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How Maps API v3 came to be

Tips, tricks, and lessons learned in developing a cross platform desktop and mobile API

Susannah Raub, Marc Ridey

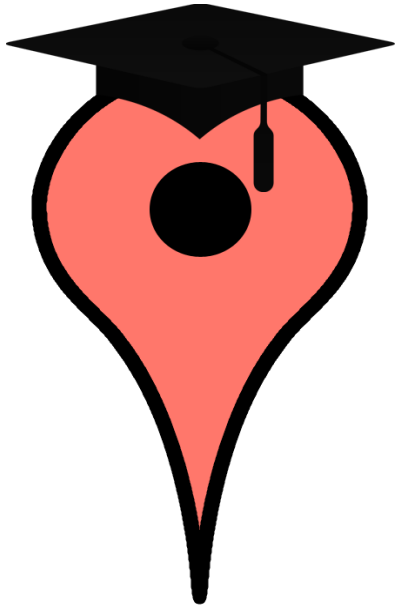
May 20, 2010

View live notes and ask questions about this session on Google Wave

http://bit.ly/cnQiok

Introductions

Marc Ridey



Maps API v3

Susannah Raub

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Content

- Latency
- Architecture
- Technology
- Debugging

Experience: Maps API v2

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Experience: Maps API v2

- 175 kB JavaScript
- 4-6 map images

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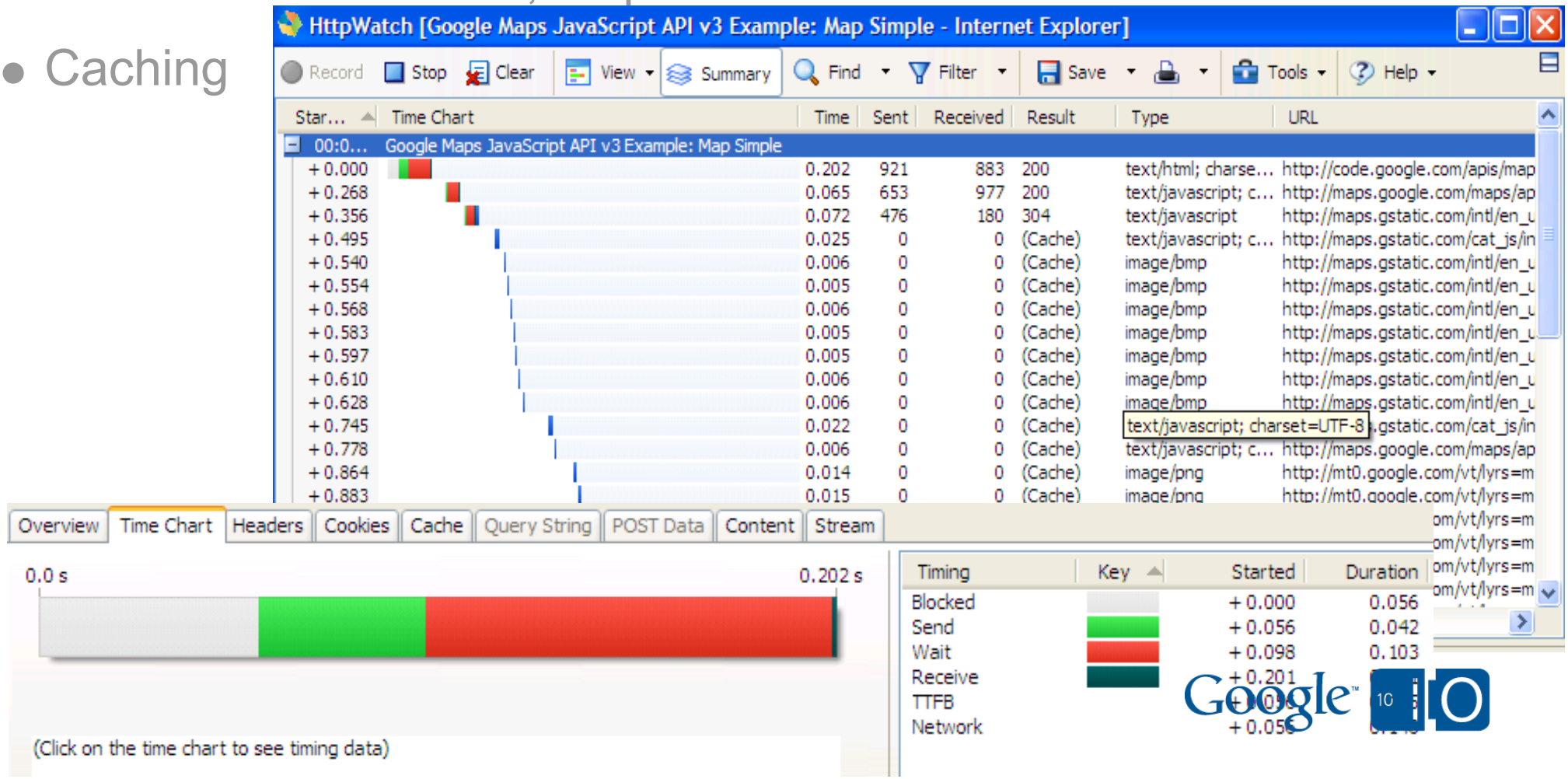
Defining Latency

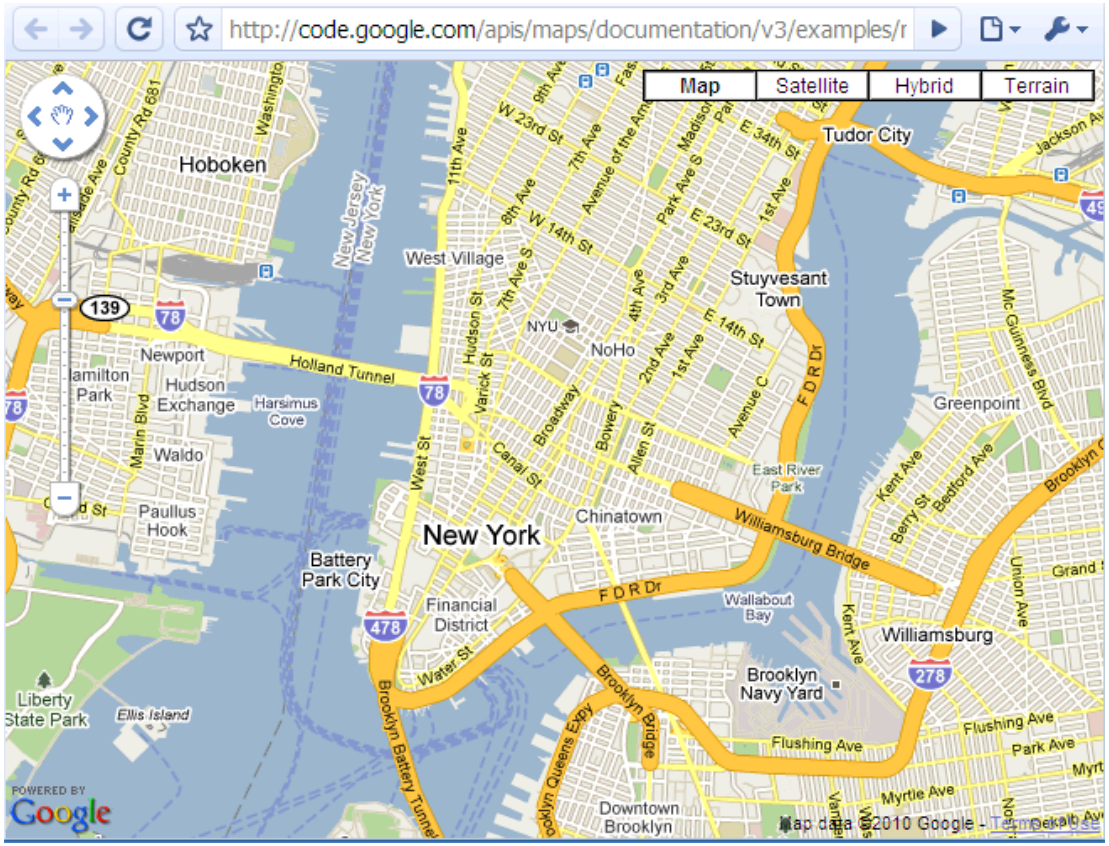
- User perceived latency
  - Page appears usable
- Page ready time
  - Page is usable
- Page load time
  - All elements are present

Measuring Latency: Desktop

- HTTP Watch
  - Internet Explorer and Firefox
- Load time breakdown, sequence
- Caching



Measuring Latency: Desktop vs Mobile



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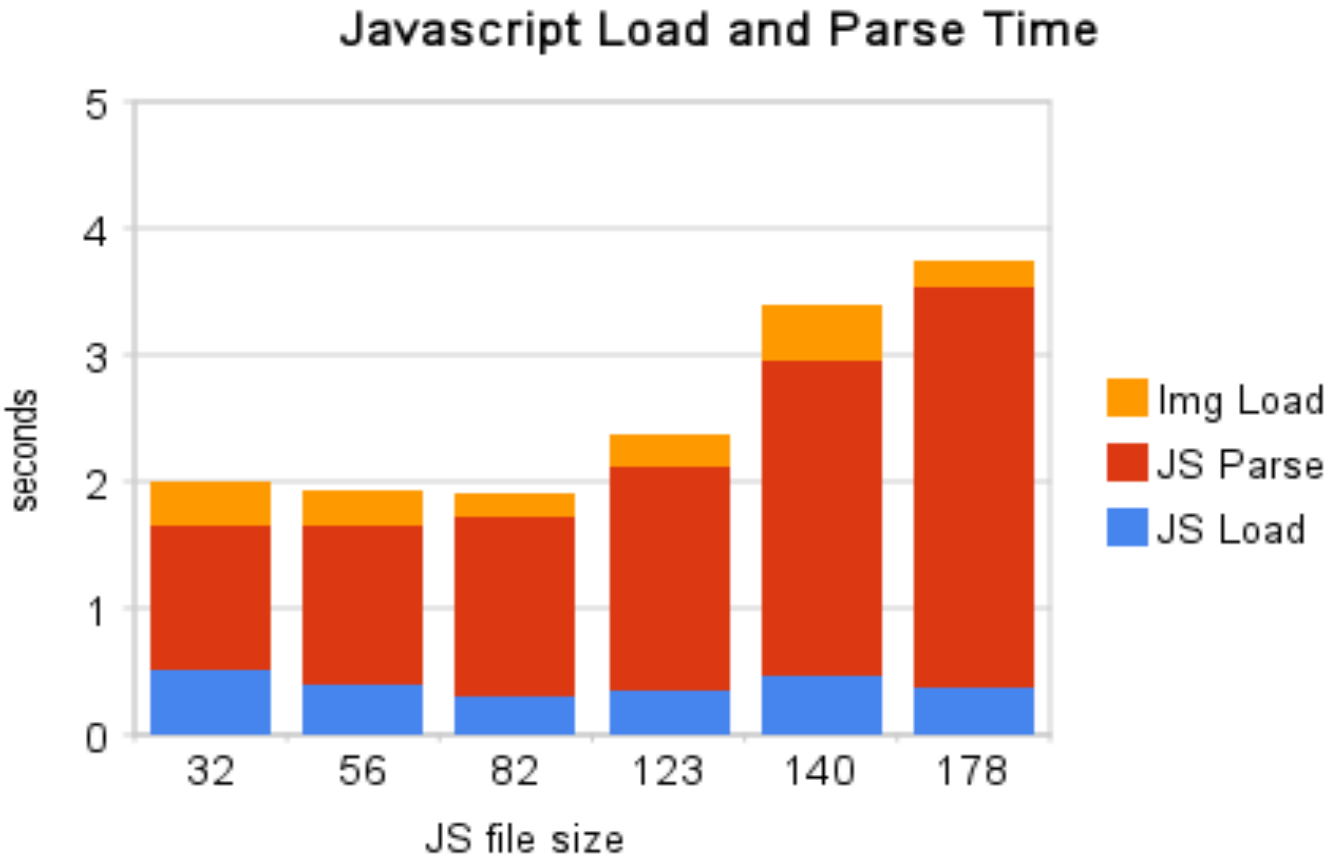
Measuring Latency: Mobile

- Using a Fiddler Proxy
- Can run over 3G

Measuring Latency: Mobile

- Takes 1s + ~5 ms/kB to load and parse JavaScript on iPhone 3 *dependent on hardware and OS version

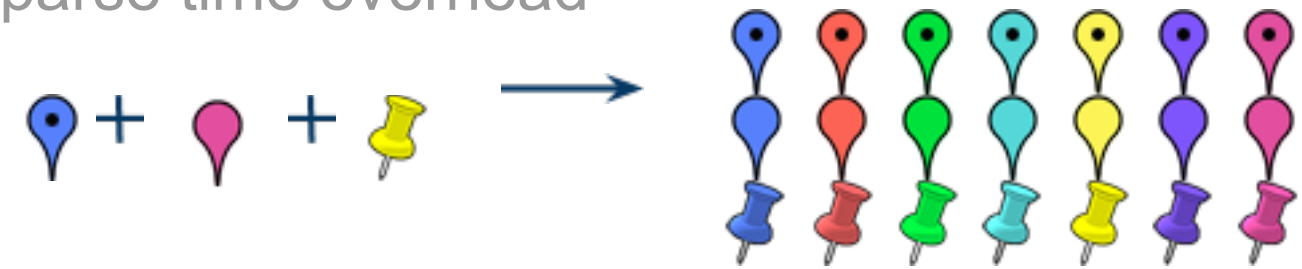


Reducing Latency: Compilers

- Obfuscates property names, reducing code size
- Optimizes for code size
- Plus, lots of helpful error checking
  - Closure - http://code.google.com/closure/compiler/
  - GWT - http://code.google.com/webtoolkit/
  - YUI, Packer, Shrinksafe, and more

Reducing Latency: Reducing downloads

- Techniques
  - Image spriting
  - Combining JS files
    - 1 HTTP request for 57kB
    - Instead of 3 requests for 15-25kB each
- Outcome
  - Fewer HTTP requests
  - Less parse time overhead



Reducing Latency: Mobile Caching

- More constrained than desktop
  - File size restrictions
  - Total size limited
- Cleared more frequently
- Improving with each hardware and OS update

Reducing Latency: HTML5 Database

- Allows for data storage within a site
- Great for static files
- Not so great for dynamic content
- Not easy to use cross-domain

Content

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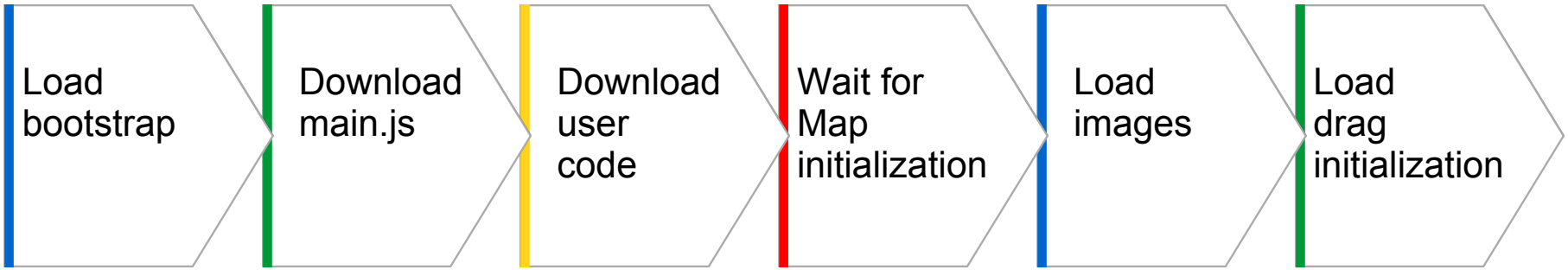
Architecture: Shortcomings of API v2

- Large synchronous public interface
- Slow to start loading map tiles

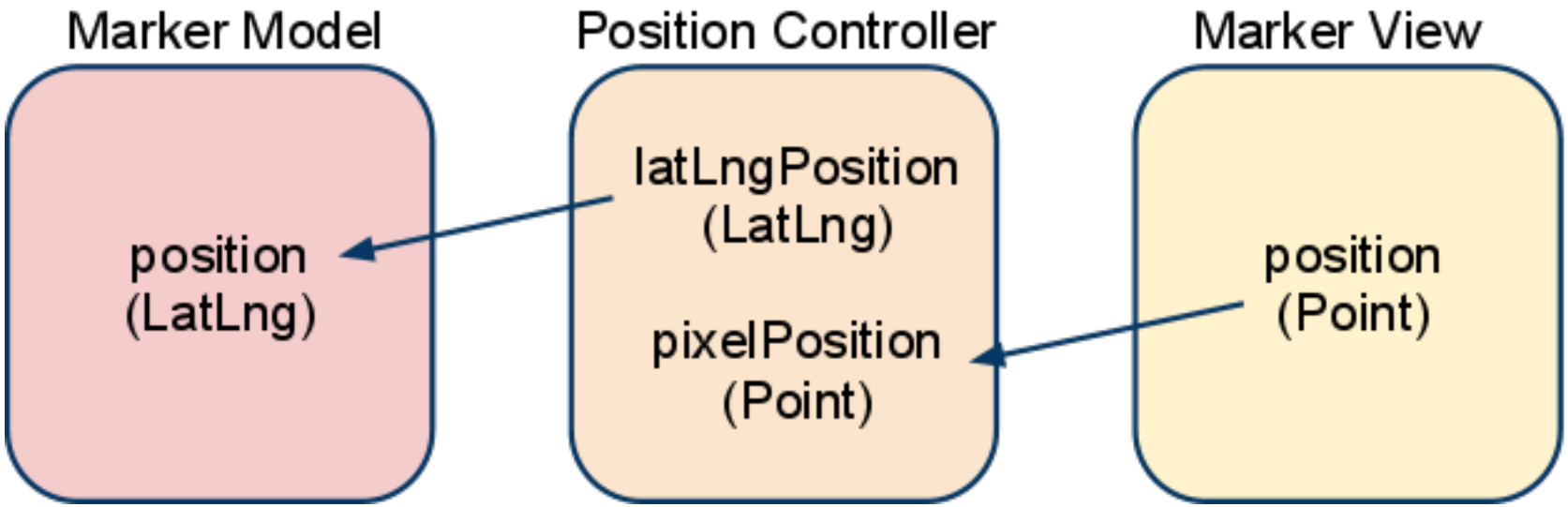


Architecture: Model-View-Controller (MVC)

- Models store state synchronously
- Views render objects asynchronously
- Controllers are go-betweens
- Initial download contains small models
- Views and controllers are loaded on-demand

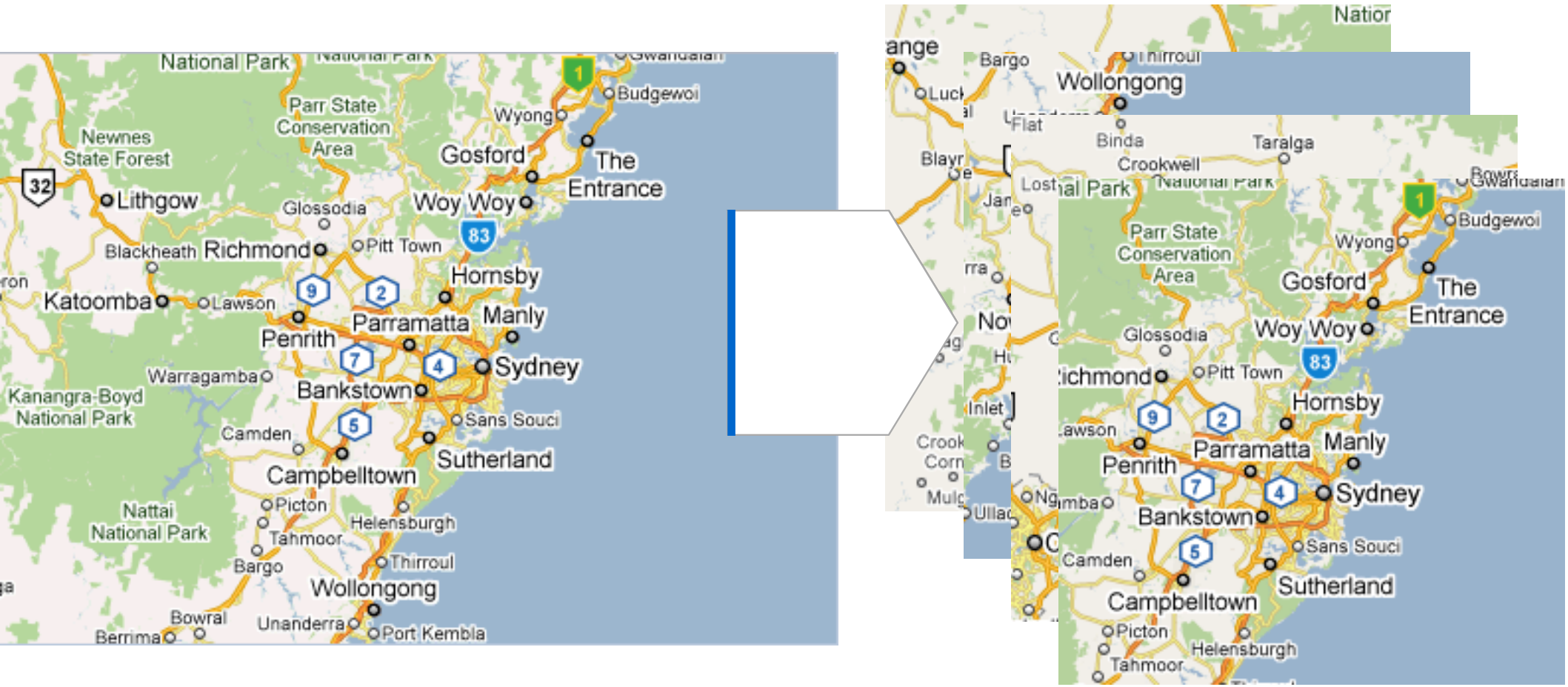
Architecture: Model-View-Controller (MVC)

- Models: Map, Marker, InfoWindow
- Views: DOM rendering
- Views are ignorant of "Map" properties (projection, LatLng, etc)



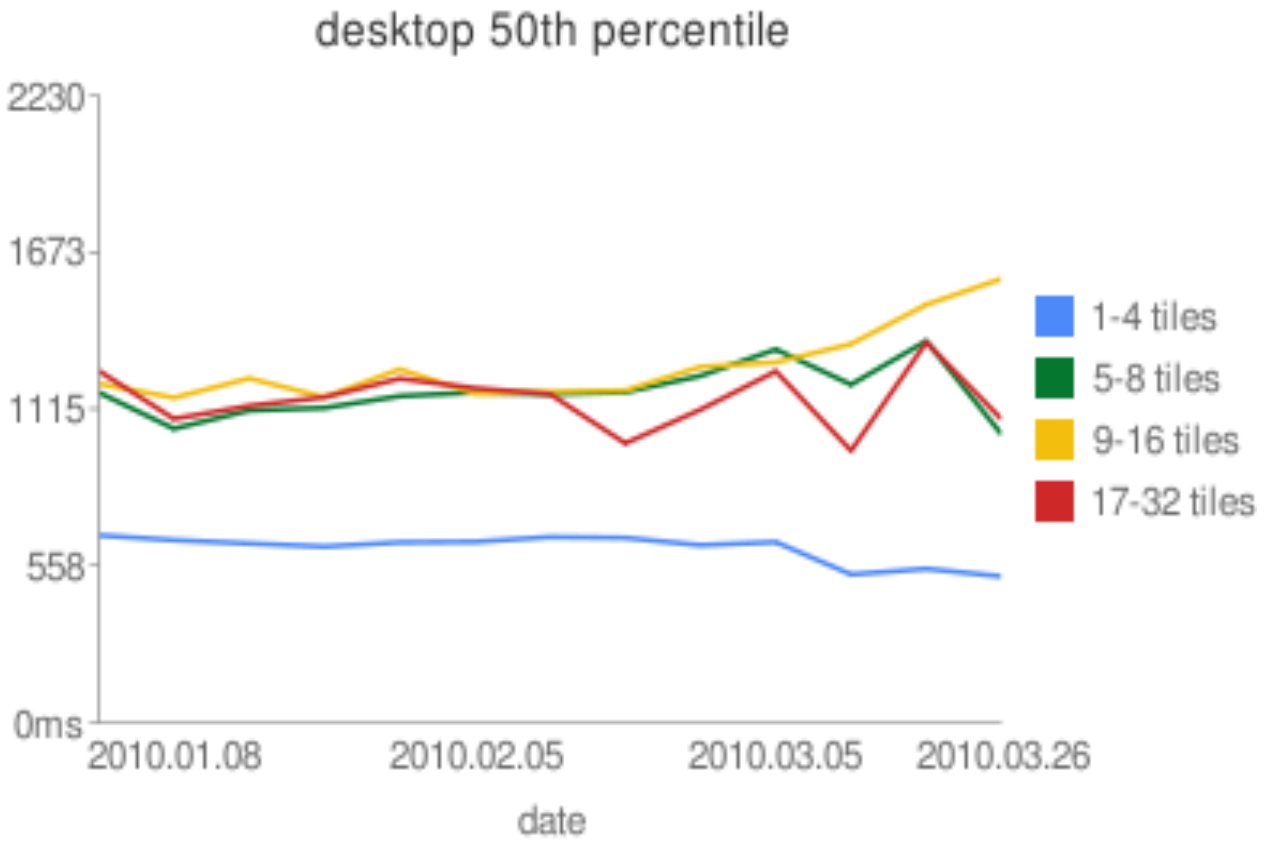
Optimizing

- Loading tiles: 4-6 HTTP requests X 25kB
- Loading one image: 1 HTTP request X 40kB



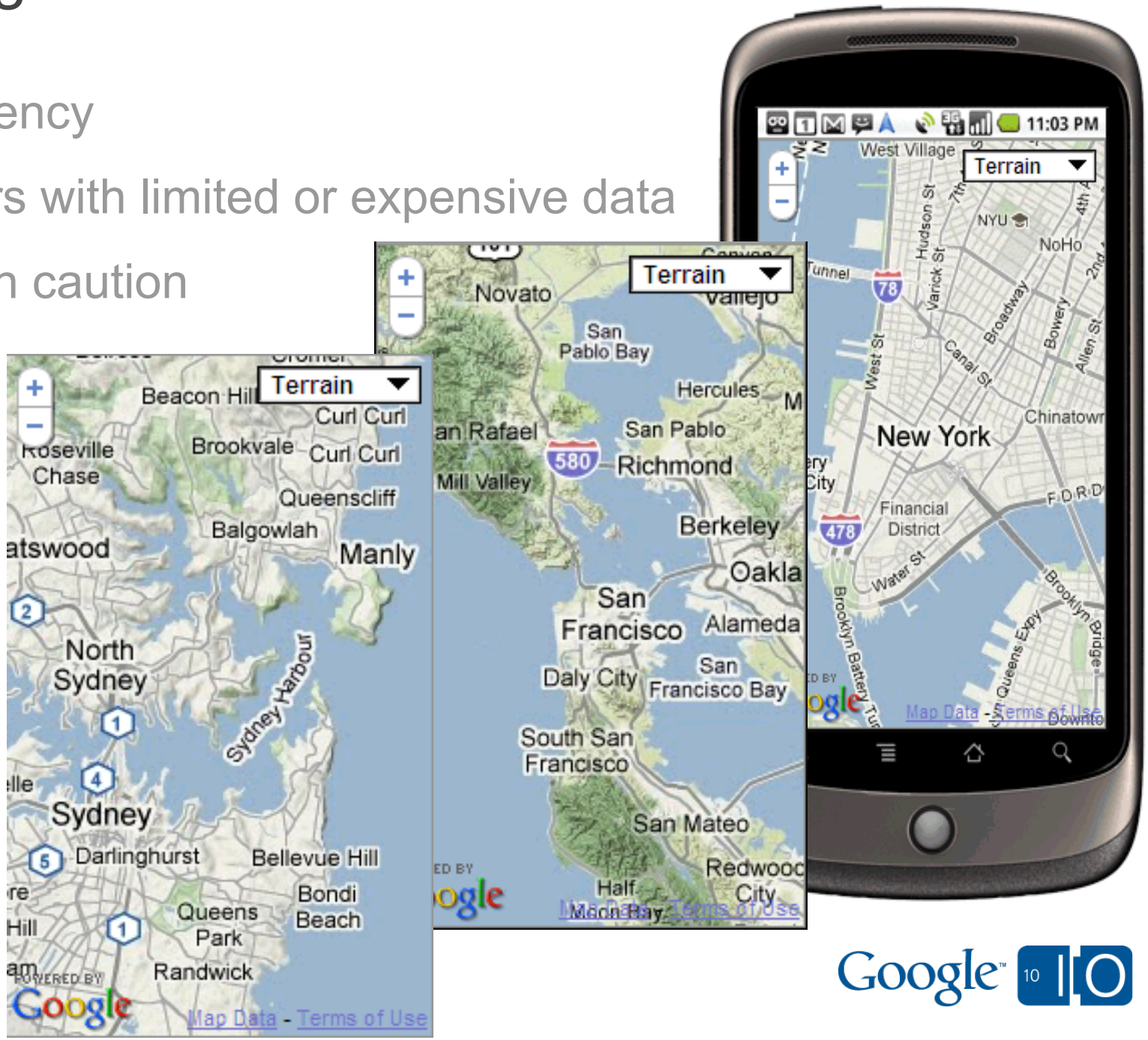
Meeting Goals

- Real world measurements
- Tracking multiple variables



Prefetching

- Good for latency
- Bad for users with limited or expensive data
- Prefetch with caution



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Technology

- Graphics
  - Scalable Vector Graphics (SVG)
  - Vector Markup Language (VML)
  - Canvas 2D
  - WebGL, Canvas 3D
- Geolocation
- Touch events

Technology - Graphics

- Mixed technologies: SVG, VML, Canvas, CSS transforms
- Mixed support: Webkit, IE, iPhone, Android
- Mixed mouse/touch events handling capabilities

Used by Maps API v3 in polys, StreetView and the compass control.

Technology - Graphics

Comparison Chart

	Pros	Cons	Coverage
SVG	...	...	...
VML	...	...	...
Canvas 2D	...	...	...
Canvas 3D	...	...	...
CSS Transforms	...	...	...

Technology - Graphics

Comparison Chart

	Pros	Cons	Coverage
SVG	Fast for polys, retained mode, DOM based	Opaque for mouse/touch events, slow for images	Not IE and Android
VML	...	...	...
Canvas 2D	...	...	...
Canvas 3D	...	...	...
CSS Transforms	...	...	...

Technology - Graphics

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Canvas 3D	...	...	...
CSS Transforms	...	...	...

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Canvas 3D	Very fast, retained geometry, 3D transforms	complex events	latest nightly builds only. Not IE
CSS Transforms	...	...	...

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Technology - Canvas 2D

Render time for StreetView panorama

per frame	Chrome	Firefox	Safari	Android
Linux	25ms (v5.0)	56ms (v3.0)	--	--
MacBook Pro	280ms (v5.0)	292ms (v3.6)	67ms (v4.0.5)	--
Windows XP	33ms (v4.1)	863ms (v3.0)	105ms (v4.0.5)	--
iPad	--	--	801ms	--
iTouch v3.1.2	--	--	1904ms	--
Nexus One	--	--	--	340ms

Desktop and iPad tests done with a 600*400 pixels view, iTouch with 320*400 pixels, and Nexus One with 600*400 pixels.

Linux Chrome: 400*300: 20ms, 600*400: 25ms, 800*600: 52ms, 1200*800: 79ms.

Technology - Canvas 2D and WebGL

Render time for StreetView panorama

per frame	Chrome	Firefox	Safari	Android
Linux	25ms (v5.0) **0.9ms (WebGL)**	56ms (v3.0)	--	--
MacBook Pro	280ms (v5.0)	292ms (v3.6)	67ms (v4.0.5) **1.5ms (WebGL)**	--
Windows XP	33ms (v4.1)	863ms (v3.0) **1.1ms (WebGL)**	105ms (v4.0.5)	--
iPad	--	--	801ms	--
iTouch v3.1.2	--	--	1904ms	--
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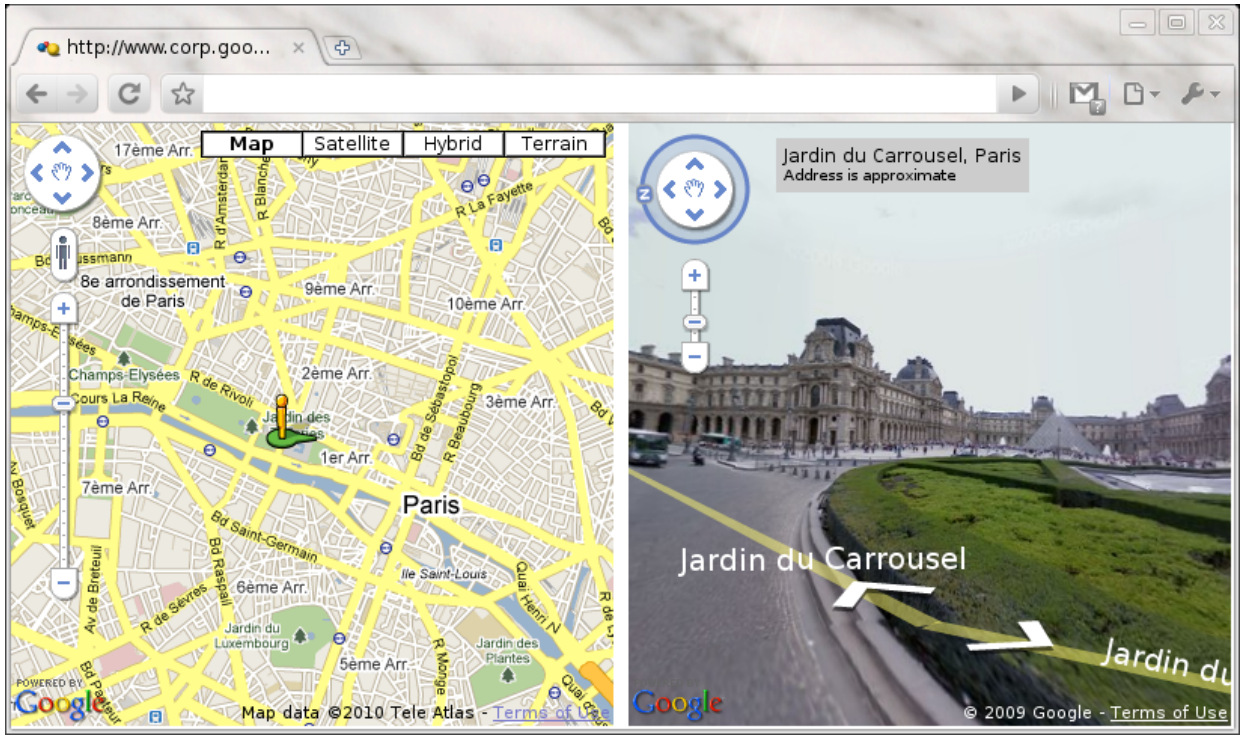
Technology - What to use

	Technology	Browsers
Polygons	SVG / VML	Not Android
Animations	CSS Transforms	Not IE
Image Transforms	Canvas	Not IE
3D Transforms	WebGL	Coming soon, not IE

Technology - Graphics Demo

http://code.google.com/apis/maps/documentation/javascript/examples/streetview-simple.html



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Technology - Graphics beware

- Canvas 2D performance drops for large canvas or large number of Javascript calls.
- iPhone 3D Transform bug with touch events (version 3.1)
- Android Canvas bug with images until Froyo.
- WebGL only supported in nightly builds
- Bug with Embed objects and CSS transform.

Technology - Geolocation

- Uses W3C on Mobiles and Firefox 3.6+
- Falls back to Google Gears if installed
- Used in the API by the Places API
- Not exposed directly as an API

```
var geolocation;
 if (navigator && navigator.geolocation) {
   geolocation = navigator.geolocation;
 } else {
   var factory = initGears();
   if (factory) {
     geolocation = factory.create('beta.geolocation');
   }
 }
 if (geolocation) {
   try {
     geolocation.getCurrentPosition(function(position) { ... });
   } catch (err) {
     ...
  }
 } else {
   ...
 }
```

Technology - Mouse and Touch events

- iPhone, iTouch, iPad and Android so far.
- S60, Palm OS and other mobiles making progress.
- Multi-touch and gestures, Apple only.
- Mouse events and touch events.

iPhone events sequence:

- drag:
  touchstart,
  touchmove*,
  touchend.

- click:
  touchstart,
  touchend,
  mousemove,
  mousedown,
  mouseup,
  click.

- pinch:
  touchstart,
  touchmove*,
  gesturestart + touchstart,
  (touchmove + gesturechange)*,
  gestureend + touchend,
  touchmove*,
  touchend

Technology - Mouse and Touch events

	drag	pinch	click
iPhone/iTouch	✓	✓	✓
iPad	✓	✓	✓
Android 2.x	✓	–	✓
Samsung Wave	–	–	✓
Palm OS	–	–	✓
Nokia X6	*	–	✓

*: Simulated hover mouse events with mousedown/mouseup/click triggered together on finger up.

Content

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Debugging

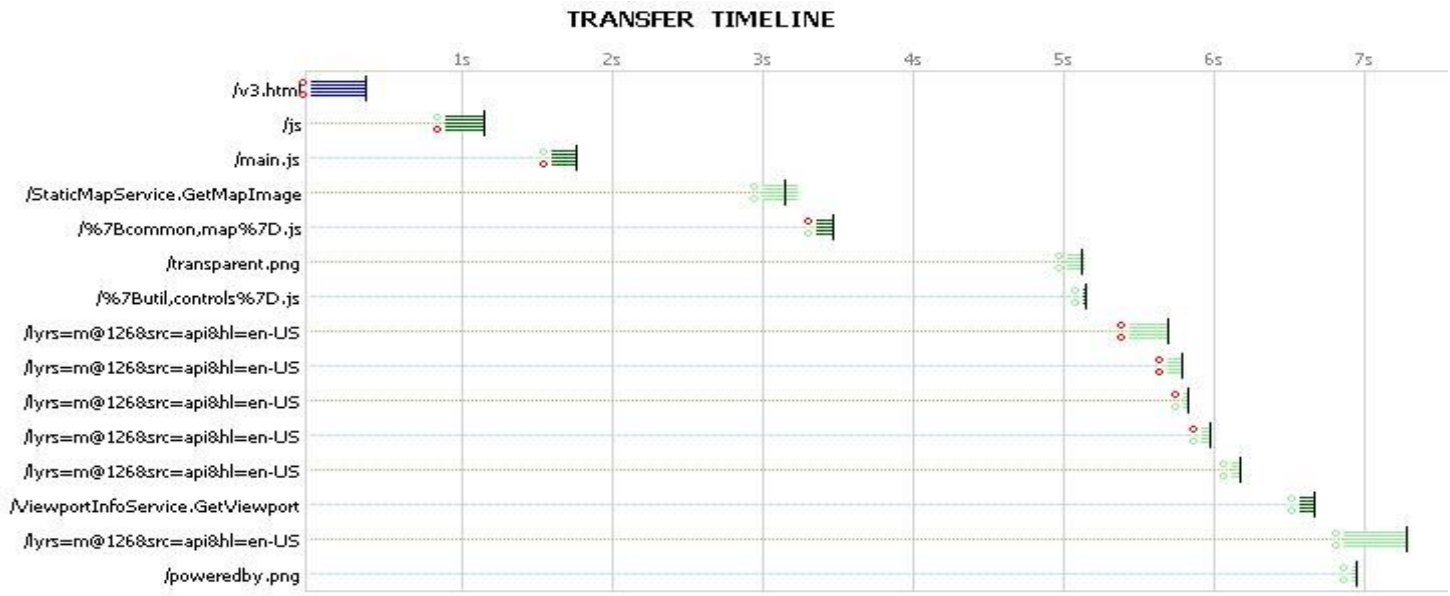
- Debugging
  - Desktops
  - iPhone
  - Android

Debugging desktops

- Firefox: Firebug
- Internet Explorer: Visual Debugger, Dev toolbar
- Chrome: Developer Console, SpeedTracer
- Safari: Web Inspector

Debugging iPhone

- Console
  - Go to Settings/Safari/Developer
  - Set Debug Console ON
  - Use window.console.log to add trace messages.
- HTTP proxy
  - Available for 3G connection only, no Wifi.
  - Use the iPhone Configuration Utility.



Debugging Android

- adb logcat
  - Download Android SDK
  - Run setup and download USB drivers
  - Set Android device to accept USB debugging
  - Use adb tool.
- HTTP proxy
  - 3G only, no Wifi
  - Setup proxy in Network APNs
  - Note: Fails on current Android release 2.1, fix coming soon.

Google Developer Qualification

Chrome Extensions

Gadgets

Search

App Engine

JS Maps API

KML

3D

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