



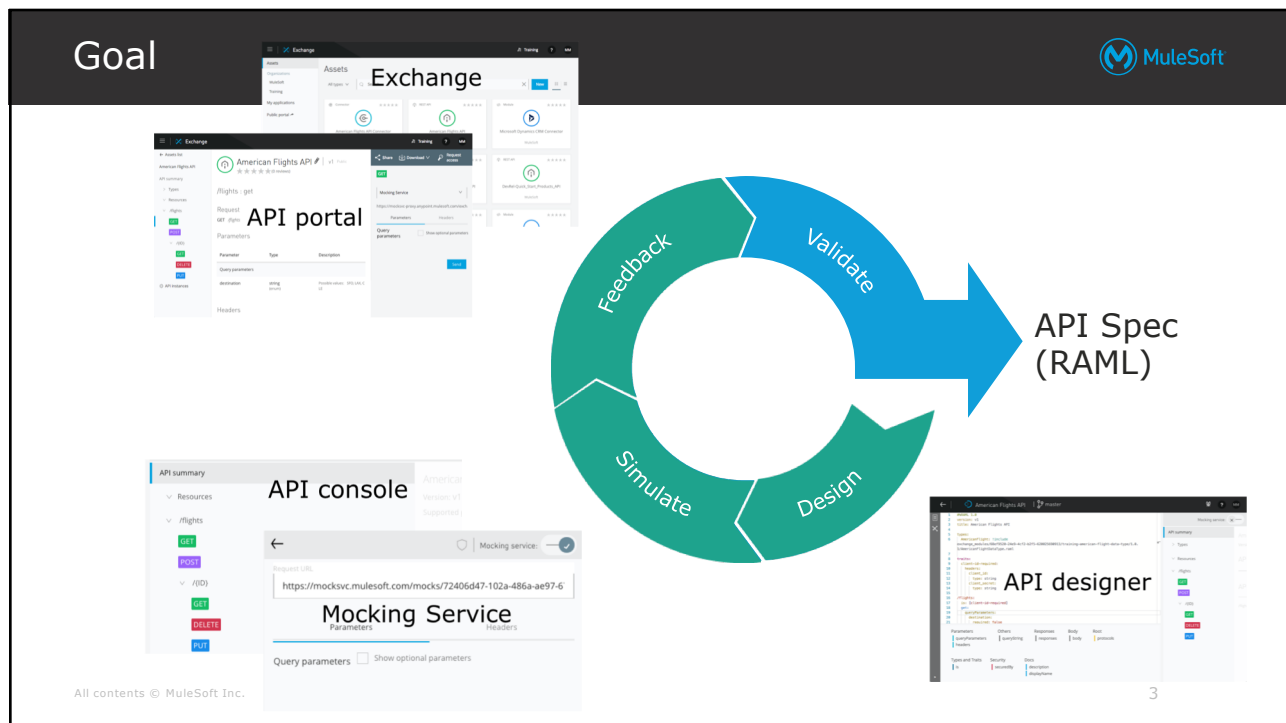
Module 3: Designing APIs



Spec driven development



- We discussed in the last modules about the benefits of designing an API first before actually building it
- This is often referred to as **spec driven development**
 - A development process where your application is built in two distinct phases
 - The creation of a spec (the design phase)
 - Development of code to match the spec (the development phase)
- In this module, we'll
 - Create this API specification using a standardized API description language (RAML)
 - Then learn to test it with users without writing any code



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



- Define APIs with RAML, the Restful API Modeling Language
- Mock APIs to test their design before they are built
- Make APIs discoverable by adding them to the private Anypoint Exchange
- Create public API portals for external developers

Reviewing the options for defining APIs



Approaches to API design



Hand coding



API Blueprint



OpenAPI Spec



RAML



Introducing RAML



RAML: RESTful API Modeling Language



- **A simple, structured, and succinct way of describing RESTful APIs**
- A non-proprietary, vendor-neutral open spec
- Developed to help out the current API ecosystem
 - Encourages reuse, enables discovery and pattern-sharing, and aims for merit-based emergence of best practices
- RAML files can be used to auto-generate documentation, mocked endpoints, interfaces for API implementations, and more!

RAML
<http://raml.org>

RAML syntax



- RAML is based on broadly-used standards such as YAML and JSON
- Uses a human-readable data serialization format where **data structure hierarchy is specified by indentation**
 - Not additional markup characters

```

1  #%RAML 1.0
2  version: v1
3  title: American Flights API
4
5  /flights:
6    get:
7    post:
8
9    /{ID}:
10     get:
11     delete:
12     put:
13
14     responses:
15       200:
16         body:
17           application/json:

```

Notice the indentation used to specify to what each line applies

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Defining resources and methods



- Resources are the objects identified by the web service URL that you want to act upon using the HTTP method used for the request
- All resources begin with a slash
- Any methods and parameters nested under a resource belong to and act upon that resource
- Nested resources are used for a subset of a resource to narrow it
 - URI parameter are enclosed in {}

```

1  #%RAML 1.0
2  version: v1
3  title: American Flights API
4
5  /flights:
6    get:
7    post:
8
9    /{ID}:
10     get:
11     delete:
12     put:
13
14     responses:
15       200:
16         body:
17           application/json:

```

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Using API Designer to define APIs with RAML

API Designer

MuleSoft

Design Center

American Flights API/master

Files

- examples
- exchange_modules
- american-flights-api.raml

File browser

```
1 #RAML 1.0
2 version: v1
3 title: American Flights API
4
5 types:
6   AmericanFlight: !include
7     exchange_modules/68ef9528-24e9-4cf2-b2f5-620025690913/training-american-flight-data-type/1.0.1/AmericanFlightDataType.raml
8
9 traits:
10   client-id-required:
11     headers:
12       client_id:
13         type: string
14       client_secret:
15         type: string
16     responses:
17       401:
18         description: Unauthorized, The client_id or client_secret are not valid or the client does not have access.
```

Editor

Parameters

- enum
- default

Docs

- displayName
- description

Others

- type
- xml
- examples
- facets
- properties
- items

Schemas

- schema

Shelf

American Flights API

Version: v1

Base URI not defined in the API file.

API endpoints

- /flights
- /flights/{ID}

GET POST

GET DELETE PUT

API console

Documentation

Errors & Warnings

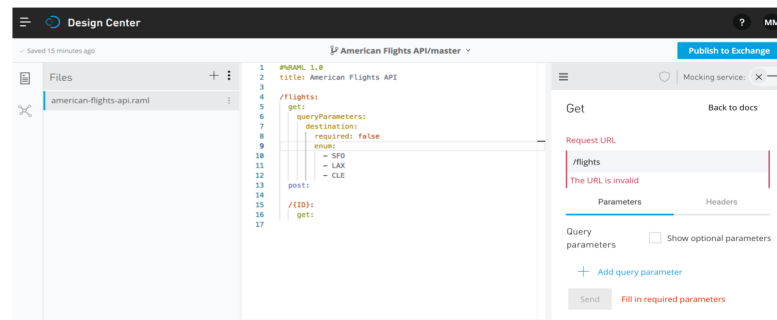
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Walkthrough 3-1: Use API Designer to define an API with RAML



- Define resources and nested resources
- Define get and post methods
- Specify query parameters
- Interact with an API using the API console



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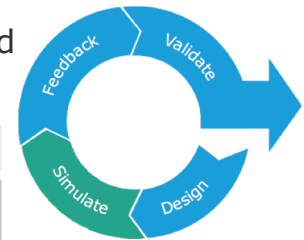
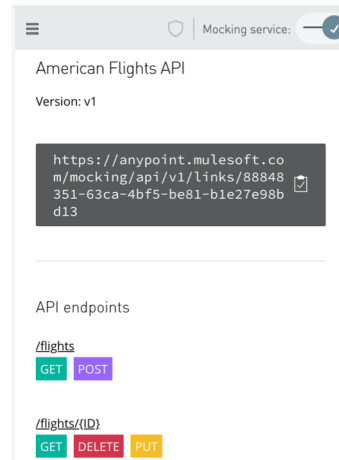
Testing API design without writing code



Simulating an API



- You can mock an API to test it before it is implemented
 - Useful to get early feedback from developers
- Use the **API console** and the **mocking service** to run a live simulation
 - Returns sample API responses defined in the API definition
- The API console is available in
 - API Designer** – so the API designer can test it
 - API portals in Exchange** – so users/developers can test it



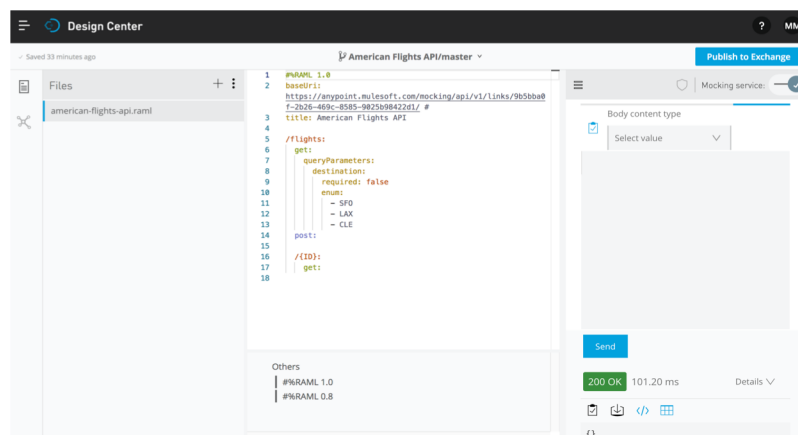
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Walkthrough 3-2: Use the mocking service to test an API



- Turn on the mocking service
- Use the API console to make calls to a mocked API



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Using RAML to define specifications for requests and responses



Defining method **response** details with RAML



- Responses must be a map of one or more HTTP status codes
- For each response, specify possible return data types along with descriptions and examples

```

/{ID}:
  get:
    responses:
      200:
        body:
          application/json:
            type: AmericanFlight
            examples:
              output:
                ID: 1
                code: ER38sd
                price: 400
                departureDate: 2017/07/26
                origin: CLE
                destination: SFO
                emptySeats: 0
                plane:
                  type: Boeing 737
                  totalSeats: 150

```

Defining method **request** details with RAML



- For a request, similarly specify the possible request data types along with data types, descriptions, and examples

```

/flights:
  get: ...
  post:
    body:
      application/json:
        type: AmericanFlight
        examples:
          input:
            code: ER38sd
            price: 400
            departureDate: 2017/07/26
            origin: CLE
            destination: SFO
            emptySeats: 0
            plane:
              type: Boeing 737
            totalSeats: 150

```

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Specifying examples



- There are two optional facets you can use to specify example data: **example** and **examples**

- Use **example** to represent a single instance of the data

```

type: User
example:
  name: Bob
  lastname: Marley

```

- Use **examples** to represent multiple instances of the data as a map of key-value pairs

```

type: User
examples:
  person1:
    name: Paul
    lastname: McCartney
  person2:
    name: Lady
    lastname: Gaga

```

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Modularizing APIs



- Instead of including all code in one RAML file, you can modularize it and compose it of reusable fragments
 - **Data types**, **examples**, traits, resource types, overlays, extensions, security schemes, documentation, annotations, and libraries
- Fragments can be stored
 - In different files and folders within a project
 - In a separate API fragment project in Design Center
 - In a separate RAML fragment in Exchange

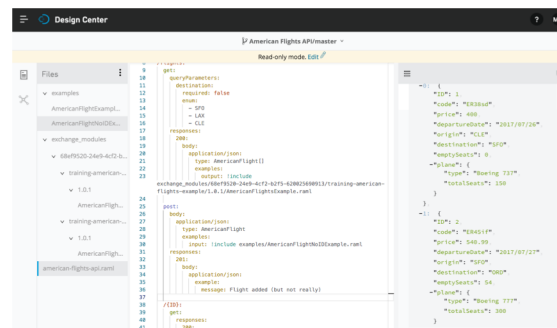
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Walkthrough 3-3: Add request and response details



- Use API fragments from Exchange
- Add a data type and use it to define method requests and responses
- Add example JSON requests and responses
- Test an API and get example responses



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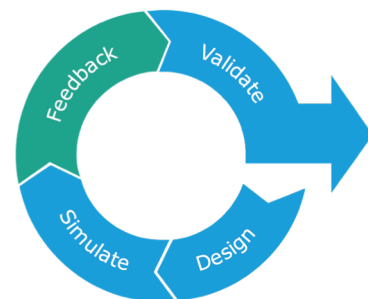
Engaging with users



Engaging users during the API design phase



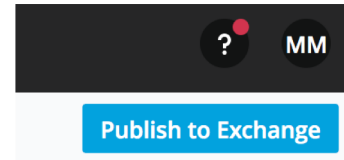
- To build a successful API, you should define it iteratively
 - Get feedback from developers on usability and functionality along the way
- To do this, you need to provide ways for developers to discover and play with the API
- Anypoint Platform makes this easy with **API portals in Exchange**
 - In **private Exchange** for internal developers
 - In a **public portal** for external developers



Publishing RAML APIs to Anypoint Exchange



- You publish RAML API Specifications and RAML fragments to the Exchange **from API Designer**
 - Not from Exchange itself



- API portals** are automatically created for REST APIs added to Exchange
 - An **API console** for consuming and testing APIs
 - An **automatically generated API endpoint** that uses a **mocking service** to allow the API to be tested without having to implement it
- API portals can be shared with both internal and external users

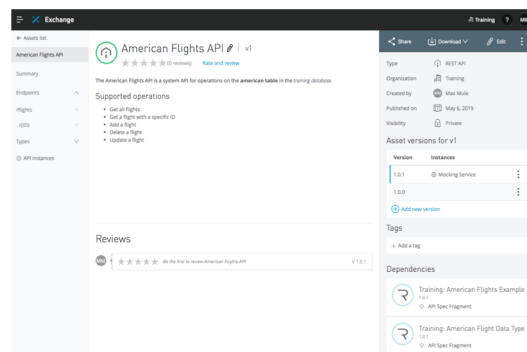
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Walkthrough 3-4: Add an API to Anypoint Exchange



- Publish an API to Exchange from API Designer
- Review an auto-generated API portal in Exchange and test the API
- Add information about an API to its API portal
- Create and publish a new API version to Exchange



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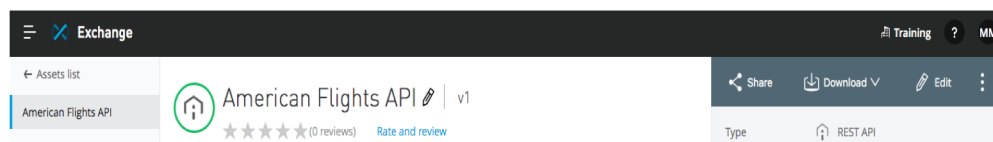
Sharing APIs



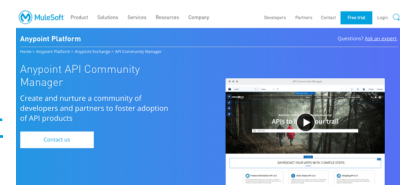
Sharing APIs



- You can share an API in Exchange with other internal or external users



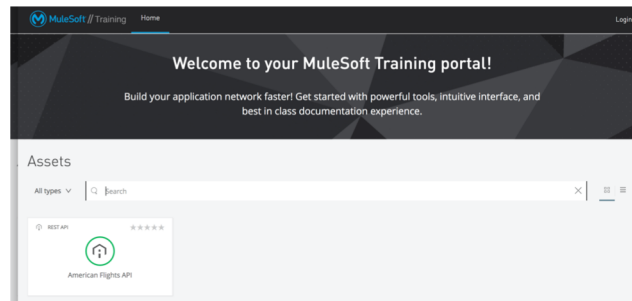
- Share an API within an org through the **private Exchange**
- Share an API with external users in a **public portal** that you create from Exchange
- Anypoint API Community Manager
 - www.mulesoft.com/platform/api/community-manager
 - Community of developers and partners



Walkthrough 3-5: Share an API



- Share an API within an organization using the private Exchange
- Create a public API portal
- Customize a public portal
- Explore a public portal as an external developer



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Summary



Summary



- **RAML** is a non-proprietary, standards-based API description language spec that is simple, succinct, and intuitive to use
 - Data structure hierarchy is specified by indentation, not markup characters
- Use **API Designer** to write API specifications with RAML
- Documentation is auto-generated from a RAML file and displayed in an **API console**
- A **mocking service** can be used in API console to test an API and return the example data specified in RAML

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Summary



- Make an **API discoverable** by adding it to your **private Exchange**
- **API portals** are automatically created for the APIs with
 - Auto-generated **API documentation**
 - An **API console** that provides a way to consume and test an API
 - An **automatically generated API endpoint** that uses a **mocking service** to allow the API to be tested without having to implement it
- API portals can be shared with both internal and external users
 - Selectively share APIs in your org's **private Exchange** with other internal developers
 - Share APIs with external developers by creating and customizing a **public portal** from Exchange and specifying what APIs you would like to include in it

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RAML resources



- RAML definitions can be a lot more complex and sophisticated than what we built here
- Training: training.mulesoft.com
 - *Anypoint Platform: API Design*
- Website: raml.org
 - Documentation
 - Tutorials
 - Full spec
 - Resources

