MuleSoft

Module 5: Deploying and Managing APIs

Goal

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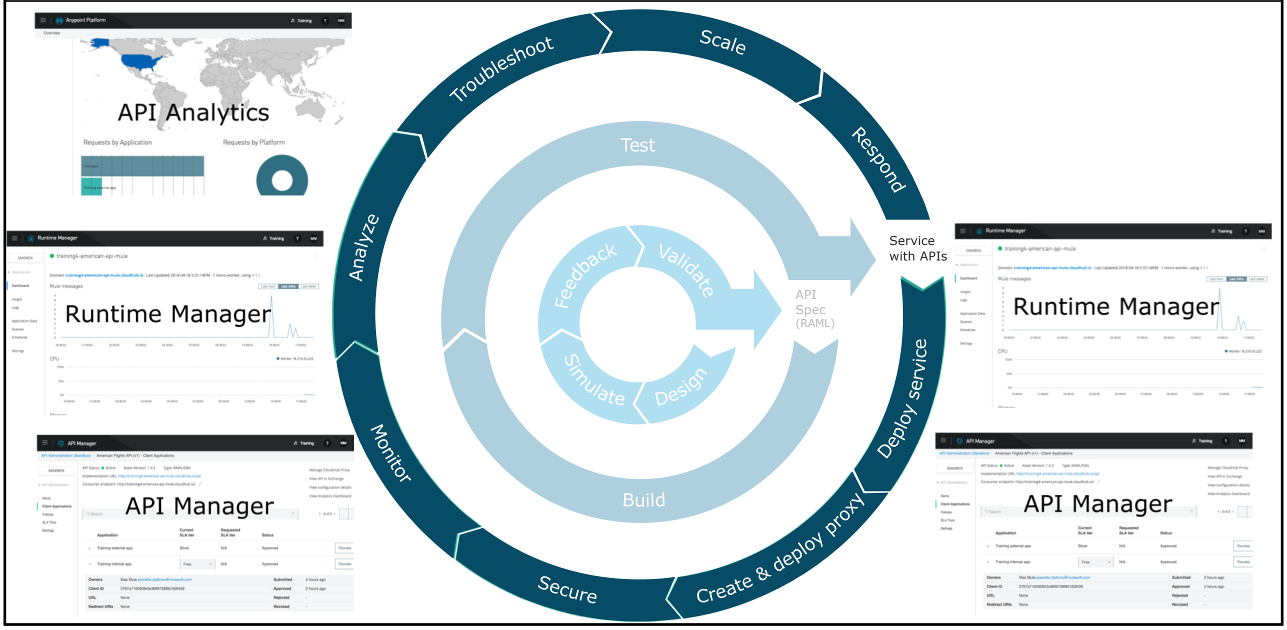

At the end of this module, you should be able to

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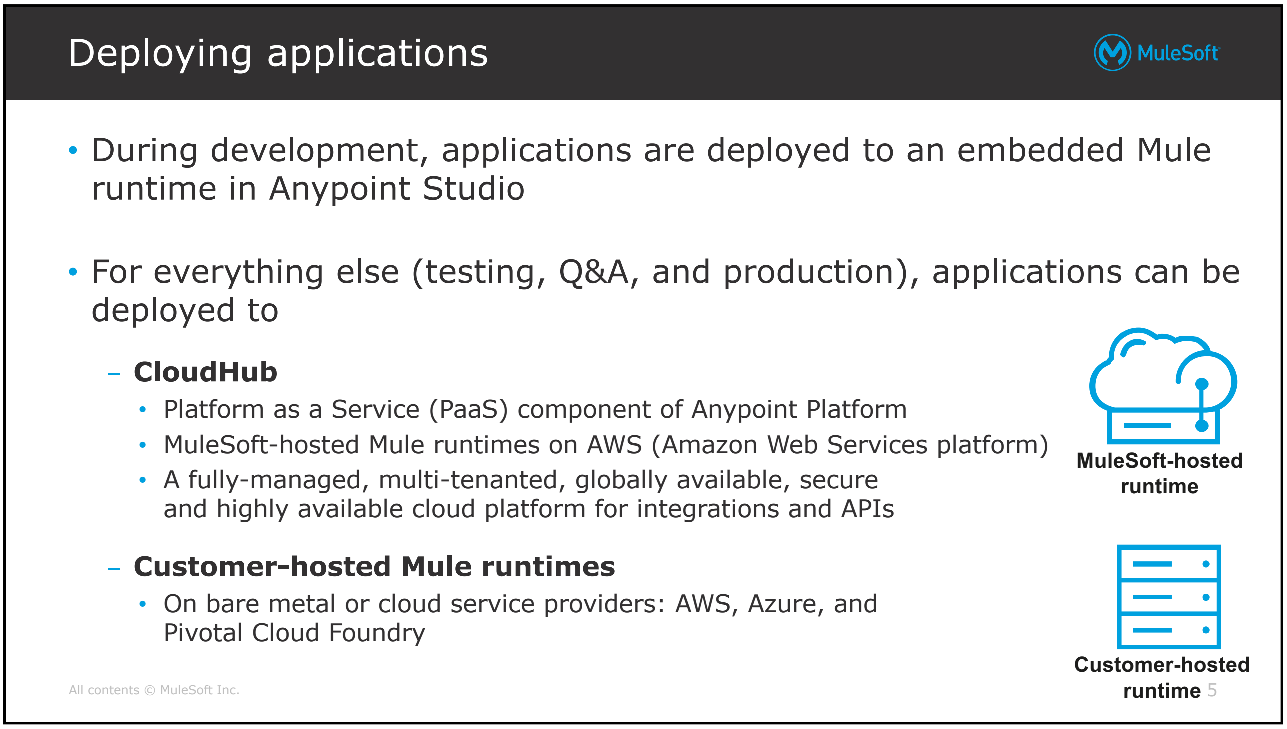
- Describe the options for deploying Mule applications
- Deploy Mule applications to CloudHub
- Use API Manager to create and deploy proxies for APIs
- Use API Manager to restrict access to API proxies

Introducing deployment options



Deploying applications

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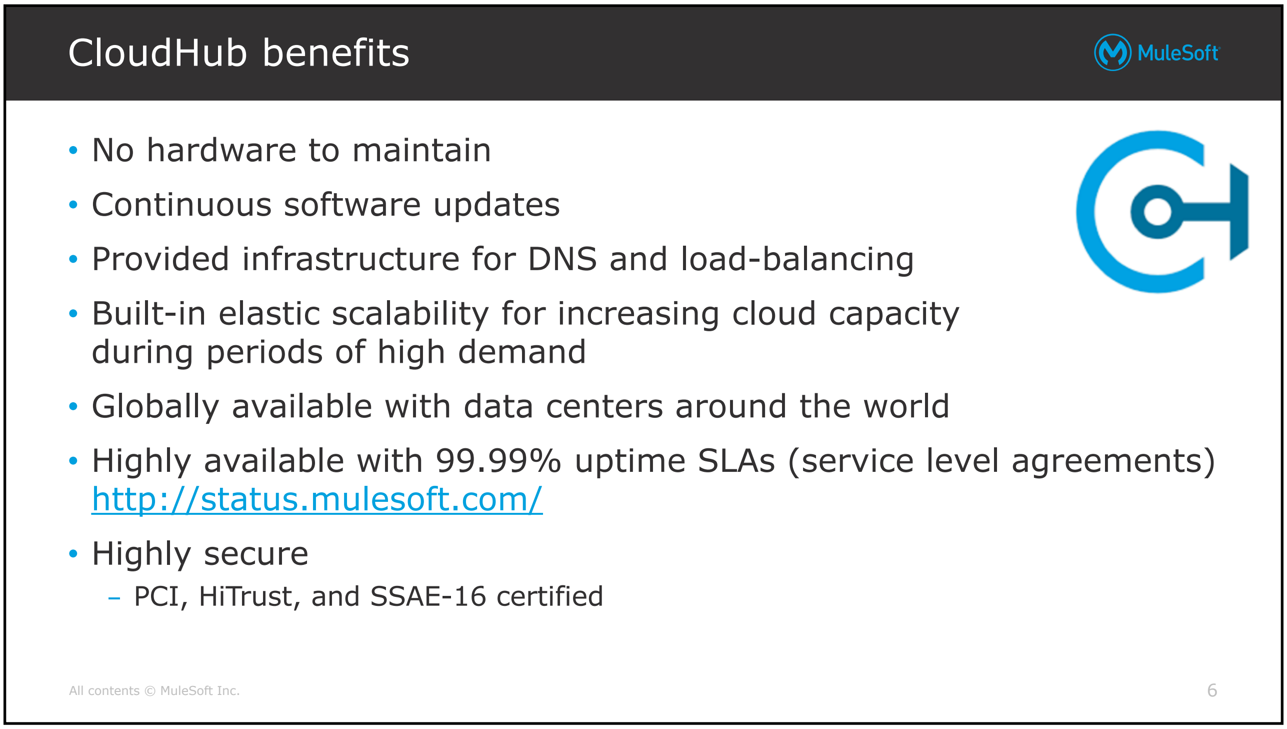
- During development, applications are deployed to an embedded Mule runtime in Anypoint Studio
- For everything else (testing, Q&A, and production), applications can be deployed to
  - **CloudHub**
    - Platform as a Service (PaaS) component of Anypoint Platform
    - MuleSoft-hosted Mule runtimes on AWS (Amazon Web Services platform)
    - A fully-managed, multi-tenanted, globally available, secure and highly available cloud platform for integrations and APIs
  - **Customer-hosted Mule runtimes**
    - On bare metal or cloud service providers: AWS, Azure, and Pivotal Cloud Foundry

MuleSoft-hosted runtime

Customer-hosted runtime



CloudHub benefits

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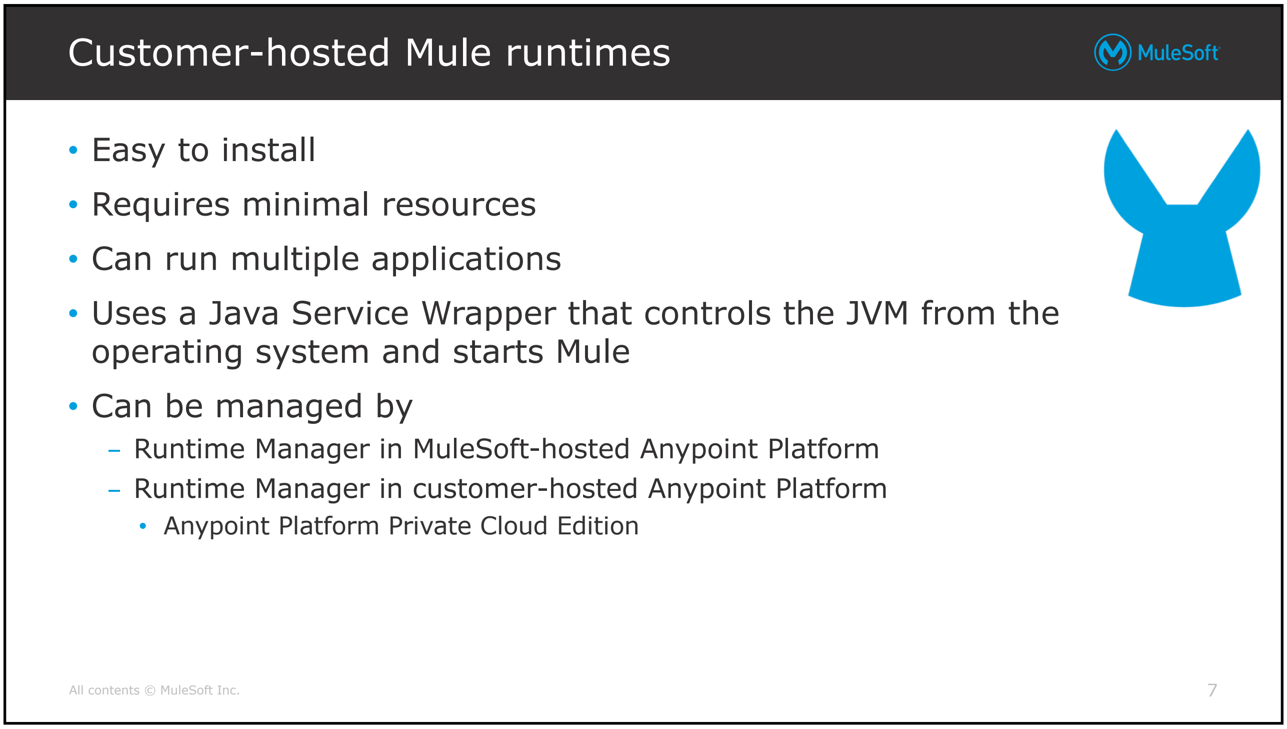
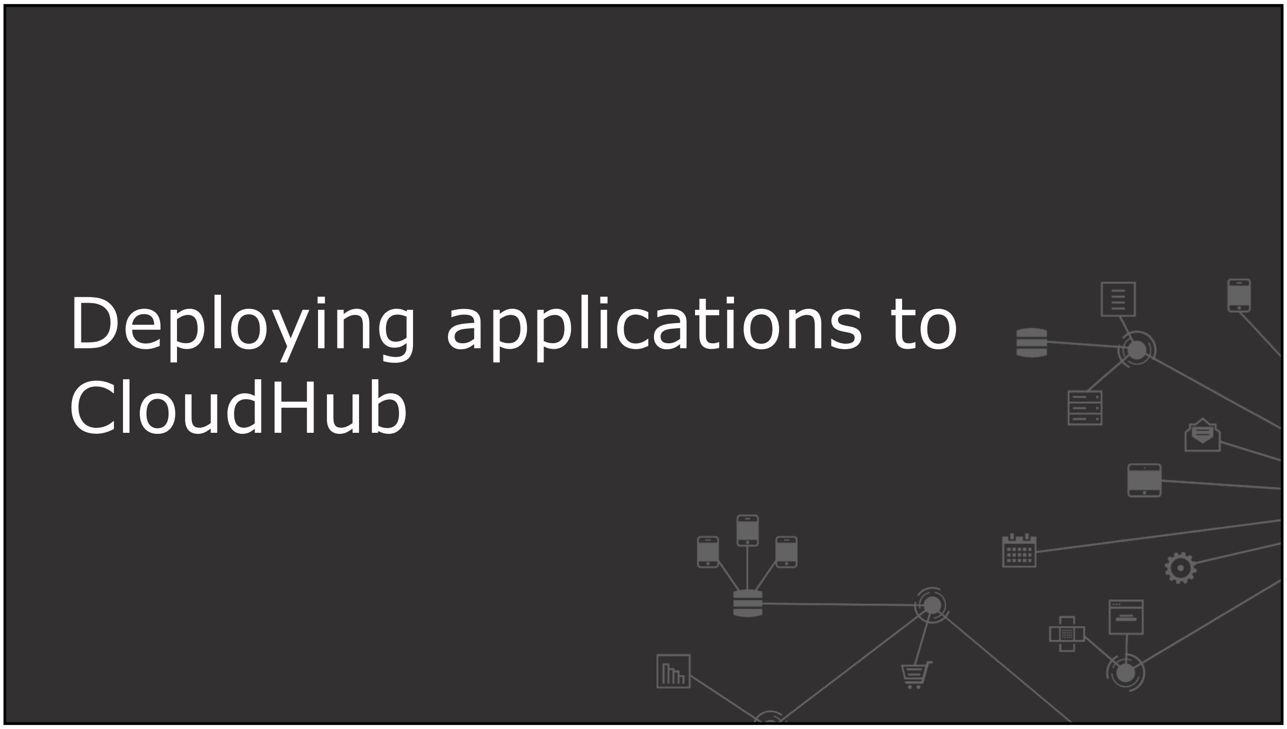
- No hardware to maintain
- Continuous software updates
- Provided infrastructure for DNS and load-balancing
- Built-in elastic scalability for increasing cloud capacity during periods of high demand
- Globally available with data centers around the world
- Highly available with 99.99% uptime SLAs (service level agreements) http://status.mulesoft.com/
- Highly secure
  - PCI, HiTrust, and SSAE-16 certified



Customer-hosted Mule runtimes

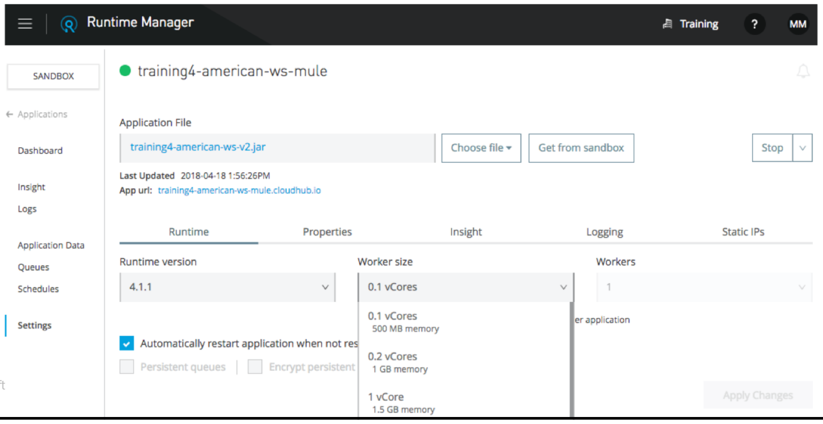
- Easy to install
- Requires minimal resources
- Can run multiple applications
- Uses a Java Service Wrapper that controls the JVM from the operating system and starts Mule
- Can be managed by
  - Runtime Manager in MuleSoft-hosted Anypoint Platform
  - Runtime Manager in customer-hosted Anypoint Platform
    - Anypoint Platform Private Cloud Edition



Deploying applications to CloudHub

Deploying applications to CloudHub

- Can deploy from Anypoint Studio or from Anypoint Platform using Runtime Manager
- You must set worker size and number
  - For apps deployed from flow designer, these values were set automatically



training4-american-ws-mule

Application File: training4-american-ws-v2.jar

Last Updated 2018-04-18 1:56:26PM
App url: training4-american-ws-mule.cloudhub.io

Runtime version: 4.1.1

Worker size: 0.1 vCores

0.1 vCores
500 MB memory

0.2 vCores
1 GB memory

1 vCore
1.5 GB memory

Workers: 1

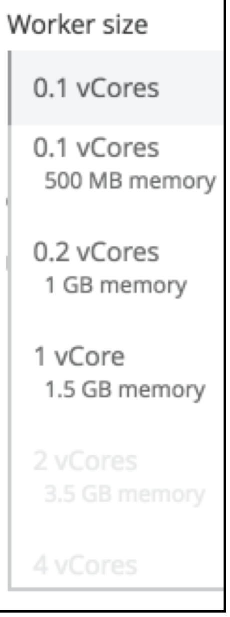
er application

☑ Automatically restart application when not res

□ Persistent queues | □ Encrypt persistent

Review: CloudHub workers

- A worker is a dedicated instance of Mule that runs an app
- Each worker
  - Runs in a separate container from every other application
  - Is deployed and monitored independently
  - Runs in a specific worker cloud in a region of the world
- Workers can have a different memory capacity and processing power
  - Applications can be scaled vertically by changing the worker size
  - Applications can be scaled horizontally by adding multiple workers



Worker size

0.1 vCores

0.1 vCores
500 MB memory

0.2 vCores
1 GB memory

1 vCore
1.5 GB memory

2 vCores
3.5 GB memory

4 vCores

Walkthrough 5-1: Deploy an application to CloudHub

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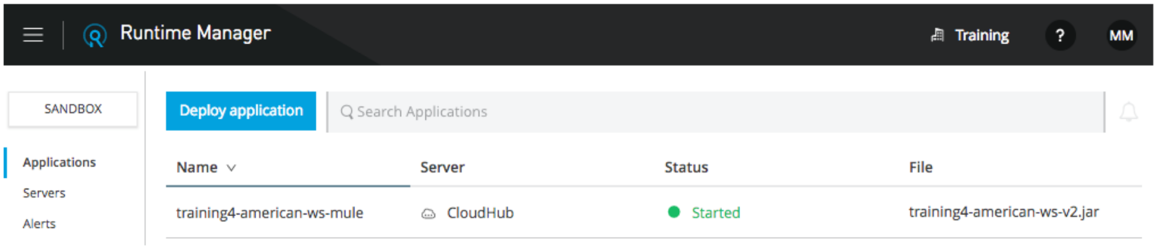
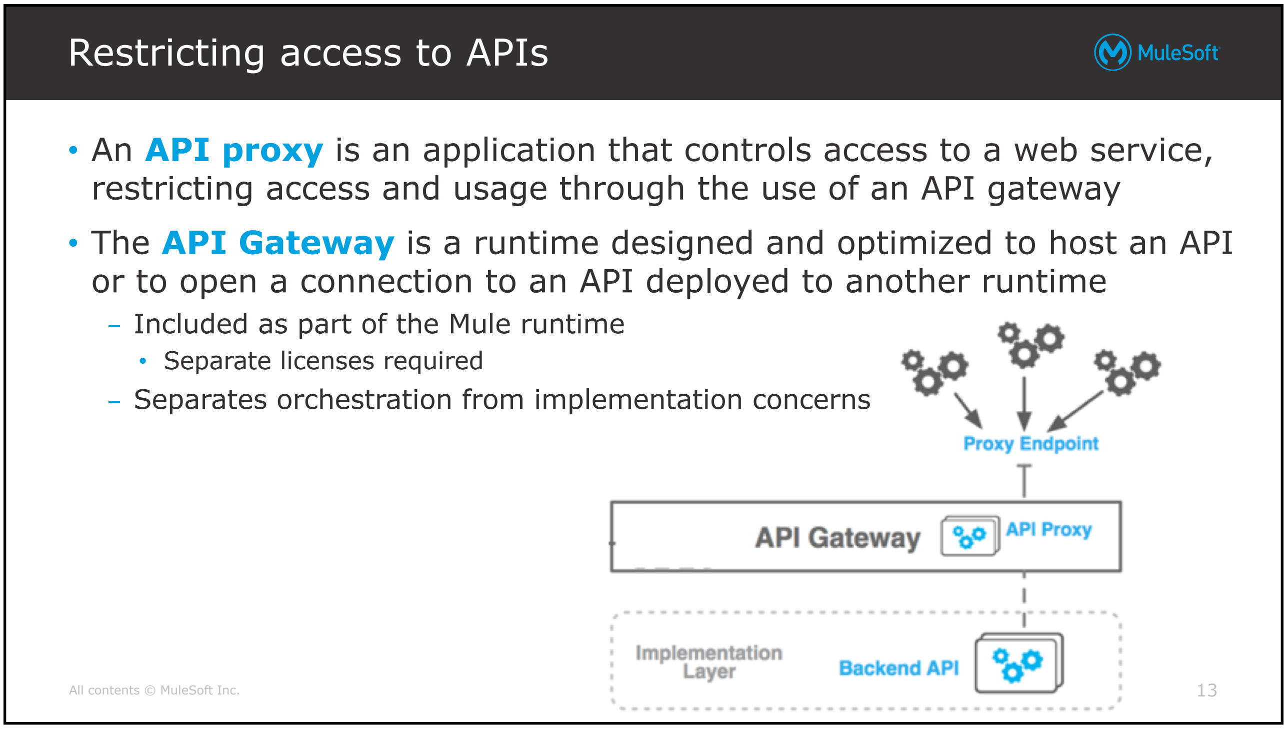
- Deploy an application from Anypoint Studio to CloudHub
- Run the application on its new, hosted domain
- Make calls to the web service
- Update an API implementation deployed to CloudHub



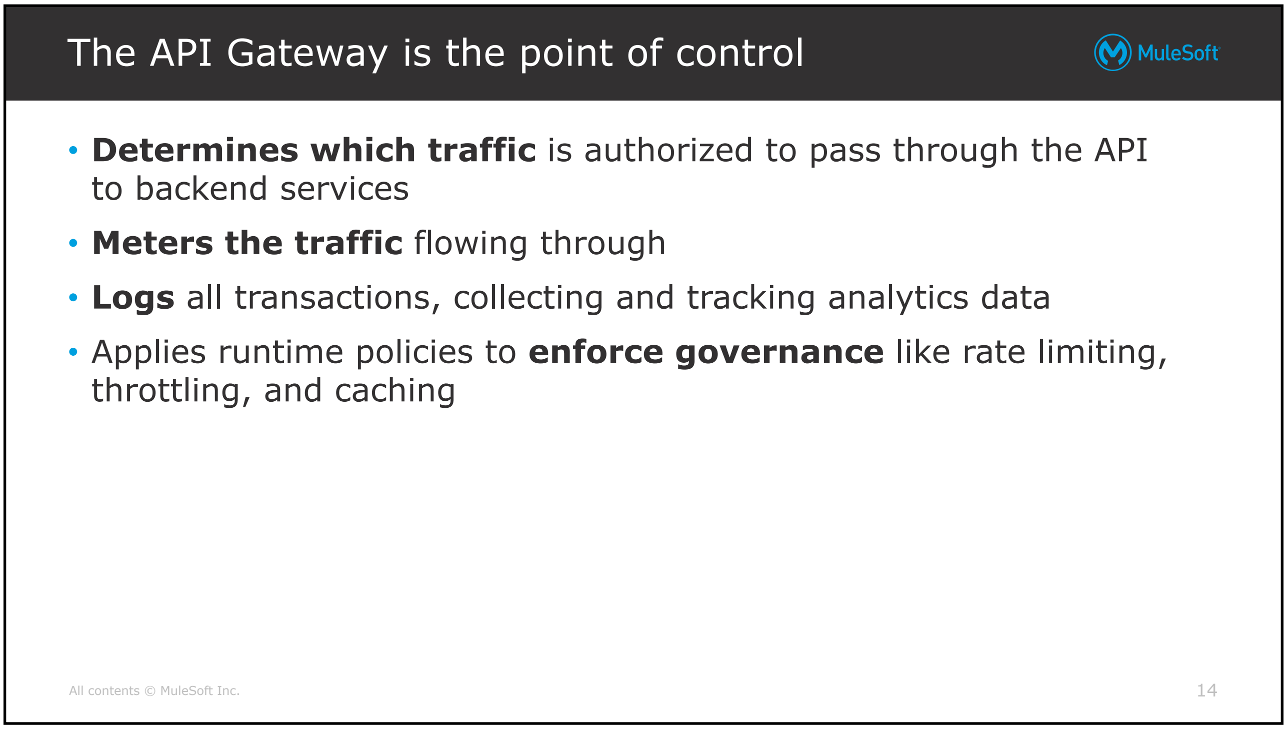
Name	Server	Status	File
training4-american-ws-mule	CloudHub	● Started	training4-american-ws-v2.jar

Creating API proxies



Restricting access to APIs

- An **API proxy** is an application that controls access to a web service, restricting access and usage through the use of an API gateway
- The **API Gateway** is a runtime designed and optimized to host an API or to open a connection to an API deployed to another runtime
  - Included as part of the Mule runtime
    - Separate licenses required
  - Separates orchestration from implementation concerns



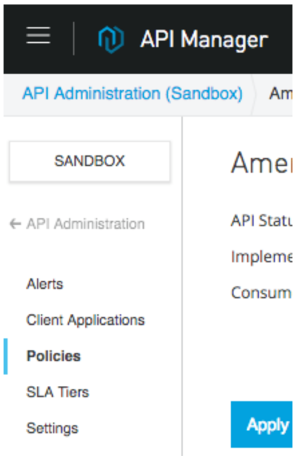
The API Gateway is the point of control

- **Determines which traffic** is authorized to pass through the API to backend services
- **Meters the traffic** flowing through
- **Logs** all transactions, collecting and tracking analytics data
- Applies runtime policies to **enforce governance** like rate limiting, throttling, and caching

Using API Manager to manage access to APIs

MuleSoft

- **Create** proxy applications
- **Deploy** proxies to an API Gateway runtime
  - On CloudHub or a customer-hosted runtime
- Specify throttling, security, and other **policies**
- Specify **tiers** with different types of access
- Approve, reject, or revoke **access** to APIs by clients
- **Promote** managed APIs between environments
- Review **analytics**



Walkthrough 5-2: Create and deploy an API proxy

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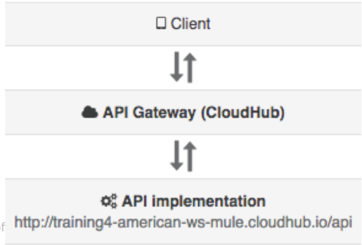
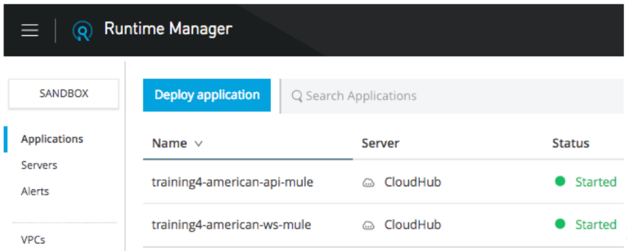
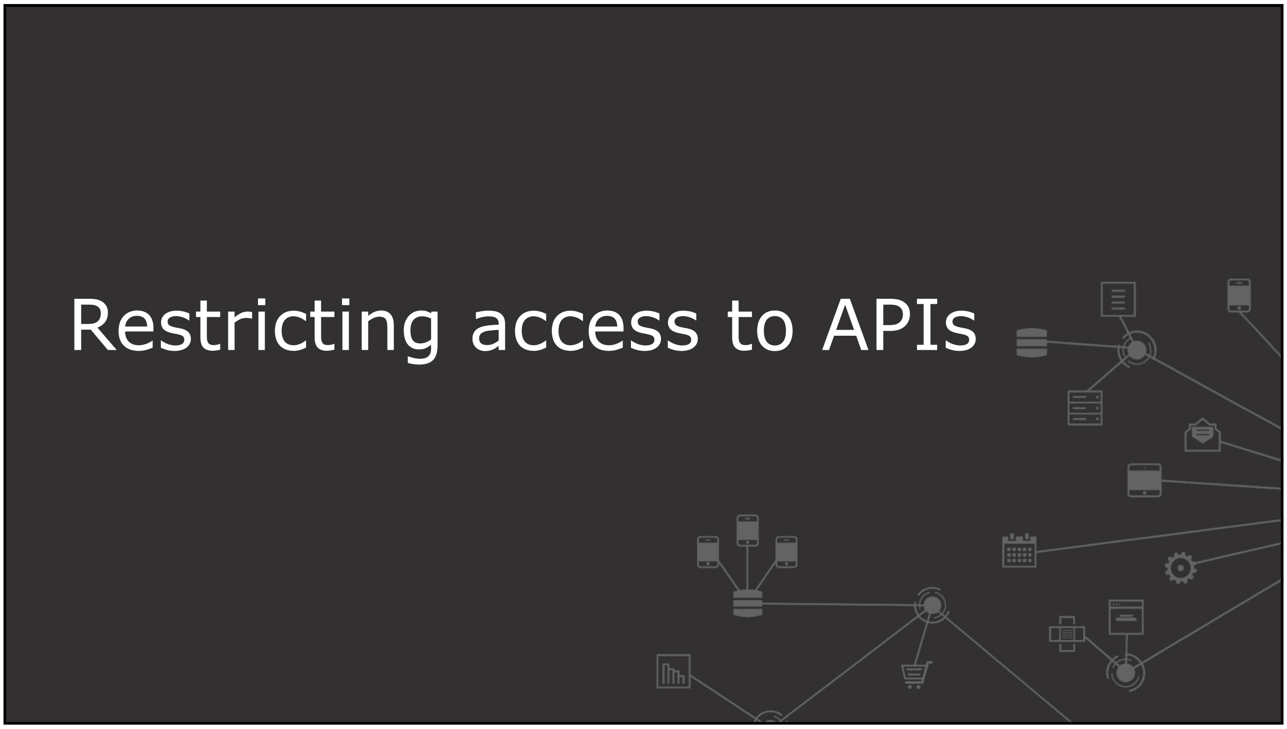
- Add an API to API Manager
- Use API Manager to create and deploy an API proxy application
- Set a proxy consumer endpoint so requests can be made to it from Exchange
- Make calls to an API proxy from API portals for internal & external users
- View API request data in API Manager.

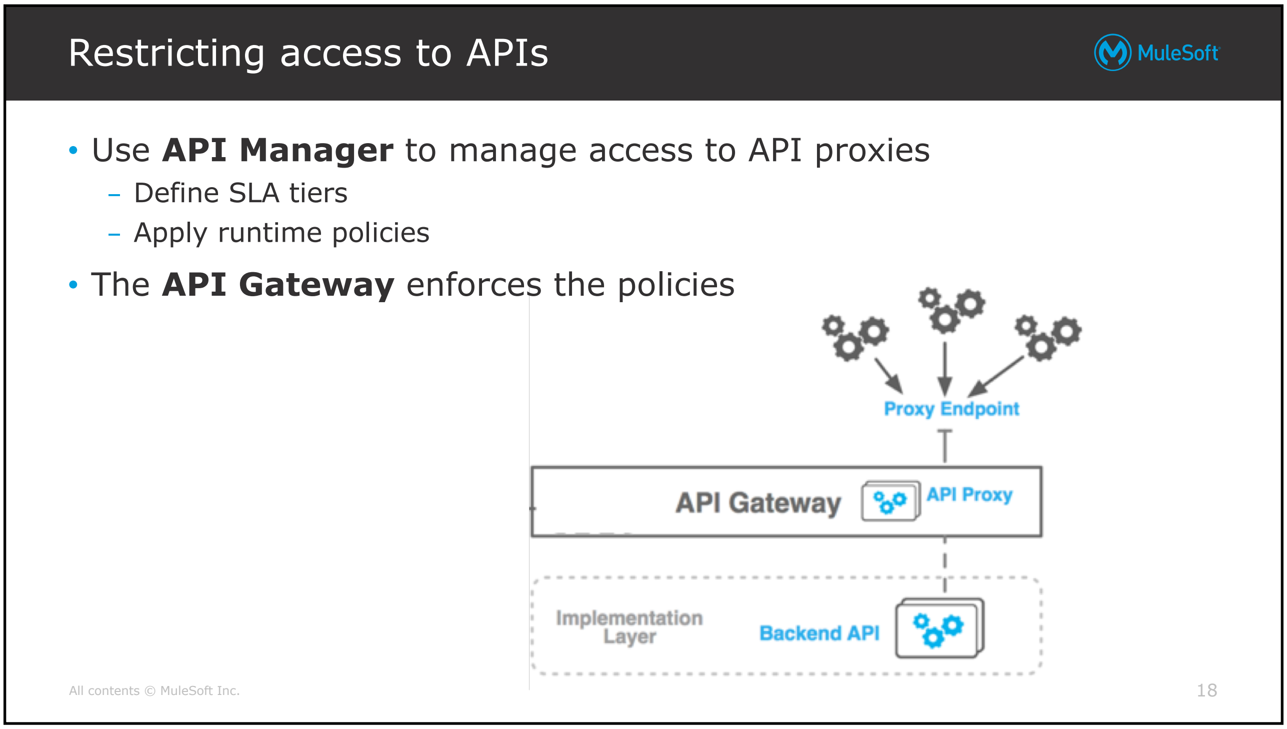




Name	Server	Status
training4-american-api-mule	CloudHub	Started
training4-american-ws-mule	CloudHub	Started



Restricting access to APIs



Restricting access to APIs

MuleSoft

- Use **API Manager** to manage access to API proxies
  - Define SLA tiers
  - Apply runtime policies
- The **API Gateway** enforces the policies

Proxy Endpoint

API Gateway

API Proxy

Implementation Layer

Backend API

Applying policies to restrict access

MuleSoft

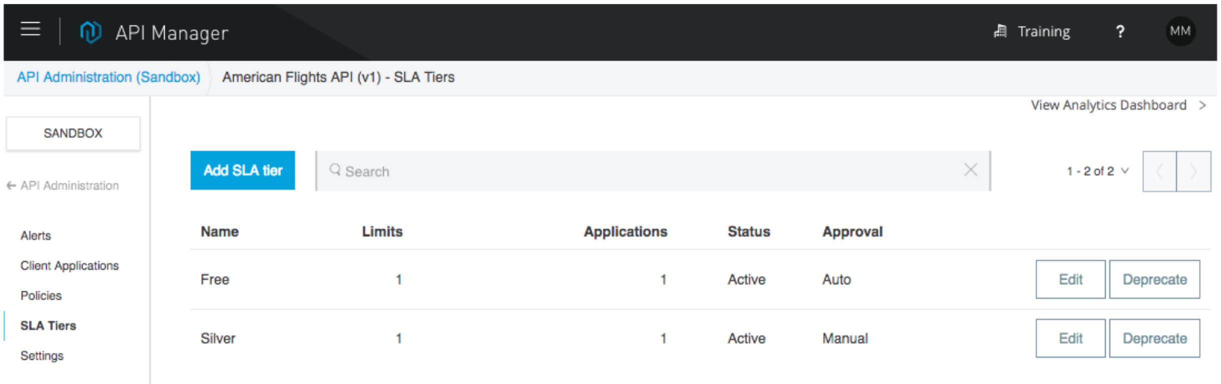
- There are **out-of-the box** policies for many common use cases
  - Rate limiting
  - Spike control
  - Security
- You can define **custom** policies (using XML and YAML)
- You can apply **multiple** policies and set the order

- Client ID enforcement
- Cross-Origin resource sharing
- OAuth 2.0 access token enforcement
- Header Injection
- Header Removal
- Basic authentication - Simple
- IP blacklist
- IP whitelist
- JSON threat protection
- Basic Authentication - LDAP
- Message Logging
- Rate limiting
- Rate limiting - SLA based
- Spike Control
- XML threat protection

Using SLA tiers to restrict access by client ID

MuleSoft

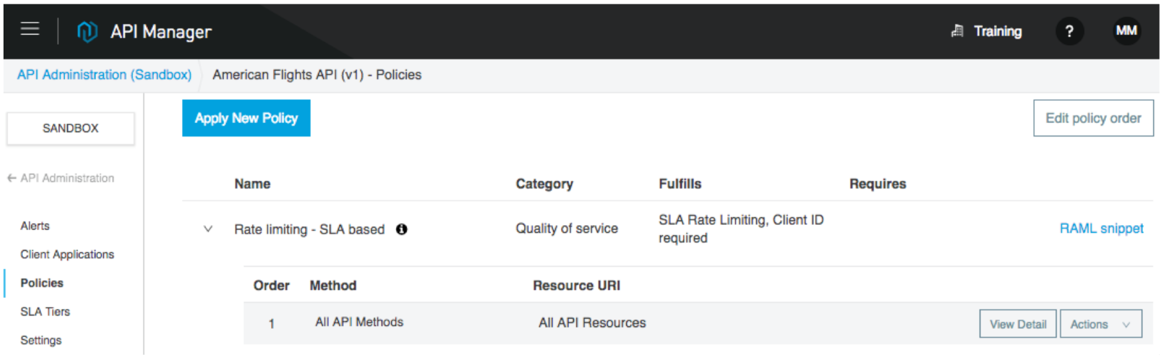
- A **S**ervice **L**evel **A**greement tier defines the # of requests that can be made per time frame to an API
  - Request approval can be set to automatic (free) or manual (for tiers that cost $)



Name	Limits	Applications	Status	Approval		
Free	1	1	Active	Auto	Edit	Deprecate
Silver	1	1	Active	Manual	Edit	Deprecate

Walkthrough 5-3: Restrict API access with policies and SLAs

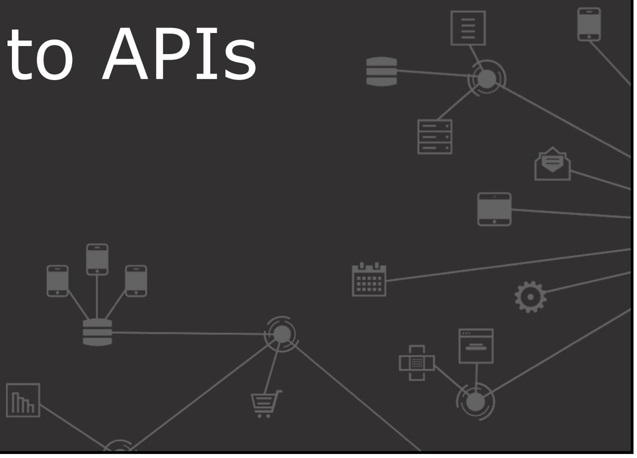
- Add and test a rate limiting policy
- Add SLA tiers, one with manual approval required
- Add and test a rate limiting SLA based policy



Name	Category	Fulfills	Requires
Rate limiting - SLA based	Quality of service	SLA Rate Limiting, Client ID required	

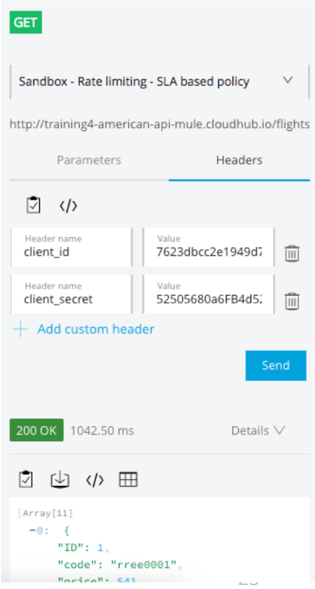
Order	Method	Resource URI
1	All API Methods	All API Resources

Granting access to APIs



Enforcing access to APIs using SLA tiers

- To enforce, apply an **SLA based** rate limiting policy
- SLA based policies require all applications that consume the API to
  - **Register** for access to a specific tier
    - From an API portal in private or public Exchange
  - **Pass their client credentials** in calls made to the API



Sandbox - Rate limiting - SLA based policy

http://training4-american-api-mule.cloudhub.io/flights

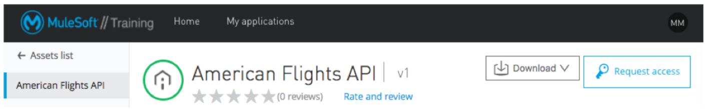
Header name	Value
client_id	7623dbcc2e1949d7
client_secret	52505680a6FB4d52

200 OK 1042.50 ms

```
[Array[11]
  -0:  {
      "ID": 1,
      "code": "rree0001",
      "price": 541
```

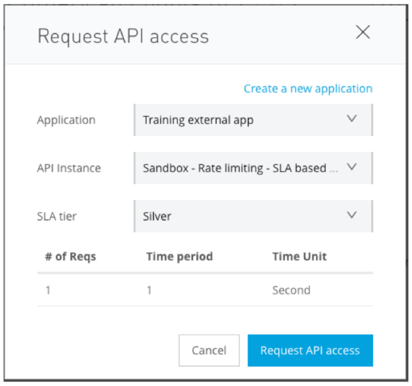
Requesting access to SLA tiers

- If an API has an SLA-based policy, a Request API access button appears in API portal



- To request access, developer must belong to the Anypoint Platform organization and be logged in

- When developers request access, they must
  - Register/add an app to their Anypoint Platform account
  - Select a tier



Application: Training external app

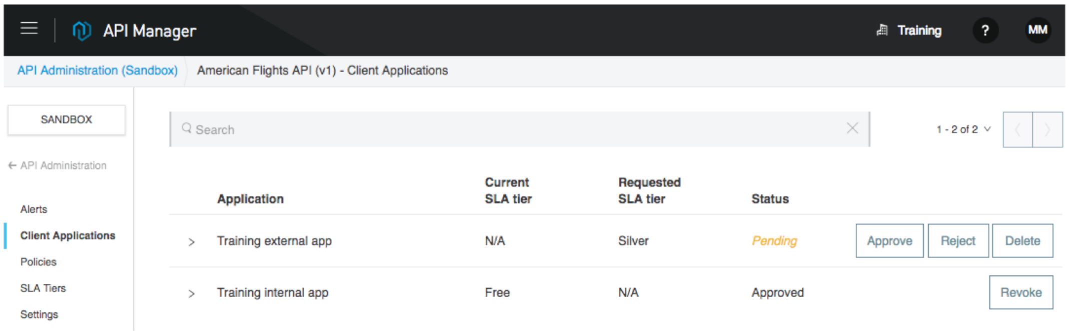
API Instance: Sandbox - Rate limiting - SLA based ...

SLA tier: Silver

# of Reqs	Time period	Time Unit
1	1	Second

Approving SLA tier access requests

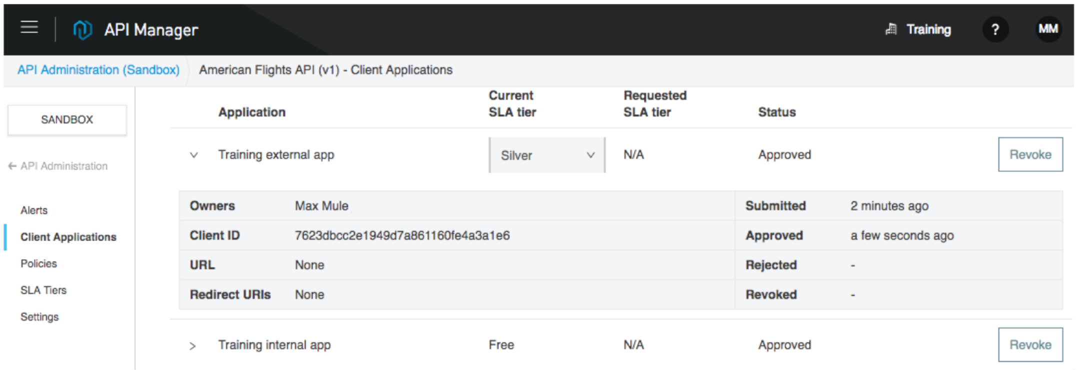
- For tiers with manual approval, emails are sent to the Organization Administrators when developers request access for applications
- Organization Administrators can review the applications in API Manager and approve, reject, or revoke requests



Application	Current SLA tier	Requested SLA tier	Status	
> Training external app	N/A	Silver	*Pending*	Approve Reject Delete
> Training internal app	Free	N/A	Approved	Revoke

Walkthrough 5-4: Request and grant access to a managed API

- Request application access to SLA tiers from private and public API portals
- Approve application requests to SLA tiers in API Manager



Application	Current SLA tier	Requested SLA tier	Status	
∨ Training external app	Silver	N/A	Approved	Revoke
> Training internal app	Free	N/A	Approved	Revoke

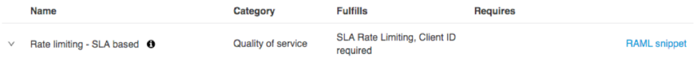
Owners	Max Mule	**Submitted**	2 minutes ago
Client ID	7623dbcc2e1949d7a861160fe4a3a1e6	**Approved**	a few seconds ago
URL	None	**Rejected**	-
Redirect URIs	None	**Revoked**	-

Adding client ID enforcement to API specifications

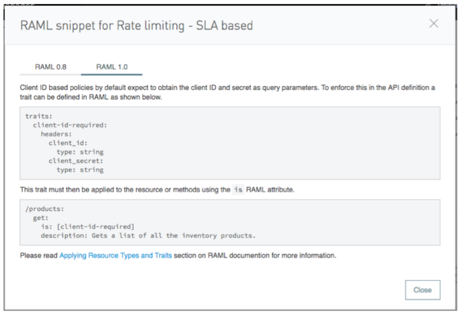
Adding client ID enforcement to API specifications

- You need to add client ID enforcement to the API spec for the
  - REST connector that is created for the API to enforce the authentication
  - Required headers to automatically show up in the API console so you don't have to manually add them for every call

- Instructions are in the RAML snippet for a policy in API Manager



	Name	Category	Fulfills	Requires	
∨	Rate limiting - SLA based ℹ	Quality of service	SLA Rate Limiting, Client ID required		RAML snippet



RAML snippet for Rate limiting - SLA based

Client ID based policies by default expect to obtain the client ID and secret as query parameters. To enforce this in the API definition a trait can be defined in RAML as shown below.

```
traits:
  client-id-required:
    headers:
      client_id:
        type: string
      client_secret:
        type: string
```

This trait must then be applied to the resource or methods using the `is` RAML attribute.

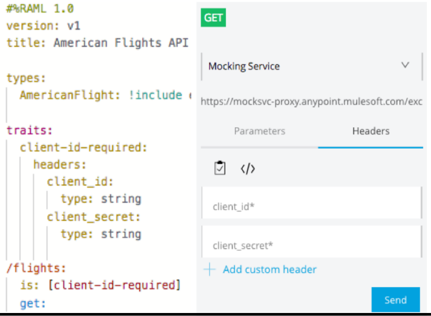
```
/products:
  get:
    is: [client-id-required]
    description: Gets a list of all the inventory products.
```

Please read Applying Resource Types and Traits section on RAML documention for more information.

Walkthrough 5-5: (Optional) Add client ID enforcement to an API specification

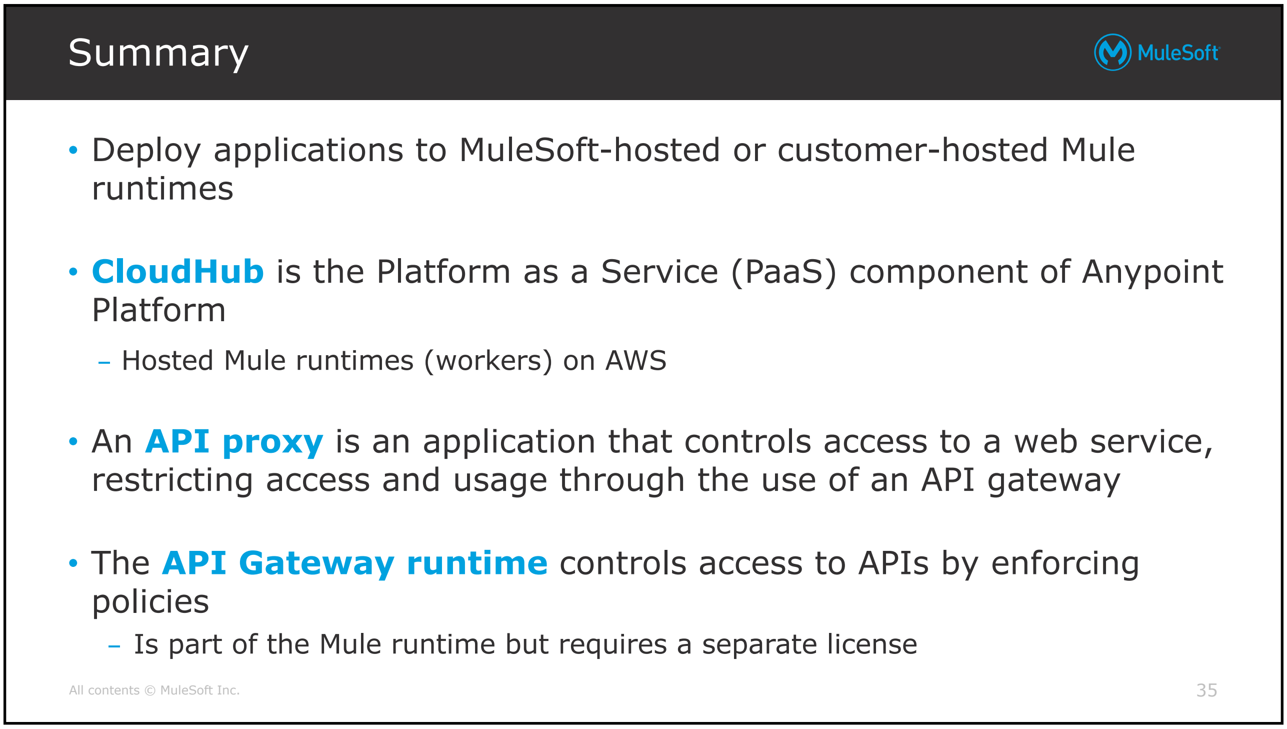
- Modify an API specification to require client id and client secret headers with requests
- Update a managed API to use a new version of an API specification
- Call a governed API with client credentials from API portals

Note: If you do not complete this exercise for Fundamentals, the REST connector that is created for the API and that you use later in the course will not have client_id authentication



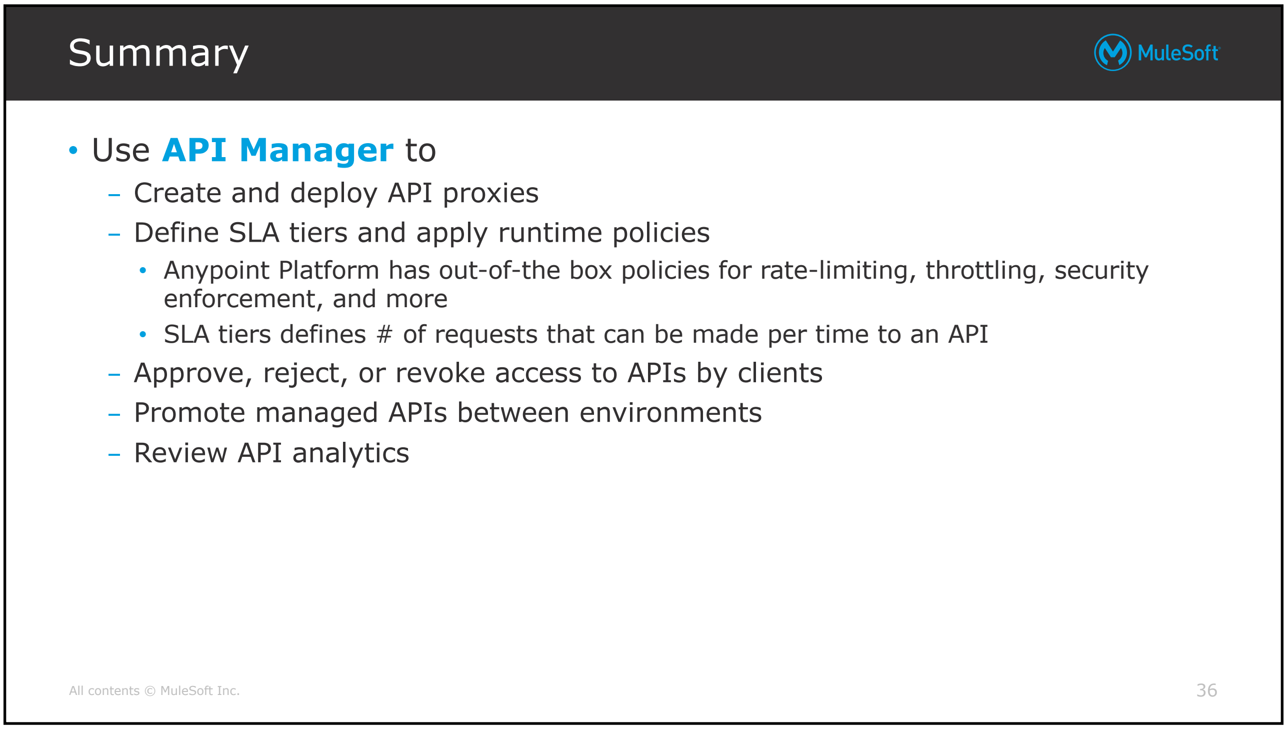
```
#%RAML 1.0
version: v1
title: American Flights API

types:
  AmericanFlight: !include 

traits:
  client-id-required:
    headers:
      client_id:
        type: string
      client_secret:
        type: string

/flights:
  is: [client-id-required]
  get:
```

Summary



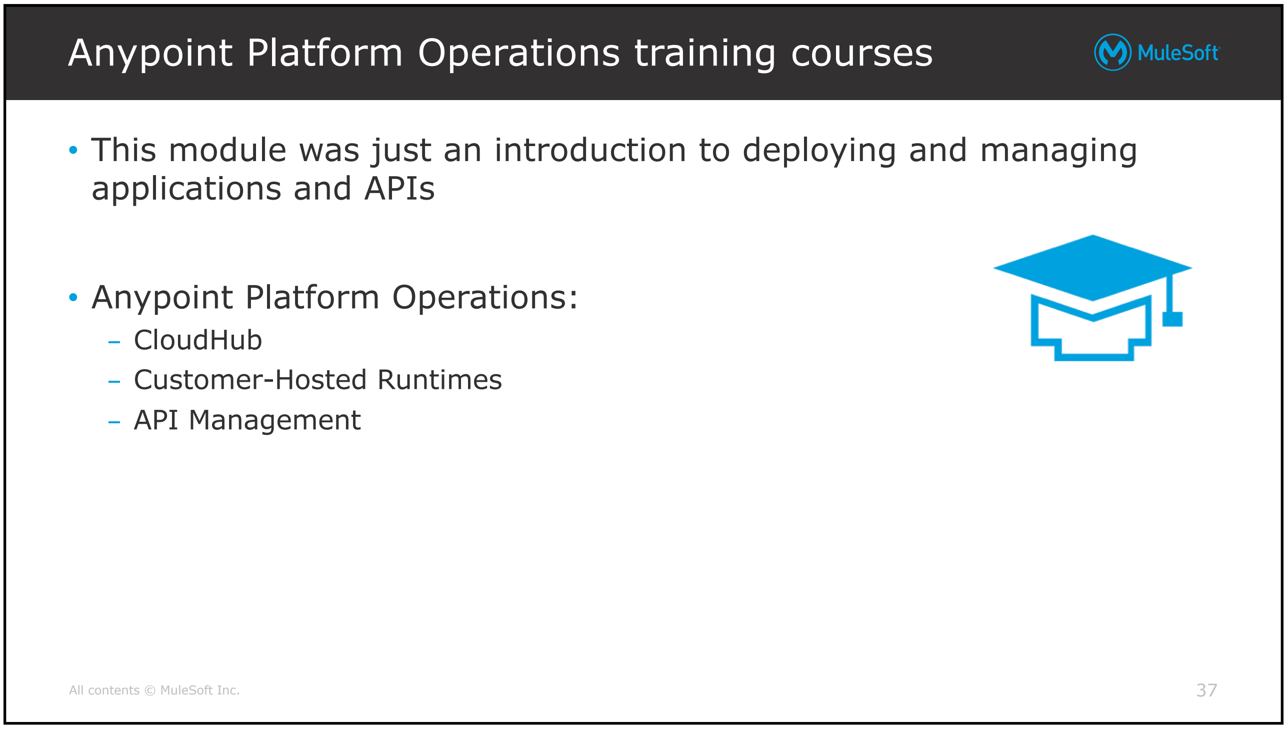
Summary

- Deploy applications to MuleSoft-hosted or customer-hosted Mule runtimes
- **CloudHub** is the Platform as a Service (PaaS) component of Anypoint Platform
  - Hosted Mule runtimes (workers) on AWS
- An **API proxy** is an application that controls access to a web service, restricting access and usage through the use of an API gateway
- The **API Gateway runtime** controls access to APIs by enforcing policies
  - Is part of the Mule runtime but requires a separate license



Summary

- Use **API Manager** to
  - Create and deploy API proxies
  - Define SLA tiers and apply runtime policies
    - Anypoint Platform has out-of-the box policies for rate-limiting, throttling, security enforcement, and more
    - SLA tiers defines # of requests that can be made per time to an API
  - Approve, reject, or revoke access to APIs by clients
  - Promote managed APIs between environments
  - Review API analytics



Anypoint Platform Operations training courses

MuleSoft

- This module was just an introduction to deploying and managing applications and APIs
- Anypoint Platform Operations:
  - CloudHub
  - Customer-Hosted Runtimes
  - API Management