

# IPv6 a long term solution for IPv4 address shortage

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# AGENDA

- **The Limits of IPv4**
- **Facts and reasons for IPv6**
- **IPv6 a new Challenge for Africa**
- **Case Study : Sonatel's IPv6 deployment**

# THE LIMITS OF IPv4

## ▪ IPv4 Address Allocation History

1981 – IPv4 protocol published

- IP addresses used to uniquely identify and locate IP devices

1985 – 1/16 of total space

1990 – 1/8 of total space

1995 – 1/3 of total space

2000 – 1/2 of total space

2002.5 – 2/3 of total space

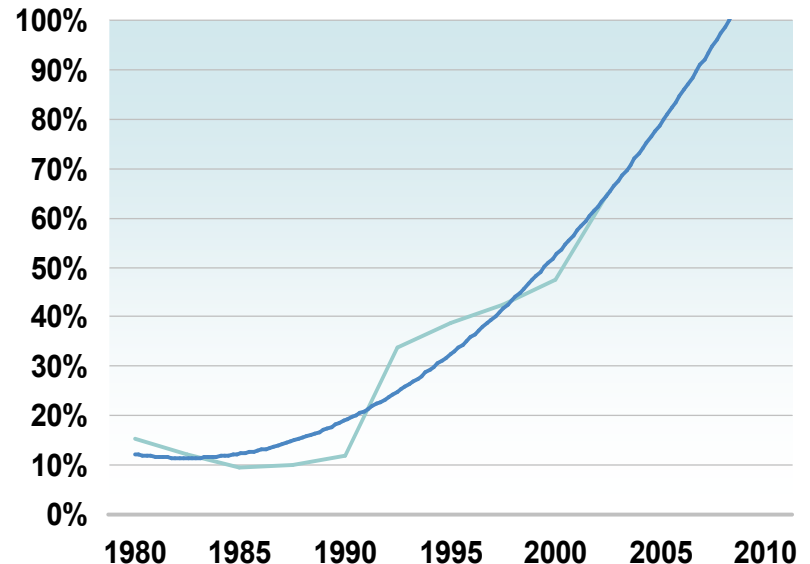
This consumption despite increasingly intense conservation efforts

PPP/DHCP address sharing

NAT (network address translation)

CIDR (classless interdomain routing)

Current estimates predict that all IPv4 addresses will be used between 2008 and 2015, the most common prediction is sometime in 2010.



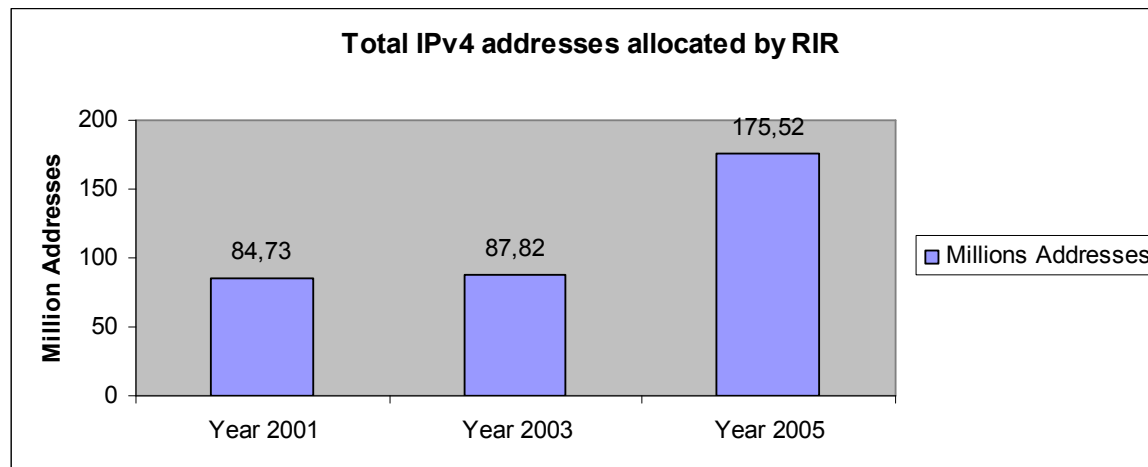
Source: Neil Lovering, Cisco Systems “IPv6 and Semantic Interoperability”  
(<http://cscab.cim3.net/file/work/SICoP/2006-04-2728/NLovering04272006.ppt>)



# THE LIMITS OF IPv4

- IPv4 a restricted addressing space and a Non Equal distribution

An addressing on 32 bits representing approximately 4.2 billion addresses



Source 2006 IPv4 address use report

The total IPv4 addresses available is almost exactly 1.3 billion in January 1<sup>st</sup> 2007 this out of 3706.65 million usable IPv4 addresses

Non Equal Geographical Distribution (> 50% USA)

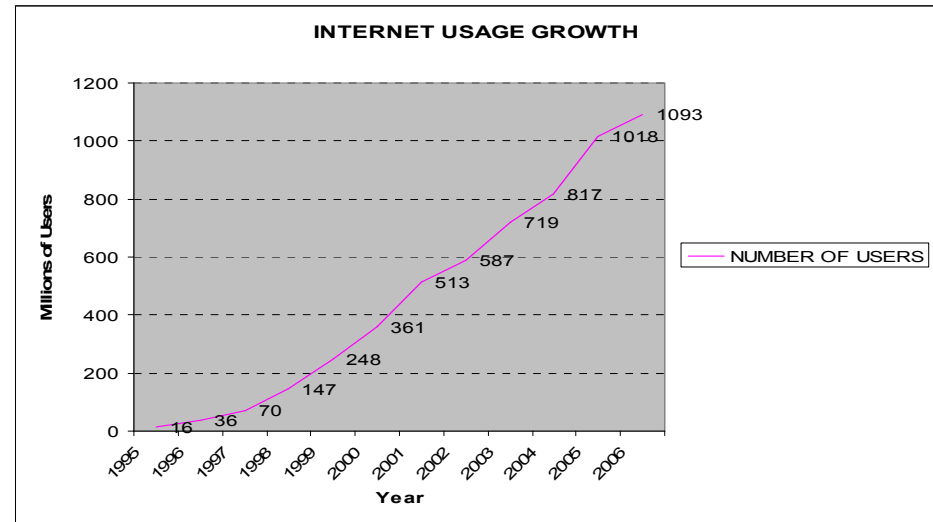
# THE LIMITS OF IPv4

## Internet Growth

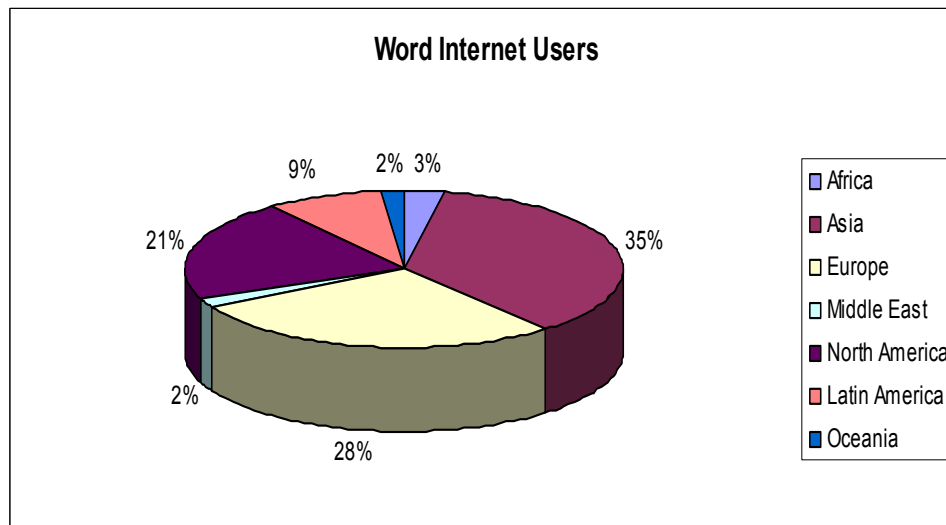
1,093 millions of users in Dec. 06

16.6% of World Population

How can we address the future  
Worldwide population? (2 billion in  
the next 10-12 years)



Source internetworldstats.com



Source internetworldstats.com

**35% of world internet  
Users are located in ASIA**

**In Asia the available IPv4 address  
space is already exhausted**

**Emerging Countries need Address  
space**

# THE LIMITS OF IPv4

## ▪ Mobile Growth

Over 2.6 billion mobile subscribers worldwide

Over 100% penetration for more mature mobile markets

3G roll-outs are progressing, and 10% penetration level are reached in some Countries

In the developing market of Africa 85% of all telephone lines are mobile and the Growing of 3G/HSDPA mobile system will really increase the development of Internet Access

(Source : 2007 Global Mobile Communications Statistics, trends and forecast- Paul Budde Communication Pty Ltd)

**New Generation of Internet Devices are introduced for Mobile Internet :**

- PDAs
- Mobiles Phone
- Tablet PCs
- Etc.



## THE LIMITS OF IPv4

### ▪ NGN-Next Generation Network

Evolution of the networks towards whole IP with a fixed/mobile convergence:

- IP/MPLS Based Infrastructure for voice, video and data. Standardized, cheap and open access
- IP addressing will bring in not just people and computers to the network but also cars, refrigerators, tv-sets, sensor system, home games and many more.
- A QoS multiple-broadband network and will support seamless mobility providing users with a ubiquitous provision of service
- Multiple-Technologies : UMTS/HSxPA, xDSL, LTE, FTTx, Wimax etc.

THE ANSWER TO THAT CHALLENGE IS IPv6

# THE LIMITS OF IPv4

## ▪ NGN-Next Generation Network

② Broadband everywhere

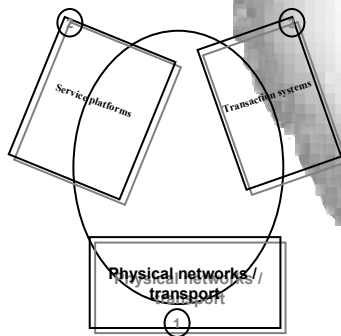


③ Mobility everywhere



① IP Network

⑤ Service Platforms inter working with network



④ Multi access intelligent devices



Source: FT investor day 11/2003



## THE LIMITS OF IPv4

### ▪ **NGN-Next Generation Network**

- **IMS based for Voice, Video and Data convergence in fixed/mobile network**
- **Broadband Access with “ Always on Mode”**
- **Mobility Services Everywhere around GPRS/UMTS/HxDPA/Wifi/Wimax**
- **Multi access intelligent Devices**
- **Connected electronics and communicating vehicles**
- **The robotic applications and the sensors systems**

**THE ANSWER TO THAT CHALLENGE IS IPv6**

## FACTS AND REASONS FOR IPv6

- IPv6 a very large addressing space

Addressing on 128 bits

Available Stock of  $2^{128}$  Addresses- ( $3.4 \times 10^{38} \sim$ )

This stock will make possible to face:

- Growth of Internet in all the geographical areas
- To satisfy the needs for new applications :

Mobile Internet

Large Public Electronic connected

Sensors system fixed or mobile,

Needs rising from the “always on” mode for Broadband Access

- The “end to end” mode restoration for some applications like VoIP



## FACTS AND REASONS FOR IPv6

- **IPv6 ensures a better management of mobility**

The number of mobile devices and devices with embedded Internet stacks will grow by magnitudes over the following years (the ongoing use of IPv4 would create poorly interconnected islands of IP networks with limited mobility and security between them)

IPv6 is **MANDATORY** for the 3GPP UMTS IMS (IP Multimedia Subsystem) in release 5

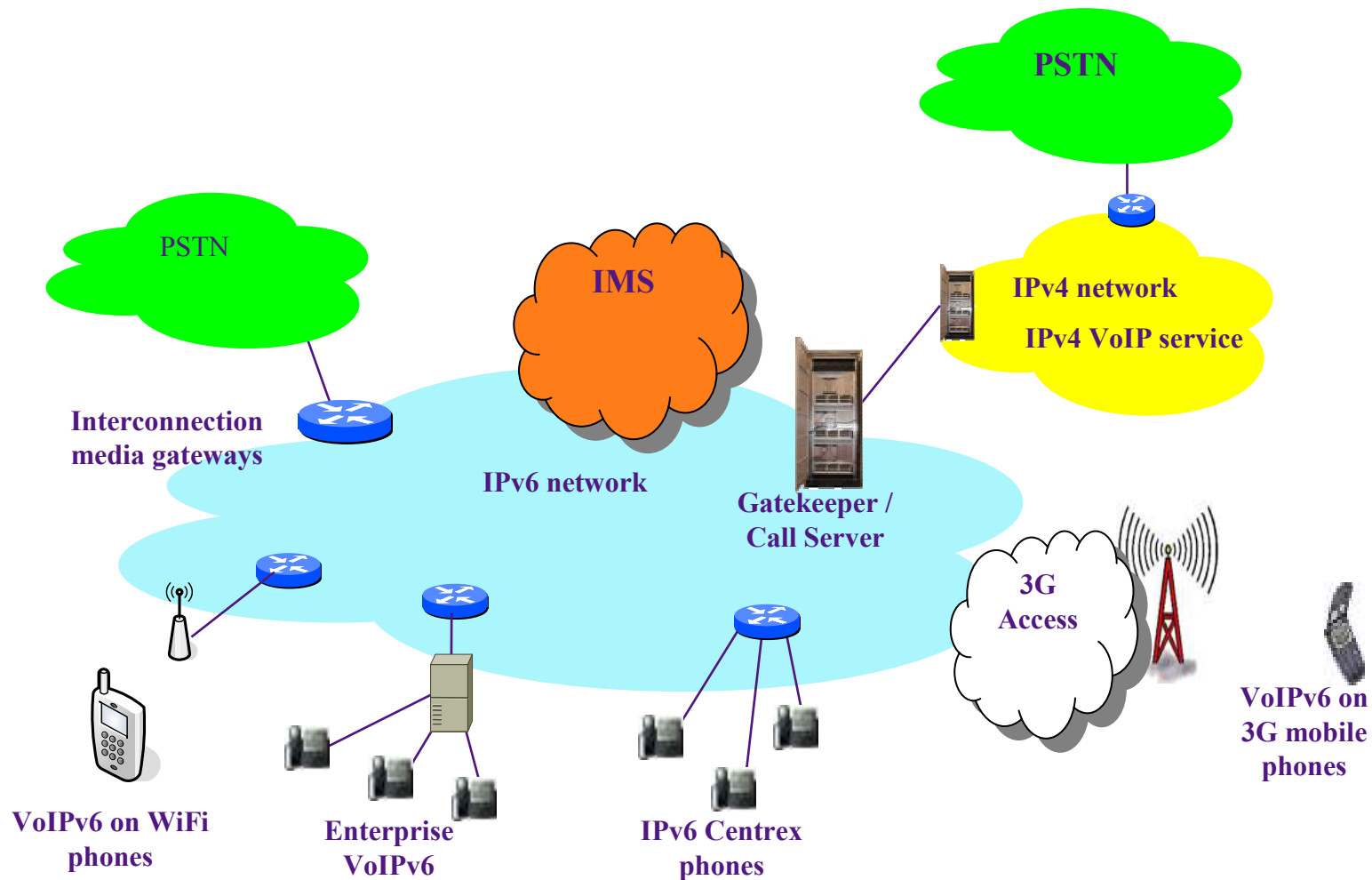
IPv6 will bring better support for security and quality of service for mobility

IPv6 allows the accesses since any point of the network with the principle of the auto configuration

IPv6 is designed taking into account the mobile networks, which are expected to be ubiquitous networks of the future providing always on-line, anytime and anywhere

# FACTS AND REASONS FOR IPv6

- VoIPv6 in a fixe/mobile converged network context



## IPv6 A NEW CHALLENGE FOR AFRICA

**IPv6 is an opportunity for Africa to reduce Digital Divide**

**The IPv6 protocol is stable and most of the commercial products are IPv6 ready (equipments and operational systems)**

- **Telecom Operators**

**IPv6 will (soon) come and it's better to be prepared for it!**

Development of IPv6 competencies and expertise

Hands-on training

Set IPv6 testbeds

Participation and involvement in the national and regional (AfrinIC) IPv6 initiatives

Plan of IPv6 Integration in the operational networks (Core and Access)

# IPv6 A NEW CHALLENGE FOR AFRICA

## ▪ Telecom Operators

### Prepare the migration for existing services

- Establishment of a migration roadmap per service (progressive migration of the services according to the availability and maturity of the equipments),

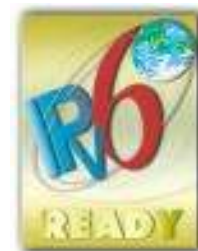
### In coherence with the renewal of the equipment and the terminals :

- To minimise the CAPEX
- **The launched RFP will have obligatorily an IPv6 dedicated chapter**

The strategy of migration “dual-stack” is recommended for its reliability and its flexibility:

- It will be focused in priority on the applications and the CPE

The new services will have to be studied « V6 ready »



# IPv6 A NEW CHALLENGE FOR AFRICA

## ▪ African Universities

- To integrate IPv6 modules in the network trainings
- To encourage the field of fundamental and applied research in IPv6
- Implementation of an IPv6 Backbone inter-connecting the main African Universities
- Development of the Technical cooperation with Telecom Operators

## CASE STUDY : SONATEL's IPv6 DEPLOYMENT

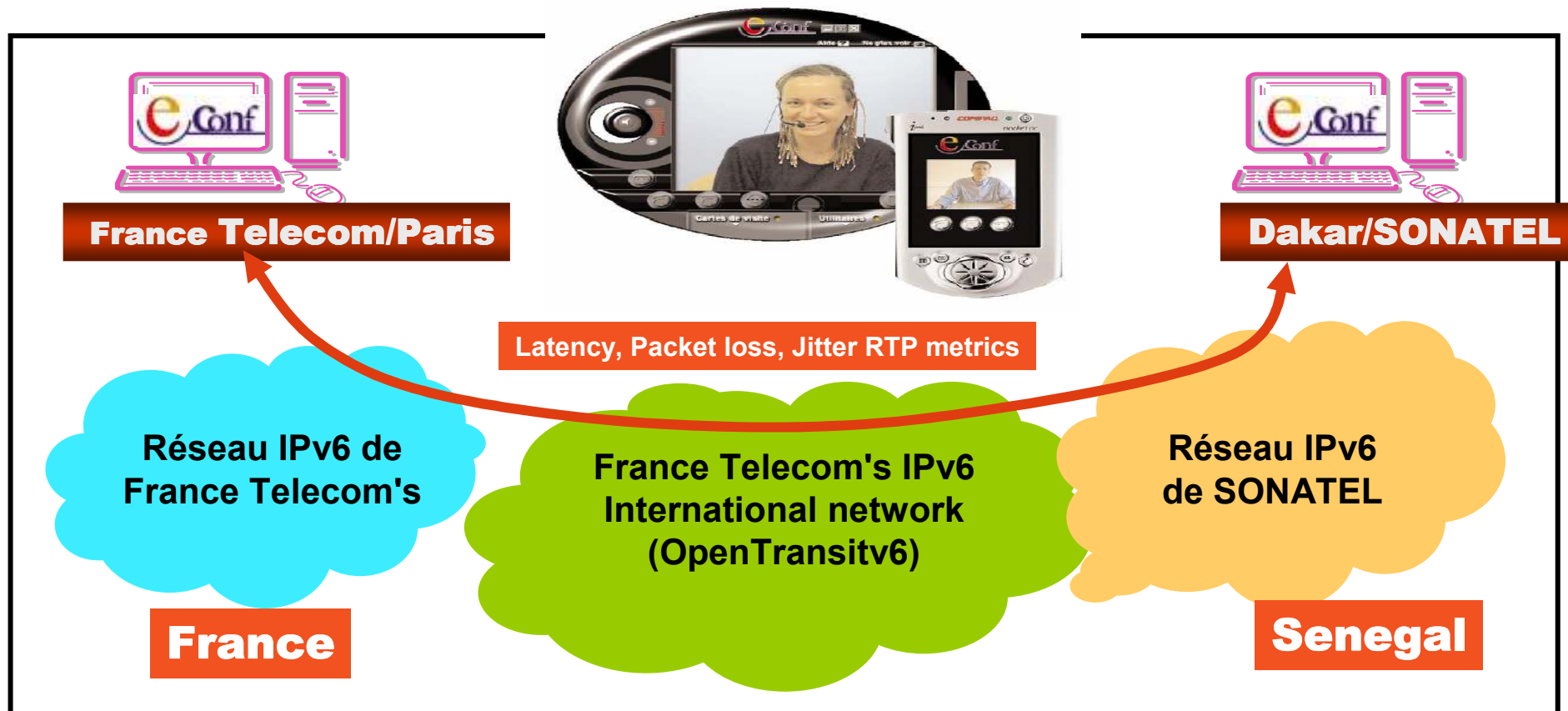
- Acquisition of an IPv6 Prefix from AfriNIC [2001:4278::/32](#)
- A Native IPv6 connectivity with 6bone via France Telecom
- Development of IPv6 Competencies
- Active member Task Force IPv6 Senegal



## CASE STUDY : SONATEL'S IPv6 DEPLOYMENT

- ADSLv6 connectivity service (- Ongoing)
- Videoconferencing IPv6 (- Ongoing)
- VPNv6 (- Planned Q4 2007)
- E-learningv6 (Multicast)
- P2P Applications
- IPv6 applications in the context of mobility: VoIPv6 & Multimedia over WiFi/WiMAX/3G
- VoIPv6

# CASE STUDY : SONATEL's IPv6 DEPLOYMENT Videoconferencing Tests with FT



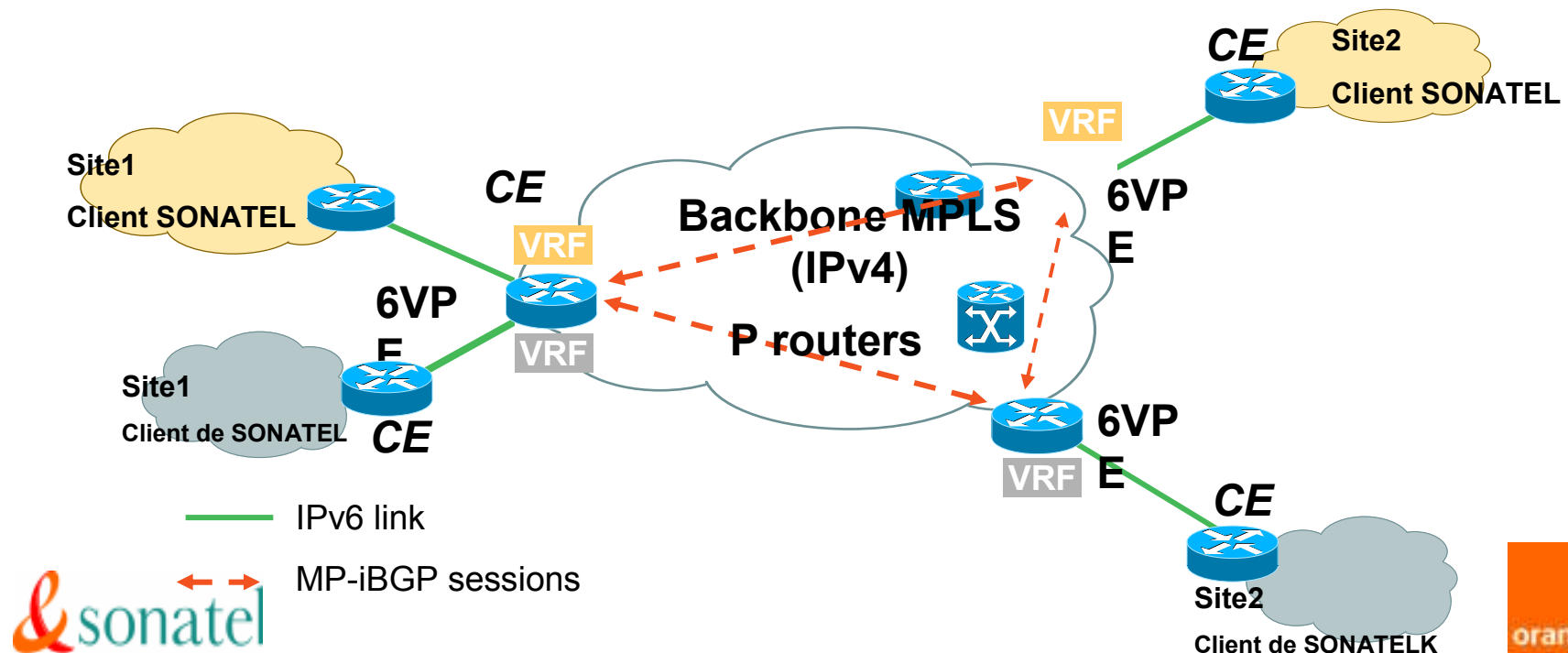
Tester le comportement de la visioconférence à travers une liaison IPv6 longue distance caractérisée par un fort taux de perte de paquets, gigue, délai

- 1) Phase 1: Tester en local chez SONATEL
- 2) Phase 2: Tester entre Paris (FT) et Dakar(SONATEL)

# CASE STUDY : SONATEL's IPv6 DEPLOYMENT VPNv6 Tests

## Description de l'expérimentation

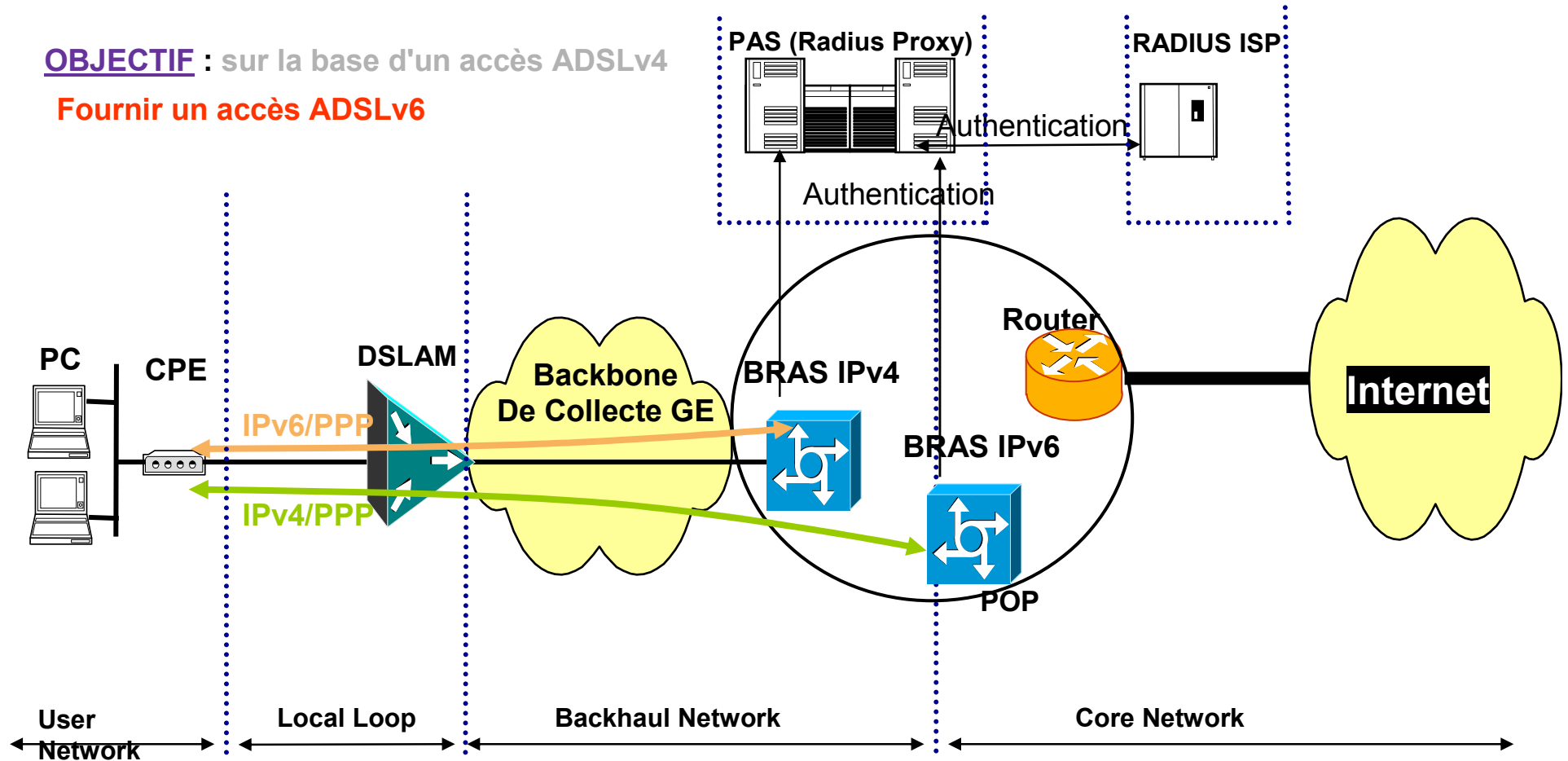
- Mettre les VPNv6 au même niveau que les VPNv4
- Convergence entre IPv6 et IPv4 sur MPLS VPN (RFC 2547bis)
- Résout les limitations techniques des solutions basées sur IP-Sec
- Solutions sur la technologie MPLS largement éprouvée.
- Equipements industriels disponibles
- Ne remet pas en cause le coeur de réseau IPv4 (donc économique)
- Seuls les routeurs de périphérie(PE) sont impactés



# CASE STUDY : SONATEL's IPv6 DEPLOYMENT ADSLv6 Tests

**OBJECTIF** : sur la base d'un accès ADSLv4

**Fournir un accès ADSLv6**



# Thank You