ARCHITECTING RESILIENT FRONT-ENDS
The page cannot be displayed

There is a problem with the page you are trying to reach and it cannot be displayed.

Please try the following:

- Open the home page, and then look for links to the information you want.
- Click the refresh button, or try again later.
- Click Search to look for information on the Internet.
- You can also see a list of related sites.

HTTP 500 - Internal server error
Internet Explorer
Something is technically wrong.

Thanks for noticing—we're going to fix it up and have things back to normal soon.
waiting for fonts.com
Unreliable network
Progressive enhancement

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

- Content
- Enhancement
- Leftovers
THREE STAGES

- Content
- Enhancement
- Leftovers
THREE STAGES

- Content
- Enhancement
- Leftovers
THREE STAGES

- Content
- Enhancement
- Leftovers
Time to screen

- Key performance metric
- Aiming for 1s on mobile
- Understand *the network*
- Understand *the browser*
Time to screen: The network

DNS lookup → TCP connect → HTTP request → Server time → HTTP resp
Time to screen: **The network**

- DNS lookup → TCP connect → HTTP request → Server time → HTTP resp
Time to screen: The network

DNS lookup → TCP connect → HTTP request → Server time → HTTP resp
Time to screen: The network

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

SSL Handshake
Time to screen: The network

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

HTTP Redirect

SSL Handshake
Time to screen: **The network**

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

**SSL Handshake**

**HTTP Redirect**
Time to screen: The network

- DNS lookup
- TCP connect
- HTTP request
- Server time
- HTTP resp
- HTTP Redirect
- SSL Handshake
Time to screen: The network

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

HTTP Redirect

SSL Handshake
Time to screen: The network

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

HTTP Redirect

SSL Handshake
Time to screen: **The network**

- Eliminate redirects
- Flush the document early
- Prefetch DNS
- But mostly, eliminate redirects
Time to screen: **The browser**

- Single threaded event loop

1. Construct DOM tree from HTML
2. Construct render tree from DOM tree and stylesheets
3. Layout & paint
Time to screen: **Start render**

1. HTML parser → DOM tree
2. DOM tree → Render tree
3. Render tree → Layout
4. Layout → Paint
Time to screen: **Start render**
Time to screen: **Start render**

- HTML parser
- DOM tree
- Render tree
- Layout
- Paint
Time to screen: **Start render**

- HTML parser
- DOM tree
- Render tree
- Layout
- Paint
Blocking: remote script

```html
<script src="app.js"></script>
```
Blocking: inline script waiting on remote CSS

```html
<style rel="stylesheet" href="app.css" />

<script>
  var rules = window.styleSheets[0].cssRules;
</script>
```
Blocking: remote script (solution 1)

```html
</div>
<script src="app.js"></script>
</body>
</html>
```
<script>
var script = document.createElement('script');
script.src = "app.js";
document.head.appendChild(script);
</script>
Blocking: remote script (solution 2)

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

HIDDEN FROM PRE-PARSER!
Blocking: remote script (solution 3)

```html
<script src="app.js" async></script>
```
Time to screen: **Start render**

- HTML parser
- DOM tree
- Render tree
- Layout
- Paint
Time to screen: **Start render**

- HTML parser → DOM tree → Render tree → Layout → Paint
Time to screen: **Start render**

- **HTML parser** → **DOM tree**
- **DOM tree** → **Render tree** → **Layout** → **Paint**
Time to screen: **Start render**

Diagram:
- HTML parser → DOM tree → Render tree → Layout → Paint
Blocking: fetching stylesheets

```html
<style rel="stylesheet" href="app.css" />
```
Blocking: fetching stylesheets (solution)

```html
<head>
  <style>
    // Core styles in the head of the document.
    body {
      background: grey;
      color: #3A2FDE;
    }
  </style>
</head>
<body>
</body>
```
Blocking: **critical CSS generators**

- https://github.com/pocketjoso/penthouse
- http://jonassebastianohlsson.com/criticalpathcssgenerator/
- https://github.com/filamentgroup/criticalcss
Recap: **What blocks render?**

- Remote scripts that need to be executed synchronously
- Inline script waiting on stylesheet fetch
- Stylesheet fetch for relevant media type/query
Recap: **Fault isolation**

- ...or swimlaning
- Avoid synchronous dependencies
- *Uptime is not binary*
Blocking web fonts
Blocking web fonts
Blocking web fonts
Blocking web fonts

HTML → CSS → START RENDER → TEXT RENDER
Blocking web fonts
## Blocking web fonts

<table>
<thead>
<tr>
<th>FALLBACK</th>
<th>BLOCKING</th>
<th>BLOCKING + TIMEOUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet Explorer</td>
<td>Safari Mobile Safari Chrome Opera (Blink)</td>
<td>Firefox Opera (Presto)</td>
</tr>
</tbody>
</table>
Web font loader

- Provide control over font loading
- Remove fonts from the critical path
- Make cross-browser behaviour consistent
Web font loader

```html
<style rel="stylesheet" href="myfonts.css" />
```
Web font loader

```html
<style rel="stylesheet" href="myfonts.css"/>
```
Web font loader

```html
<style rel="stylesheet" href="myfonts.css"/>

var WebFontConfig = {
    custom: {
        families: ['Clarendon', 'Clarendon Bold'],
        urls: ['/myfonts.css']
    }
};

<script src="//ajax.googleapis.com/webfonts.js" async"></script>
```
Web font loader

```html
<body class="clarendon-loading">

<body class="clarendon-loaded">
```
Web font loader

```html
<body class="clarendon-loading">

<body class="clarendon-loaded">

h1 {
    font-family: georgia, serif;
}
.clarendon-loaded h1 {
    font-family: Clarendon, georgia, serif;
}
```
CSS Font Loading Module

document.fonts.load('Clarendon').then(function () {
    document.documentElement.className += 'clarendon-loaded';
});

h1 {
    font-family: georgia, serif;
}
.clarendon-loaded h1 {
    font-family: Clarendon, georgia, serif;
}
Median of nine test runs

<table>
<thead>
<tr>
<th>Performance Results (Median Run)</th>
<th>First View (Run 7)</th>
<th>Repeat View (Run 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load Time</td>
<td>3.675s</td>
<td>2.437s</td>
</tr>
<tr>
<td>First Byte</td>
<td>0.000s</td>
<td>0.000s</td>
</tr>
<tr>
<td>Start Render</td>
<td>0.762s</td>
<td>10320</td>
</tr>
<tr>
<td>Speed Index</td>
<td>2680</td>
<td>2</td>
</tr>
</tbody>
</table>
Median of nine test runs
iPhone 4, iOS 5.1

http://www.webpagetest.org/result/130908_K2_796/
Median of nine test runs
iPhone 4, iOS 5.1
3G (1.6Mps, 300ms RTT)

http://www.webpagetest.org/result/130908_K2_796/
Thank-you!

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