



IPv6 Deployment

CANTO

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History of the Internet Protocol

- **Internet Protocol version 4 (IPv4)**
 - Developed for the original Internet (ARPANET) in 1978
 - 4 billion addresses
 - Deployed globally & well entrenched
 - Allocated based on documented need
- **Internet Protocol version 6 (IPv6)**
 - Design began in 1993 when IETF forecasts showed IPv4 depletion between 2010 and 2017
 - 340 undecillion addresses
 - Completed, tested, and available from ARIN since 1999
 - Used and managed similar to IPv4

IPv4

Deployed 1981

Address Size:

32-bit number

Address Format:

Dotted Decimal Notation:

192.149.252.76

Prefix Notation:

192.149.0.0/24

Number of Addresses:

$2^{32} = \sim 4,294,967,296$

IPv6

Deployed 1999

Address Size:

128-bit number

Address Format:

Hexadecimal Notation:

3FFE:F200:0234:AB00:0123:4567:8901:ABCD

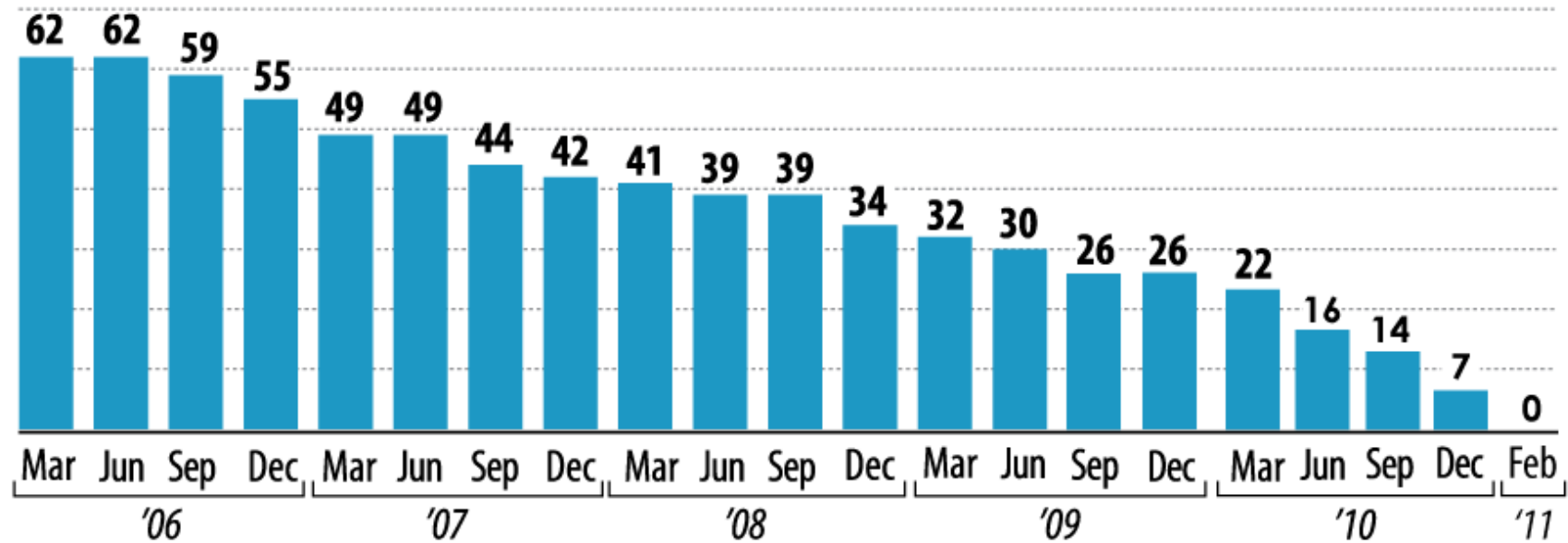
Prefix Notation:

3FFE:F200:0234::/48

Number of Addresses:

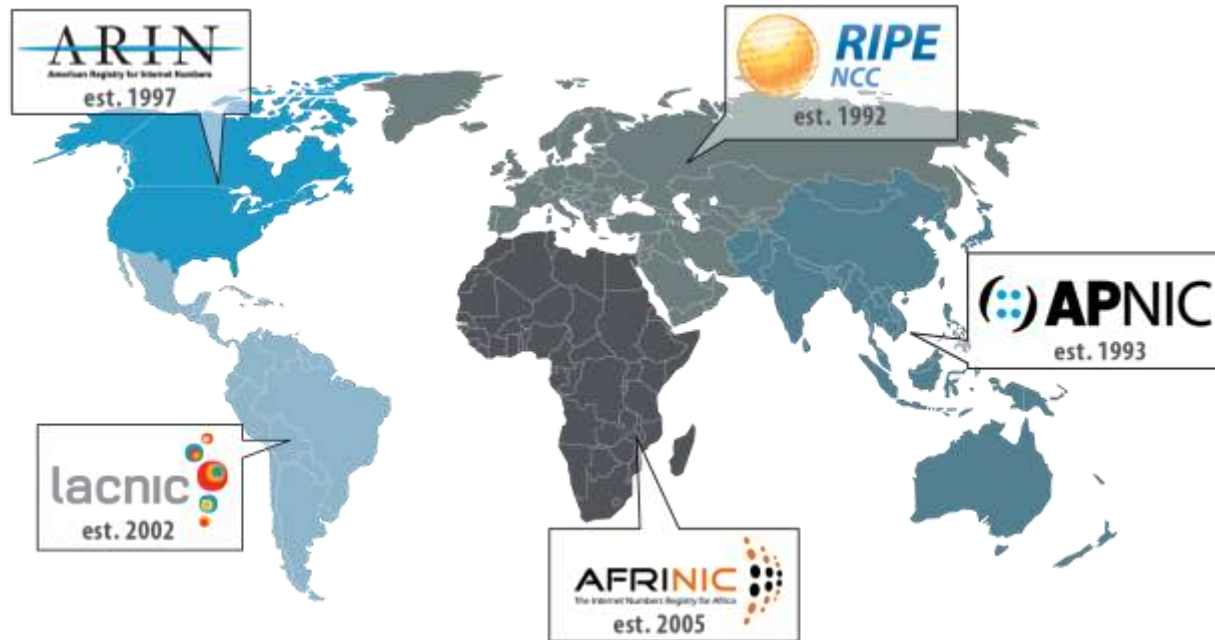
**$2^{128} =$
 $\sim 340,282,366,920,938,463,463,374,$
 $607,431,768,211,456$**

Global IPv4 Depletion



IANA IPv4 Space in /8s

Regional IPv4 Depletion



Out of 5 RIRs 4 have reached their final /8

ARIN IPv4 Depletion

ARIN IPv4 SPACE AVAILABLE

1.00

/8s IN AGGREGATE

* only reflects total available for allocation at this time

NOW IN PHASE 4

ARIN's IPv4 Inventory & IPv4 Depletion & /Countdown Plan

LEARN MORE ▶

ARIN reached a last /8 on 23 April 2014

Triggering Final Phase of IPv4 Countdown Plan

IPv4 Depletion/Countdown Plan

PHASE 4

What does this mean for you?

Phase 4 of the ARIN IPv4 Countdown Plan changes requesting procedures for all IPv4 requests.

ARIN's IPv4 Inventory

ARIN still has a few IPv4 addresses remaining



IPv4 inventory published on ARIN's website: www.arin.net

Updated daily @ 12AM ET

Why so little IPv4 left?

- The community-developed policies that manage how IPv4 is allocated and assigned did:
 - Extend the life of the IPv4
 - BUT...IPv4 depletion is unavoidable
- Not enough addresses to meet growing need of the global Internet



Why Adopt IPv6?

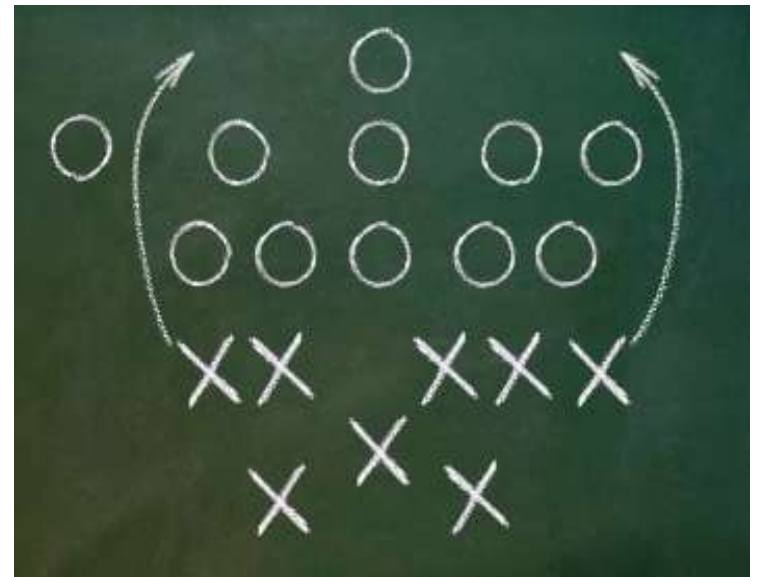
- Global IPv4 pool is depleted
- ARIN's IPv4 free pool will be gone soon
- IPv4 Waiting list is uncertain and sure to be long in queue
- IPv4 Transfer Market = \$\$\$\$\$
- How will you continue to grow your network?
- What other options do you have?

Alternatives?

- Large Scale/Carrier-Grade NAT?
 - Equipment costs to consider
 - Degraded services: increased latency, certain applications don't work well, law enforcement compliance issues, geo-location, etc.
- Or: **solve the problem the right way**

Everyone needs an IPv6 Plan

- Each organization must decide on a unique IPv6 deployment plan right for them
 - Timeline will vary
 - Investment level will vary



How can you prepare?

- **Talk to your ISP about IPv6 services**
 - You want access to the entire Internet
- **ISPs must connect customers via IPv4-only, IPv4/IPv6, & Via IPv6-only**
- **Must plan for IPv4/IPv6 transition services**
 - Many transition technologies available
 - Research options
 - Make architectural decisions



How can you get started?

- **Dual-Stack your networks**
 - IPv6 not backwards compatible with IPv4
 - Both will run simultaneously for years
- **Servers must be reachable via both IPv4 and IPv6**
 - Mail
 - Web
 - Applications
- **Do you operate a website?**
 - Ensure content will be available to all customers
 - Even new Internet users with an IPv6-only address



What else can you do?

- **Audit your equipment and software**
 - Are your devices and applications IPv6 ready?
- **Encourage vendors to support IPv6**
 - If not already, when will IPv6 support be part of their product cycle?
- **Get training for your staff**
 - Free resources available



Your IPv6 Check List

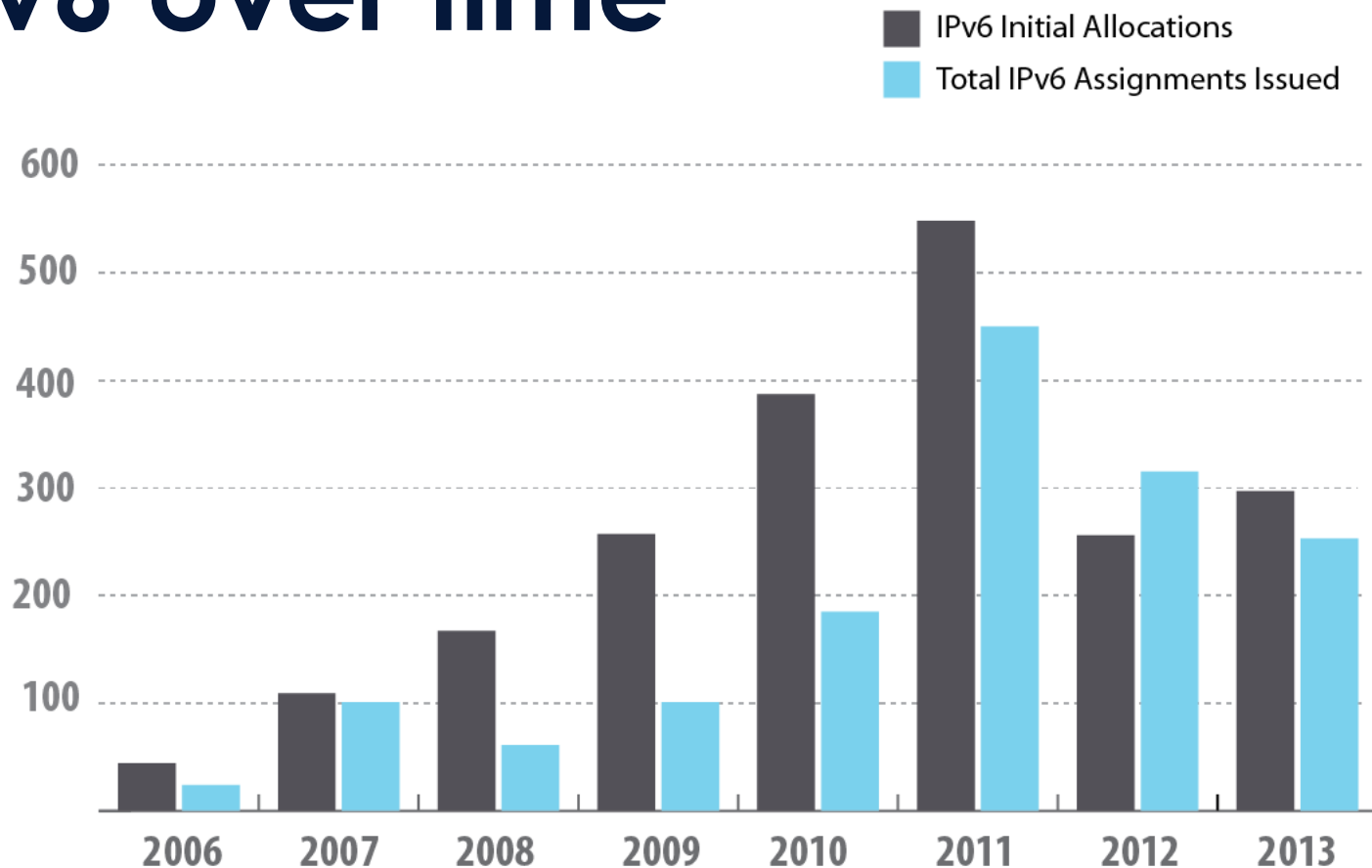
- IPv6 address space
- IPv6 connectivity (native or tunneled)
- Operating systems, software, and network management tool upgrades
- Router, firewall, and other hardware upgrades
- IT staff and customer service training

What Can Governments Do?

- **Government and the Internet community need to coordinate to support and promote**
 - IPv6 awareness
 - IPv6 education
- **Governments should consider:**
 - Regulatory and economic incentives to encourage IPv6 adoption
 - Required IPv6 compatibility in procurement procedures
 - Official IPv6 deployment within agencies

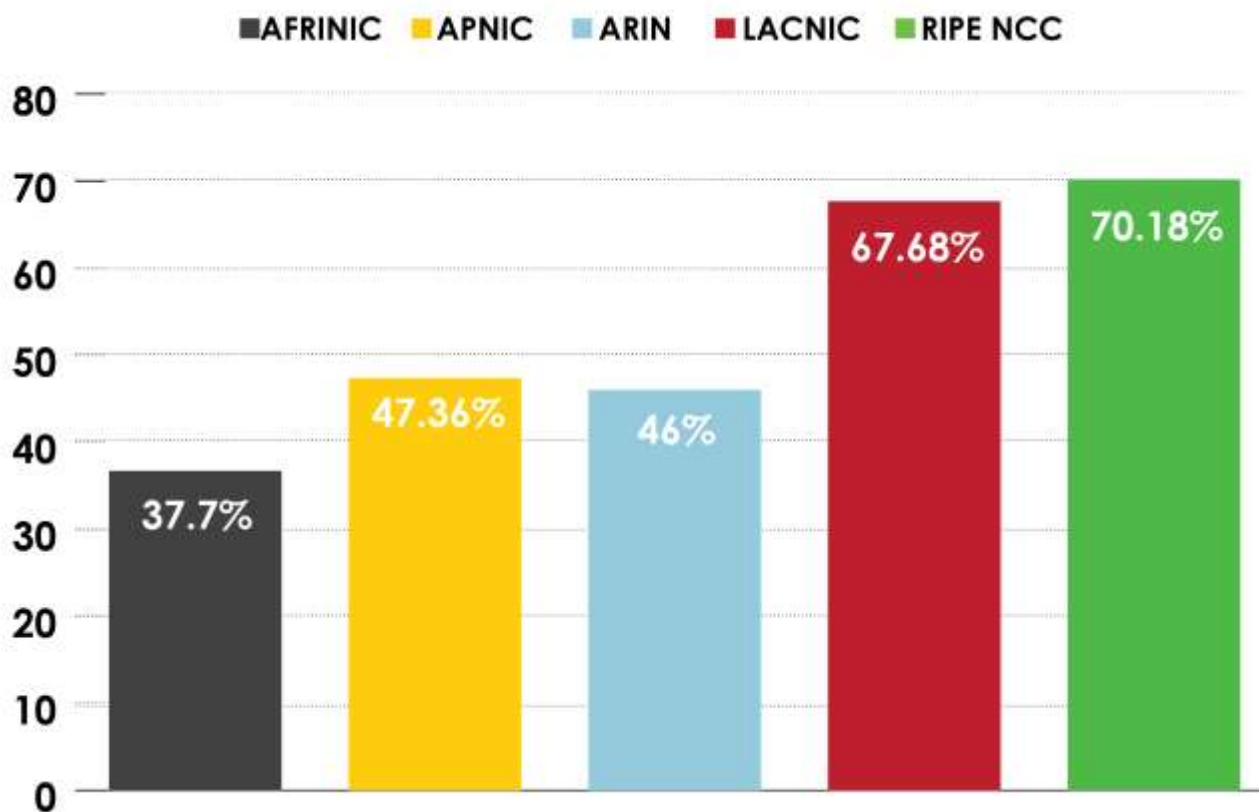


IPv6 over time



ARIN IPv6 Allocations and Assignments

PERCENTAGE OF MEMBERS WITH BOTH IPv4 AND IPv6 IN EACH RIR



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IPv4?

Getting
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without increasing their annual ARIN fees.

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Most organizations with IPv4 can get IPv6 without increasing their annual ARIN fees

Learn More

www.GetIPv6.info



IPv6 Info Center

www.arin.net/knowledge/ipv6_info_center.html



www.TeamARIN.net

Operational Guidance

[www.InternetSociety.org/
Deploy360/](http://www.InternetSociety.org/Deploy360/)



www.NANOG.org/archives/



bcop.NANOG.org

[www.hpc.mil/cms2/index.php/
ipv6-knowledge-base-general-info](http://www.hpc.mil/cms2/index.php/ipv6-knowledge-base-general-info)



Thank You