Introduction to IBM API Connect 10

IBM **Training**

Unit objectives

- Describe the key capabilities of API Connect
- Describe what an API is and the different classifications of APIs
- Explain the key benefits and use cases of API management
- Describe how API Connect manages APIs through the entire API lifecycle
- Identify the components of an API Connect on-premises cloud
- Describe the use of the Cloud Manager user interface to administer the cloud topology and resources
- Describe the different gateway types for securing and managing APIs
- Review the topology of an API Connect cloud
- Explain how DataPower secures the API Gateway
- Describe the roles and activities involved in the development of an API
- Identify the requirements for installing an API Connect on-premises cloud
- Describe the API Connect user interfaces by function
- Identify deployment options for API Connect at installation
- Describe the function of the installation assist utility
- Identify the components of the runtime environment

Topics

- Overview of APIs and API Management
- IBM API Connect 10 overview
- API lifecycle management
- Configuring the cloud topology
- Registering services in Cloud Manager
- Configuring the DataPower Gateway

Acronyms

Acronym	Definition
API	Application Programming Interface
JSON	JavaScript Object Notation
JWT	JSON Web Token
OVA	Open Virtual Appliance
REST	Representational State Transfer
SMTP	Simple Mail Transfer Protocol
SOAP	Simple Object Access Protocol
TLS	Transport Layer Security
URL	Uniform Resource Locator
XML	Extensible Markup Language

Key concepts

- **API gateway**
  - An API gateway is an API management tool that sits between a client and a collection of backend services. An API gateway acts as a reverse proxy to accept all application programming interface (API) calls, aggregate the various services that are required to fulfill them, and return the appropriate result.
- **Endpoints**
  - An endpoint is a remote service that communicates back and forth with a network to which it is connected.
- **Kubernetes**
  - Kubernetes is an extensible, open source platform for managing containerized workloads and services that facilitate both declarative configuration and automation. It has a large, rapidly growing ecosystem.
- **OpenShift**
  - Red Hat OpenShift is a hybrid cloud, enterprise Kubernetes application platform
- **VSphere**
  - VMware’s suite of server virtualization products

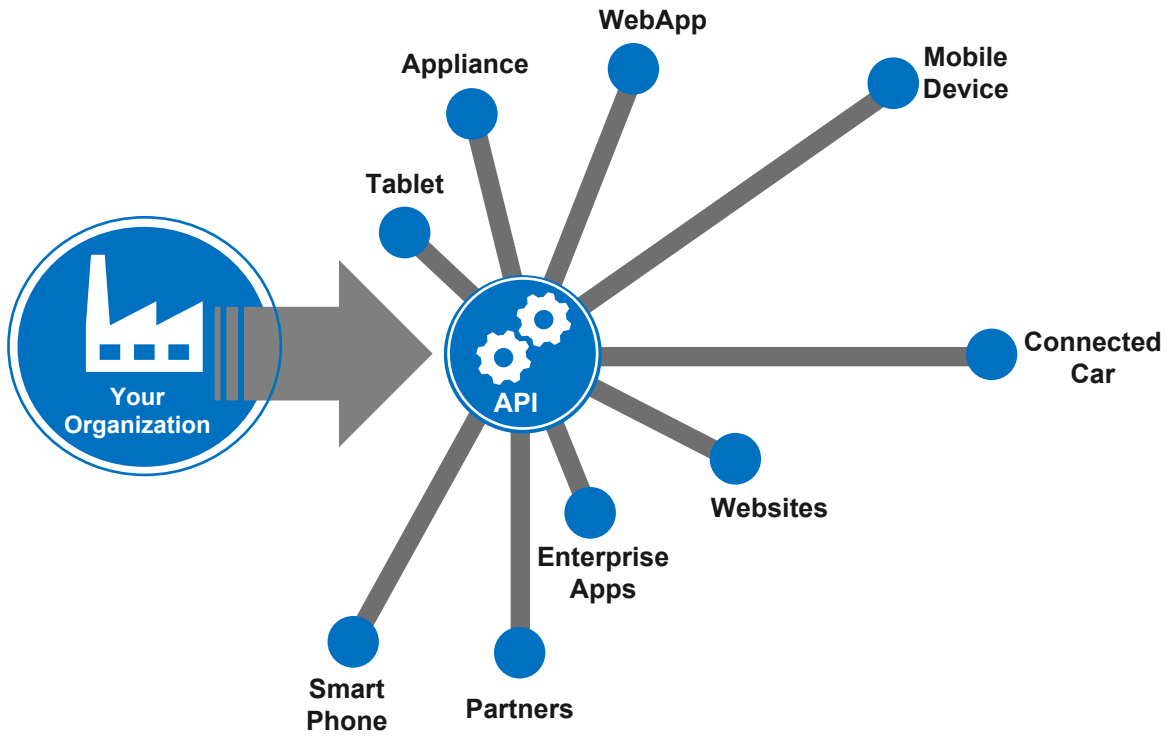
Key concepts

- **General Data Protection Regulation (GDPR)**
  - GDPR is a European Union law on data protection. The GDPR's primary aim is to give individuals control over their personal data and to simplify the regulatory environment for international business.
- **Open Virtual Appliance (OVA)**
  - A virtual appliance is a pre-configured virtual machine image, ready to run on a hypervisor. OVA files are used to store Open Virtualization Format files for packaging and distributing virtual appliances or software to be run in virtual machines.
- **OAuth**
  - OAuth (Open Authorization) is a token-based authorization protocol that allows third-party websites or applications to access user data without requiring the user to share personal information.
- **YAML**
  - YAML has been repurposed as YAML Ain't Markup Language. YAML is a data serialization standard and is used for configuration files and applications where data is being stored or transmitted.

Overview of APIs and API Management

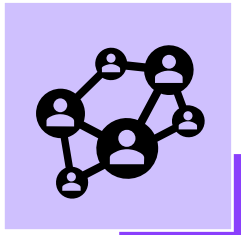
What is an API?

- What is an **API**?
  - An `application programming interface` is a collection of remote service operations that you make available to API consumers
  - In IBM API Connect, the API is a collection of REST service operations
- What is an **API consumer**?
  - An API consumer is an application that **calls** remote operations in an API
- What is an **API provider**?
  - An API provider is an application or a system that **implements** the REST service operation in an API



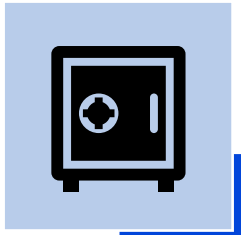
- What is an **API gateway**?
  - An API gateway manages access to a set of API operations
  - The gateway enforces service policies to restrict consumer access to APIs

Classification of APIs



Public

- Share data sets and services
- Foster relationships between internal and external developers



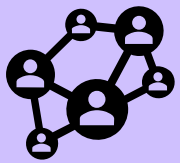
Partner

- Open to selected business partners
- Designed to support access to specific business functions

Private

- Internal APIs are the predominant category of APIs, as most APIs start privately inside organizations and later evolve for public or partner access.

API Examples



Public

- Twitter
- Yelp
- Facebook
- Google Maps
- Google Search
- Yahoo Finance

Partner

Ride Services

- Find driver
- Cancel ride

Banks

- Get balance
- Update acct
- Payment services

Private

- New employee
- Request days off
- Paycheck services
- Document processing

API Management use cases

- API management platforms benefit organizations in a number of ways. Here are a few everyday use cases when implementing an API management solution:
- **Supporting digital transformation strategies**
  - API management is becoming an essential part of digital transformation strategies, giving organizations the ability to create seamless connections between their digital assets. As businesses continue to scale their day-to-day operations, it becomes necessary that they adopt new tools and services that help them evolve their digital ecosystem.
- **GDPR and compliance considerations**
  - API gateways are a perfect way to address many of the GDPR requirements for data privacy and compliance when accessing and moving large volumes of data. Gateways are designed to protect user data and the access points as information is transmitted through an API.
- **Ensuring data security**
  - API management solutions are becoming the gold standard for securing API integrations in an enterprise setting. Using a managed solution, enterprises can encrypt all of their data and require signatures to ensure that the right users are accessing their data.

Benefits of API management

- API management gives enterprises greater flexibility when reusing the functionality of API integrations and helps save time and money without trading off security.
- By managing all of your APIs on one unified and centrally visible platform, enterprises can easily share the API documentation and coding constructs between teams, significantly reducing development costs and time to market.
- API management platforms also help to keep existing services much safer by tracking API usage and allowing for the integration of state-of-the-art security protocols, including OAuth, JWT, and OpenID.

Common business drivers for API initiatives

Speed

The speed driver focuses on allowing the business and IT organization to run at different speeds.

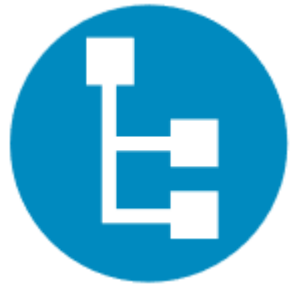
Reach

To reach new markets and obtain new customers, you can make APIs available to other enterprises, such as partners who, through their interaction with clients, can generate additional revenue and new customers for your enterprise.

Internet of Things

Typically, domains refer to interactions across multiple lines of business. Lines of business can largely work independently but benefit by sharing data or the occasional need to share data.

Domain



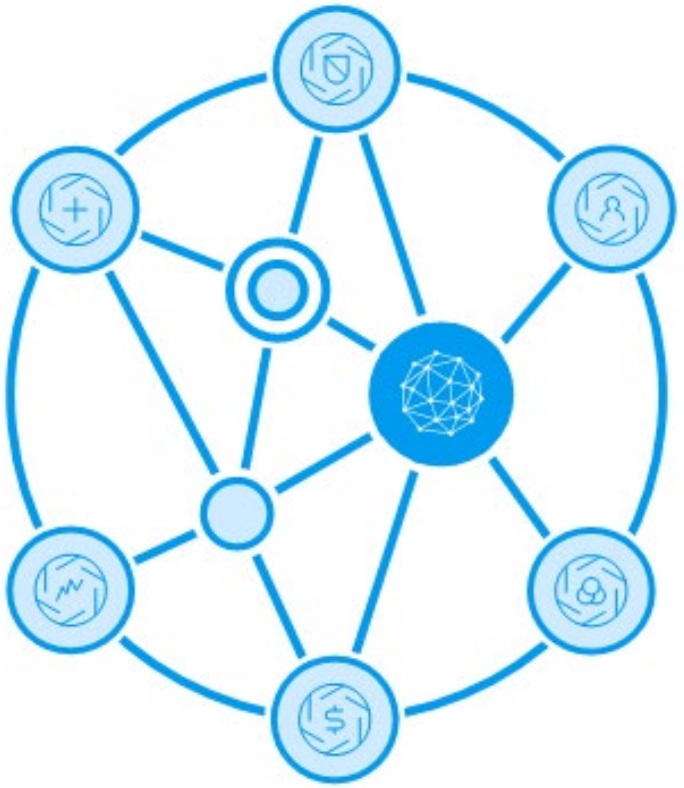
In many industries, devices are used along with APIs to provide new and innovative solutions.

IBM API Connect 10 overview

IBM API Connect overview

- What is IBM API Connect?
  - IBM API Connect is an integrated solution that includes creating, running, managing, and securing APIs for a range of applications in a digital environment.

- What does IBM API Connect provide?
  - Automated, visual, and coding options for creating APIs
  - Node.js Loopback framework support for generating API implementations
  - Creation of models and APIs from diverse data sources
  - Lifecycle and governance for APIs, products, and plans
  - Advanced API usage analytics and reporting
  - Customizable, self-service Developer Portal for publishing APIs
  - Policy enforcement, security, and control provided by the IBM DataPower Gateway



Components of API Connect

Gateway

API Connect uses IBM DataPower Gateway to provide the gateway service. IBM API Connect provides two gateway types, DataPower API Gateway and DataPower Gateway (v5 compatible).

API Manager

API manager is an intuitive user interface that lets you manage APIs for internal use, or to externally monetize and manage services as REST or SOAP APIs.

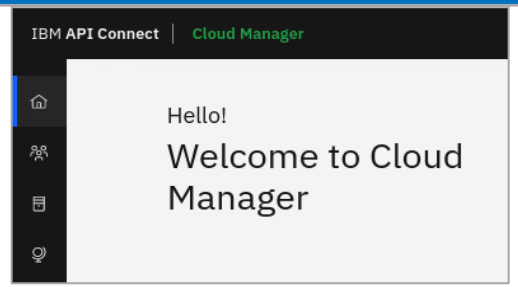
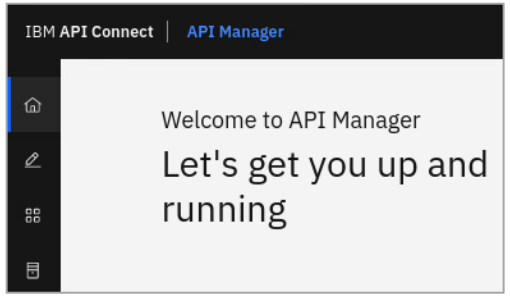
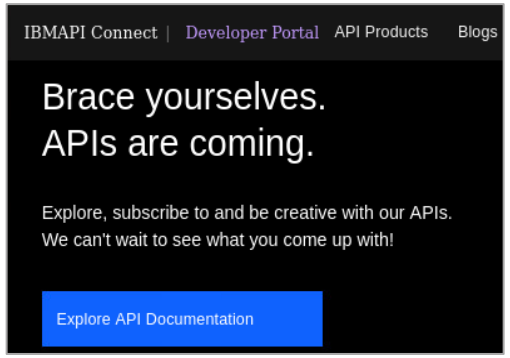
Developer Portal

Share your APIs with application developers through a company-branded portal. Developers can discover and subscribe to APIs as well as register and deploy associated applications.

Analytics

API analytics is built on the Kibana V5.5.1 open source analytics and visualization platform, which is designed to work with the Elasticsearch real-time distributed search and Analytics Engine.

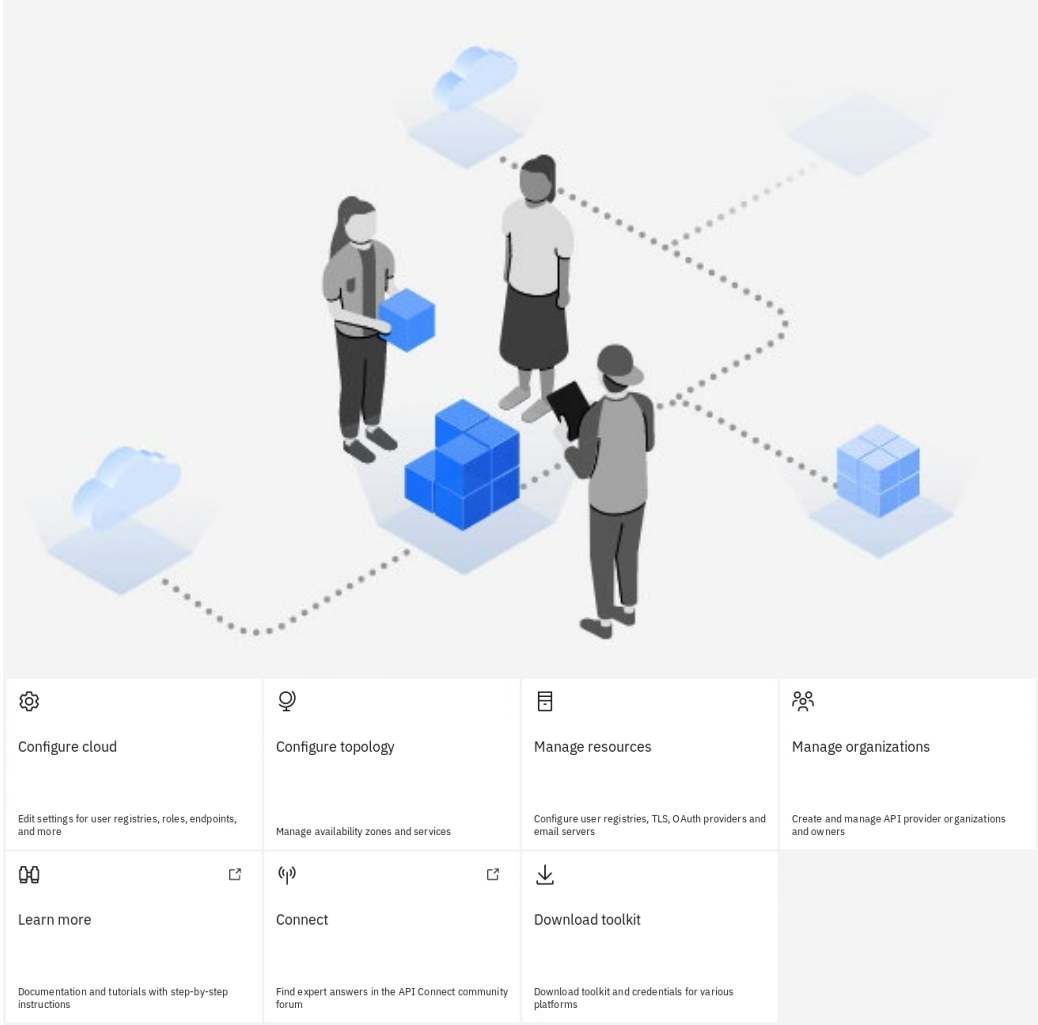
API Connect user interfaces: By function

User interface	Function	Screen capture
Cloud Manager	Configure resources	
API Manager	Create, assemble, stage, publish, retire, archive, and version APIs	
Developer Portal	Search for APIs and register applications	

Cloud Manager user interface

Enables a Cloud Administrator to configure, and manage the API Connect on-premises cloud

- Configure:
  - Declare settings such as timeout values for invitations to join an organization
  - Configure member roles and role defaults
  - Define user registries
  - Define provider organizations
  - Connect to an existing SMTP mail server
  - Configure endpoints for the analytics, gateway, and portal services
- Manage
  - Register new services and manage existing services
  - Manage Transport Layer Security (TLS) server and client profiles
  - Manage provider organizations



IBM API Connect deployment options

There are three ways in which you can deploy API Connect:

Deploying on Kubernetes

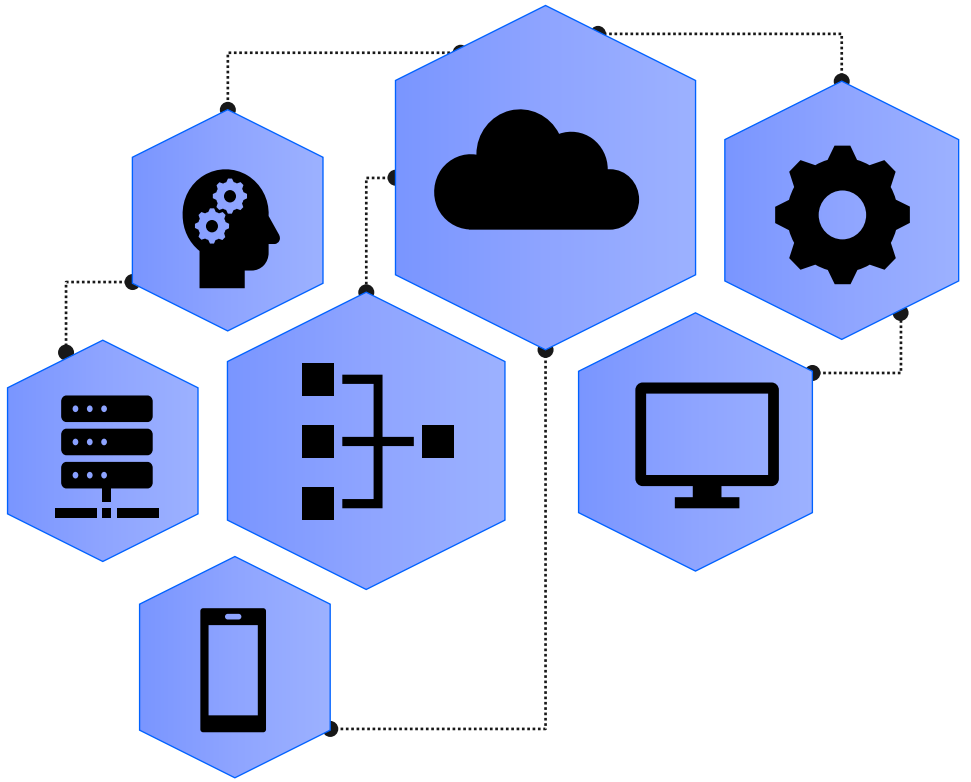
- Runtime that is used in course lab environment
- Uses Docker containers that are orchestrated by Kubernetes

Deploying on OpenShift

- You can install API Connect in an OpenShift environment and as part of IBM Cloud Pak for Integration.

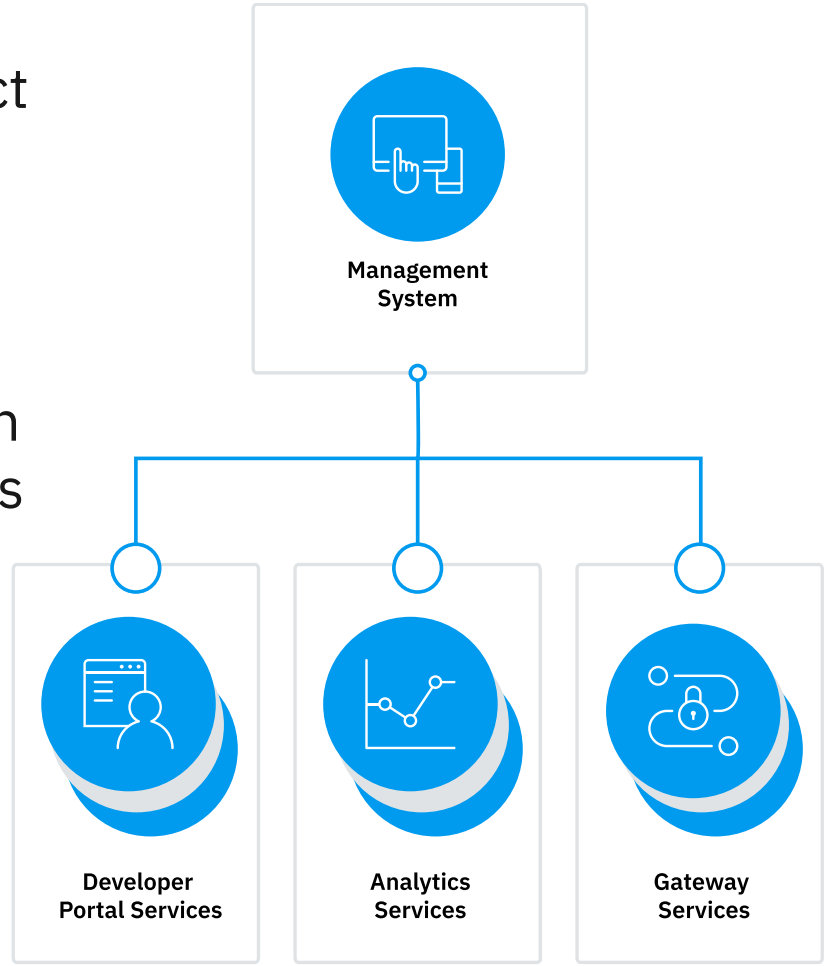
Deploying into a VSphere environment

- Deploy by using OVA files



Installation considerations

- Stand-alone API Analytics component to scale independently based on API project growth
- Zero to N portal clusters can be configured to an API Connect deployment to align with API project growth
- Native install of API Connect toolkit for enhanced user experience
- V5 to V10 Upgrade through automated migration scripts with a parallel stack setup that follows modern software practices
- Single Manager Cluster per API Connect Cloud, as it is the brain of the API Management system
- Manager can span multiple Availability Zones, giving flexibility in deployment scenarios
- Multiple Portal, Analytics and Gateway Cluster per Cloud, and are scoped to an Availability Zone



Installation utility program (APICUP)

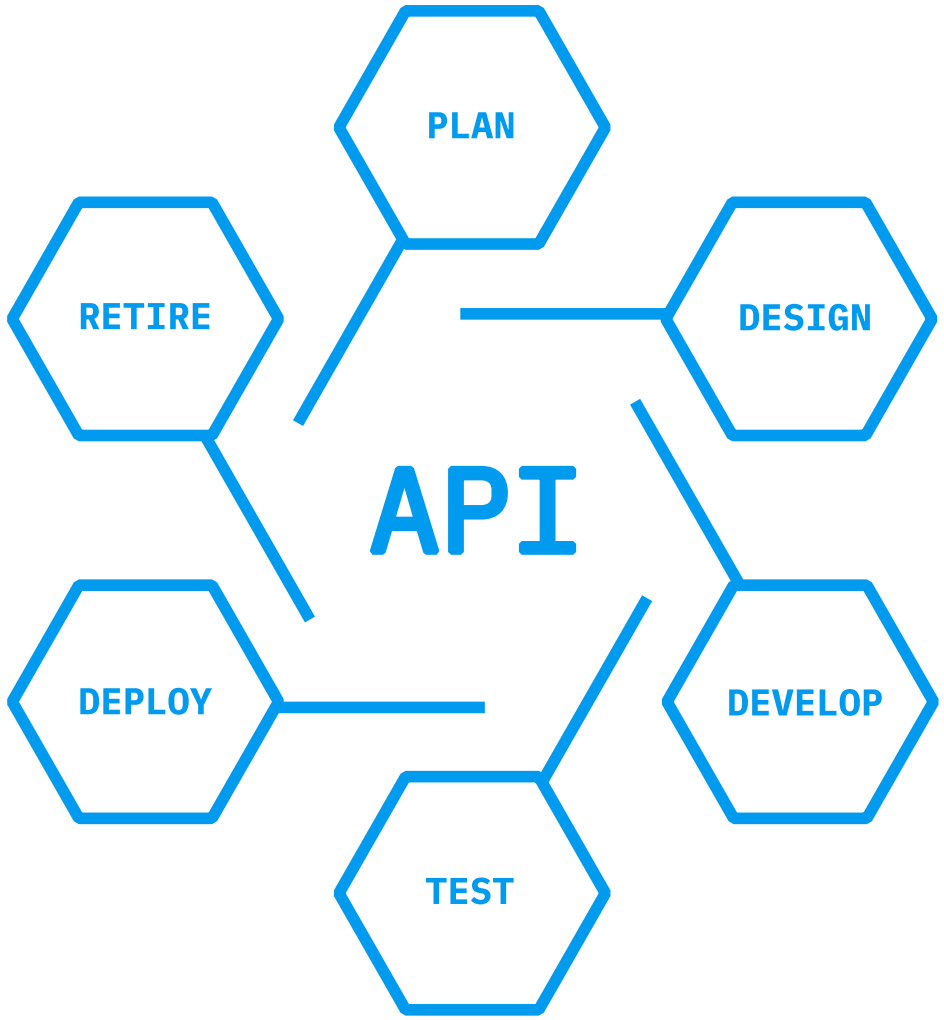
- **Install Assist** tool contains the **APICUP** installation utility program, which provides an automated installation process for API Connect
- **Install Assist** provides a script-based installation into the Kubernetes runtime environment
  - YAML-based installation script
  - Reference the YAML file when you are registering services in Cloud Manager
- The **APICUP** installer creates charts and secrets that are managed by Helm.
- Using **APICUP**, you can generate an installation plan and confirm it is correct before running the installation. You can then install the subsystem from the plan.

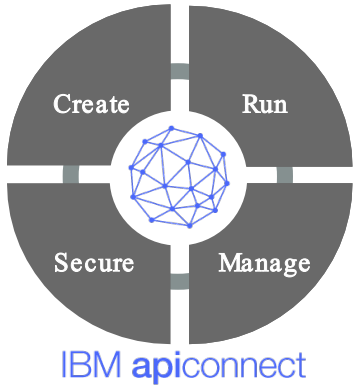
```
kind: apiconnect-up
subsystems:
  analytics:
    endpoints:
    - hostname: ai.think.ibm
      name: analytics-ingestion
    - hostname: ac.think.ibm
      name: analytics-client
    kvs:
      coordinating-max-memory-gb: "12"
      data-max-memory-gb: "8"
      data-storage-size-gb: "50"
      enable-persistence: "true"
      extra-values-file: ""
      ingress-type: ingress
      master-max-memory-gb: "8"
      master-storage-size-gb: "5"
      mode: demo
      namespace: apiconnect
      registry: localhost:5000
      registry-secret: my-localreg-secret
      storage-class: velox-block
    target: k8s
    type: analytics
  gw:
    endpoints:
    - hostname: gw.think.ibm
```

API lifecycle management

API lifecycle (1 of 2)

With IBM API Connect, you can manage APIs through the API lifecycle.

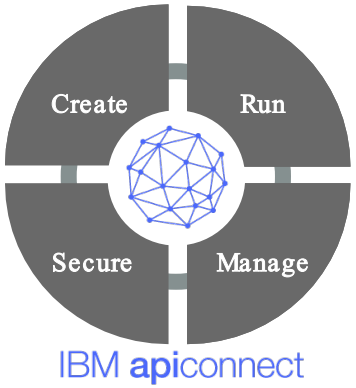




- Define and import REST or SOAP services so that customers can evolve their existing corporate assets.
- Package APIs into product groupings to target specific development teams or consumer organizations.
- Publish and promote products and APIs across different catalogs to align with DevOps practices.
- API lifecycle and version management from the initial staging of the APIs to deprecation and retirement to meet corporate governance needs.
- API subscription and application access control. Corporations need to control the access to the APIs and impose rate limits on API use.

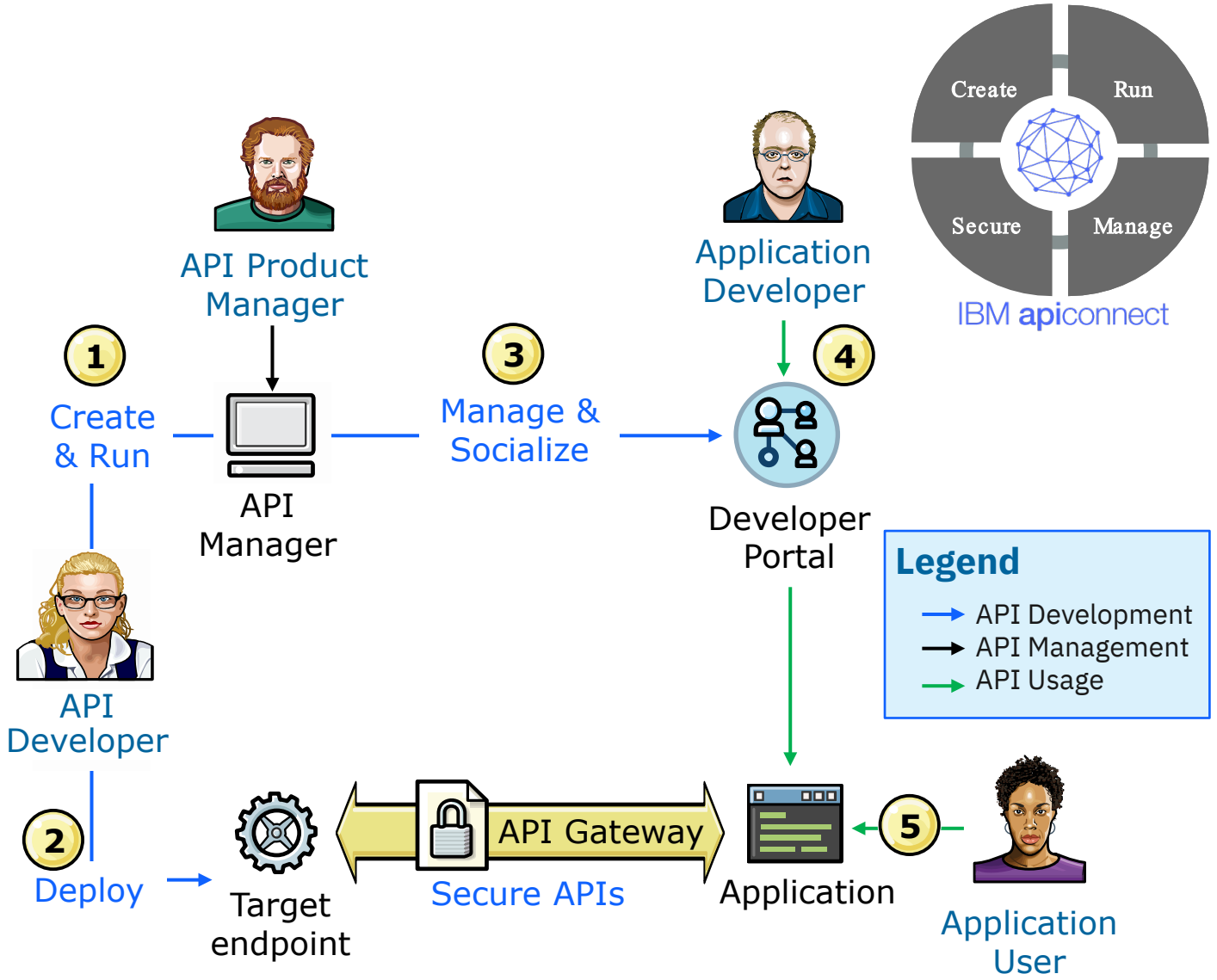
API lifecycle (2 of 2)

- **Create and run APIs**
  - Develop and write the API definition and implementation and test the API.
- **Secure and control APIs**
  - Incorporate access control, monitoring, and logging to properly secure the API.
- **Manage APIs**
  - Create and manage self-service portals that expose the API-to-API consumers.
  - Monitor the set of rules and conditions that govern the API to ensure it is fulfilling its intended purpose and adjust if necessary.
  - Retire and archive the API when appropriate.
- **Socialize APIs**
  - Socializing the APIs means that the APIs can be browsed and tested on the Developer Portal.
- **Analyze APIs**
  - The analytics that are provided with API Connect provide you with visibility into API usage.



API roles and the development workflow

1. **API Developers** create and run APIs by using API Manager. An **API Product Manager** oversees the management and socialization of the APIs.
2. **API Developers** deploy APIs to the API Gateway. IBM DataPower secures the APIs and acts as the API Gateway.
3. **API Developers** socialize their APIs, packaging them into products and publishes them to the Developer Portal.
4. **Application Developers** consume APIs by using the Developer Portal.
5. **Application Users** run the secured APIs.



Configuring the cloud topology

What is the API Connect Cloud?

The API Connect cloud is a collection of services that make up an API Connect installation, including configuration information and metadata.

Management service

The **API Management service** maintains the runtime configuration of the API Connect Cloud: the servers, the API, the plans, and products

API Connect Toolkit

- The **API Connect Toolkit** is a set of development tools that run on the API developer's workstation
- It can stage, publish, and test APIs in the API Connect Cloud

API Gateway

- The **API Gateway** secures runtime access to APIs
- It enforces a set of message processing policies against API requests

Developer Portal

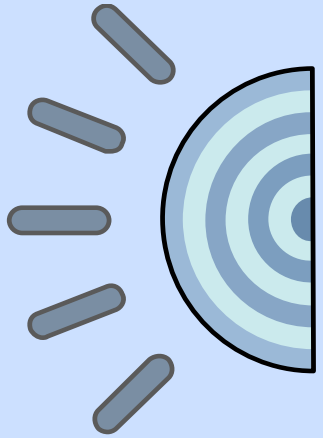
- The **Developer Portal** is a repository for published API definitions, plans, and products
- Application developers register apps that use APIs on the portal

API Connect cloud topology (1 of 2)

The API Connect cloud is:

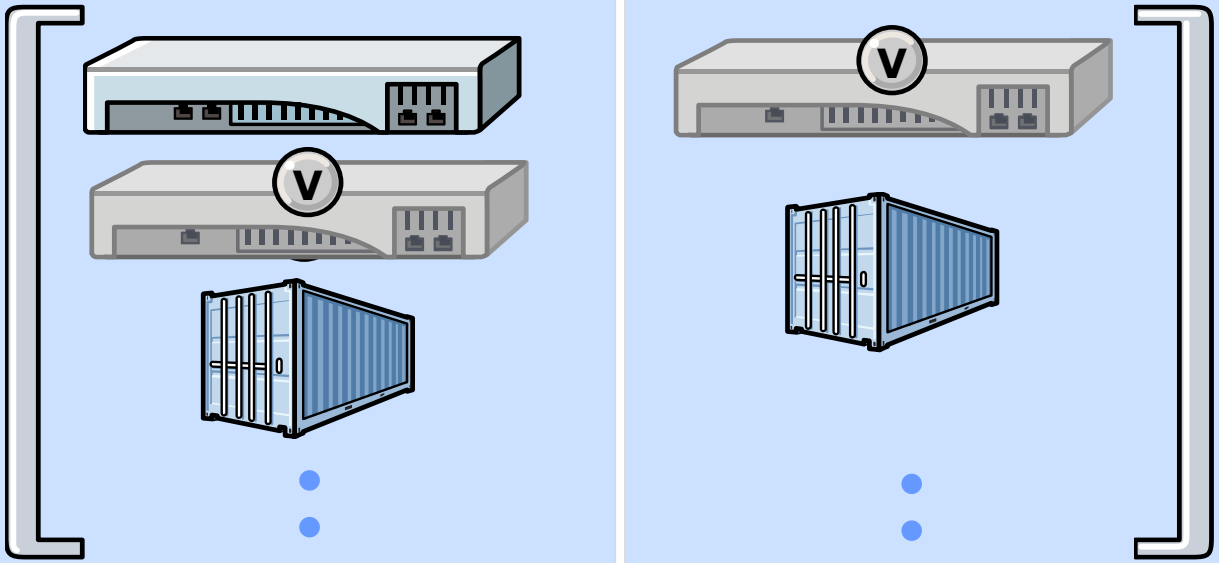
- The combination of virtual appliances (V) or Docker containers that are needed to host your APIs
- A set of servers and services that are provided by an API Connect installation, whether it is installed on-premises or hosted as a cloud-based service

Platform APIs



Platform APIs allow other products to interact with the API Management system

Gateway layer



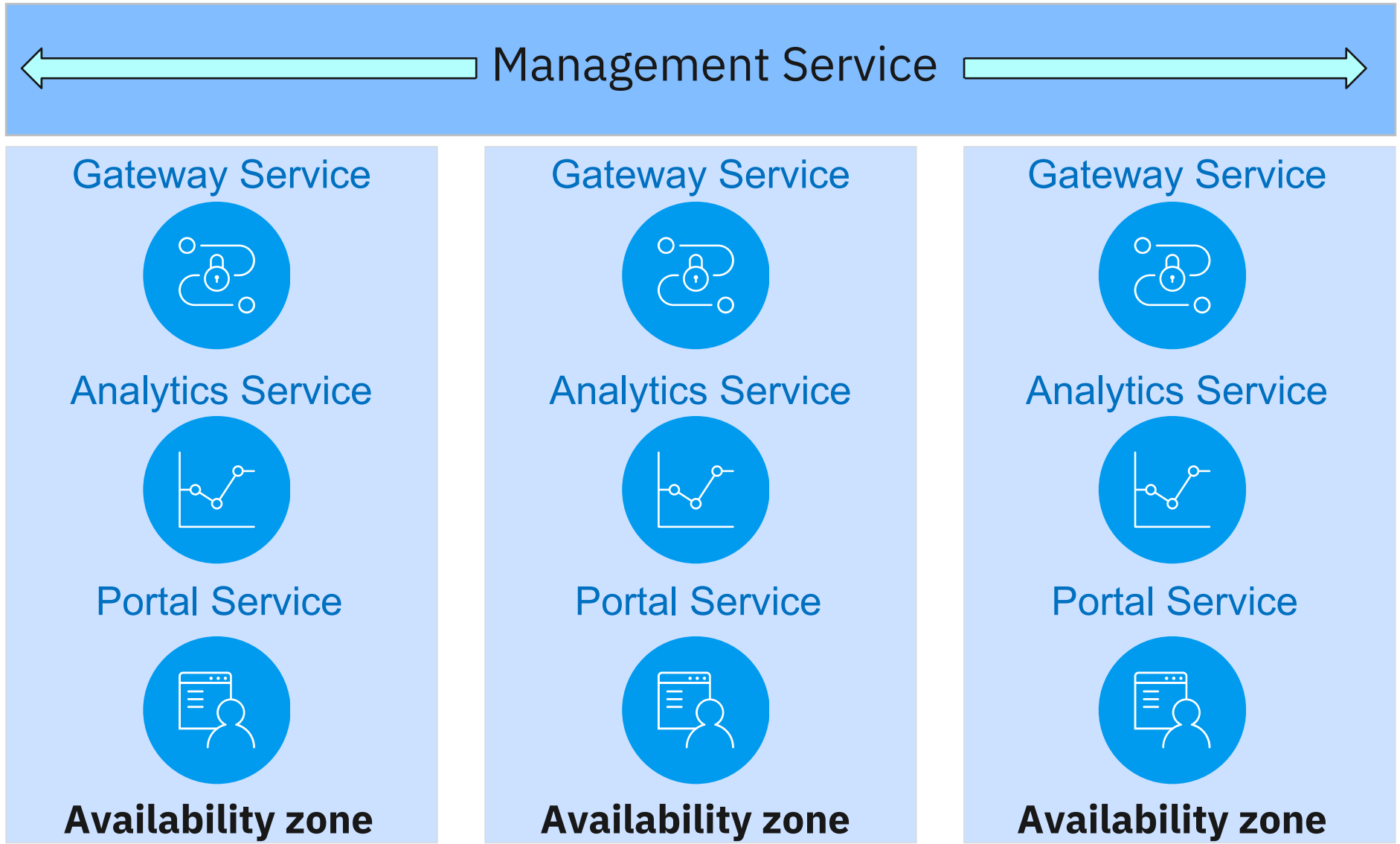
API configurations are deployed to the gateway, which provides the enforcement point for runtime policies to control API traffic

Management layer

The management layer embodies the capability for organizations to define, manage, and control APIs

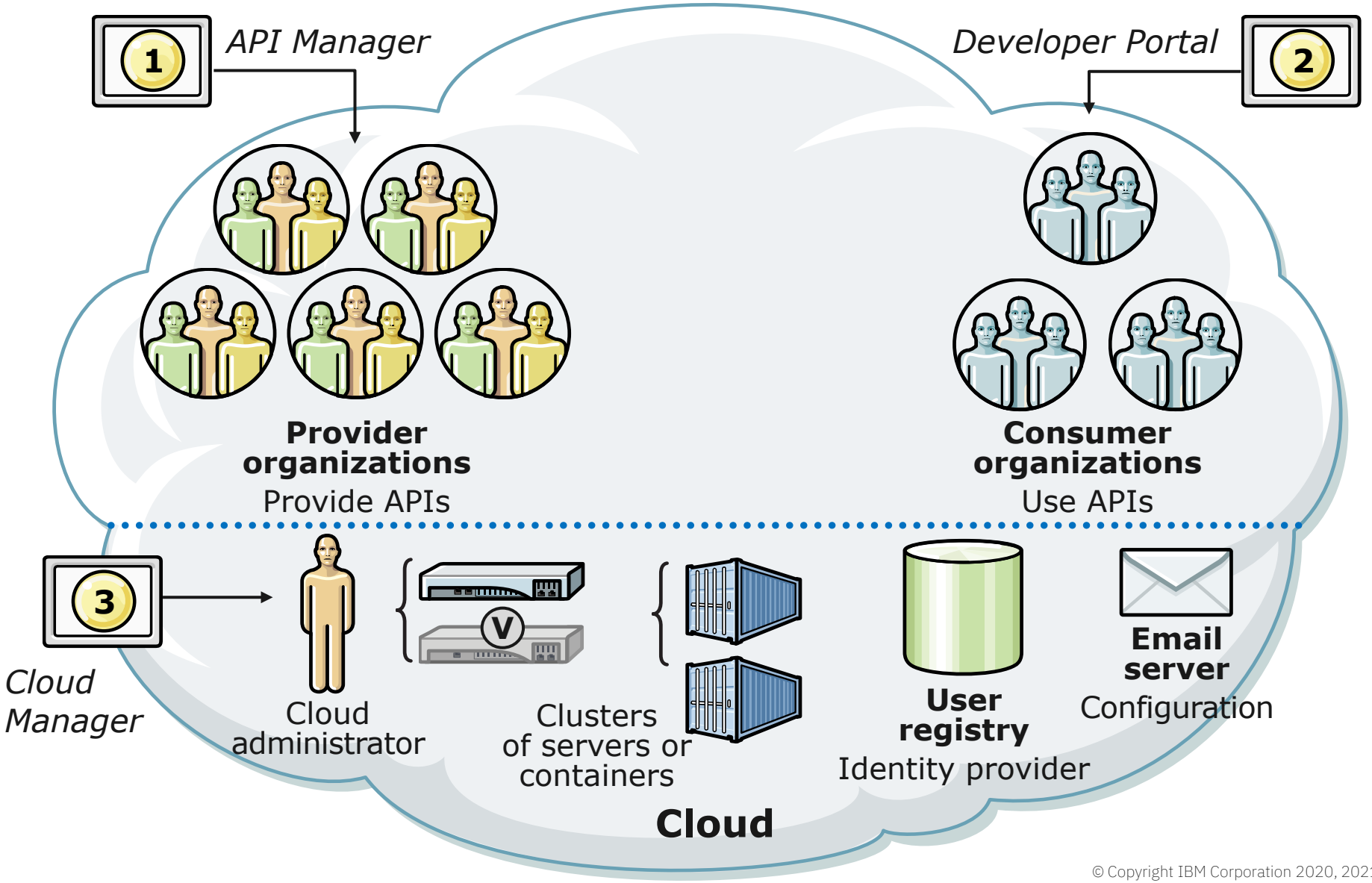
API Connect cloud topology (2 of 2)

- The Cloud Manager topology consists of availability zones that contain the API Connect services.
- Availability zones can contain one or more gateway services, analytics service, and portal service, but there is one management service that spans all availability zones.



API Connect cloud and user interfaces

1. The API Manager user interface provides authorized access to the APIs, Products, and plans and related linked services capability for the API provider.
2. The Developer Portal provides access for consumer organizations to the Products, plans, and APIs that are published by an API provider organization to a catalog.
3. The Cloud Manager user interface provides access for authorized users to administer the servers and user registries that make up the cloud infrastructure.



Stand-alone topology

- Non high-availability (HA), single instance deployment
- Single instance of each component that is defined for a non-HA deployment
- Non-HA deployment suitable for small projects and workloads
- HA deployment is recommended for larger projects and workloads, running critical applications
- One API Management cloud with Single Instance of each component
- Can be deployed on the same physical machine or can be a hybrid cloud setup

Gateway instance

Analytics instance

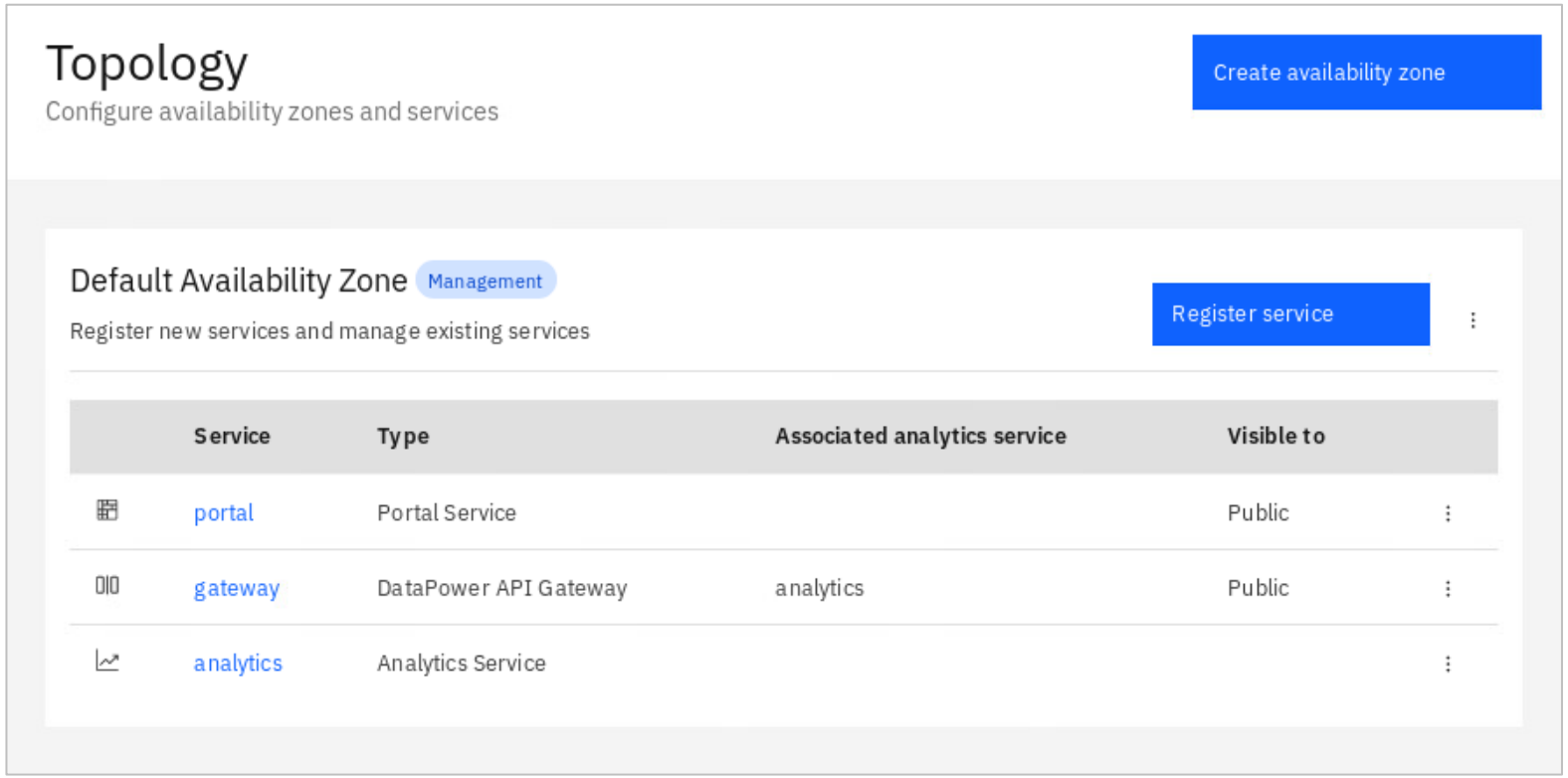
Manager instance

Portal instance

Registering services in Cloud Manager

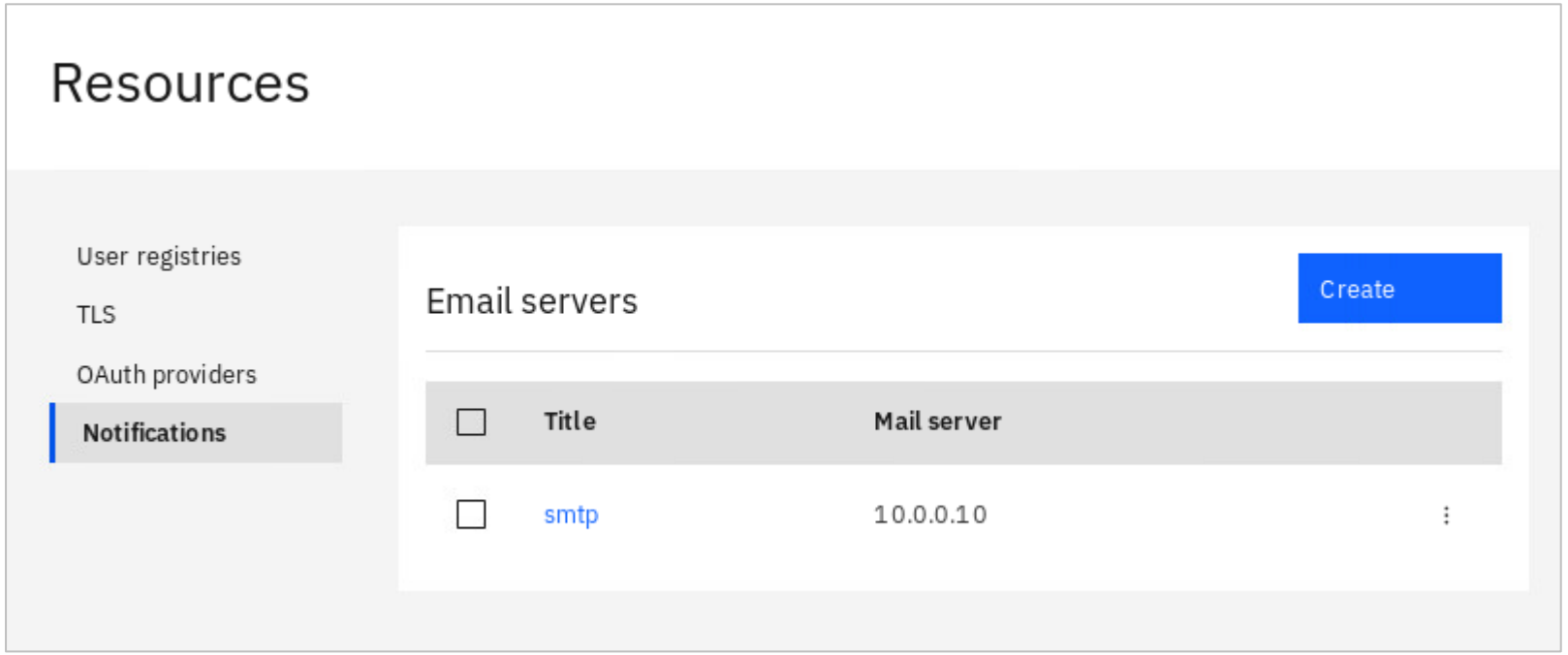
Services that are registered in Cloud Manager

- Gateway Service, Portal Service, and Analytics Service are registered
- The default availability zone contains the Management Service.
- When the Gateway Service, Portal Service, and Analytics Service are registered, the API Connect Cloud is configured for the stand-alone topology that is used in the class exercises.



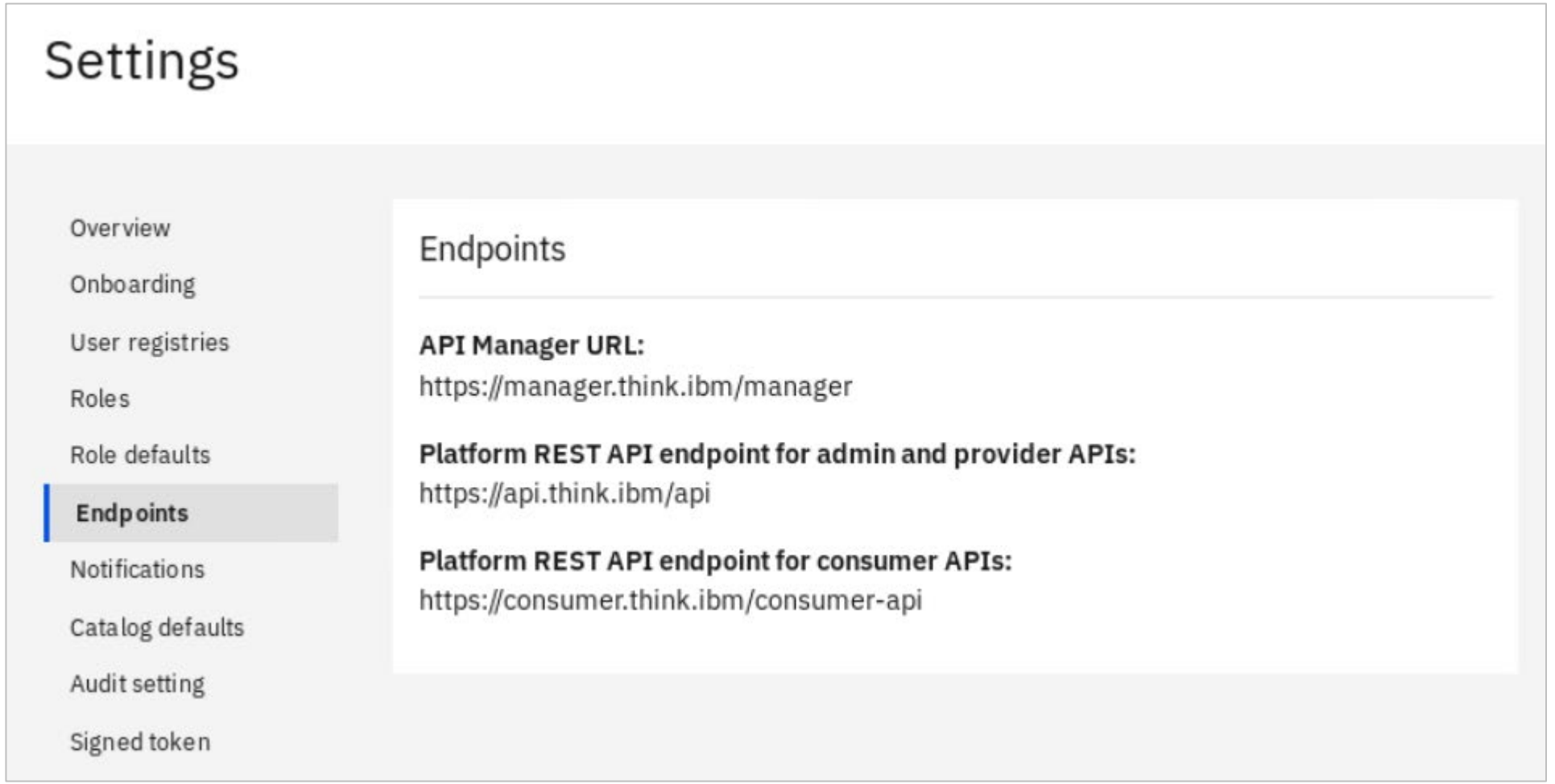
Configure the cloud environment: SMTP server

- To define the email server, select the **Resources** option
  - Then, selected **Notifications**



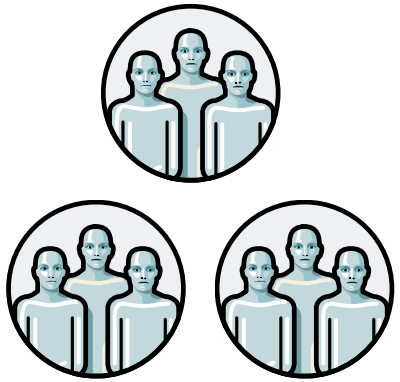
Configure the cloud environment: Endpoints

- View endpoint settings from Cloud Settings
- API Manager endpoint is the URL used to sign on to the API Manager user interface



Configuring the DataPower Gateway

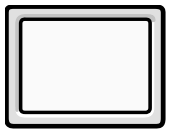
API Gateway (DataPower)



Consumer organizations

Business partners

Mobile & Web Apps

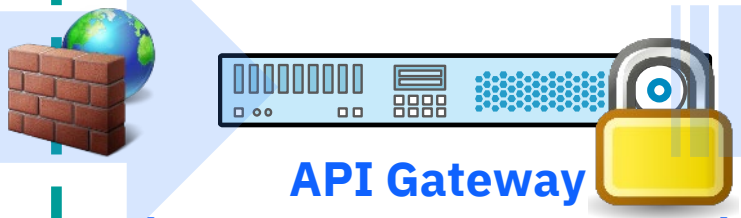


Enterprise Apps

API Management Solution

Management endpoint

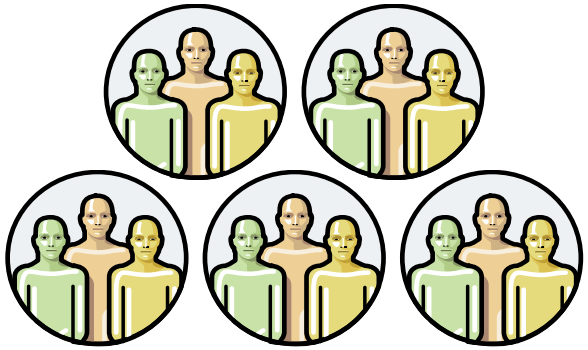
- URL that the Management server connects to the gateway



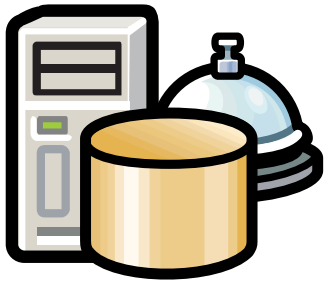
API Gateway (IBM DataPower Gateway)

API invocation endpoint

- Base portion of the URL
- A public address appended with paths that are specific to your API calls



Provider organizations

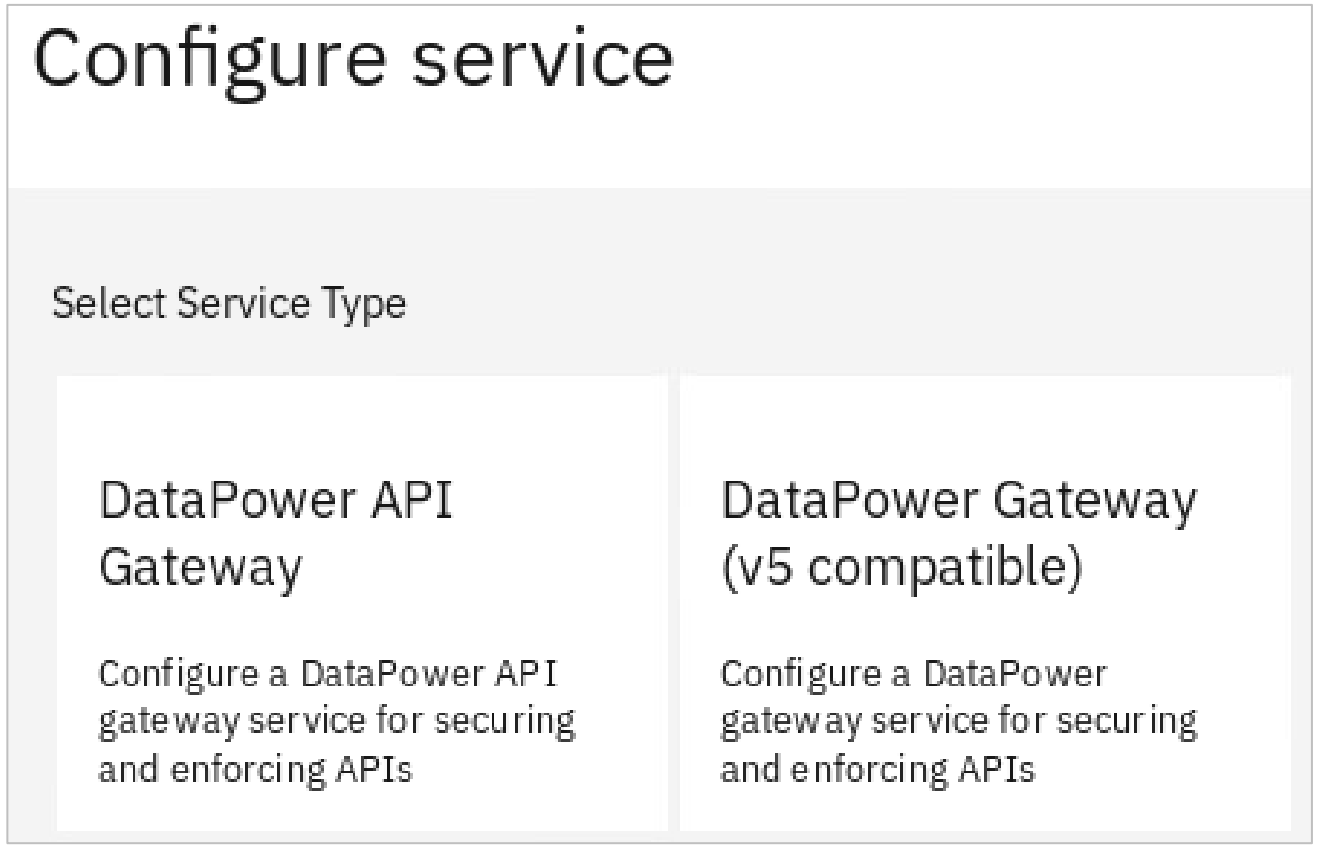


App / API Provider, Middleware, Data store, z System
On-premise or Cloud

AP gateway types

IBM API Connect provides two gateway types, DataPower API Gateway and DataPower Gateway (v5 compatible)

- DataPower API Gateway
  - Consider that use this gateway if you are running applications in a public or private cloud and want to use them as APIs
- DataPower Gateway (v5 compatible)
  - Consider using this gateway if you are an existing DataPower user and want to use your DataPower resources and knowledge



API gateway types comparison

Feature	DataPower Gateway (v5 compatible)	DataPower API Gateway
Native policies	No	Yes
OAuth provider	Full OAuth 2.0 Support	Full OAuth 2.0 Support
OAuth policy	No	Yes
OpenID Connect	Supported through a template	Supported natively
Invoke policy	Yes	Yes
Custom policies	Yes	Yes
Conditional policies	if, operation-switch, switch	switch
Activity logging	Implicitly executed at the end of API assembly	Configured in the API design, outside of the API assembly.
Parse policy (threat detection)	No	Yes
Gateway extensions	Yes	Yes
Support for mutual TLS (mTLS)	Yes	Yes

DataPower Gateway security

- Signed and encrypted gateway image without external software dependencies to minimize risk
- Well-established API security policies to protect services and data across multi-clouds
- Scalable architecture to help meet high-availability workloads
- Optimized built-in policies for security, traffic management, and mediation
- Workload tenant isolation to optimize governance on a single appliance across multiple lines of business

Secure, scalable, and optimized

IBM DataPower Gateway

IBM DataPower Gateway Virtual Edition

DataPower in the cloud

- The DataPower Gateway is available in cloud, physical, virtual appliance, Linux, and Docker form factors
- When DataPower runs in the cloud, it is running under a hypervisor, in Linux, or in a Docker container
- DataPower in a Docker container is supported in:
  - IBM Cloud
  - Amazon Web Services (AWS)
  - Google Cloud
  - Microsoft Azure

Unit summary

- Describe the key capabilities of API Connect
- Describe what an API is and the different classifications of APIs
- Explain the key benefits and use cases of API management
- Describe how API Connect manages APIs through the entire API lifecycle
- Identify the components of an API Connect on-premises cloud
- Describe the use of the Cloud Manager user interface to administer the cloud topology and resources
- Describe the different gateway types for securing and managing APIs
- Review the topology of an API Connect cloud
- Explain how DataPower secures the API Gateway
- Describe the roles and activities involved in the development of an API
- Identify the requirements for installing an API Connect on-premises cloud
- Describe the API Connect user interfaces by function
- Identify deployment options for API Connect at installation
- Describe the function of the installation assist utility
- Identify the components of the runtime environment

Review questions

1. True or False: API Connect enables both the creation of APIs and the full lifecycle management of APIs.

2. What is the role of the API gateway?
   a. It secures API endpoints
   b. It manages and monitors API traffic
   c. It transforms API requests and responses
   d. All of the above

Review questions

3. Which capability can you find in the DataPower Gateway (v5 compatible) but not the DataPower API Gateway?
   a. GatewayScript support
   b. Rate limiting
   c. Message transformation
   d. Custom user-defined policies

4. All of the following are user interfaces of API Connect except:
   a. Cloud Manager
   b. API Manager
   c. Gateway Manager
   d. Developer Portal

Review answers

1. True or False: API Connect enables both the creation of APIs and the full lifecycle management of APIs.

   The answer is True.

2. What is the role of the API gateway?
   a. It secures API endpoints
   b. It manages and monitors API traffic
   c. It transforms API requests and responses
   d. All of the above

   The answer is D.

Review answers

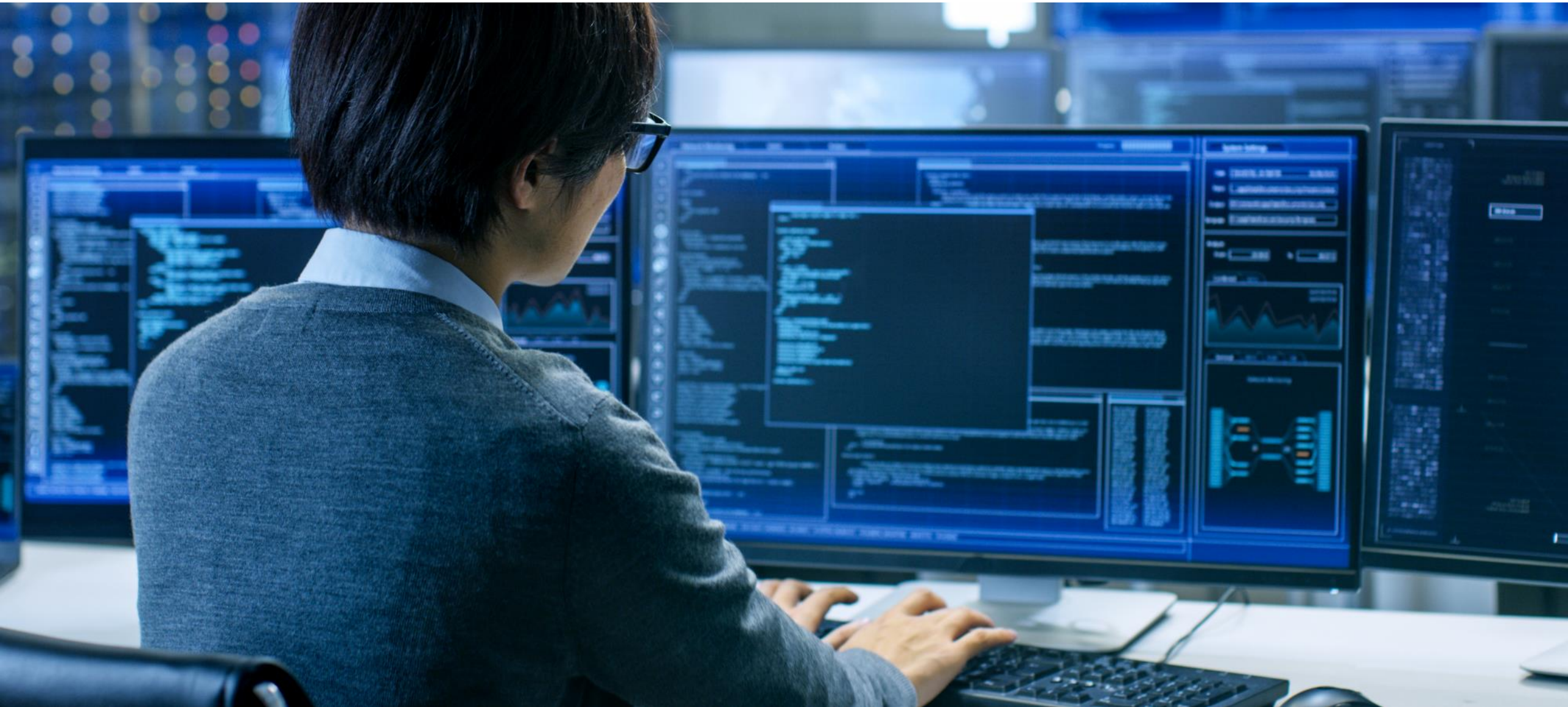
3. Which capability can you find in the DataPower Gateway (v5 compatible) but not the DataPower API Gateway?
   a. GatewayScript support
   b. Rate limiting
   c. Message transformation
   d. Custom user-defined policies

   The answer is D.

4. All of the following are user interfaces of API Connect except:
   a. Cloud Manager
   b. API Manager
   c. Gateway Manager
   d. Developer Portal

   The answer is C.

Exercise: Reviewing the API Connect development and runtime environment



Exercise objectives

- Review the network connectivity and domains
- Review the Kubernetes certificates
- Review the Kubernetes runtime environment
- Review the API Connect installation file
- Review how notifications are configured
- Review the configured services in Cloud Manager Console
- Review the provider and consumer organization settings and user registries