

Sistemes Distribuïts



IBM Cloud



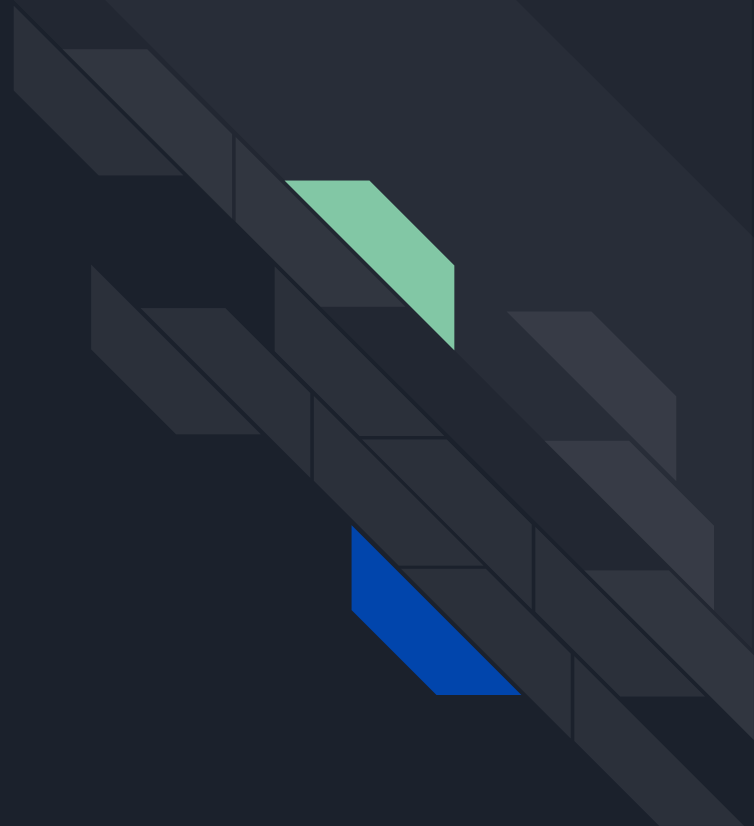
Outline

1. IBM Cloud
2. IBM Cloud Object Storage
3. IBM Cloud Functions





IBM Cloud





IBM Cloud

- Cloud public de IBM
 - Competidors: Amazon Web Services, Microsoft Azure, Google Cloud Platform
- Combina “platform as a service” (PaaS) i “infrastructure as a service” (IaaS) i Software as a Service (SaaS)
- Ofereix més de 190 serveis
 - Computació, base de dades, emmagatzematge, xarxa, etc...



IBM Cloud - Registre

- IBM Cloud ofereix 6 mesos d'accés gratuïta a alguns dels seus serveis si el registre es realitza **amb la direcció de correu universitària**.
- Registre a <https://www.ibm.com/academic/home>

Register below

Complete the information below to register. In addition to the forms below you will need to register for an IBM ID to enroll in the program.

Academic institution issued email: josep.sampe@urv.cat

Academic institution name: Universitat Rovira I Virgili Tarragona - Rovira University, Tarragona

Role

Student



Current Degree

Bachelor of Engineering



IBM Cloud - Dashboard

- <https://cloud.ibm.com>

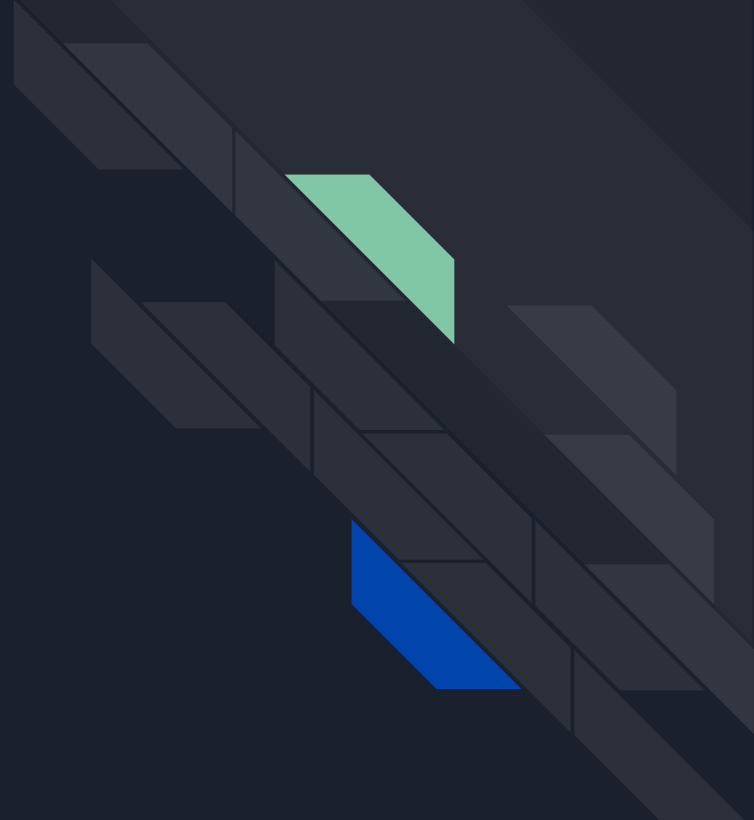
The screenshot displays the IBM Cloud dashboard interface. At the top, there is a navigation bar with the IBM Cloud logo, a search bar, and links to Catalog, Docs, Support, and Manage. The main content area is divided into several sections:

- Resource summary:** Shows a total of 33 resources. A table lists various resource types with their counts and status indicators:

Resource Type	Count	Status
Devices	10	Code Engine
VPC infrastructure	3	1 error, 1 warning, 5 success
Clusters	1	Success
Services	1	Success
Storage	5	Success
Functions namespaces	2	
- Planned maintenance:** Lists upcoming events, including a "Planned Maintenance - Low: Switch Firmware Upgrade - WDC04 on April 27th at 0400 UTC" and a "Planned Maintenance: fcr03a.dal05 Line-card Maintenance".
- For you:** A section with a "Learn how Base Media uses Aspera high speed transfer to move Terabytes to the Cloud." link and an "Aspera Use Case" link.
- News:** A section with a "View all" link and a "Increased IAM Control of Log Analysis and Activity Tracker Services in IBM Cloud" link.
- Recent support cases:** Shows 0 cases waiting on customer, with a "Severity 4: IBM Invoices" link.



IBM Cloud
Object Storage





IBM Cloud Object Storage (COS)

- S'utilitza habitualment per guardar dades desestructurades. Arxivar dades, còpia de seguretat, aplicacions web i mòbils, i com a emmagatzematge persistent i escalable per a analítiques.
- Escriure, llegir, eliminar objectes 0byte-10TB, PUT simple <10TB
- Espai de noms: buckets, claus, objectes
- Accessible mitjançant URL

IBM COS - Instància

- Cada usuari pot tenir una o més instàncies d'object storage
 - <https://cloud.ibm.com/objectstorage/create>

IBM Cloud Search resources and offerings...

Catalog / Services /

Cloud Object Storage

Author: IBM • Date of last update: 2021-03-25 9:59 PM • Docs • API docs

Create About

Select a pricing plan

Displayed prices do not include tax. Monthly prices shown are for country or region: Spain

Warning You can have only one instance of a Lite plan per service. To create a new instance, [delete](#) your existing Lite plan instance.

Plan	Features	Pricing
Lite	<ul style="list-style-type: none">1 COS Service InstanceStorage up to 25 GB/monthUp to 2,000 Class A (PUT, COPY, POST, and LIST) requests per monthUp to 20,000 Class B (GET and all others) requests per monthUp to 10 GB/month of Data RetrievalUp to 5GB of egress (Public Outbound)Applies to aggregate total across all storage bucket classes	Free

The Lite service plan for Cloud Object Storage includes Regional and Cross Regional resiliency, flexible data classes, and

Summary

Cloud Object Storage **Free**

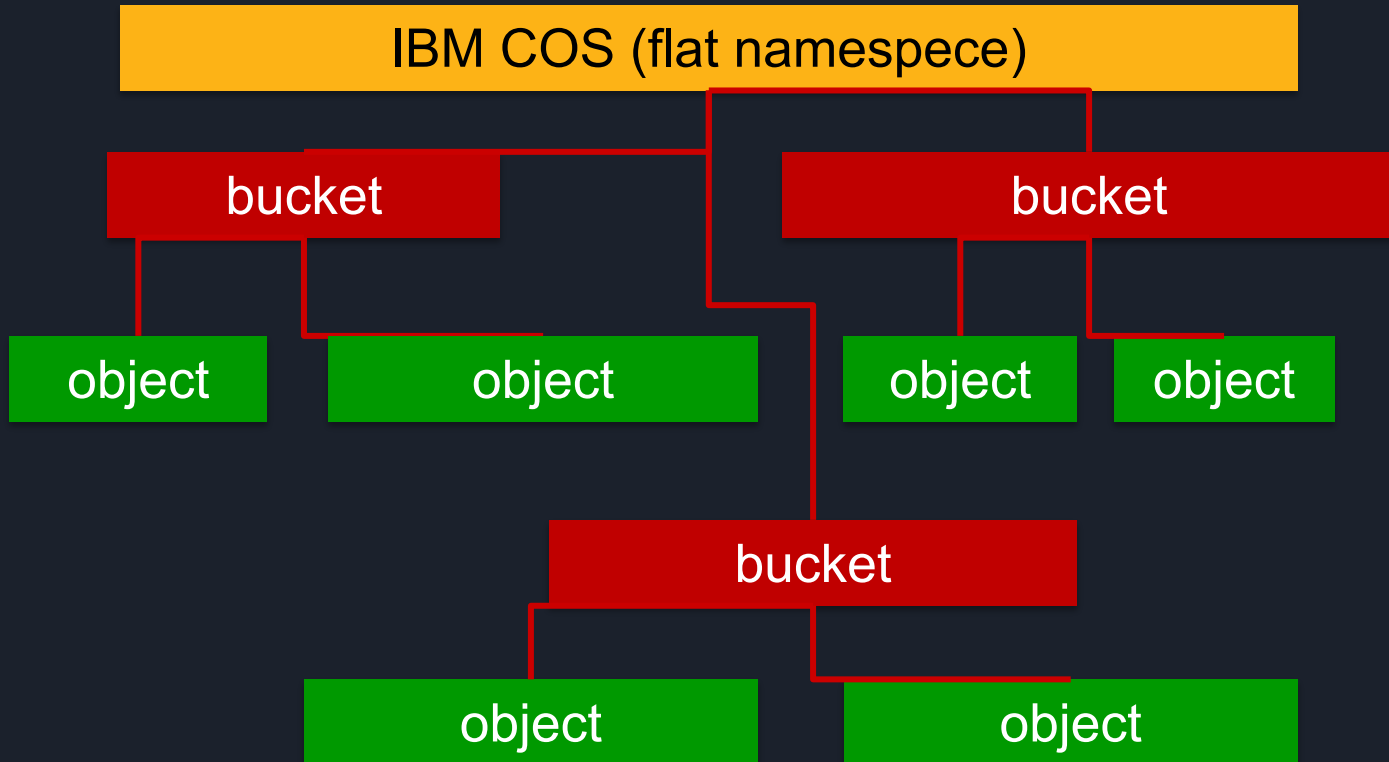
Region: Global
Plan: Lite
Service name: Cloud Object Storage-nr
Resource group: Default

Create

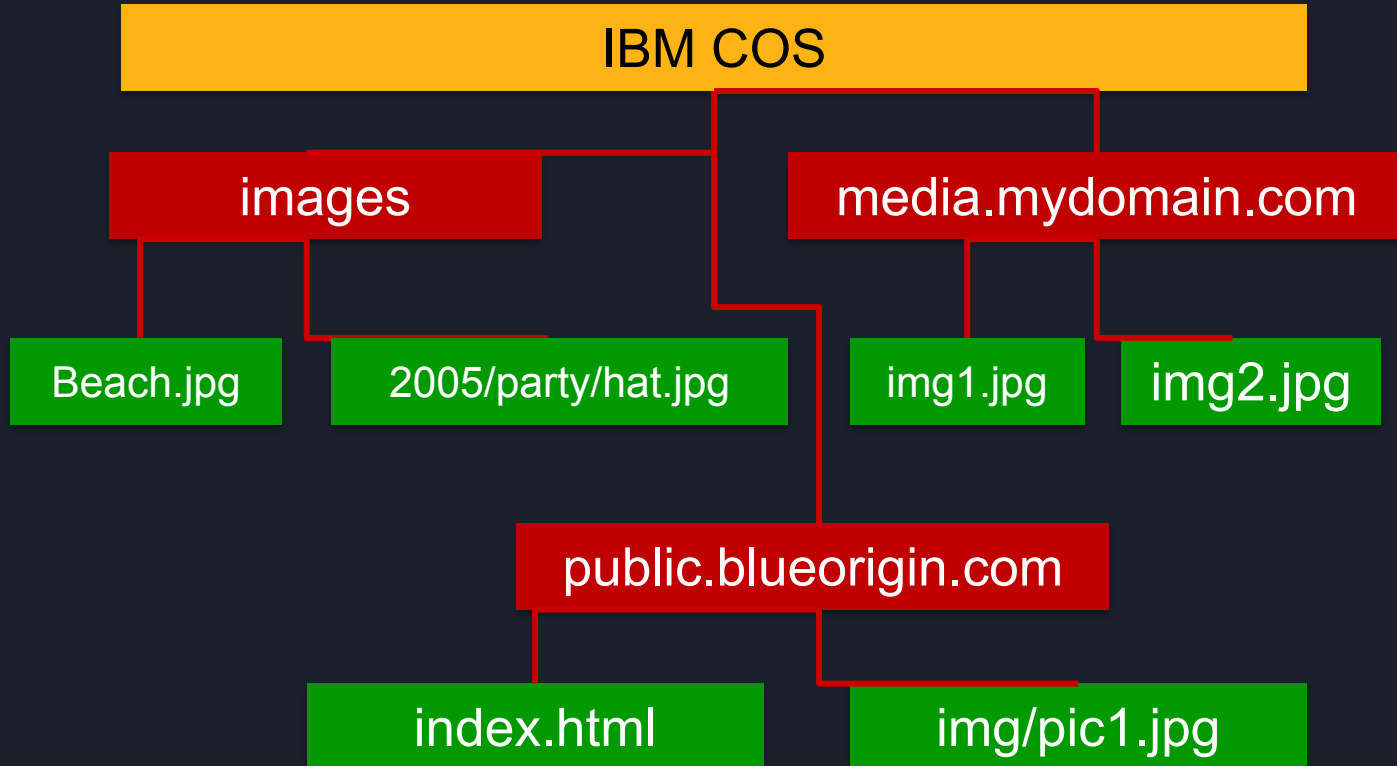
Add to estimate

View terms

IBM COS - Namespace



IBM COS - Namespace





IBM COS - Accés https

- HTTP RESTfull API

Una RESTful API es una interfície de programació d'aplicacions (API) que utilitza requests HTTP per a:

- PUT (pujar un objecte)
- GET (descarregar un objecte)
- POST (pujar metadades a un objecte)
- HEAD (descarregar metadades d'un objecte)
- DELETE (eliminar un objecte)



IBM COS - Accès https

- Bucket: images, objet: casa.jpg

- Accessible amb:

`https://s3.us-east.objectstorage.net/images/casa.jpg`

- Pseudo-folders (directories virtuals)

- Accessible amb:

`https://s3.us-east.objectstorage.net/images/january/casa.jpg`



IBM COS - Control d'Accés

- Els objectes són privats per al compte d'usuari
 - Autenticació
- Autorització
 - ACL: usuaris d'IBM Cloud, usuaris identificats per correu electrònic, qualsevol usuari ...
- Signatura digital per garantir la integritat
- Accés xifrat: https

IBM COS - Control d'Accès

- CREDENTIALS d'accès (IBM IAM, HMAC, API Key)

The screenshot displays the IBM Cloud console interface. On the left, the 'Service credentials' tab is selected and highlighted with a red box. The main area shows a 'Create credential' dialog for the resource 'josep-object-storage'. The dialog includes the following fields and options:

- Service credentials-1**: The name of the credential.
- Role**: A dropdown menu set to 'Writer'.
- Advanced options**: A link to expand additional settings.
- Select Service ID (Optional)**: A dropdown menu set to 'Auto Generate'.
- Include HMAC Credential**: A toggle switch set to 'On', highlighted with a red box.

At the bottom of the dialog are 'Cancel' and 'Add' buttons. The background shows the 'josep-object-storage' resource page with a 'New credential' button.



IBM COS - Modes d'Accés

- Command line interface (CLI)

- Client **aws** | `python3 -m pip install -U awscli --user`

`$ aws --endpoint-url=http://s3-api.us-geo.objectstorage.softlayer.net s3 ls s3://images`

- Interfície de programació (llibreria)

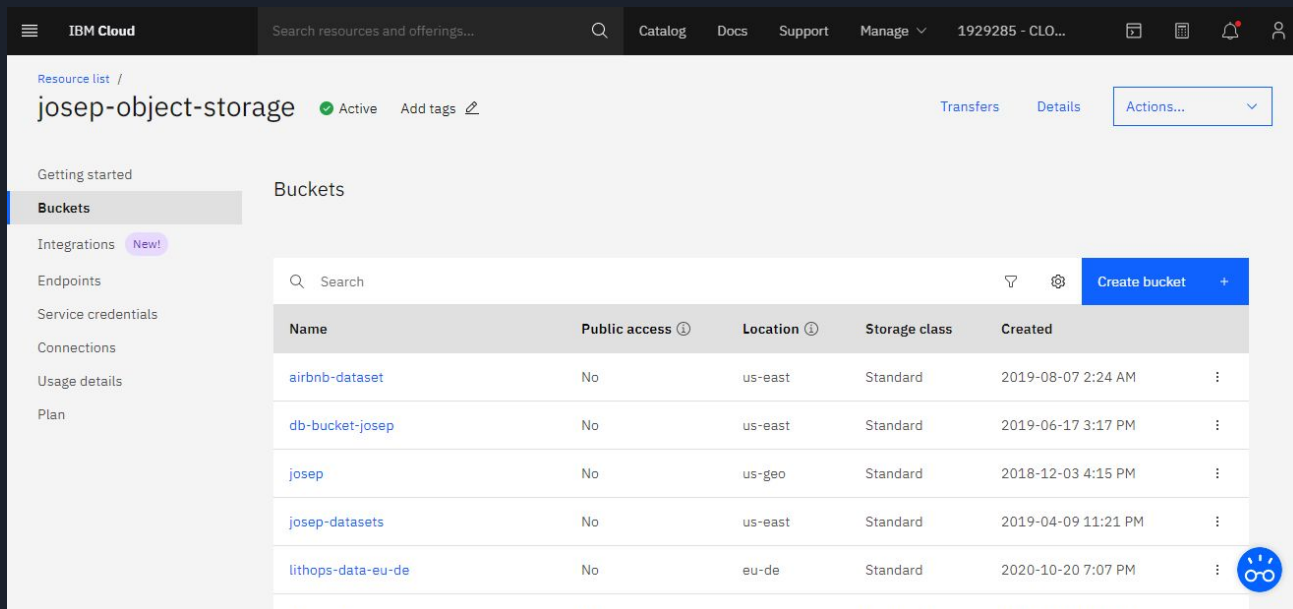
- E.g., `ibm_boto3` python library

- `python3 -m pip install -U ibm-cos-sdk --user`

- <https://ibm.github.io/ibm-cos-sdk-python>

IBM COS - Modes d'Accès

- Interface web (IBM Cloud Dashboard)



The screenshot shows the IBM Cloud Dashboard interface for the 'josep-object-storage' resource. The left sidebar contains navigation links: Getting started, Buckets (selected), Integrations (marked 'New!'), Endpoints, Service credentials, Connections, Usage details, and Plan. The main content area is titled 'Buckets' and features a search bar and a 'Create bucket' button. Below this is a table listing the buckets.

Name	Public access ⓘ	Location ⓘ	Storage class	Created	
airbnb-dataset	No	us-east	Standard	2019-08-07 2:24 AM	⋮
db-bucket-josep	No	us-east	Standard	2019-06-17 3:17 PM	⋮
josep	No	us-geo	Standard	2018-12-03 4:15 PM	⋮
josep-datasets	No	us-east	Standard	2019-04-09 11:21 PM	⋮
lithops-data-eu-de	No	eu-de	Standard	2020-10-20 7:07 PM	⋮



IBM Cloud
Functions





IBM Cloud Functions

- Granularitat a nivell de funció
- Computació **Serverless**
 - No es necessita manegar servidos
- Escalabilitat automàtica basada en events/requests
- Es paga només pel temps que s'utilitza
- Accessible mitjançant URL (sync/async)



Què es serverless?

Una plataforma nativa al núvol

- per

càlcul sense estat de curta durada

- i

aplicacions basades en esdeveniments

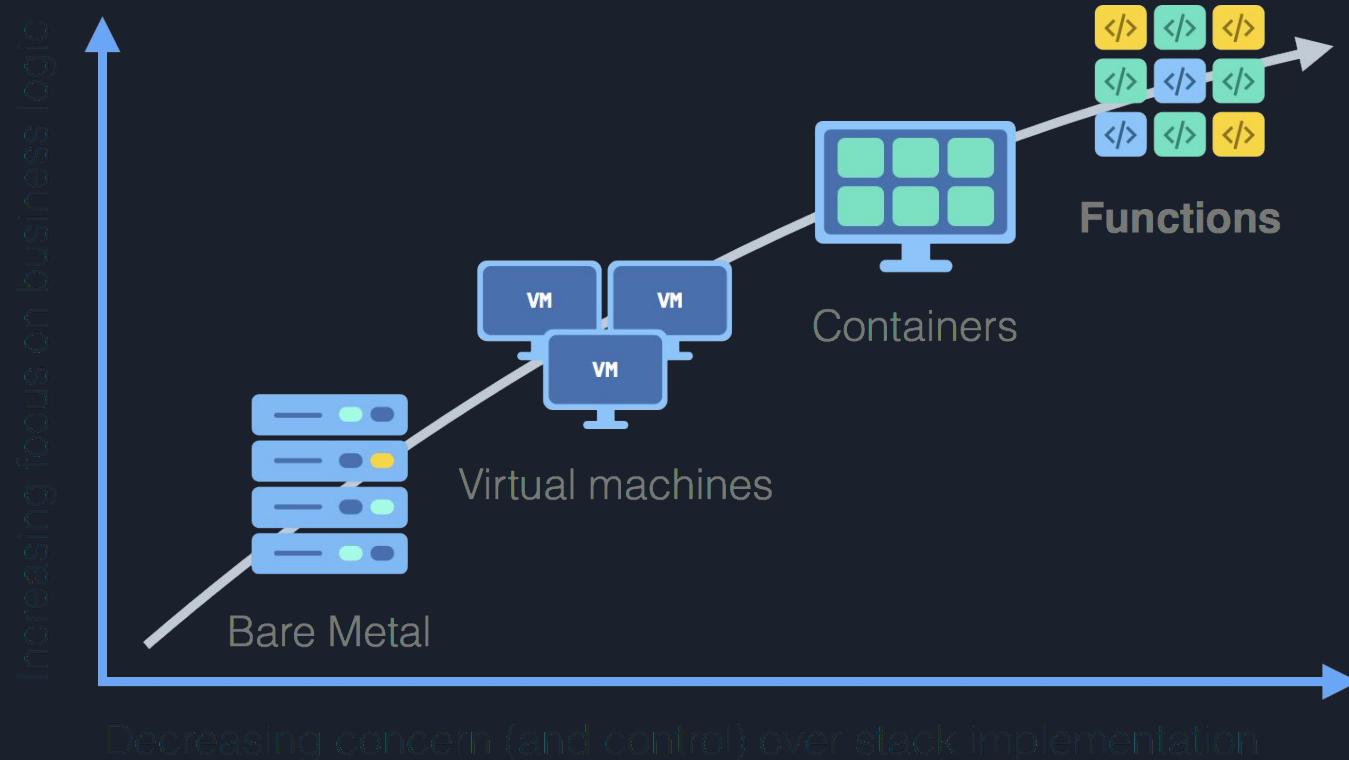
- que

escala cap amunt i cap avall de forma instantània i automàtica

- i

càrrecs per ús real a una granularitat de mil·lisegons

Evolució del serverless



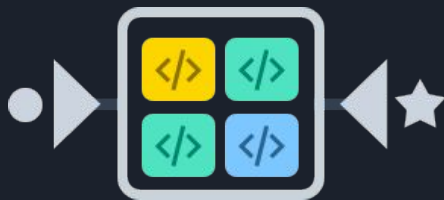
Perquè és serverless atractiu?

Fa que el desenvolupament d'aplicacions i operacions sigui més ràpid, més barat i més fàcil.

	On-prem	VMs	Containers	Serverless
Time to provision	Weeks-months	Minutes	Seconds-Minutes	Milliseconds
Utilization	Low	High	Higher	Highest
Charging granularity	CapEx	Hours	Minutes	Blocks of milliseconds



No servers



Just code

On és convenient serverless?

Serverless es **bó** per

short-running

stateless

event-driven



Microservices



Mobile Backends



Bots, ML Inferencing



IoT



Modest Stream Processing



Service integration

Serverless **no es tan bó** per

long-running

stateful

number crunching



Databases



Deep Learning Training



Heavy-Duty Stream Analytics

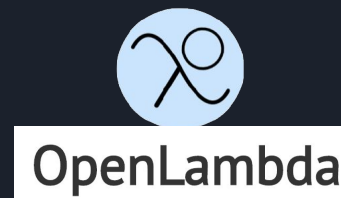
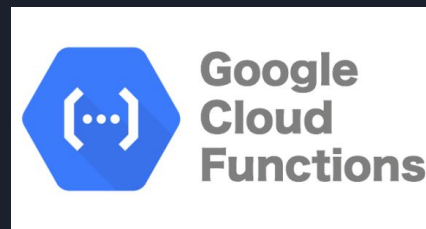
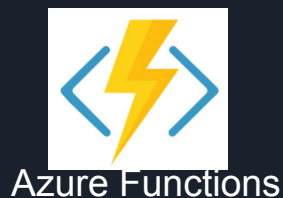


Numerical Simulation



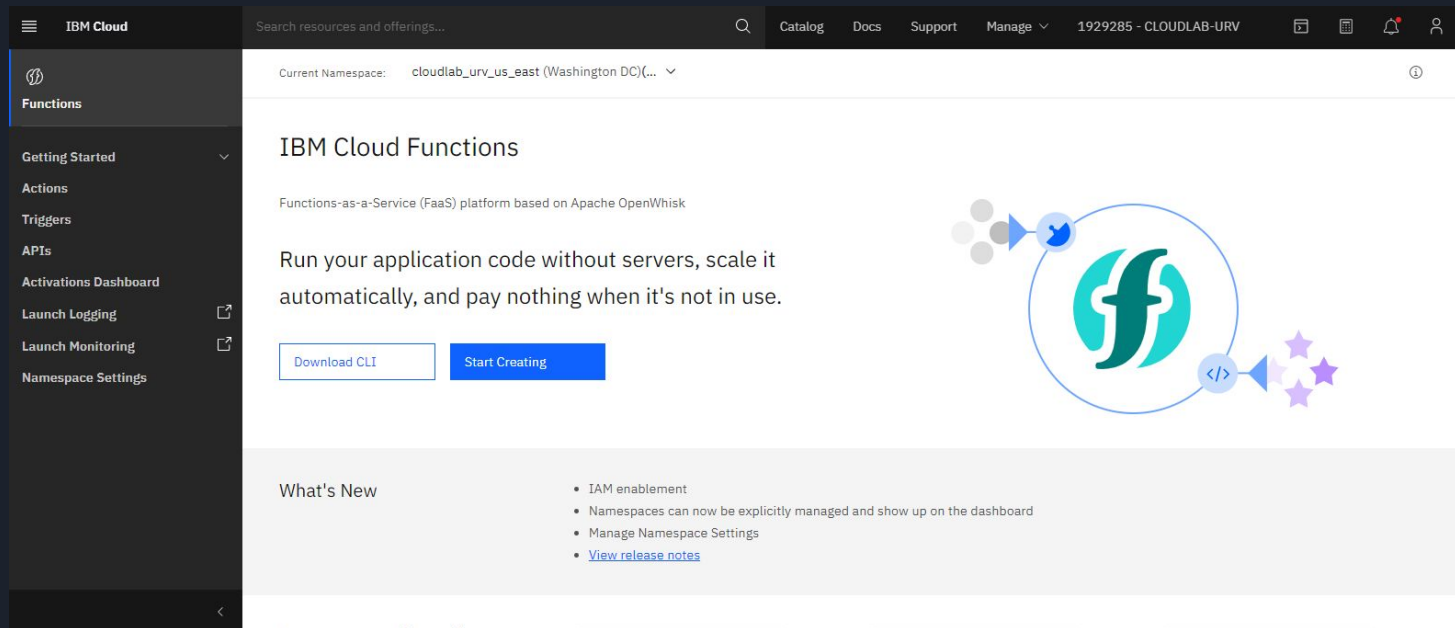
Video Streaming

Plataformes Serverless



IBM Cloud Functions

- <https://cloud.ibm.com/functions>



The screenshot shows the IBM Cloud Functions dashboard. The left sidebar contains the 'Functions' menu and a list of navigation items: 'Getting Started', 'Actions', 'Triggers', 'APIs', 'Activations Dashboard', 'Launch Logging', 'Launch Monitoring', and 'Namespace Settings'. The main content area has a search bar at the top, followed by the 'Current Namespace' dropdown set to 'cloudlab_urv_us_east (Washington DC)'. The title 'IBM Cloud Functions' is displayed, along with the description 'Functions-as-a-Service (FaaS) platform based on Apache OpenWhisk'. Below this is the text 'Run your application code without servers, scale it automatically, and pay nothing when it's not in use.' and two buttons: 'Download CLI' and 'Start Creating'. A diagram on the right illustrates the FaaS architecture with a central 'ff' logo, input triggers, and output functions. At the bottom, the 'What's New' section lists updates: 'IAM enablement', 'Namespaces can now be explicitly managed and show up on the dashboard', 'Manage Namespace Settings', and a link to 'View release notes'.

IBM Cloud

Search resources and offerings...

Catalog Docs Support Manage 1929285 - CLOUDLAB-URV

Current Namespace: cloudlab_urv_us_east (Washington DC)(...

IBM Cloud Functions

Functions-as-a-Service (FaaS) platform based on Apache OpenWhisk

Run your application code without servers, scale it automatically, and pay nothing when it's not in use.

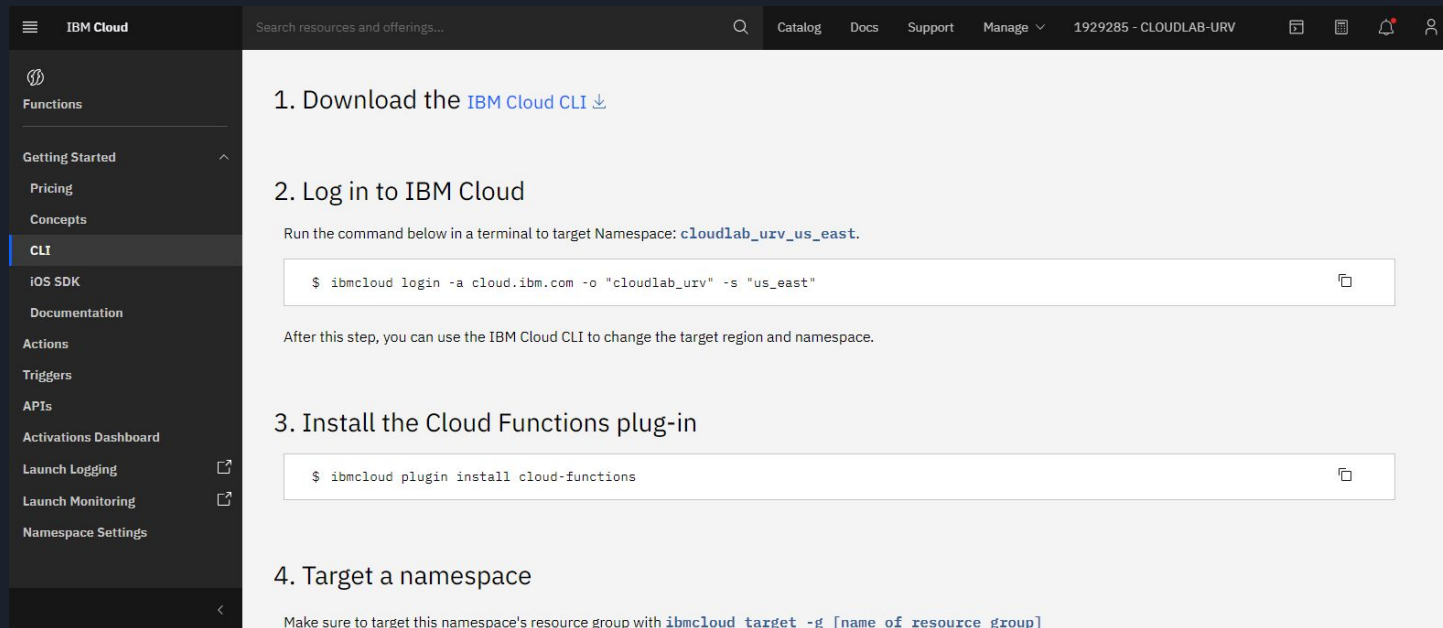
[Download CLI](#) [Start Creating](#)

What's New

- IAM enablement
- Namespaces can now be explicitly managed and show up on the dashboard
- Manage Namespace Settings
- [View release notes](#)

IBM Cloud Functions

- <https://cloud.ibm.com/functions/learn/cli>



The screenshot shows the IBM Cloud CLI tutorial page. The left sidebar contains a navigation menu with items: Functions, Getting Started, Pricing, Concepts, CLI (highlighted), iOS SDK, Documentation, Actions, Triggers, APIs, Activations Dashboard, Launch Logging, Launch Monitoring, and Namespace Settings. The main content area is titled '1. Download the IBM Cloud CLI' and '2. Log in to IBM Cloud'. It provides a terminal command to log in and a note about the target namespace. The third step, '3. Install the Cloud Functions plug-in', shows a terminal command to install the plugin. The fourth step, '4. Target a namespace', is partially visible at the bottom.

IBM Cloud

Search resources and offerings...

Catalog Docs Support Manage 1929285 - CLOUDLAB-URV

Functions

Getting Started

Pricing

Concepts

CLI

iOS SDK

Documentation

Actions

Triggers

APIs

Activations Dashboard

Launch Logging

Launch Monitoring

Namespace Settings

1. Download the IBM Cloud CLI

2. Log in to IBM Cloud

Run the command below in a terminal to target Namespace: `cloudlab_urv_us_east`.

```
$ ibmcloud login -a cloud.ibm.com -o "cloudlab_urv" -s "us_east"
```

After this step, you can use the IBM Cloud CLI to change the target region and namespace.

3. Install the Cloud Functions plug-in

```
$ ibmcloud plugin install cloud-functions
```

4. Target a namespace

Make sure to target this namespace's resource group with `ibmcloud target -g [name of resource group]`

IBM Cloud Functions

- <https://cloud.ibm.com/functions/create/action>

The screenshot displays the IBM Cloud Functions console for a specific action named 'hello'. The interface includes a top navigation bar with the IBM Cloud logo, a search bar, and links to Catalog, Docs, Support, and Manage. The main content area shows the 'hello' action details, including its namespace 'cloudlab_urv_us_east(Washington DC)'. On the left, a sidebar lists various options: Code, Parameters, Runtime, Endpoints, Connected Triggers, Enclosing Sequences, Launch Logging, and Launch Monitoring. The 'Code' tab is selected, showing a Python 3.7 function. The function code is as follows:

```
1 #
2 #
3 # main() will be run when you invoke this action
4 #
5 # @param Cloud Functions actions accept a single parameter, which must be a JSON object.
6 #
7 # @return The output of this action, which must be a JSON object.
8 #
9 #
10 import sys
11
12 ~ def main(dict):
13     return { 'message': 'Hello world' }
14
```

On the right side of the code editor, there are two buttons: 'Invoke with parameters' and 'Invoke'. The 'Invoke' button is highlighted with a red box, indicating it is the primary action to trigger the function.

IBM Cloud Functions

- <https://cloud.ibm.com/functions/namespace-settings>

The screenshot shows the IBM Cloud Functions Namespace Settings page. The left sidebar contains navigation links: Functions, Getting Started, Actions, Triggers, APIs, Activations Dashboard, Launch Logging, Launch Monitoring, and Namespace Settings (which is highlighted). The main content area is titled 'Namespace settings' and shows the current namespace as 'cloudlab_urv_us_east (Washington DC)'. A blue box contains a note: 'Consider creating an IAM enabled namespace to leverage IAM access control.' Below this, the 'Cloud Foundry-based namespace' section explains that the namespace is based on a specific Cloud Foundry org and space. It lists the following details:

Location:	Cloud Foundry org:	Cloud Foundry space:
Washington DC	cloudlab_urv	us_east

Below the table, the 'CF-based API key for this namespace' section explains that access is protected by an API key and provides a masked key: '...@...'. A note at the bottom states: 'This API key is associated with the user Josep Sampé.'



IBM Cloud