

T-Mobile  
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

# T-Mobile Customer Base

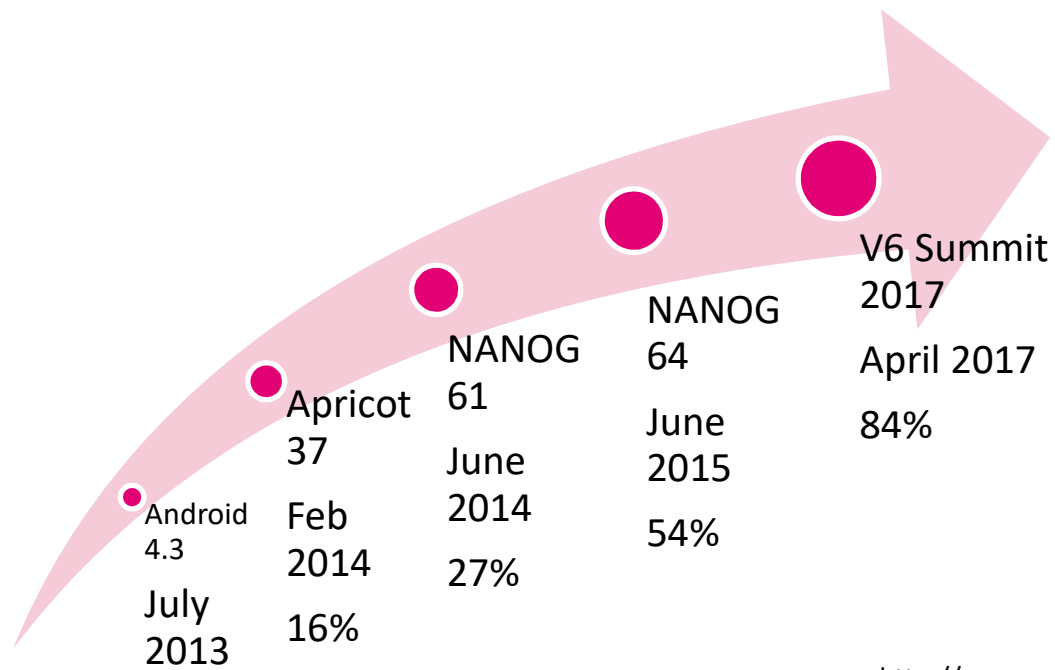


- At WWDC 2015 Apple announced the transition to IPv6-only network services in iOS 9. Starting June 1, 2016 all apps submitted to the App Store must support IPv6-only networking.
- IOS 10.3 is IPv6 only on the T-Mobile network



- Android 4.3 + have support for IPv6 + 464XLAT

# Our progress towards IPv6

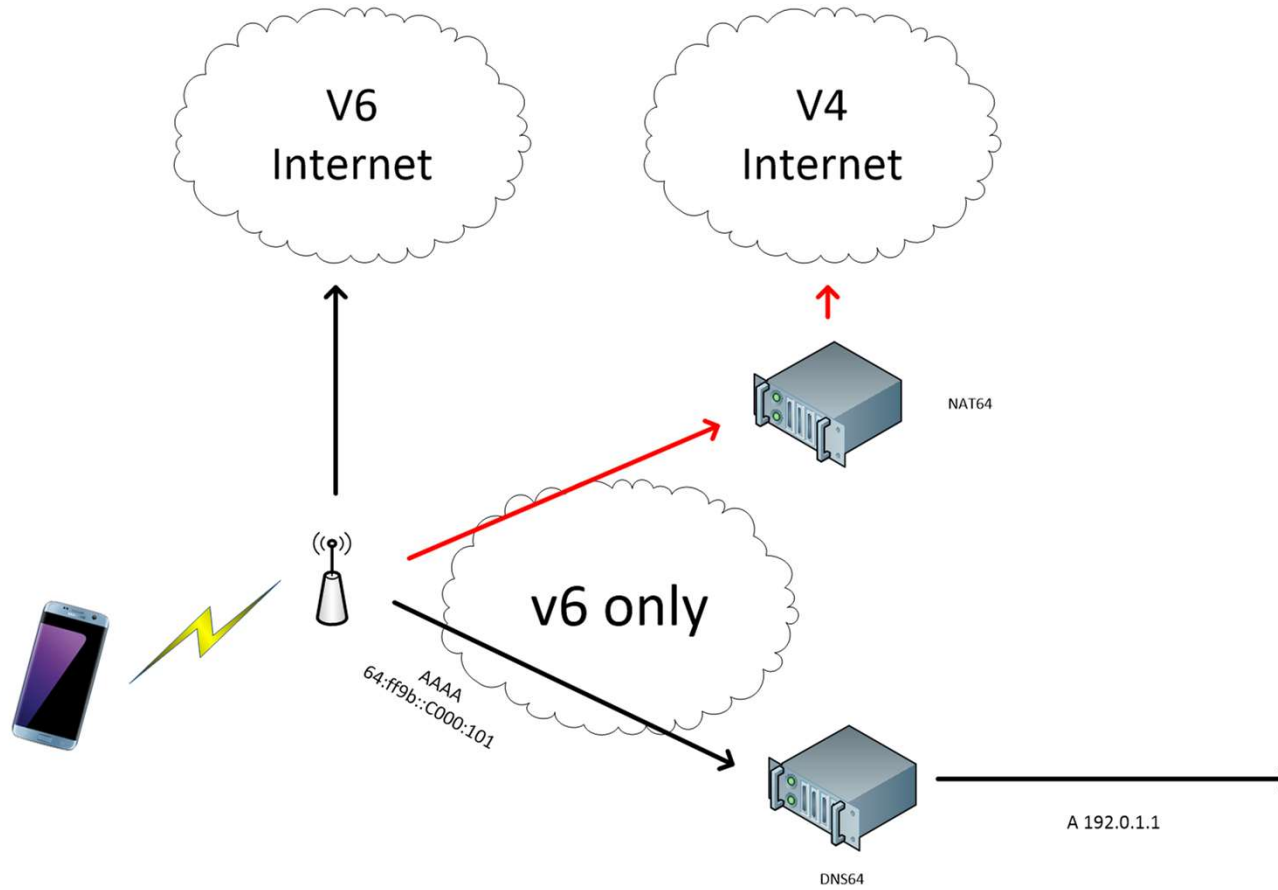


<http://www.worldipv6launch.org/measurements/>

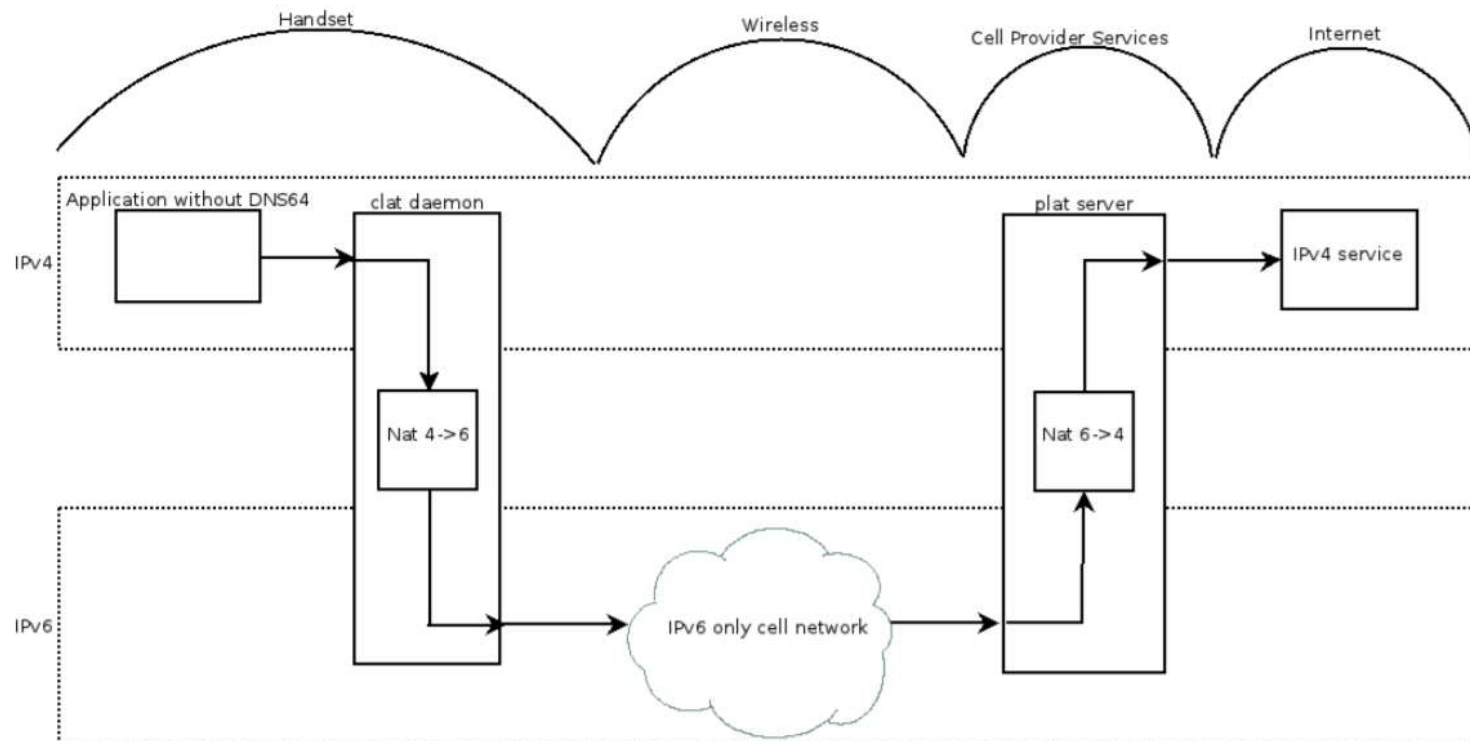
## The remaining 16%

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

# DNS64/NAT64 (RFC6147)



# 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

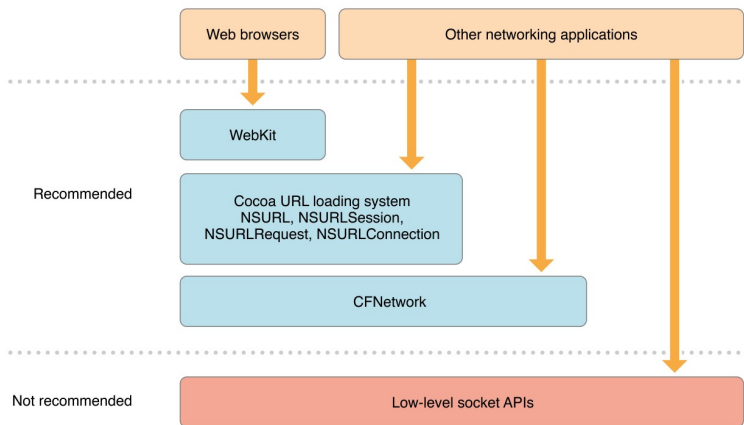


## Happy Eyeballs (RFC6555)

- 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

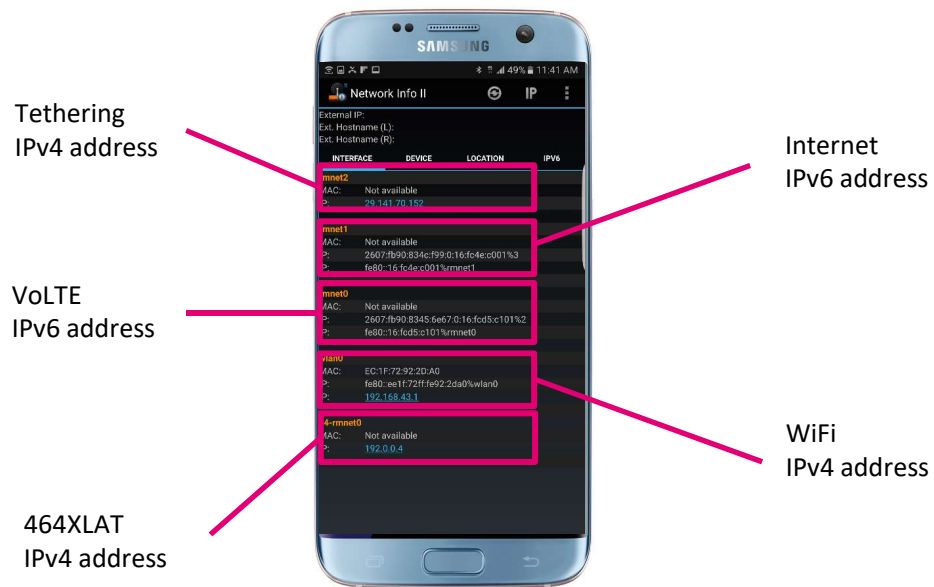
# Application level fallback

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



[https://developer.apple.com/library/content/documentation/NetworkingInternetWeb/Conceptual/NetworkingOverview/UnderstandingandPreparingfortheIPv6Transition/UnderstandingandPreparingfortheIPv6Transition.html#//apple\\_ref/doc/uid/TP40010220-CH213-SW13](https://developer.apple.com/library/content/documentation/NetworkingInternetWeb/Conceptual/NetworkingOverview/UnderstandingandPreparingfortheIPv6Transition/UnderstandingandPreparingfortheIPv6Transition.html#//apple_ref/doc/uid/TP40010220-CH213-SW13)

# 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](http://www.nuevosvecinos.com)

SOA – Does not provide  
SOA for the same domain  
as asked for (somewhat  
common)

Photo site

Flag – Does not return  
the AA flag in the empty  
answer (rare)

Major cloud storage app

Timeout – Simply does  
not return anything when  
asked for AAAA  
(common)

[www.sky.com.mx](http://www.sky.com.mx)

## Network related failures

Special use – Special use  
AAAA record such as ::1,  
link-local, etc (common)

[Edu22.info](http://Edu22.info)

Routing – AAAA  
returned, but unable to  
connect to the IP, :: (very  
common)

[here.com](http://here.com)  
[www.ericsson.se](http://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



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