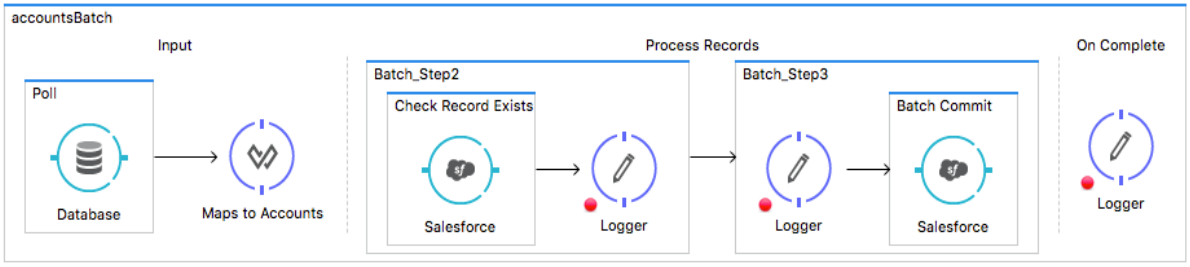
Module 12: Processing Records

Goal



Objectives

- Use the For Each scope to process items in a collection individually
- Use the batch job element (EE) to process individual records
- Trigger a batch job using a poll
- Use a batch job to synchronize data from a legacy database to a SaaS application

Processing items in a collection

Processing items in a collection

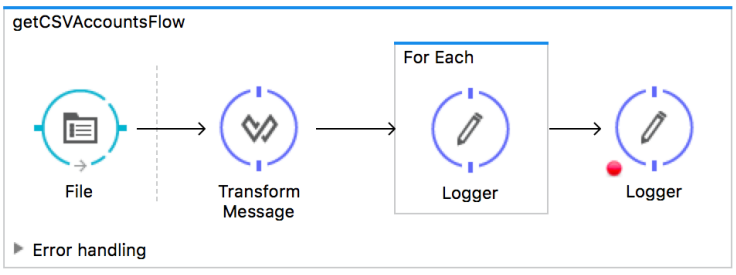
MuleSoft

- Create a flow that uses
  - A splitter-aggregator pair
    - One flow control splits the collection into individual elements, which the flow processes iteratively
    - Another flow control is used to re-aggregate the elements into a new collection so they can be passed out of the flow
  - A For Each scope
    - Splits a message collection and processes the individual elements and then returns the original message
    - More versatile and convenient that splitter/aggregator pairs
- Use a batch job (enterprise edition only)
  - Created especially for processing data sets
  - Not a flow, but another top level element

Walkthrough 12-1: Process items in a collection individually

MuleSoft

- Use the For Each scope element to process each item in a collection individually
- Look at the thread used to process each record

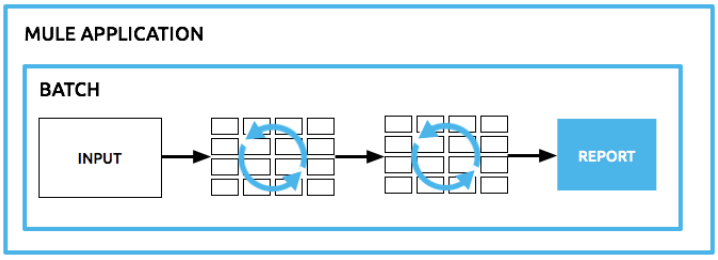


Processing records with the batch job element

Batch processing with the batch job element

MuleSoft

- Is an alternative to standard flows
- Stands on its own as an independent block of code
- Provides ability to split large messages into records that are processed asynchronously in a batch job
- Provides ability to process messages in batches
- Is exclusive to Mule EE runtimes



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Example use cases

MuleSoft

- Integrating data sets to parallel process records
  - Small or large data sets, streaming or not
- Engineering "near real-time" data integration
  - Synchronizing data sets between business applications
  - Like syncing contacts between NetSuite and Salesforce
- Extracting, transforming and loading (ETL) information into a target system
  - Like uploading data from a flat file (CSV) to Hadoop
- Handling large quantities of incoming data from an API into a legacy system

Batch jobs

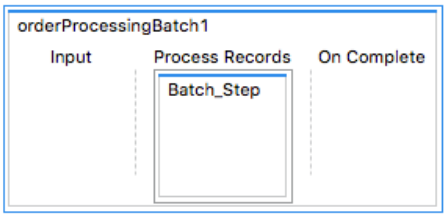
MuleSoft

- Accept data from an external resource
  - May poll for the input
- Split messages into individual records and perform actions upon each record
  - Can use record-level variables to enrich, route, or otherwise act upon records
  - Handle record level failures that occur so batch job is not aborted
- Report on the results and potentially push output to other systems or queues

Creating batch jobs

MuleSoft

- Batch jobs are top-level elements that exists outside the context of any regular Mule flow
- To create, drag a Batch scope element to the canvas

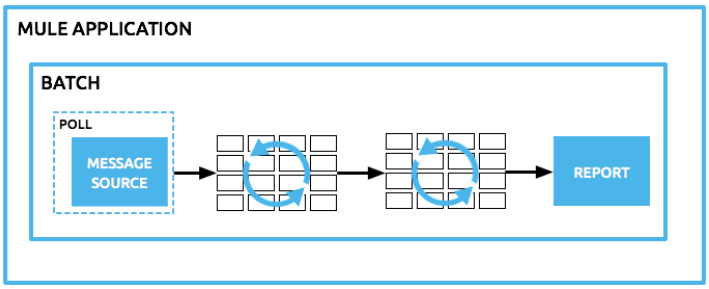



```
<batch:job
name="orderprocessingBatch1">
  <batch:process-records>
    <batch:step name="Step1"/>
  </batch:process-records>
</batch:job>
```


Triggering batch jobs: Option 1

MuleSoft

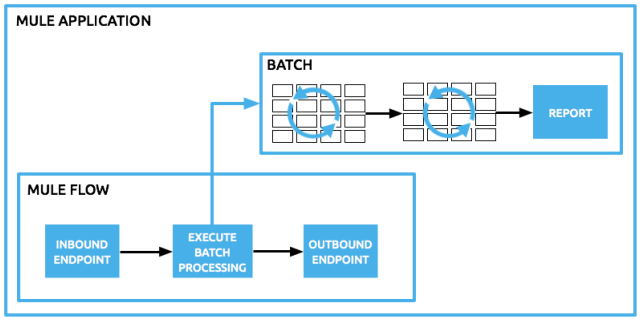
- Place an inbound, one-way message source at the beginning of the batch job
  - It cannot be a request-response inbound message source



Triggering batch jobs: Option 2

MuleSoft

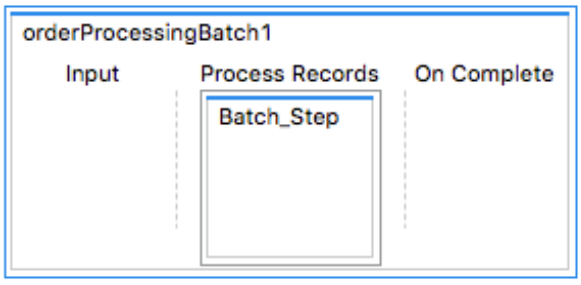
- Use a Batch Execute message processor to reference the batch job from within a Mule flow in the same application



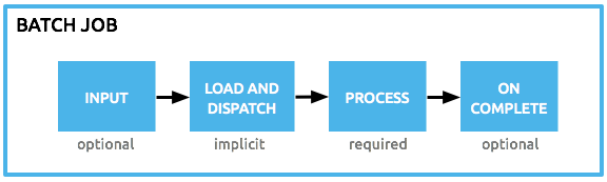
Batch phases in the canvas

MuleSoft

- When you add a Batch scope element to the canvas, multiple phases are shown
  - Input, process records, and on complete

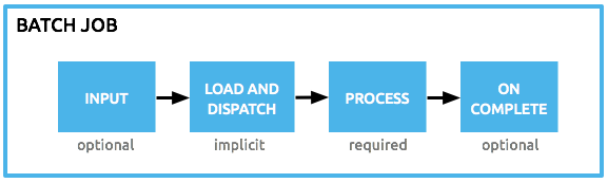


Phases of a batch job



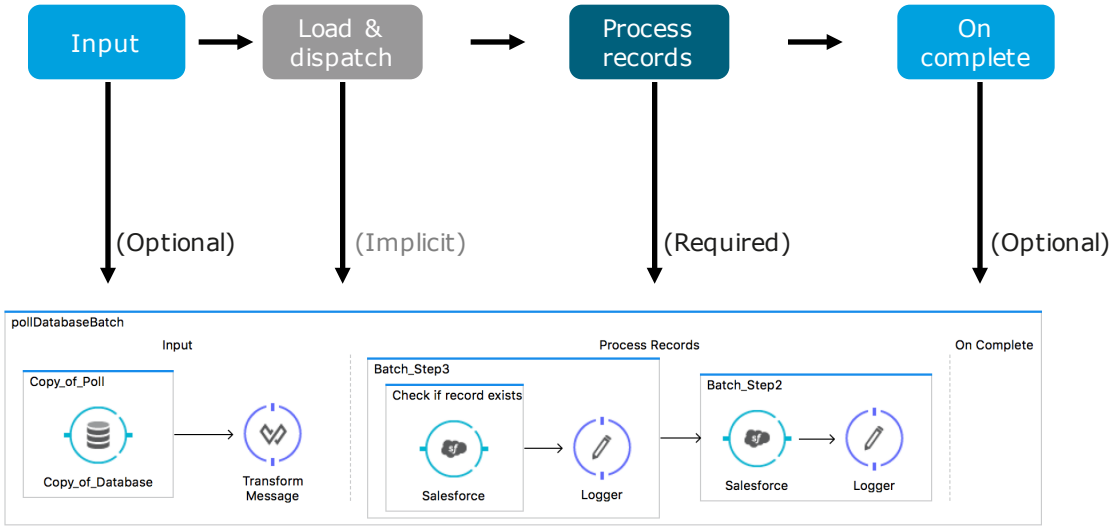
- Input (optional)
  - Triggers the processing via an inbound endpoint
  - Modifies the payload as needed before batch processing
- Load and dispatch (implicit)
  - Performs "behind-the-scene" work
  - Splits payload into a collection of records and creates a queue

Phases of a batch job



- Process (required)
  - Asynchronously processes the records
  - Contains one or more batch steps
- On complete (optional)
  - Report summary of records processed
  - Get insight into which records failed so can address issues

A batch job example



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How record processing works

- Only one queue exists and records are picked out of it for each batch step, processed, and then sent back to it
- Each record keeps track of what stages it has been processed through while it sits on this queue
- A batch job instance does not wait for all its queued records to finish processing in one batch step before pushing any of them to the next batch step

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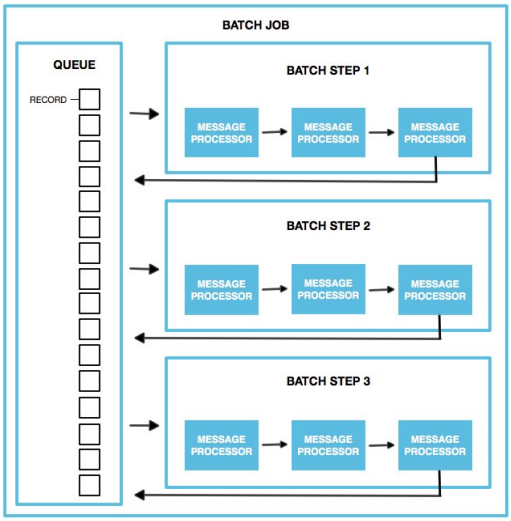
How record processing works

MuleSoft

- Each record
  - Moves through the processors in the first batch step
  - Is sent back to the queue
  - Waits to be processed by the second batch step
- This repeats until each record has passed through every batch step

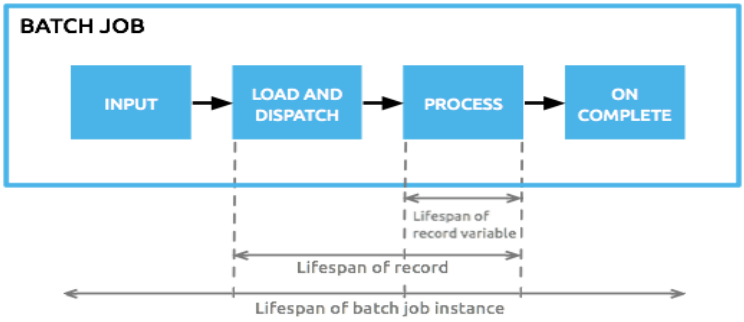


How record processing works

MuleSoft

- To store record-specific information, use record variables
  - Are stored in the recordVars scope
- Persist across all batch steps in the processing phase
  - A flow variable only persists in a single batch step
- Commonly used to capture whether or not a record already exists in a database


Record Variable



Reporting in the on complete phase

- Payload is a BatchJobResult
  - Has properties for processing statistics including
    - loadedRecords
    - processedRecords
    - successfulRecords
    - failedRecords
    - totalRecords

Handling record-level errors during processing

- If a message processor in a batch step cannot process a record (corrupt or incomplete data) there are 3 options

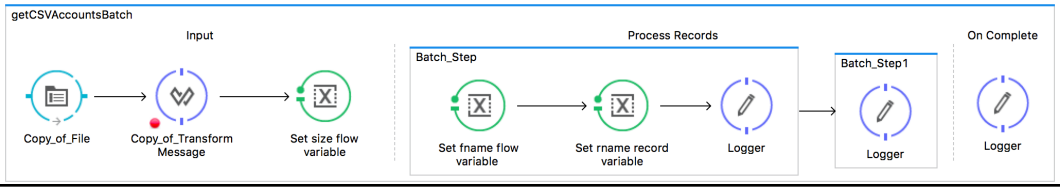
```
<batch:job name="Batch1" max-failed-records="0”>
```

  - 0: Stop processing the entire batch (default)
    - Any remaining batch steps are skipped and all records are passed to the on complete phase
  - -1: Continue processing the batch
    - You need to use filters to instruct subsequent batch steps how to handle failed records
  - {integer}: Continue processing the batch until a max number of failed records is reached
    - All records are then passed to the on complete phase

Walkthrough 12-2: Create a batch job for records in a file

MuleSoft

- Create a batch job
- Explore flow & record variable persistence across batch steps & phases
- In the input phase, check for CSV files every second and convert them to a collection of objects
- In the process records phase, create two batch steps for setting and tracking variables
- In the on complete phase, look at the # of records processed and failed
- Look at the thread used to process each record in each step



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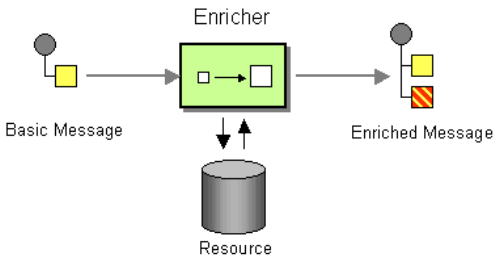
Using a batch job to synchronize data

Checking for duplicate records

MuleSoft

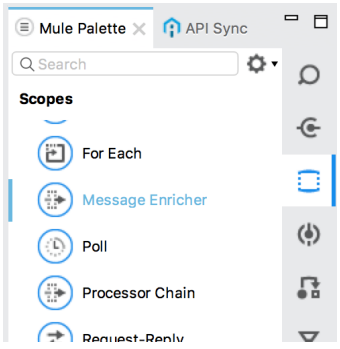
- When synchronizing data between data sources, you often check to see if a record already exists in the target resource
- If you simply add an endpoint to query the target resource first before adding it, the response would become the payload
  - This is not what you want
- You want the external call to act as an enrichment of the existing message with the original payload retained



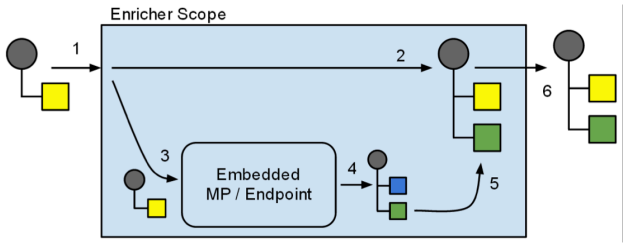
Using a message enricher

MuleSoft

- Add a Message Enricher scope to a flow
- Add message processor(s) to the scope
- Specify the message enricher source and target
  - The target specifies what part of the message to modify
  - The source specifies what to set the target to
    - By default, is equal to payload



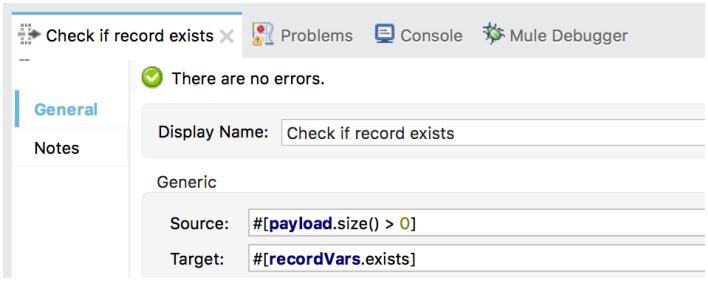
How the message enricher works



1. Enricher sends a copy of the original message into the processor
2. The original message waits
3. The copy is processed
4. The copy's response is a message
5. Part(s) of the response are added to part(s) of the original message
6. The enriched message moves forward

Adding logic to only insert new records

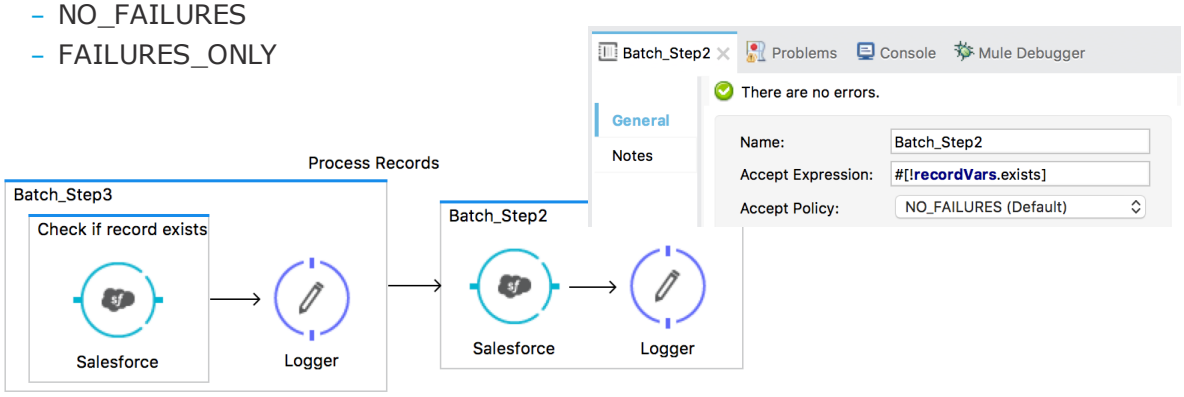
- When determining if a record exists in a target resource, it is common to store the result in a record variable



- After determining if the record exists in the target resource, you can use batch steps filters to only process qualified records

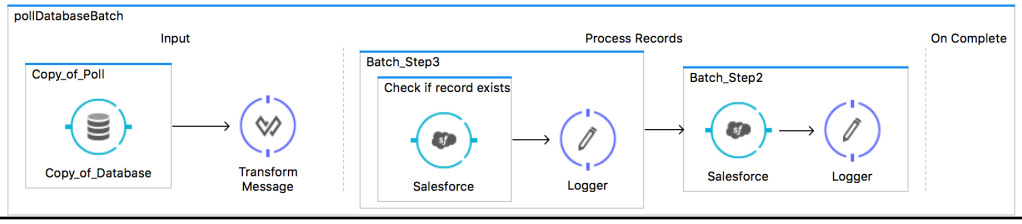
Batch step filters

- Restricts records to be processed
- Accept policies
  - ALL
  - NO_FAILURES
  - FAILURES_ONLY



Walkthrough 12-3: Restrict processing using a message enricher and a batch step filter

- Create a batch job that polls a database for records with a specific postal code
- Use a message enricher to check if a record already exists in Salesforce (an account with the same Name) and stores the result in a record variable and retains the original payload
- Add a second batch step with a filter that only allows new records (records that don't already exist in Salesforce) to be added to Salesforce
- Use a batch commit scope to commit records in batches



Summary

Summary

MuleSoft

- Use the For Each scope in a flow to process individual collection elements sequentially and return the original message
- Use the batch job element (EE only) for complex batch jobs
  - Created especially for processing data sets
  - It is not a flow, but another top level element
  - It also splits messages into individual records and performs actions upon each record
  - But it can also use record-level variables, handle record level failures, and report on job results
  - Can have multiple batch steps and these can have filters
- A batch job is triggered via a one-way, inbound endpoint in the optional input phase (often within in a poll) or a batch execute from another flow

Summary

MuleSoft

- The implicit **load and dispatch** phase splits the payload into a collection of records and creates a queue
- The **process** phase contains processors in one or more batch steps, which can have filters to restrict which messages are processed
  - Can use record-level variables to enrich, route, or otherwise act upon records
  - Can handle record level failures so the job is not aborted
- The **on complete** phase reports on the results for insight into which records were processed or failed
- Use the Message Enricher scope to run nested message processors that do not modify the original payload