Nasdaq Calypso

Clearing Member OTC Margin

Version 18

Revision 1.0

February 2024

Approved

Document History

Revision	Published	Summary of Changes
1.0	February 2024	First revision for version 18

The Margin solution allows calculating the CCP margin requirements, as an end of day process, as an incremental intraday process, or as part of the clearing novation process.

It is installed as part of the Calypso Installer when you select the "Margin Engine" and "Enterprise Risk" processes.

In addition, incoming messages can be validated against Initial Margin (IM) exposure limits. Once an incoming message is accepted, a CLEARED trade is created, and it can then be processed by the Clearing Member module.

ⓘ **[NOTE: The indicative margin requirements generated by the Calypso Margin calculators are estimates which are provided for reference purposes only. The actual margins imposed by the exchange may differ from these indicative margin requirements. Calypso Technology and its affiliates will not be liable for any loss suffered due to any omission, error, inaccuracy, incompleteness, or otherwise any reliance on these indicative margin requirements]**

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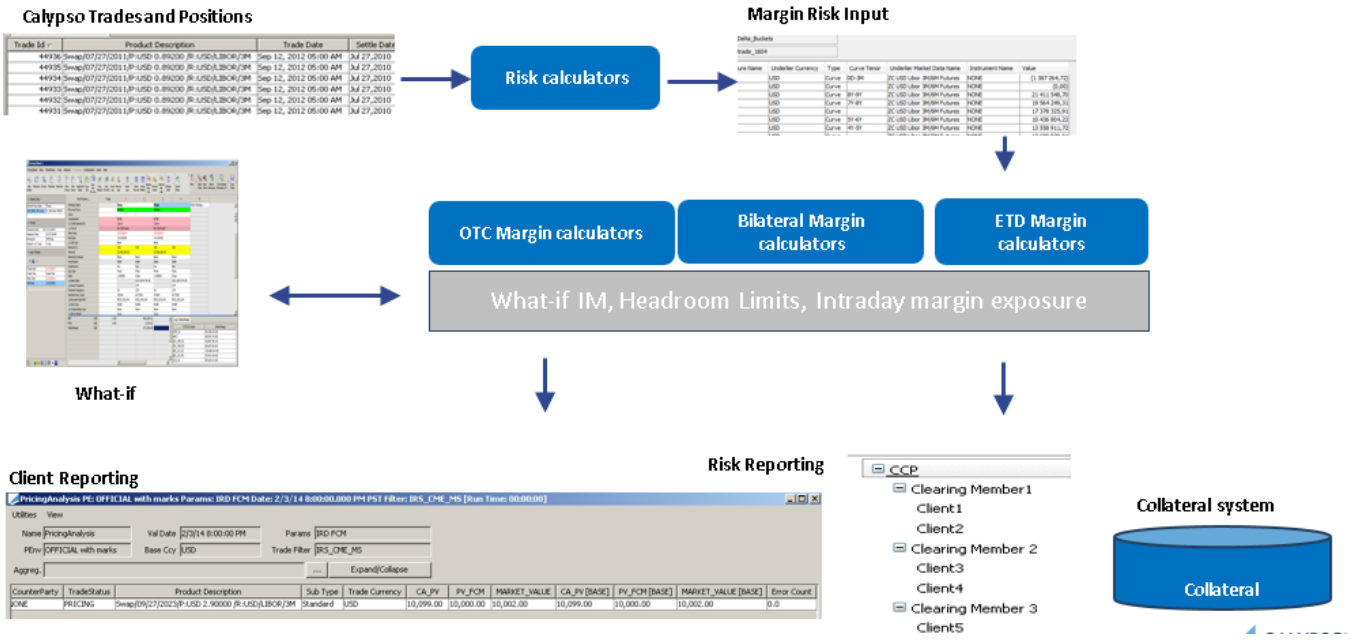
1. OTC Margin Overview

After all the market data and shifting scenarios have been imported by the various market data scheduled tasks, you can compute initial margins using the Margin Engine.



Intraday incremental margin calculation, limit/headroom check, and clearing novation (INCREMENTAL MARGIN section below)

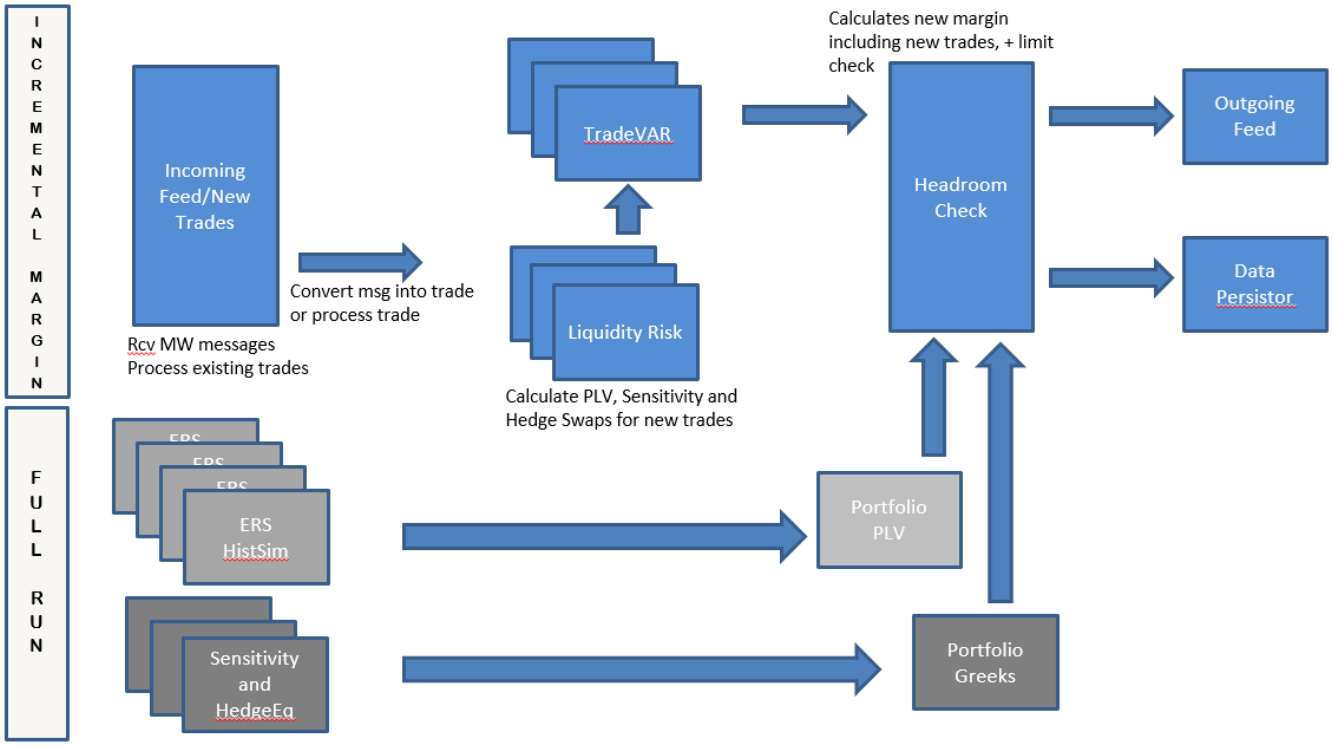
- In preparation for the clearing novation limit check and incremental margin calculation, at the start of the day, PL Vectors are loaded in memory for all portfolios in the selected hierarchy
- SEF or MW proxy messages are injected in Calypso via the “Message Injector”, and validated
- Messages are paired in the “Trade Pairing” Engine
- Messages are translated into trade objects by the “Feed Translator”
- The PL Vectors for each new trade are calculated by the “Trade VAR” engine
- The incremental Margin Exposure for each new trade is calculated by the “Headroom Check” engine
- The updated Margin Exposure (including the incremental margin calculated in step f) is compared against the Initial Margin and Headroom limits. If the limits are breached, trades are rejected; if not trades are accepted for clearing. This process is handled by the “Headroom Check” engine.
- Accepted trades are booked between the CCP and each Clearing Member. Trades attributes are created to track information related to the clearing channel, and the clearing limit check.
- In parallel, data related to margin calculation and limit check are persisted in the database by the “Data Persistor”. An example of the persisted data is provided below.

End of day Margin Calculation (FULL RUN section below)

As part of the end of day process, the margin calculation is performed by running HistSim Analysis, using a DataGrid and a Calculation Grid.

The margin calculation process is decomposed into 4 steps:

- Using the Data Grid, hydrate the market data and historical scenarios for the selected hierarchy of portfolios.
- Using the Calculation Grid, calculate the PL Vectors and Initial Margin
- Save the results in the database
- The results will be loaded in memory for intraday incremental margin calculation, at the start of the day, and each time a market data catch up is required.
- Results are also available in a csv files, and can be saved as PL Marks (using the Scheduled task MARGIN_OTC_VM_CALCULATOR)



Sample market data setup for margin estimation is described below.

The general process for accepting or rejecting incoming messages is the following:

- The process allows users to check whether they have enough limits to accept a trade request for clearing.
- The process is an intraday process, which calculates and stores PL Vectors in memory, for a fast estimate of the corresponding Initial Margin, and Limit Check. It is based on an incremental update of the initial margin.

- The limits consider the Initial Margin Exposure, the collateral and the limits defined at the CCP Margin Account and/or the client level.
- The end-to-end process is the following:
  - As part of the End of Day process the current Initial Margin exposure is calculated for each portfolio. At the start of the day, those exposures are loaded in memory (in the form of PL Vectors).
  - Messages are received from the CCPs: Request for Consent, Cleared, Rejected, Terminated, Compressed. Those messages are converted into transient trades when possible, and sent to the limit layer for processing.
  - The process is organized around 3 steps: P&L Vector calculation for new trade (in Trade VAR), incremental IM estimation and limit check.
  - Once the limit check is complete, the results are sent to the Persistor, which will save the trades to the database. Trades are saved in a LIMIT_APPROVED or LIMIT_REJECTED trade status.
  - If the messages don't include enough information for the limit check, the messages will be sent to the Persistor to be mapped to existing trades, and resent to the limit check. This is done via the Update Manager.
- The trade workflow can be configured to either reject the trades automatically, send them back for a new limit check, or manual approval.

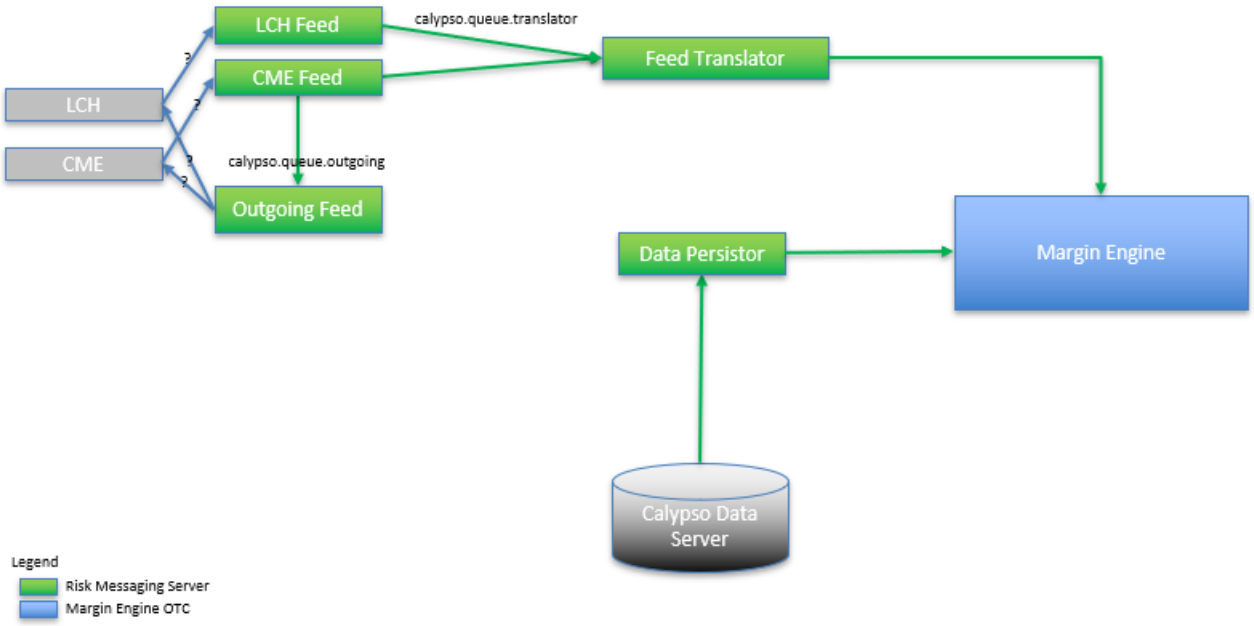
If the collateral positions are modified intraday, a set of processes allow updating the limit check accordingly.

If new limits are imported intraday, the limit check will take the updated limits into account intraday.

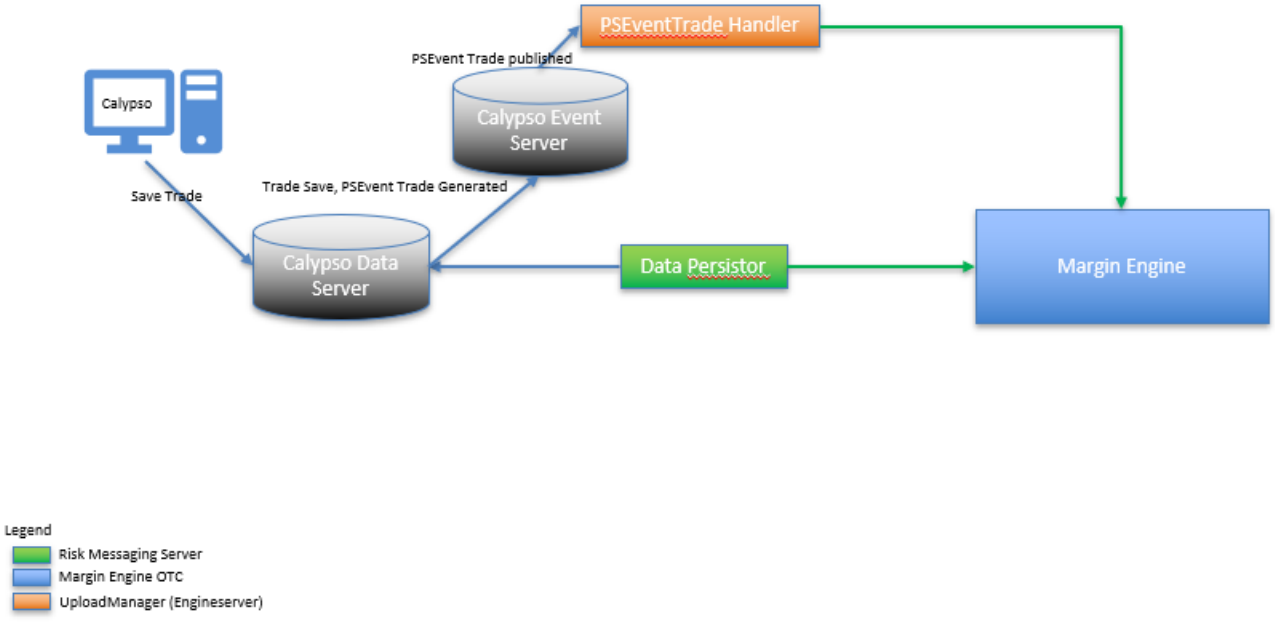
The limit check does not process messages in a sequential order.

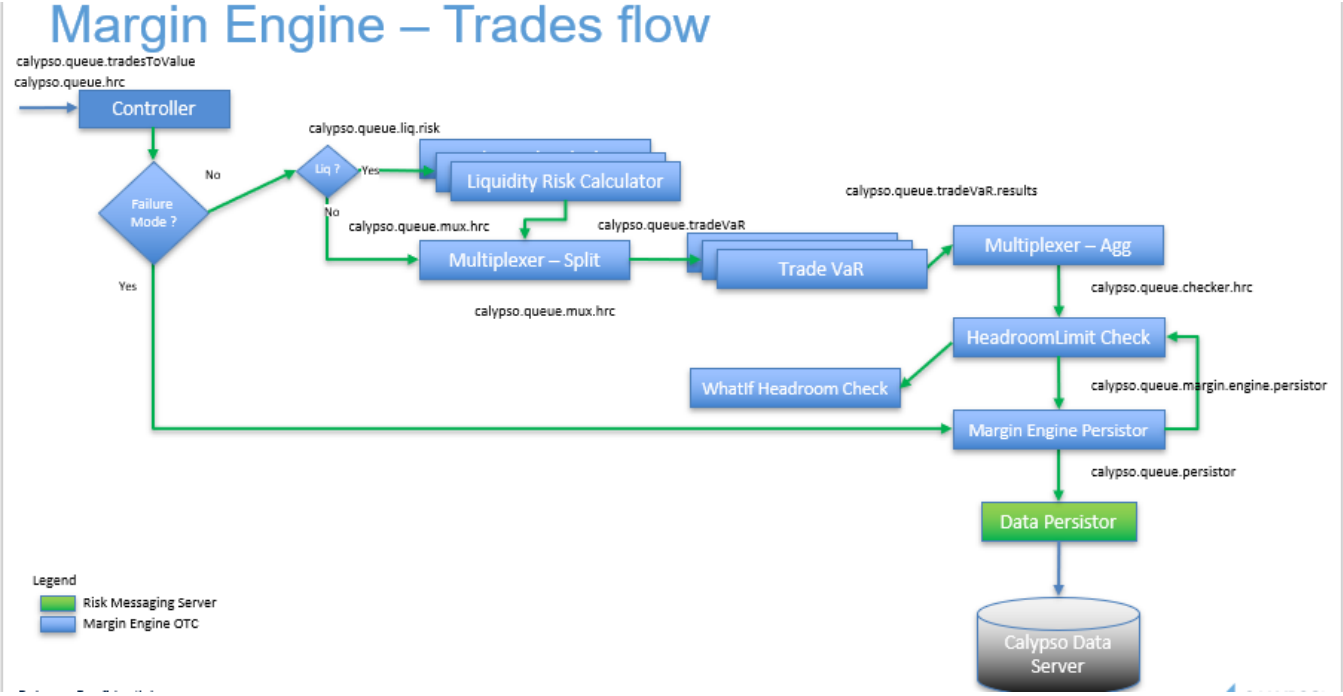
FCM and CCP Architecture Overview

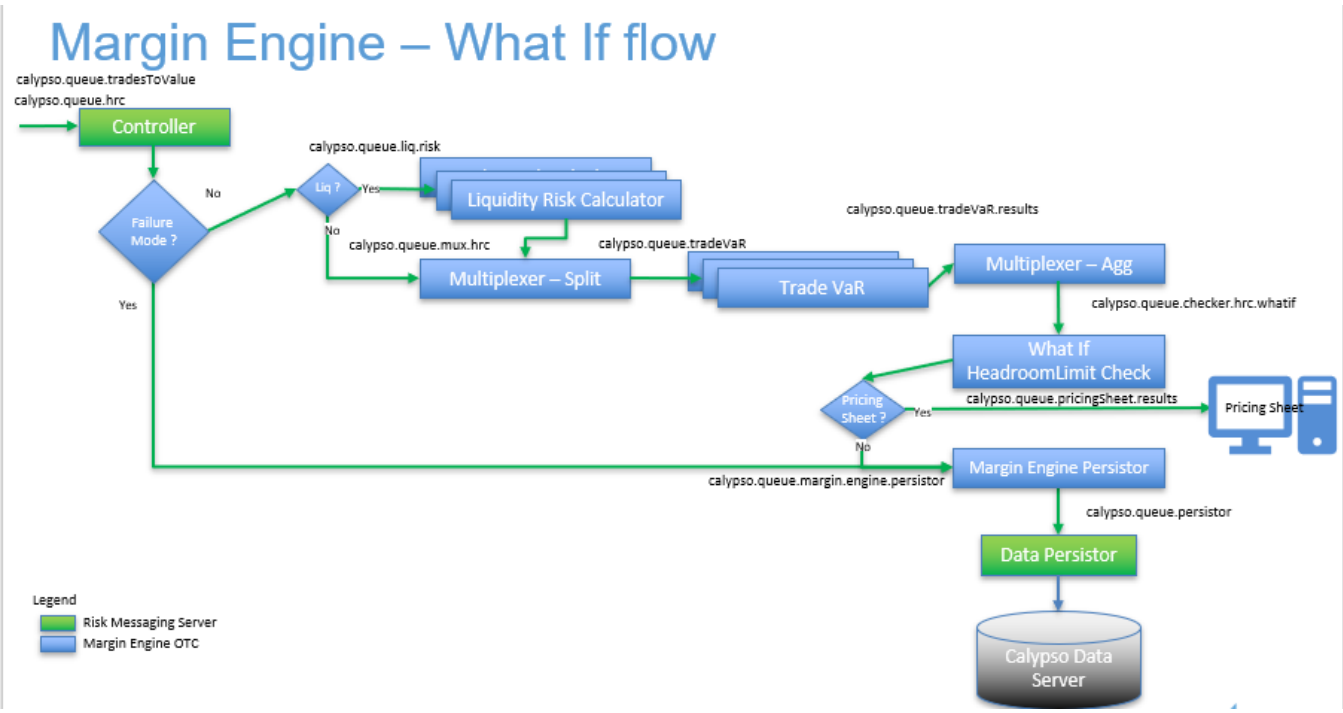
Margin Engine – Flow - FCM



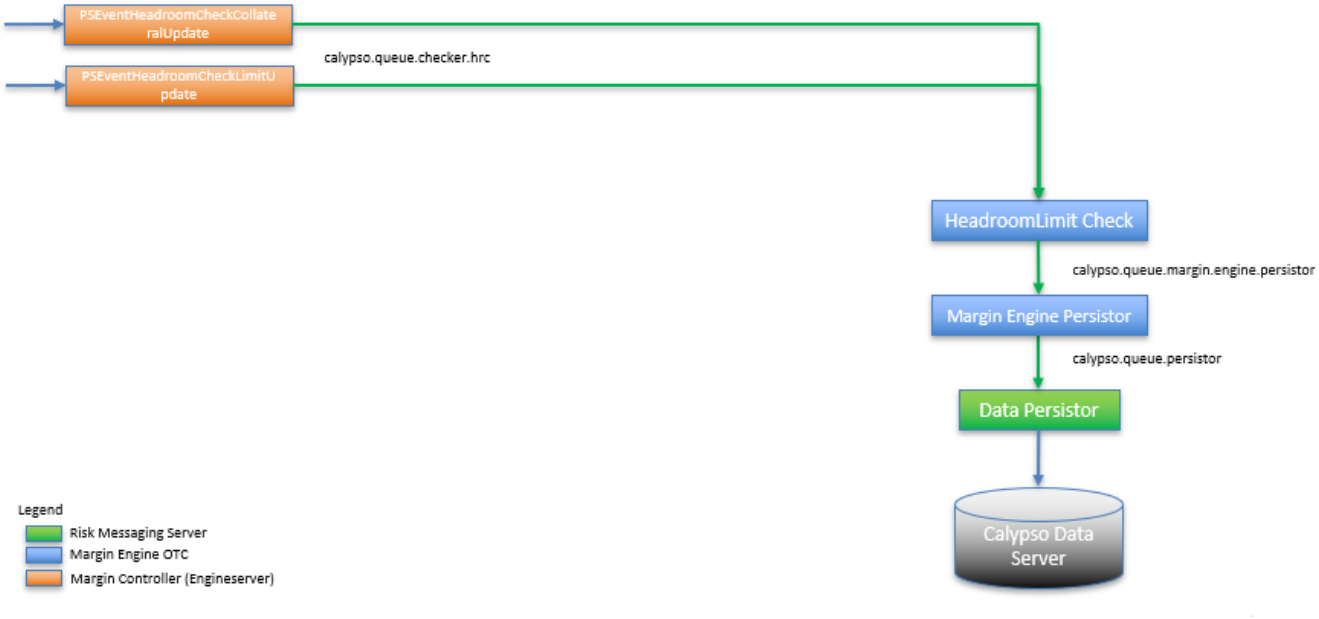
Margin Engine – Flow - CCP




Margin Engine – Trades flow
calypso.queue.tradesToValue
calypso.queue.hrc
Controller
calypso.queue.liq.risk
Liq ?
Yes
No
Liquidity Risk Calculator
Failure Mode ?
No
Yes
calypso.queue.tradeVaR.results
calypso.queue.mux.hrc
calypso.queue.tradeVaR
Multiplexer – Split
Trade VaR
Multiplexer – Agg
calypso.queue.checker.hrc
calypso.queue.mux.hrc
HeadroomLimit Check
WhatIf Headroom Check
calypso.queue.margin.engine.persistor
Margin Engine Persistor
calypso.queue.persistor
Data Persistor
Calypso Data Server
Legend
Risk Messaging Server
Margin Engine OTC


Margin Engine – What If flow
calypso.queue.tradesToValue
calypso.queue.hrc
Controller
calypso.queue.liq.risk
Liq ?
Yes
No
Liquidity Risk Calculator
Failure Mode ?
No
Yes
calypso.queue.tradeVaR.results
calypso.queue.mux.hrc
calypso.queue.tradeVaR
Multiplexer – Split
Trade VaR
Multiplexer – Agg
calypso.queue.checker.hrc.whatif
What If HeadroomLimit Check
Pricing Sheet ?
Yes
No
calypso.queue.pricingSheet.results
Pricing Sheet
calypso.queue.margin.engine.persistor
Margin Engine Persistor
calypso.queue.persistor
Data Persistor
Calypso Data Server
Legend
Risk Messaging Server
Margin Engine OTC

Margin Engine – Update Flow (Limits and Collateral)

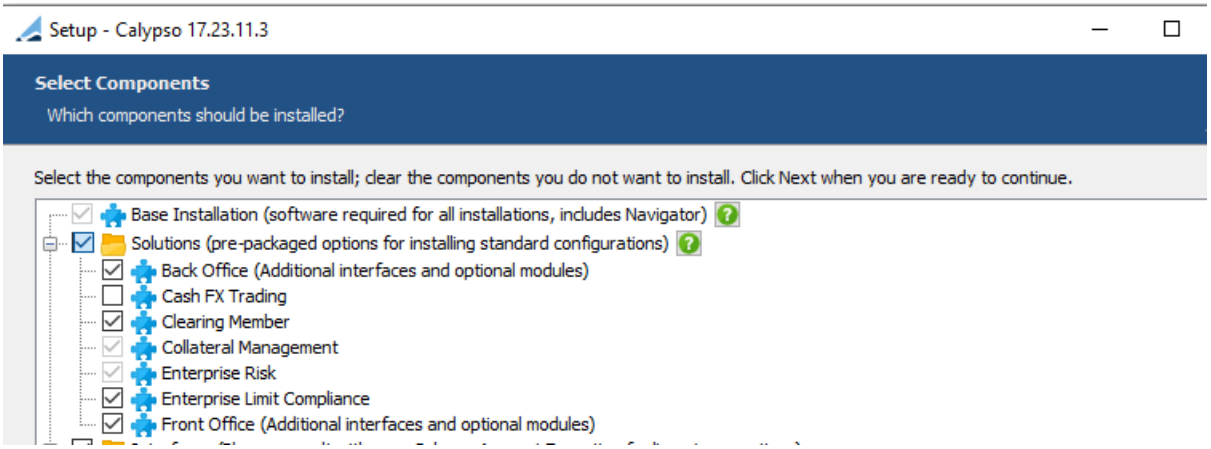


2. OTC Margin Installation

The Margin calculators are installed as part of the Calypso Installer when you select the “Clearing Member” and the “Margin Engine” modules.

In addition to core Calypso, you need the following modules:

- Clearing Member
- Collateral
- Data Uploader
- Enterprise Risk
- Margin Engine



Please refer to the *Calypso Installation Guide* and *Calypso Clearing Member Setup Guide* for installation details.

Margin Calculators

In the "Common Third-Party Libraries & Extension" window, add the Margin Calculator JARs to the “Libraries (Jar files)” section.

Please contact Calypso Product Support for obtaining the margin calculators. They will be delivered via the customer portal.

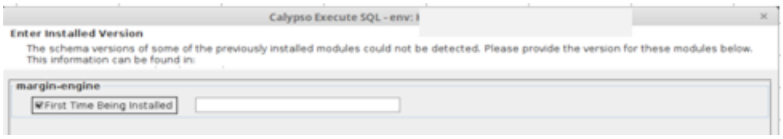
Name	Date modified	Type	Size
calypso-margin-calculator-typed-15.11.1.jar	12-05-2023 00:23	Executable Jar File	20 KB
calypso-margin-calculator-typee-15.11.2.jar	04-09-2023 00:41	Executable Jar File	9 KB
calypso-margin-calculator-typef-15.11.2.jar	04-09-2023 00:41	Executable Jar File	12 KB
calypso-margin-calculator-typeh-15.11.2.jar	04-09-2023 00:41	Executable Jar File	12 KB
calypso-margin-calculator-typeia-15.11.1.jar	23-05-2023 00:52	Executable Jar File	26 KB
calypso-margin-calculator-typej-15.11.2.jar	04-09-2023 00:41	Executable Jar File	58 KB

Database Upgrade

When you run Execute SQL as part of your installation, the data files will be already loaded.

For first-time installation, check “First Time Being Installed”.

In case of upgrade, please enter value of 1.0.0 for previous version.



3. OTC Margin FCM Setup

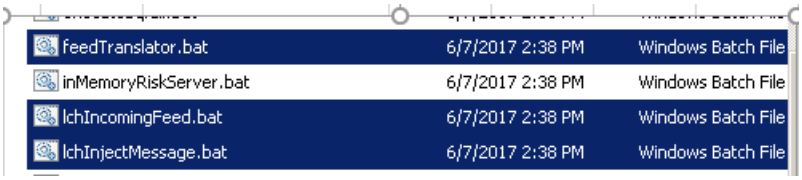
3.1 Exchange Feed

3.1.1 Messages Setup

Import the following message workflows:

- `<calypso home>/client/resources/INCOMINGSOURCEMSG.wf`
- `<calypso home>/client/resources/PLATFORMMSG.wf`

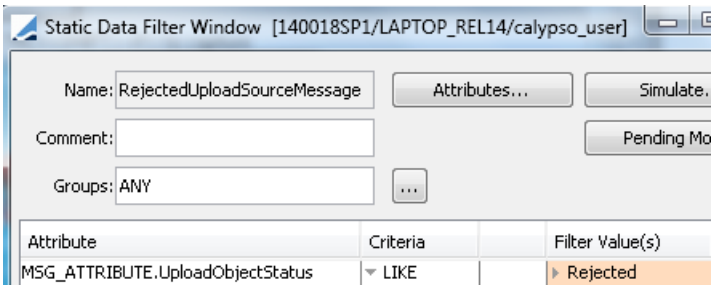
Additional services to start



INCOMINGSOURCEMSG Message Workflow

Orig Status	Action	Resulting Status	Use STP	Rules	Filter
CANCELED	CANCEL	CANCELED	false		
NONE	NEW	PENDING	true		
PENDING	CANCEL	CANCELED	false		
PENDING	PROCESS	RECEIVED	true	CheckLink	
PENDING	REJECT	REJECTED	false		RejectedUploadSourceMessage
RECEIVED	CANCEL	CANCELED	false		
RECEIVED	COMPLETE	COMPLETED	true		CompletedUploadSourceMessage
RECEIVED	REJECT	REJECTED	false		RejectedUploadSourceMessage
RECEIVED	REPROCESS	RECEIVED	false		

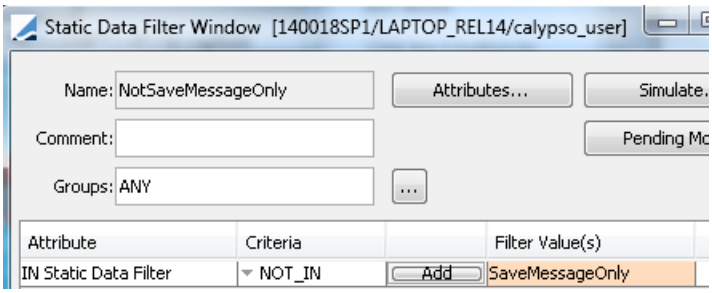
Static data filters:



PLATFORMMSG Message Workflow

Orig Status	Action	Resulting Status	Use STP	Rules	Filter
COMPLETED	UPDATE	COMPLETED	false		
NONE	NEW	COMPLETED	true		SaveMessageOnly
NONE	NEW	PENDING	true		NotSaveMessageOnly
PENDING	PROCESS	TO_TRANSLATE	true		
SENT	CANCEL	CANCELED	false		
SENT	COMPLETE	COMPLETED	false		
SENT	FAIL_SEND	TO_BE_SENT	false		
TO_BE_SENT	CANCEL	CANCELED	false		
TO_BE_SENT	RESEND	SENT	false	PlatformReprocess	
TO_TRANSLATE	CANCEL	CANCELED	false		
TO_TRANSLATE	REPROCESS	TO_TRANSLATE	false	PlatformReprocess	
TO_TRANSLATE	TRANSLATE	TRANSLATED	false		
TRANSLATED	CANCEL	CANCELED	false		
TRANSLATED	FAILED	TO_TRANSLATE	false		
TRANSLATED	FAIL_SEND	TO_BE_SENT	false		
TRANSLATED	SEND	SENT	false		

Static data filters:



3.1.2 Task Station Configuration

You can view EX_INCOMINGSOURCEMSG exceptions in the Task Station for exceptions related to the integration of INCOMINGSOURCEMSG messages.

You can also view INCOMINGSOURCEMSG messages using <status code>_INCOMINGSOURCEMSG.

You can view EX_PLATFORMMSG exceptions in the Task Station for exceptions related to the integration of PLATFORMMSG messages.

You can also view PLATFORMMSG messages using <status code>_PLATFORMMSG.

3.2 Trade Workflow

There are two use cases:

- Messages are received via the Incoming Feed/Feed translator
- Existing trades are resubmitted to the Margin Engine for re-processing or post-novation event

3.2.1 Messages Received via the Incoming Feed/Feed Translator

The Feed translator creates a trade in memory. It is processed by the Margin Engine. After the margin calculation and limit check process, a trade is created with a NONE/NEW transition. The trade will be assigned 3 keywords:

- HRCStatus - Accepted/Rejected/AutoRejected

- HRCRejectReason
- IM_PORTFOLIO_NAME

Sample Workflow

You can import the trade workflow from:

```
<calypso home>/client/resources/workflow/TRADE_WORKFLOW_HRC.wf
```

Step 1 – Edit "`TRADE_WORKFLOW_HRC.wf`", and set the processing org to your processing org. It is set to CALYPUS by default.

TRADE_WORKFLOW_HRC.wf

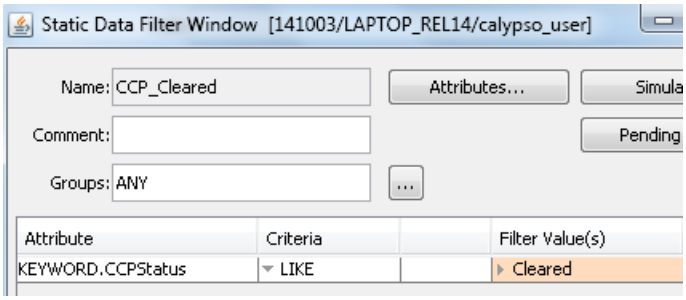
```
1  PSEventTrade;CLEARED;COMPRESS;PENDING_HRC_TERM;true;false;false;ALL;ALL;;CALYPUS;false
2  PSEventTrade;CLEARED;DECLEAR;PENDING_HRC_TERM;true;false;false;ALL;ALL;;CALYPUS;false;
3  PSEventTrade;CLEARED;TRANSFER;PENDING_HRC_TERM;true;false;false;ALL;ALL;;CALYPUS;false
```

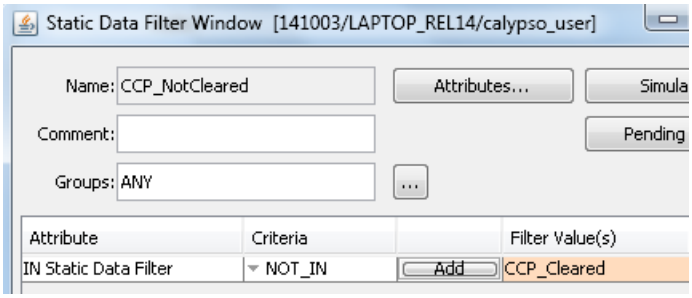
Step2 – Import the trade workflow (PSEventTrade) for your processing org, ALL subtypes, ALL product types.

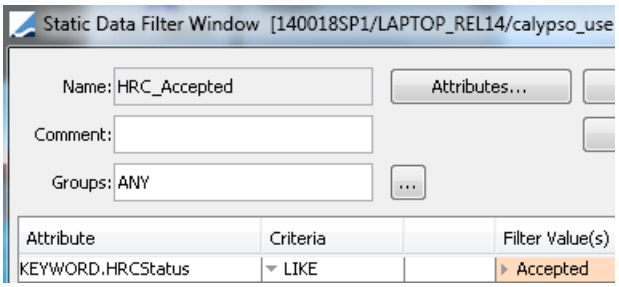
Orig Status	Action	Resulting Status	Use STP	Rules	Filter
CLEARED	COMPRESS	PENDING_HRC_TERMINATE	false	blank	blank
CLEARED	DECLEAR	PENDING_HRC_TERMINATE	false	blank	blank
CLEARED	TRANSFER	PENDING_HRC_TERMINATE	false	blank	blank
LIMIT_APPROVED	CLEAR	CLEARED	true	blank	CCP_Cleared
LIMIT_APPROVED	REFUSE	PENDING_HRC_REVERT	false	blank	blank
LIMIT_FAILED	CANCEL	CANCELED	false	blank	CCP_NotCleared
LIMIT_FAILED	FORCE_ACCEPT	PENDING_HRC	false	blank	blank
LIMIT_FAILED	FORCE_REJECT	PENDING_HRC_REJECTION	false	blank	CCP_NotCleared
LIMIT_FAILED	REFUSE	REJECTED	false	blank	CCP_NotCleared
LIMIT_FAILED	SUBMIT	PENDING_HRC	false	blank	blank
LIMIT_REJECTED	REFUSE	REJECTED	false	blank	blank
NONE	NEW	PENDING	true	blank	CCP_NotCleared
NONE	NEW	PENDING_HRC	true	blank	CCP_Cleared
PENDING	CANCEL	CANCELED	false	Cancel	blank
PENDING	STP-ACCEPT	LIMIT_APPROVED	true	blank	HRC_Accepted
PENDING	STP-REJECT	LIMIT_FAILED	true	blank	HRC_Rejected

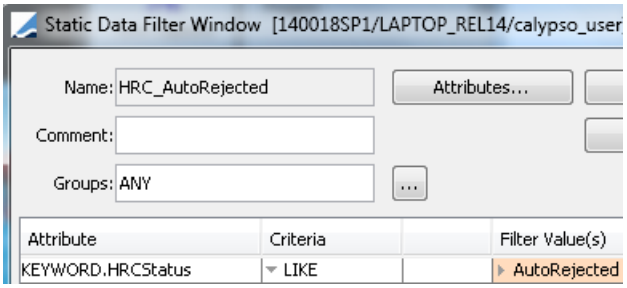
Orig Status	Action	Resulting Status	Use STP	Rules	Filter
PENDING	STP-REJECT	LIMIT_REJECTED	true	blank	HRC_AutoRejected
PENDING_HRC	ACCEPT	LIMIT_APPROVED	false	blank	blank
PENDING_HRC	FORCE_ACCEPT	PENDING_HRC	false	blank	blank
PENDING_HRC	REFUSE	REJECTED	false	blank	blank
PENDING_HRC	REJECT	LIMIT_FAILED	False	blank	blank
PENDING_HRC	SUBMIT	PENDING_HRC	false	blank	blank
PENDING_HRC_REJECTION	STP-REJECT	LIMIT_REJECTED	true	blank	blank
PENDING_HRC_REVERT	REVERT	REJECTED	false	blank	blank
PENDING_HRC_REVERT	SUBMIT	PENDING_HRC_REVERT	false	blank	blank
PENDING_HRC_REVERT	UPDATE	PENDING_HRC_REVERT	false	blank	blank
PENDING_HRC_TERMINATE	SUBMIT	PENDING_HRC_TERMINATE	false	blank	blank
PENDING_HRC_TERMINATE	TERMINATE	TERMINATED	false	blank	blank
PENDING_HRC_TERMINATE	UPDATE	PENDING_HRC_TERMINATE	false	blank	blank
REJECTED	ACCEPT	PENDING_HRC_REVERT	false	blank	blank
REJECTED	REJECT	REJECTED	false	blank	blank

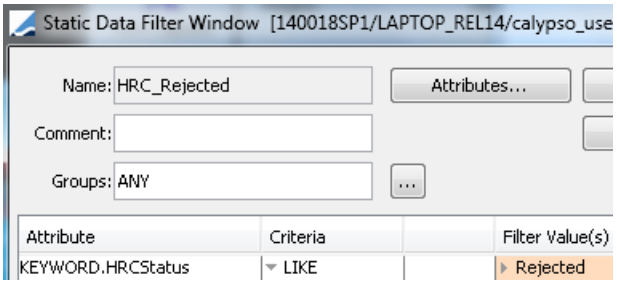
Static data filters:











The various types of incoming messages may trigger limit check and/or impact IM Exposure:

Message Type	CCP	Limit Check	IM Exposure	Workflow
Request for Consent	CME	Check	Include	If the limit check passes, a trade is created in status LIMIT_APPROVED.
Clearing Confirm (auto consent)	CME	No Check	None	A LIMIT_APPROVED trade moves to status CLEARED.
Clearing Refuse	CME	No check	Remove	A LIMIT_APPROVED trade moves to status REJECTED.
Clearing Confirm (no auto consent)	CME	No check	Include	A trade is created in status CLEARED.
Clearing Confirm (netting new)	CME	No check	Include	A trade is created in status CLEARED.
Clearing Confirm (Terminate, Transfer)	CME	No check	Remove	A CLEARED trade moves to status TERMINATED.

Message Type	CCP	Limit Check	IM Exposure	Workflow
Clearing Confirm (Terminate, Netting)	CME	No check	Remove	A CLEARED trade moves to status TERMINATED.
Request for Consent (normal trade, transfer in, transfer out)	LCH	Check	Include	If the limit check passes, a trade is created in status LIMIT_APPROVED.
Clearing Confirm (normal trade, transfer in, transfer out)	LCH	No check	None	A LIMIT_APPROVED trade moves to status CLEARED.
Clearing Refuse	LCH	No check	Remove	A LIMIT_APPROVED trade moves to status REJECTED.
Clearing Confirm (netting new)	LCH	No check	Include	A trade is created in status CLEARED.

When the limit check fails, the trade can be manually resubmitted for limit check (action SUBMIT). In this case, the trade is routed to the TradeVaR process through the Margin Controller engine.

3.2.2 Existing Trades Resubmitted to the Margin Engine

For existing trades, here are the supported actions:

- SUBMIT - ACCEPT/REJECT
- RESUBMIT - ACCEPT/REJECT
- FORCEACCEPT - ACCEPT/REJECT
- REFUSE - REFUSE
- REVERT - REVERT/REJECT
- CLEAR - CLEAR if accepted by MGNE
- COMPRESS - COMPRESS if accepted by MGNE
- TERMINATE - ACCEPT/REJECT
- AMEND - ACCEPT/REJECT
- FORCEAMEND - ACCEPT/REJECT

For any other action, trades will not be updated, and the margin results will not be saved. A task will be created in the task station.

3.3 Limit Check

For complete details on Limit Check setup, please also refer to the *Calypso Messaging Framework Integration Guide*.

3.3.1 Environment Properties

Please set the following environment properties:

Property Name	Property Value	Description
datagrid.impl	hazelcast	In-memory data grid.
RISKCONTROLEVENTSERVERURL	tcp://localhost:61919	Host name and port number of the Uploader Messaging Server.

3.3.2 Domain "MarginEngine"

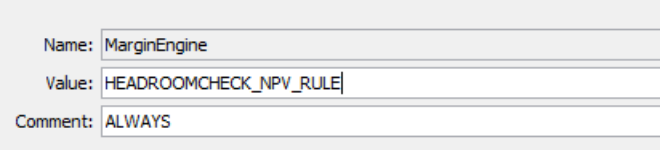
The following domain values need to be defined in the domain “MarginEngine”.

Value = HEADROOMCHECK_PRICING_ENV

Comment = Pricing environment used to compute Limit Check. It defines what base currency is used for client level calculation.

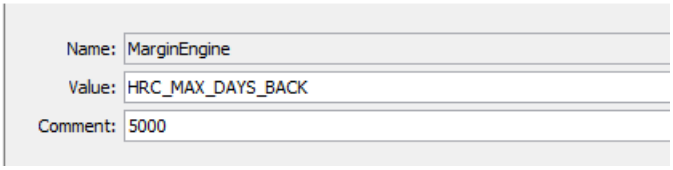
Value = HEADROOMCHECK_NPV_RULE

Determines if the NPV should be included in limit check:



- ALWAYS - NPV is included for all trades.
- NEVER - NPV is never included.
- BACKDATED - NPV is included only for back-dated trades.
- RISK_INCREASING - Only Positive NPV is included for all trades.

Value = HRC_MAX_DAYS_BACK



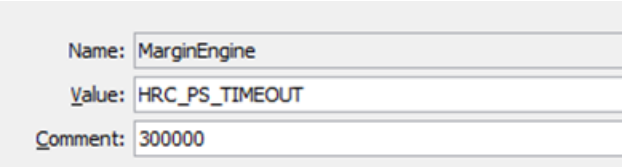
Comment = Number of days for which historical PL Vectors can be used (mostly for testing). The domain value is used to load collateral results. This can be set to any number of days.

Value = HEADROOMCHECK_RULES

Comment = Limit Check rule. You can set:

- CMFMarginAccountRules - Checks limits at the account level only.
- CMFClientAndMarginAccountRules - Checks limits at the account and aggregation levels.
- OriginHeadroomTotalIM – Checks limits for hierarchies with a single level.
- ClientHeadroomTotalIM - Checks headroom limits (Collateral + Limit – TOTAL IM>0 or risk reducing) and IM limit (Limit – IM > 0 or risk reducing) at the Clearing Member level.

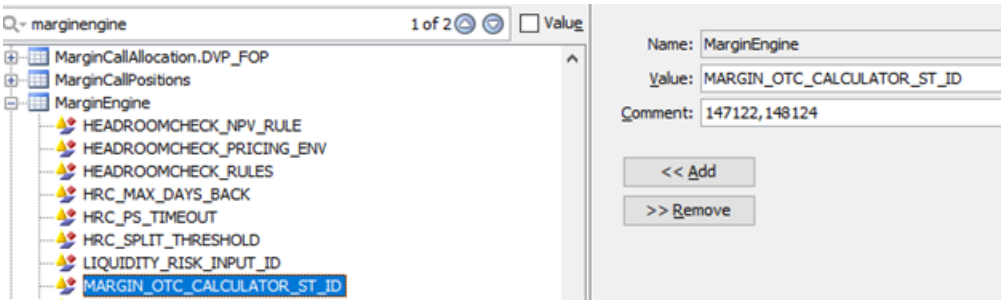
Value = HRC_PS_TIMEOUT



Data Persistor timeout in ms.

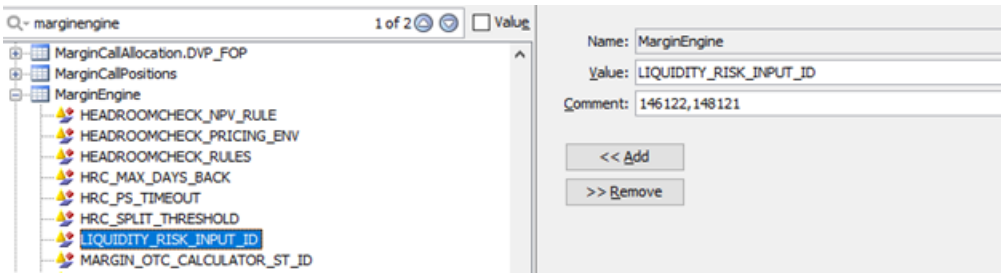
Value = MARGIN_OTC_CALCULATOR_ST_ID

List of scheduled task ids of MARGIN_OTC_CALCULATOR scheduled task used to calculate IM for intraday trades.



Value = LIQUIDITY_RISK_INPUT

List of scheduled task ids of LIQUIDITY_RISK_INPUT scheduled task used to calculate liquidity add-on for intraday trades. This attribute is mandatory to start the liquidity risk calculator. This calculator is only required for TYPEJ for calculating liquidity risk component for EUREX.



3.3.3 Limits

Limits can be imported using the Data Uploader.

Limits can be set to 0 by default.

Limits can be updated in bulk for all margin accounts, or for individual margin accounts.

Limits are set based on hierarchies.

Sample hierarchies:

CCP

- Clearing Member 1
  - House (CCP limit)
  - Client (CCP Limit)
    - Client 1 (CMF Limit)
    - Client 2 (CMF Limit)

CMF

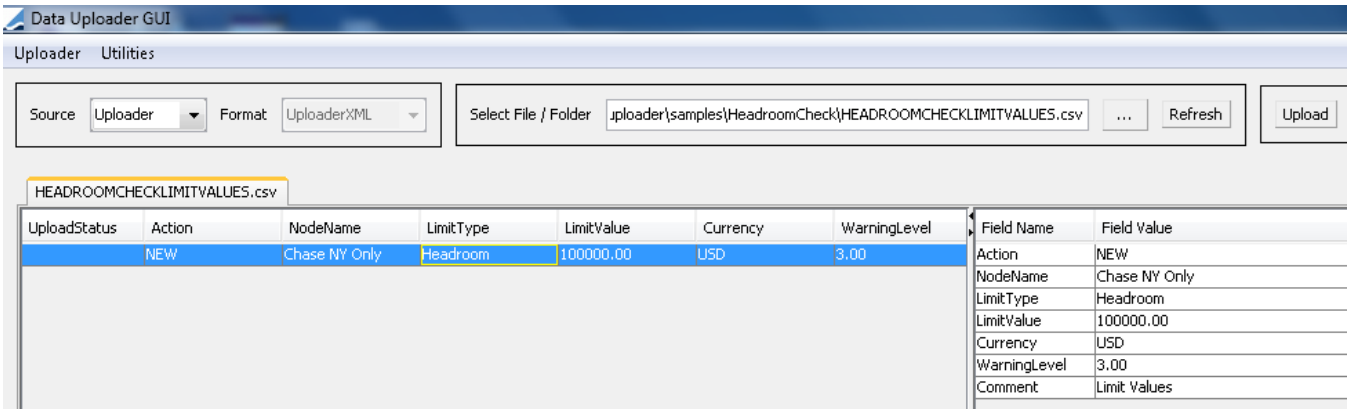
- Client 1 (Client Limit)
  - CCP1 MA (Margin Limit)
  - CCP2 MA (Margin Limit)

The Data Uploader supports CSV and XML files. The file names should start with “HEADROOMCHECKLIMITVALUES_”, for example “HEADROOMCHECKLIMITVALUES_<name>.csv”.

Sample files are provided under `<calypso home>/docs/calypso-datauploader/samples/HeadroomCheck`.

Launch the Data Uploader window using Processing > Tools > Data Uploader from the Calypso Navigator.

Select a file from your machine, the content for the file is displayed:



» Click **Upload** to load the limit values into Calypso.

3.3.4 Margin Controller Engine

The Margin Controller Engine allows routing the collateral positions changes to the Trade VaR process.

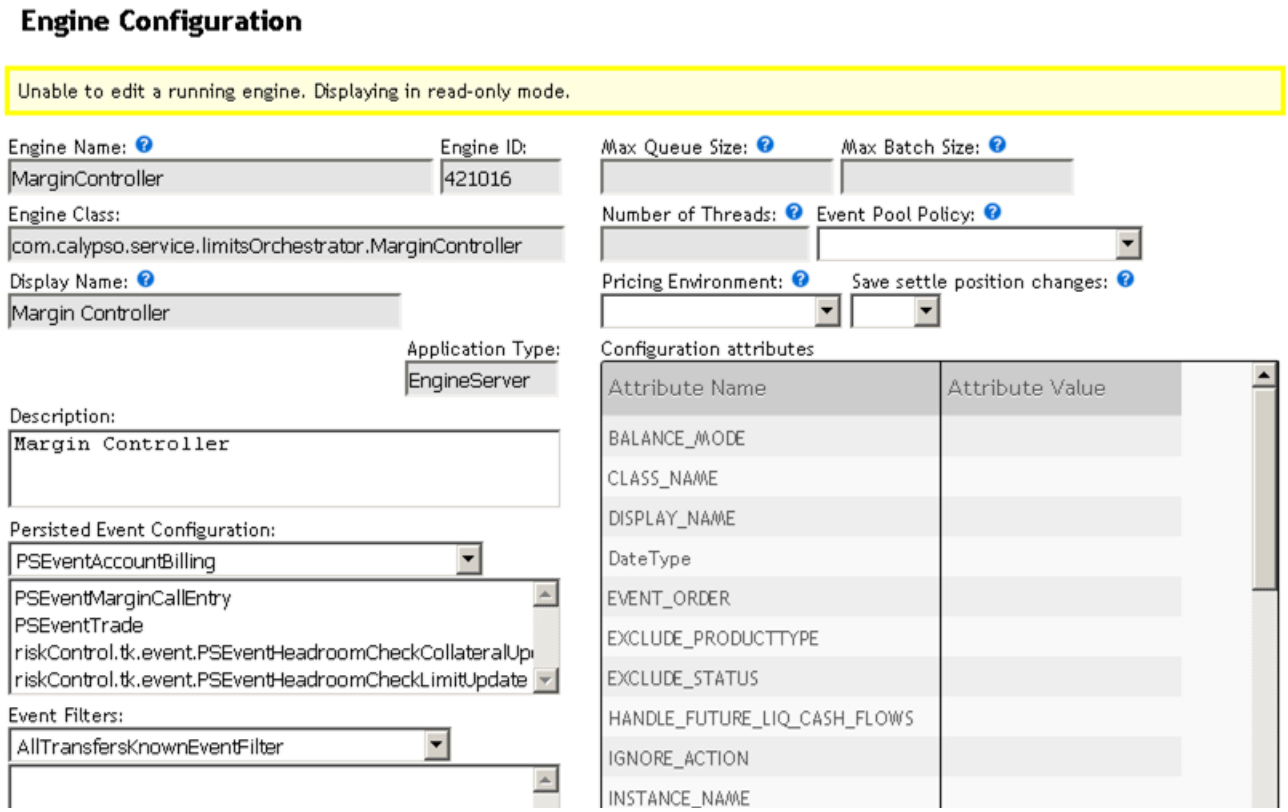
It is configured in the Engine Manager of Web Admin: event subscription and engine parameters.

You may need to add this engine if it is not available for configuration: Create a new engine called MarginController with class name `com.calypso.service.limitsOrchestrator.MarginController`.

It subscribes to:

- PSEventHeadroomCheckCollateralUpdate
- PSEventHeadroomCheckLimitUpdate
- PSEventTrade
- PSEventMarginCallEntry

No event filter.



Please refer to Calypso Web Admin documentation for complete details.

3.3.5 Update Manager Engine

The Update Manager engine allows routing of trade, imported collateral and limit updates.

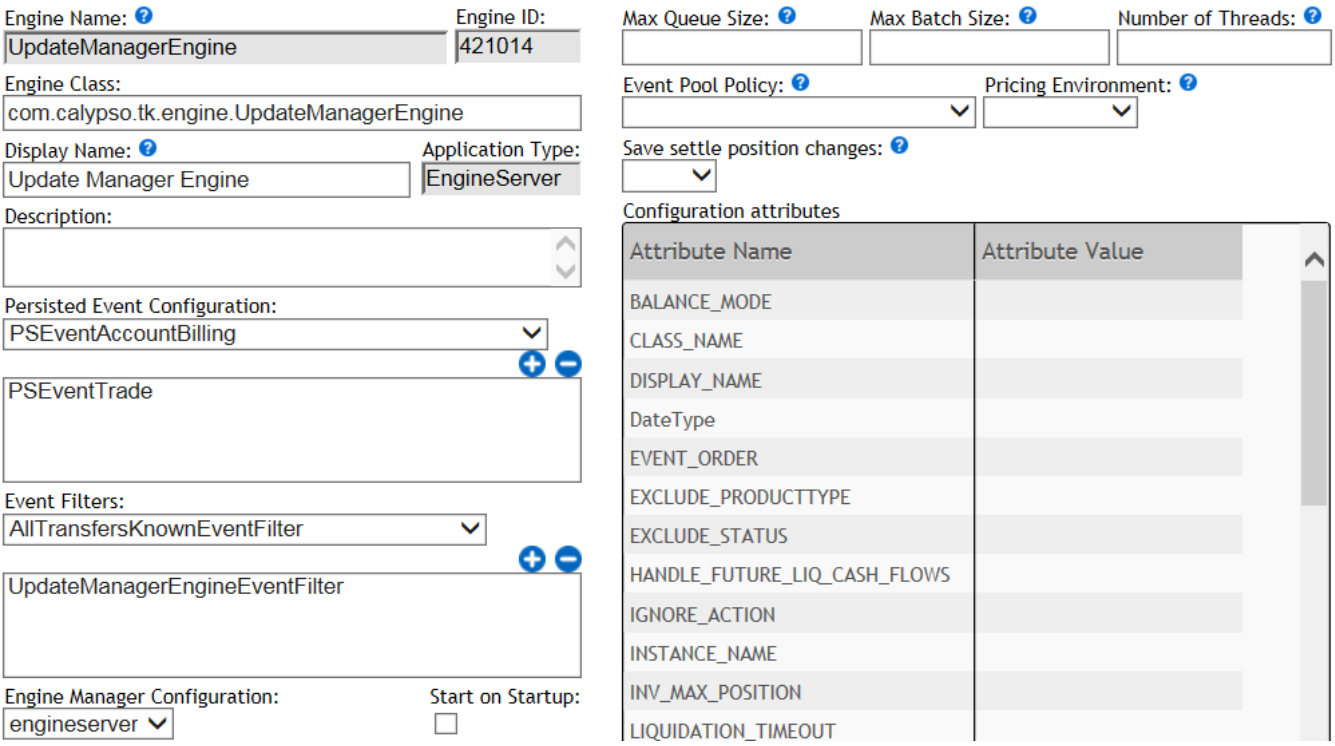
It is configured in the Engine Manager of Web Admin: event subscription and engine parameters.

You may need to add this engine if it is not available for configuration: Create a new engine called UpdateManagerEngine with class name `com.calypso.tk.engine.UpdateManagerEngine`.

It subscribes to:

- PSEventTrade

Event filter = UpdateManagerEngineEventFilter



Please refer to Calypso Web Admin documentation for complete details.

4. OTC Margin Process Setup

This section describes the configuration requirements to run the HistSim report.

4.1 Trade Filters

You need to configure a trade filter for each client and for each CCP that contains the trades for which you want to compute IM exposure.

4.2 Market Risk Hierarchies

Market Risk hierarchies are created using /market-risk/setup/hierarchy/edit.

Examples:

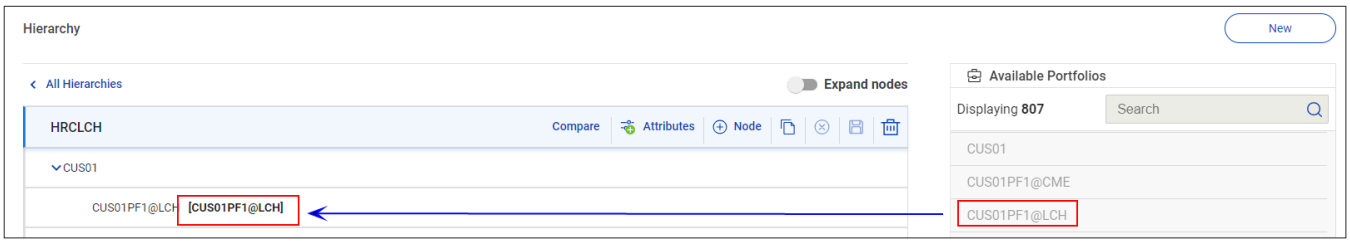
FX Tree

IRS Tree

Create a node for each client and each client account. The client account node must be associated with the trade filter previously created.

[NOTE: The client account node MUST have the same name as the trade filter]

Example:



Important Note: Also, the client account node (CUS01PF1@CME or CUS01PF1@LCH in this example) must be set on the account attribute InitialMarginAccountName of the Calypso client clearing accounts. This is used when computing the incremental IM exposure to associate the incoming message with the proper market hierarchy.

Name	Value
ClearingCashAccount	false
Propagate	false
AccountType	Client
Description	Clearing
InitialMarginAccountName	CUS01PF1@LCH
CCPOriginCode	CLIENT
InitialMarginAccount	AAA222

4.3 Data Grid Configuration

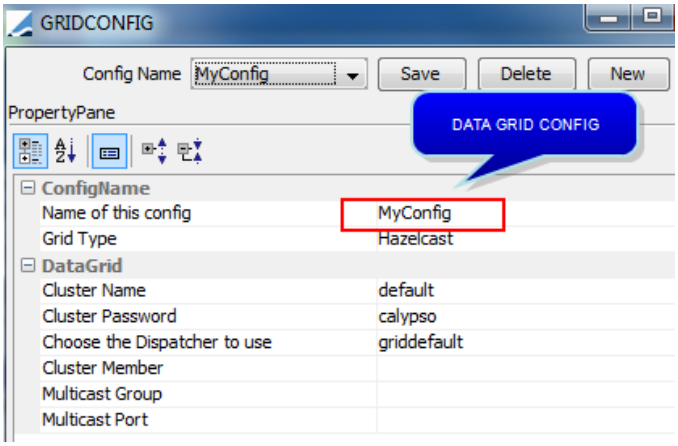
You need to use the in-memory data grid to compute the HistSim analysis.

Calypso currently supports the Hazelcast data grid.

The data grid is created using the scheduled task DATA_GRID_HYDRATE based on a data grid configuration and a HistSim batch name.

The HistSim analysis is then run on the data grid using the scheduled task ERS_ANALYSIS.

Bring up the Data Grid Configuration window (menu action `grid.GridConfigEditor`).



- Enter a name for the configuration. It is used to generate the data grid. Then enter the fields describe below.
- Then click Save.

Fields Details

Fields	Description
Grid Type	Select Hazelcast. Add datagrid.impl=hazelcast in env properties file.
Cluster Name Cluster Password	Enter a cluster name and cluster password. The cluster members (nodes) and clients having the same cluster configuration (i.e. same cluster name and password) form a private cluster.
Choose the Dispatcher to use	Select the dispatcher configuration for the data grid. **[NOTE: You need a dedicated dispatcher configuration for all data grid calculators]** Please refer to the Calypso Installation Guide for information on setting up a dispatcher.
Cluster Member	Enter a cluster member (optional). If no value is entered, then Hazelcast client expects the data grid server to be running on the same machine as the client.
Multicast Group	Enter the multicast group IP address. Values can be between 224.0.0.0 and 239.255.255.255.
Multicast Port	Enter the multicast socket port which Hazelcast member listens to and uses to send discovery messages.

Environment Property

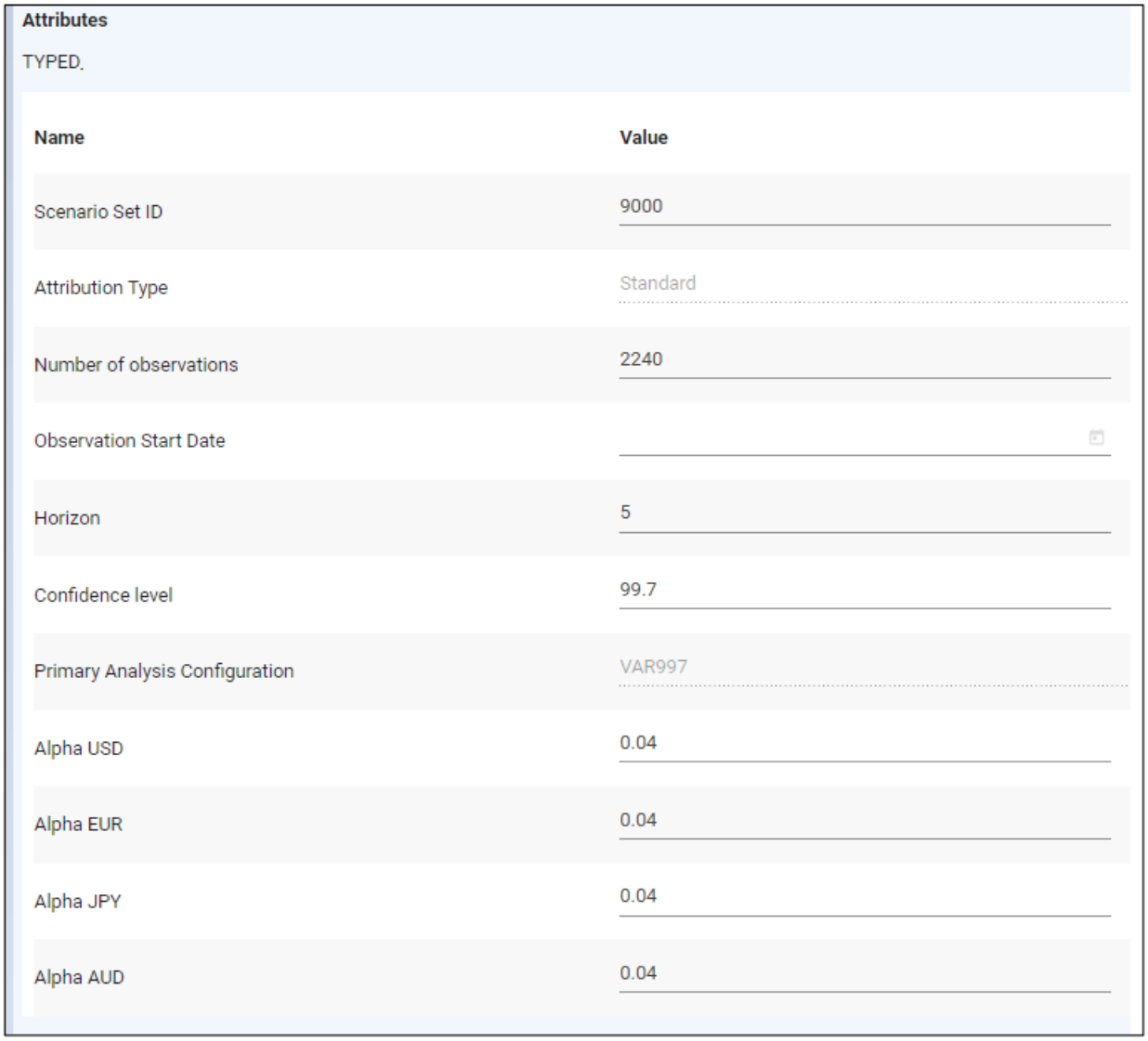
Once you have defined the Data Grid Configuration, set the environment property:

grid.config=<data grid configuration name>

4.4 Configuring the Sim Analysis

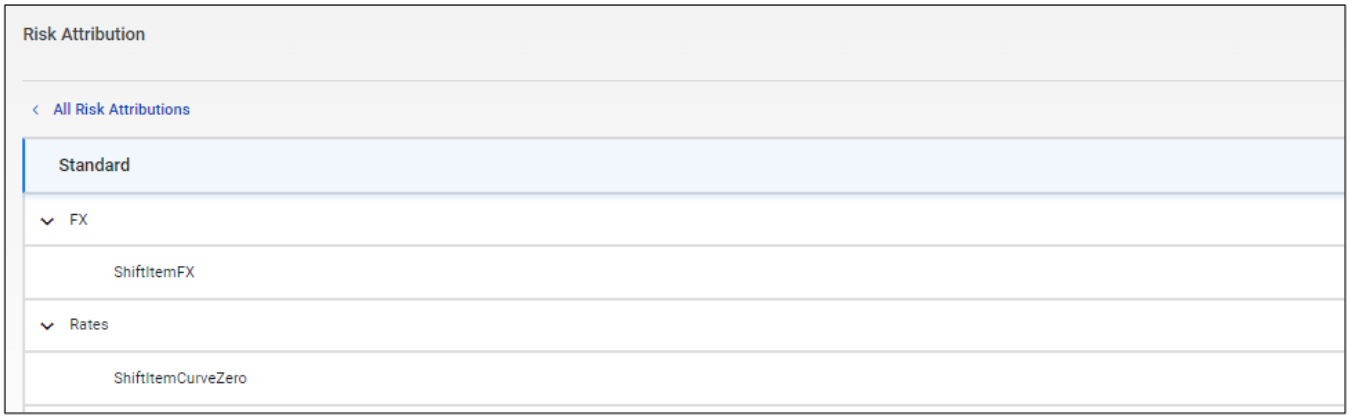
You need to add the Sim analysis to Market Risk under Setup >> Sim Parameter .

CME Parameters

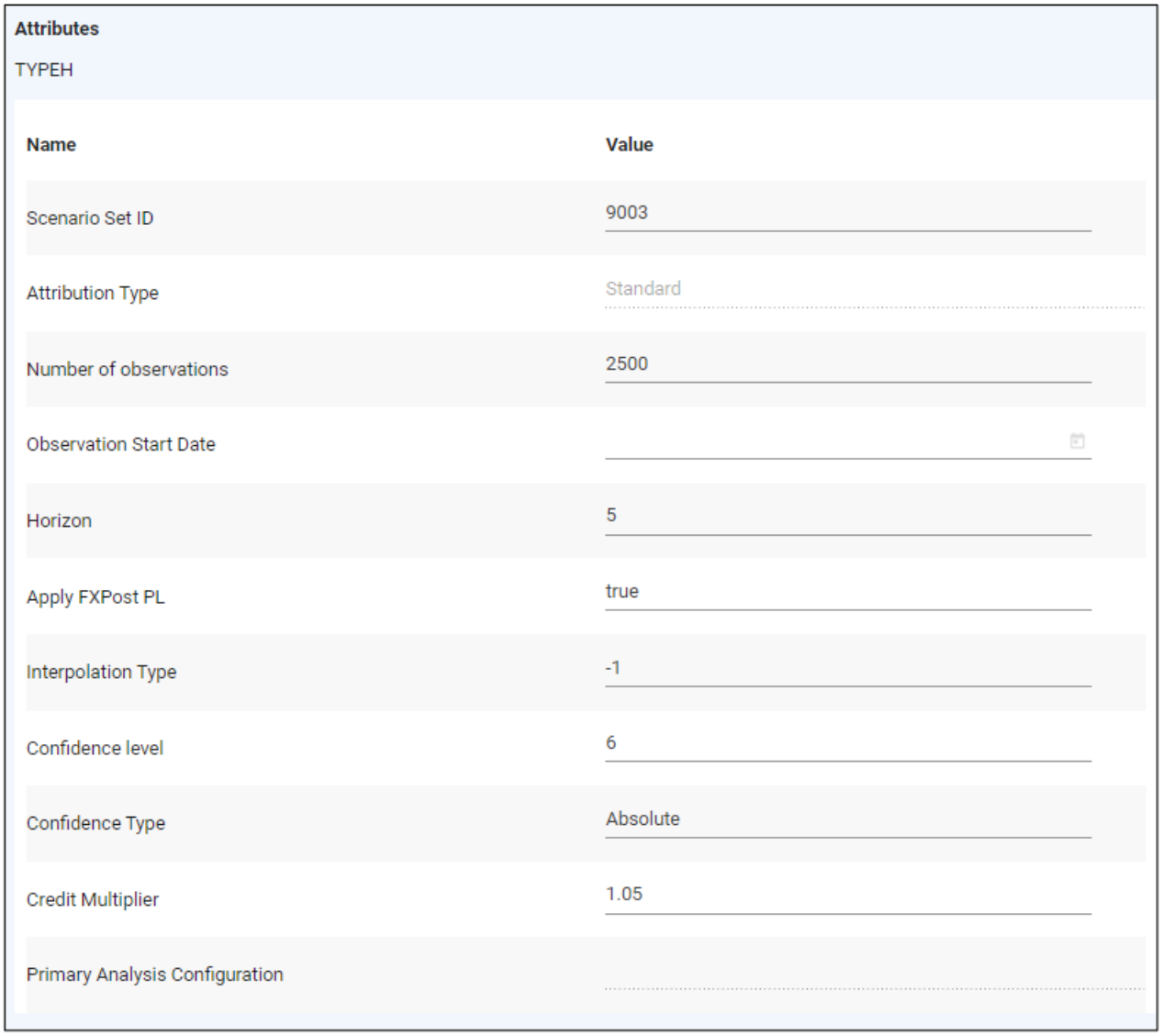


- Scenario Set ID – Enter the scenario set ID for the historical simulation.
- Number of observations – Enter the number of observations (scenarios) for the historical simulation.
- Confidence Level – Enter the confidence interval for the VAR calculation.
- Alpha<currency> should be added to the parameters for each currency. Currently alpha is 0.04 for each ccy.
- Horizon
- Methodology – We do not need to select methodology in the Sim Parameters. It can be selected in the MARGIN_OTC_CALCULATOR scheduled task (Described later in the document).

Add the following attribution types using **Setup >> Risk Attribution**:



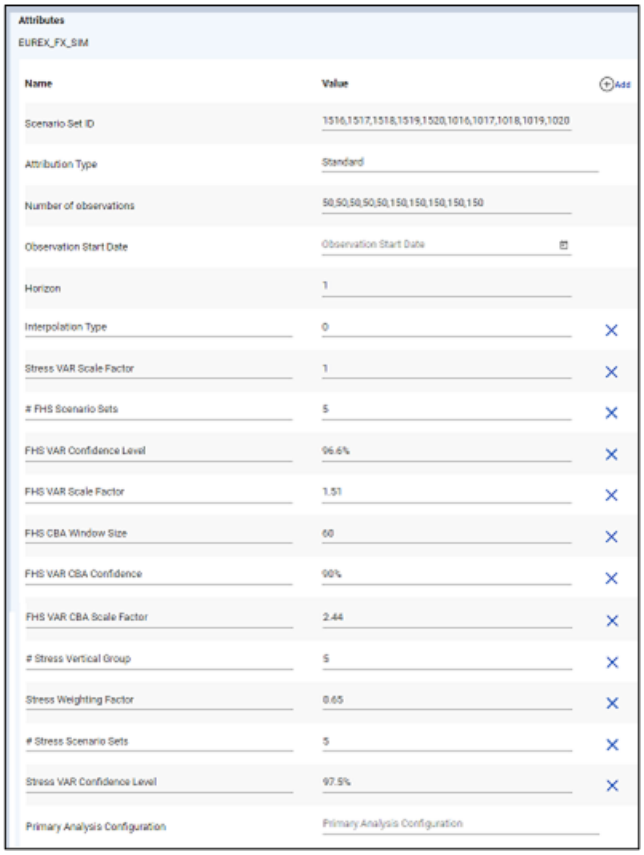
LCH Parameters

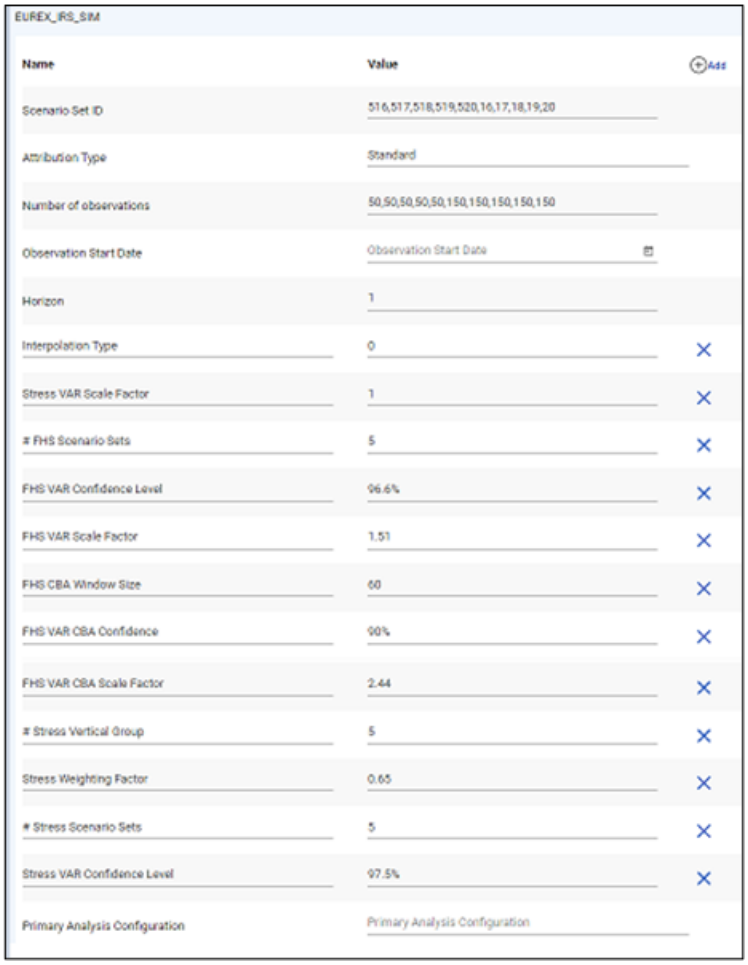


- Confidence Level - Percentage
  - PL vectors are sorted from the smallest to the largest value
  - ETL is the average[(rounddown(p*(n+1)),0):1st PL] where p is 1-confidence interval and n the number of observations
- Confidence Level – Absolute Number of Losses
  - PL vectors are sorted from the smallest to the largest value
  - ETL is the average of xth PL to 1st PL
- Horizon
- Scenario Set ID – Enter the scenario set ID for the historical simulation.
- Number of observations – Enter the number of observations (scenarios) for the historical simulation.

- Methodology – We do not need to select methodology in the Sim Parameters.

EUREX Parameters





- Scenario Set ID: List of comma-separated list of scenario ids.
- Number of observations: List of comma-separated list of number of observations. The first one will be used for FHS VaR and the second one will be used for SP VaR.
- Methodology – Select “TYPEJ”.
- Stress Confidence Level: Specify the confidence level for stress VaR.
- FHS Factor: Scaling factor to be multiplied by FHS VaR.
- SP Factor: Scaling factor to be multiplied by Stress VaR.
- CBA Factor: Scaling factor to be multiplied by correlation break adjustment.
- CBA Moving Window: N days moving window for calculating CBA.
- SP VaR Weight: Weighting factor on SP VaR.
- Horizon

4.5 Market Data

Importing Variation Margin Curves

CCPs often use different curves to price trades to calculate NPV and Variation Margin than they do to calculate Initial Margin requirements. This is especially true for CME, where the curves used for VM have daily points that go out 50 years. You would NEVER want to try to run a curve with this many points through a Historical Simulation required for IM calculation because it would take too long. The VM curve names vary by CCP, and they are mapped to curve names in Calypso through the Calypso Mapping window. We recommend to users to create pricer configurations called "CME_VM", "LCH_VM", etc. to hold VM curves.

VM curves are imported daily using the scheduled task CLEARING_IMPORT_MARKET_DATA.

Importing Initial Margin Curves

Very similarly to VM cures, IM curves are separate curves that are used in the Pricing Environment for IM calculations: "CME_IM" and "LCH_IM" pricer configurations.

IM curves are imported daily using the scheduled task CLEARING_IMPORT_MARKET_DATA.

Importing Quotes

Rate Index quotes and FX quotes provided by the CCP are imported using the scheduled task CLEARING_MARKET_DATA_IMPORT.

Importing Curve Shifting Scenarios

You can import the set of curve shifting scenarios that can be used to calculate VaR and IM through the CLEARING_IMPORT_SCENARIO_SHIFTS scheduled task. These curves are stored in the Market Risk tables.

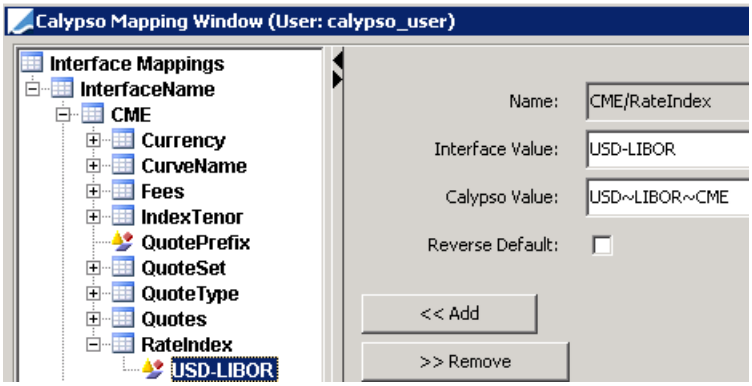
4.5.1 Mapping Configuration

There is additional configuration required within the Calypso Mapping Window (menu action `mapping.CalypsoMappingWindow`).

Rate Indices

The Rate Index Definition is defined using the standard process to generate a quote name for a given index. For our example we will use “MM.USD.LIBOR.*tenor*.CME” as our set of indices.

To map all of the tenors, we simply need one mapping for USD LIBOR as shown here:



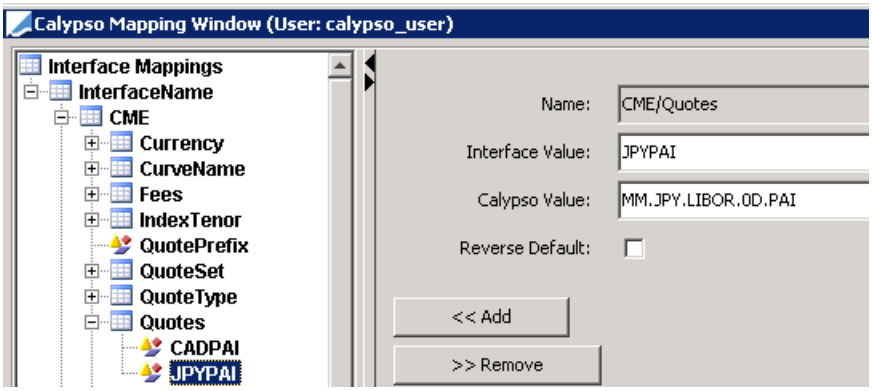
The Calypso Value “USD~LIBOR~CME” has some logic behind it to map the correct tenors of the quote name form “MM.USD.LIBOR.tenor.CME”. In other words, all tenors of USD LIBOR will be imported with this one mapping.

CME Quotes

You can define quote mapping under CME > Quotes.

For example the quotes returned from CME are in the form "JPYPAI", "CADPAI" etc. They come from the file “CMEPAI_$date_stamp.csv”.

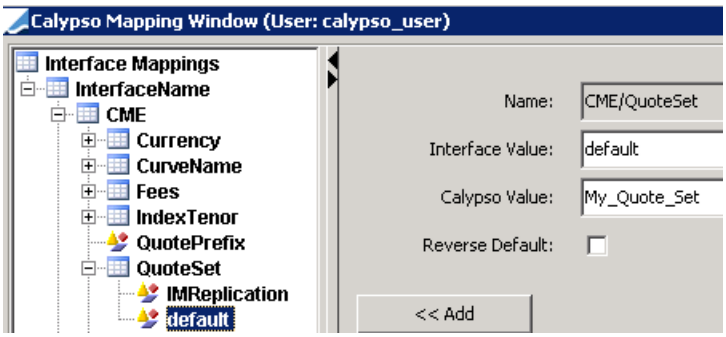
You then define the mapping for the specific interface name. For example JPYPAI (interface value) can map to MM.JPY.LIBOR.0D.PAI (Calypso value).



Sample rate reset quote mapping:

[NOTE: The Calypso Value depends on the interest rate definition: “MM.<currency>.<rate index>.<tenor>.<source>”]

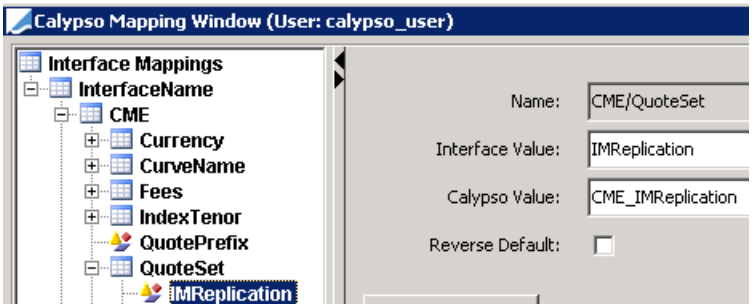
The quotes for the rate indices are stored into the default quote set, unless the user maps the default quote set to another quote set using the mapping below.



The CLEARING_IMPORT_MARKET_DATA scheduled task also imports the FX rates used by CME for IM replication into a specific quote set (because CME publishes unique FX rates that are specific to Initial Margin calculations).

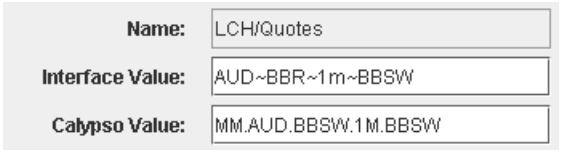
The quote set must be defined in the Data Mapping window for InterfaceName = CME/QuoteSet, and Interface Value = IMReplication.

Example:



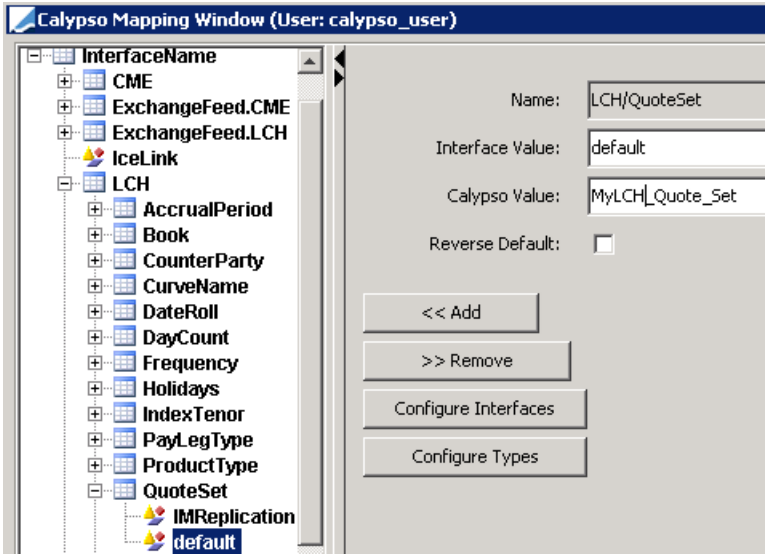
LCH Quotes

Sample rate reset quote mapping:



[NOTE: The Calypso Value depends on the interest rate definition: "MM.<currency>.<rate index>.<tenor>.<source>"]

The quotes for the rate indices are stored into the default quote set, unless the user maps the default quote set to another quote set using the mapping below.



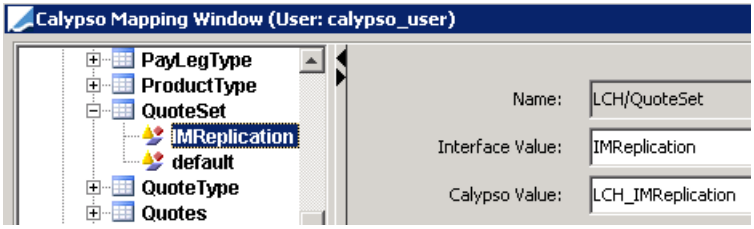
The CLEARING_IMPORT_MARKET_DATA scheduled task also imports the FX rates used by LCH for IM replication into a specific quote set (because LCH publishes unique FX rates that are specific to Initial Margin calculations).

No Calypso mapping in necessary for FX quotes, as LCH directly provides Quotes in the form “FX.cur1.cur2”.

Please note that both CME and LCH are only providing the "Close" FX quotes – So only Close quotes are saved in the system.

The quote set must be defined in the Data Mapping window for InterfaceName = LCH/QuoteSet, and Interface Value = IMReplication.

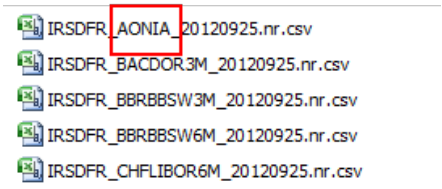
Example:

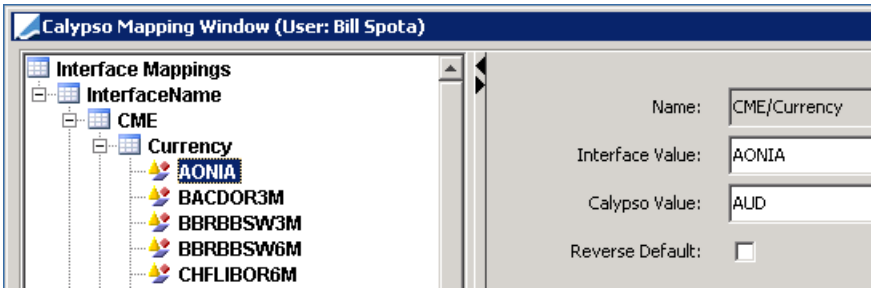


CME Curves

This scheduled task is used for importing the various IRSDFR curves published by CME so that IM can be reconciled. Sample mapping is shown below, and you will need to create simple shell curves for a date that is before the date you intend to import.

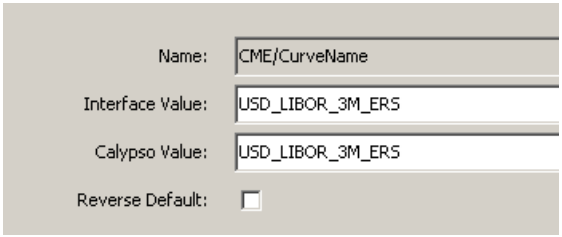
Let’s start with the Calypso Mapping Window.



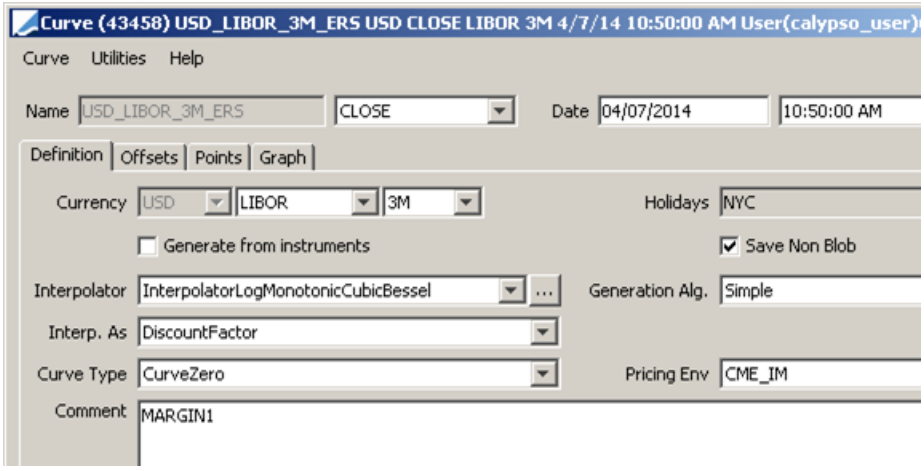


In the above example, you will map the middle section of the IRSDFR file name to a specific currency. This takes some basic knowledge of IRS Clearing to determine what currency is associated with what name. Example AONIA is the discount curve used for VM in AUD whereas BACDOR3M is the forecast curve for CAD.

You then need to map that name to an actual curve name in Calypso, a simple discount curve.



The curve “USD_LIBOR_3M_ERS” in this example, must be defined under **Market Data > Interest Rate Curves > Zero Yield Curve**.



The interpolator should set as InterpolatorLogMonotonicCubicBessel and Interp. As DiscountFactor.

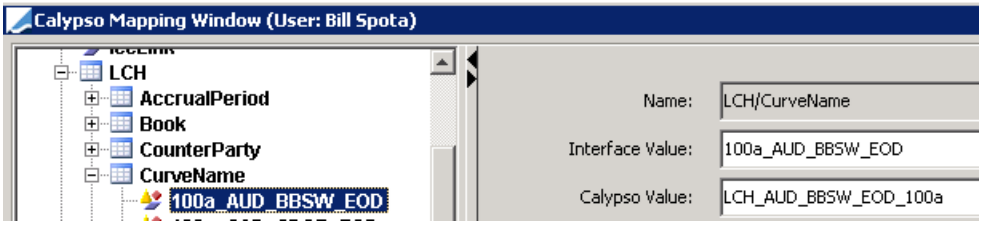
LCH Curves

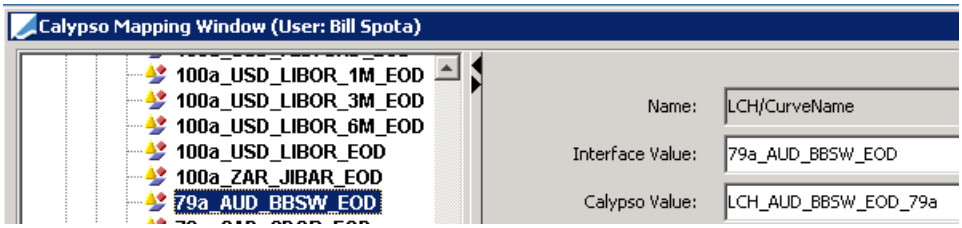
This scheduled task is used for importing the various IM and VM curves published by LCH on reports 79/100 so that both can be reconciled. Additionally, it is used to import the FX and PAI rates.

In the Calypso Mapping Window, under the interface LCH > CurveName, specify the value of the interface name. For example this could be AUD_BBSW_EOD, and map this to a Calypso value (example LCH_AUD_BBSW).

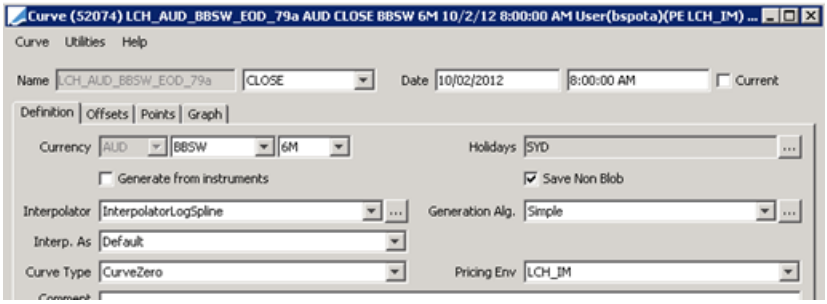
However, there are two LCH reports we use to import these data, REP00079 and REP000100. The same CurveName can exist in both reports but yet have different values as "79" is for IM and "100" is for VM. To ensure we distinguish the two data from both reports with same name, you should use the following naming convention:

- 79a_CHF_LIBOR_EOD mapped to Calypso value (example LCH_CHF_LIB_3M_EOD_79a)
- 100a_CHF_LIBOR_EOD mapped to Calypso value (example LCH_CHF_LIB_3M_EOD_100a)





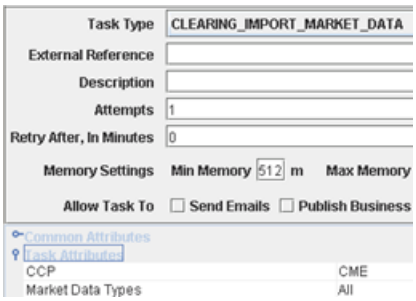
The curves "LCH_AUD_BBSW_EOD_100a" and "LCH_AUD_BBSW_EOD_79a" in this example, must be defined under **Market Data > Interest Rate Curves > Zero Yield Curve**.



In the above examples you can see that there is a curve named "AUD_BBSW_EOD" in both reports 79 and 100, and that each LCH curve is mapped to a different curve in Calypso.

4.5.2 CLEARING_IMPORT_MARKET_DATA

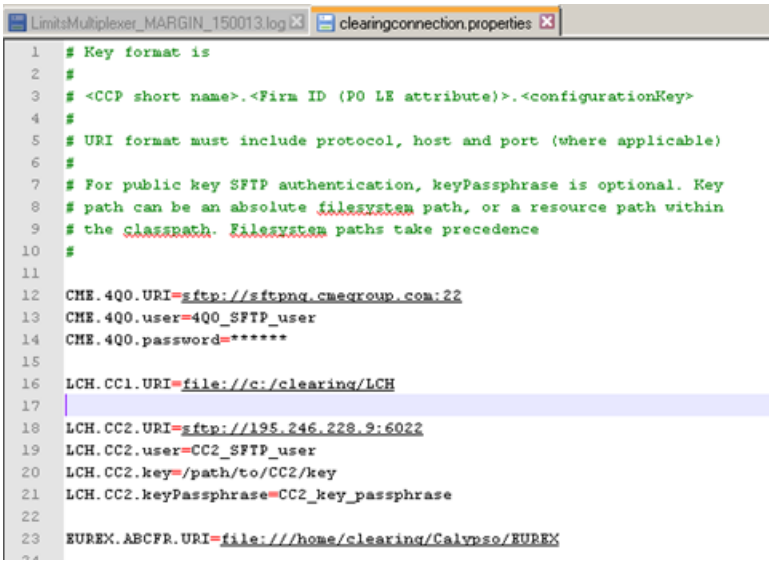
This scheduled task is used to import curves, quotes, and rate resets.



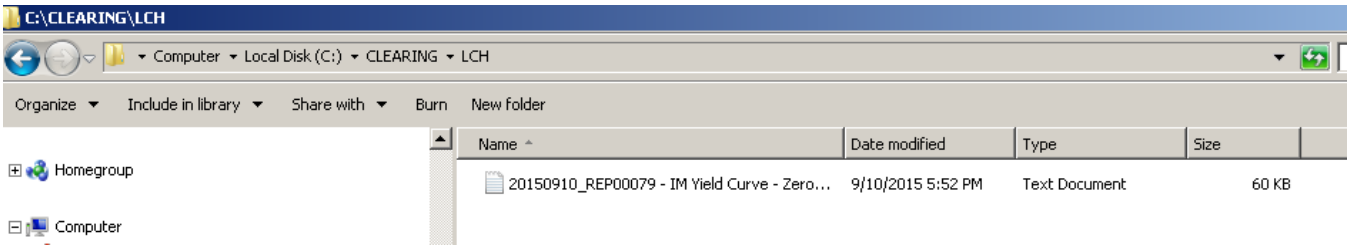
Attributes

- Select a CCP.
- Select the market data types: All, Curves, FX Rates, Holidays, Quotes, QuotesIM, or Rate Reset.

The files are imported based on the locations defined in “clearingconnection.properties” file:



Example:



This scheduled task is used to import the market data from the following CCP files:

LCH

- VM and IM Curves - REP00079 and REP00100
- Quotes - DailyExchangeRates REP00018
- Rate Reset – HistoricalIndexRates REP00003 and FX rates REP00016c
- Holidays – Holidays REP00006 - The holiday calendars must be mapped in the Calypso Mapping Window for the interface name LCH/Holidays.

CME

- VM Curves – IRSDFRCurve_* "IRSDFR_*.csv"
- IM Curves - "Base_Curves_*DATE.csv"
- Quotes – CMEPAIQuote "CMEPAI_*.csv"
- Rate Resets - CMEIRSRateReset "IRSRR_*"
- QuotesIM – FX rates "IRSMR3_*.csv"

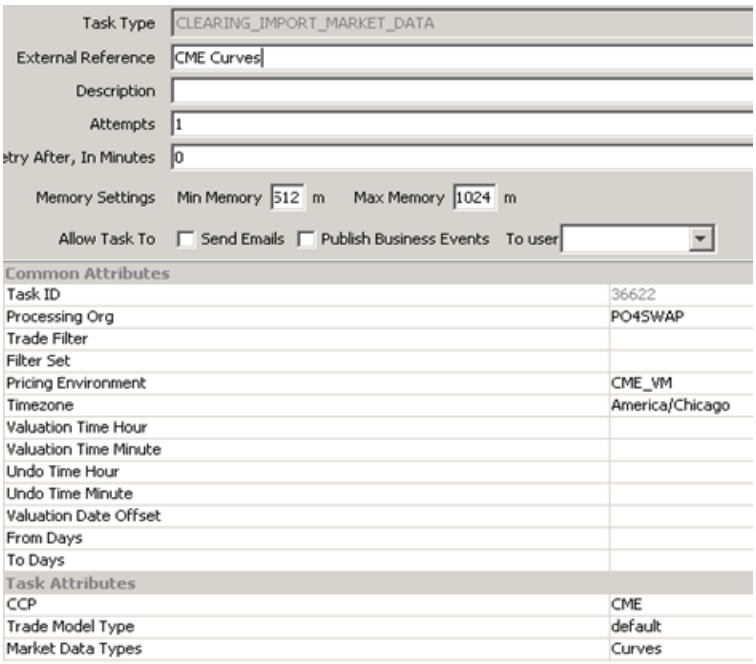
[NOTE: The performance can be improved by adding the value CLEARING_IMPORT_MARKET_DATA to the domain "Clearing.ParallelDownloadTasks". This allows the scheduled task CLEARING_IMPORT_MARKET_DATA to perform parallel download]

CME Example

Sample CME Curves

Once all the mappings are done for each currency/curve name for discount and forecast curves, you then run the CLEARING_IMPORT_MARKET_DATA scheduled task.

Note: There is not a discount curve for every currency, and in this case, the forecast curve is used for both discounting and forecasting.



Task Type	CLEARING_IMPORT_MARKET_DATA
External Reference	CME Curves
Description	
Attempts	1
Retry After, In Minutes	0
Memory Settings	Min Memory 512 m Max Memory 1024 m
Allow Task To	Send Emails, Publish Business Events, To user
Common Attributes	
Task ID	36622
Processing Org	PO4SWAP
Trade Filter	
Filter Set	
Pricing Environment	CME_VM
Timezone	America/Chicago
Valuation Time Hour	
Valuation Time Minute	
Undo Time Hour	
Undo Time Minute	
Valuation Date Offset	
From Days	
To Days	
Task Attributes	
CCP	CME
Trade Model Type	default
Market Data Types	Curves

Sample CME QuotesIM

The CLEARING_IMPORT_MARKET_DATA scheduled task also imports the FX rates used by CME for IM replication. The data comes from the report “IRSMR3_yyyymmdd.csv”.

If the FX rate supplied on this report comes in nonstandard market quote convention, there is logic in the scheduled task to use the position pair reference as per each currency pair definition. For example, the report provides USD/JPY quotes, whereas the convention is JPY/USD quotes so the scheduled task will invert the quote in that case.

The configuration of the task requires the user to choose the QuotesIM attribute located under Market Data Types:

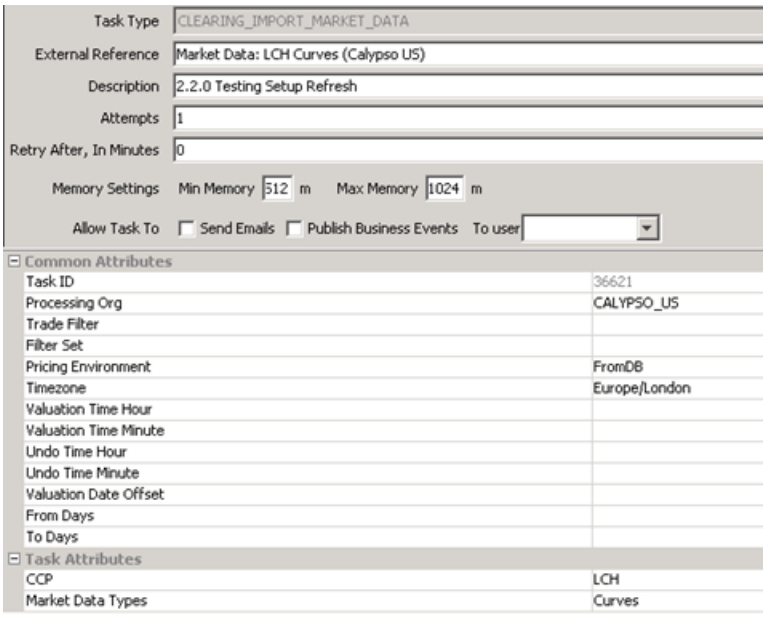
Task Attributes	
CCP	CME
Market Data Types	QuotesIM

By choosing this attribute, the task will look for the CME IRSMR3 report, and will save the FX rates as of the day before.

LCH Example

Sample LCH Curves

Once all the mappings are done for each curve name for discount and forecast curves, you then run the CLEARING_IMPORT_MARKET_DATA scheduled task.



Task Type	CLEARING_IMPORT_MARKET_DATA
External Reference	Market Data: LCH Curves (Calypso US)
Description	2.2.0 Testing Setup Refresh
Attempts	1
Retry After, In Minutes	0
Memory Settings	Min Memory 512 m Max Memory 1024 m
Allow Task To	Send Emails, Publish Business Events, To user
Common Attributes	
Task ID	36621
Processing Org	CALYPSO_US
Trade Filter	
Filter Set	
Pricing Environment	FromDB
Timezone	Europe/London
Valuation Time Hour	
Valuation Time Minute	
Undo Time Hour	
Undo Time Minute	
Valuation Date Offset	
From Days	
To Days	
Task Attributes	
CCP	LCH
Market Data Types	Curves

Sample LCH Rate Resets and FX Rates

The CLEARING_IMPORT_MARKET_DATA scheduled task also imports the FX rates used by LCH for IM estimation. The data comes from the report “REP00016c”.

If the FX rate supplied on this report comes in non-standard market quote convention, there is logic in the scheduled task to use the position pair reference as per each currency pair definition. For example, the report provides USD/JPY quotes, whereas the convention is JPY/USD quotes so the scheduled task will invert the quote in that case.

The configuration of the task requires the user to choose the Rate Reset attribute located under Market Data Types:

Task Attributes	
CCP	LCH
Market Data Types	Rate Reset

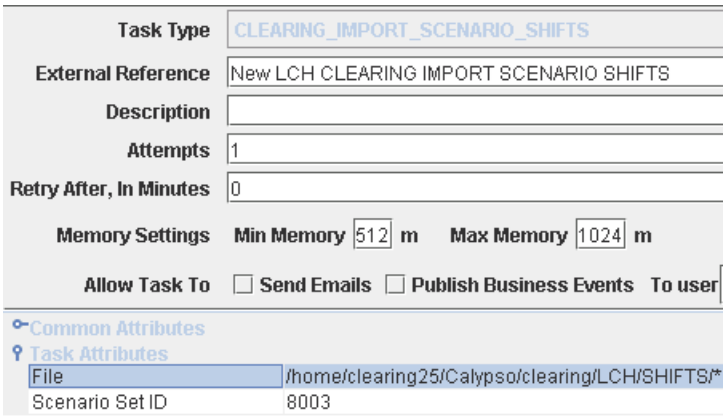
By choosing this attribute, the task will look for the REP00016c report, and will save the FX rates as of the day before.

4.5.3 CLEARING_IMPORT_SCENARIO_SHIFTS

This scheduled task is used to import curve shifting scenarios into Market Risk. This is used for margin replication.

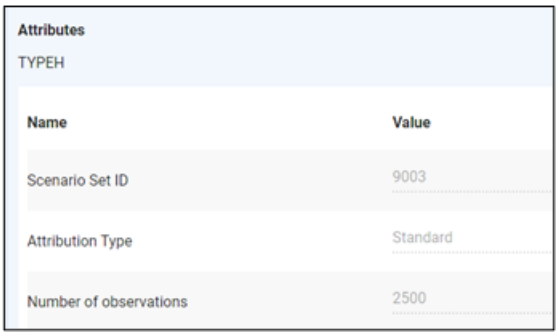
[NOTE: It is recommended to execute this schedule task every day as scenario shifts provided by CCPs are changing every day]

Example for LCH:



Attributes

- Select the file to be imported:
  - LCH - REP00090 – SwapClear Scenario Report
  - CME – Log Return
- Set the scenario set ID to the scenario defined in the parameters of the Sim analysis in Market Risk.



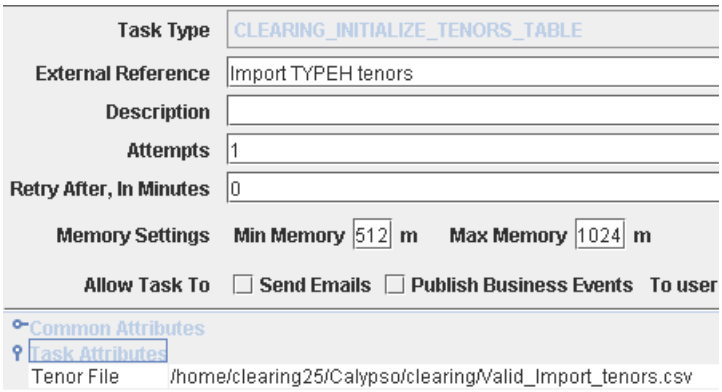
If the TYPEH_TENORS table is empty, the scheduled task fails. You need to run the scheduled task CLEARING_INITIALIZE_TENORS_TABLE to re-initialize the TYPEH_TENORS table. See below.

If the table exists and some tenors are missing, the scheduled task is successful, and a warning message reports the missing tenors in the table.

If the table exists and the file doesn't have data for all the tenors in the table, the scheduled task is successful, and a warning message reports the missing tenors in the file.

4.5.4 CLEARING_INITIALIZE_TENORS_TABLE

This scheduled task should be run when the scheduled task CLEARING_IMPORT_SCENARIO_SHIFTS fails.



This scheduled task populates the table TYPEH_TENORS with valid tenors only.

Example:

CCY INDEX TENOR

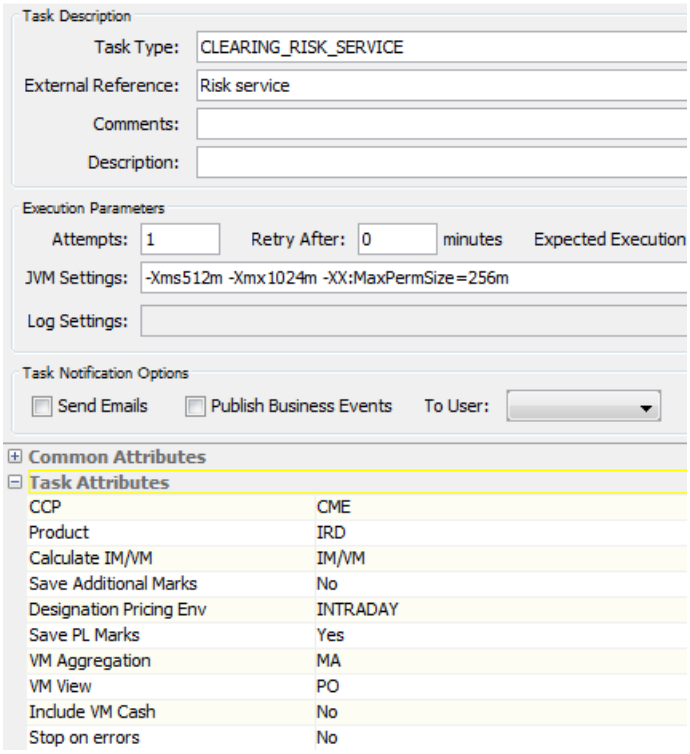
AUD BBSW O/N

AUD BBSW 1W

AUD BBSW 1M

4.6 Margin IM/VM Calculation

The scheduled task CLEARING_RISK_SERVICE can be used to calculate the IM/VM.



Common Attributes

- Trade Filter: Select the trade filter.

Task Attributes

- CCP: Select the CCP.
- Product: Select the product type.
- Calculate IM/VM: Select IM, VM, or IM/VM for both.
- Save Additional Marks: Select Yes to save additional PL Marks for NPV and DELTA, or No otherwise.
- Designation Pricing Env: Select the pricing environment used to calculate the marks.
- Save PL Marks: Select Yes to save the PL marks, or No otherwise.
- VM Aggregation: Select the aggregation level for the VM: MA for margin account or PA for position account.
- VM View: Select the direction of the VM: from PO or from Counterparty.
- Include VM Cash: Select Yes to include VM_CASH in VM_EXPOSURE, or No otherwise.
- Stop on errors: Select Yes to stop when an error is encountered, or No to continue.

If the scheduled task is run for valuation date = T, it uses a HistSim output with valuation date = T, and PL Marks are stored with valuation date = T.

The scheduled task creates the following PL Marks:

- VM
- VM_CASH
- VM_EXPOSURE
- NPV_ADJ
- IM_EXPOSURE
- MARGIN_CALL = IM_EXPOSURE for IM Collateral Exposure trades, or VM_EXPOSURE for VM_EXPOSURE trades
- PAI
- Additional measures: NPV and DELTA

They can be used to price the Collateral Exposure trades using “PricerFromDB”, provided they are also defined as pricer measures.

Variation Margin

T+1 currencies:

- NPV_ADJ(T)=NPV(T)-Cash(T+1)
- VM(T)=NPV_Adj(T)-NPV_Adj(T-1)
- VM_CASH(T) = CASH(T) – PreviousDayVMCash + CASH(T+1)

- VM_EXPOSURE(T) = VM_CASH(T) + VM(T) + PAI(T)

T+2 currencies:

- NPV_ADJ (T)=NPV(T)-Cash(T+1)-Cash(T+2)
- VM (T)=NPV_Adj(T)-NPV_Adj(T-1)
- VM_CASH(T) = CASH(T) – PreviousDayVMCash +Cash (T+2)
- VM_EXPOSURE(T) = VM_CASH(T) + VM(T) + PAI(T)

GBP FRAs:

- NPV_ADJ(T)=NPV(T)
- VM (T)=NPV_Adj(T)-NPV_Adj(T-1)

4.7 Scheduled Tasks Execution

The scheduled tasks are executed by the Calypso Scheduler once you have defined triggers as described in the Calypso Scheduled Tasks User Guide.

Important Note – Timezones Considerations

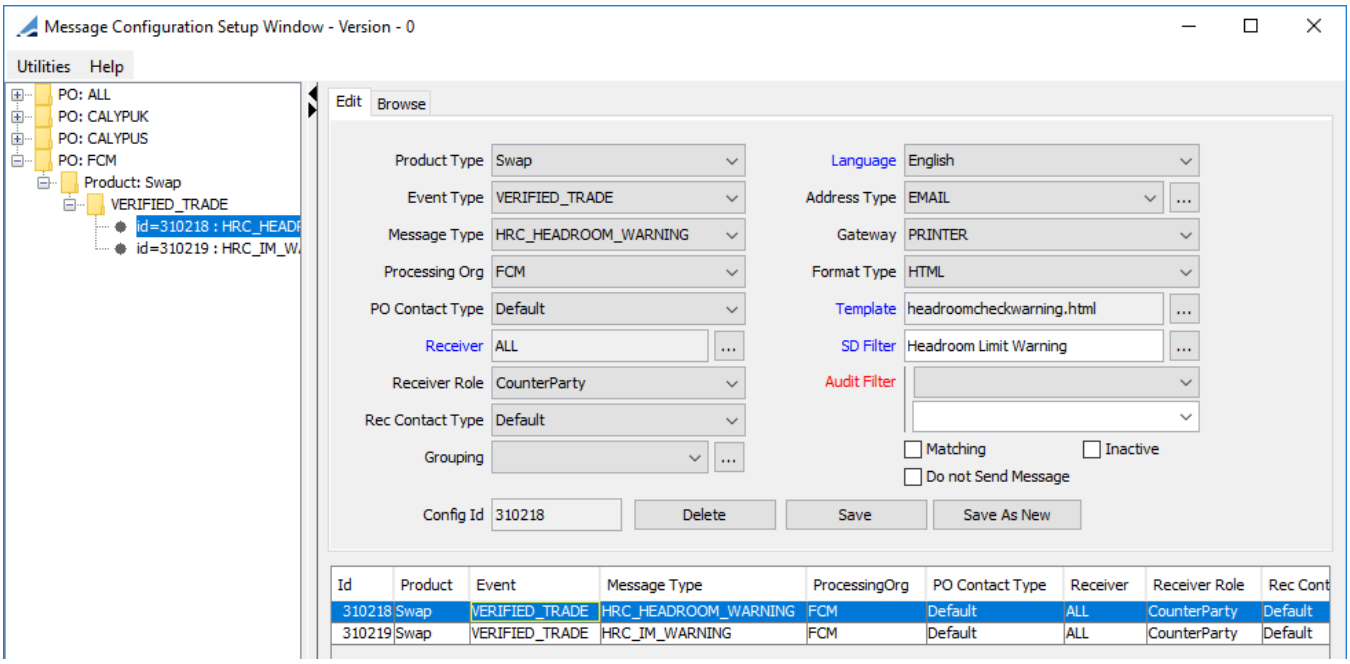
In order to successfully process scheduled tasks which combine the import and processing of EOD files, you need to run the relevant scheduled tasks for a given day before the EOD of the books where the trades are saved, based on the book's timezone.

For example, the book's timezone is New York EOD 5pm. To process today's files, you need to run the scheduled tasks before 5pm New York time, regardless of where you run the scheduled tasks from, so that the trades are timestamped as of today, and the settlement date is computed from today.

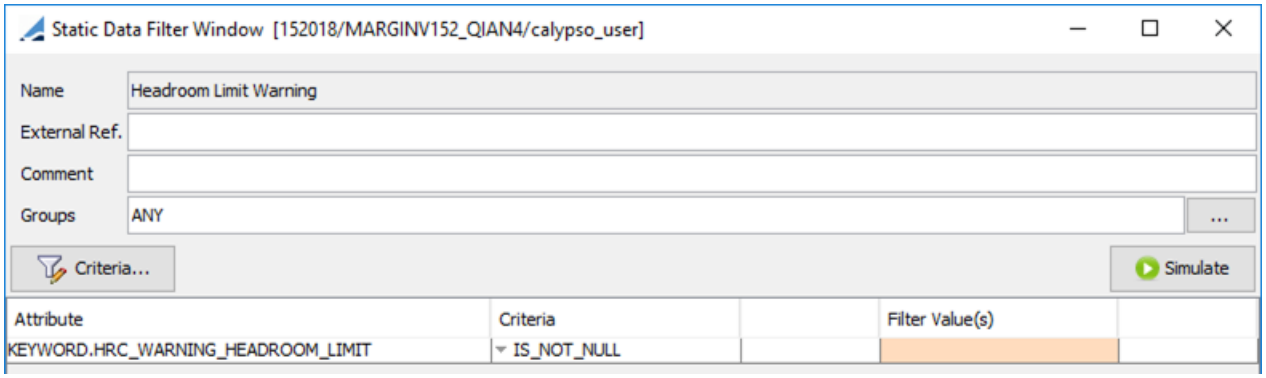
4.8 Email Alert

You can setup an email alert if the available limit is close to preventing from clearing more trades. For example, if the warning level is 80% and the limit is $10,000,000, if the limit utilization reaches $8,000,000, a trade keyword is set on the trade (HEADROOM_IN_WARNING = Y), and an email is triggered.

Message Configuration HRC_HEADROOM_WARNING

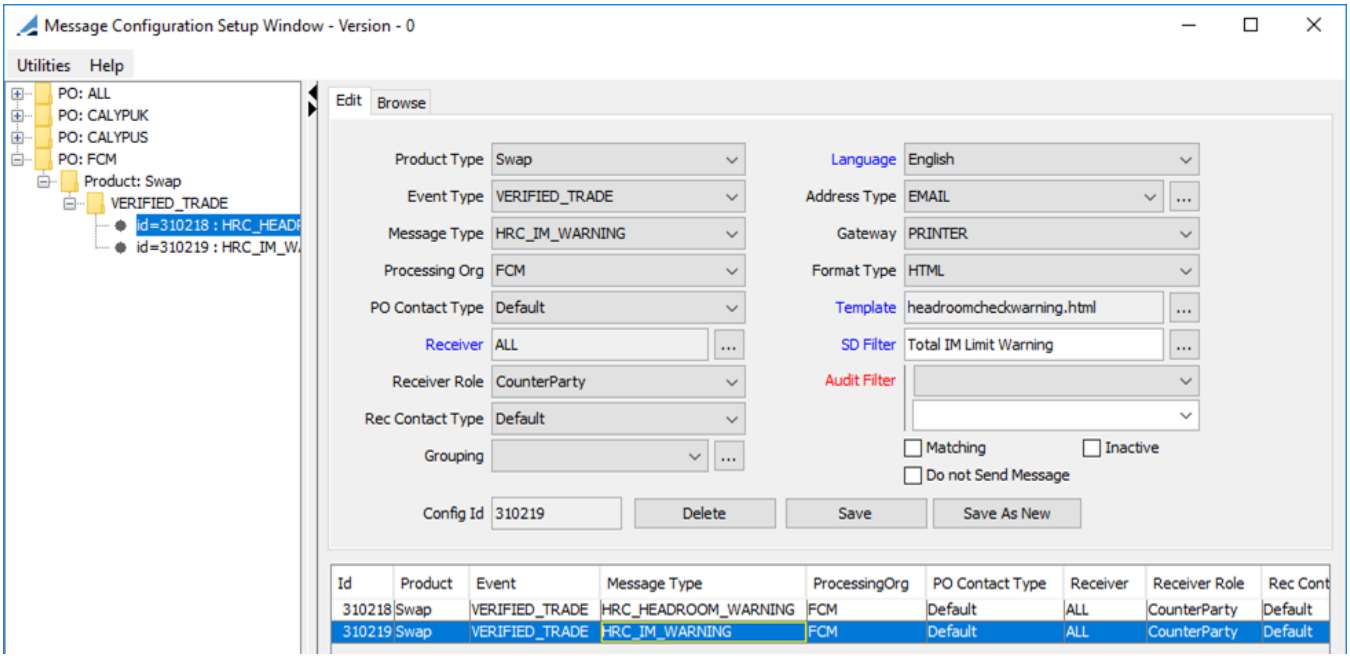


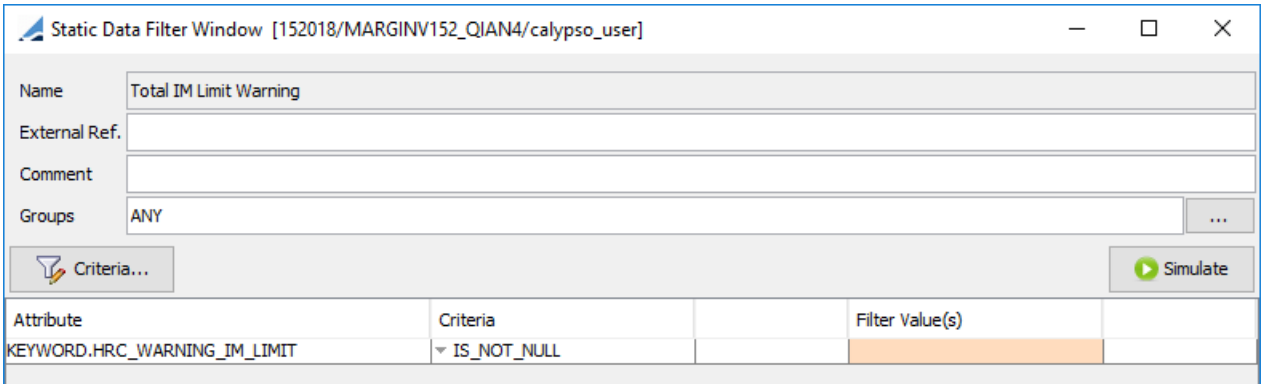
- Product Type = Swap
- Event Type = VERIFIED status of the trade. This can be changed according to client's requirement. E.g. client can decide when this message will be generated.
- Address Type = "EMAIL"
- Gateway = "PRINTER"
- Format Type = HTML
- Template can be a custom one
- SD filter filters trades with keyword Headroom Limit Warning



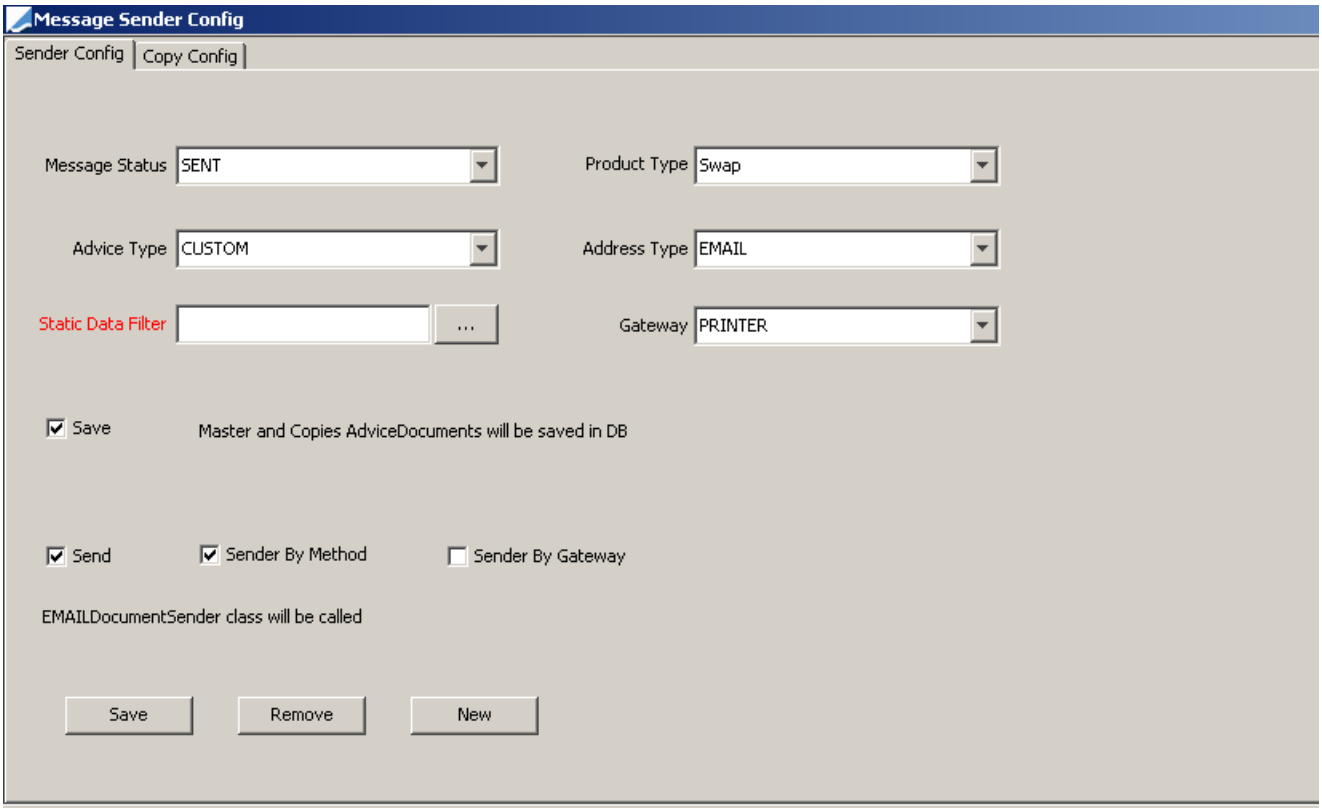
- PO Contact Type set to Default
- Rec Contact Type set to Default

Message Configuration HRC_IM_WARNING



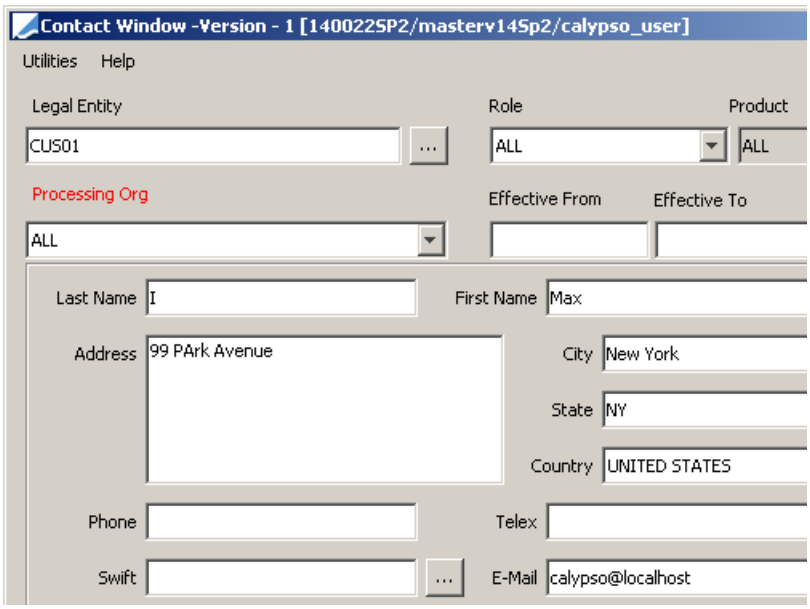


Messenger Sender Configuration



Id	Status	Product	Advice Type	Address Type	Gateway	SD Filter	Send	Save	By Gateway	By Method
281218	SENT	Swap	CONFIRM	EMAIL	PRINTER		☑	☑	☐	☑
1	TO_SEND	ALL	CONFIRM	SWIFT	SWIFT		☑	☑	☑	☐
850	SENT	ALL	CONFIRM	MAIL	PRINTER		☐	☑	☐	☐
142196	SENT	ALL	CONSENT	LCH_UK	MQ	NonCancelSubActionMsg	☑	☑	☑	☑
116698	TO_BE_SENT	ALL	CONSENT	LCH_UK	MQ	NonCancelSubActionMsg	☑	☑	☑	☑
83704	TO_BE_SENT	ALL	CONSENT	LCH	MQ	NonCancelSubActionMsg	☑	☑	☑	☑
64733	TO_BE_SENT	ALL	CONSENT	CME	MQ		☑	☑	☑	☑
281217	SENT	Swap	CUSTOM	EMAIL	PRINTER		☑	☑	☐	☑
273214	TO_BE_SENT	ALL	CVR_WORKSHEET	LCH	MQ	isLCHCVRValidToSend	☑	☑	☑	☑
910	PENDING	ALL	DKCONF	DTCC	DTCC		☑	☑	☑	☐

Email address is configured on the sender's and receiver's contact specified in the Message Setup.

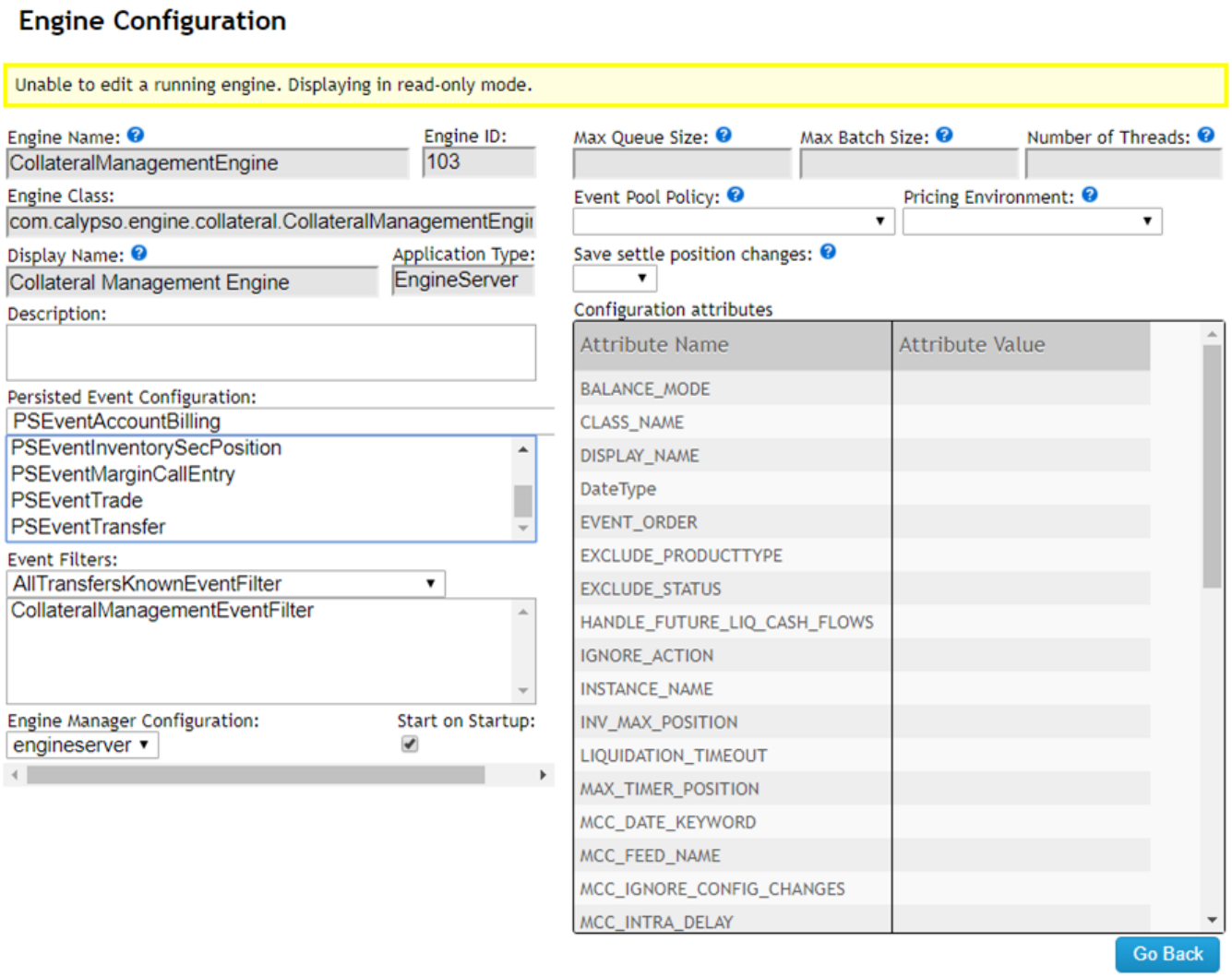


Email address is configured on the sender's and receiver's contact specified in the Message Setup.

5. OTC Margin Collateral Setup

The collateral can be taken into account in the limits check. You can use the collateral computed for Calypso Margin Call Contracts, or you can import external collateral amounts.

5.1 Collateral Management Engine

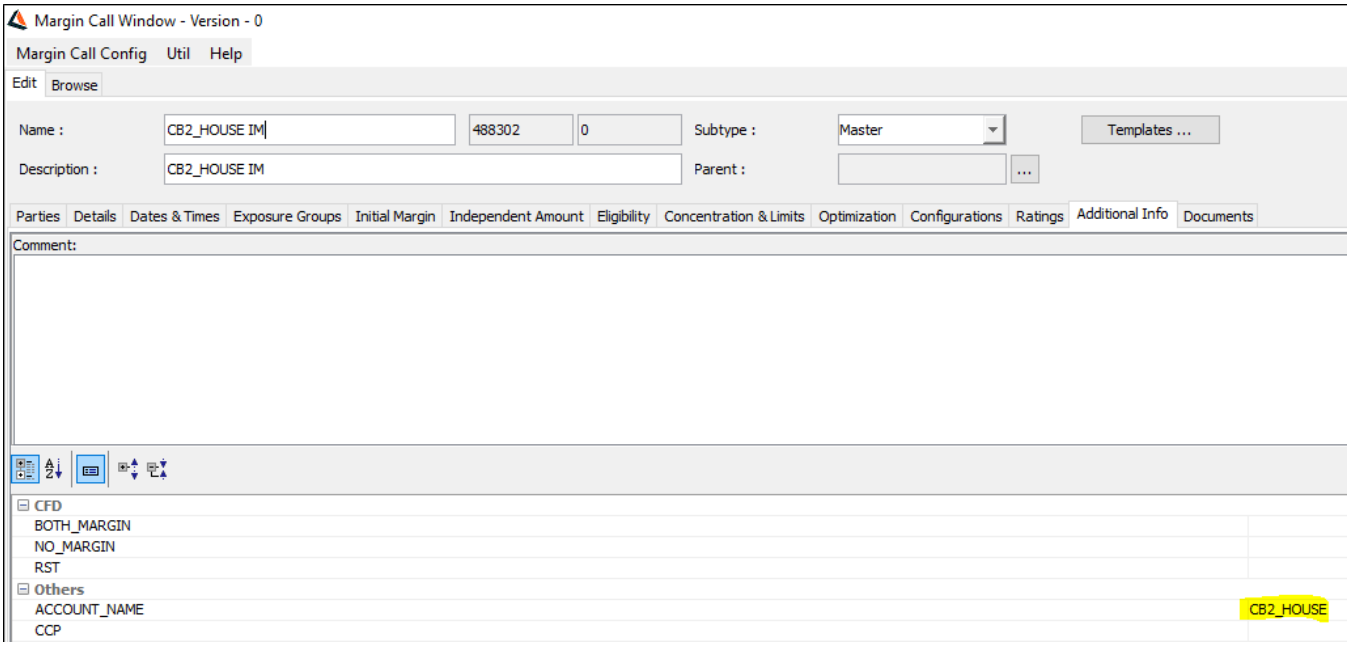


5.2 Margin Call Contracts

For the IM Clearing Member contracts, you need to add a margin call contract attribute that matches the clearing member account node.

Sample account node in the Market Risk Hierarchy

Set the margin call contract attribute ACCOUNT_NAME to the account node.



5.3 Importing External Collateral Amounts

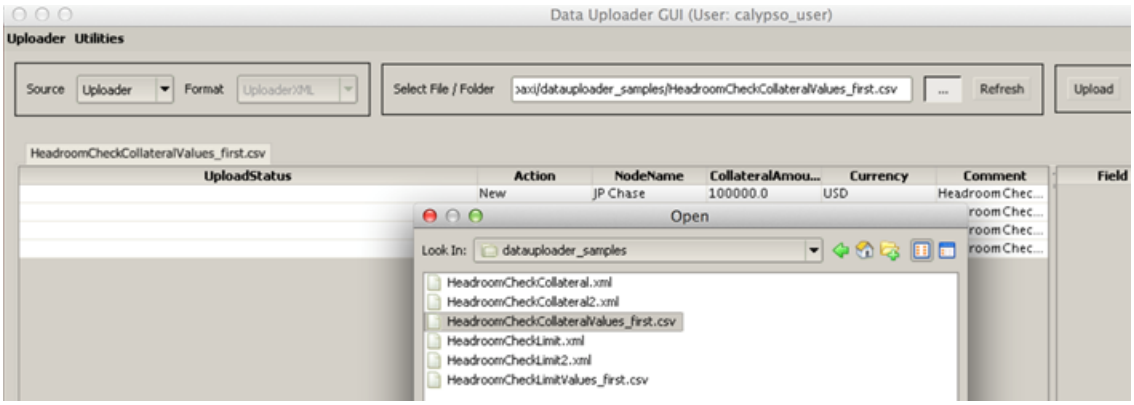
External Collateral Amounts can be imported using the Data Uploader.

The Data Uploader supports CSV and XML files. The file names should start with "HEADROOMCHECKCOLLATERALVALUES", for example "HEADROOMCHECKCOLLATERALVALUES_<name>.csv".

Sample files are provided under `<calypso home>/docs/calypso-datauploader/samples/HeadroomCheck`.

Launch the Data Uploader window using **Processing > Tools > Data Uploader** from the Calypso Navigator.

Select a file from your machine, the content for the file is displayed:



» Click **Upload** to load the collateral amounts into Calypso.

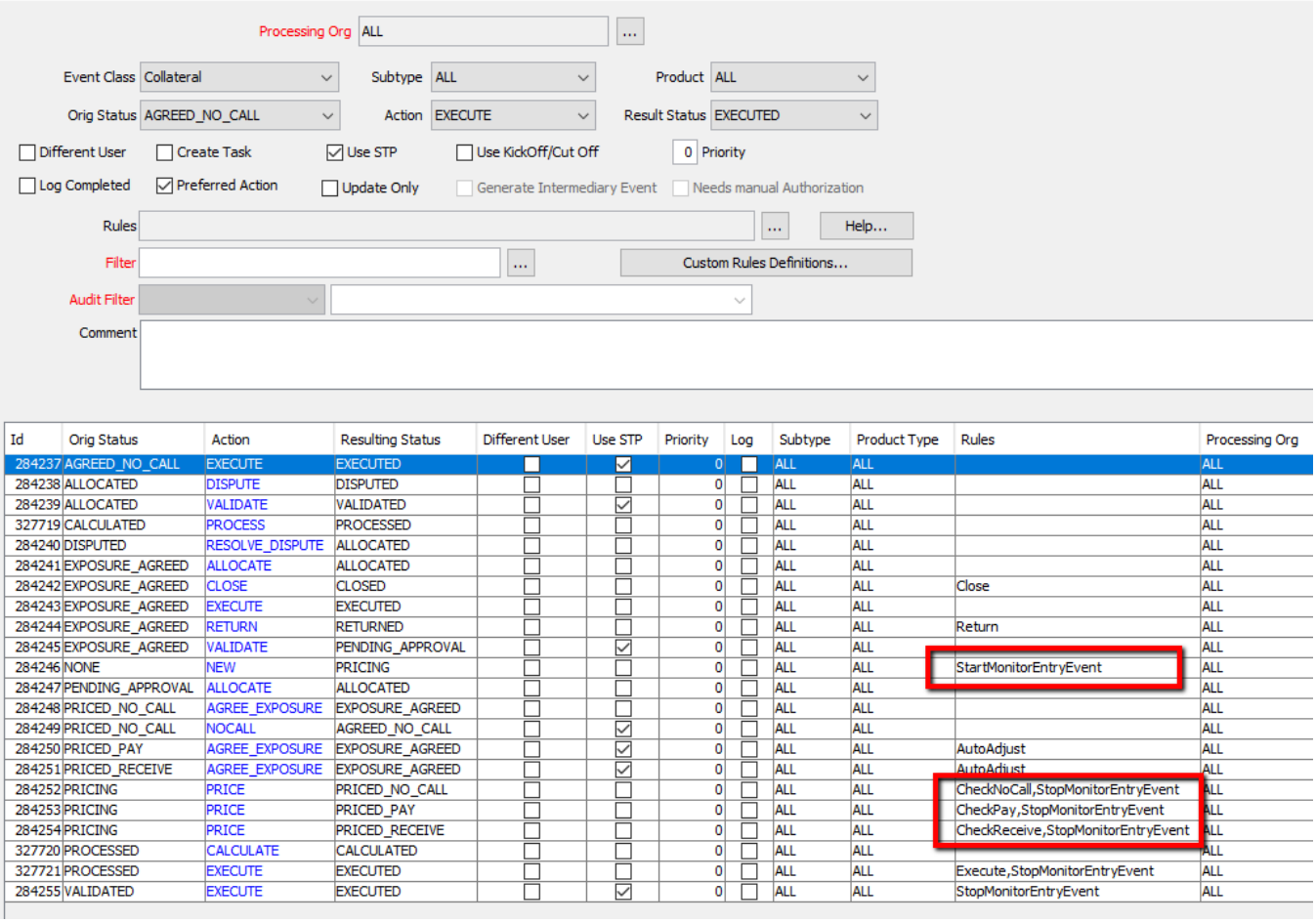
Note that the collateral currency is the base currency of the pricing environment defined in the environment property HEADROOMCHECK_PRICING_ENV.

5.4 Collateral Workflow

In order to trigger the Limit Check for collateral positions updates, you need to add the following rules to the Collateral workflow provided out-of-the box by the Collateral module.

- All the transitions from NONE to EXECUTED should be STP.
- Add the rule StartMonitorEntryEvent on the transition NONE – NEW – PRICING. It allows the scheduled task COLLATERAL_MANAGEMENT to monitor collateral positions changes. It generates PSEventMarginCallEntry events that are consumed by the CollateralManagement engine to update the Limit Check accordingly.
- Add the rule StopMonitorEntryEvent on the transition of your choice, (all PRICING – PRICE transitions for example). It stops monitoring collateral positions changes for those transitions.

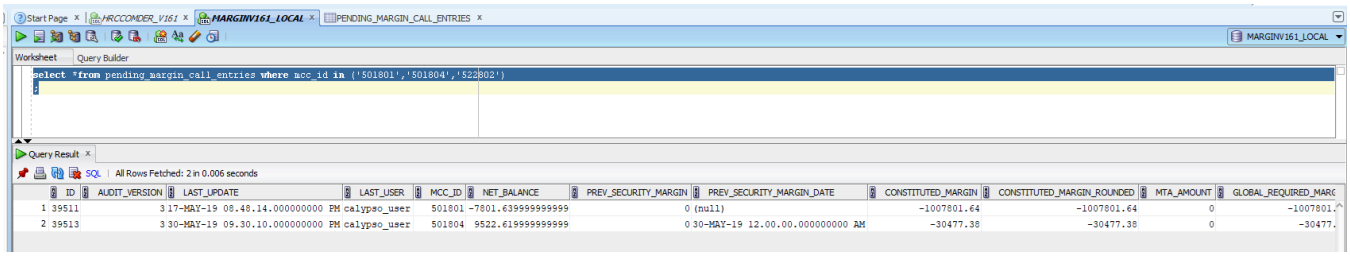
1_LOCAL/calypso_user]

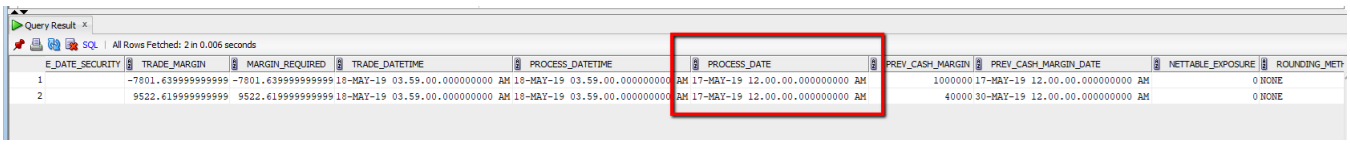


Id	Orig Status	Action	Resulting Status	Different User	Use STP	Priority	Log	Subtype	Product Type	Rules	Processing Org
284237	AGREED_NO_CALL	EXECUTE	EXECUTED		☑	0		ALL	ALL		ALL
284238	ALLOCATED	DISPUTE	DISPUTED			0		ALL	ALL		ALL
284239	ALLOCATED	VALIDATE	VALIDATED		☑	0		ALL	ALL		ALL
327719	CALCULATED	PROCESS	PROCESSED			0		ALL	ALL		ALL
284240	DISPUTED	RESOLVE_DISPUTE	ALLOCATED			0		ALL	ALL		ALL
284241	EXPOSURE_AGREED	ALLOCATE	ALLOCATED			0		ALL	ALL		ALL
284242	EXPOSURE_AGREED	CLOSE	CLOSED			0		ALL	ALL	Close	ALL
284243	EXPOSURE_AGREED	EXECUTE	EXECUTED			0		ALL	ALL		ALL
284244	EXPOSURE_AGREED	RETURN	RETURNED			0		ALL	ALL	Return	ALL
284245	EXPOSURE_AGREED	VALIDATE	PENDING_APPROVAL		☑	0		ALL	ALL		ALL
284246	NONE	NEW	PRICING			0		ALL	ALL	StartMonitorEntryEvent	ALL
284247	PENDING_APPROVAL	ALLOCATE	ALLOCATED			0		ALL	ALL		ALL
284248	PRICED_NO_CALL	AGREE_EXPOSURE	EXPOSURE_AGREED			0		ALL	ALL		ALL
284249	PRICED_NO_CALL	NOCALL	AGREED_NO_CALL		☑	0		ALL	ALL		ALL
284250	PRICED_PAY	AGREE_EXPOSURE	EXPOSURE_AGREED		☑	0		ALL	ALL	AutoAdjust	ALL
284251	PRICED_RECEIVE	AGREE_EXPOSURE	EXPOSURE_AGREED		☑	0		ALL	ALL	AutoAdjust	ALL
284252	PRICING	PRICE	PRICED_NO_CALL			0		ALL	ALL	CheckNoCall,StopMonitorEntryEvent	ALL
284253	PRICING	PRICE	PRICED_PAY			0		ALL	ALL	CheckPay,StopMonitorEntryEvent	ALL
284254	PRICING	PRICE	PRICED_RECEIVE			0		ALL	ALL	CheckReceive,StopMonitorEntryEvent	ALL
327720	PROCESSED	CALCULATE	CALCULATED			0		ALL	ALL		ALL
327721	PROCESSED	EXECUTE	EXECUTED			0		ALL	ALL	Execute,StopMonitorEntryEvent	ALL
284255	VALIDATED	EXECUTE	EXECUTED		☑	0		ALL	ALL	StopMonitorEntryEvent	ALL

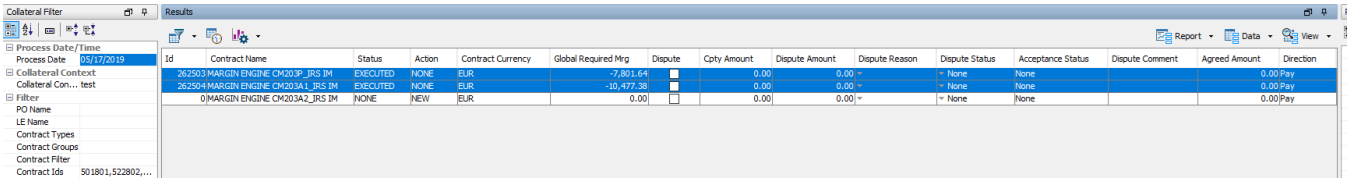
Make sure that there are no entries for Margin call contracts you use for margin engine in PENDING_MARGIN_CALL_ENTRIES DB table. If there are any MCC entries from some old dates then the user should go back to collateral manager and load MCC on the process date and apply the action which trigger the stopmonitorentryevent.

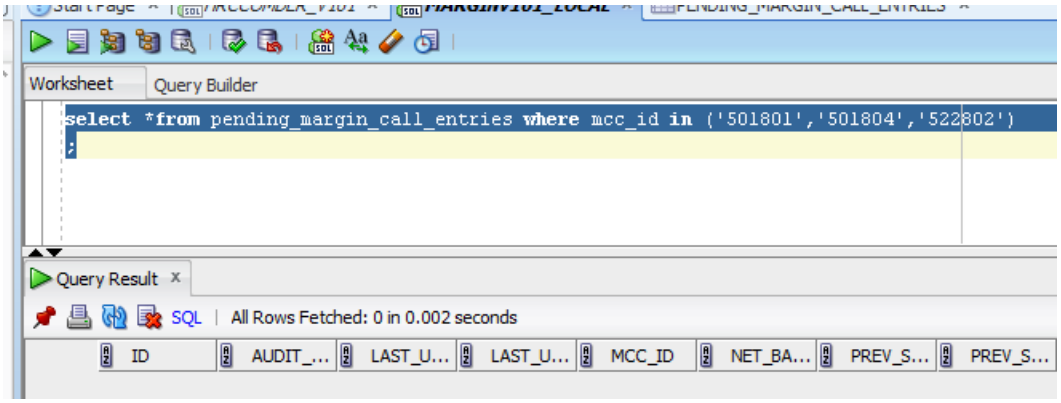
For example, there are entries for MCC 501801 AND 501804 on process date May 17 2019

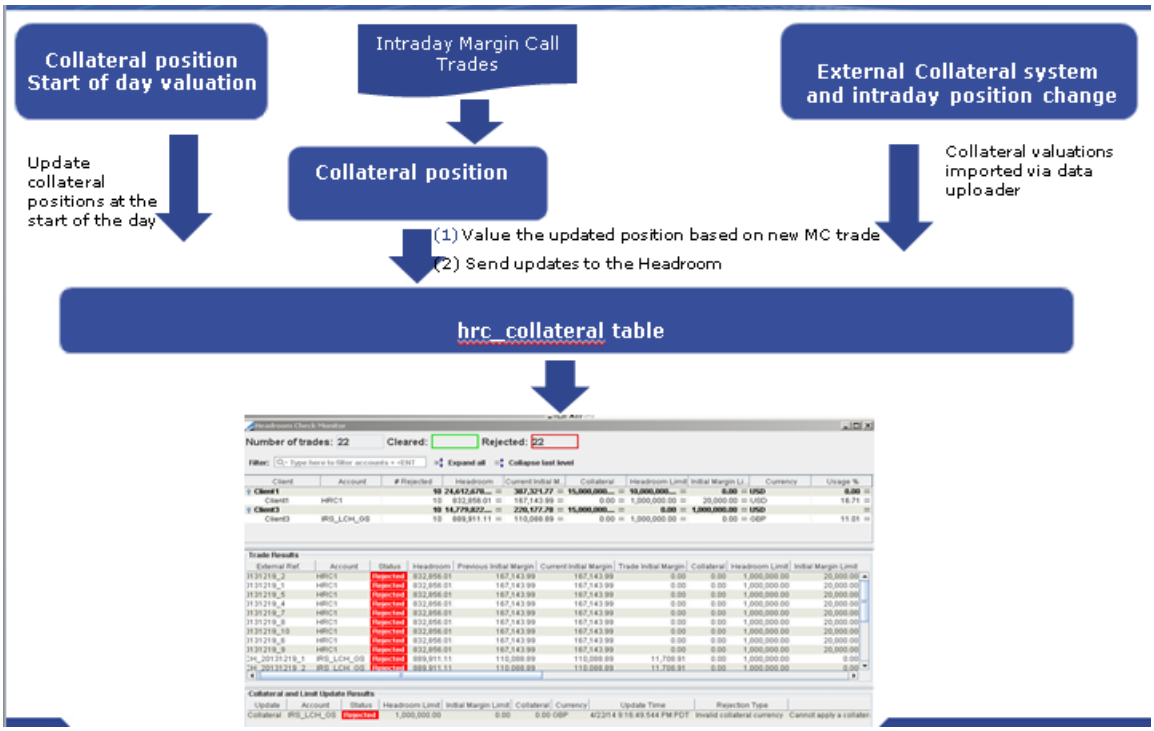




Load the MCC on 5/17/2019 and execute the contracts and make sure that the entries are not there in the DB table anymore.







5.5 Steps for Collateral Withdrawal and Limit Check

1. Margin Call Trade is saved

2. Transfer Engine generates transfers for margin call trade

3. Margin Call Position (Inventory Position) is created by Margin Call Position Engine.

4. Collateral Management Engine gets Inventory Position.

5. Collateral Management Engine creates Pending Margin Call Entries.

6. Margin Controller Engine gets a PSEventMarginCallEntry event.

7. Margin Controller Engine sends a specific message (Headroom Collateral Message) to the margin engine bus to request head room validation. This message will carry the trade information along with it, so the action accept, or reject could be applied as an outcome of the headroom check

8. The Margin Engine Head Room check either accepts or rejects the collateral request

9. The DataPersistor within Margin Engine receives the Accept/Reject result from the Margin Engine

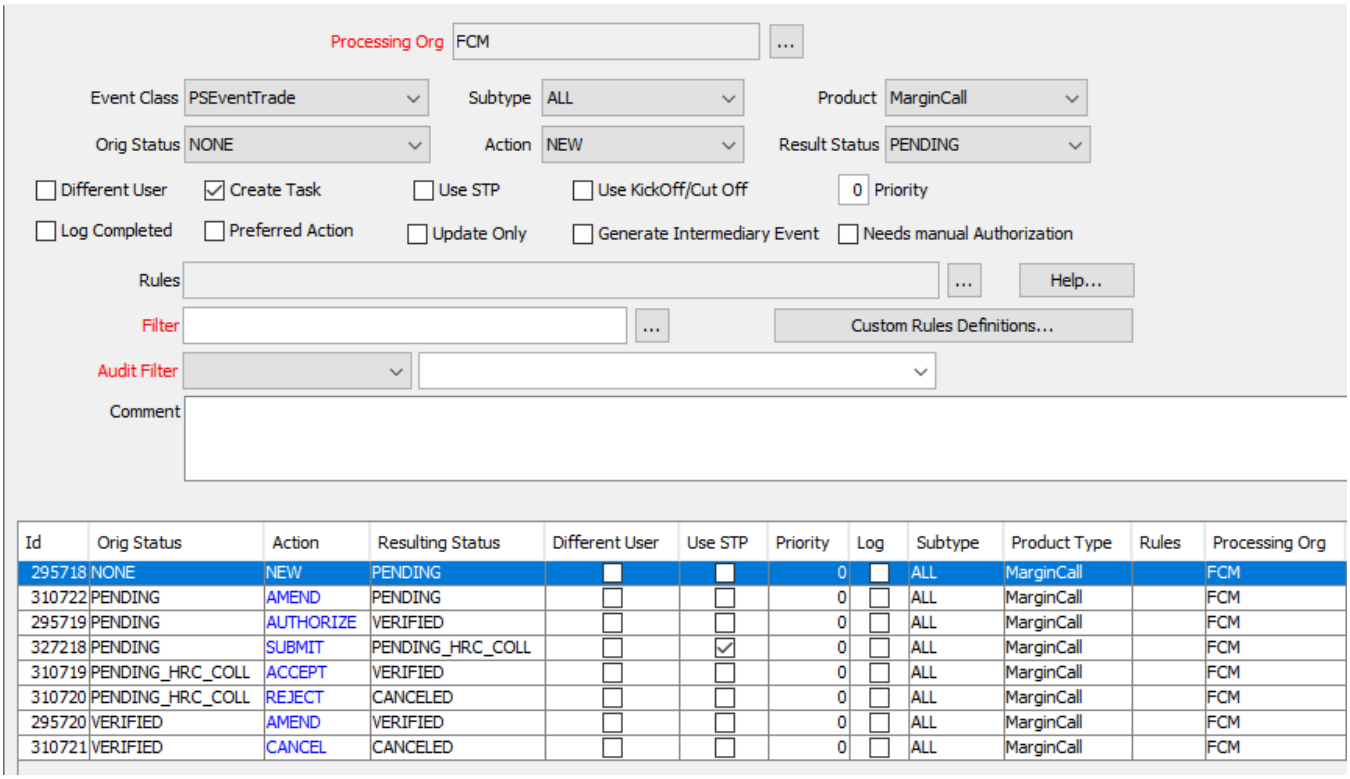
10. The DataPersistor applies the "ACCEPT" or "REJECT" action to the Margin Call Trade

11. If rejected, the Margin Call Trade should have workflow that CANCELS the Transfers

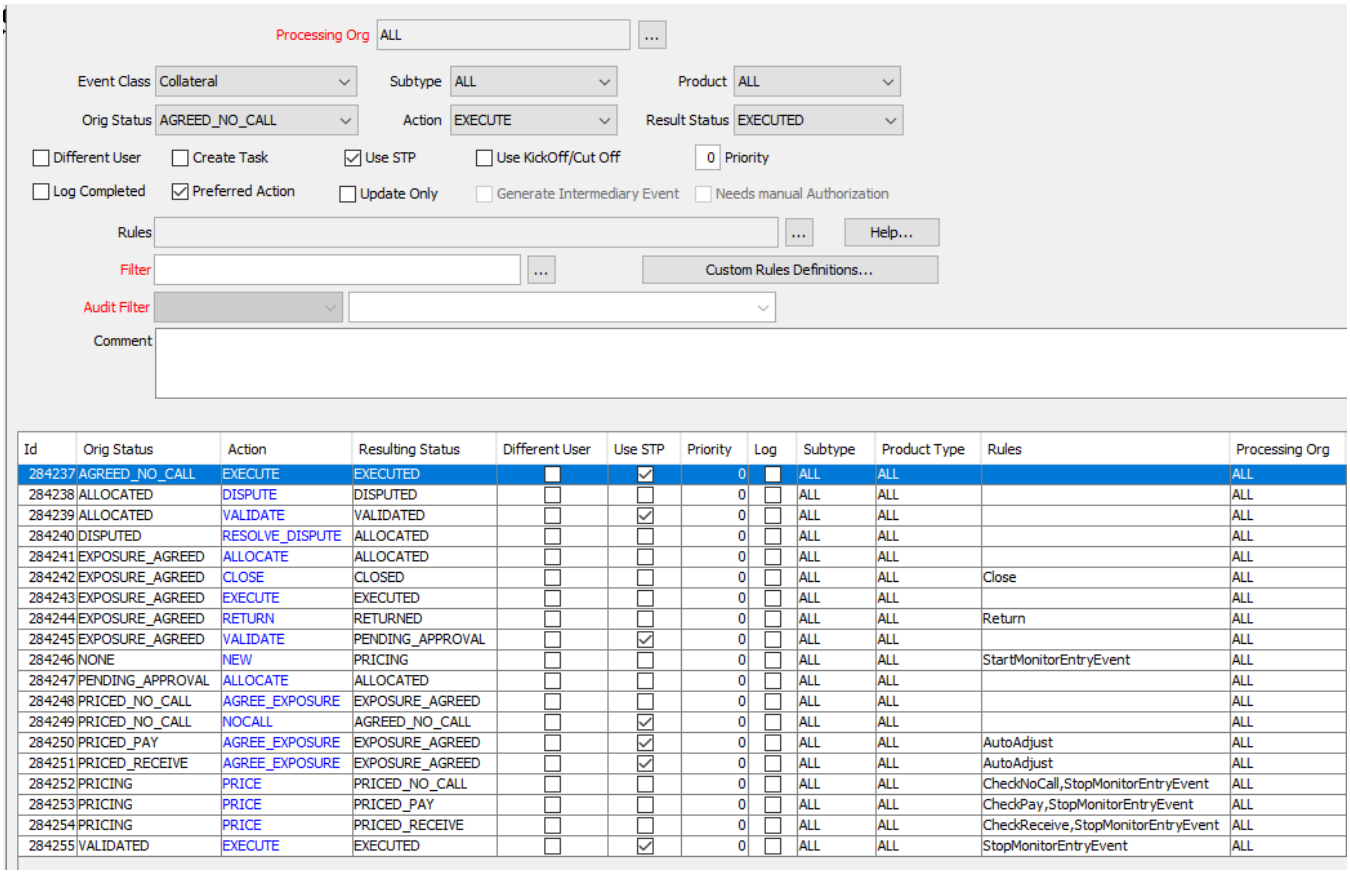
12. If rejected, the transfers are canceled

13. The Margin Call Position engine receives the event for the canceled transfers and updates the Inventory Position

Margin Call trade and collateral workflow:



Id	Orig Status	Action	Resulting Status	Different User	Use STP	Priority	Log	Subtype	Product Type	Rules	Processing Org
295718	NONE	NEW	PENDING	☐	☐	0	☐	ALL	MarginCall		FCM
310722	PENDING	AMEND	PENDING	☐	☐	0	☐	ALL	MarginCall		FCM
295719	PENDING	AUTHORIZE	VERIFIED	☐	☐	0	☐	ALL	MarginCall		FCM
327218	PENDING	SUBMIT	PENDING_HRC_COLL	☐	☑	0	☐	ALL	MarginCall		FCM
310719	PENDING_HRC_COLL	ACCEPT	VERIFIED	☐	☐	0	☐	ALL	MarginCall		FCM
310720	PENDING_HRC_COLL	REJECT	CANCELED	☐	☐	0	☐	ALL	MarginCall		FCM
295720	VERIFIED	AMEND	VERIFIED	☐	☐	0	☐	ALL	MarginCall		FCM
310721	VERIFIED	CANCEL	CANCELED	☐	☐	0	☐	ALL	MarginCall		FCM



Id	Orig Status	Action	Resulting Status	Different User	Use STP	Priority	Log	Subtype	Product Type	Rules	Processing Org
284237	AGREED_NO_CALL	EXECUTE	EXECUTED	☐	☑	0	☐	ALL	ALL		ALL
284238	ALLOCATED	DISPUTE	DISPUTED	☐	☐	0	☐	ALL	ALL		ALL
284239	ALLOCATED	VALIDATE	VALIDATED	☐	☑	0	☐	ALL	ALL		ALL
284240	DISPUTED	RESOLVE_DISPUTE	ALLOCATED	☐	☐	0	☐	ALL	ALL		ALL
284241	EXPOSURE_AGREED	ALLOCATE	ALLOCATED	☐	☐	0	☐	ALL	ALL		ALL
284242	EXPOSURE_AGREED	CLOSE	CLOSED	☐	☐	0	☐	ALL	ALL	Close	ALL
284243	EXPOSURE_AGREED	EXECUTE	EXECUTED	☐	☐	0	☐	ALL	ALL		ALL
284244	EXPOSURE_AGREED	RETURN	RETURNED	☐	☐	0	☐	ALL	ALL	Return	ALL
284245	EXPOSURE_AGREED	VALIDATE	PENDING_APPROVAL	☐	☑	0	☐	ALL	ALL		ALL
284246	NONE	NEW	PRICING	☐	☐	0	☐	ALL	ALL	StartMonitorEntryEvent	ALL
284247	PENDING_APPROVAL	ALLOCATE	ALLOCATED	☐	☐	0	☐	ALL	ALL		ALL
284248	PRICED_NO_CALL	AGREE_EXPOSURE	EXPOSURE_AGREED	☐	☐	0	☐	ALL	ALL		ALL
284249	PRICED_NO_CALL	NOCALL	AGREED_NO_CALL	☐	☑	0	☐	ALL	ALL		ALL
284250	PRICED_PAY	AGREE_EXPOSURE	EXPOSURE_AGREED	☐	☑	0	☐	ALL	ALL	AutoAdjust	ALL
284251	PRICED_RECEIVE	AGREE_EXPOSURE	EXPOSURE_AGREED	☐	☑	0	☐	ALL	ALL	AutoAdjust	ALL
284252	PRICING	PRICE	PRICED_NO_CALL	☐	☐	0	☐	ALL	ALL	CheckNoCall,StopMonitorEntryEvent	ALL
284253	PRICING	PRICE	PRICED_PAY	☐	☐	0	☐	ALL	ALL	CheckPay,StopMonitorEntryEvent	ALL
284254	PRICING	PRICE	PRICED_RECEIVE	☐	☐	0	☐	ALL	ALL	CheckReceive,StopMonitorEntryEvent	ALL
284255	VALIDATED	EXECUTE	EXECUTED	☐	☑	0	☐	ALL	ALL	StopMonitorEntryEvent	ALL

6. OTC Margin Sample Process

6.1 Running the Servers

The following servers need to be running. They are located under `<calypso home>/deploy-local/<environment>/`.

- authServer
- discoveryServer
- gatewayServer
- eventserver
- dataServer
- riskServer
- sharedServices
- dataGridNode
- dataGridEnabledCalculator
- dispatcher
- ersRiskServer
- engineServer
- calypsoMessagingServer
- riskMessagingServer
- marginEngineOtcCleared
- Scheduler
- Navigator

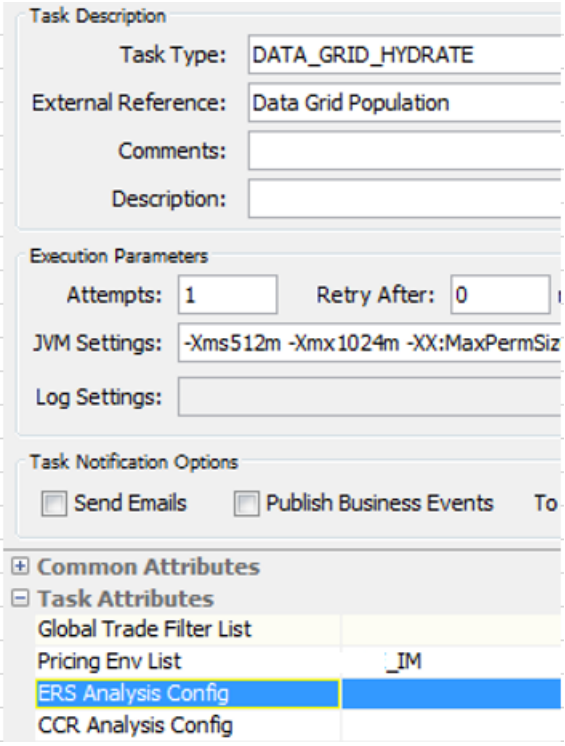
6.2 Computing the Margins

6.2.1 Create a Batch Configuration

Bring up Market Risk and create a batch configuration under **Setup>>Batch**. Please refer to Calypso Market Risk documentation for details.

6.2.2 Populate the Data Grid

Create a DATA_GRID_HYDRATE scheduled task.



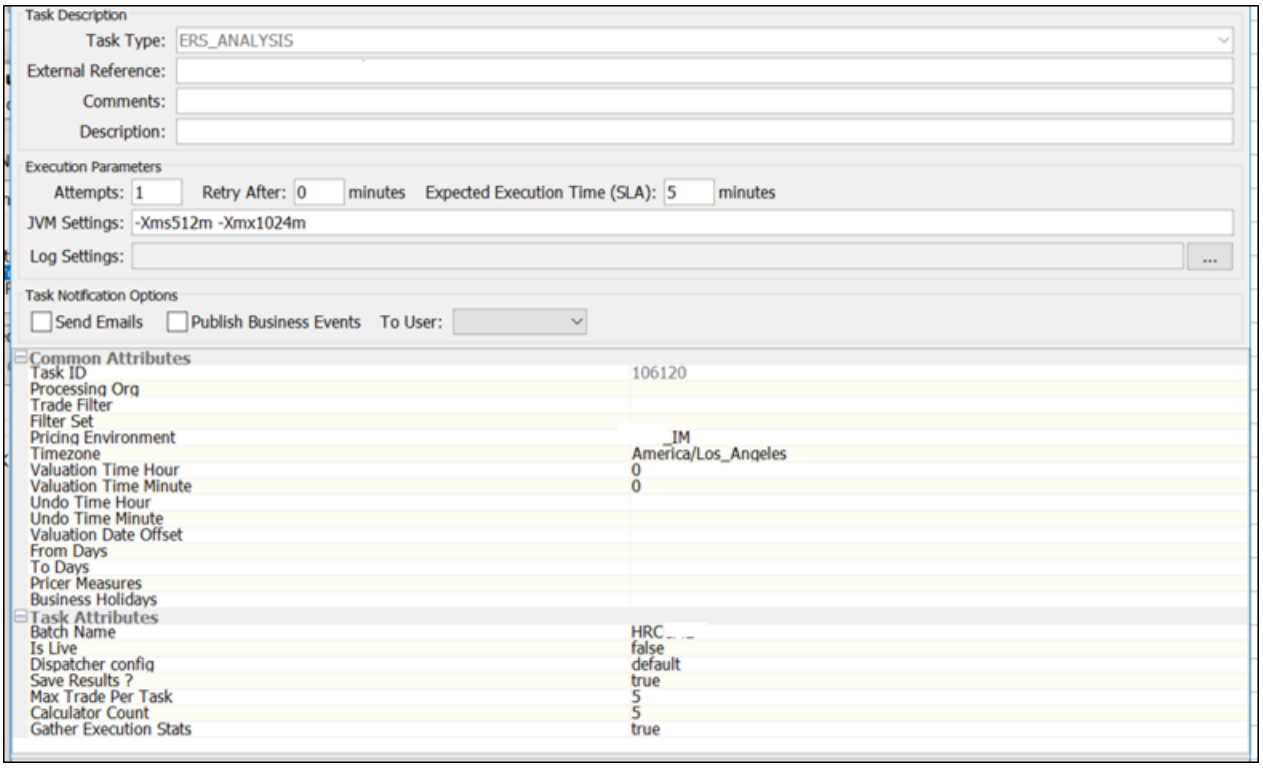
- Enter a trade filter
- Enter a pricing environment
- Enter the Market Risk Batch for which you want to use a data grid.

The CCR Analysis Config attribute **does not apply** to Market Risk.

Run the DATA_GRID_HYDRATE scheduled task.

6.2.3 Compute the Sim Analysis

Create a ERS_ANALYSIS scheduled task.



- Batch Name – Select the Market Risk batch to run. It should be the same Market Risk batch specified in the DATA_GRID_HYDRATE scheduled task.
- Is Live – Need to be set to False
- Dispatcher config – Select the dispatcher configuration to use.
- Save Results? – True or false. Set to true to save the analysis results to the database.

  If set to false or not set, you can save the results to the database using the scheduled task ERS_SAVE_RESULTS (described below). Optional.
- Max Trade Per Task – For optimization, you can restrict the maximum number of trades that each calculator will process at a time. Optional.
- Calculator Count – For optimization, you can enter the number of calculators. Optional.
- Gather Execution Stats – True of false. Set to true to gather job execution statistics. Optional.

Run the ERS_ANALYSIS scheduled task.

[NOTE: Make sure to set the timezone in the scheduled tasks – It is mandatory]

6.2.4 Compute the Margins

It is mandatory to start the margin engine (using the engine server).

Then run the following scheduled tasks as needed:

CCP OTC Margins:

- LIQUIDITY_RISK_INPUT - For CCP OTC margins only
- MARGIN_OTC_CALCULATOR
- MARGIN_OTC_VM_CALCULATOR scheduled task.

Clearing Member (FCM) Margins:

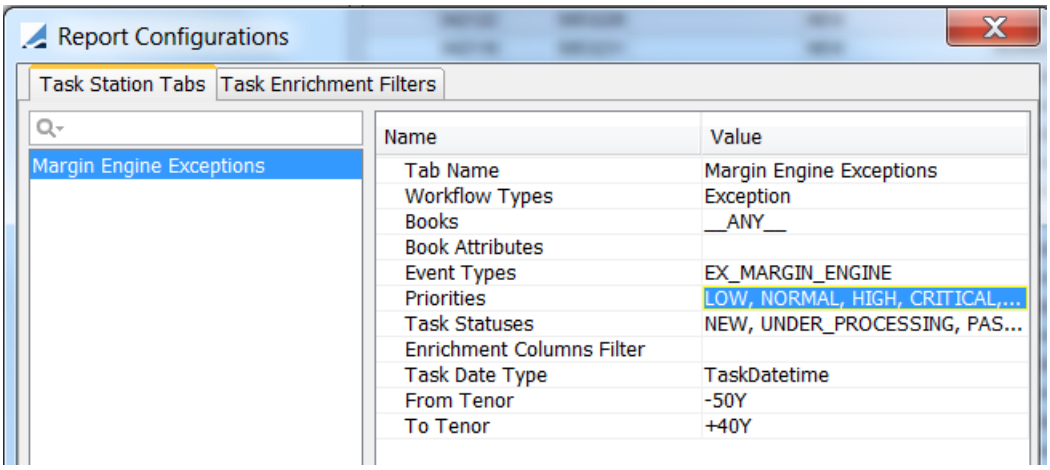
- CLEARING_RISK_SERVICE

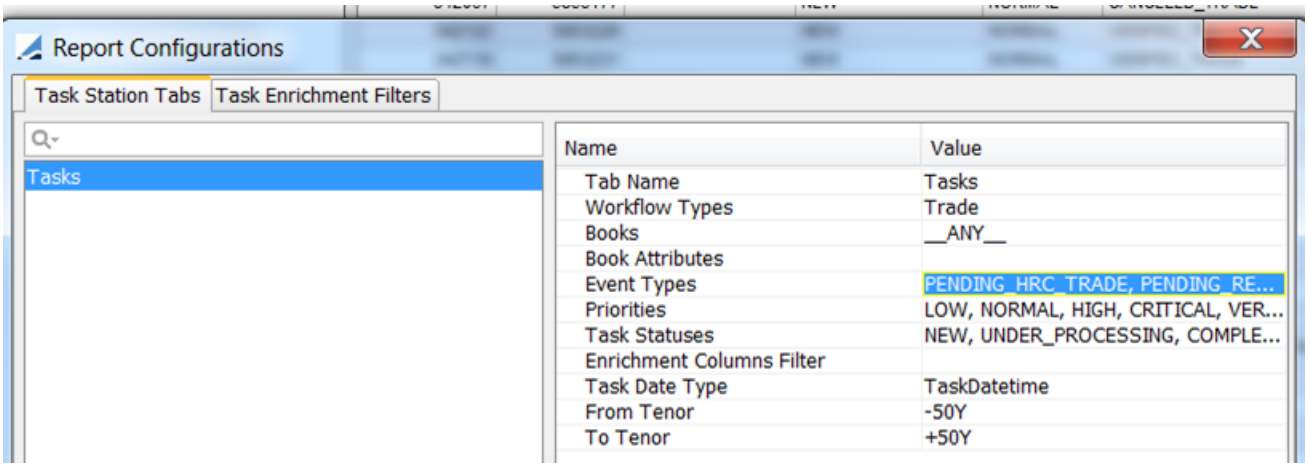
6.2.5 Margin Engine Monitoring

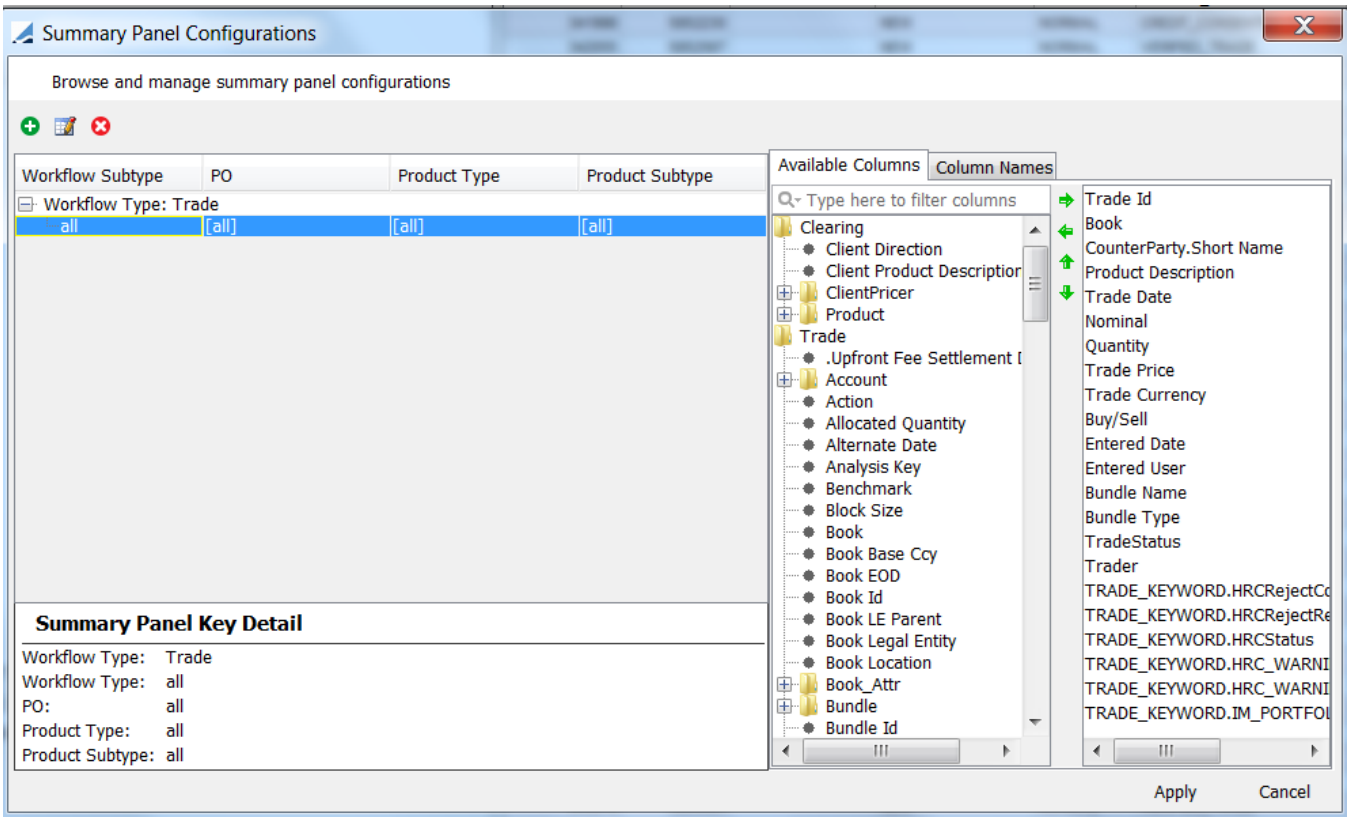
Margin Engine Monitoring

If the Margin Engine cannot start due to a missing FX rate or a missing batch, or any other “business reason”, the user can select Action/Retry after updating the market data or running the EOD batch. The Margin Engine will try to restart.

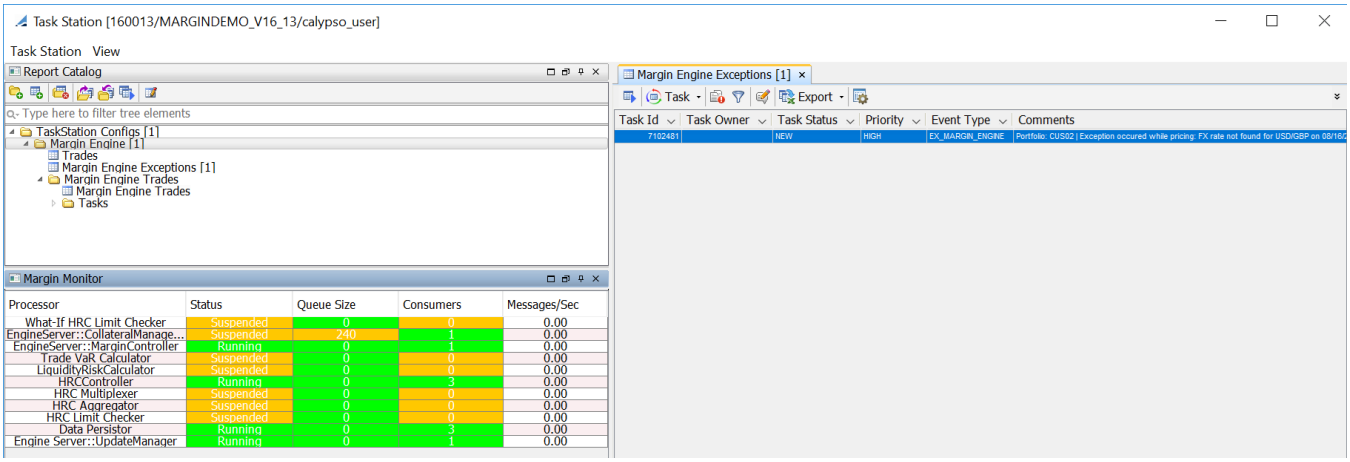
Task Station Setup

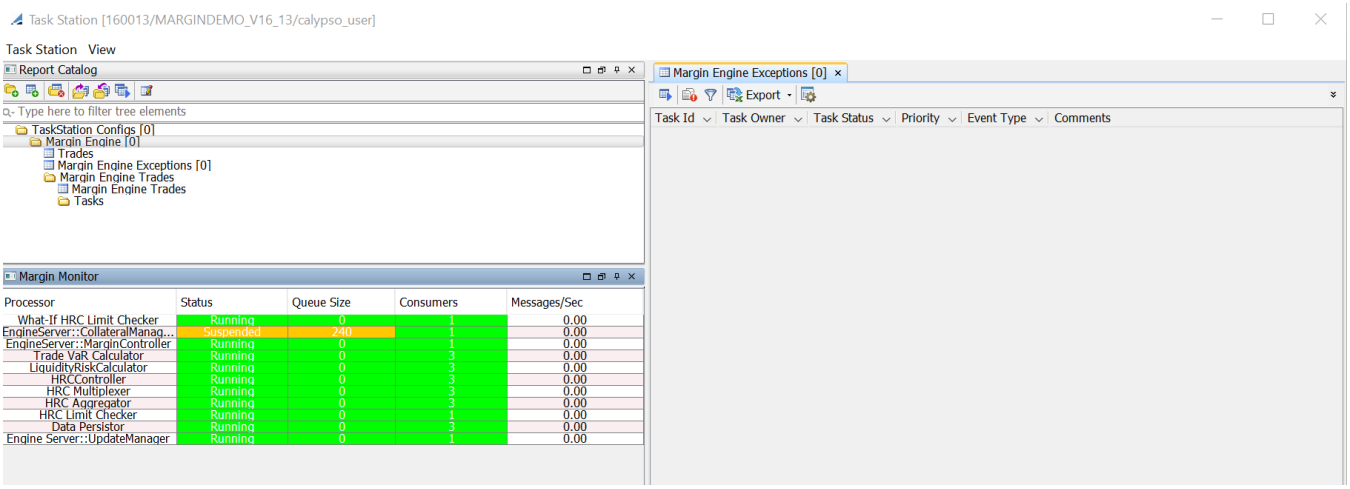






Sample Outputs





Margin Engine Logs

Following alerts are logged in the *ALERT* log file. These alerts are triggered when ...

- **System|Startup**
  --> When the technical wiring of a component is done
- **System|Disconnected**
  --> When the component is disconnected from the bus. A business error is preventing the component to connect properly. Business User is expecting to fix the issue and retry (through the task station)
- **System|Connected**
  --> When the component is disconnected from the bus. Business initialization is Successful
- **MarginEngine|ConsumerInfo**
  --> Each time the Number of Consumers (thread) changes
- **MarginEngine|QueueSize**
  --> Each time the Queue size of a Component is bigger than the threshold defined in the alerts.properties (default is 1), refreshes each time the queue size changes
- **MarginEngine|QueueSizeInfo**
  --> Each time the Queue size is changed, and not above threshold. So by default this alert is generated when the Queue Size comes back to 0.

Example of Log generated

```
2017-11-16 14:18:39,186-0800|1510870719184|WARN|SQL|GetConnectionTime|1|Mar
2017-11-16 14:18:44,000-0800|1510870724000|INFO|System|Startup|2|TopicClean
2017-11-16 14:18:46,198-0800|1510870726198|INFO|System|Startup|3|HRCMultipl
2017-11-16 14:18:46,678-0800|1510870726678|INFO|MarginEngine|ConsumerInfo|4
2017-11-16 14:18:46,679-0800|1510870726678|INFO|MarginEngine|QueueSizeInfo|
2017-11-16 14:18:46,733-0800|1510870726733|INFO|MarginEngine|ConsumerInfo|6
2017-11-16 14:18:46,734-0800|1510870726734|INFO|MarginEngine|QueueSizeInfo|
```

6.3 Limit Check Process

6.3.1 Initializing the Limit Check Process

At the start of day, a number of scheduled tasks need to be executed in the following order, to initialize the Limit Check process:

- HRC_CLEAR_NPV – Initialization of cumulative NPV for all portfolios.
- HRC_COLLATERAL_INITIALIZATION – Initialization of collateral amounts.
- HRC_NODE_INITIALIZATION – Initialization of Limit Check results.

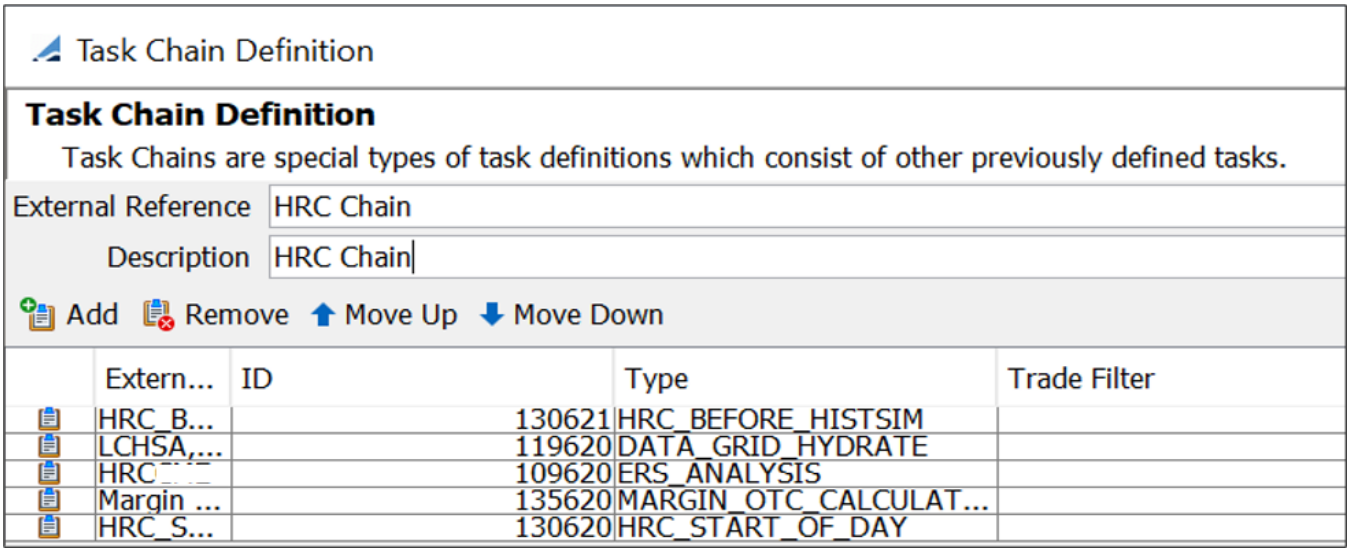
You can also use the scheduled task HRC_START_OF_DAY with everything set to true to initialize the process.

Task Attributes	
Initialize Collateral	true
Initialize Headroom Check Nodes	true
Restart Option	Restart IM, Init PLVectors, Restart VM, Clear VM, Init VM
Additional Calculation Params	

You can also use the scheduled task HRC_BEFORE_HISTSIM to initialize headroom statistics or to catch up intraday market data changes in order to update all statistics based on latest market data.

The scheduled task HRC_BEFORE_HISTSIM does not have any attributes.

And if you want to refresh the Market Risk batch and restart the Margin Engine components, you can run a scheduled task chain like below.



6.3.2 Starting the Limit Check Process

Start the following servers:

- Risk Messaging Server using "`riskMessagingServer.bat\.sh`" (this server must be started first) – It creates in-memory trades for the imported trades.
- Margin Engine OTC Cleared using "`marginEngineOtcCleared.bat\.sh`" – It takes trades routed by the Trade VaR Server and the Margin Controller engine and computes incremental VaR.
- Engine Server– It starts the Margin Controller engine that routes the collateral and limit changes to the Trade VaR process, and starts the Update Manager engine that routes the trades and limit changes to the Margin Controller.

6.3.3 Limit Check Monitor

You can add a menu item for the Limit Check Monitor to view the results of the Limit Check (menu action `hc.apps.monitor.HeadroomCheckMonitor`).

If “IM Exposure – Collateral” <= Limit

=> The trade is accepted

If “IM Exposure – Collateral” > Limit

=> The trade is rejected

In addition, limits are also checked at the trade pair level:

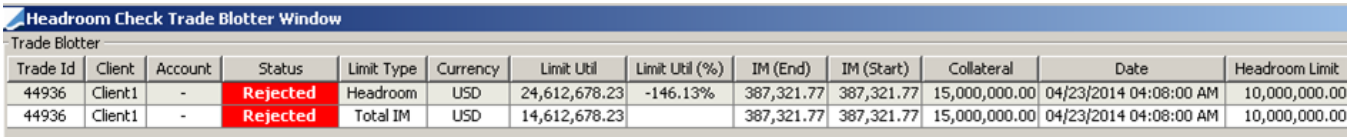
- If both trades of a trade pair are accepted, both trades are accepted
- If any trade of the trade pair is rejected, both trades are rejected

For the Headroom Limit Checker to send results to the Headroom Check Monitor, HRC_MONITOR needs to be set to true in the Calypso environment property file.

```
MARGIN_APP_URL=http\://localhost\:9140/margin-ui
DS_ENFORCE_UNIQUE=false
DBURL=jdbc\:oracle\:thin\:@localhost\:1521\:CALYPSO
HTML_EDITOR=C\:Program\ FilesMicrosoft\ OfficeOffice10WINWORD.EXE
BLOOMBERG_FTP_PASSWORD=]zHUu.sVLzK0DRXP
HRC_MONITOR=true
ERS_INTERNAL_LE_RULE=TRUE
EDEALINGWEBSERVER_NAMING_PROVIDER_URL=http-remoting\://localhost\:8460
WEB_SERVER_LOCATION=SET\ PATH\ TO\ <CALYPSO_HOME>
PARTIAL_CASH_FOR_SECURITY_MATCHING=TRUE
ENTITLEMENTSERVER_NAMING_PROVIDER_URL=http\://localhost\:8320
```

6.3.4 Trade Blotter

You can right-click a trade in the Trade Blotter and choose “Headroom Check Results” to view Limit Check information:


Headroom Check Trade Blotter Window

Trade Blotter

Trade Id	Client	Account	Status	Limit Type	Currency	Limit Util	Limit Util (%)	IM (End)	IM (Start)	Collateral	Date	Headroom Limit
44936	Client1	-	Rejected	Headroom	USD	24,612,678.23	-146.13%	387,321.77	387,321.77	15,000,000.00	04/23/2014 04:08:00 AM	10,000,000.00
44936	Client1	-	Rejected	Total IM	USD	14,612,678.23		387,321.77	387,321.77	15,000,000.00	04/23/2014 04:08:00 AM	10,000,000.00

The Limit Check popup window shows the following information:

- Time of Check
- Start initial margin (at the time of the check)
- Initial margin including the new submitted trade
- Trade NPV (if applicable)
- Initial margin Limit (at the time of check)
- Limit (at the time of check)
- Collateral value (at the time of check)
- Utilization

- Limit Utilization
- STATUS of limit check
- Corresponding trade in the pair (if applicable)

Limit Utilization is defined as follows:

HRC Utilization = Total IM

HRC Utilization % = Total IM / (Total Collateral+ Limit)

For Headroom Limit, it translates into:

HRC Utilization = Total IM – Total Collateral

HRC Utilization % = Total IM / (Total Collateral+ Limit), limit can be 0.

For IM Limit, it translates into:

HRC Utilization = Total IM

HRC Utilization % = Total IM /Limit (total Collateral = 0)

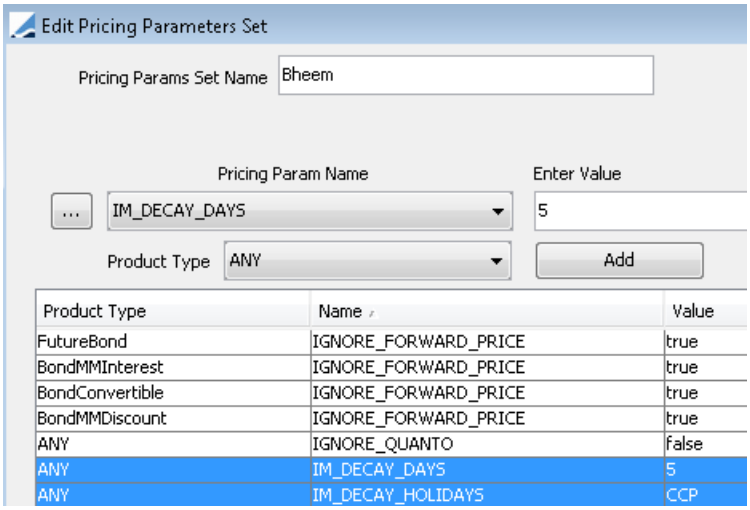
7. OTC Margin Forecasting the Initial Margin

The Expiry report allows forecasting the Initial Margin over a few days, taking into account trade lifecycle events.

7.1 Setup Requirements

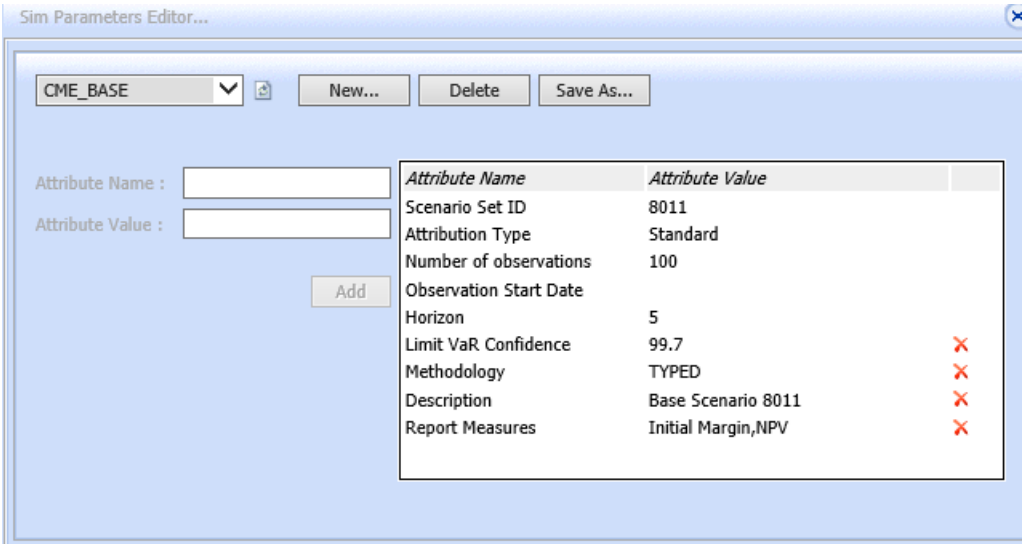
7.1.1 Pricing Parameters

Set the pricing parameters IM_DECAY_DAYS and IM_DECAY_HOLIDAYS for the default forecasting days and holiday calendar.



7.1.2 Configuring the Sim Analysis

Specify the Sim analysis parameters, under Market Risk > Setup > Risk Attribution Editor. Select the Sim analysis, and click Parameter Editor.



- Scenario Set ID – Enter the scenario set ID for the historical simulation.
- Number of observations – Enter the number of observations (scenarios) for the historical simulation.
- Methodology – Select the desired methodology.
- Confidence Level – Enter the confidence interval for the VAR calculation.
- Report Measures – Select the measures corresponding to the selected methodology.

7.2 Sample Process

7.2.1 Create a Batch Configuration

Bring up Market Risk and create a batch configuration under Market Risk > Setup > Batches > Editor.

7.2.2 Populating the Data Grid

From the Calypso Navigator, navigate to **Configuration > Scheduled Tasks** (menu action `scheduling.ScheduledTaskListWindow`) to configure the scheduled task.

Click New Task and select the DATA_GRID_HYDRATE task type.

» Enter a trade filter

» Enter a pricing environment

» Enter the Market Risk Batch for which you want to use a data grid.

The CCR Analysis Config attribute does not apply to Market Risk.

Run the DATA_GRID_HYDRATE scheduled task.

7.2.3 Running the Expiry Report

From the Calypso Navigator, navigate to **Configuration > Scheduled Tasks** (menu action `scheduling.ScheduledTaskListWindow`) to configure the scheduled task.

Click New Task and select the EXPIRY_RISK_REPORT task type.

Task Attributes	
Batch name	Expiry_Sim
Horizon Days	5
Quote Rolling Policy	
Output Processor	DefaultExpiryRiskOutputProcessor
Output CSV Dir	C:\Users\qian_liu\Calypso
Dispatcher config	default
Clear Results After Save	true
Max Trade Per Task	
Calculator Count	
Gather Execution Stats	false

- Batch Name – Select the Market Risk Batch to run. It should be the same Market Risk Batch specified in the DATA_GRID_HYDRATE scheduled task.
- Horizon Days – Number of forecasting days.
- Output Processor – Set to Default ExpiryRiskOutputProcessor.
- Output CSV Dir – Enter the directory where the CSV file containing the results should be saved.
- Dispatcher config – Select the dispatcher configuration to use.
- Max Trade Per Task – For optimization, you can restrict the maximum number of trades that each calculator will process at a time. Optional.
- Calculator Count – For optimization, you can enter the number of calculators. Optional.
- Gather Execution Stats – True of false. Set to true to gather job execution statistics. Optional.

Run the EXPIRY_RISK_REPORT scheduled task.