

DDS Blockset

User's Guide



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DDS Blockset User's Guide

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Revision History

March 2021	Online only	New for Version 1.0 (Release 2021a)
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Import DDS

Import or Create DDS Definitions

To bring DDS concepts such as Domains, Topics, Types, and Quality of Service (QoS) into the Simulink environment so that you can model and configure DDS applications, use the DDS Application Quick Start. The Quick Start enables you to import XML/IDL definitions or create default definitions and configure your application appropriately for its DDS vendor, RTI or eProsima, to provide the framework to model and build your application in Simulink.

To create DDS definitions and configure your application:

- 1 “Open the DDS Application Quick Start” on page 1-2.
- 2 “Specify Application Name and Vendor” on page 1-2.
- 3 “Specify Source of DDS Definitions” on page 1-3.
- 4 “Transition from DDS to Simulink Environment” on page 1-4

Open the DDS Application Quick Start

When you open a model in the DDS Blockset app, you are directed into the DDS Application Quick Start. The Quick Start enables you to name your application, specify your DDS vendor, and import or create DDS definitions required to configure your DDS application. To update these configuration options after completing the Quick Start, you can reopen the DDS Application Quick Start from the toolbar by clicking **Quick Start**.

Specify Application Name and Vendor

On the first page of DDS Application Quick Start, specify the DDS application name and vendor.

The screenshot shows a window titled "DDS Application Quick Start" with a dark blue header bar. The header bar contains three steps: "Set Application" (active), "Associate Dictionary", and "Finish". Below the header, the main area is split into two columns. The left column is titled "Configure DDS Application properties" and contains two input fields: "Application name:" with the text "mTrackShape" and "Vendor:" with a dropdown menu showing "eProsima" selected, and "RTI Connext 6.0" as an alternative option. The right column is titled "What to consider" and contains the text: "Specify the name of your DDS application and the vendor it uses to connect to the DDS network." At the bottom right of the window, there are two buttons: "Help" and "Next".

By default, the name of your DDS application is set to the name of its application model. To customize the name, in the **Application name** field, enter a customized name.

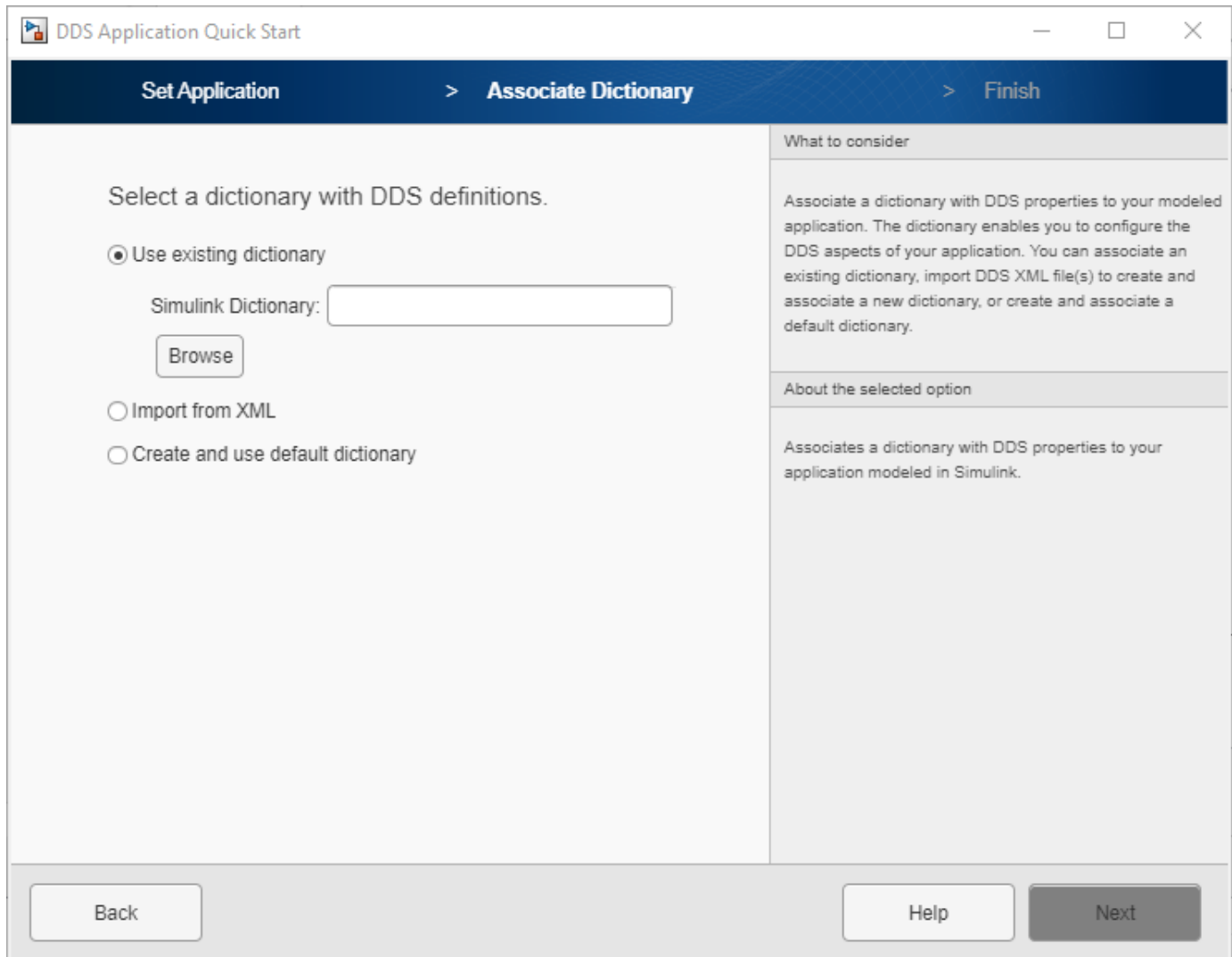
To specify your DDS vendor (and set your toolchain), from the **Vendor** drop-down list, select RTI or eProsima. If you do not intend to generate code, vendor selection does not affect simulation, so you can accept the default vendor.

Specify Source of DDS Definitions

On the second page of the DDS Application Quick Start, specify the source of your DDS definitions for your application. DDS definitions, whether created or imported, are stored in a section of the Simulink data dictionary called the DDS Dictionary. You can create and associate a DDS Dictionary with your application by using one of these options:

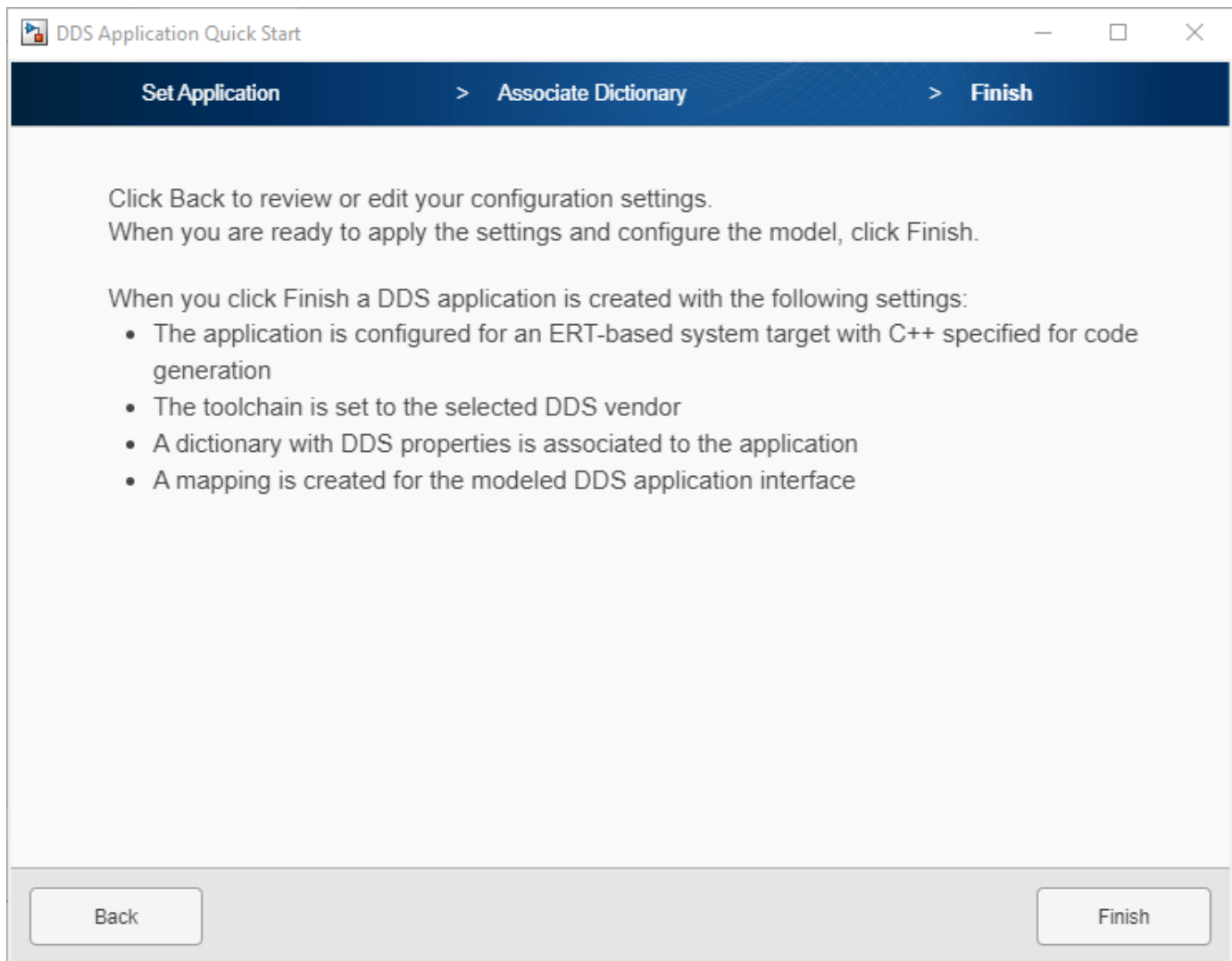
- **Use existing dictionary** — If you have an existing DDS Dictionary, you can associate that dictionary with your new DDS application and reuse the definitions. This option is ideal for building applications set to similar requirements or standards.

- **Import from XML** — If you have or would like to specify DDS definitions in XML, you can import XML definitions into a new DDS Dictionary and associate it with your application. XML specifications enable maximum flexibility and control over your definitions.
- **Create and use default dictionary** — If you would like to have a new DDS Dictionary created for you based on your application model, you can select to create and use a default dictionary. This option is the quickest and simplest option to get started.



Transition from DDS to Simulink Environment

To wrap-up, click **Finish**. The Quick Start creates and associates a DDS Dictionary with your application and configures the application so that you can generate an executable specific to RTI or eProsima.



Review DDS Definitions

Verify Definitions

To verify your DDS definitions, you can use the DDS Dictionary or Code Mappings editor. To verify Domain, Topic, Type, or QoS definitions, you can use the DDS Dictionary to view and edit these definitions. For more information, see “Manage DDS Definitions” on page 2-2.

To verify imported DataReader and DataWriter definitions, use the Code Mappings editor. To view the readers and writers, open the editor, set the **Configuration Mode** to Use Reader XML Path or Use Writer XML Path and verify that they appear as drop-down list options for the inports or outports. If you select a reader or writer, you can also verify its Topic and QoS properties loaded in the editor. For more information, see “Interactively Configure DDS Interface” on page 4-2.

Troubleshoot

If your imported definitions are not correct, examine and correct any errors in the imported XML or DDS Dictionary, and then associate the new definitions with your DDS application. To update or change vendor information, on the toolstrip, open the **Quick Start** and update the vendor.

Considerations and limitations

- Multiple XML Files — The Quick Start allows you to import one XML file. To import additional files, use the DDS Dictionary.
- IDL File Import — To import IDL specifications, convert IDL to XML and import XML files.
- Duplicate Data Imported — Imported XML files pull additional XML files referenced by the include mechanism into the DDS Dictionary. If an XML file is referenced multiple times its definitions are imported each time resulting in duplicates.

See Also

Code Mappings Editor | DDS Dictionary

Related Examples

- “Manage DDS Definitions” on page 2-2
- “Interactively Configure DDS Interface” on page 4-2

DDS Definition Management

- “Manage DDS Definitions” on page 2-2
- “Manage Types” on page 2-3
- “Manage Domains” on page 2-8
- “Manage QoS” on page 2-15

Manage DDS Definitions

To manage the DDS aspects of your applications in the Simulink environment, you can use a section of the Simulink data dictionary that contains DDS properties called the DDS Dictionary. The DDS Dictionary is an intuitive graphical interface that enables you to quickly create and edit the DDS Domains, Topics, Data Samples, and Quality of Service (QoS) you need to configure the Publisher, Subscriber, DataReader, and DataWriter aspects of your model. The DDS Dictionary enables you to easily create and configure the DDS aspects of your application without having to delve into the tedious, low-level details of XML or IDL specification.

To create the DDS aspects of your application, open the DDS Dictionary and configure the DDS aspects of your application by working through the graphical interface tabs from left to right:

- 1** Create DDS data types. To create a DDS application that sends and receives Data Samples, composed of DDS data types, across the DDS network use the **Types** tab of the DDS Dictionary. The DDS Blockset supports the DDS data types Struct, Const, and Enum. If you have numerous types, you can organize these types into libraries and modules for easier access to these types during configuration. For each DDS data type in your dictionary, you can edit the data type and its associated Simulink equivalent data type. These Simulink equivalent data types are used in the application logic in the Simulink environment. For more information, see “Manage Types” on page 2-3.
- 2** Create Domains and Topics. After you have created DDS data types to send and receive data, you can use the **Domains** tab to configure the Domains and Topics so that your application can publish and subscribe to specific categories of data. Domains specify a portion of the DDS network and a Topic specifies a category of data. You can use the DDS Dictionary to create Domains and configure their names, IDs, and Topics. You can also create Topics and configure their names, Registered Types, and QoS. For more information, see “Manage Domains” on page 2-8.
- 3** Create Quality of Service (QoS). Finally, you can use the **QoS** tab to import and control QoS policies that specify aspects of the data connection for your DDS application. DDS Blockset provides access to your vendor default QoS profile, a built-in QoS profile library, and the ability to import and edit QoS specified in XML. You can use the DDS Dictionary to apply QoS to Topics or you can use the profiles to specify QoS to the Publisher, Subscriber, DataReader, and DataWriter aspects of your application represented within the model workspace. For more information, see “Manage QoS” on page 2-15.

See Also

DDS Dictionary

Related Examples

- “What Is DDS?”
- “Manage Types” on page 2-3
- “Manage Domains” on page 2-8
- “Manage QoS” on page 2-15
- “Model DDS Applications” on page 3-2
- “Interactively Configure DDS Interface” on page 4-2

Manage Types

The DDS middleware platform requires that applications use Data Samples, composed of DDS data types, to send and receive data on the DDS network. When you use DDS Blockset, you configure application model inports and outports as DataReaders and DataWriters that use Data Samples defined in the DDS Dictionary as DDS data types. DDS Blockset supports the DDS data types Const, Struct, and Enum. You can use the DDS Dictionary to import, create, and edit these DDS data types and their Simulink equivalent data types to meet your application requirements.

To import and manage DDS data types for applications:

- 1 “Import DDS Data Types” on page 2-3 (optional)
- 2 “View DDS Data Types” on page 2-3
- 3 “Edit DDS and Simulink Data Types” on page 2-4

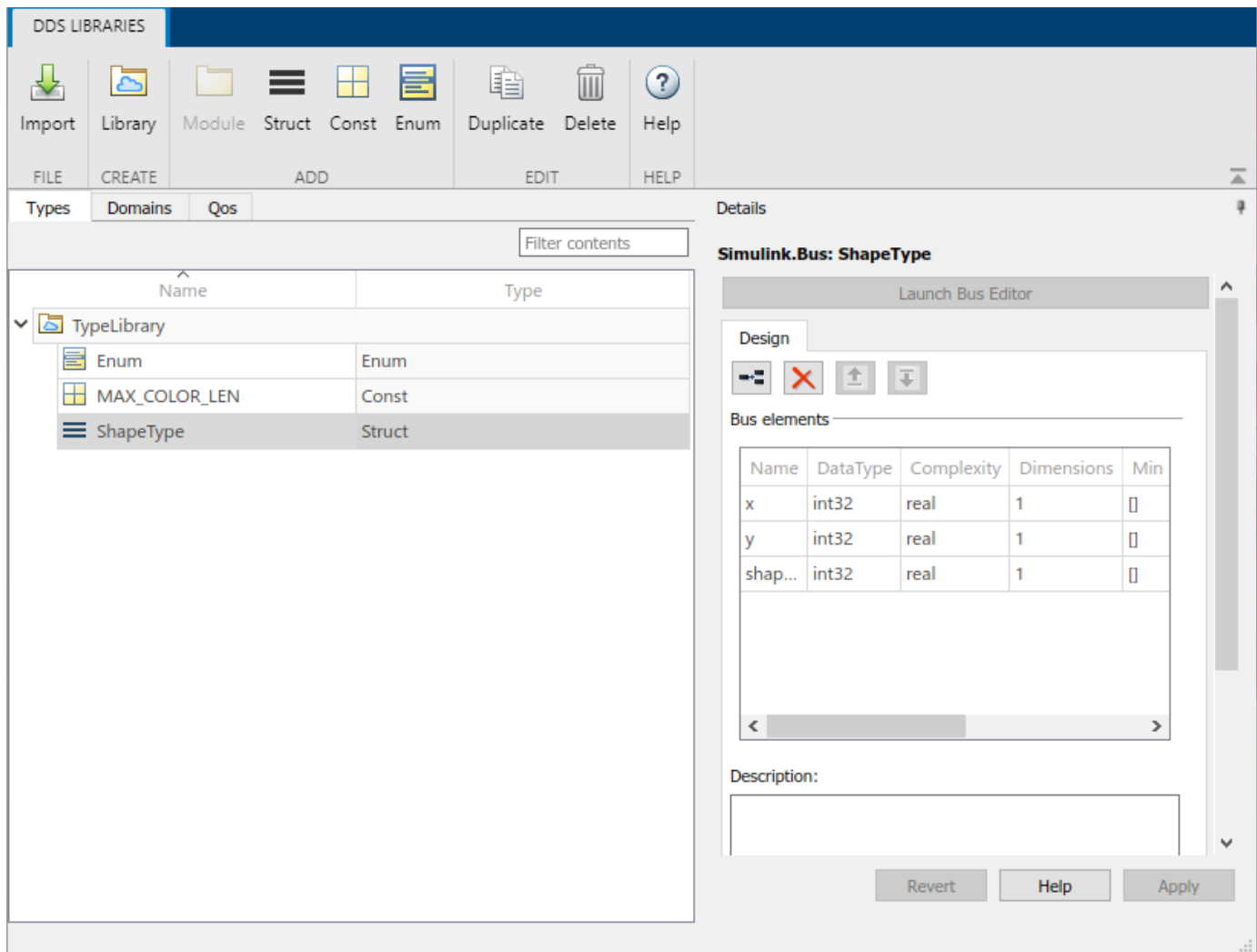
To learn how to apply these DDS data types to configure Data Samples for applications, see “Configure Data Samples” on page 2-6 and “Configure DataReaders and DataWriters” on page 2-6.

Import DDS Data Types

If you have DDS data types previously specified by XML or you would like to specify data types by using XML, you can define XML data type definitions and use the DDS Application Quick Start to import them into a DDS Dictionary. If you would like to import more than one XML file or you are working in an existing DDS Dictionary, you can use the DDS Dictionary to import additional XML files. To import from the DDS Dictionary, on the dictionary toolstrip, click **Import** to select and upload additional XML files.

View DDS Data Types

To view the DDS data types available for your application, open its associated DDS Dictionary. To open the DDS Dictionary, on the DDS Blockset toolstrip, click **Code Interface** and select **DDS Dictionary**.



Alternatively, you can open the DDS Dictionary from a Simulink data dictionary. In a Simulink data dictionary, if DDS definitions are available, a **DDS Libraries** node appears in the dictionary. If you open the **DDS Libraries** section of the Simulink data dictionary, in the **Details** pane, you can click **Open DDS Libraries** to open the graphical interface for the DDS Dictionary.

Edit DDS and Simulink Data Types

You can use the DDS Dictionary to configure these aspects of the DDS data types available for your DDS application:

- “Organize DDS Data Types in the DDS Dictionary” on page 2-5
- “Create New DDS Data Types” on page 2-5
- “Configure DDS Data Type Names” on page 2-5
- “Configure the Values of Simulink equivalent data types” on page 2-5
- “Duplicate DDS Data Types” on page 2-5
- “Delete DDS Data Types” on page 2-5

Organize DDS Data Types in the DDS Dictionary

To organize large numbers of DDS data types, you can group DDS data types into libraries and then subgroup libraries into modules.

To create a DDS data type library, on the DDS Dictionary toolstrip, click **Library**. To duplicate a library, select a library, and then on the toolstrip, click **Duplicate**. To delete a library, select a library, and then on the toolstrip, click **Delete**.

To add a module within a library, select a library, and then on the DDS Dictionary toolstrip, click **Module**. A module appears nested within the selected library. To duplicate a module, select the module, and then on the toolstrip, click **Duplicate**. To delete a module, select the model, on the toolstrip, click **Delete**.

You can have an infinite number of libraries and nested modules within a DDS Dictionary to organize your DDS data types.

Create New DDS Data Types

To create new DDS data types, on the DDS Dictionary toolstrip, click the icon of the data type you would like to create: Const, Struct, or Enum.

Configure DDS Data Type Names

To change the name of a DDS data type, in the **Name** column, click and directly edit the spreadsheet.

Configure the Values of Simulink equivalent data types

To adjust the properties of the equivalent Simulink data type that represents the DDS data type in the Simulink environment, select the DDS data type to open and view the Simulink data type in the **Details** pane. The equivalent Simulink data types for the supported DDS data types are the following:

DDS Data Type	Simulink Data Type
Const	Numeric MATLAB [®] variable
Enum	Enumeration
Struct	Simulink.Bus object

You can configure the Simulink data type properties as available and necessary for your application.

You can view, but not edit, these Simulink equivalent data types in the **Design Data** section of a Simulink data dictionary with the other Simulink data objects that are not a part of the DDS specification. The types shown are kept in sync with their counterparts in the DDS Dictionary, including the renaming and deleting of DDS data types.

Duplicate DDS Data Types

To duplicate DDS data types, select the data types, and then on the DDS Dictionary toolstrip, click **Duplicate**.

Delete DDS Data Types

To delete DDS data types, select the data types, and then on the DDS Dictionary toolstrip, click **Delete**.

Examples

These examples show how to configure DDS data types from a data management perspective and then how to apply these created DDS data types to configure the inports and outports of DDS application models so that applications modeled in Simulink can send and receive Data Samples from the DDS network.

Configure Data Samples

This example shows how to import, create, and configure DDS data types that represent Data Samples.

- 1 (Optional) Import DDS data types. If you would like to import DDS data types from XML, use the DDS Application Quick Start or DDS Dictionary to import XML files.
- 2 Open the DDS Dictionary. On the DDS Blockset toolstrip, click **Code Interface** and select **DDS Dictionary**.
- 3 Add a new library. On the DDS Dictionary toolstrip, click **Library**.
- 4 Create new DDS data types.
 - Create and name a new DDS Struct data type. On the DDS Dictionary toolstrip, click **Struct**. In the **Name** column, rename the data type. Select the new DDS type and in the **Details** pane, view its Simulink equivalent data type, a `Simulink.Busobject`.
 - Create a DDS Const data type. On the DDS Dictionary toolstrip, click **Const**. In the **Name** column, rename the data type. Select the new DDS type and in the **Details** pane, view its Simulink equivalent data type, a numeric MATLAB variable.
 - Create a DDS Enum data type. On the DDS Dictionary toolstrip, click **Enum**. In the **Name** column, rename the data type. Select the new DDS type and in the **Details** pane, view its Simulink equivalent data type, an Enumeration.
- 5 Delete a DDS data type. Select one of the DDS data types, and on the DDS Dictionary toolstrip, click **Delete**.

Configure DataReaders and DataWriters

This example shows at a high level how to configure a DDS application model so that the inports and outports that represent DataReaders and DataWriters are configured with DDS data types. The DDS data types enable the application to send and receive Data Samples.

- 1 Open a model in the DDS Blockset app.
- 2 Open the DDS Dictionary and create the necessary DDS data types.
- 3 Construct or adapt the Simulink model so that it acts as a Publisher or Subscriber.
- 4 Set the inports and outports to DDS data types that match the Registered Type of the Topic that the application subscribes to or publishes.

For more information about how to configure a model and its ports as a Publisher or Subscriber, see “Model DDS Applications” on page 3-2.

See Also

DDS Dictionary | **Take DDS Sample** | **Write DDS Sample**

Related Examples

- “What Is DDS?”
- “Manage DDS Definitions” on page 2-2
- “Manage Domains” on page 2-8
- “Manage QoS” on page 2-15
- “Model DDS Applications” on page 3-2

Manage Domains

The DDS middleware platform requires that applications specify a Domain, Topic, and Registered Type to publish and subscribe to the DDS network. DDS provides a network, the Global Data Space, that can be partitioned into subnetworks, Domains, and then into categories of data, Topics. To use DDS, your application must specify the Domain it wants to participate in, the Topic it wants to subscribe or publish data to, and the DDS data type for that data, referred to as the Registered Type for the Topic. You can use the DDS Dictionary to import, create, and edit the Domain, Topic, and Registered Types to meet your application requirements.

To create and manage Domains, Topics, and Registered Types for applications:

- 1 “Import Domains and Topics” on page 2-8 (optional)
- 2 “View Domains, Topics, and Registered Types” on page 2-8
- 3 “Edit Domains, Topics, and Registered Types” on page 2-9

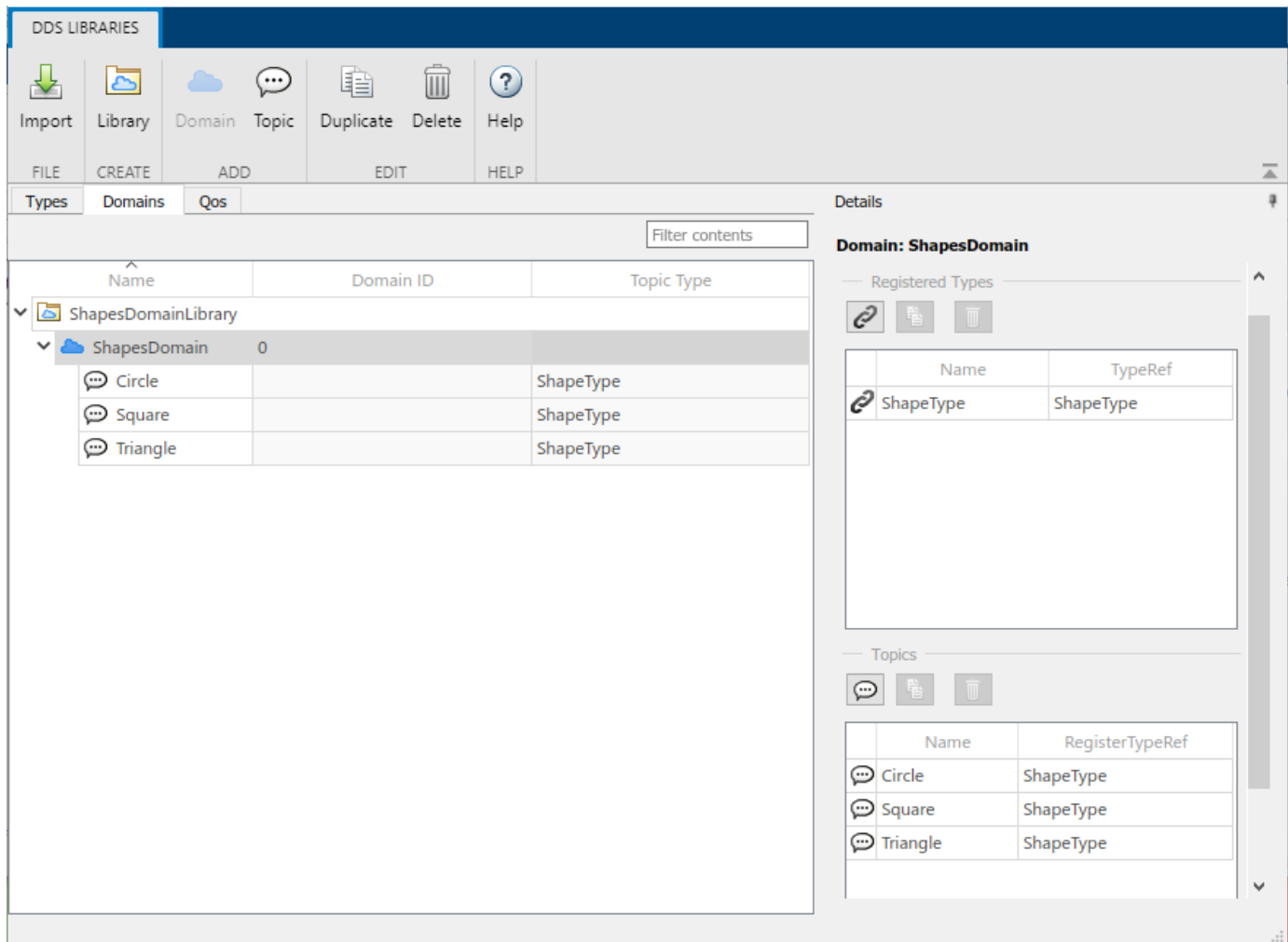
To learn how to create Domains, Topics, and Registered Types, see “Create Domains” on page 2-11, “Create Topics” on page 2-12, and “Register DDS Data Types for Topics” on page 2-12. To learn how to apply these definitions to publish and subscribe to DDS, see “Subscribe to a Topic” on page 2-13, and “Publish a Topic” on page 2-14.

Import Domains and Topics

If you have DDS data types previously specified by XML or you would like to specify data types by using XML, you can define XML data type definitions and use the DDS Application Quick Start to import them into a DDS Dictionary. If you would like to import more than one XML file or you are working in an existing DDS Dictionary, you can use the DDS Dictionary to import additional XML files. To import from the DDS Dictionary, on the dictionary toolstrip, click **Import** to select and upload additional XML files.

View Domains, Topics, and Registered Types

To open a DDS Dictionary to configure Domains, Topics, and Registered Types, on the DDS Blockset toolstrip, click **Code Interface** and select **DDS Dictionary**. In the DDS Dictionary, click the **Domains** tab.



Alternatively, you can open the DDS Dictionary from a Simulink data dictionary. In a Simulink data dictionary, if DDS definitions are available, a **DDS Libraries** node appears in the dictionary. If you open the **DDS Libraries** section of the Simulink data dictionary, in the **Details** pane, you can click **Open DDS Libraries** to open the graphical interface for the DDS Dictionary.

Edit Domains, Topics, and Registered Types

You can use the DDS Dictionary to configure these aspects of the Domains, Topics, and Registered Types available for your DDS application:

Edit Domains

- “Organize Domains in the DDS Dictionary” on page 2-10
- “Create New Domains” on page 2-10
- “Configure Domain Names” on page 2-10
- “Configure Domain IDs” on page 2-10
- “Configure Registered Types Domains” on page 2-10

- “Duplicate Domains” on page 2-10
- “Delete Domains” on page 2-10

Organize Domains in the DDS Dictionary

To organize large numbers of Domains, you can group the Domains into libraries. To create a Domain library, on the DDS Dictionary toolbar, click **Library**. To duplicate a library, select a library, on the toolbar, click **Duplicate**. If you duplicate a library the Domains and Topics contained within that library are also duplicated and reproduced in the duplicate library. To delete a library, on the toolbar, click **Delete**.

Create New Domains

To create a new Domain, select a library, and then on the DDS Dictionary toolbar, click **Domain**.

Configure Domain Names

To change the name of a Domain, in the **Name** column, click and directly edit the spreadsheet.

Configure Domain IDs

To change a Domain ID, select the Domain. In the **Domain ID** column, click and directly edit the spreadsheet.

Configure Registered Types Domains

To configure the Registered Types for Domains, select a Domain. In the **Details** pane, click the link button to add a Registered Type. To edit the name and DDS type for your Registered Type, use the **Name** and **TypeRef** fields. To manage the Registered Types for the Domain, use the duplicate and delete buttons. To register a type for a Topic, the data type must be registered for its Domain.

Duplicate Domains

To duplicate a Domain, select the Domain, and then on the DDS Dictionary toolbar, click **Duplicate**.

Delete Domains

To delete a Domain, select the Domain, and then on the DDS Dictionary toolbar, click the **Delete**.

Edit Topics

- “Create new Topics” on page 2-10
- “Configure Topic Names” on page 2-10
- “Configure Registered Types Topics” on page 2-11
- “Configure QoS for Topics” on page 2-11
- “Duplicate Topics” on page 2-11
- “Delete Topics” on page 2-11

Create new Topics

To create a new Topic, select a Domain, on the DDS Dictionary toolbar, click **Topic**.

Configure Topic Names

To change the name of a Topic, in the **Name** column, click and directly edit the spreadsheet.

Configure Registered Types Topics

To configure the Registered Type for a Topic, select the Topic. In the **Details** pane, use the Registered Type drop-down list to select from the DDS data type options. The available options are DDS data types that are in the DDS Dictionary and registered with the Domain. If you do not see a DDS data type that you expected, verify or create the DDS data type in the dictionary, and then register the data type with the Domain for it to appear as an option. After the data type is registered, it appears as the **Topic Type** for the Topic.

Configure QoS for Topics

To configure the QoS for a Topic, select the Topic. In the **Details** pane, use the Topic QoS drop-down list to select from the available QoS profiles in the DDS Dictionary. If you do not see the QoS profiles that you expected, import the necessary QoS profiles to the DDS Dictionary.

Duplicate Topics

To duplicate a Topic, select a Topic, and then on the DDS Dictionary toolstrip, click **Duplicate**.

Delete Topics

To delete a Topic, select the Topic, and then on the DDS Dictionary toolstrip, click **Delete**.

Edit Registered Types

- “Create Registered Types” on page 2-11
- “Duplicate Registered Types” on page 2-11
- “Delete Registered Types” on page 2-11

Create Registered Types

To create Registered Types, select a Domain. In the **Registered Types** section of the **Details** pane, click the link button to add a Registered Type. The DDS data types available are the types in the dictionary. To change the name of a Registered Type, click and directly edit the **Name** field. To change the DDS data type of a Registered Type, click in the **TypeRef** field and select from the drop-down options.

Duplicate Registered Types

To duplicate a Registered Type, select a Registered Type and click the **Duplicate** button.

Delete Registered Types

To delete a Registered Type, select a Registered Type and click the **Delete** button.

Examples

These examples show incrementally how to create the Domains, Topics, and Registered Types needed to configure DDS applications. The examples then show how to apply these definitions to enable applications to publish and subscribe to data on the DDS network.

Create Domains

This example shows how to import, create, and configure Domains.

- 1 (Optional) Import Domains. If you would like to import Domains from XML, you can use the DDS Application Quick Start or DDS Dictionary to import XML files.

- 2 Open the DDS Dictionary. On the DDS Blockset toolstrip, click **Code Interface** and select **DDS Dictionary**.
- 3 Click the **Domains** tab.
- 4 Create a Domain. On the DDS Toolstrip, click **Domain**.
- 5 Configure the Domain. To configure the Domain name and Domain ID, click and edit the spreadsheet.
- 6 Create Topics within the Domain as necessary.

Create Topics

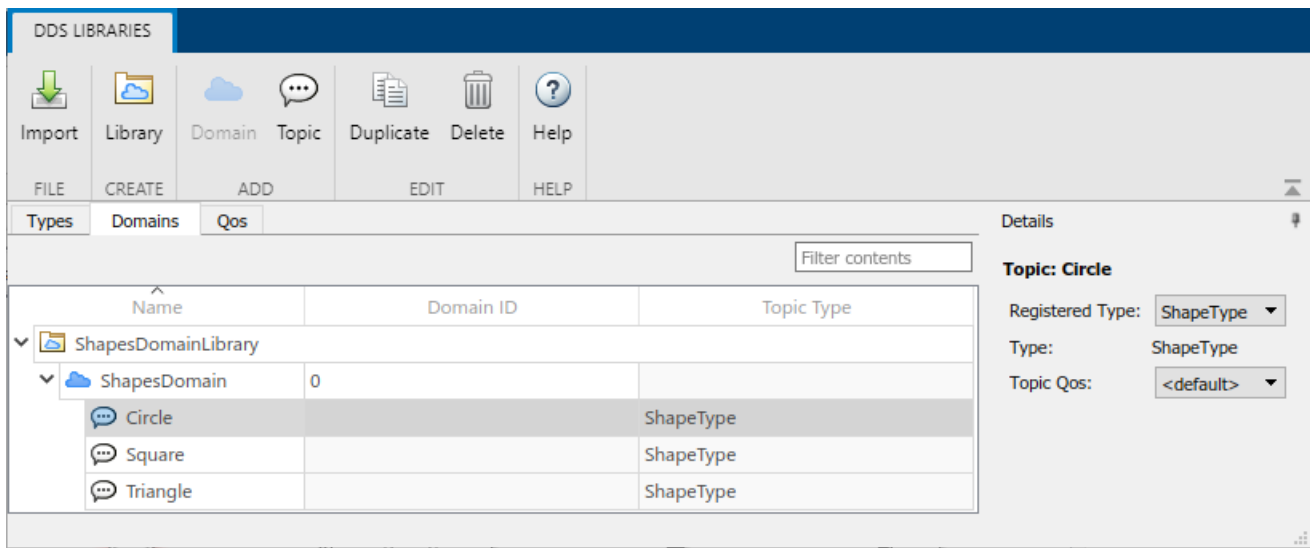
This example shows how to import, create, and configure Topics.

- 1 (Optional) Import Topics. If you would like to import Topics from XML, you can use the DDS Application Quick Start or DDS Dictionary to import XML files.
- 2 Open the DDS Dictionary. On the DDS Blockset toolstrip, click **Code Interface** and select **DDS Dictionary**.
- 3 Topics are contained within Domains. To configure Topics, click the **Domains** tab.
- 4 Select or create a Domain.
- 5 Create a Topic. On the DDS Toolstrip, click **Topic**.

Register DDS Data Types for Topics

This example shows how to create and configure Registered Types for Topics. To configure a Registered Type for a Topic, create the DDS data type in the DDS Dictionary, register the data type with the Domain, and then register the data type with the Topic.

- 1 Open the DDS Dictionary. On the DDS Blockset toolstrip, click **Code Interface** and select **DDS Dictionary**.
- 2 Registered Types are contained within Domains. To configure Registered Types, click the **Domains** tab.
- 3 Register a DDS data type with the Domain. In the **Details** pane, in the **Registered Types** section, click the link button to create a Registered Type. Adjust the **Name** and **TypeRef** as necessary.
- 4 Associate the Registered Type for a Topic. In the **Details** pane, in the **Topics** section, the Topics for the selected Domain are displayed. To set the Registered Type for a Topic, click in the **Register TypeRef** field and select from the drop-down options. The options reflect the Registered Types for the Domain.
- 5 Verify the Registered Type for the Topic. You can view the data type associated with the Registered Type for a Topic in the **Topic Type** column in the spreadsheet. Alternatively, you can select the Topic. In the **Details** pane, the **Registered Type** field shows the Registered Type for the Topic. You can also use the **Registered Type** drop-down to adjust the Registered Type for the Topic.



Subscribe to a Topic

This example shows at a high level how to use the DDS Dictionary to create a Topic and then configure the application modeled in Simulink to subscribe to that Topic.

- 1 Create a Topic in the DDS Dictionary.
 - a Open the DDS Dictionary. Topics are contained within Domains. To configure Topics, click the **Domains** tab.
 - b Create a Domain. On the toolbar, click **Domain**.
 - c Create a Topic. Select the Domain, from the toolbar, click **Topic**. Click and edit the spreadsheet to configure the Topic.
 - d Registered a DDS data type for the Topic. Select the Domain, in the **Details** pane, register a DDS data type and then apply it to the Topic.
 - e Close the DDS Dictionary.
- 2 In the application model the inports act as DataReaders and must have the same DDS data type as the Topic they subscribe to. Configure the inports to the Registered Type for the Topic.
- 3 Configure the DDS interface to subscribe to the Topic.
 - a Open the Code Mappings editor to configure the DDS interface. From the toolbar, click **Code Interface** and select **Individual Element Code Mappings**.
 - b Select the configuration mode. For the **Configuration Mode**, select Use Topic and QoS.
 - c Select the Topic. For the inports in the model, select the Topic specified in the drop-down options by its path (DomainLibrary/Domain/Topic).
 - d To generate the DataReaders to subscribe to the Topic, press **Ctrl+D**. You can now view the DataReaders in the editor.
- 4 Build and deploy the application to subscribe to the Topic.

For more information about how to configure a model, see “Model DDS Applications” on page 3-2. For more information about how to configure the inports, see “Interactively Configure DDS Interface” on page 4-2.

Publish a Topic

This example shows at a high level how to use the DDS Dictionary to create a Topic and then configure the application modeled in Simulink to publish for that Topic.

- 1** Create a Topic in the DDS Dictionary.
 - a** Open the DDS Dictionary. Topics are contained within Domains. To configure Topics, click the **Domains** tab.
 - b** Create a Domain. On the toolstrip, click **Domain**.
 - c** Create a Topic. Select the Domain, on the toolstrip, click **Topic**. Click and edit the spreadsheet to configure the Topic.
 - d** Registered a DDS data type for the Topic. Select the Domain, in the **Details** pane, register a DDS data type and then apply it to the Topic.
 - e** Close the DDS Dictionary.
- 2** In the application model, the outputs act as DataWriters and must have the same DDS data type as the Topic they publish. Configure the outputs to the Registered Type for the Topic.
- 3** Configure the DDS interface to subscribe to the Topic.
 - a** Open the Code Mappings editor to configure the DDS interface. On the toolstrip, click **Code Interface** and select **Individual Element Code Mappings**.
 - b** Select the configuration mode. For the **Configuration Mode**, select Use Topic and QoS.
 - c** Select the Topic. For the inports in the model, select the Topic specified in the drop-down options by its path (DomainLibrary/Domain/Topic).
 - d** To generate the DataWriters to subscribe to the Topic, press **Ctrl+D**. You can now view the DataWriters in the editor.
- 4** Build and deploy the application to publish the Topic.

For more information about how to configure a model, see “Model DDS Applications” on page 3-2. For more information about how to configure the outputs, see “Interactively Configure DDS Interface” on page 4-2.

See Also

Code Mappings Editor | DDS Dictionary

Related Examples

- “What Is DDS?”
- “Manage DDS Definitions” on page 2-2
- “Manage Types” on page 2-3
- “Manage QoS” on page 2-15
- “Model DDS Applications” on page 3-2
- “Interactively Configure DDS Interface” on page 4-2

Manage QoS

The DDS middleware platform offers several Quality of Service (QoS) policies that can be applied to control the data connection of your application on the DDS network. QoS policies are grouped into sets called profiles, that can be applied to DataWriters and DataReaders, Publishers and Subscribers, or Topics within the DDS network. When you use DDS Blockset, you can apply QoS profiles at each level of specification. DDS Blockset supports the default QoS profile provided by your DDS vendor, a built-in QoS profile included in DDS Blockset, or imported QoS profiles. You can use the DDS Dictionary to import, view, and edit these QoS profiles to meet your application requirements.

To create and manage the QoS for applications:

- 1 “Import Quality of Service (QoS)” on page 2-15
- 2 “View Quality of Service (QoS)” on page 2-15
- 3 “Edit Quality of Service (QoS)” on page 2-16

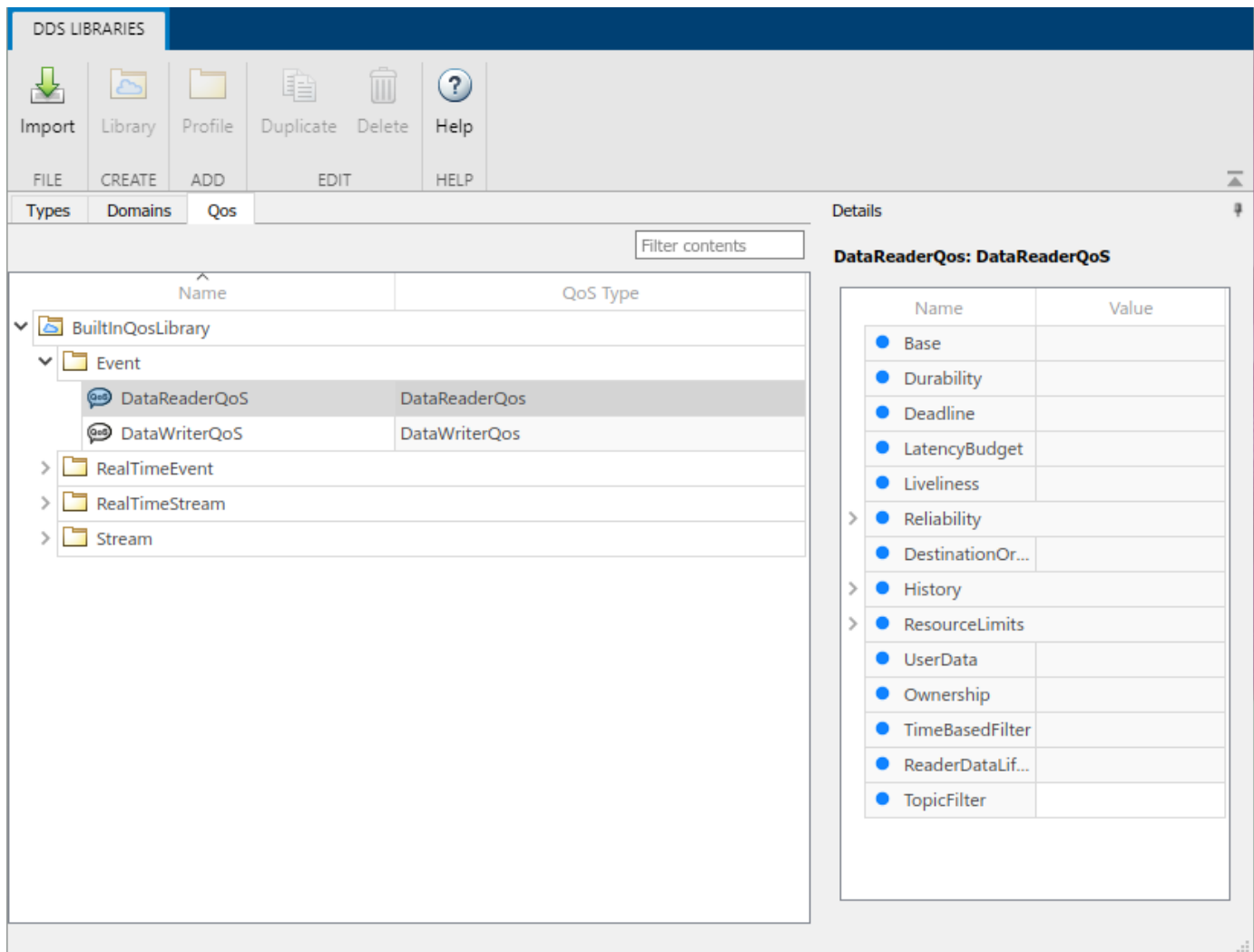
To learn how to apply QoS to your applications, see “Configure QoS for DataReaders and DataWriters” on page 2-17, “Configure QoS for Subscribers and Publishers” on page 2-18, and “Configure QoS for Topics” on page 2-18.

Import Quality of Service (QoS)

If you have DDS data types previously specified by XML or you would like to specify data types by using XML, you can define XML data type definitions and use the DDS Application Quick Start to import them into a DDS Dictionary. If you would like to import more than one XML file or you are working in an existing DDS Dictionary, you can use the DDS Dictionary to import additional XML files. To import from the DDS Dictionary, on the dictionary toolstrip, click **Import** to select and upload additional XML files.

View Quality of Service (QoS)

To open a DDS Dictionary to view QoS profiles and policies, on the DDS Blockset toolstrip, click **Code Interface** and select **DDS Dictionary**. To view QoS, click the **QoS** tab in the DDS Dictionary.



Alternatively, you can open the DDS Dictionary from a Simulink data dictionary. In a Simulink data dictionary, if DDS definitions are available, a **DDS Libraries** node appears in the dictionary. If you open the **DDS Libraries** section of the Simulink data dictionary, in the **Details** pane, you can click **Open DDS Libraries** to open the graphical interface for the DDS Dictionary.

Edit Quality of Service (QoS)

You can use the DDS Dictionary to view and configure these aspects of the QoS available for your DDS application:

- “View QoS Libraries, Profiles, and Policies” on page 2-17
- “Configure Default QoS” on page 2-17
- “Configure Built-In QoS” on page 2-17
- “Configure QoS Profile Names” on page 2-17
- “Configure the Values of QoS Policies” on page 2-17

View QoS Libraries, Profiles, and Policies

QoS policies can be grouped into sets called QoS profiles. These profiles can then be grouped into sets of profiles called libraries. You can view imported libraries, profiles, and policies in the DDS Dictionary **QoS** tab. To adjust the QoS libraries, profiles, and policies available for your application, you must define these definitions in XML and import them into the DDS Dictionary.

Configure Default QoS

The default QoS profile is the default provided by your target DDS vendor (RTI or eProsima). To see details of this profile, refer to your vendor documentation.

Configure Built-In QoS

DDS Blockset provides a built-in QoS library, composed of four QoS profiles specified by application type:

- Event-based applications
- Real-time event-based applications
- Real-time stream applications
- Stream applications

To access the default QoS profile, if you select the **Create and use default dictionary** option in the DDS Application Quick Start, the built-in library is included in your created default dictionary. If you use a different source of DDS definitions, you can use the DDS Dictionary to import the built-in QoS profile that is included in DDS Blockset, `defaultqos.xml`.

Configure QoS Profile Names

To change the name of a QoS profile, in the **Name** column, click and directly edit the spreadsheet.

Configure the Values of QoS Policies

To adjust the values of certain QoS policies, select a QoS profile. In the **Details** pane, if a QoS policy is collapsed, you can expand the policy and adjust the value.

Examples

These examples show how to apply QoS at various levels of your DDS application.

Configure QoS for DataReaders and DataWriters

In DDS Blockset, application model inports and outports behave as DataReaders and DataWriters. To apply QoS to a reader or writer, you can use the Code Mappings editor and Property Inspector to configure the QoS for individual ports.

- 1 (Optional) Import QoS. You can use the DDS Application Quick Start or DDS Dictionary to import XML or the built-in QoS profile.
- 2 Open the DDS Dictionary to view the QoS profiles available for your application. On the DDS Blockset toolbar, click **Code Interface** and select **DDS Dictionary**.
- 3 Configure QoS for DataReaders and DataWriters. If you would like to configure QoS from a previously defined and imported reader or writer, use the Reader/Writer XML Path configuration

mode and select the reader or writer. Otherwise, use the Topic and QoS configuration mode, and use the Property Inspector to select a QoS profile for your inport or output.

For more information about how to configure inports and outputs, see “Interactively Configure DDS Interface” on page 4-2.

Configure QoS for Subscribers and Publishers

In DDS Blockset, the application model behaves as a Publisher or Subscriber and the inports and outputs as DataReaders and DataWriters. To apply QoS at the Publisher or Subscriber level, you can simulate this effect by using the Code Mappings editor and Property Inspector to configure all the inports or outputs to the same QoS profile. To simulate a Subscriber, configure all the inports to the same QoS profile. To simulate a Publisher, configure all the outputs to the same QoS profile.

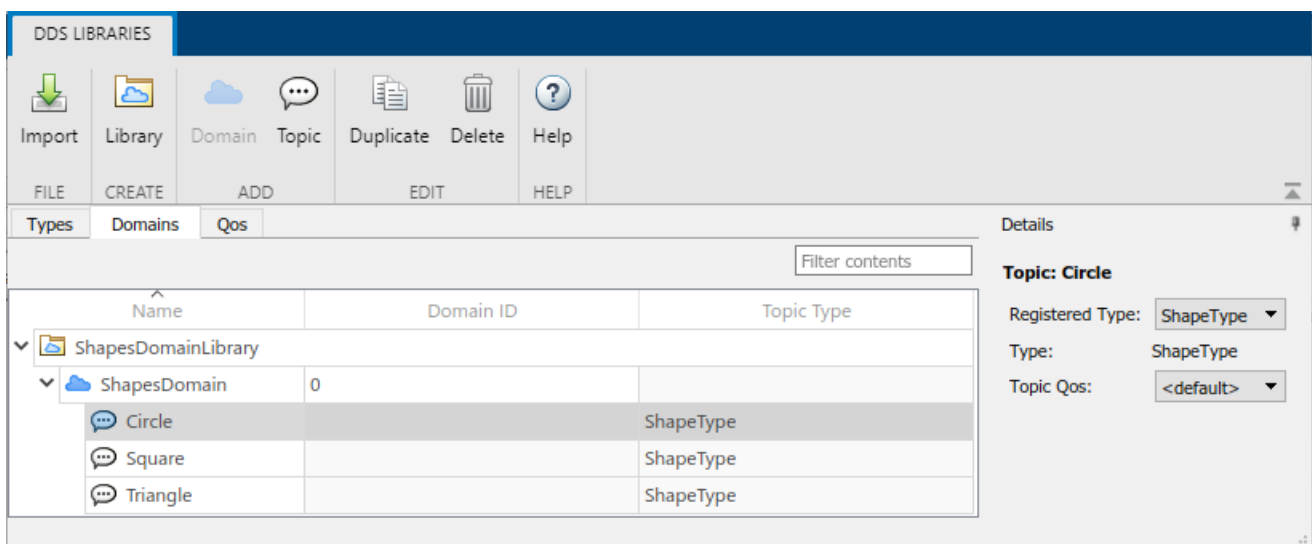
- 1 (Optional) Import QoS. You can use the DDS Application Quick Start or DDS Dictionary to import XML or the built-in QoS profile.
- 2 Open the DDS Dictionary to view the QoS profiles available for your application. On the DDS Blockset toolstrip, click **Code Interface** and select **DDS Dictionary**.
- 3 Configure QoS for Publishers and Subscribers. If you would like to configure QoS from a previously defined reader or writer, use the Reader/Writer XML Path configuration mode and select the same reader or writer for all inports or outputs. Otherwise, use the Topic and QoS configuration mode, and use the Property Inspector to select the same QoS profile for all inports or outputs.

For more information about how to configure inports and outputs, see “Interactively Configure DDS Interface” on page 4-2.

Configure QoS for Topics

This example shows how to use the DDS Dictionary to configure the QoS for a Topic.

- 1 Open the DDS Dictionary.
- 2 Topics are contained within Domains. To configure Topics, click the **Domains** tab.
- 3 Select a Topic.



- 4 Configure the QoS for that Topic. In the **Details** pane, for the **Topic QoS**, select a QoS profile from the drop-down options. By default, Topics are set to the default QoS for the selected DDS vendor. The other options reflect the QoS available in the DDS Dictionary.

See Also

Code Mappings Editor | DDS Dictionary

Related Examples

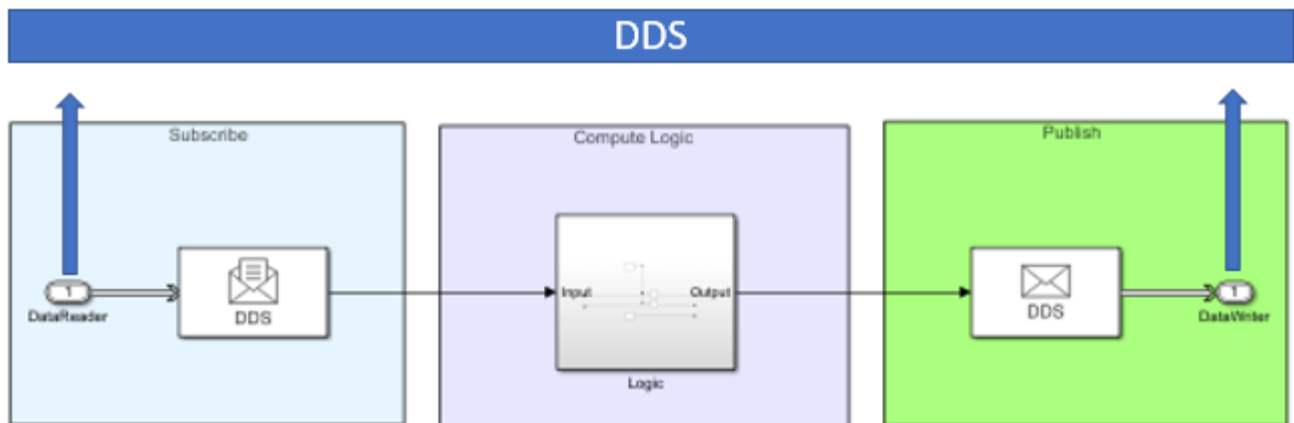
- “What Is DDS?”
- “Manage DDS Definitions” on page 2-2
- “Manage Types” on page 2-3
- “Manage Domains” on page 2-8
- “Interactively Configure DDS Interface” on page 4-2

Model Architecture

Model DDS Applications

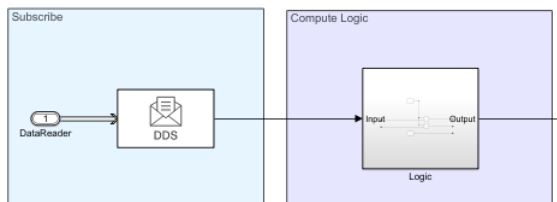
To model a DDS application, construct or adapt a Simulink model so that it can connect to the DDS middleware platform. To prepare a Simulink model so that it can publish and subscribe to the DDS network, the model must be configured as a top model with these modeling aspects:

- 1 The model must have inports and outports set to DDS data types.
- 2 The model must have message blocks that send and receive Data Samples from the DDS network. It is recommended that the model uses the DDS Blockset Take DDS Sample and Write DDS Sample blocks. These blocks convert between DDS and Simulink data types to enable the application modeled in Simulink to publish and subscribe to the DDS network.
- 3 The model itself that contains the DDS application logic. The logic portion of the model is independent of the middleware. The DDS application uses the Simulink equivalent data types to compute its application logic.



You can model DDS applications to act as Subscribers, Publishers, or both.

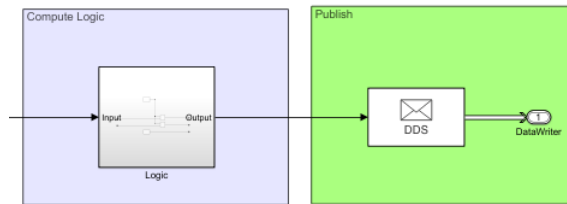
Model a Subscriber



To configure the Simulink model as a Subscriber:

- 1 Add an inport and set it to a DDS data type.
- 2 Insert a Take DDS Sample block to convert the DDS data type to its Simulink equivalent data type.
- 3 Enclose your application logic in a subsystem. On the boundary of the subsystem, insert In Bus Element ports to accept the Simulink data types from the Take DDS Sample block. For more information, see In Bus Element.

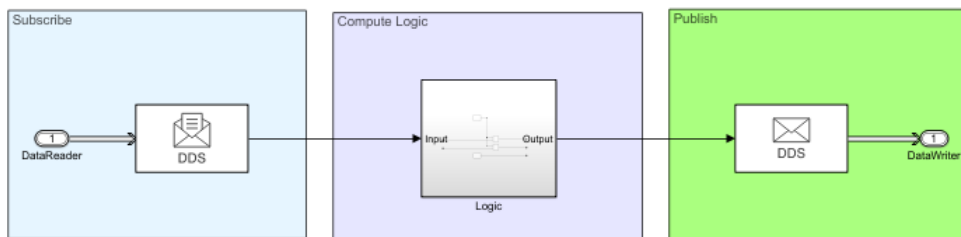
Model a Publisher



To configure the Simulink model as a Publisher:

- 1 Enclose your application logic in a subsystem. On the boundary of the subsystem, insert Out Bus Element ports to send Simulink data types to the Write DDS Sample block. For more information, see Out Bus Element.
- 2 Insert a Write DDS Sample block to convert Simulink data types to DDS data types.
- 3 Add an output and set it to a DDS data type.

Model a Subscriber and Publisher



To configure a Simulink model as a Publisher and Subscriber:

- 1 Add an inport and set it to a DDS data type.
- 2 Insert a Take DDS Sample block to convert a DDS data type to its Simulink equivalent data type.
- 3 Enclose your application logic in a subsystem. On the boundary of the subsystem, insert in bus element ports to receive Simulink data types from the Take DDS Sample block and out bus element ports to send Simulink data types to a Write DDS Sample. For more information, see In Bus Element and Out Bus Element.
- 4 Insert a Write DDS Sample block to convert Simulink data types to DDS data types.
- 5 Add an output and set it to a DDS data type.

Modeling Pattern Considerations and Limitations

- Modeling - DDS applications must be configured as a top models.
- Ports Configuration - DDS Blockset requires that all ports for must map to DDS. If you have ports that do not map DDS, the model will not simulate or build correctly.

See Also

[Code Mappings Editor](#) | [DDS Dictionary](#) | [Take DDS Sample](#) | [Write DDS Sample](#)

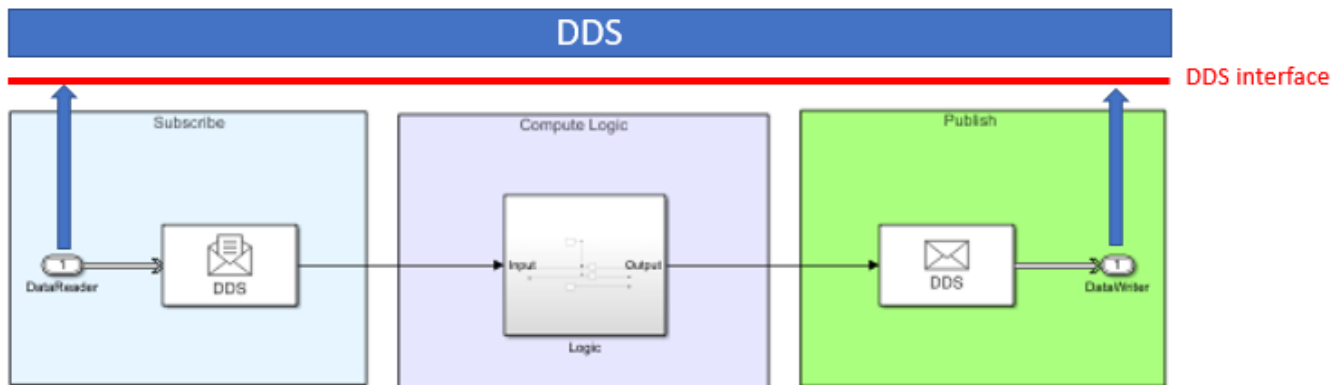
Related Examples

- “Manage DDS Definitions” on page 2-2
- “Interactively Configure DDS Interface” on page 4-2

DDS Interface Configuration

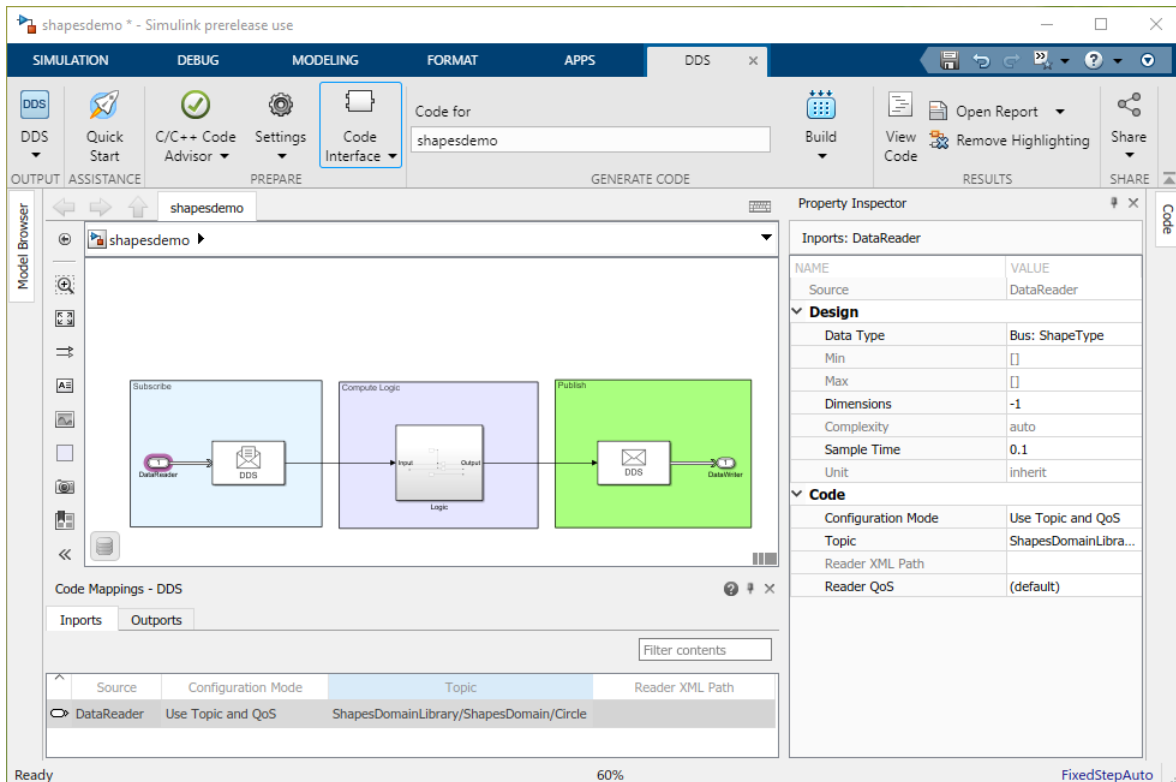
Interactively Configure DDS Interface

To connect a DDS application to publish and subscribe to the DDS network, configure a DDS interface. A DDS interface is the connection point between the application and the DDS network. Specifically, the interface defines the Topic and Quality of Service (QoS) for the DataReaders and DataWriters in an application. In an application model, the inports represent DataReaders and the outports represent DataWriters. To configure an interface, use the Code Mappings editor and Property Inspector to configure the ports as readers and writers that meet your application requirements.



Open DDS Interface Configuration Environment

To configure your DDS interface, configure the Topics in the Code Mappings editor and configure the QoS in the Property Inspector. To open the Code Mappings editor, with a model open in the DDS Blockset app, on the toolstrip, click **Code Interface** and select **Individual Code Element Mappings**. To view the QoS specification, in the Property Inspector, expand the **Code** section.



Select Configuration Mode

To configure the interface, use one of these configuration modes:

- Use Topic and QoS
- Use Reader/Writer XML Path

Use Topic and QoS

The Topic and QoS configuration mode enables a simplified, quick, and intuitive way to configure a DDS interface that does not require prior XML specification of DataReaders and DataWriters. You can use the Code Mappings editor to select Topics for your application and the DDS Blockset generates the necessary DataReaders and DataWriters to connect to the DDS network. If you would like to specify QoS for the generated readers and writers, you can use the Property Inspector to select a QoS profile.

Use Reader/Writer XML Path

The Use Reader/Writer XML Path configuration mode supports using imported XML specifications and provides customization and control over DataReaders and DataWriters. The XML Path configuration mode enables you to import and assign previously specified DDS applications with minimal effort. Additionally, XML specifications provide the ability to control specific properties of DataReaders and DataWriters. You can use the Code Mappings editor to select previously defined DataReaders and DataWriters from imported XML for the model ports and the Topic and QoS properties from those definitions load into the application.

Comparison of Configuration Modes

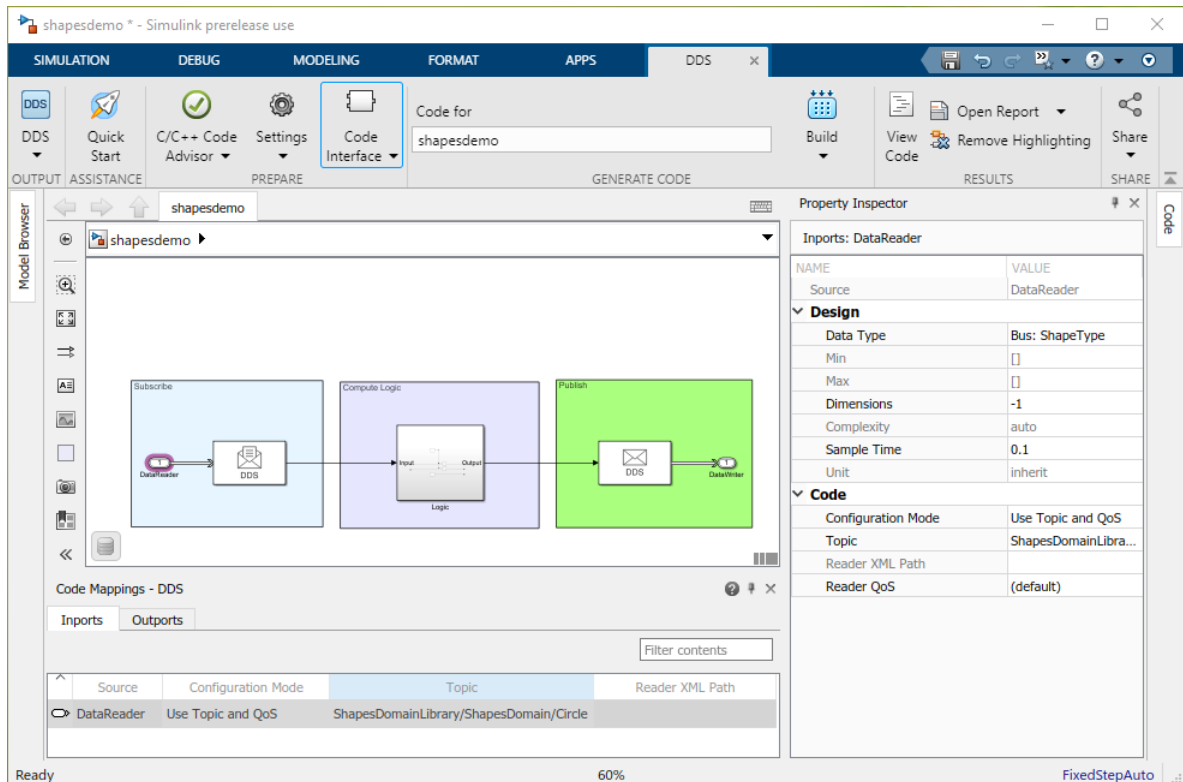
The differences between these configuration modes are listed in this table.

Configuration Mode	Requirements	Source of Topic Options	Source of QoS Options	Benefits
Use Topic and QoS	None	Topics defined in the DDS Dictionary	<ul style="list-style-type: none"> • Default QoS • Built in QoS profiles • Imported XML QoS profiles 	<ul style="list-style-type: none"> • Ideal for DDS newcomers • No XML specification necessary • DDS Blockset manages underlying DataReader/DataWriter specifications so you do not have to manage, create, or troubleshoot these entities
Use Writer/Reader XML Path	DataReader or DataWriter must be specified in imported XML	Topics specified within DataReader/DataWriter definitions	QoS specified within DataReader/DataWriter definitions	<ul style="list-style-type: none"> • Easily map DDS applications defined in XML into Simulink • Supports customization and control with explicit DataReader/DataWriter specifications

Configure DDS Interface by Using Topic and QoS

To configure a DDS interface by using Topic and QoS:

- 1 Open a model in the DDS Blockset app.
- 2 Import or create DDS definitions. The Topic and QoS configuration mode does not require prior XML specifications so you can use the DDS Application Quick Start to create a default dictionary for your application as well as use an existing DDS dictionary or imported XML.
- 3 Open the Code Mappings editor to configure the DDS interface. On the toolbar, click **Code Interface** and select **Individual Element Code Mappings**.



- 4 Configure the inports and outputs. The inports represent DataReaders used to subscribe to Topics. The outputs represent DataWriters used to publish Topics.
 - a Select the configuration mode. For the **Configuration Mode**, select Use Topic and QoS.
 - b Select the Topic. For each inport or output in the application model, you can select a Topic specified in the drop-down options by its path (DomainLibrary/Domain/Topic). The set of drop-down options shows the Topics that are specified with the same DDS data type as the port. If you do not see a Topic that you expected, review the port data type and the Registered Type for the Topic.
 - c Select the QoS. To specify QoS, in the Property Inspector, expand the **Code** section and select a QoS profile from the **Reader QoS** or **Writer QoS** drop-down options. You have several options to configure QoS:
 - You can leave the QoS policy as the default. The default QoS profile is the default provided by your target DDS vendor (RTI or eProsima). To see details of this profile, refer to your vendor documentation.
 - You can select from built-in QoS profiles. The built-in QoS profiles are profiles provided by the DDS Blockset. These profiles provide a set of QoS policies applicable to event-based, real-time event-based, real-time stream, and stream applications.
 - You can select from QoS profiles imported from XML. Imported QoS profiles also appear as options in this drop-down list.

For more information, see “Manage QoS” on page 2-15.

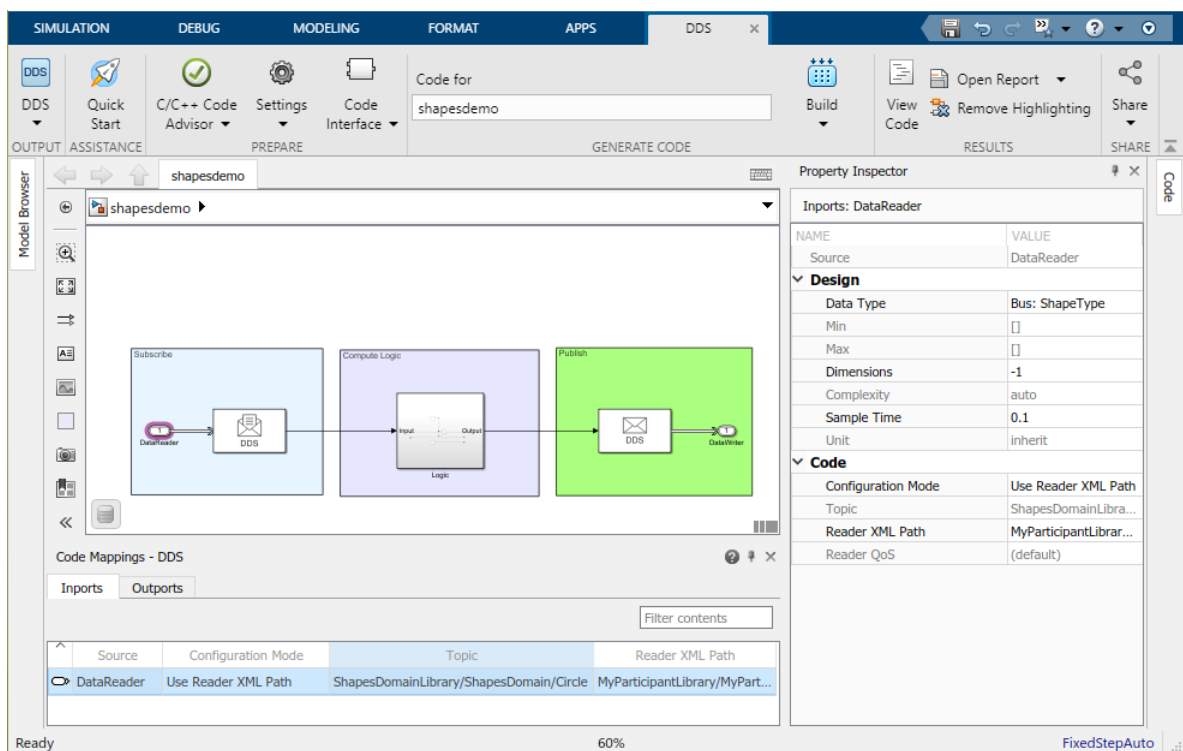
- d To generate the DataReaders and DataWriters, press **Ctrl+D**. You can now view the DataReaders and DataWriters in the editor.

- 5 Build and deploy application to DDS network.

Configure DDS Interface by Using Reader or Writer XML Path

To configure a DDS interface by using Reader or Writer XML Path:

- 1 Open a model in the DDS Blockset app.
- 2 Import DDS definitions. The Use Reader/Writer XML Path configuration mode requires prior XML specifications of readers and writers so you must import XML by using the DDS Application Quick Start or DDS Dictionary.
- 3 Configure the DDS interface. Open the Code Mappings editor. On the toolstrip, click **Code Interface** and select **Individual Element Code Mappings**.



- 4 Configure inports and outports. The inports represent DataReaders used to subscribe to Topics. The outports represent DataWriters used to publish Topics.
 - a Select the configuration mode. For the **Configuration Mode**, for the inports select Use Reader XML Path or for the outports select Use Writer XML Path.
 - b Select the DataReader or DataWriter. For the import **Reader XML Path** or for the output **Writer XML Path** field, select the reader or writer from the drop-down list specified by its path (myParticipant/MySubscriber/MyRdr). The **Topic** and **QoS** fields load as read-only based on your XML definitions. To change the Topic or QoS properties for the readers and writers, update and reimport the XML definitions. The set of drop-down options shows the readers and writers that are specified with the same DDS data type as the port. If you do not see a reader or writer that you expected, review the port data type and the XML specification of the reader or writer.
- 5 Build and deploy application to DDS network. Build the model and use the executable to deploy the application.

Considerations and Limitations

- **DDS Definitions** — The DDS Topics and QoS for your application are retrieved from the DDS Dictionary associated with your application model. Ensure that this dictionary is on your MATLAB path.
- **Data Types** — Inports and outports must have the same DDS data type as the Topic that they subscribe to or publish.
- **Unique Reader/Writer Mapping** — Inports and outports must map to unique DataReaders and DataWriters. For example, two different inports cannot map to the same DataReader, and two different outports cannot map to the same DataWriter.
- **Accurate Data Management** — Inports and outports must map to Topics and Quality of Service (QoS) definitions that can be found in the associated DDS dictionary or XML. For example, if you map the ports for a DDS application, and then remove Topics or QoS profiles from the dictionary, you might create invalid mappings where previously mapped ports now are configured to deleted definitions.
- **Mixed Mapping Configuration Modes** — When you configure a DDS interface, you can use different configuration modes to map different inports and outports. For example, you can use `Use Topic and QoS` to configure one inport and `Use Reader XML Path` to configure a different inport within the same model.

See Also

[Code Mappings Editor | DDS Dictionary](#)

Related Examples

- “What Is DDS?”
- “Import or Create DDS Definitions” on page 1-2
- “Manage DDS Definitions” on page 2-2
- “Model DDS Applications” on page 3-2
- “Deploy DDS Applications” on page 5-2

Deployment

Deploy DDS Applications

DDS Blockset connects applications modeled in Simulink to DDS by providing out-of-the-box support for the DDS vendors RTI and eProsima. To use out-of-the-box DDS, create and model a DDS application in Simulink, set up the environment, and use Embedded Coder® to build the application model. The build creates exported XML, generated C++ code, and an application executable that you can use to directly connect to the DDS network.

Build and Deploy DDS Applications

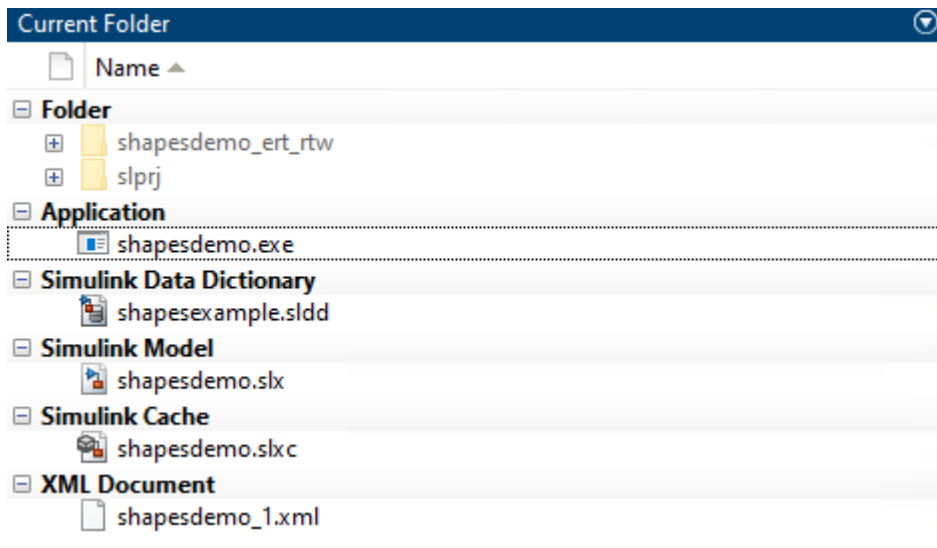
To deploy your application on the DDS network:

- 1 Ensure that your model is configured correctly. Verify that the model ports are configured and mapped appropriately for DDS. For more information, see “Interactively Configure DDS Interface” on page 4-2.
- 2 Set up the environment. DDS Blockset generates an executable specific to the DDS vendor that you select, RTI or eProsima. To verify or change your vendor selection, you can use the Configuration Parameters dialog box to review the toolchain setting for your application. To build an executable of your application, set up your environment with a supported platform, C++ compiler, and CMake. If your target vendor is eProsima, additional setup is not required. If your target vendor is RTI, you must also install RTI Connex. For more information, see “DDS Blockset System Requirements”.
- 3 Build the application model. On the DDS Blockset toolstrip, click **Build**.
- 4 Run the executable and connect your application to the DDS network.

Overview of Generated Files

When you build your DDS application model, the following folders and files are generated in your current working folder:

- Application executable — The executable that you can deploy to connect the application to the DDS network.
- Embedded Coder build folder — The generated C++ code files.
- Simulink project folder (slprj) — The model simulation files.
- Simulink Data Dictionary file — The associated DDS Dictionary (.sldd) file.
- DDS Application model — The Simulink model for the application.
- Exported XML/IDL file — The XML/IDL specifications of your DDS application.



You can use these generated files to analyze, deploy, and port your DDS application. Additionally, you can use the Pack-N-Go functionality to relocate and rebuild your application.

Portability of DDS Applications

To relocate, unpack, and rebuild your DDS application in another development environment, you can use Pack-N-Go. The Pack-N-Go function enables you to relocate files so you can recompile for a specific target environment or rebuild in a development environment where MATLAB is not installed. By default, the function packages the files as a flat folder structure in a ZIP file within the code generation folder. After you relocate the ZIP file, use a standard ZIP utility to unpack the compressed file.

To configure your model to build with Pack-N-Go:

- 1 Open the Configuration Parameters dialog box.
- 2 Select **Pack code and artifacts**.
- 3 On the toolstrip, click **Build**.

For more information, see `packNGo` (Embedded Coder).

Implementation Details and Generated C++ Code

The implementation of DDS is specified by the Object Management Group (OMG) standard and implemented by several vendors in several different programming languages. The DDS Blockset provides out-of-the box integration with the DDS vendors RTI and eProsima. Specifically, the blockset provides support for the C implementation of the DDS standard provided by RTI and the C++ implementation of the standard provided by eProsima.

The basic architecture of the generated C++ code is that the application is composed of message classes, vendor helper classes, and the main file. The message classes enable the application to send and receive data. The vendor helper classes are specific to the vendor and load the application profile, register the data types, create and initialize the DDS entities, and wrap the send and receive message classes specific to the vendor. The main file then performs the application logic. If you would

like to examine the generated C++ code, view the Embedded Coder build folder. If you are interested in the vendor APIs, refer to your vendor documentation.

Debug and Troubleshoot

A few common build issues you can troubleshoot are the following:

Incorrect environment setup

- Description — If you do not have CMake installed, the DDS application does not build an application executable.
- Action — Download and install CMake 3.15.5+. For RTI, also download and install RTI Connex.

Missing or invalid mapping for inports and outports in application model

- Description — If the inports or outports have not been configured correctly the model does not build.
- Action — Map the inports and outports in the application model to DDS Topics and configure the ports with the corresponding DDS data types.

Inconsistent data management of the DDS definitions

- Description — If you map an inport or an outport to a Topic and then delete or change the data type for the Topic the model does not build.
- Action — Verify that the DDS definitions are available in the associated DDS Dictionary.

Considerations and Limitations

- DDS Target Specification — DDS Blockset does not support compiling the code generated from a DDS application model for a non-DDS application
- DDS Definitions — The DDS Topics and QoS for your application are retrieved from the DDS Dictionary associated with your application model. Ensure that this dictionary is on your MATLAB path to appropriately build your model.
- Code Generation Data Types — The generated C++ code does not provide support for certain data types. Multidimensional arrays are not supported for code generation. The array data type is not supported for eProsim code generation. The string data type is not supported for RTI code generation.
- Security — There are security risks inherent in communication platforms. These risks include the potential of malicious users to attempt to listen to or spoof DDS communication. Additionally, late-joining readers can potentially access previously transmitted data. To increase protection against these security risks, download and use the secure version of your vendor. The version of eProsim included with DDS Blockset is not the secure version.

See Also

Related Examples

- “Interactively Configure DDS Interface” on page 4-2
- “DDS Blockset System Requirements”

External Websites

- CMake
- RTI Connex

DDS Examples

- “DDS Positioning System Application” on page 6-2
- “DDS Blockset Shapes Demo” on page 6-7

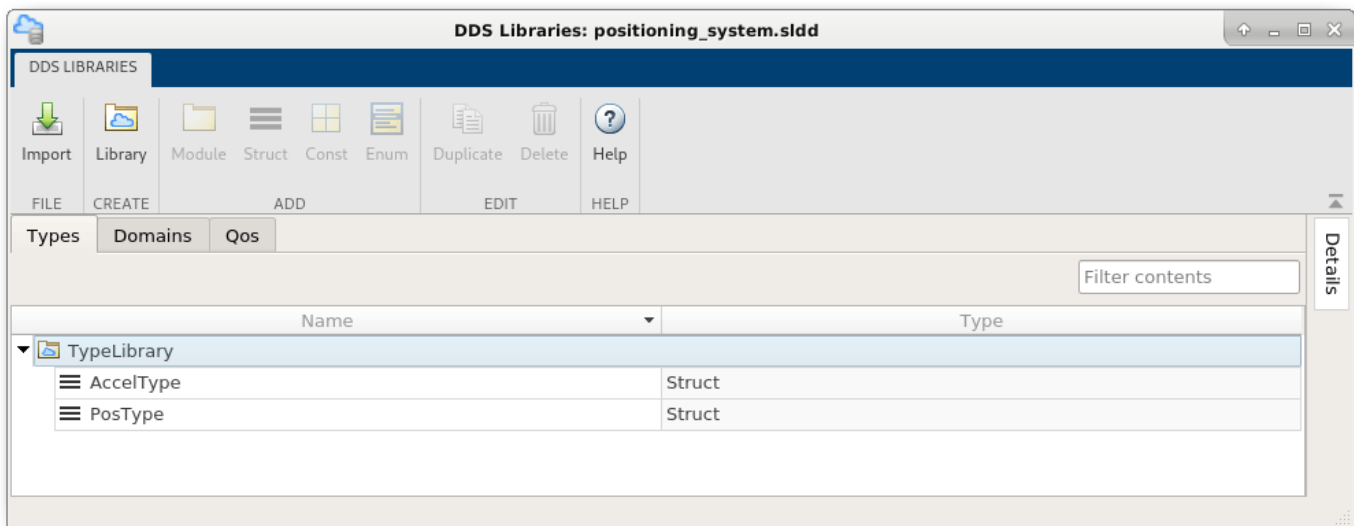
DDS Positioning System Application

This example shows how to import, model, and deploy a DDS application. The example application is a multi-sensor positioning system designed to estimate the position of a vehicle. The positioning system is composed of three components: a sensor component, an estimation component, and a display component. In the positioning system, the sensors send data to the estimation component that calculates the vehicle position estimate that it sends to the display component to show as a visual representation of the estimated vehicle position.

Import DDS Definitions for Positioning System

For the positioning system, the DDS definitions (for example, Domains, Topics, Types, and QoS policies) were specified in XML. In the general DDS Blockset workflow, you use the DDS Application Quick Start to import these XML definitions. For this example, the XML has already been imported. To view the XML specifications for the positioning system, open the XML file `positioning_system.xml`. To view the representation of these definitions in the DDS Blockset, open the DDS Dictionary:

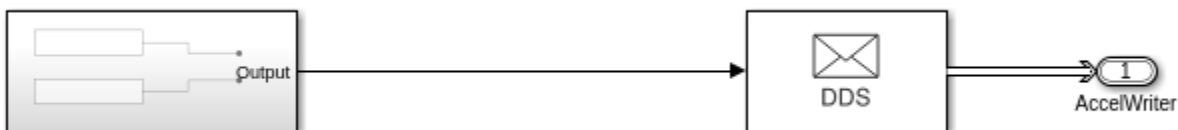
open `positioning_system.sidd`



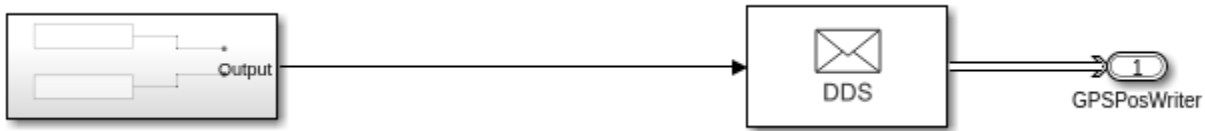
Model and Configure Sensor Component

The first component in the positioning system is the sensors. The positioning system uses an accelerometer and GPS, each represented by a model, to estimate the vehicle position. Each sensor model is constructed as a Publisher. To view the model structure and interface, open the models:

open_system('ex_accelerometer');



open_system('ex_gps');



In each sensor model, you can view each aspect of a Publisher modeled in Simulink:

- 1 The Sensor model logic, which is composed of a Function block that simulates sensor input data.
- 2 The Write DDS Sample block that converts the sensor data from a Simulink data type to a DDS data type.
- 3 The outport that sends the DDS data type.

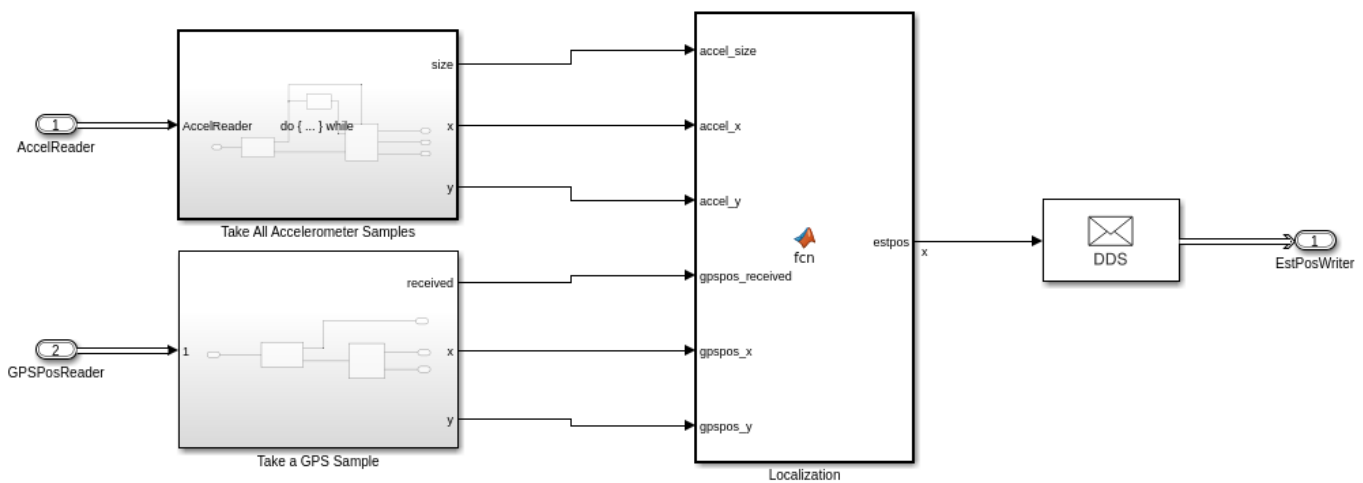
In addition to the modeling of the sensors, the DDS interface has been configured for each sensor model. You can view the DDS interface for each sensor in the Code Mappings editor:

- 1 On the toolbar, click the **Code Interface** and select **Individual Elements Code Mappings**.
- 2 On the **Outports** tab, you can view that the **Configuration Mode** is set to Use Writer XML Path. This configuration sets the DataWriters to the definitions specified in the XML.

Model and Configure Position Estimate Component

The second component is the estimate model. The estimate model receives data from the sensors and calculates the estimated position of the vehicle. The estimation model is constructed as a Subscriber to the sensors and as a Publisher to the display component. To view the model structure and interface, open the model:

```
open_system('ex_positionestimator');
```



In the estimation model, you can view each aspect of a Subscriber and Publisher modeled in Simulink:

- 1 The estimation model has two inports configured as DDS data types to receive the sensor data.
- 2 The model has a Take DDS Sample block attached to each Inport to convert the DDS data types to Simulink data types.

- 3 The estimation model computes the logic to estimate the vehicle position.
- 4 The model uses the Write DDS Sample block to convert the Simulink data types to DDS data types.
- 5 The estimate model uses an outport to send the estimate as a DDS data type to the display component.

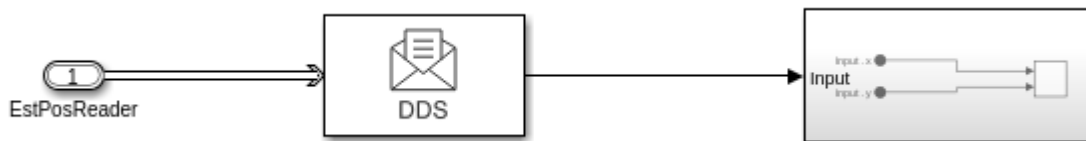
In addition to the modeling of the estimation model, the DDS interface has been configured for the estimation model. You can view the DDS interface in the Code Mappings editor:

- 1 On the toolstrip, click the **Code Interface** and select **Individual Elements Code Mappings**.
- 2 On the **Inports** tab, you can view that the **Configuration Mode** is set to Use Reader XML Path. This configuration sets the DataReaders to the definitions specified in the XML.
- 3 On the **Outports** tab, you can view that the **Configuration Mode** is set to Use Writer XML Path. This configuration sets the DataWriter to the definition specified in the XML.

Model and Configure Display Component

The third component is the display model. The display model receives and graphically displays the estimated position of the vehicle. The display model is constructed as a Subscriber to the estimation component. To view the model structure and interface, open the model:

```
open_system('ex_resultdisplay');
```



In the display model, you can view each aspect of an application that acts as a Subscriber modeled in Simulink:

- 1 The estimation model has an inport configured as a DDS data type to receive the vehicle position estimate.
- 2 The model has a Take DDS Sample block to convert the DDS data type to the Simulink data type so that it can display the vehicle estimate.
- 3 The model logic of the display component graphically shows the estimate of the vehicle position.

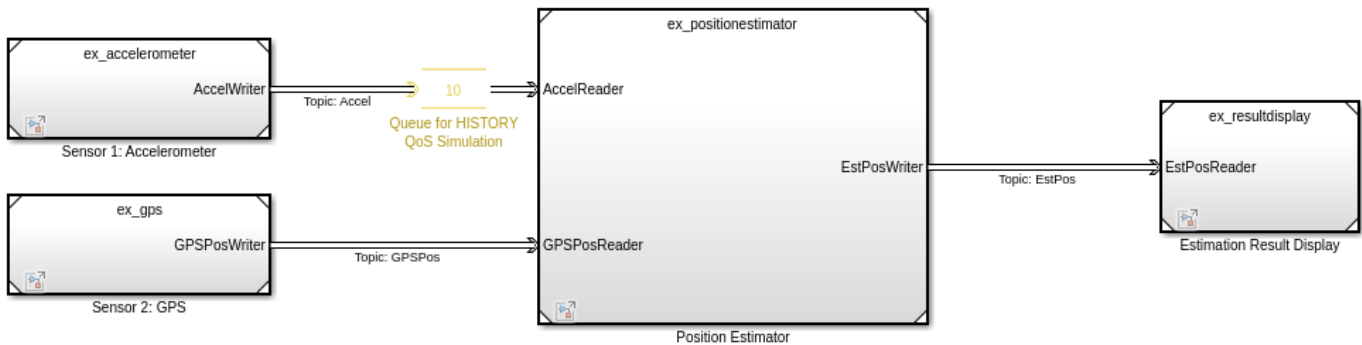
In addition to the modeling the display model, the DDS interface has been configured. You can view the DDS interface in the Code Mappings editor:

- 1 On the toolstrip, click the **Code Interface** and select **Individual Elements Code Mappings**.
- 2 On the **Inports** tab, you can view that the **Configuration Mode** is set to Use Reader XML Path. This configuration sets the DataReader to the definition specified in the XML.

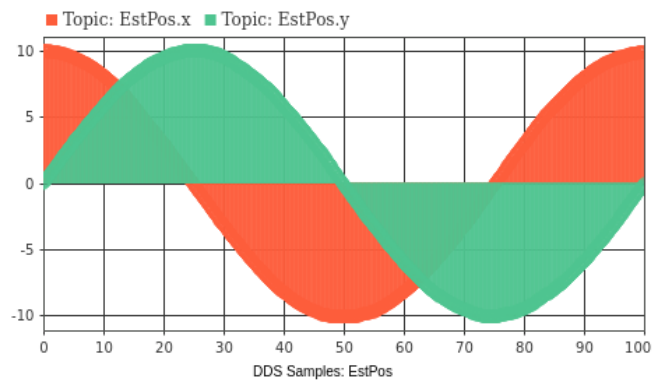
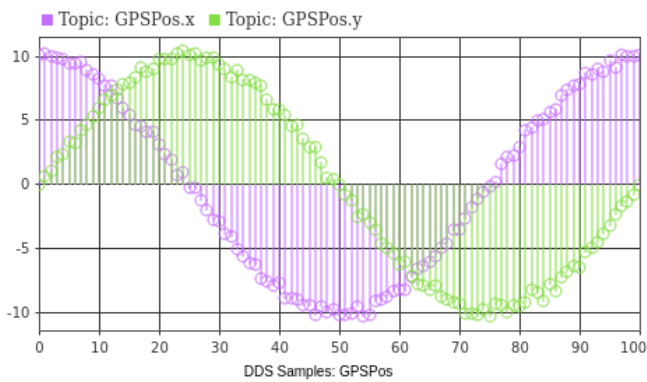
Build and Deploy Positioning System

To visually show the DDS positioning system application, this example simulates the DDS network to show the results of the positioning system. A Queue block is placed between Accelerometer and Position Estimator model blocks to simulate HISTORY QoS. When you simulate the application, you can see on the dashboard that the position estimation system produces a more accurate position of the vehicle than the sensor input.

```
open_system('ex_positioningsystem');
```

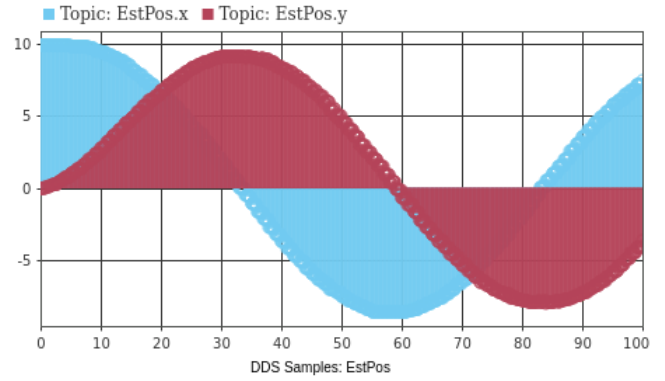
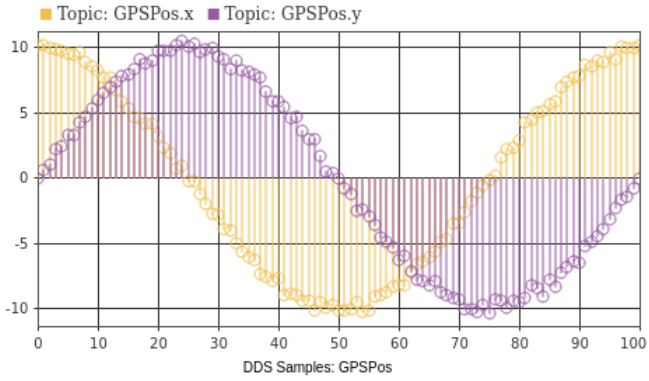


```
set_param('ex_positioningsystem/DDS Samples: GPSPos', 'TimeSpan', '10');
set_param('ex_positioningsystem/DDS Samples: EstPos', 'TimeSpan', '10');
sim('ex_positioningsystem');
set_param('ex_positioningsystem/DDS Samples: GPSPos', 'TimeSpan', '100');
set_param('ex_positioningsystem/DDS Samples: EstPos', 'TimeSpan', '100');
```



To see the effect of Quality of Service (QoS) on the estimate, if the QoS is not honored the results are inaccurate.

```
set_param(['ex_positioningsystem/Queue for HISTORY' newline 'QoS Simulation'], ...
    'Commented', 'through')
set_param('ex_positioningsystem/DDS Samples: GPSPos', 'TimeSpan', '10');
set_param('ex_positioningsystem/DDS Samples: EstPos', 'TimeSpan', '10');
sim('ex_positioningsystem');
set_param('ex_positioningsystem/DDS Samples: GPSPos', 'TimeSpan', '100');
set_param('ex_positioningsystem/DDS Samples: EstPos', 'TimeSpan', '100');
```



After reviewing the simulation of the positioning system, if you would like to deploy this example, you can build the model and use the executable to deploy this application on the DDS network.

DDS Blockset Shapes Demo

This example shows how to import, configure, and deploy the Shapes Demo provided by DDS vendors to introduce DDS concepts. In the demo there are various shapes - Circles, Squares, and Triangles - that you can subscribe to watch their location as they move around a canvas. In this version of the demo, DDS Blockset provides an application that subscribes to a Square and then publishes the location of a Circle.

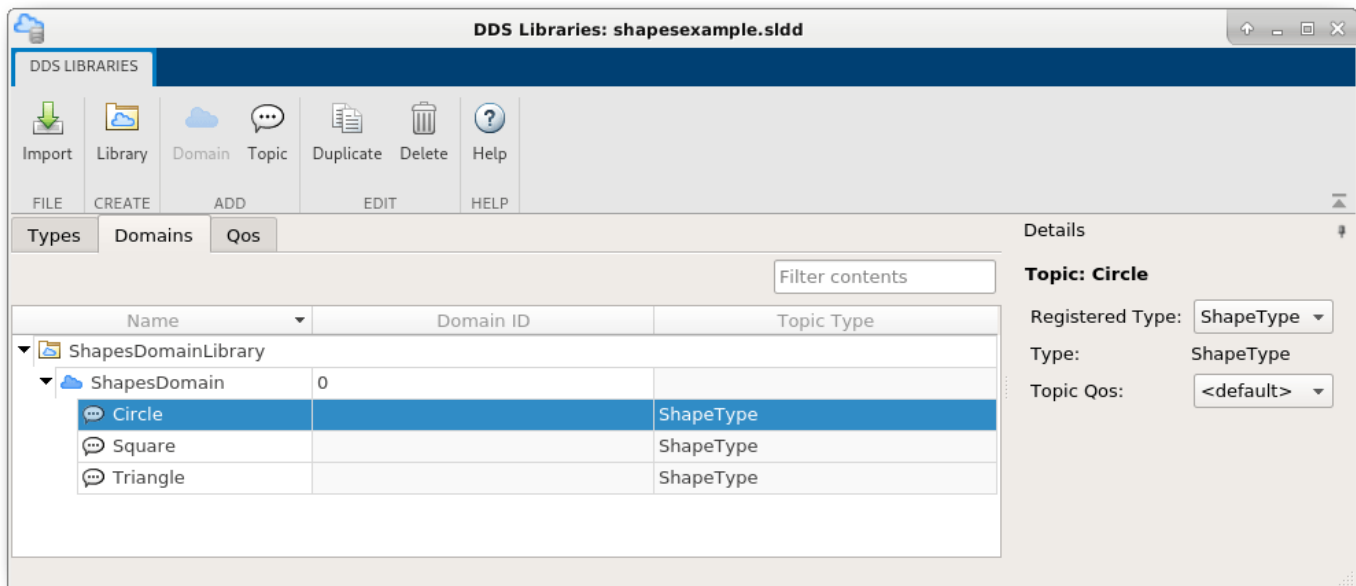
Import DDS Definitions

To get started with the Shapes Demo, the DDS definitions of Domains, Topics, Types, and Quality of Service (QoS) have been imported from XML. To view the XML specifications, open `shapexample.xml`.

View and Edit Definitions

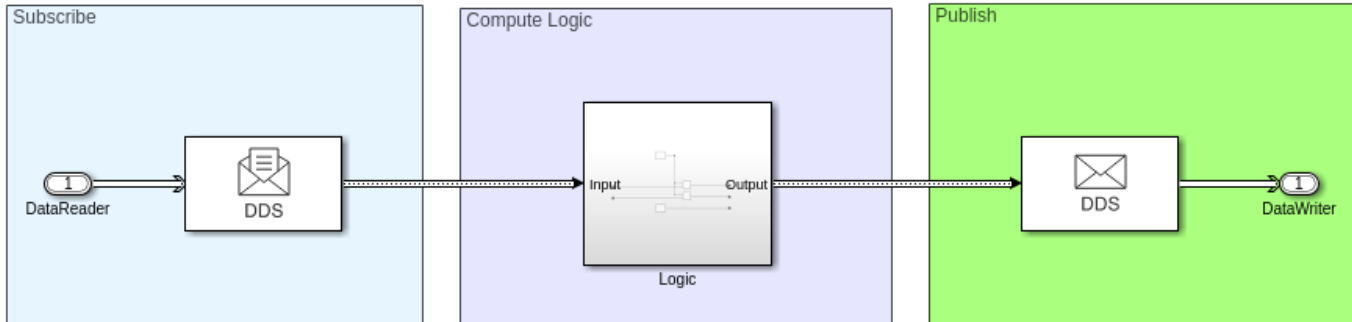
To view these DDS definitions in the DDS Dictionary, open the dictionary and view the **Types**, **Domains**, and **QoS** tabs.

open `shapexample.sidd`



View Publisher and Subscriber Model Construction

```
open_system('shapedemo');
```



In the Simulink model for the Shapes Demo, view how the DDS blocks, Take DDS Sample and Write DDS Sample, are used to subscribe to and publish the location of the shape.

- 1 Click the inport and view the DDS data type of the shape.
- 2 Click the Take DDS Sample block that converts the DDS data type to the Simulink data type.
- 3 Examine the logic component of the application model. The logic component uses the Simulink data types to compute the logic of the DDS application.
- 4 Click the Write DDS Sample block that converts the Simulink data types to a DDS data type.
- 5 Click the outport and view the DDS data type to send the shape position to the DDS network.

View Configured DDS Interface

In addition to the modeling of the Shapes Demo, you can view the DDS interface configuration of the DataReaders and DataWriters for the model. This example uses the Reader/Writer XML path configuration mode to specify previously imported readers and writers to configure the interface.

- 1 Open the Code Mappings editor. On the toolbar, click **Code Interface** and select **Individual Elements Code Mappings**.
- 2 On the **Inports** tab, view how the **Configuration Mode** is set to Use Reader XML Path. This configuration sets the DataReader to the definition specified in the imported XML.
- 3 On the **Outports** tab, view how the **Configuration Mode** is set to Use Writer XML Path. This configuration sets the DataWriter to the definition specified in the imported XML.

Build and Deploy the Shapes Demo

DDS Blockset enables out-of-the-box support for RTI and eProsima. To use this out-of-the-box support, build your application model and deploy your generated executable in your development environment. For this example, click **Build** to subscribe to a Square and publish the location of a Circle Topic.