



Your comments and suggestions on the operation of this software are welcome. Please address them to:

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Introduction

The ICONICS Simulator OPC Server is an OPC compliant Server able to internally generate simulation signals that are constantly changing and serve data to OPC clients. The Simulator OPC Server was implemented using advanced programming concepts of the most current version of the OPC specification (Version 2.0) for use in developing next generation industrial software applications.

The ICONICS Simulator OPC Server communicates with OPC clients and internal simulation occurs generating different devices. The Simulator OPC Server is based on several simulation signals such as Sine, Random, Ramp and a square wave signal. It also has dummy output digital Bits and registers that allow "writing to." The Simulator OPC Server/Client is an ideal way to learn about the new emerging OPC standard and can also be used to test other OPC compliant Clients.

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Simulator OPC Server features

The OPC Server is extremely flexible, and can be utilized and used with DCOM for intranet and internet applications.

Key features of the Simulator OPC Server .

- Advanced OPC data Quality and data conversion to client's request
- OPC Simulator server utilizes advanced free-threading capabilities.
- Supports Multiple Groups for easy configuration and manageability
- Internally Simulated for configuration and testing
- Supports, Sine, Ramp, Random and Square signals in addition to static
- Read/Write functionality
- Tag Multiplier let you create hundreds of tags in seconds
- OPC Client for rapid testing of your OPC data connections
- GUI interface for viewing tags, groups, and simulated values
- Full online help
- Change Device, Group and Tag properties online
- Flexible engineering units and signal ranges

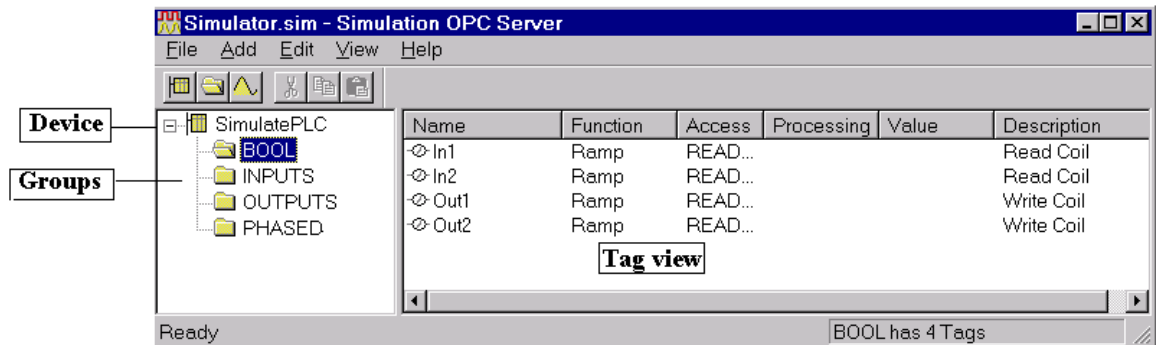
OPC Client application

An OPC test Client application, provided with the Simulator OPC Server, which has a rapid method for testing your Server's configuration. The OPC Client is able to browse the registry of PC and display the complete list of installed OPC Servers. Also provide real live data feedback and OPC Server browsing capabilities.

OPC test Client is also helpful for verifying results and testing other 3rd party OPC servers.

Simulator OPC Server

Start the Simulator OPC Server from the program group and load the Sample.sim configuration file (located in the root installation directory). The Simulator OPC Server configuration appears with the tags defined for this sample file, as shown below.



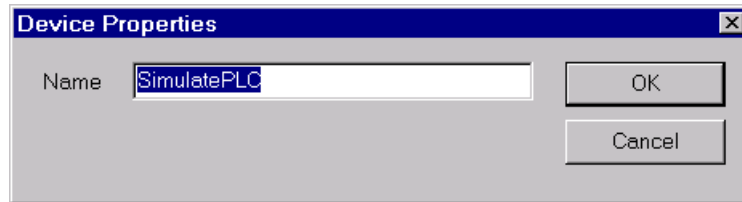
Sample.sim loaded in Simulator OPC Server

Note: As explained in the installation section of this manual, Windows NT 4.0 or Windows 95 with the DCOM is required to run the Simulator OPC Server .

This sample configuration has one devices with defined subgroups and tags. The defined tags use a variety of data types and Simulator signals. Only Read and Write Registers are simulated. (Write Registers are not modified by the server's simulation mode.) You can move the Splitters left or right, to better view the information shown in the two panes.

The Simulator OPC Server uses an Explorer style user interface to display a hierarchical tree of devices and groups and their associated tags. Tags represent registers and coils within a device. Groups are like subdirectories that logically group tags. A device may have subgroups that all have tags within them, but all of the tags really belong to their device when they are scanned to perform I/O.

To Create a Device, choose New Device from the Add menu. A Device may have any name, but avoid names with spaces or punctuation such as "!.,".

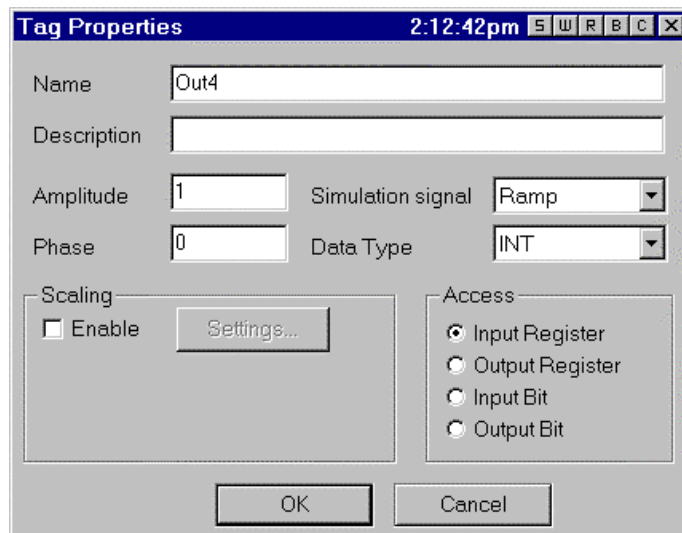


Device properties

A device can contain any number and level of groups, just like subdirectories. To add a group, select the parent device or group, and choose New Group from the Add menu, or right click on the parent and choose New Group. A group only has a name, which must be unique among its parent's groups (just like subdirectories).

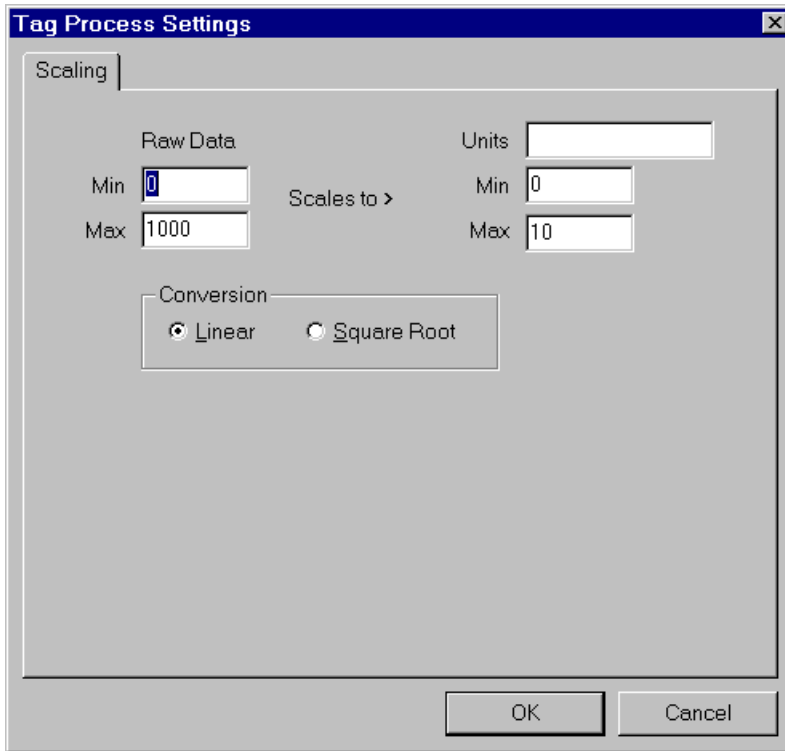
To add a tag, select the device or group on the left pane, and choose New Tag from the Add menu, or right click on the parent and choose New Tag. A tag has a name, which must be unique within its group, a description, an amplitude, a phase and data type. Bits are always boolean.

A register's data type can be 2 Bytes (Word), 4 Bytes (Dword), or a 4 Byte floating point number. Other data type are INT, BIT, LONG and Strings.



Setting a data type

Tags can be scaled in the server, to convert to Engineering Units, for example. Selecting Enable Scaling and setting the scaling parameters accomplishes this. Scaled tags will be converted to double precision floating point numbers when they are scaled.



Setting Ranges

For Simulation Signal Types to check the connectivity of clients to the Simulator OPC Server, you can select Ramp, Random, Sine or a Square Wave signal. These simulation types determine how the tag value will be generated and how frequently it will change.

Sine

Random

Ramp

Toggles every 6 seconds

Random on/off

Toggles every 6 seconds

0 to 100, period is 2 min

Random from 0 to 100

Increments at scan rate

-1 to 1, period is 2 min

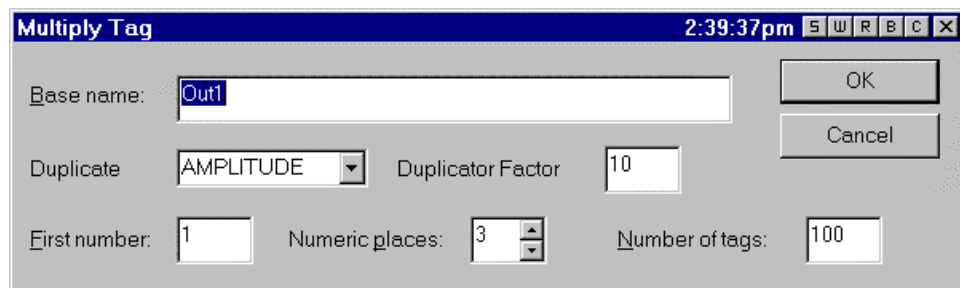
Random from 0 to 100

Increments of scan rate and amplitude

Note on naming: The OPC item name, or ItemID, is made up of "device.group.tag" where the server uses periods as delimiters. There are some clients that may use other delimiters between server name, access path, and itemID. This is similar to the case of Excel's DDE syntax "application|topic!item". To avoid possible naming conflicts in clients, the access path and itemID should be free of spaces and punctuation.

Tag Multiplier

If you select a tag in the Tag view pane and then select Add/Multiply, the following dialog is displayed:



Tag Multiplier

The Tag Multiplier provides an easy and fast method for creating many tags without having to individually enter all of them. Within the Edit menu there is a Tag Multiplier which first chooses the tag that is to be multiplied, then does Tag Multiply. In the dialog, there are following items:

Base name: This is the prefix part of the tag name that will stay the same in all tags (defaults to the name of the original tag selected)

Duplicate: This simply generates the Tag according to criteria

Amplitude, Phase, None – options that are available in the drop-down list box.

Duplicator Factor: This represents the increment index for duplicating

the Tags

First number: is the number to be appended to the first generated tag. Other tags will have consecutive numbers starting from this number up (defaults to 1)

Numeric places: is the number of digits that will be appended to base name (defaults 3)

Number of tags: is how many tags will be generated (defaults to 100).

The function generates copies of the originally selected tag, substituting new tag names and amplitude or phase. All other tag properties remain the same. For example, when following values are entered, notice the 4 numeric places after the base name:

Base name: Sine

First number: 100

Numeric places: 4

Duplicate Factor: 30

Number of tags: 300

The following 300 tags will be generated when duplicating according to Phases:

Sine0100 with Phase 30

Sine0101 with Phase 60

Sine0102 with Phase 90

Etc..... up to

Sine0399 with Phase 360

Devices and groups are displayed in the left hand pane in a tree. Tags are displayed in the right hand pane. Right clicking on any object brings up a menu appropriate for the context. Tags can be cut, copied, deleted, or edited. Tags that are cut or copied can be pasted into the selected device or group. Tags can also be dragged to a device or group. Following the drag and drop standard, drag means move, while drag with the control key depressed means copy. Multiple tags can be selected for these operations. If tags are dragged or pasted and there is a name conflict, a dialog prompts the user to rename, overwrite, skip, or cancel.

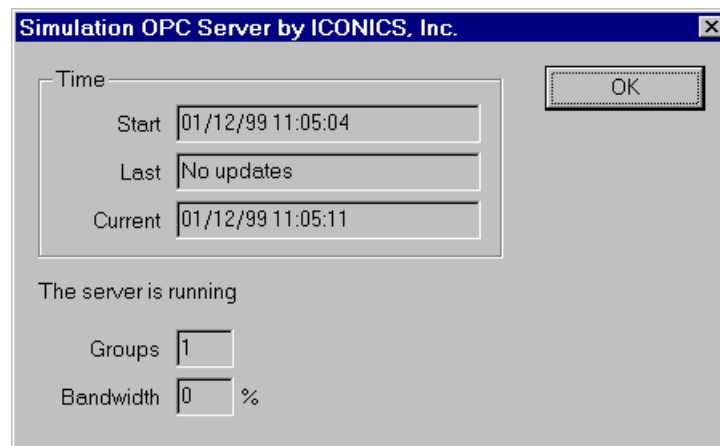
When tags are configured, their data can be viewed in Monitor mode. Choose Monitor from the View menu to toggle this mode. In monitor mode, the tag values are displayed in the tag view, updating periodically. The data is displayed the appropriate format for its data type. Boolean data is either "on" or "off". Integer and floating point numbers are displayed in their native format. Scaled tags are displayed in floating point with the Engineering Units field. When in monitor mode, just the tags in view are scanned for data. Selecting a different device or group will remove any previous tags and add the tags now in view to the scan list. Monitoring is completely independent of OPC items that are scanned for data. Monitoring is also independent of a device's Simulator mode.

Simulator OPC Client

OPC Client

The OPC Client is used as a TEST case to debug an OPC Compliant Server and access various some of the OPC variables and parameter configuration.

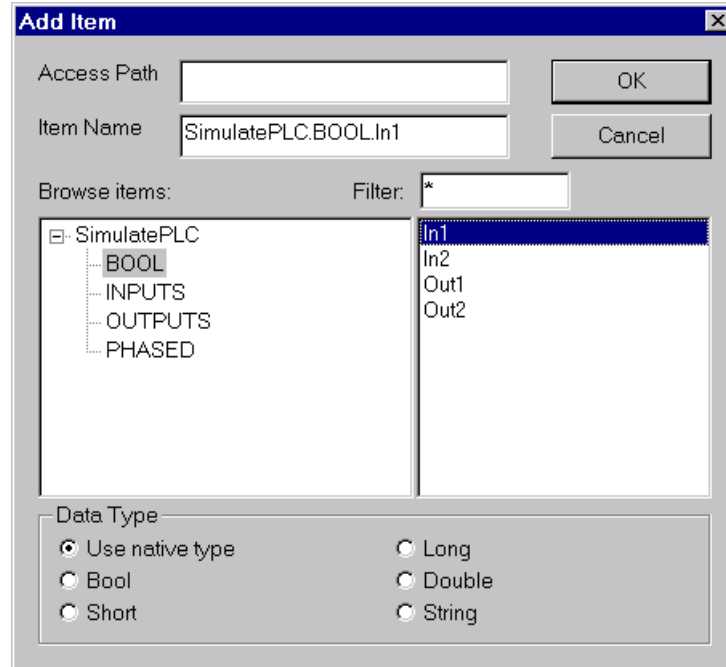
- Start the OPC Client.
- From the OPC menu, Choose Connect. The OPC Server menu appears showing all registered OPC servers.
- Select ICONICS.Sample and click OK. This connects the OPC Client to the sample server.
- From the OPC menu, choose Server Status to view the Simulator Server status window. Refer to the following figure.



Server status window for the Simulator OPC Server

The Server status window continuously updates the server start time, time of last update, and current time, the number of groups, and the bandwidth for the selected server. Use this window to verify that the server is running and is connected to the OPC Client.

- Click OK to close the Server status window.
- From the OPC menu, choose Add Item. The Add Item dialog box appears, as shown below.



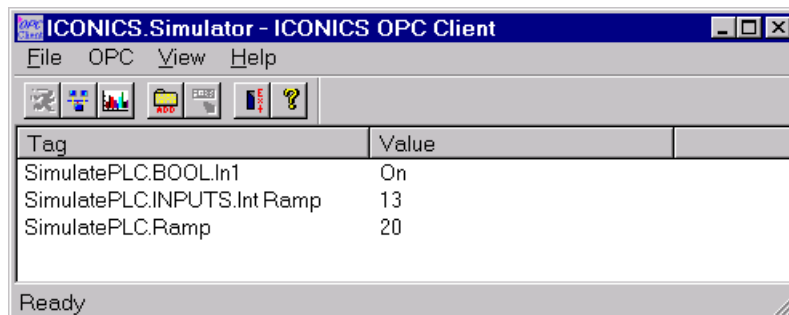
Add Item dialog box listing devices defined in connected server

The Add Item dialog box displays the devices, groups, and tags defined in the current server configuration. These are filtered by expression "*" and by data type. You can enter an access path, type or select an item name, and choose the data type in which you want to view the requested tag.

In the Browse Items list, select the device, group, and tag. The full name appears in the Item Name field. For example, "Simulate.Float.Ramp" or "Simulate1.Bits.Out1."

- Click OK. The item appears in the OPC Client window with updating data values.

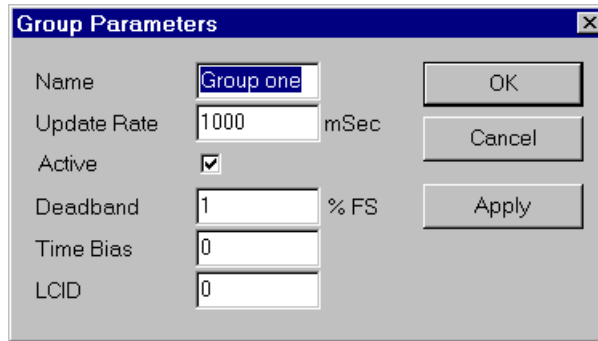
Add more tags repeating previous steps. An example of the OPC Client displaying three sample server items is shown in the following figure.



OPC Client shown with three items

- From the OPC menu, choose Group Parameters. This command

displays the parameters of the group of tags.



Group Parameters dialog box for the selected sample server

- The Update Rate determines how fast data is sent to the client, in milliseconds (mSec). The Simulator server's minimum Update Rate is 10 mSec. The Active state initiates active communications between the client and the server. You can change the Active state or the Update Rate, for example, and click Apply to send changes to the server.
- If the group is not active data is not sent to the client. You can choose Disconnect from the OPC menu to clean up all selections and disconnect from the server.
- While a client is connected to a server, you cannot exit the server or open new configurations in the server. You can modify the existing server configuration while client(s) are connected; however, you cannot delete any device or tag in use. For example, you can take a device off-line or change a tag's scaling values, without shutting down a client that may be controlling many devices.
- Start another instance of the OPC Client and make the same server connection as those defined in the first Client instance.
- You can add items, change the group update rate and active states, and view the server status in each instance of the OPC Client independently of the other instance. For example, the number of groups is "1" in each client because each one only has one group.
- The only way that one client affects the other is through data and data changes. Make sure both clients are showing Simulate1.Out1. The data does not change while monitoring because it is an output.
- In one of the clients, select Simulate1.Out1 in the window and choose Write Value to Item from the OPC menu.
- Type a numeric value and click OK. Both clients display the new value at their own update rates. (Note that a client defined with a very slow update rate does not receive the value immediately.)
- Edit the Simulator device by clicking on it and choosing Properties from the Edit menu or right clicking and choosing Properties.
- From the View menu, choose Monitor to scan the Simulator and display tag values.

How the client connects and gets data from an OPC server

When OPC servers are installed on the system, they are registered so that clients can find them and users can view them in a list. To make a client/server connection, the user must first choose a server. The server name selected (for example, "ICONICS.Simulator") is used to get a class ID which, in turn, is used to create a COM object. If the user selects a server that is not currently running, the system starts the server and then creates the object in that server on behalf of the client.

Once the COM object is created, the client application has an IOPCServer interface, as defined in the OPC specification. This is the main interface to the OPC server and this document refers to this as a *Server* interface. (The other interface is *Group*.) This OPC client always creates a group and registers an advise interface with it to get asynchronous data notification.

When an item is added, the dialog displays either a hierarchy or a flat list of names, depending on the server. The names are queried from the Server object using the filter string and requested data type. When the user either types or selects a name, an item by that name is added to the Group object. This item is also read immediately to get an initial value.

Items in a group are scanned by the server; when their values change, the advise interface in the client is notified. A data structure containing the data for each item whose value or quality has changed (and only those items) is passed to the client's advise interface. The client unpacks and uses the data.

Server status and Group parameters

The Server status dialog periodically queries the Server object for status and displays the results. The Group Parameters dialog queries the group state and displays the results. The OK or Apply buttons in the Group Parameters dialog box write the parameters from the dialog to the Group object and read the parameters back. This primarily controls the scanning and updating of data. When a group is inactive, it does not send data notifications to the client and, typically there is no reason to scan the items when the group is inactive. The Update Rate in the Group Parameters dialog box specifies the rate at which data notifications should be sent back to the client, assuming that data has changed. This is also the rate at which items are scanned on behalf of this client.

To write a value to an item, select the item in the OPC Client windows and choose Write Value to Item from the OPC menu, The client writes the value typed in the Write Item Value dialog box to the correct item in the Group object. The method of writing data is determined by the "Asynchronous" checkbox. When data is written synchronously, the call to the server blocks until the operation has completed, which may take a long time. When data is written asynchronously, the call to the server returns quickly and the operation is carried out on another thread. When the write has finished, the client's advise interface is notified with the results.

The user can disconnect from the selected server by choosing Disconnect from the OPC menu, The Disconnect command unregisters the advise interface, releases the Group object, and then releases the Server object. *Releasing an*

object means that the client is no longer interested in the object, so the system can delete the object in the server.