



**TU/ITC Regional Seminar on  
Network Evolution to NGN & FMC  
for CEE, CIS and Baltic States**



**"Mobile Network Evolution to NGN"**

Moscow Russia  
27-30/04/2004  
Roland THIES

# Presentation Outline

## What is NGN and how it applies in Mobile Networks?

- > Mobile Networks Architectures
- > Why NGN?



# What is NGN?

# What is NGN?

## NGN: Next Generation Networks

- Separation of
  - Access Layer
  - Transport Layer
  - Control Layer
  - Service Layer
- with Control & Transport Layers being shared by
  - the different Access Type (RAN, Fixed...)
  - and Service Layers
- with Packet (ATM, IP) Transport converging toward IP transport
- for provision of **Multimedia Services** (Real Time, Presence, Messaging, Voice, Video, Data...)

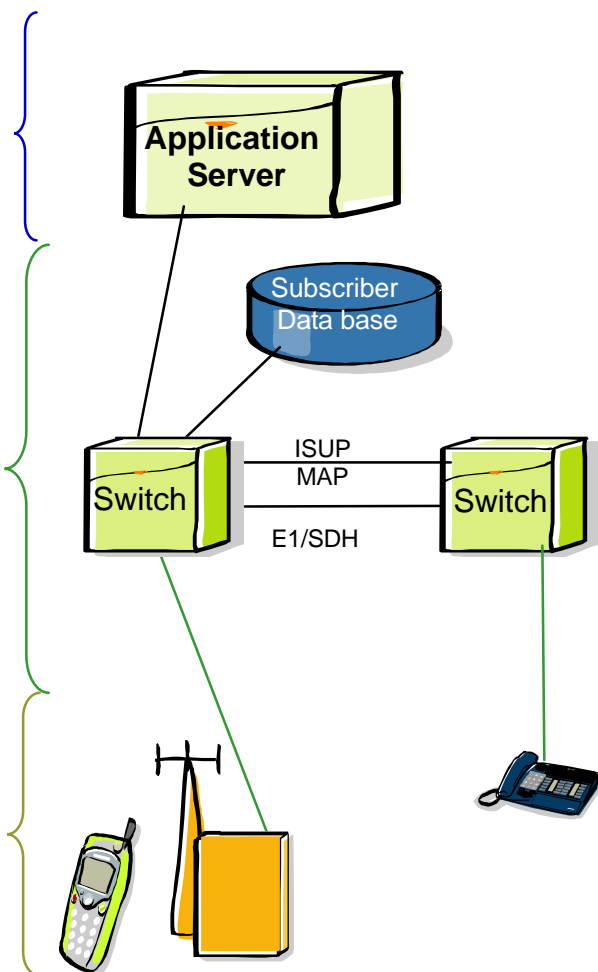


# What is NGN?

Service

Control + Transport

Access

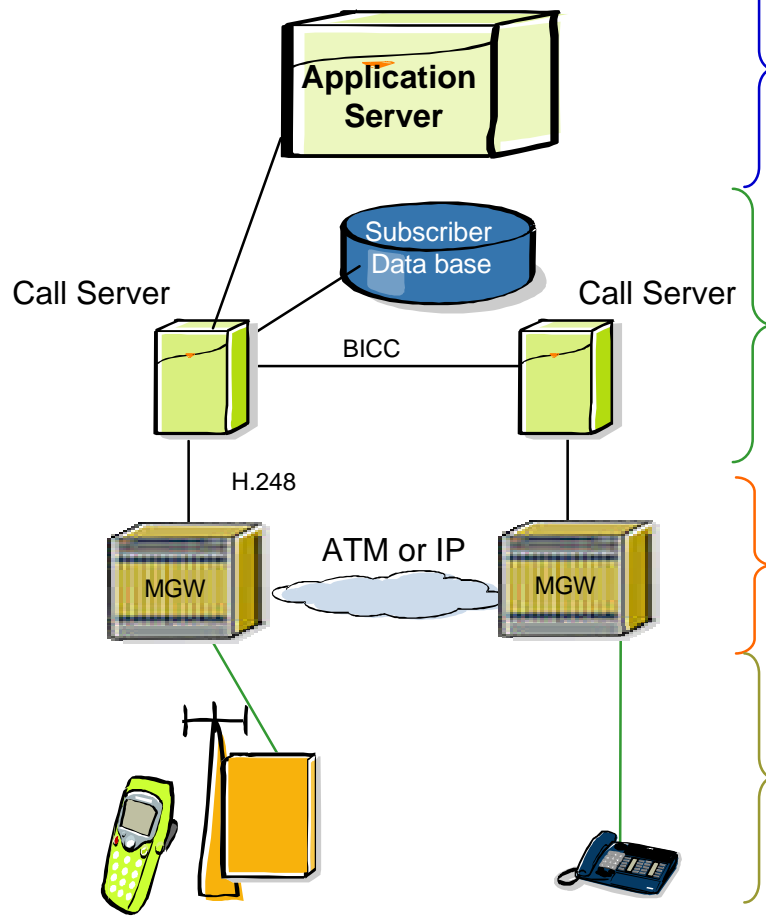


Service

Control

Transport

Access





# How NGN applies in Mobile Networks?

# How NGN Applies in Mobile Networks?

## ➤ UMTS R99:

- Largely derived from GSM
- Last non-NGN Release
- Features content functionally frozen 12/2000
- Still Change Requests (Mobile Test Plan to be finalised by 2H04)

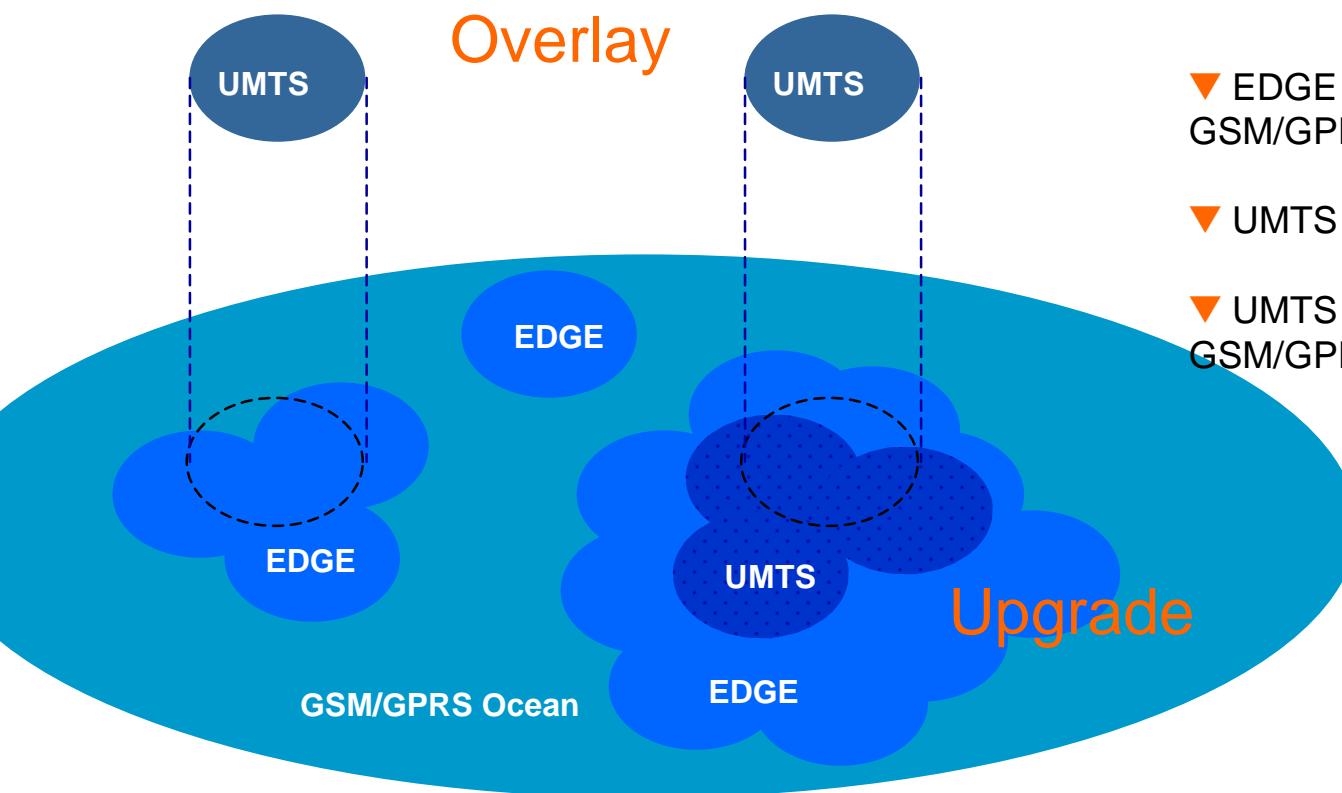
## ➤ UMTS R4:

- NGN in Cs Domain with Separation of Control and User layers
  - Introduction of Server & MGW
  - Introduction of ATM and IP transport instead of TDM
- Standard completed in March 2001 but still essential CR (TrFO...)

## ➤ UMTS R5:

- NGN for IMS
- Introduction of MM Call Server with SIP Call Control Protocol
- ~~Standard Content frozen in June 2003 (many CR to come)~~

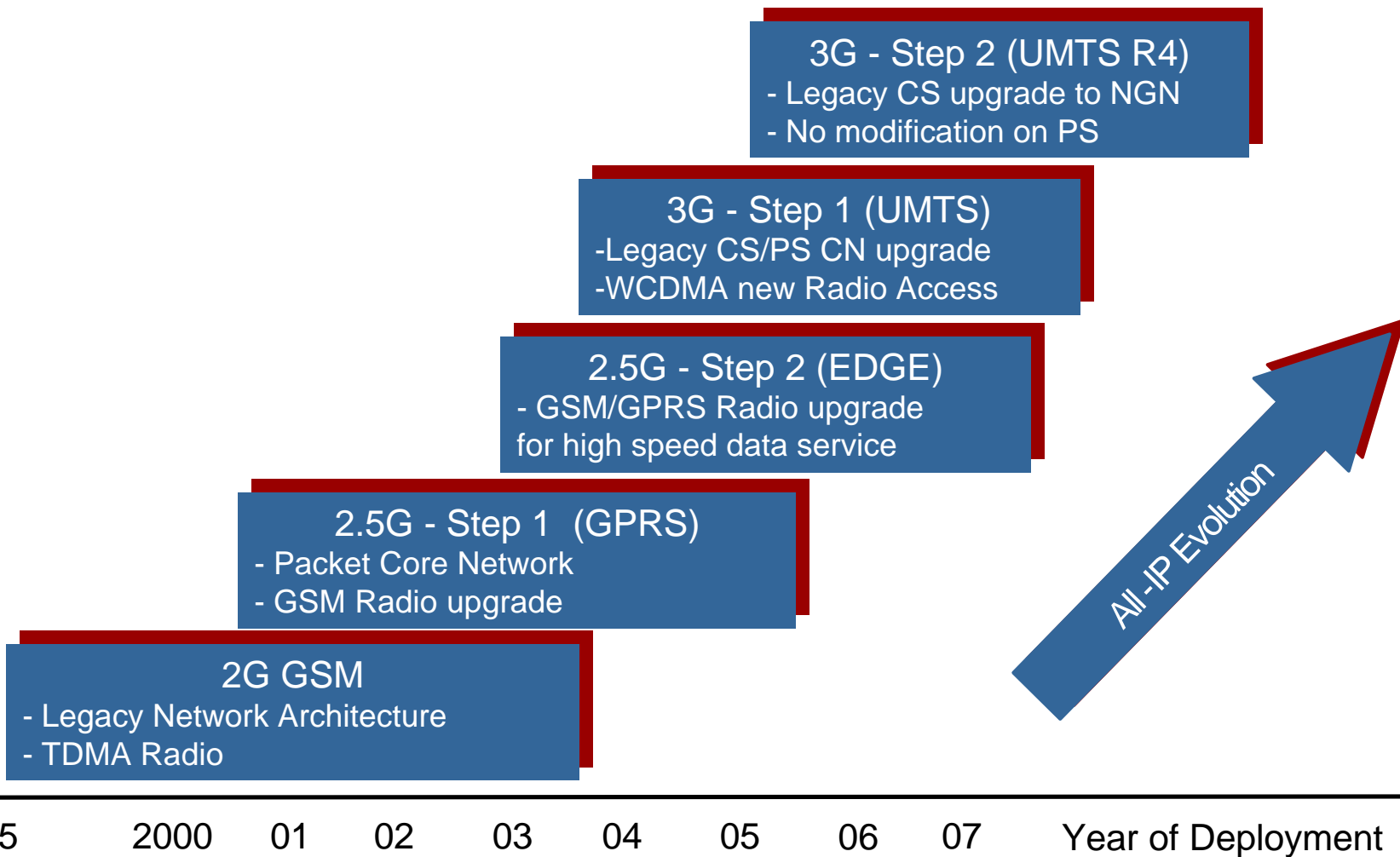
# GSM Radio Technology Evolution



- ▼ EDGE is upgraded from GSM/GPRS
- ▼ UMTS overlays from GSM/GPRS
- ▼ UMTS is upgraded from GSM/GPRS



# 3GPP Network Evolution



# How NGN Applies in Mobile Networks?

## ➤ CDMA 1x RTT:

- Extended radio technology from IS95
- Last non-NGN Release
- Release 0 in commercial service since Oct 2000
- New overlay Packet Data Serving Node

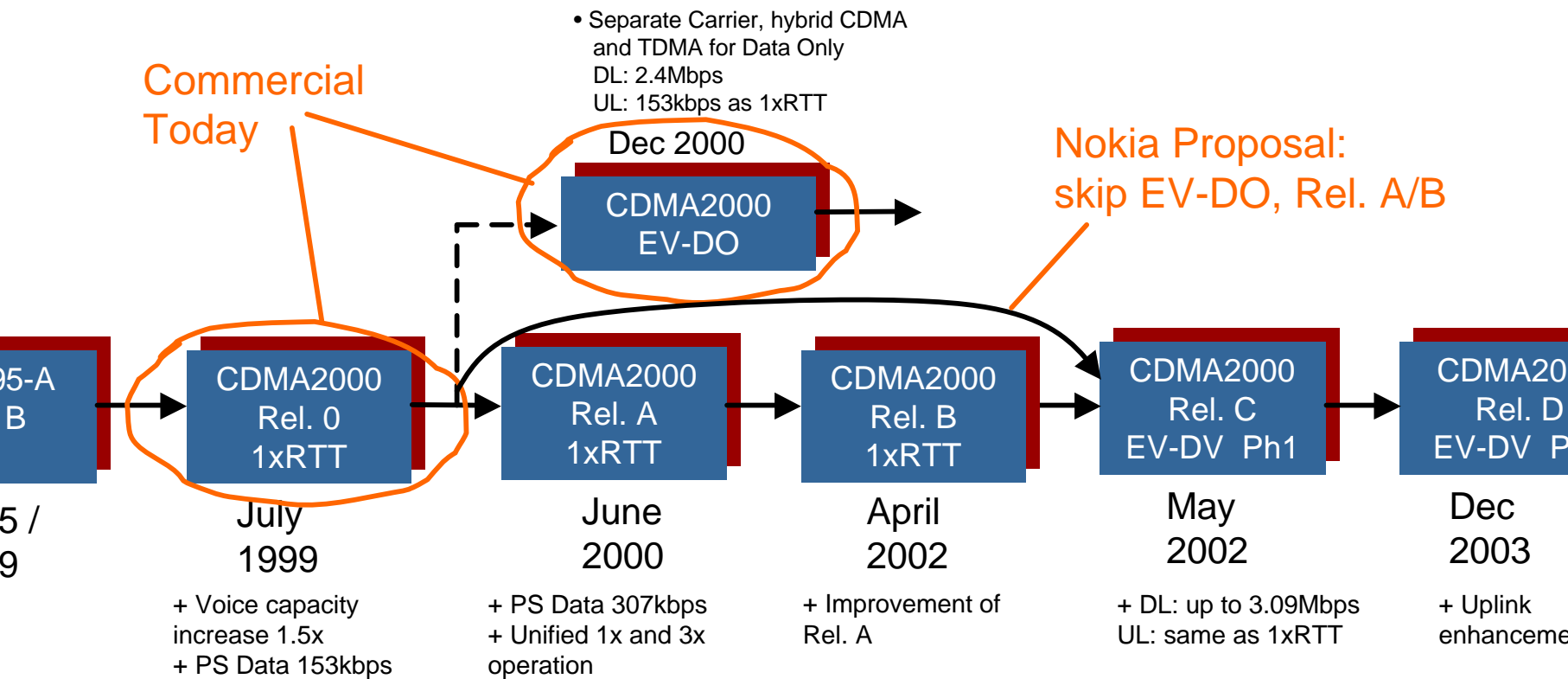
## ➤ CDMA 1x EV-DO:

- Hybrid CDMA+TDMA technologies for bursty applications (High Speed Data)
  - Requires a separate carrier (1.25MHz), mainly deployed for hot zones.
  - Could be developed independent of IS95/1xRTT. (No MSC/VLR needed)
- Commercial service in SK, US since 2002

## ➤ CDMA 1x EV-DV:

- NGN in Cs Domain with Separation of Control and User layers
- Backward compatible with CDMA2000 1xRTT
- Commercial service in 2005

# CDMA2000 Radio Technology Evolution

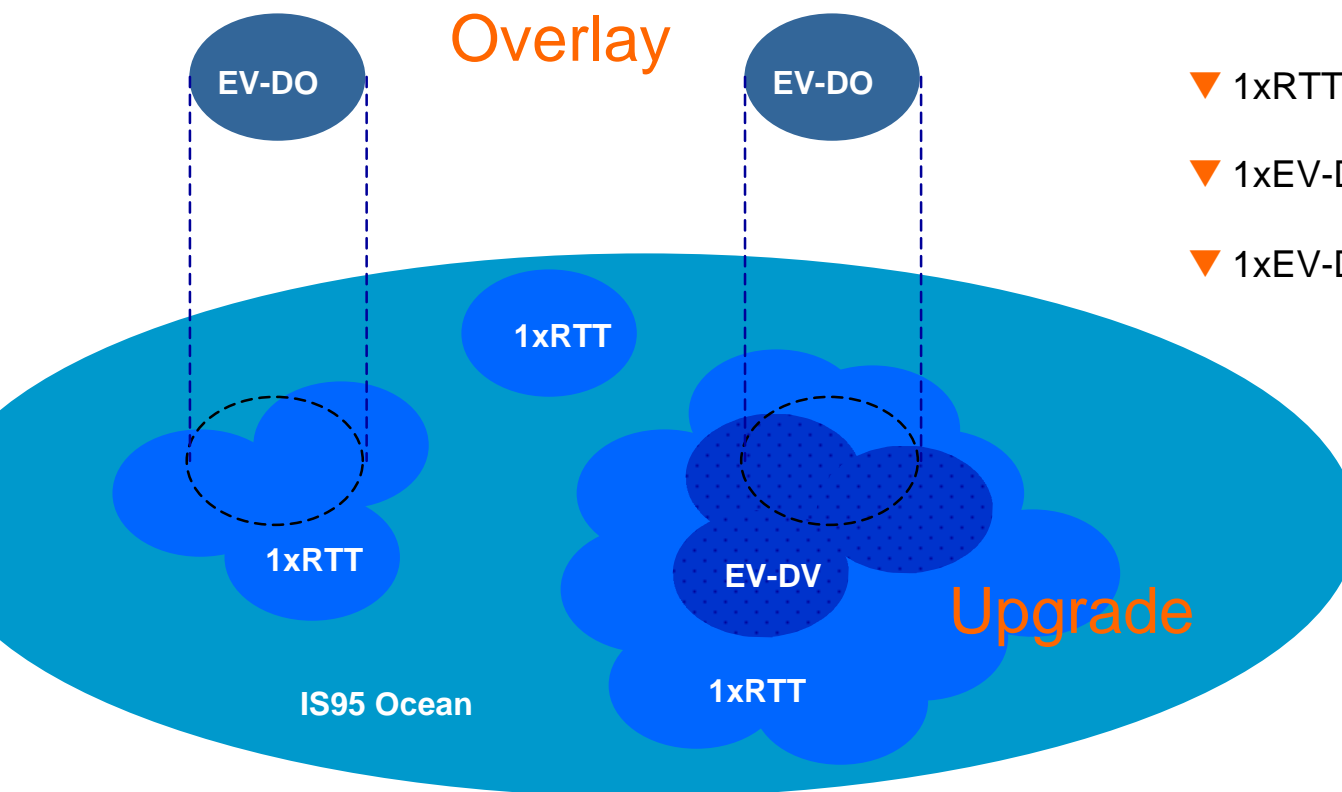


EV-DO: 1x Evolution Data Only , now also called HDR (high data rate)

EV-DV: 1x Evolution Data and Voice

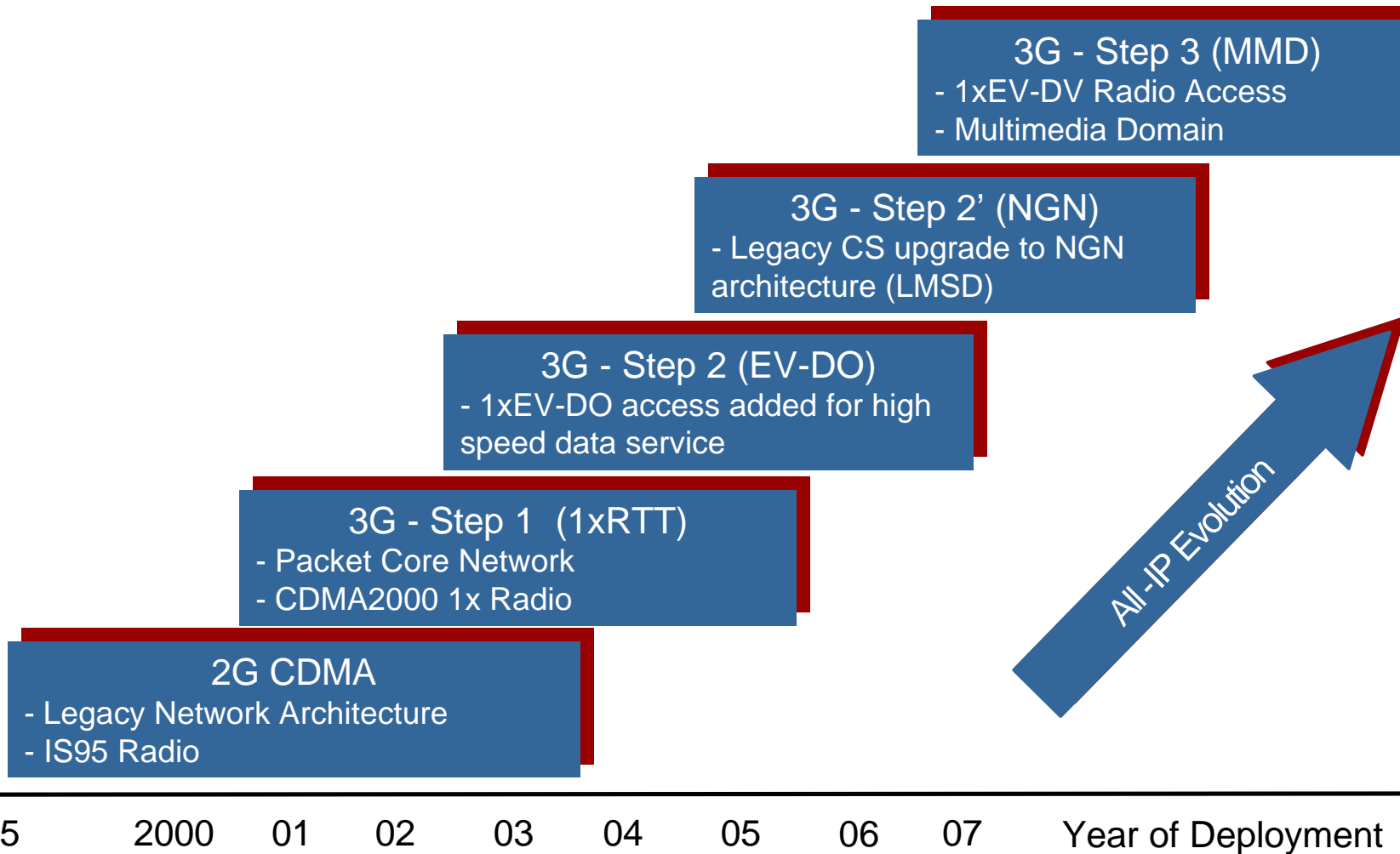
Release dates are publication day of version 1.0 standard. (E.g. CDMA2000 Rel. A published version 1.0 in June 2000, and version 6.0 in February 2002.)

# CDMA2000 Radio Technology Evolution



- ▼ 1xRTT is upgraded from IS95
- ▼ 1xEV-DO overlays IS95/1xRTT
- ▼ 1xEV-DV is upgraded from 1xRTT

# 3GPP2 Network Evolution



# Presentation Outline

- > What is NGN and how it applies in Mobile Networks?

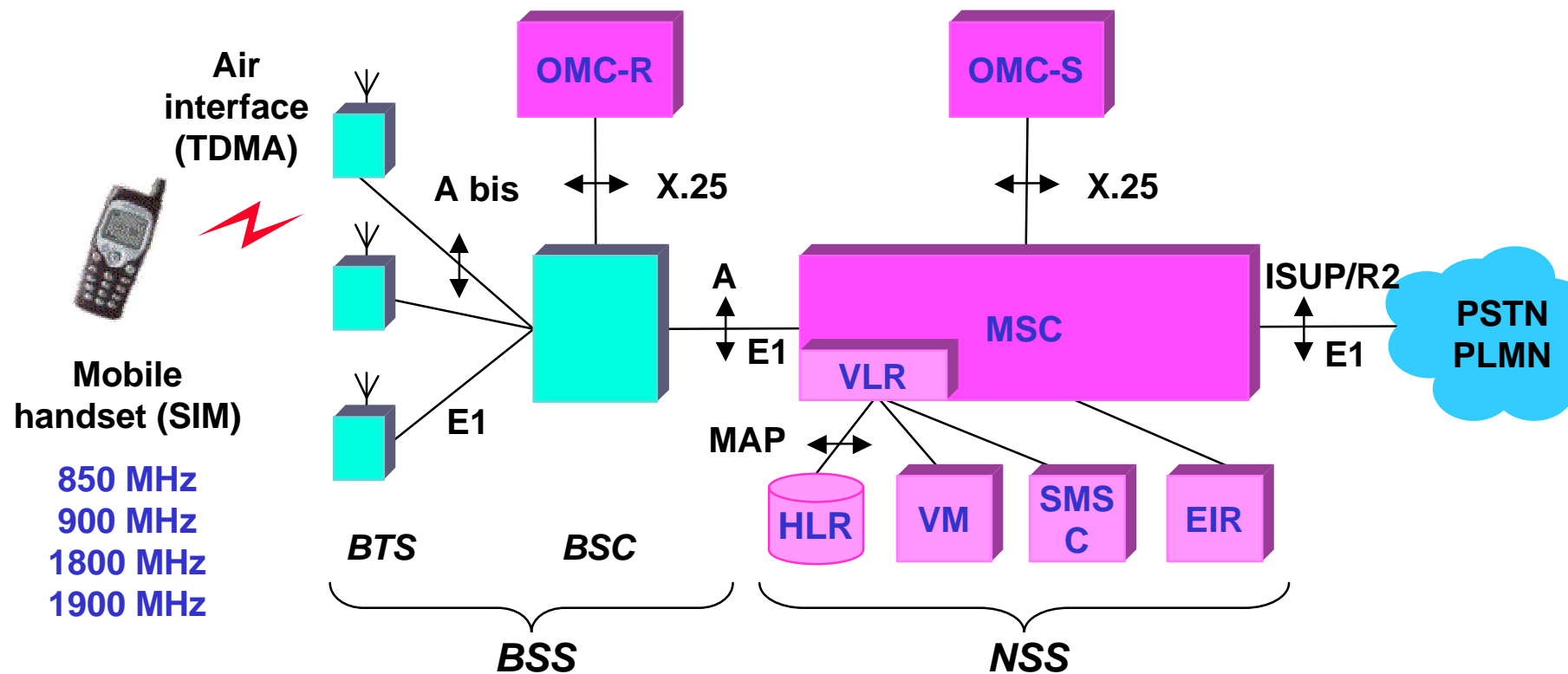
- > **Mobile Networks Architectures**

  - > 2G/3G Mobile Networks

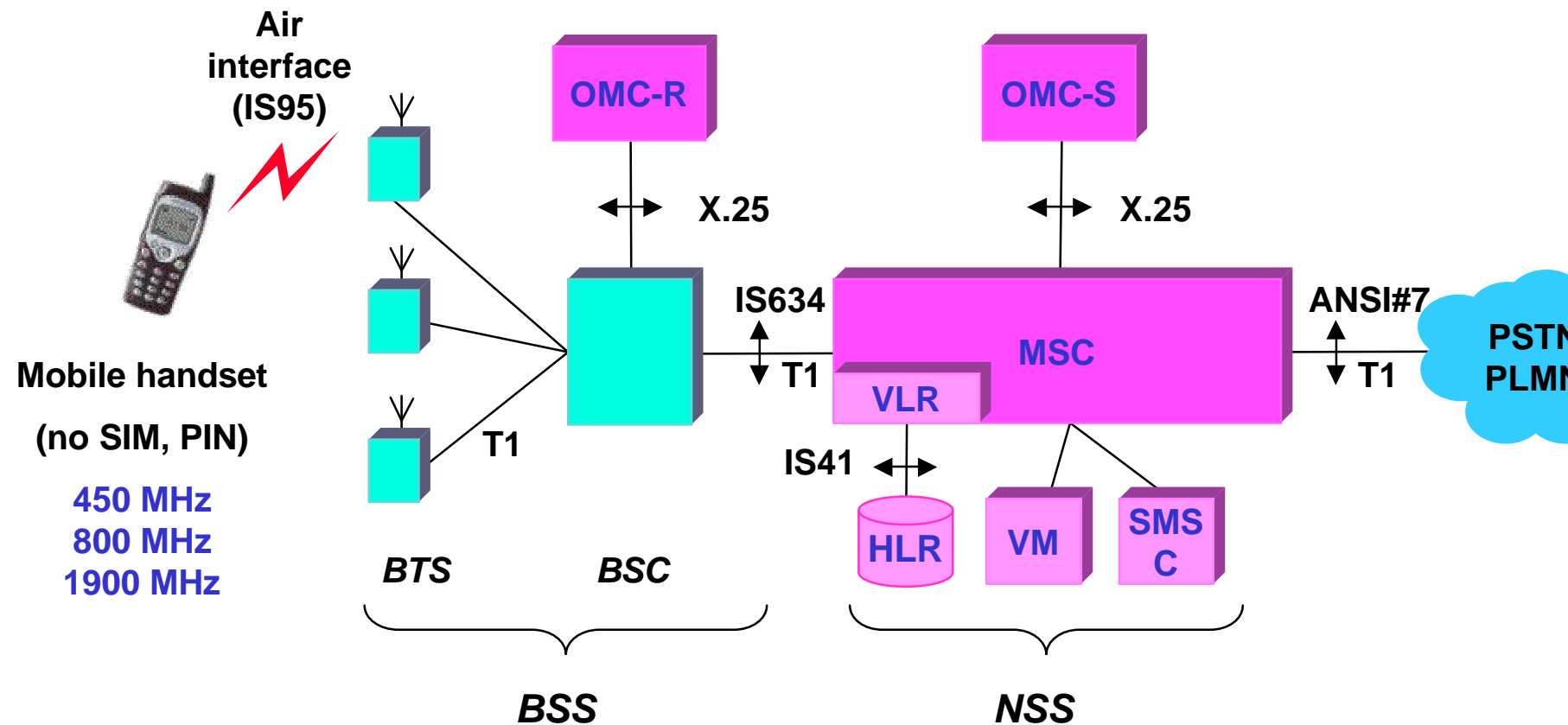
  - > NGN Evolution

- > Why NGN?

# GSM Architecture

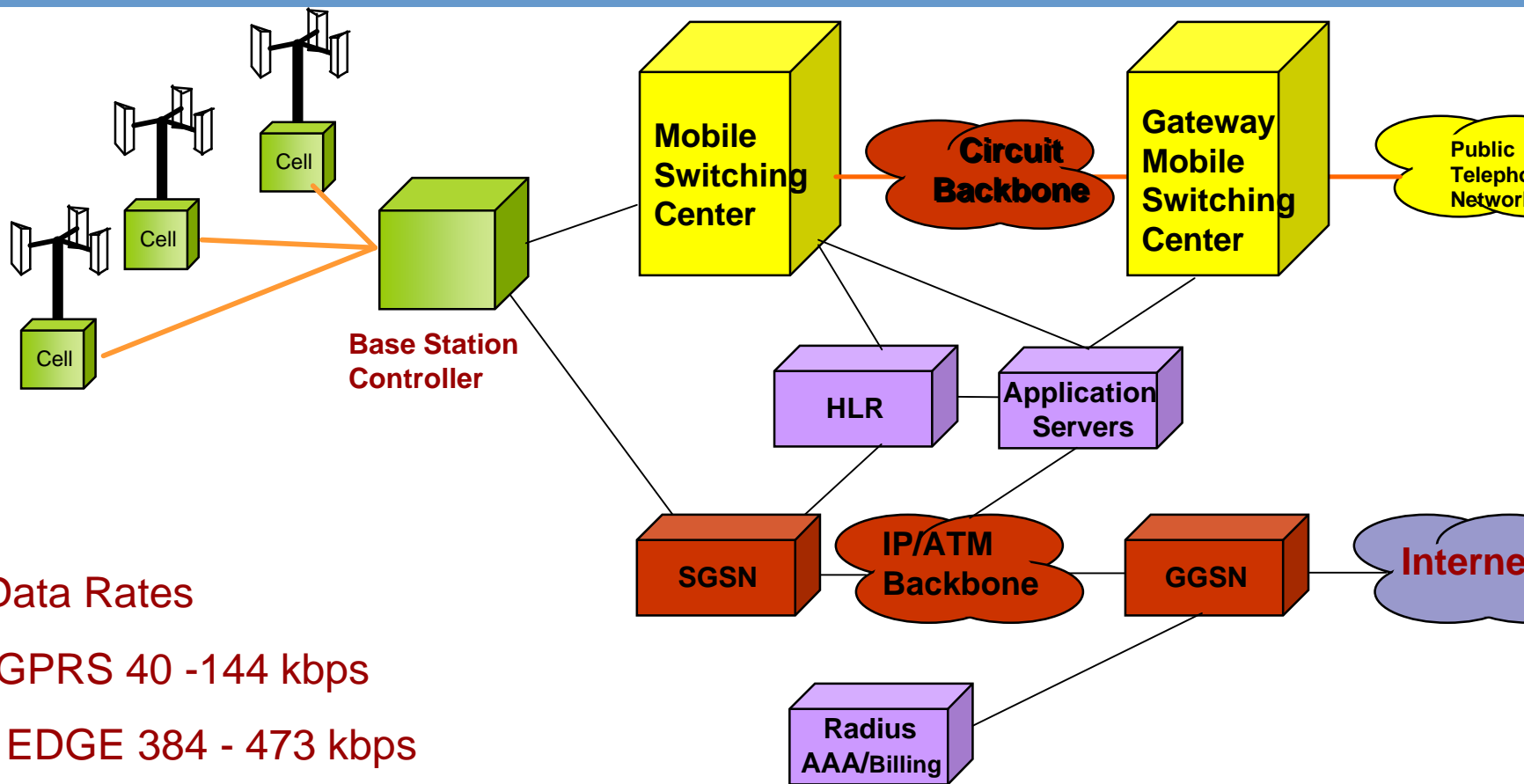


# CDMA Architecture





# 2.5G GPRS/EDGE

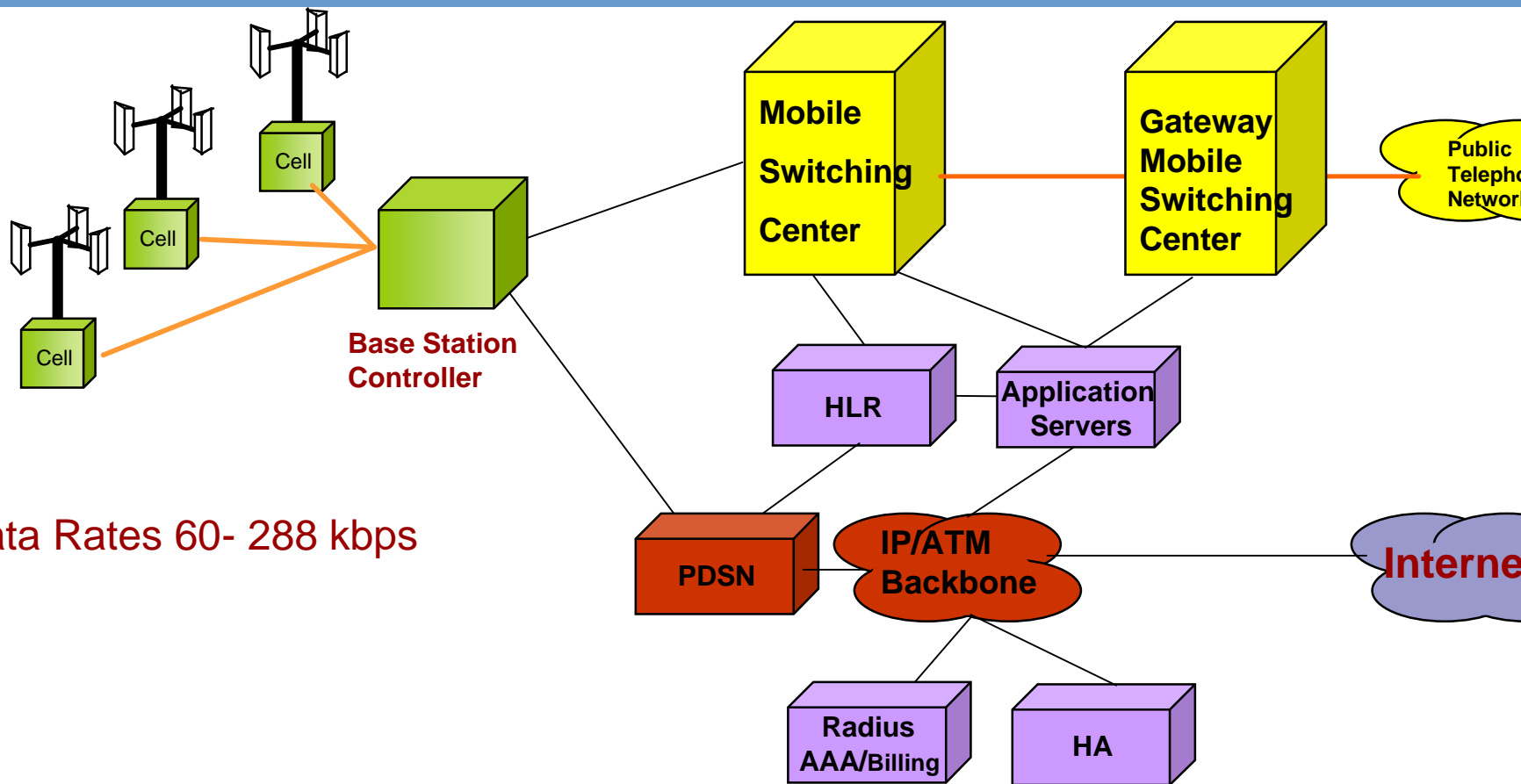


## Data Rates

GPRS 40 - 144 kbps

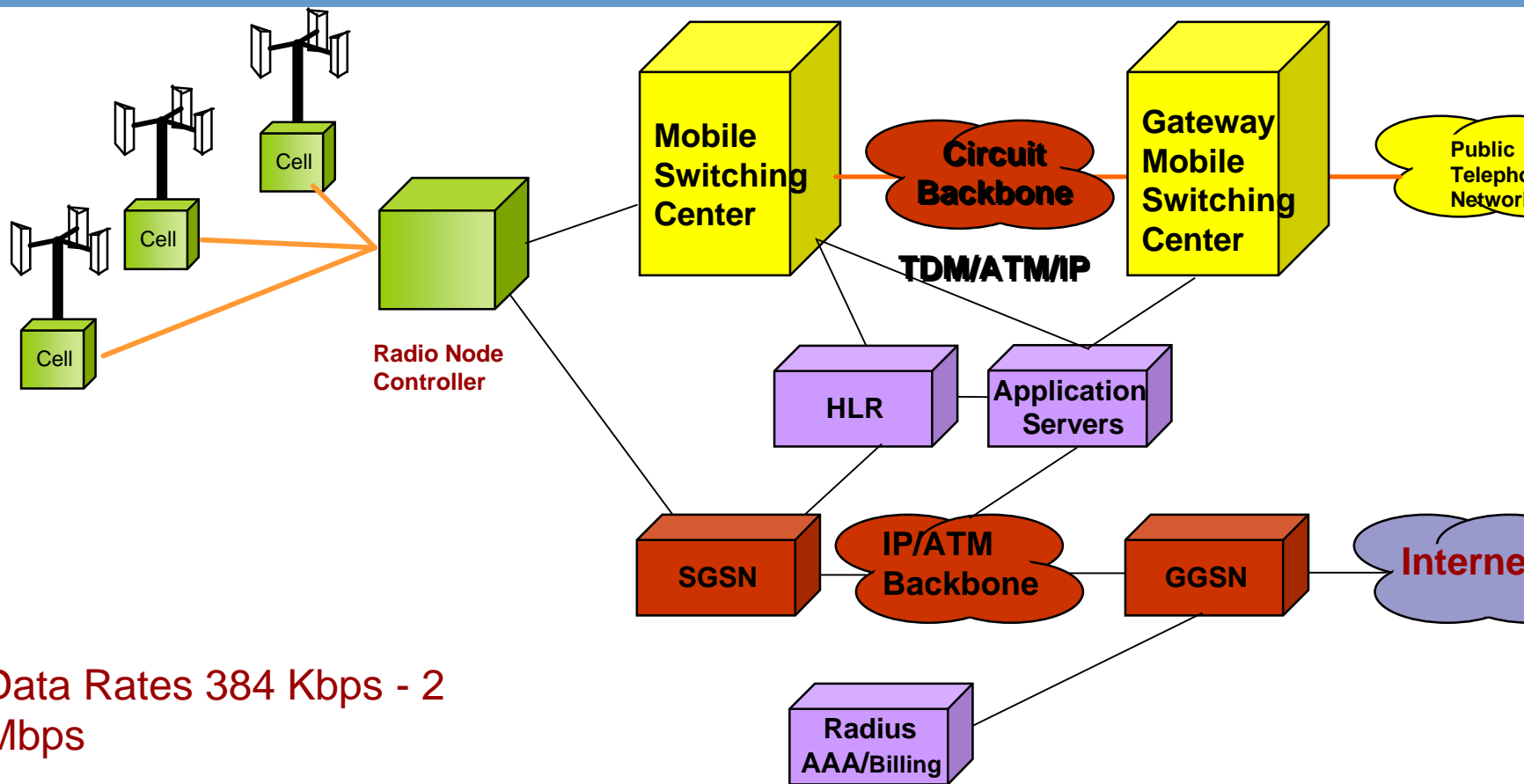
EDGE 384 - 473 kbps

# 2.5G CDMA 1XRTT



Data Rates 60- 288 kbps

# 3G W-CDMA R3 (R99)



Data Rates 384 Kbps - 2 Mbps

# Presentation Outline

- > What is NGN and how it applies in Mobile Networks?

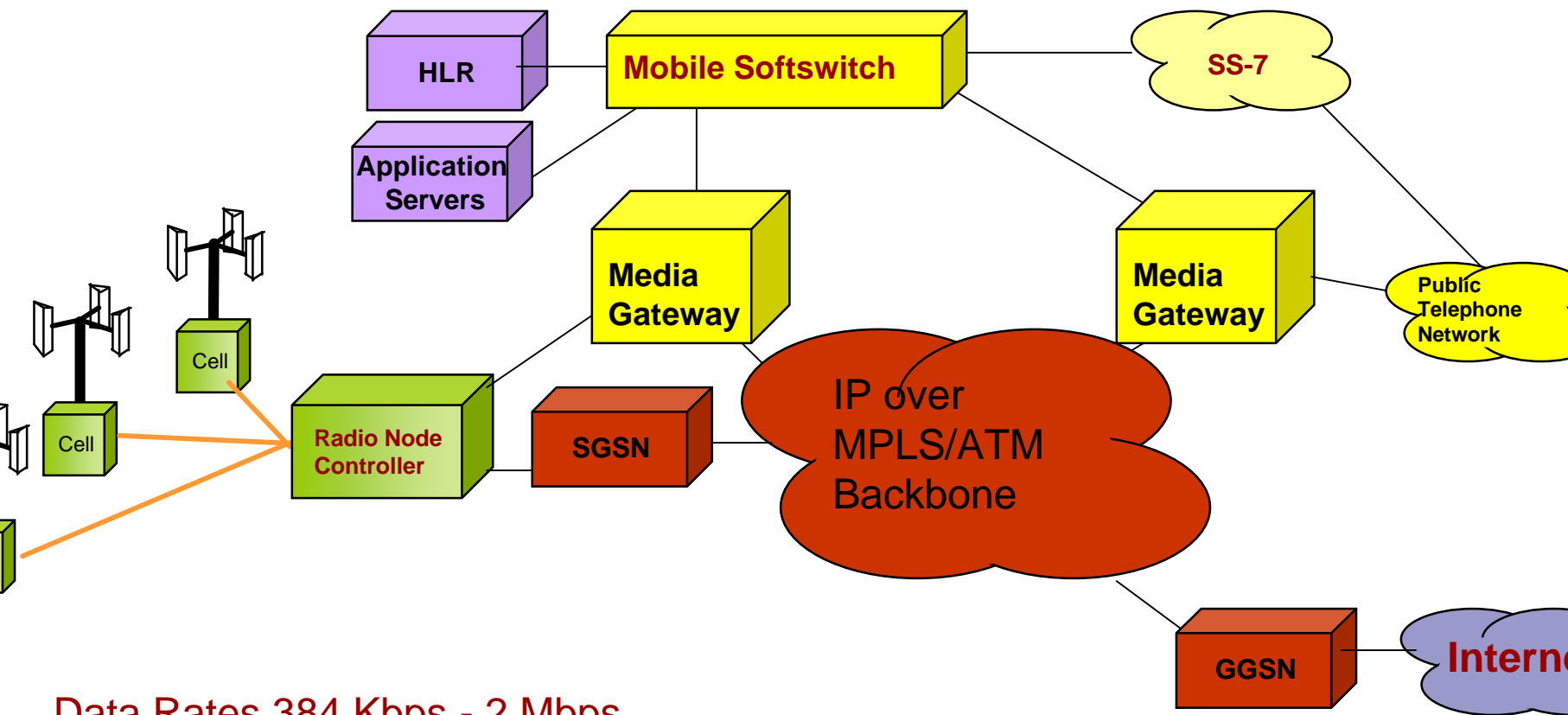
- > **Mobile Networks Architectures**

  - > 2G/3G Mobile Networks

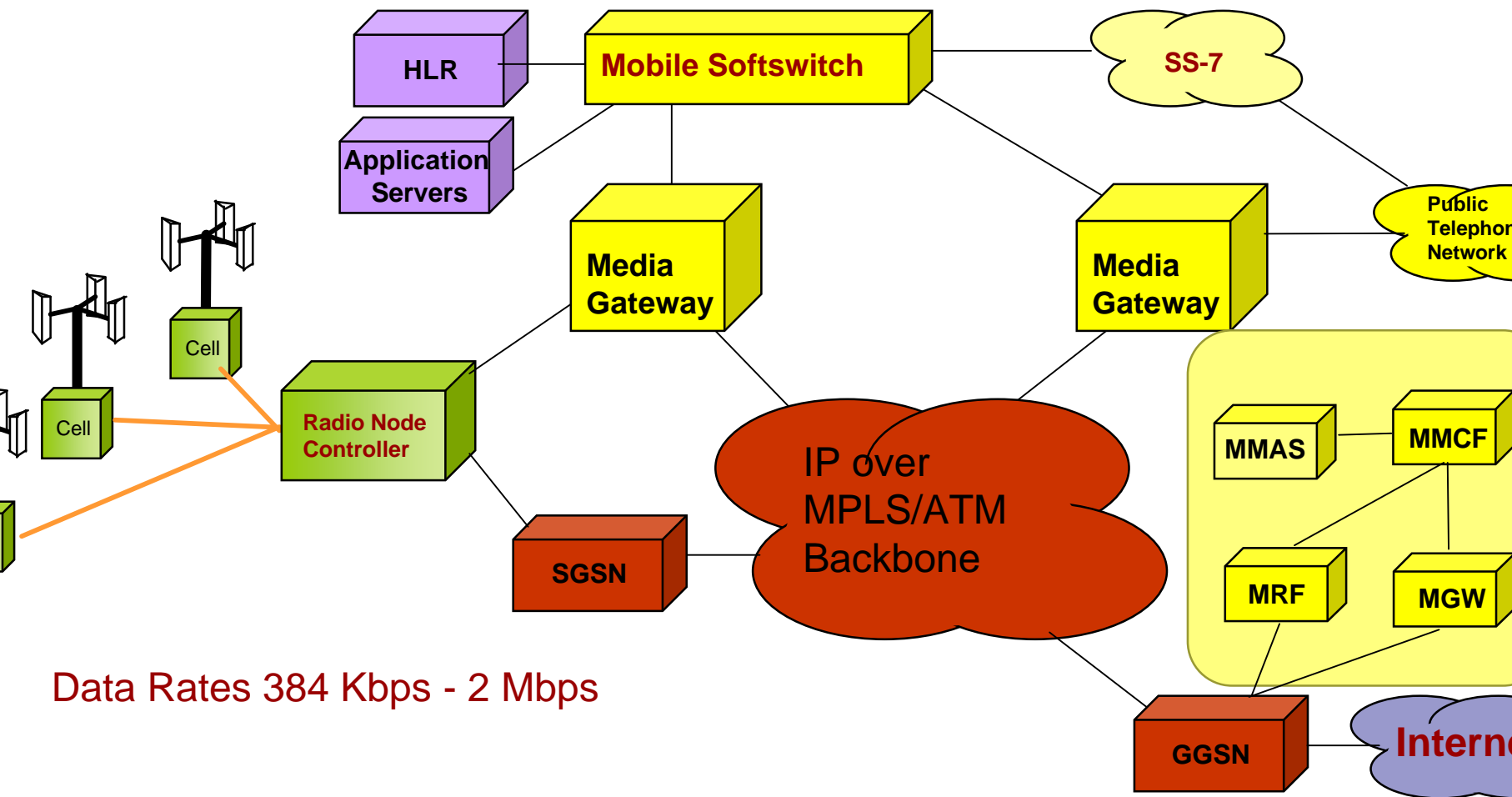
  - > **NGN Evolution**

- > Why NGN?

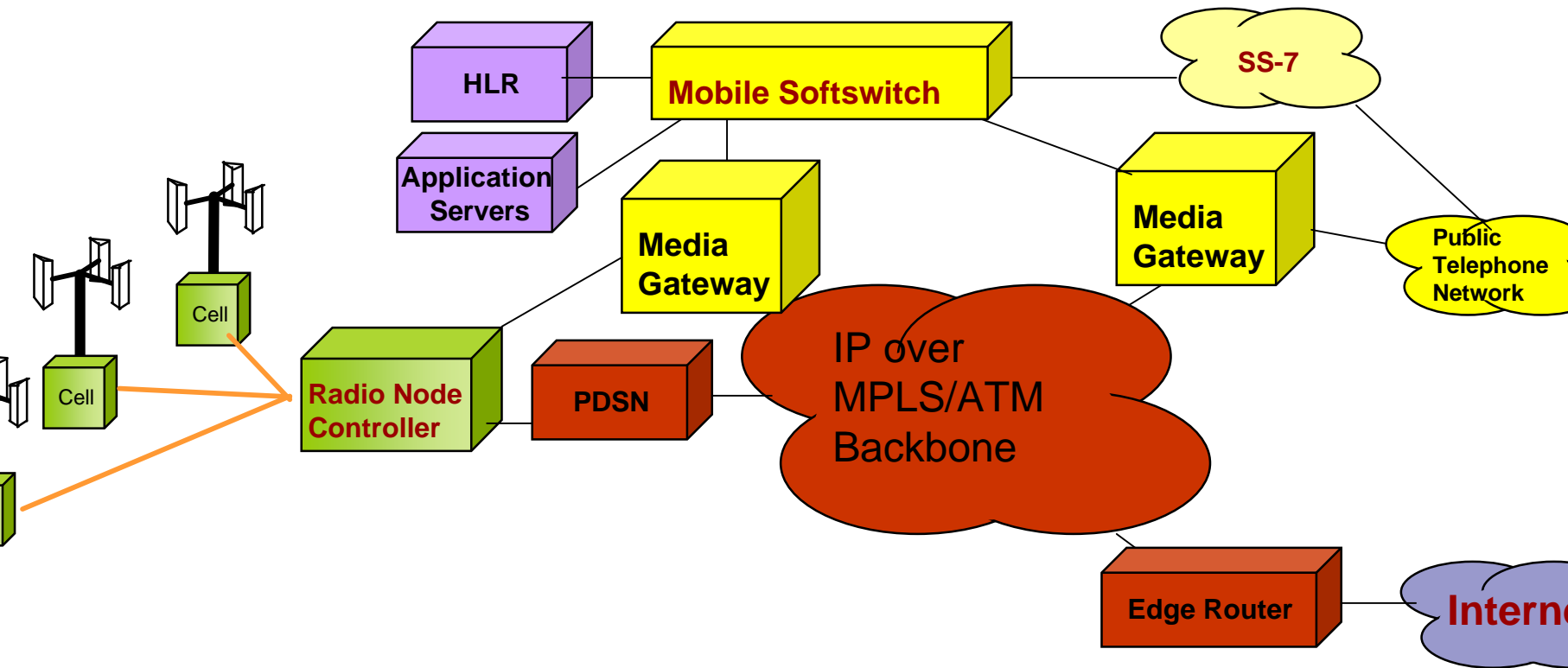
# 3G W-CDMA R4



# 3G W-CDMA R5 (IMS)



# 3G CDMA 2000



Data Rates 2 - 5 Mbps

# Presentation Outline

- > What is NGN and how it applies in Mobile Networks?
- > Mobile Networks Architectures
- > **Why NGN?**



# Why NGN?

1 - Transport Network Simplification

2 - Higher Network Scalability

3 - Bandwidth Saving

4 - New Services



# y NGN?

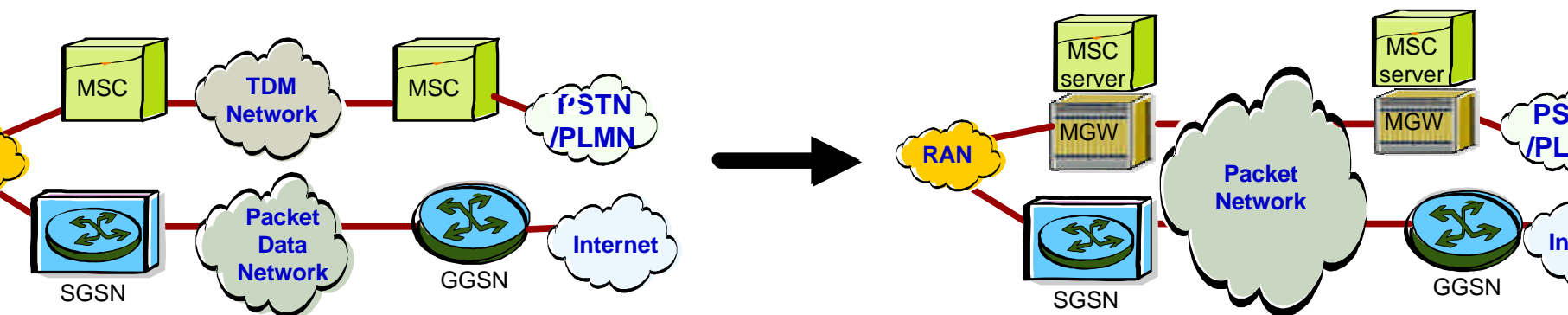
## Transport Network Simplification - Common Cs/Ps Backbone

➤ Only one transport backbone for Voice, Data on ATM or IP

➤ improved resources use efficiency

➤ resources sharing

➤ one network management

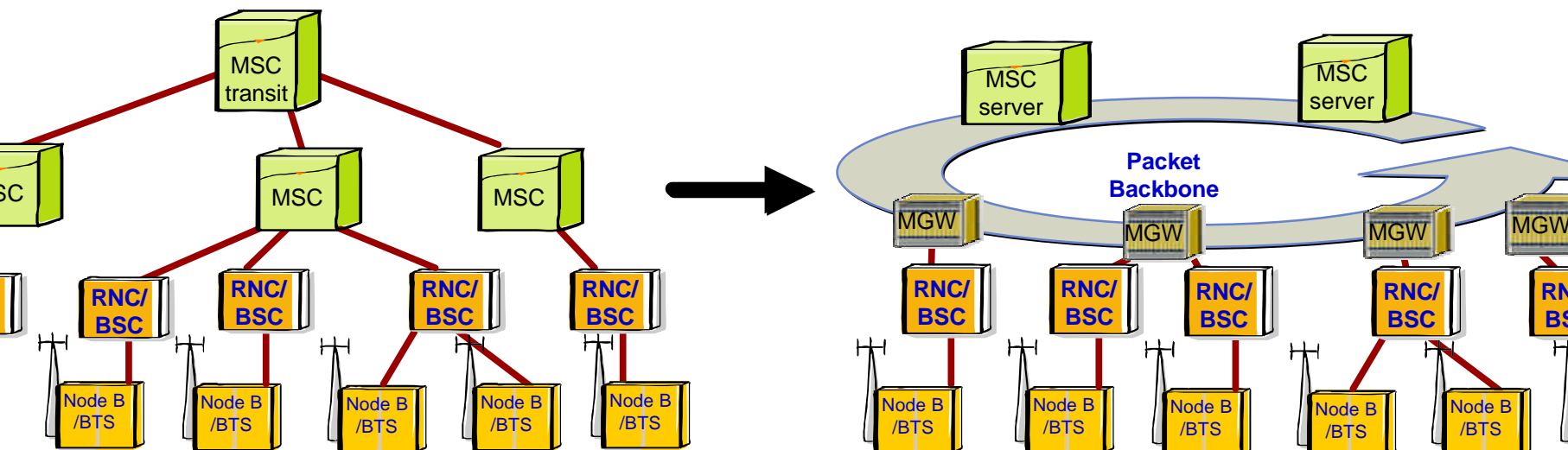


# Why NGN?

## Transport Network Simplification - No Transit Layer

### No Need for Transit Layer MSC

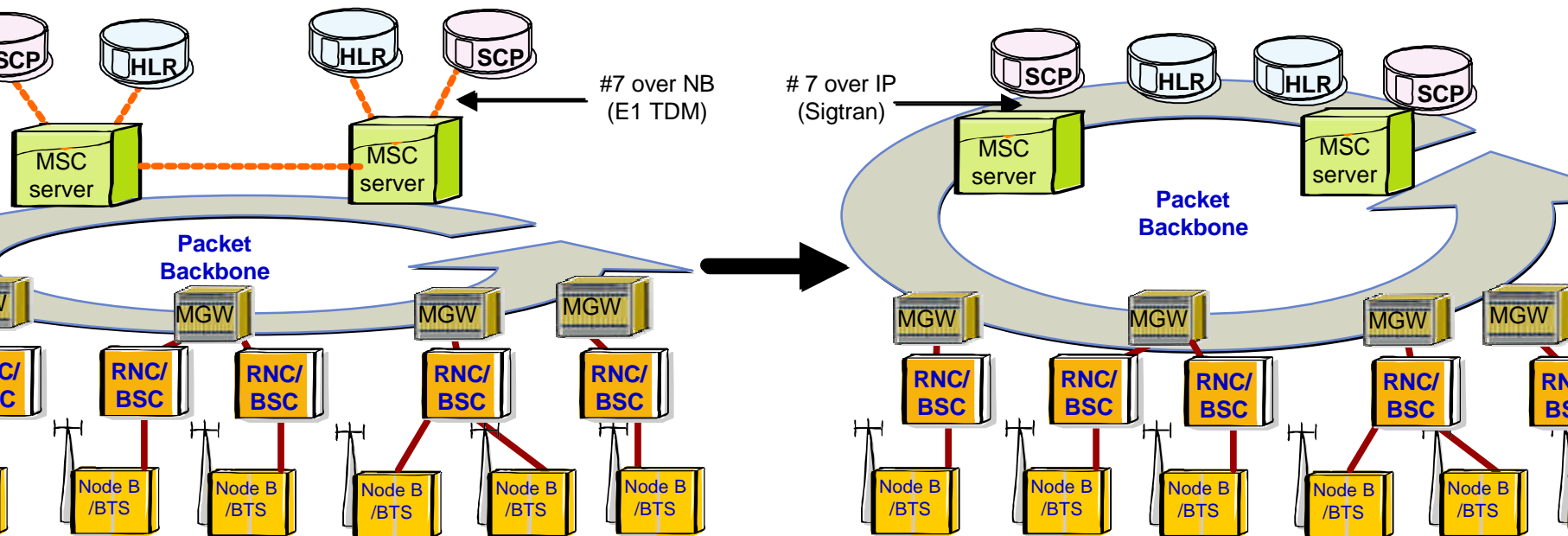
- Dynamic connection establishment between nodes
- in ATM through SVC, in IP through routing



# NGN?

## Transport Network Simplification - Common Signalling/Packet Backbone

- With Signalling over IP, no Need for Dedicated Signalling Network
- simplification of transport network
- improved resource use efficiency



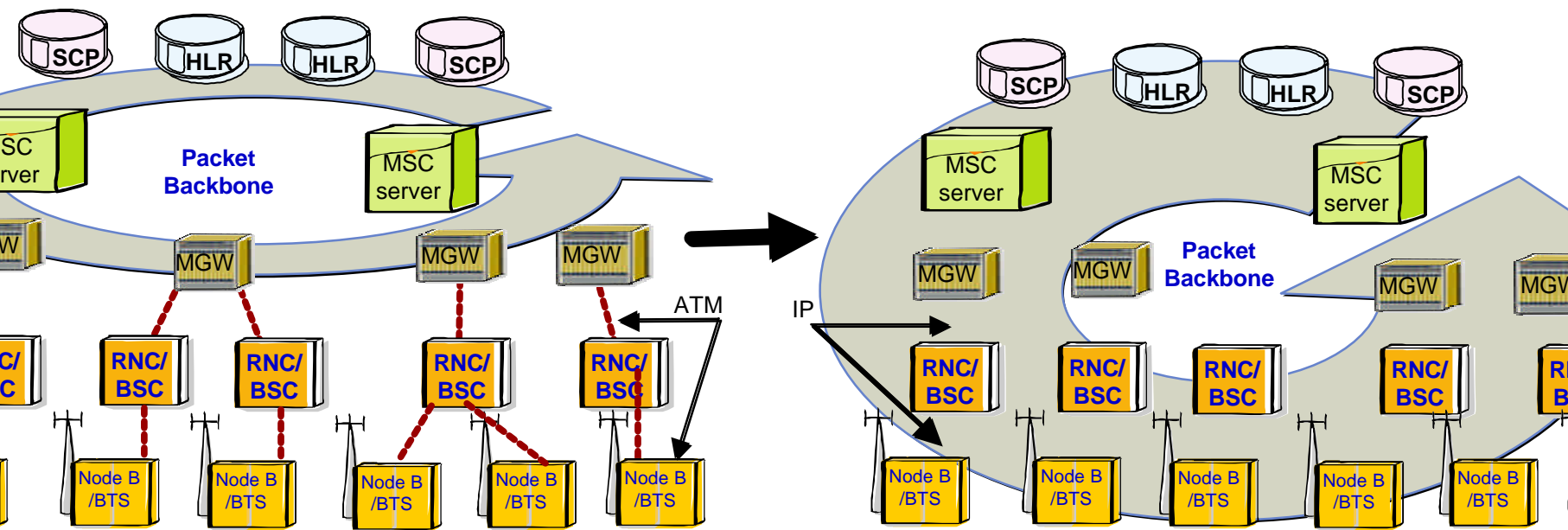
# y NGN?

## Transport Network Simplification - Common CN/RAN backbone

➤ With IP in RAN in R5, Merge of CN & RAN IP Transport Networks

➤ simplification of transport network

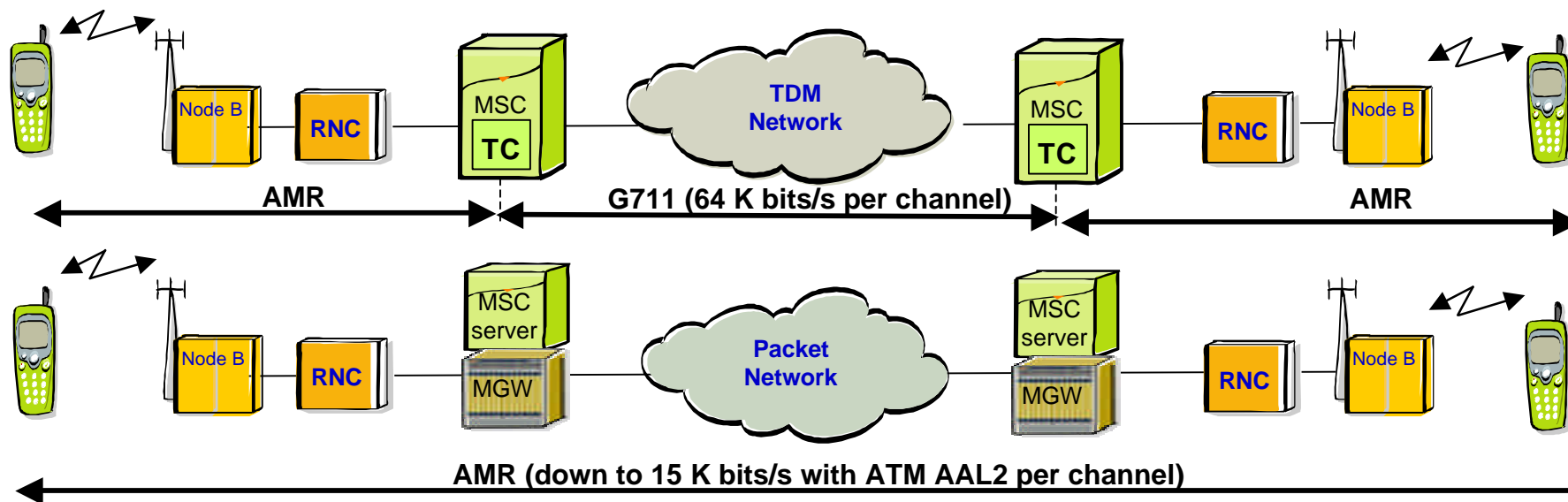
➤ improved resource use efficiency



# Why NGN? Bandwidth Saving

## ➤ End to End AMR voice transport (3G/3G Call)

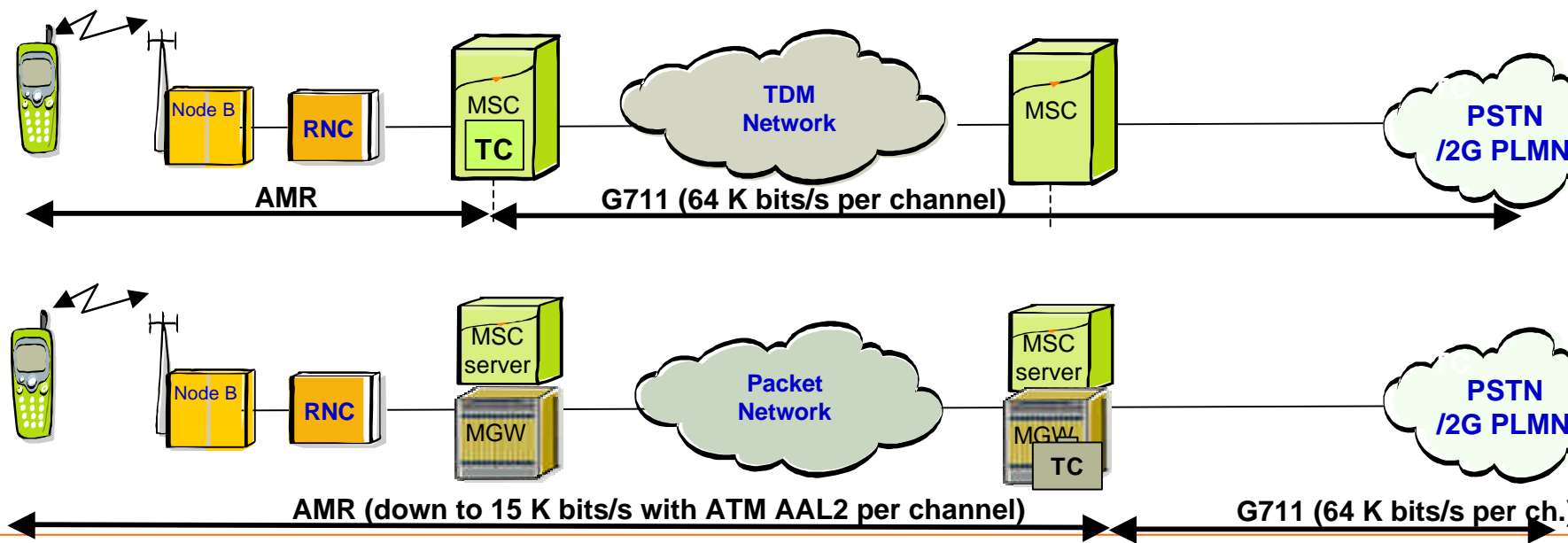
- Bandwidth optimisation
- Transcoder saving
- Voice quality improvement



# Why NGN? Bandwidth Saving

## ➤ AMR in CN for 3G<->PSTN/2G PLMN Voice Call (R4)

### ➤ Bandwidth optimisation



# Why NGN?

## Bandwidth Saving (CS domain)

### Transport Bandwidth Efficiency (from R4 & beyond)

transport type per channel	G711 over TDM (reference)	AMR over ATM AAL2	AMR over POS IP V4	AMR over POS IP V6	AMR over GE IP V4	AMR over GE IP V6	AMR over IP V4 over ATM AAL5	AMR over IP V6 over ATM AAL5	G711 ATM
per voice channel	64	<b>15</b>	<b>34</b>	44	49	59	51	51	
per 64kb data ch.	64	<b>85</b>	<b>121</b>	141	151	171	153	204	N

**ATM AAL2:** the most efficient for both Voice and 64kb/s Data

**POS:** the most efficient of the IP transport

**64kb/s Data:** Packet transport brings degradation

but data traffic on Cs should be low w/r to voice traffic



# Why NGN?

## 3- Bandwidth Saving (PS domain)

Transport type Byte per packet	IP over SDH	IP over ATM AAL5
256 byte IP packet	<b>267</b>	318
512 byte IP packet	<b>525</b>	583

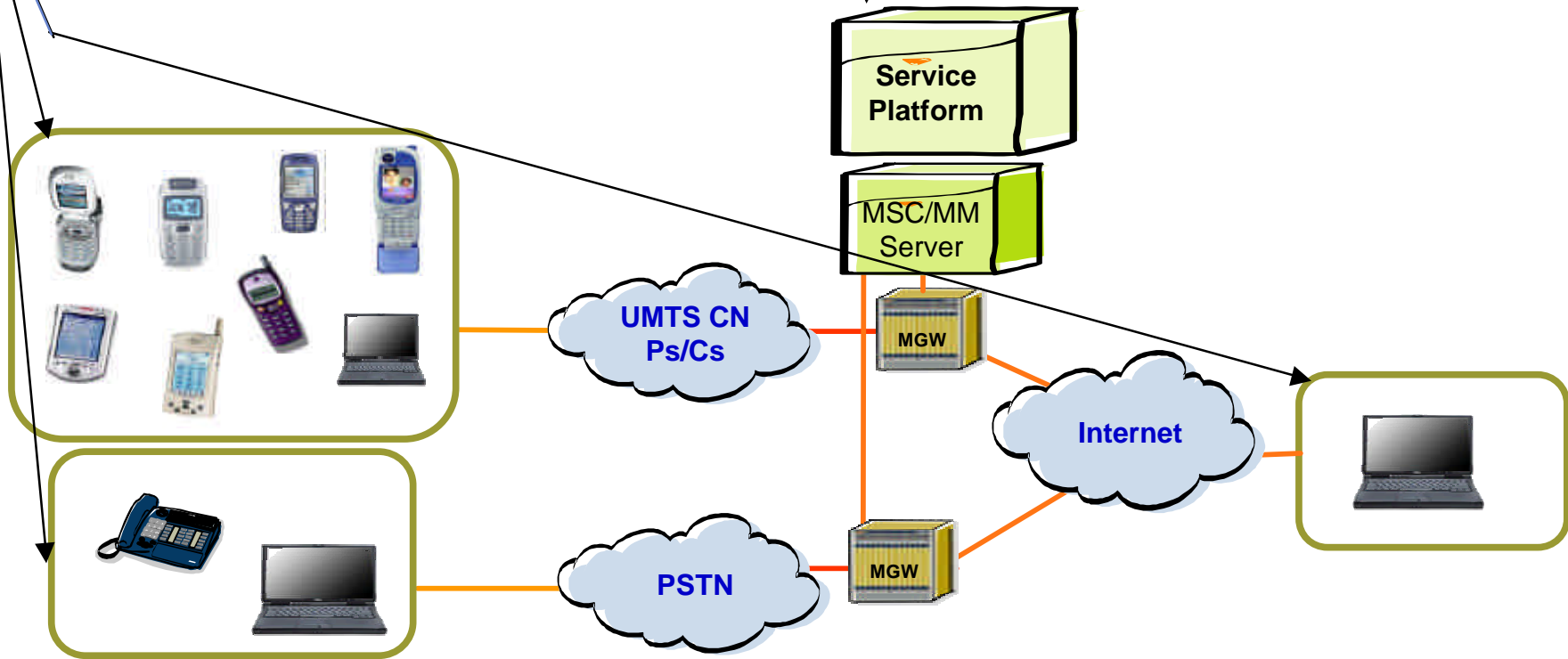
**over SDH more efficient than IP over ATM (10 to 20%)**

# y NGN?

## ew Services Unified Services through standardized Interfaces

services independent of  
access layer type  
(fixed, mobile, PC, Phone)

one Service Platforms  
whatever the access layer types  
(unlike IN, Voice Mail for Mobile, email for fixed Internet)

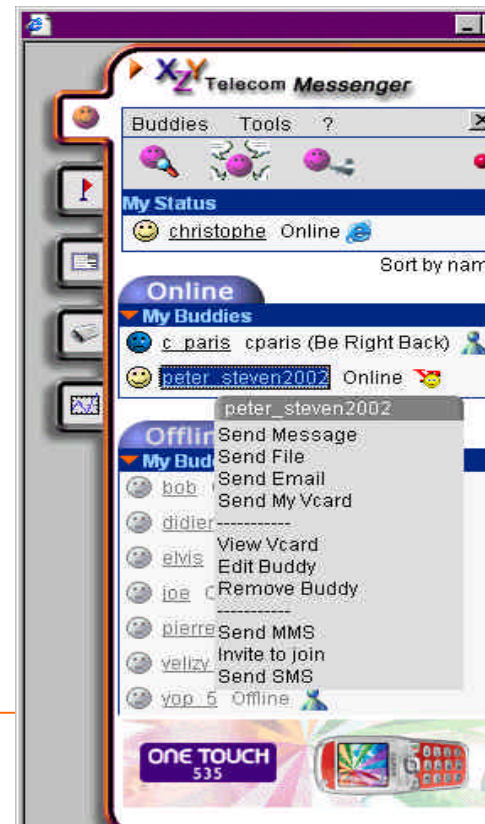


# Why NGN? New Services

as target transport layer with benefit of existing IP services

merge and combination of existing services

- **Standardized Video Communication** (between fixed & mobile, video conferencing & video mail)
- **Unified messaging** one mail box whatever the message (voice, text, video) & device type
- **Multimedia Messaging**
- **Instant Messaging**



# Why NGN?

## Summary

### CAPEX OPTIMIZER

### OPEX OPTIMIZER

### REVENUE ASSURANCE

Transport Network Simplification



Higher Network Scalability



Bandwidth Saving



New Services



# Conclusion

**NGN is the separation between Control and Transport**

**NGN is mainly introduced in 3G UMTS R4/R5 and CDMA2000 1x EV-DV**

**Only one transport backbone for Voice, Data on ATM or IP**

**Bandwidth optimisation, Transcoder saving & Voice quality improvement  
when Mobile to Mobile/PSTN calls using TrFO**

**Unified Services through standardized Interfaces independent of access layer type  
(Fixed, mobile, PC, Phone)**

**New Services (Merge and combination of existing services):**

- **Standardized Video Communication**
- **Unified messaging**
- **Multimedia Messaging**
- **Instant Messaging**

[www.itu.int/ITU-D/Imt-2000](http://www.itu.int/ITU-D/Imt-2000)

**Thank you for your attention...**