ITU and IPv6

ARIN

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by

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TSB

- **International treaty organization founded in 1865 to facilitate international interconnection of telegraphy**
- **Unique partnership of industry and governments**
- **Three sectors:**
  - Development (aid to developing countries)
  - Radio (radio spectrum and satellite slot allocations)
  - Standardization (formerly CCITT, for example modem standards) (now called ITU-T; secretariat is called TSB)
- **In ITU-T industry and government work together to develop mutually agreed non-binding Recommendations**

A description of ITU work related to IP-based networks in given at: http://www.itu.int/osg/spu/ip/index.phtml

ENUM is an IETF protocol for mapping telephone numbers into the DNS. IETF asked ITU to facilitate government approval of ENUM implementations, given that telephony is still regulated in most countries

- No real technical issues
- Complex regulatory issues
- After considerable discussion, most determined to be national matters
- Under agreed procedures
  - RIPE NCC will ask TSB if country approves ENUM delegation request
  - If yes, it proceeds
  - If no or no answer from country, it does not proceed (TSB objects)
- TSB does not itself evaluate requests in any way. RIPE NCC checks technical aspects of requests

See http://www.itu.int/ITU-T/inr/enum/index.html

The ITU-T does not do the following:

- **World-wide regulation**
- **Consider issues that are national matters**
- **Binding recommendations**
- **Top-down decisions**
- **Impose contractual terms or operating rules on private companies**
- **Work in non-transparent ways**
- **Act bureaucratically**
- **Have staff that decides policies**
- **Collect fees other than membership fees (with the exception of minor cost-recovery activities)**

- **ITU-T working methods are fast and efficient: for example, about 800 Recommendations have been approved under Alternative Approval Process since 2001, more than 60% in less than 2 months**
- **ITU membership has increased in the private sector**
- **ITU-T is a dynamic, well-respected industry-government partnership (650 Sector Members)**
- **Non-government (non-profit) organizations can apply for ITU membership**

	before 1988	1989-1993	1993-1996	1997-2000	2001-2004
Approval time	**4 years**	**2 years**	**18 months**	**9 months** (exceptional case: **5 months**)	**2-9 months**
Publication time	**2-4 years**	**2 years**	**1-1.5 year**	**6-12 months**	**3-9 months**

Notes:

1. **Pre-published Recommendations, available on ITU-T Website, from a few days to four weeks after approval of the text.**
2. **Recs in force, pre-published, superseded/obsolete: available on ITU-T Website.**
3. **Forms of publication: paper, CD-ROM, electronic bookshop, online, etc.**
4. **FREE ONLINE ACCESS SINCE JANUARY 2001 (one free access per member, 3 free downloads for public)**
5. **"Approval time" counted between "determination/consent" and final approval**

- **All Recommendations available online**
- **Key databases (for example, telephone country codes) available online**
- **Working documents available online**
- **Examples of ITU-T Recommendations:**
  - **G.723.1 & G.729 - Speech coding for Voice over IP and other applications**
  - **H.323 - Packet based multimedia communication systems - the protocols behind Voice over IP, along with:**
    - » **H.245 - Control protocol for multimedia communications**
    - » **H.248 - Gateway control protocol (developed jointly with IETF)**
  - **X.509 - Public-key encryption**
  - **V.90 - 56kbit/s PSTN modems - providing ubiquitous worldwide internet access**
  - **G.99x series - xDSL Recommendations for broadband access**

- **Consensus of Sector Members and Member States**
- **Work typically driven by Sector Members**
- **Open (for members), transparent, bottoms-up process**
- **Sensitive to national sovereignty: will only cover matters not considered to be national**
- **Will not impose contractual terms or operating rules on private companies**

Recommendations are not binding, but tend to be followed because they represent a true consensus.

- **ITU participation and coordination do not imply ITU control or government control**

- **A good example is the international telephone numbering scheme, which is coordinated by ITU-T and is universally considered to work to the satisfaction of the general public; however, telephone services are not controlled by ITU-T and are provided by private companies**

- **ITU Resolution 102 (Marrakesh, 2002) instructs the Director of TSB:**

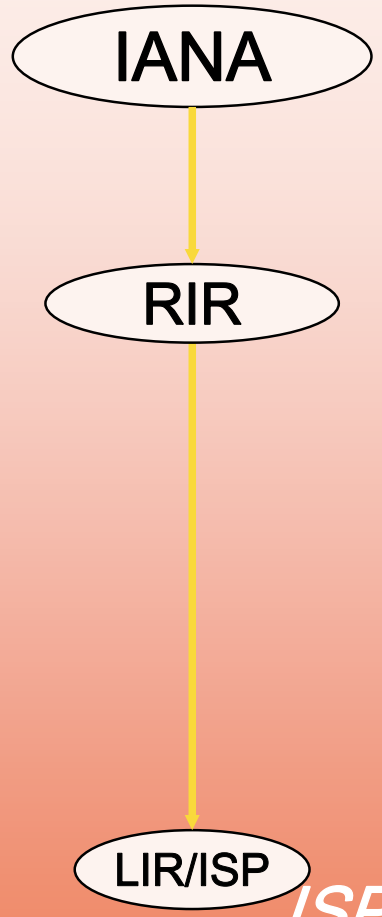
  "1. to continue to liaise and to cooperate with appropriate entities on relevant Internet domain name and address management issues, such as the transition to IP Version 6 (IPv6), ENUM, and internationalized domain names (IDN);

  2. to work with Member States and Sector Members, recognizing the activities of other appropriate entities, to review Member States' ccTLD and other related experiences;
  …"

- **ITU supports IPv6, for example:**
  - **TSB Director participates in IPv6 conferences**
  - **TSB Director's paper "ITU and Internet Governance", see § 4.2 and § 4.4 (www.itu.int/ITU-T/tsb-director/ITUt-WSIS)**
- **Workshop on IPv6, Geneva, 6th May 2002, see http://www.itu.int/ITU-T/worksem/ipv6/index.html**
- **2nd Workshop on IPv6, Geneva, 22-22 June 2005, see http://www.itu.int/ITU-T/worksem/ipv6/200506/index.html**

The IPv6 is one of the useful delivery protocols for the future fixed and wireless/mobile network environments. From service and application aspects, the necessity of IPv6 protocol will be increasing for the coming NGN world. The IPv6 protocol should be accommodated with an alignment of the reference model and functional architecture of NGN.

Current Allocation System (IPv4)



❶ 212/8

❷ 212.100/16

❸ 212.101/16

212.100/15

❹ 213/8

❺ 213.50/16

ISP has 2 prefixes after 3 requests!

APNIC Asia Pacific Network Information Centre

Extract from a slide of APNIC

(to SG2, Geneva, 30 April 2003)

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Status of Top 10 National IPv4 address space		
Order	Country	No. of IPv4 (/32)
1	USA	1,281,905,152
2	Japan	119,730,688
3	EU	115,670,396
4	Canada	64,327,168
5	UK	63,288,536
6	China	55,659,008
7	Germany	46,597,840
8	Rep Korea	34,081,024
9	France	32,565,504
10	Australia	25,140,736
Total		2,047,349,994

(*2004 Dec. 01 NIDA)

Dec 2004 status of worldwide distribution of IPv4

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1. **32-bit address space, $4x10^9$ capacity, "was then (1970s) believed to be adequate <u>for all time</u>";**
2. **In 1980s, the "class based" structure was relaxed with "subnetting", "Classless Inter-Domain Routing (CIDR)", NATs, etc.**
3. **In late 1990s, the address space is rapidly <u>exhausted</u>, and it is estimated by someone to be so by either 2005, or 2010**

<u>But:</u>

- **is its capacity really exhausted?**
- **the real situation is: 35% remains unassigned and many assigned are not used**

- **Structure of IPv4 address is not the best one, (but neither is it very bad)**
- **Policy to assign the IPv4 address is not the best one: first come, first serve**
- **Management of IPv4 addresses by academic institutions in the early days, compared today with private agencies**
- **No deployment plans at global level, (from the bottom up)**
- **Preoccupation of a large amount of IPv4 addresses by those who do not have the capacity to build up their proper infrastructure**
- **Government involvement is missed**
- **International cooperation is not sufficient**

<u>In short</u>, IPv4 problems are not caused by technical factors only

How long will IPv6 last?

- **IPv6 address space is not very large, under current allocation policies**
  - **Total of 36 site addresses per person in 2010 (10 billion population)**
- **Space will be 'rapidly' exhausted, and policies will require review**
- **How will we do the next transition?**
  - **Has anyone thought about this?**

- **Public numbering resources managed by ITU**

  - **Telephone numbering scheme such as:**

    "+1" for USA, Canada and others;

    "+86" for China

    "+852" for Hong Kong, China

    also, "+800" for global services

  - **Mobile codes, data codes and other codes**
    (In ITU terminology, these codes are called "Country or Geographical area codes")

  - **Operational codes: SANCs (for operators)**

- **Mechanism:** **All international codes are assigned to the country authority, except for "800-series" are assigned to the public**

- **IPv4 addresses:** **first by a few experts, now by private sectors: IANA, RIRs, ICANN;**

  not country-oriented assignment, but open to the public.

- **IPv6:** **Currently: the same as IPv4**
  Future: co-exist market-oriented allocation + country-oriented allocation?

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)
- NA assigns to LIR/ISPs

Market-oriented Assignment

- same as IPv4 and continues the current system for IPv6, i.e. through RIRs
- RIR assigns to LIR/ISPs of their region directly

Coordination of allocation policies

(Choice by LIR/ISP)

LIR/ISP

- Technically possible but difficult:

    - many issues have to be addressed

- Politically, some issues:

    - national sovereignty vs. global management

    - national security vs. market competition

    - Governments position vs. market players

    - developing countries vs. industrialized countries

- Commercial consideration has a role to play

- By requests of market players (current practice)?

- By population?

- By population and social/economic development?

- By social/economic development (e.g. by GDP?)?

- By other criteria?

- How to assign the addresses?

  One option:

  ITU develops Recommendations on principles, guidelines, but operation to be entrusted to private sector

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

- **that national interests are safeguarded (e.g. allocation policies, cost of obtaining names or addresses, possible abuse of significant market power, legal intercept, authenticated data base of who has been assigned which name or address to ensure traceability**
- **that fair and open competition prevails nationally**
- **that national developments match national plans regarding interoperability, upgrading services, etc.**
- **that international operability, such as global roaming be assured at national level**

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

ITU is open to proposals for the Global success of Internet services

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