Ingegneria del Software

GWT

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So you want to create a web application?

Minimal list of technologies you need to master:

- HTML
- DOM
- JavaScript
- CSS
- HTTP
- XML / JSON
- Server-side language (PHP, ASP, JSP, JavaScript, ...)

GWT

GWT [/ˈgwɪt/] (originally Google Web Toolkit, but that's being obsoleted) is a set of tools aiming at simplifying (highly dynamic) web application development. A Java-centric approach trying to avoid the tech soup.

Client-side code is transcompiled from Java to JavaScript, presentation content is handled by widgets and panel classes, server-side code is Java (simplified servlets).

You still need CSS, though.

Development toolkit

GWT is mainly a development toolkit, it includes useful tools meant to ease the life of web application programmers (such as a powerful development mode).

The client side

Java code is transcompiled to Javascript (Java 17 syntax is supported). There are limitations, though:

- No multithreading (and synchronization)

- (Almost) no reflection

- No serialization (but has its own version of it)

- Limited API (parts of `java.lang`, `java.lang.annotation,` `java.math,` `java.io,` `java.sql,` `java.util,` `java.util.logging` are avaliable)

The server side

Server side code is hosted in a Servlet container, no knowledge of Servets API is needed. Client/server communications are handled by an integrated RPC mechanism. Most services extend the `RemoteServiceServlet` class that handles all the plumbing.

Client-server interaction

The provided RPC mechanism allow client code to invoke services running on the server side by creating a dynamic proxy that handles all the low-level details (marshaling, exceptions, ...). Beware: this is AJAX at heart so invocations are asynchronous: services have to expose an asynchronous interface (derived from the "regular" one) and clients refer to that interface.

Other mechanisms can be used for client-server communications (XML, JSON, ...), libraries are available but support is not integrated.

Host page and entry point

The host page is the entry point of the web application. Client code can add panels/widgets to specific areas of the host page or replace all its contents.

Once the host page is loaded the `onModuleLoad` method of the main class (that has to implement `EntryPoint`) is called.

Widgets, panels and events

UI elements on the web page can be dynamically created/modified using a set of UI classes containing panels (containers) and widget (UI elements).

Event handlers are used to react to user gestures just as in Swing.

If needed, an API is available to directly manipulate the host page's DOM.

GWT RPC

GWT RPC is a simplified method to let client code interact with server code. Server code is structured in services, Java classes that extend `RemoteServiceServlet` and implement an interface describing the operations available to the client. An asynchronous version of the interface has to be provided too.

Clients dynamically create a proxy for each service they want to use (using `GWT.create()`) and interact with them by using their asynchronous interface.

Services and interfaces

```java
package com.example.foo.client;

import com.google.gwt.user.client.rpc.RemoteService;

public interface MyService extends RemoteService {
  public String myMethod(String s);
}
```

```java
package com.example.foo.server;

import com.google.gwt.user.server.rpc.RemoteServiceServlet;
import com.example.client.MyService;


public class MyServiceImpl extends RemoteServiceServlet implements
    MyService {

  public String myMethod(String s) {
    // Do something interesting with 's' here on the server.
    return s;
  }
}
```
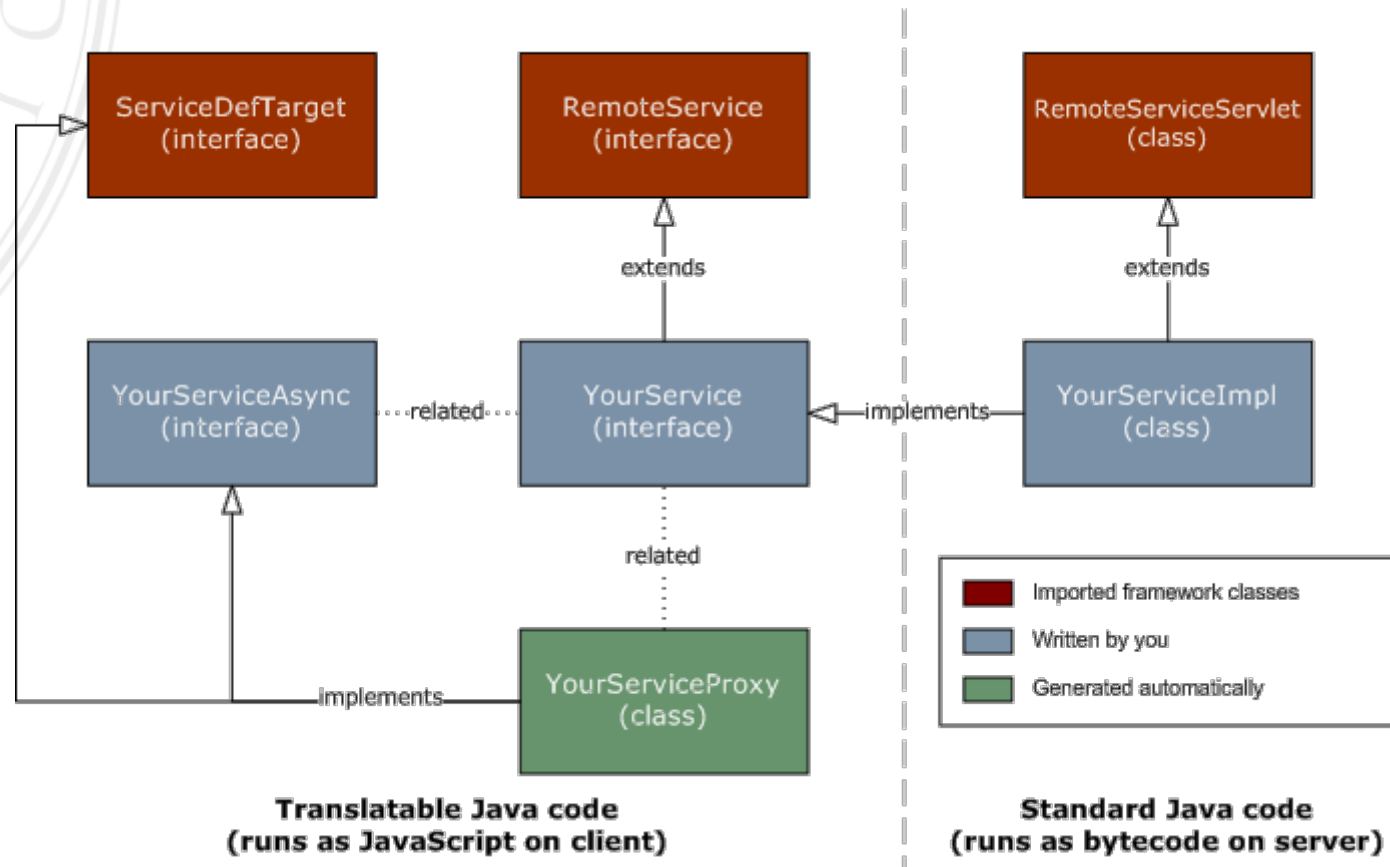
```java
package com.example.foo.client;

interface MyServiceAsync {
  public void myMethod(String s, AsyncCallback<String> callback);
}
```

GWT RPC

ServiceDefTarget (interface)

RemoteService (interface)

RemoteServiceServlet (class)

extends

extends

YourServiceAsync (interface) ···related··· YourService (interface) ◁—implements— YourServiceImpl (class)

related

YourServiceProxy (class)

implements

Legend:
- Imported framework classes
- Written by you
- Generated automatically

Translatable Java code
(runs as JavaScript on client)

Standard Java code
(runs as bytecode on server)

Marshalling

When passing object references between the client and the server, the content of the object is serialized and is sent to the other endpoint.

The default serialization mechanisms is almost transparent. Classes to be serialized have to implement the empty `IsSerializable` interface.

Sessions

As with all web applications, the server-side code has no knowledge about who is making invocations.

When creating a multi-page GWT application (but remember: GWT applications can be hosted in a single page) sessions can be used to associate information to the requests (such as: the identity of the user making the call).

```
getThreadLocalRequest().getSession().setAttribute(name, value)
```
and
```
getThreadLocalRequest().getSession().getAttribute(name)
```
can be used to access session data.

Status

GWT is still maintained, but only the core toolset is updated.
The website and the Eclipse plugin are **not**.
Use to the references given for the project, do not try to search the web for solutions: most information is outdated!