Kepware Technologies
KEPServerEX OPC Tunnel

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1. Introduction

There are instances where users need to collect data from processes located in other domains or networks from the client doing the data collection. This could be in the same building, separate buildings in the same facility, or locations in different towns or countries. It is not practical nor easy to create a COM/DCOM connection across these remote OPC applications. OPC UA allows users to establish a connection based on Internet-based technology. Kepware provides a means to do this using built-in interfaces and components.

2. Overview

There are two components of a KEPServerEX OPC tunnel:

1. The KEPServerEX instance that functions as the tunnel server.
2. The KEPServerEX instance that functions as the tunnel client.

The instance of KEPServerEX that functions as the tunnel server is installed on (or on the same network as) the operating system running the target OPC DA server whose data must be tunneled. This operating system is called the tunnel server machine. The instance of KEPServerEX that functions as the tunnel client is installed on (or on the same network as) the operating system running the application that needs to consume the data provided by the target OPC DA server. This operating system is called the tunnel client machine.

3. Prerequisites

1. Open port 49320 to TCP communication in each tunnel server machine's firewall. You can choose any available port in place of 49320 as long as the chosen port is not used by another application.
2. An internet connection. It will be used for product licensing.
3. License the application. Launch the License Utility through the KEPServerEX Administration tool or the Start menu and follow the wizard. License Utility details can be found in the License Utility Help file and online at https://www.kepware.com/support/licensing/.

4. Terminology

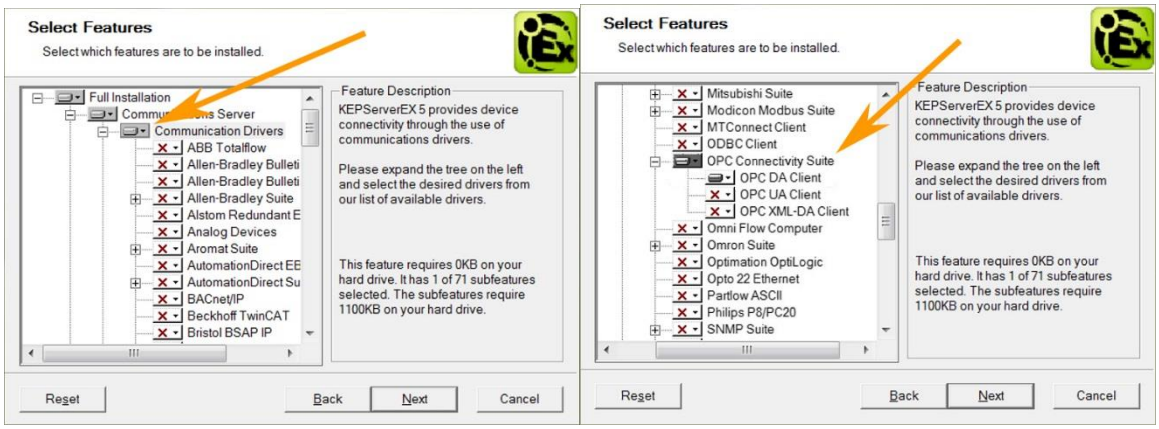
- The words "tag" and "item" are used interchangeably.
- The phrase "OPC UA Client Driver" refers to an internal component of the server designated as the tunnel client.
- The phrase "OPC DA Client Driver" refers to an internal component of the server designated as the tunnel server and is used to connect to OPC DA servers.

5. Instructions

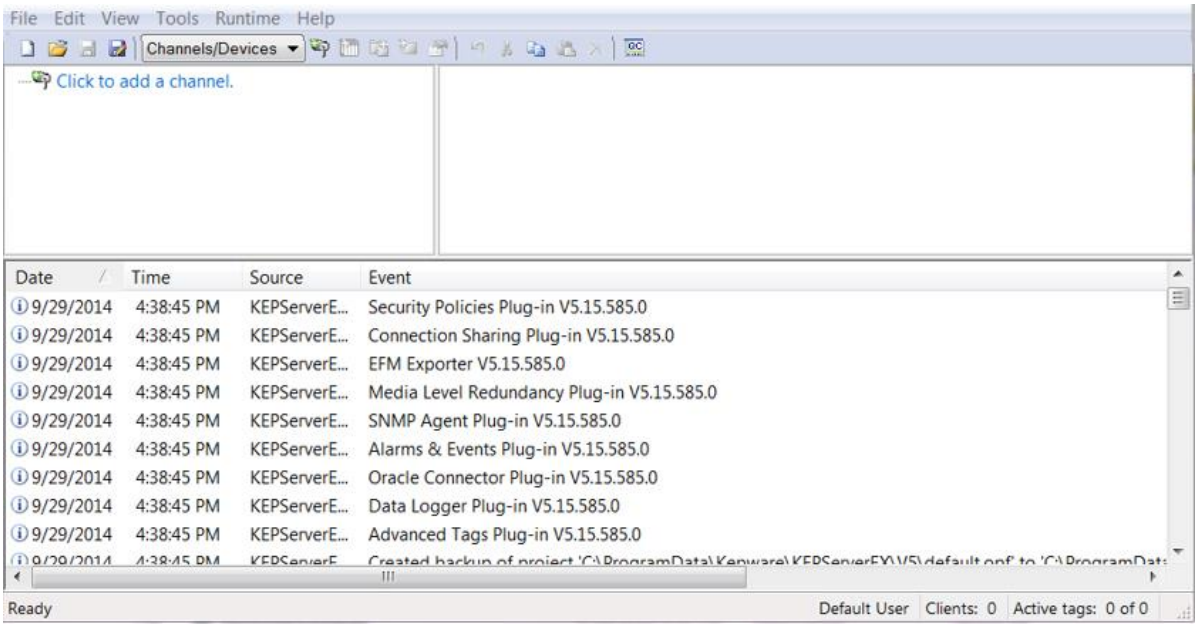
5.1 Configure the Tunnel Server

5.1.1 Installation

1. Access the machine that will be the tunnel server.
2. Double-click the KEPServerEX installation executable to begin installation.
3. When prompted by the list of components to install, expand the Communication Drivers branch of the tree.



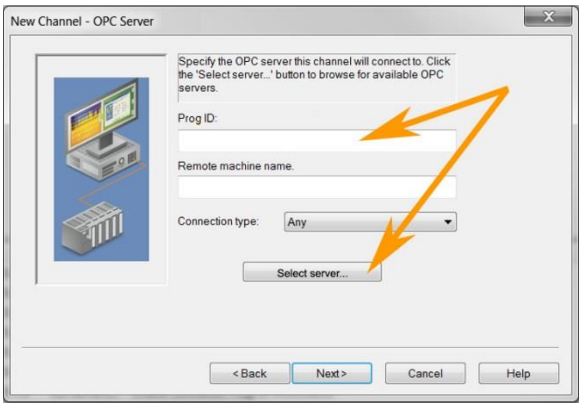
4. Expand the OPC Connectivity Suite and click the box to select the OPC DA Client for installation.
5. After installation completes, launch the KEPServerEX Configuration tool from the Desktop, Start Menu, or KEPServerEX Administration tool.



5.1.2 Configure a Channel

Create a new channel with the OPC DA Client driver to connect the instance of KEPServerEX to the target OPC DA server. This instance of KEPServerEX will act as the tunnel server.

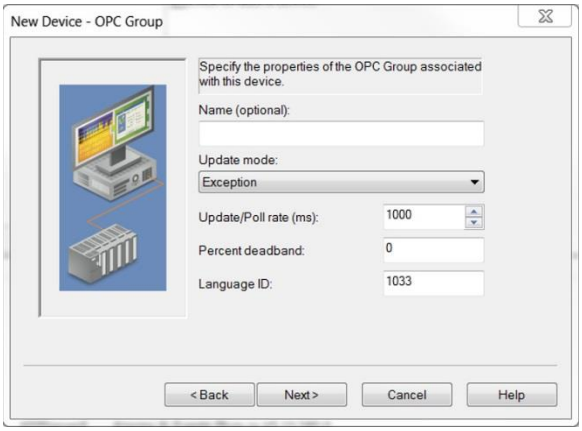
6. From the KEPServerEX Configuration main menu, start a blank project by selecting **File | New**, and confirm the prompts.
7. Click the blue link to **Add a new channel**.
8. Give the channel a name and select **Next >**.
9. Select the OPC DA Client driver as the driver type.
10. Click **Next >** until prompted to select the OPC DA server to connect.
11. Click the **Select server...** button to browse the local machine for the name of the target OPC DA server. (Alternatively, specify the name of the target OPC DA server manually in the ProgID field.)



12. Move through the next two dialog boxes of the New Channel wizard by selecting **Next >** and **Finish**.

5.1.3 Add a Device

13. Click the blue link below the new channel to **Add a new device**.
14. Give the device a name and select **Next >** until the OPC Group page of the wizard appears.



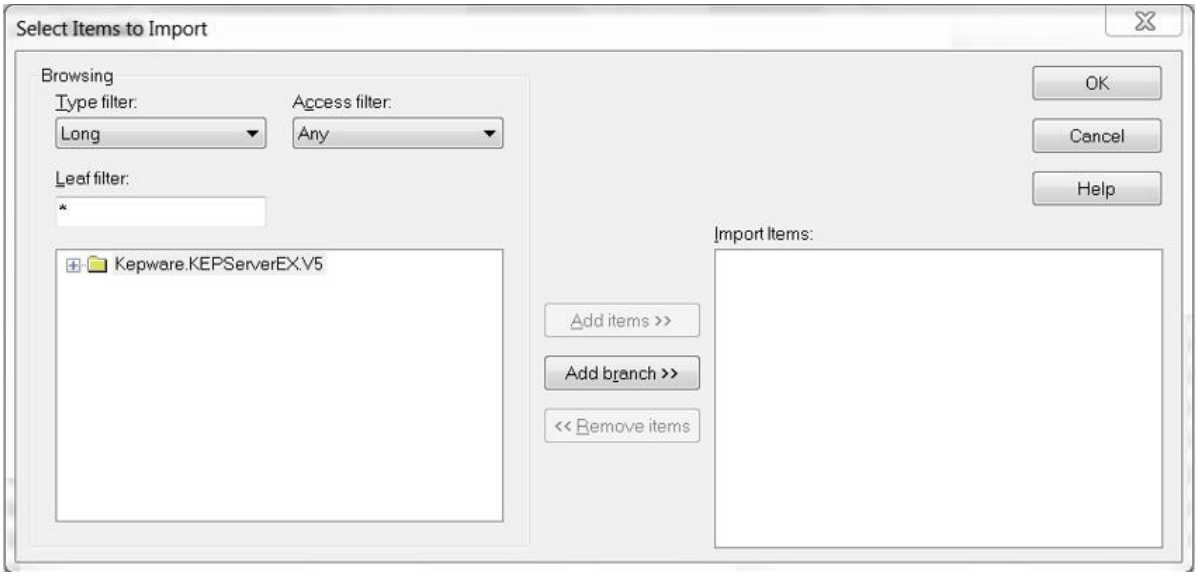
15. In the Update Mode selectable drop-down menu, select **Exception** unless the target OPC DA server does not support "subscription-based tag updates."

Tip: Exception Update Mode offers the best performance. It allows the target OPC DA server to notify the OPC DA Client driver of changing tag values without the driver continually sending read commands. The other option is Poll Mode, where the driver sends read commands for all desired items at the interval specified in the Update/Poll Rate field. Poll Mode offers compatibility with older OPC DA servers that do not support subscription-based tag updates.

The Update/Poll Rate determines the speed at which the target OPC DA server samples requested data points in Exception Mode. If Poll Mode is selected, this setting determines how frequently the driver sends read commands to obtain values for the desired data points.

Leave this at the default of 1000 milliseconds unless you wish to capture more or fewer value samples per second. It is common to sample twice as fast as the data changes to be sure data-change events are captured. For example, an Update/Poll Rate setting of 1000 milliseconds guarantees a data-change event in a data point changing every 2000 milliseconds is not missed.

16. Select **Next >** until the Watchdog page appears.
17. Enable Watchdog and choose an item from the target OPC DA server that changes on a regular basis. A "seconds" time value is ideal because this tag should change reliably every second. This watchdog allows the OPC DA Client driver to quickly reconnect to the target OPC DA server if the target OPC DA server stops providing regular tag updates.
18. Select **Next >** and use the Import dialog box to include all items to be read (and potentially written) through the tunnel.



Tip: Importing tags is not required, but imported tags can be browsed by OPC clients. Without importing tags, users can address OPC items in the target OPC DA server across the KEPServerEX OPC tunnel by using a particular tag address syntax from the client application connected to the tunnel client. For example, users can create a tag in the PI OPC DA collector with the following syntax:

```
<UAClientDriver_ChannelName>.<UAClientDriver_DeviceName>.ns=2;s=
<DAClientDriver_ChannelName>.<DAClientDriver_DeviceName>.TaginTargetOPCDAServer
```

where actual channel and device names replace the words inside the brackets (< >).

For example:

```
MyOPCUAchannel1.myOPCUAdevice1.ns=2;s=myOPCDAchannel2.myOPCDAdevice2.tag
```

This is called a dynamic tag. Dynamic tags are a benefit when working with an OPC tunnel because the tag is only created in one place - the PI OPC DA client. Otherwise, when working imported tags, new tags added to the target OPC DA server must be first imported by the OPC DA Client driver, then by the OPC UA Client driver.

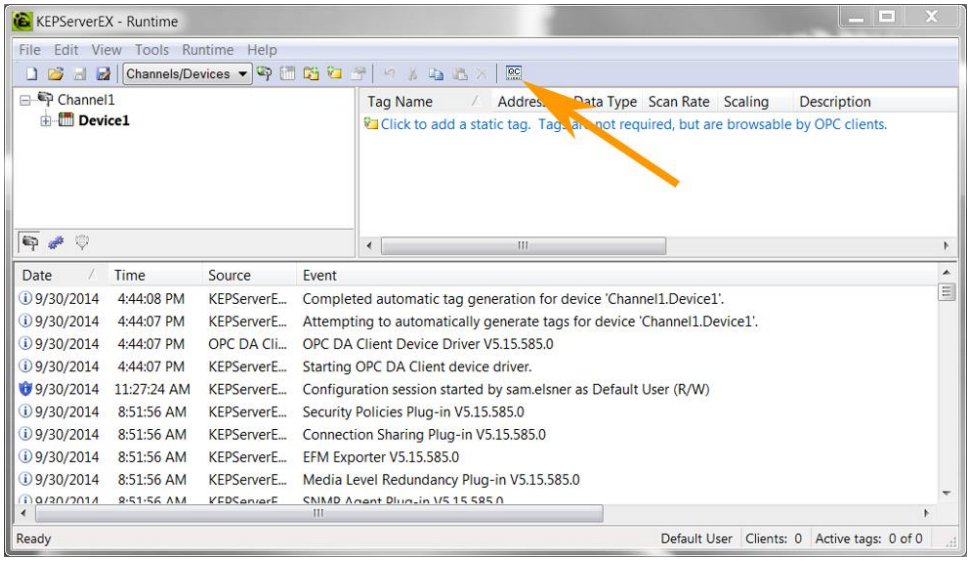
19. Select **Next >** and **Finish** to complete device creation.

5.1.4 Verify

You have now created a channel and a device. With the OPC DA Client driver, a channel object represents a connection from the tunnel server to a target OPC DA server. The device object represents a group of OPC items to be read from the target OPC DA server.

Tip: It is possible to receive more samples per second from the target OPC DA server by creating multiple channels to connect the tunnel server to the target OPC DA server. Use one device per channel and spread tag load across all channels. Maximum channel count is discussed in the OPC DA Client driver help file.

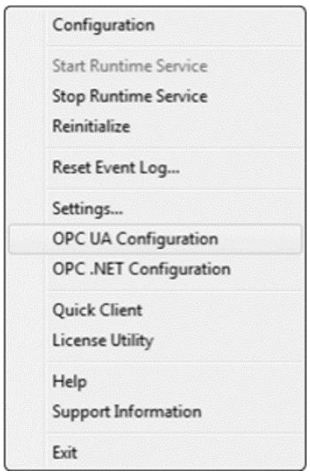
20. Test the OPC DA Client driver connection to the target OPC DA server by launching the Quick Client in the Configuration tool. Quick Client automatically references all tags in KEPServerEX, which verifies communication between the OPC DA Client driver and the target OPC DA server.



21. Verify values and "Good" quality in the Quick Client for the imported items.

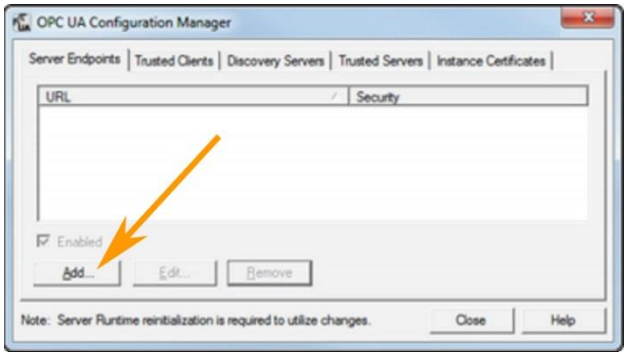
Note: All tags and tag groups with a leading underscore (_System, for example) are generated by KEPServerEX. Do not use the quality reading of these items to interpret communication success or failure with the target OPC DA server; these tags have Good quality when KEPServerEX is running.

5.2 Configure the OPC UA Server Interface

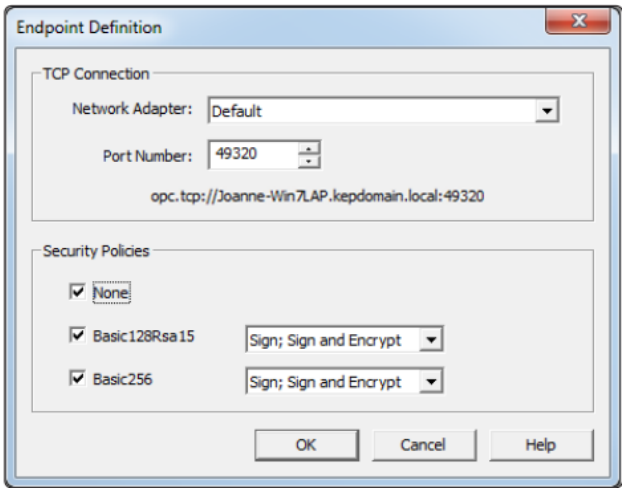


22. Open the OPC UA Configuration Manager by right-clicking on the Administration tool icon in the system tray in the Windows task.
23. In the OPC UA Configuration Manager, select the Server Endpoints tab and click **Add...**.

Tip: An Endpoint is a point of access to the OPC UA server. Multiple endpoints can be created and multiple OPC UA clients can connect to a single endpoint.



24. In Endpoint Definition, select the **Network Adapter** on which to create this access point to the OPC UA server.
25. Select the TCP port to be used.
26. Select the type of encryption. A setting of "default" creates the endpoint with the domain name of the machine in place of an IP address.



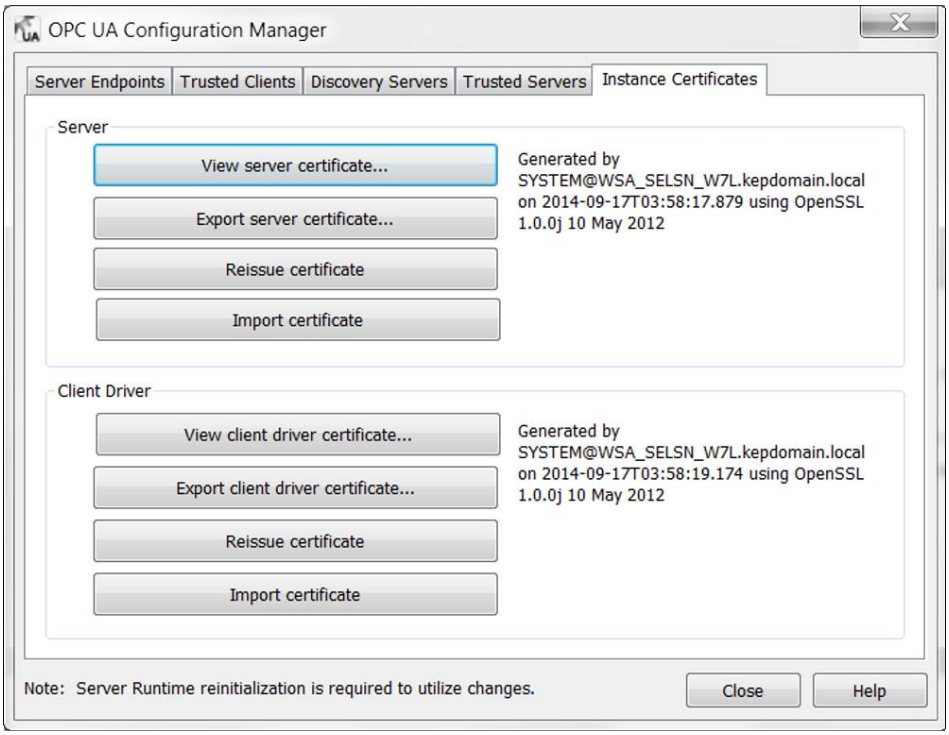
27. Write down or copy, paste, and save the "opc.tcp:// …" string displayed just below the Port Number selection box for later use.
28. Stop and restart the KEPServerEX Runtime Service to register the new endpoint (Right-click the Administration tool and select **Stop Runtime Service**, then right-click the tool again and select **Start Runtime Service**.

5.2.1 Configure Certificates

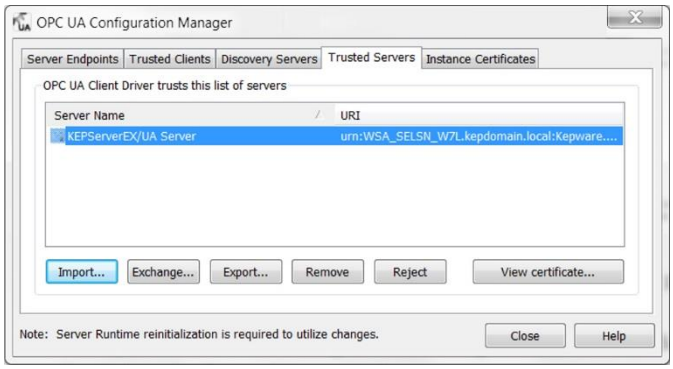
To conduct certificate exchange between the tunnel server and the tunnel client, there must be trusted security certificates. KEPServerEX and the driver exchange certificates automatically, but other servers and clients require this configuration, so the steps are included for reference.

Note: Certificates are only required for connections using security. When **None** is selected for security, these steps can be skipped.

29. Open the OPC UA Configuration Manager on the tunnel server.
30. Select the **Instance Certificates** tab.



31. On the Server tab, click the **Export server certificate...** button and save the certificate.
32. Close the OPC UA Configuration Manager.
33. Copy this certificate to the tunnel client machine.
34. Open the OPC UA Configuration Manager on the tunnel client.
35. Select the **Trusted Servers** tab.



36. Click the **Import…** button and locate and select the server certificate copied from the tunnel server machine.
37. Click on the **Instance Certificates** tab.
38. Click the **Export client driver certificate…** button on the Client Driver pane and save the certificate.
39. Close the OPC UA Configuration Manager.
40. Open the OPC UA Configuration Manager of the tunnel server.
41. Select the **Trusted Clients** tab.
42. Click the **Import…** button and locate and select the client driver certificate.
43. Close the OPC UA Configuration Manager.

5.3 Configure the Tunnel Client

5.3.1 Installation

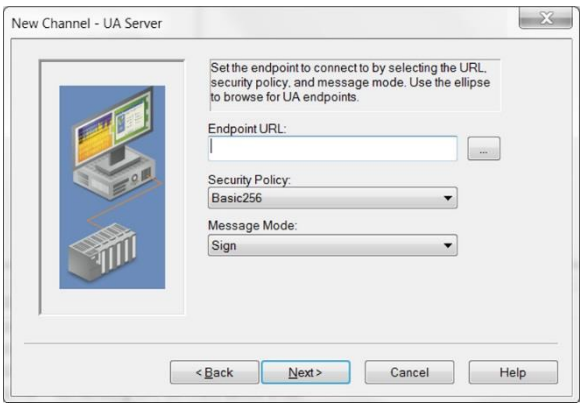
44. Move to the PC running the PI OPC DA collector.
45. Install KEPServerEX, selecting the OPC UA Client driver to be installed. (Follow the same process outlined above in this document, substituting the OPC UA Client driver for the OPC DA Client driver).
46. After installation, launch the KEPServerEX Configuration tool.
47. Select **File | New** to create a new project.

5.3.2 Configure a Channel

Create a channel with the OPC UA Client driver. With the OPC UA Client driver, the channel represents an individual connection with a target OPC UA server. A device created within the channel represents a collection of items to be read from the OPC UA server.

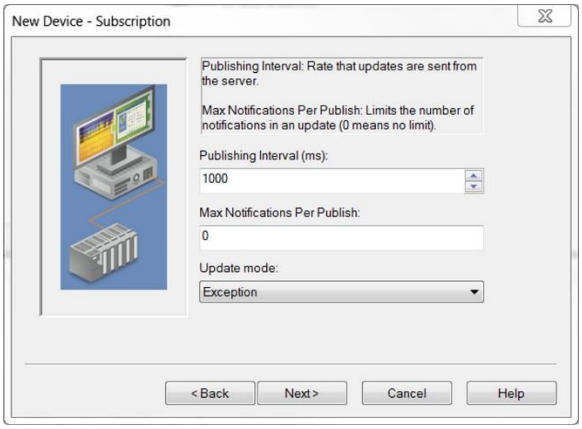
48. Click the blue link to **Add a new channel**.
49. Give the channel a name and select **Next >**.
50. Choose the OPC UA Client driver as the driver for this channel.
51. Click **Next>** to accept the defaults on the Write Optimizations page.
52. On the UA Server page of the wizard, type or paste the "opc.tcp:// …" string from step 27.
53. Select the proper security policy based on the settings applied in step 26.
54. Click **Next >** through all the remaining settings until channel is created.

Note: It is only necessary to change these settings if using OPC UA connection authentication through username/password exchange.



5.3.3 Add a Device

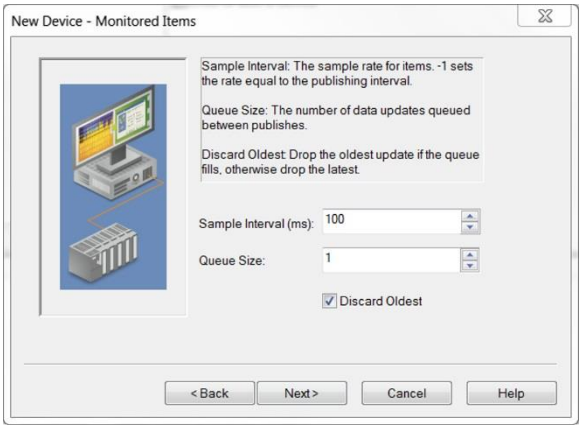
55. Click the blue link to **Add a new device**.
56. Enter the device a name and select **Next >** until the Subscription page.



57. Set the **Publishing Interval**, which defines how frequently the OPC UA Client driver requests newly-changed values from the tunnel server. The default setting is 1000 milliseconds.

Tip: This setting should be at least equal in value to the Update Rate defined in the OPC DA Client driver in the other system in step 15.

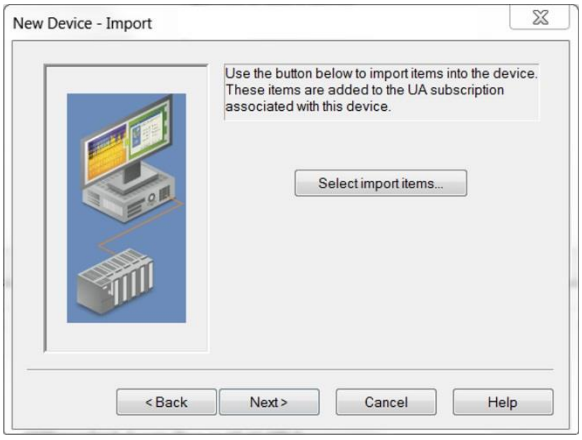
58. Select **Next >** until the Monitored Items page of the wizard.



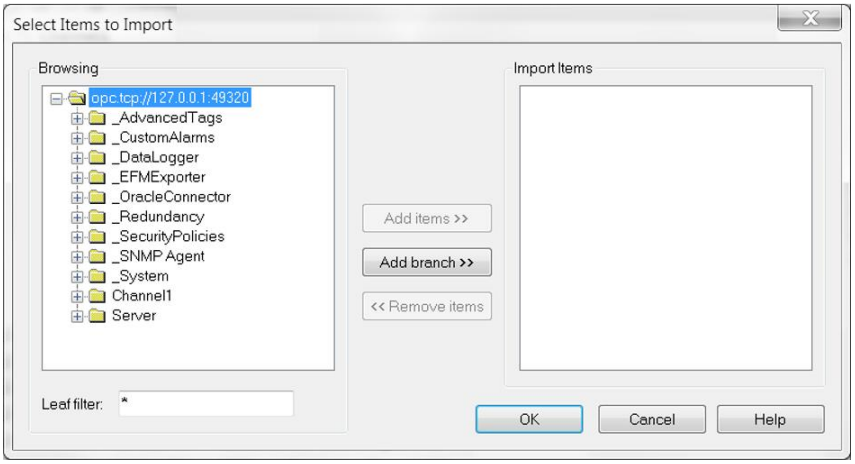
59. Set the **Sample Interval**, which determines how quickly the tunnel server reads data from the cache provided by the OPC DA Client driver.

Tip: The Sample Interval should be at least twice as fast as data is updating in the cache of the tunnel server, which is determined by the Update Rate defined in the OPC DA Client driver during step 15. For example, if the Update Rate is 1000 milliseconds, the Sample Interval should be set for 500 milliseconds with a Publishing Interval of 1000 milliseconds (defined in step 57).

60. Click **Next >** until the Import page of the wizard.



61. Click the **Select Import Items...** button. The UA Client attempts to connect to the target OPC UA server and expose a view of namespace #2, which holds all OPC items. If imported tags exist from the target OPC DA server into the tunnel server, use this menu to add items and branches of items. If tags were not imported, skip this step.



62. Select **Next >** and **Finish** to complete the device creation process.

5.3.4 Verify

With the OPC UA Client driver, a channel object represents a connection from the tunnel client to the tunnel server. The device object represents a group of OPC items to be read from the tunnel server.

Tip: You can receive more samples per second across the tunnel by creating up to 100 channels to connect the tunnel client to the tunnel server. Use one device per channel to spread tag load across all channels.

63. Test the OPC DA Client driver connection to the target OPC DA server by launching the Quick Client from the Configuration tool. Quick Client automatically references all tags in KEPServerEX, which verifies for communication between the tunnel server and the target OPC DA server.

64. If Quick Client shows "Good" quality for non-system tag, Congrats!

65. If Quick Client shows "Bad" quality, check the following:

- Ping the IP address of the tunnel server machine from the tunnel client machine. If ping fails, there may not be a working network path between the tunnel client and tunnel server. If ping requests are restricted on the network, proceed with a few other troubleshooting steps before attempting to resolve a network path problem.
- Verify Quick Client on the tunnel server machine can connect to the target OPC DA server directly. Use the **Edit** menu to connect to third-party OPC DA servers.
  a. If it cannot, the target OPC DA server may not be working properly.
  b. If it can, the runtime process of KEPServerEX may not have COM security permissions sufficient to connect to the target OPC DA server.
  c. To attempt to resolve this, set the KEPServerEX runtime process identity to the same user account as the target OPC DA server.
     - To check the user account tied to OPC DA server processes, use the Windows Task Manager.
     - To set the identity of the KEPServerEX runtime, navigate **to Control Panel | Administration Tool | COM Security | Computers | My Computer**, expand DCOM Config, and find "Kepware Communications Server 5.x" where x is the version of KEPServerEX 5 installed.
     - Select **Properties** and navigate to the Identity tab.
     - Set the Identity to "This user" and enter the username and password of the user account.
     - Click **OK**.
     - Use the Administration tool to stop and restart the KEPServerEX runtime service.

6. Conclusion

The user should now have the basic knowledge and skills to establish an OPC UA connection between the OPC UA Client driver and any OPC UA server with or without security. Congratulations!