Chrome’s view on Push

IETF 102, httpbis
Brad Lassey
Prevalence of Push

- 0.04% of HTTP/2 sessions have a push frame
- The average amount of pushed data in a session is 32kb
Push success

- 63.51% of pushed streams are accepted
- 22.35% time out
- 13.39% are duplicate URLs
- The remaining 0.75% fail for various other reasons
A/B/C experiment

- Experiment in dev, canary and beta
- Disables Push
  - sends a SETTINGS_ENABLE_PUSH but still processes Push Frames
- Compares to two control groups
  - No changes
  - Unrelated settings change (SETTINGS_MAX_CONCURRENT_STREAMS) in dev and canary
- Dev/Canary data was too noisy to be useful
A/B Experiment results (Beta)

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Control Δ</th>
<th>PushDisabled Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td>25th</td>
<td>-0.02%</td>
<td>-0.13%</td>
</tr>
<tr>
<td>50th</td>
<td>-0.06%</td>
<td>-0.16%</td>
</tr>
<tr>
<td>75th</td>
<td></td>
<td></td>
</tr>
<tr>
<td>95th</td>
<td></td>
<td></td>
</tr>
<tr>
<td>99th</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A/B Experiment, Filtered by Domains that Push

From http archive: https://bigquery.cloud.google.com/savedquery/1058239268713:ec65e4a42dbd486fb091718584d73efd
Maximum usefulness of Push

\[ S_{mp} = \min(BW_i \times RTT, IW) - S_{mr} \]

- \( S_{mp} \): Maximum size of pushed resources
- \( BW_i \): Initial throughput
- \( RTT \): Round Trip Time
- \( S_{mr} \): Size of main resource
- \( IW \): Initial connection window
Some Examples

<table>
<thead>
<tr>
<th>Country</th>
<th>Mean Min RTT (ms)$^1$</th>
<th>Mean Connection Speed (Mb/s)$^2$</th>
<th>Max 1RT Data (kb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Korea</td>
<td>38</td>
<td>28.6</td>
<td>135.85</td>
</tr>
<tr>
<td>US</td>
<td>50</td>
<td>18.7</td>
<td>116.87</td>
</tr>
<tr>
<td>India</td>
<td>188</td>
<td>4.9</td>
<td>115.15</td>
</tr>
</tbody>
</table>

- Despite different network conditions, max 1RT data is similar
- But…. Initial CWND caps this
- IW10($\text{rfc6928}$) equates to ~14600 bytes
  - Need ~IW100 for RTT and speed to factor in (Hi Fastly$^3$ folks!)

---


If we destroyed push, would anyone really notice?

Currently only 0.04% of sessions

Seems to be a footgun

Better things to work on:

- Connection Pooling
- Prioritization
- DoH
- QUIC
- Alt svc
- ????