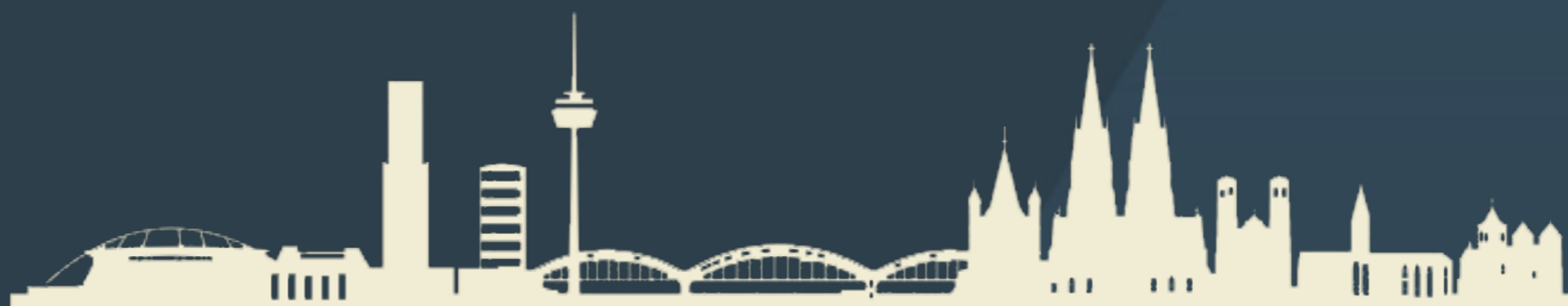





HTTP/2

eine Bestandsaufnahme



Über mich

- Yanick Witschi / terminal42 gmbh
- 27
- Schweizer in München
- Contao Core Entwickler
-  @toflar



Was wollen wir heute erreichen?

- Funktionsweise von HTTP verstehen.
- Neuerungen in HTTP/2 verstehen.
- Etwas davon für die tägliche Arbeit mitnehmen.

Disclaimer

Diese Präsentation enthält ziemlich sicher technische Ungenauigkeiten/Unstimmigkeiten, die zu Gunsten der allgemeinen Verständlichkeit

- selbstverständlich absichtlich –
in Kauf genommen wurden.

Inhalt

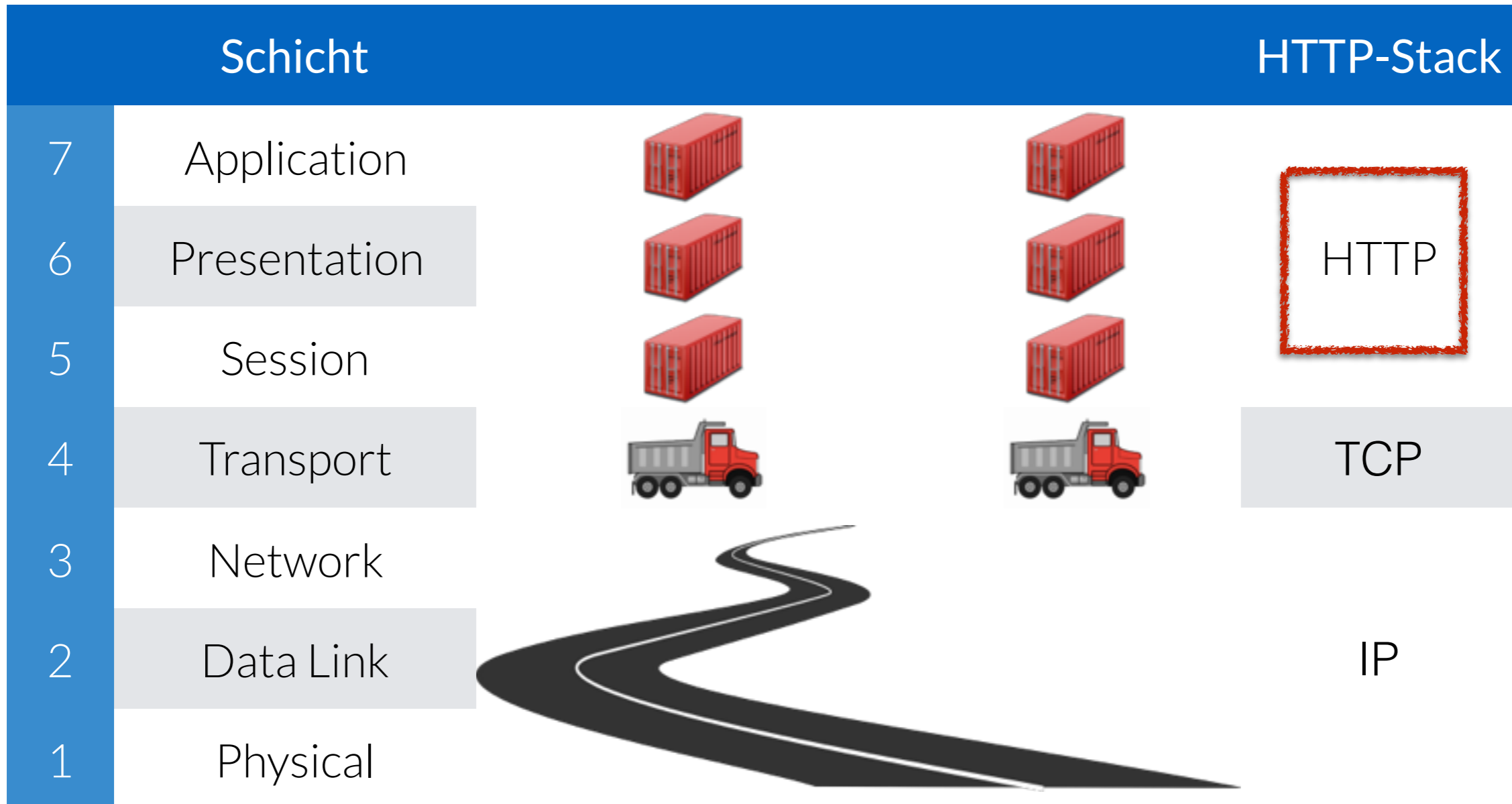
- Netzwerktechnik: Wo befinden wir uns?
- Das Hypertext Transfer Protocol
- Was macht denn HTTP/1.1 eigentlich falsch?
- Die Neuerungen in HTTP/2 und die Auswirkungen
- Kann ich heute schon davon profitieren?
- Fragen

Netzwerktechnik: Wo befinden wir uns?

Das OSI-Modell

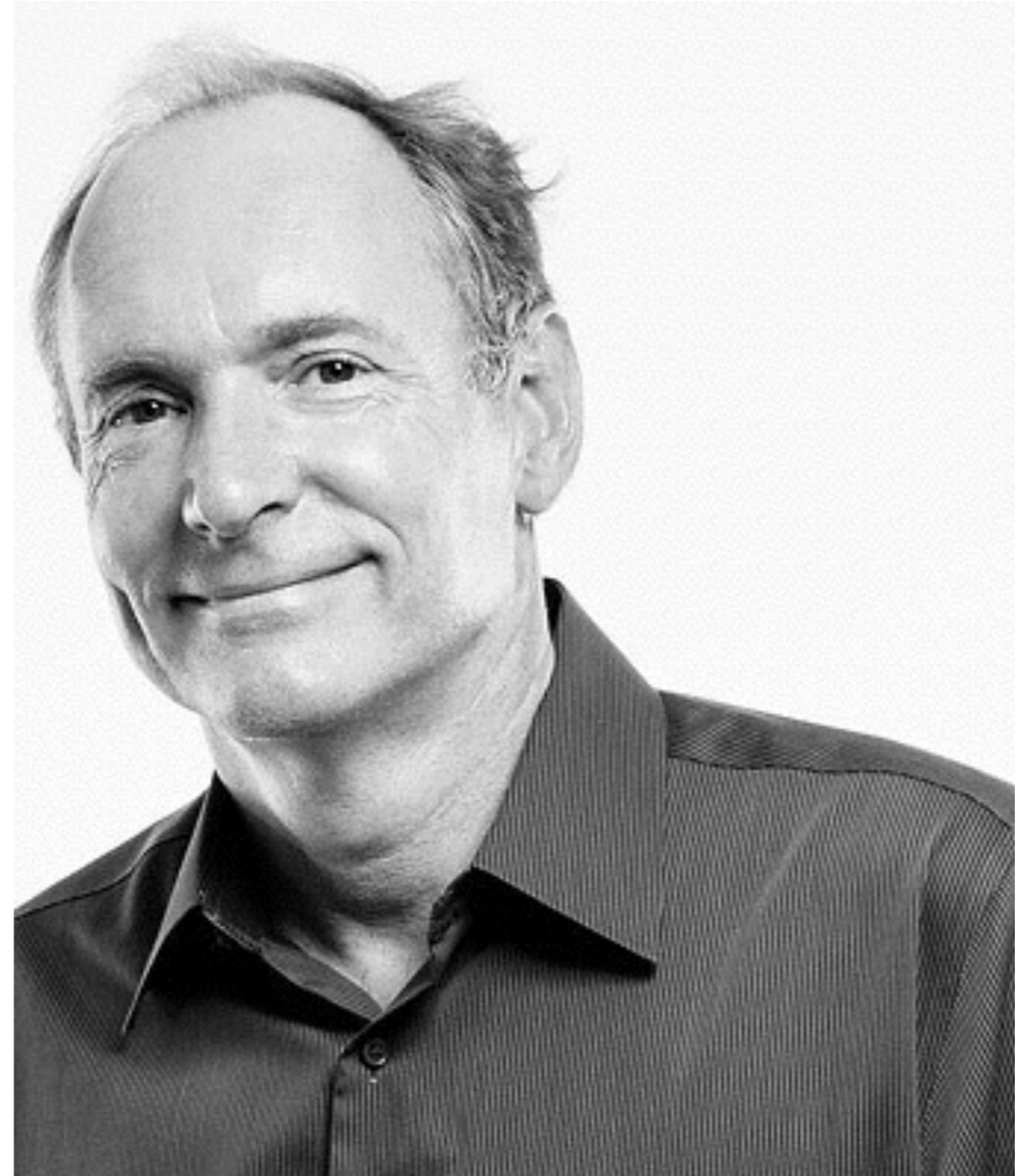
	Schicht	Kopplungselement	Beispiele	HTTP-Stack
7	Application		DNS, FTP,	
6	Presentation		SSH, SMTP,	HTTP
5	Session	Gateway	IMAP	
4	Transport		TCP, UDP, TLS	TCP
3	Network	Router, L3-Switch	IPsec, ICMP	
2	Data Link	Switch	Ethernet, WLAN,	IP
1	Physical	Kabel, Repeater	ARP	

Das OSI-Modell



Das Hypertext Transfer Protocol

- **HTTP/0.9** (1989 - 1991, CERN, Genf), ebenso Geburt von HTML und URL
- **HTTP/1.0** (1996, RFC 1945, 60 Seiten)
- **HTTP/1.1** (1999, RFC 2616, 176 Seiten)
- **SPDY/1.0** (2009)
- **SPDY/2.0** (2012)
- **HTTP/2** (2015, RFC 7540, 96 Seiten)
- Ergänzende RFCs für Range Requests, Caching etc.



RFC

Internet Engineering Task Force (IETF)
Request for Comments: 7540
Category: Standards Track
ISSN: 2070-1721

M. Belshe
BitGo
R. Peon
Google, Inc
M. Thomson, Ed.
Mozilla
May 2015

Hypertext Transfer Protocol Version 2 (HTTP/2)

Abstract

This specification describes an optimized expression of the semantics of the Hypertext Transfer Protocol (HTTP), referred to as HTTP version 2 (HTTP/2). HTTP/2 enables a more efficient use of network resources and a reduced perception of latency by introducing header field compression and allowing multiple concurrent exchanges on the same connection. It also introduces unsolicited push of representations from servers to clients.

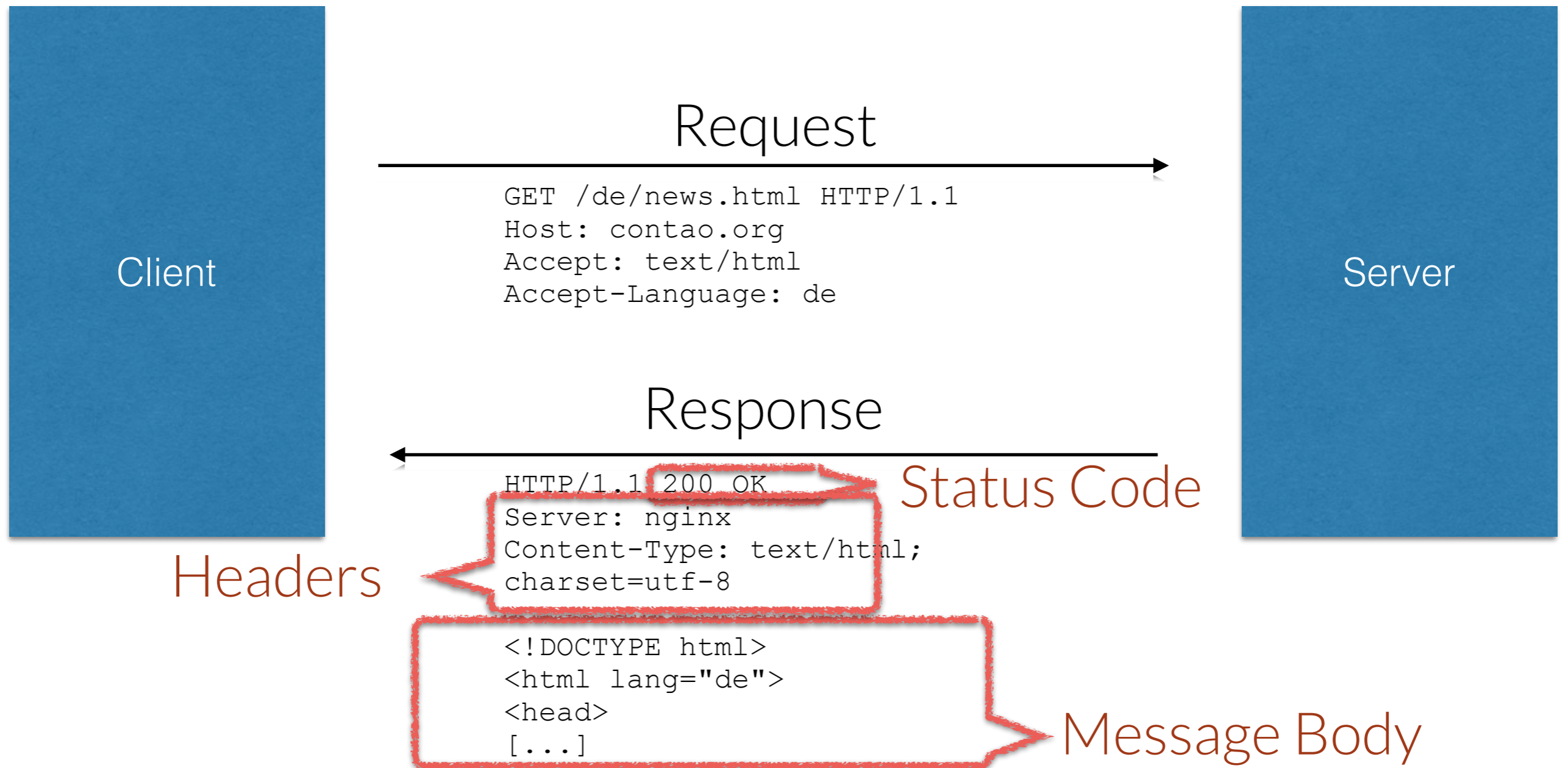
This specification is an alternative to, but does not obsolete, the HTTP/1.1 message syntax. HTTP's existing semantics remain unchanged.

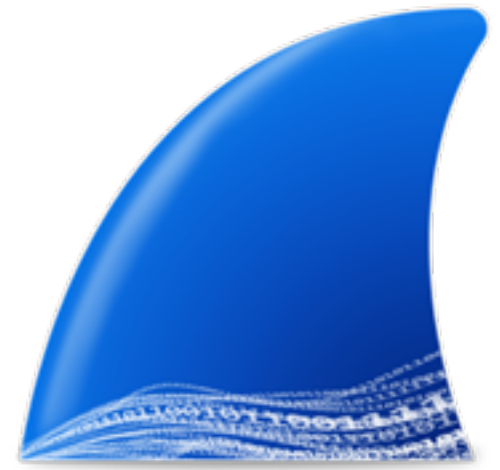
Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force

Aufbau





<https://www.wireshark.org>

10936	5.932383000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10937	5.932384000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10939	5.933451000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10940	5.933452000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10941	5.933453000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10942	5.933454000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10943	5.933455000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10944	5.934566000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10945	5.934567000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10946	5.934568000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10947	5.934569000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10949	5.935649000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10951	5.935652000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10952	5.960708000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10953	5.960709000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10954	5.960710000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10955	5.960712000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10956	5.960713000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10959	5.964988000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10960	5.964990000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10961	5.964991000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10962	5.964992000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10963	5.964994000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10965	5.966139000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10966	5.966141000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10967	5.966142000	192.168.178.119	TCP	589	[TCP Previous segment not captured] [TCP segment of a reassembled PDU]
10968	5.966143000	192.168.178.119	HTTP	1466	[TCP Out-Of-Order] HTTP/1.1 200 OK (image/jpeg)
10973	5.991323000	192.168.178.119	TCP	1466	[TCP segment of a reassembled PDU]
10974	5.991325000	192.168.178.119	HTTP	1200	HTTP/1.1 200 OK (text/html)
10984	6.211050000	192.168.178.119	TCP	66	80_52871 [ACK] Seq=1121491 Ack=8988 Win=33814

```

▷ Frame 10974: 1200 bytes on wire (9600 bits), 1200 bytes captured (9600 bits) on interface 0
▷ Ethernet II, Src: Avm_9c:9d:b6 (9c:c7:a6:9c:9d:b6), Dst: Apple_cc:ee:eb (10:dd:b1:cc:ee:eb)
▷ Internet Protocol Version 4, Src: 192.168.178.119 (192.168.178.119), Dst: 192.168.178.119 (192.168.178.119)
▷ Transmission Control Protocol, Src Port: 80 (80), Dst Port: 52871 (52871), Seq: 1120357, Ack: 8543
▷ [7 Reassembled TCP Segments (9534 bytes): #10952(1400), #10953(1400), #10954(1400), #10955(1400),
▽ Hypertext Transfer Protocol
  ▷ HTTP/1.1 200 OK\r\n
    Server: Apache\r\n
    Cache-Control: no-store, no-cache, must-revalidate, post-check=0, pre-check=0\r\n
    Pragma: no-cache\r\n
    Expires: Fri, 06 Jun 1975 15:10:00 GMT\r\n
    Vary: User-Agent,Accept-Encoding\r\n

```

```

10974 5.991325000 192.168.178.119 192.168.178.119
▷ Frame 10974: 1200 bytes on wire (9600 bits), 1200 bytes captured (9600 bits) on interface 0
▷ Ethernet II, Src: Avm_9c:9d:b6 (9c:c7:a6:9c:9d:b6), Dst: Apple_cc:ee:eb (10:dd:b1:cc:ee:eb)
▷ Internet Protocol Version 4, Src: 192.168.178.119 (192.168.178.119), Dst: 192.168.178.119 (192.168.178.119)
▷ Transmission Control Protocol, Src Port: 80 (80), Dst Port: 52871 (52871), Seq: 1120357, Ack: 8543
▷ [7 Reassembled TCP Segments (9534 bytes): #10952(1400), #10953(1400), #10954(1400), #10955(1400),
▷ Hypertext Transfer Protocol
▽ Line-based text data: text/html
  <!DOCTYPE html>\n
  <html lang="de">\n
  <head>\n
  \n
  \t \n
  \t\t<meta charset="utf-8">\n

```

- news.html**
- f4d36619e4bd.js.pagespeed.jm.pYVjIXXBrx.js
- A.530731bf5dd1.css.pagespeed.cf.UINuwSkedi.css
- css?family=Open+Sans:400,300
- jquery-ui.min.js.pagespeed.jm.u60ZR1Gt7Z.js
- colorbox.min.js.pagespeed.jm.CQVvrgWcj4.js
- mediaelement-and-player.min.js
- contao_styleguide_js_script.min.js+js_network.js
- DXI1ORHCpsQm3Vp6mXoaTRampu5_7CjHW5spxc
- cJZKeOuBrn4kERxqtaUH3ZBw1xU1rKptJi_0jans92

Headers Preview Response Cookies Timing

General

Request URL: https://contao.org/de/news.html
Request Method: GET
Status Code: 200 OK
Remote Address: 79.133.35.115:443

Response Headers [view source](#)

Cache-Control: max-age=0, no-cache
Connection: keep-alive
Content-Encoding: gzip
Content-Type: text/html; charset=utf-8
Date: Mon, 02 May 2016 09:19:38 GMT
Pragma: public

- f4d36619e4bd.js.pagespeed.jm.pYVjIXXBrx.js
 - A.530731bf5dd1.css.pagespeed.cf.UINuwSkedi.css
 - css?family=Open+Sans:400,300
 - jquery-ui.min.js.pagespeed.jm.u60ZR1Gt7Z.js
 - colorbox.min.js.pagespeed.jm.CQVvrgWcj4.js
 - mediaelement-and-player.min.js
 - contao_styleguide_js_script.min.js+js_network.js
 - DXI1ORHCpsQm3Vp6mXoaTRampu5_7CjHW5spxc
 - cJZKeOuBrn4kERxqtaUH3ZBw1xU1rKptJi_0jans92
 - contao-logo-corporate.svg
 - icon-search.svg
 - contao-academy-ch3b5031.png.pagespeed.ic.iah...
- 17 requests | 16.9KB transferred | Finish: 1.11s | D...

Request URL: https://contao.org/de/news.html
Request Method: GET
Status Code: 200 OK
Remote Address: 79.133.35.115:443

Response Headers [view parsed](#)

HTTP/1.1 200 OK
 Server: nginx
 Content-Type: text/html; charset=utf-8
 Transfer-Encoding: chunked
 Connection: keep-alive
 Vary: Accept-Encoding
 X-Powered-By: PHP/5.6.21
 Pragma: public
 Vary: User-Agent
 Set-Cookie: BE_USER_AUTH=429f9ada0852d6cd1cda45b24a03ad6c4
 Set-Cookie: FE_USER_AUTH=6dc107793d7452cd5d3bed82c35f17c4e
 Date: Mon, 02 May 2016 09:19:38 GMT
 Vary: Accept-Encoding

Wir fassen zusammen

- basiert in nahezu allen Fällen auf TCP/IP
- textbasiert

```
HTTP/1.1 200 OK
Server: nginx
Content-Type: text/html;
charset=utf-8
```

```
<!DOCTYPE html>
<html lang="de">
<head>
[...]
```

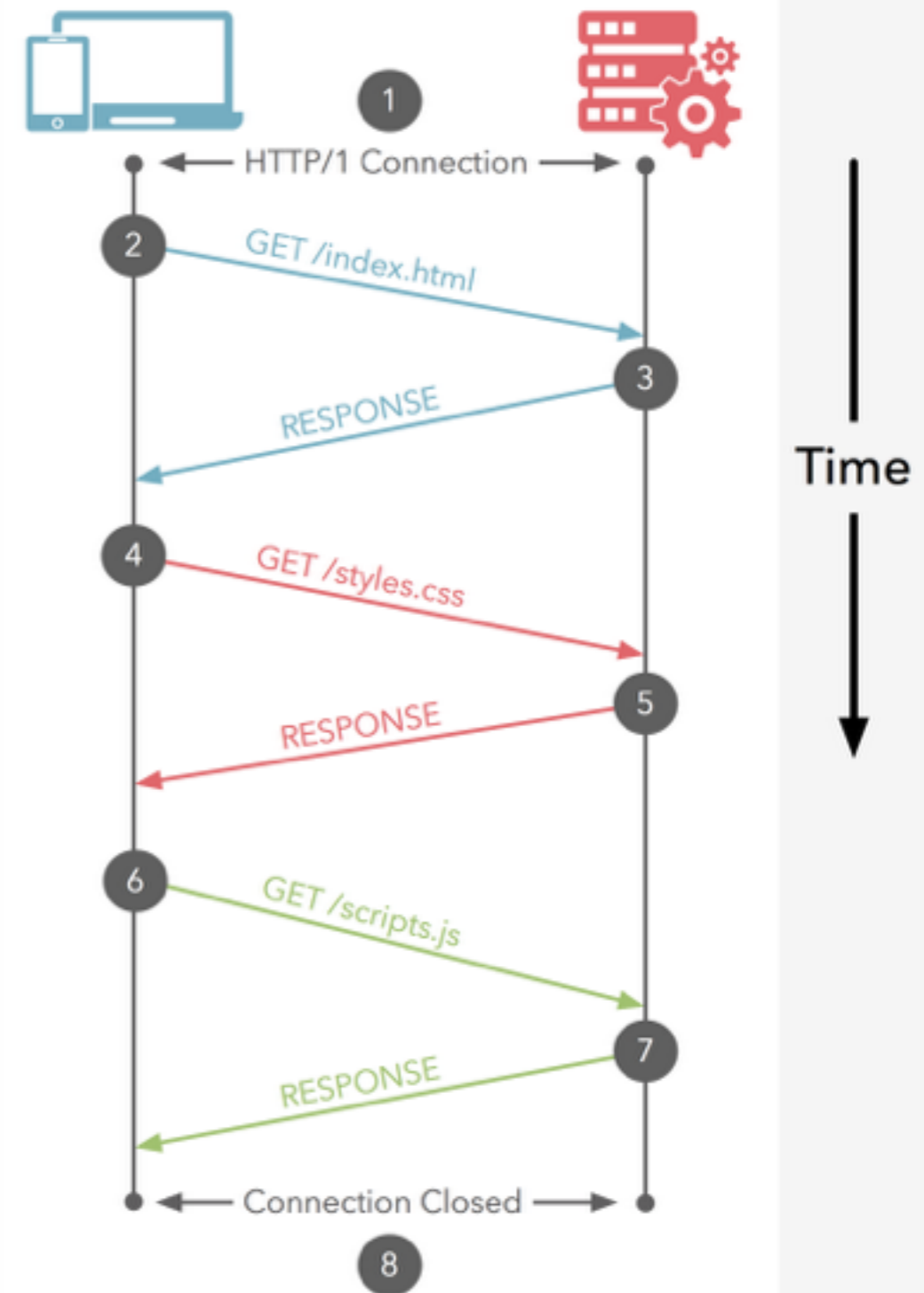
Schicht		
7	Application	
6	Presentation	HTTP
5	Session	
4	Transport	TCP
3	Network	
2	Data Link	IP
1	Physical	

Was macht denn HTTP/1.1 falsch?

Und was unternehmen wir dagegen?

1 Request pro TCP Verbindung

- Webseiten haben gem. <http://httparchive.org> per Mitte Mai 2016 im Schnitt 109 (!!!) Requests
- contao.org: 56 Requests
- t3n.de: 149 Requests
- facebook.com: 185 Requests



200	GET	news.html	contao.org	html	6.42 KB	25.55 KB	→ 40 ms
200	GET	css?family=Open+Sans:400,300	fonts.googleapis.com	css	0.73 KB	4.56 KB	→ 36 ms
304	GET	A.530731bf5dd1.css.pagespeed.cf._wsD0yyzOa.css	contao.org	css	15.70 KB	85.01 KB	→ 26 ms
304	GET	f4d36619e4bd.js.pagespeed.jm.pYVjDXXBrx.js	contao.org	js	90.33 KB	278.48 KB	→ 5 ms
304	GET	jquery-ui.min.js.pagespeed.jm.u60ZR1Gt7Z.js	contao.org	js	5.97 KB	18.18 KB	→ 82 ms
304	GET	colorbox.min.js.pagespeed.jm.CQVvrgWcj4.js	contao.org	js	4.55 KB	11.55	→ 85 ms
304	GET	mediaelement-and-player.min.js	contao.org	js	21.74 KB	78.42	→ 90 ms
304	GET	contao_styleguide._js._script.min.js+js_network.js.pagespeed.ic.-jrkijPp42.js	contao.org	js	21.15 KB	73.44 KB	→ 88 ms
304	GET	background.png.pagespeed.ce.384ZA8zTho.png	contao.org	png	—	43.78 KB	→ 0 ms
304	GET	contao-logo-corporate.svg	contao.org	svg	—	10.57 KB	→ 2 ms
304	GET	icon-search.svg	contao.org	svg	—	1.05 KB	→ 0 ms
304	GET	xcontao-academy-cb3b5031.png.pagespeed.ic.zXst0c59rk.png	contao.org	png	—	12.84 KB	→ 7 ms
304	GET	xwebsites-erstellen-mit-contao3.jpg.pagespeed.ic.ewYyHElrc.jpg	contao.org	jpeg	—	10.69 KB	→ 0 ms
304	GET	xcontao-fuer-webdesigner.jpg.pagespeed.ic.4FDwggEicW.jpg	contao.org	jpeg	—	6.67 KB	→ 9 ms
304	GET	xcontao-videotraining.jpg.pagespeed.ic.taKF2Ao1w9.jpg	contao.org	jpeg	—	6.42 KB	→ 51 ms
304	GET	xcontao-handbuch.jpg.pagespeed.ic._fEcfXHIFY.jpg	contao.org	jpeg	—	8.34 KB	→ 54 ms
304	GET	xmit-contao-webseiten-erfolgreich-gestalten.jpg.pagespeed.ic.WvelY5kRR8....	contao.org	jpeg	—	6.48 KB	→ 53 ms
304	GET	xcontao-praxisbuch.jpg.pagespeed.ic.hDIZO4coJD.jpg	contao.org	jpeg	—	9.74 KB	→ 57 ms
304	GET	xcontao-fuer-redakteure.jpg.pagespeed.ic.j19H70R6Kr.jpg	contao.org	jpeg	—	8.22 KB	→ 57 ms
304	GET	btn-open.svg	contao.org	svg	—	1.12 KB	→ 56 ms
304	GET	arrow_right_corporate.svg	contao.org	svg	—	1.12 KB	→ 72 ms
304	GET	twitter.svg	contao.org	svg	—	2.82 KB	→ 74 ms
304	GET	facebook.svg	contao.org	svg	—	1.48 KB	→ 73 ms
304	GET	google-plus.svg	contao.org	svg	—	2.97 KB	→ 76 ms
304	GET	select-arrow-down.png.pagespeed.ce.MkYFn9kx3C.png	contao.org	png	—	0.43 KB	→ 25 ms
304	GET	network.css	contao.org	css	3.81 KB	10.41 KB	→ 26 ms

185 / 6 =
>30

6

6

6



TCP-Handshake, Server-Load, Congestion (Stau)

network.http.pacing.requests.min-parallelism	default	integer	6
network.http.speculative-parallel-limit	default	integer	6

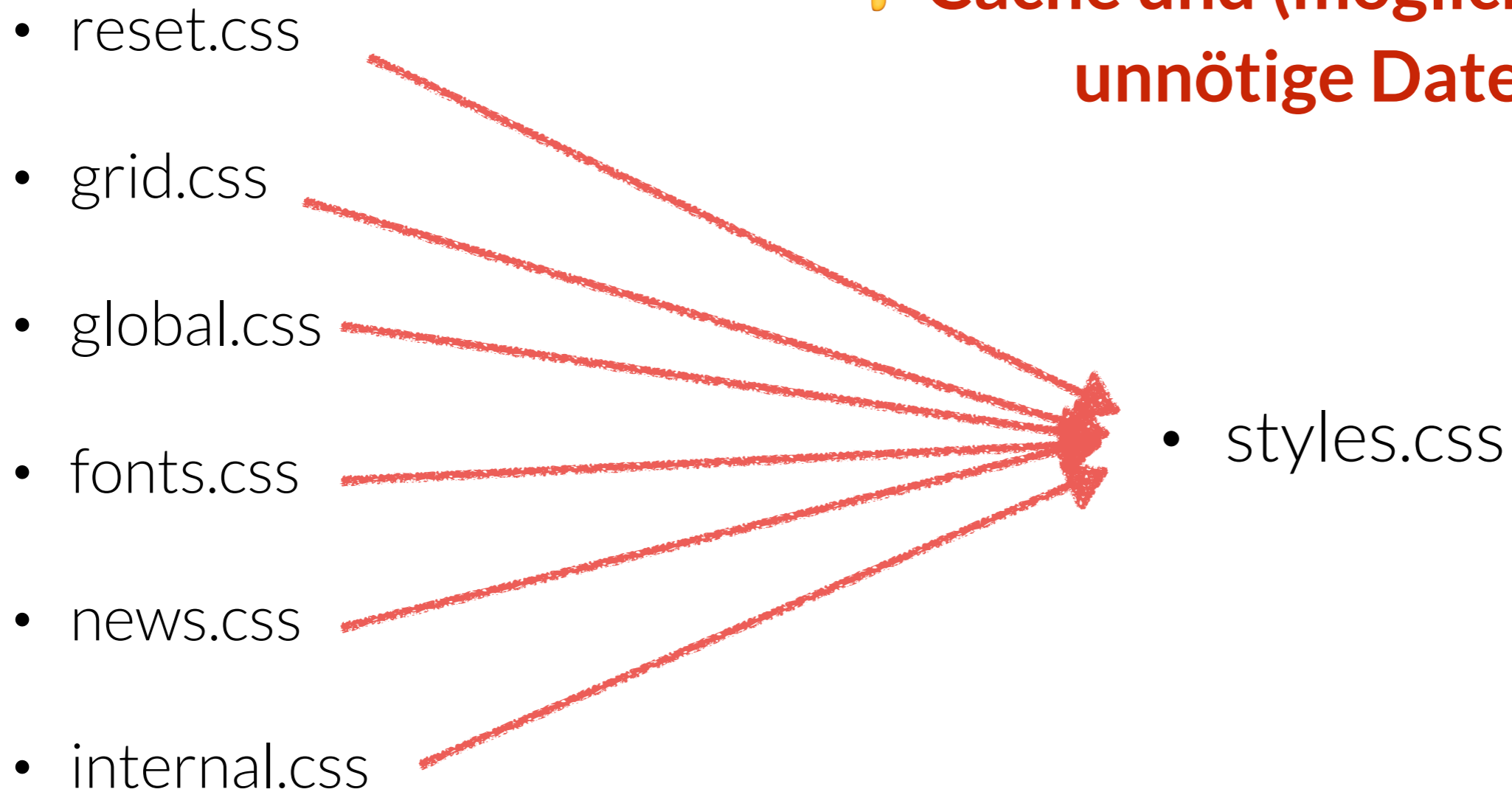
6

Fazit für den schlaunen Webentwickler

Requests sparen!

1. Concatenate it all!

👎 Cache und (möglicherweise)
unnötige Daten!



2. Inline it all!

👎 **Cache und (möglicherweise)
unnötige Daten!**

```
<html>
  <head>
    <style>
      .yellow {background-color: yellow;}
      .blue {color: blue;}
      [...]
    </style>
  </head>
  <body>
    
    <script type="text/javascript">
      [...]
    </script>
  </body>
</html>
```

3. Domain Sharding

- files.domain.de
- assets.domain.de
- etc.

Files URL

The files URL applies to the *files* directory (page speed optimization).

Assets URL

The assets URL applies to the *assets* directory (page speed optimization).

Language*

Please enter the page language according to the ISO-639-1 standard (e.g. "en" for English)

Language fallback

Show this page if there is none that matches the visitor's language.

 **Komplexität**

HTTP/2

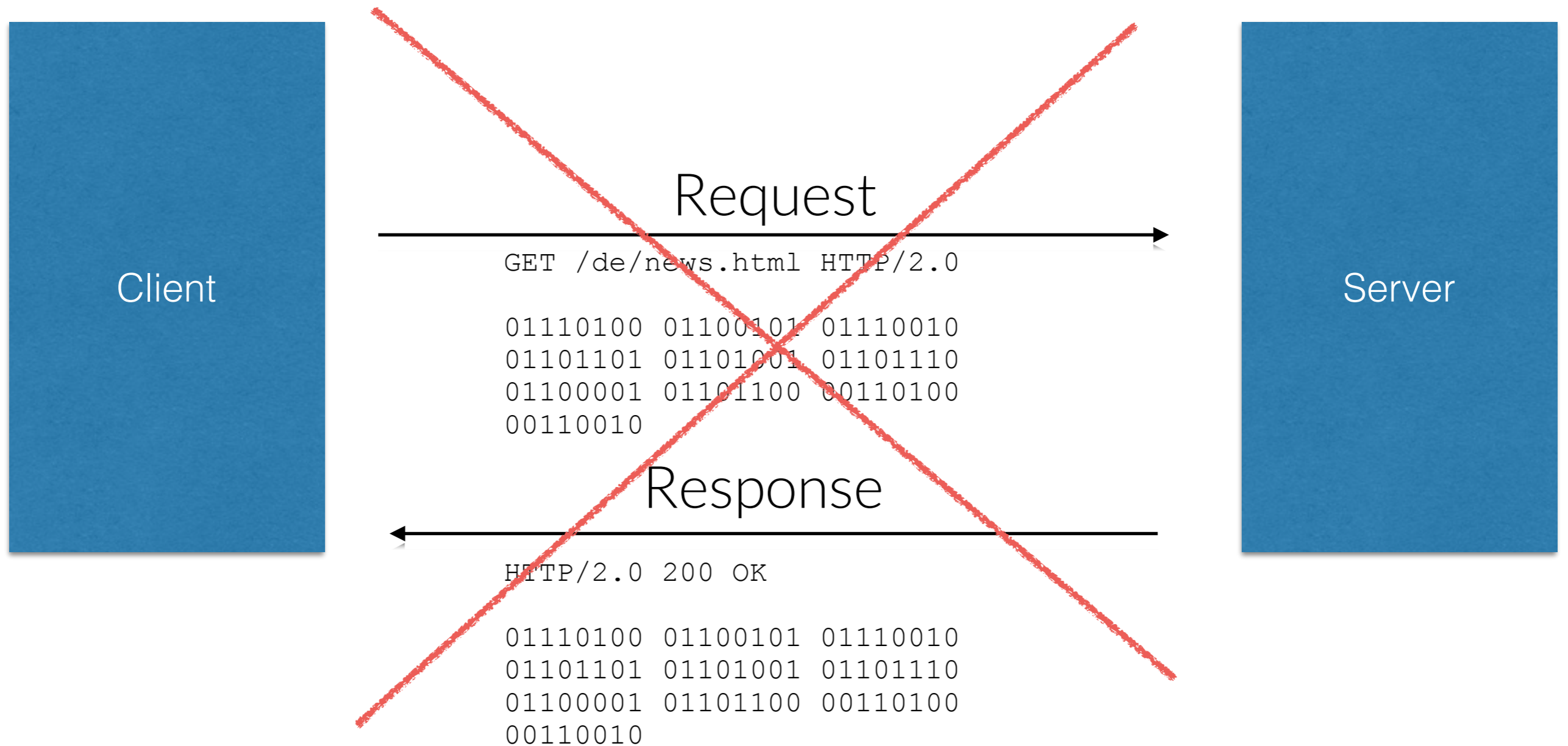
Übersicht

- HTTP/2 ist kompatibel mit HTTP 1.1 (Syntax bleibt), wird allerdings binär statt in Textform übertragen

```
GET /de/news.html HTTP/2.0  
Host: contao.org  
Accept: text/html  
Accept-Language: de
```

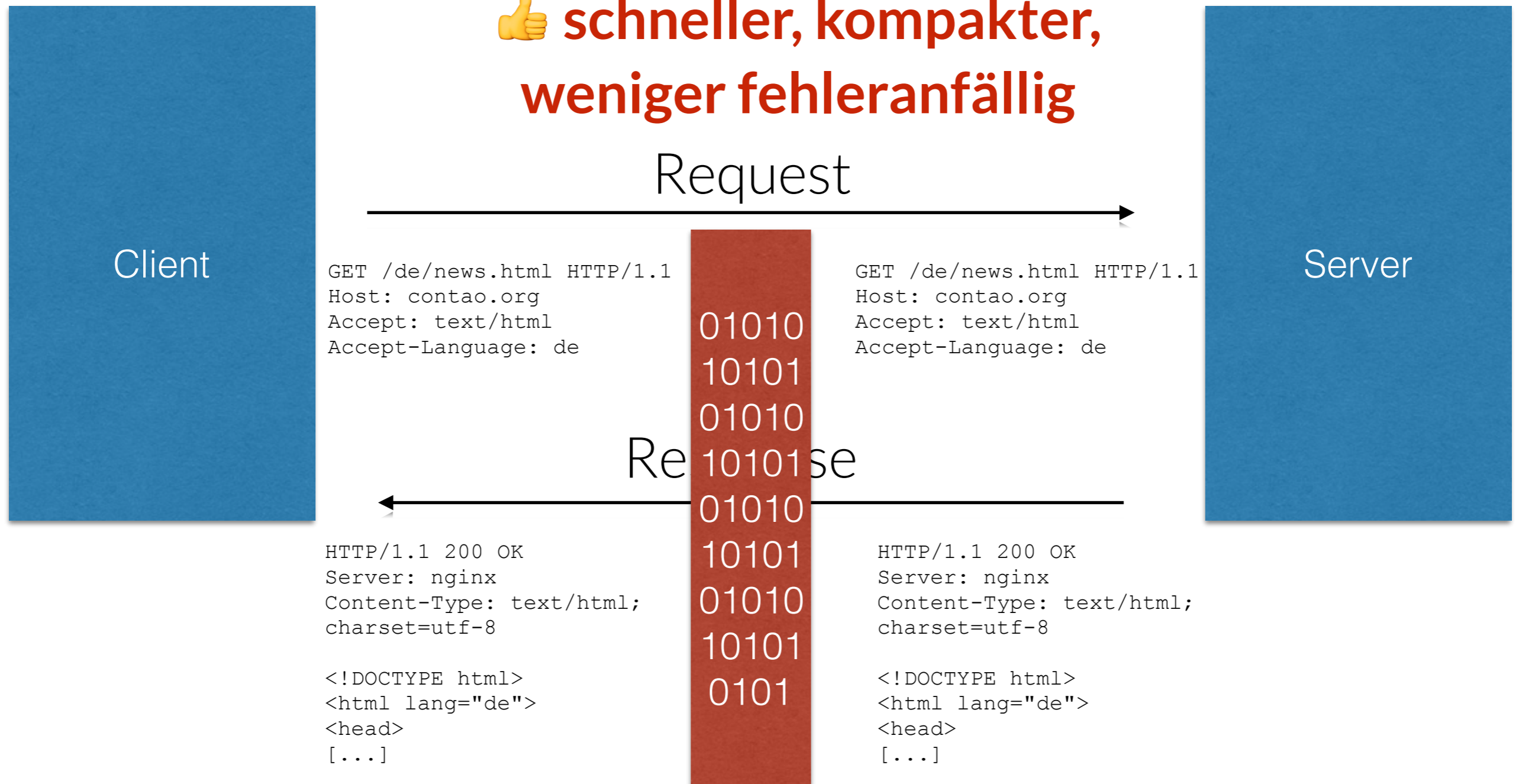
- HTTP/2 Requests sind vollständig "multiplexed" statt in Reihenfolge und blockierend
- HTTP/2 erlaubt das aktive "Pushen" vom Server zum Client
- weitere Verbesserungen wie z.B. Header Compression

Binär, also alles kaputt jetzt?



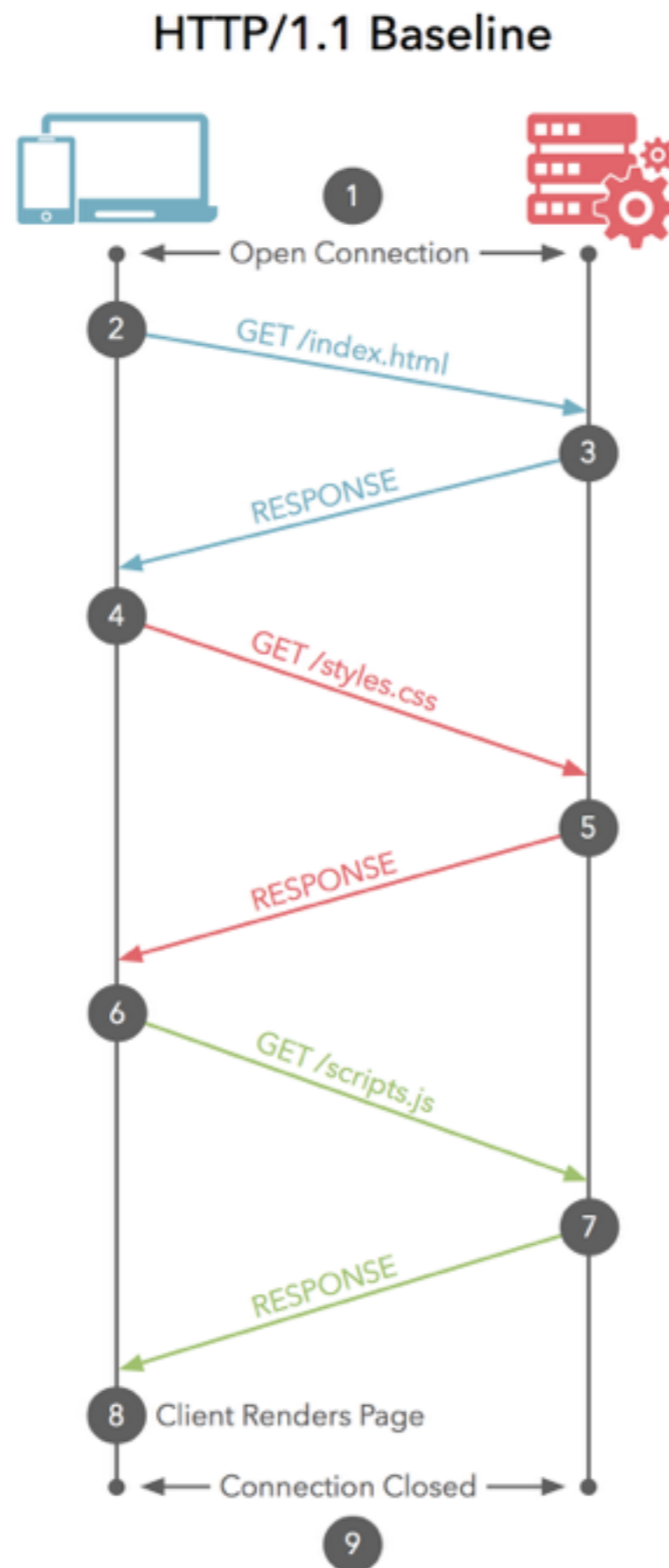
Binär, also alles kaputt jetzt?

👍 **schneller, kompakter,
weniger fehleranfällig**

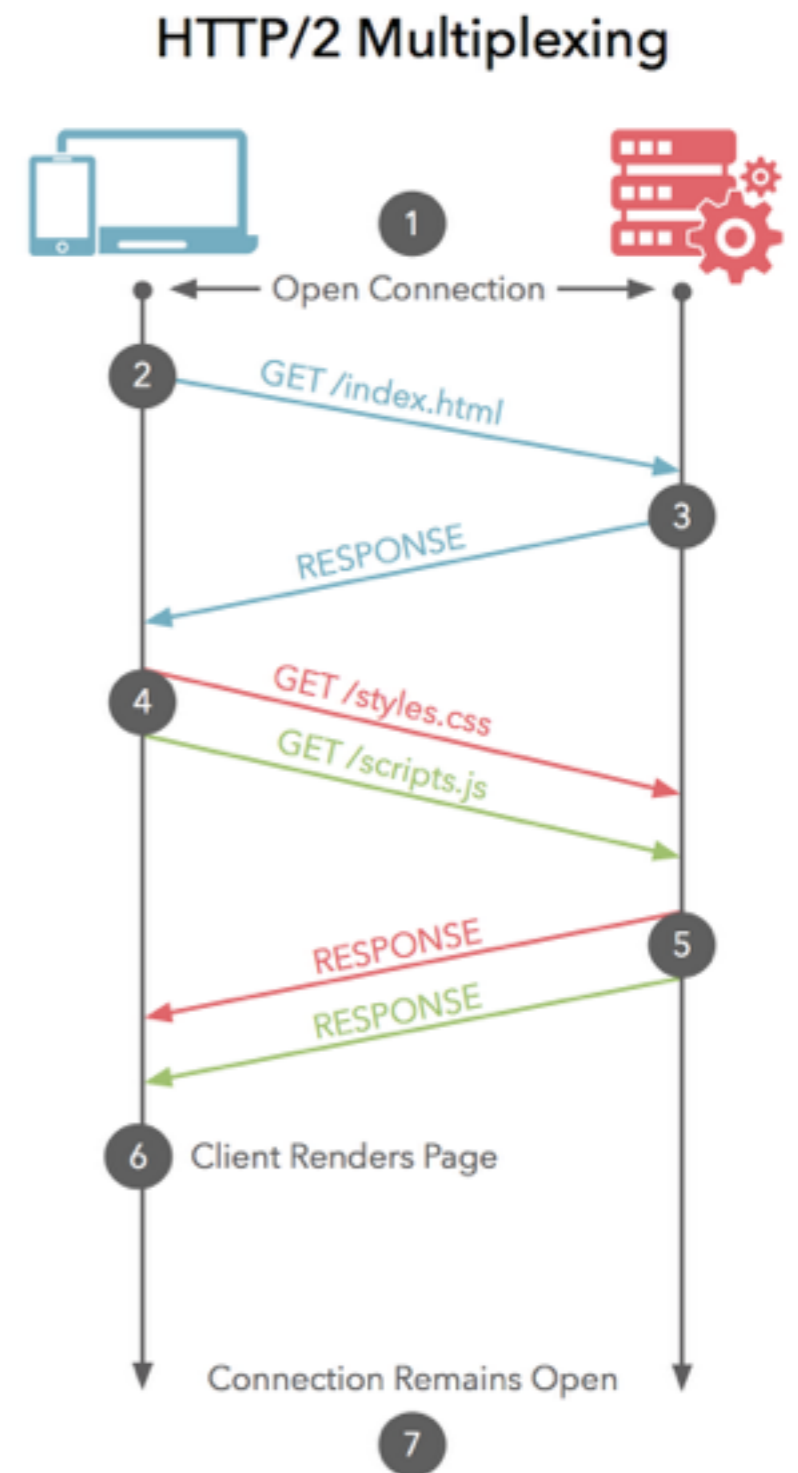


multi-plexing

👍 schneller,
erlaubt
Priorisierung,
nur noch 1 TCP-
Verbindung,
Network
congestion



Time



Server Push

- Ähnlich wie "Inlining", nur separat "cachebar" - z.B. Homepage HTML plus Logo und Scripts.

👍 **Performance**

- HTTP Header:

Link: `<https://domain.tld/asset.jpg>; rel=prefetch`

- `<link>`-Tag im `<head>`:

**dns-prefetch, preconnect,
prefetch, prerender**

```
<link rel="prefetch" href="https://domain.tld/asset.jpg">
```

<https://http2.akamai.com/demo>

HTTP/2 is the future of the Web, and it is here!

Your browser supports HTTP/2!

This is a demo of HTTP/2's impact on your download of many small tiles making up the [Akamai Spinning Globe](#).

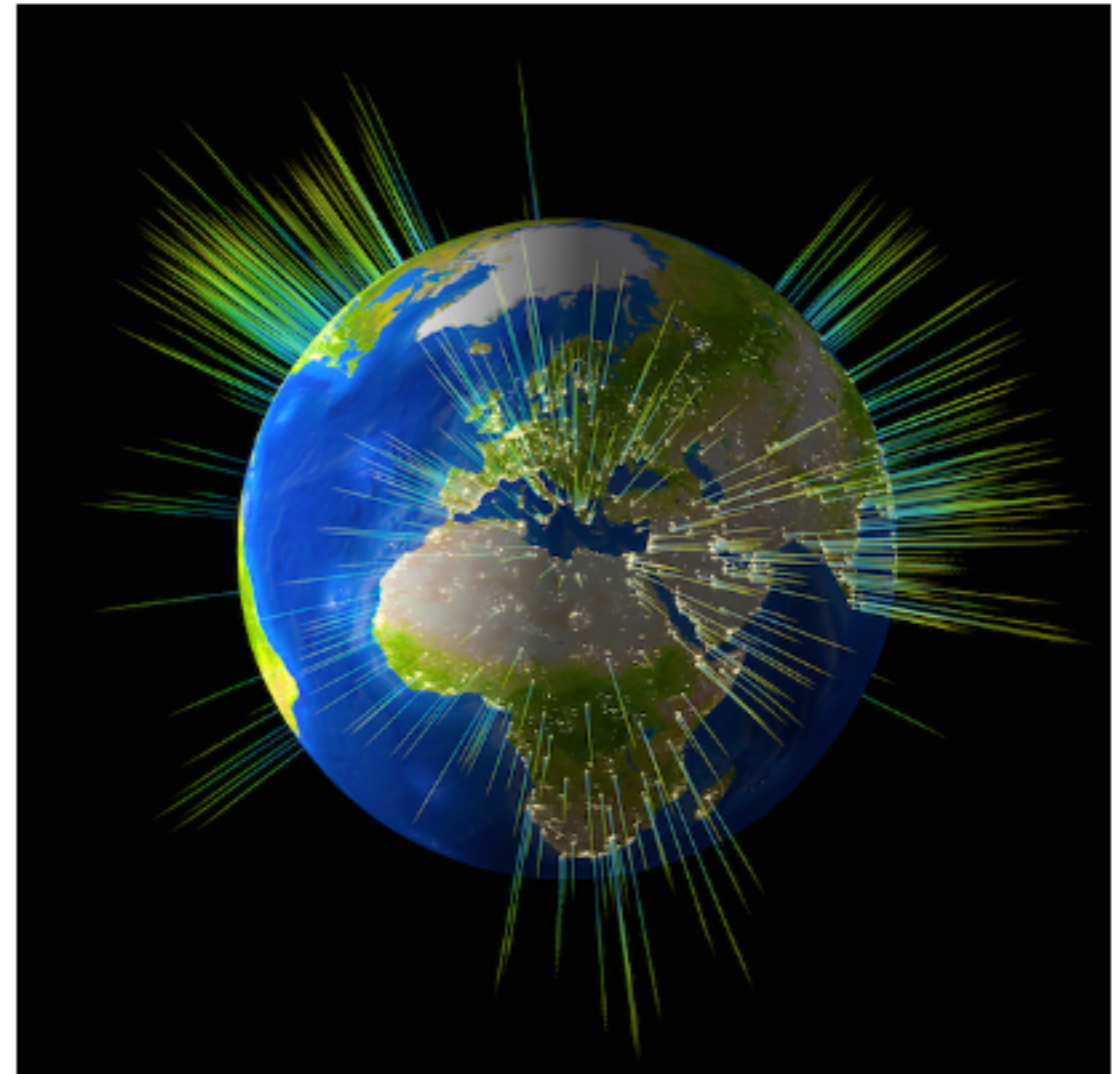
HTTP/1.1

Latency: **19ms**
Load time: **2.64s**



HTTP/2

Latency: **0ms**
Load time: **0.86s**



Performance-Optimierung

Zusammenfassung

Beschreibung	HTTP/1.1	HTTP/2
DNS-Lookups reduzieren	👍	👍
CDN verwenden	👍	👍
Redirects reduzieren	👍	👍
Dateien komprimieren	👍	👍
Caching	👍	👍
Unnötige Daten weglassen	👍	👍
Domain Sharding	👍	weglassen
Dateien "inlinen"	👍	Server Push
Dateien "concatenaten"	👍	reduzieren

Heisst das, wir können jetzt auf HTTP/2 setzen?



Server-Support

Software	Support ab Version	Support ab
Apache	2.4.17	11.10.2015
Nginx	1.9.5	22.09.2015
Microsoft IIS	10 (Windows Server 2016, Windows 10)	29.07.2015 bzw. Q3 2016

Wie weiss ich ob mein Hosting-Provider bzw. mein Hosting schon so weit ist?

⚡ HTTP/2 Test Verify HTTP/2.0 Support

Online **HTTP/2 test** - Verify if your server or CDN supports HTTP/2.

URL Public

HTTP/2 Test Result terminal42.ch

Yeah! terminal42.ch supports HTTP/2.0. Share via:

ALPN supported.

<https://tools.keycdn.com/http2-test>

Client-Support

Current aligned	Usage relative	Show all	IE	Edge *	Firefox	Chrome	Safari	Opera	iOS Safari *	Opera Mini *	Android Browser *	Chrome for Android
						² 47					4.3	
8					² 44	² 48					4.4	
9					² 45	² 49	^{2,3} 9		8.4		4.4	
^{1,2} 11	² 13			² 14	² 46	² 50	^{2,3} 9.1	² 36			7	² 49
					² 47	² 51	^{2,3} TP					
					² 48	²						

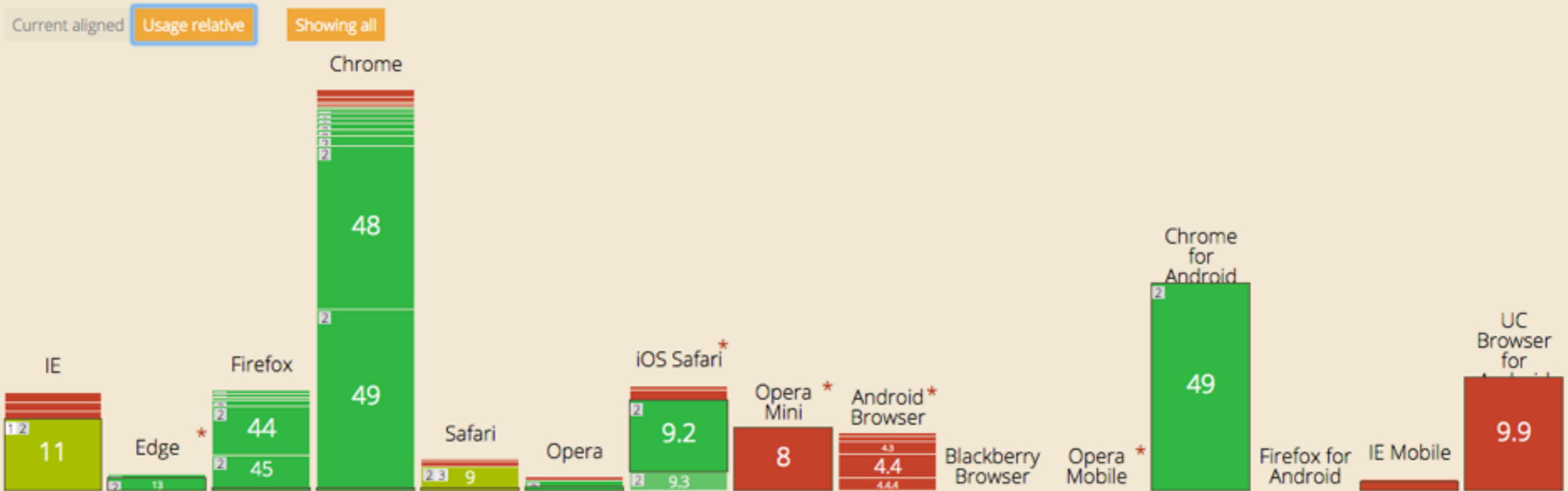
Notes Known issues (0)

See also support for the SPDY protocol, precursor of HTTP2.

- ¹ Partial support in IE11 refers to being limited to Windows 10.
- ² Only supports HTTP2 over TLS (https)
- ³ Partial support in Safari refers to being limited to OSX 10.11+

TLS ist de facto Voraussetzung!

Client-Support



Notes Known issues (0) Resources (6) Feedback

See also support for [the SPDY protocol](#), precursor of HTTP2.

- 1 Partial support in IE11 refers to being limited to Windows 10.
- 2 Only supports HTTP2 over TLS (https)
- 3 Partial support in Safari refers to being limited to OSX 10.11+

Wir fassen zusammen

um HTTP/2 heute verwenden zu können, braucht ihr:

- einen Server mit HTTP/2 und ALPN (für Chrome 51+)-Support.
 - das prüft ihr ganz einfach mit <https://tools.keycdn.com/http2-test>
- einen Client mit HTTP/2 Support.
 - das prüft ihr wie viele andere Browser-Features auf caniuse.com
- ein TLS-Zertifikat

Contao

HTTP/2 optimizations #484

Open

Toflar opened this issue an hour ago · 0 comments



Toflar commented an hour ago

Contao member



This is a accumulative ticket collecting all the features/todo's for future versions of Contao to better support HTTP/2 to get the best out of it. The list is not final, I'll just keep updating it, every time something comes to my mind.

- Must be able to disable concatenation of files in the page layout.
- Add support for server hints (server push) using either `Link: <https://domain.tld/asset.jpg>; rel=prefetch` headers or `<link rel="prefetch" href="https://domain.tld/asset.jpg">` `<head>` tags. Also think about other strategies like `preload` etc.

Labels

None yet

Milestones

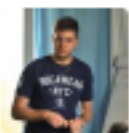
No milestones

Assignees

No one assigned

Notifications

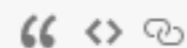
You're receiving notifications because you're watching this repository



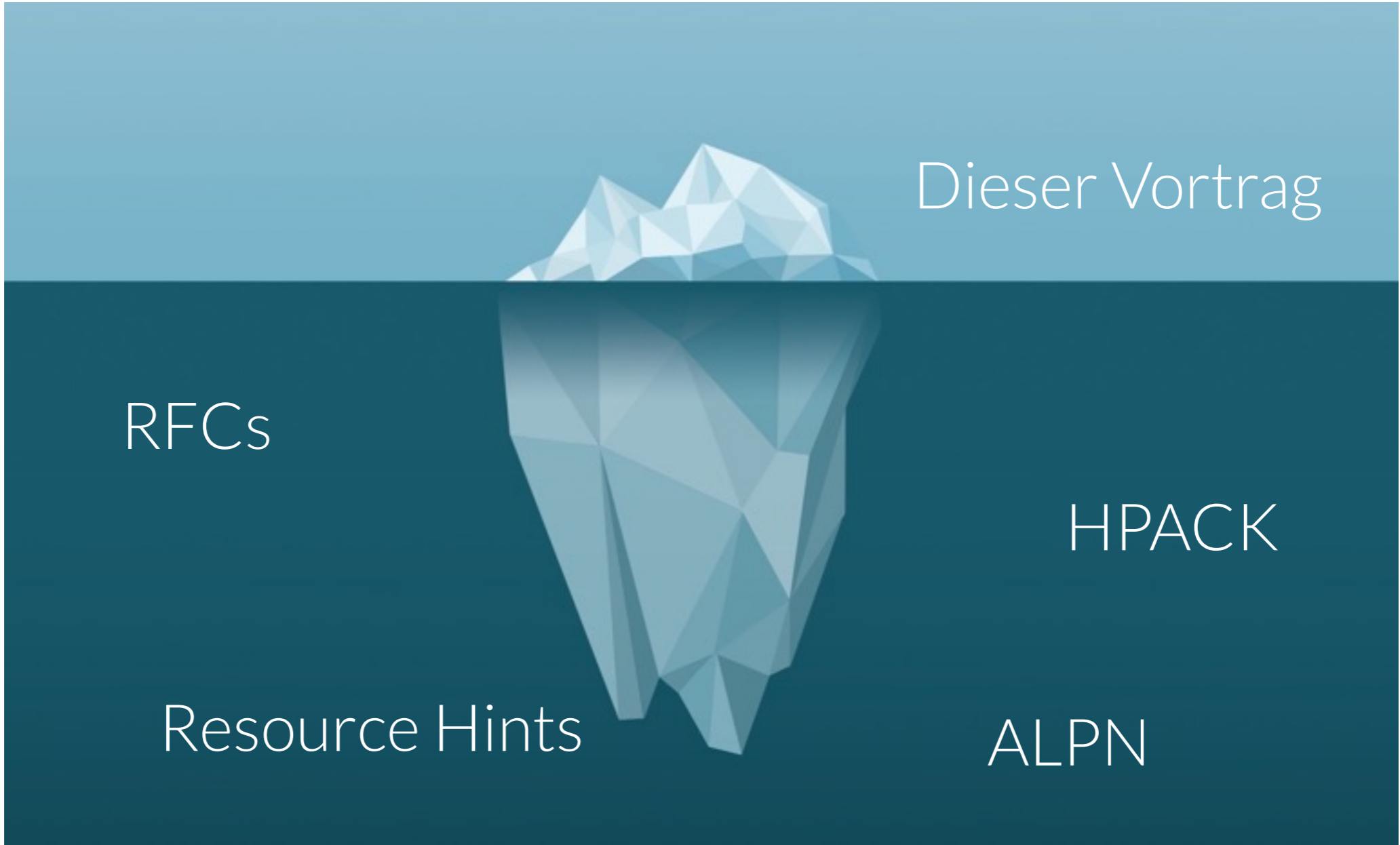
Write

Preview

AA B i



<https://github.com/contao/core-bundle/issues/484>



Dieser Vortrag

RFCs

HPACK

Resource Hints

ALPN

Ressourcen

- <http://designmodo.com/http2/>
- <https://www.mnot.net/blog/2016/04/22/ideal-http>
- https://docs.google.com/presentation/d/1_SMrVmiMxW2X1QZ1EcCnLKSosiD0PppP70Q3bw-I5Lg/present
- <https://www.smashingmagazine.com/2016/02/getting-ready-for-http2/>
- <https://kinsta.com/learn/what-is-http2/>
- <https://tools.keycdn.com/http2-test>
- <https://http2.akamai.com/demo>
- <https://cascadingmedia.com/insites/2015/03/http-2.html>
- <https://ma.ttias.be/day-google-chrome-disabled-http2-nearly-everyone-may-15th-2016/>
- <https://www.cyon.ch/blog/HTTP2-Raketenantrieb-fuers-Web>



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