/or service providers