Context-Aware Encoding & Delivery in the Web

ICWE 2020

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Business Impact of Page Speed

Google: 500ms slower loads decreased traffic by 20%
Walmart: 100ms faster website increases revenue by 1%
Amazon: 100ms slower website lowers conversion rate by 1%
Zalando: 100ms faster website increase revenue per session by 0.7%
Otto: 42% decrease in time to FCP raises session length by 25%
Pinterest: 40% load acceleration increases SEO traffic by 15%

Felix Gessert: Mobile Site Speed and the Impact on E-Commerce, CodeTalks 2019
So Far On Compression...

- Deflate
- Delta Encoding
- GZip
- SDCH
- Brotli
GZIP/Deflate – The De Facto Standard in the Web

This example text is used to show how LZ77 finds repeating elements in the example text [70;14]

<table>
<thead>
<tr>
<th>Encoding</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>200 kB</td>
</tr>
<tr>
<td>Gzip</td>
<td>~36 kB</td>
</tr>
</tbody>
</table>

~81.9% saved data

Delta Encoding – Updating Stale Content

<table>
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</tr>
<tr>
<td>Delta Encoding</td>
<td>~34 kB</td>
</tr>
</tbody>
</table>

83% saved data

SDCH – Reusing Dictionaries

<table>
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<tr>
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<td>~36 kB</td>
</tr>
<tr>
<td>Delta Encoding</td>
<td>~34 kB</td>
</tr>
<tr>
<td>SDCH</td>
<td>~7 kB</td>
</tr>
</tbody>
</table>

Up to 81% better results (compared to gzip)

O. Shapira: Shared Dictionary Compression for HTTP at LinkedIn, 2015
Brotli – SDCH for Everyone

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<td>~34 kB</td>
</tr>
<tr>
<td>SDCH</td>
<td>~7 kB</td>
</tr>
<tr>
<td>Brotli</td>
<td>~29 kB</td>
</tr>
</tbody>
</table>

~85.6% saved data

So Far On Compression... Theory vs. Reality

![Diagram showing compression methods and their efficiency.]

- Deflate
- Delta Encoding
- GZip (~80%)
- SDCH
- Brotli (~20%)

What Went Wrong?

- Efficient Transmission
- Partial Cache Usage
- New Possibilities
- Share Metadata
- Efficient Cache Usage
- Cutting-Edge Technology
- Predict client needs
- Dependencies
- State Synchronization
The Main Problem

Dependencies on non-standardized features
Speed Kit – Enabling End-To-End Optimizations

Standard Through Service Worker

Website + Speed Kit JS

Fast Requests

Speed Kit Cloud

Real-Time Sync

Your Backend

3rd Party Services

Wolfram Wingerath, Felix Gessert, Erik Witt, Hannes Kuhlmann, Florian Bücklers, Benjamin Wollmer, Norbert Ritter:
Speed Kit: A Polyglot & GDPR-Compliant Approach For Caching Personalized Content, ICDE 2020
Goals

Gold Standard
Understand potential gains of different encodings
1. Evaluate Delta Encoding

End-to-End Approach
Control over the whole architecture from client to server
2. Implement Prototype on Top of Speed Kit

Cross-Entity Scope
Find closed delta to an arbitrary related file
3. The First Implementation

Context-Aware Optimizations
Autonomously choose protocol to a given runtime context
4. Start with Brotli and Cross-Entity Encoding
Thanks!

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