



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

PREPARED FOR:
UNITED STATES AIR FORCE PROJECT RAND

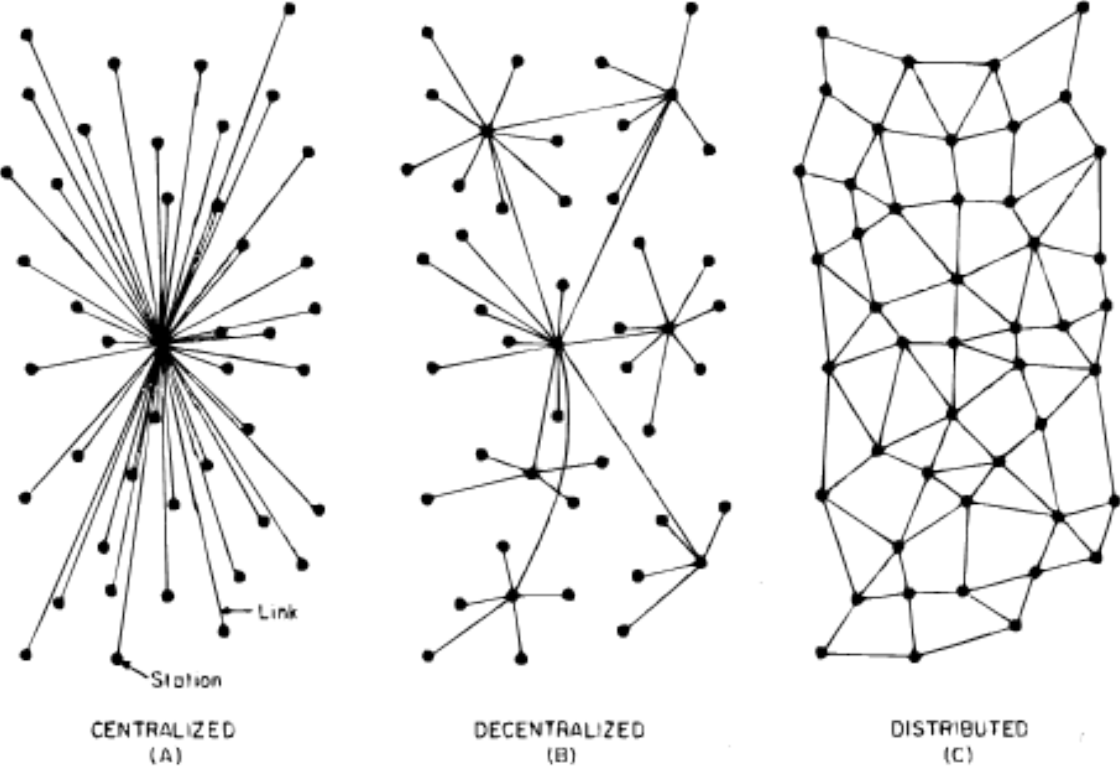
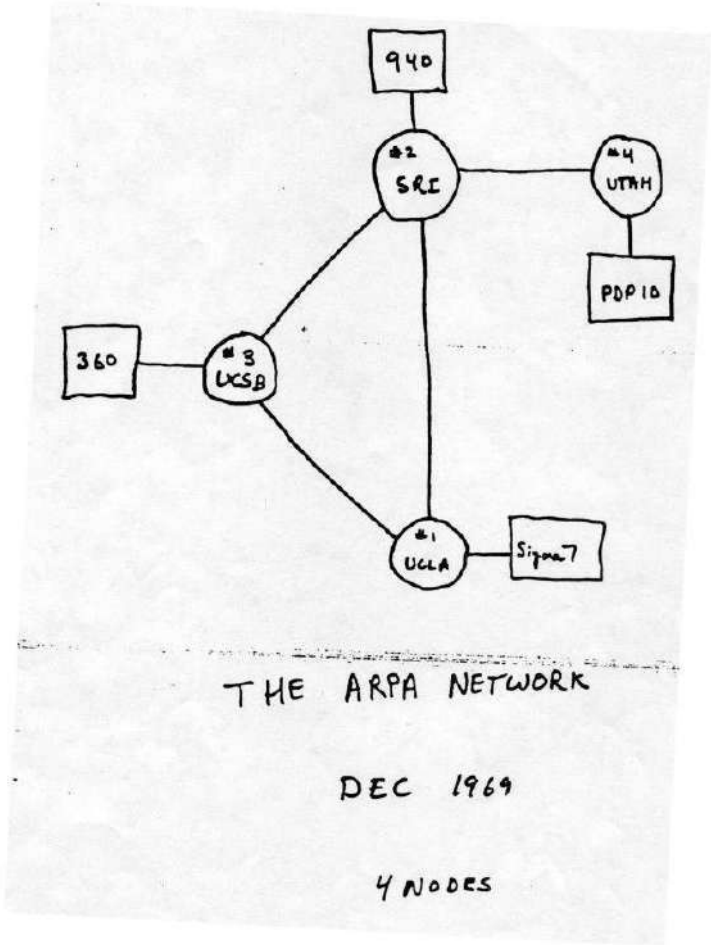


FIG. 1 - Centralized, Decentralized and Distributed Networks

The **RAND** Corporation
SANTA MONICA - CALIFORNIA



Thank you –

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www.icann.org

www.icann.org/get-started

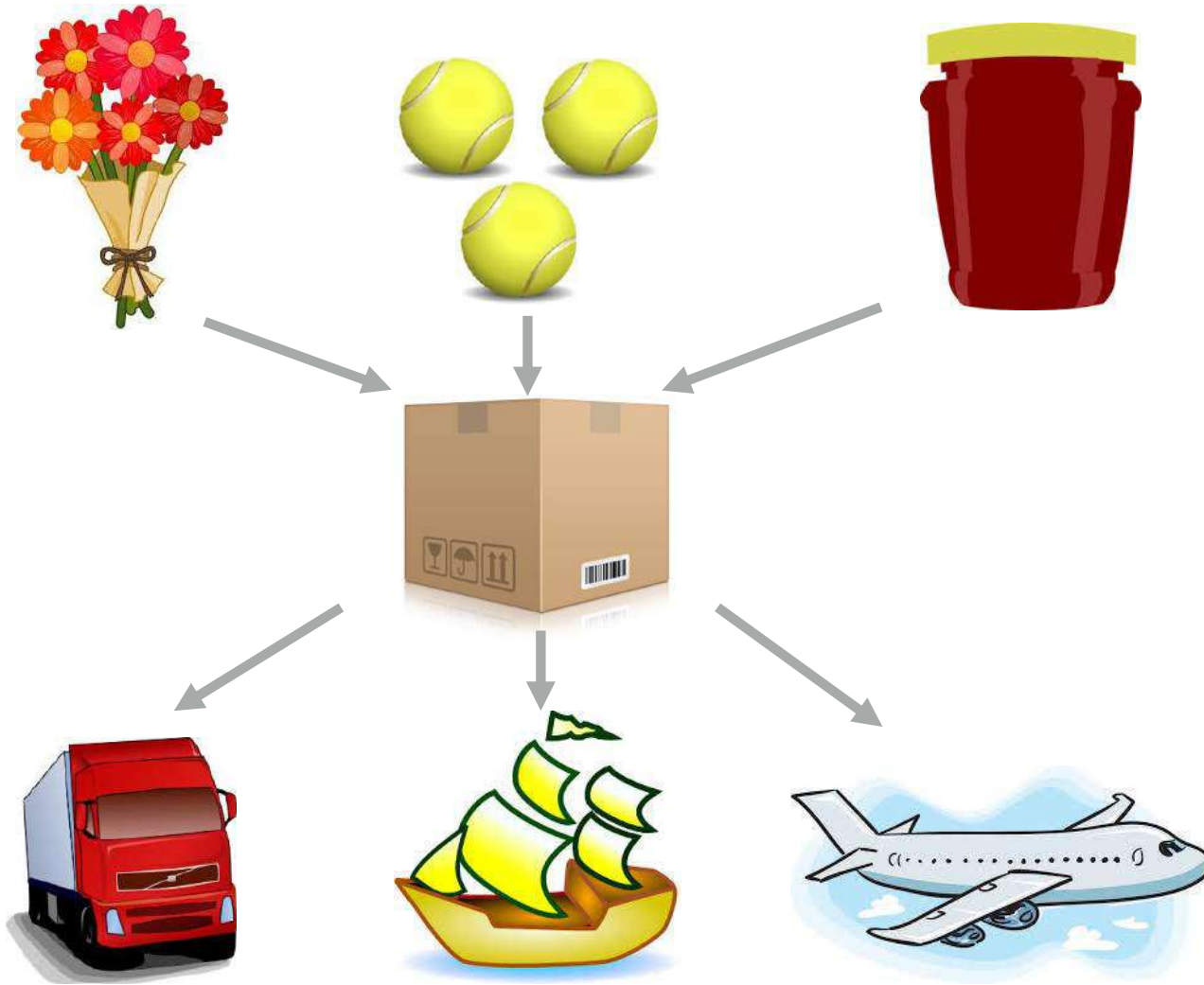
learn.icann.org

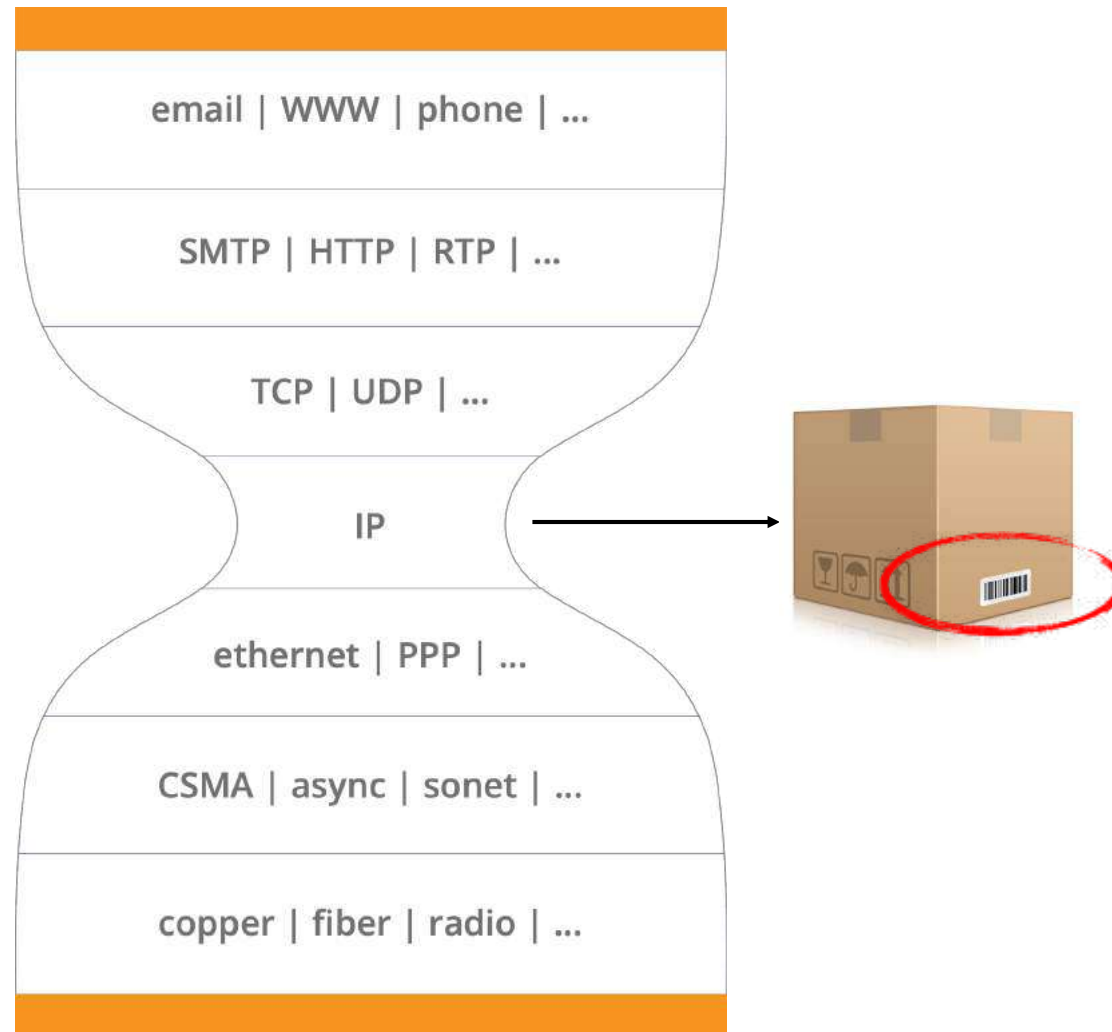


IP Addresses and Routing

Getting your packet there

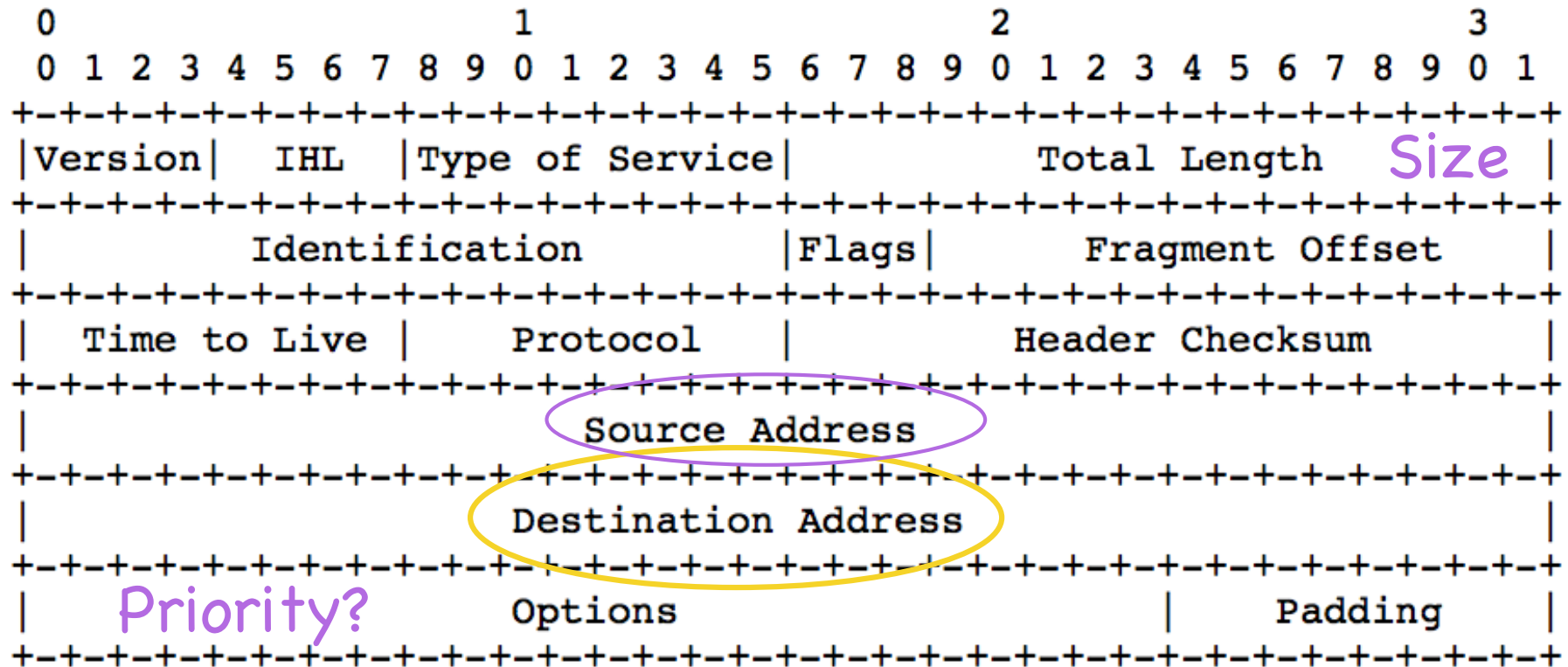








P	
USPS PRIORITY MAIL	
Sample Mailer 1123 Main St Test City DC 20260	
ADDRESS SERVICE REQUESTED	
SHIP WILLIAM SMITH TO: ONLINE SPECIALISTS 2345 GLENDALE DR RM 245 ATLANTA GA 30328-3474	
e/ USPS SIGNATURE CONFIRM	
	
9121 0268 3733 1000 0010 10	
ELECTRONIC RATE APPROVED #026837331	
<small>Priority Mail is a registered trademark of the U. S. Postal Service.</small>	



Example Internet Datagram Header

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



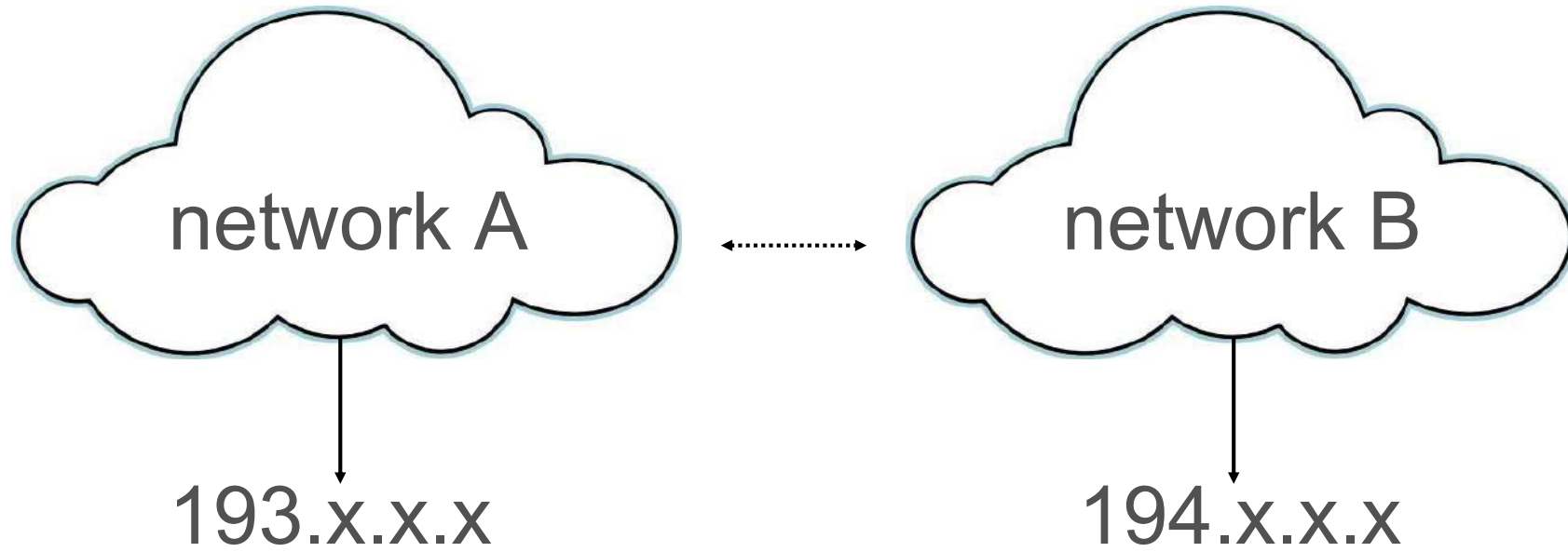
11000001000000000000000011010111110
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11000001000000000000000011011000000
11000001000000000000000011011000001
11000001000000000000000011011000010
11000001000000000000000011011000011
11000001000000000000000011011000100

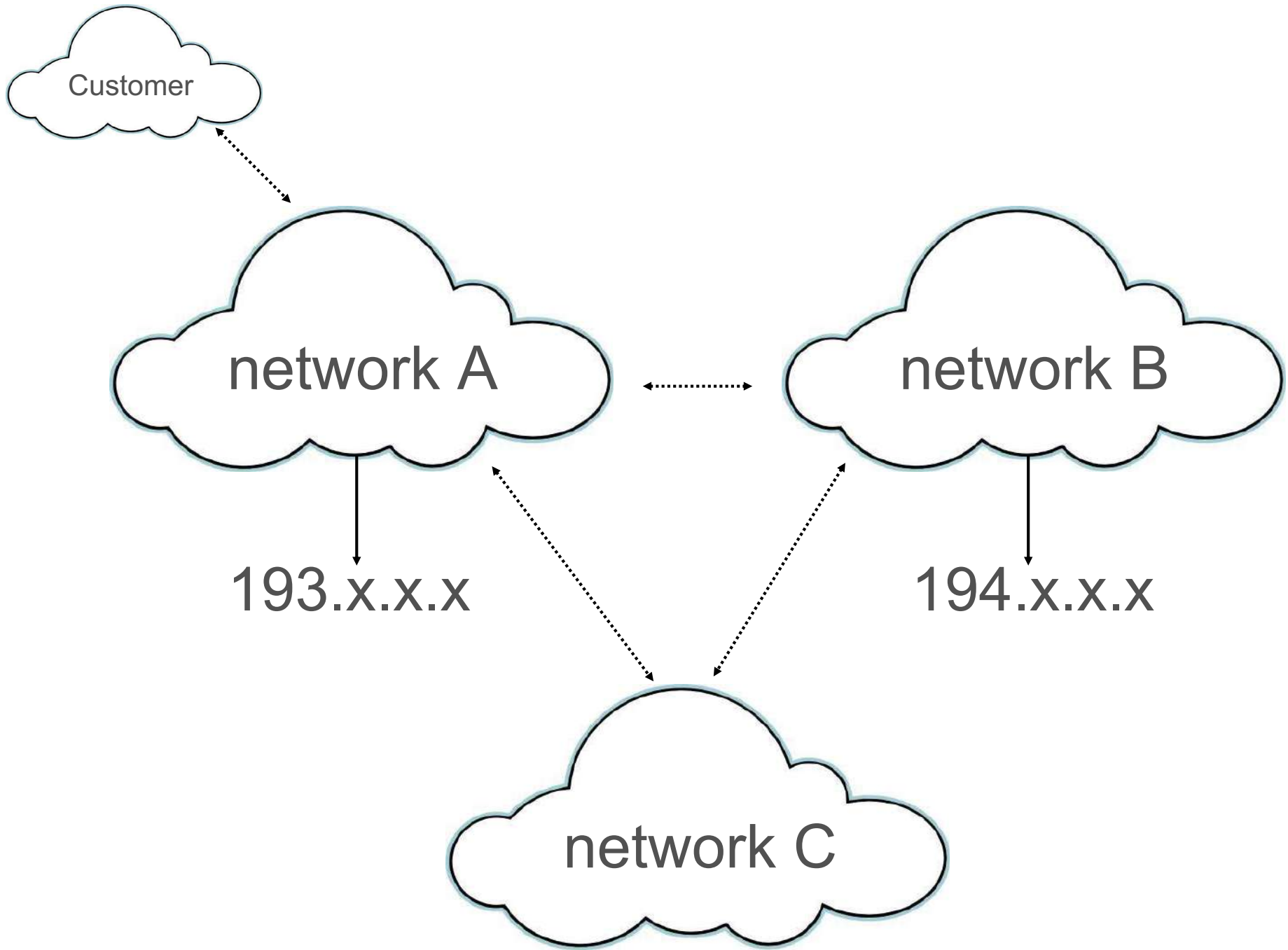


⋮

193.0.6.190
193.0.6.191
193.0.6.192
193.0.6.193
193.0.6.194
193.0.6.195
193.0.6.196

network computer







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?



www.europa.eu

www.hyves.nl

www.allegro.pl

www.bbc.co.uk

blog.orange.fr

info@standaard.be

www.google.it

iotastudio.ge

рнидс.срб



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



The screenshot shows a web browser window with the URL <https://www.intgovforum.org/>. The page features the IGF logo, which includes the United Nations emblem and the text "IGF Internet Governance Forum". A navigation menu includes links for "ABOUT", "IGF2020", "INTERSESSIONAL", "IGF INITIATIVES", and "PUBLICATIONS & REPORTS". A "Latest News" section is visible on the right, with links for "How to connect to IGF 2020?" and "IGF 2020 Meeting Page". A banner at the bottom of the page says "WELCOME" and features the IGF 2020 logo with the text "IGF 2020 João Pessoa, B".



The Protocol

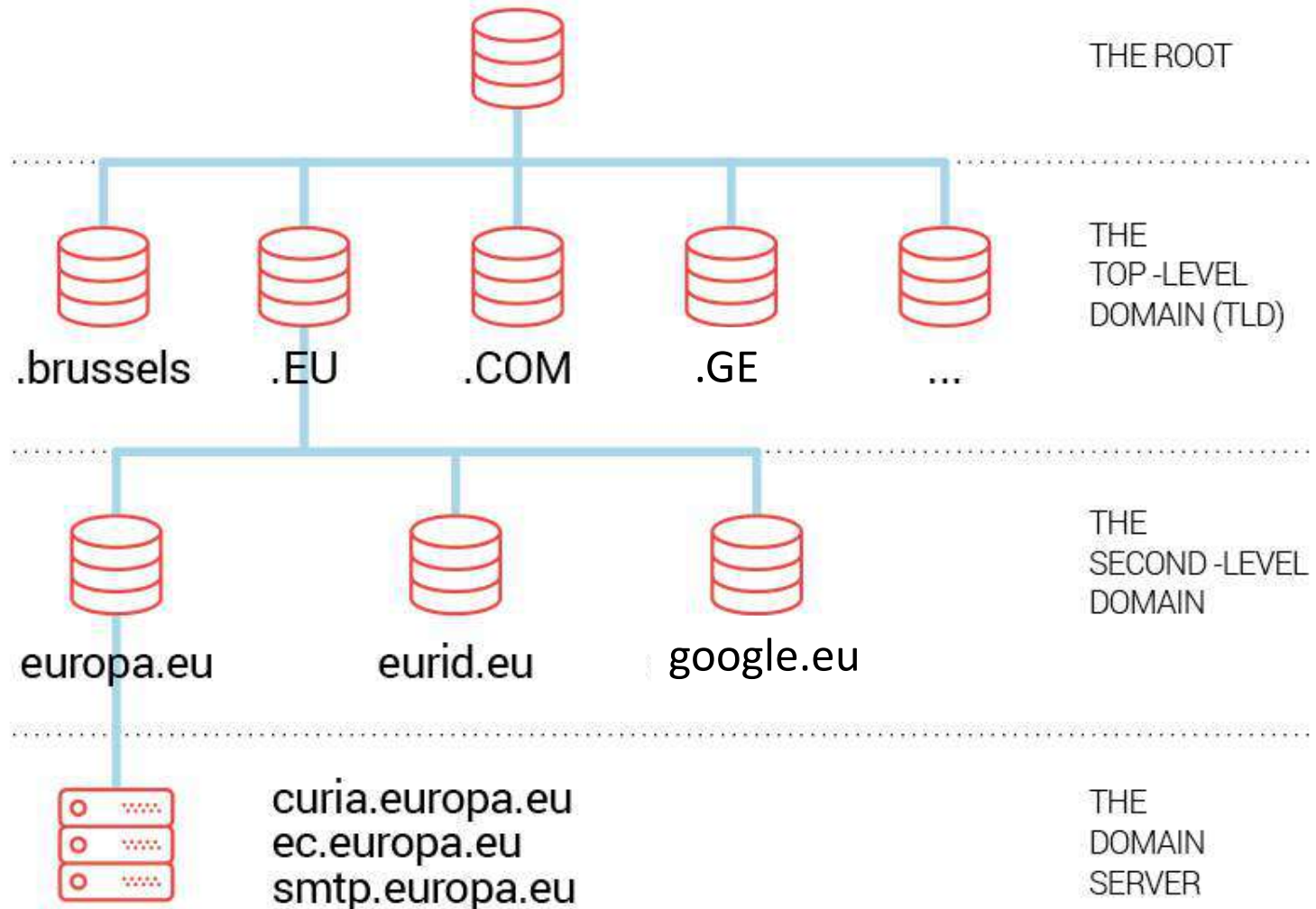
The Root

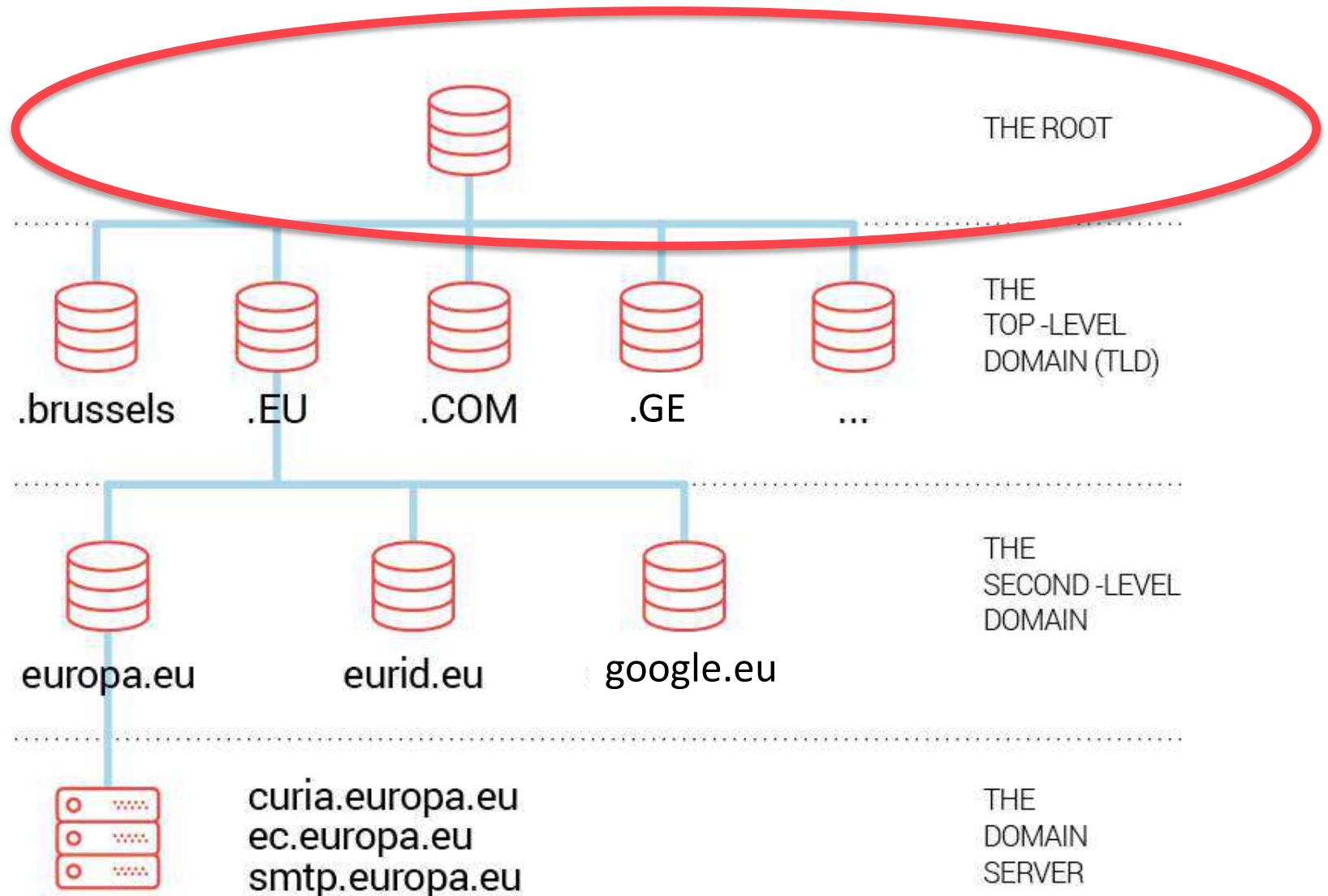
<https://www.intgovforum.org>

The Top Level
Domain

The Second
Level Domain

The website
server





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)

```

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 3B526BCC354AE085AD9984C9BE73D271411023EFF421EF184BCE41ACE3DE9F8B

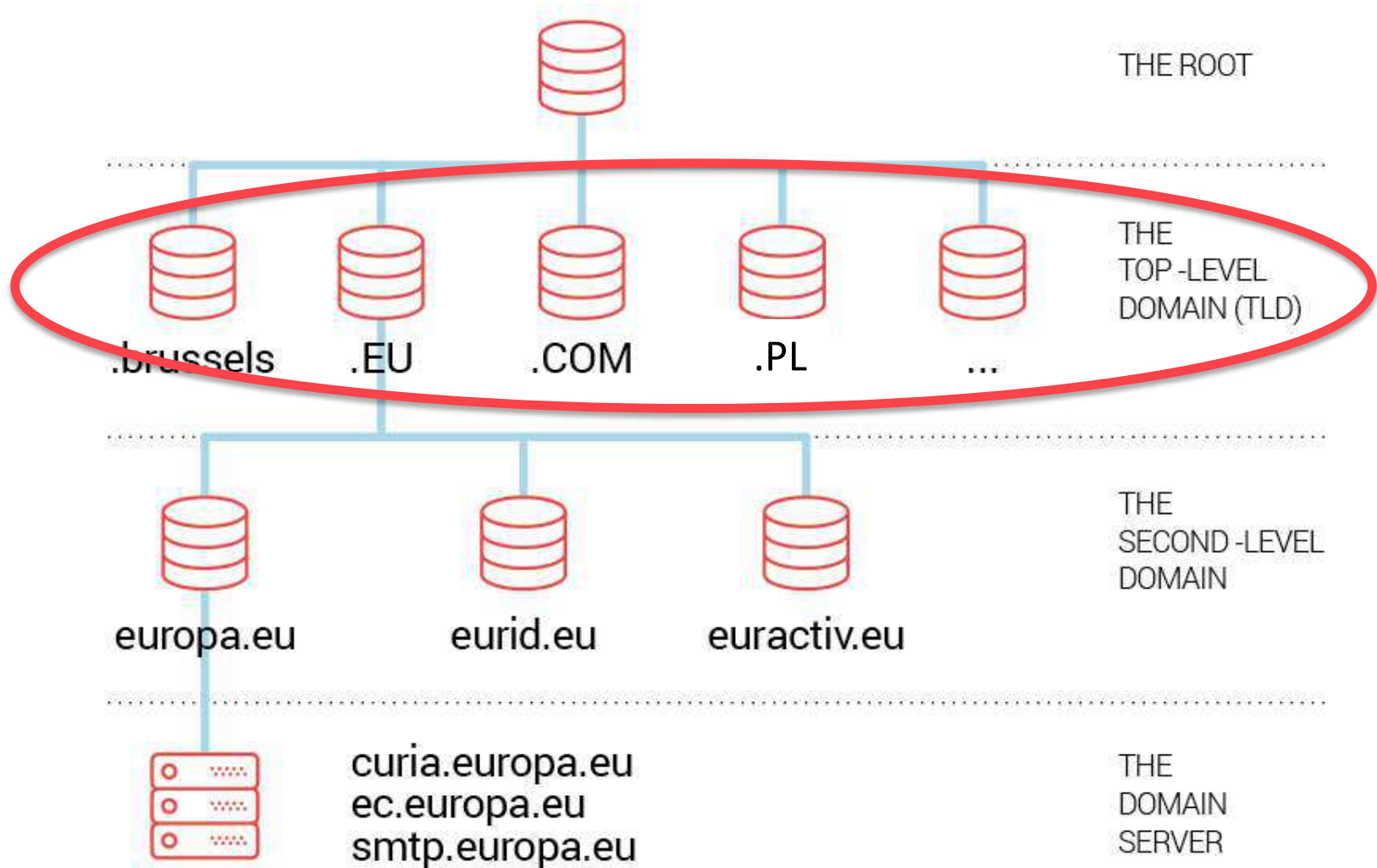
EU.                86400  IN      RRSIG   DS 8 1 86400 20150411170000 20150401160000 48613 .
bCTz3iQYxp7pTGQI7hG3jjZiSuQ5pP3mkDbOl1QPRoejWtSnpf9caiovgI9Z49MN1bc8nWpbN6cVjB0HaswkH5OcJ0VMD6ZsXlIMNGtHPnWcBujayiGG2EdEaavBbUu
xH39zJcb1R73qZtzocbVAizuYRVlQEvTz6rg7RgXl/nE=

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:1010:23:0:0:0:53
ns6.nominum.eu.  172800 IN      A       81.200.69.35

eu.                86400  IN      NSEC    eurovision. NS DS RRSIG NSEC

eu.                86400  IN      RRSIG   NSEC 8 1 86400 20150411170000 20150401160000 48613 .
Y2+jPipksunT5NSn9BGs6XUpONfCFX8wIYwZug1+Hh4xrh3f+YzoHAMtm3maHqN/A2QwB+tWKxbQhLx9bIR4vFaj2H8fEGOFs+P6e3X2IRRxYOcEkubx+v9QweLpSq
5yp5uA6OVpOUQ/phShZLDVVfCTbLOxbBacFeXTQFSLZjQ=

```

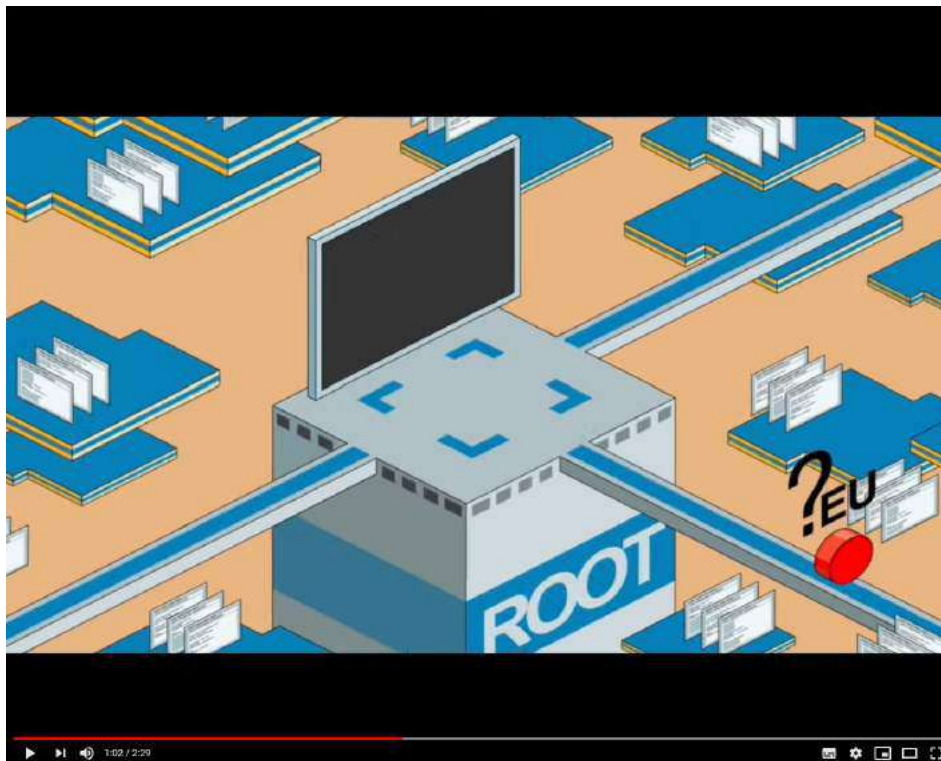


2. The top-level domains

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

example.pl ccTLDs	gTLDs example.com
Country code top level domains	Generic top level domains
311 ccTLDs – (10% IDN ccTLDs)	+1,200 gTLDs
2 characters	3 or more characters
Managed locally – serving the local internet community – policies set by local internet community	Managed by independent operator under contract with ICANN – policies set by the ICANN community

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.





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- 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