RTI Spreadsheet Add-in

for Microsoft® Excel®

Getting Started Guide

Version 6.1.2

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Chapter 1 Welcome to Spreadsheet Add-in for Microsoft Excel

Welcome to *RTI® Spreadsheet Add-in for Microsoft® Excel®*. This revolutionary component of the *RTI Connext® DDS* product family allows you to rapidly analyze, visualize, and respond to your real-time data, transforming information into intelligent action and ultimately business value. This powerful tool leverages Microsoft Excel technology to radically increase the productivity of both analysts and decision makers by decreasing the amount of time and effort that stand between the arrival of information and the actions taken in response to that information.

Traditionally, data analysis involves recording the data, post-processing it (perhaps with hand-coded programs), and creating static summaries and reports by hand. Only then can the data be visualized, understood, and acted upon. Not only is this process slow and expensive, the information may be obsolete by the time the report is ready. To get real-time data visualization and analysis, you have to invest in expensive custom tooling—often an impractical option at the user or the operator level.

Spreadsheet Add-in for Microsoft Excel is different. Your queries, formulas, and charts aren't part of a static report: they operate on live data that is continually updated in real time. You can even republish the results of your analysis as it changes, making it instantly available to team members and other applications. There are no custom applications to deploy, administer, or be trained on: all of this happens within the Microsoft Excel application that you know and use already.

With *Spreadsheet Add-in for Microsoft Excel*, application developers can truly enable *data-centric* design and focus on putting the data on the network, leaving the visualization aspect to the data consumers. Dashboards can be created at deployment time and customized according to the needs of the data consumer.

By leveraging a well-known and widely used technology such as Excel, you can build alerts, correlate multiple streams of real-time data, process and analyze high-volume event streams to uncover opportunities and threats as they happen, not after the fact.

You can easily validate, cleanse, and enrich real-time data, and inject data back into the network, since *Spreadsheet Add-in for Microsoft Excel* can work both as a subscriber and a publisher.

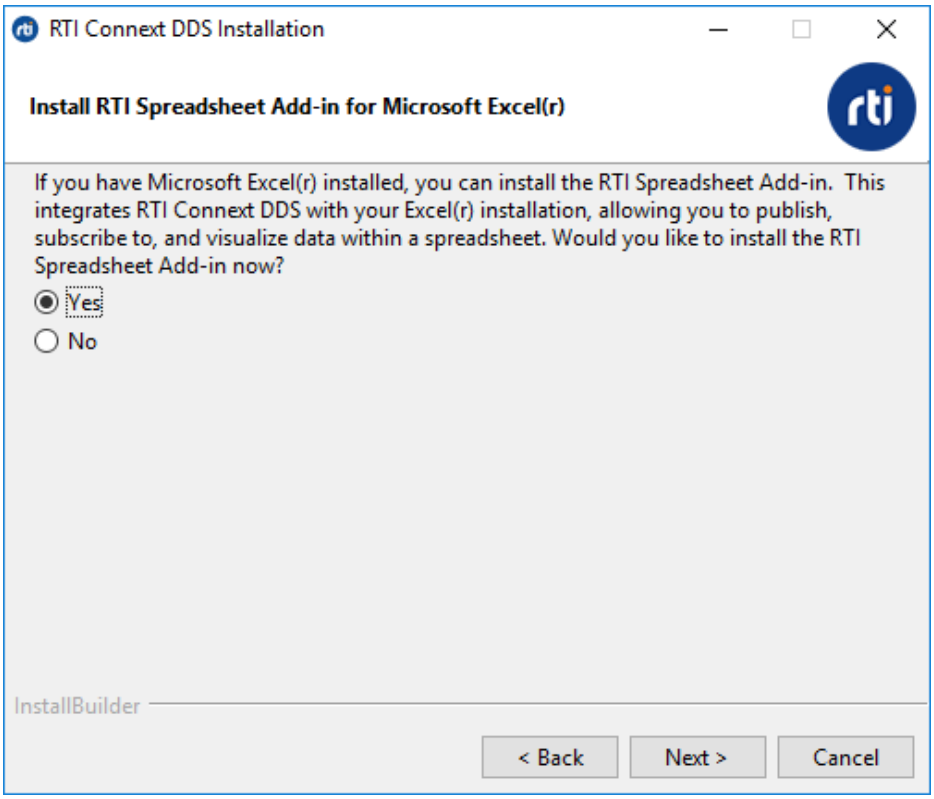
Wizards make it simple to create publications and subscriptions using a point-and-click interface.

Key Benefits of *Spreadsheet Add-in for Microsoft Excel*:

- Allows spreadsheets to participate seamlessly as peers on a distributed network databus along with applications written in C, C++, Java, .Net and Ada; Complex Event Processing (CEP) engines; databases; and mobile and embedded devices.
- Supports data injection (write back)
- Provides low-latency, real-time analytics and data visualization
- Allows introspection, status and health monitoring of *Connext DDS* applications
- Self-contained within an Excel Add-in, requires no separate service or gateway or custom integration code

1.1 Installation Notes

Spreadsheet Add-in for Microsoft Excel can be installed with the *Connext DDS* bundles. When running the installer, make sure you check the 'Yes' button when prompted:



If you want to install at a later time or you forgot to check the 'Yes' option in the installation dialog, you can use the Spreadsheet Add-in standalone installer at any time. This installer is in **<NDDSHOME>\resource\installers\spreadsheet_addin\rti_spreadsheet_addin-<version>.exe**. (See 1.4 Paths Mentioned in Documentation below.) You can also install Spreadsheet Add-in via *Launcher*. See the *Launcher User's Manual*.

1.2 Uninstalling the Spreadsheet Add-in

To uninstall *Spreadsheet Add-in for Microsoft Excel*, use the uninstall application, **<NDDSHOME>\uninstall\uninstall_spreadsheet_addin.exe**. (See 1.4 Paths Mentioned in Documentation below.)

The application will perform the necessary cleanup tasks to properly remove the add-in from Excel and the Global Assembly Cache (GAC).

1.3 Available Documentation

Spreadsheet Add-in for Microsoft Excel documentation includes:

- **Getting Started Guide** (RTI_Spreadsheet_Addin_GettingStarted.pdf)—Highlights the benefits of *Spreadsheet Add-in for Microsoft Excel*. It also walks you through a short demonstration and a tutorial, so you can quickly see the benefits of using *Spreadsheet Add-in for Microsoft Excel*.
- **Release Notes** (RTI_Spreadsheet_Addin_ReleaseNotes.pdf)—Describes system requirements, as well as any version-specific changes and known issues. (For migration and compatibility information for all products, see the *Migration Guide* on the RTI Community Portal (https://community.rti.com/documentation).
- **User's Manual** (RTI_Spreadsheet_Addin_UsersManual.pdf)—Describes how to configure *Spreadsheet Add-in for Microsoft Excel* and provides details on each feature.

1.4 Paths Mentioned in Documentation

The documentation refers to:

- **<NDDSHOME>**

  This refers to the installation directory for *RTI® Connext® DDS*. The default installation paths are:
  - macOS® systems:
    /Applications/rti_connext_dds-6.1.2
  - Linux systems, non-*root* user:
    /home/<*your user name*>/rti_connext_dds-6.1.2
  - Linux systems, *root* user:
    /opt/rti_connext_dds-6.1.2

- Windows® systems, user without Administrator privileges:
  <*your home directory*>\rti_connext_dds-6.1.2
- Windows systems, user with Administrator privileges:
  C:\Program Files\rti_connext_dds-6.1.2

You may also see **$NDDSHOME** or **%NDDSHOME%**, which refers to an environment variable set to the installation path.

Wherever you see **<NDDSHOME>** used in a path, replace it with your installation path.

Note for Windows Users: When using a command prompt to enter a command that includes the path **C:\Program Files** (or any directory name that has a space), enclose the path in quotation marks. For example:

```
"C:\Program Files\rti_connext_dds-6.1.2\bin\rtiddsgen"
```

Or if you have defined the **NDDSHOME** environment variable:

```
"%NDDSHOME%\bin\rtiddsgen"
```

- ***<path to examples>***

By default, examples are copied into your home directory the first time you run *RTI Launcher* or any script in **<NDDSHOME>/bin**. This document refers to the location of the copied examples as ***<path to examples>***.

Wherever you see ***<path to examples>***, replace it with the appropriate path.

Default path to the examples:

- macOS systems: **/Users/<*your user name*>/rti_workspace/6.1.2/examples**
- Linux systems: **/home/<*your user name*>/rti_workspace/6.1.2/examples**
- Windows systems: **<*your Windows documents folder*>\rti_workspace\6.1.2\examples**

  Where 'your Windows documents folder' depends on your version of Windows. For example, on Windows 10, the folder is **C:\Users\<*your user name*>\Documents**.

Note: You can specify a different location for **rti_workspace**. You can also specify that you do not want the examples copied to the workspace. For details, see *Controlling Location for RTI Workspace and Copying of Examples* in the *RTI Connext DDS Installation Guide*.

Chapter 2 A Quick Demonstration

The best way to learn about *Spreadsheet Add-in for Microsoft Excel* is to start using it. The provided demonstration file, **ShapesExtended_Example.xls**, will give you a quick idea of the add-in's capabilities. This file can be found in **<your home directory>\rti_workspace*version*\user_config\spreadsheet_addin**.

After the demonstration, see Chapter 3 Tutorial on page 11 for a more in-depth look at what you can do with *Spreadsheet Add-in for Microsoft Excel*.

Both the demonstration and the tutorial use *RTI Shapes Demo*, a *Connext DDS* application that can send and receive colored, moving shapes.

Shapes Demo is available from https://www.rti.com/free-trial/shapes-demo.

Before continuing, please make sure you have the following software installed (both components should have the same version number):

- *Spreadsheet Add-in for Microsoft Excel*
- *Shapes Demo*

Notes:

- *Shapes Demo* uses Domain ID 0 by default. If you need to use a different domain ID, please see B.1 Changing the Domain ID for Shapes Demo on page 29.
- If you are using a computer that does not have an active network interface, please see B.2 Running without an Active Network Interface on page 29.

1. Start *Shapes Demo*.

   There are two ways to start it, from *RTI Launcher*, or from a command prompt.
   - From *RTI Launcher*, select the **Learn** tab and click the **Shapes Demo** icon.

or

- From a command prompt, enter (replacing <NDDSHOME> to match your system, see 1.4 Paths Mentioned in Documentation on page 3):

```
<NDDSHOME>\bin\rtishapesdemo
```

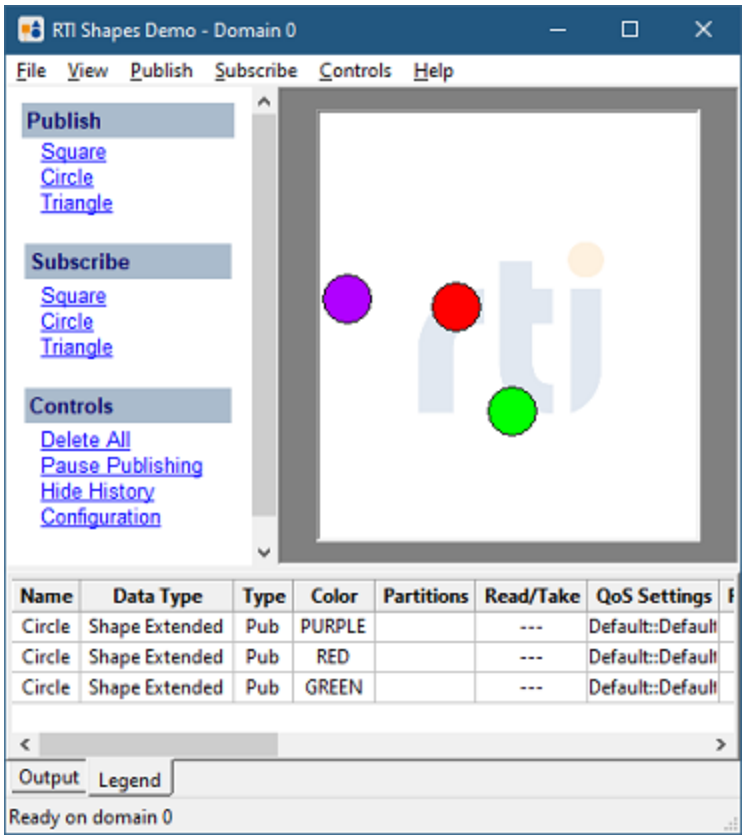
(Depending on your security settings, you may encounter a "Windows Security Alert" dialog. Simply click **Allow Access**.)

2. In the *Shapes Demo* window, publish 3 circles (purple, red, and green):
   a. Under **Publish**, select **Circle**.
   b. In the **Create New Publisher** dialog, select **PURPLE** and click **OK**. (Use the defaults for the other settings).

      You should see a purple circle moving in the display area.
   c. Use the same process to create a red circle and a green circle.

Now *Shapes Demo* is publishing data for one topic called Circle. There are three *instances* of the topic, one for each color. (The color is the *key* that identifies the different instances of the topic.)

You should see these three circles moving in the *Shapes Demo* window.



3. In the same *Shapes Demo* window, subscribe to *Triangles*:
   a. Under **Subscribe**, select **Triangle**. (Use the defaults for the other settings).
   b. Click **OK.**

   What's happening so far?

   Notice that you don't see any triangles in the *Shapes Demo* window. That's because it is subscribing to *triangles*, but so far, we're only publishing *circles*.

   This is where *Spreadsheet Add-in for Microsoft Excel* comes in. It's going to subscribe to circles, use the data from those circles to fill in data for triangles, then publish triangles.

4. Open **<*your home directory*>\rti_workspace*version*\user_config\spreadsheet_addin\ShapesExtended_Example.xls**[1].

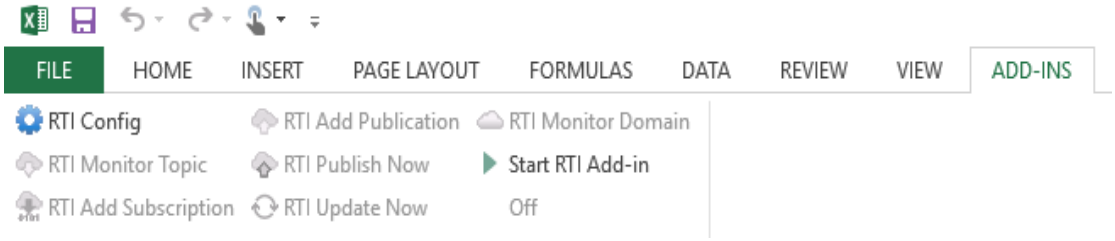
   Spreadsheet Add-in for Microsoft Excel will load automatically when Excel starts up.

[1]These instructions assume you kept the default configuration for *Shapes Demo*, so that it is using the **Shape Extended** data type. If you changed *Shapes Demo* to use the alternate **Shape** data type, use **Shapes_Example.xls** instead.

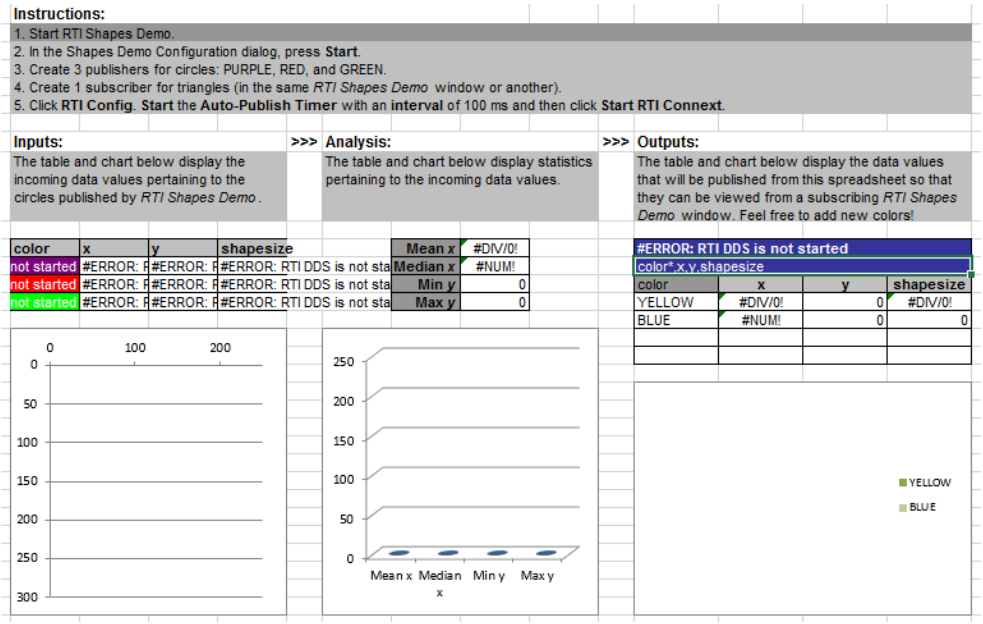
Note: This is when the add-in reads your license file. You may see a window with license information—you may close this window.

The status bar in Excel will show "Loading RTI Spreadsheet Add-in for Microsoft Excel <*version*>…", then change to "RTI Spreadsheet Add-in for Microsoft Excel <*version*> init O.K.", and finally to "Ready" when the add-in has been loaded.

5. To see the Spreadsheet Add-In toolbar, select the **ADD-INS** tab on the Ribbon. (If you don't see the add-in, refer to A.3 Spreadsheet Add-in does not Appear in Excel ADD-INS Tab on page 27).



The worksheet in **ShapesExtended_Example.xls** has three sets of tables and charts. You will see errors in the data cells because the add-in isn't running yet.



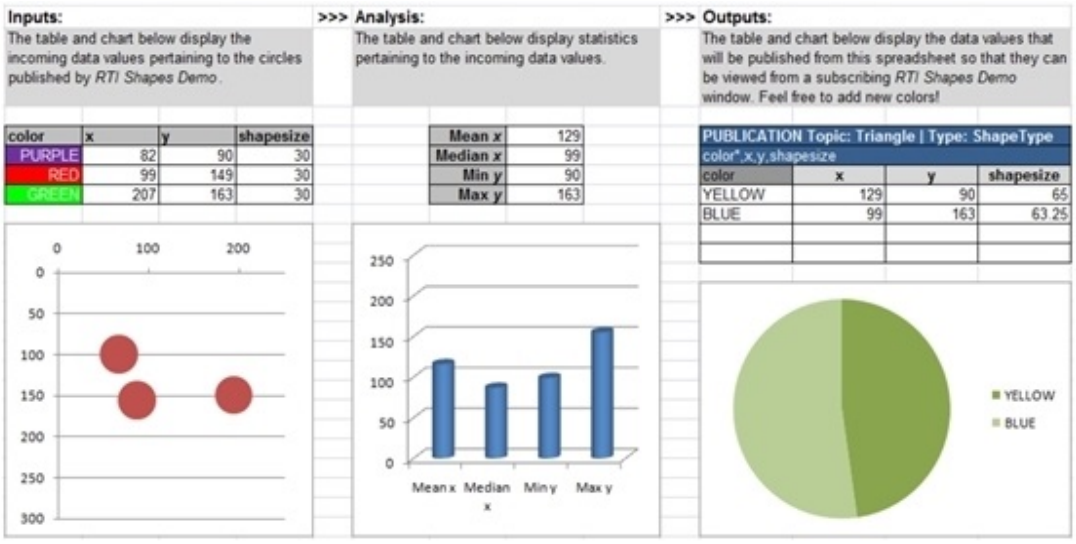
6. *Optional, not required for most users:* For *Connext DDS* applications to communicate, they must use the same domain ID. Since both *Spreadsheet Add-in for Microsoft Excel* and *Shapes Demo* use a default domain ID of 0, they are already set up to communicate on domain 0. If you need to use a different domain ID (for example, if you are running *Shapes Demo* with a non-0 domain ID because

you have other *Connext DDS* applications already using domain 0), select RTI Config and change the domain ID (an integer value) in this dialog, then click **Close**.

7. *Optional, not required for most users:* For *Connext DDS* applications to communicate, they must use the same domain ID. Since both *Spreadsheet Add-in for Microsoft Excel* and *Shapes Demo* use a default domain ID of 0, they are already set up to communicate on domain 0. If you need to use a different domain ID (for example, if you are running *Shapes Demo* with a non-0 domain ID because you have other *Connext DDS* applications already using domain 0), select RTI Config and change the domain ID (an integer value) in this dialog, then click **Close**.
8. From the ADD-INS toolbar, select RTI Config.
9. Change the **Auto publish timer** interval to 100 ms. and click the Start button next to the interval.

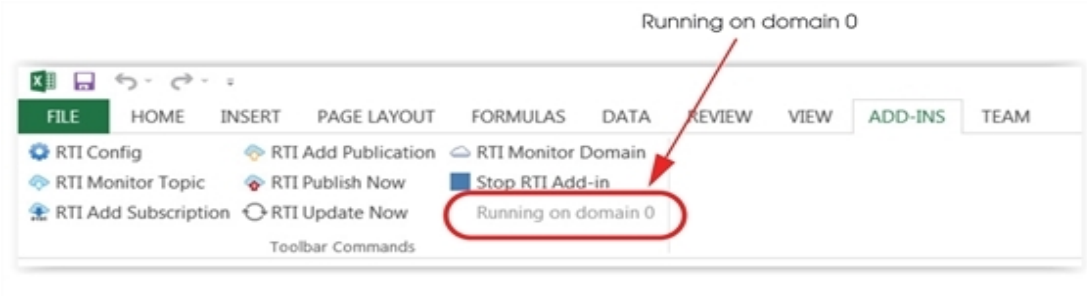
   Note: The interval must be greater than or equal to the **RTDThrottleInterval** value set in the registry (see A.2 Changing the Excel Throttle Interval, RTDThrottleInterval on page 26). Otherwise, the add-in will automatically set the auto publish timer equal to **RTDThrottleInterval**.
10. Click Start RTI Service.

    The add-in is publishing triangles and you will see that the tables and charts are filled in and changing:



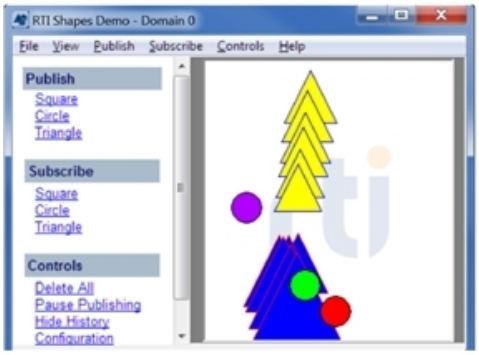
Subscribing to data from Shapes Demo. *Analyzing incoming data.* *Publishing data to Shapes Demo. Input data from the far-left table is used as output.*

Notice that the domain ID is now displayed in the Spreadsheet Add-in toolbar and the other toolbar commands are enabled.



You will also see the triangles in the *Shapes Demo* window.

By default, Subscribers show the most recent 6 samples—this is why you see extra triangles behind the leading one. The most recent shape has a thick colored border. Older (historical) samples have a thinner border of the same color. Published shapes have a thin black border.



Shapes that are being received (subscribed to) have a thick colored border. Shapes being sent (published) have a thin black border.

11. Use the cursor to move the circles around in the *Shapes Demo* window.

    Notice that the position of the circles affects the size and position of the triangles. The add-in reads the x/y position of the circles and uses that data as the size of the triangles it is publishing.

This concludes the demonstration. Next, we recommend reading Chapter 3 Tutorial on page 11 for a more in-depth look at what you can do with *Spreadsheet Add-in for Microsoft Excel*.

Chapter 3 Tutorial

This tutorial will help you become familiar with *Spreadsheet Add-in for Microsoft Excel*'s main features. We will use *RTI Shapes Demo* as an easy way to start a *Connext DDS* application. *Shapes Demo* is a *Connext DDS* application that can send and receive colored, moving shapes—squares, circles, and triangles.

To work through the tutorial, you need *Shapes Demo*. You can download it from https://www.rti.com/downloads/shapes-demo. To learn how to use it, read the *Shapes Demo User's Manual* included with the *Shapes Demo* installation.

The tutorial assumes you have the following software installed (both components should have the same version number):

- *Spreadsheet Add-in for Microsoft Excel*
- *Shapes Demo*

This chapter includes the following sections:

- 3.1 Lesson 1—Setting Up Shapes Demo below
- 3.2 Lesson 2—Starting the Add-in on page 14
- 3.3 Lesson 3—Monitoring Topics on page 15
- 3.4 Lesson 4—Subscribing to Data on page 18
- 3.5 Lesson 5—Publishing Data on page 19
- 3.6 Lesson 6—Monitoring a Domain's Built-in Topics on page 23

3.1 Lesson 1—Setting Up Shapes Demo

Shapes Demo publishes and subscribes to (writes and reads) colored moving shapes, which are displayed in the demo's window. Each shape is a *topic*; the shapes' color is the topic's *key*.

What are Topics and Keys?

Connext DDS applications publish (write) and subscribe to (read) Topics. A Topic has a name and a type; the type defines the structure of the data. *Shapes Demo* can publish (write) and subscribe to (read) three topics: Square, Circle, and Triangle. All three topics use the same data type, which includes the shape's color, x/y coordinates, and size. A shape's color is used as a key—simply a way to distinguish between data for multiple instances of the same shape (topic). Data that belongs to the same instance in the topic (shape) will have the same key value (color).

- *Shapes Demo* uses Domain ID 0 by default. If you want to use a different Domain ID, please see B.1 Changing the Domain ID for Shapes Demo on page 29.
- If you are using a computer that does not have an active network interface, please see B.2 Running without an Active Network Interface on page 29.

1. Start two copies of *Shapes Demo*.

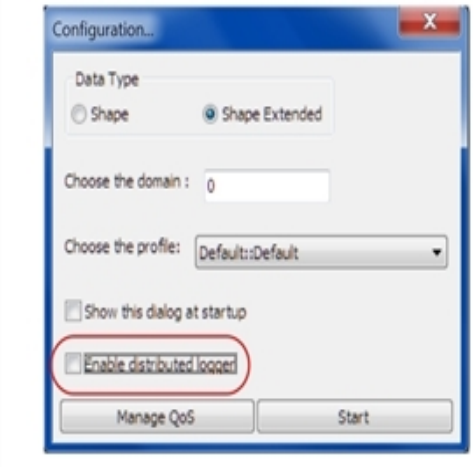
   There are two ways to start it, from *RTI Launcher*, or from a command prompt.
   - From *RTI Launcher*, select the **Learn** tab and click the **Shapes Demo** icon.

   or
   - From a command prompt, enter (replacing <NDDSHOME> to match your system, see 1.4 Paths Mentioned in Documentation on page 3):

     ```
     <NDDSHOME>\bin\rtishapesdemo
     ```

   Depending on your security settings, you may encounter a "Windows Security Alert" dialog. Simply click **Allow Access**.

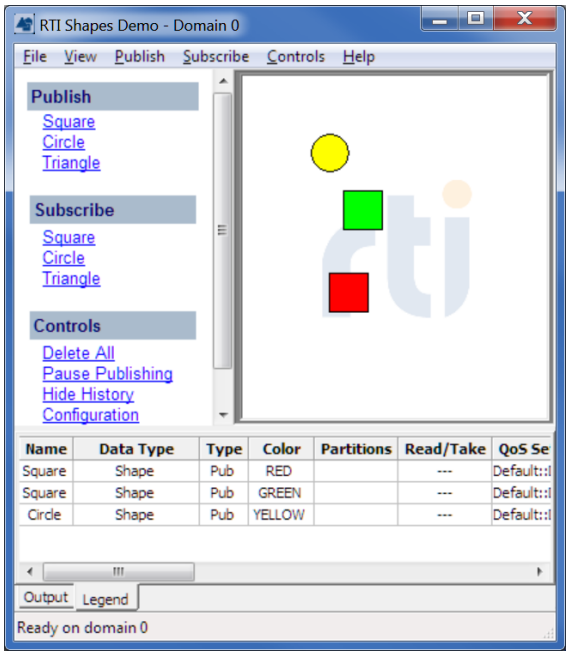
   In *Shapes Demo*, select **File, New Shapes Demo** to start a second instance.
2. In each copy of *Shapes Demo*, open the Configuration dialog. press **Stop**, uncheck the "Enable Distributed Logger" checkbox, then press **Start**.



3. In one of the demo windows, publish two squares (red and green) and a yellow circle (all with default QoS settings). Here are the steps:
   a. Under **Publish**, select **Square**.
   b. In the **Create New Publisher** dialog, select **RED** and click **OK**. (Use the defaults for the other settings).

      You should see a red square moving in the display area.
   c. Use the same process to create a green square and a yellow circle.

   Now *Shapes Demo* is publishing data for two topics: Square and Circle. There are two instances of the topic Square, one for each color. The color is the *key* that identifies the two instances. We will refer to this as the Publisher Demo window.



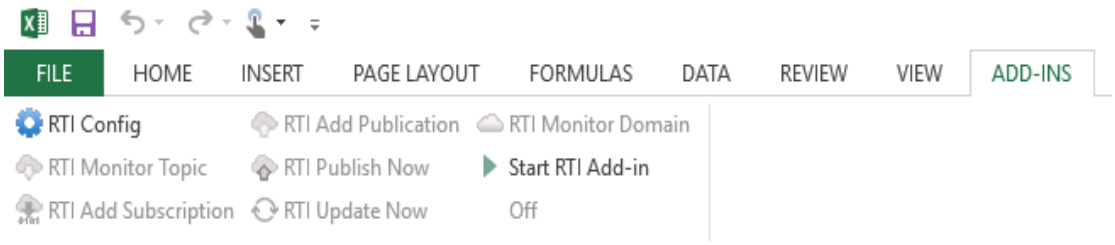
3.2 Lesson 2—Starting the Add-in

1. Start Microsoft Excel and create a new workbook.

   Spreadsheet Add-in for Microsoft Excel loads automatically when Excel starts up (you should see a brief message about loading *RTI Spreadsheet Add-in* in the status bar at the bottom of the Excel window).

   Note: This is when the add-in reads your license file. You may see a window appear with license information—you may close this window.

   Select the **Add-Ins** tab on the Ribbon. You should see the Spreadsheet Add-In toolbar (if not, refer to A.2 Changing the Excel Throttle Interval, RTDThrottleInterval on page 26).

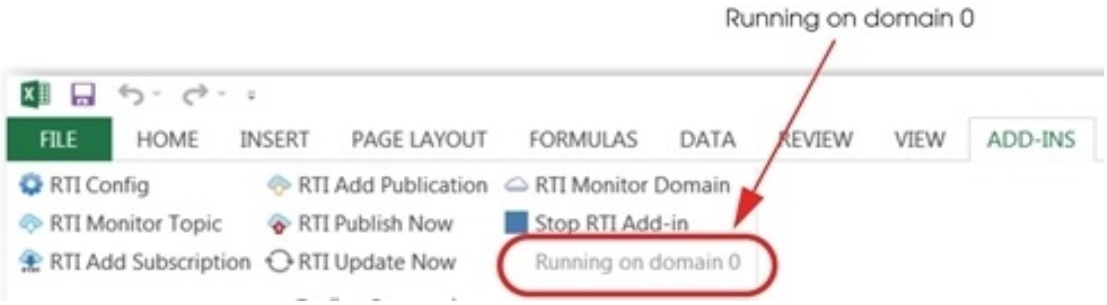


2. *Optional, not required for most users:* For *Connext DDS* applications to communicate, they must use the same domain ID. Since both *Spreadsheet Add-in for Microsoft Excel* and *Shapes Demo* use a default domain ID of 0, they're already set up to communicate on domain 0. If you need to use a different domain ID (for example, maybe you started *Shapes Demo* with a non-0 domain ID

because you have other *Connext DDS* applications already using domain 0), select RTI Config and change the domain ID (an integer value) in this dialog, then click **Close**.

3. Select Start RTI Add-in .

   Now you should notice that the domain ID is displayed in the Spreadsheet Add-in toolbar and the other toolbar commands are enabled.



Starting *Spreadsheet Add-in* does not cause the add-in to subscribe to or publish user data; those features are described in the following lessons.

3.3 Lesson 3—Monitoring Topics

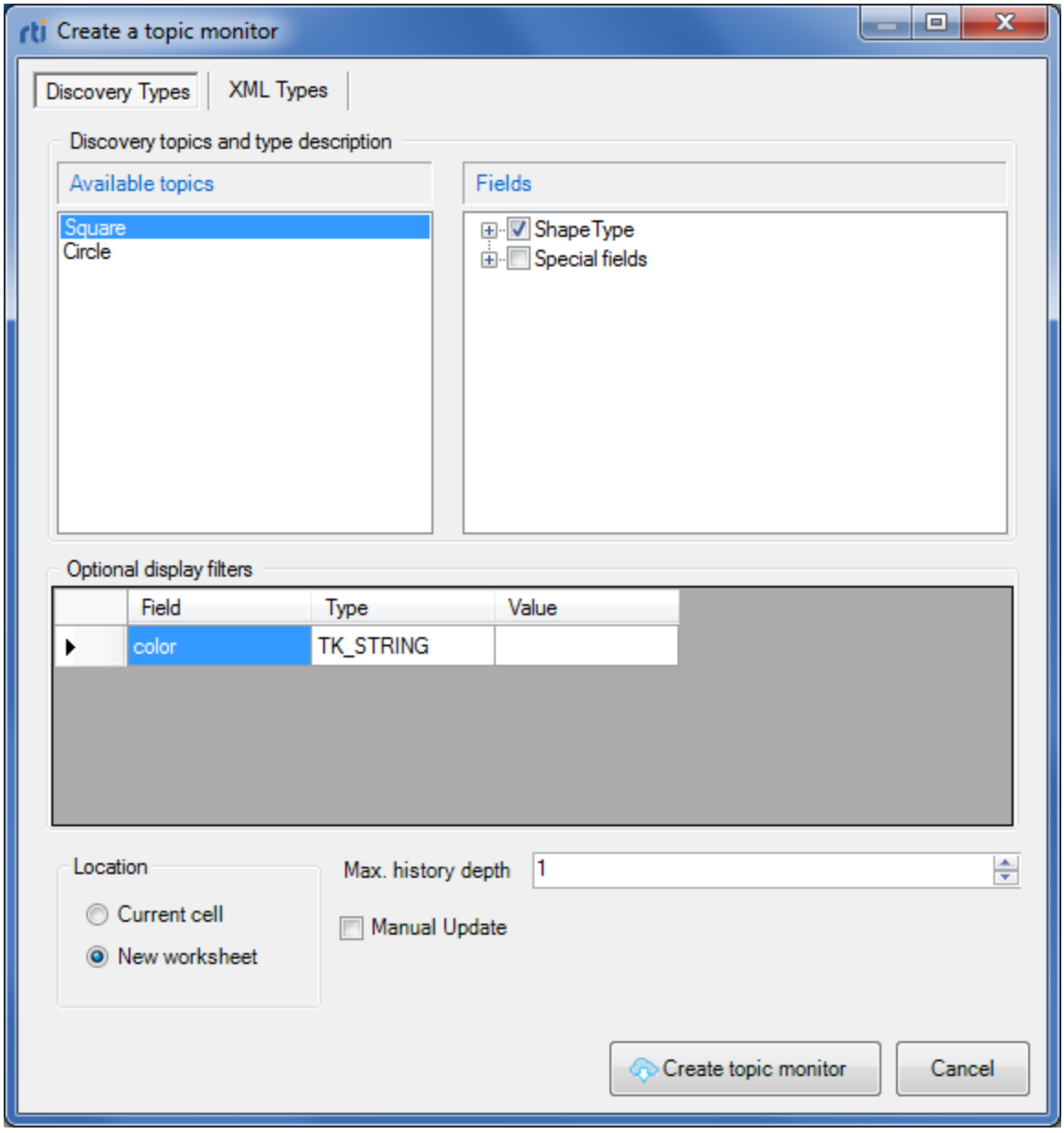
You can use a *Topic Monitor* to monitor data for a specific topic. In this lesson, we will create a worksheet that subscribes to all the instances of a specific topic.

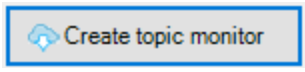
1. Create an Excel worksheet that will subscribe to, or monitor, the square topic being published by *Shapes Demo:*
   a. Start Microsoft Excel; you can create a new workbook or use the one from the previous lesson.
   b. From the Spreadsheet Add-in toolbar, select RTI Monitor Topic .

      In the dialog that opens, the list on the left shows topics that the add-in has discovered in Domain 0 (this can be changed in the **RTI Config** dialog). We are interested in the topics being published by *Shapes Demo*, which also uses Domain 0 by default.

      (If you forgot to uncheck the "enable Distributed Logger" option in Shapes Demo (see Lesson 1), you may also see topics related to *RTI Distributed Logger*; this is because *Shapes Demo* uses *RTI Distributed Logger* to publish its log messages. You can ignore these.)
   c. Click "Square."

      The list on the right shows the fields in the Square's data type. Click on the + sign next to ShapeType to expand it. By default, all fields are selected.



d. Click 

.

Notice you have a new worksheet, with a Topic Monitor table already filled in.

Each row in the table is monitoring an instance (color) of the topic named Square. Each column contains data for one of the selected fields in the topic's data type (color, x, y, and shapesize).

The topic monitor table contains three header rows.

	A	B	C	D	E	F
1	SUBSCRIPTION Topic: Square | Type: ShapeType					
2	color,x,y,shapesize,fillKind,angle					
3	color	x	y	shapesize	fillKind	angle
4	RED	177	135	30	2	300
5	GREEN	140	135	30	3	60

Each time a new instance is received, a new row is added to the end of the topic monitor table in the worksheet. A column header with a darker color indicates that the field is a keyed field in the data type.

2. In the Publisher Demo, add a square with a new color, such as MAGENTA.

   Notice that the new color automatically appears in the worksheet. That's because you're already set up to subscribe to all instances (colors) of the topic Square. It's a new row in the table, because each instance (color) gets its own row.

	A	B	C	D	E	F
1	SUBSCRIPTION Topic: Square | Type: ShapeType					
2	color,x,y,shapesize,fillKind,angle					
3	color	x	y	shapesize	fillKind	angle
4	RED	115	135	30	2	144
5	GREEN	135	135	30	3	342
6	MAGENTA	162	135	30	0	0

3. In the Publisher Demo, add another square, using one of the same colors already being published, such as RED.

   Notice that the worksheet does not have a new row for that square. Since it doesn't use a new color, it isn't a new instance.

4. In the Publisher Demo's **Legend** tab (at the bottom), select either one of the red squares and press **Delete** on your keyboard.

5. In the Publisher Demo's **Legend** tab (at the bottom), select the green square and press **Delete** on your keyboard.

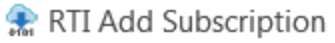
   In the worksheet, notice that the row for the green square now appears in red to show it's been deleted. (The deleted red square doesn't show up in red, because you still have a red square.)

	A	B	C	D	E	F
1	SUBSCRIPTION Topic: Square | Type: ShapeType					
2	color,x,y,shapesize,fillKind,angle					
3	color	x	y	shapesize	fillKind	angle
4	RED	190	135	30	2	96
5	GREEN	53	135	30	3	126
6	MAGENTA	66	135	30	0	0

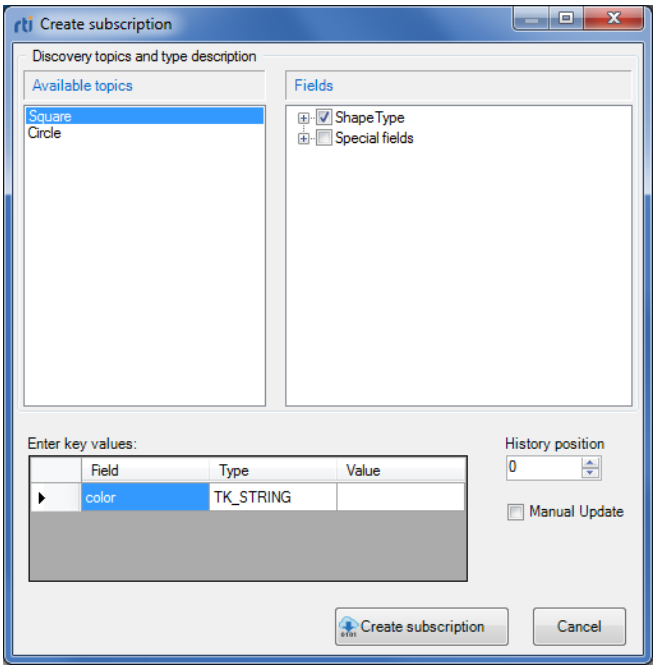
3.4 Lesson 4–Subscribing to Data

The previous lesson showed you how to subscribe to data for *all* instances of a topic. Now let's see how to subscribe to a *specific* instance. Remember that the shape's color is its key—the data that uniquely identifies different instances.

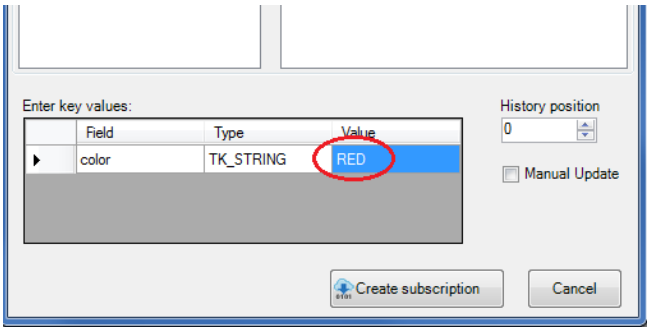
We will be adding a subscription to an Excel worksheet that will only receive red squares being published by *Shapes Demo:*

1. Start Microsoft Excel; you can create a new workbook or use the one from the previous lesson.
2. Select a cell in an empty worksheet.
3. From the RTI Spreadsheet Add-in toolbar, select 

.
4. In the new dialog that appears, click on the **Square** topic from the list on the left..



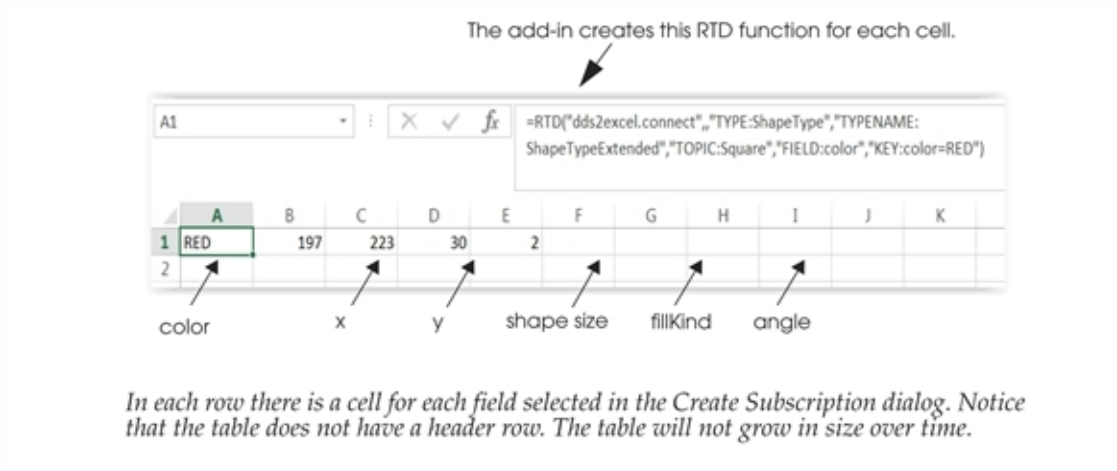
5. Since the topic's data type has a key, you *must* specify the color of squares that you want to subscribe to by entering a color in the Value cell in the key values table. Enter RED.



- You can only specify one value per key field at a time (that is, you cannot specify RED *and* GREEN).
- The key is case-sensitive. Colors in *Shapes Demo* are all upper-case.

6. Click

.



In each row there is a cell for each field selected in the Create Subscription dialog. Notice that the table does not have a header row. The table will not grow in size over time.

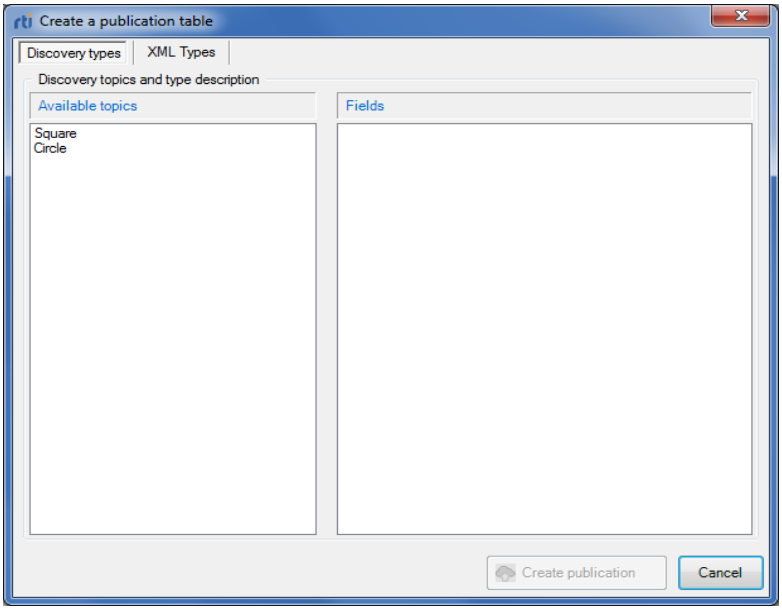
7. To prove that the values you are seeing are for red squares, click the red square in the Publisher Demo window to hold it still. Notice that the values in your worksheet stop updating. (You can give the square a push with your cursor to get it moving again.)

3.5 Lesson 5–Publishing Data

So far, we have *Shapes Demo* publishing data and two Excel worksheets subscribing to that data (one is subscribing to all squares, the other just to red squares). Now it's time to see how to *publish* data from Excel.

We will be adding a publication to an Excel worksheet that will publish cyan squares and those squares will be received by *Shapes Demo:*

1. Start Microsoft Excel; you can create a new workbook or use the one from the previous lesson.
2. Select a cell in an empty worksheet.
3. From the Spreadsheet Add-in toolbar, select RTI Add Publication.
4. In the new dialog that appears, select the Square topic from the list on the left.



5. Click Create publication.

   Your worksheet should resemble this:

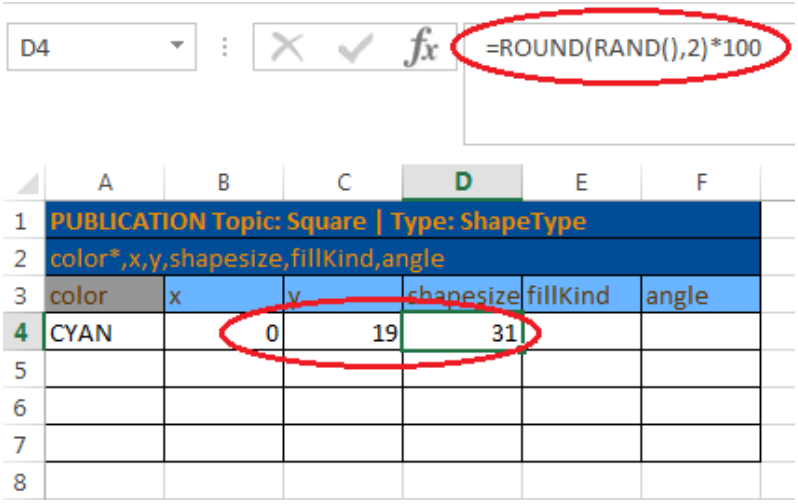
	A	B	C	D	E	F
1	PUBLICATION Topic: Square | Type: ShapeType					
2	color*,x,y,shapesize,fillKind,angle					
3	color	x	y	shapesize	fillKind	angle
4						
5						
6						
7						

You are creating a range of cells that represent a topic each row will be a sample, with a column for each field. By filling in this table (in the next step), you will be able to publish these samples.

6. Fill in one row of the publication table for squares:
   a. In the cell under the **color** column, enter a color name. Use a color not already being published with *Shapes Demo*, such as CYAN.

b. For **x**, **y**, and **shapesize**, use this formula (so the values will vary each time you publish them): **=ROUND(RAND(),2)*100**

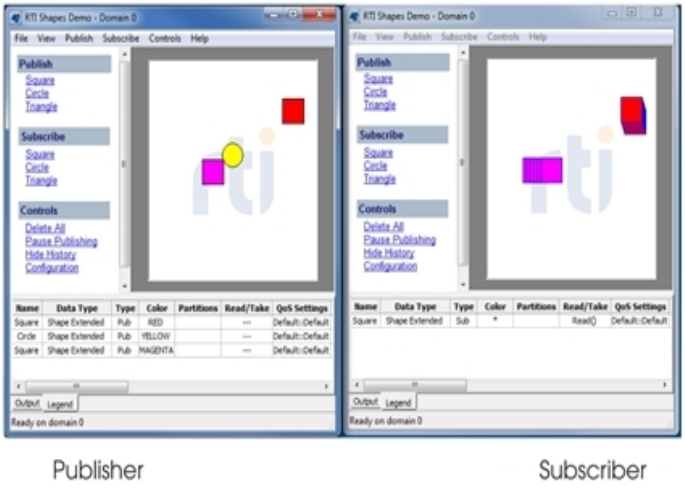
You will see later that the values in these three cells change randomly every time you publish.



c. Set **fillKind** and **angle** to 0.

7. Recall that we started two copies of *Shapes Demo*. So far we've only used one. In the unused copy, which we refer to as the Subscriber Demo, subscribe to Squares:
   a. Under **Subscribe**, select **Square**.
   b. In the **Create New Subscriber** dialog, click **OK**.

Your two *Shapes Demo* windows should look similar to this:



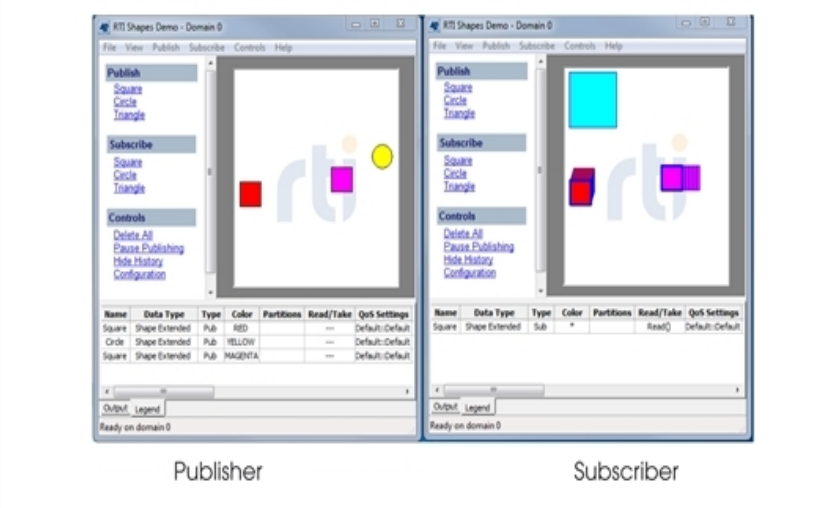
Notice that the Subscriber's shapes have thick blue borders. This is how you can distinguish between Subscribers and Publishers.

By default, Subscribers show the most recent six samples—this is why you see extra squares behind the leading ones. The most recent shape of each color has a thick colored border. Older (historical) samples have a thinner border of the same color. Published shapes have a thin black border.

Also notice that you do not see a cyan square yet—although your worksheet is *set up* to publish them (from the work done above), you haven't actually published from Excel yet.

8. From the Spreadsheet Add-in toolbar, select RTI Publish Now .

   Now you should see one cyan square in the Subscriber Demo.



9. Now let's see another way to publish data from the worksheet using a timer.
   a. From the Spreadsheet Add-in toolbar, select RTI Config .
   b. Set the **Auto publish timer** (in milliseconds) to 500.

      Note: The interval must be greater than or equal to the **RTDThrottleInterval** value set in the registry (see A.2 Changing the Excel Throttle Interval, RTDThrottleInterval on page 26). Otherwise, the add-in will automatically set the auto publish timer equal to **RTDThrottleInterval**.
   c. Click Start .
   d. Click **Close**.

      In the Subscriber Demo, you should now see a cyan square of randomly varying size jumping around on the canvas.

3.6 Lesson 6–Monitoring a Domain's Built-in Topics

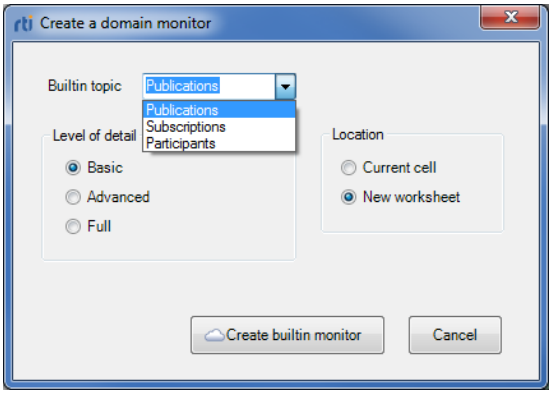
Connext DDS must discover and keep track of remote entities, such as new participants in the domain. This information may also be important to the application itself, which may want to react to this discovery information, or else access it on demand. To support these needs, *Connext DDS* provides built-in topics and corresponding built-in DataReaders that you can use to access this discovery information.

With *Spreadsheet Add-in for Microsoft Excel*, you can use a built-in domain monitor to display built-in topics for discovered publications, subscriptions, and participants.

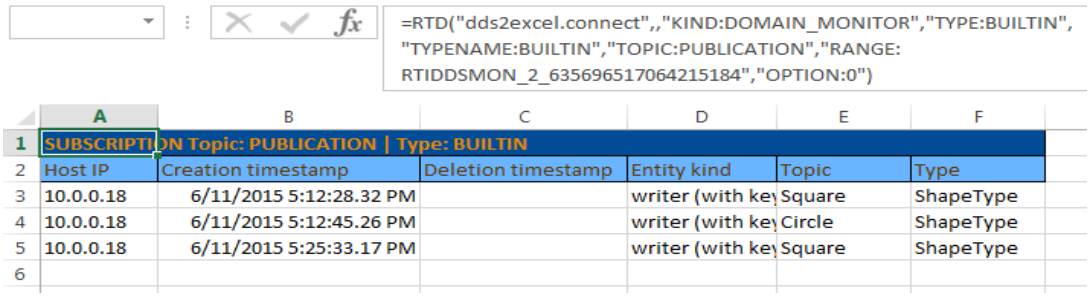
We will be creating an Excel worksheet that will monitor all the discovered publications.

To create a built-in domain monitor:

1. Start Microsoft Excel; you can create a new workbook or use the one from the previous lesson.
2. Select a cell in an empty worksheet.
3. From the Spreadsheet Add-in toolbar, select RTI Monitor Domain .
4. Select **Publications** from the Builtin topic drop-down list box to monitor discovered publications:



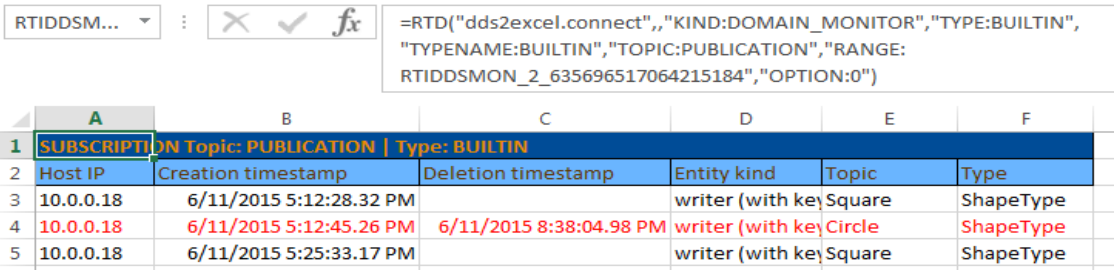
5. Click Create builtin monitor. You'll see the builtin topics, such as these:



Each time a new publication is discovered, a new row is added at the bottom of the builtin topic monitor table.

You may notice that the writer for the cyan squares (being published from your Excel worksheet) does not appear in this list. That's because only entities discovered from *other Connext DDS* applications will appear in the builtin topics. Since the cyan squares are coming from this *same Connext DDS* participant (the add-in), they will not appear in the builtin topic.

6. In the Publisher Demo's **Legend** tab (at the bottom), select the yellow circle and press **Delete** on your keyboard. You will see the corresponding row turn red to show the last publisher of circle has been deleted.



	A	B	C	D	E	F
1	SUBSCRIPTION Topic: PUBLICATION | Type: BUILTIN					
2	Host IP	Creation timestamp	Deletion timestamp	Entity kind	Topic	Type
3	10.0.0.18	6/11/2015 5:12:28.32 PM		writer (with ke	Square	ShapeType
4	10.0.0.18	6/11/2015 5:12:45.26 PM	6/11/2015 8:38:04.98 PM	writer (with ke	Circle	ShapeType
5	10.0.0.18	6/11/2015 5:25:33.17 PM		writer (with ke	Square	ShapeType

This concludes the tutorial. For more information, please read the *User's Manual*.

Appendix A Troubleshooting

A.1 License Management

Spreadsheet Add-in for Microsoft Excel requires a license file, which you will receive via email from RTI.

If you want to use *RTI Launcher*[1] to start *Spreadsheet Add-in for Microsoft Excel*[2]:

- By default, *Launcher* looks for the license file **rti_license.dat** in the top-level directory where you installed *Connext DDS*. If you choose to save the license file elsewhere, you can configure *Launcher* to look in a different location by using its **Configuration** tab.

Otherwise:

- Save the license file in any location of your choice. When *Spreadsheet Add-in for Microsoft Excel* starts, it will look in these locations until it finds a valid license:
  1. The file **rti_license.dat** in the directory ***<your home directory>*\rti_workspace*version***.
  2. The file specified in the environment variable RTI_LICENSE_FILE, which you may set to point to the full path of the license file, including the filename (for example, **C:\RTI\my_rti_license.dat**).

---

[1] *Launcher* is a convenient GUI-based tool that can start and configure all of your *Connext DDS* components, including *Spreadsheet Add-in for Microsoft Excel*.

[2] Even if your distribution of *Connext DDS Professional* is not license-managed, you always need a license file to run *Spreadsheet Add-in for Microsoft Excel*.

3. The file **rti_license.dat** in the current working directory.
4. The file **rti_license.dat** in the directory specified by the environment variable NDDSHOME.

As *Spreadsheet Add-in for Microsoft Excel* attempts to locate and read your license file, you may (depending on the terms of the license) see a window with messages with details about your license—you may close the window.

If the license file cannot be found or the license has expired, *Spreadsheet Add-in for Microsoft Excel*, will not initialize and you will not be able to use the add-in.

If you have any questions about license installation, please contact **support@rti.com**.

A.2 Changing the Excel Throttle Interval, RTDThrottleInterval

This section describes changes that *Spreadsheet Add-in for Microsoft Excel* makes to **RTDThrottleInterval** in the registry, a parameter that determines how fast Excel updates real-time data streams.

By default, Excel uses a value of 2 seconds for **RTDThrottleInterval**. The installer for *Spreadsheet Add-in for Microsoft Excel* changes **RTDThrottleInterval** in the registry to 100 milliseconds. This value affects all real-time data feeds that you may be using in Excel.

If you need a different value for **RTDThrottleInterval**, you can change it as follows:[1]

Microsoft Excel 2010:

1. Open the Windows registry editor.
   - On a Windows 7 or later system, select **Start** and type "**regedit**".
2. Go to the following key: **HKEY_CURRENT_USER, Software, Microsoft, Office, <***your version of Microsoft Office***>, Excel, Options**.
3. Look up the entry **RTDThrottleInterval** and change its value as needed (in milliseconds).
4. Close the registry editor.

Microsoft Excel 2013 and later versions:

1. Open Excel.
2. Open the **Visual Basic Editor,** by clicking Visual Basic Editor from the **Developer Tab**
3. Open the Immediate window in **View, Immediate Window**.
4. Type the following and press ENTER:

[1] We recommend creating a backup before doing any modification on Windows' registry.

```
Application.RTD.ThrottleInterval = 100
```

5. Verify that it is set correctly, by typing this line in the Immediate window:

```
? Application.RTD.ThrottleInterval
```

RTDThrottleInterval is the upper limit for the rate at which **all** data will be updated in Excel (that is, it is the smallest update interval). This value cannot be changed dynamically and applies to all data.

If you want to adjust the throttle interval for updating **DDS** data only, it can be changed after *Spreadsheet Add-in for Microsoft Excel* has been installed. To lower the update rate for DDS data in all worksheets, set the DDS-specific data throttle interval to a value larger than **RTDThrottleInterval**.

The maximum rate (minimum interval) at which DDS data can be automatically published is also limited by **RTDThrottleInterval**. This auto-publish rate can also be adjusted after *Spreadsheet Add-in for Microsoft Excel* has been installed.

See the *Spreadsheet Add-in for Microsoft Excel User's Manual* for details on adjusting the DDS data send and receive rate.

A.3 Spreadsheet Add-in does not Appear in Excel ADD-INS Tab

After installing *Spreadsheet Add-in for Microsoft Excel*, you should see it in the Excel **ADD-INS** tab. If you do not, here are some possible reasons why and how to fix them:

- Missing language package: Because of Microsoft issue KB320369 (http://support.microsoft.com/kb/320369), *Spreadsheet Add-in for Microsoft Excel* will not work at all in computers with a locale other than English (United States). To fix this issue, you need to install a Microsoft Office Language Pack for the corresponding locale in the client machine. See the *Spreadsheet Add-in for Microsoft Excel Release Notes* for more details.
- Date set to Non-US format: If your system's Region and Language format is not set to **English (United States)**, the add-in will not show up. To verify and/or change the format: From the **Start** menu, select **Control Panel**; **Clock, Language, and Region**; **Change the date, time, or number format**. If the format is not **English (United States)**, use the Format list to select this setting.
- Missing license: Follow the instructions in A.1 License Management on page 25 to install the license in a correct location.

A.3.1 Enabling Spreadsheet Add-In After Recovering from a Loading Error

When a COM Add-in is disabled once by Excel, it will remain disabled until manually re-enabled. This could likely happen because of an error when loading any COM Add-in.

To re-enable *Spreadsheet Add-in for Microsoft Excel*:

1. Open the **FILE** menu in Excel and select **Options**.
2. In the window that will pop-up, go to **Add-Ins**.
3. In the drop-down menu labeled as **Manage**, select **COM Add-Ins** and click **Go...**.
4. A new window will show up with a list of the COM Add-ins installed, and with a check box indicating whether the Add-in is enabled or not.

   If *RTI Spreadsheet Add-in for Microsoft Excel* is unchecked, check it and click **OK**.

A.4 Spreadsheet Add-in Appears Unresponsive in Excel 2013

When using *Spreadsheet Add-in* with Excel 2013, you may find that the Add-in bar looks unresponsive. This may be caused by have several workbooks open at the same time. If you look at the workbook that was opened first, you will see *Spreadsheet Add-in* responding as expected. This is due to a change in Microsoft Excel policy regarding process and thread management.

To open several workbooks and have *Spreadsheet Add-in* be responsive in all of them, you will need to manually force each workbook to be run in individual instances of Excel 2013. There are two ways to open individual instances of Excel: from the taskbar or desktop icon, or from a command prompt.

To open individual instances of Excel using the taskbar or desktop icon:

1. Right-click the Excel 2013 icon on your desktop or taskbar, keeping the ALT key pressed.
2. Without releasing the ALT key, click on the "Microsoft Excel 2013" option from the context menu.
3. You will see a prompt asking if you want to open Excel as a new instance. Choose YES.
4. Once the new Excel instance is up and running, open an existing workbook or create a new one.
5. Repeat these steps for each workbook you need.

To open individual instances of Excel from a command prompt:

1. From the command prompt, run **EXCEL /X &**. (The **/X** option forces the creation of a new instance.)
2. Once the new Excel instance is up and running, open an existing workbook or create a new one.
3. Repeat these steps for each workbook you need.

Appendix B Configuration Changes for Special Situations

B.1 Changing the Domain ID for Shapes Demo

Shapes Demo uses domain ID 0 by default. To use a different ID, start *Shapes Demo* with the "**-domainId <#>**" command-line option. (See the *Shapes Demo User's Manual* for details on running from the command line.)

> *Spreadsheet Add-in for Microsoft Excel* must use the same domain ID as *Shapes Demo*, or the two applications will not communicate. To change the domain ID in *Spreadsheet Add-in for Microsoft Excel*, see 3.2 Lesson 2—Starting the Add-in on page 14.

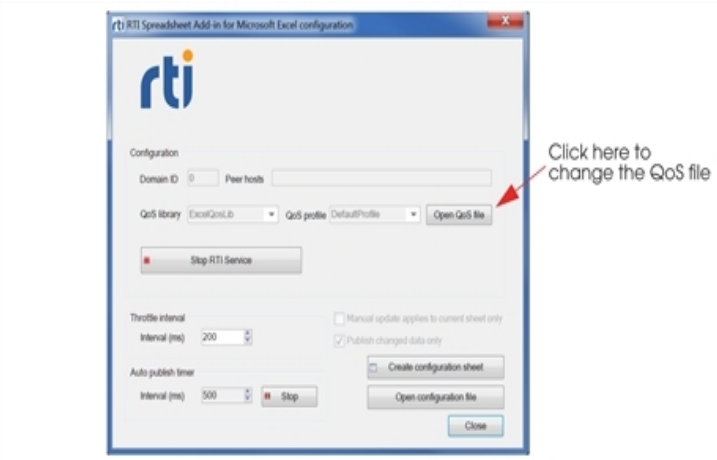
B.2 Running without an Active Network Interface

To use *Spreadsheet Add-in for Microsoft Excel* on a computer that does not have an active network interface, change the QoS profile to use only shared memory, as described below. You can make this change in the default QoS profile or in a new profile. For more information on profiles, see the *User's Manual*.

Another option is to install Microsoft Loopback Adapter, which simulates the existence of a network interface.

To change the current QoS profile to use only shared memory:

1. Open the QoS file (through the **RTI Config** dialog, or open from **My Documents\RTI Spreadsheet Add-in for Microsoft Excel <***version***>\EXCEL_QOS_PROFILES.xml**).



2. Find the **<domain_participant_qos>** section in the QoS file.

   The QoS file contains a QoS library (ExcelQoSLib) with two QoS profiles (DefaultProfile and NoHistoryProfile). You will find <domain_participant_qos> in each of these profiles.

3. Change the bold line below:

```
<domain_participant_qos>
    ...
    <transport_builtin>
        <mask>MASK_DEFAULT</mask>
    </transport_builtin>
    ...
</domain_participant_qos>
```

   to this:

```
<domain_participant_qos>
    ...
    <transport_builtin>
        <mask>SHMEM</mask>
    </transport_builtin>
    ...
</domain_participant_qos>
```

4. Save the file.

5. Restart Excel so your changes will take effect.