



# Kepware Technologies

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## KEPServerEX<sup>®</sup> OPC Tunnel

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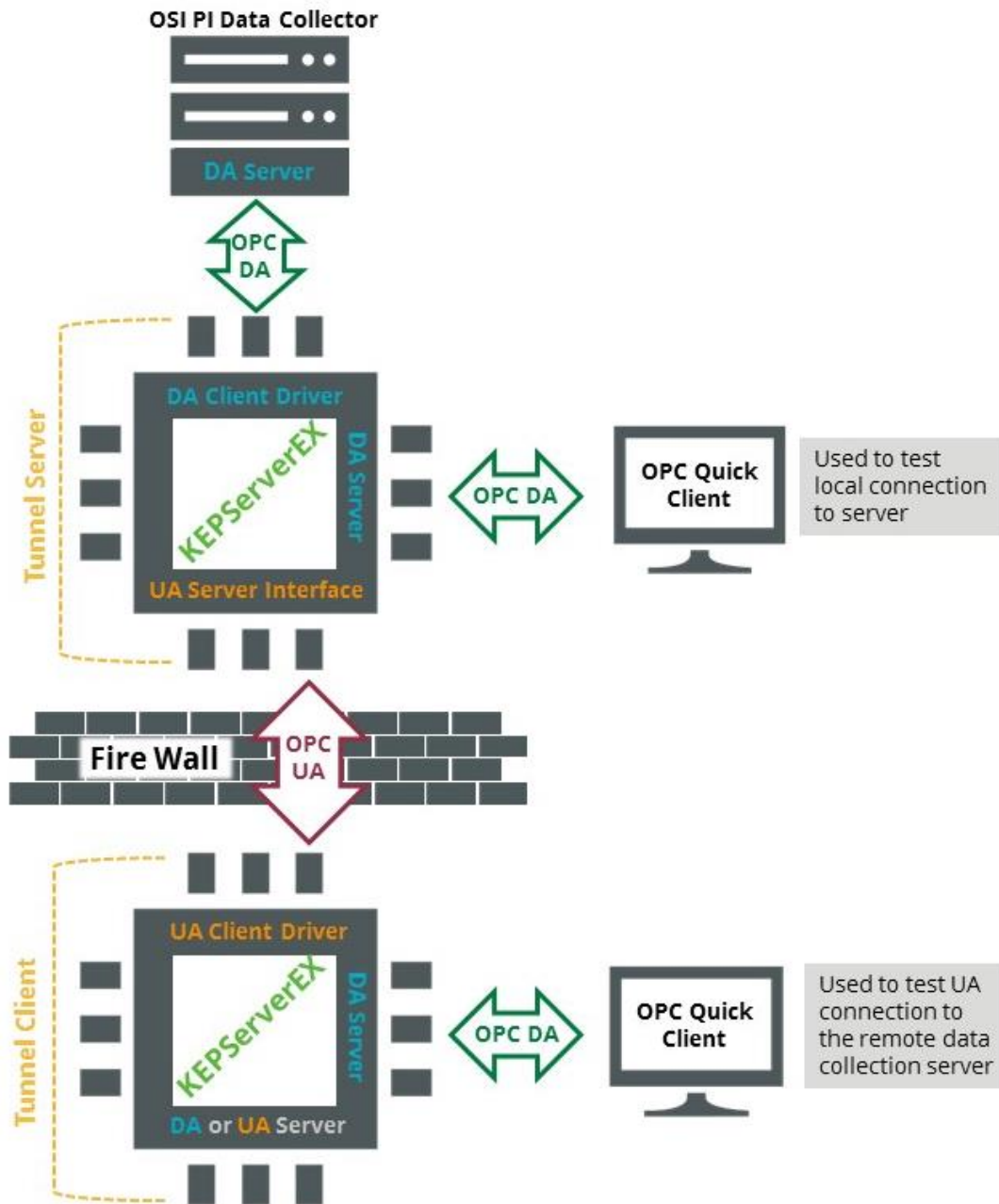
# Table of Contents

<b>1.</b>	<b>Introduction</b> .....	1
<b>2.</b>	<b>Diagram</b> .....	1
<b>3.</b>	<b>Overview</b> .....	2
<b>4.</b>	<b>Prerequisites</b> .....	2
<b>5.</b>	<b>Terminology</b> .....	2
<b>6.</b>	<b>Instructions</b> .....	2
6.1	Configure the Tunnel Server .....	2
6.1.1	Tunnel Server Installation.....	2
6.1.2	Configure a Tunnel Server Channel.....	3
6.1.3	Add a Tunnel Server Device .....	3
6.1.4	Tunnel Server Verification.....	5
6.2	Configure the OPC UA Server Interface .....	5
6.2.1	Configure Certificates.....	6
6.3	Configure the Tunnel Client.....	7
6.3.1	Tunnel Client Installation .....	7
6.3.2	Configure a Tunnel Client Channel.....	8
6.3.3	Add a Tunnel Client Device .....	8
6.3.4	Tunnel Client Verification.....	9

# 1. Introduction

Users may need to collect data from processes located in other domains or networks, whether from the same building or from a different country. It is not practical nor easy to create a COM/DCOM connection across remote OPC applications. OPC UA allows users to establish an internet-based connection. KEPServerEX® helps accomplish this with built-in interfaces and components.

# 2. Diagram



## 3. Overview

There are two components of a KEPServerEX OPC tunnel:

- The KEPServerEX instance that functions as the tunnel server.
- 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.

## 4. Prerequisites

1. Open port 49320 to TCP communication in each tunnel server machine's firewall. Choose any available port in place of 49320 as long as the chosen port is not used by another application.
2. Confirm an internet connection (for product licensing).
3. License the application. Launch the License Utility (through the Administration menu or the Start menu) and follow the wizard. License Utility details can be found in the License Utility Help file and online at [Kepware Support](#).

## 5. Terminology

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

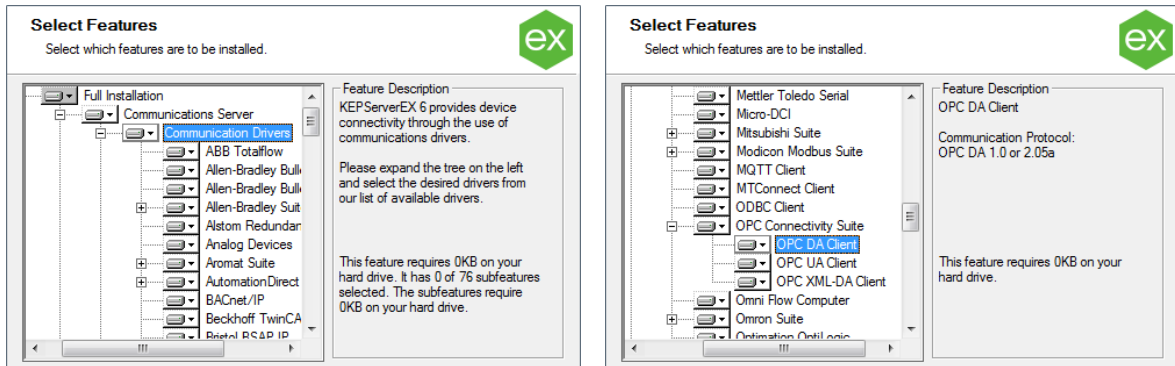
## 6. Instructions

### 6.1 Configure the Tunnel Server

#### 6.1.1 Tunnel Server Installation

1. Access the machine that will be the tunnel server and run the KEPServerEX installation executable to begin installation.
2. In **Select Features**, expand the Communication Drivers branch.

- Expand the OPC Connectivity Suite and select OPC DA Client to be installed.

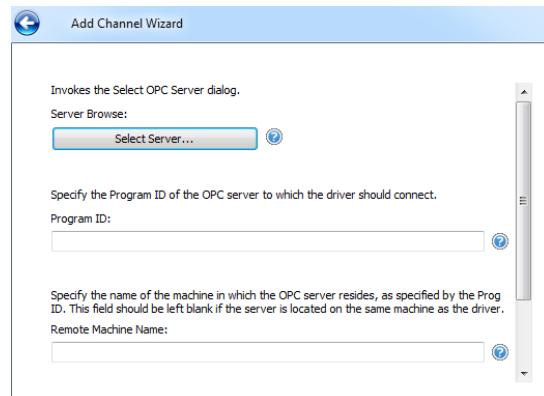


- Complete the installation and launch **KEPServerEX**.

### 6.1.2 Configure a Tunnel Server Channel

- From the KEPServerEX Configuration, select **File | New** to start a blank project.
- Create a new channel and select OPC DA Client driver as the driver type (which will connect this instance of KEPServerEX to the target OPC DA server).  
  - For more information on how to add a channel, refer to the [Server Help](#).

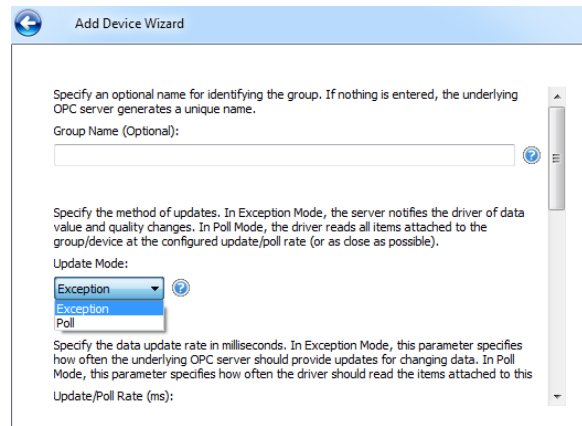
- Continue through the Add Channel wizard until prompted to select the OPC DA server to connect. Click the **Select server...** button to browse the local machine for the target OPC DA server (the name of the target OPC DA server can be manually entered in the **Program ID** field).
- Continue through the wizard to finish adding a channel.



### 6.1.3 Add a Tunnel Server Device

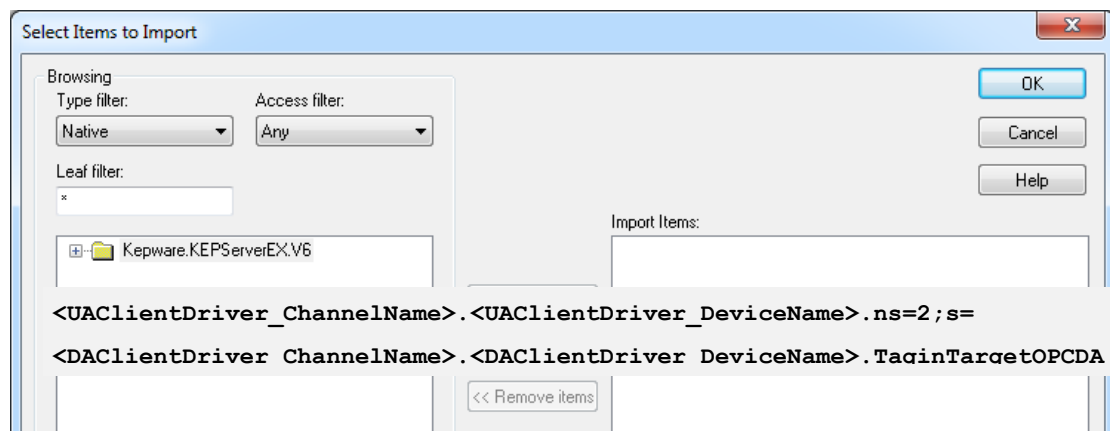
- Create a new device under the new channel created above.  
    - For more information on how to add a device, refer to the [Server Help](#).
  - Continue through the Add Device wizard until prompted for the Group Name.
  - Select **Exception** from the Update Mode drop-down menu, unless the target OPC DA server does not support "subscription-based tag updates."
- Tip:** Exception Update Mode offers the best performance because 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. In Poll Mode, 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 the Update/Poll rate at the default (1000ms) 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 assure that 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.

4. Continue through the Add Device wizard until prompted to enable/disable the Watchdog. Enable Watchdog and choose an item that changes on a regular basis from the target OPC DA server. A "seconds" time value is ideal because the tag should change reliably every second. This 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.
5. In the next step of the wizard, click the **Select Import Items...** button to include all items to be read (and potentially written) through the tunnel.



**Tip:** Importing tags is not required; however, 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:

where actual channel and device names replace the words inside the brackets ( < > ), such as:

```
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 created in only one place - the PI OPC DA client. Otherwise, when working with imported tags, new tags added to the target OPC DA server must be imported first by the OPC DA Client driver, then by the OPC UA Client driver.

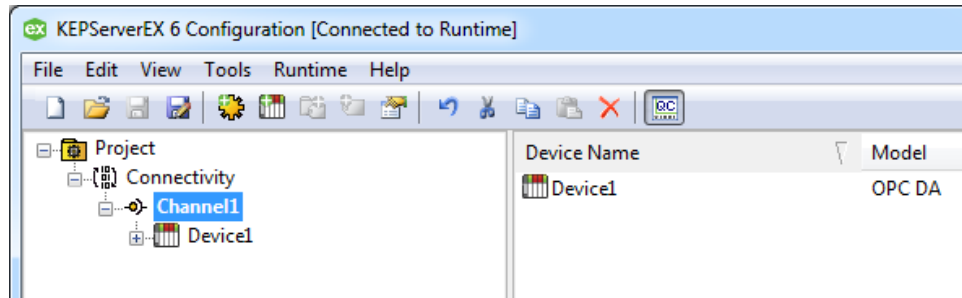
6. Continue through the wizard to finish adding a device.

### 6.1.4 Tunnel Server Verification

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 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 that connect the tunnel server to the target OPC DA server. Use one device per channel and spread the tag load across all available channels (refer to driver help for a maximum channel count).

To test the connection, launch the Quick Client from the Configuration. Quick Client automatically references all tags in KEPServerEX, which verifies communication between the OPC DA Client driver and the target OPC DA server.



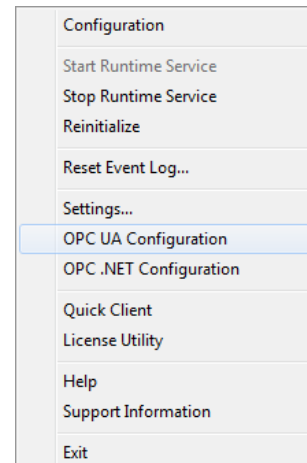
In the Quick Client, verify values and Good quality readings for the imported items.

- **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 determine success or failure of communication with the target OPC DA server; these tags yield Good quality if KEPServerEX is running.

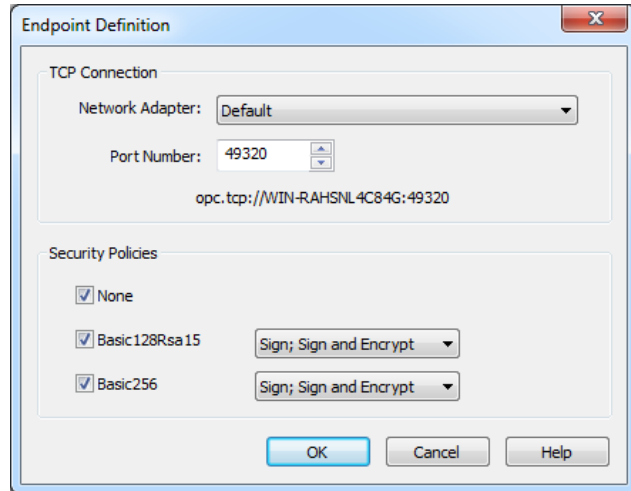
## 6.2 Configure the OPC UA Server Interface

1. Access **OPC UA Configuration** from the Administration menu.
2. In **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.



3. From the **Network Adapter** dropdown menu, select the adapter for this access point to the OPC UA server.
4. Enter the TCP Port Number.
5. Under Security Policies, select an encryption type.
6. Write down or copy/paste the "opc.tcp:// ..." string displayed just below the Port Number for later use.
7. Stop and restart the KEPServerEX Runtime Service to register the new endpoint (from the Administration menu, select **Stop Runtime Service**, then repeat to select **Start Runtime Service**).



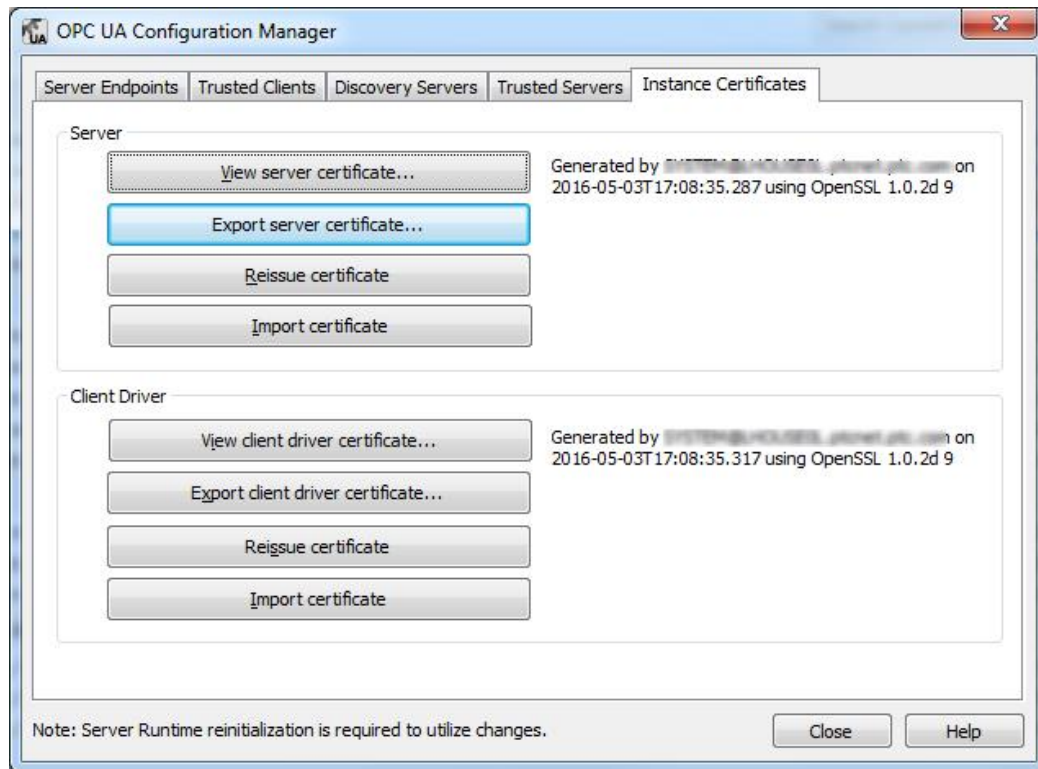
### 6.2.1 Configure Certificates

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 further configuration.

- **Note:** Certificates are only required for connections with security. When **None** is selected for security, this process can be skipped. Under [Security Policies](#), select an encryption type.



1. Open OPC UA Configuration Manager on the tunnel server and access the **Instance Certificates** tab.



2. Click the **Export server certificate...** button and save the certificate. Close the OPC UA Configuration Manager.
3. Copy the exported certificate to the tunnel client machine.
4. Open OPC UA Configuration Manager on the tunnel client and access the **Trusted Servers** tab.
5. Click the **Import...** button and select the exported server certificate copied from the tunnel server machine.
6. Access the **Instance Certificates** tab and click the **Export client driver certificate...** button and save the certificate. Close the OPC UA Configuration Manager.
7. Reopen the OPC UA Configuration on the tunnel server and access the **Trusted Clients** tab.
8. Click the **Import...** button and select the exported client driver certificate. Close the OPC UA Configuration Manager.

## 6.3 Configure the Tunnel Client

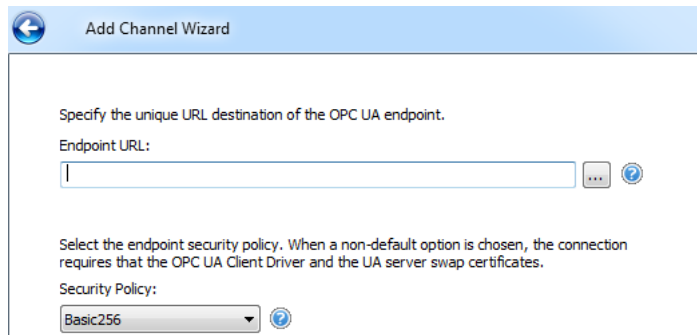
### 6.3.1 Tunnel Client Installation

1. Access the machine running the PI OPC DA collector.
2. Install KEPServerEX and select the OPC UA Client driver to be installed (see [Expand the OPC Connectivity Suite](#) and select OPC DA Client to be installed.).
3. After installation, launch the KEPServerEX Configuration.
4. Select **File | New** to create a new project.

## 6.3.2 Configure a Tunnel Client Channel

Create a channel with the OPC UA Client driver. With the OPC UA Client driver, a 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.

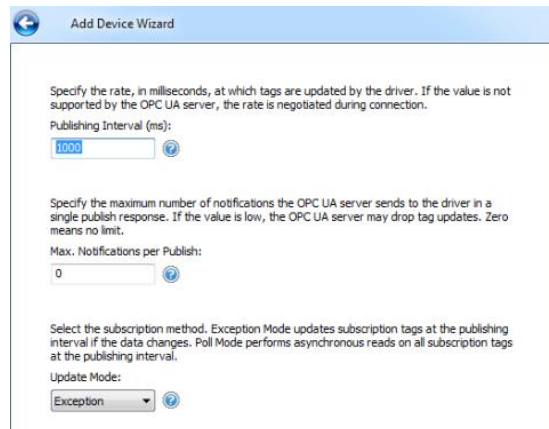
1. From the KEPServerEX main menu, select **File | New** to start a blank project.
2. Create a new channel, and select OPC UA Client driver as the driver type.
  - *For more information on how to add a channel, refer to the server help.*
3. Continue through the wizard, accepting the defaults for Write Optimizations.
4. When prompted for an **Endpoint URL**, enter or paste the “opc.tcp:// ...” string (See Write down or copy/paste the “opc.tcp:// ...” string displayed just below the Port Number for later use.).
5. Select the proper security policy based on the tunnel server settings.
6. Continue through the wizard to finish adding a channel.



- **Note:** It is only necessary to change these settings if the OPC UA connection is authenticated through a username/password exchange.

## 6.3.3 Add a Tunnel Client Device

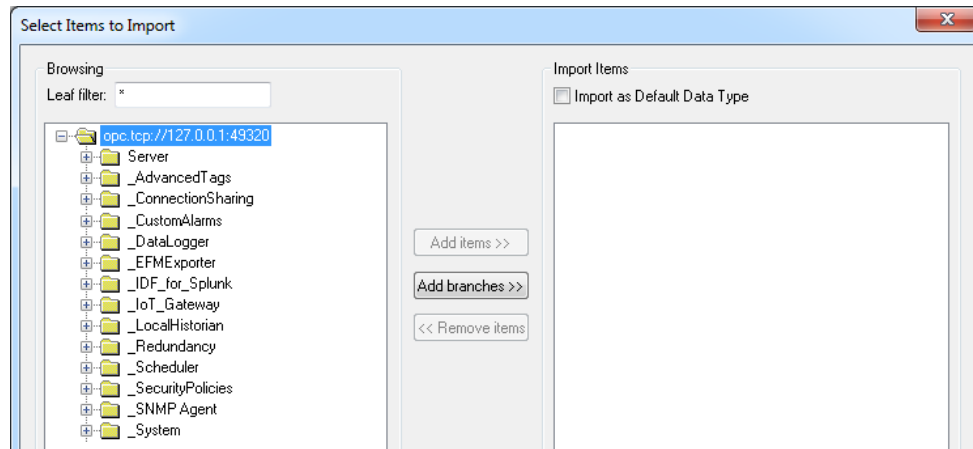
1. Create a new device.
  - *For more information on how to add a device, refer to the server help.*
2. Continue through the wizard until prompted to set the **Publishing Interval**. This defines how frequently the OPC UA Client driver requests newly-changed values from the tunnel server. The default setting is 1000 milliseconds.



- **Tip:** This setting should be at least equal to the Update Rate defined in the OPC DA Client driver (see [Select Exception from](#) the Update Mode drop-down menu, unless the target OPC DA server does not support “subscription-based tag updates.”).
3. Continue through the wizard until prompted to set the **Sample Interval**. This 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 (see [Select Exception from](#) the Update Mode drop-down

menu, unless the target OPC DA server does not support “subscription-based tag updates.”). 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.

4. Continue through the wizard until prompted to import items. Click the **Select Import Items...** button. The OPC UA Client attempts to connect to the target OPC UA server and view all OPC items. If tags from the target OPC DA server were imported to the tunnel server, use this menu to add individual items and branches. If tags were not imported, skip this step.
5. Continue through the wizard to finish adding a device.



### 6.3.4 Tunnel Client Verification

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 the tag load across all channels.

Test the OPC DA Client driver connection to the target OPC DA server by launching the Quick Client from the Configuration. Quick Client automatically references all tags in KEPServerEX, which confirms communication between the tunnel server and the target OPC DA server. If there are Good quality readings for non-system tags in Quick Client, the connection is valid. If there are Bad quality readings, 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 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. Connect to third-party OPC DA servers by accessing **Edit | New Server Connection....**
  - If it cannot connect, the target OPC DA server may not be working properly.

- If it can, the KEPServerEX runtime may not have sufficient COM security permissions to connect to the target OPC DA server. Verify the KEPServerEX runtime identity is the same user account as the target OPC DA server:
  1. Access Windows Task Manager to check the user account tied to OPC DA server processes.
  2. To set the identity of the KEPServerEX runtime, navigate to **Control Panel | Administrative Tools | Component Services | Computers | My Computer**, expand DCOM Config, and find “Kepware Communications Server x.x” where x is the version of KEPServerEX installed.
    - **Note:** This navigation applies to Windows 7, as earlier versions are different.
  3. Select **Properties** and access the Identity tab. Set the Identity to “This user” and enter the username and password of the user account.
  4. Access the Administration menu to stop and restart the runtime service.