IP TAX in BSNL Class 4 Services

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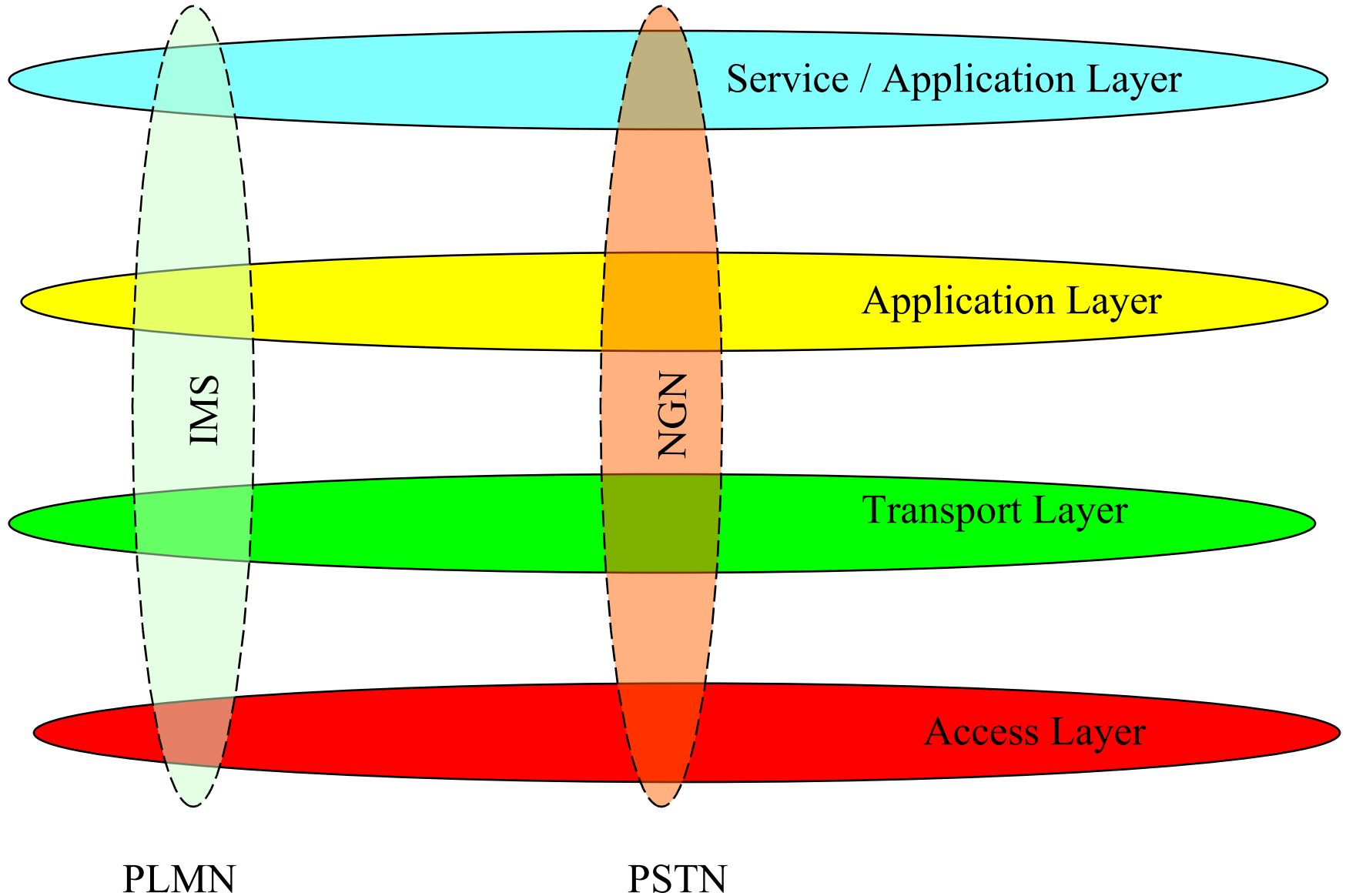
NGN Concept

NGN Concept

PSPDN

PLMN

PSTN

→

Service / Application Layer

Control Layer

Transport Layer

Access Layer
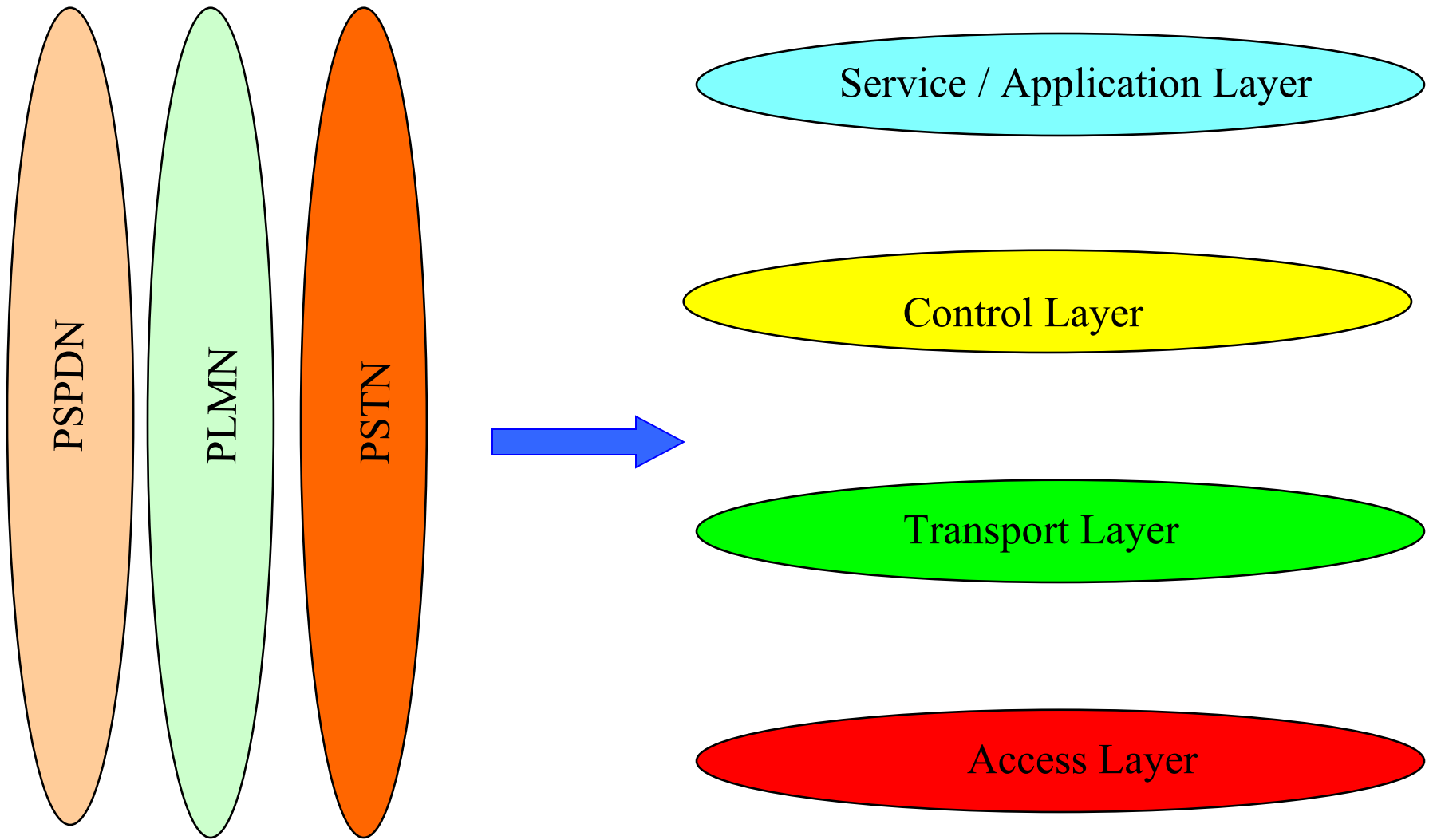
Each vertical on the left has to be split into Network Elements that map onto each horizontal on the right

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
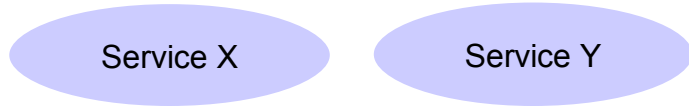
Requirements for NGN Implementation

- 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
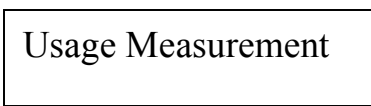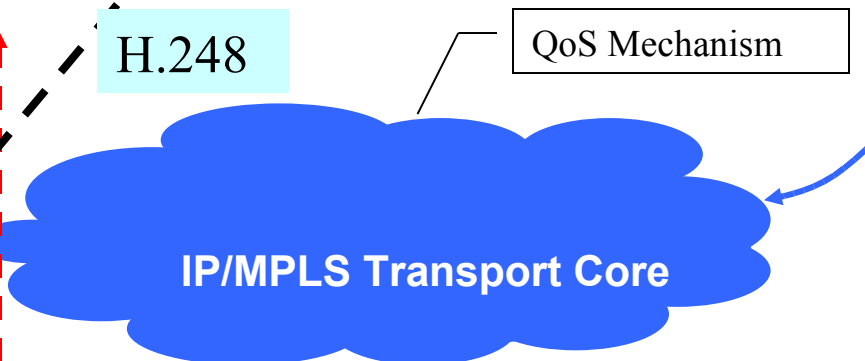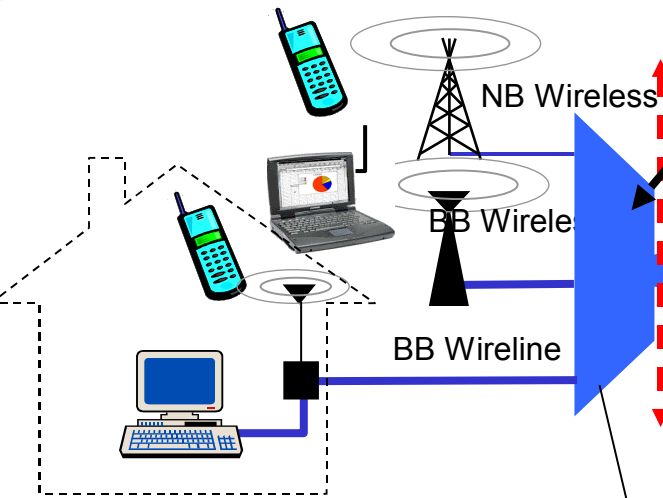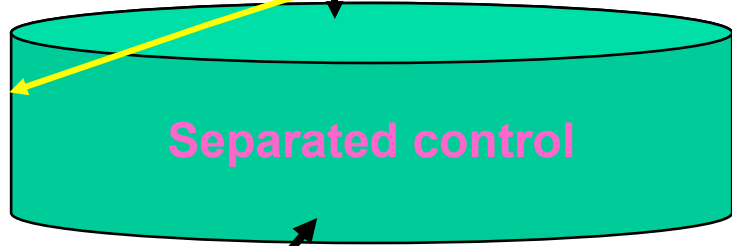
Service Layer

Service X   Service Y

Open interfaces

Control Layer

Management

SIP

Separated control

H.248

QoS Mechanism

NB Wireless

BB Wireless

BB Wireline
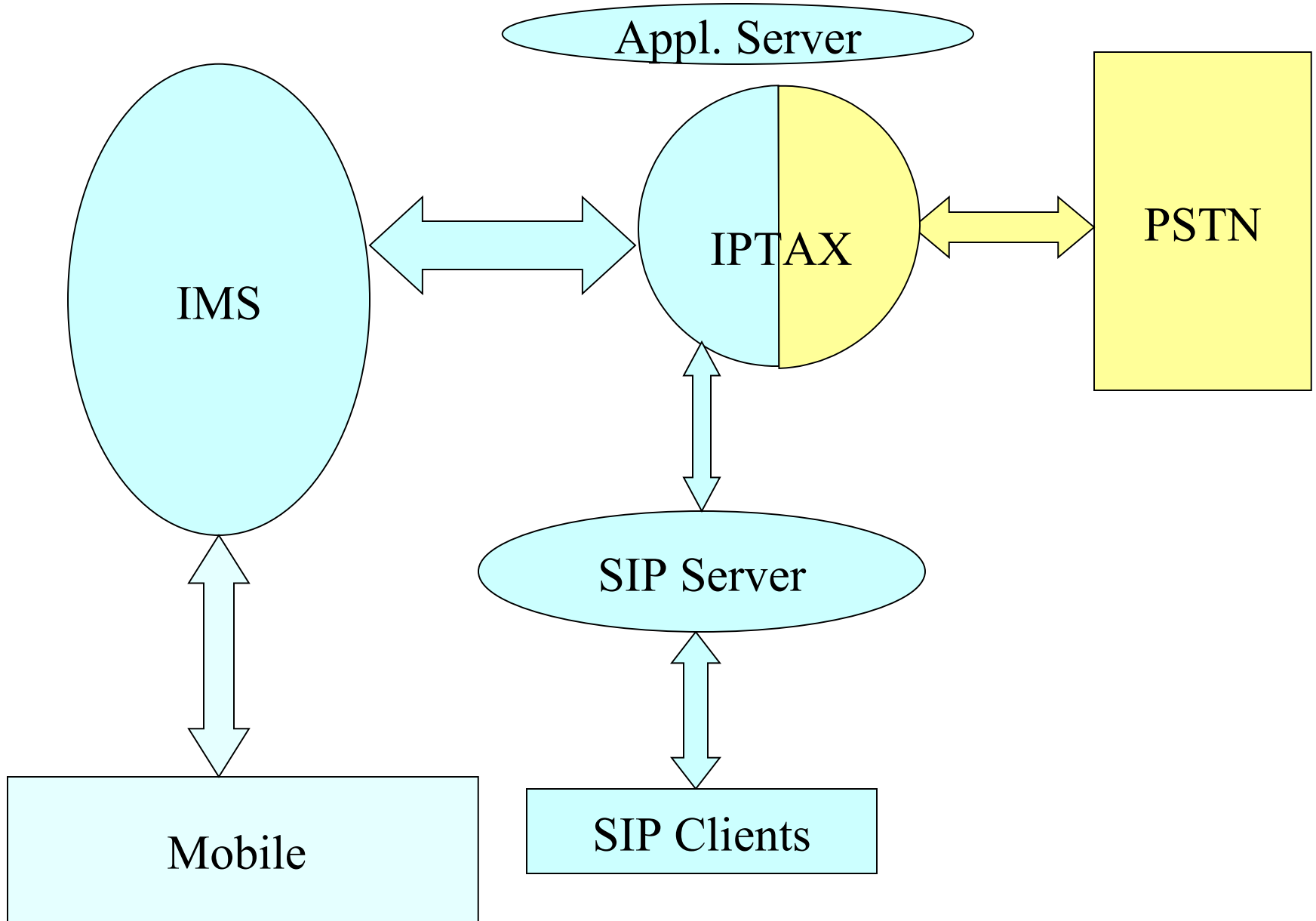
IP/MPLS Transport Core

Usage Measurement

FMC

Access Layer

Network Schematic Perspective

Network Evolution Steps

Circuit Switching (CAS)

Transit

Local Exchange

Local Exchange

Call Control

Call Control

Call Control

Switching

Switching

Switching

Interfaces

Interfaces

Interfaces

Signaling & Bearer

Signaling & Bearer
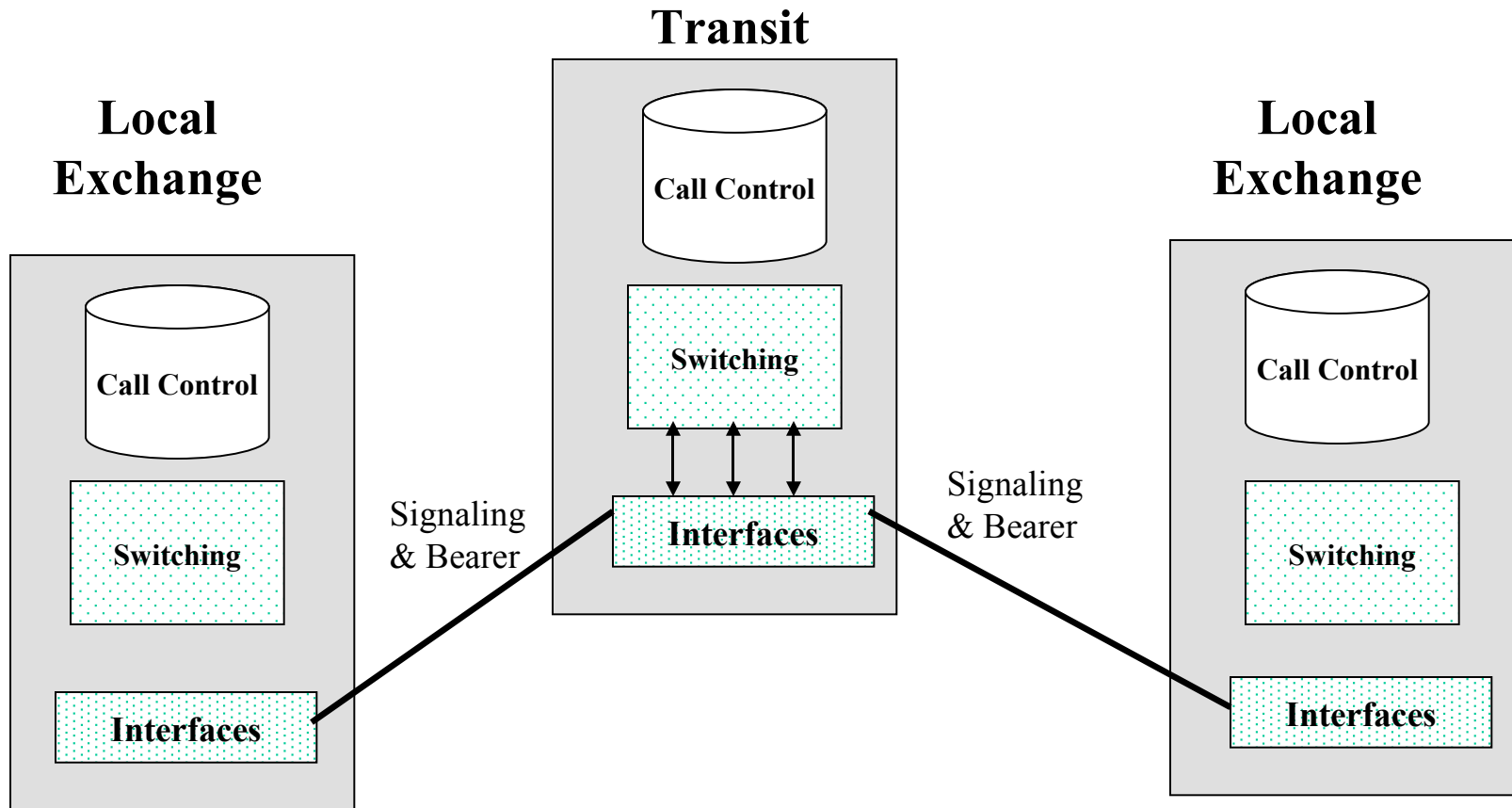
Bearer is a voice channel

Circuit Switching (CCS)

Transit

Local Exchange

Local Exchange

Call Control

Call Control

Call Control

Switching

Switching

Switching

Interfaces

Interfaces

Interfaces

Bearer

Bearer

Call Control

Switching

Interfaces

Signaling

Signaling

STP

Circuit Switching (CCS)

Transit

Local Exchange

Local Exchange

Call Control

Call Control

Call Control

Switching

Switching

Switching

Interfaces

Interfaces

Interfaces

Bearer

Bearer

Signaling

Signaling Transfer

Signaling

Circuit Switching (CCS)

Transit

Local Exchange

Call Control

Local Exchange

Call Control

Switching

Interfaces

Bearer

Bearer Transfer

Bearer

Call Control

Switching

Interfaces

Signaling

Signaling Transfer

Signaling

Soft Switching Transit Architecture

Transit

Soft switch

Local
Exchange

Call Control

Switching

Interfaces

TMG

Bearer

Signaling

SGW

Common IP MPLS Transport

TMG

Bearer

SGW

Local
Exchange

Call Control

Switching

Interfaces

Signaling

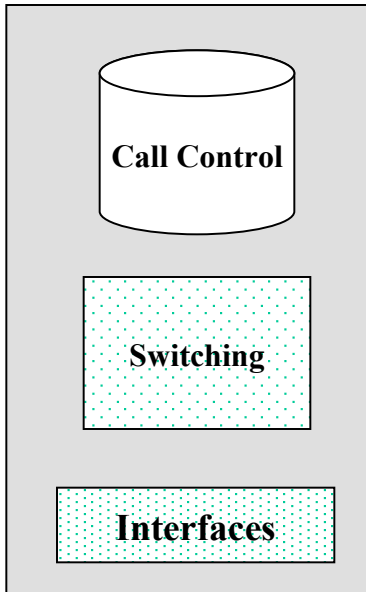# Soft Switching Transit Architecture

PSTN to NGN Mapping

PSTN Switch

NGN Components

Call Control → Call Server / Soft Switch

Switching → Routers of IP/MPLS Network

Interfaces → Gateways   SG / TMG / LAG

TDM Transport Network → Common IP MPLS Transport
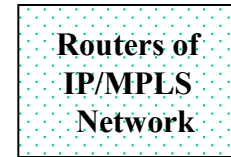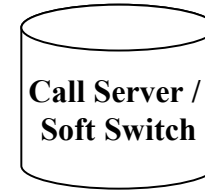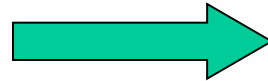
Scope of IP TAX Project

- **Setting up Two Soft Switches at New Delhi and Chennai and Signalling Gateways at New Delhi, Chennai, Kolkotta and Bangalore**
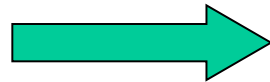
- **Providing Trunk Media Gateways (TMGs) at 21 Level-1 locations**

- **Providing one Announcement Servers in each IP domain**

- **Billing interface to Centralized Billing Server**

- **NMC**

NMS

New Delhi

Soft switch (MGC)   AS   EMS   SG

MG   AG - 4
MG   AM - 4
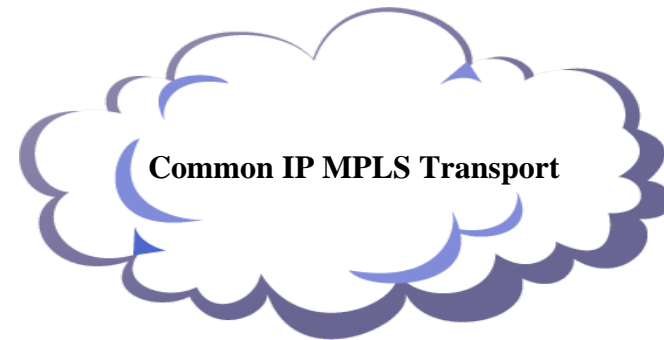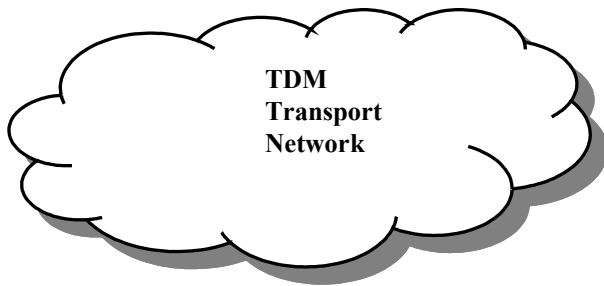MG   RJ - 4
MG
MG   PT - 8
MG   LW - 4
MG   JLN - 4
MG   KOL - 16
MG   ND -40
MG   GU - 4
MG   JPR - 4
MG   AHM - 8
MG   RPR - 4
MG   BPL - 4
MG
MG   HYD - 8
MG   MBI - 40
MG   NGP – 4
MG   BG - 12
MG   ENK - 4
MG   CBT - 4
MG   CHN - 16
MG   CK - 4
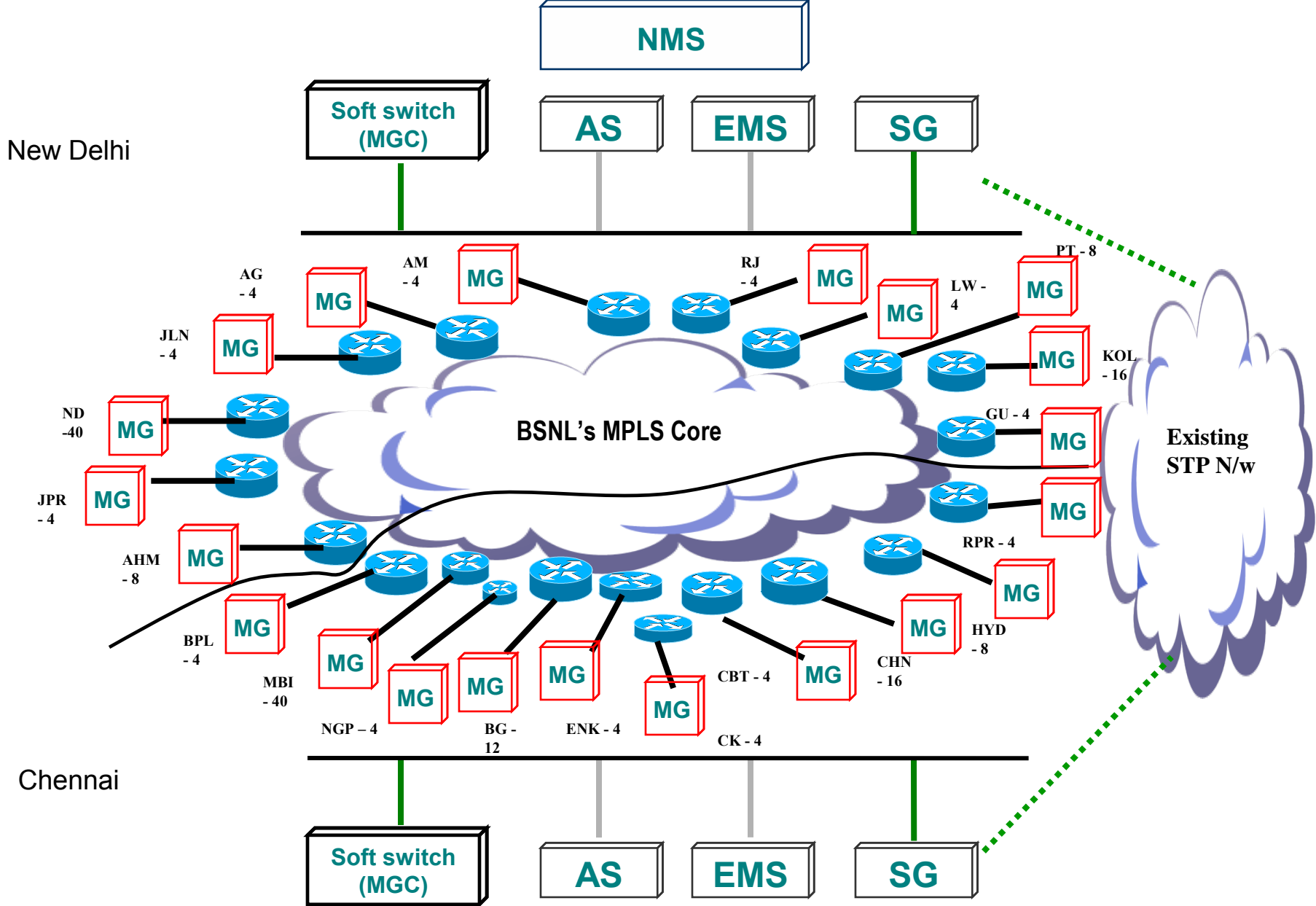
BSNL's MPLS Core

Existing STP N/w

Chennai

Soft switch (MGC)   AS   EMS   SG
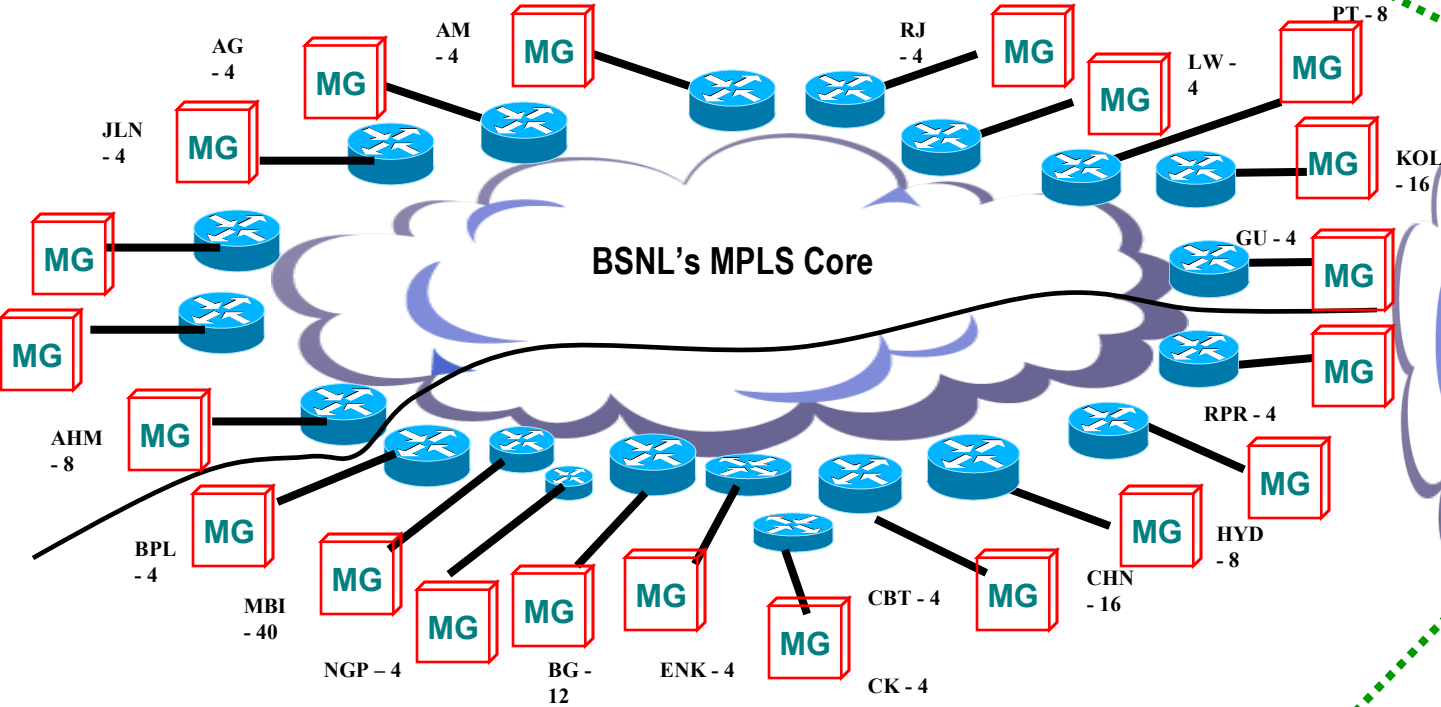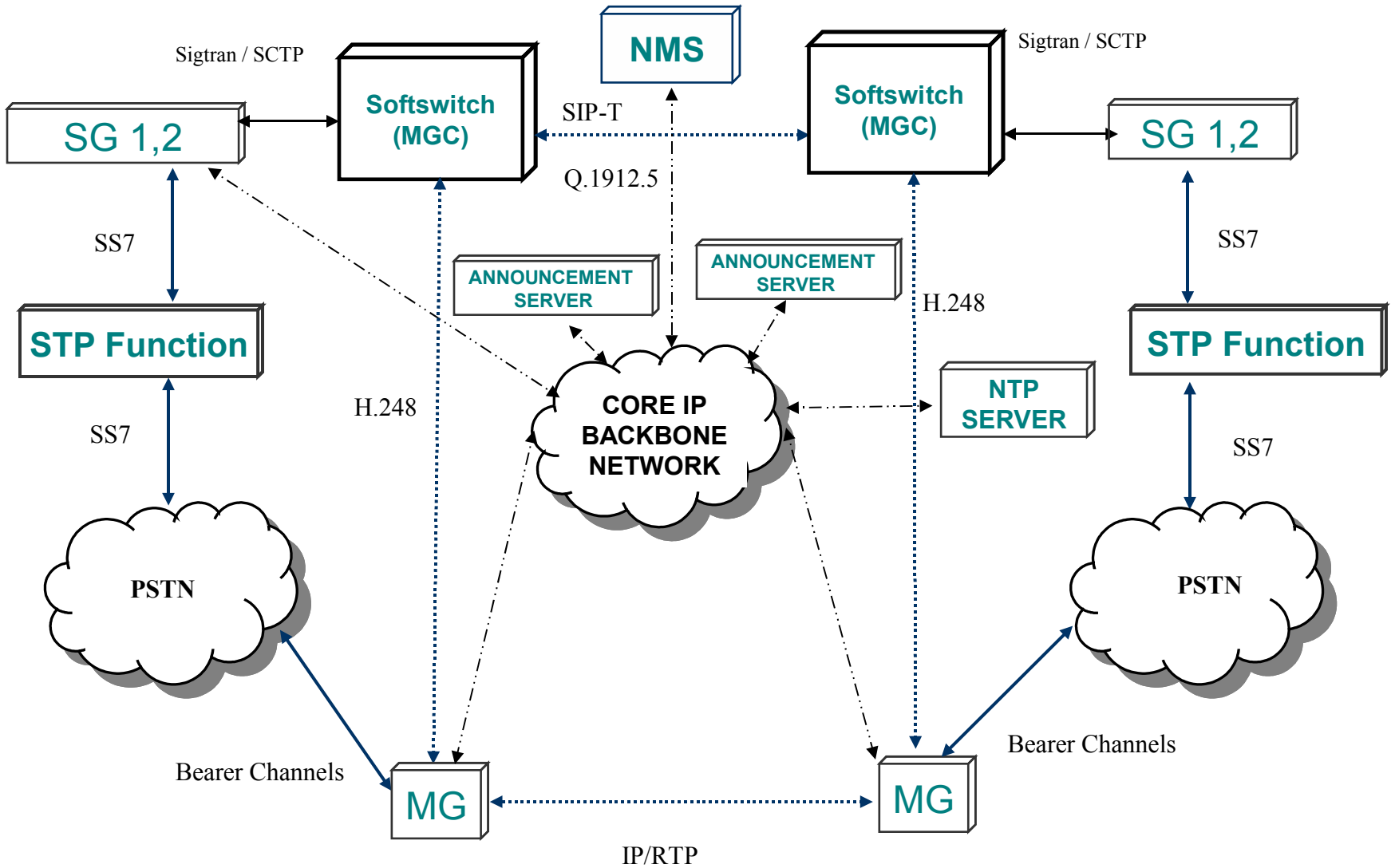
What is Session

- 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
- can also invite participants to already existing sessions, such as multicast conferences
- 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

SIP Architecture

SIP Signalling

IP Network

RTP Media Stream
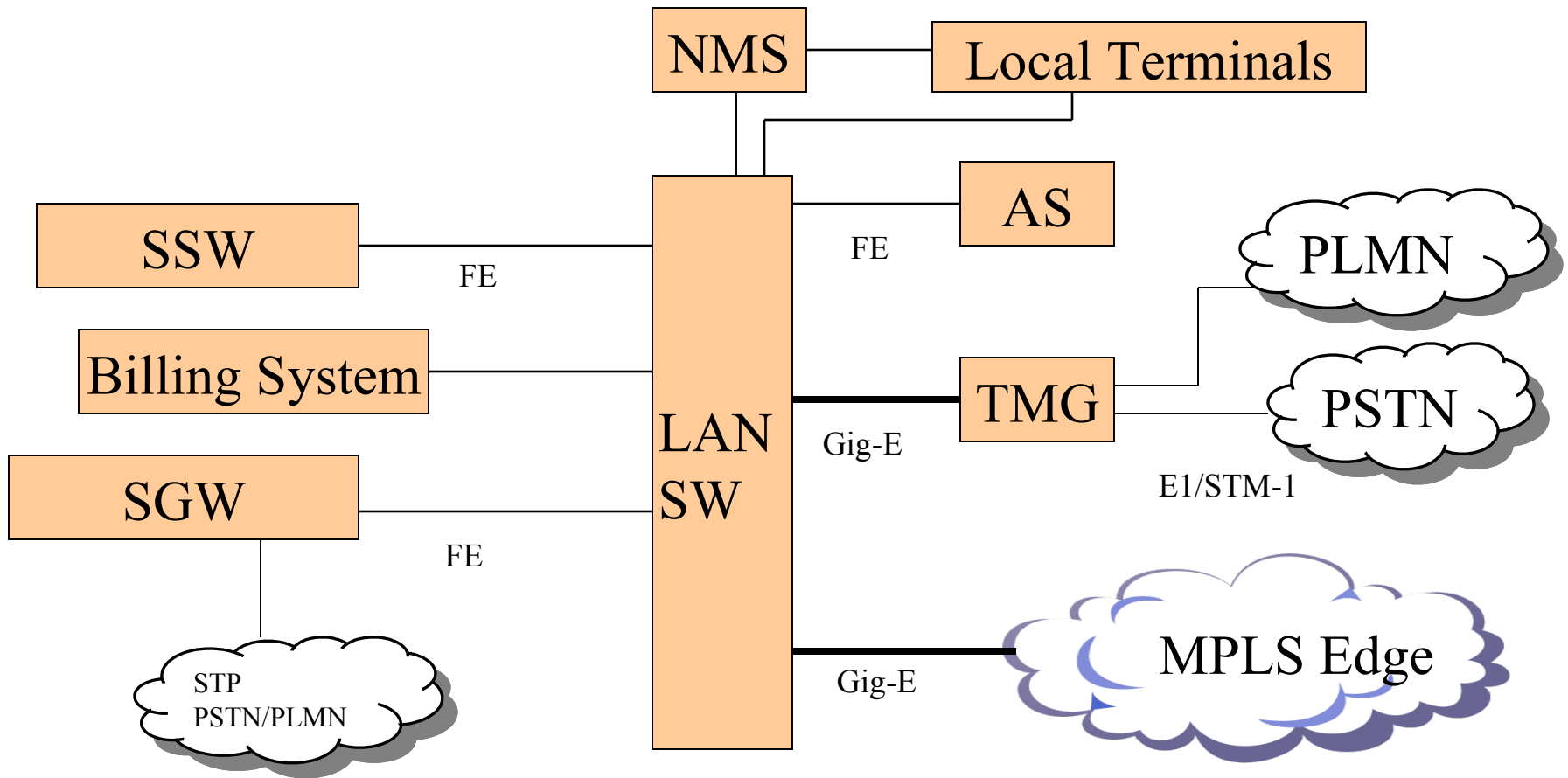
SIP User A

SIP User B
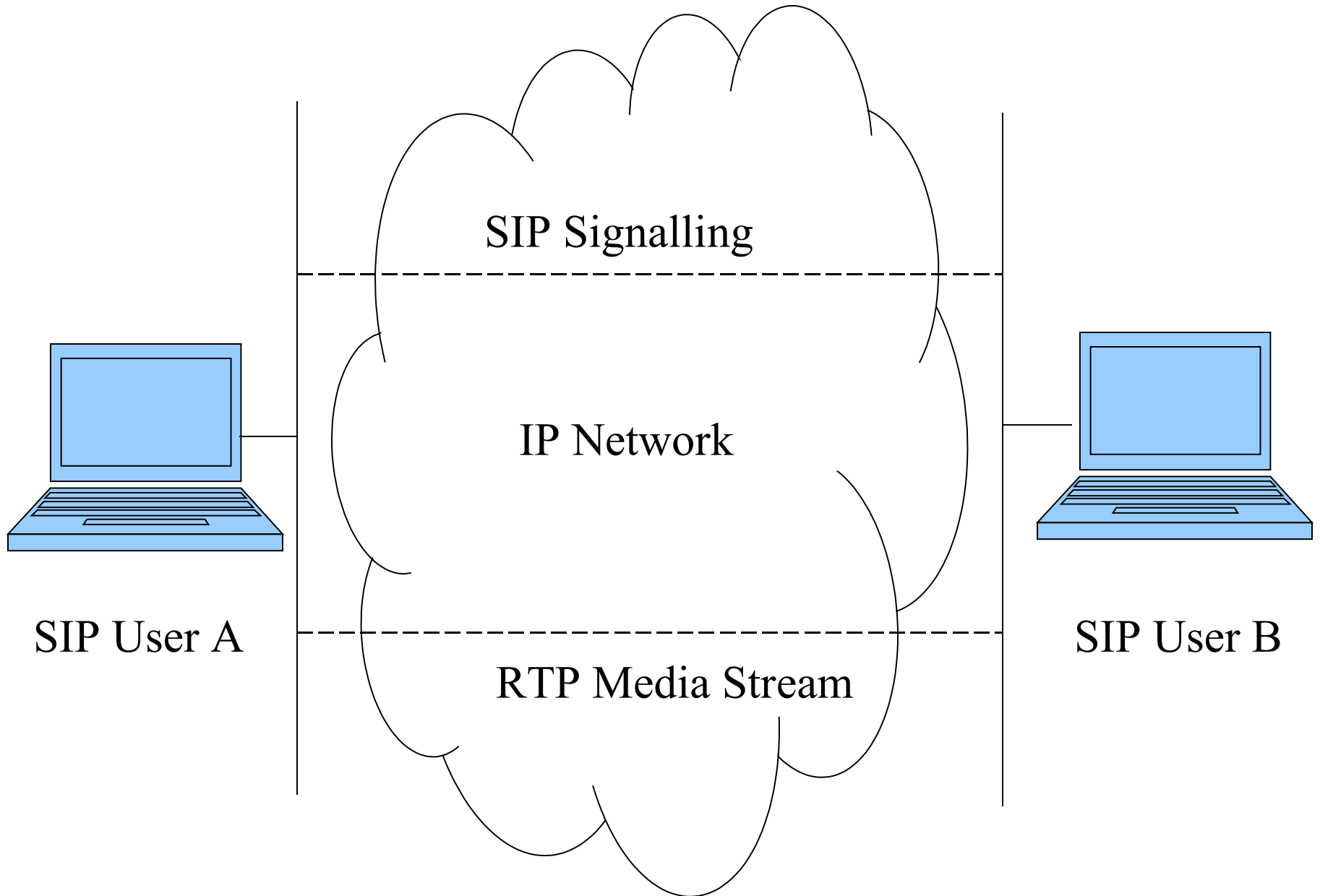
Equipment Schematic

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

Soft switch (MGC)

AS

EMS

SG

Existing STP N/w

BSNL's MPLS Core

E1

LE/TAX/MSCs

IP Pipe

Copper wires

DSLAM

DSL Modem

MG

MG

E1s

Other operators POI

IP Clients

Next Generation Switching

Transit

Local Exchange

Soft switch

Call Control

Gateway

Switching

Bearer

Common IP MPLS Transport

Interfaces

Gateway

Gateway
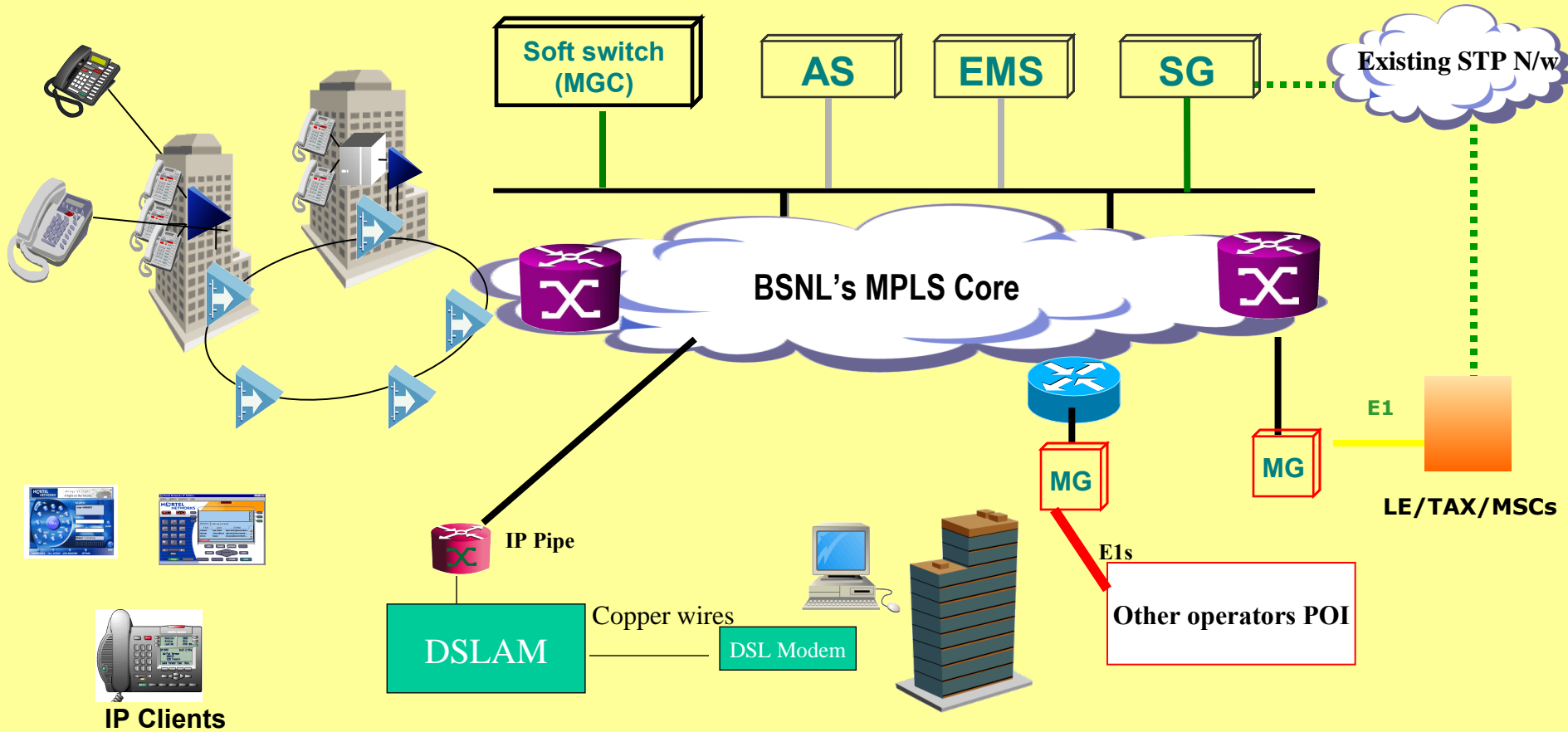
Signaling
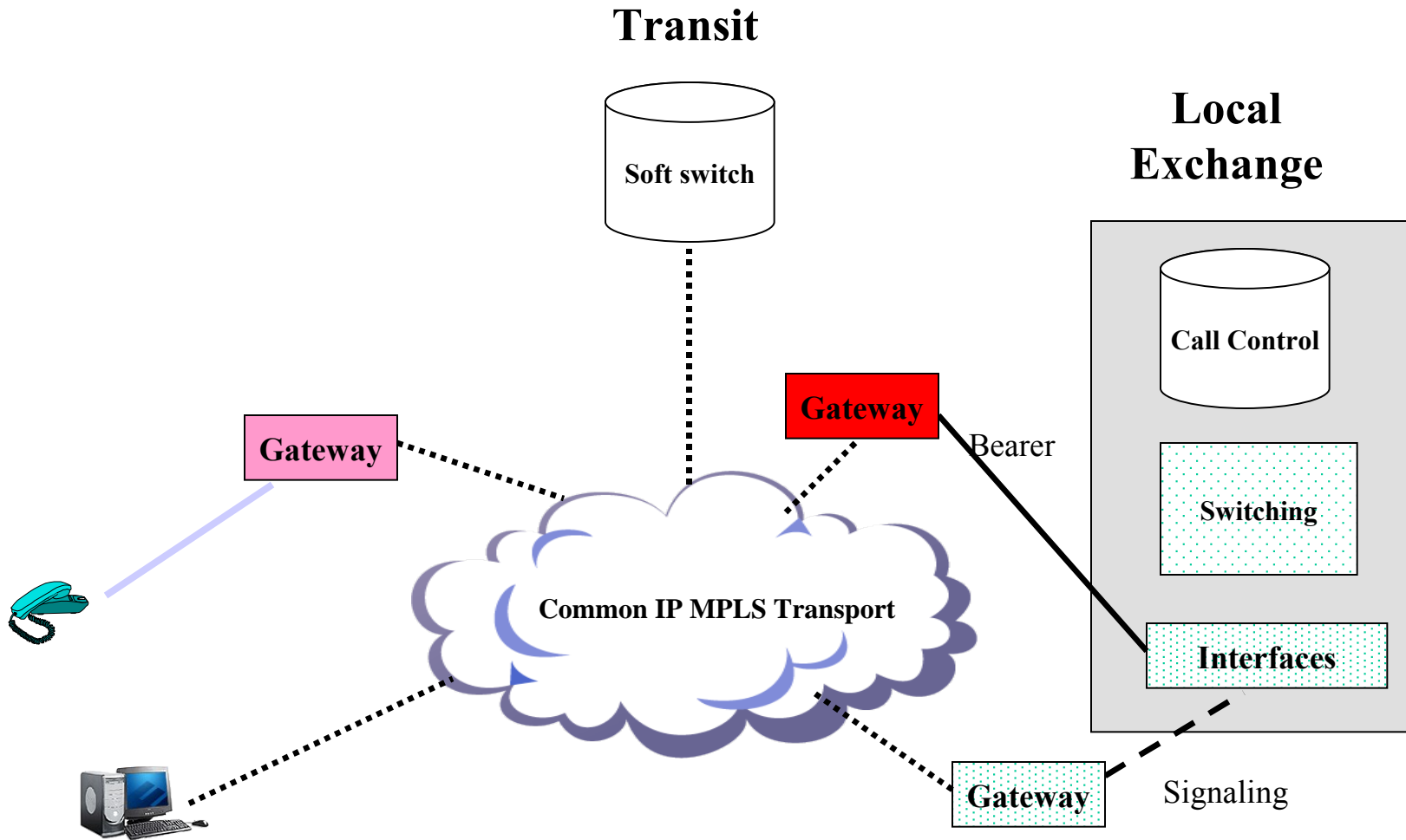
Next Generation Switching Architecture

Application Server

Soft switch

SBC

Line Access Gateway

Access Gateway

PRI

SHDSL

V5.2

RSU

Common IP MPLS Transport

2B+D

ADSL/ADSL2+

AN

TMG

E1s

Local / Rural Exchanges
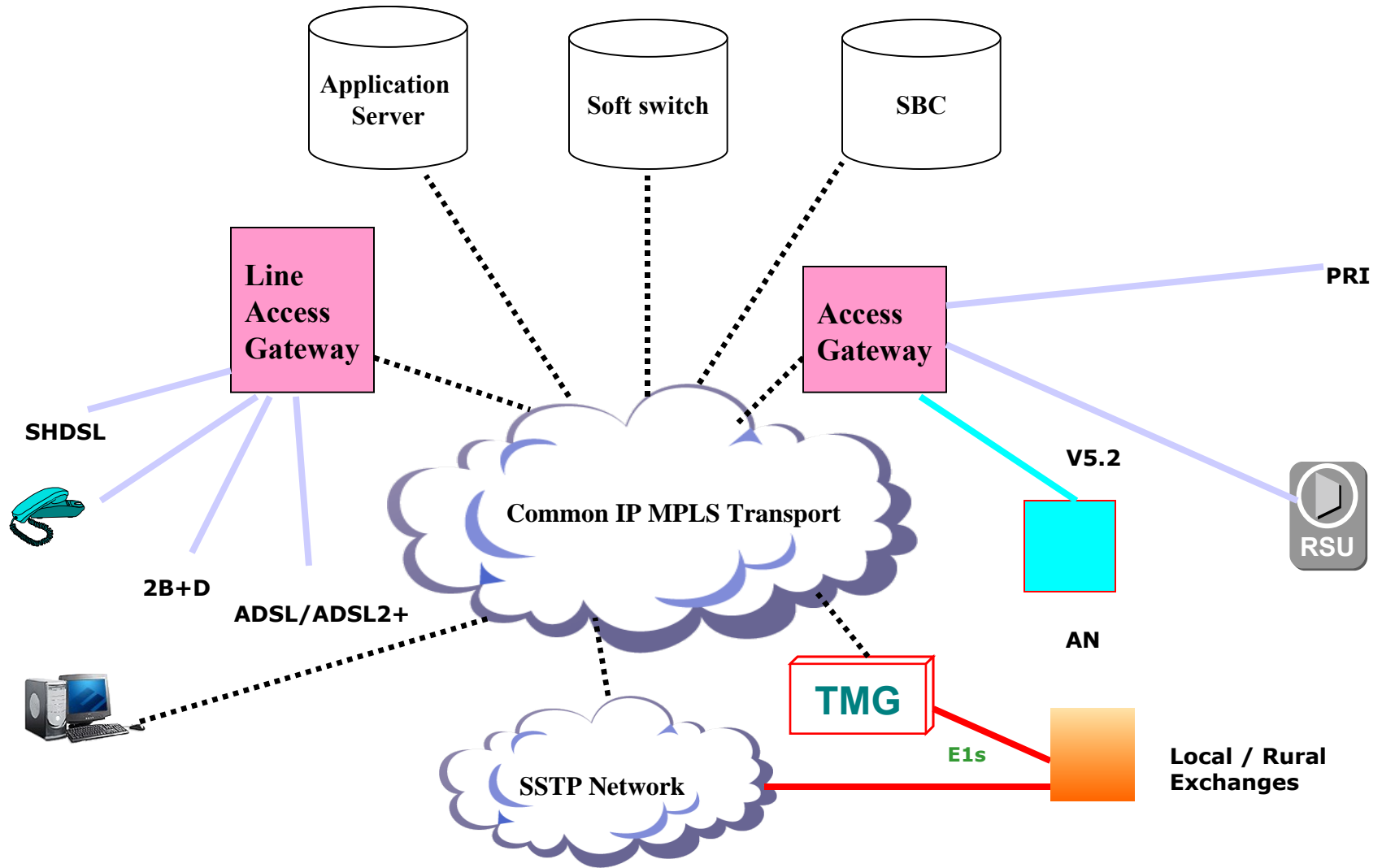
SSTP Network

Below SDCA Level IP Network
A case of Metro City
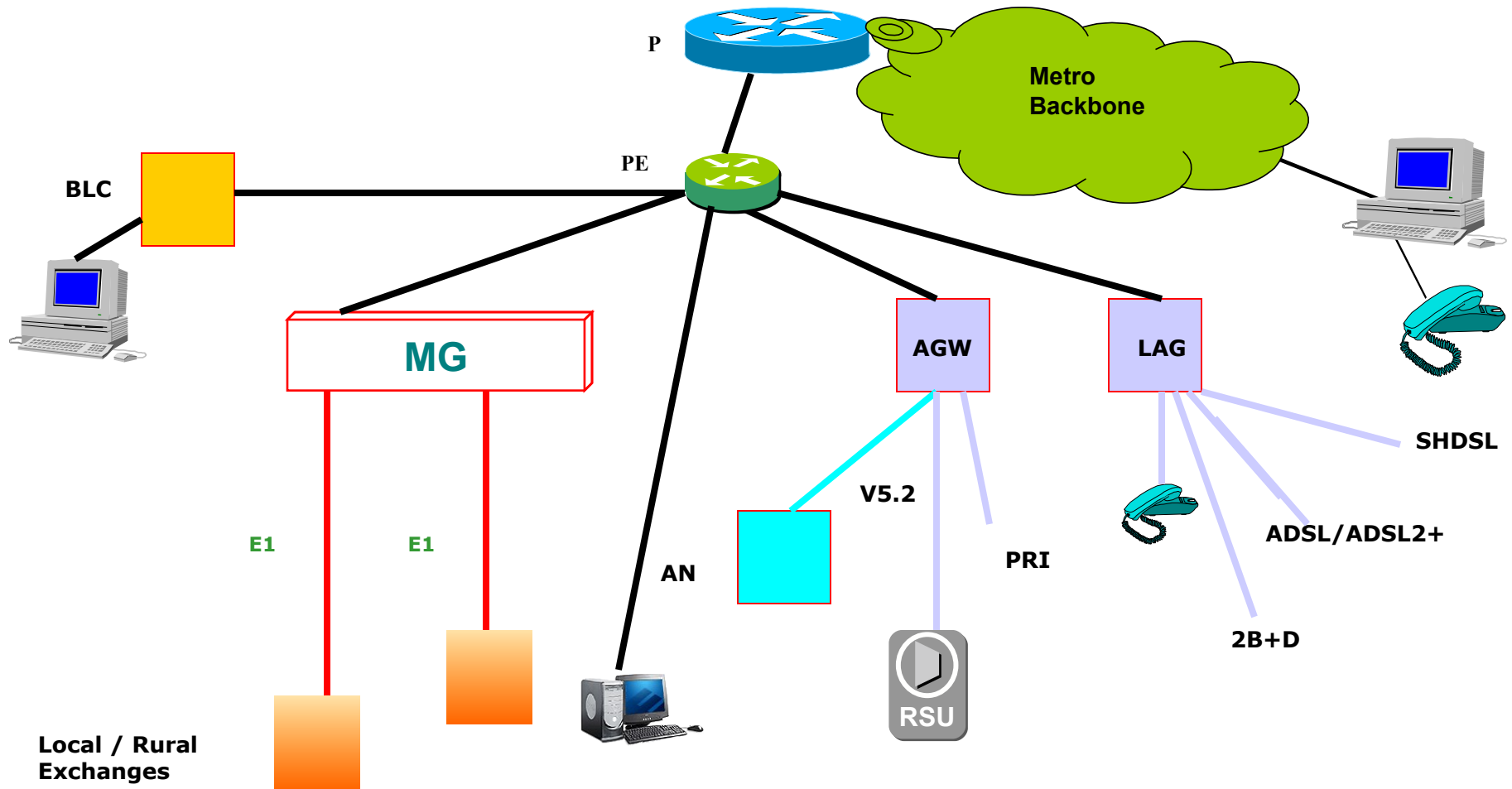
Below SDCA Level IP Network
A case of Normal City

Below SDCA Level IP Network
A case of Normal SDCA

P

PE

MG

AGW

E1   E1

V5.2

AN

PRI

RSU

Local / Rural Exchanges
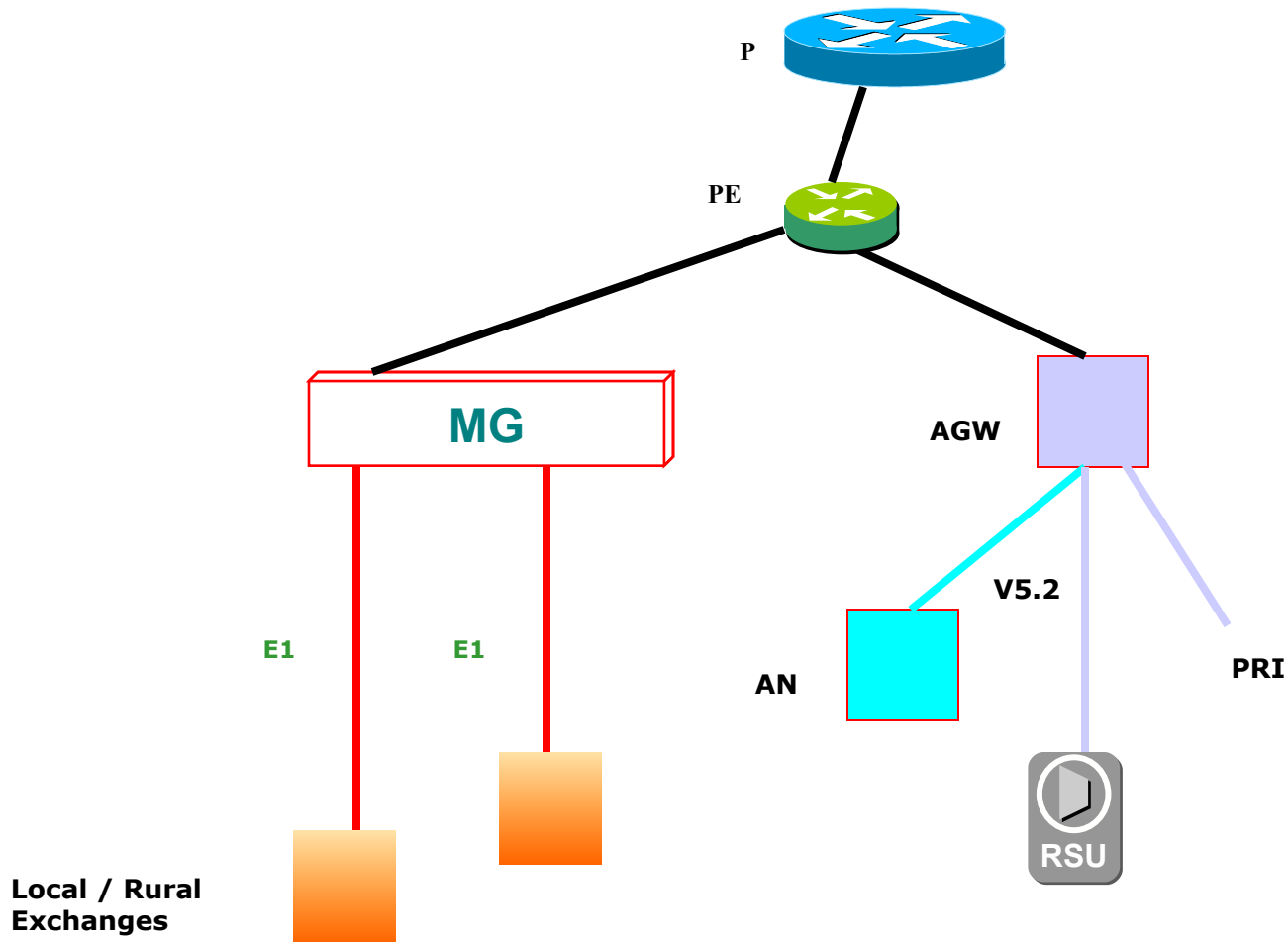
Fully Converged Architecture
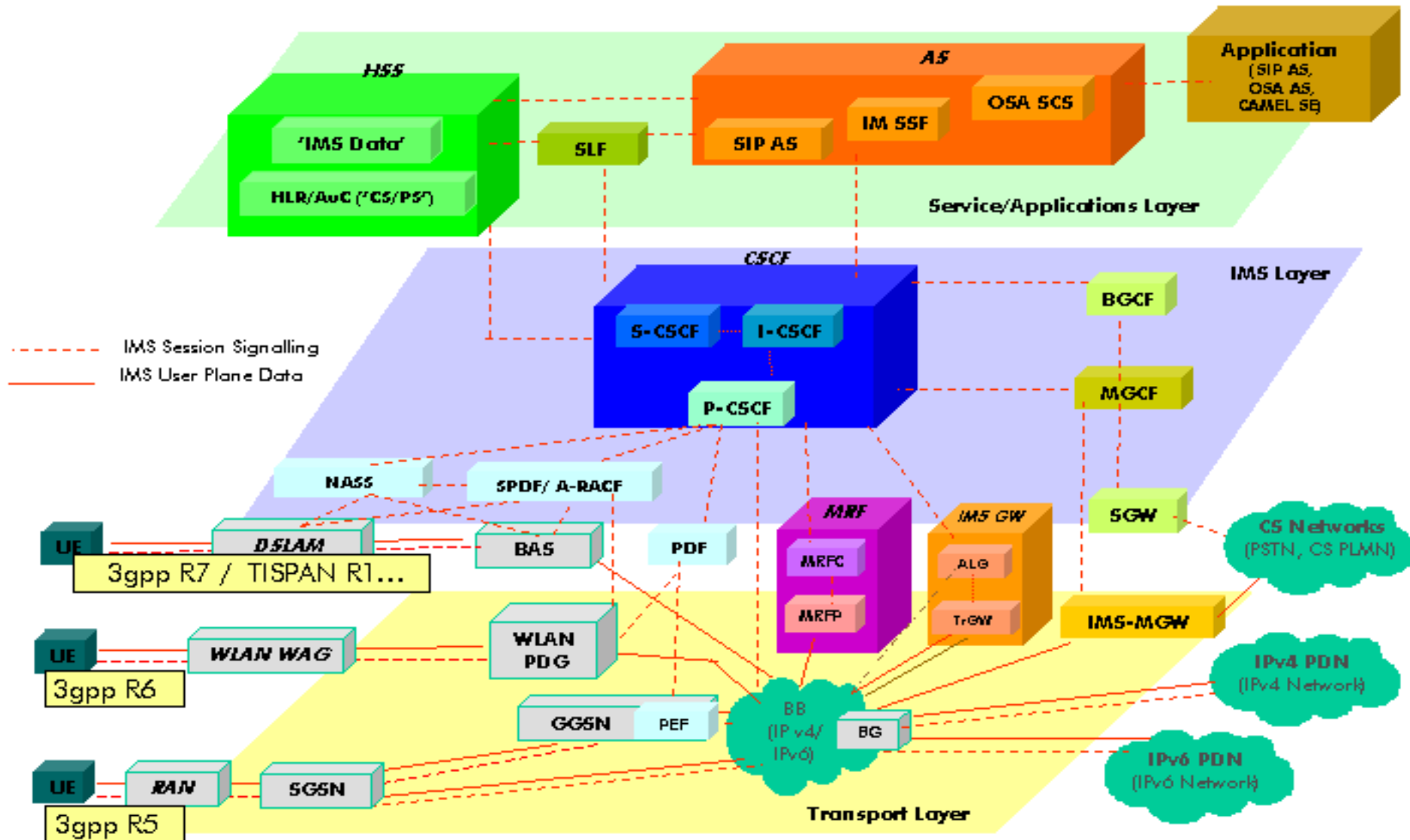
THANK YOU

Does Network Evolution lead to NGN?
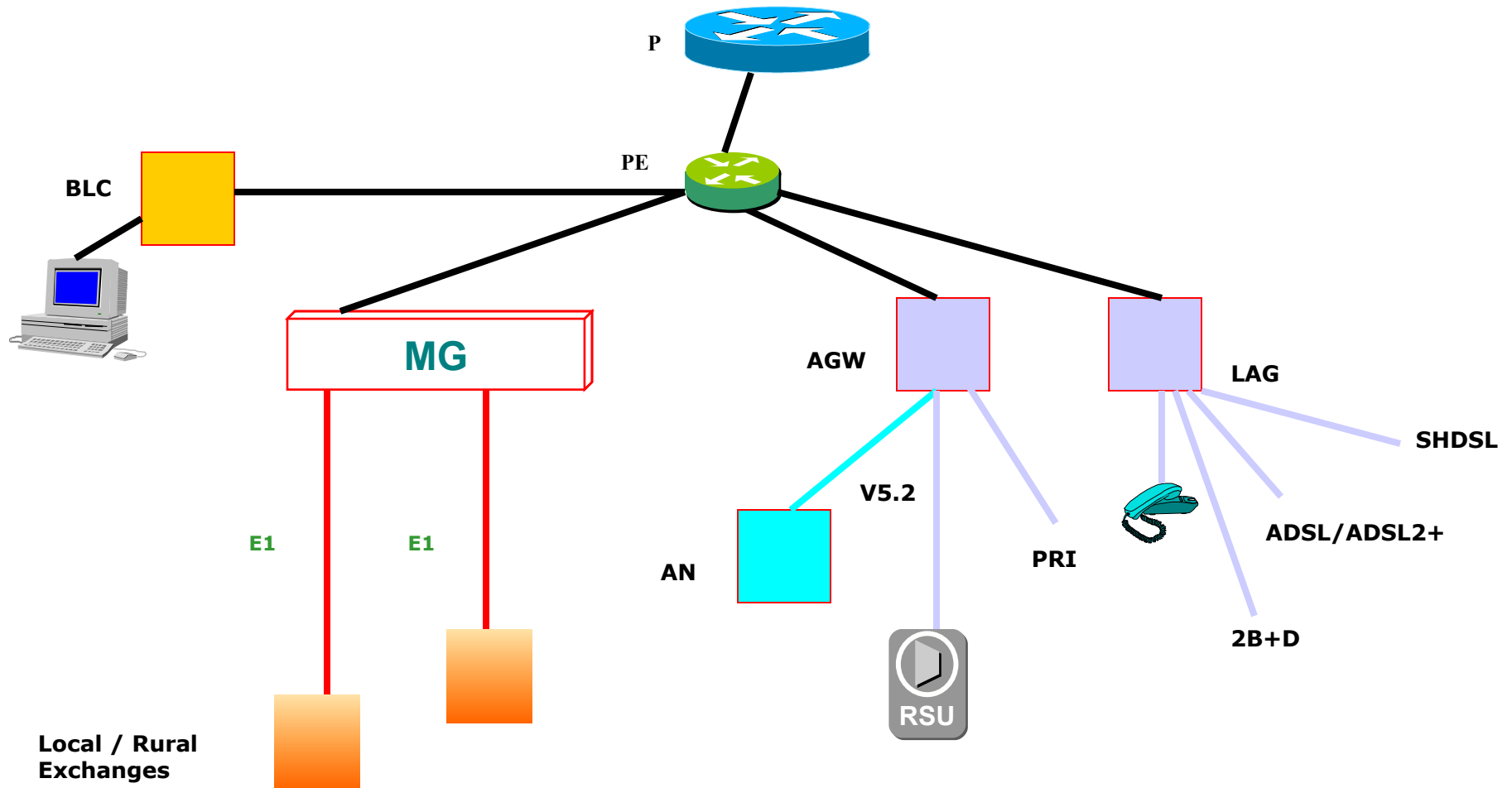
- Hyper competitive telecom environment
  - Tariffs continuously on decline
  - Quick returns on investment required
  - Need to keep network costs as low as possible
- Traffic trends
  - Fixed PSTN traffic showing almost no growth
  - Mobile traffic showing growth and is now shared between various operators
- 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
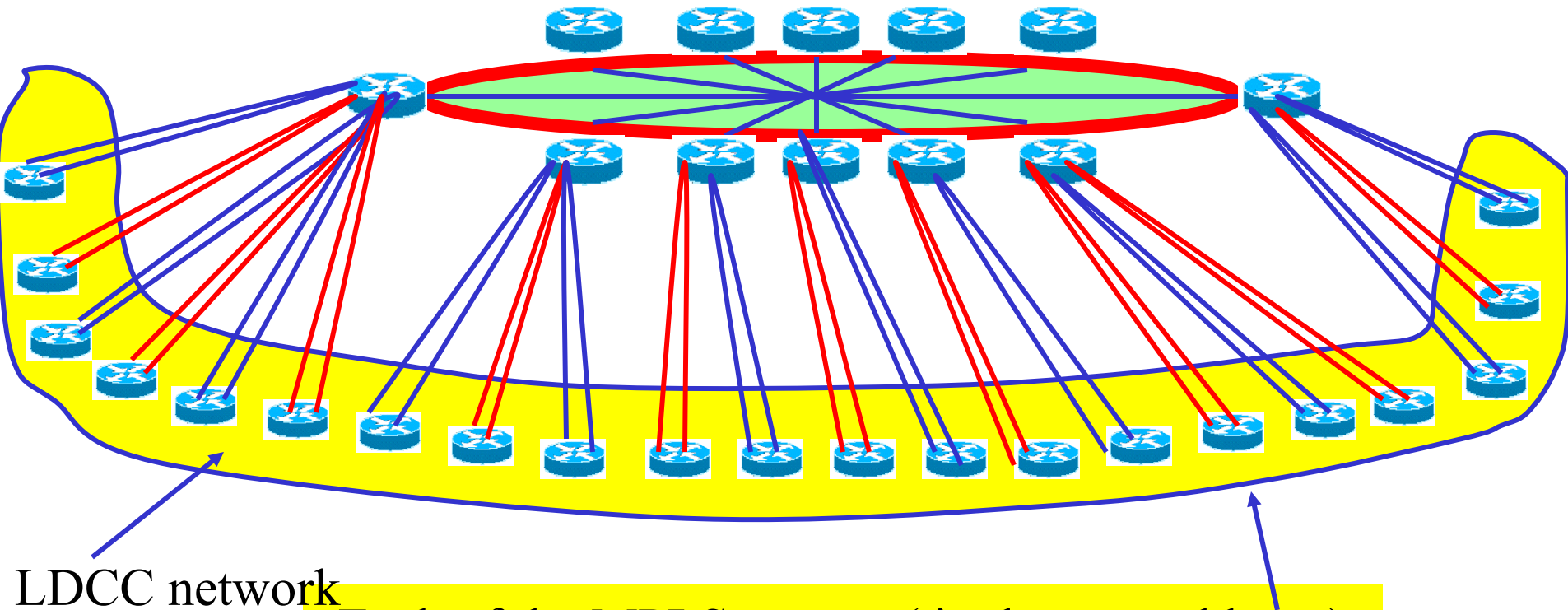
LDCC network

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
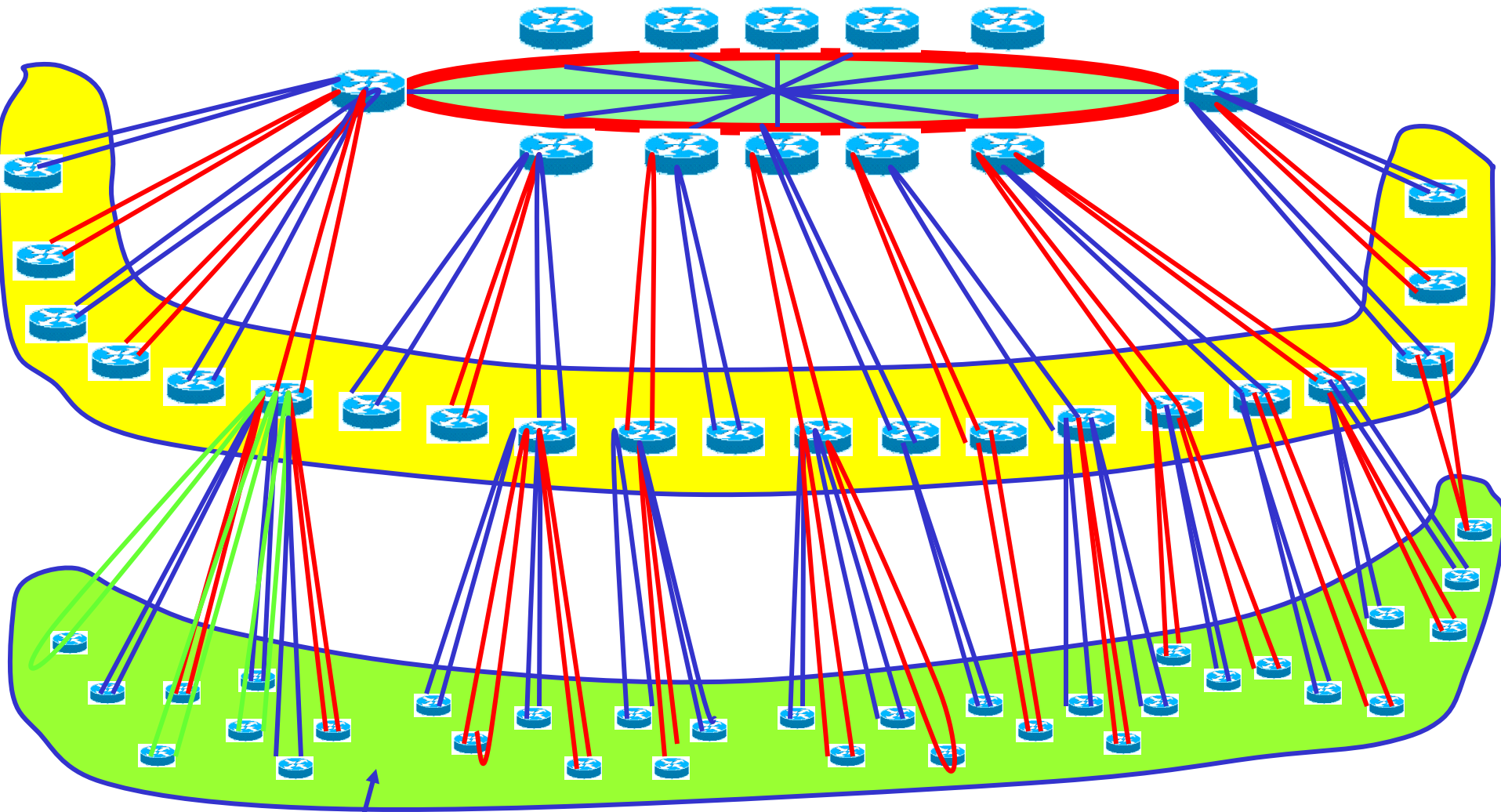
SDCCs routers are connected to respective LDCC on two different paths

SDCC network
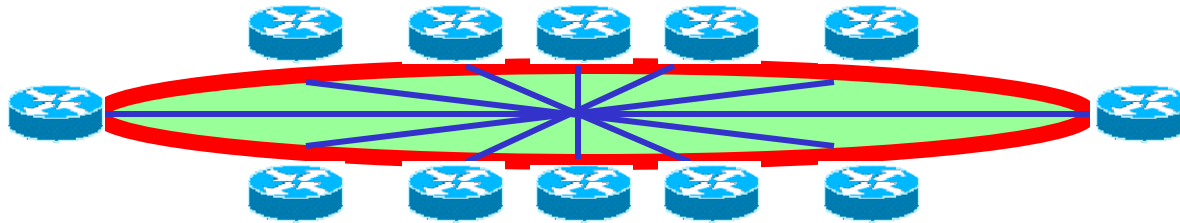
Mesh network

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

IMS Key Components

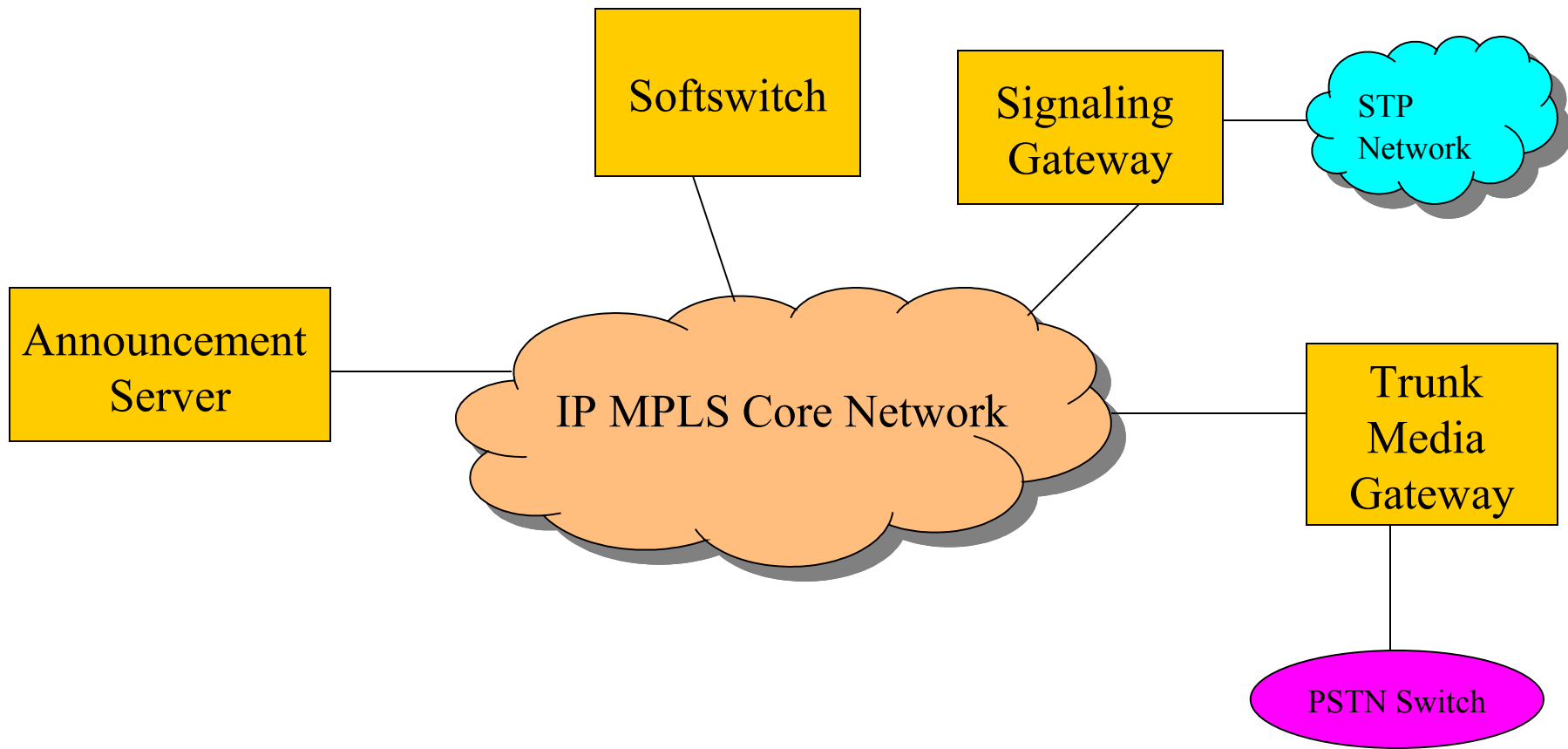| Network Function	Role	Origin
Call Session Control Function (CSCF)	Handles registration of end points, routing of SIP signaling messages	SIP Proxy Servers, Developed from scratch
Home Subscriber Server (HSS)	One-stop database for user information	HLR from mobile network
Media Gateway Control Function (MGCF)	Softswitch Media Gateway Control	Softswitch
Application Server (AS)	Provide service logic for applications	Feature Servers, Feature sets from Softswitches
Policy Decision Function (PDF)	Provides QoS	Existing Policy Managers, from scratch

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**

Softswitch

Signaling Gateway

STP Network

Announcement Server

IP MPLS Core Network

Trunk Media Gateway

PSTN Switch

Step- 1:   IP TAX – Class 4 NGN

Application Servers

Softswitch

Signaling Gateway

STP Network

Announcement / Media Server

IP MPLS Core Network

Trunk Media Gateway

Other VoIP Network

Session Border Controller

PSTN Switch

Customer Network

Access Network

Line / Access Gateway
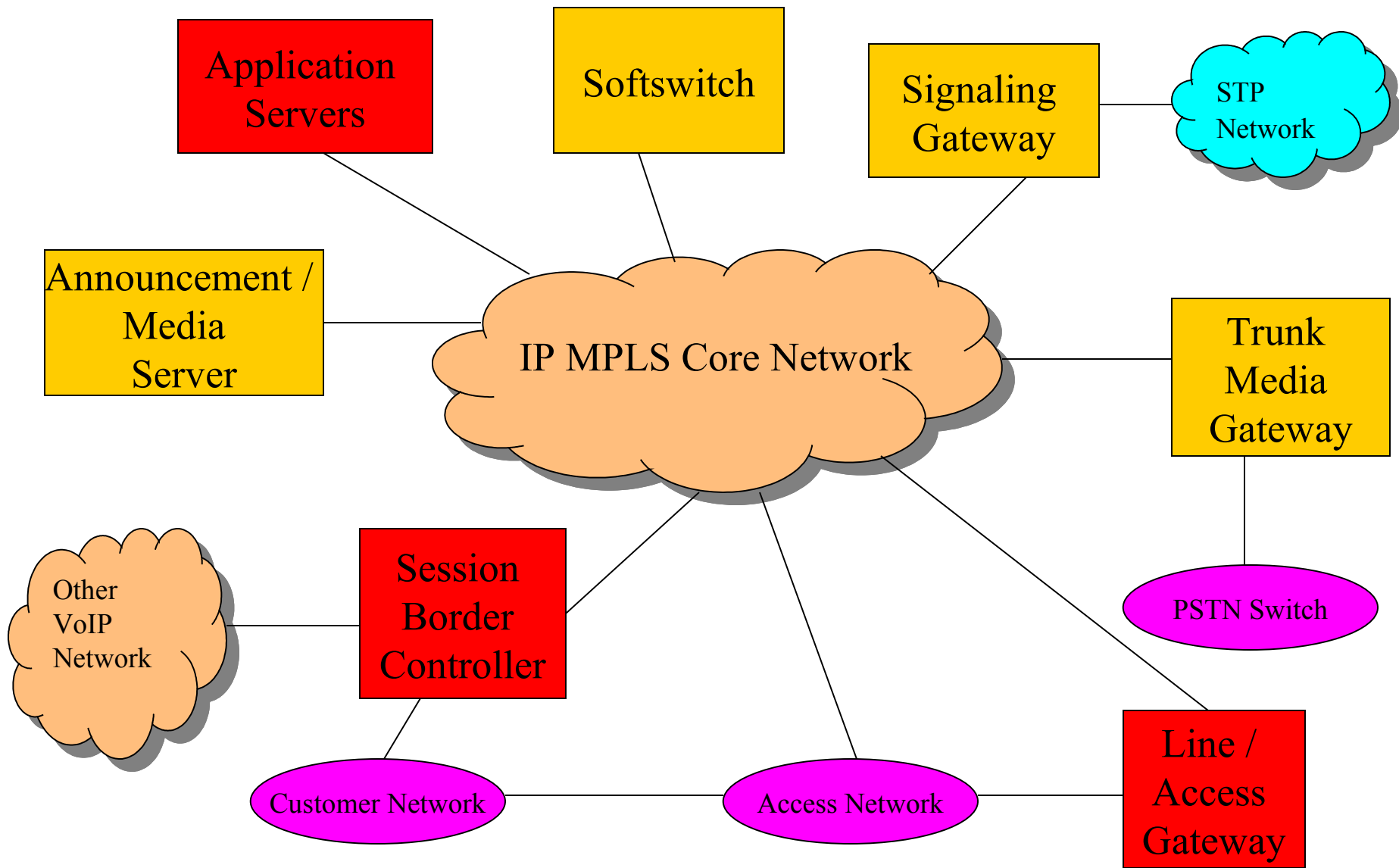
Step 2:   IP TAX and Access in NGN

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

NGN – ITU Perspective

- 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