



THE FUTURE IS FOREVER
6 JUNE 2012

www.WorldIPv6Launch.org

THIS TIME IT'S FOR REAL

- 6 June 2012 is the kick-off date
- Regular business operation with IPv6
- IPv6 “on by default” is the new normal
- Commercial IPv6 at scale by year-end



World IPv6 Launch

www.worldipv6launch.org

When?

- 6 June 2012

What?

- IPv6 is part of Regular Business, on by default, no special configuration necessary for anyone anywhere

Who?

- Access networks, home router vendors, websites from around the world participating, please join – www.worldipv6launch.org

Why?

- Acceleration: those already planning to roll-out IPv6 should accelerate their plans
- Adoption: those who don't have plans yet, it's safe now, please start
- Definition: industry leaders are establishing IPv6 as the new normal



World IPv6 Launch: Access Networks

Who?

- ATT, Comcast, Free, Internode, KDDI, Time Warner Cable, and XS4ALL initially
- Additional networks are welcome to join, see: www.worldipv6launch.org

IPv6 becomes part of Regular Business now

- New subscribers get IPv6 on by default after 6 June 2012
- No user config required
- IPv6 usage will depend on home networks, home equipment, etc.
- But 1% of visits to big websites from participating networks needs to be done using IPv6 by 6 June
- This will be measured by the big participating websites and displayed on the World IPv6 Launch website



World IPv6 Launch: Home Router Vendors

Who?

- Cisco and D-Link initially
- Additional home router vendors are welcome to join, see: www.worldipv6launch.org

IPv6 becomes part of Regular Business now

- Majority of products shipping with IPv6 on by default
- No user configuration is required to use IPv6
- V6 interoperability verification by UNH-IOL (and others?)



World IPv6 Launch: Websites

Who?

- Facebook, Google, Microsoft Bing, and Yahoo! initially
- Others are welcomed to join, see:
www.worldipv6launch.org

IPv6 becomes part of Regular Business now

- IPv6 is enabled on the main website
- No IPv6 specific URLs (www.ipv6.example.com) or mirror sites
- IPv6 enabled users will use IPv6 without doing anything
- The World IPv6 Launch website will have a reachability dashboard similar to what was used in 2011 for World IPv6 Day



Internet Society Deploy360 Programme

<http://www.internetsociety.org/deploy360/>

- **IPv6 and DNSSEC knowledge base including tutorials, case studies, training resources, etc.**
- **Content specific to:**
 - **Network Operators**
 - **Developers**
 - **Content Providers**
 - **Consumer Electronics Manufacturers**
 - **Enterprise Customers**
- **Blog posts**
- **Social media integration**

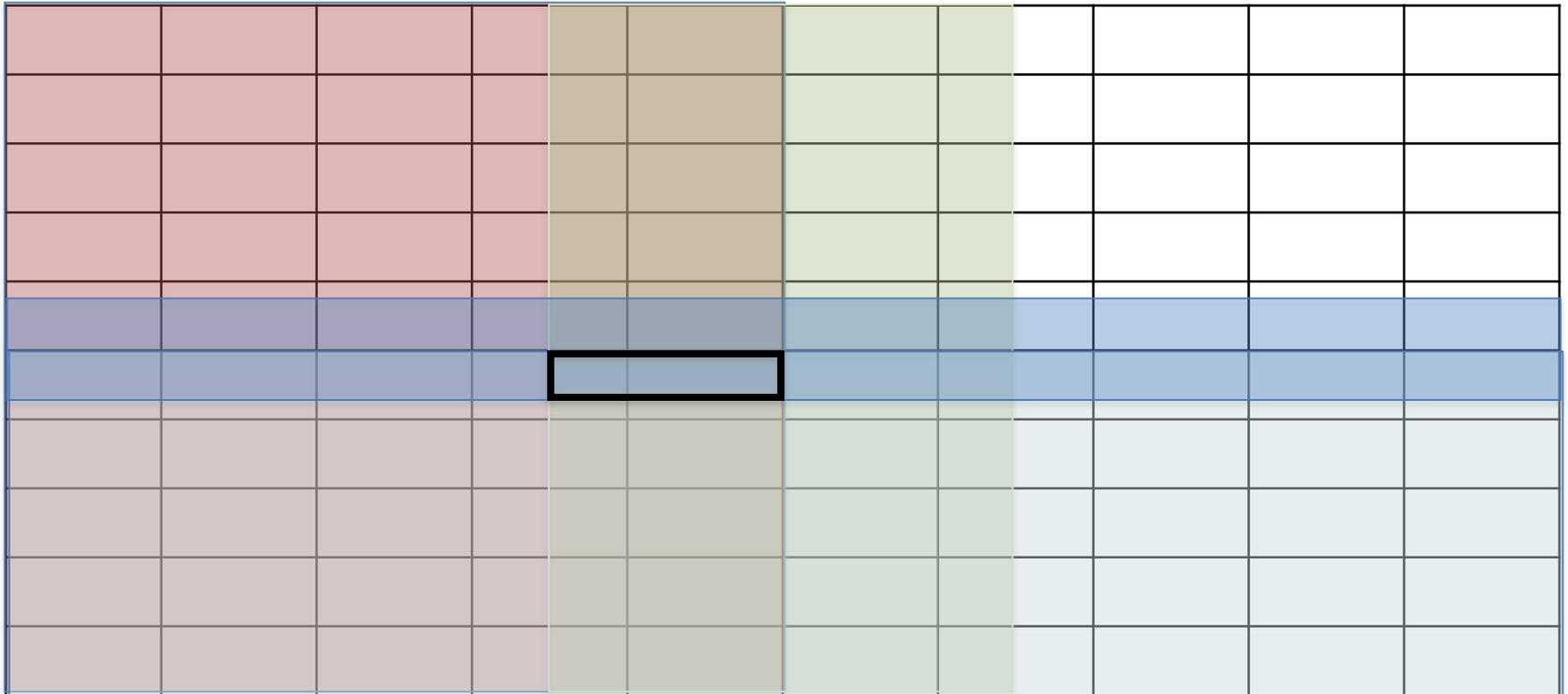




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How do we get to 1% actively using IPv6?



Each block represents 100,000 users.

1% = 100,000

50% of CMs

30% of CMTSs

50% of OS support IPv6

15% have no gateway



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Home Router Participation in World IPv6 Launch

Timothy Winters
April, 2012

IPv6 World Launch



Home Routers Manufactures

- **Completing the Interoperability portion of the CPE Logo will get you on IPv6 World Launch list.**
- **<http://www.worldipv6launch.org/participants>**
- **Must pass every mandatory test case to be included as a participant in World IPv6 Launch.**

IPv6 CE Router Event



The UNH-IOL is hosting a CE Router Event April 12, 2012.

IPv6 Ready CPE Interoperability Test Plan is executed.

[Whitepapers](#) discussing technical discoveries

- DHCP Issues
- ISP Prefix length issues
- M/O Flag
- Forwarding Loops



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IPv6 @ Yahoo

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Agenda:

Motivation for IPv6

World IPv6 Day Recap, 2011

World IPv6 Launch, 2012

YAHOO!

Motivation for IPv6

Why not just rely on Carrier Grade NAT (CGN)?





**“The internet is a
series of tubes.”**

- Senator Ted Stevens



**“The internet is a
series of tubes.”**

- Senator Ted Stevens

Photo by USG via Wikimedia Commons
<http://tinyurl.com/3whv8jl>
Public Domain

Photo by Horia Varlan - <http://flic.kr/p/7vEzW1>

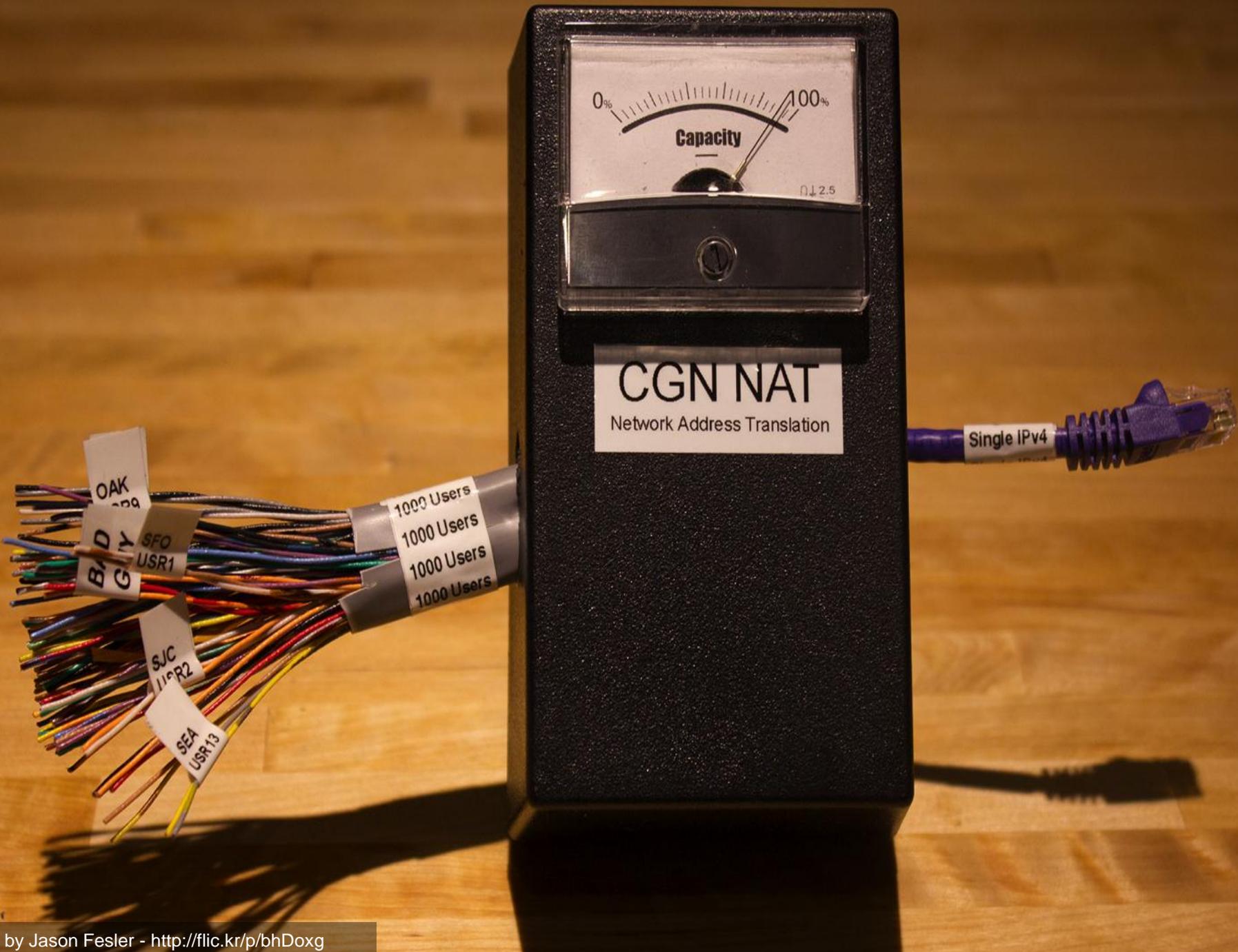
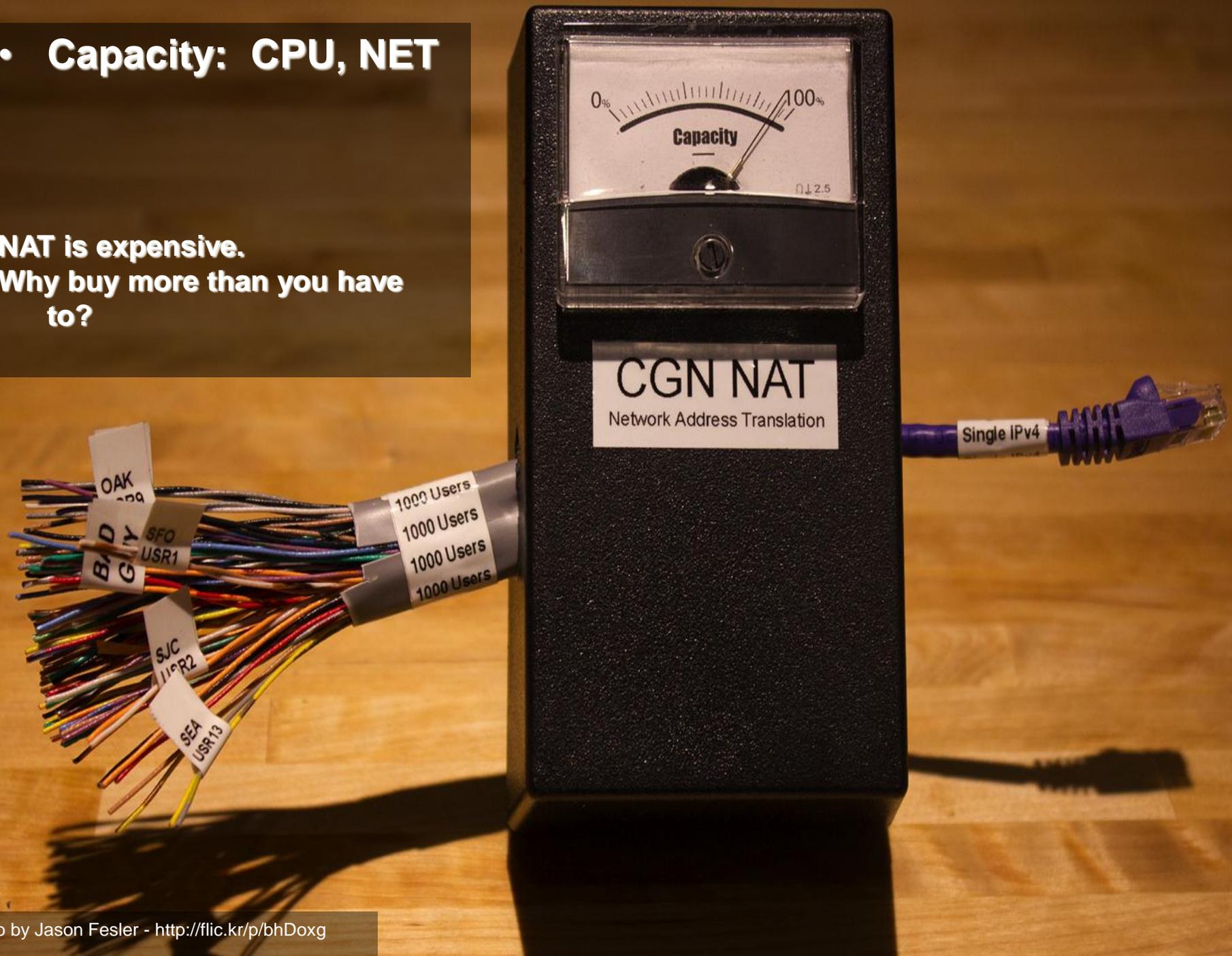


Photo by Jason Fesler - <http://flic.kr/p/bhDoxg>

- **Capacity: CPU, NET**

**NAT is expensive.
Why buy more than you have
to?**



- Capacity: CPU, NET
- **Port Exhaustion**

**TCP source/destination
IP+port reuse limited over
time**



- Capacity: CPU, NET
- Port Exhaustion
- **Geo Location**

Local news, weather, movies



- Capacity: CPU, NET
- Port Exhaustion
- Geo Location
- **Abuse – Bad Guys**



This is how NAT abuse will be handled by content providers.



NAT is a reality, and we must learn to cope...

Adopting IPv6 will limit the NAT shared IP pain long term.



0% 100%

Capacity

0.25

The image shows a black gauge with a white face. The needle is positioned at the 100% mark. The word 'Capacity' is printed in the center. There are tick marks from 0% to 100%. A small '0.25' is visible at the bottom right of the gauge.

CGN NAT

Network Address Translation



Single IPv4

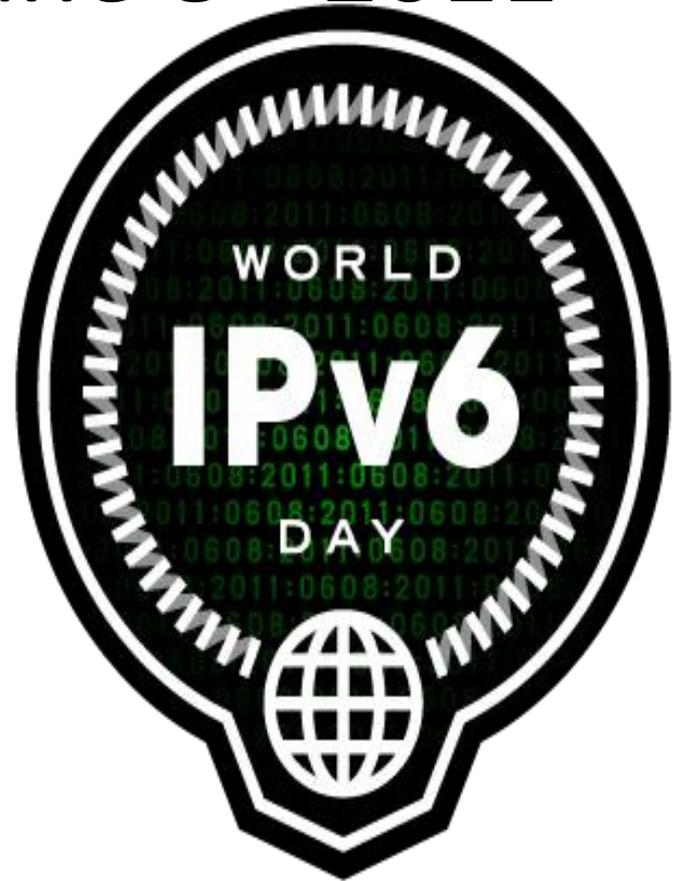
A pair of black pliers is shown cutting a purple Ethernet cable. The cable has a white label that reads 'Single IPv4'. The pliers are positioned over the RJ45 connector of the cable.

World IPv6 Day 2011 Recap



World IPv6 Day – June 8th 2011

- Global event coordinated by the Internet Society
- Major content providers enabled IPv6 access on their “front door” for 24 hours
 - Sites accessible via IPv4 + IPv6
- “Test flight” for IPv6 on a broad basis
 - Motivate industry to move forward – Break the chicken/egg cycle
 - Real world smoke test – what you can’t do in a lab
 - Test included real end users



Participating Yahoo! Front Page Markets



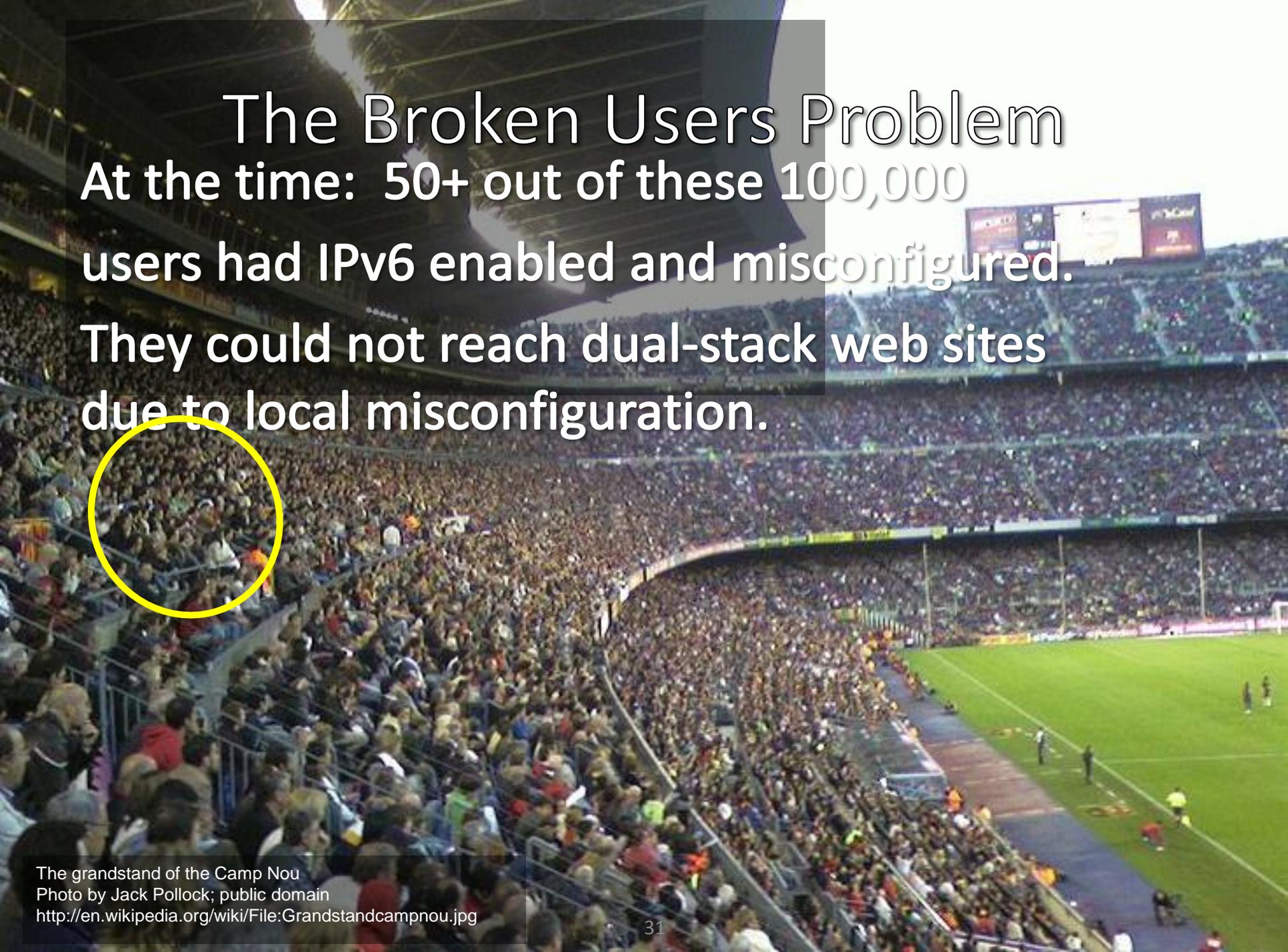
IPv6 Proxy Locations



Traffic Server (Proxy)
translated HTML for IPv6 users

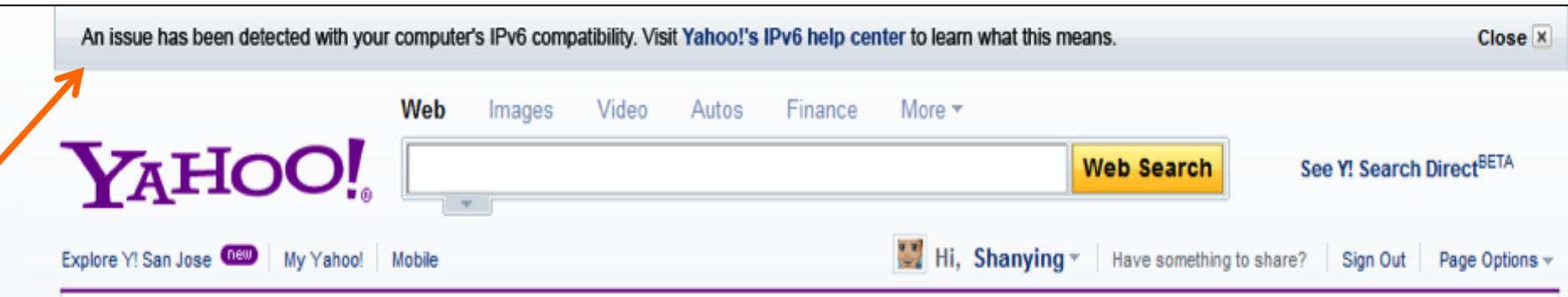
Some risk involved.





The Broken Users Problem
At the time: 50+ out of these 100,000
users had IPv6 enabled and misconfigured.
They could not reach dual-stack web sites
due to local misconfiguration.

Customer Outreach



- Real time detection of “Broken” Users, with a “Window Shade”
- Search results advertising based on keywords
- Traditional PR
- Social channels, blogs

Help Page – with IPv6 test

New User? Register | Sign In | Help | Make Y! Your Home Page | Yahoo! | Mail |   

YAHOO! HELP

[Home](#) | [IPv6 Help Topics](#) | [Community](#)

 Learn more about IPv6 readiness

 **Hi there! Find your answer now**

1.2 million page views
400k distinct users
38 translations

IPv6 Help Topics

- [Are you ready for IPv6?](#)

Top IPv6 Questions

- [Press the button to start the test.](#)
- [What is IPv6 and why is it necessary?](#)
- [What is World IPv6 day?](#)
- [Will IPv6 become a permanent change on June 8, 2011?](#)
- [What other companies are participating in World IPv6 day?](#)

My Help

[Sign In](#) [Forgot your ID or password?](#)

Sign in to see your account information saved articles and more.

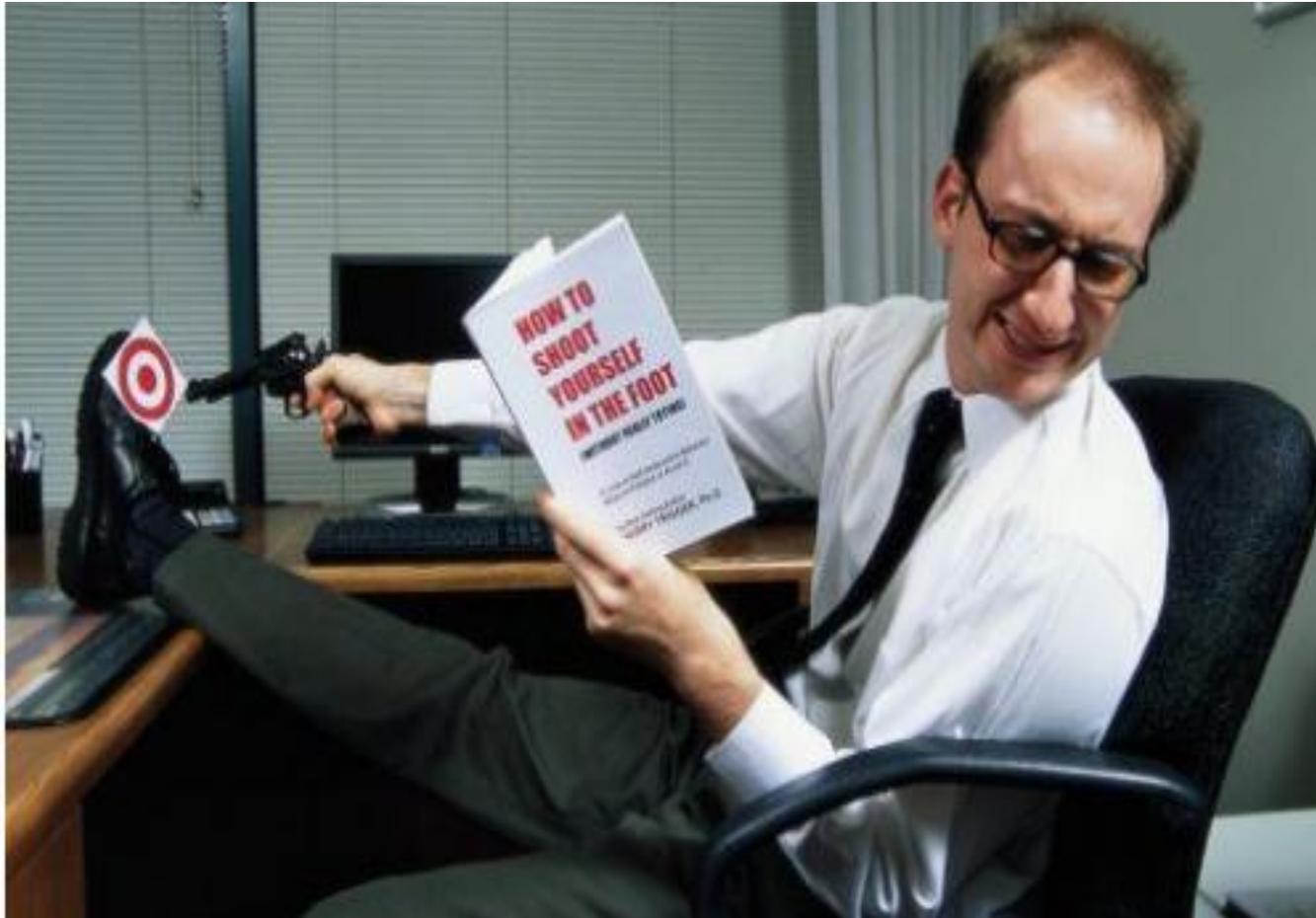
[▶ RECENT SEARCHES \(0\)](#)

[▶ RECENTLY VIEWED \(0\)](#)

Other IPv6 information sites

- [Internet Society \(ISOC\)](#)

Trial Runs



What Happened on World IPv6 Day?



What we feared.



Photo by Peter Hamer via Flickr
<http://creativecommons.org/licenses/by-sa/2.0/deed.en>

Reality.



Photo by CountryLemonade (Garrett) via Flickr
<http://creativecommons.org/licenses/by/2.0/deed.en>

Few support calls

- About 10 calls to Yahoo! Support
- Some ISPs reported few or no calls



Photo by Seattle Municipal Archives - <http://flic.kr/p/57gjm3>

Practice makes perfect.

For a major change, schedule one or more test runs.



Results for Y! at a peek

Over 2.2 Million users served via IPv6

Over 1 Million visits to Y! IPv6 help pages

Ratio of users served via IPv6:

- Peak = 0.229%
- Average = 0.168%

France led the pack with over 3% IPv6-enabled users! Thank you Free.fr!

US was at 0.35%

Breakage stats now at 0.022%

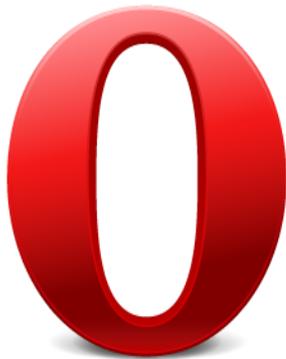


5206006101

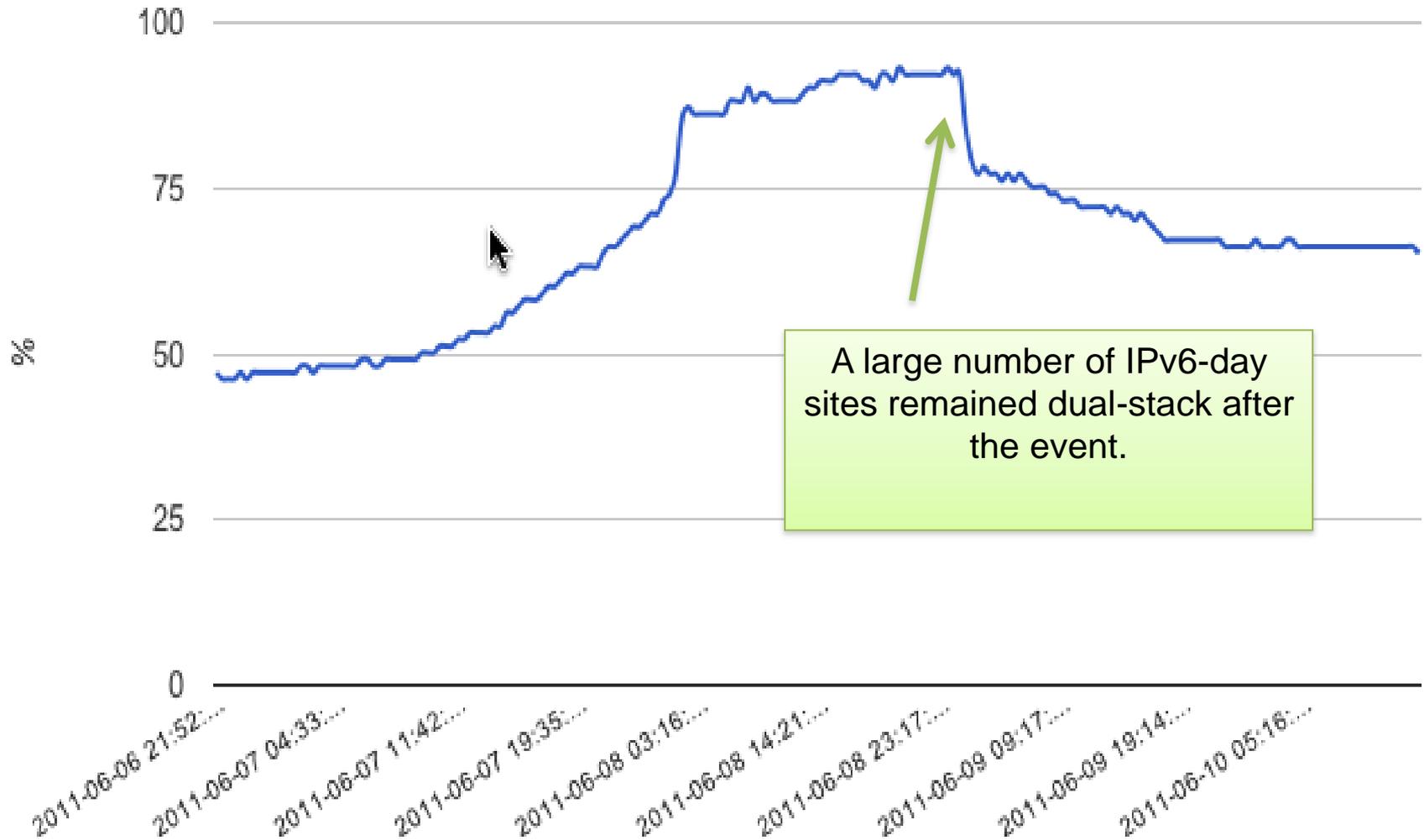
TEAC

Photo by Iain Fergusson via Wikimedia Commons
http://en.wikipedia.org/wiki/File:VU_Meter.jpg
<http://creativecommons.org/licenses/by/2.5/deed.en>

Industry changes



Percentage of IPv6-reachable Participants



A large number of IPv6-day sites remained dual-stack after the event.

<http://gigondas.dh.bytemark.co.uk/3days.html> Time

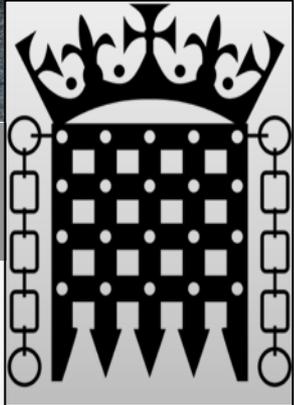
Even the politicians are paying attention.



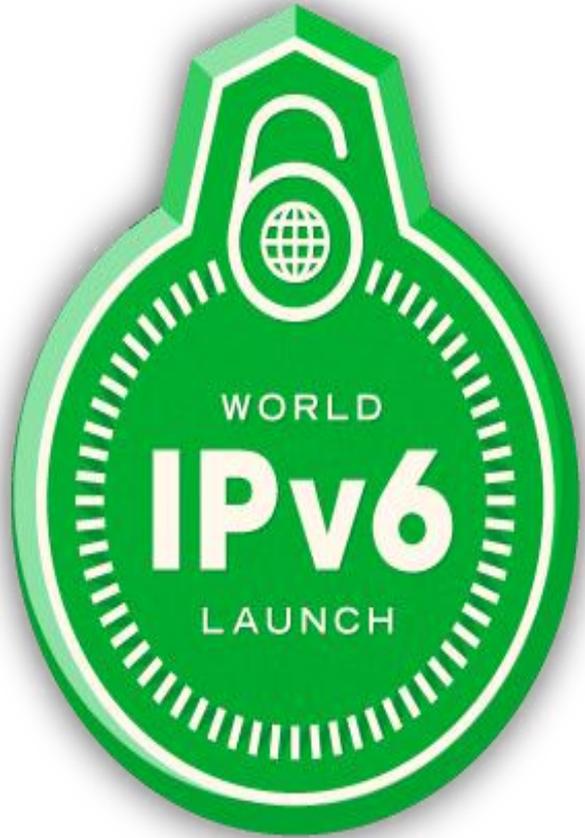
Photo by USG via
Wikimedia Commons
<http://tinyurl.com/3whv8jl>
Public Domain



Photo by Mгимelfarb via Wikimedia Commons
<http://tinyurl.com/6v6uvt7>
Public Domain



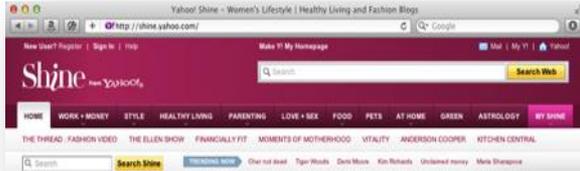
**We need more than just a
World IPv6 Day.**



6/6/12:
**Turn it on,
Leave it on.**

<http://www.worldipv6launch.org>

Launch Properties 6/6/12



Yahoo! CDN 6/6/12



Monday, November 28, 2011

SIGN IN New here? Sign Up MAIL Check email



- YAHOO! SITES
- Mail
 - Autos
 - Dating
 - Finance (Dow ↑)
 - Flickr
 - Games
 - Horoscopes
 - Jobs



Tim Tebow makes football history
 The Broncos quarterback pulls off something in a wild win that hasn't been done since at

- TRENDING NOW
- 01 Melissa McCarthy
 - 02 Bank bailout
 - 03 Tallulah Willis
 - 04 Eat More Kale
 - 05 LCD televisions
 - 06 Online piracy
 - 07 Melissa Kellerman
 - 08 Forex trading
 - 09 Gift baskets
 - 10 Flu shots



Name	Method	Status	Type	Size	Time	Timeline	14.67s	22.01s	29.35s	36.68s	44.02s	51.36s
ybang_22_111908.gif l.yimg.com/a/i/ww/met/mc	GET	304 Not Modi	text/pl...	469B 155B	224ms 224ms							
img_c3e3d79b.jpg l.yimg.com/a/i/mntl/	GET	200 OK	image...	5.19KB 155B	277ms 277ms							
92x55lowmhj74g.gif l.yimg.com/cv/ae/us/target	GET	304 Not Modi	text/pl...	2.03KB 214B	266ms 266ms							
yahoo-logo-sm-png8.png l.yimg.com/a/images/ww/n	GET	304 Not Modi	text/pl...	743B 155B	263ms 263ms							
combo l.yimg.com/a	GET	200 OK	applic...	380.04KI 122.22KI	75ms 35ms							
bc_2.0.5.js l.yimg.com/d/lib/bc	GET	304 Not Modi	text/pl...	1.93KB 178B	56ms 56ms							
b us.bc.yahoo.com	GET	200 OK	image...	43B 365B	72ms 72ms							

yimg.com

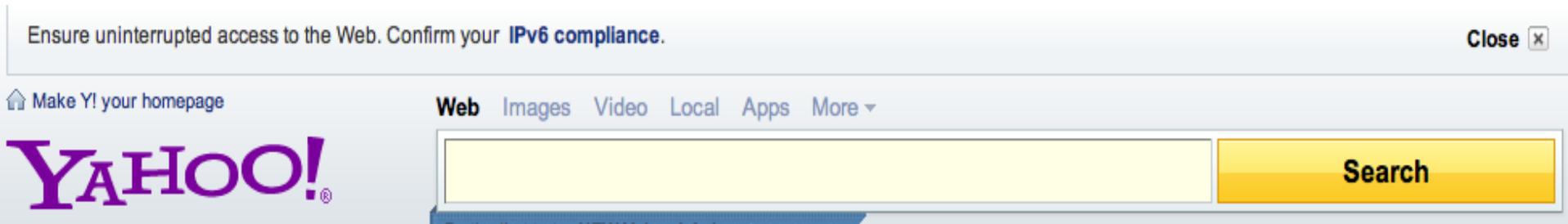
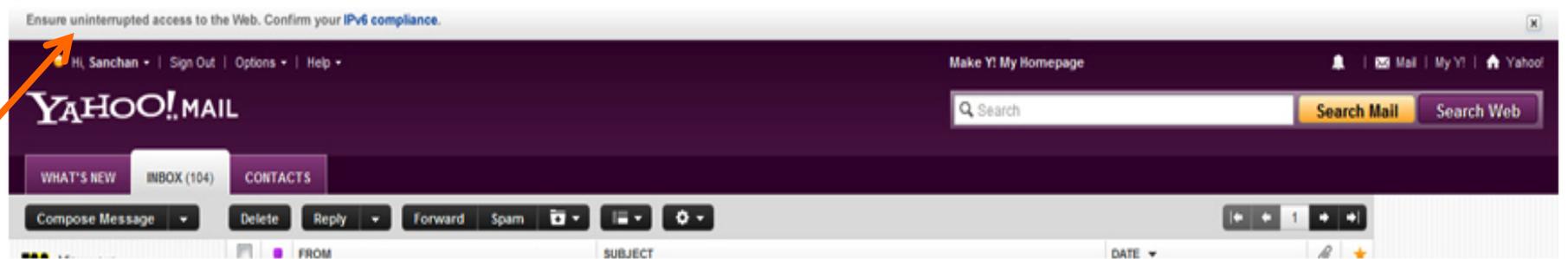
Static images, JavaScript, and CSS on **most** Y! pages will automatically become IPv6 accessible as part of the World IPv6 Launch.

Committed IPv6 Proxy Locations – 6/6/12



Traffic Server (Proxy)
HTML (*launch properties*) + Images, CSS,
JS

Extended Customer Outreach



- Windowshade deployed to more sites
- Same outreach channels as Flag day

More sites to come!

The image displays three overlapping screenshots of Yahoo! web services:

- Top Screenshot (Yahoo! Mail):** Shows the user interface for a Yahoo! Mail inbox. The header includes "Hi, Tony", "Sign Out", "Options", and "Help". Navigation tabs for "WHAT'S NEW", "INBOX (1022)", and "CONTACTS" are visible. A search bar is present with "Search Mail" and "Search Web" buttons. A sidebar on the left lists folders like "Inbox", "Conversations", "Drafts", "Sent", "Spam", and "Trash". A central message area displays "No messages from contacts." and a weather widget for Santa Clara showing "64° Now".
- Middle Screenshot (Yahoo! News):** Shows the Yahoo! News homepage. The header includes "Hi, Tony", "Sign Out", and "Help". A search bar is present with "Web Search" and "AdChoices" links. A navigation bar lists categories: "Home", "U.S.", "Business", "World", "Entertainment", "Sports", "Tech", "Politics", "Science", "Health", "Travel", and "Most Popular". A secondary navigation bar includes "Video", "Photos", "Blog", "Opinion", "Local", "Odd News", "Comics", "Weather", "Vitality", and "Site Index". A search bar is present with "Yahoo! News Only" and "Advanced" options. A featured article for "Santa Clara Weather Forecasts" is visible, along with a "FreeScore.com" advertisement.
- Bottom Screenshot (Yahoo! Weather):** Shows a detailed weather forecast for Santa Clara. The header includes "Hi, Tony", "Sign Out", and "Help". A search bar is present with "Web Search" and "AdChoices" links. A navigation bar lists categories: "Home", "U.S.", "Business", "World", "Entertainment", "Sports", "Tech", "Politics", "Science", "Health", "Travel", and "Most Popular". A secondary navigation bar includes "Video", "Photos", "Blog", "Opinion", "Local", "Odd News", "Comics", "Weather", "Vitality", and "Site Index". A search bar is present with "Yahoo! News Only" and "Advanced" options. A featured article for "Santa Clara Weather Forecasts" is visible, along with a "FreeScore.com" advertisement.

</ppt>

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Appendix



Example Causes for Broken Users



Photo by hipster librarian - <http://flic.kr/p/4R8Abp>

- Incorrect Addresses
- Bad Routes
- Good Routes, Bad Performance
- Good Routes, Dumb Firewalls

Timeouts until IPv4 fallback

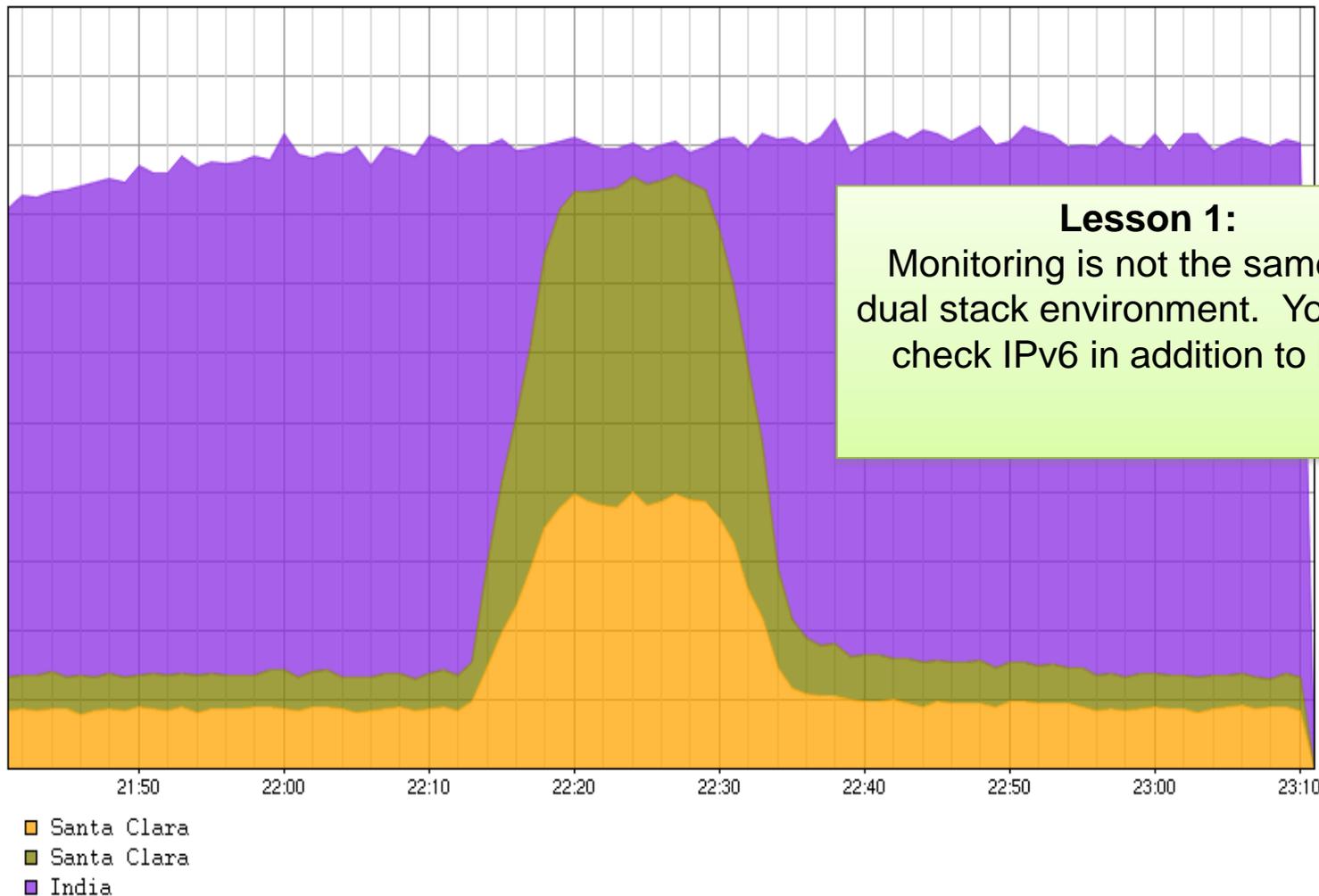


Photo by wwarby - <http://flic.kr/p/62n3eY>

- Windows:
21 seconds
per AAAA
- Linux:
21 seconds
per AAAA
- OS X:
75 seconds
per AAAA
- iPhone,
iPad:
No fallback

Test Run #1: 5/31/11, 10:00 PM

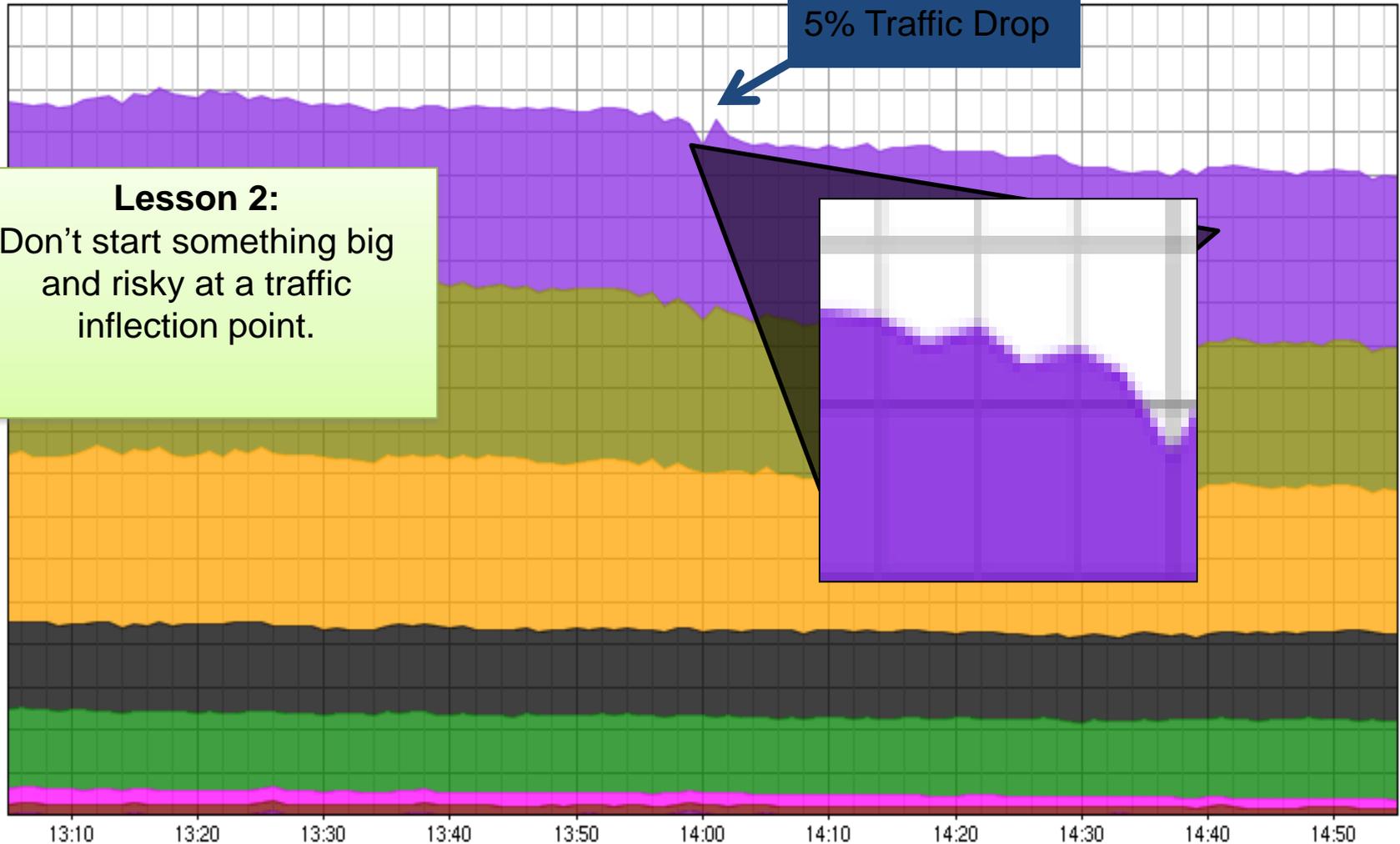
intl breakdown for in



Lesson 1:
Monitoring is not the same in a dual stack environment. You must check IPv6 in addition to IPv4.

Root cause: One geo load balancer was not set up with IPv6, failed health checks.

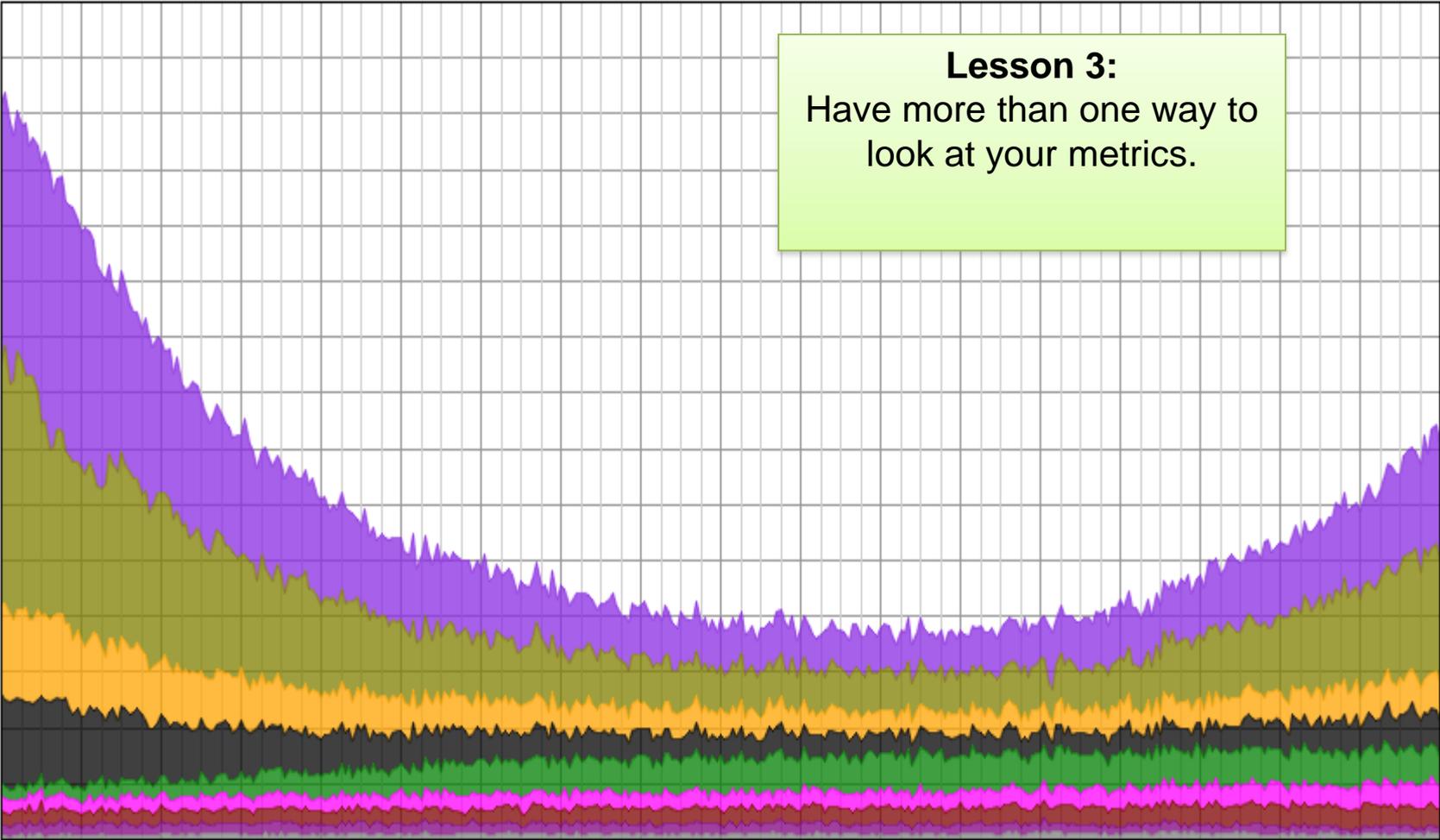
Test Run #2. 6/2/11 2.00 PM EDT intl breakdown for us



Root cause: People leaving the office, 5pm Eastern USA time.

intl breakdown for uk

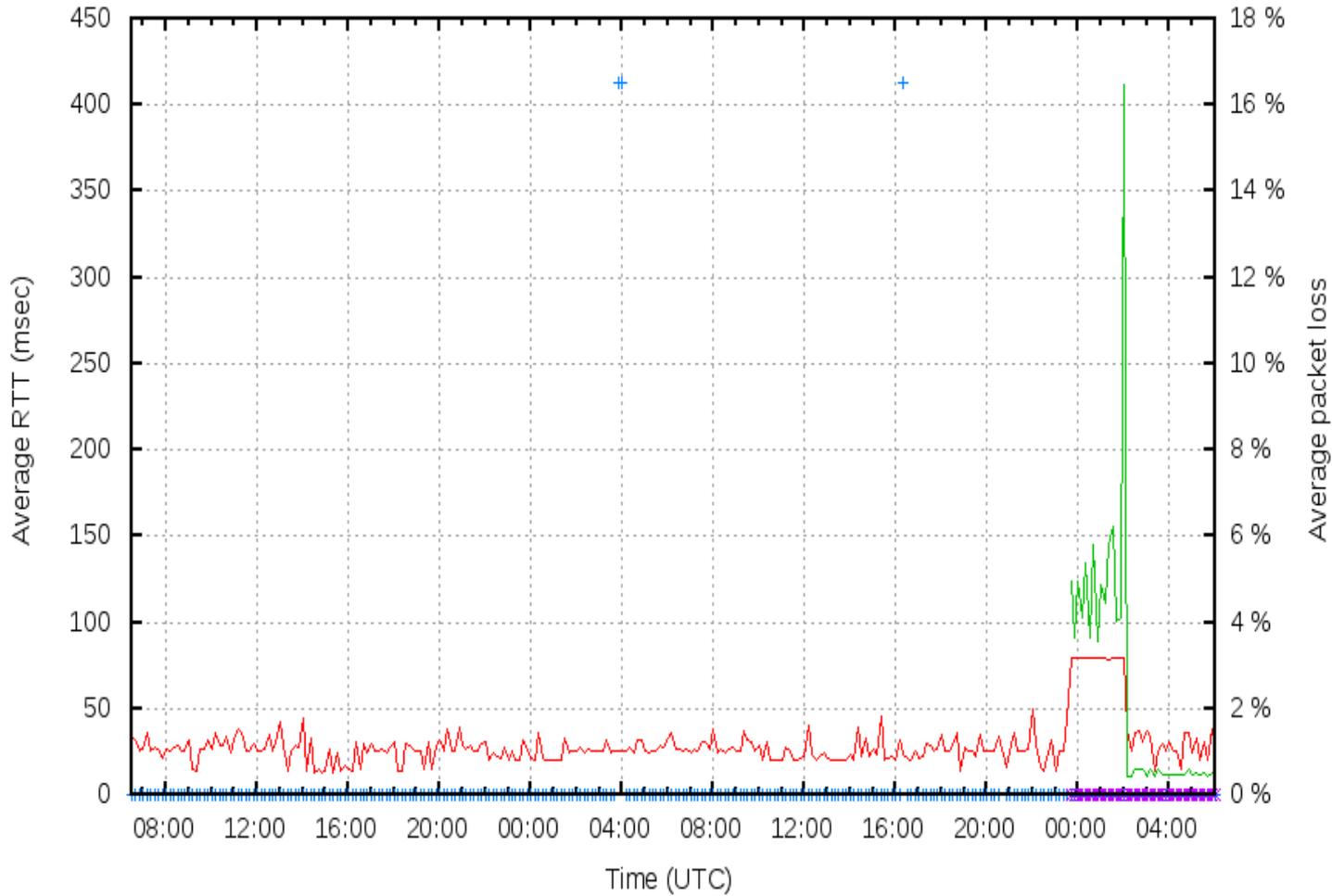
Lesson 3:
Have more than one way to
look at your metrics.



16:20 16:40 17:00 17:20 17:40 18:00 18:20 18:40 19:00 19:20 19:40 20:00 20:20 20:40 21:00 21:20 21:40 22:00

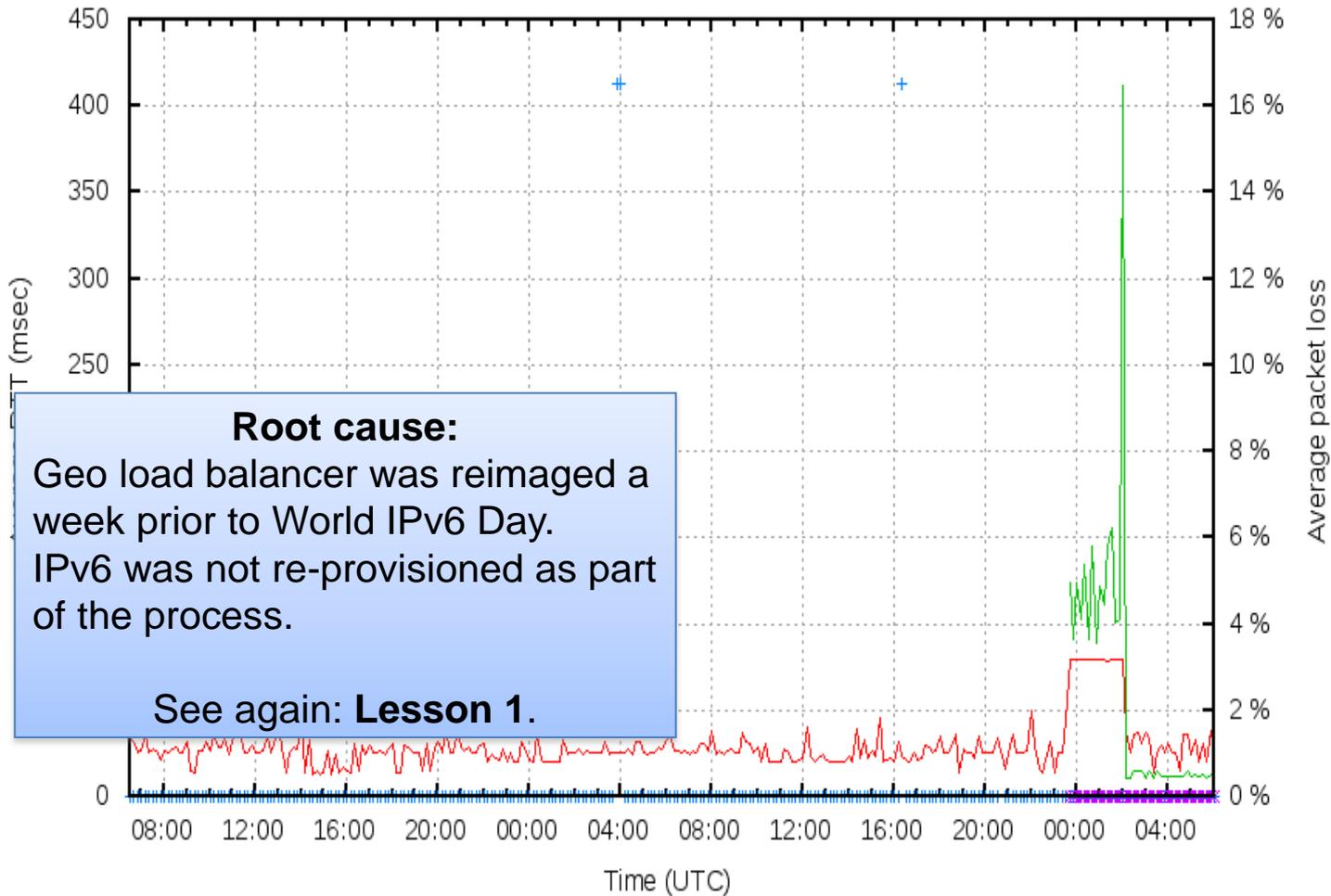
June 7 Pacific (Local)

Ping (RTT) measurements in the last 48 hours, from 'tt120' to Yahoo
as of 2011-06-08 06:20:43 UTC, target: primary site



Avg. IPv4 RTT — Avg. IPv6 RTT — Avg. IPv4 loss + Avg. IPv6 loss x

Ping (RTT) measurements in the last 48 hours, from 'tt120' to Yahoo
as of 2011-06-08 06:20:43 UTC, target: primary site

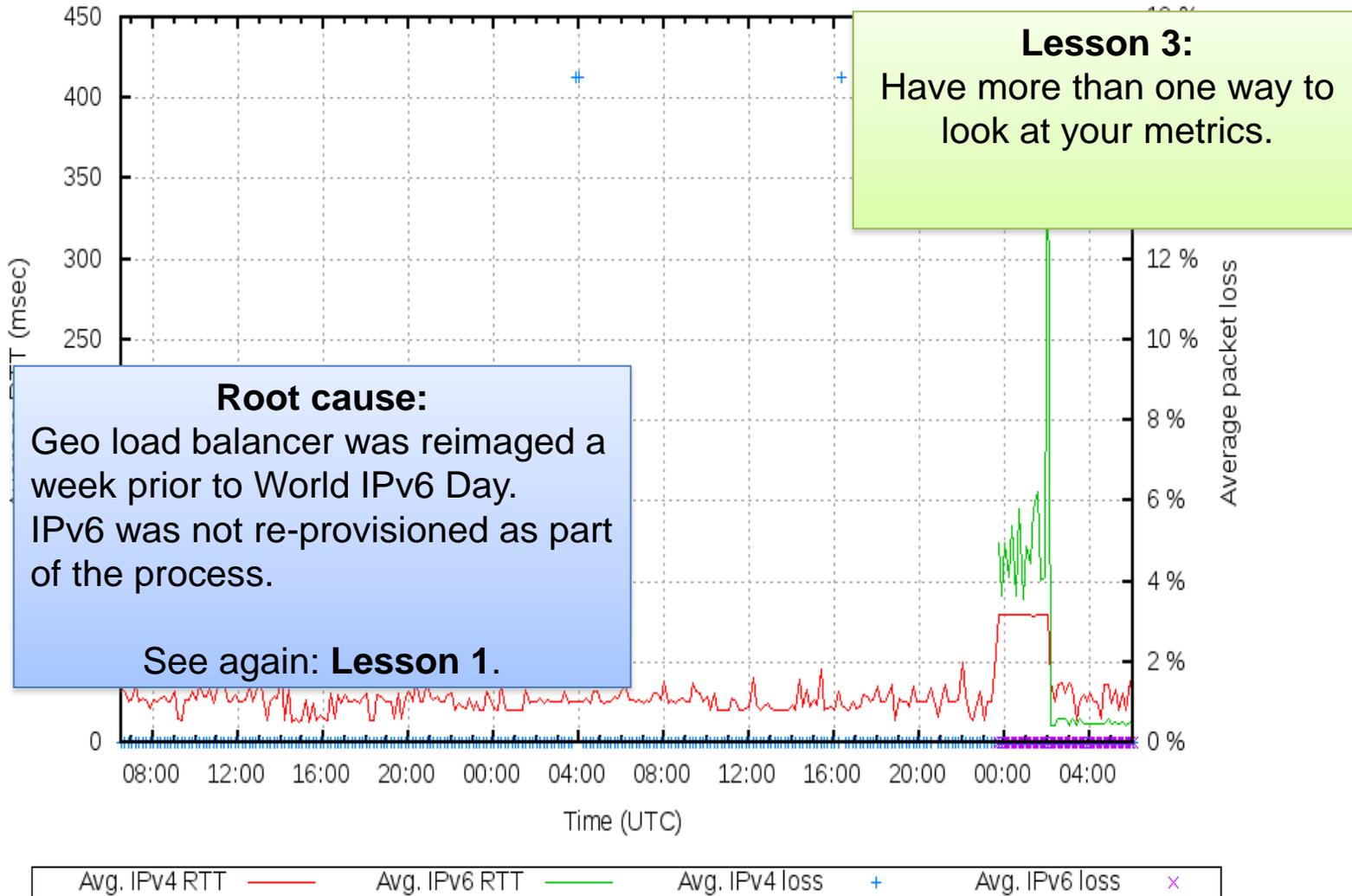


Root cause:
Geo load balancer was reimaged a week prior to World IPv6 Day. IPv6 was not re-provisioned as part of the process.

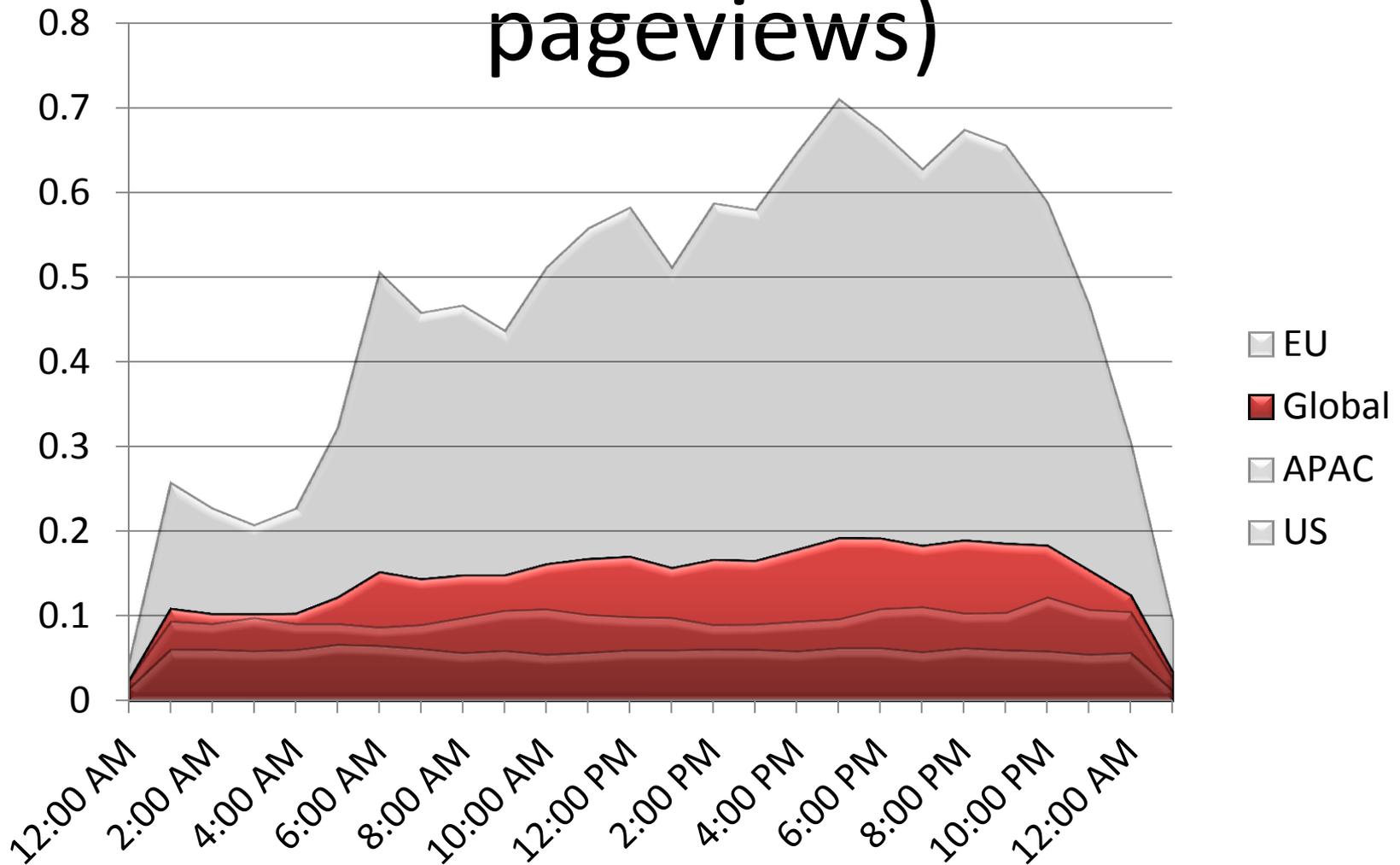
See again: **Lesson 1.**

Avg. IPv4 RTT — Avg. IPv6 RTT — Avg. IPv4 loss + Avg. IPv6 loss x

Ping (RTT) measurements in the last 48 hours, from 'tt120' to Yahoo
as of 2011-06-08 06:20:43 UTC, target: primary site

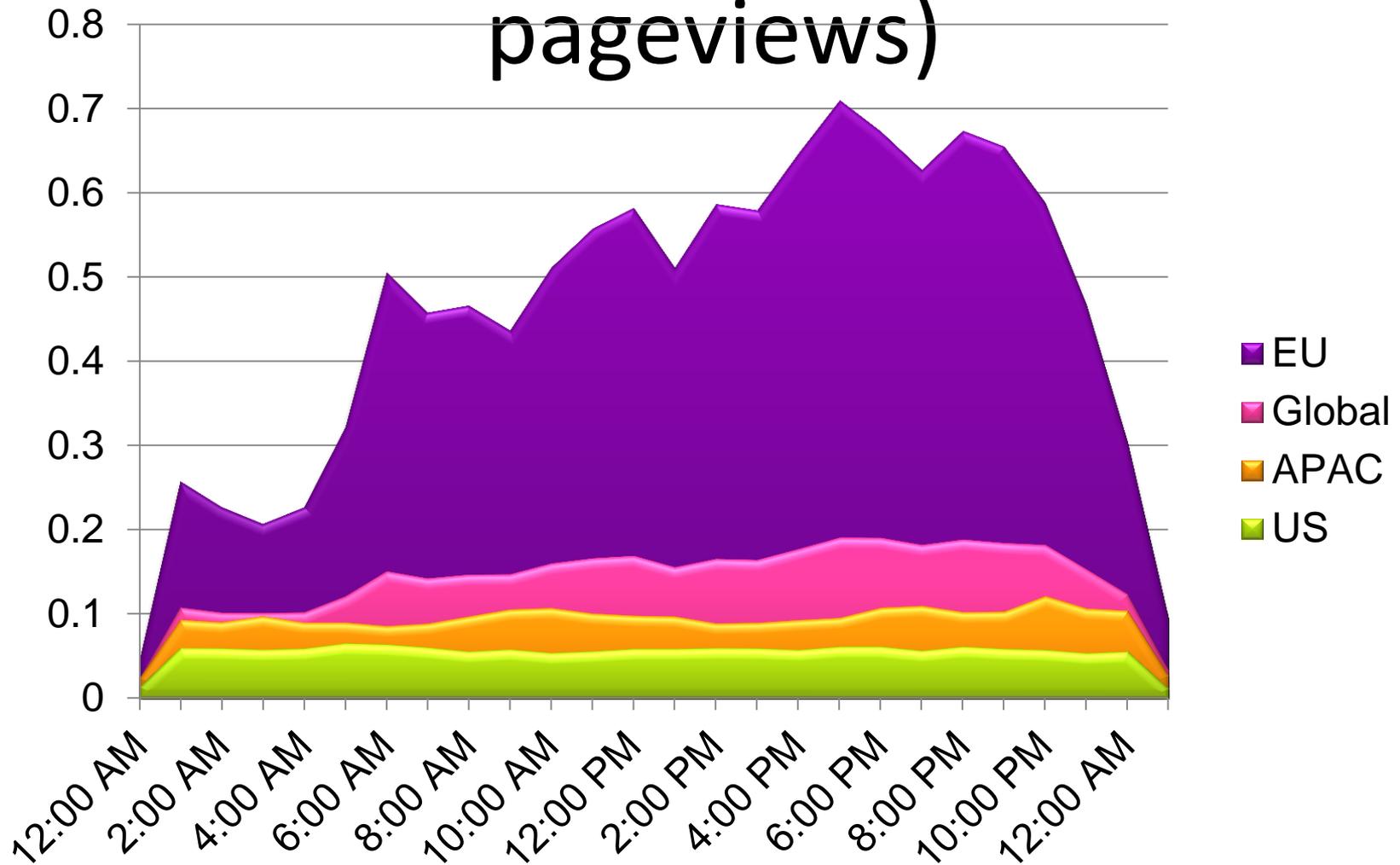


Per-hour Breakdown (IPv6 pageviews)



Note: Excludes Y!JP, Y!CN

Per-hour Breakdown (IPv6 pageviews)



Note: Excludes Y!JP, Y!CN