



Life after IPv4/ ARIN's Policy Development Process

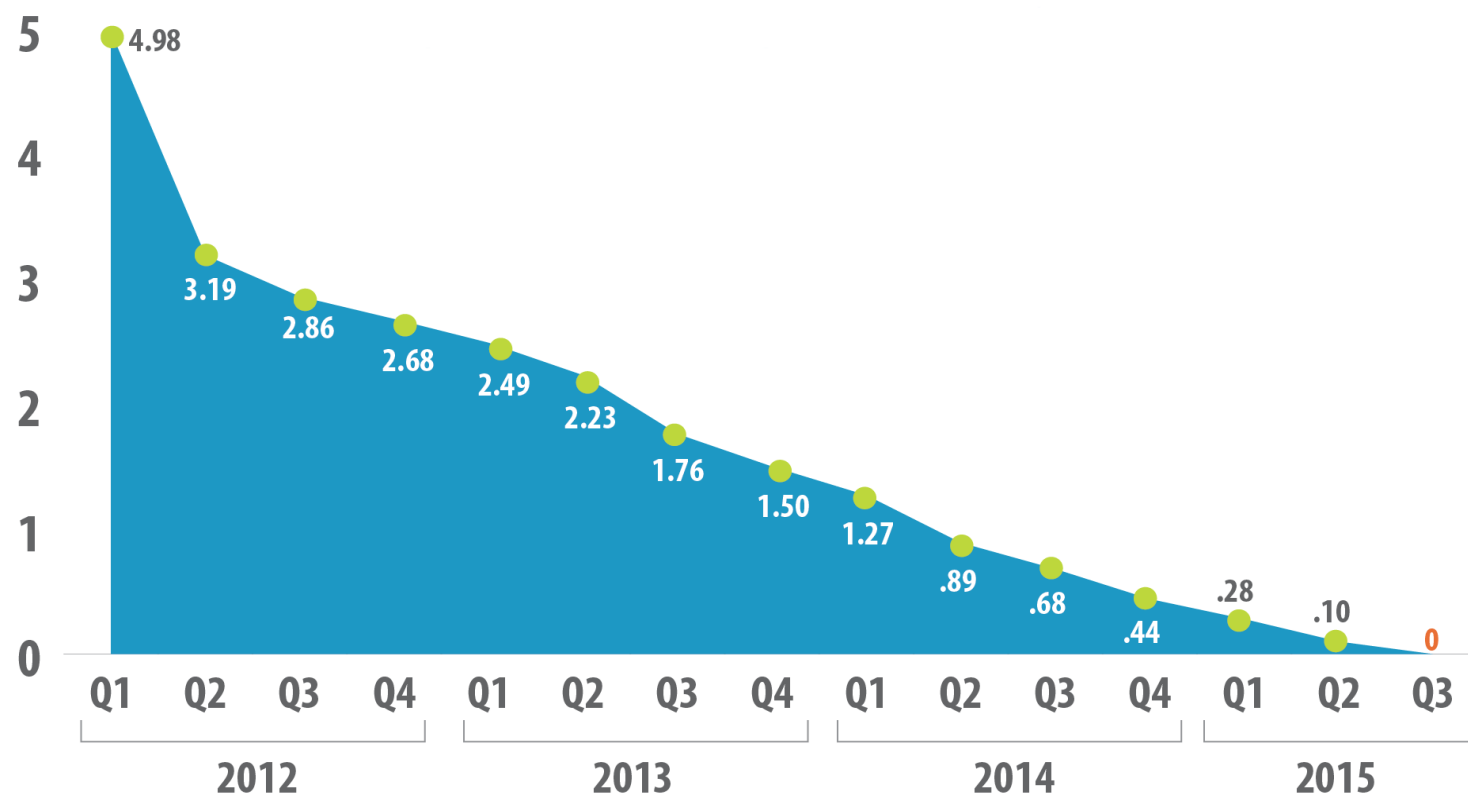
John Curran
President and CEO

Overview

- IPv4 depletion recap
- Post-depletion IPv4 options
 - IPv4 Waiting List
 - IPv4 Transfers
 - Dedicated IPv4 block to facilitate IPv6 deployment
 - IPv6
- Policy development in the ARIN region

IPv4 Address Space in ARIN Free Pool

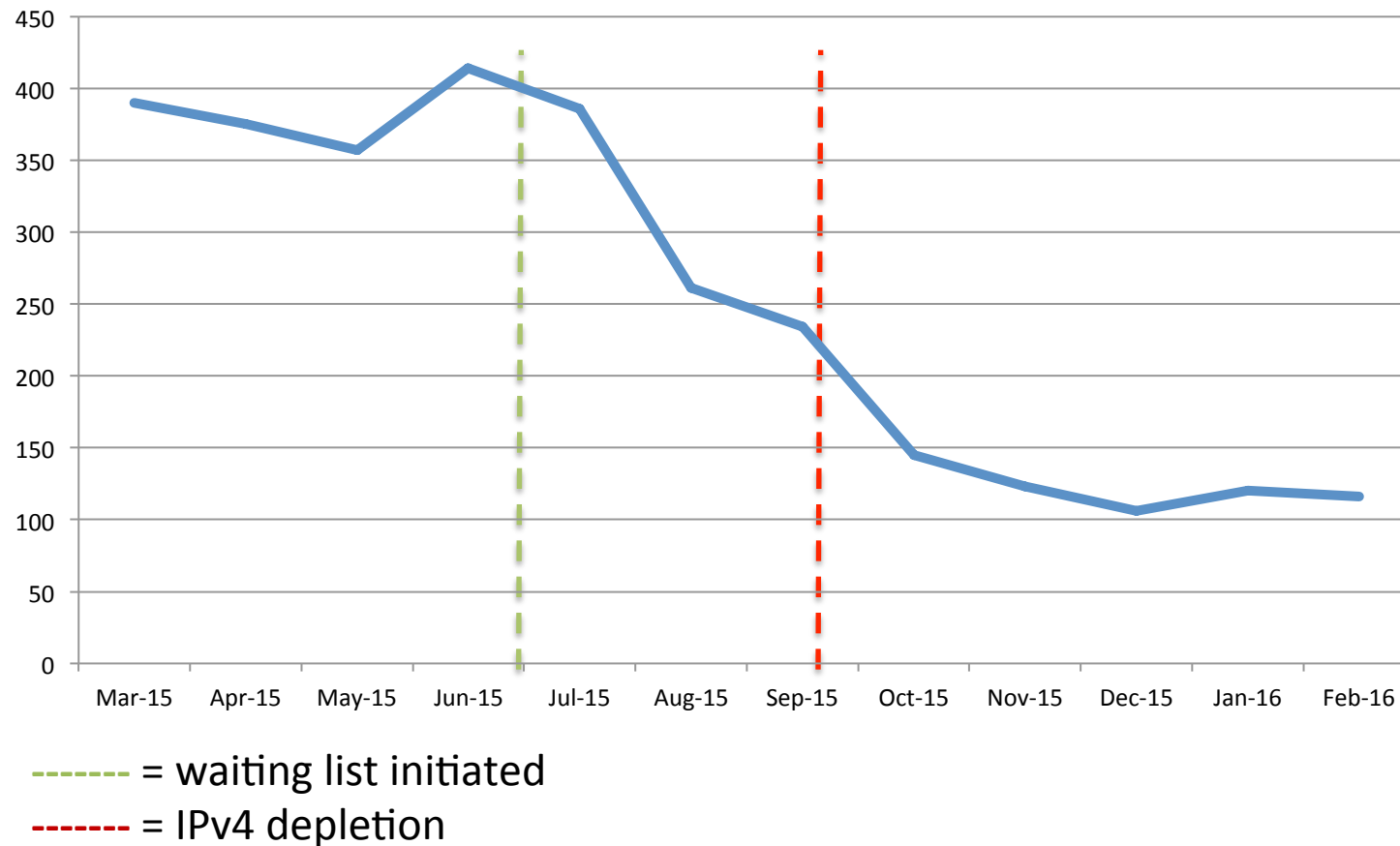
/8s



IPv4 Depletion Recap

- June 2015: IPv4 requests reach peak volume
 - 414 total requests
 - A mad rush for the last IPv4 blocks
- July 1st, 2015: First unmet IPv4 request
 - An org qualified for a block size that was no longer available
 - Within a few weeks, only single /24s remained in the free pool
- September 24th, 2015: Full IPv4 depletion
 - No IPv4 blocks available other than those reserved for specific policies
 - Significant drop in monthly # of IPv4 requests

IPv4 Requests – Past Year



Reserved IPv4 Space

- /10 reserved to facilitate IPv6 deployment
- 2 /16s reserved for critical Internet infrastructure
 - Public exchange points
 - Core DNS service providers (excluding new gTLDs)
 - Regional Internet Registries
 - IANA

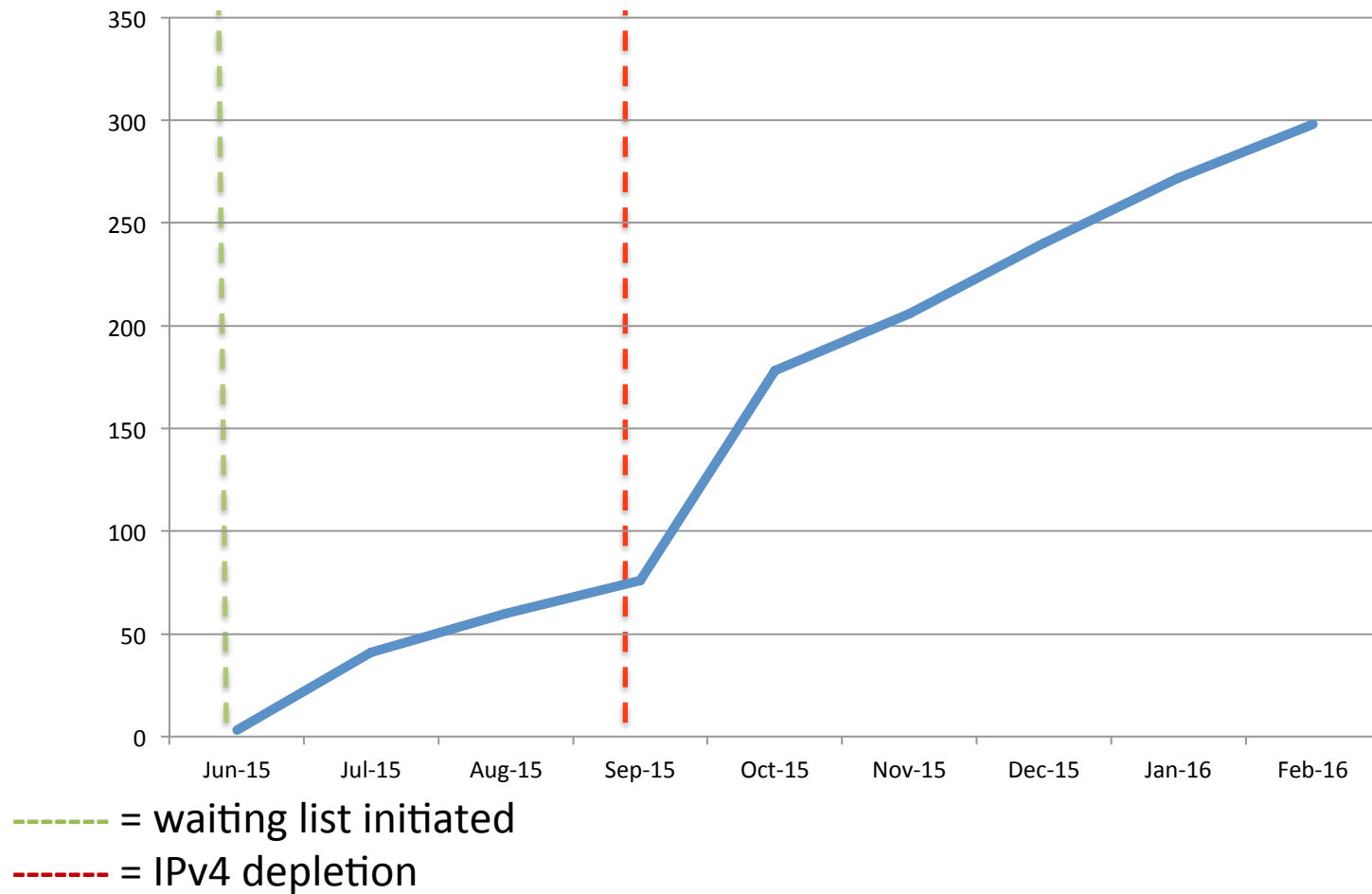
Post-IPv4 Depletion Options

- IPv4 Waiting List
- IPv4 Transfer Market
- Dedicated IPv4 block to facilitate IPv6 deployment
- Adopt IPv6

IPv4 Waiting List

- Policy enacted first time ARIN did not have a contiguous block of addresses of sufficient size to fulfill a qualified request
- Waiting List published on ARIN's web site
 - https://www.arin.net/resources/request/waiting_list.html
- Sources to fill it:
 - Returned to ARIN or **revoked** for non-payment and
 - **redistributed** by IANA per global policy for “post exhaustion IPv4 allocation mechanisms by IANA”

IPv4 Waiting List Growth



How Long Might You Wait?

- 364 tickets added since wait list started
- 33 wait list requests filled
 - 19 filled with IANA /14 equivalent issued in 9/2015
 - 13 filled with blocks previously held for organizations deciding whether to go on the waiting
 - 1 filled with space that had been revoked
- 33 filled via 8.3 transfer and removed from list (as required per policy)
- Demand is far greater than availability

Transfers of IPv4 Addresses

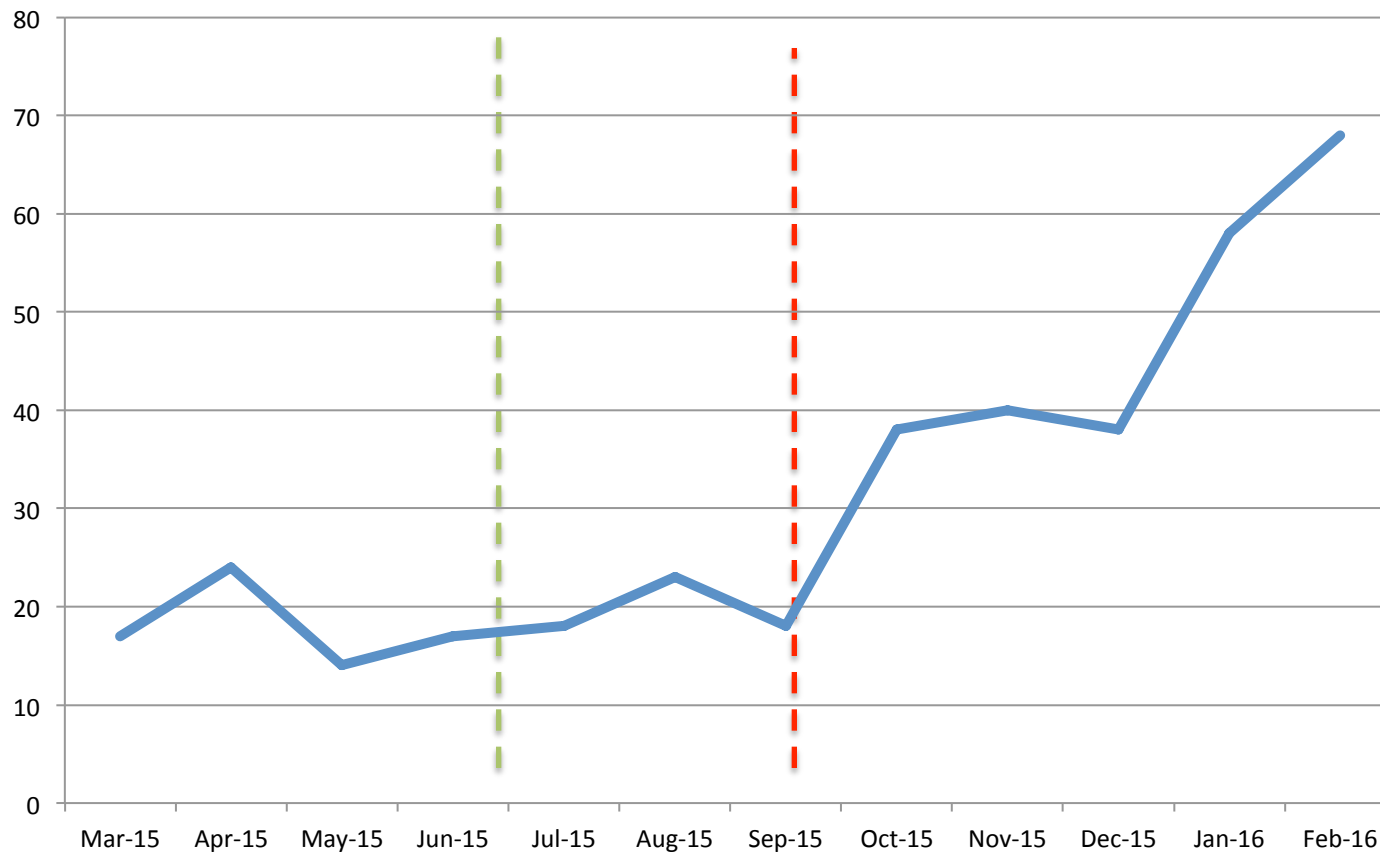
3 ARIN Transfer Policies Available:

- Mergers and Acquisitions (NRPM 8.2)
 - Traditional transfer based on change in business structure, including company reorganizations, supported by legal documentation
- Transfers to Specified Recipients (NRPM 8.3)
 - [IPv4 market transfer](#) based on financial transaction, supported by justified need (within region)
- Inter-RIR transfers to Specified Recipients (NRPM 8.4)
 - [IPv4 market transfer](#) based on financial transaction, supported by justified need (outside region)

Transfers to Specified Recipients (NRPM 8.3)

- Allows orgs with unused IPv4 resources to transfer them to orgs in need of IPv4 resources
- **Source**
 - Must be current registrant, no disputes
 - Not have received addresses from ARIN for 12 months prior
- **Recipient**
 - Must demonstrate need for 24-month supply under current ARIN policy

8.3 Transfers Completed

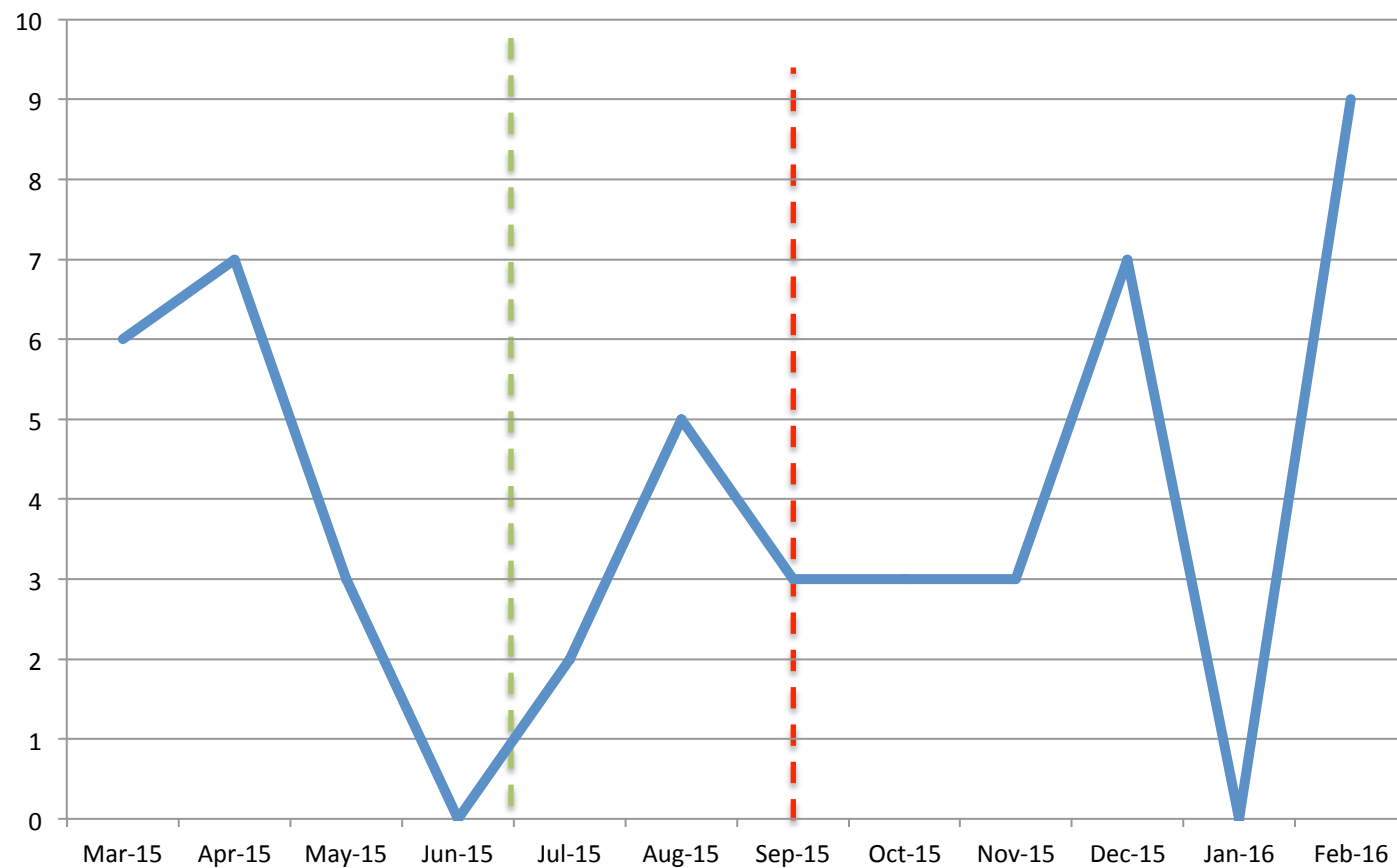


----- = waiting list initiated
----- = IPv4 depletion

Inter-RIR Transfers (NRPM 8.4)

- RIR must have reciprocal, compatible needs-based policies
 - Currently APNIC and RIPE NCC
- **Transfers from ARIN**
 - Source cannot have received IPv4 from ARIN 12 months prior to transfer
 - Must be current registrant, no disputes
 - Recipient meets destination RIR policies
- **Transfers to ARIN**
 - Must demonstrate need for 24-month supply under current ARIN policy

Inter-RIR Transfers Completed



----- = waiting list initiated

----- = IPv4 depletion

IPv4 Transfer Stats

- **Transfers to Specified Recipients (8.3)**
 - 505 prefixes transferred, ranging from /24s to /10
 - 23 ASNs
- **Inter-RIR Transfers (8.4)**
 - 215 prefixes transferred, ranging from /24s to /13s
 - 197 ARIN to APNIC
 - 12 ARIN to RIPE NCC
 - 5 APNIC to ARIN
 - 1 RIPE NCC to ARIN

<https://www.arin.net/knowledge/statistics/transfers.html>

Tips for Faster Transfer Processing

- Ensure all registration information is current
 - If not, we can help you get it up to date
- Request pre-approval
 - Ensures you can bid confidently
 - Turns transfers into a point-click-ship exercise
- Provide detailed information to support 24-month need when submitting transfer/pre-approval

Reserved IPv4 Block for IPv6 Deployment Requirements

- Used to facilitate IPv6 deployment (dual stacking, IPv4->IPv6 translation, etc)
- Need cannot be met from your existing ARIN IPv4 space
- Have an IPv6 block registered
- One /24 per organization every six months

Help! What Should I Do?

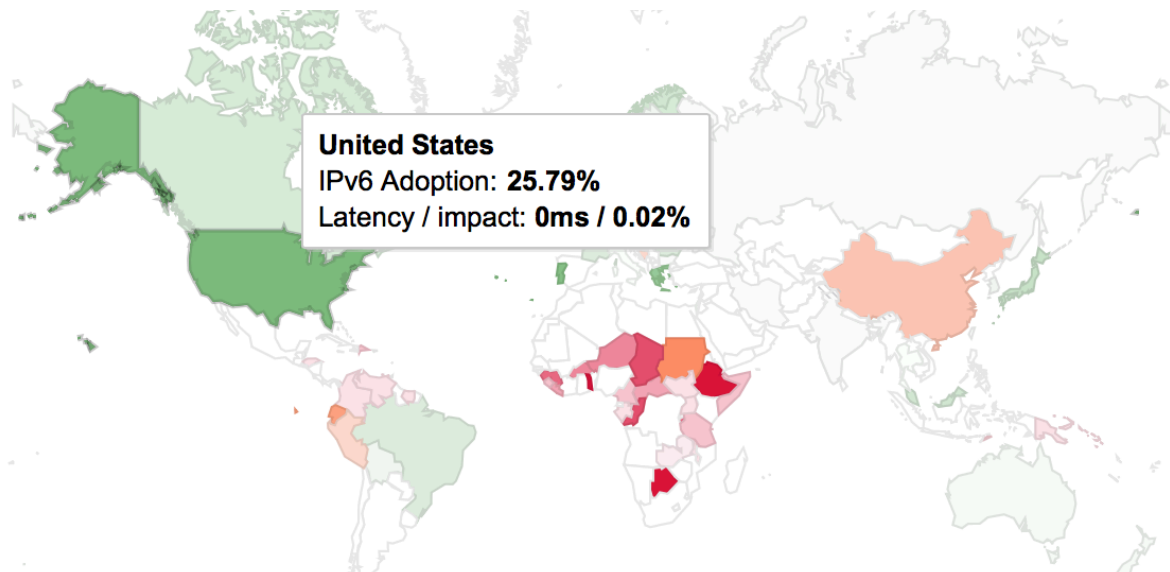
- Small networks can get a /24 once per six months for IPv6 transition
 - Cost likely to be lower than the transfer market
 - Reserved block likely to last several years
 - Can also have a request on the waiting list
- Larger networks can get pre-approved for 24 month need and seek IPv4 on the transfer market
 - Waiting list probably not a realistic option unless you can delay your IPv4 needs indefinitely
- All networks should begin IPv6 adoption

Moving to IPv6

Why Move to IPv6 Now?

- Being IPv4-only has costs
 - Transfer market, latency, CGN boxes, NAT
- Many operational issues solved by early adopters
- If not IPv6, then what?

Google's IPv6 Traffic Growing



- > 25% of US customers connected to Google via IPv6 - up from 10% one year ago today & growing rapidly

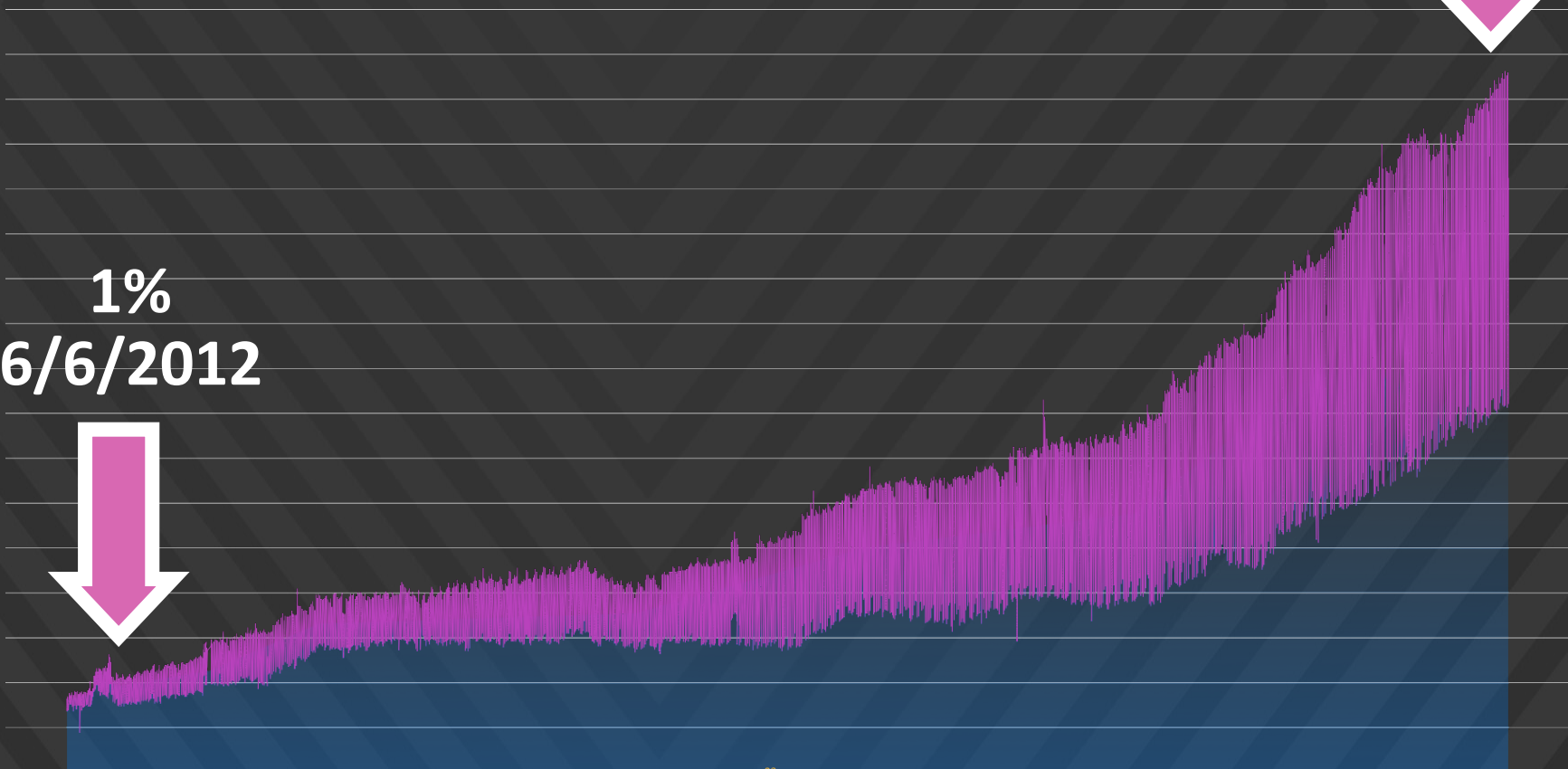
Facebook

- Over 10% of the world uses facebook over IPv6

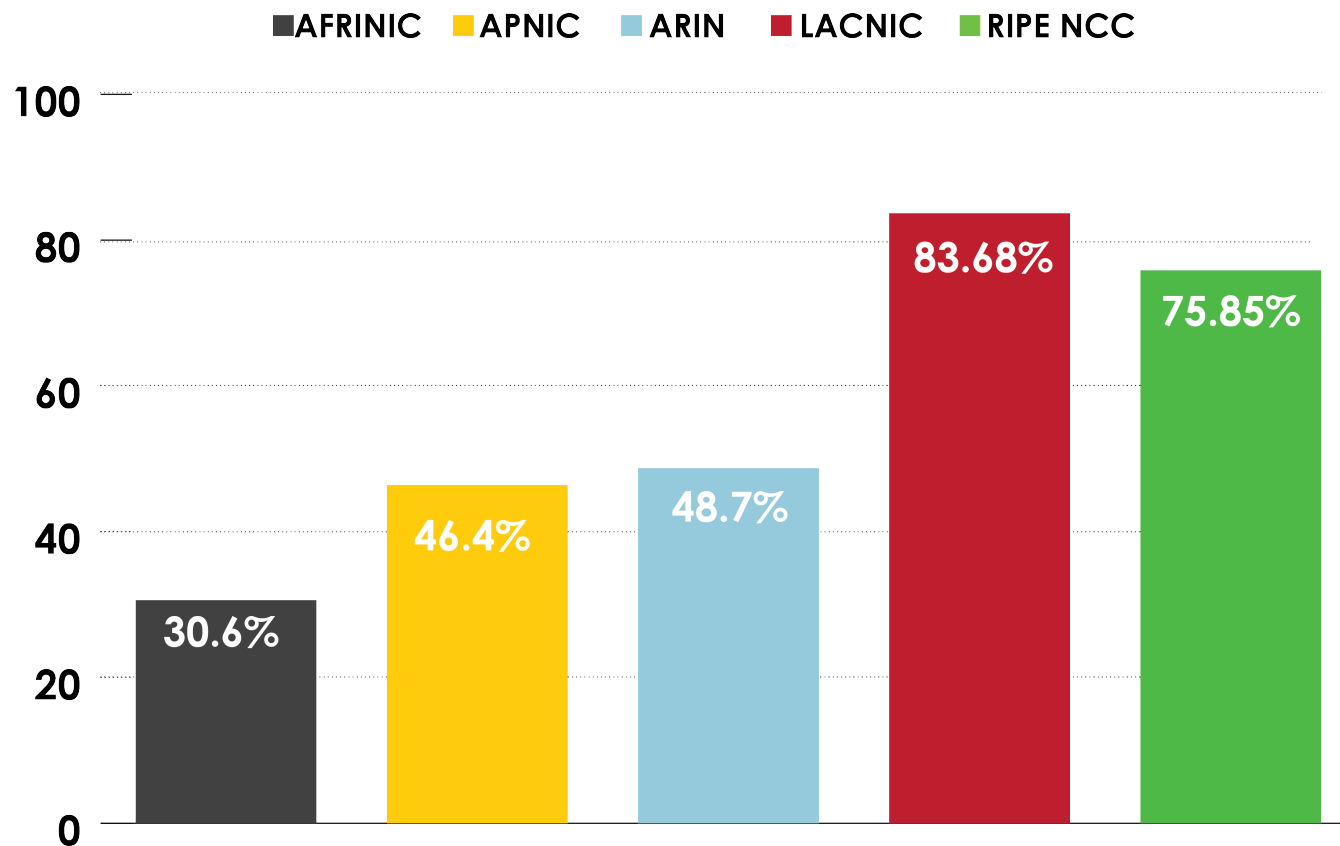
Over 10%
2015



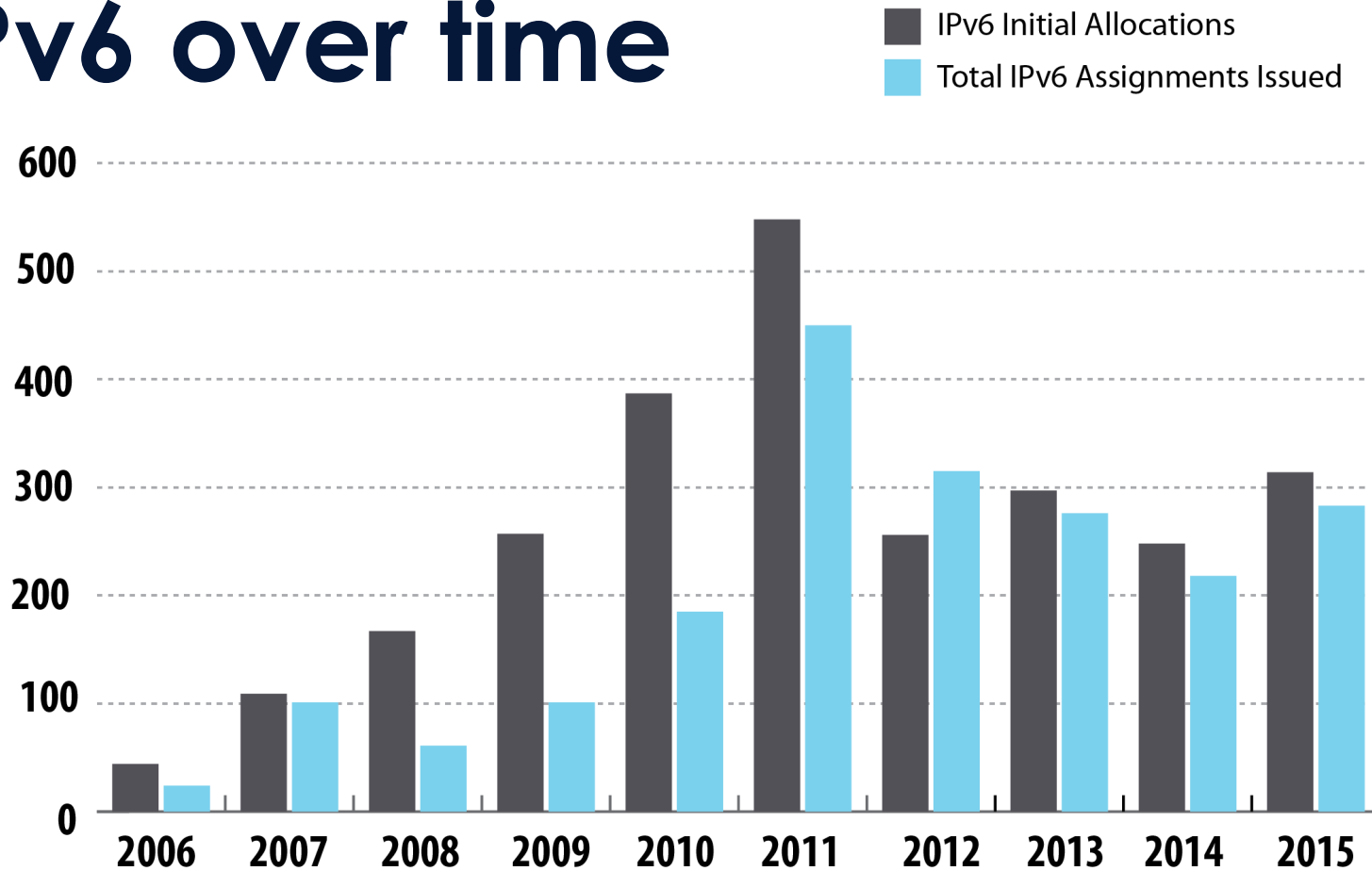
1%
6/6/2012



Global IPv6 Status Percentage of Members with IPv6



IPv6 over time



ARIN IPv6 Allocations and Assignments

Requesting IPv6 from ARIN is easy – ISPs

- Have a previous v4 allocation from ARIN or predecessor registry

OR

- Intend to multi-home

OR

- Provide a technical justification which details at least 50 assignments made within 5 years

Requesting IPv6 – End Users

- Have a v4 direct assignment from ARIN or predecessor registry
- OR**
- Intend to multi-home
- OR**
- Show how you will use 2000 IPv6 addresses or 200 IPv6 subnets within a year
- OR**
- Technical justification as to why provider-assigned IPs are unsuitable

Your IPv6 Checklist



- Get your IPv6 address space
- Set up IPv6 connectivity (native or tunneled)
- Configure your operating systems, software, and network management tools
- Upgrade your router, firewall, and other hardware
- Get your IT staff training
- Enable IPv6 on your website

Enable IPv6 on Your Website

WEBSITES THAT ARE FULLY

IPv6
ENABLED **MUST:**



PUBLISH
AAAA RECORDS



BE REACHABLE OVER AN
IPV6 CONNECTION



SERVE DNS
OVER IPV6

Learn More

www.GetIPv6.info



IPv6 Info Center

www.arin.net/knowledge/ipv6_info_center.html



www.TeamARIN.net

Operational Guidance

<http://www.internetsociety.org/deploy360/>



www.NANOG.org/archives/



http://nabcop.org/index.php/Main_Page

Internet Governance Forum – Enabling Environment for IPv6 Adoption

<http://www.intgovforum.org/cms/best-practice-forums/2015-bpf-outs>

ARIN's Policy Development Process

Overview

Basic steps

Major policy changes (examples)

A current proposal

How to get involved

Policy Development Process (PDP) Steps

- 1) Proposal – Someone in the community thinks a policy can be improved and documents
- 2) Draft Policy- Discussion on the list and possibly at meeting(s) - Is there really a problem? Is this a good solution?
- 3) Recommended Draft Policy - More discussion and presentation at meeting(s). Does community support turning this into policy?
- 4) Last call
- 5) Board Review
- 6) Staff Implementation (NRPM)

If you submit a proposal, you can participate further, or let the ARIN process “shepherd” it through the steps

Past Policy Changes: IPv6 Policy

Circa 2001: Initial IPv6 policy aligned with IPv4 at that time, conservation was important, small amounts issued for short periods, hierarchical distribution from upstreams, and, no end user policy at all

2003-2016 Dozens of proposals to improve IPv6 policy

Changes included: Minimum allocation size increased (/35 to /32), larger allocations from IANA, policy for end users, community networks (mesh networks), assignment sizes from ISPs to customers (/56s), larger amounts for ISPs and easier criteria, larger amounts for end users and easier criteria, bit boundary assignments and allocations, etc.

Policy Currently Under Discussion

- **ARIN-2015-5: Out of Region Use**
Would allow an organization to receive Internet number resources from ARIN for use out of region as long as the applicant is currently using at least the equivalent of a /22 of IPv4 space, /44 of IPv6, or 1 ASN within the ARIN service region.
- **Earlier Abandoned Proposals**
 - ARIN-2014-1: Out of Region Use
 - ARIN-2013-6: Allocation of IPv4 and IPv6 Address Space to Out-of-region Requestors
 - ARIN-2011-13: IPv4 Number Resources for Use Within Region
(continued on next slide)

2015-5 continued

- ARIN-2015-5 presented at ARIN 36 in Oct 2015
- AC found draft to be fair, technically sound and supported and promoted to recommended state (late Oct 2015)
- Presented as Recommended Draft Policy at NANOG 66
- Last Call was 24 February thru 9 March 2016
- Next steps:
 - Review of last call comments
 - Board Review
 - Implementation by Staff

How Can You Get Involved?

Two ways to learn and be heard

1. Public Policy Mailing List - open
2. Public Policy Consultations/Meetings - open
 - ARIN meetings (April and October)
 - ARIN Public Policy Consultations at NANOG
 - Remote participation supported

Takeaways

- 1) ARIN doesn't create number policy, you do.
- 2) Well documented policy development process includes assistance from ARIN AC and staff throughout the process.
- 3) Stay informed. Join the policy list and/or attend meetings (in person or remotely).

References

Policy Development Process (PDP)

<http://www.arin.net/policy/pdp.html>

Draft Policies and Proposals

<http://www.arin.net/policy/proposals/index.html>

Number Resource Policy Manual (NRPM)

<http://www.arin.net/policy/nrpm.html>

Q&A

