Image Optimization:

9 best practices
(and some tools)

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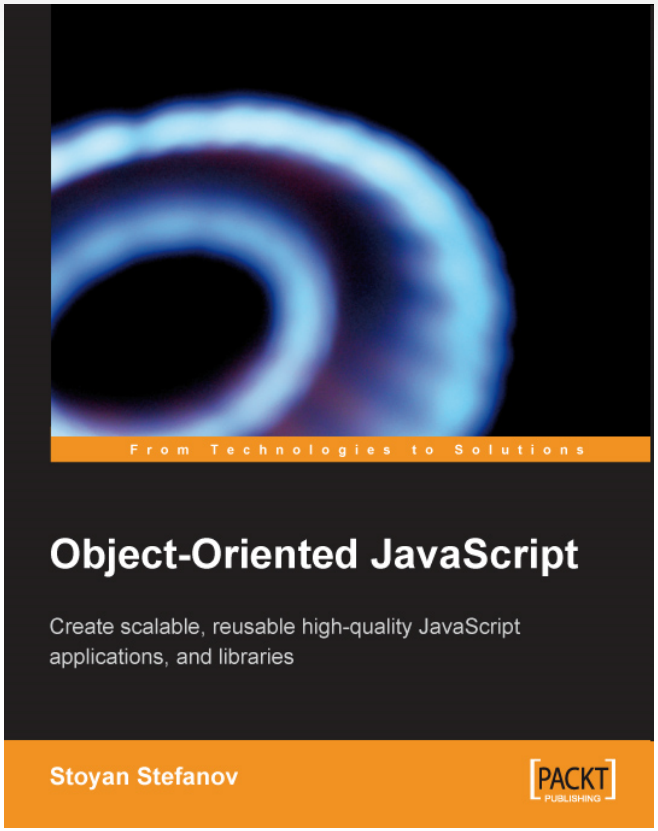
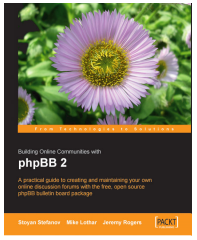
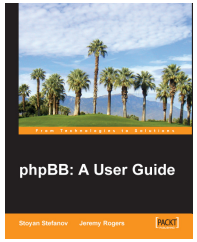
php|works + PyWorks, Atlanta, 2008

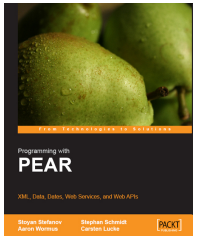
About the presenter

- Exceptional Performance
- http://developer.yahoo.com
- YSlow 2.0: architect, dev
- Smush.it: http://smush.it
- Blog: http://phpied.com









Best practices

- Choose PNG over GIF
- Crush PNGs
- Strip JPEG metadata
- Optimize GIF animations
- Try PNG8
- Avoid `AlphaImageLoader`
- Crush dynamic images
- Make favicons small and cacheable
- Use CSS sprites

Hmm, images?

Q: Is this really important?

A: Let's survey the global top 10 sites.

What % of page weight is images?

1	Yahoo!	29%
2	Google	75%
3	YouTube	62%
4	Live.com	64%
5	MSN	41%
6	MySpace	48%
7	Wikipedia	39%
8	Facebook	35%
9	Blogger	27%
10	Yahoo! JP	36%

- Average

  45.6%
- Not exactly half, but pretty close
- Your site may be different, amazon.com for example is 71% images
- huge potential

LOSSLESS!

#1: Choose PNG over GIF

GIF vs. PNG

	GIF	Palette PNG (aka PNG8, aka indexed)	Truecolor PNG
Number of colors	256	256	Up to 48bit
Transparency	Boolean (on/off)	Alpha (variable) *	Alpha (variable) *
Browser support	Nearly all	All A-grade (96%+)	All A-grade (96%+)
Animation	Yes	No (future)	No (future)

* some IE < v.7 issues

PNG transparency and IE

Truecolor PNG

IE 7 and up

IE 6 and earlier

PNG8

IE 7 and up

IE 6 and earlier

GIF vs. PNG

- Verdict: IE7+ is OK; IE6 supports GIF-like transparency
- PNG8 can do everything a GIF can do, and more (sans cheesy Web 1.0 animations)
- PNG8 works across all A-Grade browsers

Q: And what about the size?

A: Let's survey the top 10 sites and convert all GIFs to PNGs to check if there are savings

GIF-to-PNG

1	Yahoo!	9.55%
2	Google	22.95%
3	YouTube	33.82%
4	Live.com	19.93%
5	MSN	13.53%
6	MySpace	17.65%
7	Wikipedia	No GIFs!
8	Facebook	17.47%
9	Blogger	24.27%
10	Yahoo! JP	24.58%

- Average

20.42% savings

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#2: Crush your PNGs

About the PNG chunks

- PNGs store information in "chunks"
- Most chunks can safely be deleted
- Most image programs DO NOT optimize
- Command line tools:
  - pngcrush http://pmt.sourceforge.net/pngcrush/
  - pngrewrite http://www.pobox.com/~jason1/pngrewrite/
  - OptiPNG http://www.cs.toronto.edu/~cosmin/pngtech/optipng/
  - PNGOut http://advsys.net/ken/utils.htm
- Example:

```
> pngcrush -rem alla -brute -reduce
  src.png dest.png
```

Crush top 10 and check for savings

1	Yahoo!	15.52%
2	Google Reader	22.60%
3	YouTube	17.32%
4	Live.com	No PNGs
5	MSN	No PNGs
6	MySpace	25.44%
7	Wikipedia	21.32%
8	Facebook	9.08%
9	Blogger	1.07%
10	Yahoo! JP	No PNGs

- Average

16.05% savings

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#3: Strip JPEG metadata

JPEG metadata

- Comments
- EXIF
  - camera information
  - thumbnail!
  - audio!?!
  - …
- Application specific (e.g. Photoshop)

Lossless JPEG operations

- jpegtran (http://jpegclub.org/)
- Free command-line tool
- Loseless operations such as crop, rotate
- You probably have it installed already

Example:

```
> jpegtran -copy none -optimize src.jpg
  dest.jpg
```

-progressive?

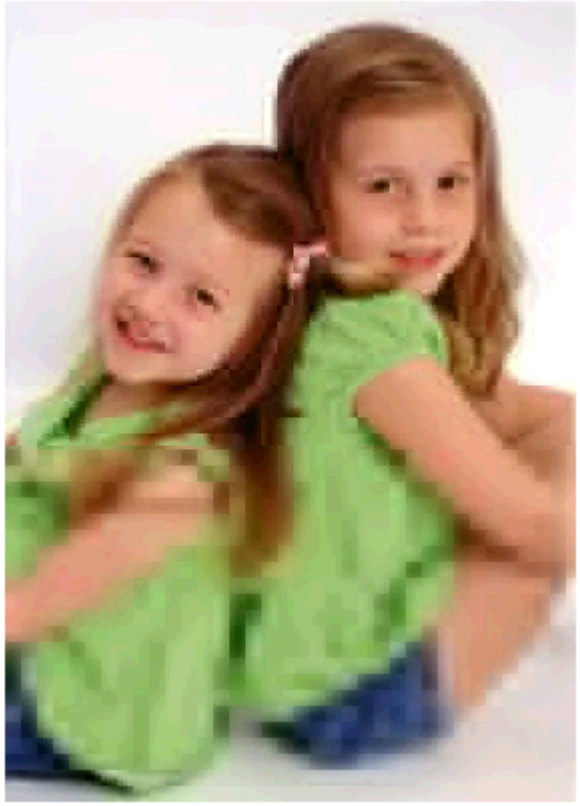
“baseline” JPEG - 1

“baseline” JPEG - 2

“baseline” JPEG - 3

Progressive loading - 1

Progressive loading - 2



Progressive loading - 3

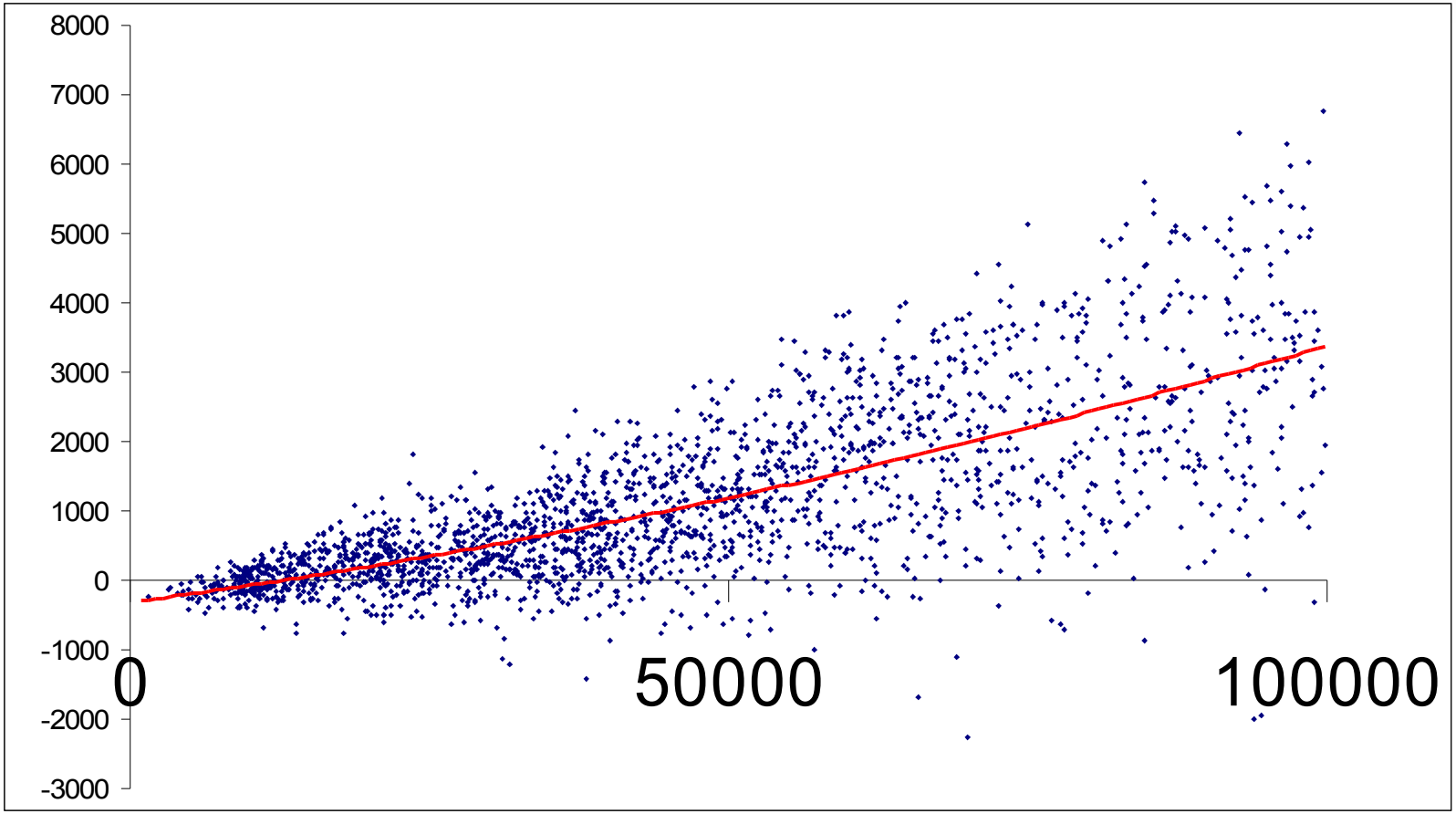
Experiment: jpegtran and 10360 images

- Using Yahoo Image Search API
- Download 12000 images – query: “monkeys”, “babies”, “flowers”, “kittens”…
- Cleanup 4xx responses and incorrect file types
- Run jpegtran
  - with `-optimize` flag
  - with `-progressive` flag

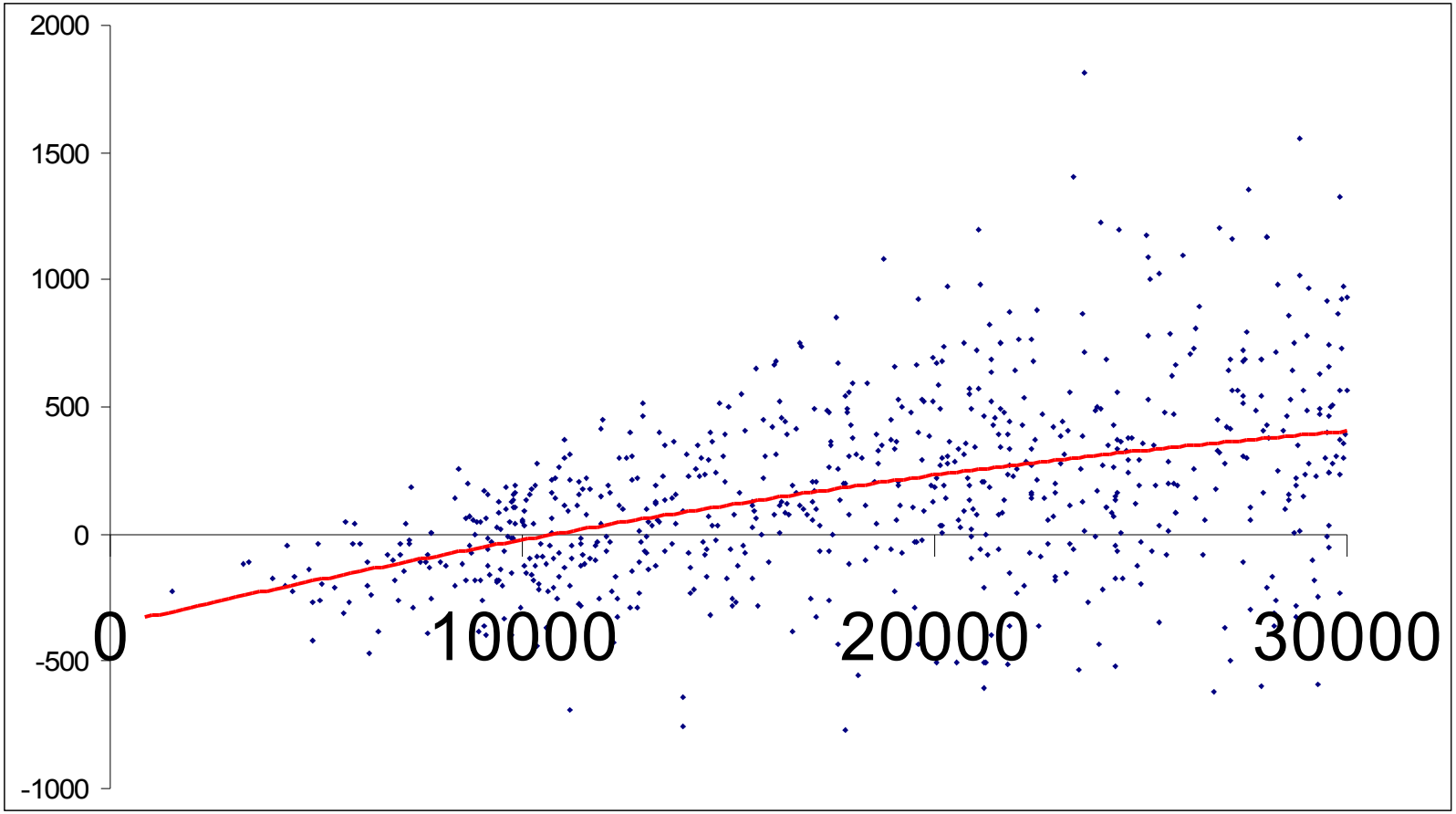
Running jpegtran on 10360 images

- Stats:
  - The average JPEG on the web today is 52.07K (median size)
  - Can be optimized to 47.36K or 9.04%
  - Converted to progressive is 46.11K or 11.45%

Progressive vs. optimized baseline



Progressive vs. optimized baseline



Progressive vs. optimized baseline

- Progressive is usually* better for bigger** images
- Baseline is better for thumbs

- * usually = 84%
- ** bigger = 10K and over

- This is just the trendline
- If offline and don’t care about consistency, try both (“bruteforce”)

In any event…

- You can strip out ~10% of your JPEGs
- with no quality loss

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#4: Optimize GIF animations

Animated GIFs

- Some pixels don’t change from one frame to the other
- Make them transparent
- gifsicle – http://www.lcdf.org/gifsicle

```
> gifsicle o2 source.gif > dest.gif
```

Review

1. Convert GIFs to PNG
2. Crush PNGs
3. ~~Strip JPEG metadata~~

   Try progressive JPEG

- Optimize animated GIFs

a.k.a....

smushit

#5: Make all PNGs palette PNGs *

* but visually check the result

(or wait for someone to complain, chances are you'll be waiting in vain ;)

Truecolor vs. palette PNGs

- Palette PNGs (PNG8) have 256 colors
- Truecolor PNGs could have millions
- In practice, truecolor PNGs often have less than 1000 colors
- Otherwise it would mean they are photos and should be JPEGs
- Human eye is not that sensitive

Truecolor vs. palette PNGs

- Convert truecolor to palette
- How about 50% savings?
- Solves IE<7's little alpha transparency problem

- Warning 1: LOSSY
  - But no one will ever know
- Warning 2: automation is hard when there's alpha

Truecolor vs. palette PNGs

Command-line tools:

- pngquant (http://www.libpng.org/pub/png/apps/pngquant.html)
- pngnq (http://pngnq.sourceforge.net/)

Example:

```
> pngquant 256 src.png
```

#6: Avoid `AlphaImageLoader`

CSS filters

- Back to the problem with truecolor PNG alpha transparency in earlier IEs
- `AlphaImageLoader` CSS filter to fix the issue

```
#mydiv {
  background: url(image.png);
  _background: none;
  _filter:progid:DXImageTransform.Microsoft.AlphaImageLoader
          (src='image.png', sizingMethod='crop');
}
```

CSS filters problems

- IE proprietary
- Blocks rendering, freezes the browser
- Increased memory consumption
- Per element, not per image!
- CSS code for sprites becomes messy

Avoid filters

- Best: Avoid completely, use gracefully degrading PNG8
- Fallback: use underscore hack `_filter` not to penalize IE7+ users

- Yahoo! Search saved 50-100ms for users of IE5&6

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#7: Crush dynamic images

Dynamically generated images

- GD library doesn't do what pngcrush does
- Generated images are bigger
- From big to small:
  generated GIF > generated PNG > crushed PNG
- Server resources on every request

Recipe for generated images

1st request:

- generate
- write to disk
- pngcrush
- serve

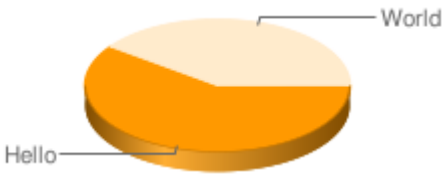
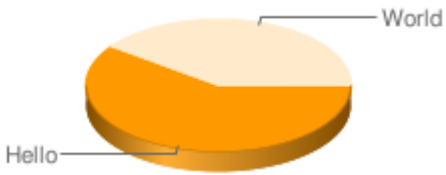
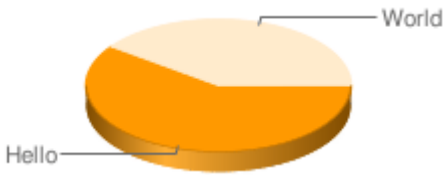
2nd request:

- serve cached

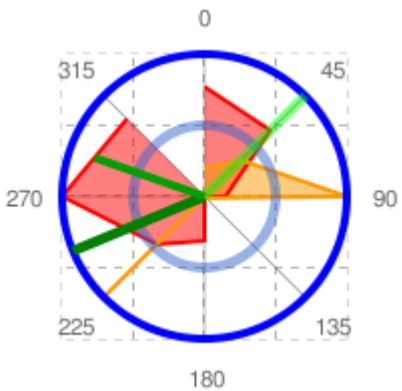
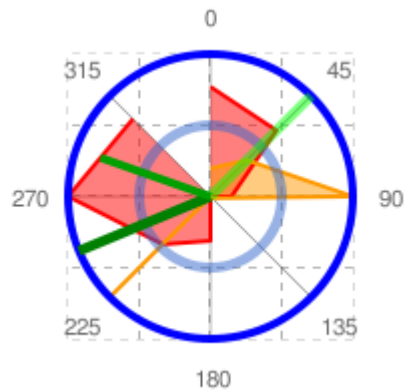
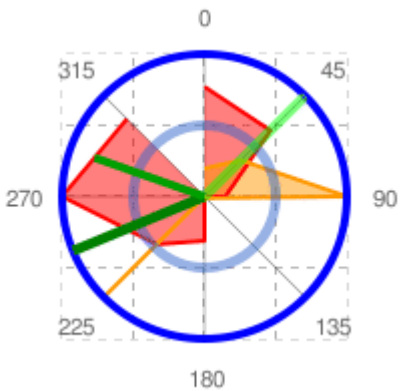
- Estimate

5-30% savings

Case study: Google charts API

Original (707 colors)	Crushed (707 colors)	PNG8 (256 colors)
		
	12% saving	38% saving

Case study: Google charts API

Original (1408 colors)	Crushed (1408 colors)	PNG8 (256 colors)
		
	25% saving	55% saving (1000+ colors are lost but who can tell?)

#8: Make favicon smaller

favicon.ico

- www.example.org/favicon.ico
  - The browser will request it
  - Better not respond with a 404
  - Cookies are sent
  - Cannot be on CDN
  - Interferes with the download sequence
- Make it small (<= 1K)
- Set Expires header (but not “forever”)

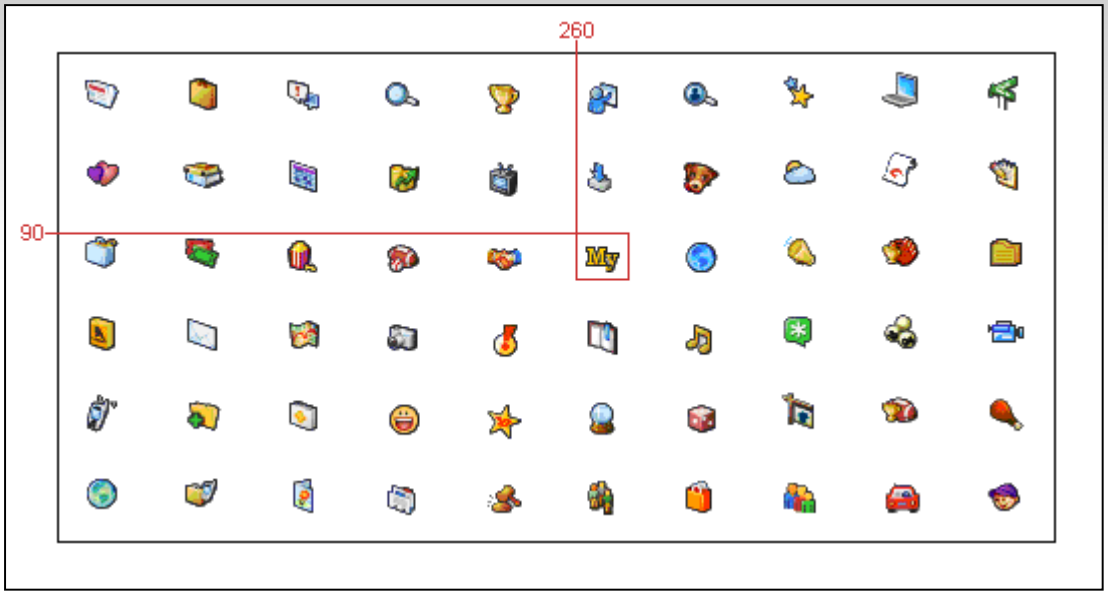
```
<link rel="shortcut icon"…> ???
```

favicon.ico

- Tools: imagemagick, png2ico
- Case study: Yahoo! Search - favicon.ico is 9% of all page views

#9: Use CSS sprites

CSS Sprites



CSS:

```
6  li {background: #fff url('sprites.gif') no-repeat 0 0;}
7  li.my{background-position: -260px -90px;}
```

...

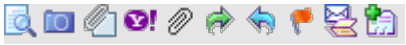
HTML:

```
142            <li class="my"><a href="#">My Yahoo!</a></li>
```

CSS Sprites

- Size of the combined image is usually less
- You save HTTP requests
- Articles:
  http://alistapart.com/articles/sprites
  http
  ://css-tricks.com/css-sprites-what-they-are-why-th

Optimizing sprites



Optimize CSS sprites

- Avoid gaps
- Stay within the 256 colors of PNG8

CSS sprites

- Creating…
- Maintaining…
- … is a pain

But there are tools:

- http://csssprites.com
- http://spritegen.website-performance.org

Wrapping up

You can save 10-30% in unnecessary image size!

Thank you!

slides…

Slides and other URLs

- Slides: http://slideshare.net/stoyan
- Blog: http://phpied.com
- Img opt series: http://www.yuiblog.com/
- Tool: http://smush.it
- Yahoo! http://developer.yahoo.com/performance

Credits

- http://svs.gsfc.nasa.gov/vis/a000000/a002600/a002680/ Apolo 17 Full-Earth Photograph
- http://www.w3.org/Graphics/PNG/inline-alpha.html W3C PNG Alpha Test
- http://www.sitepoint.com/blogs/2007/09/18/png8-the-clear-winner/ PNG8 - The Clear Winner