IPv6
Public Policy Making Aspects

ITU Regional Workshop for the CIS countries

Recommendations on transition from IPv4 to IPv6 in the CIS region , 16-18 April 2014

Tashkent , Republic of Uzbekistan

Desire.karyabwite@itu.int

IEE/TND
International Telecommunication Union

I. Introduction

Global Shortage of IP addresses

Continued rapid growth of the Internet, IP addresses have **greater demand**

Despite NAT, IPv4 addresses expected to **run out in the next few years**

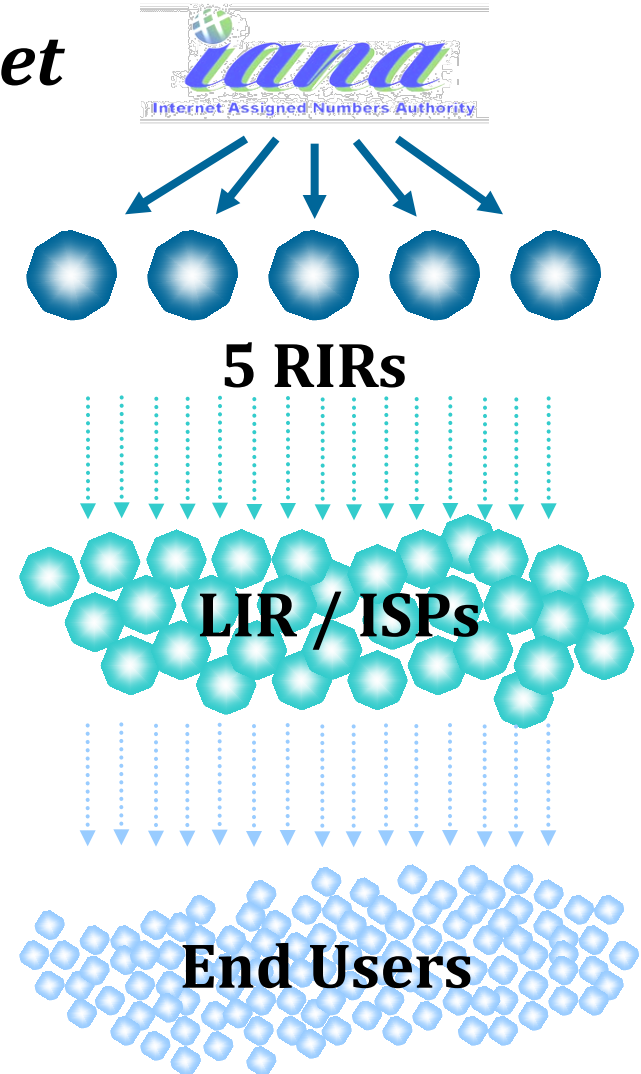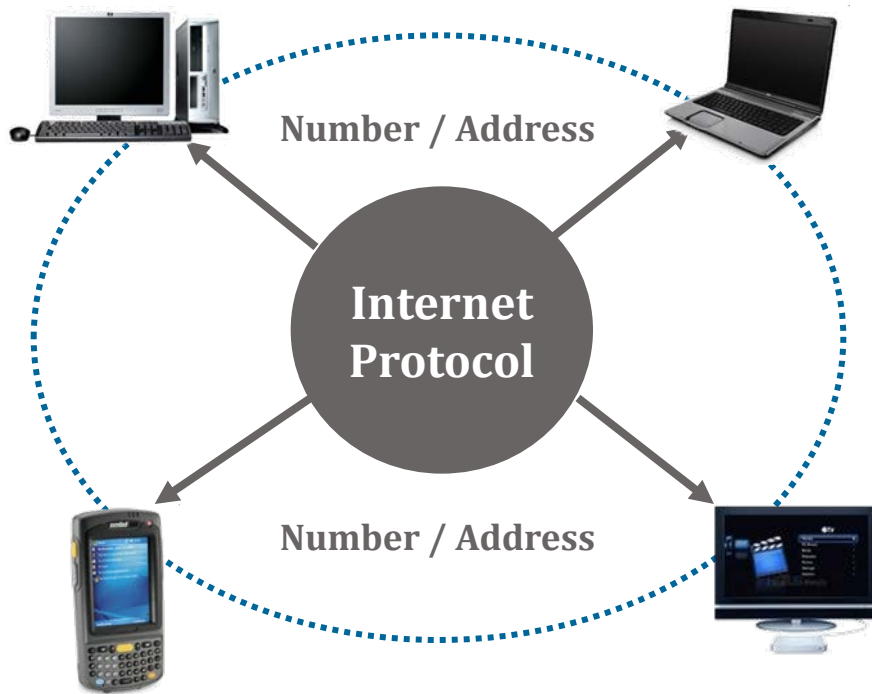**N**eed a fair and equitable policy for **allocation of the remaining IPv4 address space**

Now, deployment of IPv6 has become an urgent global issue

Public policy concern on IPv6 is

"The smooth migration from IPv4 to IPv6"

II. Internet Addressing

IP Addresses connect the Internet

Number / Address

Internet Protocol

Number / Address

5 RIRs

LIR / ISPs

End Users

Current IP address version: IPv4

Fixed length, 32 bit scheme, more than 4 billion (2^{32}) addresses

Management of IPv4 address space by IANA (ICANN), RIRs

Low Government involvement; need for International cooperation

Policy to assign IPv4 addresses was based on *First come, First serve*

Preoccupancy of substantial amount of IPv4 addresses stockpiled by early entrants and will likely not be available to those who need it

Distribution of IPv4 : *Serious lack of global balance (leans towards ARIN> APNIC > RIPE NCC)*
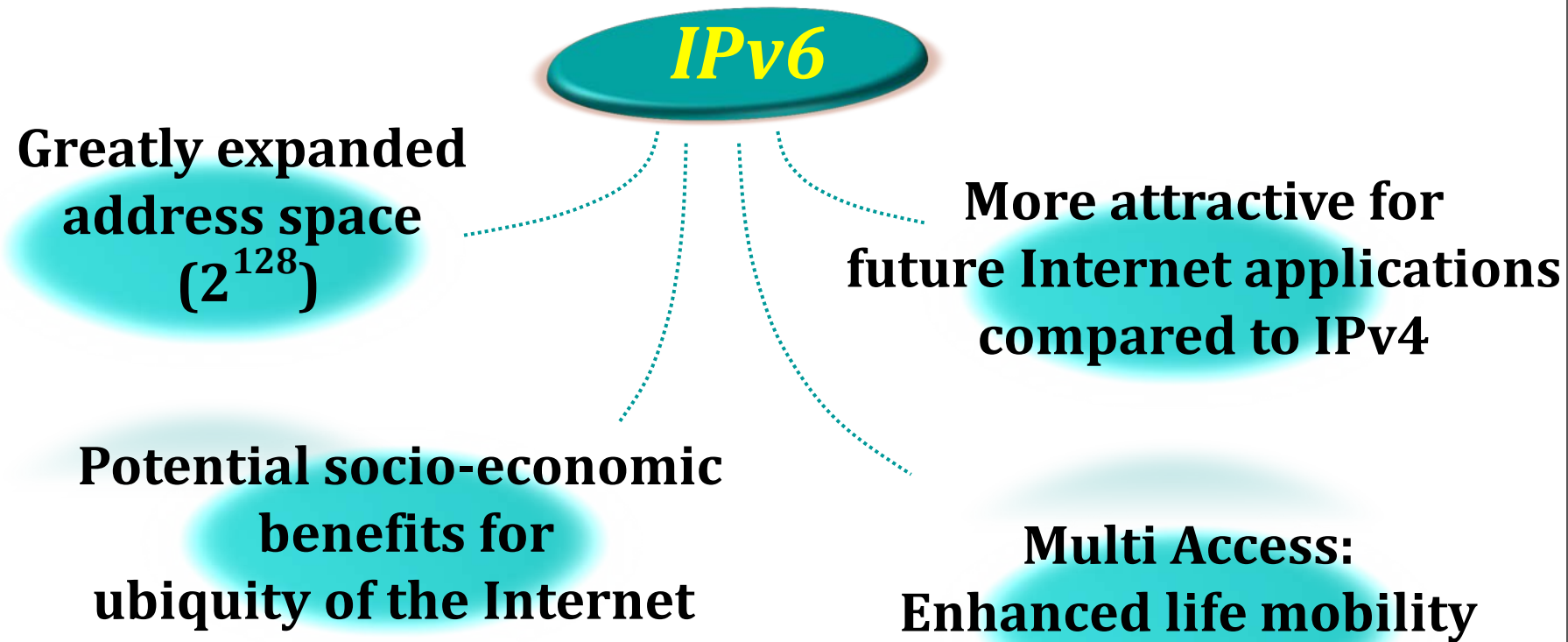
Distribution of IPv4 Allocations
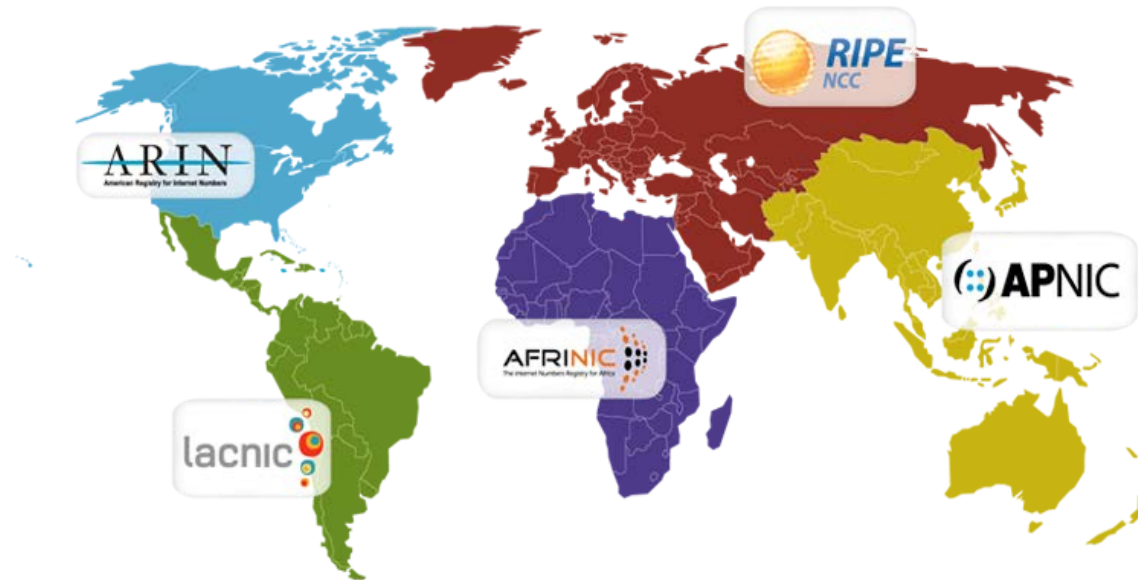
"Global policy for the Allocation of the Remaining IPv4 Address Space" (Feb. 2009)

• **Each RIR will be allocated one /8 IPv4 address block when the IANA free pool of IPv4 address space reaches five remaining /8 blocks**

• **Proposed by the Address Supporting Organization Address Council (ASO AC) for ratification by the ICANN Board**

• **All RIRs have formally adopted the proposal (Nov. 2008)**

• **Public comments :**
http://www.icann.org/en/announcements/announcement-2-05feb09-en.htm

Still, assignment not country-oriented, but regional (AfriNIC, APNIC, ARIN, LACNIC, RIPE NCC)

III. IP Next Generation Protocol

IPv6

Greatly expanded address space (2^{128})

More attractive for future Internet applications compared to IPv4

Potential socio-economic benefits for ubiquity of the Internet

Multi Access: Enhanced life mobility

IPv6 Deployment: Vital to Bridging the Digital Divide

**Internet is now a critical global infrastructure for socio-economic development and growing faster in developing countries :
It is necessary to take account of the needs of developing countries**

Developing Countries have shown significant improvement in ICT but still lag behind in Internet access

Mobile/Wireless growing at a much faster rate than fixed networks

Relatively greater availability of mobile/wireless networks in many developing and emerging economies

Internet access using mobile networks: Lower Cost, Higher speed of deployment than fixed networks

Digital Divide may be reduced by extending mobile networks

IPv6 Deployment: Essential for wireless Internet

Emergence of mobiles as platform for wireless Internet access especially in developing countries will put more pressure on the IP address space

Require a larger IP address space to enable wireless networking & mobility

IPv6 protocol provides the availability & extensibility of IP addresses : Large-scale sensor networks, IP Security, Mobile IPv6, IP-based Multimedia

IPv6 is emerging as the preferred platform and is a core component of the wireless Internet architecture (3G & Beyond 3G e.g 4G)

Need for fair and equitable policies for the management/allocation on IPv6

*Current & future challenges of wireless Internet require IPv6*

Paradigm shift on IPv6

- **Wireless operators and ISPs** as well as **governments** in developing countries can derive significant advantages from IPv6 adoption

- **The paradigm shift on the application and usage of IPv6** is already taking place in many countries

- **Several government initiatives to promote IPv6 adoption and pervasive Internet networks**

Current deployment of IPv6

- **Allocation of IPv6 based on similar policy as IPv4**

- **Actual implementations are fast growing, but**
  Still low & unbalanced

  ➡ RIPE NCC and APNIC already started large-scale deployment

  ➡ ARIN, LACNIC, AfriNIC are relatively slow
    : more inclined towards evaluating current deployment of IPv6

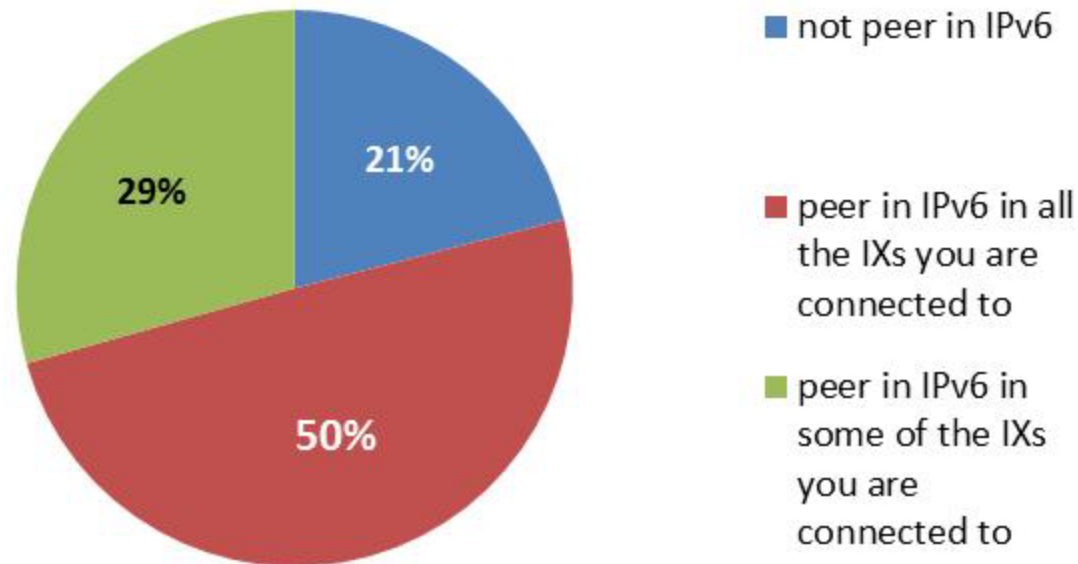# What are the biggest problems with IPv6 in production ?
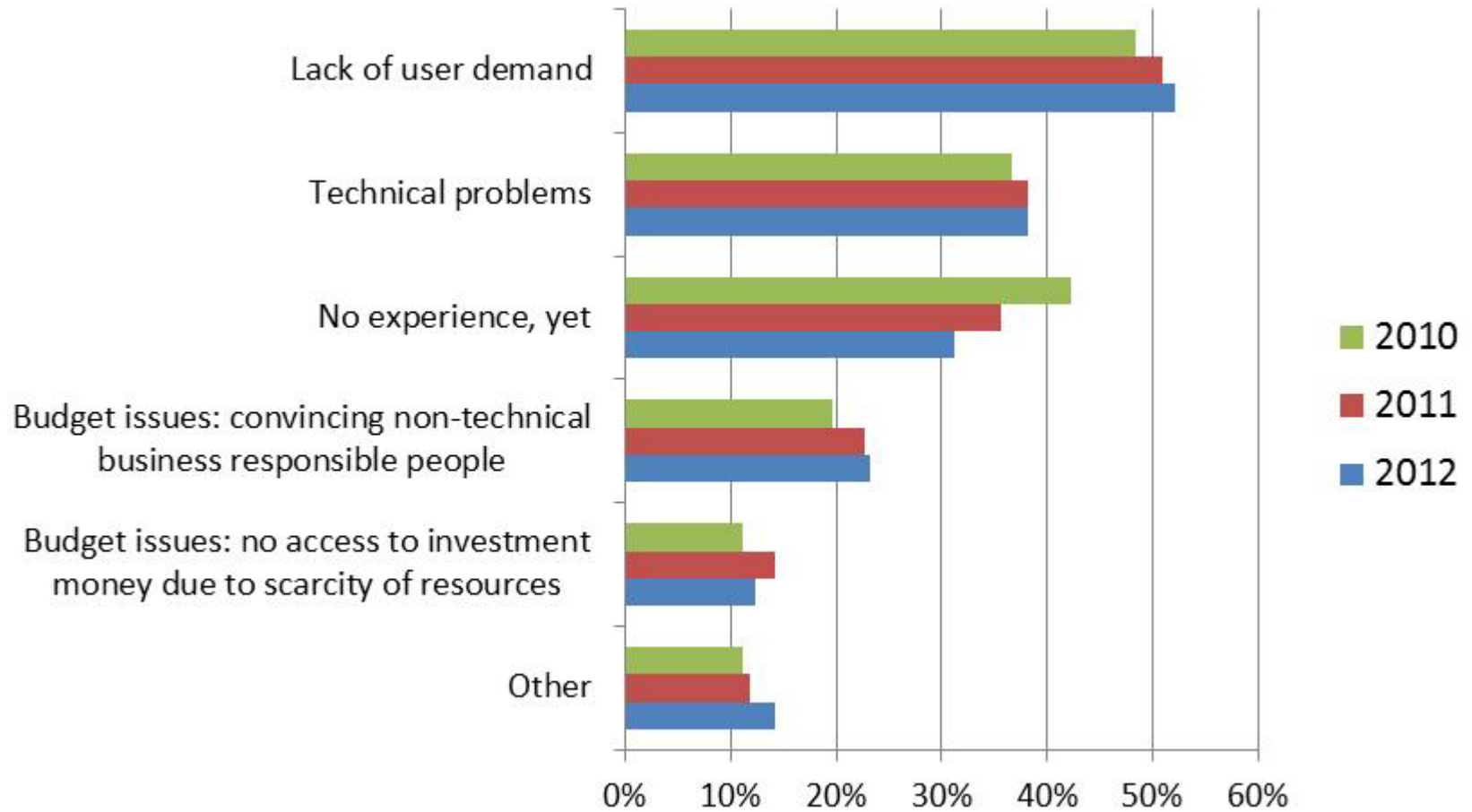
source: GNKS 2012

If your organization has IPv6 in production, how does the amount of IPv6 traffic compare to your IPv4 traffic?
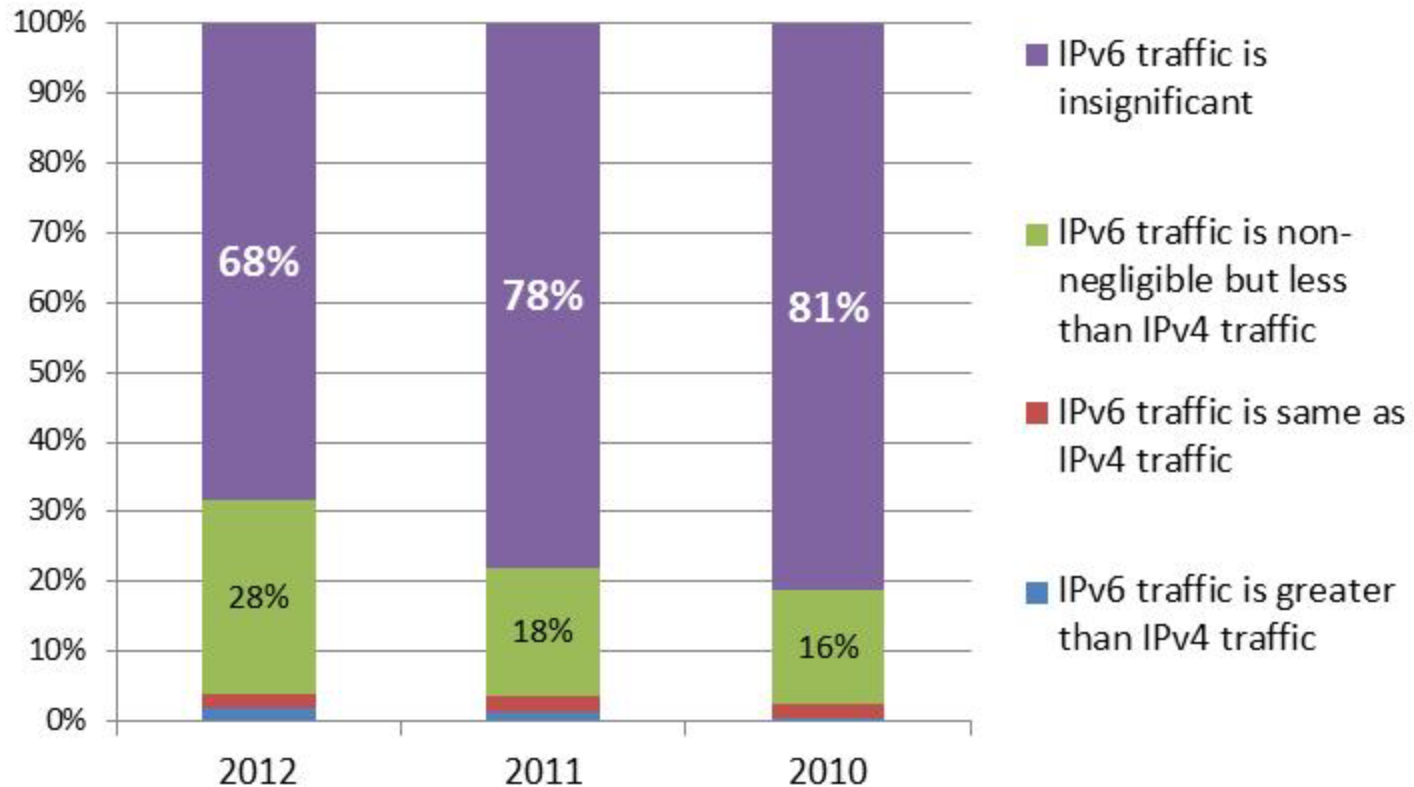
source: GNKS 2012

If your organization is connected to one or several Internet Exchanges (IXs), do you

- not peer in IPv6
- peer in IPv6 in all the IXs you are connected to
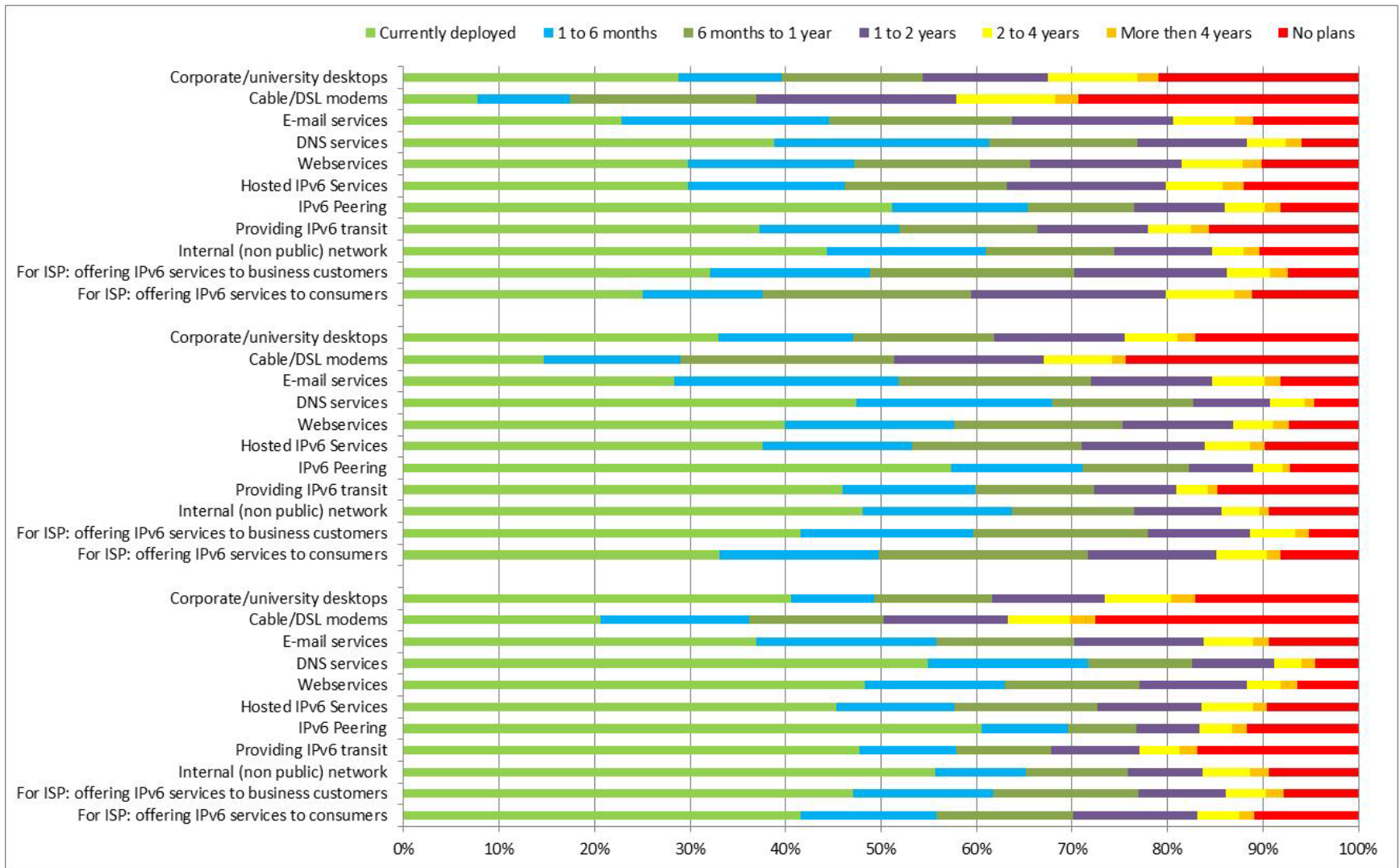- peer in IPv6 in some of the IXs you are connected to

source: GNKS 2012
These answers are given by the 55% of the 1104 respondents, who indicated to connect to IXs.

On Large Scale NAT (LSN), CGN (Carrier Grade NAT):
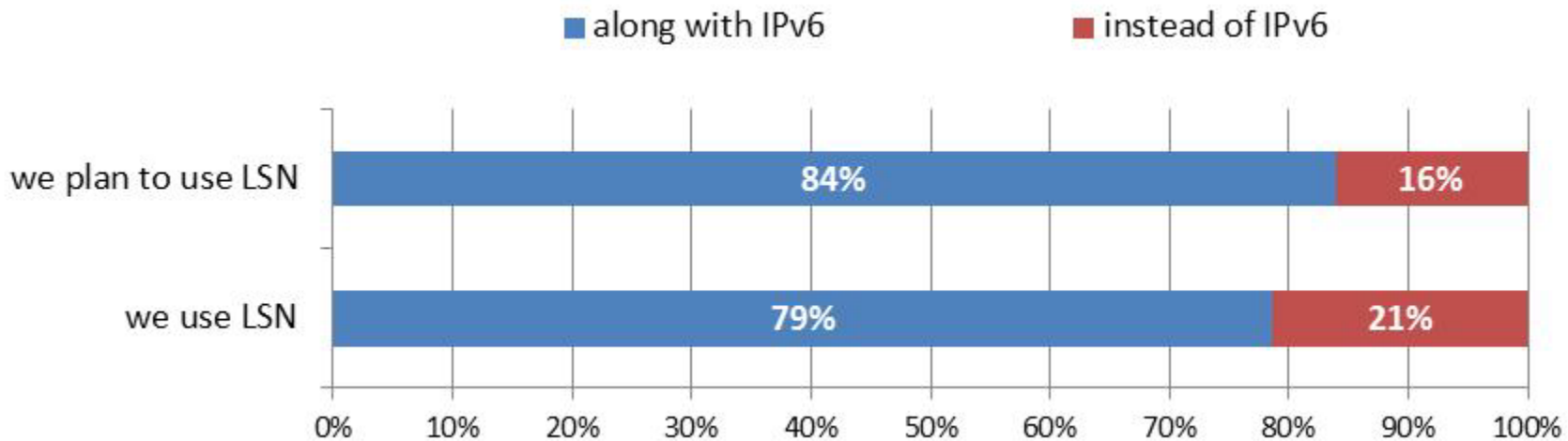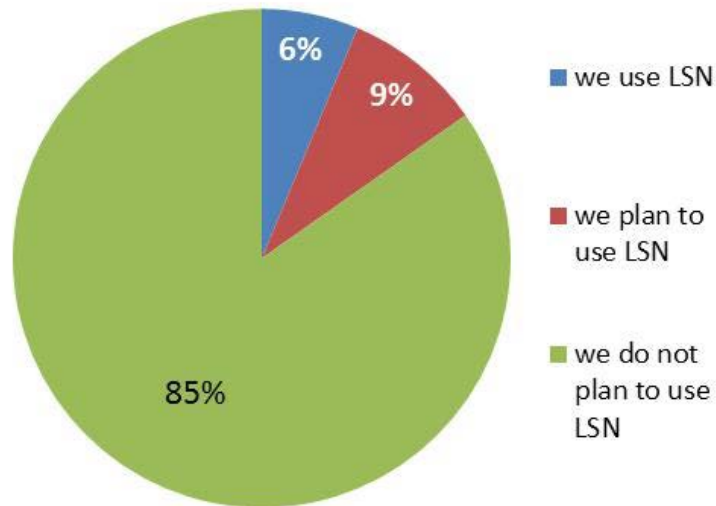
source: GNKS 2012

Which best describes your organization's IPv6 implementation (plans)?

source: GNKS 2012

Potential Allocation Scheme: Dual-Assignment

IPv6 Addresses
$2^{128} = 3.40282 \times 10^{38}$

Country-oriented Assignment ?

ITU reserves a block of addresses, assigns them - free of charge - to National Authority (NA)

Market-oriented Assignment ?

Same as for IPv4
(i.e. through RIRs)

Coordination of allocation policies

NA assigns to LIR/ISPs

RIR directly assigns to LIR/ISPs of their region

(Choice by LIR/ISP)

LIR / ISP

National authority (NA) and IPv6

For public resource management, a national authority is needed to assure:

that national interests are safeguarded

that fair and open competition prevail nationally

that national developments match national plans regarding interoperability, upgrading services, etc.

that international operability, such as global roaming be assured at the national level

National authorities could consider leaving operational and commercial management to the private sector

Co-existence of IPv6 allocations

Technically possible but many issues have to be addressed:

- National sovereignty **vs.** Global management
- National security **vs.** Market competition
- Governments position **vs.** Market players
- Developing countries **vs.** Industrialized countries

➡ *Balancing Fairness and Efficiency*

Criteria for allocation to countries:

- By requests from market players (current practice)?
- By population?
- By population and socio-economic development?
- By socio-economic development (e.g., by GDP)?

IV. ITU and IPv6

International Telecommunication Union (ITU)

- Leading UN agency for ICT, Headquarters in Geneva
- Global focal point for governments and private sector:
  191 Member States, more than 700 Sector Members

ITU Mission

- Bringing the benefits of ICT to all the world's inhabitants
- Lead organizer/manager of the World Summit on the Information Society
  (WSIS; Geneva 2003, Tunis 2005)

Action Line C2 "Information & communication infrastructure",
Action Line C5 "Building confidence & security in the use of ICT's "

Driving Principles for the Management of Critical Internet Resources:

TUNIS AGENDA FOR
THE INFORMATION SOCIETY (2005)

Paragraph 58.
We recognize that Internet governance includes more than Internet naming and addressing. It also includes other significant public policy issues such as, inter alia, critical Internet resources, the security and safety of the Internet, and developmental aspects and issues pertaining to the use of the Internet.

Paragraph 63.
Countries should not be involved in decisions regarding another country's country-code Top-Level Domain (ccTLD). Their legitimate interests, as expressed and defined by each country, in diverse ways, regarding decisions affecting their ccTLDs, need to be respected, upheld and addressed via a flexible and improved framework and mechanisms.

Paragraph 68.
We recognize that all governments should have an equal role and responsibility for international Internet governance and for ensuring the stability, security and continuity of the Internet. We also recognize the need for development of public policy by governments in consultation with all stakeholders.

Paragraph 70.
Using relevant international organizations, such cooperation should include the development of globally-applicable principles on public policy issues associated with the coordination and management of Critical Internet resources. In this regard, we call upon the organizations responsible for essential tasks Associated with the Internet to contribute to creating an environment that facilitates this development of public policy principles.

ITU Mandate on IPv6 Continues (WTDC Dubai, 2014)

PP. Resolution 101 (Rev. Antalya 2006)
Internet Protocol-based networks

PP. Resolution 102 (Rev. Antalya 2006)
ITU's role with regard to international public policy issues pertaining to the Internet and the management of Internet resources, including domain names and addresses

PP. Resolution 133 (Rev. Antalya 2006)
Role of administrations of Member States in the management of internationalized (multilingual) domain names

ITU Council 2008 Resolution 1282 (Mod)
ITU's role in implementing the outcomes of the World Summit on the Information society

WTSA Resolutions 48 (Rev. Johannesburg, 2008)
Internationalized (multilingual) domain names

WTSA Resolutions 64 (Rev. Johannesburg, 2008)
IP address allocation and encouraging the deployment of IPv6

WTSA Resolution 75 (Rev. Johannesburg, 2008)
ITU-T's contribution in implementing the outcomes
of the World Summit on the Information Society, and the establishment of a Dedicated Group on Internet related Public Policy Issues as an integral
part of the Council Working Group on the World Summit on the Information Society

WTDC Programme 3 (Rev. Doha, 2006)
E-strategies and ICT applications

WTDC Resolution 20 (Rev.Doha, 2006)
Non-discriminatory access to modern telecommunication and information technology facilities and services

WTDC RESOLUTION 30 (Rev.Doha, 2006)
Role of the ITU Telecommunication Development Sector in implementing the outcomes of the World Summit on the Information Society

V. ITU Standardization work related to IPv6

SG 2 (Service definition, numbering & routing)
   Handbook on IP-based networks

SG 3 (Telecommunication economic issues)
   Proposal to consider the economic aspects of migration from IPv4 to IPv6

SG 13 (Next Generation Networks)
   A suite of 4 Recommendations was completed in January 2008 on IPv6-based NGN
   Impact of IPv6 on an NGN has been studied

SG 16 (Multimedia terminals, systems and applications)
   Evolution of the H.323 system (widely used for VoIP) for compatibility with IPv4/IPv6,
   Media Gateway Protocol (H.248) operation in IPv6

SG 17 (Future networks including mobile and NGN)

Specifically, Recommendations based on IP regarding performance (QoS),
IP-based networks (IP CableCome, satellites, NGN),
Multimedia (H.323 system), Numbering (ENUM), and so on

Assistance to Member States

- Several activities to assist Member States in the migration to IPv6; Workshops/Seminars have been organized in the past

- ITU activities in Human Capacity Building on IPv4/IPv6 Transition

International Cooperation

- Cooperation agreements with over 70 standards bodies
- Long-standing collaboration with the IETF
- Liaison relationship with the IPv6 Forum, and the ICANN board (a member of Technical Liaison Group)
- Innovations in NGN – Future Network and Services

ITU will actively

Contribute to the study
> *on the technical management and implementation of IPv6*

Participate in international policy
> *administrative and management discussions on IPv6*

Collaborate with relevant interested parties
> *to accelerate the implementation of IPv6*

Provide information
> *about global IPv6 activities for capacity building purposes*

Assist developing countries
> *by responding to their regional needs*

Promote awareness of the importance of IPv6
> *to facilitate joint training activities, including ITU tutorial workshop on IPv6*

THANK YOU