



LEARN KEPSERVEREX USING A SIGMA TILE GUIDE



Apps: V8.2 or later
KepServerEX: 6.3 or later
Sigma Tile: V5
05/07/2018

The screenshot displays two software windows. The top window is 'KEPServerEX 6 Configuration (Connected to Runtime)', showing a project tree on the left and a table of tag configurations. The bottom window is 'OPC Quick Client - Untitled *', showing a tree view of the data source and a table of real-time data points.

Tag Name	Address	Data Type	Scan Rate
Acceleration_X	40007	Float	100
Acceleration_Y	40009	Float	100
Acceleration_Z	40011	Float	100
BadCount	40027	Word	100
ErrorCode	40028	Word	100
GoodCount	40026	Word	100
Gyroscope_Pitch	40015	Float	100

Item ID	Data Type	Value	Timestamp
Channel1.SigmaTile1.Acceleration_X	Float	0.0339424	17:43:17.040
Channel1.SigmaTile1.Acceleration_Y	Float	1.02895	17:43:17.040
Channel1.SigmaTile1.Acceleration_Z	Float	0.0599494	17:43:17.040
Channel1.SigmaTile1.BadCount	Word	2117	17:43:16.073
Channel1.SigmaTile1.ErrorCode	Word	100	17:20:43.858
Channel1.SigmaTile1.GoodCount	Word	2116	17:43:15.054
Channel1.SigmaTile1.Gyroscope_Pitch	Float	-0.00379826	17:43:17.040
Channel1.SigmaTile1.Gyroscope_Roll	Float	0.00316224	17:43:17.040
Channel1.SigmaTile1.Gyroscope_Yaw	Float	0.00412892	17:43:17.040
Channel1.SigmaTile1.Humidity	Float	23.299	17:43:17.040
Channel1.SigmaTile1.Orientation_Pitch	Float	357.508	17:43:17.040
Channel1.SigmaTile1.Orientation_Roll	Float	87.4474	17:43:17.040
Channel1.SigmaTile1.Orientation_Yaw	Float	269.642	17:43:17.040
Channel1.SigmaTile1.Pressure	Float	1021.28	17:43:17.040
Channel1.SigmaTile1.Screen_Control	Word	1	17:19:35.915
Channel1.SigmaTile1.Temperature	Float	33.6724	17:43:17.040
Channel1.SigmaTile1.VibrationAlert	Word	0	17:19:35.915

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INTRODUCTION

In this guide you will learn how to connect a Sigma Tile to a computer or server running Kepware KEPServerEX.

After downloading and configuring the free trial version of Kepware KEPServerEX, you will be able to experience the power of the Industrial IoT with your Sigma Tile acting as PLC communicating to your server via MODBUS and representing a device, an asset or a line streaming its sensor data: temperature, humidity, pressure, acceleration and acting like a real production asset. You will also be able to control the Sigma Tile LED display from KEPServerEX.

If you are new to the Sigma Tile and want to better understand what it is and intended application, go to Appendix A.

SYSTEM REQUIREMENTS

Before proceeding with this guide, ensure that you have the required hardware, software and that the following requirements are met:

HARDWARE REQUIREMENTS

- Sigma Tile
- WIFI router / network
- Computer running Windows (you must have administrative privileges on the computer.)

OPERATING SYSTEMS REQUIREMENTS

Servers:

- Windows Server 2012 R2
- windows Server 2008 R2 SP1

Clients:

- Windows 7
- Windows 8.1
- Windows 10

If you are going to install the ThingWorx Manufacturing Apps in a Virtual Machine, ensure that you have the latest VM tools installed. You will need at least 4 cores and 16GB of RAM


RECOMMENDED BROWSERS

- Chrome 51 (recommended)
- Firefox ESR 47+
- Internet Explorer 11

STEP 1 - CONNECTING YOUR SIGMA TILE TO A NETWORK

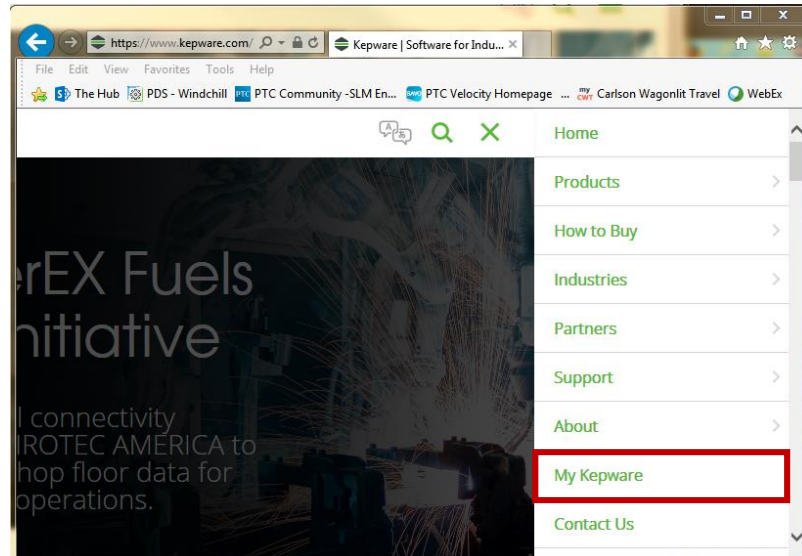
1. Power your Sigma Tile with the Micro-USB cable. Within about 15 seconds a WIFI symbol will be displayed on the LED display, indicating that the Sigma Tile is searching for a network.



2. Connect the Sigma Tile to a **network** using one of the following methods:
 - a. Ethernet:
 - i. Connect to a network via an Ethernet cable in the Sigma Tile Ethernet port.
 - ii. Watch the LED display of the Sigma Tile for its IP address. The IP address will be displayed 3 times after a connection to the network is established.
 - iii. Make note of the IP address: `__ . __ . __ . __`
 - b. WIFI:
 - i. Connect a mouse, keyboard, and monitor to your Sigma Tile. You may have to turn-off and repower the Sigma Tile to be able to connect to the monitor.
 - ii. Log in: -user: **pi** -password: **raspberrry**
 - iii. Use the pixel GUI to configure the Sigma Tile with your network.
 - iv. Watch the LED display of the Sigma Tile for its IP address. The IP address will be displayed 3 times after a connection to the network is established.
 - v. Make note of the IP address: `__ . __ . __ . __`
3. Wait for the  icon (white disk) to be displayed on **LED display**. Your Sigma Tile is now ready to be connected to Kepware KEPServerEX and the ThingWorx Manufacturing Apps.

STEP 2 - INSTALLING AND CONFIGURING KEPWARE KEPSERVEREX

1. From your computer connected to a **network with internet access**, navigate to Kepware.com (<https://www.kepware.com>)
2. Select My Kepware



3. Log in using your PTC credentials:

My Kepware Customer Self-Service Portal

Already have a My Kepware Account?

Email Address:

Password:

[Log in](#)

[Need a My Kepware Account? Sign up here](#)

[Forgot Your Password?](#)

[Information Request Form](#)

4. In the DOWNLOADS section for KEPServerEX, select and download **KEPServerEX 6.3**.

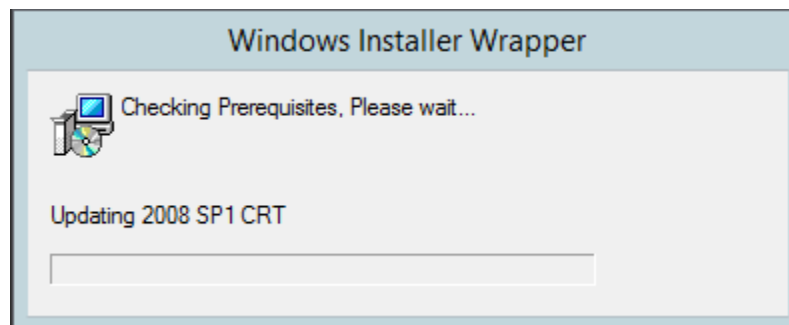
DOWNLOADS

KEPServerEX

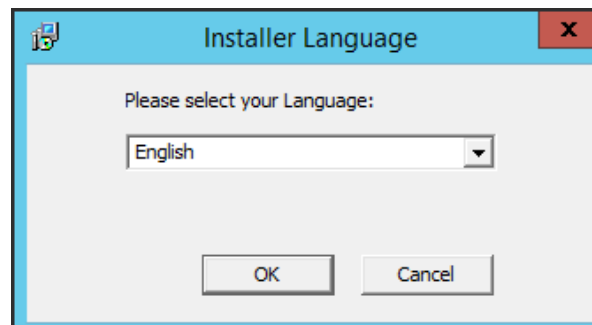
This download contains all KEPServerEX drivers, suites, and advanced plug-ins. Select the desired components during installation.

KEPServerEX 6.3

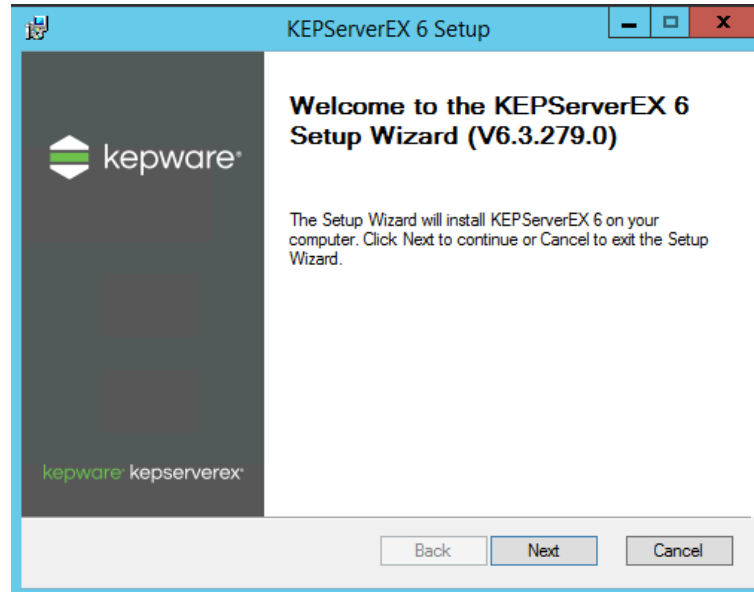
5. Copy the file **KEPServerEX-6.3.XXX.0.exe** to your computer / server.
6. Run KEPServerEX-6.3.279.0.exe to install.



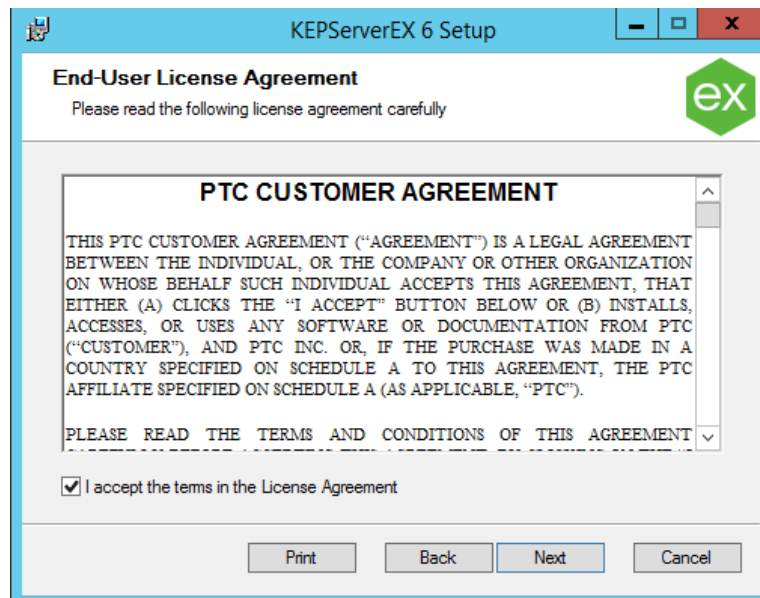
7. Select the language.



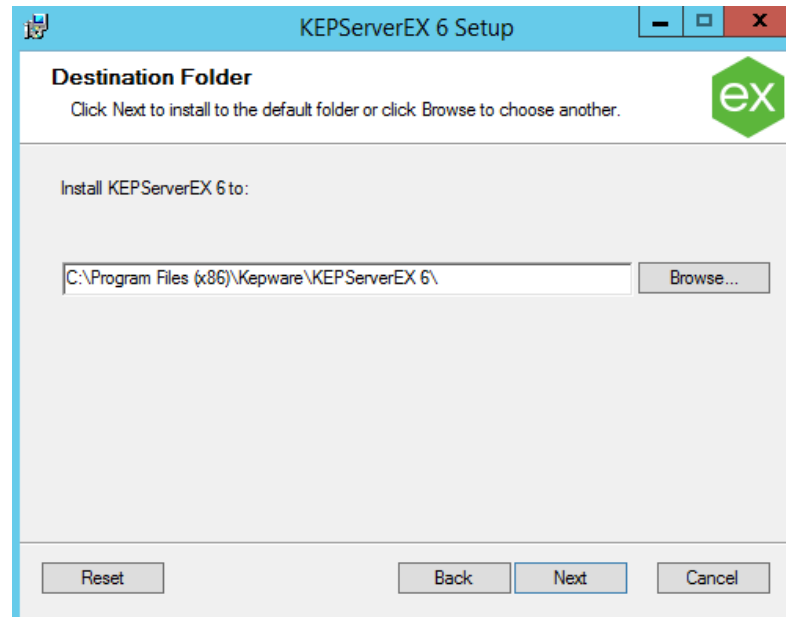
8. Select **Next** to allow the KEPServer EX 6 Setup Wizard to run.



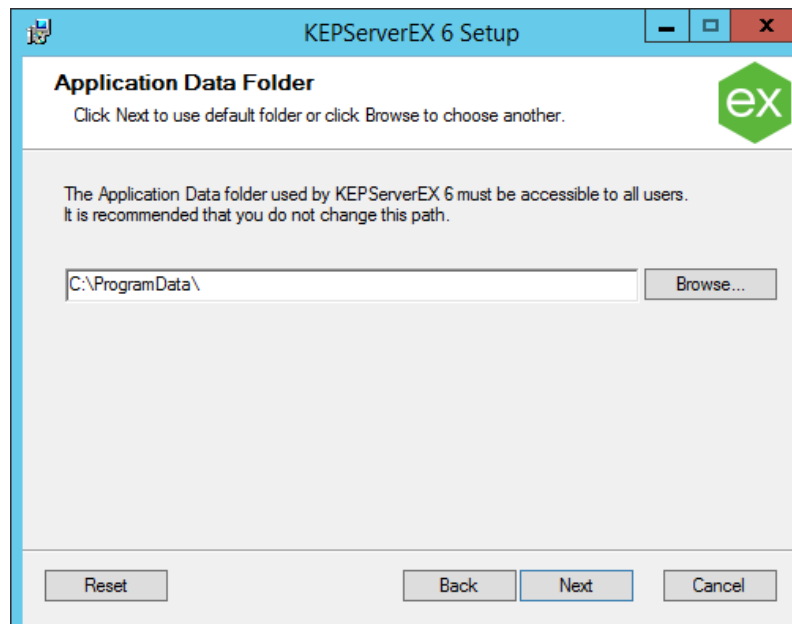
9. Accept the End-User License Agreement and select **Next**.



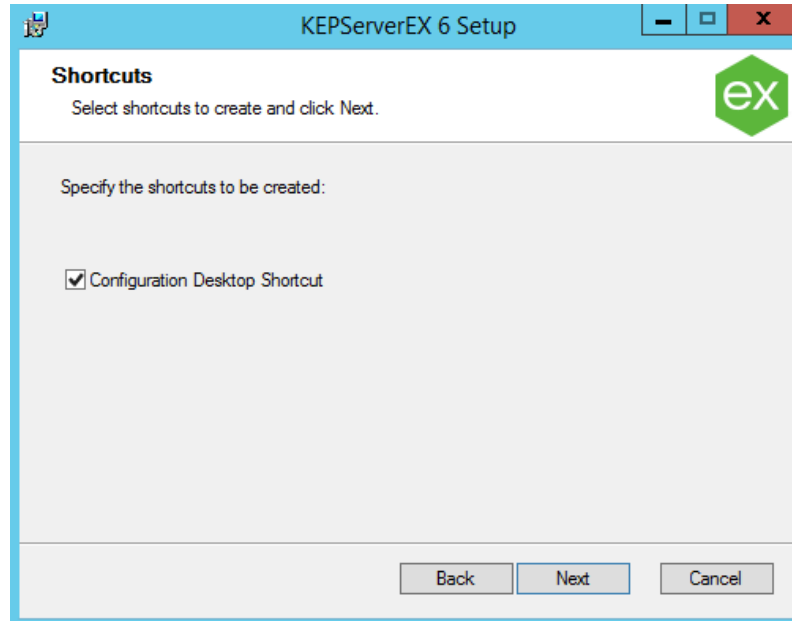
10. Choose the Destination Folder and select **Next**.



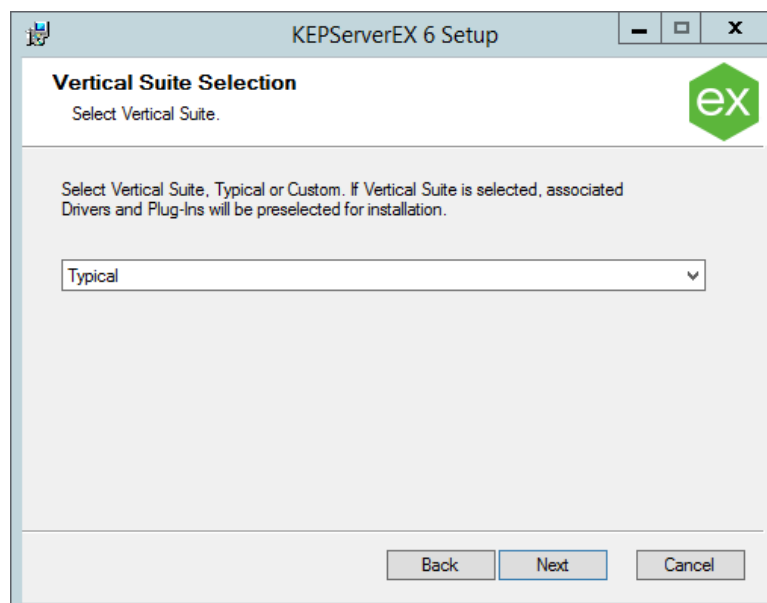
11. Choose the Application Data Folder and select **Next**.



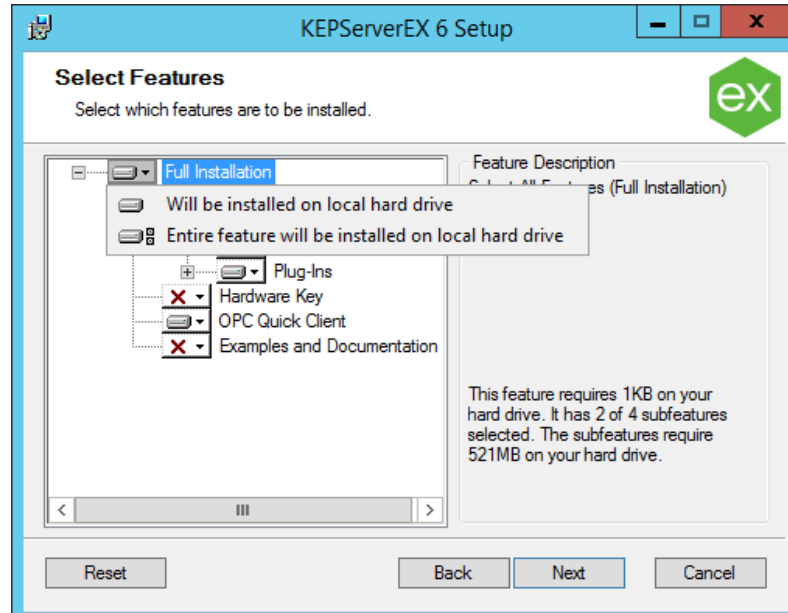
12. Allow configuration of desktop shortcut and select **Next**.



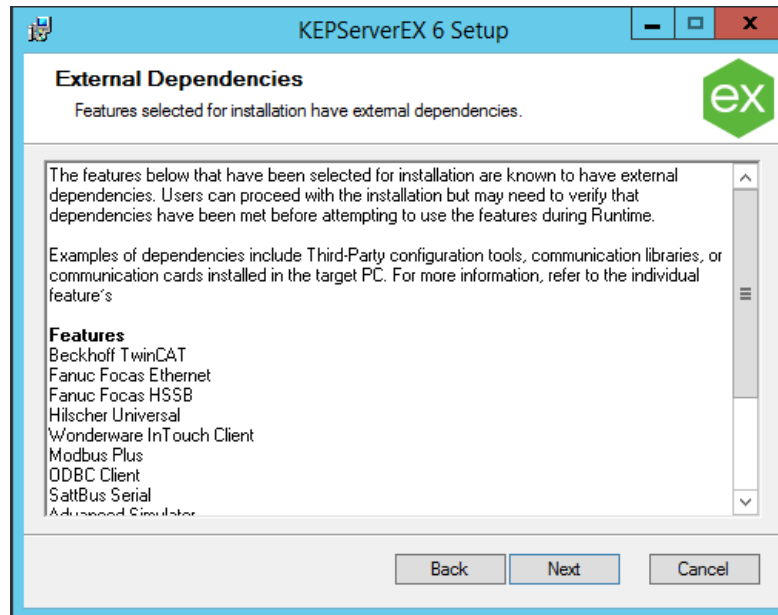
13. Select **Typical** install.



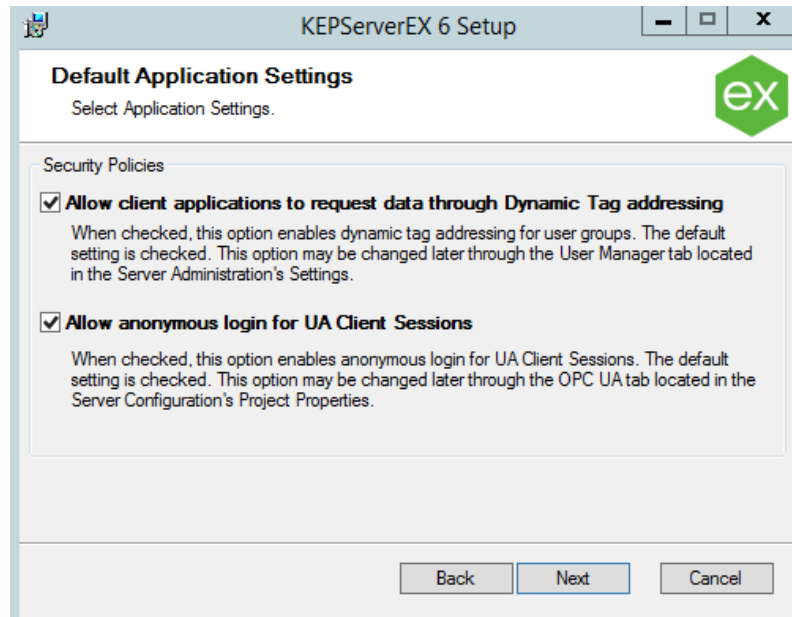
14. Ensure Full Installation choice (“**Entire feature will be installed on local hard drive**”), is selected.



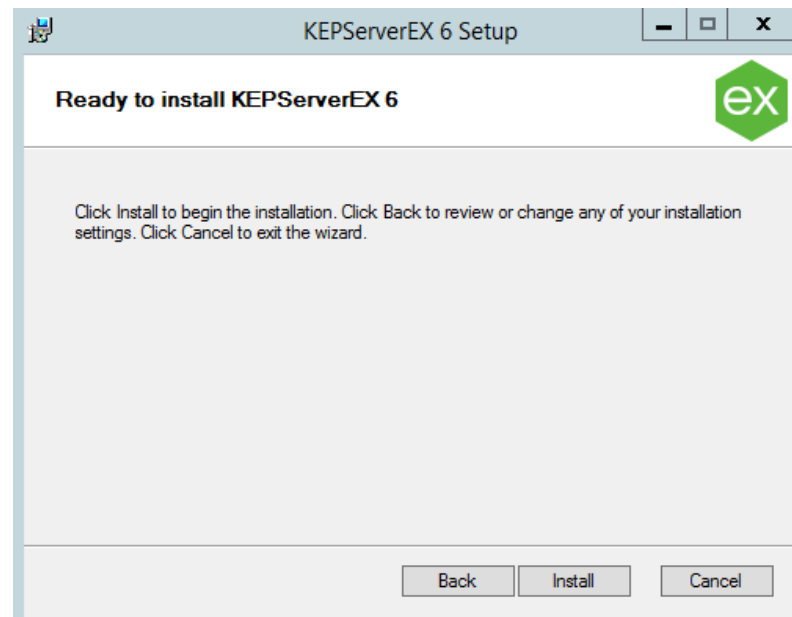
15. Review Setup External Dependencies and click **Next**.



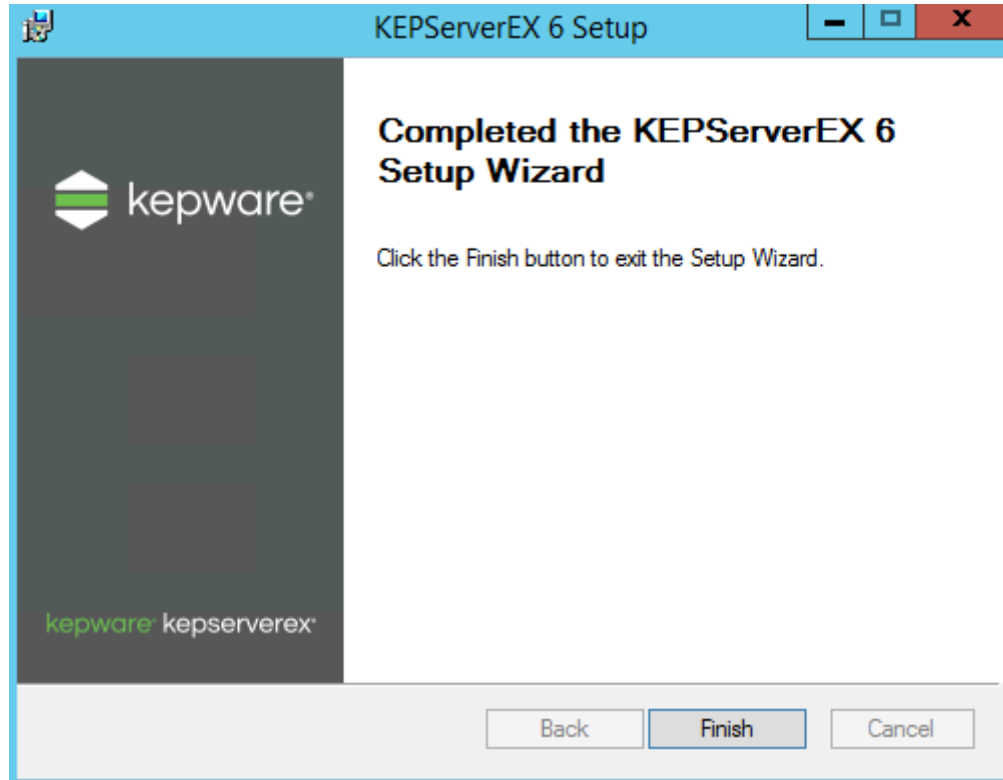
16. Review setup Settings and click **Next**.




17. Select **Install**.

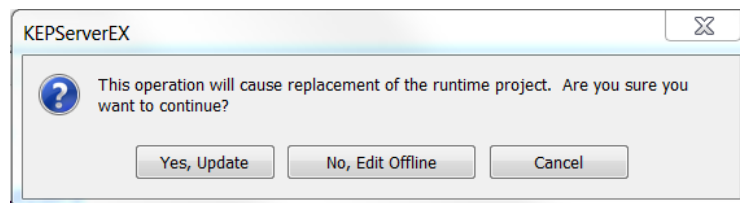


18. The following screen indicates successful setup, select **Finish**.



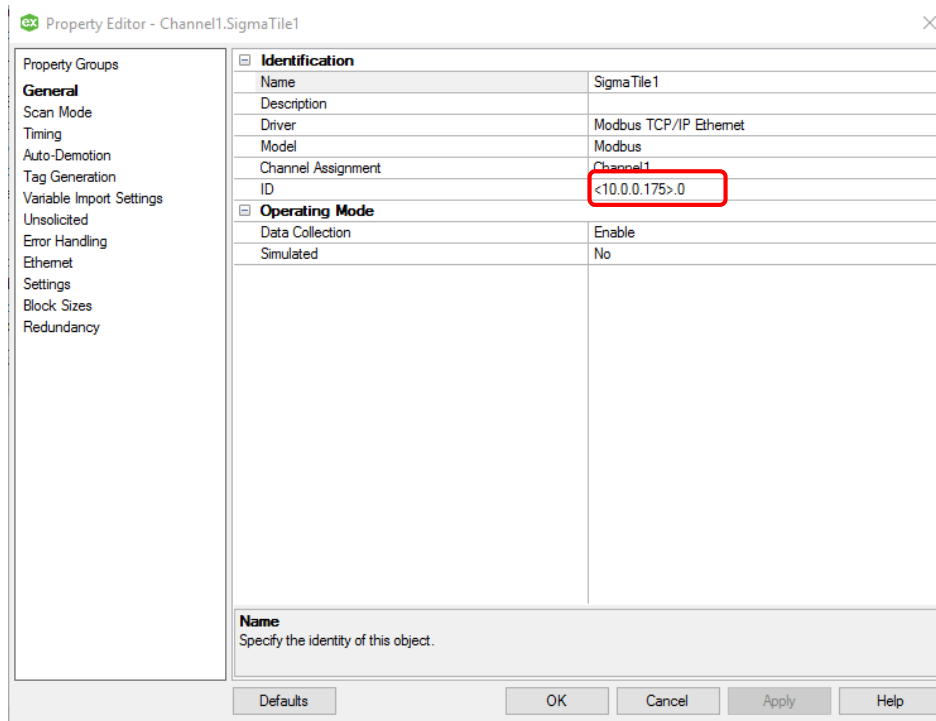
STEP 3 - CONFIGURING KEPWARE TO COMMUNICATE WITH THE SIGMA TILE

1. If it is not already the case, connect your computer to **the same network** as your Sigma Tile.
2. Open Kepware. If you have the shortcut, it looks like this: 
3. Download [SigmaTile_SenseHat_v5.opf](#) to a location accessible from Kepware configuration.
4. In Kepware, navigate to and open the project **SigmaTile_SenseHat_v5.opf**. A dialogue box may pop up asking if you want to replace your current project. Select **Yes**.

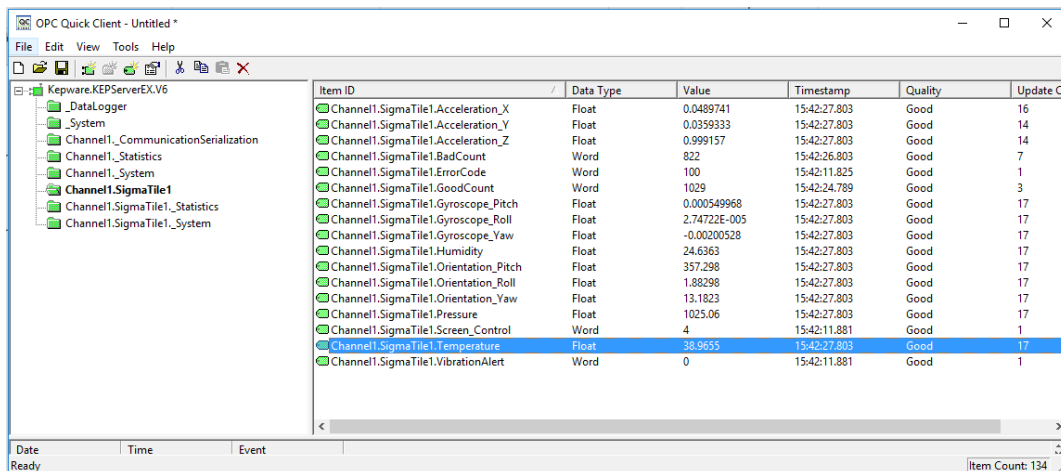


5. Select **Channel1** in the left-hand menu, and double click on the **SigmaTile1**

device to update the **IP address** to the one that scrolled across the Sigma Tile screen.



- Open up the **Quick Client** by selecting **Tools > Launch OPC Quick Client** and ensure data flow from the Sigma Tile by selecting **Channel1.SigmaTile1** and verifying that values are streaming. Check, for example, the Temperature value



Item ID	Data Type	Value	Timestamp	Quality	Update C
Channel1.SigmaTile1.Acceleration_X	Float	0.0489741	15:42:27.803	Good	16
Channel1.SigmaTile1.Acceleration_Y	Float	0.0359333	15:42:27.803	Good	14
Channel1.SigmaTile1.Acceleration_Z	Float	0.999157	15:42:27.803	Good	14
Channel1.SigmaTile1.BadCount	Word	822	15:42:26.803	Good	7
Channel1.SigmaTile1.ErrorCode	Word	100	15:42:11.825	Good	1
Channel1.SigmaTile1.GoodCount	Word	1029	15:42:24.789	Good	3
Channel1.SigmaTile1.Gyroscope_Pitch	Float	0.000549968	15:42:27.803	Good	17
Channel1.SigmaTile1.Gyroscope_Roll	Float	2.74722E-005	15:42:27.803	Good	17
Channel1.SigmaTile1.Gyroscope_Yaw	Float	-0.00200528	15:42:27.803	Good	17
Channel1.SigmaTile1.Humidity	Float	24.6363	15:42:27.803	Good	17
Channel1.SigmaTile1.Orientation_Pitch	Float	357.298	15:42:27.803	Good	17
Channel1.SigmaTile1.Orientation_Roll	Float	1.88298	15:42:27.803	Good	17
Channel1.SigmaTile1.Orientation_Yaw	Float	13.1823	15:42:27.803	Good	17
Channel1.SigmaTile1.Pressure	Float	1025.06	15:42:27.803	Good	17
Channel1.SigmaTile1.Screen_Control	Word	4	15:42:11.881	Good	1
Channel1.SigmaTile1.Temperature	Float	38.9655	15:42:27.803	Good	17
Channel1.SigmaTile1.VibrationAlert	Word	0	15:42:11.881	Good	1

Date Ready Time Event Item Count: 134

Troubleshooting Tips:

If you do not see any values updating in the value column, check the following:

- Your Sigma Tile and KepServerEX (computer) are on the same network.

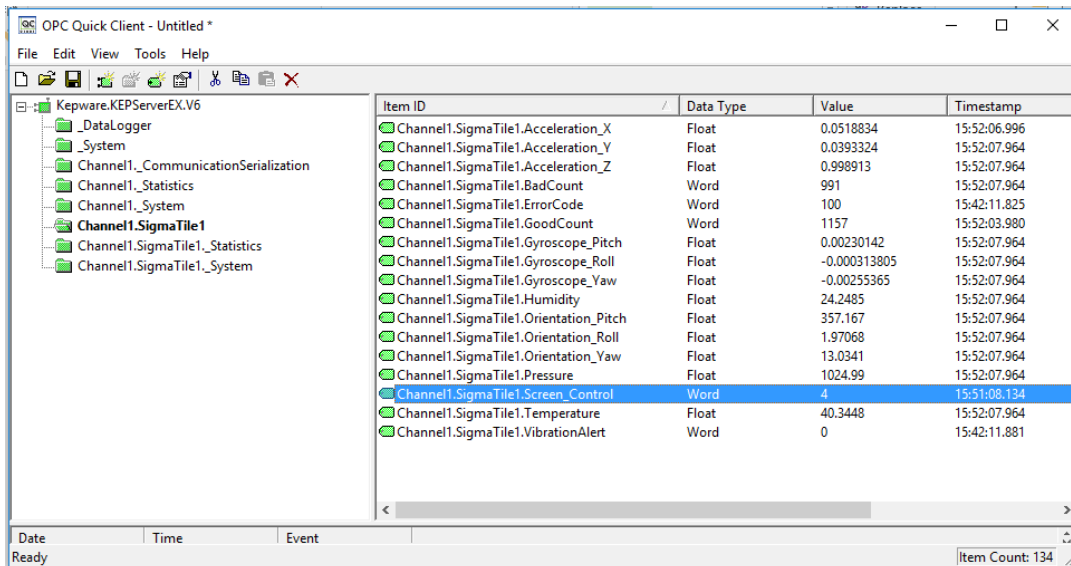
- You can ping your Sigma Tile from your computer
- Your KepServerEX license (or trial license) has not expired. If you are using a trial license of Kepware, keep in mind that it will expire every 2 hours. To reinitialize the trial period, follow these steps:

1. Locate the KepServerEX icon in your system tray







2. Right click on the KepServerEX icon and click "Stop Runtime Service". The system will ask you to confirm that you want stop the runtime service, say "Yes".
3. Right click again on the KepServerEX icon and click "Start Runtime Service"

7. Change the **LED display** on the Sigma Tile's screen by right-clicking on the tag labeled **Screen_Control**, and select **Synchronous Write**.



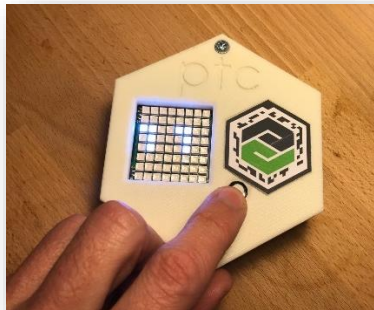
Apply any value between 0-5 and observe what happens on the Sigma Tile display. Each icon corresponds to a different state detailed in table below:

LED Display	Status Description	KepServerEX "Screen_Control" tag value
	Not configured	0
	Warning	1
	Running	2
	Planned downtime	3

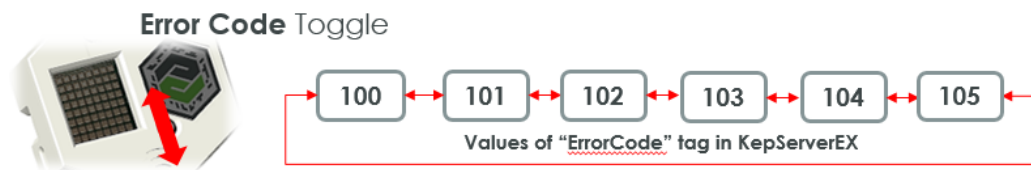
	Unplanned downtime	4
	Unavailable	5

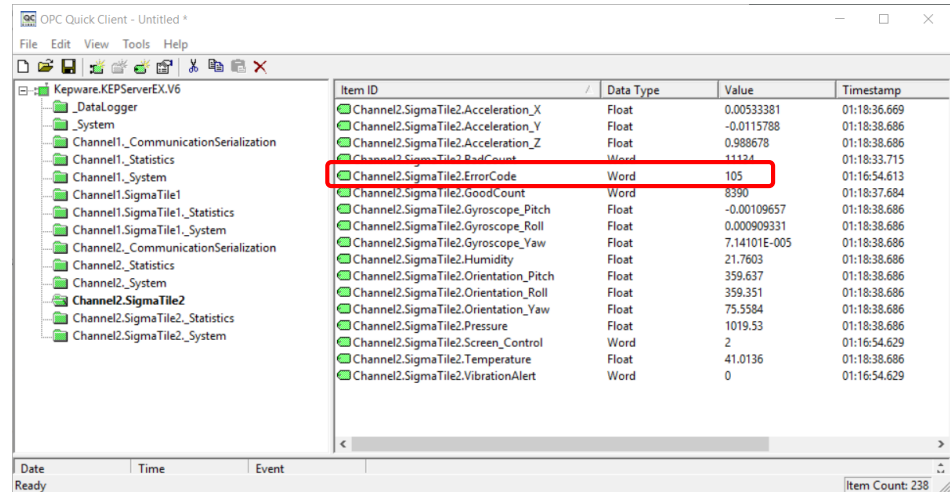
STEP 4 – FAMILIARIZE YOURSELF WITH THE FEATURES OF THE SIGMA TILE

1. Using the joystick in front of the Sigma Tile:

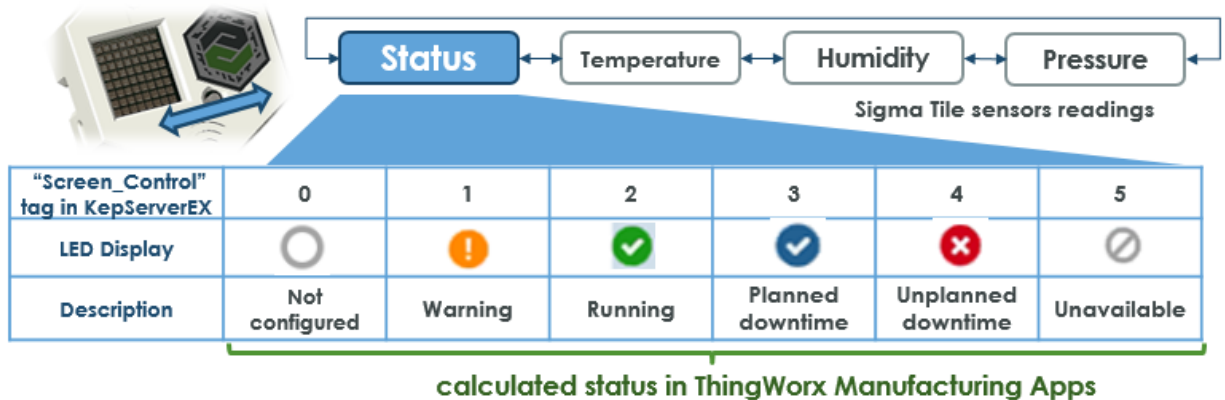


- a. Toggle between the different value of possible “Error Code” by moving the joystick up or down. Note the value change in the Quick Client: **Channel1.SigmaTile1.ErrorCode**. The ErrorCode tag can be used, as you will see in the **Learn the ThingWorx Manufacturing Apps using a Sigma Tile** guide to trigger different **alerts** and messages in the **ThingWorx Manufacturing Apps**.





- b. Toggle the **LED display mode** by moving the joystick left or right to change the information displayed between **Status**, **Temperature**, **Humidity** and **Pressure**. Note that you will have to wait for the text to fully scroll through the Sigma Tile LED display to see a change in the mode after clicking the joystick left or right. Observe, for example, the value of the temperature displayed on the LED screen and the value shown in the **Quick Client**.



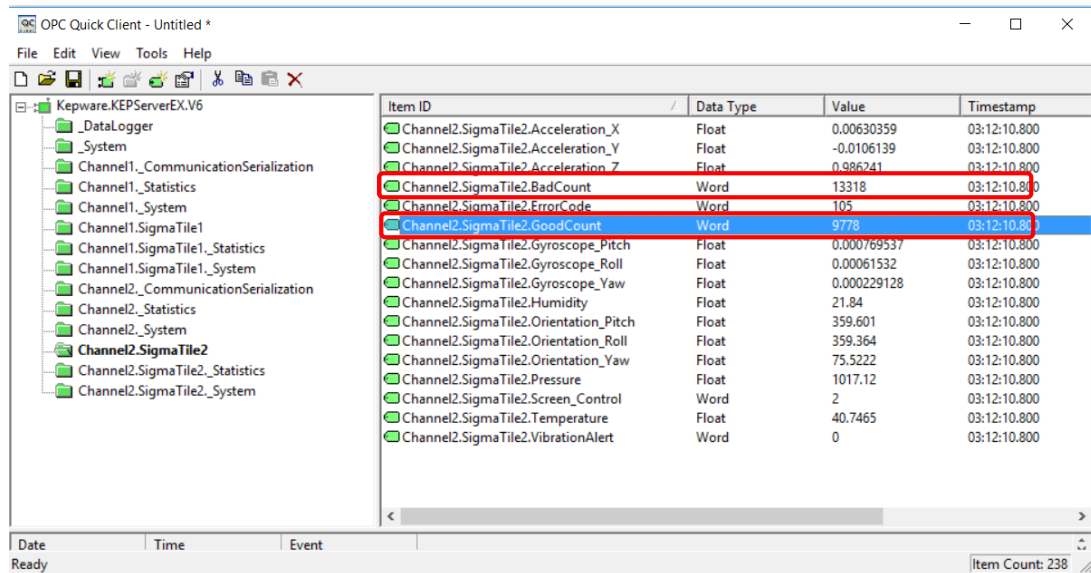
2. Understand the **Status mode**.

The Status Mode on the LED display indicates, via an icon, the status of the **Asset** or **Line** that the Sigma Tile represents **as defined and calculated** in the **ThingWorx Manufacturing Apps**. See the **Learn the ThingWorx Manufacturing Apps using a Sigma Tile** guide, to learn how to configure your Sigma Tile as an Asset in the Apps. The status value is controlled by a tag (Screen_Control tag) in KEPServerEX as you have seen in Step 2 above.

3. Understand the Sigma Tile **GoodCount** and **BadCount** tags

The program running on the Sigma Tile (Python script that starts automatically at startup) includes a routine that will increment the GoodCount and BadCount tag values as if the Sigma Tile were a real production asset or line producing parts at

an average rate of 35 parts / minutes under baseline conditions. But as the conditions of the Sigma Tile change (e.g. temperature and pressure) the production rate and quality will change. Specifically, as the temperature rises the ratio of bad parts to good parts will increase, representing a decrease in quality. You can observe the values of the GoodCount and BadCount tags in KepServerEX. In the **Learn the ThingWorx Manufacturing Apps using a Sigma Tile** guide you will use these tags to define the **performance metrics** of the asset and further observe this behavior.



Item ID	Data Type	Value	Timestamp
Channel2.SigmaTile2.Acceleration_X	Float	0.00630359	03:12:10.800
Channel2.SigmaTile2.Acceleration_Y	Float	-0.0106139	03:12:10.800
Channel2.SigmaTile2.Acceleration_Z	Float	0.986241	03:12:10.800
Channel2.SigmaTile2.BadCount	Word	13318	03:12:10.800
Channel2.SigmaTile2.ErrorCode	Word	105	03:12:10.800
Channel2.SigmaTile2.GoodCount	Word	9778	03:12:10.800
Channel2.SigmaTile2.Gyroscope_Pitch	Float	0.000769537	03:12:10.800
Channel2.SigmaTile2.Gyroscope_Roll	Float	0.00061532	03:12:10.800
Channel2.SigmaTile2.Gyroscope_Yaw	Float	0.000229128	03:12:10.800
Channel2.SigmaTile2.Humidity	Float	21.84	03:12:10.800
Channel2.SigmaTile2.Orientation_Pitch	Float	359.601	03:12:10.800
Channel2.SigmaTile2.Orientation_Roll	Float	359.364	03:12:10.800
Channel2.SigmaTile2.Orientation_Yaw	Float	75.5222	03:12:10.800
Channel2.SigmaTile2.Pressure	Float	1017.12	03:12:10.800
Channel2.SigmaTile2.Screen_Control	Word	2	03:12:10.800
Channel2.SigmaTile2.Temperature	Float	40.7465	03:12:10.800
Channel2.SigmaTile2.VibrationAlert	Word	0	03:12:10.800

4. Understand the **VibrationAlert** tag.

The **VibrationAlert** tag in KepServerEX is used to indicate any excessive vibration detected by the Sigma Tile. The Python script on the Sigma Tile has some code that uses the acceleration sensors to make that determination. If vibration is detected the **VibrationAlert** tag will be set to 1. If no vibration is detected the tag is set to 0.

OPC Quick Client - Untitled *

File Edit View Tools Help

Keeware.KEPServerEX.V6

Item ID	Data Type	Value	Timestamp
Channel1.SigmaTile1.Acceleration_X	Float	-0.00370253	17:52:42.269
Channel1.SigmaTile1.Acceleration_Y	Float	1.02774	17:52:42.269
Channel1.SigmaTile1.Acceleration_Z	Float	0.0584872	17:52:42.269
Channel1.SigmaTile1.BadCount	Word	2215	17:52:42.269
Channel1.SigmaTile1.ErrorCode	Word	100	17:20:43.858
Channel1.SigmaTile1.GoodCount	Word	2310	17:52:38.328
Channel1.SigmaTile1.Gyroscope_Pitch	Float	-0.00244382	17:52:42.269
Channel1.SigmaTile1.Gyroscope_Roll	Float	0.00363216	17:52:41.269
Channel1.SigmaTile1.Gyroscope_Yaw	Float	0.00140268	17:52:41.269
Channel1.SigmaTile1.Humidity	Float	26.6332	17:52:41.269
Channel1.SigmaTile1.Orientation_Pitch	Float	359.873	17:52:41.269
Channel1.SigmaTile1.Orientation_Roll	Float	87.2462	17:52:41.269
Channel1.SigmaTile1.Orientation_Yaw	Float	276.924	17:52:41.269
Channel1.SigmaTile1.Pressure	Float	1021.07	17:52:41.269
Channel1.SigmaTile1.Screen_Control	Word	1	17:19:35.915
Channel1.SigmaTile1.Temperature	Float	32.1552	17:52:41.269
Channel1.SigmaTile1.VibrationAlert	Word	1	17:52:33.302

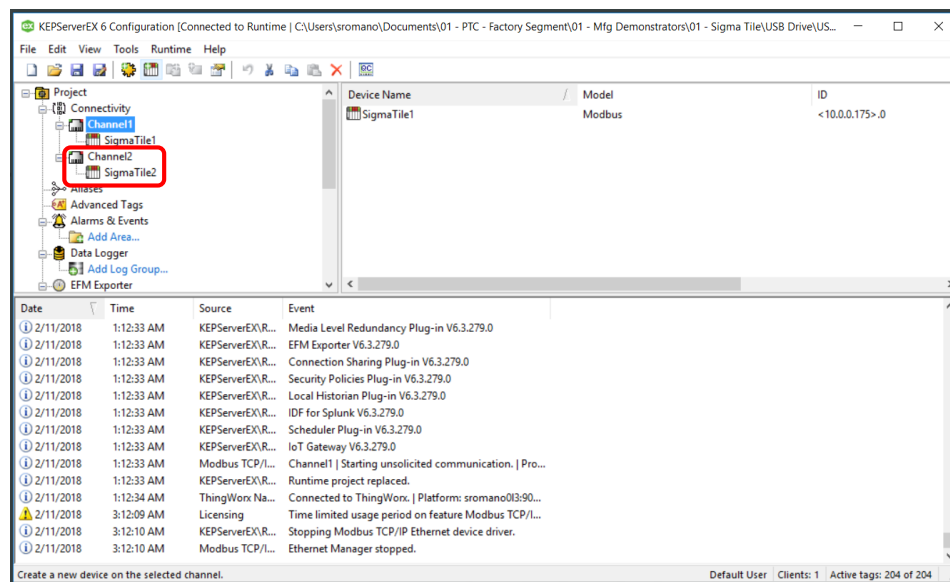
Date Time Event

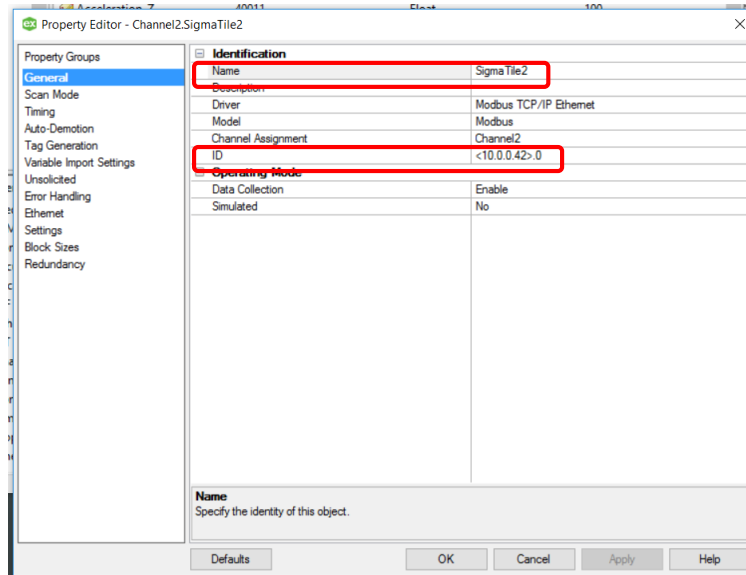
Ready Item Count: 238

STEP 5 - ADDING ANOTHER SIGMA TILE TO KEPSERVEREX

If you have another Sigma Tile, you can easily add it by following these steps.

1. In the **Configuration** app of KEPServerEX, select **Channel1**, right click on it, and select **Copy**.
2. Now, select **Connectivity**, right click and click **Paste**. You will now see a new channel automatically called **Channel2** containing one device called "SigmaTile1".
3. Right click on the "SigmaTile1" under Channel2 and select **Properties**. Rename this device to "**SigmaTile2**" and update the IP address of this device to match the value on the LED display of your second Sigma Tile.





Congratulations! You have completed this guide. You have learned how to install KepServerEX and configure a real device (Sigma Tile) and monitor its sensors readings. You have also learned more about the features of the Sigma Tile and how to use it including controlling the LED Display (Status) via KEPServerEX.

The next step is to setup and configure the **ThingWorx Manufacturing Apps** to experience the power of the ThingWorx Industrial Innovation Platform with the Sigma Tile acting as a Production Asset or as a Smart Connected Product. Check the **Learn the ThingWorx Manufacturing Apps using a Sigma Tile** guide for details.

APPENDIX A: UNDERSTANDING THE SIGMA TILE

WHAT IS A SIGMA TILE?

The **PTC Sigma Tile** is a **very low cost, ultra-portable** IoT device that you can **build yourself**. It is equipped with sensors and controls and can act as a **Smart Connected Product** or as the **Industrial Controller (PLC) of a production asset or line**. It is intended to be used for **IoT demonstration** and **IoT applications development and testing** purposes.



For a quick demo overview of the Sigma Tile in action, check out this video:



<https://vimeo.com/246388214>
(2-minute video)

GET STARTED

Step 1 – Learn Industrial Connectivity with KEPServerEX and a Sigma Tile



LearnKepServerEXUsingSigmaTileGuide.pdf

Install and configure the free trial edition of Kepware KEPServerEX to connect to the Sigma Tile and, in less than 10 minutes, stream real time readings from the Sigma Tile sensors: temperature, pressure, humidity... and control the Sigma Tile from KEPServerEX.

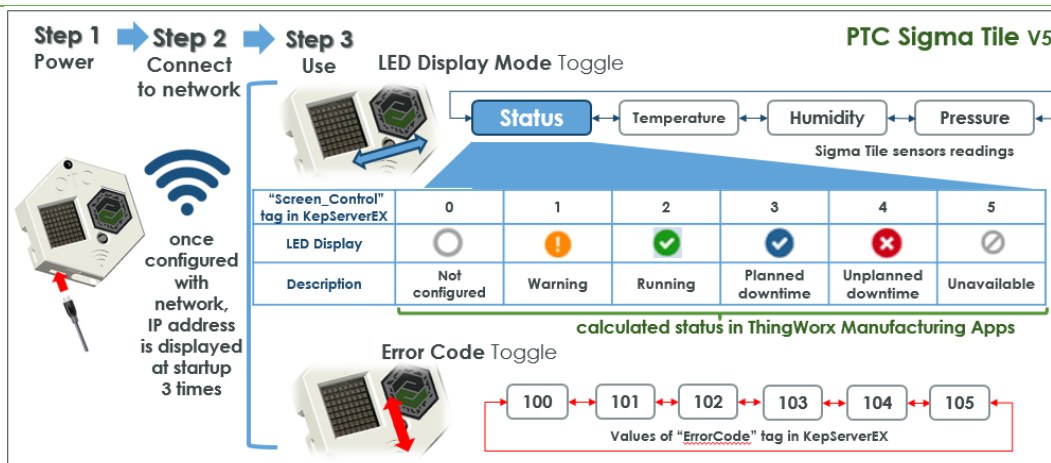
Step 2 – Learn ThingWorx Manufacturing Apps



LearnThingWorxMFGAppsUsingSigmaTileGuide.pdf

Download the ThingWorx Manufacturing Apps Free Trial and, in less than 60 minutes, experience the power of the Industrial IoT with your Sigma Tile acting as the PLC of a production asset or line.

SIGMA TILE FUNCTIONAL REFERENCE GUIDE



RESOURCES



- Sigma Tile related Guides – on ThingWorx Developer Portal (under **Additional Resources**):
<https://developer.thingworx.com/apps/manufacturing>
- Kepware KepServerEX - Trial Edition:
<https://my.kepware.com/mykepware/Landing.aspx>
- ThingWorx Manufacturing Apps Free Trial:
<https://developer.thingworx.com/apps/manufacturing>

APPENDIX B: TECHNICAL SUPPORT

If you have **any questions related to the Sigma Tile or this guide**, (installation, configuration, capabilities), we invite to check our ThingWorx User Community page at the link below:

- <https://community.ptc.com/t5/PTC-Sigma-Tile/gp-p/sigma-file>.

You will be able to search and view posts from other users, from PTC Subject Matter Experts. You will be able to ask questions, share your lessons learned and provide feedback. If you already a PTC customer, you probably already have an account. If you do not have an account, you will first have to login on the top right end side of the page

If you have **any questions related to the ThingWorx Manufacturing Apps**, check the following Community page:

- <https://community.ptc.com/t5/Manufacturing-Apps/bd-p/manufacturingapps>

If you have **any questions related to the KEPServerEX**, check the Kepware Technical Support page:

- <https://www.kepware.com/en-us/support/technical-support/>