Mule ESB Interview Questions and Answers

RAML:

**1. What is RAML and why do we use it?**

**Answer:**  
RAML stands for **RESTful API Modeling Language**. It is a YAML-based language used to describe RESTful APIs in a human-readable format. RAML allows you to define endpoints, HTTP methods, request/response schemas, query parameters, and more. This makes it easier for both API providers and consumers to understand, design, and document the API.

**2. What HTTP methods are supported by RAML?**

**Answer:**  
RAML supports the standard HTTP methods, including:

* **GET:** Retrieve data.
* **POST:** Create new resources.
* **PUT:** Update or replace existing resources.
* **PATCH:** Partially update resources.
* **DELETE:** Remove resources.

**3. What are Resource Types in RAML?**

**Answer:**  
Resource Types are templates that allow you to define a common set of methods, descriptions, and parameters for multiple resources. By using resource types, you can avoid repetitive definitions and ensure consistency across your API.

**4. How do you reuse Resource Types in your RAML file?**

**Answer:**  
Once you define a resource type (for example, “collection”), you can assign it to multiple resources using the type property. This tells RAML to apply the predefined methods and structures to those resources. For instance:

yaml

Copy

/fixed\_pay:

type: collection

properties:

exampleReference1: !include /examples/fixedPay.json

**5. What is the role of Traits in RAML and how do you use them?**

**Answer:**  
Traits in RAML allow you to define reusable patterns or properties (such as common headers or query parameters) for HTTP methods. You can then apply these traits to individual methods using the is keyword. For example:

yaml

Copy

traits:

client-id-required:

headers:

client\_id:

type: string

/foos:

get:

is: [client-id-required]

This makes your API specification more modular and DRY (Don’t Repeat Yourself).

**6. Can you have multiple request paths in a single RAML file?**

**Answer:**  
Yes. In RAML, you can define as many resource paths as needed. Each resource path (e.g., /users, /orders/{id}) can have its own set of methods, parameters, and response definitions.

**7. Is it possible to use the same HTTP method multiple times for a single request path?**

**Answer:**  
No. RAML allows each HTTP method (GET, POST, etc.) to be defined only once per resource. For example, if you have a /users resource, you can define one GET method for that path.

**8. How do you define data types in a RAML file?**

**Answer:**  
Data types in RAML are defined in the types section at the root of the file. They allow you to specify the structure of the objects exchanged in requests and responses. For example:

yaml

Copy

types:

User:

type: object

properties:

id:

type: integer

name:

type: string

email:

type: string

**9. What is the difference between RAML and Swagger?**

**Answer:**  
While both RAML and Swagger (now known as OpenAPI) are used to describe RESTful APIs, there are some key differences:

* **RAML** emphasizes reusability and modular design (using resource types, traits, and includes) and is known for its human-readability.
* **Swagger/OpenAPI** is more widely adopted for generating interactive documentation and client SDKs, and it uses JSON or YAML for its definitions.  
  Each has its strengths, and the choice often depends on your project needs and ecosystem.

**10. How do you import external files in RAML?**

**Answer:**  
RAML allows you to import external files (such as examples or data types) using the !include directive. This helps in modularizing your API definition. For example:

yaml

Copy

/example:

get:

responses:

200:

body:

application/json:

example: !include examples/example.json

1. **RAML vs. Swagger/OpenAPI**  
   *Answer:*
   * **RAML**: Focuses on design-first, reusable components, and human readability.
   * **Swagger/OpenAPI**: Code-first approach with stronger tooling for code generation.
   * RAML uses YAML, while Swagger supports YAML/JSON.
   * RAML 1.0 introduced overlays/extensions for customization.
2. **Structure of a RAML File**  
   *Answer:*

yaml

Copy

#%RAML 1.0

title: User API

version: v1

baseUri: https://api.example.com/{version}

/users:

get:

responses:

200:

body:

application/json:

example: |

[{ "id": 1, "name": "John" }]

1. **What are Data Types in RAML?**  
   *Answer:* RAML allows defining data types (e.g., for request/response bodies) using JSON Schema, XML Schema, or inline types:

yaml

Copy

types:

User:

type: object

properties:

id: number

name: string

**Intermediate Concepts**

1. **Traits vs. Resource Types**  
   *Answer:*
   * **Traits**: Reusable method-level behaviors (e.g., pagination, rate-limiting).
   * **Resource Types**: Define reusable resource structures (e.g., /users and /products sharing common CRUD operations).  
     Example Trait:

yaml

Copy

traits:

secured:

headers:

Authorization: string

1. **How to Handle Security in RAML?**  
   *Answer:* Use **security schemes** (OAuth 1.0/2.0, Basic Auth, etc.):

yaml

Copy

securitySchemes:

oauth\_2\_0:

type: OAuth 2.0

settings:

scopes: [ "read", "write" ]

/users:

get:

securedBy: [ oauth\_2\_0 ]

1. **Error Handling in RAML**  
   *Answer:* Define error responses in the responses section:

yaml

Copy

/users:

get:

responses:

400:

body:

application/json:

example: |

{ "error": "Invalid request" }

1. **How to Document APIs in RAML?**  
   *Answer:* Use the documentation node or annotations:

yaml

Copy

documentation:

- title: Overview

content: |

This API manages user data.

**Advanced Topics**

1. **Overlays and Extensions (RAML 1.0)**  
   *Answer:*
   * **Overlays**: Add or override documentation, examples, or descriptions without modifying the base RAML.
   * **Extensions**: Modify the API definition (e.g., adding new resources/methods).
2. **Libraries in RAML**  
   *Answer:* Reusable components (data types, traits, resource types) stored in separate files:

yaml

Copy

#%RAML 1.0 Library

types:

ErrorResponse:

type: object

properties:

code: number

message: string

1. **Including External Schemas**  
   *Answer:* Use !include to reference external JSON/XSD schemas:

yaml

Copy

types:

User: !include schemas/user.json

1. **Mocking APIs with RAML**  
   *Answer:* Tools like **RAML API Console** or **API Notebook** generate mock servers from RAML definitions. Anypoint Platform also provides mocking services.
2. **Versioning Best Practices**  
   *Answer:*
   * Use URI versioning (/v1/resource).
   * Define versions in the baseUri and maintain backward compatibility.
   * Deprecate old versions gracefully.

**Tools & Integration**

1. **RAML and MuleSoft**  
   *Answer:* MuleSoft’s Anypoint Platform uses RAML to design APIs in Design Center, generate flows in Mule, and publish to Exchange. Anypoint API Manager enforces policies defined in RAML.
2. **Testing RAML APIs**  
   *Answer:* Use **Postman** (import RAML), **JMeter**, or frameworks like **Dredd** for contract testing.
3. **what is the difference between web services and restful services?**

-> Web service is generic term which used to refer the service/API which available in the web. Web service can be http web service or SOAP web service or REST web service.

-> RESTful services – an architectural style which used to expose the service in http/https(s) using REST/JSON or REST/xml format

2. **Difference between Http requestor and router?**

-> Http Requestor used to invoke external http web service.

-> Router – This used to route the message based on conditional routing. Example: Choice

3.**How you start the Flow when you get the requirement? what are factors you will consider?**

When we start the new flow, we will consider the following.

What’s the source system?

What’s the target system?

What’s the mapping when we need to while connecting the system?

What data format we need to change

What’s the file size and do we need to batch

Serial processing / concurrent processing required

How do we need to handle error?

4. **what is Active MQ? why we use Active MQ?**

Active MQ acts a broker to achieve publish/message pattern using JMS

It act as a JMS layer for messaging which we can publish and subscribe the messages from the topic or queues.

**5.How you will use Data base functions in your project?**

We can add database module to configure the database connection and use database related operations like select,insert,update, etc.,

**6.what are the methods developed in your project?**

Get, Post , Put

**7.what is Orchestration Layer in your project?**

Orchestration layer is used to compose multiple components. Its used to combine the database from different system such as CRM, SAP and etc.,

**8.Explain about the Data wave, have you used Java coding in Data wave?**

Dataweave is MuleSoft expression language for accessing and transforming data that travels through a Mule app.

This helps to modify and process the data.

**9.How you will create project using RAML?**

Create a project and select API file (REST) specification while creating the project and it creates the project with required REST router kit.

**10.what is REST API? why we use REST API’s?**

REST is architectural style used to expose http method such as get/post/delete/put etc., its lightweight and we can retrieve the response faster.

**11.Can you explain some the connectors used in your project?**

I have used AWS S3 connector to connect S3 storage to receive the file.

I have used database connector to connect the data base.

I have used http request connector to invoke REST based web service

I have used SOAP connector to consume SOAP based WS.

**12.How you apply the policies in your project?**

Create API in API Manager in any point platform and take a note of API discovery id.

In the API, add the policy which are required

Create project using API in Any point studio.

Add auto discovery configuration and provide the details of API discovery id.

Execute the project; Now API will become active in any point platform. whenever request comes to the Mule app and it apply the policy and then it will allow the request to proceed further based on policy we applied.

**13.How you will deploy the API's?**

From any point studio->Any point platform->Deploy into Cloudhub

How DB is working in background in your project?

We have added database module and invoking the required select service to retrieve the records from table and also we have exposed those information in get service in http listener.

**14.How you validate the RAML and Explain about the RAML Flow?**

When we actually create project using RAML file in any point studio, it also creates the API console and REST router kit. Whenever request received to the flow, it goes to the api console and validate the configuration what we have specified in the RAML specification.

**15.Have you used Java in your project? where you have used?**

For Existing methods which already developed.

**16.How you use the Process API in your project?**

Process APIs are invoked from Experience layer. This generally receives the common data model / canonical document and in turn invokes system api.

**17.Explain about the POSTMAN?**

Post man is http rest client which acts as a testing tool to run the Mule app which is running with method http/https.

**18.Have you ever built API'S alone?**

Yes. I have built the API using design certner-> RAML specification.

**19.What is Scatter-Gather?**

Scatter gather, receive the requests and it sends the same data /payload to all flows which are available in the scatter gather scope and its works in parallel.

**20.Difference Between For-each and batch processing?**

For each to process each messages in the array/collection in the sequential order

Batch to process each messages in the array/collection in the concurrent/parrallel order

**21.How to transform csv file into json using data weave?**

In the dataweave expression, provide the syntax as application/JSON, it will automatically convert the csv to JSON

**API LED connectivity**

This term used to expose everything as API. Connect all application as a API

**What are the scopes**

For Each

Flow

Subflow

Try

**What is caching and why do we use it?**

Caching used to cache the data which we can be reused later. Its used to take the reusable configuration/data from the memory instead of file system.

**How to handle errors?**

We can handle the error by adding error handling flow in the same mule app or global mule app configuration.

**what kind of operations you are going to perform by using database connector?**

Select

Insert, update, delete

Store procedure call

**what is exact functionality of the database connector in the MuleSoft?**

It is to connect to different database so that we can connect and retrieve / process the records to database.

**What is the meaning of auto discovery?**

Autodiscovery is a feature used to link the Mule app with the API available in the API manager in the anypoint platform using auto discovery id of API.

what is the use of Rate Limiting policy,

It limits the number of requests.

Fragments:

API fragmentation used to specific/create the reusable blocks, so that same fragments can be referred from the multiple flow.

RAML

**What is traits in RAML?**

Fragments: Instead of including all code in one RAML file, you can modularize it and compose it of reusable fragments (examples).

Traits: Traits is like function and is used to define common attributes for HTTP method (GET, PUT, POST, PATCH, DELETE, etc) such as whether or not they are filterable, searchable, or pageable.

Traits can be called by resources using the "is" keyword.

**If we wanted to process only one message at a time in mule flow how can we achieve that?**

we can make a flow to process in single thread, there is an option to define the Max Concurrency you can configure the same as 1 to  process only one message at a time

**How can you process message asynchronously in Mule Soft?**

Async scope

**What are various types of error handling in Mule 4?**

on-error-continue and on-error-propagate.

**Why we use Batch Aggregator scope**

Batch Aggregator scope is used to accumulate a subset of records from a batch step and process them to external source or service for example rather than processing single record to target system you can use batch aggregate to process all the records at once

**How we will access the properly value in dataweave**

p(‘<propertyname>') – to access the property from configuration

p(‘secure::<propertyname>') – to access the property from configuration

**How do we store the encrypted value in the configuration file**

key=![encrypted content goes here ]

**How the keys are fetched from the configuration file.**

${key}

${secure::key}

**What is Anypoint Exchange in MuleSoft?**

Anypoint Exchange provides the benefit of being able to discover, share, and incorporate assets and resources into your applications.

**What are the different types of APIs in API led architecture**

Experience API

Process API

System API

**What are deployment options available in MuleSoft?**

•Cloud hub

•On-premise

•Runtime Fabric(RTF)

•Anypoint PCE(Anypoint Private Cloud Edition)

•Anypoint PCF(Anypoint Platform for Pivotal Cloud Foundry)

**What is Cloudhub?**

Cloudhub is an (IPass) Integrated platform as a service which is multitenant, secure, highly available service where we can deploy our integration application on cloud also integrate on-premise application with cloud services

**How many ways you can deploy application on Cloudhub?**

Anypoint Studio

Runtime Manager

Anypoint CLI

Cloudhub API

**What is persistent queue?**

Persistent queues also guarantee delivery of your messages; even if one or more workers or datacenters go down, persistent queues facilitate disaster recovery and provide resilience to hardware or application failures.

**What is RTF (Run time Fabric)?**

Anypoint Runtime Fabric is a container service that automates the deployment and orchestration of your Mule applications Runtime Fabric runs on customer-managed infrastructure on AWS, Azure, virtual machines (VMs).

**What is API Portal in MuleSoft?**

API Portal allows providers to expose and publicise their APIs, educate developers communities about them, provision user access generate client keys and more

**Explain ESB Integration core principles?**

Transformation

Mediation

**What is scheduler Endpoint?**

Scheduler Endpoint is a MuleSoft component or middleware are working on time-based conditions. It allows the user to trigger whenever this condition is met.

**What is Choice Router?**

Choice Router dynamically routes messages using a flow. It is based on a set of DataWeave expressions to evaluate the message content.

**Explain VM transport in MuleSoft**

The VM (Virtual Machine) transport is a special type of transport that can be used to send a message via memory.

**What is API?**

APIs provides product or service to communicate with other products and services without having to know how they're implemented.

Private Flow: a flow that does not have source. This means a private flow cannot start of its own on receiving the inbound message as it does not have an inbound connector, A private flow can only be called using flow-ref same as sub-flow.

Transform Message

A transformer takes care of translating the content of a message from one form to another.

What are the advantages of REST

Fast

Different data format like XML, JSON

Language and platform independent.

**MuleSoft Anypoint Studio- Initial setup error.**

Java Path error

Tooling instance error.

**Explain few Http Status Codes:**

200 - OK

201- CREATED

202 - Accepted

400 – Bad request

401-Unauthorized

404 – Not found

429 – Too many requests

Fast

Different data format like XML, JSON

Language and platform independent.

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**What is ObjectStore v2**

Cloud Hub applications store data and states across batch processes, Mule components and applications, from within an application or by using the Object Store REST API.

In the Mule project where the package dependencies details are stored.

POM. XML file

**How to access query Parameters and other attributes?**

Attributes.queryParams.number1

**What is API first Approach**

Design the API using specification (ex: RAML) and use that specification to Implement the flow.

**How to see the logs on cloud hub ?**

Anypoint platform->Runtime Manager-> choose your application -> click Logs

What is Munit?

MUnit is a Mule application testing framework that allows you to easily build automated tests for your integrations and APIs.

**What is Anypoint Design Center ?**

is a development environment that consists of two tools:

[API Designer](https://docs.mulesoft.com/design-center/design-create-publish-api-specs)

[Flow Designer](https://docs.mulesoft.com/design-center/about-designing-a-mule-application)

**What is VPC**

The Anypoint Virtual Private Cloud (VPC) offering allows you to create a virtual, private, and isolated network segment in the cloud to host your CloudHub workers. Customer can choose which region they need their VPC.

**What is Any Point MQ**

Anypoint MQ is a multi-tenant, cloud messaging service that enables customers to perform advanced asynchronous messaging scenarios between their applications. Anypoint MQ is fully integrated with Anypoint Platform, offering role-based access control, client management, and connectors.

Supports – FIFO (First in First out), Exchange (topics)

We can use Message browser UI to view the messages.

**How will we identify ESB is needed in a project?**

•Implementation of ESB is not suitable for all the projects. We should analyze is really ESB is required here or not. You need to analyze by taking below points into consideration:

•In the project, require 2 or more applications and services to be integrated and there must be a need to communicate between the applications.

•If there is plan of interacting with more applications and Services in the future then we can go with Mule ESB because it is highly scalable.

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**How do you draw architecture diagram in your enterprise and what are the diagram which you draw**

•Tools: Confluence – Gliffy diagram , Archimate, Draw.io, SmartDraw

•Diagrams: Sequence, Flow, Activity, Deployment

**What is layered Architecture? (Software Architecture Pattern)**

It is the organization of the project structure into four main categories: presentation, application, domain, and infrastructure. Each of the layers contains objects related to the particular concern it represents.

Mule soft use 3 layered architecture – Experience, Process , System API

Java –MVC Pattern

**What is Application Networks**

Set of Application is talking to Set of Applications called Application Networks

**What is Business Groups**

Business groups are self-contained resource groups that contain Anypoint Platform resources such as APIs and applications. Business groups provide a way to separate and control access to Anypoint Platform resources, as users have access only to the business groups in which they have a role.

**What is Control plane and What is run time plane.**

Any Point Platform – Control Plane

Mule Runtime – Run Plane

**What is connector?**

Connector is a module which talks to external system. If its not available in the module, then it needs to be download it from Exchange. Its better to download it from Exchange, so that we can get the latest version.

**Where do you add documentation in Mule application?**

Mule Flow properties - > Notes section

**What is DataSense ?**

Data Sense is a feature of Anypoint Studio that uses Mule event metadata to help you design applications. Rather than forcing you to manually discover this metadata, Anypoint Studio automatically acquires it so that you can map or use this data in your application.

**How will you get the current date/time in Data weave (DW)**

now() -> Sample result : "2020-09-17T04:39:45.129Z"

**What is Thru MFT**

Thru MFT is third party Managed File transfer framework certified by Mule Soft. We can use Thru MFT connector to send/receive the files Thru MFT for processing.

**What are the things called Transactions**

Object Store – No transaction

Database connector – Transactions -- Advanced Tab Transaction action

JMS Connector – Transactions

If connector has tranactions then it supports transaction management.

Bitronix Transaction Manager allows Mule to automatically recover interrupted transactions on restart.

**Why Socket module gets added by Default while creating new project.**

It needs by HTTP

**What is Any Point CLI?**

Anypoint Platform provides a scripting and command-line tool for both Anypoint Platform and Anypoint Platform Private Cloud Edition (Anypoint Platform PCE).

**What is target Variables in Mule4?**

Target Variable is used to store the contents of service call. In mule3, this is Enricher

**Mule Domain project**

When you deploy Mule on premises, you can define global configurations such as default error handlers, shared properties, scheduler pools, and connector configurations to be shared among all applications deployed under the same domain. To do so, create a Mule domain and then reference it from each application.

**AnyPoint Visualizer**

Displays views of different aspects of an application network graph. You can use the graph to explore your application network. To see how the transaction going inside your application.

**AnyPoint API community Manager**

Enriched design with API for developer portal.

**CloudHub Workers**

Applications on CloudHub are run by one or more instances of Mule, called workers. Each worker is a dedicated instance of Mule that runs your integration application. We can specify worker size (0.1vcore = 500 MB Heap memory, 8 GB storage)

**What is Edge Policy**

To protect all of the mule apps proxies – Denial of Service (DOS) - used in Runtime fabric deployment Architecture.

**What is Edge Tokenization Policy**

This policy calls the service to tokenize the data before giving to actual mule application.

Ex: masking credit cards, social security numbers

**How to invoke mule flow - asynchronous**

1) Publish-subscribe pattern using VM/JMS/Anypoint MQ

2) Async scope-Async can be used to do the processing in parallel with the main flow, it can be used to process the time consuming operations that does not expect a response back

**How will you combine 2 arrays into single array in MuleSoft?**

You can use flatten dataweave function to combine two arrays in to single array

What is the difference – mule3 vs mule4? This question might come when you worked in both version!

Mule event structure got changed

Variables (flow, session, record var) changed to 1 variable.

Mule3 – we use enricher, and Mule4 it is target variable

**How we store environment level properties?**

Global properties in Studio and we can override properties value in runtime manager in anypoint platform.

How do you call store procedure in database from mule?

Connector->Database->Stored procedure

**How do we store data in variable in mule4?**

We can use ‘set variable’ to store the data

We are using post method to send the data to mule flow from restclient/postman, but we are not sending any data in the payload

**while sending the request ? What will happen to your flow?**

Mule flow will receive your request with empty payload and also with other http related attributes/headers

Mule flow is defined to accept only post method. But source is sending the request to your endpoint using get method.

Method not allowed for endpoint: <endpoint name> with http status 405 Method Not allowed.

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