How to Create an IBM Cloud Function

This document will serve as a guide on creating a Cloud Function in IBM Cloud - using the work done on the Audio Acquisition workflow, including examples from that work to help illustrate the steps where needed. While Cloud Functions can be created in virtually any language - this document will include a focus on aspects that need to be considered which are specific to the Go language.

The basic steps involved in creating a cloud function include:

Creating A Namespace

A namespace is required for all cloud functions. The namespace serves to qualify the name of the cloud function and access to that namespace is required in order to create or update the cloud functions and their associated packages. The namespace is tied to the resource group - so permissions are controlled via that mechanism. The current setup requires access to be requested to be able to both create a namespace as well as work with existing namespaces. If you do not have the proper access - you will get errors if you try to create a namespace and you will not be able to see any existing namespaces. If you are not able to see the namespace then you will be prevented from creating a cloud function or its package.

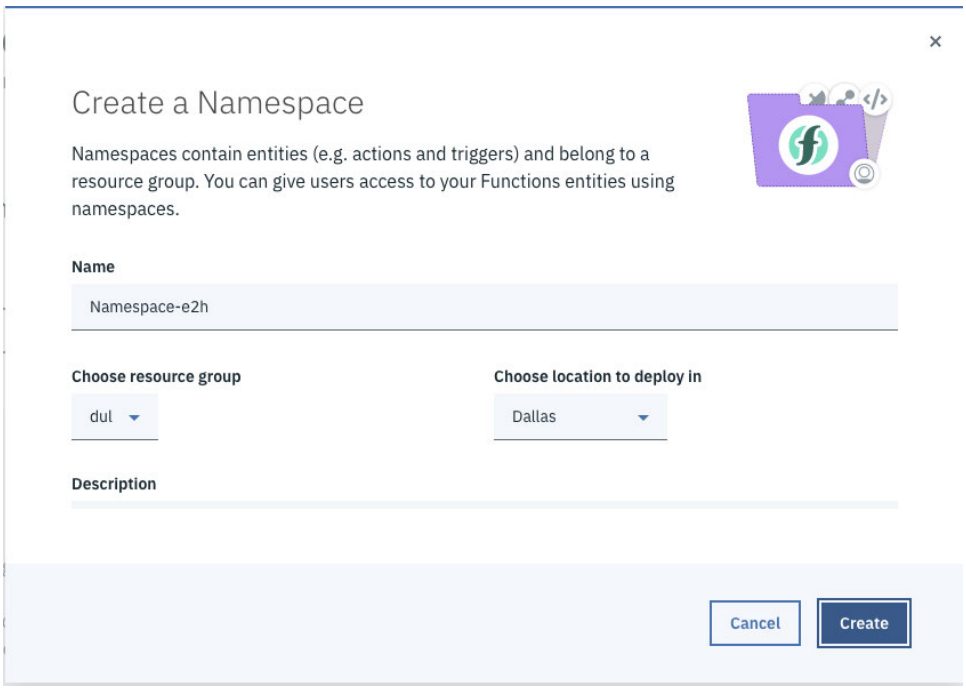
Most objects in IBM Cloud can be managed by Terraform. However, at present it does not seem that Terraform supports creation / maintenance of a Cloud Function Namespace. You can use the IBM Cloud CLI or the IBM Cloud Console to create a namespace. The easiest method is probably to use the IBM Cloud Console - but both ways will be shown below.

Creating A Namespace Using The IBM Cloud Console

Perform the following steps to create a namespace:

- Log on to the IBM Cloud console - https://cloud.ibm.com
- Make sure you are signed in using credentials that have the ability to create a namespace. Also make sure that you are selected to the right account by checking the drop-down that is in the upper right of the web-page once you have logged in.
- Click on the hamburger menu in the top left portion of the page and select "Functions" from the drop-down menu.
- If you don't already have at least one namespace created - you will be taken to a page that prompts you to create a namespace. If you have namespaces already created - then you will notice a drop-down in the top right of the page that lists those existing namespaces and a selection at the bottom to create a new one.
- You do not necessarily need to create a new namespace if one already exists unless you just want to isolate sets of cloud functions from each other. For example - all of the cloud functions that we are creating for the Audio Acquisition workflow are contained in the WLC-Audio-Acquisition workspace. More specifically - you do not need to create separate workspaces for development vs production - that can be accomplished with packages (see below on creating packages).
- To create a new namespace - click on the appropriate selection depending on whether this is the first or a subsequent namespace within your account.

- The screen to create a new namespace should look something like this:



- Give it a name that makes sense for its purpose and choose the appropriate resource group and location.

  Note: There are current limitations on the locations that support COS events for triggering Cloud Functions - so make sure you create the namespace in a location that supports those events if you will need to use that kind of triggering in your cloud function.
- Click on the Create button to create your namespace. Once created - you should now see it in the drop-down list in the upper right portion of the page.

Creating a Namespace Using The IBM Cloud CLI

In order to perform these steps you will need to make sure that you have downloaded and installed the IBM Cloud CLI, including the Cloud Function plug-in. For instructions on how to do this - see https://cloud.ibm.com/functions/learn/cli. Also more detailed documentation can be found here: https://cloud. bm. com/docs/openwhisk?topic=cloud-functions-cli_install.

These steps assume you have logged into the IBM Cloud CLI and have targeted the proper account, region and resource group. To verify that this is the case you can issue the following command to get a display of your current login session properties:

```
ibmcloud target
```

Once you have verified you are logged in and configured properly for the right account, region and resource group, you can use the following command to list any current namespaces:

```
ibmcloud fn namespace list
```

That should display something similar to what is shown below if you have existing namespaces configured:

```
[redacted]

name                  type           id                                     description
[redacted]  [redacted]  [redacted]  [redacted]
acquisition fx's for training and test sets
[redacted]  [redacted]  [redacted]
```

Once you have confirmed that the namespace you want to create does not already exist - perform the following command:

```
ibmcloud fn namespace create NAMESPACE_NAME  --description "SHORT DESCRIPTION OF NAMESPACE"
```

For example to create the namespace shown in the previous list example for the Audio Acquisition workflow - you would enter the following:

```
ibmcloud fn namespace create WLC-Audio-Acquisition --description "Namespace for all WLC Audio acquisition fx's
for training and test sets"
```

Once you enter the above command you should get a confirmation that the namespace was created successfully. Possible errors include insufficient access rights to create a namespace or poss ble duplicate names if that namespace name already exists.

More Information

For more information on namespaces, how to manage them and what they are used for - see https://cloud.ibm.com/docs/openwhisk?topic=cloud-functions-namespaces

Creating A Package

A package is required to further qualify the name of a given cloud function. Packages can be useful to group cloud functions according to the environment that they are targeting. For example you might create a package for your development environment and then another for QA and then perhaps another for production. The same cloud function name can be created and is a separate instance for each package that it is deployed to. The fully qualified path to a given cloud function instance is:

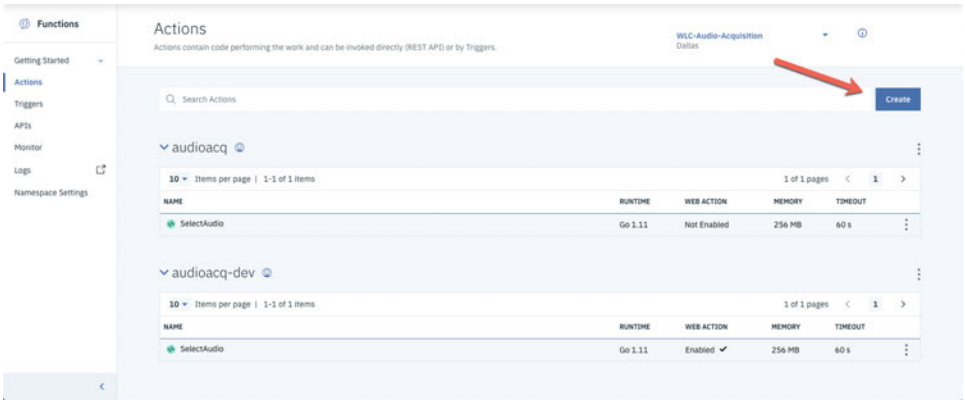
```
/<namespace_ID>/<package_name>/<entity_name>
```

Packages can be created a number of different ways. Like with namespaces, packages can be created as part of the process when you choose to create a new Cloud Function in the IBM Cloud Console. If you prefer, you can also manage packages via either the IBM Cloud CLI or through Terraform. The documentation below shows you how to create a package as part of creating a Cloud Function within the IBM Console, as well as creating one via the IBM Cloud CLI.

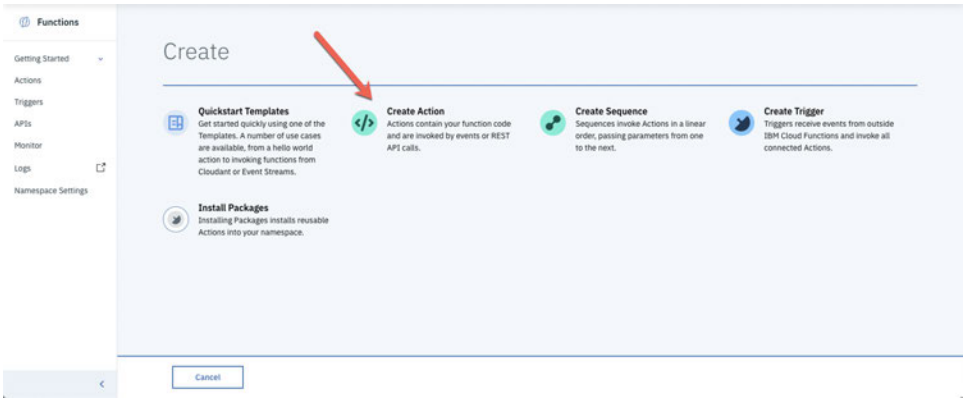
Creating A Package Using The IBM Cloud Console

To create a package using the IBM Cloud Console, perform the following steps:

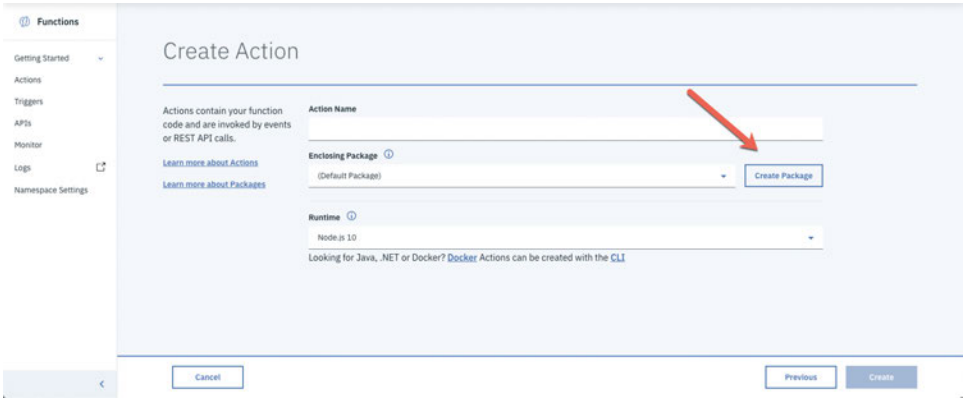
- Log on to the IBM Cloud console - https://cloud.ibm.com
- Make sure you are signed in using credentials that have the ability to create a namespace. Also make sure that you are selected to the right account by checking the drop-down that is in the upper right of the web-page once you have logged in.
- Click on the hamburger menu in the top left portion of the page and select "Functions" from the drop-down menu.
- Select the namespace to use for this function from the drop-down menu of namespaces in the upper right corner of the page.
- Click on the Actions link in the left-hand navigation menu.
- Click on the Create button on the top right of the page - as shown below:



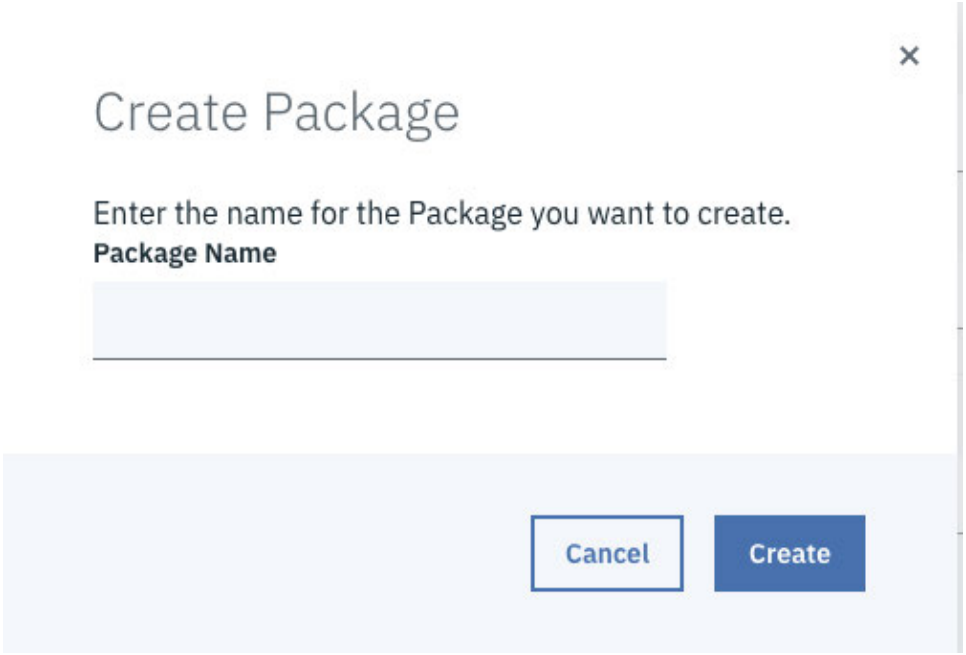
- Once you click on Create - you will be taken to a second screen where you need to click on the Create Action link shown below:



- That will display the Create Action page - where by default the Enclosing Package drop-down is set to (Default Package). Instead of accepting that default you can click on the Create Package button next to that drop-down field as shown below:



- Once you click on the Create Package button you see the following pop-up displayed where you can enter your package name:



- Specify the name you want for the package and click Create to create a new package with that name. If you are using packages to separate your deployments into separate environments - you may want to include the environment designation as part of that name to make it obvious as to its purpose.
- Once you create the package as shown above it will be available to choose from when you create a new Cloud Function.

Creating A Package Using the IBM Cloud CLI

These steps assume you have logged into the IBM Cloud CLI and have targeted the proper account, region and resource group.

To create a new package you may want to first list any existing packages to make sure the package you want to create doesn't already exist. To list the existing packages, run the following command:

```
ibmcloud fn package list
```

You should see something like the example shown below if you already have at least one package created in any namespace within the designated resource group:

```
[redacted]

packages
[redacted]                                                    private
```

Note that the package name is qualified with the namespace identifier - you can see this GUID if you click on the namespace settings for a given namespace within the IBM Cloud Console.

To create a new package you would run the following command:

```
ibmcloud fn package create PACKAGE_NAME
```

For example to create the package shown in the example package list above - you would enter the following command:

```
ibmcloud fn package create audioacq-dev
```

Once you enter the above command you should get a confirmation that the namespace was created successfully. Possible errors include insufficient access rights to create a package or possible duplicate names if that package name already exists.

Creating The Cloud Function

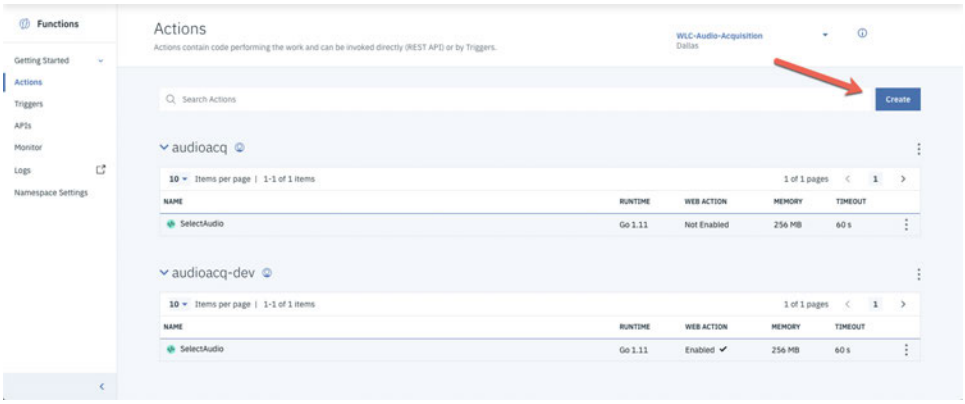
Once you have created the namespace and the package for your Cloud Function you can create any number of Cloud Functions within that namespace and package. As with Namespaces and Packages, you can create a Cloud Function in a number of different ways - including with the IBM Cloud Console, the IBM Cloud CLI or with Terraform.

The following two sections describe how to create a new Cloud Function with both the IBM Console and the IBM Cloud CLI.

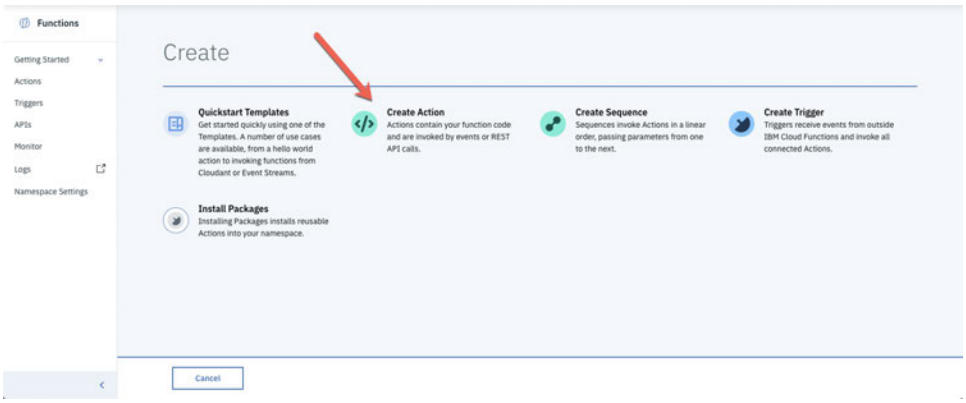
Creating A Cloud Function Using The IBM Cloud Console

To create a Cloud Function with the IBM Cloud Console, perform the following steps:

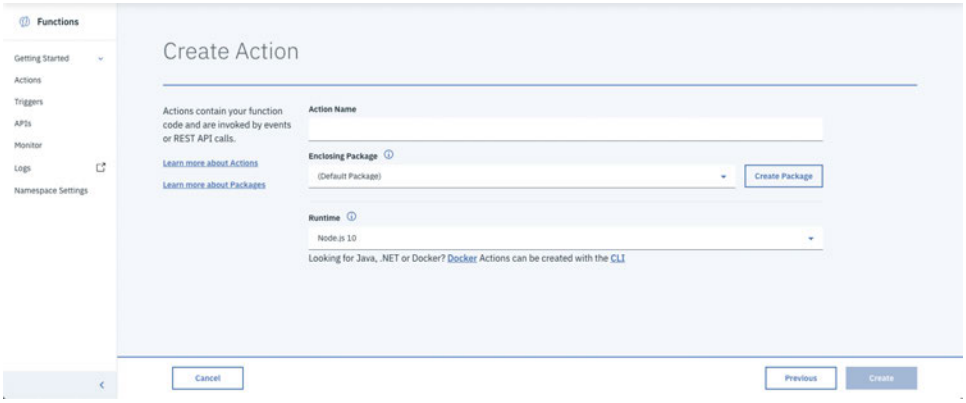
- Log on to the IBM Cloud console - https://cloud.ibm.com
- Make sure you are signed in using credentials that have the ability to create a namespace. Also make sure that you are selected to the right account by checking the drop-down that is in the upper right of the web-page once you have logged in.
- Click on the hamburger menu in the top left portion of the page and select "Functions" from the drop-down menu.
- Select the namespace to use for this function from the drop-down menu of namespaces in the upper right corner of the page.
- Click on the Actions link in the left-hand navigation menu.
- Click on the Create button on the top right of the page - as shown below:



- Once you click on Create - you will be taken to a second screen where you need to click on the Create Action link shown below:



- That will display the Create Action page - where by default the Enclosing Package drop-down is set to (Default Package).



- Instead of accepting that default you can click on the drop-down menu and choose the appropriate package name for this function.
- You should enter a suitable name in the Action Name entry field and choose the appropriate Runtime for your function. For all of the Audio Acquisition functions we are using Go 1.11. Unfortunately no later versions of Go are currently supported.
- Once you have made the appropriate selections and entered a name for this new function, click on the Create to create your new Cloud Function.

Creating A Cloud Function Using The IBM Cloud CLI

These steps assume you have logged into the IBM Cloud CLI and have targeted the proper account, region and resource group.

To create a new cloud function you may want to first list any existing cloud functions to make sure the function you want to create doesn't already exist. To list the existing functions, run the following command:

```
ibmcloud fn action list
```

If you have some cloud functions already defined you will see something like the following:

```
[redacted]
Entities in namespace: default
actions
[redacted]
```

The fully qualified name that you see in the above example consists of the namespace/package/action. That fully qualifies an action. When you create an action - the namespace will default to the one that you have currently targeted, and is optional if you want to create the function in that current default namespace. If you want to ensure that the function gets created in a certain namespace - use the GUID for that namespace as shown in the above example as the first component of the name.

In order to create a cloud function from the command line - you need to first have created and packaged your function code. For Go functions of any complexity (e.g. multiple go files, external package dependencies) that requires certain considerations be accounted for in your project setup - as well as in how you turn that code into a binary zip file that is deployable as a Cloud Function. See the sections below for more details on this. For now - assume that you have gone through those steps and have created a Go Cloud Function .zip file ready to be created/deployed for the first time.

To create a new cloud function, run one of the following commands, depending on whether you need to specify the namespace explicitly or want to accept the default namespace:

```
ibmcloud fn action create PACKAGE_NAME/FUNCTION_NAME gocloudfx.zip --kind go:1.11

or

ibmcloud fn action create NAMESPACE_GUID/PACKAGE_NAME/FUNCTION_NAME gocloudfx.zip --kind go:1.11
```

In the example commands above - you would replace the values in all caps with the specifics for your environment and desired name for your function. The gocloudfx.zip is the assumed Go cloud function zip file that you have created and want to deploy for the first time. Note that the final flag '--kind go:1.11' is required to define to IBM Cloud what kind of code is contained in your Cloud Function zip file.

You should get a positive response indicating that the new action was created successfully. Poss ble errors include insufficient access rights to create a function or possible duplicate names if that function name already exists.

Note that there are a number of other flags that you might find useful to specify beyond that shown above. To get a complete list of those flags - you can enter the following command:

```
ibmcloud fn action create --help
```

Building And Testing The Cloud Function

You can create a Cloud Function in a number of different languages. You can even provide your function in a custom Docker container. Packaging considerations vary depending on the language that you choose for your Cloud Function. For the purposes of this documentation, it is assumed that you are creating your function with the Go language. If you choose to create your function in a different language - you will need to consult the following documentation link to review the specific considerations for packaging your function prior to creating it or updating it using the IBM Cloud CLI:

https://cloud.ibm.com/docs/openwhisk?topic=cloud-functions-prep#prep_js

The specifics for a Go language application are covered starting here within that document:

https://cloud.ibm.com/docs/openwhisk?topic=cloud-functions-prep#prep_go

Binding Parameters

You can bind parameters to both a package and an action. Parameters that are bound to the package are visible to all functions in the package. Parameters bound to a single function are visible only to that function. Parameters which are bound to a package can be over-ridden at the function level.

You can bind parameters to a package via the IBM Cloud CLI. You can bind parameters to a function (as well as override existing package level parameters) using both the IBM Cloud Console as well as the IBM Cloud CLI.

Binding Parameters To A Package

These steps assume you have logged into the IBM Cloud CLI and have targeted the proper account, region and resource group.

To bind parameters to a package you first need to determine the package name that you need to update. See the directions above to see how to get a list of your current packages. Once you have determined the package name to update, you perform the following command:

```
ibmcloud fn package update PACKAGE_NAME --param <<key>> <<value>>
```

Warning! In the above syntax, if you have more than one parameter value to set - you must specify additional --param <<key>> <<value>> sets for each param - all on a single command line. If you try to run multiple update commands with just a single --param per command - you will find that only your last command will be in effect as each of these update statements replaces all of the existing params with those specified for the current command - they are not additive! As is often the case if you need to specify a JSON string as a parameter value - you will need to enclose the value in quotes and escape the quotes around the JSON key, value within the param string. For example - see the following:

```
[redacted]
```

This command updates the package named audioacq-arena with 2 params with the following values:

Key	Value
cos_bucket	wlc-audio-ingest-arena
rev_credentials	[redacted]

To confirm that you have successfully set the parameter values on the package - you can run the following command:

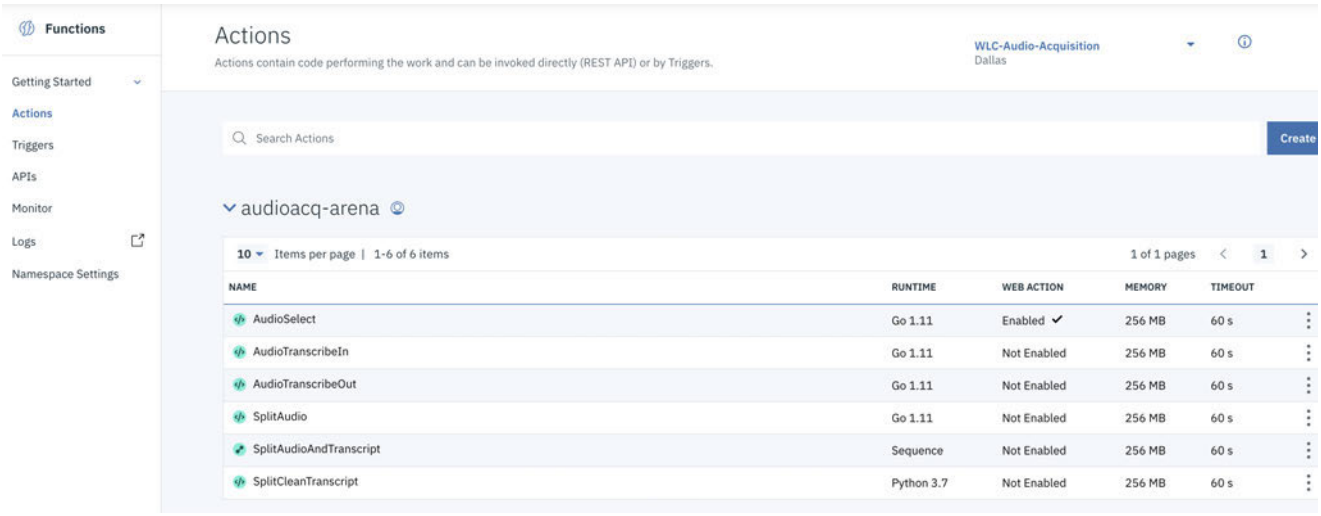
```
ibmcloud fn package get PACKAGE_NAME
```

Running the above will return details about the package in JSON format - including a section that shows the array of parameters that have been set.

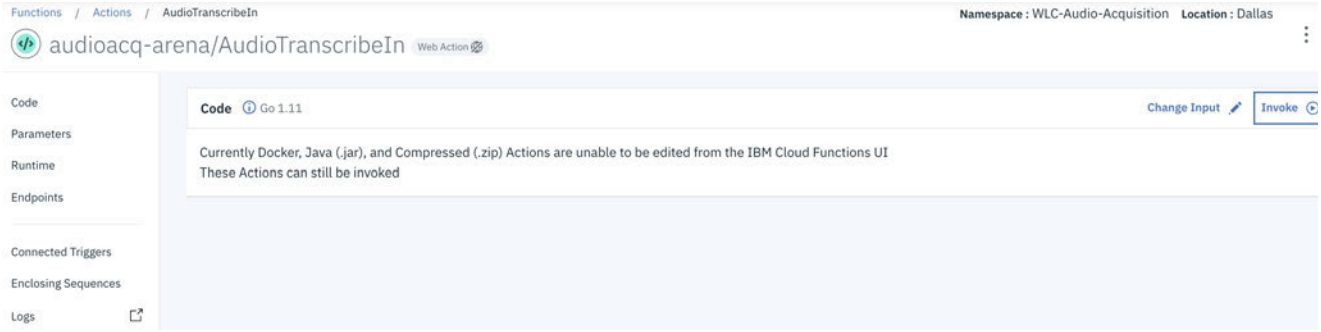
Binding Parameters To A Function

To bind parameters to a function - you can do so either via the IBM Cloud Console or via the IBM Cloud CLI. To bind parameters to a function the syntax of the command is exactly the same as for a package - with the exception that you substitute the word "action" in place of "package". Otherwise, the syntax is the same as that shown in the instructions above for binding parameters to a package and will not be repeated here. To bind parameters to a given function using the IBM Cloud Console, perform the following steps:

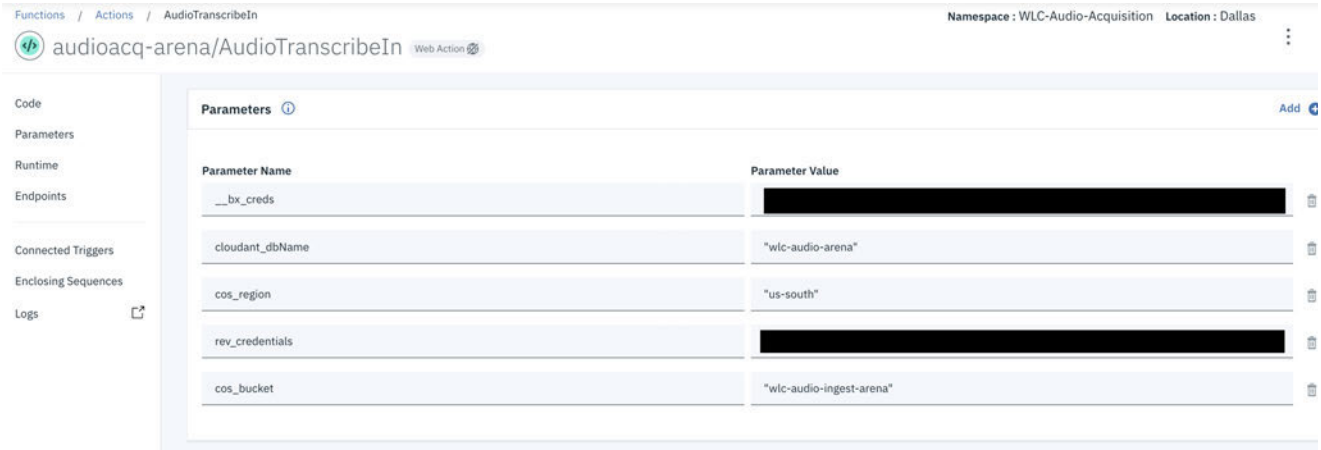
- Log on to the IBM Cloud console - https://cloud.ibm.com
- Make sure you are signed in using credentials that have the ability to create a namespace. Also, make sure that you are selected to the right account by checking the drop-down that is in the upper right of the web-page once you have logged in.
- Click on the hamburger menu in the top left portion of the page and select "Functions" from the drop-down menu.
- Select the namespace that contains the function you want to update from the drop-down menu of namespaces in the upper right corner of the page.
- Click on the Actions link in the left-hand navigation menu.
- Once you do that - you should see a list of your existing functions - similar to the example screenshot below:



- Click on the text name link of the function that you want to update. Once you do that you should see a screen similar to the example screenshot below:



- Click on the "Parameters" navigation link to get to the panel where you can update the parameters for this cloud function. Once you do that you will see a screen similar to the example screenshot below:



- Depending on whether you have ever added any parameters to this function before, you may or may not see any parameters listed. The above screen shows that this function has 5 parameters already defined. Note that parameters that were defined at the package level for this function will also be shown in this list. You can add a new parameter by clicking on the Add link in the upper right portion of this panel as shown above. This will add a new line after the last parameter in the list where you can type the parameter name or key and in the second field the parameter value. Click on the Save button to save your new parameter definition.
- If you need to delete a given parameter - click on the trashcan icon at the far right column for the parameter that you want to delete.

- If you need to override a value that was supplied from the package level - you can type in the new value and then click on the Save button to save the update.