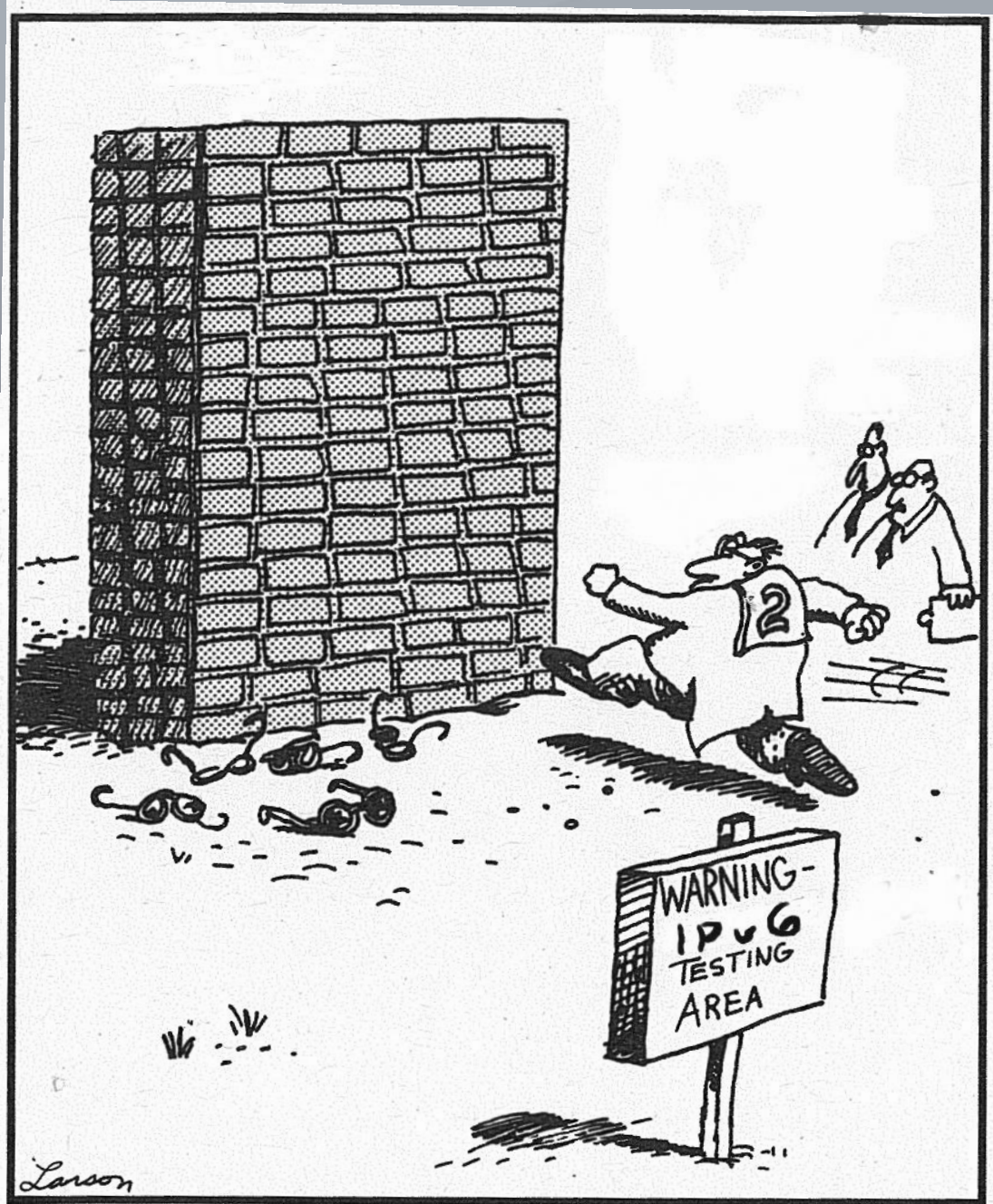


IPv6-only?  
You're kidding,  
right?

Wes George  
wes.george@twcable.com



ENJOY  
BETTER

# What happens when all you have is IPv6?



```
C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\E158182>ipconfig

Windows IP Configuration

Ethernet adapter Bluetooth Network Connection:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . :

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix . : corp.twcable.com
    IPv6 Address. . . . . : 2001:1998:601:2003:6820:a8ab:83e1:45ce
    Link-local IPv6 Address . . . . . : fe80::cc65:197d:6171:277e%11
    Autoconfiguration IPv4 Address. . : 169.254.39.126
    Subnet Mask . . . . . : 255.255.0.0
    Default Gateway . . . . . : fe80::212:d9ff:fe54:11e3%11

Wireless LAN adapter Wireless Network Connection:

    Media State . . . . . : Media disconnected
```

Let's turn off IPv4 and find out...

# Test Environment/OS Notes



- Cable Modem filtering IPv4, first directly connected to the host under test, then with host behind a D-Link DIR-655 via WiFi
- Host receives IPv6 prefix and IPv6 DNS via DHCPv6
- Windows (7/8) – Works
- Mac OS (10.7+) – Works, but disabling IPv4 makes things quicker
- Ubuntu (13.04) – Works
- Android – no DHCPv6/RDNSS support = no DNS servers
  - <https://code.google.com/p/android/issues/detail?id=32621>
    - filed in 2012, Medium priority enhancement, **no owner**
  - No IPv6 UI <https://code.google.com/p/android/issues/detail?id=57231>
- iOS – sorta works
  - Some testing details available from Andrew Yourtchenko's Ripe 66 talk here: <https://ripe66.ripe.net/archives/video/1196/>
  - No IPv6 UI – need to open an enhancement req w/ Apple

# Major Security Issue!



- OS supports IPv6-only by default, but can't get software updates over IPv6
  - Apple: MacOS, Apple Software Update (PC), iTunes app store
  - Windows 7 (they tell me 8 should work, haven't tested)
  - Java
  - Adobe (Flash, Reader, Air, etc)
  - Firefox
  - Antivirus/Anti Malware, Firewall/IDS signature updates
  - Reported to each company's security team, felt ok to disclose because it's not a zero day by itself
  - Probably hundreds of others, these are just the most exploited

# It just works!



## The Internet Engineering Task Force (IETF)

The goal of the IETF is to make the Internet work better.

The mission of the IETF is to make the Internet work better by producing high quality, relevant technical documents that influence the way people design

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### The Internet Engineering Task Force

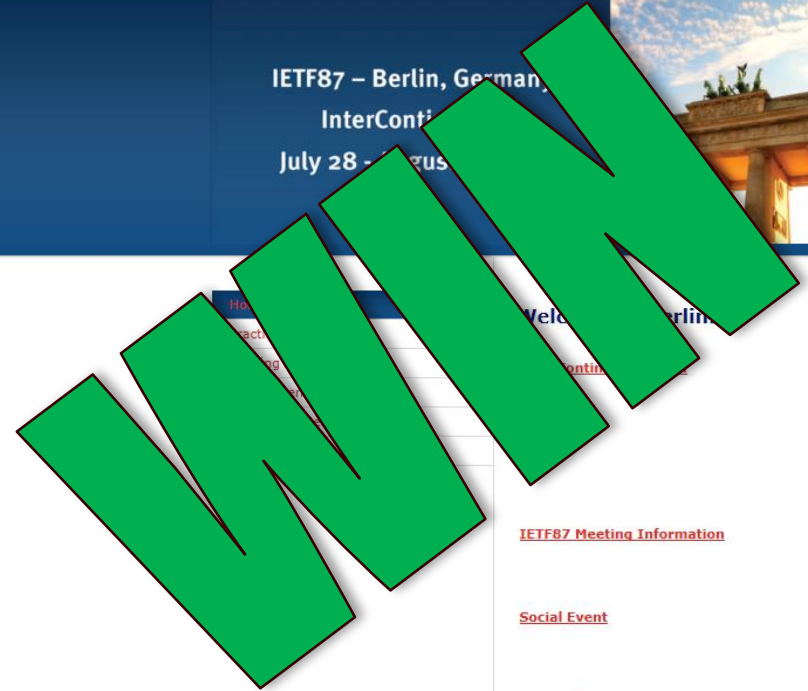
ISOC is a non-profit organization dedicated to the education, and promotion of the benefits of the Internet for the benefit of all.



## IETF87 – Berlin, Germany

### InterContinental Hotel

July 28 - August 1, 2009



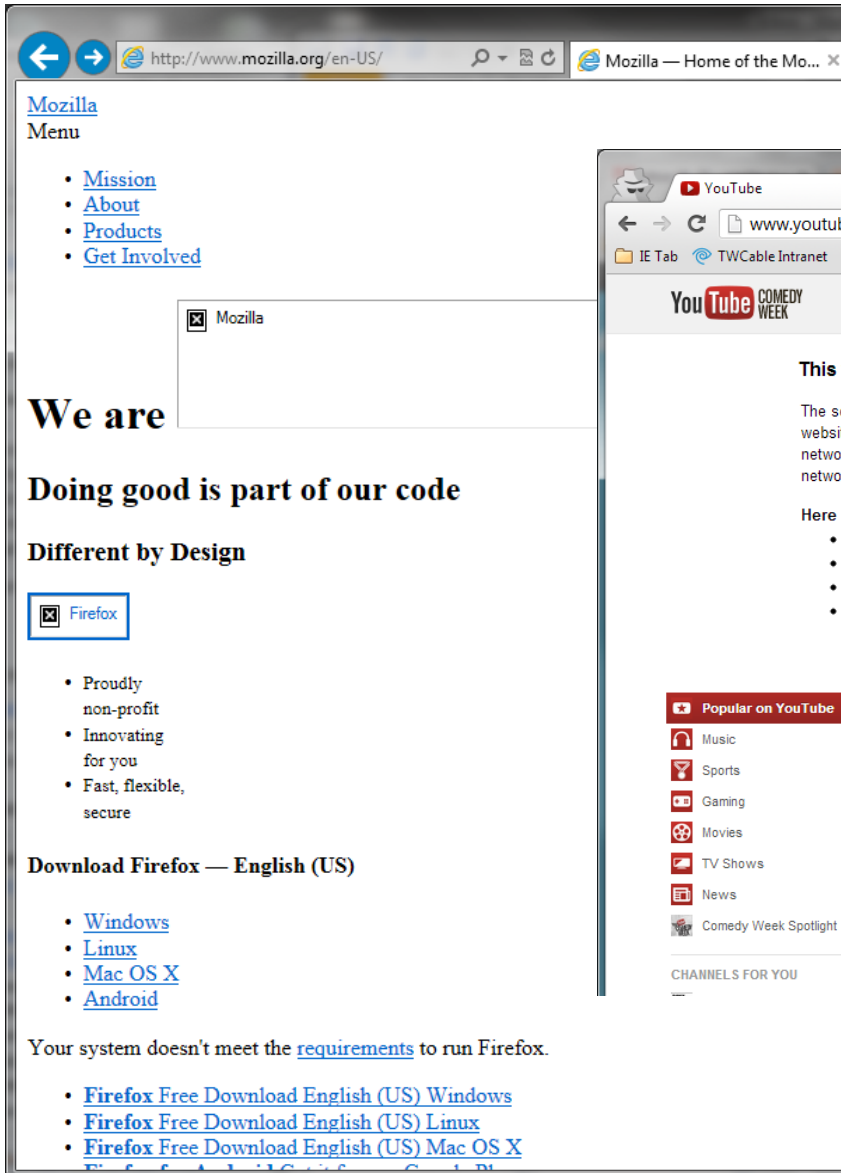
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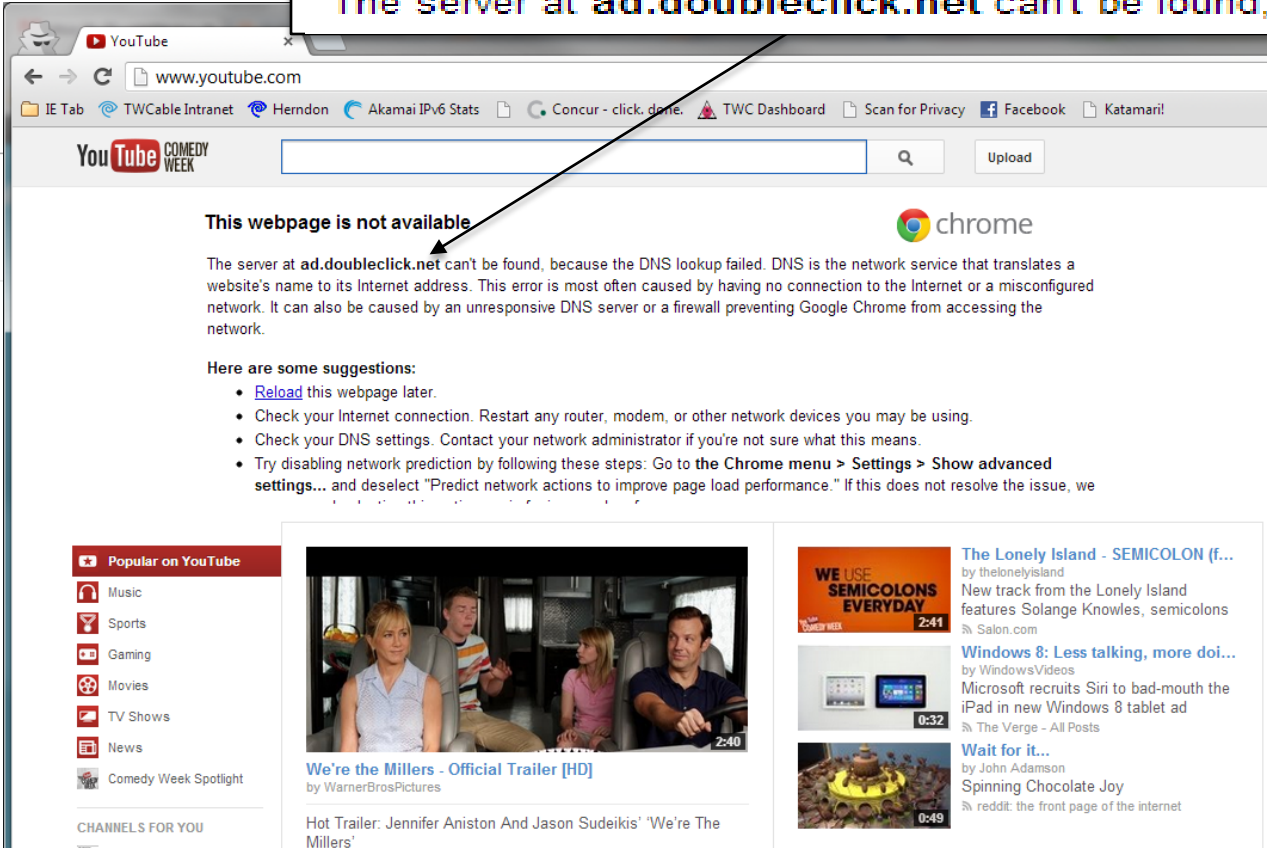


# ... for some values of "work"



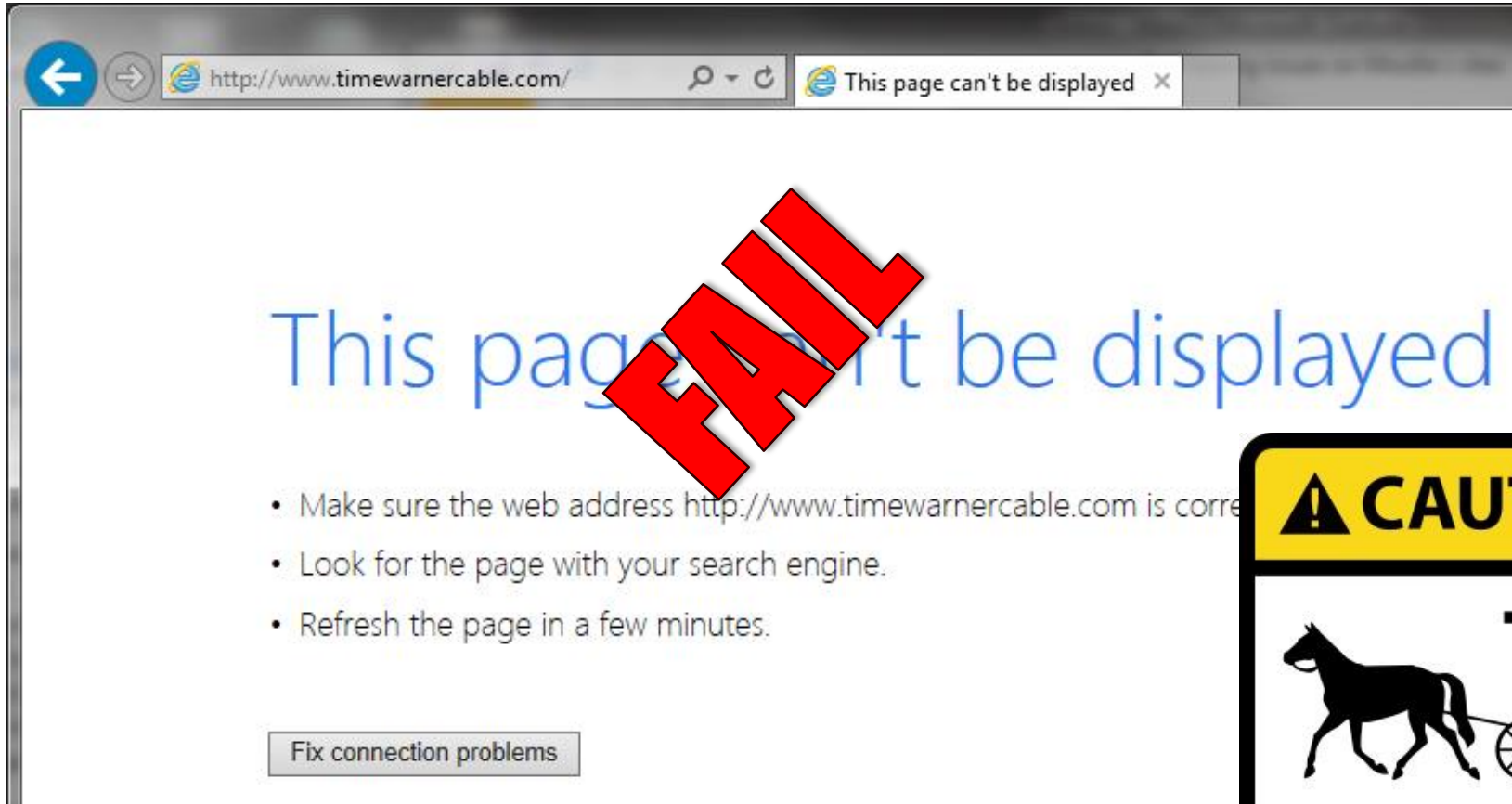
Screenshot of the Mozilla website. The browser address bar shows <http://www.mozilla.org/en-US/>. The page title is "Mozilla — Home of the Mo...". The navigation menu includes links for Mission, About, Products, and Get Involved. A Firefox download button is visible. The main content area features the text "We are Doing good is part of our code Different by Design". Below this, there are download links for Windows, Linux, Mac OS X, and Android. At the bottom, a message states "Your system doesn't meet the requirements to run Firefox." followed by links for Firefox Free Download English (US) for Windows, Linux, and Mac OS X.

The server at [ad.doubleclick.net](http://ad.doubleclick.net) can't be found.



Screenshot of a YouTube error page in a Chrome browser. The address bar shows [www.youtube.com](http://www.youtube.com). The page displays the message "This webpage is not available" with the Chrome logo. Below the message, it explains: "The server at [ad.doubleclick.net](http://ad.doubleclick.net) can't be found, because the DNS lookup failed. DNS is the network service that translates a website's name to its Internet address. This error is most often caused by having no connection to the Internet or a misconfigured network. It can also be caused by an unresponsive DNS server or a firewall preventing Google Chrome from accessing the network." It then provides suggestions: "Here are some suggestions: Reload this webpage later. Check your Internet connection. Restart any router, modem, or other network devices you may be using. Check your DNS settings. Contact your network administrator if you're not sure what this means. Try disabling network prediction by following these steps: Go to the Chrome menu > Settings > Show advanced settings... and deselect 'Predict network actions to improve page load performance.' If this does not resolve the issue, we". Below the error message, there are video recommendations including "We're the Millers - Official Trailer [HD]" and "The Lonely Island - SEMICOLON (f...".

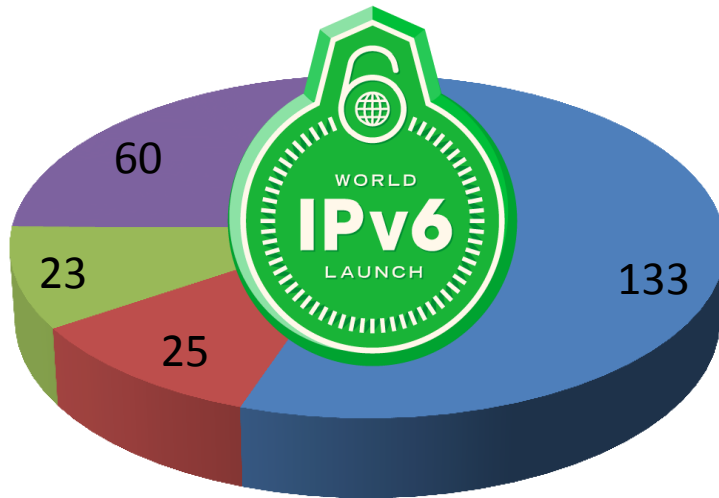
Except... when it doesn't



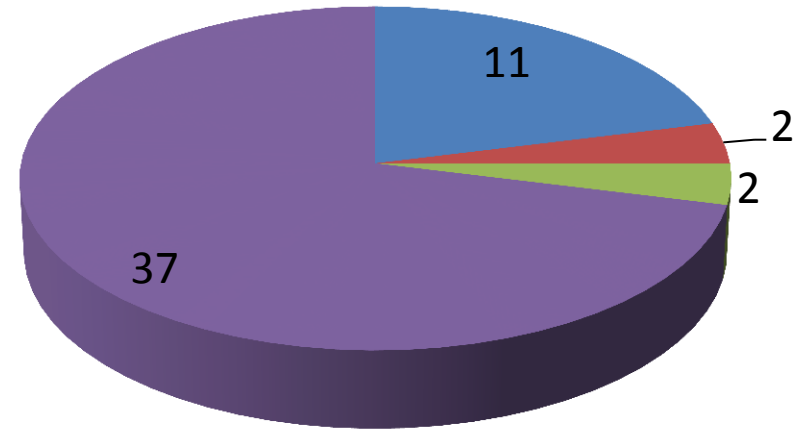
# Test results – Do webpages work over IPv6-only?



## World IPv6 Launch Participants (random sample, mainly US/CA)



## Other sites



■ Yes ■ Mostly ■ Sorta ■ No



# A little experiment with our favorite IETF sponsors



Welcome Reception Sponsor



Connectivity Sponsor



Sponsors



Bits-n-Bites Sponsors



Platinum Sponsor:



Gold Sponsor:



Bronze Sponsor:



# IETF Sponsors reachable via IPv6-only



## Welcome Reception Sponsor



## Platinum Sponsor:



## Connectivity Sponsor



## Gold Sponsor:



## Sponsors



## Bronze Sponsor:



## Bits-n-Bites Sponsors



NANOG version:  
<http://bit.ly/15jsPbE>



- Intern currently working to automate website testing
  - First test: Pass/Fail IPv6 reachability (wget -6)
    - 1900/3000 World V6 Launch participants pass
  - Second test: If Yes, does the whole page work?
    - Perl to parse HTML: Follow links, download images, CSS, report failures
- New Wiki to track IPv6-only/NAT64 issues:
  - <http://wiki.test-ipv6.com/>
  - Need more people testing and contributing

# Lessons Learned



- Those with IPv6 websites and apps need to start testing them with IPv4 disabled
  - Dual-stack (especially with Happy Eyeballs) masks problems with your IPv6 connectivity
  - In the future, IPv6 SHOULD work, IPv4 MAY be “folded, spindled or mutilated” (so don’t rely on it)
- Monitor your IPv6 site just like you monitor your IPv4 site
  - Can’t fix what you don’t know is broken
  - An IPv6 outage should have the same urgency as an IPv4 outage – now affects >1.5% of your customers!
  - Again, single-stack IPv6 is better at exposing problems



# Pushing more IPv6 deployment

- Name and Shame sites w/o external IPv6
  - Companies that consider themselves technology leaders
  - Content sites that feature articles about IPv6, but have no AAAA
- Vendor pressure
  - IPv4 costs us money (CGN or buy addresses)
    - TCO of CGN:  
<http://www.nanog.org/meetings/abstract?id=2025>
    - Cost of IPv4-IPv6 Transition:  
<http://youtu.be/vXf8Zlew1j0>
  - IPv4 is for customers (don't waste on internal stuff)
  - IPv6 from **ALL** vendors, not just technology vendors
  - RFPs, Contracts, etc: All products, support sites, etc **MUST NOT** require IPv4

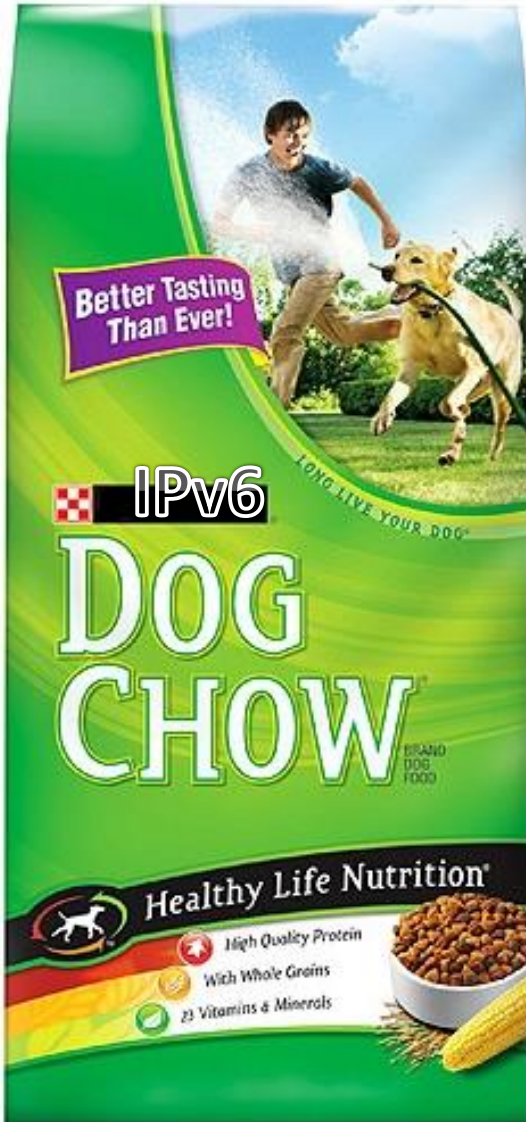


"Faster. Must go faster." - Jurassic Park (1993)



"Faster. Must go faster." - Independence Day (1996)

# How committed is your company to IPv6?



“IPv6 is important...”

“We’re committed to IPv6...”

“We are your IPv6 partner...”



Time to make that commitment publicly visible:  
Turn on IPv6 on **all** of your external services