

CSC 421, Fall 2017

Google Web Toolkit (GWT)

GWT

- Google Web Toolkit (GWT) is a development toolkit for creating RICH Internet Applications (RIA).
- Some features of GWT:
 - GWT compiles Java code to JavaScript code.
 - GWT is cross-browser compliant.
 - GWT is open source licensed under the Apache License version 2.0

GWT

■ Advantages

- GWT lowers the learning curve for Java developers
- GWT produces optimized, browser specific JavaScript
- GWT can be integrated with Java IDEs
- GWT has an extensible widget library

■ Disadvantages

- Web pages generated by GWT are not indexable
- GWT applications require JavaScript to be enabled
- GWT is not suitable for web designers

GWT Components

- GWT Java to JavaScript compiler
- JRE emulation library
- GWT UI binding library

Parts of a GWT Application

- Module descriptors
- Public resources
- Client-side code
- Server-side code (optional)

Module Descriptors

- A module descriptor is an XML file used to configure a GWT application
- Module descriptor parts:
 - `<module rename-to="app-name">`: the name of the application
 - `<inherits name="module-name"/>`: adds another GWT module to the application
 - `<entry-point class="classname"/>`: the class that loads the GWT application
 - `<source path="path"/>`: path to source files
 - `<public path="path"/>`: path to static resources
 - `<script src="js-url"/>`: external JavaScript file
 - `<stylesheet src="css-url">`: external CSS file

Public Resources

- Public resources are files referenced by the GWT module
- Examples:
 - the host HTML page
 - CSS files
 - images
- The location of public resources can be configured using the `public` element of the module descriptor
- Public resources are copied to the output directory during compilation of the application

Client-side Code

- The client-side code is the Java code that implements the logic of the GWT application
- The location of client-side code can be configured using the source element of the module descriptor
- A module *entry point* is a class that implements `EntryPoint`
- When a module is loaded, every entry point class is instantiated and its `onModuleLoad()` method is called

Example Entry Point

```
public class HelloWorld implements EntryPoint {  
    public void onModuleLoad() {  
        Window.alert("Hello, World!");  
    }  
}
```

Basic Steps to Create a GWT Application

- 1 Create the project
- 2 Modify the module descriptor, CSS, and HTML files as needed
- 3 Modify the Java entry point class
- 4 Compile

The webAppCreator Command Line Tool

- webAppCreator is a command line tool that creates a GWT starter application
- Flags and Parameters:
 - `-out` : the directory to place files
 - `-junit` : path to JUnit
 - `moduleName` : the name of the module
- Example usage

```
webAppCreator -out Hello com.example.Hello
```

webAppCreator Example Output

```
Hello
├── build.xml
├── src
│   ├── com
│   │   └── example
│   │       ├── client
│   │       │   ├── Hello.java
│   │       │   └── Hello.gwt.xml
│   └── war
│       ├── favicon.ico
│       ├── Hello.css
│       ├── Hello.html
│       ├── WEB-INF
│       └── web.xml
```

Deploying a GWT Application

- 1** Build the application
- 2** Create a WAR file
- 3** Copy the WAR file to a compatible server

GWT User Interfaces

- **UI elements:** core visual and dynamic elements
- **Layouts:** define the organization of the UI elements
- **Behavior:** events that occur when the user interacts with UI elements

GWT UI Elements

- The GWT library defines a class heirarchy of UI components
- The base class of this heirarchy is `UIObject`
- Basic UI widgets inherit properties from the `Widget` class, which is a subclass of `UIObject`

Basic GWT Widgets

- Label: a text label
- HTML: can contain HTML text
- Image: displays an image
- Anchor: represents a HTML anchor element

Form Widgets

- `Button`: a standard button
- `PushButton`: a standard button with custom style
- `ToggleButton`: a stateful button
- `CheckBox`: a standard check box widget
- `Radio Button`: mutually exclusive selection button
- `ListBox`: a list of choices
- `TextBox`: a single line of text
- `PasswordTextBox`: a text box that masks the input

Complex Widgets

- Tree: a hierarchical tree widget
- MenuBar: a menu bar
- DatePicker: a date picker
- CellTree: represents a view of a tree
- CellList: a single column list of cells
- CellTable: a tabular view
- CellBrowser: a browsable tree

Layout Panels

- FlowPanel:
- HorizontalPanel:
- VerticalPanel:
- HorizontalSplitPanel:
- VerticalSplitPanel:
- FlexTable:
- Grid:
- DeckPanel:
- DockPanel:

Layout Panels

- HTMLPanel:
- TabPanel:
- Composite:
- SimplePanel:
- ScrollPanel:
- FocusPanel:
- FormPanel:
- PopupPanel:
- DialogBox:

DOM Manipulation

Style with CSS

- GWT widgets rely on CSS for visual styling
- The default CSS class name for each component is `gwt-*` where `*` is the GWT Java class name.