

# Transitioning to IPv6

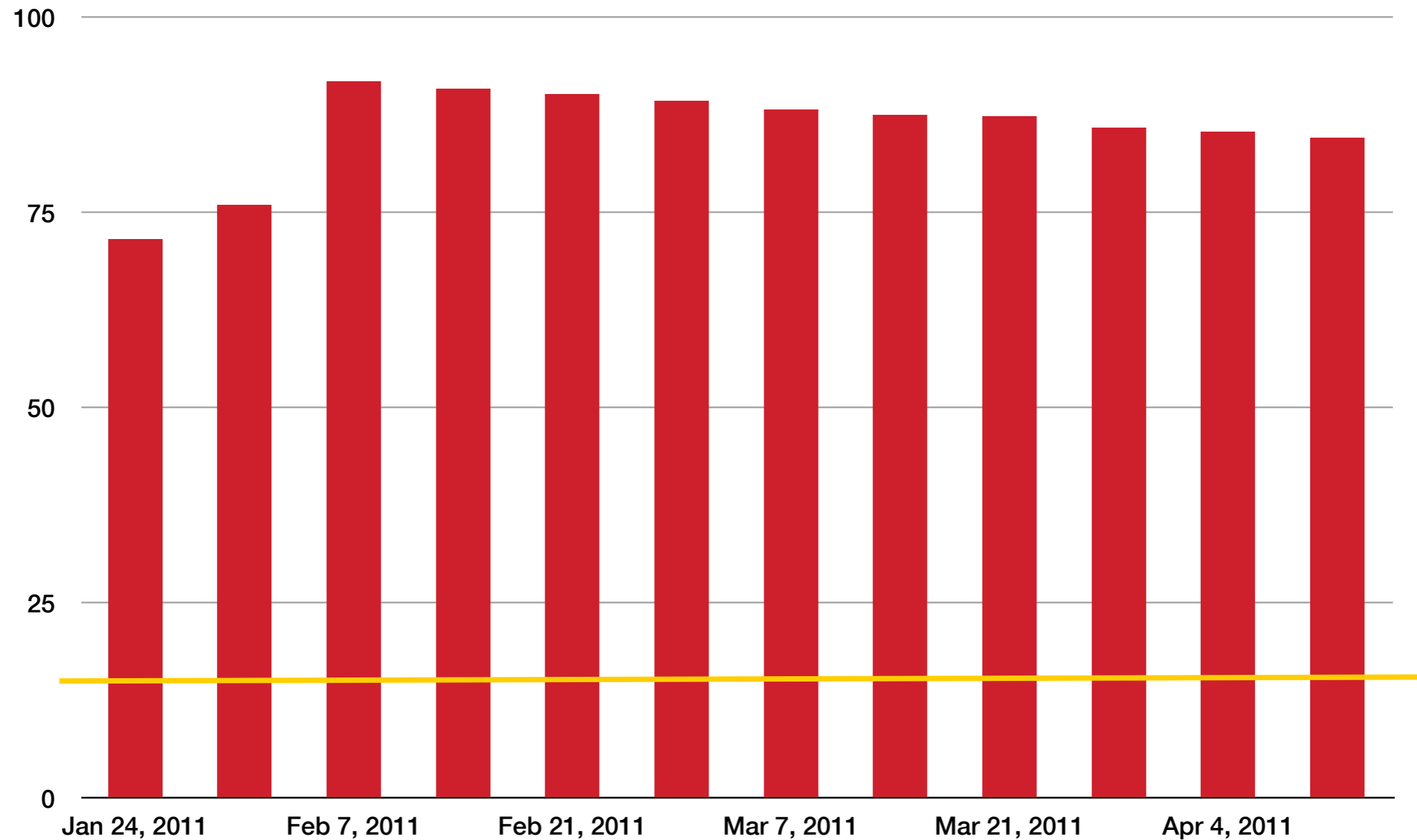
---

Marco Hogewoning

Trainer, RIPE NCC

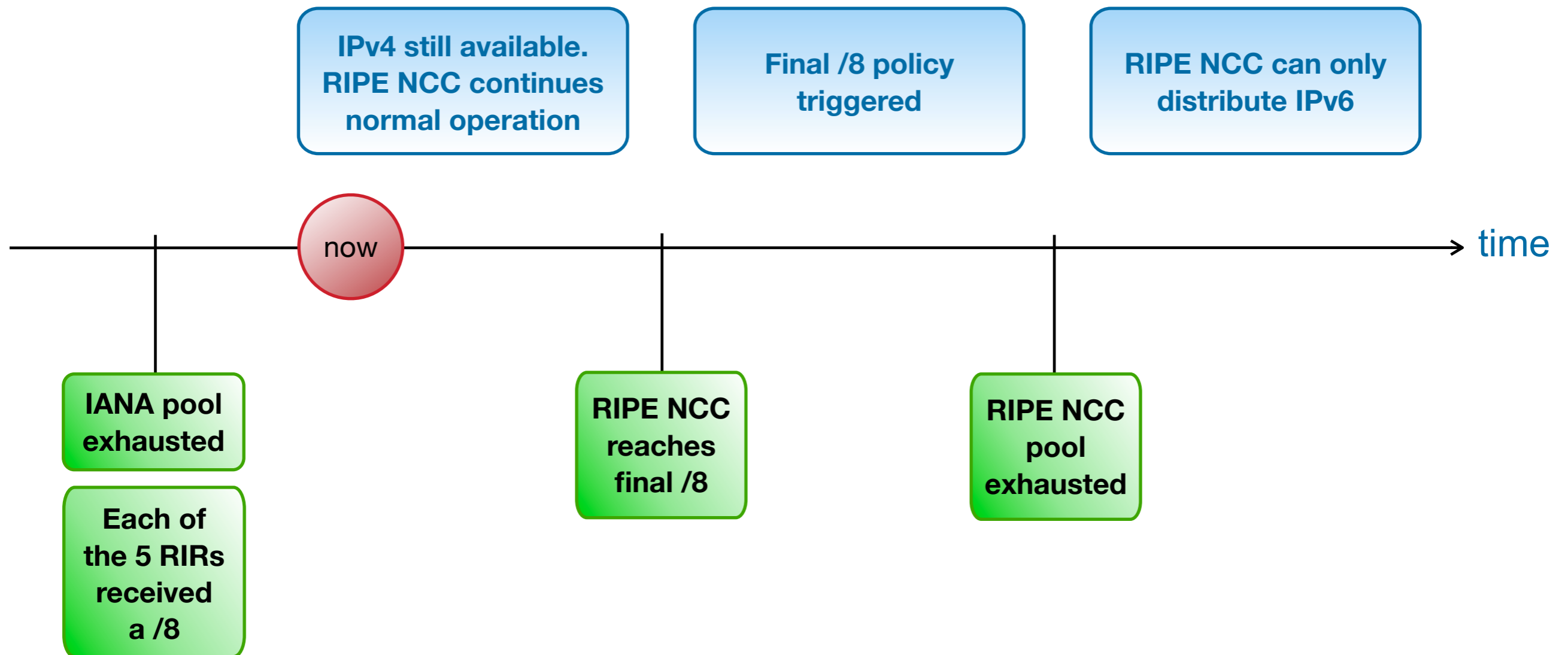


# IPv4 Reserves at RIPE NCC



Amount of IPv4 addresses (million),  
includes the final /8

# IPv4 Exhaustion Phases



# Business As Usual

---

- As long as there are IPv4 addresses left, the RIPE NCC will keep on distributing them, based on justified need
- Same allocation and assignment policies still apply (RIPE-509)
- Until the final /8 is reached

# “Run Out Fairly”

---

- Gradually reduced allocation and assignment periods
- Needs for “Entire Period” of up to...
  - 12 months (January 2010)
  - 9 months (July 2010)
  - **6 months (January 2011)**
  - 3 months (July 2011)
- 50% has to be used up by half-period

# Final /8 Policy

---

- Each LIR can get **one** /22 allocation
  - 1024 IPv4 addresses
  - New and existing members
  - As long as supplies will last
- You must meet the criteria for an (additional) allocation
- Only when you already have IPv6 addresses

# Transfer of IPv4 Allocations

---

- LIRs can transfer IPv4 address blocks:
  - To another LIR
  - Only when the block is not in use
  - Meets minimum allocation size (/21)
- Requests are evaluated by the RIPE NCC
  - Justified need
- Registered in the RIPE Database

# No Changes Yet

---

- At the moment the RIPE NCC continues normal operations
- Policy will only change when the RIPE NCC's final /8 is reached
- Be aware of the shorter assignment period!
- **And start deploying IPv6 now!**



# IPv6 Deployment

---

# There Was a Plan

---

- Originally it was planned that the deployment of IPv6 would take place before the IPv4 free pool would have been exhausted
- At this moment the whole Internet should have been Dual Stacked
- Unfortunately this is not the case

# Solving Two Problems

---

- Maintaining connectivity to IPv4 hosts by sharing IPv4 addresses between clients
  - Extending the address space with NAT/CGN/LSN
  - Translating between IPv6 and IPv4
- Provide a mechanism to connect to the emerging IPv6-only networks
  - Tunnelling IPv6 packets over IPv4-only networks

# Network Address Translation

---

- Extends the capacity of the IPv4 address space by sharing an IPv4 address between clients
- Fairly common technology, used everywhere
- Breaks the end to end connectivity model
- **It doesn't allow communication with IPv6!**
- You are probably going to need it in some form

# Other Challenges With NAT

---

- Does it scale?
  - How many users can share a single address?
- Do you know who is talking?
  - In case of abuse complaints
  - What about lawful interception
- Logs will grow huge
  - Data retention?

# Transitioning Techniques

---

- Most of them use ‘tunnels’
  - Put X in Y (IPv6 in IPv4)
- The end point has both protocols
- And the network in between doesn’t
- Requires assistance in the form of so called ‘tunnel servers’
  - ‘Bridge’ between the 2 worlds
  - Unpacking and repacking the data

# Tunnelling Options

---

- Well known: 6in4, 6to4, Teredo, 6RD, TSP
- These all come with drawbacks:
  - MTU gets lower, this can cause issues
  - Security gets more complicated
  - Some use anycast, where does your traffic go?
  - Depending on third parties
  - Does it really scale?
- Your mileage may vary

# Translation (NAT64/DNS64)

---

- Alternative solution translate IPv6 into IPv4
- Customer will only get one protocol (IPv6)
- Translator box sits in between
  - Talks to both IPv4 and IPv6
  - Shares a pool of IPv4 addresses
- Requires fiddling with DNS
  - Capture all queries
  - Replace IPv4 answers with crafted IPv6 addresses



# Drawbacks of Translation

---

- Clients are not aware there is another protocol
- DNSsec will break
- Again you are sharing IPv4 addresses
  - Who is talking?
  - Can you really keep track of what happens?
  
- Does it really scale?

# Conclusion

---

- Multiple solutions exist and more are being developed as we speak
- If you need an intermediate solution, choose wisely which one to deploy
- These are all temporary solutions for a permanent problem
- **Dual Stack wherever you can!**

# Deployment Statistics

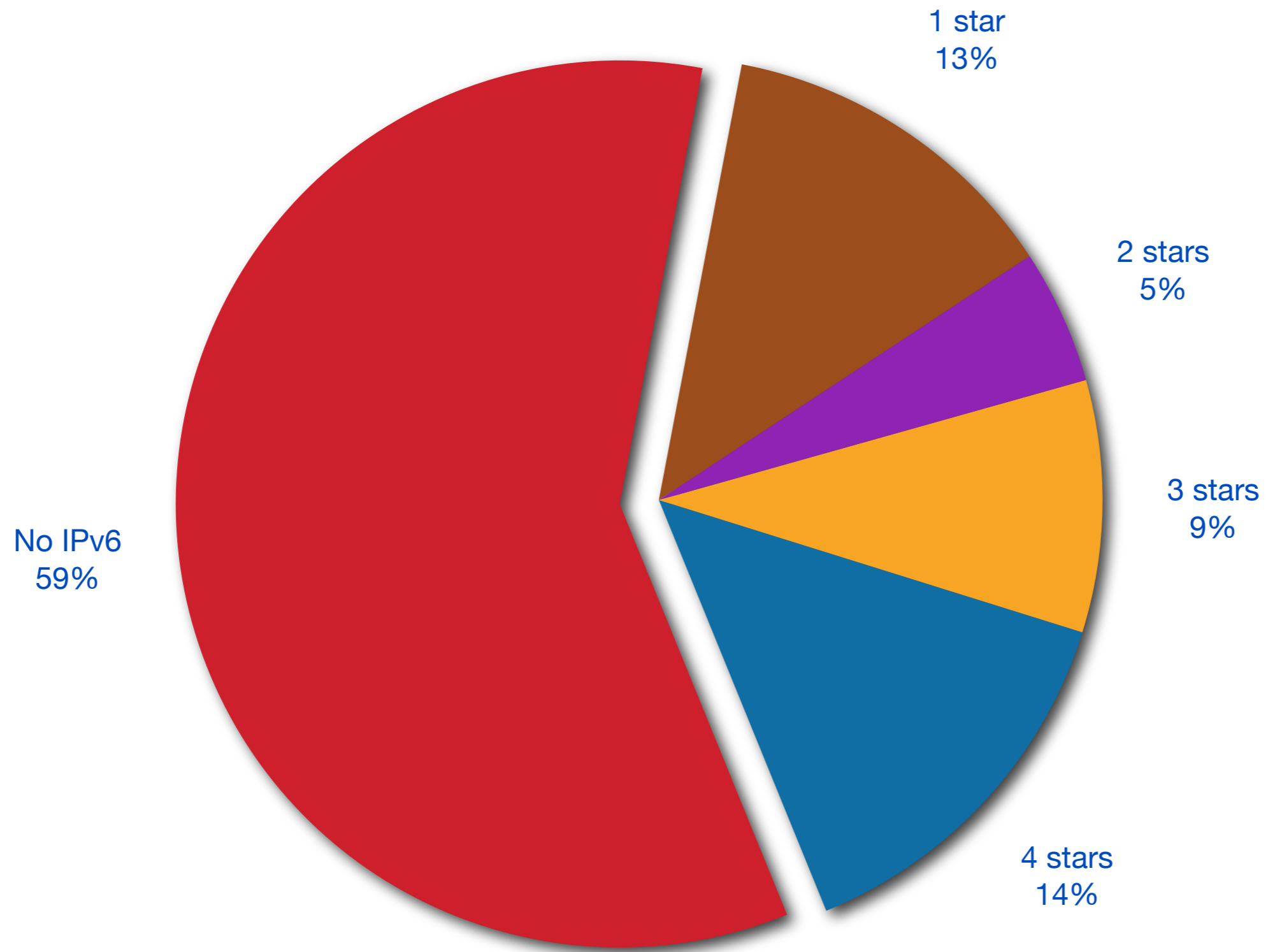
---

# IPv6 RIPEness

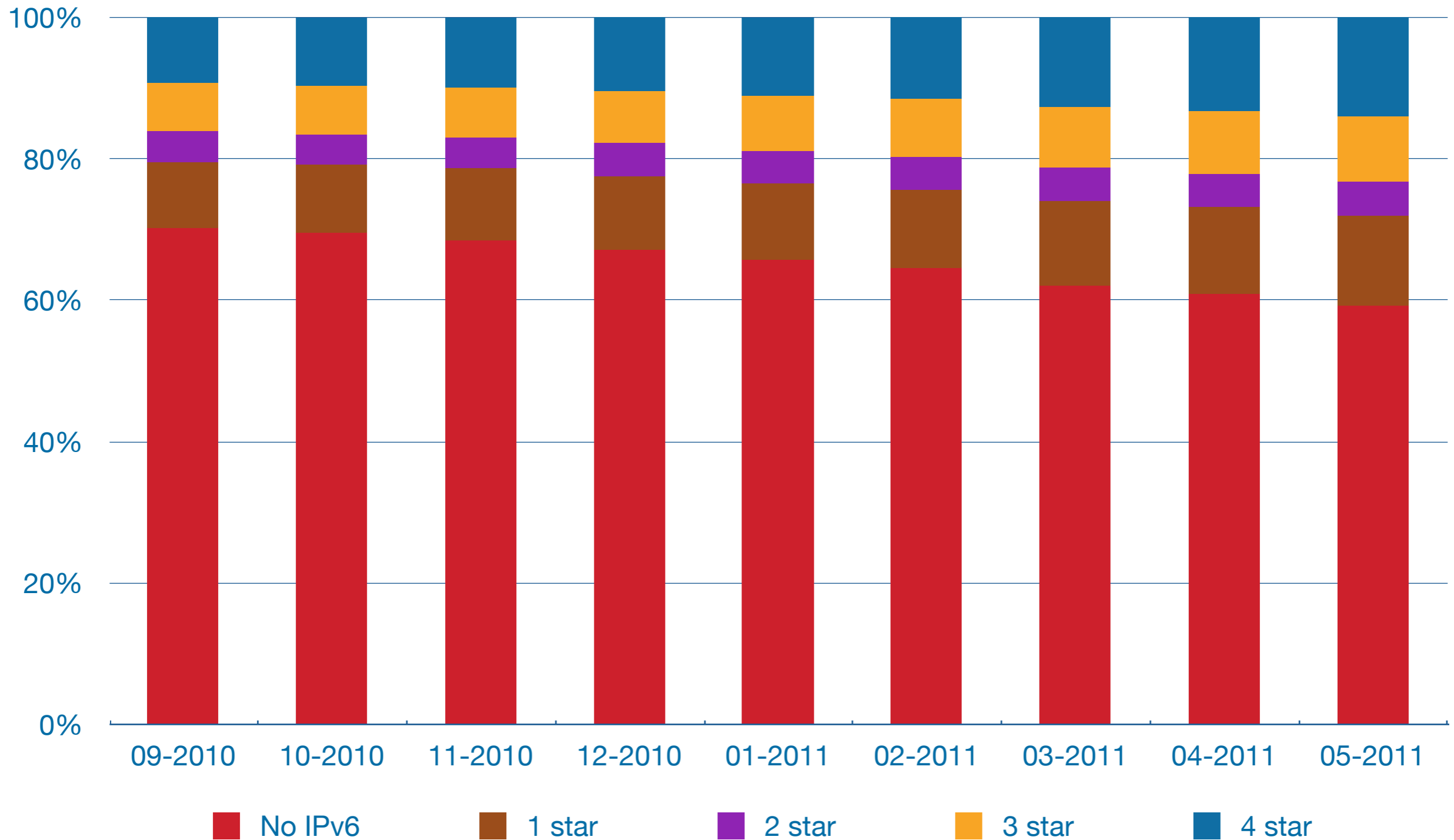
---

- Rating system:
  - One star if the member has an IPv6 allocation
  - Additional stars if:
    - IPv6 Prefix is visible on the internet
    - A route6 object is in the RIPE Database
    - Reverse DNS is set up
  - A list of all 4 star LIRs: <http://ripeness.ripe.net/>

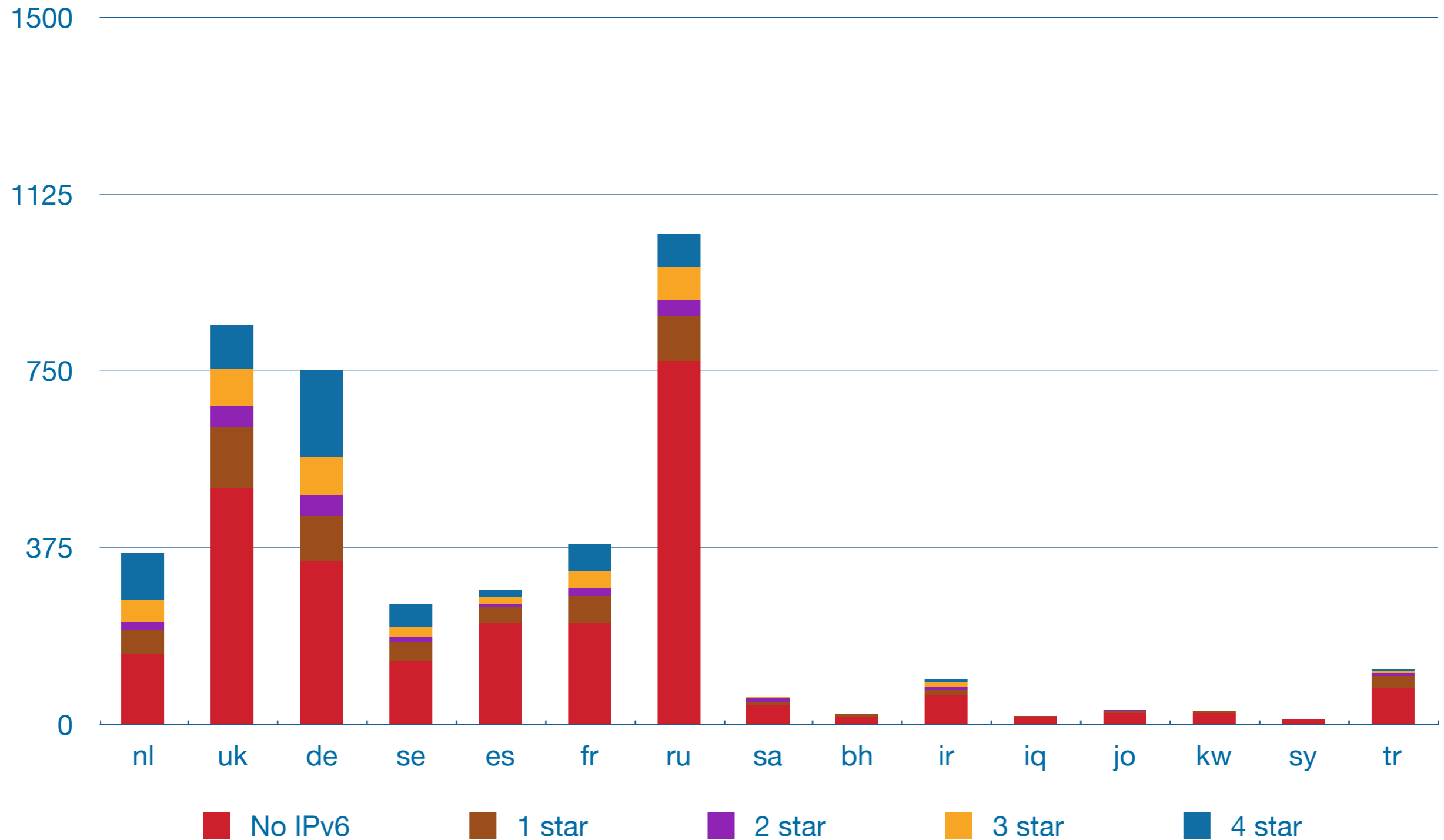
# IPv6 RIPEness: 7425 LIRs



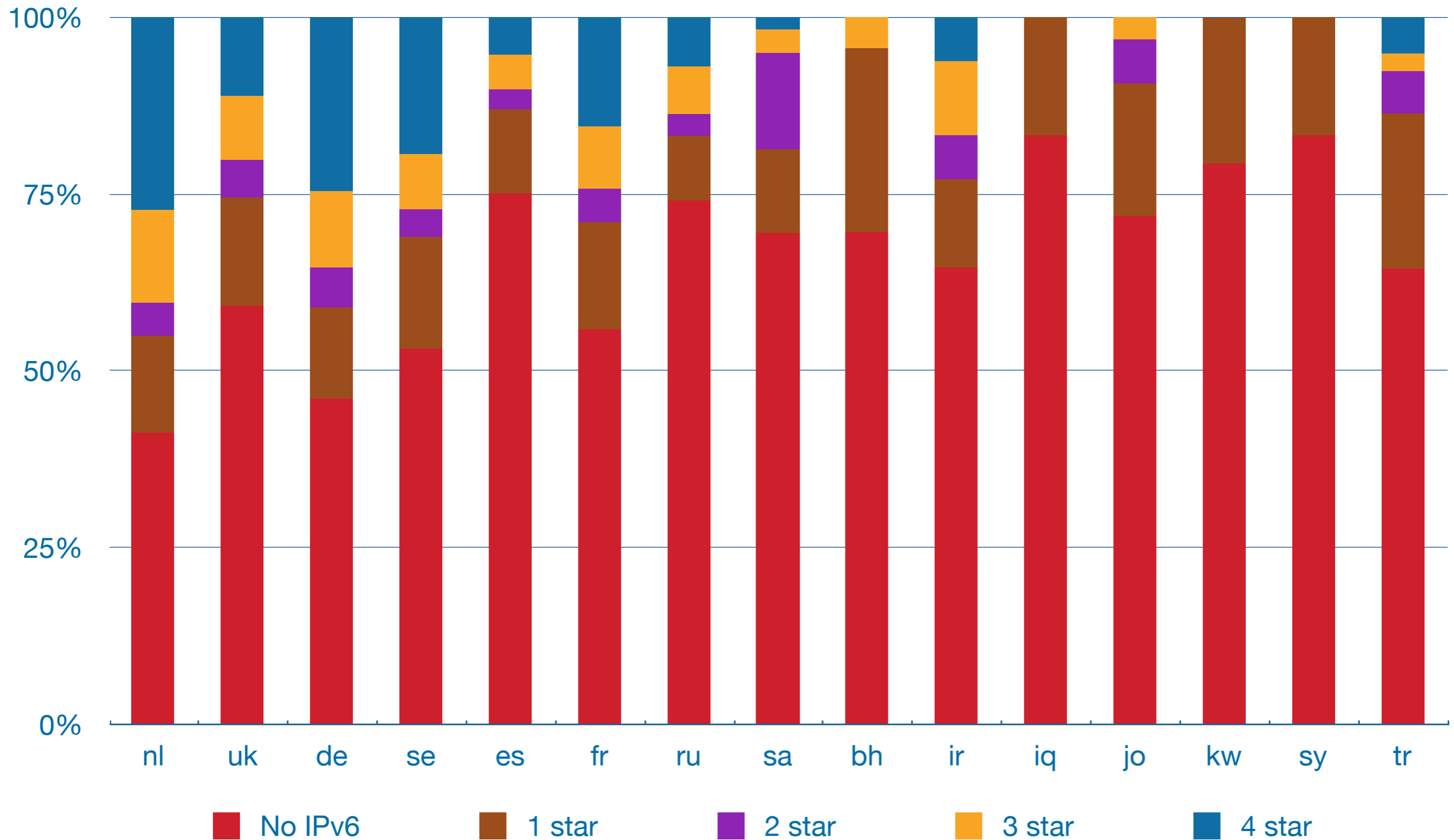
# IPv6 RIPEness over time



# IPv6 RIPEness per country (01-05)



# IPv6 RIPEness per country (01-05)



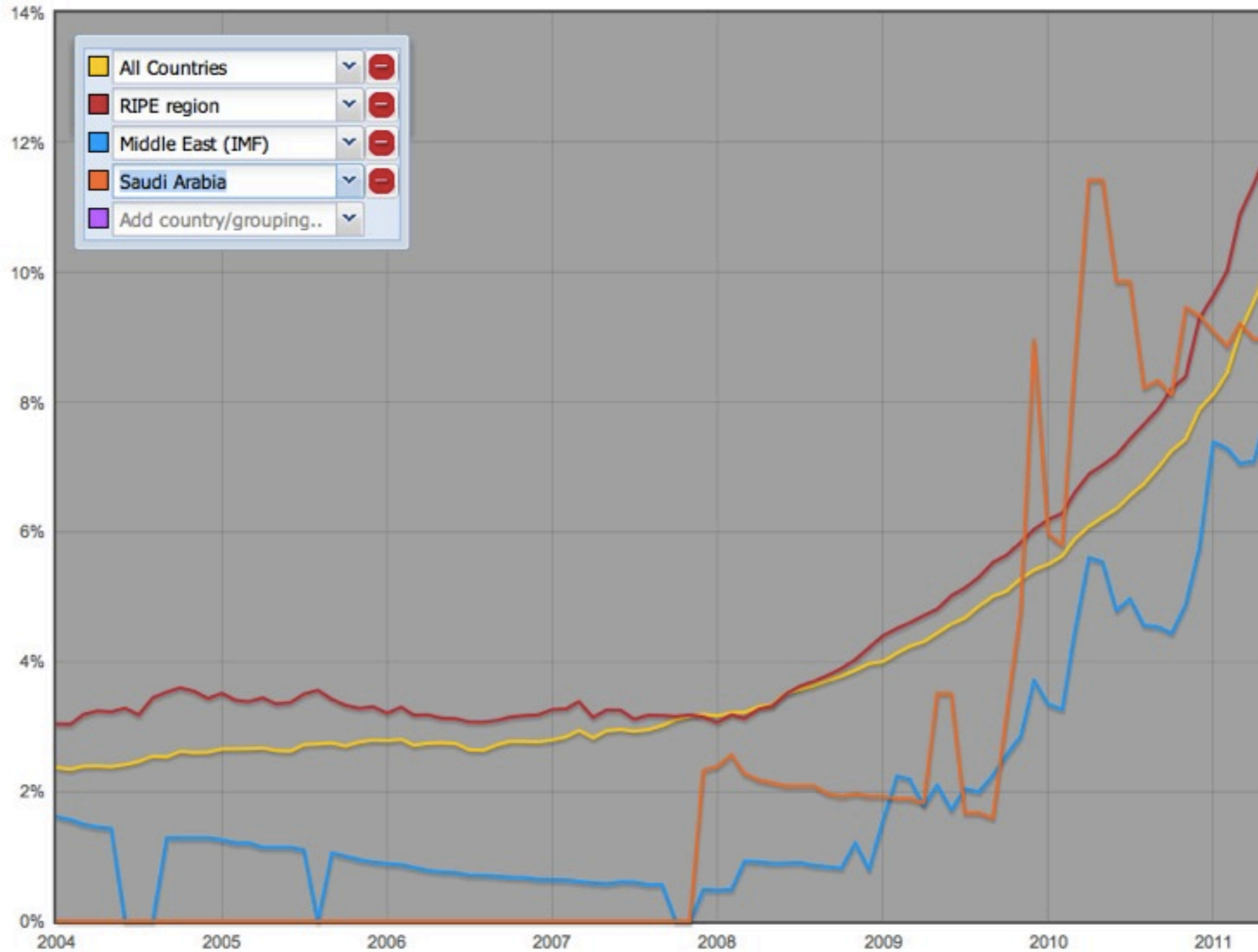


# A Different Approach

---

- IPv6 RIPENess only looks at members
- What about the other networks?
- Measurements per ASN
  - How many networks advertise IPv6?
- Try it yourself <http://v6asns.ripe.net>

# Percentage of ASNs With IPv6



# More Information

---

- <http://www.ipv6actnow.org>
- <http://ripeness.ripe.net>
- <http://v6asns.ripe.net>
  
- Mailing list:
  - <http://www.menog.net/menog/mailling-list>
  - <http://www.ripe.net/ripe/mail/wg-lists/ipv6-working-group>

Questions?

