Facilitating IPv6 Deployment

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RIPE NCC

Agenda

- Introduction
  - RIPE, the RIPE NCC and the Policy Development Process

- RIPE Labs
  - IPv6 Statistics and Measurements

- Capacity Building
  - IPv6 Meetings and Events

- Multi-stakeholder Engagement

RIPE NCC

- Not-for-profit independent association
  - Established in 1992 in Amsterdam

- One of five Regional Internet Registries (RIRs)

- Many other activities
  - Provide open community platform

- 7000+ members in 75 countries

- Does not make policies, oversees Policy Development Process (PDP)

RIPE NCC Services

- Member services
  - Distributing resources
    - IPv4
    - IPv6
    - AS numbers
  - Training courses
    - LIR
    - Routing Registry
    - IPv6

- Public services
  - RIPE Database
  - Reverse DNS
  - ENUM (e164.arpa)
  - K-root name server
  - RIPEstat, RIPE Atlas
  - E-learning
  - RIPE Labs
  - IPv6 Act Now

IP Address Distribution (IPv4 and IPv6)

```
          ┌──────────────┐
          │     IANA     │
          └──────┬───────┘
                 │
                 ▼
     ┌──────────────────────────┐          RIPE NCC
     │ Regional Internet Registry│◄─────────
     └────────────┬─────────────┘
                  │
                  ▼
     ┌──────────────────────────┐
     │  Local Internet Registry │
     └────────────┬─────────────┘
                  │
                  ▼
          ┌──────────────┐
          │   End User   │
          └──────────────┘
```
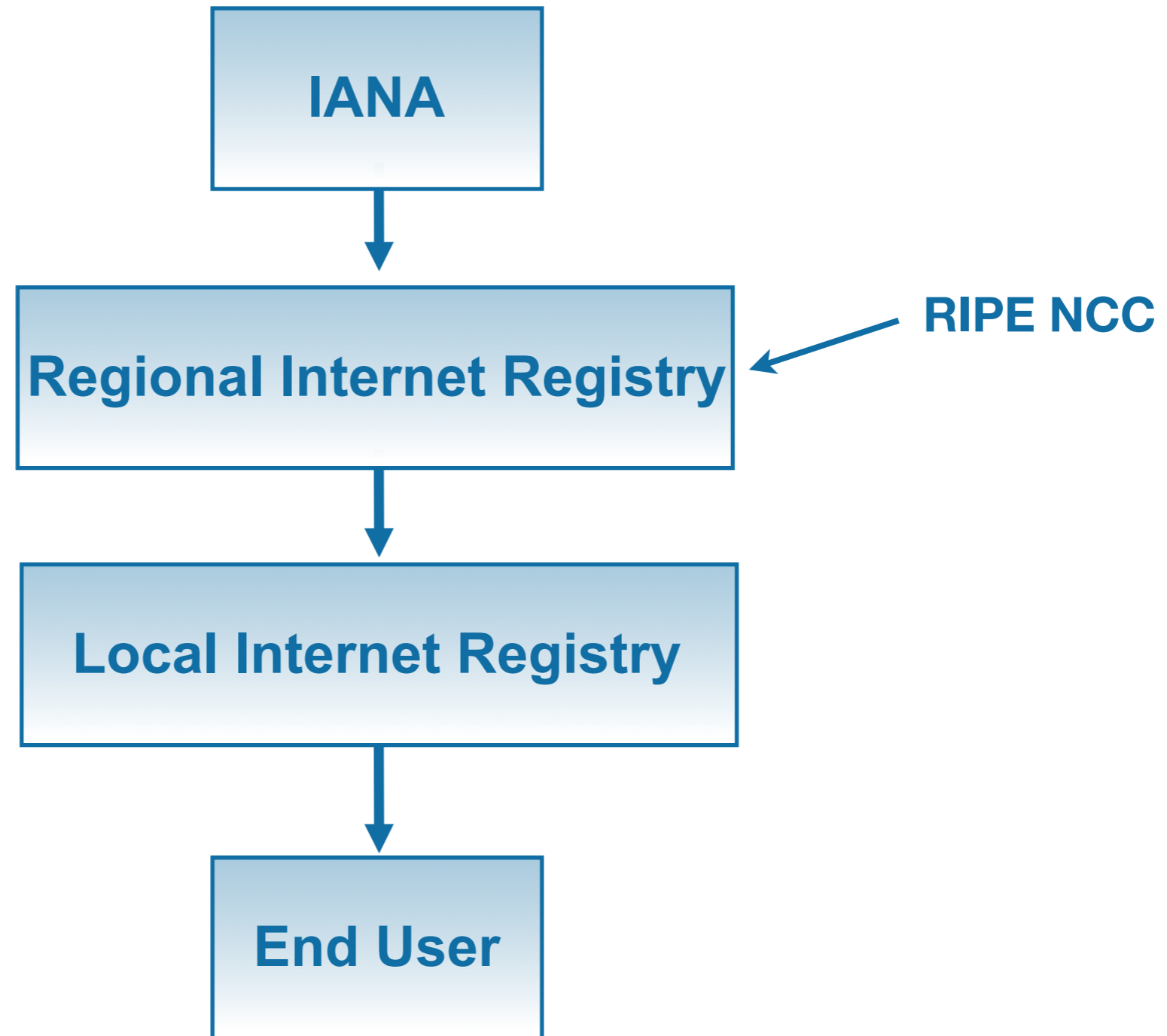
RIPE Policy Development Process

- Open to anyone
  - RIPE meetings, Working Group sessions
  - Public mailing lists

- Transparent
  - List discussions archived publicly
  - Meetings transcribed

- Developed bottom-up
  - By the Internet community (those who use the IP addresses)

RIPE Labs http://labs.ripe.net

- A platform and a tool for the community
    - open, innovative, easy to give feedback

- You can
    - Test and evaluate new tools and prototypes
    - Contribute new ideas and research results
    - Discover and discuss in forums and blogs

RIPE Labs

IPv6 on RIPE Labs

- IPv6 measurements compilation

- Measuring IPv6 at web clients and resolvers

- Measuring 6to4 brokenness

- IPv6 RIPEness

- IPv6 Customer Premise Equipment (CPE) survey

- World IPv6 Day Measurements

- Autonomous Systems (ASes) with IPv6 per Country

IPv6 RIPEness

- Rating system:

  – One star if the LIR has an IPv6 allocation

- Additional stars if:

  – IPv6 prefix is announced

  – A route6 object is in the RIPE Database

  – Reverse DNS is set up

- A list of all 4-star LIRs and country graphics:

  http://ripeness.ripe.net/

IPv6 RIPEness

IPv6 'ripeness'–rating of LIRs per country (2011–10–26)
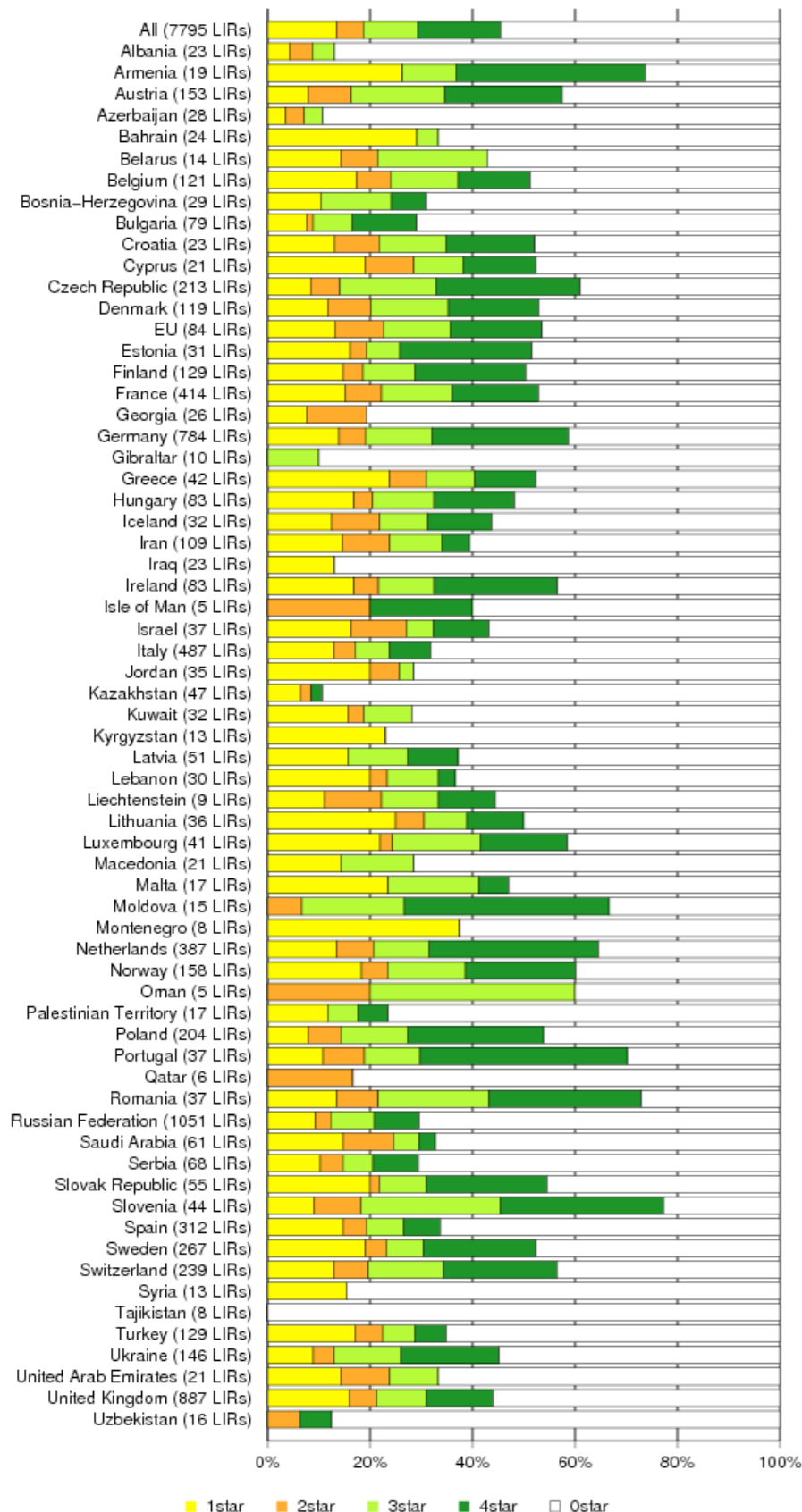
- Indication of an LIR's IPv6 readiness

- Only countries with ≥5 LIRs

- Awards LIRs

  - Visibility on web site

- Updated regularly

IPv6 RIPEness in the RIPE NCC Service Region

Legend: 1 star, 2 stars, 3 stars, 4 stars, No IPv6

- 4 stars: 16%
- 3 stars: 11%
- 2 stars: 5%
- 1 star: 14%
- No IPv6: 54%
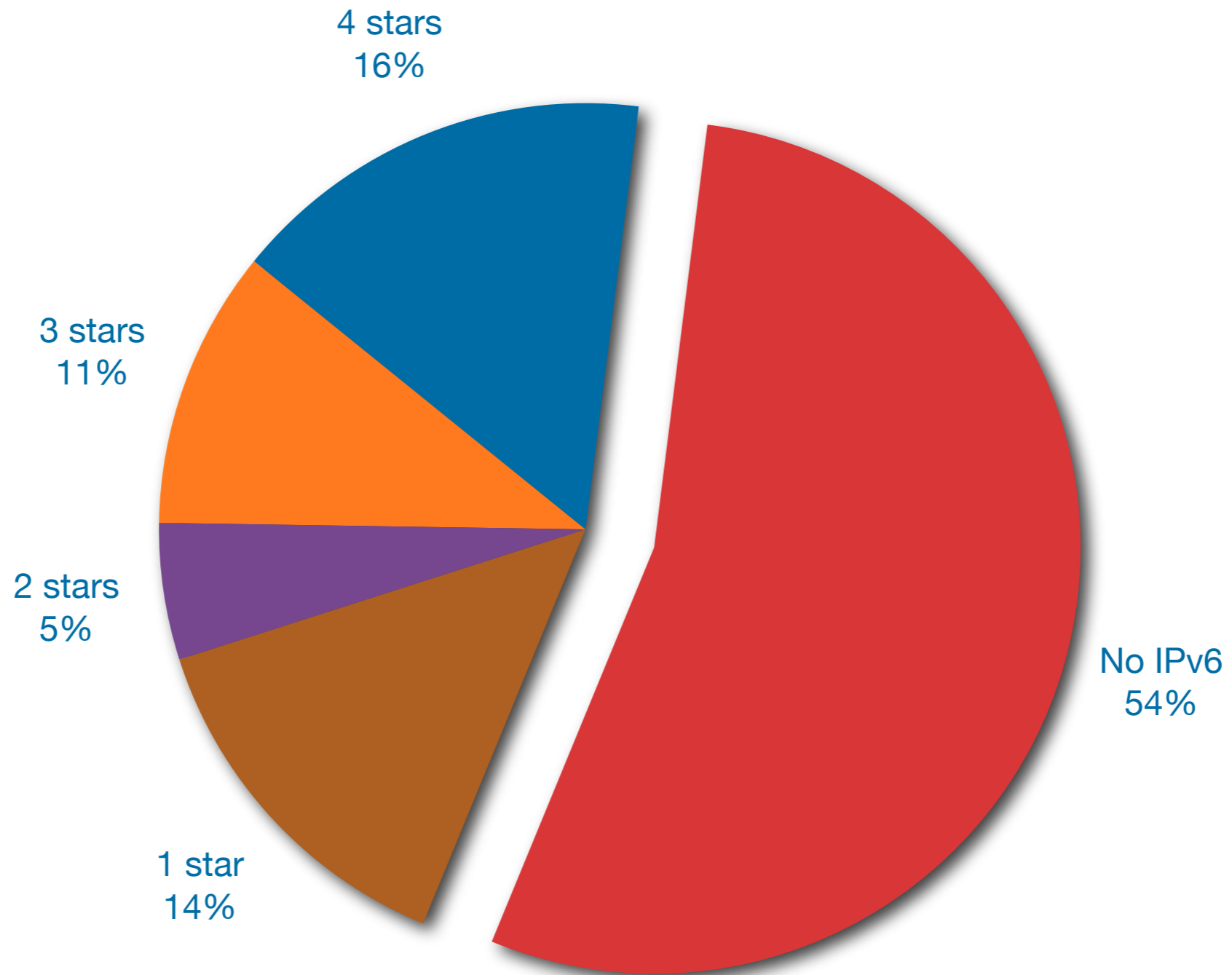
IPv6 RIPEness in Poland

- 1 star
- 2 stars
- 3 stars
- 4 stars
- No IPv6

4 stars
26%

No IPv6
46%

3 stars
13%

2 stars
6%

1 star
8%
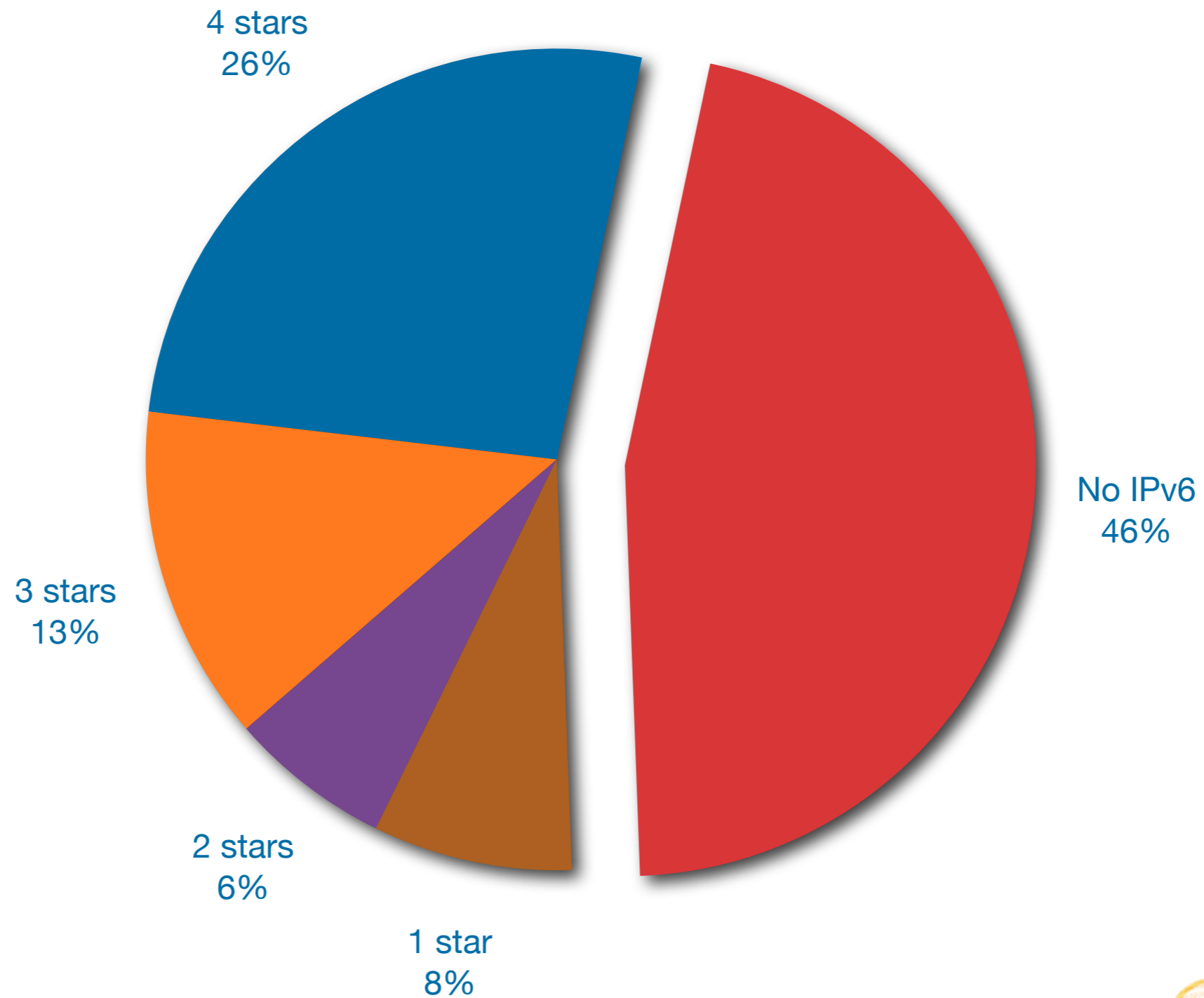
IPv6 Enabled ASes in Global Routing

- Any country or region possible, updated daily

http://v6asns.ripe.net
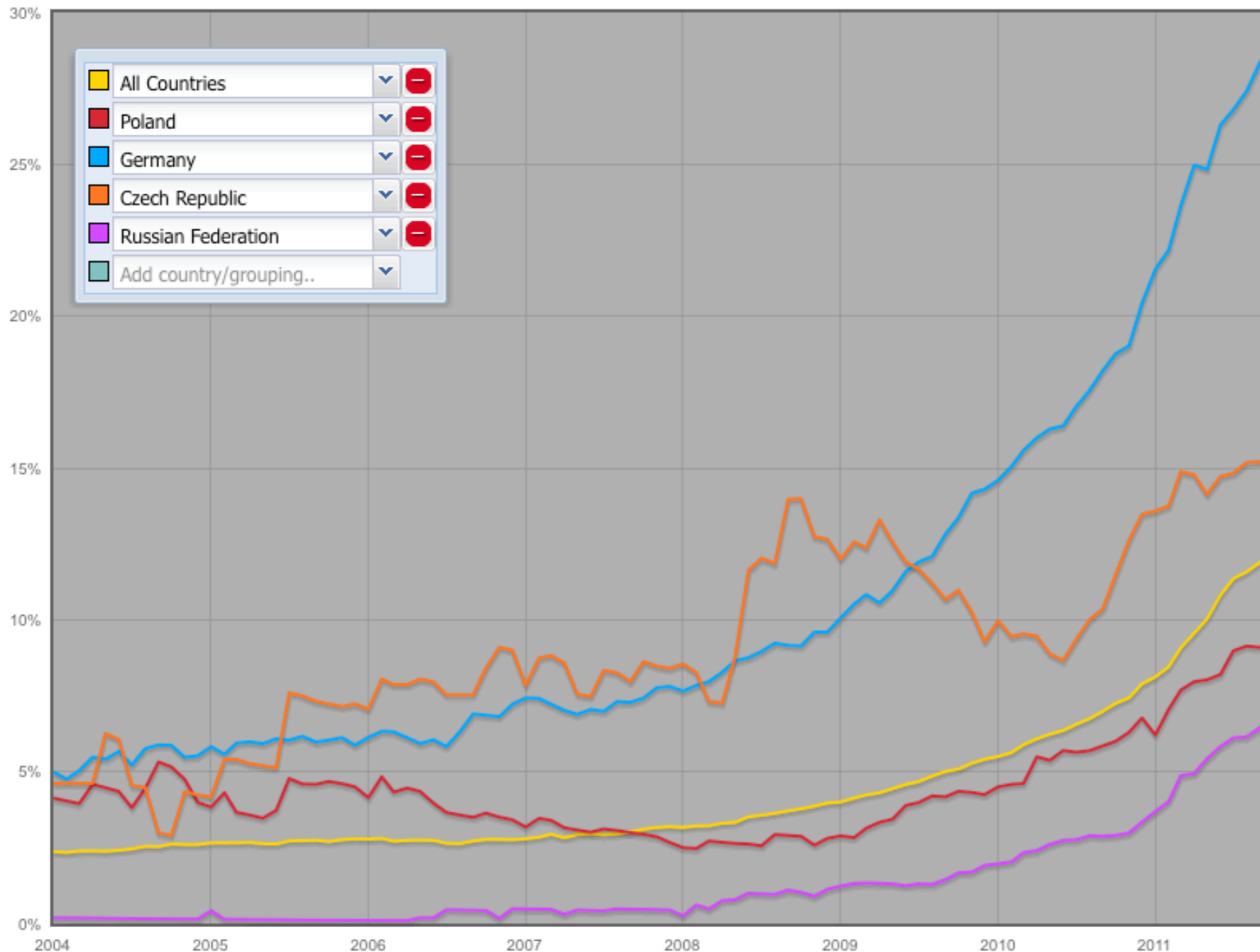
Accessing www.ripe.net over IPv6

IPv6 in web clients and the resolvers they use (daily bins)

client IPv6 preference
client IPv6 capability
clients with IPv6 capable resolver
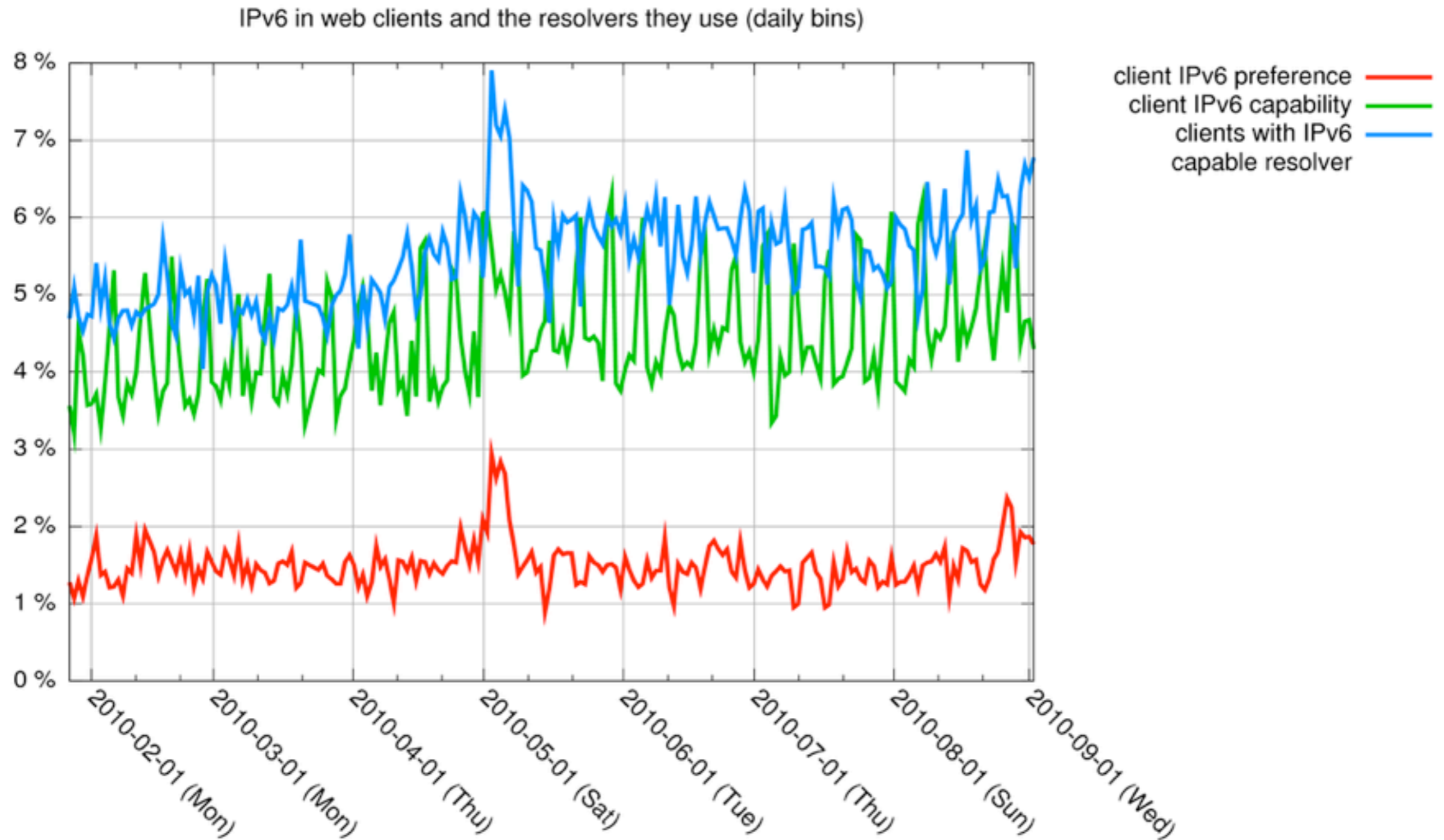
IPv6 Customer Premise Equipment Survey

- Survey among CPE vendors and users
- http://labs.ripe.net/Members/mirjam/ipv6-cpe-surveys

	AVM (FRITZ!Box)	Draytek	Zyxel	Juniper (ScreenOS)	Juniper (JUNOS)	Cisco	D-Link
Hardware version required	7270, 7570	Vigor 2130 series, vigor 120	All models released in 2010	All	All	Most SOHO boxes	Most new boxes
Minimum software level required	"Labor" only	2130:v1.3.0 120:v3.2.4.3	Per model, check vendor	6.1	10.2	12.4T or 15	see notes
Status	Beta	General deployment	Beta	General deployment	Early deployment	General deployment	General deployment
WAN layer 2							
Docsis 3.0	vendor	no	no	no	no	-	-
ADSL 2+	confirmed	120 only	vendor	confirmed	confirmed	confirmed	no
VDSL	confirmed	no	vendor	no	vendor	-	no
Ethernet	confirmed	vendor	vendor	confirmed	confirmed	confirmed	confirmed
FTTx	-	vendor	vendor	no	no	-	no
WAN Layer 3							
PPPoA	confirmed	no	vendor	no	vendor	confirmed	no
PPPoE	confirmed	confirmed	vendor	confirmed	confirmed	confirmed	vendor
RFC1483/bridge	vendor	no	vendor	no	no	vendor	no
RFC1483/routed	-	-	vendor	vendor	vendor	vendor	no
Plain IP	-	vendor	vendor	confirmed	confirmed	confirmed	no

World IPv6 Day Measurements

- Various measurements before, during, after
  - performance measurements
  - identifying glitches
  - monitoring long-term effects

http://labs.ripe.net/ipv6day
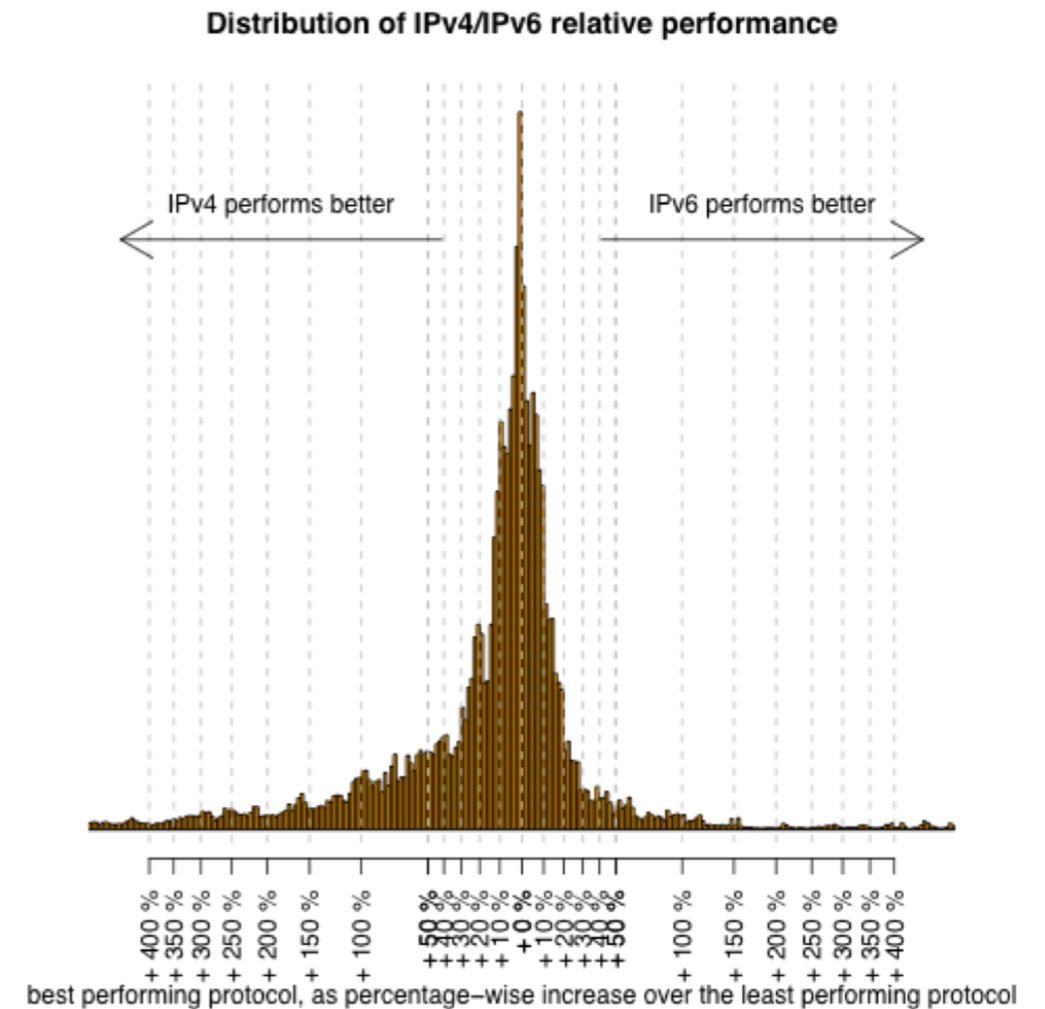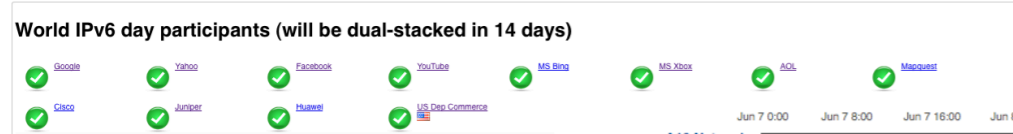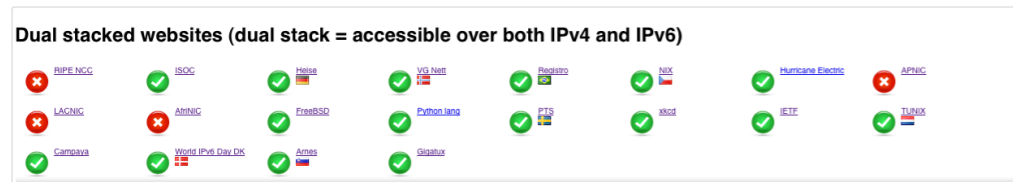
IPv6 Eye Chart

- End users could check IPv6 connectivity before and during World IPv6 Day

- Fetched content from WIPv6D participants, and from already dual-stacked websites

http://ipv6eyechart.ripe.net

IPv6 Eye Chart - One Option

- Partial reachability brokenness

Dual stacked websites (dual stack = accessible over both IPv4 and IPv6)

✗ RIPE NCC	✓ ISOC	✓ Heise 🇩🇪	✓ VG Nett 🇳🇴	✓ Registro 🇧🇷	✓ NIX 🇨🇿	✓ Hurricane Electric	✗ APNIC
✗ LACNIC	✗ AfriNIC	✓ FreeBSD	✓ Python lang	✓ PTS 🇸🇪	✓ xkcd	✓ IETF	✓ TUNIX 🇳🇱
✓ Campaya	✓ World IPv6 Day DK 🇩🇰	✓ Arnes 🇸🇮	✓ Gigatux				

World IPv6 day participants (will be dual-stacked in 14 days)

| ✓ Google | ✓ Yahoo | ✓ Facebook | ✓ YouTube | ✓ MS Bing | ✓ MS Xbox | ✓ AOL | ✓ Mapquest |
| ✓ Cisco | ✓ Juniper | ✓ Huawei | ✓ US Dep Commerce 🇺🇸 | | | | |

- Network operator needs to fix (not end-user)

- Very rare, and also happens in IPv4

DNS Overview Chart (http://v6day.ripe.net)
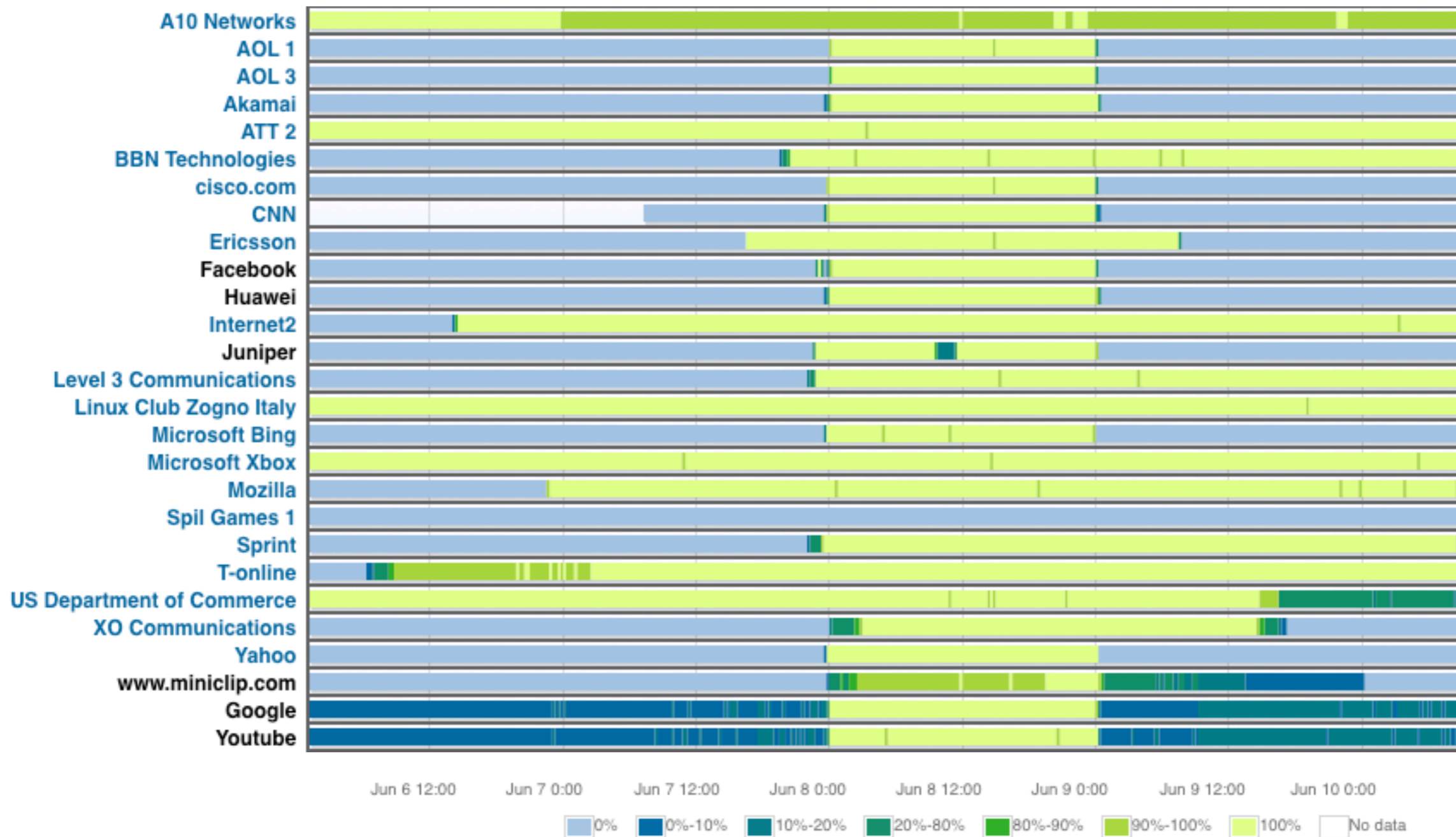
Measuring Long-term Effects

Distribution of IPv4/IPv6 relative performance
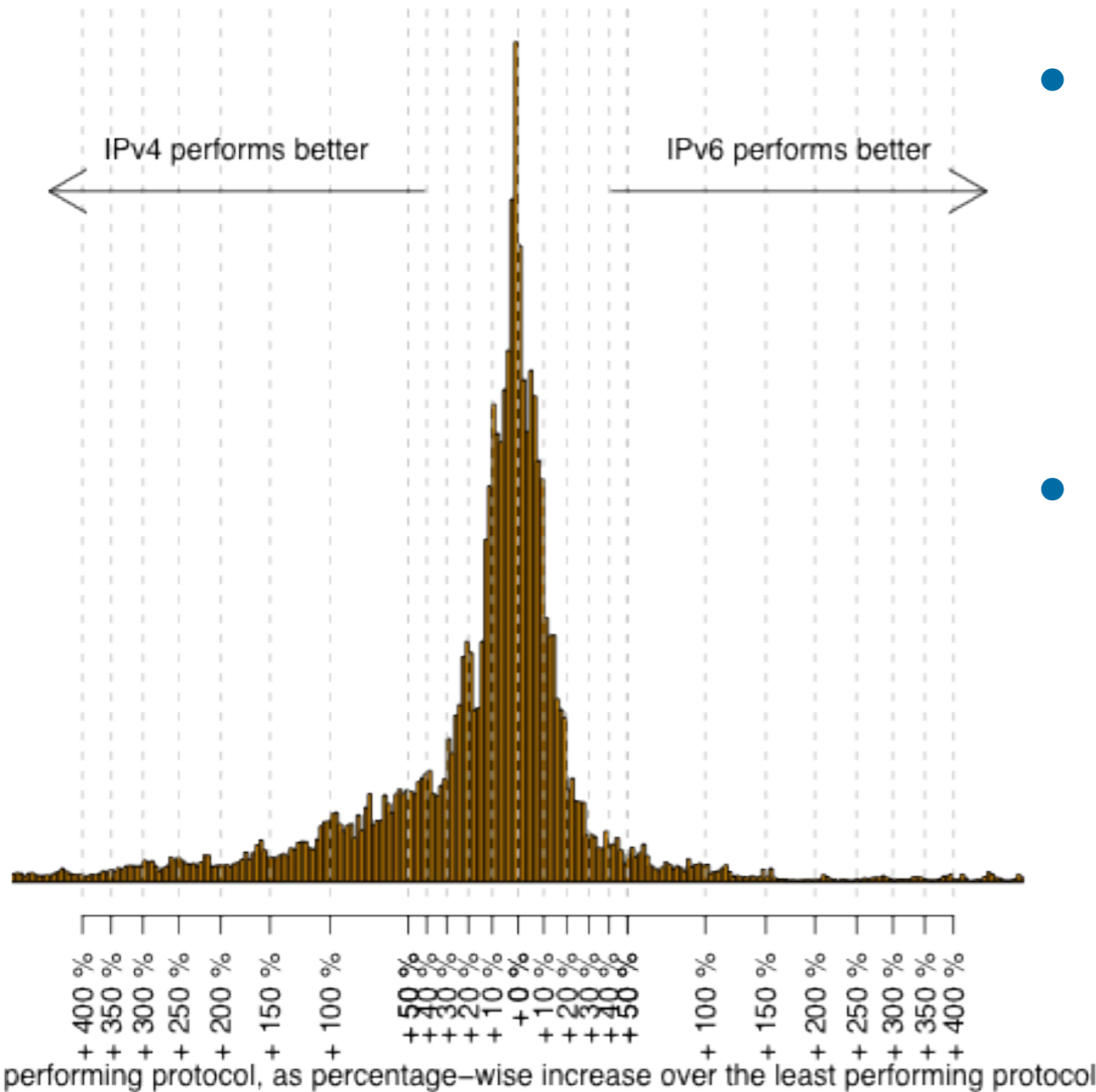
- Performance of source/ destination pairs on 8 June 201

- Bell-shaped
  - centered around 0
  - with fatter IPv4 side

Capacity Building

- Training for Local Internet Registries

  - Targeted at LIRs/RIPE NCC members

- IPv6 Hands-on Workshops and Roadshows

  - Targeted at technical staff operating government and enterprise networks

  - Collaboration with industry and regional Network Operators Groups (NOGs)

- Presenting at various conferences and events

IPv6 Events and IPv6 Deployment

IPv6 deployment indicators (2008-now) in country: PL (203 LIRs)

%ASes
%LIRs

IPV6-COURSE
WORLD-IPv6-DAY
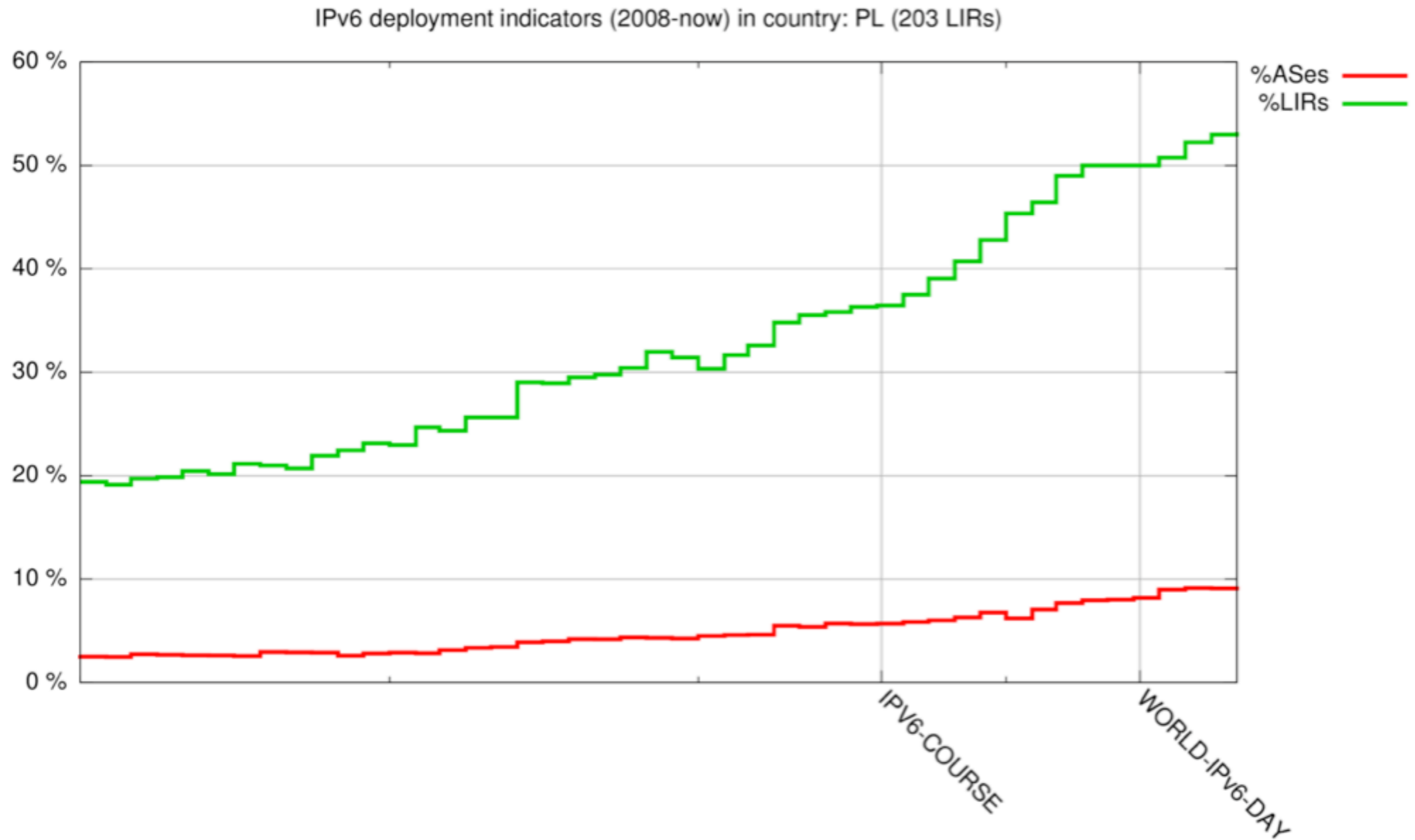
Equipment Requirements (ripe-501)

- Requirements for IPv6 in ICT Equipment
  - targeted for governments and other large enterprises
  - when ordering ICT equipment
  - to ensure it is IPv6 capable

- Co-authored by RIPE community members

- Reviewed and approved by RIPE IPv6-WG

http://www.ripe.net/ripe/docs/other-documents/requirements-for ipv6-in-ict-equipment

Engaging with Governments

- RIPE NCC Roundtable Meetings
  - Held (semi-)annually Amsterdam

- Participants
  - 40+ government representatives from 18+ countries

- Topics covered
  - IPv6 deployment, IPv4 depletion, Internet governance, DNSSEC, resource certification, quality of data
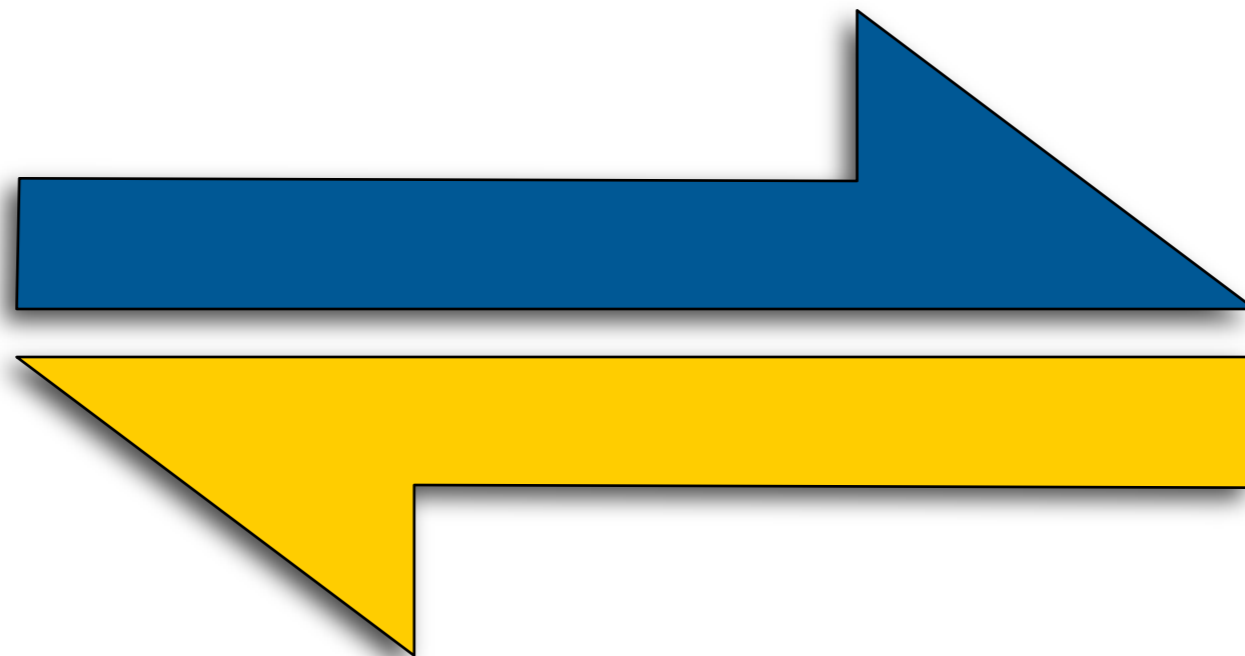
RIPE Cooperation Working Group

- Formed in 2008
  - After work by the Enhanced Cooperation Task Force

- Forum for discussion within the RIPE community, focusing on cooperation between private and public sectors

- Intended to encourage participation from stakeholders outside traditional RIPE community

Flow of Information

RIPE NCC Government Roundtables

RIPE community

Government

RIPE Cooperation Working Group

Other Fora

- Internet Governance Forum (IGF)
  - Participating since WSIS (2003) and first IGF (2006)
  - Co-organised IPv6 workshops at IGF 2009 and 2010

- International Telecommunications Union (ITU)
  - Collaborating on various workshops and events

- OECD
  - Provide technical data and highlight importance of IPv6
  - RIPE NCC is a founding member of the Internet
    Technical Advisory Committee (ITAC)

- European Commission

IPv6 Act Now! http://ipv6actnow.org

- One-stop shop for IPv6 information

- Audience includes businesses, governments, technical community

- Sections include:

  - How to Act Now

  - Community interviews

  - Statistics

  - RSS feed of IPv6 related news and developments

- Currently being updated - stay tuned!

Questions?