



# Nasdaq Calypso

## Pricing Script Lifecycle Events

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Approved

# 1. Pricing Script Lifecycle Events

This document describes the process for applying lifecycle events to Pricing Script products.

A number of Pricing Script lifecycle events are provided out-of-the-box:

- Physical Delivery
- Knock Out
- Knock In
- Redemption
- Structured Event

Lifecycle events have their own workflow.

It is also possible to create custom lifecycle events.

► For customization information, please refer to the Calypso Developer's Guide.

## Limitations

### OTC products

The Lifecycle Event window is limited to OTC products:

- ScriptableOTCProduct (Exotic Notes, Pricing Sheet scriptable products)
  - Partial Termination is not supported for ScriptableOTCProduct**
- EquityStructuredOption

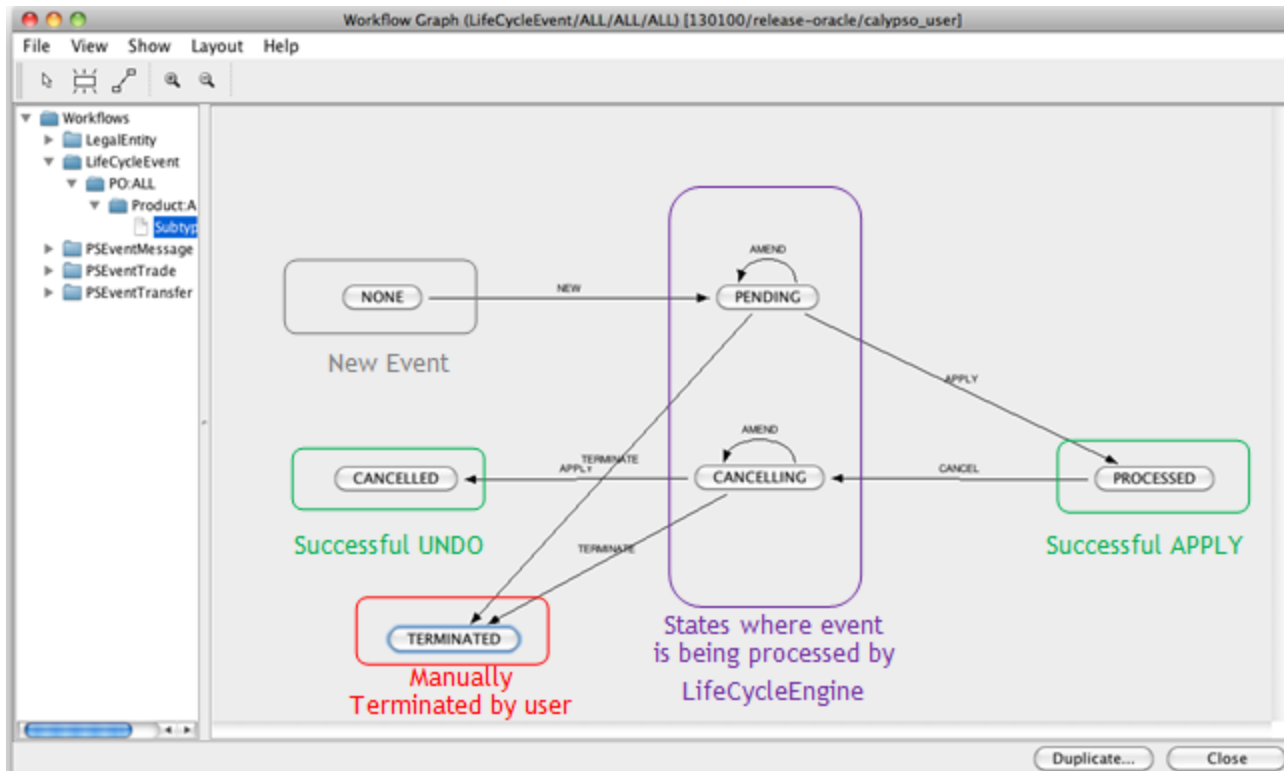
### Pricing

If a user creates a custom event that spins off a trade or in any other way adds an asset with non zero value, the user should be aware that this custom event logic will not be taken into account when pricing. Pricing physical delivery today is only based on the parameters in the script payoff function call 'Physical()', which is priced correctly. All other pricing is based on cashflows.

## 1.1 Before you Begin

### 1.1.1 LifeCycleEvent Workflow

The lifecycle events have their own workflow, which is static and cannot be changed. Transitions are triggered by the user or a scheduled task, at Execute, Undo Event or Terminate.



You will notice there are three end states. Two end states indicate successful execution.

- In a normal *apply* process, the route is from NONE to PROCESSED.
  - In a normal *undo* process, the route is from PROCESSED to CANCELLED.
  - In a failed process where the user manually terminates an event stuck in PENDING or CANCELLING, the LifeCycleEvent object will be set to TERMINATED.
- >> TERMINATED indicates the end state from abnormal activity.

The LifeCycle engine listens for events in "PENDING" and "CANCELLING" status.

Actions NEW and CANCEL initiate the execute and undo processes respectively, and the single action APPLY advances the lifecycle from the working state.

Product Type = ALL - Subtype = ALL

Orig Status	Action	Resulting Status	Use STP	Rules
CANCELLING	AMEND	CANCELLING	false	
CANCELLING	APPLY	CANCELLED	false	
CANCELLING	TERMINATE	TERMINATED	false	
NONE	NEW	PENDING	false	
PENDING	AMEND	PENDING	false	
PENDING	APPLY	PROCESSED	false	
PENDING	TERMINATE	TERMINATED	false	
PROCESSED	CANCEL	CANCELLING	false	

### 1.1.2 Trade Workflow

Make sure that the following actions are defined in the Trade workflow of the trades using a Pricing Script. They need to have their own workflow with the following actions:

- KNOCK\_IN
- UN-KNOCK\_IN
- EXERCISE
- UNEXERCISE
- KNOCK\_OUT
- UN-KNOCK\_OUT

Example for product types ScriptableOTC and EquityStructuredOption:

Orig Status	Action	Resulting Status	Use STP	Rules
EXERCISED	UNEXERCISE	VERIFIED	false	UnexerciseOption,Reject
KNOCKED_IN	UN-KNOCK_IN	VERIFIED	false	UnexerciseOption,Reject
KNOCKED_OUT	UN-KNOCK_OUT	VERIFIED	false	UnexerciseOption,Reject
VERIFIED	EXERCISE	EXERCISED	false	
VERIFIED	KNOCK_IN	KNOCKED_IN	false	
VERIFIED	KNOCK_OUT	KNOCKED_OUT	false	

### 1.1.3 Access Permissions

Access permissions are controlled on 2 levels; whether or not the user can execute/undo the lifecycle event, and then whether the user has permissions to actually apply the actions to the trades (standard Workflow Access permissions).

The following access permission functions are used in the Lifecycle Events window:

- "ExecuteLifeCycleEvent" - Permission to execute a lifecycle event
- "UndoLifeCycleEvent" - Permission to undo a lifecycle event

If an action cannot be applied to a trade, you can activate the "LifeCycleEventProcessor" debug log level to generate the following type of messages:

```
"RedemptionTradeEventProcessor-UNEXERCISE not authorised on trade, id = 49852,
status=VERIFIED"
```

## 1.2 Lifecycle Events Configuration

### 1.2.1 Trigger Rules Configuration

From the Calypso Navigator, navigate to **Configuration > Pricing Script Products > Life Cycle Trigger Rules** (menu action `lifecycle.rule.LaunchLCTriggerRuleDefinition`) to define map a lifecycle event to a Pricing Script and a trigger.

Life Cycle Trigger Rules (User: calypso_user)						
Rules						
Enabled	Product Type	Payoff	Event	Event Trigger	Last Modified	
<input checked="" type="checkbox"/>	EquityStructuredOption	(Any)	Knock In	Knock In	12/8/12 5:38 PM	
<input checked="" type="checkbox"/>	ScriptableOTCProduct	(Any)	Knock In	Knock In	12/8/12 5:38 PM	
<input checked="" type="checkbox"/>	EquityStructuredOption	(Any)	Knock Out	Knock Out	12/8/12 5:39 PM	
<input checked="" type="checkbox"/>	ScriptableOTCProduct	(Any)	Knock Out	Knock Out	12/8/12 5:39 PM	
<input checked="" type="checkbox"/>	EquityStructuredOption	(Any)	Physical Delivery	Physical Delivery	12/8/12 5:39 PM	
<input checked="" type="checkbox"/>	ScriptableOTCProduct	(Any)	Physical Delivery	Physical Delivery	12/8/12 5:41 PM	
<input checked="" type="checkbox"/>	EquityStructuredOption	(Any)	Redemption	Redemption	12/8/12 5:41 PM	
<input checked="" type="checkbox"/>	ScriptableOTCProduct	(Any)	Redemption	Redemption	12/8/12 5:47 PM	
<input checked="" type="checkbox"/>	EquityStructuredOption	(Any)	Structured Event	Default Structured Trig...	12/8/12 5:47 PM	
<input checked="" type="checkbox"/>	ScriptableOTCProduct	(Any)	Structured Event	Default Structured Trig...	12/8/12 5:47 PM	

Sample Life Cycle Trigger Rules window




- » Click  to add a rule. You will be prompted to select the following information:

Product Type

Payoff - Pricing Script name or (Any) for all.

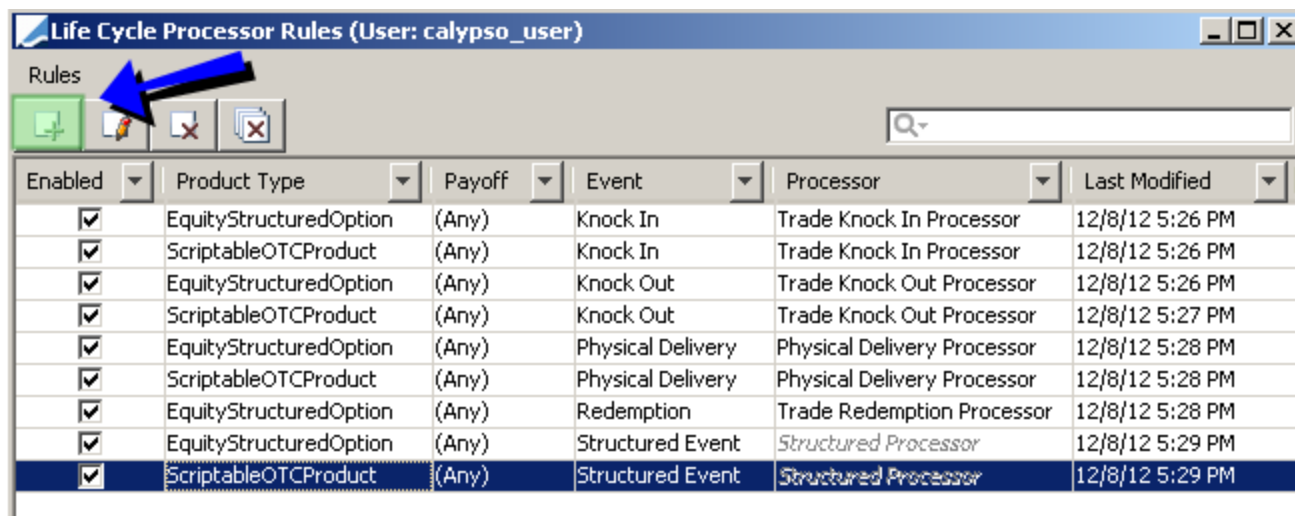
Event

Event Trigger

- » Click  to edit a selected rule.
- » Click  to delete selected rule(s).
- » Click  to delete all rules.

## 1.2.2 Processor Rules Configuration

From the Calypso Navigator, navigate to **Configuration > Pricing Scripts Products > Life Cycle Processor Rules** (menu action `lifecycle.rule.LaunchLCProcessorRuleDefinition`) to map a lifecycle event to a product and lifecycle event processor.

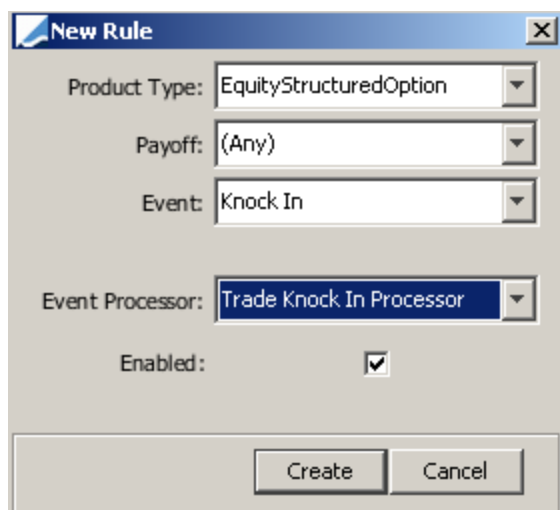


Enabled	Product Type	Payoff	Event	Processor	Last Modified
<input checked="" type="checkbox"/>	EquityStructuredOption	(Any)	Knock In	Trade Knock In Processor	12/8/12 5:26 PM
<input checked="" type="checkbox"/>	ScriptableOTCProduct	(Any)	Knock In	Trade Knock In Processor	12/8/12 5:26 PM
<input checked="" type="checkbox"/>	EquityStructuredOption	(Any)	Knock Out	Trade Knock Out Processor	12/8/12 5:26 PM
<input checked="" type="checkbox"/>	ScriptableOTCProduct	(Any)	Knock Out	Trade Knock Out Processor	12/8/12 5:27 PM
<input checked="" type="checkbox"/>	EquityStructuredOption	(Any)	Physical Delivery	Physical Delivery Processor	12/8/12 5:28 PM
<input checked="" type="checkbox"/>	ScriptableOTCProduct	(Any)	Physical Delivery	Physical Delivery Processor	12/8/12 5:28 PM
<input checked="" type="checkbox"/>	EquityStructuredOption	(Any)	Redemption	Trade Redemption Processor	12/8/12 5:28 PM
<input checked="" type="checkbox"/>	EquityStructuredOption	(Any)	Structured Event	Structured Processor	12/8/12 5:29 PM
<input checked="" type="checkbox"/>	ScriptableOTCProduct	(Any)	Structured Event	Structured Processor	12/8/12 5:29 PM

Sample Life Cycle Processor Rules window

- » Click  to add a rule.




It bring up the New Rule window, shown below, where a product type, payoff and processor can be selected.



The "New Rule" dialog box contains the following fields and controls:

- Product Type:** EquityStructuredOption
- Payoff:** (Any)
- Event:** Knock In
- Event Processor:** Trade Knock In Processor
- Enabled:** ☒
- Buttons:** Create, Cancel

Fill in the necessary information and click **Create**.

- » Click  to edit a selected rule.
- » Click  to delete selected rule(s).
- » Click  to delete all rules.

### Processor “Bermudan Exercise (Remove Flow)”

This processor will remove the known flow after exercise so that no transfer is generated.

It can be configured as needed on the Bermudan Exercise event for any payoff.

## 1.3 Applying Lifecycle Events

You can apply lifecycle events manually using the Lifecycle Events window, or in batch using the EVENT\_LIFECYCLE scheduled task.

The Lifecycle events are created by the LifeCycle engine, based on trades, lifecycle trigger Rules, and lifecycle processor rules.

### 1.3.1 LifeCycle Engine Configuration

You need to add the LifeCycleEngine to the system using the Engine Manager in Web Admin.

Create a new engine called LifeCycleEventLifeCycleEngine, with class name `com.calypso.engine.lifecycle.LifeCycleEngine`.


The LifeCycleEventLifeCycleEngine subscribes to PSEventTrade and PSEventLifecycle events.

The "config" engine parameter is `config = LifeCycleEvent`.

Add the value "LifeCycleEvent" to the domain "lifeCycleEntityType".

The behavior of the LifeCycle engine may be modified using the following engine parameters.

If a parameter is not available for setup, you can register it in the domain "engineParam".

Parameters	Description
IGNORE_ACTION	Comma-separated list of trade actions to be ignored by the engine.
MAX_BATCH_EVENT	Maximum number of persistent events loaded at one time by an engine in batch mode. The engine will load events in MAX_BATCH_EVENT chunks until all events are processed. Persistent events received after MAX_QUEUE_SIZE is reached will be processed in batch mode.  Allows controlling engine memory usage, therefore improving the performance.
MAX_QUEUE_SIZE	Maximum number of events buffered on an engine event queue.  When this number is exceeded, real time events are discarded and the engine restarts based on the restart timer (TIMEOUT_RESTART), in order to process the unprocessed persistent events using batch mode. This parameter can be useful for controlling the engine's memory usage. If not set, the default value for this parameter is no limit on queue size.  Allows controlling engine memory usage, therefore improving the performance.
PricingEnv	Pricing environment used by the engine. If not set, the default Pricing Environment of the user running the engine will be used.   <b>[NOTE: If a pricing environment is set on the processing org's attribute PricingEnv, it will be used instead]</b>
TIMEOUT_RESTART	Number of seconds to wait before an engine restarts after MAX_QUEUE_SIZE has been reached. The default value is 3600 seconds (1 hour).

### 1.3.2 Starting the LifeCycle Engine

The LifeCycleEventLifeCycle engine can be started from the Engine Manager in Web Admin.

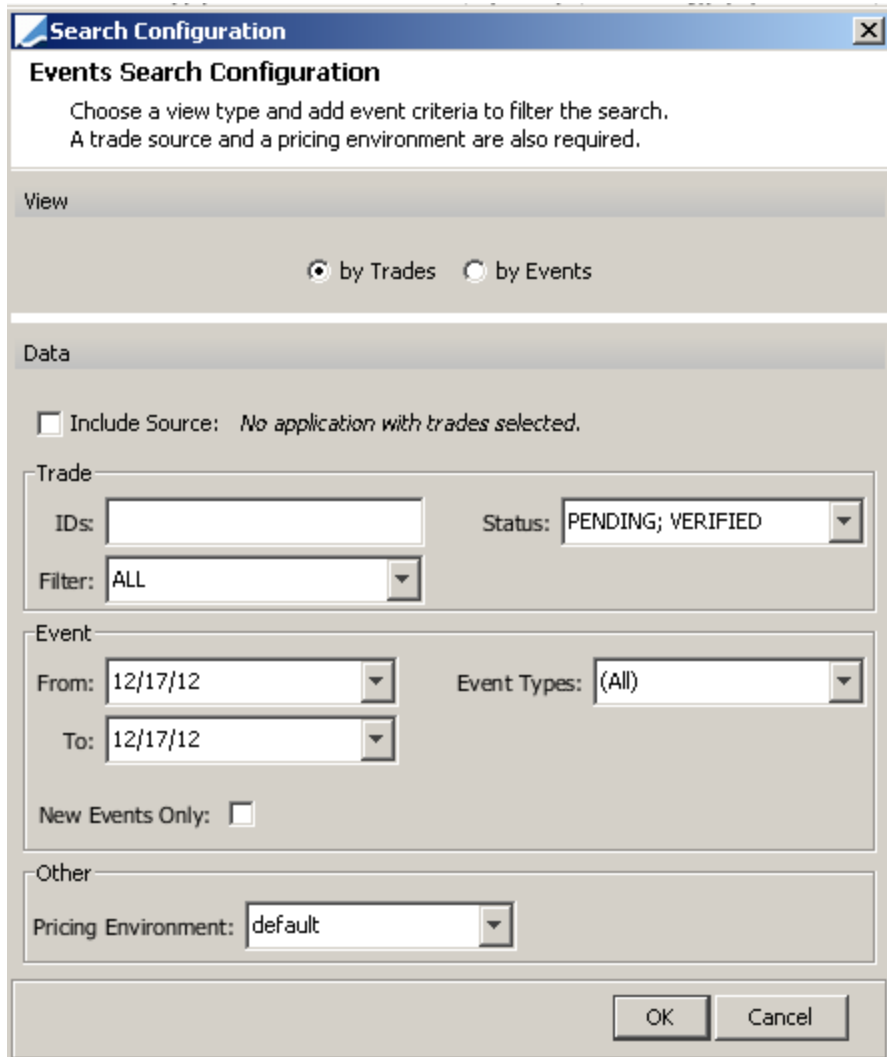
► Please refer to Calypso Web Admin documentation for complete details.

### 1.3.3 Lifecycle Events Window

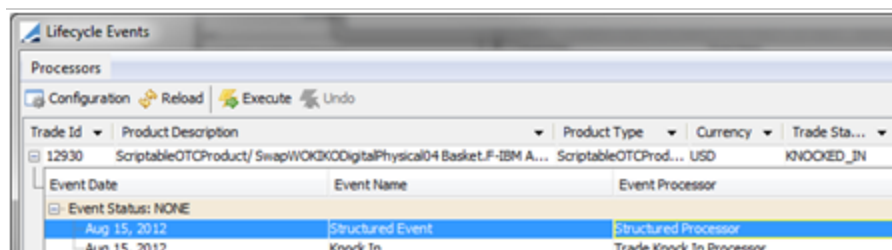
From the Calypso Navigator, navigate to **Trade Lifecycle > Pricing Script Products** (menu action lifecycle.rule.LaunchLCRuleExecution) to open the Lifecycle Events window.

When you open the Lifecycle Events window, you will be prompted to specify search criteria.





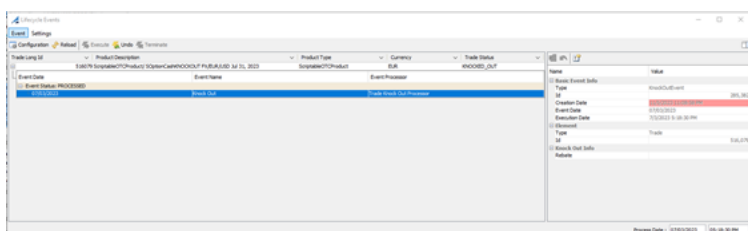
- » View - Select the view type:
  - "by Trades" - The lifecycle events are grouped by trade
  - "by Events" - The lifecycle events are grouped by event
- » Data - Include Source
- » Trade - Enter trades IDs as needed, select the trade status, and select a trade filter.
- » Event - Enter the from and to dates, and select the event type. You can select new events only.
- » Pricing Environment - Select a pricing environment.
- » Click **OK** to load the corresponding events and trades.



A new Event Process Date and Time field on Lifecycle Events window is also introduced. The default value would be the Current date time when the lifecycle Event window is opened.

When any action (Execute, Undo, Terminate) is executed from the LifeCycle Events Window, the Execution date and time would be the Process date and time.

When Lifecycle events using Scheduled Task EVENT\_LIFECYCLE are executed, Process Datetime would be Valuation Datetime while running schedule task.



## Applying an Event

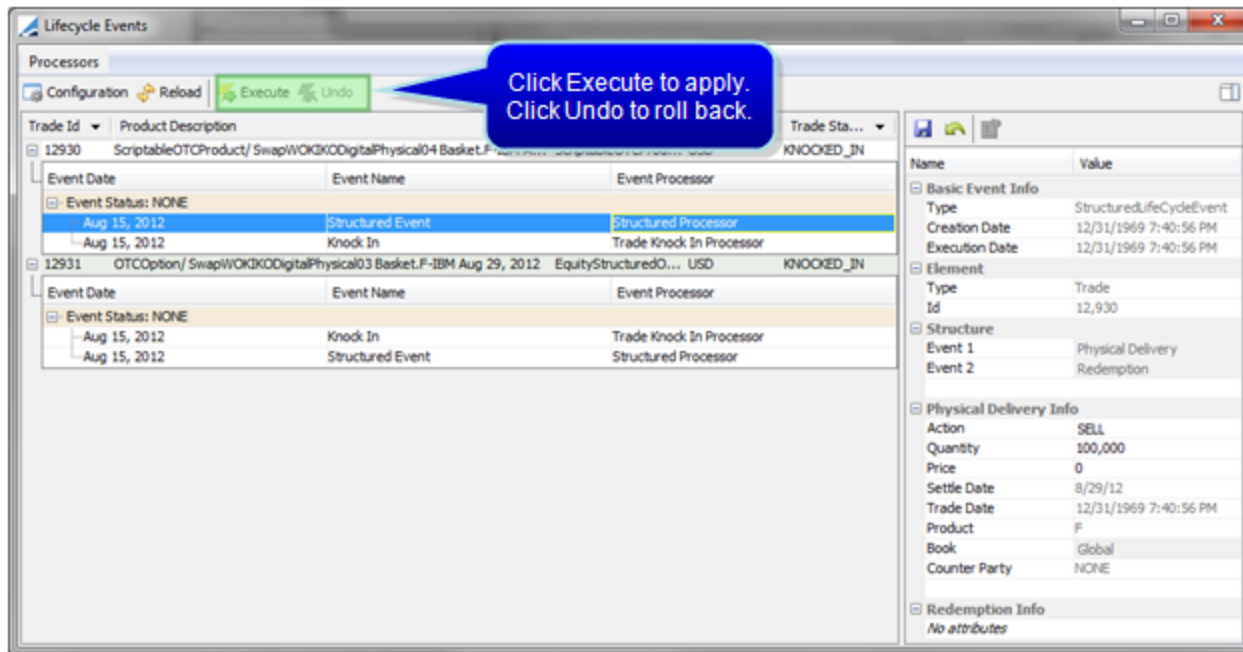
To apply an event, select an event and click **Execute**.

Executing an event will save the event as an object in the database and give it the PROCESSED status. The event will be applied to the corresponding trades.

## Canceling an Event

To can cancel an event, select an event and click **Undo**.

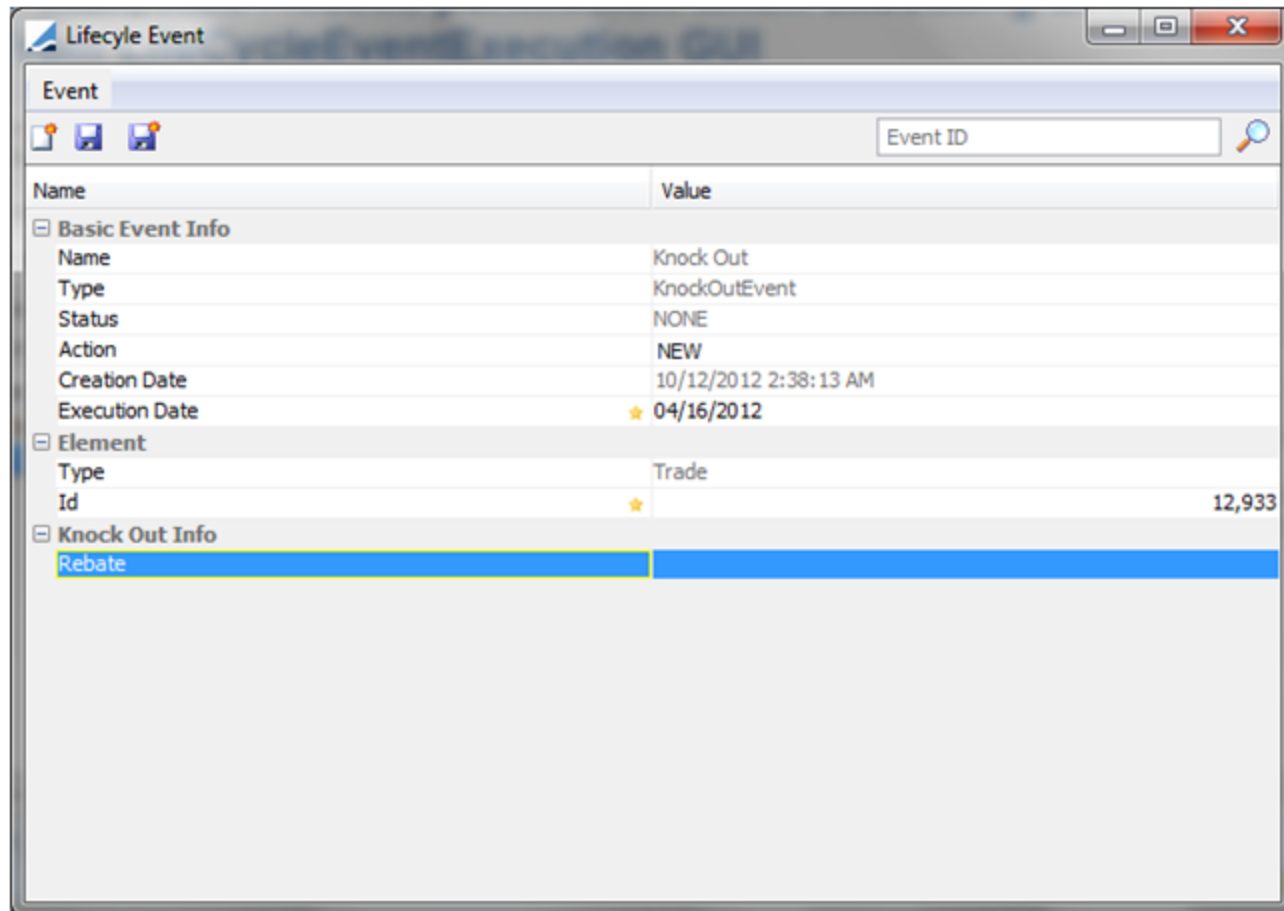
CANCEL is part of the default Lifecycle Event workflow, enabling rollback of an event. If, for example, a physical delivery is undone, the equity trade is canceled and the Lifecycle Event status goes from PROCESSED to CANCELED.



## Creating an Event

If event generation fails, or for other reasons a custom event needs to be created, a manual event can be created.

Choose **Event > Create** to create an event.



Name	Value
<b>Basic Event Info</b>	
Name	Knock Out
Type	KnockOutEvent
Status	NONE
Action	NEW
Creation Date	10/12/2012 2:38:13 AM
Execution Date	★ 04/16/2012
<b>Element</b>	
Type	Trade
Id	★ 12,933
<b>Knock Out Info</b>	
Rebate	

Type in the event type, execution date, and trade id of the event that you want to process and hit save. The event will be picked up by the LifeCycleEngine.

### 1.3.4 EVENT\_LIFECYCLE Scheduled Task

The scheduled task EVENT\_LIFECYCLE executes lifecycle events in batch mode.

You may need to add EVENT\_LIFECYCLE to the domain "scheduledTask".

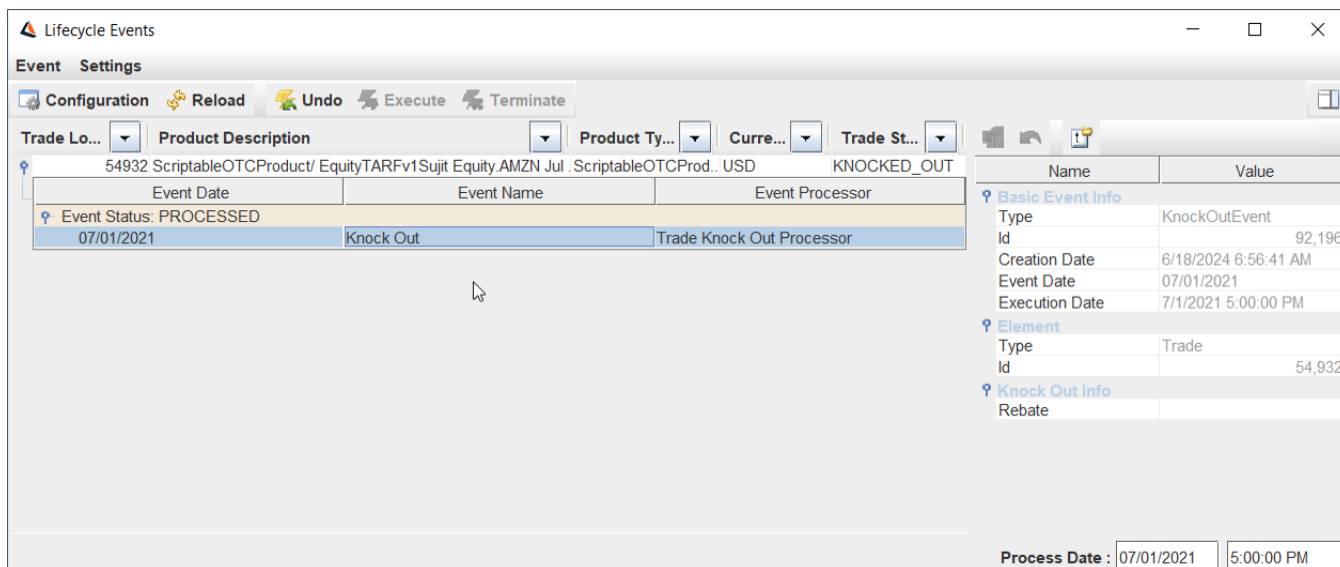
Task Type	EVENT_LIFECYCLE
External Reference	
Comments	
Description	
Attempts	1
Retry After, In Minutes	0
JVM Settings	-Xms512m -Xmx1024m
Allow Task To	<input type="checkbox"/> Skip Execute <input type="checkbox"/> Send Emails
<b>+ Common Attributes</b>	
<b>- Task Attributes</b>	
Event type	Knock In
Start Date	04/0292013
End Date	04/30/2013

## 1.4 Lifecycle Events

### 1.4.1 Knock Out Event

While processing KnockOut Event, the following Keywords are set with below values:

- EXERCISED\_DATETIME and TerminationTradeDate -> Event Lifecycle window Process Date and time.



Name	Value
<b>Basic Event Info</b>	
Type	KnockOutEvent
Id	92,196
Creation Date	6/18/2024 6:56:41 AM
Event Date	07/01/2021
Execution Date	7/1/2021 5:00:00 PM
<b>Element</b>	
Type	Trade
Id	54,932
<b>Knock Out Info</b>	
Rebate	

**Process Date :** 07/01/2021 5:00:00 PM

- TerminationDate -> Maximum of Last Payment date of all known Cash Flows and Process Date.

Pricing Sheet 2 [18240701/MR18\_APL9883\_COREFO18/calypso\_user]

**PricingSheet View MarketData Tools Analysis Processing Configuration Help**

**Market Data**

Default Rate Sides: Choice

Commodity USD NYMEX: 123.700000000000

NYMEX Heating Oil USD: CMD USD NYMEX Heatin...

NYMEX Heating Oil USD: CMD USD NYMEX Heatin...

USD LIBOR 3M Curve: ZC USD Libor 3M/6M

**Pricing**

Valuation Date: 07/02/2021

Valuation Time: 5:00:00 PM

Pricing Env: OFFICIAL

Output 1 or 2 way: 1-way

**Solver**

Show Trials: Solve F9: Apply

Leg: Solving not available

**Strip Generator**

Generate F11: Apply Clear

Legs to strip: None

**Leg Links**

Show All Links

**Leg 1 Details**

Settle Type: End Settlement Date: 07/05/2021

Settlement Lag: 2 Business

Settlement Holidays: FOLLOWING

Settlement Date Roll: 06/03/2021

**Strategy Name: CommodityTARFZ**

Price: Price

Save: Save

Solve: Don't Solve

External Reference: Trade Id: 54933

Trade Date: 06/01/2021

Trade Time: 01:26:39.000 PM

Status: KNOCKED\_OUT

Action: AMEND

Book: APL9883\_1

Counterparty Role: CounterParty

Counterparty: CP

Buy/Sell: Buy

Notional: 1,000,000.00

Notional Ccy: USD

Settle Type: BlackNFMonteCarloEx...

Pricing Model: USD

Model Price: 33.984.76

Trader Price: 33.987.00

Customer Price: 33.987.00

Model Premium: USD 0.00

Trader Premium: USD 0.00

Customer Premium: USD 0.00

Customer Fee Ccy: USD

Deal Pricing Model: Start Date: 06/01/2021

End Date: 07/01/2021

Settlement Date: 06/03/2021

Internal Reference: Trade Version: NPV\_NET: USD -33.984.76

NPV: USD -33.984.76

PV: USD -33.984.76

CUMULATIVE\_CASH: USD -30,000.00

**Trade Attributes**

EXERCISED\_DATETIME: 7/1/21 5:00:00.000 PM GMT

LifeCycleEventId: 92198

NegotiatedCurrency: USD

PremRate: =0

PriceCcy: USD

PSStrategyName: CommodityTARFZ

RateSide: Choice

TerminationDate: 07/06/2021

TerminationTradeDate: 7/1/21 5:00:00.000 PM GMT

TerminationType: KNOCK\_OUT

TradeSource: DataUploader

13CTimeIndication: 26T

ACCOMMODATION\_CHAR: AccountNumber

AccountNumber: ADR Currency

ADR Fee: AFMAPricingCashRate

AFMAPricingCashRate: AFMAPricingCashRate

OK Cancel

Current: Jun 18, 8:23:17 AM GMT