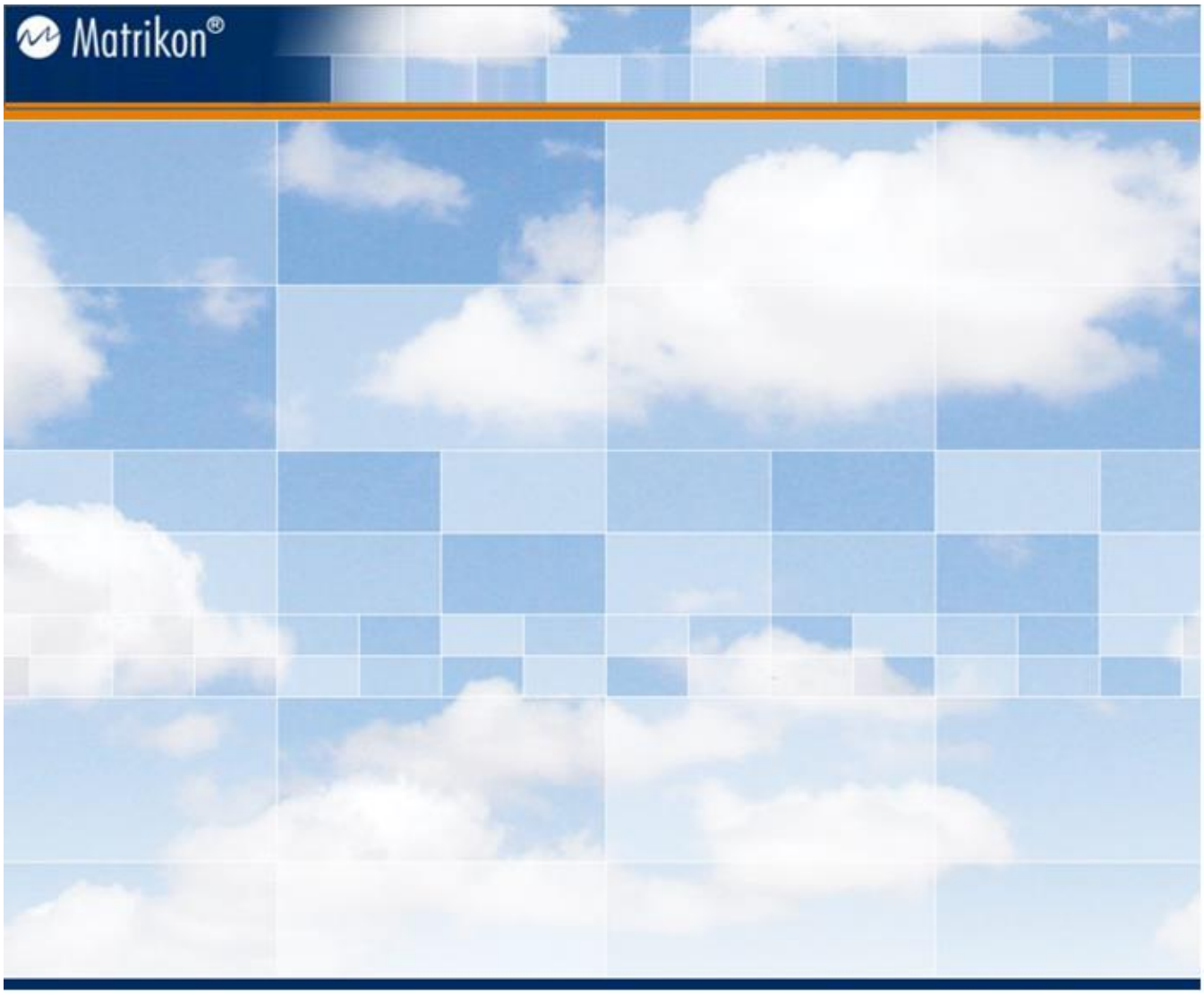


# MatrikonOPC Simulation Server

## User's Manual

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## User's Manual

## This manual is a product of Matrikon Inc.

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# Table of Contents



# Table of Tables

# Introduction

The Matrikon OPC™ Simulation Driver (also referred to as Matrikon OPC Simulation Driver and Testing or Simulation server) enables data interchange to any OPC clients. The driver provides different types of data that offers testing abilities.

Table 1 lists the various data options available in the driver.

| Source Type | Function |
|---|---|
| **Bucket Brigade** | Provides variables that can be set to any value depending on their type. Read and Write capabilities. |
| **Random** | Produces random values to test Read capabilities of an OPC client. |
| **Read Error** | Allows testing on OPC client's behaviour when an error occurs. |
| **Waves** | Produces read-only values in a Square, Saw-tooth, or Triangle wave. |
| **Write Errors** | Allows test for Write errors. |
| **Write Only** | Allow Write tests. |

**Table 1 - Data Options**

The Matrikon OPC Simulation Driver can be used to simulate other OPC servers on a simple level, and to test your OPC client or architecture. This driver can give users a useful source of data to test their system. Not only does it come pre-loaded with data points that perform multiple functions, but you can also add more simulated tags as needed.

The Simulation driver can also be used to troubleshoot system connectivity by replacing your OPC server with the Simulation driver which can then expose OPC server configuration issues.

## Who Should Use This Manual

This manual is intended for all users of Matrikon OPC Simulation Driver. This manual explains how to license, and configure the software, and how to perform common tasks. In addition and where required, technical information about OPC data items, diagnostics information, and a troubleshooting section is included.

## Overview of Manual

This manual uses icons to highlight valuable information. Remember these icons and what they mean, as they will assist you throughout the manual.

| | |
|---|---|
|  | This symbol denotes important information that must be acknowledged. Failure to do so may result in the software not functioning properly. |
| **BOLD** | Font displayed in this color and style indicates a hyperlink to the applicable/associated information within this manual, or if applicable, any external sources. |

The *User's Manual* has been designed so that you can click on references in the document to jump to that referenced point without having to scroll through several pages (in some cases). For example, if you were to see the sentence "*Refer to Figure 1 for more information*", pressing the

**CTRL** key and clicking your mouse on the text "*Figure 1*" will automatically take you to the location of Figure 1 within the document.

This manual consists of several chapters and is structured as follows:

- **Introduction** – this introductory chapter.
- **Getting Started** – provides instructions for installing the software, and Matrikon OPC Support team contact information.
- **Driver Configuration** – provides Matrikon OPC Simulation Driver configuration instructions.
- **OPC Data Items** – describes the driver's items.
- **Limitations** – provides information on specific performance and operational limitations of the software (if any).
- **Alarms and Events Functionality** – provides information about Matrikon OPC Simulation Driver A&E functionality.
- **Historical Data Access Functionality** – provides information about Matrikon OPC Simulation Driver HDA functionality.

## References

This document references information found within the following documents/sites:

- **www.opcfoundation.org**
- **www.MatrikonOPC.com**
- **www.opcsupport.com**
- *OPC Overview 1.0*
- *OPC Common Definitions and Interfaces 1.0*
- *OPC Historical Data Access Custom Interface Standard 1.20*
- *OPC Data Access Custom Interface Standard 2.05*
- *OPC Data Access Custom Interface Standard 3.00*
- *OPC Alarms and Events Custom Interface Standard 1.10*

## Terminology

The following terms are used interchangeably throughout this document:

- *screen* and *window*
- *tab* and *panel*
- *Matrikon OPC Simulation Driver* and *Simulation driver*

Table 2 provides a list of definitions for terms used throughout this document.

| Term/Abbreviation | Description |
|---|---|
| **COM** | Component Object Model. A method for organizing software, specifying how to build components that can be dynamically interchanged. |
| **DA** | OPC Data Access. Provides access to real-time process data. |
| **DCOM** | Distributed Component Object Model. An extension of COM that allows |

| Term/Abbreviation | Description |
|---|---|
| | communication between COM components over a network. |
| **DDE** | Dynamic Data Exchange. Allows the transfer of data between two running applications. |
| **DDL** | Data Definition Language. |
| **HDA** | OPC Historical Data Access. |
| **HMI** | Human Machine Interface. Device that allows interaction between the user and machine. Typically used in process control applications. |
| **LAN** | Local Area Network. |
| **Matrikon** | Matrikon Inc. |
| **Matrikon OPC** | Matrikon's brand name for its OPC servers and clients. |
| **OPC** | The communication standards published by the OPC Foundation. Refer to **www.opcfoundation.org** for more information. |
| **PLC** | Programmable Logic Controller. |
| **Sync/Async** | Abbreviations for Synchronous and Asynchronous operations. |

**Table 2 - Terms and Definitions**

# Getting Started

This section of the User's Manual contains important information regarding software installation and how to contact Matrikon OPC's Support team.

The **System Requirements** section shows how to avoid future problems by ensuring that the system meets the minimum software and hardware requirements. The **Installed Files** section will provides a list of files that are installed.

Once the software is installed, refer to the **Licensing** section for information on how to obtain the appropriate license. The Licensing section will refer you to the *Licensing Procedures* document that was installed along with the driver and this *User's Manual*. The **Contacting Support** section will provide you with contact information for the Matrikon OPC Support team, should you have any problems during the installation or licensing of the software.

## System Requirements

The software has **Software** and **Hardware** system requirements. These requirements must be met for the software to function properly.

### Software Requirements

The following software is required:

- Microsoft Windows 7, or
- Microsoft Windows 10, or
- Microsoft Windows Server 2008, or
- Microsoft Windows Server 2012, or
- Microsoft Windows Server 2016

**Note:** It is recommended that the most current service packs are installed.

### Hardware Requirements

The following hardware is required:

- Intel® Pentium® 4 Processor
- 512 MB RAM
- 40 GB 7200 RPM Hard Drive

## Installed Files

The installation program copies all necessary files to the target computer and creates shortcut icons in the **Start** menu. The driver-specific files listed in Table 3 are installed by default in the following location:

***C:\Program Files\Matrikon\OPC\Simulation***

| File Name | Description |
|---|---|
| `MatrikonOPC Simulation Server Release Notes.pdf` | *Release Notes* for this server. |
| `MatrikonOPC Simulation Server Quick Start Guide.pdf` | *Quick Start Guide* for this server. |
| `MatrikonOPC Simulation Server User` | *User's Manual* for this server. |

| File Name | Description |
|---|---|
| Manual.pdf | |
| OPCSim.exe | Server executable. |

**Table 3 - Files Installed in "Simulation" Folder**

## Licensing

Most Matrikon OPC products require some form of licensing criteria be met to ensure that it functions successfully.

The Matrikon OPC Simulation Driver **does not require licensing**.

## Contacting Support

The Matrikon OPC Customer Services department (**www.opcsupport.com**) is available 24 hours a day, seven days a week.

Contact Matrikon OPC Support using the information below, or send an email (**support@MatrikonOPC.com**).

For Monday to Friday **daytime support** requests, contact Matrikon OPC Support using the regional phone numbers provided in Table 4.

| Region | Office Hours | Contact Information |
|---|---|---|
| **North America**<br>UTC/GMT -7 hours (MST) | 8:00 am-5:00 pm | **+1-877-OPC-4-ALL** |
| **Europe /Africa ***<br>UTC/GMT +1 hours (CET) | 9:00 am-5:00 pm | **+49-221-969-77-0**<br>**(Request OPC Support)** |
| **Middle East ***<br>UTC/GMT +3 hours | 9:00 am-5:00 pm | **+973-174-65363** |
| **Australia/Asia ***<br>UTC/GMT +10 hours (AEST) | 9:00 am-5:00 pm | **+61-2-4908-2198**<br>**(Request OPC Support)** |

* Toll-free regional numbers coming soon!

**Table 4 - Matrikon OPC Support Regional Contact Information**

For **after-hours support** in all regions, please use either of the following numbers. There is no extra charge from Matrikon OPC for calling their after-hours support numbers.

| Region | Contact Information |
|---|---|
| **All** | +1-780-231-9480<br>+1-780-264-6714 |

**Table 5 - After-Hours Support**

# Driver Configuration

No driver-specific configuration is necessary for the Matrikon OPC Simulation Driver.

For basic OPC server configuration instructions, please consult the *Matrikon OPC Server User's Manual*.

# OPC Data Items

This section describes the OPC data items used in the Matrikon OPC Simulation Driver.

## Simulation Items

The Matrikon OPC Simulation Driver item ID syntax is as follows:

***Source Type.Data Type***

Where:

- ***Source Type*** is the name source the data types belong to.
- ***Data Type*** is the name of the item and the data type the item is.

### Available Items

| Item ID | Data Type | R | W | Comments |
|---|---|---|---|---|
| **Bucket Brigade.Int2** | VT_I2 | ✓ | ✓ | Short Read/Write item. |
| **Bucket Brigade.String** | VT_BSTR | ✓ | ✓ | String Read/Write item. |
| **Random.R8** | VT_R8 | ✓ | | Random Read Real item. |
| **Random.ArrayOfString** | VT_ARRAY\|VT_BSTR | ✓ | | Random value and size of Array of String Read item. |
| **Saw-toothed Waves.UInt2** | VT_UI2 | ✓ | | Unsigned short Saw-tooth wave Read item. |
| **Triangle Waves.Int4** | VT_I4 | ✓ | | Integer Triangle wave Read item. |
| **Triangle Saves.Money** | VT_CY | ✓ | | Currency Triangle wave Read item. |

**Table 6 - Available Items**

#### Examples

The following are examples of valid item IDs:

- ***Bucket Brigade.Money***
- ***Random.Real4***
- ***Saw-toothed Waves.ArrayOfReal8***

## Dynamic Item Creation

The OPC Simulation Driver has the ability to create many more items than can be initially browsed. Any item that is added under a simulation category is a valid OPC item for the Simulation driver. For example ***Bucket Brigade.xxx*** and ***Square Waves.yyy*** are valid items that can be added. The behaviour of these items that are added will always be the same as the category to which they belong (e.g., a ***Bucket Brigade*** item will be readable and writable but cannot change on its own, a ***Saw-Toothed Wave*** will ramp up to the maximum and then start coming back down). Any new automatically-created item is of the type ***VT_BSTR***. This enables the Simulation driver to easily create thousands of tags with data, with no configuration required.

# Limitations

Matrikon OPC Simulation Driver has the following limitation:

1. **History** – the Simulation driver has limited history and lists only the last 100 values per item.

Refer to the *Matrikon OPC Simulation Driver Release Notes* for known issues.

# Alarms and Events Functionality

The Matrikon OPC Simulation Driver can be used to simulate simple events and send notifications of these events to client applications. The events that can be generated fall into two categories:

- **Simulated Event**
- **Simulated Item Creation Event**

## Simulated Event

A Simulated Event is generated every time a write operation is performed on a ***Bucket Brigade*** item of type string. An event notification containing the following attributes are sent to the client:

| Attribute | Description |
|---|---|
| **Source** | Bucket Brigade.String, which is a reference to the object that generated the event notification. |
| **Time** | The time that the event occurred. |
| **Event Category** | 1 (set by the driver). |
| **Severity** | 1 (which indicates a low severity). |
| **Message** | The string that is written to the Bucket Brigade item by the user. |

**Table 7 - Simulated Event - Event Notification Attributes**

## Simulated Item Creation Event

A Simulated Item Creation Event is generated when a new simulation item is created.

**Note:** This is different than simply adding a pre-defined tag, such as ***Bucket Brigade.Boolean*** or ***Square Waves.Int1***. An example of a new simulation item is ***Bucket Brigade.xxx*** or ***Square Waves.yyy***. Thus, a new simulation item consists of a valid, existing simulation item type and a period followed by a string that does not refer to a pre-defined data type.

The event notification sent to the A&E client is as follows:

| Attribute | Description |
|---|---|
| **Source** | Simulated item type, which is a reference to the object that generated the event notification. |
| **Time** | The time that the event occurred. |
| **Event Category** | 2 (set by the driver). |
| **Severity** | 1 (which indicates a low severity). |
| **Message** | The following string: "*New simulation item created.*" |

**Table 8 - Simulated Item Creation Event - Event Notification Attributes**

# Historical Data Access Functionality

The Matrikon OPC Simulation Driver is capable of acting as a Historical Data Access server by caching values in a rolling buffer (which is capable of storing a maximum of 100 items) that can be read back using function calls contained in the HDA Custom Interface. An HDA client can be used to connect to the Simulation driver and perform a variety of read and update operations on a variety of different simulation items. Performing an update operation will write data to the buffer, while performing a read operation allows the user to view data that is already present in the buffer. The following table displays the types of operations that can be performed on each simulation item:

| Simulation Item | Updateable? | Readable? |
|---|---|---|
| **Bucket brigade** | ✓ | ✓ |
| **Random** | × | ✓ |
| **Read error** | ✓ | ✓ |
| **Saw-toothed waves** | ✓ | ✓ |
| **Square waves** | ✓ | ✓ |
| **Triangle waves** | ✓ | ✓ |
| **Write error** | ✓ | ✓ |
| **Write only** | ✓ | × |

**Table 9 - Simulated Item Types Supported Operations**

The Simulation driver supports a number of HDA read and update functions which are described in the following sub-sections.

## Read Functionality

### ReadRaw

Reads the values, qualities, and timestamps from the history buffer fro the specified time domain for one or more items in a group.

### ReadAtTime

Reads the values and qualities from the history buffer for the specified timestamps.

### ReadProcessed

Computes aggregate values, qualities, and timestamps from the data in the history buffer for the specified time domain for one or more items. The aggregate functions are performed during the retrieval of the data. The aggregate functions supported are:

| Aggregation Function | Description |
|---|---|
| **Interpolation** | Uses the linear straight-line interpolation method to estimate a value between known values. |
| **Time average** | Retrieve the time-weighted average data over the resample interval. |
| **Minimum actual time** | Retrieve the minimum value in the resample interval and the timestamp of the minimum value. |
| **Minimum** | Retrieve the minimum value in the resample interval. |

| Aggregation Function | Description |
|---|---|
| **Maximum actual time** | Retrieve the maximum value in the resample interval and the timestamp of the maximum value. |
| **Maximum** | Retrieve the maximum value in the resample interval. |

**Table 10 - Aggregation Functions Supported by Simulation Driver**

### ReadAttribute

Reads attribute values and timestamps from the history buffer for the specified time domain for the item. The item attributes tracked by the Simulation driver are:

| Attribute ID | Attribute Name | Attribute Description |
|---|---|---|
| **1** | data_type | Data type. |
| **2** | description | Item description. |
| **11** | normal_maximum | High Engineering Units. |
| **12** | normal_minimum | Low Engineering Units. |
| **13** | itemid | Item ID. |
| **-5** | triangle | Triangle wave. |
| **-4** | square | Square wave. |
| **-3** | sawtooth | Saw-toothed wave |
| **-2** | random | Random |
| **-1** | bucket | Bucket Brigade |

**Table 11 - Attributes Stored for Each Item by Simulation Driver**

## Update Functionality

### Insert

Inserts values and qualities into the history buffer at the specified timestamps for one or more items. If data is already present at the insertion point in the butter, the insert operation fails and the message "*data exists*" is returned. If the maximum size of the buffer is exceeded (i.e., more than 200 items exist) as a result of an insert operation, items are deleted from the beginning of the buffer.

### Replace

Replaces values and qualities in the history buffer at the specified timestamps for one or more items. This operation results in existing data being overwritten. If an attempt to replace a non-existent data point is made, the misleading error message, "*data exists*", is returned and the replace operation fails.

### InsertReplace

Inserts or replaces values and qualities at the specified timestamps for one or more items. If the item has a value at the specified timestamp, the new value and quality will replace the old one. If there is no value at that timestamp, the function will insert the new data.

# Matrikon OPC Simulation Driver Functionality

## Alarm and Event Capabilities

Table 12 lists the events in the OPC Alarms and Events Custom Interface Standard v1.10 that are supported by the Matrikon OPC Simulation Driver.

| Event | Supported? |
|---|---|
| **Condition-related** | Not supported. |
| **Tracking-related** | Not supported. |
| **Simple** | ✓ |

**Table 12 - OPC Alarms and Events v1.10 Events**

## Historical Data Access Capabilities

Table 13 lists the read functions in the OPC Historical Data Access Custom Interface Standard v1.20 supported by the Matrikon OPC Simulation Driver.

| Function | Supported? | |
|---|---|---|
| | Synchronous | Asynchronous |
| **ReadRaw** | ✓ | ✓ |
| **ReadProcessed** | ✓ | ✓ |
| **ReadAtTime** | ✓ | ✓ |
| **ReadModified** | Not supported. | Not supported. |
| **ReadAttribute** | ✓ | ✓ |

**Table 13 - OPC Historical Data Access v1.20 Read Functions**

Table 14 lists the update functions in the OPC Historical Data Access Custom Interface Standard v1.20 supported by the Matrikon OPC Simulation Driver.

| Function | Supported? | |
|---|---|---|
| | Synchronous | Asynchronous |
| **Insert** | ✓ | ✓ |
| **Replace** | ✓ | ✓ |
| **InsertReplace** | ✓ | ✓ |
| **DeleteRaw** | Not supported. | Not supported. |
| **DeleteAtTime** | Not supported. | Not supported. |

**Table 14 - OPC Historical Data Access v1.20 Update Functions**

Table 15 lists the annotation functions in the OPC Historical Data Access Custom Interface Standard v1.20 supported by the Matrikon OPC Simulation Driver.

| Function | Supported? | |
|---|---|---|
| | Synchronous | Asynchronous |
| **Read** | Not supported. | Not supported. |

| Function | Supported? | |
|---|---|---|
| | Synchronous | Asynchronous |
| **Insert** | Not supported. | Not supported. |

**Table 15 - OPC Historical Data Access v1.20 Annotation Functions**

Table 16 lists the playback functions in the OPC Historical Data Access Custom Interface Standard v1.20 supported by the Matrikon OPC Simulation Driver.

| Function | Supported? |
|---|---|
| **ReadRawWithUpdate** | Not supported. |
| **ReadProcessedWithUpdate** | Not supported. |

**Table 16 - OPC Historical Data Access v1.20 Playback Functions**