



Web Fonts then and now (and what WOFF2 has to do with it)

April 14, 2016

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Talking Points

- Fonts on the web (a bit of history)
- WOFF
- WOFF2
- Brotli
- Web fonts performance in Digital Ads
- Business implications

Fonts on the web



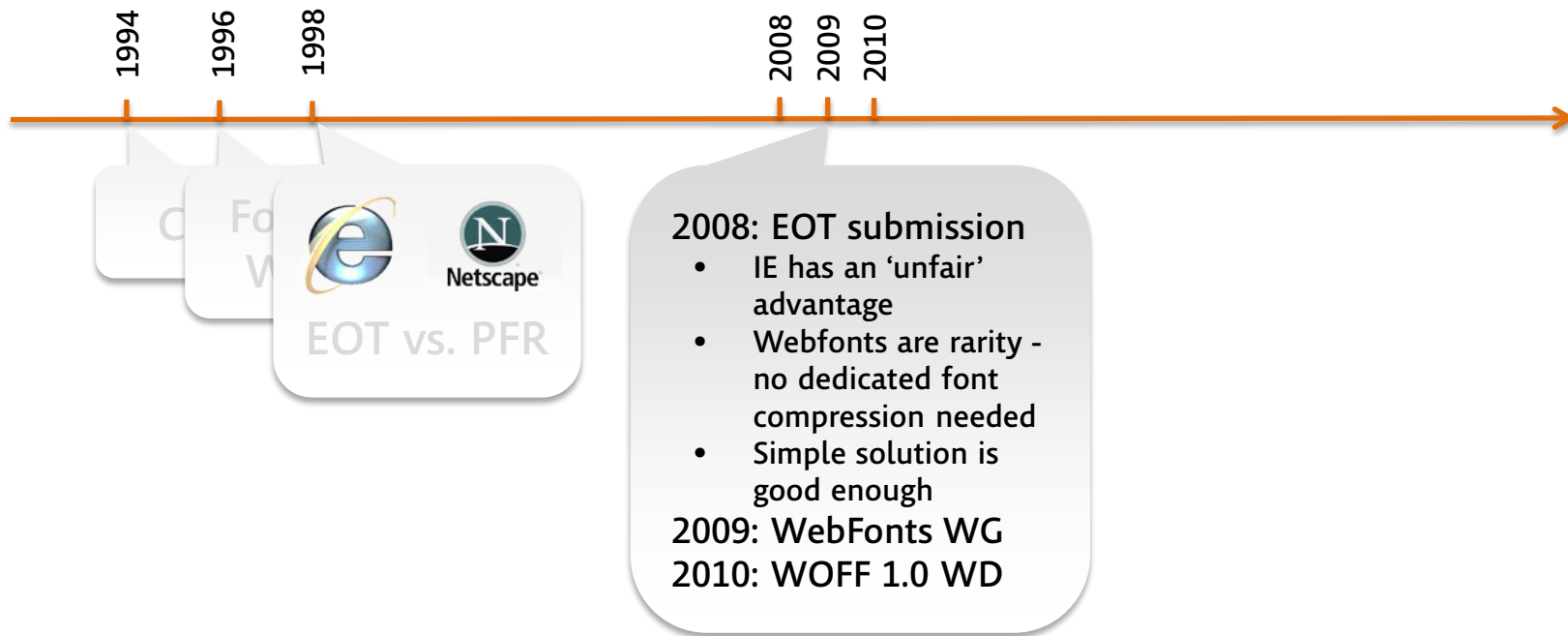
Fonts on the web



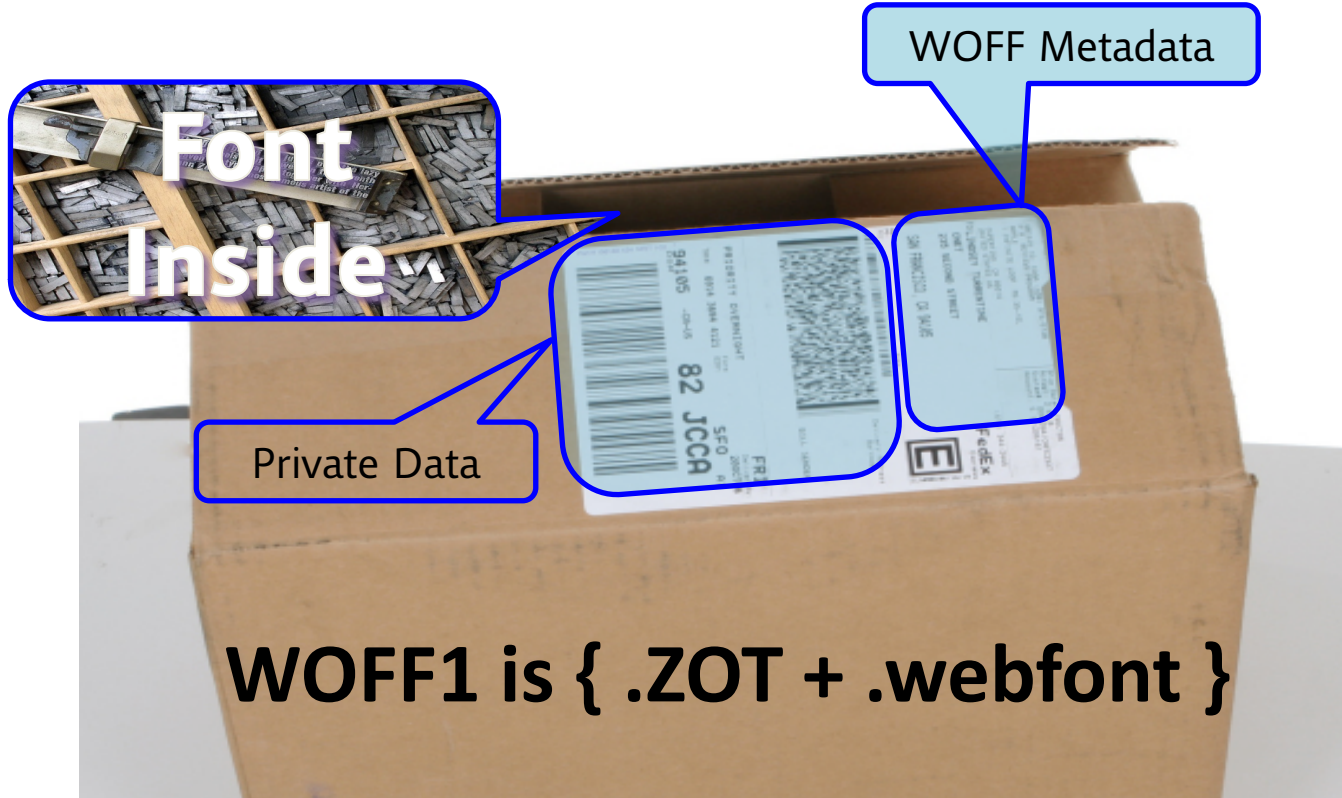
Fonts on the web



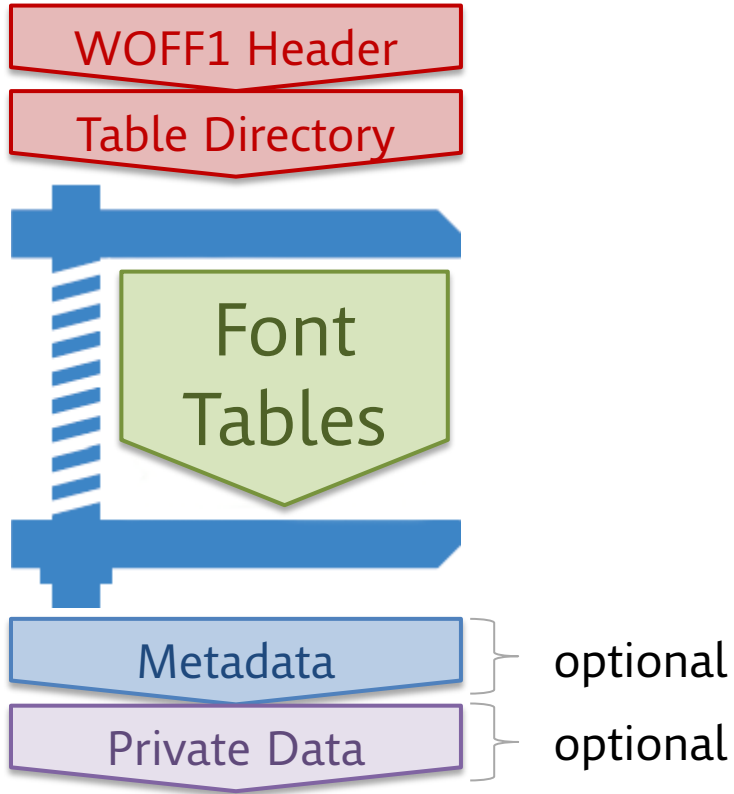
Fonts on the web



WOFF is not a new font format

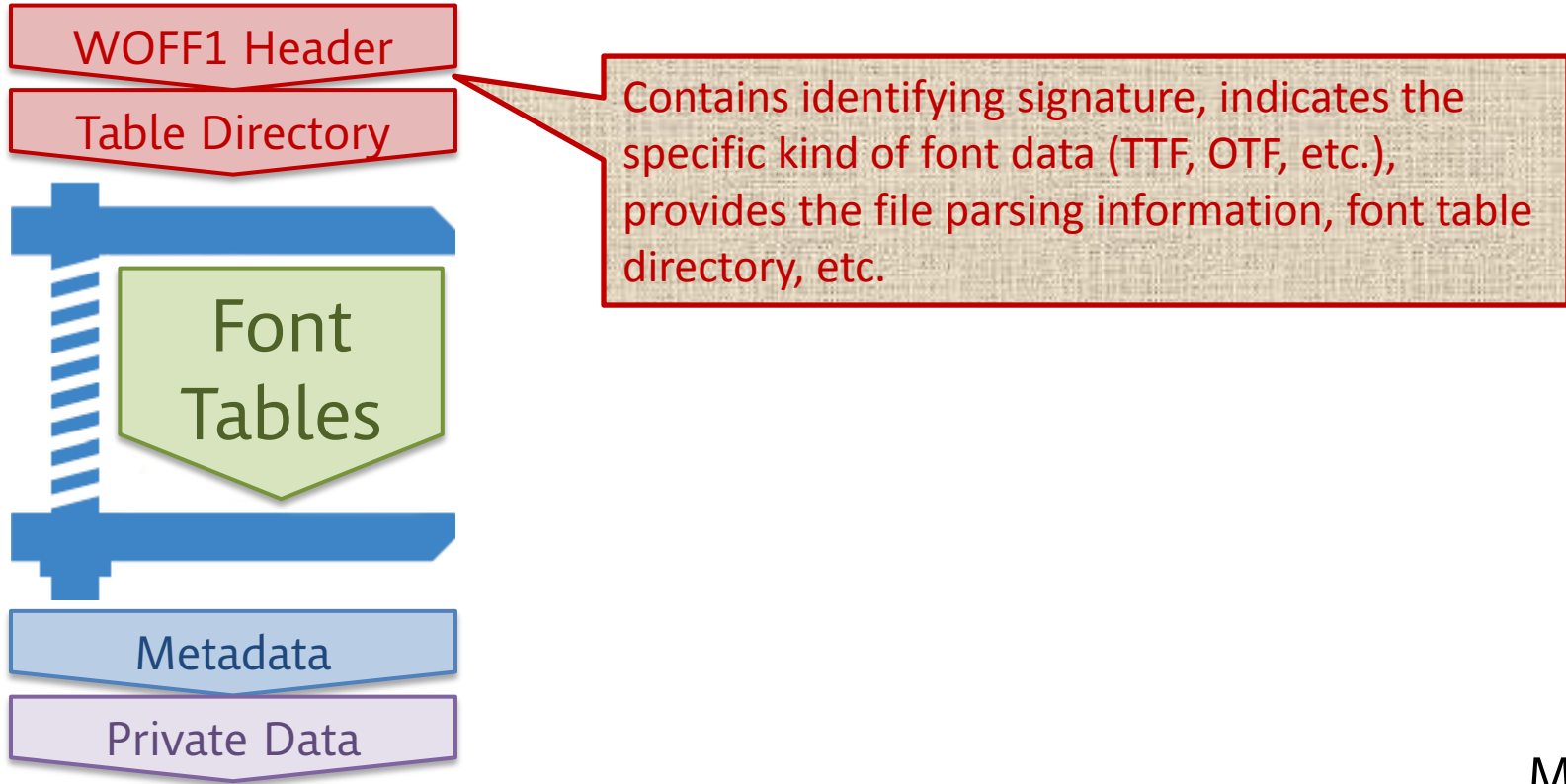


WOFF 1.0

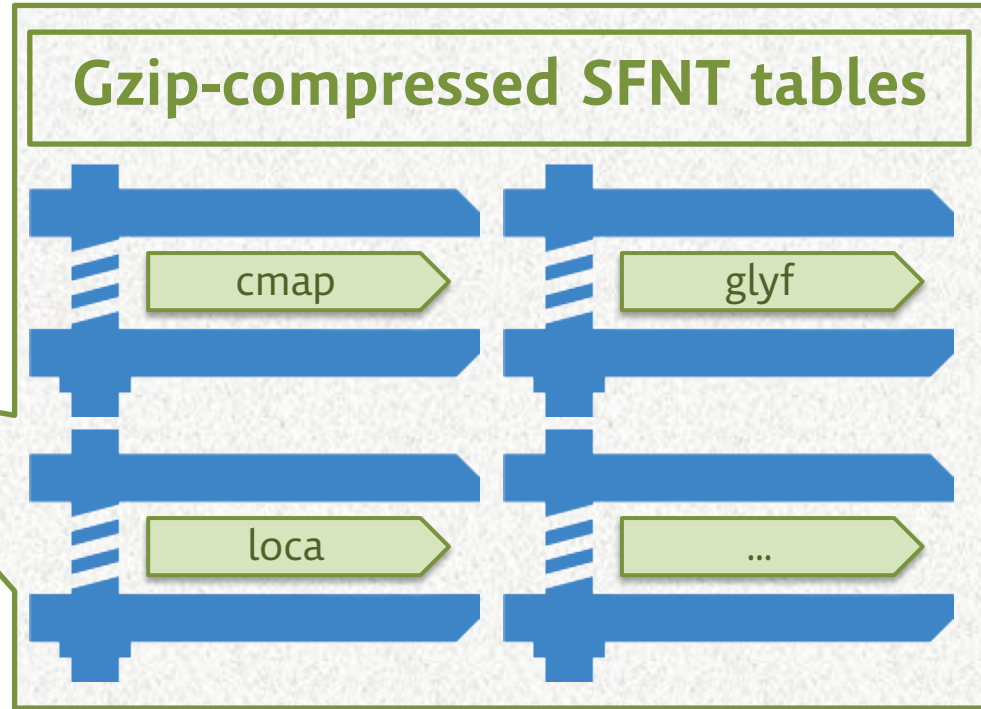


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WOFF 1.0



WOFF 1.0



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WOFF 1.0



Gzip-compressed SFNT tables

- Each table can be individually compressed or kept “as is”
- Enables HTTP range request to allow parts of WOFF be selectively read and processed

What we learned:

- HTTP GET request for partial content takes more time than the byte transfer itself!

WOFF 1.0

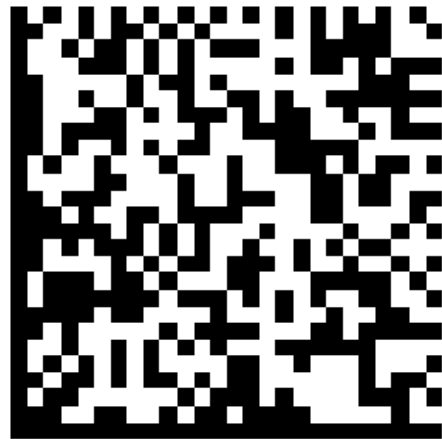


Unique ID	A unique identifier for the font
Vendor	The vendor name and URL
Credits	Info about designer, hinter, etc.
Description	Typeface description, history, use recommendation, etc.
License Info	Information about font license
Copyright	A copyright notice for the font
Trademark	A trademark statement
Licensee	The licensee for the font
Extensions	Vendor-specific extended info

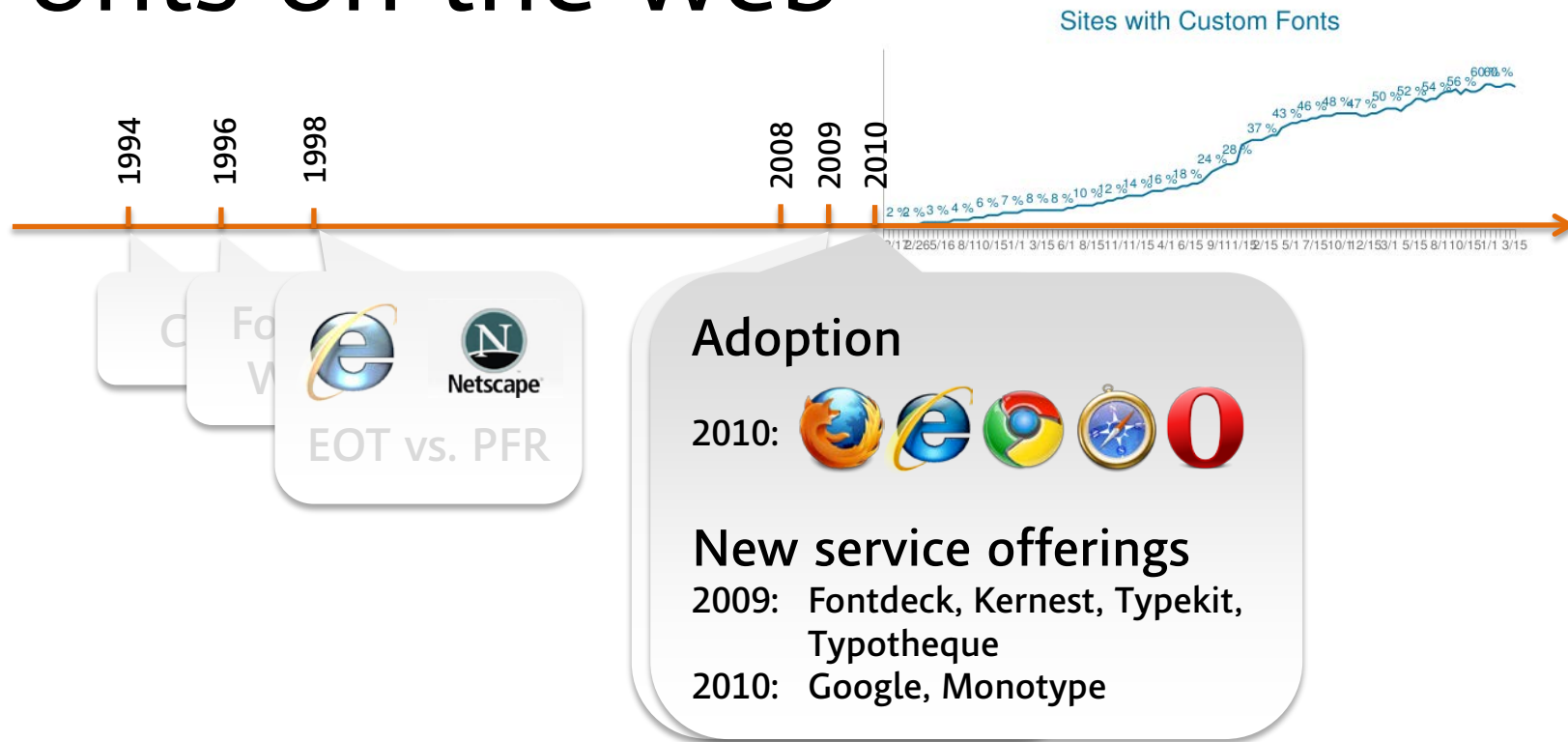
WOFF 1.0



A block of arbitrary data reserved exclusively for use by font vendors.



Fonts on the web



Fonts on the web



1994

1996

1998

EOT vs. PFR

2008: EOT submitted

- IE has an 'unfair' advantage
- Webfonts are not supported, no dedicated compression
- Simple solution is good enough

2009: WebFonts

2010: WOFF 1.0

2012:

- WOFF 1.0 is W3C Recommendation
- A new WebFonts WG charter is approved
- WOFF 2.0 Evaluation (MTX + LZMA)

2013:

- Brotli replaced LZMA
- WOFF2 on Google Fonts

2014: WOFF 2.0 WD

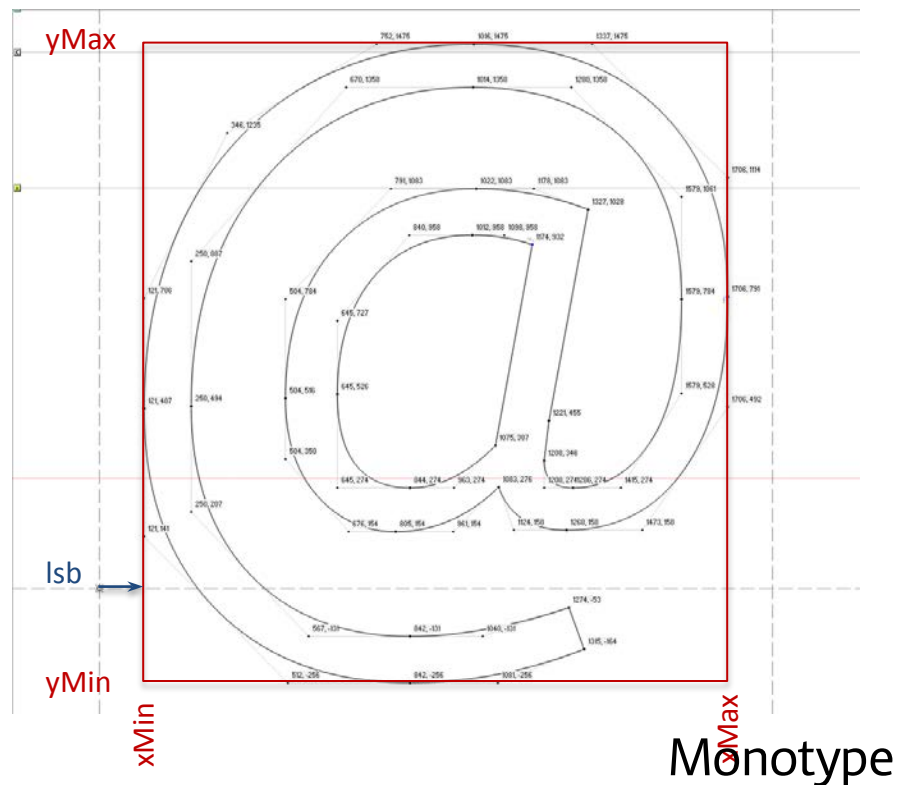
2016: WOFF 2.0 Candidate Recommendation

WOFF2 (EOT Reinvented)

- EOT includes MicroType Express[®] (MTX) content-aware preprocessing steps yielding ~ 15% size reduction compared to original font data
- LZMA – a new, complex entropy coder yielding ~ 12% in lossless compression gain over gzip
- MTX + LZMA – the best of both worlds combined?
- WOFF2 design restrictions
 - Single-pass decoding
 - Compression may be slow(er) but decompression has to be fast!

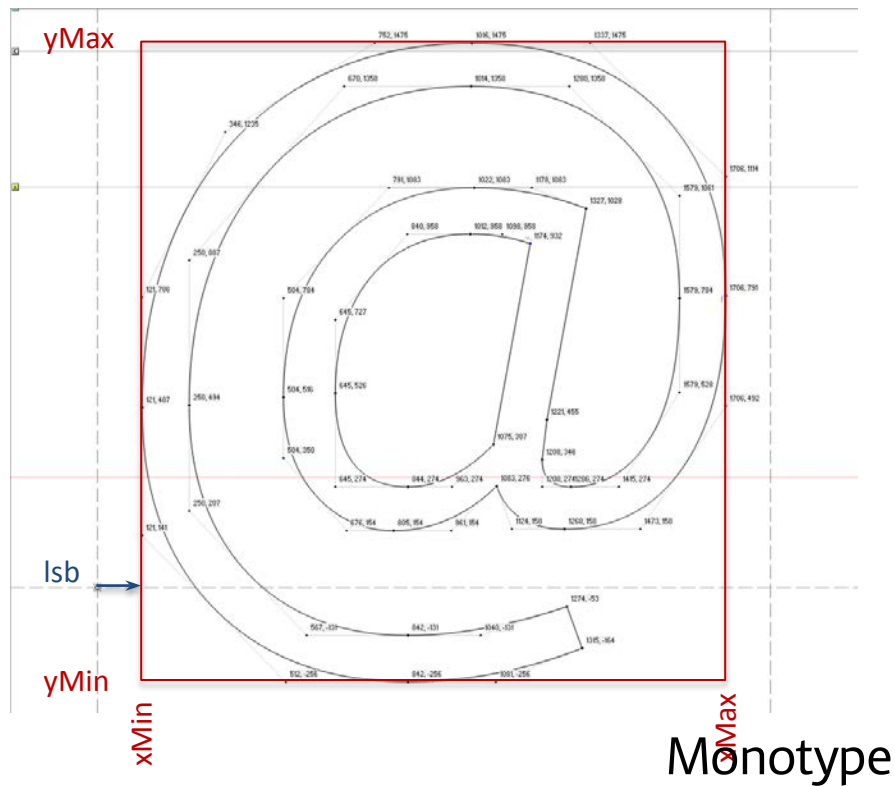
MTX

- TTF has a lot of built-in redundancy
 - Can be eliminated to reduce data size
 - Can be restructured to improve compression gains (e.g. coordinate stream)



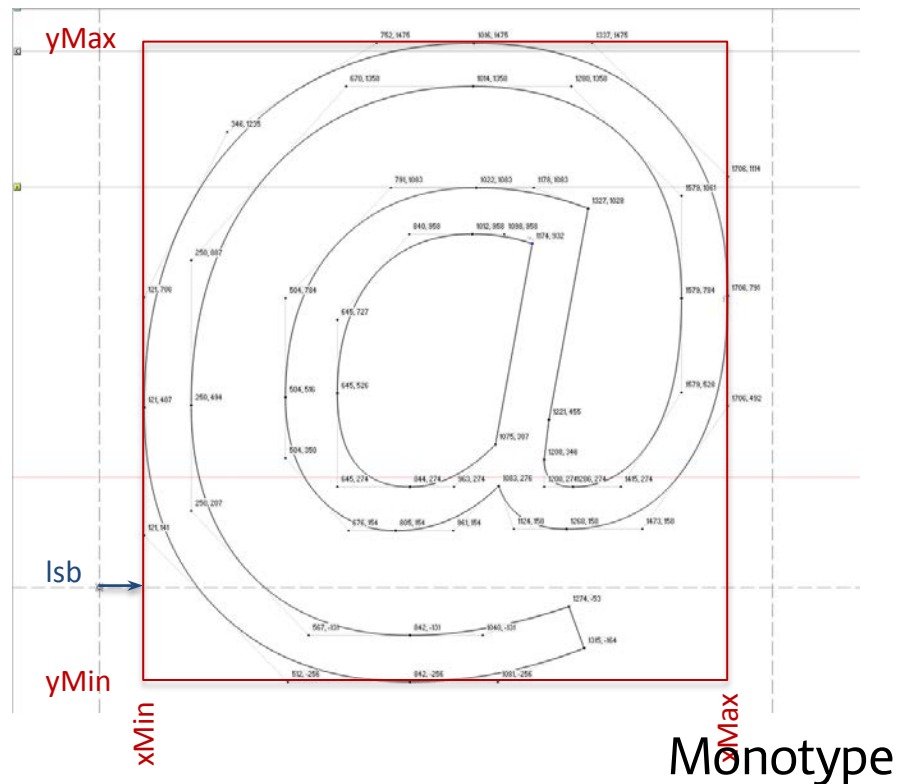
MTX

- MTX preprocessing
 - Bounding box eliminated (if it can be reconstructed from the outline coordinates)
 - Hint instructions, push data and the rest of the font tables are organized in three data sets
 - 'loca' table eliminated – reconstructed when glyph records are restored



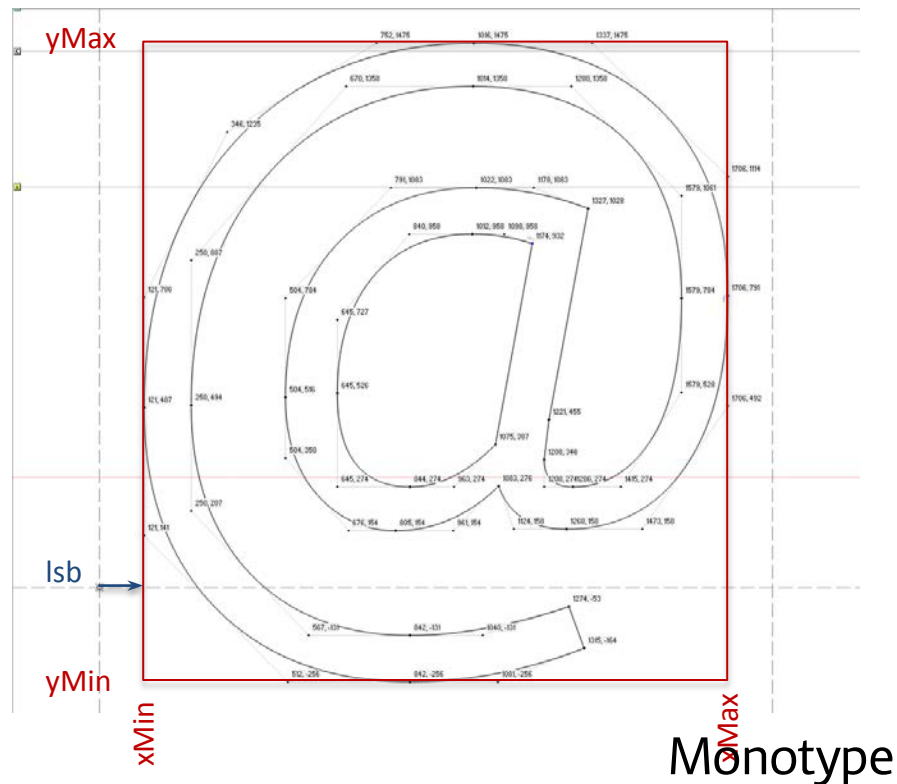
MTX

- Other ideas borrowed from MTX
 - Variable-length data types
 - Triplet encoding for point coordinates
- MTX parts that didn't make it
 - 'cvt', 'hdmx' and 'vdmx' table optimizations, "Push Data" processing – added complexity with diminishing returns
 - Minimal or no gains with improved entropy coding



WOFF2

- Content-aware preprocessing
 - Bounding box eliminated (same as in MTX)
 - LSB data eliminated (if matches bounding box xMin) – **new in WOFF2**
 - ‘loca’ table eliminated (same as in MTX)
 - Flags, Instructions and glyph point coordinates are split & concatenated into separate data streams



TTF glyphs vs. WOFF2 glyphs

```
glyfTable {  
    glyfRecord[];  
}  
glyfRecord {  
    numContours;  
    boundingBox[];  
    endPoints[];  
    instructionLength;  
    instructions[];  
    flags[];  
    xCoordinates[];  
    yCoordinates[];  
}
```

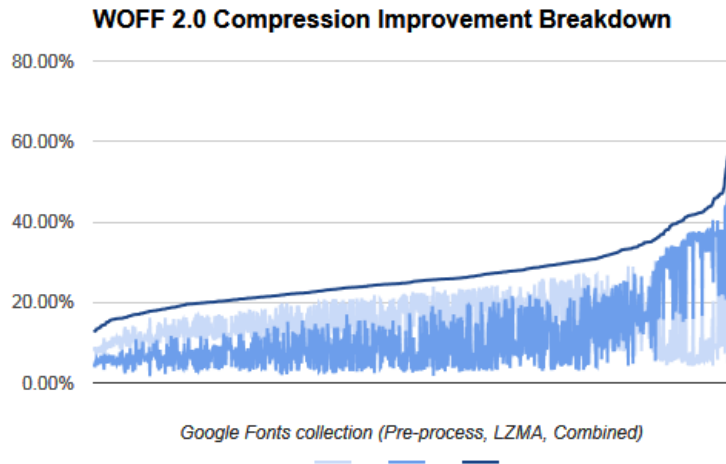
```
glyfTable {  
    numGlyphs;  
    indexFormat;  
    streamSizes[];  
    nContourStream[];  
    nPointStream[];  
    flagStream[];  
    glyphStream[];  
    compositeStream[];  
    bboxBitmap[];  
    bboxStream[];  
    instructionStream[];  
}
```

WOFF2

WOFF 2.0 Preprocess + LZMA	Compression Improvement (above WOFF 1.0)		
	WOFF 2.0 Preprocess	WOFF 2.0 LZMA	WOFF 2.0 Preprocess + LZMA
Average	14.45%	11.96%	26.40%
Median	13.75%	8.76%	25.01%
Stdev	5.35%	9.27%	7.59%
Min	3.67%	1.63%	12.60%
Max	32.24%	53.11%	60.66%
68,120	10.17%	45.54%	55.71%
69,960	10.57%	44.54%	55.11%
69,308	9.72%	44.02%	53.74%
713,892	32.24%	20.66%	52.90%
19,248	7.70%	44.16%	51.86%
15,840	7.68%	43.20%	50.88%
784,040	27.32%	21.85%	49.18%
78,580	25.25%	23.15%	48.40%
59,272	26.06%	22.11%	48.17%
707,620	21.47%	25.94%	47.41%
55,640	9.11%	38.01%	47.12%
56,476	9.36%	37.72%	47.08%
62,984	14.30%	32.72%	47.03%
56,736	9.39%	37.62%	47.01%
57,752	25.01%	21.99%	47.00%
56,584	9.19%	37.71%	46.90%

- LZMA

- Good compression ratios but *_very_slow_*
- “Too complex to write a specification” (Igor Pavlov, LZMA inventor)



Brotli (the next best thing since sliced bread)



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Brotli design

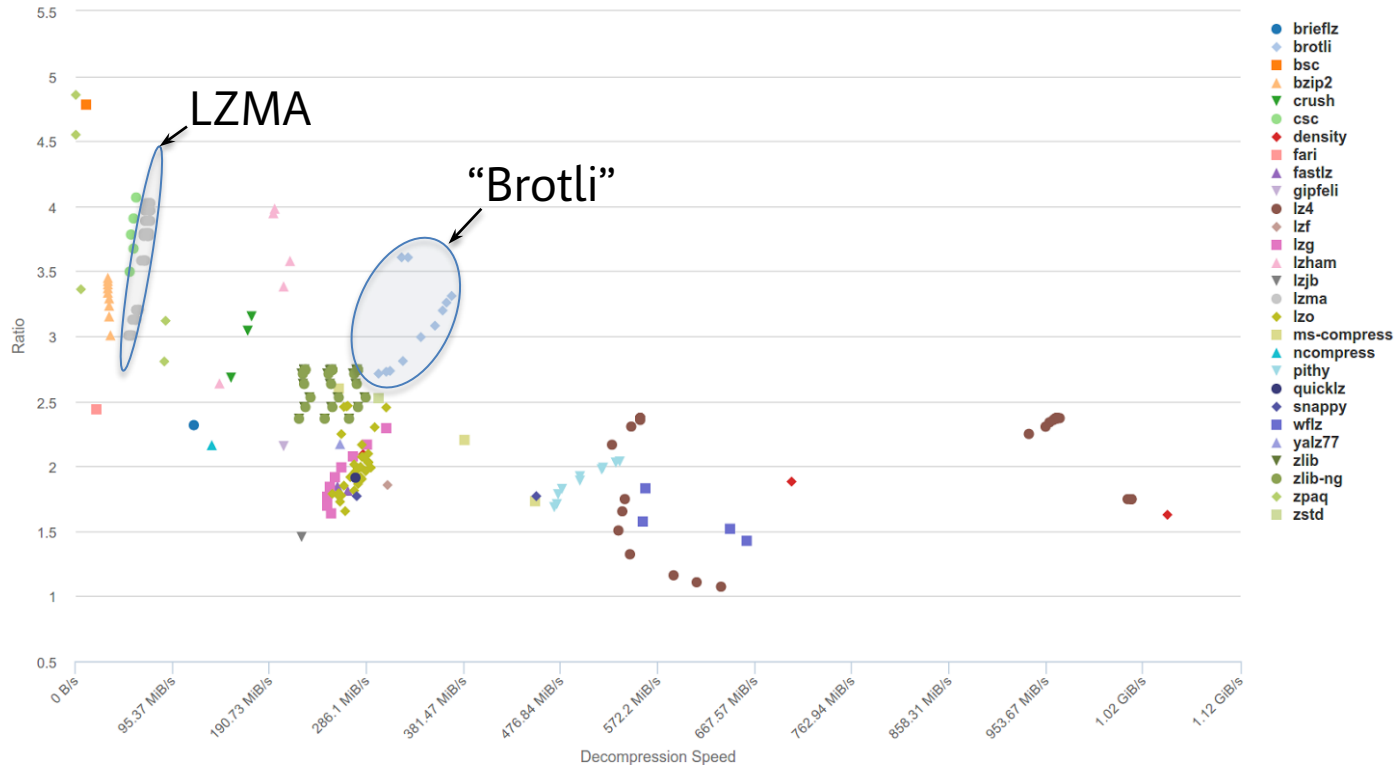
- Brotli is a new general-purpose lossless data compression format.
- Brotli is an improved Deflate (RFC1951, gzip, zip, deflate, ...):
 - 2nd order context, i.e., how consequent bytes depend on each other.
 - Reuse of entropy codes (cheaper switching of streams, HTML, English, HTML, JavaScript, Chinese, back to English)
 - Plenty of other small technical improvements that add up to big gains
- Designed for WOFF 2.0
 - based on good experiences with deploying Zopfli in WOFF 1.0

Brotli performance

- Compression speed similar with gzip and Zopfli.
 - “Compression Performance Dial” - a full range of 0.5 to 150 MB/s compression speeds are available for controlling the trade-off between speed and compression density.
- Compression density is increased by 17–25 %
- Decompression speed similar with gzip and Zopfli. Around 300 MB/s with a desktop computer, 50 MB/s on a mobile phone

WOFF2 Entropy coder

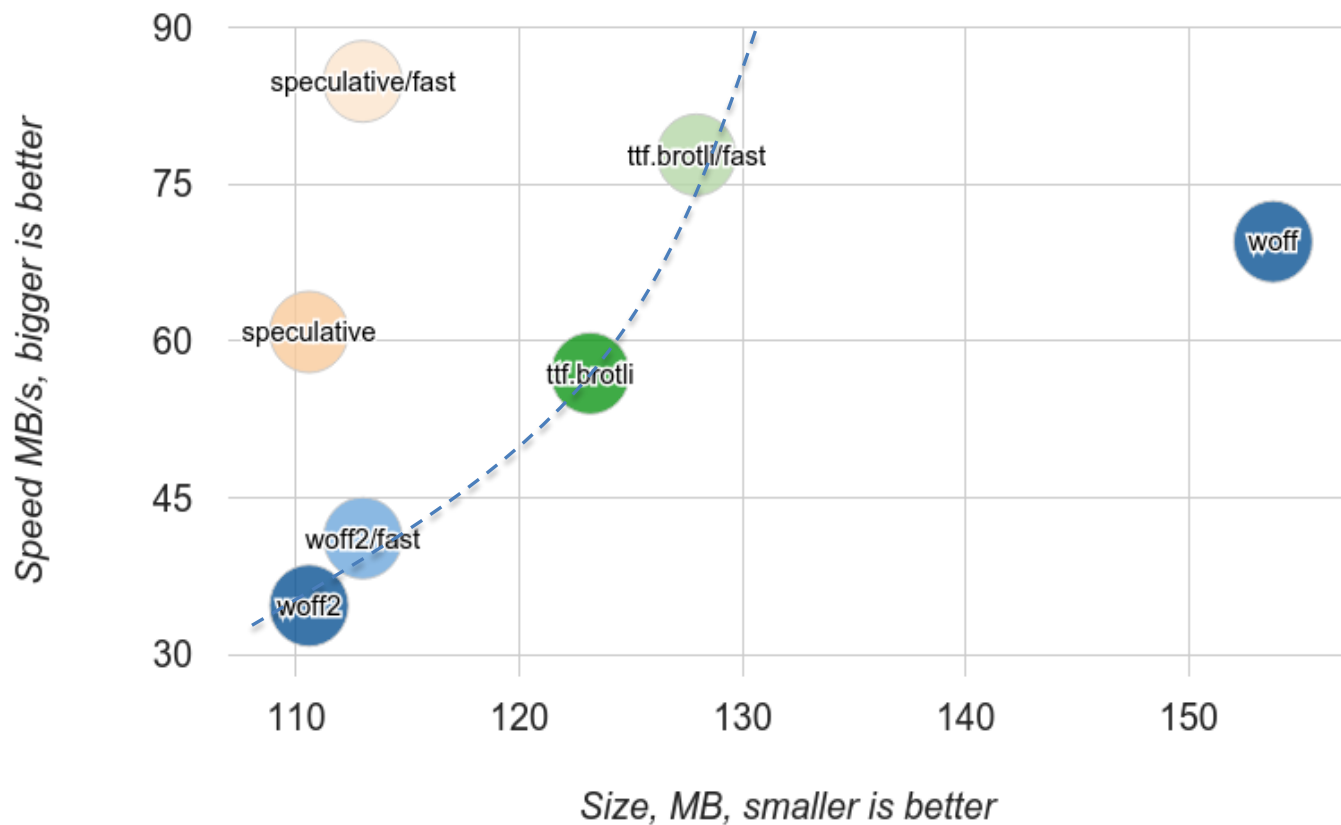
COMPRESSION RATIO VS. DECOMPRESSION SPEED %



Highcharts.com

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What if WOFF2 gets “Reinvented”



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WOFF2 Adoption

- Chrome (since version 36)
- Opera (since version 23)
- Firefox (since version 39)
- Edge
- Safari



```
return equalIgnoringCase(format, "truetype") || equalIgnoringCase(format, "opentype") || equalIgnoringCase(format, "woff");
return equalIgnoringCase(format, "truetype") || equalIgnoringCase(format, "opentype")
#if (PLATFORM(IOS) && __IPHONE_OS_VERSION_MIN_REQUIRED >= 100000) || (PLATFORM(MAC) && __MAC_OS_X_VERSION_MIN_REQUIRED >= 101200)
    || equalIgnoringCase(format, "woff2")
#endif
|| equalIgnoringCase(format, "woff");
```

- Can I use WOFF2? (<http://caniuse.com/#feat=woff2>)

Web Fonts Adoption (stats)

Total Font Views
8,231,920,470,949

2015 Apr 11 - 2016 Apr 10

7 days 30 days 90 days 1 year

Font family	Designer	Total views	1 year views	1 year change
<input type="checkbox"/> Open Sans	Steve Matteson	2,019,682,315,07	1,081,930,696,20	55%
<input type="checkbox"/> Roboto	Christian Robertson	1,132,106,876,51	715,346,253,162	137%
<input type="checkbox"/> Oswald	Vernon Adams	389,284,569,604	182,191,974,575	19%
<input type="checkbox"/> Lato	Lukasz Dziedzic	381,797,332,930	224,954,949,333	73%
<input type="checkbox"/> Slabo 27px	John Hudson	299,577,468,821	211,142,225,301	113%
<input type="checkbox"/> Roboto Condensed	Christian Robertson	231,649,703,172	149,877,634,684	80%
<input type="checkbox"/> Droid Sans	Steve Matteson	202,910,597,681	69,104,973,292	20%
<input type="checkbox"/> Source Sans Pro	Paul D. Hunt	183,837,454,138	104,680,985,938	68%
<input type="checkbox"/> PT Sans	ParaType	181,426,124,207	85,776,278,677	31%
<input type="checkbox"/> Open Sans Condensed	Steve Matteson	163,071,075,949	72,169,589,681	7%
<input type="checkbox"/> Lora	Cyreal	155,054,686,347	108,548,215,816	2%
<input type="checkbox"/> Montserrat	Julieta Ulanovsky	134,267,757,601	94,873,109,371	166%
<input type="checkbox"/> Raleway	Multiple Designers	132,704,152,552	81,540,524,902	73%
<input type="checkbox"/> Ubuntu	Dalton Maag	123,744,326,862	59,790,912,171	45%
<input type="checkbox"/> Droid Serif			49,564,466,971	14%
<input type="checkbox"/> Roboto Slab			54,051,067,283	88%

Total views

2,019,682,315,07

VS.

YouTube gangnam style

PSY - GANGNAM STYLE(강남스타일) M/V

officialpsy 8,958,557

2,554,484,664

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WOFF is brought to you by ..



WOFF is brought to you by ...



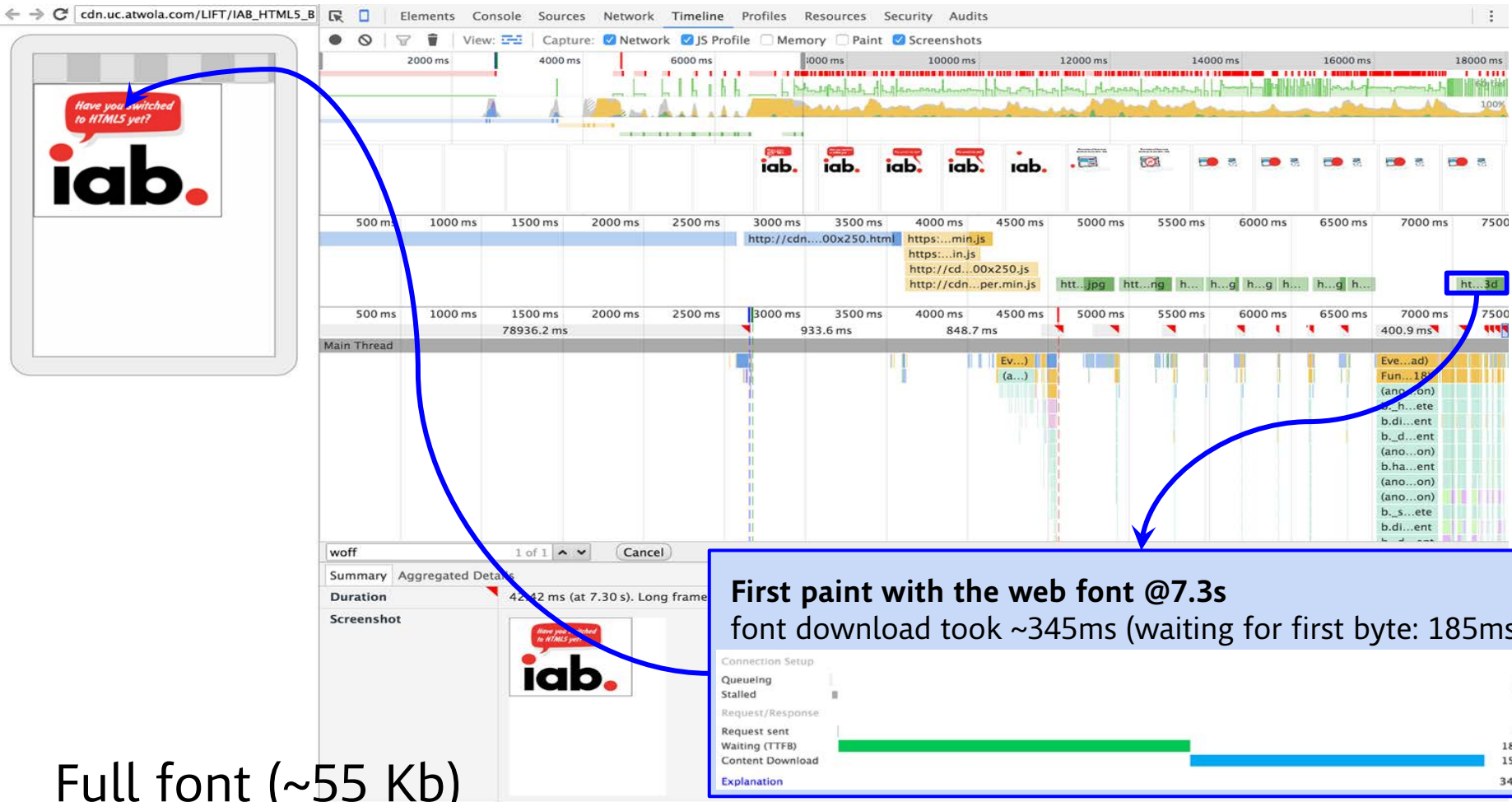
WOFF2 References

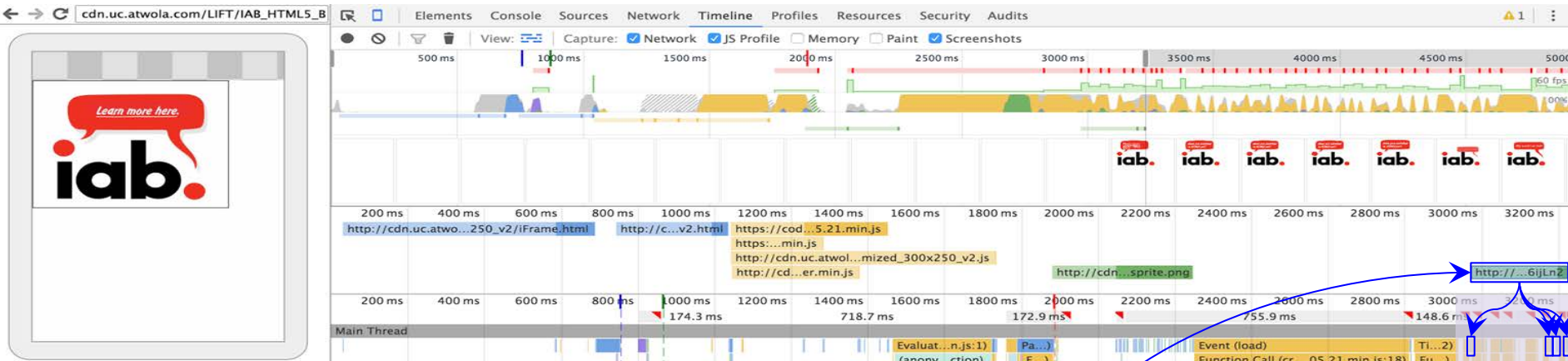
- Web fonts adoption trends
<http://httparchive.org/trends.php?s=All&minlabel=Nov+15+2010&maxlabel=Mar+15+2016#perFonts>
- WOFF2 Specification
<https://dev.w3.org/webfonts/WOFF2/spec/>
- WOFF2 Evaluation Report
<https://www.w3.org/TR/WOFF20ER/>
- WOFF2 Reference Implementation
<https://github.com/google/woff2>
- WOFF2 Conformance Test Suite
<https://github.com/w3c/woff2-compiled-tests>
- WOFF2 performance improvements:
https://docs.google.com/presentation/d/10ZuRkawUDmeNKQCKmXrenCBva53NBKSwFzaBWEmn-8Y/pub?start=false&loop=false&delayms=3000#slide=id.ge3ca6265b_0_0

Web Fonts in Digital Ads

- IAB “HTML5 for Digital Ads” guidelines are published on April 11, 2016
 - Subclause 3.4 is dedicated to “Text and Fonts” and offers an excellent summary of all the benefits us using real fonts in digital ads, *including those that are hosted online!*

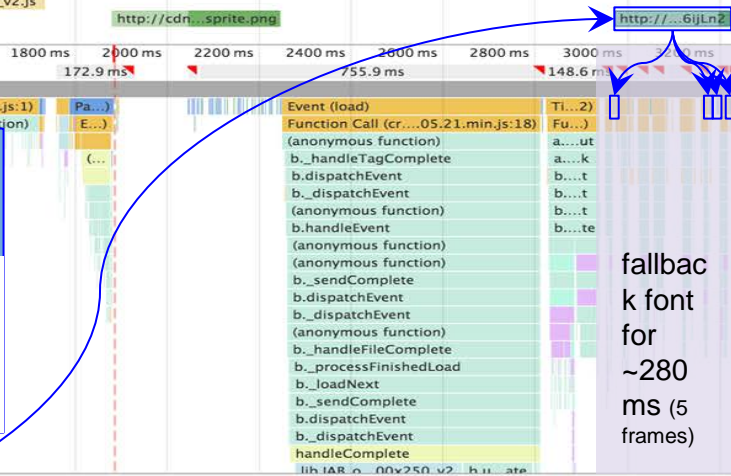






Subset font download took ~250ms
(210ms waiting for first byte)

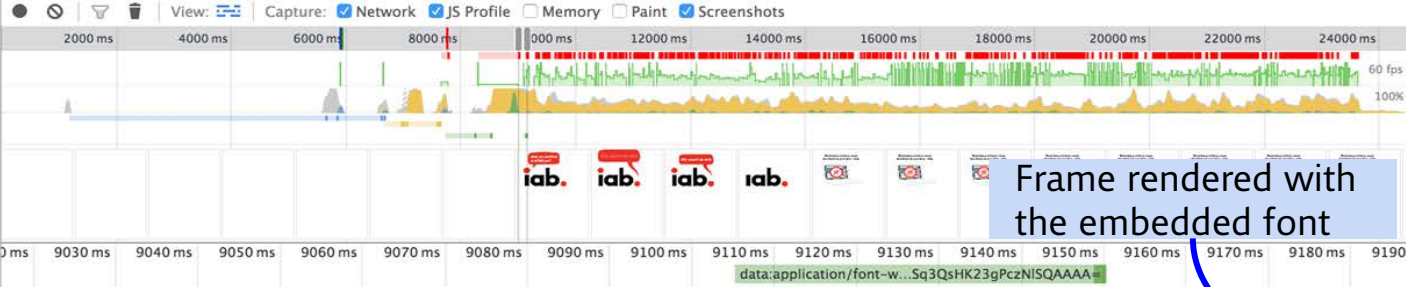
Connection Setup	TIME
Queueing	3.11 ms
Stalled	4.88 ms
Request/Response	
Request sent	0.52 ms
Waiting (TTFB)	209.64 ms
Content Download	15.44 ms
Explanation	233.60 ms



fallback font for ~280ms (5 frames)

Summary	Aggregated Details
URL	http://apiadn.fonts.com/v2/fonts/subset?x=1KVEiMfj80v%2fwAp5ZqzXR19V1bd%2fn_a2pggaHacqVm0QRvHcxB0iag%2fr1N2WbGxou3c7v1wVEACPbfqv4ihUhcRQMwAvXqx6ijLn2
Duration	253.50 ms
Request Method	GET
Mime Type	application/font-woff

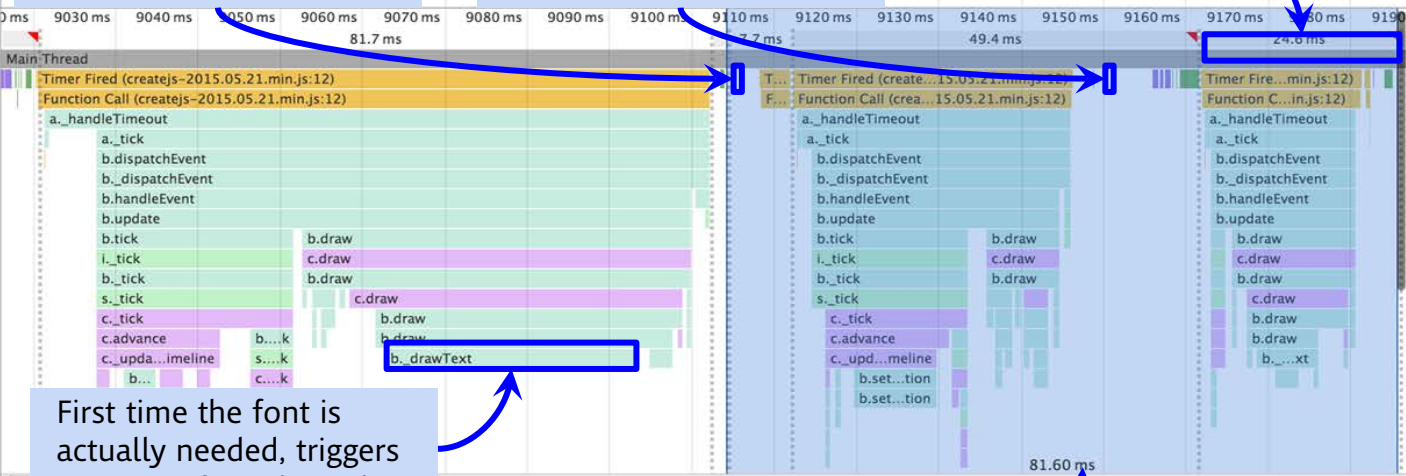
Subset font (~10 Kb)



Frame rendered with the embedded font

embedded font request

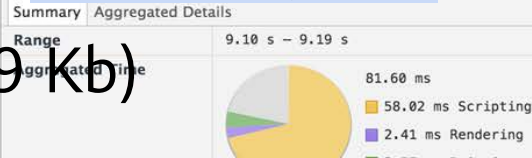
embedded font "loaded"



First time the font is actually needed, triggers a request for it (guess).

Fallback font visible for 60~80ms (with 2 frames rendered).

Data URI (~19 Kb)



Typography use cases are much broader than web sites!



Langsamer Mac?
Mindestens 25 %
Beschleunigung mit MacKeeper

Jetzt herunterladen



UP TO **60% OFF**
DESIGNER BRANDS

FREE SHIPPING

MYHABIT
by amazon.com

SIGN UP FOR FREE >



AT&T 3G 9:42 PM

ESPN Mobile Web Done

ESPN MLB Menu

CLE 0 Mid 6th MIN 3

JIM BEAM

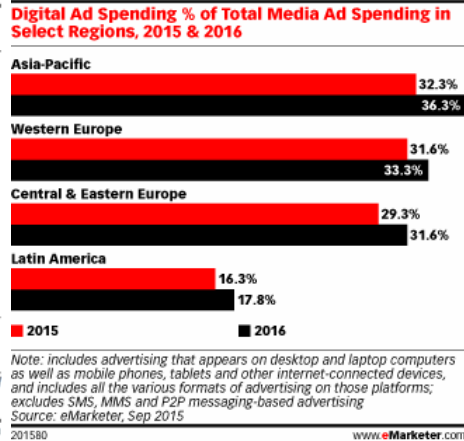
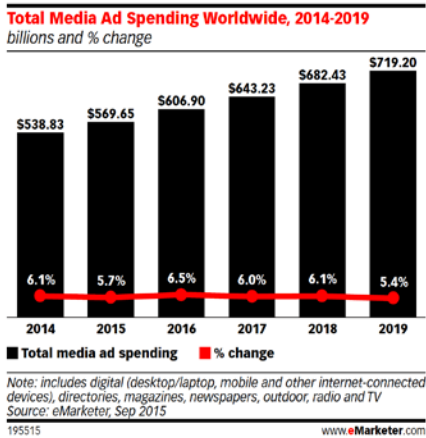
THE BOURBON
SINCE 1795

Jim Beam® Kentucky Straight Bourbon Whiskey, 40% Alc/Vol.
©2010 James B. Beam Distilling Co., Clermont, KY

drink smart

For this game: Alerts

Digital Advertising is a huge opportunity



- Global economy / Global brands
- HTML5 Ad Impressions are 10x to 100x higher vs. Web Page Views
- Text-as-Images are default behaviour
- “Mini little HTML5 web sites” inside larger websites
- Responsive, Cross Screen, Dynamic, Personalized, Localized Content driving real text use
- Remind you of anything? Same drivers that fueled web font adoption to 60%+



Flashpocalypse Now

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Browsers no longer render Flash Plug-in Content

Google – June 30th, 2016 deadline!

Updates

Images of Empty Tahrir Square Secured by Military
Video Appears to Show Protesters Shot in Ismailiya
Swedish Journalist Reports Dozens Dead at Mosque

UPDATES »

Bloomberg's Most Popular Legacy: Health Crusades

BY JAMES BARBARO and MEGAN THEE-BRENAN 10:03 AM ET

R. Bloomberg's efforts to modify behavior are now largely embraced by others, according to a Times poll, but he's still ready for him to go.



Safari's "Power Saver" in action: a Flash banner ad loads, but will not run unless clicked on by the user.

HTML



The common language
of the web

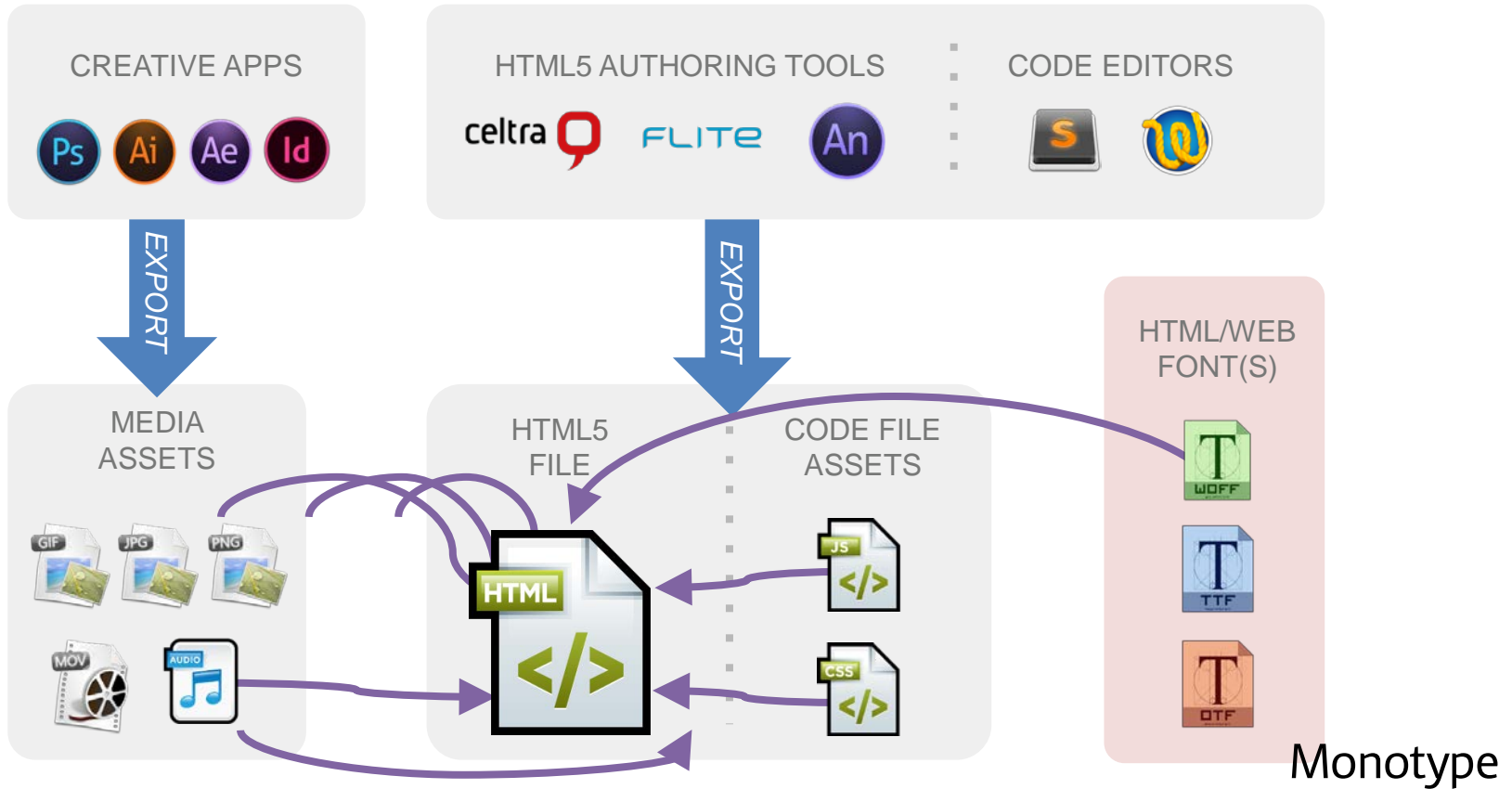
Open source industry
standard

Ubiquitous support
across every device

Wide choice of
authoring methods

Monotype

HTML5 ads are many files. Same as web pages.



On the Cusp of Availability

Today

Awareness

Industry Partners, Partner Tools, Flaspocalypse, Marketing & Education, Move Away from Text-As-Images

Availability

Partner Tools, DA License Product, Sell Direct & via Distribution Partners

Adoption

Partner Tools, License Product, Direct Sales & Distribution Sales

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A man is crawling through a muddy obstacle course. He is wearing a white tank top and shorts, and his body is covered in mud. He is looking back over his shoulder with a determined expression. In the background, other participants are also crawling through the mud, and the course is enclosed by barbed wire. The scene is outdoors and appears to be a competitive event.

Web Fonts in HTML5 Ads: Perceived Obstacles

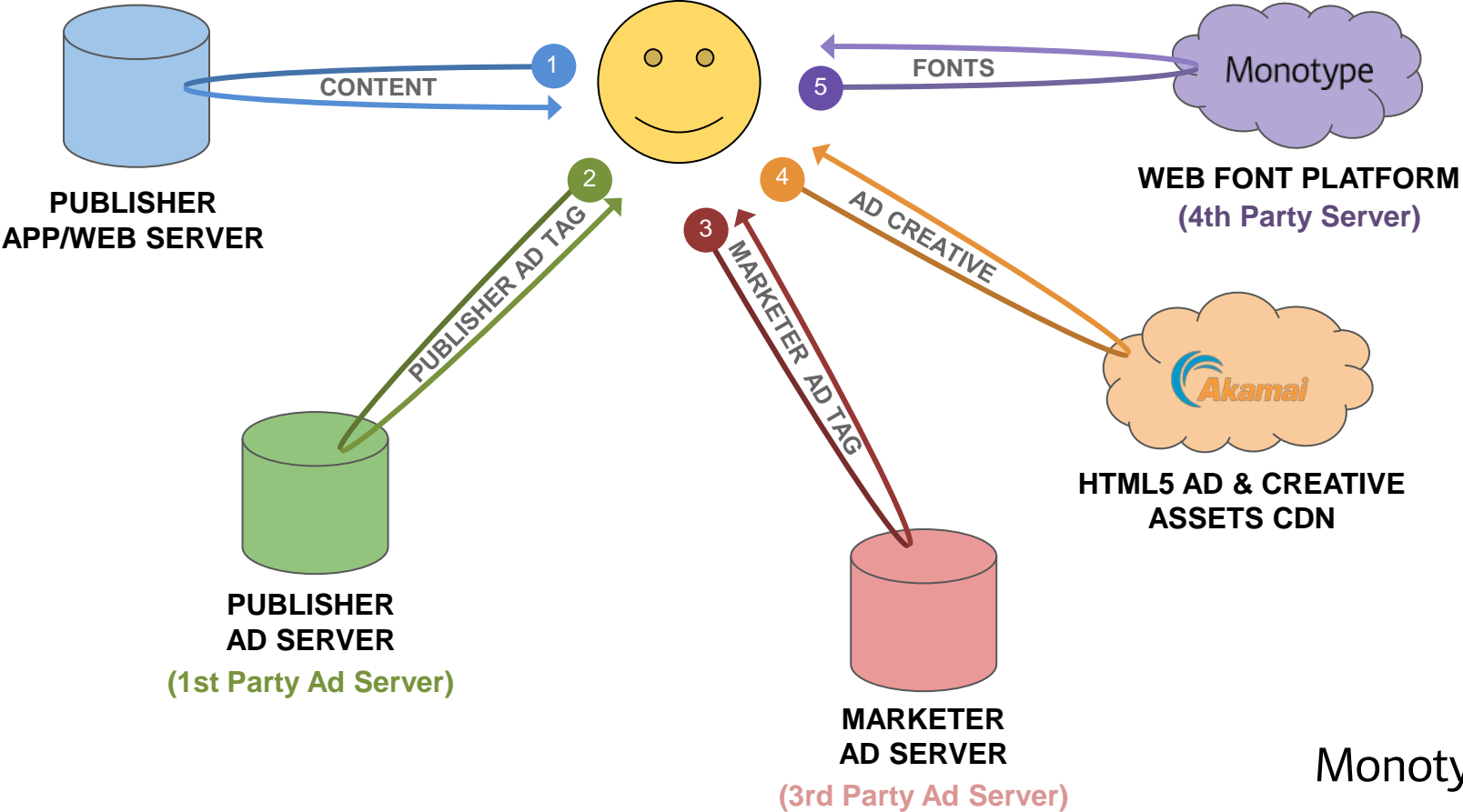
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Web Fonts in Ads Have Licensing Obstacles...



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Web fonts Have Certification Obstacles...



Web Fonts in Ads Have File Weight Obstacles?



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Subsetting to the Rescue!

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	
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/	¼	½	¾	%	‰	+	-	±	×	÷	=	≠	≈	<	>	≤	≥	μ	¬	Δ	Ω	π	∞	∂	∫	√	

Image From: Bram Stein (<http://bramstein.com/writing/web-font-anti-patterns-subsetting.html>)

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The Interactive Advertising Bureau

- IAB “HTML5 for Digital Ads” guidelines... April 11, 2016
- Publicly endorse Web Fonts in Digital Ads
 - *My favorite quote:*
“**Server-side support:** The fonts used by your ad unit(s) may be hosted online by third party servers (such as ad servers and publishers or web font service providers).”



Innovation – Technology Enablers

- WOFF2.0
- HTTP 2 – reduce # of Refer Requests
- Base64 Encoding (has been done on the web for a while)
 - Fonts inline with HTML of the ad
- Font subsetting
 - Font embedding in the ad (the Flash model)
- Reduce overhead and improve performance
 - Ad Load Times

Innovation – New License Products

- Ad Serving requires a different license
 - No Domain Restriction
 - Allows for distribution/embedding of fonts within HTML5, SWF, SVG, etc.
 - Tracking/counting code optional
 - Can be paid for after the campaign runs
 - Font Subsetting tools provided within Monotype account
 - Desktop font license included
- Make things easier for end users and they will do the right thing

Innovation - New Business Models

- Continued Market education needed
 - HTML5 is a different use case, layman's explanation as to why you need a license!
- Focus on solving the end user problem
- Tools & Partnerships
 - HTML5 Ad / Content Authoring Tools
 - Hand Rolling editors & web optimization libraries
 - Custom Font Uploads
 - Fonts should be as easy to use as they are in MS Word
- CPM-based (cost per 1000 Ad Impressions) pricing
 - Subscription or perpetual models are valid options



who am I?