Quick Lab: No Infrastructure, Just Code. See the Simplicity of Serverless

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IBM Cloud

No Infrastructure, Just Code: See the Simplicity of Serverless

Introduction

This lab walks you through the steps required to create, build and run a Serverless application using IBM Cloud Functions.

Serverless computing refers to a model where the existence of servers is entirely abstracted away. I.e. that even though servers still exist, developers are relieved from the need to care about their operation. They are relieved from the need to worry about low-level infrastructural and operational details such as scalability, high-availability, infrastructure-security, and so forth. Hence, serverless computing is essentially about reducing maintenance efforts to allow developers to quickly focus on developing value-adding code.

Serverless computing simplifies developing cloud-native applications, especially microservice-oriented solutions that decompose complex applications into small and independent modules that can be easily exchanged.

Serverless computing does not refer to a specific technology; instead if refers to the concepts underlying the model described prior. Nevertheless some promising solutions have recently emerged easing development approaches that follow the serverless model – such as OpenWhisk.

IBM Cloud Functions is a Function-as-a-Service (FaaS) platform on IBM Cloud, built using the Apache OpenWhisk open source project, that allows you to execute code in response to an event.

It provides you with the previously mentioned serverless deployment and operations model, with a granular pricing model at any scale that provides you with exactly the resources – not more not less – you need and only charges you for code really running. It offers a flexible programming model. incl. support for languages like JavaScript, Swift, Python, and Java and even for the execution of custom logic via Docker containers. This allows small agile teams to reuse existing skills and to develop in a fit-for-purpose fashion. It also provides you with tools to declaratively chain together the building blocks you have developed. It is open and can run anywhere to avoid and kind of vendor lock-in.

In summary, IBM Cloud Functions provides...

- ... a rich set of building blocks that they can easily glue/stitch together
- ... the ability to focus more on value-add business logic and less on low-level infrastructural and operational details

… the ability to easily chain together microservices to form workflows via composition

This Lab Requires:

1. An account with IBM Cloud.
    - You may use your existing account or create a new account (Section 2)

Setting Up

Before starting this lab, please do the following:

- Go to http://ibm.biz/startmylab

- Select **No Infrastructure, Just Code. See the Simplicity of Serverless** lab from the dropdown and click Ok
    - You will be brought to the sign up page to register for an IBM Cloud Platform account. If you do not have an account, please register for one.
    - This lab does not require you to have an IBM Cloud Platform account but it allows you to do some optional steps.
- Clone the project for this lab:
    - Click on the Launchpad (rocket logo) in the toolbar, search for “Terminal” and click on the icon.
    - Clone the GitHub project containing the FoodTracker application we are going to extend:

      ```
      git clone http://github.com/seabaylea/Serverless
      ```

      A copy of these instructions are available included in the project. You can open the instructions using:

      ```
      open “Serverless/ Serverless.pdf”
      ```

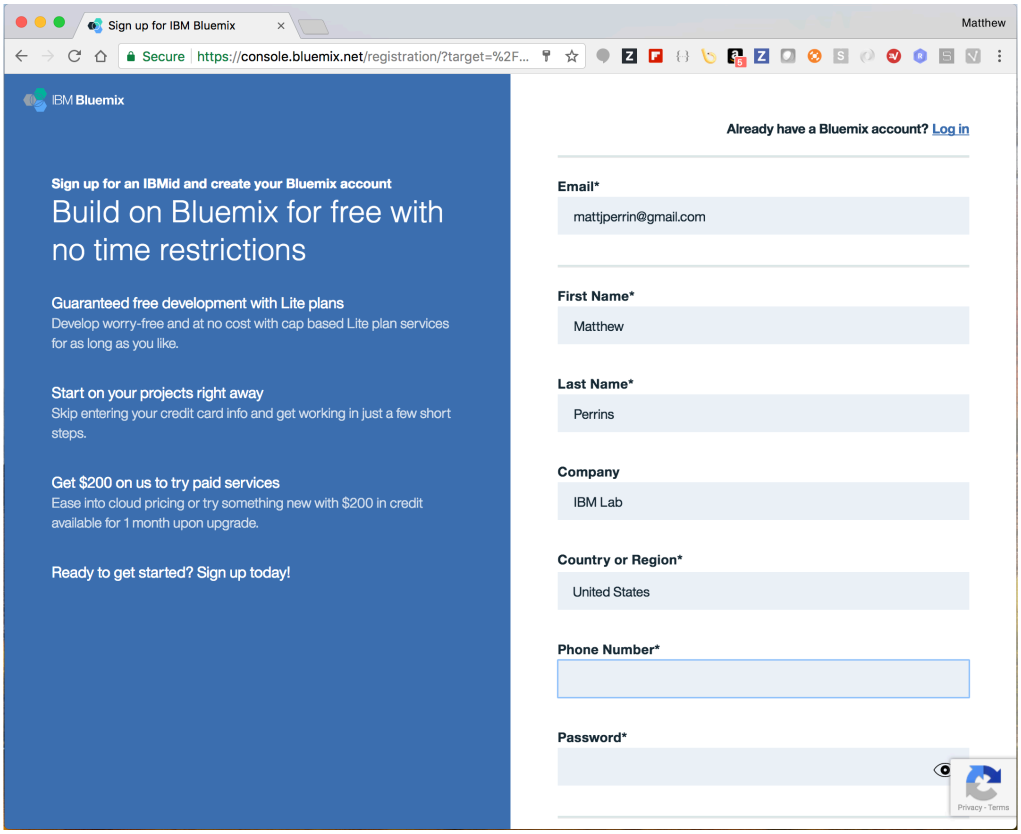
NEXT STEPS:
If you do not have an IBM Cloud account proceed to Section 2 (Create an Account)

If you do have an IBM Cloud account, proceed to section 3.

1. Create an IBM Cloud Account

If you **do** have an existing IBM Cloud account, skip to the next section.

1. To run these lab instructions, you will need to create a trial account on the IBM Cloud. You can do this free of charge and all the instructions contained in this lab do not incur any additional costs.
2. Create an IBM Cloud Trial account by navigating to this link. https://console.bluemix.net, and click on **Create a free Account.**
3. Complete the Registration Form with your details and a valid email address.



Already have a Bluemix account? Log in

Sign up for an IBMid and create your Bluemix account

Build on Bluemix for free with no time restrictions

Guaranteed free development with Lite plans
Develop worry-free and at no cost with cap based Lite plan services for as long as you like.

Start on your projects right away
Skip entering your credit card info and get working in just a few short steps.

Get $200 on us to try paid services
Ease into cloud pricing or try something new with $200 in credit available for 1 month upon upgrade.

Ready to get started? Sign up today!

Email*: mattjperrin@gmail.com

First Name*: Matthew

Last Name*: Perrins

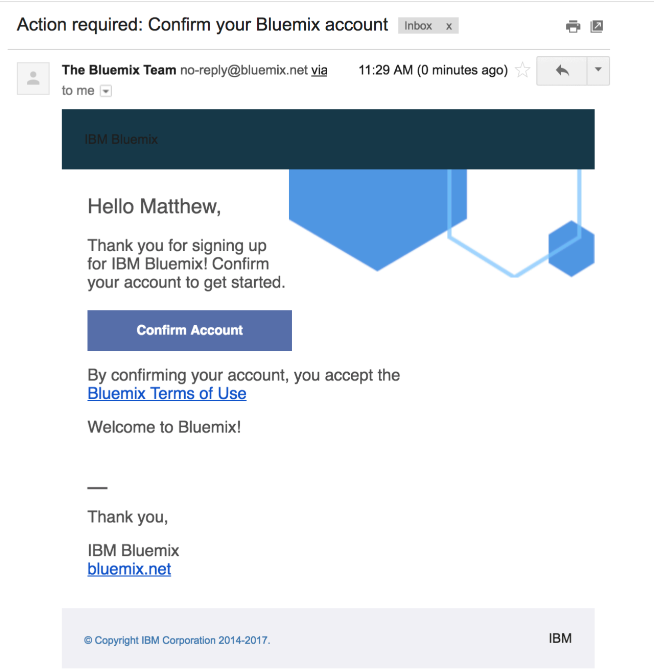
Company: IBM Lab

Country or Region*: United States

Phone Number*:

Password*:

4. Click on **Create Account.**
5. Confirm your registration by accessing your email and clicking on **Confirm Account.**



Action required: Confirm your Bluemix account

The Bluemix Team no-reply@bluemix.net via 11:29 AM (0 minutes ago)
to me

IBM Bluemix

Hello Matthew,

Thank you for signing up for IBM Bluemix! Confirm your account to get started.

Confirm Account

By confirming your account, you accept the Bluemix Terms of Use

Welcome to Bluemix!

—

Thank you,

IBM Bluemix
bluemix.net

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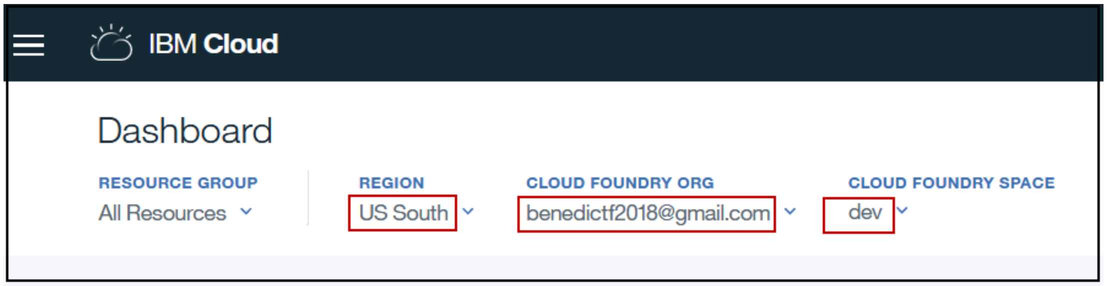
6. You can now log into IBM Cloud.
7. Click on **Login** and enter your email and password
8. You will finally see the Dashboard View, which will be empty as you have not created any services or apps at this point. Please note the **Region**, **Org** and **Space** settings.

   Typically this will be **US South**, the Org setting will be same as your email address and by default you are placed in a Space called **dev**, as shown below.



Dashboard

RESOURCE GROUP: All Resources
REGION: US South
CLOUD FOUNDRY ORG: benedictf2018@gmail.com
CLOUD FOUNDRY SPACE: dev

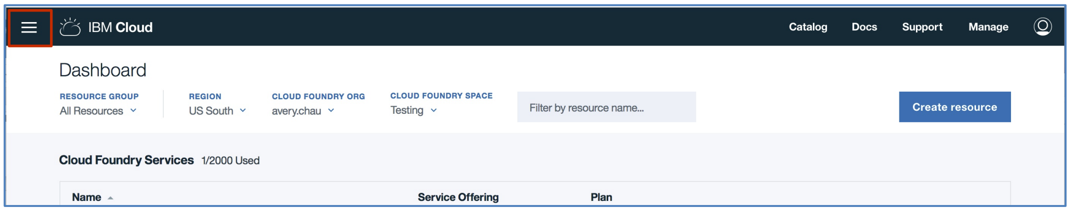
2. Create an Action in the Cloud Functions UI

There are two main options to get started with Cloud Functions. Both allow you to work with Cloud Function's basic entities by creating, updating, and deleting actions, triggers, rules and sequences.

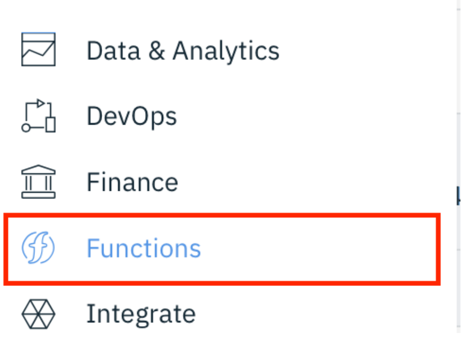
The CLI (command line interface) allows you to perform these basic operations from your shell. The IBM Cloud Functions UI (user interface), allows you to perform the same operations from your browser. During this lab we will use the UI to learn how to work with Cloud Functions.

1. Start by logging in to IBM Cloud: https://console.bluemix.net

   While logged into the IBM Cloud, click on the **Navigation** menu in the header:



   Then click on **Functions** to access the **IBM Cloud Functions** cloud-native development experience on IBM Cloud.



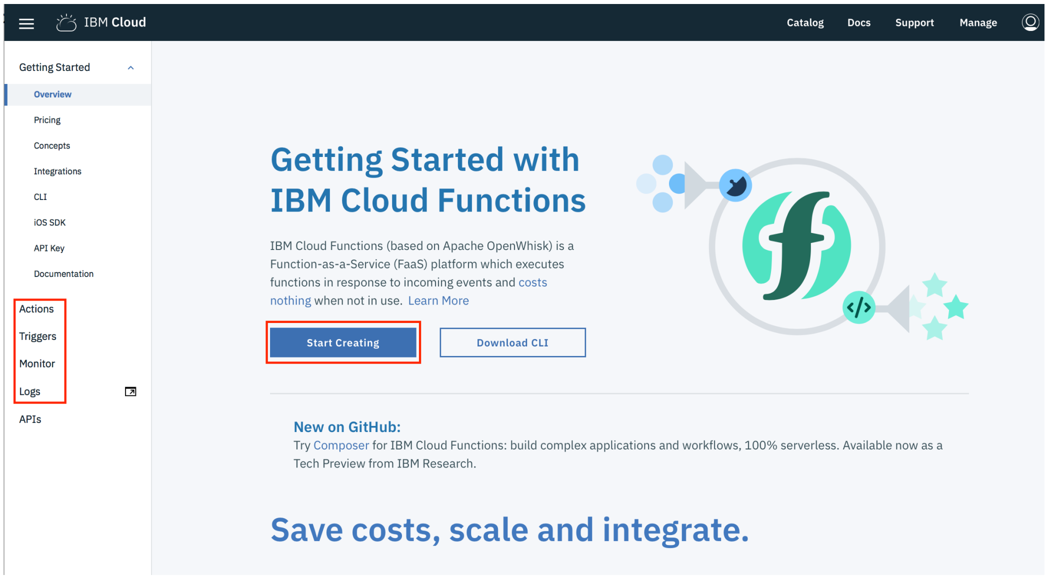
2. The Cloud Functions UI is comprised of the following sections in the left hand side menu bar(you will learn more about these basic entities like actions in the subsequent sections):

   a. Actions
      The Actions section lists all actions you have created prior.
      Clicking an action loads its code into the code editor.
      Hovering over an action lets a trash bin appear allowing to delete the action.

b. Triggers
The Triggers section lists all the triggers you have created prior.
Hovering over a trigger lets a flash icon appear allowing to fire the trigger as well as a trash bin allowing to delete the trigger.

c. Monitor
The Monitor section show you information about your actions and their activity, including an activity summary and timeline.

d. Logs
The Logs sections takes you to the IBM Cloud Logging service, which prvides you with the ability to collect, analyze and build dashboards for your logs.



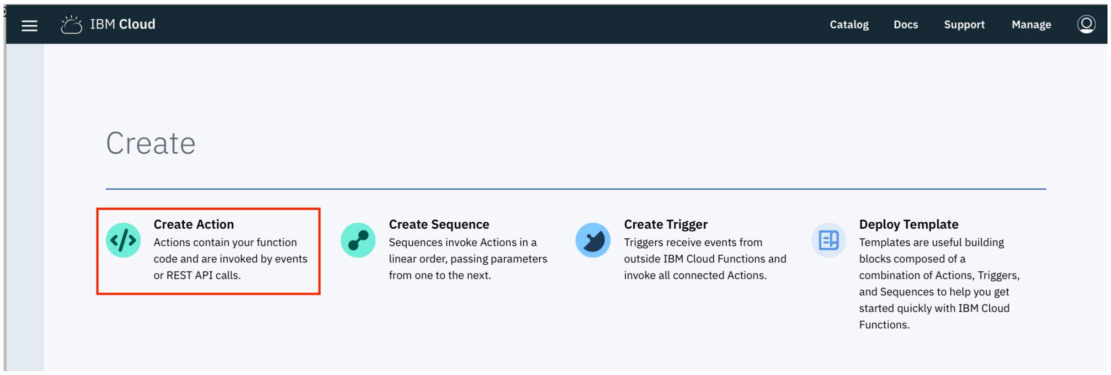
Getting Started with IBM Cloud Functions

IBM Cloud Functions (based on Apache OpenWhisk) is a Function-as-a-Service (FaaS) platform which executes functions in response to incoming events and costs nothing when not in use. Learn More

New on GitHub:
Try Composer for IBM Cloud Functions: build complex applications and workflows, 100% serverless. Available now as a Tech Preview from IBM Research.

Save costs, scale and integrate.

3. Start creating your first action by selecting the “Start Creating” button in the center of the UI, which opens the Create page. Start by selecting the “Create Action” option:



Create

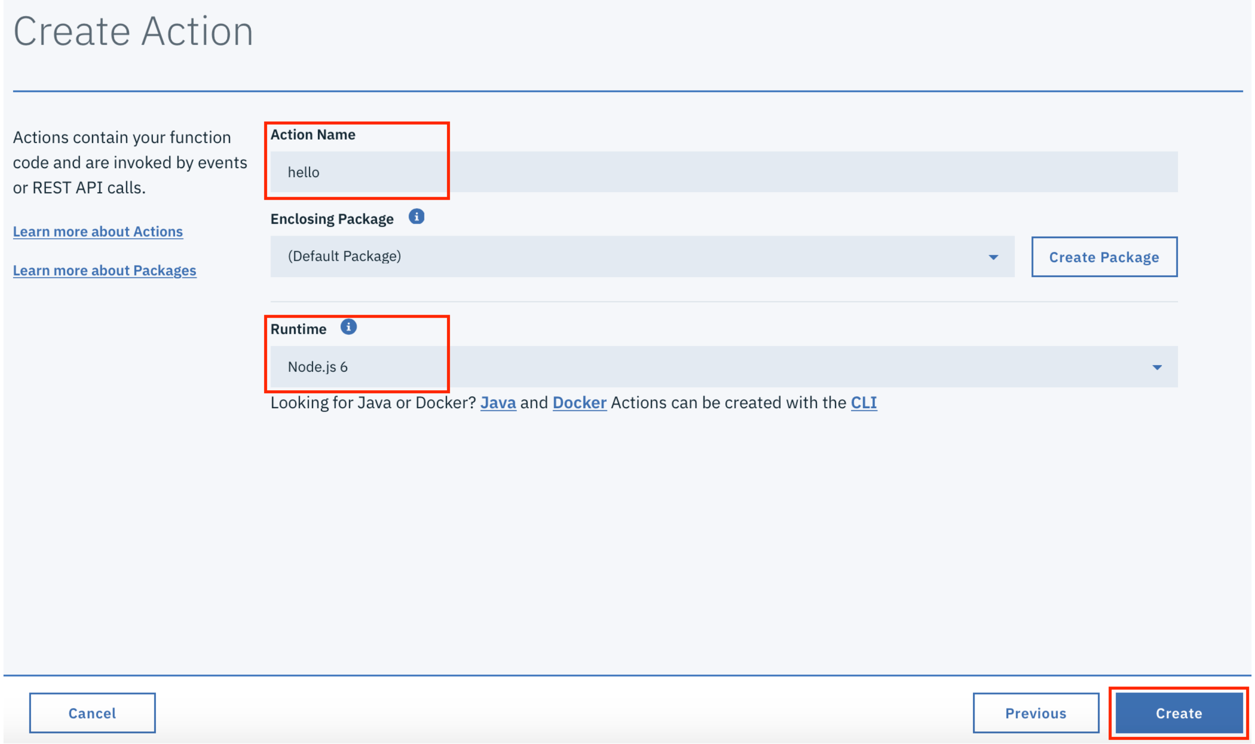
Create Action
Actions contain your function code and are invoked by events or REST API calls.

Create Sequence
Sequences invoke Actions in a linear order, passing parameters from one to the next.

Create Trigger
Triggers receive events from outside IBM Cloud Functions and invoke all connected Actions.

Deploy Template
Templates are useful building blocks composed of a combination of Actions, Triggers, and Sequences to help you get started quickly with IBM Cloud Functions.

Specify an Action Name (e.g. hello) by entering it into the text field, and select a Runtime of Node.js 6. Leave everything else as-is and click the Create Action button at the bottom of the screen.



Create Action

Actions contain your function code and are invoked by events or REST API calls.

Learn more about Actions

Learn more about Packages

Action Name: hello

Enclosing Package: (Default Package)

Runtime: Node.js 6

Looking for Java or Docker? Java and Docker Actions can be created with the CLI

This opens a cloud based code editor that you can use to create and extend your actions.

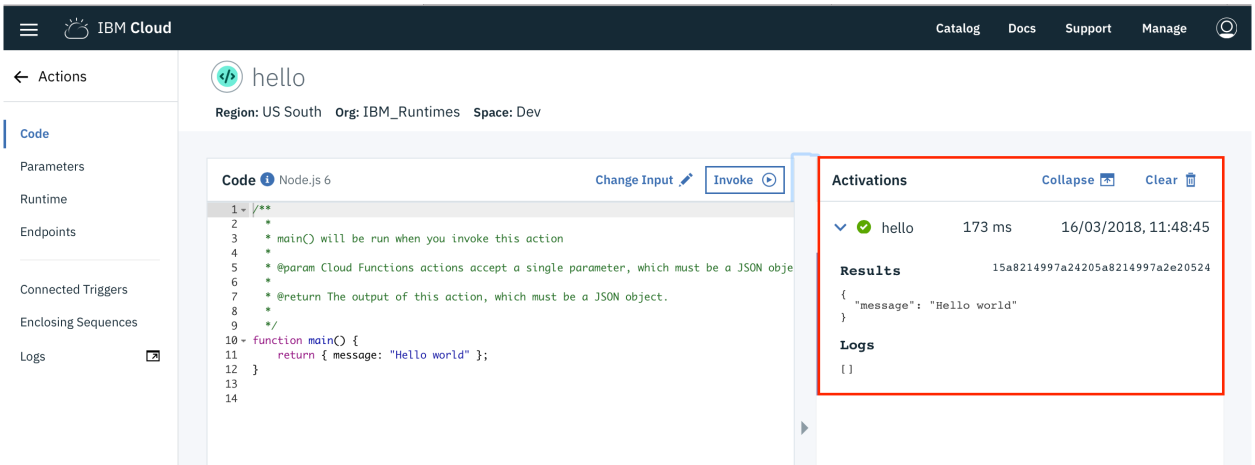
Copy the following code snippet into the code editor replacing any existing code:

```
function main() {
    return { message: "Hello world" };
}
```

Next click Save. This **Save** button will then we replaced with an Invoke button. Click the **Invoke** button t o test this action directly from within your browser.

This should provide a result directly in your browser:

```
{

  "message": "Hello world"

}
```



hello

Region: US South **Org:** IBM_Runtimes **Space:** Dev

Code Node.js 6

```
/**
  *
  * main() will be run when you invoke this action
  *
  * @param Cloud Functions actions accept a single parameter, which must be a JSON obje
  *
  * @return The output of this action, which must be a JSON object.
  *
  */
function main() {
    return { message: "Hello world" };
}
```

Activations

hello 173 ms 16/03/2018, 11:48:45

Results 15a8214997a24205a8214997a2e20524

```
{
  "message": "Hello world"
}
```

Logs

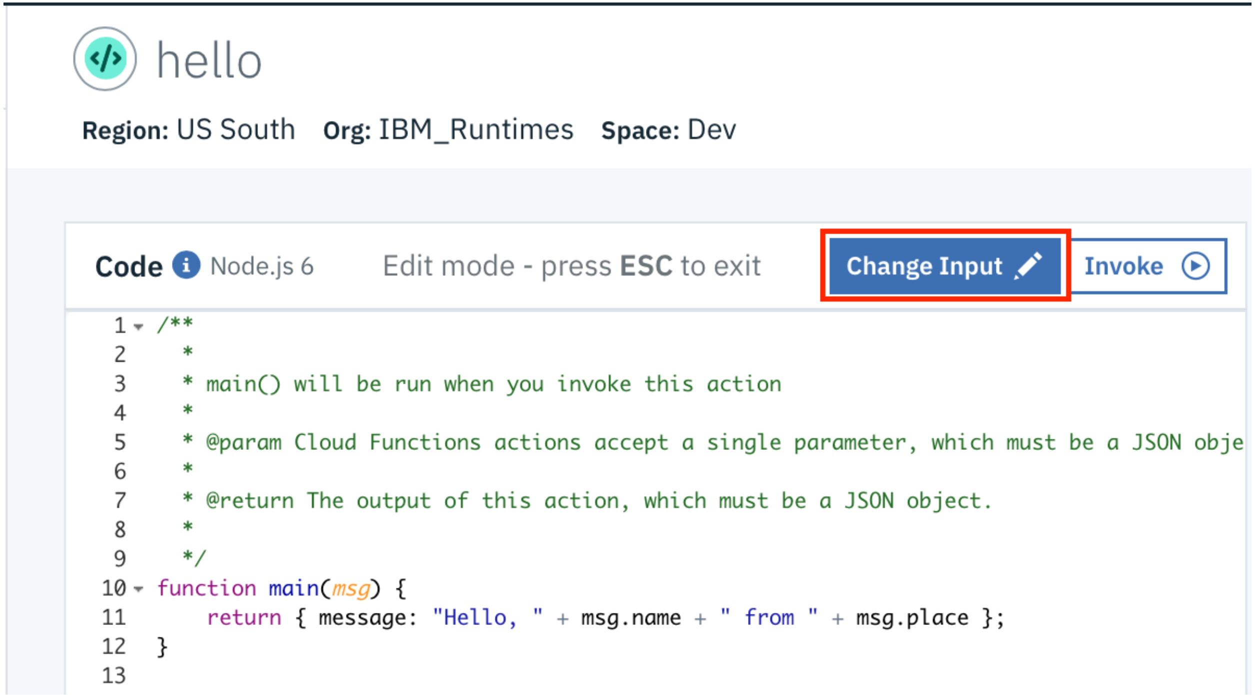
```
[]
```

Actions may also be invoked with a number of named *parameters*. To see how things work when working with an action accepting parameters update the action code to be the following:

```
function main(msg) {
    return { message: "Hello, " + msg.name + " from " + msg.place };
}
```

Once again, click the **Save** button to save the action.

As this action now requires some input parameters, we can add those before we run invoke the action. Click on the **Change Input** button:



hello

Region: US South **Org:** IBM_Runtimes **Space:** Dev

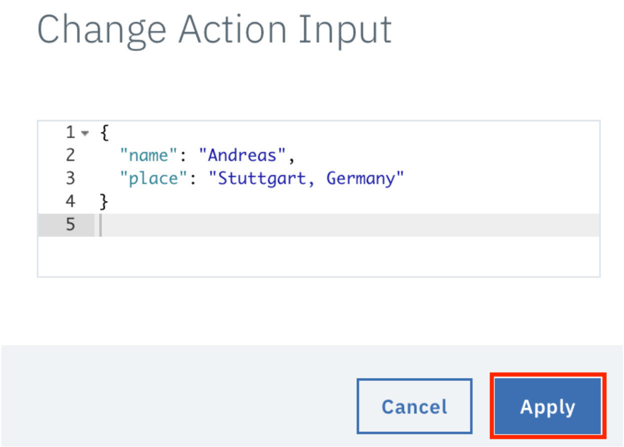
Code Node.js 6 Edit mode - press **ESC** to exit

```
/**
  *
  * main() will be run when you invoke this action
  *
  * @param Cloud Functions actions accept a single parameter, which must be a JSON obje
  *
  * @return The output of this action, which must be a JSON object.
  *
  */
function main(msg) {
    return { message: "Hello, " + msg.name + " from " + msg.place };
}

```

And add the following JSON data into the Change Action Input dialog box:

```
{
  "name": "Andreas",
  "place": "Stuttgart, Germany"
}
```

And click on the **Apply** button:

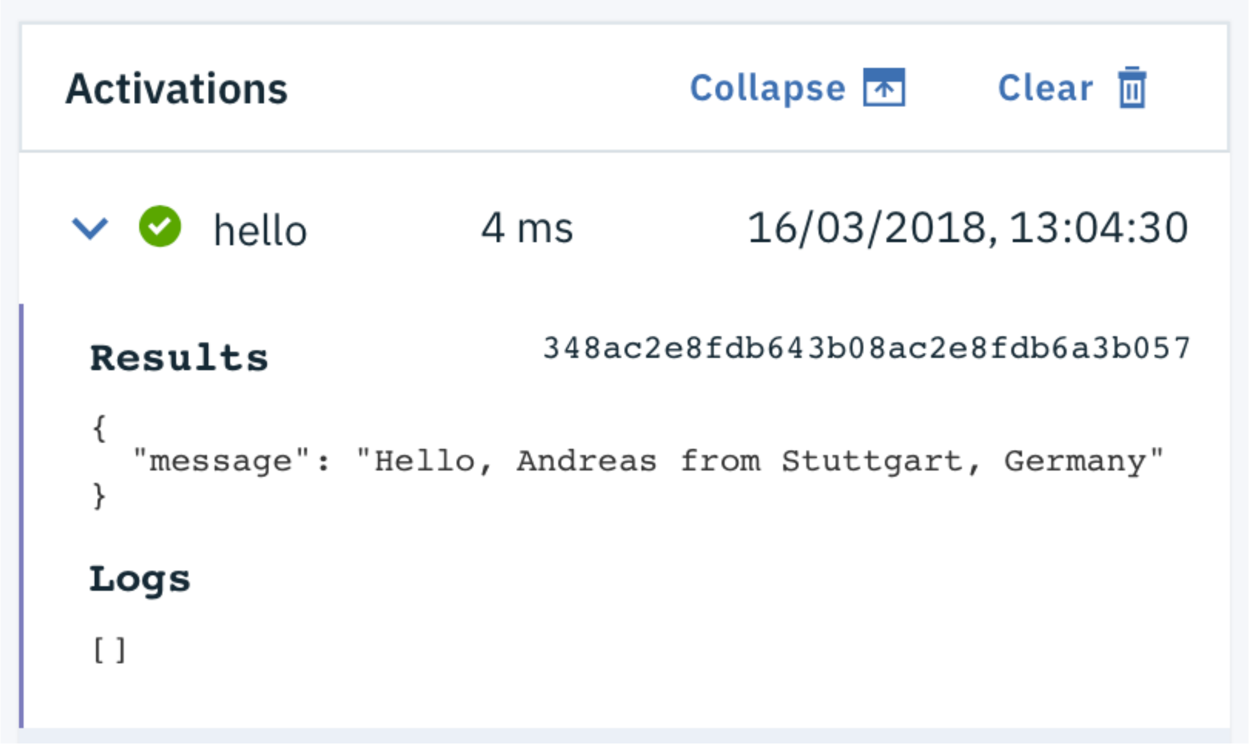


Change Action Input

```
{
  "name": "Andreas",
  "place": "Stuttgart, Germany"
}
```

You can now run the action with the new input data by clicking the **Invoke** button. You should receive the following result:

```
{
  "message": "Hello, Andreas from Stuttgart, Germany"
}
```



```
hello          4 ms          16/03/2018, 13:04:30

Results                 348ac2e8fdb643b08ac2e8fdb6a3b057
{
  "message": "Hello, Andreas from Stuttgart, Germany"
}

Logs
[]
```

3. Create a Trigger in the Cloud Functions UI

IBM Cloud Functions is a Function-as-a-Service (FaaS) platform supposed to execute code in response to events. Such events can be emitted in different ways: On the one hand side, events can be emitted by services (like other services part of the IBM Cloud platform) by what we call *triggers* which represent a named “channel” for a stream of events. On the other side, events can also be emitted in the form of API calls fired by standard web- or mobile applications which can then trigger actions, too.

So far we have triggered our actions “only” manually. Now, let’s trigger actions another way, namely periodically.

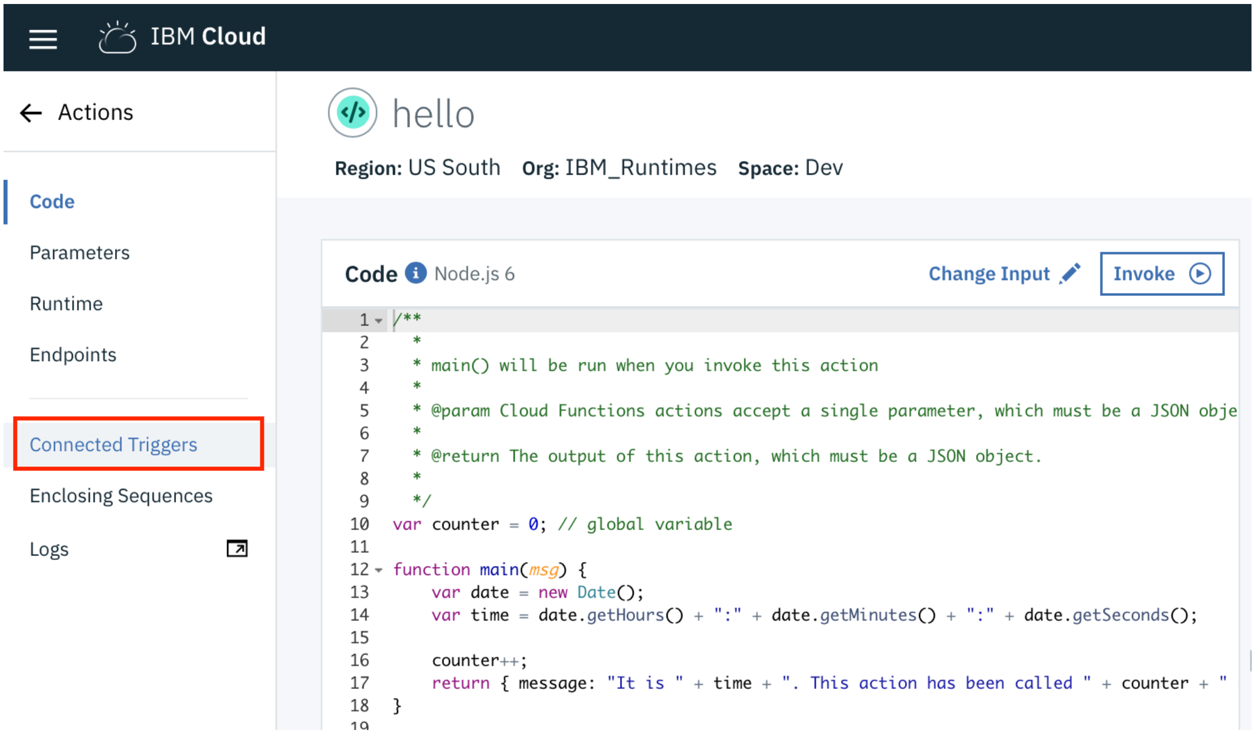
Update your existing action to contain the following:

```
var counter = 0; // global variable

function main(msg) {
    var date = new Date();
    var time = date.getHours() + ":" + date.getMinutes() + ":" +
date.getSeconds();

    counter++;

    return { message: "It is " + time + ". This action has been called " +
counter + " time(s)." };

}
```

and click **Save**.

This action returns the time and the amount of times it has been invoked. A counter is used as a global variable to maintain the count. As it is a global variable, it persists across invocations of the same action.

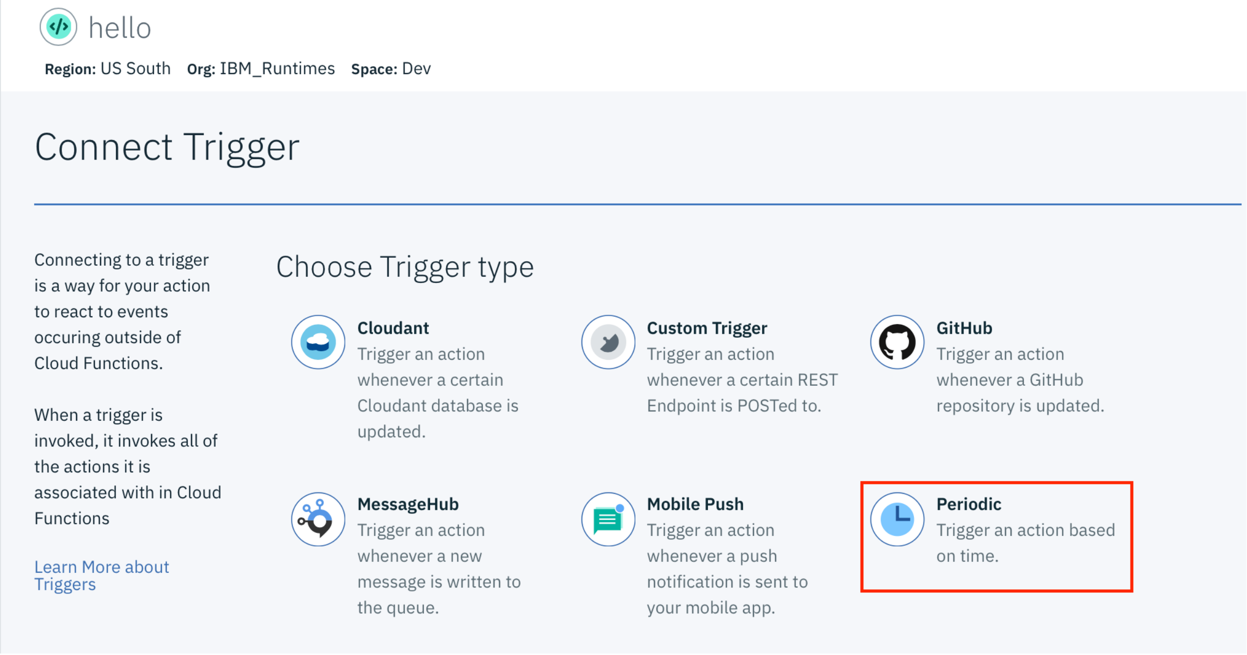
Next, click the **Connected Triggers** button on the left hand side of the pane. This will allow you to add a Trigger that causes the action to be run.



Region: US South **Org:** IBM_Runtimes **Space:** Dev

```
/**
 *
 * main() will be run when you invoke this action
 *
 * @param Cloud Functions actions accept a single parameter, which must be a JSON obje
 *
 * @return The output of this action, which must be a JSON object.
 *
 */
var counter = 0; // global variable

function main(msg) {
    var date = new Date();
    var time = date.getHours() + ":" + date.getMinutes() + ":" + date.getSeconds();

    counter++;
    return { message: "It is " + time + ". This action has been called " + counter + "
}
```

Click on Add Trigger on the right hand side of the panel and select a Periodic trigger:



Region: US South **Org:** IBM_Runtimes **Space:** Dev

Connecting to a trigger is a way for your action to react to events occuring outside of Cloud Functions.

When a trigger is invoked, it invokes all of the actions it is associated with in Cloud Functions

Cloudant Trigger an action whenever a certain Cloudant database is updated.

Custom Trigger Trigger an action whenever a certain REST Endpoint is POSTed to.

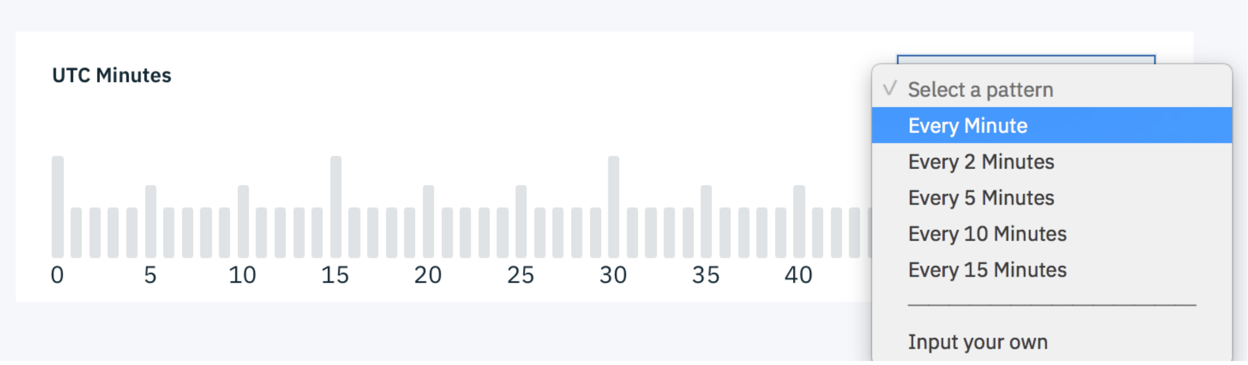
GitHub Trigger an action whenever a GitHub repository is updated.

MessageHub Trigger an action whenever a new message is written to the queue.

Mobile Push Trigger an action whenever a push notification is sent to your mobile app.

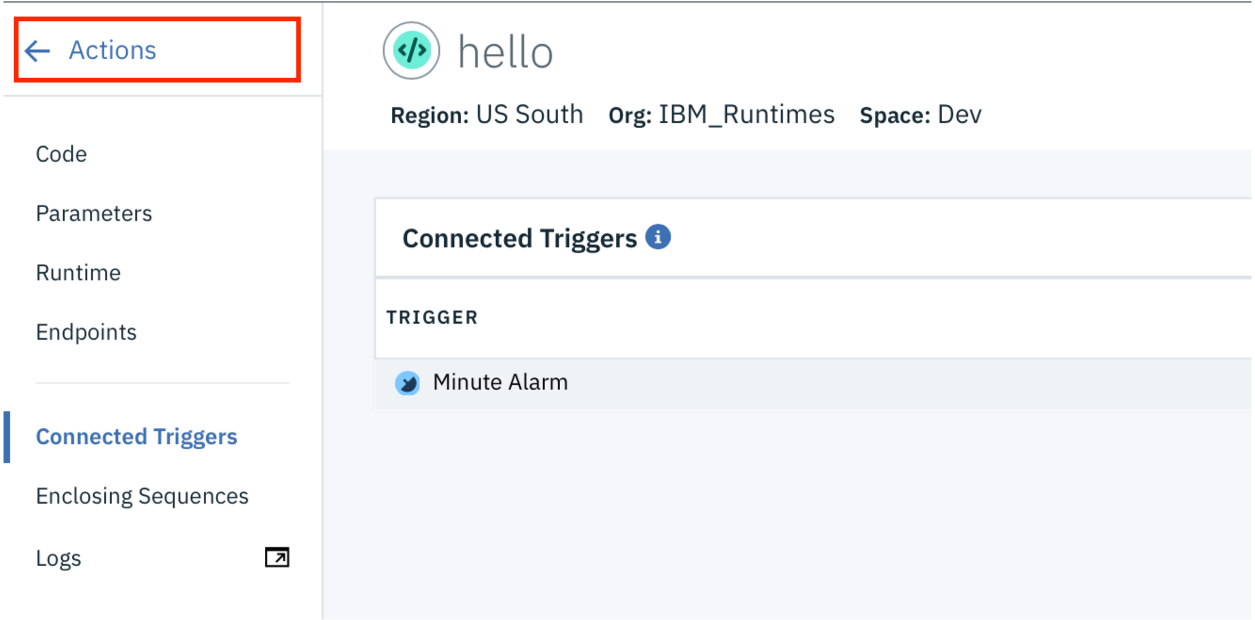
Periodic Trigger an action based on time.

Give your trigger a name (eg. “minute alarm”), scroll down to “UTC Minutes”, and select Every Minute from the pull down menu:

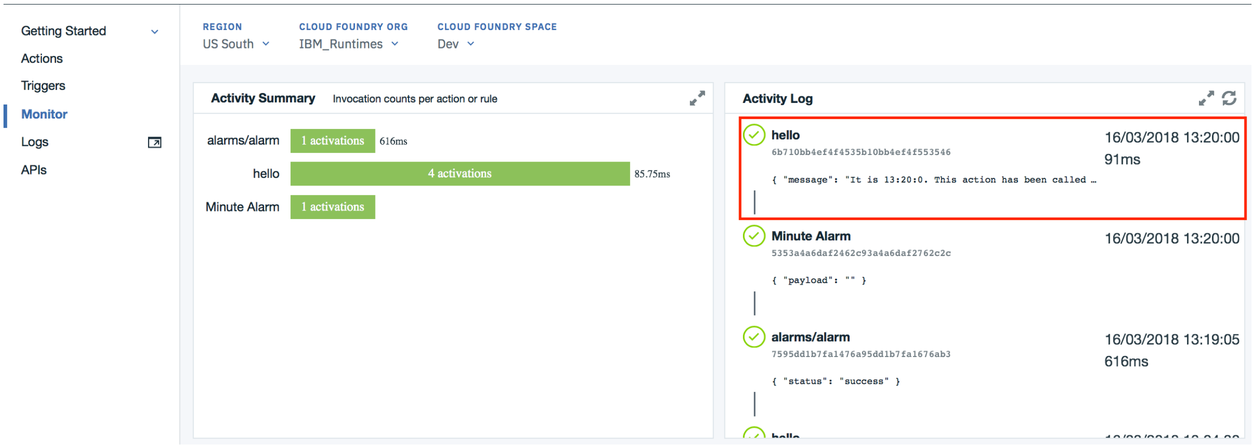


Click on **“Create & Connect**” in order to create the trigger and connect your action to it.

Return to the dashboard by clicking on the “`<- Actions`” button:



And select **Monitor** from the left hand menu to see the activity of your actions and triggers. The Activity Log should show your action being triggered and the time it was triggered in the result:

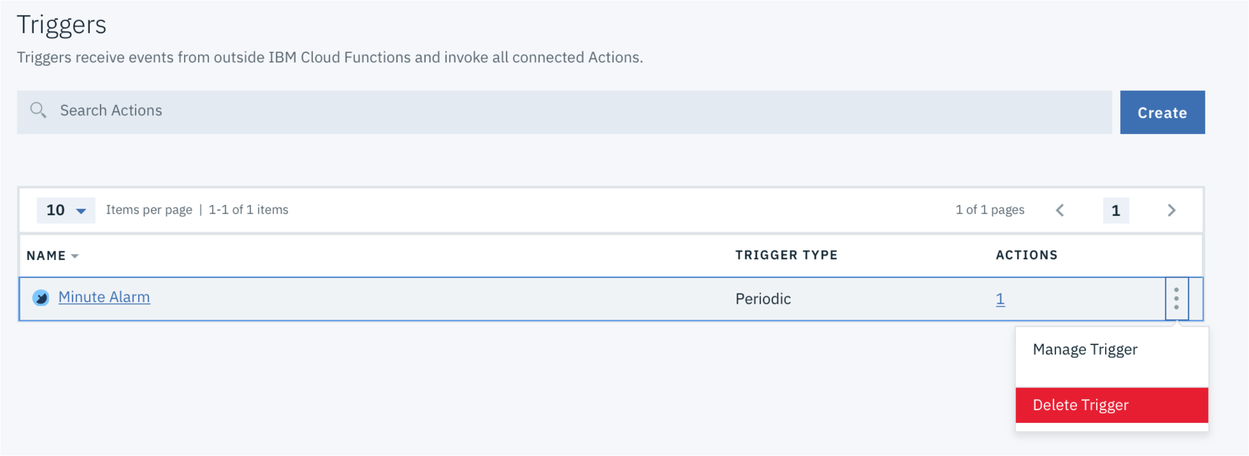


REGION: US South
CLOUD FOUNDRY ORG: IBM_Runtimes
CLOUD FOUNDRY SPACE: Dev

alarms/alarm	1 activations	616ms
hello	4 activations	85.75ms
Minute Alarm	1 activations	

```
hello                                                 16/03/2018 13:20:00
6b710bb4ef4f4535b10bb4ef4f553546                      91ms
{ "message": "It is 13:20:0. This action has been called …

Minute Alarm                                          16/03/2018 13:20:00
5353a4a6daf2462c93a4a6daf2762c2c
{ "payload": "" }

alarms/alarm                                          16/03/2018 13:19:05
7595dd1b7fa1476a95dd1b7fa1676ab3                      616ms
{ "status": "success" }
```

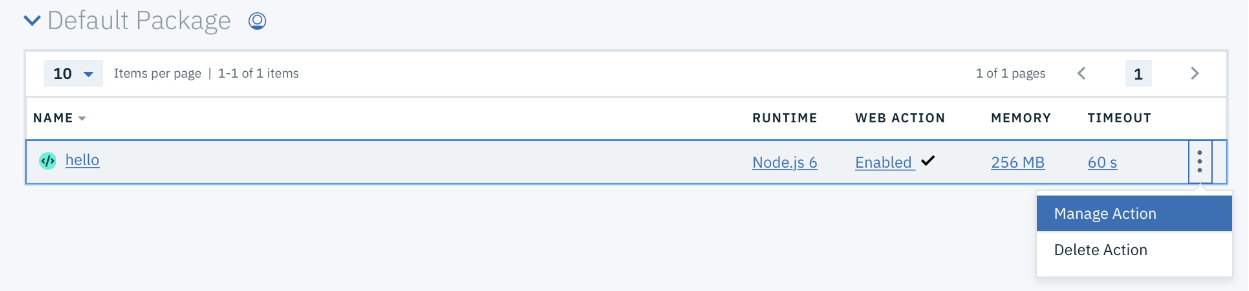
To delete the trigger, expand the **Triggers** section, select your Minute Alarm trigger you just created and click the trash bin from the pull down menu:


Triggers
Triggers receive events from outside IBM Cloud Functions and invoke all connected Actions.
Search Actions
Create
10
Items per page | 1-1 of 1 items
1 of 1 pages
1
Manage Trigger
Delete Trigger

NAME	TRIGGER TYPE	ACTIONS
Minute Alarm	Periodic	1

4. Create a Web Action

Select **Actions** from the left hand panel and select your “hello” action and choose Manage Action from the pull down menu:



Default Package

10 Items per page | 1-1 of 1 items — 1 of 1 pages — 1

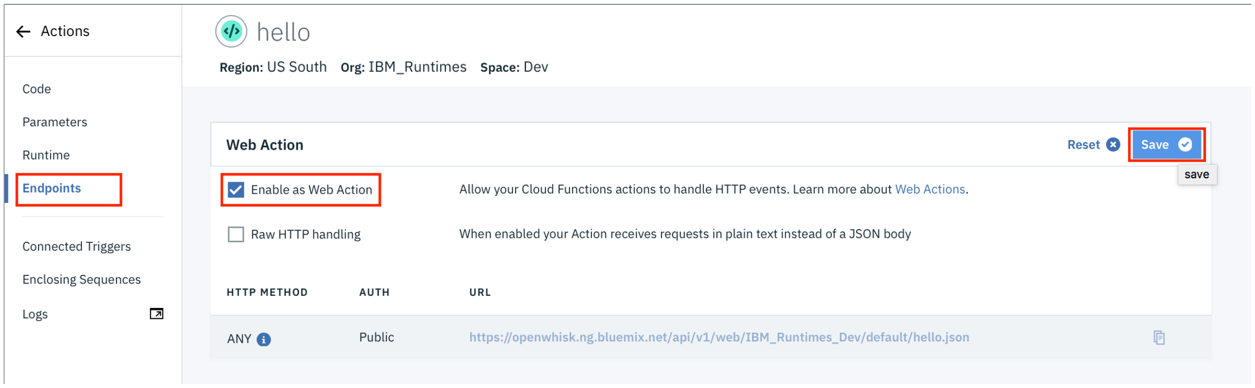
NAME	RUNTIME	WEB ACTION	MEMORY	TIMEOUT
hello	Node.js 6	Enabled ✓	256 MB	60 s

Change the code in the action back to our Hello action that takes name and place parameters:

```
var counter = 0; // global variable
function main(msg) {
    return { message: "Hello, " + msg.name + " from " + msg.place };
}
```

and click **Save**.

To add a web endpoint and create a web action, select **Endpoints** from the left hand menu and select “**Enable as a Web Action**”:



hello

Region: US South **Org:** IBM_Runtimes **Space:** Dev

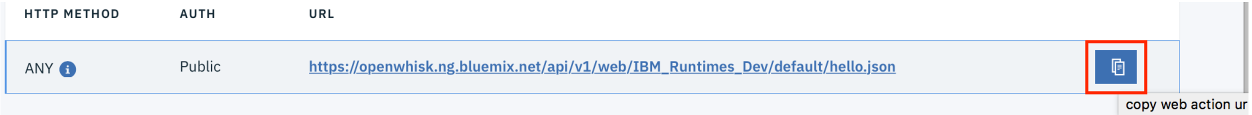
Web Action

☑ Enable as Web Action — Allow your Cloud Functions actions to handle HTTP events. Learn more about Web Actions.

☐ Raw HTTP handling — When enabled your Action receives requests in plain text instead of a JSON body

HTTP METHOD	AUTH	URL
ANY	Public	https://openwhisk.ng.bluemix.net/api/v1/web/IBM_Runtimes_Dev/default/hello.json

Once you have clicked **Save**, you can use the clipboard icon to copy the URL to the clipboard:



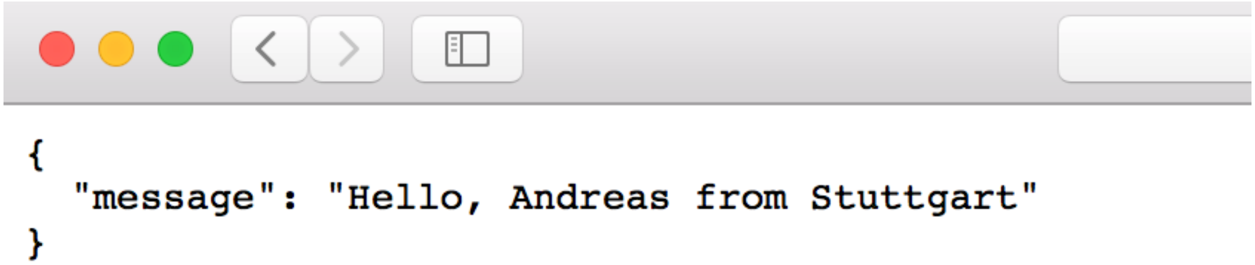
HTTP METHOD	AUTH	URL
ANY	Public	https://openwhisk.ng.bluemix.net/api/v1/web/IBM_Runtimes_Dev/default/hello.json

Copy this and then paste it as the URL into the browser window, appending the following query parameters to the request:

```
?name=Andreas&place=Stuttgart
```

This passes the name and place input parameters into the Action.

You should then get the output of your action as a response:



```
{
  "message": "Hello, Andreas from Stuttgart"
}
```

5. Conclusion

Congratulations! You have completed the lab.

You have successfully built and deployed a number of Serverless Cloud Functions, including web actions that can be invoked from the browser or from Microservices, all inside a browser!

6. Resources

- IBM Cloud App Service: Build a Node.js app to deploy on Containers to IBM Cloud - https://www.youtube.com/watch?v=1qAjtduM2TY
- IBM Cloud App Service: http://bluemix.net/developer/appservice
- IBM Cloud Container Service: https://www.ibm.com/cloud/container-service
- IBM Cloud Garage Method: https://www.ibm.com/cloud/garage/
- IBM Cloud Continuous Delivery Service: https://www.ibm.com/cloud/continuous-delivery
- IBM Cloud DevOps: https://bluemix.net/devops
- IBM Cloud Developer Tools: https://www.youtube.com/watch?v=z-ByHuI41dU&t=76s
- IBM DevOps Overview: https://www.youtube.com/watch?v=psiMSUfn9oA
- Develop a Kubernetes App Toolchain: https://www.ibm.com/cloud/garage/tutorials/use-develop-kubernetes-app-toolchain?task=2
- IBM Cloud App Service: https://www.youtube.com/watch?v=VBZTwvLkGIk
- IBM Cloud Developer Tools (IDT): https://console.bluemix.net/docs/cloudnative/idt/index.html
- Using the IDT: https://www.youtube.com/watch?v=z-ByHuI41dU&t=76s
- Jump Start Your Microservice Development: https://www.youtube.com/watch?v=1HdtILoL6O4
- Spring@IBM Developer Center: http://developer.ibm.com/java/spring
- Node@IBM Developer Center: http://developer.ibm.com/cloud/node

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