Nasdaq

Nasdaq Calypso

CCP OTC Margin

Version 18

Revision 5.0

November 2024

Approved

Document History

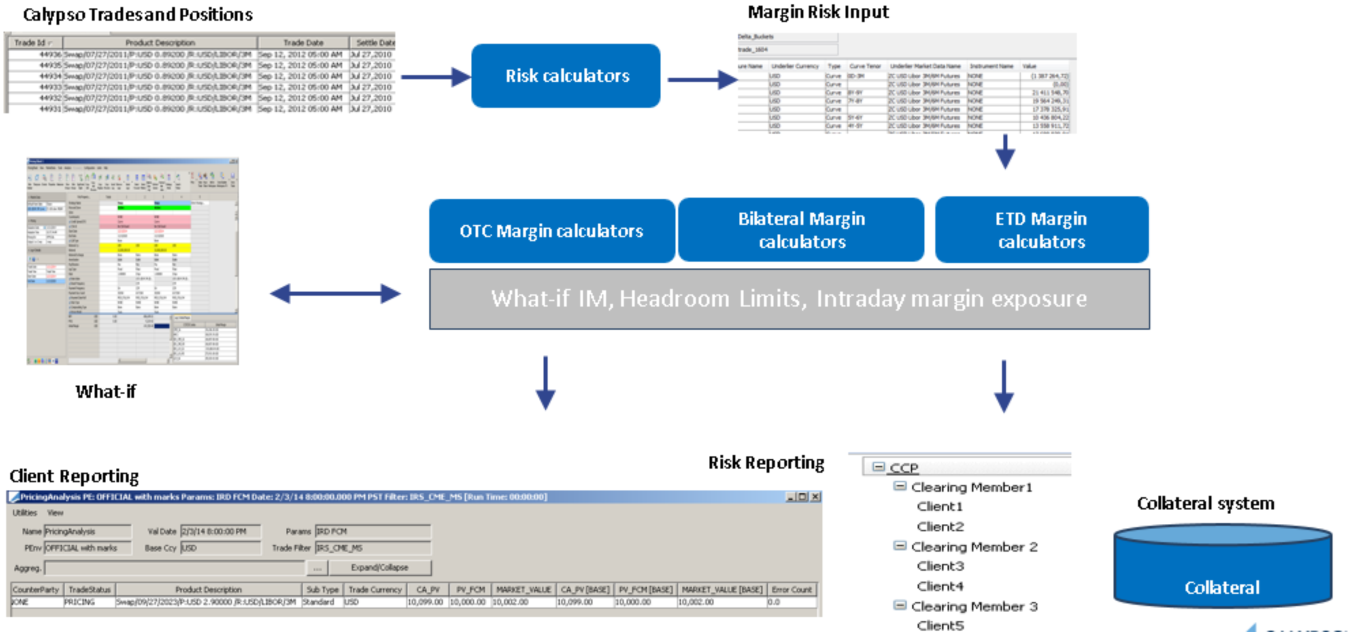
Revision	Published	Summary of Changes
1.0	February 2024	First revision for version 18
2.0	April 2024	Updates for version 18 monthly release
3.0	May 2024	Updates version 18 monthly release - Added "Exclude Product Family" to Variation Margin Config
4.0	August 2024	Updates for version 18 monthly release – Added "Zero VM measures on CCY Holiday" to Variation Margin Config
5.0	November 2024	Updates for version 18 monthly release – Updated user interface screenshots

This document describes how to install, configure, and run CCP OTC Margins

Table of Contents

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)

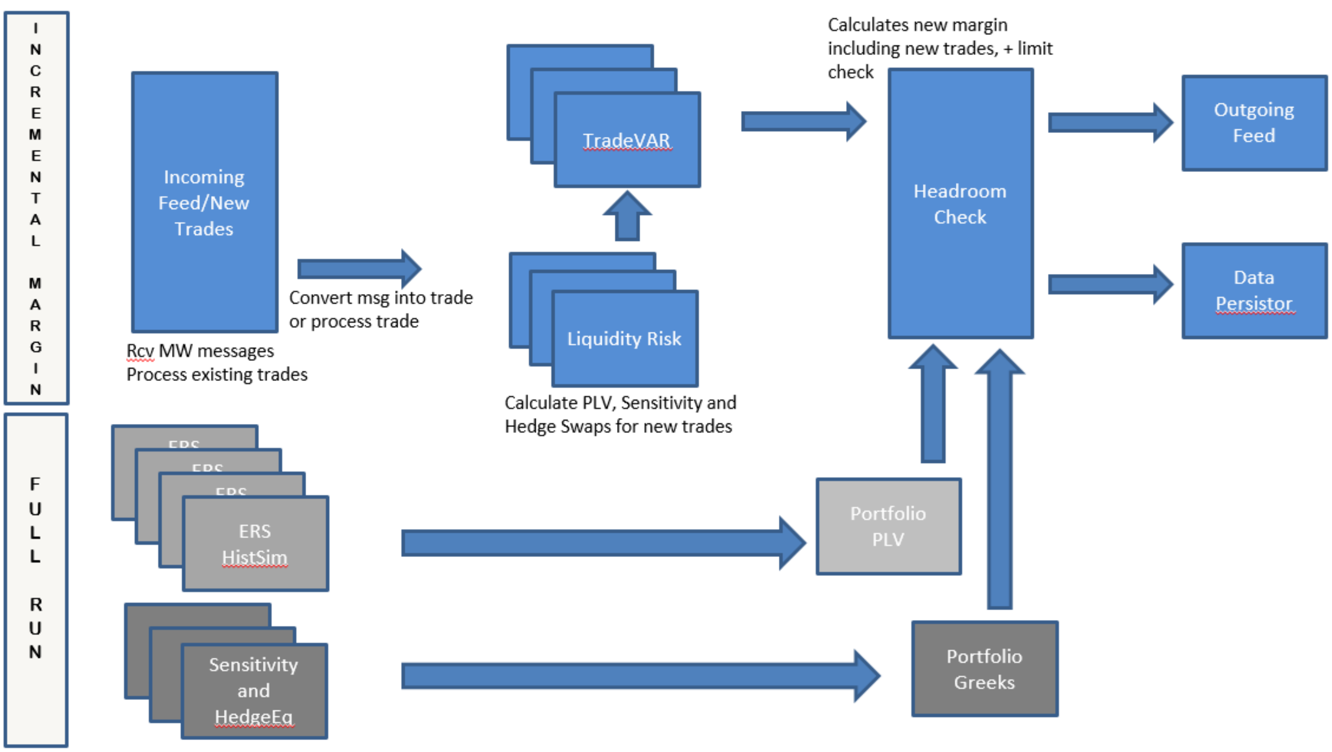
- In preparation for the clearing novation limit check and incremental margin calculation, at the start of the day, PL Vectors are loaded in memory for all portfolios in the selected hierarchy
- SEF or MW proxy messages are injected in Calypso via the “Message Injector”, and validated
- Messages are 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.

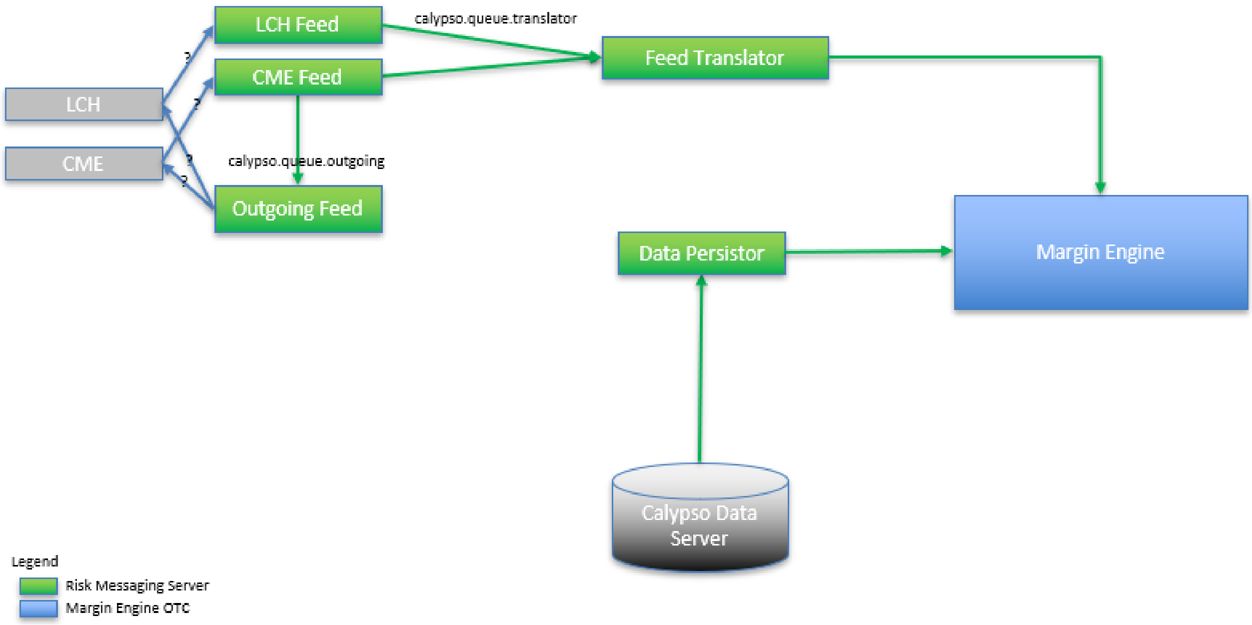
If the collateral positions are modified intraday, a set of processes allow updating the limit check accordingly.

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

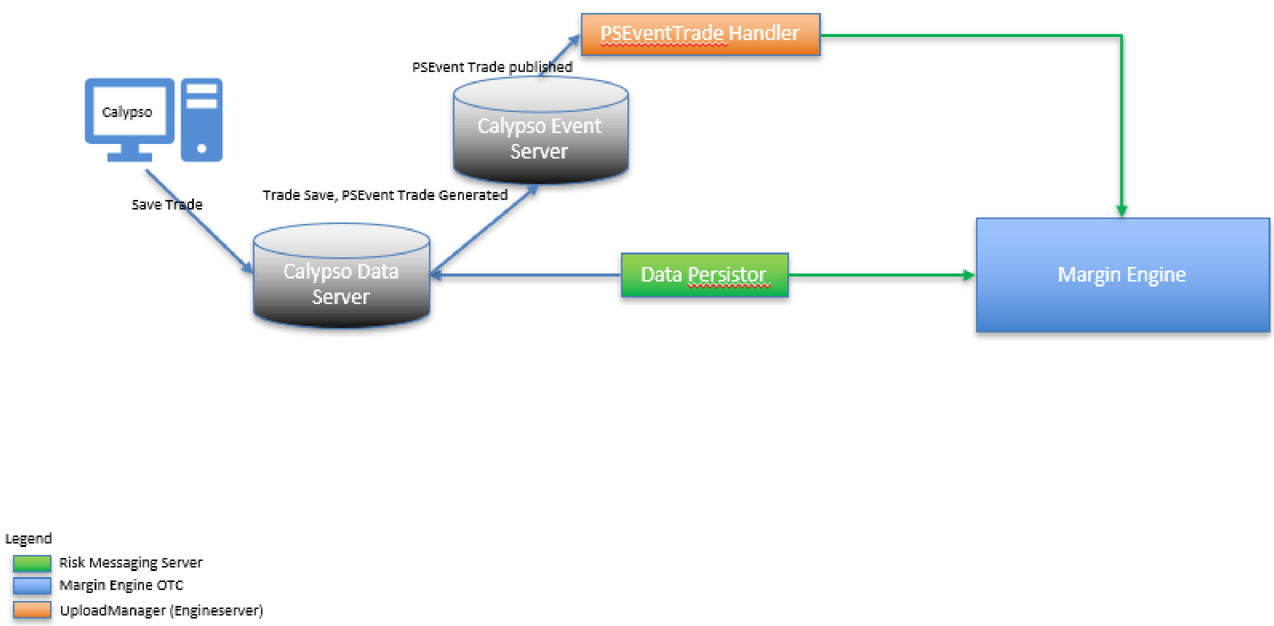
The limit check does not process messages in a sequential order.

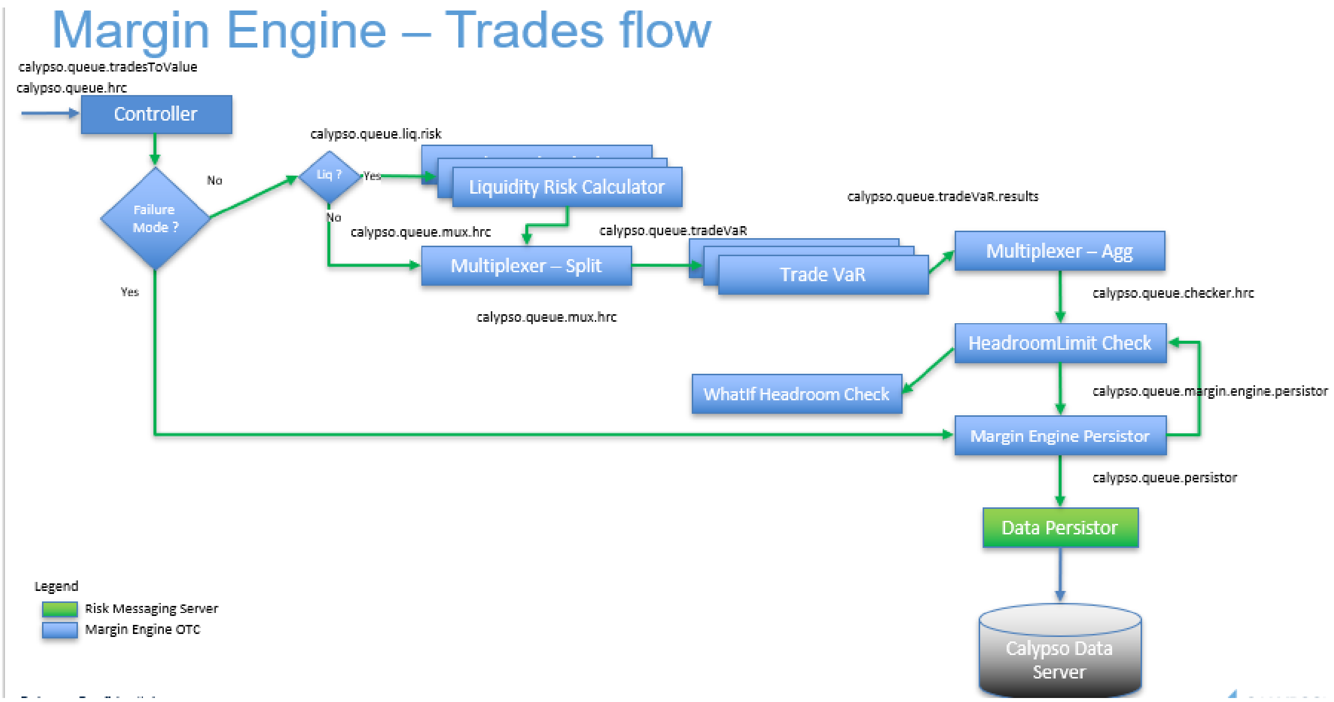
FCM and CCP Architecture Overview

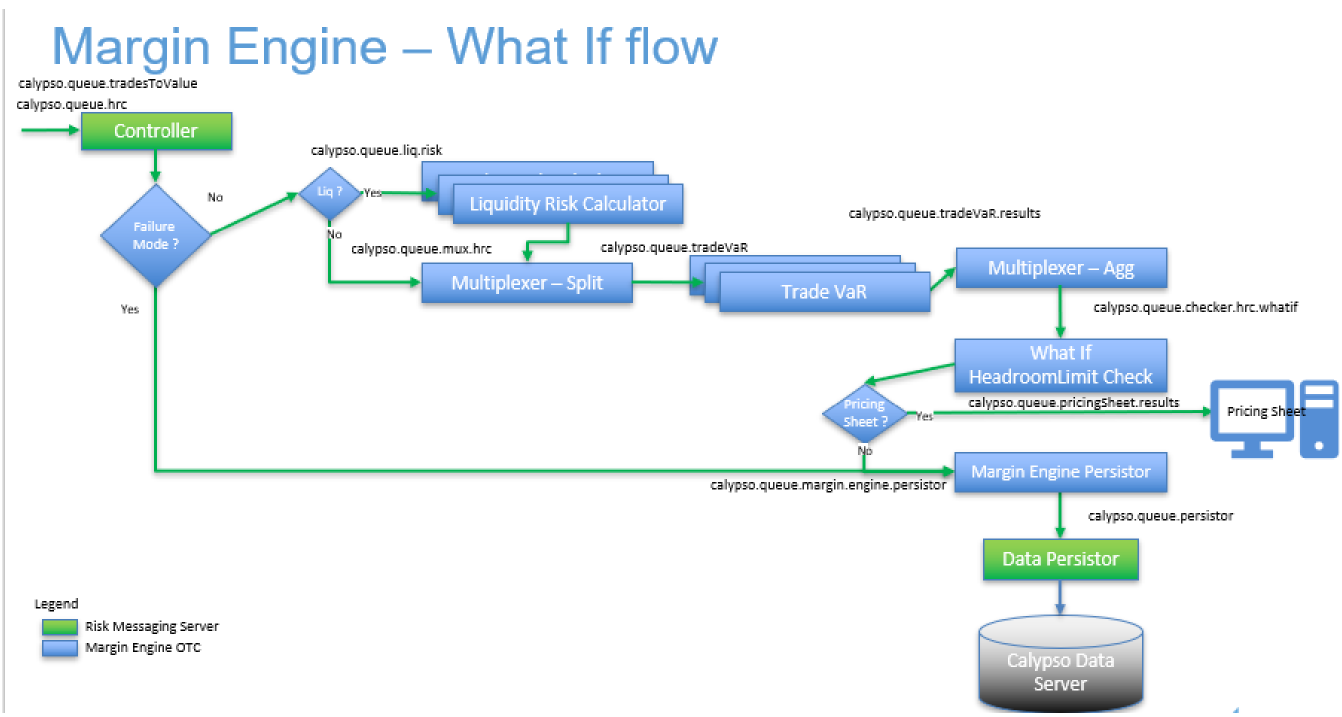
Margin Engine – Flow - FCM



Margin Engine – Flow - CCP




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


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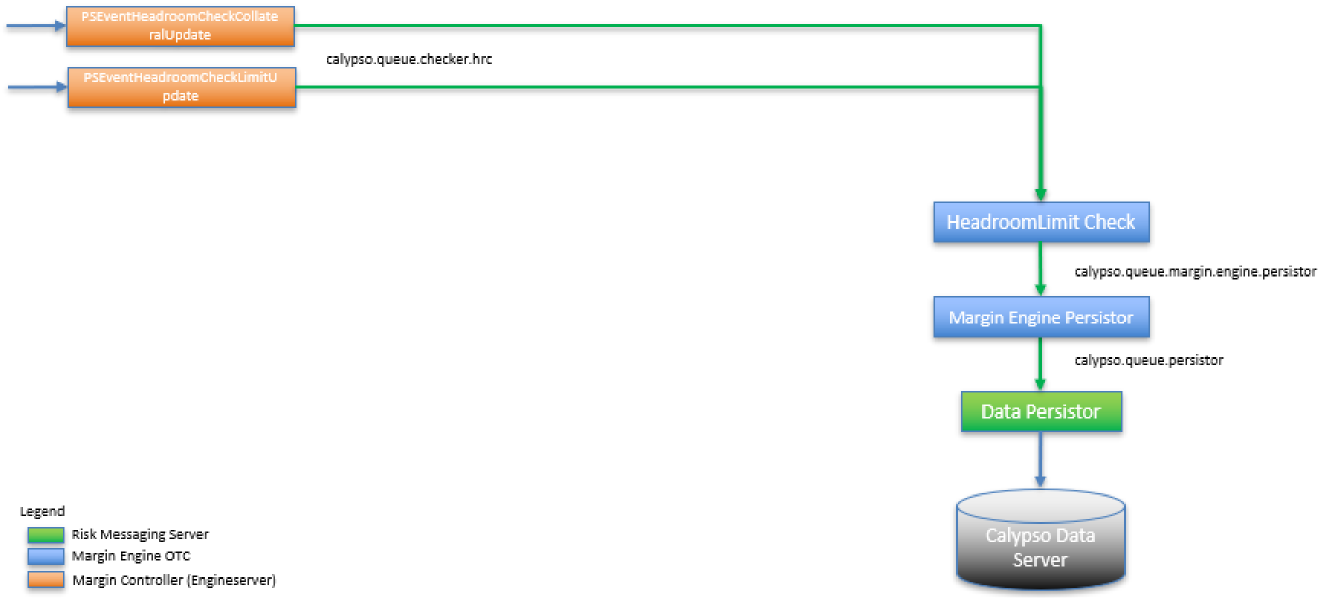
Liquidity Risk Calculator
No
calypso.queue.mux.hrc
calypso.queue.tradeVaR
calypso.queue.tradeVaR.results
Multiplexer – Split
Trade VaR
Multiplexer – Agg
Yes
calypso.queue.checker.hrc.whatif
What If HeadroomLimit Check
Pricing Sheet ?
Yes
calypso.queue.pricingSheet.results
Pricing Sheet
No
Margin Engine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

Margin Engine – Update Flow (Limits and Collateral)

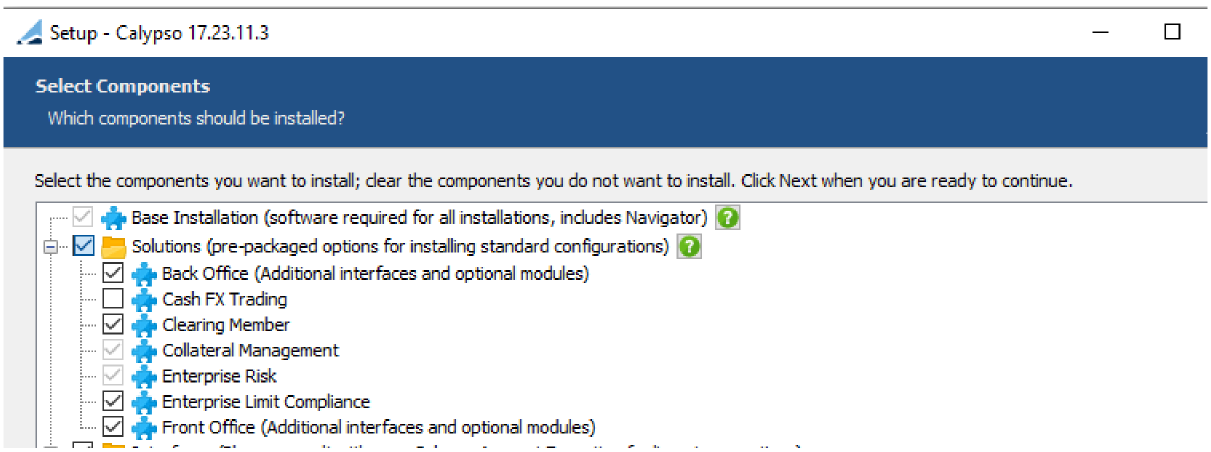


2. OTC Margin Installation

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

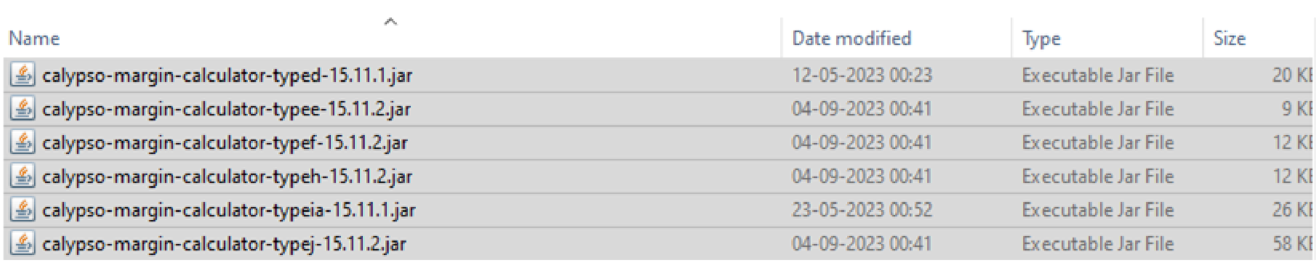


Please refer to the *Calypso Installation Guide* and *Calypso Clearing Member Setup Guide* for installation details.

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.



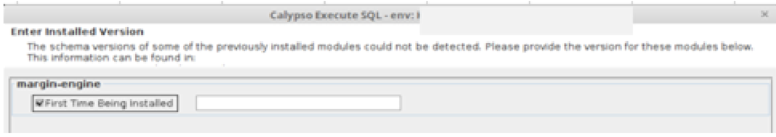
Name	Date modified	Type	Size
calypso-margin-calculator-typed-15.11.1.jar	12-05-2023 00:23	Executable Jar File	20 KB
calypso-margin-calculator-typee-15.11.2.jar	04-09-2023 00:41	Executable Jar File	9 KB
calypso-margin-calculator-typef-15.11.2.jar	04-09-2023 00:41	Executable Jar File	12 KB
calypso-margin-calculator-typeh-15.11.2.jar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

3.1 Trade Workflow

There are multiple use cases:

- Messages are received via the Incoming Feed/Feed translator
- New trade pairs (*) are submitted to the Margin Engine for limit and headroom check
- Existing trades are resubmitted to the Margin Engine for re-processing or post-novation event

(*) the trade pairing is not supported out of the box and needs to be customized.

3.1.1 CCP Trade Workflow

This workflow will be triggered based on the trade keyword BusinessFlow = CCP.

Sample workflow available on the Documentation Portal: "ccp_wf.wf".

3.1.2 New Trades Submitted to Margin Engine

Trades can go through various trade transitions.

Trades will only be sent to the Margin Engine for specific transitions, ie specific Origin Status and specific Actions.

The following is the out of the box solution- a configurable version will be available in the August MR.

Orig status	Action	Action Definition	Resulting Status
Out of the Box			
PENDING	SUBMIT	No action	user choice
WAIT_MARGIN	ACCEPT	Add trade	user choice
WAIT_MARGIN	REJECT	Remove Trade	user choice

3.1.3 Existing Trades Resubmitted to the Margin Engine

For existing trades, here are the supported actions:

Orig status	Action	Action Definition	Resulting Status
Out of the Box			
TO_BE_TERMINATED	TERMINATE	Remove Trade	user choice
TO_BE_TRANSFERED	TRANSFER	Remove Trade	user choice

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.

NOTE: For bulk actions, i.e. trade compression, portfolio transfer, backloading, the process is different. See "Headroom Check: Post-trade Novation Events" for details.

3.1.4 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.

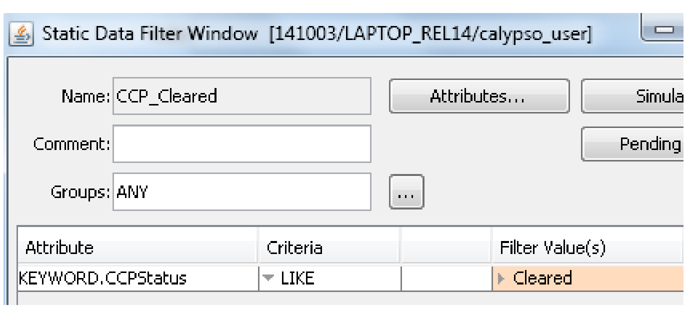
```
PSEventTrade;CLEARED;COMPRESS;PENDING_HRC_TERM;true;false;false;ALL;ALL;;CALYPUS;false
PSEventTrade;CLEARED;DECLEAR;PENDING_HRC_TERM;true;false;false;ALL;ALL;;CALYPUS;false;
PSEventTrade;CLEARED;TRANSFER;PENDING_HRC_TERM;true;false;false;ALL;ALL;;CALYPUS;false
```

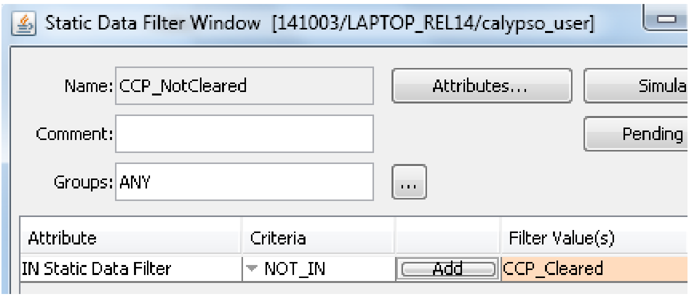
Step2 – Import the trade workflow (PSEventTrade) for your processing org, ALL subtypes, ALL product types.

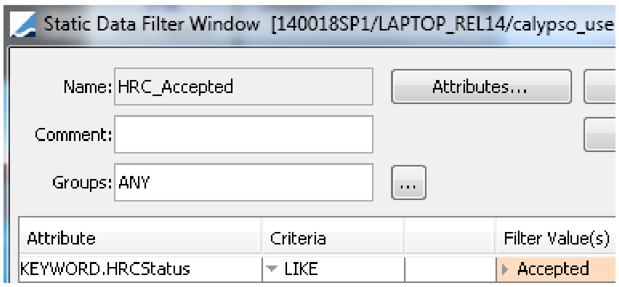
Orig Status	Action	Resulting Status	Use STP	Rules	Filter
CLEARED	COMPRESS	PENDING_HRC_TERMINATE	false	blank	blank
CLEARED	DECLEAR	PENDING_HRC_TERMINATE	false	blank	blank
CLEARED	TRANSFER	PENDING_HRC_TERMINATE	false	blank	blank
LIMIT_APPROVED	CLEAR	CLEARED	true	blank	CCP_Cleared
LIMIT_APPROVED	REFUSE	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

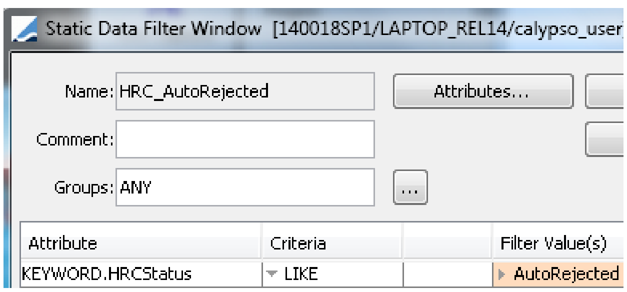
Orig Status	Action	Resulting Status	Use STP	Rules	Filter
LIMIT_REJECTED	REFUSE	REJECTED	false	blank	blank
NONE	NEW	PENDING	true	blank	CCP_NotCleared
NONE	NEW	PENDING_HRC	true	blank	CCP_Cleared
PENDING	CANCEL	CANCELED	false	Cancel	blank
PENDING	STP-ACCEPT	LIMIT_APPROVED	true	blank	HRC_Accepted
PENDING	STP-REJECT	LIMIT_FAILED	true	blank	HRC_Rejected
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

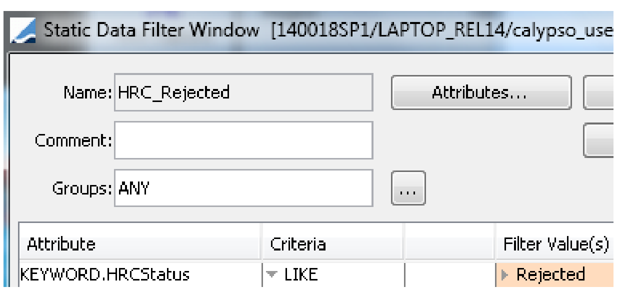
Static data filters:











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.

Message Type	CCP	Limit Check	IM Exposure	Workflow
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.
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 Limit Check

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

3.2.1 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.

3.2.2 Domain "MarginEngine"

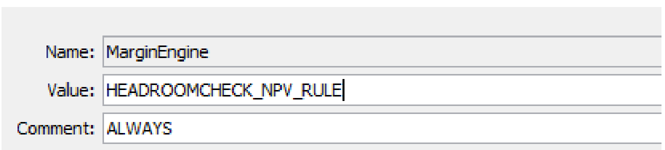
The following domain values need to be defined in the domain "MarginEngine".

Value = HEADROOMCHECK_PRICING_ENV

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

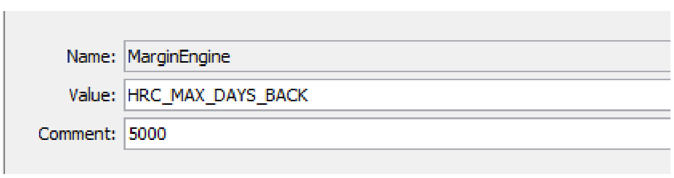
Value = HEADROOMCHECK_NPV_RULE

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



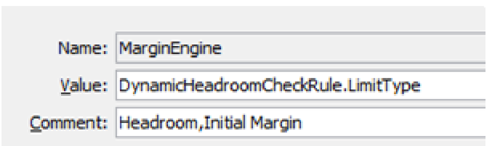
Comment = Number of days for which historical PL Vectors can be used (mostly for testing). The domain value is used to load collateral results. This can be set to any number of days.

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.
- IPDPClientClearingRule- Checks headroom limits and IM limit at the DP House level, and IM limit at IP House level.
- DynamicHeadroomCheckRule – This headroom check rule is applicable to both headroom and Initial Margin limits and is configured using the domain values below, which will be added out of the box. If you only want to check 'Headroom' limits, you can remove Initial Margin from the Comment.



For the DynamicHeadroomCheckRule, the following changes need to be made to the Market Risk hierarchy:

- Add attribute ClearingMember=true at clearing member level in Market Risk hierarchy.

  In the example below, this attribute will be added at 'CB2' and 'CB3' level.
- Add attribute CheckLimit=true at gross omnibus account level.

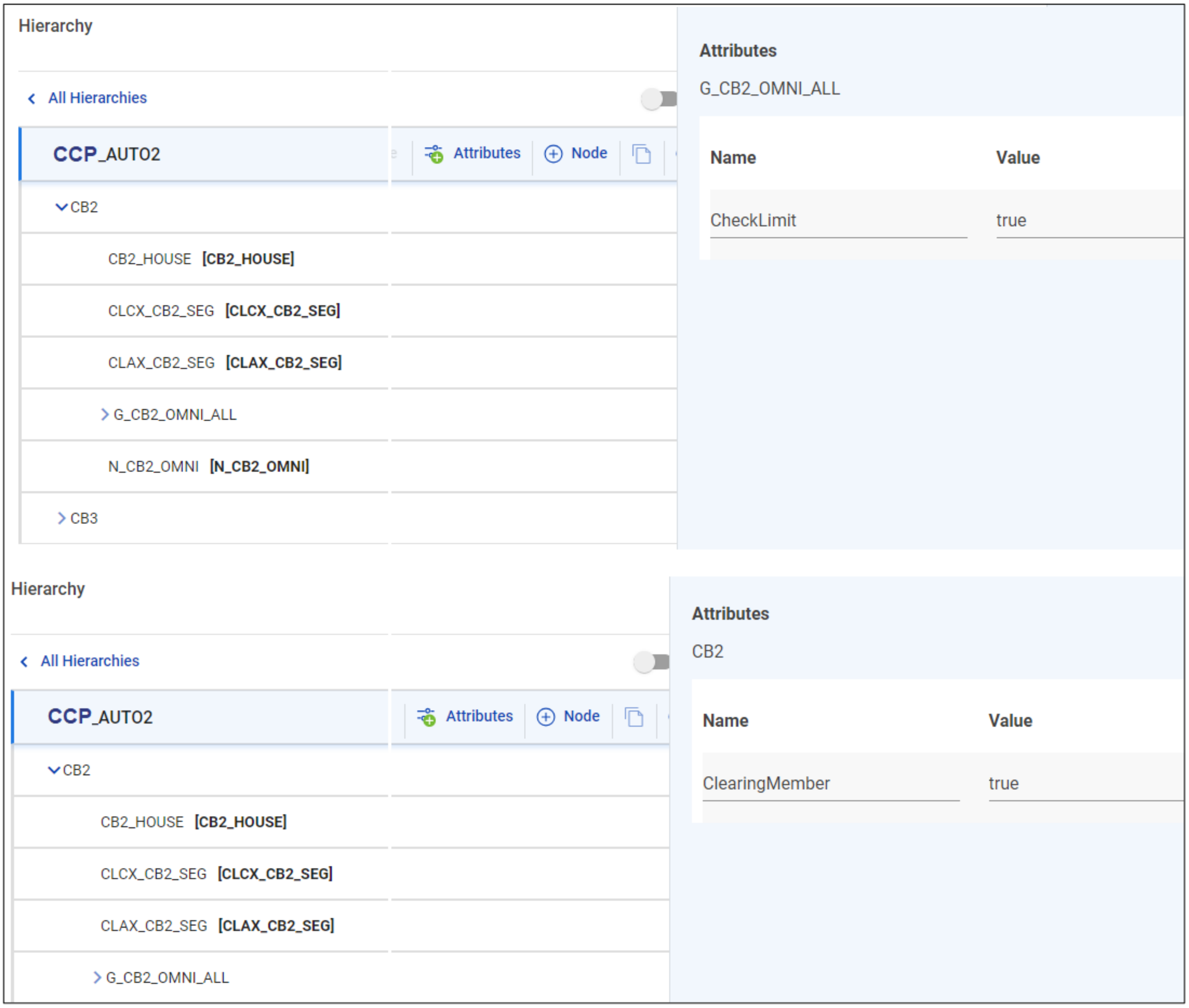
  For example, G_CB2_OMNI_ALL.

Based on this rule and this attribute, the limit check will happen at second level in the hierarchy. In the below example, it'll happen at CB2_HOUSE, CLCX_CB2_SEG, CLAX_CB2_SEG, G_CB2_OMNI_ALL, N_CB2_OMNI, CB3_HOUSE, and N_CB3_OMNI.

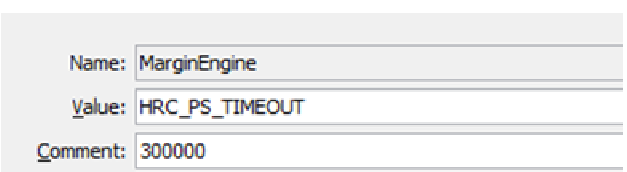
Assuming only Headroom is added to the domain value, the risk increasing trades are accepted when:

IM + CVM + UVM – collateral < Headroom Limit

Risk reducing trade will be accepted without checking the formula.



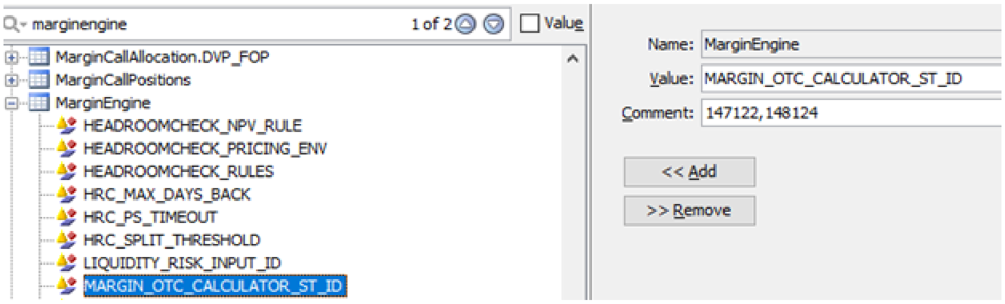
Value = HRC_PS_TIMEOUT



Data Persistor timeout in ms.

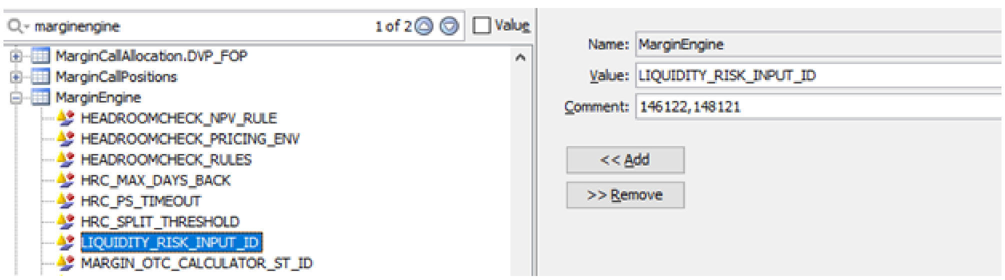
Value = MARGIN_OTC_CALCULATOR_ST_ID

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.



3.2.3 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)

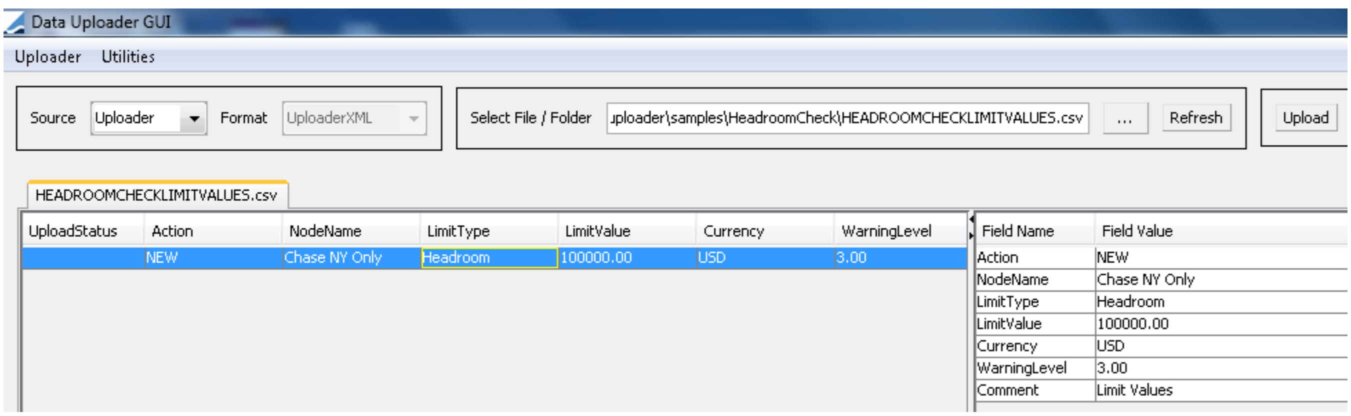
CCP2 MA (Margin Limit)

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.

3.2.4 Margin Controller Engine

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

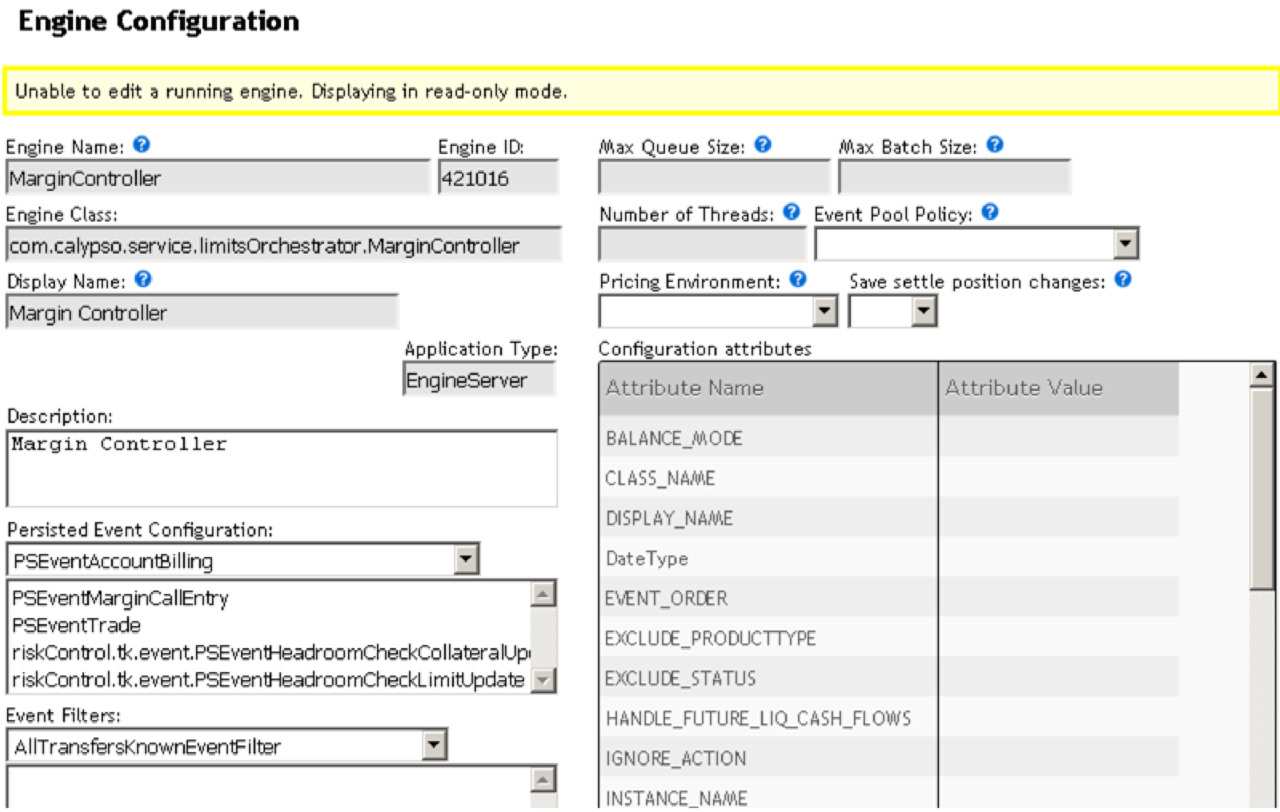
It is configured in the Engine Manager of Web Admin: event subscription and engine parameters.

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.

3.2.5 Update Manager Engine

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

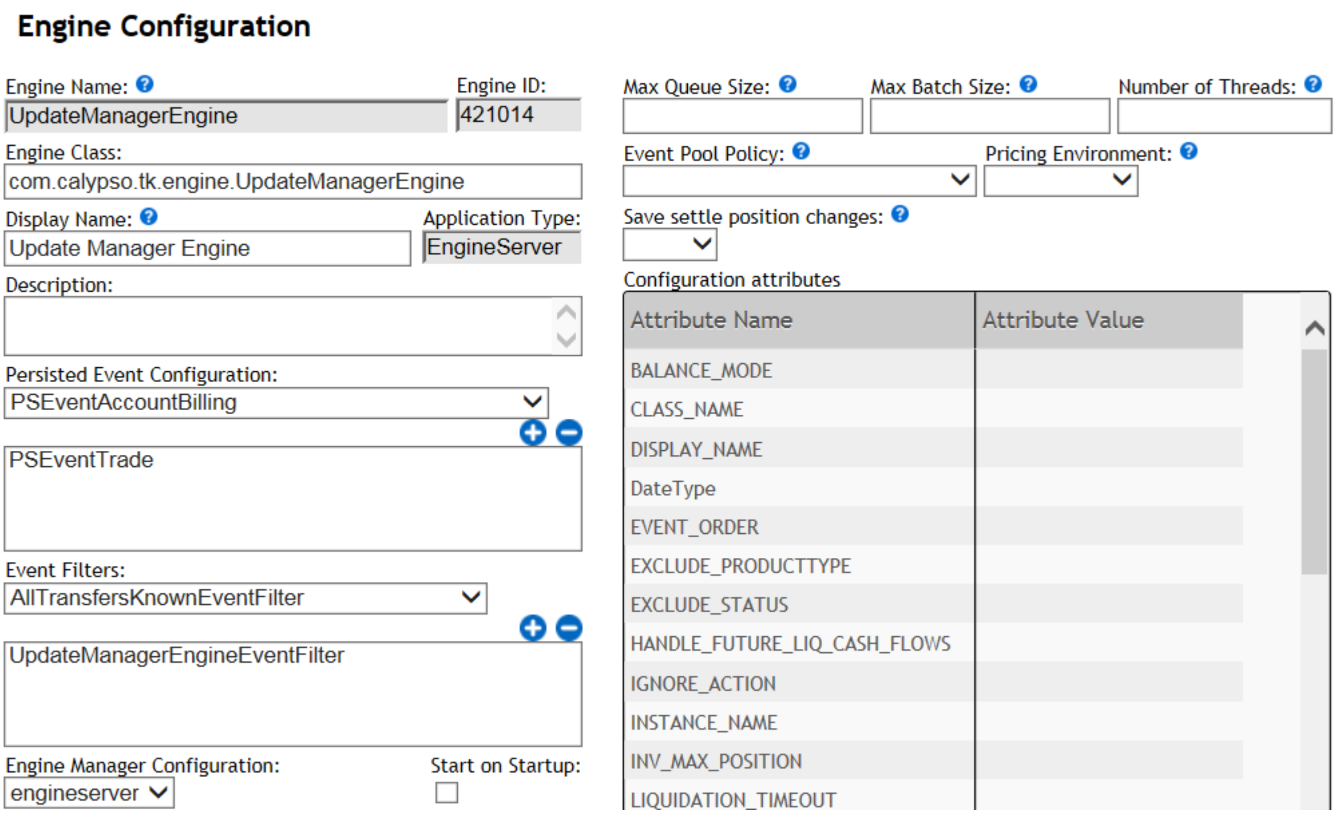
It is configured in the Engine Manager of Web Admin: event subscription and engine parameters.

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 compute the margins.

4.1 Trade Filters

You need to configure a trade filter for each clearing member 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.

Create a node for each clearing member and each clearing member account, or for each clearing member (single level). The last node must be associated with the trade filter previously created.

Examples:

FX Tree

IRS Tree

You can set the CreditMulltiplier attribute for each node. This will be used as COMPLIANCE FACTOR to calculate Compliance Margin and Initial Margin for the HistSim report.

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

4.3 Data Grid Configuration

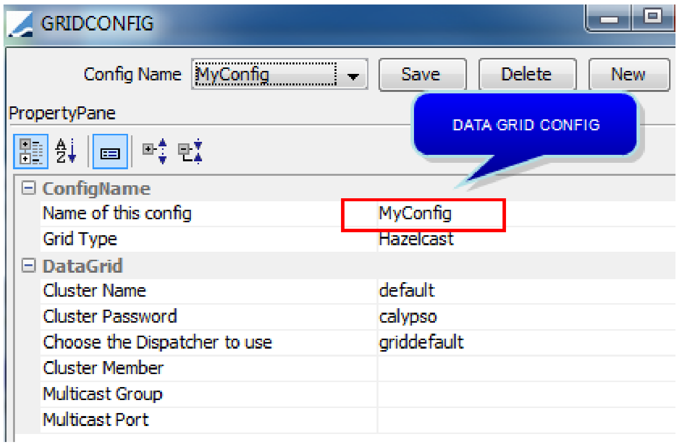
You need to use the in-memory data grid to compute the HistSim analysis.

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

Fields	Description
	messages.

Environment Property

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

grid.config=<data grid configuration name>

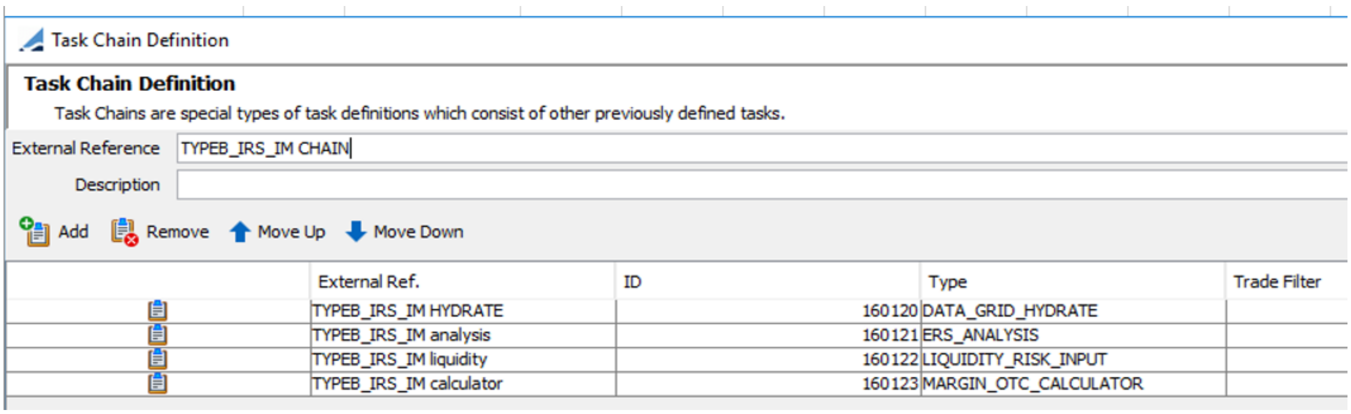
4.4 End of Day Batch

The end of day batch will be composed of margin inputs (PL vectors, risk sensitivities) and margin calculation.

The margin inputs are run in:

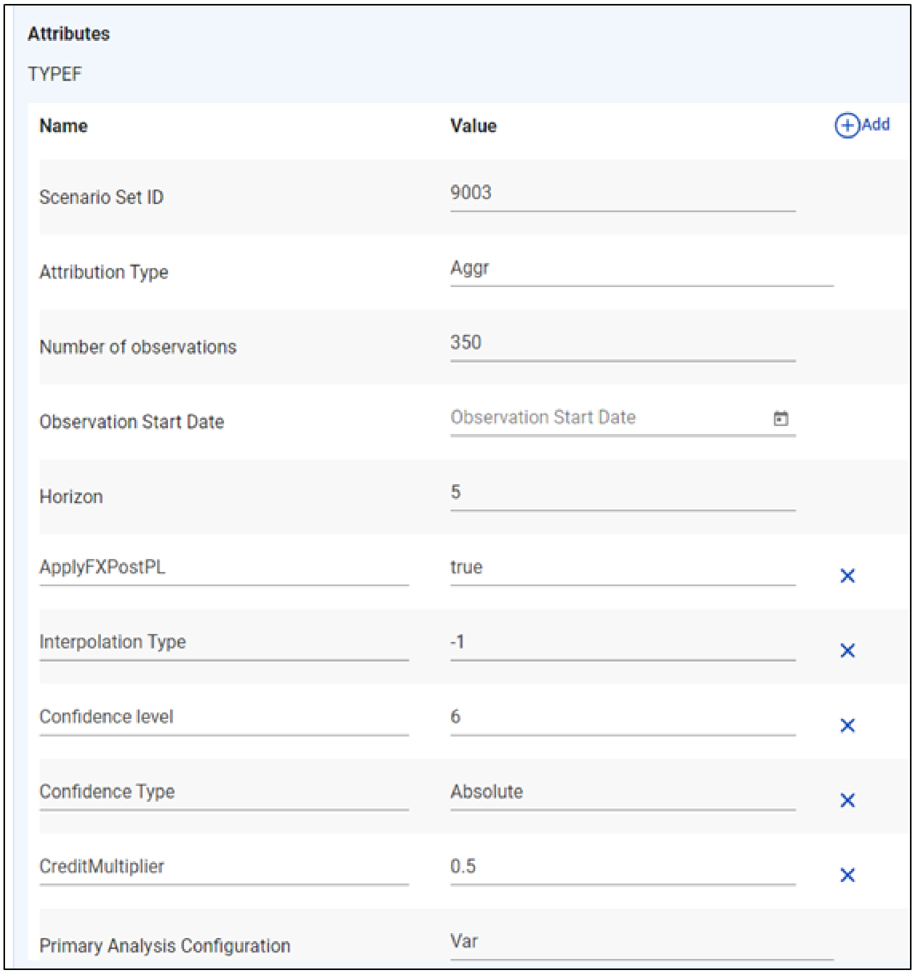
- ERS_ANALYSIS/HistSim (for the VAR component)
- LIQUIDITY_RISK_INPUT (for the sensitivities part- this part is optional)

Sample of end of day batch:



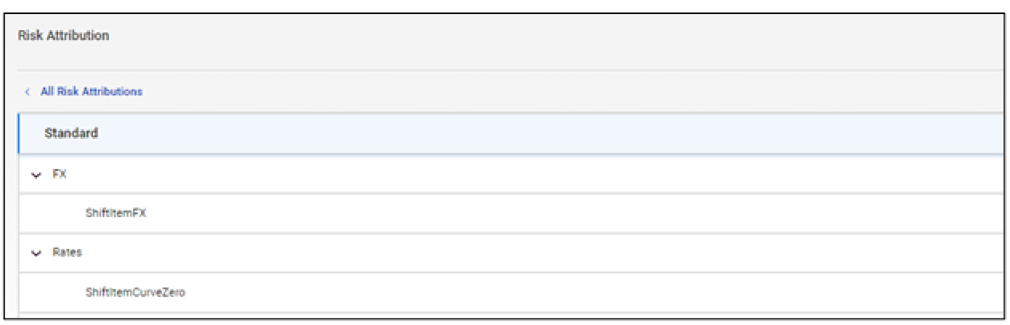
HistSim Analysis

You need define SIM parameter in **Setup>>Sim parameter** UI page.



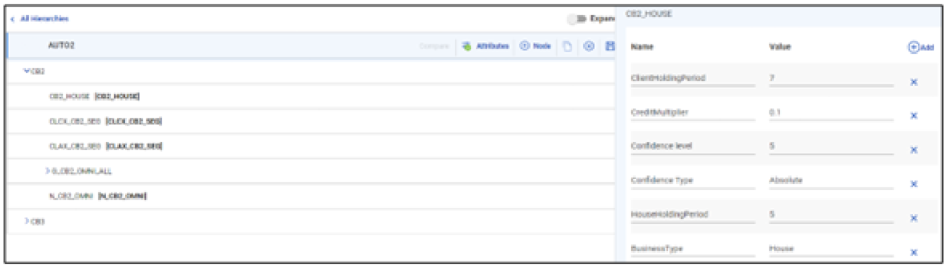
- Scenario Set ID – Enter the scenario set ID for the historical simulation.
- Number of observations – Enter the number of observations (scenarios) for the historical simulation.
- Confidence Level – Enter the confidence interval for the VAR calculation.

Add the following attribution types using **Setup>>risk-attribution** in UI page.



Setup primary analysis as per Market Risk User Guide.

Add-on components for initial margin can also be configured at node level instead of parameter level. Multipliers or add-on factors can be different for different nodes –



In the margin calculation results, the add-on factors will be calculated for separate nodes based on their node attributes, like in the example below –

Portfolio	Currency	Measure	Value
CB2_HOUSE	USD	ETL	81689.9921
CB2_HOUSE	USD	Initial Margin	81689.9921
CB2_HOUSE	USD	VaR	76224.8931
CB2_HOUSE	USD	CreditMultiplier	0
CB2_HOUSE	USD	Credit Margin	0
CB2_HOUSE	USD	HolidayMultiplier	0
CB2_HOUSE	USD	Holiday Margin	0
CB2_HOUSE	USD	Discretionary Margin	0
CB2_HOUSE	USD	Total IM	81689.9921
CB2_HOUSE	USD	Total Margin	81689.9921
CLCX_CB2_SEG	USD	ETL	69787.48806
CLCX_CB2_SEG	USD	Initial Margin	69787.48806
CLCX_CB2_SEG	USD	VaR	69624.39246
CLCX_CB2_SEG	USD	CreditMultiplier	0.3
CLCX_CB2_SEG	USD	Credit Margin	20936.24642
CLCX_CB2_SEG	USD	HolidayMultiplier	0.02
CLCX_CB2_SEG	USD	Holiday Margin	1395.749761
CLCX_CB2_SEG	USD	Discretionary Margin	500
CLCX_CB2_SEG	USD	Total IM	92619.48424
CLCX_CB2_SEG	USD	Total Margin	92619.48424
CLAX_CB2_SEG	USD	ETL	57936.37143
CLAX_CB2_SEG	USD	Initial Margin	57936.37143
CLAX_CB2_SEG	USD	VaR	54455.02923
CLAX_CB2_SEG	USD	CreditMultiplier	0
CLAX_CB2_SEG	USD	Credit Margin	0
CLAX_CB2_SEG	USD	HolidayMultiplier	0
CLAX_CB2_SEG	USD	Holiday Margin	0
CLAX_CB2_SEG	USD	Discretionary Margin	0
CLAX_CB2_SEG	USD	Total IM	57936.37143
CLAX_CB2_SEG	USD	Total Margin	57936.37143

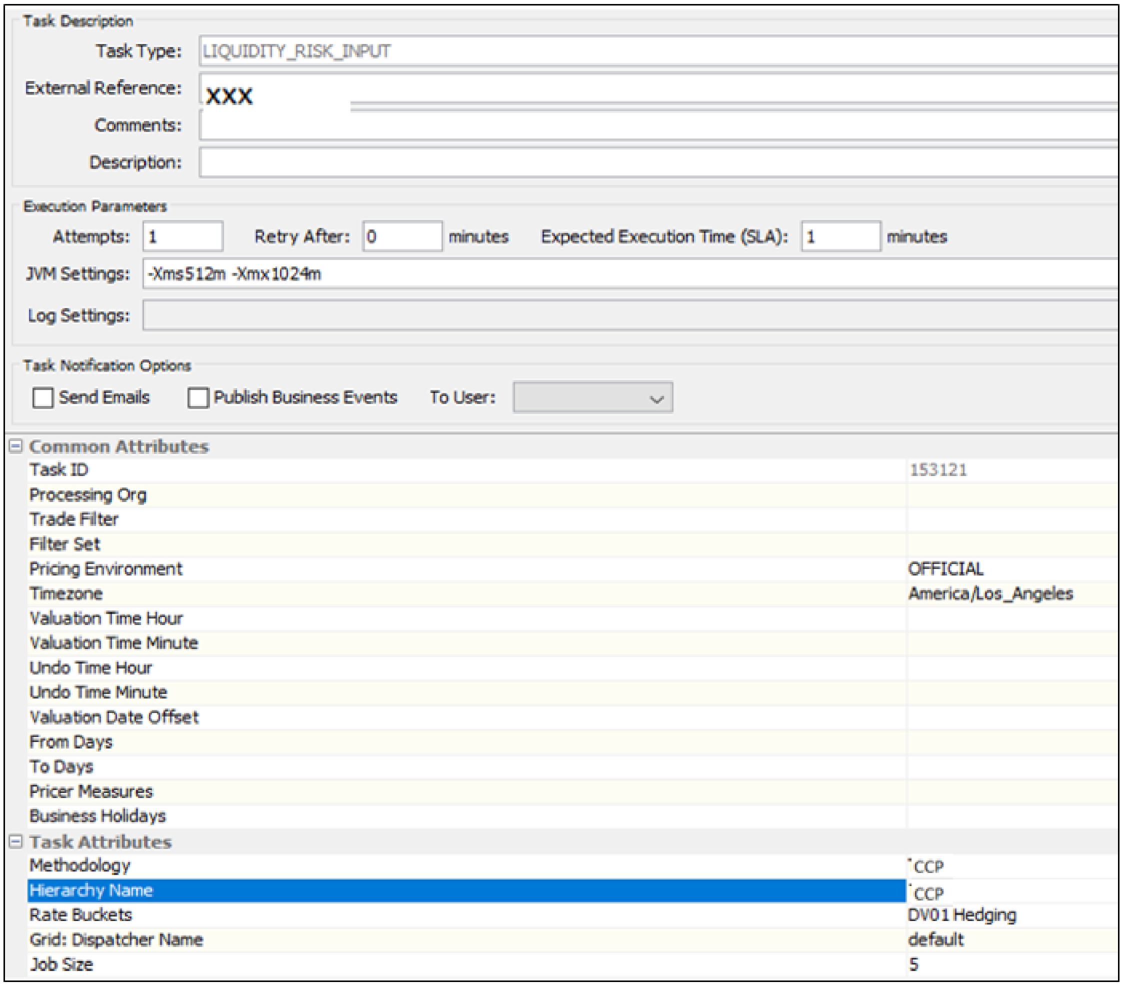
4.5 Market Data

Market data and scenario shifts are required to run HistSim.

Please refer to Calypso Market Risk documentation for information on importing Scenario Shifts.

4.6 LIQUIDITY_RISK_INPUT Scheduled Task

Create a LIQUIDITY_RISK_INPUT scheduled task.

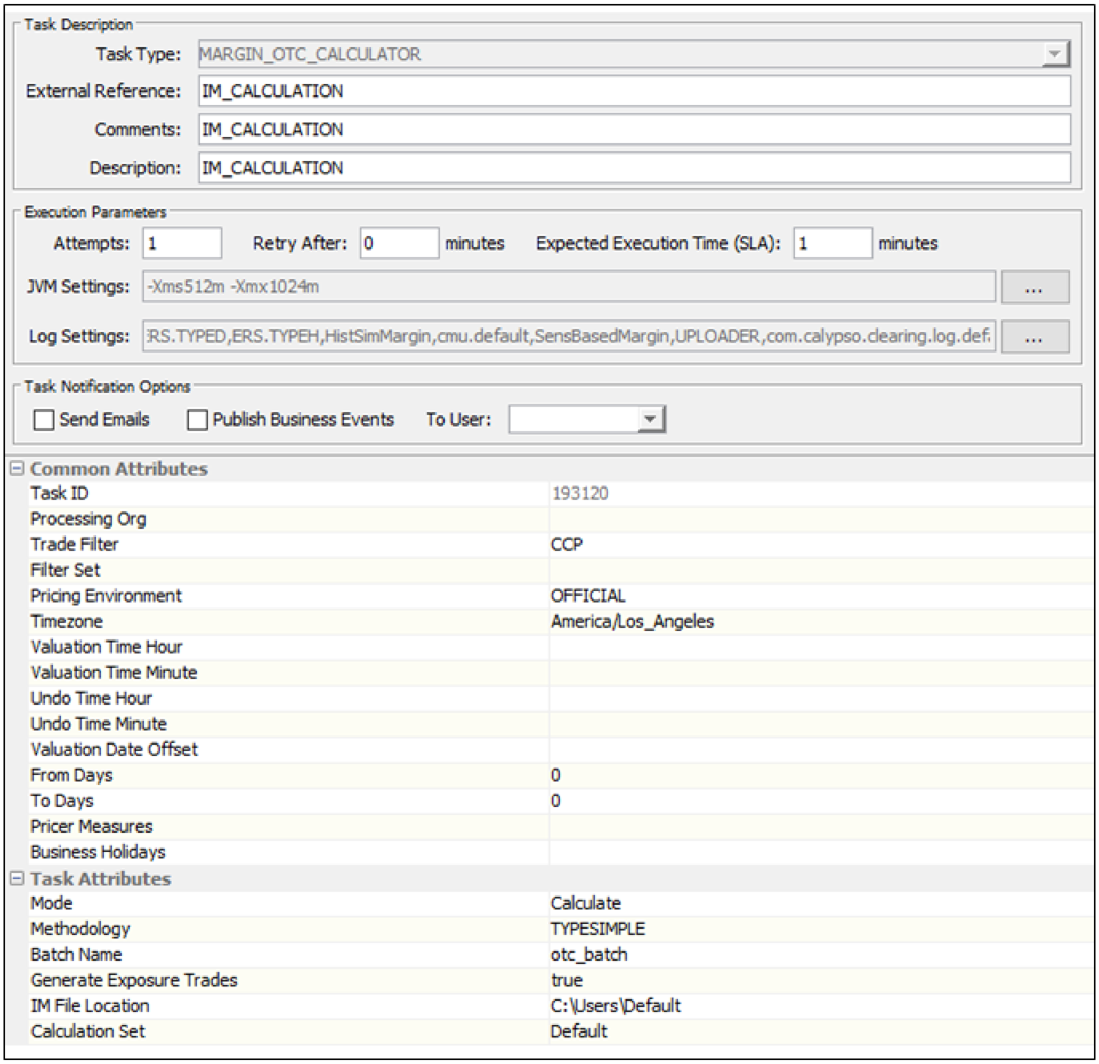


4.7 MARGIN_OTC_CALCULATOR Scheduled Task

The margin OTC calculator will calculate the Initial Margin, based on the inputs generated in HistSim and LIQUIDITY_RISK_INPUT. The margin methodology to apply is defined as an attribute.

The calculated IM is available as a csv file and as a PL Mark associated with a Collateral Exposure Trade (mapped to a margin call contract).

Create a MARGIN_OTC_CALCULATOR scheduled task referencing the ERS batch name.



- Mode – Calculate or Intraday Exposure Trades. Calculate mode calculates and saves the IM Results. Intraday Exposure Trades mode updates intraday PL marks in collateral exposure trades.
- Methodology – The desired methodology for the CCP is selected here based on the margin calculator being used.
- Batch Name – Select the Market batch to run. It should be the same Market Risk batch specified in the DATA_GRID_HYDRATE and ERS_ANALYSIS scheduled task.
- Generate Exposure Trades – True/False. When set to true, Collateral Exposure trades (CET) are generated against a VM margin call contract.
- IM File Location – This is the location where the results will be saved in csv format.
- Calculation Set – Calculation set which will be used to save IM results for value date.

Add the scheduled task ID to the comment of the MARGIN_OTC_CALCULATOR_ST_ID value in domain “MarginEngine”:

Example:

Name = MarginEngine

Value = MARGIN_OTC_CALCULATOR_ST_ID

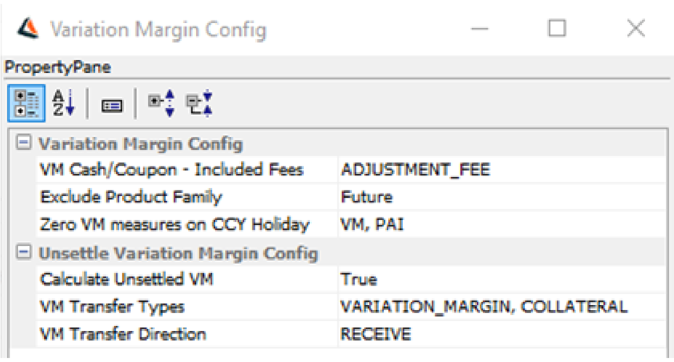
Comment = 193120

4.8 MARGIN_OTC_VM_CALCULATOR Scheduled Task

This scheduled task computes the VM for the given set of trades and stores the output as VM measures in the database. It can also compute Unsettled VM based on Variation Margin configurations.

4.8.1 Variation Margin Configuration

The Variation Margin Configuration window (menu action `margin.VariationMarginConfigWindow`) allows configuring the computation of Unsettled VM, the fees included VM Cash and Coupon, and exclusion of product families.



Variation Margin Config

» Select fee types for which user wants to include in VM_COUPON and VM_CASH.

» Select the product families for which user wants to exclude from VM results.

» Select the VM measures for which user wants to have zero values on currency holidays.

Unsettle Variation Margin Config

» Set Calculate Unsettle VM to True to calculate unsettled VM.

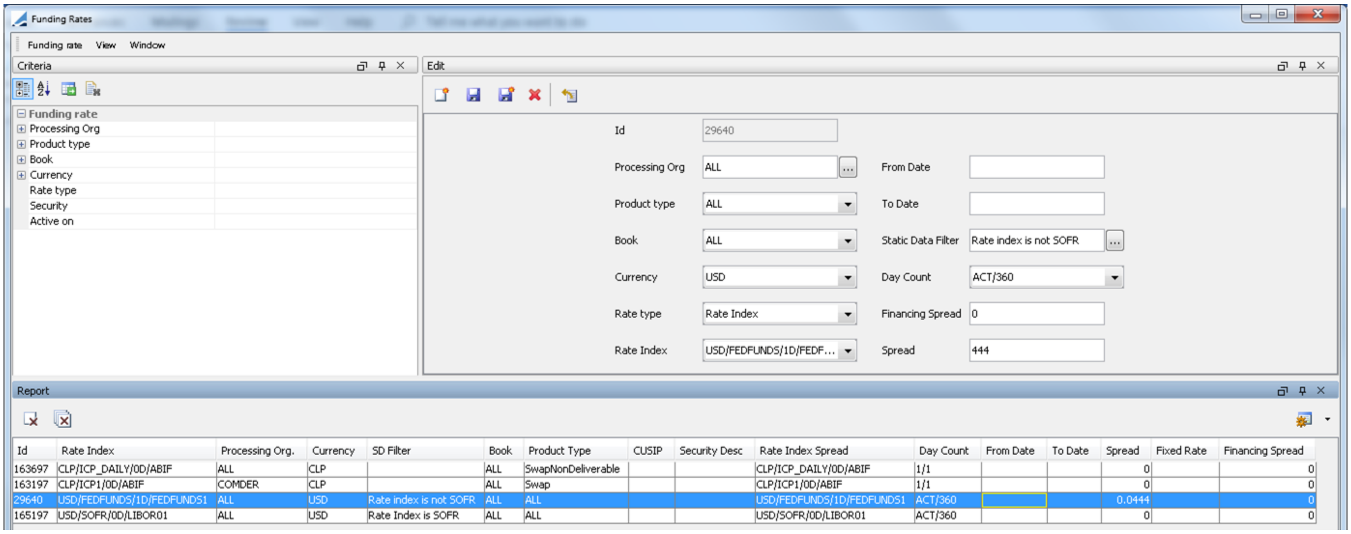
» Select the transfer types for which user wants to calculate unsettled VM.

» Select the transfer directions for which user wants to calculate unsettled VM.

4.8.2 PAI Configuration

The Funding Rate window allows a user to define the funding rule given a set of trade criteria.

You can access the Funding Rate window using **Configuration > Definitions > Funding Rates** from the Calypso Navigator.

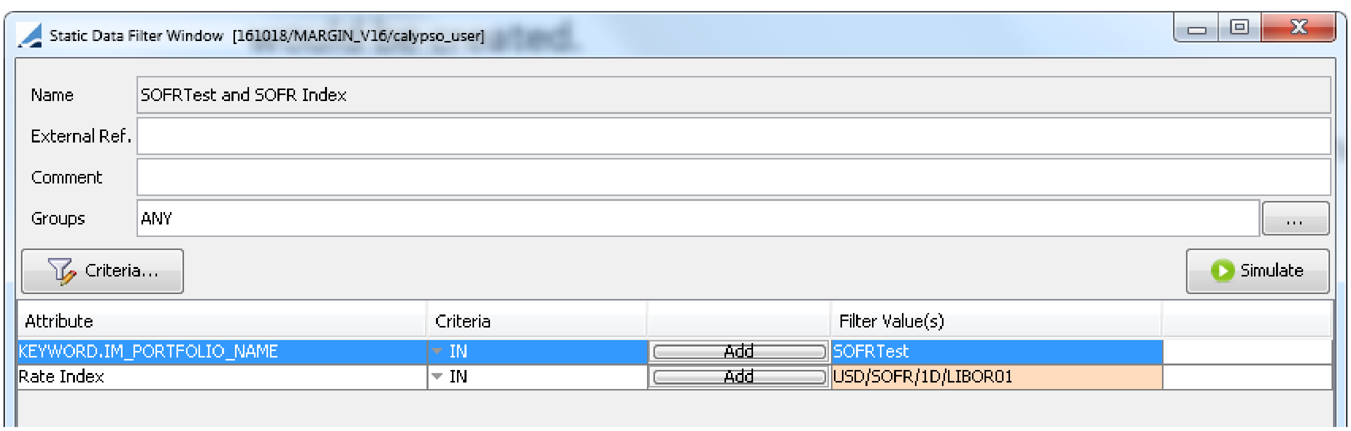


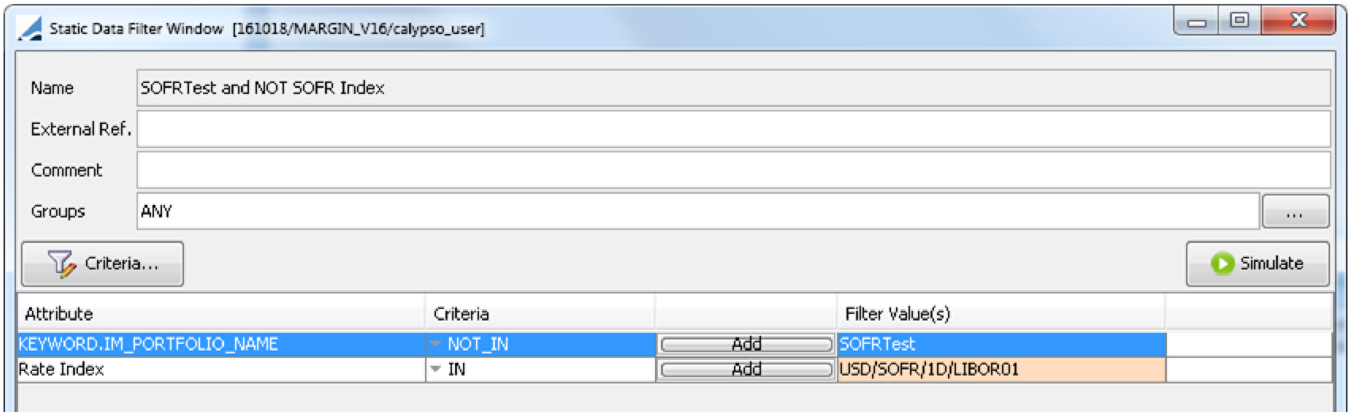
Static data filters are used to explicitly define a rate for PAI calculation. The key to identifying the rate to be applied is [Book + Product Type + Currency + SD Filter]. This is the out of the box implementation of the funding rate utility itself, so the PAI lookup during the scheduled task refers to the funding rate definitions and lets the funding rate utility filter and apply a rate accordingly.

Configuration for more than one index

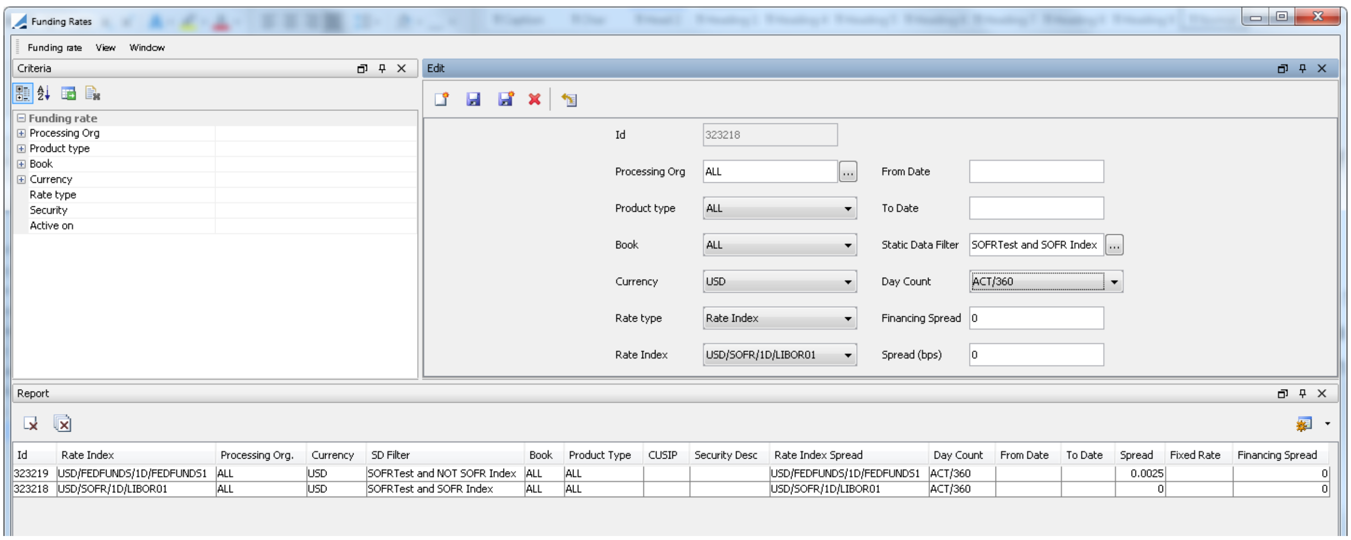
To configure different PAI rules for different margin accounts, you need multiple static data filters.

Example:





Then, the user would define two rules in the funding rate window, one for each SD Filter.

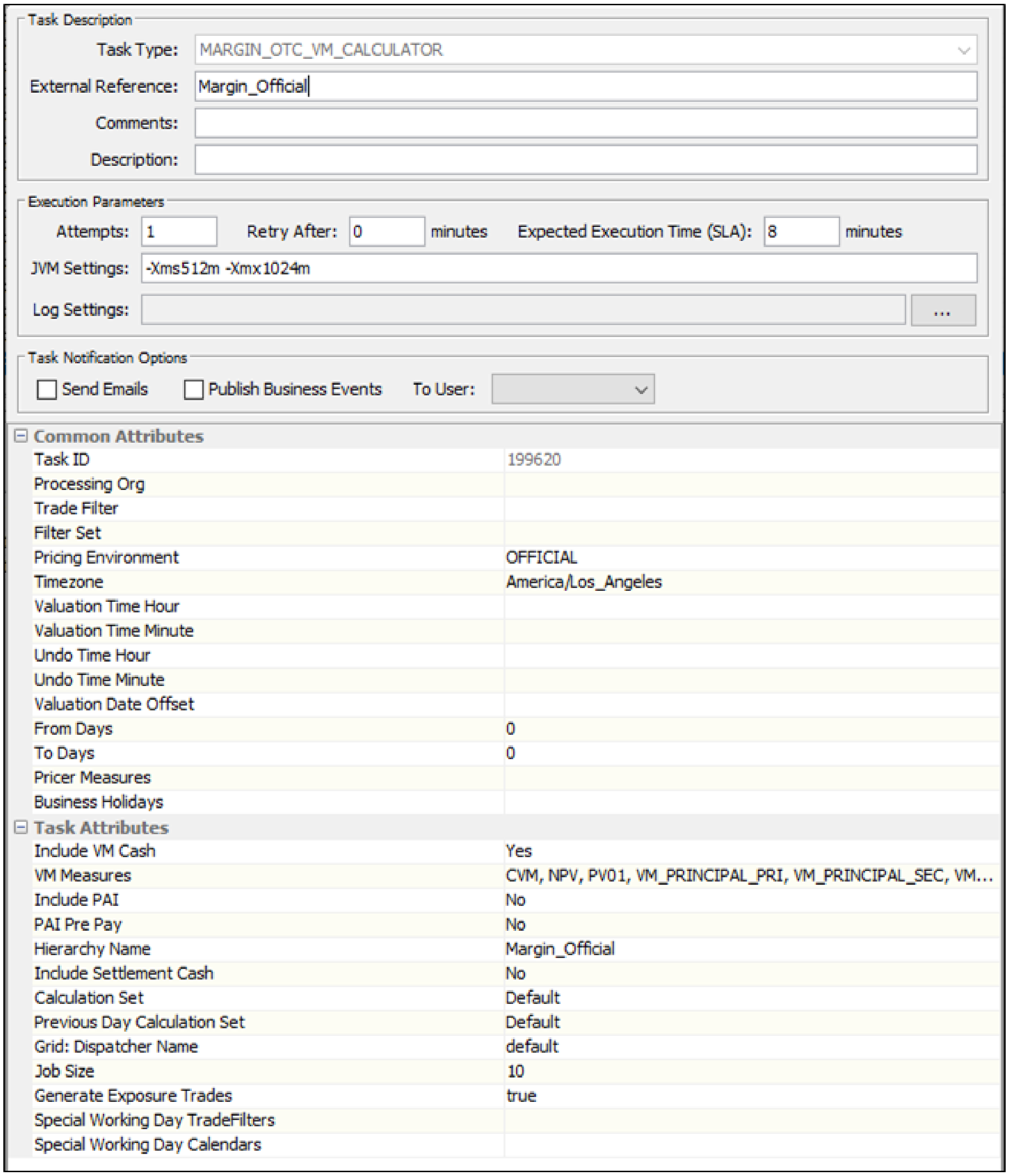


In this case, any USD Trades across any books will then be picked up if they are part of the defined IM_PORTFOLIO_NAME. If the trade has an index of SOFR, then it will use the SOFR Index to find the applicable PAI rate. If the trade has any other index or is fixed rate, it will use the FEDFUNDS index to find the applicable rate.

The SD Filters can be set up on any trade criteria, so very detailed rules can be created for applying different indexes, fixes rates, or spreads to different trades.

4.8.3 Scheduled Task

Create a MARGIN_OTC_VM_CALCULATOR scheduled task.



Mandatory Fields

- Trade Filter: Trade filter pointing to the “IM_PORTFOLIO_NAME” keyword, which represents a Margin Account.
- Pricing Environment: This is the pricing env that will be used to calculate the VM measures.

Task Attributes

- Include VM Cash: Yes/No. When set to Yes, the VM_CASH is included in the VM_EXPOSURE.

- VM Measures: Select the VM measures you want to calculate. Available VM measures are retrieved from the table margin_vm_definition (see below for details).
- Include PAI: Yes/No. When set to Yes, the PAI is included in the VM_EXPOSURE.
- PAI Pre Pay: Yes/No. Funding Period is calculated differently based on this flag of PAI calculation.
- Hierarchy Name: Market Risk Hierarchy which will be used to load the trade for which the calculation needs to be run.
- Include Settlement Cash: Yes/No. When set to Yes, cash settlement is included in the VM calculation.
- Calculation Set: Calculation set which will be used to save VM results for value date.
- Previous Day Calculation Set: Calculation set which will be used to retrieve previous VM results.
- Grid: Dispatcher Name / Job Size: Attributes to select a Dispatcher and the number of trades per calculator.
- Generate Exposure Trades: True/False. When set to true, Collateral Exposure trades (CET) are generated against a VM margin call contract.
- Special Working Day TradeFilters: A trade filter which contains only special working day trades.
- Special Working Day Calendars: the calendar which only contains special working days as business days, all other days will be holidays on this calendar.

VM is calculated at the trade level and then aggregated at the Margin Call Contract level. The VM is calculated in the trade currency (or settlement currency for NDF). VM is then aggregated in CET and all the aggregation is done at the trade currency level, i.e. there is one CET for each trade currency in the margin/position account.

The VM exposure for each trade is calculated using the formula given below:

T+1 Currencies

NPV_ADJ(T)=NPV(T)-Cash(T+1) *DF(1 Day)

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

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

T+2 Currencies

NPV_ADJUSTED (T) = NPV (T) – CASH (T+1) * DF (1 Day) – CASH (T+2) * DF (2 Day)

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

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

T+1=One Business Day After T

Where:

Cash(T+1) = coupon and fees to be settled next business day for T+1 currencies

Cash(T+2) = coupon and fees to be settled in two business days for T+2 currencies

NPV_Adj(T-1) = NPV_Adj from previous business day's result using currency holiday in Previous Day Calculation Set

Exception for GBP FRAs:

GBP FRAs

NPV_ADJ(T)=NPV(T)

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

New Trade

Any trade where no VM was run on previous day will be treated as "new" trade and while calculating VM, the NPV_ADJ and VM for previous day will be set to zero. VM for previous day will not be calculated on the fly if it was not run for previous day. For example, backloaded trades will be treated as new trades and the NPV_ADJ and VM for previous day will be set to zero.

PAI

PAI is calculated using the following formula:

PAI = -1 * (Adjusted NPV) * (Funding Rate) * (Funding Period) / (Day Count).

Where

- Adjusted NPV = First, pick a settlement date: Check if valuation date is a Currency OR Clearing holiday.

  If Valuation date = Holiday, then Last Settlement date is one business day before the valuation date using both clearing and currency holidays.

  If Valuation date is not a holiday, then last settlement date is equal to valdate.

  Once the settlement date is calculated, the NPV_ADJ selection date will be:

  If Trade NOT IN the SWD filter, choose the previous business day from settlement date using clearing calendar.

  If Trade IS in the SWD filter, choose the previous business day from the settlement date using the clearing and SWD calendars.

- Funding Rate = The rate returned from the funding rate utility as of value date of the scheduled task.

  If rate is not found, an error is thrown. All trades should have a funding rate definition so that some trades are not accidentally missed. Trades which are not supposed to have a PAI but are included in the scheduled task filter should be assigned a Fixed Rate of 0 in the funding rate window.

- Funding Period = This will have two options and will act differently according to a PAI_PREPAY flag on the scheduled task.

  If attribute is true: (Next Business Date – Valuation Date)

  If attribute is not set or set to false: (Valuation Date – Previous Business Date)

In both above cases, the next or previous business date

If Trade NOT IN the SWD filter, use the clearing calendar to find a business date.

If Trade IS in the SWD filter, use the clearing and SWD calendars to find a business date.

If no calendar is set on the Book's Processing Organization, the currency calendar will be used in place of the clearing calendar.

- Day Count = Use the day count according to the Funding Rate Definition

Table margin_vm_definition

VM measures to be computed are selected from that table. You can add more measures as needed.

NAME	ADDITIONAL_COLUMN_INDEX	PRODUCT_TYPE	MEASURE_NAME	INTRADAY	CUMULATIVE
NPV	-1		NPV	1	1
VM	-1		VM	1	1
VM_CASH	-1		VM_CASH	1	1
NPV_ADJ	-1		NPV_ADJ	1	1
PAI	-1		PAI	0	0
VM_EXPOSURE	-1		VM_EXPOSURE	0	1
FUNDING_RATE	1		PAI_FUNDING_RATE	0	0

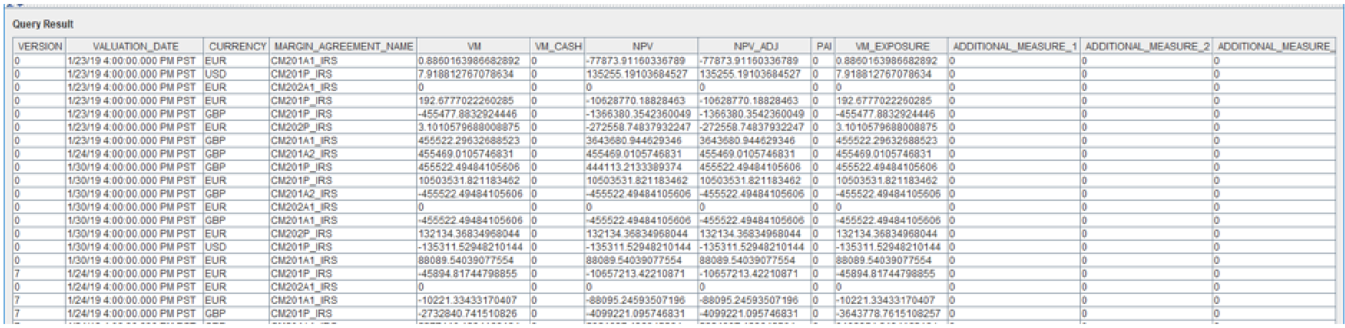
When the scheduled task is run for a certain date, the resulting VM measures are stored in the following tables: margin_trade_vm and margin_portfolio_vm. No PL Marks will be generated for these measures. These measures can be configured in the trade browser and can be added as additional columns for reporting.

Table margin_trade_vm

Query Result

TRADE_ID	VALUATION_DATE	CURRENCY	MARGIN_AGREEMENT_NAME	VM	VM_CASH	NPV	NPV_ADJ	PAI	VM_EXPOSURE	ADDITIONAL_MEASURE_1	ADDITIONAL_MEASURE_2	ADDITIONAL_MEASU
598430	1/23/19 4:00:00.000 PM PST	GBP	CM201P_IRS	0	0	0	0	0	0	0	0	0
598934	1/23/19 4:00:00.000 PM PST	EUR	CM201P_IRS	0.8860163986682892	0	-77873.91160336789	-77873.91160336789	0	0.8860163986682892	0	0	0
625029	1/23/19 4:00:00.000 PM PST	EUR	CM201P_IRS	0.8860163986682892	0	-77873.91160336789	-77873.91160336789	0	0.8860163986682892	0	0	0
598930	1/23/19 4:00:00.000 PM PST	USD	CM201P_IRS	7.918812767078634	0	135255.19103684527	135255.19103684527	0	7.918812767078634	0	0	0
631014	1/23/19 4:00:00.000 PM PST	GBP	CM201P_IRS	-8.882606888131704	0	-455460.1180786683	-455460.1180786683	0	-8.882606888131704	0	0	0
598933	1/23/19 4:00:00.000 PM PST	GBP	CM201P_IRS	-8.882606888131704	0	-455460.1180786683	-455460.1180786683	0	-8.882606888131704	0	0	0
631006	1/23/19 4:00:00.000 PM PST	GBP	CM201P_IRS	-8.882606888131704	0	-455460.1180786683	-455460.1180786683	0	-8.882606888131704	0	0	0
628503	1/23/19 4:00:00.000 PM PST	GBP	CM201P_IRS	8.882606888131704	0	455460.1180786683	455460.1180786683	0	8.882606888131704	0	0	0
631517	1/23/19 4:00:00.000 PM PST	GBP	CM201P_IRS	-455460.1180786683	0	-455460.1180786683	-455460.1180786683	0	-455460.1180786683	0	0	0
625511	1/23/19 4:00:00.000 PM PST	EUR	CM201P_IRS	0.8860163986682892	0	-77873.91160336789	-77873.91160336789	0	0.8860163986682892	0	0	0
631008	1/23/19 4:00:00.000 PM PST	GBP	CM201P_IRS	-8.882606888131704	0	-455460.1180786683	-455460.1180786683	0	-8.882606888131704	0	0	0
628005	1/23/19 4:00:00.000 PM PST	GBP	CM201P_IRS	8.882606888131704	0	455460.1180786683	455460.1180786683	0	8.882606888131704	0	0	0
598931	1/23/19 4:00:00.000 PM PST	EUR	CM201P_IRS	64.65461673401296	0	-6588142.06510835	-6588142.06510835	0	64.65461673401296	0	0	0
598431	1/23/19 4:00:00.000 PM PST	EUR	CM201P_IRS	87.53076844108728	0	-17451.583623906976	-17451.583623906976	0	87.53076844108728	0	0	0
628003	1/23/19 4:00:00.000 PM PST	GBP	CM201P_IRS	8.882606888131704	0	455460.1180786683	455460.1180786683	0	8.882606888131704	0	0	0
631504	1/23/19 4:00:00.000 PM PST	GBP	CM201P_IRS	-8.882606888131704	0	-455460.1180786683	-455460.1180786683	0	-8.882606888131704	0	0	0
628007	1/23/19 4:00:00.000 PM PST	GBP	CM201P_IRS	8.882606888131704	0	455460.1180786683	455460.1180786683	0	8.882606888131704	0	0	0
624579	1/23/19 4:00:00.000 PM PST	EUR	CM201P_IRS	0.8860163986682892	0	-77873.91160336789	-77873.91160336789	0	0.8860163986682892	0	0	0
629504	1/23/19 4:00:00.000 PM PST	GBP	CM201P_IRS	-8.882606888131704	0	-455460.1180786683	-455460.1180786683	0	-8.882606888131704	0	0	0
598932	1/23/19 4:00:00.000 PM PST	EUR	CM201P_IRS	36.50524268345907	0	-3672743.8795696828	-3672743.8795696828	0	36.50524268345907	0	0	0
628505	1/23/19 4:00:00.000 PM PST	GBP	CM201P_IRS	8.882606888131704	0	455460.1180786683	455460.1180786683	0	8.882606888131704	0	0	0
627017	1/23/19 4:00:00.000 PM PST	EUR	CM201P_IRS	0.4430087727960199	0	-38937.013569218805	-38937.013569218805	0	0.4430087727960199	0	0	0
629508	1/23/19 4:00:00.000 PM PST	GBP	CM201P_IRS	-8.882606888131704	0	-455460.1180786683	-455460.1180786683	0	-8.882606888131704	0	0	0
631007	1/23/19 4:00:00.000 PM PST	GBP	CM201A1_IRS	8.882606888131704	0	455460.1180786683	455460.1180786683	0	8.882606888131704	0	0	0
629007	1/23/19 4:00:00.000 PM PST	GBP	CM201A1_IRS	8.882606888131704	0	455460.1180786683	455460.1180786683	0	8.882606888131704	0	0	0
631503	1/23/19 4:00:00.000 PM PST	GBP	CM201A1_IRS	8.882606888131704	0	455460.1180786683	455460.1180786683	0	8.882606888131704	0	0	0
629503	1/23/19 4:00:00.000 PM PST	GBP	CM201A1_IRS	8.882606888131704	0	455460.1180786683	455460.1180786683	0	8.882606888131704	0	0	0
631009	1/23/19 4:00:00.000 PM PST	GBP	CM201A1_IRS	8.882606888131704	0	455460.1180786683	455460.1180786683	0	8.882606888131704	0	0	0
631015	1/23/19 4:00:00.000 PM PST	GBP	CM201A1_IRS	8.882606888131704	0	455460.1180786683	455460.1180786683	0	8.882606888131704	0	0	0
600430	1/23/19 4:00:00.000 PM PST	EUR	CM201A1_IRS	0.8860163986682892	0	-77873.91160336789	-77873.91160336789	0	0.8860163986682892	0	0	0

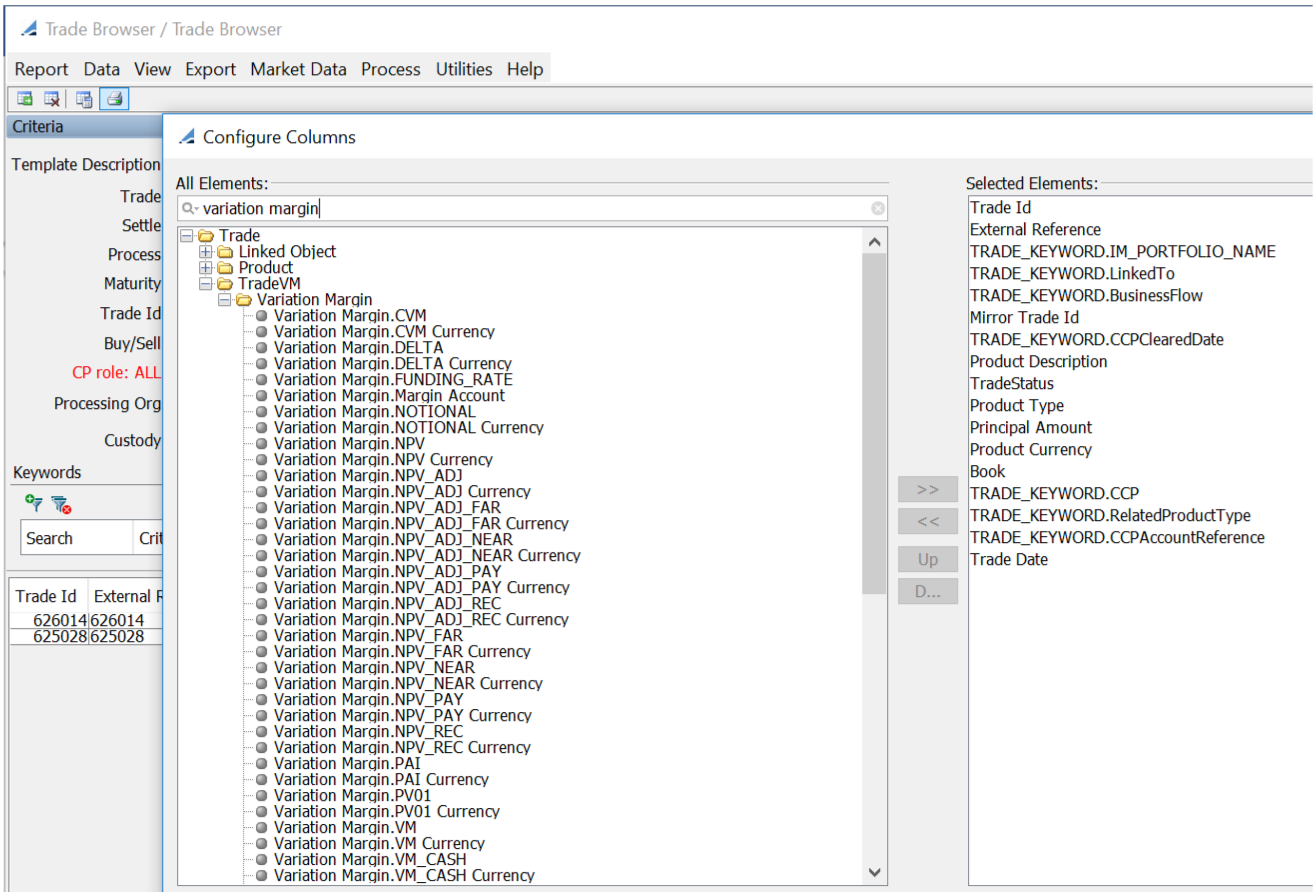
Table margin_portfolio_vm

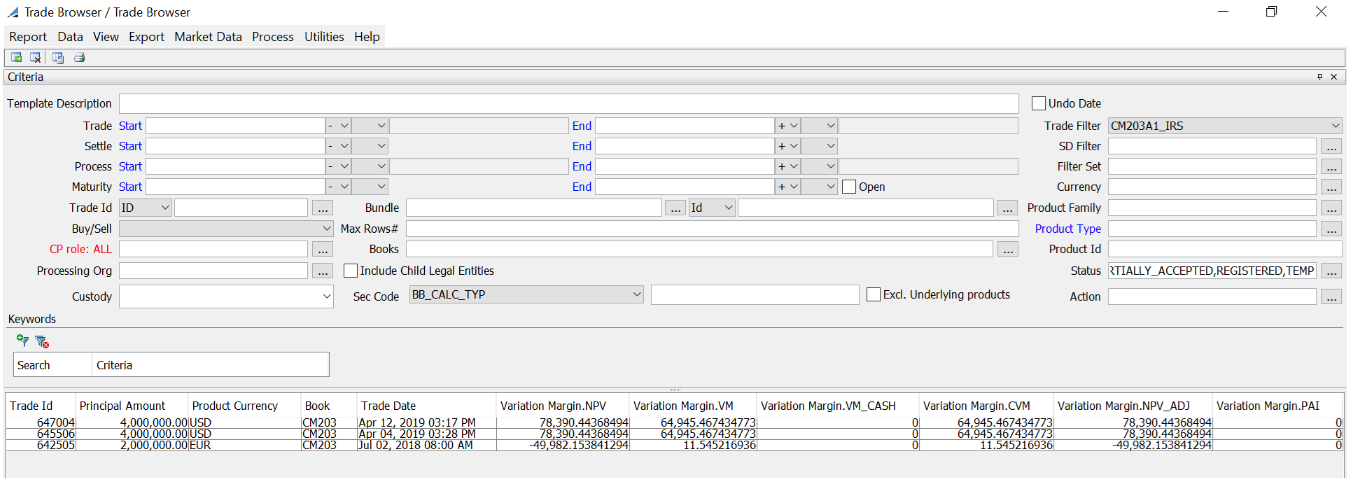


Query Result

VERSION	VALUATION_DATE	CURRENCY	MARGIN_AGREEMENT_NAME	VM	VM_CASH	NPV	NPV_ADJ	PAI	VM_EXPOSURE	ADDITIONAL_MEASURE_1	ADDITIONAL_MEASURE_2	ADDITIONAL_MEASURE_
0	1/23/19 4:00:00.000 PM PST	EUR	CM201A1_IRS	0.8860163986682892	0	-77873.91160336789	-77873.91160336789	0	0.8860163986682892	0	0	0
0	1/23/19 4:00:00.000 PM PST	USD	CM201P_IRS	7.918812767078634	0	135255.19103684527	135255.19103684527	0	7.918812767078634	0	0	0
0	1/23/19 4:00:00.000 PM PST	EUR	CM202A1_IRS	0	0	0	0	0	0	0	0	0
0	1/23/19 4:00:00.000 PM PST	EUR	CM201P_IRS	192.6777022260285	0	-10628770.18828463	-10628770.18828463	0	192.6777022260285	0	0	0
0	1/23/19 4:00:00.000 PM PST	GBP	CM201P_IRS	-455477.8832924446	0	-1366380.3542360049	-1366380.3542360049	0	-455477.8832924446	0	0	0
0	1/23/19 4:00:00.000 PM PST	EUR	CM202P_IRS	3.1010579688008875	0	-272558.74837932247	-272558.74837932247	0	3.1010579688008875	0	0	0
0	1/23/19 4:00:00.000 PM PST	GBP	CM201A1_IRS	455522.29632688523	0	3643680.944629346	3643680.944629346	0	455522.29632688523	0	0	0
0	1/24/19 4:00:00.000 PM PST	GBP	CM201A2_IRS	455469.0105746831	0	455469.0105746831	455469.0105746831	0	455469.0105746831	0	0	0
0	1/30/19 4:00:00.000 PM PST	GBP	CM201P_IRS	455522.49484105606	0	444113.2133389374	455522.49484105606	0	455522.49484105606	0	0	0
0	1/30/19 4:00:00.000 PM PST	EUR	CM201P_IRS	10503531.821183462	0	10503531.821183462	10503531.821183462	0	10503531.821183462	0	0	0
0	1/30/19 4:00:00.000 PM PST	GBP	CM201A2_IRS	-455522.49484105606	0	-455522.49484105606	-455522.49484105606	0	-455522.49484105606	0	0	0
0	1/30/19 4:00:00.000 PM PST	EUR	CM202A1_IRS	0	0	0	0	0	0	0	0	0
0	1/30/19 4:00:00.000 PM PST	GBP	CM201A1_IRS	-455522.49484105606	0	-455522.49484105606	-455522.49484105606	0	-455522.49484105606	0	0	0
0	1/30/19 4:00:00.000 PM PST	EUR	CM202P_IRS	132134.36834968044	0	132134.36834968044	132134.36834968044	0	132134.36834968044	0	0	0
0	1/30/19 4:00:00.000 PM PST	USD	CM201P_IRS	-135311.52948210144	0	-135311.52948210144	-135311.52948210144	0	-135311.52948210144	0	0	0
0	1/30/19 4:00:00.000 PM PST	EUR	CM201A1_IRS	88089.54039077554	0	88089.54039077554	88089.54039077554	0	88089.54039077554	0	0	0
7	1/24/19 4:00:00.000 PM PST	EUR	CM201P_IRS	-45894.81744798855	0	-10657213.42210871	-10657213.42210871	0	-45894.81744798855	0	0	0
0	1/24/19 4:00:00.000 PM PST	EUR	CM202A1_IRS	0	0	0	0	0	0	0	0	0
7	1/24/19 4:00:00.000 PM PST	EUR	CM201A1_IRS	-10221.33433170407	0	-88095.24593507196	-88095.24593507196	0	-10221.33433170407	0	0	0
7	1/24/19 4:00:00.000 PM PST	GBP	CM201P_IRS	-2732840.741510826	0	-4099221.095746831	-4099221.095746831	0	-3643778.7615108257	0	0	0

The variation margin results can also be configured in the trade browser by adding the desired columns.

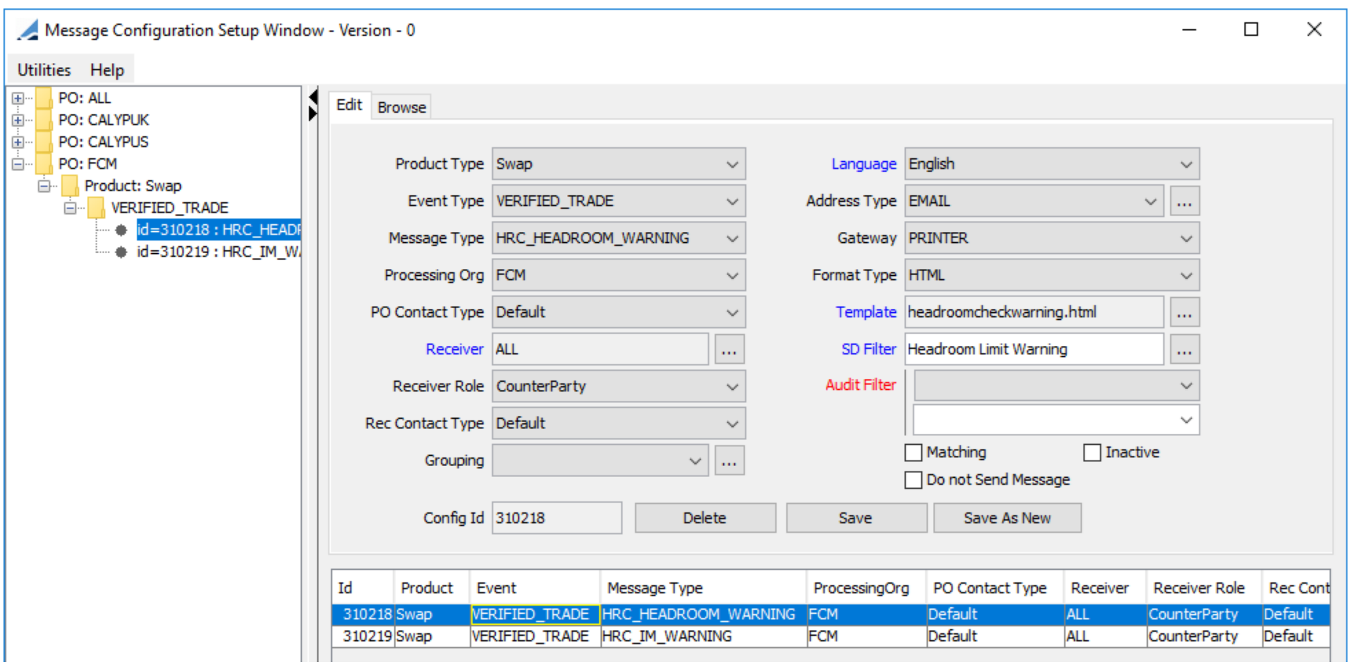




4.9 Email Alert

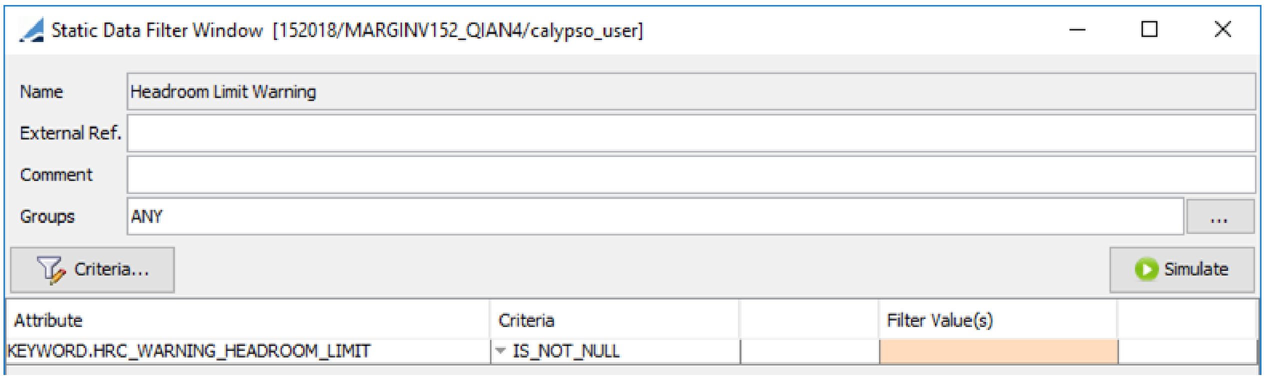
You can setup an email alert if the available limit is close to preventing from clearing more trades. For example, if the warning level is 80% and the limit is $10,000,000, if the limit utilization reaches $8,000,000, a trade keyword is set on the trade (HEADROOM_IN_WARNING = Y), and an email is triggered.

Message Configuration HRC_HEADROOM_WARNING



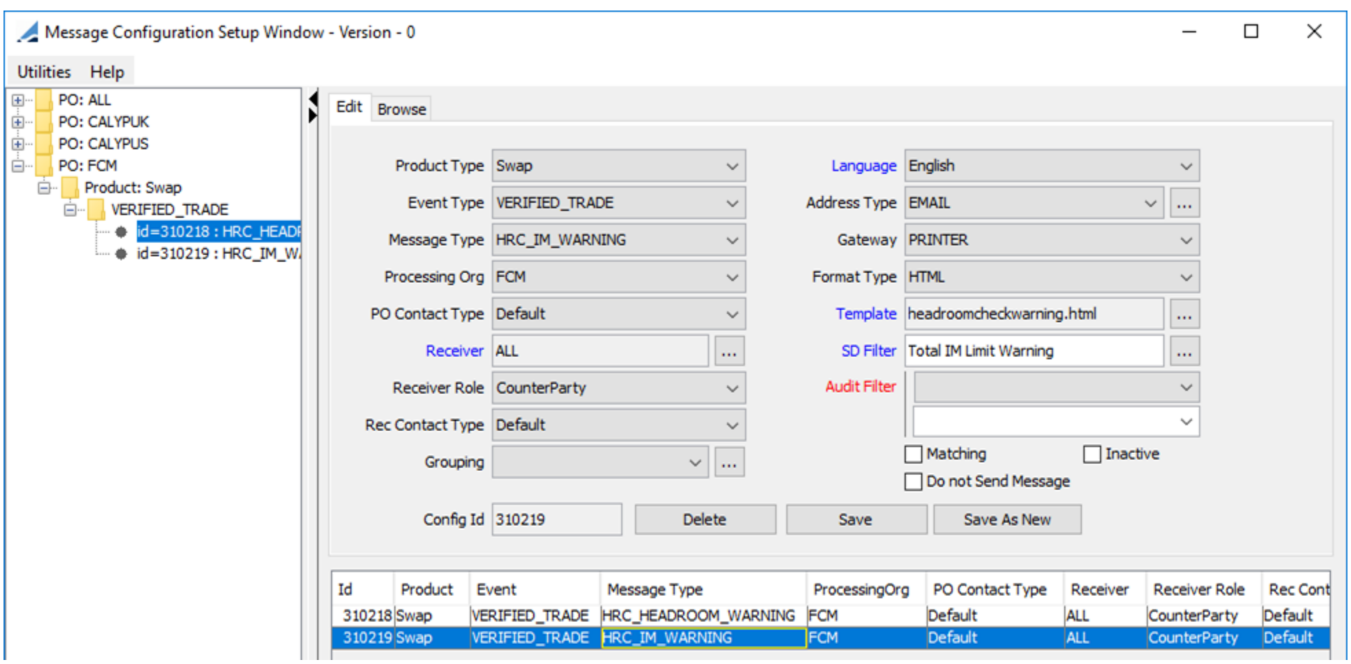
- Product Type = Swap

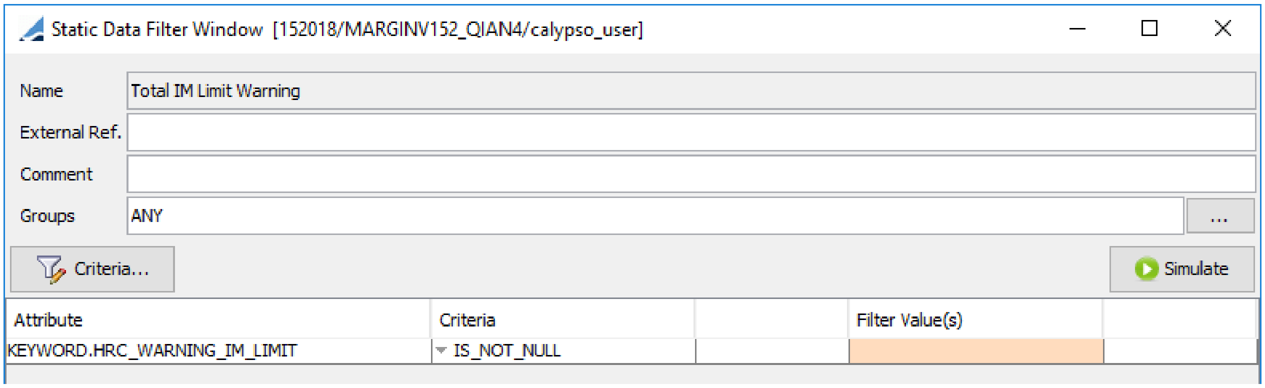
- Event Type = VERIFIED status of the trade. This can be changed according to client's requirement. E.g. client can decide when this message will be generated.
- Address Type = "EMAIL"
- Gateway = "PRINTER"
- Format Type = HTML
- Template can be a custom one
- SD filter filters trades with keyword Headroom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



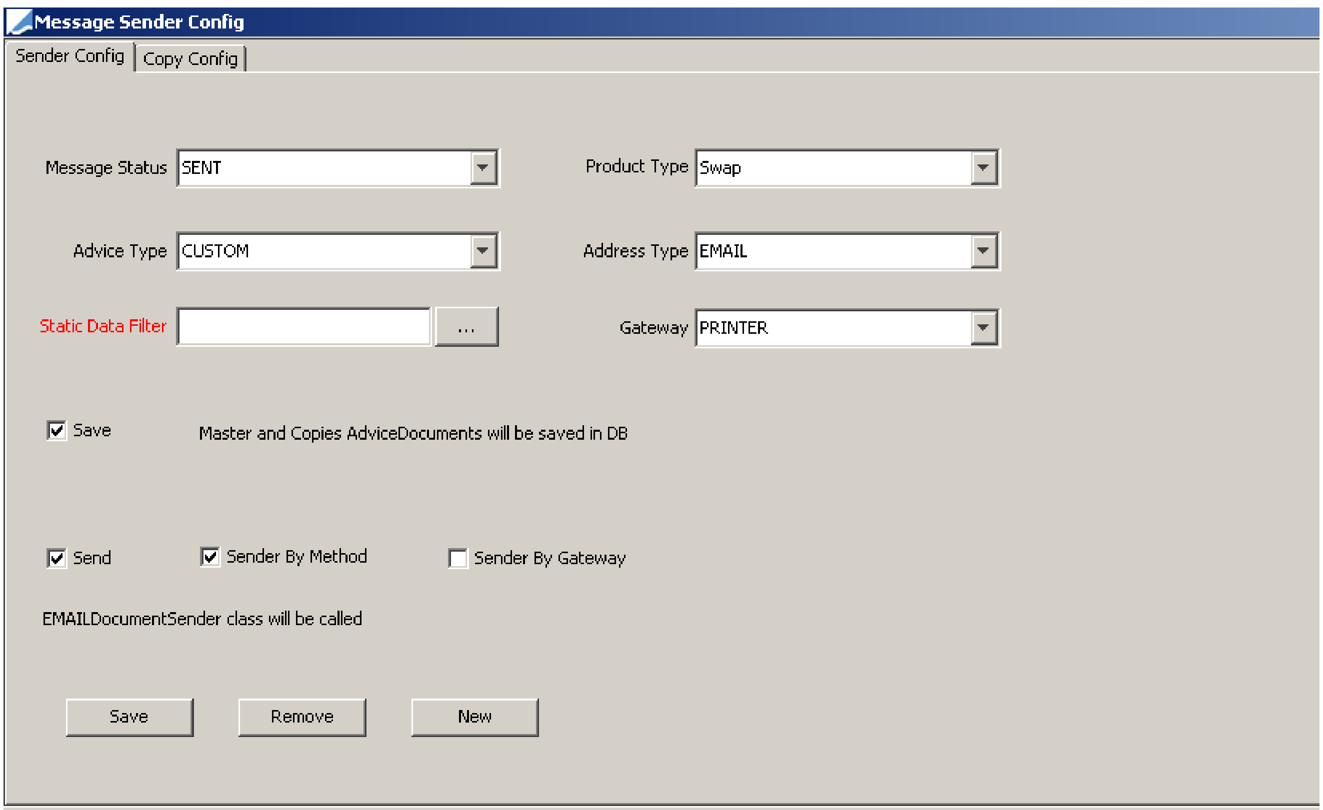
- PO Contact Type set to Default
- Rec Contact Type set to Default

Message Configuration HRC_IM_WARNING



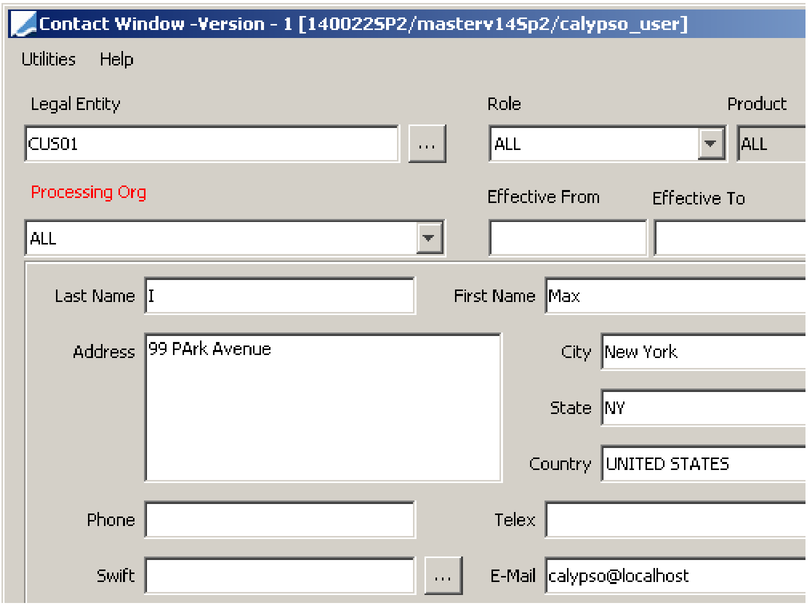


Messenger Sender Configuration



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.

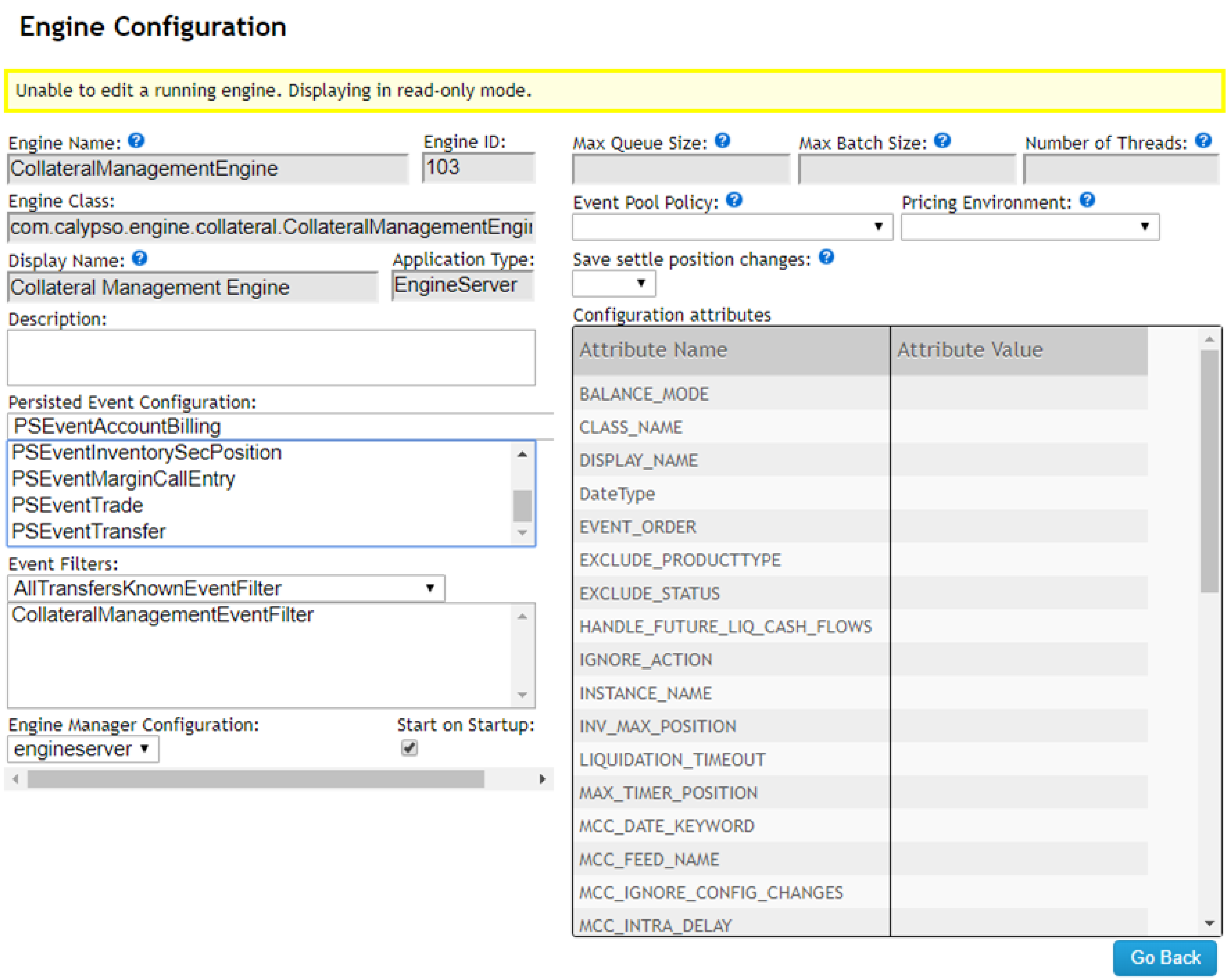


Email address is configured on the sender's and receiver's contact specified in the Message Setup.

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.

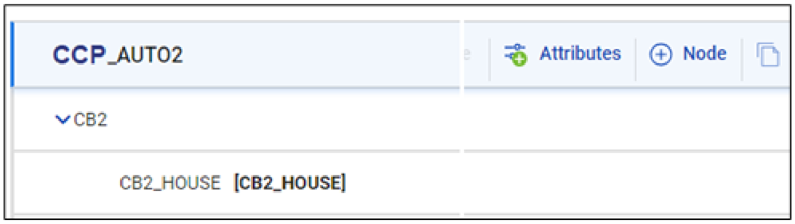
5.1 Collateral Management Engine



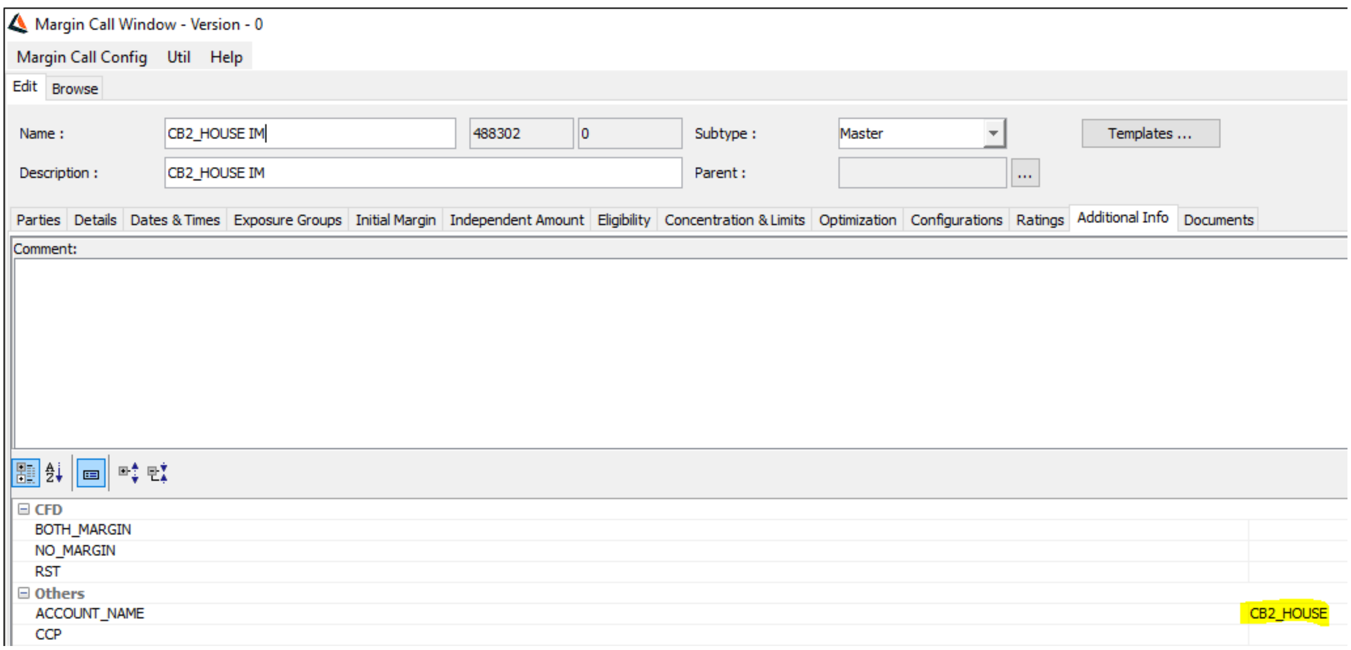
5.2 Margin Call Contracts

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

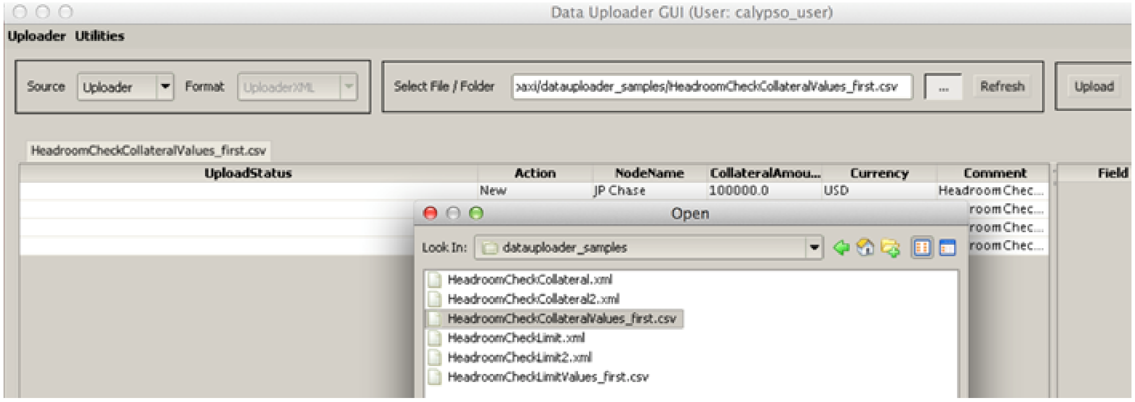
External Collateral Amounts can be imported using the Data Uploader.

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:



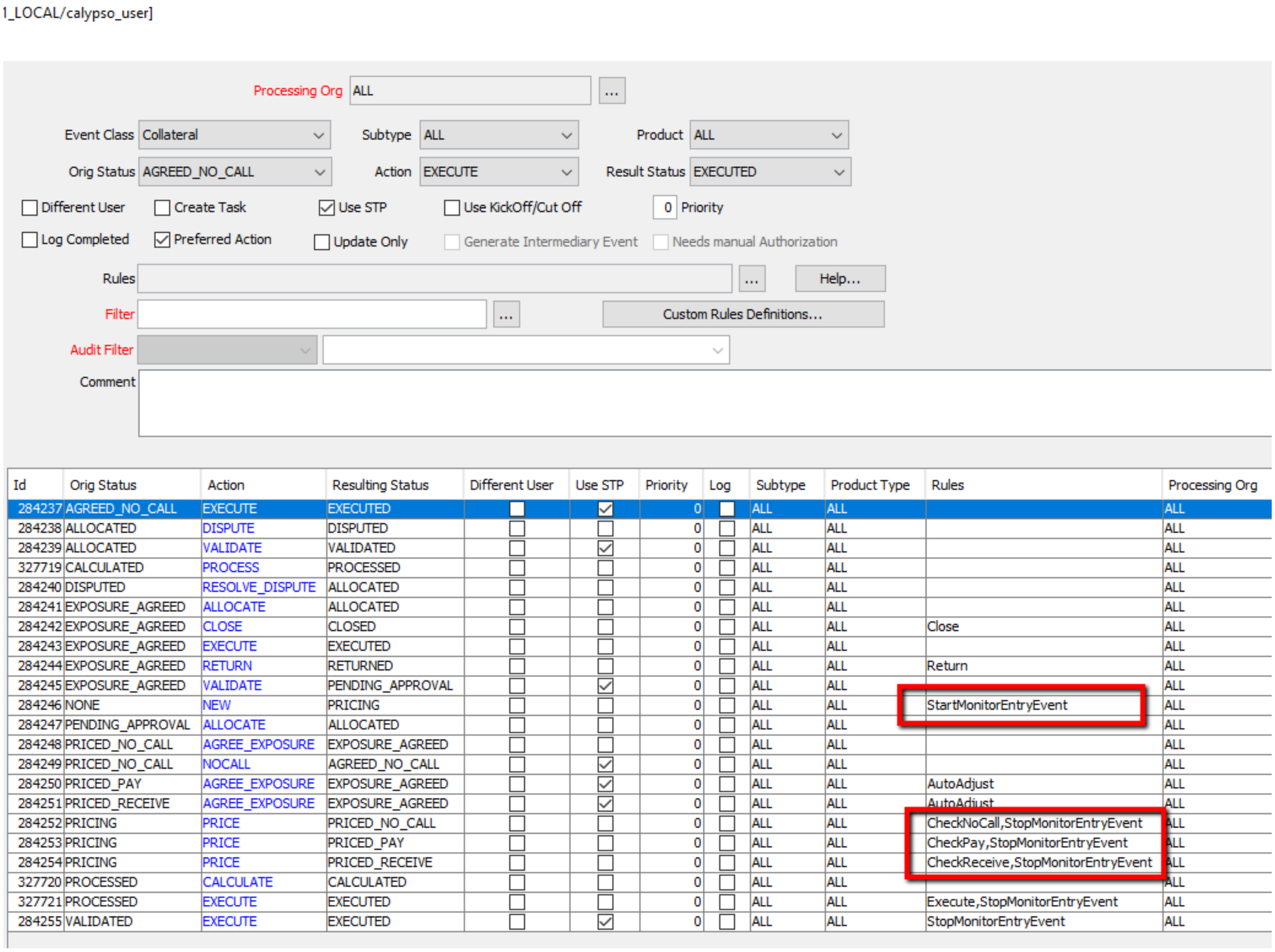
» Click **Upload** to load the collateral amounts into Calypso.

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.

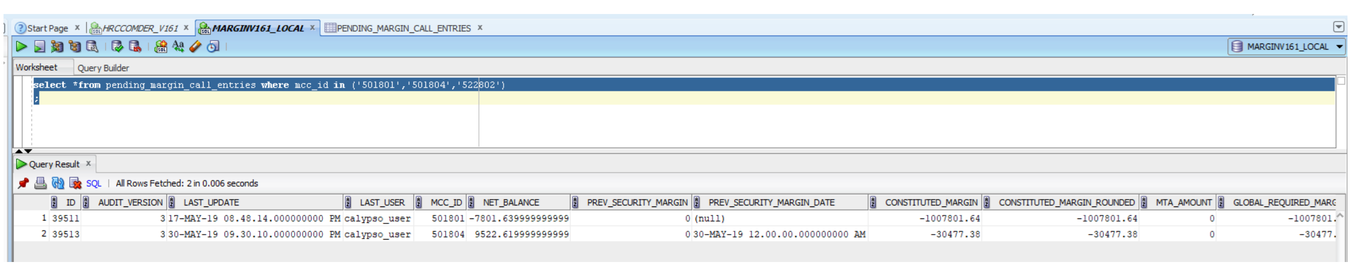
- All the transitions from NONE to EXECUTED should be STP.
- Add the rule StartMonitorEntryEvent on the transition NONE – NEW – PRICING. It allows the scheduled task COLLATERAL_MANAGEMENT to monitor collateral positions changes. It generates PSEventMarginCallEntry events that are consumed by the CollateralManagement 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.



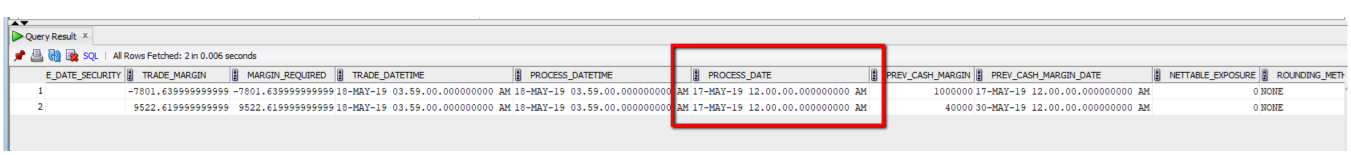
Id	Orig Status	Action	Resulting Status	Different User	Use STP	Priority	Log	Subtype	Product Type	Rules	Processing Org
284237	AGREED_NO_CALL	EXECUTE	EXECUTED	☐	☑	0	☐	ALL	ALL		ALL
284238	ALLOCATED	DISPUTE	DISPUTED	☐	☐	0	☐	ALL	ALL		ALL
284239	ALLOCATED	VALIDATE	VALIDATED	☐	☑	0	☐	ALL	ALL		ALL
327719	CALCULATED	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

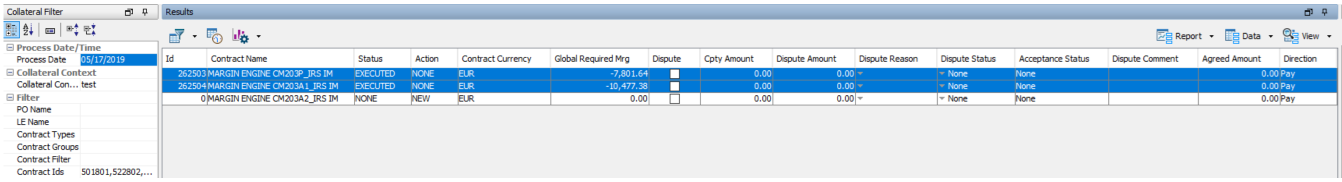


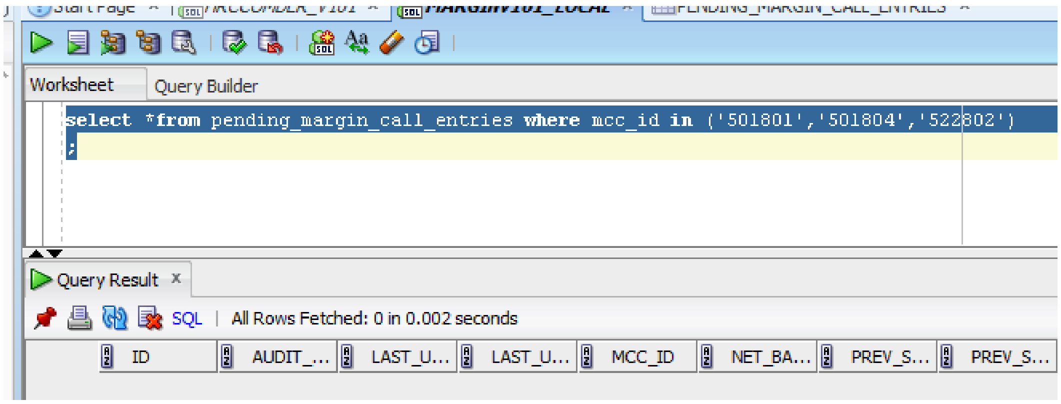
	ID	AUDIT_VERSION	LAST_UPDATE	LAST_USER	MCC_ID	NET_BALANCE	PREV_SECURITY_MARGIN	PREV_SECURITY_MARGIN_DATE	CONSTITUTED_MARGIN	CONSTITUTED_MARGIN_ROUNDED	MTA_AMOUNT	GLOBAL_REQUIRED_MARG
1	39511	3	17-MAY-19 08.48.14.000000000 PM	calypso_user	501801	-7801.639999999999	0	(null)	-1007801.64	-1007801.64	0	-1007801.
2	39513	3	30-MAY-19 09.30.10.000000000 PM	calypso_user	501804	9522.619999999999	0	30-MAY-19 12.00.00.000000000 AM	-30477.38	-30477.38	0	-30477.

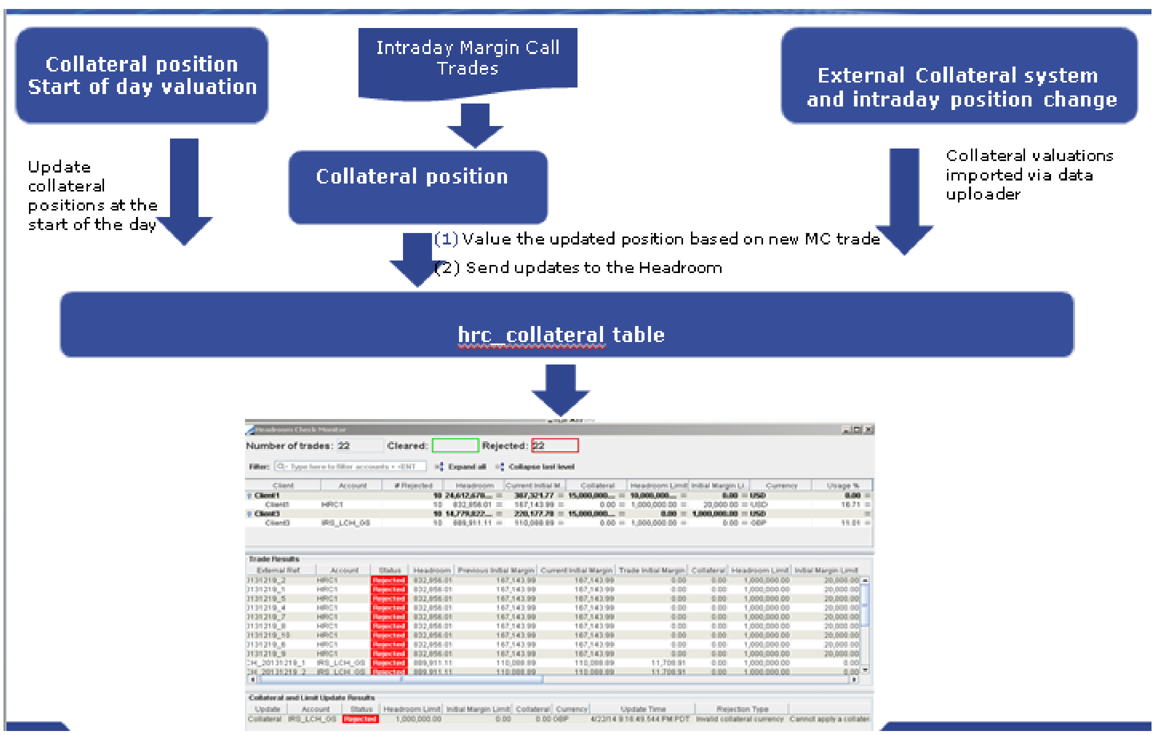


	E_DATE_SECURITY	TRADE_MARGIN	MARGIN_REQUIRED	TRADE_DATETIME	PROCESS_DATETIME	PROCESS_DATE	PREV_CASH_MARGIN	PREV_CASH_MARGIN_DATE	NETTABLE_EXPOSURE	ROUNDING_METH
1		-7801.639999999999	-7801.639999999999	18-MAY-19 03.59.00.000000000 AM	18-MAY-19 03.59.00.000000000 AM	17-MAY-19 12.00.00.000000000 AM	1000000	17-MAY-19 12.00.00.000000000 AM	0	NONE
2		9522.619999999999	9522.619999999999	18-MAY-19 03.59.00.000000000 AM	18-MAY-19 03.59.00.000000000 AM	17-MAY-19 12.00.00.000000000 AM	40000	30-MAY-19 12.00.00.000000000 AM	0	NONE

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

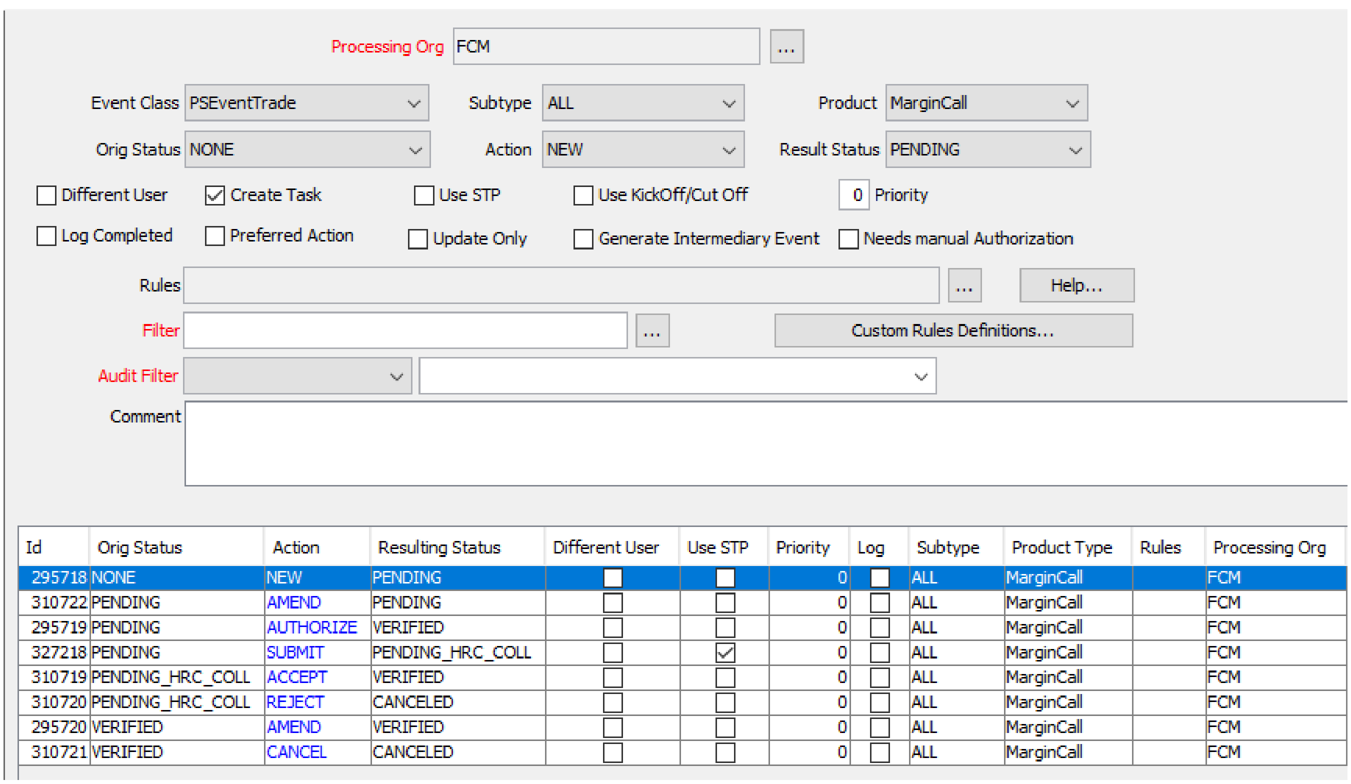
10. The DataPersistor applies the "ACCEPT" or "REJECT" action to the Margin Call Trade

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

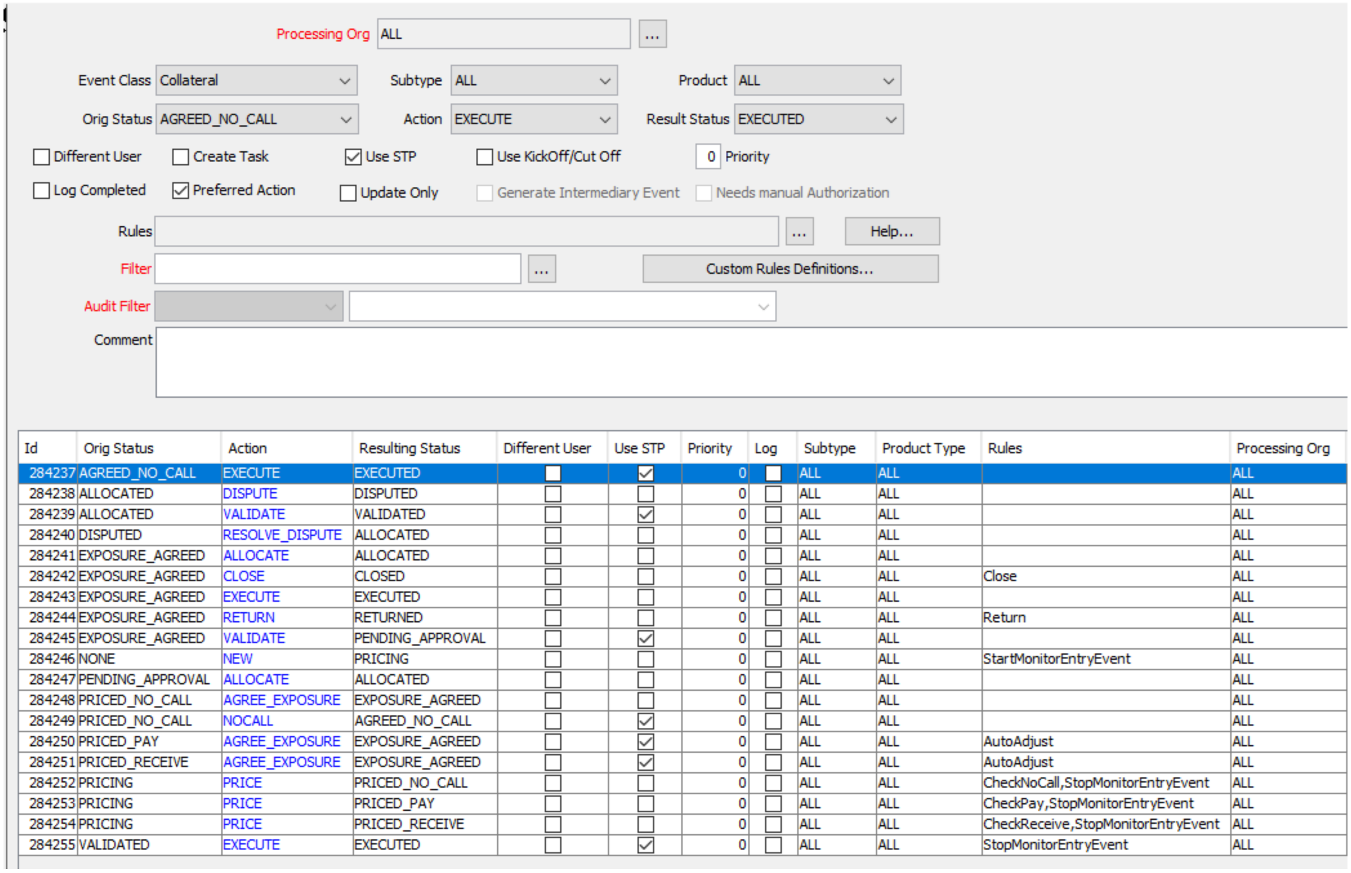
12. If rejected, the transfers are canceled

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

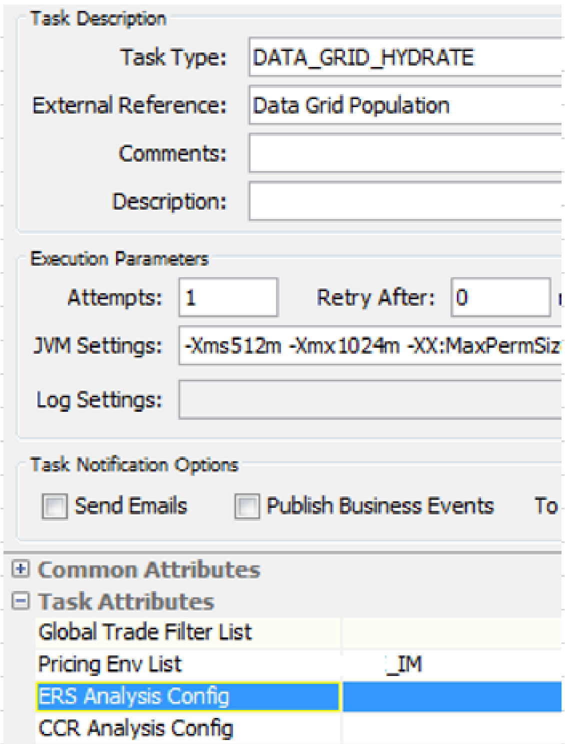
6.2 Computing the Margins

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.



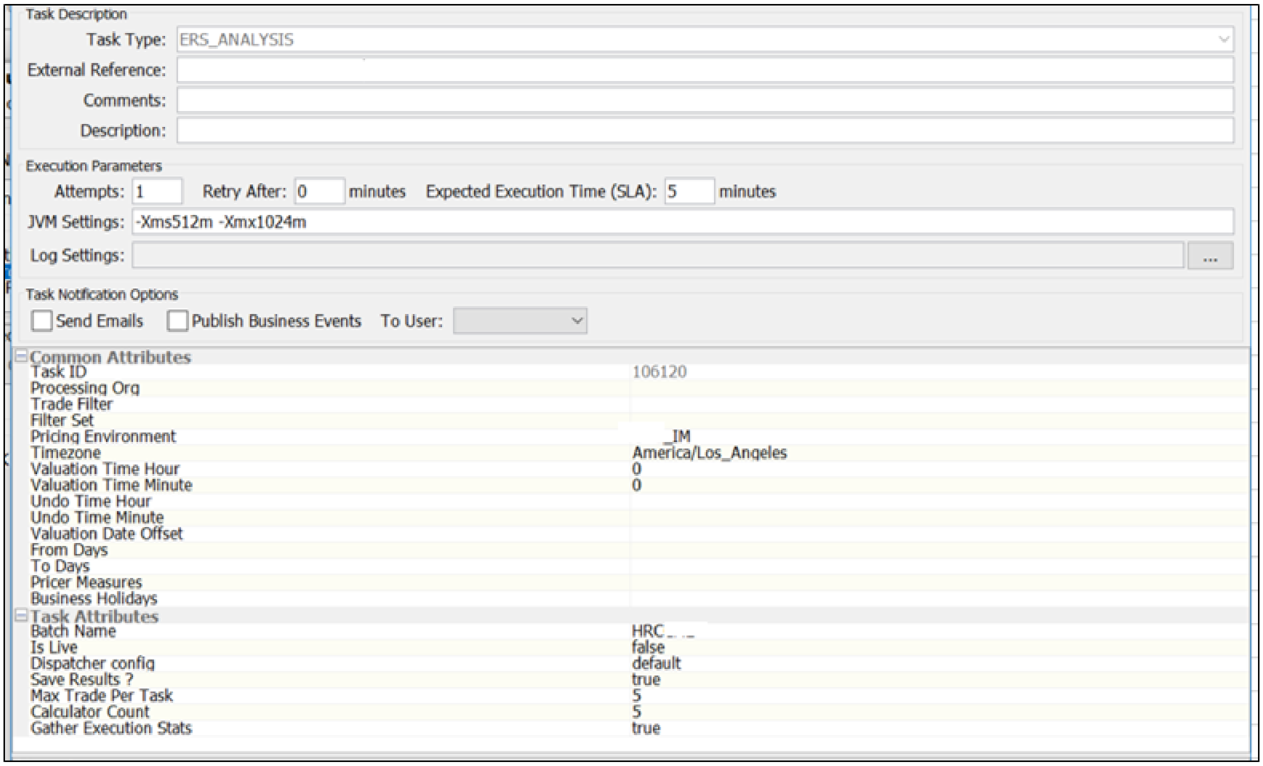
- Enter a trade filter
- Enter a pricing environment
- Enter the Market Risk Batch for which you want to use a data grid.

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:

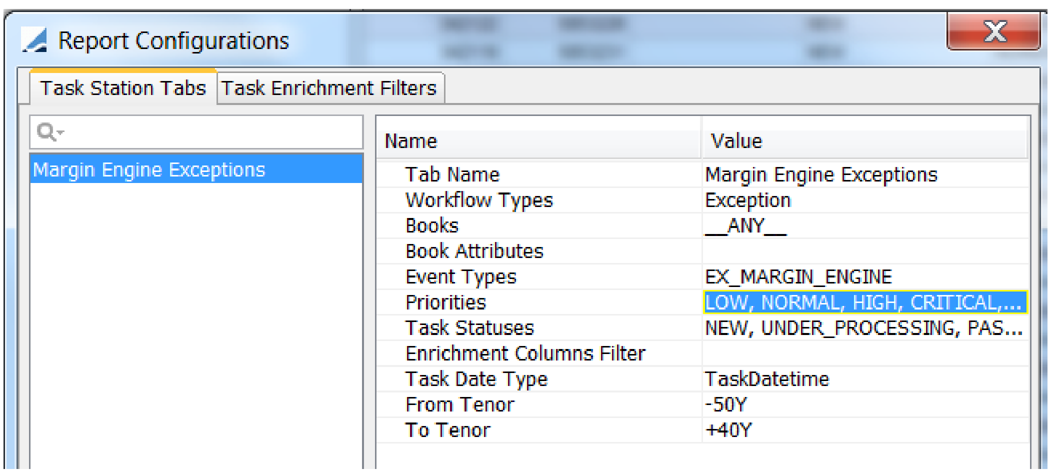
- CLEARING_RISK_SERVICE

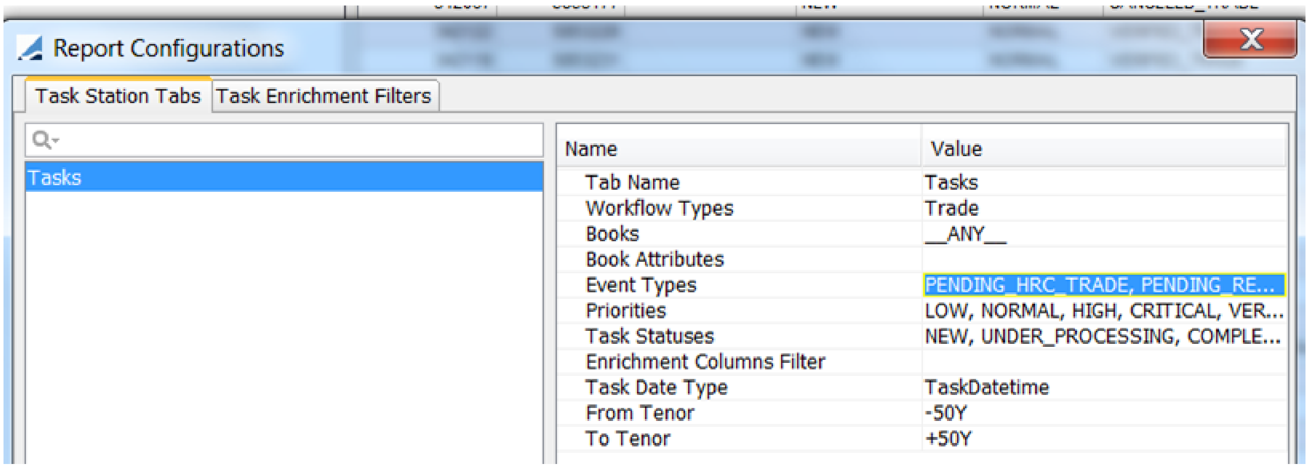
6.2.5 Margin Engine Monitoring

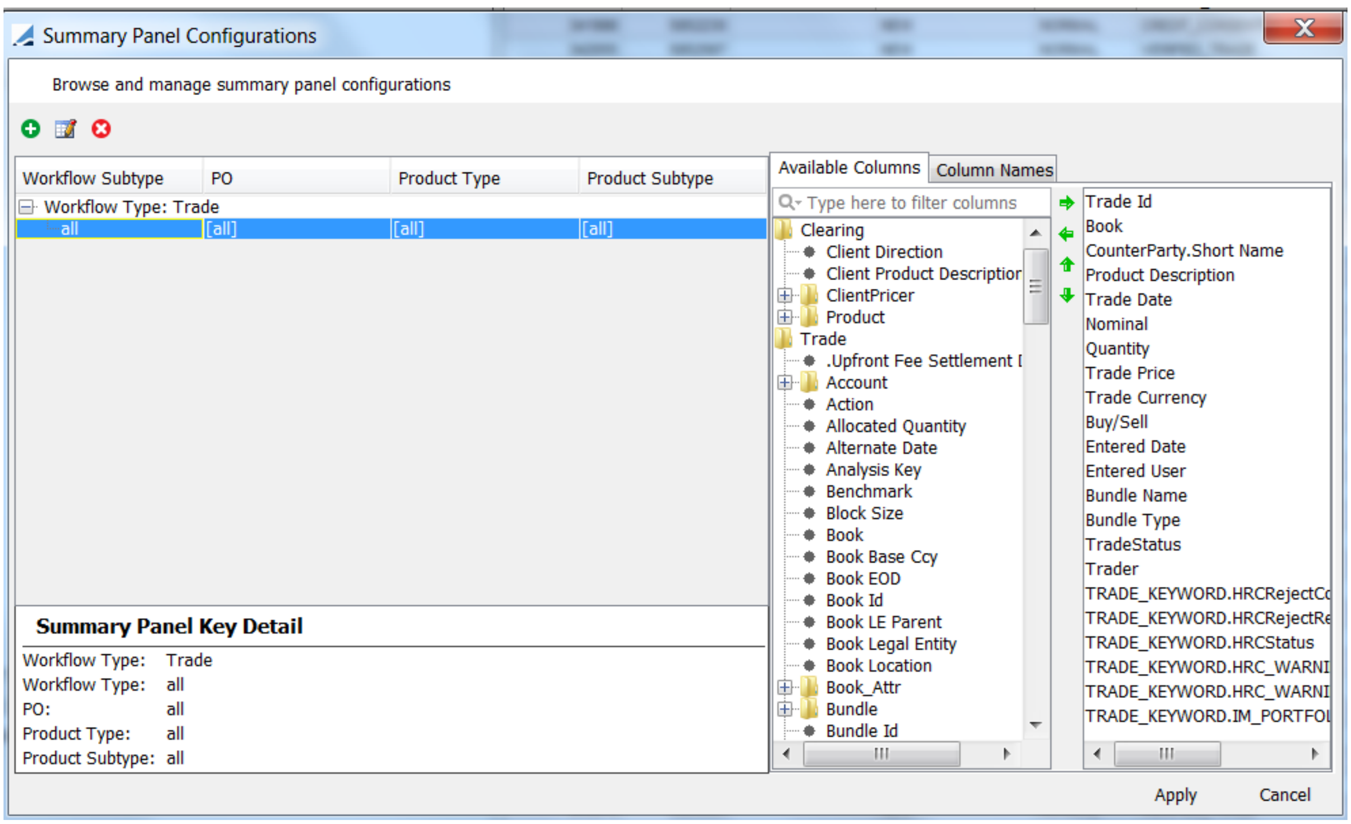
Margin Engine Monitoring

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.

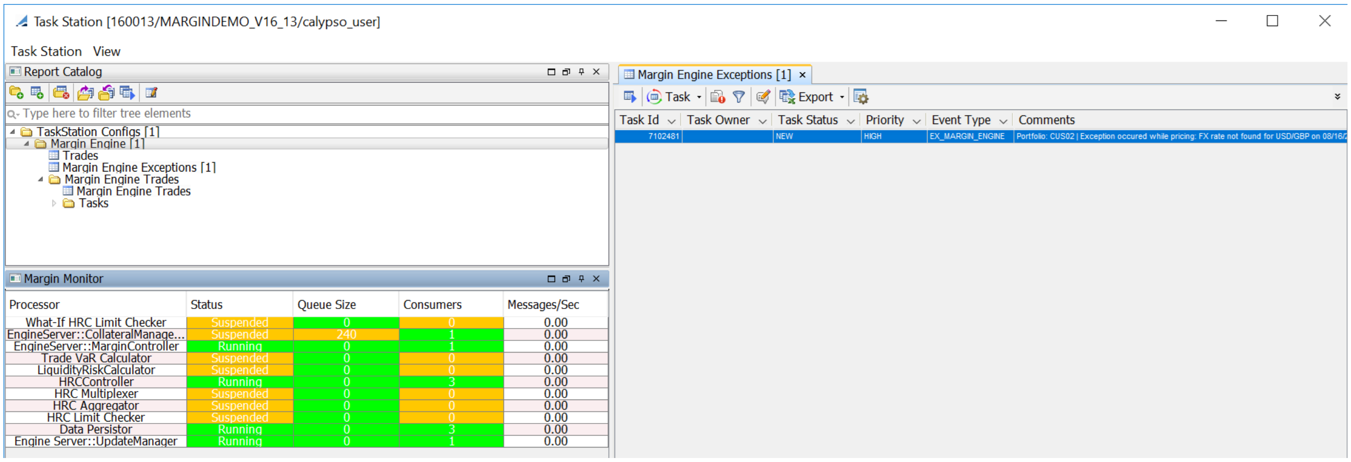
Task Station Setup

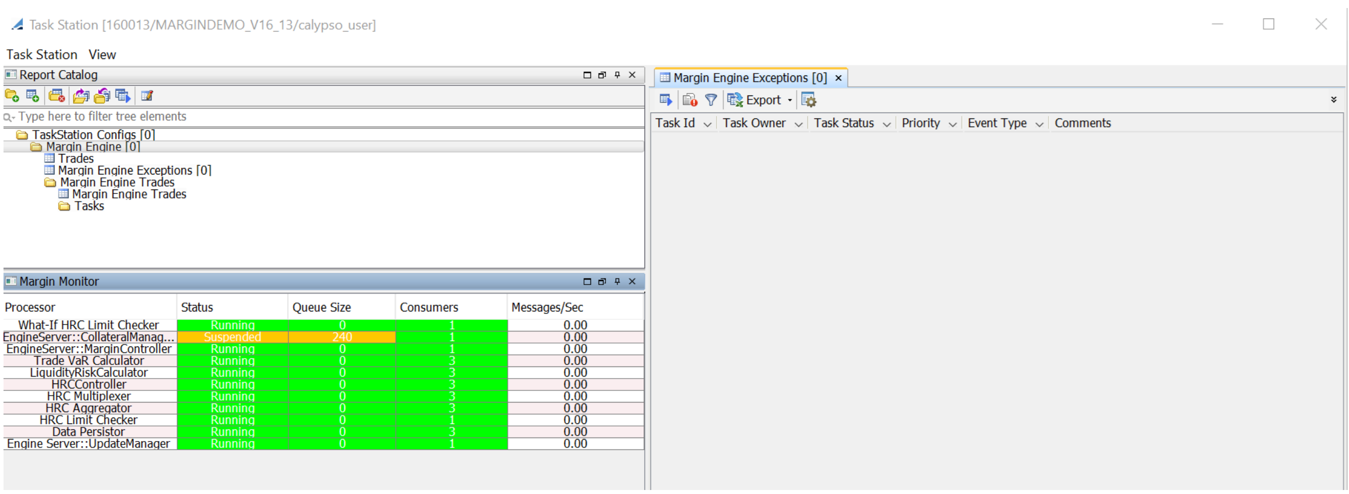






Sample Outputs





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.

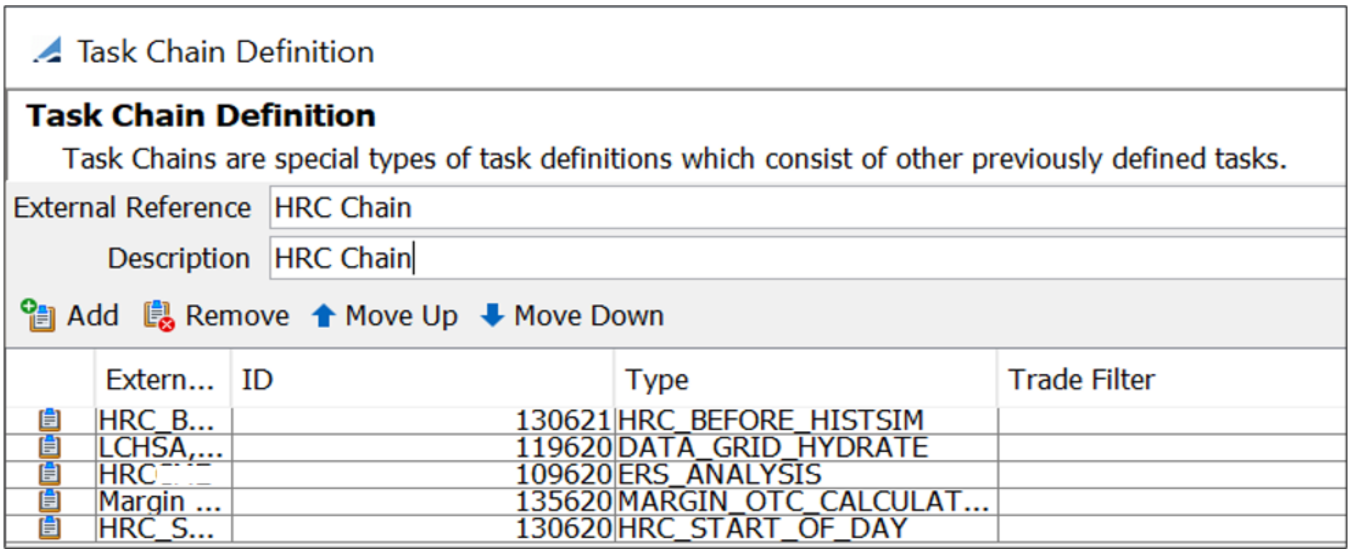
You can also use the scheduled task HRC_START_OF_DAY with everything set to true to initialize the process.

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:

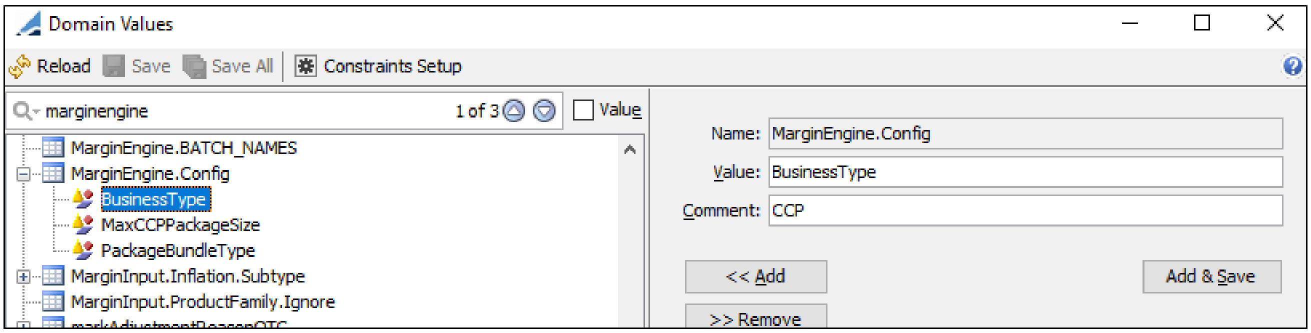
HRC Utilization = Total IM

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

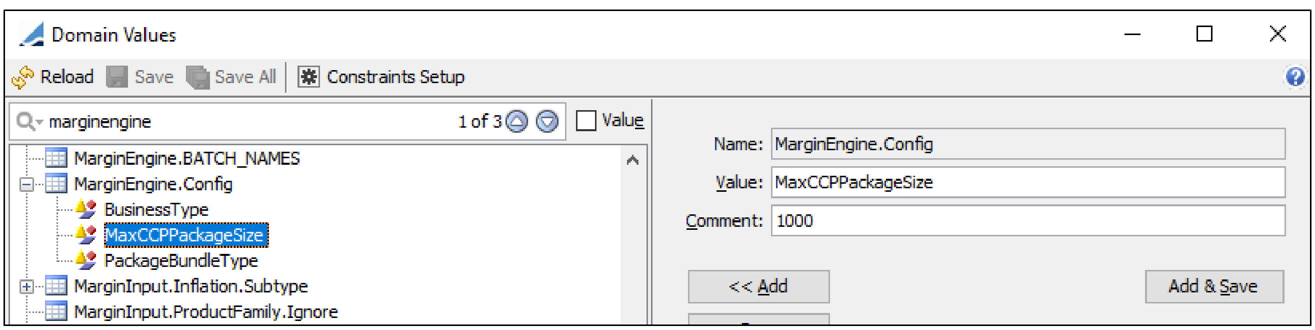
7. OTC Margin Headroom Check Life-cycle

7.1 Configuration

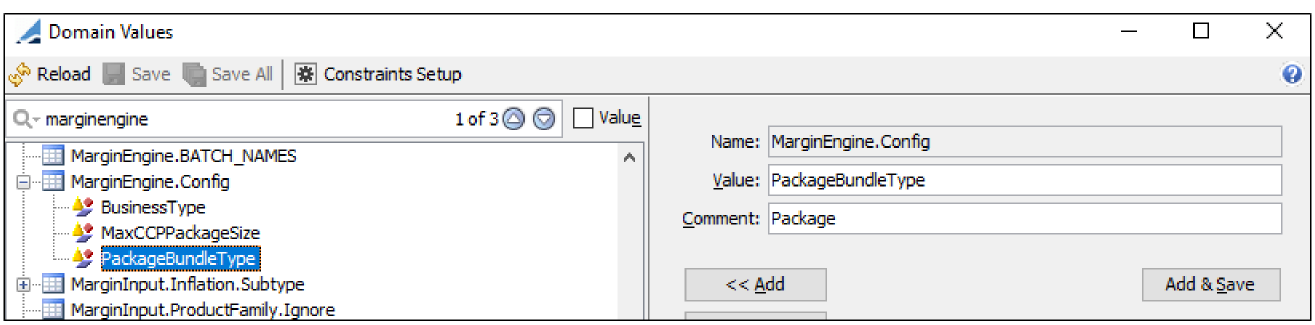
1. The domain value for business type should be set to CCP



2. Max CCP package size is the maximum number of trades in a trade package configured by the user.



3. Package Bundle type can be configured as 'Package' for trade package lifecycle events.



4. The workflow statuses can be configured by the CCP using the below domain where the comment section can be used to describe if the trades will be added or removed by the action resulting in this status. The names of the actions in the workflows would remain constant and cannot be configured.

Domain "MarginEngine.Config.CCPTradeIntegration":

Value = WAIT_TRANSFER

Comment = REMOVE

Value = WAIT_TERMINATE

Comment = REMOVE

Value = WAIT_MARGIN

Comment = ADD

Value = WAIT_DECLEAR

Comment = REMOVE

Sample CCP Workflow

Below is a sample CCP workflow which shows different trade lifecycle workflows with the above status customization.

Orig Status	Action	Resulting Status	Use STP	Sub Type	Product Type	Rules
CLEARED	PORTFOLIO_ TRANSFER	WAIT_P_TRANSFER	false	ALL	ALL	
CLEARED	COMPRESS	WAIT_COMPRESSION	false	ALL	ALL	
CLEARED	ROLLBACK	WAIT_BULK_MARGIN	false	ALL	ALL	
CLEARED	BACKLOAD	WAIT_BACKLOAD	false	ALL	ALL	
CLEARED	TRANSFER	TO_BE_TRANSFERED	false	ALL	ALL	
CLEARED	TERMINATE	TO_BE_TERMINATED	false	ALL	ALL	
CLEARED	DECLEAR	WAIT_DECLEAR	false	ALL	ALL	ApplyLifeCycle
CLEARED	AMEND	CLEARED	false	ALL	ALL	
CLEARED	CANCEL	CANCELED	false	ALL	ALL	

Orig Status	Action	Resulting Status	Use STP	Sub Type	Product Type	Rules
DECLEARED	ROLLBACK	CLEARED	false	ALL	ALL	
DECLEARED	CANCEL	CANCELED	false	ALL	ALL	
HELD_WAIT_ DECLEAR	SUBMIT	WAIT_DECLEAR	false	ALL	ALL	ApplyLifeCycle
HELD_WAIT_ DECLEAR	REJECT	CLEARED	false	ALL	ALL	
HELD_WAIT_ TERMINATE	SUBMIT	WAIT_TERMINATE	false	ALL	ALL	ApplyLifeCycle
HELD_WAIT_ TERMINATE	REJECT	CLEARED	false	ALL	ALL	
HELD_WAIT_ TRANSFER	SUBMIT	WAIT_TRANSFER	false	ALL	ALL	ApplyLifeCycle
HELD_WAIT_ TRANSFER	REJECT	CLEARED	false	ALL	ALL	
WAIT_DECLEAR	REJECT	HELD_WAIT_ DECLEAR	false	ALL	ALL	
WAIT_DECLEAR	ACCEPT	DECLEARED	false	ALL	ALL	
WAIT_MARGIN	REJECT	PROCESSING	false	ALL	ALL	
WAIT_MARGIN	ACCEPT	CLEARED	false	ALL	ALL	
WAIT_TERMINATE	ACCEPT	TERMINATED	false	ALL	ALL	
WAIT_TERMINATE	REJECT	HELD_WAIT_ TERMINATE	false	ALL	ALL	
WAIT_TRANSFER	ACCEPT	TERMINATED	false	ALL	ALL	
WAIT_TRANSFER	REJECT	HELD_WAIT_ TRANSFER	false	ALL	ALL	
NONE	NEW	PENDING	false	ALL	ALL	
PENDING	ASSIGN	WAIT_BULK_MARGIN	true	ALL	ALL	
PENDING	BACKLOAD	WAIT_BACKLOAD	false	ALL	ALL	
PENDING	AMEND	PENDING	false	ALL	ALL	
PENDING	SUBMIT	WAIT_MARGIN	true	ALL	ALL	ApplyLifeCycle
PENDING	TERMINATE	WAIT_MARGIN	false	ALL	ALL	ApplyLifeCycle
PENDING	TRANSFER	WAIT_MARGIN	false	ALL	ALL	ApplyLifeCycle

Orig Status	Action	Resulting Status	Use STP	Sub Type	Product Type	Rules
PENDING	AUTHORIZE	CLEARED	false	ALL	ALL	
PENDING	CANCEL	CANCELED	false	ALL	ALL	
PROCESSING	REJECT	LIMIT_FAILED	false	ALL	ALL	ApplyLifeCycle
PROCESSING	SUBMIT	WAIT_MARGIN	false	ALL	ALL	ApplyLifeCycle
PROCESSING	CANCEL	CANCELED	false	ALL	ALL	
TERMINATED	COMPRESS	WAIT_COMPRESSION	false	ALL	ALL	
TERMINATED	ROLLBACK	CLEARED	false	ALL	ALL	
TO_BE_TERMINATED	TERMINATE	WAIT_TERMINATE	false	ALL	ALL	ApplyLifeCycle
TO_BE_TERMINATED	ROLLBACK	CLEARED	false	ALL	ALL	
TO_BE_TRANSFERED	PORTFOLIO_ TRANSFER	WAIT_P_TRANSFER	false	ALL	ALL	
TO_BE_TRANSFERED	TRANSFER	WAIT_TRANSFER	false	ALL	ALL	ApplyLifeCycle
WAIT_BACKLOAD	REJECT	WAIT_BACKLOAD	false	ALL	ALL	
WAIT_BACKLOAD	ACCEPT	CLEARED	false	ALL	ALL	
WAIT_BULK_MARGIN	ACCEPT	CLEARED	false	ALL	ALL	
WAIT_BULK_MARGIN	REJECT	CANCELED	false	ALL	ALL	
WAIT_COMPRESSION	ACCEPT	TERMINATED	false	ALL	ALL	
WAIT_COMPRESSION	REJECT	CLEARED	false	ALL	ALL	
WAIT_P_TRANSFER	AMEND	WAIT_P_TRANSFER	false	ALL	ALL	
WAIT_P_TRANSFER	ASSIGN	TO_BE_TRANSFERED	false	ALL	ALL	
WAIT_P_TRANSFER	ACCEPT	TERMINATED	false	ALL	ALL	
WAIT_P_TRANSFER	REJECT	CLEARED	false	ALL	ALL	

7.2 Trade Lifecycle Events

1. New Trade: If a new trade pair is injected, it goes to a status 'WAIT_MARGIN' and this status triggers the post novation events and limit check. The new trade pair goes through margin engine and if its accepted, it goes to 'cleared' status. If the trade pair is rejected, then it will move to 'Processing' status, to wait for reprocessing. User can reprocess rejected trade pair by taking action SUBMIT on one of the trades.

Sample workflow:

328739	PENDING	AUTHORIZE	CLEARED	☐	☐	0	☐	ALL	ALL	
324719	PENDING	CANCEL	CANCELED	☐	☐	0	☐	ALL	ALL	
328718	PENDING	SUBMIT	WAIT_MARGIN	☐	☑	0	☐	ALL	ALL	ApplyLifeCycle
330218	PENDING	TERMINATE	WAIT_MARGIN	☐	☐	0	☐	ALL	ALL	ApplyLifeCycle
329219	PENDING	TRANSFER	WAIT_MARGIN	☐	☐	0	☐	ALL	ALL	ApplyLifeCycle
328722	PROCESSING	REJECT	LIMIT_FAILED	☐	☐	0	☐	ALL	ALL	ApplyLifeCycle

328725	WAIT_DECLEAR	REJECT	HELD_WAIT_DECLEAR	☐	☐	0	☐	ALL	ALL	
328719	WAIT_MARGIN	ACCEPT	CLEARED	☐	☐	0	☐	ALL	ALL	
328720	WAIT_MARGIN	REJECT	PROCESSING	☐	☐	0	☐	ALL	ALL	
328729	WAIT_TERMINATE	ACCEPT	TERMINATED	☐	☐	0	☐	ALL	ALL	

2. DECLEAR: If a cleared trade is decleared, it'll go to the status 'WAIT_DECLEAR' first before post novation events can be triggered. From 'WAIT_DECLEAR' status, it would go through margin engine for limit check and if the trade is accepted it will go to 'DECLEARED' status. But if the trade pair is rejected, then both trades are moved to HELD_WAIT_DECLEAR status and can be resubmitted to go through limit check again.

Sample Workflow:

Id	Orig Status	Action	Resulting Status	Different User	Use STP	Priority	Log	Subtype	Product Type	Rules
328723	CLEARED	DECLEAR	WAIT_DECLEAR	☐	☐	0	☐	ALL	ALL	ApplyLifeCycle
328728	CLEARED	TERMINATE	WAIT_TERMINATE	☐	☐	0	☐	ALL	ALL	ApplyLifeCycle

328745	WAIT_COMPRESSION	REJECT	CLEARED	☐	☐	0	☐	ALL	ALL
328724	WAIT_DECLEAR	ACCEPT	DECLEARED	☐	☐	0	☐	ALL	ALL
328725	WAIT_DECLEAR	REJECT	HELD_WAIT_DECLEAR	☐	☐	0	☐	ALL	ALL
328719	WAIT_MARGIN	ACCEPT	CLEARED	☐	☐	0	☐	ALL	ALL

3. Transfer: Transfer action can be applied to move cleared trades from one portfolio to another. The existing trades are canceled, and new trades are booked in the new portfolio by the transfer action. The user will need to add trade keyword 'Transfer To' to the original trade pair and save a new trade pair with 'Transfer From' trade keyword in the new portfolio. Based on the workflow, the new trades would remain in pending status. This step is flexible for users and the purpose it to have all four trades with correct keywords.

When action 'Transfer' is applied to the original trade pair with 'Transfer to' keyword, they move to 'TO_BE_TRANSFERED' status. When the action is applied, all four trades go to margin engine for limit check. The original trades will be in 'WAIT_TRANSFER' status and the new trades will be in 'WAIT_MARGIN' status. Based on the limit check, if the trades are accepted, the original trades will change to TERMINATED and new trades will be CLEARED. If the limit check is rejected, the original trades stay as HELD_WAIT_TRANSFER, and new trades stay as PROCESSING.

Sample Workflow:

324719	PENDING	CANCEL	CANCELED	☐	☐	0	☐	ALL	ALL	
328718	PENDING	SUBMIT	WAIT_MARGIN	☐	☑	0	☐	ALL	ALL	ApplyLifeCycle
329219	PENDING	TRANSFER	WAIT_MARGIN	☐	☐	0	☐	ALL	ALL	ApplyLifeCycle
328722	PROCESSING	REJECT	LIMIT_FAILED	☐	☐	0	☐	ALL	ALL	ApplyLifeCycle
328721	PROCESSING	SUBMIT	WAIT_MARGIN	☐	☐	0	☐	ALL	ALL	ApplyLifeCycle
329719	TO_BE_TRANSFERED	TRANSFER	WAIT_TRANSFER	☐	☐	0	☐	ALL	ALL	ApplyLifeCycle
328741	WAIT_BACKLOAD	ACCEPT	CLEARED	☐	☐	0	☐	ALL	ALL	

328724	WAIT_DECLEAR	ACCEPT	DECLEARED			0		ALL	ALL
328725	WAIT_DECLEAR	REJECT	HELD_WAIT_DECLEAR			0		ALL	ALL
328719	WAIT_MARGIN	ACCEPT	CLEARED			0		ALL	ALL
328720	WAIT_MARGIN	REJECT	PROCESSING			0		ALL	ALL
328729	WAIT_TERMINATE	ACCEPT	TERMINATED			0		ALL	ALL
328730	WAIT_TERMINATE	REJECT	HELD_WAIT_TERMINATE			0		ALL	ALL
328735	WAIT_TRANSFER	ACCEPT	TERMINATED			0		ALL	ALL
328736	WAIT_TRANSFER	REJECT	HELD_WAIT_TRANSFER			0		ALL	ALL

4. Full Termination: When action 'Terminate' is applied to a cleared trade pair. It goes to status 'WAIT_TERMINATE' before going through margin engine for limit check. If its accepted, the trade pair is terminated and if its rejected, it goes to 'HELD_ WAIT_TERMINATE' status until its resubmitted.

Partial Termination: Partial termination works like transfer where original trades are terminated, and new trades are created in the same portfolio with the remaining notional. The user will need to add trade keyword 'Transfer To' to the original trade pair and save a new trade pair with 'Transfer From' trade keyword. When action terminate is applied, the trades go to 'WAIT_TERMINATE' before going through margin engine for limit check and if they are accepted, the original trade pair is terminated, and new trade pair are cleared and if rejected, the original trades stay as HELD_WAIT_TERMINATE, and new trades stay as PROCESSING.

Sample Workflow:

Id	Orig Status	Action	Resulting Status	Different User	Use STP	Priority	Log	Subtype	Product Type	Rules
328728	CLEARED	TERMINATE	WAIT_TERMINATE			0		ALL	ALL	ApplyLifeCycle
329718	CLEARED	TRANSFER	TO_BE_TRANSFERED			0		ALL	ALL	

328720	WAIT_MARGIN	REJECT	PROCESSING			0		ALL	ALL
328729	WAIT_TERMINATE	ACCEPT	TERMINATED			0		ALL	ALL
328730	WAIT_TERMINATE	REJECT	HELD_WAIT_TERMINATE			0		ALL	ALL
328735	WAIT_TRANSFER	ACCEPT	TERMINATED			0		ALL	ALL

7.3 MARGIN_ENGINE_CONTROLLER Scheduled Task

The MARGIN_ENGINE_CONTROLLER scheduled task is run to Suspend/Resume the Margin Engine. The scheduled task below has attribute 'Suspend/resume margin engine', that can be configured based on the desired action. Another attribute 'Additional Calculation Params' can be selected to be SOD, NOON, AFTER NOON and EOD for the resume action to decide when the user wants to resume margin engine. These params are designed to give user flexibility to have different margin calculation during different time. The above parameters need to define in a domain value below.

- MarginEngine
- MarginEngine.AdditionalCalculationParameters
  - AFTER_NOON
  - EOD
  - NOON
  - SOD
- MarginEngine.BATCH_NAMES
- MarginEngine.Config

Task Attributes	
Suspend/Resume Margin Engine	SUSPEND
Additional Calculation Params	

When the scheduled task with suspend action runs successfully, the HRC Controller in margin monitor in task station can be seen as suspended and if new trades are injected, the trades would wait in 'WAIT_MARGIN' status.

Margin Monitor

Processor	Status	Queue Size	Error Queue	Cons...	Mess...
What-If HRC Limit Checker	Running	0	0	1	0.00
EngineServer::CollateralManage...	Running	0		1	0.00
EngineServer::MarginController	Running	0		1	0.00
Trade VaR Calculator	Running	0	0	3	0.00
LiquidityRiskCalculator	Running	0	0	3	0.00
MarginEnginePersistor	Running	0	0	1	0.00
HRCController	Suspended	1	0	3	0.00
HRC Multiplexer	Running	0	0	3	0.00
HRC Aggregator	Running	0	0	3	0.00
HRC Limit Checker	Running	0	0	1	0.00
Data Persistor	Running	0	0	3	0.00
Engine Server::UpdateManager	Running	0		1	0.00

When the scheduled task is run again with 'Resume' attribute, the HRC Controller will go back to running and the trades in Wait_Margin status will be processed.

Task Attributes	
Suspend/Resume Margin Engine	RESUME
Additional Calculation Params	SOD, NOON

7.4 Headroom Check: Post-trade Novation Events

For portfolio level post-trade novation, trades are submitted as a group of trades to be processed together. Trades are moved to a specific trade status, based on user interaction, or a customized process and then passed through margin engine for headroom check using a scheduled task. If accepted, trades will go to cleared status and if rejected they will stay in the same status and can be resubmitted later. The below post-trade novation events are supported by margin engine in this core version:

- Backloading
- Portfolio Transfer
- Portfolio Compression

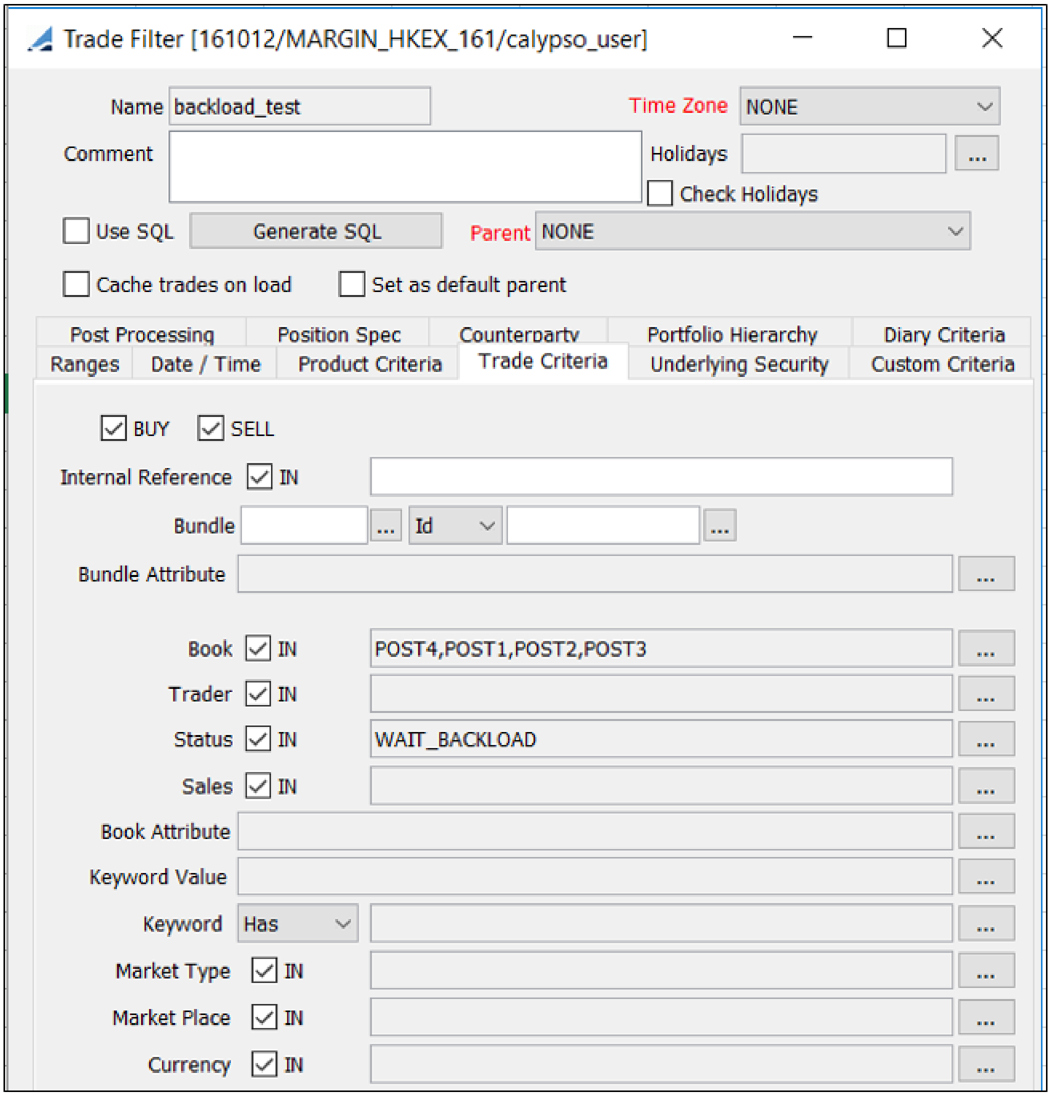
The user can design their own workflow for these events. Here is a sample workflow which shows how the trades go through margin engine and limit check.

Id	Orig Status	Action	Resulting Status	Different User	Use STP	Priority	Log	Subtype	Product Type	Rules
331218	CLEARED	AMEND	CLEARED			0		ALL	ALL	
329218	CLEARED	CANCEL	CANCELED			0		ALL	ALL	
329219	CLEARED	COMPRESS	WAIT_COMPRESSION			0		ALL	ALL	
329220	CLEARED	DECLEAR	WAIT_DECLEAR			0		ALL	ALL	ApplyLifeCycle
330219	CLEARED	LOCK	WAIT_TERMINATE			0		ALL	ALL	ApplyLifeCycle
330218	CLEARED	TERMINATE	TO_BE_TERMINATED			0		ALL	ALL	
329222	CLEARED	TRANSFER	TO_BE_TRANSFERED			0		ALL	ALL	
329223	HELD_WAIT_DECLEAR	REJECT	CLEARED			0		ALL	ALL	
329224	HELD_WAIT_DECLEAR	SUBMIT	WAIT_DECLEAR			0		ALL	ALL	ApplyLifeCycle
328229	HELD_WAIT_TERMINATE	REJECT	CLEARED			0		ALL	ALL	
328228	HELD_WAIT_TERMINATE	SUBMIT	WAIT_TERMINATE			0		ALL	ALL	ApplyLifeCycle
328233	HELD_WAIT_TRANSFER	REJECT	CLEARED			0		ALL	ALL	
328232	HELD_WAIT_TRANSFER	SUBMIT	WAIT_TRANSFER			0		ALL	ALL	ApplyLifeCycle
316719	NONE	NEW	PENDING			0		ALL	ALL	
329226	PENDING	AMEND	PENDING			0		ALL	ALL	
329227	PENDING	ASSIGN	WAIT_BULK_MARGIN			0		ALL	ALL	
329228	PENDING	AUTHORIZE	CLEARED			0		ALL	ALL	
335218	PENDING	BACKLOAD	WAIT_BACKLOAD			0		ALL	ALL	
329229	PENDING	CANCEL	CANCELED			0		ALL	ALL	
328718	PENDING	SUBMIT	WAIT_MARGIN		✓	0		ALL	ALL	ApplyLifeCycle
330718	PENDING	TERMINATE	WAIT_MARGIN			0		ALL	ALL	ApplyLifeCycle
329230	PENDING	TRANSFER	WAIT_MARGIN			0		ALL	ALL	ApplyLifeCycle
329231	PROCESSING	REJECT	LIMIT_FAILED			0		ALL	ALL	ApplyLifeCycle
328220	PROCESSING	SUBMIT	WAIT_MARGIN			0		ALL	ALL	ApplyLifeCycle
334218	TO_BE_TERMINATED	AMEND	TO_BE_TERMINATED			0		ALL	ALL	
330220	TO_BE_TERMINATED	TERMINATE	WAIT_TERMINATE			0		ALL	ALL	ApplyLifeCycle
333718	TO_BE_TRANSFERED	P_TRANSFER	WAIT_P_TRANSFER			0		ALL	ALL	
329232	TO_BE_TRANSFERED	TRANSFER	WAIT_TRANSFER			0		ALL	ALL	ApplyLifeCycle
329719	VERIFIED	TRANSFER	TO_BE_TRANSFERED			0		ALL	ALL	
329233	WAIT_BACKLOAD	ACCEPT	CLEARED			0		ALL	ALL	
335219	WAIT_BACKLOAD	AMEND	WAIT_BACKLOAD			0		ALL	ALL	
329234	WAIT_BACKLOAD	REJECT	WAIT_BACKLOAD			0		ALL	ALL	
329235	WAIT_BULK_MARGIN	ACCEPT	CLEARED			0		ALL	ALL	
333722	WAIT_BULK_MARGIN	AMEND	WAIT_BULK_MARGIN			0		ALL	ALL	
329236	WAIT_BULK_MARGIN	REJECT	CANCELED			0		ALL	ALL	
329237	WAIT_COMPRESSION	ACCEPT	TERMINATED			0		ALL	ALL	
329238	WAIT_COMPRESSION	REJECT	CLEARED			0		ALL	ALL	
329239	WAIT_DECLEAR	ACCEPT	DECLEARED			0		ALL	ALL	

The rule ApplyLifeCycle is used in case of 'Transfer' and 'Partial Termination'. In both cases there are 2 sets of trade pairs, one with the original counterparty and one with the new one. Both these trade pairs have the following two keywords: The 'Linked To' keyword links the two trades in a trade pair and the 'TransferTo' and 'TransferFrom' keywords specify which trade pair is being transferred and where is it transferred to. So the original trade pair has the 'TransferTo' keyword and the new trade pair will have the 'TransferFrom' keyword. When these two sets of trade pairs have these trade keywords and the workflow has ApplyLifeCycle rule, any action that is applied to any one of the trades is applied to all four trades. The ApplyLifeCycle rule makes sure that the action is applied to all four trades and they are all sent to the margin engine.

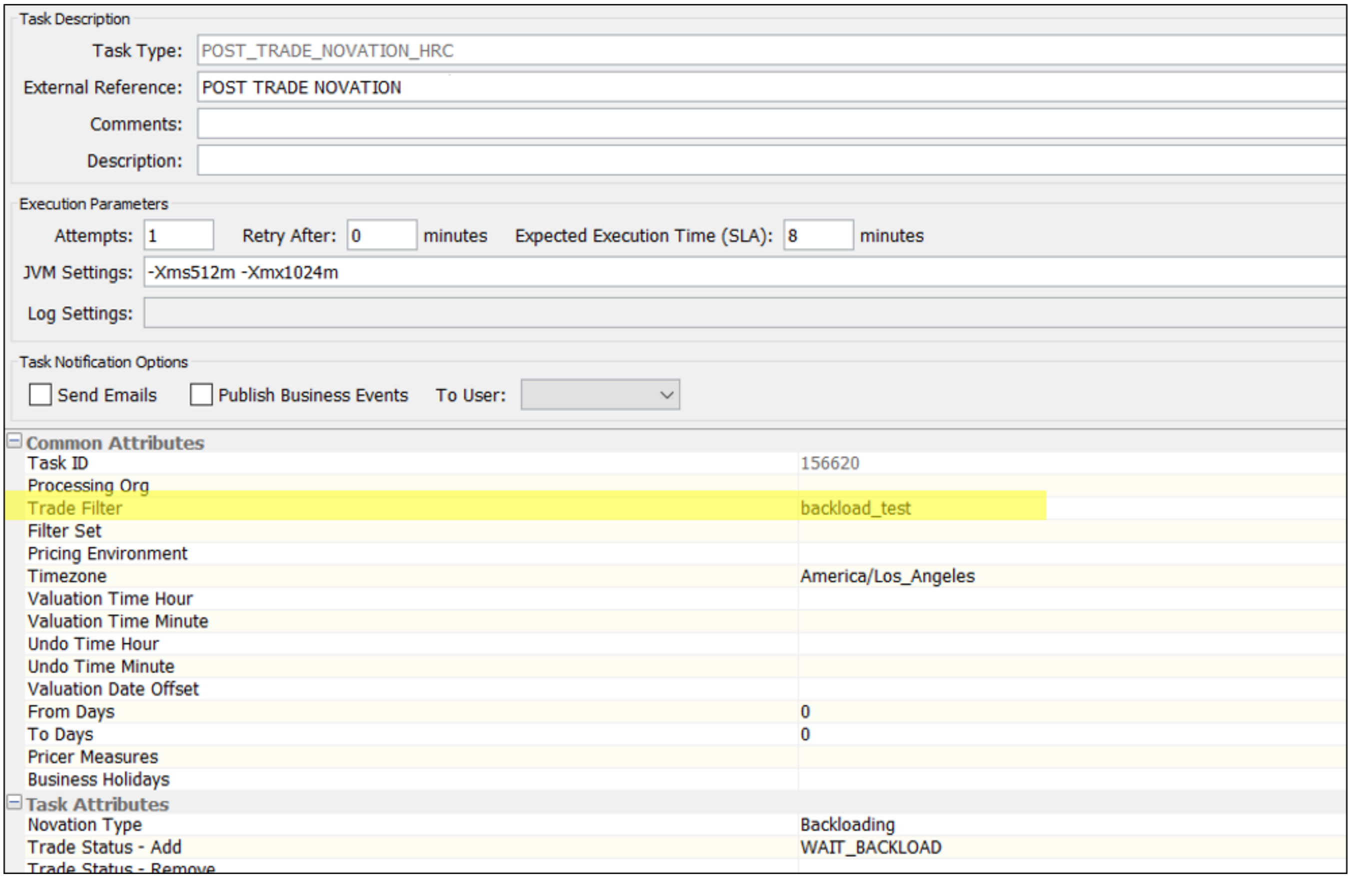
7.4.1 Backloading

To move the backloaded trades through margin engine for limit check, the user needs to configure the Post trade novation scheduled task. All backloaded trades will go through the margin engine in a package and this will be defined in a trade filter in calypso. All trades in this trade filter will be in trade status 'WAIT_BACKLOAD'.



Once we have all the backloaded trades in a trade filter and they are all in 'WAIT_BACKLOAD' status, we can run the POST_TRADE_NOVATION_HRC scheduled task to push these trades to margin engine to go through limit check.

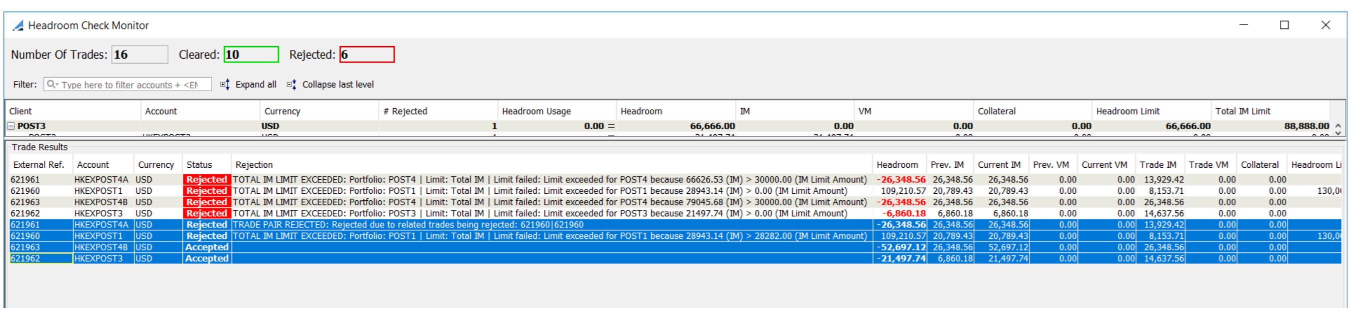
In the attributes, the 'Novation Type' is set to 'Backloading' and the trade status-add is set to 'WAIT_BACKLOAD'. Trade Status – Remove can be left blank in case of backloading.



Make sure that you add the below argument to the JVM settings in the ST to run it successfully.

-Dorg.apache.activemq.SERIALIZABLE_PACKAGES=* JVM

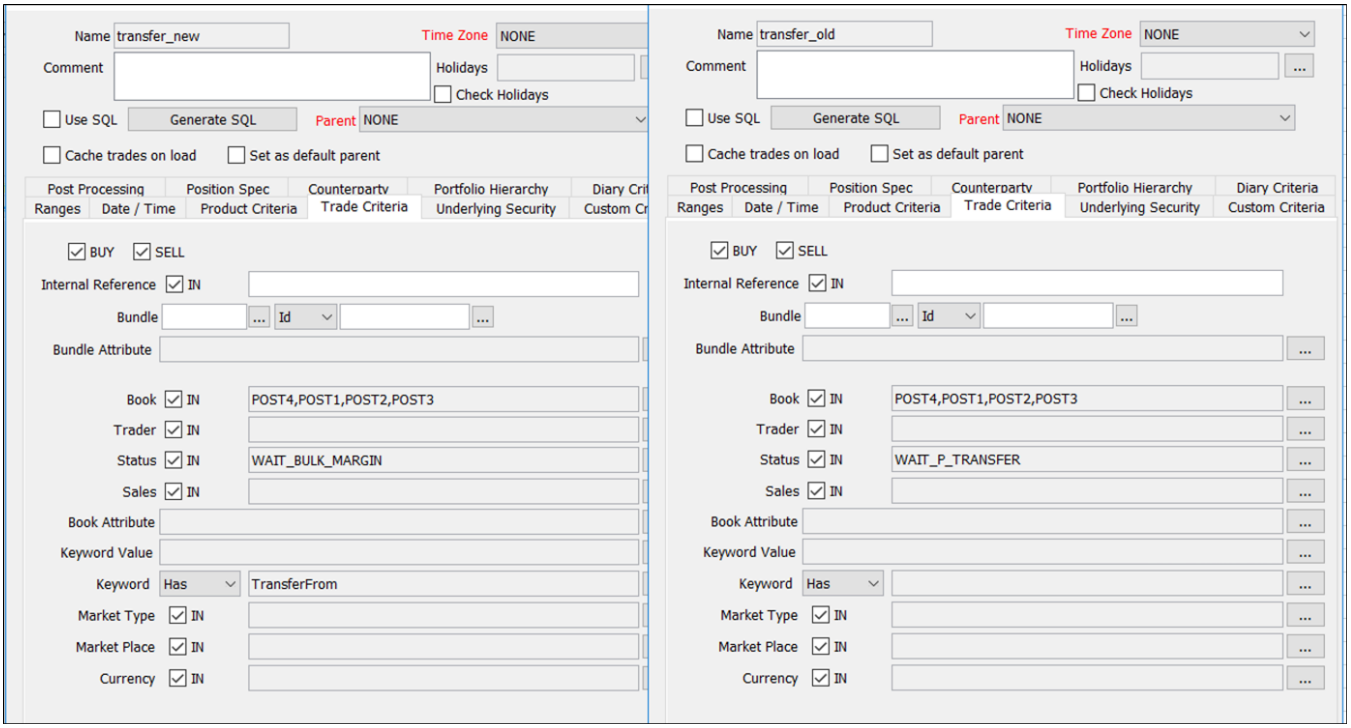
After the ST runs successfully, the trades will be submitted to headroom check and will be accepted or rejected based on the available limits. Accepted trades will go to 'Cleared' status and rejected ones will stay in 'Wait_Backload' status until submitted again.



7.4.2 Portfolio Transfer

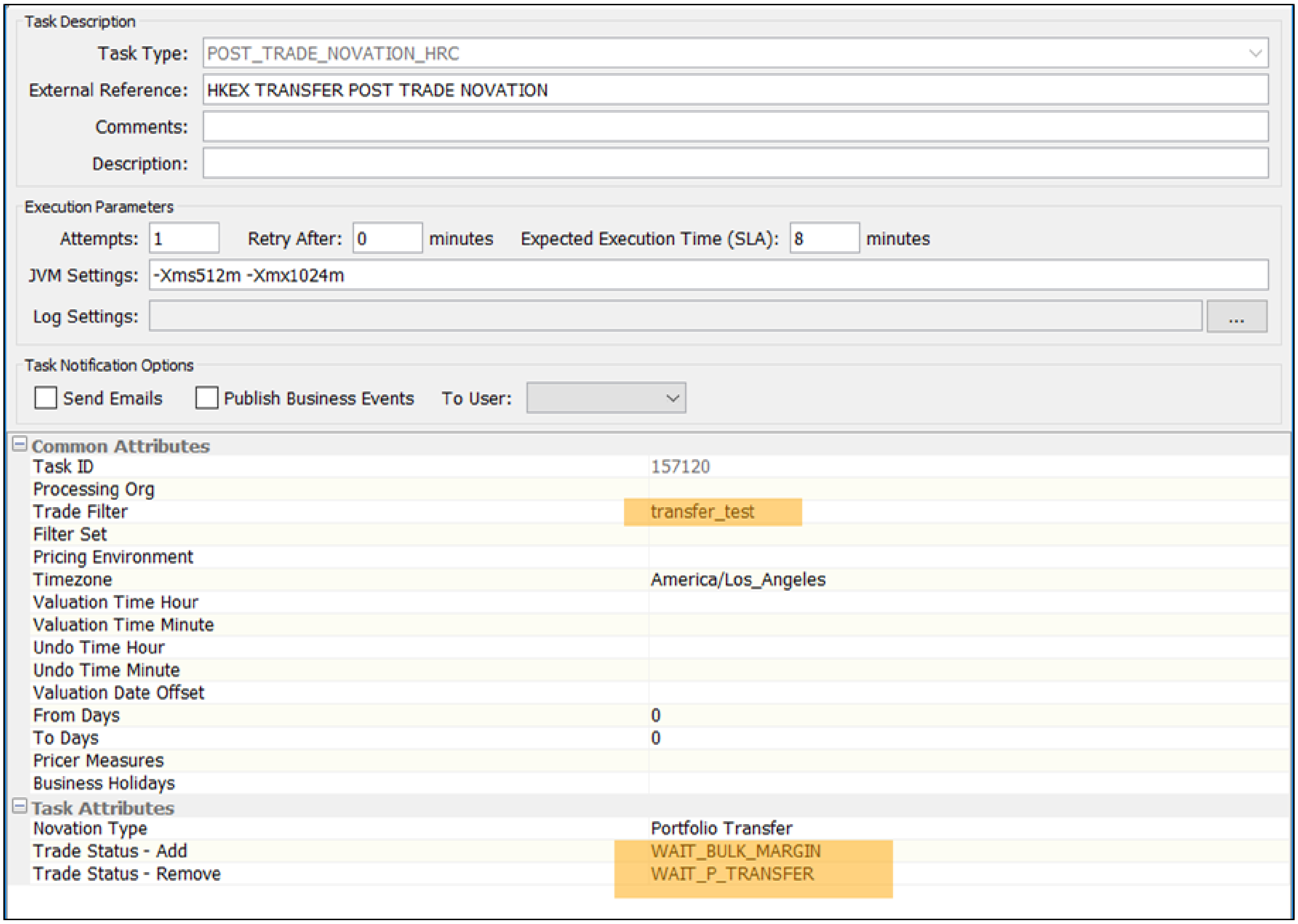
In case of portfolio transfer, the user will define two groups of trades in the trade filter. One group in a 'Wait_Bulk_Margin' status and other in 'Wait_Portfolio_Transfer' status. The first group will stay in the same portfolio and the other one will transfer to a different portfolio after running the ST. The user will define the groups by creating two different trade filters, for the existing and new portfolio based on the trade statuses.

Trade Filter examples:



The scheduled task POST_TRADE_NOVATION_HRC is then run to perform headroom check and to transfer the trades in the 'Wait_P_Transfer' status from the existing portfolio.

'Transfer_test' trades filter in the ST screenshot below includes both trade filters above for the old and new portfolio. The trades will then be transferred to a new portfolio based on the keywords and will move to WAIT_BULK_MARGIN and go through margin engine for headroom check.



Default Management

For Default Management, a new trade keyword needs to be added to the defaulted trade:

TransferType = DefaultTransfer

Example:

T1 (associated with Clearing Member CM1) is linked toT2

CM1 defaults

T1 is transferred to CM3 and T3 is created

T3 is linked to T2

Trade Keywords after default: Since T1 defaulted, a trade keyword is added to T1

T1: TransferType=DefaultTransfer

TransferTo=T3

LinkedTo=<blank>

T2: LinkedTo=T3

T3: LinkedTo=T2

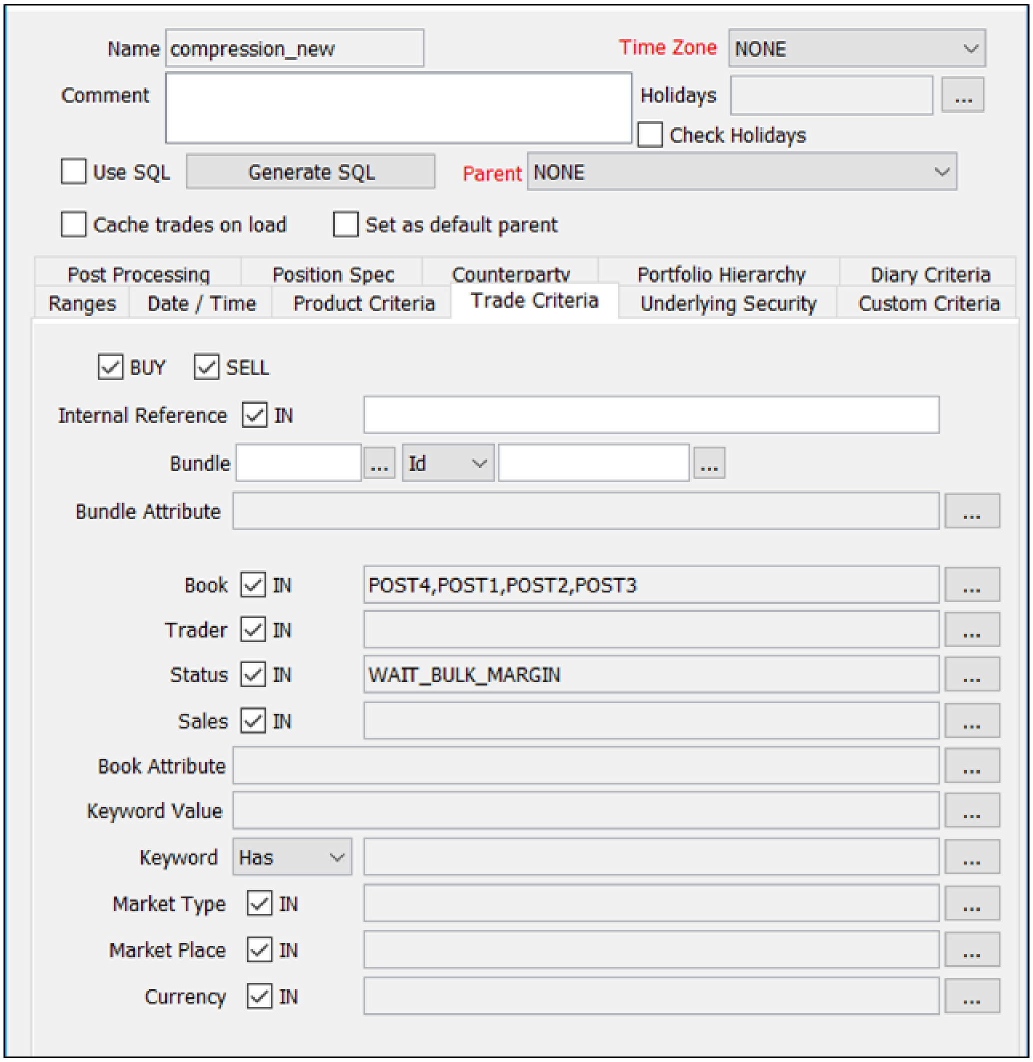
TransferFrom=T1

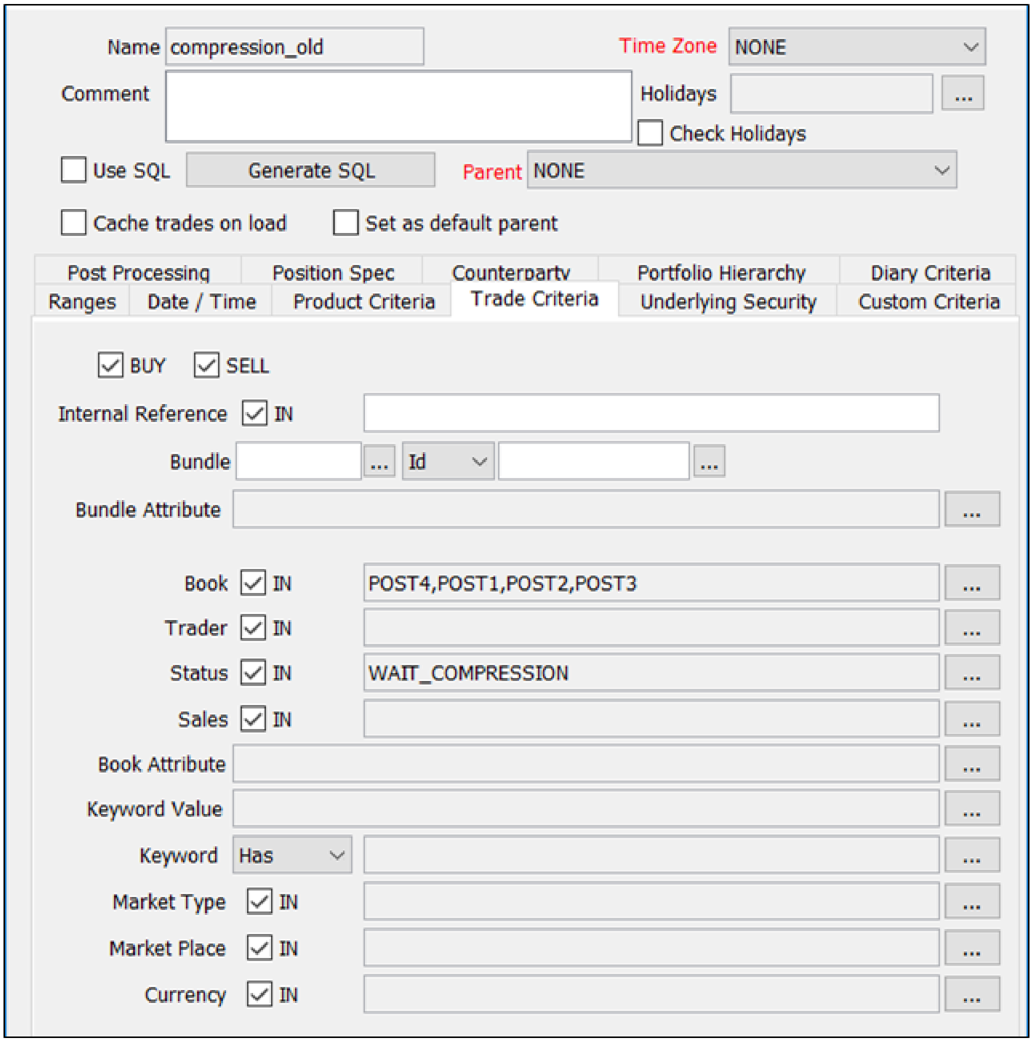
Since T2 is unchanged there is no need to send it to HRC. Only {T1, T3} will be send to the Margin Engine.

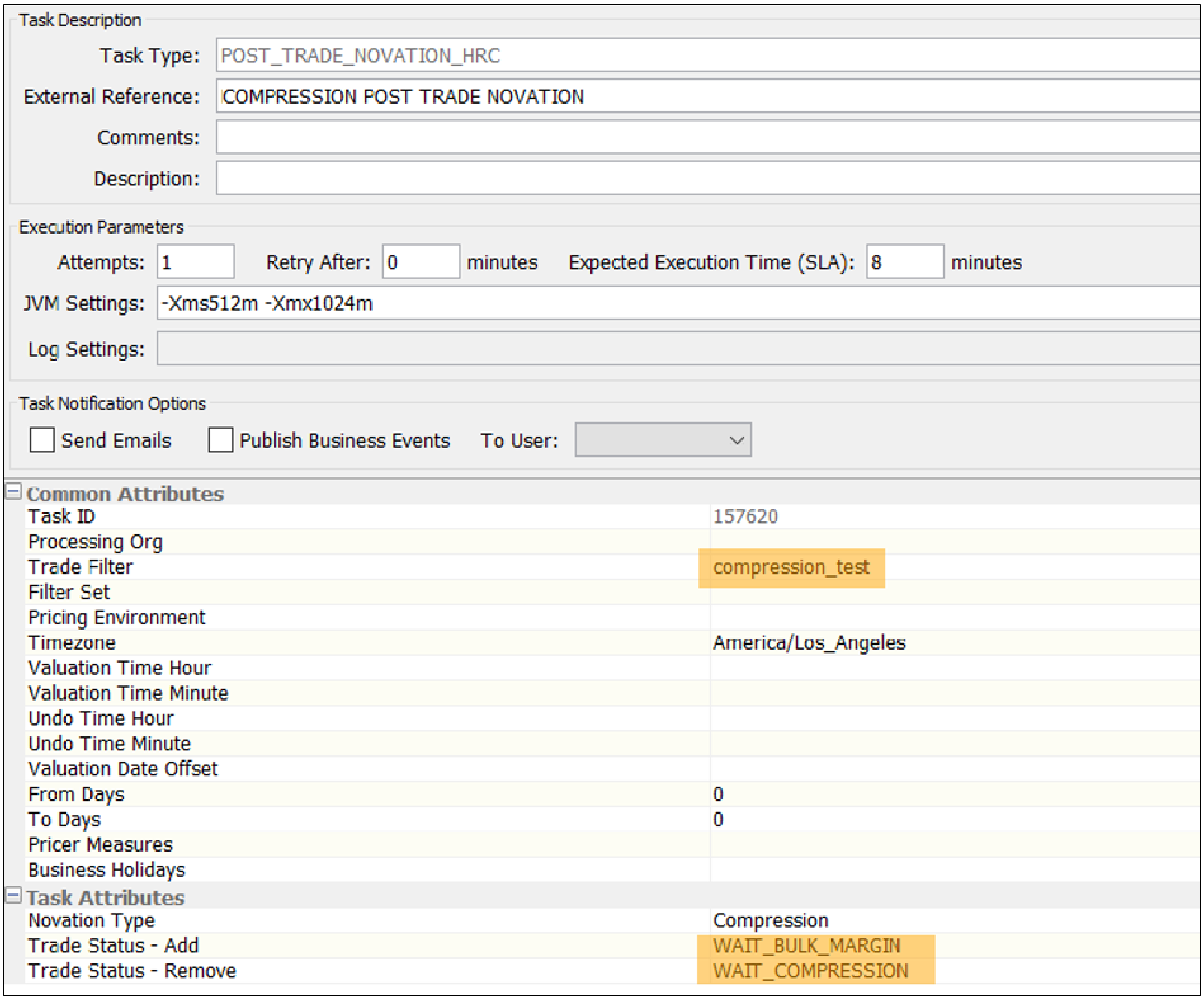
7.4.3 Portfolio Compression

Compression is similar to portfolio transfer where the user will define two different trade filters for the trades to be compressed and saved as new trade and the trades that will stay in the portfolio as is. Trades to be compressed will be moved to a WAIT_COMPRESSION trade status, based on the TriOptima custom process. Trades resulting from trade compression will be saved as a WAIT_COMPRESSION status and will then go through the margin engine for limit check.

For example, the user will define the trade filters as below based on trade status –


Name
compression_new
Time Zone
NONE
Comment
Holidays
...
Check Holidays
Use SQL
Generate SQL
Parent
NONE
Cache trades on load
Set as default parent
Post Processing
Position Spec
Counterparty
Portfolio Hierarchy
Diary Criteria
Ranges
Date / Time
Product Criteria
Trade Criteria
Underlying Security
Custom Criteria
BUY
SELL
Internal Reference
IN
Bundle
Id
Bundle Attribute
Book
IN
POST4,POST1,POST2,POST3
Trader
IN
Status
IN
WAIT_BULK_MARGIN
Sales
IN
Book Attribute
Keyword Value
Keyword
Has
Market Type
IN
Market Place
IN
Currency
IN


Name compression_old
Time Zone NONE
Comment
Holidays
Check Holidays
Use SQL
Generate SQL
Parent NONE
Cache trades on load
Set as default parent
Post Processing
Position Spec
Counterparty
Portfolio Hierarchy
Diary Criteria
Ranges
Date / Time
Product Criteria
Trade Criteria
Underlying Security
Custom Criteria
BUY
SELL
Internal Reference IN
Bundle
Id
Bundle Attribute
Book IN
POST4,POST1,POST2,POST3
Trader IN
Status IN
WAIT_COMPRESSION
Sales IN
Book Attribute
Keyword Value
Keyword Has
Market Type IN
Market Place IN
Currency IN



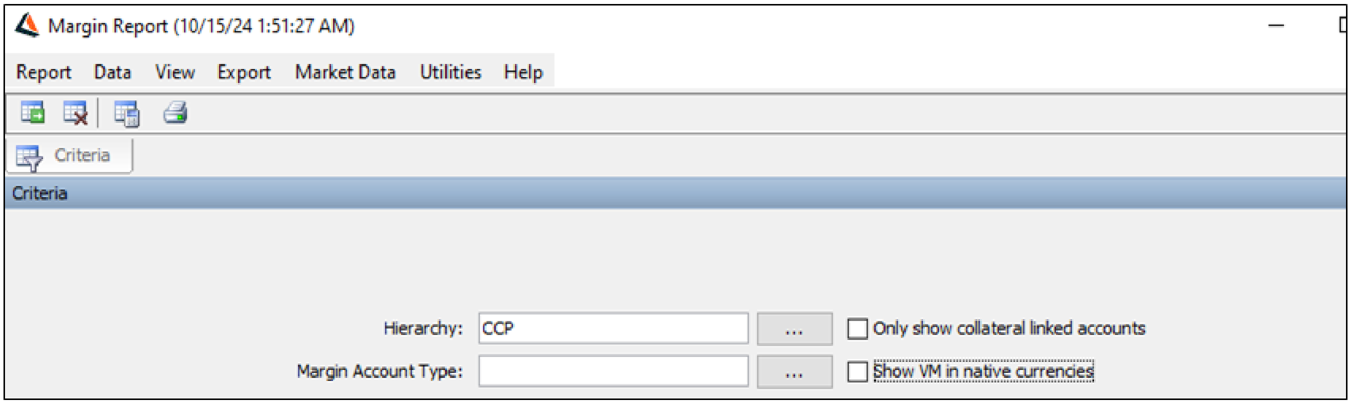
After the scheduled task is run successfully, the trades in WAIT_COMPRESSION go to CLEARED status if accepted and the trades in WAIT_BULK_MARGIN go to TERMINATED status.

7.5 Margin Report

The Margin report can be loaded for a hierarchy for a given date and pricing environment and it'll display all IM and VM results for that day for the margin account and all nodes based on the headroom check rule selected in the domain values. The columns can be configured to include only desired columns.

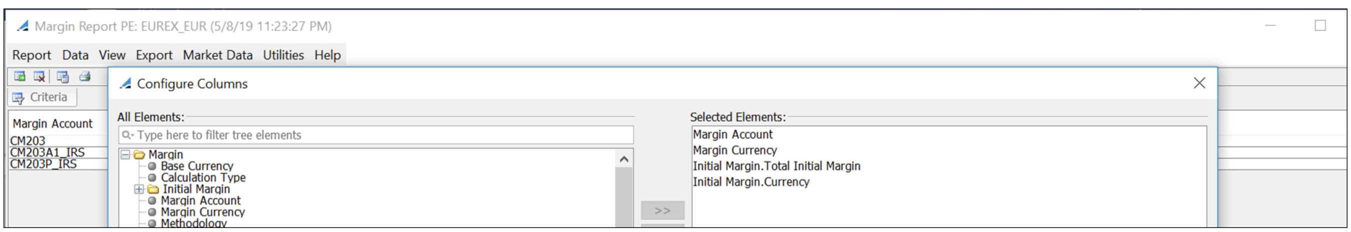
Below action can be used to add a tile for margin report in calypso –

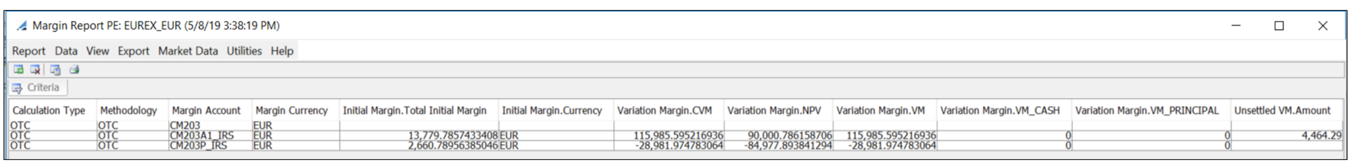
```
reporting.ReportWindow$Margin
```



Criteria

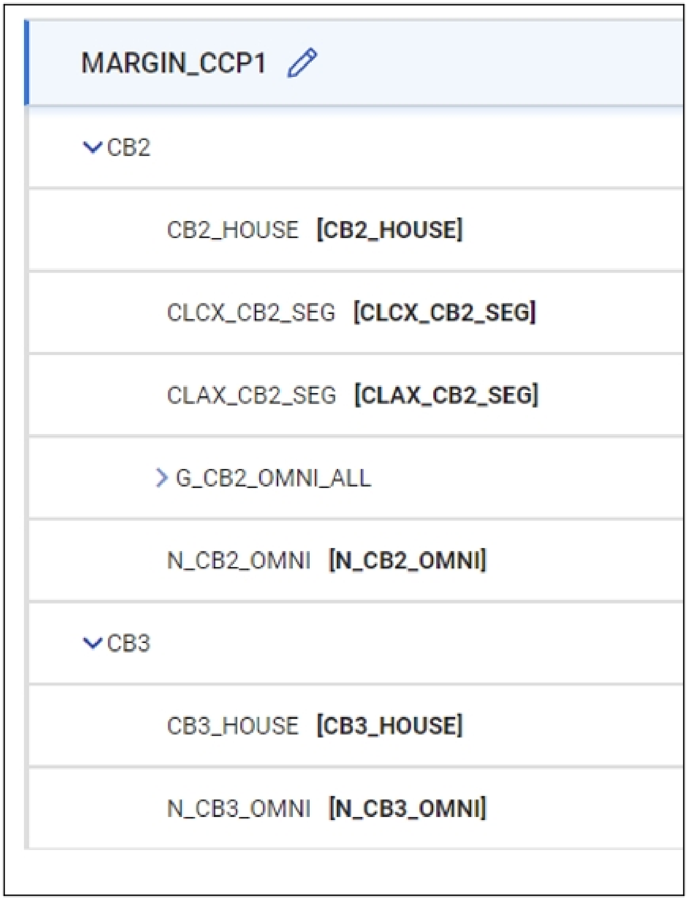
- » Hierarchy: select one or multiple hierarchies to load margin results.
- » Margin Account Type: select Margin Account Types based on node attribute MarginAccountType.
- » Only show collateral linked accounts: view results of margin accounts with collateral exposures and margin call contract.
- » Show VM in native currencies: View VM results in native currency breakdown with Variation Margin (Ccy) columns.

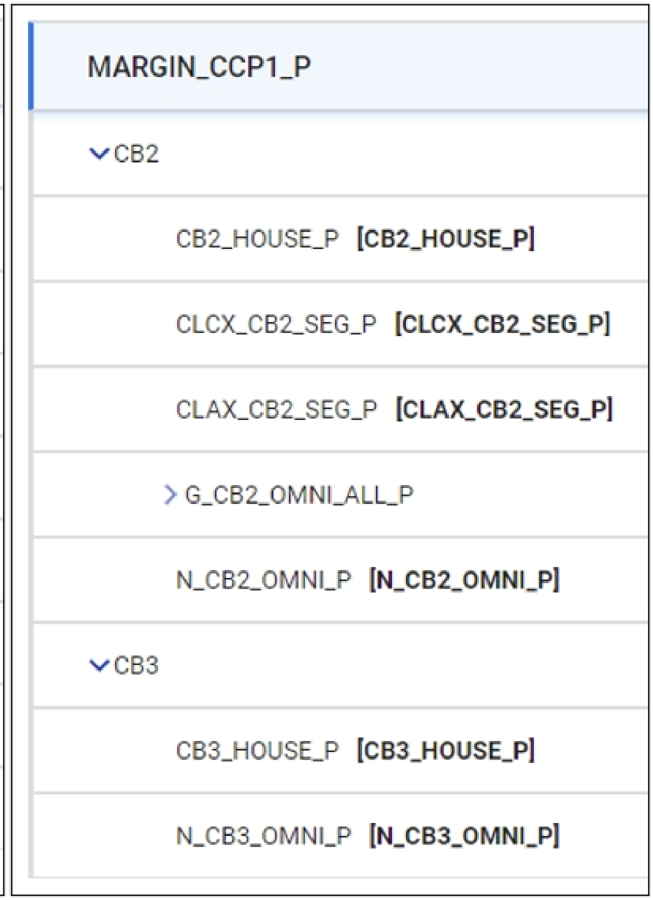


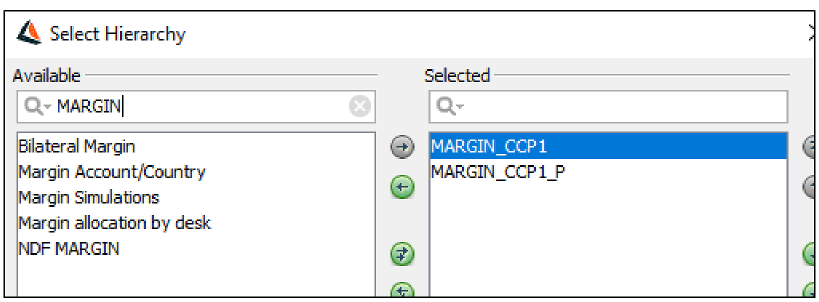


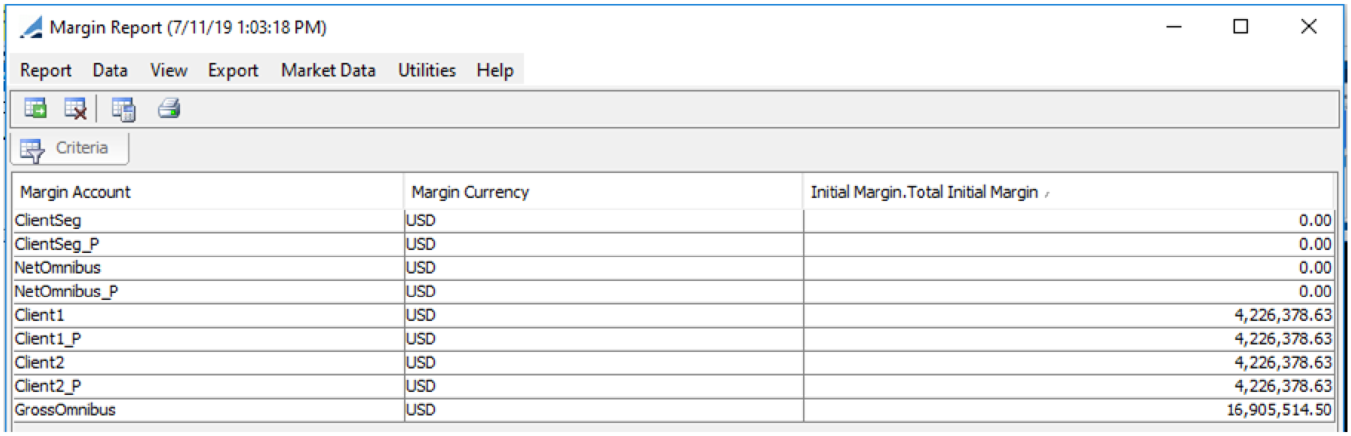
If the CCP has two different hierarchies for Pending and cleared trades, they can load the information for both hierarchies in the margin report at the same time.

A typical use case will be the merge of the “Margin” hierarchy for Cleared Trades and “Pending” Hierarchy for Pending Trades:


MARGIN_CCP1
CB2
CB2_HOUSE [CB2_HOUSE]
CLCX_CB2_SEG [CLCX_CB2_SEG]
CLAX_CB2_SEG [CLAX_CB2_SEG]
G_CB2_OMNI_ALL
N_CB2_OMNI [N_CB2_OMNI]
CB3
CB3_HOUSE [CB3_HOUSE]
N_CB3_OMNI [N_CB3_OMNI]

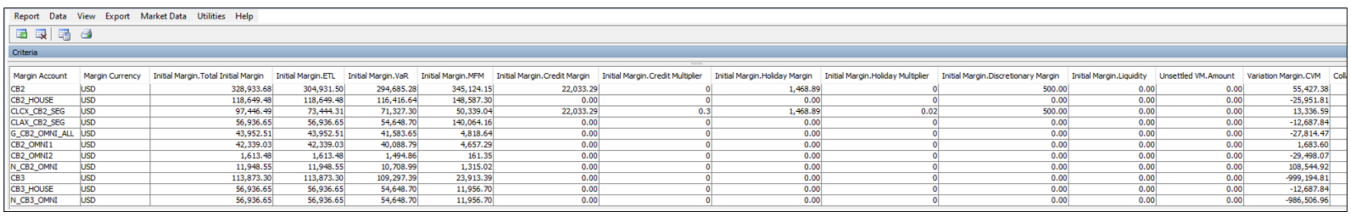

MARGIN_CCP1_P
CB2
CB2_HOUSE_P [CB2_HOUSE_P]
CLCX_CB2_SEG_P [CLCX_CB2_SEG_P]
CLAX_CB2_SEG_P [CLAX_CB2_SEG_P]
G_CB2_OMNI_ALL_P
N_CB2_OMNI_P [N_CB2_OMNI_P]
CB3
CB3_HOUSE_P [CB3_HOUSE_P]
N_CB3_OMNI_P [N_CB3_OMNI_P]


Select Hierarchy
Available
MARGIN
Bilateral Margin
Margin Account/Country
Margin Simulations
Margin allocation by desk
NDF MARGIN
Selected
MARGIN_CCP1
MARGIN_CCP1_P



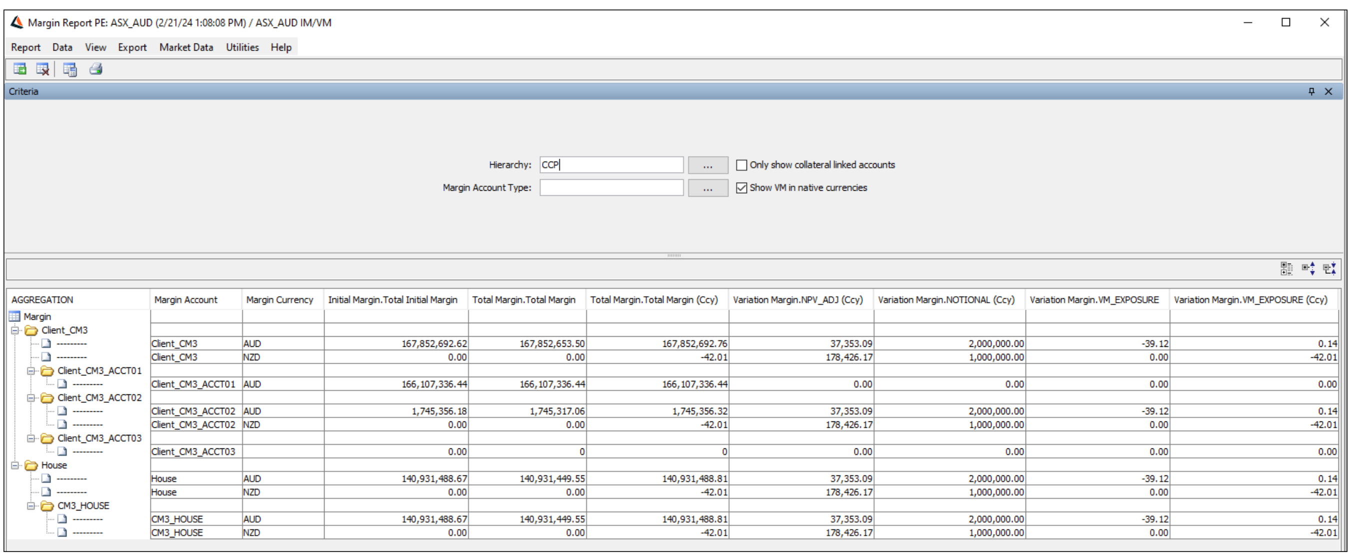
Margin Account	Margin Currency	Initial Margin.Total Initial Margin
ClientSeg	USD	0.00
ClientSeg_P	USD	0.00
NetOmnibus	USD	0.00
NetOmnibus_P	USD	0.00
Client1	USD	4,226,378.63
Client1_P	USD	4,226,378.63
Client2	USD	4,226,378.63
Client2_P	USD	4,226,378.63
GrossOmnibus	USD	16,905,514.50

Margin Report with IM breakdown results.



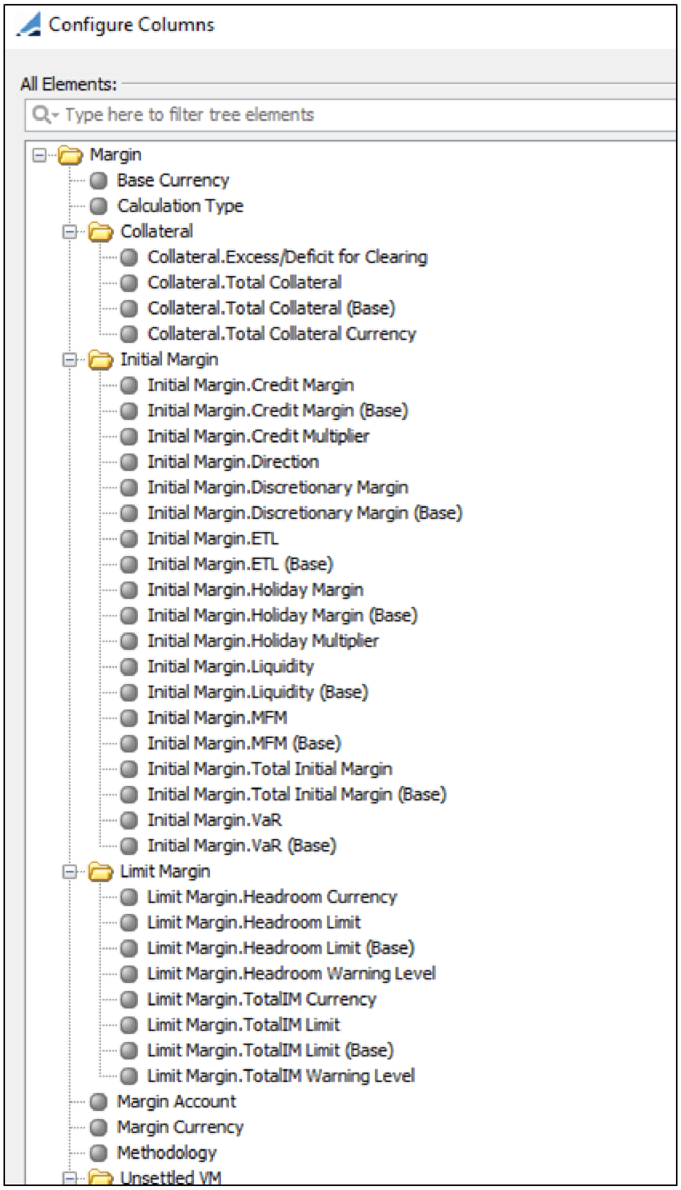
Margin Account	Margin Currency	Initial Margin.Total Initial Margin	Initial Margin.ETL	Initial Margin.VaR	Initial Margin.MFM	Initial Margin.Credit Margin	Initial Margin.Credit Multiplier	Initial Margin.Holiday Margin	Initial Margin.Holiday Multiplier	Initial Margin.Discretionary Margin	Initial Margin.Liquidity	Unsettled VM.Amount	Variation Margin.CVM
CB2	USD	328,933.68	304,931.50	294,685.28	345,124.15	22,033.29	0	1,468.89	0	500.00	0.00	0.00	55,427.38
CB2_HOUSE	USD	118,649.48	118,649.48	116,416.64	148,587.30	0.00	0	0.00	0	0.00	0.00	0.00	-25,951.81
CLCX_CB2_SEG	USD	97,446.49	73,444.31	71,327.30	50,339.04	22,033.29	0.3	1,468.89	0.02	500.00	0.00	0.00	13,336.59
CLAX_CB2_SEG	USD	56,936.65	56,936.65	54,648.70	140,064.16	0.00	0	0.00	0	0.00	0.00	0.00	-12,687.84
G_CB2_OMNI_ALL	USD	43,952.51	43,952.51	41,583.65	4,818.64	0.00	0	0.00	0	0.00	0.00	0.00	-27,814.47
CB2_OMNI1	USD	42,339.03	42,339.03	40,088.79	4,657.29	0.00	0	0.00	0	0.00	0.00	0.00	1,683.60
CB2_OMNI2	USD	1,613.48	1,613.48	1,494.86	161.35	0.00	0	0.00	0	0.00	0.00	0.00	-29,498.07
N_CB2_OMNI	USD	11,948.55	11,948.55	10,708.99	1,315.02	0.00	0	0.00	0	0.00	0.00	0.00	108,544.92
CB3	USD	113,873.30	113,873.30	109,297.39	23,913.39	0.00	0	0.00	0	0.00	0.00	0.00	-999,194.81
CB3_HOUSE	USD	56,936.65	56,936.65	54,648.70	11,956.70	0.00	0	0.00	0	0.00	0.00	0.00	-12,687.84
N_CB3_OMNI	USD	56,936.65	56,936.65	54,648.70	11,956.70	0.00	0	0.00	0	0.00	0.00	0.00	-986,506.96

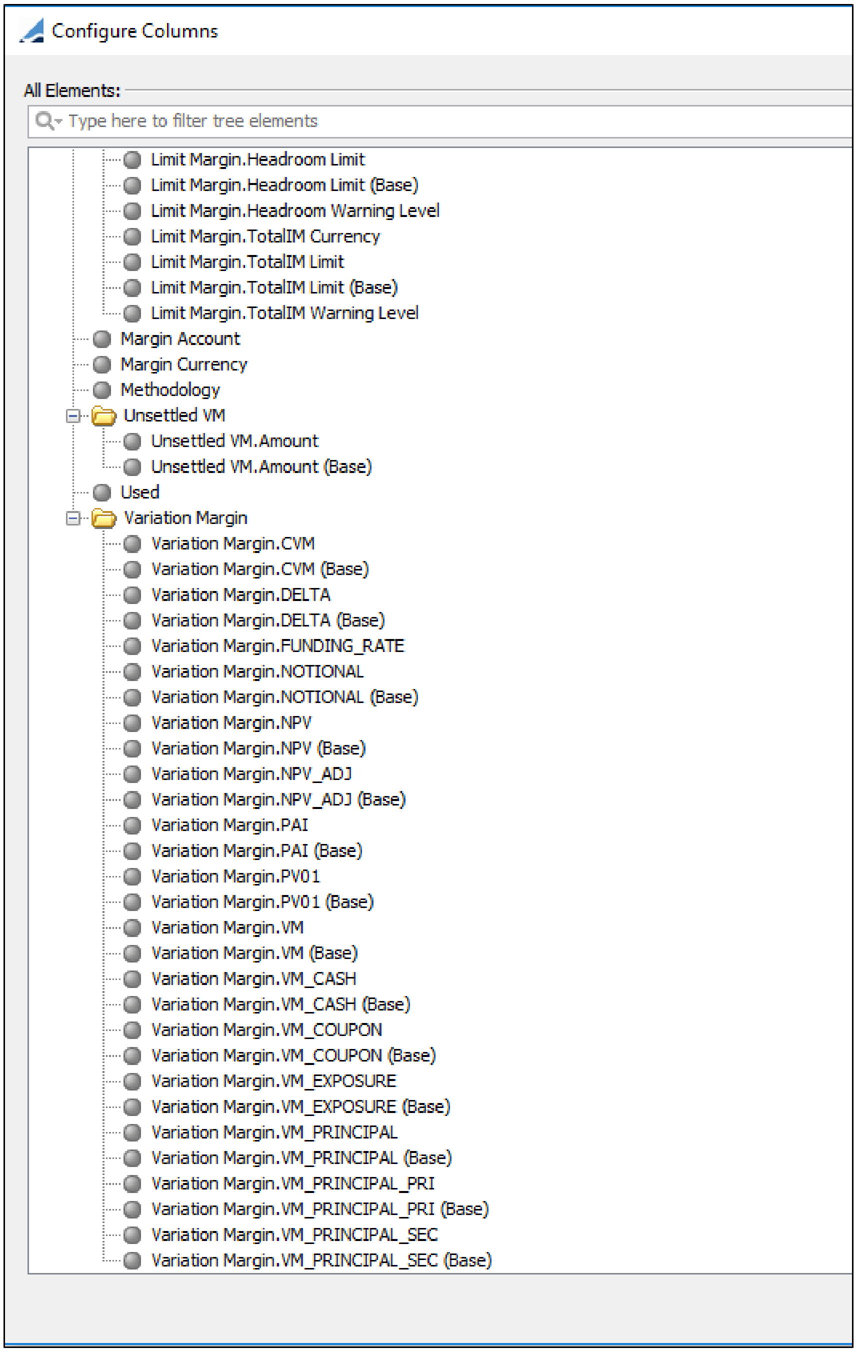
Margin Report with IM and VM results with VM breakdown in native currencies.



AGGREGATION	Margin Account	Margin Currency	Initial Margin.Total Initial Margin	Total Margin.Total Margin	Total Margin.Total Margin (Ccy)	Variation Margin.NPV_ADJ (Ccy)	Variation Margin.NOTIONAL (Ccy)	Variation Margin.VM_EXPOSURE	Variation Margin.VM_EXPOSURE (Ccy)
Margin									
Client_CM3									
---------	Client_CM3	AUD	167,852,692.62	167,852,653.50	167,852,692.76	37,353.09	2,000,000.00	-39.12	0.14
---------	Client_CM3	NZD	0.00	0.00	-42.01	178,426.17	1,000,000.00	0.00	-42.01
Client_CM3_ACCT01									
---------	Client_CM3_ACCT01	AUD	166,107,336.44	166,107,336.44	166,107,336.44	0.00	0.00	0.00	0.00
Client_CM3_ACCT02									
---------	Client_CM3_ACCT02	AUD	1,745,356.18	1,745,317.06	1,745,356.32	37,353.09	2,000,000.00	-39.12	0.14
---------	Client_CM3_ACCT02	NZD	0.00	0.00	-42.01	178,426.17	1,000,000.00	0.00	-42.01
Client_CM3_ACCT03									
---------	Client_CM3_ACCT03		0.00	0	0	0.00	0.00	0.00	0.00
House									
---------	House	AUD	140,931,488.67	140,931,449.55	140,931,488.81	37,353.09	2,000,000.00	-39.12	0.14
---------	House	NZD	0.00	0.00	-42.01	178,426.17	1,000,000.00	0.00	-42.01
CM3_HOUSE									
---------	CM3_HOUSE	AUD	140,931,488.67	140,931,449.55	140,931,488.81	37,353.09	2,000,000.00	-39.12	0.14
---------	CM3_HOUSE	NZD	0.00	0.00	-42.01	178,426.17	1,000,000.00	0.00	-42.01

These are all the columns available in margin report:


Configure Columns
All Elements:
Type here to filter tree elements
Margin
Base Currency
Calculation Type
Collateral
Collateral.Excess/Deficit for Clearing
Collateral.Total Collateral
Collateral.Total Collateral (Base)
Collateral.Total Collateral Currency
Initial Margin
Initial Margin.Credit Margin
Initial Margin.Credit Margin (Base)
Initial Margin.Credit Multiplier
Initial Margin.Direction
Initial Margin.Discretionary Margin
Initial Margin.Discretionary Margin (Base)
Initial Margin.ETL
Initial Margin.ETL (Base)
Initial Margin.Holiday Margin
Initial Margin.Holiday Margin (Base)
Initial Margin.Holiday Multiplier
Initial Margin.Liquidity
Initial Margin.Liquidity (Base)
Initial Margin.MFM
Initial Margin.MFM (Base)
Initial Margin.Total Initial Margin
Initial Margin.Total Initial Margin (Base)
Initial Margin.VaR
Initial Margin.VaR (Base)
Limit Margin
Limit Margin.Headroom Currency
Limit Margin.Headroom Limit
Limit Margin.Headroom Limit (Base)
Limit Margin.Headroom Warning Level
Limit Margin.TotalIM Currency
Limit Margin.TotalIM Limit
Limit Margin.TotalIM Limit (Base)
Limit Margin.TotalIM Warning Level
Margin Account
Margin Currency
Methodology
Unsettled VM


Configure Columns
All Elements:
Type here to filter tree elements
Limit Margin.Headroom Limit
Limit Margin.Headroom Limit (Base)
Limit Margin.Headroom Warning Level
Limit Margin.TotalIM Currency
Limit Margin.TotalIM Limit
Limit Margin.TotalIM Limit (Base)
Limit Margin.TotalIM Warning Level
Margin Account
Margin Currency
Methodology
Unsettled VM
Unsettled VM.Amount
Unsettled VM.Amount (Base)
Used
Variation Margin
Variation Margin.CVM
Variation Margin.CVM (Base)
Variation Margin.DELTA
Variation Margin.DELTA (Base)
Variation Margin.FUNDING_RATE
Variation Margin.NOTIONAL
Variation Margin.NOTIONAL (Base)
Variation Margin.NPV
Variation Margin.NPV (Base)
Variation Margin.NPV_ADJ
Variation Margin.NPV_ADJ (Base)
Variation Margin.PAI
Variation Margin.PAI (Base)
Variation Margin.PV01
Variation Margin.PV01 (Base)
Variation Margin.VM
Variation Margin.VM (Base)
Variation Margin.VM_CASH
Variation Margin.VM_CASH (Base)
Variation Margin.VM_COUPON
Variation Margin.VM_COUPON (Base)
Variation Margin.VM_EXPOSURE
Variation Margin.VM_EXPOSURE (Base)
Variation Margin.VM_PRINCIPAL
Variation Margin.VM_PRINCIPAL (Base)
Variation Margin.VM_PRINCIPAL_PRI
Variation Margin.VM_PRINCIPAL_PRI (Base)
Variation Margin.VM_PRINCIPAL_SEC
Variation Margin.VM_PRINCIPAL_SEC (Base)

8. OTC Margin What If API

API to call synchronous What If calculation:

MarginEngineClient.get().getWhatIfOTCCalculator().calculateWhatIf(requests,timeout);

where requests is List<WhatIfRequest> and timeout is a long.

Request

```
/**
* A What If Request. It contains a Collection of trade for one portfolio.
*/
public interface WhatIfRequest extends Serializable {
/**
* @return the portfolio this request is for
*/
public String getPortfolio();
/**
* @return the Trades to be posted for this WhatIfRequest
*/
public Collection<Trade> getTrades();
}
```

Response will be a WhatIfOTCMessage

```
public interface WhatIfOTCMessage extends Serializable{
/**
* @return the portfolioName requested in the What If Request
*/
public String getPortfolio();
/**
* @return the Previous IM for the given portfolio
*/
public double getPreviousIM();
/**
* @return the Trade IM for the given portfolio
*/
public double getTradeIM();
/**
* @return the IM Currency for the given portfolio
*/
public String getIMCurrency();
/**
* @return the Margin Result Tree for the given portfolio
*/
public MarginResultTree getInitialMargin();
/**
* @return the Rejection for the given portfolio
*/
public HeadroomCheckRejection getHeadroomCheckRejection();
}
```