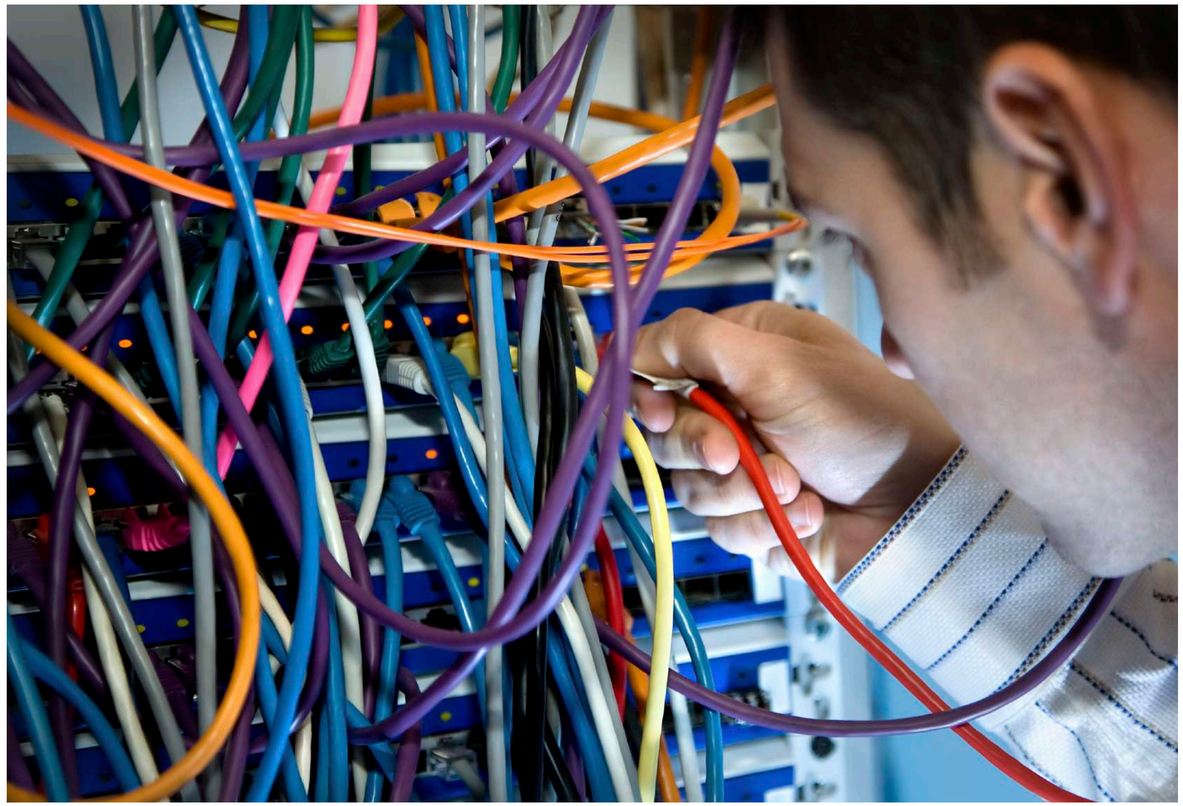
RIPE NCC
RIPE NETWORK COORDINATION CENTRE

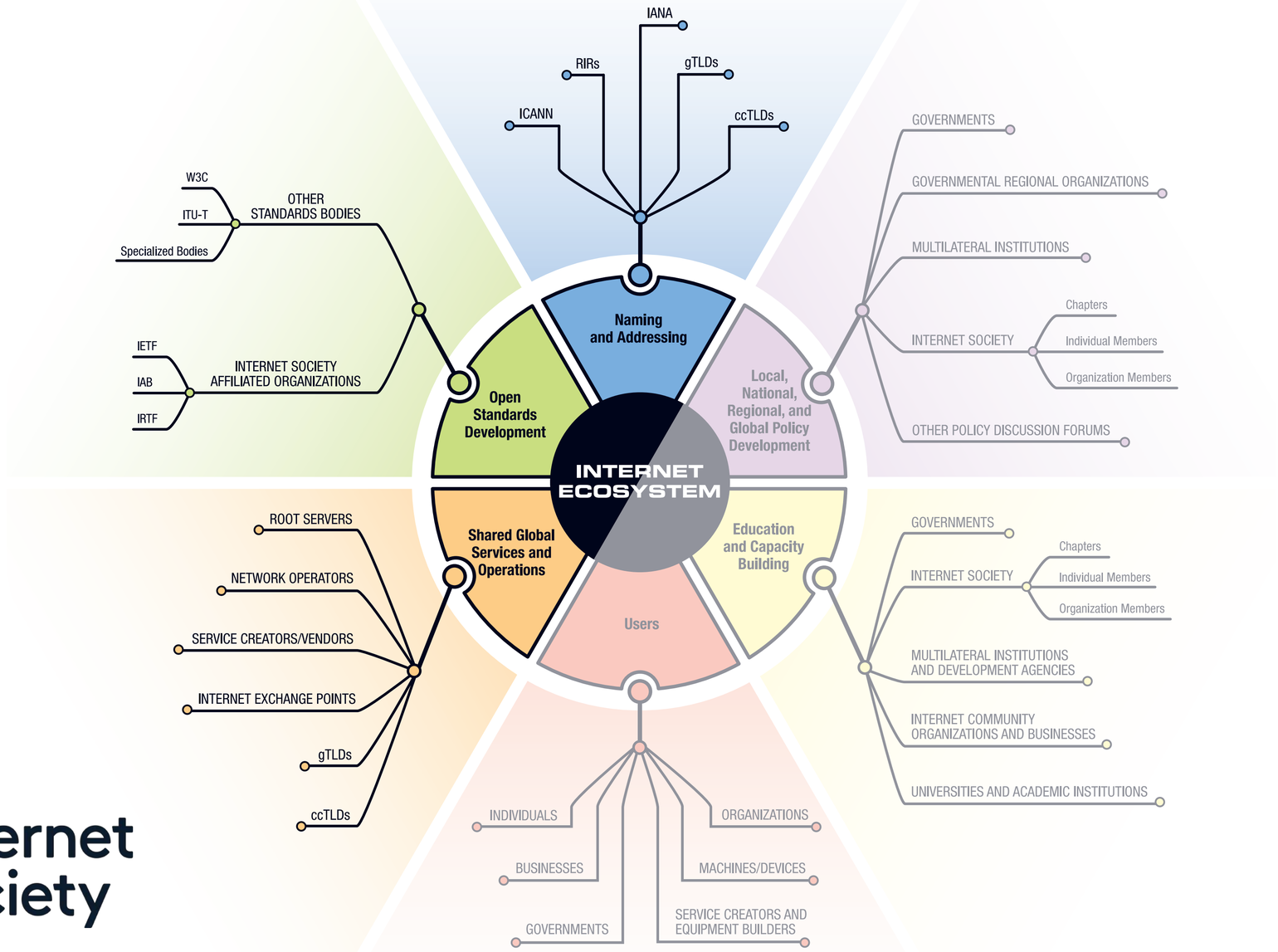
Managing the network of networks

Ongoing evolution in the governance of Internet infrastructure

Chris Buckridge | 27 September 2021 | VSIG 2021 Infrastructure Session

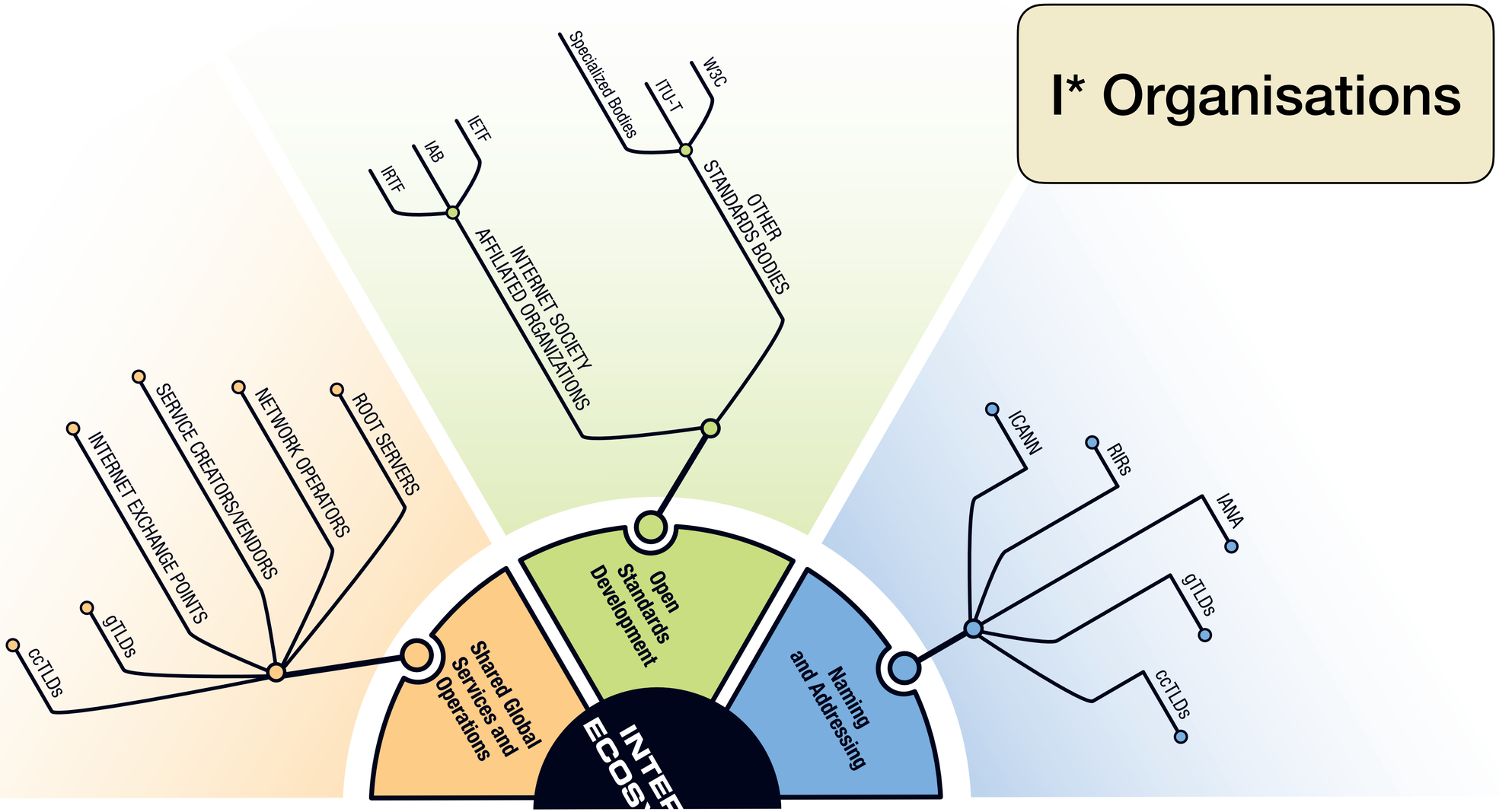
Infrastructure?





Internet Society

Internet Infrastructure



RIPE NCC

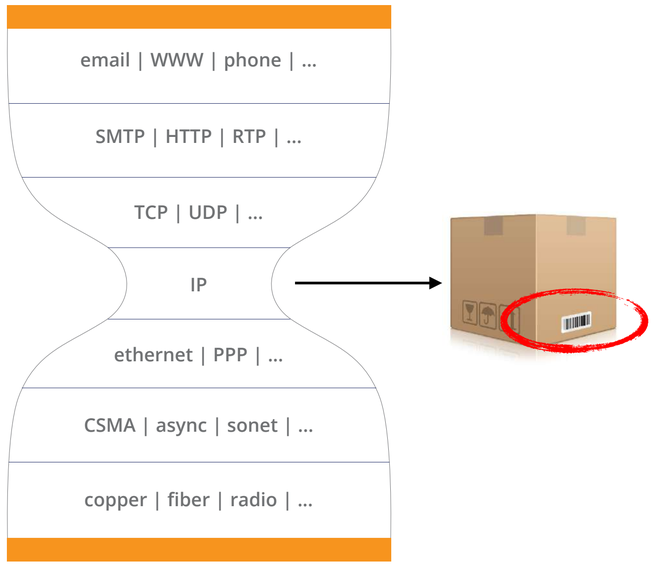
- A not-for-profit membership association under Dutch law
- Founded in 1992
- Secretariat of RIPE community
- Serves as Regional Internet Registry for 76 countries
- Operates K-root
- Around 160 staff based in Amsterdam, Dubai, and around the service region

Today’s Presentation

- IP address management and the Regional Internet Registries
- The root server system
- The IANA stewardship transition

Internet Protocol is Everywhere

- The Internet Protocol allows packets of date to move across the Internet
- An IP address is what defines an Internet connection
  - The IP address is a fundamental building block of any Internet-based service
- Each address must be unique in the context of the network
  - In a global network, the address needs to be globally unique



Two flavours of IP

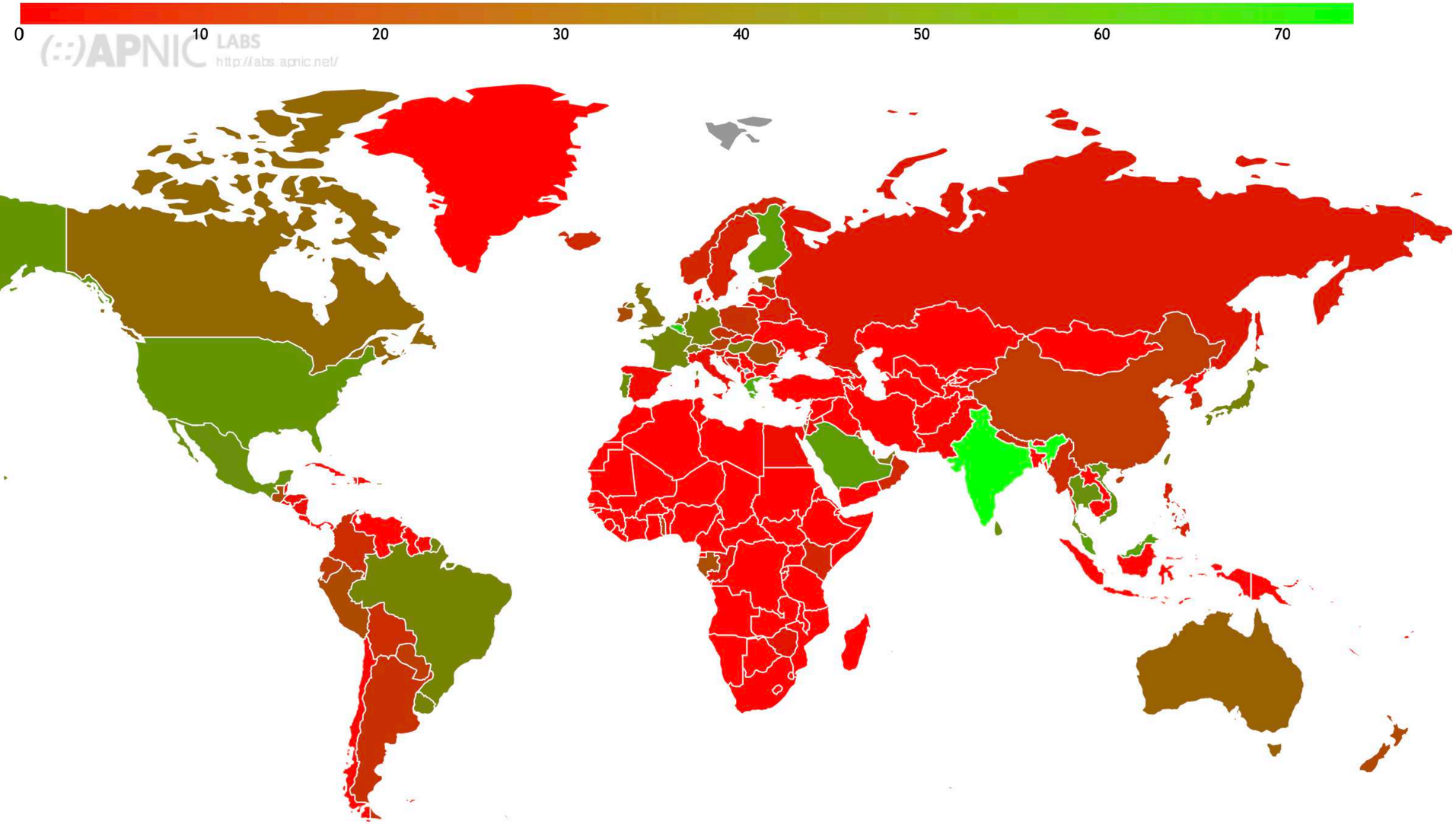
IPv4

- First deployed 1982
- 32-bit addresses
- 2^{32} unique addresses (4,294,967,296)
- Written as four “octets”, separated by periods
  - e.g. **192.0.2.130**

IPv6

- Developed in the late 1990s
- 128-bit addresses
- 2^{128} unique addresses (340,282,366,920,938,463,463,374,607,431,768,211,456)
- Written as eight hexadecimal “hextets”, separated by colons
  - e.g. **2001:db8::8a2e:370:7334** (the double-colon can stand for multiple 0-value sextets)

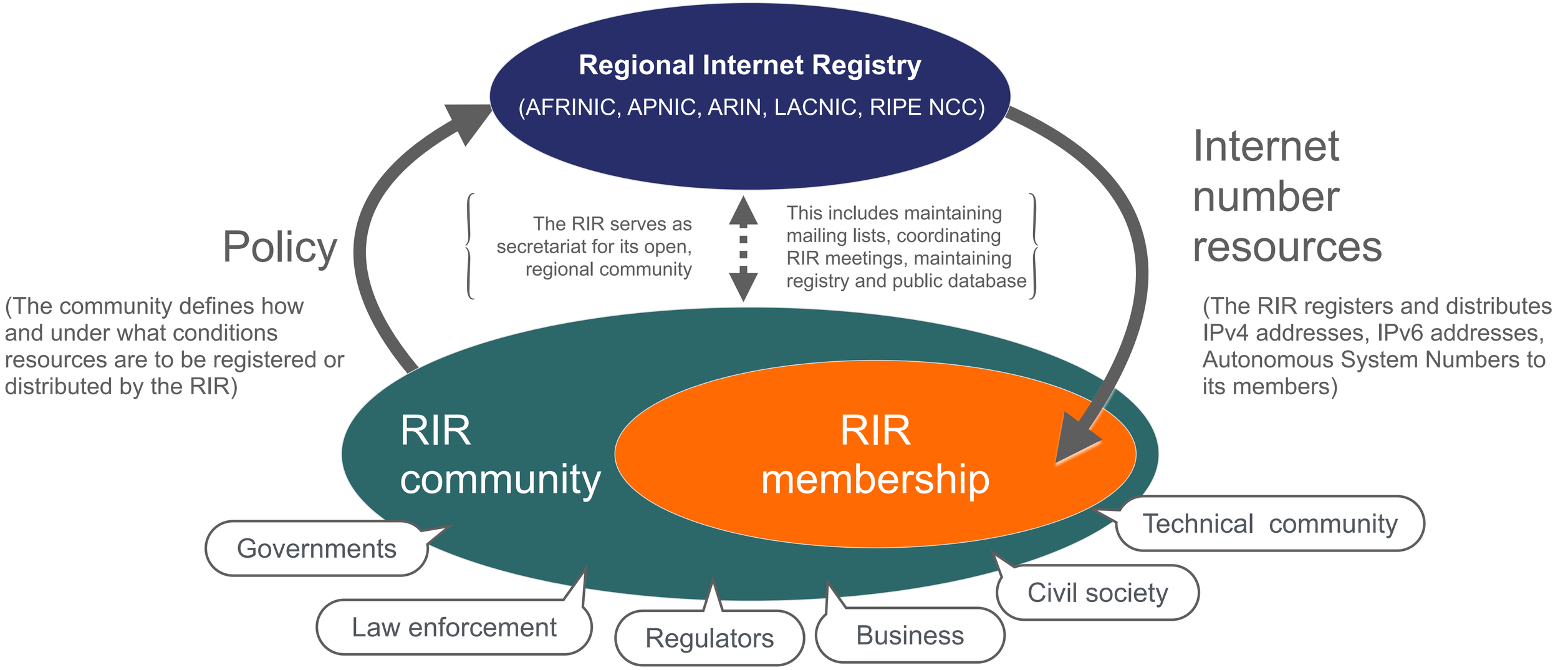
IPv6 deployment



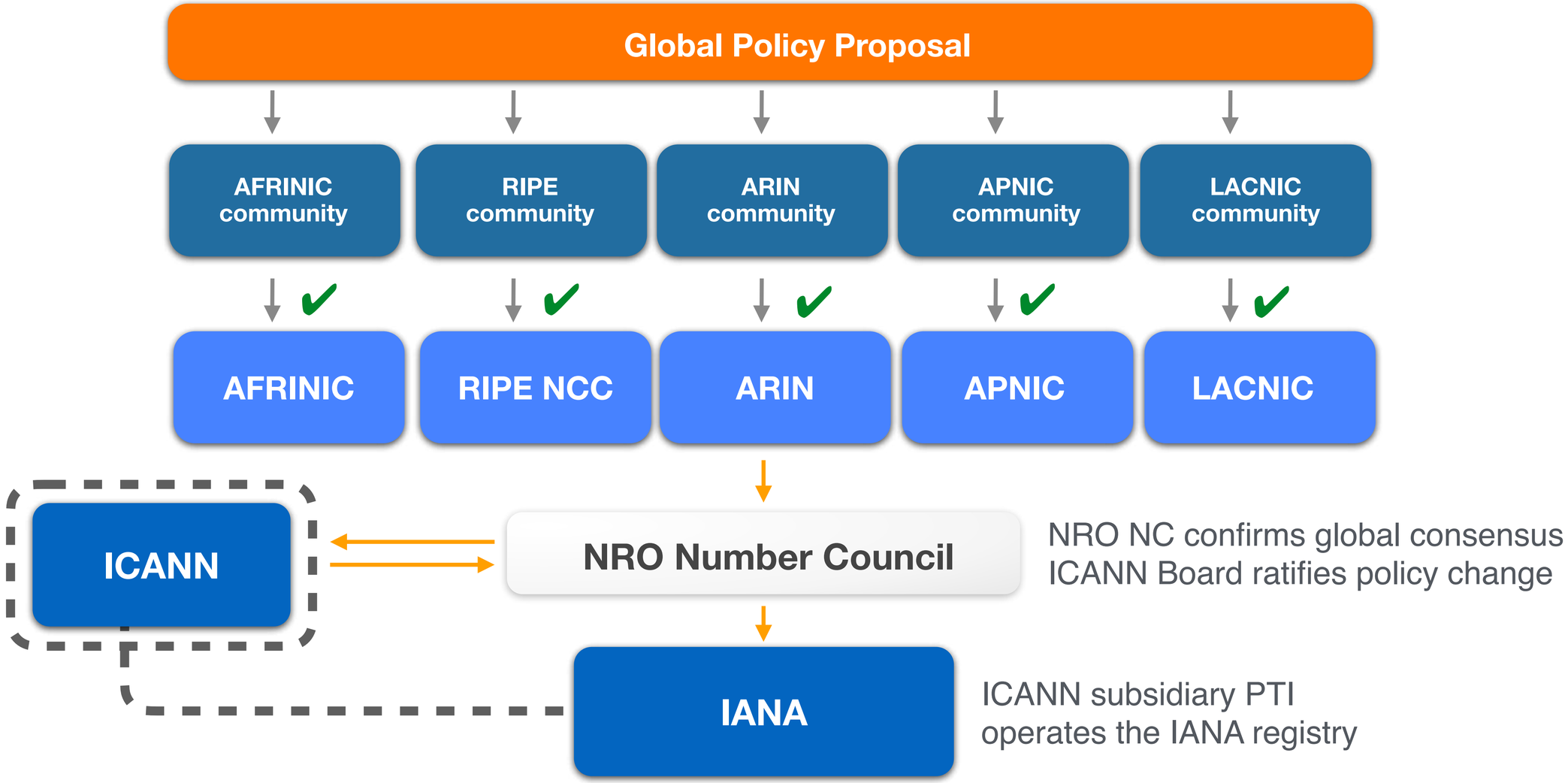
Regional Internet Registries (RIRs)

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

The RIR Ecosystem



Global Policy Development

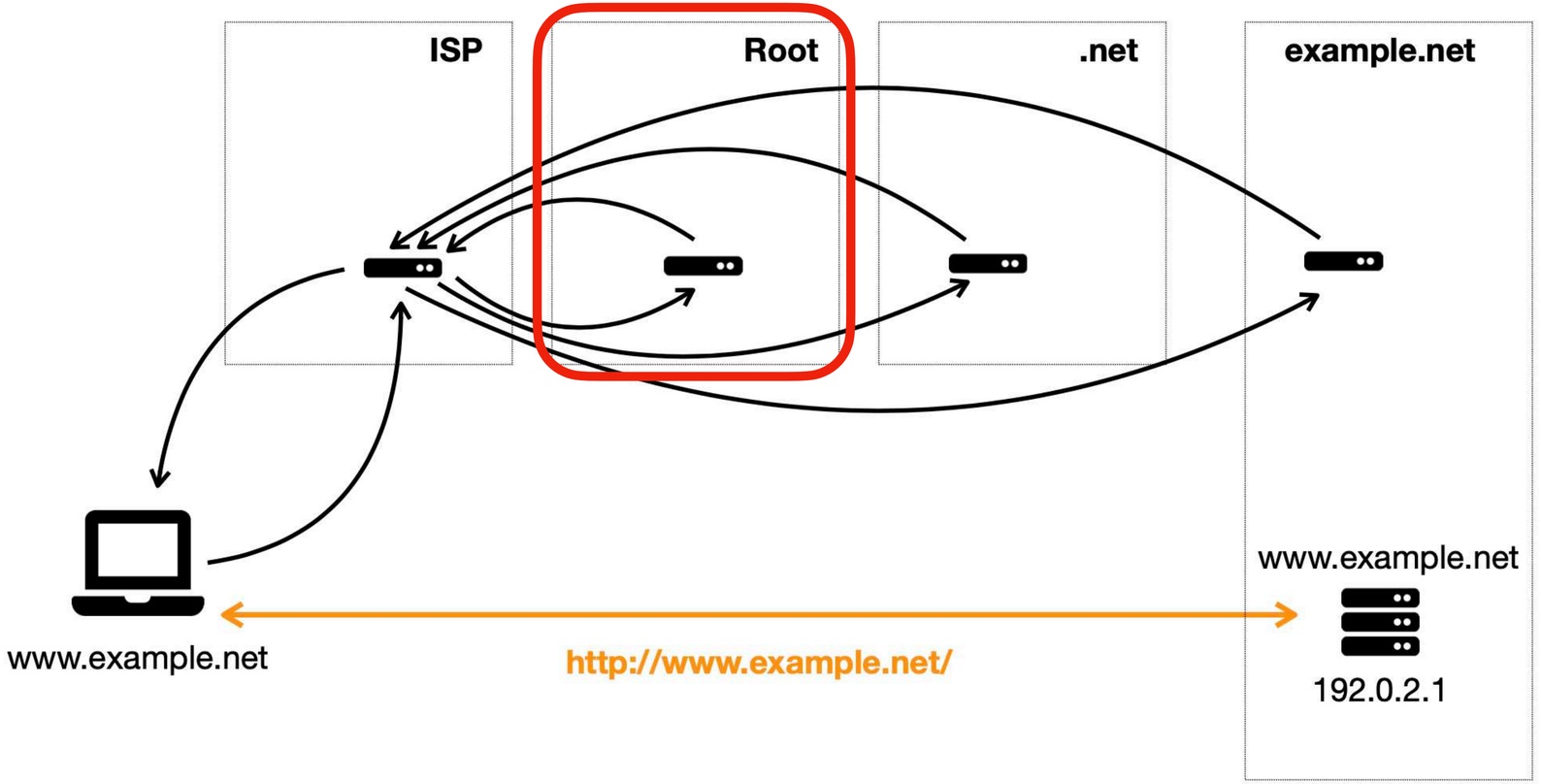


Principles & Challenges

- Key principles
  - An accurate, up-to-date registry of Internet number resource holdings
  - Open, transparent, inclusive, bottom-up development of relevant policies
- Some challenges
  - Exhaustion of IPv4 address pool
    - Emergence of a market in IPv4 addresses
    - Commodification of IP addresses creating incentives for fraud
  - Slow uptake of IPv6 across the Internet
  - RIR operation in conflict with local or regional regulation
    - …either in the RIR domicile or members' countries

What is a Root Server?

- A global network of machines that “serve” the root zone file



Some Familiar Faces…

- There are 12 root server operators:
  - Verisign
  - USC-ISI
  - Cogent
  - UMD
  - NASA Ames
  - ISC
  - DISA DoD NIC
  - ARL
  - Netnod
  - RIPE NCC
  - ICANN
  - WIDE

…but more than 1400 instances globally!

The Root Server System

https://root-servers.org

Governance of the Root Servers

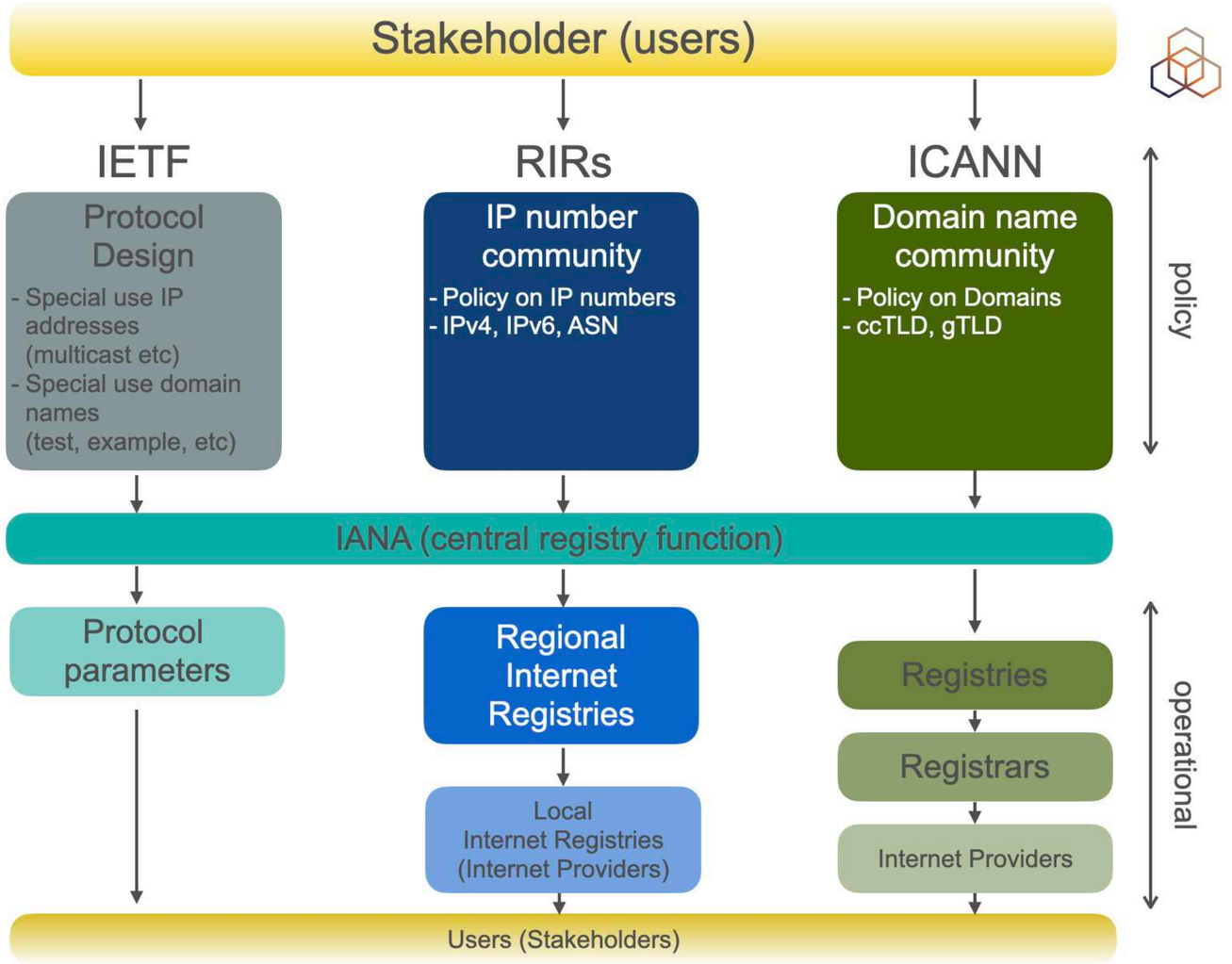
- “The 13 root name servers are operated by 12 **independent** organisations.”
  - https://root-servers.org
- “The **Root Server System Advisory Committee (RSSAC)** advises the ICANN Board and community on matters relating to the operation, administration, security, and integrity of the Root Server System”
  - https://www.icann.org/groups/rssac
- History of the Root Server System
  - https://www.icann.org/en/system/files/files/rssac-023-17jun20-en.pdf
- A new proposal for governance of the root server system was put forward in 2018:
  - https://www.icann.org/en/system/files/files/rssac-037-15jun18-en.pdf

IANA Stewardship Transition

> “The Internet’s largest single, global, multistakeholder policy development project”
>
> *Nurani Nimpuno, May 2016*

- IANA = Internet Assigned Numbers Authority
  - Global pool of Internet number resources (and other top level registries, including the DNS root zone)
  - Managed under contract to U.S. government agency since the early days of the Internet
  - In 2014, U.S. government announced intention to pass stewardship to the global community

Multistakeholder Stewardship



IANA Stewardship Transition

- Transition completed on 1 October 2016
- As a result:
  - Five RIRs have a Service Level Agreement (SLA) in place with ICANN, who is responsible for operation of the IANA functions
  - RIR operations unaffected
  - The RIRs and their communities are now ultimately responsible for the IANA number-related functions
- With greater power comes a greater focus on **accountability**

Questions

chrisb@ripe.net