

Java HTTP Adapter

Overview

Java adapters provide free reign over connectivity to your backend. It is therefore your responsibility to ensure best practices regarding performance and other implementation details.

This tutorial covers an example of a Java adapter that connects to an RSS feed by using a Java `HttpClient`.

Prerequisite: Make sure to read the Java Adapters (../) tutorial first.

RSSAdapterApplication

`RSSAdapterApplication` extends `MFPJAXRSApplication` and is a good place to trigger any initialization required by your application.

```
@Override
protected void init() throws Exception {
    RSSAdapterResource.init();
    logger.info("Adapter initialized!");
}
```

RSSAdapterResource

`RSSAdapterResource` is where we handle the requests to your adapter.

```
@Path("/")
public class RSSAdapterResource {
}
```

`@Path("/")` means that the resources will be available at the URL `http(s)://host:port/ProjectName/adapters/AdapterName/`.

HTTP Client

`RSSAdapterResource`

```
private static CloseableHttpClient client;
private static HttpHost host;

public static void init() {
    client = HttpClients.createDefault();
    host = new HttpHost("developer.ibm.com");
}
```

Because every request to your resource will create a new instance of `RSSAdapterResource`, it is important to reuse objects that may impact performance. In this example we made the `Http` client a `static` object and initialized it in a `static init()` method, which gets called by the `init()` of `RSSAdapterApplication` as described above.

Procedure resource

RSSAdapterResource

```
@GET
@Produces("application/json")
public void get(@Context HttpServletResponse response, @QueryParam("tag") String tag)
    throws ClientProtocolException, IOException, IllegalStateException, SAXException {
    if(tag!=null && !tag.isEmpty()){
        execute(new HttpGet("/mobilefirstplatform/tag/"+ tag +"/feed"), response);
    }
    else{
        execute(new HttpGet("/mobilefirstplatform/feed"), response);
    }
}
```

Our adapter exposes just one resource URL which allows to retrieve the RSS feed from the backend service.

- @GET means that this procedure only responds to HTTP GET requests.
- @Produces("application/json") specifies the Content Type of the response to send back. We chose to send the response as a JSON object to make it easier on the client-side.
- @Context HttpServletResponse response will be used to write to the response output stream. This enables us more granularity than returning a simple string.
- @QueryParam("tag") String tag enables the procedure to receive a parameter. The choice of QueryParam means the parameter is to be passed in the query (/RSSAdapter/?tag=MobileFirst_Platform). Other options include @PathParam, @HeaderParam, @CookieParam, @FormParam, etc.
- throws ClientProtocolException, ... means we are forwarding any exception back to the client. The client code is responsible for handling potential exceptions which will be received as HTTP 500 errors. Another solution (more likely in production code) is to handle exceptions in your server Java code and decide what to send to the client based on the exact error.
- execute(new HttpGet("/mobilefirstplatform/feed"), response). The actual HTTP request to the backend service is handled by another method defined later.

Depending if you pass a tag parameter, execute will retrieve a different build a different path and retrieve a different RSS file.

execute()

RSSAdapterResource

```

public void execute(HttpUriRequest req, HttpServletResponse resultResponse)
    throws ClientProtocolException, IOException,
        IllegalStateException, SAXException {
    HttpResponse RSSResponse = client.execute(host, req);
    ServletOutputStream os = resultResponse.getOutputStream();
    if (RSSResponse.getStatusLine().getStatusCode() == HttpStatus.SC_OK){
        resultResponse.addHeader("Content-Type", "application/json");
        String json = XML.toJson(RSSResponse.getEntity().getContent());
        os.write(json.getBytes(Charset.forName("UTF-8")));

    }else{
        resultResponse.setStatus(RSSResponse.getStatusLine().getStatusCode());
        RSSResponse.getEntity().getContent().close();
        os.write(RSSResponse.getStatusLine().getReasonPhrase().getBytes());
    }
    os.flush();
    os.close();
}

```

- `HttpResponse RSSResponse = client.execute(host, req)`. We use our static HTTP client to execute the HTTP request and store the response.
- `ServletOutputStream os = resultResponse.getOutputStream()`. This is the output stream to write a response to the client.
- `resultResponse.addHeader("Content-Type", "application/json")`. As mentioned before, we chose to send the response as JSON.
- `String json = XML.toJson(RSSResponse.getEntity().getContent())`. We used `org.apache.wink.json4j.utils.XML` to convert the XML RSS to a JSON string.
- `os.write(json.getBytes(Charset.forName("UTF-8")))` the resulting JSON string is written to the output stream.

The output stream is then flushed and closed.

If `RSSResponse` is not 200 OK, we write the status code and reason in the response instead.

Results

The adapter should return the RSS feed converted to JSON.

```

{
  "rss": {
    "channel": {
      "description": "Develop, test, manage, and secure your mobile web, native and hybrid apps",
      "generator": "http://wordpress.org/?v=4.2.4",
      "item": [
        {
          "category": [
            "Mobile",
            "android",
            "Mobile Quality Assurance",
            "mobile_development",
            "mobilefirst",
            "xamarin"

```

```

    ],
    "commentRss": "https://developer.ibm.com/mobilefirstplatform/2015/09/01/integrating-mqa-into-xamarin-android-app/feed/",
    "comments": [
        "https://developer.ibm.com/mobilefirstplatform/2015/09/01/integrating-mqa-into-xamarin-android-app/#comments",
        "0"
    ],
    "creator": "Vidyasagar MSC",
    "description": "<p>The post <a rel=\"nofollow\" href=\"https://developer.ibm.com/mobilefirstplatform/2015/09/01/integrating-mqa-into-xamarin-android-app/\">Integrating MQA into Xamarin.Android app</a> appeared first on <a rel=\"nofollow\" href=\"https://developer.ibm.com/mobilefirstplatform/\">IBM MobileFirst Platform</a>.</p>
    \"encoded\": \"<p>It all startedÂ when I received an email seeking help on using MQA or to be more precise integrating MQA into Xamarin based android app. Before jumping into addressing the problem, let&#8217;s define MQA.</p>
    >\\n<h4>What is MQA?</h4>\\n<p>MQA stands for &#8220;Mobile Quality Assurance&#8221; and is part of the IBM MobileFirst Platform.</p>\\n<blockquote><p><em><span style=\\\"line-height: 1.5\\\">IBM MQA provides line of business professionals and development teams with insightful and streamlined quality feedback and metrics from both pre-production and production, enabling them to prioritize and take action to support a dynamic mobile app strategy.</span></em></p></blockquote>\\n<p>The Features of MQA are</p>\\n<div style=\\\"width: 1058px\\\" class=\\\"wp-caption aligncenter\\\"><a href=\\\"http://vidyasagarmsc.com/wp-content/uploads/2015/09/MQA1.png\\\"><img class=\\\"size-full wp-image-65\\\" src=\\\"http://vidyasagarmsc.com/wp-content/uploads/2015/09/MQA1.png\\\" alt=\\\"Features of Mobile Quality Assurance.\\\" width=\\\"1048\\\" height=\\\"350\\\" \\/></a><p class=\\\"wp-caption-text\\\">Features of Mobile Quality Assurance.</p></div>\\n<p><em><strong>Note</strong></em>: To understand more about MQA, visitÂ <a href=\\\"http://www-03.ibm.com/software/products/en/ibm-mobilefirst-platform-quality-assurance\\\">IBM Mobile Quality Assurance</a></p>\\n<p>So, by now we should be good with the first part of our blog title that is MQA. So, the next question is</p>\\n<h4>What is Xamarin.Android?</h4>\\n<p>Xamarin is a platform to create nativeÂ iOS, Android, Mac and Windows apps in C#.Â Xamarin.Android allows us to create native Android applications using the same UI controls we would in Java, except with the flexibility and elegance of a modern language (C#).</p>\\n<p>As we are good with the definitions, let&#8217;s address the problem.</p>\\n<p><strong>What&#8217;s the problem in integrating MQA into Xamarin Android app?</strong></p>\\n<p>At the time of this blog post, the available MQA SDKs are iOS native SDK, Android native SDK and Javascript Â SDK.</p>\\n<p>So, we have to find a workaround to address this use-case. The initial step is to download the Android MQA SDK and see what&#8217;s provided. you can download it from <a href=\\\"http://www-01.ibm.com/support/knowledgecenter/#!\\SSJML5_6.0.0\\com.ibm.mqa.uau.saas.doc\\topics\\c_AndroidSDKsForDownload.html\\\">here</a>. Once successfully downloaded and unzipped, we should see a jar file namely <strong><em>MQA-Android-library-&lt;ve rsion number&gt;.jar</em></strong> under lib folder<strong>.</strong></p>\\n<div style=\\\"width: 634px\\\" class=\\\"wp-caption aligncenter\\\"><a href=\\\"http://vidyasagarmsc.com/wp-content/uploads/2015/09/MQA2.png\\\"><img class=\\\"size-full wp-image-70\\\" src=\\\"http://vidyasagarmsc.com/wp-content/uploads/2015/09/MQA2.png\\\" alt=\\\"MQA Android SDK \\\" width=\\\"624\\\" height=\\\"440\\\" \\/></a><p class=\\\"wp-caption-text\\\">MQA Android SDK</p></div>\\n<p>As Xamarin is C# based, What can we do with this jar file?</p>\\n<p>We haveÂ <strong>Xamarin bindings</strong> to our rescue, which helps using in consuming .JARs from C#.</p>\\n<p><strong><em>Note</em>:</strong> Steps to consume MQA Android JAR in a Xamarin.Android app is mentionedÂ <a href=\\\"https://developer.xamarin.com/guides/android/advanced_topics/java_integration_overview/binding_a_java_library_

```

(.jar)\\>here</p><div style="width: 257px" class="wp-caption align center"><p class="wp-caption-text">Xamarin binding project with MQA Android .JAR file</p></div><n<p>The files of our interest here are MQA-Android-library-2.7.4.jar (Version number may vary) and Metadata.xml.</p><n<nMQA-Android-library-2.7.4.jar file will have all the MQA related classes and methods required for us to start an Android MQA session.<nMetadata.xml- Allows changes to be made to the final API, such as changing the namespace of the generated binding.<n<n<p>Based on the errors thrown while building the project, Metadata.xml in my case looks like this</p><n<pre class="brush: xml; title: ; notranslate"><metadata><!--<!-- This sample removes the class: android.support.v4.content.AsyncTaskLoader.LoadTask:<!--<!-- remove-node path=""\/api\/package[@name='android.support.v4.content']\/class[@name='AsyncTaskLoader.LoadTask']"\/><!--<!-- This sample removes the method: android.support.v4.content.CursorLoader.loadInBackground:<!--<!-- remove-node path=""\/api\/package[@name='android.support.v4.content']\/class[@name='CursorLoader']\/method[@name='loadInBackground']"\/><!--<!--<!-- remove-node path=""\/api\/package[@name='ext.com.google.inject.spi']\/class[@name='InjectionPoint.Factory.1']"\/><!--<!-- remove-node path=""\/api\/package[@name='ext.com.google.inject.spi']\/class[@name='InjectionPoint.Factory.2']"\/><!--<!-- remove-node path=""\/api\/package[@name='com.applause.android.log']\/interface[@name='LoggerInterface']"\/><!--<!-- remove-node path=""\/api\/package[@name='ext.com.google.inject.internal']"\/><!--<!-- remove-node path=""\/api\/package[@name='ext.com.google.inject.matcher']"\/><!--<!-- remove-node path=""\/api\/package[@name='com.applause.android.util']\/class[@name='AbstractRequest']"\/><!--<!-- remove-node path=""\/api\/package[@name='ext.com.google.inject.spi']\/class[@name='Elements.RecordingBinder']\/method[@name='bind' and count(parameter)=1 and parameter[1][@type='ext.com.google.inject.Key']]"\/><!--<!--<!-- attr path=""\/api\/package[@name='com.applause.android.messages']\/class[@name='Message']\/field[@name='message']" name=""managedName" > Message1<!--<!-- attr path=""\/api\/package[@name='com.applause.android.log']" name=""managedName" > log<!--<!-- attr<!--<!--\/metadata><!--<!--</pre><n<p>Once all the errors are fixed and your binding project builds successfully, add a new Xamarin Android project (if you haven't added yet). Now, add MQA binding project reference in our Xamarin android app. Note: Both your binding project and Xamarin.Android project should be of same target framework. You can verify this by right clicking on your project -> Options -> General.</p><div id="attachment_83" style="width: 270px" class="wp-caption aligncenter"><p class="wp-caption-text">Xamarin Android project with added reference to MQA</p></div><n<p>Now, let's start MQA android session in our Count.Android app. Before doing this, we should create a MQA service on IBM Bluemix. You can follow the instructions mentioned at Getting started with Mobile Quality Assurance- Bluemix or watch this video.</p><n<p><iframe class='youtube-player' type='text/html' width='980' height='582' src='https://www.youtube.com/embed/zHRfGatcKPM?version=3&rel=1&fs=1&showsearch=0&showinfo=1&iv_load_policy=1&wmode=transparent' frameborder='0' allowfullscreen='true'></iframe></p><n<p>Starting a

an class="ph">Mobile Quality AssuranceÂ session with the Android SDK entails three steps. First, build a configuration to define howÂ Mobile Quality AssuranceÂ works with your app . Second, start the session itself. Third, add tracking to your activities. Open MainActivity.cs file (Android Project) and paste the code provided below</p>

```

using System;
using Android.App;
using Android.Content;
using Android.Runtime;
using Android.Views;
using Android.Widget;
using Android.OS;

//MQA references
using Com.Ibm.Mqa.Config;
using Com.Ibm.Mqa;

namespace Count.Android
{
    [Activity (Label = "Count.Android", MainLauncher = true, Icon = @drawable/icon)]
    public class MainActivity : Activity
    {
        int count = 1;

        //Use your own generated APP KEY
        const string APP_KEY = "lg59b7d884f9fdf5426162e5cb1f87a700648bce4fg0glg379e0d3a";

        protected override void onCreate (Bundle bundle)
        {
            base.OnCreate (bundle);

            //MQA Android session configuration
            Configuration configuration = new Configuration.Builder(this)
                .WithAPIKey(APP_KEY)
                .Provides the quality assurance application APP_KEY
                .WithMode(MQA.Mode.Qa)
                .Selects the quality assurance application mode
                .WithReportOnShakeEnabled(true)
                .Enables shake report trigger
                .WithDefaultUser("default_user@email.com")
                .Sets a default user and user selection
                .Build();

            //Starting MQA Android Session
            MQA.StartNewSession (this, configuration);

            // Set our view from the "main" layout resource
            SetContentView (Resource.Layout.Main);

            // Get our button from the layout resource, and attach an event to it
            Button button = FindViewById<Button> (Resource.Id.myButton);

            button.Click += delegate {
                button.Text = string.Format ("{0} clicks!", count++);
            };
        }
    }
}

```

Now, MQA is integrated into Xamarin.Android app and we are good to go.</p>
 What we have implemented above is just a drop in the Ocean of MQA, to know more about MQA and its features – VisitÂ MQA Knowledge Centre</p>
 Happy Coding !!!</p>
 The post Integrating MQA into Xamarin.Android app appeared first on IBM MobileFirst Platform.</p>

```

        "guid": {
            "content": "https://developer.ibm.com/mobilefirstplatform/?p=16964",
            "isPermaLink": "false"
        },
        "link": "https://developer.ibm.com/mobilefirstplatform/2015/09/01/integrating-mqa-into-xamarin-android-app/",
        "pubDate": "Tue, 01 Sep 2015 20:27:07 +0000",
        "title": "Integrating MQA into Xamarin.Android app"
    },
    {
        "category": [
            "Uncategorized",
            "MobileFirst_Platform"
        ],
        "commentRss": "https://developer.ibm.com/mobilefirstplatform/2015/08/19/try-on-bluemix-and-buy-mfp/feed/",
        "comments": [
            "https://developer.ibm.com/mobilefirstplatform/2015/08/"
        ]
    }
}

```

```

19\try-on-bluemix-and-buy-mfp\#comments",
    "0"
],
"creator": "ChethanKumar",
"description": "<p>The post <a rel=\"nofollow\" href=\"https://\n
/developer.ibm.com/mobilefirstplatform/2015/08/19/try-on-bluemix-and-buy-m\n
fp/\">Try on Bluemix and migrate to on-prem MobileFirst Platform</a> appeared\n
first on <a rel=\"nofollow\" href=\"https://\n/developer.ibm.com/mobilefirstplat\n
form\">IBM MobileFirst Platform</a>.</p>",
"encoded": "<p>Contributed By : Chethan Kumar SN (chethankumar.s\n
n@in.ibm.com) and Vittal Pai (vittalpai@in.ibm.com)</p>\n<p>With the release o\n
f MobileFirst Platform v7.1, one can now migrate any existing iOS app built for\n
MobileServices on Bluemix to MobileFirst Platform with just a handful of simple\n
steps.</p>\n<p>To elucidate the process, lets look at how to migrate a simple\n
Bluemix iOS app.</p>\n<p>To migrate an existing iOS app built for MobileService\n
s on Bluemix to run on MobileFirst Platform, follow the steps below.</p>\n<ul>\n
<li><a href=\"#migrateexisting\">Existing Bluemix Server Application</a></li>\n
<li><a href=\"#migrateblu\">Existing Bluemix Client Application</a></li>\n
<li><a href=\"#configureclient\">Migration of Client Application</a></li>\n
<li><a href=\"#migratemfp\">Migration of JAX-RS Application to JAVA Adapter</a>\n
</li>\n
<li><a href=\"#configoauth\">Configuring Custom-0Auth</a></li>\n
<li><a href=\"#configurepush\">Configuring Push Capability</a></li>\n
<li><a href=\"#sample\">Sample and Source Code</a></li>\n
</ul>\n
<h2 id=\"migrateexisting\">Existing Bluemix Server Application</h2>\n
<p>The Bluemix app has the followi\n
ng functionality:</p>\n
<ul>\n
<li>On the client side, the application stores a\n
list of items and provides a way to add more items to the list. Each item can ab\n
le to store Name, Store, Price and image of the product. The App's are pro\n
tected by Custom Authenticator via AMA security service provided by bluemix.</li>\n
<li>On the server side, the App contains a JAX-RS class to store and manipu\n
late the data. It also contains the server side AMA security implementation.</li>\n
</ul>\n
<p>On BlueMix we have application with the following configuration:\n
</p>\n
<ul>\n
<li>Liberty Runtime : which used to run JAX-RS application on Blue\n
mix</li>\n
<li>Advance Mobile Access service : which gives mobile application s\n
ecurity and monitoring functionality</li>\n
<li>Push Service for iOS 8 : which\n
provides the capability to use iOS Push features</li>\n
</ul>\n
<h3> Liberty Ru\n
ntime </h3>\n
<ul>\n
<li>Liberty contains two projects with JAX-RS service (i.e\n
Custom-oauth-java for Custom Authentication and LocalstoreAdapter for storing i\n
tems). The service include the protected resource and the custom identity provi\n
der code. The liberty server is configured with TAI.\n
</li>\n
<li>Trust Associa\n
tion Interface (TAI) is a service provider API that enables the integration of\n
third-party security services with a Liberty profile server. For more info on T\n
AI : <a href=\"http://www-01.ibm.com/support/knowledgecenter/was_beta_libe\n
rty/com.ibm.websphere.wlp.nd.multiplatform.doc/ae/twlp_dev_custom_tai.html\">\n
target=\"_blank\">click here</a>\n
</li>\n
<li>The custom identity provider aut\n
henticates a user by sending challenges to the client. However, custom identity\n
providers do not communicate directly with clients. They send challenges and rec\n
eive responses to the challenges by means of the Advanced Mobile Access service.\n
When a custom identity provider successfully authenticates the user, it provides\n
the user identity information to Advanced Mobile Access. For more information on\n
custom authentication refer bluemix documentation : <a href=\"https://www.ng.\n
bluemix.net/docs/services/mobileaccess/security/id_provs/index-gentopic2.\n
html#custom_id_prov\">target=\"_blank\">click here</a>\n
<p>The custom identity\n
provider code is defined by two http API:</p>\n
<pre class=\"brush: plain; titl\n
e: ; notranslate\">\n/startAutorization\n
</pre>\n
<p>and\n
<pre class=\"brush: pla\n
in; title: ; notranslate\">\n/handleChallengeAnswer\n
</pre>\n
<pre class=\"brush:\n
java; title: ; notranslate\">\n@POST\n\t@Consumes (&quot;application/json&quot;\n
)\n\t@Path (&quot;/{tenantId}/customAuthRealm/{startAuthorization&quot;)\n\t

```

```
@Produces(MediaType.APPLICATION_JSON)\n\tpublic JSONObject startAuthorization(String payload,\n\n\t\t\t\t\t@PathParam("tenantId")) String deviceId,\n\n\t\t\t\t\t@PathParam("realmName")) String realmName) throws Exception {\n\n\t\t\t\t\tJSONObject returnJson = (JSONObject) JSON.parse(CHALLENGE_JSON);\n\n\t\t\t\t\treturn returnJson;\n\n\t}\n\n\t@POST\n\n\t@Consumes ("application/json")\n\n\t@Path ("/{tenantId}/customAuthRealm_3/handleChallengeAnswer")\n\n\t@Produces(MediaType.APPLICATION_JSON)\n\n\tpublic JSONObject handleChllengeAnswer(String payload,\n\n\t\t\t\t\t@PathParam("tenantId")) String deviceId,\n\n\t\t\t\t\t@PathParam("realmName")) String realmName) throws Exception {\n\n\t\t\t\t\tJSONObject userStoreJson = (JSONObject) JSON.parse(USER_STORE_JSON);\n\n\t\t\t\t\tJSONObject failedResponseJson = (JSONObject) JSON.parse(FAILURE_JSON);\n\n\t\t\t\t\tif(payload == null || payload.isEmpty()) {\n\n\t\t\t\t\t\treturn failedResponseJson;\n\n\t\t\t\t\t}\n\n\t\t\t\t\tJSONObject payloadJson = (JSONObject) JSON.parse(payload);\n\n\t\t\t\t\tJSONObject challengeAnswer = (JSONObject) payloadJson.get("challengeAnswer");\n\n\t\t\t\t\tif(challengeAnswer == null ) {\n\n\t\t\t\t\t\treturn failedResponseJson;\n\n\t\t\t\t\t}\n\n\t\t\t\t\tString userName = (String) challengeAnswer.get("userName");\n\n\t\t\t\t\tString password = (String) challengeAnswer.get("password");\n\n\t\t\t\t\tif(userName == null || userName.isEmpty() || password == null || password.isEmpty()) {\n\n\t\t\t\t\t\treturn failedResponseJson;\n\n\t\t\t\t\t}\n\n\t\t\t\t\tif(userStoreJson.containsKey(userName)) {\n\n\t\t\t\t\t\tJSONObject userInfoJson = (JSONObject) userStoreJson.get(userName);\n\n\t\t\t\t\t\tString userPassword = (String) userInfoJson.get("password");\n\n\t\t\t\t\t\tString userDisplayName = (String) userInfoJson.get("displayname");\n\n\t\t\t\t\t\tif(password.equals(userPassword)) {\n\n\t\t\t\t\t\t\tJSONObject returnJson = new JSONObject();\n\n\t\t\t\t\t\t\tJSONObject userIdentityJson = new JSONObject();\n\n\t\t\t\t\t\t\tuserIdentityJson.put("username", userName);\n\n\t\t\t\t\t\t\tuserIdentityJson.put("displayname", userDisplayName);\n\n\t\t\t\t\t\t\treturnJson.put("status", "success");\n\n\t\t\t\t\t\t\treturnJson.put("userIdentity", userIdentityJson);\n\n\t\t\t\t\t\t\treturn returnJson;\n\n\t\t\t\t\t\t}\n\n\t\t\t\t\t\treturn failedResponseJson;\n\n\t\t\t\t\t}\n\n\t\t\t\t\t</pre>\n\n\t\t\t\t\t<p>The Localstore adapter contains few http API's to perform some basic operations like Add, Update, Create and Delete in client application.</p>\n\n\t\t\t\t\t<pre class="brush: java; title: ; notranslate">\n\n\t\t\t\t\t@GET\n\n\t\t\t\t\t@Path("/getAllItems")\n\n\t\t\t\t\tpublic String getAllItems() throws IOException{\n\n\t\t\t\t\t\tinit();\n\n\t\t\t\t\t\tJSONArray jsonArray = new JSONArray();\n\n\t\t\t\t\t\tfor(Object key : props.keySet()){jsonArray.add(parser.parse(props.getProperty((String) key)).getAsJsonObject());\n\n\t\t\t\t\t\treturn jsonArray.toString();\n\n\t\t\t\t\t}\n\n\t\t\t\t\t@PUT\n\n\t\t\t\t\t@Path("/addItem")\n\n\t\t\t\t\tpublic void addItem(String itemJson) \n\n\t\t\t\t\t\tthrows IOException, URISyntaxException{\n\n\t\t\t\t\t\t\ttry{\n\n\t\t\t\t\t\t\t\tinit();\n\n\t\t\t\t\t\t\t\tint newKey = props.keySet().size()+1;\n\n\t\t\t\t\t\t\t\tprops.put(String.valueOf(newKey), itemJson);\n\n\t\t\t\t\t\t\t\tURL url = this.getClass().getClassLoader().getResource("data.properties");\n\n\t\t\t\t\t\t\t\tFile file = new File(url.toURI().getPath());\n\n\t\t\t\t\t\t\t\tFileOutputStream foStream = new FileOutputStream(file);\n\n\t\t\t\t\t\t\t\tprops.store(foStream, "saving new item");\n\n\t\t\t\t\t\t\t\tfoStream.close();\n\n\t\t\t\t\t\t\t\tcatch(IOException ioe){ioe.printStackTrace();\n\n\t\t\t\t\t\t\t\t}\n\n\t\t\t\t\t\t\t@POST\n\n\t\t\t\t\t\t\t@Path("/addAllItems")\n\n\t\t\t\t\t\t\tpublic String addAllItems(String itemsJson) \n\n\t\t\t\t\t\t\t\tthrows URISyntaxException, IOException{\n\n\t\t\t\t\t\t\t\t\ttry{\n\n\t\t\t\t\t\t\t\t\t\tinit();\n\n\t\t\t\t\t\t\t\t\t\tclearAllData();\n\n\t\t\t\t\t\t\t\t\t\tJSONArray jsonArr = parser.parse(itemsJson).getAsJSONArray();\n\n\t\t\t\t\t\t\t\t\t\tfor(int i=0;i<jasonArr.size();i++){props.put(String.valueOf(i+1), jasonArr.get(i).toString());\n\n\t\t\t\t\t\t\t\t\t\t}\n\n\t\t\t\t\t\t\t\t\t\tURL url = this.getClass().getClassLoader().getResource(&quot;data.properties&quot;);\n\n\t\t\t\t\t\t\t\t\t\tFile file = new File(url.toURI().getPath());\n\n\t\t\t\t\t\t\t\t\t\tFileOutputStream foStream = new FileOutputStream(file);\n\n\t\t\t\t\t\t\t\t\t\tprops.store(foStream, &quot;saving new item&quot;);\n\n\t\t\t\t\t\t\t\t\t\tfoStream.close();\n\n\t\t\t\t\t\t\t\t\t\treturn &quot;true&quot;;\n\n\t\t\t\t\t\t\t\t\t\tcatch(IOException ioe){ioe.printStackTrace();\n\n\t\t\t\t\t\t\t\t\t\t}\n\n\t\t\t\t\t\t\t\t\t\treturn &quot;false&quot;;\n\n\t\t\t\t\t\t\t\t\t}\n\n\t\t\t\t\t\t\t\t\t@DELETE\n\n\t\t\t\t\t\t\t\t\t@Path("/clearAll")\n\n\t\t\t\t\t\t\t\t\tpublic String clearAllData() \n\n\t\t\t\t\t\t\t\t\t\tthrows MissingConfigurationException,
```


[illegible]

17-at-3.42.32-pm.png\" alt=\"AMA Client Registration\" width=\"935\" height=\"452\" class=\"alignnone size-full wp-image-14883\" \"/>AMA provides Facebook, Google, or a custom identity provider to authenticate access to protected resources. Add Custom identity provider feature as it can be migrated to MFPP and specify the corresponding jax-rs custom authentication application url and realm name.



\" alt=\"Custom Auth AMA\" width=\"955\" height=\"375\" class=\"alignnone size-full wp-image-14890\" \"/>Add the following code inside didFinishLaunchingWithOptions function in AppDelegate of client application which will register the realm and initialize connection with Bluemix Application.

```
brush: plain; title: ; notranslate
IMFClient.sharedInstance().registerAuthenticationDelegate(customAuthDelegate, forRealm: "customAuthRealm_3")
IMFClient.sharedInstance().initializeWithBackendRoute("https://parkstore.mybluemix.net", backendGUID: "5e3ad88d-dd48-469d-b46f-2c4ad66b5345")
```

The following is the sample code to invoke the Rest url's in client application.

```
brush: plain; title: ; notranslate
var request: IMFResourceRequest = IMFResourceRequest(path: "https://parkstore.mybluemix.net/LocalstoreAdapter/apps/5e3ad88d-dd48-469d-b46f-2c4ad66b5345/localstore/getAllItems", method: "GET")
```

request.sendWithCompletionHandler { (wResponse:IMFResponse!, err:NSError!) -> Void in

Push Service for iOS 8

Bind the application with Push Service for iOS 8



Configure Apple Push Notification service (APNs) which requires Apple Developer Account and Generate p12 certificates. Documentation link : [click here](https://www.ng.bluemix.net/docs/services/mobilepush/index.html#certificates)

Upload the generated p12 certificate in Push service dashboard



Add the following code inside didFinishLaunchingWithOptions function in AppDelegate of client application which will register notifications in client app.

```
brush: plain; title: ; notranslate
let notificationTypes: UIUserNotificationType = UIUserNotificationType.Badge | UIUserNotificationType.Alert | UIUserNotificationType.Sound
let notificationSettings: UIUserNotificationSettings = UIUserNotificationSettings(forTypes: notificationTypes, categories: nil)
application.registerUserNotificationSettings(notificationSettings)
application.registerForRemoteNotifications()
```

Add the following code inside didRegisterForRemoteNotificationsWithDeviceToken function in AppDelegate of client application which will register pushclient and subscribe to tag in client app.

```
brush: plain; title: ; notranslate
IMFPushClient.sharedInstance().registerDeviceToken(deviceToken, completionHandler: { (response, error) -> Void in
    if error != nil {
        println("Error during device registration \\\(error.description)")
    }
    else {
        println("Response during device registration json: \\\(response.responseJson.description)")
        var tags = ["parkstore"]
        IMFPushClient.sharedInstance().subscribeToTa
```

```

gs(tags, completionHandler: { (response:IMFResponse!, err:NSError!) -> Void
in\n
    if err != nil {\n
        println(&quot;
There was an error while subscribing to tag&quot;);\n
    }else{\n
        println(&quot;Successfully subscribe to tag parkstore&
quot;);\n
    }\n
    })\n
}</pre>\n</li>
</li>Add the following function inside AppDelegate which triggers when push no
tification arrived in client app.\n<pre class=\"brush: plain; title: ; notransl
ate\">func application(application: UIApplication, didReceiveRemoteNotification
userInfo: [NSObject : AnyObject]) {\n
    println(&quot;Got remote Notificat
ion. Data : \\\(userInfo.description)&quot;);\n
    let info = userInfo as NSD
ictionary\n
    let data = info.objectForKey(&quot;aps&quot;)?.objectForKey(
&quot;alert&quot;) as! NSDictionary\n
    let userData = data.objectForKey(&
quot;body&quot;) as! String\n
    let alertView = UIAlertView(title: &quot;W
ishList!&quot;, message: &quot;\\\(userData)&quot;, delegate: nil, cancelButtonTitle: &quot;OK&quot;);\n
    alertView.show();\n
}\n}</pre>\n</li>\n</ul>\n<h2 id=\"migrateblu\">Existing Bluemix Client Application</h2>\n<p>Add th
e following Code snippets to the existing Bluemix Client Application and name th
e application with same name which you have registered in Advance Mobile Access
Dashboard.</p>\n<ul>\n<li> Add the following code inside didFinishLaunchingWit
hOptions function in AppDelegate of client application which will register the
realm and initialize connection with Bluemix Application.\n<pre class=\"brush:
plain; title: ; notranslate\"> IMFClient.sharedInstance().registerAuthenticatio
nDelegate(customAuthDelegate, forRealm: &quot;customAuthRealm_3&quot;);\nIMFClie
nt.sharedInstance().initializeWithBackendRoute(&quot;https://\parkstore.myblue
mix.net&quot;;, backendGUID: &quot;5e3ad88d-dd48-469d-b46f-2c4ad66b5345&quot;);</
pre>\n</li>\n<li> The following is the sample code to invoke the Rest url&#8217
;s in client application.\n<pre class=\"brush: plain; title: ; notranslate\">va
r request: IMFResourceRequest = IMFResourceRequest(path: &quot;https://\parkst
ore.mybluemix.net\LocalstoreAdapter\apps\5e3ad88d-dd48-469d-b46f-2c4ad66b534
5\localstore\getAllItems&quot;;, method: &quot;GET&quot;);\n
request.send
dWithCompletionHandler { (wlResponse:IMFResponse!, err:NSError!) -> Void in<
/pre>\n</li>\n<li>Add the following code inside didFinishLaunchingWithOptions
function in AppDelegate of client application which will register notifications
in client app.\n<pre class=\"brush: plain; title: ; notranslate\"> let notific
ationTypes: UIUserNotificationType = UIUserNotificationType.Badge | UIUserNotif
icationType.Alert | UIUserNotificationType.Sound\n
let notificati
onSettings: UIUserNotificationSettings = UIUserNotificationSettings(forTypes: notifica
tionTypes, categories: nil);\n
application.registerUserNotifica
tionSettings(notificationSettings);\n
application.registerForRemoteNotifi
cations();</pre>\n</li>\n<li>Add the following code inside didRegisterForRemot
eNotificationsWithDeviceToken function in AppDelegate of client application wh
ich will register pushclient and subscribe to tag in client app.\n<pre class=\"b
rush: plain; title: ; notranslate\">IMFPushClient.sharedInstance().registerDevi
ceToken(deviceToken, completionHandler: { (response, error) -> Void in\n
if error != nil {\n
    println(&quot;Error during device registrati
on \\\(error.description)&quot;);\n
}\n
else {\n
println(&quot;Response during device registration json: \\\(response.responseJso
n.description)&quot;);\n
var tags = [&quot;parkstore&quot;];\n
IMFPushClient.sharedInstance().subscribeToTags(tags, completionHandler: { (resp
onse:IMFResponse!, err:NSError!) -> Void in\n
if err != n
il {\n
    println(&quot;There was an error while subscribin
g to tag&quot;);\n
}else{\n
    println(&
quot;Successfully subscribe to tag parkstore&quot;);\n
}\n
})\n
}</pre>\n</li>\n<li>Add the following function inside Appdele
gate which triggers when push notification arrived in client app.\n<pre class=\"
brush: plain; title: ; notranslate\">func application(application: UIApplicati
on. didReceiveRemoteNotification userInfo: [NSObject : AnyObject]) {\n
    o

```

```
println("&quot;Got remote Notification. Data : \\(userInfo.description)&quot;")\n
let info = userInfo as NSDictionary\n
let data = info.objectForKey("&quot;aps&quot;")?.objectForKey("&quot;alert&quot;") as! NSDictionary\n
let userData = data.objectForKey("&quot;body&quot;") as! String\n
let alertView = UIAlertView(title: "&quot;WishList!&quot;", message: "&quot;\\(userData)&quot;", delegate: nil, cancelButtonTitle: "&quot;OK&quot;")\n
alertView.show()\n
}\n}</pre>\n</li>\n<li>The following are the screenshots of client applicatio

```

n.
\n\n

Migration to On-Prem</h2>\n<h3 id=\"configureclient\">Migration of Client Application</h3>\n<p>Migration of Client Application includes following two steps</p>\nConfiguring Cocoapods\nClient App Migration

\n<h3 id=\"cocoapods\">Configuring Cocoapods</h3>\n<p>If CocoaPods has not been installed on a specific computer:</p>\n\nFollow the “Getting Started” guide for CocoaPods installation: [http://guides.cocoapods.org/using/getting-started.html](\"http://guides.cocoapods.org/using/getting-started.html\")\nOpen “Terminal” at the installation location and run the “pod init” command\n\n

<p>The following steps assume that the client application is working with CocoaPods. If not, follow this “Using CocoaPods” documentation : click here</p>\n<p>In both cases, the instructions below explain how to edit the “Podfile” file.</p>\n\nOpen the “Podfile” file located in the root of your XCode project in a favourite text editor.\nComment out or remove the existing content.\nAdd the following lines:

```
source 'https://github.rtp.raleigh.ibm.com/imflocalsdks/imf-client-sdk-specs.git'\npod 'IMFCompatibility'\n</pre>\n</li>\n<li>Open &#8220;Terminal&#8221; at the location of &#8220;Podfile&#8221;.</li>\n<li>Verify that the XCode project is closed.</li>\n<li>Run the &#8220;pod install&#8221; command.</li>\n</ol>\n
```

<p>Open the [MyProject].xcworkspace file in XCode. This file is located side by side with [MyProject].xcodeproj.
\nAn usual CocoaPods-based project is managed as a workspace containing the application (the executable) and the library (all project dependencies brought by the CocoaPods manager).</p>\n<p>In Xcode’s Build Settings, search for “Other Linker Flags” and insert \${inherited} (if -ObjC is defined in this field, you can just delete it, since it is configured in the CocoaPod project).</p>\n<h3>Client App Migration</h3>\n\nSearch for bluemix dependency imports like\n

```
class=\"brush: plain; title: ; notranslate\">
```


Search for bluemix dependency imports like

```
<pre class="brush: plain; title: ; notranslate">#import <IMFCore\IMFCore.h>;\n#import <IMFPush\IMFPush.h>;</pre>\n<p>Replace the above imports with </p>\n<pre class="brush: plain; title: ; notranslate">#import <IMFCompatibility\IMFCompatibility.h>;</pre>\n</li>\n<li>Look for a call to the &#8220;initializeWithBackendRoute&#8221; method and replace the route URL with your on-premise server URL. For example:\n<pre class="brush: plain; title: ; notranslate">IMFClient.sharedInstance().initializeWithBackendRoute(&quot;https:\\\/\/parkstore.mybluemix.net&quot;;, backendGUID: &quot;5e3ad88d-dd48-469d-b46f-2c4ad66b5345&quot;;</pre>\n<p>should be replaced with your on-premise MFP server URL</p>\n<pre class="brush: plain; title: ; notranslate">IMFClient.sharedInstance().initializeWithBackendRoute(&quot;http:\\\/\/localhost:10080\/ParkStoreMFP&quot;;, backendGUID: &quot;5e3ad88d-dd48-469d-b46f-2c4ad66b5345&quot;;</pre>\n<p>Note, that backendGUID parameter is ignored and can be empty. Look for all instantiations of IMFResourceRequest class and update it</li>\n<li>Look for all instantiations of IMFResourceRequest class and update the request URL with absolute or relative path to the resource. For example:\n<pre class="brush: plain; title: ; notranslate">var request: IMFResourceRequest = IMFResourceRequest(path: &quot;https:\\\/\/parkstore.mybluemix.net\/LocalstoreAdapter\/apps\/5e3ad88d-dd48-469d-b46f-2c4ad66b5345\/localstore\/getAllItems&quot;;, method: &quot;GET&quot;)</pre>\n<p>should be replaced with\n<pre class="brush: plain; title: ; notranslate">var request: IMFResourceRequest = IMFResourceRequest(path: &quot;http:\\\/\/localhost:10080\/ParkStoreMFP\/adapters\/LocalstoreAdapter\/localstore\/getAllItems&quot;;, method: &quot;GET&quot;)</pre>\n</li>\n<li>Add the following code inside didRegisterForRemoteNotificationsWithDeviceToken function in AppDelegate of Client application.\n<pre class="brush: plain; title: ; notranslate">WLPush.sharedInstance().tokenFromClient = deviceToken.description</pre>\n</li>\n<li>All on-premise applications require the &#8220;worklight.plist&#8221; file to be present in the application resources. In the <code>IBMMobileFirstPlatformFoundationNativeSDK</code> pod we supply a file named <strong>sample.worklight.plist</strong>.\n<ul>\n<li>Locate the &#8220;sample.worklight.plist&#8221; file in the &quot;IBMMobileFirstPlatformFoundationNativeSDK&quot; pod.</li>\n<li>Copy this file to the parent (application) project and rename it to &#8220;worklight.plist&#8221;.</li>\n<li>Edit the &#8220;worklight.plist&#8221; file by setting the &#8220;application id&#8221; key to the name of your application deployed to the on-premise MFPF server</li>\n</ul>\n</li>\n</ol>\n<h3 id="migratempf">Migration of JAX-RS Application to JAVA Adapter</h3>\n<ol>\n<li>To migrate JAX-RS application to on-prem (MobileFirst Foundation) server we need to do the following steps for server:\n<p>Create MobileFirst Project &#8211; Create native API app for iOS<br />\n&quot;&quot;<br />\n<a href="https:\\\/\/developer.ibm.com\/mobilefirstplatform\/wp-content\/uploads\/sites\/32\/2015\/07\/Screen-Shot-2015-07-12-at-6.50.04-pm.png"></a></p>\n<p><a href="https:\\\/\/developer.ibm.com\/mobilefirstplatform\/wp-content\/uploads\/sites\/32\/2015\/07\/Screen-Shot-2015-07-12-at-6.51.13-pm.png"></a></p>\n<p><a href="https:\\\/\/developer.ibm.com\/mobilefirstplatform\/wp-content\/uploads\/sites\/32\/2015\/07\/Screen-Shot-2015-07-12-at-6.52.28-pm.png"></a></li>\n<li>Add two adapters for Custom Authentication and Localstore and migrate the JAX-RS code as shown in the following example
```

mple.<n><p>Copy the JAX-RS BlueMix code and paste it in the newly created Localstore Java adapter JAX-RS file.</p><n><p>Add and remove the following changes in your adapter code.</p><n><n> remove <code>\/{tenantId}\/</code><n> remove the <code>@PathParam -> PathParam("<code>\/{tenantId}\"/> String deviceId</code> and <code>@PathParam("<code>\/{tenantId}\"/> String realmName</code><n> Add scope to the all http api resource <code>@OAuthSecurity (scope="customAuthRealm_3")</code><n><p>The code looks like the following</p><n><pre class="brush: plain; title: ; notranslate">\n\t@GET\n\t@OAuthSecurity (scope="customAuthRealm_3")\n\t@Path("/getAllItems")\n\tpublic String getAllItems() throws MissingConfigurationException{\n\t\t\tinit();\n\t\t\tJSONArray jsonArray = new JSONArray();\n\t\t\tfor(Object key : props.keySet()){ \n\t\t\t\tjsonArray.add(parser.parse(props.getProperty((String) key)).getAsJsonObject());\n\t\t\t}\n\t\t\treturn jsonArray.toString();\n\t}\n\n\t@PUT\n\t@OAuthSecurity (scope="customAuthRealm_3")\n\t@Path("/addItem")\n\tpublic void addItem(String itemJson) \n\t\t\tthrows MissingConfigurationException, URISyntaxException, IOException{\n\t\t\t\ttry{\n\t\t\t\t\tinit();\n\t\t\t\t\tint newKey = props.keySet().size()+1;\n\t\t\t\t\tprops.put(String.valueOf(newKey), itemJson);\n\t\t\t\t\tURL url = this.getClass().getClassLoader().getResource("data.properties");\n\t\t\t\t\tFile file = new File(url.toURI().getPath());\n\t\t\t\t\tFileOutputStream foStream = new FileOutputStream(file);\n\t\t\t\t\tprops.store(foStream, "saving new item");\n\t\t\t\t\tfoStream.close();\n\t\t\t\t}\n\t\t\t\tcatch(IOException ioe){\n\t\t\t\t\tioe.printStackTrace();\n\t\t\t\t}\n\t\t\t}\n\n\t@POST\n\t@OAuthSecurity (scope="customAuthRealm_3")\n\t@Path("/addAllItems")\n\tpublic String addAllItems(String itemsJson) \n\t\t\tthrows MissingConfigurationException, URISyntaxException, IOException{\n\t\t\t\ttry{\n\t\t\t\t\tinit();\n\t\t\t\t\tclearAllData();\n\t\t\t\t\tJSONArray jsonArr = parser.parse(itemsJson).getAsJSONArray();\n\t\t\t\t\tfor(int i=0;i<jsonArr.size();i++){ \n\t\t\t\t\t\tprops.put(String.valueOf(i+1), jsonArr.get(i).toString());\n\t\t\t\t\t}\n\t\t\t\t\tURL url = this.getClass().getClassLoader().getResource("data.properties");\n\t\t\t\t\tFile file = new File(url.toURI().getPath());\n\t\t\t\t\tFileOutputStream foStream = new FileOutputStream(file);\n\t\t\t\t\tprops.store(foStream, "saving new item");\n\t\t\t\t\tfoStream.close();\n\t\t\t\t\treturn "true";\n\t\t\t\t}\n\t\t\t\tcatch(IOException ioe){\n\t\t\t\t\tioe.printStackTrace();\n\t\t\t\t}\n\t\t\t\treturn "false";\n\t\t\t}\n\n\t@DELETE\n\t@OAuthSecurity(enabled=false)\n\t@Path("/clearAll")\n\tpublic String clearAllData() \n\t\t\tthrows MissingConfigurationException, URISyntaxException, IOException{\n\t\t\t\tinit();\n\t\t\t\tprops.clear();\n\t\t\t\tSystem.out.println("Size : "+props.size());\n\t\t\t\tURL url = this.getClass().getClassLoader().getResource("data.properties");\n\t\t\t\tFile file = new File(url.toURI().getPath());\n\t\t\t\tFileOutputStream foStream = new FileOutputStream(file);\n\t\t\t\tprops.store(foStream, "clearing all data");\n\t\t\t\tfoStream.close();\n\t\t\t\treturn "cleared";\n\t\t\t}\n\n</pre><n><h3 id="configoauth">Configuring Custom-0Auth</h3><n><n>Add realm with same name you had on BlueMix and login module to the authenticationConfig.xml.<n><pre class="brush: xml; title: ; notranslate"><?xml version="1.0" encoding="UTF-8" ?><realm name="customAuthRealm_3"><loginModule>com.worklight.core.auth.ext.CustomIdentityAuthenticator</loginModule><loginModule name="customAuthLoginModule_3"><expirationInSeconds>3600</expirationInSeconds><className>com.worklight.core.auth.ext.CustomIdentityLoginModule</className></loginModule></pre><n><n>Add Custom-oauth Realm in userIdentityRealms in Application Descriptor file of iOS Native API<n><pre class="brush: xml; title: ; notranslate"><?xml version="1.0" encoding="UTF-8" ?><userIdentityRealms><customAuthRealm_3></customAuthRealm_3></userIdentityRealms></pre><n><n><h3 id="configurepush">Configuring Push Capability</h3><n><n> Add apns p12 certificate which is generated from Apple Developer Account under iOS Native API Folder<n><p><a

```
href="//developer.ibm.com/mobilefirstplatform/wp-content/uploads/sites/32/2015/07/Screen-Shot-2015-07-12-at-6.58.03-pm.png"></a></li><li> Add Push configuration in Application Descriptor file of iOS Native API and include the password of added apns certificate.</li></ul><pre class="brush: xml; title: ; notranslate"><pushSender password="password"></pushSender><tags><tag name="parkstore"></tag></tags></pre></li><li> Create HTTP Push Adapter with following function code which will send the user push notification to the devices which is subscribed to tag #8220;parkstore#8221;.</li></ul><pre class="brush: xml; title: ; notranslate">function sendTagNotification(notificationText) {\n    var notificationOptions = {};\n    notificationOptions.message = notificationText;\n    notificationOptions.target = {};\n    notificationOptions.message.alert = notificationText;\n    notificationOptions.target.tagNames = ["parkstore"];\n    WL.Server.sendMessage("ParkStoreMFP", notificationOptions);\n    return {\n        result: "Notification sent to users subscribed to the tag parkstore.";\n    };\n}</pre></li></ul><p>By performing above steps one can easily run iOS app built for Bluemix on MobileFirst Platform and following are the links to samples.</p><h3 id="sample">Sample and Source Code</h3><p>Bluemix Server : <a href="https://hub.jazz.net/git/chethan/parkstore-bluemix-server">Parkstore bluemix server</a><br><p>Bluemix Client : <a href="https://hub.jazz.net/git/chethan/parkstore-bluemix">Parkstore bluemix</a><br><p>MFP Server : <a href="https://hub.jazz.net/git/chethan/parkstore-mfp-server">Parkstore mfp server</a><br><p>MFP Client : <a href="https://hub.jazz.net/git/chethan/parkstore-mfp">Parkstore mfp</a></p><p>The post <a rel="nofollow" href="https://developer.ibm.com/mobilefirstplatform/2015/08/19/try-on-bluemix-and-buy-mfp/">Try on Bluemix and migrate to on-prem MobileFirst Platform</a> appeared first on <a rel="nofollow" href="https://developer.ibm.com/mobilefirstplatform">IBM MobileFirst Platform</a>.</p></pre>
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Sample

Click to download (<https://github.com/MobileFirst-Platform-Developer-Center/JavaAdapters>) the MobileFirst project.

The attached sample includes an adapter called `RSSAdapter` and a hybrid application called `RSSReader` to test the adapter inside an application.

RSS Reader

All



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