



# International Management of Internet Resources

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# Outline

- **Introduction**
- **Internet Resources**
- **Addresses**
- **Autonomous System Numbers**
- **Domain Names**
- **Standards**
- **Other Organisations**
- **Conclusions**

# Internet Resources

- **Internet Protocol **addresses****
  - IPv4 and IPv6
- **Autonomous System Numbers **ASN****
- **Domain Name System **names****
- **Internet Protocol **Standards****

# Internet Resources

- **In general: finite**
  - not scarce
- **Often: hierarchical**
  - not top down
- **Often: unique**
  - not semantical
- **Always: managed**
  - not dictated

# IP Addresses

- **A number**
  - IPv4: 32 bits (4.2 billion)
  - IPv6: 128 bits (a lot more)
- **Belongs to a network interface**
  - Not to a person
- **Globally Unique**
- **Used for routing**
  - aggregation



# What is an IP Address? (1)

Example:

My email address:

**k13@nikhef.nl**

will be translated into Internet destination:

**192.16.199.99**

**k13@[192.16.199.99]** will also work



# What is an IP Address? (2)

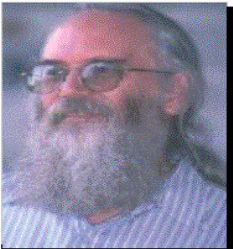
- A number used for Routing
- Not dependent on Domain Name System
- IP does **Not** mean “Intellectual Property”
- How Many:
  - IPv4:  $4.2 \times 10^{**9}$  (4.2 billion)
  - IPv6:  $3.4 \times 10^{**38}$  (340 undecillion)

# IP Addresses

- **Uniqueness, Aggregation and Conservation**
  - need rules: **Policy**
- **Rules are agreed among Internet Service Providers on a regional basis**
- **Regional Internet Registry: RIR**
- **RIRs <sup>(4)</sup> together with IANA co-ordinate globally**



# Pre 1992



**RFC 790**  
**1981**



“The assignment of numbers is also handled by Jon. If you are developing a protocol or application that will require the use of a link, socket, port, protocol, or network number **please contact Jon to receive a number assignment.**”

# 1992



# 2003



# Address Management Policy

## Conservation

- Efficient Use of Resources
- Allocation Based on Need

## Aggregation

- Limit Routing Table Growth
- Support Provider-Based Routing Policies

## Registration

- Ensure Uniqueness
- Trouble Shooting



# Autonomous System Numbers

- **16 bit number**
- **Globally unique**
- **Parameter of BGP4**
- **Used for routing**
- **Distributed to ISP by RIR**
- **No hierarchy or other systematics**
- **Global co-ordination by RIRs and IANA**

# Domain Name System

- In the beginning there were numbers – 5 of them 😊
- Then came `hosts.txt`
- **Finally: the DNS**
  - First for `.com`, `.edu`, `.org`, `.net`, etc.
  - Country codes added later, such as `.ir`, `.ue`, `.sa`, `.nl`, etc.

# Domain Name System

- **The DNS is 2 things:**
  - protocol
  - **distributed** and **delegated** database
- **The DNS is not:**
  - search engine
  - directory service
  - whatever else you may want it to be

# Domain Name System

- Translate IP address into name
- Translate name into IP address
- That's all 😊

However... 😞





# Domain Name System

- **Names look like words**
- **Words have meaning:**
  - Language
  - Culture
  - Ownership
  - Spelling
  - . . . .

# Domain Name System

- **Rules are needed**
  - First come first served, or
  - Highly regulated regime
- **Rules are set by national community:**
  - Users
  - Industry
  - Government
  - . . . . .
- **Rules are governed by national law**
- **And nobody else!**



# Internet Standards

- **Electronic mail**
- **World Wide Web**
- **File Transfer Protocol**
- **Internet Protocol IP**
- **Transmission Control Protocol TCP**
- **User Datagram Protocol UDP**
- **and 100's more. . .**

# Internet Standards

- **Internet Engineering Task Force** IETF
  - Individual volunteers
  - Working Groups
  - Documents
  - Consensus
  - Standards RFC

# Internet Standards

- **IETF**
- **Internet Engineering Steering Group IESG**
  - Co-ordinate working groups
- **Internet Architecture Board IAB**
  - Oversees Internet Assigned Numbers Authority **IANA**
  - Oversees Internet Standards publication **RFC-Editor**
- **Internet Society ISOC**
  - Provides legal protection
- **RFC3160: The Tao of IETF ([www.ietf.org/tao.html](http://www.ietf.org/tao.html))**

# Other Organisations

- **ICANN**
  - Currently home of IANA
  - Regulates gTLDs (.com, .org, etc.)
- **ISO**
  - ISO 3166-1 for ccTLD codes
- **UNICODE**
  - National characters
- **IEEE**
  - Ethernet standard + addresses
- **And more, I am sure 😊**

# Other Other Organisations

- ITU-T
- United Nations
- WIPO
- National Governments
- European Union
- WSIS
- And more, I am afraid 😞

# Other Other Organisations

“The co-ordination **responsibility** for root servers, domain names, and Internet Protocol (IP) address assignment should rest with a **suitable international, intergovernmental organisation**”.



# Conclusions

- **Self-regulation works well**
- **If it works why change it?**
- **No “international, inter-governmental organisation” needed**
- **More participation needed!!!**

# PARTICIPATE!

- **RIPE 47**
  - Amsterdam, Netherlands, 26-30 January 2004
- **APNIC 17**
  - Kuala Lumpur, Malaysia, 23-27 February 2004
- **LACNIC VI**
  - Montevideo, Uruguay, 29-31 March 2004
- **ARIN XIII**
  - Vancouver, Canada, 18-21 April 2004
- **IETF 59**
  - Seoul, Korea, 29 February – 5 March 2004

# Questions



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