



ORTOMATION.IO

OPTIMIZING YOUR WORLD

ORTO Software Quick Guide

<DRAFT>

Cover Page



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OPTIMIZING YOUR WORLD

ORTO
File Capture Help

Optimization Scheme: 2D Process Optimization Example Desc: x2 MV Process Optimization Example / Constrained
Paul Oram
8-3-24
Using OA1 & OA2

Scheme Name: 2MV Proc Scheme Status: **<Running>**

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Cover ORTO <-> Process Data Comms Optimization Objective Function ORTO Agent Build & Configuration Optimization Performance Monitoring & Analysis

Software Licence

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OPC Communications Tab

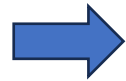


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Save and load ORTO schemes. Access help Documents.



Select communication protocol



The screenshot shows the ORTO OPC Communications Tab interface. At the top, there is a header with the ORTO logo and the text 'OPTIMIZING YOUR WORLD'. Below the header, there are fields for 'Optimization Scheme' (2D Process Optimization Example), 'Scheme Name' (2MV Proc), and 'Scheme Status' (<Running>). The 'OPC DA' dropdown is set to 'OPC DA'. The 'Server Host' is 'LocalHost', 'OPC Server ID' is 'Matrikon.OPC.Simulation.1', and 'Sample Time' is '5 Secs'. The 'OPC Server Desc.' is 'MatrikonOPC Server for Simulation and Testing'. The interface is divided into two main sections: 'Reads' and 'Writes'. The 'Reads' section has a table with 15 rows, each with a filter, a read tag, and a current value. The 'Writes' section has a table with 10 rows, each with a filter, a destination tag, and a current readback value.

| *Filter* | Read Tag | Current Value |
|----------|----------------------|---------------|
| 1 | Bucket Brigade.Int1 | 0 |
| 2 | Bucket Brigade.UInt1 | 0 |
| 3 | ---- | |
| 4 | Bucket Brigade.Int4 | -1048 |
| 5 | Bucket Brigade.UInt4 | 6667 |
| 6 | ---- | |
| 7 | Bucket Brigade.Real4 | -92.1783 |
| 8 | ---- | |
| 9 | ---- | |
| 10 | Random.Real4 | 19781.9609 |
| 11 | Random.Real8 | 8646.3046 |
| 12 | ---- | |
| 13 | ---- | |
| 14 | ---- | |
| 15 | ---- | |

| *Filter* | Destination Tag | Current Readback Value |
|----------|----------------------|------------------------|
| 1 | Bucket Brigade.Int2 | -1044 |
| 2 | Bucket Brigade.UInt2 | 6667 |
| 3 | ---- | |
| 4 | ---- | |
| 5 | ---- | |
| 6 | ---- | |
| 7 | ---- | |
| 8 | ---- | |
| 9 | ---- | |
| 10 | ---- | |

Header – always displayed

OPC protocol / server description

OPC read / write tag selection

Optimization Objective Function Tab



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Optimization Scheme: 2D Process Optimization Example
Desc: x2 MV Process Optimization Example / Constrained
Paul Oram
8-3-24
Using OA1 & OA2

Scheme Name: 2MV Proc
Scheme Status: <Running>

Optimization Variable (OV) Description: Z Output - Production

OV Calc. / Tag: Bucket Brigade.Real4
OV Value: -87.9419
OV Units: kg/hr
OV Range Low: -300
High: 300

By manipulating variables:

| ORTO Agent | MV Tag | Current Value |
|------------------|----------------------|---------------|
| ORTO Agent 1: MV | Bucket Brigade.Int2 | -1024 |
| ORTO Agent 2: MV | Bucket Brigade.UInt2 | 6665 |
| ORTO Agent 3: MV | ---- | --- |
| ORTO Agent 4: MV | ---- | --- |
| ORTO Agent 5: MV | ---- | --- |

Subject to constraints:

| Constraint | Constraint Logic |
|------------|---|
| C1 | Bucket Brigade.UInt4-Bucket Brigade.Int4<6000 |
| C2 | ----- |
| C3 | ----- |
| C4 | ----- |
| C5 | ----- |

Paused by:

| Pause Logic |
|----------------------------|
| P1: Bucket Brigade.Int1>0 |
| P2: Bucket Brigade.UInt1>0 |
| P3: ----- |
| P4: ----- |
| P5: ----- |

OV tag or calculation
(using read and/or
write tags)

MV selection
(using write tags)

Optimization Variable
(OV) description

External constraint
logic configuration
(using read or write tags)

External pause
logic configuration
(using read or write tags)

ORTO Agent Build Configuration Tab / ORTO Agent 1..5



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Configure up to five agents

Agent Output tag (i.e. the associated MV, copied from previous tab)

ORTO agent configuration parameters

Agent MV, MV RB and upper and lower bounds trends

Bars indicate when agent is constrained, paused and on.

Select Readback Tag (from read tag list)

Define the constraint and pause flag applicable to agent

ORTO Agent Build Config. Tab / ORTO Agent Config. Summary Tab



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Optimization Scheme: 2D Process Optimization Example Desc: x2 MV Process Optimization Example / Constrained
Paul Oram
8-3-24
Using OA1 & OA2

Scheme Name: 2MV Proc Scheme Status: <Running>

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ORTO Agent 1 | <On> ORTO Agent 2 | <On> ORTO Agent 3 | <Unused> ORTO Agent 4 | <Unused> ORTO Agent 5 | <Unused> ORTO Agent Config. Summary

| | ORTO Agent 1 | ORTO Agent 2 | ORTO Agent 3 | ORTO Agent 4 | ORTO Agent 5 |
|------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| On/Off | On | | | | |
| Optimization Objective | Maximize | Maximize | Maximize | Maximize | Maximize |
| Optimization Variable (OV) / Calc | Bucket Brigade.Real4 | Bucket Brigade.Real4 | Bucket Brigade.Real4 | Bucket Brigade.Real4 | Bucket Brigade.Real4 |
| OA Name | X Input (kg/hr) | Y Input (kg/hr) | | | |
| Manipulated Variable (MV) Readback | Bucket Brigade.Int4 | Bucket Brigade.UInt4 | | | |
| Constraint Flag | C1 | C1 | | | |
| Pause Flag | P1 | P2 | | | |
| OV Range Eng. Units Low | -300 | -300 | -300 | -300 | -300 |
| OV Range Eng. Units High | 300 | 300 | 300 | 300 | 300 |
| MV Range Eng. Units Low | -6000 | 0 | | | |
| MV Range Eng. Units High | 6000 | 12000 | | | |
| Cycle Time (secs) | 120 | 90 | | | |
| Sensitivity Factor | 1 | 1 | | | |
| Max. Move Size /cycle | 375 | 225 | | | |
| MV Lower Bound | -6000 | 0 | | | |
| MV Higher Bound | 6000 | 12000 | | | |
| Push Direction | Positive | Negative | Positive | Positive | Positive |
| MV Output Tag | Bucket Brigade.Int2 | Bucket Brigade.UInt2 | | | |

Agent assigned to scheme, running
 Agent assigned to scheme, not running
 Agent unused

Export .xls

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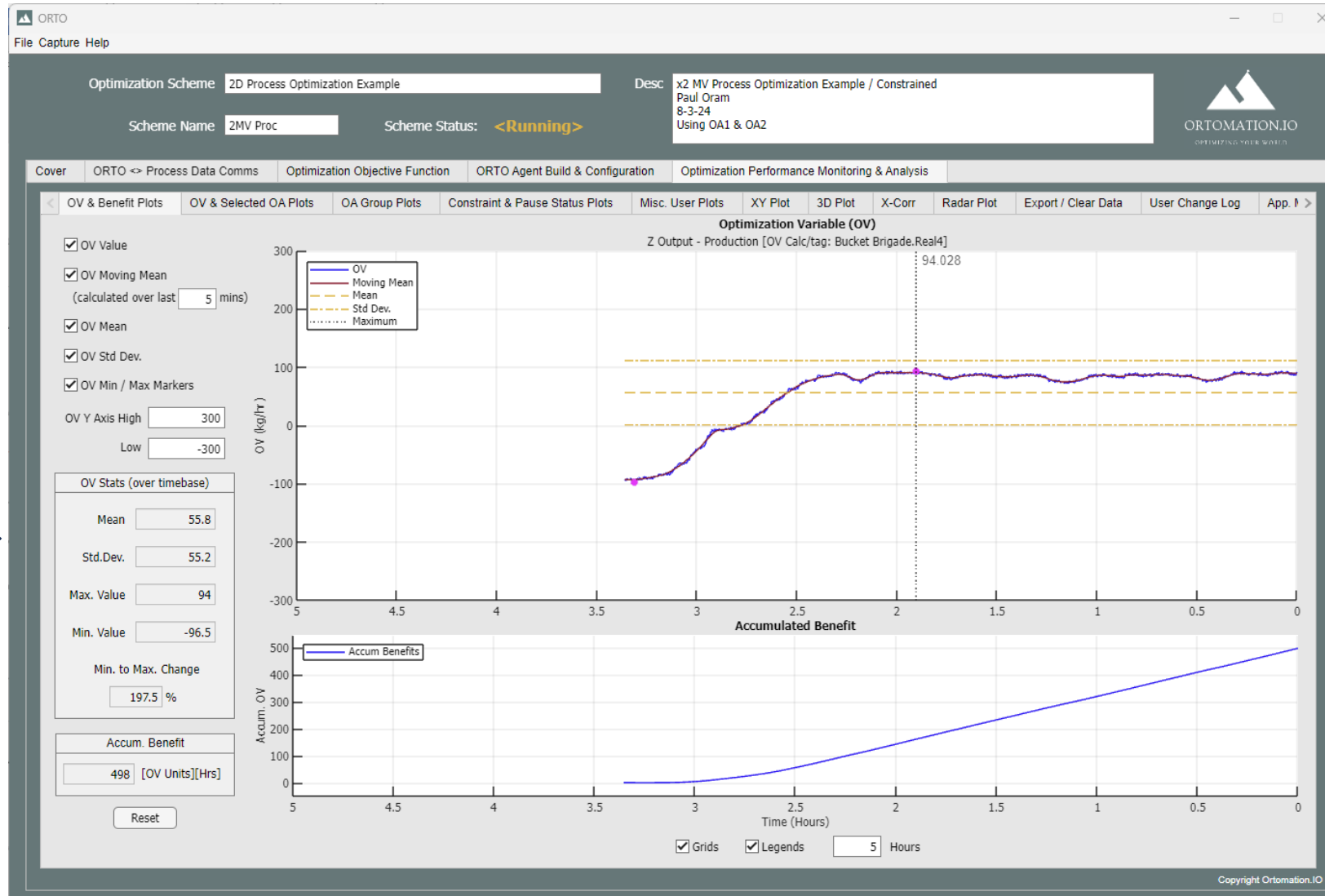


Agent configuration summary table, indicating those running, assigned or not used.

Perf. Monitoring & Analysis Tab / Optimization Variable (OV) & Benefit Plots Tab



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OV statistics panel.

OV plot, with mean and standard deviations. Min and max value shown.

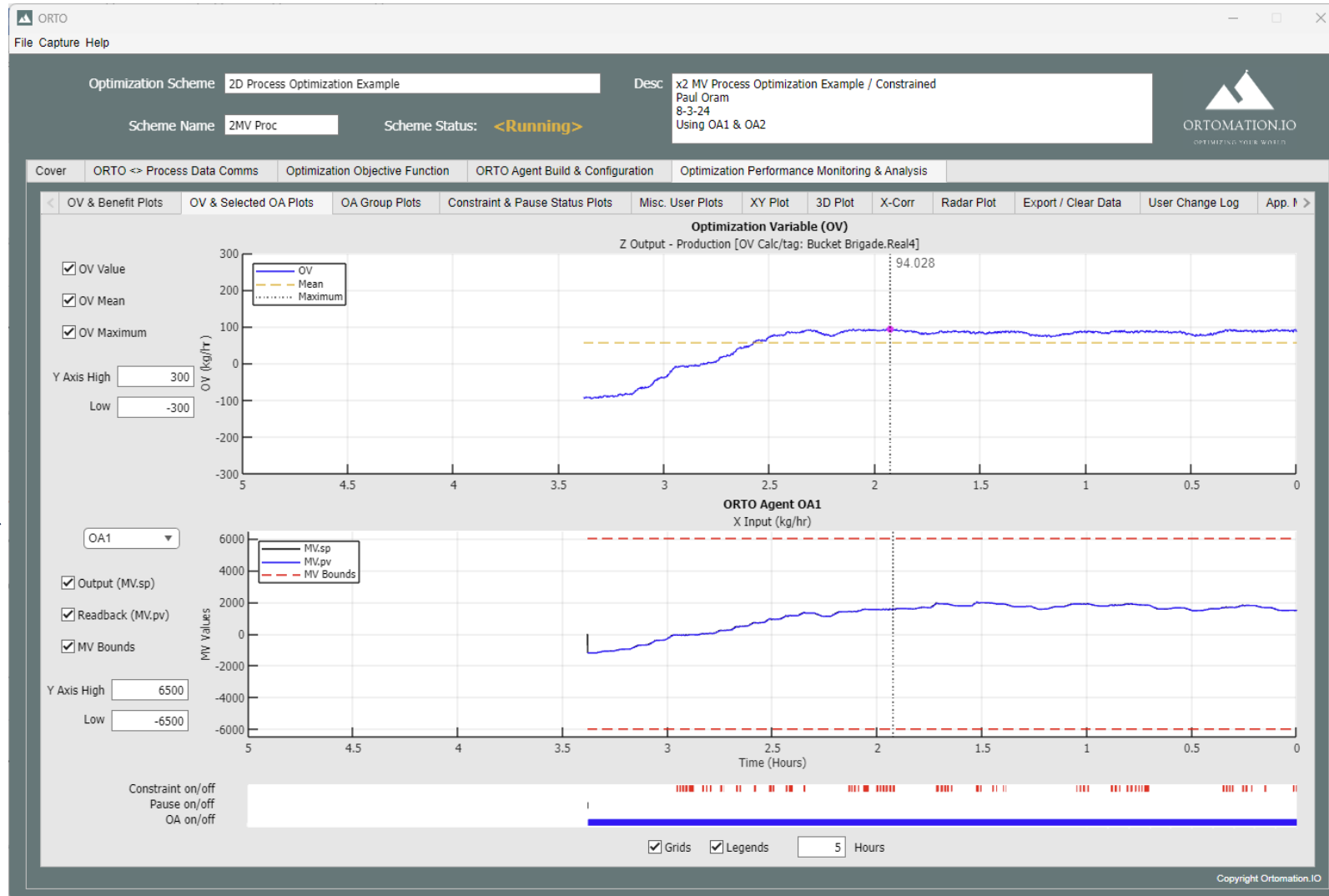
Accumulated benefits, since scheme switched on.

Perf. Monitoring & Analysis Tab / OV & Selected ORTO Agent Tab

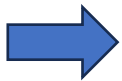


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Select OA to plot.



OV plot, with mean value.

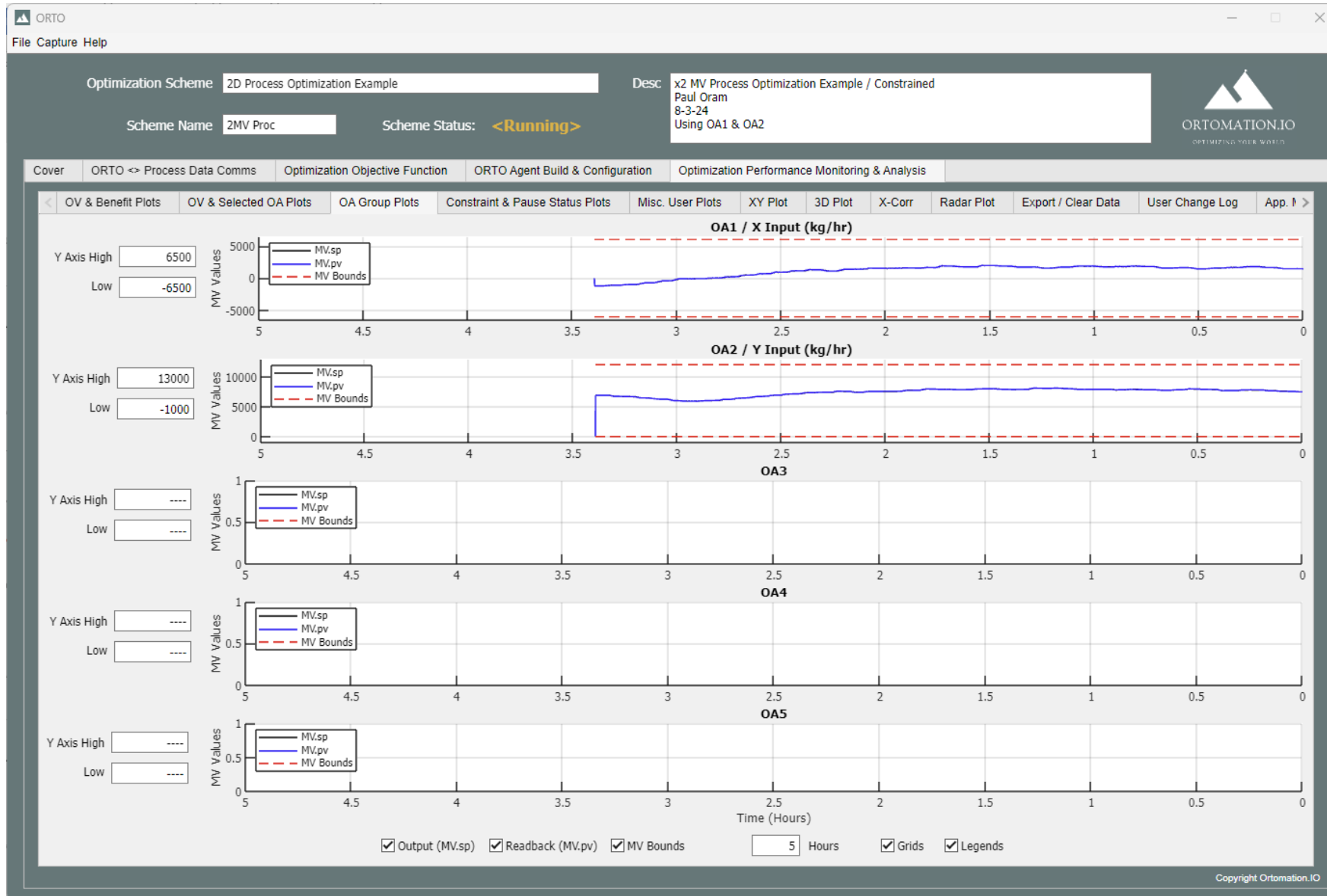
Agent MV, MV RB and upper and lower bounds trends

Bars indicate when agent is constrained, paused and on.

Perf. Monitoring & Analysis Tab / ORTO Agent Plots Tab



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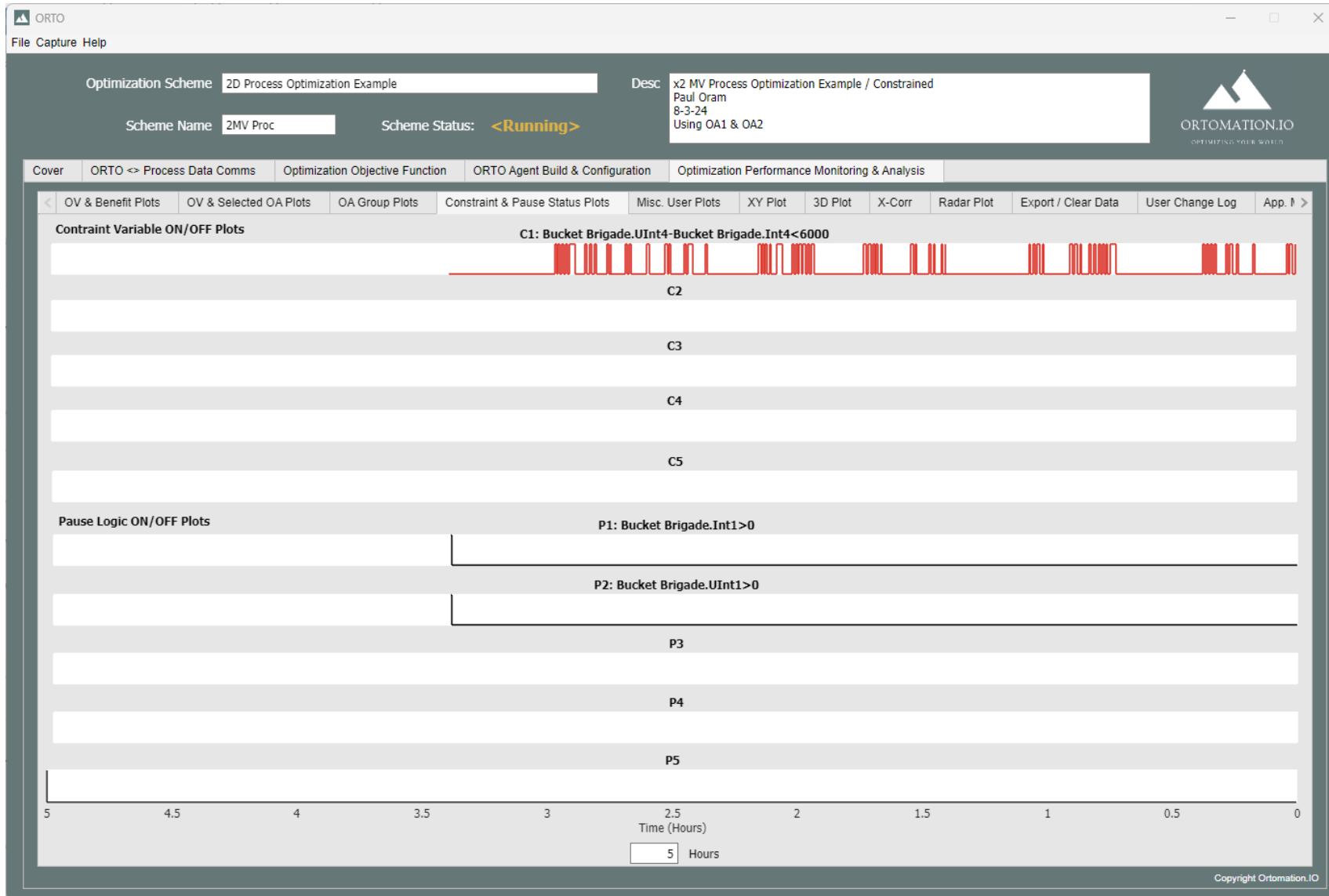


← ORTO Agent SP, MV and bounds plots.

Perf. Monitoring & Analysis Tab / Constraint & Pause Flag Plots Tab



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← Constraint flags 1-5 statuses.

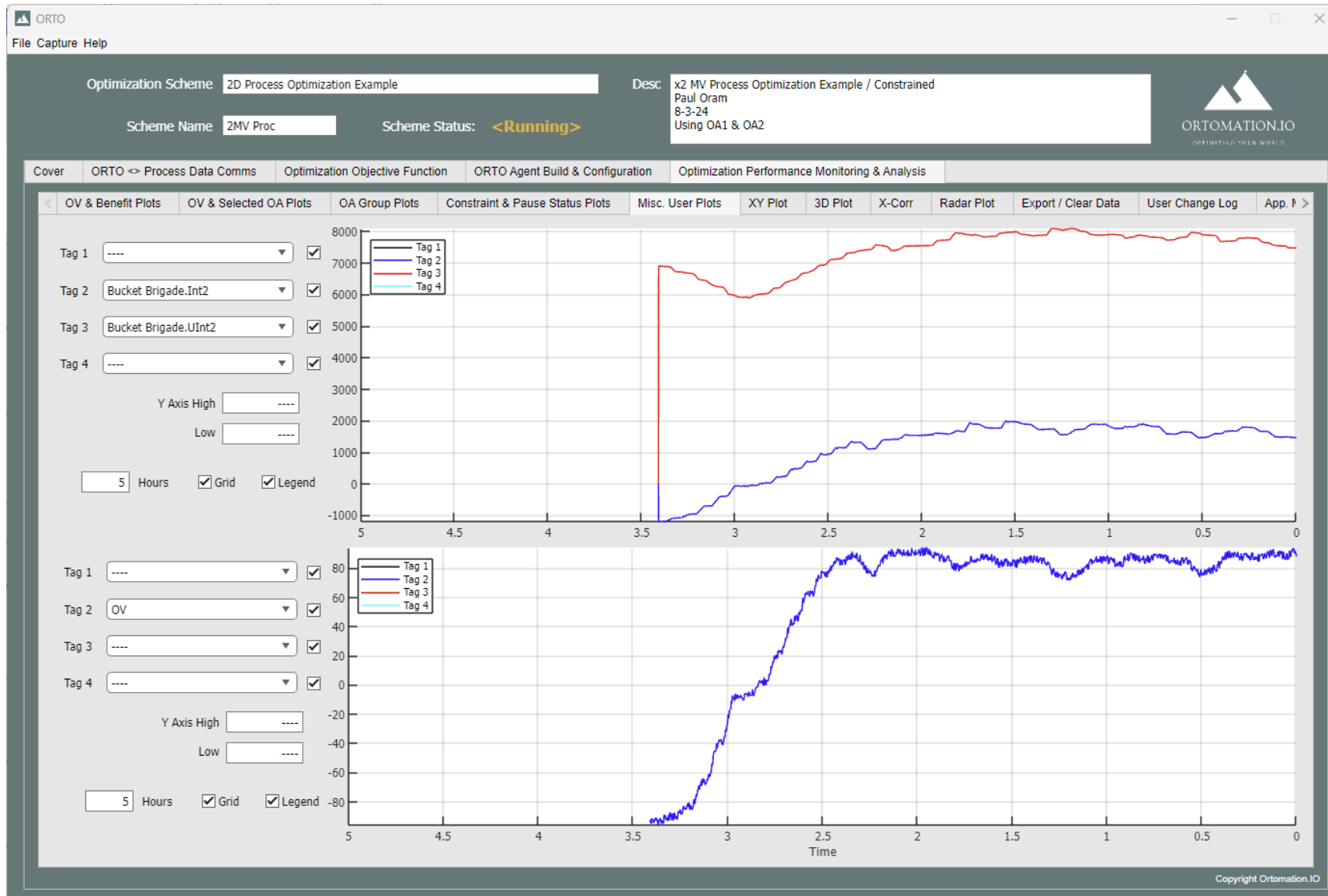
← Pause flags 1-5 statuses.

Misc. Plots Tab



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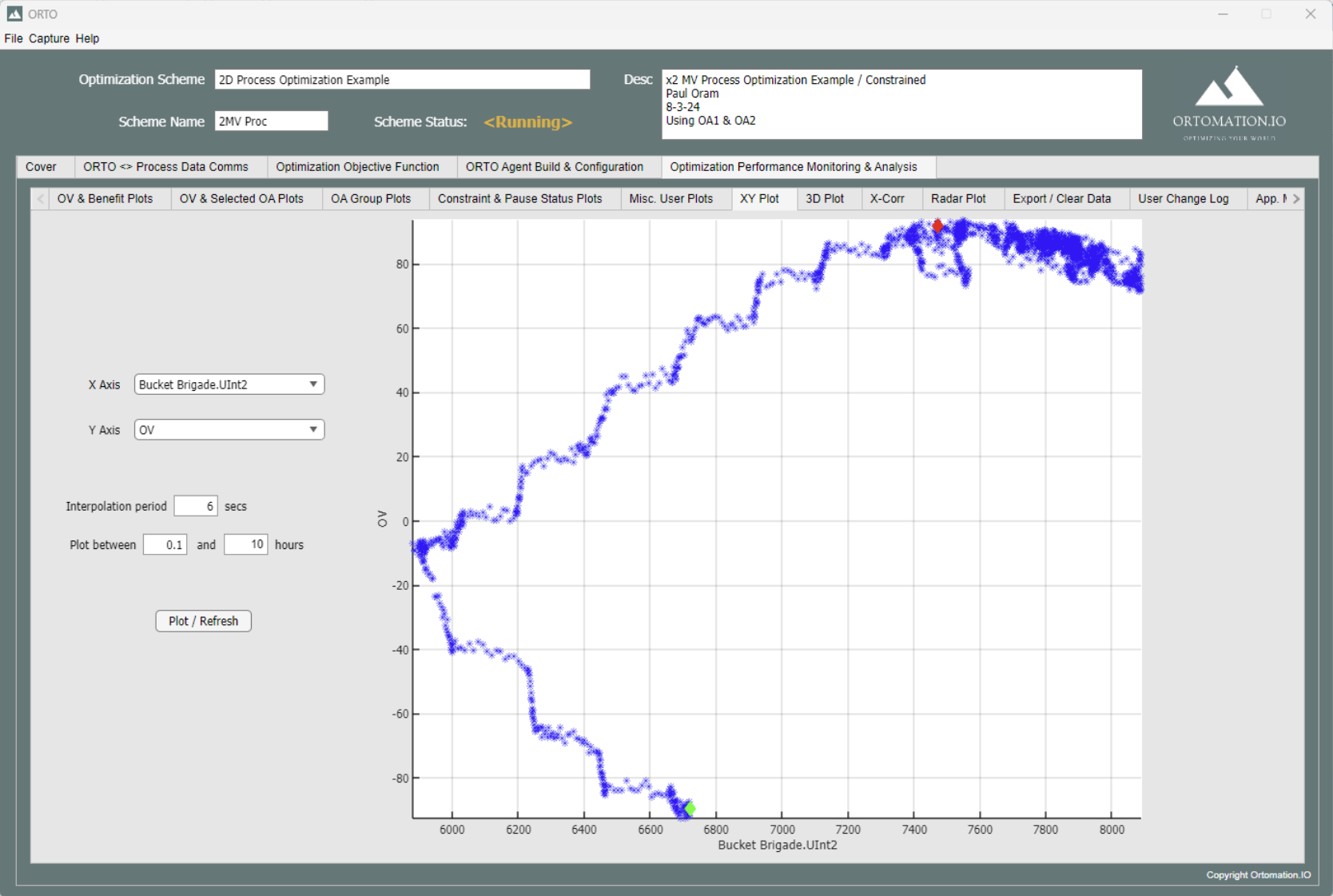


← User created real-time plots.

XY Plot Tab



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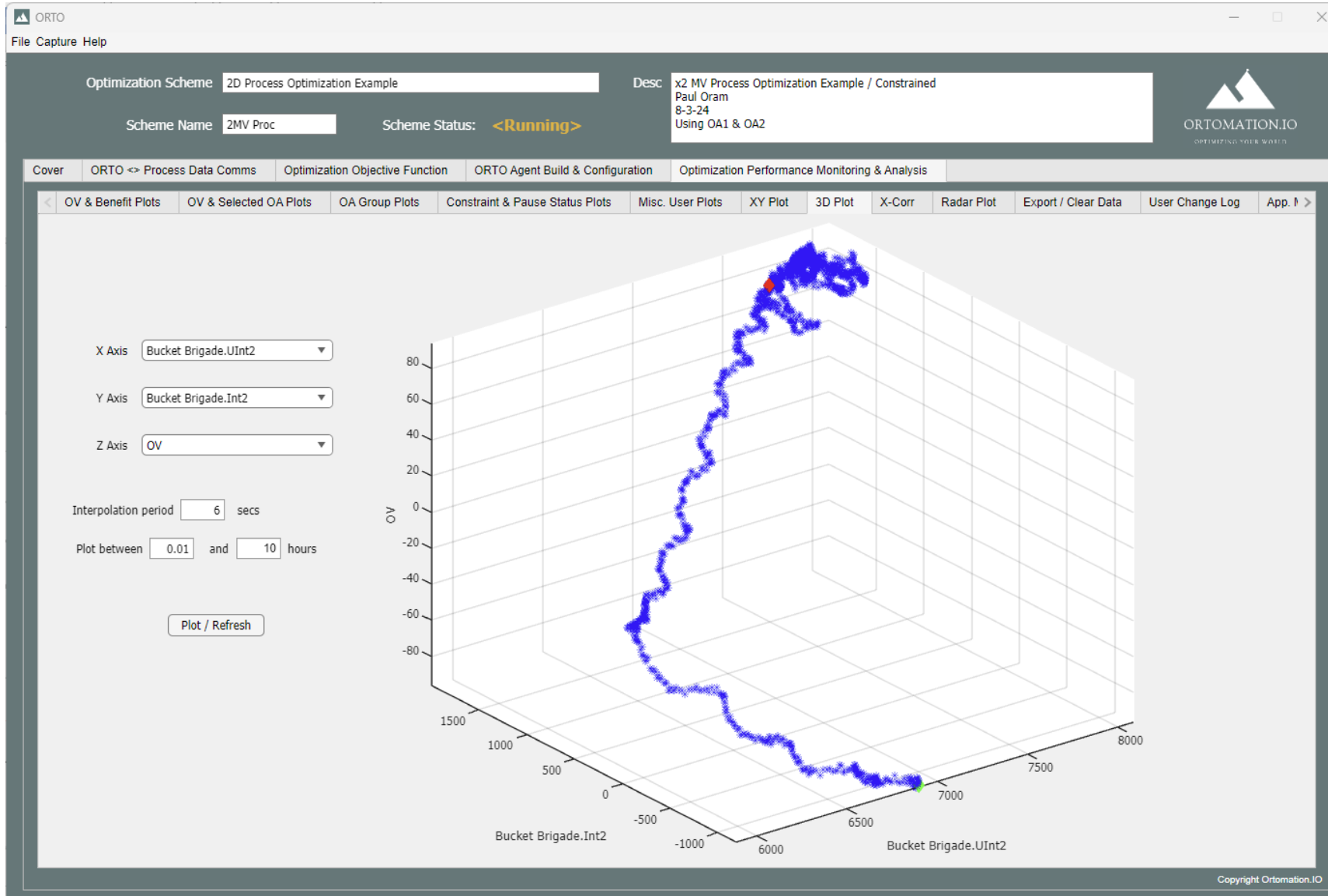
← Plot one variable against another.

3D plot



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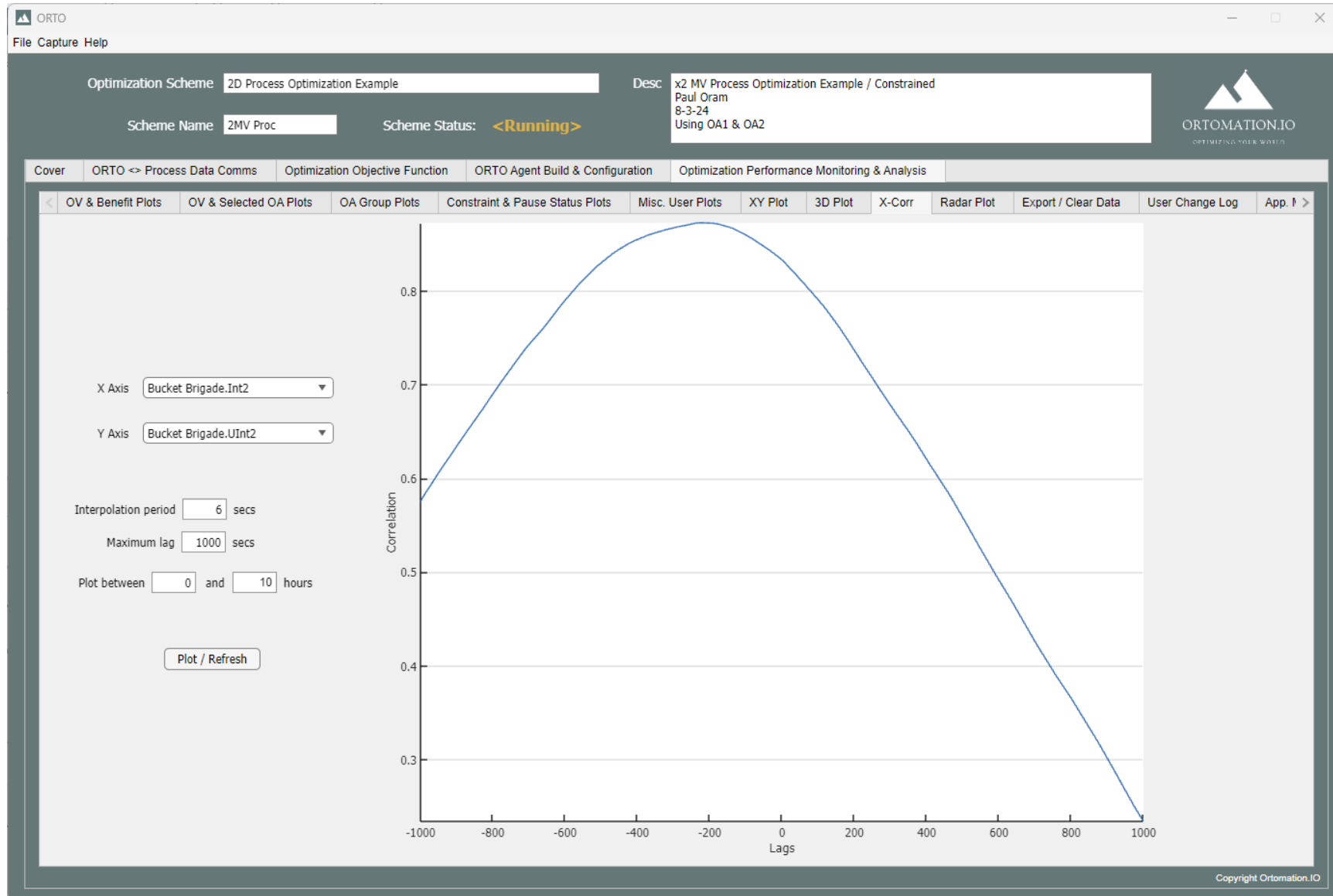
Plot three variables, for example, to visualize the 3D plane between two MVs and the OV.

Cross Correlation Tab



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Perform cross and auto correlations.

Perf. Monitoring & Analysis Tab / Export & Clear Data Tab



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The screenshot shows the ORTO software interface. At the top, the 'Optimization Scheme' is '2D Process Optimization Example' and the 'Scheme Name' is '2MV Proc'. The 'Scheme Status' is '<Running>'. The 'Desc' field contains 'x2 MV Process Optimization Example / Constrained', 'Paul Oram', '8-3-24', and 'Using OA1 & OA2'. The 'Export / Clear Data' tab is selected in the navigation bar. The main content area is divided into two sections: 'Export Process and ORTO Agent Real-time Data' and 'Clear All Historical Data'. The 'Export' section includes a 'File name' field with '2MV Proc RT Data', a 'Time Base' dropdown set to 'Hours', 'Save between' fields set to '0' and '9999' hours ago, and a 'File Format' section with radio buttons for '.xls' (selected) and '.txt'. There are five columns of checkboxes: 'OPC Data' (Read Data (1-15), Write Data (1-10)), 'Objective Function Data' (Optimization Variable, Constraint Variable Flags (1-5), Pause Logic Flags (1-5)), 'ORTO Agent Input / Output Data' (ORTO Agent 1-5), and 'Analysis Data' (Accumulated Benefit). An 'Export Data' button is at the bottom of this section. The 'Clear All Historical Data' section has a 'Clear Data' button.

← Select real-time data to export.

← Clear data and erase plots.

Perf. Monitoring & Analysis Tab / User Change Log Tab



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File Capture Help

Optimization Scheme: 2D Process Optimization Example Desc: x2 MV Process Optimization Example / Constrained Paul Oram 8-3-24 Using OA1 & OA2

Scheme Name: 2MV Proc Scheme Status: <Running>

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< OV & Selected OA Plots OA Group Plots Constraint & Pause Status Plots Misc. User Plots XY Plot 3D Plot X-Corr Radar Plot Export / Clear Data User Change Log App. Monitoring and Prefs. >

| Date / time | Header / Tab Location | ORTO Agent | OA Descriptor | Parameter | Previous Value | New Value |
|----------------------|--|------------|-----------------|--------------------------------|----------------|-------------|
| 12-Mar-2024 13:11:18 | ORTO Agent Build & Configuration | OA2 | Y Input (kg/hr) | Agent On/Off | off | on |
| 12-Mar-2024 13:11:16 | ORTO Agent Build & Configuration | OA1 | X Input (kg/hr) | Agent On/Off | off | on |
| 12-Mar-2024 13:11:00 | <2MV Process OA1 OA2 constrained_r4_2_exe.mat load comple... | - | - | - | - | - |
| 12-Mar-2024 13:11:00 | ORTO Agent Build & Configuration | OA5 | <see new value> | ORTO Agent 5 Name | ---- | ---- |
| 12-Mar-2024 13:11:00 | ORTO Agent Build & Configuration | OA5 | | Push Direction | Positive | Positive |
| 12-Mar-2024 13:11:00 | ORTO Agent Build & Configuration | OA5 | | MV Bounds [High Low] | [---- ----] | [---- ----] |
| 12-Mar-2024 13:11:00 | ORTO Agent Build & Configuration | OA5 | | MV Bounds [High Low] | ---- | [---- ----] |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA5 | | Sens. Factor | 1 | ---- |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA5 | | Max. Move / Cycle | ---- | ---- |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA5 | | Agent Cycle Time (Prime Value) | ---- | 100 |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA5 | | MV EU Range [High Low] | [---- ----] | [---- ----] |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA5 | | MV EU Range [High Low] | ---- | [---- ----] |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA5 | | Pause Flag | ---- | ---- |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA5 | | Constraint Flag | ---- | ---- |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA5 | | MV Readback Tag | ---- | ---- |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA4 | <see new value> | ORTO Agent 4 Name | ---- | ---- |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA4 | | Push Direction | Positive | Positive |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA4 | | MV Bounds [High Low] | [---- ----] | [---- ----] |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA4 | | MV Bounds [High Low] | ---- | [---- ----] |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA4 | | Sens. Factor | 1 | ---- |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA4 | | Max. Move / Cycle | ---- | ---- |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA4 | | Agent Cycle Time (Prime Value) | ---- | 100 |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA4 | | MV EU Range [High Low] | [---- ----] | [---- ----] |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA4 | | MV EU Range [High Low] | ---- | [---- ----] |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA4 | | Pause Flag | ---- | ---- |
| 12-Mar-2024 13:10:59 | ORTO Agent Build & Configuration | OA4 | | Constraint Flag | ---- | ---- |

Export .xls

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All user changes are logged. Logs can be exported as a .xls file.

App. Monitoring and Preferences Tab



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The screenshot shows the ORTO application interface. At the top, there is a menu bar with 'File', 'Capture', and 'Help'. Below the menu bar, the 'Optimization Scheme' is '2D Process Optimization Example' and the 'Scheme Name' is '2MV Proc'. The 'Scheme Status' is '<Running>'. The 'Desc.' field contains 'x2 MV Process Optimization Example / Constrained', 'Paul Oram', '8-3-24', and 'Using OA1 & OA2'. The 'App. Monitoring and Prefs.' tab is selected, showing two panels:

- App Performance Monitoring**
 - Total run time: 3.563 hours
 - Execution cycle time: 0.3885 secs
 - Reserved memory: 0.1171 GBs
 - Data memory used: 0.4775 MBs
- App Preferences**
 - Inactivity timer: 30 mins
 - Compression tolerance: 0.3 %
 - No. points / plot: 1000

← ORTO application software monitoring and preferences.