Batch Server Administration Guide

Oracle Utilities Meter Data Management,
Version 2.0.1 (OUAF 4.0.2)

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Batch Server Administration Guide, Oracle Utilities Meter Data Management, Version 2.0.1 (OUAF 4.0.2)

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Preface

Introduction

Welcome to the Oracle Utilities Meter Data Management Batch Server Administration Guide. This guide outlines the concepts applicable to operating and configuration of the batch component of the product on its platforms in association with the operations and configuration steps outlined in the Oracle Utilities Meter Data Management Server Administration Guide. It is highly recommended that readers of this guide familiarize themselves with that guide before reading this guide.

Note: All examples and screen captures are used for publishing purposes only and may vary from the actual values seen at your site.

Note: The Batch component of the may not be applicable to all products. Refer to the provided user and framework documentation for clarification.

Note: This document includes documentation of fixes up to an including Oracle Utilities Application Framework Version 4.0.2. Any new material is marked with NEW *. Individual fixes are listed in the documentation as required.*

Note: For publishing purposes, Oracle Utilities Meter Data Management will be referred to as "product".

Updates to this documentation

This documentation is provided with the version of the product indicated. Additional and updated information about the operations and configuration of the product is available from the Knowledge Base section of My Oracle Support (http://support.oracle.com). Please refer to My Oracle Support for more information.

This document is regularly updated and should be re-downloaded on a regular basis. The Service Pack that applies to this document is indicated on the initial page of this document after the product version number. This document currently applies to OUAF 4.0.2.

Other Documentation

This document is part of the product technical documentation. There are groups of manuals that should also be read for additional specific advice and information:

- *Oracle Utilities Meter Data Management Installation Guide*
- *Oracle Utilities Meter Data Management Quick Installation Guide*
- *Oracle Utilities Meter Data Management DBA Guide*

These documents are available from http://edelivery.oracle.com

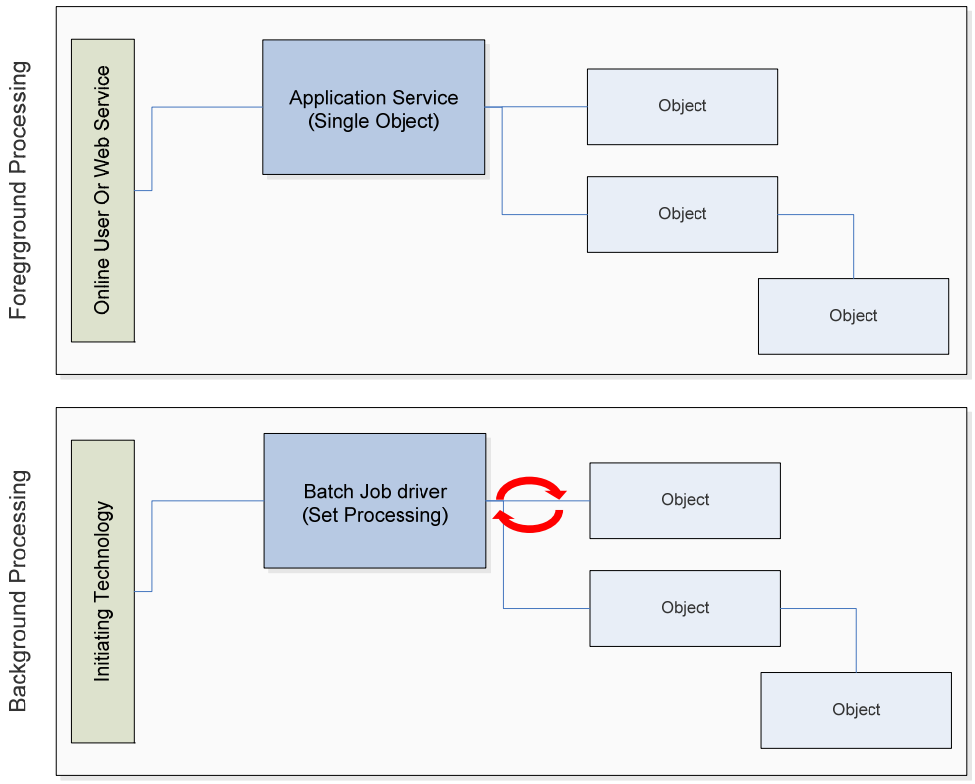
Batch Architecture

The product is known for its online (or foreground) processing (a.k.a. *online* processing) but one of the major features of the product is its set of background processes. Background processing is a major part of the product with numerous background processes supplied as *standard*.

The easiest way to understand the concept behind background processing is to think that background processing is like a *super efficient user* that operates on a batch of objects. That is why background processing is commonly called *Batch*.

Note: For publishing purpose the term "batch" will be used to denote background processing in this document.

Online typically operates on one object at a time, initiated by an online user or a Web Service call, where batch can operate on one or more objects (also known as a set of objects) at a time, initiated using a number of technologies.



The main reasoning behind the *super efficient user* is that each background process consists of a driver object that identifies the set of valid objects to process and then processes each object through the same business objects that the online uses. For example, the **BILLING** driver determines which accounts are eligible to be billed according to business calendar and then passes each account to the rate object to produce a bill. Contrast this with online bill generation, where the user identifies the account manually, and then that single account is passed to the same rate object to be billed. The background process can call more than one object during the duration of the background process.

For the batch process, all of the database access and object access (including access to

business objects, algorithms, user exits (server side only) etc is done through the Oracle Utilities Application Framework.

Background processing and the Architecture

The Background Processing component is run within the Oracle Utilities Application Framework and is associated typically with the Business Application Server. It is not associated the Web Application Server and does not require the Web Application Server to be active to operate. The only component other than product that the background processing component requires is the database server (or tier).

Depending on the initiation method employed the background processing component uses a standalone copy of the Oracle Utilities Application Framework to perform access to the database and business objects and its own copy of the same business objects used by the Business Application Server.

Essentially the background processing has its own resources (Java Virtual machines (JVMs), connection pools) independent of the rest of the architecture and can therefore be run on the same hardware as the rest of the architecture or on dedicated hardware.

Concepts

Before you attempt to configure or operate the product, there are important concepts that you should understand. These concepts are addressed in this document as a basis for the other documents in the Technical Documentation set.

Process Types

The product ships with a set of predefined background processes that are grouped into process types.

Process What's Ready Processes

Some background processes create and update records that are *ready for processing*. The definition of ready differs for every process. Processes of this type tend to use a business date in their determination of what's ready. For example, the bill cycle process creates bills for all bill cycles whose bill window is open (i.e., where the business date is between the bill cycle's start and end date). If the requester of the process does not supply a specific business date, the system assumes that the current system date should be used. If you need to use a date other than the current date, supply the desired date when you request the batch process.

Extract Processes

Some background processes extract a batch of information (to be interfaced OUT of the system). Processes of this type extract records marked with a specific batch number. If the requester of the process does not supply a specific batch number, the system assumes that the latest batch number should be extracted. If you need to re-extract an historical batch, you can supply the respective batch number when you request the batch process.

To rerun extracts it may be possible to simply rerun using a rerun number (if rerun number *re-runable*) or by running the staging process that is associated with the extract then running the extract again. Refer to individual processes for more details.

Note: Default file formats for all supplied extracts are documented in the relevant business process documentation supplied with the product.

Note: The ***FILE-PATH*** *and* ***FILE-DIR*** *additional parameters used in all extract processes are limited to two hundred and fifty-four (254) characters each fully expanded.*

Ad-hoc Processes

There is a specific background process that doesn't fit into the any other categories. This process backs out bills that were created during the bill cycle process. You must supply specific parameters to this process in order to tell it which batch of bills to remove.

Monitor Processes NEW

This is a new type of process where an object, which has a status, needs to have some processing done at a particular status, in the background. The monitor process detects a specific condition that can be triggered by data, status or combinations of data and status values. Once that condition has been reached the batch process automatically executes the instructions that have been configured on the batch process parameters and the object definition itself.

Conversion Processes

Note: Not all Oracle Utilities Application Framework based products include conversion. Refer to the relevant product documentation to check the validity of this group of processes.

A number of processes are available when converting or migrating data from external applications into the product. These processes may or may not be used as part of an implementation depending on your conversion strategy.

Refer to the Conversion Toolkit Utilities documentation for further information about conversion.

Object Validation Processes

Note: Not all Oracle Utilities Application Framework based products include object validation processes. Refer to the relevant product documentation to check the validity of this group of processes.

A number of processes are available to perform general validation for conversion or upgrade purposes. Each of the major objects in the database must be validated using the respective object validation program.

We strongly recommend validating each object in the following steps:

- Execute each object's validation program in random-sample mode to highlight pervasive errors. When you execute a validation in random-sample mode, you are actually telling it to validate every X records (where X is a parameter that you supply to the batch process).
- View errors highlighted by validation programs using the Conversion Error Summary transaction.
- Correct the errors using SQL. Note, you can use the base package's transactions (e.g., Person Maintenance, Premise Maintenance, etc.) to correct an error if the error isn't so egregious that it prevents the object from being displayed on the browser.
- After all pervasive errors have been corrected; re-execute each object's validation program in all-instances mode to highlight elusive, one-off errors.

In addition to validating your objects after conversion or an upgrade, the validation programs have another use. For example, you may want to experiment with changing the validation of a person and want to determine the impact of this new validation on your existing persons. You could change the validation and then run the person validation object -

it will produce errors for each person that fails the new validation.

Refer to the Conversion Toolkit Utilities documentation for further information about conversion.

To Do Processes

To Do processes are processes that feed off all the other processes in the system and create, update or delete To Do as defined in the system tables for the product. The number of records created will depend on the values in the system tables and the number of records satisfying those criteria.

If the To Do functionality is not used at this site then the To Do batch processes are not required to be run and should be removed from the schedules.

Refer to the *Defining General Options* and *To Do Business Process* documentation for further details.

Archive and Purge Processes

Note: Not all Oracle Utilities Application Framework based products include archiving. Refer to the relevant product documentation to check the validity of this group of processes.

During the life of a product implementation at your site the data in the database will build up. Historical records will remain in the product until they are archived and/or purged. There are a set of background processes that execute the necessary components of the archiving engine to archive and/or purge data from an environment. They are usually scheduled in accordance with business requirements. Configuration of the archive engine must be performed before executing these processes.

Refer to the *Archiving Engine* documentation for further information.

Configuration Lab Processes

Note: Not all Oracle Utilities Application Framework based products include archiving. Refer to the relevant product documentation to check the validity of this group of processes.

To migrate or synchronize data between environments a set of processes must be executed to initiate components of the Configuration Lab component of the product. These background processes are run only when synchronizing or comparing/apply changes between two environments.

Refer to the Configuration Lab Utilities documentation for further information.

Interface Processes

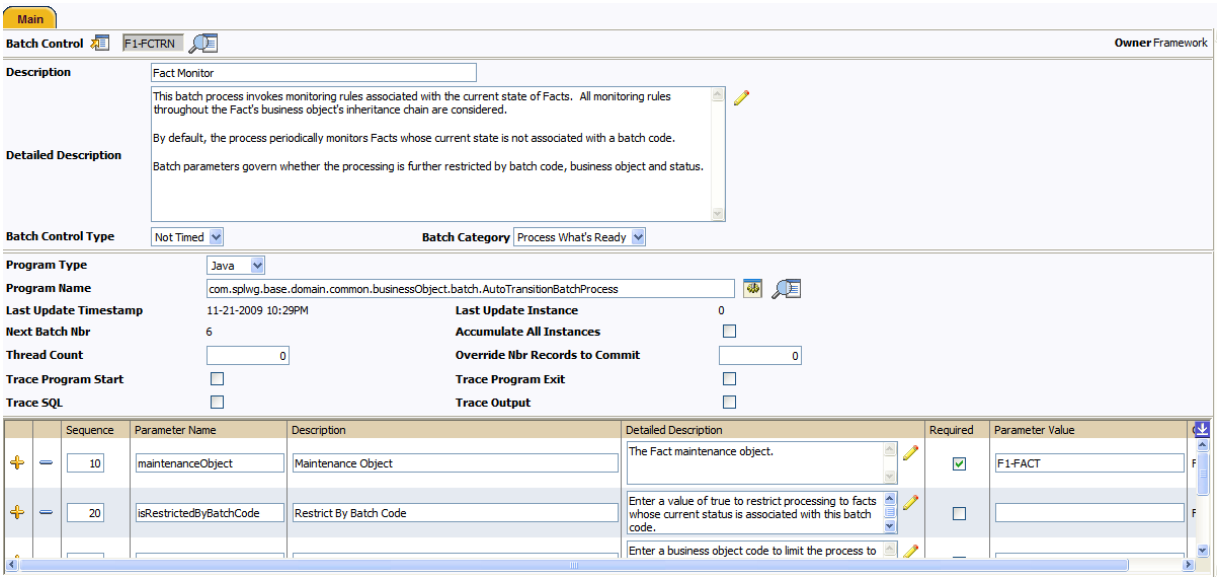
Some of the processes implemented by the product are in fact interfaces that may need to be updated during an implementation. Refer to the individual process register in the IT Supplemental Background Process Register for details of each process.

Batch Controls

In the product the concept of Batch controls are implemented to act as control points for a background process and have the following purposes:

- For those processes that extract information, the product batch control record defines the next batch number to be assigned to new records that are eligible for extraction. For example, the batch control record associated with the process that extracts bill print information defines the next batch number to be assigned to recently completed bill routings. When this bill print extract process next runs, it extracts all bill routings marked with the current batch number (and increments the next batch number).
- Each background process' batch control record organizes audit information about the historical execution of the background process. The system uses this information to control the restart of failed processes. You can use this information to view error messages associated with failed runs.
- Many processes have been designed to run in parallel in order to speed execution. For example, the Payment Process can be executed so that payments are processed in multiple "threads" (and multiple threads can execute at the same time). Batch control records associated with this type of process organize audit information about each thread in every execution. The system uses this information to control the restart of failed threads.

An example of the batch control dialog is shown in the figure below:



The parameters on the batch control object are:

Parameter	Usage
Batch code	Code that is the unique identifier of the background process
Description	Short description for Batch process. Used for Batch Run Tree
Detailed Description	Details of the execution of the batch process.
Batch Control Type	Whether this batch process is timed or not timed (see Timed

Parameter	Usage
NEW	Batch Processes for more details of this functionality).
Time Interval NEW	The number of seconds between timed batch processes. This field only appears for and is only applicable to Batch Control Type of **Timed** only (see Timed Batch Processes for more details of this functionality).
Timer Active NEW	Whether the timer is active for this timed batch process or not. This field only appears for and is only applicable to Batch Control Type of **Timed** only (see Timed Batch Processes for more details of this functionality).
Userid NEW	Default userid used for security for this batch process. This field only appears for and is only applicable to Batch Control Type of **Timed** only (see Timed Batch Processes for more details of this functionality).
Batch Language NEW	Default language for messages for this batch process. This field only appears for and is only applicable to Batch Control Type of **Timed** only (see Timed Batch Processes for more details of this functionality).
Email Address NEW	Default notification email or email group when batch process completes, is cancelled or errors. This field is optional and requires. This field only appears for and is only applicable to Batch Control Type of **Timed** only (see Timed Batch Processes for more details of this functionality).
Batch Category NEW	Category of batch process (see Process Types for valid values).
Program Type	What technology (programming language) the program is written in. Currently only Java and COBOL[1] are supported.
Program Name	Name of the program or java class to execute for batch
Last Update Timestamp	The Last date and time the batch control was updated. Used for update purposes.
Last Update Instance	The Last Update number the batch control was updated. Used for update purposes.
Next Batch Nbr	The rerun number allocated to this batch control to be used by the next execution (if the batch process supports rerun numbers). This value is maintained regardless of whether it is actually used by the batch run for implementation use.
Accumulate All Instances	Accumulate statistics at the batch process level as well as the individual thread level
Thread Count NEW	Default maximum number of Threads to be used by this batch

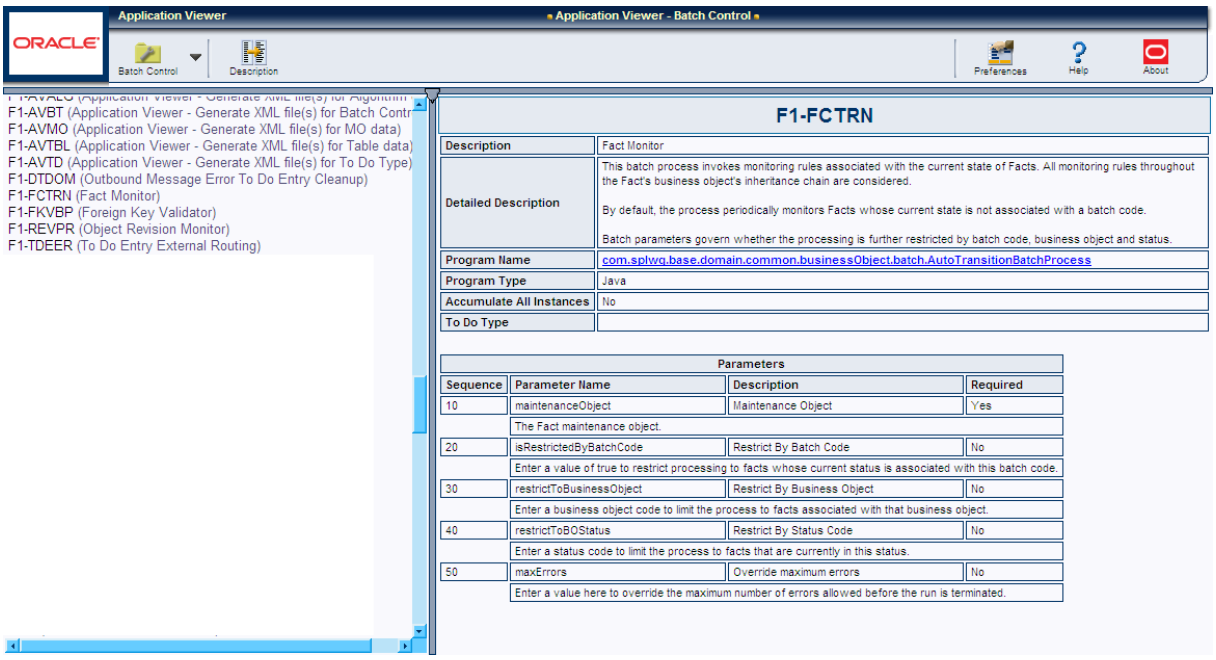
[1] COBOL is only supported on selected products for backward compatibility.

Parameter	Usage
	process. This parameter is actively used for Timed batch processs only (see Timed Batch Processes for more details of this functionality). For Non-timed batch processes this *Thread Count* is used for documentation purposes only. Refer to Explanation of Thread Limit and Thread Number for an explanation of the concept of threading.
Override Nbr Of Records to Commit NEW	Default override commit interval to be used by all executions of this batch process. This parameter is actively used for Timed batch processs only (see Timed Batch Processes for more details of this functionality). For Non-timed batch processes this *Commit Interval* is used for documentation purposes only. Refer to Explanation of Timeout and Commit Interval for an explanation of the concept of commit interval.
Trace Program Start NEW	Default value of trace flag to track start of execution to be used by all executions of this batch process. Used for development and debug purposes only.
Trace Program Exit NEW	Default value of trace flag to track end of execution to be used by all executions of this batch process. Used for development and debug purposes only.
Trace SQL NEW	Default value of trace flag to track all SQL statement issued by the batch process to be used by all executions of this batch process. Used for development and debug purposes only.
Trace Output NEW	Default value of trace flag to track internal debug information to be used by all executions of this batch process. Used for development and debug purposes only.
Batch Parameters	The list of valid parameters for this batch process including the names of the parameters, description, whether the parameter is mandatory or not and what is the default values. These values are maintained by the developers only.

Note: The system is delivered with all necessary batch controls for the supplied base background processes.

Viewing Batch Controls Using the Application Viewer

While the Batch Controls can be viewed using the online system it is possible to view batch control information from the Application Viewer application supplied with your product. It can be accessed from the menu *Admin* → *A* → *Application Viewer* → *Batch Control*. A sample of the output that can be seen is shown on the following diagram:



This information is only available if the **F1-AVBT** background process has been executed or the **genappviewitems[.sh]** command is executed.

Adding your own batch controls

In any implementation Batch Controls may need to be added for new custom processes. This needs to be done in a manner so that they are consistent with the base product as well as be supported for upgrades. The following guidelines can assist in ensuring that Batch Controls are implemented correctly:

- Every custom process should have its own batch control. While it is possible to share batch controls, there may be concurrency and restart issues if the multiple processes are executed at the same time.
- Every instance of a particular process needs to have its own batch control. If you need to run an interface multiple times, once for each supplier for example, then a batch control records needs to be assigned to each instance so that they can be tracked and managed individually. This is also important because in an environment running multiple instances of a process, there is a far more likely chance the instances will be executing at the same time according to your schedule (see point above).
- All custom batch controls should be prefixed by CM to avoid conflicts with possible future processes introduced into the batch schedule. If this rule is not obeyed then there is a risk that when an upgrade is introduced it may cause concurrency and restart issues.
- Avoid using batch controls with any special characters (i.e. characters other than letters and numbers) as it may cause intermittent or operational errors. Avoid embedded blanks and characters such as !@#$%^|\?><,.~`'"{}[]&*()/:;.

Standard parameters

To standardize all the batch processes, the product uses a number of common standard parameters to uniformly provide functionality across all processes. The table below lists all the standard parameters:

Parameter	Usage
Batch code	Code is the unique identifier of the background process
Batch thread number	Thread number is only used for background processes that can be run in multiple parallel threads. It contains the relative thread number of the process. For example, if the billing process has been set up to run in 20 parallel threads, each of the 20 instances receives its relative thread number (1 through 20).
Batch thread count	Thread count is only used for background processes that can be run in multiple parallel threads. It contains the total number of parallel threads that have been scheduled. For example, if the billing process has been set up to run in 20 parallel threads, each of the 20 instances receives a thread count of 20.
Batch rerun number	Rerun number is only used for background processes that download information that belongs to given run number. It should only be supplied if you need to download an historical run (rather than the latest run).
Batch business date	Business date is only used for background processes that use the current date in their processing. For example, billing using the business date to determine which bill cycles should be downloaded. If this parameter is left blank, the system date is used.
Commit Interval	Override maximum records between commits. This parameter represents the number of transactions that are committed in each unit of work. This parameter is optional and overrides the background process's Standard Commit between records (each background process's Standard Commit between records is documented in the product documentation). You would reduce these values, for example, if you were submitting a batch process during the day and you wanted more frequent commits to release held resources. You might want to increase these values when a background process is executed at night (or weekends) and you have a lot of memory on your servers.
Timeout	Override maximum minutes between cursor re-initiation (also known as Cursor Reinitialization). This parameter is optional and override each background process's Standard Commit Records and Standard Cursor Re-Initiation Minutes (each background process's Standard Commit Records / Standard Cursor Re-Initiation Minutes is documented in individual process registers

Parameter	Usage
	in the product documentation). You would reduce these values, for example, if you were submitting a batch process during the day and you wanted more frequent commits to release held resources (or more frequent cursor initiations). You might want to increase these values when a background process is executed at night (or weekends) and you have a lot of memory on your servers. *Note: The Maximum minutes between cursor re-initiation is for Oracle implementations only and only applies to COBOL based processes.*
User ID	This is the userid that is used to access objects. It must be defined to the security component of the product.
Password	This parameter is not applicable (it is provided for backward compatibility).
Language	This is the language code used to retrieve messages and format output from background processes.
Traces	Trace program at start (Y/N), trace program exit (Y/N), trace SQL (Y/N) and trace output. If trace program start is set to *Y*, a message is displayed whenever a program is started. If trace program at exit is set to *Y*, a message is displayed whenever a program is exited. If trace SQL is set to *Y*, a message is displayed whenever an SQL statement is executed. If trace out is set to *Y*, message are output from the program at execution points. *This facility should only be used in testing and benchmarking.*

Explanation of Timeout and Commit Interval

Note: Timeout only applies to COBOL based background processes.

The Timeout and Commit interval parameters are tuneable parameters to affect the impact of the background processes on the other processes running and prevent internal database errors. In most cases using the defaults will satisfy your site requirements. It is also important to understand their impact to ascertain whether any change is required.

During processing of any background process a main *object* is used to drive the process. For example in Payment the main object is Payment Event. The Payment process loops through the payment event objects as it processes. For other processes it is other *objects* that are considered the main object. This main object type is used to determine when a transaction is complete.

For both Timeout and Commit interval this is important as:

- When a certain number of main objects have been processed then a database commit is issued to the database. This number is the Commit Interval. The larger the commit interval the larger the amount of work that the database has to keep track of between commit points.
- The Timeout parameter is used to minimize issues in Oracle where the unit of work is so large it causes a *Snapshot too old*. Oracle stores undo information on the Rollback Segment and the read consistent information for the current open cursor is no longer available. This is primarily caused when Oracle recycles the Rollback Segment storage regularly. The product is prevented by reinitializing the cursor on a regular basis to prevent an error. When this timeout, known as the Cursor Reinitialization, is exceeded then at the end of the current transaction a commit will be issued.
- At any time in a process a commit for objects processed may be caused by the reaching the Commit Interval or the time limit set on Timeout, whichever comes first.

Explanation of Thread Limit and Thread Number

One of the features of the Oracle Utilities Application Framework is the ability to run background processes using multiple threads.

The threading concept in the product is simple. Each thread takes a predetermined slice of the data to work on. The last thread checks if all other threads are finished and updates the status of the batch control records. For example, if you have 10 threads, then each thread takes 1/10th of the work. As each thread is executing it processes its workload and then completes, the last thread executing is responsible for updating the overall process status to indicate completion.

Implementing threading means you have to execute a number of batch processes with an ascending thread number up to the thread limit. For example, if you have a batch process with 10 threads, you must run 10 batch processes each with a unique thread number between 1 and 10 to complete the batch process. Threads can be located on the same machine or different machines. For example, you can run threads 1 to 5 on one machine and threads 6 – 10 on another.

Note: If there is limited data skew in the data then the threads should finish around the same time. If there is some data skew then some threads may finish later than others.

To implement multi-threading when you submit a process:

- Specify a thread limit greater than 1 as a parameter.
- Execute a process for every thread with a sequential thread number up to an including the thread limit. There are a couple of implementation guidelines with threading:
- Make sure the number of threads is not excessive. You do not want to flood the CPU's.
- You must submit a process per thread. In some submission methods this is done automatically and in some it is done manually.
- Threading will increase throughout BUT it will cause higher than usual resource usage

(CPU, Disk etc) as well as higher contention. Excessive threading can in fact cause performance degradation in online as well as background processing. Therefore the number of threads should not be excessive.

Almost all background processes within the product support multiple threads (the only processes typically single streamed are extracts and data loads as they involve sequential files).

Explanation of Restart and Rerun

The product allows all background processes to be restarted or rerun as required. During the execution of the background process, restart information per thread is stored within framework, like a *checkpoint*. This checkpoint is performed at the last commit point as dictated by the Commit Interval and/or Timeout value (Time out only applied to Oracle implementations only). When a *commit* is performed, the last commit point is recorded for the execution. If a thread of a background process fails, the database automatically rolls back to the last commit point. The thread can then be restarted from that point automatically or from the start of the data. To indicate the restart, the thread is executed with the same parameters as the original.

Additionally, processes are *re-runable*. Re-run able means that a specific run number can be re-run as required or a process at a specific date. Using a rerun number or a previously used business date are all that is required to rerun a process.

Note: Not all background processes use Run number as a run indicator. Refer to the online documentation for which batch processes are re-runable.

Timed Batch Processes NEW

Note: This facility is ideal with Monitor batch processes.

Traditionally when you consider batch you picture processes that process large amounts of records in a longer amount of time than an online transaction. They have a start time and an end time and execute a limited amount of times a day.

The Oracle Utilities Application Framework supports the traditional approach but also supports the ability to run batch processes continuously in the background. For example, you may have a background process run continuously to monitor behaviour on a particular object (i.e. the monitor processes). Therefore the concept of timed (continuous) and non-timed (traditional) batch processes was introduced.

The idea is that the site configures whether a batch process is timed or not on the batch control record definition. By default all batch processes will be defined as *non-timed* for backward compatibility. The site then configures the batch processes it deems to run continuously as timed. At this point additional information is required:

- **Timer Interval** – The time, in seconds, between executions of the batch process. If the current execution of the timed job exceeds this tolerance, a new instance of the job will not be submitted until the job completes.

- **Timer Active** – Whether the timed batch process is active in timed mode or not. This enables the timed batch process to be *switched off* if necessary. ***Timer Active*** is *active* when this value is set to **Yes** and inactive when set to **No**.
- **Userid** – Default userid to be used for the timed batch process.
- **Batch Language** – Default language for the timed batch process.
- **Email Address** – Email address or group to email when there is an issue with the batch process.

Note: The Email adapter must be enabled for this functionality to be enabled.

The figure below illustrates the additional entries:

Additionally the following additional attributes should be specified for timed batch processes:

- **Thread Count**
- **Override Nbr of Records to Commit** (optional)

Once the Batch Control Type is defined the submission method then implements the logic to keep the background process continuously:

- For sites using the online submission facility with the online daemon, the batch controls which are timed are executed automatically once the daemon starts and is routed to a defined batch server. If the daemon or batch server crashes then the batch process will fail and automatically restart upon restart of the daemon or batch server.
- For sites using the external scheduler, the timed batch process will commence the first time the batch process is initiated. If the **`threadpoolworker`** or **`submitjob`** fails, for any reason, and there is no clustering configured then the batch process must be restarted manually (or using a scheduler) to initiate the continuous process once again.

To stop the continuous batch process at any time the following techniques can be used:

- Set the **Timer Active** flag to **No** on the Batch Control record for the batch process. At the next Timer Interval, the timed batch process will stop and complete. Remember to change the Timer Active back to **Yes** again to re-instate the batch process as a continuous process.
- Cancel the batch process using the JMX interface (JMX console or jmxbatchclient)
- Kill the **`submitjob`** process that initiated the batch process. This should be the last resort.

Common Configuration Files

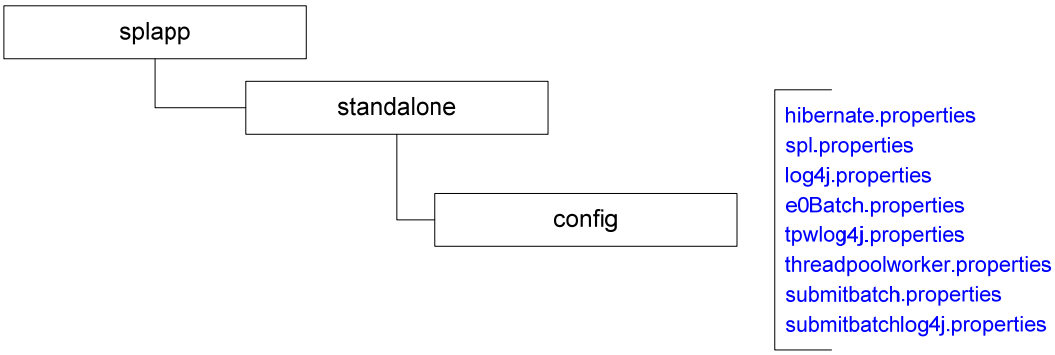
As with the online component of the Oracle Utilities Application Framework there are a

number of configuration files that control the performance and behaviour of the batch component. It is recommended that you familiarize yourself with the Server Administration Guide for additional advice in relation to the configuration discussed.

The batch component houses the configuration files differently to the online and web services component. The online and web services are *housed* within a J2EE Web Application Server and therefore the configuration files are located according to the J2EE standards.

In the batch component the configuration are *housed* in directories as the batch component is a J2EE Web Application Server. Therefore, during the configuration process, the configuration files used by the batch component, are built using templates using the **`initialSetup`** utility. This utility deposits the configuration files in the **`$SPLEBASE\splapp\standalone\config`** directory (or **`%SPLEBASE%/splapp/standalone/config`** directory in Windows).

The figure below summarizes the directory structure and the relevant configuration files:



The following configuration files (along with their templates) are listed below:

Configuration File	Contents	Template
e0Batch.properties	General environment settings	`e0Batch.properties.template`
hibernate.properties	Database connectivity	`hibernate.properties.batch.template`
log4j.properties	Logging settings	`log4j.properties.standalone.template`
spl.properties	Application behaviour	`spl.properties.standalone.template`
submitbatch.properties	**`submitjob`** default settings	`submitbatch.properties.template`
submitbatchlog4j.properties	**`submitjob`** logging settings	`submitbatchlog4j.properties.template`
threadpoolworker.properties	**`threadpoolworker`** configuration	`threadpoolworker.properties.template`
tpwlog4j.properties	**`threadpoolworker`** logging settings	`tpwlog4j.properties.template`

The subsequent subsections will outline the contents of the configuration files.

e0Batch.properties

The **e0Batch.properties** configuration file defines the environmental settings for the batch component. Typically this configuration file is generated and never altered.

The configuration contains two settings:

Parameter	Context
SPLOUTPUT	Location of the output directory for logs and temporary files.
standalone.dir	Home location of the batch component. This is a relative path to the location of this configuration file.

For example:

```
standalone.dir=../../splapp/standalone
SPLOUTPUT=/spl/sploutput/DEMO
```

Note: This configuration file should not be altered unless instructed to by Oracle Support.

spl.properties – Product configuration settings

The **spl.properties** configuration file is the configuration file that contains product behavior settings for the batch component. This configuration file also exists in the online and web application server so a common configuration standard was adopted.

For the batch component the **spl.properties** uses the following settings:

Parameter	Context
com.splwg.schema.newValidations.F1 NEW	Internal use only
InitialLimit	RAC Initial Limit
MaxLimit	RAC Maximum Limit
MinLimit	RAC Minimum Limit
spl.runtime.cobol.cobrcall	If COBOL is used, whether remote calls are supported. (true or false). Defaults to ***false***.
spl.runtime.cobol.encoding	If COBOL is used, the character set supported by the Business Application Server
spl.runtime.cobol.sql.cache.maxTotalEntries	Number of SQL statement entries stored in the cache. Defaults to 1000.
spl.runtime.cobol.sql.cursoredCache.maxRows	If COBOL used, number of cursors cached. Defaults to 10.
spl.runtime.cobol.sql.disableQueryCache	If COBOL used, whether the query cache is disabled. Defaults to **false**.
spl.runtime.cobol.sql.fetchSize	If COBOL used, size of fetch buffers for

Parameter	Context
	SQL statements. Defaults to 150.
spl.runtime.environ.init.dir	Location of the base configuration files.
spl.runtime.environ.SPLEBASE NEW	Location of **SPLEBASE**
spl.runtime.oracle.statementCacheSize	The SQL cache size allocation for SQL statements. Defaults to 300.
spl.runtime.service.extraInstallationServices	Name of Application service used for installation defaults.
spl.runtime.sql.highValue	High Value used for processing
spl.runtime.utf8Database	Whether the database supports the UTF8 characterset. (true or false).
spl.tools.loaded.applications	List of applications installed. Values are typically base,*xxx*,cm where *xxx* is the product code.

hibernate.properties – Database connectivity properties

Note: Unlike the online and web services layer, it is not possible to use JNDI based JDBC connections. Batch must use UCP for connection pooling.

Opening a connection to a database is generally much less expensive than executing an SQL statement. A connection pool is used to minimize the number of connections opened between application and database. It serves as a librarian, checking out connections to application code as needed. Much like a library, your application code needs to be strict about returning connections to the pool when complete, for if it does not do so, your application will run out of available connections. Hence, the need for having a connection pooling mechanism such as Hibernate using Universal Connection Pool (UCP) connection pooling.

Hibernate is a powerful Object Relational Mapping (ORM) technology that makes it easy to work with relational databases. Hibernate makes it seem as if the database contains plain Java objects, without having to worry about how to get them out of (or back into) database tables. Coupled with the UCP connection pooling, it provides a comprehensive connectivity tool for the java (or COBOL, if used) to operate effectively against the database.

The product uses the Hibernate and UCP libraries to create a connection pool and connect the java (or COBOL, if used) objects to the database to store, update, delete and retrieve data. It is used for all the database access for online as well as batch.

Refer to http://www.hibernate.org and http://www.oracle.com/technology/software/tech/java/sqlj_jdbc/htdocs/ucp.html for more information on the technology aspects of Hibernate and UCP.

The product has a configuration file for the database connectivity and pooling called the **hibernate.properties** configuration file. This file contains the configuration settings for the

database connections and the connection pool to be used by any of the SQL statements accessing the database.

The configuration settings contained in the **hibernate.properties** file are summarized in the following table:

Setting	Usage
`hibernate.cache.use_second_level_cache`	May be used to completely disable the second level cache, which is enabled by default for classes which specifies a cache mapping. Defaults to false
`hibernate.cglib.use_reflection_optimizer`	Enables use of CGLIB instead of runtime reflection (System-level property). Reflection can sometimes be useful when troubleshooting, note that Hibernate always requires CGLIB even if you turn off the optimizer. Tends to make Hibernate load faster if value is false. Defaults to false.
`hibernate.connection.databaseName`	Database name used for SQL Server
`hibernate.connection.driver_class`	This is the JDBC driver class used by Hibernate.
`hibernate.connection.password`	This is the user IDused to connect to the database. This value is sourced from the **DBPASS** parameter from the ENVIRON.INI. If the value is prefixed by "ENC" then the password is encrypted.
`hibernate.connection.provider_class`	The classname of a custom Connection Provider which provides JDBC connections to Hibernate. The product uses the UCP Connection provider. Other providers are not supported.
`hibernate.connection.url`	This is the connection string used to connect to the database. The URL is built using the protocol outlined by the JDBC driver and uses the values from the ENVIRON.INI.
`hibernate.connection.username`	This is the user ID used to connect to the database. This value is sourced from the **DBUSER** parameter from the ENVIRON.INI
`hibernate.dialect`	This is the SQL dialect (database type) for the database being used. Any valid Hibernate dialect may be used. Refer to http://www.hibernate.org/hib_docs/v3/api/org/hibernate/dialect/package-

Setting	Usage
	summary.html for a full list. This value is sourced from the DIALECT parameter from the ENVIRON.INI.
hibernate.jdbc.batch_size	A non-zero value enables use of JDBC2 batch updates by Hibernate. Defaults to 30
hibernate.jdbc.fetch_size	Determines a hint to the JDBC driver on the number of rows to return in any SQL statement. Defaults to 100
hibernate.max_fetch_depth	Sets a maximum "depth" for the outer join fetch tree for single-ended associations (one-to-one, many-to-one). A 0 disables default outer join fetching. Defaults to 2
hibernate.query.factory_class	Chooses the HQL parser implementation.
hibernate.query.substitutions	Mapping from tokens in Hibernate queries to SQL tokens (tokens might be function or literal names, for example). The product uses true 'Y', false 'N'
hibernate.show_sql	Write all SQL statements to console. Defaults to false.
hibernate.transaction.factory_class	The classname of a Transaction Factory to use with Hibernate Transaction API.
hibernate.ucp.connection_wait_timeout NEW	Specifies how long, in seconds, an application request waits to obtain a connection if there are no longer any connections in the pool
hibernate.ucp.inactive_connection_timeout NEW	Specifies how long, in seconds, an available connection can remain idle before it is closed and removed from the pool.
hibernate.ucp.max_idle_time NEW	Not used
hibernate.ucp.max_size NEW	Maximum Pool Size
hibernate.ucp.max_statements NEW	SQL Buffer size
hibernate.ucp.min_size NEW	Minimum Pool Size

For a more indepth description of these parameters and others not included with the product see http://www.hibernate.org and http://www.oracle.com/technology/software/tech/java/sqlj_jdbc/htdocs/ucp.html.

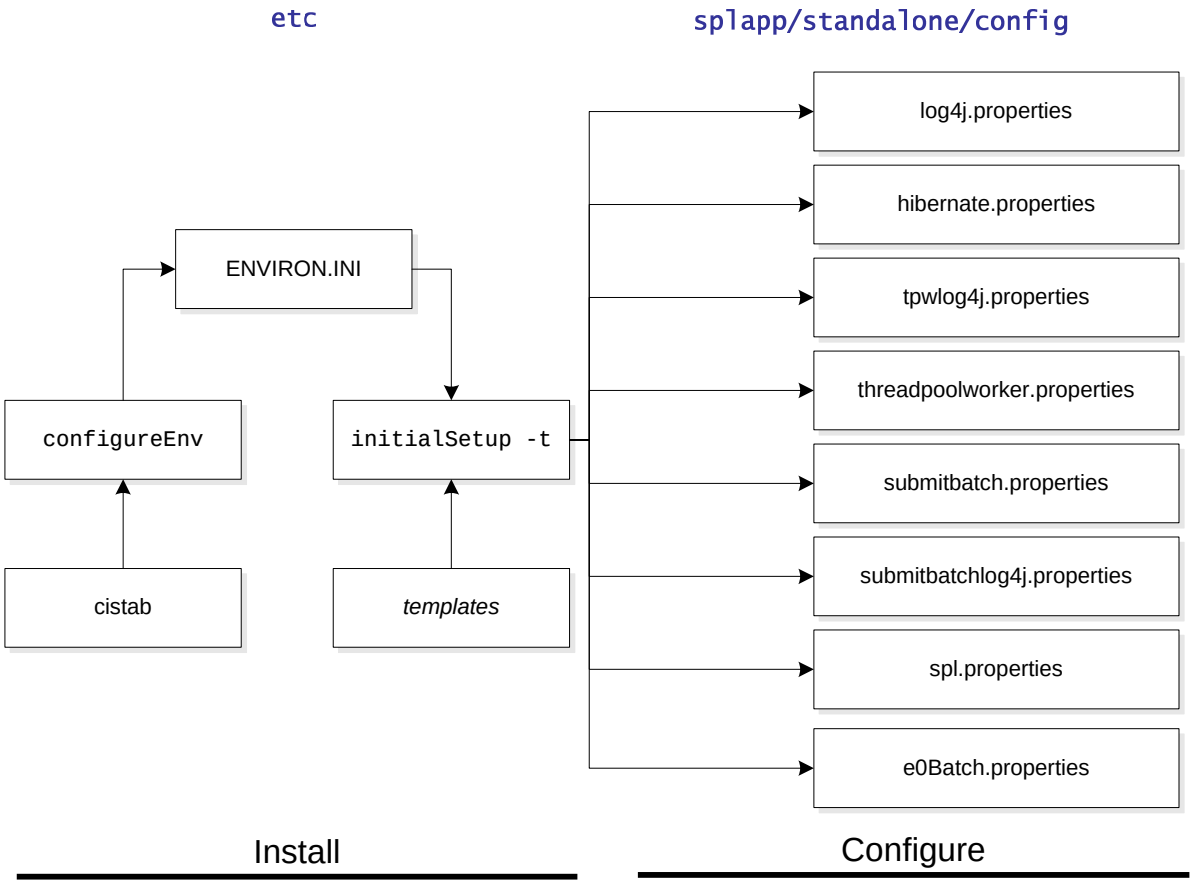
log4j.properties – Logging Configuration

Note: This log file should not be altered unless specified. The generated configuration file has all the recommended settings for all sites.

The product uses the *log4j* Java classes to centralize all log formats into a standard format. The details of the configuration settings and *log4j* itself are available at http://logging.apache.org/log4j/ or http://en.wikipedia.org/wiki/Log4j. This log file is primarily used for the daemon and **THIN** execution modes.

Configuration Process

To configure the batch component during the installation process and post-installation then the following process should be used:



- The configureEnv utility is used during installation time and can be used post implementation to set parameters in the ENVIRON.INI.

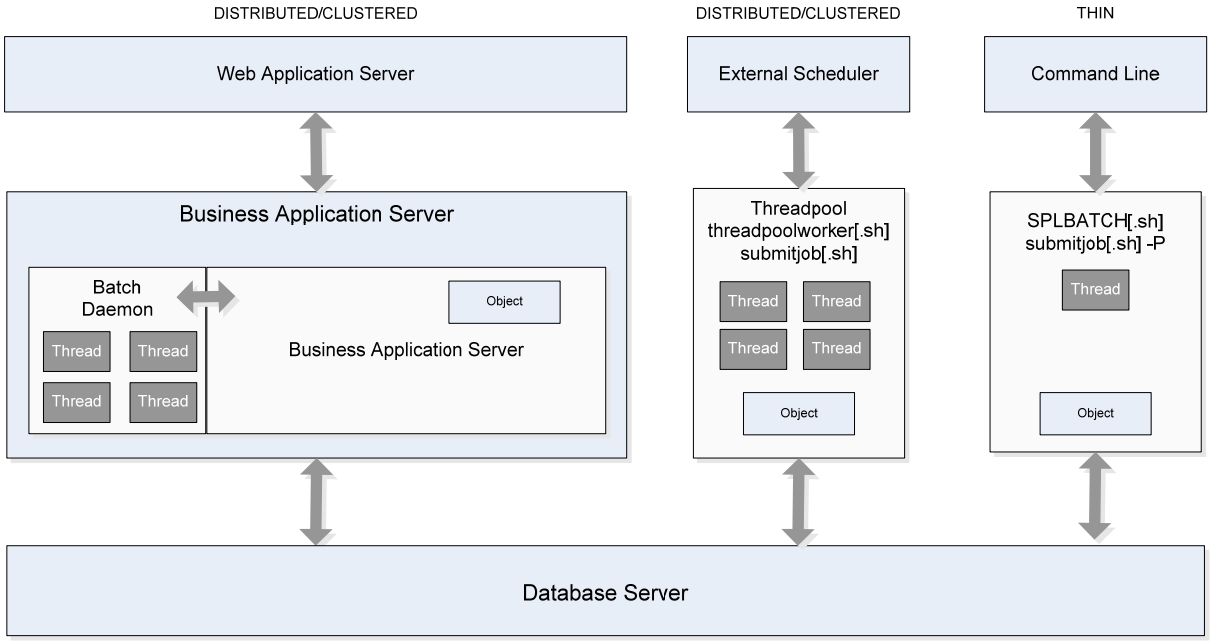
Note: The configureEnv utility should be used to make any changes to the ENVIRON.INI. Manual changes to this configuration file are not recommended.

- After the ENVIRON.INI has been set or altered, the settings must be reflected in the relevant configuration files used by the batch component using the initialSetup utility. The initialSetup utility takes the relevant templates, builds the configuration files and deposits them in the **$SPLEBASE\splapp\standalone\config** directory (or **%SPLEBASE%/splapp/standalone/config** directory in Windows).

The configuration files are now ready to be used for the batch component.

Submission Methods

There are a number of ways of submitting batch processes within the Oracle Utilities Application Framework. The various ways reflect the different uses for the product at a site. The figure below summarizes the various submission methods:



- It is possible to submit the batch process in a basic *interactive* mode where the batch object executed in a single JVM. This mode is known as THIN mode and is primarily designed for developers to test their code in isolation from the rest of the system. The mode is not efficient enough to be recommended for any activity other than developer testing. Refer to Interactive Submission section for details on how to use this method.
- The product browser user interface allows the registration and execution of batch processes within the JVM used online. This mode allows part of the resources of online be devoted to registering and executing of batch processes. This method is primarily designed for use for testing purposes. Refer to the Online Submission section for details on how to use this method.
- Typically at a site, a batch scheduling tool is used to schedule and manage all of the background tasks required at a site. This can include running product batch processes and any related maintenance process such as transferring interface files to and from other systems, backup and other maintenance activities. This method is designed for production use and has a number of variations to support flexible scheduling options. Refer to the External Scheduler Submission section for details on how to use this method.

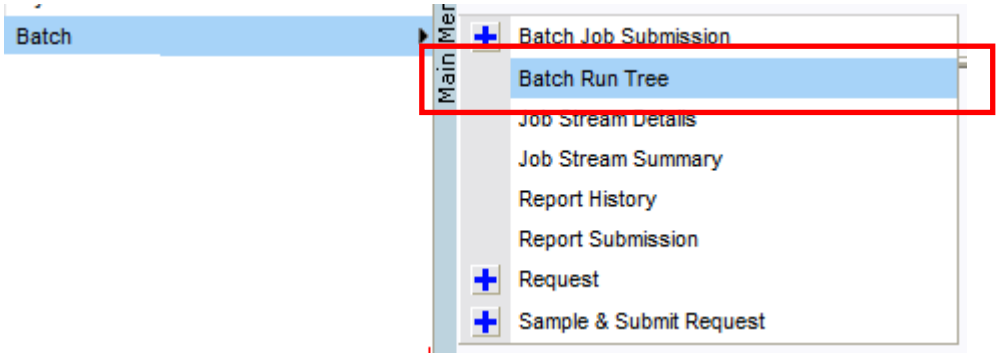
Monitoring Background Processes

When a background process is initiated the product records information about the progress of the execution using a number of methods. These methods can be used to provide feedback to the operations personnel on the health and progress of individual processes.

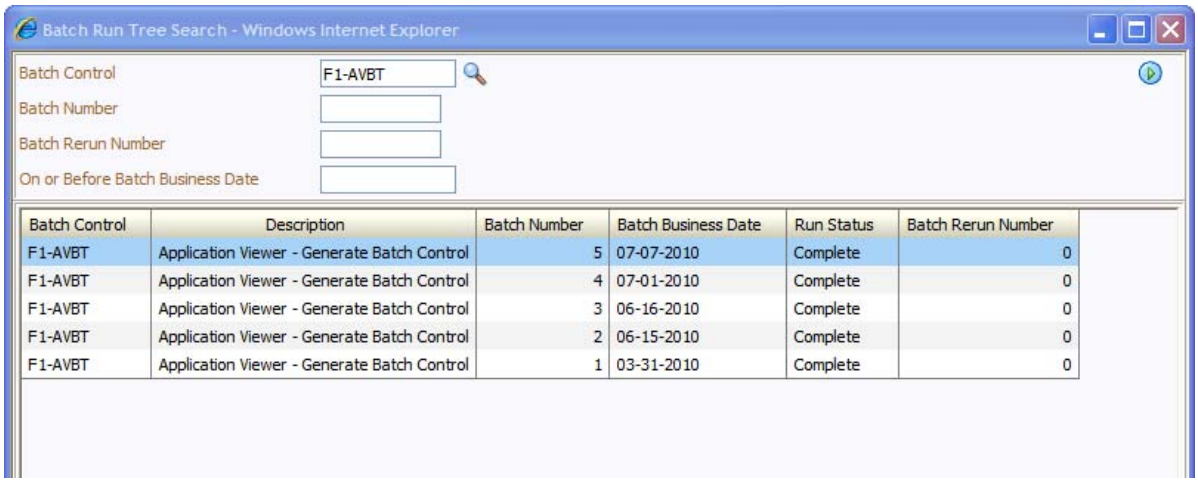
Batch Run Tree

Within the product browser interface there is an ability to monitor the status and outcomes of individual processes. This can be useful for finding out what actually occurred if an error condition occurred. To access the screen:

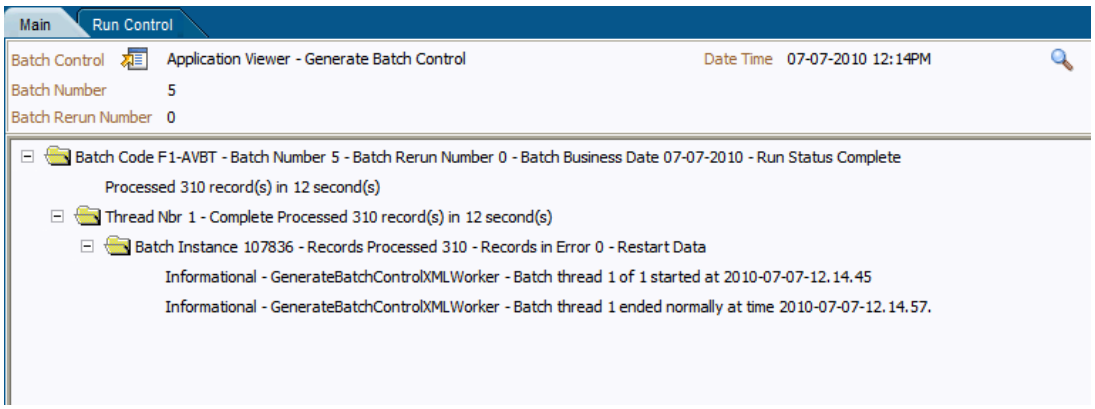
- Acquire a logon to the browser interface. It may be necessary to setup a special userid that operators can use to access the online.
- Select the *Batch → Batch Run Tree* option from the side menu. A sample is displayed in the figure below:



- A batch search window will appear to allow select of the individual execution of the process. It is possible to search on batch number, batch Control Id or rerun number. A sample is illustrated below.



- Select the appropriate batch run to monitor. This will then open a portal with the appropriate run information (for example):



- In the case of the sample the process ended successfully. Additionally the following additional elements may be displayed:
  - If the processed ended with any errors then the error message would be indicated.

Note: Technical Errors (e.g. SQL Errors) are indicated using this method.

  - Business errors that are generated as To Do's are indicated separately.

  - If the program was restarted, each restart would be displayed in the tree individually.
- To get more information about the error click on the error message on the tree.

The Batch Run tree is available to any valid user and is a method to communicate the execution information to the relevant business representatives.

Using SQL Queries to monitor background processes

The Batch Run Tree displays information within the database that is collected by the Oracle Utilities Application Framework for every background process execution, regardless of the method used to initiating the process.

While it is possible to use the Batch Run Tree as a *spot* check on particular processes, it is possible to create views on the underlying to extract the data for long term analysis of batch performance. These views can be then used to analyse or extract the data for further investigation.

The details of the views that can be created and types of analysis that can be performed are located in the Batch Troubleshooting whitepaper in the Performance Troubleshooting series

KB Id: **560382.1** on My Oracle Support.

Monitoring using JMX classes

The product supports management and monitoring using Java Management eXtensions (JMX) For example, a user may want to see exactly which processes are busy running in a worker JVM at any particular point, and may want to be able to cancel runaway tasks. Refer to the Java Management Extensions (JMX) Technology site for more information.

Java Management Extensions (JMX) is a technology that specifically addresses this requirement to introspect information within the Oracle Utilities Application Framework. By employing Management Beans (MBeans), the batch framework can implement management interfaces for the various monitoring and management instrumentation points. A remote client, such as Sun's jconsole or other JMX consoles/browsers, can then communicate with the active MBeans to query and modify the behavior of the batch node.

This section will outline the basic facilities available using JMX. Configuration of the JMX capability is discussed within each submission method outlined in Submission Methods.

Jconsole

Jconsole is a GUI application provided with the Java JDK installed. It can be invoked with the connection information configured with the product as a parameter, for example:

```
jconsole service:jmx:rmi:///jndi/rmi://<host>:<port>/spl/fw/jmxConnector
```

The ***<server>***, ***<port>*** and the "/spl/fw/jmxConnector" string correspond with the property values specified for the batch node. These values are specified in configuration files outlined in the relevant subsection of the "Submission Methods" section of this document.

Refer to http://java.sun.com/javase/6/docs/technotes/guides/management/jconsole.html for more information on using **`jconsole`**.

Note: While jconsole is used in the examples shown in this document, other JMX consoles and JMX browsers (JSR160) can be used.

Mbeans

The MBeans that expose the batch processes are divided into categories. The name of the MBean is constructed to indicate the type of batch process, the name of the batch process, and the thread number and count. For sake of uniqueness, the name also includes the Java thread number.

The name therefore is constructed as follows:

```
CCC_BBB_t_of_c.jjj
```

Where:

`CCC`	The type of MBean. This can be either *BatchJob* or *BatchThread*.
`BBB`	The Batch code from the Batch Control.

`t_of_c` The batch thread number and count. For *BatchJob* types, this will just be "0". For *BatchThread* types, the *t* is the thread number, and *c* the thread count.

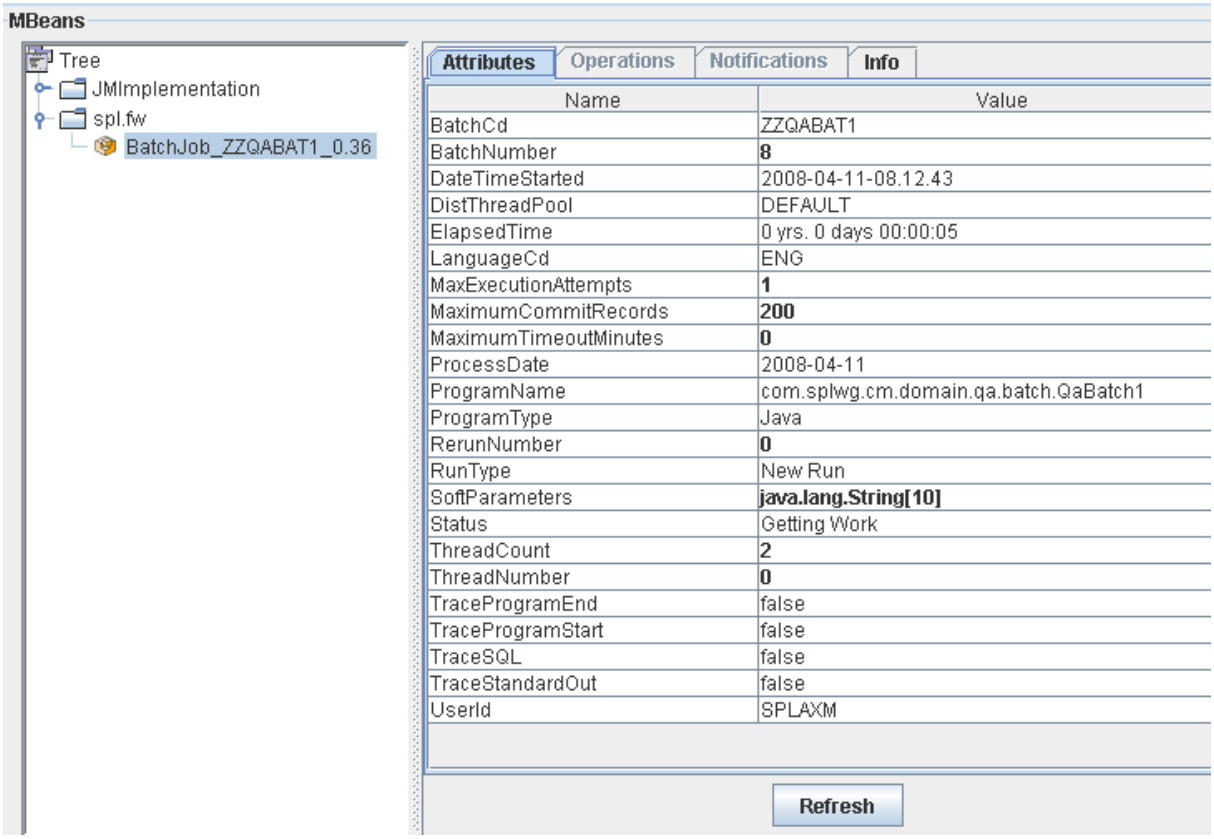
`jjj` The Java thread number, which will be unique within a batch node.

BatchJob Mbeans

Mbeans associated with "BatchJob" are created when any background process is initiated and are used to control any individual threads associated with the batch process. The Mbean exposes a number of attributes:

Attribute	Content
`BatchNumber`	The current batch number.
`DateTimeStarted`	The date and time the batch process was started.
`DistThreadPool`	The thread pool to which this batch process belongs.
`ElapsedTime`	How long the batch process has been running
`ProgramName`	The program name
`ProgramType`	The program type: *Java* or *COBOL*.
`RunType`	The type of run: *New Run*, *Restart* or *Rerun*.
`Status`	Current status of the batch process. Valid values are *Initializing* (very briefly in the beginning – prior to the call to **`getJobWork`** in the application class); *Getting Work* means it is currently in the process of selecting the work units for the batch process; *Got Work* means it is has successfully selected the work and is in the process of initiating the threads.
`Standard parameters`	The batch process parameters are also displayed. Refer to Standard parameters for details of the valid values.

For example:



Note: Refreshing this information will dynamically update the values.

Note: JMX information is only displayed at active runtime and calls process can happen very fast – depending on the amount of data to be selected for the run – so the JMX console may not even detect this MBean.

BatchThread Mbeans

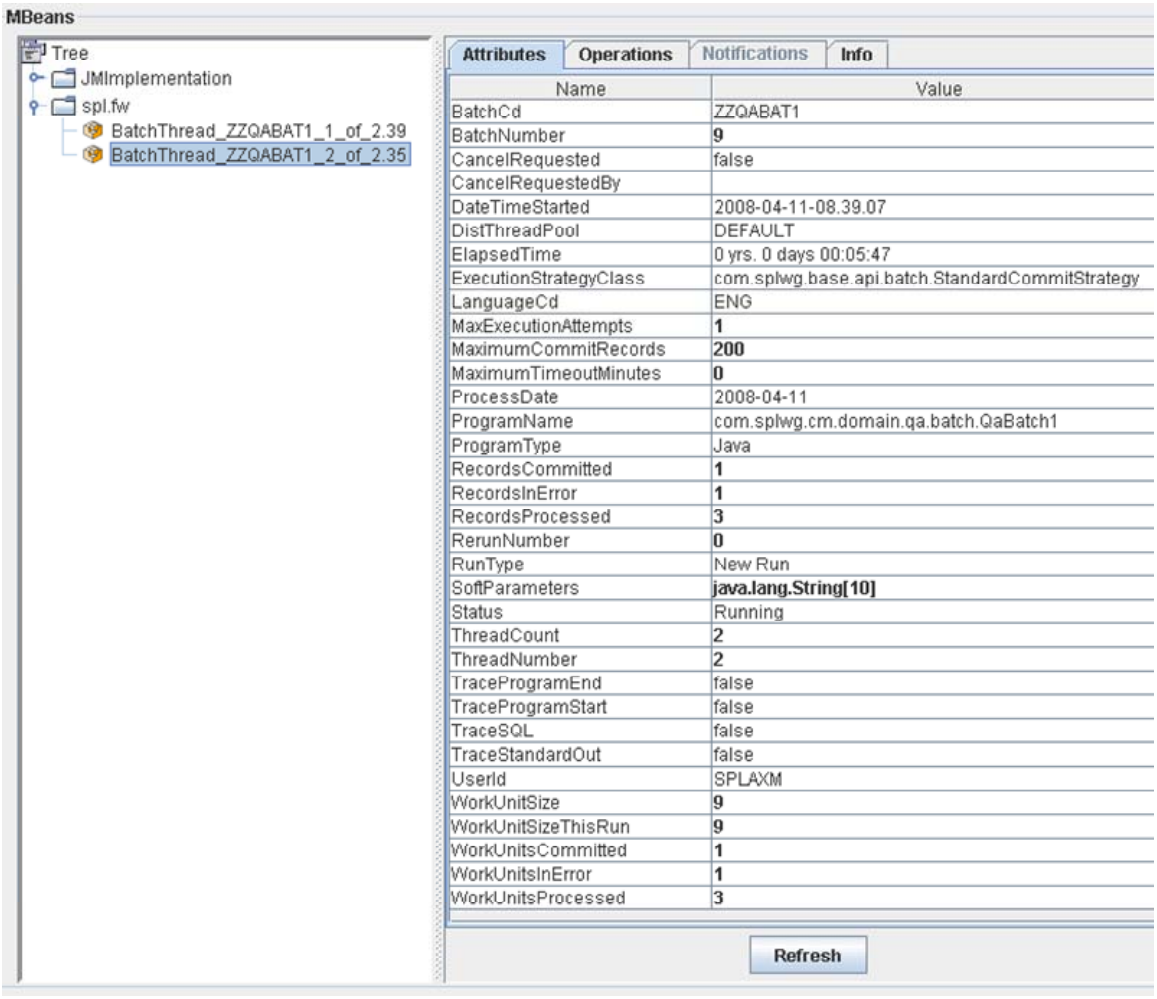
Mbeans associated with *BatchThread* are created once the *getJobWork* method for a Java program has successfully completed. Each thread, as requested by the *threadCount* parameter for the batch process, will have its own MBean. A BatchThread MBean for a thread is alive for as long as it takes for the thread to complete, and automatically destroyed when the thread ends.

The batch thread number, as indicated in the MBean name, will be the current thread's thread number.

- In the case of Java, these MBeans expose the *running values* for a thread. The records/units processed, in-error and remaining, are provided as the thread runs and updates the MBean internally.
- For a COBOL thread, if COBOL used, the values are not as detailed, since COBOL does not work in terms of *work units*, but some valuable information can still be obtained (e.g. elapsed time).

The Java BatchThread example below shows two threads running for batch process **ZZQABAT1**. The MBean name contains the thread number and count, and they show to be running in Java threads 39 and 35 respectively. The Java thread number is for uniqueness

only.



Note: Refreshing this information will dynamically update the values.

Note: JMX information is only displayed at active runtime and calls process can happen very fast – depending on the amount of data to be selected for the run – so the JMX console may not even detect this MBean.

The Mbean exposes a number of attributes:

Attribute	Comments
BatchNumber	The current batch number.
CancelRequested	True if the thread has been asked to stop running. See *CancelReqeustedBy*.
CancelRequestedBy	If *CancelRequested*=true, this will be a string indicating the workstation from where the cancellation was requested. This value will also be logged to the Batch Run Tree.
DateTimeStarted	The date and time the batch process was started.

Attribute	Comments
DistThreadPool	The thread pool to which this batch process belongs.
ElapsedTime	How long the batch process has been running.
ExecutionStrategyClass	This indicates the commit strategy followed by the program
ProgramName	The program name executed.
ProgramType	The program type: *Java* or *COBOL*.
RecordsCommitted	The number of record updates that have been committed to the database. See note below.
RecordsInError	The number of records so far in error. This is what will be logged to the Batch Run Tree. See note below.
RecordsProcessed	The number of records processed so far. This is what will be logged to the Batch Run Tree. See note below.
RunType	The type of run: *New Run*, *Restart* or *Rerun*.
Status	Current status of the thread. Valid values are: *Initializing*" (very briefly in the beginning – prior to the call to **getJobWork** in the application class); *Getting Work* means it is currently in the process of selecting the work units for the batch process; *Got Work* means it is has successfully selected the work and is in the process of initiating the threads.
WorkUnitSize	The total number of work units for this batch process. For new and restarted runs, this will always contain the total number of work units as selected in the **getJobWork** method when the batch process was originally started.
WorkUnitSizeThisRun	This is the number of work units for this particular run. For a restarted run, this value will typically be less than the above value; otherwise they will be the same.
WorkUnitsCommitted	The number of work units that have had their work committed.
WorkUnitsInError	The work units that have been found to be in error so far.
WorkUnitsProcessed	The work units that have been processed so far.

Note: The "Records…" numbers are what will be used to log to the Batch Run Tree, and they are usually in step with the "WorkUnits…" values. The reason they are shown separately is because some Java batch programs manually manipulate the record counts for the Batch Run Tree. The true progress status of a thread is reflected in the "WorkUnits…" counts.

Cancelling Batch Processes Using JMX

While JMX can be used to obtain monitoring information it is possible to cancel threads of batch processes using the operations component of JMX. To cancel a thread the following process must be performed:

- Start the JMX console of your choice and connect to the relevant JMX port configured for the batch.
- Select the thread and batch process to be cancelled from the JMX console.
- Select the *Cancel* operation from the operations component of the console. The console may recognize the operations of the JMX classes and allow the actions to be processed. For example, **`jconsole`** will generate *cancelThread* button. Issue the action.

Note: Depending on the JMX console used, a confirmation dialog may NOT be displayed and cannot be undone once issued. Ensure that the correct thread for the batch process is selected. To cancel a batch process, ALL threads must be cancelled.

- The batch process will be marked as cancelled and stopped. The IP address of the requestor is logged in the Batch Run Tree for auditing purposes.

jmxbatchclient[.sh] – JMX batch command line

While the JMX client interface provided allows real time information to be displayed in a JMX *browser*, if a JMX *browser* is not used then the JMX interface may be interfaced using a command line utility. This utility is useful to allow third party products (such as batch schedulers) or other systems to control and monitor the state of the system.

This JMX batch command line allows the following to be performed:

- Identify what thread pools are defined in a **`threadpoolworker`**
- See what active batch processes or threads are currently running
- Be able to cancel a particular thread or a batch process
- Gracefully shutdown a **`threadpoolworker`**
- The command line utility is in the following format:

To execute the command line, the administrator must:

- Logon to the machine running the product (any tier where the product software exists).
- Attach to the environment using the **`splenviron[.sh]`** command. This sets the appropriate environment settings for the script.
- Execute the JMX Batch command line utility:

```
jmxbatchclient[.sh] –j [URL] [options]
```

Where **[options]** are:

`-c` Specifies that active threads should be cancelled. Can be used with **-f** option to cancel only batch processes matching the regular expression provided. For example:

Note: Cancelled threads are marked with the date, time, userid and IP address of the user who initiated the cancel command.

`-d` Display the details of the currently active threads.

`-f` If a large number of threads are currently active, a filter can be supplied to only display or cancel threads that match the *regex* based pattern.

For example the threadpool be filtered to show only the BAT1 with the option: -f .*BAT1.* as follows:

```
jmxbatchclient.sh -j
service:jmx:rmi:///jndi/rmi://myserver:9999/spl/fw/jmxConnecto
r -f .*BAT1.*
```

would yield:

```
Options: -j
service:jmx:rmi:///jndi/rmi://myserver:9999/spl/fw/jmxConnecto
r -f .*BAT1.*

Connecting to
service:jmx:rmi:///jndi/rmi://myserver:9999/spl/fw/jmxConnecto
r

ActiveGridNode

threadPools=[MYSERVER:5,
LOCAL_THREAD_POOL:b9835d11f15fd71b:681ba91d:1200151a3c8:-
8000:0, SCHEDULER_DAEMON_THREAD_POOL:1]

BatchThread_ZZQABAT1_1_of_1.31
```

`-h` Display the available options and their descriptions.

`-j` JMX URL to perform the action against (Required).

This should match the **spl.runtime.management.connector.url.default** property specified in the **threadpoolworker.properties**.

`-k` Specifying this option will result in the cancellation of all currently running threads and the stoppage of the threadpoolworker process.

*Note: Active threads within a cancelled **threadpoolworker** are marked with the date, time, userid and IP address of the user who initiated the kill command*

`-l` By default, all logging information is displayed and logged using log4j. Supplying this option will result in only select information being displayed to the system output.

`-s` Display the summary of the currently active threads is a listing format.

Interactive submission (SPLBATCH)

One of the methods supported for developers is the "Interactive" method of submission. This method takes its name from the level of inactivity required during the initiation of the background process.

The idea with this method is that the background process driver program is invoked directly (via a supplied utility) and the parameters required for the batch process will be requested for input interactively. At the end of the interactivity the background process is executed and control is returned when the process is completed. Effectively you input the parameters interactively and run the background process in the foreground.

This submission method is only suggested to be used for development testing only for the following reasons:

- The process is actually run the foreground so interaction during execution is limited.
- To execute the background process a single threaded JVM is executed with the full context. This means the whole framework is loaded into memory before the actual execution is performed. This is not efficient for non-development use.
- The interactivity will not allow re-specification of incorrect values for parameters. While some validation is performed during input of parameters, full validation is performed during execution of the actual background process.

To use this method of submission the following process needs to be performed:

- Logon to the host machine using an appropriate authorized account (for UNIX/Linux it must be a member of the group used for the product.
- The environment must be attached to using the **splenviron[.sh]** utility. For example:

```
splenviron.sh –e DEV
```

- Execute the **SPLBATCH[.sh]** utility from the command line to initiate the interactive submission of the background process.
- When prompted, answer the parameter prompts using the following guidelines.
- Output is displayed to screen and batch run tree (see Batch Run Tree for further information).

Anatomy of an interactive submission

During the interactive submission process the following occurs:

- A Java Virtual Machine (JVM) is initiated according to the precepts in the **SPLBATCH[.sh]** utility and the configuration settings specified in the **$SPLEBASE/splapp/standalone/config** (or **%SPLEBASE%\splapp\standalone\config** on Windows) directory. Please refer to the Server Administration Guide for an explanation of the configuration settings.

- A full version of the product (including online classes) is loaded into the JVM.
- Database connections are established to the underlying database according to the **$SPLEBASE/splapp/standalone/config/hibernate.properties** (or **%SPLEBASE%\splapp\standalone\config\hibernate.properties** on Windows) configuration file. Please refer to the Server Administration Guide for an explanation of the configuration settings.
- The parameters for the background process are prompted. For example:

Parameter Prompt	Usage
Batch Code	Batch control for batch process. This is mandatory as it is used to determine the program to execute.
Batch Thread Number	Number of Thread to execute. This is mandatory and must be less or equal to thread limit. Usually specify **1**.
Batch Thread Count	Thread limit. Usually specify **1**.
Batch Rerun Number	The batch run number to rerun (*Background process must support rerun numbers for this to be used*). Specify **0** to ignore.
Batch Business Date. If not accepted, will use the system date	The business date in ISO format (i.e. *YYYY-MM-DD*). Use blank entry to use current system date.
Maximum Number of records to commit: If not accepted, the program default will be used	Commit interval. Use blank entry to use program default.
Maximum Time-out minutes: If not accepted, the program default will be used	Timeout for Oracle. Use blank entry to use program default.
User ID	Specify a valid user for security reasons.
User Password	Not applicable. Use blank entry to ignore.
Language Code	Language code used for error messages. This is mandatory. Specify **ENG** for English or another valid code. The valid language pack must be installed to use the selected language.
Trace Program Start (Y/N)	Enable tracing of program starts. Specify **Y** for Yes or **N** for No. This is mandatory. Usually specify **N**.
Trace Program Exit (Y/N)	Enable tracing of program exits. Specify **Y** for Yes or **N** for No. This is mandatory. Usually specify **N**.

Parameter Prompt	Usage
Trace SQL (Y/N)	Enable tracing of SQL Statements. Specify **Y** for Yes or **N** for No. This is mandatory. Usually specify **N**.
Trace Standard Output (Y/N)	Enable tracing of debug output from programs. Specify **Y** for Yes or **N** for No. This is mandatory. Usually specify **N**.
Additional Run Parameters (Blank line to end) :	**parmname=parmvalue** Specify additional parameters as specified on Batch Control. Use a blank line to indicate last parameter.

- The program indicated on the batch control of the Batch Code specified is executed. For each execution the following information is output:

SCHEDULER ID	Internal number allocated to instance of process execution. All messages are associated with this Scheduler Id.
BATCH CD	Batch Code submitted.
BATCH THREAD NBR	Batch Thread number submitted
BATCH THREAD CNT	Thread Limit used for submission
BATCH NBR	Batch Number allocated to this execution. Value of 0 indicates that the program does not support batch numbers or current batch number is used.
BATCH BUSINESS DT	Batch Business date used for execution in YYYY-MM-DD format.

- The execution of the batch submission is also written to **$SPLOUTOUT** (or **%SPLOUTPUT%** on Windows) in a log file named **<batch_cd>.<datetime>.THRD<threadnumber>.stdout** and **<batch_cd>.<datetime>.THRD<threadnumber>.stderr** where **<batch_cd>** is the batch code submitted, **<datetime>** is the date and time of the execution (in format *YYYYMMDDHHMMSS.S* format) and **<threadnumber>** is the thread number submitted.

Return Codes

The following return codes apply to the processing using this method:

Return Code	Usage
0 (zero)	Successful
Non-zero	Unsuccessful. See log files for more information.

Limitations of the interactive submission method

The interactive submission method is recommended for use with development only for the following reasons:

- This method is designed for development use.
- Each thread runs within its own JVM. This is not efficient for multiple simultaneous batch processes or multiple threads.
- The prompting is interactive and designed for developers only. While it is possible to pass a parameter file containing the values for each of the prompts into the **SPLBATCH[.sh]** utility it is not recommended.
- Incorrectly specified values for prompts cannot be corrected. You must wait for the batch process failure to start again.
- There is no monitoring method or cancelling from the foreground execution (apart from killing the terminal session).
- JMX monitoring is not possible with this method.

Online Submission

One of the most important useful testing/demonstration facilities of the product is the ability to submit batch processes from the online component of the product. An authorized user can submit any batch process using an online batch submission page.

The on-line batch submission page enables you to request a specific background process to be run. When submitting a background process on-line, you may override standard system parameters and you may be required to supply additional parameters for your specific background process. After submitting your background process, you may use this page to review the status of the submission.

Basically the following process is used to submit background processes using the online submission method:

- The process to be executed is registered online as to be submitted (or queued). This marks the process execution as *Pending*. When you request a batch process to be submitted from on-line, the execution of the desired background process will result in the creation of a batch run. Just as with background processes executed through your scheduler, you may use the Batch Run Tree page to view the status of the run, the status of each thread, the run-instances of each thread, and any messages that might have occurred during the run.

  Note: Your online submission record is assigned a status value so that you may know whether your batch process has been submitted and whether or not it has ended; however, it will not contain any information about the results of the background process itself. You must navigate to the Batch Run Tree page to view this detail.

- A background process is scheduled (using a submitbatch script (run in **cron**) or using the submission daemon) that will pickup any *Pending* background process executions and execute them. When you save a record on the batch process submission page, the batch process does not get submitted automatically. Rather, it saves a record in the batch process table. A special background process will periodically check this table for pending records and will execute the batch process. This background process will update the status of the batch process submission record so that a user can determine when their batch process is complete.

Note: At installation time, your system administrator will set up this special background process or configure the scheduler daemon to periodically check for pending records in the batch process submission table. Your administrator will define how often the system will look for pending records in this table.

It should be noted that this special background process only submits one pending batch process submission record at a time. It submits a batch process and waits for it to end before submitting the next pending batch process.

Note: If you request a batch process to be run multi-threaded, the special background process will submit the batch process as requested. It will wait for all threads to complete before marking the batch process submission record as ended.

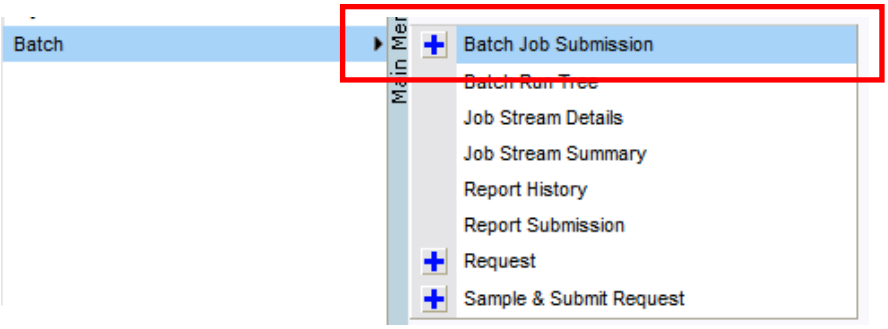
During execution the status of the execution in the batch run tree is updated as well as the original submission screen. If you wish the system to inform you when the background process completes, you may supply your email address. The email you receive will contain details related to the batch process's output; similar to the batch process results you would see from the batch run tree.

Note: This assumes that during the installation process, your system administrator configured the system to enable email notification. Your administrator may also override the amount of detail included in the email notification.

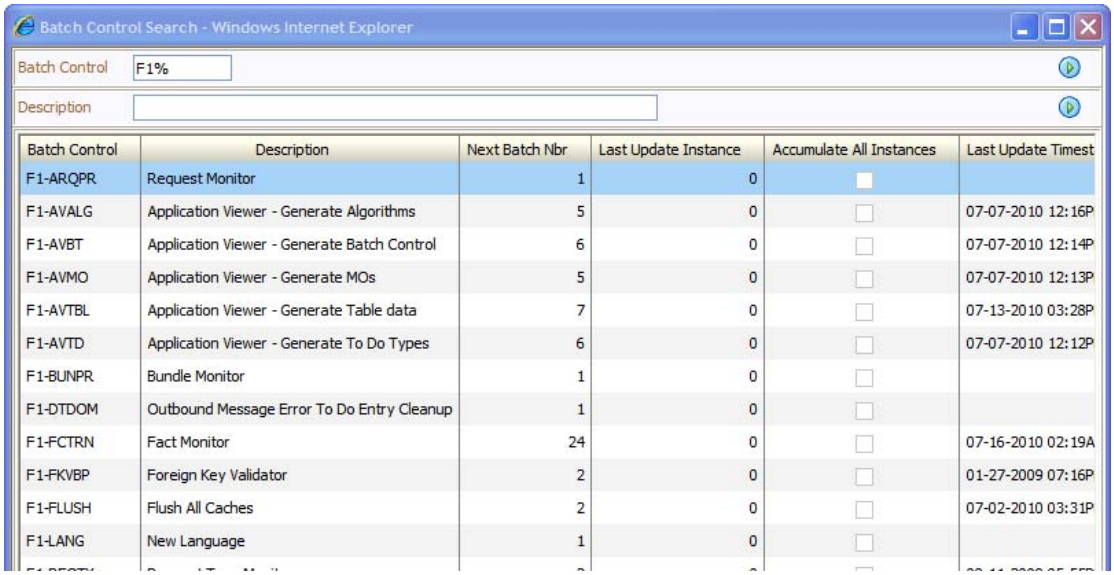
Using Online Submission

The process of submitting using the online method is as follows:

- Logon to the product environment using your browser. Use the appropriate URL.
- Navigate to *Main → Batch → Batch Submission*

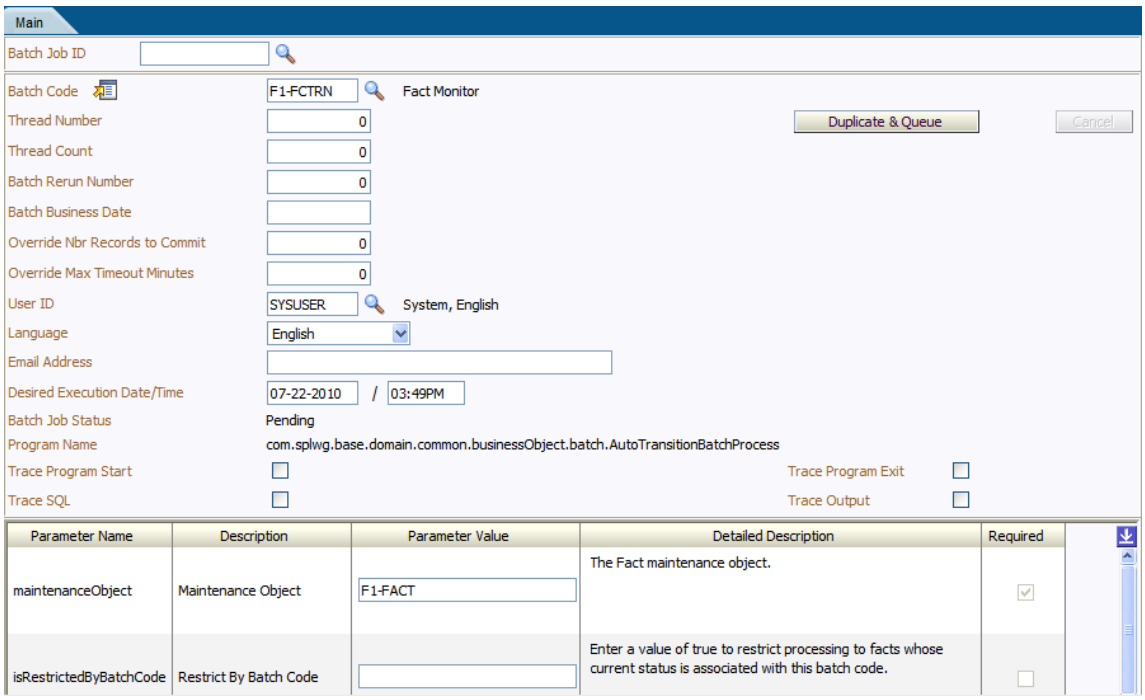


- Find the batch control you wish to submit. You can use the Batch Code or the Description of the batch process to find it. It is possible to submit any valid batch process in the list.



Batch Control	Description	Next Batch Nbr	Last Update Instance	Accumulate All Instances	Last Update Timest
F1-ARQPR	Request Monitor	1	0		
F1-AVALG	Application Viewer - Generate Algorithms	5	0		07-07-2010 12:16P
F1-AVBT	Application Viewer - Generate Batch Control	6	0		07-07-2010 12:14P
F1-AVMO	Application Viewer - Generate MOs	5	0		07-07-2010 12:13P
F1-AVTBL	Application Viewer - Generate Table data	7	0		07-13-2010 03:28P
F1-AVTD	Application Viewer - Generate To Do Types	6	0		07-07-2010 12:12P
F1-BUNPR	Bundle Monitor	1	0		
F1-DTDOM	Outbound Message Error To Do Entry Cleanup	1	0		
F1-FCTRN	Fact Monitor	24	0		07-16-2010 02:19A
F1-FKVBP	Foreign Key Validator	2	0		01-27-2009 07:16P
F1-FLUSH	Flush All Caches	2	0		07-02-2010 03:31P
F1-LANG	New Language	1	0		

- Fill in the prompts on the screen with the appropriate values.



Prompt	Comments
Batch Job Id	The Batch Job ID is a system generated random number that identifies a particular submission.
Batch Code	To submit a batch process, choose the Batch Code for the process you wish to submit.
Batch Thread Number	Thread number is used to control whether a background processes is run single threaded or in multiple parallel threads. It contains the relative thread number of the process. For example, if the process X has been set up to run in 20 parallel threads, each of the 20 instances receives its relative thread number (1 through 20). *Note: Not all processes may be run multi-threaded.* Many of the system background processes may be run multi-threaded. When submitting a background process on-line, you may also run a multi-threaded process or run a single thread of a multi-threaded process. The fields Thread Count and Thread Number on the batch submission page control the multi-threaded process requests: • To run a multi-threaded process, indicate the number of threads in Thread Count and enter 0 in the Thread Number. For example, to run the batch process XXX with 10 threads, enter Thread Count = 10 and Thread Number = 0. This will execute all 10 threads of batch process XXX. • To run a single thread in a multi-threaded process, indicate the number of threads in Thread Count and indicate the Thread Number you would like to run. For example, to

Prompt	Comments
	run only thread 1 out of 10 threads for batch process XXX, enter Thread Count = 10 and Thread Number = 1. This will execute thread 1 out of 10 for XXX. • To run a process as a single thread, enter Thread Count = 1 and Thread Number = 1. This will execute the background process single-threaded. *Note: When running a multi-threaded process, the completion of the last of the threads will "mark" the batch process submission record as ended.*
Batch Thread Count	Thread count is used to control whether a background processes is run single threaded or in multiple parallel threads. It contains the total number of threads that have been scheduled. For example, if the billing process has been set up to run in 20 parallel threads, each of the 20 instances receives a thread count of 20.
Batch Rerun Number	Rerun number is only used for background processes that download information that belongs to given run number. It should only be supplied if you need to download an historical run (rather than the latest run).
Batch Business Date	Business date is only used for background processes that use a date in their processing. For example, billing using the business date to determine which bill cycles should be downloaded. If this parameter is left blank, the system date is used at the time the background process is executed.
Override Nbr Records To Commit and Override Max Timeout Minutes	These parameters are optional and override each background process's Standard Commit Records and Standard Timeout Minutes (each background process's Standard Commit Records / Standard Timeout Minutes is documented in the list of system background processes).
User ID	Enter the user ID for the background process. This field defaults to the id of the current user.
Language Code	Language code is used to access language-specific control table values. For example, error messages are presented in this language code.
Email	If you wish the system to notify you when the batch process is complete, enter your Email ID. This field defaults to the email address for the current user, if populated on the user record. *Note: SMTP support must be configured to operate.*
Desired Execution Date/Time	The Desired Execution Date/Time defaults to the current date and time. Override this information if you wish the

Prompt	Comments
	background process to be executed at some future date and time. If you wish to request a batch process to be submitted in the future, you may do so when creating your batch process submission record by entering a future submission date. The special background process, which looks for pending records in the batch process submission table, will only submit batch processs that do not have a future submission date.
Batch Job Status	This indicates the current status of the batch process.
Program Name	The Program Name associated with the batch control code is displayed. This is used for tracking purposes
Trace Program Start	Toggle this switch on if you wish a message to be written whenever a program is started.
Trace Program Exit	Toggle this switch on if you wish a message to be written whenever a program is exited.
Trace SQL	Turn on this switch if you wish a message to be written whenever an SQL statement is executed.
Trace Output	Turn on this switch if you wish a message to be displayed for special information logged by the background process.

Note: The trace parameters are typically only used during QA and benchmarking.

Note: The information displayed when the trace output switch is turned on depends on each background process. It is possible that a background process displays no special information for this switch.

Note: The location of the output of this trace information is defined by your system administrator at installation time.

- If additional parameters have been defined for this background process on the Batch Control page, the Parameter Name, Description and an indicator of whether or not the parameter is *Required* are displayed. Enter the desired Parameter Value for each parameter.

  Each of the batch processes has, as part of its run parameters, a preset constant that determines how many errors that batch process may encounter before it is required to abort the run. You can override this constant with an optional additional parameter (**MAX-ERRORS**). The input value must be an integer that is greater than or equal to zero. The maximum valid value for this parameter is 999,999,999,999,999.

- Press the **Save** key. Once you have entered all the desired values, **Save** the record in order to include it in the queue for background processes.

- If you wish to duplicate an existing batch process submission record, including all its parameter settings, display the submission record you wish to duplicate and use the **Duplicate and Queue** button. This will create a new Batch Job Submission entry in pending status. The new submission entry will be displayed.

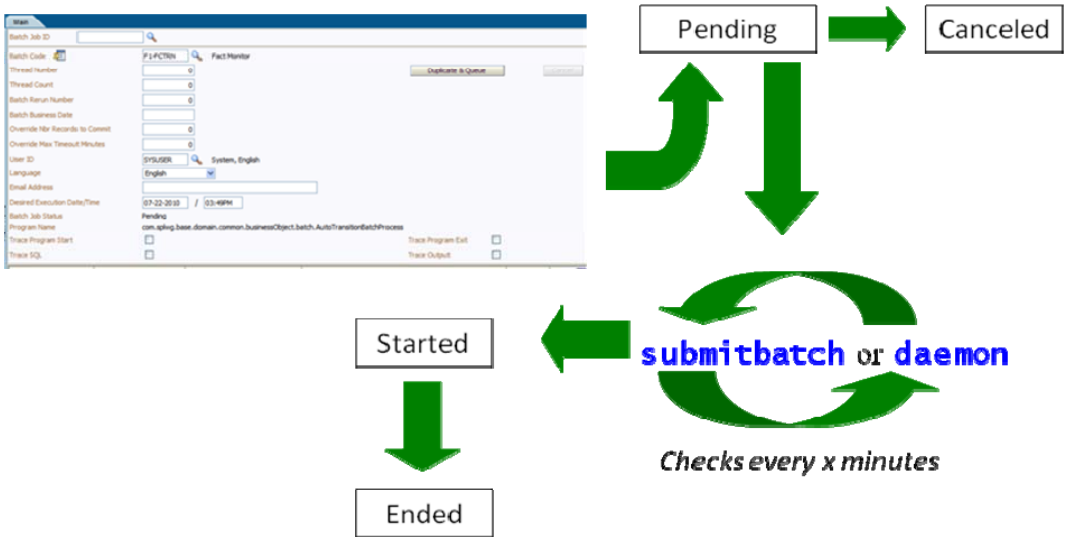
- If you wish to cancel a Pending batch process submission record, use the **Cancel** button. The button is disabled for all other status values.

Note: Saving a record on this page does not submit the batch process immediately. A special background process will run periodically to find pending records and submit them. Depending on how often the special process checks for pending records and depending on how many other pending records are in the 'queue', there may be a slight lag in submission time. If the desired execution date/time is close to midnight, it is possible that your batch process will run on the day after you submit it. If you have left the business date blank in this case, keep in mind that your business date would be set to the day after you submit the batch process.

After saving the process in the batch submission screen the following process is performed:

- The execution of the process is registered within a batch run table in *Pending* status. Prior to execution the user may cancel the batch process by pressing the cancel button. This updates the process status to *Canceled*.
- At installation time, the product administrator sets up an additional process, the online daemon (or **`submitbatch[.sh]`** cron utility see submitbatch) which polls the batch run table every x minutes (where x is the parameter used on the command line).
- It processes each *Pending* process in sequence, using FIFO and at process start updates the batch run table with a status of *Started*. This indicates the process is executing. The user cannot cancel the process after it has been *Started*. At this time the batch run tree is populated with the run information as it is executing, including restart information and threading.
- If the process is successful or errored, the batch runs information with an *Ended* status. You must check the Batch Run tree to see if has been successful.

This figure illustrates the process:

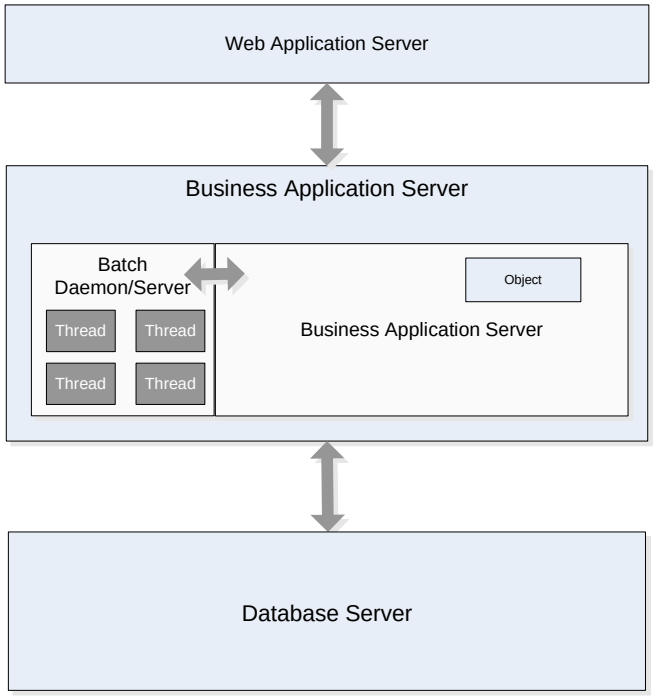


Online Batch Daemon

During the installation of the Business Application Server component of the product, it is possible to configure part of the Business Application Server runtime to become a batch

daemon. This means that part of the JVM used by the Business Application Server can be used as a daemon (or "listener") for processes submitted online.

If configured, the Business Application executes an internal process to poll for "Pending" processes registered using the online submission screen. This batch daemon then executes the batch process within the Business Application Server JVM. The daemon can be configured to limit the impact on the online system by limiting the number of concurrent threads that can be executed. The following diagram illustrates this process:



At installation time the installer asks additional questions to disable/enable the batch daemon:

```
...
      Batch Server Enabled:                          false
      Batch Threads Number:                          5
      Batch Scheduler Daemon:                        false
...
```

The three settings used can be configured using the following guidelines:

- **Batch Server Enabled** – Enable batch to be run within the JVM.
- **Batch Threads Number** – Maximum number of threads to limit background processes to within the JVM if *Batch Server Enabled* is set to Yes. This number of threads represents the number of threads surrendered from the main JVM thread pool and allocated to running batch exclusively. The default is 5.
- **Batch Scheduler Daemon** – Enable the daemon to check for pending batch processes in the Batch Submission or inbuilt batch process scheduler[2]. If a pending batch process is

[2] The inbuilt batch process scheduler is NOT covered in this guide. Refer to the online documentation provided with your product for details of this facility (if provided with your product).

found it is passed to the *Batch Server* for execution.

The valid combinations of these settings are as follows:

Batch Server Enabled	Batch Scheduler Daemon	Comments
Yes	**Yes**	Batch Daemon runs on this Business Application Server and any batch processes found by the daemon are executed on this Server.
Yes	**No**	Batch Daemon does not run on this Business Application Server but this Business Application Server can execute batch programs. It is assumed that another business application server has been allocated as a batch scheduler daemon.
No	**Yes**	Batch Daemon does run on this Business Application Server but Batch submission does not run on this Business Application Server. It is assumed that another business application server has been allocated as a batch server.
No	**No**	Batch does not execute on this Business Application Server and no Batch Daemon has been allocated to this

Guidelines for using the Batch Server/Batch Scheduler Daemon

This facility is not applicable to all environments and all situations at a site, the following guidelines will assist in the appropriate use of the facility:

- If the environment is going to use the online submission (or inbuilt scheduler) then the Batch Server and Batch Scheduler Daemon should be enabled for Business Application Server allocated to the environment. If multiple Business Application Servers are allocated to the same environment, then there should only be one server with the *Batch Server enabled* set to *Yes* and only one server with the *Batch Scheduler Daemon* set to *Yes* (they can be the same server or different servers). This setting is common for non-production environments.
- If the environment is not going to use the online submission, then both *Batch Server Enabled* and *Batch Scheduler Daemon* should set to *No*. This is a common setting for Production as online submission is usually disabled in production.

Logging using the Batch Server/Scheduler Daemon

The execution of any batch submission is also written to **$SPLOUTOUT** (or **%SPLOUTPUT%** on Windows) in a log file named ***<batch_cd>.<datetime>.THRD<threadnumber>.stdout*** and ***<batch_cd>.<datetime>.THRD<threadnumber>.stderr*** where ***<batch_cd>*** is the batch code submitted, ***<datetime>*** is the date and time of the execution (in format *YYYYMMDDHHMMSS.S* format) and ***<threadnumber>*** is the thread number submitted.

Configuring JMX with the Batch Server/Scheduler Daemon

The executing threads Batch Server can be monitored using the JMX adapter by adding the following lines to the **$SPLEBASE/etc/conf/root/WEB-INF/classes/spl.properties** (or **%SPLEBASE%\etc\conf\root\WEB-INF\classes\spl.properties** on Windows) file:

```
spl.runtime.management.rmi.port=<port>

spl.runtime.management.connector.url.default=service:jmx:rmi:///jndi/rmi://<server>:<port>/spl/fw/jmxConnector

java.rmi.server.hostname=<server>
```

Where:

<server>	Name of the host (or IP address) where the Business Application Server is located.
<port>	A unique port allocated for the JMX agent to broadcast on. This port must be unique to the host it is located upon.

To implement the change the **initialSetup[.sh]** commands must be executed. Additionally on platforms when a WAR/EAR file is used, the WAR/EAR file must be redeployed. Refer to the Server Administration Guide for details.

submitbatch – Command based daemon

Note: This facility is documented for completeness only, it is recommended that the online submission daemon be used in preference to this facility.

For backward compatibility purposes, there is a facility that can invoked on the command line (or in cron, or similar, facility) to act as an alternative to the online scheduler daemon. This facility will run a polling script that will detect a pending process and invoke the interactive method (in background) to execute the process.

This can be configured using the following command line

```
submitbatch[.sh] [-e <env>] [-s <seconds>] [-h] [-k]
```

Where:

-s *<seconds>*	Run as daemon and pause ***<seconds>*** seconds between loops of checking whether there is more work to do. Without the **-s** it runs one batch process and stops (recommended if used with

	cron).
`-k`	Stop the background batch processor
`-v`	Print out verbose messages
`-e <env>`	Dummy parameter that is only used to make the process more identifiable so 'ps -edf' can be used to determine which submitbatch script belongs to which environment (***<env>***).
`-h`	Print command line help.

External Scheduler Submission

The Oracle Utilities Application Framework exposes a callable interface that allows scheduling and execution of to be controlled by an external scheduling product. A number of utilities **`threadpoolworker`** and **`submitjob`** have been include in the product to allow external schedulers (or a command line) to establish a JVM to run background processes and then submit background process to that JVM.

Note: The words "node" and "JVM" are interchangeable in this section.

Concepts

At a site implementing the product, the batch processes to be executed to support the business as well as perform expected maintenance on the system needs to be scheduled, managed and executed from a central point. In most sites, this is done by using a third party batch process scheduler that controls the scheduling and execution of any batch processes across a site.

To support the use of such a scheduler with any Oracle Utilities Application Framework based product(s) a number of scripts and related configuration files have been provided to allow the scheduler to execute the process batch processes.

The scripts and configuration files allows for three fundamental facilities that can be used by external scheduling tools:

- The interface is command line based (*it can also be invoked using a java based API see the product javadocs within AppViewer for a description of the interface*) which most external scheduling tools support.
- The command based utilities return a standard return code to indicate the batch process has been successful or has been unsuccessful. Actions dependent on return code within the scheduler can then be configured.
- The logs within the utilities provided are in a common format that can be interrogated by the external scheduler to provide finer grained actions (*especially for unsuccessful executions*).

For additional advice about interfacing external schedulers with the product refer to the Batch Best Practices whitepaper at KB Id **836362.1** on My Oracle Support.

threadpoolworker[.sh] Utility

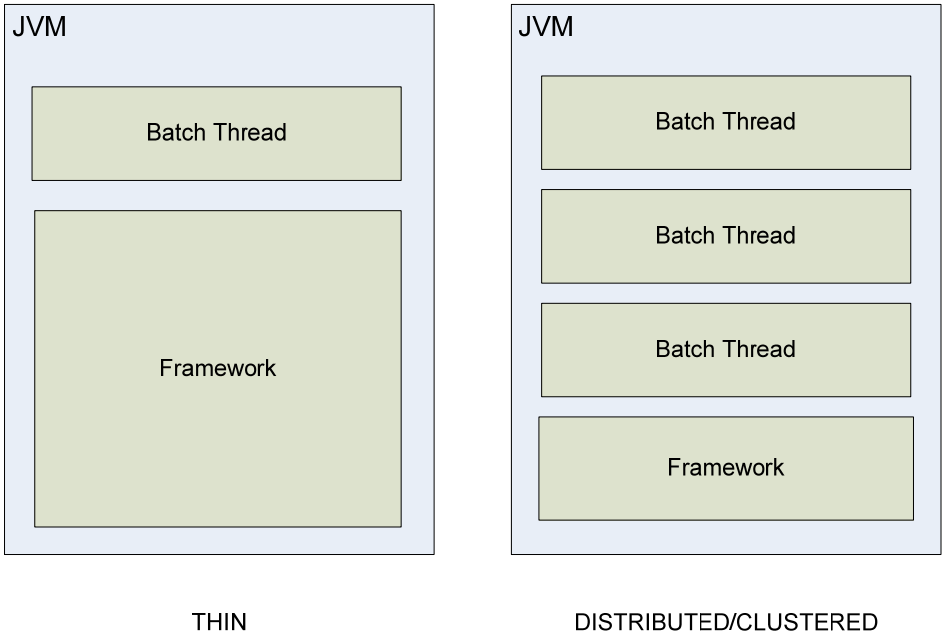
This script starts a *long-lived worker* node (JVM) in a distributed batch grid environment. Once successfully started, this process will accept submissions from lightweight submitter nodes and execute the batch processes as requested by the submitters. A worker JVM may also host a scheduler daemon, which, if activated inside a worker, will poll for batch process submission requests from the web application that were done via the Batch Job Submission transaction.

There are three modes to execute background processes using this facility **CLUSTERED**, **DISTRIBUTED** and **THIN**.

- In **THIN** mode, the batch program is executed in a *stand-alone* JVM. This means that a full application context is established before the application program is invoked, and destroyed when the execution ends. If a batch process is submitted in multiple threads, each thread requires its own context, in its own separate JVM. THIN mode is typically used by developers to isolate their tests from other developers and is not recommended for production use.
- In **DISTRIBUTED** mode, at least one *worker* JVM must be started and left running to poll for work requests from *submitter* JVMs. Worker JVMs are also known as *grid nodes*, because multiple workers can be started to load-balance batch. **DISTRIBUTED** mode is the existing, classic way that customers have been running their batch processes in past releases of the Oracle Utilities Application Framework. In this mode, one or more batch workers are started and left to run as long-running, background tasks. Each worker can be individually configured to process n number of threads concurrently, and this can further be grouped into *thread pools*. The workers also have the option to host a batch process scheduler daemon, whose role is to listen for and execute online batch process submissions (via the Batch Job Submission page for example).
- In **CLUSTERED** mode, as with **DISTRIBUTED** at least one *worker* JVM must be started. These *worker* JVM's may be standalone or clustered with appropriate batch. The difference between **CLUSTERED** and **DISTRIBUTED** is that in a **CLUSTERED** setup, worker and submitter JVMs (members) are more tightly joined in a Coherence based cluster, resulting in better management of various events, such as workers abruptly stopping (because of program crashes for example), batch processes getting cancelled, etc. As long as at least one member is active in a cluster, batch processes can be appropriately handled in the case of unexpected interruptions.

It is highly recommended that customers use the **CLUSTERED** mode.

The figure below summarizes the approaches of different execution modes:



If only **THIN** submissions are ever used, script **threadpoolworker[.sh]** does not have to be executed. If this is the case, batch processes can be submitted in **THIN** mode from the command-line using script **submitjob[.sh]**.

This script may be executed more than once if multiple workers are required. This may be for performance or load-balancing purposes, or to simply provide separate thread pool configurations in a distributed grid. Worker JVMs in a grid can be started on different machines (even if the platforms differ), provided they all access the same database and contain the runtime appropriate for the architecture. If the web application is also batch-enabled, the worker hosted by the web application then becomes one node among the nodes that were started as described above.

If multiple worker nodes, including the web application, are configured to host a scheduler daemon, only one of those will be the active daemon. The others are dormant until the active one becomes unavailable for some reason, for example if the JVM is *killed*, in which case one of the dormant ones will automatically become active.

*Note: A single product environment can be either **CLUSTERED** or **DISTRIBUTED**. Mixing JVMs that start up in **CLUSTERED** and **DISTRIBUTED** mode will have unpredictable results.*

threadpoolworker and F1_TSPACE_ENTRY

The **DISTRIBUTED** and **CLUSTERED** approaches use a database tuple space table **F1_TSPACE_ENTRY** for operations and management. The role of this table varies differently depending on the execution mode of the worker or submitter.

In **DISTRIBUTED** mode, whenever a **threadpoolworker** or **submitjob** starts an entry is created in the **F1_SPACE_ENTRY** table. This is used by the **threadpoolworker** to advertise that it is ready to accept work (known as a **THREAD_OFFER**) using a lease (to indicate when it is to check back with **F1_TSPACE_ENTRY**). If the threadpoolworker finds work in the **F1_TSPACE_ENTRY** it issues a *GRID_WORK* record grabbing the submitters work and executes the indicated batch process. After the batch process has ended it issues a *WORK_ENDED* against the submitter record in the **F1_TSPACE_ENTRY** table and updates the **threadpoolworker** entry to *THREAD_OFFER* again to accept more work. The submitter process creates an **F1_TSPACE_ENTRY** table of *WORK_OWNER* to indicate it waiting to be executed and waits. When the **threadpoolworker** accepts the submitters work it has marked the submitters records as *GRID_WORK* indicating it is processing the task. At this time, the submitted polls regulars waiting for the *WORK_ENDED* message to indicate the work has been completed.

The issues with this type of processing are when there are issues with the **threadpoolworker** or **submitter**. If these processes fail, then the **F1_TSPACE_ENTRY** does not adequately reflect the state of the processes. This may cause internal synchronization issues in some cases. A common technique used by sites when this happens is to clear the offending **F1_TSPACE_ENTRY** entries manually or truncating the table altogether and reissue the work. The latter is dangerous if there is work still running in the product.

The **CLUSTERED** mode was created to address this issue. It uses **F1_TSPACE_ENTRY** for some persistence but each **threadpoolworker** in the cluster is aware of the other nodes

and the work that is allocated to it. Any node can be used in execution of processes and in the case of submitter failure the node will communicate to the appropriate process to keep the relevant parties informed. This also occurs when a **threadpoolworker** failure where the other nodes inform the relevant parties involved of the failure.

threadpoolworker.properties configuration file

To use the **threadpoolworker** utility a configuration file must be created to specify the attributes of the JVM. The **threadpoolworker.properties** file should be placed in the **$SPLEBASE/etc** directory (or **%SPLEBASE%\etc** directory on Windows).

The properties file contains the default properties for **threadpoolworker**. The following sample illustrates the values:

```
com.splwg.grid.distThreadPool.threads.DEFAULT=5
com.splwg.grid.distThreadPool.threads.LOCAL=0
com.splwg.batch.scheduler.daemon=true
spl.runtime.management.rmi.port=9090
spl.runtime.management.connector.url.default=service:jmx:rmi:///jndi/rmi://{host}:{port}/spl/fw/jmxConnector
com.splwg.grid.executionMode=CLUSTERED
tangosol.coherence.log=log4j
tangosol.coherence.log.level=5
tangosol.coherence.guard.timeout=0
tangosol.coherence.cluster=OUAF.DEMO
tangosol.coherence.clusteraddress=255.10.10.1
tangosol.coherence.clusterport=7098
tangosol.coherence.mode=prod
```

The following table describes the parameters:

Parameter	Comments
com.splwg.grid.distThreadPool.threads.*<poolname>*	Number of Threads for pool ***<poolname>***.
com.splwg.batch.scheduler.daemon	Whether the node will act as a scheduler daemon.
com.splwg.grid.executionMode	Mode of the **threadpoolworker**. Valid values are: **THIN**, **DISTRIBUTED** or **CLUSTERED**
spl.runtime.management.rmi.port	JMX RMI Port to use. If omitted, JMX is disabled.
spl.runtime.management.connector.url.default	Default JMX service. Required if rmi.port is specified. In the example, above the URL format is shown. Substitute ***{host}*** for hostname of machine and ***{port}*** for

Parameter	Comments
	unique RMI port.
com.splwg.batch.submitter.maxExecutionAttempts	This specifies how many times the worker(s) in the grid should attempt execution of the work submitted by this submitter. If the application program crashes and brings down the worker JVM with it, this parameter is designed to prevent any other worker nodes in the grid from picking up this same bad work request and thereby spreading the "poison work" around the grid, crashing JVMs along the way and ultimately bringing the batch grid down completely. The default is set to 1 and should be left like that unless there is a good reason to change it
tangosol.coherence.log	Specifies destinations of log entries. This is set to log4j. This setting should not be changed. *Only used for* ***executionMode CLUSTERED***
tangosol.coherence.log.level	Level of logging: 0 - only output without a logging severity level specified will be logged 1 - all the above plus errors 2 - all the above plus warnings 3 - all the above plus informational messages. Default is **3**. *Only used for* ***executionMode CLUSTERED***
tangosol.coherence.guard.timeout	The timeout value used to guard against deadlocked or unresponsive services. It is recommended that service-guardian/timeout-milliseconds be set equal to or greater than the packet-delivery/timeout-milliseconds value. A timeout of zero will disable service guardians. A timeout of zero will disable service guardians. The default value is **0**. *Only used for* ***executionMode***

Parameter	Comments
	CLUSTERED
tangosol.coherence.cluster	The cluster-name element contains the name of the cluster. In order to join the cluster all members must specify the same cluster name. The name can be up to 32 characters to define the name of the cluster. This is required and must be unique for each environment. With classic **DISTRIBUTED** mode, the batch JVMs for an environment are naturally grouped because they register themselves through database table **F1_TSPACE_ENTRY**, but in **CLUSTERED** mode the JVMs are joined through a Coherence cache. The cache may be across all environments, so a unique cluster name, along with address and port (*see below*), is required to ensure that they are appropriately grouped per environment. Environments are typically separated by database and/or database user, so a possible convention may be to use a combination of database name and owner Id as the cluster name, for example **CCBDEMO.CISADM**. *Only used for* ***executionMode CLUSTERED***
tangosol.coherence.clusteraddress	Specifies the multicast IP address that a Socket will listen or publish on. Valid values are from 224.0.0.0 to 239.255.255.255. For non-multicast implementations use the Well Known Addresses (WKA) functionality. *Only used for* ***executionMode CLUSTERED***
tangosol.coherence.clusterport	Specifies the multicast port that the Socket will listen or publish on. Valid values are from 1 to 65535. For non-multicast implementations use the Well Known Addresses (WKA) functionality. *Only used for* ***executionMode CLUSTERED***
tangosol.coherence.localhost	Specifies the IP address that a Socket will listen or publish on for WKA

Parameter	Comments
	functionality. *Note: The* ***localhost*** *setting may not work on systems that define* ***localhost*** *as the loopback address; in that case, specify the machine name or the specific IP address.* Default is **localhost**. *Only used for* ***executionMode CLUSTERED***
tangosol.coherence.localport	Specifies the port that the Socket will listen or publish on for WKA functionality. Legal values are from 1 to 65535. Default value is **8088**. *Note: By default, this port will automatically increment if the specified port cannot be bound to because it is already in use.* *Only used for* ***executionMode CLUSTERED***
tangosol.coherence.mode NEW	Specifies whether the batch clustering facility is being used in a development or production mode. Valid values are **prod** (Production), and **dev** (Development).
tangosol.coherence.wka	Specifies a list of *well known* addresses (WKA) that are used by the cluster discovery protocol in place of multicast broadcast. If one or more WKA is specified, for a member to join the cluster it will either have to be a WKA or there will have to be at least one WKA member running. Additionally, all cluster communication will be performed using unicast. If empty or unspecified multicast communications will be used. *Only used for* ***executionMode CLUSTERED***
tangosol.coherence.wka.port	Port numbers associated with WKA addresses in tangosol.coherence.wka. *Only used for* ***executionMode CLUSTERED***

This file should be modified for site-specific values. For example, the scheduler daemon may not be required to be activated by default, in which case property **com.splwg.batch.scheduler.daemon** should be changed to false (or removed entirely to use the system default).

Note: If using Coherence Cluster Address and Coherence Cluster port then they form a multicast address unique to the environment/cluster. All worker and submitter JVMs that want to join this cluster must have the same cluster name, cluster address and cluster port.

The first worker JVM that starts for a particular combination of cluster/address/port establishes that cluster. Other JVMs with this same combination will then join this cluster.

The framework guards against the submission of batch processes to the wrong cluster in two ways. Firstly, if the address/port matches an existing cluster's address/port, but the cluster name is different, the JVM will exit with this error message:

This member could not join the cluster because of a configuration mismatch between this member and the configuration being used by the rest of the cluster.

Secondly, if a JVM's cluster name references an existing cluster, but the database to which the existing cluster is connected is not the same as the joining JVM's, it will exit with this message:

```
Error validating cluster membership. Terminating...
```

In either case it is a configuration issue that needs to be corrected.

Multi-cast or Uni-cast

The CLUSTERED mode can use multi-cast or uni-cast to communicate across the **threadpoolworker** nodes in a cluster. By default **CLUSTERED** mode uses a multicast protocol to discover other nodes when forming a cluster. For information about multi-cast and uni-cast see the following sites:

- Discussion of protocols - http://wiki.tangosol.com/display/COH35UG/Network+Protocols
- Advanced Configuration of the multi-cast listener - http://wiki.tangosol.com/display/COH35UG/multicast-listener
- Advanced Configuration of the uni-cast listener - http://wiki.tangosol.com/display/COH32UG/unicast-listener

Well Known Addresses

The default option at installation is use of multicast, if multicast is not an option; the *well-known-addresses* feature may be used. It requires manual edits of the **threadpoolworker.properties** and **submitbatch.properties** properties files.

The WKA properties specify one or more "well-known" nodes (JVMs) that are used to start a cluster and are likely to be available for other nodes to join. These well-known nodes are used by the other nodes to find their way into the cluster without the use of multicast. Note

that only one of these nodes is required to be up; they don't all have to be up at the same time.

The following example shows a WKA configuration.

threadpoolworker.properties on server test1

```
tangosol.coherence.log=log4j
tangosol.coherence.log.level=3
tangosol.coherence.guard.timeout=0
tangosol.coherence.cluster=tugbudemo.cisadm
tangosol.coherence.localhost=test1
tangosol.coherence.localport=19000
tangosol.coherence.wka=test1,test2
tangosol.coherence.wka.port=19000,38000
tangosol.coherence.mode=prod
```

threadpoolworker.properties on server test2

```
tangosol.coherence.log=log4j
tangosol.coherence.log.level=3
tangosol.coherence.guard.timeout=0
tangosol.coherence.cluster=tugbudemo.cisadm
tangosol.coherence.localhost=test2
tangosol.coherence.localport=38000
tangosol.coherence.wka=test1,test2
tangosol.coherence.wka.port=19000,38000
tangosol.coherence.mode=prod
```

submitbatch.properties

```
tangosol.coherence.log=log4j
tangosol.coherence.log.level=3
tangosol.coherence.guard.timeout=0
tangosol.coherence.cluster=tugbudemo.cisadm
tangosol.coherence.wka=test1,test2
tangosol.coherence.wka.port=19000,38000
tangosol.coherence.mode=prod
```

This example defines two **`threadpoolworker`** JVMs as WKA nodes:

- test1, port 19000
- test2, port 38000

With at least one of these two **`threadpoolworkers`** available, any other node that wants to

join the cluster will be able to, provided that node's configuration specifies the same list of WKAs.

This is illustrated with the **submitbatch.properties** example, which is what all submitters will use. The wka properties reference the two WKA worker nodes, which allow it to join the cluster.

For further details, refer to http://wiki.tangosol.com/display/COH35UG/unicast-listener.

Note: WKA and multicast may not be mixed within the same cluster.

When using WKA, these properties in **threadpoolworker.properties** and **submitbatch.properties** must be removed:

```
tangosol.coherence.clusteraddress
tangosol.coherence.clusterport
tangosol.coherence.clusterport
```

tangosol-coherence-override.xml

The **tangosol.coherence.*** properties as discussed above are *property overrides* for the Coherence configuration elements. The **threadpoolworker** and **submitbatch** properties are configured like this for conformity and so that the Oracle Utilities Application Framework configuration utility can be used. The overide feature is documented at http://wiki.tangosol.com/display/COH35UG/Command+Line+Setting+Override+Feature.

For manual configuration the standard Coherence **tangosol-coherence-override.xml** file may be used and placed in the **$SPLEBASE/splapp/standalone/config** (**%SPLEBASE%\splapp\standalone\config** in Windows) directory. In that case, the corresponding Coherence overrides in the **threadpoolworker** and **submitbatch** properties need to be removed. The following example illustrates a well-known-addresses configuration with logging level set to debug (5):

```
<coherence>
    <cluster-config>
        <unicast-listener>
            <well-known-addresses>
                <socket-address id="1">
                    <address system-property="tangosol.coherence.wka1">test1</address>
                    <port system-property="tangosol.coherence.wka1.port">19000</port>
                </socket-address>
                <socket-address id="2">
                    <address system-property="tangosol.coherence.wka2">test2</address>
                    <port system-property="tangosol.coherence.wka2.port">38000</port>
                </socket-address>
            </well-known-addresses>
        </unicast-listener>
```

```
    </cluster-config>
    <logging-config>
        <destination>log4j</destination>
        <severity-level>5</severity-level>
    </logging-config>
</coherence>
```

threadpoolworker[.sh] command line options

Note: that the appropriate environment has to be attached to before this script can be executed (i.e. ***splenviron[.sh] -e <environment>*** *has to be run), unless the script is directly invoked from the Windows explorer by double-clicking on it. In that case it will automatically attempt to attach to the environment that owns the bin directory in which it is located and then prompt for options.*

The following options can be specified when executing script threadpoolworker.

```
threadpoolworker[.sh] [-d] [-e][-h][-i][-J][-p][-Q][-R][-s]
```

Where command line options are:

`-d <Y|N>`

Whether the node is acting as a scheduler daemon. Specify **N** for No and **Y** for Yes. If you are already using a scheduler daemon in the online system or are not using online submission then set this to **N**. Default is **N**.

`-e <DISTRIBUTED|CLUSTERED>`

Execution mode for this threadpool. If **CLUSTERED** is the threadpool will join the cluster specified in the **threadpoolworker.properties** file.

`-h`

Show command line help. List the available options and their descriptions. It is formatted for a 121-column width display. The information is not logged.

`-i <RMI Port>`

Override port number for JMX. If specified with -R, this number will be used only to substitute applicable URL {port} references. This option will not add any new RMI/JMX properties - it can only be used to override existing ones. This option specifies the port number to:

- Use when the framework starts an RMI Registry and
- Substitute in all JMX Connector URL {port} references.

`-J`

Do not start JMX monitoring. For each property prefixed by **spl.runtime.management.connector.url** that is defined with the default set of properties (e.g. in the

	threadpoolworker.properties file), the framework will start a JMX Connector for the specified URL. This activates JMX monitoring inside the worker node so that a client JMX console can be used to monitor and manage active threads. If this option is specified, the framework will not start any JMX connectors.
`-p <name=value,name=value,…>`	Thread pool(s) offered by this worker node. Consists of one or more name=value pairs, where "name" is the name of the pool and "value" the number of threads offered in the pool. For example, DEFAULT=5,ONLINE=3
`-Q`	Preview the properties that would be active for this run. Used for testing. Preview the properties that would be in use for the run without actually running the application. Specify other options along with this option to show how they would merge with, override or substitute the default properties. The information is not logged.
`-R`	Do not start a local RMI registry. If property **spl.runtime.management.rmi.port** is defined as a default property (e.g. in the **threadpoolworker.properties** file), the batch framework will attempt to start an RMI registry on the given port number. This option can be used to suppress the automatic RMI registry startup. It may be required if an externally started RMI registry is already running. *Note: If this option is used, the RMI port number supplied through the **-i** option is only used for substitution in the JMX Connector URLs.*
`-s <space name>`	Space name for "hard partition" of workers. Default is MAIN. Reserved for internal use only.

When **threadpoolworker** is invoked, the command-line options will alter its default configuration. The default configuration options come from either internal system defaults or the **threadpoolworker.properties** file described above.

The properties are overridden in the following order:

1. The **threadpoolworker.properties** supersedes the internal system defaults.
2. The command-line options supersede the defaults in **threadpoolworker.properties** and the internal system defaults.

Example 1

Assuming we have the above set of properties in **threadpoolworker.properties** and script **threadpoolworker** is invoked as follows:

```
threadpoolworker[.sh] –d Y
```

This will replace the default "daemon" property to "N" (i.e. false) so that the properties now look as follows:

```
com.splwg.grid.distThreadPool.threads.DEFAULT=5
com.splwg.grid.distThreadPool.threads.LOCAL=0
com.splwg.batch.scheduler.daemon=false
spl.runtime.management.rmi.port=9999
spl.runtime.management.connector.url.default=service:jmx:rmi:///jndi/rmi
://{host}:{port}/spl/fw/jmxConnector
```

tpwlog4j.properties

Note: This log file should not be altered unless specified. The generated configuration file has all the recommended settings for all sites.

The **threadpoolworker** utility logs information to **$SPLOUTPUT/threadpoolworker.<datetime>.log** (or **%SPLOUTPUT%\threadpoolworker.<datetime>.log**) where **<datetime>** is the date and time in *YYYYMMDDHHMMSS* format of the start of the node. This configuration file is provided in the **$SPLEBASE/etc** directory (or **%SPLEBASE%\etc** directory on Windows).

This is a standard log4j properties file, but declares two appenders specifically for **threadpoolworker**:

1. the console and
2. a file in the product's **$SPLOUTPUT** (or **% SPLOUTPUT%** on Windows) directory.

This log4j configuration allows the worker's output to be logged to the command prompt window as well as a log file. This file should not be altered unless desired.

The product uses the *log4j* Java classes to centralize all log formats into a standard format. The details of the configuration settings and *log4j* itself are available at http://logging.apache.org/log4j/ or http://en.wikipedia.org/wiki/Log4j.

Automatic Log Rotation

By default the **threadpoolworker.log** file is appended to while the **threadpoolworker** is active. If the threadpoolworker is long running and the log needs to be automatically rotated on a daily basis the following changes should be applied to the **workersubmitterlog4j.properties** file:

Replace:

```
...
### F1 is set to be a FileAppender.
log4j.appender.F1=org.apache.log4j.FileAppender
```

```
...
```

with

```
### F1 is set to be a RollingFileAppender
log4j.appender.F1=org.apache.log4j.DailyRollingFileAppender
log4j.appender.F1.DatePattern='.'yyyy-MM-dd
```

Refer to http://logging.apache.org/log4j/1.2/index.html for additional options.

Return Codes

The following return codes apply to the processing using this method:

Return Code	Usage
0 (zero)	Successful
Non-zero	Unsuccessful. See log files for more information.

submitjob[.sh]

The **submitjob[.sh]** utility provides a means for the scheduler to submit a batch process. It can be invoked from a command prompt, Windows explorer (on Windows platforms) or a 3rd party scheduler. This script can be used to submit the batch process to an active **threadpoolworker** process, or to run it in a full-context standalone JVM.

submitbatch.properties Configuration File

To use the **submitjob[.sh]** utility a configuration file must be created to specify the global attributes of all the batch processes. The **submitbatch.properties** file should be placed in the **$SPLEBASE/etc** directory (or **%SPLEBASE%\etc** directory on Windows).

The properties file contains the default properties for **threadpoolworker**. The following sample illustrates the values:

```
com.splwg.grid.executionMode=DISTRIBUTED
com.splwg.batch.submitter.distThreadPool=DEFAULT
com.splwg.batch.submitter.promptForValues=false
com.splwg.batch.submitter.rerunNumber=0
com.splwg.batch.submitter.threadNumber=0
com.splwg.batch.submitter.threadCount=1
com.splwg.batch.submitter.maximumCommitRecords=200
com.splwg.batch.submitter.userId=AUSER
com.splwg.batch.submitter.languageCd=ENG
com.splwg.grid.executionMode=CLUSTERED
```

```
tangosol.coherence.log=log4j
tangosol.coherence.log.level=5
tangosol.coherence.guard.timeout=0
tangosol.coherence.cluster=DEMO.SPLADM
tangosol.coherence.clusteraddress=230.40.10.200
tangosol.coherence.clusterport=100
tangosol.coherence.mode=prod
```

The following table describes the parameters:

Parameter	Comments
com.splwg.batch.submitter.distThreadPool	Name of pool to be used for batch process. If **threadpoolworker** not used then **LOCAL** must be specified.
com.splwg.batch.submitter.languageCd	Default Language code used for messages. Relevant language pack must be installed.
com.splwg.batch.submitter.maximumCommitRecords	Default commit interval.
com.splwg.batch.submitter.promptForValues	Whether interactive mode is to be used. Specify **true** for Yes (development use only) and **false** for No. Default is **false**.
com.splwg.batch.submitter.rerunNumber	Default run number. Default **0**
com.splwg.batch.submitter.threadCount	Default thread limit. Default: **1**
com.splwg.batch.submitter.threadNumber	Default thread number. Default: **0**
com.splwg.batch.submitter.userId	Default userid used for all batch processes
com.splwg.grid.executionMode	Mode of execution. Valid values: **THIN**, **DISTRIBUTED** or **CLUSTERED**.
tangosol.coherence.cluster	The cluster-name element contains the name of the cluster. In order to join the cluster all members must specify the same cluster name. The name an be up to 32 characters to define the name of the cluster. This is required and must be unique for each environment. With **DISTRIBUTED** mode, the batch JVMs for an environment are naturally grouped because they register themselves through database table **F1_TSPACE_ENTRY**, but in **CLUSTERED** mode the JVMs are joined through a Coherence cache. The cache may be across all environments, so a unique cluster name, along with address and port (see below), is required to ensure

Parameter	Comments
	that they are appropriately grouped per environment. Environments are typically separated by database and/or database user, so a possible convention may be to use a combination of database name and owner Id as the cluster name, for example *CCBDEMO.CISADM*. *Only used for* ***executionMode CLUSTERED***
`tangosol.coherence.clusteraddress`	Specifies the multicast IP address that a Socket will listen or publish on. Valid values are from 224.0.0.0 to 239.255.255.255. For non-multicast implementations use the Well Known Addresses (WKA) functionality. *Only used for* ***executionMode CLUSTERED***
`tangosol.coherence.clusterport`	Specifies the multicast port that the Socket will listen or publish on. Valid values are from 1 to 65535. For non-multicast implementations use the Well Known Addresses (WKA) functionality. *Only used for* ***executionMode CLUSTERED***
`tangosol.coherence.guard.timeout`	The timeout value used to guard against deadlocked or unresponsive services. It is recommended that service-guardian/timeout-milliseconds be set equal to or greater than the packet-delivery/timeout-milliseconds value. A timeout of zero will disable service guardians. A timeout of zero will disable service guardians. The default value is **`0`**. *Only used for* ***executionMode CLUSTERED***
`tangosol.coherence.localhost`	Specifies the IP address that a Socket will listen or publish on for WKA functionality. *Note: The* ***`localhost`*** *setting may not work on systems that define* ***`localhost`*** *as the loopback address; in that case, specify the*

Parameter	Comments
	machine name or the specific IP address. Default is **localhost**. *Only used for* ***executionMode CLUSTERED***
tangosol.coherence.localport	Specifies the port that the Socket will listen or publish on for WKA functionality. Legal values are from 1 to 65535. Default value is **8088**. *Note: By default, this port will automatically increment if the specified port cannot be bound to because it is already in use.* *Only used for* ***executionMode CLUSTERED***
tangosol.coherence.log	Specifies destinations of log entries. This is set to **log4j**. This setting should not be changed. *Only used for* ***executionMode CLUSTERED***
tangosol.coherence.log.level	Level of logging: 0 - only output without a logging severity level specified will be logged 1 - all the above plus errors 2 - all the above plus warnings 3 - all the above plus informational messages. Default is **3**. *Only used for* ***executionMode CLUSTERED***
tangosol.coherence.mode NEW	Specifies whether the batch clustering facility is being used in a development or production mode. Valid values are **prod** (Production), and **dev** (Development).
tangosol.coherence.wka	Specifies a list of *well known* addresses (WKA) that are used by the cluster discovery protocol in place of multicast broadcast. If one or more WKA is specified, for a member to join the cluster it will either have to be a WKA or there will

Parameter	Comments
	have to be at least one WKA member running. Additionally, all cluster communication will be performed using unicast. If empty or unspecified multicast communications will be used. *Only used for* **executionMode CLUSTERED**
tangosol.coherence.wka.port	Port numbers associated with WKA addresses in **tangosol.coherence.wka**. *Only used for* **executionMode CLUSTERED**

This file can be modified for site-specific values. For example, the user Id will need to be changed from "AUSER", so property **com.splwg.batch.submitter.userId** should be modified to specify the appropriate user id allocated to batch. The user id property could also be removed so that there is no default, forcing every batch process submission to specify its own user id.

submitbatchlog4j.properties Configuration File

The **submitjoblog4j.properties** configuration file defines the log format and logging level used by the submitjob utility.

The submitjob utility logs information to **$SPLOUTPUT/submitjob.<batch_cd>.<datetime>.log** (or **%SPLOUTPUT%\submitjob.<batch_cd>.<datetime>.log**) where **<datetime>** is the date and time in *YYYYMMDDHHMMSS* format of the start of the node and **<batch_cd>** is the batch code of the batch process.

The product uses the *log4j* Java classes to centralize all log formats into a standard format. The details of the configuration settings and *log4j* itself are available at http://logging.apache.org/log4j/ or http://en.wikipedia.org/wiki/Log4j.

Note: This configuration file should not be altered unless instructed by Oracle Support.

Job Specific parameters files

Note: Not ALL batch processes require a batch process specific parameter file. It is recommended that ONLY batch processes that require any of the additional parameters listed below should have a batch process specific parameter file.

For individual batch processes it is possible to create a specific file to handle the batch process specific parameters. These parameters can override existing parameters or add additional parameters.

To configure individual batch process specific parameters configuration file named **<batchcode>.properties** or **<batchcode>.properties.xml** must existing in the **$SPLEBASE/scripts/cm** directory (or **%SPLEBASE%\scripts\cm** directory on Windows). In the vast majority of cases the standard text based properties file will be adequate, but if UTF-8 formatted soft parameter values have to be specified (e.g. Cyrillic characters), it is recommended the xml file format be used.

The format of the batch process specific parameter file is similar to the **submitbatch.properties** file with the following additional parameters:

Parameter	Comments
com.splwg.batch.submitter.batchCd	Batch Code this batch process is associated with.
com.splwg.batch.submitter.distThreadPool	Name of pool to be used for batch process. If threadpoolworker not used then LOCAL must be specified.
com.splwg.batch.submitter.maximumTimeoutMinutes	Specifies the number of minutes the thread(s) can run between database commits. Only COBOL programs, if used, use this value to avoid "snapshot too old" errors on Oracle databases. Java batch classes completely ignore this parameter.
com.splwg.batch.submitter.processDate	Business Date. This may be omitted. Typically, it is specified on the command line. Format: *YYYY-MM-DD*
com.splwg.batch.submitter.softParameter.<parmname>	For any program-specific parameters, use this form of property specification. The <parmname> denotes the name of the parameter. For example, to specify a "number of rows to skip" when submitting a validation program: com.splwg.batch.submitter.softParameter.SKIP-ROWS=1000 Multiple soft parameters may be specified.
com.splwg.batch.submitter.traceProgramEnd	Set this to true to see program end messages in the log.
com.splwg.batch.submitter.traceProgramStart	Set this to true to see program start messages in the log.
com.splwg.batch.submitter.traceSQL	Set this to true to see all SQL statements in the log.
com.splwg.batch.submitter.traceStandardOut	Set this to true to see program debug

Parameter	Comments
	messages in the log.
com.splwg.grid.executionMode	Mode of execution. Valid values: **THIN**, **DISTRIBUTED** or **CLUSTERED**.

A number of samples in **$SPLEBASE/etc** directory (or **%SPLEBASE%\etc** directory on Windows) named **SAMPLE.properties** and **SAMPLE.properties.xml** are provided. These should be copied and edited to provide site specific values.

*Note: Environment variables may be substituted in the command line and the properties file. Environment variable references must be surrounded by the ${…} construct. For example **${SPLOUTPUT}** refers to the **$SPLOUTPUT** (or **%SPLOUTPUT%** on Windows) directory.*

submitjob[.sh] Command-Line Options

*Note: that the appropriate environment has to be attached to before this script can be executed (i.e. **splenviron[.sh] -e <environment>** has to be run), unless the script is directly invoked from the Windows explorer by double-clicking on it. In that case it will automatically attempt to attach to the environment that owns the bin directory in which it is located and then prompt for options.*

The following options can be specified when executing utility submitjob[.sh]:

```
submitjob[.sh] [-B][-b][-c][-d][-e][-f][-g][-h][-i][-J][-l][-L][-m] [-n]
[-p][-P][-Q][-R][-r][-s][-t][-u][-x][-X]
```

where command line options are:

-B <COBOL program name>	Batch "helper" COBOL program to perform scheduling activity.
-b <batch code>	Batch code of the batch process to submit. When submitting a batch process, a batch code is always required. Either this option or **-P** may be specified, not both. If this option is specified, **submitjob** will use the supplied batch code to look for a default properties file for that batch code (e.g. **VAL-SA.properties** or **VAL-SA.properties.xml** as discussed above) and use those properties if found.
-c <thread count>	Concurrent number of threads in which to run the process.
-d <date>	Process / business date. Format is *YYYY-MM-DD*
-e <DISTRIBUTED|THIN|CLUSTERED>	Execution mode for this submission. If execution mode **THIN** is selected, the JVM will create a full application context and run the

batch process inside the JVM – i.e. it will not be submitted to a thread pool for a worker JVM to pick up and run. This is analogous to running the batch process using the existing **SPLBATCH[.sh]** utility.

If **DISTRIBUTED** or **CLUSTERED** is selected, the batch process will be submitted to run in the specified distributed thread pool (option **-p**). It is also possible to have the submitter JVM be a worker JVM and run the batch process (similar to **THIN** mode, but in parallel threads). See option **-L**.

`-f <record count>` — Record commit frequency count.

`-g <four Y|N switches>` — Positional tracing switches:

1. Program entry
2. Program exit
3. SQL statements
4. General program debugging info

For example, **NNYN** will trace all SQL statements. Value of **NNNN** diables all tracing.

`-h` — Show help information. Display the available options and their descriptions. The information is not logged.

`-i <RMI port number>` — Port number of RMI Registry to start and/or reference. If specified with **-R**, this number will be used only to substitute applicable URL **{port}** references. This option will not add any new RMI/JMX properties - it can only be used to override existing ones. *See note below*

`-J` — Do not start JMX connector. This option disables JMX monitoring for this JVM. As far as **submitjob** is concerned, options **-i**, **-R** and **-J** are only applicable to batch processes submitted in **THIN** mode, or **DISTRIBUTED** or **CLUSTERED** mode to the LOCAL thread pool.

For each property prefixed by **spl.runtime.management.connector.url** that is defined with the default set of properties (e.g. in the **submitbatch.properties** file), the framework will start a JMX Connector for the specified URL.

This activates JMX monitoring inside the worker

	node so that a client JMX console can be used to monitor and manage active threads. If this option is specified, the framework will not start any JMX connectors.
`-l <ENG|FRA|etc.>`	Language code. Relevant language pack must be installed.
`-L`	Submit this batch to the LOCAL thread pool (i.e. this JVM). Only applicable for **`DISTRIBUTED`** or **`CLUSTERED`** mode. If specified, any default thread pool property is ignored. This option and **`-p`** are mutually exclusive. By specifying option **`-L`**, the batch process is submitted to the LOCAL thread pool that every submitter JVM offers by default. This option is only applicable in a **`DISTRIBUTED`** or **`CLUSTERED`** mode execution (**`-e`**). This is similar to submitting the batch process in **`THIN`** mode (i.e. a worker JVM is not needed to run the batch process), except thread pool LOCAL can run multiple batch threads concurrently. For example, the following command will run batch process VAL-SA inside this submitter JVM (LOCAL thread pool) in 8 threads concurrently: **`submitjob[.sh] -b VAL-SA -c 8 -L -e DISTRIBUTED`**
`-m <number of minutes>`	Minutes between database commits to avoid "snapshot too old" errors.
`-n <email address>`	Send a notification email when a batch process has ended to *<email address>*. See Sending emails at the conclusion of batch processs for more information.
`-p <threadpool name>`	Distributed thread pool in which to run the batch process. This option and **`-L`** are mutually exclusive.
`-P`	Issue console prompts for the standard batch process parameters. When submitting a batch process, a batch code is always required. Either this option or **`-b`** may be specified, not both. If **`-P`** is specified, the submitter JVM will prompt for the batch code and other run parameters. If a batch-specific properties file exists for the batch code entered at the prompt, it will NOT be used; the only defaults in effect would be the ones specified in **`submitbatch.properties`**.

`-Q`	Preview the properties that would be in use for the run without actually running the application. Specify other options along with this option to show how they would override or substitute the default properties. The information is not logged.
`-R`	Do not start a local RMI registry. As far as **`submitjob`** is concerned, options **`-i`**, **`-R`** and **`-J`** are only applicable to batch processes submitted in **`THIN`** mode, or **`DISTRIBUTED`** or **`CLUSTERED`** mode to the LOCAL thread pool. If property **`spl.runtime.management.rmi.port`** is defined as a default property (e.g. in the **`submitbatch.properties`** file), the batch framework will attempt to start an RMI registry on the given port number. This option can be used to suppress the automatic RMI registry startup. It may be required if an externally started RMI registry is already running. Note that if this option is used, the RMI port number supplied through the **`-i`** option is only used for substitution in the JMX Connector URLs.
`-r <run number>`	Run number of batch process to rerun.
`-s <space name>`	Space name for "hard partition" of workers. Default is MAIN. Used for development only.
`-t <thread number>`	Number of individual thread for this submission. Specify **`0`** to automatically submit all threads.
`-u <user id>`	Application user id used for batch process
`-x <name=value,name=value,...>`	Name=value pairs of INDIVIDUAL soft parameters expected by the batch program. Value portion may be enclosed in quotes. These parameters will be merged with any existing (defaulted) soft parameters. This option and **`-X`** are mutually exclusive.
`-X <name=value,name=value,...>`	Name=value pairs of ALL soft parameters expected by the batch program. Value portion may be enclosed in quotes. These parameters will replace all existing (defaulted) soft parameters. This option and **`-x`** are mutually exclusive.

Property Override Order

When **submitjob.[sh]** is invoked, it can accept a number of command-line options to alter its default configuration. The default configuration options come from internal system defaults, the **submitbatch.properties** file or the batch specific properties file as described above.

The properties are overridden in the following order:

1. The **submitbatch.properties** supersedes the internal system defaults.
2. The batch-specific properties (e.g. **VAL-LL.properties**) supersede the **submitbatch.properties** and the internal system defaults.
3. The command-line options supersede the defaults in **submitbatch.properties**, the batch process-specific properties and the internal system defaults.

Port number of RMI Registry (-i)

As far as **submitjob[.sh]** is concerned, options **–i, -R and –J** are only applicable to batch processes submitted in **THIN** mode, or (**DISTRIBUTED**|**CLUSTERED**) mode to the LOCAL thread pool.

The **–i** option specifies the port number to:

- Use when the framework starts an RMI Registry and
- Substitute in all JMX Connector URL *{port}* references.

For example, given the following properties in **threadpoolworker.properties**

```
spl.runtime.management.rmi.port=9999
spl.runtime.management.connector.url.default=service:jmx:rmi:///jndi/rmi
://{host}:{port}/spl/fw/jmxConnect
```

or and this command-line

```
submitjob[.sh] –i 1099
```

will cause the value for property **spl.runtime.management.rmi.port** AND the "{port}" string in the **spl.runtime.management.connector.url.default** property to be substituted.

Note: that in this case, the special substitution string "{host}" will also be replaced by the name of the host machine. Therefore, assuming the host name is "localhost", the properties will therefore be modified to look as follows:

```
spl.runtime.management.rmi.port=1099
spl.runtime.management.connector.url.default=service:jmx:rmi:///jndi/rmi://
localhost:1099/spl/fw/jmxConnector
```

Soft Parameters (-x) vs (-X)

For batch processes that have multiple soft parameters, this option controls how the soft parameter properties are managed. For example, assume the following soft parameter

properties are defined for batch process **XXXX** in its **XXXX.properties** file:

```
com.splwg.batch.submitter.softParameter.FILE-PATH=C:\data
com.splwg.batch.submitter.softParameter.FILE-NAME=default.dat
```

These soft parameters are therefore the defaults for this batch process if it is submitted with no command-line options.

The following command will submit the batch process with a new **FILE-NAME**, but leave the **FILE-PATH** as the default:

```
submitjob[.sh] –b XXXX –x FILE-NAME=newfile.dat
```

In other words, only the specified soft parameter (**FILE-NAME**) has been overridden.

It may be necessary in some cases to replace ALL the soft parameters with the ones specified, particularly where there are many soft parameters and only one or two are required. This command will submit the above batch process with a new **FILE-NAME**, but remove the **FILE-PATH** property for this execution:

```
submitjob[.sh] –b XXXX –X FILE-NAME=newfile.dat
```

Environment Variable substitution at runtime

At runtime it is possible to substitute local variables by the individual thread parameters at runtime. Three new local variables will be added that will be replaced at the thread level:

- *{threadNumber}* – will be replaced by the number of the executing thread
- *{processDate}* – will be replaced by process date
- *{processDateTime}* – will be replaced by process date time

These variables can be used in the soft paramaters. For example, if the process date is 01-31-2009 1:30 PM and the current thread is thread number 1, specifying the parameter FILE-NAME as:

```
-x FILE-NAME=MYOUTPUTFILE-{processDateTime}-{threadNumber}
```

Or

```
com.splwg.batch.submitter.softParameter.FILE-NAME= MYOUTPUTFILE-
{processDateTime}-{threadNumber}
```

would result in the **FILE-NAME** parameter being resolved to:

MYOUTPUTFILE-2009-01-31-13.30.00-1

Return Codes

The following return codes apply to the processing using this method:

Return Code	Usage
0 (zero)	Successful
Non-zero	Unsuccessful. See log files for more information.

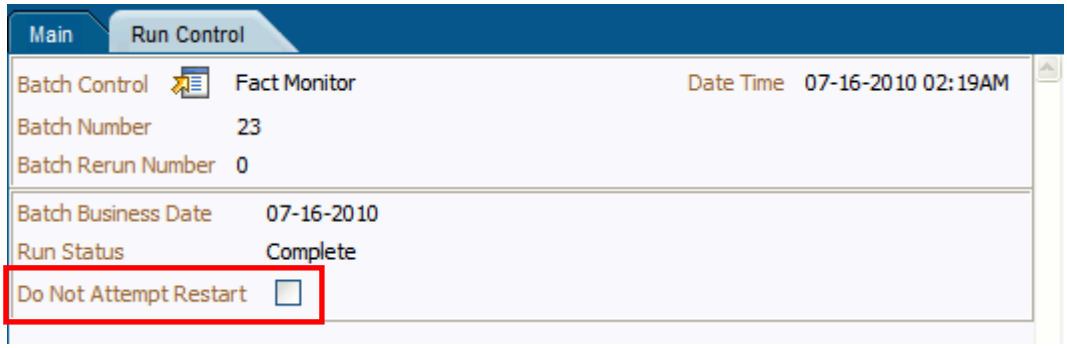
Miscellaneous Operations

There are a number of common operations that are applicable to the background processing component of the product.

Forcing a process to not attempt restart

In some cases it is necessary to *force* a background process to be *complete* within the product. This tells the product not to attempt to restart the process but start *afresh*. For example, a process may error and it may take a while to fix the error, instead of potentially holding up other processes you can tell the system to assume it has completed so that the next execution can start from the beginning and in fact reprocess the records.

To force the process to not to attempt a restart following the instructions to access the batch status information and select the *Run Control* tab and select the *Do not Attempt Restart* field. Remember to save the change using the **Save** button. A sample of this screen is illustrated below:



Error Processing

When a background process detects an error, the error may or may not be related to a specific object that is being processed. For example, if the program finds an error during batch parameter validation, this error is not object-specific. However, if the program finds an error while processing a specific bill, this error is object-specific. The system reports errors in one of the following ways:

- Errors that are not object-specific are written to the error message log in the Batch Run Tree.
- Some batch processes create entries in an *exception table* for certain object-specific errors. For example, an error detected in the creation of a bill may be written to the bill exception table. If an error is written to an exception table, it does not appear in the batch run tree. For each exception table, there is an associated ToDo Entry Process that creates a To Do Entry for each error to allow a user to correct the problem on-line.
- For some background processes, errors that do not result in the creation of an exception record may instead generate a To Do entry directly. For these processes, if you wish the system to directly create a To Do entry, you must configure the To Do type

appropriately. Refer to To Do entry for object-specific errors for information about configuring the To Do type. If the background process detects an object specific error AND you have configured the system to create a To Do entry, the error is not written to the batch run tree. If you have configured your To Do type to not create To Do entries for certain errors, these errors are written to the batch run tree. Each process that may be configured in this way is indicated in the following sections in the Error May Generate To Do column. Note that not all tables below include this column. If the table does not include the column, then the creation of a ToDo for an object-specific error is not applicable for the types of processes documented in the table.

Some processes create exceptions and To Do entries. It is possible for a background process to create entries in an exception table AND create To Do entries directly, depending on the error. Consider batch billing; any conditions that cause a bill or bill segment to be created in error status result in a record added to the bill exception table or the bill segment exception table. However, any object-specific error that is not related to a specific bill or bill segment or any error that prevents a bill or bill segment from being created may result in a To Do entry for the object-specific error.

Marking a process complete from the command line

One of the situations that may occur in the product is that an executing process may prematurely stop before completion. This situation occurs if:

- The process was manually stopped using the UNIX/Windows kill command at the OS level. Operators may choose to kill a process if it appears to be having a detrimental effect on the system.
- The application server that is running the process has a hardware fault that causes the process to stop prematurely.
- The database server that is running has a software or hardware fault that severs the connection to the database prematurely.

In all the above situations the status within the product does not reflect the current status of the process as the background process was prevented from updating its batch control records in time.

In most cases a simple rerun of the process with the same parameters may be performed, after the situation that caused the fault has been remedied, to start the process from its last consistency point. If there is a desire to ensure that the batch control information reflects the status after a failure then the **UPDERR** process should be executed prior to any restart.

Sending emails at the conclusion of batch processs

It is possible to send a notification email when a batch process has ended. This notification happens after the batch process has ended and all application-related commits/rollbacks have taken place. It does not impact the batch process itself in the event of errors happening during the notification process. The default email is a simple text email that contains the batch control, date and time of the submission, run number, submission parameters, batch process summary indicating records processed and in-error, as well as the thread details,

including logged messages (up to 100).

The email address can be configured a number of ways:

- Online submission – The email address can be specified on the batch submission screen.
- External submission - The email address is specified on the –n option of the submitjob[.sh] command.

The email address can be an individual person or a valid mail group (the latter requires additional configuration in your email system).

To use email notification the email server must be configure using one of the following options:

1. The mail server can be defined through the default XAI Sender (see XAI Options in the XAI documentation)with the appropriate SMTP settings on the Context tab.
2. Alternatively the properties can be supplied in the form of JVM properties as follows:

```
# Host whose mail services will be used
# (Default value : localhost)
mail.host=<your mail server>
# Return address to appear on emails
# (Default value : username@host)
mail.from=<name@host>

# Other possible items include:
# mail.user=
# mail.store.protocol=
# mail.transport.protocol=
# mail.smtp.host=
# mail.smtp.user=
# mail.debug=
```

Name	Type	Description
`mail.debug`	boolean	The initial debug mode. Default is false.
`mail.from`	String	The return email address of the current user, used by the **`InternetAddress`** method **`getLocalAddress`**.
`mail.host`	String	The default host name of the mail server for both Stores and Transports. Used if the **`mail.protocol.host`** property isn't set.
`mail.mime.address.strict`	boolean	The MimeMessage class uses the InternetAddress method **`parseHeader`** to parse headers in messages. This property controls the strict flag passed to the

Name	Type	Description
		parseHeader method. The default is true.
mail.smtp.class	String	Specifies the fully qualified class name of the provider for the specified protocol. Used in cases where more than one provider for a given protocol exists; this property can be used to specify which provider to use by default. The provider must still be listed in a configuration file.
mail.smtp.host	String	The host name of the mail server for the specified protocol. Overrides the **mail.host** property.
mail.smtp.port	int	The port number of the mail server for the specified protocol. If not specified the protocol's default port number is used.
mail.smtp.user	String	The user name to use when connecting to mail servers using the specified protocol. Overrides the **mail.user** property.
mail.store.protocol	String	Specifies the default message access protocol. The Session method **getStore()** returns a Store object that implements this protocol. By default the first Store provider in the configuration files is returned.
mail.transport.protocol	String	Specifies the default message access protocol. The Session method **getTransport()** returns a Transport object that implements this protocol. By default the first Transport provider in the configuration files is returned.
mail.user	String	The default user name to use when connecting to the mail server. Used if the **mail.protocol.user** property isn't set.

These properties can be added to the **threadpoolworker.properties** file for the standalone batch **threadpoolworker**, or the **spl.properties** file for an online application server that hosts a batch worker.

Template Overrides

By default, some of the configuration files outlined in this document are generated from product templates. The scripts provided with the product for use during installation, patching and configuration regularly rebuild the configuration files from templates. This can

cause any manual changes to configuration files to be reset to the base templates, which may mean loss of customizations if backups of the configuration files are not taken.

The Oracle Utilities Application Framework now features a facility where a site may substitute their own templates, based upon the product templates. This allows sites to customize their copies of the custom templates to suit their site standards and retain their settings across upgrades and patches.

The process to use this facility is as follows:

- Make a copy of the template used for the relevant configuration file and prefix the copy with cm.. Use the table below to identify the template used for the relevant configuration file (templates are stored in the etc directory of the product environment):

Configuration file	Template	Custom template name
spl.properties	spl.properties.standalone.template	cm.spl.properties.standalone.template
hibernate. properties	hibernate. properties.template	cm.hibernate.properties.template
log4j.properties	log4j.properties.standalone.template	cm.log4j.properties.standalone.template
e0batch.properties	e0batch.properties.template	cm.e0batch.properties.template

- Make the site specific changes necessary for your site. Remember to use the structure and the environment variables in the template as a guide for the format.
- Save the template.

Once this is done, if the configuration files are ever generated manually or as part of a patch then they will use the custom template instead of the base template.

Note: If this facility is used, then it is the site's responsibility to maintain the custom template in line with the product template. If future fixes add additional facilities to base templates then those changes must be manually applied to any custom templates. Check any custom templates against the base templates on a regular basis