RTI System Designer

Getting Started Guide

Version 6.1.2

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Chapter 1

Introduction

Note: This document assumes you have a basic understanding of *RTI® Connext® DDS* application development and concepts, such as a DDS Domains, *DomainParticipants, Topics, DataWriters*, and *DataReaders*. For an overview of these concepts, please see the RTI Connext DDS Getting Started Guide.

RTI System Designer is based on RTI XML-Based Application Creation - a mechanism to simplify the development of *Connext DDS* applications. For an overview of its functionality, please see the RTI Connext DDS Core Libraries XML-Based Application Creation Getting Started Guide.

System Designer is a tool that allows you to graphically design and configure all the aspects of a *Connext DDS* distributed system. Think of it as a user interface (UI) to XML-Based Application Creation, a technology that allows you to specify in XML format all the aspects of a DDS system:

- The Data Types that will be used to communicate information in the system
- The *Topics* that will be used in the domain, associating each *Topic* with a *Data Type*
- The *DomainParticipant* that can potentially be used, giving each a participant-name
- The *DataWriters* and *DataReaders* within each *DomainParticipant*, each associated with its corresponding *Topic*
- The Qualities of Service (QoS) that all the entities can use

Your application code simply indicates the participant configuration name of the *DomainParticipant* that it wants to create. The XML-Based Application Creation infrastructure takes care of the rest: creating the *DomainParticipant*, registering the types and *Topics*, and populating all the configured Entities.

Writing this XML can be quite challenging. Using a good editor with autocomplete capabilities along with the provided XML Schema can be of great help. But it is still quite complicated, especially as the project gets bigger and involves multiple files. The *System Designer* UI tool can help ease this process and manage the complexity of a large system.

This *Getting Started Guide* is not a manual for *System Designer* and it does not cover all the functionality. The tool has a lot of inline help. Look for the symbol for more help while using the tool.

Tip: You can access a live version of *System Designer* without installing it by visiting: https://community.rti.com/downloads/experimental/system-designer

This URL allows you to test a demo version of *System Designer* and learn more before you download and install it.

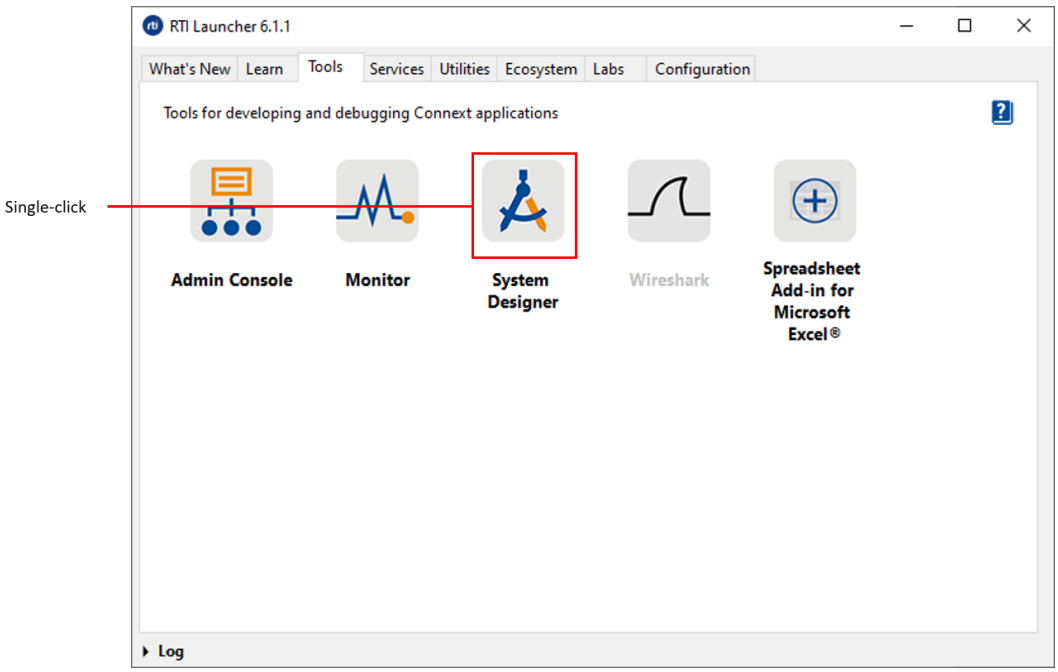
Chapter 2

Using System Designer

2.1 Starting System Designer

You can run *System Designer* from *Launcher* or from the distributed command-line executable.

In *Launcher*, go to the **Tools** tab and click the *System Designer* button:



You can also start *System Designer* with the `rtisystemdesigner[.bat]` script in the `bin` directory of your *Connext DDS* installation. The *System Designer* script will start the tool, try to open your default browser, and point to the right address.

If the browser won't start, open a new webpage and go to:

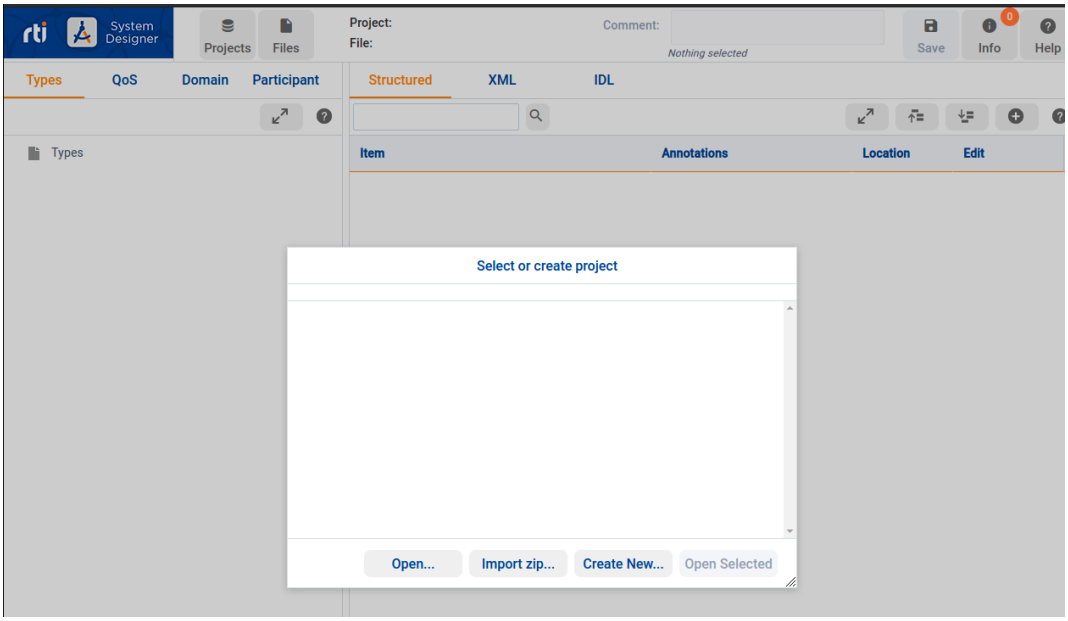
http://localhost:5000/index.html

Tip: By default, *System Designer* uses port 5000. If that port is not available, you can change it by setting `RTI_SD_PORT` to be a valid port for your system.

Note: *System Designer* automatically shuts down the server if there hasn't been a connection in the last five minutes. This is important when running *System Designer* from *Launcher*, since clicking the *System Designer* button again won't create a new server instance until the five-minute period has passed. (Clicking the *System Designer* button again while the previous instance is running will just open your default browser.) To open a new *System Designer* instance from *Launcher*, wait at least five minutes or kill the running instance.

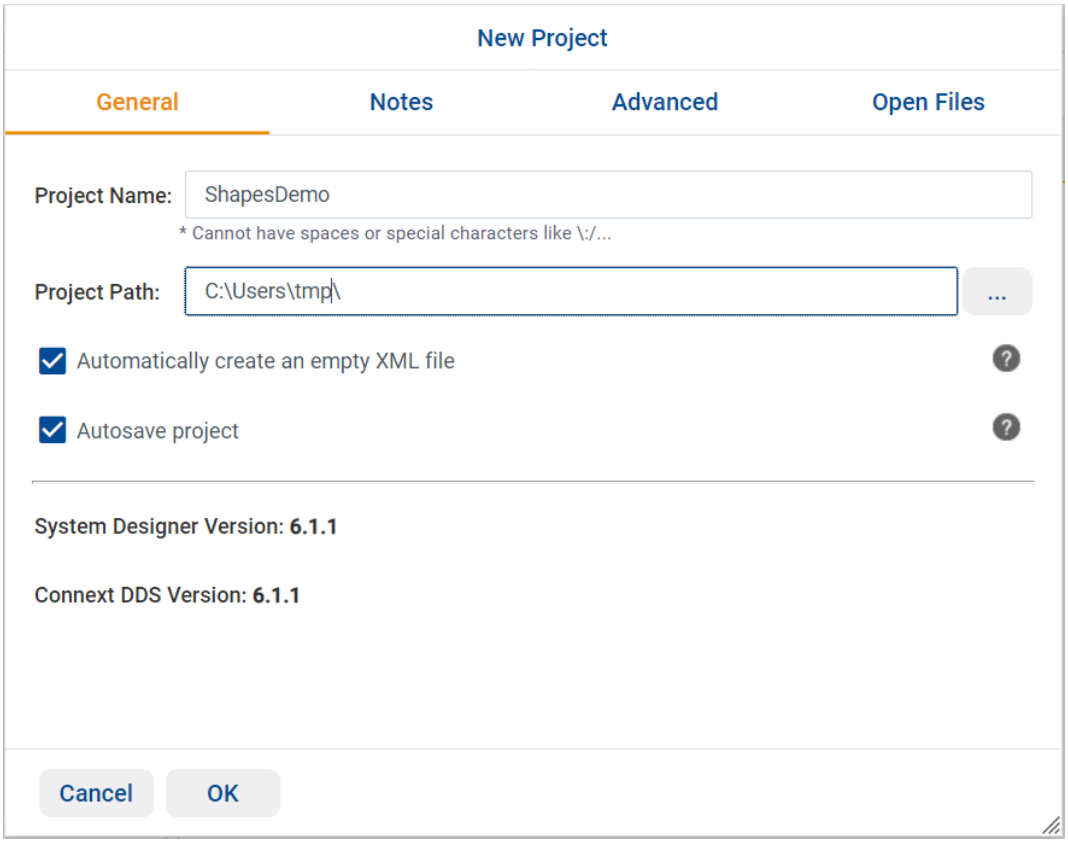
When you start *System Designer*, the application will allow you to:

- **Open…** Browse the filesystem for an existing *System Designer* project (.rtisdproj)
- **Import Zip…** Browse the filesystem to import a *System Designer* project that was previously exported and sent to you (.zip)
- **Create New…** Create a new project
- **Open Selected…** Open one of the listed Recent Projects (the list is empty right after the first execution)



2.2 Create a New Project

After you select **Create New…**, you will see this dialog:



You can choose a name and select the Project Path by clicking ... .

Press **OK**, and *System Designer* will create a new project and present you with the main UI where you can start designing your system.

When you create a new project, *System Designer* creates a project (`.rtisdproj`) file and if you checked the option when creating the project, an empty XML file. You can use *System Designer* to add components to the file.

You can work on your project wherever you want. *System Designer* finds default profiles and files in your *Connext DDS* installation for you.

2.3 Workflow

The *System Designer* main UI offers four tabs, which represent the tasks in XML-Based Application Creation:

- Types Definition
- QoS Specification
- Domain Definition
- Participant Definition

We suggest you start by defining a Type and proceed with the definition of the QoS. Then move to the Domain tab, register your types, and declare your Topic. Finally, use the Participant tab to define your participant, *DataReaders*, and *DataWriters*.

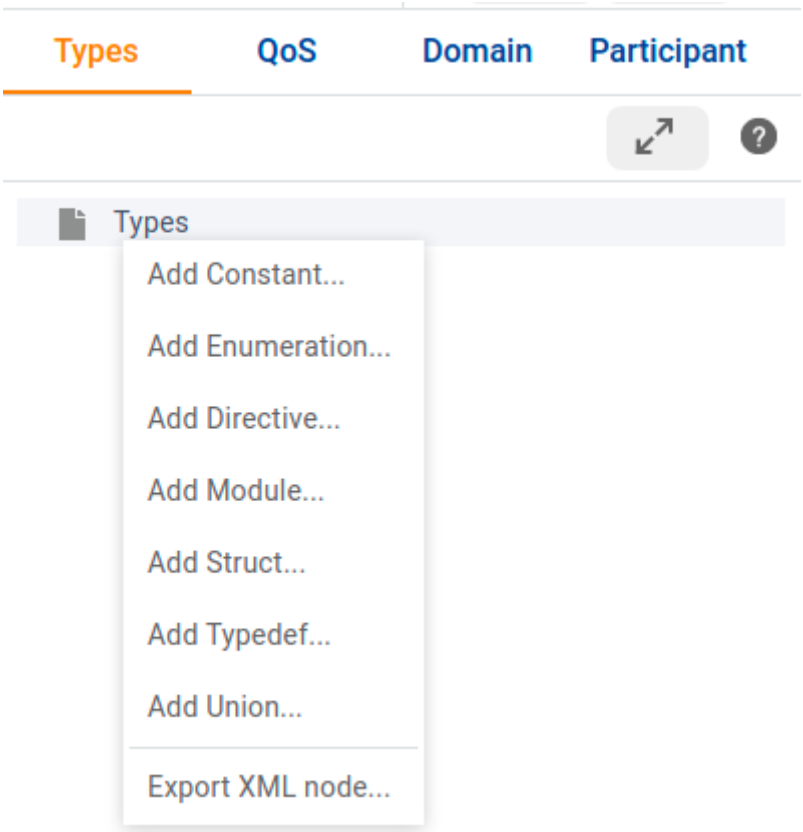
Of course, you can always (and probably will) go back and forth among these tabs to tweak your system.

System Designer automatically saves your projects and changes. (You can disable Autosave from the Projects menu: select **Properties**.)

2.4 Exploring the Tabs

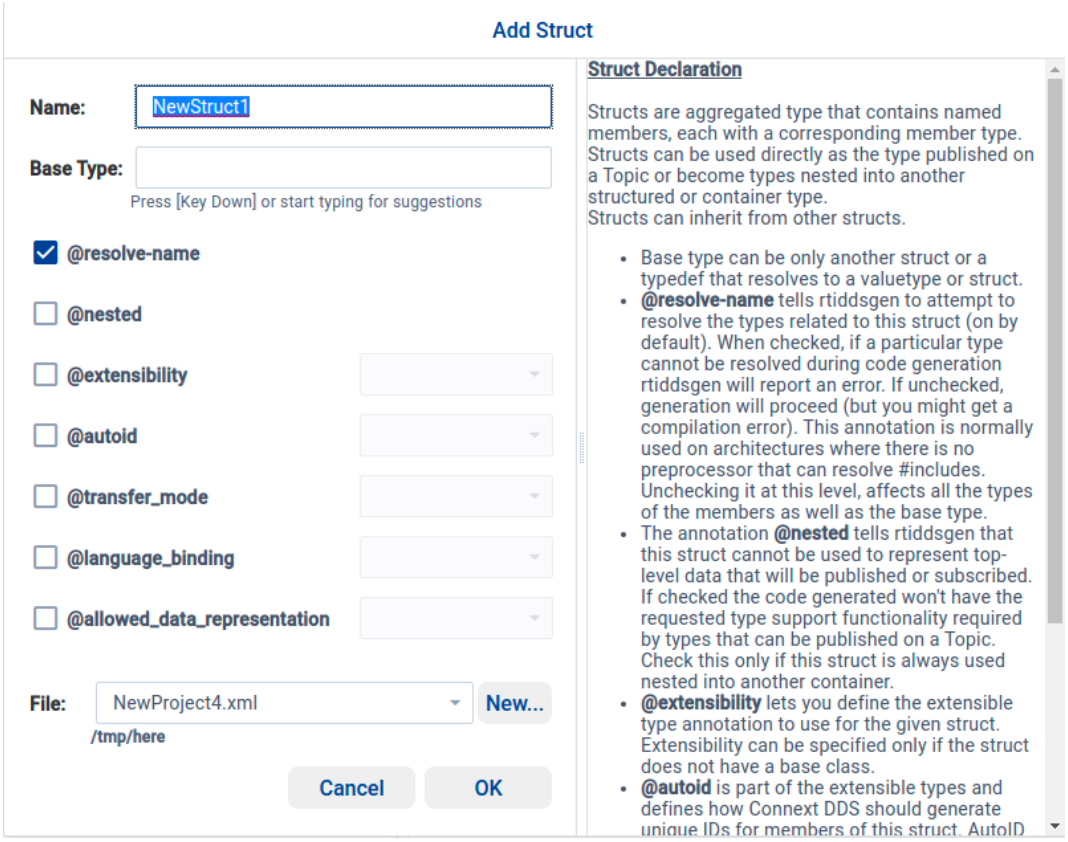
2.4.1 Working with Types

To introduce new types in your project, right-click on the **Types** node in the Tree View and add one of the top-level types:



For more information on data types, see Introduction to the Type System, in the RTI Connext DDS Core Libraries User's Manual.

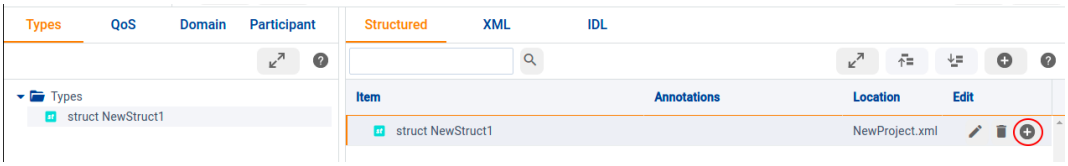
In this example, we are adding two structures, NewStruct1 and NewStruct2:



The pop-up shown above will guide you in creating a new type. You can choose the Name and, optionally, the Base Type. You can also select one of the annotations presented on the screen.

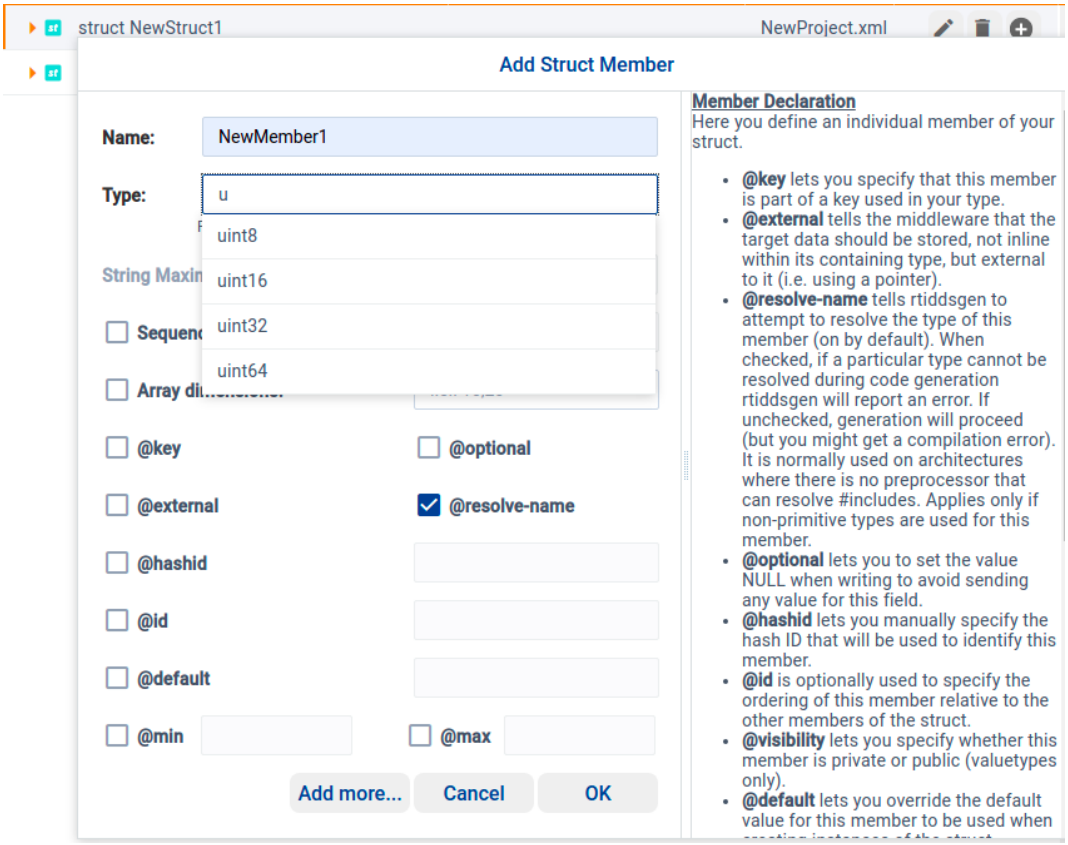
By default, the new object will be added to the last XML file used, but you can use the drop-down menu to select any XML file or use the **New…** button to add new XML files to your *System Designer* project.

Once you have added the top level, go to the Structured view and populate the new type using the button:



A pop-up will help you select the types and the right values. In this example, we are adding:

- A uint8 named 'member1' and a bounded (255) keyed string named 'member2' to the NewStruct1 structure.
- An octet named 'member1' and a char8 named 'member2' to the NewStruct2 structure.



The **Types** tab allows you to explore the types in three ways:

- Structured view
- XML view
- IDL view

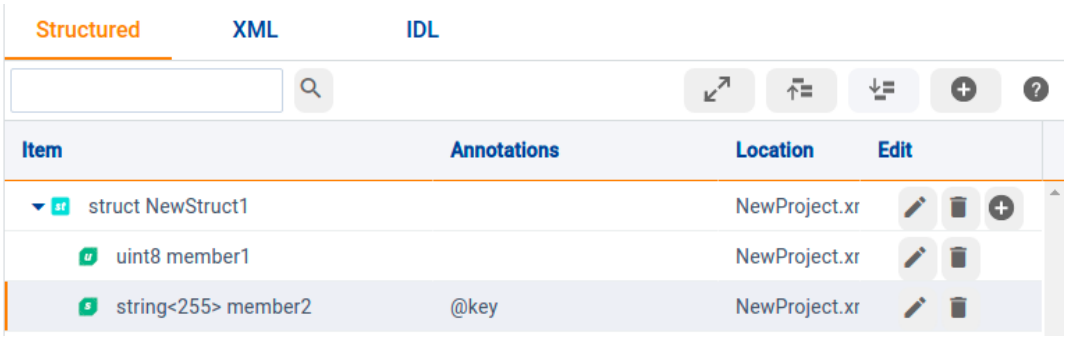
Tip: The RTI Connext DDS Core Libraries Extensible Types Guide has a mapping of type names in IDL 4.2. (For example, you may want to know that a `long` is called `int32` in IDL 4.2).

The Structured view is the simplest way to explore and modify the types in your system. The button allows you to go as deep as needed when exploring types.

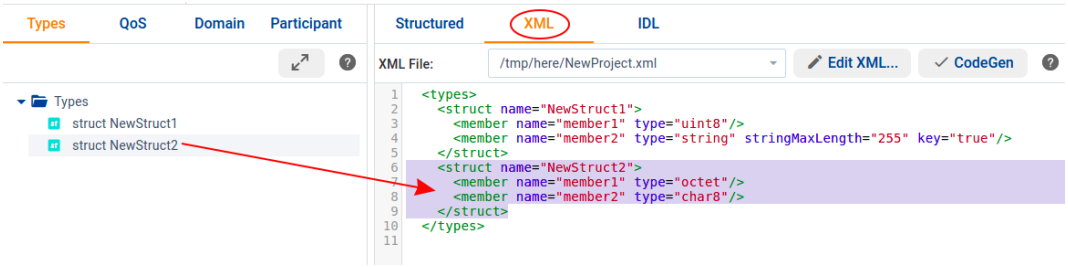
- In the **Item** column, you will see the name and type of a specific element of your type.
- In the **Annotations** column, you can see things like the ID of a member; you can see if the member is a key, or if it is an optional or extensible member.
- The **Location** column will indicate in which file the member is defined, in case you have a project with multiple XML files.
- The **Edit** column contains buttons to alter the selected item. Container objects such as structs, unions, and modules have a button to add a child to them.

You can use to rearrange all the objects.

Currently you cannot move elements in or out of a container (e.g., moving a struct out of a module is not currently supported). To do that, you can always switch to the XML view and modify the XML manually.

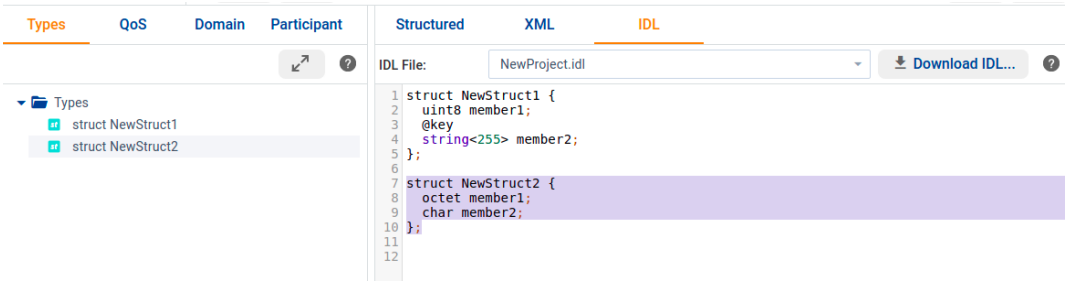


The XML view shows the types in XML format. You can highlight a specific member by selecting it in the tree on the left panel:



You can also click on to edit your XML file manually. All the changes will be reflected in the Structured view.

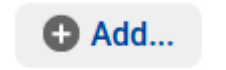
Finally, the IDL tab shows you the IDL definition of the type:



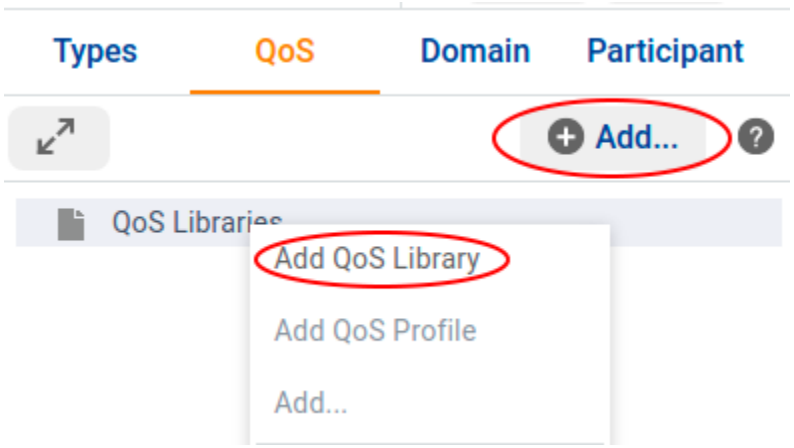
You can download the IDL type using the button. (After you click this button, a dialog box opens; click the "Download" link at the bottom.)

2.4.2 Configuring Quality of Service (QoS)

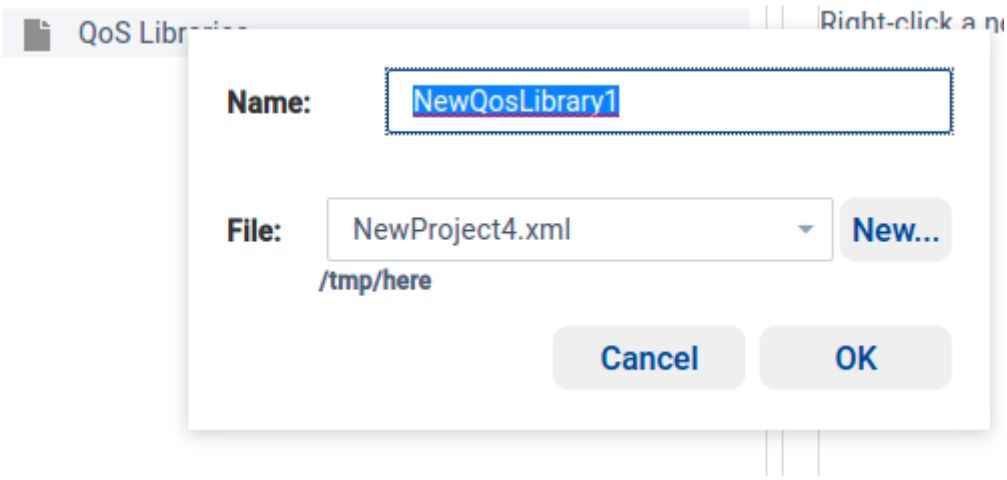
The QoS tab allows you to add Qualities of Services and organize them in QoS Libraries and QoS Profiles.

To add new QoS to your model, click 

in the QoS tab or right-click **QoS Libraries** in the tree:

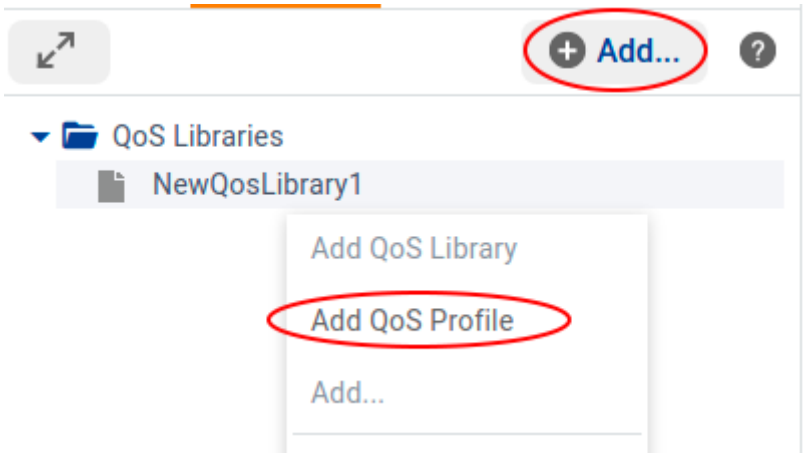


To add a QoS Library, enter the Library Name and the destination file:

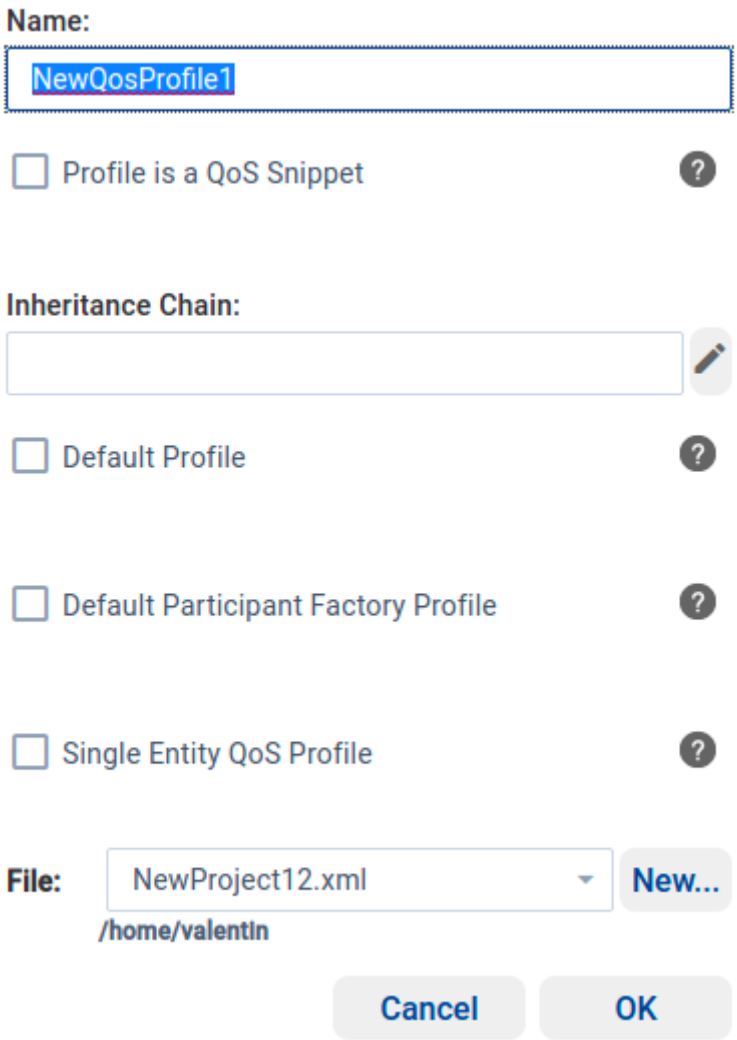


You can add QoS Profiles to that library by using

in the main panel while a QoS Library is selected or by right-clicking on the QoS Library:



A pop-up window will guide you to select the profile name, the destination file, the profile you want to inherit from, and other attributes as shown in the screenshot below:

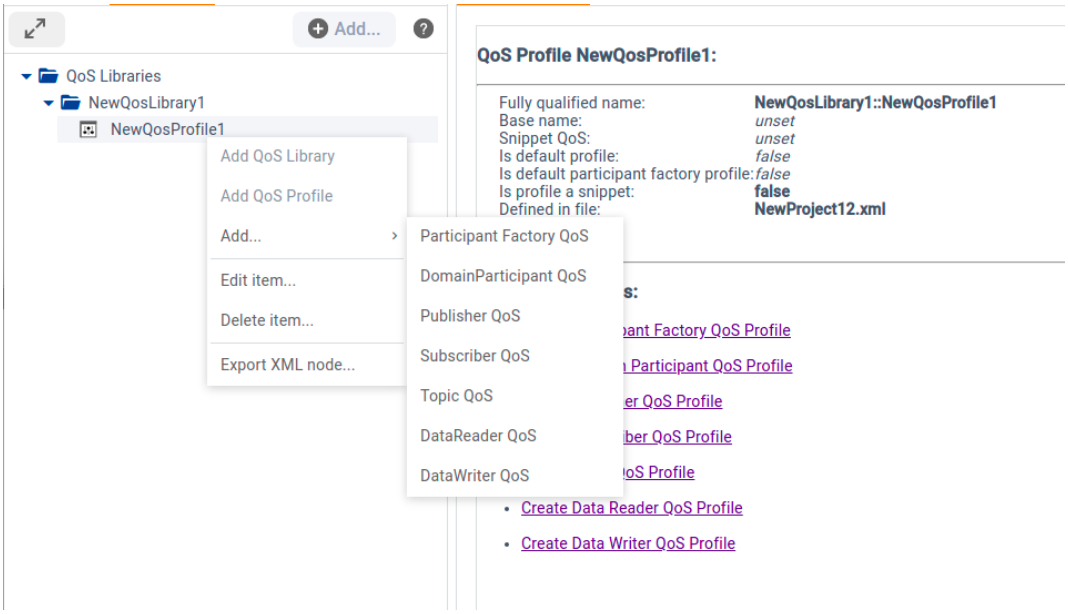


Some profiles cannot be defined as Snippets because they inherit from a base profile.

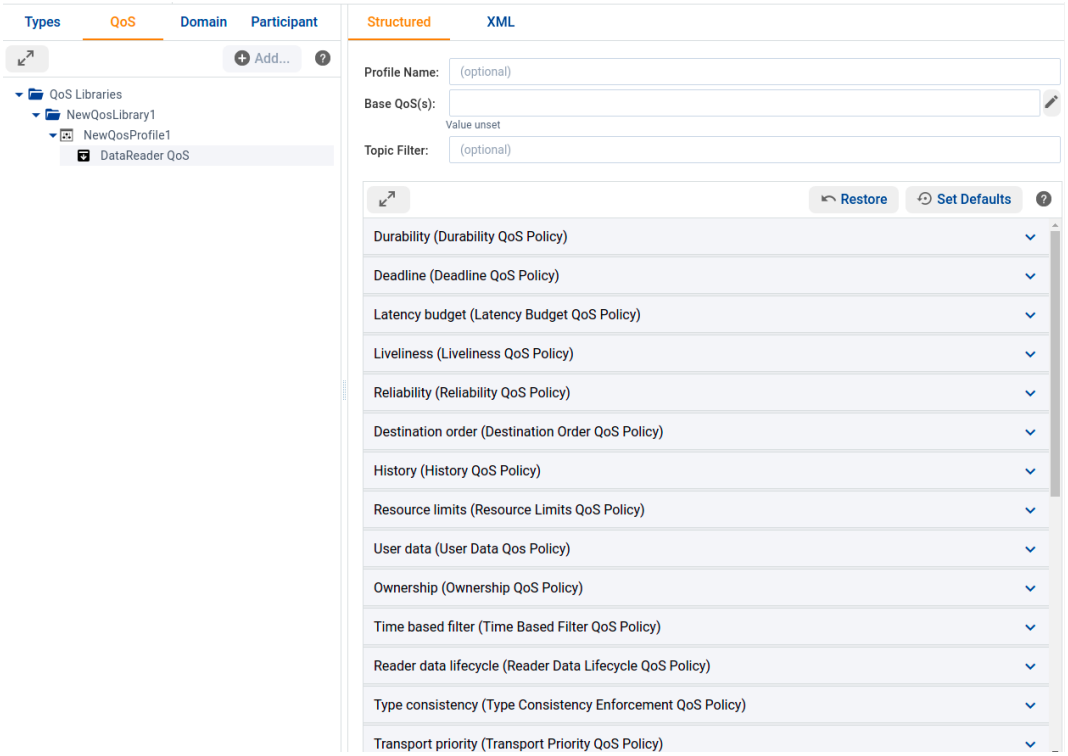
For more information on Entities and Profiles, see these sections of the *RTI Connext DDS Core Libraries User's Manual*:

- QoS Profile Inheritance and Composition
- DDS Entities
- Fundamentals of DDS Domains and DomainParticipants
- DomainParticipantFactory

Once you have your profiles, you can select one of them and add QoS for a specific Entity:

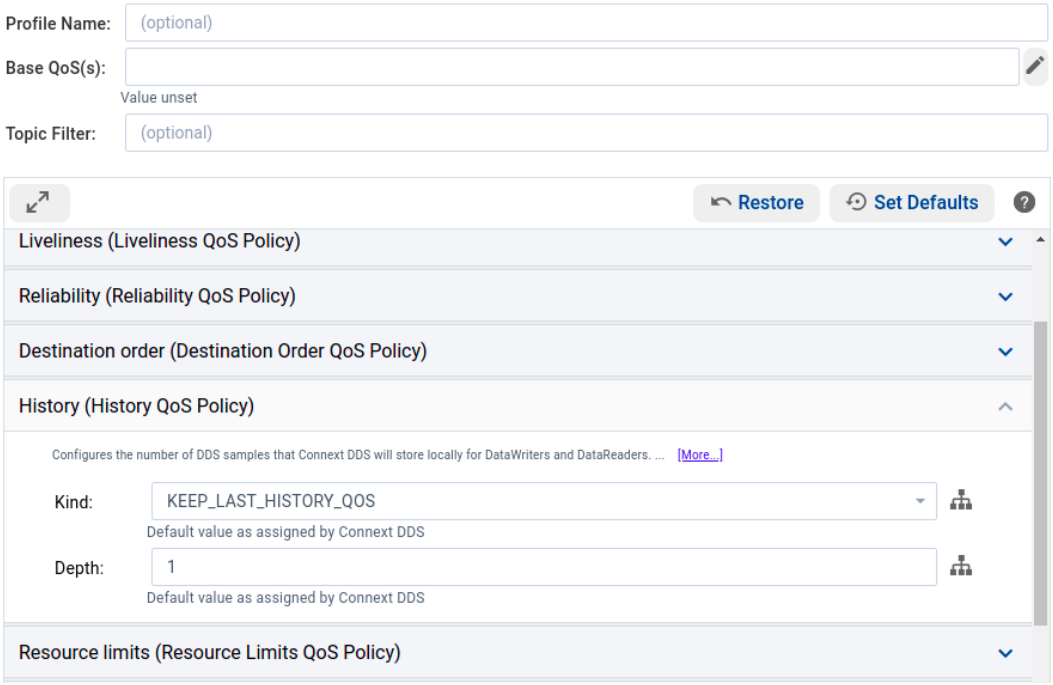


When an Entity is selected, you can set all the QoS related to that Entity in the Structured view:



See QosPolicies in the *RTI Connext DDS Core Libraries User's Manual* for more information on the QoS available for each entity.

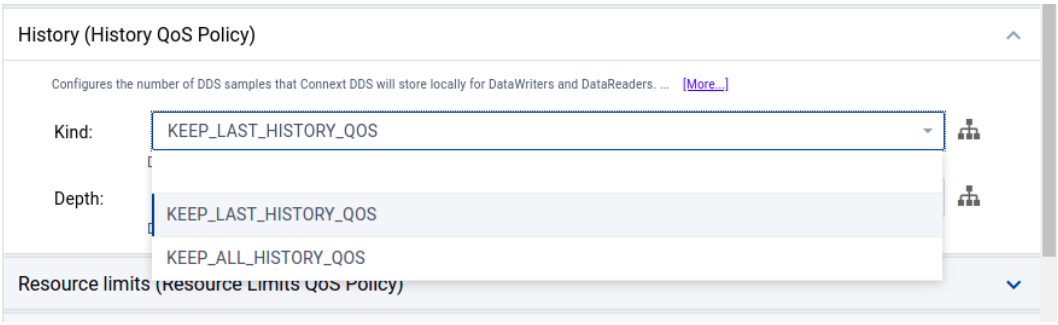
You can browse all of the QoS policies and select the button to set and get more information on a specific setting within a policy:



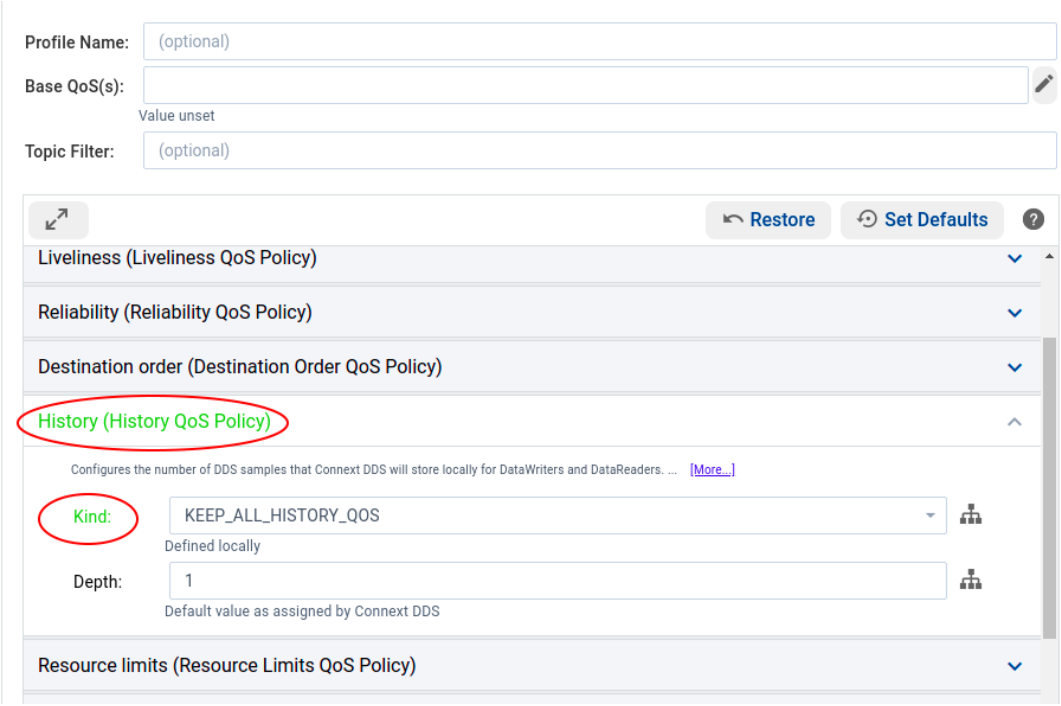
If you don't create a QoS Profile or policy for an Entity, the default QoS is used for that Entity.

A short explanation is shown, and a link to **[More…]** information for that specific policy is provided.

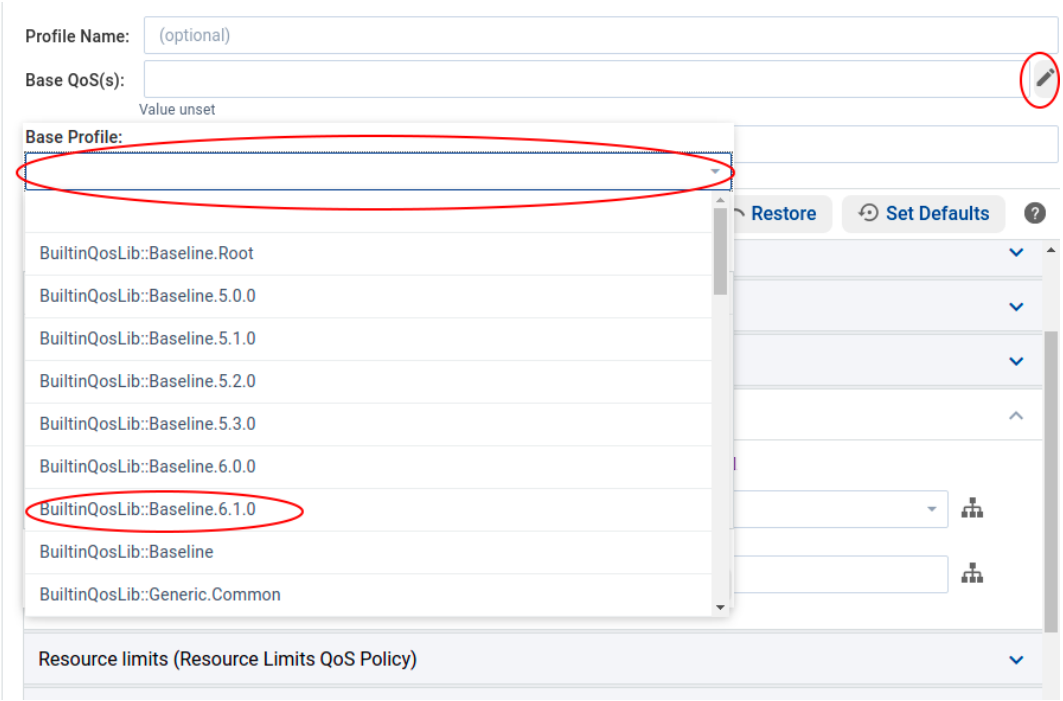
For each QoS policy, suggestions and checks are provided:



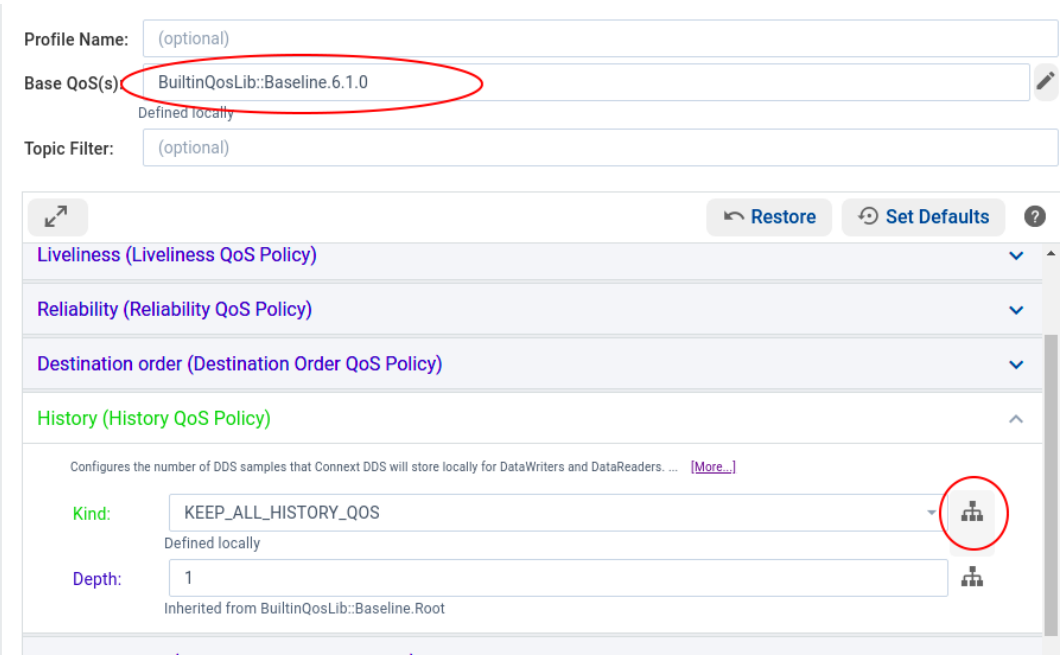
Once the QoS is set, it will be highlighted in green to indicate that it is being set locally:



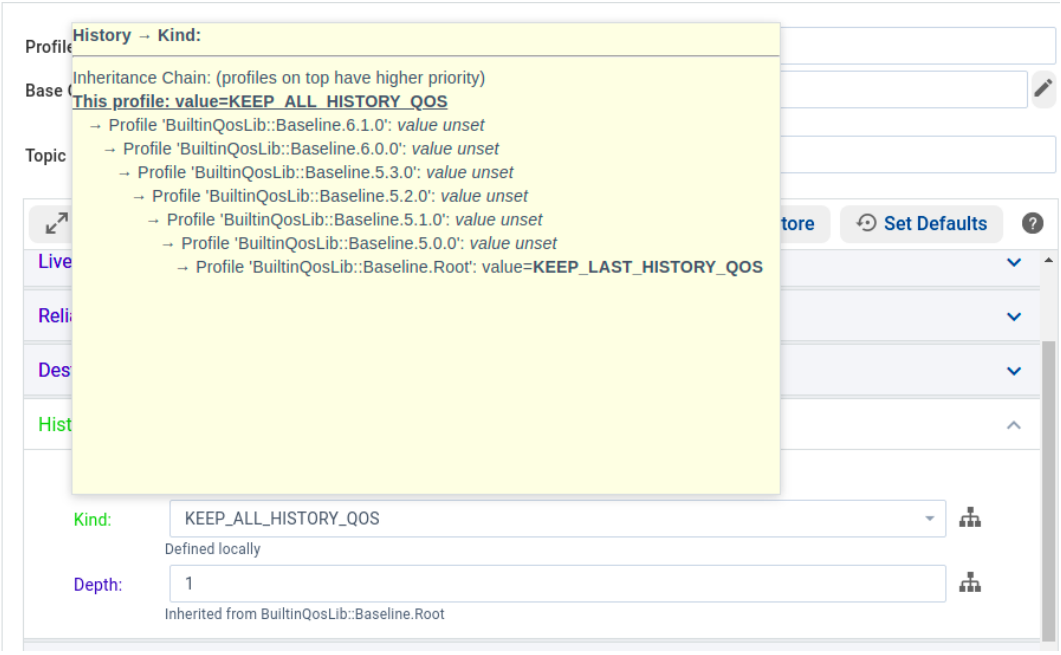
If your profile is inheriting from another profile, System Designer will highlight the values that are inherited from the base profile in blue. To inherit the values from another profile click on next to the Base QoS(s) field, and then select the QoS profile where you want to inherit from:



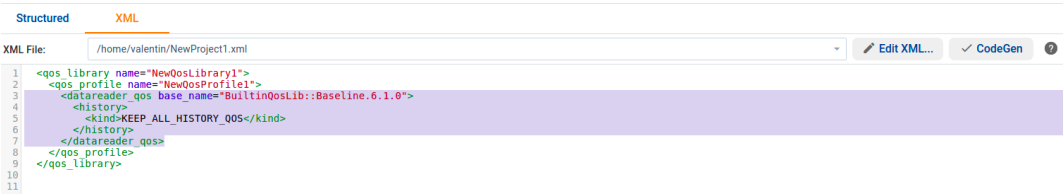
You can see where a value is coming from by selecting next to the QoS value:



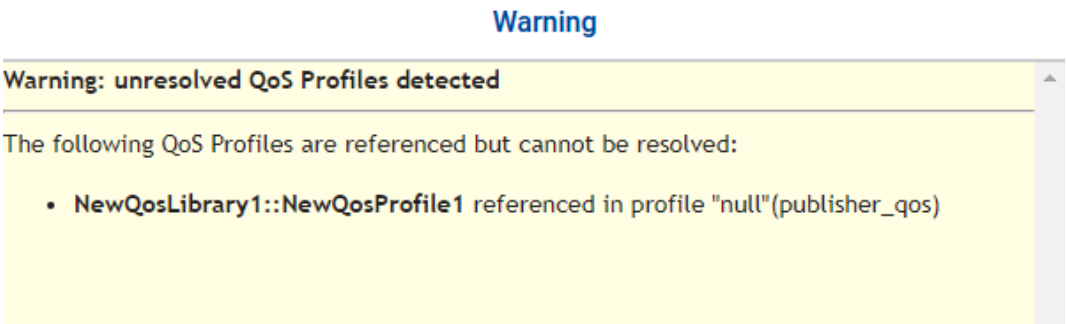
A summary will be presented to you displaying all the inheritance:



The XML view allows you to check the XML results and manually edit each XML file:



Note: If you later edit a profile name that's already being used in an entity (such as in a `<datawriter_qos>`), the entity does not get updated with your change. You will get a warning when this occurs:



You can select and edit the Entity QoS in the Structured view to use the new name, or edit the XML file directly to use the new name. *System Designer* allows you to change an already used name to give you flexibility in trying out your model. For instance, you may want to use your newly named profile in different entities. Entities that use the old (now unrecognized) name will revert to the default QoS.

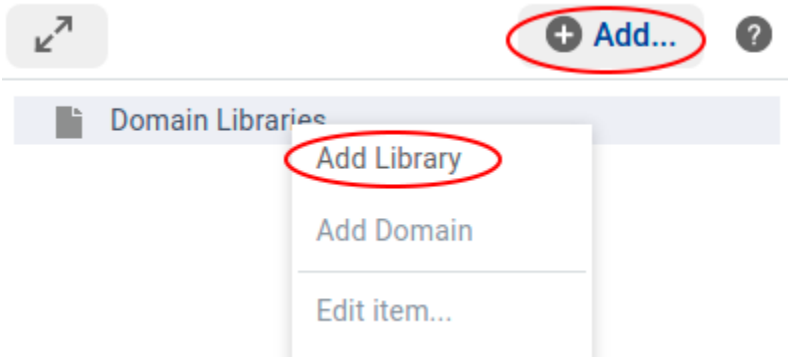
Note: About using default QoS: If you create an Entity QoS but don't modify its defaults, you won't see it the next time you open the project. Entities with no changes to the default QoS use the default settings and won't be displayed.

2.4.3 Handling Domains

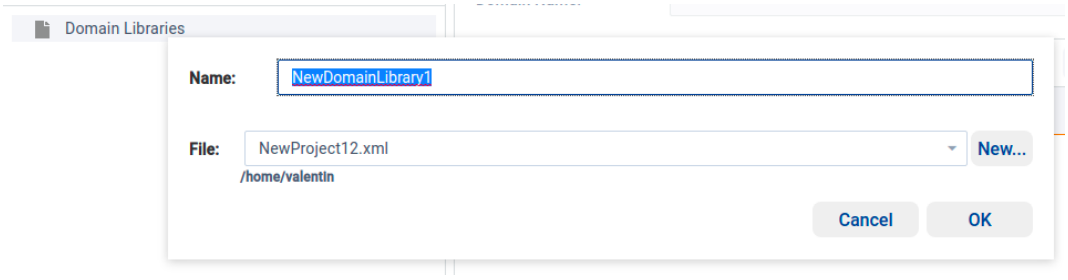
In the Domain tab, you can add all your domains and Topics. You can organize them into Domain Libraries.

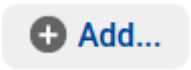
To start a new Domain Library, use the

button while Domain Libraries is selected or right-click Domain Libraries in the tree:

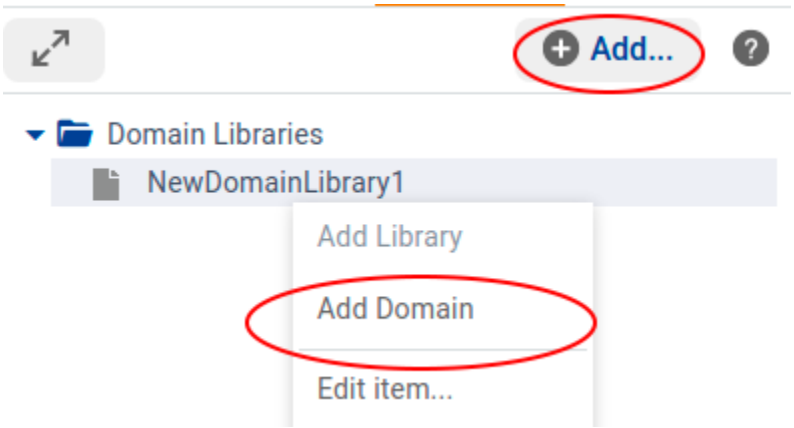


To add a Domain Library, enter the Library Name and the destination file:

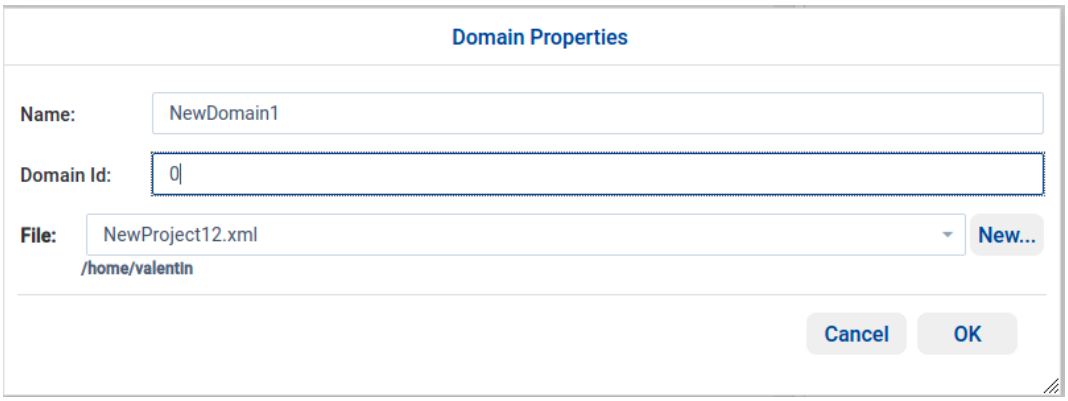


Then you can add a domain to the new library by using the 

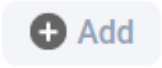
button while a Domain Library is selected or by right-clicking the Domain Library:



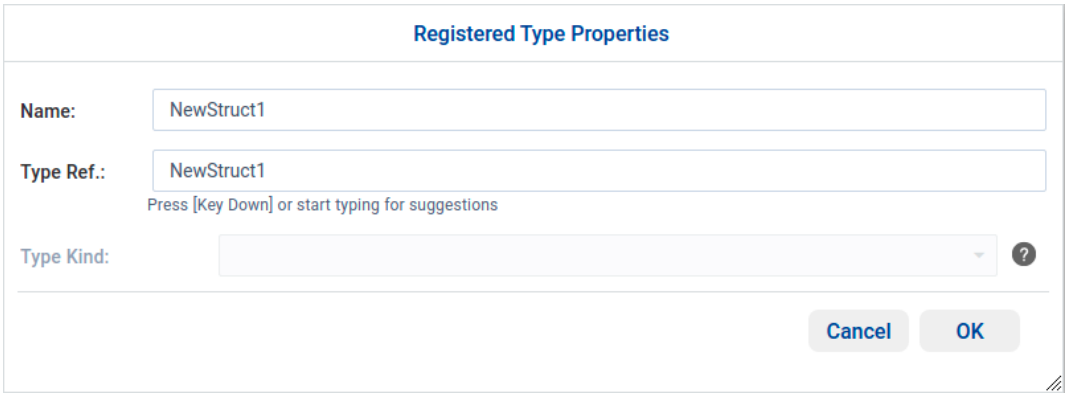
A pop-up window will guide you to enter the Domain Name, the Domain ID, and the destination file:



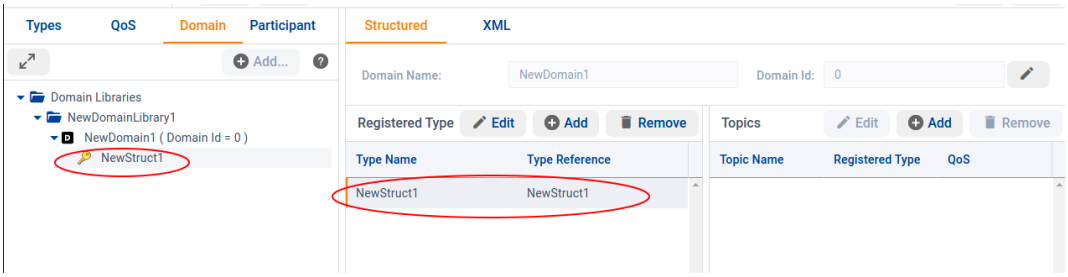
Once the domain is created, you can register types with the domain and add a new Topic in the Structured view.

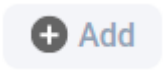
To register a new type, select 

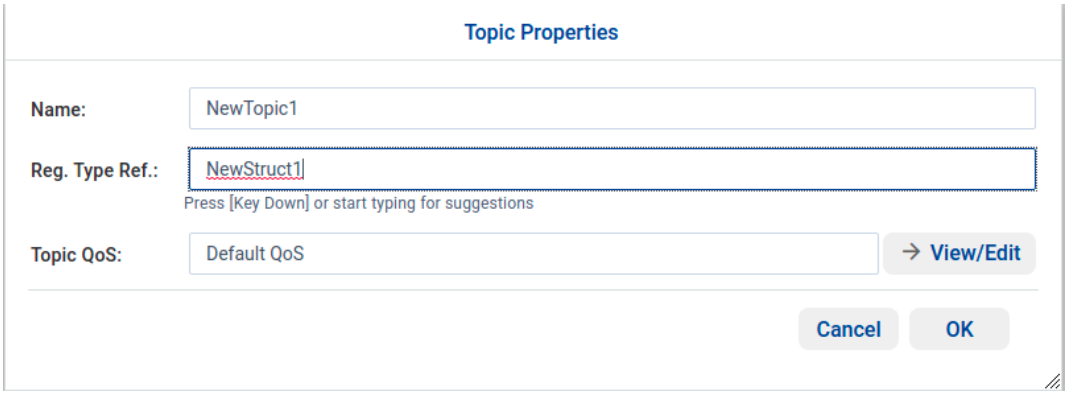
in the **Registered types** table; a pop-up will allow you to choose a Type name, Type Reference, and Type Kind from a list:



After you click **OK**, the new registered type will appear in the left tree and in the Registered types table:

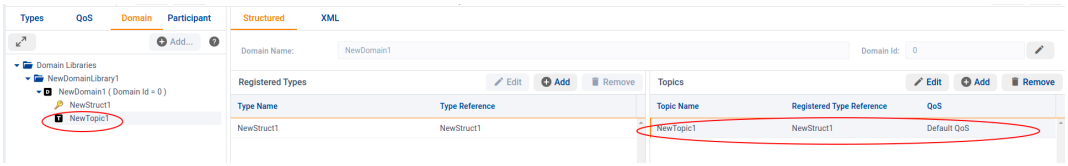


To register a new Topic, click  in the Topics table. A pop-up will open:

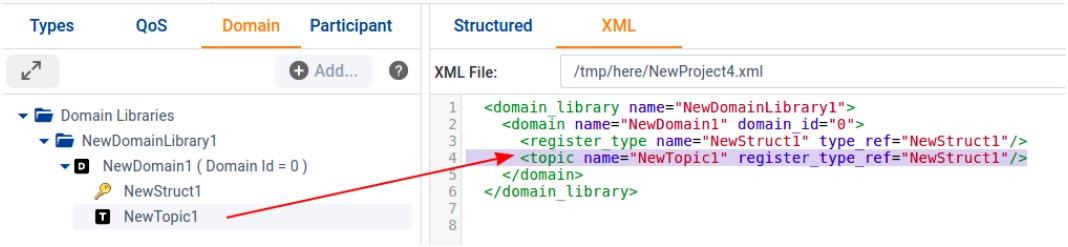


Enter your topic name and select one of the available Registered type names from the drop-down menu.

After you click **OK**, the new topic will appear in the left tree and in the main panel:



Of course, you can also see the XML definition in the XML tab:

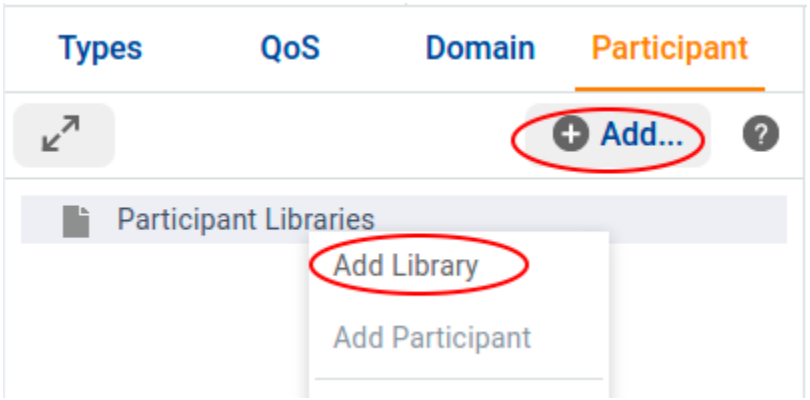


2.4.4 Define Participants and Entities

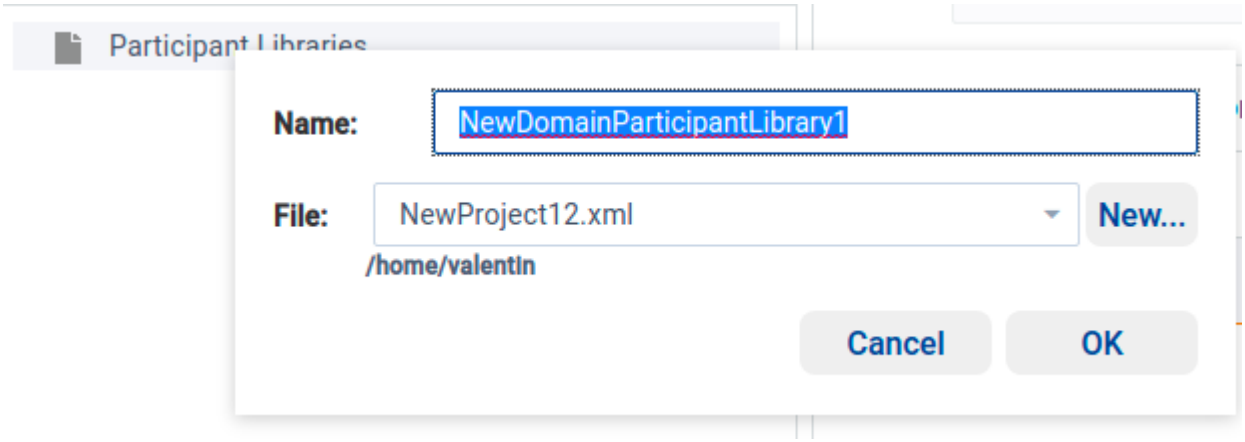
The **Participant** tab allows you to add Participants, DataReaders, and DataWriters. You have to organize them into Participant Libraries.

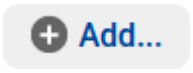
To add a new Participant Library to your model, click the

button while Participant Libraries is selected or right-click Participant Libraries in the tree and select **Add Library**:

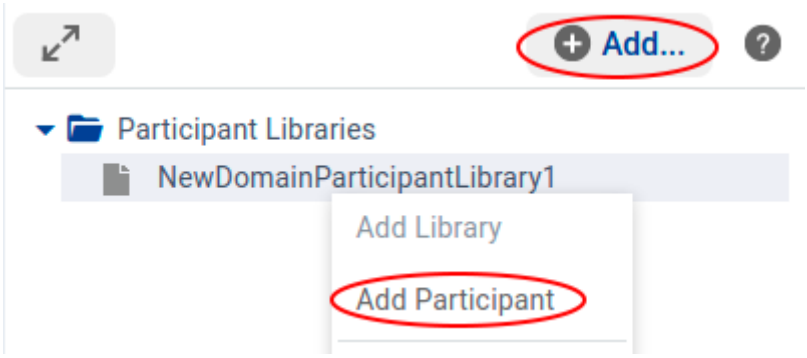


To add a Participant Library, enter the Library Name and the destination file:

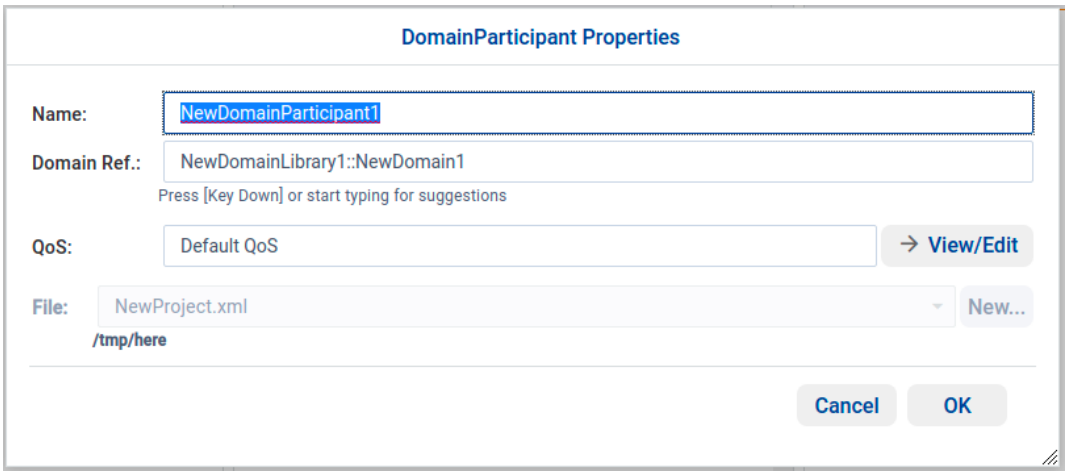


You can then add a Participant to the newly created Library by using the 

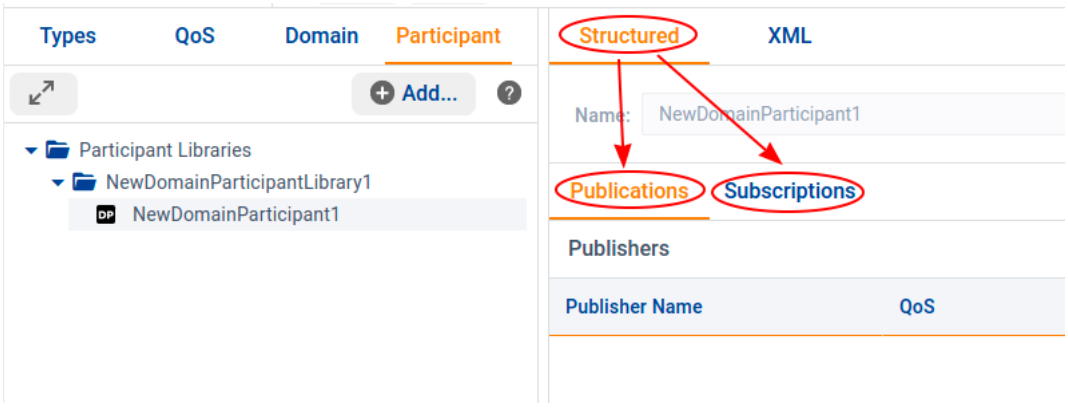
button or by right-clicking on the Participant Library in the tree and selecting **Add Participant**:



A dialog will guide you to pick a name and select one of the existing domains as the Domain Reference. You can also view and edit the QoS and select a file where the new participant will be stored:

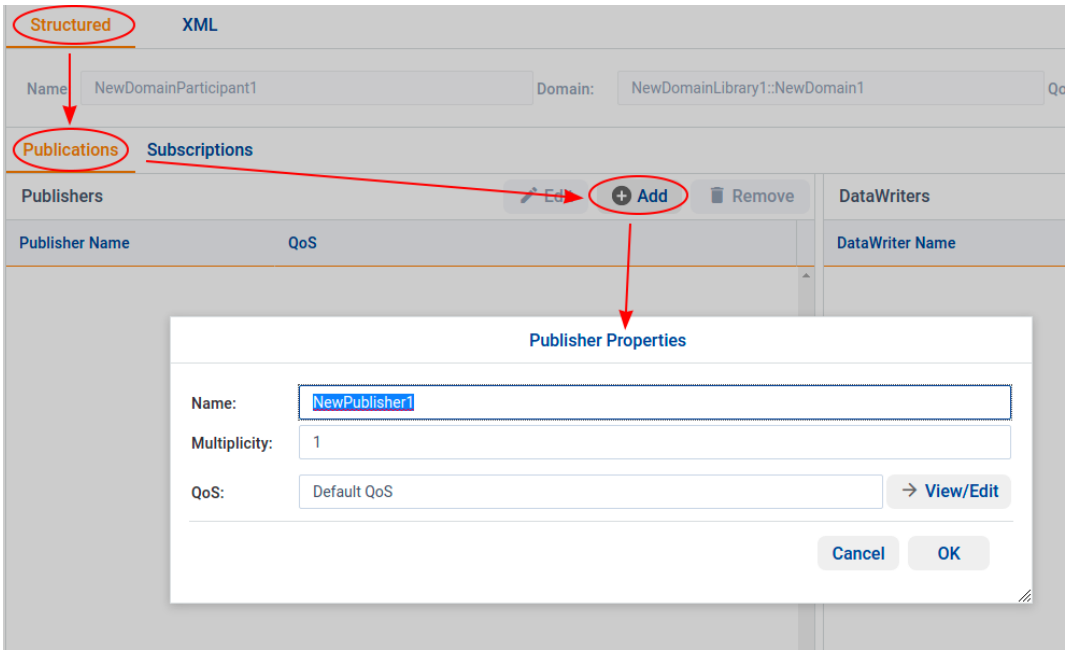


Now you can configure Publications and Subscriptions in the structured view:

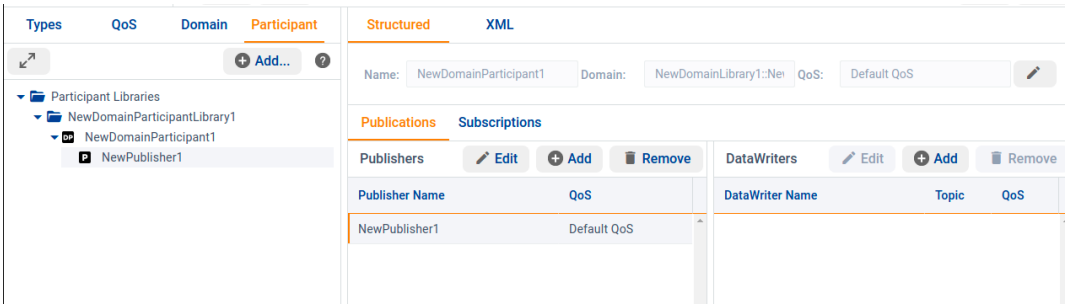


To add a new Publisher, select the

button in the Publishers table. You can then select Name, Multiplicity, and QoS Policies in the presented dialog:

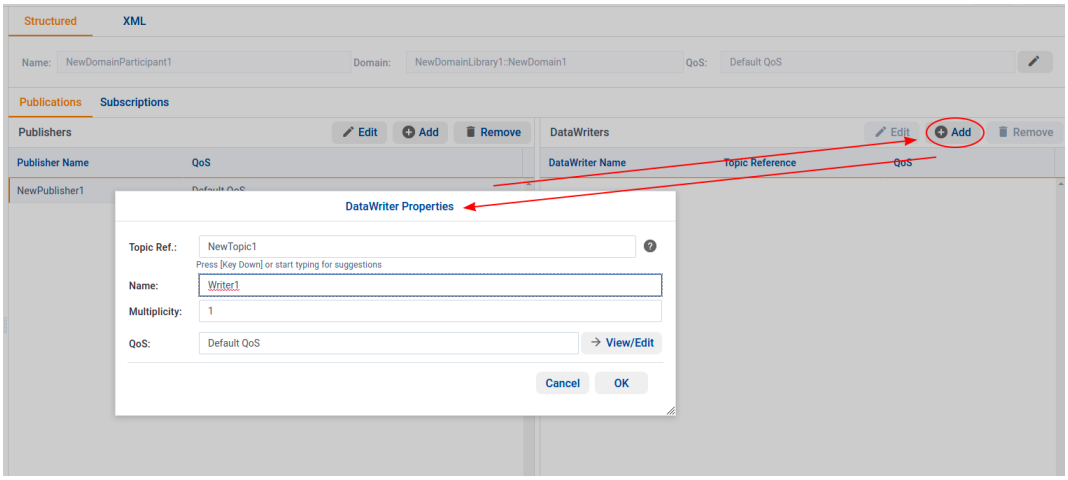


Once you click **OK**, the new Publisher will be available in the Structured view and in the tree on the left:



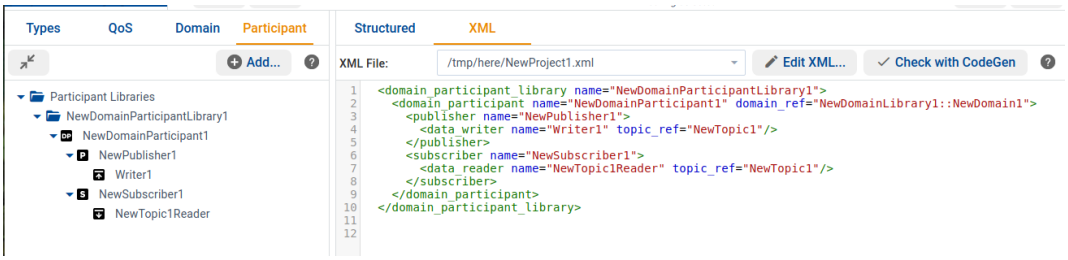
Now you can add DataWriters to the selected Publisher. Use the

button and in the pop-up window, select the topic reference, the name of the DataWriter, Multiplicity, and QoS:



Follow the same logic to add Subscribers and DataReaders in the Subscriptions tab.

As always, you can see and modify the XML file directly in the XML view:



2.4.5 Using Fully Qualified Names when Referring to Objects

When referring to another type, you can either use the target data type without a namespace (in this case, the search will occur in the same module you are working on), or you must specify the full namespace of the target object. In particular, **partial namespace qualification is not supported because it is naturally ambiguous**.

For example, suppose you have this type (using IDL syntax):

```
module MyModule {
    module AnotherModule {
        struct BaseType {
            short x;
            short y;
        };
    }
}
```

Then suppose you want to create another structure inside `AnotherModule` that extends `BaseType`. You have two choices:

- Use just the name `BaseType` to specify the base class
- Use the fully qualified name `MyModule::AnotherModule::BaseType`

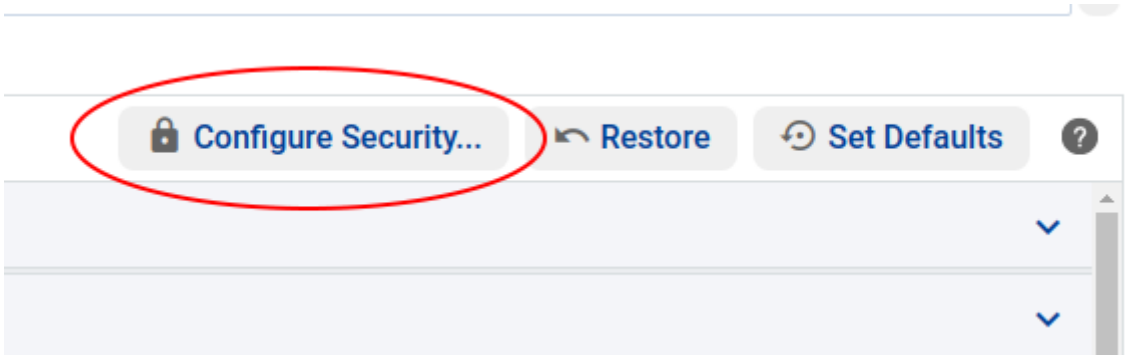
System Designer does not accept partial qualification, such as `AnotherModule::BaseType`, because it is ambiguous.

2.4.6 Configuring Security Plugins

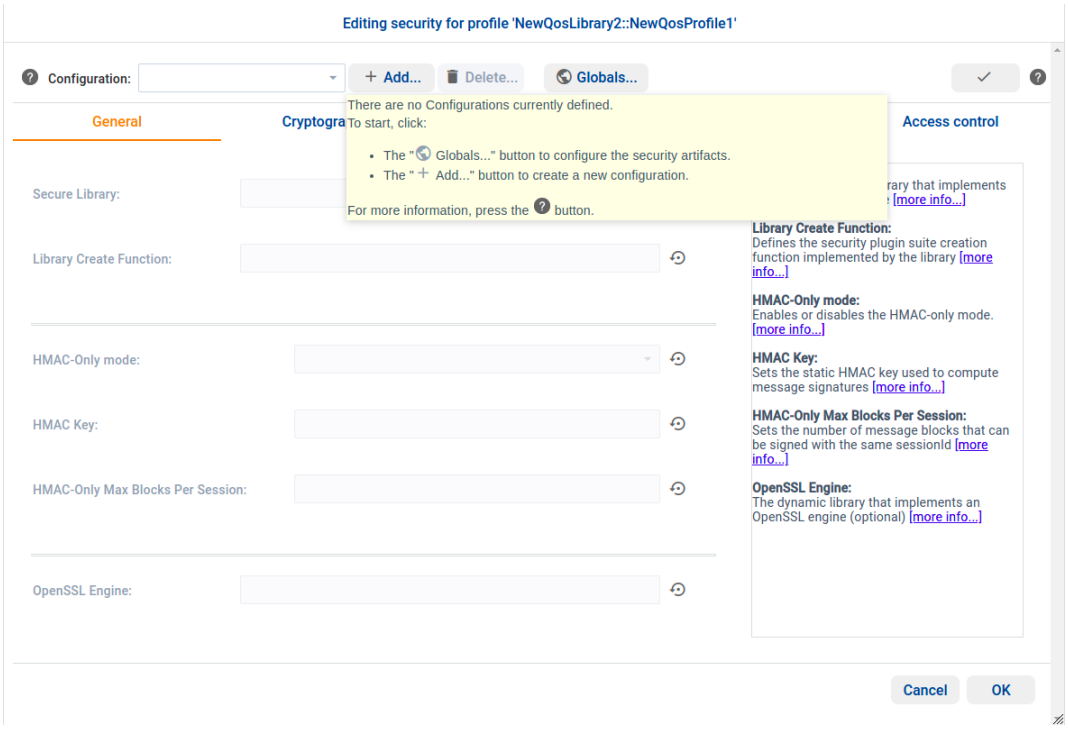
The QoS tab also allows you to configure the *Security Plugins* of a *DomainParticipant*'s QoS.

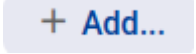
Click

in a *DomainParticipant*'s QoS.



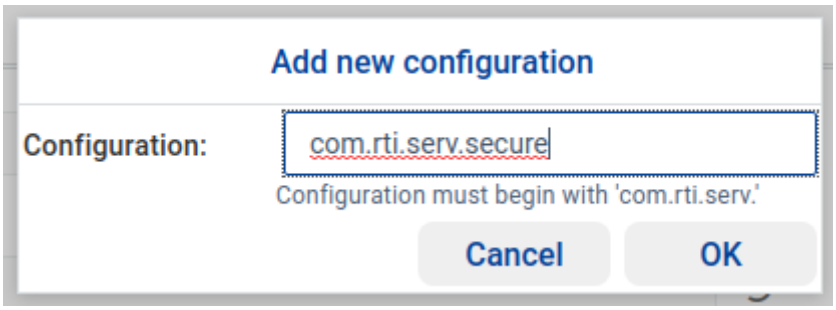
A new dialog appears that will guide you through configuring the *Security Plugins* on the selected *DomainParticipant*'s QoSs.



First, you will be asked to add a new configuration. Click 

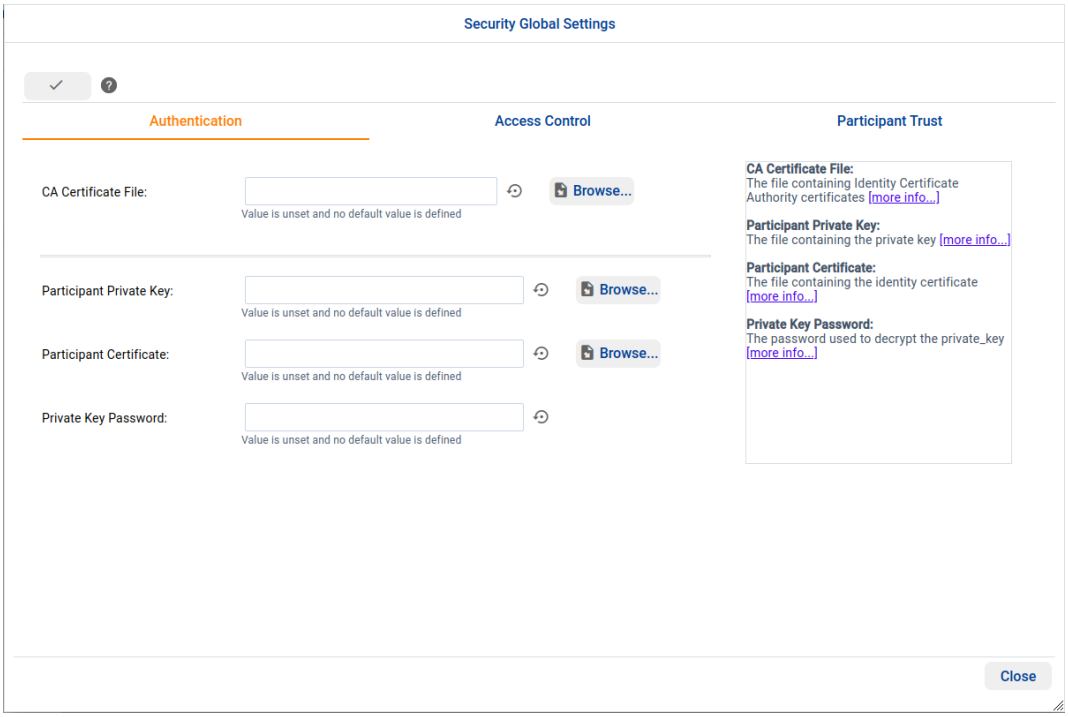
and add the name your security

configuration is going to use.

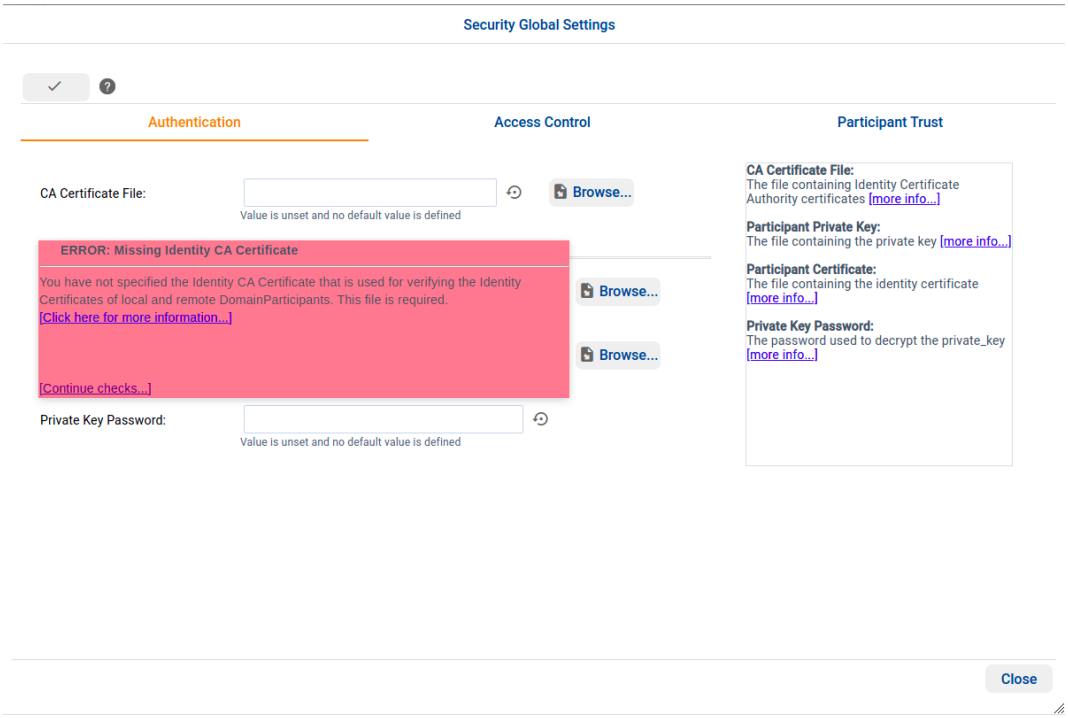


Once the configuration has been added, start configuring the security properties for your newly created configuration.

Apart from allowing you to change specific security properties associated with each configuration, *System Designer* can also be used to configure security properties that are not bound to a specific configuration. These properties can be configured by clicking on Globals... . The following dialog will open, allowing you to configure global properties such as Authentication and Access Control.



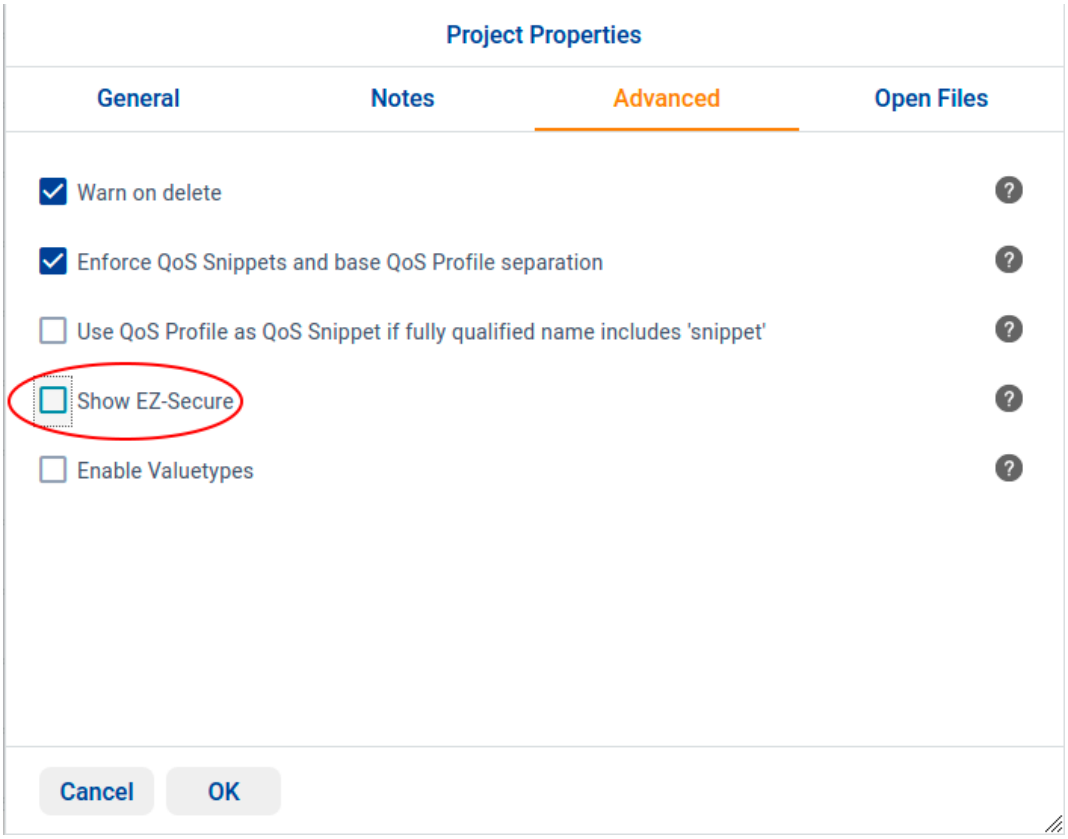
Tip: The dialogs shown above can be used to check whether the security configuration is valid. To validate the configuration, click .



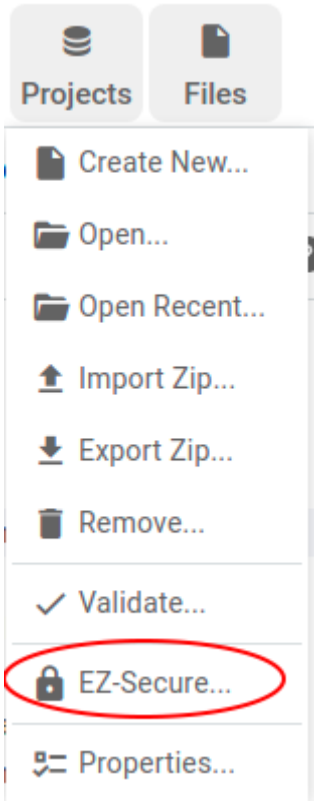
For more information on *Security Plugins*, see the RTI Security Plugins User's Manual.

2.4.7 EZ-Secure

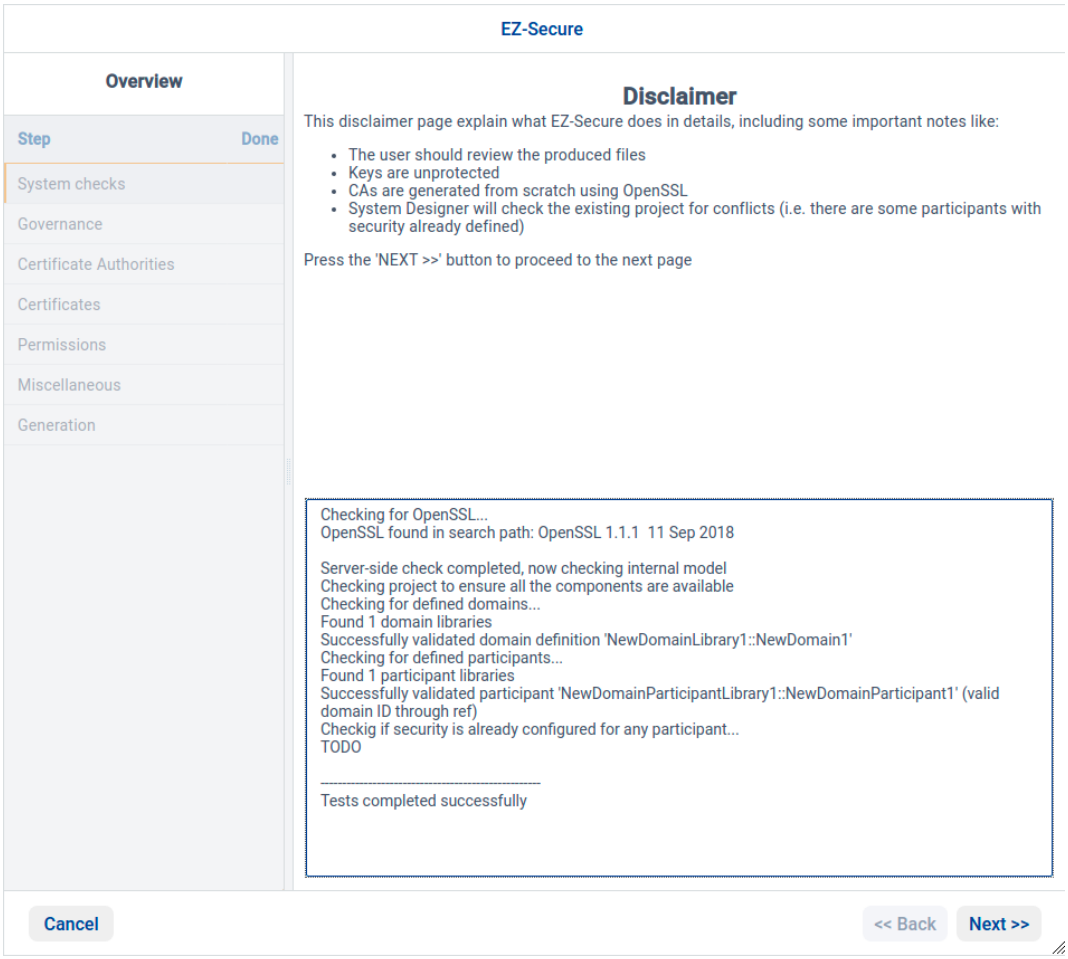
EZ-Secure is an experimental feature that can be used to automatically configure the *Security Plugins* settings. By default, it is disabled but can be enabled by selecting the *Show EZ-Secure* option in the Advanced Properties.



Once enabled, EZ-Secure will be shown in the Projects menu:



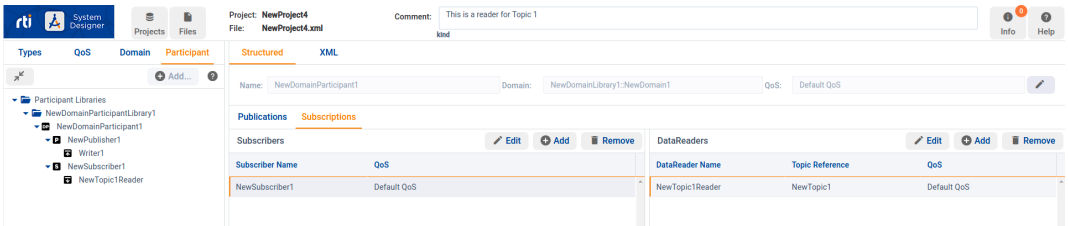
A dialog will guide you through configuring security and generating the certificates:



2.5 Toolbar

System Designer's toolbar:

- Allows you to manage your projects
- Allows you to handle existing XML files in your system
- Shows the name of the current project and last used XML file
- Has a box to add a comment to the selected XML object
- Shows general information and warnings via the Info button
- Has a Help menu



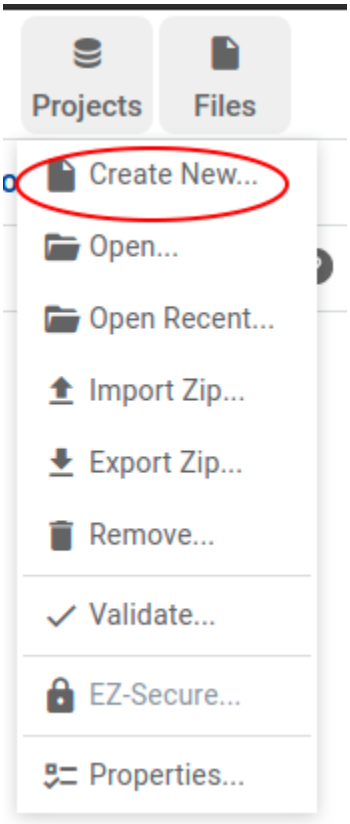
2.6 Project Management

The Projects menu in the toolbar helps you with all operations related to project management.

With this menu you can perform the actions described in the following sections.

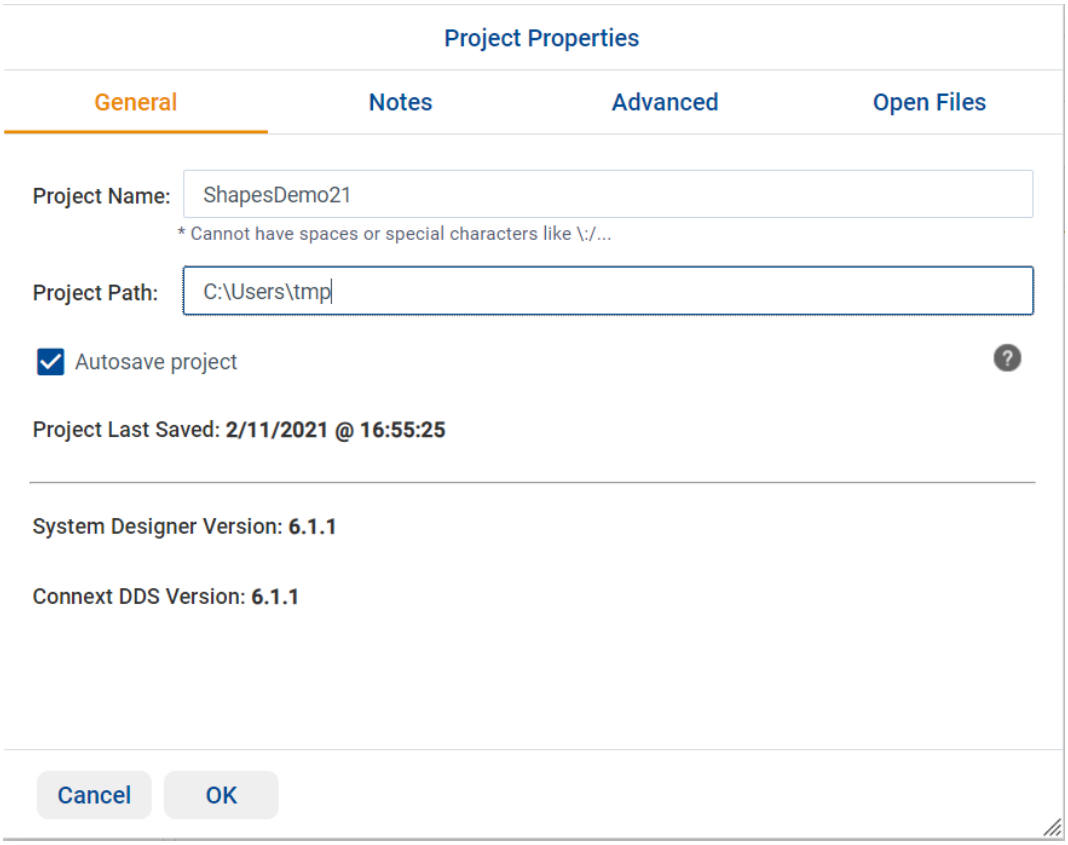
2.6.1 Create a New Project

To create a brand new project, select "Create New…" from the Projects Menu:



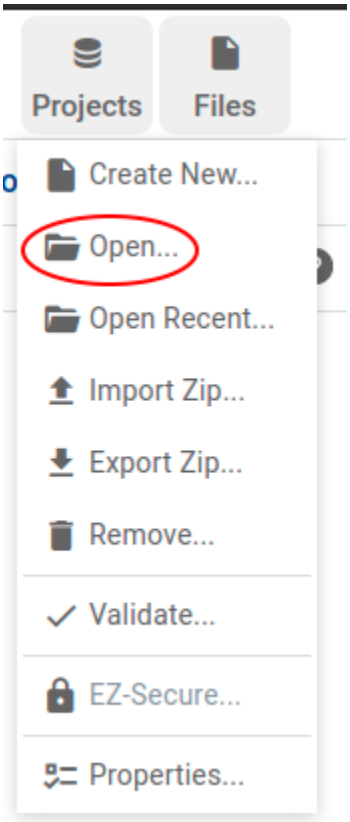
A pop-up will be presented where you can choose the name of the project and select where the project will be saved on your filesystem. You can select if you want to create an XML file now or load/create one later.

You can also choose to autosave the project, see information like the time and date of the last time the project was saved, and view the *System Designer* version and the *Connect DDS* version you are creating a file for.



2.6.2 Open an Existing Project

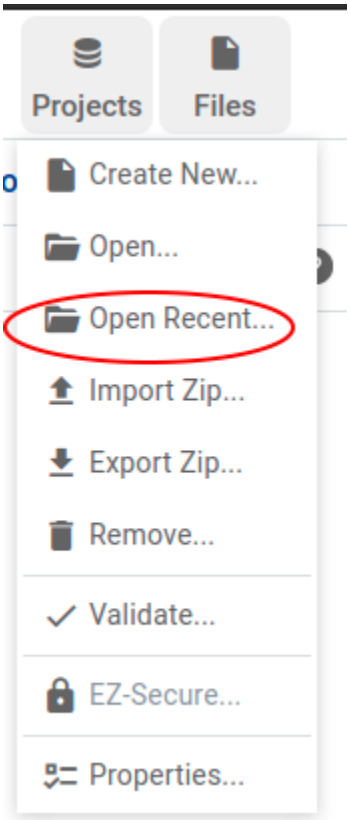
To open an existing project, select the **Open…** option in the Project menu:



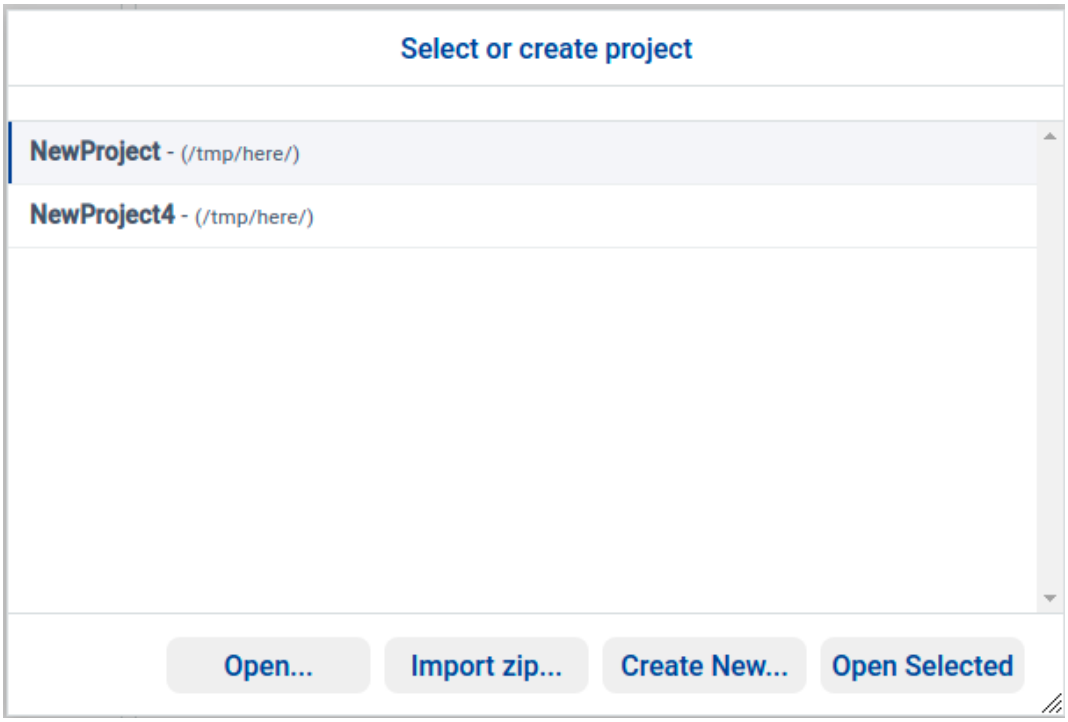
A file browser will be presented. You can use it to find your `.rtisdproj` file.

2.6.3 Open a Recent Project

To open a recent project, select **Open Recent** from the Projects Menu:

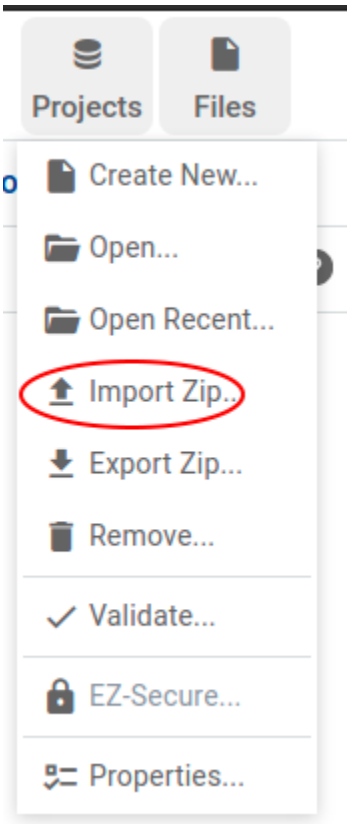


You will see a list of recently opened projects. Select one and click **Open Selected**:

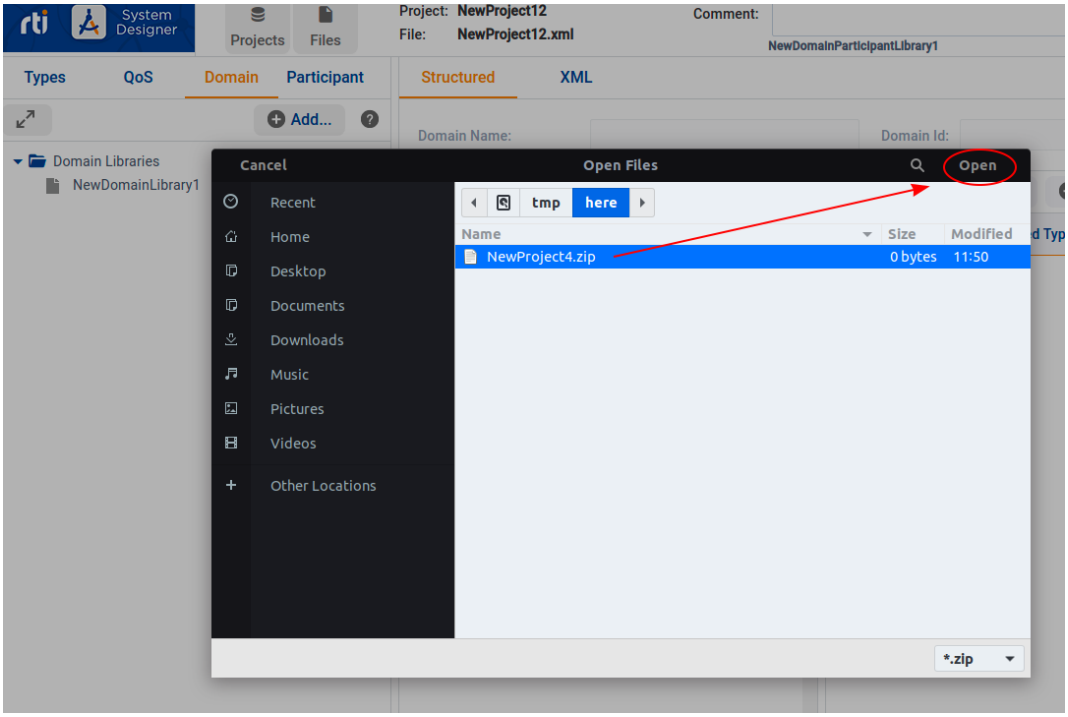


2.6.4 Import a Project from a Zip File

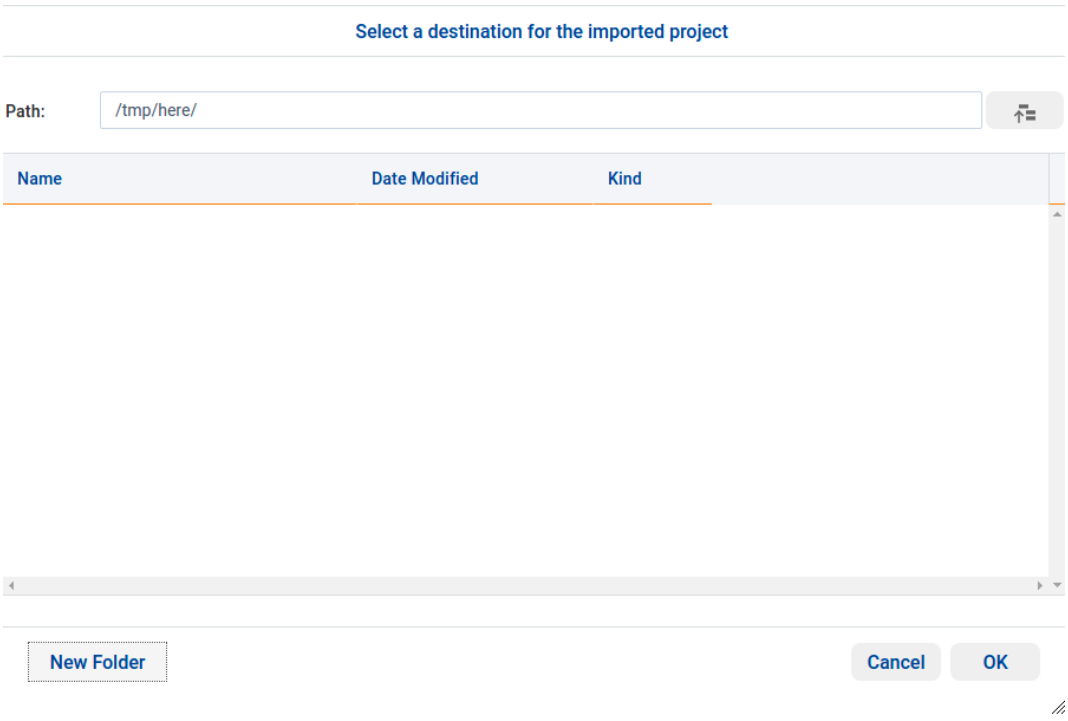
To import a project from a Zip file, select **Import Zip…** from the Projects menu:



Then use the file browser to find the Zip file:



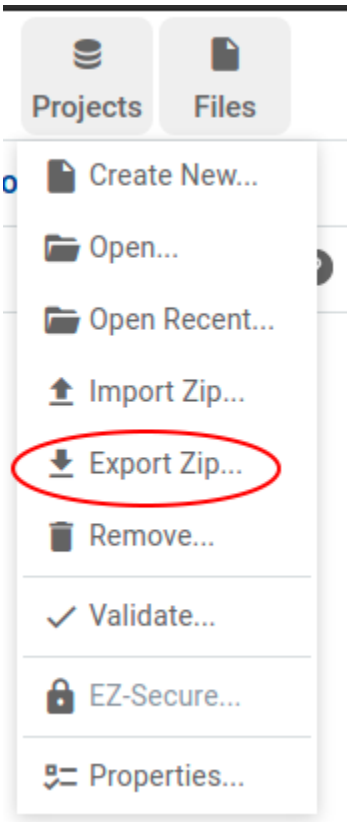
Once you find it, select and open the file. A new dialog will ask you to select a destination directory in which to unzip the file and save the imported project:



Press **OK** to import and open the project in *System Designer*.

2.6.5 Export a Project to a Zip File

To export a project to a Zip file, select **Export Zip…** from the Projects menu:

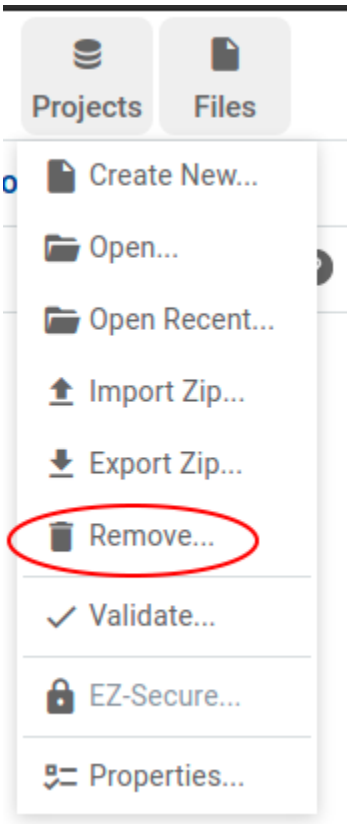


A Zip file will be downloaded in your default download directory. The Zip file will contain the project file and all the XML files used in that project.

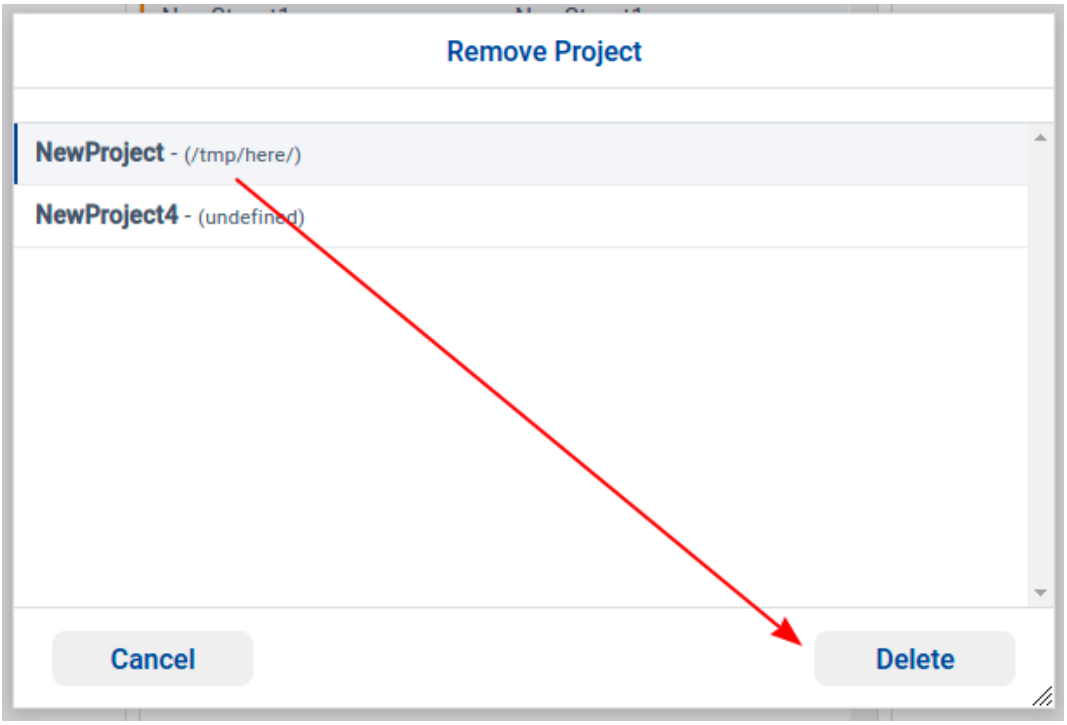
Note: Some browsers (such as Safari) automatically unzip the folder. Disable this behavior or zip the directory again for sharing.

2.6.6 Remove a Project from the List of Recent Projects

To remove a project from the list of recent projects, select **Remove…** from the Projects menu:



Then select the project you want to remove from the list and select **Delete**:

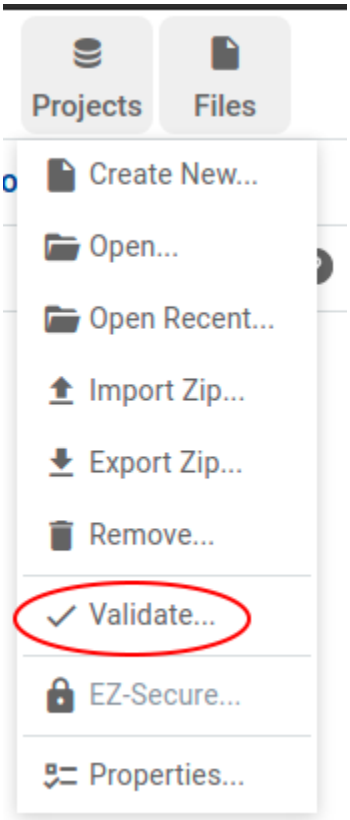


2.6.7 Validate Project

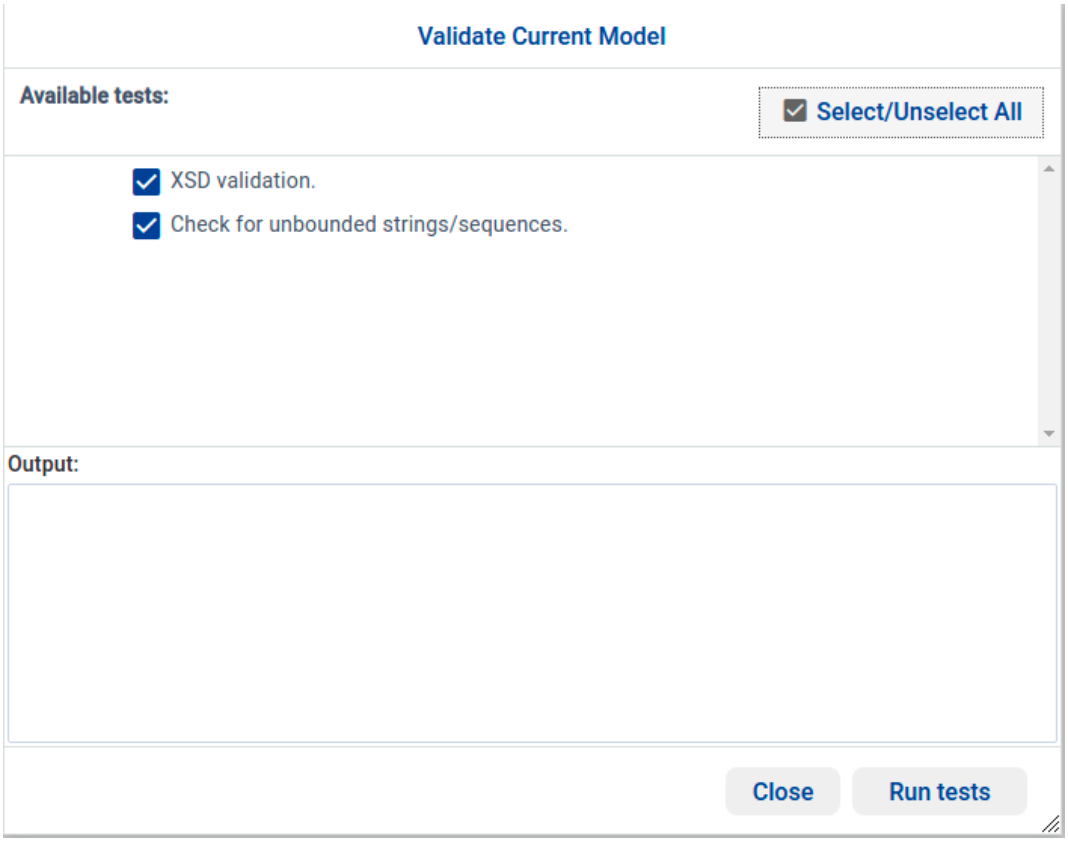
Two validation tests are currently available:

- **Validate XSD** This test uses the tool **xmllint**. The tool must already be installed; it is available for the major operating systems here: <http://xmlsoft.org/>.
- **Check for unbounded strings/sequences** This test looks in the current project to see if there are any data types that are being used (in Topics used by DataReaders or DataWriters) that use unbounded sequences or strings. If so, this test prints a warning reminding you of the limitations (and potential problems) of using unbounded sequences or strings. In future releases, *System Designer* will also analyze each Entity's QoS to ensure the required resources are correctly declared.

To validate a project, select **Validate…** from the Projects Menu.

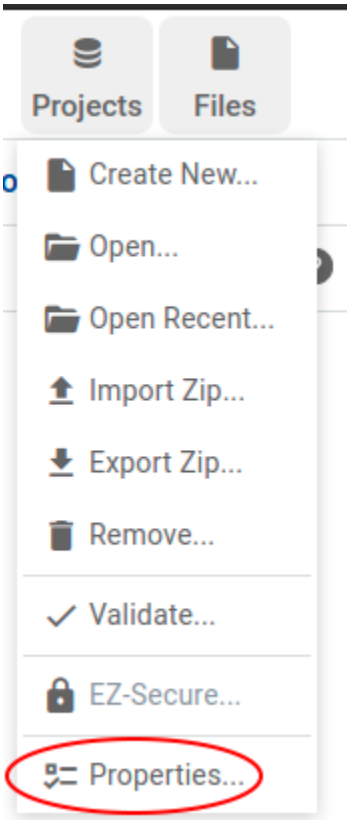


This will open a Validate dialog. You can run some or all of the available tests:



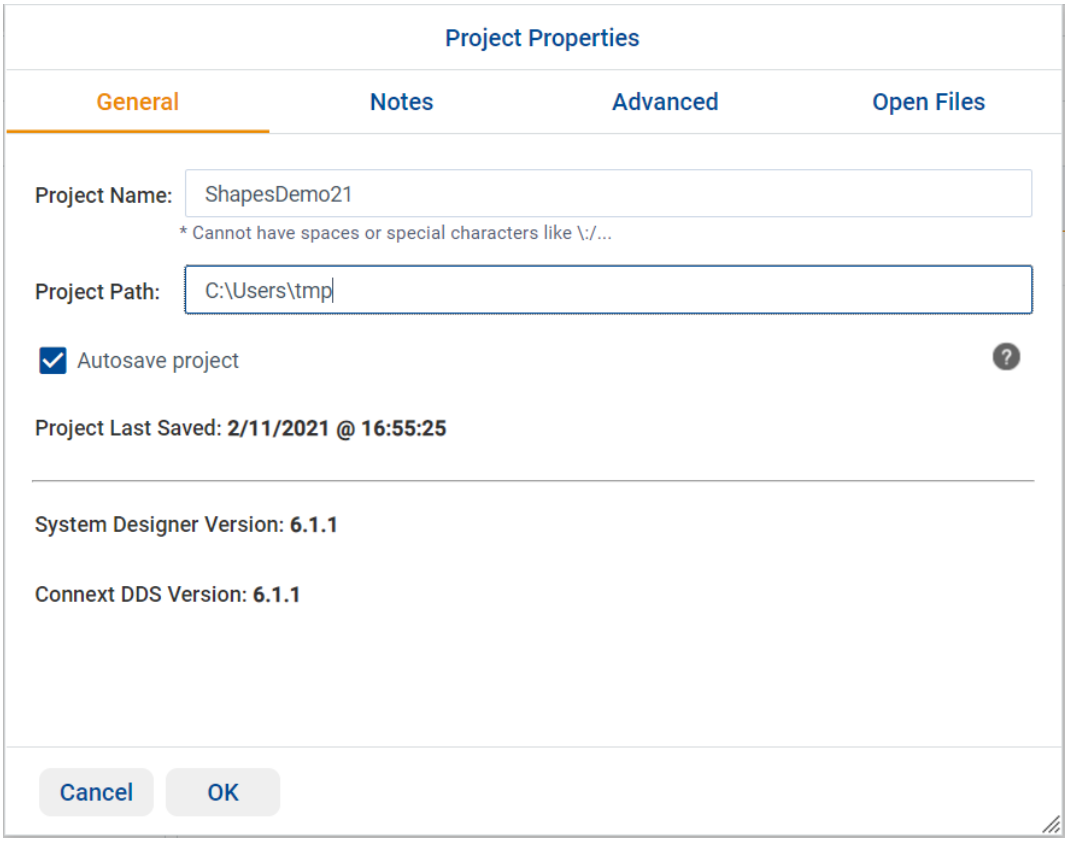
2.6.8 Project Properties

To see the properties of the current project, select Properties from the Projects menu:

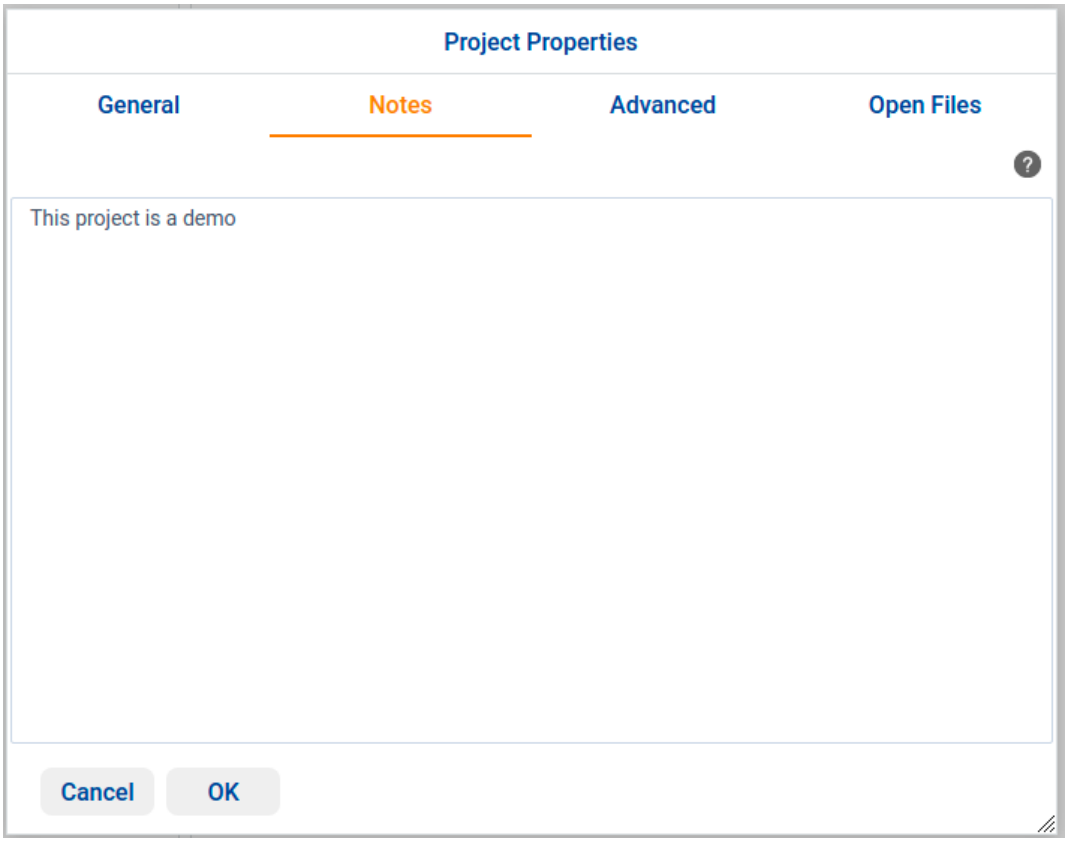


This will show a window with four tabs.

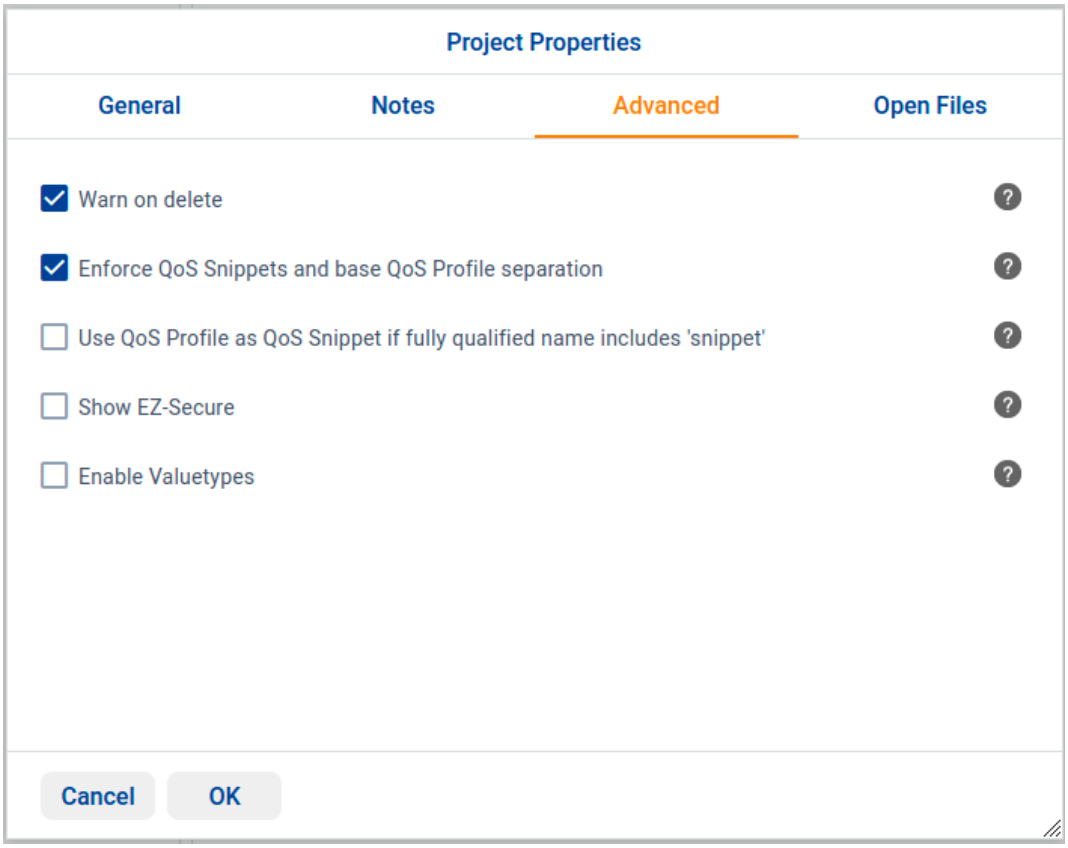
- The **General** tab shows the name of the project, where it is saved, if autosave is enabled or not, the last time the project was saved, and the *System Designer* and *Connext DDS* version numbers:



- The **Notes** tab allows you to add a free-form comment for the current project:

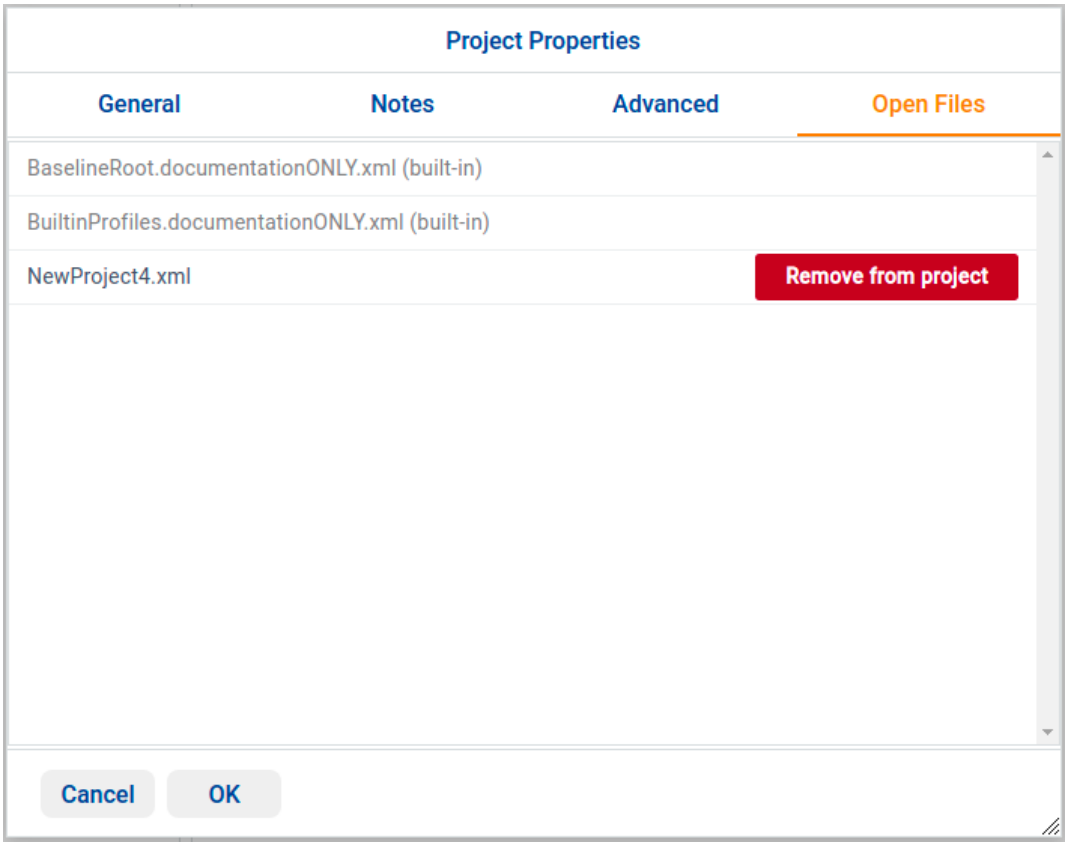


- The **Advanced** tab allows you to fine-tune some of *System Designer's* behavior.



Click for more details on each setting.

- The **Open Files** tab shows which files are in use:



2.7 External XML Files

The **Files** menu in the toolbar helps you with all operations relative to file management in the currently open project:

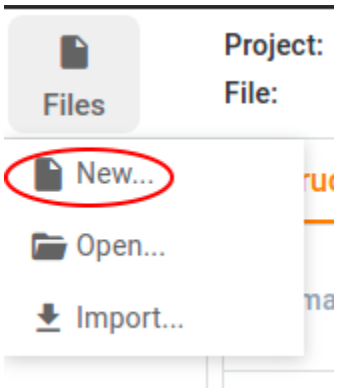
With this menu you can:

- Create a new XML file and add it to the project
- Open an existing XML file and add it to the project
- Import an existing XML file

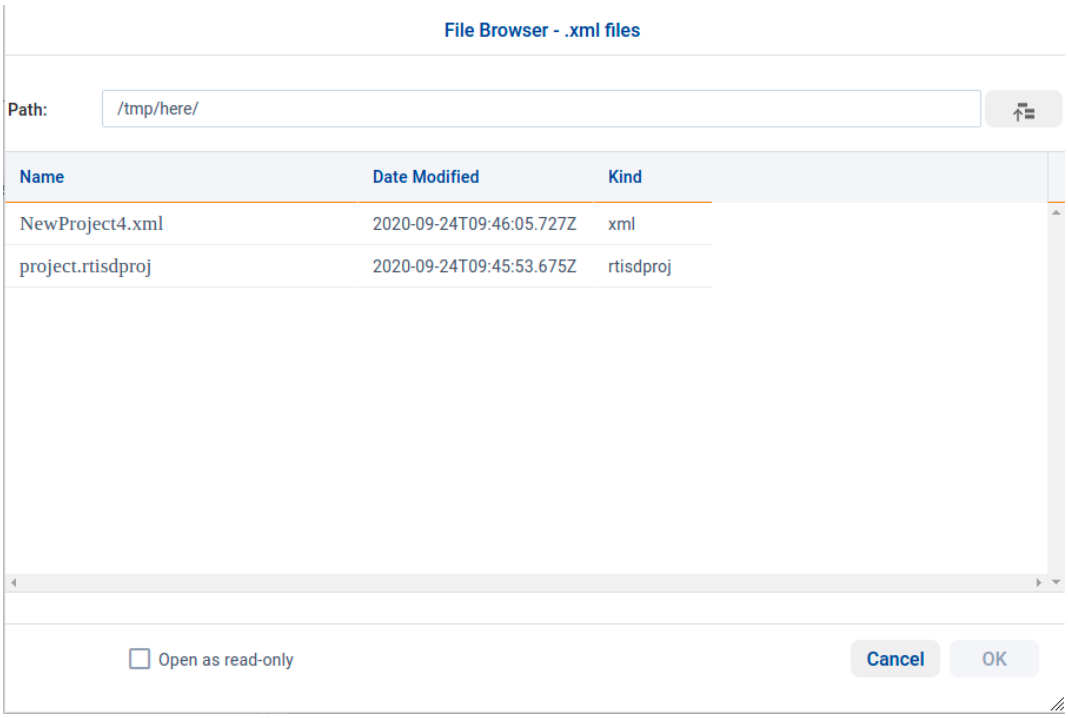
Note: Opening a file means that *System Designer* will be working (and modifying) that file directly. Importing a file helps you make a copy of that file. The original file will not be modified by *System Designer*.

2.7.1 Creating a New File

To create a new file and add it to the current project, select **New…** from the Files menu:

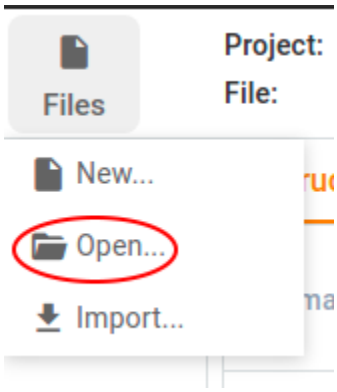


This will open a file browser to select a name and destination for the new file:



2.7.2 Open an Existing File

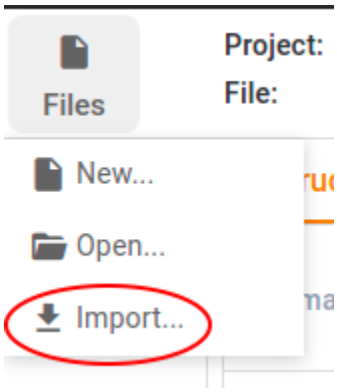
To open an existing file and add it to the current project, select **Open…** from the File menu:



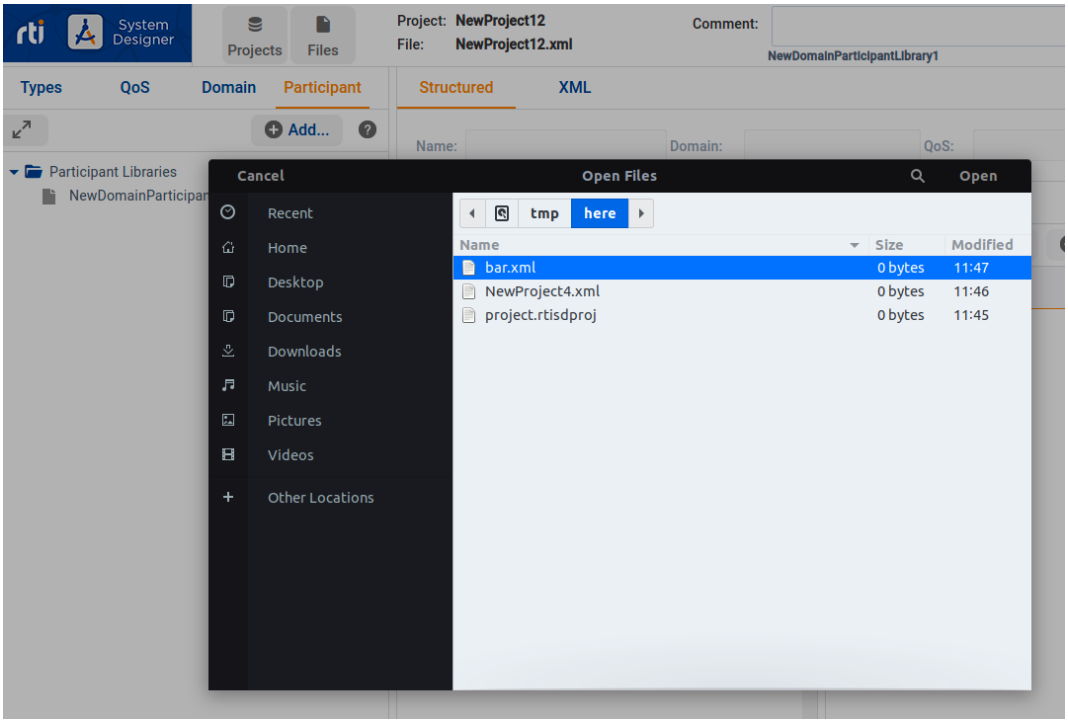
This will open a simple file browser to search for an XML file to add to the current project.

2.7.3 Import a File

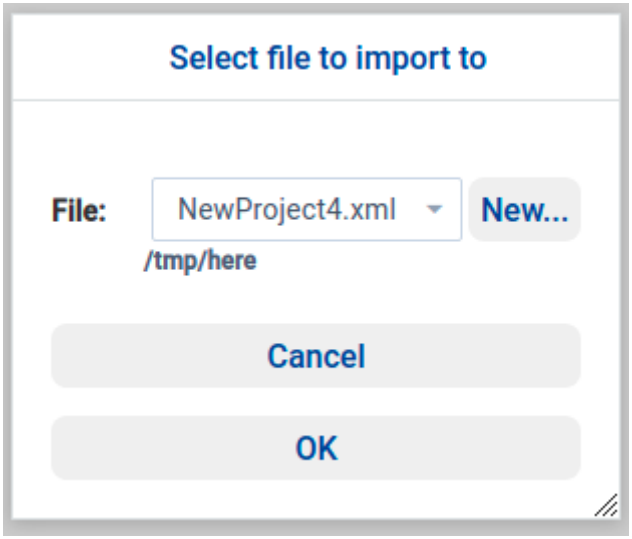
To import a file and add it to the current project, select **Import…** from the Files menu:



This will open two file browsers. The first one looks for an XML file to import:



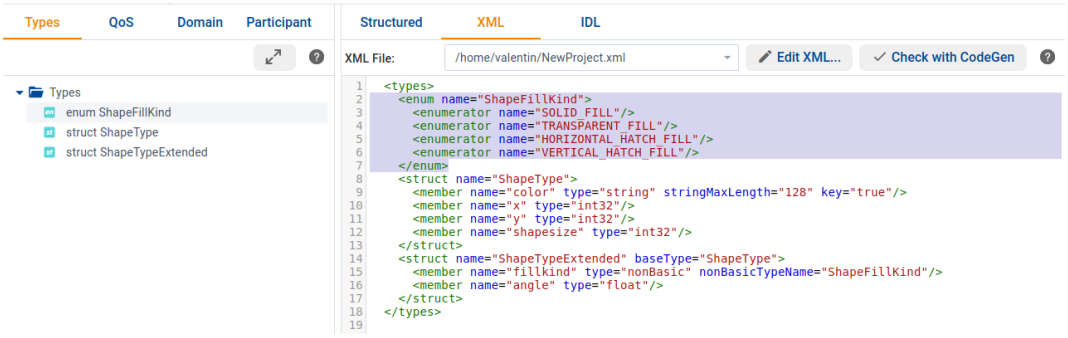
Once a file is selected, a second window lets you copy the content of the file into an existing XML file or create a new XML file with it:



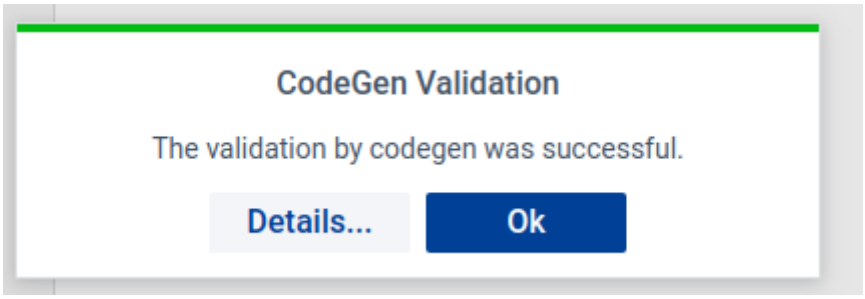
2.8 XML Validation

System Designer has an option to validate any XML against *Code Generator*. For example, you can see if the data type that you are defining is valid or not.

To validate the XML, select the XML view, select the XML file from the list of XML files used by the current project, then click the **Check with CodeGen** button.



Code Generator will generate code with the file that is selected in the XML File drop-down menu. The result of this operation will be shown once *Code Generator* finishes parsing the input file.



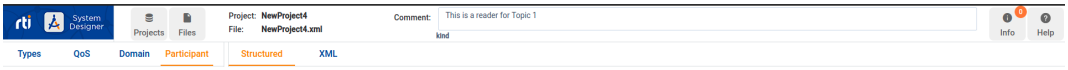
2.9 Online Help

When using the tool, you will often see a help icon: .

Click the icon to see online tips and understand what to do next.

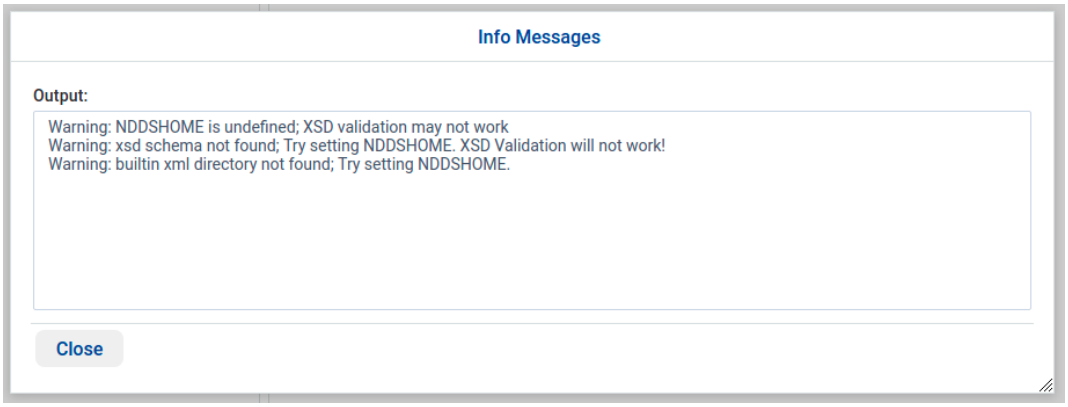
2.10 Info Dialog

This dialog can be accessed using the Info button on the far right of the toolbar:



The Orange badge indicates the number of unread messages; it is reset when the button is clicked.

Once clicked, you will see any Info Messages:



Chapter 3

Tutorials

This chapter describes several examples, all of which require a Project. You can create your own Project by following Section 2.2.

3.1 Defining Your Data Type

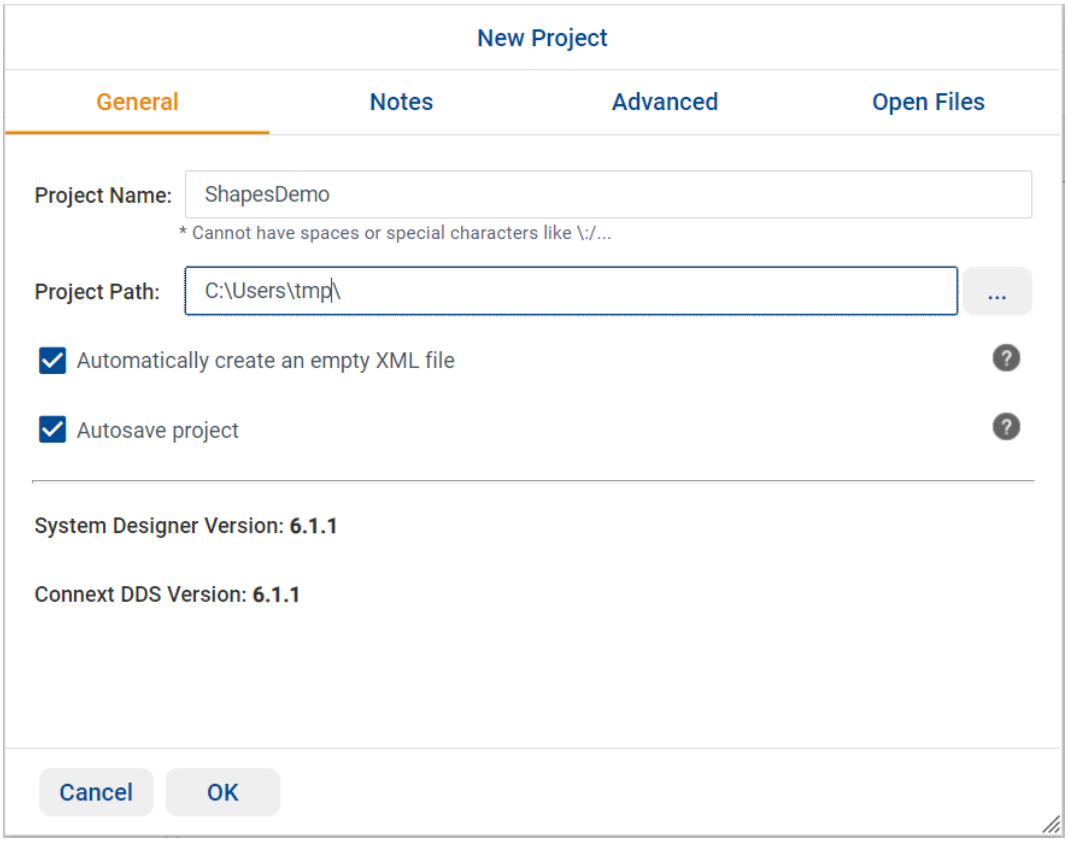
This example shows how to define your own data type using *System Designer*. In this example, we are going to create the ShapeTypeExtended data type used by the Shapes Demo:

```
enum ShapeFillKind {
    SOLID_FILL,
    TRANSPARENT_FILL,
    HORIZONTAL_HATCH_FILL,
    VERTICAL_HATCH_FILL
};

struct ShapeType
{
    string<128> color; //@key
    long x;
    long y;
    long shapesize;
};//@Extensibility EXTENSIBLE_EXTENSIBILITY

struct ShapeTypeExtended : ShapeType {
    ShapeFillKind fillKind;
    float angle;
};//@Extensibility EXTENSIBLE_EXTENSIBILITY
```

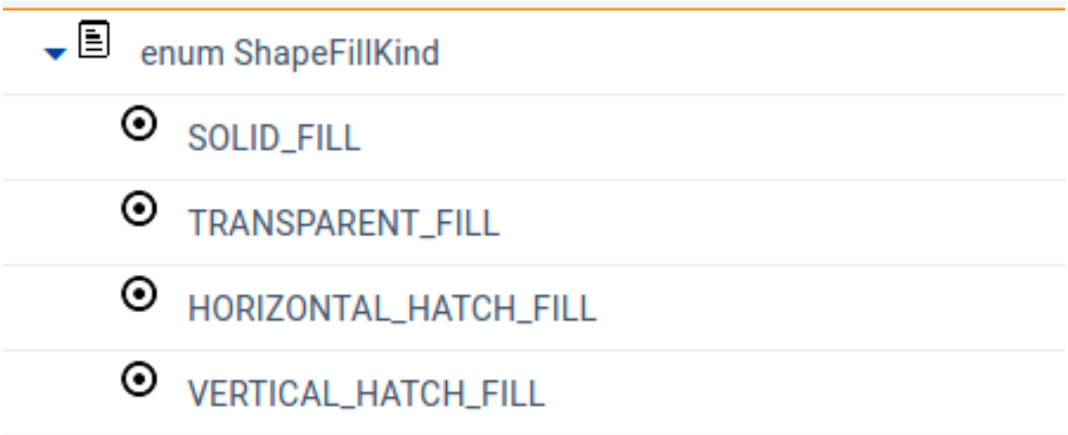
1. Create a new project (see Section 2.2), name it ShapesDemo, and click OK.



2. Go to the Types View. By default it should be the first view shown by *System Designer*.

3. Add an enumeration by right-clicking on Types and selecting **Add Enumeration…** Name your enumeration 'ShapeFillKind' and click OK.

4. Right-click on the recently created enum and select **Add Member…** to start adding each one of the following four enumerator value names: SOLID_FILL, TRANSPARENT_FILL, HORIZONTAL_HATCH_FILL, and VERTICAL_HATCH_FILL. You can leave the Value blank and @default_literal unchecked.



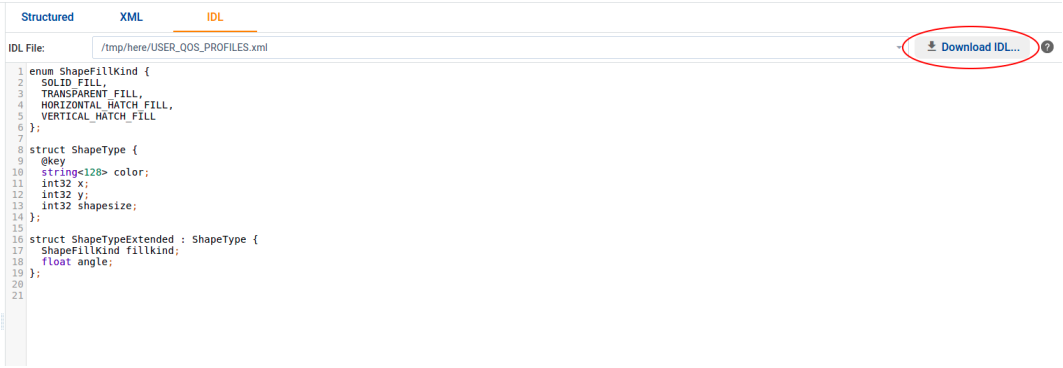
5. Create a struct and name it 'ShapeType' by right-clicking on Types and selecting **Add Struct…** Se-

lect APPENDABLE as its @extensibility value and click OK. Fill the struct, adding each member by right-clicking on the struct and selecting **Add Member…**:

- Add a bounded (128) string named 'color'. This element will be the key of our type, so select the @key checkbox. (You can accept the other defaults in this window.)
- Add three longs named 'x', 'y' and 'shapesize'. Although 'long' is not in the list of suggestions for the Type field, you can type it in. Or use the newer int32 instead of long. See *Working with Types*.

6. Create a second struct and name it 'ShapeTypeExtended'. Choose ShapeType as its base type. Add its elements by right-clicking on the struct and selecting **Add Member…**:
   - Add a ShapeFillKind enumerator named 'fillKind'.
   - Add a float32 named 'angle'.

When the type definition is complete, you can download the IDL by clicking on the Download IDL button in the IDL view.



Now you have an IDL file to use to create your own Shapes Demo application.

3.2 Defining an XML Application Creation Configuration File

This example shows how to define an XML configuration file using *System Designer*. In this example, we are going to create the same configuration file used by the **hello_world_xml_dynamic** example.

For more information about XML-Based Application Creation, see the RTI Connext DDS Core Libraries XML-Based Application Creation Getting Started Guide.

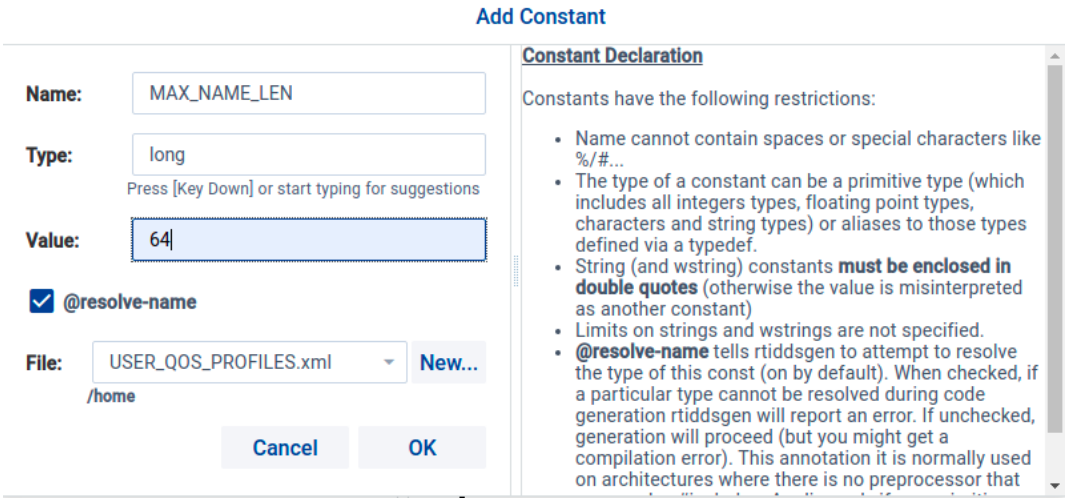
1. Create a new XML file inside the open Project by clicking the Files icon at the top and selecting **New…** You can use the same project as you used in the previous tutorial, or a new project. Name the file USER_QOS_PROFILES.xml. Click OK.

   Note: If you see a default XML file already associated with the project, that's because you kept the default selection, "Automatically create an empty XML file" when you created the project. You can still create USER_QOS_PROFILES.xml, it will not replace the default one.

2. Go to the Types View. By default it should be the first view shown by *System Designer*.

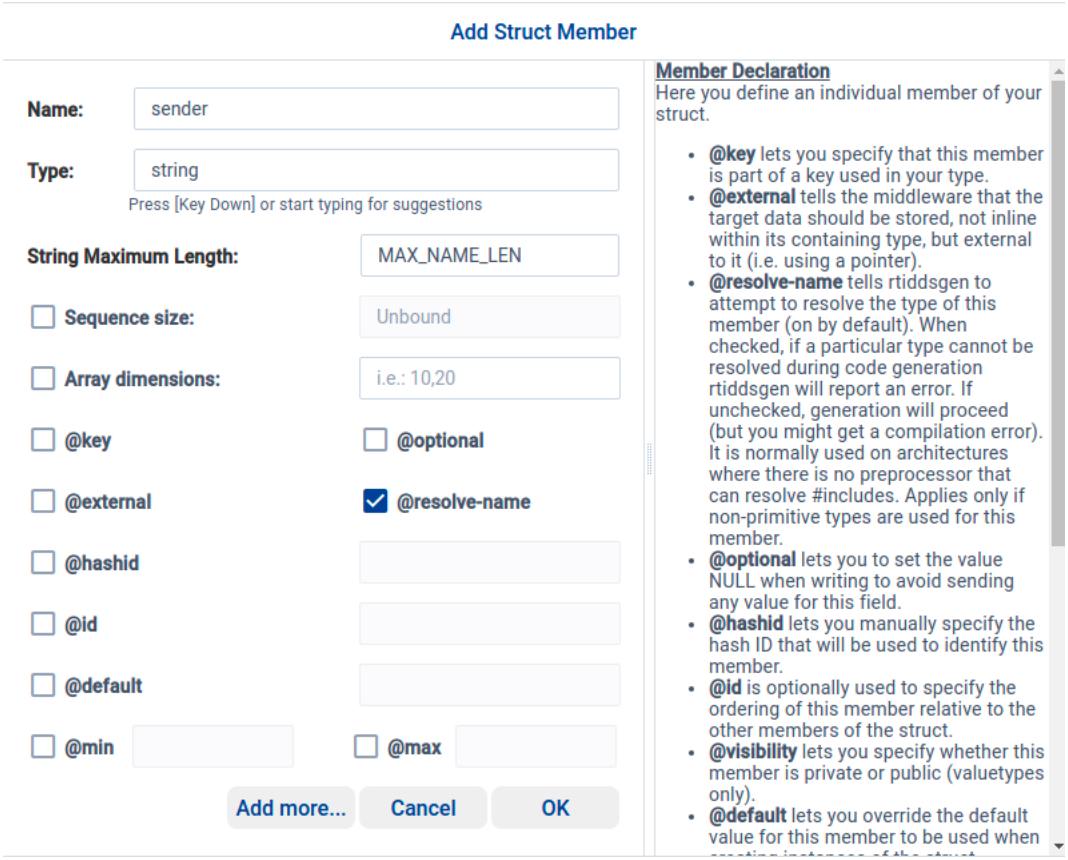
3. Add two constants (right-click Types > **Add Constant…**) as follows:

   - Name 'MAX_NAME_LEN', Type 'long', value 64, File USER_QOS_PROFILES.xml
   - Name 'MAX_MSG_LEN', Type 'long', value 128, File USER_QOS_PROFILES.xml



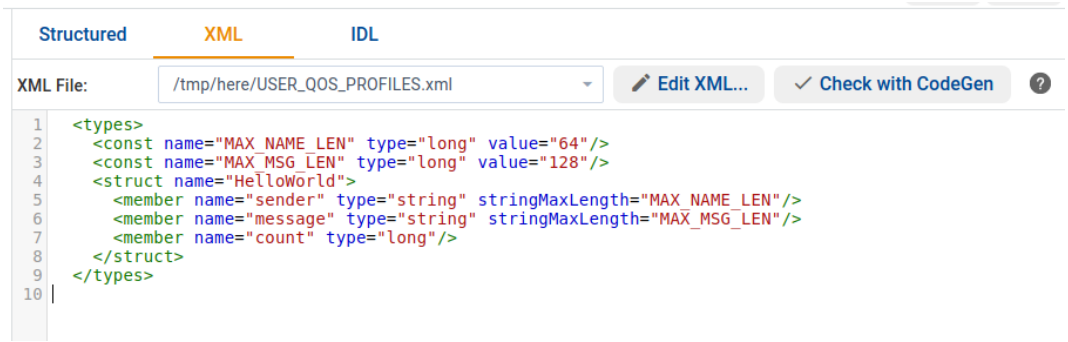
4. Create a struct (right-click Types > **Add Struct…**) and name it 'HelloWorld.' Fill the struct by adding each of the following members (right-click on the struct and select **Add Member…**):

   - Add a bounded string named 'sender' with a maximum length of MAX_NAME_LEN. (For this and the following members, you can accept the defaults in the window.)
   - Add a second bounded string named 'message' with a maximum length of MAX_MSG_LEN.



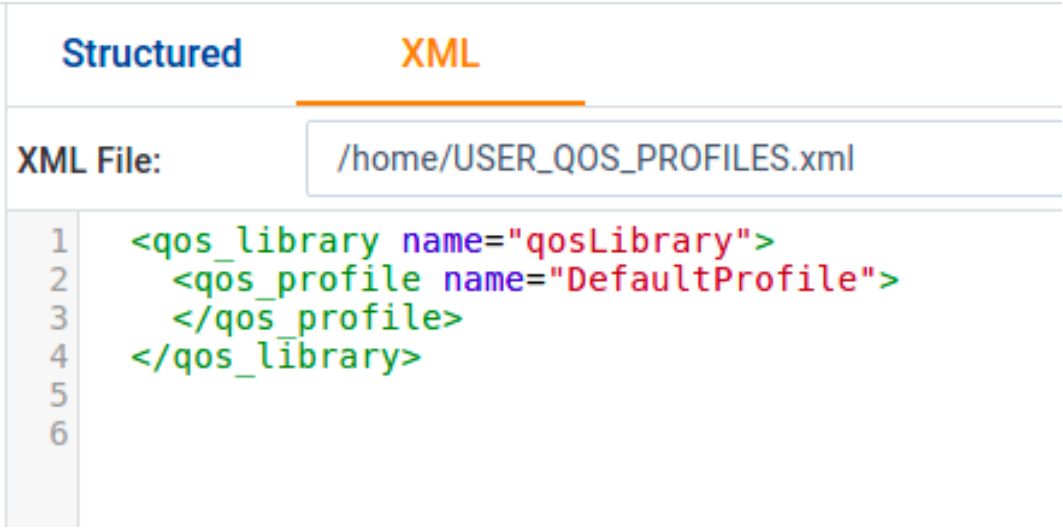
- Add a long named 'count'.

5. Click the XML view to view how your data type definition looks in XML:



6. Define the QoS that the application is going to use by clicking on the QoS view. Since we are creating the same XML file as the **hello_world_xml_dynamic** example has, to match the content of that file you only need to add a new QoS Library named 'qosLibrary' and a QoS Profile named 'DefaultProfile' inside the created libray. (You do not have to select any of the checkboxes.)

   In the XML view, your QoS Profile should look like this:

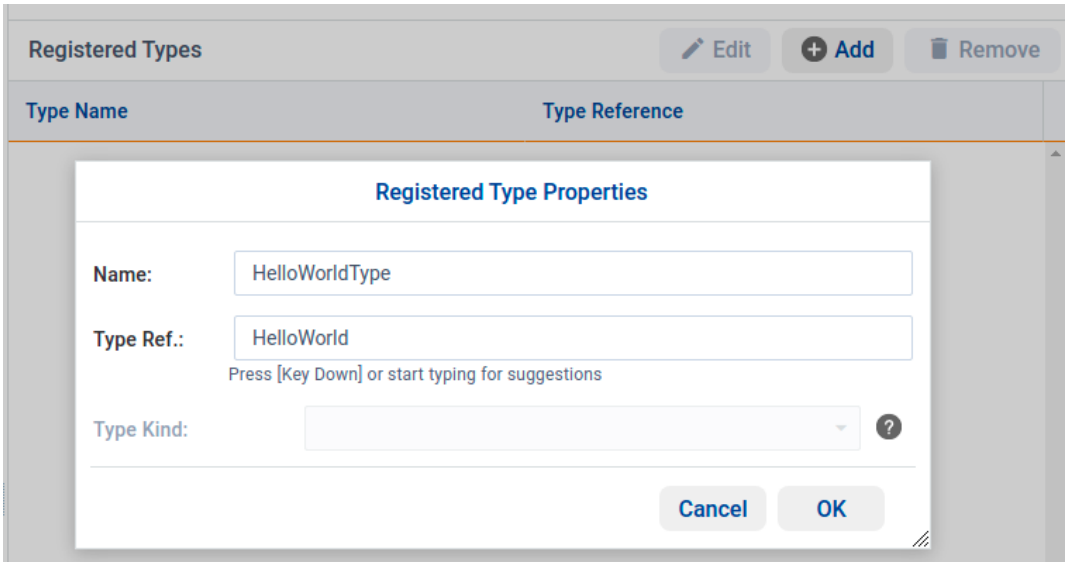


7. Now that the QoS has been defined, define the system's Topic and its corresponding data types, first by defining the Domain:

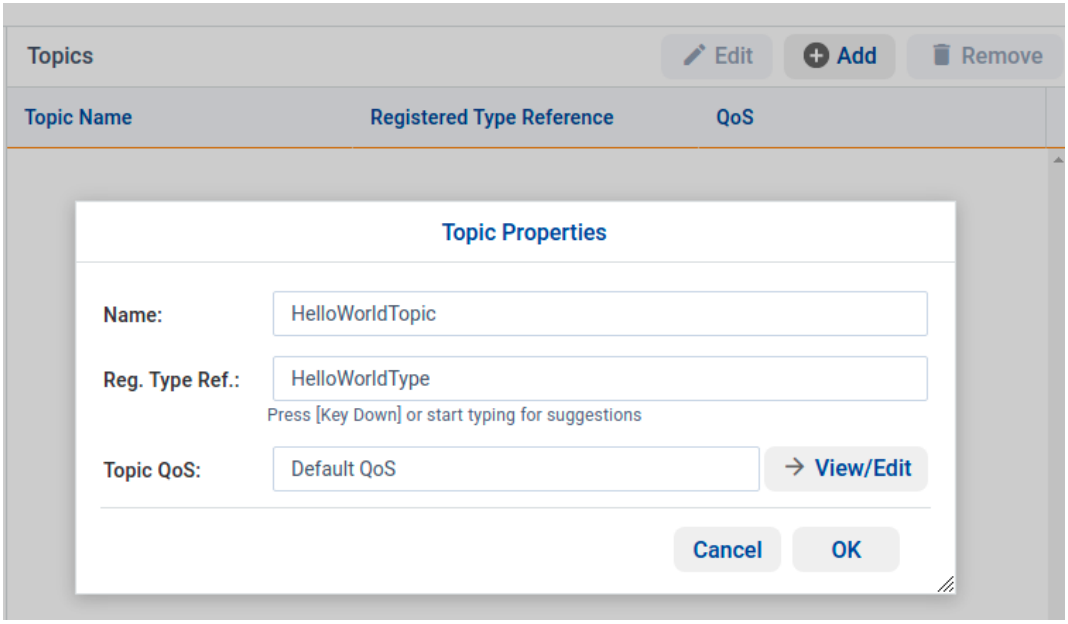
   - In the Domain view, right-click on Domain Libraries and select **Add Library**. Name your domain 'MyDomainLibrary' and click OK.

     Note: If your project contains more than one XML file, select the USER_QOS_PROFILES.xml file.

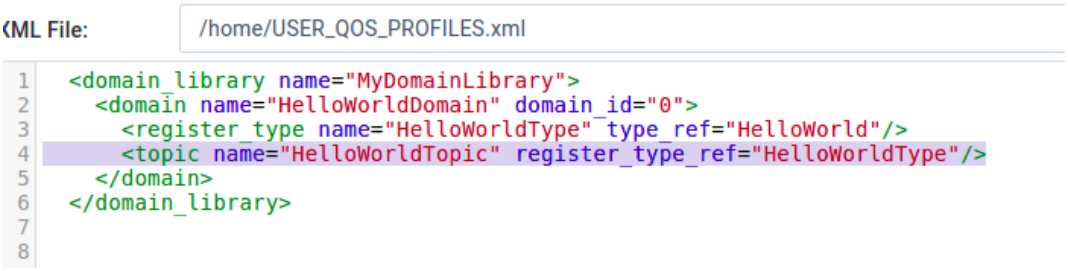
   - Add a domain to your library by right-clicking MyDomainLibrary and selecting **Add Domain**. Name it 'HelloWorldDomain,' entering 0 as its Domain Id.
   - Select HelloWorldDomain and click the **Add** button to add a registered type. Name the type 'HelloWorldType,' selecting the 'HelloWorld' struct that we created previously as its type reference.



- In the Topics panel, click the **Add** button to add a topic named 'HelloWorldTopic,' selecting the 'HelloWorldType' registered type as its registered type reference.



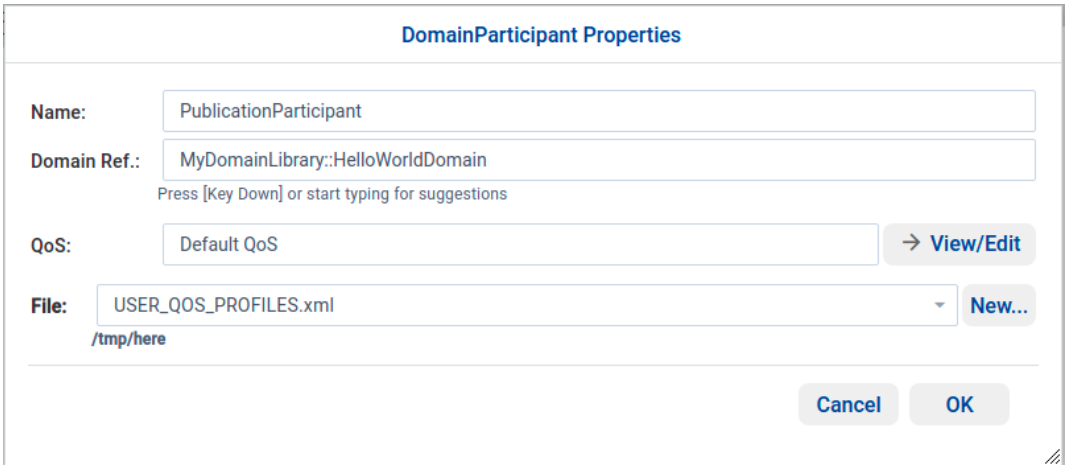
In the XML view, your domain configuration should look like this:



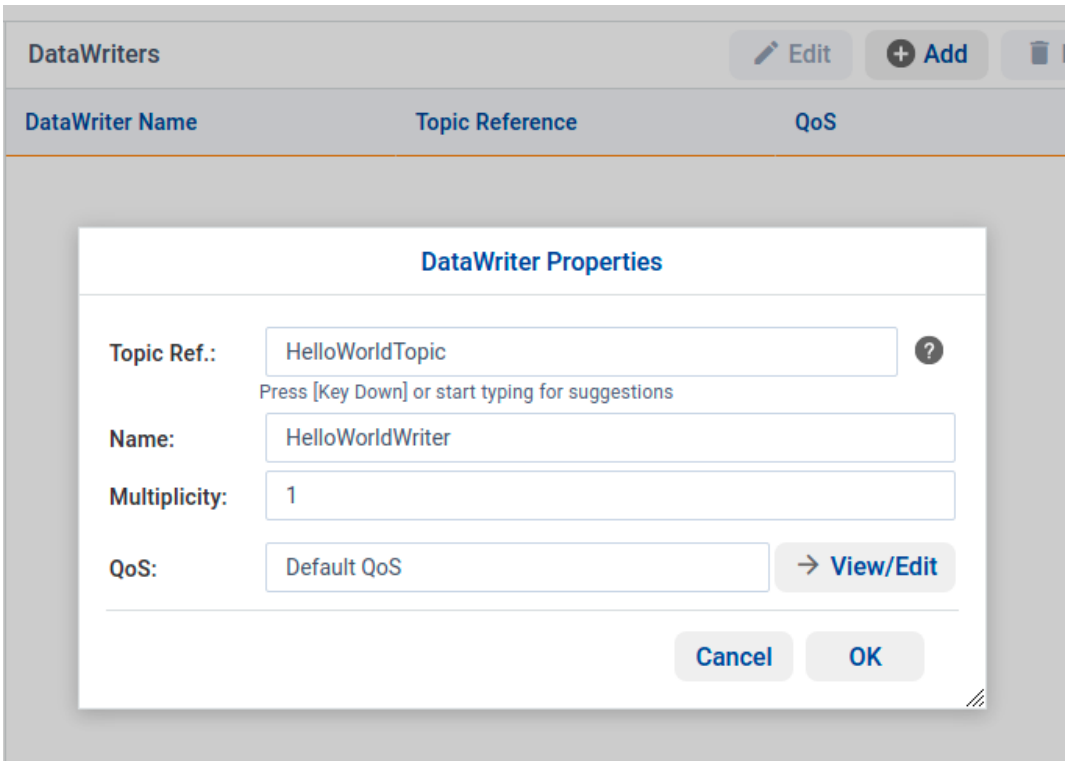
8. Define the elements that are going to be part of our system by clicking on the Participant view. In this example, we are going to create a simple application containing one DomainParticipant, one Publisher, one Subscriber, one DataReader, and one DataWriter.

   - Add a new Participant Library, naming it 'MyParticipantLibrary.' Add a Participant inside that library named 'PublicationParticipant,' selecting the previously created 'MyDomainLibrary::HelloWorldDomain' as its domain reference.

Note: If your project contains more than one XML file, select the USER_QOS_PROFILES.xml file.

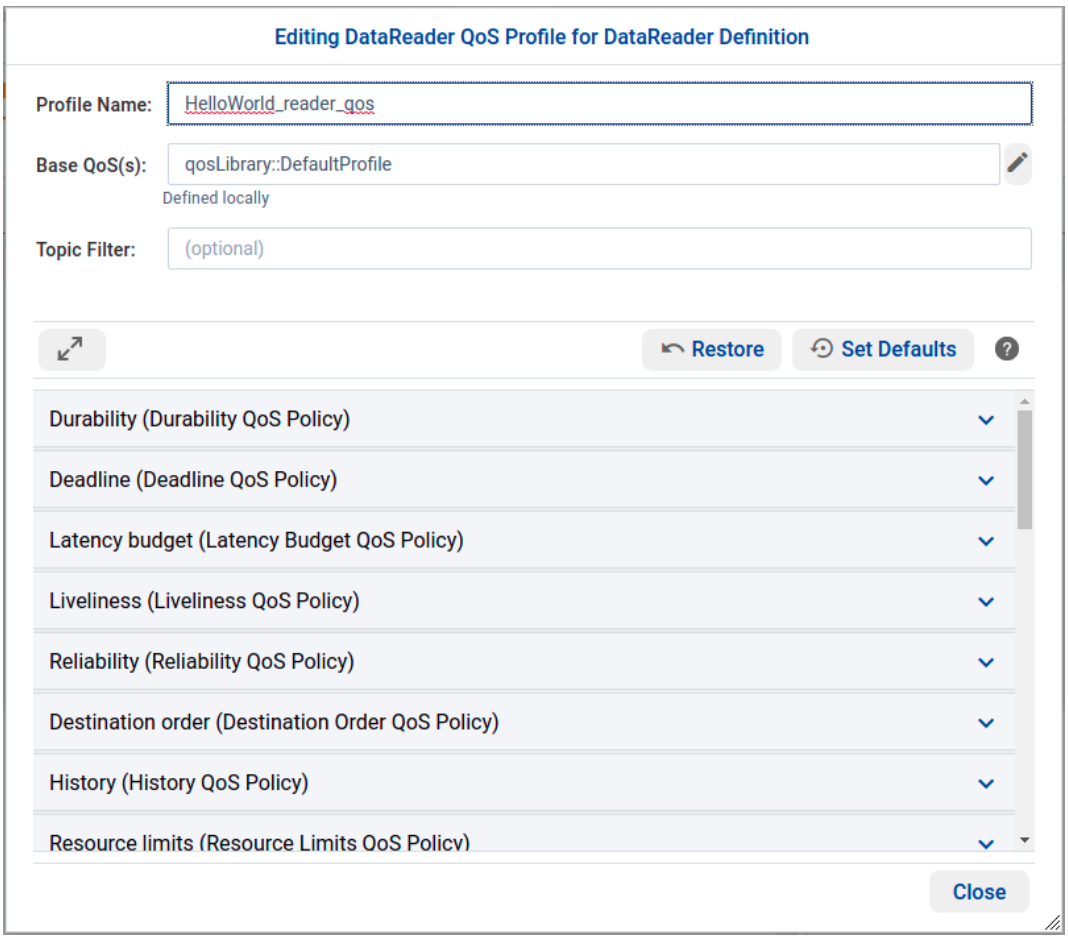


- Click the **Add** button to add a publisher named 'MyPublisher.'
- Click the **Add** button to add a DataWriter named 'HelloWorldWriter,' selecting 'HelloWorldTopic' as its topic reference.



- Add a second Participant inside that library named 'SubscriptionParticipant,' selecting the previously created 'MyDomainLibrary::HelloWorldDomain' as its domain reference.
- Click Subscriptions and add a subscriber named 'MySubscriber.'
- Add a DataReader named 'HelloWorldReader,' selecting 'HelloWorldTopic' as its topic reference. Unlike for the DataWriter, for the DataReader we are going to select the QoS profile that we created earlier, named DefaultProfile (in the Default QoS): click on View/Edit inside the DataReader dialog

and name the QoS Profile 'HelloWorld_reader_qos'. Select 'qosLibrary::DefaultProfile' as its Base QoS.



9. Your XML view should look like this:

```
<domain_participant_library name="MyParticipantLibrary">
  <domain_participant name="PublicationParticipant" domain_ref="MyDomainLibrary::HelloWorldDomain">
    <publisher name="MyPublisher">
      <data_writer name="HelloWorldWriter" topic_ref="HelloWorldTopic"/>
    </publisher>
  </domain_participant>
  <domain_participant name="SubscriptionParticipant" domain_ref="MyDomainLibrary::HelloWorldDomain">
    <subscriber name="MySubscriber">
      <data_reader name="HelloWorldReader" topic_ref="HelloWorldTopic">
        <datareader_qos name="HelloWorld_reader_qos" base_name="qosLibrary::DefaultProfile">
        </datareader_qos>
      </data_reader>
    </subscriber>
  </domain_participant>
</domain_participant_library>
```

You can use this XML file to define your *Connext DDS* system using XML-Based Application Creation.

Chapter 4

Release Notes

4.1 Supported Platforms and Browsers

System Designer 6.1.2 is compatible with *Connext DDS* 6.1.2. It is available for the following platforms.

Table 4.1: Supported Platforms

Operating System	Version and CPU	Browsers
Linux®	All Intel 64-bit Linux platforms listed in the *RTI Connext DDS Core Libraries Release Notes* with the same version number.	Tested on Ubuntu® 18.04 LTS only, with Chrome® version 77 and Firefox® version 69.
macOS®	All Intel 64-bit macOS platforms listed in the *RTI Connext DDS Core Libraries Release Notes* with the same version number.	Tested on macOS 10.14 only, with Chrome version 77, Firefox version 69 and Safari® version 12.
Windows®	All Intel 64-bit Windows platforms listed in the *RTI Connext DDS Core Libraries Release Notes* with the same version number.	Tested on Windows 10 only, with Chrome version 77 and Firefox version 69.

System Designer is not supported on POSIX-compliant architectures that end with "FACE_GP" or any custom-supported platforms.

System Designer works with these browsers:

- Chrome version 77
- Firefox version 69
- Safari version 12

4.2 Compatibility

For backward compatibility issues between *System Designer* 6.1.2 and previous releases, see the Migration Guide on the RTI Community Portal (https://community.rti.com/documentation).

4.3 What's New in 6.1.2

4.3.1 New platforms

System Designer is supported on these new platforms:

Table 4.2: New Platforms

Operating System	Version and CPU
Linux	Ubuntu 22.04 on x64
macOS	macOS 12 on x64
Windows	Windows 11 on x64 with Visual Studio 2022

For details on these platforms, see the *RTI Connext DDS Core Libraries Platform Notes* for this release.

4.3.2 Third-party software upgrades

The following third-party software change has occurred in *System Designer*:

Table 4.3: Third-Party Software Upgrade

Third-Party Software	Previous Version	Current Version
express-fileupload	1.2.1	1.4.0

This upgrade may fix potential vulnerabilities. See *Potential vulnerability: Possible crash when receiving a modified form*.

For information on third-party software used by *Connext DDS* products, see the "3rdPartySoftware" documents in your installation: `<NDDSHOME>/doc/manuals/connext_dds_professional/release_notes_3rdparty`.

4.4 What's Fixed in 6.1.2

4.4.1 Potential vulnerability: Possible crash when receiving a modified form

System Designer had a third-party dependency on express-fileupload version 1.2.1. This version had a dependency on dicer, which is known to be affected by a number of publicly disclosed vulnerabilities. These vulnerabilities have been fixed by upgrading express-fileupload to the latest stable version, 1.4.0.

For *System Designer*, the impacts of using express-fileupload 1.2.1 were:

- Exploitable through a malicious form sent to the *System Designer* server.
- The *System Designer* server could crash upon receiving the malicious form. A complete denial of service could be achieved by repeatedly sending the malicious form to the *System Designer* server.
- CVSS v3.1 Score: 7.5 HIGH
- CVSS v3.1 Vector: AV:N/AC:L/PR:N/UI:N/S:U/C:N/I:N/A:H

[RTI Issue ID SYSD-1029]

4.4.2 Renamed items were not updated in System Designer's UI

References to items were not updated in *System Designer* after the item was renamed. This caused *System Designer* to generate an invalid configuration file. This problem has been resolved. Now *System Designer* will automatically update all the references to the renamed item.

[RTI Issue ID SYSD-975]

4.5 Previous Releases

4.5.1 What's New in 6.1.1

Improved usability of the XML view

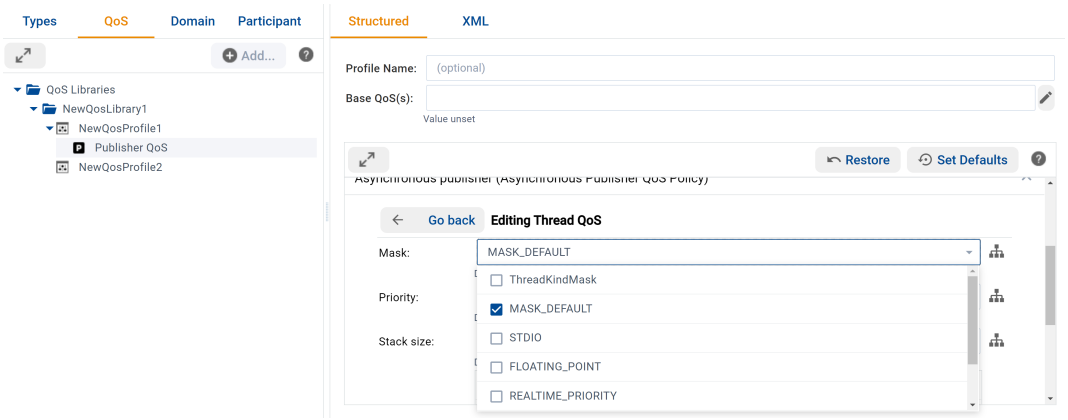
The following improvements have been made to the XML view:

- The "Codegen" button has been renamed "Check with Codegen," and a tooltip has been added to the button.
- When entering the XML view, if the project only contains one XML file, that file will be selected by default in the XML file dropdown box.

See *XML Validation* for information on the XML view.

Added sanity checks to mask multiselectors in QoS editor

QoS properties that are masks can be edited by selecting options from a multiselect dropdown. This dropdown has been modified so that you can no longer select nonsensical combinations of options, like MASK_ALL and MASK_NONE.



Changes to supported platforms

Validation of macOS 11 on x64 CPUs

This release has validated that the libraries for architecture x64Darwin17clang9.0 can also be used on macOS 11 (Big Sur) systems with x64 CPUs. For information on this platform, see the *RTI Connext DDS Core Libraries Platform Notes* for this release.

Ubuntu 16.04 LTS on x64 CPUs available on demand

Ubuntu 16.04 LTS on x64 CPUs (x64Linux3gcc5.4.0) is still supported, but now it is only available on demand. Please contact support@rti.com if you need to use this platform.

Third-party software upgrades

The following third-party software changes have occurred in *System Designer* in this release:

Table 4.4: Third-Party Changes

Third-Party Software	Previous Version	Current Version
nodejs®	10.16.3	10.24.1
shelljs	0.7.4	No longer used by *System Designer*
adm-zip	0.4.11	0.5.9
body-parser	1.15.0	1.19.1
express	4.13.4	4.17.2
express-session	1.13.0	1.17.2
fs-extra	9.1.0	10.0.0
mkdirp	1.0.3	1.0.4
open	8.0.4	8.4.0
sax	1.2.1	1.2.4
session-file-store	0.2.1	1.5.0
sprintf-js	1.0.0	1.1.2
sanitize-filename	1.6.0	1.6.3
webix-pro	7.2.0	9.1.4
Material Design Icons	5.8.55	6.5.95

For information on third-party software used by *Connext DDS* products, see the "3rdPartySoftware" documents in your installation: `<NDDSHOME>/doc/manuals/connext_dds_professional/release_notes_3rdparty`.

4.5.2 What's Fixed in 6.1.1

System Designer only allowed a single entity QoS to be configured inside of a QoS Profile

System Designer only allowed a single entity QoS to be configured inside of a QoS Profile. This problem has been resolved. Now, *System Designer* will allow the definition of multiple entity QoSes within a QoS Profile. Because of this change, the following improvements have been made to the inheritance logic:

- Use `topic_filters` and `topic_ref` when calculating which profile to inherit from. In previous releases, these fields were not taken into account.
- Enable *DataReader* QoSes and *DataWriter* QoSes to inherit from a *Topic* QoS. In previous releases, this inheritance was not supported.
- Fix an issue that prevented the Snippet profiles from being taken into account in some cases.
- Fix an issue that prevented *System Designer* from finding the parent QoS when the `base_name` contained the entity name.

As a result of these changes, duplicated tags are no longer supported. *System Designer* will report an error if a duplicate tag is found. For example, if the XML file contains two `<property>` tags inside a `<domain_participant_qos>` tag, *System Designer* will report the following error:

```
Duplicated tag: property in domain_participant_qos definition
```

System Designer only allows duplicated tags when defining an entity QoS inside a `qos_profile` or a `qos_library`.

System Designer's user interface has also been updated to display multiple entity QoSes instead of only one as in in previous releases.

[RTI Issue ID SYSD-304]

System Designer failed to run if content of session.json file was invalid

System Designer failed to run if the `session.json` file was corrupt—for example, empty. It failed with the following error:

```
Uncaught SyntaxError: Unexpected token < in JSON at position 0
    at JSON.parse (<anonymous>)
    at scenarioEditorReloadSessions (rti_sd.min.js:1)
    at Object.e.main (rti_sd.min.js:1)
    at rti_sd.min.js:1
```

This problem has been resolved. Now, *System Designer* will not only create the `session.json` if it is the first time that *System Designer* is run, but it will also recreate the file if its content is invalid.

[RTI Issue ID SYSD-874]

@key fields could be set in derived structure if base structure was keyed

Previously, `@key` fields could be set in a derived structure regardless of whether any of the base structures were keyed. The OMG 'Extensible and Dynamic Topic Types for DDS' specification, version 1.3, however, states the following:

> "A Structure Type may inherit from another Structure Type as long as the following conditions are met:
>
> - The derived type does not define any key fields. This ensures the key fields of the derived type are the same as those of the base root type."

If an existing XML contains `@key` fields, *System Designer* will now report a warning message and remove the `@key` annotation for that member.

[RTI Issue ID SYSD-885]

System Designer allowed defining an invalid datatype that could not be used by Code Generator

System Designer allowed defining an invalid datatype that could not be used by *RTI Code Generator*. This problem has been resolved. The following changes have been made in *System Designer* to avoid defining an invalid type:

- When creating a new type or a new member inside a type, the suggestion list will only show types that are defined above the new type/member. Previously, the suggestion list included all the types defined in the Types tab.
- When trying to move an element up or down, *System Designer* now will check if it is possible to move the element. If not, it will display a warning. For example:

```
struct NewStruct1
struct NewStruct2: NewStruct1
```

  In this example, *System Designer* will show a warning if you try to move the first struct down or the second struct up. The parent of the second struct is the first one, and moving the elements will produce an invalid datatype that cannot be used by *Code Generator* to generate code.

[RTI Issue ID SYSD-895]

System Designer allowed setting a floating number to an integer field

System Designer allowed setting a floating number to an integer field. This problem has been resolved. Now *System Designer* raises an error when attempting to use a decimal value, such as 1.3, in an integer field. The affected fields include constant value and annotations such as @default, @min, and @max.

[RTI Issue ID SYSD-897]

System Designer allowed using @resolve_name annotation on basic types

System Designer allowed using the @resolve_name annotation on basic types. This problem has been resolved. Now *System Designer* will disable the @resolve_name field if the type is a basic type. *System Designer* will also remove @resolve_name annotations on basic types when loading a previously created XML/IDL file.

[RTI Issue ID SYSD-899]

System Designer failed when creating a constant of a type defined by a TypeDef

System Designer failed when creating a constant of a type defined by a TypeDef. This problem has been resolved.

[RTI Issue ID SYSD-921]

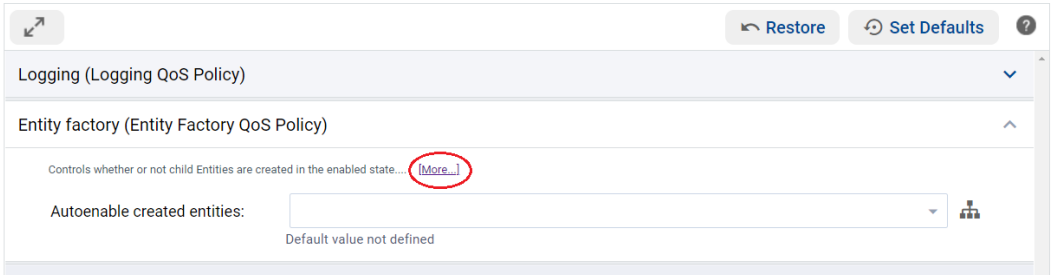
Types defined by a TypeDef couldn't be used as union discriminators

Types defined by a TypeDef couldn't be used as union discriminators in *System Designer*. This problem has been resolved. Now types defined by a TypeDef can be used as union discriminators.

[RTI Issue ID SYSD-923]

Links to documentation did not work in QoS configuration tab

The "More …" link describing each QoS Policy in the QoS configuration tab pointed to an invalid section of the *Core Libraries User's Manual*.



This problem has been resolved, and the links now work.

[RTI Issue ID SYSD-924]

XML validation failed if XML file was located in path with spaces

XML validation failed if the XML file was located in a path with spaces. This problem has been resolved.

[RTI Issue ID SYSD-927]

System Designer failed to move up an item if you removed the previous item

System Designer failed to move up an item if you removed the previous item:

It failed with the following error:

```
Uncaught Error: Invalid position
    at e.DDSSystemTypes.u.swapChildren (rti_sd.min.js:1)
    at u.P (rti_sd.min.js:1)
    at u.scenarioEditorOnEventProtected (rti_sd.min.js:1)
    at u.click (rti_sd.min.js:1)
    at Object.<anonymous> (core.js:357)
    at Object.callEvent (eventsystem.js:56)
    at y (customevents.js:7)
    at HTMLBodyElement.<anonymous> (ready.js:56)
```

This problem has been resolved.

[RTI Issue ID SYSD-930]

drop_incomplete_coherent_set element missing from PRESENTATION QosPolicy

The `drop_incomplete_coherent_set` element was missing and has been added to the PRESENTATION Qos Policy.

The QoS tab in general has also been updated, reorganizing the elements to match their positions in the QoS Policy structure as documented in the API Reference HTML documentation.

[RTI Issue ID SYSD-937]

Invalid first option shown when selecting a value for any Mask field

System Designer showed an invalid first option when selecting a value for any Mask field. This problem has been resolved.

[RTI Issue ID SYSD-938]

Empty value for kind field if value in XML started with `DDS_`

System Designer showed an empty value for a kind field if its value in XML started with `DDS_`. For example, if the XML contained `DDS_BEST_EFFORT_RELIABILITY_QOS` instead of `BEST_EFFORT_RELIABILITY_QOS`, *System Designer* showed an empty value for that field. This problem has been resolved.

[RTI Issue ID SYSD-943]

Invalid behavior when browsing folders using File Browser window

Invalid behavior occurred when browsing folders using the File Browser window:

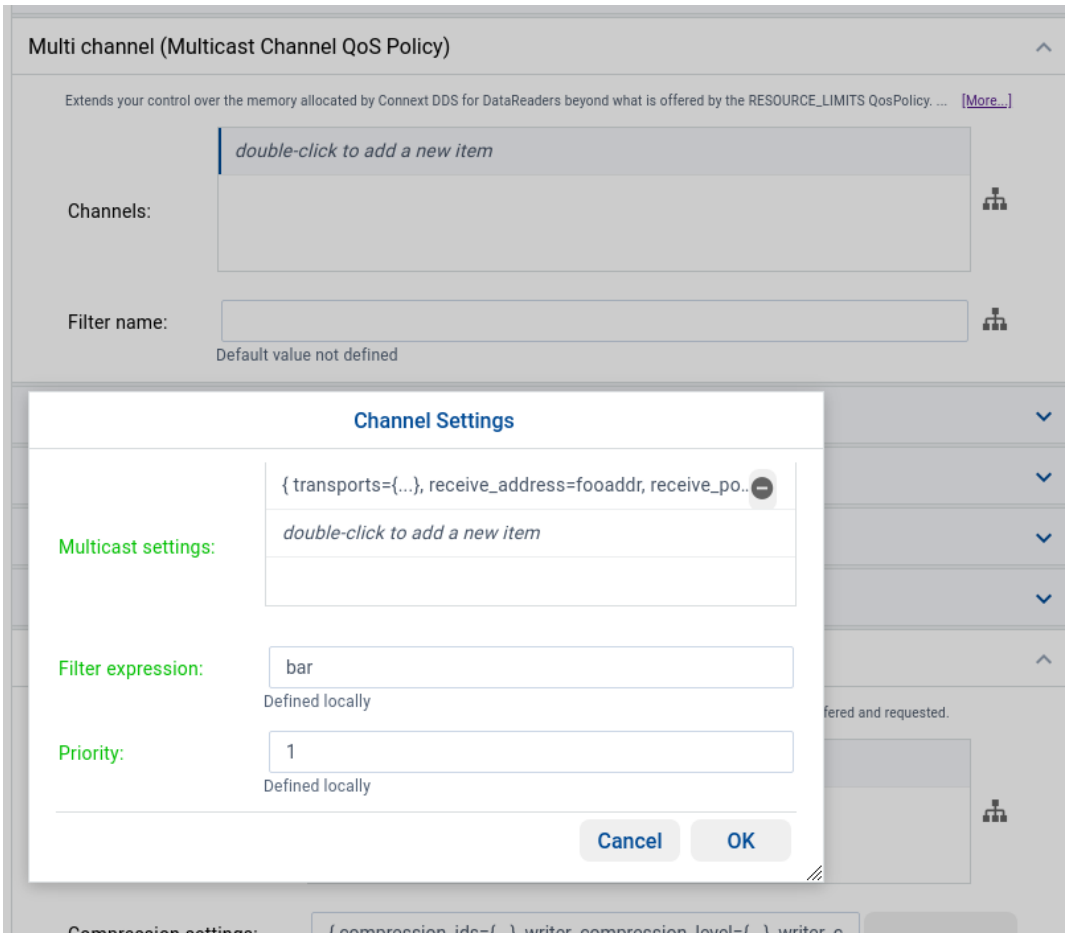
- *System Designer* showed an invalid Path when trying to open a project file if you clicked on any directory.
- Typing escape didn't close the File Browser window if you navigated to a different directory.

These issues have been resolved.

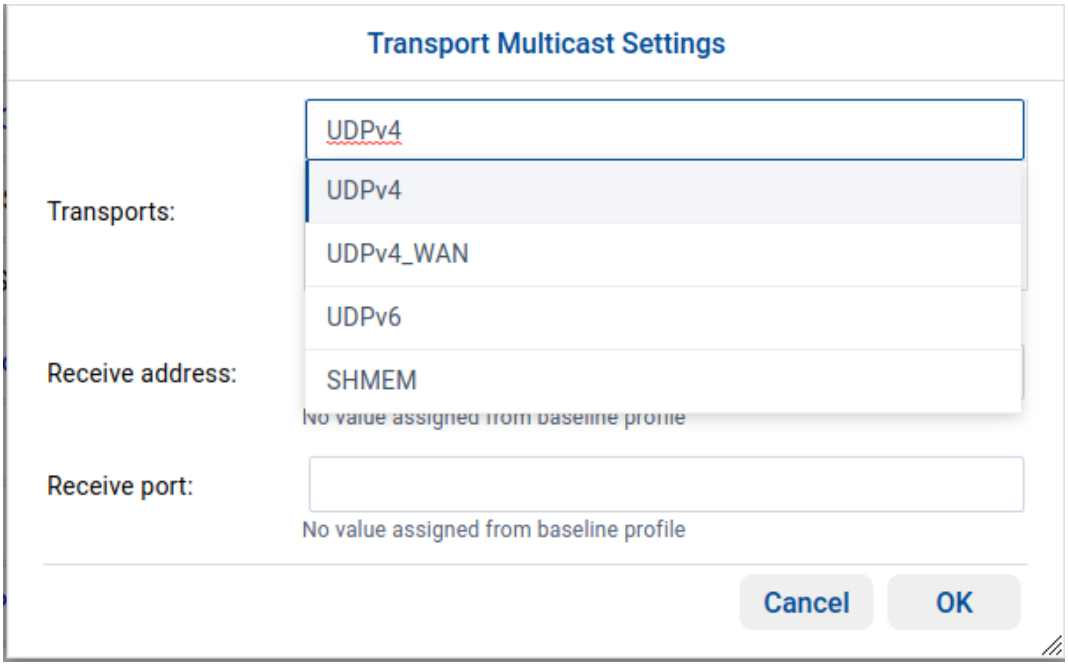
[RTI Issue ID SYSD-945]

"Multi channel" editor failed to dismiss dialog when clicking OK

The "Multi channel (Multicast Channel QoS Policy)" editor failed to dismiss the dialog when clicking the OK button. This problem has been resolved.



The "Multi channel" editor has also been improved by adding a pick list of the available transports for you to select, rather than your having to type in the transport.



[RTI Issue ID SYSD-949]

Failure to load XML file if any <group_data>, <user_data>, or <topic_data> tags used a value from new representation added in 6.1.0

Release 6.1.0 updated the type used by `<group_data>`, `<user_data>`, and `<topic_data>`. The new representation is a `xs:hexBinary` value. *System Designer* was not updated to support this new representation. As a result, *System Designer* failed when trying to load an XML file containing a value from the new representation.

This problem has been resolved; however, due to the fix, now only values from the new representation can be added when using *System Designer*. The old format, in which the content is provided as a set of comma-separated decimal or hexadecimal element values, will still be accepted by *System Designer*; however, it will be transformed into the new format.

For more information about this change see XML Compatibility, in the RTI Connext Migration Guide.

[RTI Issue ID SYSD-959]

Failure to show content of some directories if path to directory contained special characters

System Designer failed to show the content of some directories if the path to that directory contained any special characters, such as +. This problem has been resolved.

[RTI Issue ID SYSD-970]

Error when adding non-alphanumeric characters to name of any entity in Domain or Participant tab

System Designer did not allow adding non-alphanumeric characters, except . and _, to the name of any entity in the Domain or Participant tab. This problem has been resolved.

[RTI Issue ID SYSD-971]

4.5.3 What's New in 6.1.0

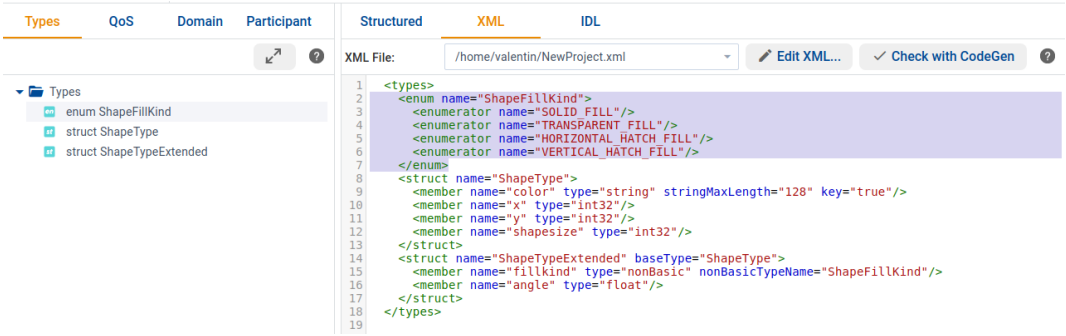
System Designer 6.1.0 is the first official release of *System Designer*.

If you had access to previous experimental releases, this release makes the product more robust and adds new functionality.

System Designer 6.1.0 is built on *Connext DDS* 6.1.0. The previous, experimental release of *System Designer* (version 0.4.0) was built on *Connext DDS* 6.0.1.

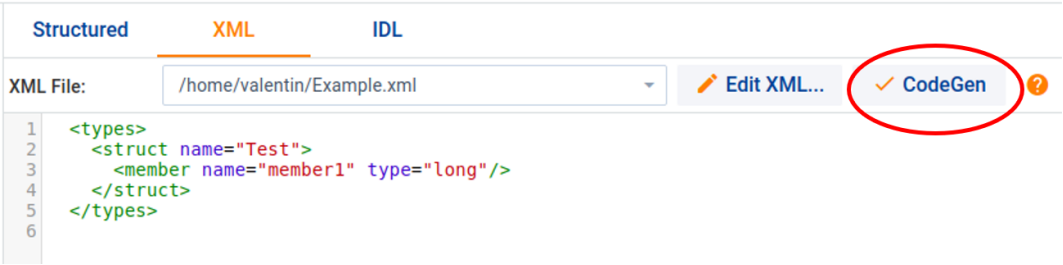
Improved XML and IDL view with Markdown

The text area of the XML and IDL view has been improved with Markdown. For example, tags and attributes are now highlighted in XML.



New validation button to check XML files with Code Generator

A new validation button enables you to select an XML file and have it validated by *Code Generator* to confirm that the current state of the file can be used to generate code. This validation also provides the output from *Code Generator* if there are errors.



Ability to view content of a specific IDL file

Now you can view the content of a specific IDL file. To do so, select the Types tab, then the IDL tab. Choose a file from the list of IDL files in the drop-down menu. This is similar to the behavior of the XML tab.

Valuetypes enabled by advanced project properties

Valuetypes are deprecated and therefore can only be activated via a project setting in the project properties file. To use valuetypes in *System Designer*, navigate to Project -> Properties -> Advanced -> and check the Enable Valuetypes check box.

Support for use of environment variables as domain ID

System Designer now allows setting the domain ID as an environment variable $(ENV_VAR_DOMAIN_ID).

Delete project files when removing a project

Now when you remove a project from the *System Designer* workspace, you can also choose to delete the project files from the filesystem.

Create a domain without a domain ID

It is no longer a requirement to set a domain ID when creating a domain.

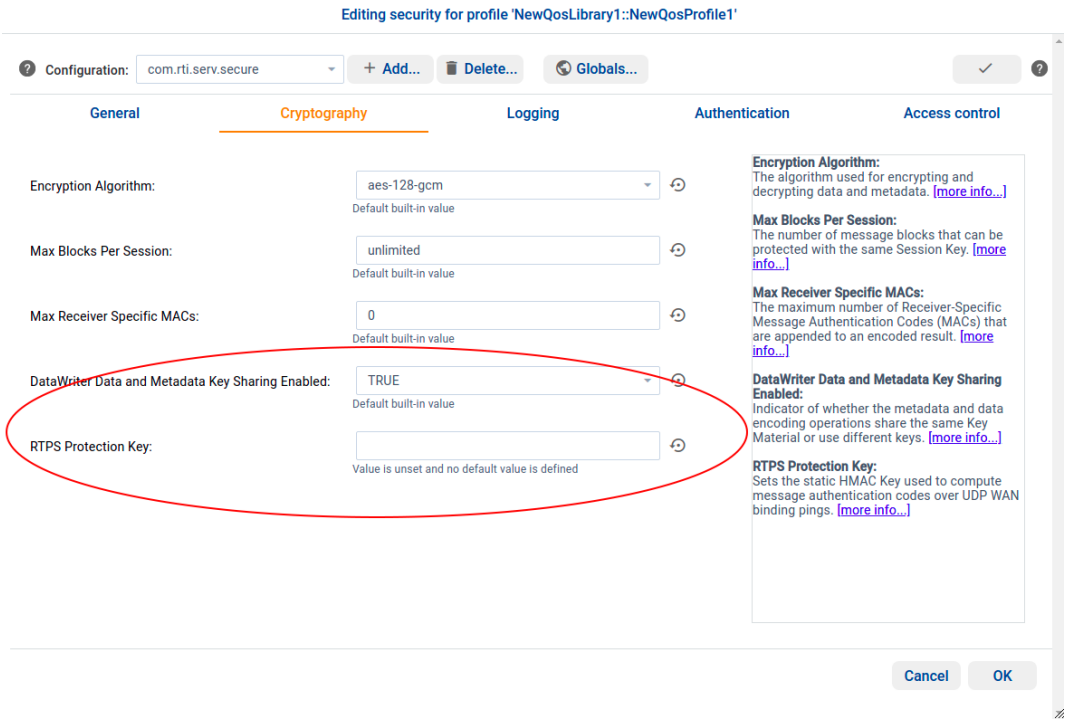
"Add" buttons merged into a single, context-aware Add button

The Add buttons in the QoS, Domain, and Participant panels have been merged into a single context-aware Add button. This new button contains the same functionality as the previous two add buttons in each panel. Previously, to create a QoS you had to click first on +Library to create a library and then +Profile to create a profile inside the library. Now, you need only click on the Add button to first create a Library, and then, with the library selected by default, click Add again to create a profile inside the library.

Updated "Configure Security" dialog with new security properties

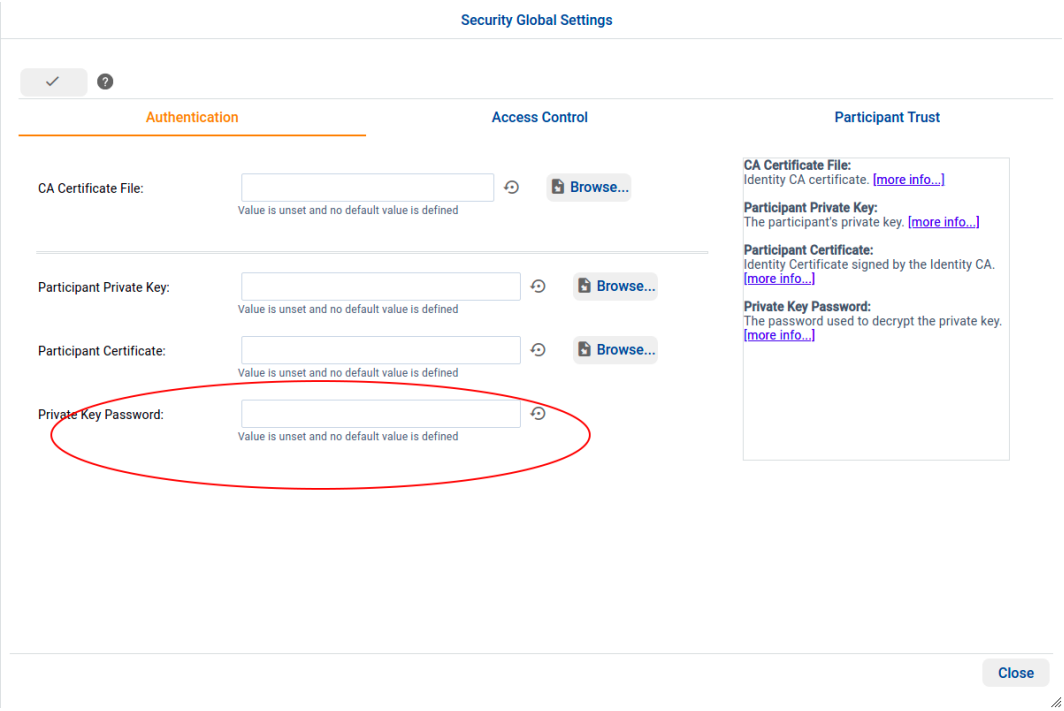
The "Configure Security" dialog for a Participant QoS has been updated. The following fields have been added to configure new security properties; an example is shown below:

- **DataWriter Data and Metadata Key Sharing Enabled** (Cryptography tab)
- **RTPS Protection Key** (Cryptography tab)
- **Alternative Permissions CA certificate(s)** (Access control tab)
- **Alternative CA file(s)** (Authentication tab)
- **Enforce X.509 v3 Extension** (Authentication tab)



In addition, the following fields and properties have been added to the "Security Global Settings" dialog; an example is shown below:

- **Private Key Password** (Authentication tab)
- **Authentication Request Timeout (sec)** (Participant Trust tab)
- **Simple Participant Discovery DataReader's Mode** (Participant Trust tab)



4.5.4 What's Fixed in 6.1.0

Existing comments in XML/IDL text area not updated when modified

Editing an existing comment in the XML/IDL view via the Comment box in the upper-right didn't update the comment in the text area. The updated comment was only shown after reopening the XML/IDL view. Now the comment is updated without reopening the XML/IDL view.

[RTI Issue ID SYSD-727]

Invalid content in IDL view when using aliases

Using aliases (long, short, …) for types resulted in "undefined" types in the IDL view. Now aliases are properly shown in the IDL view.

[RTI Issue ID SYSD-740]

Crash when trying to create a type inside a module

System Designer crashed when trying to create a type inside a module under the following circumstances:

- Select a module and click on the + button located in the Structured View. Don't select any element and instead click outside of the menu.
- Click on the + button near the Help button. Again, don't select any element and click outside the menu.
- Click again on the + button located in the Structured View.

This problem has been resolved.

[RTI Issue ID SYSD-765]

Uint64 member produced invalid IDLs

Adding a Uint64 member to a structure produced an invalid IDL. This issue has been resolved.

[RTI Issue ID SYSD-766]

Use of constants in @min, @max, and @default fields

System Designer now allows you to use constant value names in @min, @max, and @default fields.

[RTI Issue ID SYSD-767]

Version control issues

System Designer saved the project path (ui_projectPath), causing issues when dealing with the version control system. This issue has been resolved.

[RTI Issue ID SYSD-769]

Inheritance Chain edit icon was enabled when the QoS Profile was a QoS Snippet

The Inheritance Chain edit icon was enabled when the QoS Profile was a QoS Snippet. Now the edit button is only enabled when the QoS profile is not an QoS Snippet.

[RTI Issue ID SYSD-810]

Unbounded sequences of strings converted to strings

Refreshing *System Designer* caused unbounded sequences of strings to be transformed into strings. This problem has been resolved.

[RTI Issue ID SYSD-816]

System Designer failed to delete QoS Library, Domain Library, and Participant Library

Previously, when you deleted a QoS Library, Domain Library, or Participant Library, then later reopened the project, *System Designer* had actually failed to delete the library. Now *System Designer* deletes it.

[RTI Issue ID SYSD-833]

Union Editor did not allow addition of cases after adding default case

Previously, *System Designer* prevented you from adding any cases to a union after the "default" case was added. Now you can. As part of this fix, *System Designer* now also prevents you from adding duplicate default cases.

[RTI Issue ID SYSD-835]

System Designer didn't allow creating a constant of an enumerator

System Designer now allows you to create a constant of an enumerator.

[RTI Issue ID SYSD-839]

List of XML files incorrectly updated when importing invalid XML file

If the process of importing an XML file failed—for example, the XML file contained an element already defined in the open project—System Designer still showed that file in the list of XML files. This problem has been resolved.

[RTI Issue ID SYSD-854]

List of XML files in XML view not updated when creating new XML file

The list of XML files in the XML view was not updated when creating a new XML file. Now, the newly created file will be shown in the list of XML files.

[RTI Issue ID SYSD-855]

Browse button in EZ-Secure dialog didn't work

Selecting a folder by the Browse button in the EZ-Secure dialog didn't work. This prevented *System Designer* from generating all the required Secure files and updating the participant QoS. This issue has been resolved.

[RTI Issue ID SYSD-862]

Invalid (HTTP) 400 Bad Request when checking if a file exists

System Designer produced a (HTTP) 400 Bad Request if, when checking if a file exists, the file didn't exist. This problem has been resolved. *System Designer* no longer produces an error in this case.

[RTI Issue ID SYSD-871]

Updated security property names

The following security properties have been renamed to match the latest DDS Security speficication:

Legacy property name (prefix with `com.rti.serv.secure`)	New property name (no prefix)
`authentication.ca_file`	`dds.sec.auth.identity_ca`
`authentication.private_key_file`	`dds.sec.auth.private_key`
`authentication.certificate_file`	`dds.sec.auth.identity_certificate`
`access_control.permissions_authority_file`	`dds.sec.access.permissions_ca`
`access_control.governance_file`	`dds.sec.access.governance`
`access_control.permissions_file`	`dds.sec.access.permissions`

The legacy property names are no longer supported. *System Designer* will generate a warning if it detects any of the legacy property names being used by any XML file. For example, if the following XML file is loaded:

```
<participant_qos>
  <property>
      <value>
          <element>
              <name>com.rti.serv.secure.authentication.ca_file</name>
          </element>
      </value>
```

(continues on next page)

(continued from previous page)

```
  </property>
</participant_qos>
```

System Designer will generate the following warning:

```
com.rti.serv.secure.authentication.ca_file has been deprecated, System␣
↪Designer will
ignore its value. Please update the property name with the new one:
<dds.sec.auth.identity_ca>
```

These properties have been moved from the Security Configuration dialog to the Global Security configuration. This dialog can be accessed by clicking on the "Globals" button in the Security Configuration dialog.

[RTI Issue ID SYSD-875]

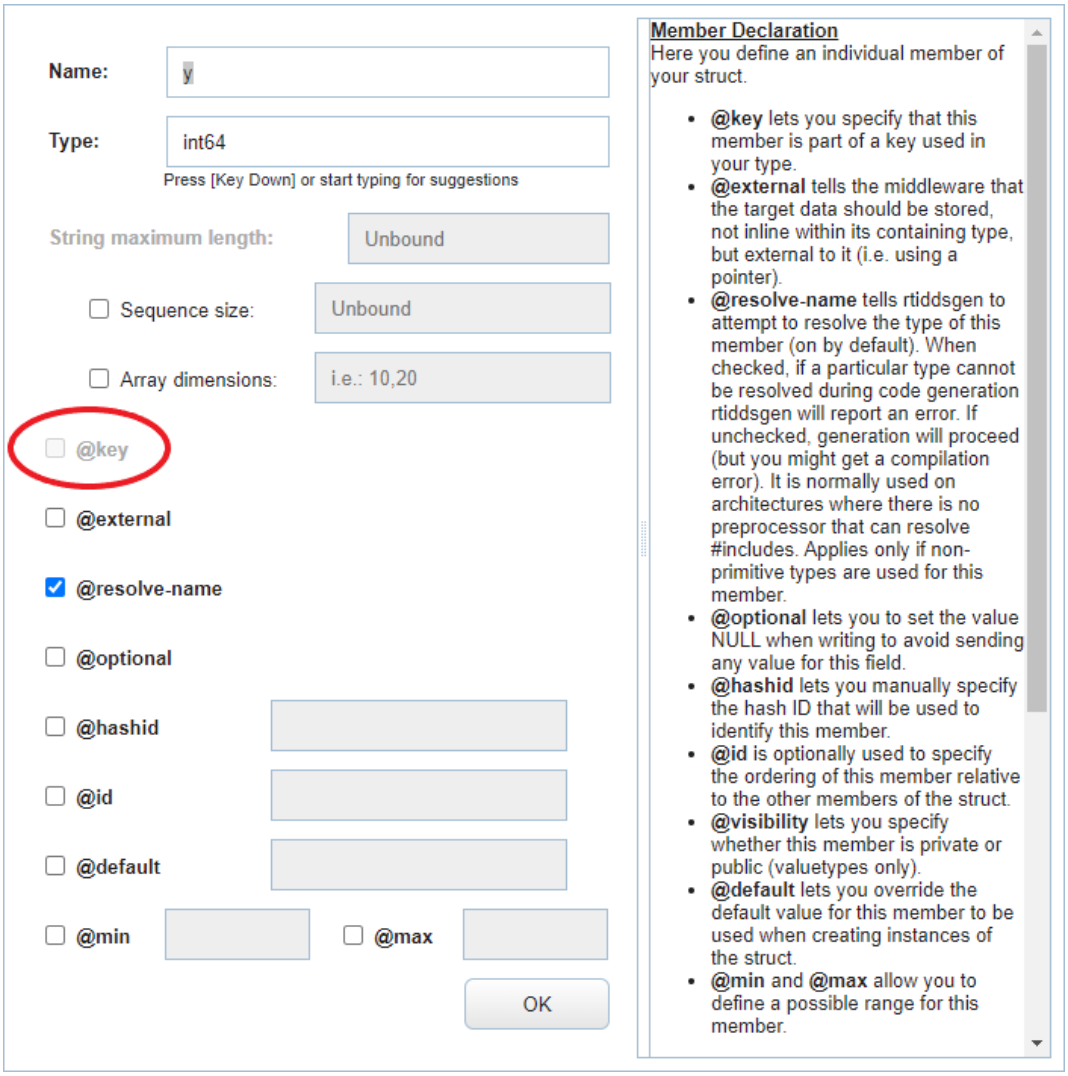
System Designer crashed when attempting to load XML file that contained a forward_dcl

System Designer crashed when attempting to load an XML file that contained a forward declaration (`forward_dcl`). This issue has been resolved.

[RTI Issue ID SYSD-876]

@key fields couldn't be set in derived structures

A derived structure couldn't configure any of its members to be keyed. Now it can.



[RTI Issue ID SYSD-882]

System Designer failed to import a zip project in Windows

System Designer failed to import a zip project in Windows with the following error:

```
SyntaxError: Unexpected token U in JSON at position XX
```

This problem has been resolved.

[RTI Issue ID SYSD-898]

4.6 Known Issues

Modules can be defined in multiple files, and each file might define the module with different annotations:

- @autoid
- @transfer_mode
- @language_binding
- @allowed_data_representation

Semantically, those annotations (when defined in a module) apply only to the contained entities.

Since internally modules are identified by a single object, when their definition comes from multiple files, their annotations must be the same.

Chapter 5

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