Going IPv6 only

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Introduction & Agenda

- **Agenda**
  - T-Mobile’s IPv6 journey
  - Background DNS64 and 464XLAT
  - Live demo of IPv6 interfaces on an Android phone using “Network Info II”
  - Some best practices and learnings

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- @ipv4depletion

Hiring Network Engineer with automation skills based in Bellevue, WA
At WWDC 2015 Apple announced the transition to IPv6-only network services in iOS 9. Starting June 1, 2016 all apps submitted to the App Store must support IPv6-only networking.

- iOS 10.3 is IPv6 only on the T-Mobile network

- Android 4.3 + have support for IPv6 + 464XLAT
Our progress towards IPv6

- **Android 4.3**
  - **July 2013**
  - **16%**

- **Apricot 37**
  - **Feb 2014**

- **NANOG 61**
  - **June 2014**
  - **27%**

- **NANOG 64**
  - **June 2015**
  - **54%**

- **V6 Summit 2017**
  - **April 2017**
  - **84%**

http://www.worldipv6launch.org/measurements/
The remaining 16%

- Really old handsets
- Tethering
- Tablets
- MVNO (Mobile Virtual Network Operators)
- IOT devices
- Retries over IPv4 for one or another reason
DNS64/NAT64 (RFC6147)

V6 Internet

V4 Internet

v6 only

AAA

64:ff9b:cc00:101

NAT64

DHS64

A 192.0.1.1
464 XLAT (RFC 6877)
Discovery of IPv6 Prefix (RFC 7050)

- Alternative to hardcoded pref64
- Sends DNS query for ipv4only.arpa
- Extract the pref64
- Happens during startup of 464XLAT
Happy Eyeballs  (RFC6555)

- Fallback to IPv4 after a reasonable time
- Happy Eyeballs work well for Dual Stack and 464XLAT clients
- Note! Happy Eyeballs have no effect on IPv6 only devices

- New version being worked on: draft-ietf-v6ops-rfc6555bis-00
Application level fallback

- **NSURLConnection** on Apple devices handles IPv4 literals
- Note there is no fallback if IPv6 fails, no Happy Eyeballs

Demo of Android Interfaces

Network Info II app can be found in Google/Apple Store
Failure scenarios

DNS Related failures

- RCODE – Does not return EMPTY NOERROR or NXDOMAIN (rare)
  - www.nuevosvecinos.com
- Flag – Does not return the AA flag in the empty answer (rare)
  - Major cloud storage app
- SOA – Does not provide SOA for the same domain as asked for (somewhat common)
  - Photo site
- Timeout – Simply does not return anything when asked for AAAA (common)
  - www.sky.com.mx

Network related failures

- Special use – Special use AAAA record such as ::1, link-local, etc (common)
  - Edu22.info
- Routing – AAAA returned, but unable to connect to the IP, :: (very common)
  - here.com
  - www.ericsson.se

http://www.employees.org/~dwing/aaaa-stats/
IPv6 Only Learnings

- Determine what sites/apps are important
- Proactively scan top sites
- Reach out to broken sites
- Don’t try to fix things with local overrides
- Scan social media for direct customer feedback
- Don’t try to change the world
- Keep things in perspective
Questions