



Cúram 8.2.2

Tuning Batch Streaming Performance Guide

Note

Before using this information and the product it supports, read the information in [Notices on page 31](#)

Edition

This edition applies to Cúram 8.2.2.

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1 Tuning batch streaming performance

Use this information to learn how to improve performance and scalability of batch streaming and the caching of batch process data. Batch streaming allows for concurrent execution of multiple instances of batch processes. SPM batch processes use transaction level data caching. This can greatly reduce the volume of database transactions that are required for batch process execution.

1.1 Overview

This guide gives an overview of the application functionality which allows both caching of batch data and execution of multiple instances of a single batch process. These enhancements were designed to improve the efficiency and scalability of batch processing in Cúram.

Note that this guide should be read in conjunction with the *Cúram Batch Processing Guide*, which provides a description of all other aspects of Batch Processing.

Intended Audience

This guide is intended for people interested in batch process performance mechanisms in the application.

What Batch Performance Mechanisms does the application Provide?

Over and above good design and development paradigms, the application provides two primary mechanisms for improving the performance and scalability of Batch Processes:

- Batch Streaming
- Caching of Batch Process Data

Batch Streaming

Batch Streaming refers to the application support for the concurrent execution of multiple instances of batch processes. Each logical batch process in the application (for example, `GenerateInstructionLineItems`) is represented by two physical batch executables. The first, the 'Chunker', divides the record set to be processed into a number of subsets or 'chunks', based on a 'chunk size' parameter set via system properties. The second, the 'Stream', processes these chunks. The Stream processes each record in a chunk, commits the result, and then looks for another chunk to process. Multiple instances of the Stream can execute in parallel.

By utilizing this Batch Streaming mechanism, batch processes can employ all of the available processing power of their host machine(s). Ultimately, this allows for the processing of more records in a given time period than a single instance of a batch process would allow.

Caching of Batch Process Data

Cúram batch processes can also avail of transaction level data caching. Utilization of this mechanism can greatly reduce the volume of database I/O required for batch process execution. A

good example of the performance savings that this provides is when an error is encountered when processing a record, requiring it to be skipped or excluded. Caching of data in such situations (where processing effectively needs to restart without including a particular record) greatly improves operational efficiency.

Cúram Batch Processes using Batch Streaming

The above streaming and caching mechanisms are used in the processing of the following batch programs:

- Determine Product Delivery Eligibility
- Generate Instruction Line Items
- Generate Instruments
- CREOLE Bulk Case Chunk Reassessment By Product
- Apply Product Reassessment Strategy
- Perform Batch Recalculations From Precedent Change Set

Operation of Streamed Batch Processes

Batch Streaming introduces a number of operational considerations, including:

- Command-line execution of streamed batch processes
- Properties that are introduced by Batch Streaming
- Exception processing in streamed batch processes

1.2 Batch Streaming Architecture

This section describes the architecture underlying batch streaming in the application.

Overview

A simple overview of the architecture is included in the figure here. The mechanism is based on the concept of segmenting data to be processed into subsets or 'chunks'. Once segmented, an arbitrary number of batch processes then can operate in parallel on these chunks, performing identical processing on each constituent record in each chunk. In this way, with the appropriate configuration of the number and distribution of the batch processes, the use of resources used can be maximized in the most efficient manner for each process.

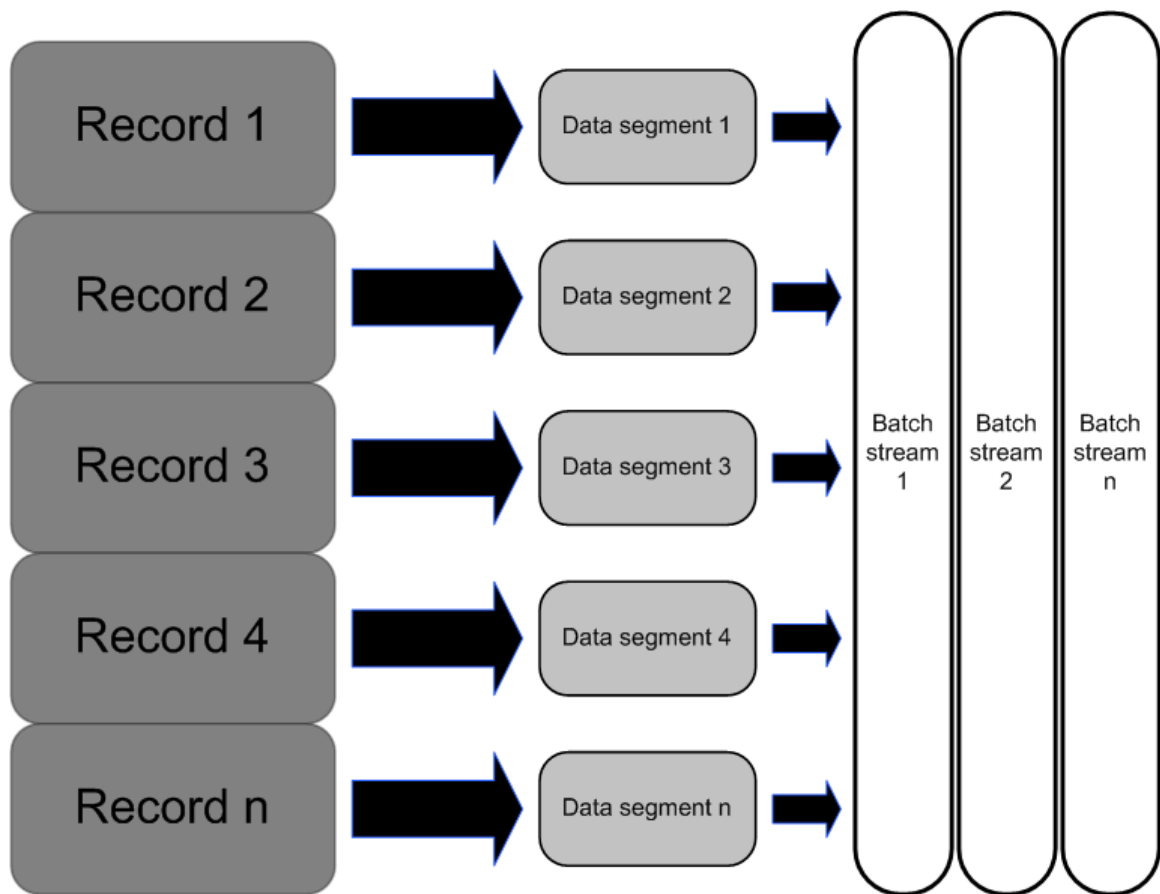


Figure 1: Streaming Architecture Overview

Architectural Details

As mentioned in the introduction, each logical Batch Process is composed of two physical batch executables: the 'Chunker' and the 'Stream'.

The Chunker

The 'Chunker' is the batch process executable which identifies the records to be processed. This process constructs 'chunks' of these records and writes them to the database, in effect assembling them in a queuing table called BatchProcessChunk. This table is populated at the beginning of batch processing, and each set of records to be processed is identified on this table by a chunk ID. Note that this assembly is transactional, and must succeed before any Streams can start their processing.

In addition to creating the chunks, the Chunker waits for all chunks to be processed by the Stream(s) and produces a summary report when they are all complete. In most cases only one instance of the Chunker is required for each batch process. Note that if the chunker fails after chunk assembly, it is possible to just restart it even if streaming has already commenced.

The Stream

The Stream is the batch process executable which performs the appropriate business functionality on each chunk. Each instance of a Stream operates on one chunk at a time, executing business processing on each record in the chunk in turn, and updating the chunk record with summary information once processing is complete. When complete, the records are marked as processed. If further chunks are available, processing starts again and the streams pick up another chunk.

Two important elements of this processing are as follows:

1. Each chunk is processed in a separate database transaction providing commit-point processing. This ensures that once a chunk is successfully processed, there will be no need to reprocess its constituent records if other chunks do not succeed for any reason.
2. Because processing of chunks is transactional, problem records can be excluded from the chunk during processing. For instance, if there is a lock contention during the processing of a chunk, one of the records may not be able to be processed at that point in time. In this instance, the work done by the chunk will be rolled back and the problem record removed. Processing of the chunk can then start again. Note that use of transaction level caching can greatly reduce the database I/O in this type of situation (see [1.3 Data Caching on page 15](#) for more details).

When all the chunks have been processed, a final search is done for any remaining unprocessed records. One final attempt is made to process these. These unprocessed chunks are processed serially. Streaming is not supported here to mitigate as far as possible against database contention and concurrency problems. This final search is optional, and is controlled by the 'chunkMainParameters' parameter of the runChunkMain method on the BatchStreamHelper in question.

When this process is completed, a notification containing the details of those records processed and those not processed is sent. The recipient of this notification is defined by appropriate coding of the sendBatchReport method of the chunker batch process.

Note: No differentiation is made by the Batch Streaming environment between records remaining unprocessed because of technical issues, and those which were skipped for business reasons by the batch process. It will be left up to the batch administrator or user to examine all outputs to determine any cause of failures.

Additional Information

A more detailed diagram of the batch streaming architecture is included below. Two additional elements are of note here:

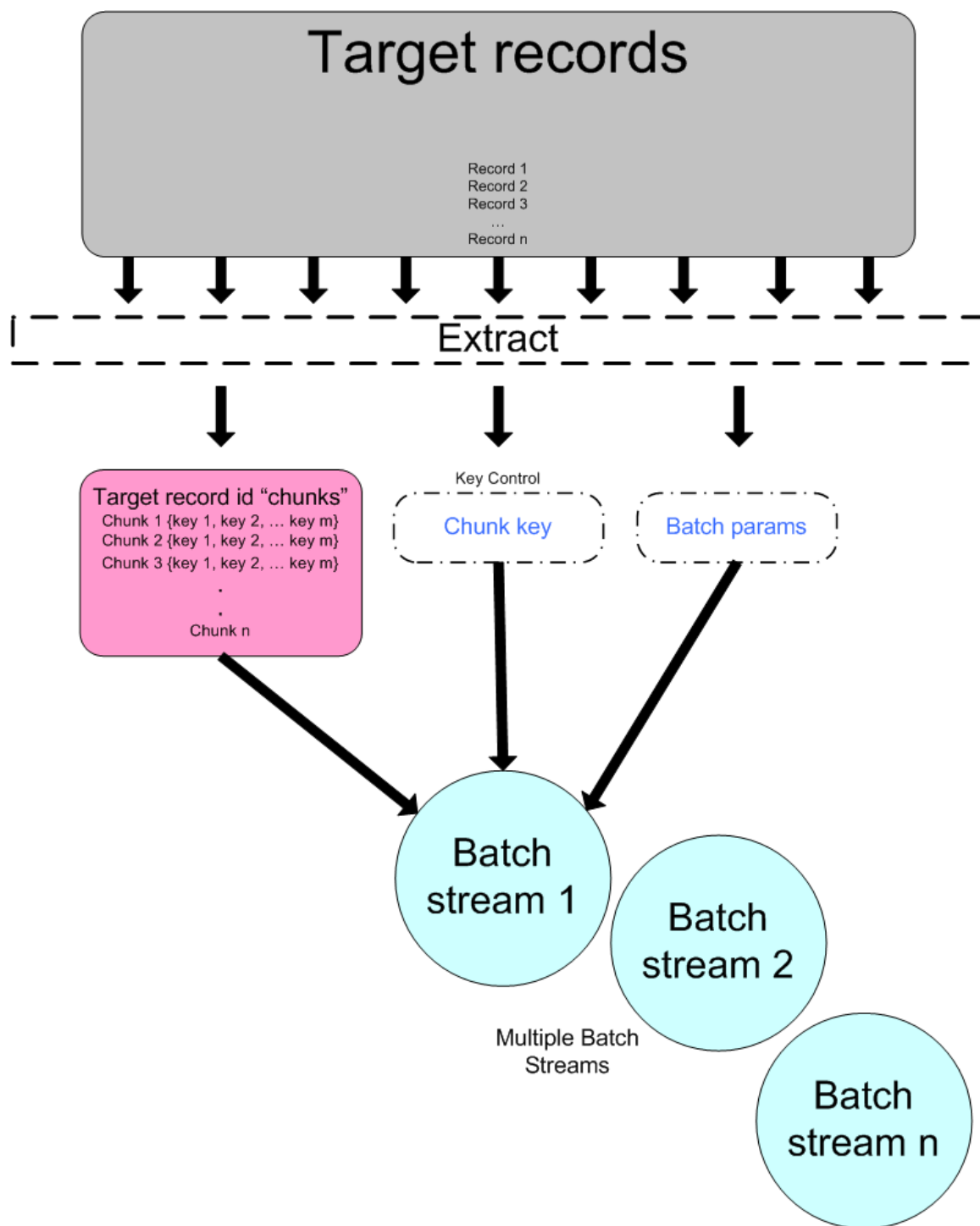
1. Chunk Key

This table (called BatchChunkKey) is essentially used as a key server, allowing chunks to be "served" up to individual streams without creating contention on the chunk table itself. It is also worth noting that the value of the next key available can be examined to determine the progress of the batch program.

2. Batch params

The details of the parameters passed into the Chunker batch process are stored to make them available to each stream without being re-entered. This table, called BatchProcess, also contains the total number of chunks written, along with some other information about the Batch Process.

Note: The batch streaming architecture also supports the dynamic addition of streams while the batch process is being run, subject to the appropriate hardware being available to execute them.



1.3 Data Caching

The second batch performance mechanism provided by the application addresses the issue of database I/O contention. Improvements to database I/O in batch processing are always worth making, especially as batch windows reduce and the case and client loads increase. To this end a number of in-memory caches have been introduced for core entities which are available for re-use by Cúram batch processes.

Note that data which is accessed repeatedly during the eligibility processing is not limited to that stored in core Cúram entities. As a result, consideration should be given by customers to the caching of custom entities (for example, evidence) which are accessed as part of this process.

It is also worth noting that these caches have been constructed so that they cannot be used in on-line mode. When on-line, because the application server is in control of the thread scheduling, the consistency between the cached data and that on the database cannot be guaranteed.

Core Entity Caches

Caches are implemented for the following core entities:

- CaseEvidenceTree

This entity is one of the constituents of the Case Evidence Tree evidence maintenance solution. The caching of this entity is incorporated into the CaseEvidenceAPI class and does not need to be accessed directly.

- CaseEvidenceGroupLink

This entity is one of the constituents of the Case Evidence Tree evidence maintenance solution. The caching of this entity is incorporated into the CaseEvidenceAPI class and does not need to be accessed directly.

- AttributedEvidence

This entity is part of the Evidence maintenance solution. The caching of this entity is incorporated into the Evidence Controller class and does not need to be accessed directly.

- CaseHeader

This stand-alone cache is implemented in the CachedCaseHeader class. Referencing this class rather than the CaseHeader entity directly allows your processing take advantage of this cache.

- ConcernRole

This stand-alone cache is implemented in the CachedConcernRole class. Referencing this class rather than the ConcernRole entity directly allows your processing take advantage of this cache.

- CaseNomineeProdDelPattern

This stand-alone cache is implemented in the CachedCaseNomineeProdDelPattern class. Referencing this class rather than the CaseNomineeProdDelPattern entity directly allows your processing take advantage of this cache.

- CaseParticipantRole

This stand-alone cache is implemented in the `CachedCaseParticipantRole` class. Referencing this class rather than the `CaseParticipantRole` entity directly allows your processing take advantage of this cache.

- `CaseRelationship`

This stand-alone cache is implemented in the `CachedCaseRelationship` class. Referencing this class rather than the `CaseRelationship` entity directly allows your processing take advantage of this cache.

- `CaseStatus`

This stand-alone cache is implemented in the `CachedCaseStatus` class. Referencing this class rather than the `CaseStatus` entity directly allows your processing take advantage of this cache.

- `ConcernRoleRelationship`

This stand-alone cache is implemented in the `CachedConcernRoleRelationship` class. Referencing this class rather than the `ConcernRoleRelationship` entity directly allows your processing take advantage of this cache.

- `FinancialCalendar`

This stand-alone cache is implemented in the `CachedFinancialCalendar` class. Referencing this class rather than the `FinancialCalendar` entity directly allows your processing take advantage of this cache.

- `Person`

This stand-alone cache is implemented in the `CachedPerson` class. Referencing this class rather than the `Person` entity directly allows your processing take advantage of this cache.

- `Product`

This stand-alone cache is implemented in the `CachedProduct` class. Referencing this class rather than the `Product` entity directly allows your processing take advantage of this cache.

- `ProductDelivery`

This stand-alone cache is implemented in the `CachedProductDelivery` class. Referencing this class rather than the `ProductDelivery` entity directly allows your processing take advantage of this cache.

- `ProductDeliveryCertDiary`

This stand-alone cache is implemented in the `CachedProductDeliveryCertDiary` class. Referencing this class rather than the `ProductDeliveryCertDiary` entity directly allows your processing take advantage of this cache.

- `ProductDeliveryPattern`

This stand-alone cache is implemented in the `CachedProductDeliveryPattern` class. Referencing this class rather than the `ProductDeliveryPattern` entity directly allows your processing take advantage of this cache.

- `ProductDeliveryPatternInfo`

This stand-alone cache is implemented in the `CachedProductDeliveryPatternInfo` class. Referencing this class rather than the `ProductDeliveryPatternInfo` entity directly allows your processing take advantage of this cache.

- `ProductRulesLink`

This stand-alone cache is implemented in the `CachedProductRulesLink` class. Referencing this class rather than the `ProductRulesLink` entity directly allows your processing take advantage of this cache.

- `ProviderLocation`

This stand-alone cache is implemented in the `CachedProviderLocation` class. Referencing this class rather than the `ProviderLocation` entity directly allows your processing take advantage of this cache.

- `RateTable`

This cache is incorporated into the `RateTable` service layer class and does not need to be accessed directly.

- `SupplierReturnHeader`

This stand-alone cache is implemented in the `CachedSupplierReturnHeader` class. Referencing this class rather than the `SupplierReturnHeader` entity directly allows your processing take advantage of this cache.

1.4 Batch Processes using Streaming

This section describes the Core batch processes which implement streaming and caching, together with their operational characteristics. Each process has been provided as two executables.

DetermineProductDeliveryEligibility

This batch process takes "Approved" cases and runs the determine eligibility process.

Two batch executables are provided for this batch process:

- `DetermineProductDeliveryEligibility`

This executable is the Chunker for this process. It identifies all cases which are "Approved" and writes their caseIDs to the chunks. This process also accepts a product identifier as an optional input parameter, which is used to limit the cases selected to those which are instances of a particular product.

- `DetermineProductDeliveryEligibilityStream`

This program is the Stream for this process. It runs the determine eligibility process for each case and stores the results on the database.

GenerateInstructionLineItems

This batch program takes Financial Components due to be processed, reassesses the case for the period to be paid and generates the appropriate Instruction Line Item records.

Two batch executables are provided for this program:

- `GenerateInstructionLineItems`

This executable is the Chunker for this process. It identifies all cases with Financial Components due to be processed and writes their caseIDs to the chunks. This process also accepts a set of optional input parameters, a 'from' date, a 'to' date and a delivery method, which are used to limit the cases selected to be processed.

- GenerateInstructionLineItemsStream

This program is the Stream for this process. It runs the determine eligibility process for the period to be paid for each case and generates all relevant Instruction Line Items.

GenerateInstruments

This batch program takes Instruction Line Items due to be processed and generates Payment Instrument records.

Two batch executables are provided for this program:

- GenerateInstruments

This executable is the Chunker for this process. It identifies all nominees with Instruction Line Items due to be processed and writes their nomineeIDs to the chunks.

- GenerateInstrumentsStream

This program is the Stream for this process. It generates Payment Instruments for each nominee.

CREOLEBulkCaseChunkReassessmentByProduct

This batch process takes "Active" CER cases and runs the case reassessment process on them.

Two batch executables are provided for this batch process:

Important: As this process will cause reassessment of all cases of the specified type, it may cause a lot of unnecessary reassessments. Where appropriate, a new batch process should be written in order to more precisely identify the cases that require reassessment, especially when the cases are spread across a range of products. For a full explanation of how to write an appropriate batch process see the *Inside Cúram Eligibility and Entitlement Using Cúram Express Rules* guide.

- CREOLEBulkCaseChunkReassessmentByProduct

This executable is the Chunker for the bulk case reassessment process. It identifies all cases which are “Active” and writes their caseIDs to the chunks. The bulk case reassessment also accepts a product identifier as an optional input parameter, which is used to limit the cases selected to those which are instances of a particular product.

- CREOLEBulkCaseChunkReassessmentStream

This program is the Stream for the bulk case reassessment process. It runs the case reassessment process for each case and, if the determination has changed, it stores the new determination and supersedes the previous one.

ApplyProductReassessmentStrategy

This batch process checks all the cases for a CER-based product whose reassessment strategy has changed.

- `ApplyProductReassessmentStrategy`

This executable is the Chunker for the Apply Product Reassessment Strategy process. It takes a product ID as input, and for that product identifies all product delivery cases and writes their caseIDs to the chunks.

- `ApplyProductReassessmentStrategyStream`

This program is the Stream for the Apply Product Reassessment Strategy process. For each product delivery case, the program checks to see if the case's support for reassessment has changed due to the change in the product's reassessment strategy.

For each product delivery case for the product:

- if the case was not reassessable under the old strategy but becomes reassessable under the new strategy, then an assessment is performed on the case to build up the dependency records for the case's determination result;
- if the case was reassessable under the old strategy but is no longer reassessable under the new strategy, then the dependency records for the determination result are removed;
- otherwise no action is performed on the case.

See the *Inside Cúram Eligibility and Entitlement Using Cúram Express Rules* guide for more detail.

Perform Batch Recalculations From Precedent Change Set batch process

The `PerformBatchRecalculationsFromPrecedentChangeSet` batch process analyzes a set of changes to precedent data and recalculates all dependents that are potentially affected by any of those precedent changes.

- `PerformBatchRecalculationsFromPrecedentChangeSet`

This executable is the Chunker for the Perform Batch Recalculations From Precedent Change Set process. It takes a dependent type as input, examines the most-recent precedent change set submitted for batch processing, identifies the unique set of dependents (for the type input) potentially affected by any of the precedent change items in the submitted precedent change set, and writes their dependent IDs to the chunks.

- `PerformBatchRecalculationsFromPrecedentChangeSetStream`

This program is the Stream for the Perform Batch Recalculations From Precedent Change Set. For each dependent identified, the dependent is recalculated in a manner appropriate to its type, for example, if the dependent identifies a CER-based case, the case is reassessed.

For full details on this batch process, see "The Dependency Manager" in the *Cúram Express Rules Reference Guide*.

RedetermineTranslator

This batch process checks all open cases for which a particular user is assigned as the case owner and compares the preferred language of each case participant in the case against the language skill of the user, and then updates the translator required indicator for the case participant if necessary. It is used to perform automatic redetermine translator processing when a change to the language skill of a user is made and the change will affect large volumes of cases.

The application property, `curam.cases.maxnocases.onlineautotranslatorredetermination`, is used to control whether automatic redetermination of translator requirements occurs in batch mode or in online mode. If the number of open cases that require processing exceeds this value, redetermination will not occur in online mode and this batch process must instead be executed. Two batch executables are provided for this program:

- **RedetermineTranslator**

This executable is the Chunker for the redetermine translator process. It takes a user name as input, and for that user name identifies all the non closed cases and writes their caseIDs to the chunks.

- **RedetermineTranslatorStream**

This program is the stream for the redetermine translator process. For each case, the program compares the preferred language of each case participant in the case against the language skill of the user, and then updates the translator required indicator for the case participant if necessary.

1.5 Operation of Streamed Batch Processes

This section details various operational considerations which apply when deploying the streamed batch processes in the application. Note that similar considerations should also apply to customer-written streamed batch processes.

Running Batch Executables

To launch the batch executables on a machine the following command can be used:

```
ant -f app_batchlauncher.xml -Dbatch.username=superuser -  
Dbatch.program=<method name>
```

Where the method name is the appropriate one from the list here:

Table 1: Method Names for batch executables

Executable	Method Name
DetermineProductDeliveryEligibility	<code>curam.core.intf.DetermineProductDeliveryEligibility.process</code>
DetermineProductDeliveryEligibilityStream	<code>curam.core.intf.DetermineProductDeliveryEligibilityStream.process</code>
GenerateInstructionLineItems	<code>curam.core.intf.GenerateInstructionLineItems.processAllFinancialComponentsDue</code>
GenerateInstructionLineItemsStream	<code>curam.core.intf.GenerateInstructionLineItemsStream.process</code>
GenerateInstruments	<code>curam.core.intf.GenerateInstruments.processInstructionLineItemsDue</code>
GenerateInstrumentsStream	<code>curam.core.intf.GenerateInstrumentsStream.process</code>
CREOLEBulkCaseChunkReassessment ByProduct	<code>curam.core.sl.infrastructure.assessment.intf.CREOLEBulkCaseChunkReassessmentByProduct.process</code>
CREOLEBulkCaseChunk ReassessmentStream	<code>curam.core.sl.infrastructure.assessment.intf.CREOLEBulkCaseChunkReassessmentStream.process</code>
ApplyProductReassessmentStrategy	<code>curam.core.sl.infrastructure.assessment.intf.ApplyProductReassessmentStrategy.process</code>
ApplyProductReassessmentStrategyStream	<code>curam.core.sl.infrastructure.assessment.intf.ApplyProductReassessmentStrategyStream.process</code>
PerformBatchRecalculationsFromPrecedent ChangeSet	<code>curam.dependency.intf.PerformBatchRecalculationsFromPrecedentChangeSet.process</code>
PerformBatchRecalculationsFromPrecedent ChangeSetStream	<code>curam.dependency.intf.PerformBatchRecalculationsFromPrecedentChangeSetStream.process</code>

So for example to run the DetermineProductDeliveryEligibilityStream process the command would be:

```
ant -f app_batchlauncher.xml -Dbatch.username=superuser -Dbatch.program=curam.core
.intf.DetermineProductDeliveryEligibilityStream.process
```

Note that it is possible to use the BatchLauncher to run the batch executables; however, the queued processes is run sequentially.

Environment variables

The environment variables listed here control the operation of the various batch performance mechanisms described in the previous sections. It is important to note that while the tuning of these parameters is key to achieving the best performance when running batch processes, it is also possible to compromise their performance by incorrect tuning of these parameters. It is therefore advised that the impact of changes to each parameter be assessed individually to ensure that it has the expected affect on performance.

General Batch streaming

The following environment variables control the generic batch streaming infrastructure behavior:

- curam.batch.streams.batchprocessreadwaitinterval

The interval (in milliseconds) for which a batch stream will wait before retrying when reading the BatchProcess table.

When a stream starts up, it will search for a BatchProcess record for this type of batch, which will not yet be available if the chunker has not yet finished writing chunks.

Starting up many streamers before starting up the chunker may result in contention on the BatchProcess and/or BatchProcessChunk tables. Increasing the value of this parameter will help mitigate this contention.

- curam.batch.streams.chunkkeyreadwaitinterval

The interval (in milliseconds) for which a batch stream will wait before retrying when reading the BatchChunkKey table.

If you use a high number of streamers and have small chunks which complete quickly, this may result in contention on the BatchChunkKey table as each streamer tries to lock and update the same record on this table frequently.

This can be mitigated by increasing the value of this parameter, or by using larger chunk sizes.

- curam.batch.streams.scanforunprocessedchunksinterval

The first interval (in milliseconds) for which the main batch process (chunker) will wait before trying to scan for unprocessed chunks, once the value in the chunk key table has exceeded the number of chunks.

Note that this particular wait will be performed once, after which the chunker will enter a loop which will repeatedly attempt to lock all unprocessed chunks in the BatchProcessChunk table. The period of that loop can be different for each chunked batch program and is determined by the '*.unprocessedchunkwaitinterval' property below.

- *.unprocessedchunkwaitinterval

Each chunked batch program supports a '.unprocessedchunkwaitinterval' parameter. Eg:

- curam.batch.creolebulkcasechunkreassessment.unprocessedchunkwaitinterval
- curam.batch.generateinstructionlineitems.unprocessedchunkwaitinterval
- curam.batch.performbatchrecalculationsfromprecedentchangeset.unprocessedchunkwaitinterval

Once all chunks have been consumed by streamer(s) and the interval specified by 'curam.batch.streams.scanforunprocessedchunksinterval' has elapsed, the chunker will attempt to lock all unprocessed chunks in the BatchProcessChunk table to conclude the batch job.

If one or more streamers is still processing a chunk, the chunker will be unable to lock the chunk(s) being processed and a record-locked status will be returned.

The chunker will loop and continue to try to lock the chunk(s) until the chunks can be locked.

The period of this loop is specified in milliseconds by the '.unprocessedchunkwaitinterval' parameter and defaults to 1000 milliseconds.

(This is in addition to the length of time for the database to return a lock timeout status for the search. For example, for DB2 this is specified by the database parameter LOCKTIMEOUT.)

Once the chunker has obtained locks on all unprocessed chunks, it means that all streamers have completed and exited, at which point the chunker can reattempt to process any unprocessed chunks and then conclude the batch job by producing the batch report, deleting the chunk records and then exiting.

- curam.batch.chunker.recordinsertdeletecommitsize

By default chunked batch programs use a single transaction to insert the chunk records at the start, and another single transaction to delete them at the end. For batch jobs with very large numbers of chunks, these large transactions can consume excessive transaction log space in the database. This property enables a maximum number of chunk records to be specified per transaction at the start and end of a chunked batch run. If the number of chunks available exceeds this value, the insert and deletes will be executed in a series of smaller transactions. Default value : 10000000 .

General Caching

The following environment variables control generic caching behavior:

- curam.batch.caching.buffersize

Batch process caches using circular buffers will use this value to set the initial buffer size.

Relationship between caching and chunk size

For certain chunked batch jobs, especially those which execute reassessments, increasing the chunk size may increase the memory demand of the streamer. This can prevent larger chunk sizes from being utilized. Part of this memory demand is caused by two transaction-level caches, the SQL Query cache and Persistence Infrastructure cache (PI cache), whose sizes increase over the duration of a chunk.

To mitigate this memory demand it is possible to enable either or both of these transaction-level caches to be cleared at the end of processing each case in the chunk instead of waiting for the end of the chunk, thereby stopping the memory demand from increasing proportionally to the size of the chunk.

The property name takes the following format:

- *curam.batch.streams.cache.clear.mode.<instanceID>*

where <instanceID> identifies a type of chunked batch program. Valid values of <instanceID> can be found in the code table `Batch Process Chunk Name`.

Valid values for this property are as follows:

0. Cache clearing off - the transaction-level caches will only be cleared at the end of the chunk. This is the default value.
1. Clear the PI cache at the end of processing each case.
2. Clear SQL Query cache at the end of processing each case.
3. Clear both caches at the end of processing each case.

Example 1:

To clear both caches per case for 'CREOLE Bulk Case Chunk Reassessment by Product':
curam.batch.streams.cache.clear.mode.BPN6=3

Example 2:

To clear only the PI cache per case for 'Generate Instruction Line Items':
curam.batch.streams.cache.clear.mode.BPN1=1.

As with all caches, there is a trade-off between memory usage and fetching data from the database. Although clearing a cache more frequently will lessen the memory demand, it will also require some data to be reloaded more frequently. The overall gain or loss will be dependent on the content of the data being processed.

Caching CER rates per transaction / chunk

By default, CER rates are included in the PI cache for the duration of a transaction / chunk. If the PI cache gets cleared at the end of each case during a chunk, rates must be re-read from the database more often. To mitigate the performance overhead in re-reading CER rates during a transaction, a separate transaction-level cache for CER rates can be enabled by setting application property *curam.cache.cer.rate* to True.

Determine Product Delivery Eligibility

The following environment variables control the behavior of the Determine Product Delivery Eligibility program:

- *curam.batch.determineproductdeliveryeligibility.chunksize*
The number of cases in each chunk that will be processed by the Determine Product Delivery Eligibility batch program.
- *curam.batch.determineproductdeliveryeligibility.dontrunstream*

Indicates whether the Determine Product Delivery Eligibility batch program should sleep while waiting for processing to be completed.

- `curam.batch.determineproductdeliveryeligibility.chunkkeywaitinterval`

The interval (in milliseconds) for which the Determine Product Delivery Eligibility batch program will wait before retrying when reading the chunk key table.

- `curam.batch.determineproductdeliveryeligibility.unprocessedchunkwaitinterval`

The interval (in milliseconds) for which the Determine Product Delivery Eligibility batch program will wait before retrying when reading the chunk table.

- `curam.batch.determineproductdeliveryeligibility.processunprocessedchunk`

Indicates whether the Determine Product Delivery Eligibility program should attempt to process any unprocessed chunks found after all the streams have completed.

Generate Instruction Line Items

The following environment variables control the behavior of the Generate Instruction Line Items process:

- `curam.batch.generateinstructionlineitems.chunksize`

The number of cases in each chunk that will be processed by the Generate Instruction Line Items batch process.

- `curam.batch.generateinstructionlineitems.dontrunstream`

Indicates whether the Generate Instruction Line Items batch program should sleep while waiting for the processing to be completed.

- `curam.batch.generateinstructionlineitems.chunkkeywaitinterval`

The interval (in milliseconds) for which the Generate Instruction Line Items batch process will wait before retrying when reading the chunk key table.

- `curam.batch.generateinstructionlineitems.unprocessedchunkwaitinterval`

The interval (in milliseconds) for which the Generate Instruction Line Items batch process will wait before retrying when reading the chunk table.

- `curam.batch.generateinstructionlineitems.processunprocessedchunk`

Indicates whether the Generate Instruction Line Items program should attempt to process any unprocessed chunks found after all the streams have completed.

- `curam.batch.generateinstructionlineitems.dontreassesscase`

Indicates whether the Generate Instruction Line Items program should skip reassessment of the case prior to payment.

Generate Instruments

The following environment variables control the behavior of the Generate Instruments process:

- `curam.batch.generateinstruments.chunksize`

The number of cases in each chunk that will be processed by the Generate Instruments batch process.

- `curam.batch.generateinstruments.dontrunstream`

Indicates whether the Generate Instruments batch process should sleep while waiting for the processing to be completed.

- `curam.batch.generateinstruments.chunkkeywaitinterval`

The interval (in milliseconds) for which the Generate Instruments batch process will wait before retrying when reading the chunk key table.

- `curam.batch.generateinstruments.unprocessedchunkwaitinterval`

The interval (in milliseconds) for which the Generate Instruments batch process will wait before retrying when reading the chunk table.

- `curam.batch.generateinstruments.processunprocessedchunk`

Indicates whether the Generate Instruments program should attempt to process any unprocessed chunks found after all the streams have completed.

CREOLE Bulk Case Chunk Reassessment By Product

The following environment variables control the behavior of the CREOLE Bulk Case Chunk Reassessment By Product program, and its associated Stream process (CREOLE Bulk Case Chunk Reassessment Stream):

- `curam.batch.creolebulkcasechunkreassessment.chunksize`

The number of cases in each chunk that will be processed by the CREOLE Bulk Case Chunk Reassessment Stream program.

- `curam.batch.creolebulkcasechunkreassessment.dontrunstream`

Indicates whether the CREOLE Bulk Case Chunk Reassessment By Product batch program should sleep while waiting for processing to be completed.

- `curam.batch.creolebulkcasechunkreassessment.chunkkeywaitinterval`

The interval (in milliseconds) for which the CREOLE Bulk Case Chunk Reassessment By Product batch program will wait before retrying when reading the chunk key table.

- `curam.batch.creolebulkcasechunkreassessment.unprocessedchunkwaitinterval`

The interval (in milliseconds) for which the CREOLE Bulk Case Chunk Reassessment By Product batch program will wait before retrying when reading the chunk table for unprocessed chunks.

- `curam.batch.creolebulkcasechunkreassessment.processunprocessedchunk`

Indicates whether the CREOLE Bulk Case Chunk Reassessment By Product program should attempt to process any unprocessed chunks found after all the streams have completed.

Apply Product Reassessment Strategy

The following environment variables control the behavior of the Apply Product Reassessment Strategy program, and its associated Stream process (Apply Product Reassessment Strategy Stream):

- `curam.batch.applyproductreassessmentstrategy.chunksize`

The number of cases in each chunk that will be processed by the Apply Product Reassessment Strategy batch program.

- `curam.batch.applyproductreassessmentstrategy.dontrunstream`

Indicates whether the Apply Product Reassessment Strategy batch program should sleep while waiting for the processing to be completed (rather than run a stream in its context)

- `curam.batch.applyproductreassessmentstrategy.chunkkeywaitinterval`

The interval (in milliseconds) for which the Apply Product Reassessment Strategy batch program will wait before retrying when reading the chunk key table.

- `curam.batch.applyproductreassessmentstrategy.unprocessedchunkwaitinterval`

The interval (in milliseconds) for which the Apply Product Reassessment Strategy batch program will wait before retrying when reading the chunk table for unprocessed chunks.

- `curam.batch.applyproductreassessmentstrategy.processunprocessedchunk`

Indicates whether the Apply Product Reassessment Strategy program should process any unprocessed chunks found after all the streams have completed.

Perform Batch Recalculations From Precedent Change Set

The following environment variables control the behavior of the Perform Batch Recalculations From Precedent Change Set program, and its associated Stream process (Perform Batch Recalculations From Precedent Change Set Stream):

- `curam.batch.performbatchrecalculationsfromprecedentchangeset.chunksize`

The number of dependents in each chunk that will be processed by the Perform Batch Recalculations From Precedent Change Set batch program.

- `curam.batch.performbatchrecalculationsfromprecedentchangeset.dontrunstream`

Indicates whether the Perform Batch Recalculations From Precedent Change Set batch program should sleep while waiting for the processing to be completed (rather than run a stream in its context)

- `curam.batch.performbatchrecalculationsfromprecedentchangeset.chunkkeywaitinterval`

The interval (in milliseconds) for which the Perform Batch Recalculations From Precedent Change Set batch program will wait before retrying when reading the chunk key table.

- `curam.batch.performbatchrecalculationsfromprecedentchangeset.unprocessedchunkwaitinterval`

The interval (in milliseconds) for which the Perform Batch Recalculations From Precedent Change Set batch program will wait before retrying when reading the chunk table for unprocessed chunks.

- `curam.batch.performbatchrecalculationsfromprecedentchangeset.processunprocessedchunk`

Indicates whether the Perform Batch Recalculations From Precedent Change Set program should process any unprocessed chunks found after all the streams have completed.

Environment variables for the RedetermineTranslator Program

The following environment variables control the behavior of the RedetermineTranslator Program:

- `curam.cases.maxnocases.onlineautotranslatortermination`

Used to control whether automatic redetermination of translator requirements will occur in batch mode versus online mode when a user skill language is created or cancelled. If the number of affected cases exceeds this number, the cases will be updated by the Redetermine Translator batch program otherwise they will be updated online.

- `curam.batch.redeterminetranslator.chunksize`

The number of cases in each chunk which will be processed by the Redetermine Translator batch program.

- `curam.batch.redeterminetranslator.dontrunstream`

Indicates if the Redetermine Translator batch program should sleep while waiting for the processing to be completed (rather than run a stream in its context).

- `curam.batch.redeterminetranslator.chunkkeywaitinterval`

The interval (in milliseconds) for which the Redetermine Translator batch program will wait before retrying when reading the chunk key table.

- `curam.batch.redeterminetranslator.unprocessedchunkwaitinterval`

The interval (in milliseconds) for which the Redetermine Translator batch program will wait before retrying when reading the chunk table.

- `curam.batch.redeterminetranslator.processunprocessedchunk`

Indicates if the Redetermine Translator batch program should process any unprocessed chunks found after all the streams have completed.

- `curam.workflow.genredetermineetranslatorfailureticket`

Indicates whether a notification task should be created for the case owner if an error occurs when attempting to re-determine a translator for the case participant.

Error handling

Two key types of errors can occur when running the streamed batch programs:

- Skipped chunks

These are reported when the batch process completes, together with an estimate of the total number of records which might have been affected. Re-running the batch process processes these chunks correctly, unless some unrecoverable error is occurring during the batch processing. Note that skipped chunks are a relatively rare phenomenon; skipped records are far more likely.

- Skipped records

These are also reported when the batch program completes, and entries are added to the log files for the stream(s), which encountered the errors, detailing the error that occurred and the stack trace. There are two possible scenarios for this:

1. Some business error was encountered processing the record

The status of the record is changed to remove it from the set of records to be processed and a task is created for the business owner. This takes the form of suspending the case and sending a task to the case owner.

2. Some technical error was encountered processing the record

The status of the record is not changed by this event. The log file(s) can be examined to determine the problem, and the batch process rerun to process these records, after the issue is resolved.

Monitoring And Reporting

For a long running chunked batch program, it is useful to monitor how quickly and efficiently the batch is progressing. The following fields in the table `BatchProcessChunk` provide a central location to assist an administrator to monitor the progress and overall health of the chunked batch job:

Field Name	Description
<code>creationTime</code>	Timestamp when the chunk was created.
<code>modificationTime</code>	Timestamp when chunk was updated - this is effectively the chunk completion time.
<code>processingDuration</code>	The number of milliseconds taken to process this chunk.
<code>processID</code>	The operation system process ID of the streamer instance which finished this chunk.
<code>streamerID</code>	A integer unique identifier value for the streamer instance which finished this chunk.
<code>chunkKeyObtainTime</code>	The number of milliseconds taken to obtain the batch chunk key for this chunk. Obtaining a chunk key involves reading, updating and committing a single record and therefore should be fast. High values here indicate contention on the <code>BatchChunkKey</code> table.
<code>chunkKeyRetries</code>	The number of retries required to obtain the batch chunk key for this chunk. Ideally no retries should be required to obtain a chunk key. A high number of retries indicates contention on the <code>BatchChunkKey</code> table possibly due to too many batch streamer instances or too small a chunk size.
<code>recordsSkipped</code>	The number of records which were skipped when processing this chunk.

Uses for these statistics include:

- To determine whether it is taking excessive time to create the chunk records
- To project the completion time of the batch run
- To determine whether the number of skipped records is abnormal
- To determine that all streamer instances are processing chunks at a normal rate
- To determine if there is excessive contention obtaining chunk keys

The records from `BatchProcessChunk` are cleaned up at the end of each batch run but by setting application property `curam.batch.streams.writechunkerlogfile` to 'True' a tab-delimited text file containing the above statistics will be written to disk. The file is suitable for importing or pasting into a spreadsheet for analysis at a later stage.

The file will be written to the same directory as the other batch output files, by default '`EJBServer/buildlogs`' and with a name of the form:

`BatchChunkReport_<instanceID>_<chunkSize>_YYYYMMDD_HHMMSS.dat`

where

- `<instanceID>` identifies a type of chunked batch program
- `<chunkSize>` was the chunk size which was used for that batch run

- YYYYMMDD_HHMMSS represents the time at which the report was generated.

Eg:

BatchChunkReport_BPN6_500_20241020_100958.dat

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