Dissecting Web Latency in Ghana

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Motivation

- Increasing Internet users from 5.4% to 14.1% from 2009 to 2011
- Page loading time so slow
Methodology

- Firefox + Firebug + Selenium to get HAR files
- Alexa Top 1000
- Linux dig to examine DNS request for further detail
- Vantage points: NYC, Bremen (Germany), Abu Dhabi (UAE), Accra, Kumawu and Hohoe (Ghana)
Main Factors

- Blocking
- DNS Lookup
- Connecting
- Sending
- Waiting
- Receiving
Main Factors

Figure 2: Web page requests (Alexa’s top global 2012)
Main Factors

- DNS Lookup: 37-40% latency
- HTTP redirects: 80% first request redirection
- HTTP blocking: 10% latency
- TLS/SSL: 15% objects requires, up to 9 RT
Speedup: DNS Caching

(a) Alexa’s top *global* websites

(b) Alexa’s top *local* websites
DNS Caching

Figure 2: Web page requests (Alexa’s top global 2012)

Figure 6: Web page requests (Alexa’s top global 2014)
DNS Server Placement

Figure 8: Per location/hierarchy delay CDFs
Caching Redirects

- Enhance the overall page load time by about 20%

Table 2: Redirects delay to total page load time (2012)

<table>
<thead>
<tr>
<th>Location</th>
<th>Websites with Redirects</th>
<th>Average Ratio</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accra cellular</td>
<td>79%</td>
<td>25%</td>
<td>15%</td>
</tr>
<tr>
<td>Accra Wifi</td>
<td>78%</td>
<td>20%</td>
<td>16%</td>
</tr>
<tr>
<td>Hohoe cellular</td>
<td>81%</td>
<td>21%</td>
<td>17%</td>
</tr>
</tbody>
</table>
SPDY

• SPDY is an application layer protocol proposed to enhance the webpage loading time

• It also helps TLS/SSL

Figure 9: Per location SPDY vs HTTP in 2013