MEASURING PERFORMANCE
# Measurement Systems at MSN

## Synthetic
- Performance Lab
- 3<sup>rd</sup> Party Agents (Keynote)

## Real User Measurement (RUM)
- In-page & Server-side instrumentation
- Browser Plug-in (toolbar)

<table>
<thead>
<tr>
<th></th>
<th>Performance Lab</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt; Party Agents</th>
<th>In-Page</th>
<th>Browser Plug-in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Cycle</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Real-User “Truth”</td>
<td>★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Rendering &amp; Resp.</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Geo-Distributed</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
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<tr>
<td>Infrastructure</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Competitive</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
</tr>
</tbody>
</table>
Synthetic Testing
ACTIVE TESTING

• Consistent results
  o Good for detecting and diagnosing issues that are 100% repeatable and on pages you are monitoring
• Lots of detail
• Availability monitoring
• Not representative of actual end-user performance
  • Usually tested from data centers
  • Sometimes co-located with CDN provider equipment
BANDWIDTH/LATENCY IMPACT

Latency per Bandwidth

- Fixed 60ms RTT

Page Load Time As RTT Decreases

- Fixed 5Mbps Bandwidth

www.belshe.com/2010/05/24/more-bandwidth-doesnt-matter-much/
Chart 9: Average peak period latency in milliseconds, by technology

- WebPageTest DSL
- WebPageTest Cable
- WebPageTest FIOS
- Backbone
DSL – Back-End: 17%

Backbone – Back-End: 52%
NETWORK LINK CONDITIONER

OSX Lion + XCode

Cable, DSL, 3G, Edge, WiFi and Custom

FACEBOOK ATC

http://facebook.github.io/augmented-traffic-control/
SYNTHETIC BROWSERS

- Know HOW your active testing is done
  - Some only test the base page
  - Synthetic browsers usually not reflective of real browser
  - Real browser testing
  - Connectivity (backbone, last-mile)

- www.engadget.com
  - Synthetic Browser: 447 requests
  - IE 8: 241 requests
MOBILE DEVICES VS EMULATION

Emulated MotoG – 26s

MotoG – 47s
GAMING SYNTHETIC TESTING

Test Machine

CDN Server

Use last-mile agents (or traffic shaping)

Web Server
Real User Measurement (RUM)
REAL USER MEASUREMENT

• Full coverage on all pages visited by users
• Real performance information for end-user experience
• No availability monitoring
• No competitive reference
• Limited detail
  o … but getting better
window.performance.timing

IE 9+/Edge
Chrome
Firefox
Opera
Safari 8+
Android 4+
Safari iOS 9+
UC Browser

www.w3.org/TR/navigation-timing/
window.performance.getEntriesByType("resource");

Timing for every network-loaded resource

www.w3.org/TR/resource-timing/
performance.mark()
performance.measure()
Site Speed Overview

Overview

339,926 of pageviews sent page load sample

Site Speed

<table>
<thead>
<tr>
<th>Browser</th>
<th>Avg. Page Load Time (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OktogoAutotestBot</td>
<td>0.96</td>
</tr>
<tr>
<td>Mozilla</td>
<td>1.06</td>
</tr>
<tr>
<td>EXCLUDEMEPLEASE</td>
<td>1.84</td>
</tr>
</tbody>
</table>

Avg. Page Load Time (sec): 3.60
Avg. Redirection Time (sec): 0.10
Avg. Domain Lookup Time (sec): 0.03
Avg. Server Connection Time (sec): 0.06
Avg. Server Response Time (sec): 0.42
Avg. Page Download Time (sec): 0.27
Application Performance Measurement (APM)
APM (Back-End)
ACCESS LOGS FTW!

• Tons of “free” data:
  o Timestamp
  o Region (IP Lookup)
  o ISP (IP Lookup)
  o OS
  o Browser
  o Mobile Device
  o Page (Referer)

• Add metrics as URL query params
ROLL YOUR OWN REPORTING

Logster: https://github.com/etsy/logster
StatsD: https://github.com/etsy/statsd
Graphite: http://graphite.wikidot.com/

codeascraft.com/2011/02/15/measure-anything-measure-everything/
Measuring the Visual Experience

“SpeedIndex”
WHEN IS “DONE”

Twitter onLoad (2.4s)

Twitter end of activity (8.2s)
START RENDER

Identical
LOAD TIME

A

WEBPAGETEST

Test a website’s performance

Enter a Website URL

START TEST

B

WEBPAGETEST

Test a website’s performance

Enter a Website URL

START TEST

12.0

Identical
LAST VISUAL CHANGE

12.0  Identical
VISUAL COMPLETENESS
Speed Index = 1219

Speed Index = 9022

Speed Index = \int_0^{\text{end}} \left( 1 - \frac{\text{VC}}{100} \right) \, dt

\text{end} = \text{end time in milliseconds}
\text{VC} = \% \text{ visually complete}

The user experience of A was 7.4 times faster than B
Web Page Performance Test for www.webpagetest.org/?bare=1&color=FFFFFF&slow=bottom&delay=9.5

From: Dulles, VA - IE8 - DSL
Fri Apr 13 2012 17:07:33 GMT-0400 (Eastern Daylight Time)

Performance Results (Median Run)

<table>
<thead>
<tr>
<th>Speed Index</th>
<th>Document Complete</th>
<th>Fully Loaded</th>
</tr>
</thead>
<tbody>
<tr>
<td>1218</td>
<td>11.591s 24 289 KB</td>
<td>12.204s 29 317 KB</td>
</tr>
</tbody>
</table>

Test Results

Run 1:

Waterfall

Screen Shot

Video
<table>
<thead>
<tr>
<th></th>
<th>Amazon</th>
<th>Twitter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Speed Index</strong></td>
<td>1501</td>
<td>6014 (+300%)</td>
</tr>
<tr>
<td><strong>onload</strong></td>
<td>2.4</td>
<td>2.4</td>
</tr>
<tr>
<td><strong>Fully Loaded</strong></td>
<td>6.4</td>
<td>8.2 (+28%)</td>
</tr>
</tbody>
</table>
I DON'T ALWAYS DO DEMOS

BUT WHEN I DO, I DO THEM LIVE!
Divining Waterfalls
POOR CACHING

First View

Repeat View
SLOW BACK-END
RESOURCE ERRORS
SLOW, BLOCKING RESOURCE
BANDWIDTH CONSTRAINED
SLOW DOM CONTENT LOADED HANDLER
LOTS OF REQUESTS
JAVASCRIPT EXECUTION CONSTRAINED
THANK YOU!

Tim Kadlec (@tkadlec) & Pat Meenan (@patmeenan)
June 20-21, 2016 at Velocity Conference (#velocityconf)

Icons courtesy of The Noun Project