WHY CARE?

WHY CARE?

WHY CARE?

WHY CARE?

WHY CARE?
WHY CARE?

Measure

http://www.flickr.com/photos/kayaker1204/4319542459/
Tell a story

We have a median page load time of seven seconds, and our primary competitor has a median page load time of three seconds.
Tell a story

Page load times increased by 25% when we added feature x.

http://www.flickr.com/photos/kayaker1204/4319542459/
Your bosses love a story

http://www.flickr.com/photos/kayaker1204/4319542459/
Hi all,

Attached are our latest web performance metrics and trends.

Spread the word

http://www.flickr.com/photos/kayaker1204/4319542459/
What numbers?!
What numbers?!
Iraq crisis: Republican senator calls for US-Iran coordination

Senator Lindsey Graham: ‘If Baghdad falls, a disaster awaits us’ and GOP leaders say ISIS represents ‘greatest threat since 9/11’

Iran and US face common foe in effort to stop ISIS fighters in Iraq

Captured Iraqi soldiers ‘murdered by militants’

US sends aircraft carrier to Gulf as Obama considers air strikes in Iraq

Iran sends troops into Iraq to aid fight against ISIS militants

Tony Blair: west must intervene in Iraq

Ex PM says allies should consider military options short of sending troops after denying 2003 invasion led to crisis

Blair rejects claims 2003 invasion of Iraq caused current crisis

Israeli forces tighten grip on West Bank in search for three abducted teenagers

Netanyahu accuses Hamas of being behind kidnap as troops flood into Hebron and hundreds of reservists are called up

Ukraine minister’s abusive remarks about Putin raise tensions

Andriy Deshchytysa caught swearing about Russian president while trying to placate protesters outside embassy in Kiev
Test a website's performance

http://www.theguardian.com

Test Location: Dulles, VA USA (IE 8–11, Chrome, Firefox, Android, iOS) Select from Map

Browser: iPhone 4 iOS 5.1

Advanced Settings: 1 run, Shaped 3G connection, results are public

Run a free website speed test from multiple locations around the globe using real browsers (IE and Chrome) and at real consumer connection speeds. You can run simple tests or perform advanced testing including multi-step transactions, video capture, content blocking and much more. Your results will provide rich diagnostic information including resource loading waterfall charts, Page Speed optimization checks and suggestions for improvements.

If you have any performance/optimization questions you should visit the Forums where industry experts regularly discuss Web Performance Optimization.
Test a website's performance

http://www.theguide.com

Mobile Devices
- Dulles, VA USA (Android 4.4, 2.3, iOS)
- North America
  - Dulles, VA USA (IE 8-11, Chrome, Firefox, Android, iOS)
  - Asheville, NC USA (IE8, Chrome, Firefox)
  - Miami, FL USA (IE8, Chrome, Firefox)
  - Chicago, IL USA (IE9-10, Chrome, Firefox)
  - Kansas City, MO USA (IE8, Chrome)
  - Denver, Colorado (IE 8, Chrome, Firefox, Safari)
  - Phoenix, AZ (IE 10, Chrome, Firefox)
  - Boardman, Oregon (IE 9, Chrome, Firefox, Safari)
  - Los Angeles, CA USA (IE 7,8,9, Chrome)
  - Montreal, Canada (IE 8, Chrome, Firefox)
  - Toronto, Canada (IE 8)
- South America
  - Buenos Aires, Argentina (IE 8, Firefox, Chrome)
  - São Paulo, Brasil (IE 8,9,Chrome,Firefox)
- Europe
  - Dublin, Ireland (IE 9,Chrome,Firefox,Safari)
  - London, UK (IE 8,9,Chrome,Canary,Firefox)
  - Paris, FR (IE 7,8, Chrome)
  - Amsterdam, NL (IE 7~9, Chrome, Firefox)
  - Amsterdam, NL - Go Daddy (IE 10, Chrome, Firefox)
  - Amsterdam, NL - llSpeed (IE 10, Chrome, FireFox, Safari)

Test Location
- Browser
- Advanced Settings

Run a free website speed test from connection speeds. You can run blocking and much more. Your r optimization checks and tips regularly discuss Web.
Test a website's performance

http://www.theguardian.com

Test Location
1 run, Shaped 3G connection, not blocking and much more. Your Speed optimization checks and

If you have any performance/optimization needs, Performance Optimization.

START TEST
## Advanced Settings

<table>
<thead>
<tr>
<th>Test Settings</th>
<th>Advanced</th>
<th>Chrome</th>
<th>Auth</th>
<th>Script</th>
<th>Block</th>
<th>SPOF</th>
<th>Custom</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Connection</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cable (5/1 Mbps 28ms RTT)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Number of Tests to Run</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to 9</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Repeat View</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>First View and Repeat View</td>
<td>First View Only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Capture Video</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Keep Test Private</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>✔️</td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Label</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Connection: Cable (5/1 Mbps 28ms RTT)
Number of Tests to Run: 9
Repeat View: First View and Repeat View
Capture Video: On
Keep Test Private: Off
Label: 

START TEST
### Performance Results (Median Run)

<table>
<thead>
<tr>
<th></th>
<th>Load Time</th>
<th>First Byte</th>
<th>Start Render</th>
<th>User Time</th>
<th>Speed Index</th>
<th>DOM Elements</th>
<th>Document Complete</th>
<th>Fully Loaded</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time</td>
<td>Requests</td>
<td>Bytes in</td>
<td>Time</td>
<td>Requests</td>
<td>Bytes in</td>
<td>Time</td>
<td>Requests</td>
</tr>
<tr>
<td>First View (Run 7)</td>
<td>3.783s</td>
<td>81</td>
<td>1,305 KB</td>
<td>6.530s</td>
<td>127</td>
<td>1,588 KB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeat View (Run 6)</td>
<td>2.268s</td>
<td>31</td>
<td>130 KB</td>
<td>3.617s</td>
<td>43</td>
<td>278 KB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Plot Full Results**

<table>
<thead>
<tr>
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<th>Fully Loaded</th>
<th>Speed Index</th>
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<tbody>
<tr>
<td>FIRST VIEW</td>
<td>3.783s</td>
<td>0.128s</td>
<td>0.676s</td>
<td>6.530s</td>
<td>1522</td>
</tr>
<tr>
<td>REPEAT VIEW</td>
<td>2.268s</td>
<td>0.486s</td>
<td>0.486s</td>
<td>3.617s</td>
<td>980</td>
</tr>
<tr>
<td></td>
<td>Load Time</td>
<td>First Byte</td>
<td>Start Render</td>
<td>User Time</td>
<td>Speed Index</td>
</tr>
<tr>
<td>------------------</td>
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<td>------------</td>
<td>--------------</td>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>FIRST VIEW</strong></td>
<td>3.783s</td>
<td>0.128s</td>
<td>0.676s</td>
<td>1.996s</td>
<td>1522</td>
</tr>
<tr>
<td><strong>REPEAT VIEW</strong></td>
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<td>0.486s</td>
<td>0.486s</td>
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<td>980</td>
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</table>
Measure and tracking trends

http://www.flickr.com/photos/kayaker1204/4319542459/
<table>
<thead>
<tr>
<th>Guardian</th>
<th>NY Times</th>
<th>Boston Globe</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>5132</td>
<td>2074</td>
</tr>
<tr>
<td>Median over last 14 days. Average was 2012.7</td>
<td>Median over last 14 days. Average was 5339</td>
<td>Median over last 14 days. Average was 2280.1</td>
</tr>
</tbody>
</table>

http://speedcurve.com
How to optimize

http://www.flickr.com/photos/freefoto/2231356418/
Content-Encoding: gzip

Cache-Control: max-age=315360000

Web performance 101
<table>
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Optimizing: **First byte**

http://www.flickr.com/photos/freefoto/2231356418/

Tuesday, June 17, 14
Optimizing: **First byte**

- DNS lookup → TCP connect → HTTP request → Server time → HTTP resp
Optimizing: **First byte**

- DNS lookup → TCP connect → HTTP request → Server time → HTTP resp
Optimizing: **First byte**

- DNS lookup
- TCP connect
- HTTP request
- Server time
- HTTP resp
Optimizing: First byte

DNS lookup → TCP connect → HTTP request → Server time → HTTP resp
Optimizing: **First byte**

- DNS lookup → TCP connect → HTTP request → Server time → HTTP resp

SSL Handshake
Optimizing: **First byte**

- DNS lookup
- TCP connect
- HTTP request
- Server time

HTTP Redirect

SSL Handshake

HTTP resp
Optimizing: **First byte**

- DNS lookup
- TCP connect
- HTTP request
- Server time
- HTTP resp

HTTP Redirect

SSL Handshake

Tuesday, June 17, 14
Optimizing: First byte

- DNS lookup
- TCP connect
- HTTP request
- Server time
- HTTP resp

HTTP Redirect

SSL Handshake
Optimizing: **First byte**

DNS lookup ➔ TCP connect ➔ HTTP request ➔ Server time ➔ HTTP resp

- **HTTP Redirect**
- **SSL Handshake**

Tuesday, June 17, 14
Optimizing: First byte

Network sequence:
- DNS lookup
- TCP connect
- HTTP request
- Server time
- HTTP response

SSL Handshake
HTTP Redirect
Optimizing: First byte

- Eliminate redirects
- Just eliminate redirects
- Flush the document early?
- Prefetch DNS?
- But really, just eliminate redirects
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Optimizing: **Start render**

http://www.flickr.com/photos/freefoto/2231356418/
Optimizing: **Start render**

- **HTML parser** → **DOM tree**
  - **Render tree** → **Layout** → **Paint**
Optimizing: **Start render**

- HTML parser
- DOM tree
- Render tree
- Layout
- Paint
Optimizing: Start render

- HTML parser
- Remote JS
- DOM tree
- Render tree
- Layout
- Paint
Optimizing: **Start render**

- HTML parser
- DOM tree
- Render tree
- Layout
- Paint
Optimizing: **Start render**

- HTML parser
- DOM tree
- Render tree
- Layout
- Paint

**inline script waiting on remote CSS**
Optimizing: **Start render**

- HTML parser
- DOM tree
- Render tree
- Layout
- Paint
Optimizing: **Start render**

- HTML parser
- DOM tree
- Render tree
- Layout
- Paint
Optimizing: **Start render**

- HTML parser
- DOM tree
  - fetching remote stylesheets
  - Render tree
  - Layout
  - Paint
Optimizing: **Start render**

- HTML parser
  - DOM tree
    - Render tree
      - Layout
        - Paint
Optimizing: Start render

HTML parser → DOM tree

Render tree → Layout → Paint
Optimizing: Start render

HTML parser → DOM tree → Render tree → Layout → Paint
Optimizing: Start render

HTML parser → DOM tree → Render tree → Layout → Paint
Optimizing: **Start render**

- Avoid blocking scripts
<script>
var script = document.createElement('script');
script.src = "app.js";
document.head.appendChild(script);

</script>
Optimizing: **Start render**

```javascript
<script>
var script = document.createElement('script');
script.src = "app.js";
document.head.appendChild(script);
</script>

**BREAKS THE PRE-PARSER!**
Optimizing: **Start render**

- HTML parser
- DOM tree
- HTML pre-parser
- Render tree
- Layout
- Paint
Optimizing: Start render

HTML parser → Remote JS → DOM tree

HTML pre-parser

→ Render tree → Layout → Paint
Optimizing: Start render

- HTML parser
- DOM tree
- HTML pre-parser
- Render tree
- Layout
- Paint
Optimizing: **Start render**

- HTML parser
- DOM tree
- **fetching remote stylesheets**
- Render tree
- Layout
- Paint
Optimizing: **Start render**

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<script>
var script = document.createElement('script');
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document.head.appendChild(script);
</script>

BREAKS THE PRE-PARSER!
Optimizing: Start render

```html
<script src="app.js" async defer></script>
```
Avoid blocking scripts
- Move script elements to end of `<body>`
- Or... add `async` attribute to script elements

Inline critical CSS
Avoid blocking scripts
- Move script elements to end of `<body>`
- Or... add `async` attribute to script elements

Inline critical CSS
- [https://github.com/pocketjoso/penthouse](https://github.com/pocketjoso/penthouse)
### Optimizing: Load time & fully loaded

<table>
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<tr>
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http://www.flickr.com/photos/freefoto/2231356418/
Optimizing: Load time & fully loaded

- gzip compression (of course!)
- Far-future caching (of course!)
- Concatenate files (of course!)
<table>
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Optimizing: **Speed Index**

http://www.flickr.com/photos/freefoto/2231356418/

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Resilience

http://www.flickr.com/photos/vpickering/6824364286/
Progressive enhancement

http://www.flickr.com/photos/8040811@N06/3167877765

Tuesday, June 17, 14
The future

http://www.flickr.com/photos/kayaker1204/4319542459/
Future: **HTTP/2 & SPDY**

- Multiplexing
- Cache pushing
Future: ServiceWorker
Future: **ServiceWorker**

```javascript
this.addEventListener('fetch', function (e) {
  if (e.request.url.host === 'guardian.co.uk') {
    e.forwardTo('http://theguardian.com');
  }
})
```

(Possibly not possible)
Future: **Service Worker**

```javascript
this.addEventListener('fetch', function (e) {
  if (window.innerWidth > 500) {
    e.forwardTo(e.request.url + '?width=large');
  }
})

(Possibly not possible)
```
Experiment and measure
Theorize

Experiment, and...

Measure

Experiment and measure

http://www.flickr.com/photos/kayaker1204/4319542459/
Thank-you!

http://lanyrd.com/sdbmhb
@andyhume