



IT314: Software Engineering

RMF & ReqIF

ReqIF Studio : Requirement Management Tool



What is Requirement?

A requirement is a specification of need or want.

Sets of requirements are used to capture the information that needed to design, build and test a process, service, product or system.

The requirements contain the behavior, attributes, and properties of the future system. Therefore, the main task of the requirements is to ensure that they are understood by all stakeholders.



RMF - Requirements Management Framework


The requirements management is a **process** of **documenting, analyzing, tracing, prioritizing, agreeing** on requirements and then controlling change. It is a continuous process throughout a project.

Requirements management begins with the **analysis** and **elicitation of the objectives** and **constraints** of the organization. Requirements management further includes supporting **planning** for requirements, **integrating requirements** and the organization for working with them (attributes for requirements), as well as **relationships** with other information delivering against requirements.



Purpose of Requirements Management

- Ensure that an organization documents, verifies, and meets the needs and expectations of its customers and internal or external stakeholders.
- Requirements management begins with the analysis and elicitation of the objectives and constraints of the organization.
- Further includes supporting planning for requirements, integrating requirements and the organization for working with them. (attributes for requirements)

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- Involves communication between the project team members and stakeholders, and adjustment to requirements changes throughout the course of the project.
 - It will help requirements come from different sources, like the business person ordering the product, the marketing manager and the actual user.
 - main activity of requirements management is to make sure that work and cost stay within schedule and budget, and that the emerging tool does in fact meet requirements.



ReqIF - Requirement Interchange Format

- **RIF/ReqIF (Requirements Interchange Format)** is an **XML** file format that can be used to exchange requirements, along with its associated metadata, between software tools from different vendors.
- **ReqIF** is an exchange file format for exchanging requirements, attributes, additional files (e.g. images) across a chain of manufacturers, suppliers, sub-suppliers and the like.
- The requirements exchange format also defines a workflow for transmitting the status of requirements between partners. Although developed in the automotive industry, ReqIF is suitable for lossless exchange of requirements in any industry.




What are the Features ?

1. The loss-free or complete exchange of requirements between companies using different tools is made possible.
2. Improves collaboration between clients and contractors or suppliers, especially as each company can continue to use its existing tools if it has a ReqIF interface.
3. The standard as such is freely visible, well documented, established and supported by numerous tools
4. XML format provides capability of capturing everything that someone wants to capture that requires to get exchanged
5. It helps to create a structure for requirement.



Operation :

- RIF/ReqIF is a standardized meta-model, defined by an XML schema. Such files must conform to the schema and contain the description of the model (the data types), as well as the data.
- The file consists of an XML root element “REQ-IF” in which information about the file itself and the data types and requirements used in the file are stored.
- To describe the requirements, “specification objects” with definable attributes are used, whereby each attribute has a data type such as Boolean, Integer, Real, String, as well as selection types with defined values or XHTML texts for displaying formatted texts and embedding graphics.

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- The exchange of requirements between the tools of the different manufacturers takes place by importing and exporting the XML file.
 - A Globally Unique Identifier (GUID) is used to uniquely identify a requirement. This remains unchanged throughout the entire process chain, regardless of changes to the content.
 - ReqIF has its origin in the automotive industry.
 - For example, you can exchange data between IBM Rational DOORS and IBM Rational DOORS Next Generation. When the exchange is finished, a report is generated that shows the data that was imported or exported.
 - Importing artifacts from ReqIF files to requirement project.
 - Exporting artifacts from requirement project to ReqFiles.



Application of ReqIF

- Requirements are typically elicited during the early phase of product development. This is the primary application of ReqIF, as development across organizations is happening more and more often.
- ReqIF allows for sharing of requirements between partners, even if different tools are used. In contrast to formats like Word, Excel or PDF, ReqIF allows for a loss-free exchange.
- ReqIF was pioneered by automotive manufacturers, who started to demand the use of ReqIF in particular for the development of embedded controllers.
- ReqIF is also used as the underlying data model for tool implementations.

Impact of using ReqIF tool:



With the help of a dedicated interchange format for requirements specifications, it is possible to bridge the gap:

- The collaboration between partner companies is improved by the benefits of applying requirements management methods across company borders.
- The partner companies do not have to use the same requirements authoring tool and suppliers do not need to have multiple requirements authoring tools to fulfill the need of their customers with regards to compatibility.
- Within a company, requirement information can be exchanged even if various tools are used to author requirements. The Requirements Interchange Format (ReqIF) described in this specification defines such an open, non-proprietary exchange format.



Conformance:

- A technology targeting the seamless information exchange between a wide variety of tool implementations may tolerate only a very limited variability in the definition of the information exchange format.
- As a compliance variation point, compliant implementations may use an alternative element identification mechanism in parallel to the primary identification mechanism. Further, implementations may be unable to interpret or handle certain forms of formatted attributes
- In this case, implementations are allowed to substitute the offending representation with a simplified form, as long as the attribute is marked as simplified, a reference to an original form of the attribute is preserved, and the simplified attribute is excluded from any further alterations.



Requirement Management Tools

- Siemens Polarian
- IBM Rational Doors

Eclipse based requirement Tools

- ProR Requirement Engineering Platform
- ReqIF Studio

1. Polarian :



- An exclusive innovation, **Polarian LiveDocs**, enables you to collaborate concurrently and securely specification documents with having every single paragraph uniquely identifiable and traceable.
- All the requirement specification documents are instantly exposed to all other ALM Stakeholder.
- Allows to define, build, test and manage complex software systems in a **unified 100% browser based** solution.
- Allows you to build test cases in parallel with requirements.
- Document **Round-trip-Export for offline collaboration** so changes made outside of the Polarian can be imported back seamlessly.
- Pass any **audit, compliance**, or regulatory inspection with **traceability** that is easily implemented and guaranteed via automatic change control of every requirement.

2. IBM Rational DOORs :



- IBM Rational DOORS is a requirements management tool that is used for **capturing, tracking, analyzing, and managing** user requirements.
- DOORS is an acronym for **Dynamic Object-Oriented Requirements System**.
- Helps in optimizing requirements communication, collaboration, and verification throughout the organization.
- Control of requirements which leads to reducing costs, increasing efficiency, improving the quality of products
- **Rational DOORS Web Access** gives you web-based access to the requirements in a Rational DOORS database.
- Its **Next Generation** includes a **server application and a web client** which provides capabilities to define and manage requirements in systems and software engineering projects.

3. ProR Requirement Engineering Platform :



- ProR is a generic Requirements Engineering Tool.
- ProR is based on the ReqIF standard, which provides interoperability with Industry tools like IBM Doors and many others.
- ProR can be customized with Plug-Ins, and the first Plug-In to be developed is an integration with Rodin, a platform for formal system development.
- The vision of ProR is to provide reliable traceability between natural language requirements and formal models.
- Interoperability with existing industrial processes is also a requirement. This approach will allow interested parties to customize ProR for their needs, without having to develop yet another RE tool.



Introduction - ReqIF Studio

- ReqIF Studio is the GUI that allows comfortable working with Requirements. It opens ReqIF files with a click, allowing you to immediately inspect and edit files. Powerful extensions exist for dealing with rich text, ReqIFz-Archives, and much more.
- ReqIF Studio is designed explicitly for integration and extendability. An Extension Point exists that allows tools to integrate their own renderer or even editor. Some integrations are publicly available, including a UML/SysML integration.



Create the Model

- Create a new Project
 - Select File -> New -> Project.
- Create a ReqIF Model
 - Select File -> New -> Reqif model
- Select the project & name the file “tutorial.reqif”. Click finish.
- After this, the model will be opened & there will be only one Specification contained in this model.
 -

Dashboard

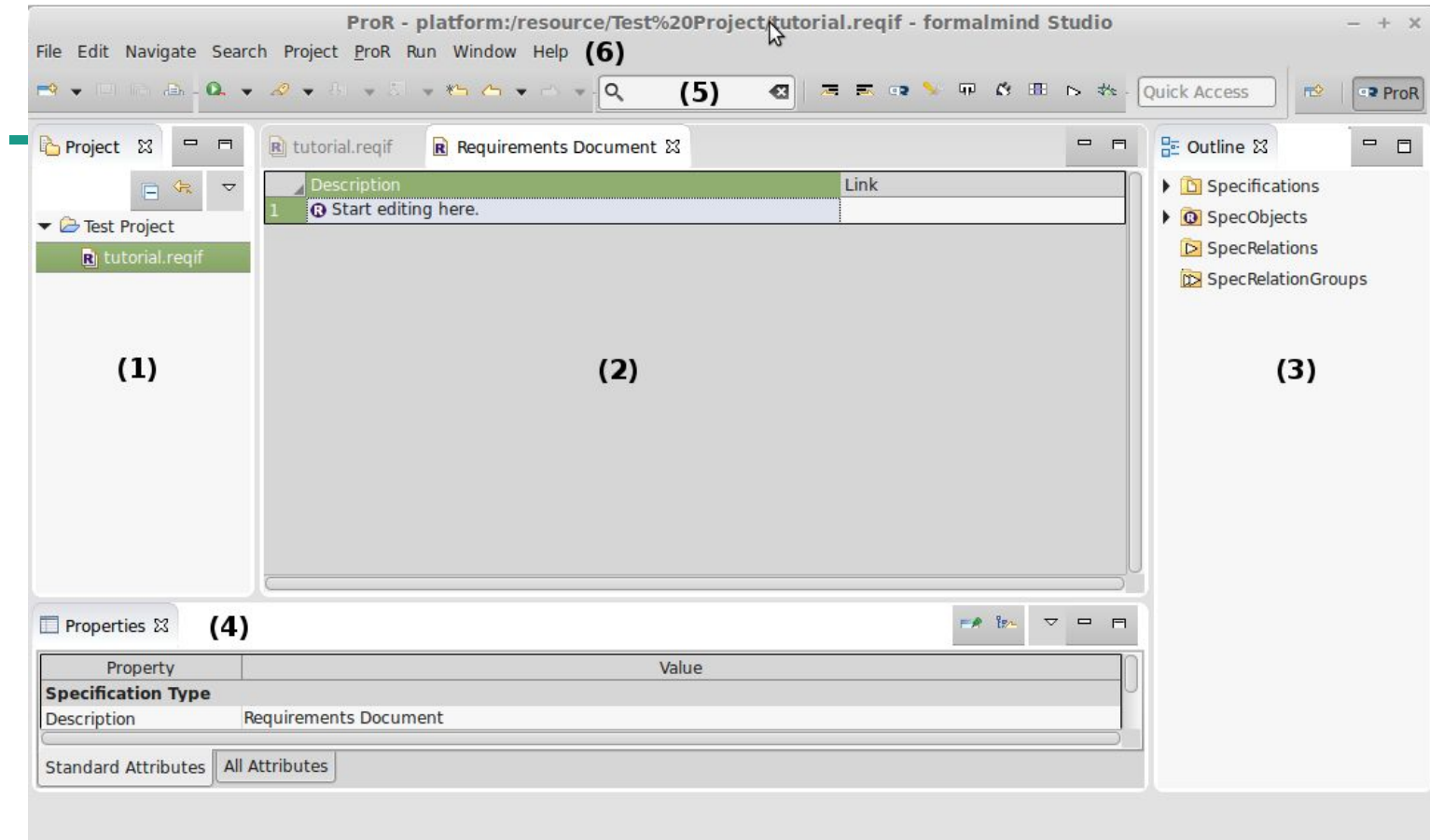


Fig. 1 The ReqIF Studio user interface



Points of previous Fig. 1 The ReqIF Studio User interface

1. Your reqIF file in the Project Explorer window.
2. The Specification Editor shows your Specifications.
3. It has 4 folders :
 - i. Specifications
 - ii. SpecObjects
 - iii. SpecRelations
 - iv. SpecRelationsGroups
4. Properties View of your selected SpecElement.
5. Toolbar
6. Menu bar

Customizing the SpecType

To get familiar with the tool , we will :

- Add two more attributes to the SpecObjectType called “ID” and “Owner” and
- We will show those Attributes in the Specification.

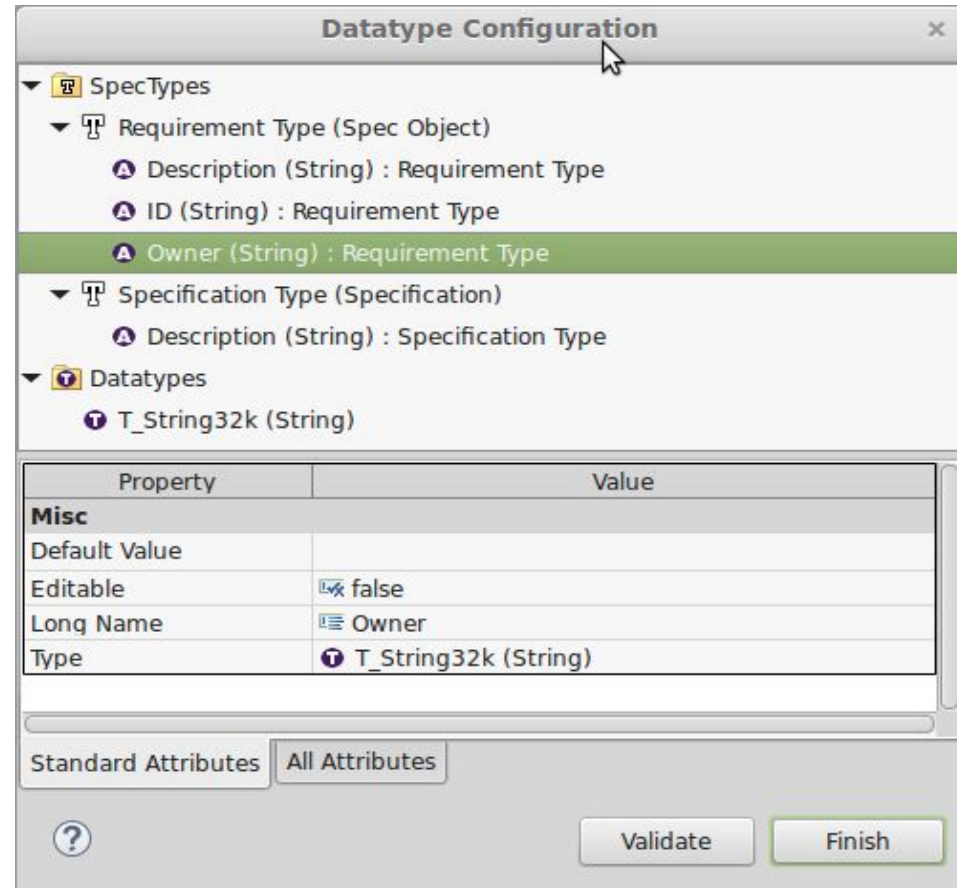


Fig. 2 Datatype Configuration Dialog

Showing the New Attributes

- To show the new Attributes in the Specification, we have to configure the columns shown in the Specification Editor. We do this by selecting **ProR | Column Configuration**. You can also click on in the Toolbar.
- The resulting Dialog shows one entry, “**Description**” for the one and only Column of the Specification. In the “**Value**” column double click on “**Description to choose it and replace it with “ID”**”.
- By clicking on the “**Add Column**” icon at the top of the dialog, create a new column and name it “**Description**”. In this view, the columns can be dragged and dropped to change their order as desired.

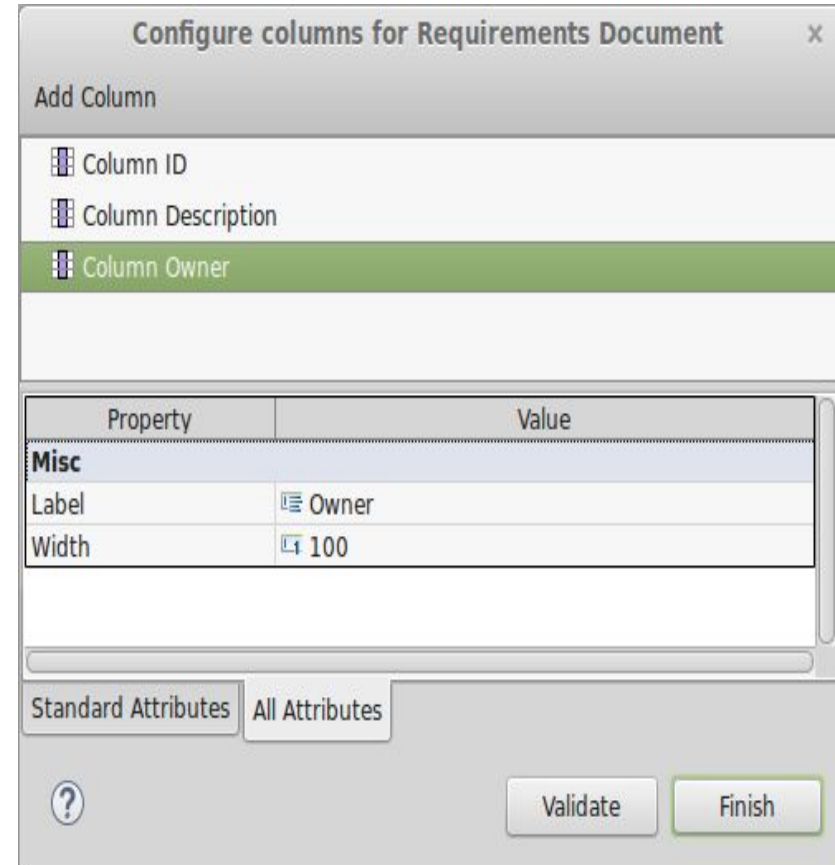


Fig. 3 Column Configuration

Adding new SpecObjects

ProR - platform:/resource/Test%20Project/tutorial.reqif - formalmind Studio

File Edit Navigate Search Project ProR Run Window Help

Project *tutorial.reqif *Requirements Document

Test Project tutorial.reqif

ID	Description	Owner	Link
1	INF-1 A ProR tutorial - This is an informational entry	MJ	
1.1	REQ-1 A new requirement		
1.1.	REQ-1a Requirment 1a		
1.2	REQ-2 A new requirement		
2	INF-2 A New Hierarchy	OW	
2.1	REQ-3 A new requirement		
2.1.	REQ-3a Requirment 3a		
2.1.	REQ 3b Requirment 3b		
2.2	REQ-4 A new requirement		
2.3	REQ-5 A new requirement		

Properties

Property	Value
Requirement Type	
Description	Requirment 1a
ID	REQ-1a
Owner	
Spec Object	
Type	Requirement Type (Spec Object)

Standard Attributes All Attributes

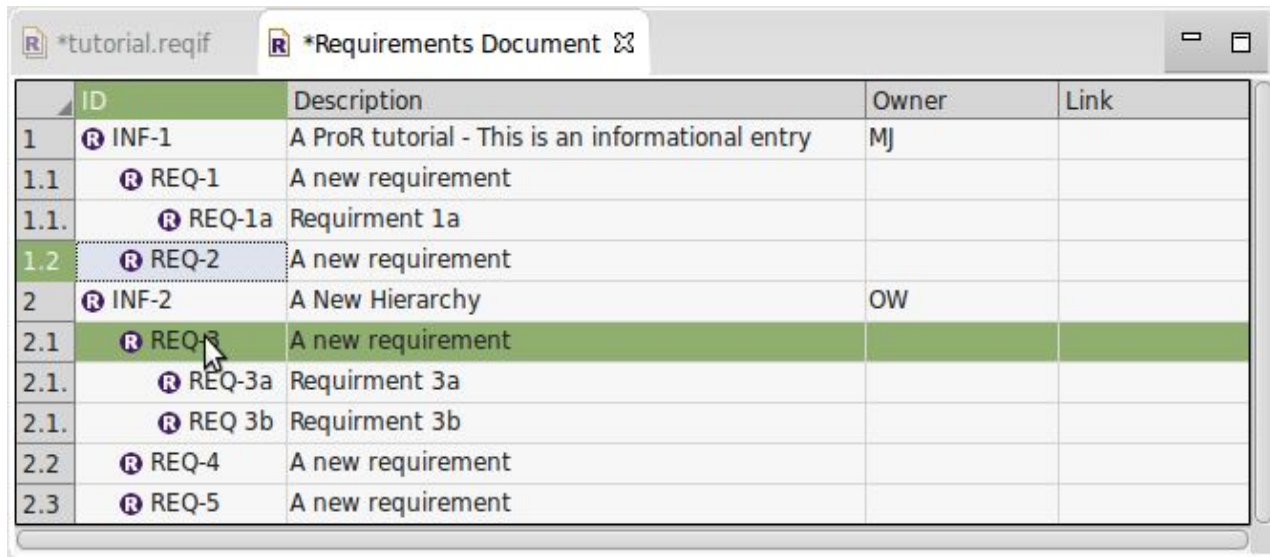
Outline

- Specifications
 - Requirements Document
 - A ProR tutorial - This is
 - A new requirement
 - Requirment 1a
 - A new requirement
 - A New Hierarchy
 - A new requirement
 - Requirment 3a
 - Requirment 3b
 - A new requirement
 - A new requirement

- SpecObjects
- SpecRelations
- SpecRelationGroups

Fig. 4 Adding SpecObjects

Rearranging Elements



The screenshot shows a software window titled '*Requirements Document' with a tab for '*tutorial.reqif'. It contains a table with four columns: ID, Description, Owner, and Link. The table lists several requirements, with REQ-3 highlighted in green and a mouse cursor hovering over it.

	ID	Description	Owner	Link
1	INF-1	A ProR tutorial - This is an informational entry	MJ	
1.1	REQ-1	A new requirement		
1.1.	REQ-1a	Requirment 1a		
1.2	REQ-2	A new requirement		
2	INF-2	A New Hierarchy	OW	
2.1	REQ-3	A new requirement		
2.1.	REQ-3a	Requirment 3a		
2.1.	REQ 3b	Requirment 3b		
2.2	REQ-4	A new requirement		
2.3	REQ-5	A new requirement		

Fig. 5 Drag & Drop

Example : Restaurant Automation System

The screenshot displays the ReqIF Studio interface with a Requirements Document titled "demo.reqif". The document is structured as follows:

ID	Main	Link
1	Restaurant Automation System	
2	Digitalization of the order billing, accounting and activities, processing.	
2.1	As a manager, I expect software to generate digital bills for all sold items.	
2.2	As a manager, I expect to maintain the prices of all the items and also support the change in the prices.	
2.3	As a sales clerk, I expect software to re-enter in inventory by entering(or clicking some keys) item id and quantity, whenever item is sold. Whenever the ordered ingredients arrive, the invoice data regarding the quantity and price is entered.	
2.4	As a manager, I expect the data should be change in the computer/server, whenever ingredients are issued for preparation of food items.	
2.5	As a manager, I expect purchase orders should be generated on a daily basis, whenever the stock for any ingredient falls below a threshold value, the RAS should calculate the threshold value for each item based on the average consumption of this ingredient for the past three days and assuming that a minimum of two days stock must be maintained for all ingredients.	
2.6	As a manager, I expect software should be able to print a menu card containing the menu items and their prices.	
3	Make supply chain more accurate.	
3.1	As a manager, I expect software to make supply chain more accurate so that the problem of excess inventories is avoided as well as the problem of non- availability of ingredients required to satisfy orders for some popular items can be minimized.	
4	Generate statistical report/data.	
4.1	As a manager, I expect software to generate statistical data/report about sales of different categories and items.	
4.2	As a manager, I expect RAS should print a cheque/draft immediately for an invoice, if sufficient cash amount is available. Monthly or weekly sales receipt and expenses data can be generated whenever the manger make request to see them.	

The bottom of the interface shows the Properties panel with the following details:

Property	Value
Specification Type	
ReqIF.Description	Requirements Document
Specification	
Type	Specification Type (Specification)

Standard Attributes All Attributes

Fig. 6 RAS

Export a New Req IF File :

Here are some steps regarding how to export a file in ReqIF studio.

1.File→Export

→select Destination →next

2.Select all files using check-box

→browse where you want to store it on local file system → Finish.

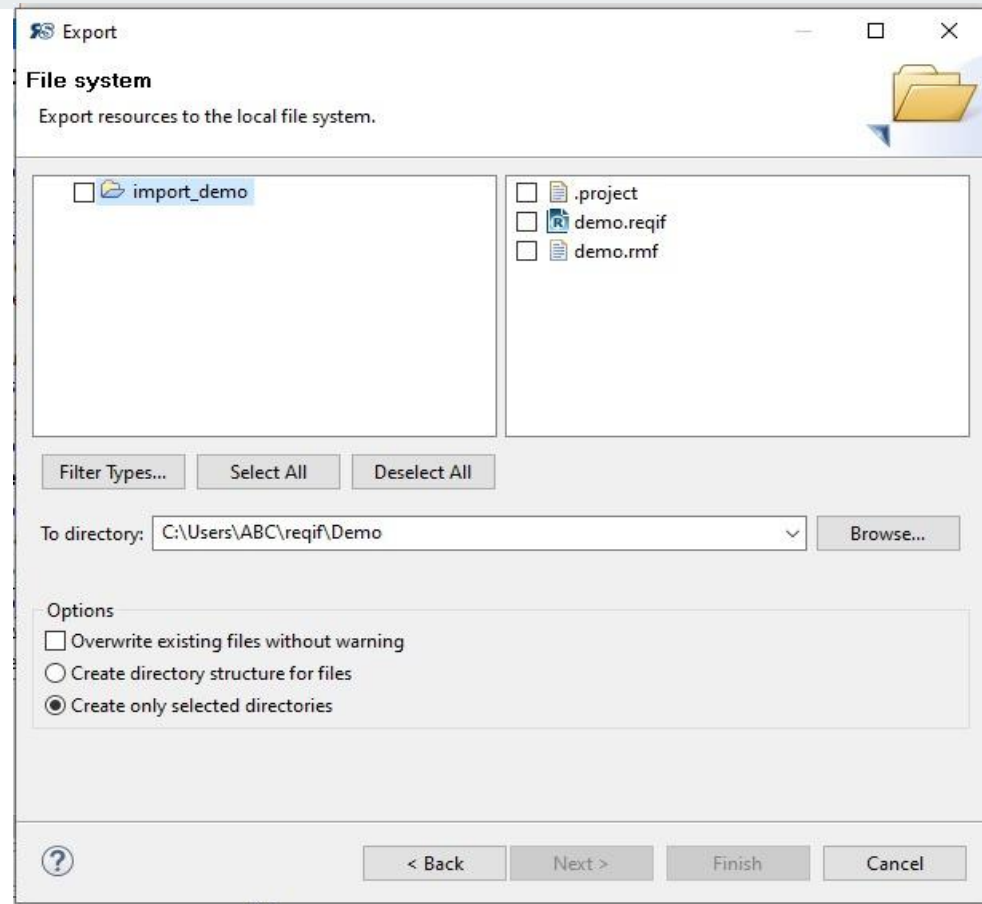


Fig. 7 Export Dialog

Import a New Req IF File :

Here are some steps regarding how to import a file in ReqIF studio.

1.New→Project

→Give it a name - **Import_demo**

2.Right click on project **Import_demo** from explorer →Select **File System** → next

—>select the path where you want to store the imported file—>check all the items sub-files →Finish

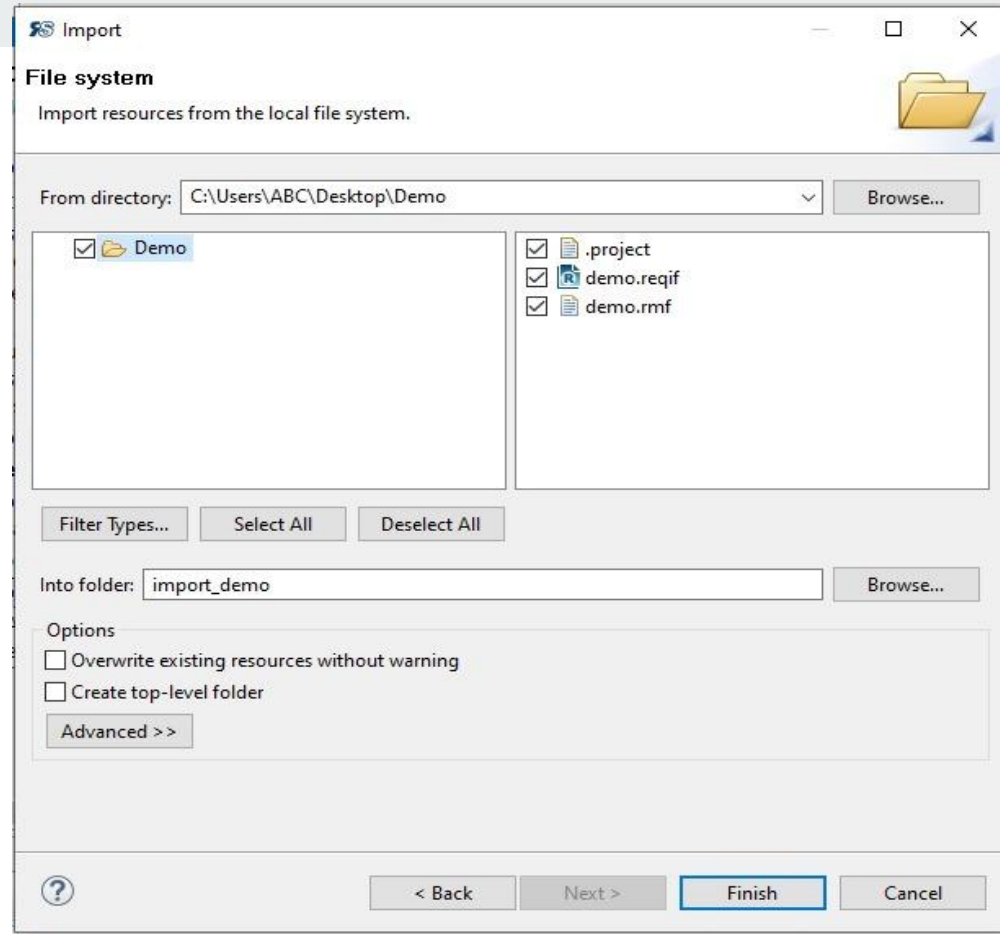


Fig. 8 Import Dialog



Export Specification as HTML

- If you want to export your Specification as HTML, open the Specification you would like to export and initiate printing File | Print.... The HTML representation is generated and opened in your system's web browser.

Req IF exchange scenario :

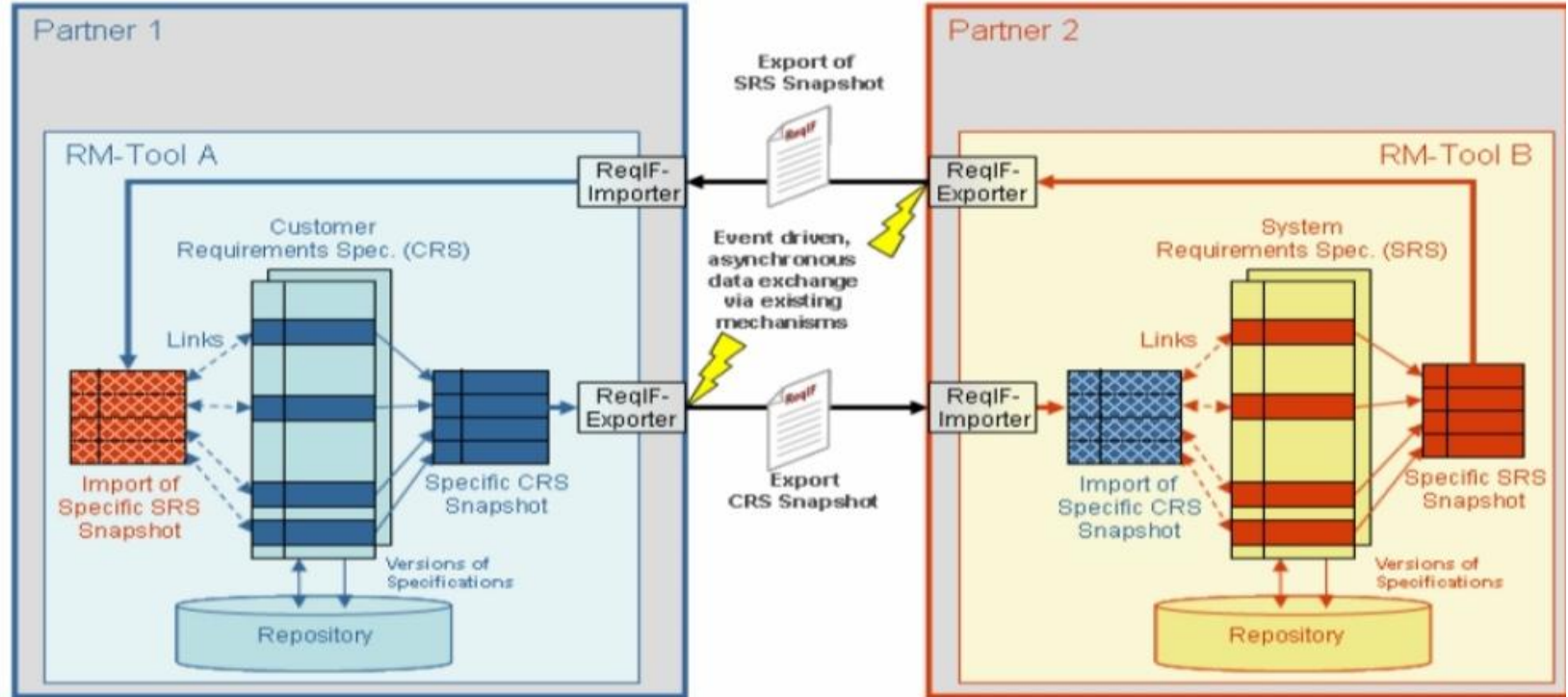


Fig. 9 Req IF exchange scenario



Thank You ...