

O'REILLY®
Velocity
Web Performance & Operations
CONFERENCE

June, 14, 2011
Santa Clara, CA

velocityconf.com



mobile web
& html5
performance
optimization

[max firtman](#)

@firt

firt.mobi

who am I?

mobile+web developer

mobilexweb.com blog

wpo passionate



where?

buenos aires ~ argentina



patagonia
soccer
tango

true lies
tango scene



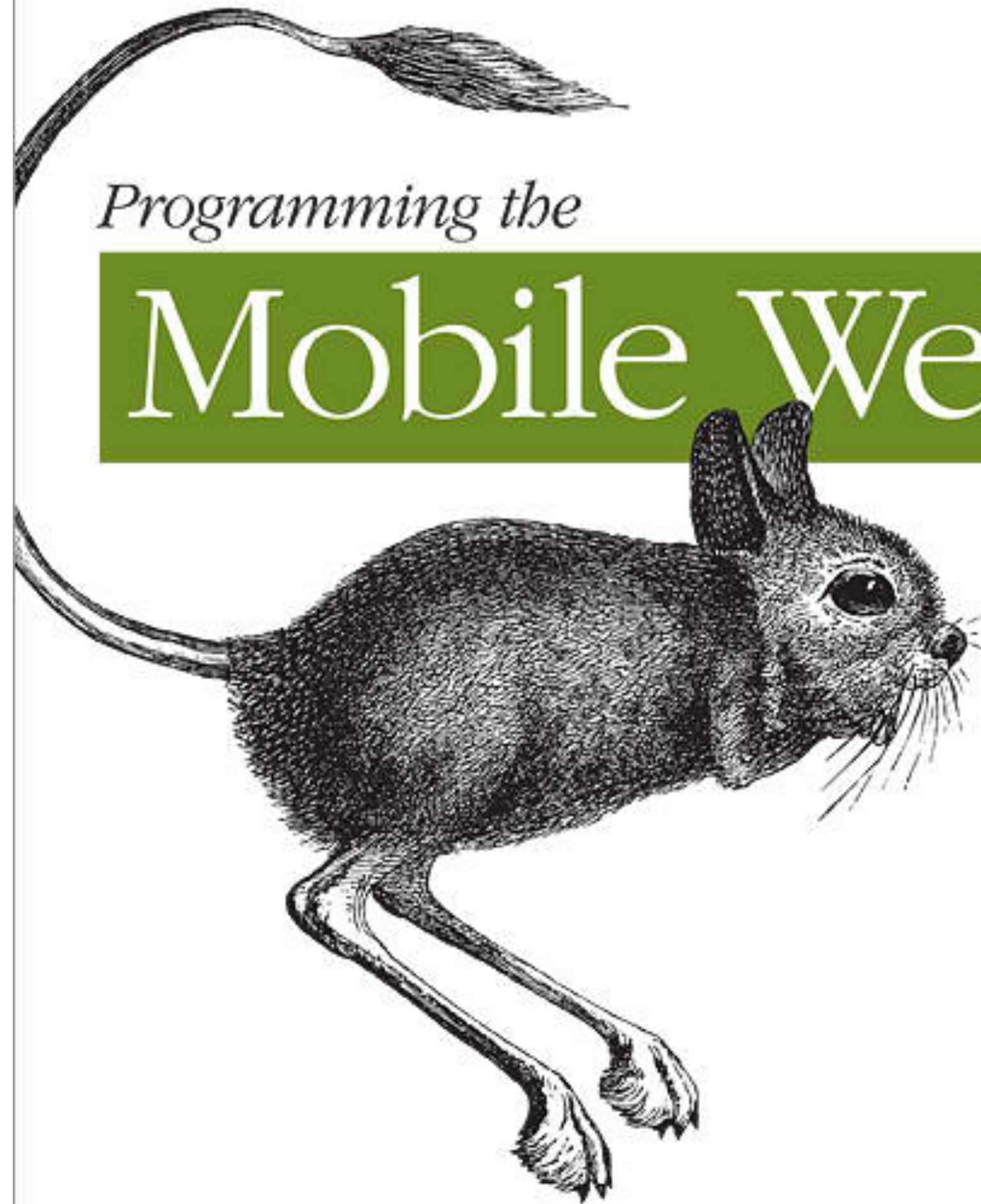
books



*Reaching Users on iPhone, Android,
BlackBerry, Symbian, and more*

Programming the

Mobile Web



O'REILLY®

Maximiliano Firtman

Using HTML5 to Design Web Apps for Tablets and Smartphones



jQuery Mobile

Up and Running

O'REILLY®

Maximiliano Firtman

good news!

today ~ last day

save 50%
oreilly.com



agenda

agenda

- ▶ a little overview of mobile web
- ▶ measuring and debugging
- ▶ mobile html5
- ▶ optimization areas
- ▶ tango dance

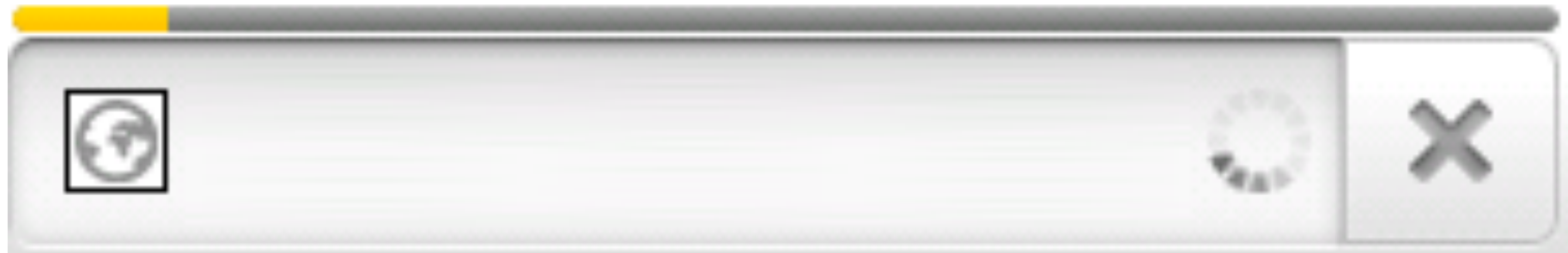
facts

you are guilty!

users hate you

The image shows a close-up of several white rectangular cards stacked on top of each other. Each card features a large, bold, black question mark. The cards are slightly offset, creating a sense of depth. In the center of the most prominent card, the word "why?" is written in a bold, red, sans-serif font.

why?



mobile web
is slow



Picture from Simon Howden freedigitalphotos.net

mobile web is slow because...

we are doing it wrong

A lush green forest scene with a gibbon in a tree on the left. The text "it's complicated" is centered in white.

it's complicated

differences

differences

- ▶ slower networks
- ▶ higher latency
- ▶ slower hardware
- ▶ different browsing experience
- ▶ different context
- ▶ different behaviours
- ▶ different possible networks

differences

```
cookie2: $Version="1"
connection: Keep-Alive
x-wap-profile: " http://www-ccpp-mpd.alcatel.com/files/ALCATEL-
BG3_1.0.rdf"
accept-language: en
content-length: 0
drm-version: 2.0
host: www.mobilexweb.com
accept-encoding: gzip, deflate
accept: application/vnd.wap.wmlc;Type=4365,
application/vnd.wap.wmlc;Type=4360,
application/vnd.wap.wmlc;Type=1108, application/vnd.wap.wmlc;Level=1.3,
application/vnd.wap.wmlc, application/vnd.wap.wmlscriptc,
application/vnd.wap.multipart.related,
application/vnd.wap.multipart.mixed, application/x-up-device,
application/vnd.phonecom.mmc-wbxml;Type=4364,
application/vnd.phonecom.mmc-wbxml, application/vnd.phonecom.im,
application/octet-stream, application/vnd.openwave.pp,
application/vnd.wap.sic, application/vnd.wap.slc,
application/vnd.wap.coc,
application/vnd.uplanet.bearer-choice-wbxml,
application/vnd.uplanet.signal,
application/vnd.uplanet.cacheop-wbxml, application/vnd.uplanet.alert-
wbxml,
image/vnd.wap.wbmp;Type=0, application/*, audio/iMelody,
audio/midi, text/x-hdml,
image/mng, image/x-mng, video/mng, video/x-mng, image/bmp, text/vnd.wap.wml
accept-charset: ISO-8859-1, US-ASCII, UTF-8; Q=0.8, ISO-10646-UCS-2;
Q=0.6
user-agent: Alcatel-BG3/1.0 UP.Browser/5.0.3.1.2 UP.Link/1.1
```


mobile browsers

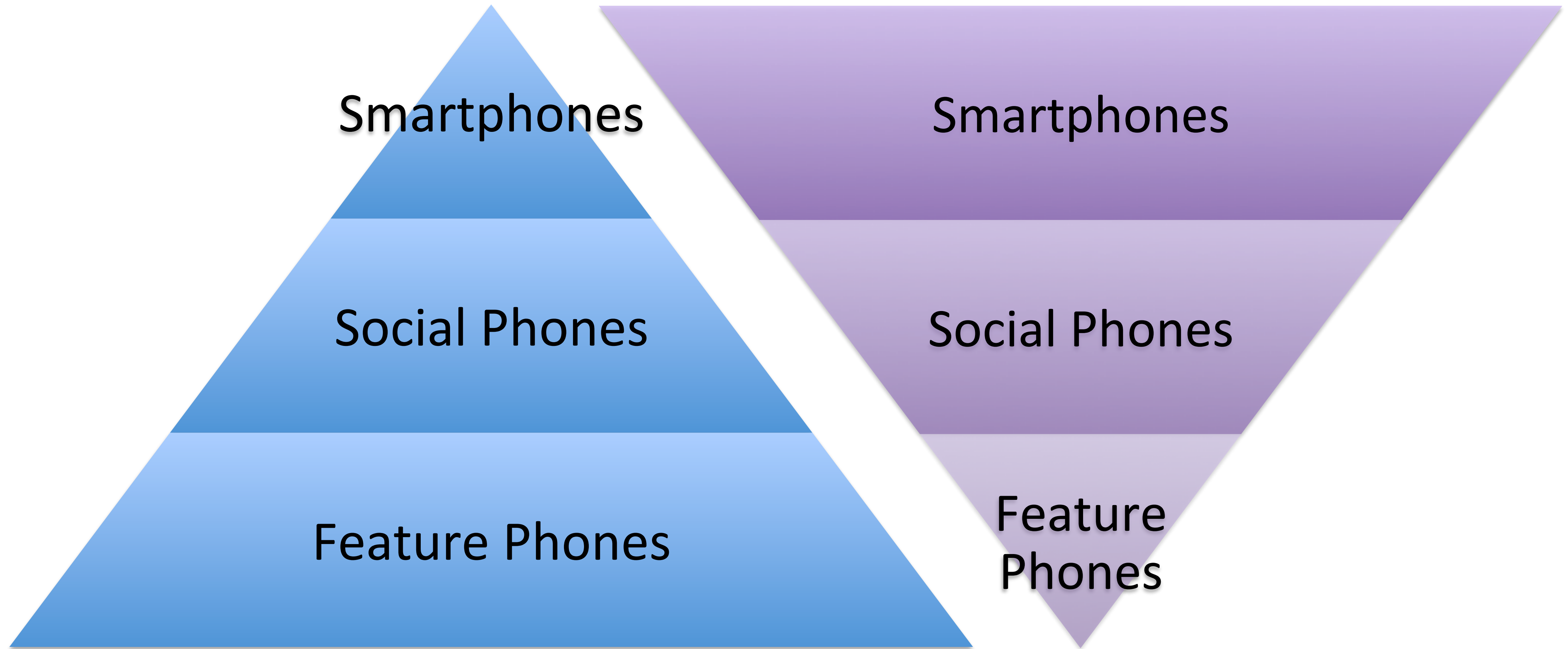
differences

There are browsers supporting 1, 2,
4, 6 parallel downloads

mobile browsers

- ▶ too many
- ▶ (some) too limited
- ▶ (some) too innovative
- ▶ (some) proxied
- ▶ (most) without documentation
- ▶ (most) without a *name*
- ▶ (most) without debugging tools

MOBILE WEB USAGE



MARKET SHARE

a quick, dirty list

- ▶ Safari on iOS
- ▶ Android Browser
- ▶ Symbian Browser
- ▶ webOS Browser
- ▶ BlackBerry Browser
- ▶ Bada Browser
- ▶ Firefox
- ▶ Internet Explorer

a quick, dirty list (cont.)

- ▶ NetFront
- ▶ Myriad
- ▶ Nokia Browser (Ovi)
- ▶ Phantom
- ▶ microB
- ▶ Opera Mobile
- ▶ Opera Mini
- ▶ Skyfire
- ▶ BOLT

they are on tablets too!

- ▶ Safari on iOS
- ▶ Android Browser
- ▶ webOS Browser
- ▶ BlackBerry Browser
- ▶ Opera Mini

and with different versions...

and there's more!

pseudo-browsers

pseudobrowsers

- ▶ mostly on iOS and Android
- ▶ uses the internal web control
- ▶ have different behavior than the native!



we can do it!

**we need to forget
and learn**

forget about

- ▶ pixels
- ▶ static designs
- ▶ desktop frameworks (ok, not always)
- ▶ always connected
- ▶ unlimited power

learn about

- ▶ server-side detection
- ▶ progressive enhancement
- ▶ responsive design
- ▶ best experience for each context
- ▶ the top-model approach

speed

speed ~ perception



measuring and debugging



two browsers with remote tools

Opera Mobile with DragonFly

BlackBerry Browser for PlayBook, for Smartphones 7.0



**and the
others?**

emulators



- ▶ different types
- ▶ good for first testing
- ▶ free, +150
- ▶ www.mobilexweb.com/emulators
- ▶ proxy: Charles Proxy, Fiddler

real devices



- ▶ proxys on wifi? charles, fiddler
- ▶ proxys on the device: mobitest
- ▶ hybrids / pseudobrowsers: mobitest
- ▶ network sniffers: pcapperf
- ▶ server-side sniffers
- ▶ remote javascript tools: weinre,
jdrop, mobileperf (p.ad.ag)

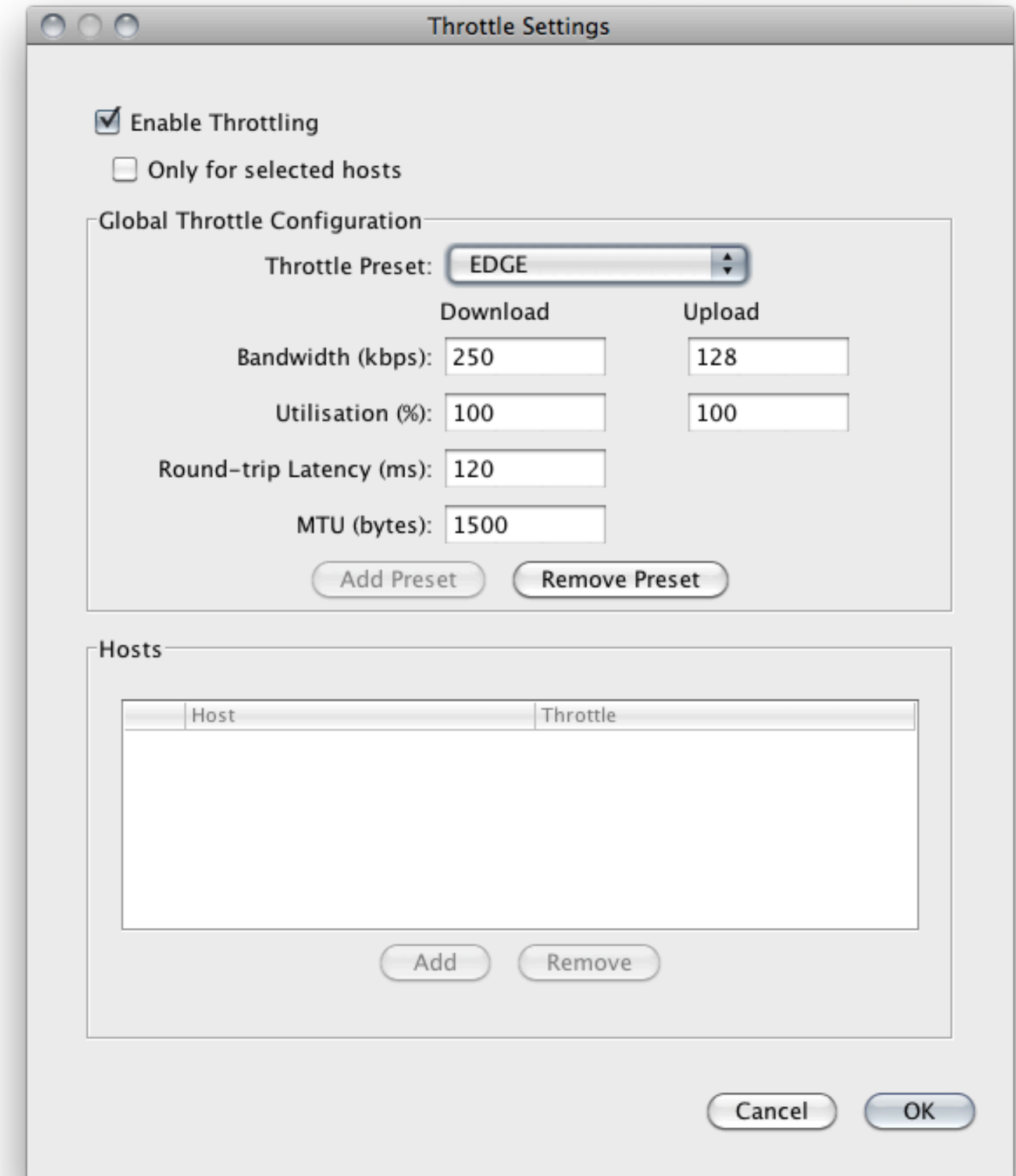
remote labs



- ▶ deviceanywhere.com
- ▶ perfectomobile.com
- ▶ remote device access (nokia) - free
- ▶ lab.dev (samsung) - free

2g, 3g, 4g

- ▶ Remember to test it
- ▶ Charles Proxy helps you with throttling



html5

HTML



html5

if the device is not html5-compatible

- ▶ it's fine...
- ▶ it will work without those enhancements
- ▶ even html5-compatible devices don't have the same compatibility level
- ▶ don't be fanatic, be multiplatform

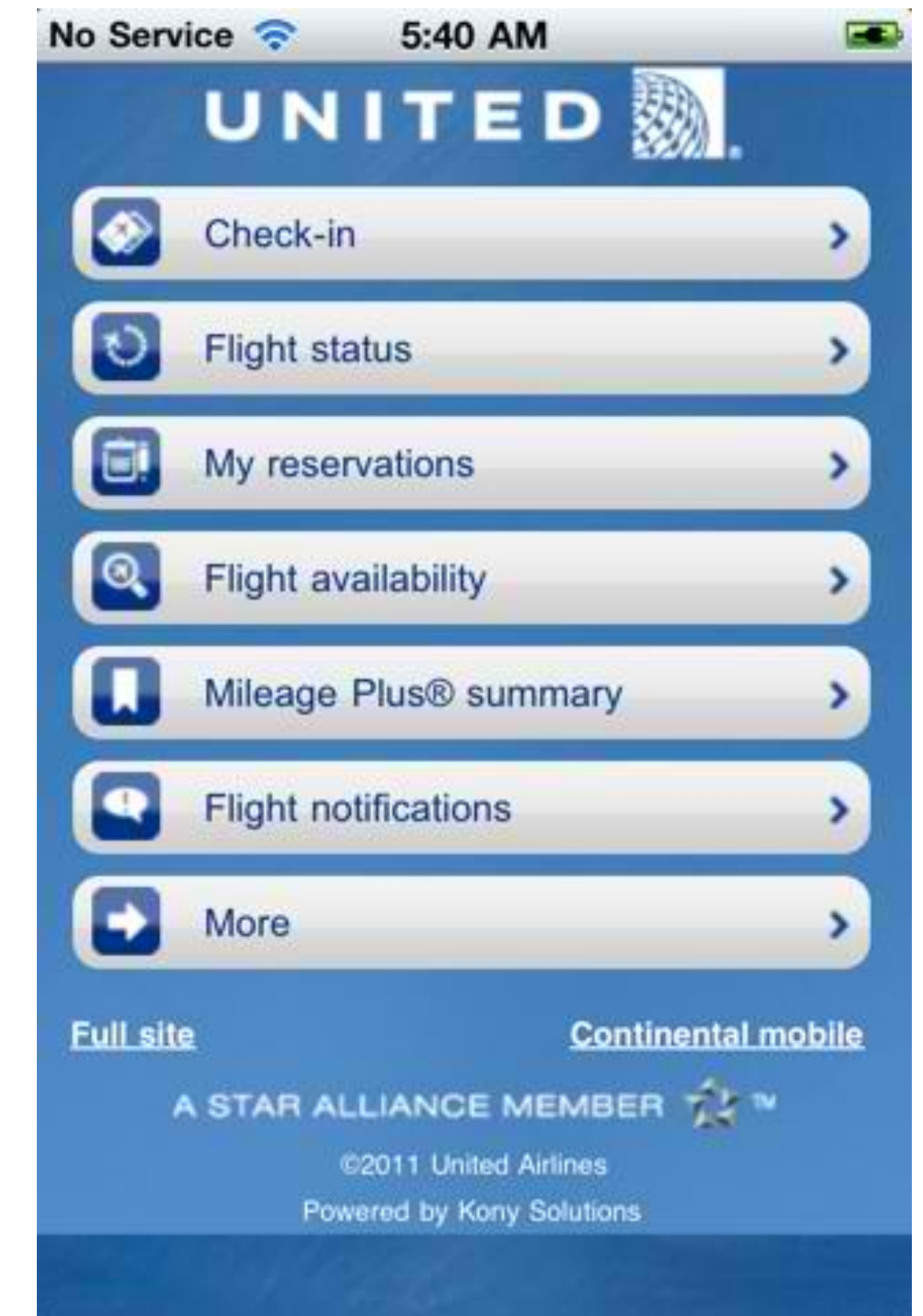
html5 compatibility 2011

- ▶ iOS 3.0+
- ▶ android 2.0+
- ▶ blackberry smartphones 5.0+
- ▶ blackberry playbook 1.0+
- ▶ webOS 1.4+
- ▶ symbian anna+
- ▶ bada 2.0
- ▶ windows phone mango+
- ▶

real world sample

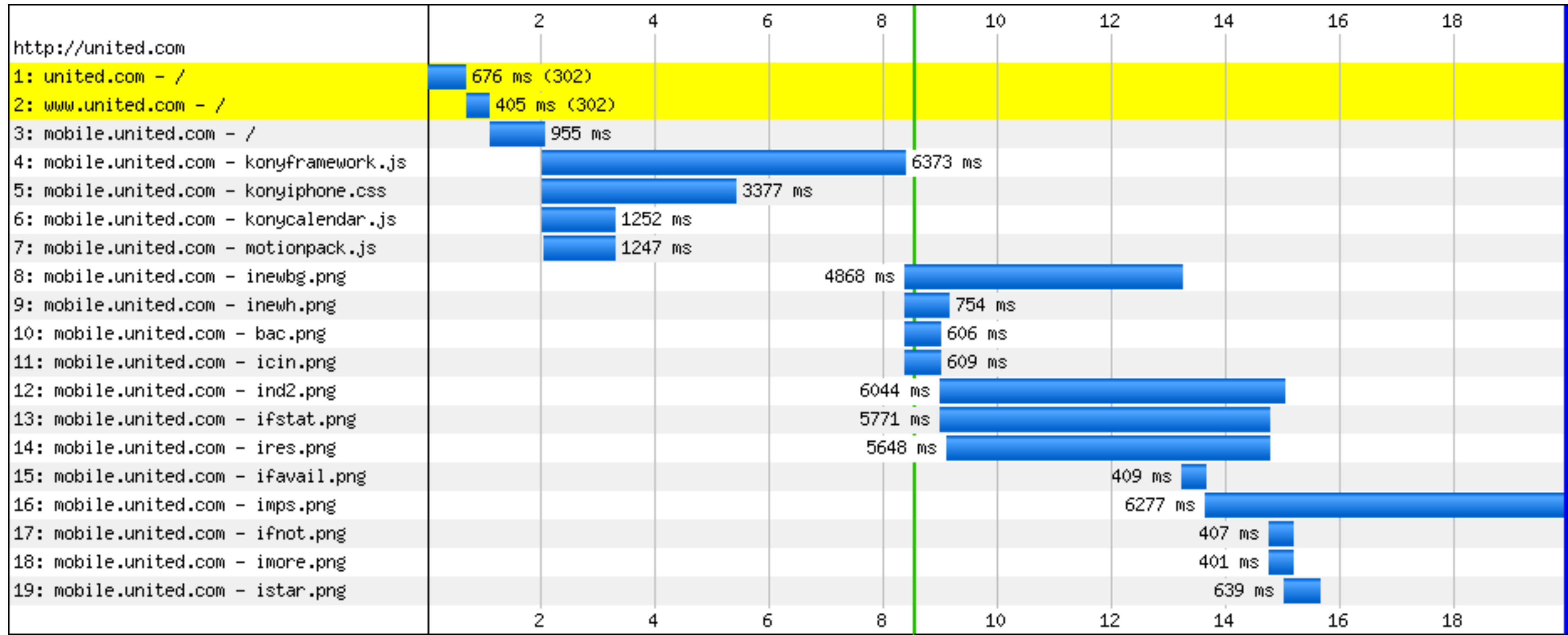
(nothing personal)

united.com



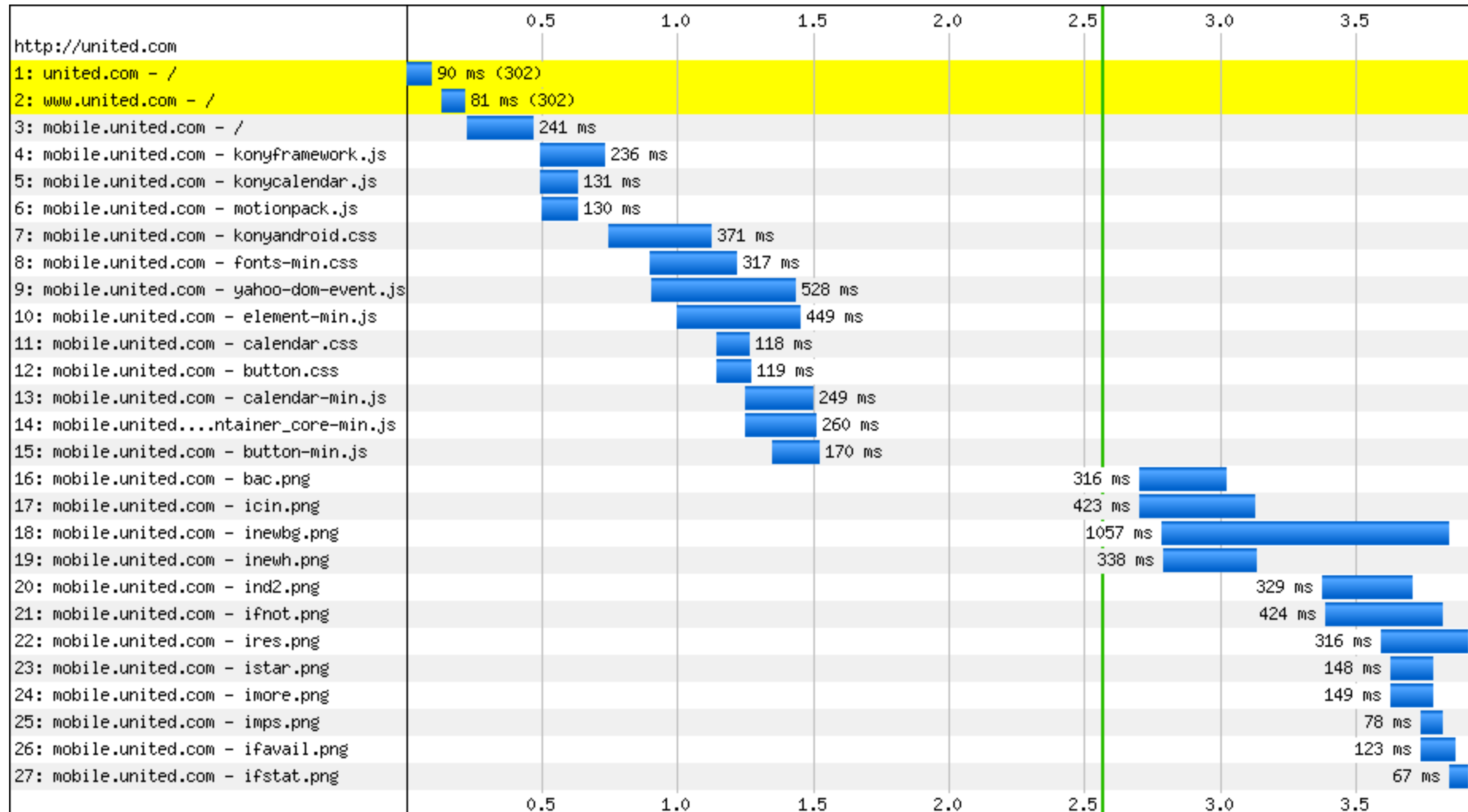
original iPhone results from blaze.io/mobile

15-20 seconds to load (over WiFi!) total 602Kb

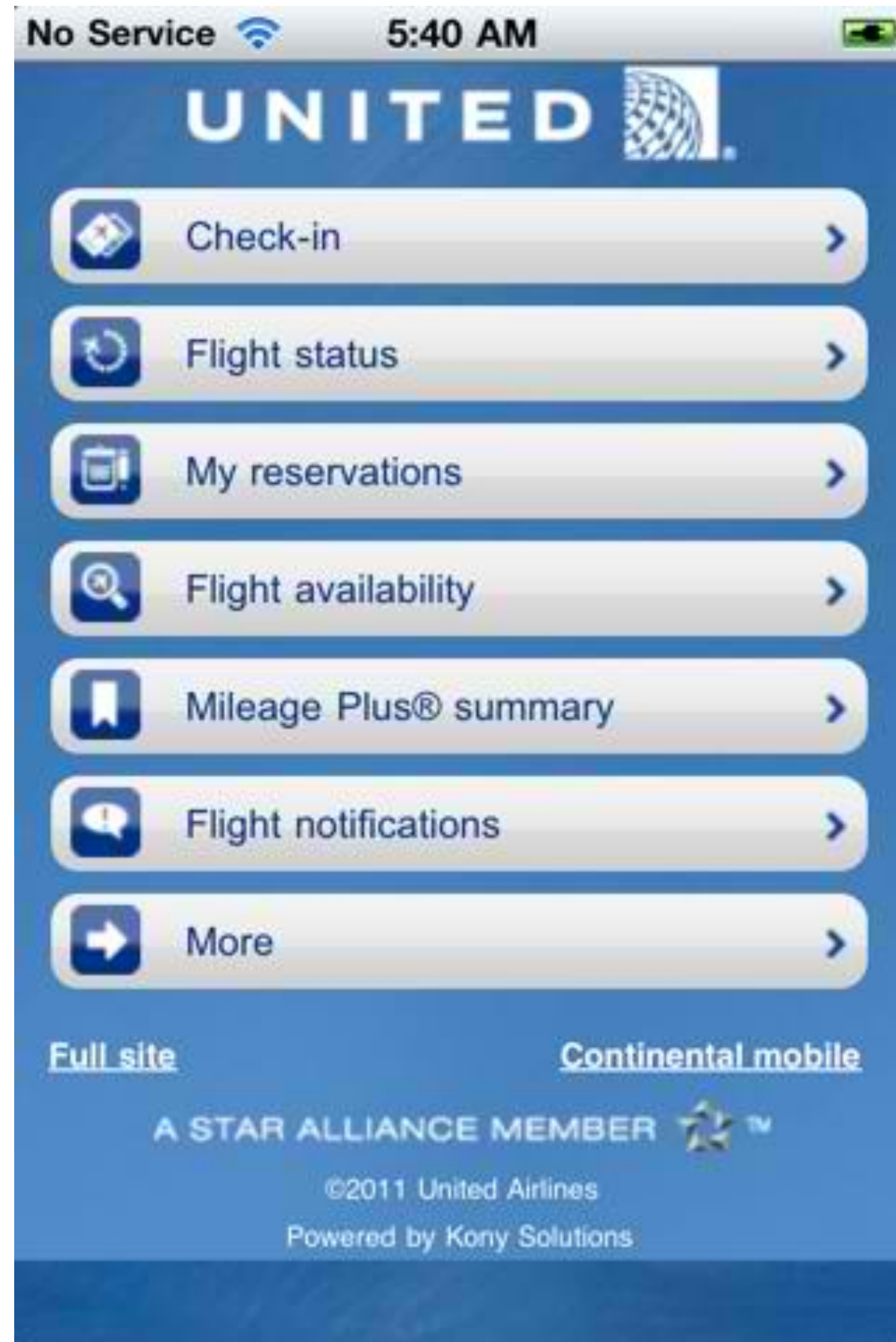


original Android results from blaze.io/mobile

4-8 seconds to load (over WiFi!) total 442Kb



400 / 600Kb? Where are they?



let's start

1. be mobile

1. be mobile

- ▶ don't leave just a desktop website
- ▶ use mobile meta tags & viewport
- ▶ usability
- ▶ use server-side detection
- ▶ right experience to each context

1. be mobile

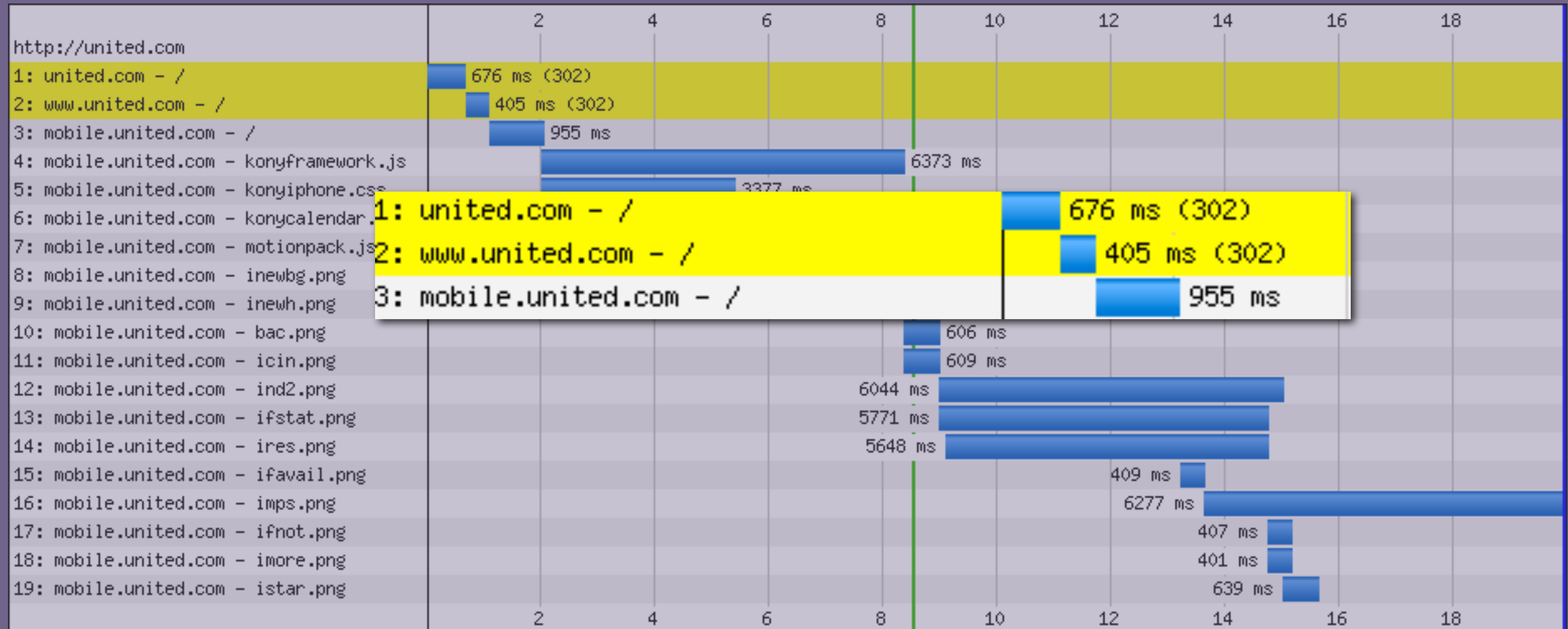


DeviceAtlas™
MOBILE DEVICE INTELLIGENCE

scientiamobile

2. don't redirect

2. don't redirect



united.com > www.united.com > mobile.united.com

2. don't redirect

- ▶ deliver the mobile site directly
- ▶ it's seo-compatible
- ▶ if too difficult: only one redirect and cached

3. be simple

3. be simple

- ▶ simple, semantic DOM
- ▶ complexity == wrong
- ▶ remember, it's mobile
- ▶ use html5 rules and tags

3. be simple

```
        </div>  
    </div>  
    </div>  
    </div>  
    </div>  
    </div>  
    </div>  
    </div>  
    </div>  
    </div>
```



3. be simple

```
<div class="ktable kbasemargin kwt100"  
konywidgettype = "Ksegment"  
>
```



3. be simple

```
<body  
class = "newBg"  
>
```



3. be simple

```
<a  
  konywidgettype = "Ksegment"  
  href="#" eventname="segNewHomeevent_"  
  rowid="0">
```



3. be simple

Current XHTML:

- 18Kb
- 180 DOM elements
- 145 has class definition (!?)
- 80% has multiple class definition

3. be simple

Current CSS:

- 137Kb!
- 6700 lines
- 681 selectors

3. be simple

[illegible]

3. be simple

Apply HTML5 semantic tips

- ▶ doctype: `<!DOCTYPE html>`
- ▶ no xml ns
- ▶ no insane attributes `<script type?>`
- ▶ no **divitis**: article, section, nav, ...
- ▶ no **classitis**: header, footer, ...

3. be simple

```
<!DOCTYPE html>
<html>
<head>...</head>

<body>
<header>
  
</header>
<nav>
  <ul>
    <li><a href='checkin.html'>Check in</a></li>
    <li><a href='flight.html'>Flight status</a></li>
    <li><a href='reservations.html'>My reservations</a></li>
    <li><a href='availability.html'>Flight availability</a></li>
    <li><a href='milleage.html'>Milleage Plus Summary</a></li>
    <li><a href='notifications.html'>Flight Notifications</a></li>
    <li><a href='more.html'>More</a></li>
  </ul>
</nav>

<footer>
  <a href='http://united.com' id='lnkFull'>Full site</a>
  <a href='http://continental.com' id='lnkContinental'>Continental mobile</a>
  
  <h5>©2011 United Airlines</h5>
</footer>
</body></html>
```

3. be simple

Semantic HTML5

- 1.3Kb (7% of original size)
- 31 DOM elements (17% of original qty)
- NO class
- <1Kb CSS
- Same design using CSS.
- If CSS is not there, no design!

4. known wpo techniques

4. known wpo techniques

- **gzip** components
- be friend of **caching**
- **stylesheets** at the top
- **scripts** to the bottom (*maybe*)
- ~~scripts and styles external~~
- reduce **dns** lookups
- **minify** javascript and css

4. known wpo techniques

```
<style type="text/css" media="screen">  
@import "iphone/iphone.css";  
</style>
```



4. known wpo techniques

check desktop-like wpo suggestions



Yslow!



Page Speed

5. resource != download

5. resource != download

Reduce http requests

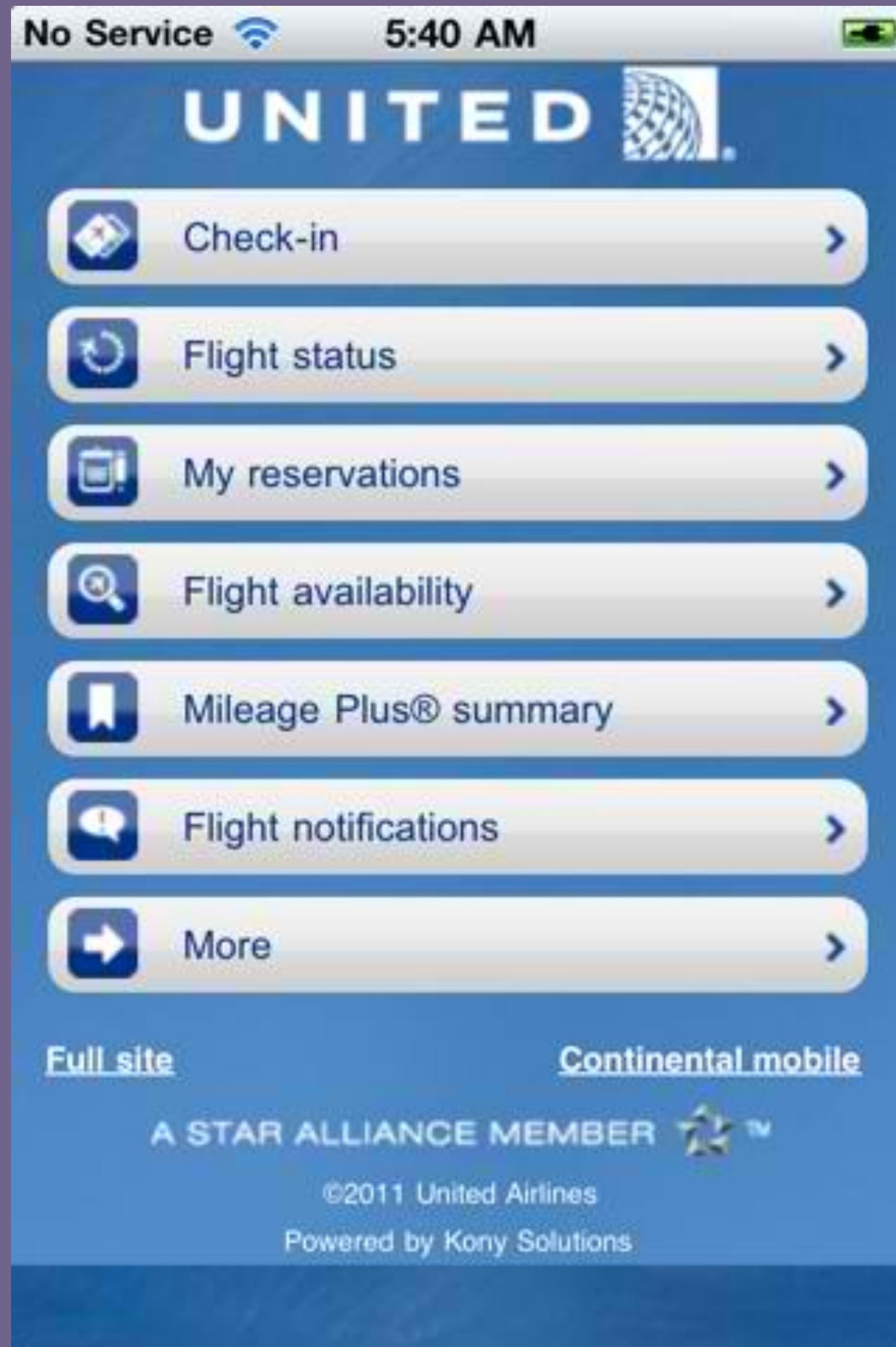
- ▶ every request hurts
- ▶ a lot...
- ▶ more in the mobile space
- ▶ ideal: 1 **only** request initial load
- ▶ even no request!

6. images

6. images

- ▶ only **semantic** images
- ▶ no **effects**, no **ornaments**
- ▶ use CSS 2.1, CSS 3 or nothing
- ▶ compress images
- ▶ deliver the right image size for every device - context
- ▶ don't think on image=file

6. images



- 7 images on icons
- 2 images for logos
- 1 image for arrow
- 1 image for cell background
- 1 background image...
- ...350Kb and 854x854 pixels!!

6. images

- ▶ we have 2 **semantic** images: logos
- ▶ **remove** background, icons & other images
- ▶ don't worry! we'll try to provide **alternatives**
if the context helps

6. images

for the background



a CSS3 gradient

```
background: #1e5799;
```

```
background: -moz-linear-gradient(top,  
#1e5799 0%, #2989d8 50%, #7db9e8 100%);
```

```
background: -webkit-gradient(linear,  
left top, left bottom, color-stop  
(0%,#1e5799), color-stop(50%,#2989d8),  
color-stop(100%,#7db9e8));
```

6. images

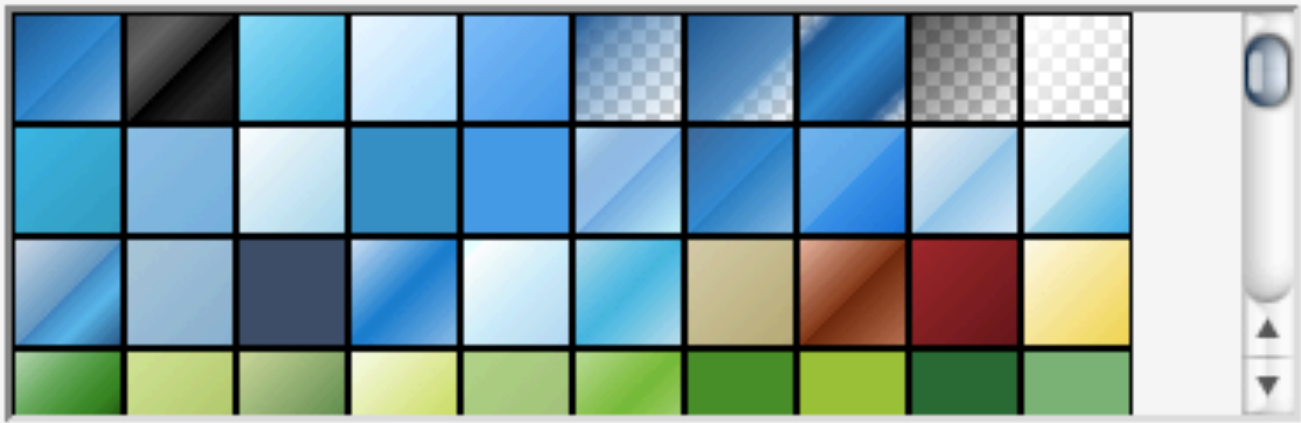
CSS3 gradientes

<http://www.colorzilla.com/gradient-editor/>


Ultimate CSS Gradient Generator

A powerful Photoshop-like CSS gradient editor from [ColorZilla](#).

Presets



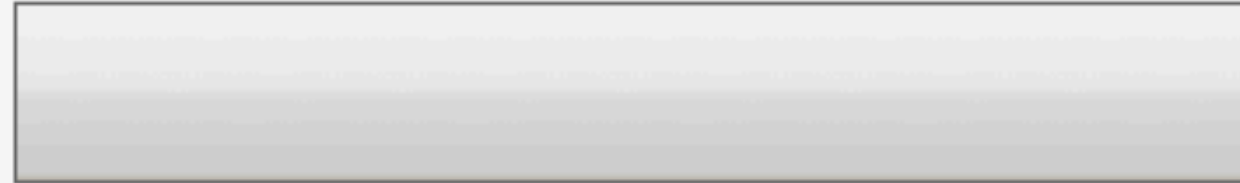
Name:



Stops

Opacity	Location	Color	Location
<input type="text" value="100"/>	<input type="text" value="0"/>	<input type="text" value="#f4f4f4"/>	<input type="text" value="0"/>
<input type="text" value="100"/>	<input type="text" value="100"/>	<input type="text" value="#bab6a9"/>	<input type="text" value="100"/>

Preview



Orientation: Size: x ☐ IE

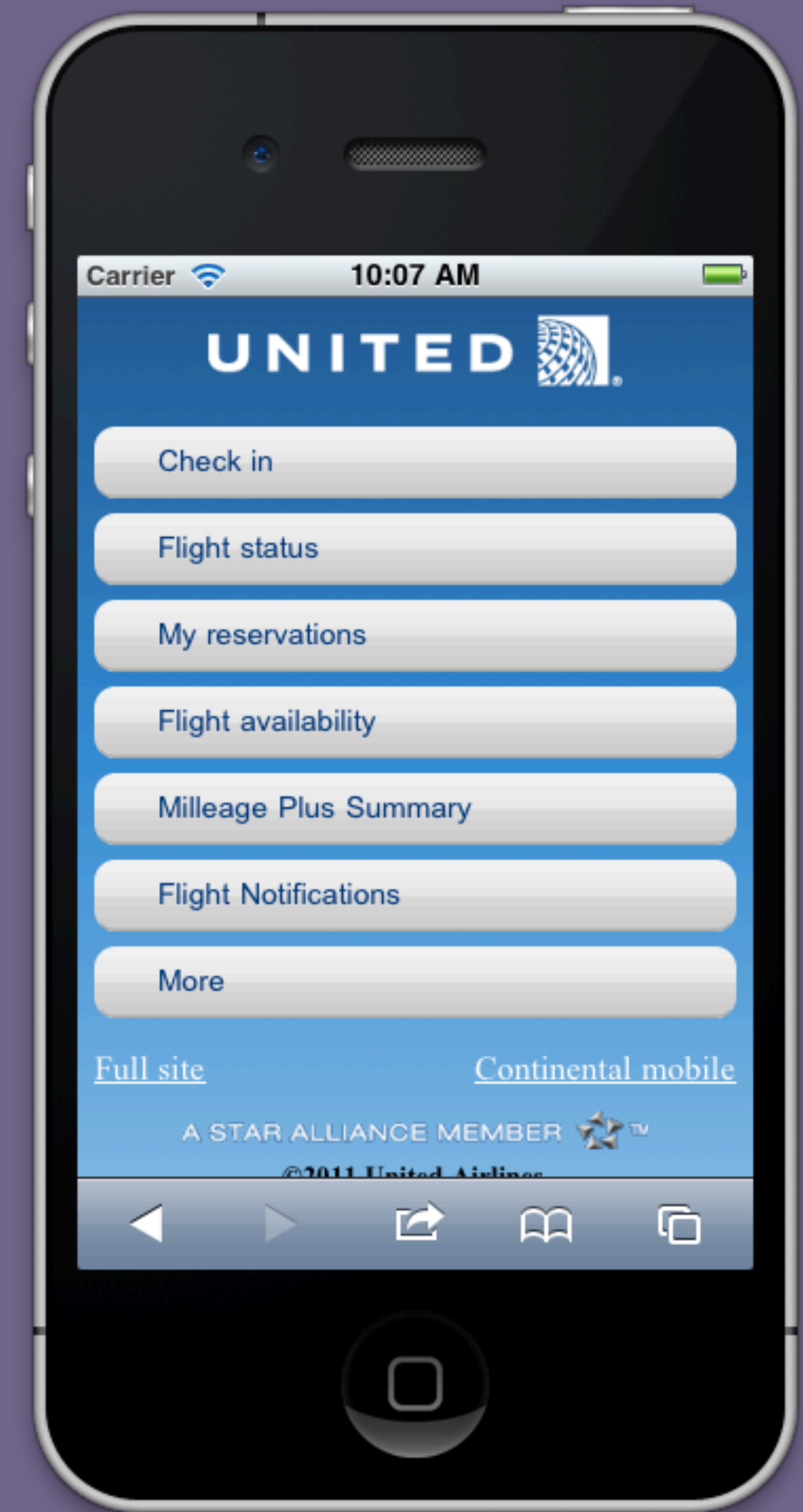
CSS

```
background: #f4f4f4; /* Old browsers */
background: -moz-linear-gradient(top, #f4f4f4 0%,
    #e9e9e9 46%, #e6e6e6 49%, #dddddd 51%, #d1d1d1
    81%, #cdcdcd 97%, #bab6a9 100%); /* FF3.6+ */
background: -webkit-gradient(linear, left top,
    left bottom, color-stop(0%,#f4f4f4), color-
    stop(46%,#e9e9e9), color-stop(49%,#e6e6e6),
    color-stop(51%,#dddddd), color-
    stop(81%,#d1d1d1), color-stop(97%,#cdcdcd),
    color-stop(100%,#bab6a9)); /* Chrome,Safari4+
    */
background: -webkit-linear-gradient(top, #f4f4f4
    0%,#e9e9e9 46%,#e6e6e6 49%,#dddddd 51%,#d1d1d1
    81%,#cdcdcd 97%,#bab6a9 100%); /*
    Chrome10+,Safari5.1+ */
background: -o-linear-gradient(top, #f4f4f4
    0%,#e9e9e9 46%,#e6e6e6 49%,#dddddd 51%,#d1d1d1
    81%,#cdcdcd 97%,#bab6a9 100%); /* Opera11.10+
    */
```

6. images

for the cell background

...a CSS3 gradient too



6. logos & icons

We can use CSS sprites

- ▶ **very good support** on mobile
- ▶ use a **device library** to detect
- ▶ lot of free services: sprite.me.org, css-sprite.es

6. logos & icons

We can use inline images (aka data URI)

- ▶ **very good support** on mobile
- ▶ use a **device library** to detect
- ▶ first, **compress!**
- ▶ lot of free online services
- ▶ just convert bytes into **base64**
- ▶ **easy to convert** from server-side
base64_encode() in PHP

6. logos & icons

We can use inline images (aka data URI)

data:<mime-type>;**base64**,<base64 data>

```
data:image/png;base64,iVBORw0KGgoAAAANSUhEUgAAAMUAAAAiAgMAAACSF/VZAAAAA3NCSVQICAjb4U/  
gAAAACVBMVEX////////+ZmZIVZlogAAAAA3RSTIP//  
wDXygIBAAAACXBIWXMAAAsSAAALEgHS3X78AAAAAHnRFWHRTb2Z0d2FyZQBBZG9iZSBJd29ya3MgQ1MlLjGrH0jrAAAA9k  
IEQVQ4je3TOw6DMAwGYMsT4hSMKKf0UTKinLj+JEAeLmmnDoIaELQf+e0ESHMD8sBE8Ce/SQhThJD4dPBjviQ/8U0eQf/  
qEfDJ6pHgEsxkacnqEkkGOJgFfRjklq0nUlgd5KY+XTJrsNiT/SLrnUS5zKU0ZGmlIglol0QWrsbwjnAG+dRL  
+UAGTX4gmmJrCHkkl8+xNjQCmcSWVEImd8Iiy0u8kt0sIVLeVr  
+Q5JNmW8aTkEd0WxIXg0YO2925C0OyGlkKSZbI9oqVw0m0DdsVjB8nEzNJNCahl/PvvnQK6ROCSnLQGAlASs9ng3IBls/JbrW8AJuDnj  
+8sV3sAAAAAEIFTkSuQmCC
```



6. logos & icons

inline images are just **GREAT**

- ▶ new way to think about images
- ▶ new way to transmit & store images
- ▶ they are just plain text
- ▶ can be used on HTML or CSS

6. logos & icons

you can create them **on the fly** with html5



- ▶ (check compatibility)
- ▶ use with html5 canvas drawing API
- ▶ use **toDataURL()** method from canvas
- ▶ voilà!
- ▶ even useful for converting image real files into data uri client-side

6. other tips

- ▶ 450 emoji characters on iOS

😊 	😄 	😁 	😂 
😏 	😬 	😌 	😈 
😊 	😓 	😞 	😓 
😰 	😓 	😓 	😭 
😡 	😡 	😓 	😷 
💙 	💜 	💖 	💚 
💕 	✨ 	⭐ 	⭐ 
? 	? 	zzZ 	☁ 
🔥 	💩 	👍 	👎 
✌ 	👋 	👋 	👐 
👉 	👐 	👐 	👉 
🏃 	👫 	👤 	👩 
👦 	👩 	👩 	👩 
👧 	👩 	👧 	👩 
👦 	👩 	👦 	👩 
👤 	👩 	👤 	👤 





<http://pukupi.com/post/1964>

6. other tips

- ▶ CSS3 multiple backgrounds
- ▶ CSS3 transformations
- ▶ CSS3 shadows, effects
- ▶ CSS3 rounded borders, border image
- ▶ SVG, inline SVG and canvas
- ▶ if not compatible, **accept it!**

7. be ready asap

7. be ready asap

- ▶ defer most of your code after **onload**
- ▶ defer content
- ▶ don't even parse frameworks
- ▶ did you say frameworks?
- ▶ remove address bar **onload**

7. defer, defer

- ▶ great support for deferring content & code
- ▶ if you have lot of content, use your own loading
- ▶ use a server-side detection

7. don't parse yet!

- parsing javascript takes time
- from 1ms to 100ms per 1Kb
- delays **onload**

7. don't parse yet!

- ▶ divide your code into modules by needs
- ▶ comment all your code
`<script>/* ... */</script>`
- ▶ when needed, remove comments and eval
`eval(stripOutCommentBlock(script.innerHTML));`
- ▶ created by Gmail Mobile team and Charles Jolley

7. forget about frameworks

- ▶ ok, not always
- ▶ think it 100 times
- ▶ do you really need it?
- ▶ don't use jQuery just for `$("")`
- ▶ jQuery can take up to 8s to parse on some phones

7. forget about frameworks

- ▶ W3C Selectors API w3.org/TR/selectors-api
document.querySelector!
- ▶ create your own mini-library
- ▶ use mini-frameworks: XUI, zepto.js, microjs
- ▶ jQuery Mobile is not a mini-framework! it's a ui framework.
- ▶ if it's not compatible, do you **really** need it?

7. forget about frameworks

our sample uses three uncompressed
javascript files:

framework: 60Kb

motionpack: 3Kb

calendar: 7Kb

7. remove address bar

- ▶ hack for some browsers
- ▶ scroll to 0, 1 after onload
- ▶ you need to have a **min-height** container of the available height - device library
- ▶ **window.scrollTo(0, 1);**
- ▶ the user will be happy to start using your web immediatly

8. application cache

8. application cache

- Defines an offline installation package
`<html manifest='offline.appcache'>`
- Next time, it will be available **immediately**
(even without connection)
- **Update** process
- Make the HTML and some basic resources
cached and manage your own cache with
localStorage

9. offline storage

9. offline storage

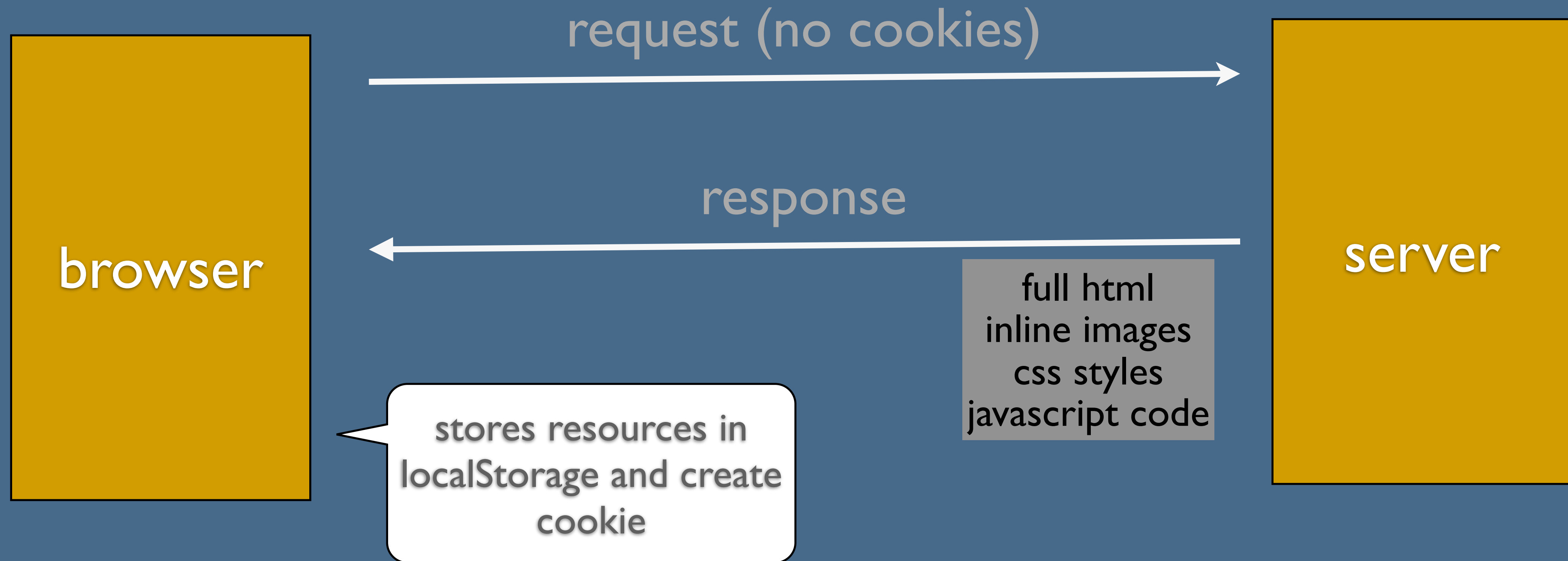
- ▶ localStorage and SQL storage
- ▶ localStorage easier and faster
- ▶ store strings (2x faster than objects)
- ▶ what to store?
 - ▶ images
 - ▶ code
 - ▶ styles
 - ▶ html elements
 - ▶ data

9. offline storage

- ▶ we can mix it with cookies
 - ▶ resource storage library
 - ▶ we store some resources client-side
 - ▶ next time, we don't send them
-
- ▶ on mobile, up to 2Mb per domain is safe

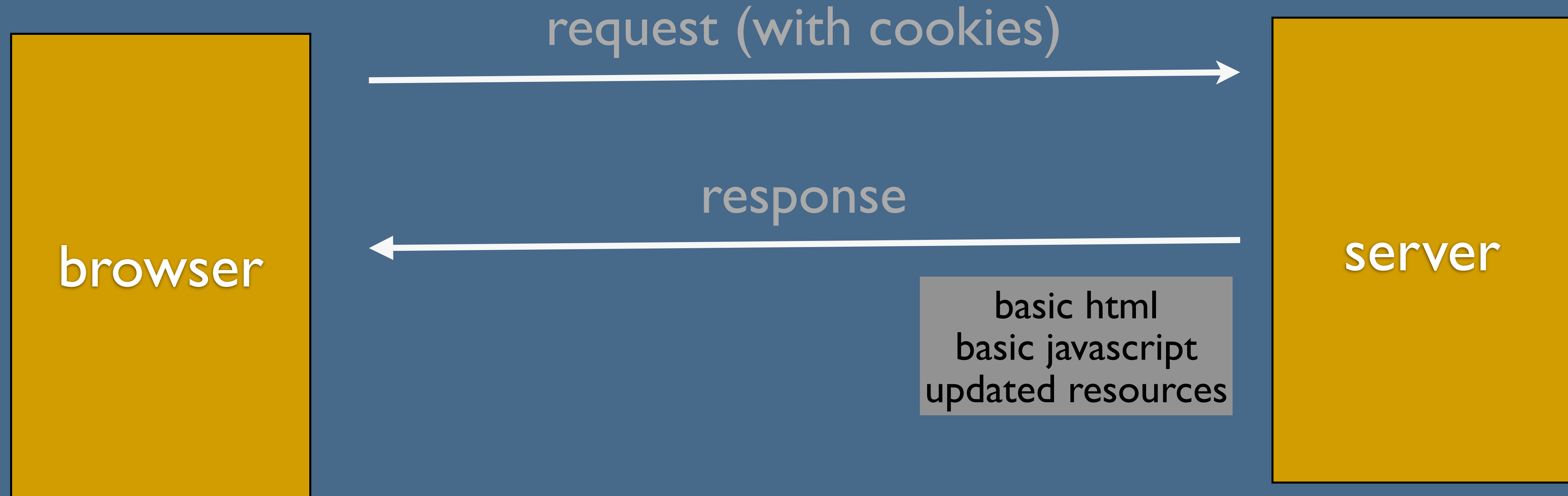
9. offline storage

first load



9. offline storage

second load



10. internal is better

10. internal is better

- ▶ code and resources used only once must be inlined in the HTML
- ▶ no external css, no external javascript, no external images
- ▶ if you use it on different pages, then:
 - ▶ external
 - ▶ localStorage

11. touch, no click

11. touch, no click

- ▶ on **touch** devices, click delays between 300 and 500 ms before executing.
- ▶ Too much!
- ▶ Use touch events: **ontouchend**
- ▶ We can use progressive enhancement and change links behavior

12. ajax please!

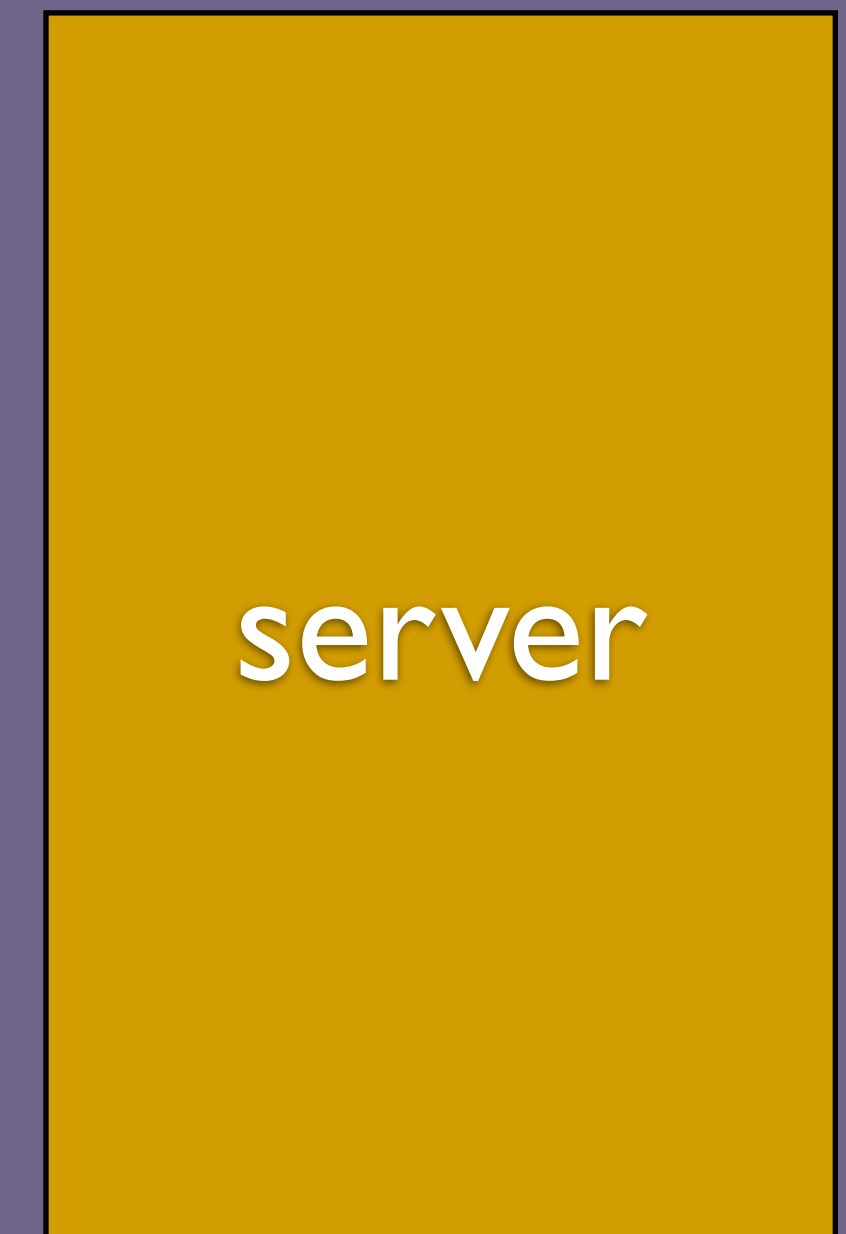
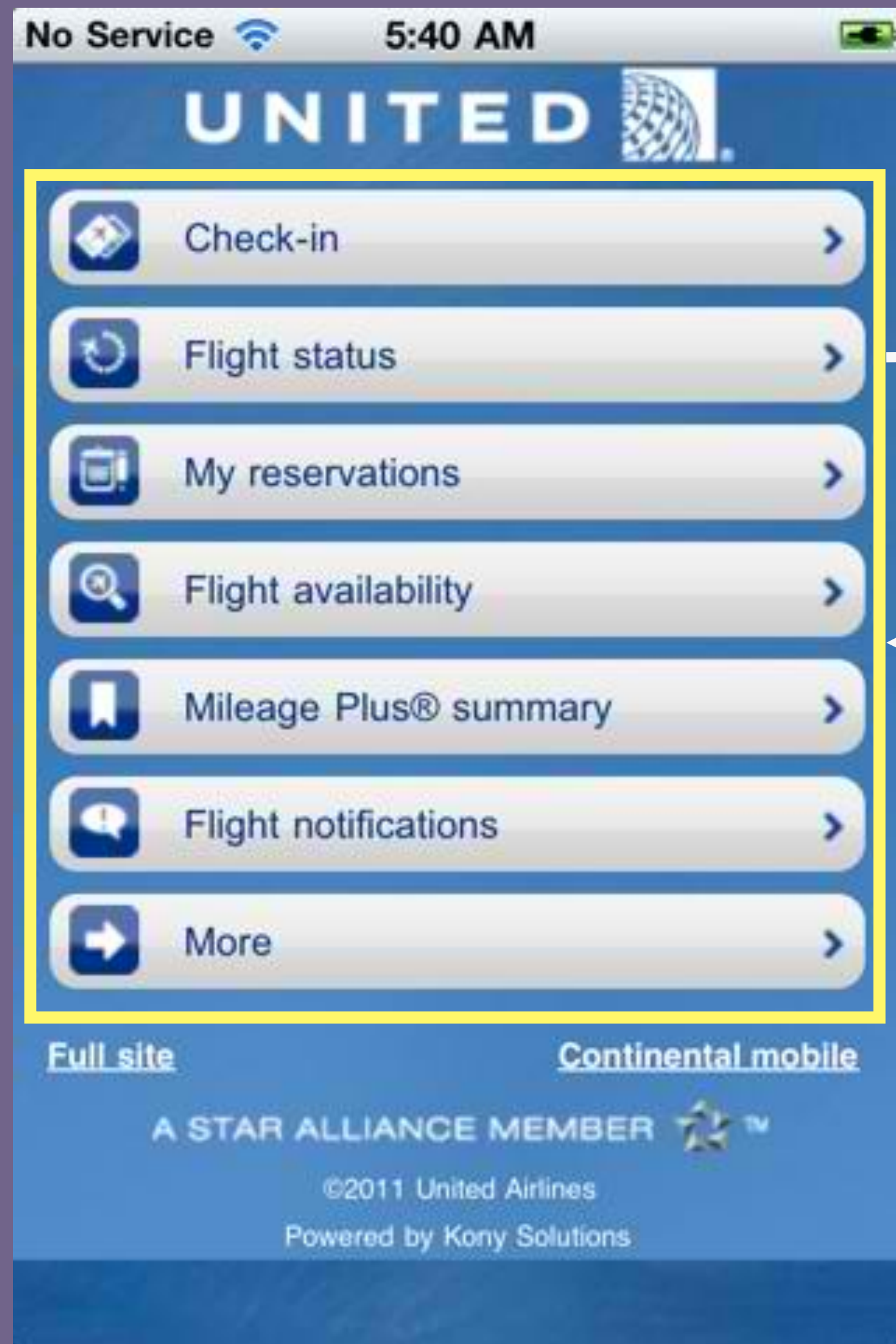
12. ajax please!

- ▶ progressive enhancement
- ▶ server-side framework
- ▶ it's seo-friendly too!
- ▶ most devices support XHR
- ▶ why don't use it!
- ▶ it's mobile-friendly!

12. ajax please!

- ▶ **onhashchange** for history management
- ▶ request only what needs to be changed
- ▶ **html** > json > xml
- ▶ with json, **JSON.parse** is up to 2x faster than eval

12. ajax please!



13. upgrading ajax

13. more than ajax

html5 server-sent events

<http://dev.w3.org/html5/eventsource/>

```
var source = new EventSource('updates.cgi');  
source.onmessage = function (event) {  
    alert(event.data);  
};
```


13. more than ajax

html5 web sockets

<http://dev.w3.org/html5/websockets/>



14. context & user decision

forget about
DECIDING FOR THE USER

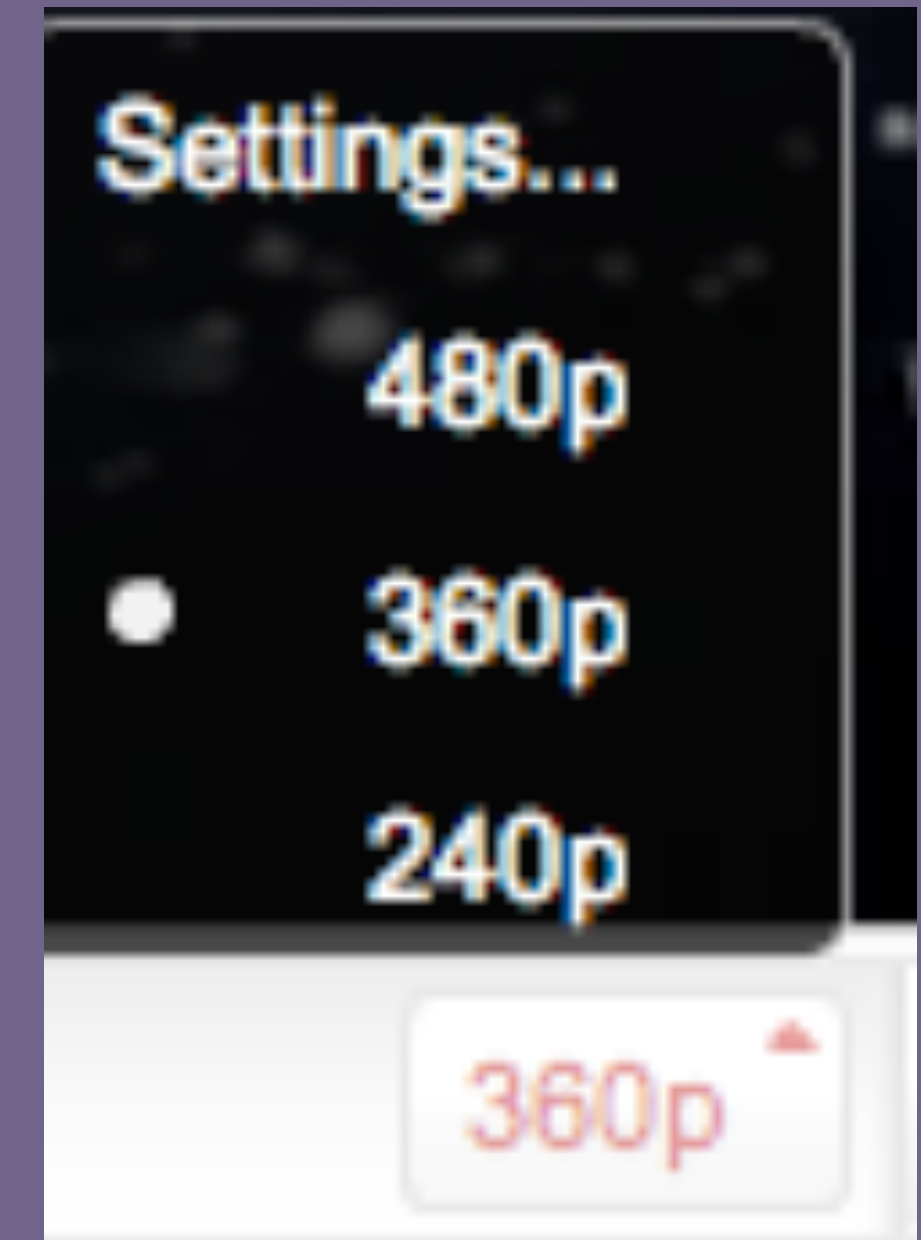
14. context & user decision

- ▶ now, **you** decide the user experience based on the device or based on... I don't know.
- ▶ if you have an iPhone or Android, this is the experience you want.
- ▶ if you have a feature phone, then this is what you need

WRONG

14. context & user decision

- ▶ provide different experiences
- ▶ YouTube resolution idea
- ▶ SD/HD version
- ▶ decide best version based on context
- ▶ let the user change the decision



how?

14. detecting connection

W3C Network Information API

- ▶ it's client-side
- ▶ works on Android 2.2+
- ▶ **navigator.connection.type**
- ▶ can be **WIFI, CELL_2G, CELL_3G**, others

```
if (navigator.connection.type==navigator.connection.WIFI) {  
}
```

14. detecting connection

BlackBerry client-side API

- ▶ works on BB smartphones 4.0+
- ▶ `blackberry.network== 'Wi-Fi'`

14. detecting connection

Server-side detection

- ▶ Symbian header x-nokia-musicshop-bearer
- ▶ BlackBerry header via
- ▶ Trying to detect if it's a carrier network
- ▶ Massive's Operator Identification Platform
(www.werwar.com)

14. detecting connection

iOS detection

- ▶ No official way (there are some hacks)
- ▶ If you are an iOS developer, go to bugrequest.apple.com and request this feature

14. detecting pixel density

don't download pixels that can not be seen

- ▶ iPhone 3 vs iPhone 4
- ▶ android
- ▶ on WebKit: **window.devicePixelRatio**
- ▶ can be used also in css3 media queries
- ▶ remember: let the user decide!

14. html5 audio & video

The standard only cares about codecs/formats

- ▶ You should care about connectivity
- ▶ iOS: Quicktime Reference Movies
- ▶ A reference movie decides different sources regarding the current bandwidth
- ▶ Doesn't update dynamically
- ▶ Search for free MakeRefMovie tool

15. animations & timers

15. animations & timers

Browsers animations or nothing

- ▶ ok, it was a bit extreme...
- ▶ don't use javascript based animation
- ▶ use css3 transitions & animations
- ▶ they can be hardware-accelerated
- ▶ move & scale using css3 transforms

15. animations & timers

Timers

- ▶ be careful
- ▶ sluggish UI
- ▶ $\geq 1s$ frequency
- ▶ reduce DOM changes
- ▶ change the DOM once per cycle

15. animations & timers

html5 web workers

- ▶ starting to appear on mobile
- ▶ allow different threads on javascript
- ▶ we can do things without affecting ui rendering (too much)
- ▶ use it if they are available!

16. mobilize

16. mobilize

- ▶ speed is also about total time to do an action
- ▶ reduce input, use html5 input types
- ▶ use context and html5 to help the user reduce times
- ▶ use w3c geolocation api
- ▶ use localStorage for history and analytics

GOVERNMENT CENTER

UND

TO B.C., CLEVELAND CIRCLE, RIVERSIDE, HEATH VIA PARK



NO SMOKING

1
1
2
0
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DON'T BE
AVERAGE.

GOOD BANKING IS GOOD CITIZENSHIP Citizens Bank

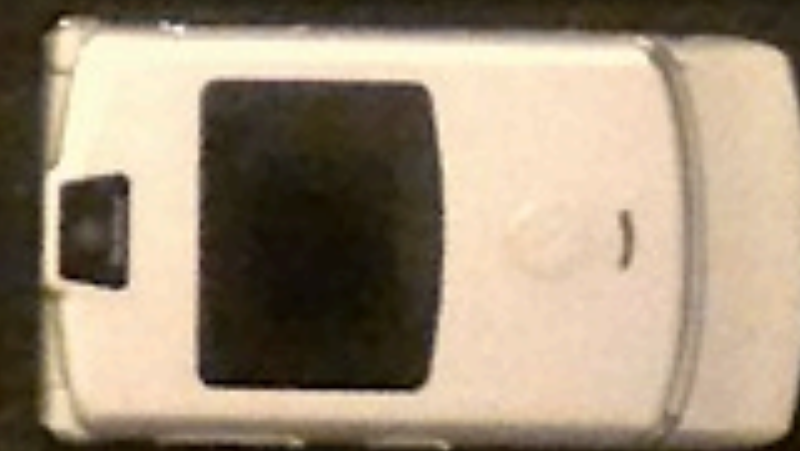
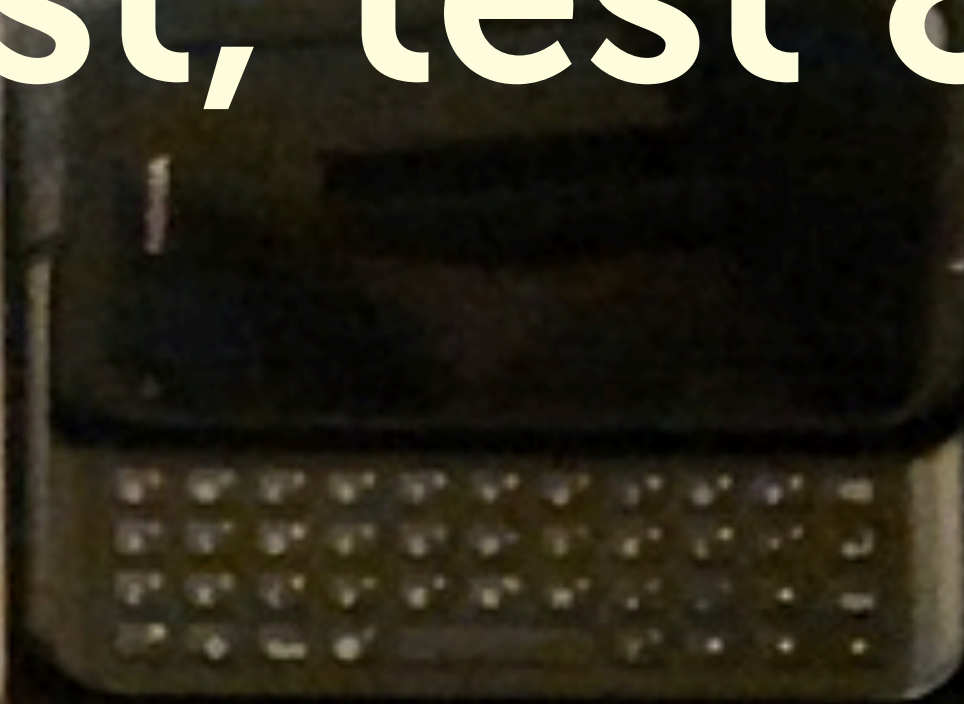
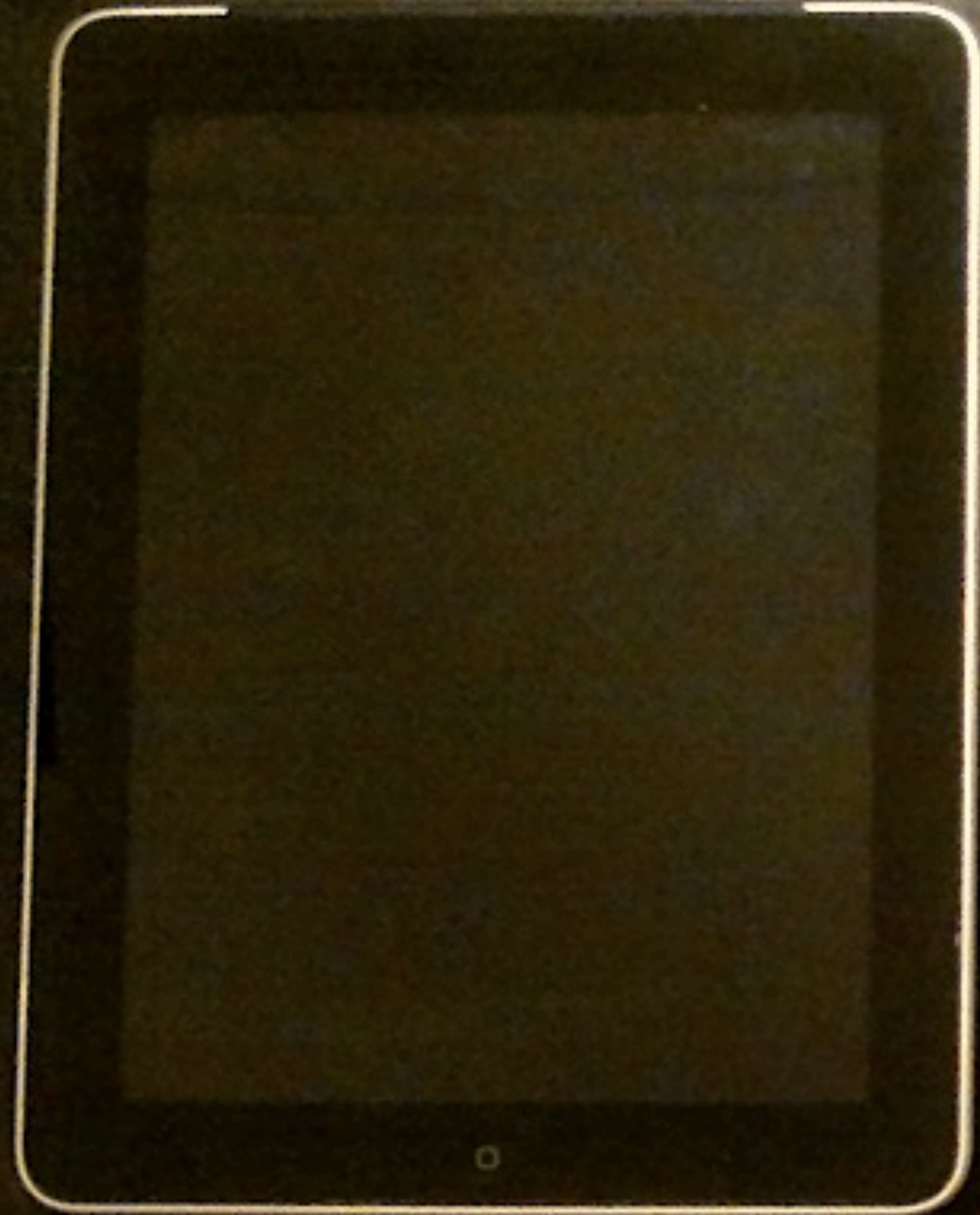


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use good practices



test, test & test



you can reach a good experience



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