NI Requirements Gateway

Getting Started with NI Requirements Gateway

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1

Introduction to NI Requirements Gateway

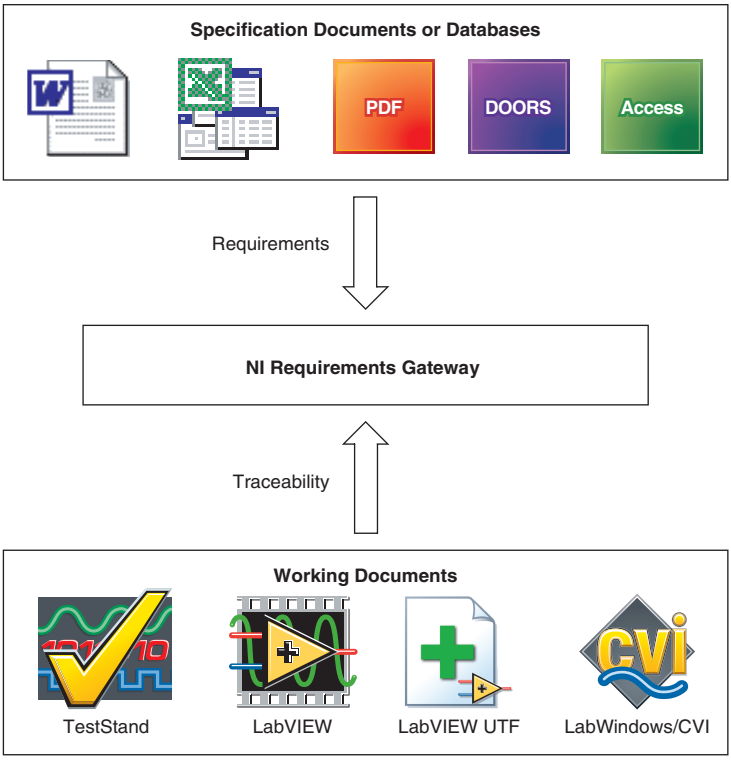
NI Requirements Gateway is a requirements traceability solution that links development and verification documents with formal requirements defined in documents and databases. Requirements Gateway improves the quality of the development process by effectively managing requirements traceability and impact analysis throughout the life cycle of a project.

Most engineering projects initially define high-level specifications and later define more detailed specifications. Specifications contain technical and procedural requirements that guide the product through each engineering phase. In addition, working documents, such as hardware schematics, simulation models, software source code, and test specifications and procedures, must adhere to and cover the requirements the specifications define.

You can use Requirements Gateway to link traceability information from external applications, as shown in Figure 1-1, to cover project requirements and to complete the following types of tasks:

- Configure the specifications and working documents you want to analyze using built-in or custom document interfaces, called types in Requirements Gateway
- Specify the traceability information, such as requirements or references that cover requirements, that you want to capture from each document
- Specify the traceability relationships between the specifications and working documents
- Use Coverage Analysis, Impact Analysis, and Graphical views to visualize and analyze traceability relationships between documents
- Create filters to customize the display or analysis of traceability
- Capture and compare project snapshots to determine changes in requirements and coverage
- Generate reports using built-in or custom report models and templates
- Navigate between Requirements Gateway and external applications to edit documents

Figure 1-1. Linking Traceability Information from External Applications



Refer to the *NI Requirements Gateway Help* for more information about Requirements Gateway features. Select **Help»NI Requirements Gateway Help** in the Requirements Gateway main window to access the *NI Requirements Gateway Help*.

Use the *Guide to Requirements Gateway Documentation* in the *NI Requirements Gateway Help* to access all the documentation in electronic format. Select **Help»Guide to Documentation** in the main window to access the *Guide to Requirements Gateway Documentation* in the *NI Requirements Gateway Help*.

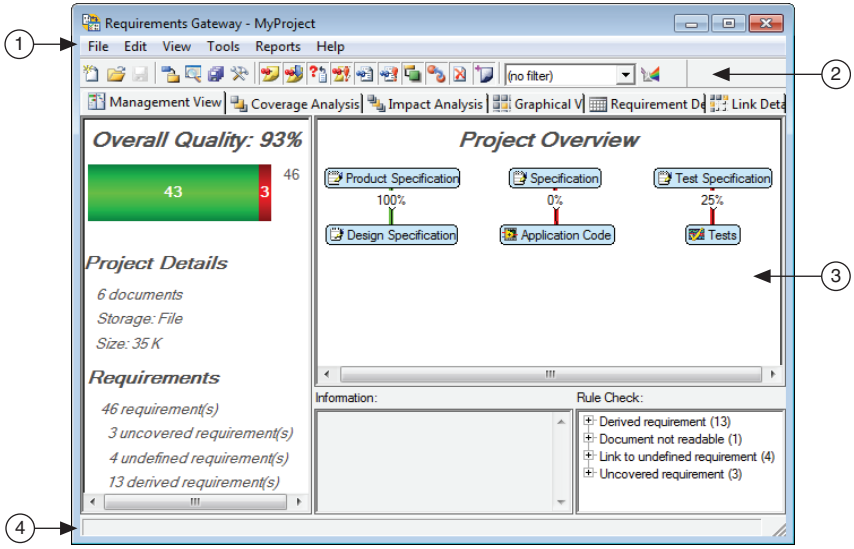
Starting Requirements Gateway

The Requirements Gateway interface includes a main window, in which you perform coverage and impact analysis, and a Configuration dialog box, in which you create and modify project documents, types, filters, and other options. Refer to the *NI Requirements Gateway Help* for more information about the main window and the Configuration dialog box.

Main Window

The main window displays when you launch Requirements Gateway, and includes the components shown in Figure 1-2.

Figure 1-2. Main Window



1	Menu Bar	3	Project Workspace
2	Toolbar	4	Status Bar

Menu Bar

The menu bar contains the File, Edit, View, Tools, Reports, and Help menus.

Toolbar

The toolbar contains options for common tasks and includes the following sections, as shown in Figure 1-3.

Figure 1-3. Main Window Toolbar

1	Standard	3	Navigation	5	Filtering
2	Configuration	4	View Options	6	Third Party

- **Standard**—Contains buttons for creating, loading, and saving project files.
- **Configuration**—Contains buttons for configuring projects, types, snapshots, and options.

- **Navigation**—Contains buttons to apply navigation commands previously performed within the coverage information of the Coverage Analysis and Impact Analysis views. This section is available only in the Coverage Analysis, Impact Analysis, Graphical, and Requirement Details views.
- **View Options**—Contains buttons to control the visible traceability elements in the Coverage Analysis and Impact Analysis views.
- **Filtering**—Contains options for applying or configuring filters that display or hide requirements in an analysis or view.
- **Third Party**—Contains buttons for exporting traceability information to third party applications, such as IBM Rational DOORS, if available. You must install and have access to the third party application on the same computer as Requirements Gateway for the buttons to become available.

Project Workspace

The project workspace displays the project information and analysis for the loaded project. The project workspace contains tabs for displaying the content of the project in the following views:

- **Feature Management**—Defines features and releases in a project, assigns requirements, macro-requirements, or sub-features, and adds attributes to features and releases.
- **Management**—Graphically summarizes the documents and requirements in the project, and displays an overall percentage of requirement coverage for the project. Refer to Chapter 2, *Managing Requirements*, for more information about using the Management view to review documents requirements in a project.
- **Coverage Analysis**—Displays one level of covering elements at the immediate downstream level, `N–1`, for a selected element of a document, and one level of covered elements at the immediate upstream level, `N+1`, from other documents as the project defines. Refer to Chapter 3, *Analyzing Requirements*, for more information about using the Coverage Analysis view.
- **Impact Analysis**—Displays all levels of covering elements at downstream levels, `N–m`, for a selected element of a document, and all levels of covered elements at upstream levels, `N+p`, from other documents as the project defines. Refer to Chapter 3, *Analyzing Requirements*, for more information about using the Impact Analysis view.
- **Graphical**—Graphically displays each document using a tree view, in which lines connect requirements in documents and covering elements in other documents. Refer to Chapter 3, *Analyzing Requirements*, for more information about using the Graphical view.
- **Requirement Details**—Displays each requirement and its attributes for a document.
- **Link Details**—Allows you to create additional references between requirements and covering documents without modifying project document source files.

Status Bar

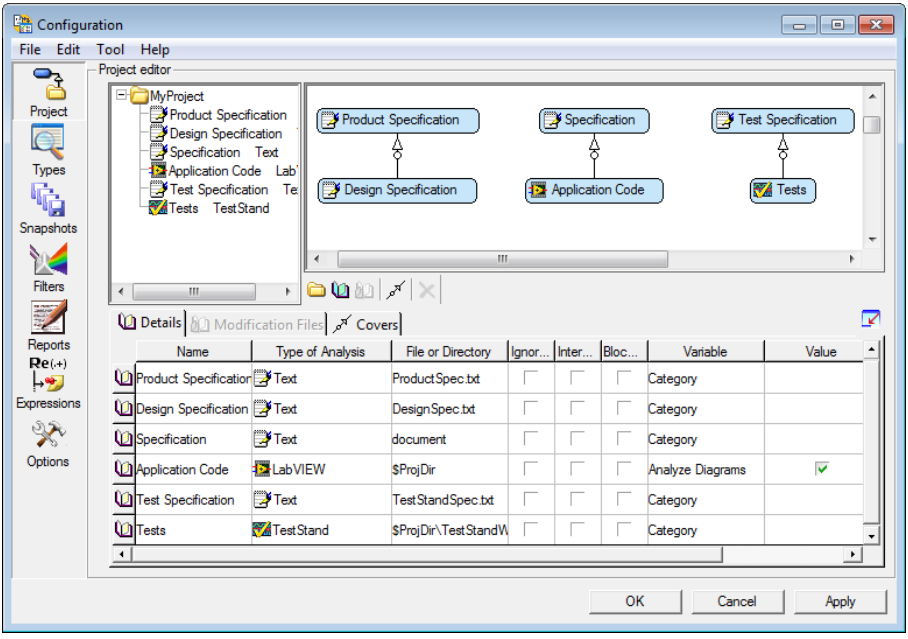
The status bar displays common application information, such as analysis status or a brief description of a menu item when you hover over the item in the menu bar.

Configuration Dialog Box

Requirements Gateway launches the Configuration dialog box, as shown in Figure 1-4, when you select a menu item or toolbar button in the main window to complete one of the following tasks:

- Edit a project
- Edit document types
- Edit snapshots
- Edit analysis display filters
- Edit reports
- Configure project options

Figure 1-4. Configuration Dialog Box



The Configuration dialog box contains the following panes:

- **Project**—Configure a project by specifying the documents to include, the type of each document, and the covering relationship between documents. Refer to Chapter 2, *Managing Requirements*, for more information about configuring projects.
- **Types**—Review built-in types, customize built-in types, or create new types for the project. Refer to Chapter 5, *Customizing Types*, for more information about customizing types.

- **Snapshots**—Create, manage, and compare snapshots of the project. A snapshot is a stored image of analysis results you can use to trace modifications, additions, or deletions of information throughout the lifetime of the project.
- **Filters**—Define custom filters to analyze or display certain requirements from documents that meet specific criteria. You can enable filters using the Filter Selection ring control on the toolbar in the main window.
- **Reports**—Review built-in report models, customize built-in report models, or create new report models. You can use the options in the Reports menu on the toolbar in the main window to generate a report. Refer to Chapter 4, *Generating Reports*, for more information about generating reports and creating custom reports.
- **Expressions**—Test the regular expressions you define for custom types you create on the Types pane to ensure the expressions accurately capture the appropriate elements before you use the expressions in a project. You can specify text from a project document source file and a regular expression, and the pane displays the traceability information the regular expression returns.
- **XML**—Test the XML syntax you define to ensure the XML syntax accurately captures the appropriate elements before you use the XML syntax in a project.
- **Options**—Specify the default font for the text in the application, specify a password for the project, define environmental variables, define user profiles for connecting to a DOORS database, and specify other settings for Requirements Gateway.

Refer to the *NI Requirements Gateway Help* for more information about configuring projects, customizing types, creating snapshots, specifying filters, generating reports, and using regular expressions.

Requirements Gateway Directory Structure

Requirements Gateway installs files in the following directories:

- **<Requirements Gateway>**—Located by default at `C:\Program Files\National Instruments\Requirements Gateway` on Microsoft Windows 32-bit systems and at `C:\Program Files (x86)\National Instruments\Requirements Gateway` on Windows 64-bit systems.

  The `<Requirements Gateway>` directory is the location where you installed Requirements Gateway on the computer and contains the read-only Requirements Gateway program files.
- **<Requirements Gateway Public>**—Located by default at `C:\Users\Public\Public Documents\National Instruments\Requirements Gateway`.

  The `<Requirements Gateway Public>` directory contains writable files such as custom types, custom report models and templates, the tutorials in this manual, and other examples.

2

Managing Requirements

You can use the Configuration dialog box to create a project and add existing documents to the project, and you can use the main window to review the content of the documents.

A project specifies the documents Requirements Gateway analyzes, the type to use for each document, and the covering links between the documents. A type defines how Requirements Gateway completes the following tasks:

- Selects the source files for a project document. For example, a project document of the LabVIEW type selects a LabVIEW VI, project file, class file, project library, or LLB as the source file.
- Reads and analyzes the content of the source files for traceability information.
- Displays the elements of the document.

Requirements Gateway includes a set of built-in types for capturing traceability information from National Instruments applications, such as LabVIEW, LabWindows™/CVI™, and NI TestStand™, and from other common data sources, such as Microsoft Office documents, PDF files, text files, and source code files. Refer to Chapter 6, *Using External Applications with Requirements Gateway*, for a complete list of applications and data sources Requirements Gateway supports.

Creating a Project

Complete the following steps to start Requirements Gateway and create a new project.

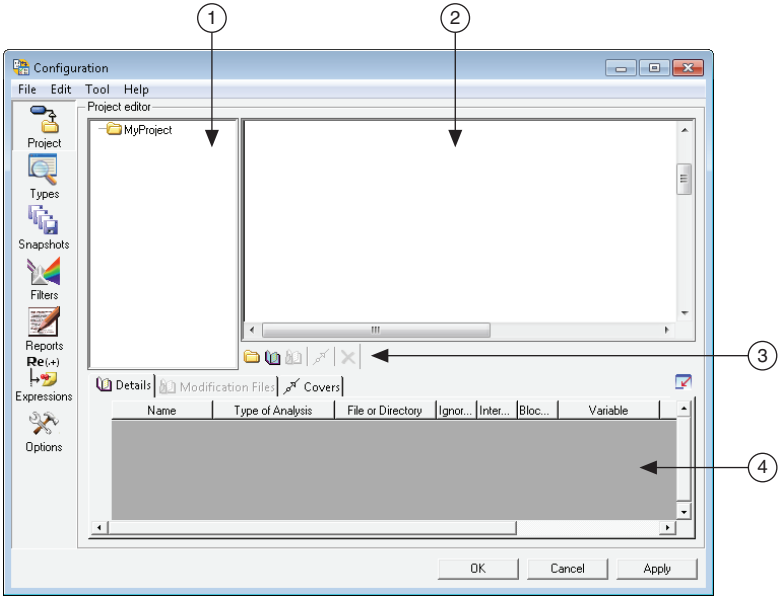
Note The exercises in this manual modify the tutorial files located in the `<Requirements Gateway Public>\Tutorials` directory. You can restore the tutorial files to the original state by copying the files from the `<Requirements Gateway Public>\Tutorials\Original` directory to the `<Requirements Gateway Public>\Tutorials` directory.

1. Select **Start»All Programs»National Instruments»Requirements Gateway» Requirements Gateway** to launch Requirements Gateway and display the main window.
2. Select **File»New** or click the **New** button, as shown in the following figure, on the toolbar in the main window to launch the Create a New Project and Save As dialog box, and navigate to the `<Requirements Gateway Public>\Tutorials` directory.

3. Enter `MyProject` in the File name control and click **Save**.

Requirements Gateway creates a new project file (`.rqtf`) and displays the Project pane of the Configuration dialog box, as shown in Figure 2-1. A project file defines the documents Requirements Gateway analyzes, the type of each document, and the covering relationship between the documents. If you do not add documents to the project file, Requirements Gateway does not save the project file to disk and discards the file in memory. After you add documents to the project and apply the changes, Requirements Gateway saves the project file in the `<Requirements Gateway Public>\Tutorials` directory.

Figure 2-1. New Project on the Project Pane of the Configuration Dialog Box



1	Project Files	3	Project Options
2	Project Configuration	4	Document Options

The Project pane contains the following sections:

- **Project Files**—Tree view of all the documents and folders the root project directory contains. Each document in the project tree displays the document name and an icon that indicates the document type.
- **Project Configuration**—Graphical overview of the documents and folders in the project. You can place and arrange documents and folders, and you can add covering links between the project documents to specify a covering relationship between the documents.

- **Project Options**—Options for adding folders, documents, modification files, and covering links to a project, and an option for removing selected items from the project. Refer to the *NI Requirements Gateway Help* for more information about adding folders and modification files to a project.
- **Document Options**—Options for configuring a selected project document, modification file, or covering link.

Adding a Document

Complete the following steps to add a specification document to the project you created in the *Creating a Project* section of this chapter.

1. Click the **Add a document** button, as shown in the following figure. The cursor automatically moves to the Project Configuration pane and outlines a document object. Click the Project Configuration pane to place the document.

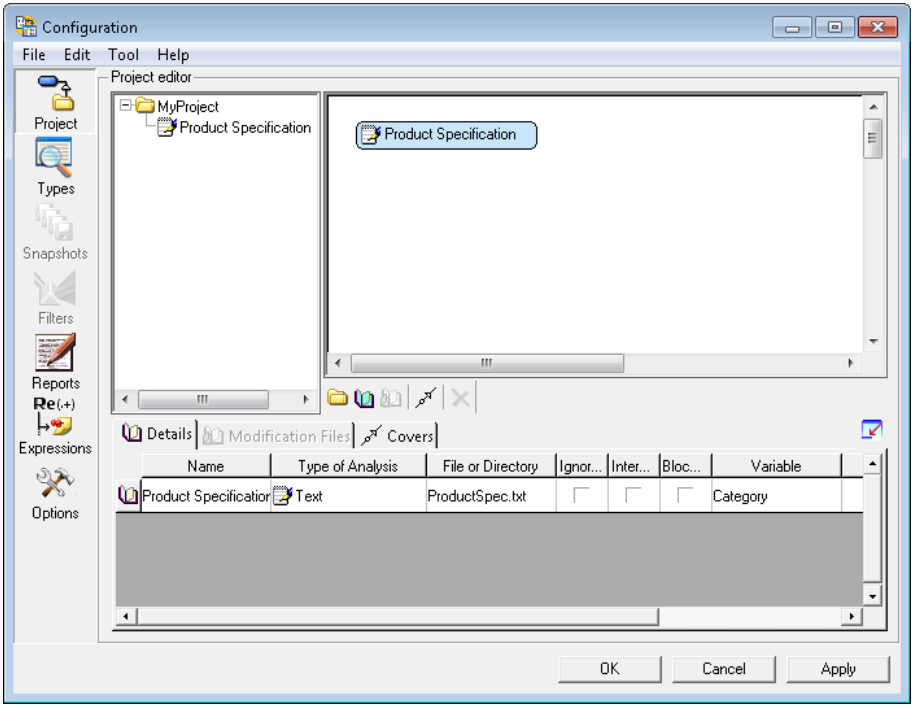
   When you place the document, Requirements Gateway adds the document to the Project Files list. The Details tab of the Document Options pane displays the settings for the document.
2. On the Details tab of the Document Options pane, click in the **Name** column to select the **Document1** text. Enter `Product Specification` and press <Enter> to rename the document.
3. Click in the **Type of Analysis** column and select **Text** from the ring control to analyze the document using the Text type.

   The Text type specifies that the document is a text file, the content of which follows a specific format for defining traceability information. Requirements Gateway analyzes the text file for text that follows the format the Text type defines. Other types define unique formats for capturing traceability information from other data sources.

   The *Reviewing the Product Specification Document* section in this chapter demonstrates how to review a text file for the traceability information Requirements Gateway captures when it analyzes the text file.
4. Click in the **File or Directory** column. The **File Browse** button, as shown in the following figure, becomes visible on the right side of the control. Click the **File Browse** button, navigate to `<Requirements Gateway Public>\Tutorials\ProductSpec.txt`, and click **Open**. Figure 2-2 shows the Configuration dialog box after you add the Product Specification document.

Figure 2-2. Adding a Document to a Project



Adding a Covering Document

A covering document is a document that contains references to requirements that another document defines. A covering document can specify a source file from any supported external application, such as a TestStand sequence file, a LabVIEW VI, or a C file. For example, a step in a TestStand sequence might cover requirements defined in a text document.

Note This tutorial adds a covering text document. Refer to the *NI Requirements Gateway Help* for more information about adding documents from each supported external application, including TestStand, LabVIEW, and LabWindows/CVI.

Complete the following steps to add a new document to the project that covers the Product Specification document.

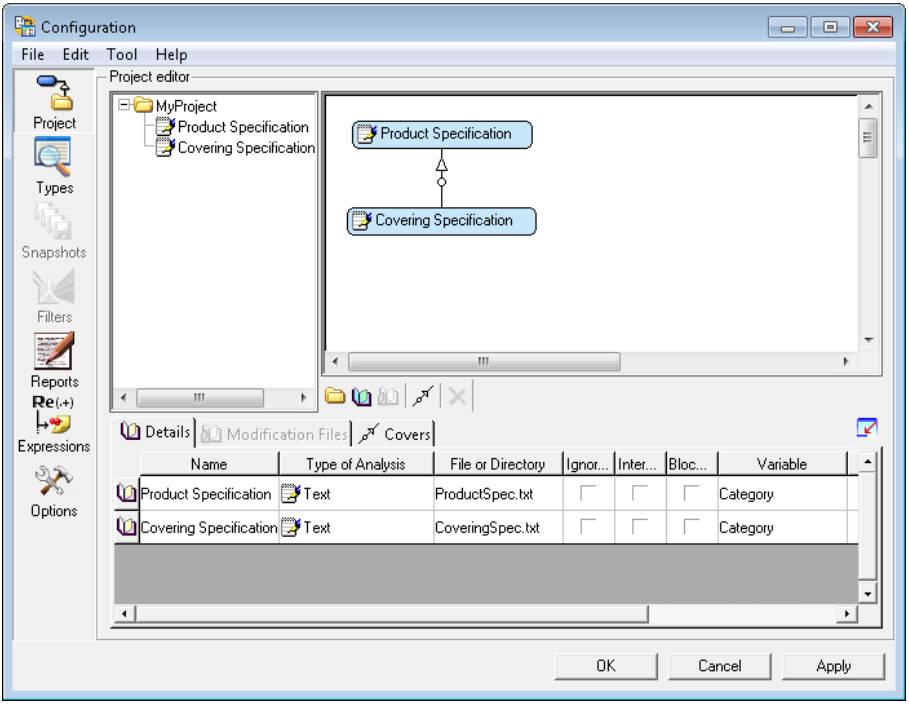
1. Click the **Add a document** button to add a second document on the Project Configuration pane. Place the document below the Product Specification document.
2. On the Details tab of the Document Options pane, enter `Covering Specification` in the Name control, select **Text** from the Type of Analysis ring control, and browse to

`<Requirements Gateway Public>\Tutorials\CoveringSpec.txt` in the **File or Directory** control.

3. Click the **Add a cover** button, as shown in the following figure.

   Click the **Covering Specification** document and then click the **Product Specification** document. A covering link appears between the two documents, as shown in Figure 2-3. The arrow on the covering link indicates that the Covering Specification document covers the Product Specification document.

Figure 2-3. Adding a Covering Document to a Project

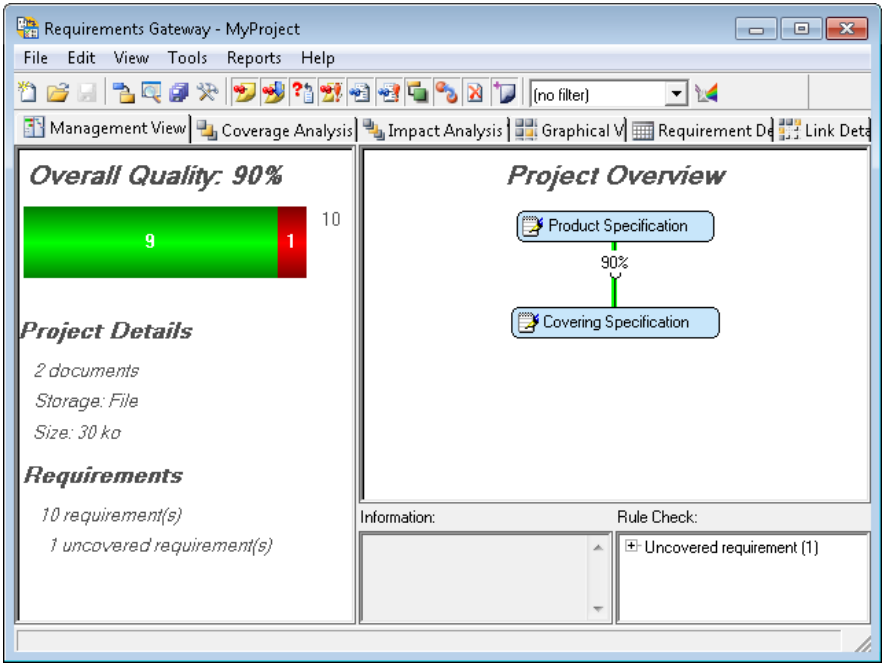


4. Click **OK** to close the Configuration dialog box.

Using the Management View

After you close the Configuration dialog box in step 4 of the *Adding a Covering Document* section, the Management view displays in the main window, as shown in Figure 2-4.

Figure 2-4. Reviewing the Project in the Management View



The Overall Quality pane in the Management view indicates that the project includes two documents and specifies ten requirements, but one requirement remains uncovered. The Project Overview pane displays the covering relationship between the documents.

Note Requirements Gateway declares a set of formal rules that define the required structure of project traceability and configuration information. When analyzing the project, Requirements Gateway identifies any violations of the rules and displays the results on the Rule Check pane in the Management view. Rule violations also display under a Rule check node in the Selection column of the Coverage Analysis and Impact Analysis views. Refer to the *NI Requirements Gateway Help* for lists of possible rule violations and recommendations for resolving the violations.

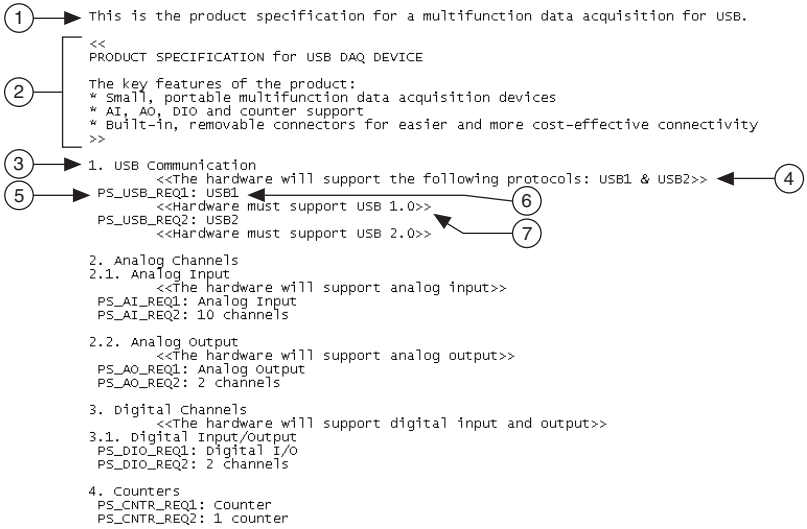
Complete the following tutorials to use the Management view to review the documents you included in the project.

Reviewing the Product Specification Document

Complete the following steps to review the content of the Product Specification document.

1. Double-click the **Product Specification** document on the Project Overview pane. Requirements Gateway displays the source file for the Product Specification document, `ProductSpec.txt`, in the default application associated with `.txt` files, as shown in Figure 2-5. The default application for Microsoft Windows is Microsoft Notepad. You can also right-click this document and select **Navigate** from the context menu to open this document in the default application.

Figure 2-5. ProductSpec.txt Document



1	General Text	3	Section	5	Requirement ID	7	Requirement Text
2	Document Text	4	Section Text	6	Requirement Label		

2. Review the content of `ProductSpec.txt`, which specifies ten requirements.

   Requirements Gateway uses the Text type applied to the document to analyze `ProductSpec.txt` and identify the following traceability elements:

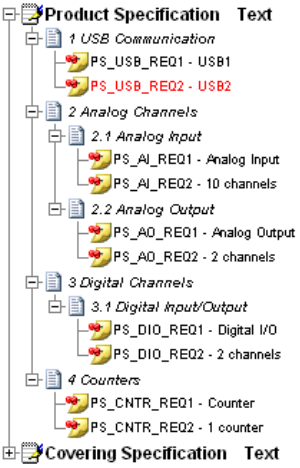
   - **Sections**—Defined by a numeric heading, such as `2.1`. The text after the numeric heading is the text of the section.
   - **Requirements**—Defined by an ID that contains a set of arbitrary characters, followed by the characters `REQ`, and ending with a numeric value. The label for the requirement is located after the ID, and the colon character delimits the label.
   - **Text**—When delimited by the << and >> characters, the text is associated with the previously specified element. If an initial text element is specified at the beginning of the file, the text is associated with the document. Otherwise, the text is associated with a section or another element, such as a requirement.

3. Exit the application that displays `ProductSpec.txt`.
4. In Requirements Gateway, click the **Coverage Analysis View** tab in the main window.
5. Expand the child elements of the Product Specification document in the Selection column.

Note Press <Shift> while expanding the parent element to display all the child elements.

The Selection column displays the section headings from the Product Specification document as parent elements and the requirements as child elements, as shown in Figure 2-6. For example, the PS_USB_REQ1 and PS_USB_REQ2 elements represent requirements the Product Specification document specifies.

Figure 2-6. Product Specification Document in the Coverage Analysis View



6. Collapse the **Product Specification** document in the Selection column.

Reviewing the Covering Specification Document

Complete the following steps to review the content of `CoveringSpec.txt`.

1. Click the **Management View** tab in the main window.
2. Select the **Covering Specification** document on the Project Overview pane. Navigate to `CoveringSpec.txt`.
3. Review the content of `CoveringSpec.txt`, which contains section and text elements. Instead of requirements, the file contains references to requirements, as shown in Figure 2-7. The prefix `[Covers:`, followed by a set of characters that represent the requirement ID and completed with a closing bracket character, defines a reference.

Figure 2-7. References in CoveringSpec.txt

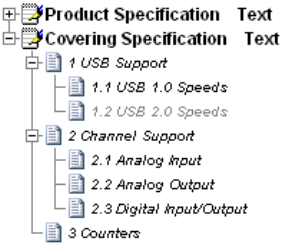
```
1. USB Support
1.1. USB 1.0 Speeds
     <<Hardware supports USB 1.0>>
     [Covers: PS_USB_REQ1]

1.2. USB 2.0 Speeds

2. Channel Support
2.1. Analog Input
     <<Hardware supports analog input>>
     [Covers: PS_AI_REQ1]
     <<10 channels>>
     [Covers: PS_AI_REQ2]
```

The text file specifies nine references. The 1.2. USB 2.0 Speeds section of the file does not contain a reference.

4. Exit the application that displays `CoveringSpec.txt`.
5. In Requirements Gateway, click the **Coverage Analysis View** tab in the main window.

6. Expand the child elements of the Covering Specification document in the Selection column. The Selection column displays the sections the Covering Specification document specifies, as shown in Figure 2-8. Requirements Gateway highlights the 1.2 USB 2.0 Speeds section in gray because this section is empty.

Figure 2-8. Covering Specification Document in the Coverage Analysis View



7. Collapse the **Covering Specification** document in the Selection column.

Refer to Chapter 3, *Analyzing Requirements*, for more information about using the Coverage Analysis view.

3

Analyzing Requirements

Use the Coverage Analysis, Impact Analysis, and Graphical views to review the relationships between requirements and the references that cover requirements.

Using the Coverage Analysis View

The Selection column of the Coverage Analysis view displays the content of all the documents in the project. Select an element of a document in the Selection column to display only the immediate level of upstream elements the selected element covers in the Upstream Coverage Information column or only the immediate level of downstream elements that cover the selected element in the Downstream Information column.

The Coverage Analysis view also contains the following tabs. Each tab displays details about the element you select in the Selection column.

- **Texts and Reference Attributes**—Displays the text for the element you select and any attributes for references that link the element you select to a corresponding element in the Upstream Coverage Information or Downstream Coverage Information column.
- **Attributes**—Displays the attributes for the element you select.
- **Messages**—Displays helpful information, including rule violation details, for the element you select.

Refer to Chapter 5, *Customizing Types*, and to the *NI Requirements Gateway Help* for more information about attributes and reference attributes.

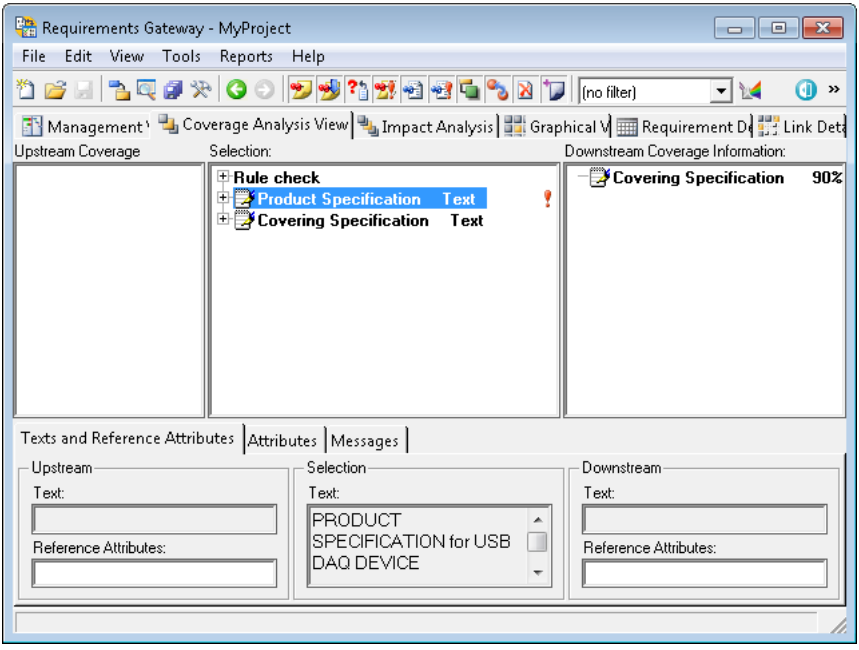
Complete the following tutorials to use the Coverage Analysis view to analyze requirement coverage for a project and add references to a project document.

Analyzing Requirement Coverage

Complete the following steps to analyze requirement coverage for the project you created in Chapter 2, *Managing Requirements*.

1. Open `<Requirements Gateway Public>\Tutorials\MyProject.rqtf` if it is not already open.
2. Click the **Coverage Analysis View** tab in the main window. Collapse the Product Specification and the Covering Specification documents in the Selection column, as shown in Figure 3-1.

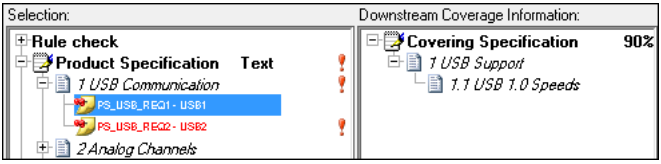
Figure 3-1. Coverage Analysis View



3. Select the **Product Specification** document in the Selection column. The Downstream Coverage Information column indicates that the Covering Specification document covers 90% of the requirements in the Product Specification document.
4. Expand the **Product Specification** document in the Selection column, and expand the **1 USB Communication** section element.

5. Select the **PS_USB_REQ1** requirement of the Product Specification document, as shown in Figure 3-2.

Figure 3-2. PS_USB_REQ1 Selected in the Coverage Analysis View



The Downstream Coverage Information column displays the 1.1 USB 1.0 Speeds section as a covering element because this section of the Covering Specification document contains a reference to the PS_USB_REQ1 requirement. The Downstream Coverage Information column also displays the 1 USB Support parent section of the 1.1 USB 1.0 Speeds section.

6. Select the **PS_USB_REQ2** requirement of the Product Specification document, as shown in Figure 3-3.

Figure 3-3. PS_USB_REQ2 Selected in the Coverage Analysis View

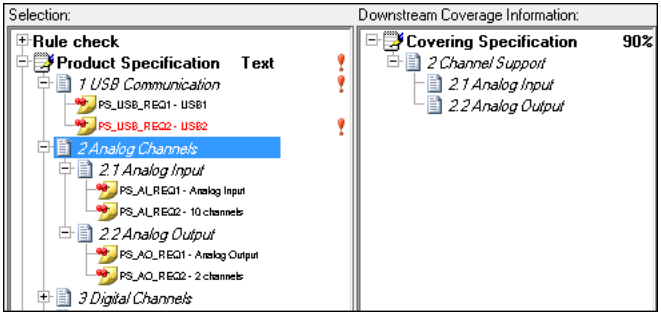
The Downstream Coverage Information column does not display any covering elements because the Covering Specification document does not contain a reference to the PS_USB_REQ2 requirement.

7. Hover over the **exclamation** icon, as shown in the following figure, to the right of the PS_USB_REQ2 requirement to display a tooltip that contains the text `1 uncovered requirement`. The Selection column displays the exclamation icon for an uncovered requirement and all the parent elements of the uncovered requirement.

Note You can also expand the **Rule check** node in the Selection column and expand the **Uncovered requirement (1)** rule violation. Requirements Gateway lists the PS_USB_REQ2 requirement as an uncovered requirement. You can double-click the PS_USB_REQ2 requirement under the Rule check node to locate the PS_USB_REQ2 requirement in the project document in the Selection column.

8. Select and expand the **2 Analog Channels** section of the Product Specification document, as shown in Figure 3-4.

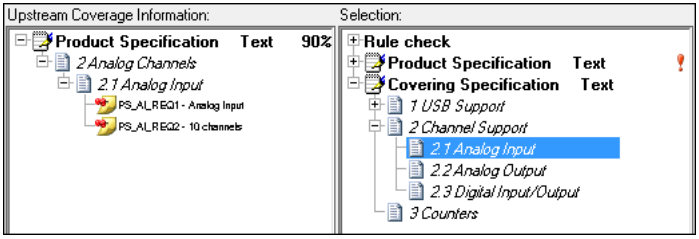
Figure 3-4. 2 Analog Channels Section Selected in the Coverage Analysis View



The 2.1 Analog Input child section of the 2 Analog Channels section contains the PS_AI_REQ1 and PS_AI_REQ2 requirements, and the 2.2 Analog Output child section contains the PS_AO_REQ1 and PS_AO_REQ2 requirements. The Downstream Coverage Information column displays the 2.1 Analog Input and 2.2 Analog Output sections of the Covering Specification document as covering elements. In the Covering Specification document, the 2.1 Analog Input section contains references to the PS_AI_REQ1 and PS_AI_REQ2 requirements, and the 2.2 Analog Output section contains references to the PS_AO_REQ1, and PS_AO_REQ2 requirements.

9. Double-click the **2.1 Analog Input** section of the Covering Specification document in the Downstream Coverage Information column. Requirements Gateway selects the 2.1 Analog Input section of the Covering Specification document as the selected element in the Selection column, as shown in Figure 3-5.

Figure 3-5. 2.1 Analog Input Section Selected in the Coverage Analysis View



The Upstream Coverage Information column indicates that the Covering Specification document covers 90% of the requirements in the Product Specification document, and that the references from the 2.1 Analog Input section of the Covering Specification document specifically cover the PS_AI_REQ1 and PS_AI_REQ2 requirements in the Product Specification document.

Adding a Reference in a Project Document

Complete the following steps to add a reference in the Covering Specification document to cover the uncovered requirement, PS_USB_REQ2, in the Product Specification document.

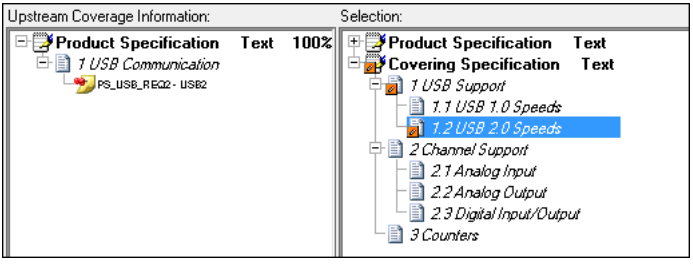
1. Expand the **1 USB Support** section of the Covering Specification document in the Selection column.
2. Double-click the **1.2 USB 2.0 Speeds** element in the Selection column to navigate to `CoveringSpec.txt`.
3. Edit the file by adding a reference to the PS_USB_REQ2 requirement below the 1.2. USB 2.0 Speeds section, as shown in Figure 3-6.

Figure 3-6. PS_USB_REQ2 Reference in Covering Specification Document

```
1. USB Support
1.1. USB 1.0 Speeds
     <<Hardware supports USB 1.0>>
     [Covers: PS_USB_REQ1]

1.2. USB 2.0 Speeds
     <<Hardware supports USB 2.0>>
     [Covers: PS_USB_REQ2]

2. Channel Support
2.1. Analog Input
     <<Hardware supports analog input>>
     [Covers: PS_AI_REQ1]
     <<10 channels>>
     [Covers: PS_AI_REQ2]
```

4. Save the changes to `CoveringSpec.txt` and exit the application.
5. Return to Requirements Gateway, which launches a dialog box that indicates that the Covering Specification document was modified. Click **Yes** to reload the file. Requirements Gateway analyzes the new document and updates the view, as shown in Figure 3-7.

Figure 3-7. Covering Specification Document after Reloading the Project



The Upstream Coverage Information column now indicates that the Covering Specification document covers 100% of the requirements in the Product Specification document. The Upstream Coverage Information column also indicates that the 1.2 USB 2.0 Speeds section

in the Covering Specification document now covers the PS_USB_REQ2 requirement in the Product Specification document. The orange icon on the 1.2 USB 2.0 Speeds section and its parent sections indicate that a change occurred to the project document source file outside of Requirements Gateway.

Note When you reload a project after making changes to a project document source file, Requirements Gateway highlights the added, deleted, modified, and moved elements with orange icons. The icons are temporary and disappear when you reload the project again without making any additional changes. If you want to persist the change information in the project, use marks or snapshots. Refer to the *NI Requirements Gateway Help* for more information about the orange icons, marks, and snapshots.

The Rule check node in the Selection column no longer appears because the project no longer contains an uncovered requirement.

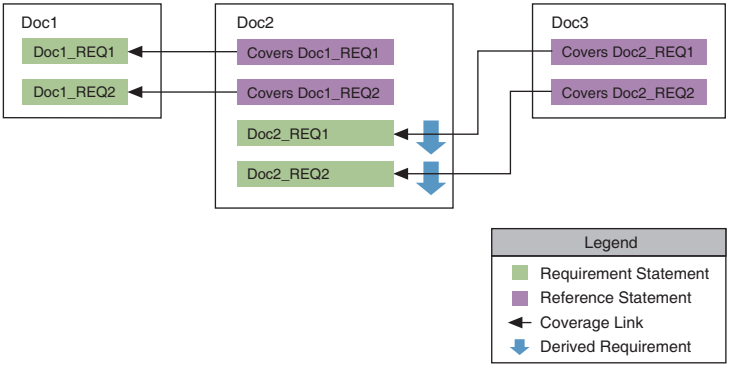
Using the Impact Analysis View

The Impact Analysis view contains the same columns and tabs as the Coverage Analysis view, but displays all levels of downstream or upstream elements.

A Requirements Gateway project can include more documents than only one upstream document and one downstream document. Requirements can exist at more than one level, and you can use requirements at one level to cover requirements at the next immediate upstream level, but you must still cover the requirements at all levels to cover 100% of the requirements in the project.

For example, consider a project that contains three total documents, Doc1, Doc2, and Doc3, as shown in Figure 3-8:

Figure 3-8. Traceability for Requirements at Multiple Levels in a Project



This project specifies the following requirements traceability:

- The document at the most upstream level, Doc1, specifies two requirements, Doc1_REQ1 and Doc1_REQ2.
- The document at the intermediate level, Doc2, covers the two requirements in Doc1, but also specifies two additional requirements, Doc2_REQ1 and Doc2_REQ2, that a further downstream document must cover. The Doc2_REQ1 and Doc2_REQ2 requirements are called derived requirements because they are not defined at the most upstream level, but they must still be covered for the project to cover 100% of all requirements.
- The most downstream level document, Doc3, covers the two derived requirements the Doc2 specifies, Doc2_REQ1 and Doc2_REQ2. If Doc3 did not cover the derived requirements Doc2 specifies, the project would cover only 50% of all requirements.

Complete the following tutorials to use the Impact Analysis view to track requirements traceability across three levels of documents.

Adding a Third Document to a Project

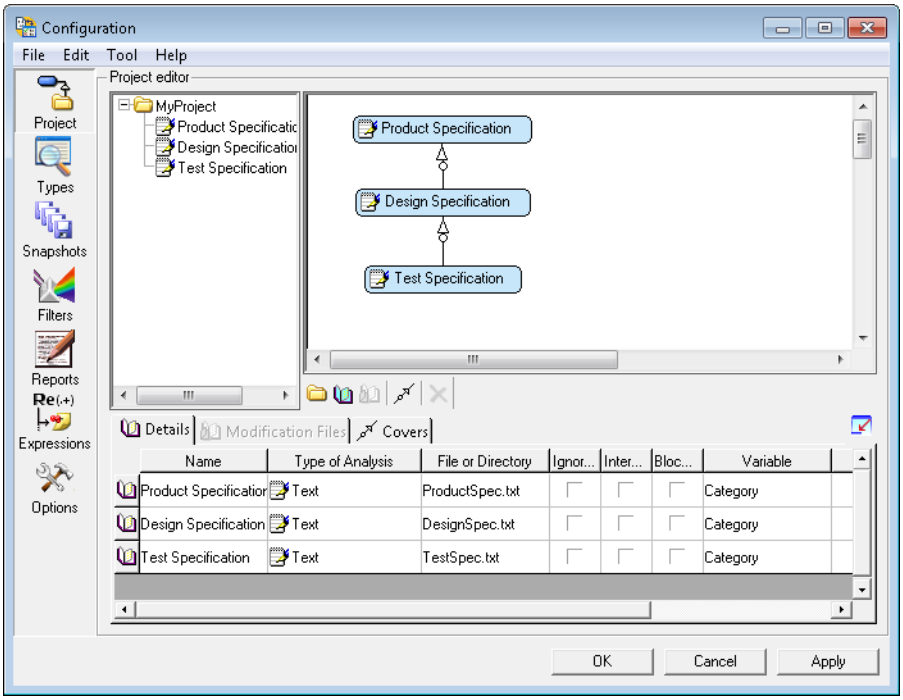
Complete the following steps to add a third document to the project you created in Chapter 2, *Managing Requirements*.

1. Open `<Requirements Gateway Public>\Tutorials\MyProject.rqtf` if it is not already open.
2. Select **File»Edit Project** or click the **Edit Project** button, as shown in the following figure, on the toolbar in the main window to launch the Project pane of the Configuration dialog box.

3. Select the **Covering Specification** document on the Project Configuration pane.
4. On the Details tab of the Document Options pane, enter `Design Specification` in the Name control, select **Text** from the Type of Analysis ring control, and browse to `<Requirements Gateway Public>\Tutorials\DesignSpec.txt` in the **File or Directory** control.
5. Click the **Add a document** button to add a third document on the Project Configuration pane. Place the document below the Design Specification document.
6. On the Details tab of the Document Options pane, enter `Test Specification` in the Name control, select **Text** from the Type of Analysis ring control, and browse to `<Requirements Gateway Public>\Tutorials\TestSpec.txt` in the **File or Directory** control.

7. Click the **Add a cover** button to add a covering link. Click the **Test Specification** document and then click the **Design Specification** document to create a covering link between the two documents, as shown in Figure 3-9.

Figure 3-9. Two Levels of Covering Documents in the Project



8. Click **OK** to close the Configuration dialog box.
9. Click **Yes** when Requirements Gateway prompts you to reanalyze the project.

Reviewing the New Documents

Complete the following steps to review the content of the two new documents.

1. Click the **Impact Analysis View** tab in the main window.
2. Select the **Design Specification** document and navigate to `DesignSpec.txt`.
3. Review the content of `DesignSpec.txt`, which contains similar sections and text elements as those in `CoveringSpec.txt`, but `DesignSpec.txt` contains 25 additional requirements.

Some of the requirements in `DesignSpec.txt` also specify reference statements that cover requirements in `ProductSpec.txt`. For example, the 1.2 USB 2.0 Speeds section in `DesignSpec.txt` specifies DS_USB2_REQ1, DS_USB2_REQ2, and DS_USB2_REQ3 requirements, and each of these requirements includes a reference to the PS_USB_REQ2 requirement in `ProductSpec.txt`, as shown in Figure 3-10.

Figure 3-10. Requirements in DesignSpec.txt

```
1.2. USB 2.0 Speeds
     <<Hardware supports USB 2.0>>

DS_USB2_REQ1: Low Speed
     <<1.5 Mbps>>
     [Covers: PS_USB_REQ2]
DS_USB2_REQ2: Med Speed
     <<12 Mbps>>
     [Covers: PS_USB_REQ2]
DS_USB2_REQ3: High Speed
     <<480 Mbp>>
     [Covers: PS_USB_REQ2]
```

4. Select the **Test Specification** document and navigate to `TestSpec.txt`.
5. Review the content of `TestSpec.txt`. The 1.2.1 Test USB 2.0 Low Speed section of `TestSpec.txt` includes the reference `[Covers: DS_USB2_REQ1]` to indicate that the section covers the DS_USB2_REQ1 requirement in `DesignSpec.txt`.

   Because the Test Specification document includes references that cover requirements in the Design Specification document, and the requirements in the Design Specification document include references that cover requirements in the Product Specification document, the three documents together cover 100% of all requirements in the project. The requirements in the Product Specification document, which is the most upstream document, cannot be considered 100% covered by only the Design Specification document because the Design Specification document includes its own requirements that must be covered. The requirements in the Product Specification document can only be considered 100% covered when the Test Specification document, which is the most downstream document, also covers all requirements in the Design Specification document.

6. Return to `DesignSpec.txt`, which also contains requirements that do not specify references to requirements in `ProductSpec.txt`. The 1.1 USB 1.0 Speeds section in `DesignSpec.txt` contains a reference to the PS_USB_REQ1 requirement in `ProductSpec.txt` and contains its own DS_USB1_REQ1 and DS_USB1_REQ2 requirements, as shown in Figure 3-11.

Figure 3-11. Derived Requirements in DesignSpec.txt

```
1. USB Support
1.1. USB 1.0 Speeds
     <<Hardware supports USB 1.0>>
     [Covers: PS_USB_REQ1]

DS_USB1_REQ1: Low Speed
     <<1.5 Mbps>>
DS_USB1_REQ2: High Speed
     <<12 Mbps>>

1.2. USB 2.0 Speeds
     <<Hardware supports USB 2.0>>
```

The DS_USB1_REQ1 and DS_USB1_REQ2 requirements are derived requirements. A requirement that includes a reference to a further upstream requirement is a non-derived requirement. The DS_USB2_REQ1, DS_USB2_REQ2, and DS_USB2_REQ3 requirements in the Design Specification document, as shown in Figure 3-10, are non-derived requirements because these requirements specify references to further upstream requirements. A non-derived requirement denotes a dependency between the coverage of one or more upstream requirements and the coverage of the non-derived requirement.

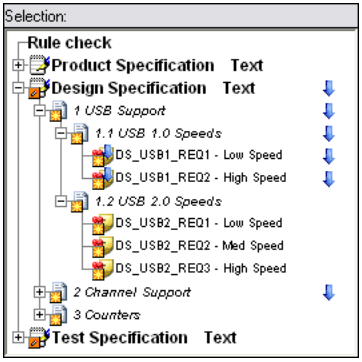
7. Exit the application that displays `DesignSpec.txt` and `TestSpec.txt`.

Performing Impact Analysis

Complete the following steps to use the Impact Analysis view to analyze the new documents.

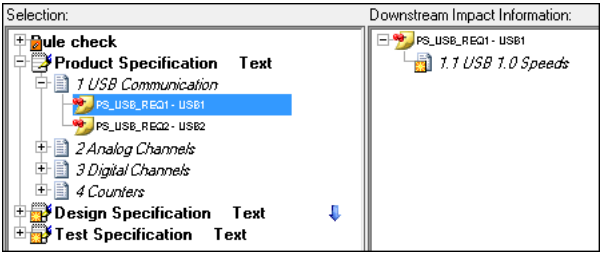
1. Expand the **Design Specification** document in the Selection column to display the derived requirements, DS_USB1_REQ1 and DS_USB1_REQ2, and the non-derived requirements, DS_USB2_REQ1, DS_USB2_REQ2, and DS_USB2_REQ3, as shown in Figure 3-12. Requirements Gateway displays different icons for derived and non-derived requirements and displays an arrow icon to the right of a derived requirement and all parent elements of the requirement.

Figure 3-12. Derived and Non-Derived Requirements



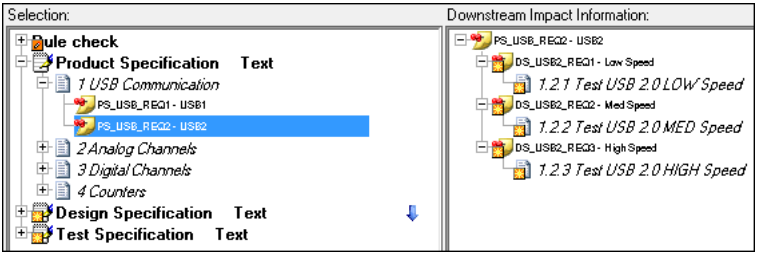
2. Expand the **Product Specification** document in the Selection column and select the **PS_USB_REQ1** requirement. The Downstream Impact Information column displays only the covering 1.1 USB 1.0 Speeds section in the Design Specification document, as shown in Figure 3-13, because the 1.1 USB 1.0 Speeds section does not contain any non-derived requirements.

Figure 3-13. PS_USB_REQ1 Downstream Impact Analysis



3. Select the **PS_USB_REQ2** requirement. The Downstream Impact Information column displays the non-derived requirements in the covering Design Specification document and the sections in the Test Specification document that cover the non-derived requirements, as shown in Figure 3-14.

Figure 3-14. PS_USB_REQ2 Downstream Impact Analysis



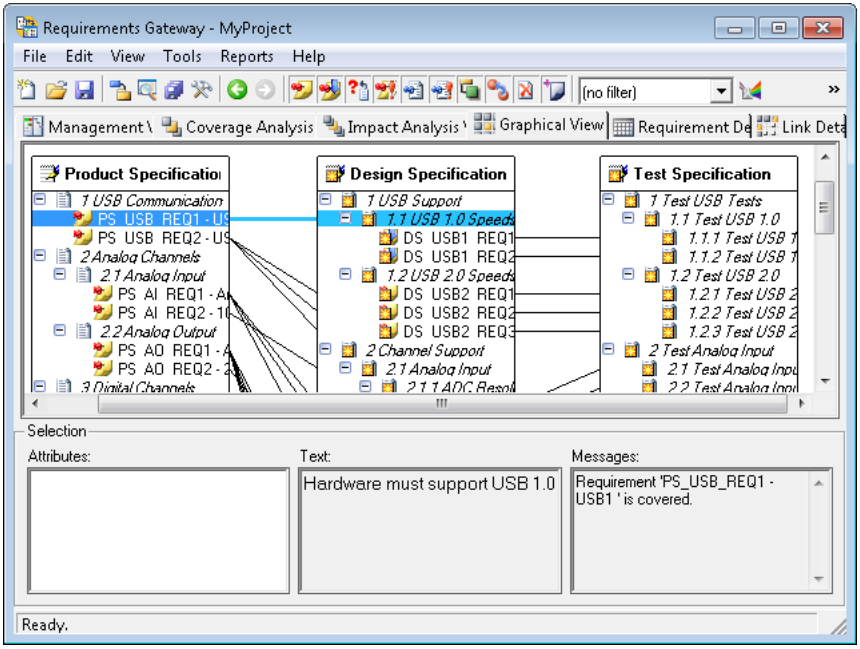
Using the Graphical View

The Graphical view displays each document as an object with its traceability elements displayed in a tree view within the object. Solid lines represent traceability between requirement elements of a document and covering elements in another document. Dotted lines between objects represent links other than references, such as support, allocation, or validation information for requirements.

Complete the following steps to use the Graphical view to review project documents.

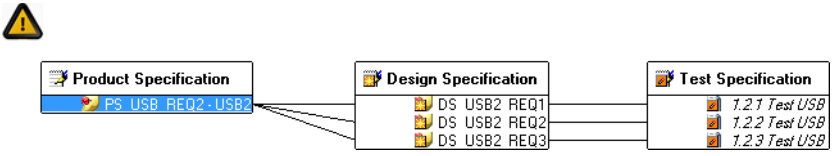
1. Open `<Requirements Gateway Public>\Tutorials\MyProject.rqtf` if it is not already open.
2. Click the **Graphical View** tab.
3. Select the **PS_USB_REQ1** requirement in the Product Specification document. The Graphical view highlights the PS_USB_REQ1 requirement in the Product Specification document, the covering 1.1 USB 1.0 Speeds section in the Design Specification document, and the line between the elements, as shown in Figure 3-15.

Figure 3-15. PS_USB_REQ1 Selected in the Graphical View



4. Select the **PS_USB_REQ2** requirement. The Graphical view highlights the PS_USB_REQ2 requirement in the Product Specification document, the derived requirements in the 1.2 USB 2.0 Speeds section of the Design Specification document that cover the PS_USB_REQ2 requirement, and the sections in the Test Specification document that cover the derived requirements in the Design Specification document.
5. Right-click the **PS_USB_REQ2** requirement and select **View Graph for Selection** from the context menu to display only the highlighted elements from the three documents, as shown in Figure 3-16.

Figure 3-16. PS_USB_REQ2 Selected in the Graphical View



The yellow warning icon in the Graphical view indicates that the graph is only a partial view of the entire project.

6. Right-click the Graphical view and select **Show All Elements** from the context menu to display all the elements of the documents again.

7. Click the header of the Test Specification document to select the entire document.
8. Right-click the **Test Specification** document and select **Hide Selected Documents** from the context menu. The Graphical view hides the Test Specification document, displays the traceability information for the remaining two documents, and again displays a yellow warning icon.
9. Right-click the Graphical view and select **Show Hidden Documents** from the context menu to launch a dialog box in which you can select a previously hidden document to show again in the Graphical view.
10. Select **Test Specification** from the list of documents and click **OK** to close the dialog box. The Graphical view shows the Test Specification document again.
11. Select **File»Save** or click the **Save** button, as shown in the following figure, on the toolbar in the main window to save the project.

4

Generating Reports

You can generate built-in or custom reports that contain project analysis information. Requirements Gateway distinguishes between the following types of reports:

- **Features Reports**—Built-in report types for feature-related information. Features reports are available for all projects and stored in `<Requirements Gateway>\config\doc_models\Features Reports.xml`.
- **Library Reports**—Built-in report types for project-related information. Library reports are available for all projects and stored in `<Requirements Gateway>\config\doc_models\Library Reports.xml`.
- **Public Reports**—Custom reports available for all projects and stored in `<Requirements Gateway Public>\Config\doc_models\Public Reports.xml`.
- **Project Reports**—Custom reports available only for a specific project and stored in the same directory as the project in `doc_models\Project Reports.xml`.

Requirements Gateway installs the following features report:

- **Features Information**—Contains a summary of the releases and features that you define in the project.

Requirements Gateway installs the following library reports:

- **Traceability Matrix**—Lists the upstream-to-downstream covered requirements and the downstream-to-upstream covering references.
- **Analysis Results**—Summarizes the coverage analysis of the entire project.
- **Project Description**—Describes the project and the project documents.
- **Upstream Impact Analysis**—Lists the upstream traceability information for selected elements of the project.
- **Downstream Impact Analysis**—Lists the downstream traceability information for selected elements of the project.
- **Synthesis of Added Information**—Summarizes any added attributes, references, and text in the project.
- **Rules Checking**—Contains a summary of any rules the project violates.
- **Requirement Attributes**—Lists the requirements, attributes, and attribute values for one or more selected documents in the project.
- **Requirement Details View**—Lists the details of all the requirements, including the requirement text and added text, for one or more selected documents in the project.

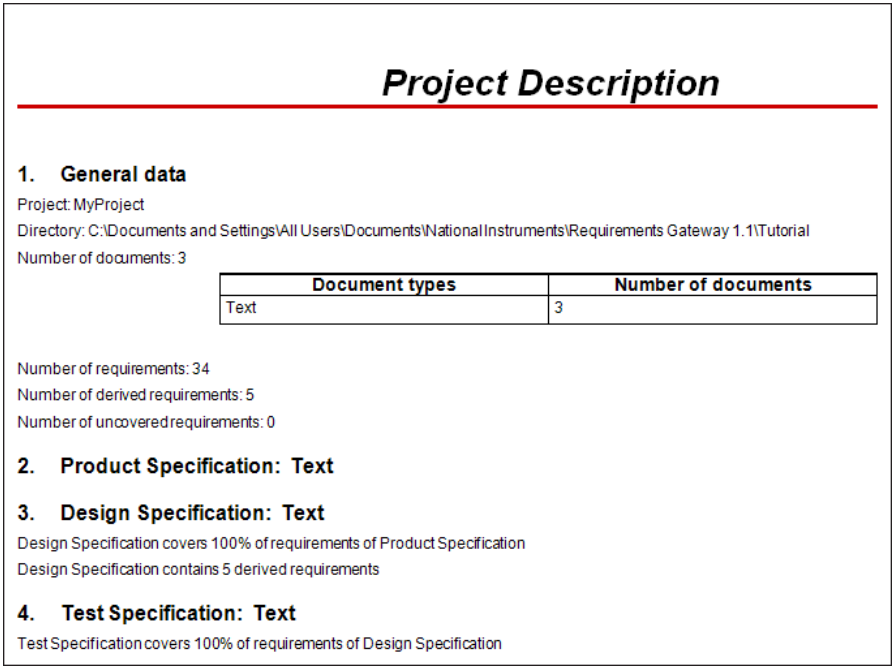
Refer to the *NI Requirements Gateway Help* for more information about the content of each default report type.

Generating a Built-in Report

Complete the following steps to generate a Project Description report for the project you created in Chapter 2, *Managing Requirements*, and modified in Chapter 3, *Analyzing Requirements*.

1. Open `<Requirements Gateway Public>\Tutorials\MyProject.rqtf` if it is not already open.
2. Select **Reports»Library Reports»Project Description** to launch the Save As dialog box.
3. Browse to the `<Requirements Gateway Public>\Tutorials` directory, enter `ProjectDescription` in the **File name** control, select a report format template from the **Save as type** ring control, and click **Save**. Requirements Gateway generates and displays the report in the default application for the format you specified, as shown in Figure 4-1.

Figure 4-1. Project Description Report



Project Description

1. General data

Project: MyProject

Directory: C:\Documents and Settings\All Users\Documents\National Instruments\Requirements Gateway 1.1\Tutorial

Number of documents: 3

Document types	Number of documents
Text	3

Number of requirements: 34

Number of derived requirements: 5

Number of uncovered requirements: 0

2. Product Specification: Text

3. Design Specification: Text

Design Specification covers 100% of requirements of Product Specification

Design Specification contains 5 derived requirements

4. Test Specification: Text

Test Specification covers 100% of requirements of Design Specification

4. Review the content of the report.
5. Exit the application that displays the report.

Report Models and Templates

Report templates define the format and orientation of the report, and report models define the structure and content of the report. Requirements Gateway includes the following built-in templates:

- Rich Text Format in portrait or landscape orientation
- PDF in portrait or landscape orientation
- HTML

You can customize the default templates so that the generated report uses custom formatting. Refer to the *NI Requirements Gateway Help* for more information about customizing report templates.

Creating a Custom Report Model

Complete the following tutorials to create a custom report model that lists the requirements defined in each document of a project.

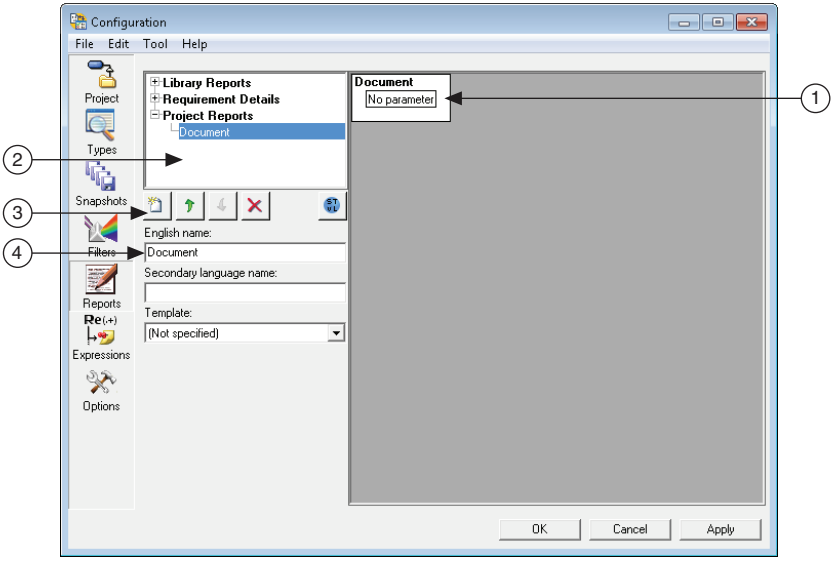
Note The content of this section is optional and intended for only advanced Requirements Gateway users.

Creating a New Custom Report Model

Complete the following steps to create a new custom report model for the project you created in Chapter 2, *Managing Requirements*, and modified in Chapter 3, *Analyzing Requirements*.

1. Open `<Requirements Gateway Public>\Tutorials\MyProject.rqtf` if it is not already open.
2. Select **Reports»Edit Reports** to launch the Reports pane of the Configuration dialog box.
3. Click the **New Report** button, as shown in the following figure, to add a new report under Project Reports, as shown in Figure 4-2.

Figure 4-2. New Report on the Reports Pane of the Configuration Dialog Box



1	Report Configuration	2	Reports List	3	Toolbar	4	Properties

The Reports pane contains the following sections:

- **Report Configuration**—A graphical model of the active report selected in the Reports List. Drag structures, data blocks, and other parameters from the Report Element pane and drop them on the Report Configuration pane to build the report model.
- **Reports List**—Lists the built-in and custom reports for the project.
- **Toolbar**—Buttons to create, rearrange, and delete reports from the Reports List. In addition, the **Report elements** button, as shown in the following figure, toggles the controls below the Reports List to display the properties for the item you select on the Report Configuration pane or the elements available to insert in the report. You can also double-click the **Report elements** button to launch a modal Report elements window.

- **Properties**—Contains the following panes that display separately when you toggle the **Report elements** button:
  - **Selection Properties**—Options for configuring the item you select in the Reports List or on the Report Configuration pane. The options available depend on the element you select.
  - **Report Elements**—Structures, data blocks, and other parameters you can add to the report. When you select an element on the Report Configuration pane, Requirements Gateway highlights on the Report Elements pane the valid elements you can insert into the selected element.

    The Report Elements pane contains the following tabs:
  - **Structures**—Elements that define the structure of the report, such as text, paragraph, list, or table.
    - **Data**—Elements associated with the object you select on the Report Configuration pane, such as the project, a document, or a requirement.
    - **Parameters**—Data type elements you can pass to a structure element.

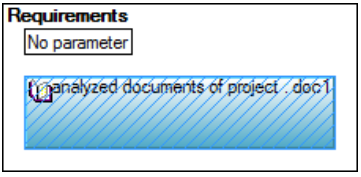
4. Enter `Requirements` in the **English name** control.
5. Select **portrait.rtf** from the Template ring control.

Configuring the Report

Complete the following steps to configure the custom report so that the report can loop on all documents in the project.

1. Select the **Requirements** root object of the report on the Report Configuration pane. Requirements Gateway highlights the Requirements object with hashing.
2. Click the **Report elements** button to display the Report Elements pane.
3. Click the **Data** tab.
4. Select the **project»Contents»analyzed documents** element and drag it to the Report Configuration pane to add the element to the report, as shown in Figure 4-3.

Figure 4-3. Analyzed Documents Element Added to Report



The analyzed documents element instructs the report to loop on all documents in the project.

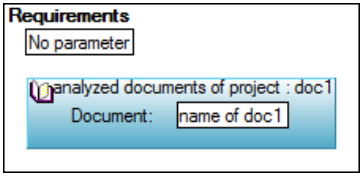
5. Click the **Report elements** button to display the Selection Properties pane. The Variable name control value defaults to `doc1`. This variable represents the active document while looping on all documents in the project.

Adding Paragraph and Text Elements to the Report

Complete the following steps to add paragraph and text elements to the custom report.

1. Click the **Report elements** button to display the Report Elements pane and click the **Structures** tab.
2. Select the **paragraph** element and drag it to the analyzed documents element on the Report Configuration pane. Requirements Gateway adds a paragraph to the report for each document in the project.
3. Complete the following steps to define the structure and content of the paragraphs.
   a. Select the **text** element and drag it to the paragraph element.
   b. Click the **Report elements** button to display the Selection Properties pane and enter `Document:` in the **English text** control.
   c. Click to the right of the **Document:** text element on the Report Configuration pane to highlight the entire paragraph element. Ensure that you select only the paragraph element and not the entire analyzed documents element.
   d. Click the **Report elements** button to display the Report Elements pane and click the **Data** tab.
   e. Select the **doc1»Identification information»name** element and drag the element to the right of the **Document:** text element, as shown in Figure 4-4.

Figure 4-4. Paragraph and Text Elements Added to Report



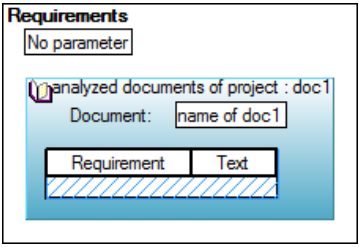
Adding a Table Element to the Report

Complete the following steps to add a table element to the custom report.

1. Select the **analyzed documents of project: doc1** element on the Report Configuration pane and click the **Structures** tab on the Report Elements pane.
2. Select the **table** element and drag it to the bottom of the analyzed documents of project element.
3. Drag a **text** element to each cell in the header row of the table, click the **Report elements** button to display the Selection Properties pane, and enter `Requirement` and `Text`, respectively, in the **English text** control for the table header elements.

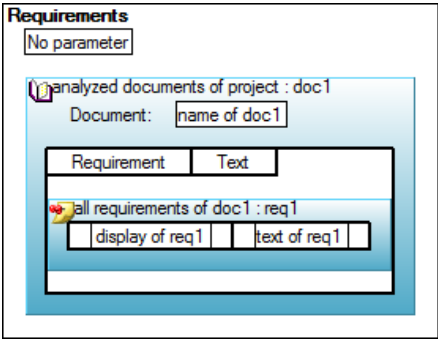
4. Select the area below the column headers, as shown in Figure 4-5.

Figure 4-5. Inserted Column Text Elements



5. Click the **Report elements** button to display the Report Elements pane, click the **Data** tab, and drag the **doc1»Contents»all requirements** element to the selected area.
6. Click the **Structures** tab and drag the **table row** element to the requirements of doc1 element.
7. Click the **Data** tab and drag the **req1»Identification information»display** element and the **req1»Identification information»text** element to the respective cells in the new table row, as shown in Figure 4-6.

Figure 4-6. Final Custom Report



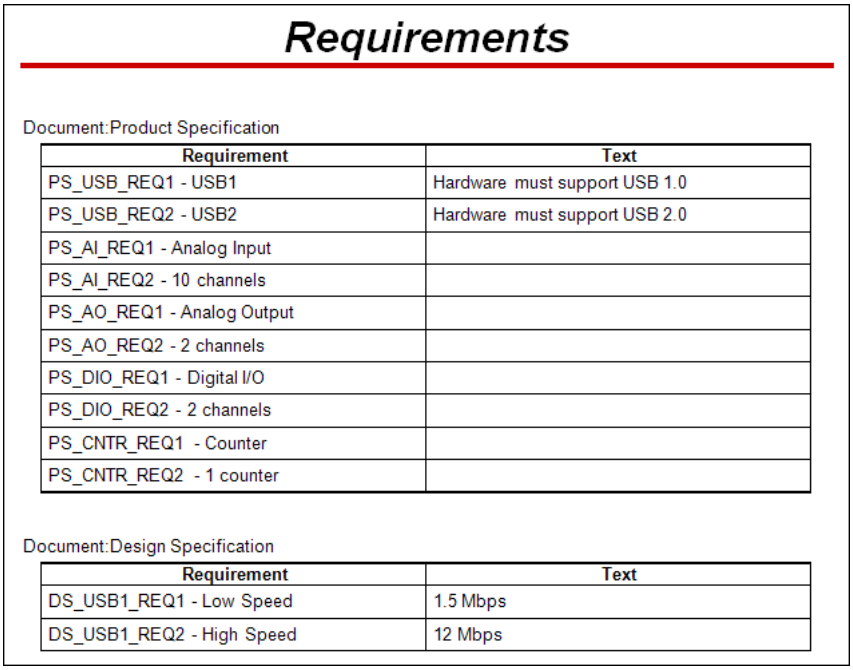
8. Click **OK** to close the Configuration dialog box.

Generating a Custom Report

Complete the following steps to generate and save the custom report.

1. Select **Reports»Project Reports»Requirements** from the main window to launch the Save As dialog box.
2. Enter `Requirements` in the **File name** control. Because you specified `portrait.rtf` as the template to use for the custom report in step 5 of the *Creating a New Custom Report Model* section, you cannot select a different report format template from the Save as type ring control.
3. Click **Save** to generate the report and launch the default application associated with `.rtf` files, as shown in Figure 4-7.

Figure 4-7. Final Generated Custom Requirements Report



Requirements

Document:Product Specification

Requirement	Text
PS_USB_REQ1 - USB1	Hardware must support USB 1.0
PS_USB_REQ2 - USB2	Hardware must support USB 2.0
PS_AI_REQ1 - Analog Input	
PS_AI_REQ2 - 10 channels	
PS_AO_REQ1 - Analog Output	
PS_AO_REQ2 - 2 channels	
PS_DIO_REQ1 - Digital I/O	
PS_DIO_REQ2 - 2 channels	
PS_CNTR_REQ1 - Counter	
PS_CNTR_REQ2 - 1 counter	

Document:Design Specification

Requirement	Text
DS_USB1_REQ1 - Low Speed	1.5 Mbps
DS_USB1_REQ2 - High Speed	12 Mbps

4. Review the content of the report.

Note The report does not contain a table for the Test Specification document because the Test Specification document does not contain any requirements.

5. Exit the application that displays the report.

Refer to the *NI Requirements Gateway Help* for more information about customizing reports.

5

Customizing Types

The organization and format of data can vary between documents and does not always adhere to the format a built-in type defines. You can modify a project document source file to conform to the format a built-in type requires, or you can create a custom type that analyzes the format the project document source file uses.

This tutorial explains how to create a custom type based on the default Text type to capture traceability information from text files that use unique syntax for defining traceability information.

Reviewing File Formats

For most types, Requirements Gateway captures traceability information by translating a project document source file, such as a Microsoft Word document, into a text or XML intermediate file. The type analyzes the intermediate file and captures the required structure and traceability information. Refer to the *NI Requirements Gateway Help* for more information about the content and format of a text or XML intermediate file.

The Text type directly processes the content of a text file without using a translated intermediate file.

Complete the following steps to evaluate the format of custom text files so you can create a custom type to capture the traceability information from the files.

1. Open `<Requirements Gateway Public>\Tutorials\CustomTypeProject.rqtf`.
2. Click the **Management View** tab. The Overall Quality pane indicates that the project specifies two documents, but does not define any requirements.
3. Click the **Coverage Analysis View** tab. Requirements Gateway does not display any sections or requirements for the documents in the project because the documents use a syntax for requirements, references, and text elements that the default Text type cannot recognize.
4. Select the **Product Specification** document on the Project Overview pane and navigate to `CustomProductSpec.txt`.

5. Review the content of `CustomProductSpec.txt`. Figure 5-1 shows a portion of `CustomProductSpec.txt`.

Figure 5-1. Text from CustomProductSpec.txt

```
- USB Communication            # The hardware will
    [REQ: USB1] USB1            # Low & High Speeds
    [REQ: USB2] USB2            # Low, Med, and High

- Analog Channels
  - Analog Input               # The hardware will
    [REQ: AI] Analog Input      # +/- 12 Volts
    [REQ: AI_COUNT] 10 channels
```

6. In Requirements Gateway, select the **Covering Specification** document on the Project Overview pane and navigate to `CustomCoveringSpec.txt`.
7. Review the content of `CustomCoveringSpec.txt`. Figure 5-2 shows a portion of `CustomCoveringSpec.txt`.

Figure 5-2. Text from CustomCoveringSpec.txt

```
- USB Support
  - USB 1.0 Speeds             #Hardware supports USB
    [REF: USB1]

  - USB 2.0 Speeds             #Hardware supports USB
    [REF: USB2]
```

The `CustomProductSpec.txt` and `CustomCoveringSpec.txt` files contain the following traceability content format:

- Each document specifies two levels of sections. A minus character precedes a first-level section, and two space characters and a minus character precede a second-level section.
- The syntax `[REQ: ID]`, where *ID* is a set of characters that represent a requirement ID, specifies requirements. An optional text label follows the requirement.
- The syntax `[REF: ID]`, where *ID* is a set of characters that represents a requirement ID, specifies references.
- The # character specifies text associated with a section or requirement.

8. Exit the external applications.

Creating a Custom Type

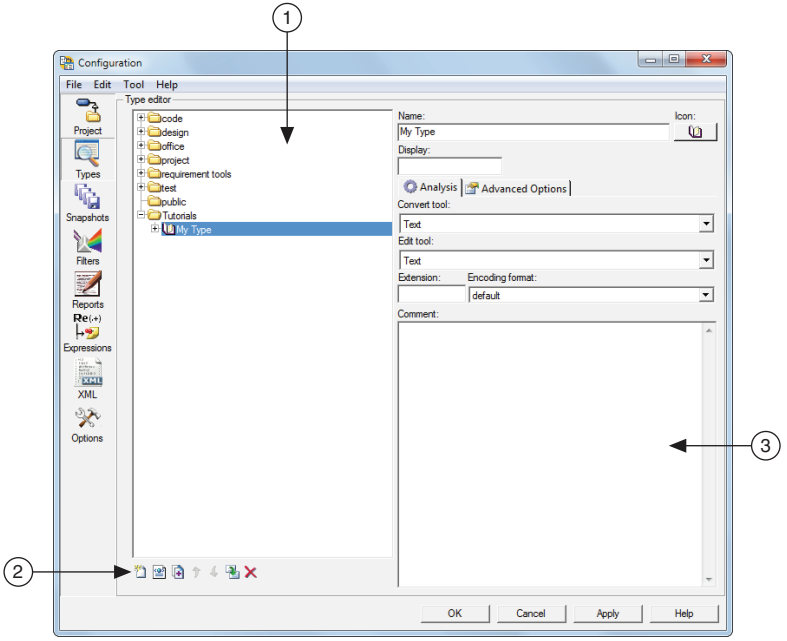
When you create a custom type, you can duplicate and modify an existing type or create a new type. Because the custom Product Specification and Coverage Specification documents adhere to a very different content format than the format the default Text type defines, you must create a new type.

Note The content of this section is optional and intended for advanced Requirements Gateway users.

Complete the following steps to create a new type and configure the name, conversion tool, and editing tool for the type.

1. Select **File»Edit Types** or click the **Edit Types** button, as shown in the following figure, on the toolbar in the main window to launch the Types pane of the Configuration dialog box, as shown in Figure 5-3.

Figure 5-3. Types Pane of the Configuration Dialog Box



1 Types List
2 Toolbar
3 Selection Properties

The Types pane contains the following sections and panes:

- **Types List**—The list of available types. The Types List groups the types in folders that correspond to the read-only directories in the `<Requirements Gateway>\config\types` directory.

  The Types List also contains a public folder. You can place custom types and duplicates of the default types in the public folder to make the types available for all projects. Requirements Gateway stores the type definitions for the public folder in

`<Requirements Gateway Public>\Config\types\public\public.types`.

The final folder in the list contains the custom types defined for any projects located in the same directory as the current project file.

- **Toolbar**—Buttons to copy, delete, and add new elements to the Types List or to the elements of a specific type.
- **Selection Properties**—Options available for the type or type element you select in the Types List. Depending on the element you select in the Types List, the Selection Properties pane can display Analysis, Advanced Options, and Attributes tabs.

2. Select the **Tutorials** folder in the Types List.
3. Click the **Add new type** button, as shown in the following figure, on the toolbar to add a new type to the **Tutorials** folder in the Types List.

Note Use the **Add XML type** and **Add a type for added elements** buttons on the toolbar to create custom types for specific purposes. Refer to the *NI Requirements Gateway Help* for more information about XML types and types for added elements.

4. Enter `My Type` in the **Name** control on the Selection Properties pane.
5. Click the **Analysis** tab on the Selection Properties pane, if it is not already selected.
6. Select **Text** from the **Convert tool** ring control for Requirements Gateway to interpret any document that uses the type as a general text file, similar to the default Text type.
7. Select **Text** from the **Edit tool** ring control for Requirements Gateway to launch the default application associated with `.txt` files when you navigate to the document.
8. Expand the **My Type** type node in the Types List.

   The elements under a type in the Types List define how Requirements Gateway identifies traceability information in a text or XML intermediate file. Type elements use regular expressions to specify patterns in the text of the intermediate file for Requirements Gateway to identify instances of an element. Types that use XML intermediate files also specify the structure of the XML data to identify traceability information.

   Table 5-1 lists the elements a type can define and the purpose of each element. Refer to the *NI Requirements Gateway Help* for more information about the elements that each built-in type defines.

Table 5-1. Type Elements

Element	Description
Section	Specifies how to identify and display the structural elements for a document. Examples of sections include headings in a text or Microsoft Word file; files in a directory; rows in a database; sequences, step groups, and steps in a TestStand sequence file; or front panels, diagrams, controls, and indicators in a LabVIEW VI.
Macro-Requirement	Specifies how to identify and display macro-requirements for a document. A macro-requirement contains requirements and passes its attributes, text, or links onto those requirements. If a downstream element directly references a macro-requirement, the downstream element also covers all the requirements the macro-requirement contains A macro-requirement element defines a starting location and an ending location, where Requirements Gateway associates any requirement element between the locations with the macro-requirement. For example, a macro-requirement element might interpret the syntax `[MacroReq_`*`ID`*`]` as a starting location and the syntax `[End_of_MacroReq]` as an ending location.
Requirement	Specifies how to identify and display requirements for a document. For example, a requirement element might interpret `[REQ: `*`ID`*`]` as a requirement.
Entity	Specifies how to identify and display an entity for a document. An entity element must contain a reference to a requirement, derived requirement, or macro-requirement and cannot reference itself. An entity element is similar to a section element, except that Requirements Gateway returns a rule violation if a reference element does not follow an entity element.
Reference	Specifies how to identify references to requirements for a document. For example, a reference element might interpret `[Covers: `*`requirement ID`*`]` as a reference. Requirements Gateway does not display a reference as a separate element in the Coverage Analysis or Impact Analysis views but associates the reference with a preceding section or entity element. The Graphical view displays the references between requirements and covering elements as covering links.

Table 5-1. Type Elements (Continued)

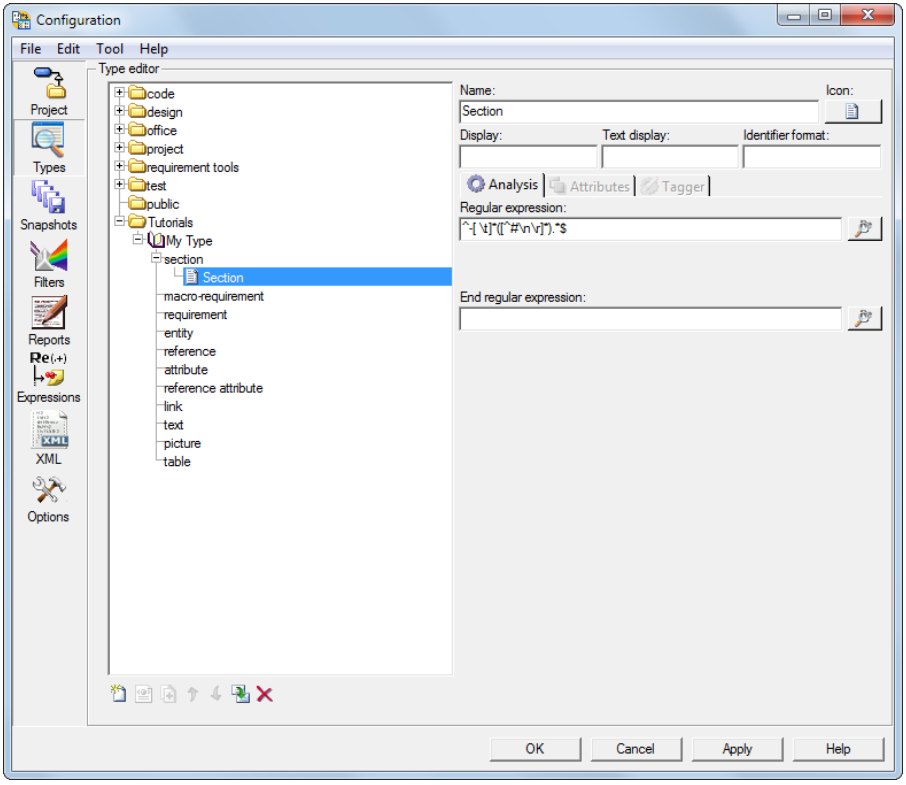
Element	Description
Attribute	Specifies how to identify and display attributes of requirement elements for a document. An attribute element has a name and a Boolean, string, or numeric value. An attribute element might define the priority or owner of a requirement. A requirement can have only one attribute with a specific name.
Reference Attribute	Specifies how to identify and display attributes of reference elements for a document. A reference attribute element has a name and a Boolean, string, or numeric value. A reference attribute element might define the type of coverage for a reference. A reference can have only one attribute with a specific name.
Link	Specifies how to identify and display a non-covering relationship to a requirement or a reference to a section or entity. A link element must refer to the ID of the requirement, section, or entity. In the main window, you can navigate from the link element to the target requirement, section, or entity element.
Text	Specifies how to identify descriptive information associated with a preceding section, entity, requirement, or attribute element.
Picture	Specifies how to identify image files associated with a preceding section or entity element. Requirements Gateway supports images with BMP, PNG, Scalable Vector Graphics (SVG), and Windows Metafile (WMF) file formats.
Table	Specifies how to identify and display tables with a preceding text element.

Adding Section Elements to the Type

Complete the following steps to add a hierarchy of section elements to the type you created.

1. Select the **section** element in the Types List.
2. Click the **Add new type** button to add a new section element named `Section`.
3. Enter `^-[ \t]*([^#\n\r]*).*$` in the **Regular expression** control on the Analysis tab, as shown in Figure 5-4.

Figure 5-4. Section Element of the Custom Type



The regular expression of a section element specifies the pattern of text to match in the source document to locate section elements and the text of section elements. Table 5-2 explains each component of the expression you entered in step 3.

Table 5-2. Section Regular Expression Components

Expression Component	Purpose
`^`	Specifies to start matching text patterns at the beginning of a line.
`-`	Specifies that the next character must be the minus character.
`[ \t]*`	The surrounding bracket characters specify that a character must match a space or a tab character, and the asterisk specifies that the text must contain zero or more matches.
`( )`	Specifies that any text that matches the inside pattern is returned as a field. This returns the text associated with the section.
`[^#\n\r]*`	The ^ character specifies that the pattern cannot match the #, new line, or carriage return characters. This expression component forces the pattern to stop at the # character, if the # character exists.
`.*`	Specifies to match zero or more of any of the characters. This pattern processes the # character, if it exists, and any subsequent text.
`$`	Specifies to match the end of a line.

4. With the new Section element still selected in the Types List, click the **Add new type** button to add a new section element named `Section1` under the Section element.
5. Enter `^[ \t][ \t]-[ \t]*([^#\n\r]*).*$` in the **Regular expression** control on the Analysis tab. This regular expression is similar to the expression in step 3, with two additional required spaces or tabs that precede the minus character.

Adding a Requirement Element to the Type

Complete the following steps to add a requirement element to the type you created.

1. Select the **requirement** element in the Types List.
2. Click the **Add new type** button to add a new requirement element named `Requirement`.
3. Enter `\[REQ: ([^\]]+)\][ \t]*([^#\r\n]*)` in the **Regular expression** control. Table 5-3 explains each component of this expression.

Table 5-3. Requirement Regular Expression Components

Expression Component	Purpose
`\[REQ:`	Specifies to match the `[REQ:` characters followed by a space character.
`([^\]]+)`	Specifies to return one or more characters that do not include the closing bracket character. This expression component returns the requirement ID.
`\]`	Specifies to match the closing bracket character.
`[ \t]*`	Specifies to match zero or more space or tab characters.
`([^#\r\n]*)`	Specifies to return zero or more characters that do not include the `#`, new line, or carriage return characters. This expression component returns the requirement label.

Adding a Reference Element to the Type

Complete the following steps to add a reference element to the type you created.

1. Select the **reference** element in the Types List.
2. Click the **Add new type** button to add a new reference element named `Reference`.
3. Enter `\[REF: ([^\]]+)` in the **Regular expression** control on the Analysis tab. This regular expression specifies to return one or more characters between the space character after the `[REF:` characters and the closing bracket character. This expression returns the requirement ID for the reference.

Adding a Text Element to the Type

Complete the following steps to add a text element to the type you created.

1. Select the **text** element in the Types List.
2. Click the **Add new type** button to add a new text element named `Text1`.
3. Enter `#[\t ]*(.+)$` in the **Regular expression** control. This regular expression specifies to return as the text value all characters between the `#` character and the end of line, excluding any preceding space or tab characters after the `#` character.

4. Click **Apply** to save the new type.
5. Click **Yes** when Requirements Gateway prompts you to reanalyze the project.

Applying a Custom Type in a Project

Complete the following steps to configure the documents in the project to use the new type:

1. Click the **Project** button in the Configuration dialog box to display the Project pane.
2. Select the **Product Specification** document on the Project Configuration pane and select **My Type** from the Type of Analysis ring control on the Details tab of the Document Options pane.
3. Select the **Covering Specification** document on the Project Configuration pane and select **My Type** from the Type of Analysis ring control on the Details tab of the Document Options pane.
4. Click **OK** to close the Configuration dialog box.
5. Click **Yes** when Requirements Gateway prompts you to reanalyze the project.
6. Click the **Management View** tab in the main window and review the content of each document. The Overall Quality pane now indicates that the project specifies ten requirements and that the coverage percentage is 100%.

6

Using External Applications with Requirements Gateway

Requirements Gateway supports capturing traceability information from the following National Instruments data sources:

- LabVIEW VIs, projects, classes, project libraries, and LLBs
- LabVIEW Unit Test Framework Toolkit test files, test vector files, and ATML report files
- LabWindows/CVI source code and function panel files
- TestStand sequence files, ATML report files, and XML report files

Requirements Gateway supports capturing traceability information from the following third-party data sources:

- Microsoft Word documents
- Microsoft Excel spreadsheets
- Microsoft Access databases
- Microsoft Visio project files
- IBM Rational DOORS databases
- IBM Rational RequisitePro databases
- PDF files
- Text files
- C, C++, and C# source code files

Refer to the *NI Requirements Gateway Help* for tutorials on using Requirements Gateway with LabVIEW, LabWindows/CVI, TestStand, and DOORS, and for more information about each type of the supported external applications.

A

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