MuleSoft

Learning Program 2016

People matter, results count.

Objectives of MuleSoft

- Purpose:
  - Understanding various integration pattern, and when to use the pattern.
- Product:
  - Understanding Integration Styles
  - Mule Soft implementation
- Process:
  - Learn Various Integration Styles
  - Connecters
  - Routers
  - Transformers
  - Filters

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Introduction

- Runtime engine of Anypoint Platform.
- Lightweight Java-based enterprise service bus (ESB)
- Integration platform that allows developers to connect applications together quickly and easily, enabling them to exchange data.
- Easy integration of existing systems, regardless of the different technologies that the applications use, including JMS, Web Services, JDBC, HTTP, and more.
- The ESB can be deployed anywhere, can integrate and orchestrate events in real time or in batch, and has universal connectivity.

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Introduction

All integration solutions have to deal with a few fundamental challenges:

- Networks are unreliable
- Networks are slow
- Any two applications are different
- Change is inevitable

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Introduction

- Transit system for carrying data between applications within our enterprise or across the Internet.
- Mule has powerful capabilities that include:
  - Service creation and hosting
  - Service mediation
  - Message routing
  - Data transformation

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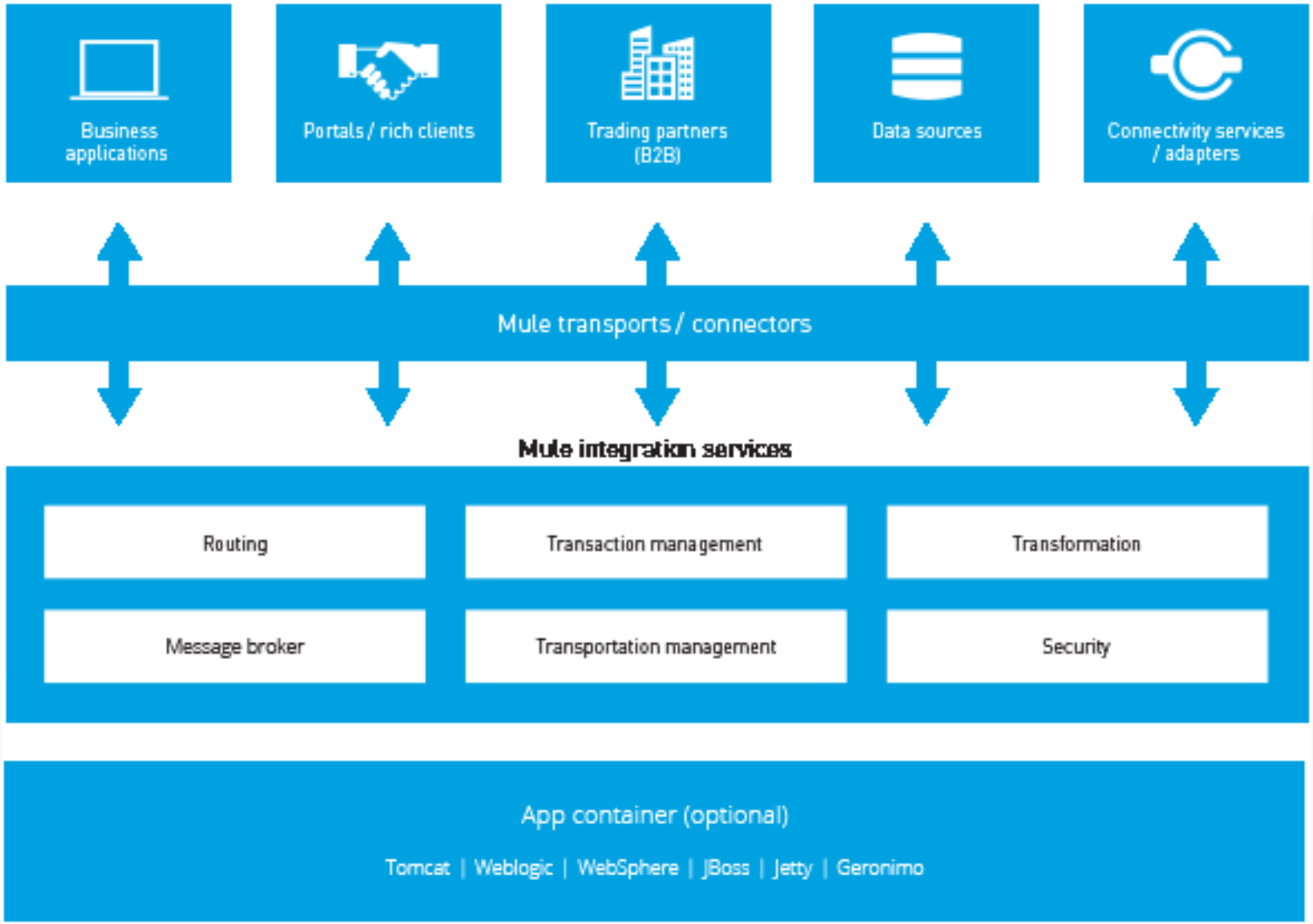
Mule ESB



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Integration Pattern

- Solving Integration Problems using Patterns
  - Information Portal
  - Data Replication
  - Shared Business Function
  - Service Oriented Architecture
  - Distributed Business Process
  - Business to Business
- Tightly Coupled System
- Loosely Coupled System

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Integration Styles

- Integration Styles
  - File Transfer
  - Shared Database
  - Remote Procedure Invocation
  - Messaging

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Terminologies of Integration

- ***Splitter**, a component that breaks a single message into multiple individual* messages.
- ***Aggregator*** , the component that can combine multiple messages into a single message.
- A *Content* ***Enricher*** *is a* component that adds missing data items to an incoming message.
- The combination of a *Splitter, a Router and an Aggregator is fairly common. We refer to it as a* ***Composed Message Processor.***
- ***Process Manager*** *component that receives a New Order message (which includes the current* shipping and billing address0 and publishes two separate messages to the billing (or shipping) system
- A ***Dynamic Recipient List*** *is the* combination of two Message Routing patterns.
- ***Message Store*** *can provide us with some important business metrics such as the average time to* fulfill an order.

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Anypoint Studio Components

- Connector
- Scopes
- Components
- Transformers
- Filters
- Flow Control
- Error Handling
- Security

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Connector

- A **connector** is the object that sends and receive messages on behalf of an endpoint.
- Connectors are bundled as part of specific transports of providers.
- For example, the **FileConnector** can read and write file system files.
  - File
  - Database
  - VM
  - Anypoint MQ

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VM

- VM are in memory queues available in Mule JVM.

- Pros:
  - Can be used where message queuing setup is not unavailable in the infrastructure.
  - High performance compared to other message queue.
  - Asynchronies kind of transfer VM is best choice.

- Cons:
  - VM file persistency
  - Extended Memory Usage

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FTP

- The FTP Connector implements **a file transport channel** so that your Mule application can exchange files with an **external FTP server**. You can configure FTP as an inbound endpoint (which receives files) or outbound endpoint (which writes files to the FTP server).

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Scopes

- Sometimes referred to as "wrappers", the message processors known as Scopes appear as processing blocks when you first place them on the Message Flow canvas.
- Certain scopes (i.e., **Poll**, **Message Enricher**, and **Until Successful**) require you to embed no more than one message processor within the processing block. Variously, these scopes add functionality to the embedded message processor by:
  - triggering it periodically
  - enhancing its payload
  - triggering it until the associated event succeeds

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Variable

- Record variable – Batch Processing
- Flow Variable – Scope is within the flow
- Session variable – Scope is within the application

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Composite Source

- To accept incoming messages from multiple input channels, place two or more message sources (also known as receivers) into a Composite Source. A message entering the Composite Source on any supported channel triggers the processing flow.

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Router

- A **Router** is an object that do something with messages once they have been received by a connector, or prior to being sent out by the connector.
- Routers route messages to various destinations in a Mule flow. Some routers incorporate logic to analyze and possibly transform messages before routing takes place.

- Example
  - Scatter – Gather
  - Splitter
  - Choice

***Note**: In Anypoint routers are configured under **FlowControl**.*

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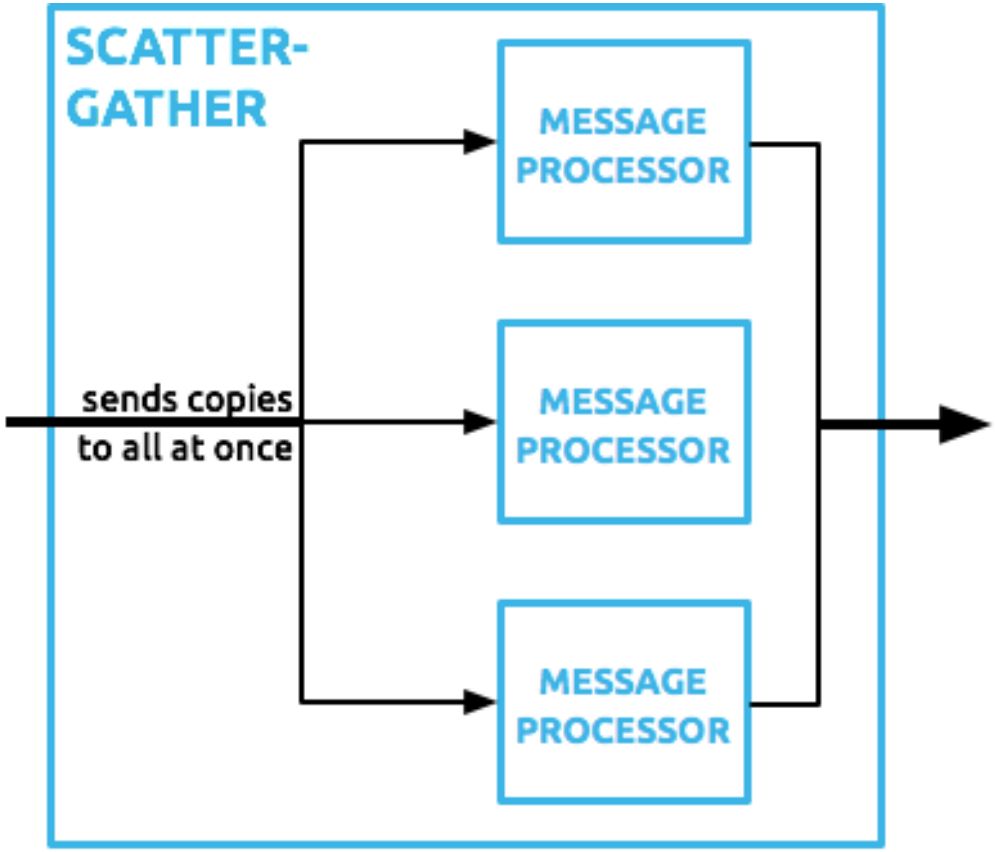
Scatter and Gather

The routing message processor **Scatter-Gather** sends a request message to multiple targets concurrently. It collects the responses from all routes, and aggregates them into a single message.



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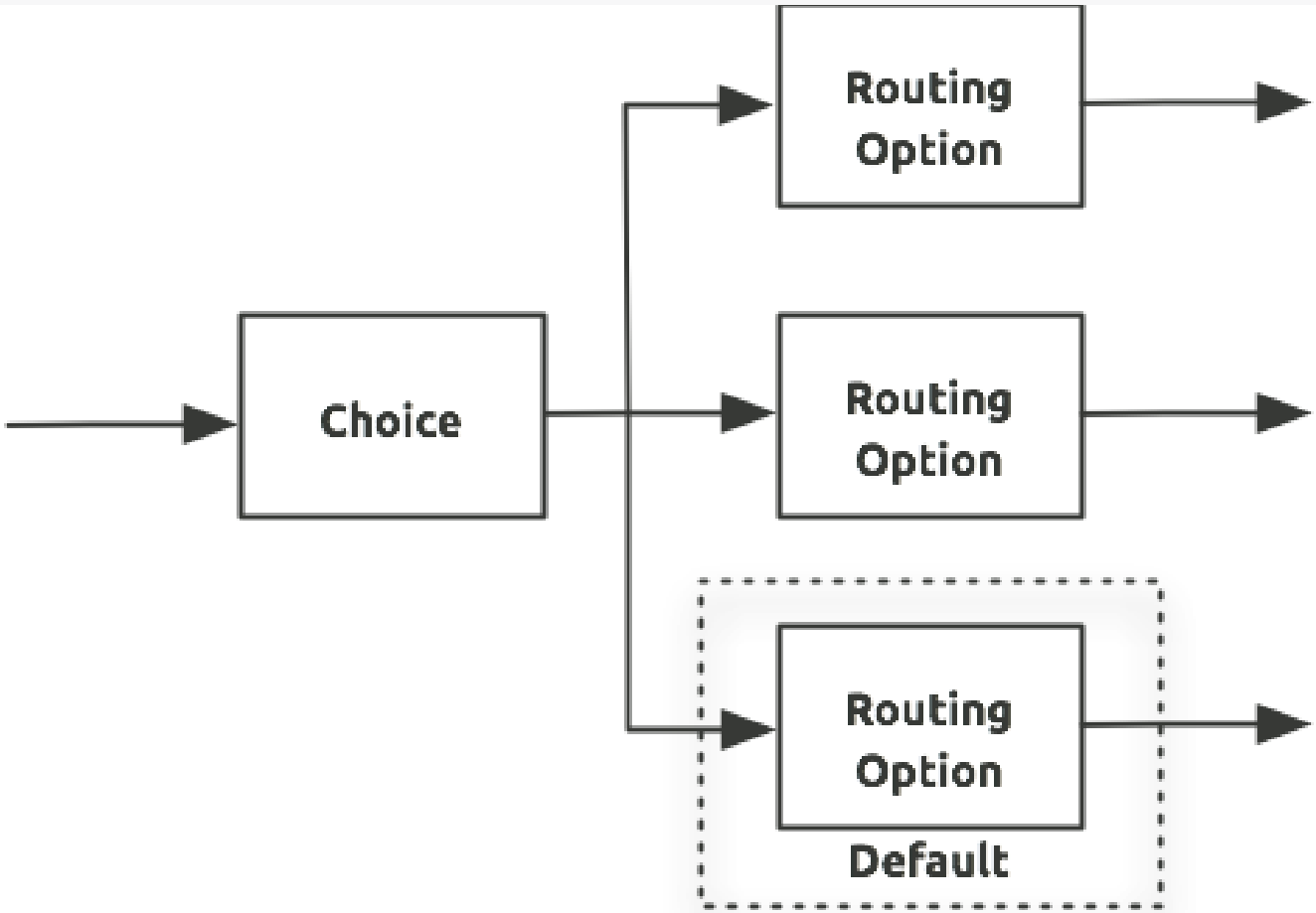
Choice

The **choice flow control** dynamically routes messages based on message payload or properties. It adds conditional programming to a flow, similar to an if/then/else code block.



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Filter

- A filter optionally filters incoming or outgoing messages that are coming into or going out from a connector.
- For example, the File Provider comes with a **FilenameWildCardFilter** that restricts which files are read by the connector based on file name patterns. For example only files with the .xml extension can be routed.
- Filters are used in conjunction with Routers.

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Idempotent Filter

- Ensures that only unique messages are received by a service by checking the unique ID of the incoming message.

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Validate JSON Schema

- The JSON Schema validator evaluates JSON payloads at runtime and verifies that they match a referenced JSON schema.
- Match against schemas that exist in a local file or in an external URI.
- If the validation fails, an exception is raised with feedback about what went wrong and a reference to the original invalid payload. The JSON Schema Validator supports schema drafts of version 4 and older.

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Transformer

- A **transformer** optionally changes incoming or outgoing messages in some way
- This is usually done to make the message format useable by a downstream function
- Examples:
  - The **ByteArrayToString** transformer converts byte arrays into String objects.

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Flow Control – Round Robin

- This means that the first message will be processed by the first processor in the Round Robin and the second message will be processed by the second processor and so on.
- It is useful to **load balance** incoming requests over a number internal services that expose the same API.

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Poll Reference

- While some connectors, such as HTTP and FTP, utilize a polling process to actively retrieve messages from an external resource, most message processors in Mule are triggered when called by a previous element in a flow. If you want to arrange for a message processor to actively call a resource at regular intervals, use a Poll scope.

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Echo - Components

- The Echo components logs the message and returns the payload as the result.

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Batch Processing

- Mule possesses the ability to process messages in batches. Within an application, you can initiate a batch job which is a block of code that splits messages into individual records, performs actions upon each record, then reports on the results and potentially pushes the processed output to other systems or queues.

- This functionality is particularly useful when working with streaming input or when engineering "near real-time" data integration between SaaS applications.

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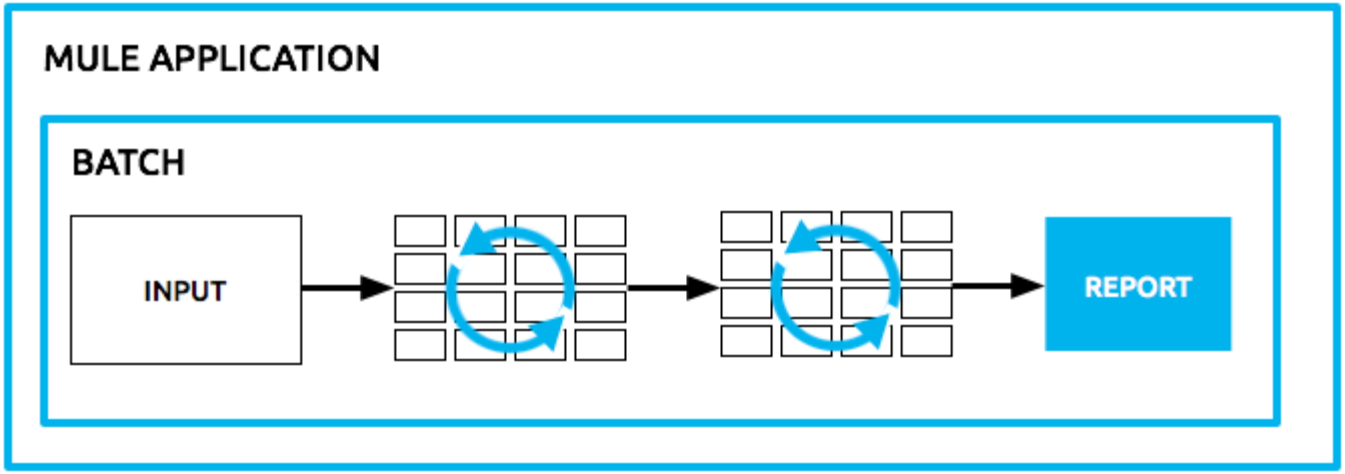
Batch Processing



Scenarios:

- integrating data sets, small or large, streaming or not, to parallel process records
- synchronizing data sets between business applications, such as syncing contacts between Netsuite and Salesforce, effecting "near real-time"data integration
- extracting, transforming and loading (ETL) information into a target system, such as uploading data from a flat file (CSV) to Hadoop
- handling large quantities of incoming data from an API into a legacy system

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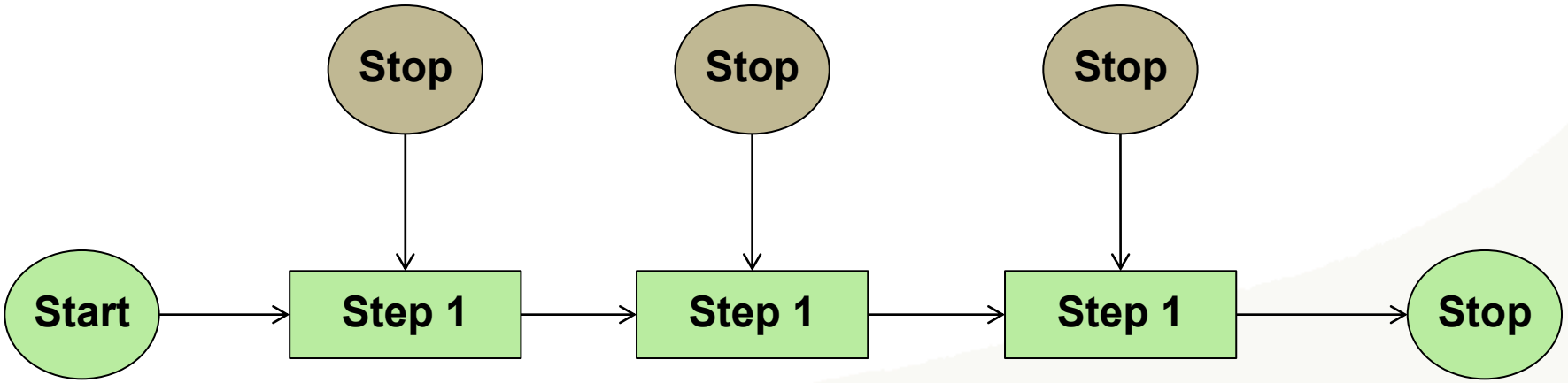
Exception Handling



- By default, error free documents follow a central path known as the "happy path"
- Documents that have errors may be handled in different ways (rejected, warning etc.)

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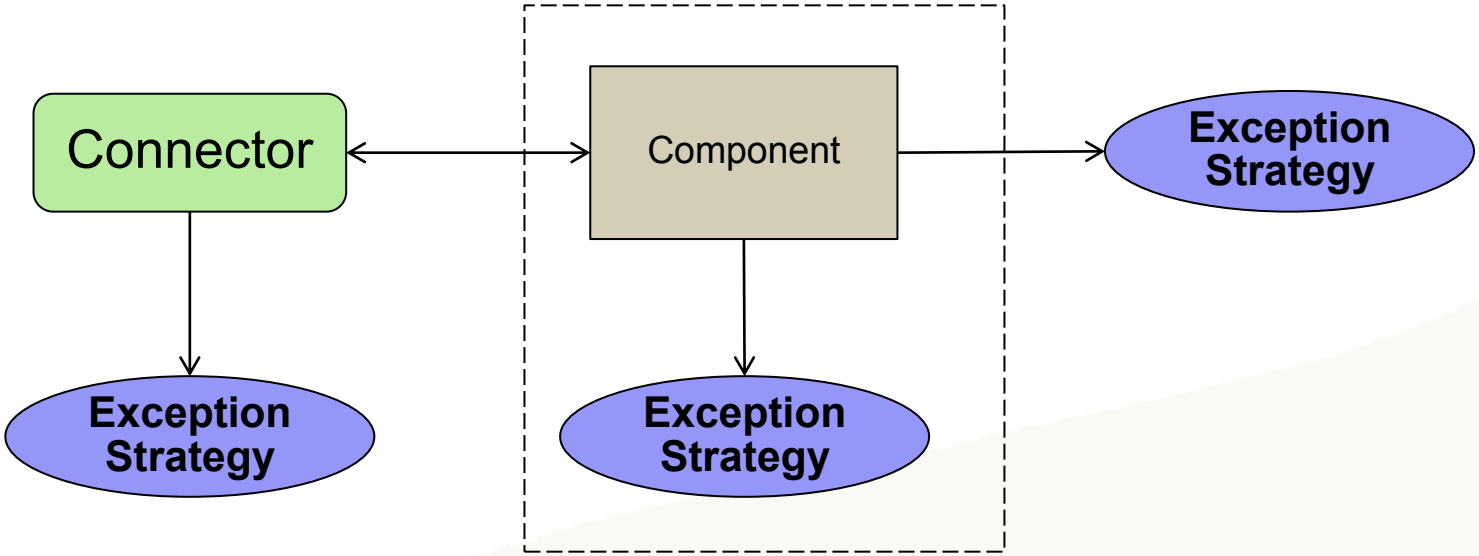
Exception Handling



- Mule has a special way of handling non-happy path processing. This is called an "exception Strategy" but is it really just an exception path and there is very little strategy involved.
- There are three places you can associate an exception strategy
  - Connector
  - Component
  - Model(set for all components in a model)

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Exception Strategy

```
<exception-strategy
  className="org.mule.impl.DefaultComponentExceptionStrategy">
<endpoint address="file:///c:/mule-class/error" />
</exception-strategy>
```

we want all invalid documents to be moved into the error folder.

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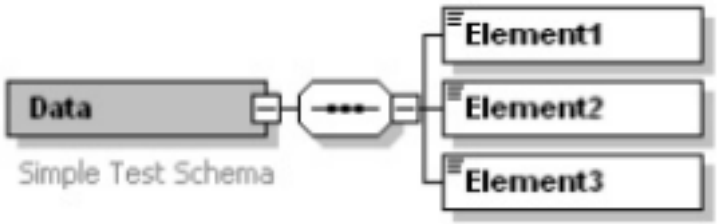
Exception Strategy

Sample XML:

Given the following XML Schema file:



XML Schema validation will generate an error message when it gets to the fourth invalid data element:

```
<?xml version="1.0" encoding="UTF-8" ?>
<Data>
   <Element1>Hello world</Element1>
   <Element2>String</Element2>
   <Element3>String</Element3>
   <BOIInvalidDataElement>
This is BOI invalid data element.
   </BOIInvalidDataElement>
</Data>
```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Exception Strategy

```
<outbound-router>
<router className="org.mule.routing.outbound.FilterXmlMessageSplitter">
<endpoint address="file:///c:mule-class/out?outPattern=$[ORIGINALNAME]" />
        <properties>
        <property name="validateSchema" value="true"/>
        <property name="externalSchemaLoaction"
                value="file:///c:mule-class/labs/07-validate/my-schema.xsd"/>
        </properties>
</router>
</outbound-router>
```

- To validate the XML Schema, just add two properties:
  - tell it to validate the document
  - tell it to what file to use and where to find it

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Exception Strategy

document : cvc-complex-type.2.4.d : Invalid content was found starting with element 'BOIInvalidDataElement'. No child element is expected at this point.

- This error message is generated on the Mule Console when an invalid data element is found. But what should we do with it> How do we redirect it to the appropriate user?

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Recap

Enterprise Bus

Connector

Transformer

scopes

Components

Filters

FlowControl

ErrorHandling

Security

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Thank You For Your Time

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