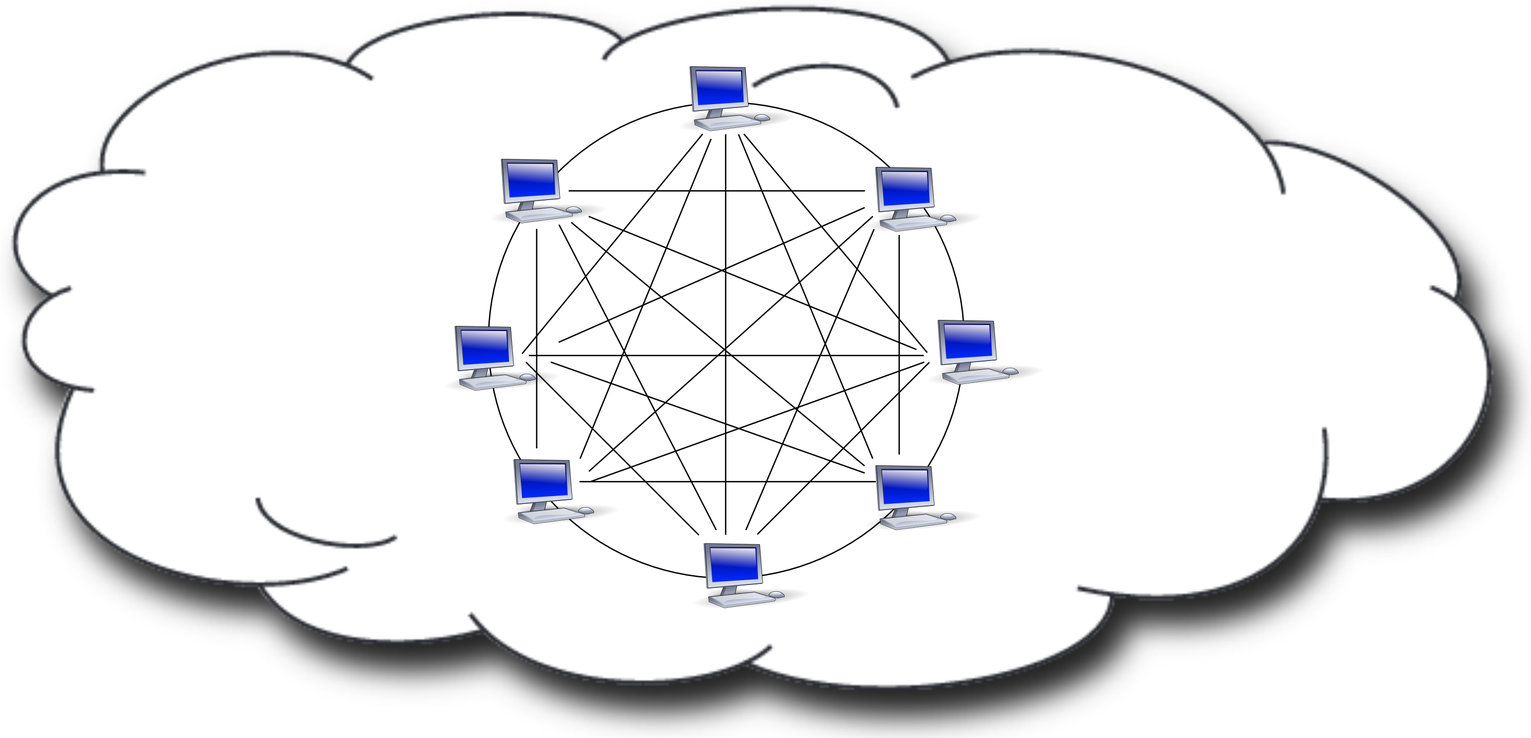
RIPE NCC
RIPE NETWORK COORDINATION CENTRE

The RIR System, the RIPE Community, and the RIPE NCC

Gergana Petrova | 5 July 2021

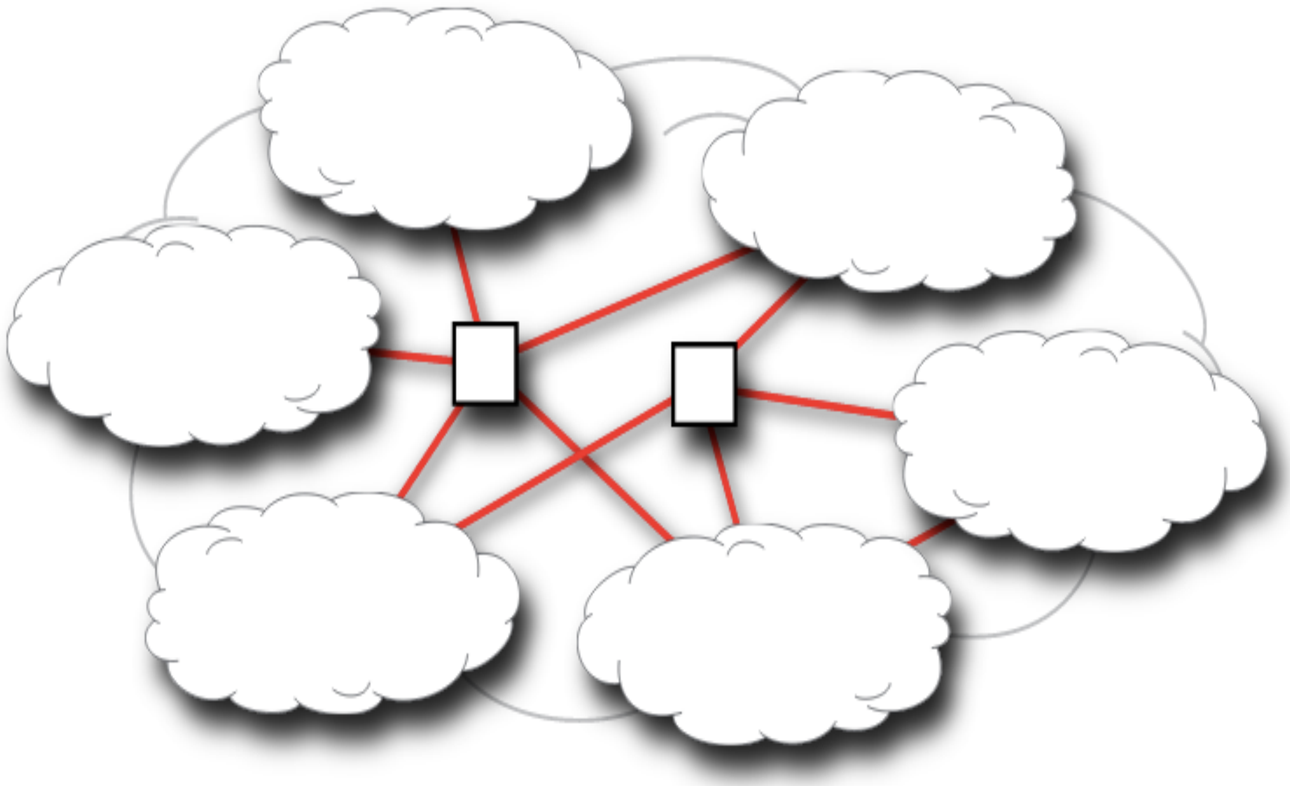
What is the Internet?

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

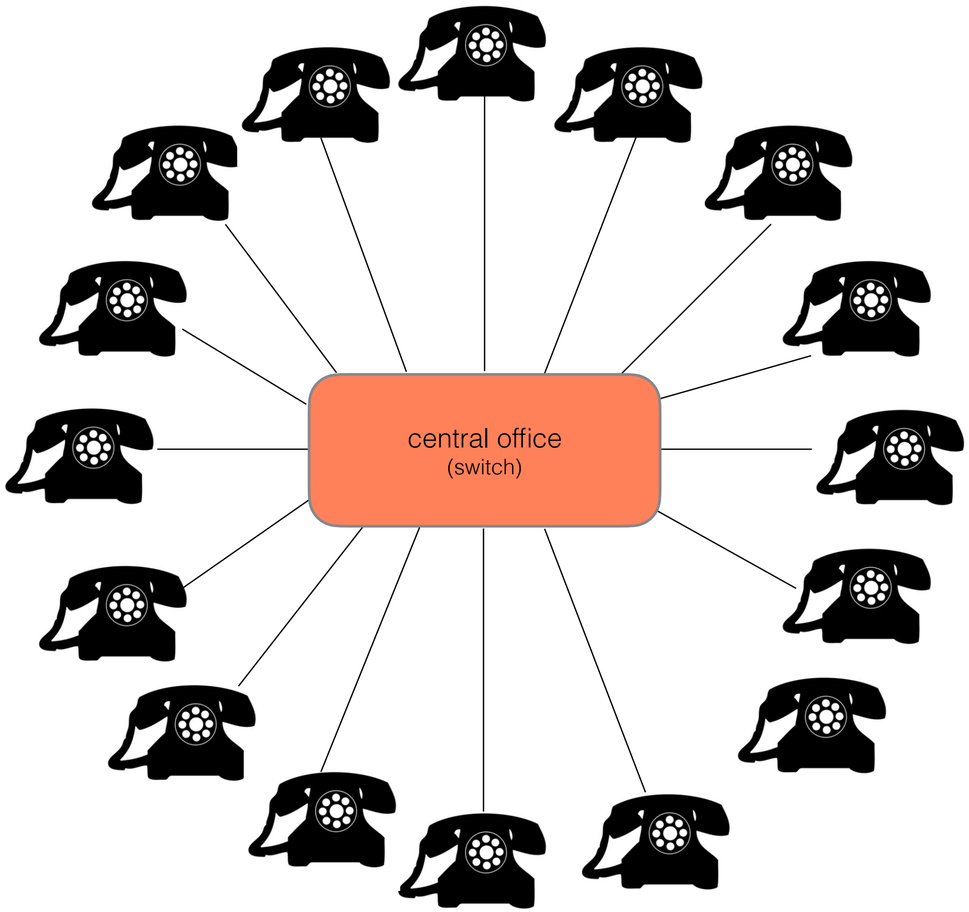


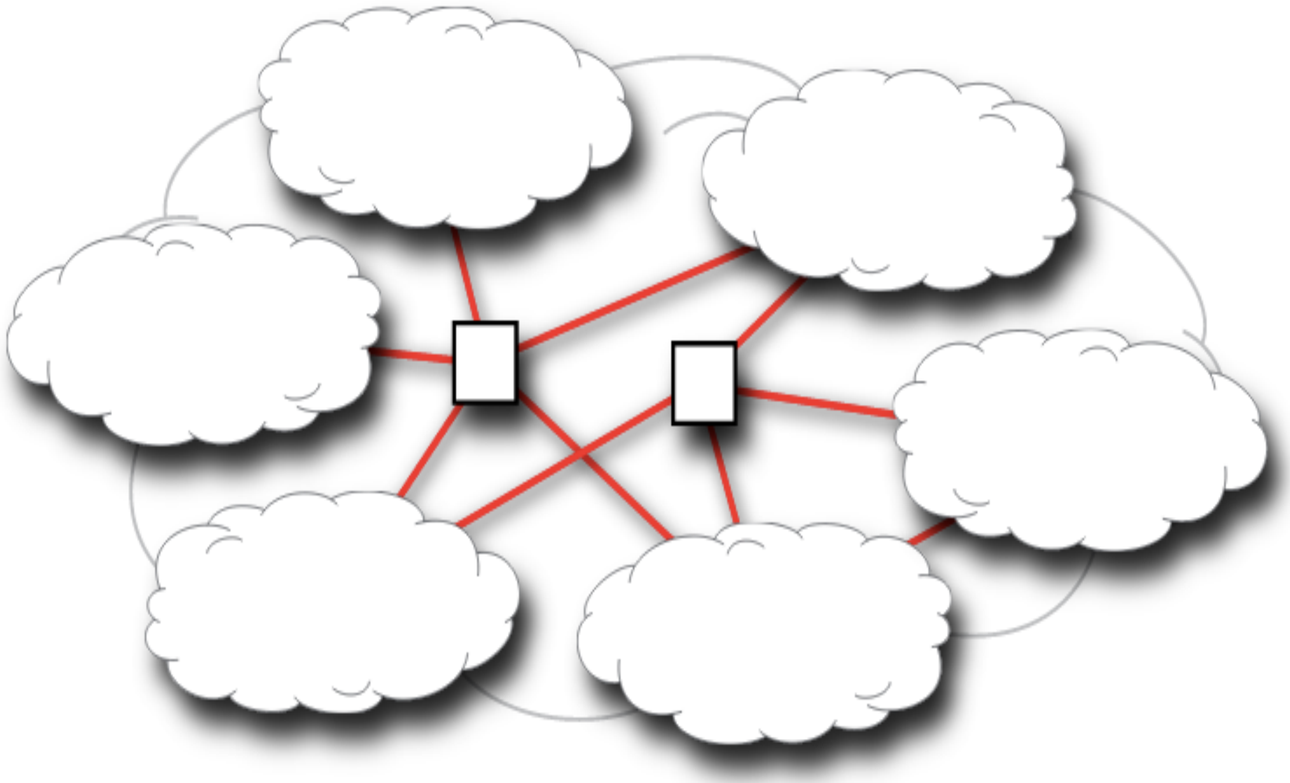
What is the Internet?

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



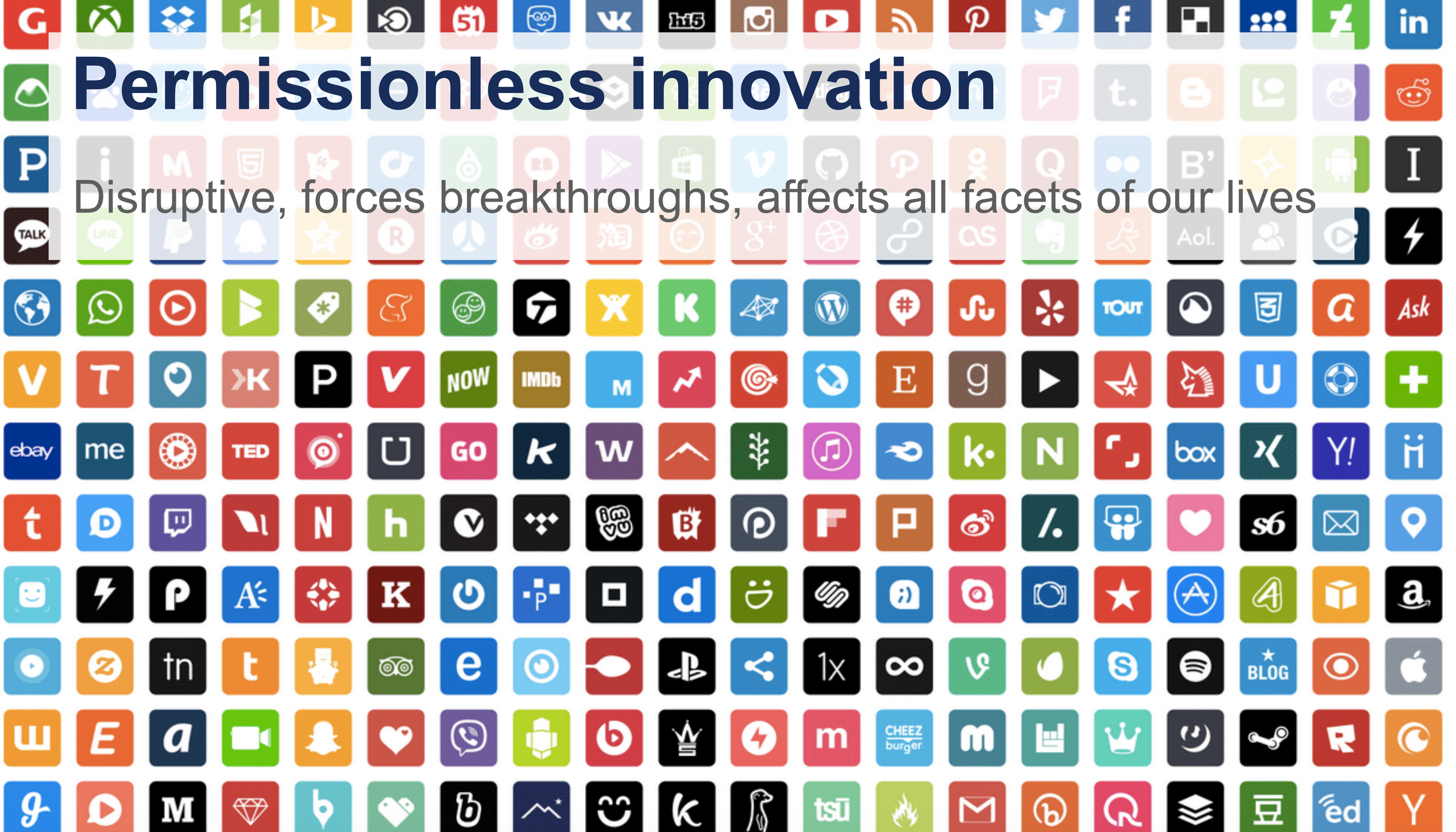
Unlike the phone system, the Internet is decentralised





Permissionless innovation

Disruptive, forces breakthroughs, affects all facets of our lives



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

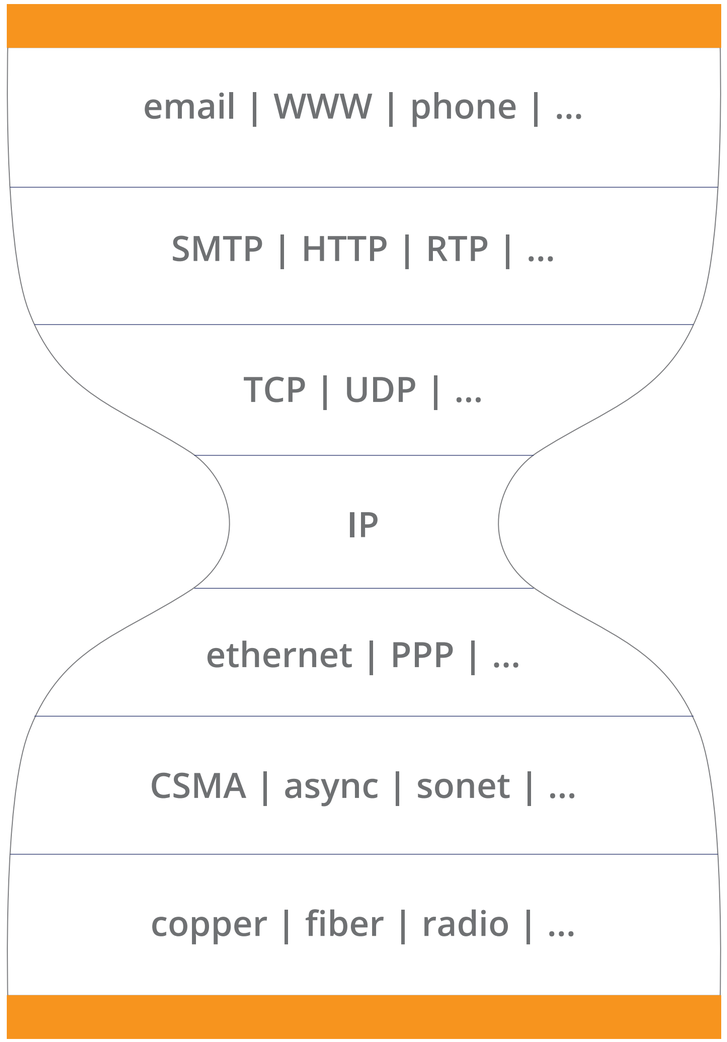
- Develop open standards to ensure the long-term growth of the Web

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

The Internet Layers



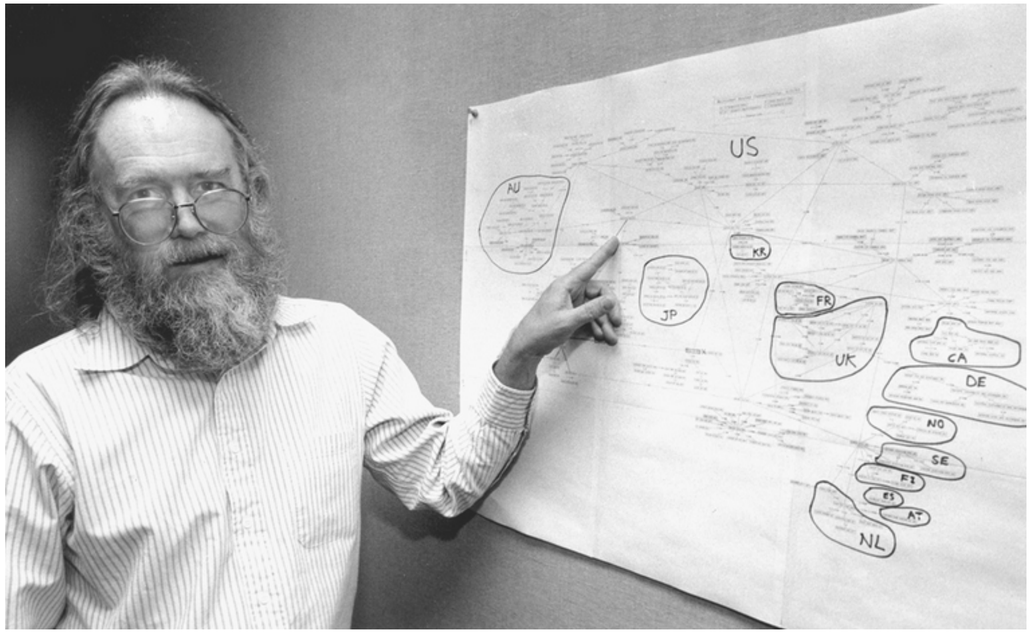
Internet Protocol (IP) Address

- 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)

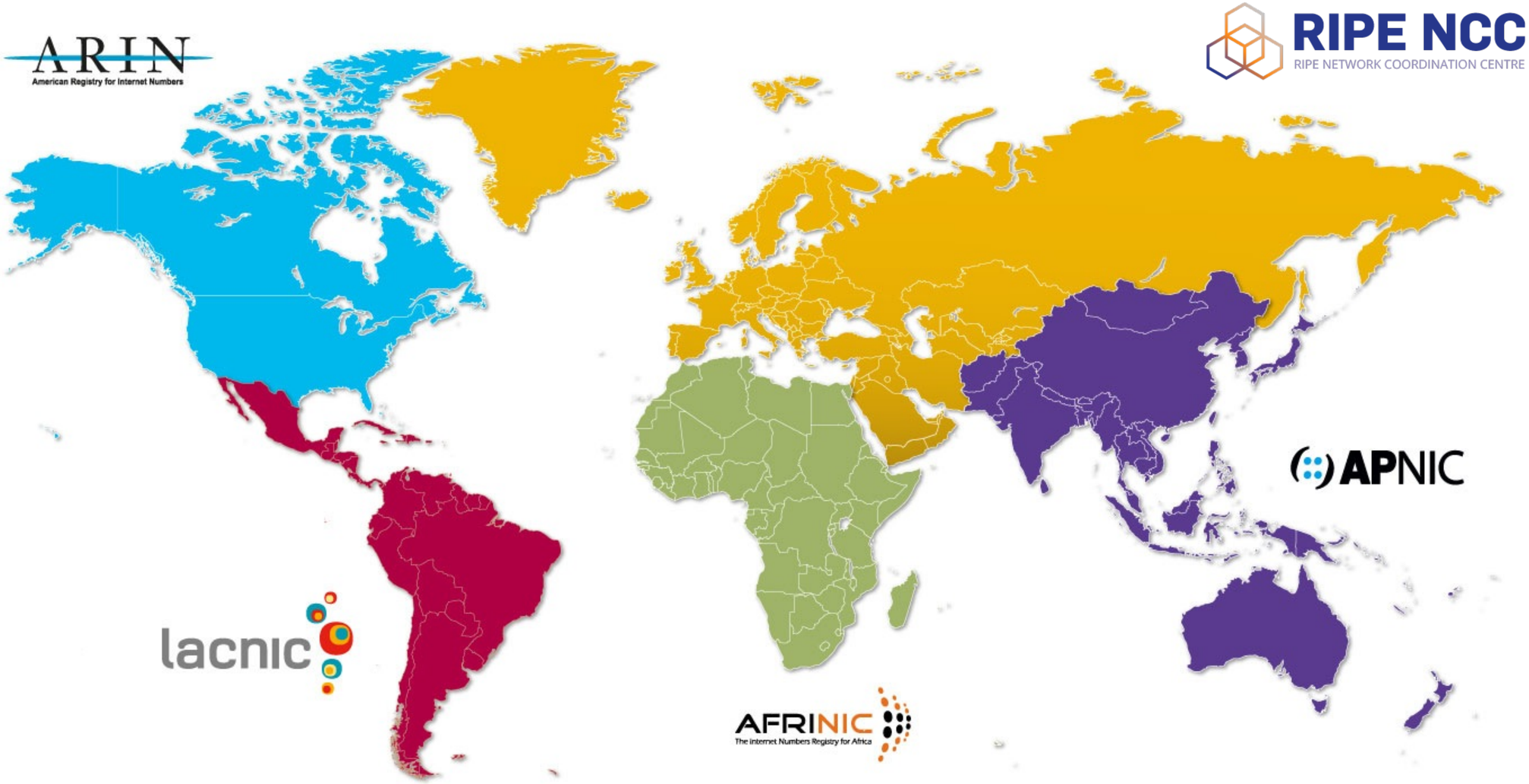
How to make sure IPs are unique?

- We need a coordinator



Jon Postel
(1943-1998)
“The Internet Assigned Numbers Authority (IANA)”

Where are the RIRs?



What is RIPE NCC?

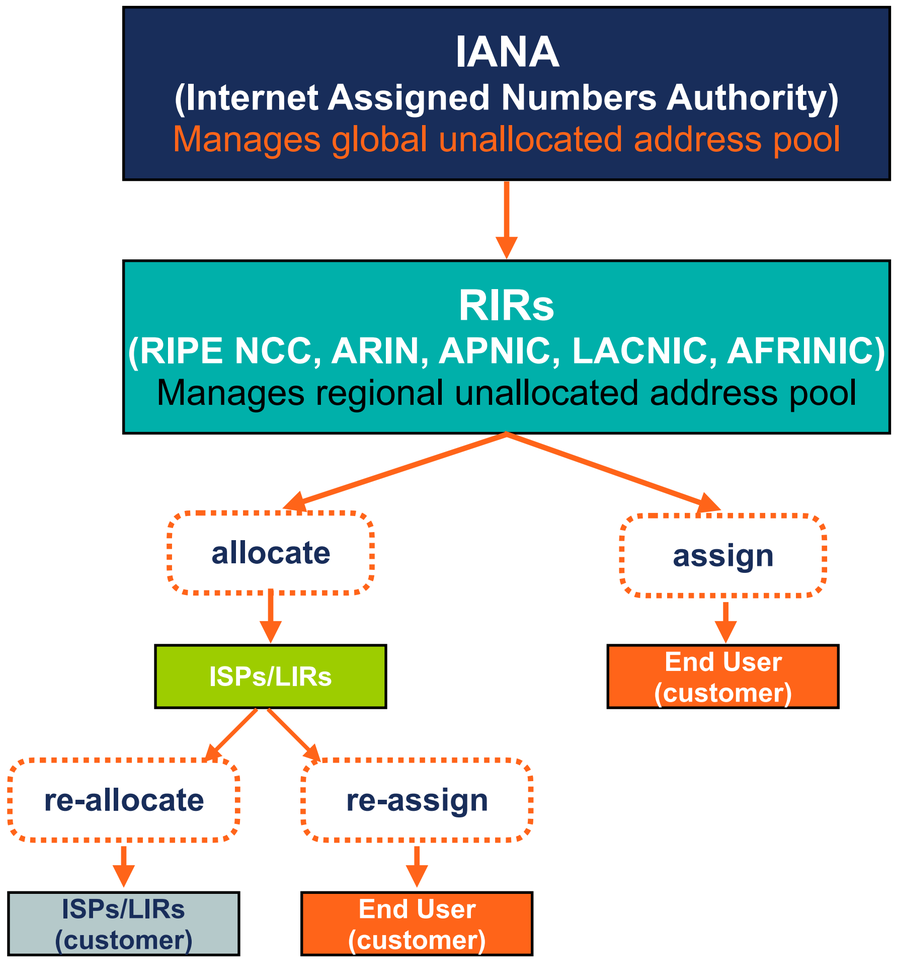
- RIPE Network Coordination Centre
- Established in 1992
- Independent, not-for-profit, membership organisation
- One of the five RIRs (Regional Internet Registry)
- Serving Europe, the Middle East, parts of Central Asia
- Around 140 staff based in Amsterdam, Dubai and Moscow

What is an RIR?

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

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



What is in the RIPE Database?

- Registration information about
  - IP addresses and AS Numbers issued by the RIPE NCC
  - IP addresses and AS Numbers issued prior to the establishment of the RIRs (legacy space)
  - Original registration date
  - Organisations that hold these resources (ORGs)
  - Points of Contact for resources or organisations (POCs)
  - Customer reassignment information (from ISPs to their customers)
  - Referential information to the authoritative RIR

www.metu.edu.tr
144.122.145.153

Responsible organisation: Middle East Technical University
Abuse contact info: abuse@metu.edu.tr

```
inetnum:        144.122.0.0 - 144.122.255.255
netname:        METU-NET
descr:          Middle East Technical University(METU)
descr:          Computer Center
descr:          Ankara
country:        TR
org:            ORG-METU1-RIPE
admin-c:        MH4497-RIPE
tech-c:         MH4497-RIPE
status:         LEGACY
mnt-by:         AS1967-MNT
mnt-domains:    AS1967-MNT
mnt-irt:        irt-METU-NET
created:        2002-03-04T13:03:43Z
last-modified:  2019-12-04T13:09:45Z
source:         RIPE
```

What is not in the RIPE Database?

- Domain names
- Certain customer reassignments
  - Example: private residence
- Accurate geographic location of the network or end user customer

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

RIPE Policy Development

- Process described in document ripe-642
- Decisions based on mailing list discussion
  - Face to face meetings help
- Rough Consensus
  - Properly address all concerns and objections
  - Work out differences
  - No voting or counting

Benefits of a Regional Approach

- We are very close to our users (stakeholders)
  - Easier communication
  - Easier to maintain accurate registry
- Policies can adapt to regional differences
  - Different stages of Internet development
  - Different priorities amongst stakeholders
- Overlap exists between community members
  - All policy development is open to everyone
  - No requirement to be from inside the region

Online Learning

- Online Webinars: ripe.net/support/training/webinars/webinar-recordings
- RIPE Academy: academy.ripe.net

RIPE Database

Learn how the RIPE Database works. Practise querying, creating and updating objects in the database. Understand database best-practices and more.

Introduction to IPv6

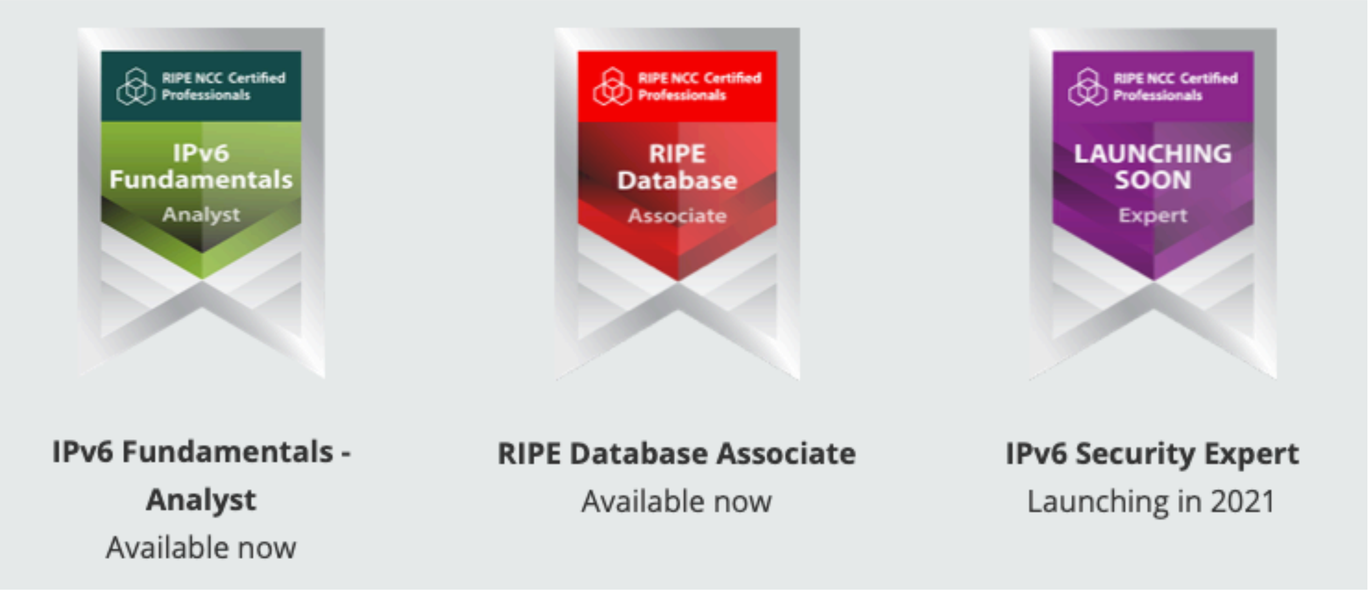
Get started with IPv6. You will learn how IPv6 addresses work, how to subnet, best-practices and IPv6-related RFCs among other topics.

Microlearnings

Learn about the mechanisms that make the Internet work.

Online Learning

- RIPE NCC Certified Professionals: ripe.net/support/certified-professionals
- Write to exams@ripe.net if interested



IPv4 and IPv6

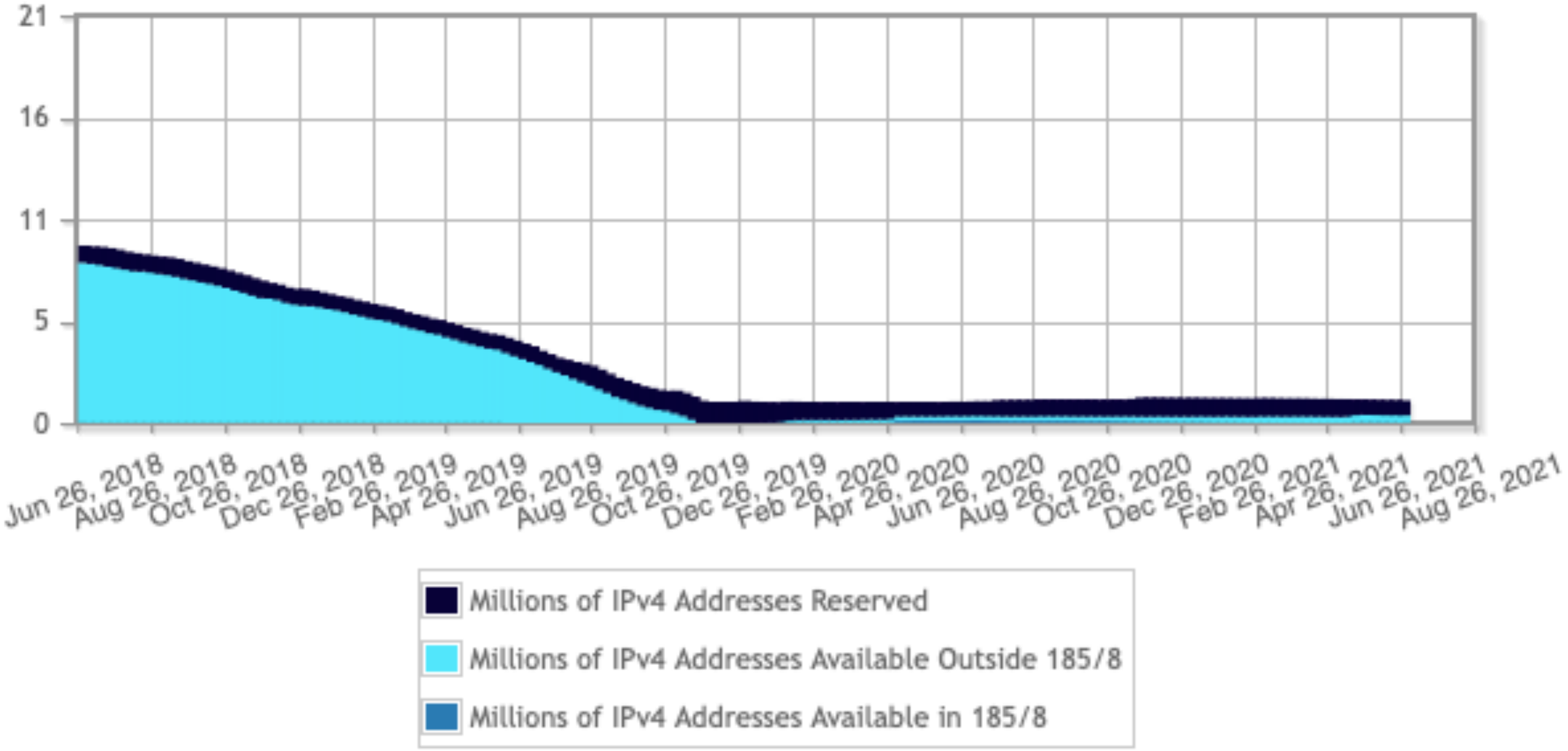
Internet Protocol (IP) Address

- 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)
  - 2^128 addresses available
  - 340282366920938463463374607431768211456 options
- Example:
  - IPv4: 192.0.2.53
  - IPv6: 2001:0db8:582:ae33::29

IPv6 and IPv4 are not interoperable

- Design feature, not a bug; easier to deploy
- You can use both protocols at the same time on the same network without interference
- You can “retrofit” IPv6 onto existing networks without breaking or removing IPv4
- Computers which have both can choose to use either IPv4 or IPv6

RIPE NCC's IPv4 Address Pool

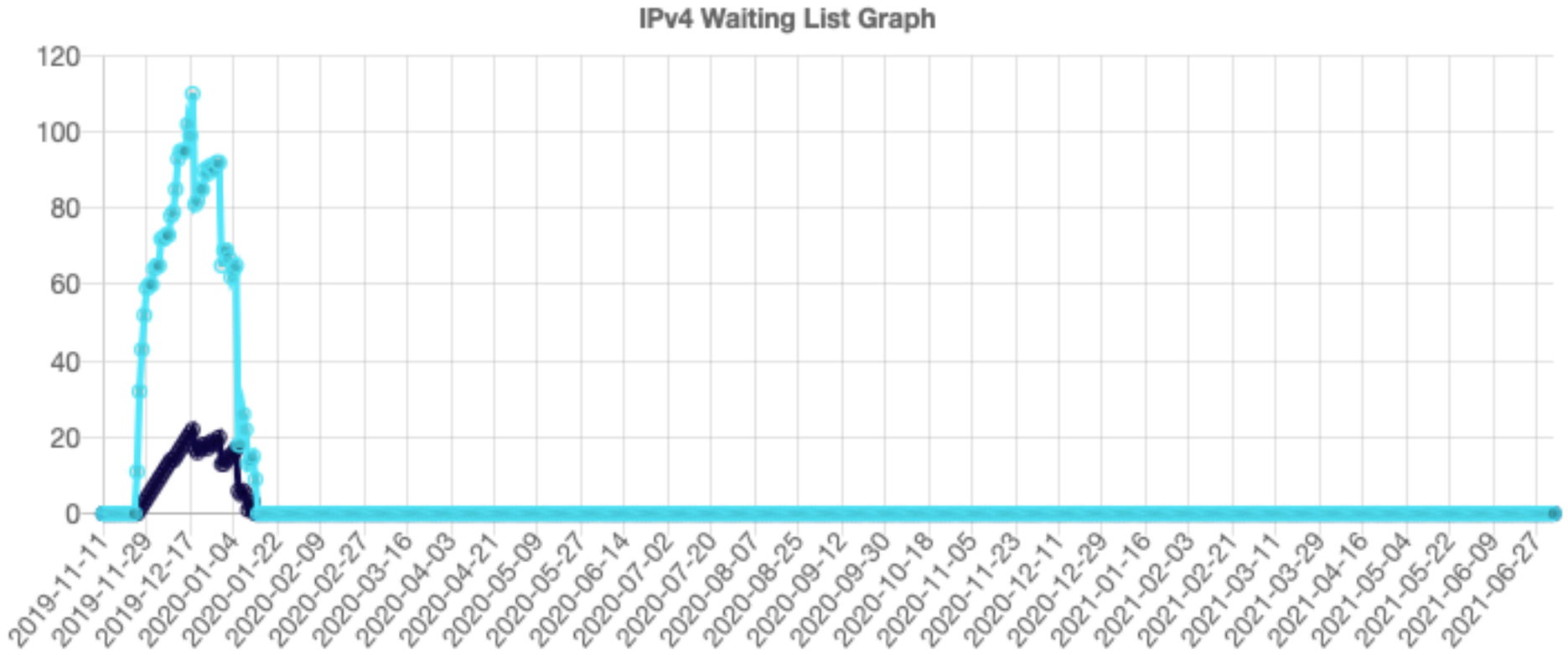


Still Recovering Some IPv4 bits

- From organisations that have gone out of business
- From closed LIR accounts
- From networks that return addresses they no longer need

The Waiting List

- LIRs that have submitted an IPv4 request can see their position on the waiting list in the LIR Portal



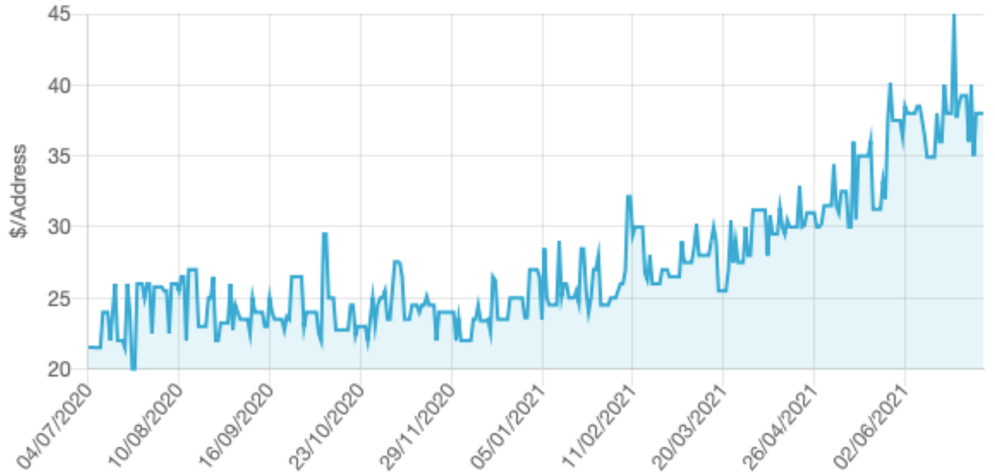
The Waiting List

Only LIRs that have never received an IPv4 allocation from the RIPE NCC (of any size) may request addresses from the waiting list, and they are only eligible to receive a single /24 allocation.

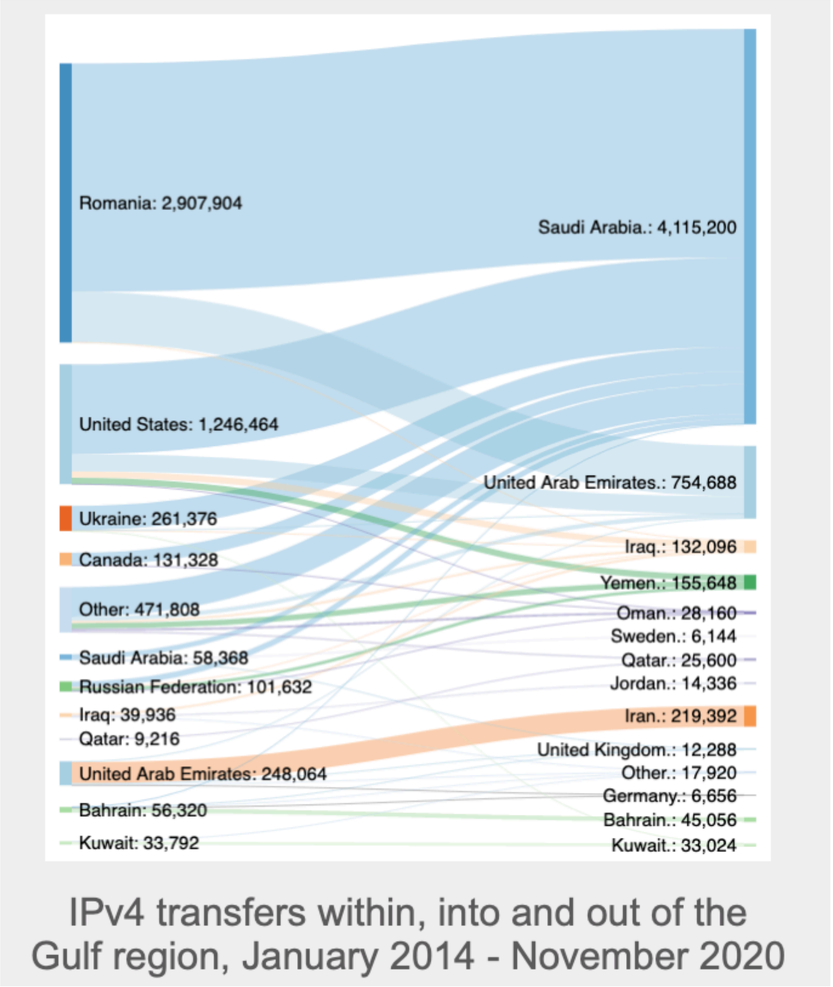
That’s 256 addresses…

IPv4 Transfer Market

- $28-$45 depending on the size of the block
- Increase of demand
- Big blocks are becoming scarce



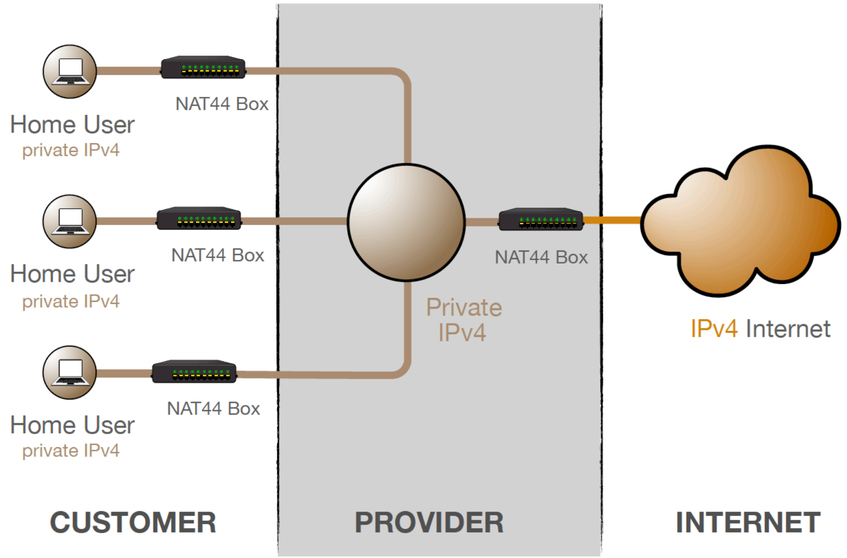
IPv4 Transfer Market



IPv4 transfers within, into and out of the Gulf region, January 2014 - November 2020

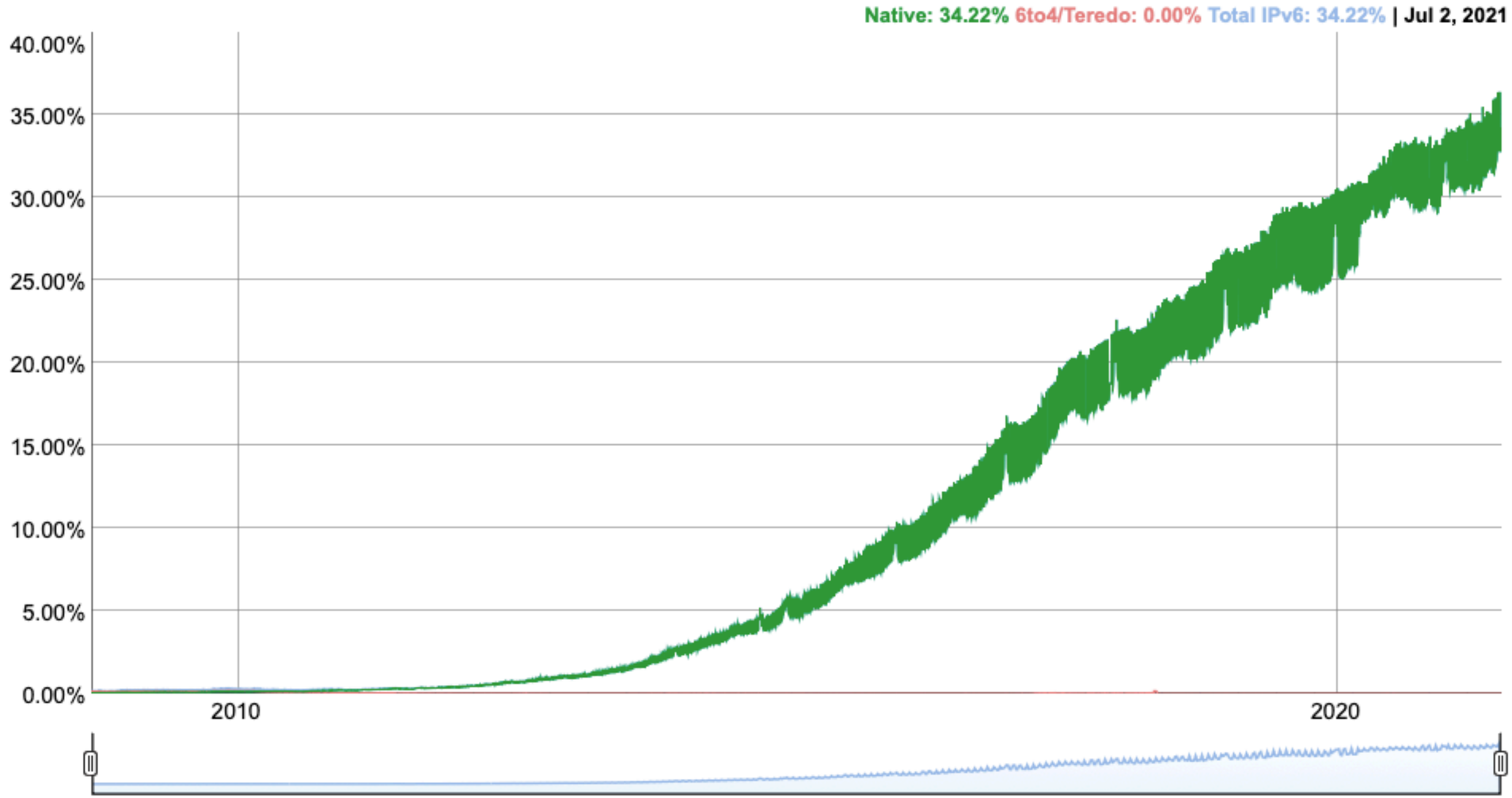
Network Address Translation (NAT)

- Instead of one IPv4 address per customer
  - Share a single IPv4 address with multiple customers
  - Internal addresses only have to be unique locally
  - Common amongst mobile network operators
- However:
  - Breaks the end-to-end connectivity model of the Internet
  - Inhibitor to “permissionless innovation”
  - NATs are expensive to scale
  - Difficult for law enforcement to identify people behind IPs

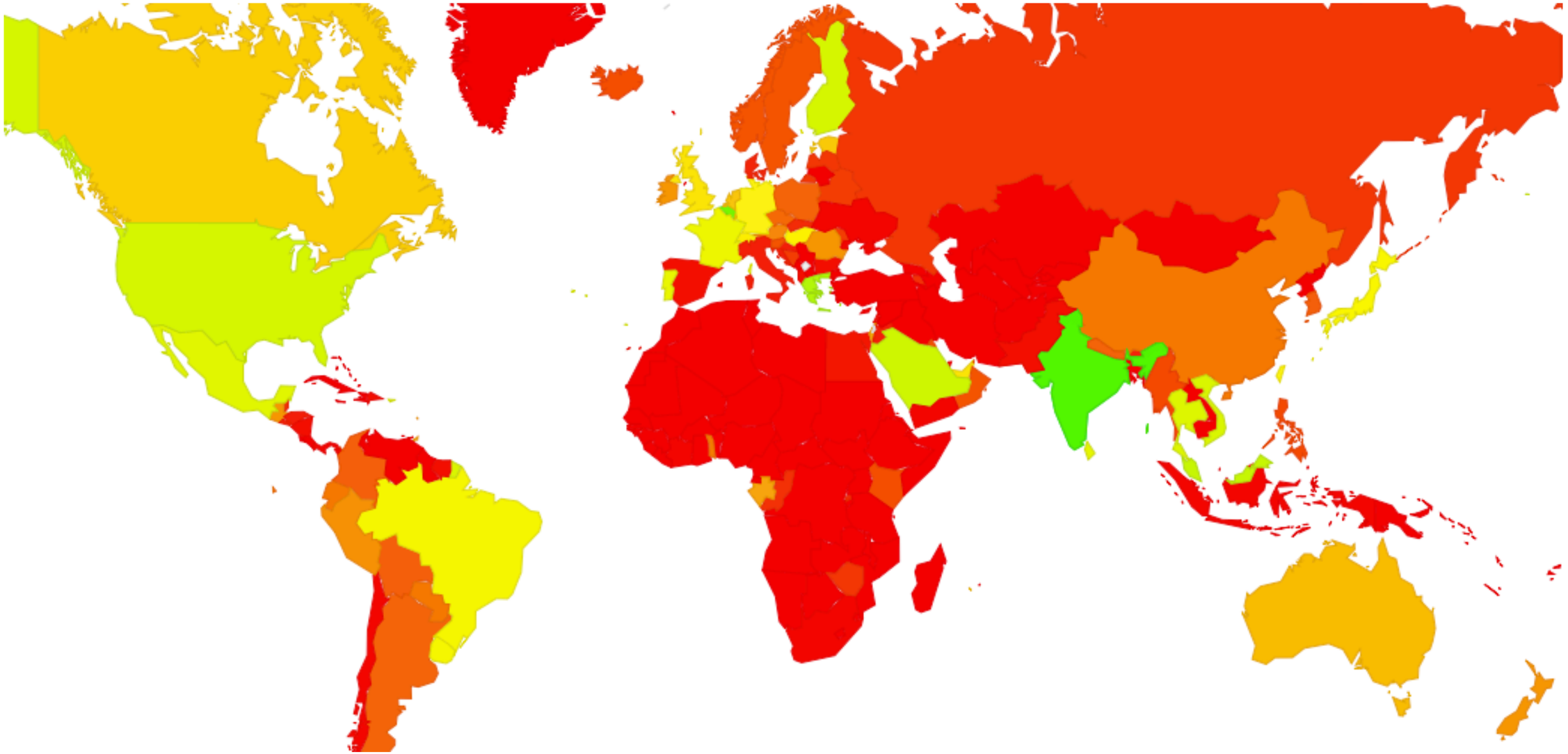


IPv6 Adoption

We are continuously measuring the availability of IPv6 connectivity among Google users. The graph shows the percentage of users that access Google over IPv6.



IPv6 Adoption



Top countries

Country	IPv6 Capable	IPv6 Preferred
India, Southern Asia, Asia	74.18%	70.47%
Saint Barthelemy, Caribbean, Americas	74.02%	74.02%
Mayotte, Eastern Africa, Africa	65.39%	64.90%
Belgium, Western Europe, Europe	61.31%	60.75%
Greece, Southern Europe, Europe	50.82%	50.52%
Malaysia, South-Eastern Asia, Asia	47.11%	45.30%
Saudi Arabia, Western Asia, Asia	45.40%	44.54%

Why the hold up?

- “We still have enough” or “We use NAT”
- Old equipment
- Lack of expertise
- Lack of management buy in
- A lof of content is still on IPv4

Questions

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