

# The Decline of Scarcity

Elise Gerich, VP IANA & Technical  
Operations

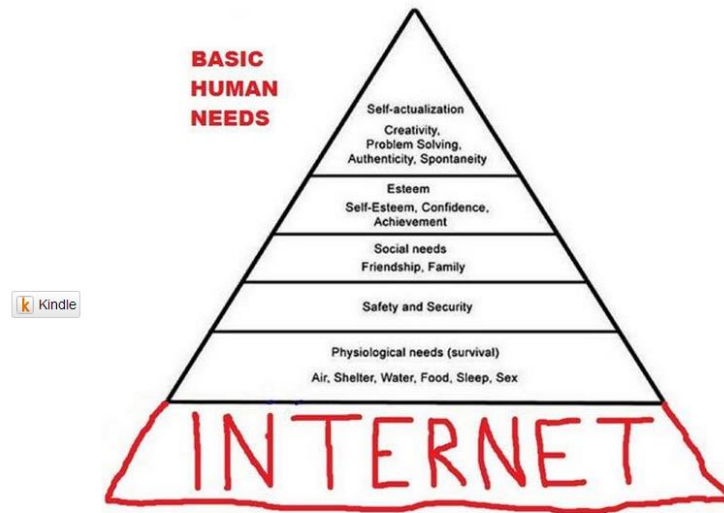
Taipei, July 2013

# 21<sup>st</sup> century is being built on the Internet



## Maslow XXI C.

Cory Doctorow at 1:58 pm Fri, Apr 19, 2013

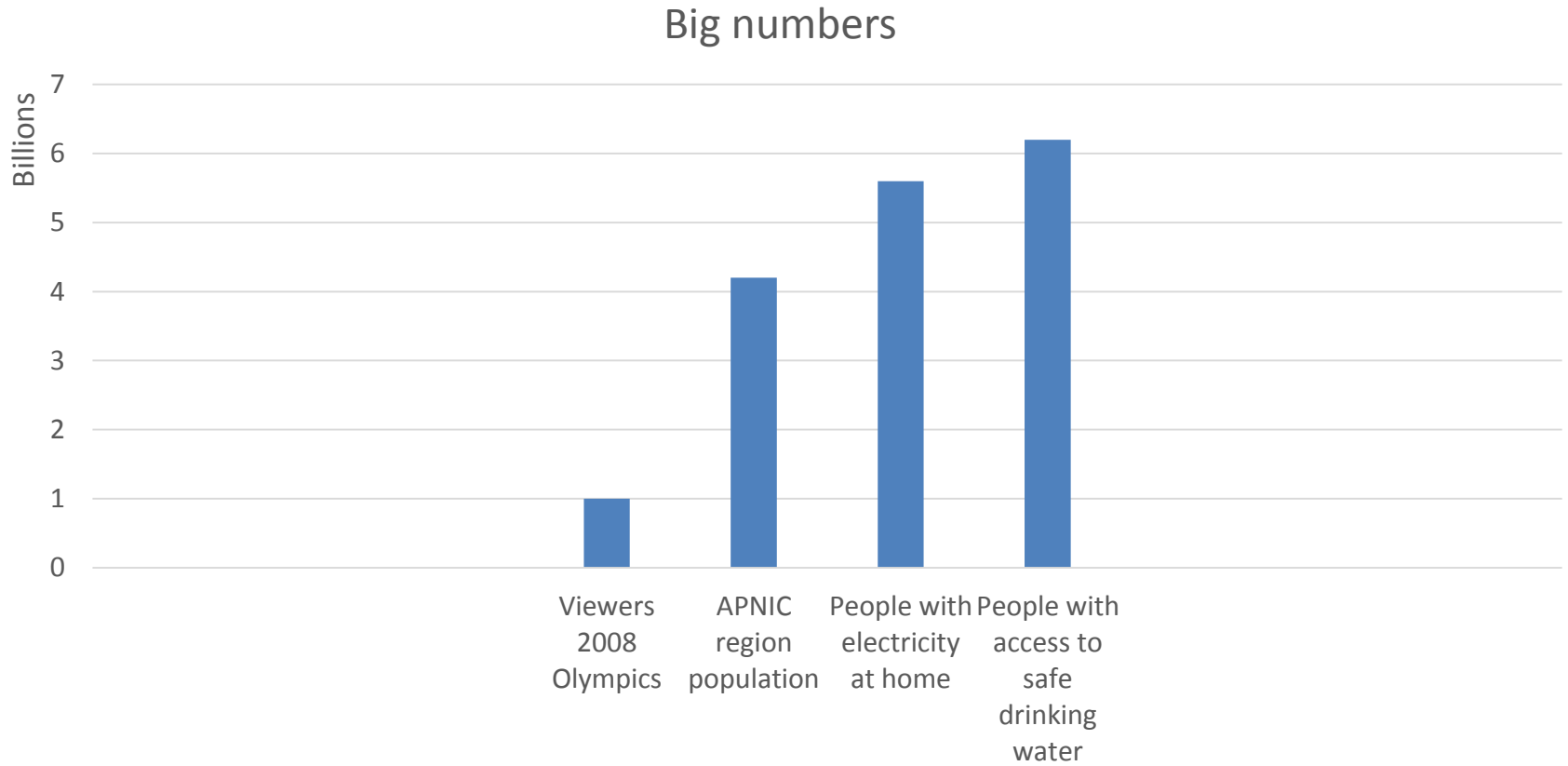


Take that, Maslow.

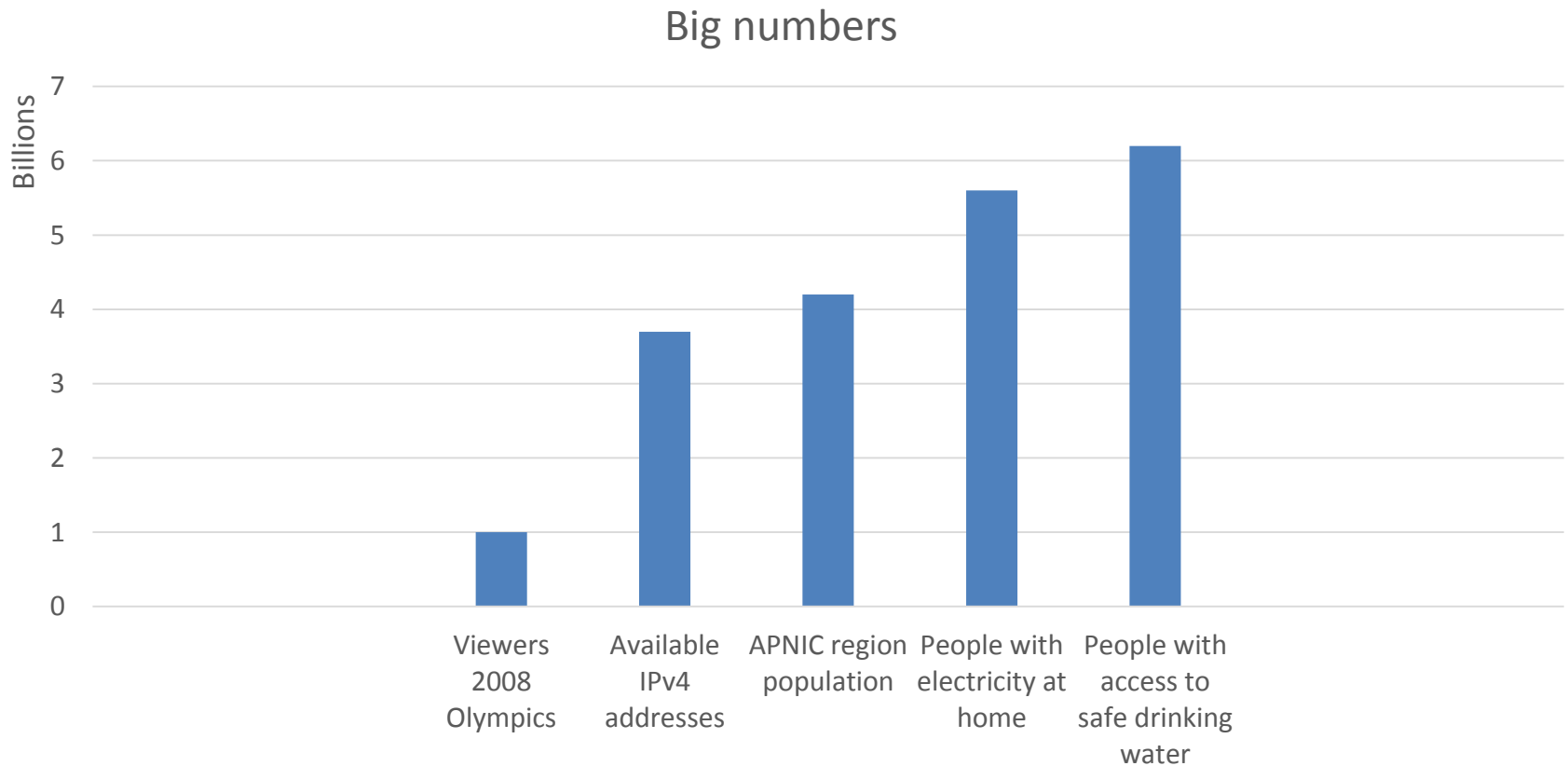
# How is the 21<sup>st</sup> Century built on the Internet?

- E-Government services require citizens to have Internet access
- Utility consumption measuring
- Personal health monitors (blood pressure, heart rhythm &c)
- Crop growth data monitors
- Just a few examples of the Internet of Things

# Who might be using the Internet?



# What is wrong with this picture?



# What are the principle causes of scarcity?

- Physical Laws – caused by the physical world
- Law- caused by government regulation
- Positionality – caused by social competition for goods whose value arises from how much one has
- Architecture – caused by engineering and design

Credit to Jon Perry & Ted Kupper

# Does this mean scarcity with regard to the Internet?



# What are the myths from 2010?

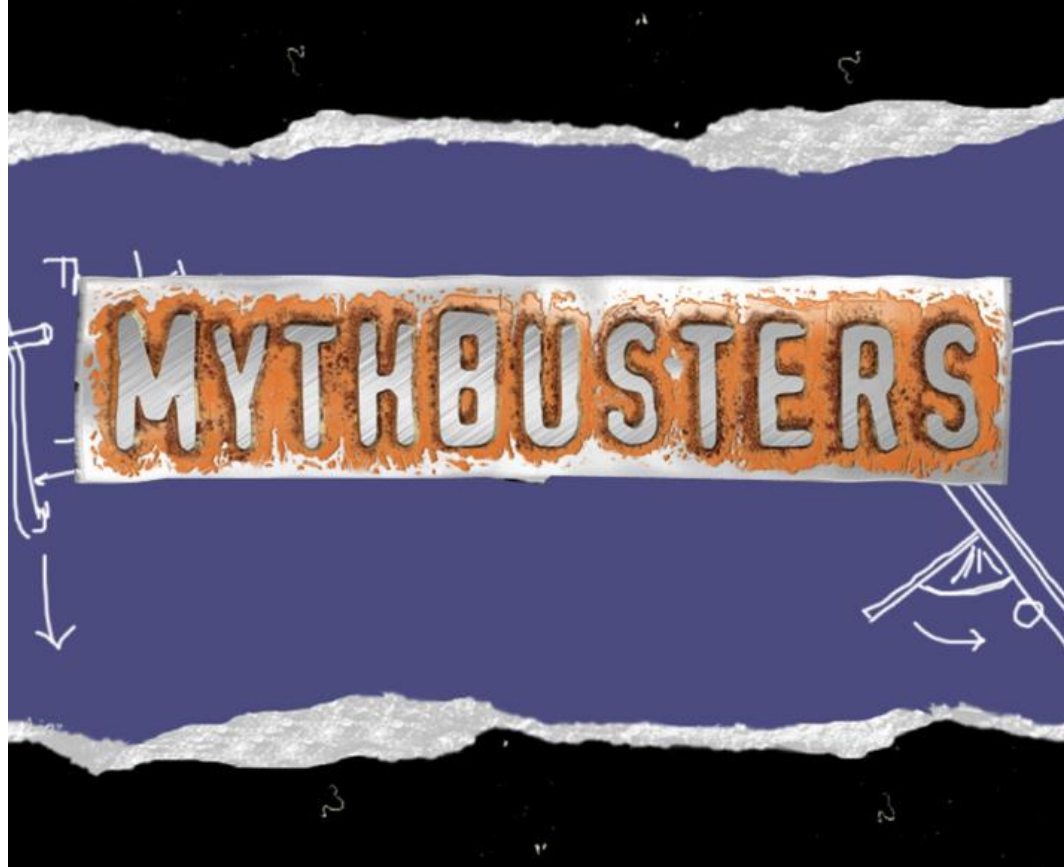
IPv6 is too slow

Content is unavailable

DNS queries will not work

Applications will not work

Too expensive for mobile networks



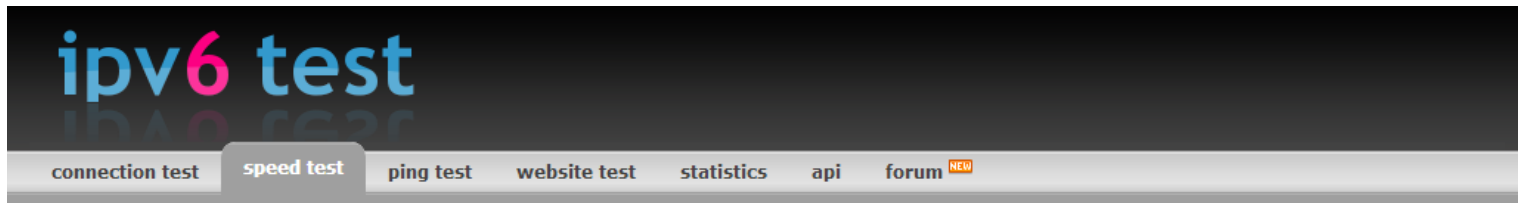


# 2010 Myth – IPv6 connectivity is slower than IPv4 connectivity

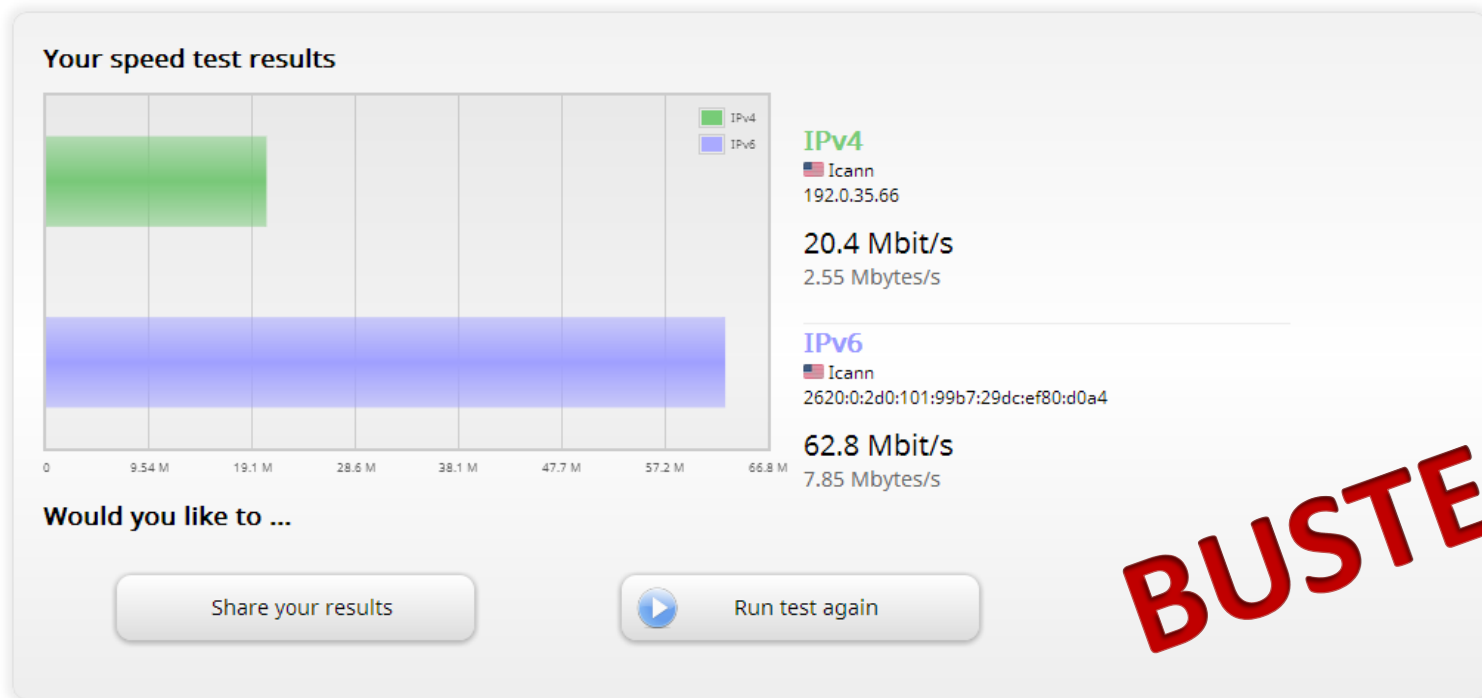
What has taken place in 3 years:

- June 2011 IPv6 Day
- Measurements by Keranen & Arkko of Ericsson – delay characteristics on median similar for IPv4 & IPv6- often IPv6 was faster
- Production quality IPv6 configurations

# IPv6 reality 2013: speed



On this page you can test the speed of your broadband connection, and compare the performance of your IPv4 and IPv6 connectivity.



# 2010 Myth – Content is not available via IPv6

What has taken place in 3 years:

- June 2012 IPv6 Launch
- Commitment from web companies, home network equipment manufacturers, and service providers
- All permanently enabled IPv6 products and Services
- <http://www.worldipv6launch.org>

# IPv6 reality 2013: content Top Websites running IPv6

IPv6 used by 3.4% of all websites

(Alexa raw data top 5)

- [google.com](http://google.com) 2607:f8b0:4005:800::1008
- [facebook.com](http://facebook.com) 2a03:2880:2110:df07:face:b00c:0:1
- [blogspot.com](http://blogspot.com) 2607:f8b0:400e:c01::bf
- [flipkart.com](http://flipkart.com) 2001:df0:23e:9002::15
- [agame.com](http://agame.com) 2001:4c08:2005::5

<http://bgp.he.net/ipv6-progress-report.cgi>

<http://w3techs.com/technologies/details/ce-ipv6/all/al>

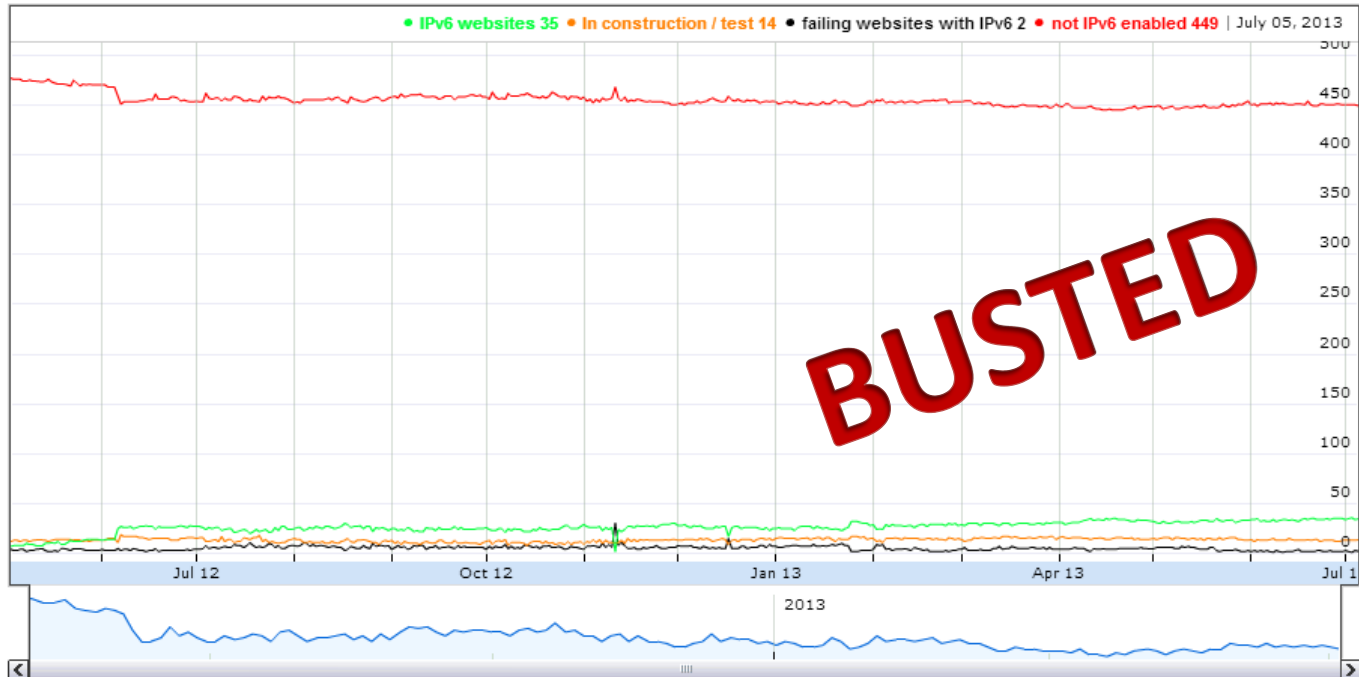
# IPv6 Reality 2013: Content Taiwan surpasses global percentage

## Taiwan

Display IPv6 Prefixes Data

Display Transit AS Data

Display Content Data

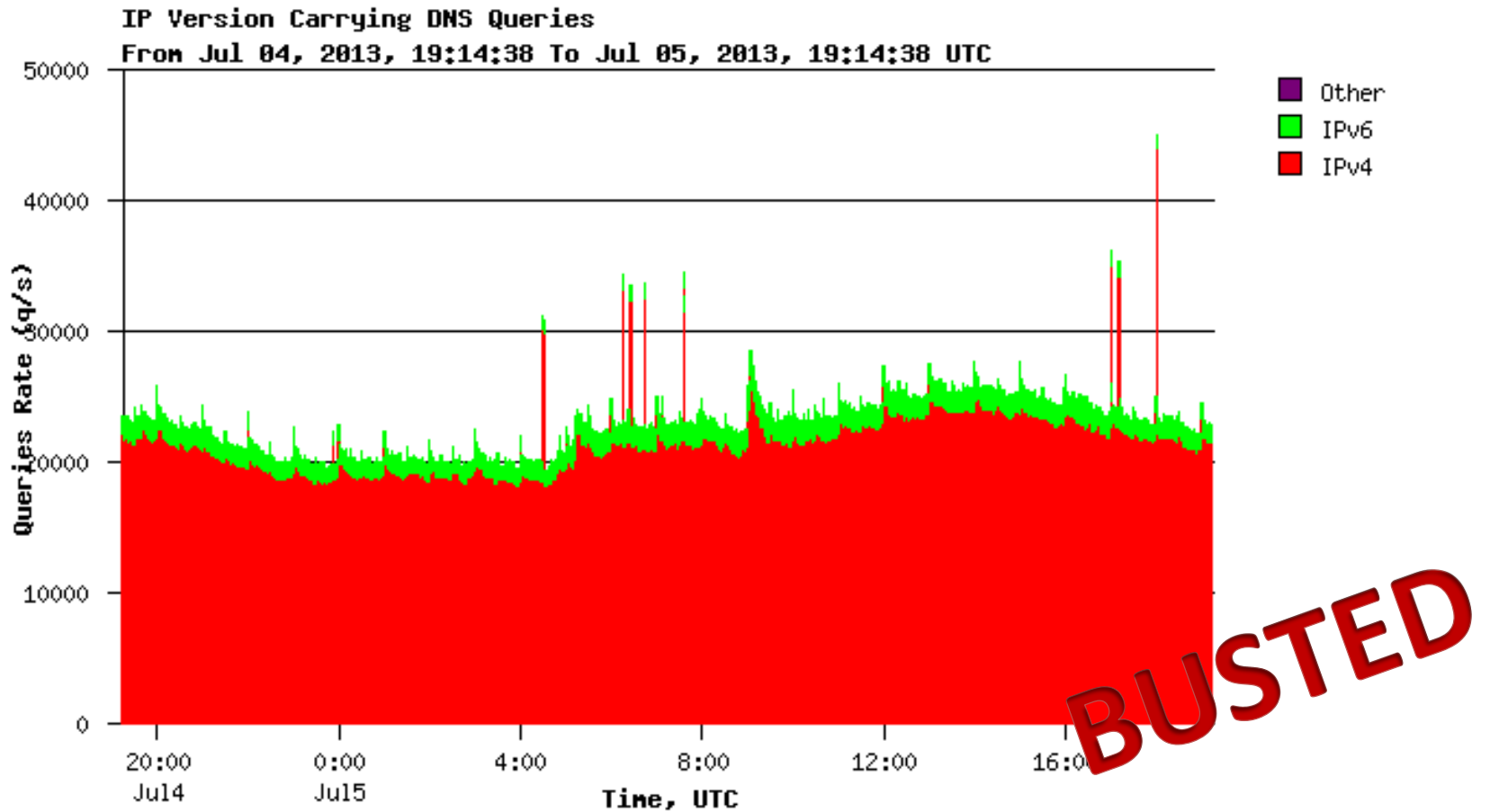


## 2010 Myth – lack of resolution for DNS queries

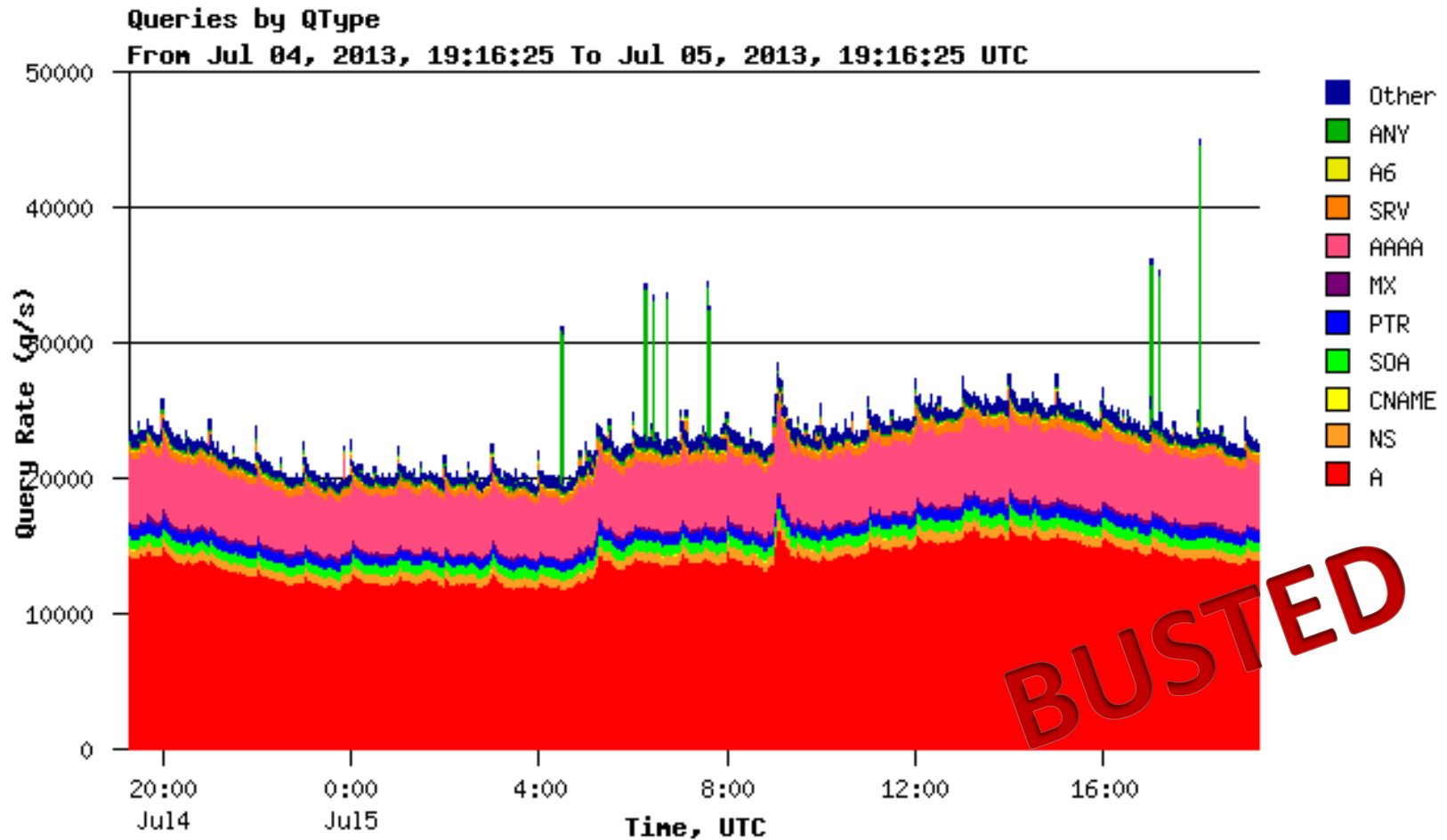
What has taken place in 3 years:

- Jan 2012 - 267 of 312 Top Level Domains had IPv6 name servers
- July 2013 – 281 of 317 Top Level Domains have IPv6 name servers – 88.6%
- 86.9% of TLDs have nameservers with IPv6 glue in the root zone - 275

# IPv6 reality 2013: DNS (1)



# IPv6 reality 2013: DNS (2)





## 2010 Myth – Applications will not work

What has taken place in 3 years:

- More operating systems support both IP addressing protocols
- Most vendors offer IPv6 capable data center switches -  
<http://blog.ioshints.info/2012/09/state-of-ipv6-in-data-center-gear.html>
- [http://en.wikipedia.org/wiki/Comparison\\_of\\_IPv6\\_application\\_support](http://en.wikipedia.org/wiki/Comparison_of_IPv6_application_support)

# IPv6 reality 2013: Apps

This is a comparison of operating systems in regards to their support of the IPv6 protocol.

OS	Version	Claimed IPv6-ready	Installed by Default	DHCPv6	ND RDNSS	Notes
AIX	4.3	Yes	Yes	Yes	No	
Android	4.2 (Jelly Bean)	Partial <sup>[1]</sup>	Yes	No <sup>[2]</sup>	No <sup>[3]</sup>	
Cisco IOS	15.2	Yes	Yes	Yes	No	
Fedora	13	Yes	Yes <sup>[4]</sup>	Yes <sup>[4]</sup>	Yes <sup>[4]</sup>	
FreeBSD	9.0	Yes <sup>[5]</sup>	Yes	Addon <sup>[6]</sup>	Yes <sup>[7]</sup>	
HP-UX	11i	Yes	Yes	Yes	Yes	<sup>[8]</sup>
IBM i	7.1	Yes	Yes	Yes	No	<sup>[9]</sup>
iOS	4.1	Yes	Yes	Yes	Yes <sup>[10]</sup>	iOS supports stateless DHCPv6 since version 4 and stateful DHCPv6 since 4.3.1.
Juniper JUNOS	12.2	Yes	Yes	Yes	No <sup>[11]</sup>	
Mac OS X	10.7 (Lion)	Yes	Yes	Yes <sup>[12]</sup>	Yes <sup>[13]</sup>	
MeeGo	1.2	No <sup>[14]</sup>	Yes <sup>[15]</sup>	No	Yes <sup>[16]</sup>	
OpenBSD	5.2	Yes	Yes	Addon <sup>[6]</sup>	Yes	RDNSS is only supported for rtdvd so far.
OpenVMS	8.3	Yes	Yes	No	No	
Red Hat Enterprise Linux	6	Yes <sup>[17]</sup>	Yes	Yes <sup>[6]</sup>	Yes	
Solaris	10	Yes	Yes	Yes	No	
SUSE Linux Enterprise Server	11	Yes <sup>[18]</sup>	Yes	Yes	Yes	
Symbian	7.0	Yes	Yes	No	No	<sup>[1]</sup> 
Ubuntu	11.04 (Natty Narwhal)	Yes	Yes	Yes	Yes	RDNSS support available so long as NetworkManager uses IPv6 "Automatic" setting, otherwise "rdnssd" package required.

[http://en.wikipedia.org/wiki/Comparison\\_of\\_IPv6\\_support\\_in\\_operating\\_systems](http://en.wikipedia.org/wiki/Comparison_of_IPv6_support_in_operating_systems)

# IPv6 reality 2013: apps



 Windows Phone



**BUSTED**



# The policies of 2010



- Were to address scarcity
- Tried to prolong a finite resource
- Were all about IPv4

# Perceptions of Internet scarcity from 2010?

- IPv6 connectivity is slower than IPv4 connectivity
- Content is not available via IPv6
- Very low percentage of DNS queries resolved for v6
- Applications don't support v6
- Mobile networks need 2 separate licenses

# What has happened since 2010?

- IPv6 Day
- IPv6 Launch
- Deploy 360 Program
- Websites to confirm IPv6 connection speed
- New operating systems
- Quad A records in name servers
- Mobile LTE only 1 license

# The Internet of 2013 and the Future

- The Myths of 2010 are no longer true
- The Internet  $\neq$  IPv4
- The Internet  $\neq$  IPv6
- THE Internet = both v4 & v6
- 2013 has seen the decline of scarcity

Thank You





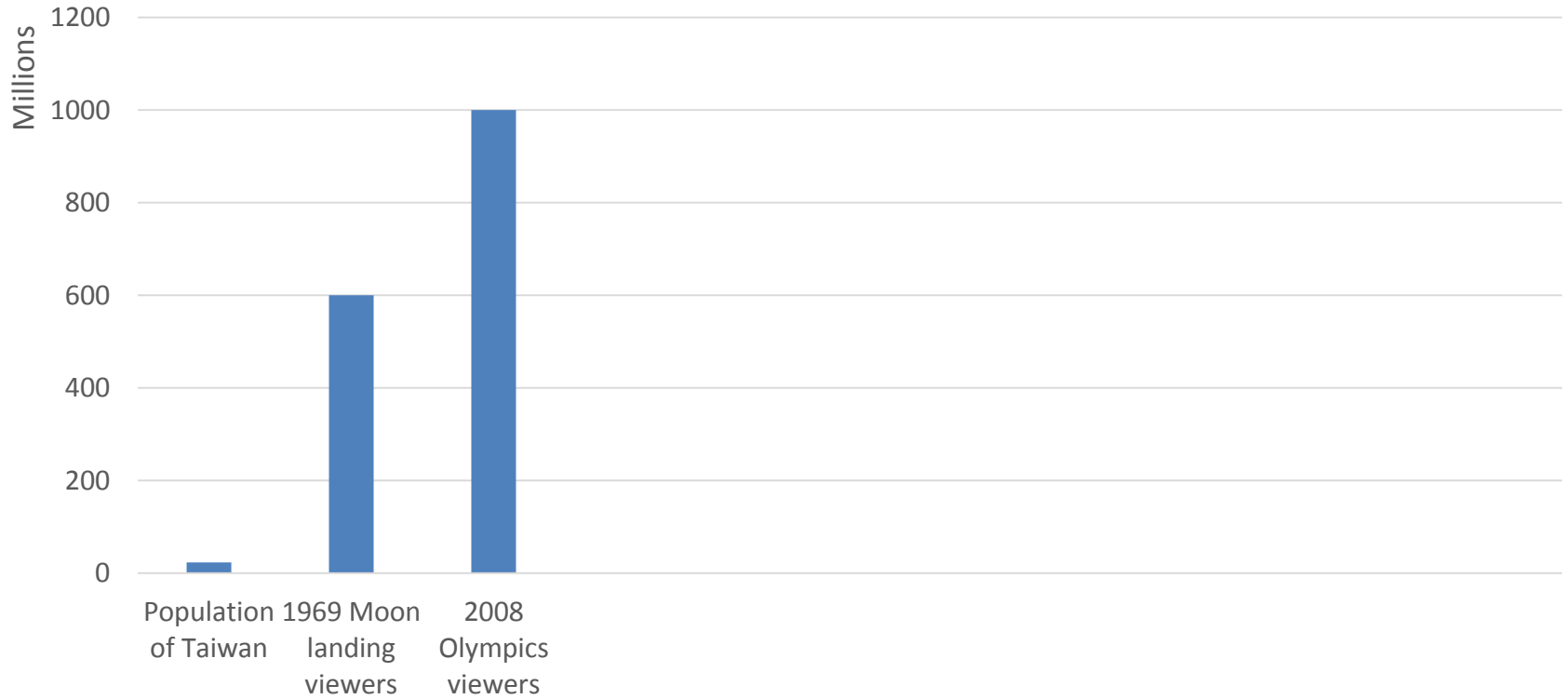
# Lot of Numbers – No Scarcity

Big numbers



# How many numbers?

## Big numbers



# More Sand than addresses?

## Big numbers



# More people than addresses?

