



IBM Cloud for Financial Services – Tech Zone Demo Environment
Ecosystem Engineering

FS Cloud Reference Architecture Components

This document will walk you through the demonstration of the IBM Cloud for Financial Services Reference Architecture. It sets up the purpose of the Reference Architecture and walks through the various services and the proscribed configuration that produces a compliant deployment.

Goals for the Demo

- Review the purpose of the Reference Architecture
- Show the settings required to enable the IBM Cloud account for the Reference Architecture deployment
- Walk through the services that make up the Reference Architecture and the three main groupings – Shared services, Management network, and Workload network
- Describe the particular configuration that makes the combination of services FS Cloud compliant

Prerequisites

- If you have not already done so, request access to the FS Cloud demo environment at: <https://techzone.ibm.com/collection/ibm-cloud-for-financial-services>



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Steps

Account setup

1. Navigate to the official docs for the FS Cloud Reference architecture and browse the different sections: <https://cloud.ibm.com/docs/framework-financial-services?topic=framework-financial-services-reference-architecture-overview>
2. In the next steps, we will focus on the [IBM Cloud® Virtual Private Cloud](#) reference architecture. Login into IBM Cloud and navigate to the Dashboard at <https://cloud.ibm.com>
3. This an IBM Cloud account that has been configured for IBM Cloud for Financial Services deployment and where the VPC with Red Hat OpenShift Reference Architecture has been deployed. Before we get to the services that make up the reference architecture, there are several settings that have been made within the account to enable the Financial Services Cloud. We will start with the Account Settings.
4. Unfortunately, in order to view the “Account Settings” page one must be given “Editor” permission to the account which is not possible in the shared account. The following screenshots show these settings.
5. The ‘Financial Services Validated’ setting has been turned on. With this setting on, a warning will be shown in the IBM Cloud console when anyone attempts to provision a service that is not ‘FS Validated’.



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The screenshot shows the 'Account settings' page in the IBM Cloud interface. The left sidebar is titled 'Account' and includes options like 'Account resources', 'Best practices', 'Resource groups', 'Cloud Foundry orgs', 'Licenses and entitlements', 'Tags', 'Dashboards', 'Account settings' (which is selected and highlighted in blue), 'IBM Cloud Shell settings', 'Notification distribution list', 'Classic infrastructure', 'Subscriptions', 'Audit log', and 'Company information'. The main content area is titled 'Account settings' and shows the account details: 'Tech Zone FS Cloud 01' (ID: ea243e63212643dc927f7fe26b6e726c) and 'Pay-As-You-Go'. Below this, there's a section for 'Subscription and feature codes' with a 'Apply code' button. A red box highlights the 'Financial Services Validated: On' section, which states: 'Your account is enabled to use Cloud services designated as IBM Cloud for Financial Services Validated (Financial Services Validated). You and your authorized users are solely responsible for the use of the Financial Services Validated services or other Cloud services within any regulated or professional practice and you should obtain your own expert advice for your use of cloud services.' It includes an 'Off' button and a 'Learn more' link. Further down, it says 'EU Supported: Off' with a note about support issues being limited to the European Union, an 'On' button, and a 'Learn more' link. A small circular icon with a gear and a person symbol is in the bottom right corner.

6. 'Virtual routing and forwarding' has also been turned on which creates a separate routing table for the account and allows private endpoints to be used for the provisioned services. This setting is irreversible and therefore requires a support ticket to be opened for it to be enabled.
7. Finally, 'Service endpoints' have been turned on which allows IBM Cloud services to be connected to the IBM Cloud private network.



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Search resources and offerings...

IBM Cloud

Account

Account resources

Best practices

Resource groups

Cloud Foundry orgs

Licenses and entitlements

Tags

Dashboards

Account settings

IBM Cloud Shell settings

Notification distribution list

Classic infrastructure

Subscriptions

Audit log

Company information

Commercial Proof of Concept (PoC)

If you enter into a contract to ensure safeguarding of protected health information (PHI). If you or your company is a covered entity as defined by HIPAA, turn on this setting to accept the IBM Business Associate Agreement (BAA) and enable this account to run sensitive workloads regulated under HIPAA.

Note: If you are not a covered entity, do not enable this setting. Instead, contact [IBM Cloud Sales](#) to accept the applicable IBM Business Associate Agreement.

Learn more

On

Virtual routing and forwarding: On

Virtual routing and forwarding (VRF) isolates the IP routing for services in your account to a separate routing table.

This setting is permanently enabled for your account and cannot be disabled.

See previous PoC requests

Apply for PoC

Service endpoints: On

IBM Cloud service endpoints enable you to connect to select services over the IBM Cloud private network instead of the public network. Connecting directly to service endpoints does not require internet access, providing increased security. [Learn more](#).

Off

8. Open the Access settings from the “Manage” menu on the top menu bar: “Manage” -> “Access (IAM)” then “Settings” from the left menu.

IBM Cloud

Catalog

Docs

Support

Manage

2137132 - Tec...

Dashboard

For you

Build

Explore IBM Cloud with this selection of easy starter tutorials and services.

Explore IBM Cloud Shell

Try a command-driven approach for creating, developing, and deploying a web project.

Account

Billing and usage

Catalogs

Enterprise

View APIs and SDKs

View the API and SDK documentation for products and services in IBM Cloud.

Access (IAM)

Context-based restrictions

Security and Compliance



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The screenshot shows the IBM Cloud interface for managing access control. On the left, a sidebar menu under 'Access (IAM)' includes options like 'Users', 'Access groups', 'Service IDs', 'API keys', 'Authorizations', 'Roles', 'Identity providers', 'Trusted profiles', and 'Settings'. The 'Settings' option is highlighted with a red box. The main content area is titled 'Manage access' and shows a large purple circular progress bar or loading indicator.

9. There are several access control settings that are required by FS Cloud SCC goals. Multifactor authentication has been enabled for all users. Additionally, user access to the account has been restricted. By default, users are not able to see the list of other users, create API keys, or create service IDs. If a user does need to perform one of these activities they can be explicitly granted the necessary policy.



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The screenshot shows the 'Access (IAM)' settings page under the 'IBM Cloud' interface. The left sidebar lists various IAM components: Users, Access groups, Service IDs, API keys, Authorizations, Roles, Identity providers, Trusted profiles, and Settings. The 'Settings' option is selected. The main content area is titled 'Login session' and contains three sections: 'Active sessions', 'Sign out due to inactivity', and 'Concurrent sessions'. Each section has a description, a current value, and a 'Learn more' link. A red box highlights the 'Multifactor authentication (MFA)' section under 'Authentication', which includes a description, a status indicator ('Enabled'), and a note about security.

Login session

Active sessions	Sign out due to inactivity	Concurrent sessions
Select how long each active session lasts before a user needs to enter their login credentials. An active session can last up to 720 hours. 24 hours (default)	Select the maximum time it takes before an inactive user is signed out and their credentials are required again. A user can be inactive for up to 24 hours. 2 hours (default)	Select the number of login sessions that an account user can have active. Unlimited

Authentication

Multifactor authentication (MFA)

MFA for users with an IBMID (All users)
This option adds an extra layer of security for all users by requiring an ID, password, and a time-based one-time passcode. [Learn more](#).

Looks like you don't have access to update this setting. Only account owners or users assigned the editor role or higher for the IAM Identity service can update it.

Public access

Looks like you don't have access to view this setting. Only account owners or users assigned the viewer role or higher for the IAM Access Groups service can view it. [Learn more](#).

The screenshot shows the 'Access (IAM)' settings page under the 'IBM Cloud' interface. The left sidebar lists various IAM components: Users, Access groups, Service IDs, API keys, Authorizations, Roles, Identity providers, Trusted profiles, and Settings. The 'Settings' option is selected. The main content area is titled 'Account' and contains four sections: 'Restrict user list visibility', 'Restrict API key creation', 'Restrict service ID creation', and 'Restrict IP address access'. Each section has a status indicator, a description, and a note about who can update it. A red box highlights the 'Restrict user list visibility' section.

Account

Setting	Status	Description	Update Note
Restrict user list visibility	Enabled	Restricts the users each person can view on the Users page.	Looks like you don't have access to update this setting. Only account owners or users assigned the editor role or higher for the IAM Identity service can update it.
Restrict API key creation	Enabled	Only users with the required access assigned can create API keys.	Looks like you don't have access to update this setting. Only account owners or users assigned the editor role or higher for the IAM Identity service can update it.
Restrict service ID creation	Enabled	Only users with the required access assigned can create service IDs.	Looks like you don't have access to update this setting. Only account owners or users assigned the editor role or higher for the IAM Identity service can update it.
Restrict IP address access	Disabled	Access is allowed from any IP address.	Looks like you don't have access to update this setting. Only account



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- Now we will move on to the infrastructure and managed services that make up the Reference Architecture.

Shared services

- Open the Resource list: <https://cloud.ibm.com/resources>
- The account has been provisioned with a different resource group for each subset of the architecture. We can use the ‘tags’ to filter the resources in each layer. Let’s start with the ‘shared services’.
- Select the “shared” tag to filter the list of services to the shared services.

The screenshot shows the IBM Cloud Resource list interface. On the left, there's a sidebar with icons for various service categories like Devices, VPC infrastructure, Clusters, Container Registry, Satellite, Cloud Foundry apps, Cloud Foundry services, Services and software, Storage, Network, Functions namespaces, Apps, Developer tools, VMware, Schematics workspaces, and Code Engine. The 'Services and software' and 'Storage' sections are expanded, showing they are currently empty. On the right, there's a main table with columns for Name, Group, Location, Status, and Tags. A sidebar titled 'Tags' is open, showing a list of tags with checkboxes. The 'shared' checkbox is checked and highlighted with a red border. Other tags listed include pvc:pvc-f7dedc..., pvc:artifactory..., pvc:mongodb, reclaimpolicy:..., schematics:fss..., schematics:m..., schematics:m... (repeated), security, storageclass:i..., and workload.

- Expand the “Services and software” and “Storage” sections in the resource list (these are the only two sections with resources).



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The screenshot shows the IBM Cloud Resource list interface. At the top, there's a navigation bar with links for Catalog, Docs, Support, Manage, and a user profile. Below the navigation is a search bar and a 'Create resource' button. The main area is titled 'Resource list' and contains a table of resources. The columns are: Name, Group, Location, Status, and Tags. There are also filter and sort options at the top of the table. The table data includes:

Name	Group	Location	Status	Tags
activity-tracker-au-syd	Default	Sydney	Active	fscloud +1
activity-tracker-eu-de	Default	Frankfurt	Active	fscloud +1
activity-tracker-eu-gb	Default	London	Active	fscloud +1
activity-tracker-jp-osa	Default	Osaka	Active	fscloud +1
activity-tracker-jp-tok	Default	Tokyo	Active	fscloud +1
activity-tracker-us-east	Default	Washington DC	Active	fscloud +1
activity-tracker-us-south	Default	Dallas	Active	fscloud +1
crypto-hsm-kyok	security-ops	Frankfurt	Active	fscloud +2
frontoffice-cert-manager	frontoffice-common	Frankfurt	Active	fscloud +1
frontoffice-logging	frontoffice-common	Frankfurt	Active	fscloud +1
frontoffice-monitoring	frontoffice-common	Frankfurt	Active	fscloud +1
frontoffice-cos	frontoffice-common	Global	Active	fscloud +1

5. A number of Activity Tracker instances have been provisioned across different regions in the account.
6. Click on one of the Activity Tracker instances. It will take you to the Activity Tracker landing page. Click on the “Open dashboard” link for one of the Activity Tracker instances.



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IBM Cloud

Search resources and offerings... Catalog Docs Support Manage 2137132 - Tec... 🔍 📁 🌐 📡 🚧 🗃

Observability

Logging Monitoring Activity Tracker

Activity Tracker

Resource groups: Filter... Region: Filter... Search

Name	Status	Resource group	Region	Plan	View
activity-tracker-au-syd	Active	Default	Sydney	7 day Event Search	Open dashboard ⋮
activity-tracker-eu-de	Active	Default	Frankfurt	7 day Event Search	Open dashboard ⋮
activity-tracker-eu-gb	Active	Default	London	7 day Event Search	Open dashboard ⋮
activity-tracker-jp-osa	Active	Default	Osaka	7 day Event Search	Open dashboard ⋮
activity-tracker-jp-tok	Active	Default	Tokyo	7 day Event Search	Open dashboard ⋮
activity-tracker-us-east	Active	Default	Washington DC	7 day Event Search	Open dashboard ⋮
activity-tracker-us-south	Active	Default	Dallas	7 day Event Search	Open dashboard ⋮

Items per page: 25 1–7 of 7 items 1 1 of 1 page ⏪ ⏩

IBM Cloud

Search resources and offerings... Catalog Docs Support Manage 2137132 - Tec... 🔍 📁 🌐 📡 🚧 🗃

activity-tracker-eu-de (Frankfurt)

Find a View

EVERYTHING VIEWS

Views are a great way to bookmark frequent searches or filters. To create a view, search and filter your logs, then click on the view menu.

Filters Sources Apps Levels

704 lines

Timeline

Time scale: 60 minutes (default) 10/12 9:50:30 - 10/12 10:50:30

Oct 12 10:52:21 containers-kubernetes crn:v1:bluemix:public:containers-kubernetes:eu-de:a/e0243e63212643dc927f7fe26b6e726c::: normal Kubernetes Service: ready-to-use credentials c599eqdF0cth2mcnk8g

Oct 12 10:52:23 cloud-object-storage crn:v1:bluemix:public:cloud-object-storage:eu-de:a/e0243e63212643dc927f7fe26b6e726c:a04c7ac7-29fd-4b7b-a602-45d5336b90dd: [critical] Cloud Object Storage: list objects for bucket frontoffice-mgmt-flow-logs in location eu-de -failure

Oct 12 10:52:24 containers-kubernetes crn:v1:bluemix:public:containers-kubernetes:eu-de:a/e0243e63212643dc927f7fe26b6e726c:c599eqdF0cth2mcnk83g: [normal] Kubernetes Service: get cluster frontoffice-mgmt-cluster

Oct 12 10:52:24 cloud-object-storage crn:v1:bluemix:public:cloud-object-storage:eu-de:a/e0243e63212643dc927f7fe26b6e726c:a04c7ac7-29fd-4b7b-a602-45d5336b90dd: [critical] Cloud Object Storage: list objects for bucket frontoffice-mgmt-flow-logs in location eu-de -failure

Oct 12 10:52:33 containers-kubernetes crn:v1:bluemix:public:containers-kubernetes:eu-de:a/e0243e63212643dc927f7fe26b6e726c:c599eqdF0cth2mcnk83g: [normal] Kubernetes Service: config cluster frontoffice-mgmt-cluster

Oct 12 10:52:33 containers-kubernetes crn:v1:bluemix:public:containers-kubernetes:eu-de:a/e0243e63212643dc927f7fe26b6e726c:c599eqdF0cth2mcnk83g: [normal] Kubernetes Service: list observe-monitoring-frontoffice-mgmt-cluster

Oct 12 10:52:47 containers-kubernetes crn:v1:bluemix:public:containers-kubernetes:eu-de:a/e0243e63212643dc927f7fe26b6e726c:c599eqdF0cth2mcnk83g: [normal] Kubernetes Service: get cluster-ingress-status

Oct 12 10:52:53 hs-crypto crn:v1:bluemix:public:crypto:eu-de:a/e0243e63212643dc927f7fe26b6e726c:50423d85-9f41-470d-8527-3c3cf7295ce: [critical] Hyper Protect Crypto Services: umwrap secret -failure

Oct 12 10:52:53 hs-crypto crn:v1:bluemix:public:crypto:eu-de:a/e0243e63212643dc927f7fe26b6e726c:50423d85-9f41-470d-8527-3c3cf7295ce: [critical] Hyper Protect Crypto Services: umwrap secret -failure

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Oct 12 10:52:53 hs-crypto crn:v1:bluemix:public:crypto:eu-de:a/e0243e63212643dc927f7fe26b6e726c:50423d85-9f41-470d-8527-3c3cf7295ce: [critical] Hyper Protect Crypto Services: umwrap secret -failure

Oct 12 10:52:54 iam-identity crn:v1:bluemix:public:iam-identity:global:a/e0243e63212643dc927f7fe26b6e726c::: IAM Identity Service: login serviceId=apkey-openfin-auth

Oct 12 10:52:55 hs-crypto crn:v1:bluemix:public:hs-crypto:eu-de:a/e0243e63212643dc927f7fe26b6e726c:50423d85-9f41-470d-8527-3c3cf7295ce: [normal] Hyper Protect Crypto Services: umwrap secret management-key

Oct 12 10:52:55 appid crn:v1:bluemix:public:appid:eu-de:a/e0243e63212643dc927f7fe26b6e726c:f5d5cd3d-6405-4c11-8c23-291f5fd64a74: [normal] App ID: read cloud-directory-user cloud_directory:2d095ccb-83d6-4835-9585-f4e334311c2

7566c872-4e54-48fc-a804... Read-Only | IBM-7DAY

Search... Jump to timeframe ⏪ ⏩ 🔴 LIVE



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7. Activity Tracker collects the platform logs for the various services within the IBM Cloud account. This includes user access and configuration changes. Activity Tracker and the provided auditability of all the services in the account is one of the differentiators of IBM Cloud and an enabler for FS Cloud reporting.
8. Return to the IBM Cloud resource list – <https://cloud.ibm.com/resources>
9. A Hyper Protect Crypto Service instance has also been provisioned and initialized in the account.
10. Click on the Hyper Protect Crypto Service instance then click on the “Overview” menu

The screenshot shows the IBM Cloud Resource List interface. At the top, there's a navigation bar with 'IBM Cloud', a search bar, and links for Catalog, Docs, Support, Manage, and a user profile. Below the navigation is a breadcrumb trail: 'Resource list / crypto-hsm-kyok'. The main area displays the 'crypto-hsm-kyok' instance details. On the left, a sidebar titled 'Getting started' includes 'Overview' (which is selected and highlighted in blue), 'Instance policies', 'KMS key rings', 'KMS keys', 'KMS associated resources', 'EP11 keystores', and 'EP11 keys'. The main content area has three tabs: 'Crypto units' (selected), 'Details', and 'Actions...'. Under 'Crypto units', it shows two operational units: '[eu-de].[AZ1-CS1].[03].[06]' and '[eu-de].[AZ3-CS3].[00].[06]', both of which are initialized. To the right is a 'Location' section with a world map showing the 'Operational region Frankfurt (eu-de)' marked with a green dot. Below the map, there are sections for 'Instance' (Instance ID: 50423a85-9f41-470d-8527-3c3c5f7295ce, Resource group: security-ops) and 'Key management endpoint URL' (Public: https://api.eu-de.hs-crypto.cloud.ibm.com:9327, Private: https://api.private.eu-de.hs-crypto.cloud.ibm.com:9327). A blue circular icon with a gear and double arrows is located at the bottom right of the main content area.

11. The Hyper Protect Crypto Service is built on FIPS 140-2 Level 4-certified hardware security modules (HSMs) – the only such service in the industry. The service allows customers to manage root keys that are completely inaccessible by anyone but authorized users. This instance has been initialized with two crypto units in Frankfurt. <https://www.ibm.com/security/cryptocards>



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The screenshot shows the IBM Cloud interface with the following details:

- Top Bar:** IBM Cloud, Search resources and offerings..., Catalog, Docs, Support, Manage, 2137132 - Tec...
- Resource List:** crypto-hsm-kyok (Active), fscloud, security, shared.
- Left Sidebar (KMS keys selected):** Getting started, Overview, Instance policies, KMS key rings, **KMS keys**, KMS associated resources, EP11 keystores, EP11 keys.
- Table Headers:** Key management service keys (78), Name, ID, Alias, Key ring ID, Type, State, Origin, Last updated.
- Table Data:** A list of 10 root keys, each with a status icon (green checkmark for active, red circle for destroyed), name, ID, alias (default), key ring ID, type (Root key or Standard key), state (Active or Destroyed), origin (Created), and last updated date.

Name	ID	Alias	Key ring ID	Type	State	Origin	Last updated
workload-key	6681...cb84	default	Root key	Active	Created	2021-10-11 11:25:10	
portieris-image-signing-public-key	4e58...9064	default	Standard key	Active	Imported	2021-10-08 13:52:51	
portieris-image-signing-private-key	e363...a0b3	default	Standard key	Active	Imported	2021-10-08 13:52:47	
management-key	5ac5...9ac0	default	Root key	Active	Created	2021-09-29 19:00:06	
management-key	ae2e...afe7	default	Root key	Active	Created	2021-09-29 19:00:06	
management-key	c2ee...5eff	default	Root key	Active	Created	2021-09-29 19:00:06	
sms-mgmt-key	ea29...732b	default	Root key	Active	Created	2021-09-29 19:00:06	
frontoffice-workload-key	a9f9...0ea1	default	Root key	Active	Created	2021-09-28 00:35:17	
frontoffice-mgmt-key	6674...08c0	default	Root key	Active	Created	2021-09-27 23:16:37	
frontoffice-workload-key	209e...bebc	default	Root key	Destroyed	Created	2021-09-27 05:55:54	

12. Click on “KMS keys” in the left menu.
13. A number of root keys have been created within this HPCS instance. These root keys can be used to encrypt the data in the other IBM Cloud services, making that data inaccessible to anyone but those authorized by the customer. The root keys listed here have been used to encrypt the other services of the Reference Architecture.
14. Return to the IBM Cloud resource list: <https://cloud.ibm.com/resources>
15. A Secrets Manager instance has been provisioned in the shared services to certificates. This instance has been encrypted by the HPCS root keys.
16. Click on the “**common-sm**” instance.



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The screenshot shows the IBM Cloud interface for managing secrets. The left sidebar has a 'Secrets' section selected. The main area displays a table of secrets with the following data:

Name	Type	Group	Expires in	Status	Locks	Labels
vpn-server-cert	Imported certificate	vpn-cert-group	822 days	Active		test eu-gb
vpn-client-cert	Imported certificate	vpn-cert-group	822 days	Active		test eu-gb

17. There are currently two certificates here that are used by the VPN server that provides access to the resources in the account.
18. Return to the IBM Cloud resource list: <https://cloud.ibm.com/resources>
19. IBM Log Analysis has been provisioned to aggregate the logs across the various servers and the OpenShift clusters in the reference architecture.
20. Click on the “**common-logging**” service to get to the Logging landing page. Click on “Open dashboard” for the instance.

The screenshot shows the IBM Cloud interface for logging. The left sidebar has a 'Logging' section selected. The main area displays a table with one item:

Name	Status	Resource group	Region	Sources	Plan	View
frontoffice-logging	Active	frontoffice-common	Frankfurt	Add log sources	7 day Log Search	Open dashboard



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The screenshot shows the IBM Cloud Log Analysis interface. The left sidebar includes a search bar, catalog, docs, support, and manage options. The main area displays log entries for the 'frontoffice-logging (Frankfurt)' instance. A sidebar on the left provides navigation and filtering options. On the right, there's a timeline view showing log entries from Oct 12, 2021, at 13:52:10 to Oct 13, 2021, at 13:52:10. The timeline shows a series of blue bars representing log entries, with specific log lines visible in the center pane.

21. The Log Analysis instance shows an aggregated view of the logs across the various servers.
22. Return to the IBM Cloud resource list – <https://cloud.ibm.com/resources>
23. IBM Monitoring provides monitoring for the servers environment, particularly the OpenShift clusters.
24. Click on the “**common-monitoring**” service. Click on “Open dashboard” for the instance. Click on “Overview” and select the “Clusters” view.



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The screenshot shows the IBM Cloud Observability Monitoring interface. On the left sidebar, under the 'Observability' section, the 'Monitoring' tab is selected. The main area displays a table with one item:

Name	Status	Resource group	Region	Sources	Plan	View
frontoffice-monitoring	Active	frontoffice-common	Frankfurt	Platform metrics	Add sources	Graduated Tier

A red box highlights the 'Open dashboard' button in the 'View' column.

The screenshot shows the detailed monitoring view for the 'frontoffice-monitoring (Frankfurt)' cluster. It displays two clusters: 'frontoffice-workload-cluster' and 'frontoffice-mgmt-cluster'. Each cluster has a summary card with metrics like Events, Node Ready Status, Pods Available vs Desired, CPU Requests vs Allocatable, Memory Req. vs Allocatable, and Network I/O. To the right, there is a 'Events' panel showing a list of log entries from Oct 12, 12:50 pm to Oct 12, 1:50 pm, with filters for H, M, L, I, and All Types.



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25. This view provides the monitor dashboard for the clusters in the reference architecture. From here we can drill down on particular nodes and deployed applications to get more information about specific components.
26. Return to IBM Cloud resource list – <https://cloud.ibm.com/resources>
27. Finally, the Cloud Object Storage instance has been provisioned to manage the various storage buckets required by the Reference Architecture.
28. Click on the “**common-cos**” instance.

The screenshot shows the IBM Cloud Object Storage interface for the 'frontoffice-cos' instance. The left sidebar includes links for Getting started, Buckets (which is selected), Integrations (New!), Endpoints, Service credentials, Connections, Usage details, and Plan. The main area displays a table of buckets with columns: Name, Public access, Location, Storage class, and Created. The table lists eight buckets:

Name	Public access	Location	Storage class	Created
frontoffice-mgmt-activitytracker	No	eu-de	Smart Tier	2021-10-08 4:11 PM
frontoffice-mgmt-flow-logs	No	eu-de	Standard	2021-09-27 11:16 PM
frontoffice-workload-flow-logs	No	eu-de	Standard	2021-09-28 12:35 AM
roks-c55nd3df0fqg82hpc380-1369	No	eu-geo	Standard	2021-09-22 1:31 PM
roks-c56afb kf06e0u9v8hhm0-6cb3	No	eu-geo	Standard	2021-09-23 11:13 AM
roks-c58q772f09q81cqdfk0-b0ad	No	eu-geo	Standard	2021-09-27 5:57 AM
roks-c599eq6f0cth2mcnk83g-cfff	No	eu-geo	Standard	2021-09-27 11:17 PM
roks-c59ajpaf05mue24gojog-c29f	No	eu-geo	Standard	2021-09-28 12:36 AM

At the bottom, there are buttons for 'Items per page:' (set to 10), '1-8 of 8 items', and navigation icons for '1 of 1 pages'.

29. Within this Object Storage instance a number of buckets have been created, each for a different purpose.
30. Click on the “**management-flow-logs-1da26000**” bucket.



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The screenshot shows the IBM Cloud Storage interface. The left sidebar has a 'Objects' tab selected. The main area displays a table of objects in the 'frontoffice-mgmt-flow-logs' bucket. Each object is a gzipped log file named ibm_vpc_flowlogs_v1/account... followed by a timestamp. The table includes columns for Object name, Archived status, Size, and Last modified date.

Object name	Archived	Size	Last modified
ibm_vpc_flowlogs_v1/account...11001T181710Z/00000000.gz		3.4 KB	2021-10-01 1:17 PM
ibm_vpc_flowlogs_v1/account...11001T181710Z/00000001.gz		5.4 KB	2021-10-01 1:22 PM
ibm_vpc_flowlogs_v1/account...11001T181710Z/00000002.gz		5.2 KB	2021-10-01 1:27 PM
ibm_vpc_flowlogs_v1/account...11001T181710Z/00000003.gz		5.4 KB	2021-10-01 1:32 PM
ibm_vpc_flowlogs_v1/account...11001T181710Z/00000004.gz		5.8 KB	2021-10-01 1:37 PM
ibm_vpc_flowlogs_v1/account...11001T181710Z/00000005.gz		5.9 KB	2021-10-01 1:42 PM
ibm_vpc_flowlogs_v1/account...11001T181710Z/00000006.gz		4.9 KB	2021-10-01 1:47 PM

31. Within the flow logs bucket, a number of objects have been created to hold the log data.
32. Click on the “Configuration” menu on the left. Scroll down to the “Key management” section.



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The screenshot shows the IBM Cloud Storage service details page for a bucket named "frontoffice-mgmt-flow-logs". The top navigation bar includes links for Catalog, Docs, Support, Manage, and a user profile. The main content area is divided into sections: "Associated key management services", "Activity Tracker", and "Monitoring".

Associated key management services:

Key Service	Hyper Protect Crypto Services
Key ID	667475cd-e53f-4646-b896-980816a708c0
Service instance	crypto-hsm-kyok
Key name	frontoffice-mgmt-key

Activity Tracker:

All bucket management events will be recorded with IBM Cloud Activity Tracker.

Service instance	activity-tracker-eu-de
Resource group	Default
Location	eu-de
Plan	7 day Event Search
Data events	read & write

Monitoring:

IBM Cloud Monitoring usage metrics include bucket size and number of objects in bucket.

Service instance	frontoffice-monitoring
Resource group	frontoffice-common

33. You can see that the contents of this bucket are encrypted with the root key from the Hyper Protect Crypto Service.
34. Return to the IBM Cloud resource list – <https://cloud.ibm.com/resources>
35. Expand the “Networking” section in the resource list.
36. Click on the “common-tg-gateway” entry.



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Connection type	Name	Network	Region	Status
VPC	connection_instance1	frontoffice-mgmt-vpc Gen 2	Frankfurt	Attached
VPC	connection_instance0	frontoffice-workload... Gen 2	Frankfurt	Attached

37. This Transit gateway shows 3 members: the Edge VPC, the Management VPC and the Workload VPC. It allows traffic to flow between the 3 networks, so we can use a single VPN server in the Edge network to access resources in Management and Workload networks as well.
38. The Reference Architecture can be extended with additional shared services depending upon the requirements of the particular application being deployed.

Edge VPC

The Edge VPC is the single entry-point into the environment, it provides bastion servers and VPN access to the Virtual Private Clouds in the account.

1. Return to the IBM Cloud resource list – <https://cloud.ibm.com/resources>
2. Select the “**frontoffice-management**” resource group to filter the list of services for the Edge VPC.



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The screenshot shows the IBM Cloud Resource list interface. On the left, there's a sidebar with a "Hamburger menu" icon, followed by sections for Compute (with items like edge-vpc-server00, edge-vpc-server01, edge-vpc-server02), Networking (with items like edge-vpc, edge-vpc-base, edge-vpc-default, edge-vpc-flowlog, edge-vpc-server-group), and other cloud services. The main area displays a table with columns: Name, Group, Location, Product, Status, and Tags. A filter bar at the top allows searching by name or IP address, group, location, product, status, and tags. A "Create resource" button is in the top right.

Name	Group	Location	Product	Status	Tags
edge-vpc-server00	Default	Frankfurt 1	Virtual Server for VPC	Running	bastion
edge-vpc-server01	frontoffice-common	Frankfurt 2	Virtual Server for VPC	Running	bastion
edge-vpc-server02	frontoffice-edge	Frankfurt 3	Virtual Server for VPC	Running	bastion
edge-vpc	frontoffice-management	Frankfurt	Virtual Private Cloud	Available	
edge-vpc-base	frontoffice-workload	Frankfurt	Security Group for VPC	—	
edge-vpc-default	internet-services	Frankfurt	Security Group for VPC	—	
edge-vpc-flowlog	new-frontoffice-edge	Frankfurt	Flow Logs for VPC	Active	
edge-vpc-server-group	old-frontoffice-edge	Frankfurt	Security Group for VPC	—	

3. Click on the “Hamburger menu” in the top left and select “VPC Infrastructure” -> “VPCs”. Make sure the region filter has been set to the region where the VPC infrastructure has been provisioned. All the Edge, Management and Workload VPC will be listed.
4. Click on the “Virtual server instances” menu on the left.

The screenshot shows the IBM Cloud VPC Infrastructure Virtual server instances for VPC interface. The left sidebar is expanded to show "Virtual server instances" under "Compute". The main area displays a table titled "Virtual server instances for VPC" with a "Region" filter set to "Frankfurt". The table columns are: Name, Status, Resource group, Virtual Private Cloud, Profile, Reserved IP, and Floating IP. There are four entries in the table, all marked as "Running". A "Create" button is in the top right of the table header. Below the table, there's a message box asking "What do you want to do next? Learn how to connect to your new instance or add extra services." The URL at the bottom is https://cloud.ibm.com/vpc-ext/compute/vs

Name	Status	Resource group	Virtual Private Cloud	Profile	Reserved IP	Floating IP
frontoffice-mgmt-bastion02	Running	frontoffice-management	frontoffice-mgmt-vpc	bx2-2x8	10.30.30.4	—
frontoffice-mgmt-bastion01	Running	frontoffice-management	frontoffice-mgmt-vpc	bx2-2x8	10.20.30.5	—
frontoffice-workload-vpc-server00	Running	frontoffice-workload	frontoffice-workload-vpc	cx2-2x4	10.50.30.4	—
frontoffice-workload-vpc-server01	Running	frontoffice-workload	frontoffice-workload-vpc	cx2-2x4	10.60.30.4	—

5. Here we see the Virtual server instances (VSIs) provisioned within the VPCs. The Management VPC has 3 VSIs – “edge-vpc-server00”, “edge-vpc-server01” and



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“edge-vpc-server02” – that are used as Bastion servers to provide terminal access into the VPC networks.

6. Click on the “VPNs” menu on the left. Click on the “Client-to-site servers” tab on the top.

The screenshot shows the IBM Cloud VPC Infrastructure interface. The left sidebar is expanded to show the VPC Infrastructure section, with the 'VPNs' item highlighted. The main content area is titled 'VPNs for VPC'. At the top of this area, there are two tabs: 'Site-to-site gateways' and 'Client-to-site servers (Beta)', with 'Client-to-site servers' being the active tab. Below the tabs, there is a search bar and a 'Create' button. The main table lists one client-to-site server resource:

Name	Server status	Health status	Hostname	Virtual Private Cloud	Active client(s)
frontoffice-mgmt-vpn-server	Stable	Healthy	c8013dec0aa6.eu-de.vpn-server.appdomain.cloud	frontoffice-mgmt-vpc	2

At the bottom of the table, there are pagination controls showing '1 item' and '1 of 1 page'.

7. In this environment a client-to-site VPN server has been provisioned to allow access from a client computer to the VPC networks using a VPN client. This VPN client connection is required to be able to access the OpenShift cluster and any of the VSIs in the network (like the bastion servers).

Management VPC

1. Return to the IBM Cloud resource list – <https://cloud.ibm.com/resources>
2. Select the “**frontoffice-management**” resource group to filter the list of services for the Management VPC.



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The screenshot shows the IBM Cloud Resource list interface. On the left, there is a sidebar with a tree view of resources categorized by type: Containers, Networking, VMs, and others. The main area is a table titled "Resource list" with columns: Name, Group, Location, Product, Status, and Tags. The table lists various resources such as management-cluster, new-frontoffice-management, and several networking components like Virtual Private Endpoints and Security Groups. A filter bar at the top allows searching by name or IP address and filtering by group or org.

Name	Group	Location	Product	Status	Tags
management-cluster	Default	Frankfurt	Red Hat OpenShift on IBM Cloud	Normal	-
new-frontoffice-management	frontoffice-common	Frankfurt	Container Registry	-	-
frontoffice-management	frontoffice-edge	Frankfurt	Virtual Private Endpoint for VPC	Healthy	-
frontoffice-workload	internet-services	Frankfurt	Security Group for VPC	-	-
kube-ce5g0iff0qj35lbmlp0	new-frontoffice-edge	Frankfurt	Load Balancer for VPC	Active	-
kube-ce5g0iff0qj35lbmlp0		Frankfurt	Security Group for VPC	-	-
kube-ce5g0iff0qj35lbmlp-65bf6599d3aa469e8...		Frankfurt	Virtual Private Cloud	Available	-
kube-e010-0d71e4fc-8099-42df-834f-0f4ba0a8...					
management-vpc					

3. Expand the “VPC infrastructure”, “Clusters”, and “Services and software” sections of the resource list.
4. Under the ‘VPC Infrastructure’ section there are many resources listed. We will look at in more detail shortly from the VPC service page.
5. Take note of the region in which the VPC resources have been provisioned. You will need it when you look at the services in the VPC service page later.
6. Under the Clusters tab, we can see the management cluster which has been provisioned in subnets within the Management VPC network. We will come back to this cluster in a bit. Finally, under the ‘Services and software’ section we have an App Id instance that provides authentication services for the test instance of the OpenFn server and the Certificate Manager instance that was automatically provisioned with the OpenShift cluster.
7. Click on the “Hamburger menu” in the top left and select “VPC Infrastructure” -> “VPCs”. Make sure the region filter has been set to the region where the VPC infrastructure has been provisioned. Both the Management and Workload VPC will be listed.



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The screenshot shows the IBM Cloud interface with the 'VPC Infrastructure' section selected in the sidebar. The main area displays a table of VPC resources. One row, 'frontoffice-mgmt-vpc', is highlighted with a red border.

Group	Location	Status	Tags
Getting started	Frankfurt	—	fscloud +1
Overview	office-management	Frankfurt	fscloud +1
VPC layout	office-management	Frankfurt	fscloud +1
Compute	office-management	Frankfurt	Active
Virtual server instances	office-management	Frankfurt	Available
Dedicated hosts	office-management	Frankfurt	Healthy
Placement groups	office-management	Frankfurt	Stable
SSH keys	office-management	Frankfurt	Healthy
Custom images	office-management	Frankfurt	Stable
Network	office-management	Frankfurt	Normal
VPCs	office-management	Frankfurt	Active
Subnets	office-management	Frankfurt	Normal
Floating IPs	office-management	Frankfurt	Normal
Public gateways	office-management	Frankfurt	Normal
Virtual private endpoint gateways	office-management	Frankfurt	Normal
Access control lists	office-management	Frankfurt	Normal

8. Click on the Management VPC.

The screenshot shows the 'Virtual private clouds' page in the IBM Cloud interface. The 'frontoffice-mgmt-vpc' row is highlighted with a red border. A callout bubble at the bottom left suggests adding other services.

Name	Status	Resource group	Subnets	Default ACL	Default security group
frontoffice-mgmt-vpc	Available	frontoffice-management	9	frontoffice-mgmt-vpc-default	frontoffice-mgmt-vpc-default
frontoffice-workload-vpc	Available	frontoffice-workload	8	frontoffice-workload-vpc-default	frontoffice-workload-vpc-default



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9. This is the Management VPC. The allocated IP address ranges per zone are listed on the right-hand side.

The screenshot shows the IBM Cloud VPC Infrastructure Overview page for the 'frontoffice-mgmt-vpc'. The left sidebar is collapsed. The main content area has a header with 'VPC Infrastructure / Virtual Private Clouds / frontoffice-mgmt-vpc' and status 'Available' with tags 'fscloud' and 'management'. Below the header are two tabs: 'Overview' (selected) and 'Address prefixes'. The 'Overview' section displays 'Virtual private cloud details' with fields like Name (frontoffice-mgmt-vpc), Resource group (frontoffice-management), ID (r010-108aa3ff-b06d-4c9c-9785-7eb068657001), Created (September 27, 2021 11:16:32 PM), Region (Frankfurt), Default ACL (frontoffice-mgmt-vpc-default), Default security group (frontoffice-mgmt-vpc-default), and Default routing table (frontoffice-mgmt-vpc-default). The 'Address prefixes' section is highlighted with a red border and contains a table with three rows:

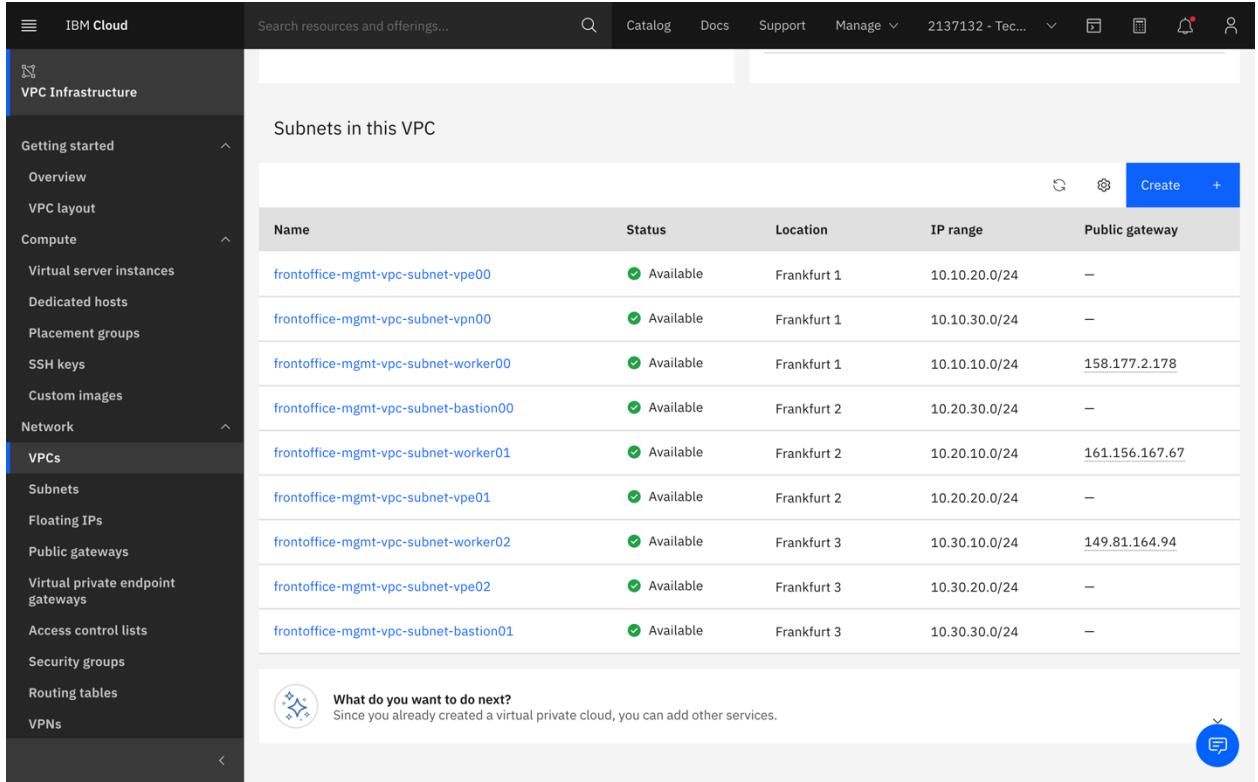
IP Range	Location
10.10.0.0/18	Frankfurt 1
10.20.0.0/18	Frankfurt 2
10.30.0.0/18	Frankfurt 3

Below the 'Address prefixes' section is a 'Manage address prefixes' button. The 'Routing tables' section shows one entry for 'frontoffice-mgmt-vpc-default' with 3 routes and 9 attached subnets. The 'Cloud Service Endpoint source addresses' section shows two entries: 10.16.206.166 (Frankfurt 1) and 10.223.38.112 (Frankfurt 2). A blue message icon is located at the bottom right of the page.

10. At the bottom, we see the subnets that have been provisioned within this VPC. There are nine subnets, matching the 3 by 3 grid shown in the Reference Architecture diagram. Each grouping has three subnets, one for each availability zone. The group of subnets named “frontoffice-mgmt-vpc-subnet-workerXX” contain the OpenShift worker nodes. The group of subnets named “frontoffice-mgmt-vpc-subnet-vpeXX” are used for the Virtual Private Endpoint Gateways. And finally the “frontoffice-mgmt-vpc-subnet-vpn00” and the two “frontoffice-mgmt-vpc-subnet-bastionXX” subnets contain the VPN server and the bastion servers.



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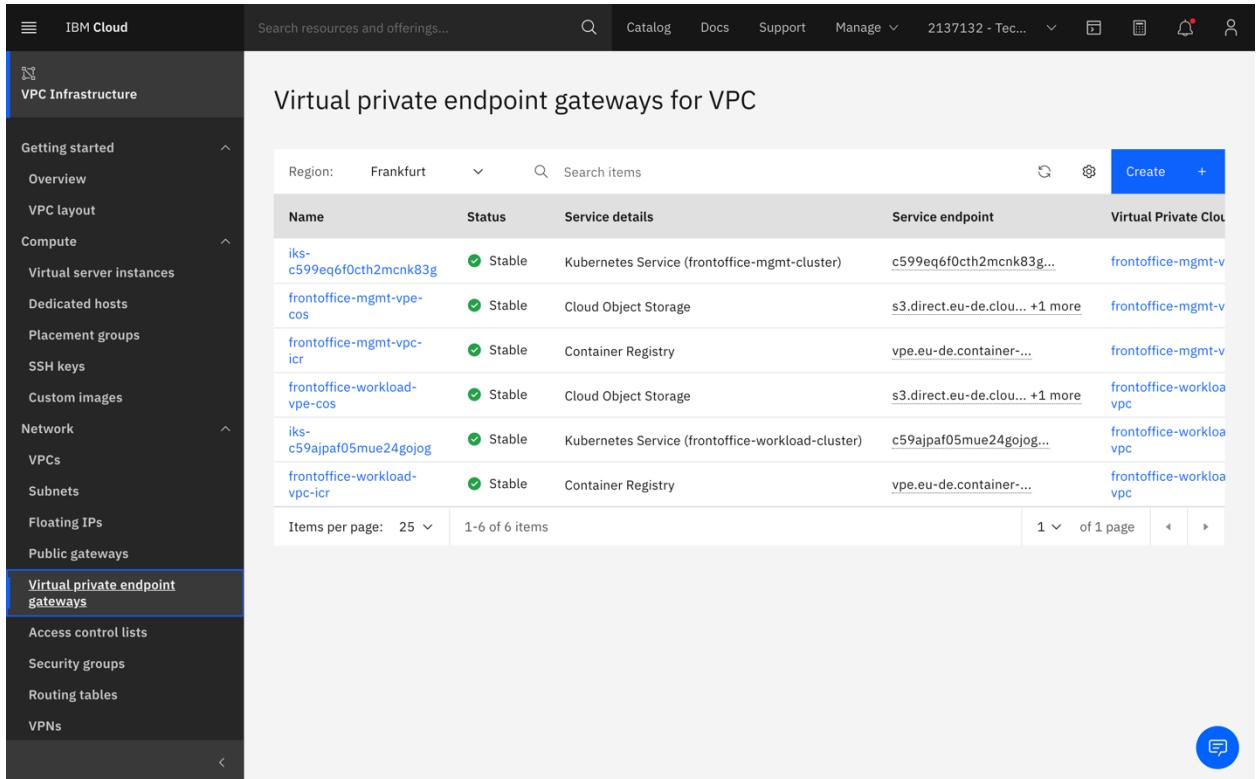


The screenshot shows the IBM Cloud VPC Infrastructure Subnets page. The left sidebar is titled 'VPC Infrastructure' and includes sections for Getting started, Overview, VPC layout, Compute, Virtual server instances, Dedicated hosts, Placement groups, SSH keys, Custom images, Network, VPCs, Subnets, Floating IPs, Public gateways, Virtual private endpoint gateways, Access control lists, Security groups, Routing tables, and VPNs. The 'Subnets' section is currently selected. The main content area is titled 'Subnets in this VPC' and displays a table with the following data:

Name	Status	Location	IP range	Public gateway
frontoffice-mgmt-vpc-subnet-vpe00	Available	Frankfurt 1	10.10.20.0/24	—
frontoffice-mgmt-vpc-subnet-vpn00	Available	Frankfurt 1	10.10.30.0/24	—
frontoffice-mgmt-vpc-subnet-worker00	Available	Frankfurt 1	10.10.10.0/24	158.177.2.178
frontoffice-mgmt-vpc-subnet-bastion00	Available	Frankfurt 2	10.20.30.0/24	—
frontoffice-mgmt-vpc-subnet-worker01	Available	Frankfurt 2	10.20.10.0/24	161.156.167.67
frontoffice-mgmt-vpc-subnet-vpe01	Available	Frankfurt 2	10.20.20.0/24	—
frontoffice-mgmt-vpc-subnet-worker02	Available	Frankfurt 3	10.30.10.0/24	149.81.164.94
frontoffice-mgmt-vpc-subnet-vpe02	Available	Frankfurt 3	10.30.20.0/24	—
frontoffice-mgmt-vpc-subnet-bastion01	Available	Frankfurt 3	10.30.30.0/24	—

Below the table, a message says: 'What do you want to do next? Since you already created a virtual private cloud, you can add other services.' There is also a blue 'Create' button.

11. Click on “Virtual private endpoint gateways” on the left menu.



The screenshot shows the IBM Cloud VPC Infrastructure Virtual private endpoint gateways page. The left sidebar is identical to the previous screenshot. The main content area is titled 'Virtual private endpoint gateways for VPC' and displays a table with the following data:

Name	Status	Service details	Service endpoint	Virtual Private Cloud
iks-c599eq6f0cth2mcnk83g	Stable	Kubernetes Service (frontoffice-mgmt-cluster)	c599eq6f0cth2mcnk83g...	frontoffice-mgmt-vpc
frontoffice-mgmt-vpc-icos	Stable	Cloud Object Storage	s3.direct.eu-de.clo... +1 more	frontoffice-mgmt-vpc
frontoffice-mgmt-vpc-icr	Stable	Container Registry	vpe.eu-de.container-...	frontoffice-mgmt-vpc
frontoffice-workload-vpc-icos	Stable	Cloud Object Storage	s3.direct.eu-de.clo... +1 more	frontoffice-workload-vpc
iks-c59ajpaf05muae24gojog	Stable	Kubernetes Service (frontoffice-workload-cluster)	c59ajpaf05muae24gojog...	frontoffice-workload-vpc
frontoffice-workload-vpc-icr	Stable	Container Registry	vpe.eu-de.container-...	frontoffice-workload-vpc

Below the table, there is a pagination bar showing 'Items per page: 25' and '1-6 of 6 items'. There is also a blue 'Create' button.



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12. The Virtual private endpoints assign a local IP address to an IBM Cloud service within the subnet. This allow local network traffic between the components running in the VPC network (like the OpenShift cluster) and the IBM Cloud service. This environment has VPEs for Cloud Object Storage, the Container Registry, and the Kubernetes service.

13. Click on the “Access control lists” menu the left.

Name	Virtual Private Cloud	Resource group	Default	Inbound rules	Outbound rules	Attached s
frontoffice-workload-vpc-subnet-worker	frontoffice-workload-vpc	frontoffice-workload		2	5	3
frontoffice-workload-vpc-default	frontoffice-workload-vpc	frontoffice-workload	<input checked="" type="checkbox"/>	1	1	0
frontoffice-workload-vpc-subnet-bastion	frontoffice-workload-vpc	frontoffice-workload		1	7	2
frontoffice-workload-vpc-subnet-vpe	frontoffice-workload-vpc	frontoffice-workload		1	4	3
frontoffice-mgmt-vpc-subnet-vpe	frontoffice-mgmt-vpc	frontoffice-management		1	4	3
frontoffice-mgmt-vpc-subnet-vpn	frontoffice-mgmt-vpc	frontoffice-management		3	5	1
frontoffice-mgmt-vpc-default	frontoffice-mgmt-vpc	frontoffice-management	<input checked="" type="checkbox"/>	1	1	0
frontoffice-mgmt-vpc-subnet-worker	frontoffice-mgmt-vpc	frontoffice-management		2	5	3
frontoffice-mgmt-vpc-subnet-bastion	frontoffice-mgmt-vpc	frontoffice-management		2	4	2

14. The defined access control lists define network rules that control the flow of network traffic into and out of the subnets in the VPCs.
15. Click on “Flow logs” in the left menu.



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Name	Status	Active	Target	Object Storage Bucket	Resource group	Date created
frontoffice-workload-vpc-flowlog	Stable	●	frontoffice-workload-vpc	frontoffice-workload-flow-logs	frontoffice-workload	September
frontoffice-mgmt-vpc-flowlog	Stable	●	frontoffice-mgmt-vpc	frontoffice-mgmt-flow-logs	frontoffice-management	September

16. The Flow logs capture the logs of the network traffic through the VPC. These logs can be used to audit the traffic and configured in the Security and Compliance Center to provide proactive notifications of network threats and suspicious activity.
17. Now lets take a look at the OpenShift cluster.
18. Make sure the VPN connection for the environment is running. Click on the “Resource list” from the “Hamburger menu” – <https://cloud.ibm.com/resources>. Expand the “Clusters” section and click on the “**management-cluster**”.



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IBM Cloud Search resources and offerings... Catalog Docs Support Manage 2137132 - Tec... Actions...

Resource list

Name	Group	Location	Status	Tags
Devices (0 / 0)				
VPC infrastructure (12 / 39)				
Clusters (1 / 2)				
frontoffice-mgmt-cluster	frontoffice-management	Frankfurt	Normal	fscloud +1
Container Registry (1 / 1)				
openfn-frontoffice	frontoffice-management	Frankfurt	-	fscloud +1
Satellite (0 / 0)				
Cloud Foundry apps (0 / 0)				
Cloud Foundry services (0 / 0)				
Services and software (2 / 17)				
frontoffice-mgmt-appid	frontoffice-management	Frankfurt	Active	fscloud +1
kube-certmgr-c599eq6f0cth2mcnk83g	frontoffice-management	Frankfurt	Active	fscloud +1
Storage (0 / 1)				
Network (0 / 1)				
Functions namespaces (0 / 0)				
Apps (0 / 0)				

IBM Cloud Search resources and offerings... Catalog Docs Support Manage 2137132 - Tec... Actions...

frontoffice-mgmt-cluster

Normal fscloud management

Help OpenShift web console Actions...

Overview

Worker nodes	6 of 6	Normal
Worker pools	1 of 1	Normal
DevOps	Details ↓	Docs ↗

Add-on status Master status Ingress status

Node status: 6 of 6 (Normal) Add-on status: 1 of 1 (Normal) Master status: Normal Ingress status: Healthy

Cluster ID: c599eq6f0cth2mcnk83g Version: 4.7.30_1532 Infrastructure: VPC Gen2 Zones: eu-de-1, eu-de-2, eu-de-3

Created: 9/27/2021, 11:17 PM Resource group: frontoffice-management Image security enforcement: Disable

Node health

6 total nodes

Critical 0% Warning 0% Normal 100% Pending 0%

Networking

Service endpoint URL: Private enabled Copy link

Ingress subdomain: frontoffice-mgmt-cluster-48d3a96f95acca62076e928d79df50c



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19. This cluster has provisioned as a multi-zone cluster against the three availability zones in the Frankfurt region with two worker nodes in each zone. This cluster also has provisioned with only private endpoints. Since we have the VPN client running, we will be able to access the OpenShift console.
20. Click on the “Openshift web console” button.

The screenshot shows the IBM Cloud Cluster Overview page for the 'frontoffice-mgmt-cluster'. The cluster status is listed as 'Normal'. The 'OpenShift web console' button is highlighted with a red box. The 'Overview' section includes details like Node status (6 of 6), Add-on status (1 of 1), Master status (Normal), and Ingress status (Healthy). The 'Details' section provides specific information such as Cluster ID (c599eq6f0cth2mcnk83g), Version (4.7.30_1532), Infrastructure (VPC Gen2), and Zones (eu-de-1, eu-de-2, eu-de-3). The 'Node health' section shows 6 total nodes with 100% Normal status. The 'Networking' section includes a Service endpoint URL and an Ingress subdomain (frontoffice-mgmt-cluster-48d3a96f95acca62076e928d79df50c).



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The screenshot shows the Red Hat OpenShift Container Platform Management interface. The left sidebar has a dark theme with various options: Developer (selected), +Add, Topology (selected), Monitoring, Search, Builds, Pipelines, Environments, Helm, Project (disabled), ConfigMaps, and Secrets. The main content area is titled 'Topology' and displays a message: 'Select a Project to view the topology or [create a Project](#)'. Below this is a search bar with 'Name' and 'Search by name...' and a clear icon. A table lists two projects:

Name	Display name	Status	Requester	Created
PR openfn-dev	OpenFn Dev	Active	IAM#ramragh1@in.ibm.com	Oct 1, 2021, 10:24 AM
PR openfn-test	OpenFn Test	Active	IAM#seansund@us.ibm.com	Sep 28, 2021, 9:54 PM

21. The OpenShift cluster in the management VPC has been set up as a development environment. The banner at the top helps distinguish this cluster from the Workload cluster. Also, tools to support the development process have been installed in the cluster.
22. Click on the application menu along the top (the 3x3 grid icon near the middle-right).



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The screenshot shows the Red Hat OpenShift Container Platform interface. The left sidebar has a 'Developer' dropdown set to 'Topology'. The main area displays a network diagram with several nodes: 'support-svc-data', 'busine...r-acct', and 'web-app'. A tooltip for 'support-svc-data' shows a red circular icon with a white arrow. A large red square highlights the top right corner of the interface.

Project: openfn-dev Application: all applications

Display options Filter by resource Find by

Application Stages

- ArgoCD
- Cloud-Native Toolkit
 - Artifactory
 - Ascent
 - Developer Dashboard
- GitHub
- IBM Logging
- IBM Monitoring
- Image Registry
- Pact Broker
- SonarQube

OpenShift on IBM Cloud

- Manage Cluster

23. Artifactory, GitHub, Pact Broker, and SonarQube are tools that support the Continuous Integration process. ArgoCD is a tools that provides Continuous Delivery following a GitOps approach. IBM Logging, IBM Monitoring, and Image Registry provide links to the tools that support the management of the cluster. And Ascent and Developer Dashboard are additional tools that support the overall development lifecycle.
24. Select the “**openfn-dev**” project and click on the “Pipelines” menu on the left.



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The screenshot shows the Red Hat OpenShift Container Platform interface. The top navigation bar has a purple header with the text "Management". Below it is a dark header with the Red Hat logo and "OpenShift Container Platform". The left sidebar is titled "Developer" and contains the following options: +Add, Topology, Monitoring, Search, Builds, Pipelines (which is selected and highlighted in grey), Environments, Helm, Project, ConfigMaps, and Secrets. The main content area is titled "Pipelines" and includes a "Tech preview" badge. It shows a table of pipelines with the following data:

Name	Last run	Task status	Last run status
PL support-service-data	[PLR] support-service-data-8ehu7u	<div style="width: 100%; background-color: green;"></div>	✓ Succeeded
PL web-app	[PLR] web-app-4me582	<div style="width: 100%; background-color: green;"></div>	✓ Succeeded
PL business-service-savings-account	[PLR] business-service-savings-account-xqkk2y	<div style="width: 100%; background-color: green;"></div>	✓ Succeeded
PL experience-service-accounts	[PLR] experience-service-accounts-t0fooe	<div style="width: 100%; background-color: green;"></div>	✓ Succeeded
PL business-service-current-account	[PLR] business-service-current-account-vaix34	<div style="width: 100%; background-color: green;"></div>	✓ Succeeded
PL business-service-credit-card	[PLR] business-service-credit-card-qaf38r	<div style="width: 100%; background-color: green;"></div>	✓ Succeeded
PL business-service-customer-position	[PLR] business-service-customer-position-0q76jy	<div style="width: 100%; background-color: green;"></div>	✓ Succeeded

25. This cluster has a number of CI pipelines provisioned to build the microservices that make up the Open Fn application. A detailed walkthrough of these development tools and the development lifecycle is provided in a subsequent video in this series.

Workload VPC

1. Return to the IBM Cloud resource list – <https://cloud.ibm.com/resources>. Select the “**front-office-workload**” resource group to filter the list of services for the Workload VPC.
2. As with the Management VPC, we have a number of VPC resources that have been provisioned for the Workload network. The structure of the VPC mirrors that of the Management VPC with the three sets of subnets across the three availability zones. An OpenShift cluster has also been provisioned in the Workload network.
3. Expand the “Containers” section and click on the Workload cluster



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The screenshot shows the IBM Cloud Resource list interface. On the left, there's a sidebar with icons for various service categories like Devices, VPC infrastructure, Clusters, Container Registry, Satellite, Cloud Foundry apps, Cloud Foundry services, Services and software, Storage, Network, Functions namespaces, Apps, Developer tools, and VMware. The 'Clusters' section is expanded, showing one item: 'frontoffice-workload-cluster'. This item is highlighted with a red box. The main table lists resources under 'Name', 'Group', 'Location', 'Status', and 'Tags'. The 'frontoffice-workload-cluster' entry has 'frontoffice-workload' under Group, 'Frankfurt' under Location, 'Normal' under Status, and 'fscloud +1' under Tags.

Name	Group	Location	Status	Tags
frontoffice-workload-cluster	frontoffice-workload	Frankfurt	Normal	fscloud +1

4. Like the Management cluster, the Workload cluster has been provisioned as a multi-zone cluster with private endpoints only. Since the VPN is running we can access the Workload cluster console as well.
5. Click on the “OpenShift web console” button.



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The screenshot shows the Red Hat OpenShift Container Platform interface. At the top, there's a red banner with the word "Workload". Below it, the header includes the IBM logo, the Red Hat logo, and the text "OpenShift Container Platform". On the far right, there are user profile icons and the email address "IAM#seansund@gmail.com". The left sidebar has a dark background with white text, listing various navigation options: Developer (+Add), Topology (which is selected and highlighted in blue), Monitoring, Search, Builds, Pipelines, Environments, Helm, Project (which is collapsed), ConfigMaps, and Secrets. The main content area has a light gray background. It starts with a section titled "Topology" with the sub-instruction "Select a Project to view the topology or [create a Project](#)". Below this is a search bar with dropdown menus for "Name" and "Search by name...". A table follows, showing one row of data:

Name	Display name	Status	Requester	Created
PR openfn-prod	No display name	Active	IAM#seansund@us.ibm.com	Oct 6, 2021, 1:47 PM

6. This cluster has been set up to deploy and run the production workload for the Open Fn application. The banner at the top marks this as the workload cluster.
7. Click on the application menu.



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8. Since we are using this cluster to run the application workloads, the development tools have not been installed here. ArgoCD has been provisioned to manage software deployments into the cluster using GitOps. Also, links to the IBM Logging, IBM Monitoring, and Image Registry have been added to make it easier to navigate to the services.
9. Return to the IBM Cloud resource list – <https://cloud.ibm.com/resources>

THIS CONCLUDES THE LAB STEPS