



IP and WiFi

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Agenda

- IP: Where Are We ?
And where do we want to be ?
- IPv6-only WiFi
 - Protocols
 - Platforms
 - People

IP: Where Are We ?



First, why „IP“ ? ... RFC6540

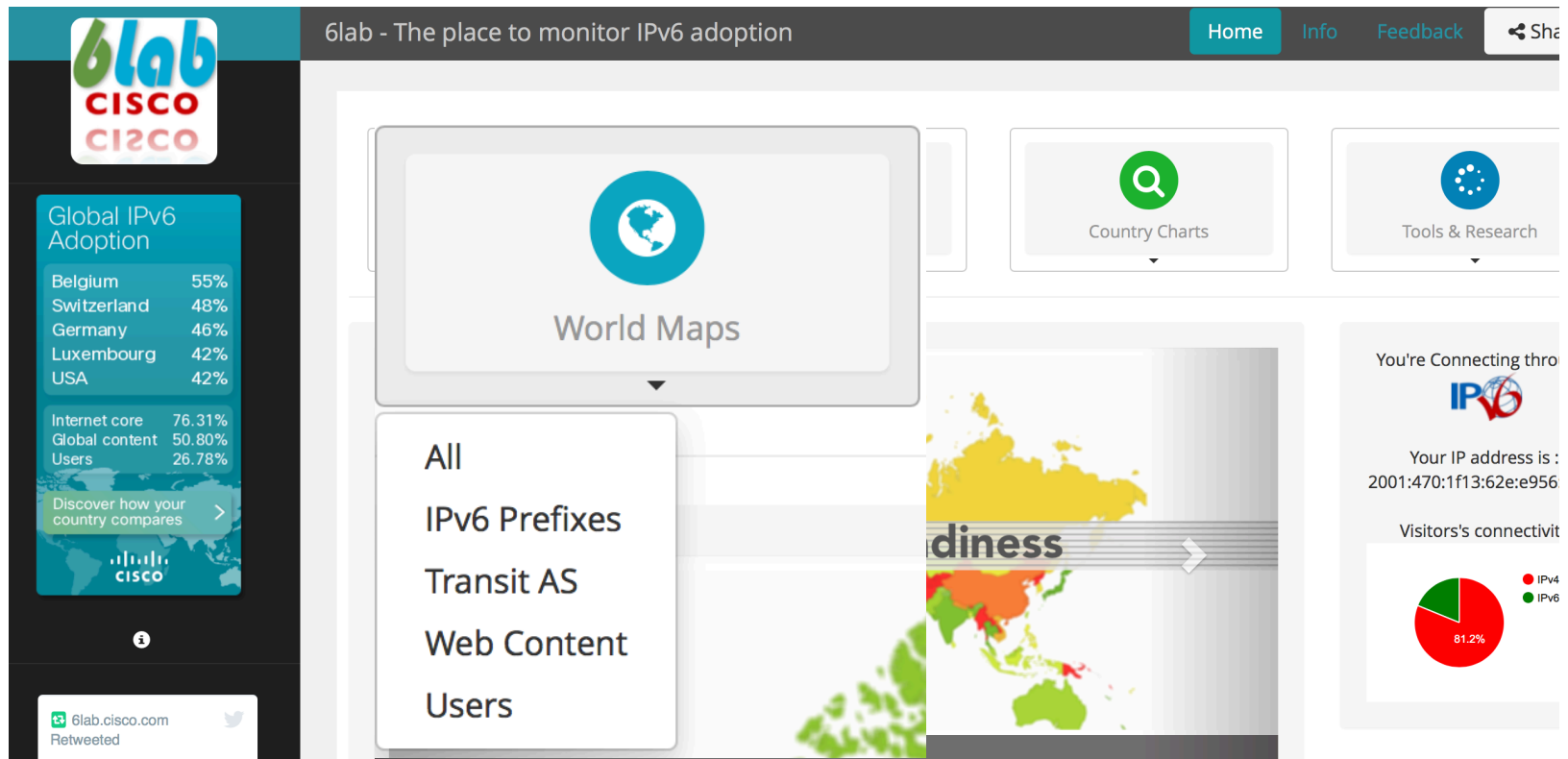
Given the global lack of available IPv4 space, and limitations in IPv4 extension and transition technologies, this document advises that IPv6 support is no longer considered optional. It also cautions that there are places in existing IETF documents where the term "IP" is used in a way that could be misunderstood by implementers as the term "IP" becomes a generic that can mean IPv4 + IPv6, IPv6-only, or IPv4-only, depending on context and application.

<https://tools.ietf.org/html/rfc6540>

Ongoing (IPv4=>IPv6) work in IETF

- <https://tools.ietf.org/html/draft-robachevsky-mandating-use-of-ipv6-examples-00>
Make the IPv6 examples mandatory in the IETF work
- <https://tools.ietf.org/html/draft-howard-sunset4-v4historic-00>
Discourage the use of IPv4 in the future standards

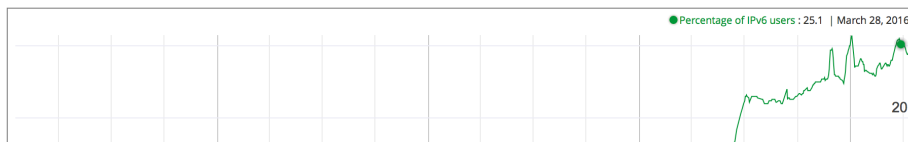
Where Are We With IPv6 ? <http://6lab.cisco.com/>



Users: Different Countries, Same Trend

United States of America

Display Users Data ⓘ



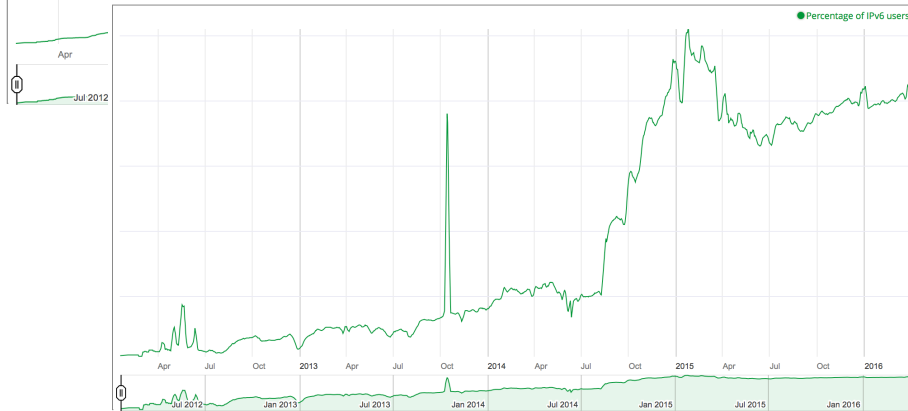
France

Display Users Data ⓘ



Norway

Display Users Data ⓘ



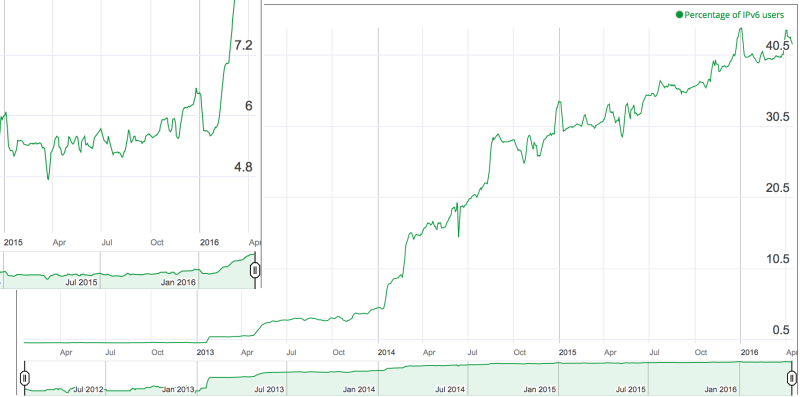
Finland

Display Users Data ⓘ



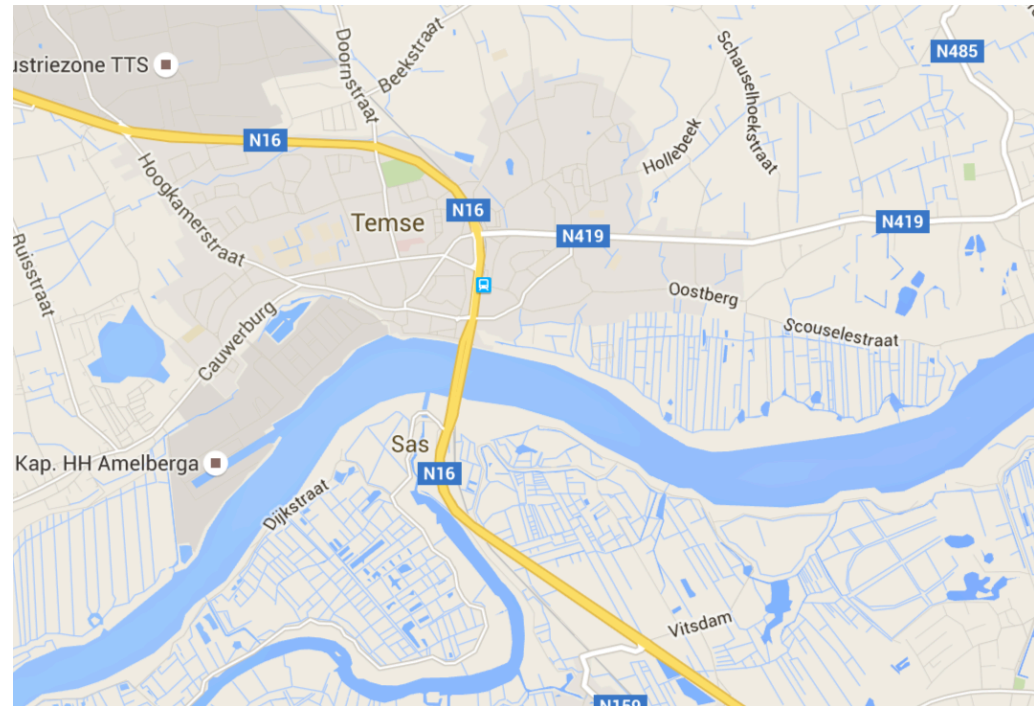
Belgium

Display Users Data ⓘ



A Story Of One Bridge...

- Built in 1949
- Need to pass wider ships
1963: Increase by 20m
- Too much traffic
Closed 1992..1994 for repairs, no upgrade
- Upgrade options
Tunnel: rejected
Add an extra lane: not enough capacity
- Result:
2007..2009: add a parallel bridge!



Result: “DualStack” !

- Both bridges used for traffic
- Each bridge - 2 lanes in each direction
- Immediate congestion problem solved
Still a problem if the “old” bridge breaks



IPv6-only is THE long-term option



IPv6-only WiFi

Protocols - Platforms - People



IPv6 tuning for happy WiFi

- Avoid multicast solicited Router Advertisements if you can
- Use Long Lifetimes
- In big setups: manage service advertisement protocols



Deep-dive sessions on tuning IPv6+WiFi

- WLPC_EU 2015 (1h)

<https://vimeo.com/album/3638907/video/144433678>

- CiscoLive (1.5h)

2015:

https://www.ciscolive.com/online/connect/sessionDetail.ww?SESSION_ID=81869&tclass=popup

2014:

https://www.ciscolive.com/online/connect/sessionDetail.ww?SESSION_ID=76326&tclass=popup



IPv6-only Router configuration for Large-Scale event

```
interface GigabitEthernet0/0/3.1401
.
.
.
ipv6 address 2001:67C:1810:F054::1/64
ipv6 enable
ipv6 nd reachable-time 600000
ipv6 nd prefix default infinite infinite off-link
ipv6 nd other-config-flag
ipv6 nd router-preference High
ipv6 nd ra lifetime 9000
ipv6 nd ra solicited unicast
ipv6 nd ra dns server 2001:67C:1810:F056::2
ipv6 dhcp server FOSDEM-v6-ONLY
ipv6 verify unicast source reachable-via rx allow-default
```

<https://supportforums.cisco.com/document/12068481/example-configuration-nat64-asr1k>

Remaining question

- How to turn off IPv4 on the device if there is none on the network ?
- Mostly an optimization - can be decided by the device independently



IPv6-only WiFi

Protocols - Platforms - People



Android

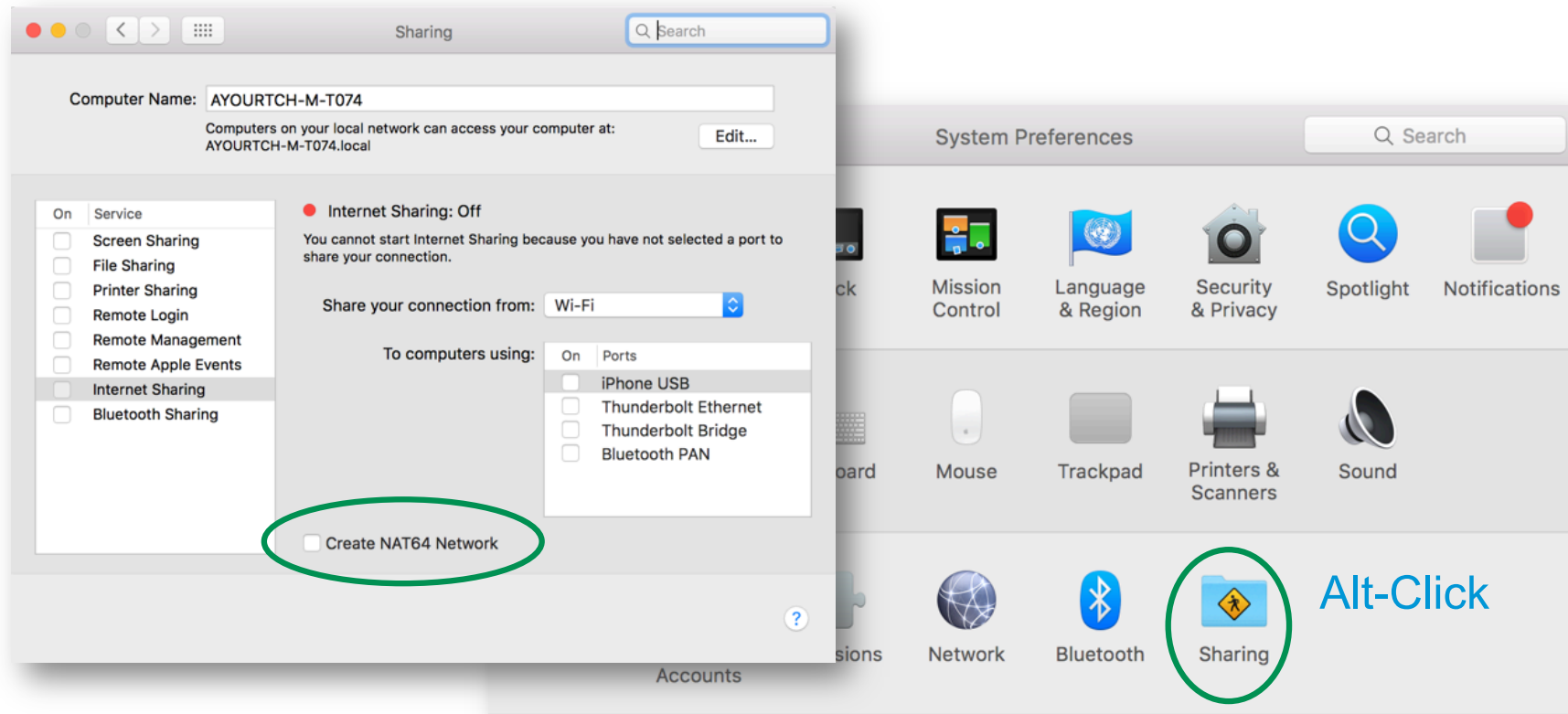
- Android 5.0 (Lollipop): RDNSS support in beginning of 2015
<https://code.google.com/p/android/issues/detail?id=32629>
- Can connect to IPv6-only WiFi! (with SLAAC)

“Because IPv6 support is so critical to ensuring your applications work across the world for every customer, we are making it an AppStore submission requirement, starting with iOS 9.”

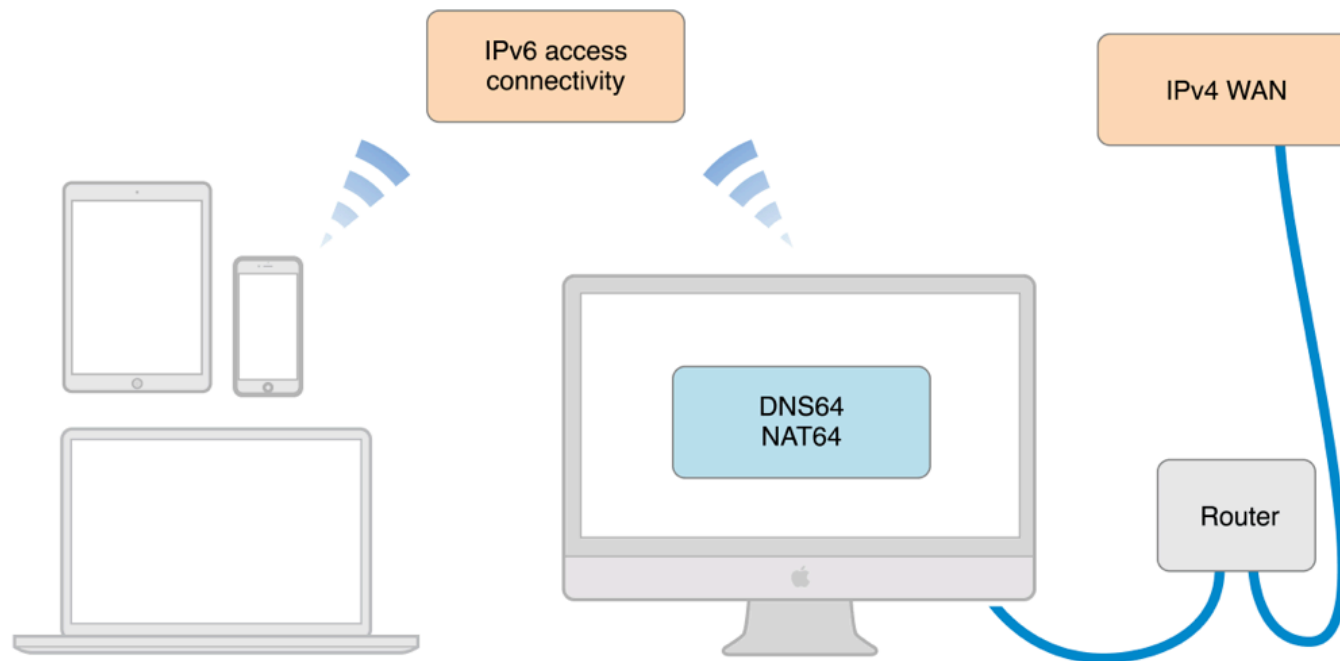
Sebastien Marineau, VP of Core OS, Apple (June 2015)

<http://www.internetsociety.org/deploy360/blog/2015/06/apple-will-require-ipv6-support-for-all-ios-9-apps/>

Have A Mac (10.11+) ? Have IPv6-Only Test Network!



OS X El Capitan (10.11) as access gateway



Testing NAT64 Client Applications With IOS

```
ipv6 access-list NAT64
  permit tcp 2001:DB8::/64 64:FF9B::/64
  permit udp 2001:DB8::/64 64:FF9B::/64
  permit icmp 2001:DB8::/64 64:FF9B::/64
!
!
nat64 v4 pool NAT64-IPv4 192.0.2.1 192.0.2.1
nat64 v6v4 list NAT64 pool NAT64-IPv4 overload
!
```

http://docwiki.cisco.com/wiki/IPv6_only_setup_with_NAT64

IPv6-only WiFi

Protocols - Platforms - People



IPv6-only test networks at various conferences

- Participation quite low ($\leq 1\%$ of the participants)
- Hard to assess how good/bad the state of the affairs is
- Typical reaction about IPv6-only:



Image: <http://blog.codinghorror.com>



beer
open source
lightning talks



devrooms
5000+ hackers
512 lectures

Brussels / 1 & 2 February 2014 [schedule](#)

(Probably) The World First: IPv6-only WiFi by default



Dirk Haun @dirkhaun

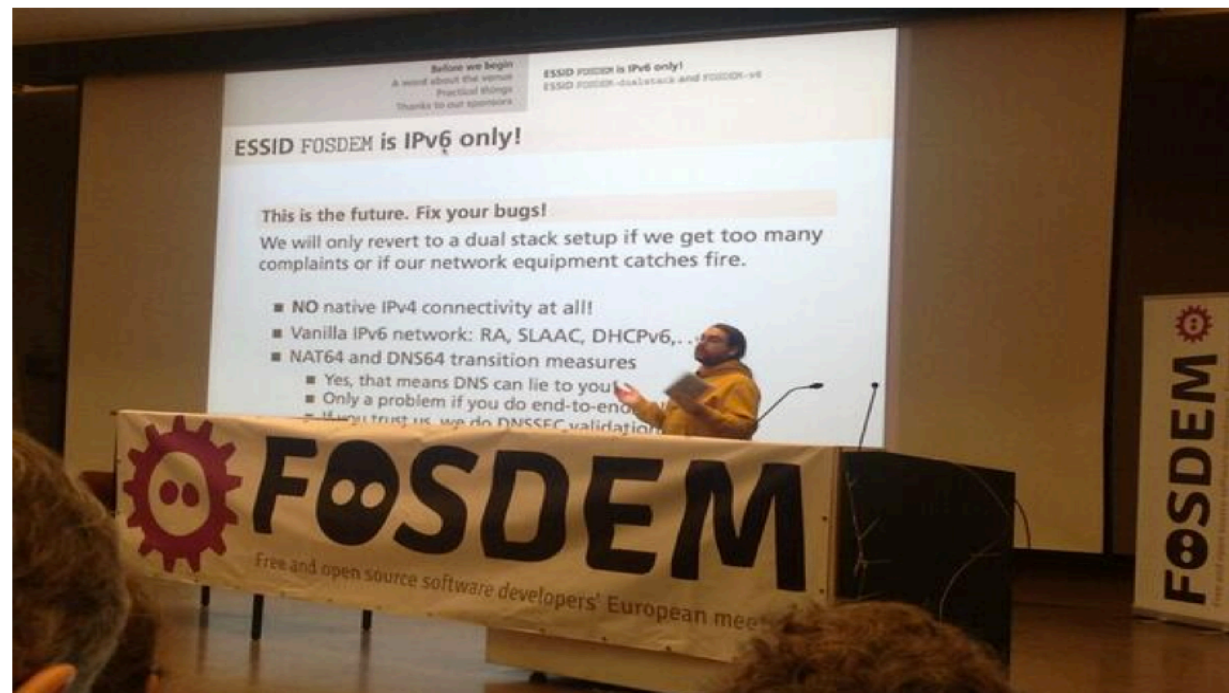
6h

Forced **progress**: #FOSDEM network is IPv6 only by default. "We're all developers. If you find bugs, fix them!"

pic.twitter.com/pM9vvVYB9e

Hide photo

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Technical details

- FOSDEM SSID (default): IPv6-only + NAT64
- FOSDEM_legacy SSID : dualstack
- ~15 people (volunteers) in the NOC
- Communication, Communication, Communication
Critical part of ensuring the expectations are correctly set



Maksim Melnikau @max_posedon

1h

So, I'm switched to **ipv6** #fosdem ESSID ... It is my first time ever when I use **ipv6** ... pic.twitter.com/KO1nCoCwHr

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```

wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::863a:4bff:fece:9dec prefixlen 64 scopeid 0x20<link>
    inet6 2001:67c:1810:f051:863a:4bff:fece:9dec prefixlen 64 scopeid 0x0<global>
    ether 84:3a:4b:ce:9d:ec txqueuelen 1000 (Ethernet)
    RX packets 282214 bytes 262806444 (250.6 MiB)
    RX errors 0 dropped 6 overruns 0 frame 0
    TX packets 250257 bytes 46739319 (44.5 MiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
  
```



Olaf Flebbe @OlafFlebbe

2h

#fosdem vmware fusion seems not to work with **ipv6**



Łukasz Jernaś @didzej1

16 Feb 2011

Favorite More

I'm all for being #IPv6 only at next years #FOSDEM, this time I'll take a device with WiFi :P <http://ur1.ca/39f5g>

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Grégory Paul @paulgreg

5h

At #FOSDEM with @thierrymarianne. Network is **IPv6** only and pretty solid for now ! Yeah #wifi #conference #rocks

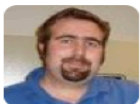
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Andreas Ol

Just cancell

IPv6 support. Instead using git-annex assistant - git-annex.branchable.com/assistant/

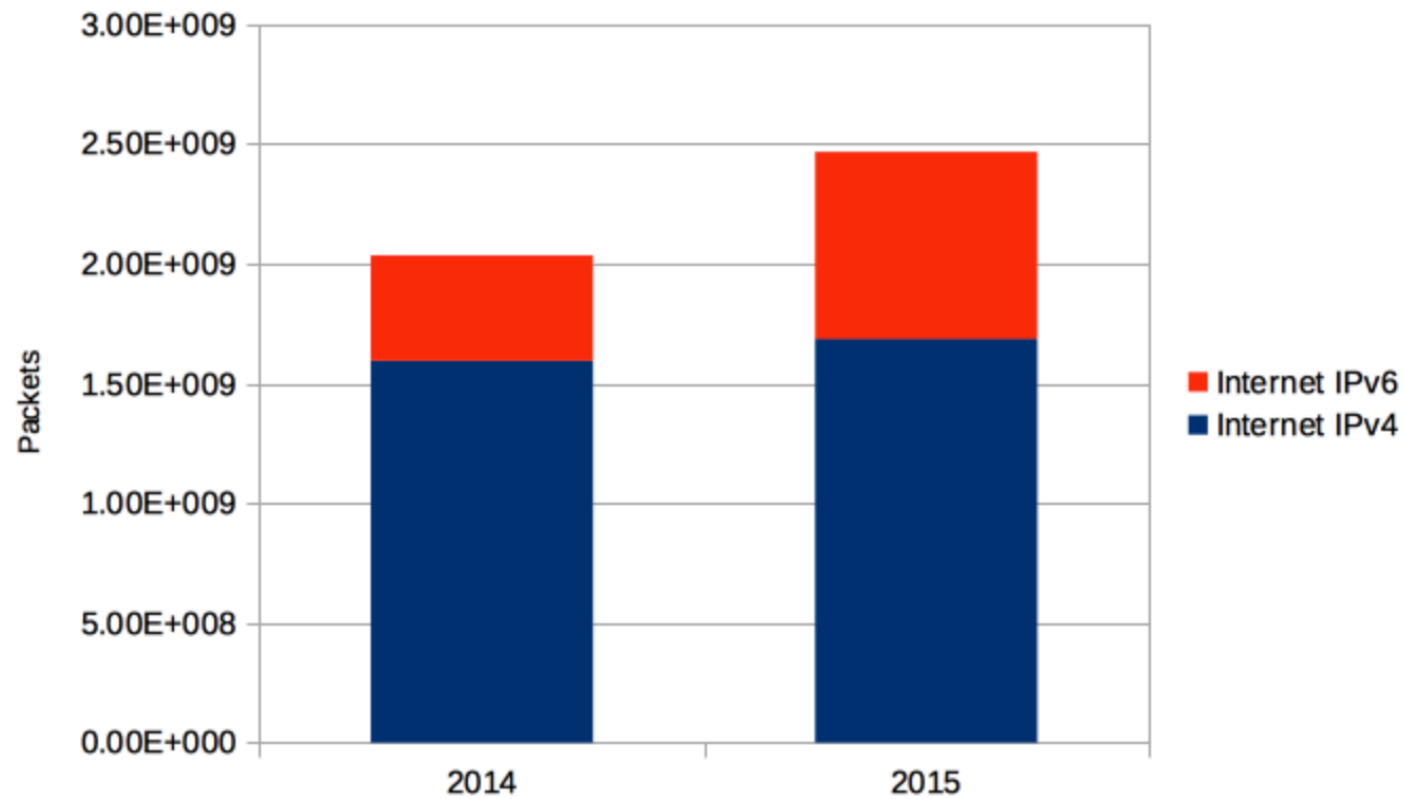
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Internet-bound traffic from FOSDEM conference

Percentage of the clients using default SSID

- 2014: ~ 16%
- 2015: ~ 35%
- 2016: ~ 50%

- NOTE: Client base is Android-heavy!
- NOTE: These are not “IPv6” developer.
These are not even “Network” developers
Just “Application” developers
- Reference: <http://blogs.cisco.com/getyourbuildon/fosdem-2016-a-first-quick-look>





FOSDEM is no longer the only IPv6-default event !

https://www.troopers.de/wp-content/uploads/2013/11/TROOPERS14-Case_Study-Building_a_Secure_IPv6_Guest_WiFi_Network-Christopher_Werny.pdf

IPv6-only: Not Just For Networking Geeks!

CEDEC

Clip slide

- Largest conference in Japan for computer entertainment developers
- 3 days at Pacifico Yokohama
- 6,373 attendees in 2015

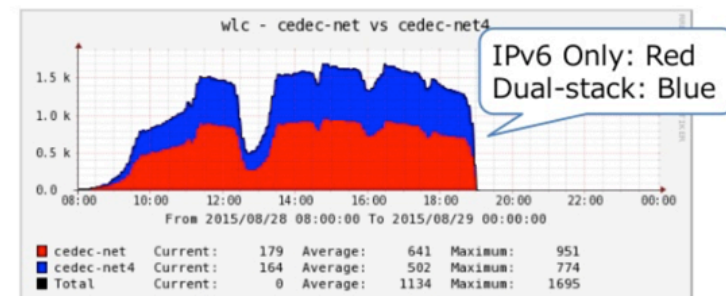


Reach
Next
Level

Devices in each network



approx. **65% Devices**
works with **IPv6 Only**



almost same as share of Apple devices
If RDNSS is enabled, Android devices can be added

Reach
Next
Level

<http://www.slideshare.net/yuyarin/janog37-ltcedecnet2015-en-57359924>

Conclusions

- IPv6 is picking up and IPv6-only is the only long-term solution
- Protocols & Platforms are getting ready for IPv6-only WiFi
- Help make sure People are ready as well
 - Run IPv6-only+NAT64 WiFi – at least as a secondary one
 - (and report/fix the broken apps!)

Thank you.

