
Google™
11
I/O

Using GWT and Eclipse to Build Great Mobile Web Apps

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Product Manager, GWT and Google Plugin for Eclipse

Feedback: http://goo.gl/mn6Y4
Twitter: #io2011 #gwt

Why Are We Here?

The Problems

- Mobile devices
  - ...have smaller screens
  - ...can have different orientations
  - ...have slower processors
  - ...can be disconnected

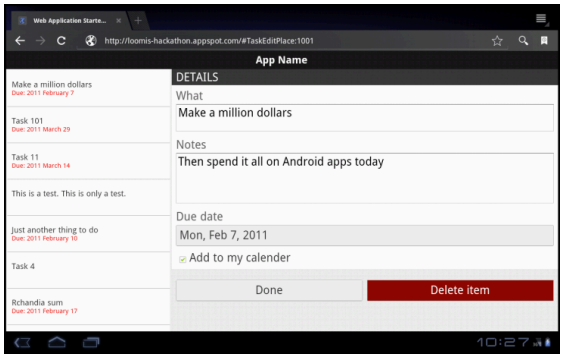
The Solution

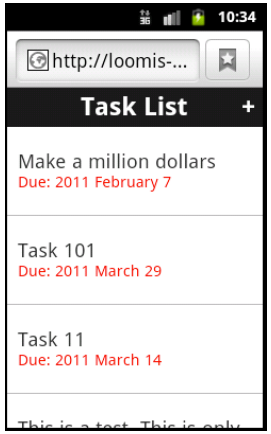
- Use GWT and Google's Plugin for Eclipse (GPE) to build great mobile web apps for iPhone and Android

- And helps you
  - ...build great mobile UIs for any form factor
  - ...optimize the user experience
  - ...make it snappy
  - ...work without a connection

Example App: Cloud Tasks

- Web based task mgmt app
- UIs for Android, iPhone, iPad, and desktop browsers
- Orientation change handling
- Offline support
- Source code available at the end





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- Build great UIs for any form factor
- Optimize the user experience
- Make it snappy
- Work without a connection

Build Great Mobile UIs For Any Form Factor

- UI code like you expect it
  - Declarative UI layout with UiBinder
- Speed up UI development with WYSIWYG tools
  - Using GWT Designer to build great UIs

Build Great Mobile UIs For Any Form Factor

UI code like you expect it

```
<ui:UiBinder>
    <ui:style>
        .addButton {
            color: white;
            font-size: 18pt;
            background: none;
            border: none;
            text-align: right;
            font-weight: bold;
        }
    </ui:style>

    ...

</ui:UiBinder>
```

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Build Great Mobile UIs For Any Form Factor

UI code like you expect it

```
<ui:UiBinder>
    <g:DockLayoutPanel>

        <!-- Header -->
        <g:north size="32">
          <g:HTMLPanel></g:HTMLPanel>
        </g:north>

        <g:center>
            <g:DockLayoutPanel>
                <!-- Task List. -->
                <g:west size="30">
                    <g:SimpleLayoutPanel addStyleNames="{style.taskList}"/>
                </g:west>

                <!-- Content. -->
                <g:center>
                    <g:DeckLayoutPanel></g:DeckLayoutPanel>
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        </g:center>
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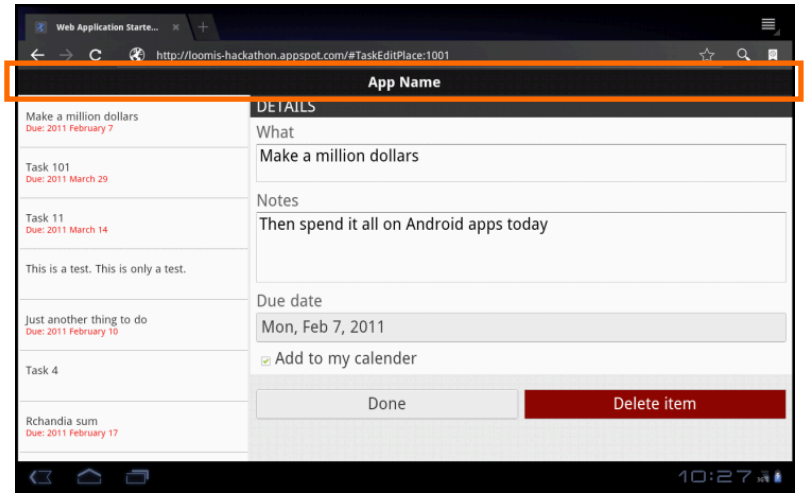

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Build Great Mobile UIs For Any Form Factor

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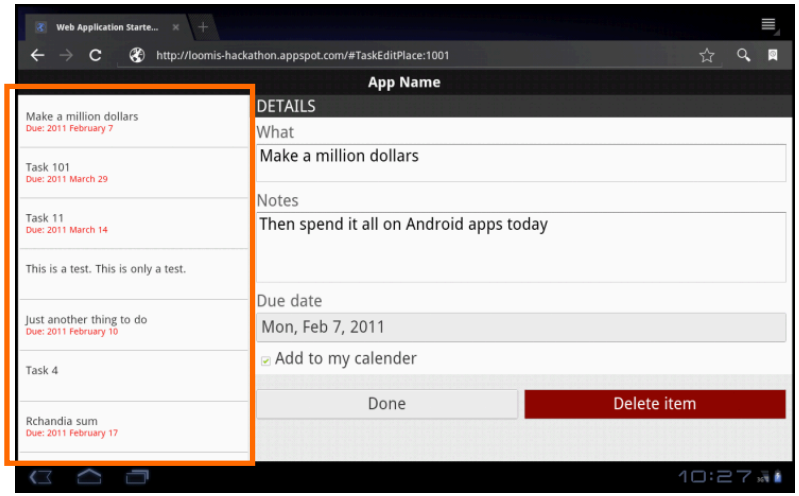

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Build Great Mobile UIs For Any Form Factor

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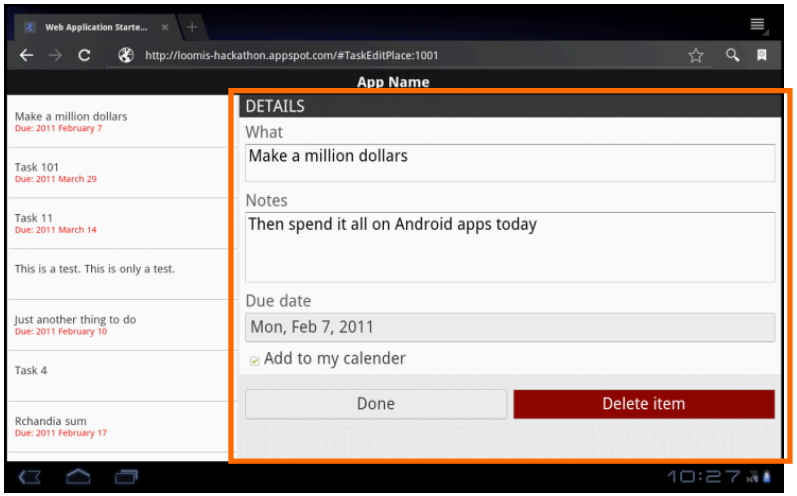

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Build Great Mobile UIs For Any Form Factor

Speed up UI development with WYSIWYG tools

Build Great Mobile UIs For Any Form Factor

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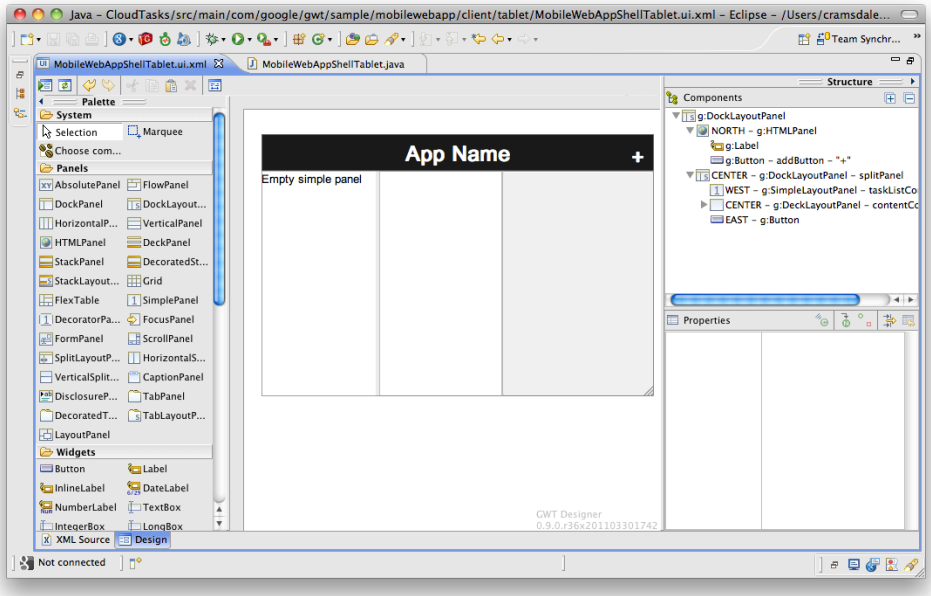

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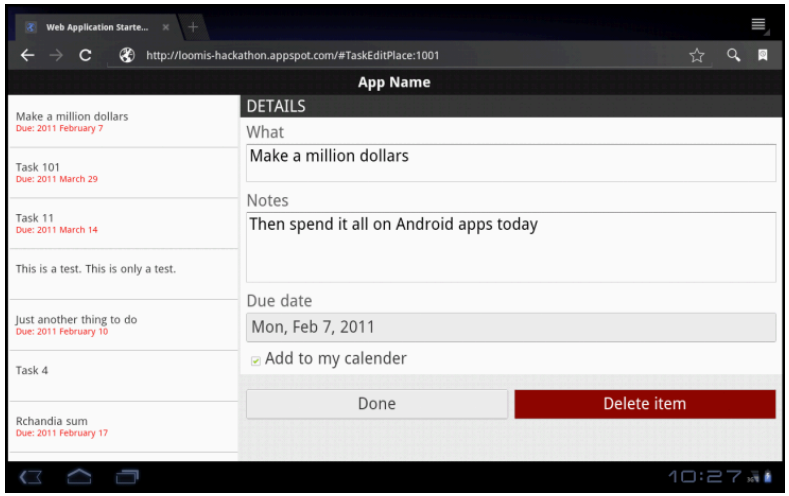
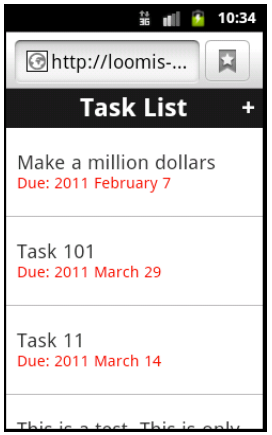
Build Great Mobile UIs For Any Form Factor

Device-specific, declarative UIs



XML ListView**Tablet**.ui.xml



XML ListView**Phone**.ui.xml

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- Build great UIs for any form factor
- Optimize the user experience
- Make it snappy
- Work without a connection

Optimize the User Experience

- Desktops, tablets, and phones...oh my!
  - Deferred binding to sort them out
- Landscape vs. portrait
  - Capture and respond to orientation changes
- Icing on the cake
  - Maximize code reuse by using the Model-View-Presenter (MVP) design pattern

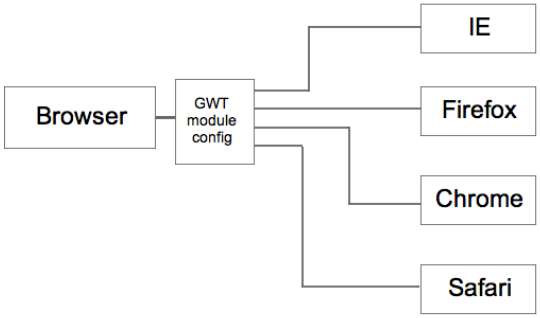
Optimize the User Experience

Select the right UI using deferred binding

Deferred what?

Optimize the User Experience

Deferred binding - optimize for the browser



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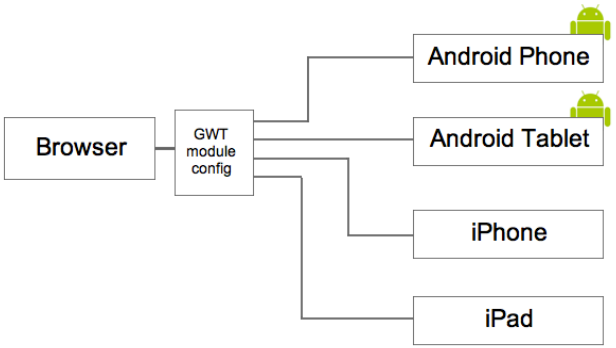

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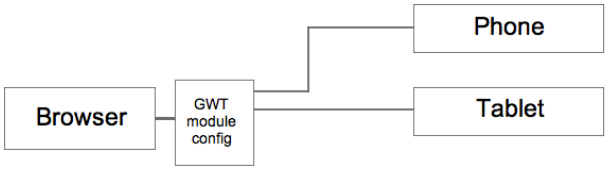

Optimize the User Experience

Select the right UI using deferred binding

CloudTasks.gwt.xml (GWT app config)

```
<!-- Use ViewFactoryImplMobile for mobile form factor. -->
<replace-with class="com.google.mobilecalendar.client.ViewFactoryImplMobile">
  <when-type-is class="com.google.mobilecalendar.client.ViewFactory"/>
  <when-property-is name="formfactor" value="mobile"/>
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```

Optimize the User Experience

Select the right UI using deferred binding

FormFactor.gwt.xml

```
<property-provider name="formfactor">
  <![CDATA[
    var ua = navigator.userAgent.toLowerCase();
    if (ua.indexOf("ipad") != -1) {
      return "tablet";
    } else if (ua.indexOf("iphone") != -1 || ) {
      return "mobile";
    } else if (ua.indexOf("android") != -1) {
      // Overly complex hueristic for determining Android form factor
      ...
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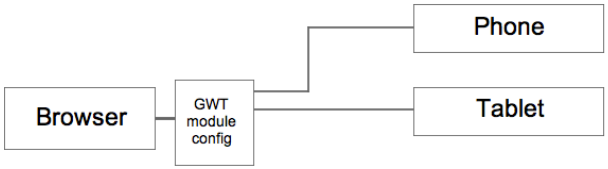
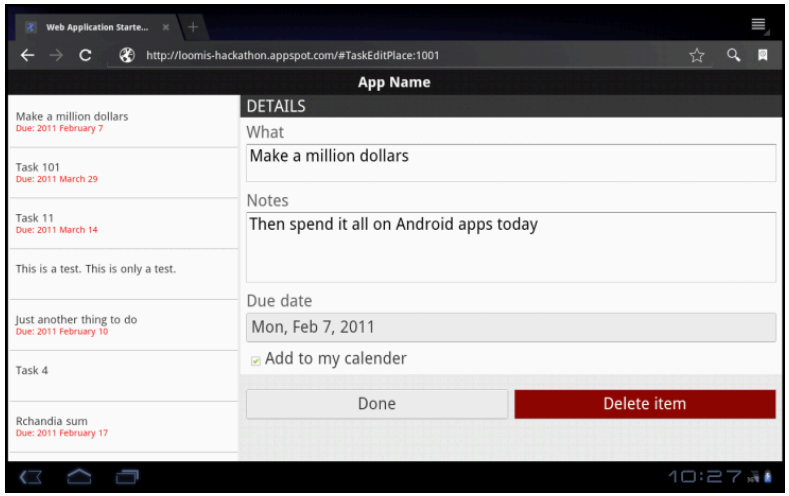


Build Great Mobile UIs For Any Form Factor

Device-specific, declarative UIs



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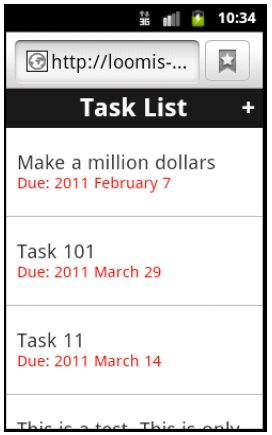

XML ListView**Phone**.ui.xml

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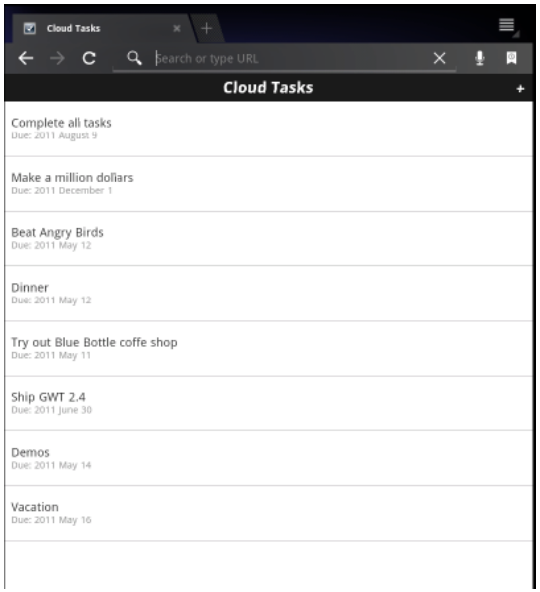
Optimize the User Experience

Capture and respond to orientation changes



Optimize the User Experience

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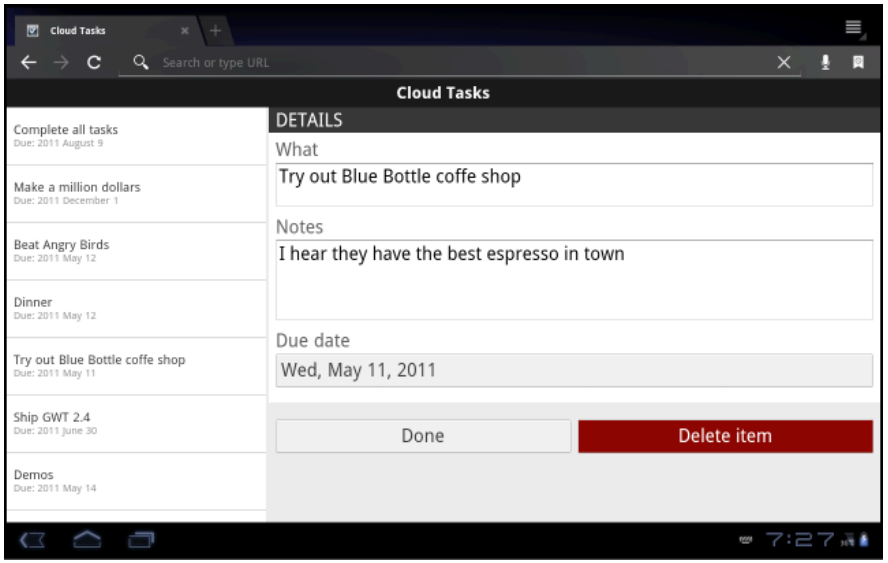

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Optimize the User Experience

Capture and respond to orientation changes

Optimize the User Experience

Capture and respond to orientation changes

```
/*
 * Listen for changes in the window size so we can adjust the
 * orientation of the app. This will also catch orientation changes
 * on mobile devices.
 */
windowResizeHandler = Window.addResizeHandler(new ResizeHandler() {
  public void onResize(ResizeEvent event) {
    if (isOrientationPortrait != calculateOrientationPortrait()) {
      isOrientationPortrait = !isOrientationPortrait;
      adjustOrientation(isOrientationPortrait);
    }
  }
});
```

Optimize the User Experience

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});
```

Optimize the User Experience

Capture and respond to orientation changes

```
private static boolean calculateOrientationPortrait() {
    return Window.getClientHeight() > Window.getClientWidth();
}
```

Optimize the User Experience

Capture and respond to orientation changes

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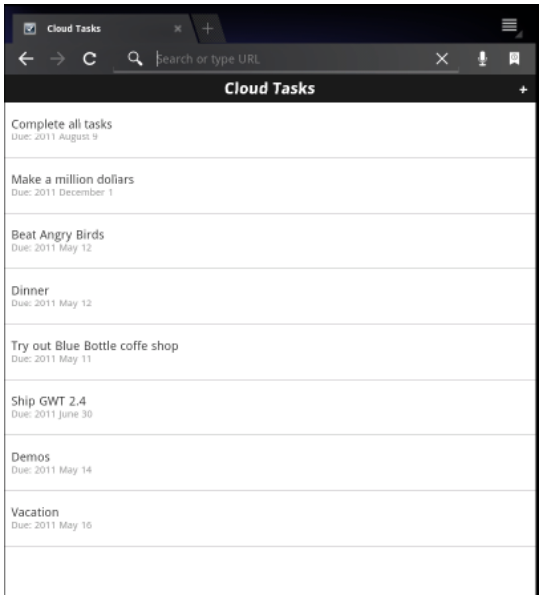

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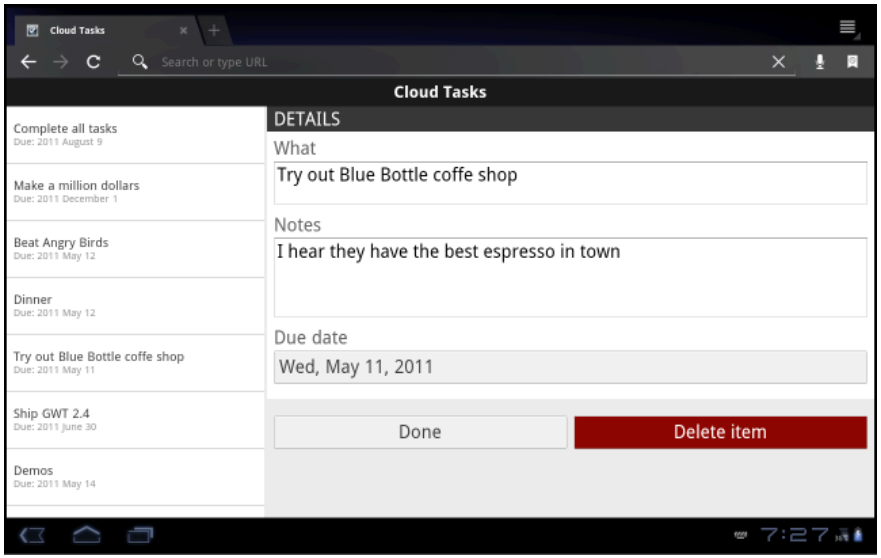

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Optimize the User Experience

Maximize code reuse using the MVP pattern

Optimize the User Experience

Maximize code reuse using the MVP pattern

- MVP recap
  - Model-View-Presenter design pattern
  - Similar to MVC - less logic in the View
  - Business logic goes are part of Model/Presenter
  - Keep Views as simple as possible
  - Faster test cycles: run tests as vanilla JRE tests

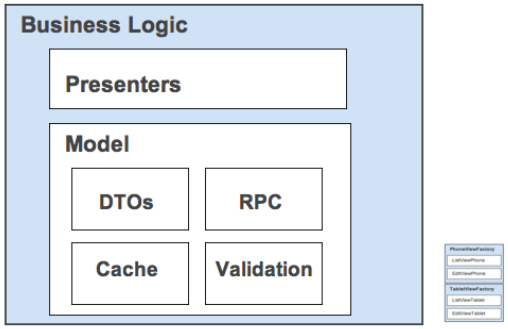
Optimize the User Experience

Maximize code reuse using the MVP pattern

- Tablet vs Phone
  - Business logic is the same
  - Views change
  - Ideal design pattern for supporting multiple form factors

Optimize the User Experience

Maximize code reuse using the MVP pattern



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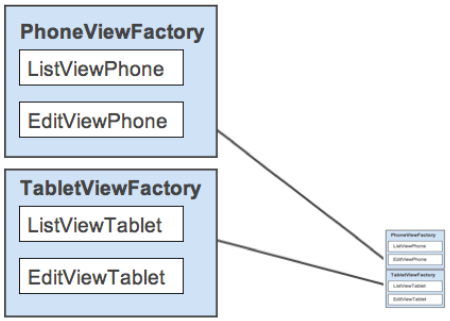

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```

- Build great UIs for any form factor
- Optimize the user experience
- Make it snappy
- Work without a connection

Make it Snappy

- Increase responsiveness
  - **Problem**: HTTP requests are expensive over 3G connections
- Minimize startup time
  - **Problem**: Mobile processing power still trails desktops/laptops
  - **Problem**: Parsing large amounts of Javascript can be a large source of latency

Make it Snappy

- Increase responsiveness
  - **Solution**: Use GWT's Client Bundle to batch resource fetches
- Minimize startup time
  - **Solution**: Use Code Splitting to grab only the code you need
  - **Solution**: Remove unused code, reduce overall code size using GWT compiler optimizations

Make it Snappy

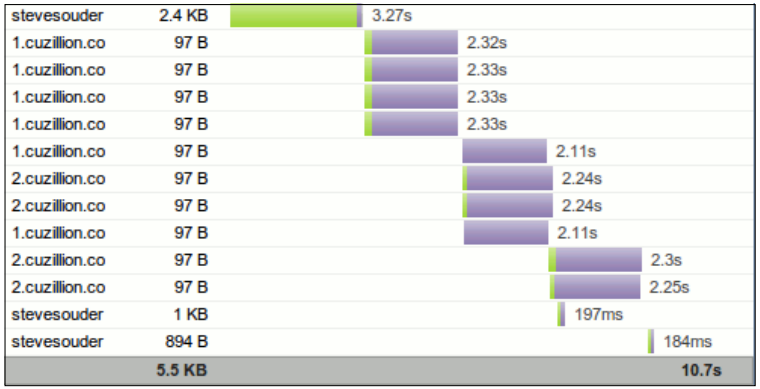
Increase responsiveness by bundling resource fetches

Demo

Make it Snappy

Increase responsiveness by bundling resource fetches

- Even worse, mobile browsers limit the number of concurrent requests
- Ex http request waterfall chart for Android - 4 concurrent TCP connections



http://calendar.perfplanet.com/2010/mobile-performance-analysis-using-pcapperf/

Make it Snappy

Increase responsiveness by bundling resources

```
public interface Resources extends ClientBundle {
    @Source("image0.gif")
    public ImageResource image0();

    @Source("image1.gif")
    public ImageResource image1();

    ...
}
```

Make it Snappy

Increase responsiveness by deferring resource fetching

```
void onShowImagesButtonClicked() {
    GWT.runAsync(new RunAsyncCallback() {
        public void onSuccess() {
            showImagesDialog();
        }
    }
}
```

Make it Snappy

Increase responsiveness by deferring resource fetching

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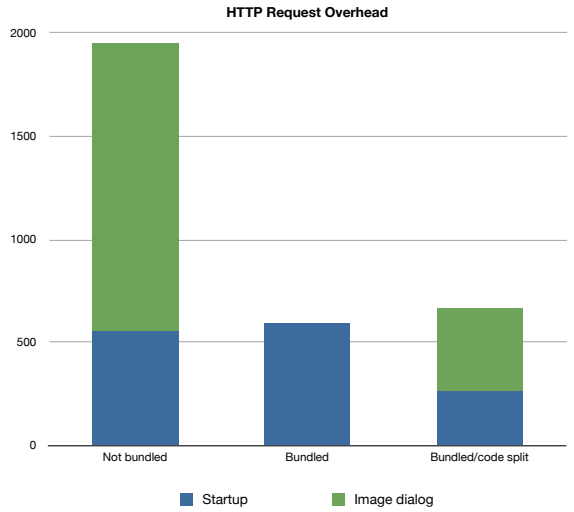
Make it Snappy

Increase responsiveness by deferring resource fetching

Total time spent waiting (ms)

- Not bundled: 1409ms
- Bundled: 594ms
- Bundled and code split: 664ms

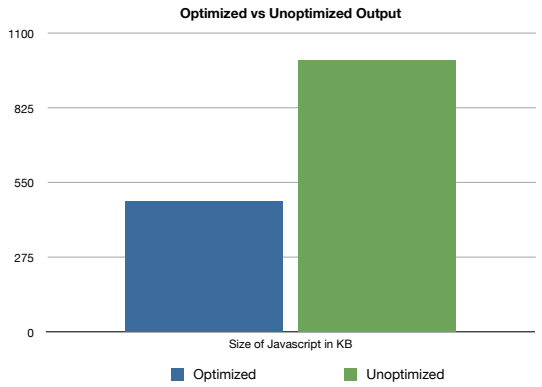


Make it Snappy

Reduce overall code size, reduce startup time

- More Javascript == more parsing == increased load time, cpu cycles
- Increased cpu cycles == battery drain == poor user experience

- GWT compiler optimizations can help
  - Dead code elimination
  - Duplicate function removal
  - Obfuscation



- Build great UIs for any form factor
- Optimize the user experience
- Make it snappy
- Work without a connection

Work Without a Connection

- Run wherever, whenever
  - Use Application Cache to load resources locally
- Access data wherever, whenever
  - Use Local Storage as a caching mechanism for RPCs

Work Without a Connection

Run wherever, whenever using Application Cache

- Part of the HTML5 feature set
- Loads resources like HTML, CSS, and JS from disk
- Works with iPhone and Android (+ Chrome, Safari, and Firefox)

Work Without a Connection

Run wherever, whenever using Application Cache

- appcache.nocache.manifest
  - Lists all of the files that you want to browser to cache
    - Include HTML, CSS, JS
      - Exclude GWT-RPC-related files (security)
      - "nocache" - always requested
- web.xml
  - mime-type for manifest files (text/plain)
- <your_app>.html
  - include <html manifest="app.nocache.manifest">

Work Without a Connection

Run wherever, whenever using Application Cache

...or check out the GWT 2.4 SDK :-)

Work Without a Connection

Run wherever, whenever using Application Cache

```
<!-- Define a custom App Cache linker -->
<define-linker name="appcachelinker"
    class="com.google.gwt.sample.mobilewebapp.linker.AppCacheLinker"/>

<!-- Use it -->
<add-linker name="appcachelinker"/>
```

Work Without a Connection

Access data wherever, whenever using Local Storage

- Part of the HTML5 feature set
- Utilizes a local database for reading/writing data
- Key/value-pair persistence
- Works with iPhone and Android (+ Chrome, Safari, and Firefox)
- Included in the GWT 2.3 SDK

Work Without a Connection

Access data wherever, whenever using Local Storage

- Grab an instance of the Local Storage interface

```
localStorage = Storage.getLocalStorageIfSupported();
```

- Read cache and then request any updates

```
public List<Tasks> getTasks() {
  String taskListString = localStorage.getItem(TASKLIST_SAVE_KEY);
  List<Tasks> tasks = deserialize(taskListString);
  requestFactory.taskRequest().queryForUpdates().fire(...) {
    ...
  }
  return tasks;
}
```

Work Without a Connection

Access data wherever, whenever using Local Storage

- Upon response, update cache and any listeners

```
public List<Tasks> getTasks() {
  ...
  requestFactory.taskRequest().queryForUpdates().fire(
    new Receiver<List<Tasks>>() {
      public onSuccess(List<Tasks> tasks) {
        String tasksListString = serialize(tasks);
        localStorage.setItem(TASKSLIST_SAVE_KEY, tasksListString);
        // update everyone listening for task list updates
      }});
  ...
}
```

Summary

- There are many challenges when building great mobile web apps
- GWT and GPE can help
- Tools for quickly building great UIs
- Frameworks for optimizing the user experience
- Compilers and code generators to improve speed
- API support for working offline

More Info...

- You can download the source and tools here:
  - http://code.google.com/webtoolkit/download.html
- Other sessions to check out
  - Use Page Speed to Optimize Your Web Site For Mobile (Check back for YouTube link)
  - Mobile Web Development: From Zero to Hero (12:30pm)
  - HTML5 versus Android: Apps or Web for Mobile Development? (3pm)

Q&A

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