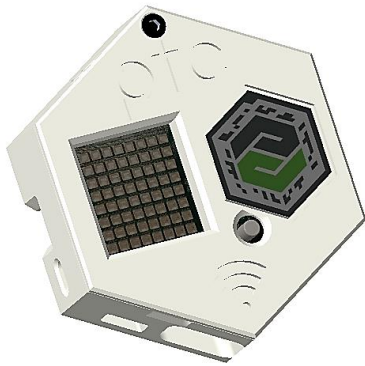




# LEARN THINGWORX MANUFACTURING APPS USING SIGMA TILE GUIDE



Apps: V8.2 or later  
KepServerEX: 6.3 or later  
Sigma Tile: V5

05/07/2018

thingworx controls advisor Administrator

CONNECTED SERVERS 0 of 11 Active Filter(s) Add Filter Servers Aggregators

View	Name	Description	Status	Alert	Devices	Device Status	Client Count	Tag Count	Server Time	Server Type	Aggregator Name
	MyKepServerEX				2		0	59	2018-02-13 ...	KEPServerEX	

thingworx production advisor

CONNECTED PRODUCTION EQUIPMENT

Name	Type	Status	Alert	OEE (%)	Availability (%)	Quality (%)	Performance (%)	KPI Last Updated
Line 1	Line			58	100	56	105	2018-02-13 17:39:00
CNC 1-1	Asset			60	100	58	103	2018-02-13 17:39:00
CNC1-2	Asset			49	100	53	91	2018-02-13 17:39:00

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## INTRODUCTION

In this guide you will learn how to install, configure and use the **ThingWorx Manufacturing Apps** using a **Sigma Tile acting as a production asset** such as a CNC machine to understand the power of the **ThingWorx Industrial Innovation platform** and the Manufacturing starter Apps.

You will learn about the main ThingWorx for Manufacturing Apps: **Controls Advisor**, **Asset Advisor** and **Production Advisor**. You will also use the **Trending & Troubleshooting** and **Alert Monitoring** functionality using the sensor readings and controls on the Sigma Tile to trigger events and alerts.

If you are new to the Sigma Tile and want to better understand what it is and how it can be used, 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

---

#### OTHER REQUIREMENTS

- **.Net** Framework (version 3.5.1 and 4.5) needs to be installed and running if you are working with the ThingWorx Manufacturing Apps Version 8.2.x. Installation will not work with version 4.6.1 of .NET

### STEP 1 – DOWNLOAD THE THINGWORX MANUFACTURING APPS

Prior to starting this step, you should have:

- connected your Sigma Tile to a network,
- installed KepServerEX
- configured KepServerEX to communicate with your Sigma Tile

If you have not completed these steps, refer to the **Learn KEPServerEX using a Sigma Tile** guide.

1. From your computer connected to a **network with internet access**, navigate to the [ThingWorx Manufacturing Apps Developer Portal](https://developer.thingworx.com/apps/manufacturing).  
(<https://developer.thingworx.com/apps/manufacturing>)
2. Login using your PTC credentials. If you do not have an account with PTC already, you will need to create one.
3. Locate and click on **Download ThingWorx Manufacturing Apps Free Trial** (Version 8.3) or **Download 30-Day Developer Kit Edition** (Version 8.2.1).  
(you may be asked to authenticate again to continue with the download)

### ThingWorx Manufacturing Apps

ThingWorx® Manufacturing Apps are easy-to-deploy, pre-configured role-based apps that enhance visibility, productivity, and performance across the factory. Powered by KEPServerEX® the apps provide seamless connectivity and real-time data visualizations. Use our guides to learn how to remotely monitor and troubleshoot machine connectivity, detect anomalies across all assets, and gain insight into production line performance and status.

#### Includes:

- 30 day free access to Manufacturing Apps.
- Ability to renew the apps for free every 30 days.

[Download ThingWorx Manufacturing Apps](#)

### ThingWorx Manufacturing 30-day Developer Kit

Experience the power of the ThingWorx® platform with the Manufacturing Apps by downloading the ThingWorx Dev Kit installation. DevKit will give you full access to ThingWorx platform. This includes composer and mashup builder to customize the Manufacturing Apps, create new apps to meet your organization's needs, and view enterprise-level operations. Use our tutorials and how to guides to get started enhancing your custom manufacturing operations today.

#### Includes:

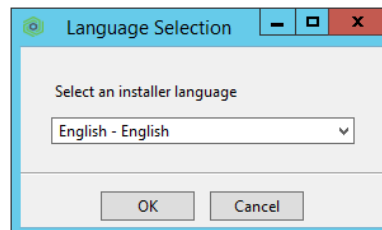
- 30 day free access to Manufacturing Apps.
- 30 day free access to ThingWorx platform.

[Download 30-Day Developer Kit Edition](#)

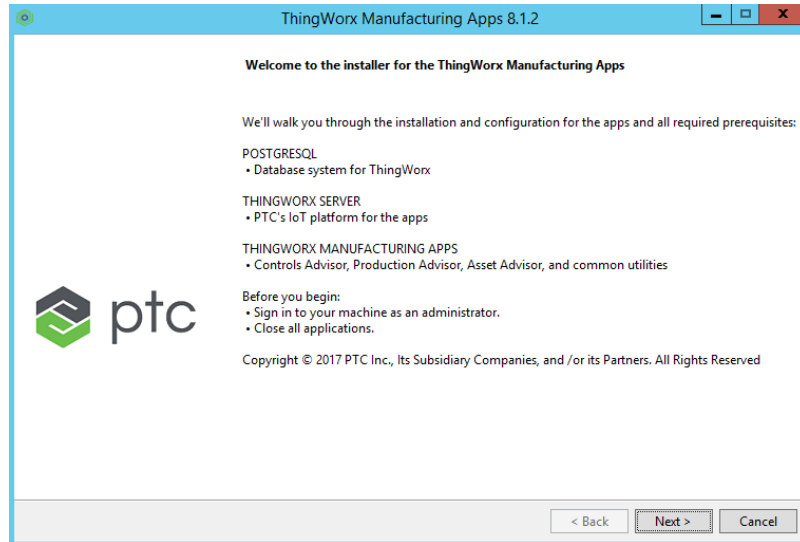
4. Once you have downloaded the installer for the Apps, ensure that your computer is connected to the same network as your Sigma Tile.

## STEP 2 – INSTALL THE THINGWORX MANUFACTURING APPS

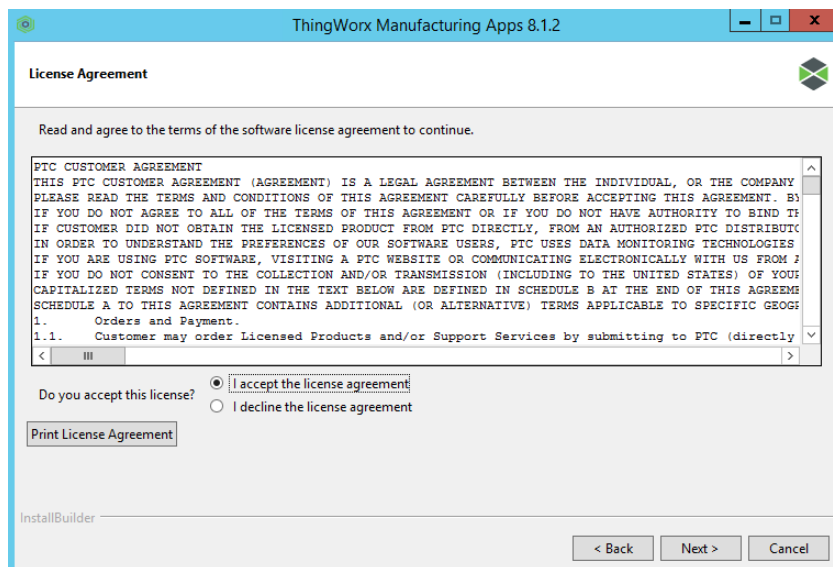
1. Extract the **ThingWorx-Manufacturing-Apps-8.2.0-XX-Devkit.zip** file (or later version of the installer) to a file where you have administrator privileges.
2. Navigate to and **run** ThingWorx-Manufacturing-Apps-8.2.X-XX-Devkit.exe. Select your language.



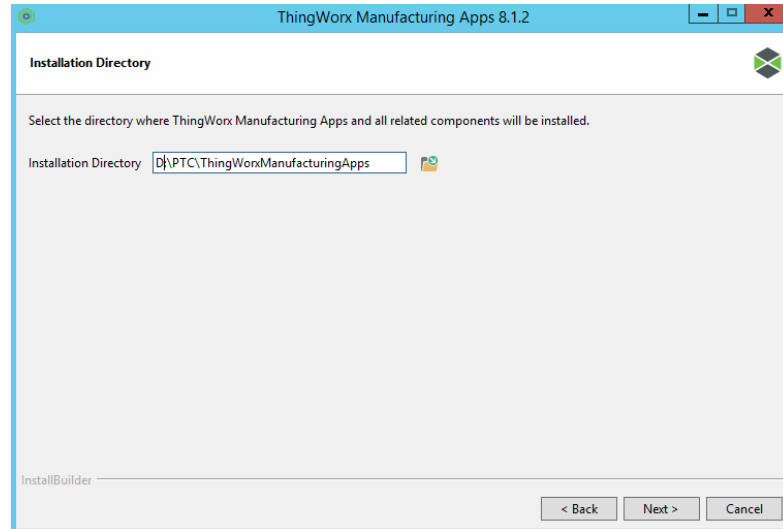
3. Follow the instructions on the Welcome screen, then select **Next**.



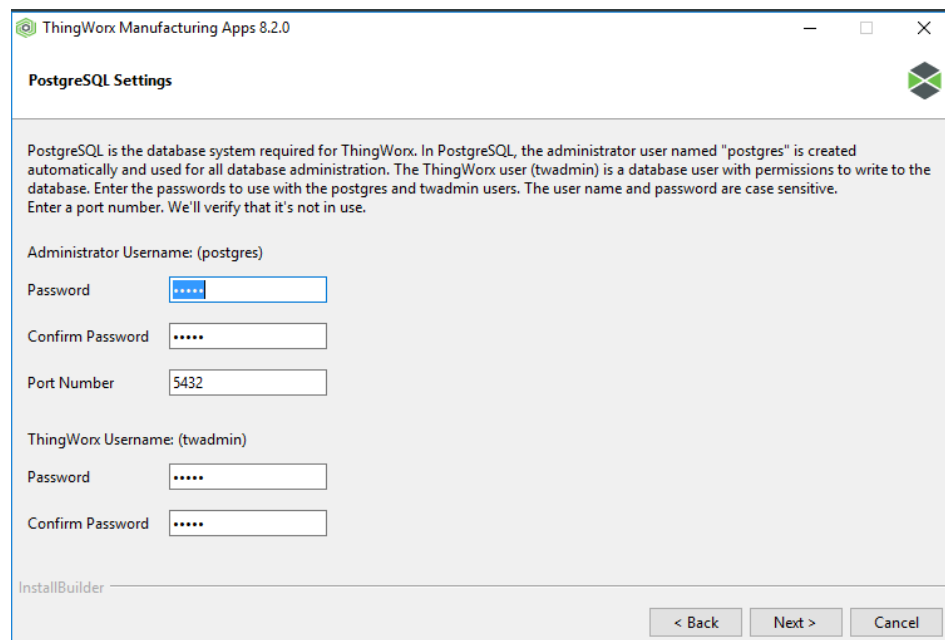
4. Accept the License Agreement, select **Next**.



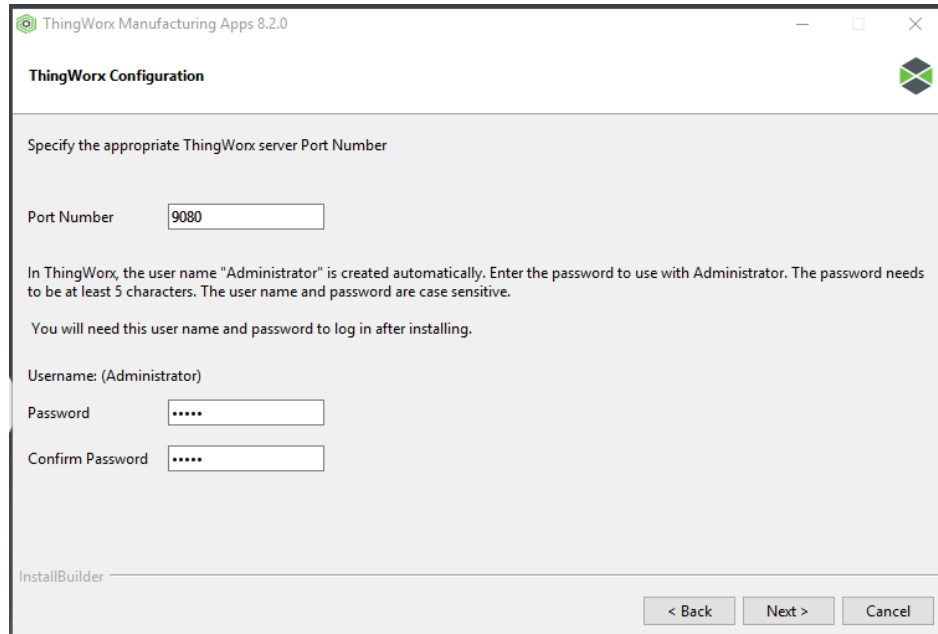
5. Choose the installation directory and select **Next**.



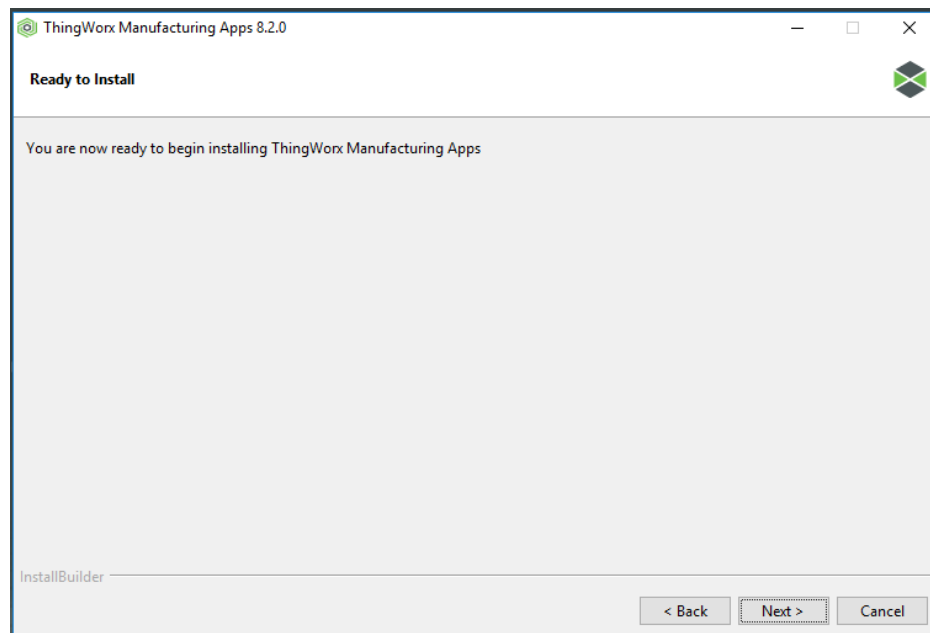
6. On this dialog, specify the Postgres administrator password, which will be needed to install the software, as well as the password for twadmin which ThingWorx will use to interact with the database. Accept the default port for postgres(5432), then select **Next**.



7. Set the **ThingWorx Server port** number (you can keep the default of 9080), and password for the ThingWorx server **Administrator** user and select **Next**. Be sure to record your password and port number as you will need this information later.

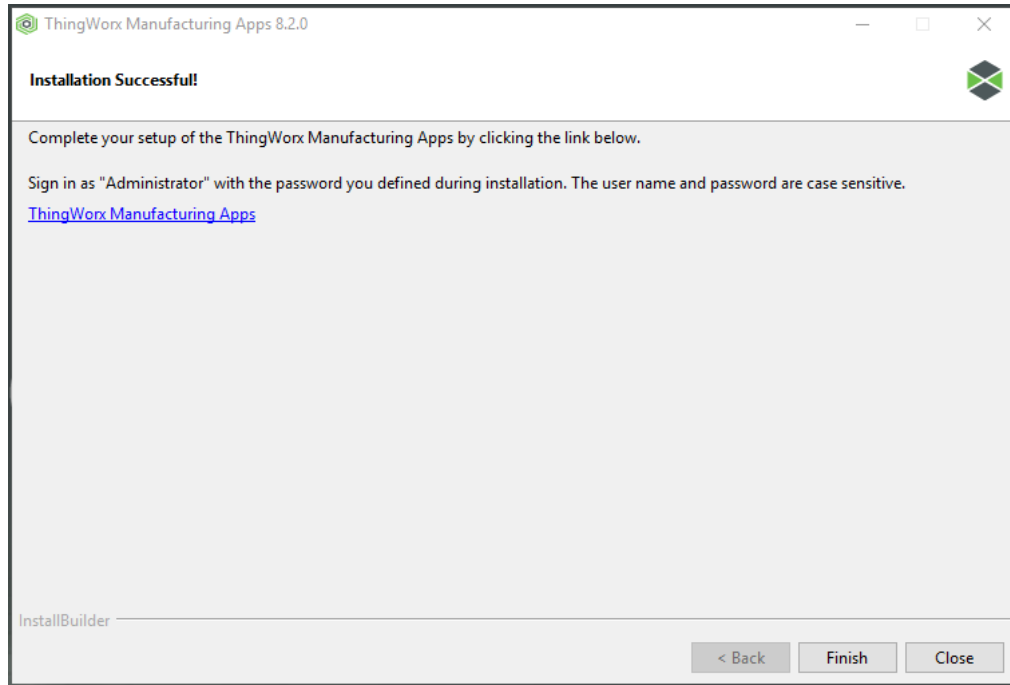


8. The following dialog should appear, indicating that the Manufacturing Apps are ready to install. The install will take between 5 and 10 minutes. Select **Next**.



9. This screen will appear after a successful install.

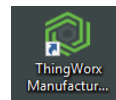




10. Select **Finish**

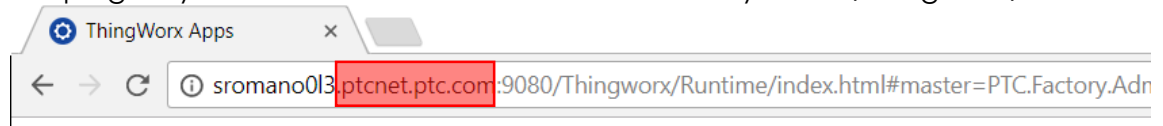
### STEP 3 - CONFIGURE AND CONNECT KEPSEVEREX TO THE THINGWORX MANUFACTURING APPS

1. Launch the ThingWorx Manufacturing Apps from the icon on your desktop or the **Start** menu.

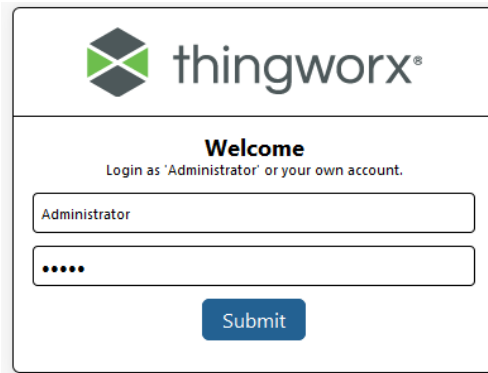


#### Troubleshooting Tip:

If nothing comes up and/or ThingWorx does not appear to open in the browser, try modifying the URL in your browser and removing any domain information and keeping only the hostname of the server followed by "":9080/ThingWorx/..."

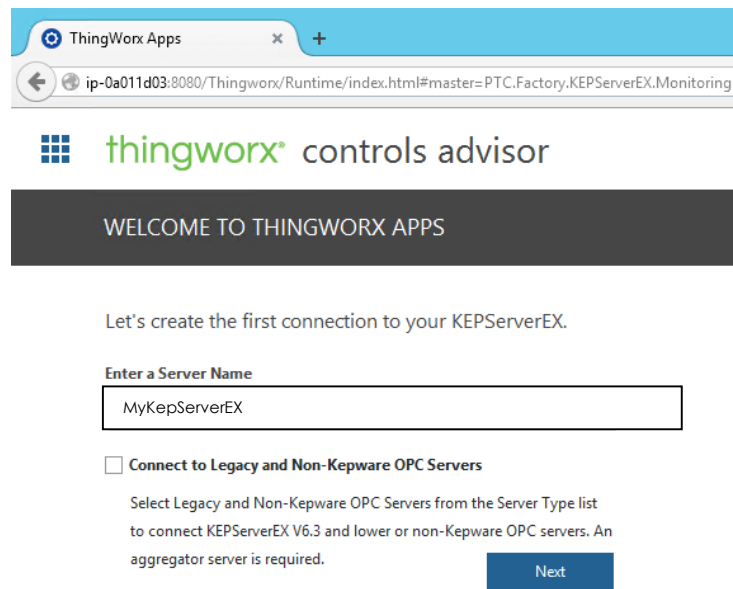


2. Log in using the username **Administrator** and the ThingWorx password created during installation:



The image shows a login form for ThingWorx. At the top is the ThingWorx logo. Below it, the text "Welcome" is centered, followed by the instruction "Login as 'Administrator' or your own account." There are two input fields: the first is labeled "Administrator" and the second is a password field with four dots. A blue "Submit" button is located below the password field.

3. When you open the ThingWorx Manufacturing Apps for the first time, it will prompt you to enter a server or Thingname. Make this name something you can later use to identify this KEPServerEX instance, for example "**MyKepServerEX**". Please note that you will need to reference this server name for future configuration tasks. Click **Next**.



The image is a screenshot of a web browser showing the ThingWorx controls advisor interface. The browser tab is titled "ThingWorx Apps" and the address bar shows the URL "ip-0a011d03:8080/Thingworx/Runtime/index.html#master=PTC.Factory.KEPServerEX.Monitoring". The page header says "thingworx controls advisor". Below that is a dark grey banner with the text "WELCOME TO THINGWORX APPS". The main content area says "Let's create the first connection to your KEPServerEX." There is a section titled "Enter a Server Name" with a text input field containing "MyKepServerEX". Below this is a checkbox labeled "Connect to Legacy and Non-Keeware OPC Servers" which is currently unchecked. Underneath the checkbox is a note: "Select Legacy and Non-Keeware OPC Servers from the Server Type list to connect KEPServerEX V6.3 and lower or non-Keeware OPC servers. An aggregator server is required." A blue "Next" button is at the bottom right of the form.

4. Once your KEPServerEX connection is created, a dialog box will appear providing a log of information about the connection that you will need to configure KepServerEX to communicate with the Manufacturing apps. Keep this window open to set properties in a future step.

## CONNECTION INFORMATION

**Name:** PTC.MfgSegmentKepwareSimulator

**Description:** PTC Factory Simulator

**Instruction to Complete Connection**

Important! You need your app key and Thing name later. Please note these in a separate location.

Next, go to your server and complete these easy steps:

1. Right-click on the **Project** folder and select **Properties**.

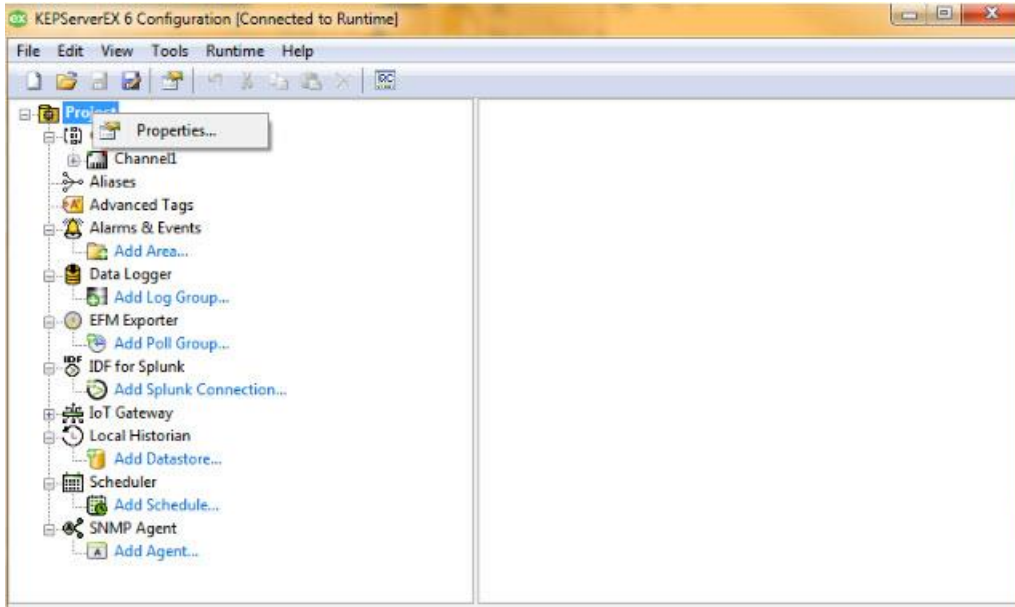
2. Under the ThingWorx tab, set the following:

<b>Enable:</b>	Yes
<b>Legacy:</b>	Disable
<b>Host:</b>	ip-0a0123d6
<b>Port:</b>	8080
<b>Thing name:</b>	PTC.MfgSegmentKepwareSimulator-GW
<b>Application Key:</b>	cb55ff8a-38f0-4d8b-911c-60ae621630d9
<b>Trust self-signed certificates:</b>	No
<b>Trust all certificates:</b>	No
<b>Disable encryption:</b>	Yes

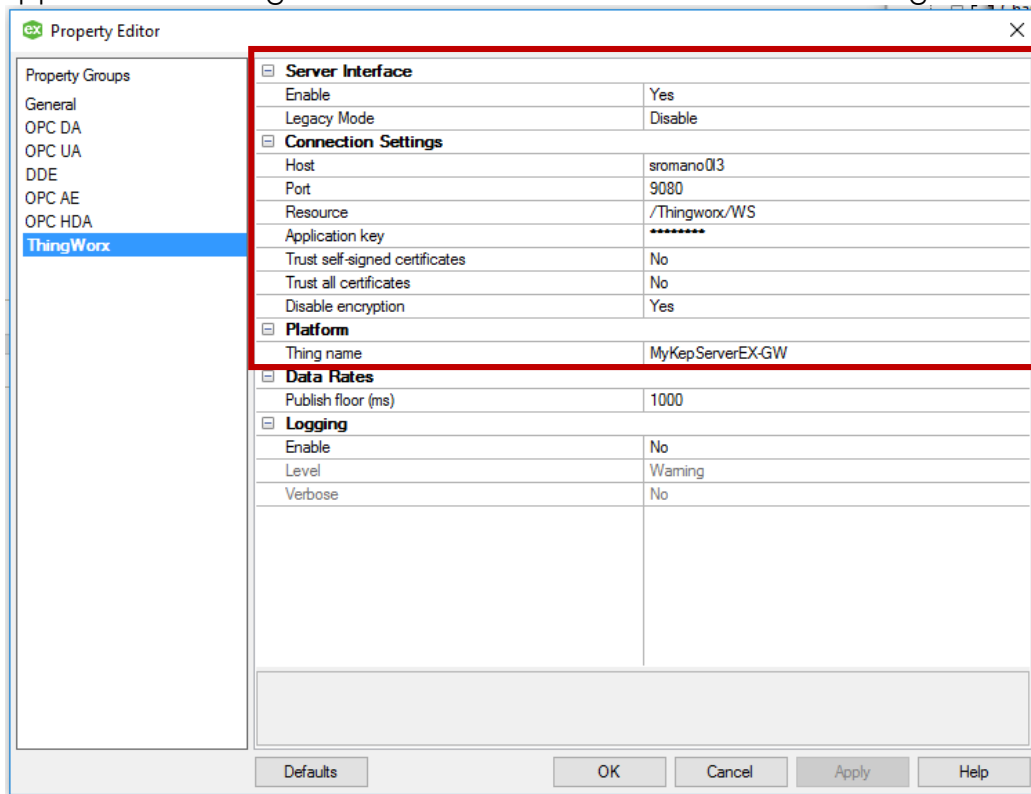
[Print Instructions](#)[Close](#)

5. Open the KEPServerEX application: 

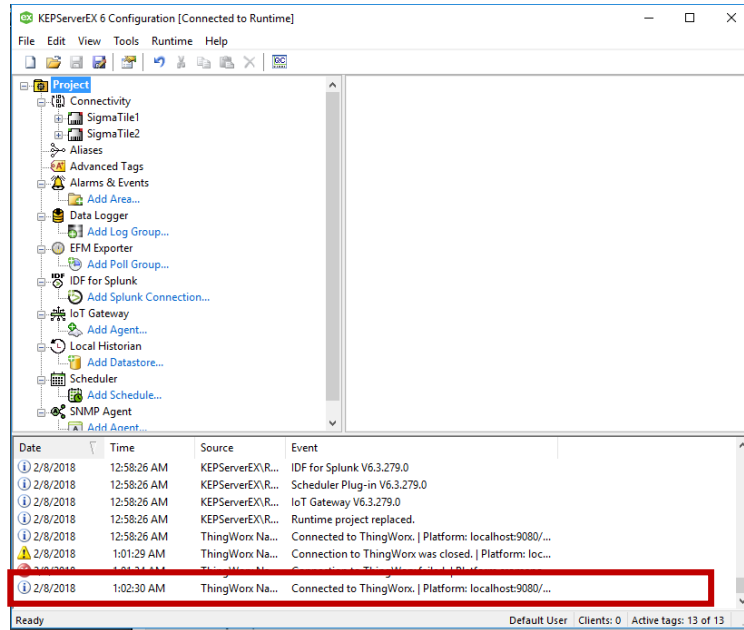
6. On the project folder icon, right mouse to open the context menu. Select **Properties** to open the **Property Editor** dialog.



7. Select the **ThingWorx** tab. Change all the settings to match the configuration information shown in the dialog from step 4 above. Select **OK**. If you forgot, to take a screen capture and/or to keep the configuration page open go to Appendix C of this guide to see how to access this information again.



8. In KEPServerEX Configuration, confirm a connection to ThingWorx displays in the **Event** column.



### Troubleshooting Tips:

If you receive an error message similar to "Connection to ThingWorx platform <URL or Host>/Thingworx/WS failed: could not initialize a secure socket connection," try the following steps:

- Verify the **host, port, resource, Thing name and application key** are all valid and correct
- Verify the host of KEPServerEX can reach the machine you've installed ThingWorx Manufacturing Apps on by pinging the ThingWorx Manufacturing Apps Host hostname or IP address.
- Verify that the proper certificate settings are enabled
- If your KepServerEX and ThingWorx servers are running on the same machine, try replacing the machine host name with "**localhost**"

If you encounter other issues, check the following:

- 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



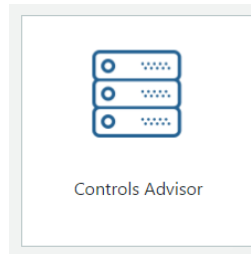
2. Right click on the KepServerEX icon and click "Stop Runtime Service". The system will ask you to confirm that you want stop the runtime service, say "Yes".
3. Right click again on the KepServerEX icon and click "Start Runtime Service"


## STEP 4 - GETTING STARTED WITH CONTROLS ADVISOR

1. Launch the ThingWorx Manufacturing Apps from the icon on your desktop or the **Start** menu.



2. Click **Controls Advisor**.



3. The server you connected displays in the Connected Servers list. Select it and click discover devices .



4. The action scans the server and creates the devices in the ThingWorx Manufacturing Apps. **Confirm that you see at least 1 new device.** The number of devices you will see here will depend on the number of Sigma Tiles (devices) that you have configured with KepServerEX.



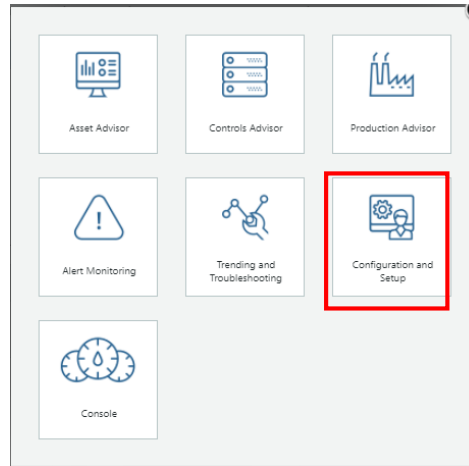
## STEP 5 - CONFIGURE USERS AND ROLES

1. In the top left corner of your window, click the console icon and select the **Configuration and Setup** App



CONNECTED SERVERS

View Name



2. Select the "User" tab and click  to create a new user.
3. Begin by **creating a user for yourself in the Controls Engineer role.**

CREATE USER

**User**

User Name \*  
sromano

First Name \*  
Serge

Last Name \*  
Romano

Language  
English

**Contact Information**

Email \*  
sromano@ptc.com

Work Phone \*  
+16179916943

Mobile Phone  
+16179916943

**Notification Preference**

Email  SMS  
Standard message rates may apply.

**Security**

Password \*  
.....

Confirm Password \*  
.....

**Role Assignment**

**Roles**

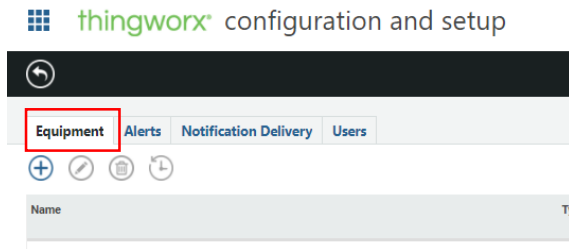
- Controls Engineer
- Maintenance Engineer
- Maintenance Manager
- Production Manager

OK Cancel

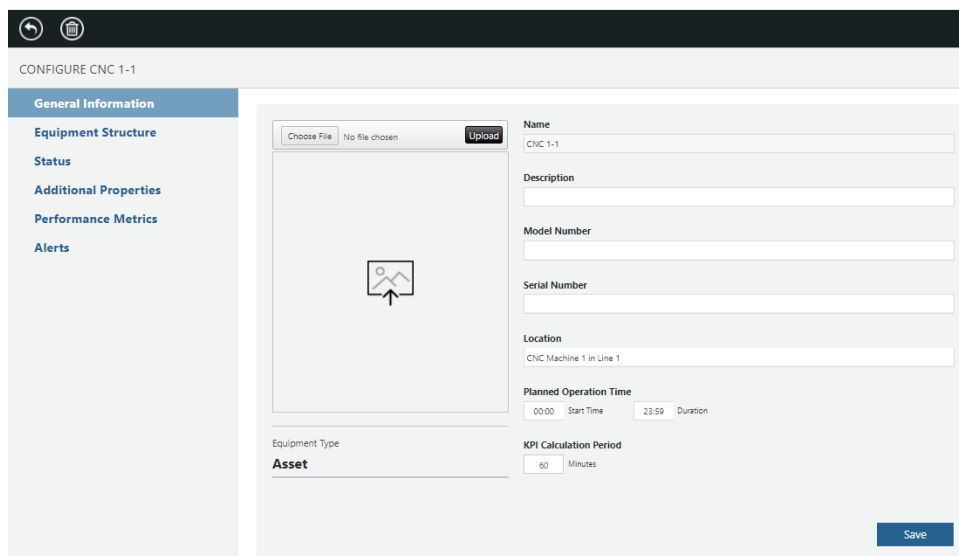
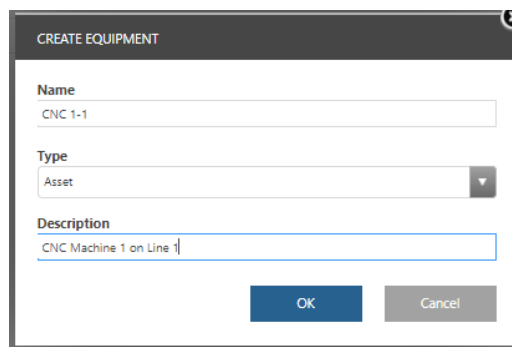
4. Add two other users: one **Maintenance Manager** and one **Production Manager**.

## STEP 6 - CREATE LINES AND ASSETS

1. Select the **Equipment** tab.



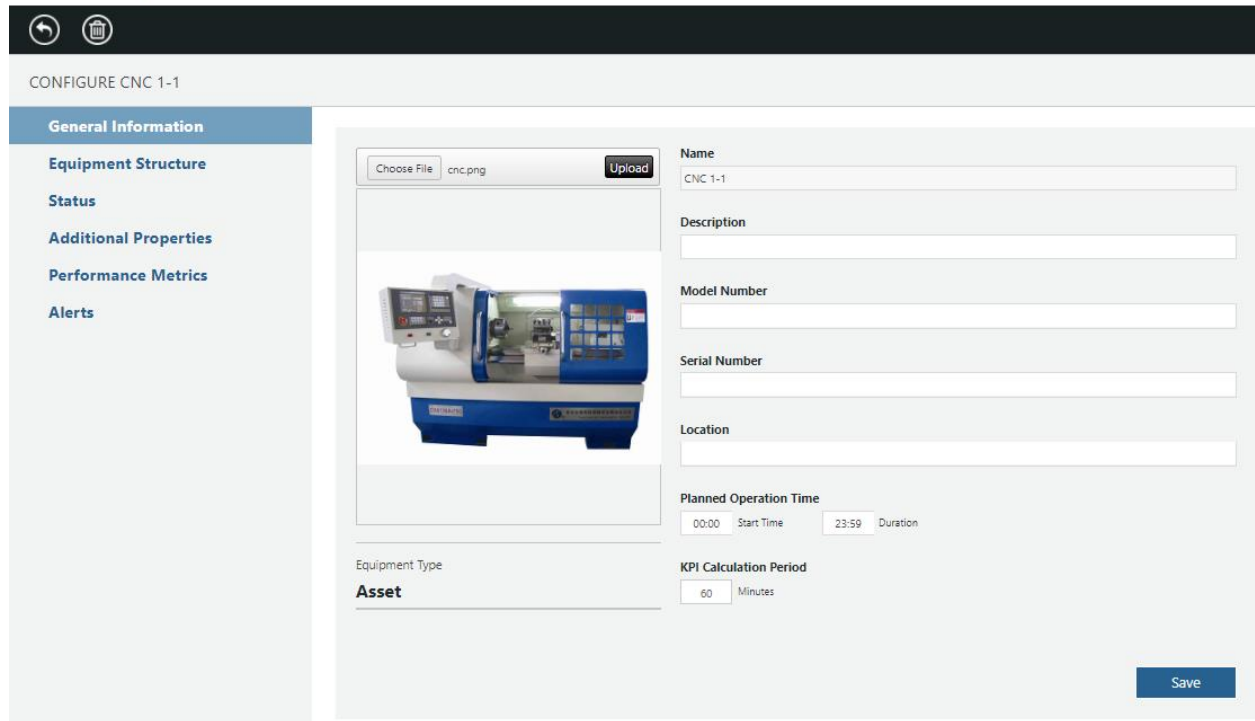
2. Create an **asset** naming it what you would like your Sigma Tile to simulate (e.g. a CNC machine, naming it **CNC 1-1**) and click **OK**.



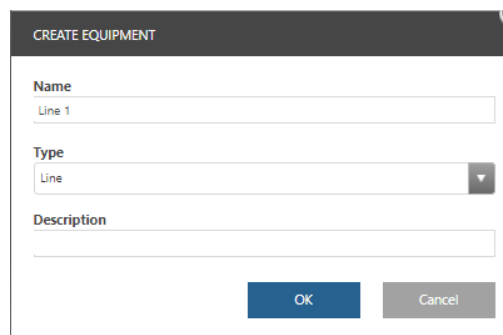


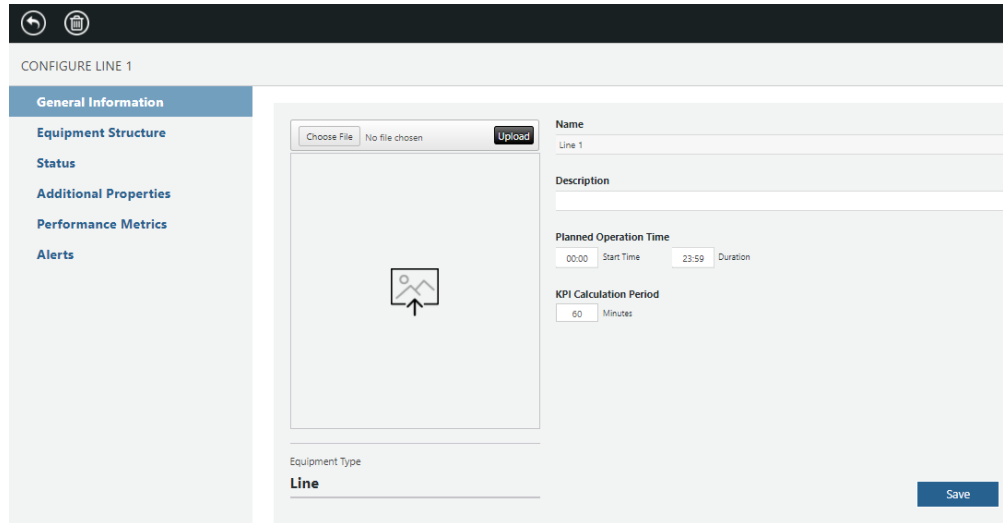
- Optionally find and add an image to represent your machine by choosing a file. Select **Upload** and make sure to select **Save**.


 configuration and setup



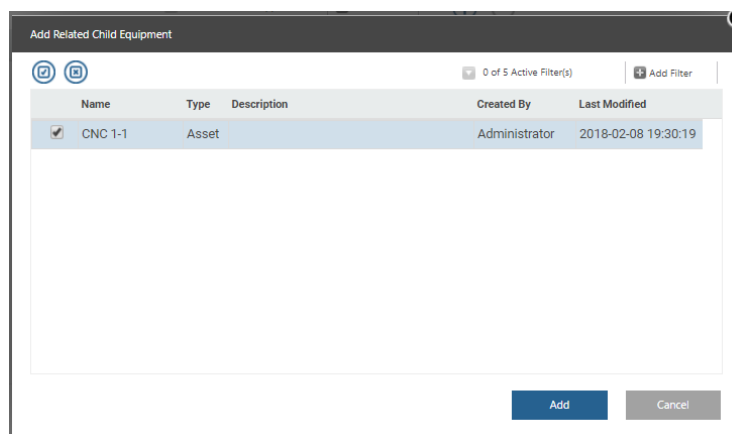
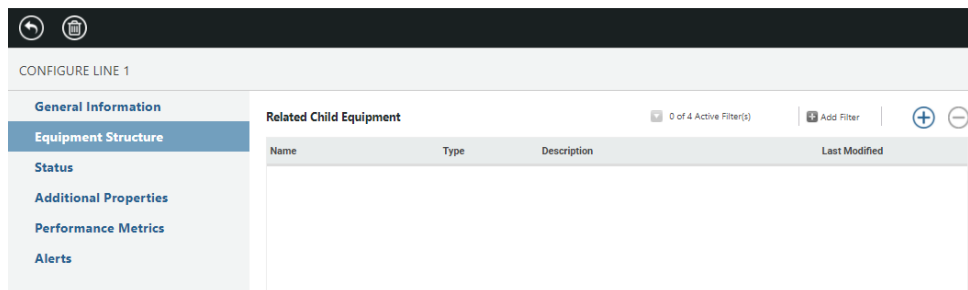
- Create a new equipment by clicking . Select **Line** for the Type and name it **Line 1** and click **OK**.

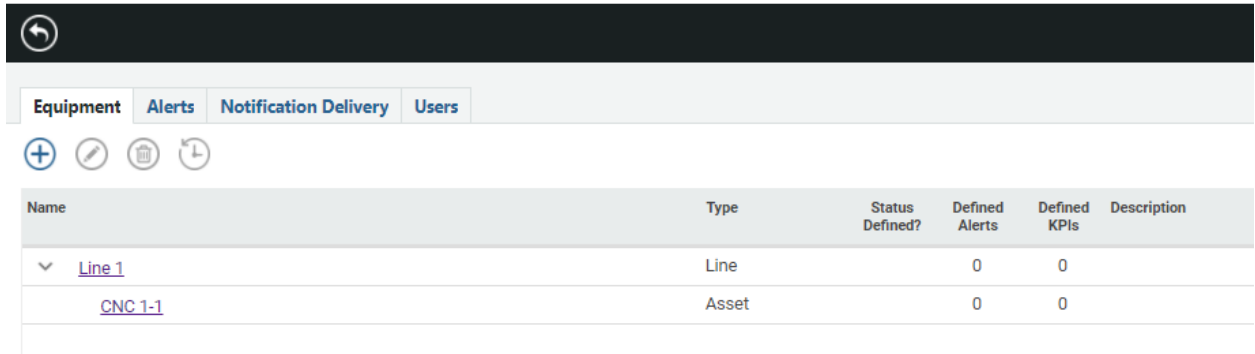




5. Configure **Line 1** by selecting **Equipment Structure** and adding the **CNC 1-1** asset that you created earlier to your Line (using the  )

 configuration and setup



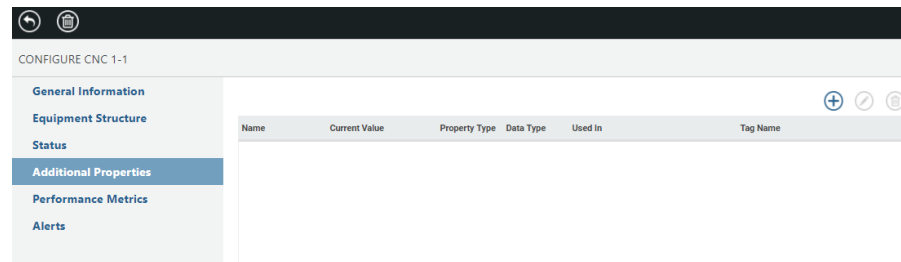


Name	Type	Status Defined?	Defined Alerts	Defined KPIs	Description
Line 1	Line		0	0	
CNC 1-1	Asset		0	0	

## STEP 7 - CONFIGURE LINES AND ASSETS

Now that the line and asset are created, you will learn how to configure and define their properties, status, and performance metrics.

1. Under **Configuration and Setup**.
2. Select your asset (CNC 1-1) and select **Additional Properties**



- a. Click on  to create a new property.
- b. Locate and select the information from your Kepware server. Locate the **Temperature** Tag from **Channel 1 / SigmaTile1** device:

CONFIGURE CNC 1-1

- General Information
- Equipment Structure
- Status
- Additional Properties**
- Performance Metrics
- Alerts

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Tag Values    Static Values    OK    Cancel    Apply

Equipment Type: KEPServerEX    Equipment: MyKepServerEX    Property Name: Temperature

Server Structure	Tags
Channel1	Humidity
Channel1_CommunicationSerialization	Orientation_Pitch
Channel1_Statistics	Orientation_Roll
Channel1_System	Orientation_Yaw
Channel1.SigmaTile1	Pressure
Channel1.SigmaTile1_System	Screen_Control
Channel1.SigmaTile1_Statistics	<b>Temperature</b>
Channel1.SigmaTile1_Hints	VibrationAlert

Name	Current Value	Property Type	Data Type	Used In	Tag Name

- c. Click **Apply**.
- d. Add the following additional tags to your asset:
  - i. Temperature
  - ii. Pressure
  - iii. Humidity
  - iv. GoodCount
  - v. ErrorCode
  - vi. BadCount
  - vii. Acceleration\_X
  - viii. Acceleration\_Y
  - ix. Acceleration\_Z
- e. Click on the **Additional Properties** tab again to confirm that you have added all the desired tags and notice their values:

thingworx configuration and setup

CONFIGURE CNC 1-1

- General Information
- Equipment Structure
- Status
- Additional Properties**
- Performance Metrics
- Alerts

Name	Current Value	Property Type	Data Type	Used In	Tag Name
Temperature	40.91379165649414	Tag	Number	Alerts, Trends	MyKepServerEX:Channel1.Sigma...
Pressure	1013.959716796875	Tag	Number		MyKepServerEX:Channel1.Sigma...
Humidity	20.058895111083984	Tag	Number		MyKepServerEX:Channel1.Sigma...
GoodCount	52339	Tag	Integer		MyKepServerEX:Channel1.Sigma...
ErrorCode	105	Tag	Integer	Alerts, Expressions	MyKepServerEX:Channel1.Sigma...
BadCount	50945	Tag	Integer		MyKepServerEX:Channel1.Sigma...
Acceleration_Z	0.9989133477210999	Tag	Number		MyKepServerEX:Channel1.Sigma...
Acceleration_Y	0.037875641137361...	Tag	Number		MyKepServerEX:Channel1.Sigma...
Acceleration_X	0.052368316799402...	Tag	Number		MyKepServerEX:Channel1.Sigma...

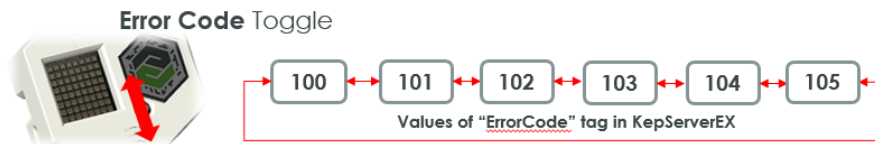
- Now select the **Status** configuration tab. You will be entering and modifying the status definitions for your asset to match this screen:

**Define Status** ⏴ ⏵ ✎

Icon	State	Expression
<input type="radio"/>	Not Configured (0)	The resource status has not been configured.
<input checked="" type="radio"/>	Unplanned Downtime (4)	"Asset_CNC 1-1:ErrorCode"=104 OR "Asset_CNC 1-1:ErrorCode"=105
<input checked="" type="radio"/>	Planned Downtime (3)	"Asset_CNC 1-1:ErrorCode"=103
<input checked="" type="radio"/>	Warning (1)	"HAS_ALERTS:Asset_CNC 1-1"
<input checked="" type="radio"/>	Running (2)	true
<input type="radio"/>	Unavailable (5)	Default value if no other expressions are true.

**First, let's understand the behavior that we want:**

- Using the up and down positions on the joystick of the Sigma Tile, we want to be able to trigger various alerts and conditions that will update the **asset status**. As you have seen in the **Learn KEPServerEX using a Sigma Tile** guide, the up and down joystick toggles update the **ErrorCode** tag in KepServerEX between the following values:



- We want ErrorCode **105** to represent an **"E-Stop" condition** of the machine. When that condition is met, we want both an **alert** to be created that specifies that the "E-Stop" on the machine was triggered and we want to bring the asset status to **"Unplanned Downtime (4)"**.
- We want ErrorCode **104** to represent an **unknown unplanned downtime condition** of the machine. When that condition is met, we want both an **alert** to be created for the asset and bring the asset status to **"Unplanned Downtime (4)"**.
- We want ErrorCode **103** to represent a **planned downtime condition** of the machine. When that condition is met, we want to bring the asset status to **"Planned Downtime (3)"**.
- We want ErrorCode **101** to represent an **alert** on the machine but that doesn't stop the machine.
- When any alert comes up for this asset, we want the asset status to change to **"Warning (1)"**.
- Under all the other conditions, the asset will be considered to be running and the status will be **"Running (2)"**.

Now, let's go ahead and configure the asset status definition to match the screen shot above and using these tips:

- Use the arrows in the Define Status header ( ) to place the states in the order they are checked by the system. The statuses are **read by the system from the top to the bottom**. The moment an expression is determined by the system to be true, the status associated with that expression is used. The numbers associated with the state name, for example (1), do not apply to the order in which they are read. They are used when you create a new alert.
- For each state, enter the desired expression to enable the behavior described previously. You can manually enter the expression or browse to select tags from your Kepware server by clicking on the tag icon as shown below. Click **Save** after entering each expression.

### Edit Expression

---

Enter an expression or browse for a tag or property.

- Verify that you have entered all the expressions correctly:

configuration and setup

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CONFIGURE CNC 1-1

**General Information**

**Equipment Structure**

**Status**

**Additional Properties**

**Performance Metrics**

**Alerts**

### Define Status

Icon	State	Expression
	Not Configured (0)	The resource status has not been configured.
	Unplanned Downtime (4)	"Asset_CNC 1-1:ErrorCode"=104 OR "Asset_CNC 1-1:ErrorCode"=105
	Planned Downtime (3)	"Asset_CNC 1-1:ErrorCode"=103
	Warning (1)	"HAS_ALERTS:Asset_CNC 1-1"
	Running (2)	true
	Unavailable (5)	Default value if no other expressions are true.

#### Edit Expression

---

Enter an expression or browse for a tag or property.

true

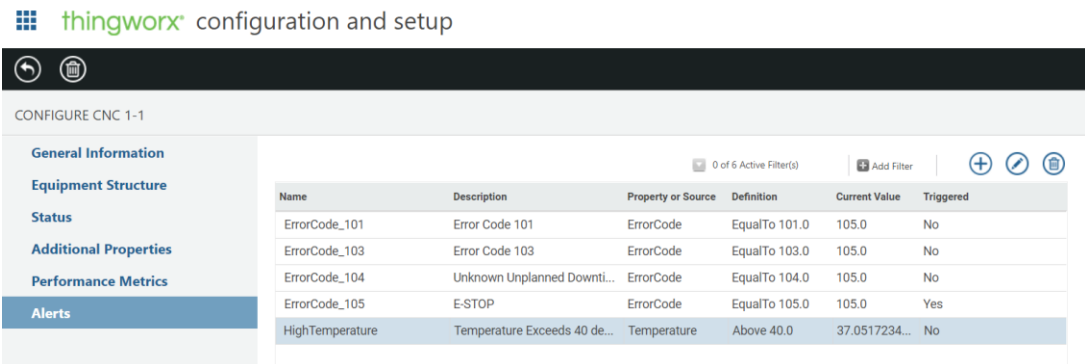
Valid operators: AND, OR, <, >, <=, >=, |=, !, ()  
Valid operands: true, false, numbers and tags  
Strings between single quotes ('). KEPServerEX tags between double quotes (").

**Save**

4. Select the Alert tab now and define the following **alerts**:
  - a. If ErrorCode = **101** an alert should be triggered on the asset specifying the Error Code reference number.
  - b. If ErrorCode = **103** an alert should be triggered on the asset specifying the

Planned Downtime condition

- c. If ErrorCode = **104** an alert should be triggered on the asset specifying an **“Unknown Unplanned Downtime”** condition
- d. If ErrorCode = **105** an alert should be triggered on the asset specifying an **“E-Stop”** condition
- e. Finally, if an alert should also be triggered if the **temperature of the Sigma Tile exceeds 40 degrees C.**
- f. When done, your screen should look like this:



5. From the details page of the asset select the **Performance Metrics** tab.

- a. First let's understand the behavior of the Sigma Tile. As you have learned in the **Learn KEPServerEX using a Sigma Tile** guide, 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 in KEPServerEX as if the Sigma Tile was 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 may change. For example, as the temperature rises the ratio of bad parts to good parts will increase, representing a decrease in quality.
- b. The procedure below describes how to enter performance metrics for your asset. The **help icons** in each field state the equations used.

CONFIGURE CNC 1-1

- General Information
- Equipment Structure
- Status
- Additional Properties
- Performance Metrics**
- Alerts

Performance (Total Count / Run Time) / Ideal Run Rate

0% Red 30 % Yellow 70 % Green 100+ %

OEE (Total Count / Run Time) / Ideal Run Rate

0% Red 30 % Yellow 70 % Green 100+ %

**Parameters for Performance Calculations**  
Enter an expression or browse for a tag.

The following operators are valid: +, -, \*, /  
The following operands are valid: numbers and tags.  
Strings between single quotes ('). KEPServerEX tags between double quotes (").

Good Count (?)

Total Count (?)

Ideal Run Rate (?)

Save

- c. Define the **Good Count**. Browse to the Kepware tag labeled **GoodCount** for your Sigma Tile.

SELECT TAG

Equipment Type: KEPServerEX

Equipment: MyKepServerEX

**Server Structure**

- \_SecurityPolicies
- \_SNMP Agent
- \_System
- Channel1
  - Channel1\_CommunicationSerialization
  - Channel1\_Statistics
  - Channel1\_System
  - Channel1.SigmaTile1

**Tags**

- Acceleration\_X
- Acceleration\_Y
- Acceleration\_Z
- BadCount
- ErrorCode
- GoodCount**
- Gyroscope\_Pitch
- Gyroscope\_Roll

OK Cancel

- d. **Total Count**. Browse for your **BadCount** and then add your good count. You can copy and paste the good count from the previous field, as seen in the example below



**Good Count** ⓘ ↕

"MyKepServerEX:Channel1.SigmaTile1.GoodCount"

---

**Total Count** ⓘ ↕

"MyKepServerEX:Channel1.SigmaTile1.GoodCount"+"MyKepServerEX:Channel1.SigmaTile1.BadCount"

---

**Ideal Run Rate** ⓘ ↕

25

- e. **Ideal Run Rate.** Identify how quickly your factory would be producing parts for the asset or line in an ideal situation. Enter parts per minute. For the Sigma Tile and this example, that would be approximately **25** parts per minute.
  - f. Click **Save**.
6. Go back to **General Information** and change the **KPI Calculation Period** to **1 min** and click **Save**.

CONFIGURE CNC 1-1

**General Information**

Equipment Structure


Status

Additional Properties

Performance Metrics

Alerts

Choose File No file chosen Upload



Equipment Type  
**Asset**

**Name**  
CNC 1-1

**Description**

**Model Number**

**Serial Number**

**Location**  
CNC Machine 1 in Line 1

**Planned Operation Time**  
00:00 Start Time 23:59 Duration

**KPI Calculation Period**  
1 Minutes

Save

## STEP 8 – EXTENDING THE APP TO UPDATE THE SIGMA TILE DISPLAY WITH STATUS

Now that we have defined the status for the asset representing the Sigma Tile, we will need to extend the asset object in ThingWorx composer to ensure that the status value updates the "Screen\_Control" KEPServerEX tag and thus **updates the LED display on the Sigma Tile**.

1. From the Console, go to the **Configuration & Setup**, and click on the asset **CNC 1-1**.
2. Add the **Screen\_Control** tag from Kepware to the **Additional Properties**

configuration and setup

CONFIGURE CNC 1-1

**General Information**

**Equipment Structure**

**Status**

**Additional Properties**

**Performance Metrics**

**Alerts**

Name	Current Value	Property Type	Data Type	Used In	Tag Name
Temperature	42.844825744628906	Tag	Number	Alerts	MyKepServerEX:Channel1.Sigma...
Screen_Control	0	Tag	Integer		MyKepServerEX:Channel1.Sigma...
Pressure	1023.1376953125	Tag	Number		MyKepServerEX:Channel1.Sigma...
Humidity	18.913639068603516	Tag	Number		MyKepServerEX:Channel1.Sigma...
GoodCount	6628	Tag	Integer	Expressions	MyKepServerEX:Channel1.Sigma...
ErrorCode	100	Tag	Integer	Alerts, Expressions	MyKepServerEX:Channel1.Sigma...
BadCount	9307	Tag	Integer	Expressions	MyKepServerEX:Channel1.Sigma...
Acceleration_Z	0.9962327480316162	Tag	Number		MyKepServerEX:Channel1.Sigma...
Acceleration_Y	0.051957610994577...	Tag	Number		MyKepServerEX:Channel1.Sigma...
Acceleration_X	0.056489896029233...	Tag	Number		MyKepServerEX:Channel1.Sigma...

3. Now, go to Composer by deleting all the characters following “/ThingWorx/” in the URL of the Apps. It will automatically redirect you to **ThingWorx composer**.

ThingWorx Composer

Folder - Sigma Tile

ThingWorx Apps

Folder - 3D Printing

sromano013:9080/Thingworx/Composer/index.html

thingworx

Search

+ New Entity

Import/Export

Monitoring

Help

Learning Connector

Administrator

All

type to filter list...

Advanced

Clear

View

Edit

Duplicate

Delete

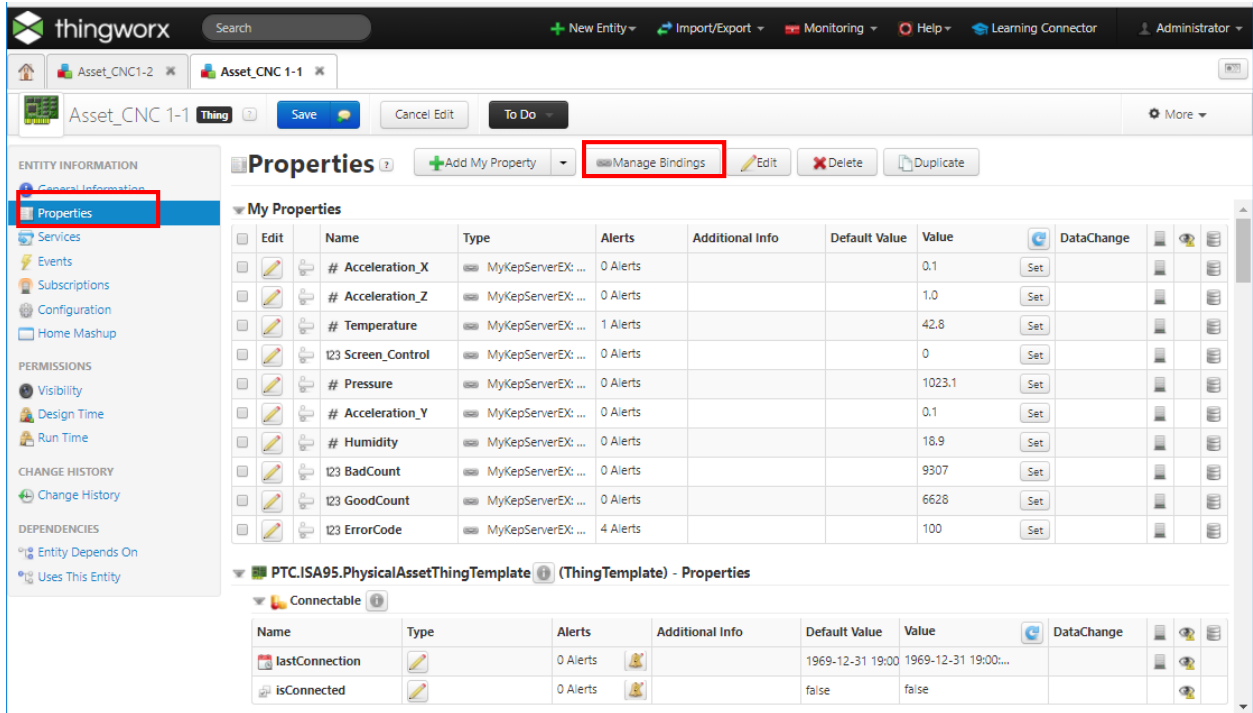
Permissions

Filtering by: Exclude System Objects

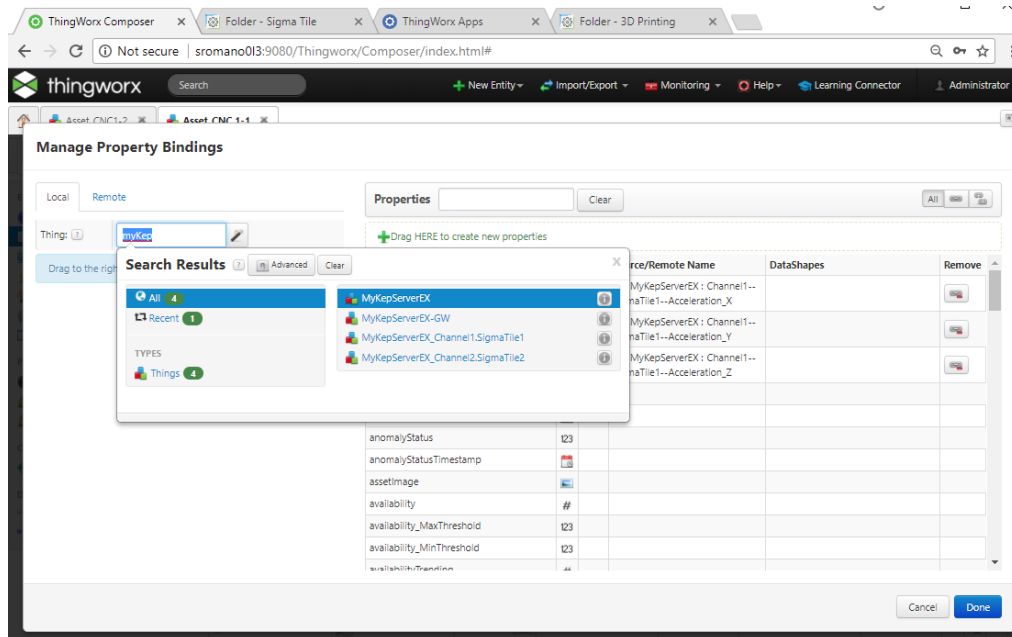
Showing: 500+ items

View	Name	Description	Type	Modified
	Asset_CNC 1-1		Thing	2018-02-19 16:32:00
	Asset_CNC1-2	Laser Cutter	Thing	2018-02-19 14:18:55
	ValueStream_Asset_CNC1-2		Thing	2018-02-12 00:12:50
	ValueStream_MyKepServerEX...		Thing	2018-02-11 00:00:00
	MyKepServerEX_Channel2.Sig...		Thing	2018-02-11 00:00:00

4. Locate the **Asset\_CNC 1-1** and click on it.

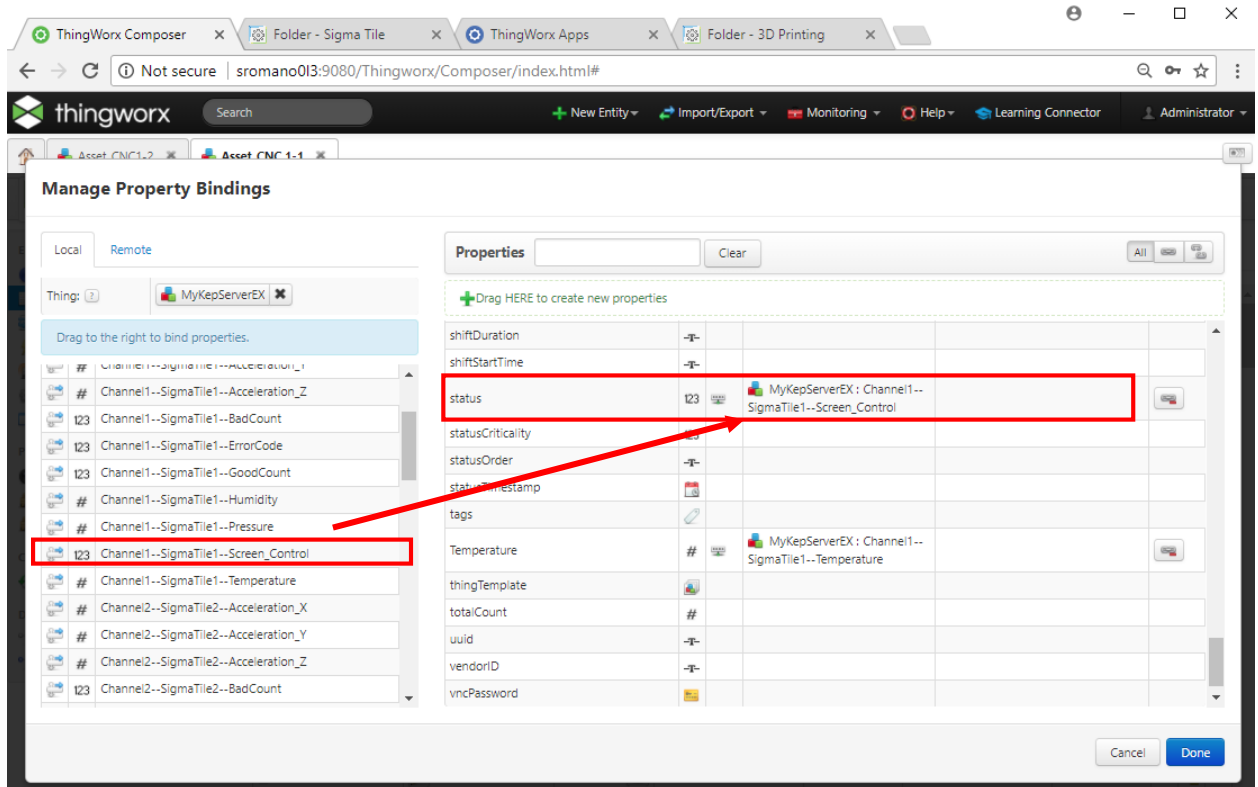


5. Click on **Properties** and select the **Manage Bindings** tab as shown on the screen shot above.
6. In the **Thing** field start typing the name of your KEPServerEX thing as you defined during configuration. In this case, "MyKEPServerEX" and click the **enter** key to select it.



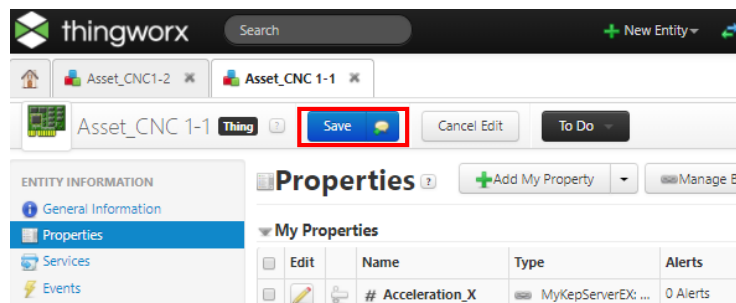
7. Drag and drop the "**Channel1-SigmaTile1--Screen\_Control**" tag to the **status**

property of the asset as shown below:

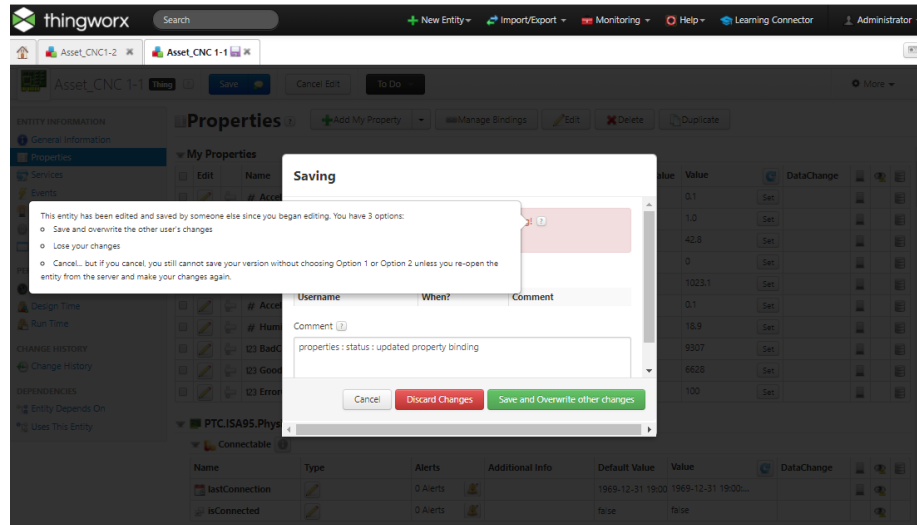



8. Click **Done**.

9. Click **Save**.



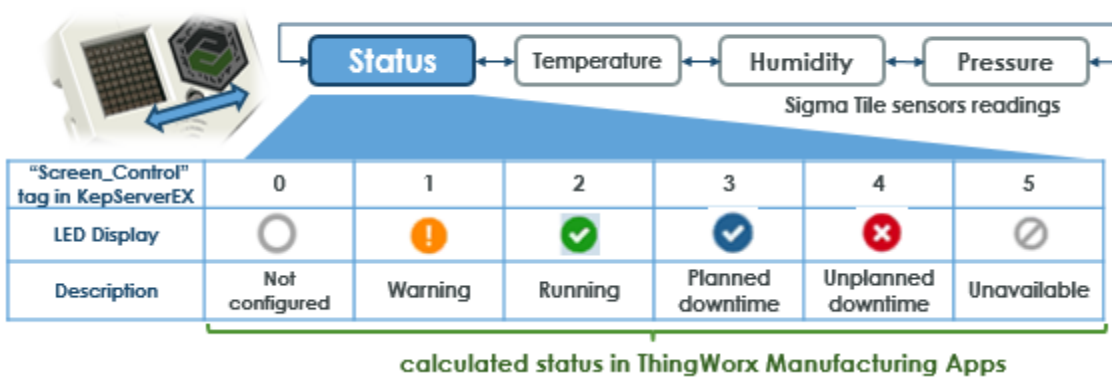
10. Select **Save and Overwrite other Changes**.



11. Now wait for a few seconds and watch your Sigma Tile status display change from the  (white disk) icon to the status icon representing the status of your asset as calculated by ThingWorx based on how you defined it above. You will learn more about Status monitoring in the next steps.

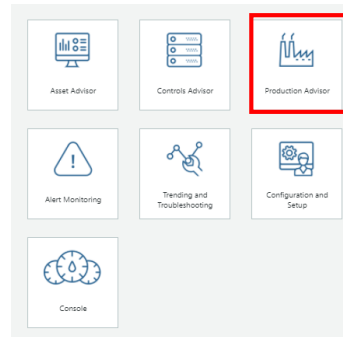
Your Sigma Tile LED display will now reflect the status of your Asset anytime you have the Status mode selected on the LED display. Remember that you can toggle between modes of the LED display by clicking the joystick left or right as shown below:

### LED Display Mode Toggle



## STEP 9 - MONITOR PRODUCTION METRICS WITH PRODUCTION ADVISOR

1. Navigate to the **Production Advisor** App from the console.



- View the performance metrics you have defined for your asset.

thingworx production advisor Administrator

CONNECTED PRODUCTION EQUIPMENT

Name	Type	Status	Alert	OEE (%)	Availability (%)	Quality (%)	Performance (%)	KPI Last Updated	Description
Line 1	Line							---	
CNC 1-1	Asset			40	100	33	120	2018-02-08 21:...	

**NOTE:** Immediately after configuring performance metrics, the performance metrics may appear wrong or out of expected range. Because we set the KPI recalculation period to 1 min, these values will update every minute. Wait for a couple of minutes for the performance metrics to stabilize.

In the case represented by the image above, there is an **Alert** with this asset. Consistent with the definition of the status entered, the status of the asset is "Warning" and we can see that there is an alert on this asset. To investigate the reason for the warning, we can click on the "Alert" icon:

### thingworx alert monitoring

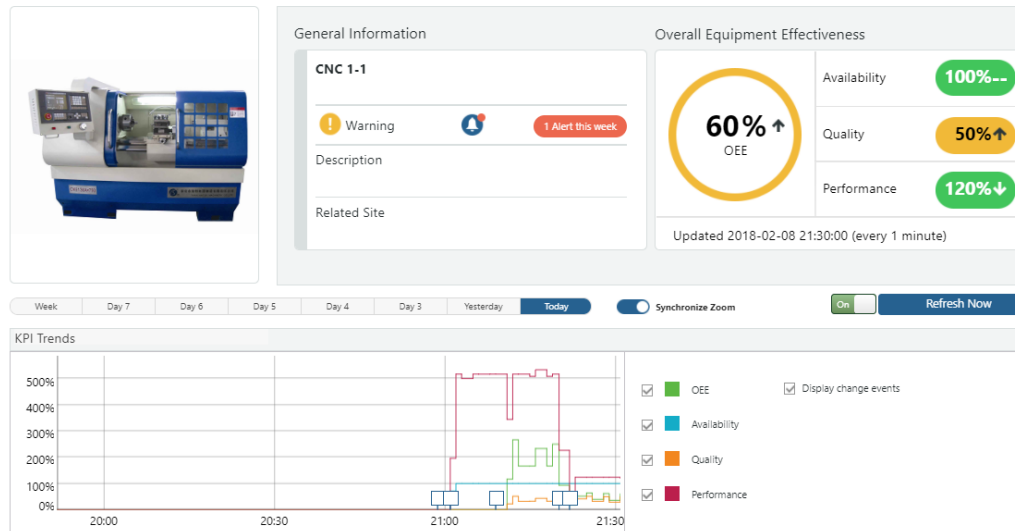
ALERT MONITOR: CNC 1-1

On Refresh Now

Name	Source Property	Source	Time Stamp	Definition	Duration (ms)	Description
ErrorCo...	ErrorCode	CNC 1-1	2018-02-11 23:59:53	EqualTo 101.0	298692.00	Error Code 101

- Return to Production Advisor and select your asset (CNC 1-1) and click on the to see the details of the performance metrics of that asset including production history data.

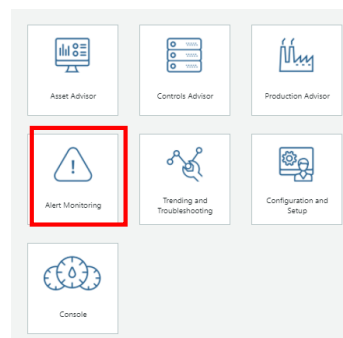
Asset Production History Data



## STEP 10 - MONITORING ALERTS

You can create alerts using the status expressions set when you configure assets and lines. In this example, follow these directions to create an alert whenever your asset is in a particular status.

1. Go to **Console ► Alert Monitoring**



2. Check to see if you have any alerts:


### thingworx alert monitoring

ALERT MONITOR: CNC 1-1

On Refresh Now

Name	Source Property	Source	Time Stamp	Definition	Duration (ms)	Description
ErrorCo...	ErrorCode	CNC 1-1	2018-02-11 23:59:53	EqualTo 101.0	298692.00	Error Code 101

3. If you see an alert, acknowledge it.

**NOTE:** In our example, the asset has an ErrorCode 101 and an active alert. Select the alert and click on  to acknowledge it. Once an alert has been acknowledged, a **checkmark** appears in the table and it no longer sends out emails and text messages.

## alert monitoring

↶ ✓

ALERT MONITOR: All Alerts

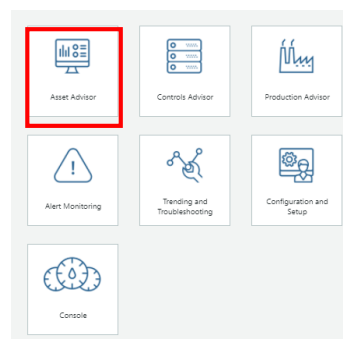
On Refresh Now

	Name	Source Property	Source	Time Stamp	Definition	Duration (ms)	Description
✓	ErrorCo...	ErrorCode	CNC 1-1	2018-02-11 23:59:53	EqualTo 101.0	472249.00	Error Code 101

## STEP 11 – MONITORING YOUR ASSETS WITH ASSET ADVISOR

With the Asset Advisor App, you can monitor the status of your assets.

1. Go to **Console ▶ Asset Advisor**





**FILTERS**

Sort Order: Criticality 1 Asset

**Monitor Status**

- Unplanned Downtime
- Warning (1)
- Unavailable
- Planned Downtime
- Running
- Not Configured

**More**

- Model Number  
Select a Model
- Related Lines  
Select a Related Line
- Related Site  
Select a Related Site

**CNC 1-1**

Model Number:  
Serial Number:  
Description:  
Location: CNC Machine 1 in Line 1  
Related Lines: Line 1  
Related Site:

Warning: 1 hr 11 mins  
Alerts: 1 active  
Weekly total: 1

2. Click on your CNC 1-1 asset to see more details on the status of this asset.

thingworx asset advisor Administrator

**Performance**

Monitored Properties  
Additional Properties  
Remote Access  
File Transfer  
File Transfer History

**CNC 1-1**

Model Number:  
Serial Number:  
Description:  
Location: CNC Machine 1 in Line 1  
Related Lines: Line 1  
Related Site:

Warning: 10 mins  
Alerts: 1 active  
Weekly total: 56

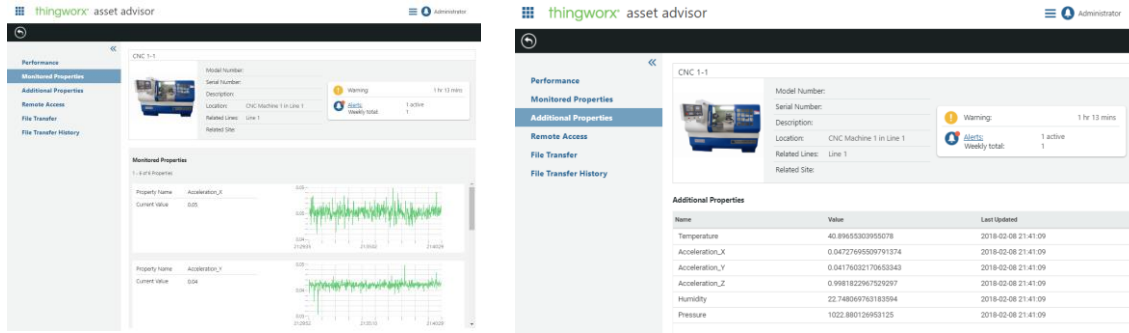
**Performance**  
100% -- Availability Updated 2018-02-12 00:10:00 (every 1 minute)

Status This Week

Date	Running	Warning	Planned Downtime	Unplanned Downtime	Unavailable	Not Configured
06-Feb	0	0	0	0	24	0
07-Feb	0	0	0	0	24	0
08-Feb	0	4	0	0	20	0
09-Feb	0	24	0	0	0	0
10-Feb	1	23	0	0	0	0
11-Feb	0	23	0	1	0	0
12-Feb	0	0	0	0	24	0

Legend: Running (Green), Warning (Yellow), Planned Downtime (Blue), Unplanned Downtime (Red), Unavailable (Grey), Not Configured (Light Grey)

3. Toggle between the different tabs to see different set of properties and information about the asset.

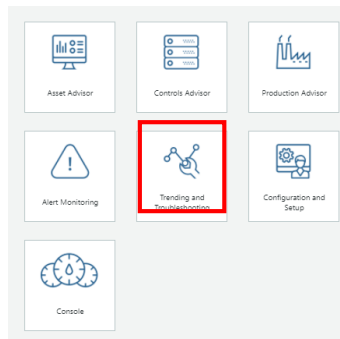



## STEP 12 - CONFIGURING TRENDS

Each trend you create in ThingWorx Manufacturing Apps tracks up to five tags or properties for a given equipment (line or asset). Follow the directions below to create trends for several properties of your Sigma Tile.

To create a trend:

1. From the console, go to **Trending and Troubleshooting**.




2. Click new trend .
3. In the **New Trend** window, enter a name and optionally, a description: e.g. CNC 1-Temperature

**NEW TREND**

Trend

Trend Name \*

Description

4. In the Tags section on the right, select  to add the properties you want to track. Select the **Equipment** and **Equipment Type** for the asset you created earlier. Select the **Temperature** property.

ADD TAGS OR PROPERTIES TO TREND

Equipment Type

Equipment  Select up to 5

Search:

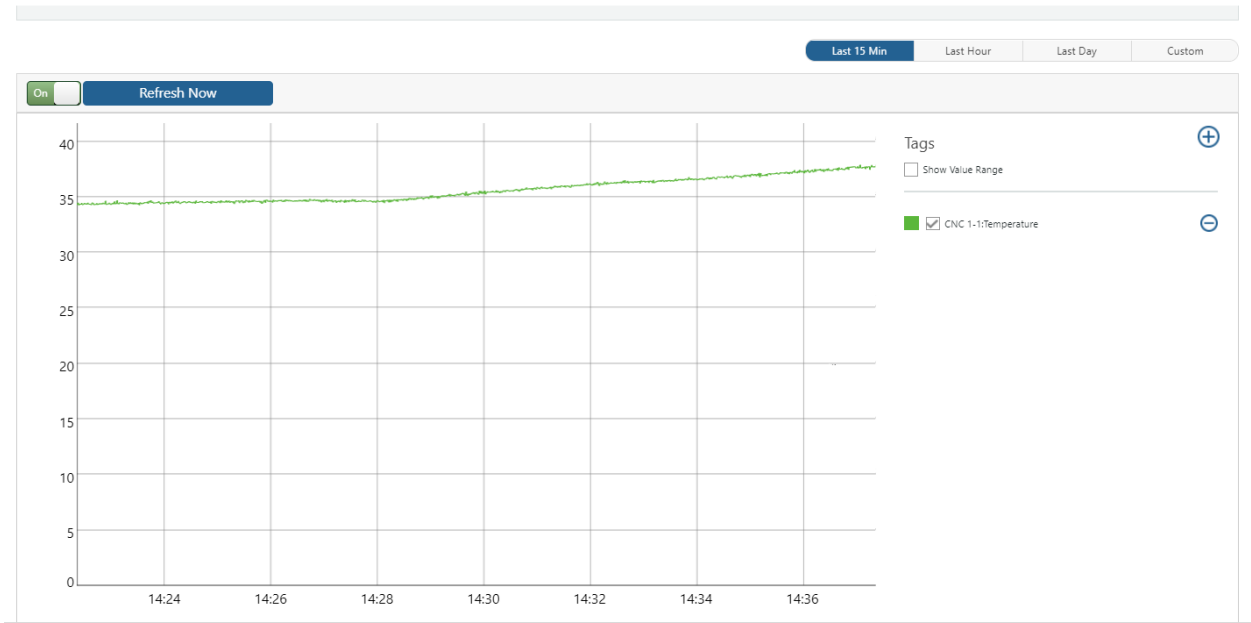
**Properties**

Acceleration_X
Acceleration_Y
Acceleration_Z
Humidity
Pressure
Temperature
availability

OK Cancel Apply

5. Once the trend is created, you can view any of the selected properties over different lengths of time.

CNC1-Temperature



6. Create additional trends showing the Parts counts for your asset and the Humidity.

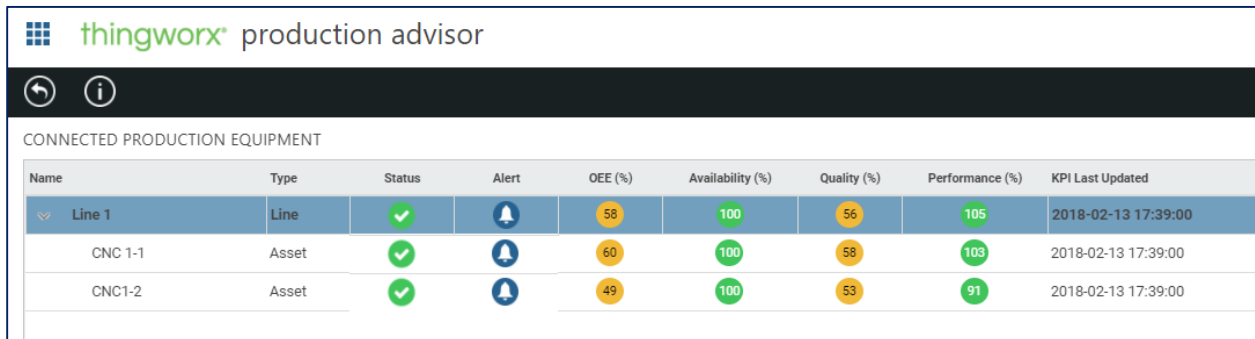


TRENDS 0 of 4 Active Filter(s) Add Filter

View	Name	Description	Created On	Created By
	Temperature_CNC_1		2017-05-17 15:02:43	Administrator
	Count_CNC_1-1		2017-05-17 15:04:37	Administrator
	Humidity_CNC_1		2017-05-17 15:05:20	Administrator

## STEP 13 - ADDING MORE ASSETS AND LINES

If you have multiple assets connected to your KEPServerEX server, such as multiple Sigma Tiles follow steps 4 through 12 to configure these additional assets and associated trends.



The screenshot shows the 'thingworx production advisor' interface. At the top, there are navigation icons (back and info). Below that, the section is titled 'CONNECTED PRODUCTION EQUIPMENT'. A table displays the following data:

Name	Type	Status	Alert	OEE (%)	Availability (%)	Quality (%)	Performance (%)	KPI Last Updated
Line 1	Line	✓	🔔	58	100	56	105	2018-02-13 17:39:00
CNC 1-1	Asset	✓	🔔	60	100	58	103	2018-02-13 17:39:00
CNC1-2	Asset	✓	🔔	49	100	53	91	2018-02-13 17:39:00

**Congratulations!** You have now completed this guide and **learned how to use the ThingWorx Manufacturing Apps using one or several Sigma Tiles acting as a production asset(s).**

## 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.

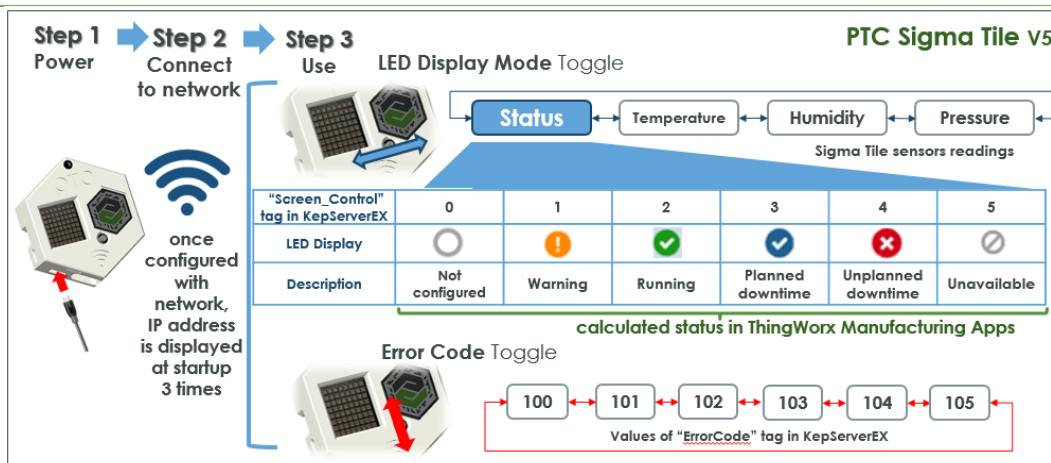
#### Step 2 – Learn ThingWorx Manufacturing Apps



##### 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-tile>.

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:

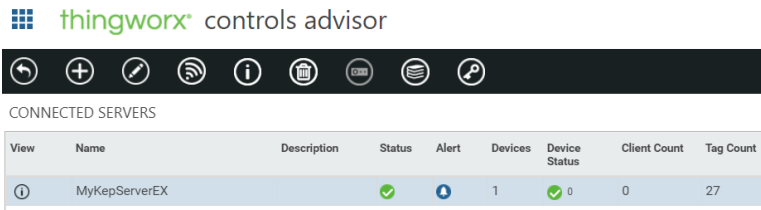
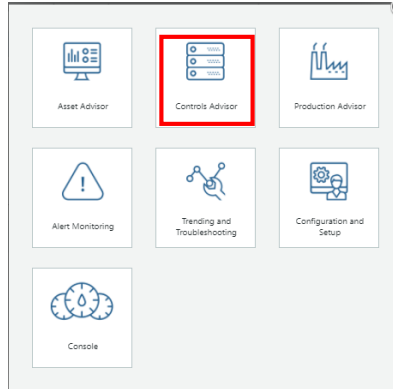
- <https://community.ptc.com/t5/Manufacturing-Apps/bd-p/manufacturingapps>

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

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

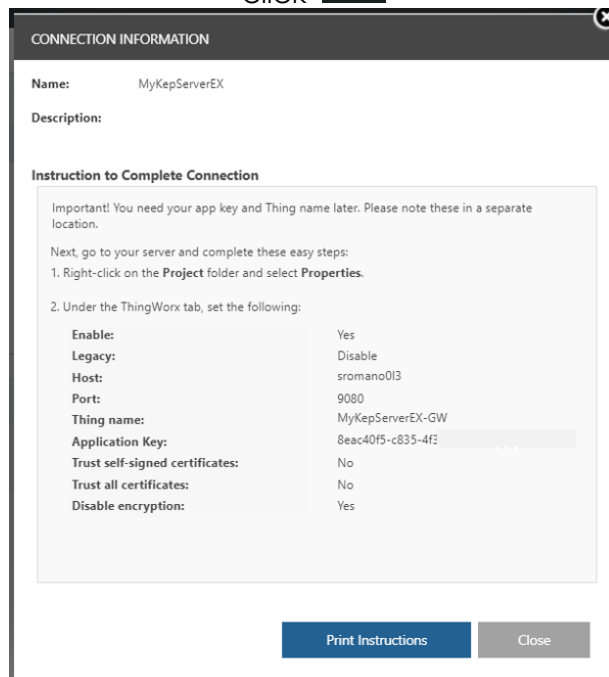
APPENDIX C: RETRIEVING KEPSERVEREX CONNECTION INFORMATION

1. Navigate to **Controls Advisor** App from the console.



2. Select the Server for which you want to display the connection information and

click



3.