



DEPLOY

# Introduction to IPv6

Formation IPv6

Marrakech, Maroc –Avril 2009



# Copy ...Rights

*This slide set is the ownership of the 6DISS project via its partners*

*The Powerpoint version of this material may be reused and modified only with written authorization*

*Using part of this material must mention 6DISS courtesy*

*PDF files are available from [www.6deploy.org](http://www.6deploy.org)*

*Looking for a contact ?*

- ***Mail to : [martin.potts@martel-consulting.ch](mailto:martin.potts@martel-consulting.ch)***
- ***Or [bernard.tuy@renater.fr](mailto:bernard.tuy@renater.fr)***

# Droits d'auteur ...

*L'ensemble des présentations utilisées dans le cadre de cet atelier est la propriété de 6DISS, représenté par ses différents partenaires.*

*La version Powerpoint des présentations peut être réutilisée et modifiée après qu'une autorisation écrite ait été obtenue*

*L'usage de tout ou partie de ce matériel doit mentionné que sa source est le projet 6DISS*

*La version PDF des présentations est disponible sur [www.6deploy.org](http://www.6deploy.org)*

*Pour tout contact :*

- *Mail à [Martin.Potts@martel-consulting.ch](mailto:Martin.Potts@martel-consulting.ch)*
- *Ou [Bernard.Tuy@renater.fr](mailto:Bernard.Tuy@renater.fr)*

# Contribs & updates

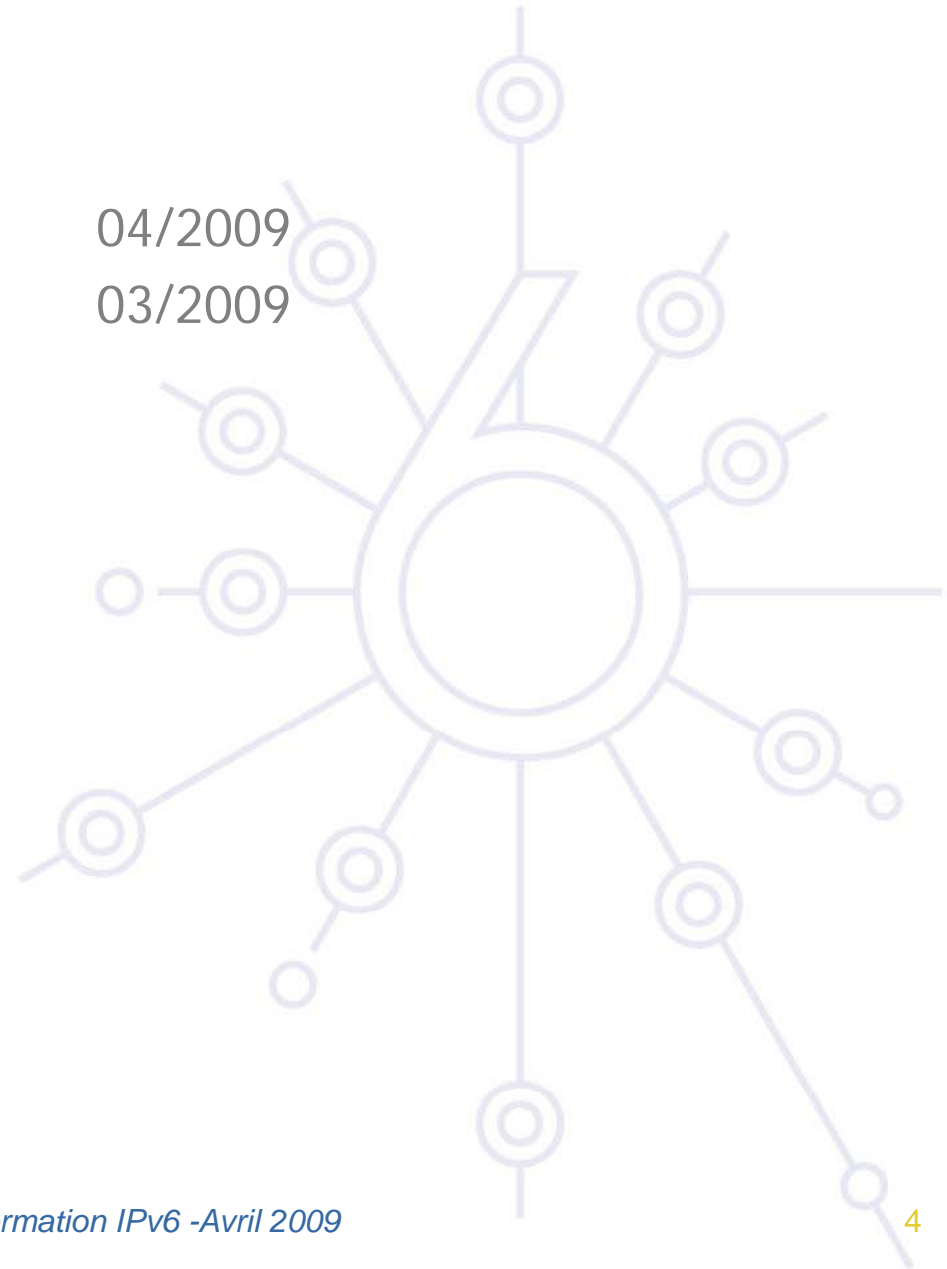
Bernard Tuy, RENATER

Alvaro Vives, Consulintel

Laurent Toutain, Telecom B.

04/2009

03/2009



## *Why a new version for IP ?*



# Agenda

**Historical facts**

**IPv4 address space status**

**From Emergency measures ...**

**... to IPv6**



## Historical facts

**1983 : Research network for ~ 100 computers**

**1992 : Internet is open to the commercial sector :**

- Exponential growth
- IETF urged to work on a IP next generation protocol

**1993 : - Exhaustion of the class B address space**

**Forecast of network collapse for 1994 !**

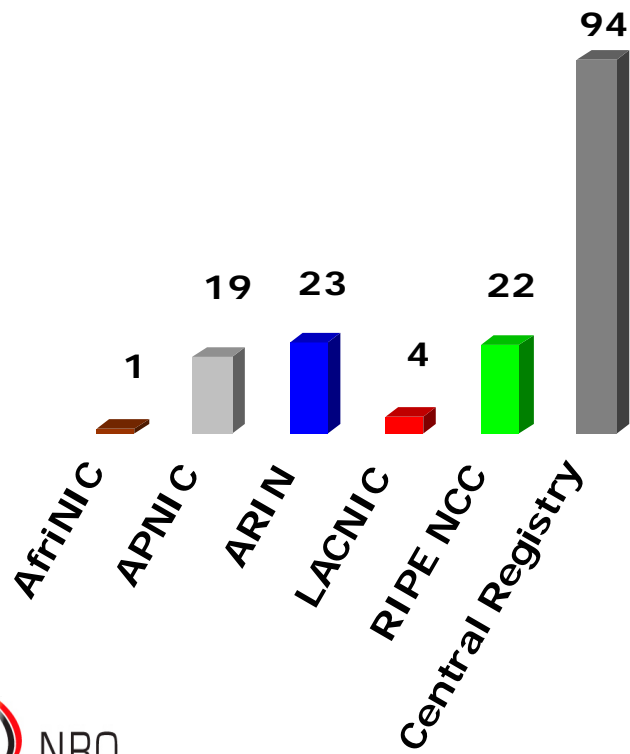
**- RFC 1519 (CIDR) published**

**1995 : RFC 1883 (IPv6 specs) published**

- First RFC about IPv6

# IPv4 Address Space Status (sep. 2006)

## Allocated



## Available



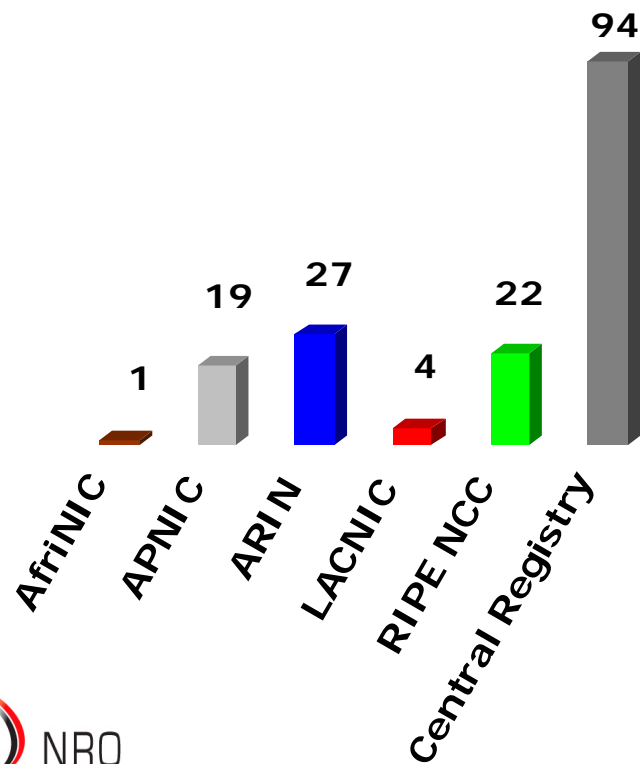
## Not Available





# IPv4 Address Space Status (dec.2006)

## Allocated



## Available

IANA Reserved 55

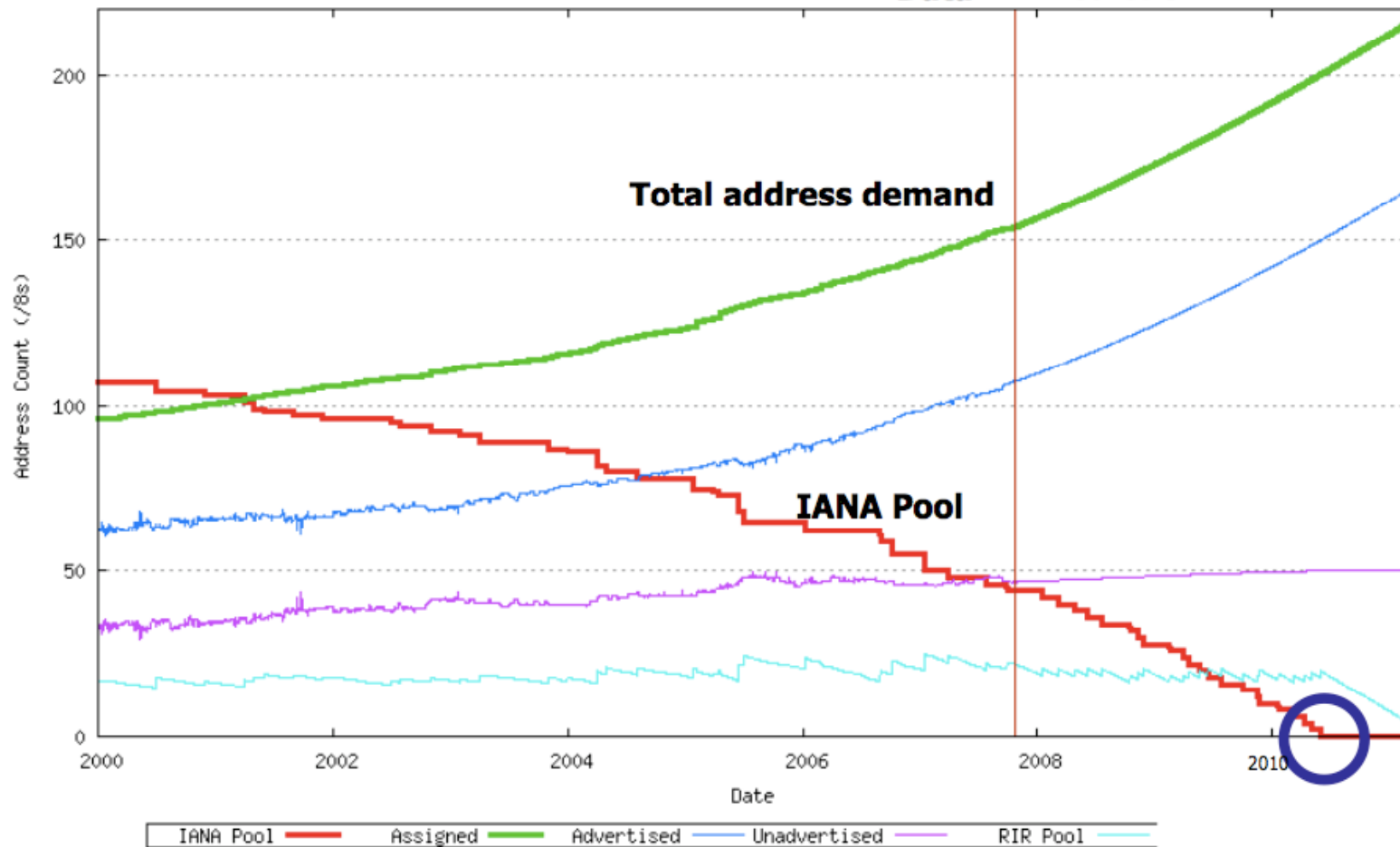
## Not Available



# IPv4 prefixes consumption pace

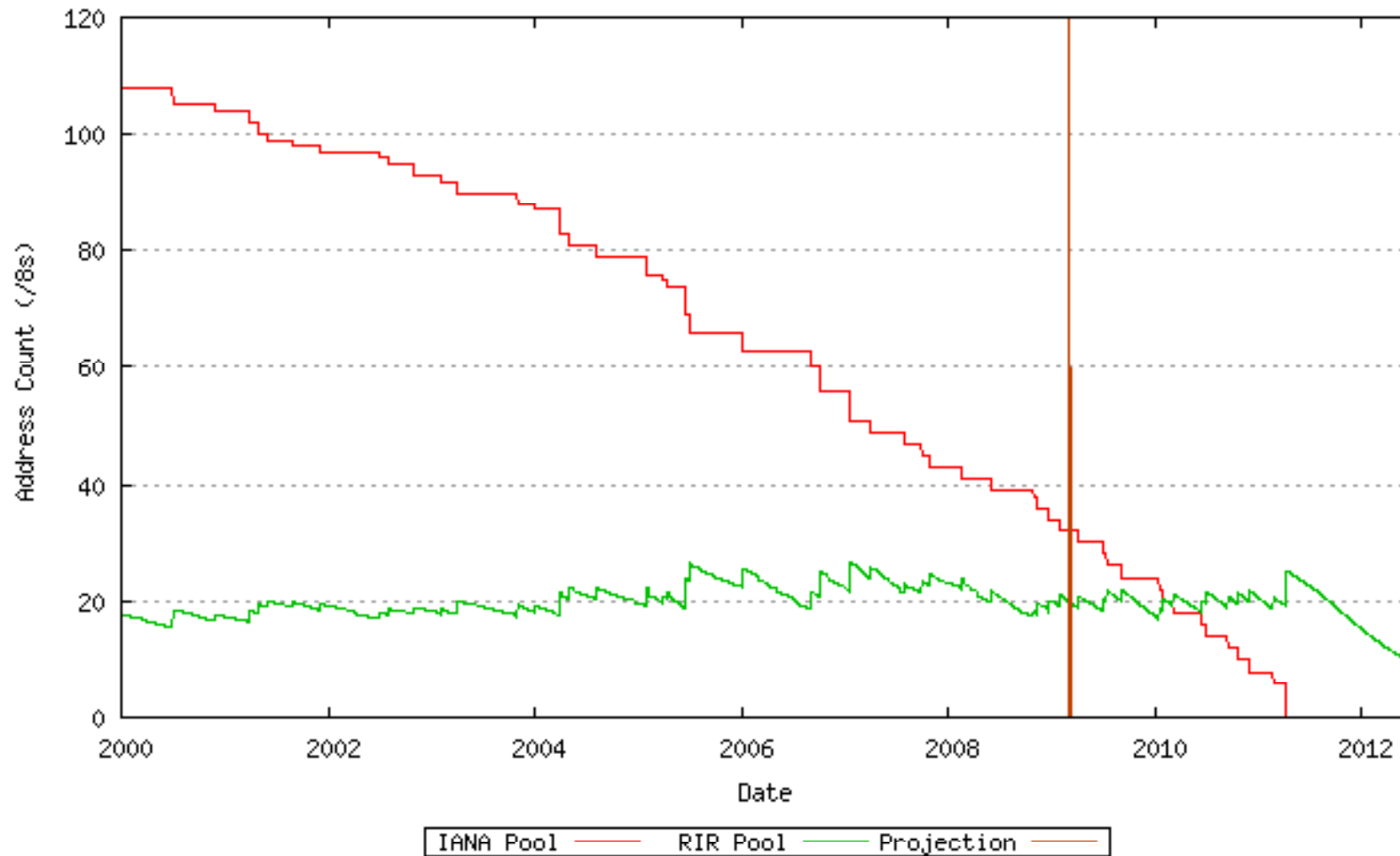
Year	Month	available /8s (IANA)	Yearly consumption
2006	September	59	
	December	55	16
2007	September	44	15
	December	42	14
2008	June	39 (-2) ?	11 (13) ?
	December	34	11
2009	March	32	11

# IPv4 address space depletion



Geoff Huston  
APNIC  
Sept. 2007

# IPv4 address space depletion



<http://www.potaroo.net/tools/ipv4/index.html>

## *Emergency measures ...*



# Summary

**CIDR**

**Private addresses**

**NAT**



## CIDR ...

### **Allocate former “class B” addresses exceptionally**

- known as /16 prefixes since then

### **Re-use “class C” address space**

- Without any more address classes

### **CIDR (*Classless Internet Domain Routing*)**

- RFC 1519 (PS)
- network address = {prefix/prefix length}
- Classes abandon = less address waste
- allows aggregation => reduces routing table size

# Private addresses (RFC 1918)

**Allow private addressing plans**

**Addresses are used internally**

**Similar to security architecture with firewall**

**Use of proxies or NAT to go outside**

- RFC 1631, 2663 and 2993

**NAT-PT**

- the most commonly used of NAT variations in the IPv6 world



## NAT (continued)

### Advantages:

- Reduce the need of official addresses
- Ease the internal addressing plan
- Transparent to some applications
- "Security" vs obscurity
- Netadmins/sysadmin

### Disadvantages:

- Translation sometime complex (e.g. FTP)
- Apps using dynamic ports
- Does not scale
- Introduce states inside the network:
  - Multihomed networks
- Breaks the end-to-end paradigm
- Security with IPsec

=> Should be reserved for small sites in Client/Server mode

# Emergency Measures

These emergency measures gave time to develop a **new version** of IP, named IPv6

IPv6 keeps principles that have made the success of IP

Corrects what was wrong with the current version (v4)

**BUT are emergency measures enough?**

# From emergency to IPv6

## IPv6 is already there ...

- Internet v6 is there today :
- NRENs in EU, North America, Asia ... are interconnected in IPv6
- Lots of IXP are offering IPv6 connectivity
- ISPs and Telcos exchange IPv6 routes
- Vista and Windows 2008 (servers) are IPv6 enabled by default

**Then the question is not "if" but "when ?" and "how ?"**

By Apr. 10<sup>th</sup> 2009 resources exhaustion are projected

- IANA pool : Jun. 2011
- RIRs pool : Oct. 2012
- Data from : <http://www.potaroo.net/tools/ipv4/index.html>



DEPLOY

Questions ...