Module 13: Processing records

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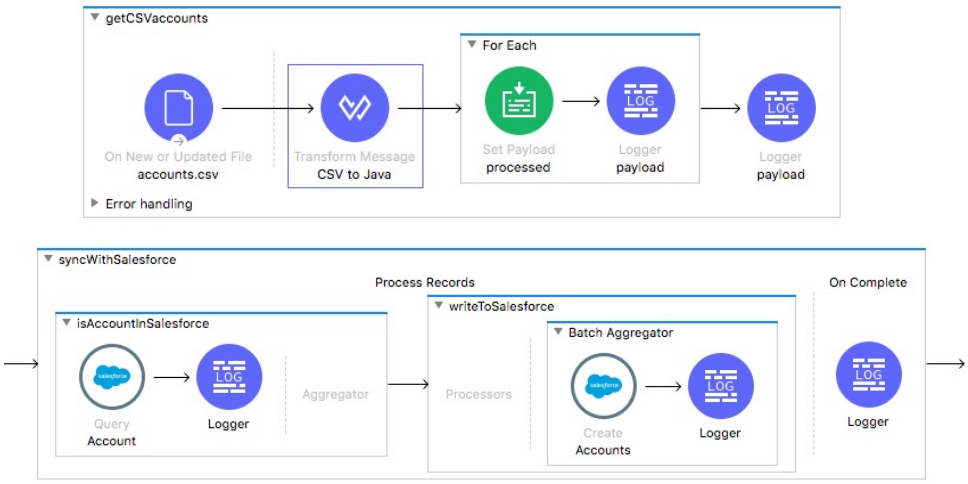
Goal



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

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- Process items in a collection using the For Each scope
- Process records using the Batch Job scope
- Use filtering and aggregation in a batch step

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Processing items in a collection with the For Each scope

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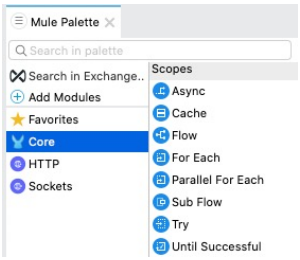
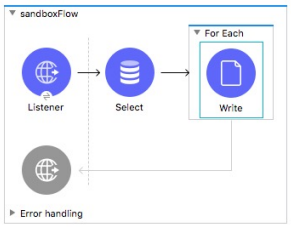
The For Each scope

- Splits a payload collection and processes the individual elements sequentially
  - Collection can be any supported content type, including application/json, application/java, or application/xml
- Returns the original payload
  - Regardless of any modifications made inside the scope
- Stops processing and invokes an error handler if one element throws an exception
- There is also a Parallel For Each scope
  - Same payload split but works in multiple parallel threads
  - Rather than return the original payload, outputs a collection of output messages from each iteration





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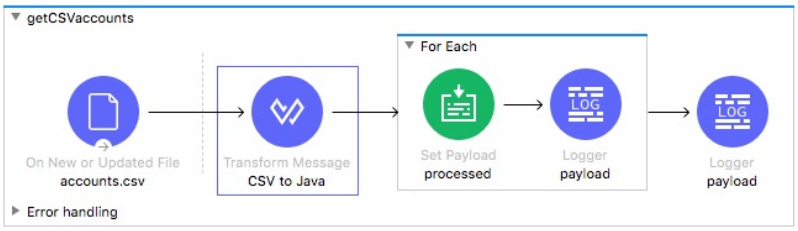
Walkthrough 13-1: Process items in a collection using the For Each scope

- Use the For Each scope element to process each item in a collection individually
- Change the value of an item inside the scope
- Examine the payload before, during, and after the scope
- Look at the thread used to process each item



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Processing records with the Batch Job scope

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The Batch Job scope

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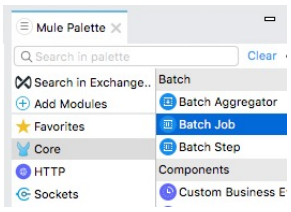
- Provides ability to split large messages into records that are processed asynchronously in a batch job



- Created especially for processing data sets
  - Splits large or streamed messages into individual records
  - Performs actions upon each record
  - Handles record level failures that occur so batch job is not aborted
  - Reports on the results
  - Potentially pushes the processed output to other systems or queues
- Enterprise edition only

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Example use cases

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- 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) info 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

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How a batch job works

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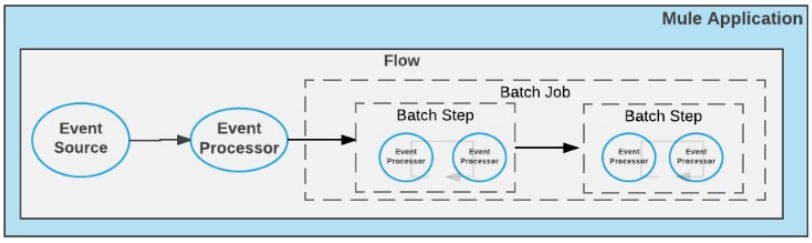
- A batch job contains one or more batch steps that act upon records as they move through the batch job



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A batch job contains three different phases

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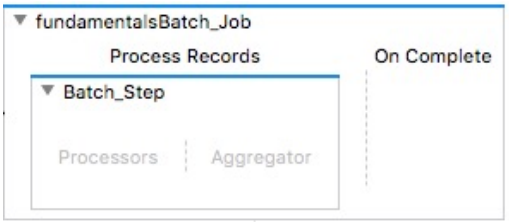
- **Load and dispatch** (implicit)
  - Performs "behind-the-scene" work
    - Splits payload into a collection of records
    - Creates a persistent queue and stores each record in it
- **Process** (required)
  - Asynchronously processes the records
  - Contains one or more batch steps
- **On complete** (optional)
  - Reports summary of records processed
  - Provides insight into which records failed so you can address issues



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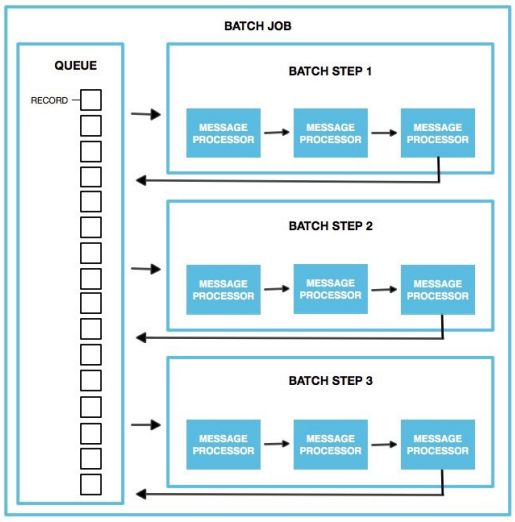
How record processing works

MuleSoft

- One queue exists
- Each record
  - Keeps track of what steps it has been processed through
  - Moves through the processors in the first batch step
  - Is sent back to the queue
  - Waits to be processed by the second step
- This repeats until each record has passed through every batch step
- **Note**: All records do not have to finish processing in one step before any of them are sent to the next step



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Batch job performance

- Batch records are queued and scheduled in blocks of 100
  - This lessens the amount of I/O requests and improves an operation's load
- The Mule runtime engine determines the number of threads to use per job
  - Thread pool size is auto-tuned based on CPU cores and memory
  - Each thread processes a block of 100 records
  - Each thread iterates through that block processing each record, and then each block is queued back and the process continues
- This configuration works for most use cases, but can be customized to improve batch's performance in certain use cases

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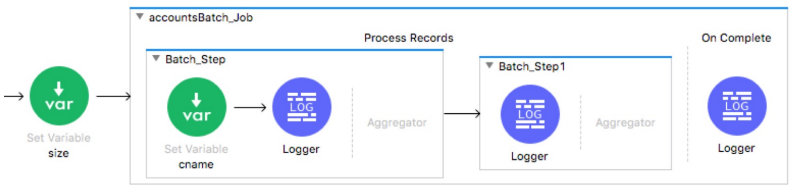
Variables in a batch job

- Variables created before a batch job are available in all batch steps
- Variables created inside a batch step are record-specific
  - Persist across all batch steps in the processing phase
  - Commonly used to capture whether or not a record already exists in a database



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Handling record-level errors during processing

- If a record fails to be processed by a processor in a batch step, there are three options
  - **Stop processing** the entire batch (default)
    - In-flight steps are finished, but all other steps are skipped and the on complete phase is invoked
  - **Continue processing** the batch
    - You need to specify how subsequent batch steps should handle failed records
      - To do this, use batch step filters that are covered in the next section
  - **Continue processing** the batch **until a max number** of failed records is reached
    - At that point, the on complete phase is invoked

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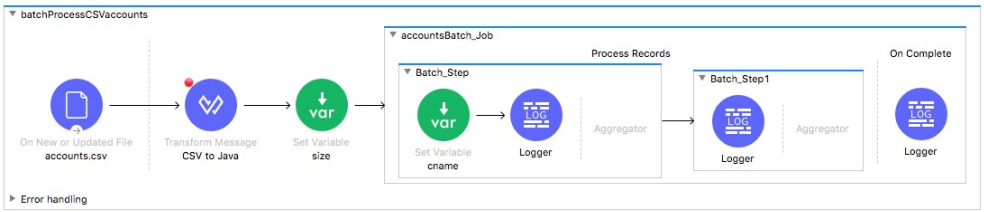
Walkthrough 13-2: Process records using the Batch Job scope

- Use the Batch Job scope to process items in a collection
- Examine the payload as it moves through the batch job
- Explore variable persistence across batch steps and phases
- Examine the payload that contains information about the job in the On Complete phase
- Look at the threads used to process the records in each step



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Using filtering and aggregation in a batch step

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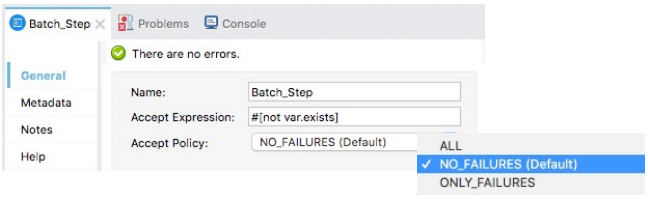
Using filters to specify when a batch step is executed

MuleSoft

- A batch step has two attributes to filter the records it processes
  - An accept expression
  - An accept policy



- Examples
  - Prevent a step from processing any records which failed processing in the preceding step
  - In one step, check and see if the record exists in some data store and then in the next only upload it to that data store if it does not exist

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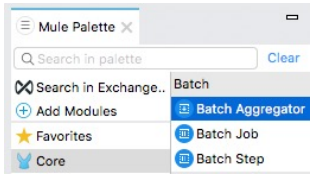
Aggregating records in a batch step for for bulk insert

- To accumulate records, use a **Batch Aggregator** scope inside the Aggregator section of a batch step
- For example, instead of using a separate API call to upsert each record to a service, upload them in a batch of 100



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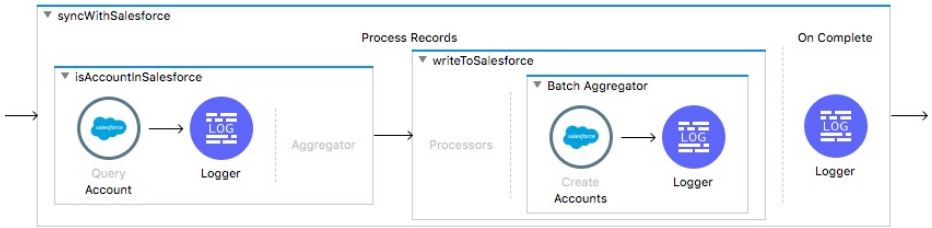
Walkthrough 13-3: Use filtering and aggregation in a batch step

- Use a batch job to synchronize database records to Salesforce
- In a first batch step, check to see if the record exists in Salesforce
- In a second batch step, add the record to Salesforce
- Use a batch step filter so the second batch step is only executed for specific records
- Use a Batch Aggregator scope to commit records in batches



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Summary

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Summary

MuleSoft

- Use the **For Each** scope to process individual collection elements sequentially and return the original payload
- Use the **Batch Job** scope (EE only) for complex batch jobs
  - Created especially for processing data sets
  - Splits messages into individual records and performs actions upon each record
  - Can have multiple batch steps and these can have filters
  - Record-level data is persisted across steps using variables
  - Can handle record level failures so the job is not aborted
  - The batch job returns an object with the results of the job for insight into which records were processed or failed

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