Building Fast(er) Web Sites

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The Big Picture



We have to optimize all elements in the system

- Understand how all elements work
- Identify the major roadblocks
- Remove the biggest choke point
- Repeat ...

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Why Do We Care?

We are impatient and forgetful:

< 0.1sec Instantaneous response (Nielsen, 1993)

- 1 sec User's flow of thoughts is interrupted
- 2 sec Interference with short-term memory
- 10 sec User is no longer focused on dialog

Some other numbers:

- Users abandon non-working web page in 3-4 seconds
- Half a second delay caused 20% drop in traffic (Google, 2006)
- Ultimate goal: 100 msec load time

Sources:

http://csi.ufs.ac.za/resres/files/Nah.pdf

http://www.strangeloopnetworks.com/web-performance-optimization-hub/topics/psychology-and-human-factors/

http://www.webperformancetoday.com/category/human-factors/

http://www.websiteoptimization.com/speed/tweak/psychology-web-performance/

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Behind the Scenes – Tens of HTTP Requests

| Developer Tools - http://www.stanford.edu/ | | | | | | | Th | This is when the user | | | | | | | | 9 🛛 |
|---|-----|-----|----------|-------|----------|-------|---------------------|-----------------------|-------|-------|-------|-----------|--------|-------|-------|-------|
| Elements Resources Network Sources Timeline Profiles Audits Console | | | | | | | sees the web page ø | | | | | | | | | |
| Name | Met | Sta | Size | Time | Timeline | 675ms | 1.01s | 1.35s | 1.69s | 2.035 | 2.36s | 2.70s | 3.04s | 3.38s | 3.71s | 4.05s |
| www.stanford.edu | GET | 200 | 27.94KB | 970ms | | | | | | | | | | | | ^ |
| layout.css?v=3.0 | GET | 200 | 11.49KB | 392ms | | | | | | | | _ | | | | |
| homepage.css?v=3.1 | GET | 200 | 8.85KB | 415ms | | | | | | | | | i ne v | vep p | age | |
| css?family=Source+Sans+Pro:300,4 | GET | 200 | 1008B | 60ms | | | | | | | | | | dod | - | |
| css?family=Crimson+Text:400,600,700 | GET | 200 | 0B | 60ms | | | | | | | | | 5 100 | lueu | | |
| jquery.fancybox.css?v=2.0.5 | GET | 200 | 3.98KB | 203ms | | | | | | | | - | | | _ | |
| jquery.tools.126.min.js | GET | 200 | 100.34KB | 1.17s | | | | | | | | | | | | |
| jquery.fancybox.pack.js?v=2.0.5 | GET | 200 | 16.93KB | 595ms | | | | | | | | | | | | |
| custom.js?v=2.1.1 | GET | 200 | 5.81KB | 434ms | | | | | | | | | | | | |
| ga.js | GET | 200 | 14.96KB | 464ms | | | | | | | | | | | | |
| 🔤 gateways.jpg | GET | 200 | 11.65KB | 1.12s | | | | | | | | | | | | |
| nudge-icon-arrow-up.png | GET | 200 | (from ca | 50ms | | | | | (| | | | | | | |
| nudge-icon-arrow-lr.png | GET | 200 | (from ca | 50ms | | | | | (| | | | | | | E |
| nudge-icon-arrow-down.png | GET | 200 | (from ca | 49ms | | | | | (| | | | | | | |
| nudge-icon-return.png | GET | 200 | (from ca | 49ms | | | | | (| | | | | | | |
| 2013-01-05_ht-fans_final.jpg | GET | 200 | 129.37KB | 1.48s | | | | | | | | | | | | |
| 💿 seal.png | GET | 200 | 13.27KB | 724ms | | | | | | | láms. | | | | | |
| 2012-10-26_ht-innovation.jpg | GET | 200 | 129.92KB | 1.51s | | | | | | | | \langle | | | | |
| 🛥 2013-01-02_2012-12-21_ht-Rhodes.jpg | GET | 200 | 41.29KB | 898ms | | | | | | | ints | | | | | |
| » raquo.gif | GET | 200 | 420B | 1.09s | | | | | | | | | | | | |
| 💵 2013-01-18_king_hp.jpg | GET | 200 | 11.91KB | 925ms | | | | | | | | 0 | | | | |
| 📾 rss.png | GET | 200 | 842B | 719ms | | | | | | | | | | | | |
| 🛤 2013-01-18_ban1_hp.jpg | GET | 200 | 15.39KB | 921ms | | | | | | | | 0 | | | | |
| ⊯ tedx.jpg | GET | 200 | 22.40KB | 1.30s | | | | | | | | | 6 | | | |
| 🔤 stanfordlive.jpg | GET | 200 | 20.02KB | 1.33s | | | | | | | | | | | | |
| 📟 ecorner.jpg | GET | 200 | 26.27KB | 1.47s | | | | | | | | | | | | |
| 페 iriss.jpg | GET | 200 | 24.61KB | 1.34s | | | | | | | | | | | | |

What's going on?



The Problem – Details

| Name | Meţ | <u>}</u> | Timeline | 675ms | 1.01s | 1.35s | | | |
|-------------------------------------|---------------------------|---|------------------|-------------|-------|----------|--|--|--|
| www.stanford.edu | GEŞ | 2970ms | 391ms | | | €++579ms | | | |
| ayout.css?v=3.0 | GE | {392 | | | | | | | |
| homepage.css?v=3.1 | | GE 2415 | | | | | | | |
| css?family=Source+Sans+Pro:300,4 | | | onnecting 18 | 92 ms | | | | | |
| css?family=Crimson+Text:400,600,700 | | ξ 60 🔐 | aitina | 0 107 ms | | | | | |
| jquery.fancybox.css?v=2.0.5 | | 203 R | anny aceiring | 1071115 | | 579ms | | | |
| jquery.tools.126.min.js | | ۲.1.1 · · · · · · · · · · · · · · · · · · | | | | or on b | | | |
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- Most web pages have tens (or more) elements
- HTTP request sent for each element
- Some elements might block other elements (CSS, SCRIPT)

Major choke points:

- Slow web servers
- Transmission delays
- Overloaded web browsers (mobile)

Usually we have to optimize every choke point

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Focal Points

Markup & Content

- Make fewer HTTP requests
- Optimize CSS and scripts
- Simplify CSS selectors
- Use sprites
- Use ETags properly
- Minimize cookies
- Split initial payload

Browser

- Use progressive enhancement
- Load scripts without blocking
- Use AJAX and deferred scripts

Network

- Use caching and compression
- Flushing and chunking
- Use Content Delivery Network
- Reduce DNS lookups
- Avoid redirects
- Domain sharding

Server

- Load balancing
- Back-end server scripts
- Message queues
- Optimized databases

Questions?

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Send them to ip@ipSpace.net or @ioshints

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