

Monitoring real world speed of a website or application is a difficult task. We'll describe the Web Timing API and how Google Analytics (GA) uses it to provide fine grained real world speed data to its publishers. We'll talk about customizing GA to gain detailed insights about site's performance and share performance insights based on aggregate data



About Satish Kambala

[View full profile](#)

Satish Kambala is a Staff Engineer at Google working on tools for measuring the web speed. He is passionate about speed and helps in making the web faster. He graduated from NIT Trichy, India and joined Google in 2006.



About Arvind Jain

[View full profile](#)

Arvind is a Director of Engineering at Google and works on making Google and the Internet fast. He also helped establish and chairs the W3C's Web Performance Working Group.



Real World Web Performance Measurement

Arvind Jain - Director of Engineering, Google
Satish Kambala - Staff Engineer, Google

Why Measure?

- Slow site results in
 - Lower usage
 - Less Revenue
 - Poor user experience

Agenda

- Measure Performance with HTML5 Web Timing
- Google Analytics Site Speed
- How Fast is the Web?

HTML5 Web Timing API

Allows web pages to get detailed timing information about the page load.

Goals:

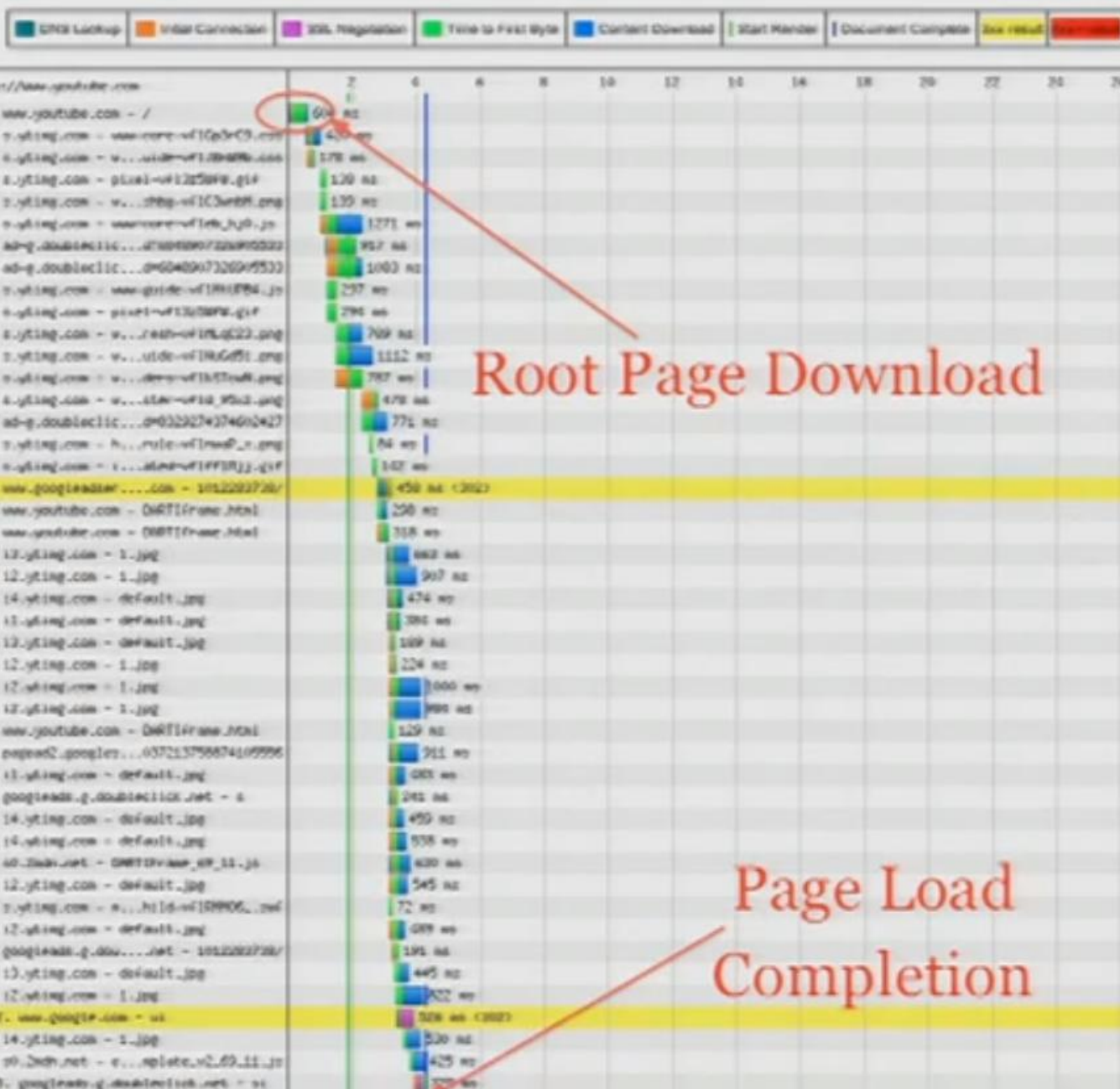
- Supported everywhere (all browsers, mobile and desktop)
- Consistent interface and metric definitions across browsers
- Visibility into detailed network, HTTP level and DOM timing information

HTML5 Web Timing API

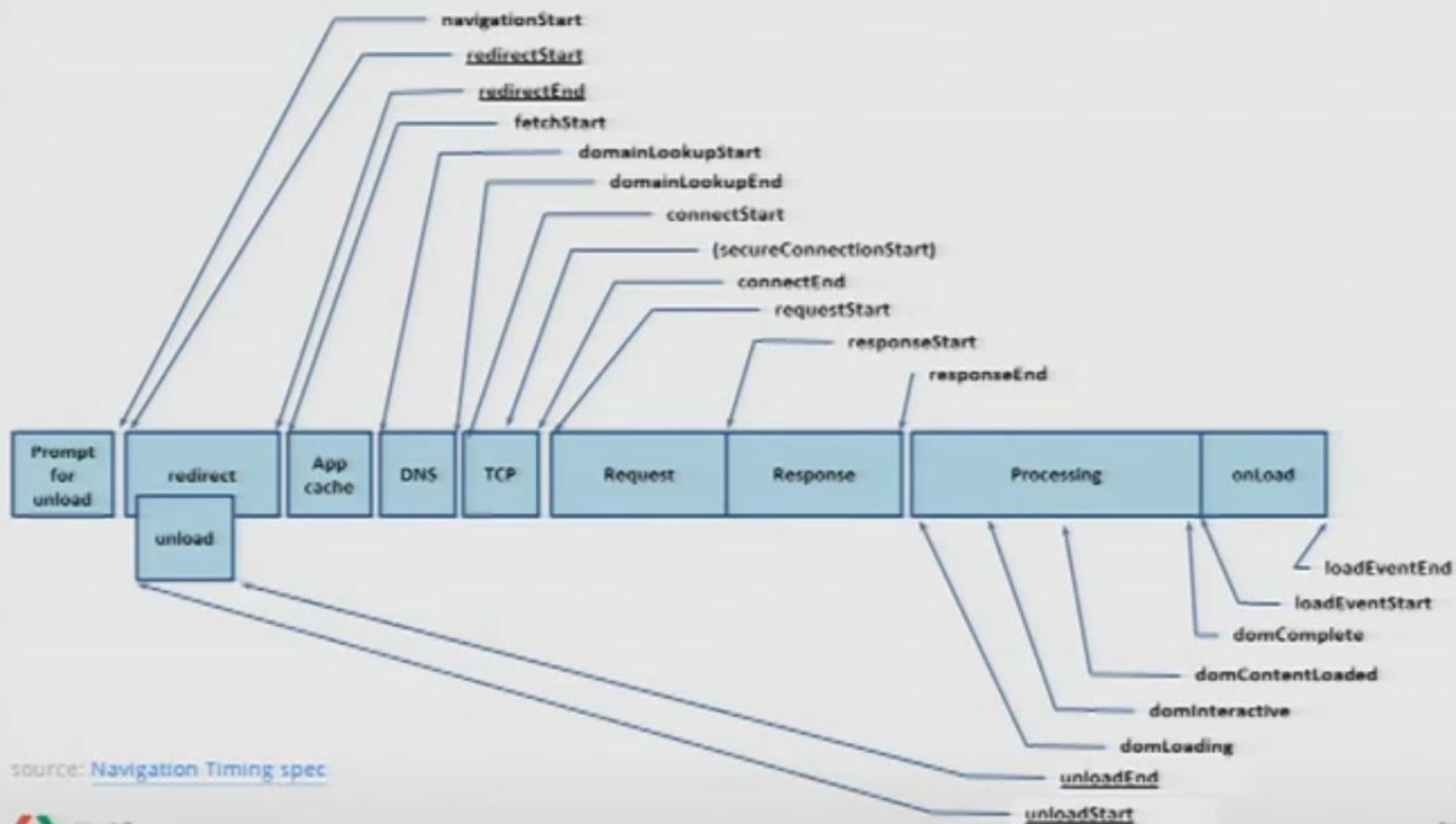
The API consists of the following specifications:

- Navigation Timing
- Resource Timing
- User Timing

Waterfall View



Navigation Timing Attributes (window.performance.timing)





Google I/O giveaways: \$5.5 million buys a lot of buzz

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How Google pulled off its sky...

How did...

tout its specs by send...

San Francisco? CNE

- [Google glasses: \\$1](#)
- [Editors' take: Google](#)
- [Edition](#)
- [Brin: Google Glass will free you](#)
- [Google Glass lands for consumers in 2014](#)

June 28, 2012 3:32 PM PDT



Will Nexus 7 prod Apple

to make iPad Mini

New Tab
New Window
New Incognito Window
Bookmarks

Edit Cut Copy Paste

Zoom - 110% +

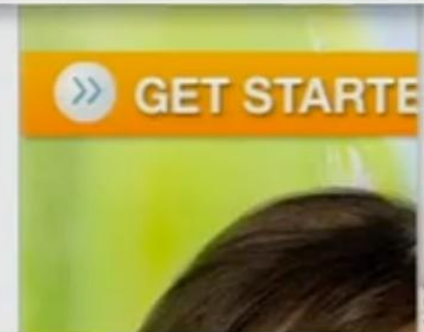
Save Page As...
Find...
Print...

Tools

History
Downloads


Signed in as satish.kambala@gmail.com...

Settings
About Google Chrome
View Background Pages (24)
Help




Real World Web Performance 2X Visitors Overview

news.cnet.com



GOOGLE I/O



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How to get developers on your side

Developer Tools - http://news.cnet.com/

ElementsResourcesNetworkSources


> window.performance.timing



▼ PerformanceTiming

connectEnd: 1340929331035
connectStart: 1340929331035
domComplete: 1340929335362
domContentLoadedEventEnd: 1340929331948
domContentLoadedEventStart: 1340929331918
domInteractive: 1340929331918
domLoading: 1340929331351
domainLookupEnd: 1340929331018
domainLookupStart: 1340929331018
fetchStart: 1340929331018
loadEventEnd: 1340929335362
loadEventStart: 1340929335362
navigationStart: 1340929331016
redirectEnd: 0
redirectStart: 0
requestStart: 1340929331036
responseEnd: 1340929331405
responseStart: 1340929331347
secureConnectionStart: 0
unloadEventEnd: 0
unloadEventStart: 0

Real World Web Performance 30 Visitors Overview

news.cnet.com









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Elements Resources Network Sources





> t=window.performance.timing

▶ PerformanceTiming


> t.loadEventEnd-t.navigationStart

4346


> |

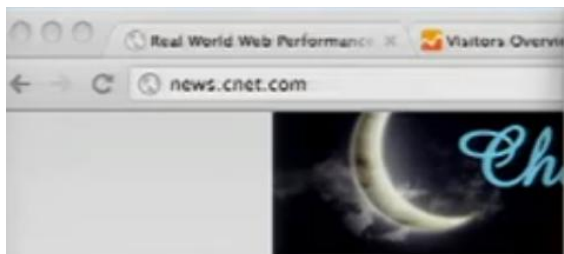


<top frame>



<page context>





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Elements Resources Network Sources

```
> t=window.performance.timing
  ▶ PerformanceTiming
> t.loadEventEnd-t.navigationStart
  4346
> t.responseEnd-t.responseStart
  responseEnd
  responseStart
```

<top frame> <page context>

Real World Web Performance X Visitors Overview

news.cnet.com




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Elements Resources Network Sources

Search Network

| Name | Path | M... | Stat | T... | Initia... | Size | Tim | Timeline | | |
|------|-----------|------|-----------|-------|-------------------|------------|------------|----------|--------|--------|
| | 8330-1_3- | GET | 200 OK | te... | oreo.mc Script | 678 663 | 262 261 | | 20.18s | 30.27s |
| | 8330-1_3- | GET | 200 OK | te... | oreo.mc Script | 679 663 | 263 261 | | | |

2 requests | 1.33KB transferred

Resource Timing Attributes

Provides timing info related to resources on a page, e.g., image, script, object, iframe, svg.

```
interface PerformanceResourceTiming : PerformanceEntry {  
    readonly attribute unsigned short initiatorType;  
  
    readonly attribute double redirectStart;  
    readonly attribute double redirectEnd;  
    readonly attribute double fetchStart;  
    readonly attribute double domainLookupStart;  
    readonly attribute double domainLookupEnd;  
    readonly attribute double connectStart;  
    readonly attribute double connectEnd;  
    readonly attribute double secureConnectionStart;  
    readonly attribute double requestStart;  
    readonly attribute double responseStart;  
    readonly attribute double responseEnd;  
};
```

Example Usage

JAVASCRIPT

```
function getImageLoadTimings()
{
    var resourceList = window.performance.getEntriesByType("resource");
    for (i = 0; i < resourceList.length; i++)
    {
        if (resourceList[i].initiatorType == "img")
        {
            alert("Time: " + resourceList[i].responseEnd - resourceList[i].startTime);
        }
    }
}
```

User Timing API

Provides a high precision (1 ms) timer and a standard mechanism for buffering and retrieval of timing information with a web developer supplied name.

Interfaces:

- Mark (UTC time)
 - `window.performance.mark(name)`
 - `window.performance.getMarks(name)`
 - `window.performance.clearMarks()`
- Measure (duration)
 - `window.performance.measure(measure_name, mark_name1, opt mark_name2)`
 - `window.performance.getMeasure(measure_name)`
 - `window.performance.clearMeasure()`

Web Timing Status

Navigation Timing is supported in the following browsers:

- Chrome 6+
- IE9+
- Firefox 7+ (mobile & desktop)
- Android 4.0+

Resource Timing and User Timing implementations expected soon.

Google Analytics Site Speed

Site Speed in Google Analytics

- Analytics set up

```
<script type='text/javascript'>  
  _gaq.push(['_setAccount', 'UA-XXXX-X']);  
  _gaq.push(['_trackPageview']);  
</script>
```

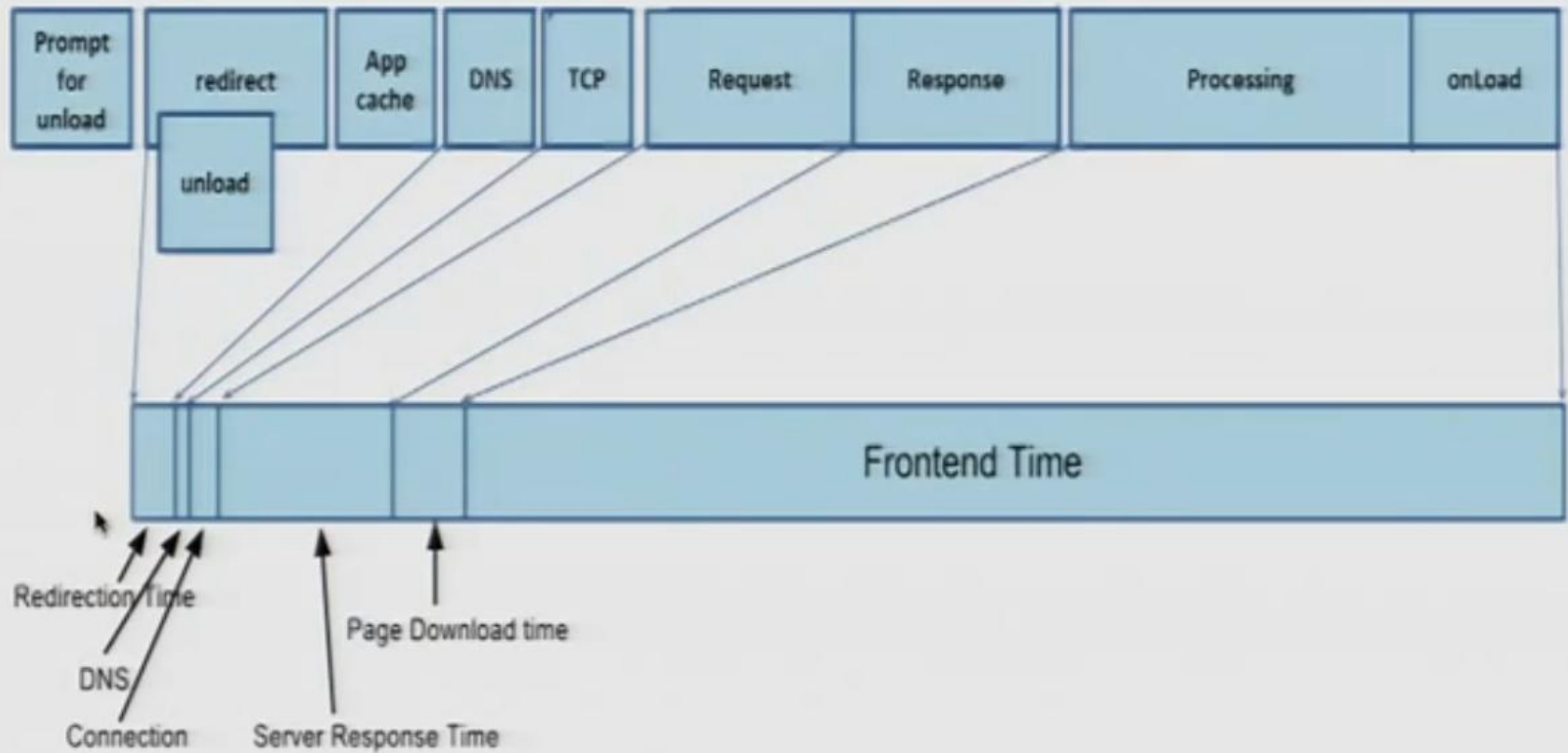
JAVASCRIPT

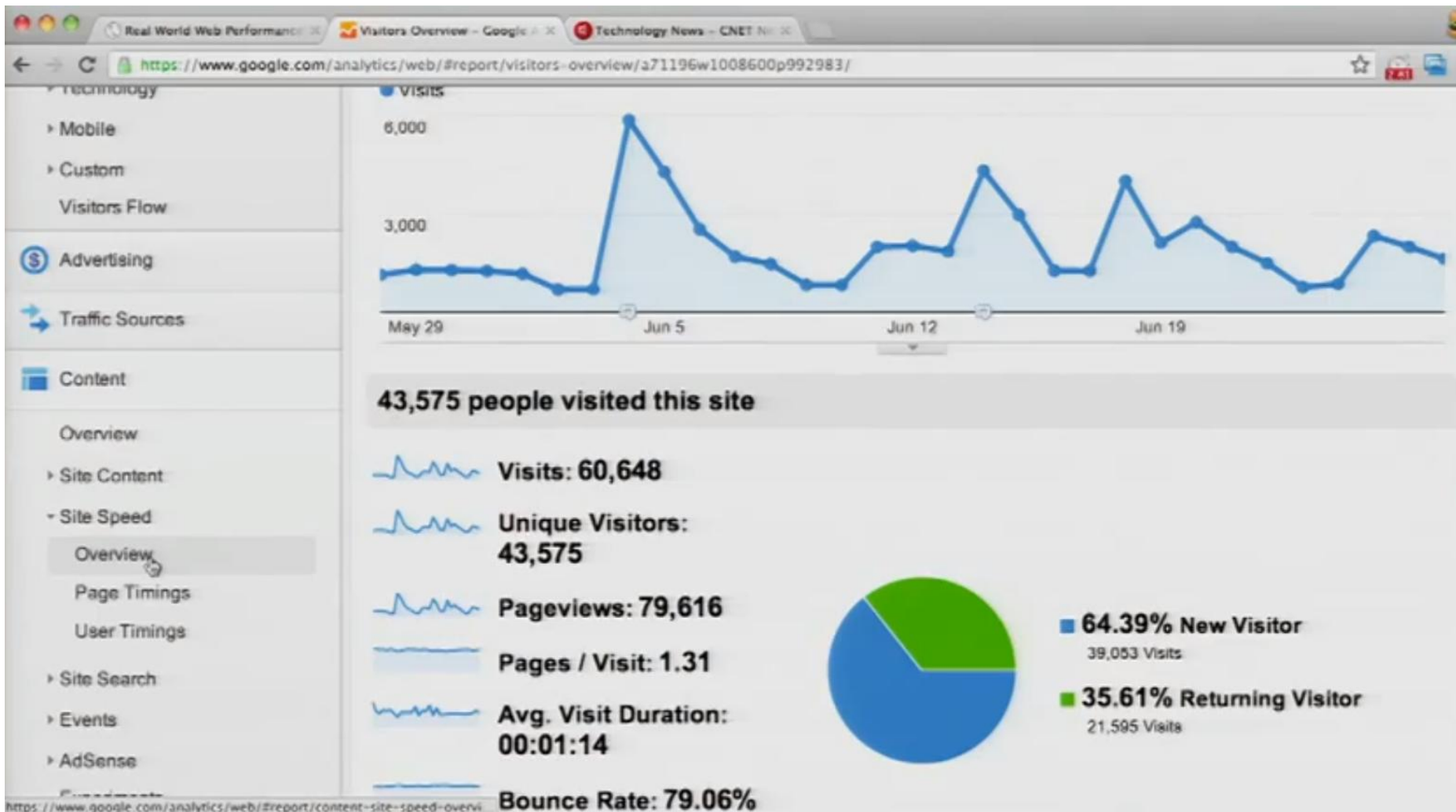
- Site Speed set up
 - None, Collects speed data for 1% of traffic
- Increase sample rate for small sites

```
<script type='text/javascript'>  
  _gaq.push(['_setSiteSpeedSampleRate', 50]);  
  _gaq.push(['_trackPageview']);  
</script>
```

JAVASCRIPT

Page Load Process





Real World Web Performance | Site Speed Page Timings | Technology News - CNET News.com

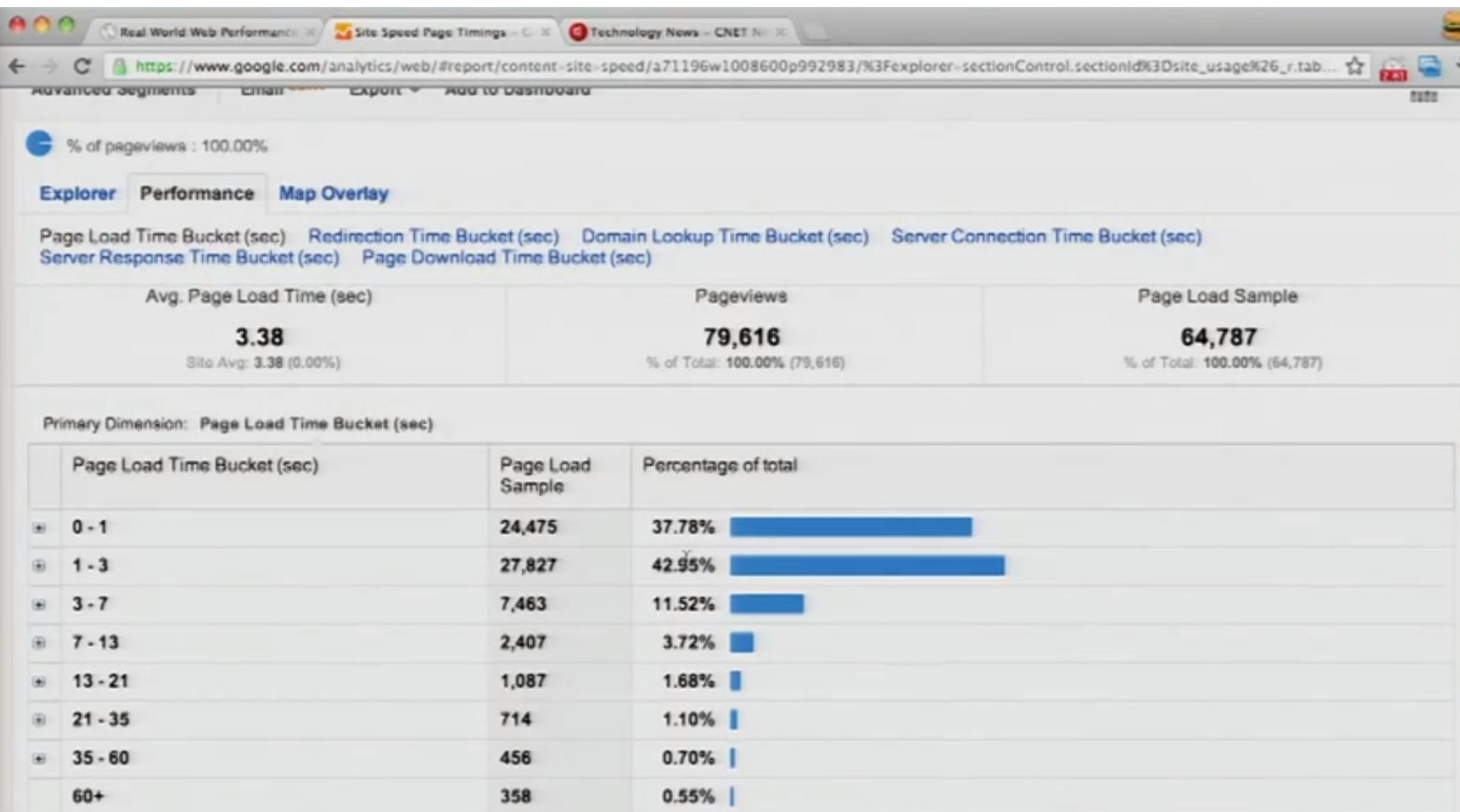
https://www.google.com/analytics/web/#report/content-site-speed/a71196w1008600p992983/

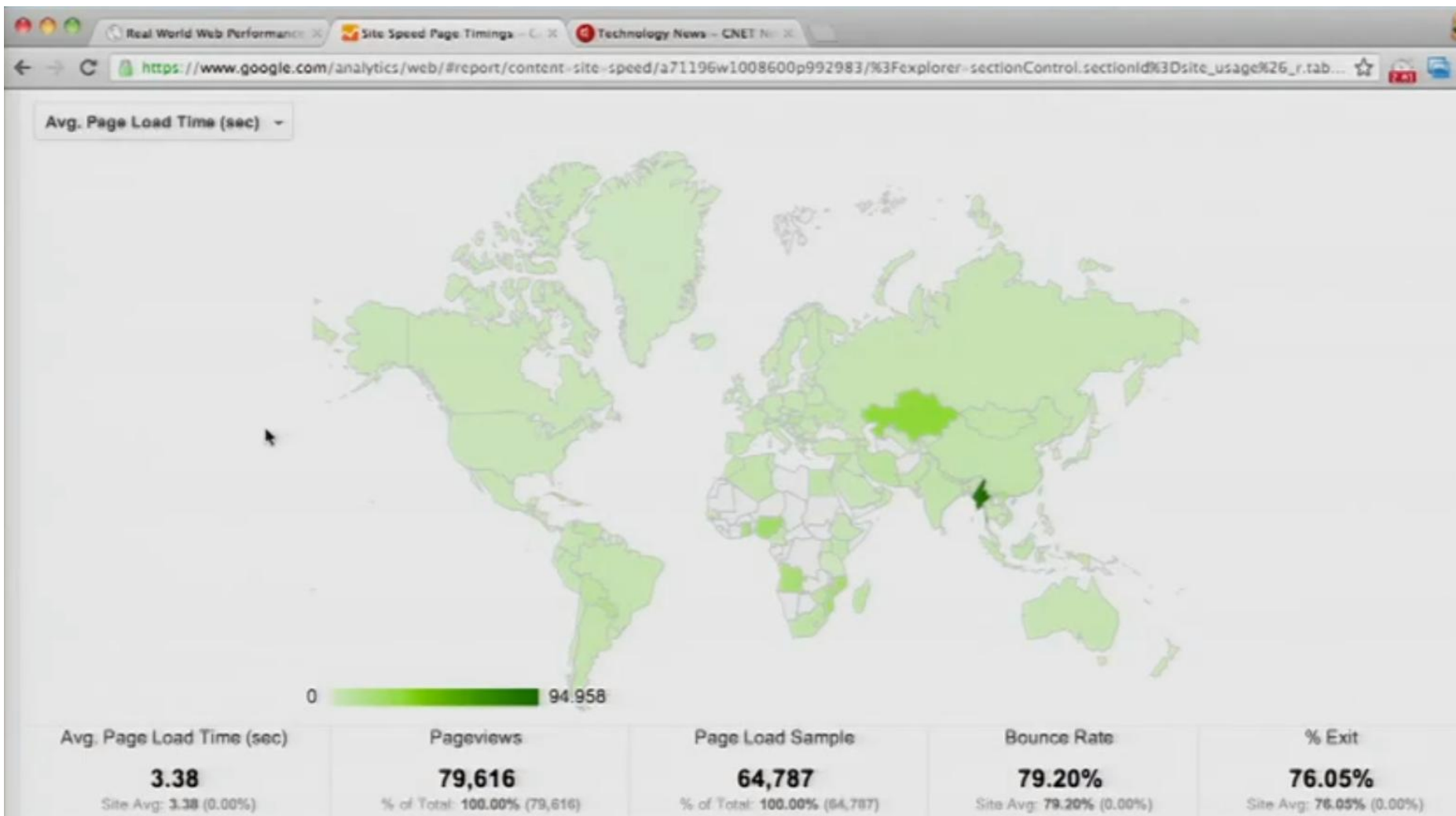
Plot Rows Secondary dimension Sort Type: Default

advanced

| | Page | Avg. Page Load Time (sec) | Pageviews | Page Load Sample | Bounce Rate | % Exit |
|-----|---|---------------------------|-----------|------------------|-------------|--------|
| 1. | /2012/06/04/chrome-networking-dns-prefetch-and-tcp-pr-econnect/ | 3.62 | 14,695 | 11,715 | 83.47% | 85.61% |
| 2. | /2012/06/14/debunking-responsive-css-performance-myths/ | 3.48 | 12,715 | 9,022 | 86.02% | 86.84% |
| 3. | / | 1.94 | 6,055 | 5,253 | 50.67% | 43.42% |
| 4. | /2008/04/14/custom-putty-color-themes/ | 2.15 | 2,297 | 2,150 | 66.30% | 73.97% |
| 5. | /2012/05/14/all-presentation-software-is-broken/ | 5.64 | 2,249 | 1,829 | 81.18% | 69.23% |
| 6. | /2012/06/25/spdy-and-secure-proxy-support-in-google-chrome/ | 3.22 | 1,603 | 1,310 | 82.10% | 81.91% |
| 7. | /2012/02/06/ssstable-and-log-structured-storage-leveldb/ | 4.22 | 1,369 | 1,098 | 76.95% | 75.16% |
| 8. | /2011/08/01/protocol-buffers-avro-thrift-messagepack/ | 2.19 | 1,359 | 1,135 | 80.04% | 79.47% |
| 9. | /2009/12/22/ruby-websockets-tcp-for-the-browser/ | 3.32 | 1,257 | 968 | 76.52% | 77.96% |
| 10. | /2008/02/11/nginx-and-memcached-a-400-boost/ | 3.84 | 1,242 | 1,086 | 84.38% | 85.51% |

Show rows: 10 Go to: 1 1 - 10 of 419





User Timings

- Measure user defined custom timings

Examples:

- Timings for Ajax actions
- Define your own "User Perceived Load Time"
(Time to load main article for news publishers)
- Detailed performance measurements

API

```
_gaq.push(['_trackTiming', category, variable, time_ms, opt_label, opt_sample]);
```

JAVASCRIPT

| Parameter | Example |
|------------|----------------------------|
| category* | "Watch Page" |
| variable* | "Social widgets load time" |
| time_ms* | 2340 |
| opt_label | "logged in users" |
| opt_sample | 100 |

Example

JAVASCRIPT

```
function TimeTracker(category, variable, opt_label) {  
    ...  
}  
  
TimeTracker.prototype.send = function() {  
    var timeSpent = this.endTime - this.startTime;  
    window._gaq.push(['_trackTiming', this.category, this.variable, timeSpent, this.label]);  
    return this;  
}  
  
var tt = new TimeTracker('Watch Page', 'Social widgets load time');  
makeXhrRequest(url, myCallback, tt);  
  
function makeXhrRequest(url, callback, tt) {  
    if (window.XMLHttpRequest) {  
        tt.startTime();  
        xhr.send();  
    }  
}  
  
function myCallback(event) {  
    if (target.readyState == 4) {  
        if (target.status == 200) {  
            target.tt.endTime();  
            target.tt.send();  
            // Do something with the resource.  
        }  
    }  
}
```

Example

JAVASCRIPT

```
function TimeTracker(category, variable, opt_label) {  
    ...  
}  
  
TimeTracker.prototype.send = function() {  
    var timeSpent = this.endTime - this.startTime;  
    window._gaq.push(['_trackTiming', this.category, this.variable, timeSpent, this.label]);  
    return this;  
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function makeXhrRequest(url, callback, tt) {  
    if (window.XMLHttpRequest) {  
        tt.startTime();  
        xhr.send();  
    }  
}  
  
function myCallback(event) {  
    if (target.readyState == 4) {  
        if (target.status == 200) {  
            target.tt.endTime();  
            target.tt.send();  
            // Do something with the resource.  
        }  
    }  
}
```

Site Speed User Timings

Jun 10, 2012 - Jun 19, 2012 ▾

ALL > TIMING VARIABLE: Social widgets load time ▾

Advanced Segments | Email **USA** | Export ▾ | Add to Dashboard

▴ % of user timing sample: 10.49%

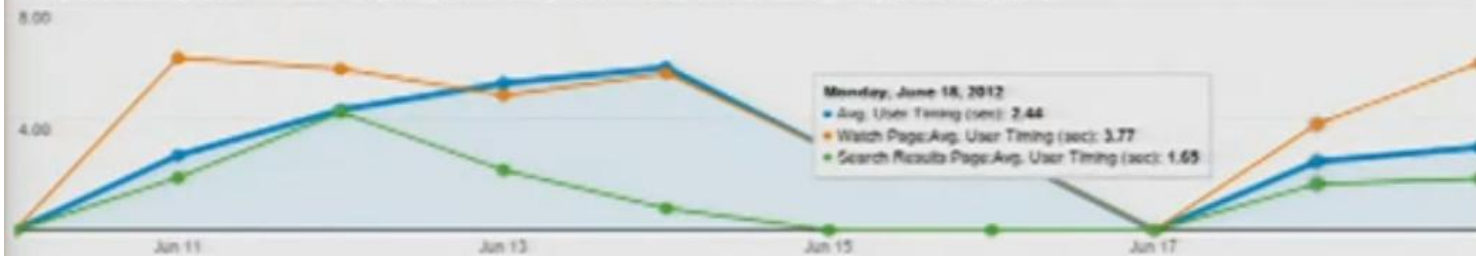
Explorer | Performance | Map Overlay

Site Usage

Avg. User Timing (sec) ▾ V5: [Select a metric](#)

Day Week Month  

● Avg. User Timing (sec) ● Watch Page:Avg. User Timing (sec) ● Search Results Page:Avg. User Timing (sec)



Avg. User Timing (sec)

3.52

(Site Avg: 3.98 (-11.60%))


User Timing Sample

138

(% of Total: 10.49% (1,318))

Primary Dimension: Timing Category Timing Label: Other ▾

Plot Rows Secondary dimension: ▾ Sort Type: Default ▾

 [advanced](#)     

| | Timing Category | Avg. User Timing (sec) | User Timing Sample | ↓ |
|-------------------------------------|--|------------------------|--------------------|---|
| <input checked="" type="checkbox"/> | 1. Watch Page | 4.43 | 47 | |
| <input type="checkbox"/> | 2. Channels | 3.65 | 28 | |
| <input checked="" type="checkbox"/> | 3. Search Results Page | 1.96 | 24 | |
| <input type="checkbox"/> | 4. Settings | 2.00 | 22 | |
| <input type="checkbox"/> | 5. Home Page | 2.45 | 9 | |

There's more with Google Analytics...

Custom Reports, Dashboards and Data API

Avg. Page Load Time (sec)

4.43

Site Avg: 4.43 (0.00%)



Visitor Caching Info

| Visitor Type | Avg. Page Load Time (sec) | Avg. Server Response Time (sec) |
|-------------------|---------------------------|---------------------------------|
| Returning Visitor | 4.20 | 1.07 |
| New Visitor | 5.77 | 0.95 |

Avg. Server Response Time

1.05

Site Avg: 1.05 (0.00%)



Server Response Time by Country

| Country/Territory | Pageviews | Avg. Server Response Time (sec) |
|-------------------|-----------|---------------------------------|
| United States | 4,026 | 0.96 |
| India | 324 | 1.90 |
| Germany | 55 | 2.24 |
| Netherlands | 51 | 1.18 |
| Australia | 18 | 1.10 |
| (not set) | 7 | 0.75 |
| Taiwan | 2 | 0.39 |
| Switzerland | 1 | 0.22 |
| Ireland | 1 | 34.16 |

Custom Alerts

Assets

[Assets](#) > [Custom Alerts](#) >

Edit an Alert

Alert name:

Apply to: **All GA Blogs** and

Period:

☒ Send me an email when this alert triggers. Also include

 [Setup your mobile phone](#) to receive a text message about Intelligence Alerts

Alert Conditions

This applies to

Alert me when

Condition

Value

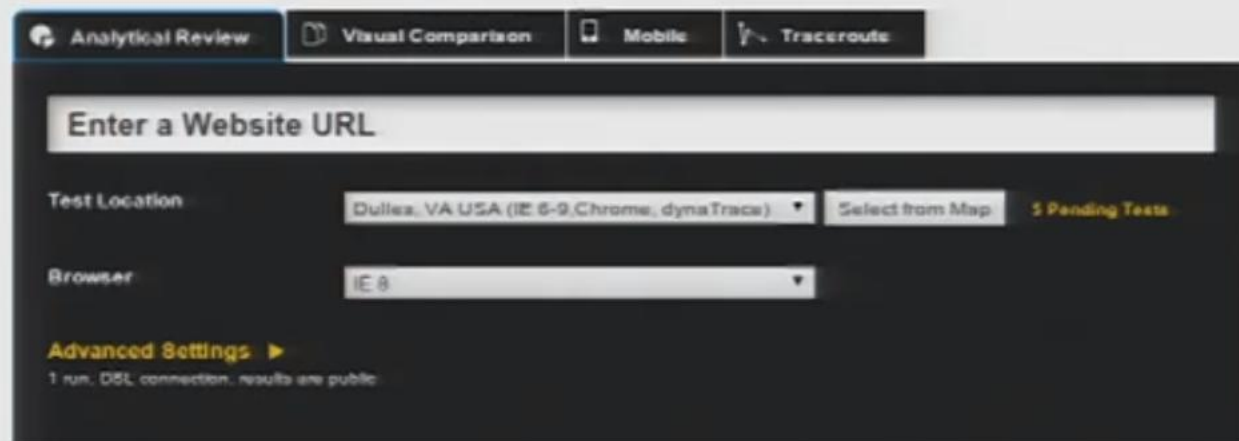
Compared to

[Cancel](#)

Analysis tools

- www.webpagetest.org

Test a website's performance



The screenshot shows the WebPageTest.org interface. At the top, there are four tabs: 'Analytical Review' (selected), 'Visual Comparison', 'Mobile', and 'Traceroute'. Below the tabs is a large text input field labeled 'Enter a Website URL'. Underneath this, there are two rows of settings. The first row is 'Test Location', with a dropdown menu showing 'Dulles, VA USA (IE 8-9, Chrome, dynaTrace)' and a 'Select from Map' button. To the right of this row is a yellow status indicator that says '1 Pending Tests'. The second row is 'Browser', with a dropdown menu showing 'IE 8'. Below these settings is a link for 'Advanced Settings' with a right-pointing arrow. At the bottom, there is a small note: '1 run, DSL connection, results are public'.

- Chrome Developer Tools[[Session](#)]

Optimization Tools

- Suggestions ([Page Speed Insights](#))

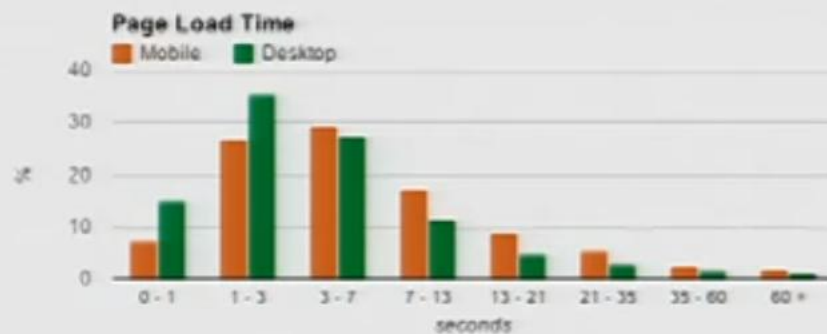
- Automatic Rewriters

Apache module [mod_pagespeed](#) & [Page Speed Service](#)

- Optimizing Your Google App Engine App [[Session](#)]

How fast is the web?

Google Analytics Site Speed Global Page Load Time: Mean, Median, Histogram



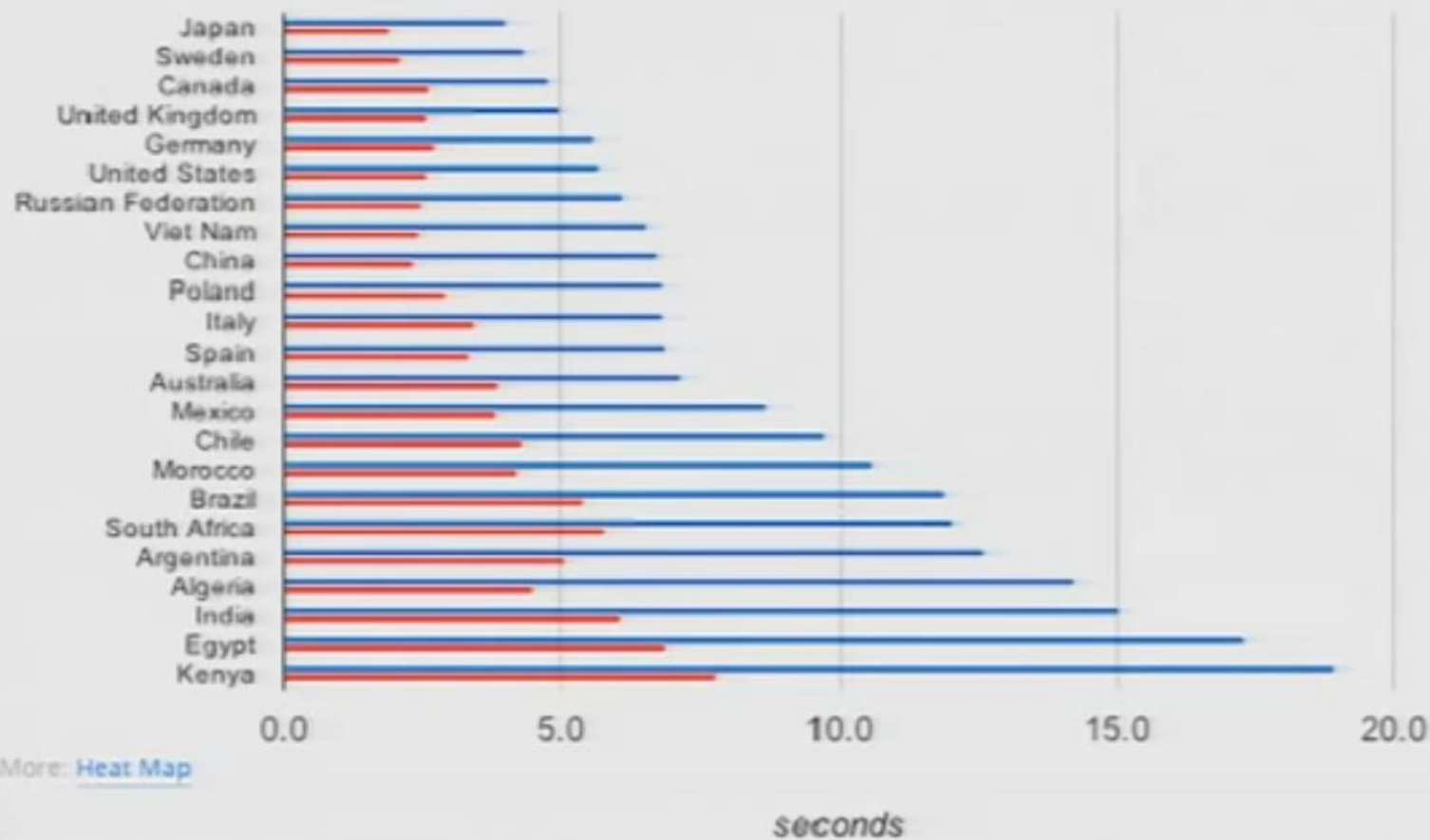
- Desktop page load time mean and median are 6.9/2.9 seconds
- Mobile mean and median are 10.2/4.7 seconds

[Google Analytics blog](#)

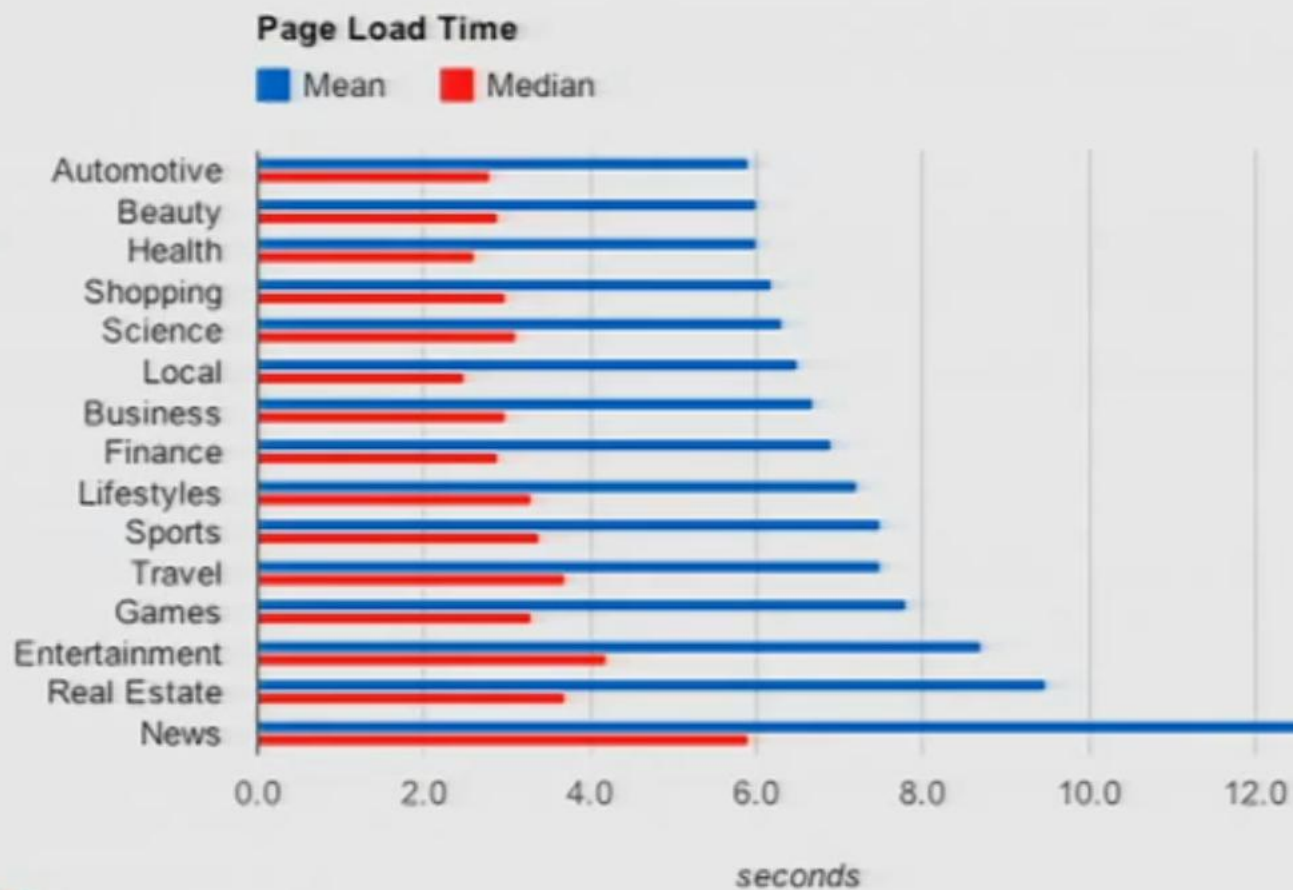
Google Analytics Site Speed Global Page Load Time: Countries

Page Load Time

■ Mean ■ Median



Google Analytics Site Speed Global Page Load Time: Verticals



Thank You!



These slides are available at <http://io12-webperf.appspot.com>

Arvind Jain - Director of Engineering, Google
Satish Kambala - Staff Engineer, Google