PTC®

PTC Windchill Quality Solutions™ Extension for ThingWorx® Guide

Contents

About This Guide

This guide documents the installation and use of the PTC Windchill Quality Solutions Extension for ThingWorx. It is intended for system administrators who are installing this extension and application developers who are using ThingWorx Composer to build ThingWorx applications that connect to PTC Windchill Quality Solutions.

To take advantage of the functionality in the PTC Windchill Quality Solutions Extension, you must have:

- Working knowledge of your PTC Windchill Quality Solutions installation
- Working knowledge of ThingWorx Composer
- Permissions for the PTC Windchill Quality Solutions Data Engine

Technical Support

Contact PTC Technical Support through the PTC website, or by phone, email, or fax if you encounter problems using this product or the product documentation.

The PTC eSupport portal provides the resources and tools to support your implementation:

https://support.ptc.com/appserver/cs/portal/

For complete support details, see the *PTC Customer Support Guide*:

http://support.ptc.com/appserver/support/csguide/csguide.jsp

You must have a Service Contract Number (SCN) before you can receive technical support. If you do not know your SCN, see "Preparing to contact TS" on the **Processes** tab of the *PTC Customer Support Guide*. This topic describes how to locate your SCN.

Comments

PTC welcomes your suggestions and comments on its documentation. To submit your feedback, you can send an email to documentation@ptc.com. To help us more quickly address your concern, include the name of the PTC product and its release number with your comments. If your comments are about this guide, include its title: *PTC Windchill Quality Solutions Extension for ThingWorx Guide*.

1

Overview

This chapter describes the PTC Windchill Quality Solutions Extension for ThingWorx and provides important overviews and requirements.

Product Overview

The PTC Windchill Quality Solutions Extension enables ThingWorx application developers to quickly and easily create connected applications that leverage the FRACAS, FMEA, FTA, and system tree data stored in PTC Windchill Quality Solutions. For example, you can do the following:

- View and filter FRACAS, FMEA, FTA, and system tree data
- Create, update, and delete records
- Generate reports and graphs
- Calculate results
- View calculation options and progress status

The PTC Windchill Quality Solutions Extension includes:

- An extension bundle that is imported into the ThingWorx Composer. For more information, see Installing Bundled Extensions on page 18.
- Sample mashups that show the use of some entities in the extension bundle. These mashups are intended as samples only. You can use them as templates for copying what you want to use. For more information, see Using the Sample Mashups on page 23.

For detailed information on files included in the PTC Windchill Quality Solutions extension, see Viewing the Extension Media on page 16.

Architecture Overview

The following diagram of the PTC Windchill Quality Solutions Extension illustrates that a portion of it runs inside of ThingWorx and a portion of it runs inside of PTC Windchill Quality Solutions. These pieces, along with the evolving technology stack provided by ThingWorx Utilities, work together to provide secure access to PTC Windchill Quality Solutions data and services.

After you have imported the PTC Windchill Quality Solutions Extension into the ThingWorx Composer, a set of extensions is ready to use. These extensions allow you to use widgets to create mashups and applications that display data from PTC Windchill Quality Solutions.

You can click the tile for the utility or application that you want to start from the ThingWorx Utilities Console. To see and work with the sample PTC Windchill Quality Solutions mashups, you click the magenta **Windchill Quality Solutions Resource** tile.

Product Requirements

To import the PTC Windchill Quality Solutions Extension, you must be using the following products:

- PTC ThingWorx 6.5 or higher
- PTC ThingWorx Utilities 6.5 or higher
- PTC Windchill Quality Solutions 11.0 or higher

Entity Overview

This section offers a high-level overview of important entities included in the PTC Windchill Quality Solutions Extension. Installing this extension installs four bundled extensions:

- `core-ui-ext.zip`
- `wqs.extension.connector-extension`

- `wqs.extension.provider-extension`
- `wqs.extension.sample-mashups-extension`

Each of these extensions includes its own set of ThingWorx entities.

`core-ui-ext.zip`

Many advanced ThingWorx widgets are contained in `core-ui-ext.zip`, including the expandable tree used in sample PTC Windchill Quality Solutions mashups.

`wqs.extension.connector-extension`

Two entities are contained in `wqs.extension.connector-extension`:

- `PTC.Connector.WQSConnector`—Thing that connects to the PTC Windchill Quality Solutions system and maps its system-specific language to the ThingWorx language.
- `PTC.Connector.WQSConnectorTemplate`—Thing template that provides base functionality for connecting to PTC Windchill Quality Solutions.

`wqs.extension.provider-extension`

More than 50 entities are contained in `wqs.extension.provider-extension`. Entities are provided for systems, configurations, system tree items, and FRACAS, FMEA, and FTA records. To view all PTC Windchill Quality Solutions entities provided in this extension, do the following:

1. In ThingWorx Composer, select **All** in the left navigation pane.
2. Type `*WQS*` for the **All** filter.

To view only particular PTC Windchill Quality Solutions entities, for the **All** filter, type any of the following: `system`, `system tree`, `configuration`, `incident`, `FMEA`, `fault tree`, `problem`, `failure`, `operating`, or `maintenance`.

For example, typing `incident` displays five incident entities:

- `PTC.Resource.WQS.IncidentResourceProvider`—Thing that provides services for supporting operations on incidents.
- `PTC.Resource.WQS.IncidentUtils`—Thing that simplifies working with incidents. This out-of-the-box utility allows you to perform operations on incidents more easily. Each PTC Windchill Quality Solutions resource provider has its own utility.

- `PTC.Resource.WQS.IncidentResourcePoviderTemplate`— Thing template that provides base functionality for acting on incidents.
- `PTC.Resource.WQS.IncidentTemplateDataShape`—Data shape that corresponds to the previously mentioned template.
- `PTC.Resource.WQS.IncidentDataShape`—Data shape that defines the FRACAS Incidents table.

wqs.extension.sample-mashups-extension

Six sample mashups are contained in `wqs.extension.sample-mashups-extension`:

- `PTC.WQS.Home`—Demonstrates how a mashup can contain other mashups. After selecting a project and system, you can generate reports and graphs from the current project or Common Library using the contained `PTC.WQS.ReportViewer` and `PTC.WQS.GraphViewer` mashups. Additionally, you can click buttons for viewing the contained `PTC.WQS.PredictedVsActualFRs` and `PTC.WQS.BasicFailureReportAndTrending` mashups.
- `PTC.WQS.GraphtViewer`—Demonstrates how to supply any required graph parameters and generate a graph.
- `PTC.WQS.PredictedVsActualFRs`—Demonstrates how to compare the FRACAS predicted failure rate to the actual field failure rate for a system tree item. Additionally, you can click buttons to calculate failure rates based on any data changes and generate the (Common) Reliability Prediction report.
- `PTC.WQS.ReportViewer`—Demonstrates how to supply any required report parameters and generate a report.
- `PTC.WQS.CreateEditIncident`—Demonstrates how to create and edit FRACAS incidents
- `PTC.WQS.BasicFailureReportAndTrending`—Demonstrates how to view the FRACAS incidents associated with the active system tree item and all inserted problems. Additionally, you can click buttons to view contained mashups for the following operations:
  - Creating an incident
  - Escalating an incident to a problem
  - Generating the (Common) FRACAS Incidents Over Time graph

For more information, see Using the Sample Mashups on page 23.

Browsing Entities

After you install the PTC Windchill Quality Solutions Extension, you can browse the ThingWorx Composer to learn more about the entities included with this extension.

For example, to learn more about `PTC.Connector.WQSConnector`, load it in the ThingWorx Composer. Then, under **ENTITY INFORMATION**, click **Services**. The many services provided for this thing are listed under the thing template, `PTC.Connector.WQSConnectorTemplate`. As shown in the following screen, you can hover over a service to view additional information about the service.

These services are PTC Windchill Quality Solutions Data Engine API functions and work in the same way as in the API. Clicking **Test** opens a page where you can enter parameters and execute the service for testing. For more information about these functions and their parameters, see the *PTC Windchill Quality Solutions Data Engine API Guide*. You can download the 11.0 version of this guide from the Reference Documents page on the PTC website:

https://support.ptc.com/appserver/cs/doc/refdoc.jsp

2

Installing the PTC Windchill Quality Solutions Extension

This chapter contains download and media details. It also includes instructions for installing the PTC Windchill Quality Solutions Extension and configuring the PTC Windchill Quality Solutions server.

Downloading the Extension

The PTC Windchill Quality Solutions Extension is available from the ThingWorx Marketplace:

http://marketplace.thingworx.com

1. From the welcome page, click **BROWSE**.

   The page refreshes and all extension categories display.

2. To locate and download the PTC Windchill Quality Solutions Extension:

   a. Navigate to the **ENTERPRISE SYSTEMS** category and click the extension.

   b. Read details about the extension on the **OVERVIEW**, **DETAILS**, and **PROVIDER** tabs.

   c. Click **GET THIS EXTENSION**.

   d. Log in and download the extension.

📋 **Note**

To download this extension, your company must have purchased ThingWorx. You must also have a valid ThingWorx user name and password. If you do not have valid ThingWorx account information, have your system administrator send an email to `twc@thingworx.com` to request this information for you.

Viewing the Extension Media

When you install the PTC Windchill Quality Solutions Extension ZIP file in the ThingWorx Composer, all bundled extensions are installed. If you first want to view the media in this file, you can unzip `ptc-wqs-extension-bundle-1.0.0.zip`:

• `core-ui-ext.zip`

  Supplies a core PTC library of ThingWorx widgets, including the expandable tree used in sample PTC Windchill Quality Solutions mashups.

• `wqs.extension.connector.zip`

  Supplies the files for enabling direct communication with the PTC Windchill Quality Solutions Data Engine.

• `wqs.extension.provider.zip`

  Supplies the interface that allows you to use ThingWorx to act on PTC Windchill Quality Solutions entities.

• `wqs.extension.sample-mashups.zip`

Supplies ThingWorx templates, things, shapes, and mashups that demonstrate how to use the PTC Windchill Quality Solutions Extension. The supplied entities are intended as samples only. You can use them as templates, copying what you need to build your own custom mashups. For information, see Using the Sample Mashups on page 23.

Installing the Extension in ThingWorx Composer

The following sections describe the actions that are needed to install the PTC Windchill Quality Solutions Extension in the ThingWorx Composer. All actions described in these sections require that you are logged in as a ThingWorx administrator.

1. Deleting Previously Installed Extensions on page 17
2. Installing Bundled Extensions on page 18

Deleting Previously Installed Extensions

If you have previously installed the PTC Windchill Quality Solutions Extension, continue reading this section to learn how to find and delete existing bundled extensions.

If you have not previously installed the PTC Windchill Quality Solutions Extension, you can skip this section.

> **Note**
>
> Failing to remove previously installed extensions before importing new ones can cause problems with the updated files. This is because data can be stored in Tomcat memory that is associated with the old entity. This data is not removed unless you delete the entities and restart Tomcat.

Complete the following steps:

1. Delete the extensions bundled in the PTC Windchill Quality Solutions Extension:

   - `core-ui-ext`
   - `wqs.extension.connector-extension`
   - `wqs.extension.provider-extension`
   - `wqs.extension.sample-mashups-extension`

For deletion instructions, see .

2. Restart Tomcat to clear the Tomcat memory.

Deleting Extensions

To delete extensions, complete the following steps in the ThingWorx Composer:

1. From the **Import/Export** menu, select **EXTENSIONS ▸ Manage**. All installed extensions are shown. In the following screen,`wqs.extension.connector-extension` is highlighted.
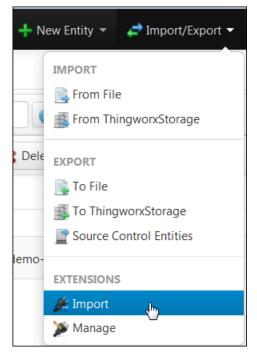

2. For each extension to delete, select the extension name and click **Delete Extension**.

Installing Bundled Extensions

To install the extensions bundled in the PTC Windchill Quality Solutions Extension, complete the following steps in the ThingWorx Composer:

1. From the **Import/Export** menu, select **EXTENSIONS ▸ Import**.

PTC Windchill Quality Solutions™ Extension for ThingWorx® Guide

2. In the **Import Extensions** window, click **Browse** and navigate to `ptc-wqs-extension-bundle-1.0.0.zip`.

3. Click **Import**.

4. If prompted, refresh the ThingWorx Composer.

To view the extensions after the import is complete, select **Import/Export ▸ Manage**. All four extensions bundled with the PTC Windchill Quality Solutions Extension are included in the list of installed packages:

- `core-ui-ext.zip`
- `wqs.extension.connector-extension`
- `wqs.extension.provider-extension`
- `wqs.extension.sample-mashups-extension`

In the following image, `wqs.extension.connector-extension` is highlighted. This extension directly communicates with the PTC Windchill Quality Solutions Data Engine API, translating SOAP requests to ThingWorx-specific entities.

Installed Extension Packages	✖ Delete Extension
Name	**Description**
propertytable_ExtensionPackage	propertytable Widget
wqs.extension.connector-extension	PTC Windchill Quality Solutions ThingWorx Connector Extension
core-ui-ext	PTC Core UI Library
linkTooltip_ExtensionPackage	Tooltips on Link

Selecting a row in the **Installed Extension Packages** table displays the entities in the extension details under **Package Details**. For example, selecting `wqs.extension.connector-extension` displays the details for this package.

Package Details	
Name	**Description**
PTC.Connector.WQSConnector	PTC Windchill Quality Solutions Connector Instance
PTC.Connector.WQSConnectorTemplate	PTC Windchill Quality Solutions Connector Template
PTC.Connector.WQSConnectorPackage	PTC Windchill Quality Solutions Connector Package
PTC.Connector.GraphRawData	Data Shape describing infotable fields for returned graph raw data

After the PTC Windchill Quality Solutions Extension is imported into the ThingWorx Composer, you can configure the connection to the PTC Windchill Quality Solutions server.

Configuring the Server Connection

The following steps describe how to configure the connection to your PTC Windchill Quality Solutions server.

1. Load `PTC.Connector.WQSConnector` in ThingWorx Composer.

2. Under **ENTITY INFORMATION** in the left navigation pane, click **Configuration**.

3. For **URL**, enter the HTTPS address for connecting to your PTC Windchill Quality Solutions server.

4. To specify the PTC Windchill Quality Solutions login, do one of the following:

- For **UserName** and **Password**, enter the PTC Windchill Quality Solutions user name and password to use for login. If the supplied user name belongs to multiple user groups, for **Group**, enter the group to use.

- Rather than enter user account information, for **WQSSessionToken**, enter a PTC Windchill Quality Solutions session token. For more information about session tokens, see the *PTC Windchill Quality Solutions Data Engine API Guide*.

All actions from ThingWorx for all users use the same PTC Windchill Quality Solutions login.

5. Click **Save**.

📝 **Note**

Now that the PTC Windchill Quality Solutions server has been configured, you can create mashups for PTC Windchill Quality Solutions.

3

Using the Sample Mashups
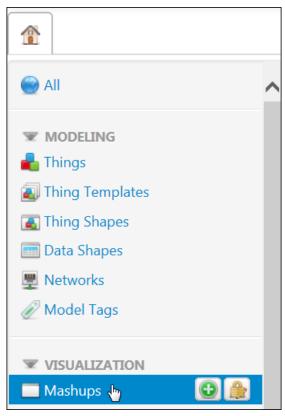
This chapter describes how to view and reuse the sample mashups that are supplied with thePTC Windchill Quality Solutions Extension

Viewing Sample Mashups

You can view the sample mashups that are supplied with the PTC Windchill Quality Solutions Extension from the main navigation pane in the ThingWorx Composer.

1. Under **VISUALIZATION**, select **Mashups**.

2. For the **Mashups** filter, type `PTC.WQS` to limit the mashups shown to only those for the PTC Windchill Quality Solutions Extension.

Sample mashups use the entities and services that are installed with the PTC Windchill Quality Solutions Extension. While it is possible to use these sample mashups just as they are supplied, you likely want to make copies that you can then customize. You can also create your own mashups from scratch.

PTC.WQS.Home Sample Mashup

The `PTC.WQS.Home` sample mashup demonstrates how a mashup can contain many other mashups. When you load this sample mashup and click **View Mashup**, the composed mashup opens in your browser.

This mashup consists of five main areas as described in the following sections.

Projects Pane

In the Projects pane, a grid widget retrieves the projects in your PTC Windchill Quality Solutions database. When you click a project, the Systems pane is populated.

Systems Pane

In the Systems pane, a grid list widget retrieves the systems in the active project. When you click a system, both the Reports pane and Graphs pane are populated.

Button Pane

The upper right corner of the mashup displays two buttons: **Predicted vs Actual Failure Rates** and **Failure Reporting and Trending**. These widgets open composed views of other sample mashups. Each of these widgets has a corresponding navigation widget and validator widget.

- Clicking **Predicted vs Actual Failure Rates** opens the composed view of the `PTC.WQS.PredictedVsActualFRs` mashup in your browser. This child mashup has several button widgets and validator widgets. This mashup also has other widgets, including the following:
  - List for selecting a configuration
  - Tree table for showing the system tree for the active configuration
  - Value display for showing progress when calculating the failure rate of the active system tree item
  - Value display for showing the calculated failure rate
  - Label chart for displaying the (Common) FRACAS Incidents per Part Number graph

- Clicking **Failure Reporting and Trending** opens the composed view of the `PTC.WQS.BasicFailureReportAndTrending` mashup in your browser. This child mashup has several label widgets, button widgets, and validator widgets. This mashup also has other widgets, including the following:
  - List for selecting a configuration
  - Tree for selecting a system tree item in the active configuration
  - Grid for displaying information about the active system tree item
  - Grid for displaying incidents for the active system tree item
  - Grid for displaying problems inserted for the system

Reports Pane

In the Reports pane, a grid widget retrieves the reports in the project and Common Library. Selecting a report opens the composed view of the `PTC.WQS.ReportViewer` mashup in your browser. In this child mashup, you enter values for any parameters required by the report and then click **Create**. If the PTC Windchill Quality Solutions Data Engine is unable to get the needed parameters, an error message appears to the right of the button. This message explains the problem encountered.
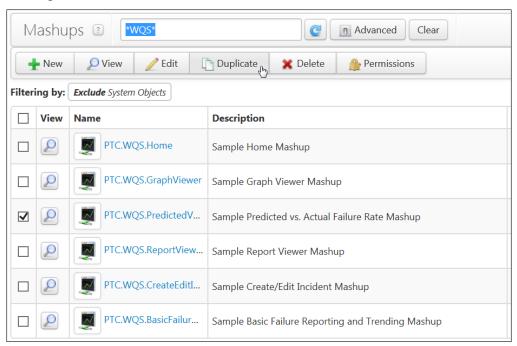
Graphs Pane

In the Graphs pane, a grid widget retrieves the graphs in the project and Common Library. Selecting a graph opens the composed view of the `PTC.WQS.GraphViewer` mashup in your browser. In this child mashup, you enter values for any parameters required by the graph and then click **Create**. If the PTC Windchill Quality Solutions Data Engine is unable to get the needed parameters, an error message appears to the right of the button. This message explains the problem encountered.

Reusing Sample Mashup Content

After you have the supplied sample mashups working with your data, PTC recommends that you create duplicate mashups. You can then change these copied mashups to meet your needs.

1. In the ThingWorx Composer, select the checkbox for one of the sample mashups and then click **Duplicate**.

2. For the new mashup that is created, enter a name and description and then save the mashup.

After the mashup is saved, you can edit your copy. Additionally, you can inspect the entities and services in the mashup. Clicking items in the main display panel changes what you see on secondary panels. For example, the following screen shows the connections and properties for the button that launches the failure rate calculation.

For details on specific entities, look for **Description** fields, hover over names, and click help icons.

The following image shows an example of the type of help that displays when you click a help icon.

This next image shows an example of a tooltip that displays when you hover over a service name.

The following topics show common activities that could be useful as you edit your copies of the sample mashups.

Changing the Report Displayed by the Sample Mashup

In the `PTC.WQS.PredictedVsActualFRs` sample mashup, the `GetReport` service is available from `PTC_Resource_WQS_SystemUtil`. This service controls the report that the mashup displays.

Clicking `GetReport` updates the properties shown below the services. The value entered for **ReportName** is `(Common) Prediction (Summary)`.

To change the report, you would modify the value. For example, entering `(Common) Prediction Overview` would cause the mashup to display this report instead. You would then change the label for the button that generates this report to the appropriate report name.

Changing the Number of System Tree Levels in a Sample Mashup

In the `PTC.WQS.PredictedVsActualFRs` sample mashup, the tree table widget is used to display the system tree.

When editing your copy of this sample mashup, clicking the tree table widget displays its properties in the lower left corner of the screen.

The **CollapseChildrenOfLevel** property identifies how many levels are expanded when the system tree is initially loaded. You can scroll to display the **CollapseChildrenOfLevel** property and enter a new value if desired. The value that you enter must be less than or equal to the number of levels in the system tree.

You can hover over a property for the tree table widget to see a property description.

4

Developing Customized Applications

ThingWorx developers can use the PTC Windchill Quality Solutions Extension for ThingWorx to build applications that connect FRACAS, FMEA, FTA, and system tree data to other enterprise system data. Such applications can deliver product risk and reliability data to more of your organization. For example, you can provide real-time failure and reliability analysis for smart, connected products operating in test or field environments to technicians.

Because ThingWorx applications are virtually limitless in scope and power, this section provides only tips about localizing labels and fields and adding saved filters. If you can imagine it, you can use ThingWorx to develop it.

Localizing Labels and Fields in Your Application

ThingWorx supports the localization of the runtime user interface of your ThingWorx application. This includes being able to localize elements, such as the labels and fields, that you create when using PTC Windchill Quality Solutions Extension entities.

To localize elements in entities, you must include a token for each element. You begin by clicking the blue localization toggle icon.

You then either search for and select an existing token or create a new token for the element. All tokens that you create are added to the localization tables maintained by ThingWorx.

By creating and populating localization tables, you can display runtime elements in different languages. For details on how to create and populate localization tables, search for "localization tables" in the ThingWorx Help Center. This help center is available from the Help Centers page on the PTC website.

For more information on how to localize labels, see the ThingWorx tutorial video:

http://youtu.be/3bo6HtXSqRA

To provide localized text for a large number of elements, you can choose to export a localization table to an XML file. You then add localized text to this file and import it back into ThingWorx when you finish.

Adding Saved Filters to Your Mashup

PTC Windchill Quality Solutions allows you to create filters to limit the records shown in its tables. These saved filters can be used in ThingWorx mashups.

To use filters in a ThingWorx application, follow these best practices:

- Because you specify a filter by name, ensure that all filters that you want to use in a ThingWorx application have unique names.
- In most instances, filters are intended to be used only with the specific type of object for which they were created. Therefore, ensure that the filters added work with the data that you want to display.
- Some filters only work properly on a specific object. Therefore, be aware of the type of filters that you create and when they can be used in a ThingWorx application.

You can code a grid widget so that the filter to use is supplied. For example, you could code the grid widget for displaying incidents in the `PTC.WQS.BasicFailureReportAndTrending` sample mashup to use the "Open Incidents" filter. Then, the grid would show only incidents that are open. You can also code your ThingWorx application to prompt you for a filter.