

# *RTI Spreadsheet Add-in*

for Microsoft<sup>®</sup> Excel<sup>®</sup>

for

RTI Data Distribution Service

## **Getting Started Guide**

Version 1.1





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Printed in U.S.A. First printing.  
May 2010.

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# Chapter 1      Welcome to RTI Spreadsheet Add-in for Microsoft Excel

Welcome to *RTI® Spreadsheet Add-in* for Microsoft Excel. This revolutionary component of *RTI Data Distribution Service* 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 ubiquitous 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.

*RTI 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 *RTI 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 *RTI 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 RTI Spreadsheet Add-in** for Microsoft Excel

- Allows spreadsheets to participate seamlessly as peers on a DDS "real-time software bus" 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 *RTI Data Distribution Service* applications
- Self-contained within an Excel Add-in, requires no separate service or gateway or custom integration code

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## 1.1 Available Documentation

*RTI Spreadsheet Add-in* for Microsoft Excel documentation includes:

- Getting Started Guide** ([RTI\\_Spreadsheet\\_Addin\\_GettingStarted.pdf](#))—Highlights the benefits of *RTI Spreadsheet Add-in* for Microsoft Excel and provides installation instructions. It also walks you through a short demonstration and a tutorial, so you can quickly see the benefits of using *RTI Spreadsheet Add-in* for Microsoft Excel.
- Release Notes** ([RTI\\_Spreadsheet\\_Addin\\_ReleaseNotes.pdf](#))—Describes system requirements and compatibility, as well as any version-specific changes and known issues.
- User's Manual** ([RTI\\_Spreadsheet\\_Addin\\_UsersManual.pdf](#))—Describes how to configure *RTI Spreadsheet Add-in* for Microsoft Excel and provides details on each feature.

## Chapter 2 Installation

This chapter will help you install *RTI Spreadsheet Add-in* for Microsoft Excel and the required license file:

- ❑ [Installing \(Section 2.1\)](#)
- ❑ [License Management \(Section 2.2\)](#)
- ❑ [The Excel Throttle Interval, RTDThrottleInterval \(Section 2.3\)](#)
- ❑ [Uninstalling \(Section 2.4\)](#)

After installation, see [Chapter 3: A Quick Demonstration](#) to get a quick idea of the add-in's capabilities. Then see [Chapter 4: Tutorial](#) for a more in-depth look at what you can do with *RTI Spreadsheet Add-in* for Microsoft Excel.

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### 2.1 Installing

**If you have run the installer before and are reinstalling the software**, be aware that the installer will not automatically remove previous installations as a part of a new installation. If you want to replace a previous installation, RTI recommends that you uninstall the software (see [Section 2.4](#)) before reinstalling it. You may want to keep a copy of your XML configuration files if you have made any changes to them, since these files are deleted by the uninstaller. These files are in **My Documents\RTI\RTI Spreadsheet Add-in for Microsoft Excel <version>**.

**To install RTI Spreadsheet Add-in for Microsoft Excel:**

**Note:** The installer must be run by a user with administrator privileges. The add-in will only be set up for use by the current user initially.<sup>1</sup> After the add-in is installed on the machine, other users (including those *without* administrator privileges) can set themselves up to use the add-in by going through an additional set-up process, described later in this section.

1. Make sure you have administrator privileges.
2. Make sure you have opened Excel at least once as the current user before running the installer. This ensures that Excel user profile is properly initialized before the add-in is installed.
3. Extract (unzip) the contents of the distribution file into a folder of your choice (this folder is only needed during installation, it will not be the final location for the add-in).
4. Run **setup.exe** (not the **.msi** file) from that folder and follow the directions on the screen.

The installer may prompt you for permission to install a patch called 'Shared Add-in Support Update for .NET Framework 2.0.' (Although the prompt indicates that the patch is for .NET Framework 2.0, it is actually for .NET 2.0 and higher.) This patch is required.

The installer also requires Microsoft .NET Framework 3.0 or higher. If you do not already have it, the installer will open a browser window so you can download the latest version. If you install .NET Framework, you will be asked to reboot your system following installation. After the reboot, you will need to re-run **setup.exe** in order to complete the installation.

5. Install the required license file. See [License Management \(Section 2.2\)](#).
6. Optional: Download and install *RTI Shapes Demo*. This is only required if you want to follow the steps in [Chapter 3: A Quick Demonstration](#) and [Chapter 4: Tutorial](#). *RTI Shapes Demo* is available from RTI's Downloads page (<http://www.rti.com/downloads>) in the section titled Interactive DDS Demonstration. *RTI Shapes Demo* runs on Windows and Linux systems. Follow the installation instructions that accompany the distribution file.

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1. Even if you belong to the administrator group (i.e., you have administrator privileges), the installation will only work for you.



**To set up *RTI Spreadsheet Add-in* for Microsoft Excel for other users:**

Initially, the add-in's installer will only set up the add-in for the current user. If you want to use the add-in as another user (including those without administrator privileges):

1. Login as the desired user.
2. Make sure you have opened Excel at least once as the current user before setting up the add-in. This ensures that Excel user profile is properly initialized first.
3. From the **Start** menu, select **[All] Programs, RTI, RTI Spreadsheet Add-in for Microsoft Excel <version>, Install Spreadsheet Add-in for this user**.
4. In the pop-up window, click **OK**. When the installation is done, close the pop-up window.
5. If you haven't put the required license file in a location that is accessible by the current user, you can do so now. (See [License Management \(Section 2.2\)](#).)

In the *<Installation Folder>* (the default is **C:\Program Files\RTI <version>\RTI Spreadsheet Add-in for Microsoft Excel <version>**), you will find:

- \doc**: Documentation, which is also available from the **Start** menu:
  - **RTI\_Spreadsheet\_Addin\_GettingStarted.pdf**: *This* document, which describes installation, a demo, and a tutorial.
  - **RTI\_Spreadsheet\_Addin\_ReleaseNotes.pdf**: Describes compatibility and known issues.
  - **RTI\_Spreadsheet\_Addin\_UsersManual.pdf**: Describes how to use the add-in.
- \lib**: All the required DLLs, a sample Visual Basic script (**DDS2ExcelModule.bas**), and a copy of the original files that are installed under *<My Documents>\RTI\RTI Spreadsheet Add-in for Microsoft Excel <version>* (see below).

In *<My Documents>\RTI\RTI Spreadsheet Add-in for Microsoft Excel <version>*, you will find:

- Shapes\_Example.xls**: A demonstration workbook, described in [Chapter 3: A Quick Demonstration](#).

- ❑ **EXCEL\_QOS\_PROFILES.xml**: The QoS profiles that Excel will load, including the default QoS library and profile. You can add your own profiles here and select which QoS library and profile to use later in the RTI configuration dialog. See the *RTI Spreadsheet Add-in for Microsoft Excel User's Manual* (Section 3.1) for details on selecting a QoS library and profile.
- ❑ **rti\_dds\_qos\_profiles.xsd**: The RTI schema for the QoS profile file.
- ❑ **RTIExcelAddin.log**: Default log file created after *RTI Spreadsheet Add-in for Microsoft Excel* is loaded.

All the documentation, the demonstration workbook, and the installer for setting up the add-in for the current user can all be accessed from the Windows **Start** menu under **[All] Programs, RTI, RTI Spreadsheet Add-in for Microsoft Excel <version>**.

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## 2.2 License Management

Your *RTI Spreadsheet Add-in for Microsoft Excel* distribution requires a license file, which you will receive via email after you download the software.

Save the license file in any location of your choice. When *RTI 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 **RTI Spreadsheet Add-in for Microsoft Excel <version>** (normally in your **My Documents\RTI** directory).
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**).
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 *RTI 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, *RTI 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**.

## 2.3 The Excel Throttle Interval, RTDThrottleInterval

This section describes changes that *RTI 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 *RTI 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. Open the Windows registry editor.
  - On a Windows Vista system, select **Start, All Programs, Accessories, Run** and enter “**regedit**”.
  - On a Windows XP system, select **Start, Accessories, Run** and enter “**regedit**”.
2. Go to the following key: **HKEY\_CURRENT\_USER, Software, Microsoft, Office, <your version of Microsoft Office<sup>1</sup>>, Excel, Options**.
3. Look up the entry **RTDThrottleInterval** and change its value as needed (in milliseconds).
4. Close the registry editor.

**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 *RTI 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 *RTI Spreadsheet Add-in* for Microsoft Excel has been installed.

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

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1. For example, the version number for Microsoft Office 2007 is 12; the version number for Microsoft Office 2003 is 11.

## 2.4 Uninstalling

To remove *RTI Spreadsheet Add-in* for Microsoft Excel, use the Control Panel.

- On a Windows Vista system, select **Start, Control Panel, Programs<sup>1</sup>, Programs and Features**.
- On a Windows XP system, select **Start, Control Panel, Add or Remove Programs**.

The uninstaller can only be run by a user with administrator privileges, and it will remove the current user's add-in configuration files. You may want to keep a copy of your XML configuration files if you have made any changes to them, since these files are deleted by the uninstaller. These files are in **My Documents\RTI\RTI Spreadsheet Add-in for Microsoft Excel <version>**. The uninstaller will not remove the add-in configuration files for other users. You will need to manually remove the files under **My Documents\RTI\RTI Spreadsheet Add-in for Microsoft Excel <version>** for all the other users individually.

**Note:** There is a known issue regarding uninstalling—the toolbar is not removed from the Add-ins tab. You may remove it manually. (For example, to remove the toolbar with Office 2003: select **Tools, Customize**; on the Toolbars page, select **RTI Spreadsheet Add-in for Microsoft Excel**, then click **Delete**.)

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1. If you are using the Control Panel's "Classic View," select Programs and Features directly from the Control Panel.

## Chapter 3 A Quick Demonstration

The best way to learn about *RTI Spreadsheet Add-in* for Microsoft Excel is to start using it. The provided demonstration file, **Shapes\_Example.xls**, will give you a quick idea of the add-in's capabilities. After the demonstration, we recommend using the tutorial in [Chapter 4](#) for a more in-depth look at what you can do with *RTI Spreadsheet Add-in* for Microsoft Excel.

Both the demonstration and the tutorial use *RTI Shapes Demo*, an *RTI Data Distribution Service* application that can send and receive colored, moving shapes.

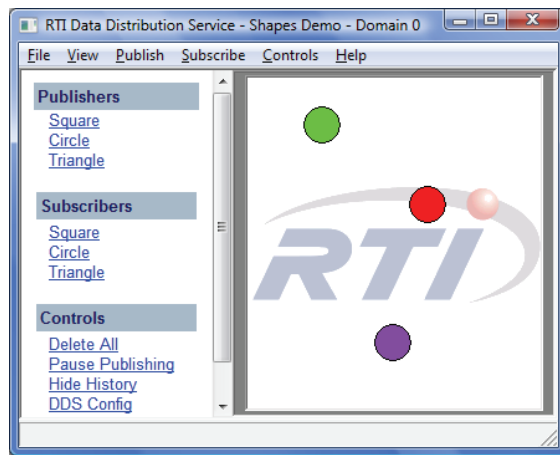
*RTI Shapes Demo* is available from RTI's download page ([www.rti.com/downloads](http://www.rti.com/downloads), in the section titled Interactive DDS Demonstration.)

Before continuing, please make sure you have the following software installed:

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

### Notes:

- RTI Shapes Demo* uses Domain ID 0 by default. If you need to use a different domain ID, please see [Section A.1](#).
- If you are using a computer that does not have an active network interface, please see [Section A.2](#).



1. Start *RTI Shapes Demo* from the Windows **Start** menu. If you installed *RTI Shapes Demo* with the *RTI Spreadsheet Add-in* for Microsoft Excel installer, select **Start, [All] Programs, RTI, RTI Shapes Demo <version>, RTI Shapes Demo**).

Depending on your security settings, you may see a Windows Security Alert dialog—simply click **Unblock**:



2. In the *RTI Shapes Demo* window, publish 3 circles (purple, red, and green):
  - a. Under **Publishers**, 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 *RTI 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 *RTI Shapes Demo* window.
3. In the *RTI Shapes Demo* window, subscribe to *triangles*:
  - a. Under **Subscribers**, 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 *RTI Shapes Demo* window. That's because it is subscribing to *triangles*, but so far, we're only publishing *circles*.

This is where *RTI 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.

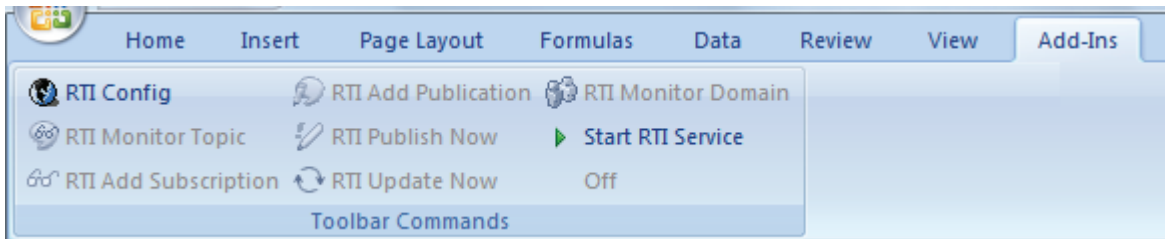
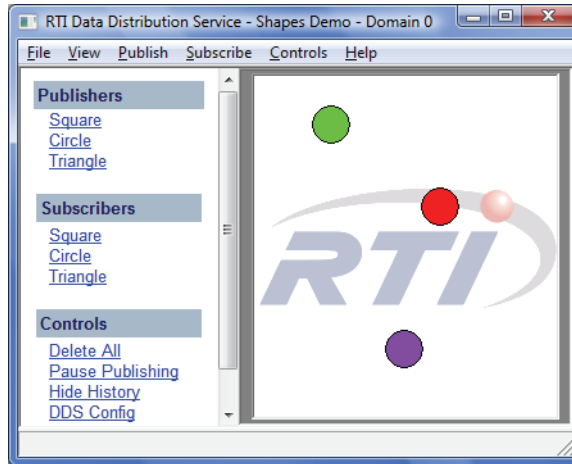
4. Open **Shapes\_Example.xls** from the **Start** menu under **[All] Programs, RTI, RTI Spreadsheet Add-in for Microsoft Excel <version>**.

*RTI Spreadsheet Add-in* for Microsoft Excel should load automatically when Excel starts up.

**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. (If you see a license-related error, see [Section 2.2](#) to review where your license file needs to be placed.)

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.

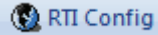
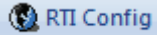

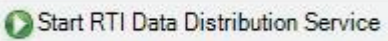
To see the RTI Spreadsheet Add-In toolbar in Excel 2007, select the **Add-Ins** tab on the Ribbon. Or, if you are using Excel 2003, right-click any Excel toolbar and choose *RTI Spreadsheet Add-in* for Microsoft Excel.



The worksheet in **Shapes\_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.

Inputs:				>>> Analysis:				>>> Outputs:			
The table and chart below display the incoming data values pertaining to the circles published by <i>RTI Shapes Demo</i> .				The table and chart below display statistics pertaining to the incoming data values.				The table and chart below display the data values that will be published from this spreadsheet so that they can be viewed from a subscribing <i>RTI Shapes Demo</i> window. Feel free to add new colors!			
color	x	y	shapsize	Mean x	#DIV/0!			#ERROR: RTI DDS is not started			
not started	#ERROR!	#ERROR!	#ERROR: RTI DDS is not sta	Median x	#NUM!			color, x, y, shapsize			
not started	#ERROR!	#ERROR!	#ERROR: RTI DDS is not sta	Min y	0			color	x	y	shapsize
not started	#ERROR!	#ERROR!	#ERROR: RTI DDS is not sta	Max y	0			YELLOW	#DIV/0!	0	#DIV/0!
								BLUE	#NUM!	0	0

5. **Optional, not required for most users:** For DDS applications to communicate, they must use the same domain ID. Since both *RTI Spreadsheet Add-in* for Microsoft Excel and *RTI 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 *RTI Shapes Demo* with a non-0 domain ID because you have other DDS applications already using domain 0), select  and change the domain ID (an integer value) in this dialog, then click **Close**.
6. From the RTI Spreadsheet Add-In toolbar, select  .
7. Change the **Auto publish timer** interval to 100 ms. and click the  button next to the interval.
8. Click 



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

Inputs:				>>> Analysis:				>>> Outputs:			
The table and chart below display the incoming data values pertaining to the circles published by RTI Shapes Demo.				The table and chart below display statistics pertaining to the incoming data values.				The table and chart below display the data values that will be published from this spreadsheet so that they can be viewed from a subscribing RTI Shapes Demo window. Feel free to add new colors!			
color	x	y	shapesize	Mean x	129	PUBLICATION Topic: Triangle   Type: ShapeType		color	x	y	shapesize
PURPLE	82	90	30	Median x	99	color,x,y,shapesize		YELLOW	129	90	65
RED	99	149	30	Min y	90			BLUE	99	163	63.25
GREEN	207	163	30	Max y	163						

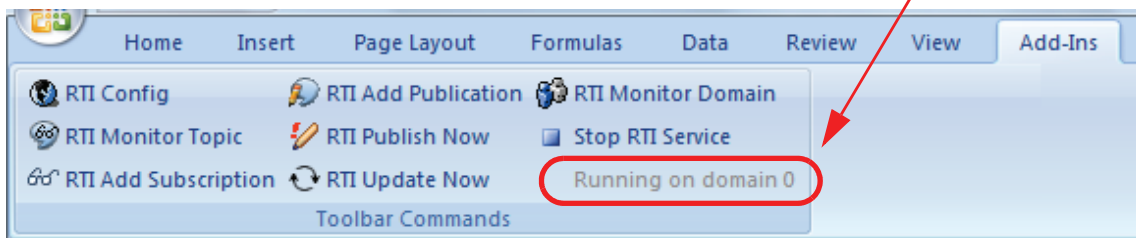
*Subscribing to data from RTI Shapes Demo.*

*Analyzing the incoming data.*

*Publishing data to RTI Shapes Demo. The input data from the far left table is used as output.*

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

RTI Data Distribution Service is running on domain 0



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

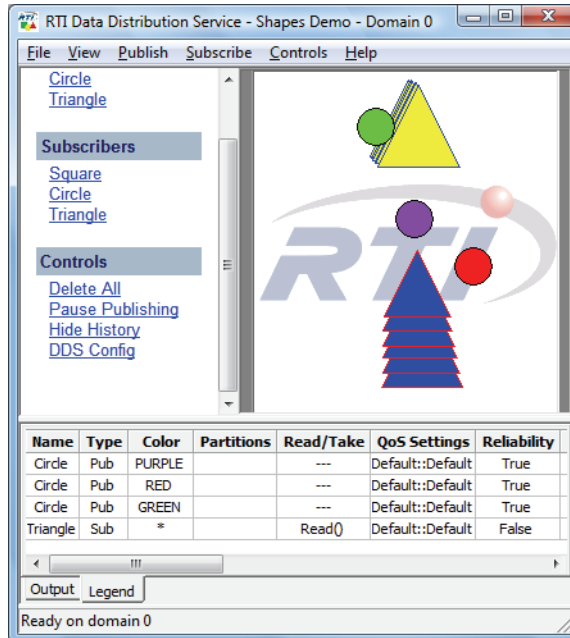
By default, Subscribers show the most recent 6 samples—this is why you see extra triangles behind the leading one. The most recent shape has a thick colored border. Older (historical) samples have a thinner border of the same color. Published shapes have a thin black border.

9. Use the cursor to move the circles around in the *RTI 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 [Chapter 4: Tutorial](#) for a more in-depth look at what you can do with *RTI Spreadsheet Add-in* for Microsoft Excel.



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

## Chapter 4 Tutorial

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

To work through the tutorial, you need *RTI Shapes Demo*. You can download *RTI Shapes Demo* from RTI's Downloads page (<http://www.rti.com/downloads>). To learn how to use it, read the *RTI Shapes Demo User's Manual* included with the *RTI Shapes Demo* installation.

The tutorial assumes you have the following software installed:

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

This chapter includes the following sections:

- Lesson 1—Setting Up RTI Shapes Demo (Section 4.1)
- Lesson 2—Starting the Add-in (Section 4.2)
- Lesson 3—Monitoring Topics (Section 4.3)
- Lesson 4—Subscribing to Data (Section 4.4)
- Lesson 5—Publishing Data (Section 4.5)
- Lesson 6—Monitoring a Domain's Built-in Topics (Section 4.6)

## 4.1 Lesson 1—Setting Up RTI Shapes Demo

*RTI 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?

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. *RTI 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).

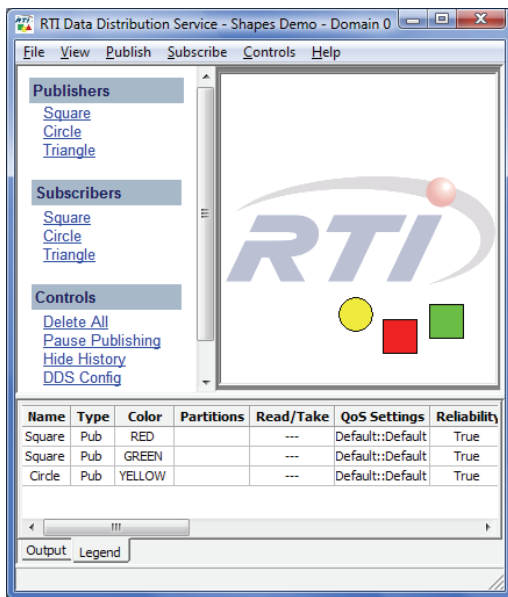
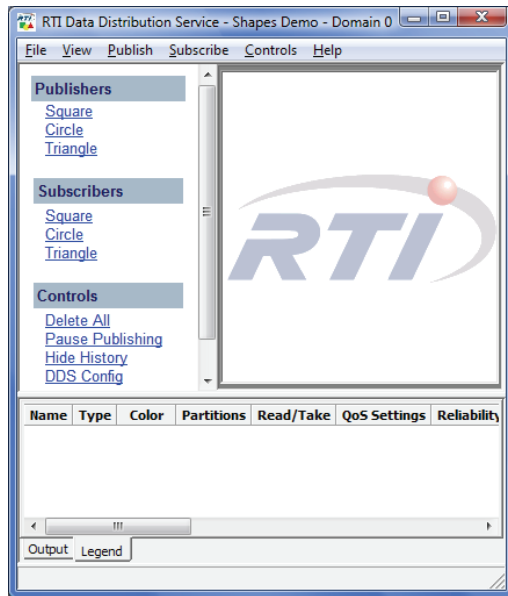
- RTI Shapes Demo* uses Domain ID 0 by default. If you want to use a different Domain ID, please see [Section A.1](#).
  - If you are using a computer that does not have an active network interface, please see [Section A.2](#).
1. Start two copies of *RTI Shapes Demo* (from the Windows **Start** menu, select [**All**] **Programs, RTI, RTI Shapes Demo <version>, RTI Shapes Demo**). Depending on your security settings, you may see a Windows Security Alert dialog—simply click **Unblock**:



The *RTI Shapes Demo* program's main window looks like this.

2. In one of the demo windows, create 2 squares publishers (red and green) and 1 yellow circle publisher (all with default QoS settings). Here are the steps:
  - a. Under **Publishers**, 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 *RTI 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.



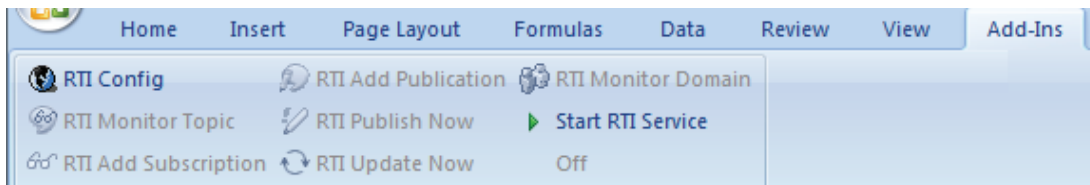
## 4.2 Lesson 2—Starting the Add-in



1. Start Microsoft Excel.

*RTI 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. (If you see a license-related error, see [Section 2.2](#) to review where your license file needs to be placed.)

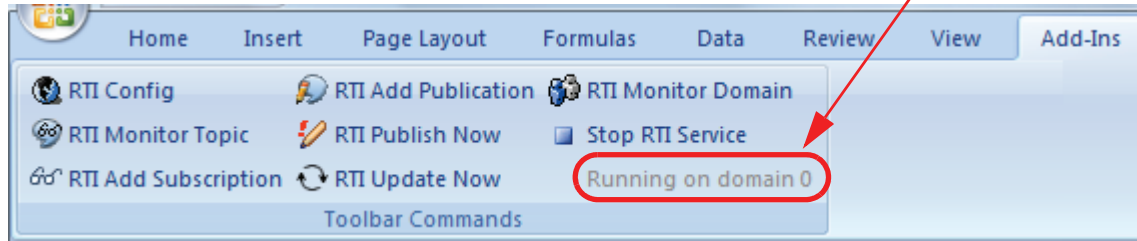
To see the *RTI Spreadsheet Add-In* toolbar, select the **Add-Ins** tab on the Ribbon in Excel 2007. Or, if you are using Excel 2003, right-click any Excel toolbar and choose *RTI Spreadsheet Add-in* for Microsoft Excel.



2. Optional, not required for most users: For DDS applications to communicate, they must use the same domain ID. Since both *RTI Spreadsheet Add-in* for Microsoft Excel and *RTI 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 *RTI Shapes Demo* with a non-0 domain ID because you have other 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 Service**.

After you select **Start RTI Service**, notice that the domain ID is displayed in the RTI Spreadsheet Add-in toolbar and the other toolbar commands are enabled.

RTI Data Distribution Service is running on domain 0




**Note:** Starting the RTI Service does not cause the add-in to subscribe to or publish user data; those features are described in the following lessons.

## 4.3 Lesson 3—Monitoring Topics

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

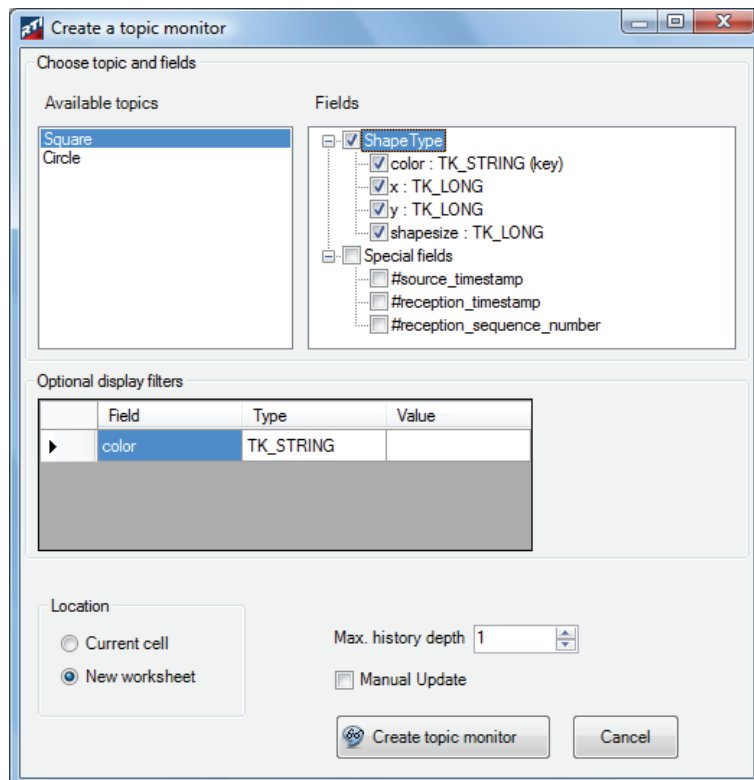
1. Create an Excel worksheet that will subscribe to, or monitor, the square topic being published by *RTI Shapes Demo*:

- a. From the RTI Spreadsheet Add-in toolbar, select  **RTI Monitor Topic**.


The list on the left shows DDS topics that have been discovered by the add-in in the domain you selected in the **RTI Config** dialog. In our case, these are the topics being published by *RTI Shapes Demo*.

- b. Click “Square.”

The list on the right shows the fields in the Square’s data type. By default, all fields are selected:





- c. Click  Create topic monitor.

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 shapsize).

*The topic monitor table contains three rows of table header.*

	A	B	C	D
1	SUBSCRIPTION Topic: Square   Type: ShapeType			
2	color,x,y,shapsize			
3	color	x	y	shapsize
4	RED	136	241	30
5	GREEN	209	88	30

*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
1	SUBSCRIPTION Topic: Square   Type: ShapeType			
2	color,x,y,shapsize			
3	color	x	y	shapsize
4	RED	150	223	30
5	GREEN	210	242	30
6	MAGENTA	18	31	30

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.

- 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
1	SUBSCRIPTION Topic: Square   Type: ShapeType			
2	color,x,y,shapsize			
3	color	x	y	shapsize
4	RED	49	121	30
5	GREEN	95	250	30
6	MAGENTA	182	169	30

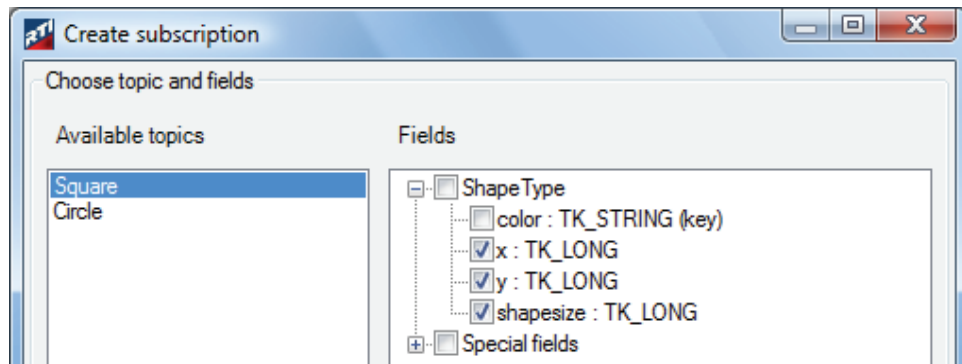
## 4.4 Lesson 4—Subscribing to Data

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.

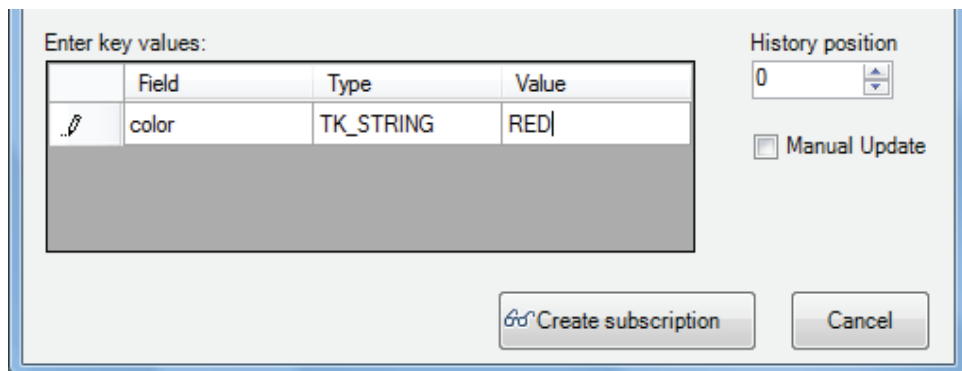
We will be adding a subscription to an Excel worksheet that will only receive red squares being published by *RTI Shapes Demo*:

- Select a cell in an empty worksheet.
- From the RTI Spreadsheet Add-in toolbar, select **RTI Add Subscription**.
- Click on the **Square** topic from the list on the left.

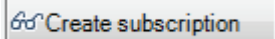
4. From the list of fields on the right, select *x*, *y*, and **shapsize** as the fields you want to display.



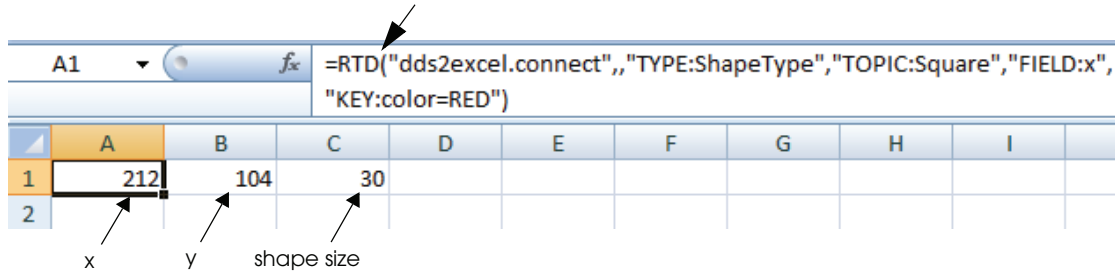
5. Since the topic's data type has a key, you *must* specify the color of squares that you want to subscribe to by entering a color in the Value cell in the key values table. Enter RED.



- 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 *RTI Shapes Demo* are all upper-case.

6. Click  .

The add-in creates this RTD function for each cell.



	A	B	C	D	E	F	G	H	I
1	212	104	30						
2									

x
y
shape size

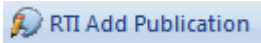
*In each row there is a cell for each field selected in the Create Subscription dialog. Notice that the table does not have a header row. The table will not grow in size over time.*

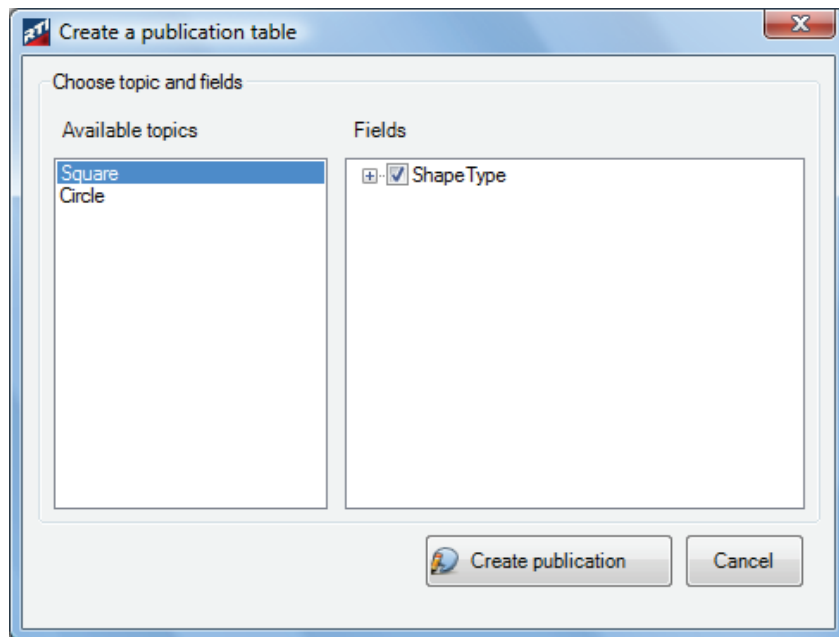
7. To prove that the values you are seeing are for red squares, click the red square in the Publisher Demo window to hold it still. Notice that the values in your worksheet stop updating. (You can give the square a push with your cursor to get it moving again.)

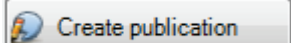
## 4.5 Lesson 5—Publishing Data

So far, we have *RTI 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 the squares will be received by *RTI Shapes Demo*:

1. Select a cell in an empty worksheet.
2. From the RTI Spreadsheet Add-in toolbar, select .
3. Select the Square topic from the list on the left.



4. Click .

Your worksheet should resemble this:

	A	B	C	D
1	PUBLICATION Topic: Square   Type: Shape			
2	color*,x,y,shapsize			
3	color	x	y	shapsize
4				
5				
6				
7				
8				

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.

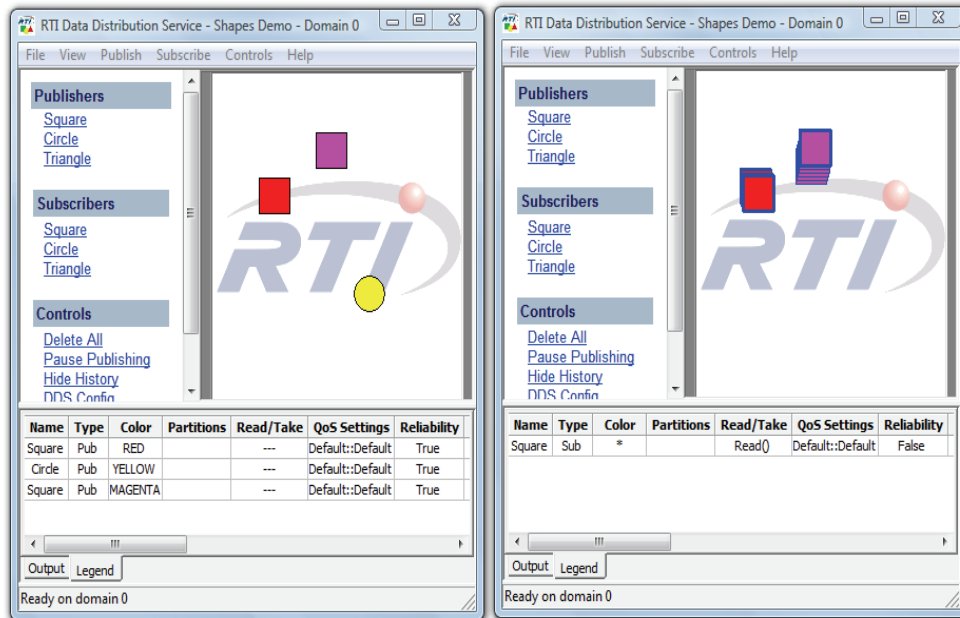
5. Fill in one row of the publication table for squares.
  - a. In the cell under the “color” column, enter a color name. Use a color not already being published with *RTI Shapes Demo*, such as CYAN.
  - b. For x, y, and shapsize, use this formula (so the values will vary each time you publish them): `=ROUND(RAND(),2)*100`

	A	B	C	D	E
1	PUBLICATION Topic: Square   Type: Shape				
2	color*,x,y,shapsize				
3	color	x	y	shapsize	
4	CYAN	26	69	69	
5					
6					
7					

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

6. Recall that we started two copies of *RTI 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 **Subscribers**, select **Square**.
  - b. In the **Create New Subscriber** dialog, click **OK**.

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



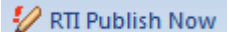
Publisher

Subscriber

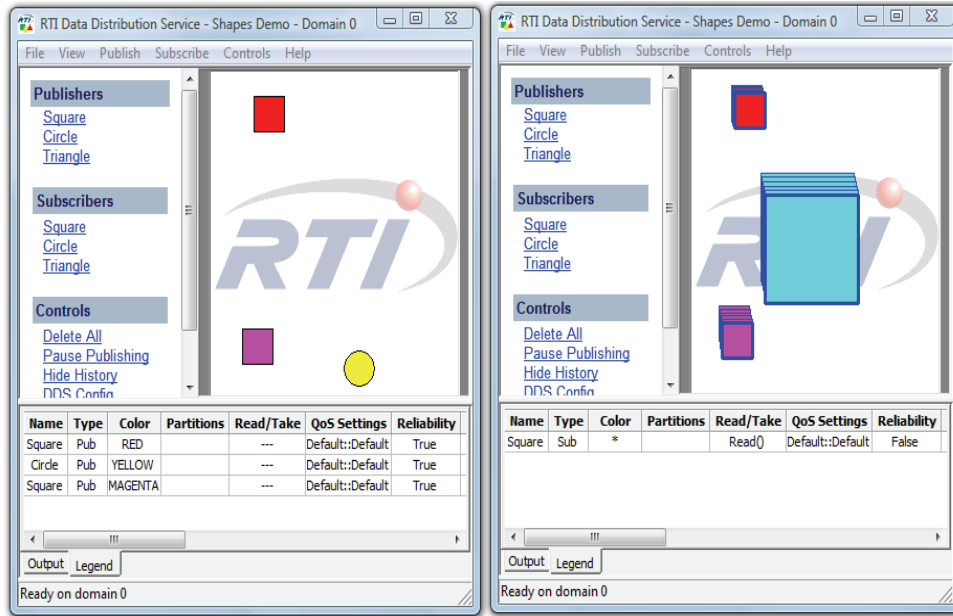
Notice that the Subscriber's shapes have thick blue borders. This is how you can distinguish between Subscribers and Publishers.

By default, Subscribers show the most recent 6 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 in [Step 5](#)), you haven't actually published from Excel yet.



7. From the RTI Spreadsheet Add-in toolbar, select  .

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



Publisher

Subscriber

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

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




## 4.6 Lesson 6—Monitoring a Domain's Built-in Topics

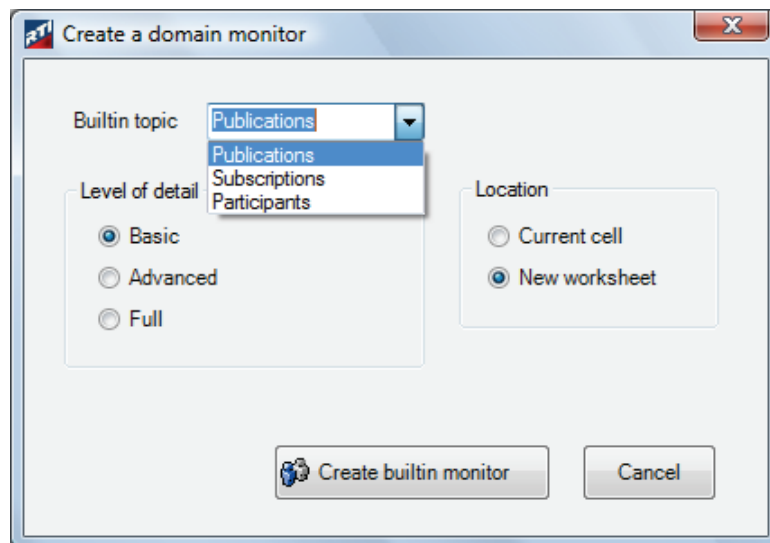
*RTI Data Distribution Service* must discover and keep track of remote entities, such as new participants in the domain. This information may also be important to the application itself, which may want to react to this discovery information, or else access it on demand. To support these needs, *RTI Data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

With *RTI 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. From the RTI Spreadsheet Add-in toolbar, select  **RTI Monitor Domain**.
2. Select **Publications** from the Built-in topic drop-down list box to monitor discovered publications:



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

	A	B	C	D	E	F
1	SUBSCRIPTION Topic: PUBLICATION   Type: BUILTIN					
2	Host IP	Creation timestamp	Deletion timestamp	Entity kind	Topic	Type
3	192.168.2.3	9/9/2009 1:03:42.17 PM		writer (with key)	Square	ShapeType
4	192.168.2.3	9/9/2009 1:03:49.74 PM		writer (with key)	Circle	ShapeType
5	192.168.2.3	9/9/2009 1:14:27.03 PM		writer (with key)	Square	ShapeType

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 applications will appear in the builtin topics. Since the cyan squares are coming from this same DDS participant (the add-in), they will not appear in the builtin topic.

4. 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	192.168.2.3	9/10/2009 3:50:07.37 PM	9/10/2009 3:56:09.17 PM	writer (with key)	Circle	ShapeType
4	192.168.2.3	9/10/2009 3:50:00.15 PM		writer (with key)	Square	ShapeType
5	192.168.2.3	9/10/2009 3:51:05.13 PM		writer (with key)	Square	ShapeType


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

# Appendix A Configuration Changes for Special Situations

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## A.1 Changing the Domain ID for RTI Shapes Demo

*RTI Shapes Demo* uses domain ID 0 by default. To use a different ID, start *RTI Shapes Demo* with the “-domainId <#>” command-line option. (See Appendix A in the *RTI Shapes Demo User’s Manual*<sup>1</sup> for details on running from the command line.)

**Important!** *RTI Spreadsheet Add-in* for Microsoft Excel must use the same domain ID as *RTI Shapes Demo*, or the two applications will not communicate. To change the domain ID in *RTI Spreadsheet Add-in* for Microsoft Excel, select  **RTI Config**.

---

## A.2 Running without an Active Network Interface

To use *RTI 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*.

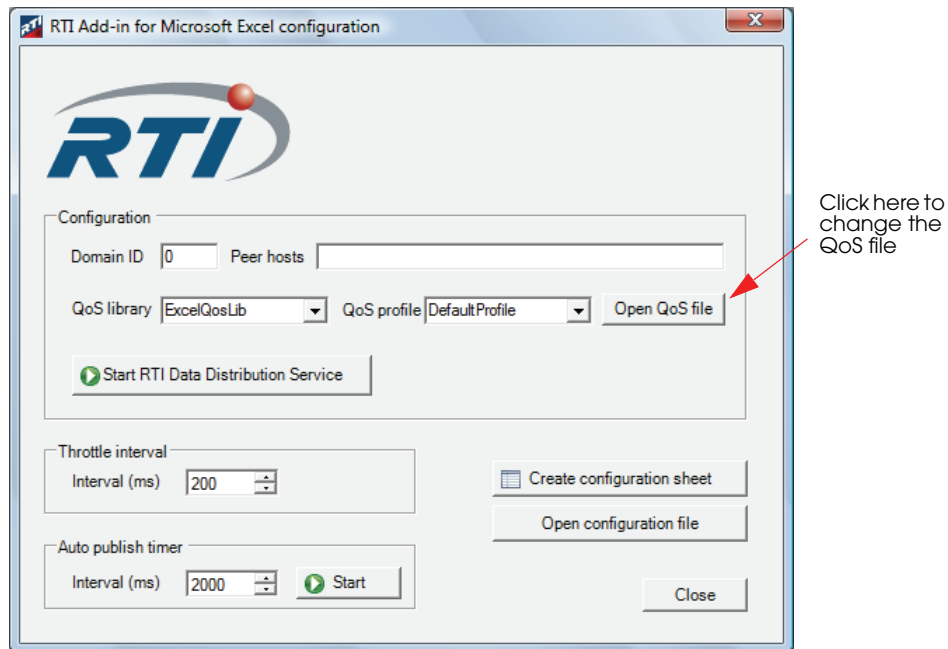
Another option is to install Microsoft Loopback Adapter, which simulates the existence of a network interface.

---

1. See <install dir>\RTI Shapes Demo <version>\RTI\_Shapes\_UsersManual.pdf.

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 <participant\_qos> section in the QoS file.

The shipped QoS file contains a QoS library (ExcelQoSLib), which consists of two QoS profiles (DefaultProfile and NoHistoryProfile). You will find the <participant\_qos> in each one of those profiles.

3. Change the bold line:

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

to this:

---

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

**4. Save the file.**

For your changes to take effect, you will need to restart Excel.

