

Our application got popular, and now it breaks

Dan Wilson



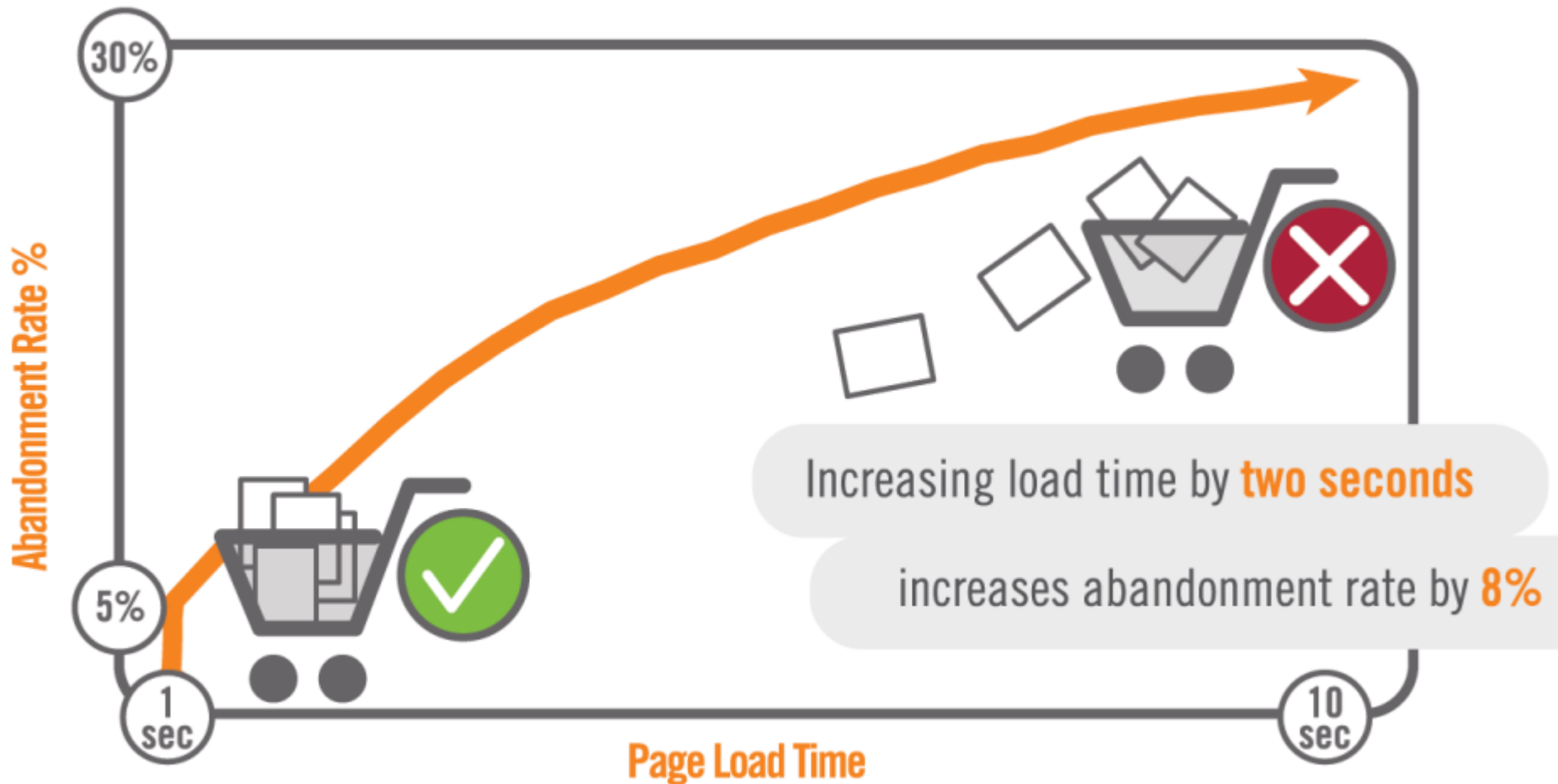


Who is Dan Wilson

- Runs ChallengeWave.com, Datacurl LLC and NCDevCon
- Specializes in project rescue, high performance applications and development team evaluation
- Owner of Model-Glue
- Dad of 2, Husband to 1
- Loves all things technical and a good debate

Time is Money

Abandonment Rate Compared to Page Load Time



Source: Gomez Real-User Monitoring
• 250+ customers
• 100,000,000+ page measurements

Let's talk about a new restaurant



Designed a brand new kitchen



Opening Day



People Waiting.....



Meltdown!!!



What does this have to do with programming?



How most projects start



Single User, No Data





the road not taken

(c) 2007 SNOWANGEL



END



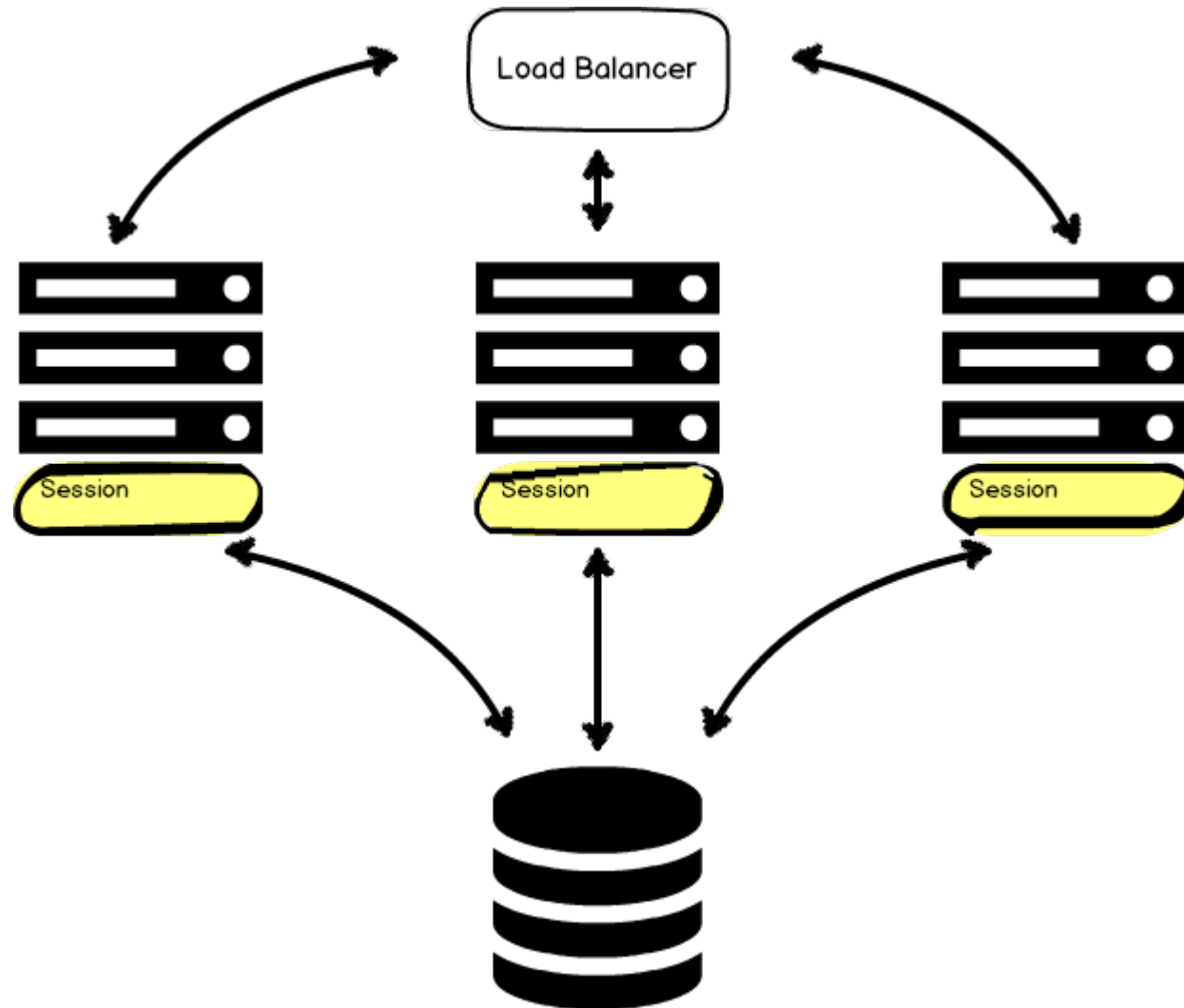
Bottlenecks

- Memory
- CPU
- Threads
- Disk Space
- Disk Transfer
- JVM Space
- ColdFusion template cache
- ColdFusion Threads
- Network Capacity
- Network Throughput
- Network Latency
- Appliances
- Database
- 3rd Party APIs
- Client Side Limitations
- And many more!

Evil #1: Making bad tradeoffs

Session

Architecture with Session



Over-reliance on Shared Scopes

- Session Scope use is the largest culprit
- Sometimes you have to deoptimize a few operations in order to provide a scalable solution (like stop caching a state query in application)
- If you want to use a shared scope and want to keep an eye on scalability later, use a lookup factory.

```
<cfcomponent>
  <cfset variables.instance = structNew() />

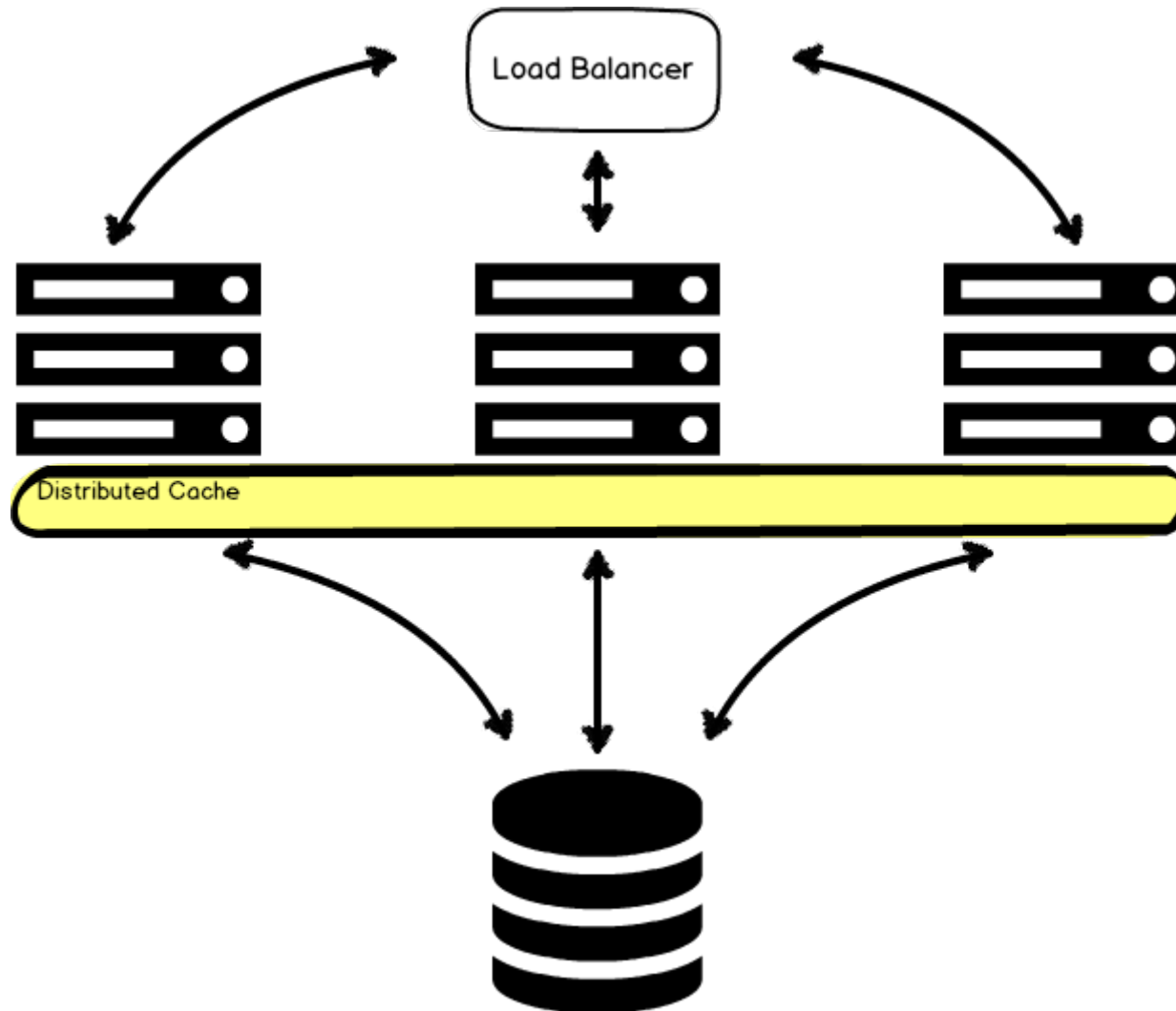
  <cffunction name="init" returntype="CurrentUserLoader" output="false"
access="public">
    <cfargument name="Transfer" type="any" required="true"/>
    <cfset variables.transfer = arguments.transfer />
    <cfreturn this />
</cffunction>

<cffunction name="destroy" output="false" access="public" returntype="void" >
    <cfset cookie.userID = "" />
    <cfset structDelete( cookie, "userID") />
</cffunction>

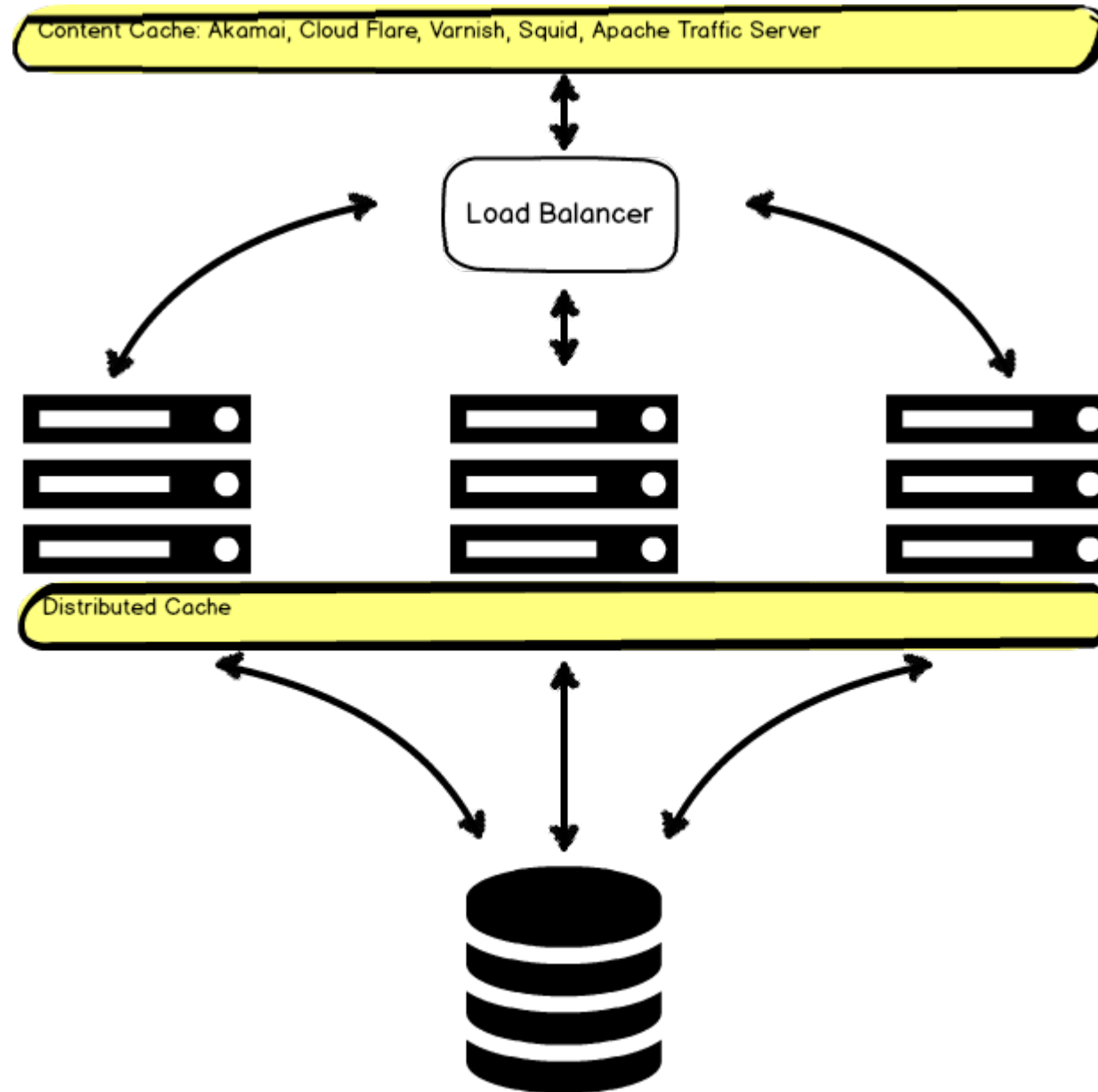
<cffunction name="load" output="false" access="public" returntype="any" hint="">
    <cfset var loggedInUserID = 0 />
    <cfif structkeyExists(cookie, "userID")>
        <cfset loggedInUserID = cookie.userID />
    </cfif>
    <cfreturn variables.transfer.get("User", val( loggedInUserID ) ) />
</cffunction>

<cffunction name="set" output="false" access="public" returntype="void" hint="">
    <cfargument name="user" type="any" required="true"/>
    <cfset cookie.UserID = arguments.User.getUserID() />
    <cfset cookie.Email = arguments.User.getEmail() />
</cffunction>
</cfcomponent>
```

Architecture with Distributed Cache



Architecture with Content Cache





Discover beautiful things on Amazon, updated daily

SHOP



All



Spring Outlet Event

Dan's Amazon.com Today's Deals Gift Cards Sell Help

Hello, Dan **Your Account**

Your **Prime**

Wish **List**

Cart

Personalization

AVAILABLE UNLOCKED

fire
PHONE

~~\$449~~ **\$189**

Limited-time offer

INCLUDES
ALL YEAR OF PRIME
+
UNLIMITED
D PHOTO STORAGE



Watch-Ready Watches [See more](#)





Back to search results for "aeropress"



You purchased this item on March 25, 2015.

Product Packaging: Frustration-Free Packaging | View this order

Aeropress Coffee and Espresso Maker

by AeroPress

★★★★★ 3,852 customer reviews

| 221 answered questions

Price: \$29.95 Prime

In Stock.

Ships from and sold by Amazon.com in easy-to-open packaging. Gift-wrap available.

Want it tomorrow, April 18? Order within 3 hrs 49 mins and choose Saturday Delivery at checkout. Details

Product Packaging: Frustration-Free Packaging

Frustration-Free Packaging

\$29.95 Prime

Retail

\$29.99 Prime

- SMOOTHEST - Using the ideal water temperature and gentle air pressure brewing yields rich flavor with lower acidity and without bitterness

Share [Email] [Facebook] [Twitter] [Pinterest]

Qty: 1



Add to Cart

Turn on 1-Click ordering for this browser

Ship to:

Daniel Wilson

Add to Wish List

Add to Wedding Registry

Other Sellers on Amazon

4 used & new from \$25.46

Have one to sell?

Sell on Amazon



Roll over image to zoom in

PHONES TO FIT YOUR LIFE.

Something you look at each day can now also be your favorite. Whether you want all the bells and whistles or need to stick to a budget, we've got a selection of Motorola phones for you.

moto X (2nd Gen.)

MOTO X SPECS:

- ✓ 3G + 4G LTE Data
- ✓ 16GB Internal Memory
- ✓ Android™ KitKat® 4.4.4
- ✓ 13MP Tap-to-Focus Camera
- ✓ 5.2" AMOLED Full HD Display
- ✓ Black or Design Your Own

\$399

🛒 ADD TO CART

Ships in 2-3 days

32GB available
BUILD YOURS >

[More Information](#)

[Accessories](#)



Color:

Capacity: 16GB

4.4 ★★★★★ (1,819)

moto X (1st Gen.)

MOTO X SPECS:

- ✓ 3G + 4G LTE Data
- ✓ 16GB Internal Memory
- ✓ Android™ KitKat® 4.4.2
- ✓ 10MP Tap-to-Focus Camera
- ✓ 4.7" AMOLED HD 720p Display
- ✓ Black or White

\$299

🛒 ADD TO CART

Ships in 2-3 days

[More Information](#)

[Accessories](#)



Moto X (2nd Gen.)

Black
16GB

\$399

[Remove](#)

[Shop Accessories](#)

Color:



Capacity:

16GB

ADD A NEW LINE OF SERVICE

| | WIFI | CELL | 3G | 4G |
|------|------|------|----|----------------------------------|
| \$5 | ✓ | | | <input type="radio"/> |
| \$10 | ✓ | ✓ | | <input checked="" type="radio"/> |
| \$25 | ✓ | ✓ | ✓ | <input type="radio"/> |
| \$40 | ✓ | ✓ | ✓ | ✓ <input type="radio"/> |

REPLACE EXISTING REPUBLIC PHONE



MONTHLY PLAN CHARGE:

\$10

TODAY'S TOTAL:

\$399

Taxes, surcharges, fees and shipping to be determined

CHECKOUT ➔

moto g (1st Gen.)

MOTO G SPECS:

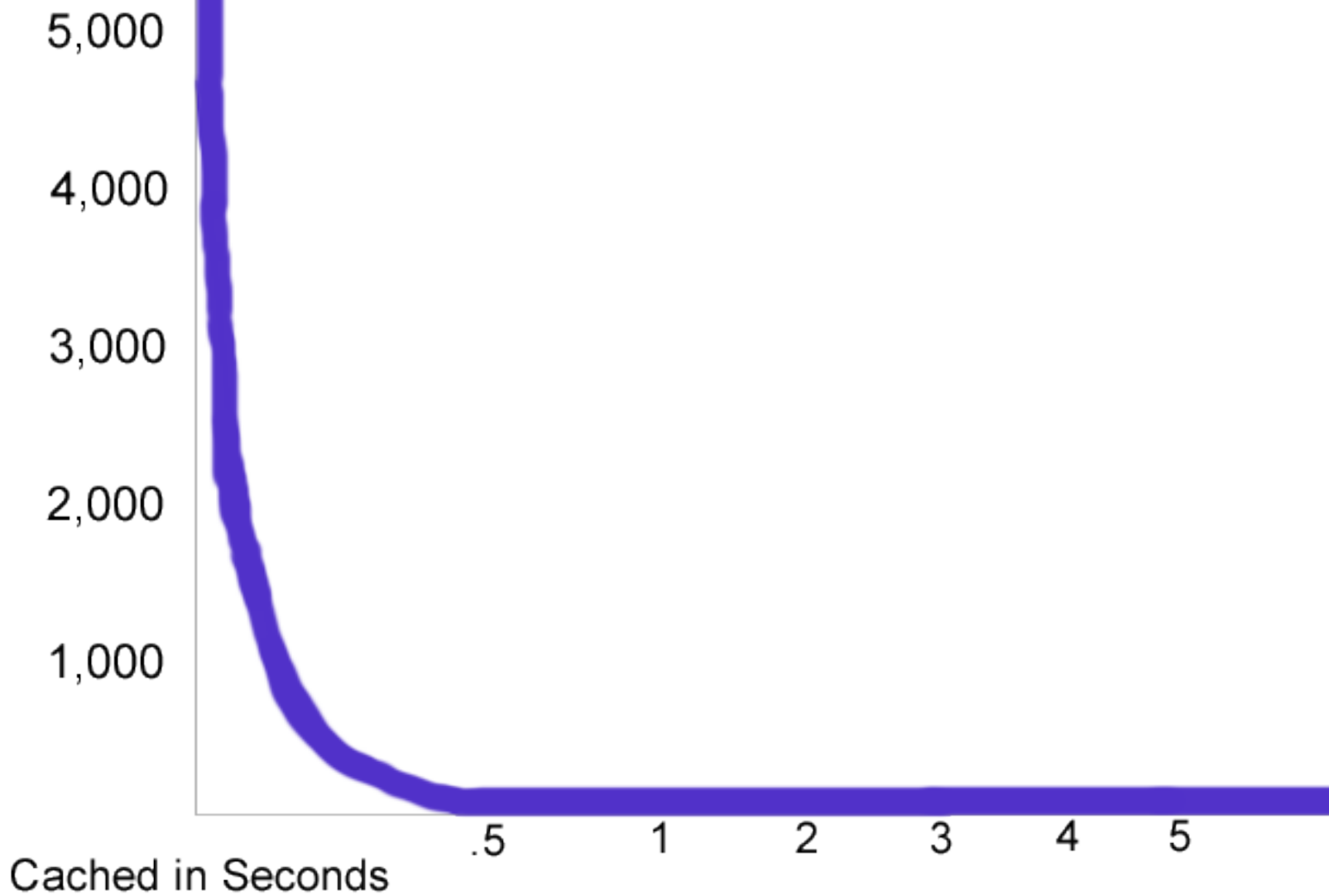


moto e (1st Gen.)

MOTO E SPECS:

Requests

Micro-increment Caching



Evil #2: Database Abuse



We all agree this is bad, right?

```
<cfloop query="OldLastLogins">
  <cfquery name="UpdateUsers" datasource="#datasource#">
    UPDATE Users
    SET Active = 0
    WHERE UserID = #OldLastLogins.UserID#
  </cfquery>
</cfloop>
```

Someone is afraid of joins

```
<cfquery name="OldLastLogins" datasource="#db#">  
    SELECT MAX(CreateDate) AS LastLoggedIn, UserID  
    FROM UserLoginHistory  
    HAVING LastLoggedIn < '2015-01-01'  
</cfquery>
```

```
<cfquery name="UpdateUsers" datasource="#db#">  
    UPDATE Users  
    SET Active = 0  
    WHERE UserID IN #ValueList(OldLastLogins, UserID)#  
</cfquery>
```

Joins for Fun and Profit - MSSQL

```
<cfquery name="UpdateUsers" datasource="#db#">
UPDATE U
SET Active = 0
FROM Users U
    INNER JOIN (
        SELECT MAX(CreateDate) AS LastLoggedIn, UserID
        FROM UserLoginHistory
        HAVING LastLoggedIn < '2015-01-01'
    ) OldUsers ON U.UserID = OldUsers.UserId
</cfquery>
```

Joins for Fun and Profit - MYSQL

```
<cfquery name="UpdateUsers" datasource="#db#">
  UPDATE Users
    INNER JOIN (
      SELECT MAX(CreateDate) AS LastLoggedIn, UserID
      FROM UserLoginHistory
      HAVING LastLoggedIn < '2015-01-01'
    ) OldUsers ON Users.UserID = OldUsers.UserId
  SET Active = 0
</cfquery>
```

Someone is afraid of queries

```
<cfscript>
    EntityToQuery(
        EntityLoad("Users",
            { Gender = arguments.genderID}
        )
    );
</cfscript>
```

Someone is afraid of proper SQL

```
<cfoutput query="GetParks"  
    startrow="#StartRow#"  
    maxrows="#MaxRows#" >  
    #ParkName#  
</cfoutput>
```

This is like a query in a loop

```
<cfquery name="BadQuery" datasource="#datasource#">  
SELECT employee_number, name  
FROM employees  
WHERE salary > (  
    SELECT AVG(salary)  
    FROM employees salary  
    WHERE salary.department = employees.department  
)  
</cfquery>
```

```
<cfquery name="AnotherBadQuery" datasource="#datasource#">  
SELECT employee_number, name, (  
    SELECT AVG(salary)  
    FROM employees salary  
    WHERE salary.department = employees.department  
)  
FROM employees  
</cfquery>
```


This is not like a query in a loop

```
<cfquery name="PeopleToFire" datasource="#db#">  
SELECT emp.employee_number, emp.name  
FROM emp  
    INNER JOIN  
        (  
            SELECT department,  
                AVG(salary) AS dept_avg  
            FROM employees  
            GROUP BY department  
        ) AS deptAvg  
    ON emp.department = deptAvg.department  
WHERE emp.salary > deptAvg.dept_avg  
</cfquery>
```

How much data are you returning?

19 rows x 8 Columns = 152 Cells

| EntryID | CreateDate | UpdateDate | ApplicationID | Severity | HostID | Error | Instance |
|---------|-----------------|-----------------|---------------|----------|--------|----------------------------------|----------|
| 5 | 6/16/2013 7:48 | {ts '2013-06-16 | 2 | 1 | 1 | The method loginExists was not f | 2 |
| 6 | 6/16/2013 7:48 | {ts '2013-06-16 | 2 | 1 | 1 | The method loginExists was not f | 3 |
| 8 | 6/16/2013 7:49 | {ts '2013-06-16 | 2 | 1 | 1 | The method loginExists was not f | 4 |
| 9 | 6/16/2013 7:50 | {ts '2013-06-16 | 2 | 1 | 1 | Element HIRINGMANAGERID is ur | 5 |
| 10 | 6/16/2013 7:50 | {ts '2013-06-16 | 2 | 1 | 1 | Element HIRINGMANAGERID is ur | 6 |
| 11 | 6/16/2013 7:50 | {ts '2013-06-16 | 2 | 1 | 1 | Variable TVENDORID is undefine | 7 |
| 12 | 6/16/2013 7:51 | {ts '2013-06-16 | 2 | 1 | 1 | The method loginExists was not f | 8 |
| 13 | 6/16/2013 7:51 | {ts '2013-06-16 | 2 | 1 | 1 | The method loginExists was not f | 9 |
| 14 | 6/16/2013 7:51 | {ts '2013-06-16 | 2 | 1 | 1 | The method loginExists was not f | 10 |
| 15 | 6/16/2013 7:51 | {ts '2013-06-16 | 2 | 1 | 1 | Element HIRINGMANAGERID is ur | 11 |
| 16 | 6/16/2013 7:51 | {ts '2013-06-16 | 2 | 1 | 1 | Element HIRINGMANAGERID is ur | 12 |
| 17 | 6/16/2013 7:53 | {ts '2013-06-16 | 2 | 1 | 1 | Variable TVENDORID is undefine | 13 |
| 29 | 6/16/2013 17:55 | Element FORU | 1 | 2 | 3 | Element FORUMVMSHIRINGMAN | 14 |
| 31 | 6/17/2013 16:07 | The method lo | 1 | 2 | 3 | The method loginExists was not f | 15 |
| 32 | 6/17/2013 16:09 | The method lo | 1 | 2 | 3 | The method loginExists was not f | 16 |
| 33 | 6/17/2013 16:11 | The method lo | 1 | 2 | 3 | The method loginExists was not f | 17 |
| 34 | 6/18/2013 0:05 | Element HIRIN | 1 | 2 | 3 | Element HIRINGMANAGERID is ur | 18 |
| 35 | 6/18/2013 8:11 | Element HIRIN | 1 | 2 | 3 | Element HIRINGMANAGERID is ur | 19 |
| 36 | 6/18/2013 14:55 | Variable TVEN | 1 | 2 | 3 | Variable TVENDORID is undefine | 20 |

Remember Join Criteria Zones

```
<cfquery name="JuneVacations" datasource="#db#">  
SELECT Department, EmployeeName, VacationDate  
FROM Department d  
    INNER JOIN Employee e  
        ON d.departmentID = e.departmentID  
        AND e.isContractor = 0  
    LEFT JOIN Vacations v  
        ON e.employeeID = v.employeeID  
        AND v.vacationDate BETWEEN '2015-06-  
01' AND '2015-06-30'  
</cfquery>
```

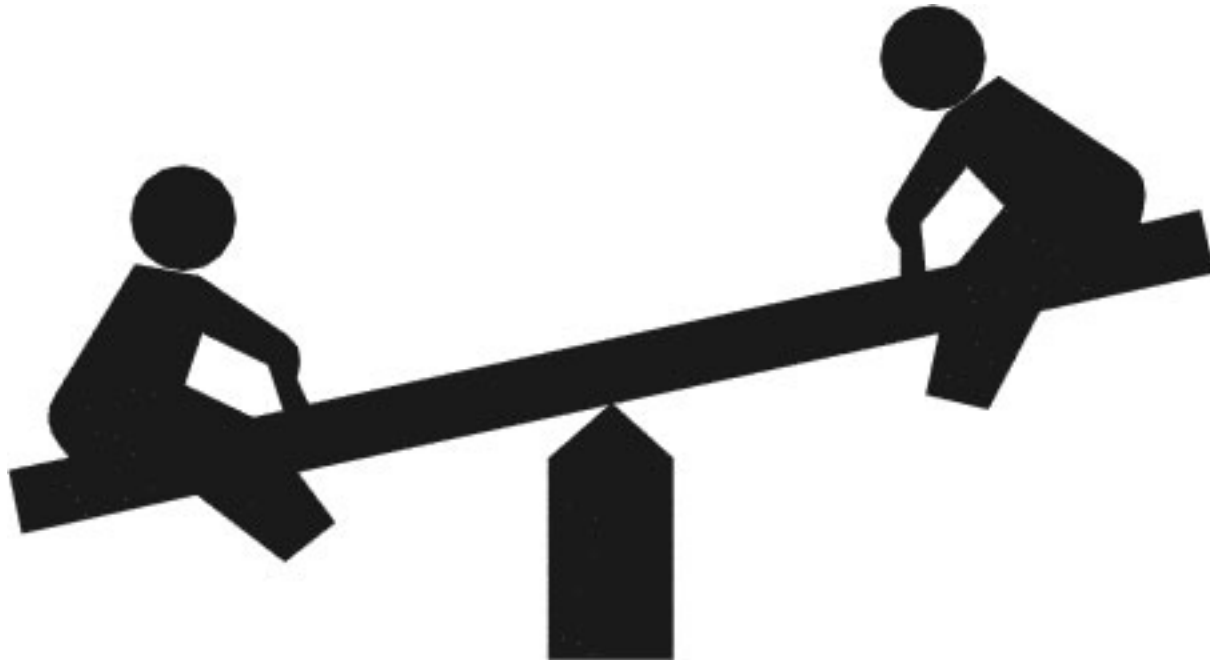
Indexes



The See Saw Tradeoff of Indexes

Index speeds up read operations at the expense of write operations.

Most web applications are read heavy. Is yours?



How Compound Indexes Work

```
CREATE INDEX IDX_CUSTOMER_LOCATION  
on CUSTOMER (City, Country)
```

Finds by City or City+Country
NOT by Country or Country+City

Wilson's Rule of Database Indexes



All database performance problems can be solved by creating indexes, save the problem of too many indexes

- Dan Wilson

Evil #3: Client Abuse



He's dead, Jim!

Either Chrome ran out of memory or the process for the web page was terminated for some other reason. To continue, reload or go to another page.

Reload

[Learn more](#)

[Send feedback to help improve Chrome](#)

Useful Front Side Events

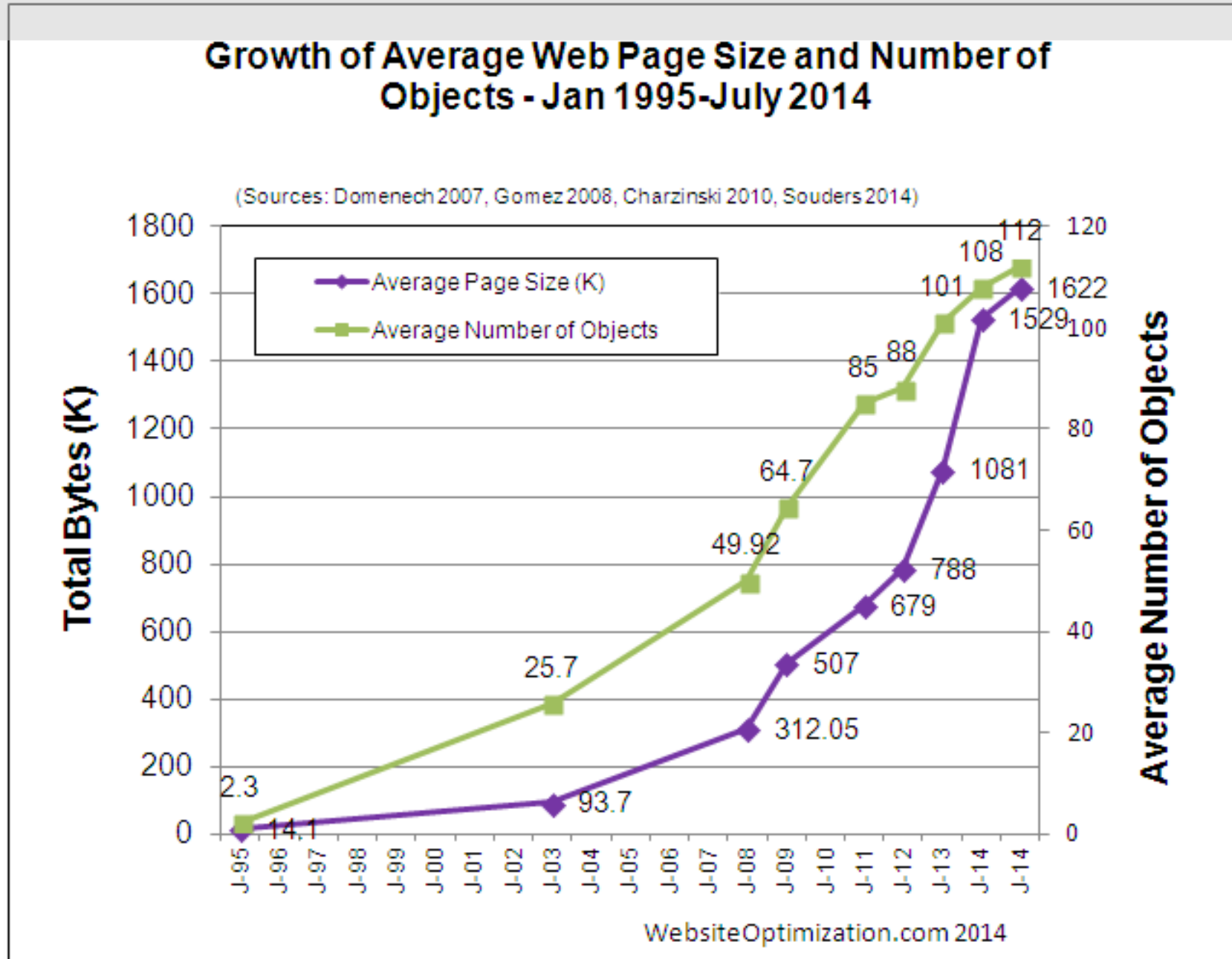
Time to First Byte

Time to Glass

Time to Functional

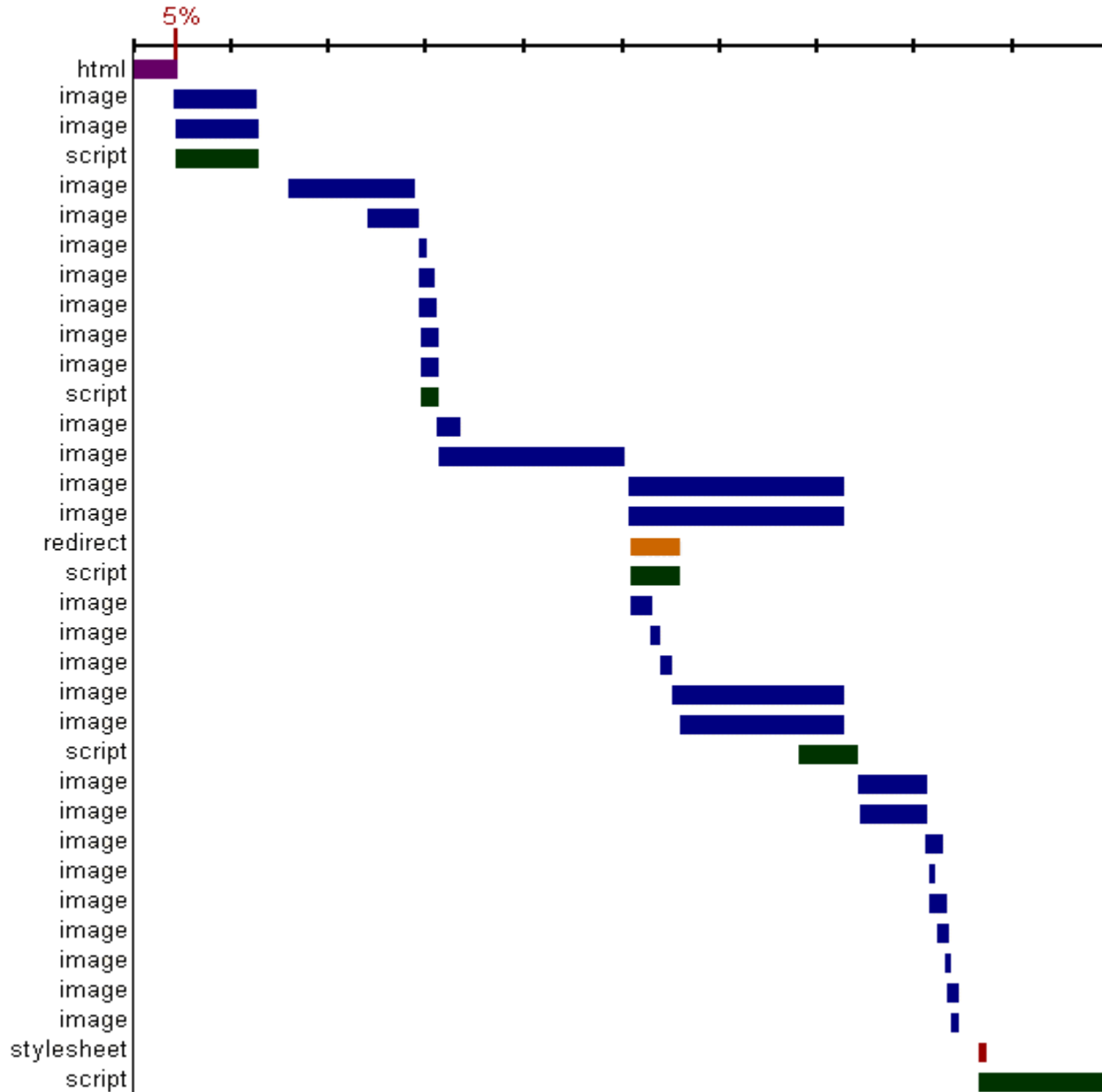
Time to Last Byte

If it's in an Excel Chart, it must be true





Blocking



No Repainting



Optimize Front Side

Page Speed Grade:

(0%)↓

F

YSlow Grade:

(73%)↓

C

Page load time: 0.85s

Total page size: 593KB

Total number of requests: 39

Breakdown

Page Speed

YSlow

Timeline

History

| RECOMMENDATION | GRADE | | TYPE | PRIORITY |
|--|---|---|---------|----------|
| Leverage browser caching | <div><div style="width: 0%;"></div></div> F (0) | ↓ | Server | High |
| Minify CSS | <div><div style="width: 0%;"></div></div> F (0) | ↓ | CSS | High |
| Optimize images | <div><div style="width: 0%;"></div></div> F (0) | ↓ | Images | High |
| Serve scaled images | <div><div style="width: 0%;"></div></div> F (0) | ↓ | Images | High |
| Combine images using CSS sprites | <div><div style="width: 0%;"></div></div> F (0) | ↓ | Images | Medium |
| Enable gzip compression | <div><div style="width: 20%;"></div></div> F (20) | ↓ | Server | High |
| Enable Keep-Alive | <div><div style="width: 52%;"></div></div> E (52) | ↓ | Server | High |
| Minify JavaScript | <div><div style="width: 66%;"></div></div> D (66) | ↓ | JS | High |
| Specify a Vary: Accept-Encoding header | <div><div style="width: 68%;"></div></div> D (68) | ↓ | Server | High |
| Minify HTML | <div><div style="width: 82%;"></div></div> B (82) | ↓ | Content | High |
| Specify image dimensions | <div><div style="width: 85%;"></div></div> B (85) | ↑ | Images | High |
| Avoid CSS @import | <div><div style="width: 85%;"></div></div> B (85) | ↓ | CSS | Medium |
| Prefer asynchronous resources | <div><div style="width: 85%;"></div></div> B (85) | ↓ | JS | Medium |

CSS and Javascript: Bad

```
<html>
  <head>
</head>
  <body>
    <h2>I am very slow</h2>
</body>
  <link rel="stylesheet" type="text/css"
        href="www/css/style.css"/>
  <script src="over/the/rainbow.js">
</script>
</html>
```

CSS and Javascript: Better

```
<html>  
  <head>  
    <link rel="stylesheet" type="text/css"  
      href="www/css/style.css" />  
    <script src="over/the/rainbow.js" >  
    </script>  
  </head>  
  <body>  
    <h2>I am not fast</h2>  
  </body>  
</html>
```

CSS and Javascript: Even Better

```
<html>
  <head>
    <link rel="stylesheet" type="text/css"
          href="www/css/style.css"/>
  </head>
  <body>
    <h2>I am fast</h2>
    <script src="over/the/rainbow.js">
    </script>
  </body>
</html>
```


Compress for the best experience

jQuery-v2.1.3

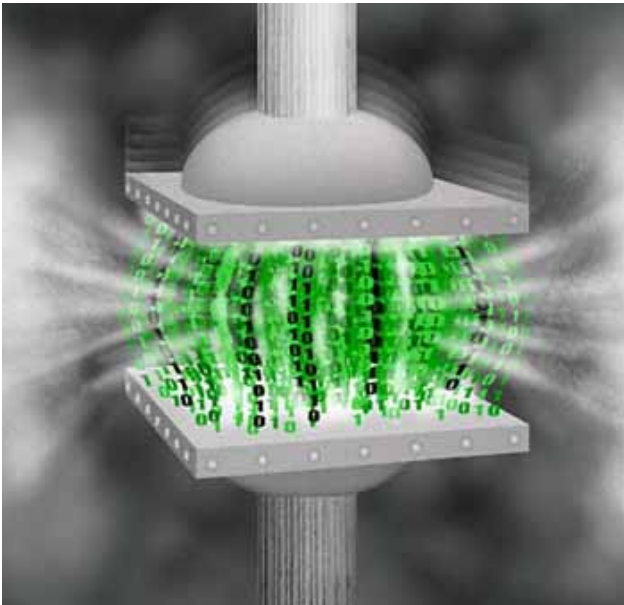
- 242KB - Uncompressed
- 32KB – Min/Gzipped
- Source file is 9205 lines of code

Javascript Compressors:

- Whitespace Removal
- Tokenization/Substitution

CSS Compressors

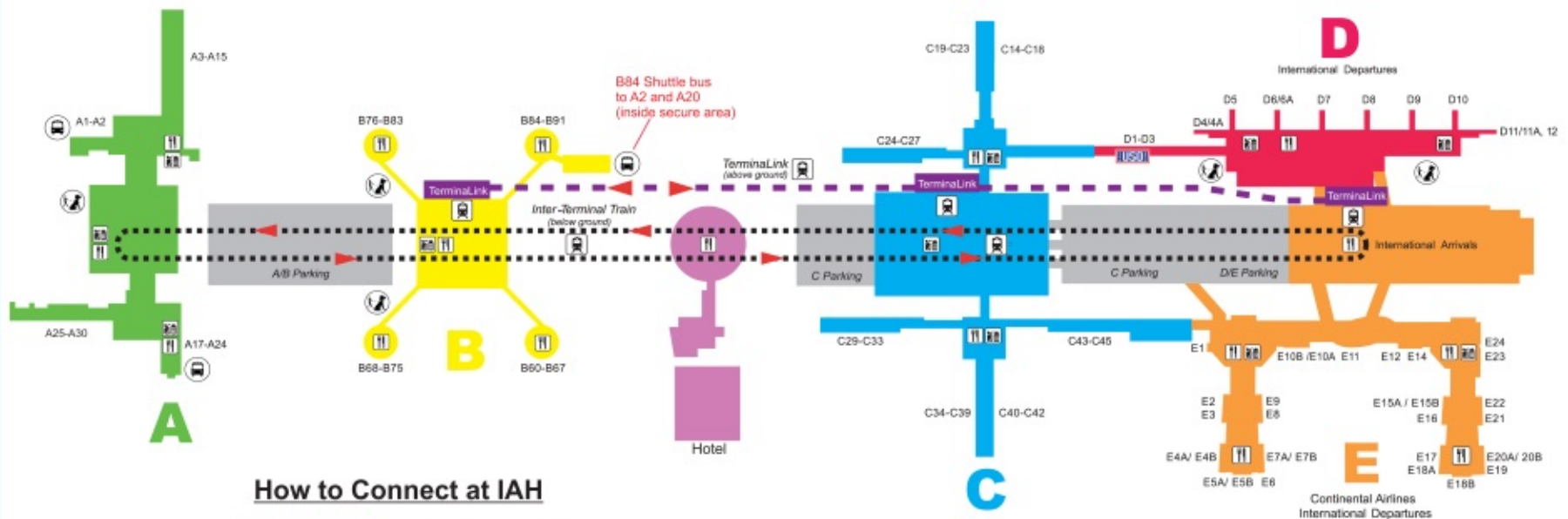
- Whitespace Removal




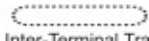

Where is he going with this slide?



George Bush Intercontinental Airport - IAH



How to Connect at IAH

-  **TerminalLink**
Connecting Terminals B,C,D/E
Above ground, for transportation between terminals while *inside* security
-  **Inter-Terminal Train**
Connecting Terminals A,B,Hotel,C,D/E
Below ground, for transportation between terminals while *outside* security
-  **Shuttle Bus**
Connecting Terminals A and B
For transportation between Terminals A and B while *inside* security

-  Gift and News
-  Restaurant
-  Train
-  Pet Relief Area



- TERMINAL A**
 - Air Canada
 - Alaska Airlines
 - American Airlines
 - Continental Connection
 - Delta Airlines
 - Frontier Airlines
 - Northwest Airlines
 - United Airlines
 - US Airways
- TERMINAL B**
 - Continental Express Jet
- TERMINAL C**
 - Continental Airlines
- TERMINAL D**
 - AeroMexico
 - Air France
 - British Airways
 - Emirates
 - KLM Royal Dutch Airlines
 - Lufthansa
 - Qatar Airways
 - Singapore Airlines
 - TACA
- TERMINAL E**
 - Continental Airlines

Thanks!

Dan Wilson

nodans.com

twitter.com/DanWilson

www.linkedin.com/in/profile/ofdanwilson



Appendix



ABANDON

ALL HOPE

YE

WHO ENTER

HERE

Enable Gzip for Apache

Put these lines in .htaccess or in your httpd.conf file

```
<IfModule mod_deflate.c>
# Compress HTML, CSS, JavaScript, Text, XML and fonts
AddOutputFilterByType DEFLATE application/javascript
AddOutputFilterByType DEFLATE application/rss+xml
AddOutputFilterByType DEFLATE application/vnd.ms-fontobject
AddOutputFilterByType DEFLATE application/x-font
AddOutputFilterByType DEFLATE application/x-font-opentype
AddOutputFilterByType DEFLATE application/x-font-otf
AddOutputFilterByType DEFLATE application/x-font-truetype
AddOutputFilterByType DEFLATE application/x-font-ttf
AddOutputFilterByType DEFLATE application/x-javascript
AddOutputFilterByType DEFLATE application/xhtml+xml
AddOutputFilterByType DEFLATE application/xml
AddOutputFilterByType DEFLATE font/opentype
AddOutputFilterByType DEFLATE font/otf
AddOutputFilterByType DEFLATE font/ttf
AddOutputFilterByType DEFLATE image/svg+xml
AddOutputFilterByType DEFLATE image/x-icon
AddOutputFilterByType DEFLATE text/css
AddOutputFilterByType DEFLATE text/html
AddOutputFilterByType DEFLATE text/javascript
AddOutputFilterByType DEFLATE text/plain
AddOutputFilterByType DEFLATE text/xml

# Remove browser bugs (only needed for really old browsers)
BrowserMatch ^Mozilla/4 gzip-only-text/html
BrowserMatch ^Mozilla/4\.0[678] no-gzip
BrowserMatch \bMSIE !no-gzip !gzip-only-text/html
Header append Vary User-Agent
</IfModule>
```

Enable Gzip for IIS

Follow directions here:

[https://technet.microsoft.com/en-us/library/cc771003\(WS.10\).aspx](https://technet.microsoft.com/en-us/library/cc771003(WS.10).aspx)

Front end speed metric tools

- Yslow: <http://yslow.org/>
- Google Page Speed:
<https://developers.google.com/speed/pagespeed/>
- <http://gtmetrix.com/>

SQL Performance Topics

- http://en.wikipedia.org/wiki/Correlated_subquery

Content Delivery Network Options

www.akamai.com

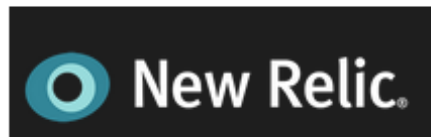


aws.amazon.com/cloudfront

Monitoring Options



ColdFusion Server Monitor
CFStat



New Relic – SaaS



Fusion Reactor Monitor



Nagios

Reverse Proxy Cache (Front Cache)

Reverse Proxy Cache

<http://varnish-cache.org>

<http://www.squid-cache.org>

<http://trafficserver.apache.org>



Helpful Caching Links

Tutorials on Caching

Varnish: <http://bit.ly/c1puD6>

Squid Video: <http://bit.ly/9iZu1Z>

Aaron West: <http://bit.ly/a4sYcr>

Rob Brooks-Bilson: <http://bit.ly/txser>

Terracotta Webinar: <http://www.terracotta.org/webcasts>

This presentation: <http://tinyurl.com/cacheme>

In-Memory Cache

<http://www.ehcache.org>

<http://terracotta.org/coldfusion>

<http://memcached.org>