An Overview of

Mobile Web Architecture

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Overview

1. Design Principles
2. Architectural Patterns
3. Building for Degradation
Design Principles
for a mobile experience
Understand Your Audience

• Desktop browsing is
  – page hops
  – searches
  – large blocks

• The mobile experience is
  – an integrated experience
  – short and directed content
  – rich interaction and movement
Keep It Simple

• Markup should be simple and compatible
  – XHTML MP 1.0
  – WCSS

• Mobile users want information fast
  – Minimize scrolling
  – Avoid excess decoration
  – Short text and icons

• Do not clutter the screen
Task-Oriented Content

• Get the user quickly to where they want
  – Minimize the number of pages to complete a task
  – Keep the user focused on the current task

• Don’t create a mini version of a desktop site

• Reconsider movement around the site
Consider the Context

• Small screen
  – Tightened focus over less real estate

• Touch interface
  – Multi-touch and gestures
  – Different sort of interactive experience

• Mobility
  – Locational awareness
  – Different goals
Architectural Patterns
that minimize development costs
Architectural Goals

- Layers
- Encapsulation
- Reusability
- Business logic integrity
- Interface consistency
Approaches

- Shared Libraries
- Model-view-controller (MVC)
- Service-oriented architecture (SOA)
Shared Library

• Concept
  – Libraries of functions and/or objects
  – Separate desktop, tablet and mobile apps

• Properties
  – Reuses objects to accomplish the same task
  – Consistency if the library is used and maintained
  – Requires homogeneous environment
Shared Library

- Good use cases
  - Decorators
  - Session and state management
  - Data setters and getters
Shared Decorator Library

• Object that encapsulates some element
  – Methods permute the content of the element
  – Render method generates the actual output

• Use case:
  – Instantiate the decorator
  – Modify element attributes
  – Add contained entities
  – Render to produce actual HTML output
Shared Decorator Library

• MWF provides two decorator sets
  – HTML Decorators
  – Site Decorators

• Site decorators create MWF entities.

• MWF entities are semantic HTML.
  – Can style them in a desktop manner as well.
  – Can simply define different CSS for desktop.
Shared Decorator Library

- Using the .menu-full decorator directly

```php
$decorator = Site_Decorator::menu_full(array(), array('class' => 'main-menu'));
$decorator->set_title('Menu')
$decorator->add_item('Item 1', '#1')
$decorator->add_item('Item 2', '#2')
$decorator->add_item('Item 3', '#3')
$decorator->add_item('Item 4', '#4')
$decorator->add_item('Item 5', '#5')
$decorator->render();
```
Encapsulate the `.menu-full` decorator

```php
class Front_Page_Menu_Full_Site_Decorator extends Menu_Full_Site_Decorator {

    public function __construct($title = false, $params = array()) {
        parent::__construct($title, $params);
        $this->set_param('class', 'main-menu menu-full');
        $this->set_title('Menu');
        $this->add_item('Item 1', '#1');
        $this->add_item('Item 2', '#2');
        $this->add_item('Item 3', '#3');
        $this->add_item('Item 4', '#4');
        $this->add_item('Item 5', '#5');
    }
}
```
Shared Decorator Library

- Using the shared library
  ```php
  $menu = new Front_Page_Menu_Full_Site_Decorator();
  echo $menu->render();
  ```

- Mobile and desktop sites both define CSS
  - CSS handler covers the mobile site
  - Different CSS file for the desktop site

- Can consolidate to one invoking script:
  - Redirect script or User_Agent call
Demo

extending decorator shared libraries
From Decorators to Views

• A decorator may use multiple decorators
  – Many site decorators are tag composites
  – A page decorator could also be a composite
  – UC San Diego has a Java-based page decorator

• Multi-element decorators are views
  – Pass a set of data into an encapsulating object
  – Object renders output based on data
Model-View-Controller

- **Model**
  - Manages, mediates and manipulates data

- **View**
  - Encapsulates the user interface

- **Controller**
  - Bridges model and view with business logic
Model-View-Controller Layers

User

View

Controller

Model

Data
Model-View-Controller Layers
Model-View-Controller Layers
Model-View-Controller Layers

User

View

Controller

Model

Data
Model-View-Controller Layers

User

View

Controller

Model

Data
Model-View-Controller Layers
Model-View-Controller Layers
MVC for Mobile Web Apps

• Can build one app that supports:
  – Desktop
  – Tablet
  – Mobile

• MVC approach:
  – One set of controllers and models
  – Different composite views for mobile & desktop
  – Reuse subviews in different composite views
Demo

using MVC to deliver to mobile and desktop
From MVC to SOA

• Views separate rendition from
  – Business logic
  – Data models

• Going a step further:
  – One entity handles business logic & data models
  – Another entity handles rendition

• Basis of service-oriented architecture
Service-Oriented Architecture

• Service provider
  – Exposes business logic through service interfaces
  – Mediates & manipulates data based on services

• Service consumer
  – Invokes services provided by the service provider

• Service definition
  – Contract between provider & consumer
Service-Oriented Architecture
Service-Oriented Architecture
Service-Oriented Architecture
Service-Oriented Architecture

User

Service Provider

Service Request

Service Contract

Service Provider

Data
Service-Oriented Architecture
Service-Oriented Architecture

- Service contract
- Loose coupling
- Abstraction
- Reusability
- Autonomy
- Granularity
- Statelessness
SOA through Web Services

• Often implemented through web services
• Two common modern protocols:
  – SOAP
  – REST
## SOA through Web Services

<table>
<thead>
<tr>
<th>SOAP</th>
<th>REST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport neutral</td>
<td>HTTP Transport</td>
</tr>
<tr>
<td>Message-driven</td>
<td>HTTP Request-driven</td>
</tr>
<tr>
<td>XML</td>
<td>XML, JSON, HTML, etc.</td>
</tr>
<tr>
<td>Complex definition</td>
<td>Simple definition</td>
</tr>
<tr>
<td>Verbose semantics</td>
<td>Limited semantics</td>
</tr>
<tr>
<td>Larger payload</td>
<td>Minimized payload</td>
</tr>
<tr>
<td>Must parse for AJAX</td>
<td>Can avoid parsing for AJAX</td>
</tr>
</tbody>
</table>
SOA for Mobile Web Apps

• Web services encapsulate business logic
• Client calls web services to perform actions
• Rough analogy back to MVC:
  – Client ~ View
  – Service ~ Controller + Models
SOA for Mobile Web Apps

• Design decisions:
  – REST or SOAP?
  – XML, JSON or HTML?
  – Thick or thin client?
  – Server or browser rendering?
SOA for Mobile Web Apps

• Design decisions:
  – **REST** or SOAP?
  – XML, **JSON** or HTML?
  – Thick or **thin** client?
  – **Server** or browser rendering?
SOA for Mobile Web Apps

• REST
  – Simple and easy to implement
  – Uses HTTP requests and responses
  – Allows XML, JSON, HTML, etc.

• JSON
  – Smaller payload than XML
  – No parsing required for Javascript
SOA for Mobile Web Apps

• Thin Client
  – Reusability
  – Business logic integrity
  – Focus client on presentation

• Server Rendering
  – Not all user agents allow Javascript or AJAX
  – Supplement with AJAX where possible
Building for Degradation
while using new HTML 5 and CSS 3 features
The Situation

• Not all phones
  – have the same features
  – provide access to the same features
  – provide the same access to the same features

• The goal:
  – Use top-end features when available
  – Still remain usable for low end devices
  – Avoid writing two applications
The Situation

• CSS 3
  – Gradients, border radii, etc.
  – Transitions, key frames, etc.

• HTML 5
  – Semantic Entities
  – Forms and Input Types

• Javascript
  – DOM Writing
  – AJAX

• Device APIs
  – Audio
  – Video
  – Geolocation
  – Compass
  – Accelerometer
  – Storage
  – Camera
  – Web Sockets
Degradation in MWF

• Handlers load styles/scripts in three tiers:
  – Basic
  – Standard
  – Full

• Degradation further prevalent in:
  – Geolocation
  – Transitions
  – Images
Degrading with CSS 3

• Cascading definitions
  – Build up from WCSS definitions to CSS 3 definitions
  – If CSS 3 definitions aren’t accepted, falls back

• A few simple degradations:
  – Rounded corners can degrade to square
  – Gradient can degrade to mean value
  – Transitioning areas can degrade to blocks
Degradng with CSS 3

• Only load where it is allowed:
  – WCSS: Basic
  – CSS 2.1: Standard
  – CSS 3: Full

• This reduces:
  – payload size
  – validation issues
Degrading with HTML 5

• HTML 5 introduces new semantics
• Rather than use new entities directly:
  – Use classes on XHTML MP 1.0 elements
  – Transform to HTML 5 elements where supported
• MWF Forms API includes this approach:
Degrading with Javascript

- Live DOM writes not supported universally
  - Degrade by showing what is visible on load
  - Use DOM write to change state of elements
- AJAX not universally supported
  - AJAX should be a plus, not a necessity
  - Define <a href...> to a new page
  - Override default with AJAX request
  - Web service can serve to AJAX and new pages
Degrading with Device APIs

• Audio/Video
  – Pre-HTML 5 semantics don’t include tags
  – Degrade to other viable players
  – Least common denominator is error message
  – MWF will eventually have an Audio/Video API

• Geolocation
  – MWF has abstraction layer for HTML 5 & Gears
  – GPS failure is treated similarly to no GPS
Degrading with Device APIs

- Compass & Accelerometer
  - Degradation similar to Geolocation
  - API will be added to MWF

- Storage
  - Specifications shifting rapidly so use caution
  - Abstraction layer to handle shifting support
  - State-saving can be offloaded via AJAX
  - API will be added to MWF
Thank you
for listening.