

Internet 101 Numbers & Names

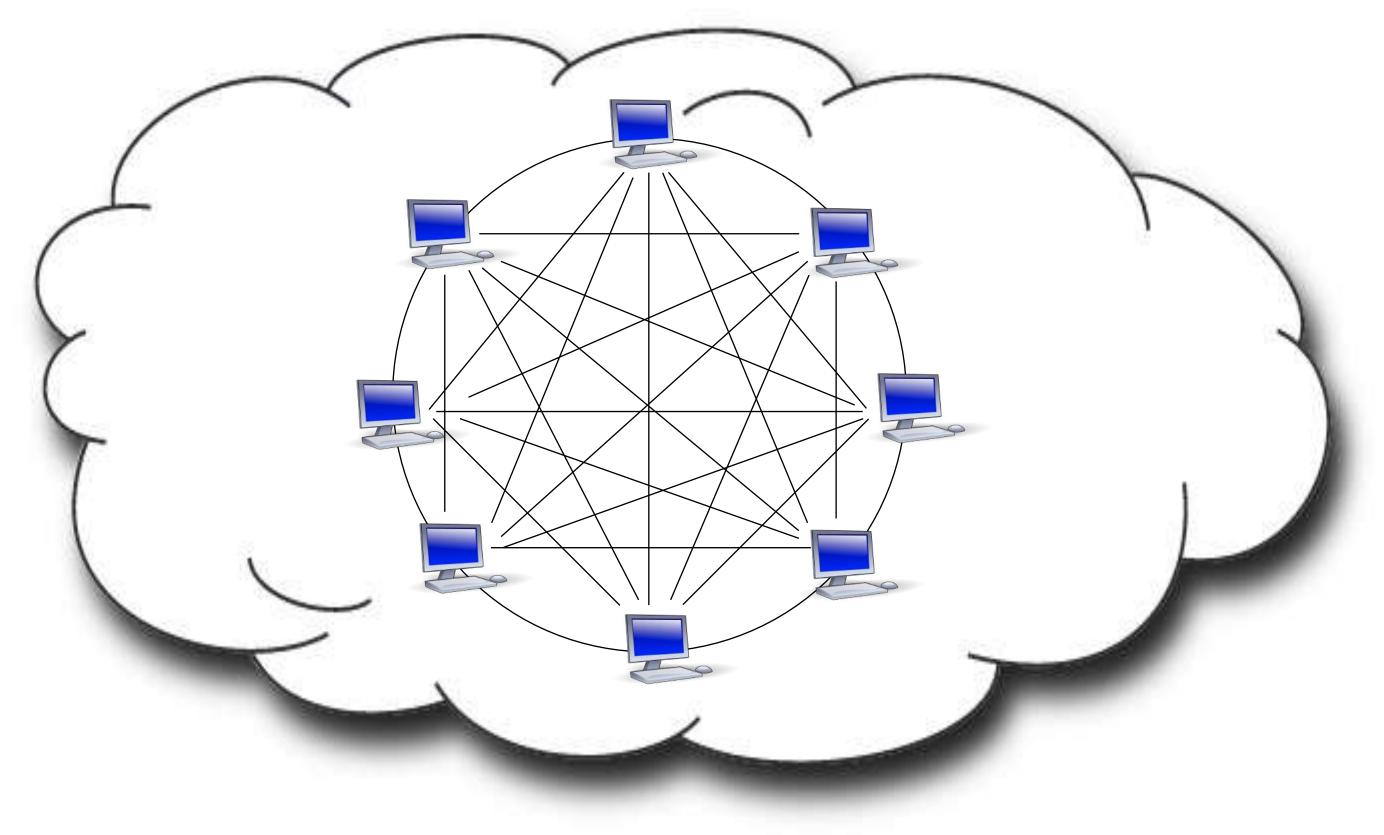


Gergana Petrova | 31 May 2021



What is the Internet?

- Autonomous System (AS)
- The Internet has roughly 60,000 interconnected ASs



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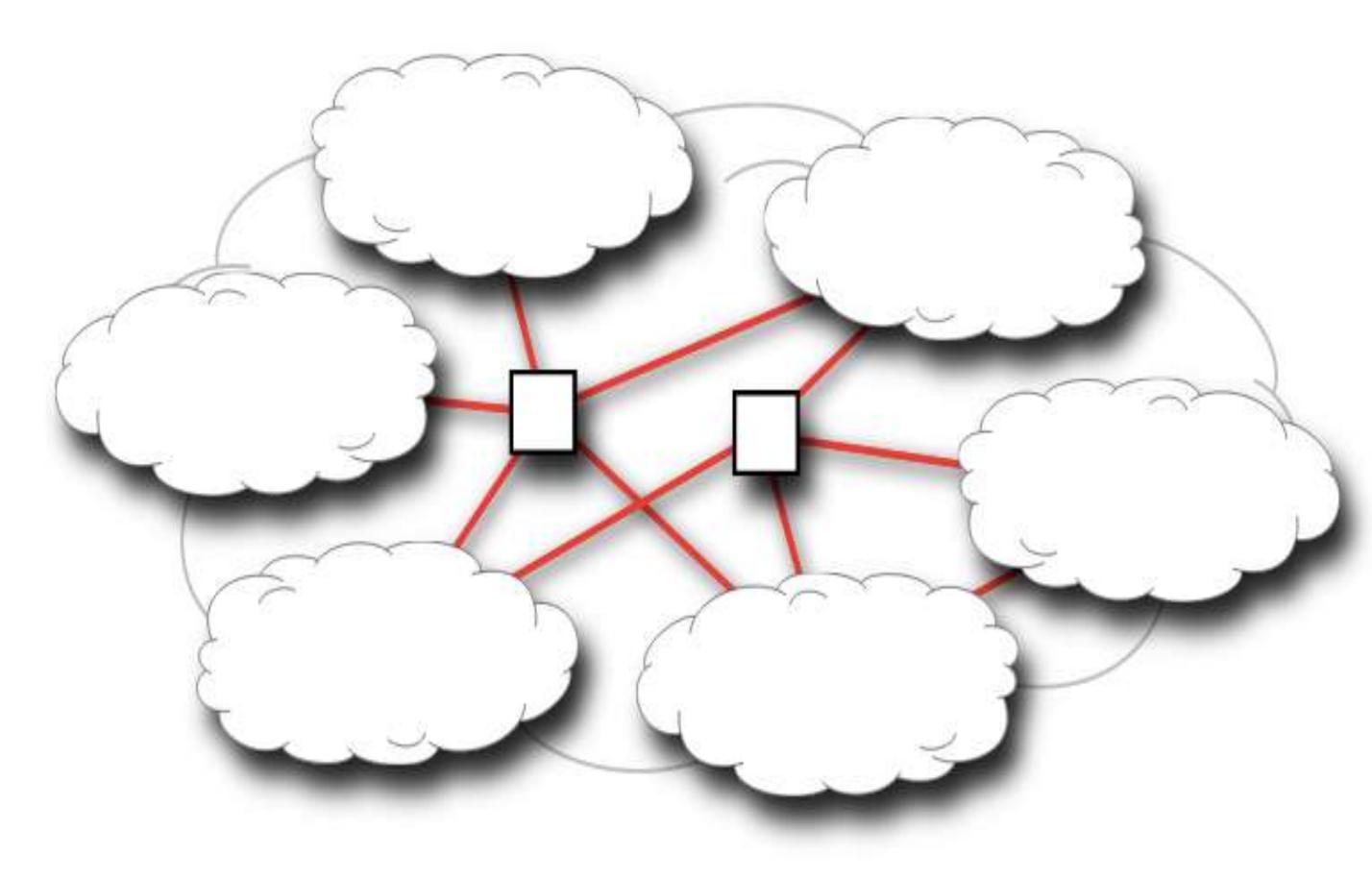


What is the Internet?

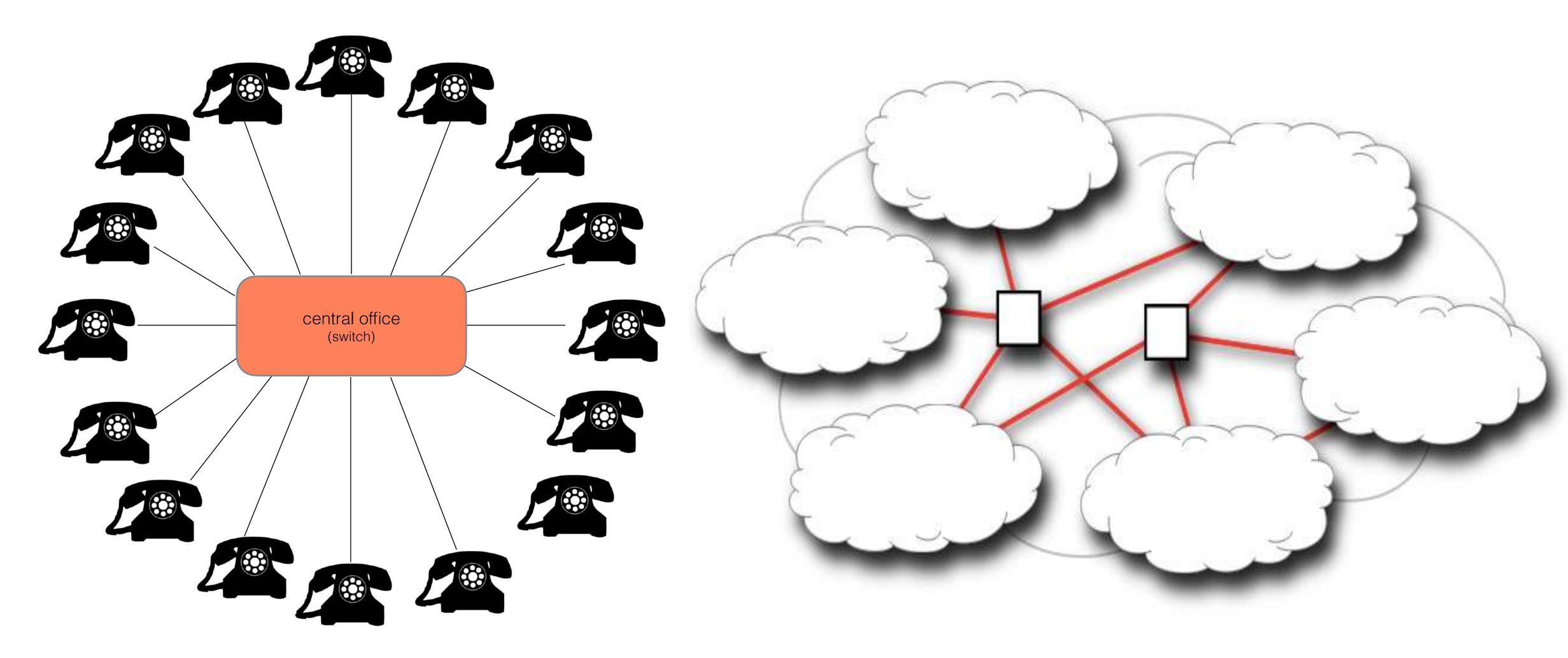
- The Internet is a network of interconnected networks
- TCP/IP is the standard of communication between all computers on this network
- IP = Internet Protocol



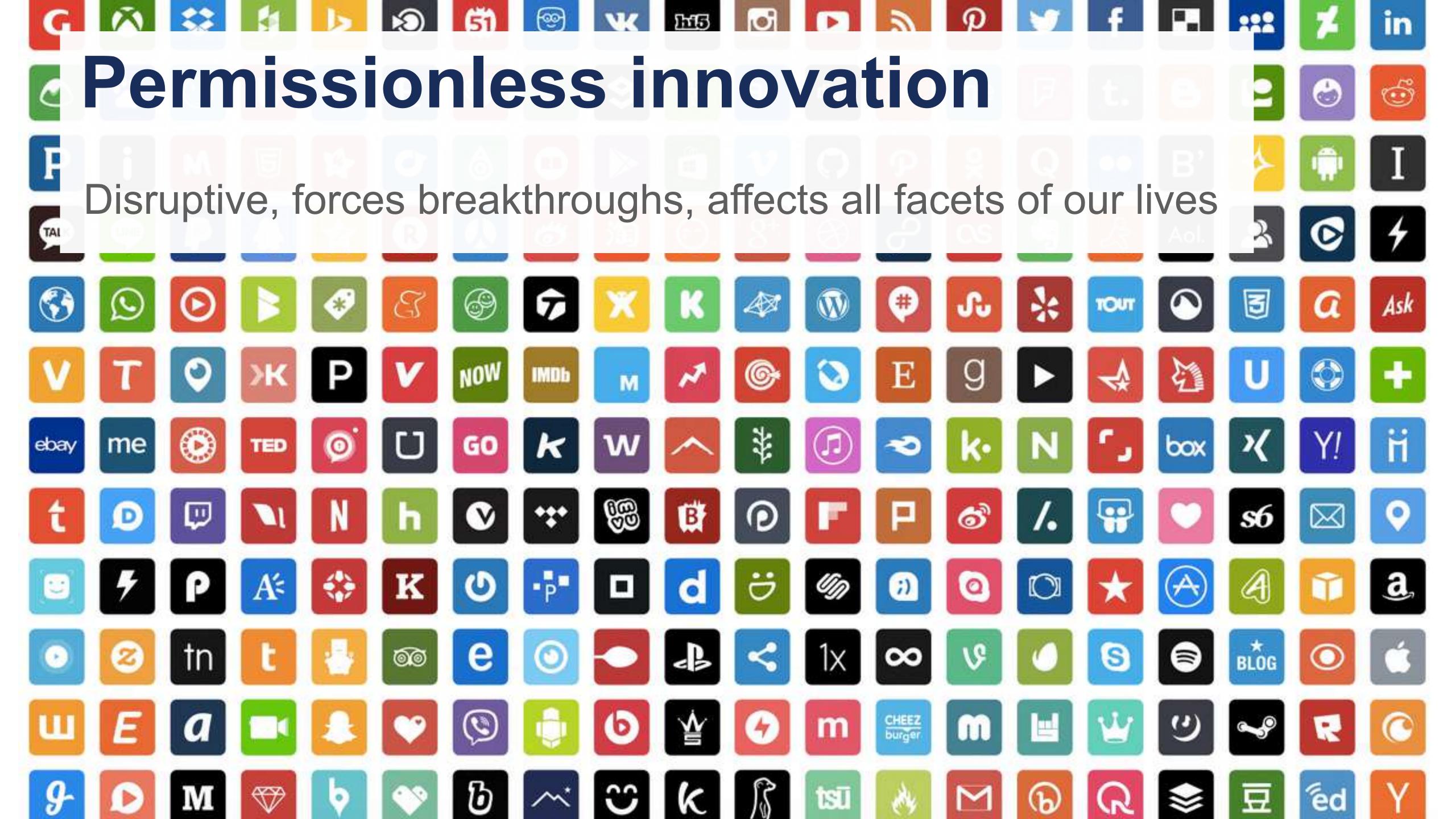




Unlike the phone system, the Internet is decentralised







Standardising organisations

- The Internet Engineering Task Force
- Develop and promote voluntary Internet standards
- Open standards organisation, with no formal membership
- Rough consensus and running code
- World Wide Web Consortium
- Develop open standards to ensure the long-term growth of the Web







Internet Corporation for Assigned Names and Numbers

- Global forum for developing policies for coordination of some of the Internet's core technical elements
- Coordinate the Internet Assigned Numbers Authority (IANA) functions:
 - management of the address and routing parameter area (ARPA) top-level domain
 - administration of certain responsibilities of generic (gTLD) and country code (ccTLD) Top-Level Domains
 - the allocation of Internet numbering resources









Numbers

Internet Protocol (IP) Address

- It needs to be globally unique
- It is an address, not an identity
 - Represents a location in a network
 - If you move, your address is likely to change

• IPv4 e.g. 192.0.2.17 (32 bits) • IPv6 e.g. 2001:db8:0:1234:0:567:8:1 (128 bits)

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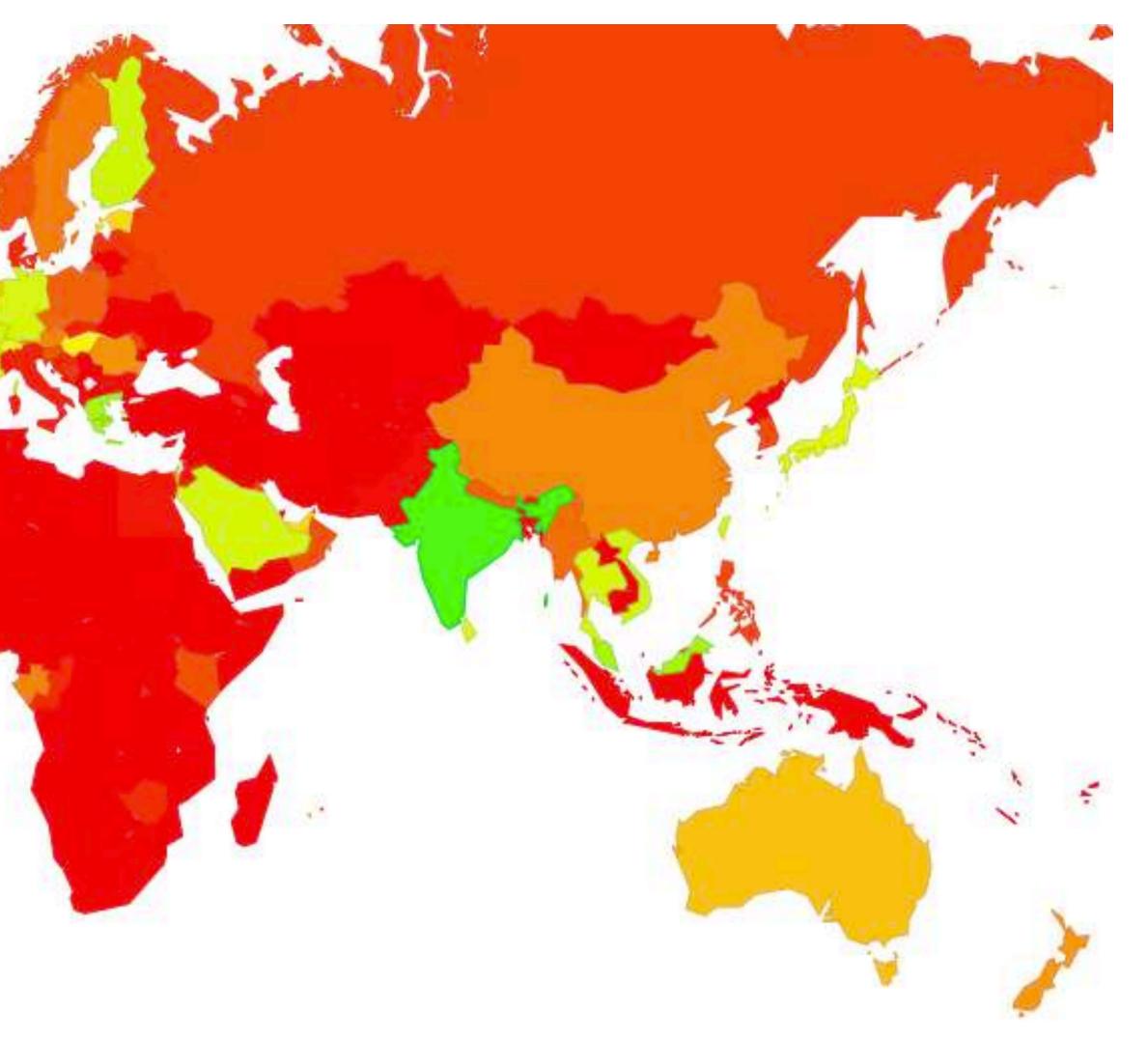


Internet Protocol (IP) Address

- The currently used IPv4 only has 4.2 billion addresses
- IPv6 functions the same as IPv4
 - "Same cardboard box, slightly bigger label on it"
- Address is 128 bits long (IPv4 uses 32 bits)
 - 2¹²⁸ addresses available
 - 340282366920938463463374607431768211456 options



IPv6 Deployment





What is the RIPE community?

- Réseaux IP Européens
- Established in 1989
- Open, inclusive, bottom-up, transparent
- Responsible for making policy, sharing information and best practices
- RIPE structures:
 - Working groups
 - Mailing lists
 - RIPE Meetings

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nsparent sharing





What is RIPE NCC?

- RIPE Network Coordination Centre
- Established in 1992
- Independent, not-for-profit, membership organisation
- One of the five RIRs (Regional Internet) Registry)
- Serving Europe, the Middle East, parts of Central Asia
- Around 140 staff based in Amsterdam, Dubai and Moscow







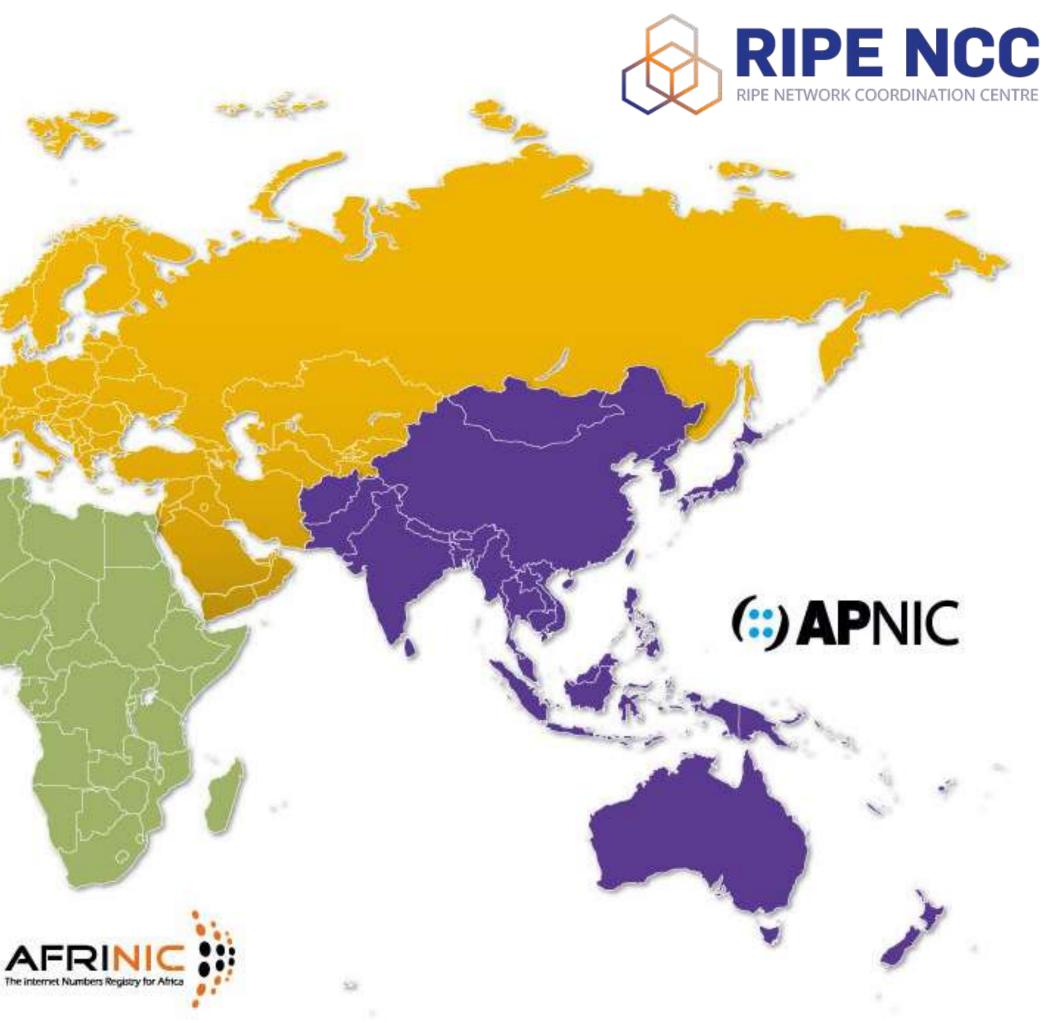


Where are the RIRs?



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What is an RIR?

- A Regional Internet Registry (RIR) manages the allocation and the world and maintains a unique registry of all IP numbers issued.
- Number resources include:
 - IP addresses (IPv4 and IPv6)
 - Autonomous System (AS) Numbers



registration of Internet number resources in a particular region of



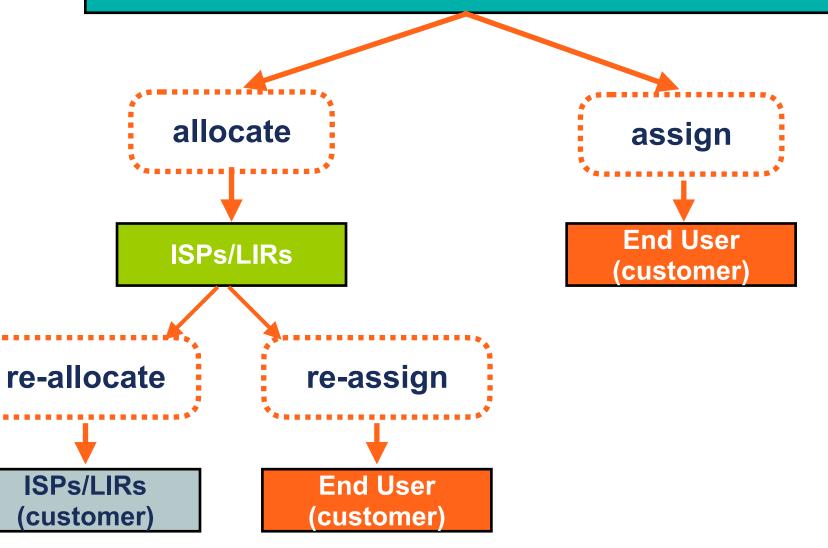
Core RIPE NCC Functions

- Receive large IP address blocks from IANA
 - Distribute those in smaller blocks to its members
 - Publish and maintain a list of who has which block
 - Implement the rules (policies) set by the RIPE community
- Support the infrastructure of the Internet through technical coordination
- Provide services for the benefit of the Internet community at large



IANA (Internet Assigned Numbers Authority) Manages global unallocated address pool

RIRs (RIPE NCC, ARIN, APNIC, LACNIC, AFRINIC) Manages regional unallocated address pool











Names

Domain Name System (DNS) People can't remember numbers, so we use names - Uniform Resource Locator (URL)

- DNS
 - A naming system for computers, services and other resources Translates the easy-to-remember domain names to the numerical IP
 - addresses
 - Hierarchical and decentralised



The Anatomy of a Domain

First or Top Level

Second Level

Host

Protocol

Generic Top Level Domain (gTLD) .com .net .shop .green

Country Code Top Level Domain (ccTLD) .uk .za .br

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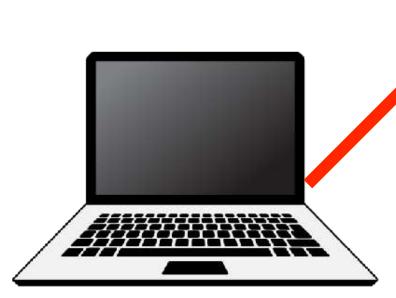


root https://www.ripe.net

The Nearest Root Nameserver



Our ISP's **Recursive Resolver DNS Server**



Domain Name Lookup to resolve <u>www.ripe.net</u>

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The Nearest Root Nameserver

Reply with the IP of .net Nameserver

DNS Lookup www.ripe.net

Our ISP's Recursive Resolver **DNS Server**

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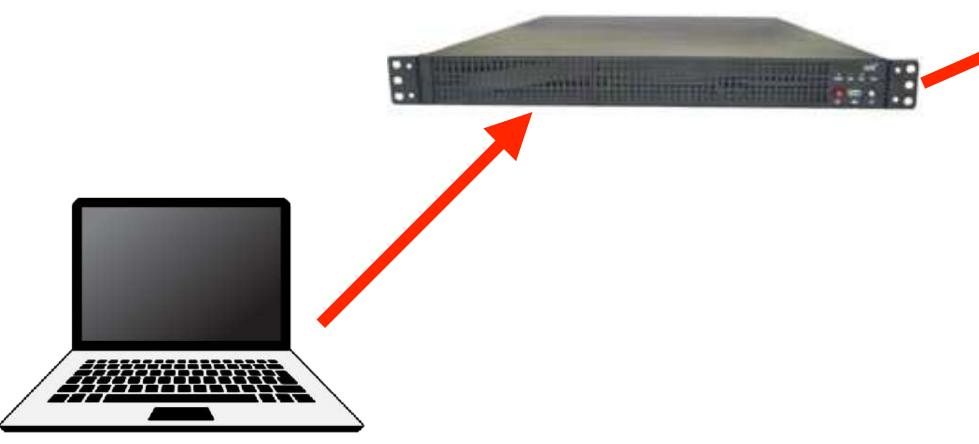




The Nearest Root Nameserver



Our ISP's **Recursive Resolver DNS Server**



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The .net Nameserver



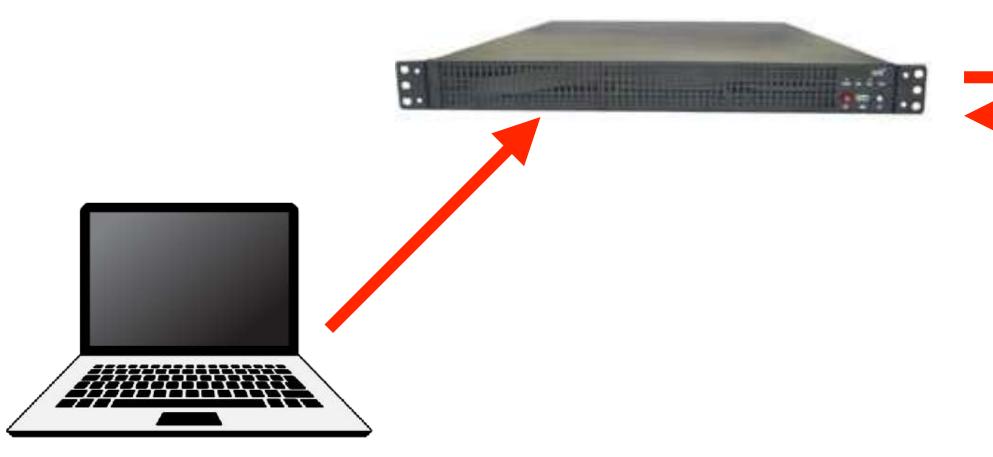
DNS Lookup www.ripe.net

> Reply with the IP of <u>ripe.net</u> Nameserver

The Nearest Root Nameserver



Our ISP's **Recursive Resolver DNS Server**



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The .net Nameserver



DNS Lookup www.ripe.net

The ripe.net Nameserver

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Reply with the IP of <u>www.ripe.net</u>

The Nearest Root Nameserver



Our ISP's **Recursive Resolver DNS Server**



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The .net Nameserver



The ripe.net Nameserver



The Nearest **Root Nameserver**



Our ISP's **Recursive Resolver DNS Server**





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The .net Nameserver



The ripe.net Nameserver

Root Server Instances



The 13 root name servers are operated by 12 independent organisations.





Root Server Instances

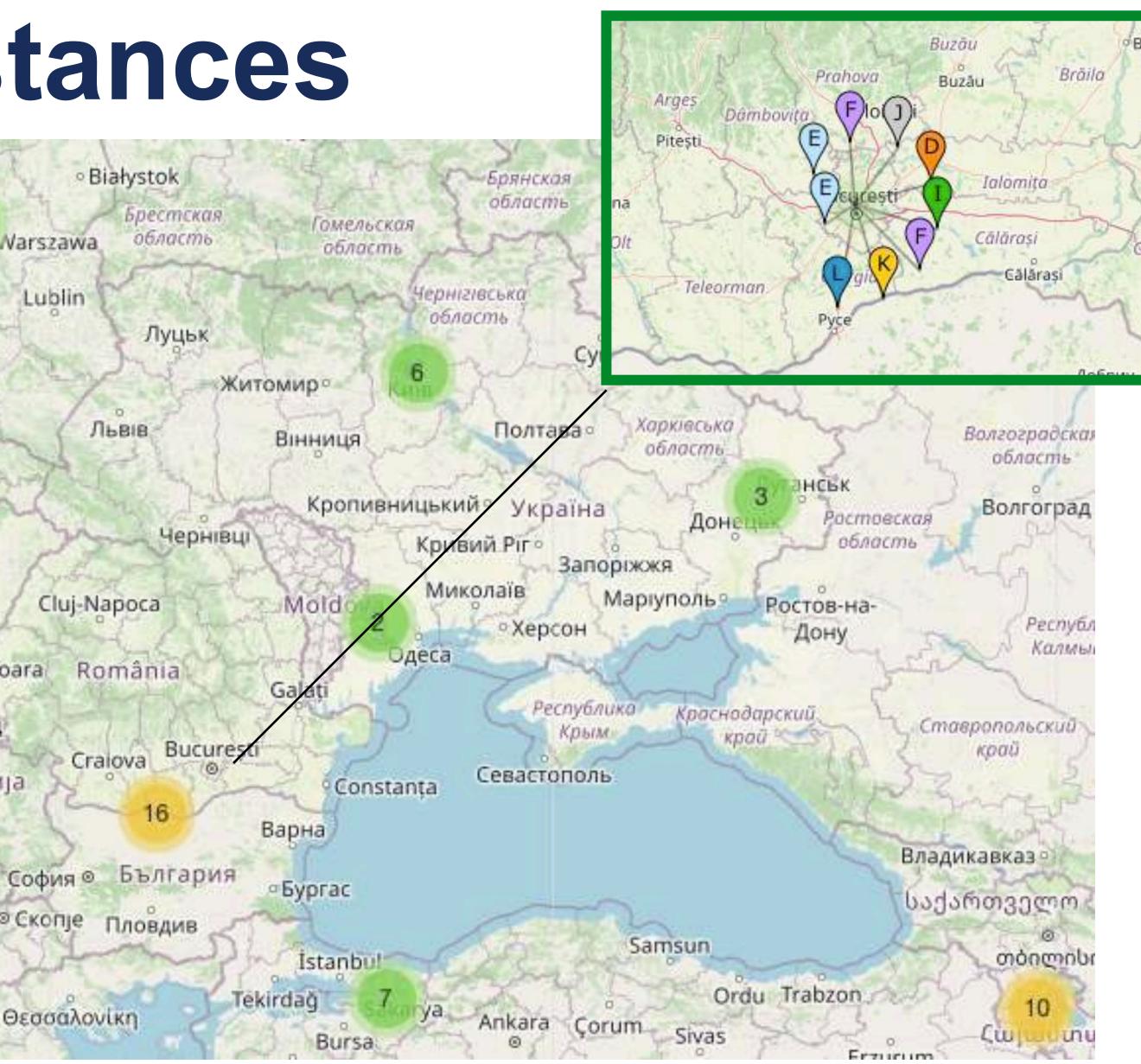
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Root Server Instances

Groningen Hamburg Bydgoszcz Szczecin Berlin Niedersachsen Poznań Nederland Warszawa Polska Magdebur 19 18 usseldorf Lublin Deutschland België Wrocław Dresden Frankfurt Belgique am Main Kraków Belgien Cesko Nürnberg Lu 28 oura Bayern Grand Est Slovensko Stuttgart Wien München Osterreic 23 Schweiz/ Magyarország Cluj-Napoca Svizzera/ Graz 33 zra Slovenija Timişoara Milano Auvergne-Rhône-Alpes Venezia Београд Torino Craiova Bologna Hrvatska Genova 11 бија Sarajevo Monaco Città di San Marino Marseille Crna Gora Црна Гора 10 ⊚Скопје Italia Rom Shqipëria Bari Napoli Θεσσαλονίκη





More resources

ccTLDs and online content explained:

- https://www.centr.org/education/cctld-registry.html (scroll down)
- By CENTR (Council of European National Top-Level Domain Registries)



Questions

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