

Getting started with IBM Cloud

Unit objectives

- Describe IBM Cloud.
- Distinguish among the various compute options in IBM Cloud.
- Identify the runtimes and services that IBM Cloud offers.
- Describe IBM Cloud regions, zones, and multi-availability zones.
- Describe the IBM Cloud dashboard, catalog, and documentation features.
- Work with IBM Cloud resources.
- Explain starter kits and Cloud Foundry boilerplates.
- Describe how to manage your IBM Cloud users and resources (optional).
- Explain Identity and Access Management (IAM) and Resource Groups (RGs) (optional).
- Describe how the application route is used to test an application in the browser.
- Bind services to an application in IBM Cloud.
- Describe the environmental variables that are used with IBM Cloud services.
- Explain function as a service.

Introduction to IBM Cloud

Topics

▶ Introduction to IBM Cloud

- IBM Cloud compute choices
- IBM Cloud console
- IBM Cloud catalog
- Creating and managing a Cloud Foundry application
- IBM Cloud regions and availability zones (optional)
- Managing your IBM Cloud users and resources (optional)

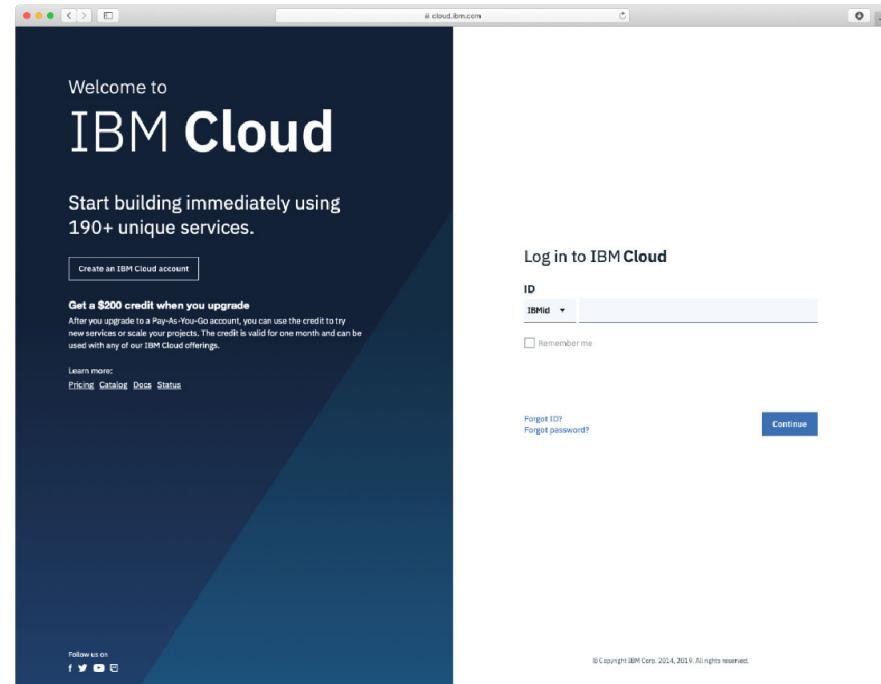
Welcome to IBM Cloud



[Welcome to IBM Cloud](#) on youtube.com

What is IBM Cloud

- An open, standards-based cloud computing platform that helps developers and enterprises rapidly build, deploy, run, and scale applications and services.
- Combines platform as a service (PaaS) with infrastructure as a service (IaaS)
- Includes a catalog of 190+ unique and diverse services.



What is IBM Cloud (cont.)



What can you build with IBM Cloud

- Infrastructure: Hardware that is provided in single or multi-tenancy configurations, such as:
 - Bare Metal Servers, virtual servers, and containers.
 - Object storage.
 - Networking.
- Applications: Programs that developers build in IBM Cloud, such as:
 - Mobile applications.
 - Web applications.
 - APIs.
- Services: Cloud extensions that are hosted by IBM Cloud:
 - Provide functions that are ready-for-use by the application.
 - Predefined services include database, messaging, push notifications for mobile apps, and elastic caching for web apps.

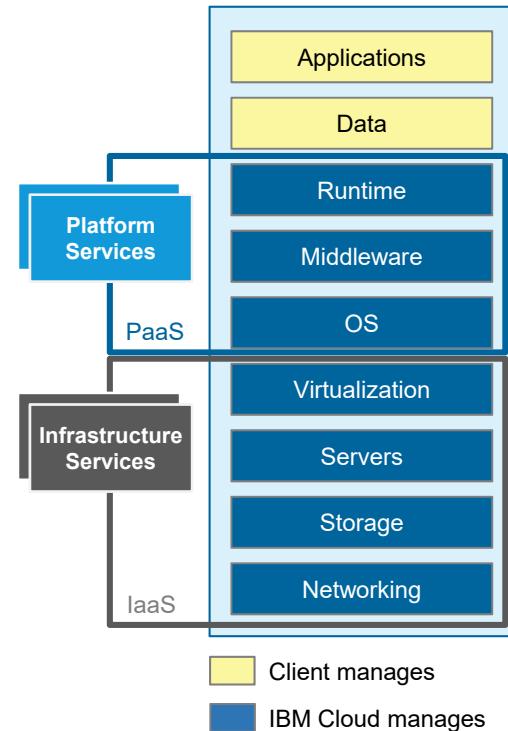
IBM Cloud compute choices

Topics

- Introduction to IBM Cloud
- IBM Cloud compute choices
 - IBM Cloud console
 - IBM Cloud catalog
 - Creating and managing a Cloud Foundry application
 - IBM Cloud regions and availability zones (optional)
 - Managing your IBM Cloud users and resources (optional)

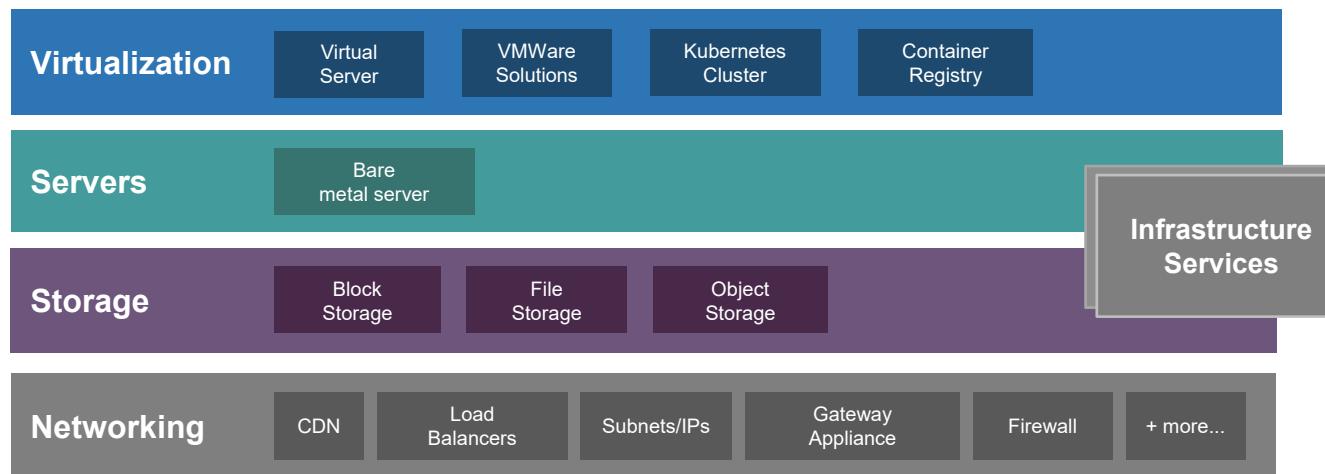
IBM Cloud service models

- Infrastructure as a Service (IaaS) allows customers to have full control of workloads and their dependencies.
- Platform as a Service (PaaS) allows customers to accelerate building and scaling applications and managing workloads while consuming services.



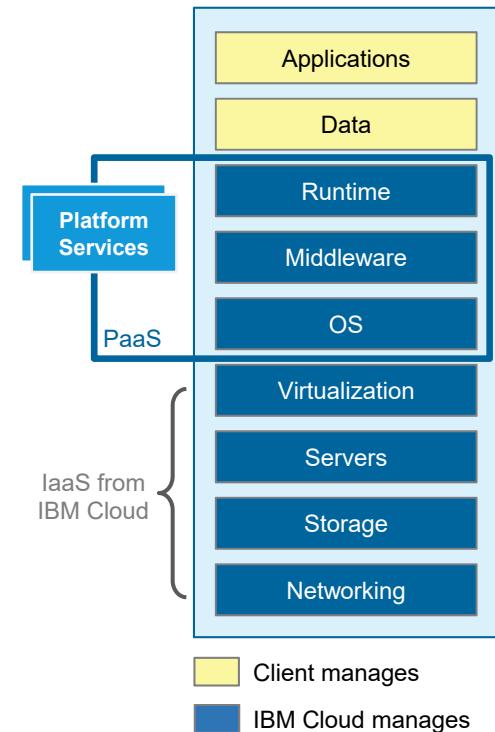
Infrastructure as a service from IBM Cloud

- Allows you to deploy a high-performance infrastructure in IBM Cloud Data Center locations around the world.
- Bare metal servers, virtual servers, containers, storage, networking, CDNs, and others.
- Provides services to deploy, access, and manage the infrastructure.



Platform as a service from IBM Cloud

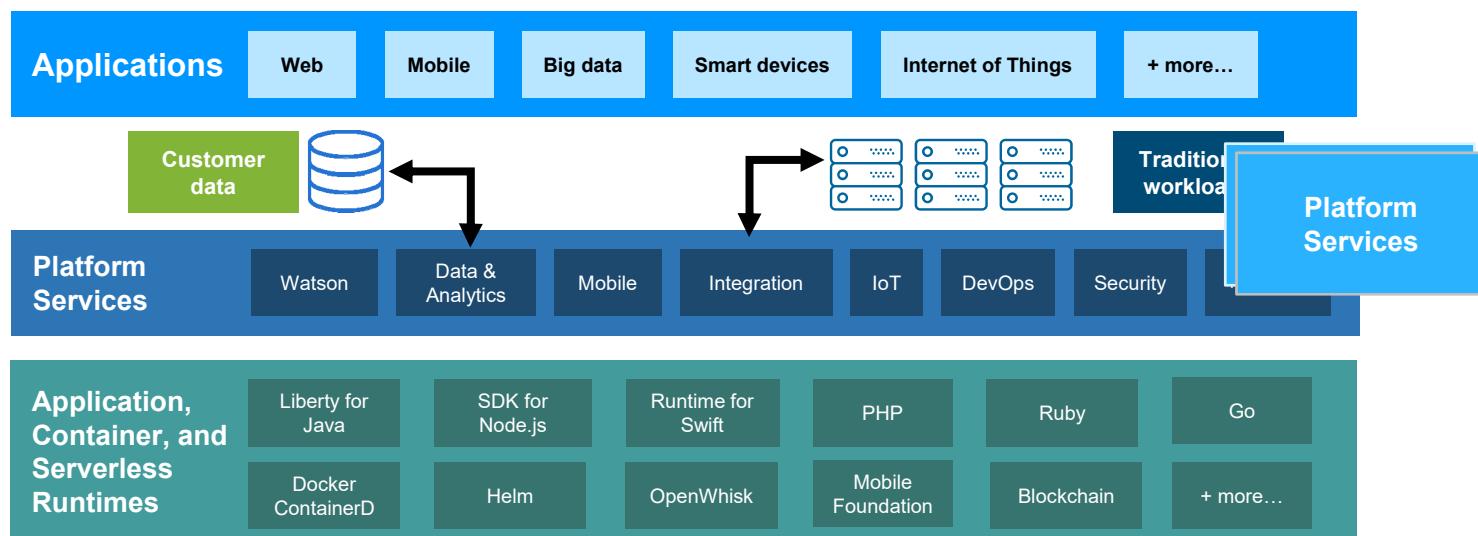
- Enables you to build, manage, run, and scale applications.
- Provides multiple choices of runtimes:
 - Kubernetes
 - Cloud Foundry
 - OpenWhisk
- Extends services from IBM and Business Partners.
- Provides a scriptable command-line interface (CLI).



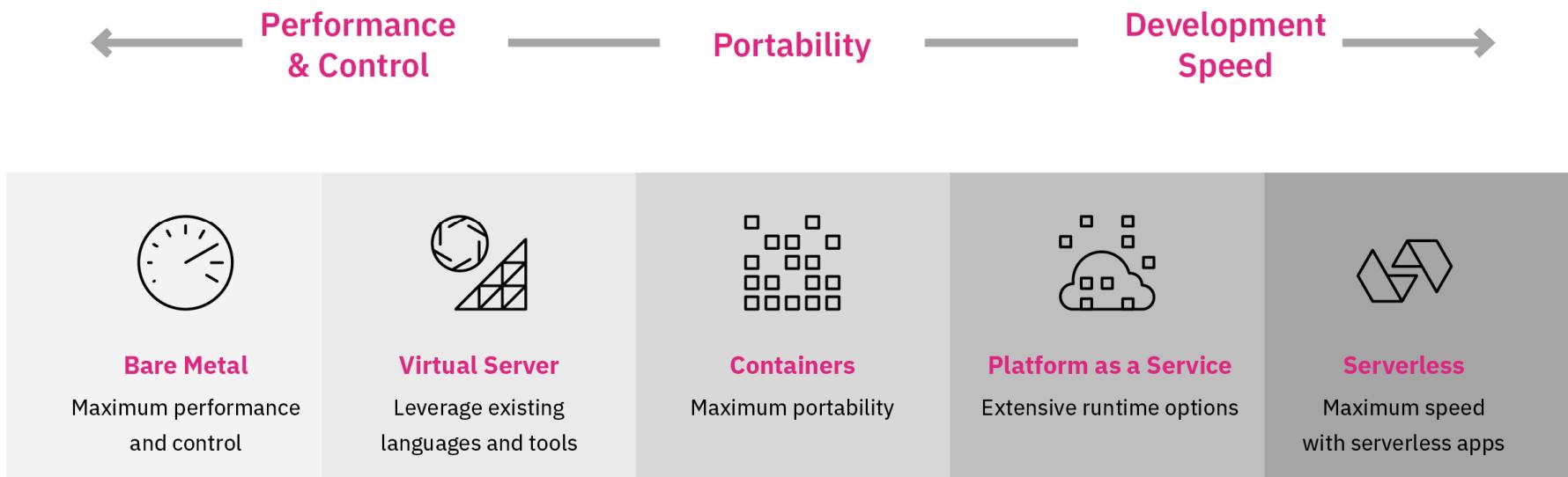
Platform as a service from IBM Cloud (cont.)

The following resources are provided on IBM Cloud:

- Runtimes on which to run applications.
- Services that can be used to build applications.
- Ability to integrate with data and traditional workloads in on-premises systems.
- DevOps capabilities and tools.



IBM Cloud: Choices



IBM Cloud: Choice of compute

IBM Cloud provides developers with multiple choices to deploy and run workloads:

- Bare metal servers
- Virtual servers
- Containers (IBM Cloud Kubernetes Services)

Bare Metal	Virtual Server	Containers	Platform as a Service	Serverless
Maximum performance and control	Leverage existing languages and tools	Maximum portability	Extensive runtime options	Maximum speed with serverless apps

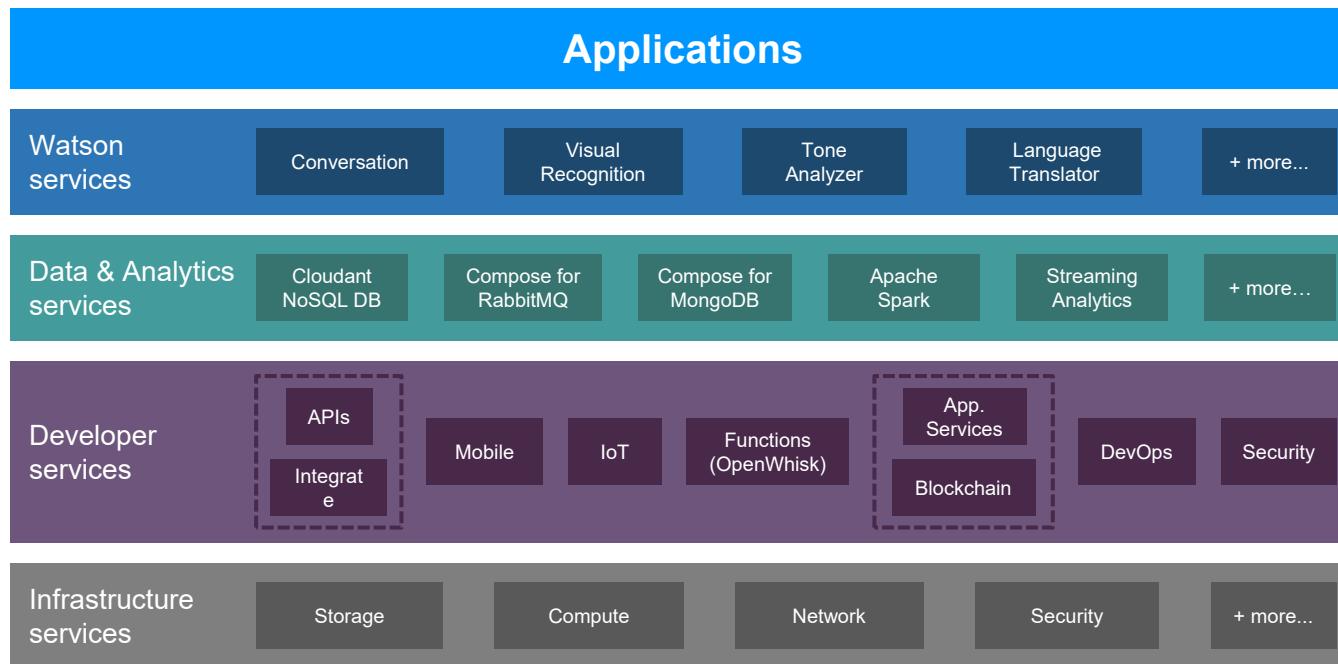
IBM Cloud: Choice of runtime

- IBM Cloud provides developers with two choices to bootstrap and run applications:
 - IBM Cloud Foundry
 - IBM Cloud Functions
- Runtimes focus on accelerating development and deployment of 12-factor apps.

				
Bare Metal Maximum performance and control	Virtual Server Leverage existing languages and tools	Containers Maximum portability	Platform as a Service Extensive runtime options	Serverless Maximum speed with serverless apps

IBM Cloud: Services

Pre-built services provide building blocks for feature-rich applications.



IBM Cloud console

Topics

- Introduction to IBM Cloud
- IBM Cloud compute choices

IBM Cloud console

- IBM Cloud catalog
- Creating and managing a Cloud Foundry application
- IBM Cloud regions and availability zones (optional)
- Managing your IBM Cloud users and resources (optional)

IBM Cloud: Signup

The screenshot shows the IBM Cloud Signup page. On the left, there's a dark sidebar with the IBM Cloud logo and the text "Build for free on IBM Cloud". Below that, it says "Sign up for an IBMid and create your IBM Cloud account". It features three sections: "Guaranteed free development with Lite plans", "Start on your projects right away", and "Get a \$200 credit when you upgrade". At the bottom, there's a button "Ready to get started? Sign up today!". On the right, the main form area has a header "Create an IBM Cloud Account" and "Already have an IBM Cloud account? [Log in](#)". The form includes fields for "Email*", "First Name*", "Last Name*", "Country or Region*", and "Password*". There are also checkboxes for marketing consent ("IBM may use my contact data to keep me informed of products, services and offerings") and a link to the Privacy Statement. A "Create Account" button is at the bottom.

Already have an IBM Cloud account? [Log in](#)

Create an IBM Cloud Account

Email*

First Name*

Last Name*

Country or Region*

United Arab Emirates

Password*

IBM may use my contact data to keep me informed of products, services and offerings:

by email by telephone

You can withdraw your marketing consent at any time by sending an email to netsupp@us.ibm.com. Also you may unsubscribe from receiving marketing emails by clicking the unsubscribe link in each such email.

More information on our processing can be found in the [IBM Privacy Statement](#). By submitting this form, I acknowledge that I have read and understand the IBM Privacy Statement.

I accept the product [Terms and Conditions](#) of this registration form.

[Create Account](#)

 Privacy Terms

IBM Cloud: Login

The screenshot shows a split-screen view of the IBM Cloud website. On the left, the main landing page is displayed with a dark blue background. It features the text "Welcome to IBM Cloud" in large white letters, followed by "Start building immediately using 190+ unique services." Below this, there is a "Create an IBM Cloud account" button and a section about getting \$200 credit for upgrading. At the bottom, there are links for "Learn more," "Pricing," "Catalog," "Docs," and "Status." Social media icons for Facebook, Twitter, YouTube, and LinkedIn are also present. On the right, the login form is shown with a light gray background. It has fields for "ID" (set to "IBMid") and "Password". There is a "Remember me" checkbox, a "Forgot ID?" link, a "Forgot password?" link, and a "Continue" button.

Welcome to
IBM Cloud

Start building immediately using
190+ unique services.

Create an IBM Cloud account

Get a \$200 credit when you upgrade

After you upgrade to a Pay-As-You-Go account, you can use the credit to try new services or scale your projects. The credit is valid for one month and can be used with any of our IBM Cloud offerings.

Learn more:
[Pricing](#) [Catalog](#) [Docs](#) [Status](#)

Follow us on

Forgot ID?
Forgot password?

Continue

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IBM Cloud: Dashboard

The screenshot shows the IBM Cloud Dashboard interface. At the top, there's a navigation bar with links for Catalog, Docs, Support, Manage, and a user profile. A search bar is also present. The main area is titled "Dashboard" and contains several cards:

- Resource summary**: Shows 1 Device and 2 Cloud Foundry Apps.
- Planned maintenance**: Lists an event for Mon, May 13, 2019 3:00 PM: MAINTENANCE: Perform Compose host ...
- Location status**: Shows green checkmarks for Asia Pacific, Europe, North America, and South America.
- Apps**: Shows a placeholder message: "You can view your apps here after you create them. Learn more about how to get started." and a "Create an app" button.
- Support cases**: Shows 0 Unresolved cases and 0 Resolved cases. Recent cases include CS0104228 Auto-upgrade of existing us... and CS0075213 Cloud Foundry Enterprise Z...
- Usage**: Shows an empty chart icon and a message: "There aren't enough resources or costs to make a chart." Estimated total is \$0.00.
- User access**: Shows a placeholder message: "Working alone is no fun. With the right permissions, you can see other users when they join this account. Learn more about users and access." and an "Invite users" button.
- Learn**: Provides links to Extend your resources with tools, Manage your account and users, Check out our solution tutorials, IBM Developer, Architecture Center, and IBM Skills Gateway.
- Kubernetes clusters**: Shows a placeholder message: "You can view your clusters here after you create them." and a "Create a cluster" button.
- Recommended offerings**: Lists Virtual Servers, Blockchain, Watson Assistant, and Consult with IBM.

IBM Cloud: Docs

The screenshot shows the IBM Cloud Documentation homepage. At the top, there's a navigation bar with links for Catalog, Docs (which is the active tab), Support, Manage, and a user account section. Below the navigation is a search bar and a "Documentation" header. Under the header, there are tabs for Get started (which is selected), Build, Manage, Tools, and All docs. To the right of these tabs is a "What's new" button. The main content area features three cards: "Welcome" (showing a laptop screen with the IBM Cloud interface), "Developing in IBM Cloud" (showing a laptop screen with developer tools), and "Learn about cloud infrastructure" (showing a laptop screen with infrastructure management tools). Below these cards, there's a section titled "Get started with the platform" with a sub-section "Quick start". The "Quick start" section includes a "Set up your account" link and four role-based cards: "Developer", "IT ops admin", "Enterprise architect", and "Try it out".

Documentation

Get started Build Manage Tools All docs What's new

Welcome

Welcome to IBM Cloud

Developing in IBM Cloud

easy to use & customizable

Learn about cloud infrastructure

Plan, build and manage your environment.

Get started with the platform

From core concepts to beginner tutorials, find the information you need to start using IBM Cloud.

How does the platform work?

Navigating the console

Exploring the developer journey

Exploring the IT ops admin journey

Creating apps

Working with resources and services

Working in the customer portal

Developing third-party integrated billing services

Quick start

First steps to quickly get up and running based on your role.

Developer

IT ops admin

Enterprise architect

Try it out

Set up your account

IBM Cloud: Support

The screenshot shows the IBM Cloud Support interface. At the top, there's a navigation bar with links for Catalog, Docs, Support, Manage, and a user account section. Below the navigation bar, the main content area is titled "Support". It features three main sections: "Find answers", "Manage cases", and "Access (IAM)". The "Find answers" section contains a list of questions related to Access (IAM), Account management, and Billing and usage. To the right, there are two boxes: one for "Need more help?" containing links to View cloud status, Ask the community, Live chat, and Create a case; and another for "Plan" which indicates basic support is free for all accounts.

Find answers

Access (IAM)

- What is IAM?
- How do I find out what I have access to?
- What access do I need to provide others access?
- How do I request access to a resource?
- How do I assign access to infrastructure and devices?
- How do resource groups and access groups work?
- Why can't I add a resource to a resource group?
- How do I delegate account administrator capabilities?
- What is an IAM access policy?

Account

- How do I upgrade or convert my account type?
- How do I change my email notification settings?
- How do I switch between multiple accounts?
- Can I make someone else the account owner?
- What happens when my Lite plan instance reaches the monthly quota?
- What can I do if I get an error when creating my account?
- Why is my account deactivated?
- How do I cancel my account?

Billing and usage

- How do I apply a promotional feature code?
- How do I update my credit card?

Need more help?

- View cloud status
- Ask the community
- Live chat
- +1-(866)403-7638
- Create a case

Plan

You have **basic** support.
Basic support is free for all IBM Cloud accounts. This plan includes access to IBM Cloud docs, our status page, community forums, and FAQs.

Upgrade

IBM Cloud catalog

Topics

- Introduction to IBM Cloud
- IBM Cloud compute choices
- IBM Cloud console
-  IBM Cloud catalog
 - Creating and managing a Cloud Foundry application
 - IBM Cloud regions and availability zones (optional)
 - Managing your IBM Cloud users and resources (optional)

IBM Cloud: Catalog

The screenshot shows the IBM Cloud Catalog interface. At the top, there's a navigation bar with links for Catalog, Docs, Support, Manage, and a user profile. A search bar is also present. The main area is titled "Catalog" and features a sidebar with "All Categories" and a list of service types: Compute, Containers, Networking, Storage, AI, Analytics, Databases, Developer Tools, Integration, Internet of Things, Security and Identity, Starter Kits, Web and Mobile, and Web and Application.

Featured Offerings

- Kubernetes Service** (IBM • IAM-enabled): Deploy secure, highly available apps in a native Kubernetes experience. (Icon: Blue cube)
- IBM Log Analysis with LogDNA** (Third Party • IAM-enabled): Provides log collection and log search for IBM Log Analysis. Define alerts and design custom views to monitor application and system logs. (Icon: Red hexagon with DNA helix)

Compute

- Bare Metal Server** (IBM): Bare metal servers provide the raw horsepower you demand for your processor-intensive and disk I/O-intensive workloads. These servers come with the most...
- Virtual Server** (IBM): Our virtual servers deliver a higher degree of transparency, predictability, and automation for all workload types. Virtual servers are guaranteed not to b...

Infrastructure

- Cloud Foundry Enterprise Environment** (IBM • IAM-enabled): An isolated environment for hosting your Cloud Foundry apps with full admin control over configuration, capacity and access. (Icon: Cloud with CF logo)
- HPC Cluster** (IBM • IAM-enabled): Provides the capability to configure, deploy and manage HPC clusters to add new or expand existing HPC footprint. (Icon: Blue cluster with people)
- WebSphere Application Server** (IBM): Allows you to quickly get up and running on a pre-configured WebSphere Application Server installation in a hosted cloud environment in IBM Cloud. (Icon: Purple globe)
- HPCaaS from Rescale** (Third Party • IAM-enabled): Enables you to rapidly deploy your HPC workloads on the IBM Cloud with your chosen execution environment. (Icon: Cloud with person icon)

VMware Virtual Data Centers

- VMware vCenter Server on IBM Cloud** (IBM • IAM-enabled): Standardized software-defined data center (SDDC) solution that combines IBM Cloud Bare Metal Servers with VMware vSphere, NSX, and optional vSAN for a...
- VMware vSphere on IBM Cloud** (IBM • IAM-enabled): Customizable virtualization service that combines VMware-compatible bare metal servers, hardware components, and licenses, to build your own IBM-host...
- NetApp ONTAP Select** (IBM • IAM-enabled): Software-defined storage cluster that addresses your needs for a dedicated and highly available storage appliance based on NetApp ONTAP Select. (Icon: Blue square with N)

Single-node Trial for Migration and App Modernization (IBM): (Icon: Blue cube with cloud)

Working with resources

- A resource is anything that can be created, managed, and contained from the list of services, run times, and templates that are available on the IBM Cloud catalog.
- Some examples include:
 - Cloud Foundry Apps
 - Service instances
 - Container clusters
 - Storage volumes
 - Virtual servers

The screenshot shows the IBM Cloud Catalog interface. At the top, there's a search bar and a filter icon. Below the header, a navigation bar has 'Services' selected (indicated by a blue underline) and 'Software'. On the left, a sidebar lists various service categories: All Categories, VPC Infrastructure, Compute, Containers, Networking, Storage, AI, Analytics, Databases, Developer Tools, Integration, Internet of Things, and Security and Identity. The 'All Categories' button is highlighted with a blue border. To the right, two service cards are displayed. The first card is for 'Cloud Foundry' (IBM), which is described as running applications in a multi-tenant or isolated environment. The second card is for 'Cloudant' (IBM), described as a scalable JSON document database for web, mobile, IoT, and serverless applications. Both cards show a small icon and a 'Compute' or 'Databases' label at the bottom.

IBM Cloud catalog: Categories

All Categories >

Compute

Containers

Networking

Storage

AI

Analytics

Databases

Developer Tools

Integration

Internet of Things

Security and Identity

Starter Kits

Web and Mobile

Web and Application

The IBM Cloud catalog provides multiple categories such as:

- Compute
- Containers
- Networking
- Storage
- AI
- Analytics
- Databases



Object Storage

Lite • IBM • IAM-enabled

Provides flexible, cost-effective, and scalable cloud storage for unstructured data.

Note: The Lite tag on the resources means that this service is available for the users who registered with an IBM Cloud Lite account.

The rest of the services are available to the users who have a Pay-As-You-Go account or a Subscription account.

IBM Cloud catalog: Starter kits

A *starter kit* contains a sample application and its associated run time, resource environment, and predefined services.

Starter Kits

All Categories

- Compute
- Containers
- Networking
- Storage
- AI
- Analytics
- Databases
- Developer Tools
- Integration
- Internet of Things
- Security and Identity

[Starter Kits >](#)

- [Web and Mobile](#)
- [Web and Application](#)

 **Basic Web for Mendix**
IBM

A starter that provides a basic web serving application using Mendix.

 **Custom Vision Model for Core ML with Watson**
IBM

Create Apple Core ML Models using the Watson Visual Recognition service to process and tag images locally.

 **Internet of Things Platform Starter**
Lite • IBM

Get started with IBM Watson IoT platform using the Node-RED Node.js sample application. With the Starter, you can quickly simulate an Internet of...

 **Java Microservice with MicroProfile and Java EE**
IBM

A starter for building a microservice in Java using the MicroProfile / Java EE framework.

 **Java Microservice with Spring**
IBM

A starter building a microservice backend in Java, using the Spring framework.

 **Java Web App with Spring**
IBM

A starter that provides a basic web serving application in Java, using the Spring framework.

 **Mobile Basic**
IBM

A basic Hello World starter with Analytics and Push services.

 **Node.js Microservice with Express.js**
IBM

A starter for building a microservice backend in Node.js, using the Express.js framework.

 **Node.js Web App with Express.js**
IBM

A starter that provides a basic web serving application in Node.js, using the Express.js framework.

IBM Cloud catalog: Starter kits (cont.)

Examples of starter kits:

- Node.js Web App with Express.js
- Node.js Microservice with Express.js
- Java Microservice with Spring
- Java Microservice with MicroProfile and Java EE
- Internet of Things Platform Starter
- Mobile Basic



Node.js Microservice with Express.js
IBM

A starter for building a microservice backend in Node.js, using the Express.js framework.



Java Microservice with Spring
IBM

A starter building a microservice backend in Java, using the Spring framework.



Internet of Things Platform Starter
Lite • IBM

Get started with IBM Watson IoT platform using the Node-RED Node.js sample application. With the Starter, you can quickly simulate an Internet of...

IBM Cloud catalog: Creating a starter kit

Catalog / Starter kit details

Node.js Web App with Express.js

Web App

Create app

1

Resource group: Default

Download code

3

More options

Lightbulb icon

Catalog / Starter kit details / Create app

Node.js Web ...

Cancel Create

App details

App name

An app name can be up to 128 characters long.

Nodejs Web App with Expressjs KDRVQ

Resource group i

Default

Tags: i

Examples: env:dev, version-1

Platform

Node.js

2

Deploy your app

4

Continuous delivery is not enabled for this app.
Enable continuous delivery to automate builds, tests, and deployments through Delivery Pipeline, GitLab, and more.

Configure continuous delivery

IBM Cloud catalog: Cloud Foundry Apps

Cloud Foundry in the IBM Cloud

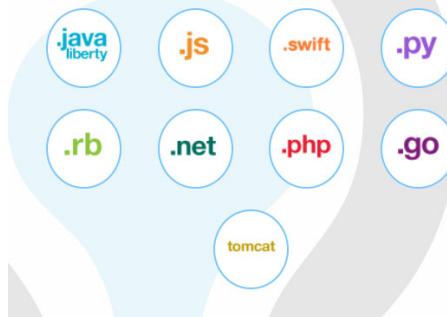
Public Applications Create

Create and deploy apps on IBM Cloud's multi-tenant Cloud Foundry environment available in 5 IBM Cloud Regions. Get started in minutes with 375 GB-HR's of memory free per Month.

[Learn more](#) about IBM Cloud Foundry Public.

Application Runtimes

A range of popular language runtimes that make working with your chosen language easy and automatic.



IBM Cloud provides Cloud Foundry runtimes that support different programming languages, such as

- Liberty for Java
- SDK for Node.js
- ASP.NET core
- Runtime for Swift

IBM Cloud catalog: AI

AI

 Watson Assistant Lite • IBM • IAM-enabled Watson Assistant lets you build conversational interfaces into any application, device, or channel.	 Watson Studio Lite • IBM • IAM-enabled Embed AI and machine learning into your business. Create custom models using your own data.
 Compare and Comply Lite • IBM • IAM-enabled Process governing documents to convert, identify, classify, and compare important elements	 Discovery Lite • IBM • IAM-enabled Add a cognitive search and content analytics engine to applications.
 Knowledge Catalog Lite • IBM • IAM-enabled Discover, catalog, and securely share enterprise data.	 Knowledge Studio Lite • IBM • IAM-enabled Teach Watson the language of your domain.
 Language Translator Lite • IBM • IAM-enabled Translate text, documents, and websites from one language to another. Create industry or region-specific translations via the service's customization capability.	 Machine Learning Lite • IBM • IAM-enabled IBM Watson Machine Learning - make smarter decisions, solve tough problems, and improve user outcomes.
 Natural Language Classifier IBM • IAM-enabled Natural Language Classifier uses advanced natural language processing and machine learning techniques to create custom classification models. Users train their data and the service...	 Natural Language Understanding Lite • IBM • IAM-enabled Analyze text to extract meta-data from content such as concepts, entities, emotion, relations, sentiment and more.

IBM Cloud provides access to dozens of AI services to enrich applications with cognitive features such as:

- Chat bots
- Machine learning
- Language translator
- Natural language understanding

IBM Cloud catalog: Web and mobile

Web and Mobile

Web and Mobile	
 App ID Lite • IBM • IAM-enabled User Authentication and User Profiles for your apps.	 App Launch IBM • Beta • IAM-enabled Accelerate the delivery of innovations to mobile apps by avoiding release cycle complexities.
 Email Delivery IBM Delivering your email through one reliable platform.	 Mobile Foundation IBM Build secure, cognitive, engaging and personalized mobile apps faster at scale
 Push Notifications Lite • IBM • IAM-enabled Scalable and reliable Push Notifications service for mobile and web applications	 Weather Company Data IBM Use the Weather Company Data for IBM Cloud service to incorporate weather data into your IBM Cloud applications.
 Bitbar Testing Cloud Third Party Mobile device cloud with real devices only	 esri ArcGIS for Developers Third Party Bring the power of location to your apps with ArcGIS.
 Intelligent Travel API Third Party ZUMATA's Artificial Intelligence for personalized hotel search experience.	 Mapbox Maps Third Party Add powerful custom maps to your app

IBM Cloud offers a set of services that can ease the common tasks that are needed in building a mobile app.

These services take the drudgery of routine tasks away from the app developer and provide compact SDKs with which the developer can interact.

IBM Cloud catalog: Developer tools

Developer Tools

Developer Tools	
 Alert Notification IBM Never miss critical alerts. Notify the right people immediately. Speed up response with automated escalation policies.	 Auto-Scaling IBM Automatically increase or decrease the number of application instances based on a policy you define.
 Availability Monitoring Lite • IBM Around the world, around the clock availability and performance monitoring.	 Continuous Delivery Lite • IBM • IAM-enabled Develop, build, test and deliver using DevOps best practices.
 Db2 Warehouse IBM • Dedicated Db2 Warehouse on Cloud is a flexible and powerful data warehouse for enterprise-level analytics.	 DevOps Insights Lite • IBM • IAM-enabled Elevate your DevOps to increase deployment quality, delivery control, and speed to market.
 Event Management IBM Consolidated operational event and incident management.	 Globalization Pipeline IBM • IAM-enabled Manage the translation of your cloud and mobile applications using IBM Globalization Pipeline.
 Monitoring Lite • IBM Collect, store, and analyze metrics from your dynamic cloud environments and micro-service applications.	 Toolchain Lite • IBM • IAM-enabled Build, test and deliver using DevOps best practices.

IBM Cloud provides developer tools to automate the tasks of developing and deploying applications.

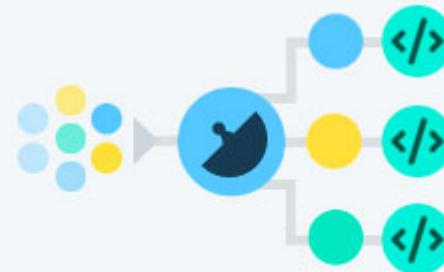
Most of the services that are available in this section are DevOps related.

IBM Cloud catalog: Functions

IBM Cloud Functions is a FaaS platform that runs functions in response to incoming events.



Cost-Effective Computing



Automatically Scale



Easy Integration

Creating and managing a Cloud Foundry application

Topics

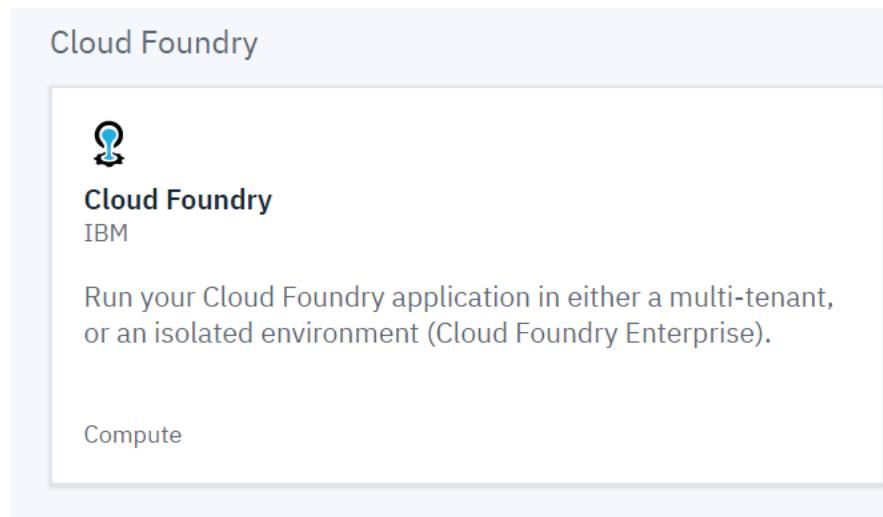
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Creating an IBM Cloud Foundry application (1 of 3)

1. To create an IBM Cloud Foundry application, click **Create resource** from the dashboard.

Create resource

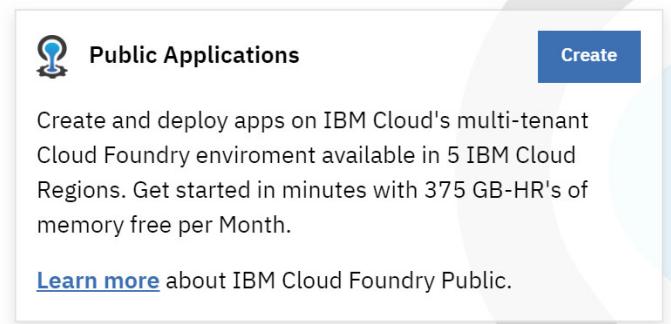
2. From the catalog, click **Compute** and then scroll down and select **Cloud Foundry** service.



Creating an IBM Cloud Foundry application (2 of 3)

3. From Cloud Foundry Overview page, click **Create** under **Public Applications**.

Cloud Foundry in the IBM Cloud



4. Select region and pricing plan.

A screenshot of a web browser showing the 'Create a Cloud Foundry Sample App' form. At the top left is a 'java liberty' icon. To its right is the text 'Create a Cloud Foundry Sample App'. In the top right corner are three small buttons: 'Lite', 'IBM', and 'Application'. Below the buttons is a link 'Need Help? Contact Support View docs'. The main form area has two tabs: 'Create' (which is selected) and 'About'. A dropdown menu labeled 'Select a region' shows 'London' as the current selection. Below the region selection is a section labeled 'Select a pricing plan' with a note: 'Displayed prices do not include tax. Monthly prices shown are for country or region: United States'. A table below lists three pricing plans:

PLAN	FEATURES	PRICING
<input checked="" type="checkbox"/> Lite	Lite apps are free You get up to 256 MB of memory while you work on your apps.	Free
<input type="radio"/> 64 MB	128 MB of allowed 256 MB is used. Need more memory? Upgrade to the Production plan.	
<input type="radio"/> 128 MB		

A note at the bottom of the table states: 'Lite apps sleep after 10 days of development inactivity.'

Creating an IBM Cloud Foundry application (3 of 3)

4. Select the runtime and enter the app name and host name.

Select a runtime

.java Liberty for Java™ Version 3.x	.js SDK for Node.js™ Version 3.x <input checked="" type="checkbox"/>	.net ASP.NET Core Version 2.x
.go Go Community	.php PHP Community	.py Python Community
.rb Ruby Community	.swift Runtime for Swift Version 1.0.0	tomcat Tomcat Community

App name:

Host name:

Domain:

▼

Choose an organization:

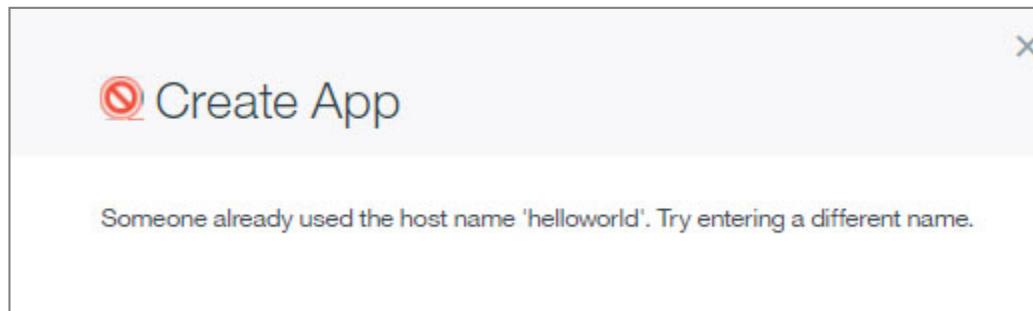
Choose a space:

Tags: ⓘ

Examples: env:dev, version-1

Host name must be unique

- IBM Cloud hosts your application on the domain that you select. It is preferable that you select `appdomain.cloud`.
You do not share your memory and application instances with other IBM Cloud accounts.
- You must choose a host name that is unique across all applications from all IBM Cloud users.
You cannot create an IBM Cloud application with a host name that is used by another application.



Creating an IBM Cloud Foundry application (3 of 3)

4. After waiting for your application to be deployed, the application is available and its status has changed from **Starting** to **Running** or **Awake**, based on the account type.

The screenshot shows the IBM Cloud Foundry interface. On the left, there's a sidebar with 'Getting started', 'Overview', 'Runtime', and 'Connections'. The main area is titled 'Resource list /' and shows an application named 'test-app-node'. To the left of the name is a circular icon containing an orange 'js' symbol. To the right of the name is a status indicator: a blue circle with a white 'S' and the word 'Starting'. This status box is highlighted with a red rectangle. Below the application name, it says 'Org: bmx_student_bmx66@yahoo.com', 'Location: London', 'Space: dev', and 'Add Tags'. To the right of the application details is a 'Routes' button with a dropdown arrow. At the bottom right of the main area is a three-dot menu icon.

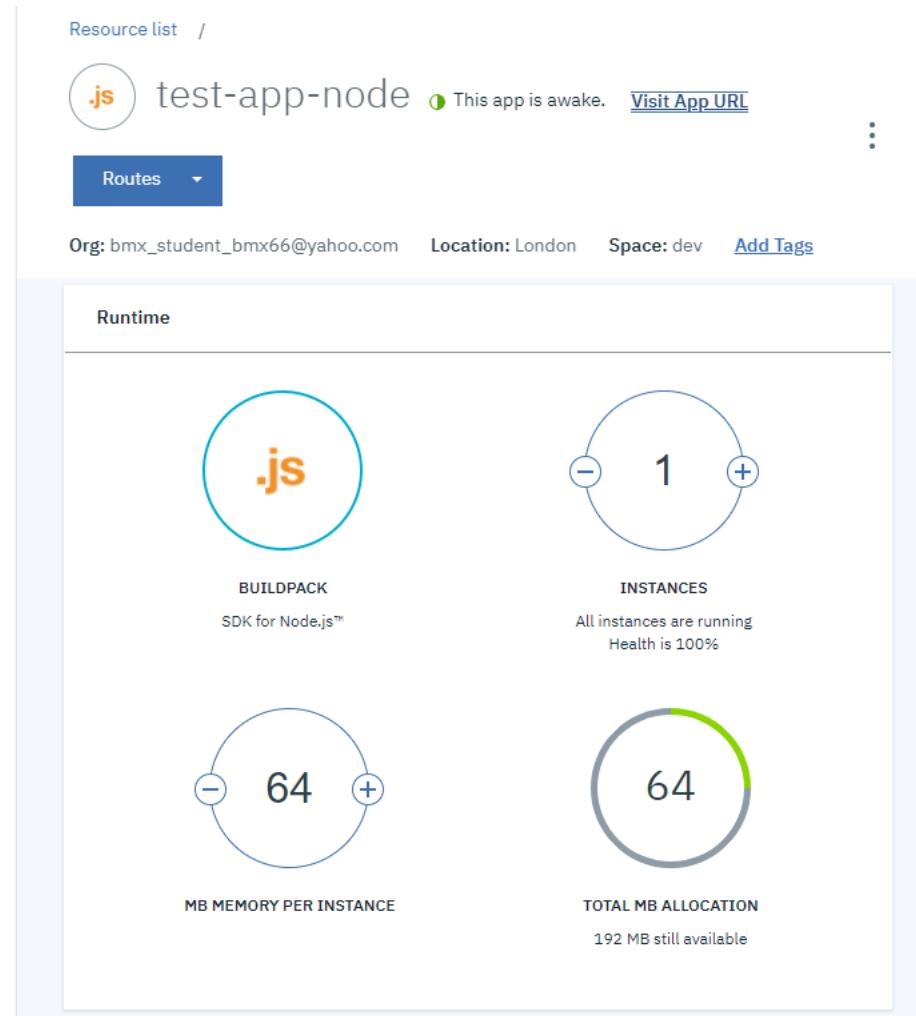
This screenshot is similar to the one above, showing the 'test-app-node' application. The status indicator now shows a green circle with a white dot and the text 'This app is awake.' This status box is also highlighted with a red rectangle. The other details like Org, Location, Space, and the three-dot menu are the same.

This screenshot shows the final state of the application. The status indicator now shows a green circle with a white dot and the word 'Running'. This status box is highlighted with a red rectangle. The other application details and the interface elements remain consistent with the previous screenshots.

IBM Cloud: Application Details page

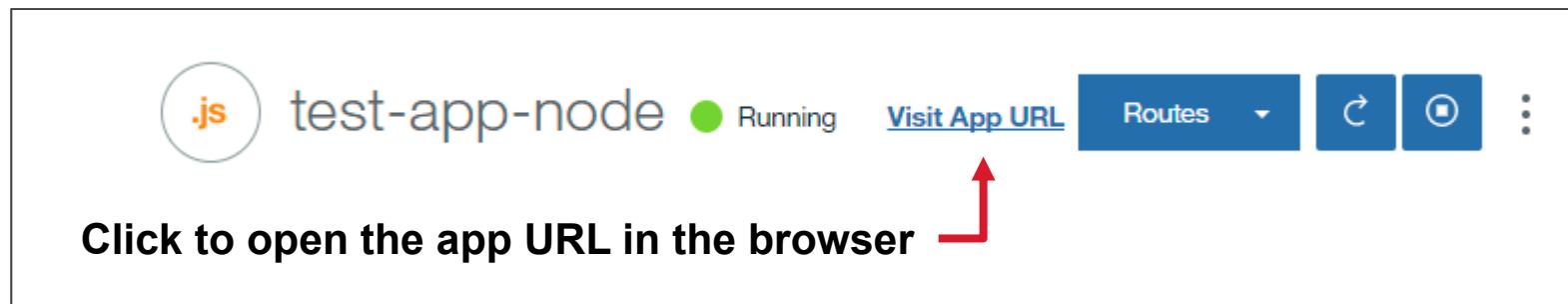
Check and control the status of applications in the Application Details page in the Overview section:

- View and adjust the memory resources that are used by the application.
- Start, stop, and restart your application.
- View your application in the browser.
- Adjust the number of instances of your application.



Testing applications through the application route

- The *application route* is the entry point for users into your application in IBM Cloud:
 - You can host a REST service, web app, or web page through this route.
- To view the application route, click **Visit App URL**:
 - You can access the application route for a running or awake application only.
 - The application route must be unique across all applications in the domain.



Adding an IBM Cloud service

Add a service by completing the following steps:

1. From the Dashboard, click **Create resource**.
2. Select a service from the catalog.
3. Enter a name for the service.
4. Select the authentication method.
5. Choose a Pricing Plan and then click **Create**.

The screenshot shows the IBM Cloud service catalog interface for creating a Cloudant service. The service details are as follows:

- Service name:** Cloudant-b9
- Choose a region/location to deploy in:** London
- Select a resource group:** Default
- Tags:** Examples: env:dev, version-1
- Available authentication methods:** Use both legacy credentials and IAM
- Pricing Plans:** Monthly prices shown are for country or region: United States
- Need Help?** Contact IBM Cloud Support
- Buttons:** Add to estimate (blue outline) and Create (blue)

Binding a service to an application (1 of 2)

1. From the Application Details page, select **Connections**. Then, click **Create connection**.

The screenshot shows the IBM Cloud Application Details interface. On the left, a sidebar menu lists several options: Getting started, Overview, Runtime, **Connections** (which is highlighted with a blue border), Logs, Autoscaling (Beta), Monitoring, and API Management. The main content area displays details for an application named "test-app-node". It includes a small icon with ".js", the application name, a green dot indicating it is awake, and a link to "Visit App URL". Below this, there are filters for "Org: bmx_student_bmx66@yahoo.com", "Location: London", "Space: dev", and a "Add Tags" button. A "Routes" dropdown menu is also visible. At the bottom, a large button labeled "Create connection" with a plus sign is prominently displayed. In the center, there is a circular icon with a question mark and the text "No connected services" below it, along with a sub-instruction: "Click Create connection to add service connections to your app."

Binding a service to an application (2 of 2)

2. Select the service to bind to your application. Then, click **Connect**:

- IBM Cloud lists the services that are compatible with your application and runtime environment only.
- You can bind a service to more than one application.

Connect Existing Compatible Service

All Resources ▼

10 Items per page | 1-4 of 4 items 1 of 1 pages < 1 >

SERVICES	RESOURCE GROUP	PLAN	SERVICE OFFERING
Cloudant-b9	Default	Lite	Cloudant
Internet of Things Platform-sx	--	Lite	Internet of Things Platform
Natural Language Understanding-ld	Default	Lite	Natural Language Understanding
Personality Insights-7t	Default	Lite	Personality Insights

IBM Cloud: Environment variables

- Environment variables contain the environment information about a deployed application on IBM Cloud:
 - VCAP_SERVICES
 - User-defined
- You can refer to environment variables within the application code.

The screenshot shows the IBM Cloud Application Overview page for a deployment named "test-app-node". The sidebar on the left lists various management options: Getting started, Overview, Runtime (selected), Connections, Logs, Autoscaling (Beta), Monitoring, and API Management. The main content area displays the deployment details: Org: bmx_student_bmx66@yahoo.com, Location: London, Space: dev, and Add Tags. Below these details, there are tabs for Memory and instances, Environment variables (selected), and SSH. Under the Environment variables tab, the "VCAP_SERVICES" section is expanded, showing a JSON object representing the service bindings. The JSON content includes entries for "cloudantNoSQLDB" and "iam" services, with specific host and port details provided.

```
{
  "cloudantNoSQLDB": [
    {
      "label": "cloudantNoSQLDB",
      "provider": null,
      "plan": "Lite",
      "name": "Cloudant-b9",
      "tags": [
        "data_management",
        "ibm_created",
        "lite",
        "ibm_dedicated_public",
        "ibmcloud-alias"
      ],
      "instance_name": "Cloudant-b9",
      "binding_name": null,
      "credentials": {
        "apikey": "nUuZ6mYU3BbyMBB6maZ-sF7cPdqoHsYuzXc9SCLdxzYs",
        "host": "39fe2aef-946a-4b28-a481-b4f3b58cd7ba-bluemix.cloudantnosqldb.appdomain.cloud",
        "iam_apikey_description": "Auto-generated for binding ea38e82b-cde3-46d3-86e6-96b4cf28b1b9",
        "iam_apikey_name": "Cloudant-b9"
      }
    }
  ],
  "iam": [
    {
      "label": "iam",
      "provider": null,
      "plan": "Basic"
    }
  ]
}
```

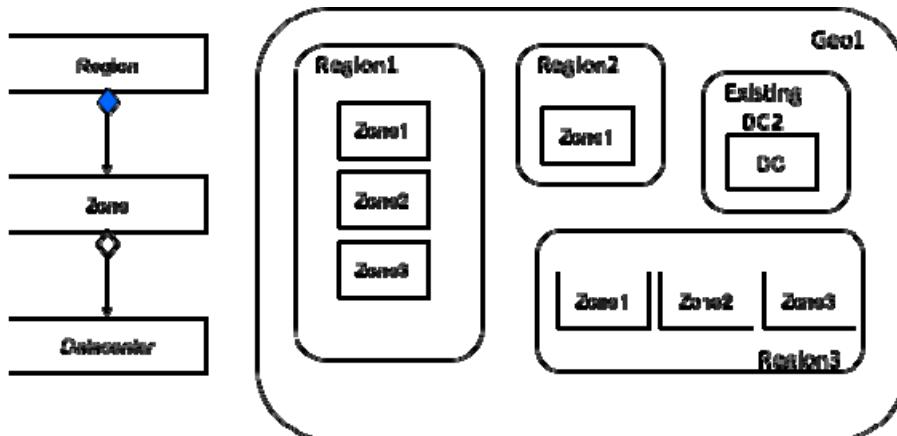
IBM Cloud regions and availability zones (optional)

Topics

- Introduction to IBM Cloud
- IBM Cloud compute choices
- IBM Cloud console
- IBM Cloud catalog
- Creating and managing a Cloud Foundry application
-  IBM Cloud regions and availability zones (optional)
- Managing your IBM Cloud users and resources (optional)

IBM Cloud: Choice of regions and availability zones

- *Regions* are geographically separated from one another, and have physically distinct infrastructure from all other regions and unrelated zones.
- Zones are logically isolated data centers within a single campus, each having isolated electrical, mechanical, and network infrastructures. Zones are separated physically from one another. Within a zone, resources are connected by ultra-low latency, high-bandwidth networks.

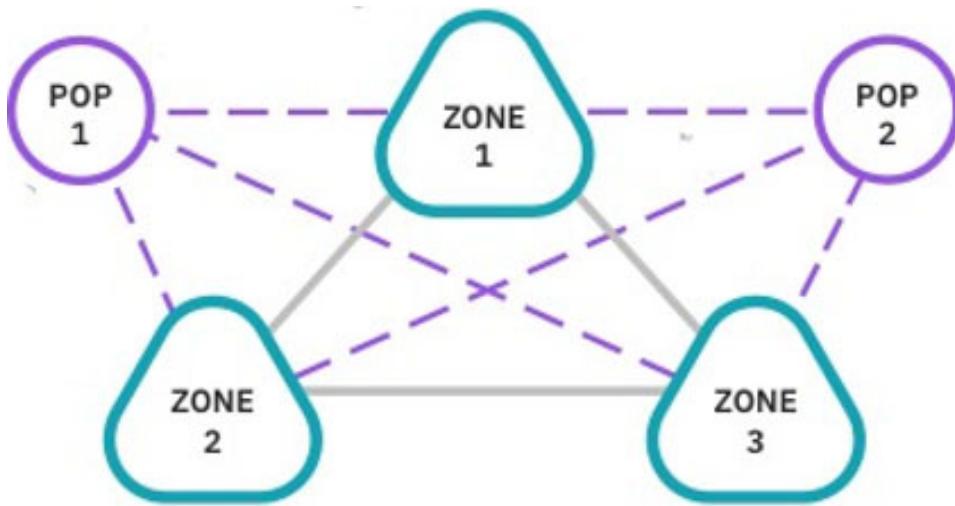


MZR Name	Data Centers
us-south	dal10, dal12, dal13
us-east	wdc04, wdc06, wdc07
eu-gb	lon04, lon05, lon06
eu-de	fra02, fra04, fra05
jp-tok	tok02, tok04, tok05
au-syd	syd01, syd04, syd05

IBM Cloud: Multi-Availability Zones

A *Multi-Zone Region (MZR)* has three or more zones that provide high availability and resiliency:

- Typically 3+ data centers within ~10 km of distance of each other with low latency between data centers.
- Each MZR offers a full and consistent set of services to support your customers' needs for highly available and enterprise-class workloads.



MZR example:

- Region: **us-south**
- Zones: **dal10, dal12, dal13**

Managing your IBM Cloud users and resources (optional)

Topics

- Introduction to IBM Cloud
 - IBM Cloud compute choices
 - IBM Cloud console
 - IBM Cloud catalog
 - Creating and managing a Cloud Foundry application
 - IBM Cloud regions and availability zones (optional)
-  Managing your IBM Cloud users and resources (optional)

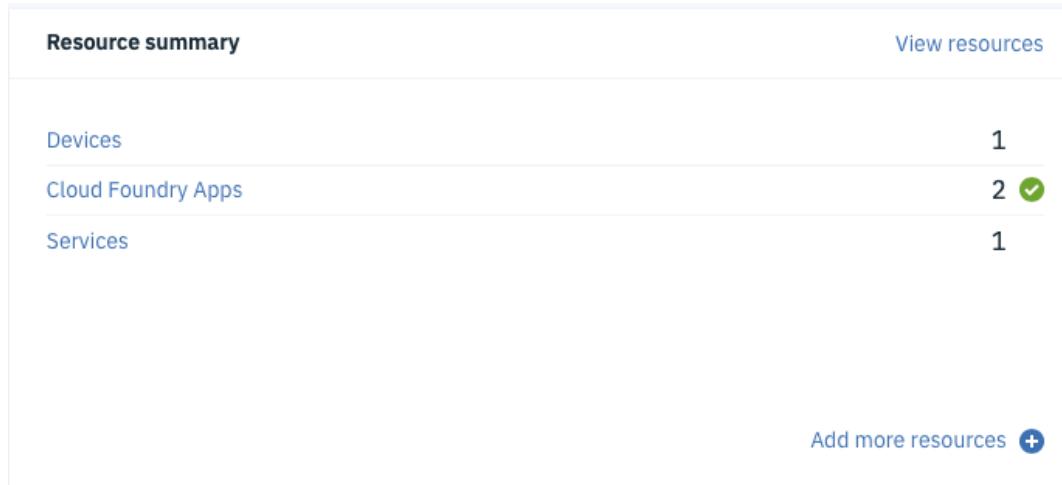
IBM Cloud: Identity and Access Management

IBM Cloud uses Identity and Access Management (Cloud IAM) to manage user identity. Some of the key features are:

- Unified user management across IaaS and PaaS resources
- Enterprise federation
- Fine-grained access control

IBM Cloud: Resources, users, and access control

- A resource is an entity in your account that you create from the IBM Cloud catalog. You can create multiple resources in an account.
- You can invite multiple users to an account and grant them access to resources.
- If the resources use Cloud IAM for access control, you can grant users access to the resources by using customizable *resource groups*.
- If the resources do not use Cloud IAM, you can use Cloud Foundry regions, organizations, and spaces for access control.



The screenshot shows a 'Resource summary' table with the following data:

Category	Count
Devices	1
Cloud Foundry Apps	2 
Services	1

At the bottom right of the table, there is a link 'Add more resources' with a plus sign icon.

IBM Cloud: Resource groups

A resource group is a way for you to organize your account resources into customizable groups.

The screenshot shows the 'Resource groups' page within the IBM Cloud account interface. On the left, a sidebar menu lists various account management options: Overview, Account resources (expanded), Best practices, Resource groups (selected and highlighted in blue), Cloud Foundry orgs, Tags, Audit log, Account settings, Notifications, Company contacts, and Company profile. The main content area is titled 'Resource groups' and contains a descriptive paragraph: 'Group resources to organize and assign access to the group. Available for all resources managed by IBM Cloud Identity and Access Management.' Below this is a 'Learn more about resource groups.' link. A search bar labeled 'Filter' is followed by a 'Create +' button. A table displays a single resource group entry:

Name	Date Created	Actions
Default	12/6/2018, 5:47:29 PM	...

IBM Cloud: Resource controller

The *resource controller* is responsible for managing the lifecycle of resources in an account:

- Offers fine-grained access control to resources through IAM.
- Organizes resources by using resource groups:
 - Users are granted access to resources in a resource group.
 - Access to resources is not restricted to Cloud Foundry regions, organizations, and spaces.
- Resources that are based on Cloud Foundry remain assigned to Cloud Foundry regions, organizations, and spaces.

IBM Cloud: Access group

An *access group* can be created to organize a set of users and service IDs into a single entity that makes it easy for you to assign access.

The screenshot shows the 'Access groups' section of the IBM Cloud Access (IAM) interface. On the left, a sidebar menu includes 'Overview', 'Users', 'Access groups' (which is selected), 'Service IDs', 'Authorizations', 'IBM Cloud API keys', and 'Settings'. The main content area is titled 'Access groups' and displays a message: 'Create access groups to quickly and easily assign access to a set of users and service IDs. To add users and assign access to an existing group, click the group name.' Below this is a table with two rows:

Group	Description
Access 1	For testing purposes

Below the table, a note for 'Public Access' states: 'This group includes all users and service IDs by default. All group members, including unauthenticated users, are given public access to any resources that are defined in the policies for the group.' At the bottom, there are pagination controls: 'Items per page: 25' and '1-2 of 2 items'.

The screenshot shows the 'Manage Access 1' page for a specific access group. The top header includes 'Groups /' and the account information 'bmx bmx's Account'. The main title is 'Manage Access 1' with the ID 'AccessGroupId-f9328964-305b-4bac-b33d-07f906d1e673' and a description 'For testing purposes'. Below the title, there are four tabs: 'Users' (selected), 'Service IDs', 'Access policies', and 'Dynamic rules'. A message 'The group does not have any users assigned.' is displayed. At the bottom is a blue 'Add users +' button.

IBM Cloud: IAM policies

A policy grants a subject one or multiple roles in a set of resources so that specific actions can be taken within the context of the specified target resources.

I want to give	Subject	access to	Target	with specific permissions	Platform roles	Service roles
	<input type="checkbox"/> Access Group       		<input type="checkbox"/> Account Management Service  		<input checked="" type="checkbox"/> Administrator <input checked="" type="checkbox"/> Editor <input checked="" type="checkbox"/> Operator <input checked="" type="checkbox"/> Viewer	<input checked="" type="checkbox"/> Manager <input checked="" type="checkbox"/> Reader <input checked="" type="checkbox"/> Writer
	<input type="checkbox"/> User 		<input type="checkbox"/> Resource Group     			
	<input type="checkbox"/> Service ID 		<input type="checkbox"/> Service     			
			<input type="checkbox"/> Service Instance 			
			<input type="checkbox"/> Service Resource Type 			

IBM Cloud: Assigning access to group

Groups / Manage Group / Choose Access Type /

Account: **bmx bmx's Account**

Assign resource group and resource access to Access 1 (i)

When you assign a group access to a resource within a resource group, you can also assign access for viewing, editing, or managing access to the group. Select a role for the Assign access to a resource group option to provide access to the group. Select "No access" if you want to only provide access to the specified resource.

Resource group

All resource groups (x) ▾

Assign access to a resource group (i)

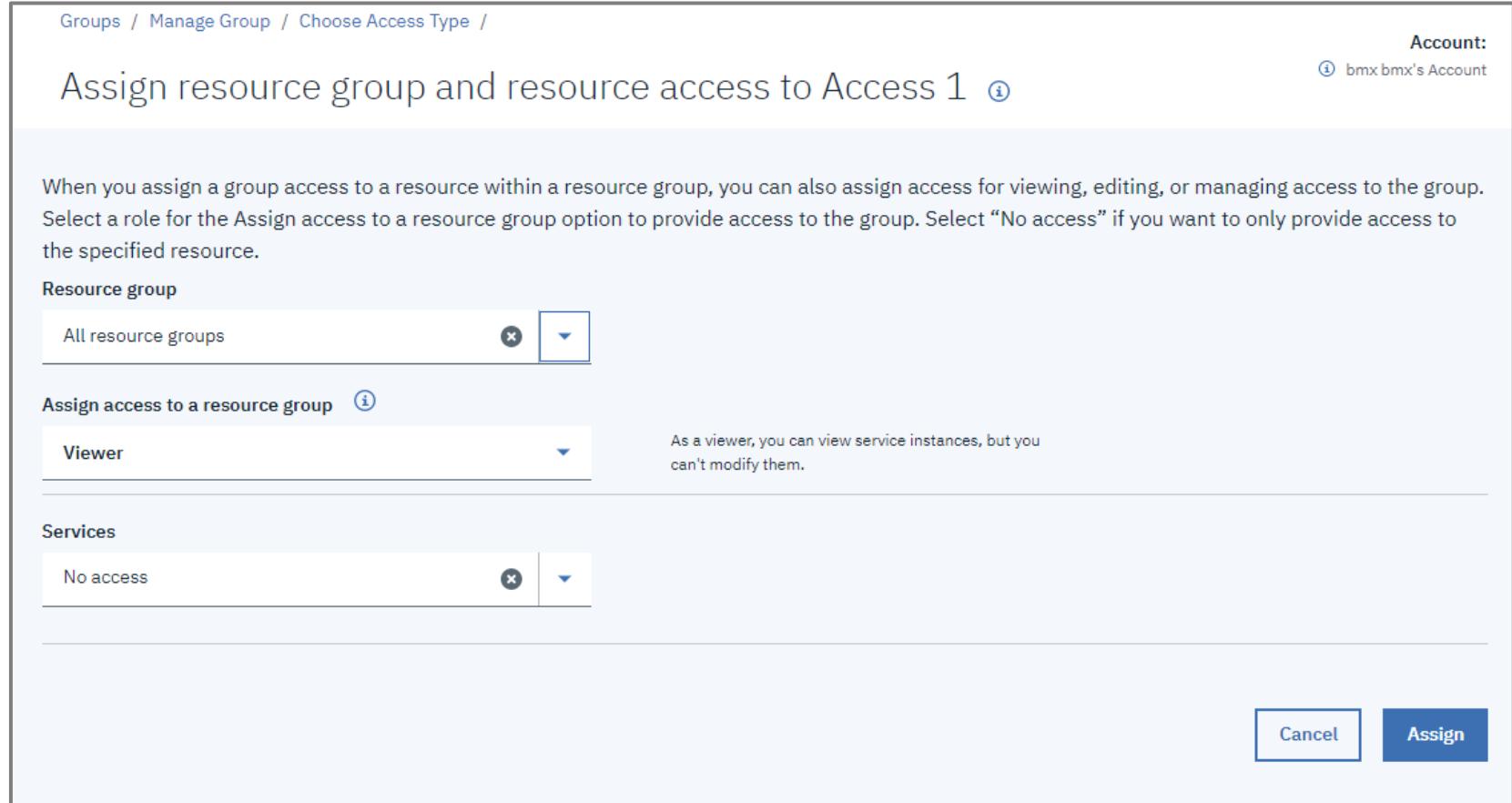
Viewer ▼

As a viewer, you can view service instances, but you can't modify them.

Services

No access (x) ▾

Cancel Assign



IBM Cloud: Cloud IAM roles

With Cloud IAM, you can manage and define access for users and resources in your account. Two types of roles can be assigned: platform management roles and service access roles.

Select roles

Assign platform access roles

Select all roles that you want to assign. Each role allows separate actions to be completed and doesn't inherit the actions of the lesser roles. These roles enable actions to be performed on platform resources, such as creating instance, connecting instance to apps, and assigning user access.

Administrator
As an administrator, you can perform all platform actions based on the resource this role is being assigned, including assigning access policies to other users.

Editor
As an editor, you can perform all platform actions except for managing the account and assigning access policies.

Operator
As an operator, you can perform platform actions required to configure and operate service instances, such as viewing a service's dashboard.

Viewer
As a viewer, you can view service instances, but you can't modify them.

Assign service access roles

These roles allow access for using the service and performing service API calls. Each role is customized by the selected service. Refer to the service's documentation for more details.

Manager
As a manager, you have permissions beyond the writer role to complete privileged actions as defined by the service. In addition, you can create and edit service-specific resources.

Writer
As a writer, you have permissions beyond the reader role, including creating and editing service-specific resources.

Reader
As a reader, you can perform read-only actions within a service such as viewing service-specific resources.

FEEDBACK

IBM Cloud: Organizing resources

Specify the resource group when creating a resource

The screenshot shows the IBM Cloud service creation interface for Cloudant. At the top left, there is a back arrow labeled "View all" and the service name "Cloudant". Below the service name, it says "Lite • IBM". To the left, there is a brief description of Cloudant: "IBM Cloudant is a fully managed JSON document database that offers independent serverless scaling of provisioned throughput capacity and storage. Cloudant is compatible with Apache CouchDB and accessible through a simple to use HTTPS API for web, mobile, serverless, and IoT applications. Cloudant is SOC2 and ISO 27001 compliant with HIPAA". On the right, there are three input fields: "Service name:" with the value "Cloudant-dh", "Choose a region/location to deploy in:" with the value "London", and "Select a resource group:" with the value "Default".

Cloud Foundry: Organizing resources

A Cloud Foundry resource is organized by region, organization, and space.

The screenshot shows the 'Create a Cloud Foundry App' page for Java Liberty. The page has a header with 'View all' and a 'Create a Cloud Foundry App' button. Below the header, there's a 'Liberty for Java™' section with a brief description and links to 'View Docs' and 'Terms'. On the left, there are details about the app: VERSION 3.x, TYPE Application, and LOCATION Sydney, Frankfurt, London, Washington DC, Dallas. The main form on the right contains fields for 'App name' (test-java-app), 'Host name' (test-java-app), 'Domain' (eu-gb.cf.appdomain.cloud), 'Choose a region/location to deploy in' (London), 'Choose an organization' (bmx_student_bmx66@y...), 'Choose a space' (dev), and 'Tags' (env:dev, version-1). At the bottom, there are 'Add to estimate' and 'Create' buttons, with 'Free' indicated next to the 'Create' button. A 'Feedback' link is also visible on the right side.

View all

Create a Cloud Foundry App

Lite • IBM

Liberty for Java™

Develop, deploy, and scale Java web apps with ease. IBM WebSphere Liberty Profile is a highly composable, ultra-fast, ultra-light profile of IBM WebSphere Application Server designed for the cloud.

[View Docs](#) [Terms](#)

VERSION 3.x

TYPE Application

LOCATION Sydney, Frankfurt, London, Washington DC, Dallas

App name: test-java-app

Host name: test-java-app

Domain: eu-gb.cf.appdomain.cloud

Choose a region/location to deploy in: London

Choose an organization: bmx_student_bmx66@y...

Choose a space: dev

Tags: env:dev, version-1

Add to estimate

Create

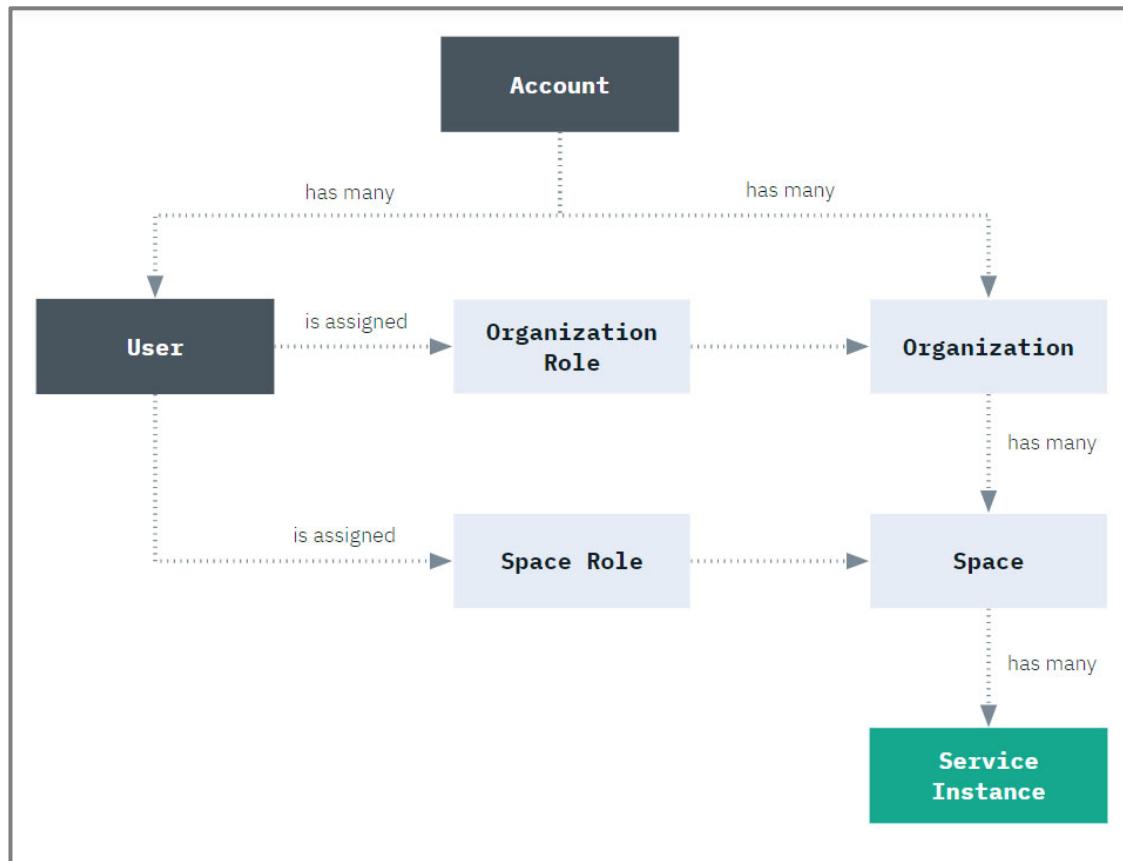
Free

Need Help?
[Contact IBM Cloud Support](#)

FEEDBACK

Cloud Foundry: Access

Cloud Foundry roles are used for access to some service instances in IBM Cloud. Users are added to the org and space to which the instance belongs with a Cloud Foundry role assigned.



Cloud Foundry: Organizations

- *Organizations* are defined by:
 - Users (team members)
 - Domains
 - Quota
- A *user (team member)* has a role with basic permissions in organizations and spaces:
 - Users must be assigned to an organization before they can be granted permissions to the spaces within an organization.
 - Users can belong to more than one organization (which is how you share access to control and monitor your applications and services).

Cloud Foundry: Domains and quota

- A *domain* provides a route on the internet that is allocated to an organization:
 - A *route* consists of a subdomain (also known as a host name) and a domain name.
 - Each application must have a unique host and domain name.
- *Quota* represents the resource limits that can be allocated for use by the organization, including the following limits:
 - Number of services
 - Amount of memory

Cloud Foundry: Spaces

- A space is a mechanism to group a set of applications, services, and team members within an organization:
 - An organization can contain multiple spaces.
 - Two organizations cannot share a space.
 - Spaces can have the same name in different organizations.
 - All applications and services are associated with a space.
 - Users must be a member of an organization to have access to a space within that organization.
 - A member of a space can view the applications within the space.
 - Only users in the developer role can create applications and services in the space.
- You can use spaces to represent different types of deployment environments, for example, a development, testing, staging, or production environment.

Cloud Foundry: User roles

Role	Permissions and tasks
Organization managers	<ul style="list-style-type: none">• Create or delete spaces within the organization.• Invite users to the organization and manage users.• Manage domains of the organization.
Billing managers	View (read-only) runtime and service usage information for the organization.
Organization auditors	View application and service content in the organization.
Space managers	<ul style="list-style-type: none">• Add users to the space and manage users.• Enable features for the space.
Space developers	<ul style="list-style-type: none">• Create, delete, and manage applications and services within the space.• Have access to logs within the space.
Space auditors	Have read-only access to settings, logs, applications, and services.

Managing Cloud Foundry organizations

Edit role for
aazraq@eg.ibm.com
organization

Organization roles

Manager

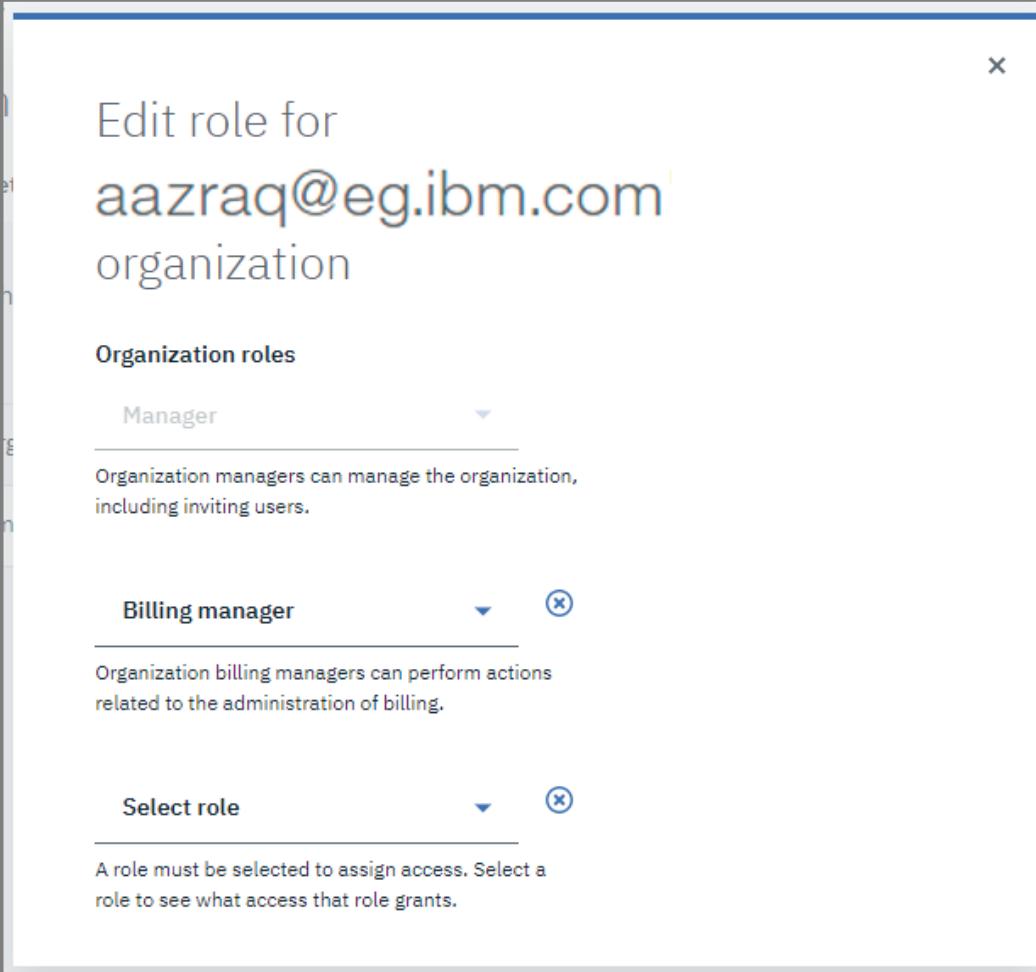
Organization managers can manage the organization, including inviting users.

Billing manager

Organization billing managers can perform actions related to the administration of billing.

Select role

A role must be selected to assign access. Select a role to see what access that role grants.



Inviting users to IBM Cloud

You can invite users, cancel invitations, and resend a pending invitation to an invited user. In addition, you can invite a single user or multiple users at once.

Services [\(i\)](#)

An initial IAM policy can be assigned with this invite. You can edit this policy or assign additional access after the user accepts the invite. All fields are required.

Assign access to [\(i\)](#)

Resource [\(i\)](#)

Services

No access [\(i\)](#) [\(x\)](#) [\(▼\)](#)

[FEEDBACK](#)

Cloud Foundry access [\(i\)](#)

You can add users to one Cloud Foundry organization with this invite. You can edit this access or assign additional access after the user accepts the invite. All fields are required.

Organization

No Cloud Foundry access [\(i\)](#) [\(▼\)](#)

[Cancel](#) [Invite users](#)

Unit summary

- Describe IBM Cloud.
- Distinguish among the various compute options in IBM Cloud.
- Identify the runtimes and services that IBM Cloud offers.
- Describe IBM Cloud regions, zones, and multi-availability zones.
- Describe the IBM Cloud dashboard, catalog, and documentation features.
- Work with IBM Cloud resources.
- Explain starter kits and Cloud Foundry boilerplates.
- Describe how to manage your IBM Cloud users and resources (optional).
- Explain Identity and Access Management (IAM) and Resource Groups (RGs) (optional).
- Describe how the application route is used to test an application in the browser.
- Bind services to an application in IBM Cloud.
- Describe the environmental variables that are used with IBM Cloud services.
- Explain function as a service.

Related resources

- The IBM Cloud documentation from the web interface provides an up-to-date reference and tutorial about building, deploying, and managing applications:
<http://cloud.ibm.com/docs/>
- Join the IBM Cloud developers community to view videos, tutorials, and forums:
<https://developer.ibm.com/depmodes/cloud/>
- Browse through a list of IBM Cloud solutions and sample applications:
<https://www.ibm.com/cloud/solutions/>
- IBM Cloud Container Service:
<https://cloud.ibm.com/docs/containers?topic=containers-getting-started>
- IBM Cloud Regions and Zones
<https://cloud.ibm.com/docs/containers?topic=containers-regions-and-zones#regions-and-zones>
- IBM Cloud Services by Region
https://cloud.ibm.com/docs/resources?topic=resources-services_region#services_region