Web Caching: Moving Away From a Binary Decision

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The Business Impact of Site Speed

Better

Faster

Worse

Slower

Forrester

GQ

Pinterest

OTO

Walmart

zalando

Aberdeen Group

amazon

radware

Google

Imperial College London

Akamai
Speed Kit

Website + Speed Kit JS

Fast Requests

Speed Kit Cloud

Real-Time Sync

3rd Party Services

Your Backend

https://www.baqend.com/how-it-works
A Binary Decision...

Object in Cache?

- Yes: Use Cache
- No: Load from Server
The Critical Rendering Path

```html
<!doctype html>
<title>Code Talks</title>
<link href=all.css rel=stylesheet />
<script src=app.js ></script>
<div>
  <h1>Web Performance</h1>
</div>

```javascript

elem.style.width = "50px";
document.write("Some Text!");

```
Object in Cache?

Yes
- Use Cache

No
- Parts in Cache?
  - Yes
    - Load \( \Delta \) from Server
  - No
    - Load Object
Potential Partial Caches
Potential benefits of delta encoding and data compression for HTTP

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Abstract

Caching in the World Wide Web currently follows a naive model, which assumes that resources are referenced many times between changes. The model also provides no way to update a cache entry if a resource does change, except by transferring the resource's entire new value. Several previous papers have proposed updating cache entries by transferring only the differences, or “delta,” between the cached entry and the current value.

In this paper, we make use of dynamic traces of the full contents of HTTP messages to quantify the potential benefits of delta-encoded responses. We show that delta encoding can provide remarkable improvements in response size and response delay for an important subset of HTTP content types. We also show the added benefit of data compression, and that the combination of delta encoding and data compression yields the best results.

retrieval. Upon receiving a conditional request, the server may either reply with a full response, or, if the resource has not changed, it may send an abbreviated reply, indicating that the client’s cache entry is still valid. HTTP/1.0 also includes a means for the server to indicate, via an “expires” timestamp, that a response will be valid until that time; if so, a client may use a cached copy of the response until that time, without first validating it using a conditional retrieval.

The proposed HTTP/1.1 specification [6] adds many new features to improve cache coherency and performance. However, it preserves the all-or-none model for responses to conditional requests: either the server indicates that the resource value has not changed at all, or it must transmit the entire current value.

Common sense suggests (and traces confirm), however, that even when a Web resource does change, the new instance is often substantially similar to the old one. If the difference (or delta) between the two instances could be sent to the client
CAMPUS-LEBEN

Was macht die Uni Hamburg aus?


Zum Studierendebakel gehört aber auch soziales oder politisches Engagement. Es gibt unterschiedliche Gruppen, in denen man sich engagieren und etwas Positives bewirken kann.

FORSCHUNGSPROFIL

Die Universität Hamburg ist die größte und vielseitigste Forschungseinrichtung Niedersachsens. Ihr Forschungsprofil umfasst exzellente Grundlagenforschung genauso wie anwendungsnahe Forschungs- und Transferprojekte. Die Forschung wird stark geprägt durch fünf Forschungsressorts.


In der Nachwuchsfinanzierung qualifizieren wir junge Wissenschaftler/innen in DFG-Graduiertenkollegs, zahlreichen Nachwuchsgruppen und durch Doktorandensprogramme in Kooperation u.a. mit außerauslandischen Forschungseinrichtungen.
Shared Compression
A Proposal for Shared Dictionary Compression over HTTP

Authors: Jon Butler, Wei-Hsin Lee, Bryan McQuade, Kenneth Mixter
Google, Inc.
Last Update: September 8, 2008

Abstract

This paper proposes an HTTP/1.1-compatible extension that supports inter-response data compression by means of a reference dictionary shared between user agent and server.
SDCH At LinkedIn

- 1282 CSS Files
- 6225 JS Files
- 81% better compression
- 400 µs encoding

Shared Dictionary Compression for HTTP at LinkedIn.

Omer Shapira  March 4, 2015

HTTP protocol has been the glue that holds together the Web, mobile apps and servers. In the world of constant innovation, HTTP/1.1 appeared to be the only safe island of consistency until the announcement of HTTP/2. Yet, even with HTTP being as robust and efficient as it is, there is still room for improvement, and this is what this post is about. LinkedIn’s Traffic Infrastructure team is making LinkedIn faster by exploring ways in which HTTP can be improved.

Traditionally, HTTP communications are compressed using either gzip or deflate algorithms. Of the two, gzip strikes the balance of being aggressive enough to reach a good compression ratio, while not having ridiculous CPU requirements. Algorithms such as Burrows-Wheeler transform (popularized through bzip2) offer higher degrees of compression, but have higher CPU requirements. Until recently it was generally accepted that gzip is the best way to compress HTTP traffic. Yet there is an alternative to using computationally intense compression algorithms to transfer less data over the wires - this alternative is to start with sending less data in the first place.

Enter SDCH

SDCH (pronounced “Sandwich”) is a an HTTP/1.1-compatible extension, which reduces the required bandwidth through the use of a dictionary shared between the

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13/25
Intent to Unship: SDCH

42 Einträge von 17 Autoren

Ryan Sleevi

Andere Empfänger: rds...@chromium.org

Summary
Move SDCH behind an experimental flag until the implementation is staffed, the specification matures, and broader consensus emerges. If those don’t happen, remove support from code entirely.

Motivation
Since its first release, Chromium has supported SDCH, an experimental compression protocol proposed in 2008. [1] Unfortunately, since this original proposal, few non-Chromium browsers have adopted support for this and it has seen limited standards activity or cross-browser interest.

As the original proposal had IPR concerns [2] that prevented it from being standardized, a new version has been submitted to the IETF [3]. While the current I-D is as an Individual submission, the intent is to work with other interested vendors, such as Yandex and LinkedIn, on standardizing this effort. This was presented at IETF97 and

Brotli
Image Variations cont.
Dynamic Blocks (Speed Kit)

Wolfram Wingerath et al., Speed Kit: A Polyglot & GDPR-Compliant Approach For Caching Personalized Content, ICDE 2020
Conclusion & Goals
Goals

Unified
Combine compression methodologies

End to End
Control over the whole architecture to benefit end users

Adaptive
Autonomously choose protocol given runtime context

Opt-in
Pluggable and compatible with legacy tech stacks
How can partial caching and compression methods be used to accelerate data access in a distributed architecture with heterogeneous clients and servers?
Progress & Next Steps
Speed Kit: A Polyglot & GDPR-Compliant Approach For Caching Personalized Content

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Abstract—Users leave when page loads take too long. This simple fact has complex implications for virtually all modern businesses, because accelerating content delivery through caching is not as simple as it used to be. As a fundamental technical challenge, the high degree of personalization in today’s Web has seemingly outgrown the capabilities of traditional content delivery networks (CDNs) which have been designed for distributing static assets under fixed caching times. As an additional legal challenge for services with personalized content, an increasing number of regional data protection laws constrain the ways in which CDNs can be used in the first place. In this paper, we present Speed Kit as a radically different approach for content distribution that combines (1) a polyglot architecture for efficiently caching personalized content with (2) a natively GDPR-compliant client critical website itself (i.e. the HTML) is typically considered uncacheable due to personalization and therefore delivered by the origin server. The second critical open challenge is related to the legal ramifications of using a CDN, since routing all incoming user traffic through it is mandatory for deployment. Since this effectively grants the CDN provider full access to information that is protected by regulations such as the General Data Protection Regulation (GDPR) [15] or the California Consumer Privacy Act of 2018 (CCPA) [9], employing a CDN requires careful consideration to avoid hefty fines [27] in case of non-compliance or data breaches.

To address the above issues, we propose Speed Kit as an
Reevaluate Benefits of Delta Encoding for HTTP

- Things have changed
  - Frameworks
  - Bundling
  - ...

=> Reevaluation necessary
- Alexa top 50 per category (~800 pages)
- 12 times a day
- Focus on text content (html, css, js, svg...)
Thanks!

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