IGF Session #33 Internet 101

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• Introduction to the Internet, how it works and a little history
• Routing, IP address and how traffic flows across the Internet
• The Domain Name System (DNS), how it works
• Your questions and comments
192.0.43.22

or

http://www.icann.org
What is the Internet?

The Internet (RFC1310)

The Internet, a (1) loosely-organized (2) international collaboration of (3) autonomous, (4) interconnected networks, supports (5) host-to-host communication through (6) voluntary adherence to open protocols and procedures defined by Internet Standards. (7) There are also many isolated interconnected networks, which are not connected to the global Internet but use the Internet Standards (1992)
Evolution of the Internet - beginnings

FIG. 1 - Centralized, Decentralized and Distributed Networks

THE ARPA NETWORK

DEC 1969

4 NODES
Thank you –

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www.icann.org
www.icann.org/get-started
learn.icann.org
IP Addresses and Routing

Getting your packet there
<table>
<thead>
<tr>
<th></th>
<th>Version</th>
<th>IHL</th>
<th>Type of Service</th>
<th>Total Length</th>
<th>Size</th>
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<td>3</td>
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Example Internet Datagram Header

<table>
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<th>Identification</th>
<th>Flags</th>
<th>Fragment Offset</th>
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<table>
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<th>Time to Live</th>
<th>Protocol</th>
<th>Header Checksum</th>
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<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
</tbody>
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<table>
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<tr>
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<th>Destination Address</th>
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</thead>
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<table>
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<th>Padding</th>
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<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Priority?

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IGF 2020 | Internet 101
Destination: Paris

Or
An address must be unique
Regional Internet Registries (RIRs)

• Making sure IP addresses remain unique
  - Publish a list of all addresses in use (and by whom)
  - Delegate responsibility for address blocks to their members

• There are 5 RIRs
  - Each serving their part of the world (service region)
  - You pick the RIR based on where you are located
  - Global coordination with each other and “IANA”
An IP Address Is Not An Identity

• An IP address points to a location in a network
  - If you move, your address will change!

• IP address sharing is a common
  - Multiple people living in your house
  - Your ISP delivering traffic “to the front door”
  - What goes on in your network is managed by you
    - Your wifi box keeps track and distributes the packages
Routing
Finding Your Way?

• Each network has its own range of IP addresses
  - Delegated by the RIR directly to the network operator
  - Or delegated by another (parent) network
  - “You get an IP address assigned by your ISP”

• Each system or “node” has its own address
  - Coming from a range assigned to the network
  - Network sizes vary considerably
  - “Grouping” usually comes from infrastructure lay-out
network A

193.x.x.x

network B

194.x.x.x
Thank you

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Let’s add the DNS!

- Why do we need the DNS?
- What is it?
- Who controls and operates the DNS?
- How are policies set?
- What are those dark clouds in the distance?
Why do we need the DNS?

The two main reasons:

• Remembering addresses
• Flexibility (the underlying IP address/servers can change without any impact on the users)
What is the DNS?

The Domain Name System (DNS) is a hierarchical and decentralized naming system for computers, services, or other resources connected to the Internet or a private network.
Let’s take a closer look
1. The Root

I root name server – Image courtesy of Netnod
1. The Root

- The root zone file is hosted on 13 identical root servers, managed by different organisations
- Each of those 13 has many copies around the globe
- (Public Technical Identifiers) PTI manages the root zone database
- The US government (NTIA) no longer oversees the PTI function (transition occurred on 1 October 2016)
- Policies for the rootzone are set by the ICANN Community (multistakeholderism in action!)
1. The Root - root zone file (root servers)

<table>
<thead>
<tr>
<th>Domain</th>
<th>TTL</th>
<th>Type</th>
<th>Pointer</th>
</tr>
</thead>
</table>
| eu              | 172800 | IN   | NS        | x.dns.eu.
| eu              | 172800 | IN   | NS        | y.dns.eu.
| eu              | 172800 | IN   | NS        | cz.dns.eu.
| eu              | 172800 | IN   | NS        | nl.dns.eu.
| eu              | 172800 | IN   | NS        | si.dns.eu.
| eu              | 172800 | IN   | NS        | uk.dns.eu.
| EU              | 86400 | IN   | DS        | 61179 7 1 87E2B3544884B45F36A0DA72DADCB0239C4D73D4
| EU              | 86400 | IN   | DS        | 61179 7 2 3B526BC354AE085AD9984C9BE73D271411023EFF421EF184BCE41ACE3DE9F8B
| cz.dns.eu.      | 172800 | IN   | A         | 93.190.128.138
| nl.dns.eu.      | 172800 | IN   | A         | 91.200.16.100
| si.dns.eu.      | 172800 | IN   | A         | 193.2.221.60
| si.dns.eu.      | 172800 | IN   | AAAA      | 2001:1470:8000:100:0:0:0:1
| uk.dns.eu.      | 172800 | IN   | A         | 195.66.241.178
| x.dns.eu.       | 172800 | IN   | A         | 194.0.1.19
| x.dns.eu.       | 172800 | IN   | AAAA      | 2001:678:4:0:0:0:0:13
| y.dns.eu.       | 172800 | IN   | A         | 194.146.106.90
| y.dns.eu.       | 172800 | IN   | AAAA      | 2001:67c:1010:23:0:0:53
| ns6.nominum.eu. | 172800 | IN   | A         | 81.200.69.35
| eu              | 86400 | IN   | NSEC      | eurovision. NS DS RRSIG NSEC
| eu              | 86400 | IN   | NSEC      | 20150411170000 20150401160000 48613
| Y2+jPipsunT5NSn9BGs6XUpONfCFX8wIYwZug1+Hh4xhr3f+YzoHAmtm3maHqN/A2QwB+tWKxbQhLx9blIR4vFaj2H8fEGOFS+P6e3X2lRRxYOcEkubx+v9QweLpSq5yp5uA6OVpOUQ/phShZLDVVfCTbL0XbBacFeXTQFSLZjQ=
2. The top-level domains

- There are (currently) +1,570 top-level domains

<table>
<thead>
<tr>
<th>ccTLDs</th>
<th>gTLDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country code top level domains</td>
<td>Generic top level domains</td>
</tr>
<tr>
<td>311 ccTLDs – (10% IDN ccTLDs)</td>
<td>+1,200 gTLDs</td>
</tr>
<tr>
<td>2 characters</td>
<td>3 or more characters</td>
</tr>
<tr>
<td>Managed locally – serving the local internet community – policies set by local internet community</td>
<td>Managed by independent operator under contract with ICANN – policies set by the ICANN community</td>
</tr>
</tbody>
</table>
How does the DNS work?

Check out this video on Youtube!
Time to wrap up
Concluding

- The DNS is a distributed hierarchical system that allows for setting local policies.
- These policies are set by the local internet community for ccTLDs and by the ICANN community for gTLDs.
- It’s redundant, highly resilient and flexible.
Concluding

• The DNS is a distributed hierarchical system that allows for setting local policies.
• These policies are set by the local internet community for ccTLDs and by the ICANN community for gTLDs.
• It’s redundant, highly resilient and flexible.
• It was not designed to be a control point for content regulation
Further info:
https://www.centr.org
peter@centr.org