Muse Customizations for IBM Connections

Muse is a middleware proxy service that facilitates the customization of the IBM Connections UX (User eXperience). In essence Muse acts as a proxy between IBM Connections and the end-user, which gives it the ability to intercept and modify requests and responses, and thus customize anything that flows through it, e.g. the behaviour of APIs, the presentation of the user interface, etc. This document focuses on customizations of the user interface.

The Muse UI customization model is simple – the service performs customizations by injecting JavaScript and/or CSS into the web pages returned by IBM Connections in response to end-user requests generated within standard components like Communities, Profiles, Files, Homepage etc. The customization details, e.g. what code must be injected, what pages should be targeted and so forth, are defined by applications stored inside the IBM Connections Application Registry (aka App Reg).

App Reg is a centralized design repository used to store and retrieve applications that customize and extend a variety of different IBM Connections services – where Muse is just one such service. In the cloud, App Reg is available to organization administrators via the **Admin > Manage Organization > Organization Extensions** menu path. From here it's possible to create and manage Muse customization applications, which are simply JSON files containing declarative design information that desribe what resources need to be targeted and what actions need to be performed. Listing 1 is a simple illustration of a Muse customization application.

Listing 1 – Hello World Muse Customization

```
1  {
2   "services": [
3     "Muse"
4   ],
5   "name": "Simple Muse Customization",
6   "title": "My First Muse Customization",
7   "description": "Sample app to insert text into Connections Homepage",
8   "extensions": [
9     {
10      "name": "Hello World Extension",
11      "type": "com.ibm.muse.ui",
12      "path": "homepage",
13       "payload": {
14         "include-files": [
15           "helloWorld/helloWorld.user.js"
16         ]
17       }
18     }
19   ]
20  }
```

The application JSON in Listing 1 requires little explanation. Even with a rudimentary understanding of the Muse customization model, the following points can be inferred by a quick perusal of the code:

- The app is named “Simple Muse Customization” and it extends the Muse service
- It contains **one** extension named “Hello World Extension” (apps can have many)
- The extension is a customization of the UI (line #11 - `com.ibm.muse.ui`)
- The customization applies to the Connections homepage (line #12 - `homepage`)
- A file named `helloWorld.user.js` is to be injected into the homepage (line #15)

A more complete summary of the relevant Muse extension properties is shown in Listing 2:

Listing 2 Muse Application Information

Property	**Description**
Name	String used to identify the extension and used as a database lookup key
Title	Short String description - translatable for international audiences
Description	Long String description - translatable for international audiences
Services	The service(s) with which the application is associated

Type	String used to identify the extension point being implemented – required. Valid values are as follows:
	`com.ibm.muse.ui`
	`com.ibm.muse.api`

Path	Standard string value used to identify the component to be customized:
	`activities`
	`blogs`
	`communities`
	`files`
	`forums`
	`global *`
	`homepage`
	`mycontacts`
	`news`
	`profiles`
	`search`
	`wikis`
	`*` Unlike the other path values, `global` does not represent a real URL path element but is a keyword meaning match **all** URLs.

Payload	
match: **url**	A regular expression used to provide more fine-grained target resource matching, i.e. beyond the broad match specified in the `path` property.
match: **user-name**	String used to identify one or more users as the target for the customization - **not unique** within a given organization.
match: **user-id**	String used to identify one or more users as the target for the customization. This property is unique within a given organization
match: **user-email**	String used to identify one or more users based on email address value.
include-files	List of files to be inserted into the response for a matched page request

A Closer Look at Muse Customization Properties

The properties outlined in Listing 2 can be broken down into two categories:

- Generic App Reg Properties

  Properties defined for *all* App Reg applications regardless of service type

- Muse Service Properties

  Properties specific to the Muse service, i.e. everything in the **Payload** section

In terms of the generic properties, App Reg requires that any application specify **name**, **title**, **description, service** and **type** property values. The Application Registry specification does not require the **path** property to be specified when an application is created, but the Muse service puts it to good use for every request it processes, as will be seen shortly. Ergo, in reality a **path** value is required also if Muse applications are to work properly.

Of the generic properties outlined in Listing 2, only **type** and **path** merit any further discussion. A **type** value always equates to an extension point defined by a service. At present Muse only defines two extension points, `com.ibm.muse.ui` and `com.ibm.muse.api`. The former is a declaration that a given Muse extension performs a modification to the IBM Connections UI, and thus will be handled in accordance with a prescribed UI extension pattern – i.e. any **include-files** specified in the **payload** are injected into the response document. The latter is reserved for future use – suffice to say that as a middleware proxy Muse is capable of modifying API behaviours, but that use case is not supported at the time of writing.

The **path** value on the other hand typically represents a path element in the IBM Connections request URL, which in most use cases corresponds to a standard IBM Connections component. Consider the URLs displayed in Listing 3 as follows:

Listing 3 – Examples of IBM Connections URLs

```
/* homepage */
//w3-connections.ibm.com/homepage/web/updates/#myStream/imFollowing/all
//w3-connections.ibm.com/homepage/web/updates/#myStream/statusUpdates/all
//w3-connections.ibm.com/homepage/web/updates/#myStream/discover/all
//w3-connections.ibm.com/homepage/web/updates/#atMentions/atMentions
/* communities */
//w3-connections.ibm.com/communities/service/html/ownedcommunities
//w3-connections.ibm.com/communities/service/html/followedcommunities
//w3-connections.ibm.com/communities/service/html/communityinvites
/* files */
//w3-connections.ibm.com/files/app#/pinnedfiles
//w3-connections.ibm.com/files/app#/person/7f37da40-8f0a-1028-938d-
db07163b51b2
/* blogs */
//w3-connections.ibm.com/blogs/roller-ui/allblogs?email=joe_schmoe
//w3-connections.ibm.com/blogs/roller-ui/homepage?lang=en_us
/* wikis */
//w3-connections.ibm.com/wikis/home?lang=en-us#!/mywikis?role=editor
```

The sample URLs outlined above follow a clear pattern where the next element after the IBM Connections cloud domain name identifies the Connections component or application associated with the request. The possible values of this element map to the **path** values enumerated in Listing 2, i.e. `homepage`, `communities`, `files`, etc.

It follows that according as http requests flow through Muse it can query the Application Registry for any extensions relating to a given request URL and reduce the scope of the result set by specifying the particular in-context **path** value. Thus a REST request from Muse to App Reg for Homepage customizations would look like this:

*/appregistry/api/v2/services/**Muse**/extensions?**type**=com.ibm.muse.ui&**path**=homepage*

… which translates as "get all UI extensions registered for the Muse service that apply to the Homepage". This should clarify why Muse extensions must contain both a **type** and **path** value. One caveat to note with regard to the **path** value is the existence of the special `global` key word. This is designed to address the use case where an extension needs to apply to *all* requests and it would be clearly inefficient to have to create an extension for every possible **path** value. For example, should a customer need to display some corporate footer text at the bottom of every page in IBM Connections then a `global` extension would facilitate that.

In response to the request shown above, App Reg returns whatever number of extensions match these criteria, i.e. a single collection of one or more JSON files just like the one shown previously in Listing 1. In effect two requests are sent to the App Reg – one for the current in-context URL path and one for any `global` extensions. It is then up to Muse to merge, parse and apply the design metadata contained in the returned extensions – and that is where the **payload** data comes into play.

Processing Payload Properties

As should now be evident, the generic **path** property provides a coarse means of querying the Application Registry for extensions pertaining to a given IBM Connections component. The optional **match** properties in the Muse **payload** provide a further means of fine tuning the filtering of extensions and essentially deciding whether an extension should be applied to a given URL request or not.

Fine Grained URL Matching

The **match url** property takes a regular expression and evaluates it against the current URL. If it matches then the extensions is applied. If no match occurs, the extension is not applied. This is a powerful feature as the following code snippets will demonstrate.

Listing 4 shown a Communities extension that has a fine-grained URL match applied on lines 14 – 16. In this case the extension is only applied if the Communities `followedcommunities` URL is being processed, and so this extension is ignored for other Communities URLs like those shown in Listing 3, i.e. `ownedcommunities`, `communityinvites`, etc.

Listing 4 – Muse Customization With URL Matching

```
{
 "services": [
   "Muse"
 ],
 "name": "Communities Customization",
 "title": "Muse Customization for Communities I Follow",
 "description": "Sample to modify Connections Communities",
 "extensions": [
   {
     "name": "Hello World Extension",
     "type": "com.ibm.muse.ui",
     "path": "communities",
      "payload": {
        "match": {
                  "url": "followedcommunities"
        },
        "include-files": [
          " flipCard/commListCardsFlipStyle.user.js "
        ]
      }
   }
 ]
}
```

Similarly, the following fragment shows how a single global extension can be applied to Homepage and Communities but nothing else:

Listing 5 – Global Muse Customization With URL Matching

```
…
      "path": "global",
      "payload": {
        "match": {
                  "url": "homepage|communities"
       },
      …
```

Note: The design of some IBM Connections components like Homepage are based on the Single Page App paradigm. For example look at the Homepage URLs at the top of Listing 3 – all contain hashtags which means that new http requests are not fired as the user navigates around. Thus Muse is not notified for example when a user moves from `imfollowing` to `atmentions`. By contrast this is not the case with Communities when a user moves from `ownedcommunities` to `followedcommunities`. Thus a developer can target individual Communities URLs using the **match url** property but cannot use the same technique to match the Homepage hashtag URLs. Instead a `homepage` extension would need to inject a script that would listen for hash change events and respond accordingly. An example has been included in the homepage samples – see `newsRiverSectionedHashChange.user.js` and in particular the `triggerHashChangeEvent()` function contained therein.

It's easy to envisage many other use cases to which this feature can be applied. For instance, if a customer wants to apply a customization to any Files URL that contains a GUID

then this can be achieved by setting the path value to "`files`" and the match **url** value to "`id=[a-z0-9]{8}-([a-z0-9]{4}-){3}[a-z0-9]{12}`" – refer back to Listing 3 for an example of such a Files URL.

Note: The various braces contained in the regular expression would need to be escaped (i.e. preceded by a backslash character: \) when entered into JSON content stored in App Reg.

Fine Grained Matching based on the Active End-User

The **match** property also accepts various user related conditions based on the current user's name or id. In both cases single or multi-value parameters may be provided, or in JSON parlance a single string value or an array of strings can be specified. The fragment illustrated in Listing 6 shows how a Communities extensions can be specifically targeted at users based on their user names: Jane Doe and Joe Schmoe in this example:

Listing 6 –Muse Customization Targetting Specific Users By Name

```
…
12      "path": "communities",
13       "payload": {
14         "match": {
15            "user-name":[
16               "Jane Doe",
17               "Joe Schmoe"
18             ]
19         },
20 …
```

It is important to note that user names are not unique within an organization so it's possible to inadvertently target unintended users by employing this technique, i.e. all users of the same name will see the extension. To avoid this scenario it is possible to apply a precise filter by using the **user-id** match property instead, as shown in Listing 7:

Listing 7 –Muse Customization Targetting Specific Users By Id

```
…
12      "path": "communities",
13       "payload": {
14         "match": {
15            "user-id":[
16               "20071635",
17               "20071656"
18             ]
19         },
20         …
```

The term "user id" is sometimes referred to as "subscriber id" in the IBM Connection UX and documentation.

Include Files for Code Injections

The **include-files** property lists one or more files to be inserted into the response thus becoming part of the DOM structure loaded in the end-user's browser. Listing 1 shows a simple single-item value for this parameter: `"helloWorld/helloWorld.user.js"`, where `helloWorld` is a folder and `helloWorld.user.js` is a JavaScript file contained within it. This raises a number of interesting questions:

1. **Where do these files reside?**

   On IBM Connections Cloud any files declared in the **include-files** property list are stored on an internal persistent volume accessible only by IBM Connections Cloud admin or dev ops staff. They are retrieved for injection as needed by a Muse microservice at runtime.

2. **How do they get there?**

   The Muse service is currently operating as a ***pilot program*** and during this pilot any **include-files** listed in a Muse extension must to be provided to IBM by the customer. For each pilot customer, a repository is created on **github.ibm.com** and the include files are located there pending a review for security and performance issues. Upon acceptance of the files, a pull request is issued by IBM which triggers a web hook to push the files to the internal persistent volume in IBM Connections Cloud at which time they are available to Muse and any extensions referencing the files become operational. Any subsequent include file updates would go through a repeat of the same process.

   Here are some important points to note regarding the handling of include files, the review process and the Muse pilot program in general:

- This process for integrating include files will be reviewed over the course of the pilot program and is very likely to change by the time the GA release occurs. For example, the repository may be hosted in a public service like github.com rather than IBM's private enterprise github server.
- The review process is a lightweight summary review which looks at various aspects of the customization, primarily from a performance and security standpoint. However ultimate responsibility for the behaviour of the Muse customization remains that of the customer adopting the extension. The review process by IBM provides no guarantee whatsoever of protection against adverse security or performance impacts. The review process may or may not be continued after the pilot program concludes.

Other Important Factoids regarding Muse

- Support for Muse customizations follows the same policy as any other customization to the IBM Connections UI – i.e. **IBM Support can address questions about the customization process, but cannot address questions about the particulars of your customization**.

- The Muse pilot program will be available only to organizations in the North America data centre for IBM Connections Cloud.

- **The Muse pilot is an opt-in program** intended for a limited number of customers who have a real-world need to explore UI customizations in IBM Connections Cloud. Organizations in IBM Connections Cloud are not enabled by default in the pilot program (the plan is to enable all customers by default with the GA release of the service). Customer tenants can request to participate in the program by sending a mail to ibmcndev@us.ibm.com and including the organization name and id. More information on this topic may be available online at this site:

  https://github.com/ibmcnxdev/muse-pilot

- Listing 2 provides the list of supported paths for Muse at this point in time. This list encompasses all core IBM Connections components with the exceptions of the Administration URLs (aka BSS), Meetings and Verse.

- The scope of Muse extensions have some initial temporary restrictions which IBM will seek to address over the course of the pilot programs, namely:

  - Muse extensions are restricted to the organization in which they have been added. For example, users from one organization may have access to communities in other organizations if they have been so invited, but they would not see any customizations added to such “external” communities.

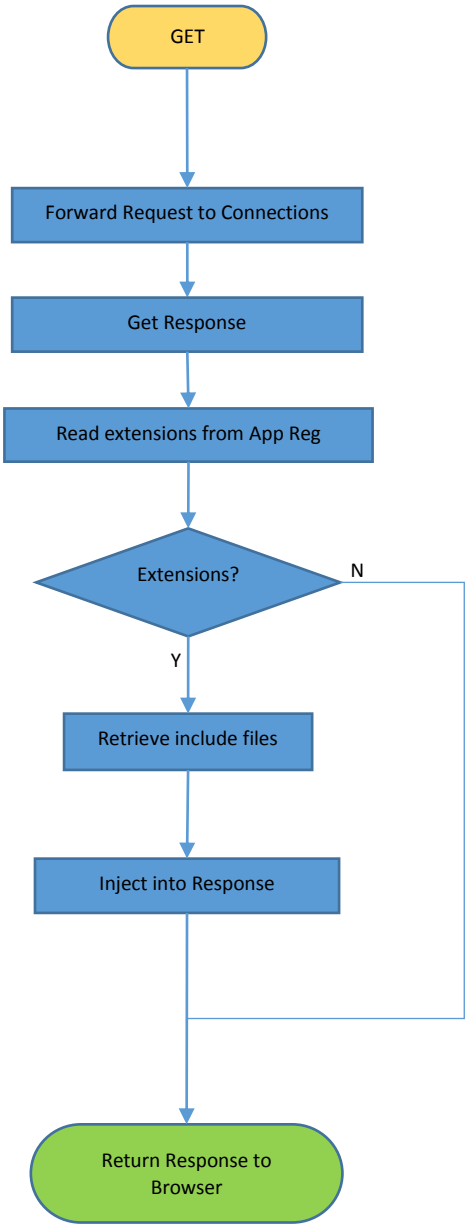
  - Muse extensions cannot make API calls outside of the IBM Connections domain. This is planned to be addressed at a future point by adding support for organizations to provide their own whitelists for approved external services.

  - At this point in time only IBM Connections GET requests are routed through Muse – no POSTs, PUTs, DELETEs etc.

Muse Process Flow Summary

Now that the Muse model has been discussed to a reasonable level of detail the flowchart shown in Figure 1 should provide a good summary of the end to end process.

Figure 1 Muse Flowchart for Request Handling



Inside the Muse Include Files

This journey started as most app dev stories do with a reference to a "Hello World" application, the point of which is to jump start the enablement process which the simplest of extensions. So what exactly does the `helloWorld.user.js` include file do? Listing 8 shows the code – certain variable names and comments have been trimmed for readability in this document but nothing that affects the execution of the script.

Listing 8 –Hello World Include File

```
1 if(typeof(dojo) != "undefined") {
2  require(["dojo/domReady!"], function(){
3   try {
4     // utility function to wait for a specific element to load...
5     var waitFor = function(callback, eXpath, eXpathRt, maxIV, waitTime){
6         if(!eXpathRt) var eXpathRt = dojo.body();
7         if(!maxIV) var maxIV = 10000; // intervals before expiring
8         if(!waitTime) var waitTime = 1;  // 1000=1 second
9         if(!eXpath) return;
10        var waitInter = 0;  // current interval
11        var intId = setInterval( function(){
12          if(++waitInter<maxIV && !dojo.query(eXpath,eXpathRt).length)
13            return;
14
15          clearInterval(intId);
16          if( waitInter >= maxIV) {
17            console.log("**** WAITFOR ["+eXpath+"] WATCH EXPIRED!!!
interval "+waitInter+" (max:"+ maxIV +")");
18          } else {
19            console.log("**** WAITFOR ["+eXpath+"] WATCH TRIPPED AT
interval "+waitInter+" (max:"+maxInter+")");
20            callback();
21          }
22        }, waitTime); // end setInterval()
23     }; // end waitFor()
24
25     // here we use waitFor to wait for the
26     // .lotusStreamTopLoading div.loaderMain.lotusHidden element
27     // before we proceed to customize the page...
28     waitFor( function(){
29       // example customization of the "Updates" title...
30
31        var updatesDescription = document.getElementById("asDesc");
32        var originalText = updatesDescription.textContent;
33        updatesDescription.textContent="Hello World: "+originalText;
34        updatesDescription.style="color:#ff0000";
35
36        // wait until the "loading..." node has been hidden
37        // indicating that we have loaded content.
38     }, ".lotusStreamTopLoading div.loaderMain.lotusHidden");
39
40    } catch(e) {
41        alert("Exception occurred in helloWorld: " + e);
42    }
43  });
44 }
```

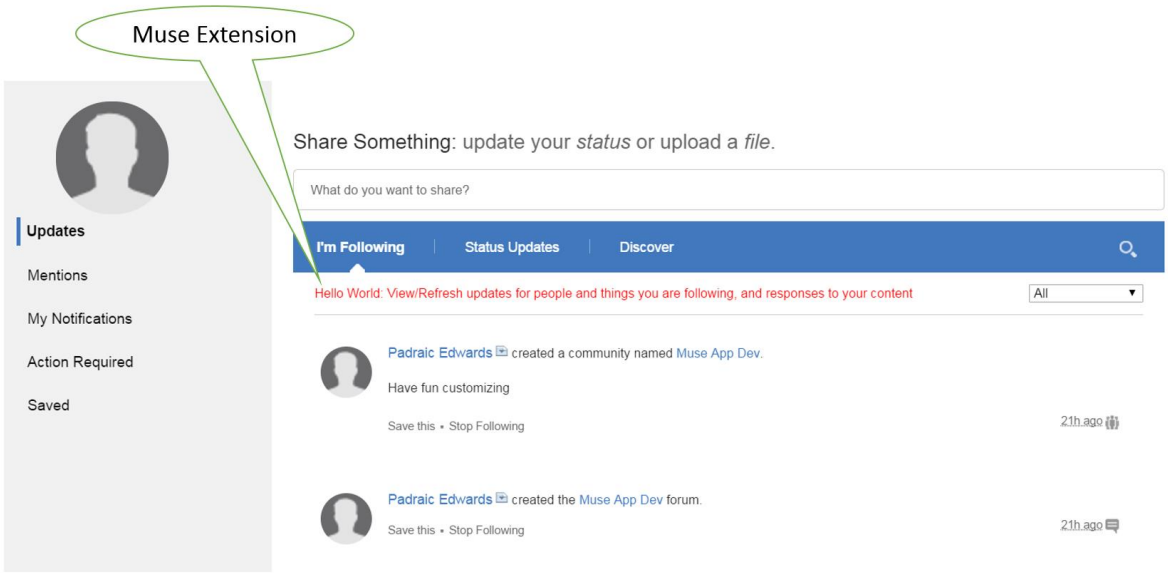
For a simple Hello World example, this may appear at first glance to be more complicated than one might expect, but a closer inspection will simplify matters considerably. Before perusing the code be aware of the following points:

- Most of the code in Listing 8 is a re-usable template that any injection code can sit inside
- Just 4 lines of code are needed for the actual Hello World UI update: Lines 31 – 34 in **bold**
- IBM Connections UI uses the Dojo framework so code is injected into a Dojo structured page

The JavaScript code initially validates that Dojo itself is loaded and then uses a standard Dojo utility (domReady) to wait for the DOM to fully load before calling a bound function to perform the customization. Lines 2 – 23 define a function which will wait up to a maximum of 10 seconds for the page to fully load and if successfully loaded within that time period will execute a callback function. If the page does not load within 10 seconds then an error is logged to the JS console.

This `waitFor()` function is thus called passing in the callback function to manipulate the DOM and modify the UI. The interesting part of the callback function (Lines 31 – 34 as already highlighted) locates a DOM element named `asDesc`, extracts its text, prepends "Hello World" to the existing text content and sets the font color to red (`#ff0000`). When this extension is loaded and run by Muse then the IBM Connections Homepage is modified in the manner shown in Figure 2 as follows:

Figure 2 Hello World Extension for IBM Connections Homepage



The code injection can be seen by viewing the source of the IBM Connections Hompage in the browwswer and scrolling to the bottom. The following tag fragment should be evident (the '`/files/muse-static/`' prefix in the `src` attribute can be ignored as this is an internal reference):

```
<script type='text/javascript' src='/files/muse-
static/helloWorld/helloWorld.user.js'> </script>
```

TIP: IBM Connections web pages contain a lot of predefined JS variables which can be leveraged by Muse extensions. For instance, there is an `lconn` (**L**otus **Conn**ections) object with many properties defined that any extension script can exploit. Thus on Line #33, replacing **`"Hello World: "`** with **`"Hello " + lconn.homepage.userName + " "`** would dynamically address the current user by name. The `lconn` object and others like it should be explored and leveraged by your extensions.

Other Samples

Besides Hello World, there are a number of other Muse examples to be found in the samples folder of the muse-pilot repository, as described below. Each sample has its own subfolder which contains the App Reg design definition (JSON file) and the resources to be injected to perform the customization (JavaScript, CSS).

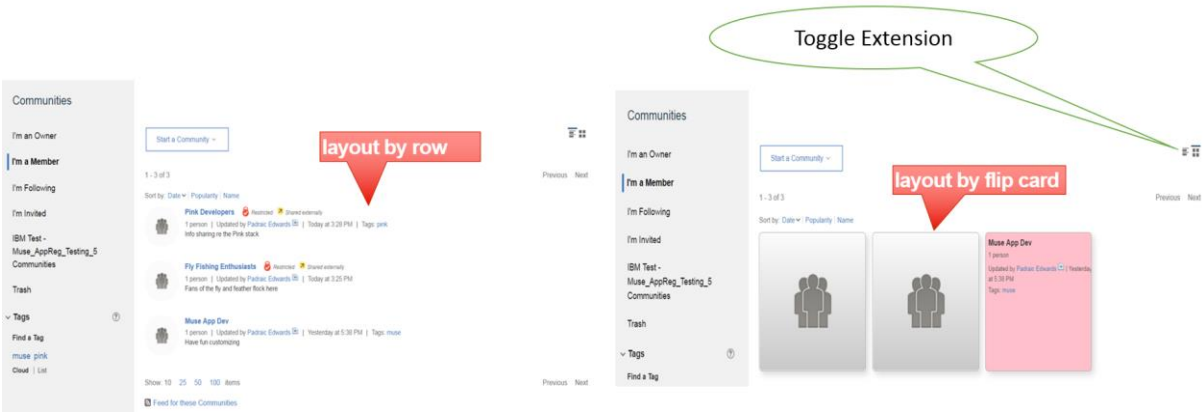
flipcards

This extension provides an alternative rendering for the Communities pages so that a user's communities can be displayed as flip cards rather than a table of rows. Figure 3 shows a list of three communities with the traditional row based rendering on the left hand side juxtaposed with the flip card layout on the right. Each flip card displays the Communities logo until the user hovers over it whereupon the card is flipped to display the details of the community in question.

The `flipCard.json` file follows the standard App Reg pattern explained already with the Hello World example. The JavaScript file `commListCardsFlipStyle.user.js` uses the sample Dojo wrapper to envelope the customization but the code itself is significantly more advanced and serves to give a more real-world indication of the art-of-the-possible with Muse extensions.

Look for the Toggle Extension control on the Communities page when this customization is applied. Clicking the button allows the user to switch back and forth between the standard row layout and the flip card format.

Figure 3 Communities Page before and after Flipcard Customization



newsRiver

This extension targets the IBM Connections Homepage and reformats the layout of the activity stream updates by accentuating the space surrounding each entry. Figure 4 shows the Homepage when the newsRiver customization is run – note how the entries display as sections against a pink backdrop. Notice that the Hello World extension is also applied to the Homepage? This shows how multiple App Reg extensions can target the same IBM Connections path - viewing the source of the page will show two JavaScript file injections in this case.

profiles

The Profiles extension delivers a more sophisticated rendering to the page that is displayed when the user selects the "My Profile" dropdown menu option in IBM Connections. The new UI look and feel is achieved via stylesheet updates. There are two files in the `profiles` subfolder - the JS file

`profilesCustomization.js` simply inserts a link to the `profilesCustomization.css` file which does all the work. The new look Profiles page is shown in Figure 5.

Figure 4 Multiple Extensions for IBM Connections Homepage

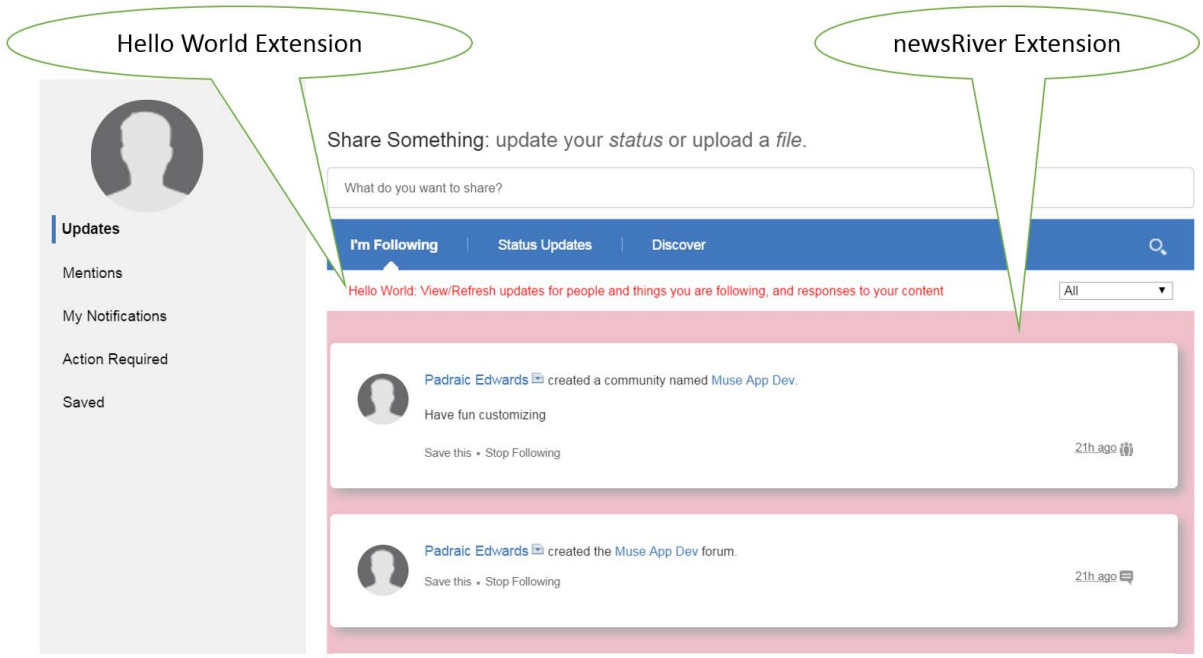
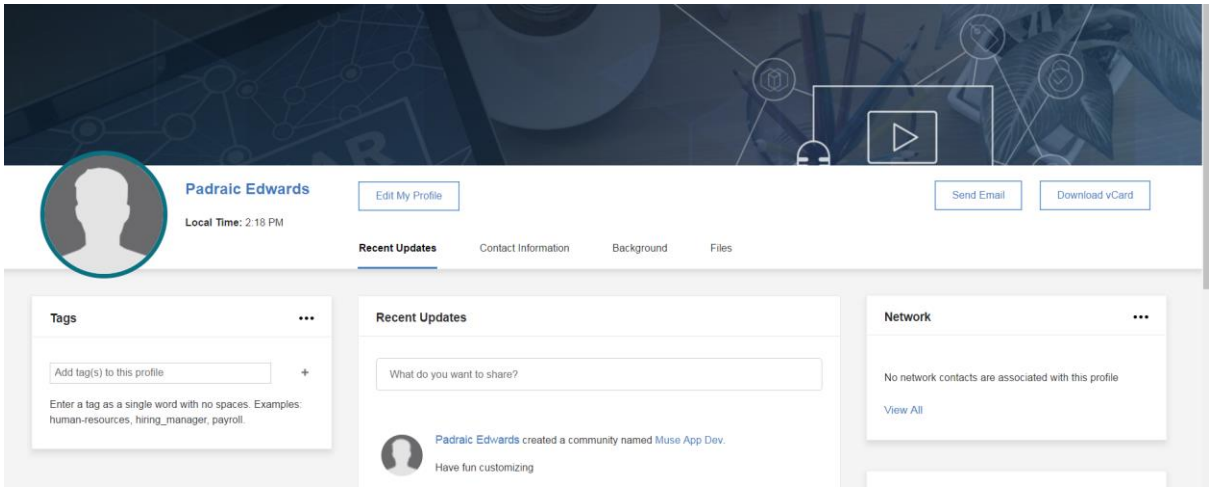


Figure 5 Profile Page Extension



Note the inclusion of a new page header graphic, the relocation of action buttons and so forth.

Getting Up and Running

The include files associated with all of the samples discussed in this document are automatically provisioned to each organization when it becomes Muse-enabled on IBM Connections Cloud. This means that the samples can be used immediately by simply importing the relevant JSON file into the organization's Application Registry. So for example, to validate that your organization is Muse-enabled you could import the `helloWorld.json` file into App Reg as follows:

- Make a local copy of the `helloWorld.json` file
- As org admin user, go to **Admin > Manage Organization > Organization Extensions**
- Click **Add** > **Choose File** on the "**upload an extension from a JSON file"** radio button option
- Select your local copy of the `helloWorld.json`
- Click **Enable Editing**
- Insert a match criterion like the one in Listing 6 so that the extension is only applied to you
    - i.e. match to **your** user-name, e-mail address or user id
- Click **Add** to save the application in App Reg
- Refresh the IBM Connections Homepage and verify that the Hello World extension appears

If this is successful then you have validated that Muse is properly enabled for your organization by applying a customization that is visible only to you and not all other users. If the customization does not appear then you should report the issue by sending a mail to `ibmcndev@us.ibm.com`.

You can experiment with the other samples in a similar way. In reviewing the include files you may have noticed that some samples use a JavaScript filename notation that follows the GreaseMonkey naming convention: `somename.user.js`. This is because these customizations were originally developed as GreaseMonkey scripts using browser-based extensions. They were then deployed on the server-side in IBM Connections as Muse extensions. This option is still valid – i.e. create some new extensions via GreaseMonkey and once you are happy with the customization then you can submit it to IBM for review as a Muse include file and invoke it via an Application Registry app once the submission is accepted.