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

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**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 reached a last /8 on 23 April 2014

Triggering Final Phase of IPv4 Countdown Plan
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

- AFRINIC: 37.7%
- APNIC: 47.36%
- ARIN: 46%
- LACNIC: 67.68%
- RIPE NCC: 70.18%
Get IPv6 from ARIN now

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

Have IPv4? Getting IPv6 is easy!
Most organizations with IPv4 can get IPv6 without increasing their annual ARIN fees.

Find out if you qualify
www.arin.net
Learn More

IPv6 Info Center
www.arin.net/knowledge/ipv6_info_center.html


www.TeamARIN.net
Operational Guidance

www.InternetSociety.org/Deploy360/

www.NANOG.org/archives/

bcop.NANOG.org

Thank You