FLEX - QUICK GUIDE

FLEX - OVERVIEW

What is Flex?

- Flex is a powerful, open source application framework which allows to build traditional applications for browser, mobile and desktop using the same programming model, tool, and codebase.
- Flex provides FLEX SDK consisting of the Flex class library *ActionScriptclasses*, the Flex compilers, the debugger, the MXML and ActionScript programming languages, and other utilities to build expressive and interactive rich internet applications *RIA*
- Flex takes care of the user interface *UI* or the client-side functionality of a web application. Server-side functionality dependent on server-side components written in a traditional scripting language *Java/PHPetc.*
- A Flex based application actually delivered as a SWF file and it closely resembles the HTML / Javascript portion of a traditional web application.
- Flex application is deployed as SWF file*s* plus an HTML wrapper, the CSS file*s* and any server-side script files *i. e. Java, . CFM, . PHP, etc* to the server. Like traditional web applications
- These resources are delivered from the server to the client browser using the customary HTTP request / response fashion and Flash Player run the application in the browser.

Advantages of Flex

- Flex applications being Flash Player based can access device capabilities like GPS, camera, local database, graphics accelerometer.
- Flex applications can run on Andriod, BlackBerry Tablet OS, iOS devices.
- Flex applications can run on Browsers as well as on Desktop.
- Flex applications are platform independent. UI can be native to platform or can be made same on each platform.
- Flex applications can interact with server with all major server side technologies like Java, Spring, Hibernate, PHP, Ruby, .NET, Adobe ColdFusion, and SAP using industry standards such as REST, SOAP, JSON, JMS, and AMF.
- Flex Applications developed assures Rich User Experience through intuitive interaction with the application and presenting information in a visually richer interface.
- Flex application is a single page application where states can can transition from one state to other state without having to fetch a new page from the server or to refresh the browser.
- Flex application reduces the load on the server to great extent because it is only required return the application once, rather than a new page every time when the user changes views.

Disadvantages of Flex

- Flex applications are single threaded applications but Flex provides an asynchronous programming model to mitigate this concern.
- Flex is actionscript and XML based. Learning of these two is a must to work in Flex.

FLEX - ENVIRONMENT SETUP

This tutorial will guide you on how to prepare a development environment to start your work with Adobe Flex Framework. This tutorial will also teach you how to setup JDK and Adobe Flash Builder on your machine before you setup Flex Framework:

System Requirement

FLEX requires JDK 1.4 or higher so the very first requirement is to have JDK installed in your machine.

JDK	1.4 or above.
Memory	no minimum requirement.
Disk Space	no minimum requirement.
Operating System	no minimum requirement.

Follow the given steps to setup your environment to start with Flex application development.

Step 1 - Verify Java installation on your machine

Now open console and execute the following **java** command.

OS	**Task**	**Command**
Windows	Open Command Console	c:\> java -version
Linux	Open Command Terminal	$ java -version
Mac	Open Terminal	machine:~ joseph$ java -version

Let's verify the output for all the operating systems:

OS	**Generated Output**
Windows	java version "1.6.0_21"
	JavaTM SE Runtime Environment $build1.6.0_21 - b07$
	Java HotSpotTM Client VM $build17.0 - b17, mixedmode, sharing$
Linux	java version "1.6.0_21"
	JavaTM SE Runtime Environment $build1.6.0_21 - b07$
	Java HotSpotTM Client VM $build17.0 - b17, mixedmode, sharing$
Mac	java version "1.6.0_21"
	JavaTM SE Runtime Environment $build1.6.0_21 - b07$
	Java HotSpotTM64-Bit Server VM $build17.0 - b17, mixedmode, sharing$

Step 2 - Setup Java Development Kit *JDK*:

If you do not have Java installed then you can install the Java Software Development Kit *SDK* from Oracle's Java site: [Java SE Downloads](). You will find instructions for installing JDK in downloaded files, follow the given instructions to install and configure the setup. Finally set PATH and JAVA_HOME environment variables to refer to the directory that contains java and javac, typically java_install_dir/bin and java_install_dir respectively.

Set the **JAVA_HOME** environment variable to point to the base directory location where Java is installed on your machine. For example

OS	Output
Windows	Set the environment variable JAVA_HOME to C:\Program Files\Java\jdk1.6.0_21
Linux	export JAVA_HOME=/usr/local/java-current
Mac	export JAVA_HOME=/Library/Java/Home

Append Java compiler location to System Path.

OS	Output
Windows	Append the string ;%JAVA_HOME%\bin to the end of the system variable, Path.
Linux	export PATH=*PATH*:JAVA_HOME/bin/
Mac	not required

Step 3 - Setup Adobe Flash Builder 4.5

All the examples in this tutorial have been written using Adobe Flash Builder 4.5 Profession IDE Trial Version. So I would suggest you should have latest version of Adobe Flash Builder installed on your machine based on your operating system.

To install Adobe Flash Builder IDE, download the latest Adobe Flash Builder binaries from http://www.adobe.com/in/products/flash-builder.html. Once you downloaded the installation, unpack the binary distribution into a convenient location. For example in C:\flash-builder on windows, or /usr/local/flash-builder on Linux/Unix and finally set PATH variable appropriately.

Flash Builder can be started by executing the following commands on windows machine, or you can simply double click on FlashBuilder.exe

```
%C:\flash-builder\FlashBuilder.exe
```

Flash Builder can be started by executing the following commands on Unix *Solaris, Linux, etc.* machine:

```
$/usr/local/flash-builder/FlashBuilder
```

Adobe Flash Builder Trial Version can be used for 60 days. Just accept the terms and conditions and skip the initial registration steps and continue with the IDE. We're using the trial version for teaching purpose.

After a successful startup, if everything is fine then it should display following result:

Adobe Flash Builder comes pre-configured with FLEX SDKs. We're using FLEX SDK 4.5 in our examples which comes bundled with Adobe Flash Builder 4.5.

Step 4: Setup Apache Tomcat:

You can download the latest version of Tomcat from http://tomcat.apache.org/. Once you downloaded the installation, unpack the binary distribution into a convenient location. For example in C:\apache-tomcat-6.0.33 on windows, or /usr/local/apache-tomcat-6.0.33 on Linux/Unix and set CATALINA_HOME environment variable pointing to the installation locations.

Tomcat can be started by executing the following commands on windows machine, or you can simply double click on startup.bat

```
 %CATALINA_HOME%\bin\startup.bat

 or

 C:\apache-tomcat-6.0.33\bin\startup.bat
```

Tomcat can be started by executing the following commands on Unix *Solaris, Linux, etc.* machine:

```
$CATALINA_HOME/bin/startup.sh

or

/usr/local/apache-tomcat-6.0.33/bin/startup.sh
```

After a successful startup, the default web applications included with Tomcat will be available by visiting **http://localhost:8080/**. If everything is fine then it should display following result:

Further information about configuring and running Tomcat can be found in the documentation included here, as well as on the Tomcat web site: http://tomcat.apache.org

Tomcat can be stopped by executing the following commands on windows machine:

```
%CATALINA_HOME%\bin\shutdown

or

C:\apache-tomcat-5.5.29\bin\shutdown
```

Tomcat can be stopped by executing the following commands on Unix *Solaris, Linux, etc.* machine:

```
$CATALINA_HOME/bin/shutdown.sh

or

/usr/local/apache-tomcat-5.5.29/bin/shutdown.sh
```

FLEX - APPLICATIONS

Before we start with creating actual *HelloWorld* application using Flash Builder, let us see what are the actual parts of a Flex application. A Flex application consists of following four important parts out of which last part is optional but first three parts are mandatory:

- **Flex Framework Libraries**
- **Client-side code**
- **Public Resources *HTML/JS/CSS***
- **Server-side code**

Sample locations of different parts of a typical Flex application **HelloWord** will be as shown below:

Name	Location
Project root	HelloWorld/
Flex Framework Libraries	Build Path
Public resources	html-template
Client-side code	table table-bordered/com/tutorialspoint/client
Server-side code	table table-bordered/com/tutorialspoint/server

Application Build Process

Flex application required Flex Framework libraries. Flash Builder automatically add the libraries to build path.

When we build our code using Flash Builder, Flash builder will do the following tasks

- Compiles the source code to HelloWorld.swf file.
- Compiles a HelloWorld.html $awrapperfileforswffile$ from a file index.template.html stored in html-template folder
- Copies HelloWorld.swf and HelloWorld.html files in target folder, bin-debug.
- Copies swfobject.js, a javascript code responsible to load swf file dynamically in HelloWorld.html in target folder, bin-debug
- Copies framework libraries in form of swf file named frameworks_xxx.swf in target folder, bin-debug
- Copies other flex modules $.\, swffilessuchassparkskins_x xx.\, swf, textLayout_x xx.\, swf$ in target folder.

Application Launch Process

- Open the HelloWorld.html file available in \HelloWorld\bin-debug folder in any web-browser.
- HelloWorld.swf will load automatically and application will start running.

Flex Framework Libraries

Following is the brief detail about few important framework libraries.

In flex libraries are denoted using .swc notation

S.N.	Nodes & Description
1	**playerglobal.swc** This library is specific to FlashPlayer installed on your machine and contains native methods supported by flash player.
2	

	textlayout.swc This library supports the text layout related features.
3	**framework.swc** This is the flex framework library contains the core features of Flex.
4	**mx.swc** This library stores the definations of mx UI controls.
5	**charts.swc** This library supports the charting controls.
6	**spark.swc** This library stores the definations of spark UI controls.
7	**sparkskins.swc** This library supports the skinning of spark UI controls.

Client-side code

Flex application code can be written in MXML and ActionScript.

S.N.	Type & Description
1	**MXML** MXML is an XML markup language that we'll use to lay out user interface components.MXML is compiled into ActionScript during build process.
2	**ActionScript** ActionScript is an object-oriented procedural programming language and is based on the ECMAScript $ECMA - 262$ edition 4 draft language specification.

In Flex, we can mix ActionScript and MXML, to do the following:

- Lay out user interface components using MXML tags
- Use MXML to declaratively define nonvisual aspects of an application, such as access to data sources on the server
- Use MXML to create data bindings between user interface components and data sources on the server.
- Use ActionScript to define event listeners inside MXML event attributes.

- Add script blocks using the <mx:Script> tag.
- Include external ActionScript files.
- Import ActionScript classes.
- Create ActionScript components.

Public resources

These are helper files referenced by Flex application, such as Host HTML page, CSS or images located under html-template folder.It contains following files

S.N.	File Name & Description
1	**index.template.html** Host HTML page, with place holders. Flash Builder uses this template to build actual page HelloWorld.html with HelloWorld.swf file.
2	**playerProductInstall.swf** This is a flash utility to install Flash Player in express mode.
3	**swfobject.js** This is the javascript responsible to check version of flash player installed and to load HelloWorld.swf in HelloWorld.html page.
4	**html-template/history** This folder contains resources for history management of the application.

HelloWorld.mxml

This is the actual MXML/AS *ActionScript* code written implementing the business logic of the application and that the Flex compiler translates into SWF file which will be executed by flash player in the browser.A sample HelloWorld Entry class will be as follows:

```
<?xml version="1.0" encoding="utf-8"?>
<s:Application xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx"
   width="100%" height="100%"
   minWidth="500" minHeight="500"
   initialize="application_initializeHandler(event)">

   <fx:Script>
      <![CDATA[
         import mx.controls.Alert;
         import mx.events.FlexEvent;
         protected function btnClickMe_clickHandler(event:MouseEvent):void
         {
            Alert.show("Hello World!");
         }

         protected function application_initializeHandler(event:FlexEvent):void
         {
            lblHeader.text = "My Hello World Application";
         }
      ]]>
   </fx:Script>
   <s:VGroup horizontalAlign="center" width="100%" height="100%"
   paddingTop="100" gap="50">
      <s:Label />
      <s:Button label="Click Me!"
      click="btnClickMe_clickHandler(event)" />
   </s:VGroup>
</s:Application>
```

Following Table gives the description of all the tags used in the above code script.

S.N.	Node & Description
1	**Application** Defines the Application container that is always the root tag of a Flex application.
2	**Script** Contains the business logic in ActionScript language.
3	**VGroup** Defines a Vertical Grouping Container which can contain Flex UI controls in vertical fashion.
4	**Label** Represents a Label control, a very simple user interface component that displays text.
5	**Button** Represents a Button control, which can be clicked to do some action.

Server-side code

This is the server side part of your application and its very much optional. If you are not doing any backend processing with-in your application then you do not need this part, but if there is some processing required at backend and your client-side application interact with the server then you will have to develop these components.

Next chapter will make use of all the above mentioned concepts to create HelloWorld application using Flash Builder.

FLEX - CREATE APPLICATION

We'll use Flash Builder 4.5 to create Flex Applications. Let's start with a simple *HelloWorld* application:

Step 1 - Create Project

The first step is to create a simple Flex Project using Flash Builder IDE. Launch project wizard using the option **File > New > Flex Project**. Now name your project as *HelloWorld* using the wizard window as follows:

Select Application Type **Web** ***runsinAdobeFlashPlayer*** if not selected and leave other default values as such and click Finish Button. Once your project is created successfully, you will have following content in your Project Explorer:

Here is brief description of all important folders:

Folder	Location
table table-bordered	• Source code *mxml/asclasses* files. • We've created com/tutorialspoint/client folder structure containing the client-side specific java classes responsible for client UI display.
bin-debug	• This is the output part, it represents the actual deployable web application. • history folder contains support files for history management of Flex application. • framework_xxx.swf, flex framework files to be used by flex application. • HelloWorld.html, wrapper/host HTML File for flex application. • HelloWorld.swf, our flex based application. • playerProductInstall.swf, flash player express installer. • spark_xxx.swf, library for spark component support. • swfobject.js, javascript responsible to load HelloWorld.swf in HelloWorld.html. It checks flash player version and passes initialization parameter to HelloWorld.swf file. • textLayout_xxx.swf, library for text component support.
html-template	• This represents the configurable web application. Flash Builder compiles files from html-template to bin-debug folder. • history folder contains support files for history management of Flex application. • index.template.html, wrapper/host HTML File for flex application having place holders for Flash Builder specific configuration. Gets compiled to HelloWorld.html in bin-debug folder during build. • playerProductInstall.swf, flash player express installer.Gets copied to bin-debug folder during build. • swfobject.js, javascript responsible to load HelloWorld.swf in HelloWorld.html. It checks flash player version and passes initialization parameter to HelloWorld.swf file.Gets copied to bin-debug folder during build.

Step 2 - Create external CSS file

Create a CSS file **styles.css** for Wrapper HTML page in **html-template** folder.

```
html, body  {
   height:100%;
}
body {
   margin:0;
   padding:0;
   overflow:auto;
   text-align:center;
}
object:focus {
   outline:none;
}
#flashContent {
   display:none;
}

.pluginHeader {
   font-family:Arial, Helvetica, sans-serif;
   font-size:14px;
   color:#9b1204;
   text-decoration:none;
   font-weight:bold;
}

.pluginInstallText {
   font-family:Arial, Helvetica, sans-serif;
   font-size:12px;
   color:#000000;
   line-height:18px;
   font-style:normal;
}

.pluginText {
   font-family:Arial, Helvetica, sans-serif;
   font-size:12px;
   color:#000000;
   line-height:18px;
   font-style:normal;
}
```

Step 3 - Modify Wrapper HTML page template

Modify Wrapper HTML page template **index.template.html** in **html-template** folder. Flash Builder will create a default Wrapper HTML page template *html-template/index.template.html*, which will be compiled to HelloWorld.html. This file contains placeholders which Flash Builder replaces during compilation process for example flash player version, application name etc.

Let us modify this file to display custom messages if flash plugin is not installed.

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml" lang="en" xml:lang="en">
<head>
<title>${title}</title>
<meta name="google" value="notranslate" />
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<link rel="stylesheet" href="styles.css" type="text/css"></link>
<link rel="stylesheet" type="text/css" href="history/history.css" />
<script type="text/javascript" table table-bordered="history/history.js"></script>
<script type="text/javascript" table table-bordered="swfobject.js"></script>
<script type="text/javascript">
   // For version detection, set to min. required Flash Player version,
   //or 0 (or 0.0.0), for no version detection.
   var swfVersionStr = "${version_major}.${version_minor}.${version_revision}";
```

```
    // To use express install, set to playerProductInstall.swf,
    //otherwise the empty string.
    var xiSwfUrlStr = "${expressInstallSwf}";
    var flashvars = {};
    var params = {};
    params.quality = "high";
    params.bgcolor = "${bgcolor}";
    params.allowscriptaccess = "sameDomain";
    params.allowfullscreen = "true";
    var attributes = {};
    attributes.id = "${application}";
    attributes.name = "${application}";
    attributes.align = "middle";
    swfobject.embedSWF(
    "${swf}.swf", "flashContent",
    "${width}", "${height}",
    swfVersionStr, xiSwfUrlStr,
    flashvars, params, attributes);
    // JavaScript enabled so display the flashContent div in case
    //it is not replaced with a swf object.
    swfobject.createCSS("#flashContent", "display:block;text-align:left;");
</script>
</head>
<body>
<div >
    <p style="margin:100px;">
    <table  width="700" cellpadding="10" cellspacing="2" border="0">
        <tr><td >Flash Player Required</td></tr>
        <tr><td >The Adobe Flash Player version
        10.2.0 or greater is required.</td></tr>
        <tr><td class = "pluginInstallText" align="left">
            <table border="0" width="100%">
            <tr class = "pluginInstallText" >
            <td>Click here to download and install Adobe Flash Player:</td>
            <td> </td>
            <td align="right"> <script type="text/javascript">
            var pageHost
            =((document.location.protocol == "https:") ? "https://" : "http://");
            document.write("<a target='_blank'"
            +" href='http://get.adobe.com/flashplayer/'><"
            +"img style='border-style: none' table table-bordered='"
            +pageHost
            +"www.adobe.com/images/shared/download_buttons/get_flash_player.gif'"
            +" alt='Get Adobe Flash player' /></a>" );
            </script>
            </td>
            </tr>
            </table>
            </td>
        </tr>
    </table>
    </p>
</div>
<noscript>
    <object class
    width="${width}" height="${height}" >
    <param name="movie" value="${swf}.swf" />
    <param name="quality" value="high" />
    <param name="bgcolor" value="${bgcolor}" />
    <param name="allowScriptAccess" value="sameDomain" />
    <param name="allowFullScreen" value="true" />
    <!--[if !IE]>-->
    <object type="application/x-shockwave-flash" data="${swf}.swf"
    width="${width}" height="${height}">
    <param name="quality" value="high" />
    <param name="bgcolor" value="${bgcolor}" />
    <param name="allowScriptAccess" value="sameDomain" />
    <param name="allowFullScreen" value="true" />
    <!--<![endif]-->
```

```
   <!--[if gte IE 6]>-->
   <p>
      <p style="margin:100px;">
      <table  width="700" cellpadding="10" cellspacing="2" border="0">
      <tr><td >Flash Player Required</td></tr>
      <tr><td >The Adobe Flash Player version
      10.2.0 or greater is required.</td></tr>
      <tr><td class = "pluginInstallText" align="left">
         <table border="0" width="100%">
         <tr class = "pluginInstallText" >
         <td>Click here to download and install Adobe Flash Player:</td>
         <td> </td>
         <td align="right"> <script type="text/javascript">
         var pageHost
         = ((document.location.protocol == "https:") ? "https://" : "http://");
         document.write("<a target='_blank'"
         +" href='http://get.adobe.com/flashplayer/'><"
         +"img style='border-style: none' table table-bordered='"
         +pageHost
         +"www.adobe.com/images/shared/download_buttons/get_flash_player.gif'"
         +" alt='Get Adobe Flash player' /></a>" );
         </script>
         </td>
         </tr>
         </table>
         </td>
      </tr>
   </table>
   </p>
   </p>
   <!--<![endif]-->
     <p style="margin:100px;">
      <table  width="700" cellpadding="10" cellspacing="2" border="0">
      <tr><td >Flash Player Required</td></tr>
      <tr><td >The Adobe Flash Player version
      10.2.0 or greater is required.</td></tr>
      <tr><td class = "pluginInstallText" align="left">
         <table border="0" width="100%">
         <tr class = "pluginInstallText" >
         <td>Click here to download and install Adobe Flash Player:</td>
         <td> </td>
         <td align="right"> <script type="text/javascript">
         var pageHost
         = ((document.location.protocol == "https:") ? "https://" : "http://");
         document.write("<a target='_blank'"
         +" href='http://get.adobe.com/flashplayer/'><"
         +"img style='border-style: none' table table-bordered='"
         +pageHost
         +"www.adobe.com/images/shared/download_buttons/get_flash_player.gif'"
         +" alt='Get Adobe Flash player' /></a>" );
         </script>
         </td>
         </tr>
         </table>
         </td>
      </tr>
   </table>
   </p>
   <!--[if !IE]>-->
   </object>
   <!--<![endif]-->
   </object>
</noscript>
</body>
</html>
```

Step 4 - Create internal CSS file

Create a CSS file **Style.css** for **HelloWorld.mxml** in **table table-bordered/com/tutorialspoint** folder. Flex provides similar css styles for its UI Controls as there are css styles for HTML UI controls.

```
/* CSS file */
@namespace s "library://ns.adobe.com/flex/spark";
@namespace mx "library://ns.adobe.com/flex/mx";

.heading
{
   fontFamily: Arial, Helvetica, sans-serif;
   fontSize: 17px;
   color: #9b1204;
   textDecoration:none;
   fontWeight:normal;
}

.button {
   fontWeight: bold;
}

.container {
   cornerRadius :10;
   horizontalCenter :0;
   borderColor: #777777;
   verticalCenter:0;
   backgroundColor: #efefef;
}
```

Step 5 - Modify Entry Level Class

Flash Builder will create a default mxml file *table table-bordered/com.tutorialspoint/HelloWorld.mxml*, which is having root tag <application> container for the application. Let us modify this file to display "Hello,World!":

```
<?xml version="1.0" encoding="utf-8"?>
<s:Application xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx"
   width="100%" height="100%"
   minWidth="500" minHeight="500"
   initialize="application_initializeHandler(event)">
   <fx:Style source="/com/tutorialspoint/client/Style.css"/>
   <fx:Script>
      <![CDATA[
       import mx.controls.Alert;
       import mx.events.FlexEvent;
       protected function btnClickMe_clickHandler(event:MouseEvent):void
       {
          Alert.show("Hello World!");
       }

       protected function application_initializeHandler(event:FlexEvent):void
       {
          lblHeader.text = "My Hello World Application";
       }
      ]]>
   </fx:Script>
   <s:BorderContainer width="500" height="500"
      styleName="container">
      <s:VGroup width="100%" height="100%" gap="50" horizontalAlign="center"
         verticalAlign="middle">
         <s:Label
            styleName="heading"/>
         <s:Button label="Click Me!"
            click="btnClickMe_clickHandler(event)" styleName="button" />
      </s:VGroup>
   </s:BorderContainer>
</s:Application>
```

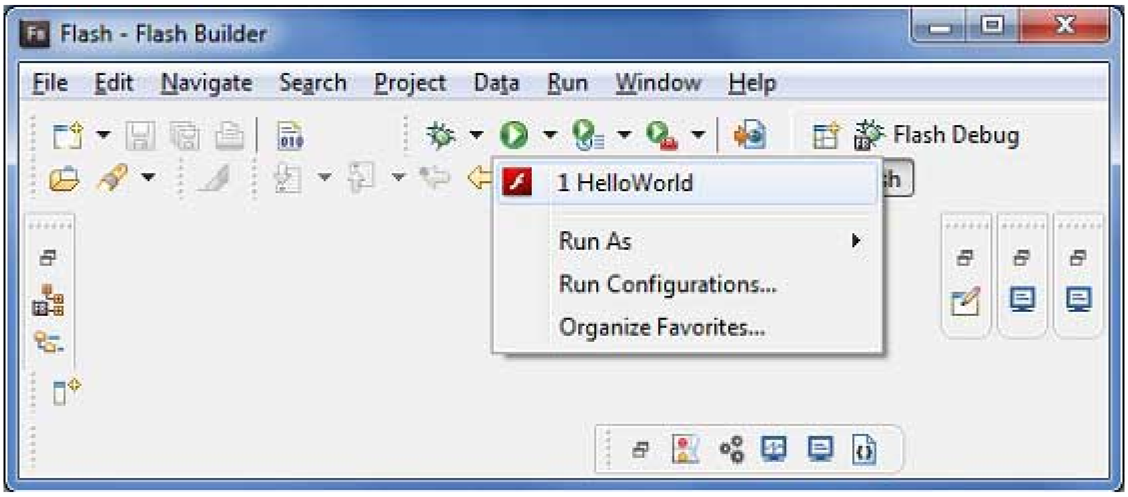
You can create more mxml or actionscript files in the same source directory to define either new applications or to define helper routines.

Step 6 - Build Application

Flash Builder has **Build Automatically** by default checked. Just check the **Problems** View if there is any error. Once you are done with the changes, you will not see any errors.

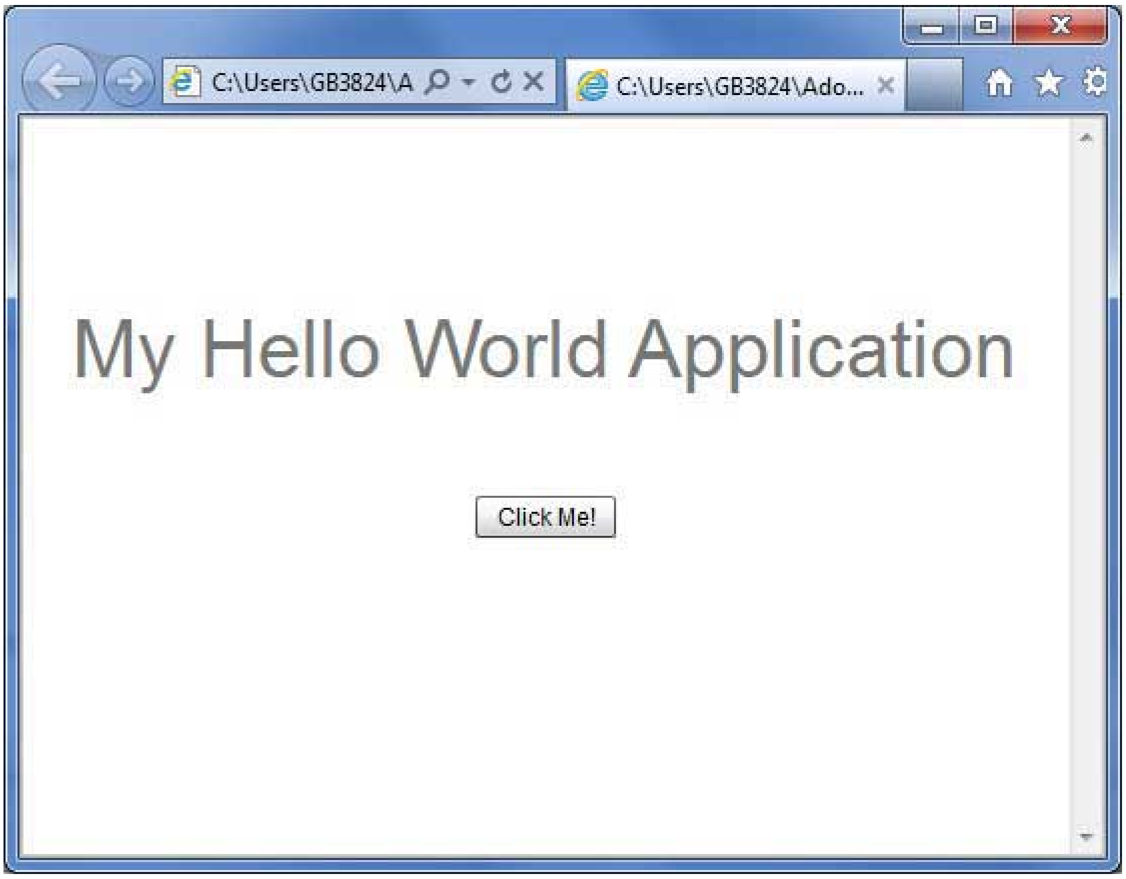
Step 7 - Run Application

Now click on
Run application menu and select **HelloWorld** application to run the application.



If everything is fine, you must see browser pop up and application up and running. If everything is fine with your application, this will produce following result: [Try it online]

Because you are running your application in flash player, so you will need to install Flash Player plugin for your browser. Simply follow the onscreen instructions to install the plugin. If you already have Flash Player plugin set for your browser, then you should be able to see the following output:



Congratulations! you have implemented your first application using Flex.

FLEX - DEPLOY APPLICATION

This tutorial will explain you how to create an application **war** file and how to deploy that in Apache Tomcat Websever root. If you understood this simple example then you will also be able to deploy a complex Flex application following the same steps.

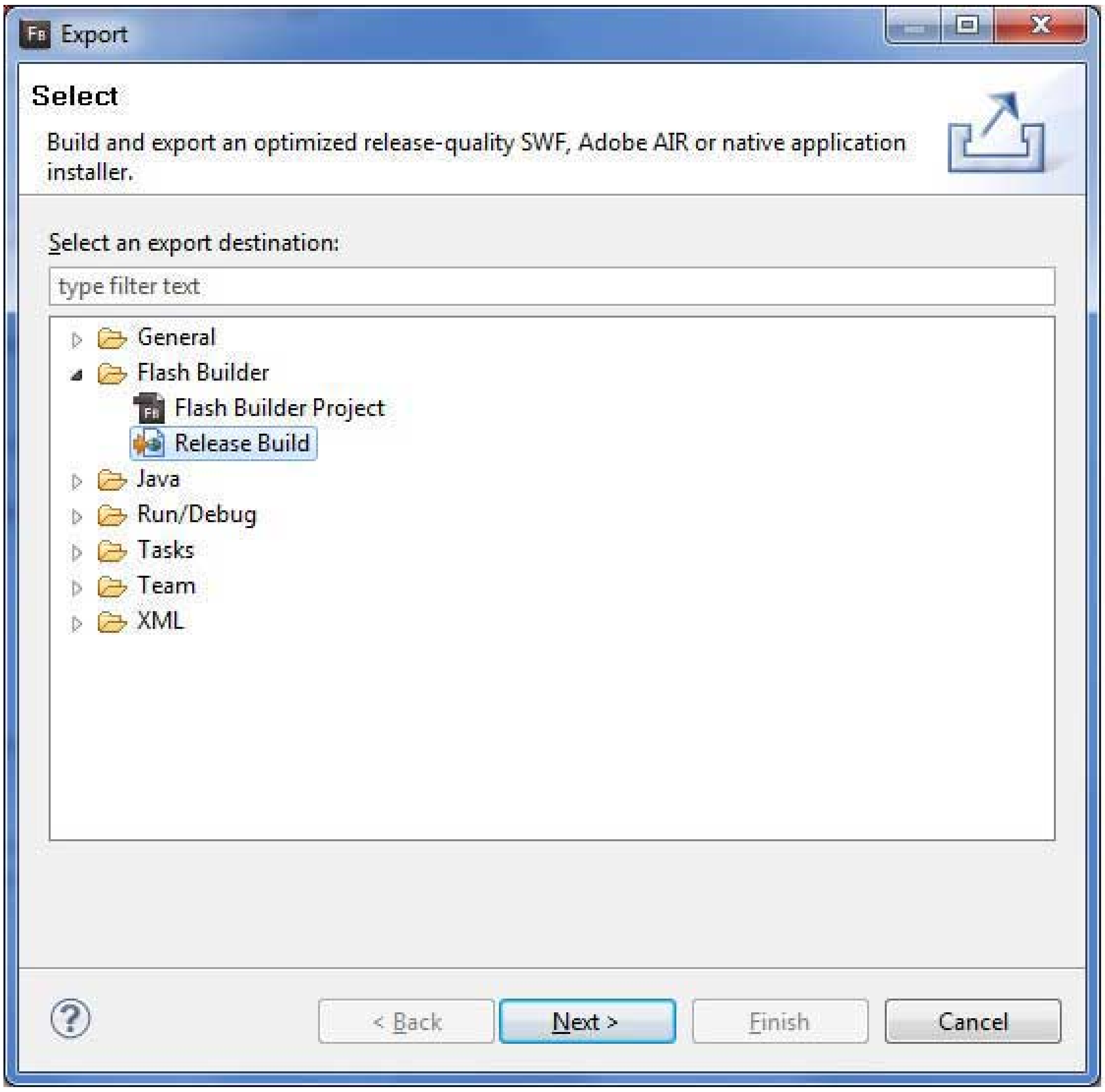
Let us follow the following steps to create a Flex application:

Step	Description
1	Create a project with a name *HelloWorld* under a package *com.tutorialspoint.client* as explained in the *Flex - Create Application* chapter.
2	Modify *HelloWorld.mxml* as explained below. Keep rest of the files unchanged.
3	Compile and run the application to make sure business logic is working as per the requirements.

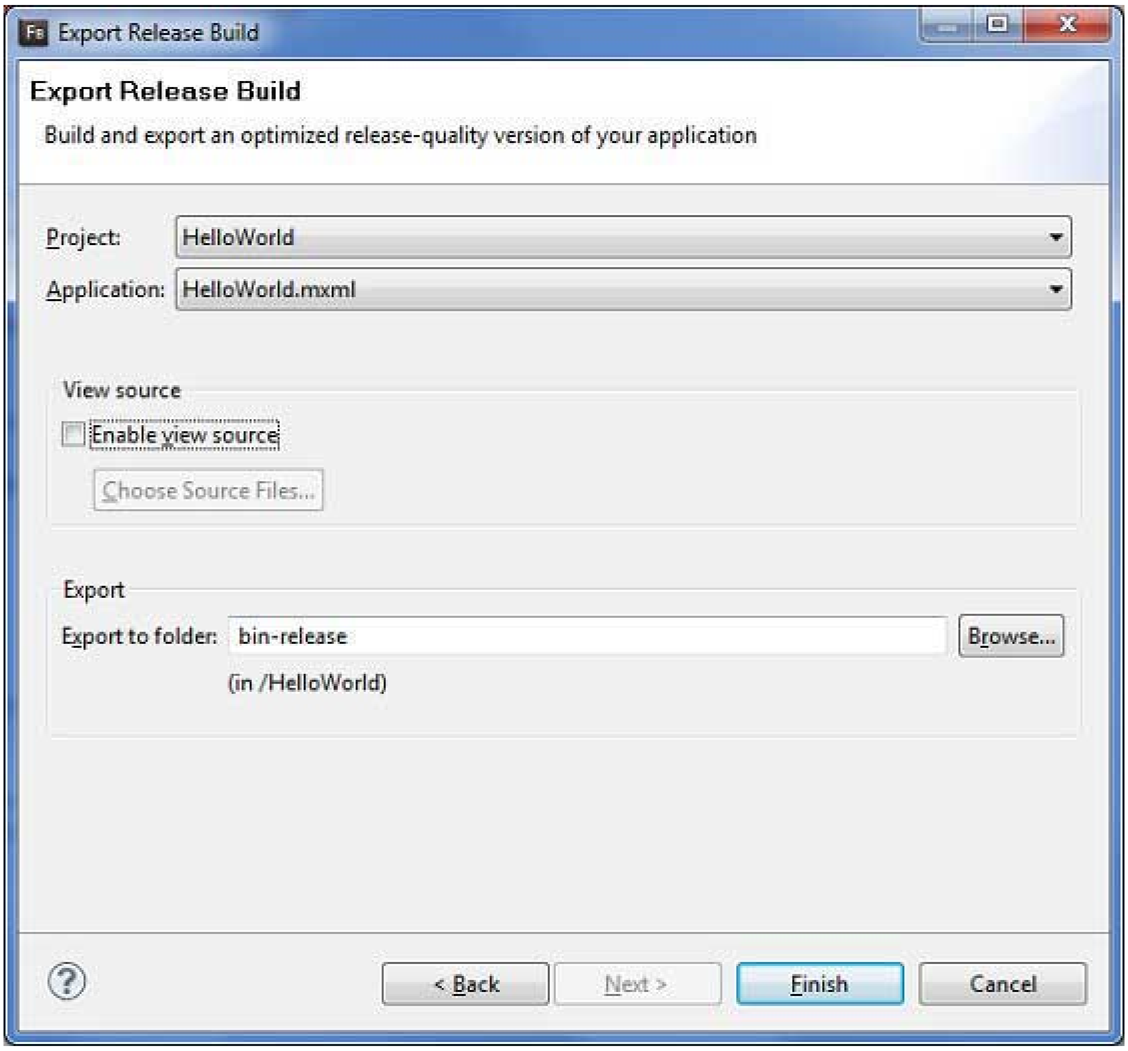
Follow the following steps to create a release build of a Flex application and then deploy it to tomcat server:

The first step is to create a release build using Flash Builder IDE. Launch release build wizard using the option **File > Export > Flash Builder > Release Build**

.



Select project as *HelloWorld* using the wizard window as follows


Export Release Build

Build and export an optimized release-quality version of your application

Project: HelloWorld

Application: HelloWorld.mxml

View source

Enable view source

Export

Export to folder: bin-release

(in /HelloWorld)

Leave other default values as such and click Finish Button. Now Flash Builder will create a bin-release folder containing the project's release build.

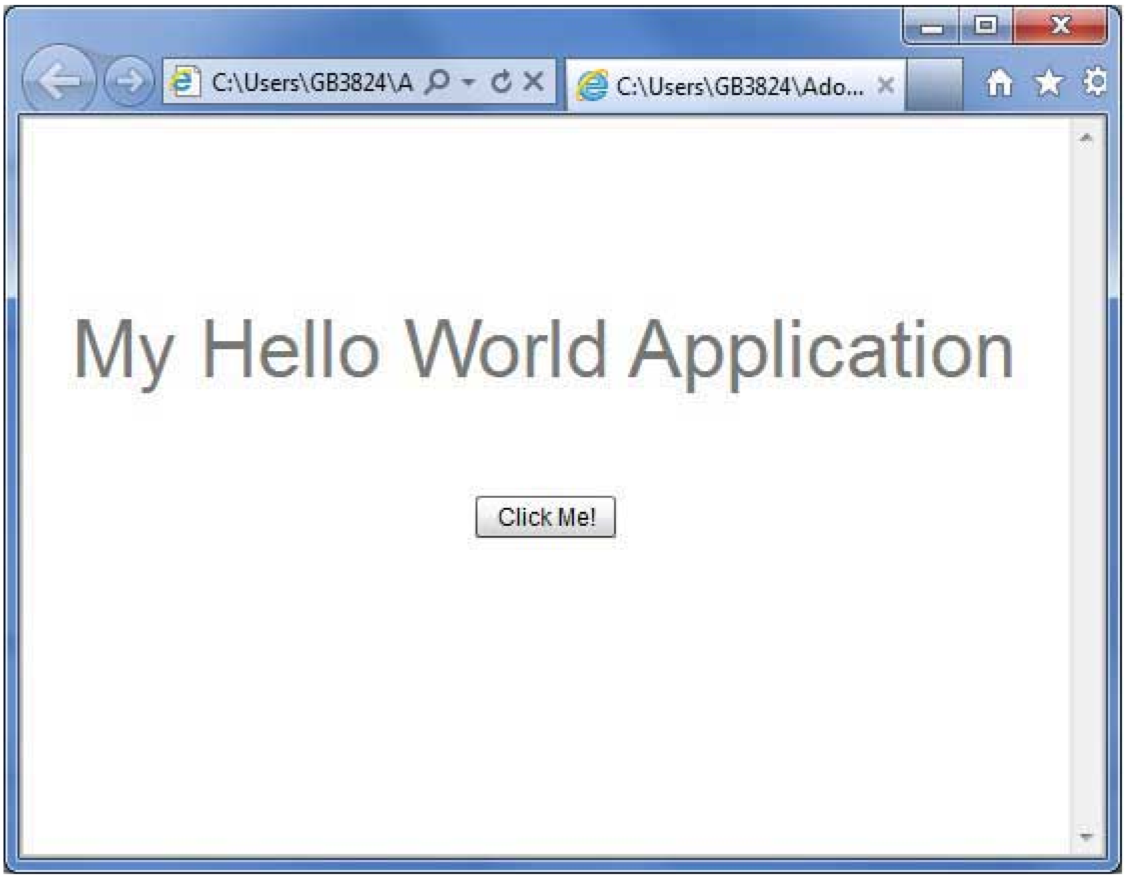
Now our release build is ready ,let us follow the following steps to deploy a Flex application:

Step	Description
1	Zip the content of the **bin-release** folder of the application in the form of HelloWorld.war file and deploy it in Apache Tomcat Webserver.
2	Launch your web application using appropriate URL as explained below in the last step.

Following is the content of the modified mxml file **table table-bordered/com.tutorialspoint/HelloWorld.mxml**.

```
<?xml version="1.0" encoding="utf-8"?>
<s:Application xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx"
   width="100%" height="100%"
   minWidth="500" minHeight="500"
   initialize="application_initializeHandler(event)">
   <fx:Style source="/com/tutorialspoint/client/Style.css"/>
   <fx:Script>
      <![CDATA[
         import mx.controls.Alert;
         import mx.events.FlexEvent;
         protected function btnClickMe_clickHandler(event:MouseEvent):void
         {
            Alert.show("Hello World!");
         }

         protected function application_initializeHandler(event:FlexEvent):void
         {
            lblHeader.text = "My Hello World Application";
         }
      ]]>
   </fx:Script>
   <s:BorderContainer width="500" height="500"
      styleName="container">
      <s:VGroup width="100%" height="100%" gap="50" horizontalAlign="center"
         verticalAlign="middle">
         <s:Label
            styleName="heading"/>
         <s:Button label="Click Me!"
            click="btnClickMe_clickHandler(event)" styleName="button" />
      </s:VGroup>
   </s:BorderContainer>
</s:Application>
```

Once you are ready with all the changes done, let us compile and run the application in normal mode as we did in Flex - Create Application chapter. If everything is fine with your application, this will produce following result: [Try it online]



Create WAR File

Now our applictaion is working fine and we are ready to export it as a war file. Follow the following steps:

- Go into your project's **bin-release** directory **C:\workspace\HelloWorld\bin-release**
- Select all the files & folders available inside bin-release directory.
- Zip all the selected files & folders in a file called *HelloWorld.zip*.
- Rename *HelloWorld.zip* to *HelloWorld.war*.

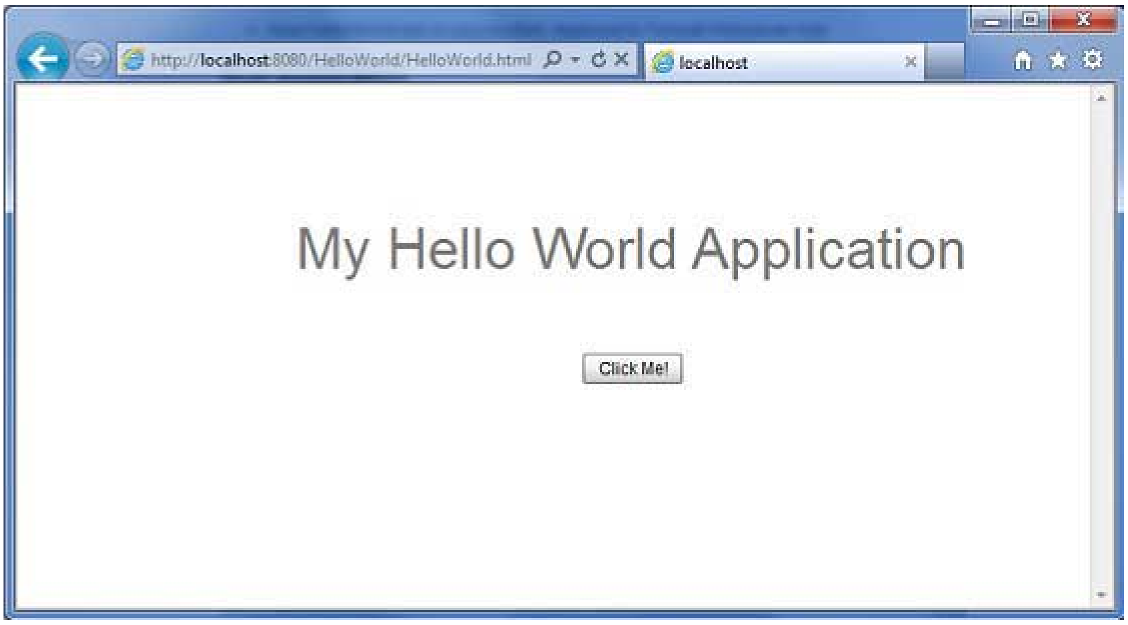
Deploy WAR file

- Stop the tomcat server.
- Copy the *HelloWorld.war* file to **tomcat installation directory > webapps folder.**
- Start the tomcat server.
- Look inside webapps directory, there should be a folder **HelloWorld** got created.
- Now HelloWorld.war is successfully deployed in Tomcat Webserver root.

Run Application

Enter a url in web browser: **http://localhost:8080/HelloWorld/HelloWorld.html** to launch the application

Server name *localhost* and port 8080 may vary as per your tomcat configuration.


http://localhost:8080/HelloWorld/HelloWorld.html
localhost
My Hello World Application
Click Me!

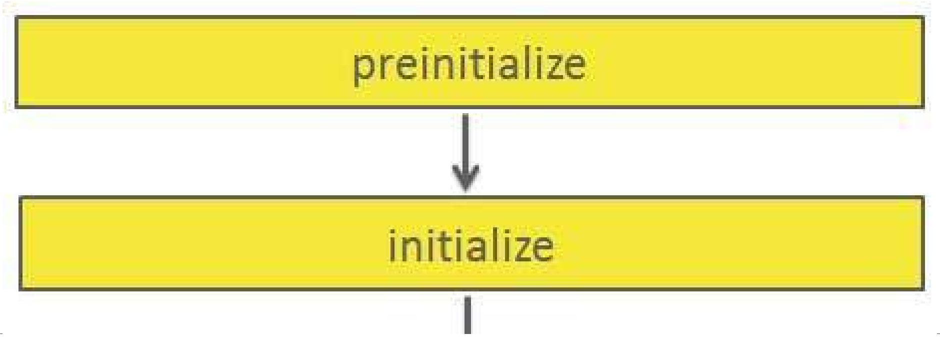
FLEX - LIFE CYCLE PHASES

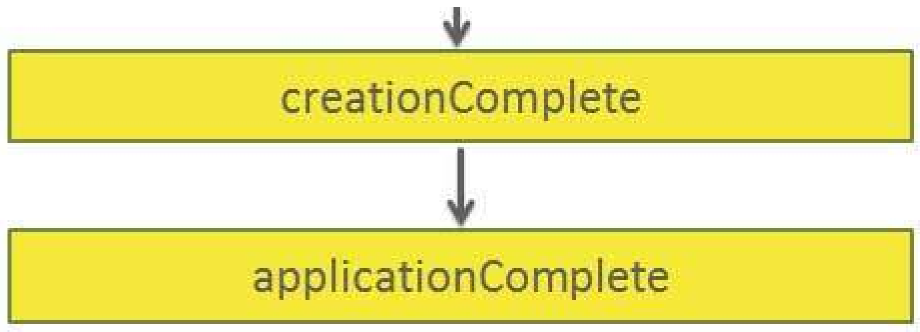
Life Cycle of flex application:

Although you can build Flex applications without understanding life cycle phases of an application life cycle, but it is good to know the basic mechanism: the order in which things occur.It will help you configure features such as load other Flex applications at runtime, and manage the process of loading and unloading class libraries and assets at runtime.

A good understanding of the Flex application life cycle will enable you to build better applications and optimize them because you will know where to optimally run code. For example, if you need to ensure that some code runs during a preloader, you need to know where to place the code for that event.

When we loads flex application in browser the following events occurs during the lifeCycle of flex application.





Following is the brief detail about different Flex Life Cycle Events.

S.N.	Event & Description
1	**preInitialize:** mx.core.UIComponent.preinitialize **Event Type:** mx.events.FlexEvent.PREINITIALIZE This event is dispatched at the beginning of the component initialization sequence. The component is in a very raw state when this event is dispatched. Many components, such as Button control, creates internal child components to implement functionality. For example, the Button control creates an internal UITextField component to represent its label text. When Flex dispatches the preinitialize event, the children, including all the internal children, of a component have not yet been created.
2	**initialize:** mx.core.UIComponent.initialize **Event Type:** mx.events.FlexEvent.INITIALIZE This event is dispatched after preinitialize phase. Flex framework initializes the internal structure of this component during this phase. This event automatically fires when the component is added to a parent. you do not need to call initialize generally.
3	**creationComplete:** mx.core.UIComponent.creationComplete **Event Type:** mx.events.FlexEvent.CREATION_COMPLETE This event is dispatched when the component has finished its construction, property processing, measuring, layout, and drawing. At this point, depending on its visible property, the component is not visible even though it has been drawn.
4	**applicationComplete:** spark.components.Application.applicationComplete **Event Type:**mx.events.FlexEvent.APPLICATION_COMPLETE Dispatched after the Application has been initialized, processed by the LayoutManager, and attached to the display list. This is the last event of the application creation life cycle and signifies that application has been loaded completely.

Flex Life Cycle Example

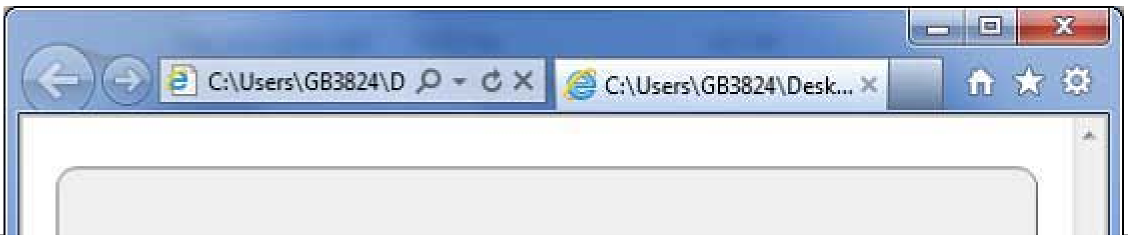
Let us follow the following steps to test life cycle of a Flex application by creating a test application:

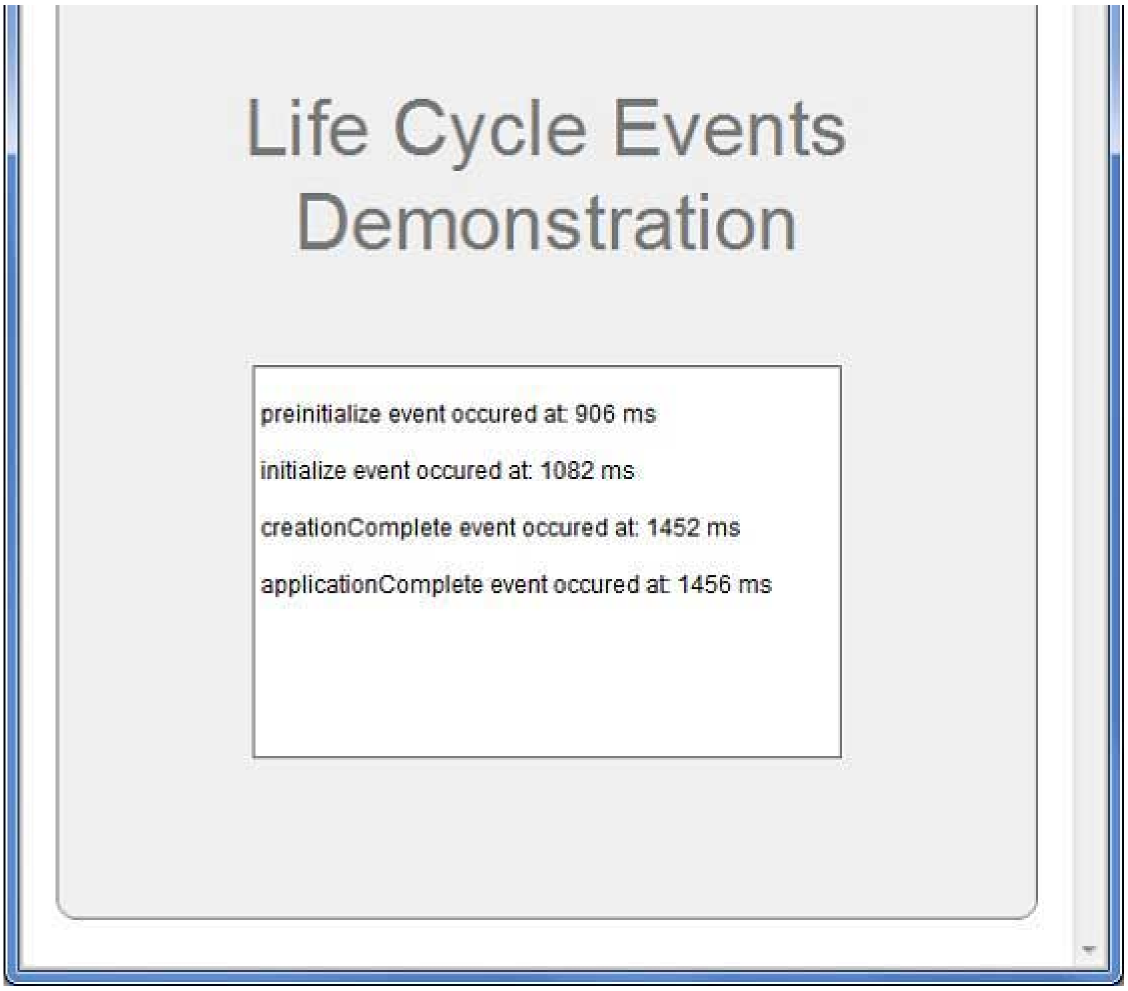
Step	Description
1	Create a project with a name *HelloWorld* under a package *com.tutorialspoint.client* as explained in the *Flex - Create Application* chapter.
2	Modify *HelloWorld.mxml* as explained below. Keep rest of the files unchanged.
3	Compile and run the application to make sure business logic is working as per the requirements.

Following is the content of the modified mxml file **src/com.tutorialspoint/HelloWorld.mxml**.

```
<?xml version="1.0" encoding="utf-8"?>
<s:Application xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx"
   width="100%" height="100%" minWidth="500" minHeight="500"
   initialize="reportEvent(event)"
   preinitialize="reportEvent(event)"
   creationComplete="reportEvent(event)"
   applicationComplete="reportEvent(event)">
   <fx:Style source="/com/tutorialspoint/client/Style.css"/>
   <fx:Script>
      <![CDATA[
         import mx.controls.Alert;
         import mx.events.FlexEvent;

         [Bindable]
         private var report:String = "";

         private function reportEvent(event:FlexEvent):void{
            report += "\n" + (event.type + " event occured at: "
            + getTimer() + " ms" + "\n");
         }
      ]]>
   </fx:Script>
   <s:BorderContainer width="500" height="500"
      styleName="container">
      <s:VGroup width="100%" height="100%" gap="50"
         horizontalAlign="center" verticalAlign="middle">
         <s:Label textAlign="center" width="100%"
         fontSize="40" color="0x777777" styleName="heading"
         text="Life Cycle Events Demonstration"/>
         <s:TextArea
         width="300" height="200">
         </s:TextArea>
      </s:VGroup>
   </s:BorderContainer>
</s:Application>
```

Once you are ready with all the changes done, let us compile and run the application in normal mode as we did in Flex - Create Application chapter. If everything is fine with your application, this will produce following result: [Try it online]




Life Cycle Events Demonstration

preinitialize event occured at: 906 ms

initialize event occured at: 1082 ms

creationComplete event occured at: 1452 ms

applicationComplete event occured at: 1456 ms

FLEX - STYLE WITH CSS

Flex supports the use of CSS syntax and styles to apply styles to its UI controls in the same way as CSS to HTML components.

Way #1: Using external style sheet file

You can refer to a style sheet available in the class path of the application. For example consider Style.css file in **com/tutorialspoint/client folder** where HelloWorld.mxml file also lies.

```
/* CSS file */
@namespace s "library://ns.adobe.com/flex/spark";
@namespace mx "library://ns.adobe.com/flex/mx";
...
.container {
   cornerRadius :10;
   horizontalCenter :0;
   borderColor: #777777;
   verticalCenter:0;
   backgroundColor: #efefef;
}
```

Then css file can be referred by following code snippet

```
<fx:Style source="/com/tutorialspoint/client/Style.css"/>
```

Assign styles to UI component using styleName property

```
<s:BorderContainer width="500" height="500"
      styleName="container">
...
</s:BorderContainer>
```

Way #2: Using styles within UI container component

You can define styles within UI container component using <fx:Style> tag

Class Level Selector

```
<fx:Style>
@namespace s "library://ns.adobe.com/flex/spark";
@namespace mx "library://ns.adobe.com/flex/mx";

/* class level selector  */
.errorLabel {
   color: red;
}
</fx:Style>
```

Assign styles to UI component using styleName property.

```
<s:Label />
```

Id Level Selector

Style UI component using id selector.

```
<fx:Style>
/* id level selector  */
#msgLabel {
   color: gray;
}
</fx:Style>
```

```
<s:Label  />
```

Type Level Selector

Style one type of UI Component in one go.

```
<fx:Style>
/* style applied on all buttons  */
s|Button {
   fontSize: 15;
   color: #9933FF;
}
</fx:Style>
```

```
<s:Button label="Click Me!"
click="btnClickMe_clickHandler(event)"  />
```

Flex Style with CSS Example

Let us follow the following steps to check css styling of a Flex application by creating a test application:

Step	Description
1	Create a project with a name *HelloWorld* under a package *com.tutorialspoint.client* as explained in the *Flex - Create Application* chapter.
2	Modify *Style.css*, *HelloWorld.mxml* as explained below. Keep rest of the files unchanged.
3	Compile and run the application to make sure business logic is working as per the requirements.

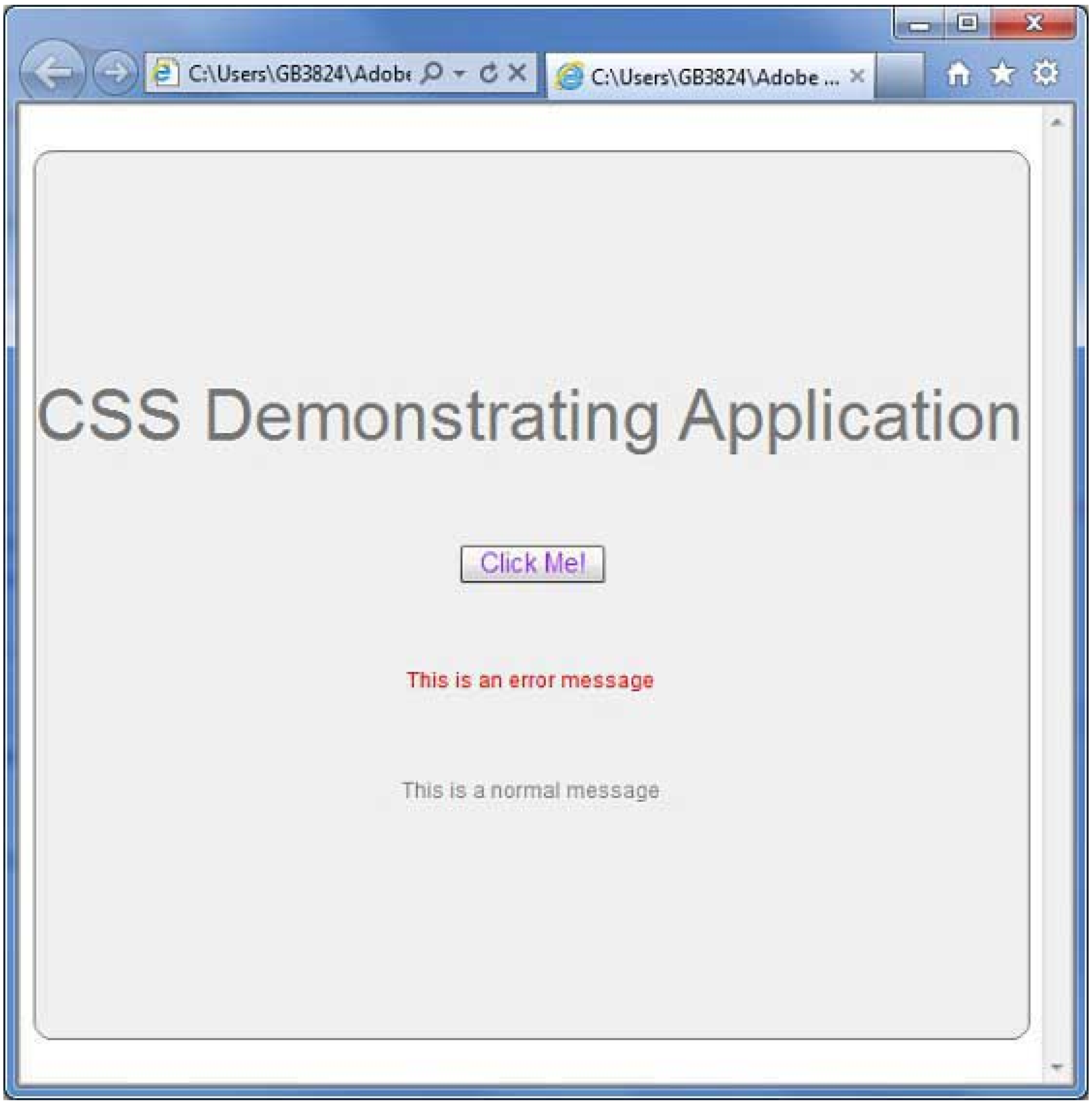
Following is the content of the modified css file **src/com.tutorialspoint/Style.css**.

```
/* CSS file */
@namespace s "library://ns.adobe.com/flex/spark";
@namespace mx "library://ns.adobe.com/flex/mx";

.heading
{
   fontFamily: Arial, Helvetica, sans-serif;
   fontSize: 17px;
   color: #9b1204;
   textDecoration:none;
   fontWeight:normal;
}

.button {
   fontWeight: bold;
}

.container {
   cornerRadius :10;
   horizontalCenter :0;
   borderColor: #777777;
   verticalCenter:0;
   backgroundColor: #efefef;
}
```

Following is the content of the modified mxml file **src/com.tutorialspoint/HelloWorld.mxml**.

```
<?xml version="1.0" encoding="utf-8"?>
<s:Application xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx"
   width="100%" height="100%" minWidth="500" minHeight="500"
   initialize="application_initializeHandler(event)">
   <!--Add reference to style sheet -->
   <fx:Style source="/com/tutorialspoint/client/Style.css"/>

   <!--Using styles within mxml file -->
   <fx:Style>
      @namespace s "library://ns.adobe.com/flex/spark";
      @namespace mx "library://ns.adobe.com/flex/mx";

      /* class level selector  */
      .errorLabel {
         color: red;
      }

      /* id level selector  */
      #msgLabel {
         color: gray;
      }

      /* style applied on all buttons  */
      s|Button {
         fontSize: 15;
         color: #9933FF;
      }
   </fx:Style>
   <fx:Script>
      <![CDATA[
         import mx.controls.Alert;
         import mx.events.FlexEvent;
         protected function btnClickMe_clickHandler(event:MouseEvent)
         :void {
            Alert.show("Hello World!");
         }
         protected function application_initializeHandler(event:FlexEvent)
         :void {
            lblHeader.text = "CSS Demonstrating Application";
         }
      ]]>
   </fx:Script>
   <s:BorderContainer width="560" height="500"
      styleName="container">
      <s:VGroup width="100%" height="100%" gap="50"
         horizontalAlign="center" verticalAlign="middle">
         <s:Label width="100%"
            color="0x777777" styleName="heading"/>
         <s:Button label="Click Me!"
            click="btnClickMe_clickHandler(event)"  />
         <s:Label
            text="This is an error message" styleName="errorLabel" />
         <s:Label  />
      </s:VGroup>
   </s:BorderContainer>
</s:Application>
```

Once you are ready with all the changes done, let us compile and run the application in normal mode as we did in Flex - Create Application chapter. If everything is fine with your application, this will produce following result: [Try it online]



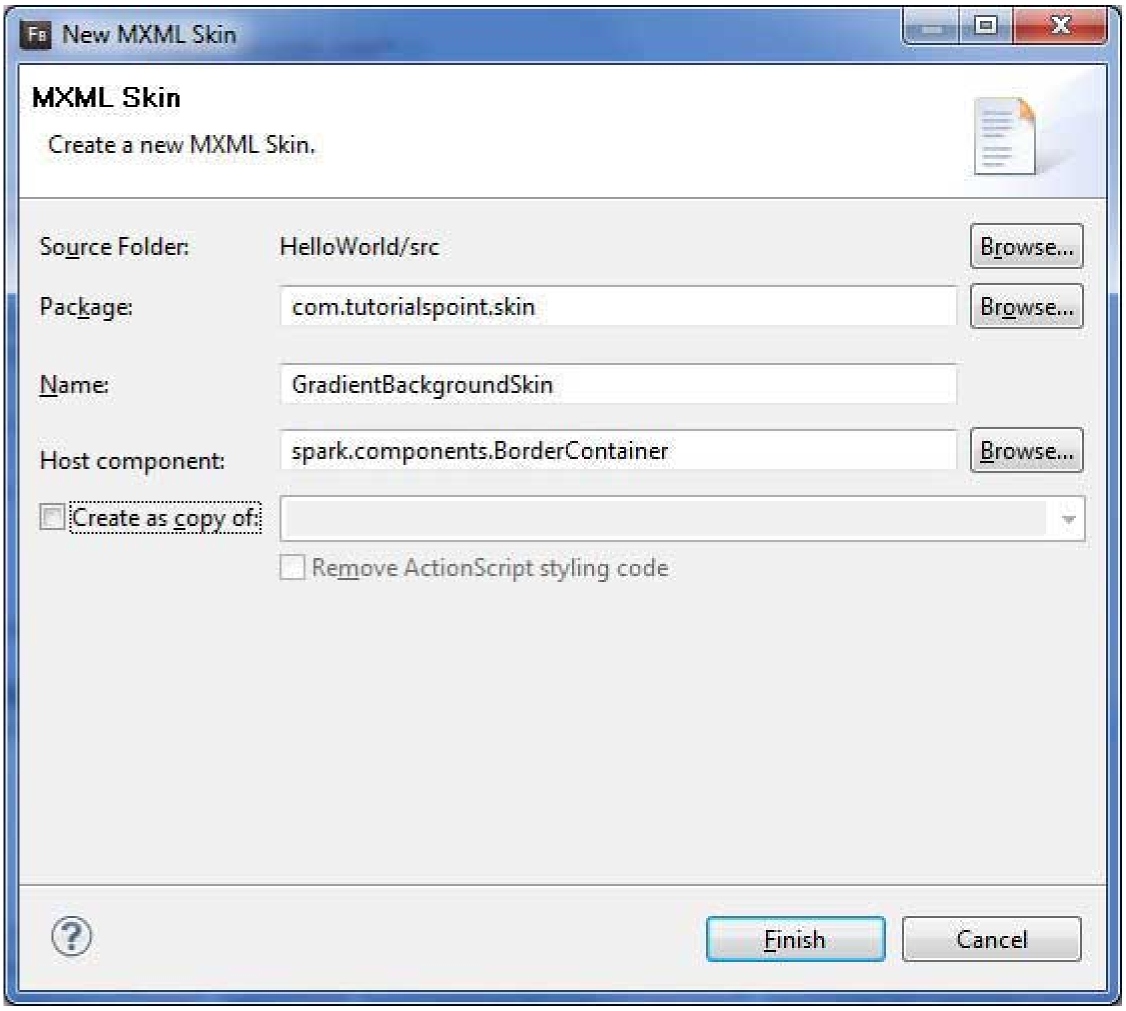
FLEX - STYLE WITH SKIN

What is Skining?

- Skinning in Flex, is a process of customizing look and feel of a UI Component completely.
- A Skin can define text, image, filters , transitions and states of a compoent.
- A Skin can be created as a seperate mxml or ActionScript component.
- Using skin, we can control all visual aspects of a UI component.
- The process of defining skin is same for all the UI component.

Step 1: Create a skin

Launch Create MXML Skin wizard using the option **File > New > MXML Skin**.


New MXML Skin

MXML Skin

Create a new MXML Skin.

Source Folder: HelloWorld/src

Package: com.tutorialspoint.skin

Name: GradientBackgroundSkin

Host component: spark.components.BorderContainer

[ ] Create as copy of:

[ ] Remove ActionScript styling code

Enter Package as **com.tutorialspoint.skin**, name as **GradientBackgroundSkin** and choose host component as existing flex BorderContainer control **spark.component.BorderContainer**.

Now you've created a skin for a BorderContainer. Modify content of the mxml skin file **src/com.tutorialspoint/skin/GradientBackgroundSkin.mxml**. Update fill layer as follows:

```
<!-- fill -->
<s:Rect >
   <s:fill>
      <s:LinearGradient rotation="90">
         <s:GradientEntry color="0x888888" ratio="0.2"/>
         <s:GradientEntry color="0x111111" ratio="1"/>
      </s:LinearGradient>
   </s:fill>
</s:Rect>
```

Step 2: Apply skin

You can apply skin over a component using two ways

Apply skin in MXML script *statically*

Apply **GradientBackgroundSkin** to a BorderContainer with id **mainContainer** using its **skinClass** attribute.

```
<s:BorderContainer width="560" height="500"
   styleName="container">
   <s:VGroup width="100%" height="100%" gap="50"
   horizontalAlign="center" verticalAlign="middle"
   skinClass="com.tutorialspoint.skin.GradientBackgroundSkin">
```

Apply skin in ActionScript *dynamically*

Apply **GradientBackgroundSkin** to a BorderContainer with id **mainContainer** using its **skinClass** property.

```
protected function gradientBackground_clickHandler(event:MouseEvent):void
{
   mainContainer.setStyle("skinClass", GradientBackgroundSkin );
}
```

Flex Style with Skin Example

Let us follow the following steps to see skinning in action in a Flex application by creating a test application:

Step	Description
1	Create a project with a name *HelloWorld* under a package *com.tutorialspoint.client* as explained in the *Flex - Create Application* chapter.
2	Create skin *GradientBackgroundSkin.mxml* under a package *com.tutorialspoint.skin* as explained above. Keep rest of the files unchanged.
3	Modify *HelloWorld.mxml* as explained below. Keep rest of the files unchanged.
4	Compile and run the application to make sure business logic is working as per the requirements.

Following is the content of the **GradientBackgroundSkin.mxml** file **src/com/tutorialspoint/skin/GradientBackgroundSkin.mxml**.

```
<?xml version="1.0" encoding="utf-8"?>
<s:Skin xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx">
   <!-- host component -->
   <fx:Metadata>
      [HostComponent("spark.components.BorderContainer")]
   </fx:Metadata>

   <!-- states -->
   <s:states>
      <s:State name="disabled" />
      <s:State name="disabled" />
      <s:State name="normal" />
   </s:states>

   <!-- SkinParts
   name=contentGroup, type=spark.components.Group, required=false
   -->
   <!-- fill -->
   <s:Rect >
      <s:fill>
```

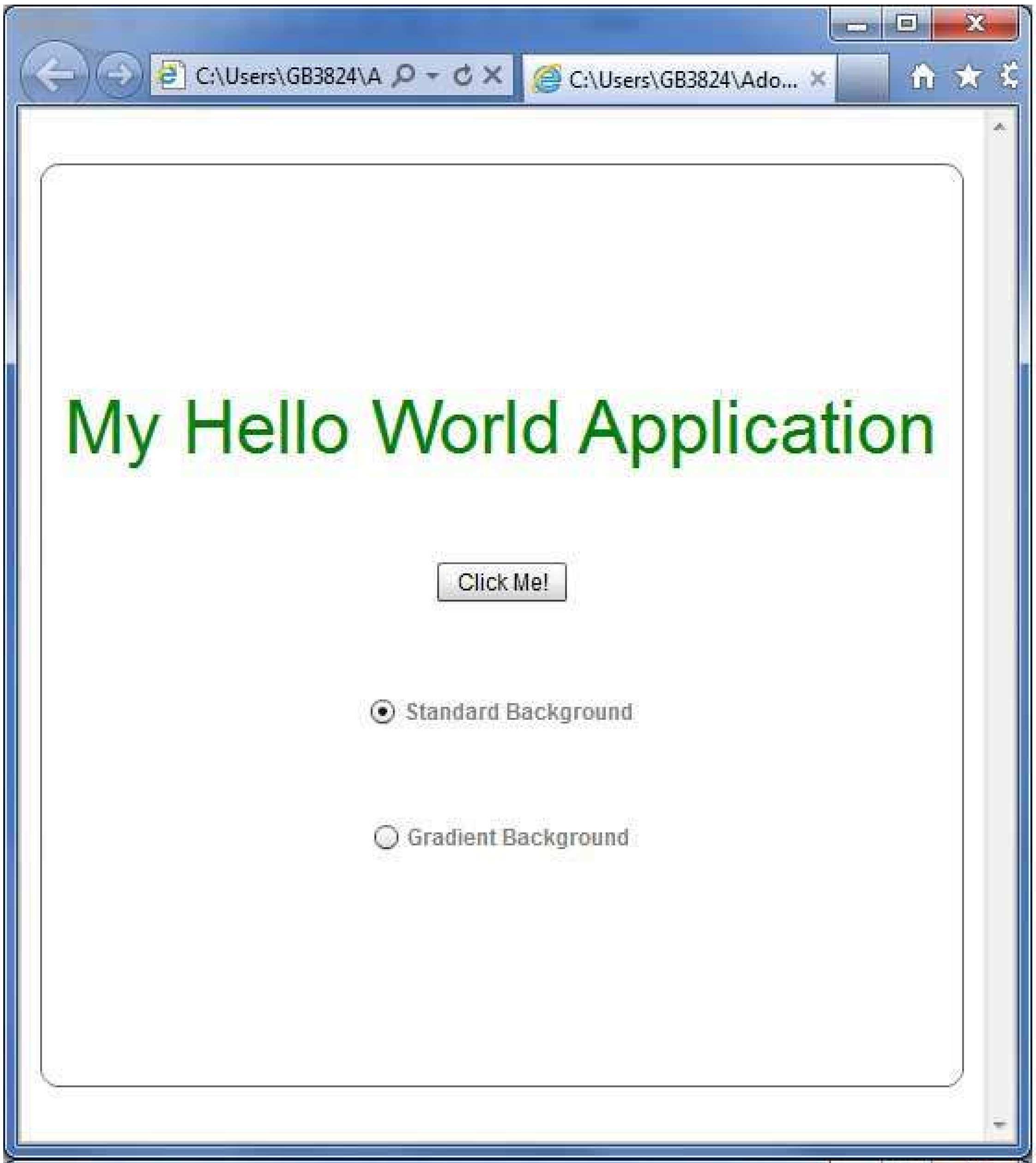
```
         <s:LinearGradient rotation="90">
            <s:GradientEntry color="0x111111" ratio="0.2"/>
            <s:GradientEntry color="0x888888" ratio="1"/>
         </s:LinearGradient>
      </s:fill>
   </s:Rect>
   <!-- must specify this for the host component -->
   <s:Group  />
</s:Skin>
```

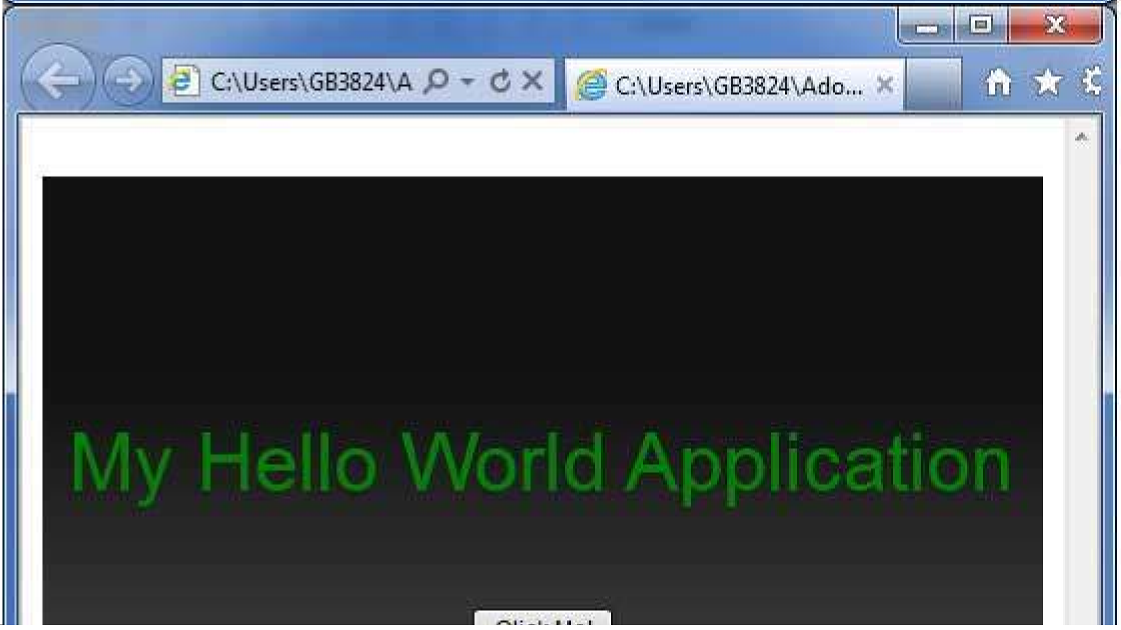
Following is the content of the modified **HelloWorld.mxml** file **src/com/tutorialspoint/client/HelloWorld.mxml**.

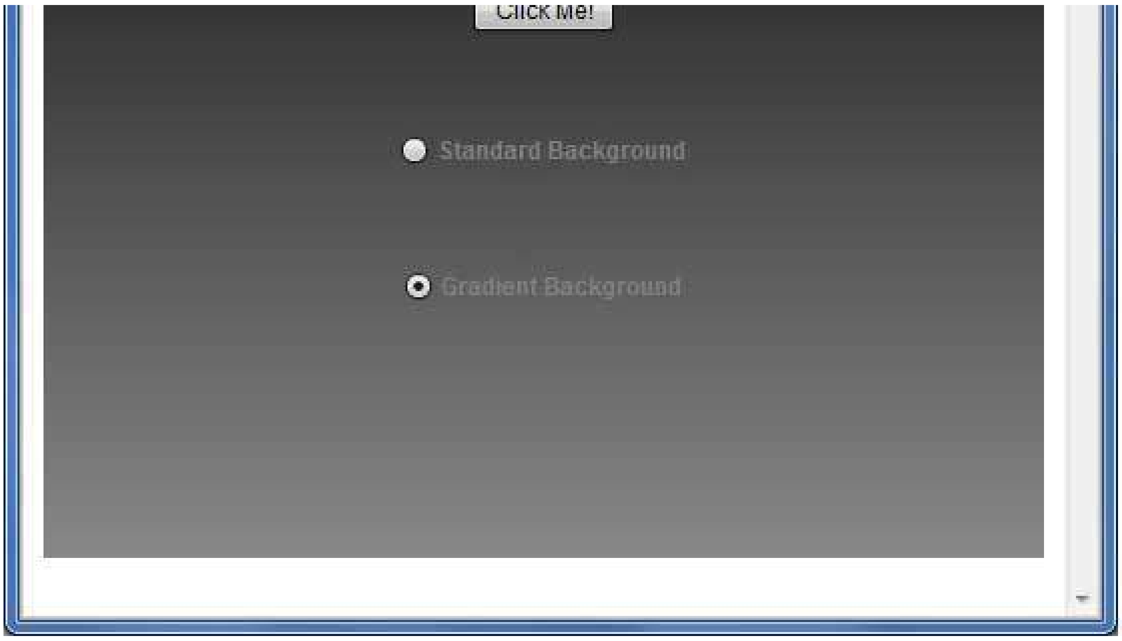
```
<?xml version="1.0" encoding="utf-8"?>
<s:Application xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx"
   width="100%" height="100%" minWidth="500" minHeight="500"
   initialize="application_initializeHandler(event)">

  <fx:Style source="/com/tutorialspoint/client/Style.css"/>

  <fx:Script>
  <![CDATA[
     import com.tutorialspoint.skin.GradientBackgroundSkin;
     import mx.controls.Alert;
     import mx.events.FlexEvent;
     import spark.skins.spark.BorderContainerSkin;

     protected function btnClickMe_clickHandler(event:MouseEvent):void
     {
        Alert.show("Hello World!");
     }

     protected function application_initializeHandler(event:FlexEvent):void
     {
        lblHeader.text = "My Hello World Application";
     }

     protected function gradientBackground_clickHandler(event:MouseEvent):void
     {
         mainContainer.setStyle("skinClass", GradientBackgroundSkin );
     }

     protected function standardBackground_clickHandler(event:MouseEvent):void
     {
        mainContainer.setStyle("skinClass", BorderContainerSkin );
     }
   ]]>
   </fx:Script>
   <fx:Declarations>
      <s:RadioButtonGroup  />
   </fx:Declarations>
   <s:BorderContainer width="500" height="500"
      skinClass="spark.skins.spark.BorderContainerSkin"
      horizontalCenter="0" verticalCenter="0" cornerRadius="10">
      <s:VGroup width="100%" height="100%" gap="50" horizontalAlign="center"
      verticalAlign="middle">
         <s:Label
         styleName="heading"/>
         <s:Button label="Click Me!"
            click="btnClickMe_clickHandler(event)"/>
         <s:RadioButton color="gray" fontWeight="bold"
            group="{selectorGroup}" label="Standard Background"
            click="standardBackground_clickHandler(event)" selected="true"/>
         <s:RadioButton color="gray" fontWeight="bold"
            group="{selectorGroup}" label="Gradient Background"
            click="gradientBackground_clickHandler(event)"/>
      </s:VGroup>
```

```
    </s:BorderContainer>
</s:Application>
```

Once you are ready with all the changes done, let us compile and run the application in normal mode as we did in Flex - Create Application chapter. If everything is fine with your application, this will produce following result: [Try it online]







FLEX - DATA BINDING

What is Data Binding?

Data Binding is a process in which data of one object is tied to another object. Data binding requires a source property, a destination property and a triggering event which indicates when to copy the data from source to destination.

Flex provides three ways to do Data Binding

- Curly brace syntax in MXML Script
- <fx:binding> tag in MXML
- BindingUtils in ActionScript

Data Binding - Using Curly Braces in MXML

Following example demonstrates using curly braces to specify data binding of a source to destination.

```
<s:TextInput />
<s:TextInput />
```

Data Binding - Using <fx:Binding> tag in MXML

Following example demonstrates using <fx:Binding> tag to specify data binding of a source to destination.

```
<fx:Binding source="txtInput1.text" destination="txtInput2.text" />
<s:TextInput />
<s:TextInput />
```

Data Binding - Using BindingUtils in ActionScript

Following example demonstrates using BindingUtils to specify data binding of a source to destination.

```
<fx:Script>
   <![CDATA[
      import mx.binding.utils.BindingUtils;
      import mx.events.FlexEvent;

      protected function txtInput2_preinitializeHandler(event:FlexEvent):void
      {
         BindingUtils.bindProperty(txtInput2,"text",txtInput1, "text");
      }
]]>
</fx:Script>
<s:TextInput />
<s:TextInput
preinitialize="txtInput2_preinitializeHandler(event)"/>
```

Flex Data Binding Example

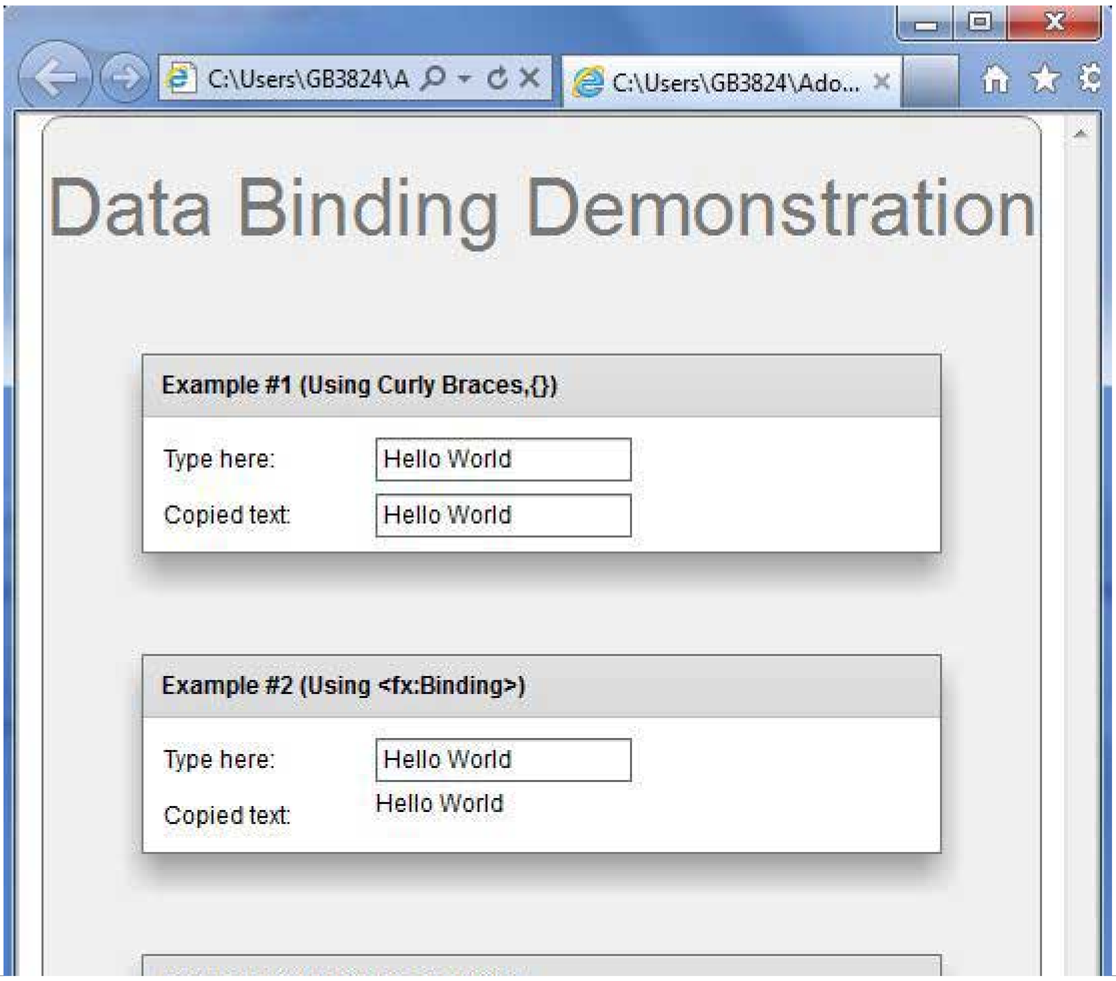
Let us follow the following steps to see skinning in action in a Flex application by creating a test application:

Step	Description
1	Create a project with a name *HelloWorld* under a package *com.tutorialspoint.client* as explained in the *Flex - Create Application* chapter.
2	Modify *HelloWorld.mxml* as explained below. Keep rest of the files unchanged.
3	Compile and run the application to make sure business logic is working as per the requirements.

Following is the content of the modified **HelloWorld.mxml** file **src/com/tutorialspoint/client/HelloWorld.mxml**.

```
<?xml version="1.0" encoding="utf-8"?>
<s:Application xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx"
   width="100%" height="100%" minWidth="500" minHeight="500"
   >
   <fx:Style source="/com/tutorialspoint/client/Style.css"/>
   <fx:Script>
   <![CDATA[
      import mx.binding.utils.BindingUtils;
      import mx.events.FlexEvent;

      protected function txtInput6_preinitializeHandler(event:FlexEvent):void
      {
         BindingUtils.bindProperty(txtInput6,"text",txtInput5, "text");
      }
      ]]>
   </fx:Script>
   <fx:Binding source="txtInput3.text" destination="txtInput4.text" />
   <s:BorderContainer width="500" height="550"
   styleName="container">
      <s:VGroup width="100%" height="100%" gap="50" horizontalAlign="center"
      verticalAlign="middle">
         <s:Label
         fontSize="40" color="0x777777" styleName="heading"/>
         <s:Panel title="Example #1 (Using Curly Braces,\{\})" width="400"
         height="100" >
            <s:layout>
               <s:VerticalLayout paddingTop="10" paddingLeft="10"/>
            </s:layout>
            <s:HGroup >
               <s:Label text = "Type here: " width="100" paddingTop="6"/>
               <s:TextInput />
            </s:HGroup>
            <s:HGroup >
               <s:Label text = "Copied text: " width="100" paddingTop="6"/>
               <s:TextInput />
            </s:HGroup>
         </s:Panel>
         <s:Panel title="Example #2 (Using &lt;fx:Binding&gt;)" width="400"
         height="100" >
            <s:layout>
               <s:VerticalLayout paddingTop="10" paddingLeft="10"/>
            </s:layout>
            <s:HGroup >
               <s:Label text = "Type here: " width="100" paddingTop="6"/>
               <s:TextInput />
            </s:HGroup>
            <s:HGroup >
               <s:Label text = "Copied text: " width="100" paddingTop="6"/>
               <s:Label />
            </s:HGroup>
         </s:Panel>
         <s:Panel title="Example #3 (Using BindingUtils)" width="400"
            height="100" > <s:layout>
               <s:VerticalLayout paddingTop="10" paddingLeft="10"/>
            </s:layout>
            <s:HGroup >
               <s:Label text = "Type here: " width="100" paddingTop="6"/>
               <s:TextInput />
            </s:HGroup>
            <s:HGroup >
               <s:Label text = "Copied text: " width="100" paddingTop="6"/>
               <s:TextInput enabled="false"
               preinitialize="txtInput6_preinitializeHandler(event)"/>
            </s:HGroup>
         </s:Panel>
      </s:VGroup>
   </s:BorderContainer>
</s:Application>
```

Once you are ready with all the changes done, let us compile and run the application in normal mode as we did in Flex - Create Application chapter. If everything is fine with your application, this will produce following result: [Try it online]



Data Binding Demonstration

Example #1 (Using Curly Braces,{})

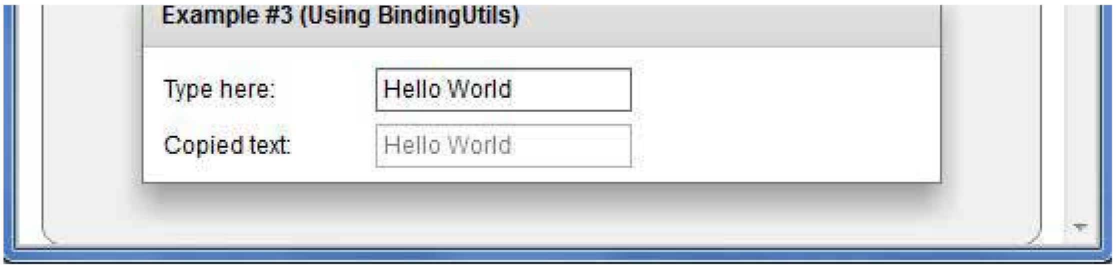
Type here: Hello World

Copied text: Hello World

Example #2 (Using <fx:Binding>)

Type here: Hello World

Copied text: Hello World


Example #3 (Using BindingUtils)

Type here: Hello World

Copied text: Hello World

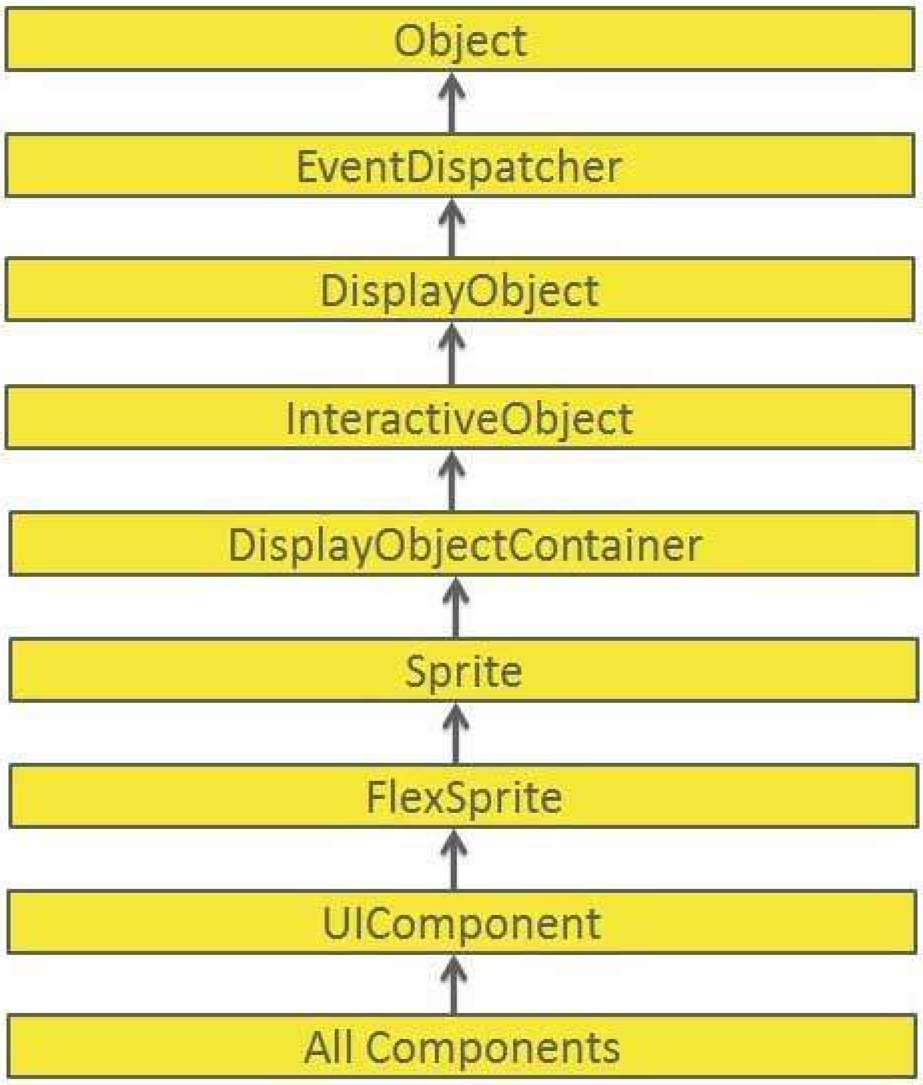
FLEX - BASIC CONTROLS

Every user interface considers the following three main aspects:

- **UI elements** : These are the core visual elements the user eventually sees and interacts with. Flex provides a huge list of widely used and common elements varying from basic to complex which we will cover in this tutorial.
- **Layouts:** They define how UI elements should be organized on the screen and provide a final look and feel to the GUI *GraphicalUserInterface*. This part will be covered in Layout chapter.
- **Behavior:** These are events which occur when the user interacts with UI elements. This part will be covered in Event Handling chapter.

Flex UI Elements:

The Flex UI library provides classes in a well-defined class hierarchy to create complex web-based user interfaces. All classes in this component hierarchy has been derived from the **EventDispatcher** base class as shown below:



Every Basic UI control inherits properties from UIComponent class which in turn inherits properties from EventDispatcher and other top level classes.

S.N.	Control & Description
1	Flex EventDispatcher Class The EventDispatcher class is the base class for all classes that can dispatch events. The EventDispatcher class allows any object on the display list to be an event target and as such, to use the methods of the IEventDispatcher interface.
2	Flex UIComponent The UIComponent class is the base class for all visual components, both interactive and noninteractive.

Basic Controls

Following are few important *Basic Controls*:

S.N.	Controls & Description
1	Label Label is a low-level UIComponent that can render one or more lines of uniformly-formatted text.
2	Text The Text control lets you display HTML content as well as normal text in your application.
3	Image The Image control lets you import JPEG, PNG, GIF, and SWF files at runtime.
4	LinkButton The LinkButton control is a borderless Button control whose contents are highlighted when a user moves the mouse over it.

FLEX - FORM CONTROLS

Form controls allows users to input data and provides them interaction capability with the application. Every Form UI control inherits properties from UIComponent class which in turn inherits properties from EventDispatcher and other top level classes.

S.N.	Control & Description
1	Flex EventDispatcher Class The EventDispatcher class is the base class for all classes that can dispatch events. The EventDispatcher class allows any object on the display list to be an event target and as such, to use the methods of the IEventDispatcher interface.
2	Flex UIComponent

The UIComponent class is the base class for all visual components, both interactive and noninteractive.

Form Controls

Following are few important *Form Controls*:

S.N.	Control & Description
1	Button The Button component is a commonly used rectangular button.
2	ToggleButton The ToggleButton component defines a toggle button.
3	CheckBox The CheckBox component consists of an optional label and a small box that can contain a check mark or not.
4	ColorPicker The ColorPicker control provides a way for a user to choose a color from a swatch list.
5	ComboBox The ComboBox control is a child class of the DropDownListBase control.
6	DateChooser The DateChooser control displays the name of a month, the year, and a grid of the days of the month, with columns labeled for the day of the week.
7	RadioButton The RadioButton component allows the user make a single choice within a set of mutually exclusive choices.
8	TextArea TextArea is a text-entry control that lets users enter and edit multiple lines of formatted text.
9	TextInput TextInput is a text-entry control that lets users enter and edit a single line of uniformly-formatted text.
10	DropDownList The DropDownList control contains a drop-down list from which the user can select a single value.

11	NumericStepper The NumericStepper control lets you select a number from an ordered set.

FLEX - COMPLEX CONTROLS

Complex controls provides users advanced capabilities to deal with large amount of data in an easy way and provides them interaction capability with the application. Every Complex UI control inherits properties from UIComponent class which in turn inherits properties from EventDispatcher and other top level classes.

S.N.	Control & Description
1	Flex EventDispatcher Class The EventDispatcher class is the base class for all classes that can dispatch events. The EventDispatcher class allows any object on the display list to be an event target and as such, to use the methods of the IEventDispatcher interface.
2	Flex UIComponent The UIComponent class is the base class for all visual components, both interactive and noninteractive.

Complex Controls

Following are few important *Complex Controls*:

S.N.	Control & Description
1	DataGrid The DataGrid control displays a row of column headings above a scrollable grid.
2	AdvancedDataGrid The AdvancedDataGrid adds few additional functionality to the standard DataGrid control to add data visualization features.
3	Menu The Menu control creates a pop-up menu of individually selectable choices.
4	ProgressBar The ProgressBar control provides a visual representation of the progress of a task over time.
5	RichTextEditor The RichTextEditor control lets users enter and format text.
6	TileList

	The TileList control The TileList control displays a number of items laid out in tiles.
7	Tree The Tree control lets a user view hierarchical data arranged as an expandable tree.
8	VideoPlayer The VideoPlayer control is a skinnable video player that supports progressive download, multi-bitrate streaming, and streaming video.
9	Accordian An Accordian control has a collection of child MX containers or Spark NavigatorContent containers, but only one of them at a time is visible.
10	TabNavigator The TabNavigator control includes a TabBar container for navigating between its child containers.
11	ToggleButtonBar The ToggleButtonBar control defines a horizontal or vertical group of buttons that maintain their selected or deselected state.

FLEX - LAYOUT PANELS

Layout panel controls provides users to organize UI controls on the page. Every Layout control inherits properties from UIComponent class which in turn inherits properties from EventDispatcher and other top level classes.

S.N.	Control & Description
1	Flex EventDispatcher Class The EventDispatcher class is the base class for all classes that can dispatch events. The EventDispatcher class allows any object on the display list to be an event target and as such, to use the methods of the IEventDispatcher interface.
2	Flex UIComponent The UIComponent class is the base class for all visual components, both interactive and noninteractive.

Layout Panels

Following are few important *Layout Panels*:

S.N.	Panel & Description
1	BorderContainer The BorderContainer class provides a set of CSS styles that control the appearance of the

	border and background fill of the container.
2	Form The Form container provides control over the layout of a form, mark form fields as required or optional, handle error messages, and bind form data to the Flex data model to perform data checking and validation.
3	VGroup The VGroup container is a Group container that uses the VerticalLayout class.
4	HGroup The HGroup container is a Group container that uses the HorizontalLayout class.
5	Panel The Panel class is a container that includes a title bar, a caption, a border, and a content area for its children.
6	SkinnableContainer The SkinnableContainer class is the base class for skinnable containers that provide visual content.
7	TabBar The TabBar displays a set of identical tabs.
8	TitleWindow The TitleWindow extends Panel to include a close button and move area.

FLEX - VISUAL EFFECTS

We can add behaviour to flex application using concept of Effects. For example, when a text box get focus, we can make its text become bolder and make its size slight bigger.

Every Effect inherits properties from Effect class which in turn inherits properties from EventDispatcher and other top level classes.

S.N.	Effect & Description
1	Flex Effect Class The Effect class is an abstract base class that defines the basic functionality of all Flex effects. This class defines the base factory class for all effects.

Basic Effects

Following are few important *Basic Visual Effects*:

S.N.	Effect & Description

1	Fade The Fade effect animates the alpha property of a component.
2	WipeLeft The WipeLeft class defines a wipe left effect.
3	WipeRight The WipeRight class defines a wipe right effect.
4	Move3D The Move3D class moves a target object in the x, y, and z dimensions.
5	Scale3D The Scale3D class scales a target object in three dimensions around the transform center.
6	Rotate3D The Rotate3D class rotate a target object in three dimensions around the x, y, or z axes.
7	Animate This Animate effect animates an arbitrary set of properties between values. Specify the properties and values to animate by setting the motionPaths property.

FLEX - EVENT HANDLING

Flex uses concept of event to pass data from one object to another depend upon the state or user interaction within the application.

ActionScript has a generic **Event** class which defines much of the functionality needed to work with events. Every time an event occurs within a Flex application, three types of objects from the Event class hierarchy are created.

Event has the following three key properties

Property	Description
type	type states about what kind of event just happened. This may be click, initialize, mouseover, change, etc. The actual values will be represented by constants like MouseEvent.CLICK.
target	The target property of Event is an object reference to the component that generated the event.If you click a Button with an id of clickMeButton, the target of that click event will be clickMeButton
currentTarget	The currentTarget property varies container hierarchy. It mainly deals with flow of events.

Event Flow Phases

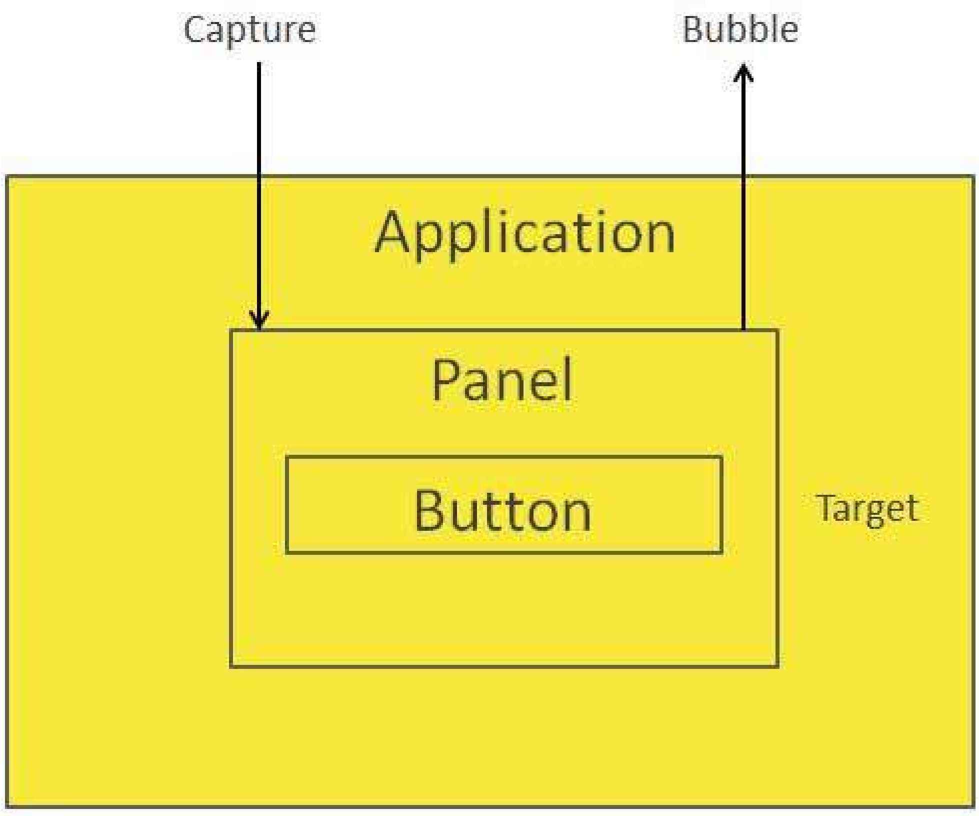
An event goes through three phases looking for event handlers.

Phase	Description
Capture	In the capture phase the program will start looking for event handlers from the outside *ortop* parent to the innermost one. The capture phase stops at the parent of the object that triggered the event.
Target	In the target phase ,the component that triggered the event, is checked for an event handler.
Bubble	The Bubble phase is reverse of capture phase, working back through the structure, from the target component's parent on up.

Consider the following application code

```
<?xml version="1.0" encoding="utf-8"?>
<s:Application xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx"
   width="100%" height="100%"
   minWidth="500" minHeight="500" >
   <s:Panel>
      <s:Button />
   </s:Panel>
</s:Application>
```

When the user clicks the Button, he or she has also clicked the Panel and the Application.The event goes through three phases looking for event-handler assignments.



Let us follow the following steps to test event handing in a Flex application:

Step	Description
1	Create a project with a name *HelloWorld* under a package *com.tutorialspoint.client* as

explained in the *Flex - Create Application* chapter.

2 Modify *HelloWorld.mxml* as explained below. Keep rest of the files unchanged.

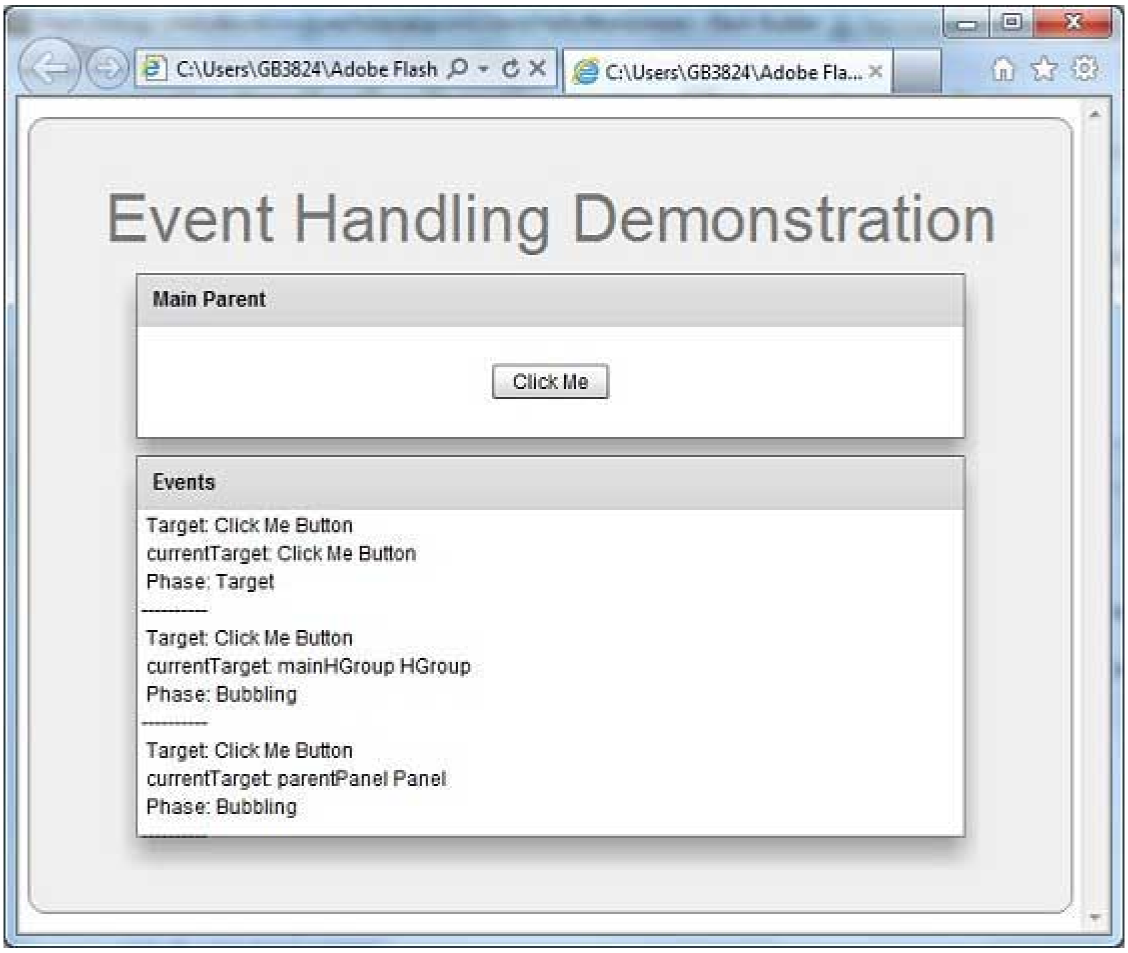
3 Compile and run the application to make sure business logic is working as per the requirements.

Following is the content of the modified mxml file **src/com.tutorialspoint/HelloWorld.mxml**.

```
<?xml version="1.0" encoding="utf-8"?>
<s:Application xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx"
   width="100%" height="100%" minWidth="500" minHeight="500"
   >
   <fx:Style source="/com/tutorialspoint/client/Style.css"/>
   <fx:Script>
      <![CDATA[
         protected function reportEvent(event:MouseEvent):void
         {
            var target:String = event.target.id;
            var currentTarget:String = event.target.id;
            var eventPhase: String;

            if(event.target is Button){
               var button:Button = event.target as Button;
               target = button.label + " Button";
            } else if(event.target is HGroup){
               var hGroup:HGroup = event.target as HGroup;
               target = hGroup.id + " HGroup";
            }else if(event.target is Panel){
               var panel:Panel = event.target as Panel;
               target = panel.id + " Panel";
            }

            if(event.currentTarget is Button){
               var button1:Button = event.currentTarget as Button;
               currentTarget = button1.label + " Button";
            }else if(event.currentTarget is HGroup){
               var hGroup1:HGroup = event.currentTarget as HGroup;
               currentTarget = hGroup1.id + " HGroup";
            }else if(event.currentTarget is Panel){
               var panel1:Panel = event.currentTarget as Panel;
               currentTarget = panel1.id + " Panel";
            }

            var eventPhaseInt:uint = event.eventPhase;

            if(eventPhaseInt == EventPhase.AT_TARGET){
               eventPhase = "Target";
            } else if(eventPhaseInt == EventPhase.BUBBLING_PHASE){
               eventPhase = "Bubbling";
            }else if(eventPhaseInt == EventPhase.CAPTURING_PHASE){
               eventPhase = "Capturing";
            }

            reports.text += " Target: " + target + "\n currentTarget: " +
            currentTarget + "\n Phase: " + eventPhase + "\n----------\n";
         }
      ]]>
   </fx:Script>
   <s:BorderContainer width="630" height="480"
      styleName="container">
      <s:VGroup width="100%" height="100%" gap="10"
         horizontalAlign="center" verticalAlign="middle">
         <s:Label
            fontSize="40" color="0x777777" styleName="heading"/>
         <s:Panel
```

```
            click="reportEvent(event)" width="500"
            height="100" includeInLayout="true" visible="true">
            <s:layout>
               <s:VerticalLayout  gap="10"
                  verticalAlign="middle" horizontalAlign="center"/>
            </s:layout>
            <s:HGroup >
               <s:Button label="Click Me"
                  click="reportEvent(event)"/>
            </s:HGroup>
         </s:Panel>
         <s:Panel
            title="Events" width="500" height="230">
            <mx:Text  />
         </s:Panel>
      </s:VGroup>
   </s:BorderContainer>
</s:Application>
```

Once you are ready with all the changes done, let us compile and run the application in normal mode as we did in Flex - Create Application chapter. If everything is fine with your application, this will produce following result: [Try it online]


C:\Users\GB3824\Adobe Flash
C:\Users\GB3824\Adobe Fla...
Event Handling Demonstration
Main Parent
Click Me
Events

Target: Click Me Button
currentTarget: Click Me Button
Phase: Target

Target: Click Me Button
currentTarget: mainHGroup HGroup
Phase: Bubbling

Target: Click Me Button
currentTarget: parentPanel Panel
Phase: Bubbling

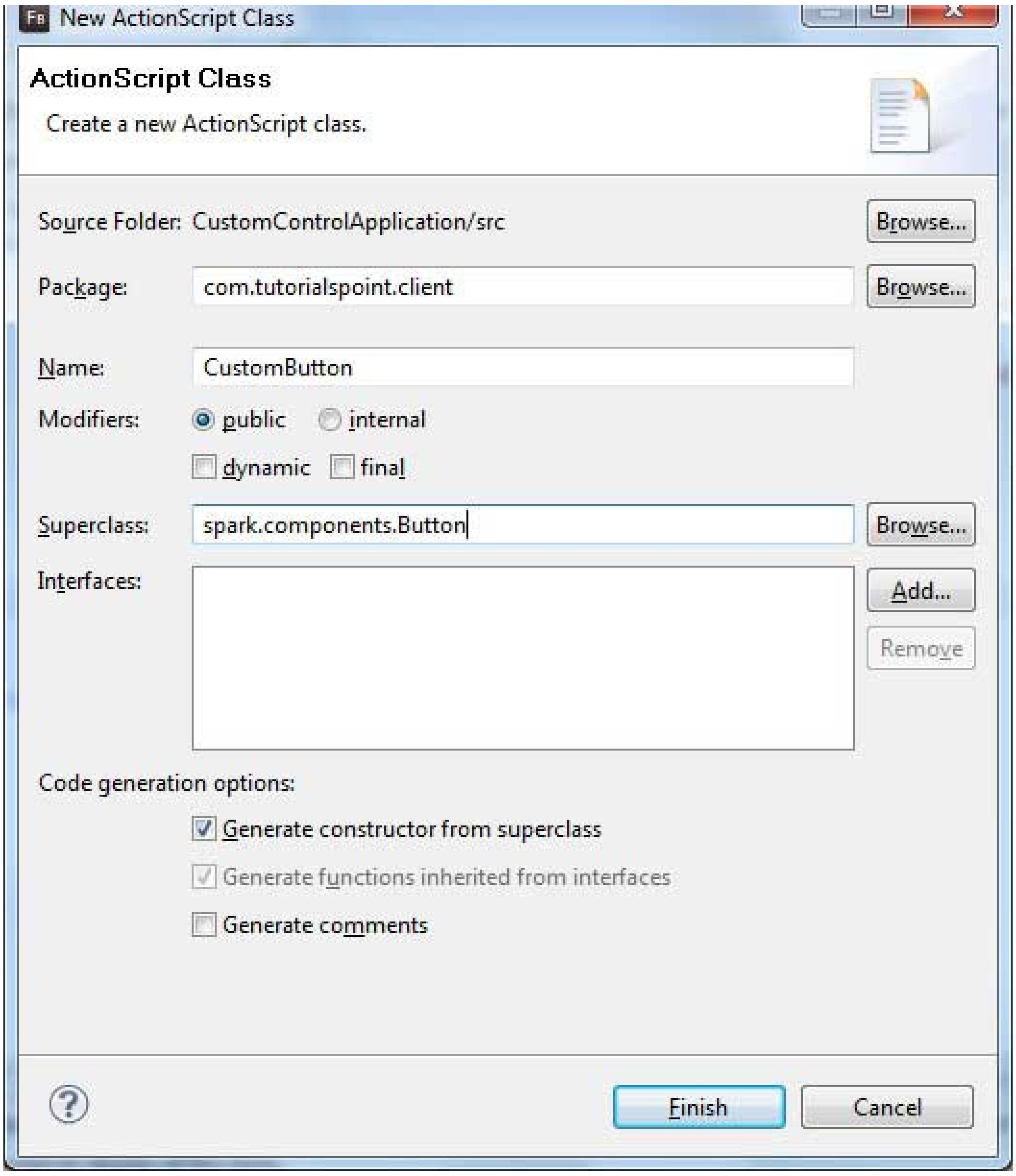
FLEX - CUSTOM CONTROLS

Flex provides two ways to create custom components.

- Using ActionScript
- Using MXML

Using ActionScript

You can create a component by extending existing component. To create a component using Flash Builder, Click on ***File > New > ActionScript Class***. Enter the details as shown below.


New ActionScript Class

ActionScript Class

Create a new ActionScript class.

Source Folder: CustomControlApplication/src

Package: com.tutorialspoint.client

Name: CustomButton

Modifiers: [✓ public] internal

dynamic final

Superclass: spark.components.Button

Interfaces:

Code generation options:

[✓ Generate constructor from superclass]

[✓ Generate functions inherited from interfaces]

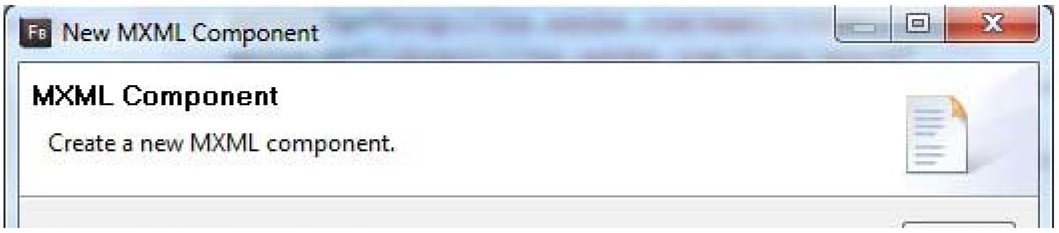
Generate comments

Flash Builder will create the following CustomButton.as file.

```
package com.tutorialspoint.client
{
   import spark.components.Button;

   public class CustomButton extends Button
   {
      public function CustomButton()
      {
         super();
      }
   }
}
```

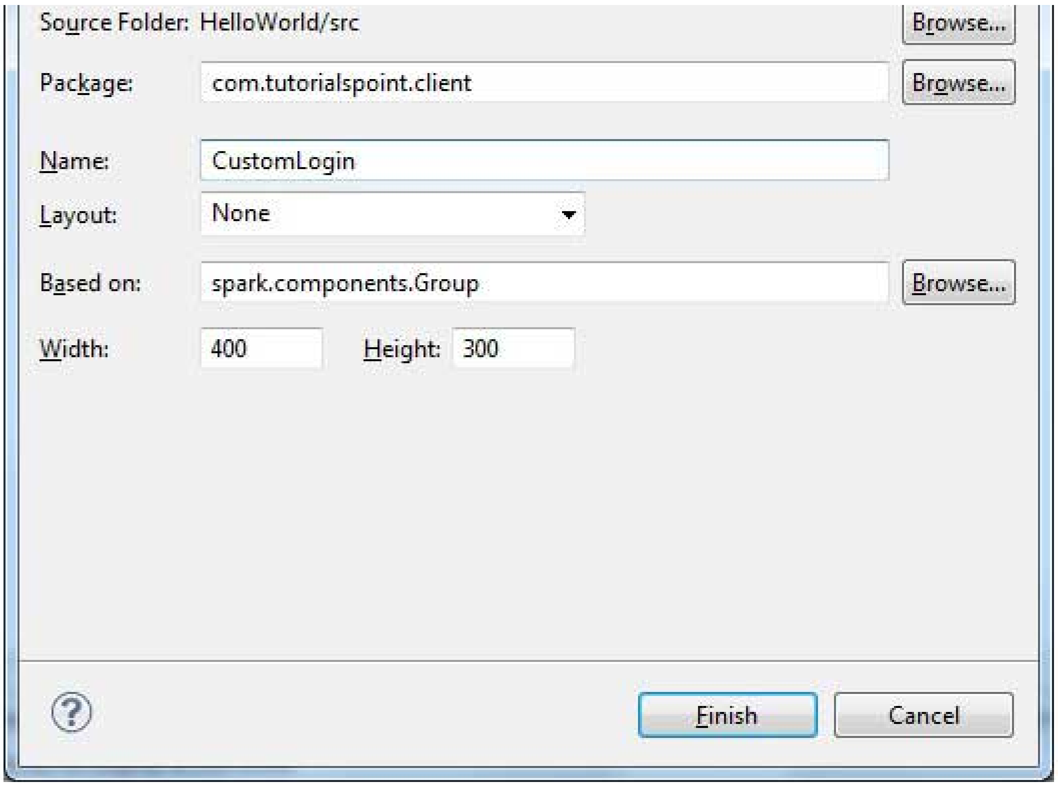
Using MXML

You can create a component by extending existing component. To create a component using Flash Builder, Click on ***File > New > MXML Component***. Enter the details as shown below.


New MXML Component

MXML Component

Create a new MXML component.


Source Folder: HelloWorld/src

Package: com.tutorialspoint.client

Name: CustomLogin

Layout: None

Based on: spark.components.Group

Width: 400 Height: 300

Flash Builder will create the following CustomLogin.mxml file.

```
<?xml version="1.0" encoding="utf-8"?>
<s:Group xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx"
   width="400" height="300">

</s:Group>
```

Let us follow the following steps to test custom controls in a Flex application:

Step	Description
1	Create a project with a name *HelloWorld* under a package *com.tutorialspoint.client* as explained in the *Flex - Create Application* chapter.
2	Modify *HelloWorld.mxml* as explained below. Keep rest of the files unchanged.
4	Create *CustomLogin.mxml* and *CustomButton.as* component as explained above. Modify these files as explained below. Keep rest of the files unchanged.
3	Compile and run the application to make sure business logic is working as per the requirements.

Following is the content of the modified mxml file **src/com.tutorialspoint/client/CustomLogin.mxml**.

```
<?xml version="1.0" encoding="utf-8"?>
<s:Group xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx" width="400" height="300">
   <s:Form>
      <s:FormItem label="UserName:">
         <s:TextInput width="200" />
      </s:FormItem>
      <s:FormItem label="Password:">
         <s:TextInput width="200"
```

```
            displayAsPassword="true" />
      </s:FormItem>
      <s:FormItem>
         <s:Button label="Login" />
      </s:FormItem>
   </s:Form>
</s:Group>
```

Following is the content of the modified mxml file **src/com.tutorialspoint/client/CustomButton.as**.

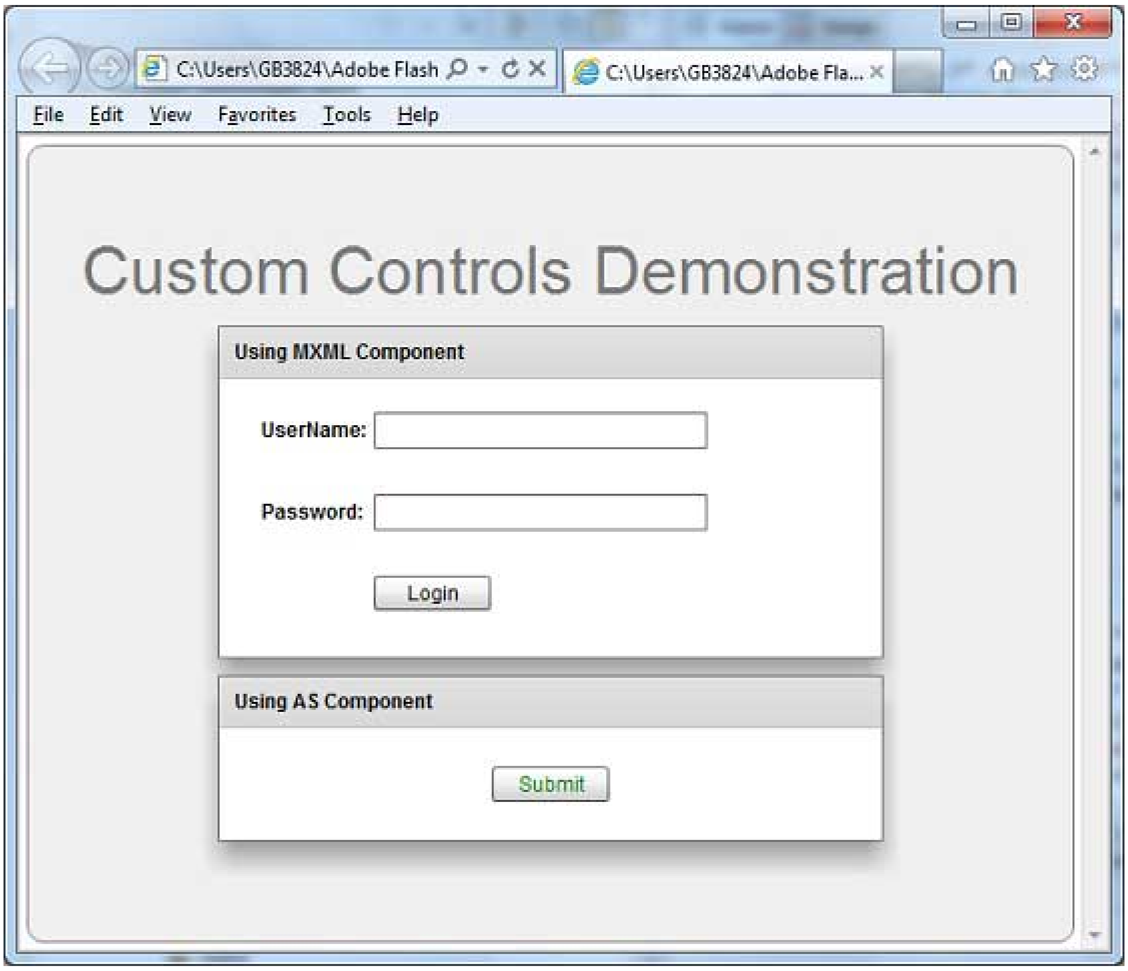
```
package com.tutorialspoint.client
{
   import spark.components.Button;

   public class CustomButton extends Button
   {
      public function CustomButton()
      {
         super();
         this.setStyle("color","green");
         this.label = "Submit";
      }
   }
}
```

Following is the content of the modified mxml file **src/com.tutorialspoint/client/HelloWorld.mxml**.

```
<?xml version="1.0" encoding="utf-8"?>
<s:Application xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx"
   xmlns:client="com.tutorialspoint.client.*"
   initialize="application_initializeHandler(event)"
   >
   <fx:Style source="/com/tutorialspoint/client/Style.css"/>
   <fx:Script>
      <![CDATA[
        import mx.events.FlexEvent;

        protected function application_initializeHandler(event:FlexEvent):void
        {
           //create a new custom button
           var customButton: CustomButton = new CustomButton();
           asPanel.addElement(customButton);
        }

      ]]>
   </fx:Script>
   <s:BorderContainer width="630" height="480"
      styleName="container">
      <s:VGroup width="100%" height="100%" gap="10"
         horizontalAlign="center" verticalAlign="middle">
         <s:Label
            fontSize="40" color="0x777777" styleName="heading"/>

         <s:Panel title="Using MXML Component" width="400" height="200">
            <client:CustomLogin>
            </client:CustomLogin>
         </s:Panel>
         <s:Panel  title="Using AS Component" width="400" height="100">
            <s:VGroup
               horizontalAlign="center" verticalAlign="middle">
            </s:VGroup>
         </s:Panel>
      </s:VGroup>
   </s:BorderContainer>
```

```
</s:Application>
```

Once you are ready with all the changes done, let us compile and run the application in normal mode as we did in Flex - Create Application chapter. If everything is fine with your application, this will produce following result: [Try it online]



FLEX - RPC SERVICES

Flex provides RPC services to provide server side data to client side. Flex provides a fair amount of control on to server side data.

- Using Flex RPC services, we can define user actions to be executed on server side.
- Flex RPC Sservices can be integrated with any server side technologies.
- One of Flex RPC Service provide inbuilt support for compressed binary data to be transferred over the wire and is pretty fast.

Flex provides following three types of RPC Services

RPC Service	Description
HttpService	<mx:HTTPService> tag is used to represent an HTTPService object in an MXML file. When you make a call to HTTPService object's send method, it makes an HTTP request to the specified URL, and an HTTP response is returned.You can also use the HTTP HEAD, OPTIONS, TRACE, and DELETE methods.
WebService	The <mx:WebService> tag is used to get access to the operations of SOAP-compliant web services.
RemoteObject	The <mx:RemoteObject> tag is used to represent an HTTPService object in an MXML file. This tag gives you access to the methods of Java objects using Action Message Format *AMF* encoding.

We're going to discuss HTTP Service in detail. We'll use an XML source file placed at server and access it at client side via HTTP Service

Items.xml

```
<items>
   <item name="Book" description="History of France"></item>
   <item name="Pen" description="Parker Pen"></item>
   <item name="Pencil" description="Stationary"></item>
<items>
```

HTTPService Declaration

Now declare a HTTPService and pass it url of the above file

```
<fx:Declarations>
   <mx:HTTPService
   url="http://www.tutorialspoint.com/flex/Items.xml" />
</fx:Declarations>
```

RPC Call

Make a call to itemRequest.send method and bind values from lastResult object of itemRequest webservice to Flex UI component.

```
...
itemRequest.send();
...
<mx:DataGrid
   dataProvider="{itemRequest.lastResult.items.item}">
   <mx:columns>
      <mx:DataGridColumn headerText="Name" dataField="name"/>
      <mx:DataGridColumn headerText="Description" dataField="description"/>
   </mx:columns>
</mx:DataGrid>
```

RPC Service Call Example

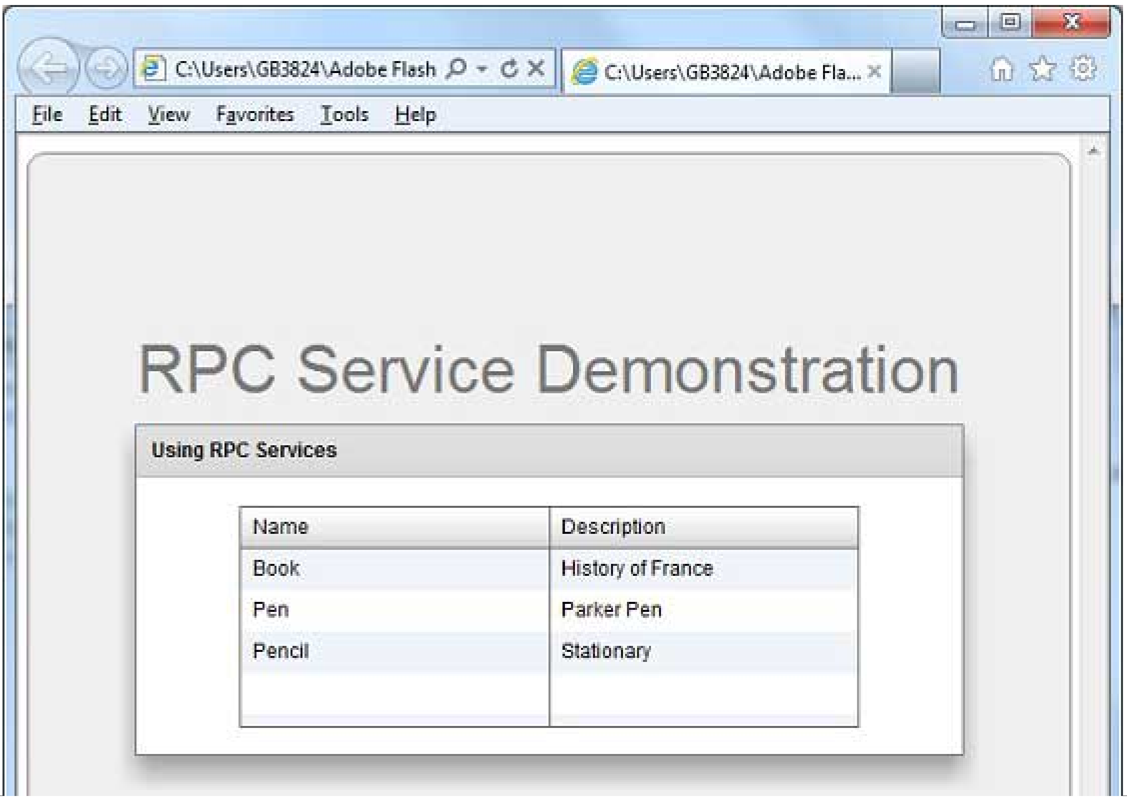
Now Let us follow the following steps to test RPC services in a Flex application:

Step	Description
1	Create a project with a name *HelloWorld* under a package *com.tutorialspoint.client* as explained in the *Flex - Create Application* chapter.
2	Modify *HelloWorld.mxml* as explained below. Keep rest of the files unchanged.
3	Compile and run the application to make sure business logic is working as per the requirements.

Following is the content of the modified mxml file **src/com.tutorialspoint/HelloWorld.mxml**.

```
<?xml version="1.0" encoding="utf-8"?>
<s:Application xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx"
   minWidth="500" minHeight="500" creationComplete="init(event)">
   <fx:Style source="/com/tutorialspoint/client/Style.css"/>
   <fx:Script>
      <![CDATA[
         import mx.events.FlexEvent;
         import mx.rpc.events.FaultEvent;
         import mx.rpc.events.ResultEvent;

         protected function init(event:FlexEvent):void
         {
            itemRequest.send();
         }

      ]]>
   </fx:Script>
   <fx:Declarations>
      <mx:HTTPService
      url="http://www.tutorialspoint.com/flex/Items.xml" />
   </fx:Declarations>
   <s:BorderContainer width="630" height="480"
      styleName="container">
      <s:VGroup width="100%" height="100%" gap="10"
         horizontalAlign="center" verticalAlign="middle">
         <s:Label
            fontSize="40" color="0x777777" styleName="heading"/>
         <s:Panel
            width="500" height="200" >
            <s:layout>
               <s:VerticalLayout  gap="10"
                  verticalAlign="middle" horizontalAlign="center"/>
            </s:layout>
            <mx:DataGrid
               dataProvider="{itemRequest.lastResult.items.item}">
               <mx:columns>
                  <mx:DataGridColumn headerText="Name"
                     dataField="name"/>
                  <mx:DataGridColumn headerText="Description"
                     dataField="description"/>
               </mx:columns>
            </mx:DataGrid>
         </s:Panel>
      </s:VGroup>
   </s:BorderContainer>
</s:Application>
```

Once you are ready with all the changes done, let us compile and run the application in normal mode as we did in Flex - Create Application chapter. If everything is fine with your application, this will produce following result: [Try it online]


C:\Users\GB3824\Adobe Flash
C:\Users\GB3824\Adobe Fla...
File Edit View Favorites Tools Help

RPC Service Demonstration

Using RPC Services

Name	Description
Book	History of France
Pen	Parker Pen
Pencil	Stationary

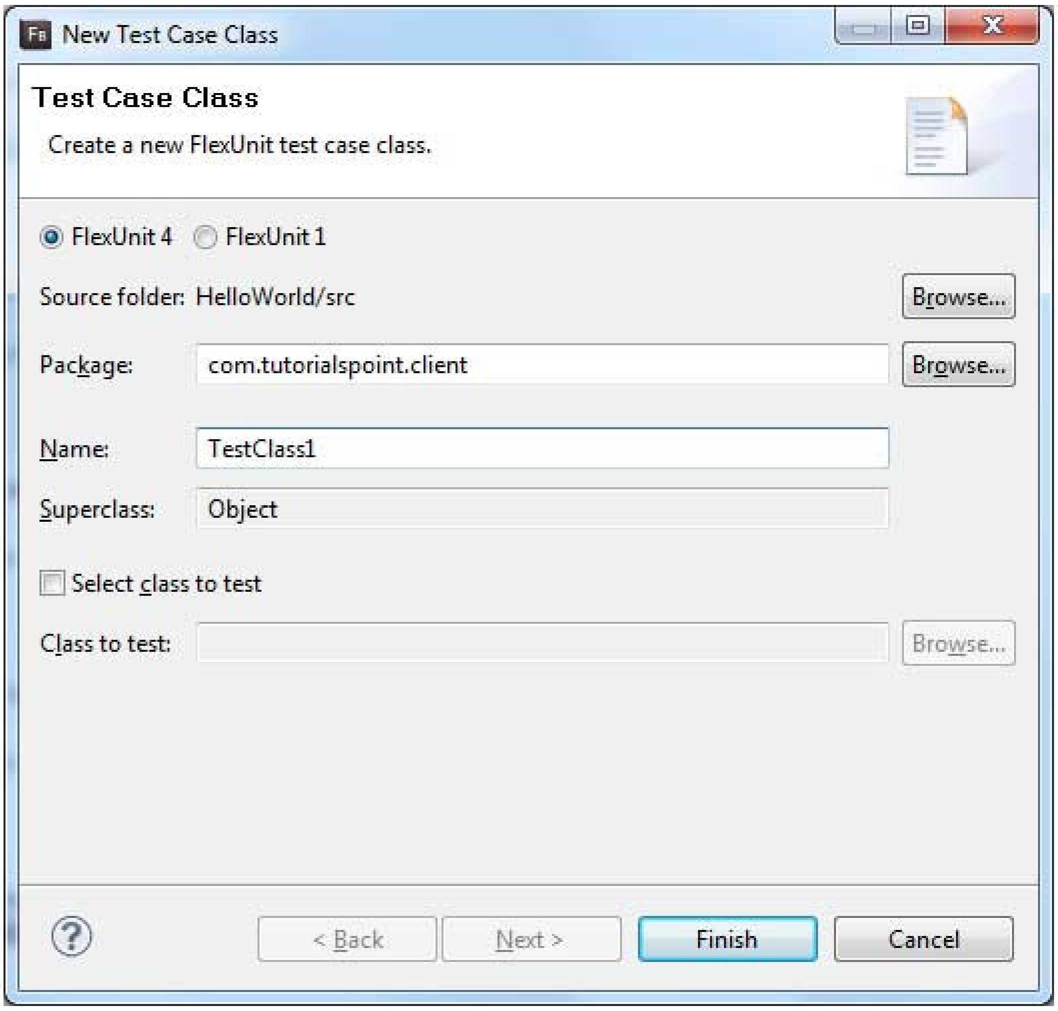
FLEX - FLEXUNIT INTEGRATION

Flash Builder 4 excellent inbuilt support for FlexUnit integration in Flex development Cycle.

Create a Test Case Class

You can create a Test Case Class using Flash Builder Create Test Class wizard. Running test cases is a breeze with Flash Builder as you will see in this article.

To create a test case class using Flash Builder, Click on ***File > New > Test Case Class***. Enter the details as shown below.



New Test Case Class

Test Case Class

Create a new FlexUnit test case class.

[✓ FlexUnit 4] FlexUnit 1

Source folder: HelloWorld/src

Package: com.tutorialspoint.client

Name: TestClass1

Superclass: Object

☐ Select class to test

Class to test:

Flash Builder will create the following TestClass1.as file.

```
package com.tutorialspoint.client
{
   public class TestClass1
   {
      [Before]
      public function setUp():void {}

      [After]
      public function tearDown():void {}

      [BeforeClass]
      public static function setUpBeforeClass():void {}

      [AfterClass]
      public static function tearDownAfterClass():void {}
   }
}
```

FlexUnit Integration Example

Now Let us follow the following steps to test FlexUnit Integration in a Flex application:

Step	Description
1	Create a project with a name *HelloWorld* under a package *com.tutorialspoint.client* as explained in the *Flex - Create Application* chapter.
2	Modify *HelloWorld.mxml* as explained below. Keep rest of the files unchanged.
3	Create *TestClass1.as* test case as described above and Modify *TestClass1.as* as explained below.
4	Compile and run the application to make sure business logic is working as per the requirements.

Following is the content of the modified as file **src/com.tutorialspoint/client/TestClass1.as**.

```
package com.tutorialspoint.client
{
   import org.flexunit.asserts.assertEquals;

   public class TestClass1
   {
      private var counter: int = 1;

      [Before]
      public function setUp():void
      {
         //this code will run before every test case execution
      }

      [After]
      public function tearDown():void
      {
         //this code will run after every test case execution
      }

      [BeforeClass]
      public static function setUpBeforeClass():void
      {
         //this code will run once when test cases start execution
      }

      [AfterClass]
      public static function tearDownAfterClass():void
      {
         //this code will run once when test cases ends execution
      }

      [Test]
      public function testCounter():void {
         assertEquals(counter, 1);
      }
   }
}
```

Following is the content of the modified mxml file **src/com.tutorialspoint/HelloWorld.mxml**.

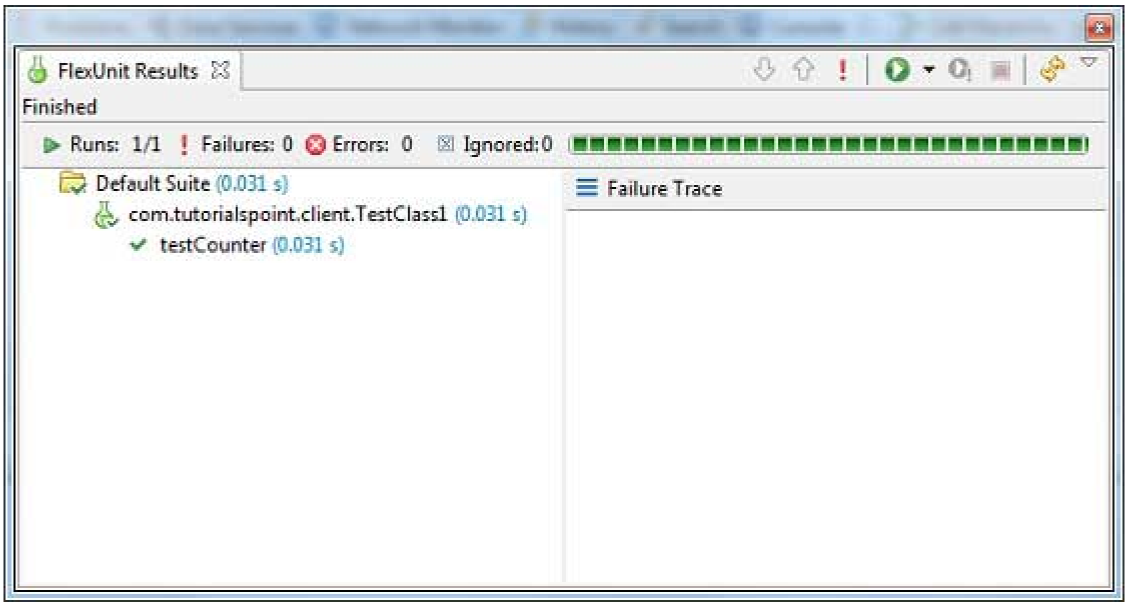
```
<?xml version="1.0" encoding="utf-8"?>
```

```
<s:Application xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx"
   minWidth="500" minHeight="500">
</s:Application>
```

Once you are ready with all the changes done, let us compile in normal mode as we did in Flex - Create Application chapter.

Running Test cases

Now Right Click on TestClass1 in package explorer and select ***Run As > FlexUnit Tests***. You'll see the following output in Flash Builder test window.

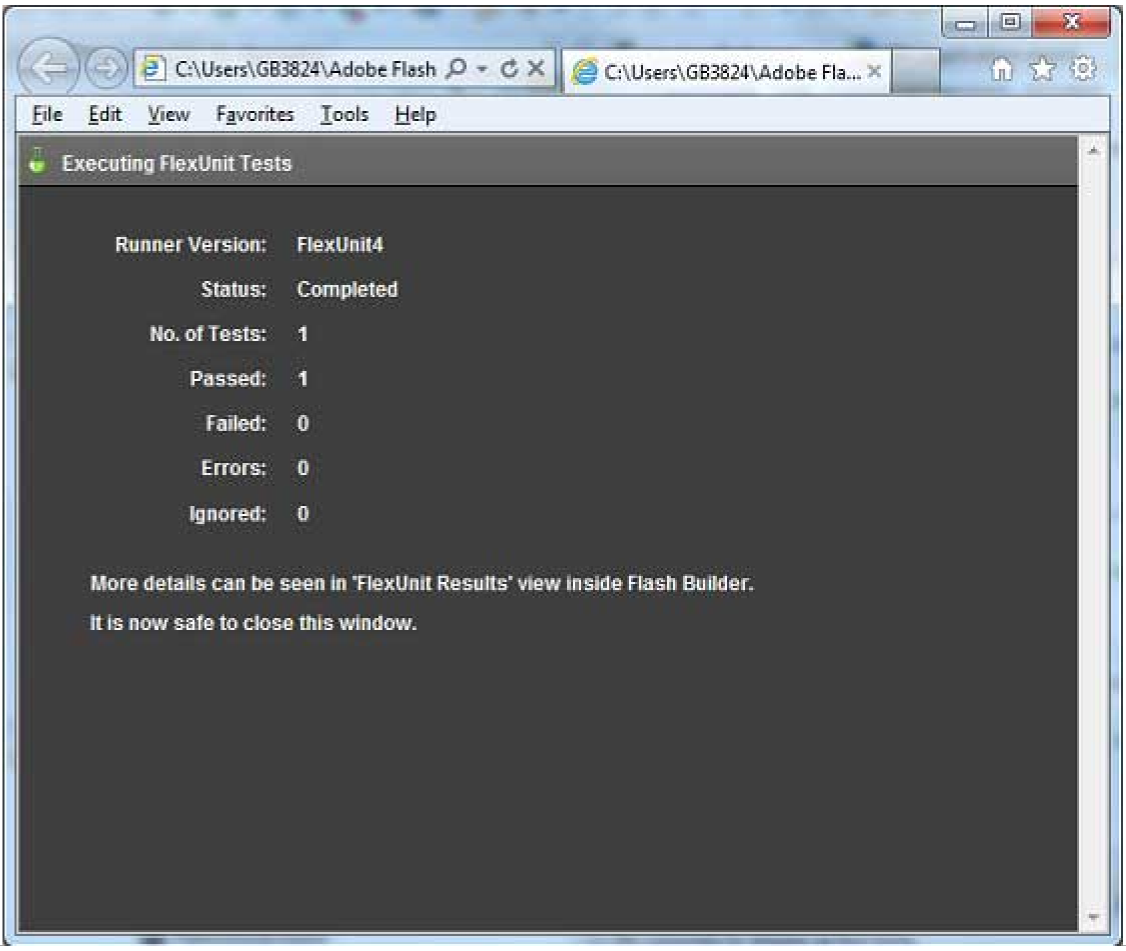


Finished

Runs: 1/1 Failures: 0 Errors: 0 Ignored: 0

Default Suite (0.031 s)
com.tutorialspoint.client.TestClass1 (0.031 s)
testCounter (0.031 s)

Flash Builder also show test result in the browser.



Executing FlexUnit Tests

Runner Version: FlexUnit4
Status: Completed
No. of Tests: 1
Passed: 1
Failed: 0
Errors: 0
Ignored: 0

More details can be seen in 'FlexUnit Results' view inside Flash Builder.

It is now safe to close this window.

FLEX - DEBUG APPLICATION

Flex provides excellent capability of debugging flex code and Flash Builder 4 has an excellent built-in debugger and debugging perspective support.

- During debug mode, Flex Application runs on Flash Player Debugger version built in Flash Builder 4 which supports debugging capability.
- So developers get an easy and inbuilt debugging configuration in Flash Builder

In this article we'll demonstrate usage of debugging Flex Client code using Flash Builder. We'll do the following tasks

- Set break points in the code and see them in BreakPoint Explorer.
- Step through the code line by line during debugging.
- View the values of variable.
- Inspect the values of all the variables.
- Inspect the value of an expression.
- Display the stack frame for suspended threads.

Debugging Example

Step	Description
1	Create a project with a name *HelloWorld* under a package *com.tutorialspoint.client* as explained in the *Flex - Create Application* chapter.
2	Modify *HelloWorld.mxml* as explained below. Keep rest of the files unchanged.
3	Compile and run the application to make sure business logic is working as per the requirements.

Following is the content of the modified mxml file **src/com.tutorialspoint/HelloWorld.mxml**.

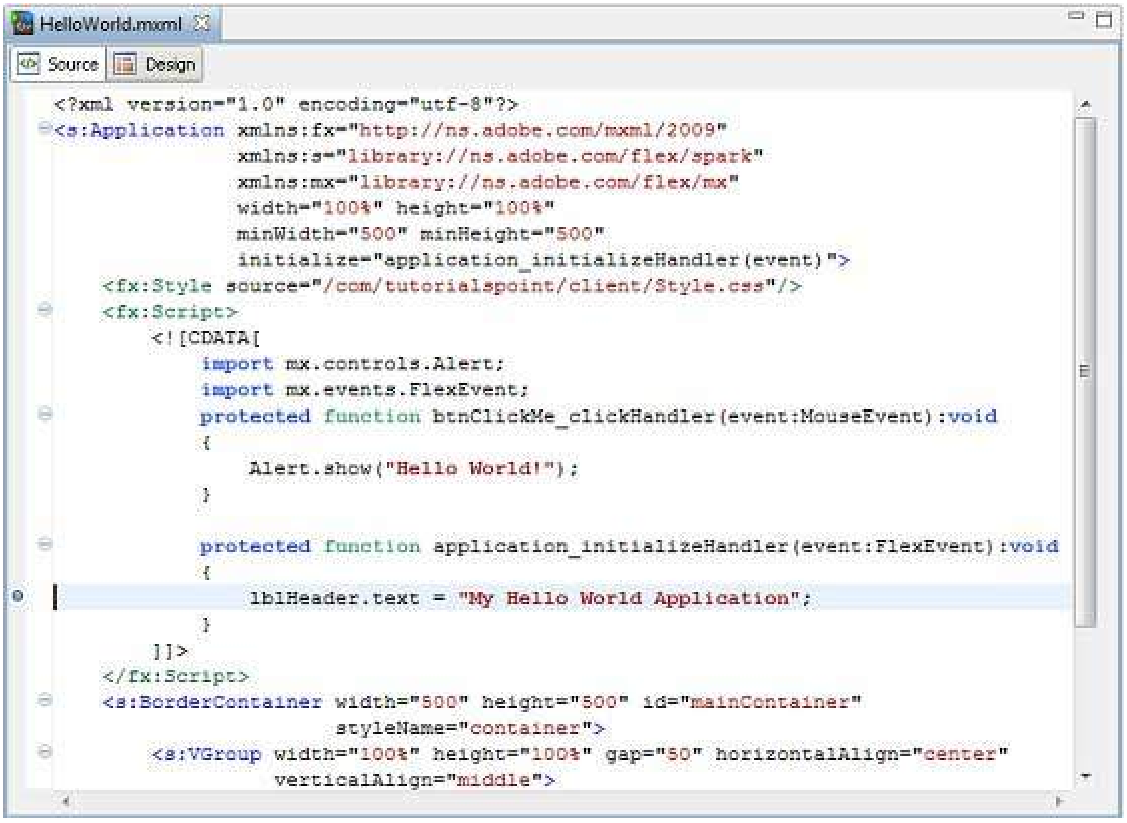
```
<?xml version="1.0" encoding="utf-8"?>
<s:Application xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx"
   width="100%" height="100%"
   minWidth="500" minHeight="500"
   initialize="application_initializeHandler(event)">
   <fx:Style source="/com/tutorialspoint/client/Style.css"/>
   <fx:Script>
      <![CDATA[
       import mx.controls.Alert;
       import mx.events.FlexEvent;
       protected function btnClickMe_clickHandler(event:MouseEvent):void
       {
          Alert.show("Hello World!");
       }

       protected function application_initializeHandler(event:FlexEvent):void
       {
          lblHeader.text = "My Hello World Application";
       }
      ]]>
   </fx:Script>
   <s:BorderContainer width="500" height="500"
      styleName="container">
      <s:VGroup width="100%" height="100%" gap="50" horizontalAlign="center"
```

```
         verticalAlign="middle">
         <s:Label
            styleName="heading"/>
         <s:Button label="Click Me!"
            click="btnClickMe_clickHandler(event)" styleName="button" />
      </s:VGroup>
   </s:BorderContainer>
</s:Application>
```

Once you are ready with all the changes done, let us compile in normal mode as we did in Flex - Create Application chapter.

Step 1 - Place BreakPoints

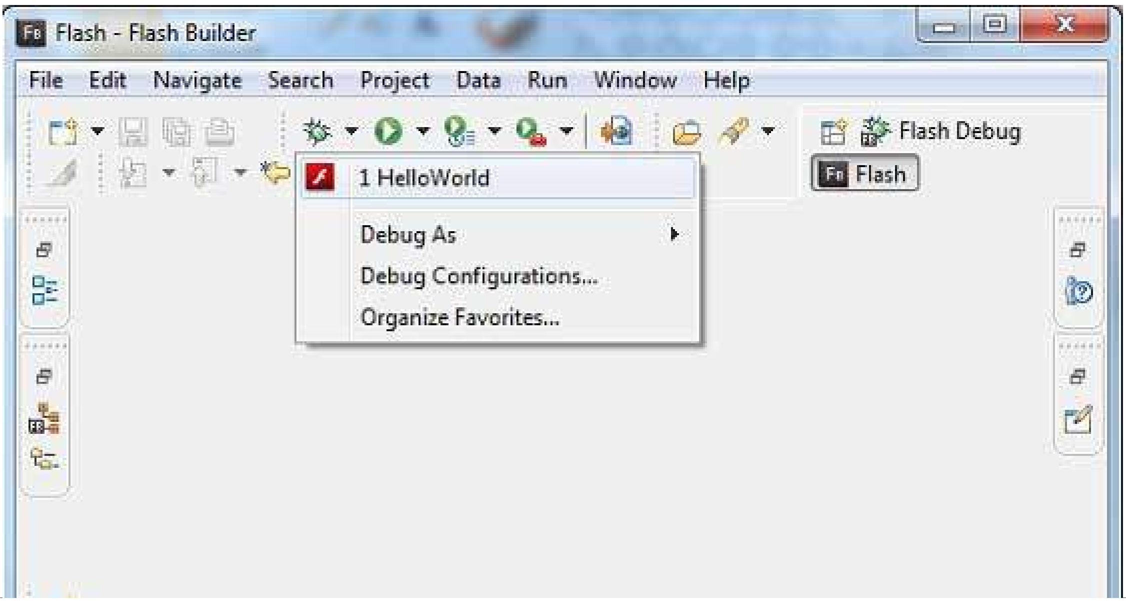
Place a breakpoint on the first line of application_initializeHandler of HelloWorld.mxml

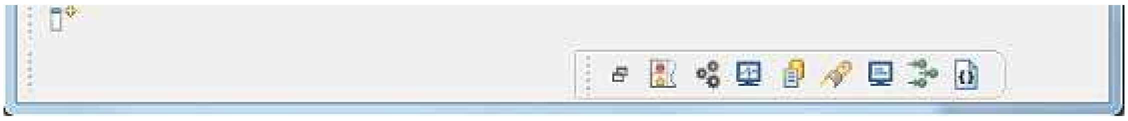


```
<?xml version="1.0" encoding="utf-8"?>
<s:Application xmlns:fx="http://ns.adobe.com/mxml/2009"
               xmlns:s="library://ns.adobe.com/flex/spark"
               xmlns:mx="library://ns.adobe.com/flex/mx"
               width="100%" height="100%"
               minWidth="500" minHeight="500"
               initialize="application_initializeHandler(event)">
    <fx:Style source="/com/tutorialspoint/client/Style.css"/>
    <fx:Script>
        <![CDATA[
            import mx.controls.Alert;
            import mx.events.FlexEvent;
            protected function btnClickMe_clickHandler(event:MouseEvent):void
            {
                Alert.show("Hello World!");
            }

            protected function application_initializeHandler(event:FlexEvent):void
            {
                lblHeader.text = "My Hello World Application";
            }
        ]]>
    </fx:Script>
    <s:BorderContainer width="500" height="500" id="mainContainer"
                       styleName="container">
        <s:VGroup width="100%" height="100%" gap="50" horizontalAlign="center"
                  verticalAlign="middle">
```

Step 2 - Debug Application

Now click on
Debug application menu and select **HelloWorld** application to debug the application.

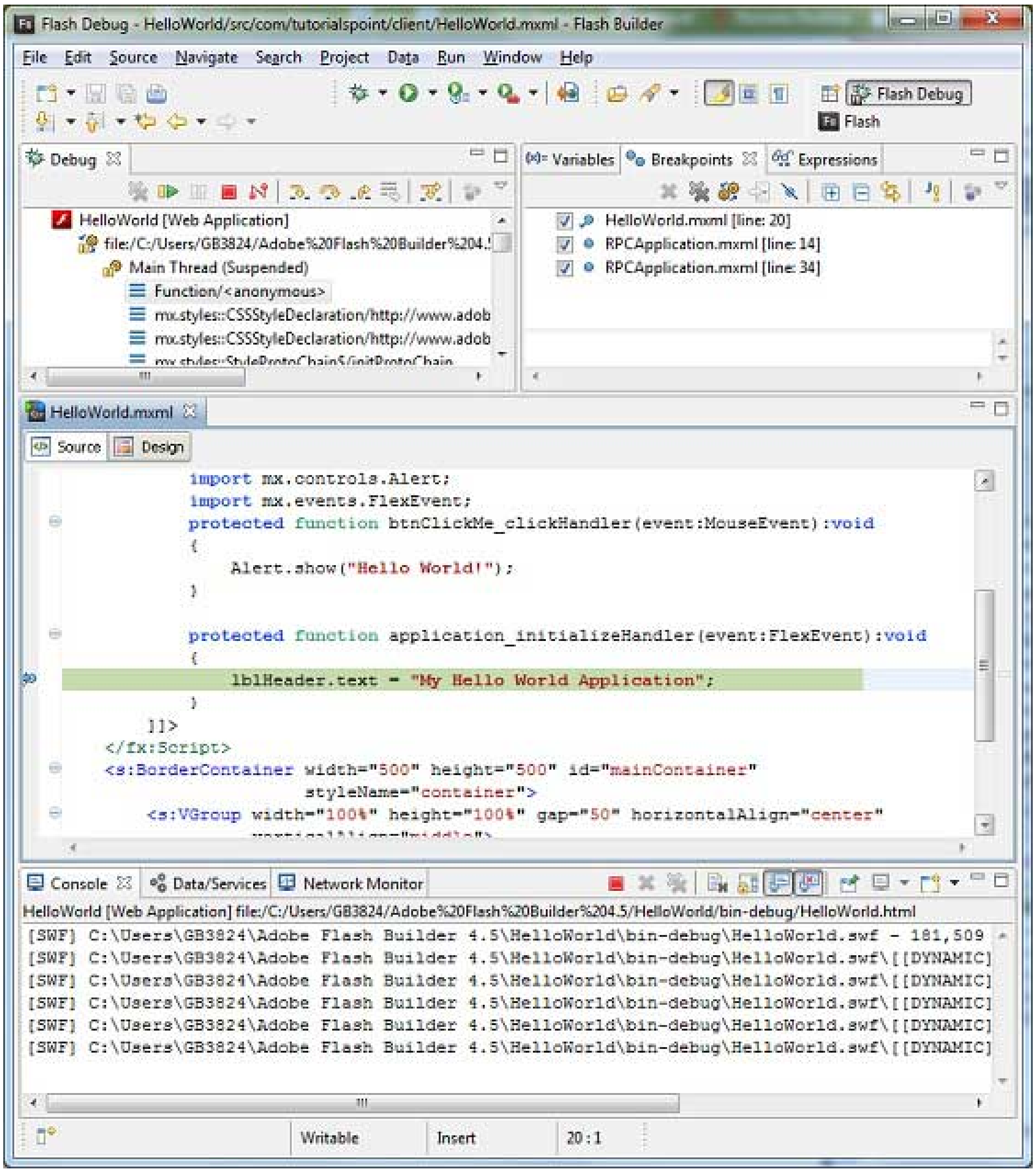




If everything is fine, application will launch in the browser and you will see following debug logs in Flash Builder console

```
[SWF] \HelloWorld\bin-debug\HelloWorld.swf
- 181,509 bytes after decompression
[SWF] \HelloWorld\bin-debug\HelloWorld.swf\[[DYNAMIC]]\1
- 763,122 bytes after decompression
[SWF] \HelloWorld\bin-debug\HelloWorld.swf\[[DYNAMIC]]\2
- 1,221,837 bytes after decompression
[SWF] \HelloWorld\bin-debug\HelloWorld.swf\[[DYNAMIC]]\3
- 1,136,788 bytes after decompression
[SWF] \HelloWorld\bin-debug\HelloWorld.swf\[[DYNAMIC]]\4
- 2,019,570 bytes after decompression
[SWF] \HelloWorld\bin-debug\HelloWorld.swf\[[DYNAMIC]]\5
- 318,334 bytes after decompression
```

As soon as Application launches,you will see the focus on Flash Builder breakpoint as we've placed the breakpoint on first line of application_initializeHandler method.


Flash Debug - HelloWorld/src/com/tutorialspoint/client/HelloWorld.mxml - Flash Builder
File Edit Source Navigate Search Project Data Run Window Help
Flash Debug
Flash
Debug
Variables
Breakpoints
Expressions
HelloWorld.mxml
Source
Design
Console
Data/Services
Network Monitor
Writable
Insert
20 : 1

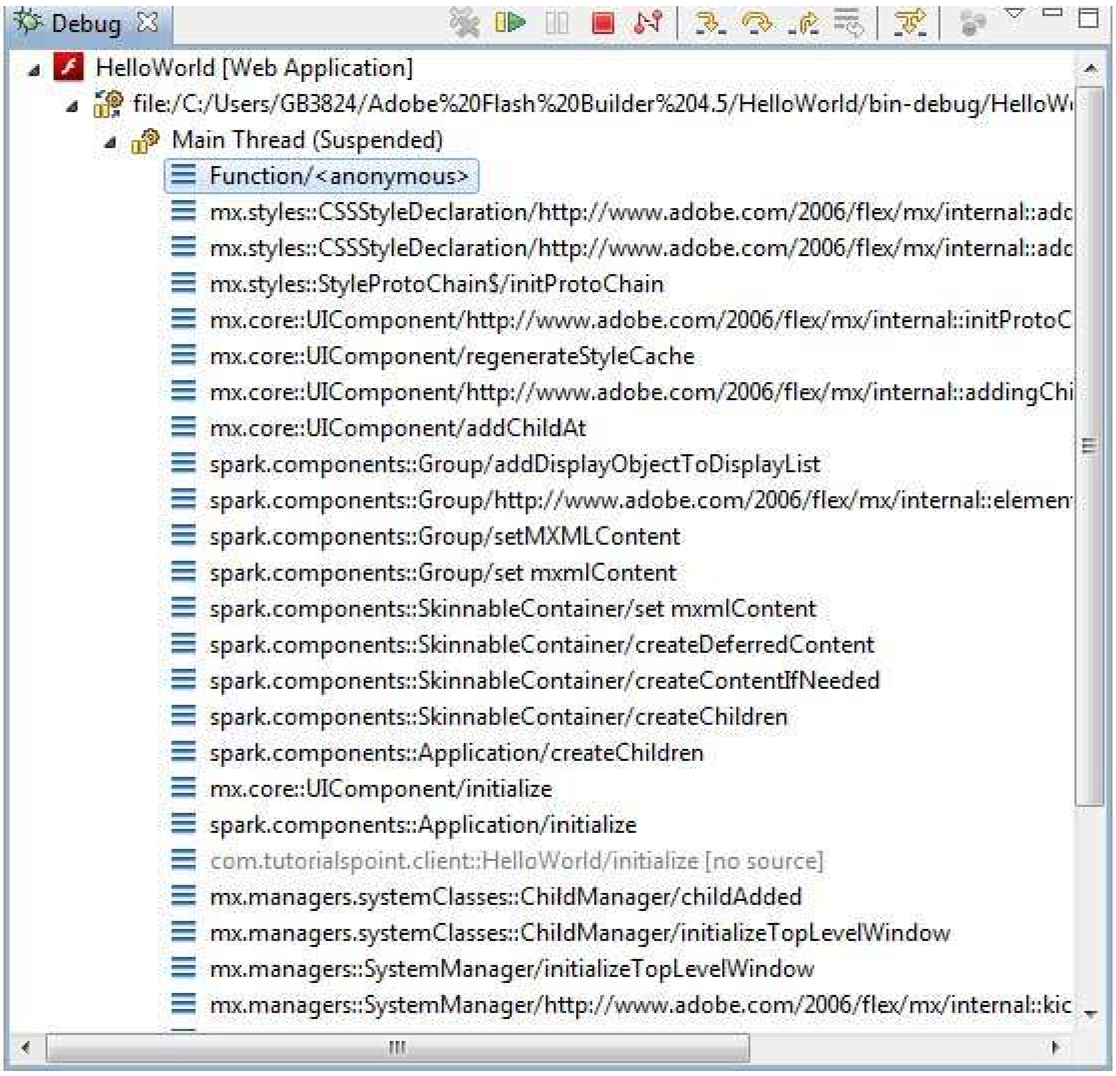
```
HelloWorld [Web Application]
  file:/C:/Users/GB3824/Adobe%20Flash%20Builder%204.5
    Main Thread (Suspended)
      Function/<anonymous>
      mx.styles::CSSStyleDeclaration/http://www.adob
      mx.styles::CSSStyleDeclaration/http://www.adob
```

```
HelloWorld.mxml [line: 20]
RPCApplication.mxml [line: 14]
RPCApplication.mxml [line: 34]
```

```
            import mx.controls.Alert;
            import mx.events.FlexEvent;
            protected function btnClickMe_clickHandler(event:MouseEvent):void
            {
                Alert.show("Hello World!");
            }

            protected function application_initializeHandler(event:FlexEvent):void
            {
                lblHeader.text = "My Hello World Application";
            }
        ]]>
    </fx:Script>
    <s:BorderContainer width="500" height="500" id="mainContainer"
                       styleName="container">
        <s:VGroup width="100%" height="100%" gap="50" horizontalAlign="center"
```

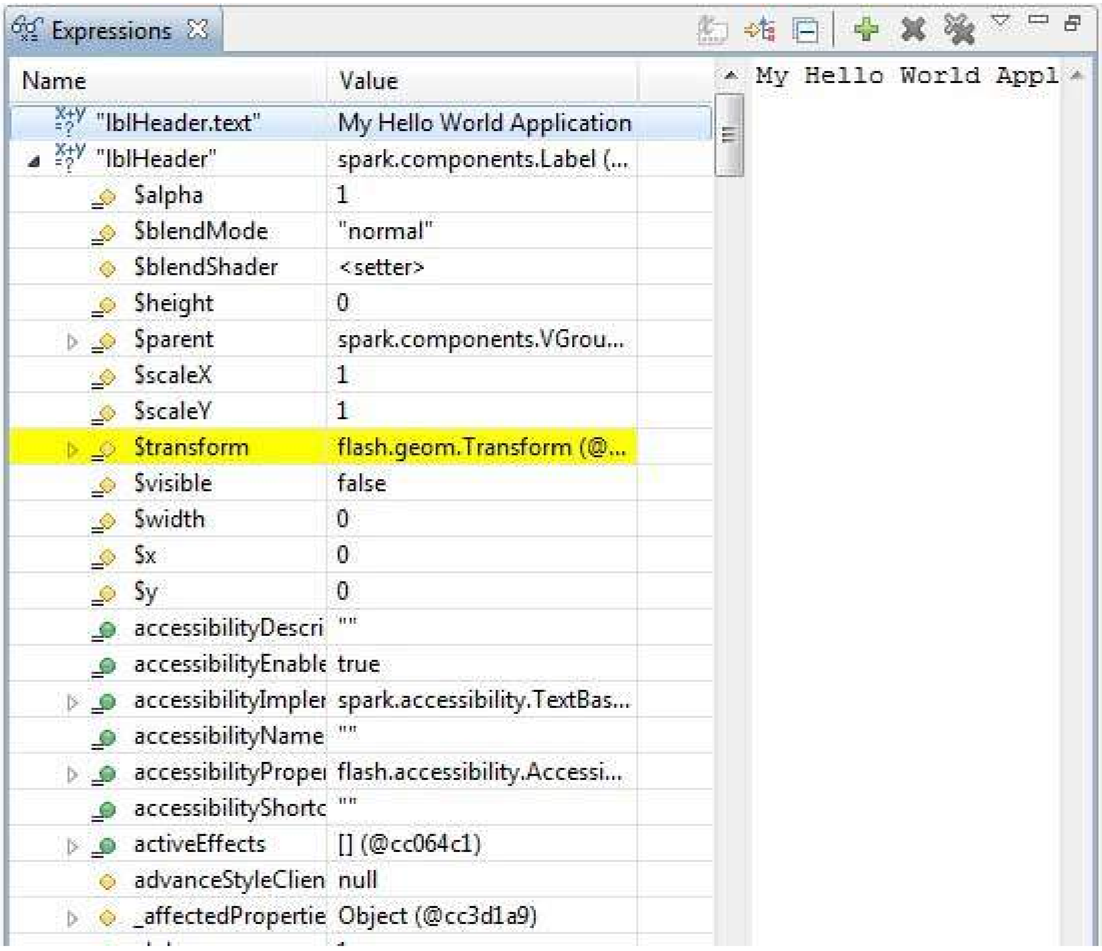
```
HelloWorld [Web Application] file:/C:/Users/GB3824/Adobe%20Flash%20Builder%204.5/HelloWorld/bin-debug/HelloWorld.html
[SWF] C:\Users\GB3824\Adobe Flash Builder 4.5\HelloWorld\bin-debug\HelloWorld.swf - 181,509
[SWF] C:\Users\GB3824\Adobe Flash Builder 4.5\HelloWorld\bin-debug\HelloWorld.swf\[[DYNAMIC]
[SWF] C:\Users\GB3824\Adobe Flash Builder 4.5\HelloWorld\bin-debug\HelloWorld.swf\[[DYNAMIC]
[SWF] C:\Users\GB3824\Adobe Flash Builder 4.5\HelloWorld\bin-debug\HelloWorld.swf\[[DYNAMIC]
[SWF] C:\Users\GB3824\Adobe Flash Builder 4.5\HelloWorld\bin-debug\HelloWorld.swf\[[DYNAMIC]
[SWF] C:\Users\GB3824\Adobe Flash Builder 4.5\HelloWorld\bin-debug\HelloWorld.swf\[[DYNAMIC]
```

You can see the stacktrace for suspended threads.


Debug

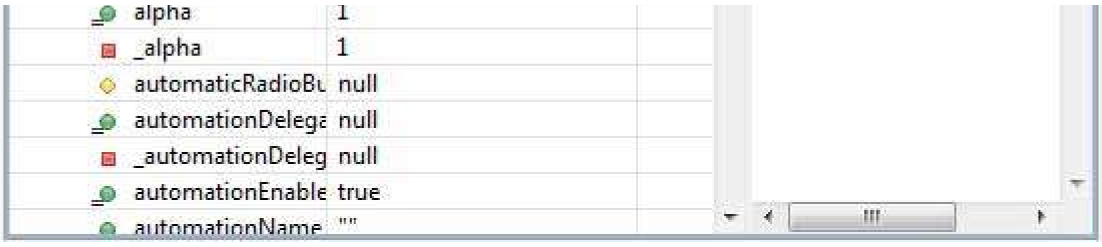
```
HelloWorld [Web Application]
  file:/C:/Users/GB3824/Adobe%20Flash%20Builder%204.5/HelloWorld/bin-debug/HelloW
    Main Thread (Suspended)
      Function/<anonymous>
      mx.styles::CSSStyleDeclaration/http://www.adobe.com/2006/flex/mx/internal::adc
      mx.styles::CSSStyleDeclaration/http://www.adobe.com/2006/flex/mx/internal::adc
      mx.styles::StyleProtoChain$/initProtoChain
      mx.core::UIComponent/http://www.adobe.com/2006/flex/mx/internal::initProtoC
      mx.core::UIComponent/regenerateStyleCache
      mx.core::UIComponent/http://www.adobe.com/2006/flex/mx/internal::addingChi
      mx.core::UIComponent/addChildAt
      spark.components::Group/addDisplayObjectToDisplayList
      spark.components::Group/http://www.adobe.com/2006/flex/mx/internal::elemen
      spark.components::Group/setMXMLContent
      spark.components::Group/set mxmlContent
      spark.components::SkinnableContainer/set mxmlContent
      spark.components::SkinnableContainer/createDeferredContent
      spark.components::SkinnableContainer/createContentIfNeeded
      spark.components::SkinnableContainer/createChildren
      spark.components::Application/createChildren
      mx.core::UIComponent/initialize
      spark.components::Application/initialize
      com.tutorialspoint.client::HelloWorld/initialize [no source]
      mx.managers.systemClasses::ChildManager/childAdded
      mx.managers.systemClasses::ChildManager/initializeTopLevelWindow
      mx.managers::SystemManager/initializeTopLevelWindow
      mx.managers::SystemManager/http://www.adobe.com/2006/flex/mx/internal::kic
```

You can see the values for expressions.


Expressions

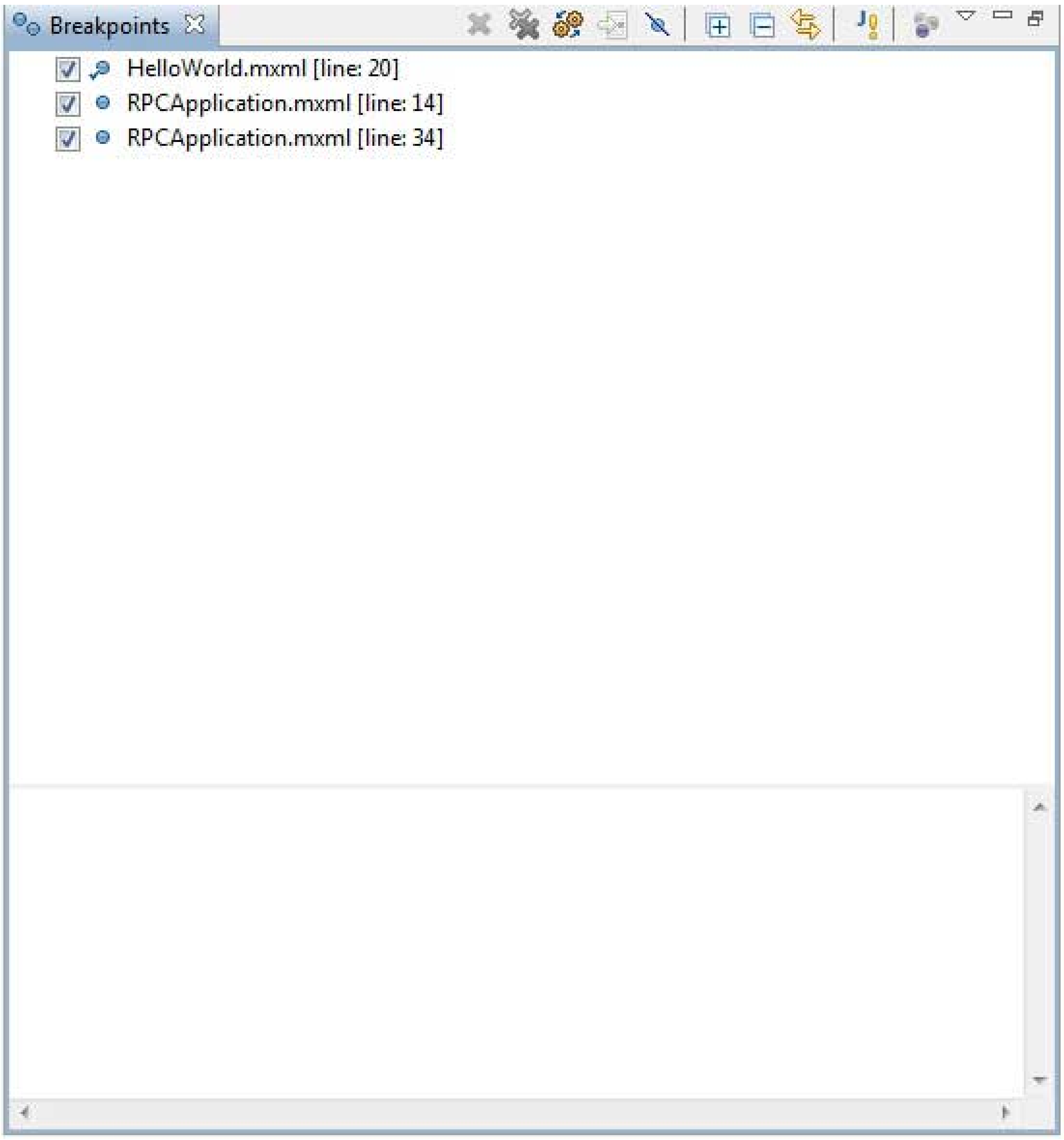
Name	Value
"lblHeader.text"	My Hello World Application
"lblHeader"	spark.components.Label (...
$alpha	1
$blendMode	"normal"
$blendShader	<setter>
$height	0
$parent	spark.components.VGrou...
$scaleX	1
$scaleY	1
$transform	flash.geom.Transform (@...
$visible	false
$width	0
$x	0
$y	0
accessibilityDescri	""
accessibilityEnable	true
accessibilityImpler	spark.accessibility.TextBas...
accessibilityName	""
accessibilityPropei	flash.accessibility.Accessi...
accessibilityShortc	""
activeEffects	[] (@cc064c1)
advanceStyleClien	null
_affectedPropertie	Object (@cc3d1a9)

```
My Hello World Appl
```



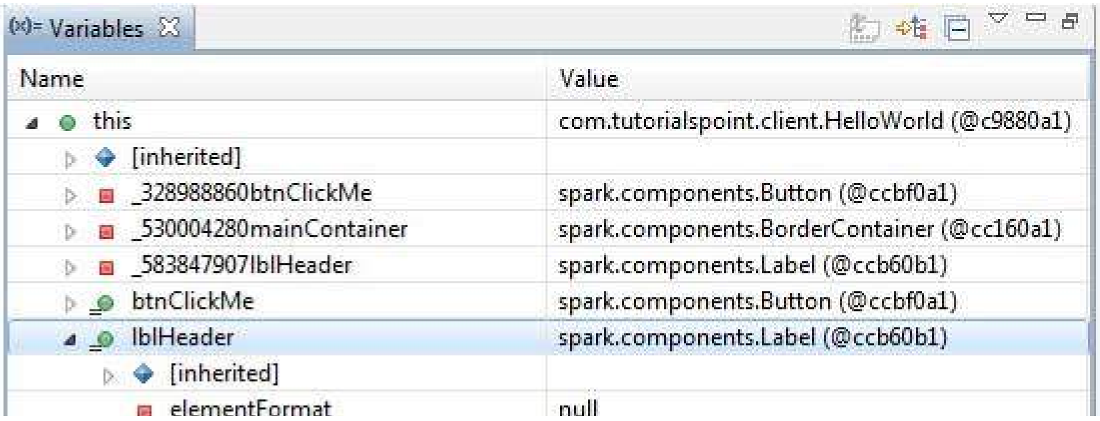
alpha	1
_alpha	1
automaticRadioBu	null
automationDelega	null
_automationDeleg	null
automationEnable	true
automationName	""

You can see the list of breakpoints placed.

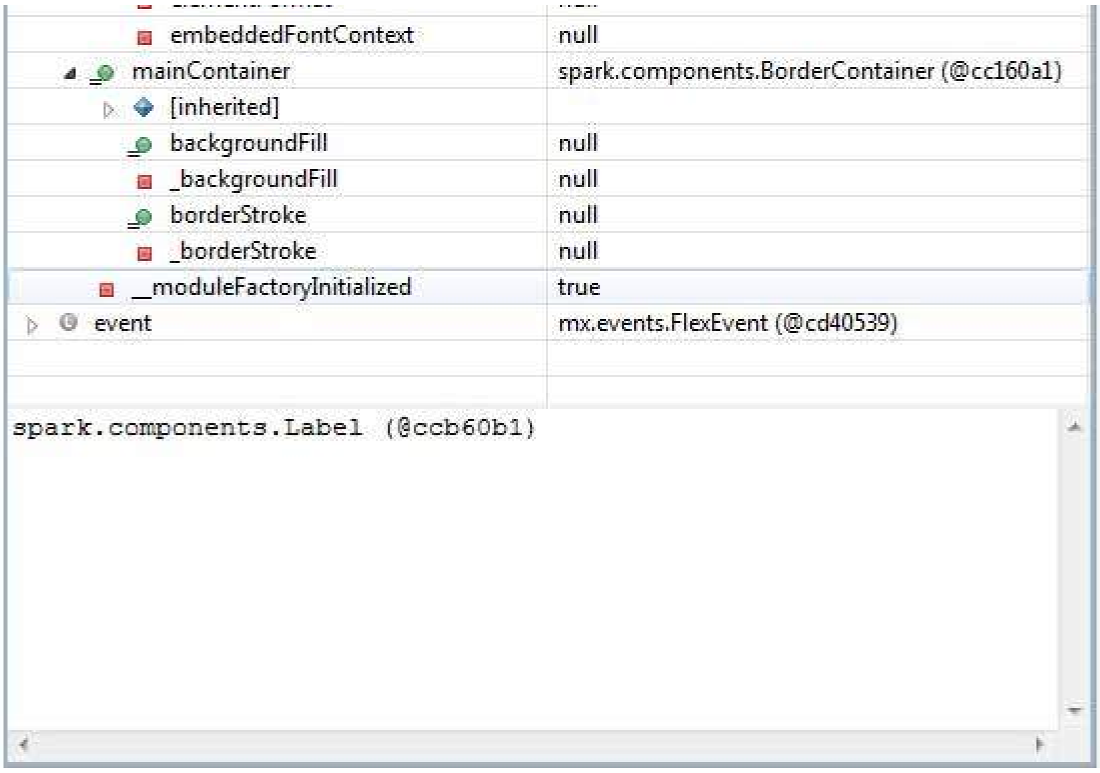


- HelloWorld.mxml [line: 20]
- RPCApplication.mxml [line: 14]
- RPCApplication.mxml [line: 34]

Now keep pressing F6 until you reach the last line of application_initializeHandler method. As reference for function keys, F6 inspects code line by line, F5 steps inside further and F8 will resume the application. Now you can see the list of values of all variables of application_initializeHandler method.



Name	Value
this	com.tutorialspoint.client.HelloWorld (@c9880a1)
[inherited]	
_328988860btnClickMe	spark.components.Button (@ccbf0a1)
_530004280mainContainer	spark.components.BorderContainer (@cc160a1)
_583847907lblHeader	spark.components.Label (@ccb60b1)
btnClickMe	spark.components.Button (@ccbf0a1)
lblHeader	spark.components.Label (@ccb60b1)
[inherited]	
elementFormat	null



```
embeddedFontContext              null
mainContainer                    spark.components.BorderContainer (@cc160a1)
  [inherited]
  backgroundFill                 null
  _backgroundFill                null
  borderStroke                   null
  _borderStroke                  null
__moduleFactoryInitialized       true
event                            mx.events.FlexEvent (@cd40539)

spark.components.Label (@ccb60b1)
```

Now you can see the flex code can be debugged in the same way as a Java Application can be debugged. Place breakpoints to any line and play with debugging capabilities of flex.

FLEX - INTERNATIONALIZATION

Flex provides two ways to internationalize a Flex application, We'll demonstrate use of Compile time Internationalization being most commonly used among projects.

Technique	Description
Compile Time Internationalization	This technique is most prevalent and requires very little overhead at runtime; is a very efficient technique for translating both constant and parameterized strings;simplest to implement. Compile Time internationalization uses standard properties files to store translated strings and parameterized messages, and these properties files are compiled directly in the application.
Run Time Internationalization	This technique is very flexible but slower than static string internationalization. You need to compile the localization properties files separately, leave them external to application, and load them at run time.

Workflow of internationalizing a Flex Application

Step 1: Create folder structure

Create a locale folder under src folder of Flex project.This will be the parent directory for all of the properties files for the locales that the application will support. Inside the locale folder, create subfolders, one for each of the application's locales to be supported. The convention for naming a locale is

```
{language}_{country code}
```

For example, en_US represents English of the United States. The locale de_DE represents German. The sample application will support two common languages: English, and German

Step 2: Create properties files

Create properties file containing the messages to be used in the application. We've created a **HelloWorldMessages.properties** file under ***src > locale > en_US*** folder in our example.

```
enterName=Enter your name
clickMe=Click Me
applicationTitle=Application Internationalization Demonstration
greeting=Hello {0}
```

Create properties files containing translated values specific to locale. We've created a **HelloWorldMessages.properties** file under ***src > locale > de_DE*** folder in our example. This file contains translations in german language. _de specifies the german locale and we're going to support german language in our application.

If you are creating properties file using Flash Builder then change the encoding of the file to UTF-8.Select the file and then right-click in it to open its properties window.Select Text file encoding as **Other UTF-8**. Apply and Save the change.

```
enterName=Geben Sie Ihren Namen
clickMe=Klick mich
applicationTitle=Anwendung Internationalisierung Demonstration
greeting=Hallo {0}
```

Step 3: Specify Compiler options

- Right-click your project and select Properties.
- Select Flex Compiler, and add the following to the Additional Compiler Arguments settings:

```
-locale en_US de_DE
```

- Right-click your project and select Properties.
- Select Flex Build Path, and add the following to the Source Path settings:

```
src\locale\{locale}
```

Internalization Example

Now Let us follow the following steps to test Internalization technique in a Flex application:

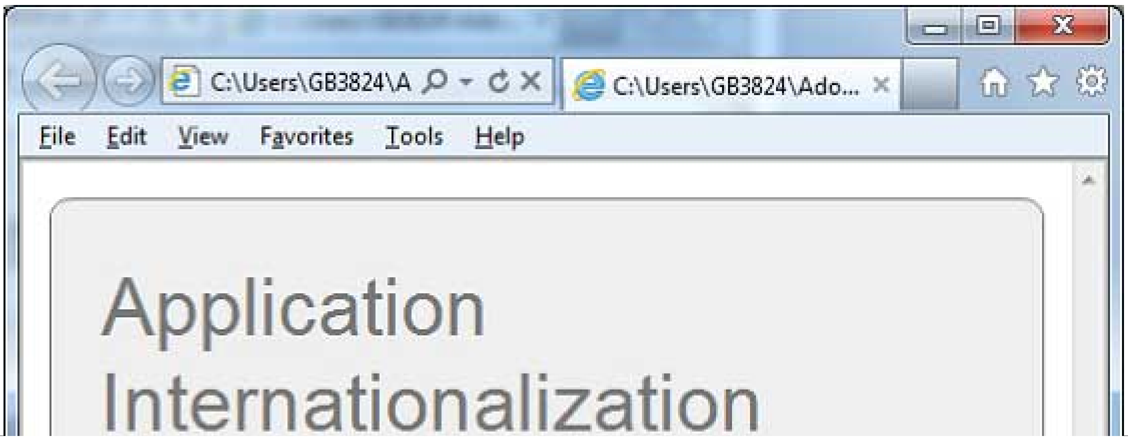
Step	Description
1	Create a project with a name *HelloWorld* under a package *com.tutorialspoint.client* as explained in the *Flex - Create Application* chapter.
2	Modify *HelloWorld.mxml* as explained below. Keep rest of the files unchanged.
3	Compile and run the application to make sure business logic is working as per the requirements.

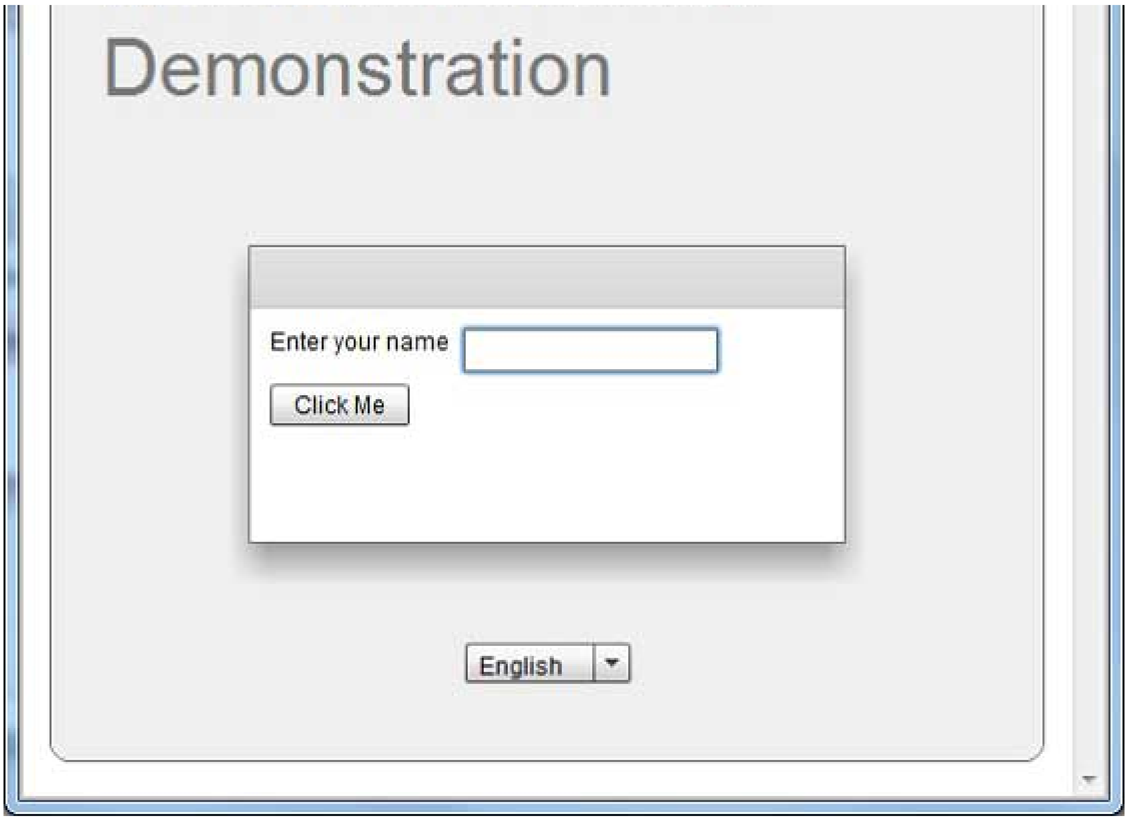
Following is the content of the modified mxml file **src/com.tutorialspoint/HelloWorld.mxml**.

```
<?xml version="1.0" encoding="utf-8"?>
   <s:Application xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx"
   minWidth="500" minHeight="500">
   <fx:Metadata>
      [ResourceBundle("HelloWorldMessages")]
   </fx:Metadata>
   <fx:Style source="/com/tutorialspoint/client/Style.css"/>
   <fx:Script>
```

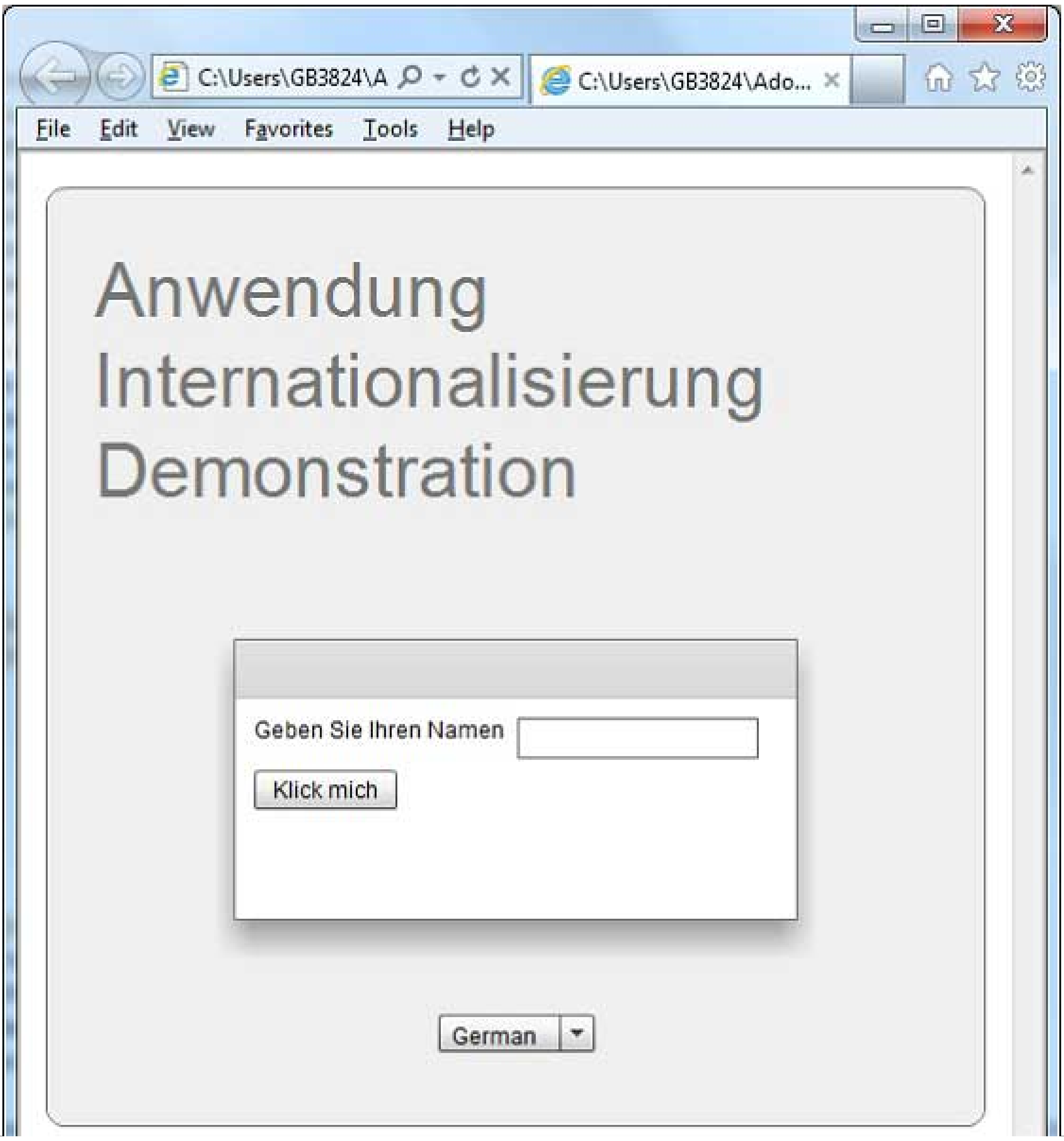
```
      <![CDATA[
         import mx.controls.Alert;
         [Bindable]
         private var locales:Array = [{label:"English", locale:"en_US"},
            {label:"German", locale:"de_DE"}];

         private function comboChangeHandler():void
         {
           resourceManager.localeChain = [localeComboBox.selectedItem.locale];
         }

         protected function clickMe_clickHandler(event:MouseEvent):void
         {
            var name:String = txtName.text;
            var inputArray:Array = new Array();
            inputArray.push(name);
            Alert.show(resourceManager.getString('HelloWorldMessages'
            ,'greeting',inputArray));
         }
      ]]>
   </fx:Script>
   <s:BorderContainer width="500" height="500"
      styleName="container">
      <s:VGroup width="100%" height="100%" gap="50"
   horizontalAlign="center" verticalAlign="middle">
         <s:Label
            color="0x777777"
            text ="{resourceManager.getString('HelloWorldMessages'
            ,'applicationTitle')}"
            styleName="heading" width="90%" height="150"/>
         <s:Panel width="300" height="150">
            <s:layout>
               <s:VerticalLayout paddingTop="10" paddingLeft="10" />
            </s:layout>
            <s:HGroup >
               <s:Label
               text="{resourceManager.getString('HelloWorldMessages'
               ,'enterName')}"
               paddingTop="2"/>
               <s:TextInput />
            </s:HGroup>
            <s:Button
            label="{resourceManager.getString('HelloWorldMessages','clickMe')}"
            click="clickMe_clickHandler(event)" right="10" />
         </s:Panel>
         <mx:ComboBox
         dataProvider="{locales}" change="comboChangeHandler()"/>
      </s:VGroup>
   </s:BorderContainer>
</s:Application>
```

Once you are ready with all the changes done, let us compile and run the application in normal mode as we did in Flex - Create Application chapter. If everything is fine with your application, this will produce following result: [Try it online]





Change the language using language drop down and see the result.



FLEX - PRINTING SUPPORT

Flex provides a special class **FlexPrintJob** to print flex objects.

- FlexPrintJob can be used to print one or more Flex objects, such as a Form or VBox container.
- FlexPrintJob prints the object and all objects that it contains.
- The objects can be all or part of the displayed interface.
- The objects can be components that format data specifically for printing.
- The FlexPrintJob class lets you scale the output to fit the page.
- The FlexPrintJob class automatically uses multiple pages to print an object that does not fit on a single page.
- The FlexPrintJob class causes the operating system to display a Print dialog box. You cannot print without some user action.

Prepare and send a print job

You print output by preparing and sending a print job. Let's create an instance of the FlexPrintJob class

```
var printJob:FlexPrintJob = new FlexPrintJob();
```

Start the print job

```
printJob.start();
```

Flex will cause the operating system to display a Print dialog box. Add one or more objects to the print job and specify how to scale them

```
printJob.addObject(myObject, FlexPrintJobScaleType.MATCH_WIDTH);
```

Each object starts on a new page. Send the print job to the printer

```
printJob.send();
```

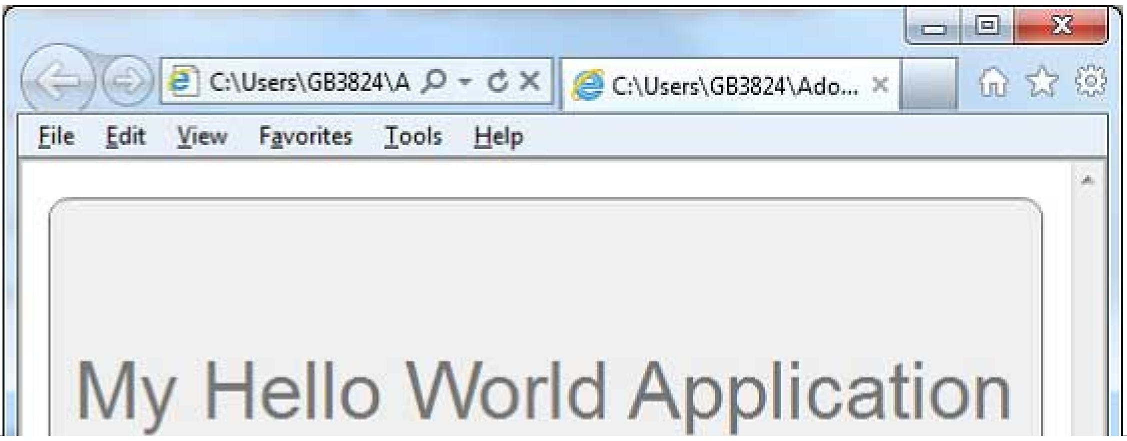
Printing Example

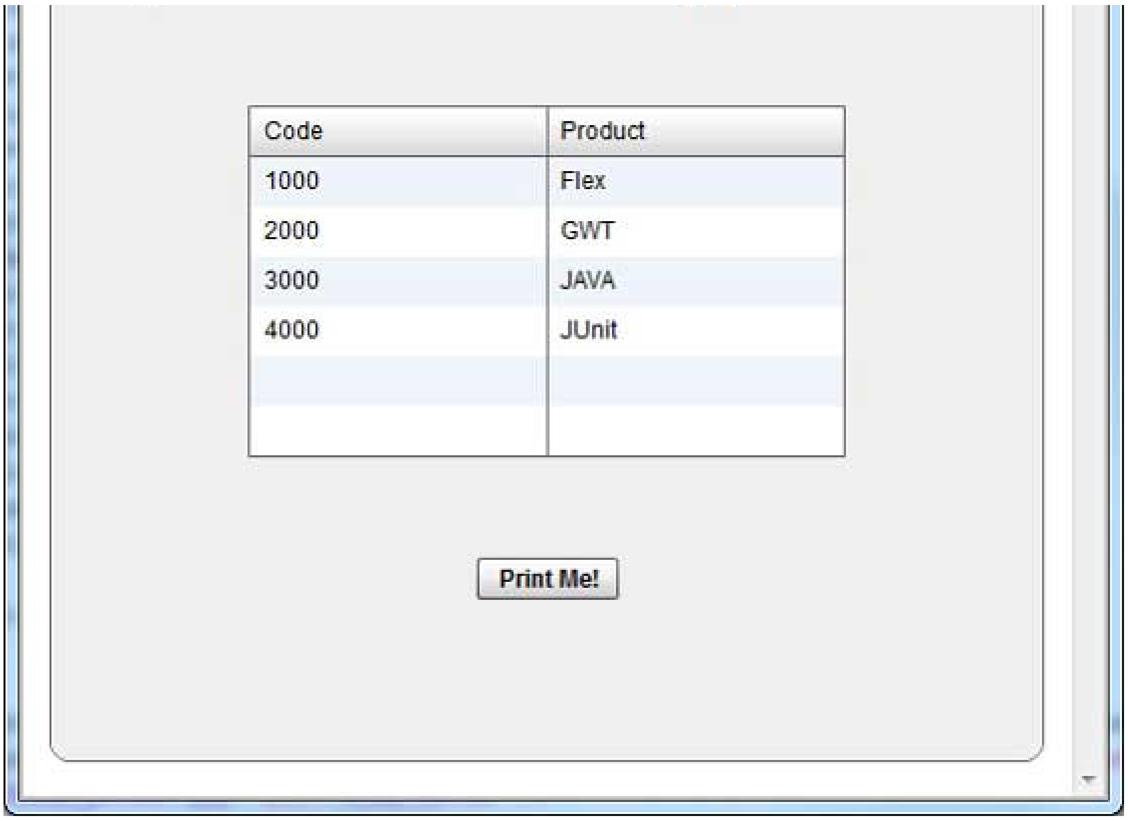
Step	Description
1	Create a project with a name *HelloWorld* under a package *com.tutorialspoint.client* as explained in the *Flex - Create Application* chapter.
2	Modify *HelloWorld.mxml* as explained below. Keep rest of the files unchanged.
3	Compile and run the application to make sure business logic is working as per the requirements.

Following is the content of the modified mxml file **src/com.tutorialspoint/HelloWorld.mxml**.

```
<?xml version="1.0" encoding="utf-8"?>
<s:Application xmlns:fx="http://ns.adobe.com/mxml/2009"
   xmlns:s="library://ns.adobe.com/flex/spark"
   xmlns:mx="library://ns.adobe.com/flex/mx"
   width="100%" height="100%"
   minWidth="500" minHeight="500"
   initialize="application_initializeHandler(event)">
   <fx:Style source="/com/tutorialspoint/client/Style.css"/>
   <fx:Script>
     <![CDATA[
        import mx.controls.Alert;
        import mx.events.FlexEvent;
        import mx.printing.FlexPrintJob;
        import mx.printing.FlexPrintJobScaleType;
        protected function btnClickMe_clickHandler(event:MouseEvent):void
        {
            // Create an instance of the FlexPrintJob class.
            var printJob:FlexPrintJob = new FlexPrintJob();

            // Start the print job.
            if (printJob.start() != true) return;

            // Add the object to print. Do not scale it.
            printJob.addObject(myDataGrid, FlexPrintJobScaleType.NONE);

            // Send the job to the printer.
            printJob.send();
        }

        protected function application_initializeHandler(event:FlexEvent):void
        {
            lblHeader.text = "My Hello World Application";
        }
     ]]>
   </fx:Script>
   <s:BorderContainer width="500" height="500"
      styleName="container">
      <s:VGroup width="100%" height="100%" gap="50"
         horizontalAlign="center"
         verticalAlign="middle">
         <s:Label
            styleName="heading"/>
         <mx:DataGrid >
            <mx:dataProvider>
               <fx:Object Product="Flex" Code="1000"/>
               <fx:Object Product="GWT" Code="2000"/>
               <fx:Object Product="JAVA" Code="3000"/>
               <fx:Object Product="JUnit" Code="4000"/>
            </mx:dataProvider>
         </mx:DataGrid>
         <s:Button label="Print Me!"
            click="btnClickMe_clickHandler(event)"
            styleName="button" />
      </s:VGroup>
   </s:BorderContainer>
</s:Application>
```

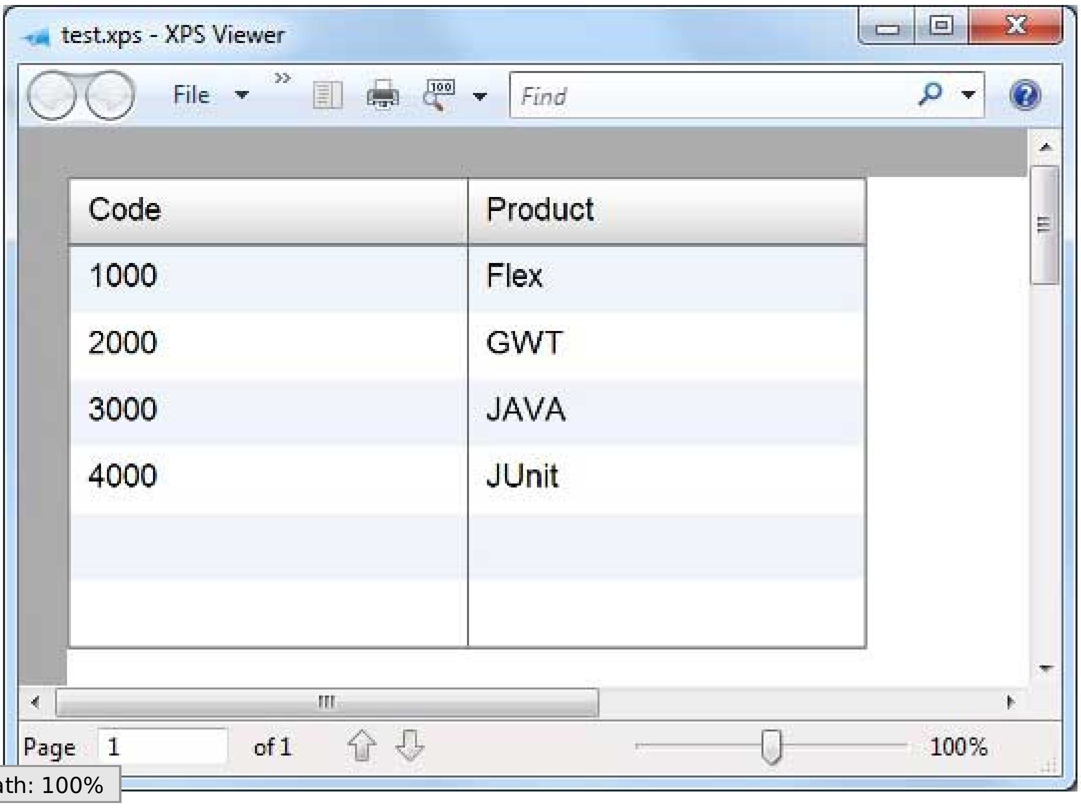
Once you are ready with all the changes done, let us compile and run the application in normal mode as we did in Flex - Create Application chapter. If everything is fine with your application, this will produce following result: [Try it online]





Code	Product
1000	Flex
2000	GWT
3000	JAVA
4000	JUnit

Click on print me button and you can see the printout of the data grid shown below.



Code	Product
1000	Flex
2000	GWT
3000	JAVA
4000	JUnit

Processing math: 100%