

IBM Rational DOORS
Requirements Management Framework Add-On

USER MANUAL

*IBM Rational DOORS Requirements
Management Framework Add-on
User manual
Release 5.4*

Before using this information, be sure to read the general information under the “Notices” chapter on page 174.

This edition applies to **VERSION 5.4, IBM Rational DOORS Requirements Management Framework Add-on** and to all subsequent releases and modifications until otherwise indicated in new editions.

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1 Overview

This document relates to the requirements management add-on **IBM® Rational® DOORS® Requirements Management Framework Add-on**, based upon DOORS.

IBM® Rational® DOORS® Requirements Management Framework Add-on is a solution which will save your time starting your project with one of the best possible practices you can handle with DOORS. Originating from Thales company, and previously delivered under the name DOORS T-REK, **IBM® Rational® DOORS® Requirements Management Framework Add-on** is a solution developed for the industry by industrials. It implements a methodology in compliance with EIA632 , ISO 15288 and CMMI.

IBM® Rational® DOORS® Requirements Management Framework Add-on can be used by System Engineers, Software Engineers, Hardware...a wide set of disciplines.

IBM® Rational® DOORS® Requirements Management Framework Add-on adds a process, a data model and utilities to DOORS. This user manual describes how to use the data model and how to apply the tool.

In the body of the document the acronym **IRDRMFAO** will frequently be used to designate the product **IBM® Rational® DOORS® Requirements Management Framework Add-on**.

The acronym **RMF** will be used to qualify an operation of the product, or a piece of information managed by the product.

Note: The word “project” used in the following is generic and could designate a project before or after the contract has been signed. **IRDRMFAO** applies to both of these two phases.

2 Introduction

2.1 DOORS VERSUS IRDRMFAO

IRDRMFAO is a solution that implements a methodology in compliance with EIA632 , ISO 15288 and CMMI.

To achieve this, **IRDRMFAO** adds a process, a data model and utilities to DOORS. Notice that **IRDRMFAO** doesn't hide DOORS layout, all DOORS commands are still available to users.

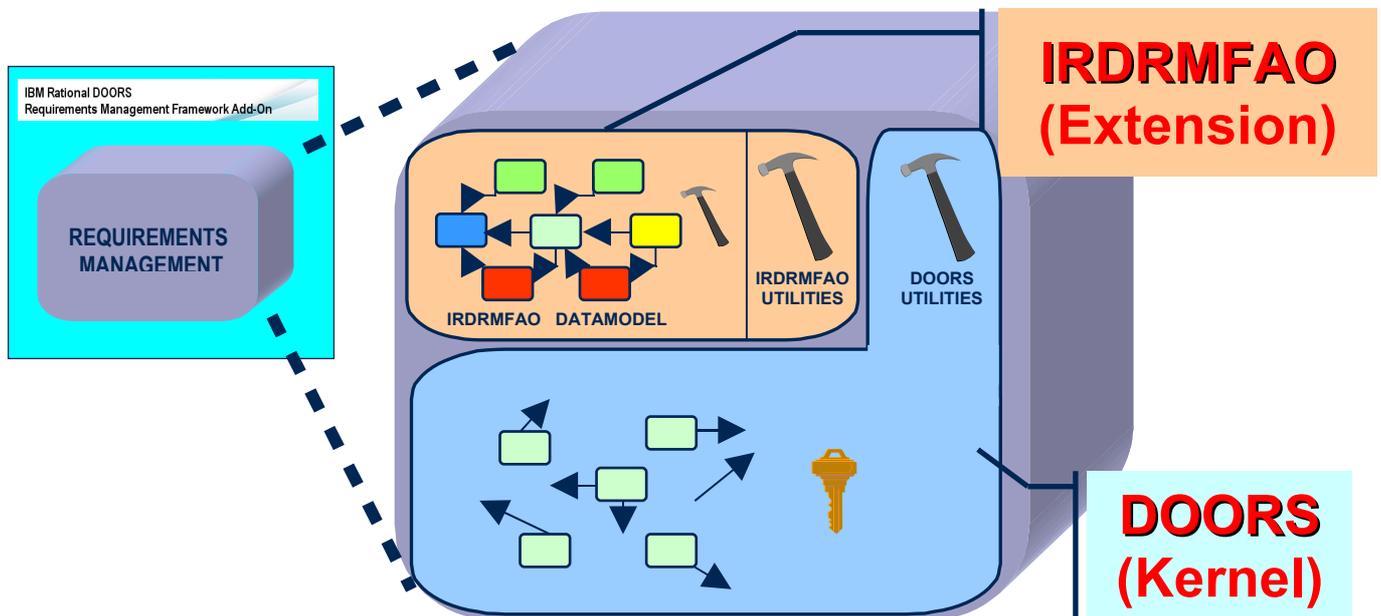


Figure 1: Product Layout

2.2 RMF GENERIC DATA MODEL

IRDRMFAO proposes a generic data model but does not constraint you to use it precisely. In fact, it implements a collection of module types and links that you will pick from to build your own data model to fit your project needs.

The following figure shows a example of a **RMF** generic data model. It is composed of modules and relationships between them.

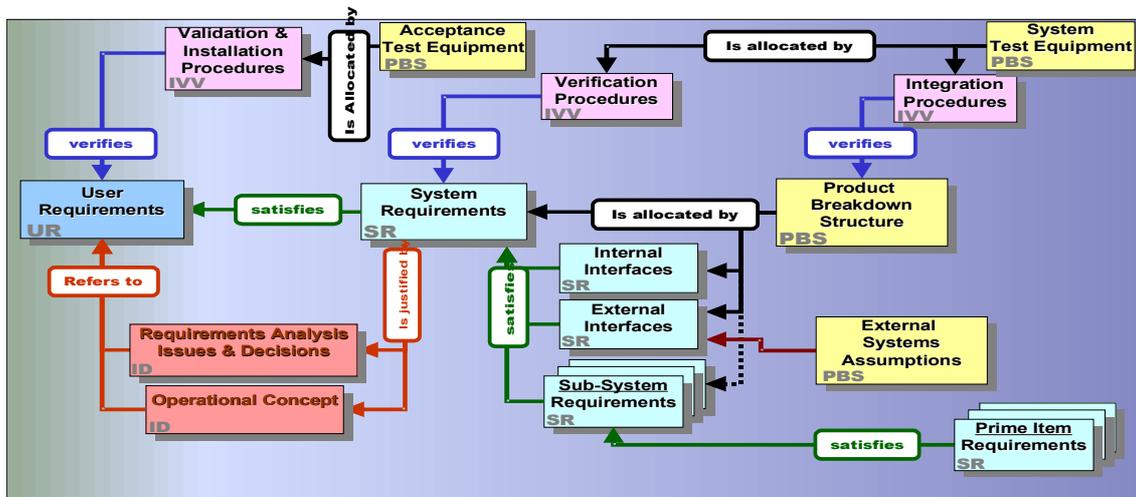


Figure 2 : RMF generic data model example

Each box represents a module of a predefined type (DOORS formal modules), connected between them by links (DOORS link modules). Note that in this data model the links are bottom-up oriented. This feature assists impact analysis and traceability, but more importantly it means that links can be added even if the current user does not have write access higher level module. All links can of course be browsed in either direction.

- This data model is adaptable to your project. **IRDRMFAO** does not constraint it; you can use some parts of it and if needed, progressively implement it. Eventually, you may modify it entirely. Each module of a certain type is not necessary unique. For example, you can have multiple modules of type “User Requirements” or “System Requirements”. In short, the data model can be adapted to fit to your project (small and large ones).

Briefly, each activity supported by the Requirements Management process deals with a part of the data model, and uses different kinds of modules and links:

- System requirements analysis : UR, SR, IDJ modules and “satisfies”, “is justified by” and “refers to” links,
- Design analysis : SR, PBS, IDJ modules and “is allocated by”, “is justified by” and “refers to” links,
- Validation test : IVV, UR modules and “verifies” link,
- Verification and integration tests : IVV, SR modules and “verifies” link.

For more detail on the modules, consult the appendix.

2.3 DATABASE AND DOCUMENT APPROACHES

IRDRMFAO allows the user to swap instantly between the display of data in two types of visualization: document or database.

The document approach is used to obtain:

- a global and linear visualization,
- structured information (Section, chapters, paragraph,...),
- a snapshot or baseline in a book format (export) for communicate with customers, contractors,...

The database approach is used to:

- analyze information and characterize data with attributes,
- concentrate the relevant information (filters)
- display traceability matrices.

The instantaneous display swapping between the two approaches is performed through the predefined views in **RMF** modules.

3 Getting started with IRDRMFAO

The steps necessary to create a **RMF** project are shown below:

- Project initialization (Create a **RMF** structure)
- Define and fill your own project data model

3.1 RMF PROJECT INITIALIZATION

It is assumed that :

- DOORS and **IRDRMFAO** have already been installed
- A DOORS database has been created with users, groups and access rights defined
- The reader is familiar with DOORS.

3.1.1 CREATE A NEW RMF PROJECT

To create a new **RMF** project:

- Run DOORS,
 - **You should be logged with the “Database Manager” profile, to be able to create a project and restore a project archive,**
 - In the project manager window (also called “Database window”), select a location with the DOORS Explorer (left part of the “Database window”). You should see the root of database called “DOORS Database”, otherwise select the menu “View ->Database view”,
 - From the project manager window, call the menu “**RMF ->Create/Tag a RMF project**”,
 - To create a new **RMF** project, give a name and a description to new project. Both fields are mandatory. Check if your company has adopted naming convention. Note that project name and description can be modified later.
 - Select a data model in the list (a company can create several customized data model). By default select the Generic **RMF** data model.
 - The option "Launch the project configuration tool" allows to directly follow on a other tool described in the next paragraph. We suggest to unset it for this first try.
 - Click on the 'Create' button, if successful, an acknowledgement window is then displayed.
-

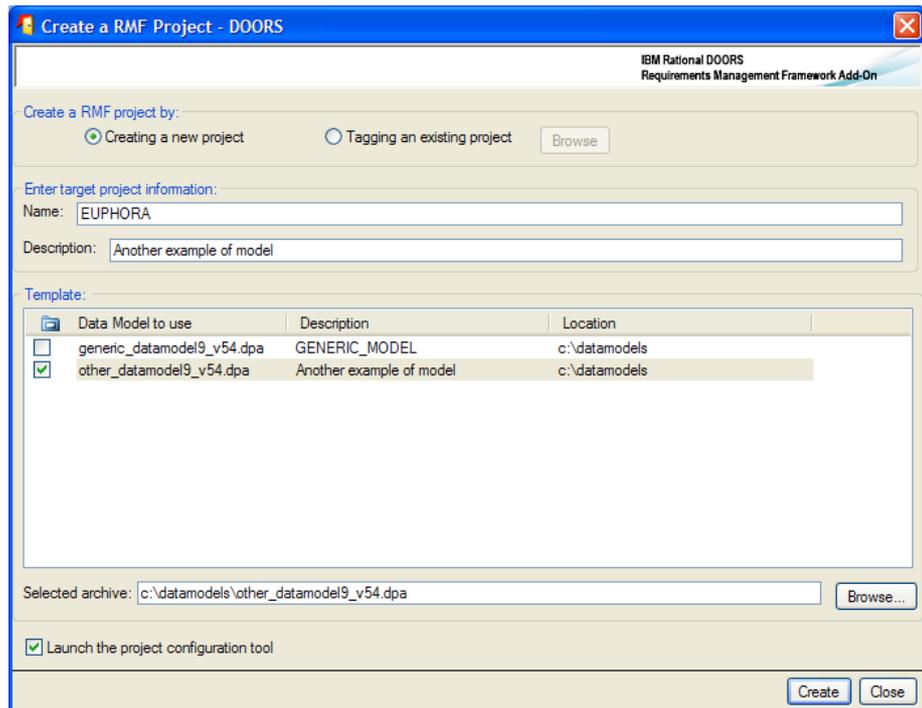


Figure 3 : Create a new RMF project window

Your project contains now a folder "Config" and links modules.

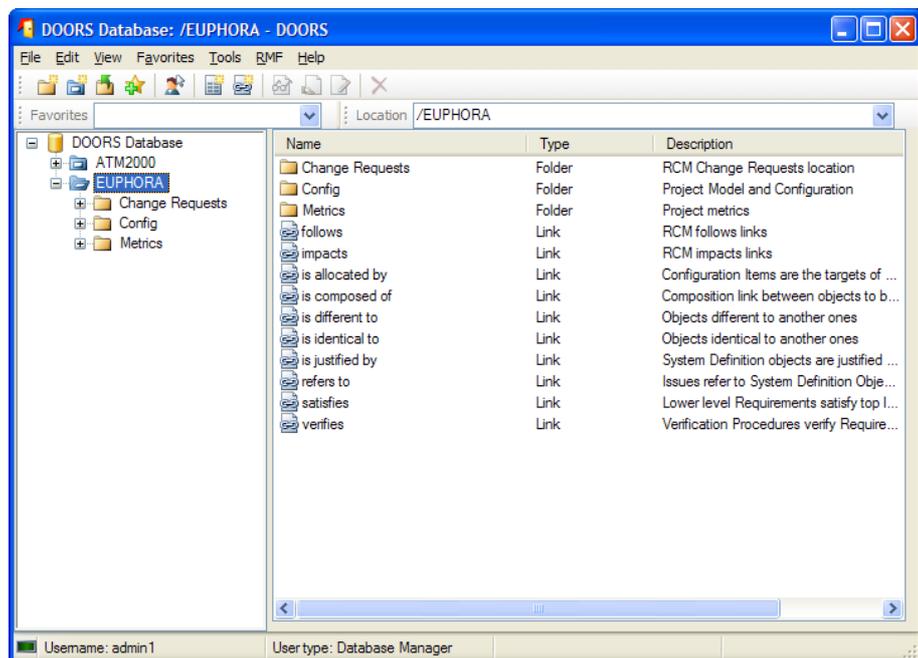


Figure 4 : RMF project creation example

Notice that some links (“*is identical to*”, “*is different to*” and “*is composed of*”) don’t appear in the generic data model description but are used by the comparison tool or used as internal links to show a composition relation between objects within the same module.

3.1.2 MIGRATE AN EXISTING DOORS PROJECT INTO RMF FORMAT

To migrate an existing DOORS project to a RMF structured project, you have to follow 3 steps:

- Tag the project: Call the menu “RMF ->Create/Tag a RMF project” from the project manager window. Set the option "Tagging an existing project" and browse the project. Then the options are the same as those described above for project creation.
At this step, your project contains now additional data like a "Config" folder and links modules.
- Treat existing links: To treat links, you have to find a match between your own *Link Modules* and the *Link Modules* defined by RMF data model (*is justified by, refers to, satisfies, is allocated by, verifies,...*). Then, move Links modules (for expert users only!) by renaming your own *Link Modules* to the RMF ones if match is possible or using the command “*Manage Linksets*”
- Treat formal modules: Refer to the paragraph § 3.2.3 MIGRATE A EXISTING DOORS MODULE INTO RMF FORMAT

3.1.3 RMF PROJECT CONFIGURATION

IRDRMFAO allows the definition for the whole project of some parameters that are applied by default in modules, but that may be modified locally for some specific modules.

To configure parameters applicable to the project,

- Open the RMF project,
 - Run the menu “RMF ->Configure a RMF Project”,
-

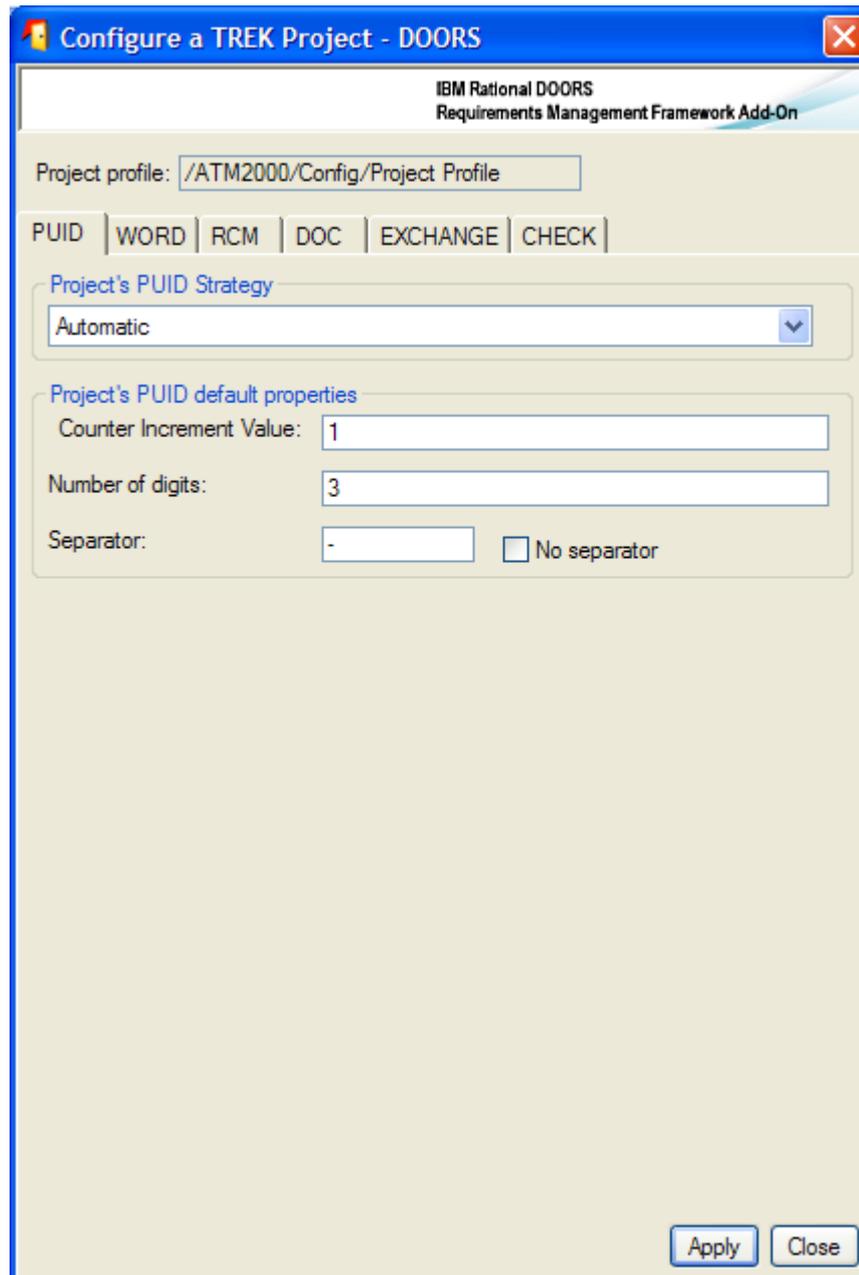


Figure 5 : Project configuration PUID tab

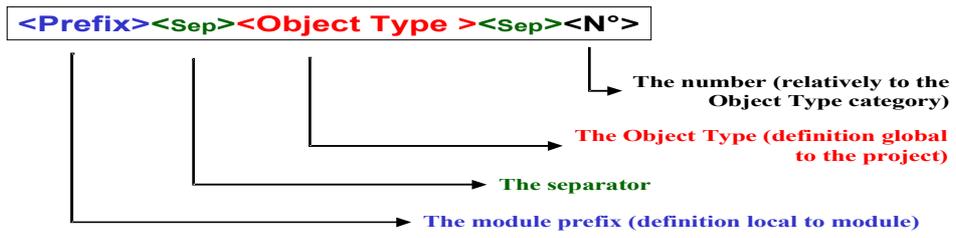
The different parameters are visible into different tabs.

3.1.3.1 PUID

What is a PUID ?

The PUID means **P**roject **U**nique **I**dentifier. It's the reference name of RMF objects like Requirements.

You can either decide to manage yourself the PUID entering their values manually or let IRDRMFAO set it automatically. This last case is the default mode called "Automatic PUID strategy". In automatic mode the PUID is composed of 3 parts (Prefix, Object Type and Number) separate by a separator.



e.g.: RFP-REQ-015

Figure 6 : PUID structure in automatic mode

To configure parameters applicable to the whole project,

- In the project manager window (also called “Database window”), select the RMF project with the DOORS Explorer (left part of the “Database window”),
- Run the menu “RMF ->Configure a RMF project”,

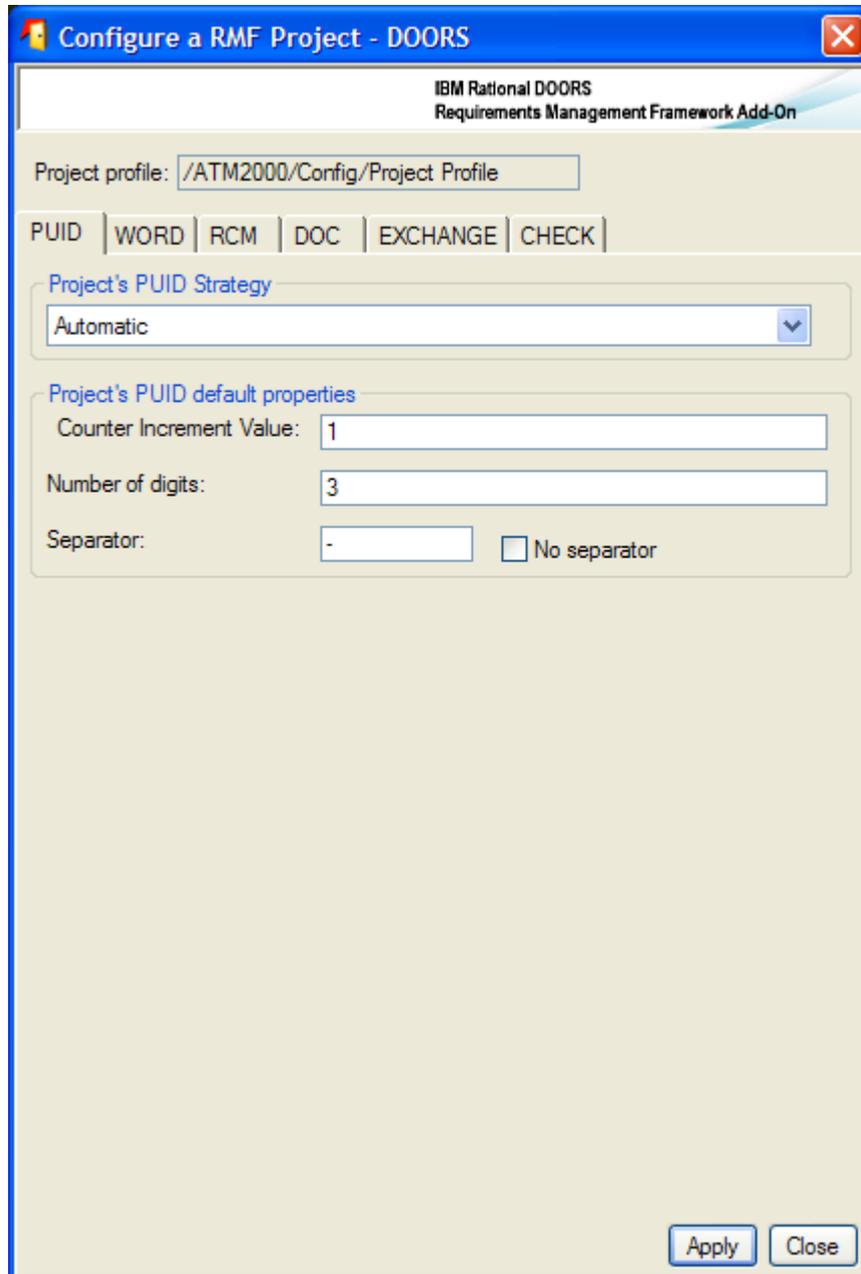


Figure 7 : RMF project configuration, PUID tab

- Select the project PUID strategy : Automatic (default) or Manual,
- Then for Automatic mode, set the PUID properties:
 - Counter increment value (e.g. if 10 : RFP-REQ-10, RFP-REQ-20, RFP-REQ-30,...),

- The number of fixed digit for the counter (e.g. if 3 : RFP-REQ-003, RFP-REQ-020, RFP-REQ-234,...)
Set "0" if you don't want a number of fixed digit,
- The separator character. If you want an empty separator you should select the toggle “no separator”. If not an empty value will be replaced by a space character.

Remark: In Automatic mode, the Prefix part of the PUID is defined at module level by the "Module Configuration" utility.

3.1.3.2 WORD

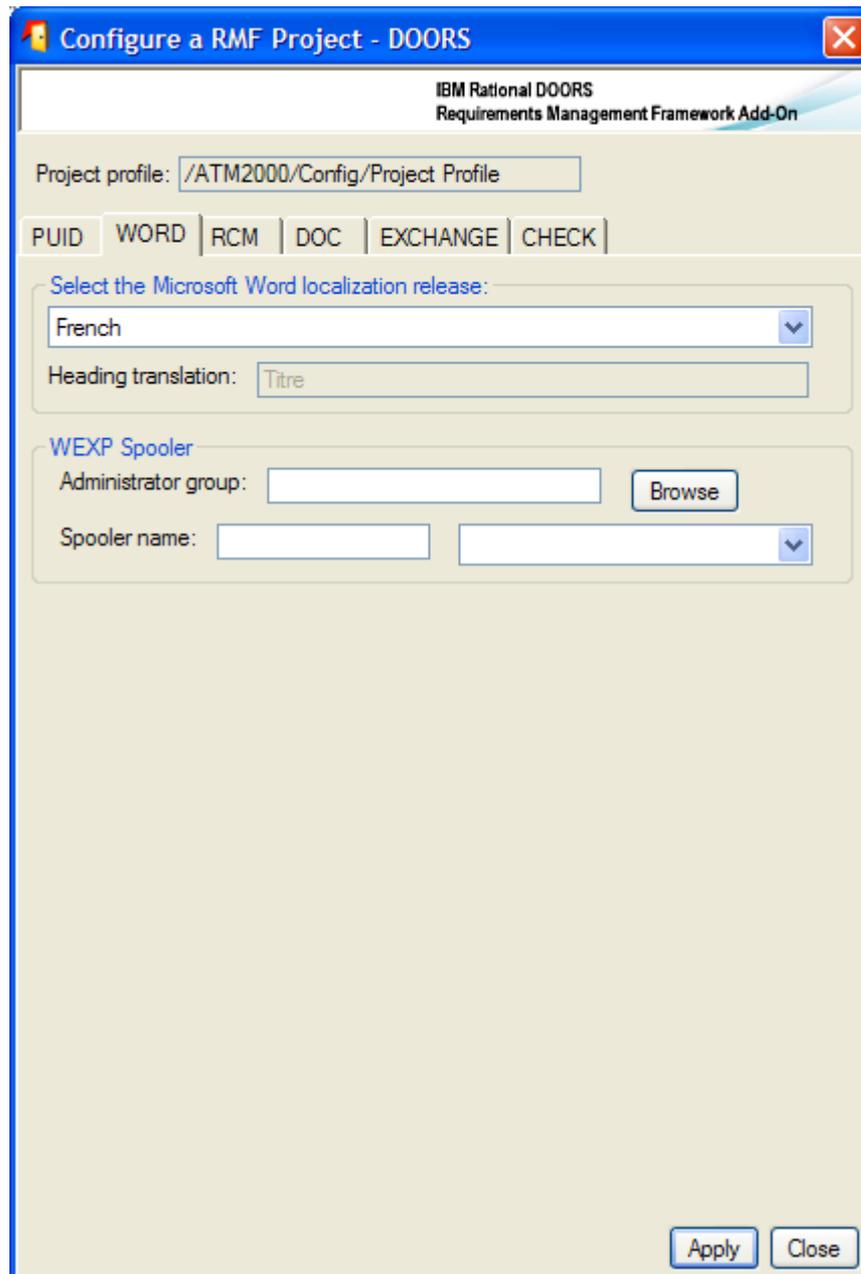


Figure 8 : RMF project configuration, WORD tab

This tab contains some parameters used for the document generation function. Document generation with IRDRMFAO is possible only with Word.

- Select the Microsoft Word language release. This is used by the document production utility to decide the style name to export for headings. Notice that there is no relation between that parameter and the spelling checker to use.
- For the spooler configuration, that can be used to manage WEXP exports on a dedicated computer, you should consult the WEXP manual.

3.1.3.3 RCM

The screenshot shows a Windows-style dialog box titled "Configure a RMF Project - DOORS". The title bar includes the IBM logo and the text "IBM Rational DOORS Requirements Management Framework Add-On". The main content area is divided into several sections:

- Project profile:** A text box containing the path "/ATM2000/Config/Project Profile".
- Navigation tabs:** A row of tabs labeled "PUID", "WORD", "RCM" (which is selected), "DOC", "EXCHANGE", and "CHECK".
- Administration:** A section with a label "Administration" and a text box for "Administrator group" containing "rcm_admin", with a "Browse" button to its right.
- Change Requests:** A section with a label "Change Requests" containing:
 - A text box for "CR Manager group" containing "cr_admin" and a "Browse" button.
 - A text box for "CR Location (folder)" containing "/ATM2000/Change Requests" and a "Browse" button.
 - Radio buttons for "List of impacted modules": "Optional" (selected) and "Mandatory".
- RCM control modes and parameters:** A section with a label "RCM control modes and parameters" containing:
 - A dropdown menu for "Object control mode" set to "RMF Objects".
 - Radio buttons for "Change control mode": "formal only" (selected) and "not formal authorized".
 - Radio buttons for "Version numbering code": "standard" (selected) and "custom".
 - Three checked checkboxes for "Repair out-link modification of an object in reference":
 - to an object in reference
 - to a working object
 - to an uncontrolled object
 - An unchecked checkbox for "Detect out-links to working objects with a different CR".
- Configure the RCM clearing actions authorized:** A section with a label "Configure the RCM clearing actions authorized" containing three checked checkboxes for "Clearing actions":
 - Clear the suspect link
 - Duplicate to a new version
 - Transfer to a new version

At the bottom right of the dialog, there are "Apply" and "Close" buttons.

Figure 9 : RMF project configuration, RCM tab

The definition of these parameters is required to deploy the RCM functionality. This configuration is documented into the RCM reference manual.

3.1.3.4 DOC

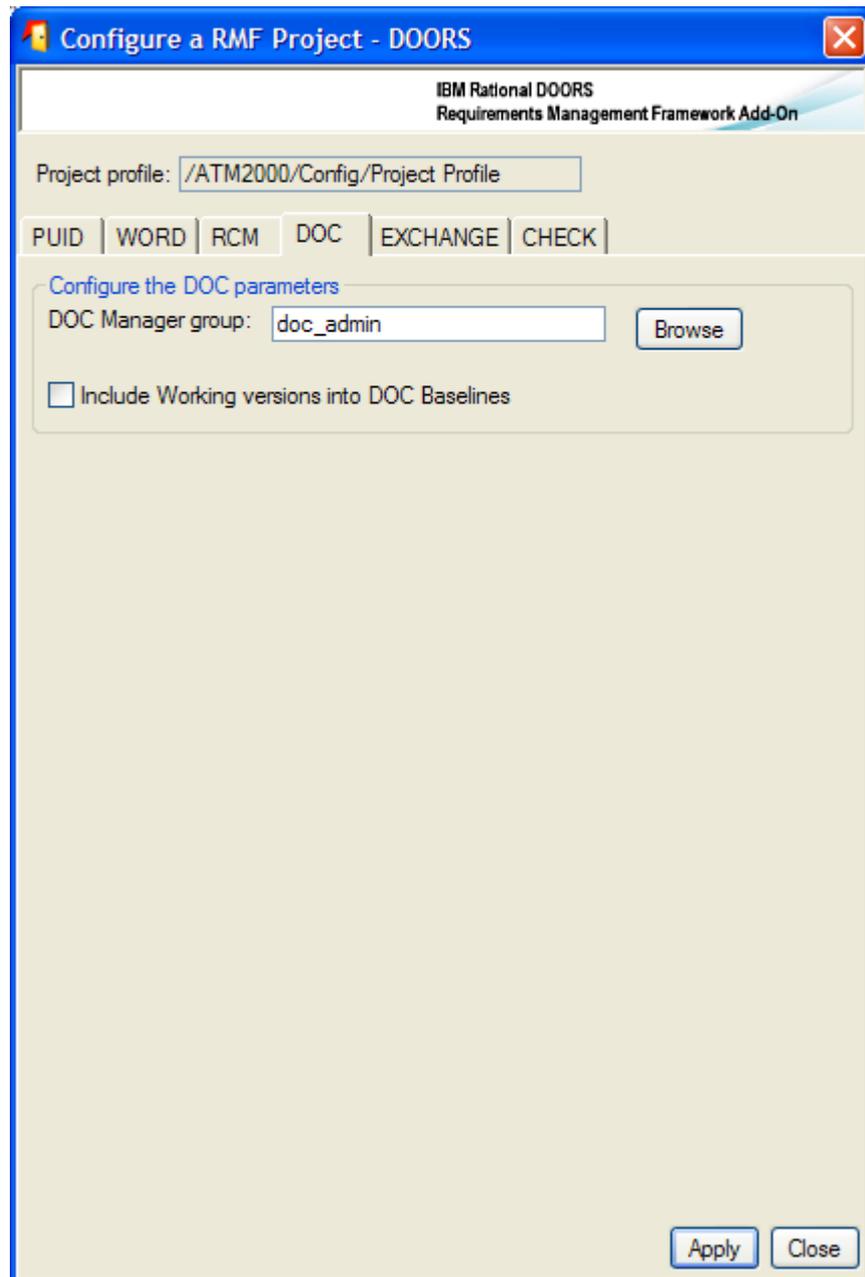


Figure 10 : RMF project configuration, DOC tab

The definition of these parameters is required to deploy the DOC functionality. This configuration is documented into the DOC reference manual.

3.1.3.5 EXCHANGE

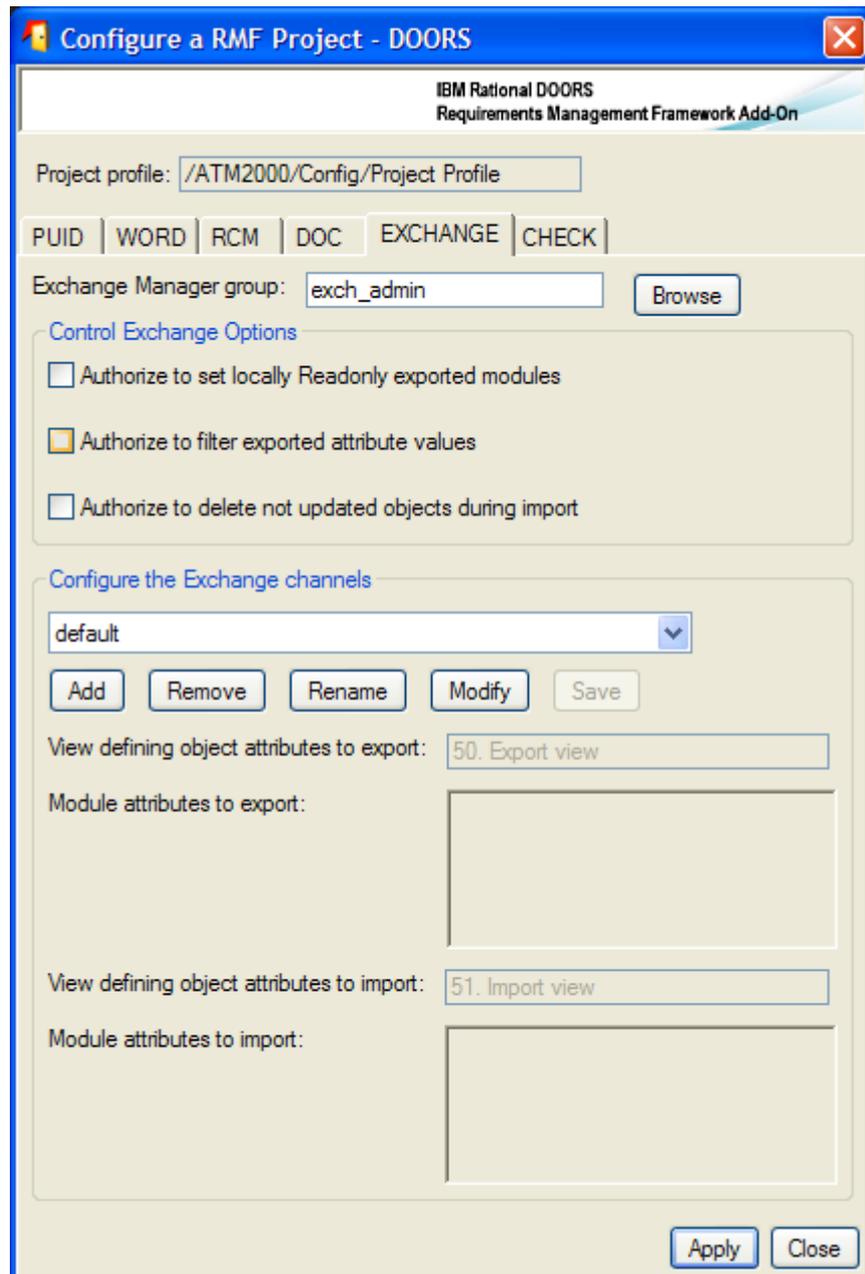


Figure 11 : RMF project configuration, EXCHANGE tab

The definition of these parameters is required to use the Exchange functionality. This configuration is documented into the Exchange reference manual.

3.1.3.6 CHECK

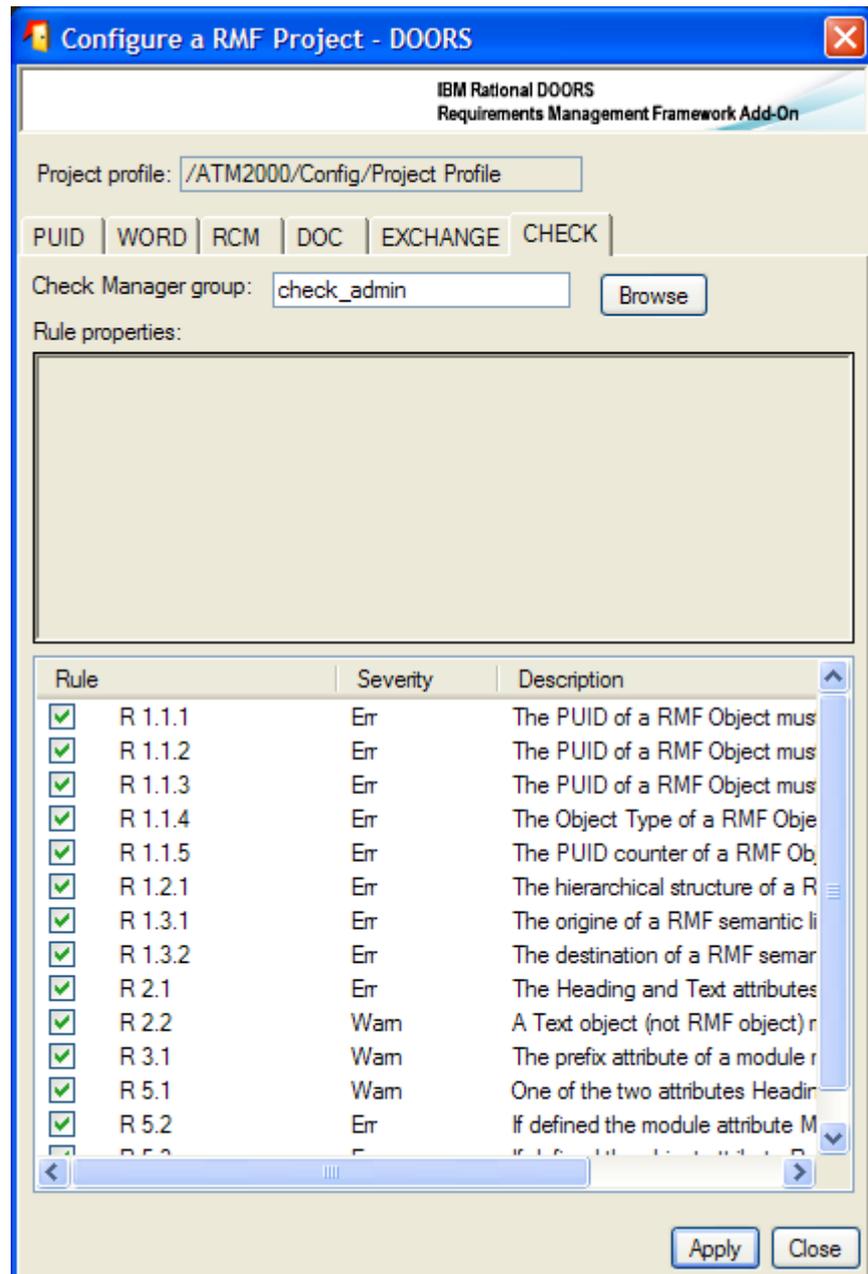
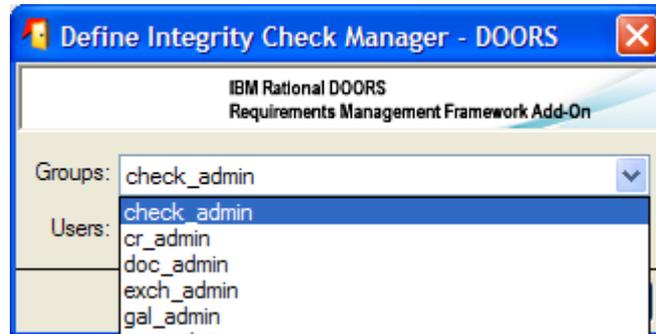


Figure 12 : RMF project configuration, CHECK tab

The definition of these parameters is required to use the Integrity Check functionality.

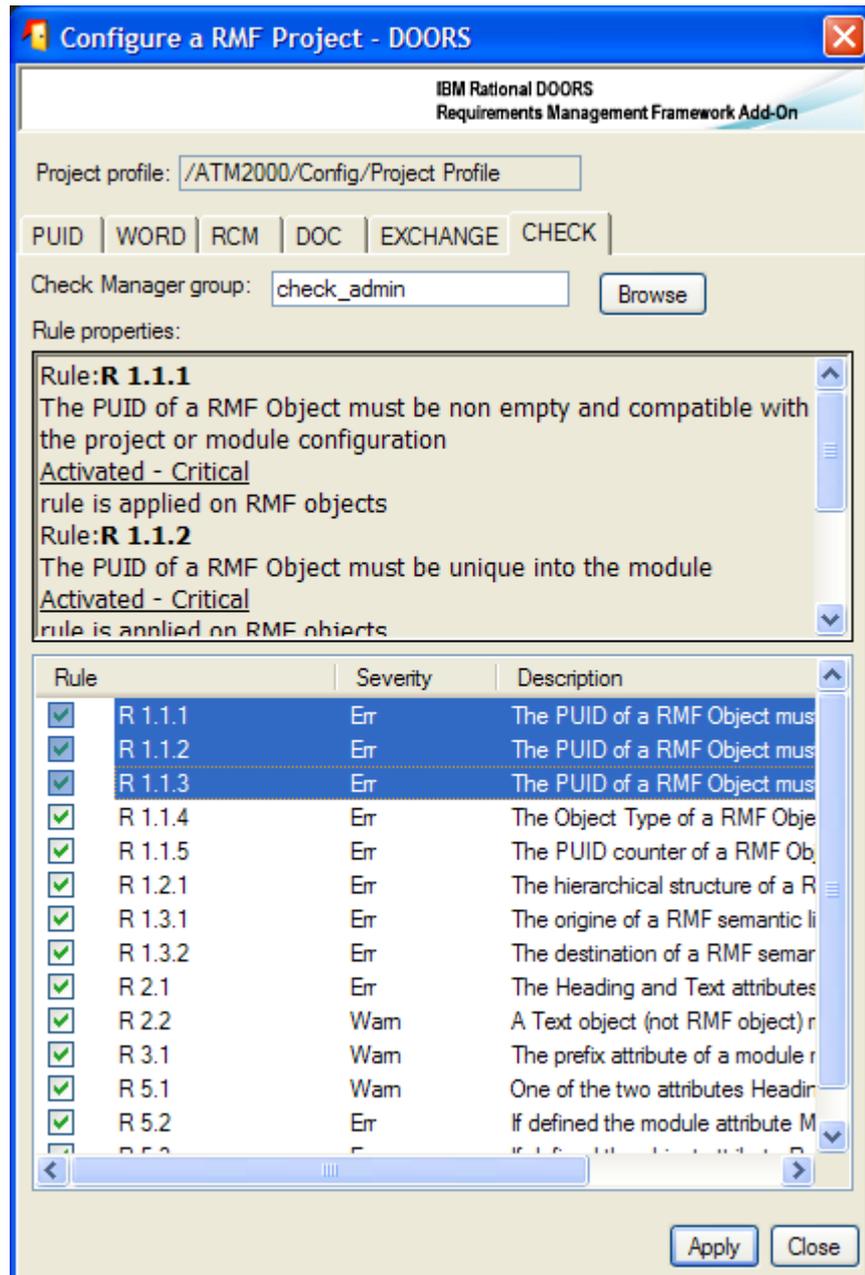
The first parameter is the definition of the Check Manager group for the project. This role gives the ability to change the Integrity check configuration at module level, it is also used to “protect” the integrity status of each module with specific access rights.

To define the Check Manager click the “Browse” button, and then select a group from the displayed dialog.



The second parameter is the list of integrity rules that are available with the IRDRMF AO version installed. The integrity rules should be defined into DXL, in some specific place of the IRDRMF AO software. There is a predefined set of rules delivered with IRDRMF AO , these rules are generic and applicable to any RMF project. It is also possible to define specific rules by developing new rules.

When defined, a rule may be activated or not into the project. It is also possible to redefine for some specific modules the set of activated or non activated rules.



To activate or inactivate a rule, you may check or uncheck the check box associated with each rule, or you may select several rules and apply the operations “Activate selection” and “Inactivate selection” from the contextual menu (right button of the mouse).

The operations “Error” and “Warning” may be used to change the severity level associated with each rule. The initial severity level is defined into the DXL code.

When a rule is selected, a description of the rule is displayed in the text field above the rule list.

To get more information on the Integrity Check functionality, refers to chapter § 4.5 CHECK DATA CONSISTENCY.

3.2 RMF MODULE INITIALIZATION

Your project initialization needs careful thought:

- First, does the generic data model proposed in IRDRMFAO and composed of RMF Module Types fit your problem? Which part of the data model may you need? Without having to have a complete answer at the start, you can make a list of the retained modules.
- Second, for each module retained from the data model, are the default attributes proposed relevant for your project? Then, according to your need, you can delete or add attributes within the modules.

If the RMF generic data model or your company data model needs customization see chapter 7 for explanation to what can be done on your project and how.

3.2.1 WHAT IS A Module type ?

The implementation of a RMF data model can be compared as a library of RMF module types.

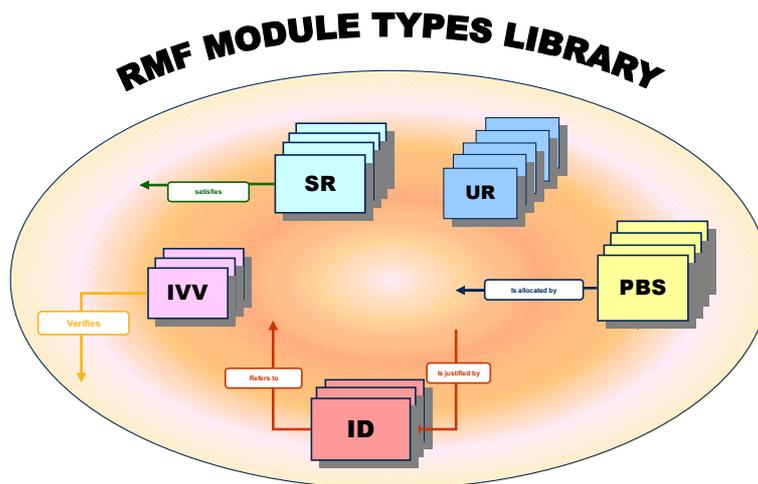


Figure 13 : RMF module types library

IRDRMFAO provides different kinds of predefined module types, and each module type can be used for several purposes, for example:

- Several modules in the data model. The IVV module type implements a “*verification procedure*” module, a “*validation procedure*” module and an “*integration procedure*” module...and it’s not an exhaustive list.
- Several documents. The SR module type can be used to store a System Specification document, a Sub-system Specification document, Other Stakeholders requirements or Interface Specification.

The generic data model, and your own version that is derived from it, can be seen as an assembly of building blocks.

Each building block is a module type characterized by its attributes, views and incoming/outgoing links. These are summarized in the table below.

Tableau 1: List of RMF generic module types

MODULE TYPES		UTILIZATION
UR		~ User Requirements Module <i>Ex: Contract Request For Proposal</i>
SR		~ System Requirements Module <i>Ex: SSS</i> ~ Sub-System Requirements Module ~ PIDS Module <i>Ex: SRS</i> ~ Other stakeholders Requirements Modules
ID		~ Requirements Analysis Module ~ Design Analysis Module
PBS		~ PBS Module <i>Ex: SSDD</i>
IVV		~ Integration Procedures Module ~ Verification Procedures Module ~ Validation Procedures Module

For more detail on the modules, consult the appendix.

When implementing a module type into the model, two different concepts are used:

- The formal module containing the attribute and view definitions associated with the type is called a “Module Template”. This template concept is completely different from the DOORS template concept, a DOORS template defines only a document plan. A RMF template may define also the plan of the formal modules, but the most important part is the attribute and view definitions.
- A “Module Type” is implemented by a “Module Template”. All the types derived from the same template contain the same set of definitions. It is the type that is

saved into a formal module, when created by IRDRMFAO from a type. The associations between types may be different of the associations between templates.

Example: The “SR” template implements the types “System Requirements”, “Subsystem requirements” and “Prime Item Requirements”.

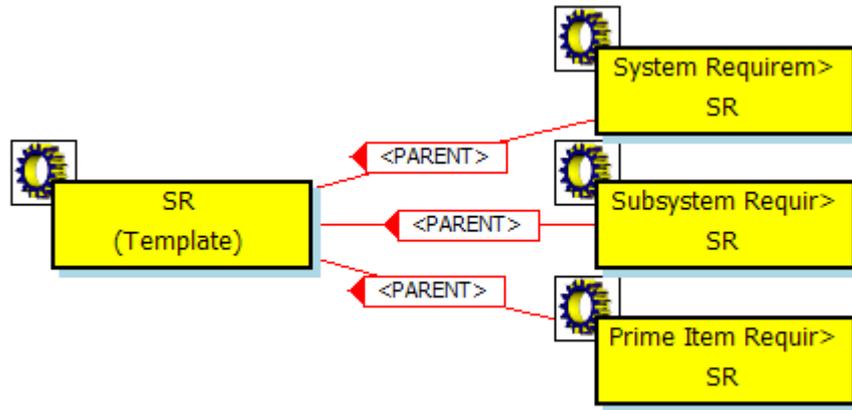


Figure 14 : the SR template

The RMF model contains also the definition of some other module types, such as Dashboard, Change Request (CR) and Document Index (DI). The corresponding templates and module types are not dependant on the data model used by the project and are required by the corresponding components IRDRMFAO .

To create your own project, you have to pick from the module type library in order to build your project data model, drawing one's inspiration from the generic RMF data model.

Your own data model

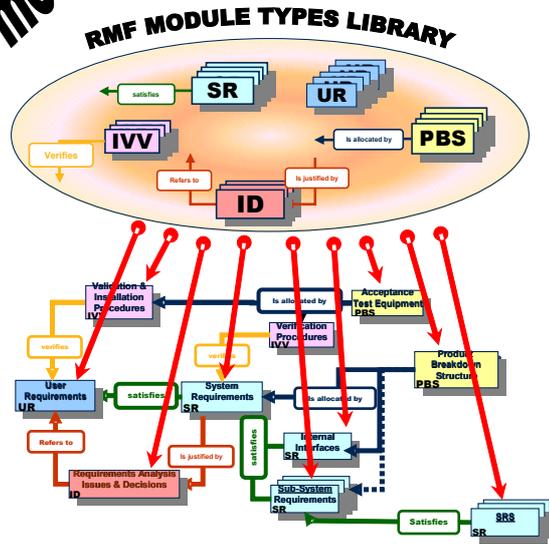


Figure 15 : Build your own data model from module types library

You may examine your RMF Project Model with the **Explorer** tool, by executing the operation “Explore Model” from the RMF project menu.

Example: partial view of the generic model with the **Explorer** tool

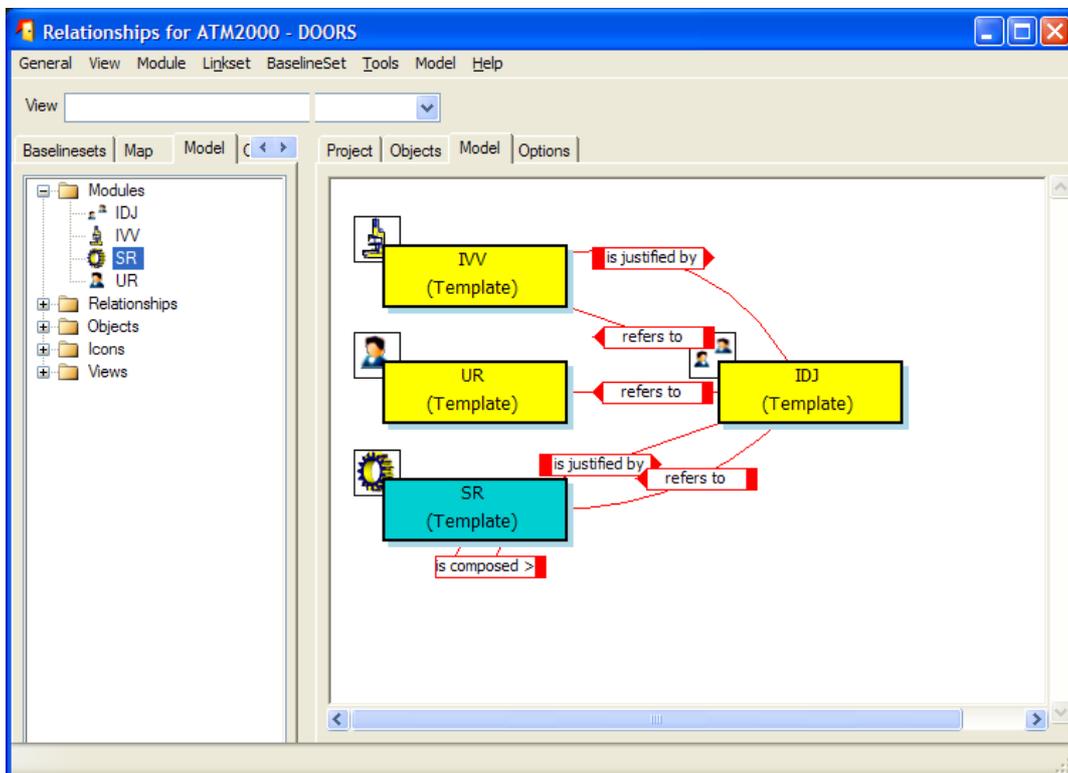


Figure 16 : Explorer (template level)

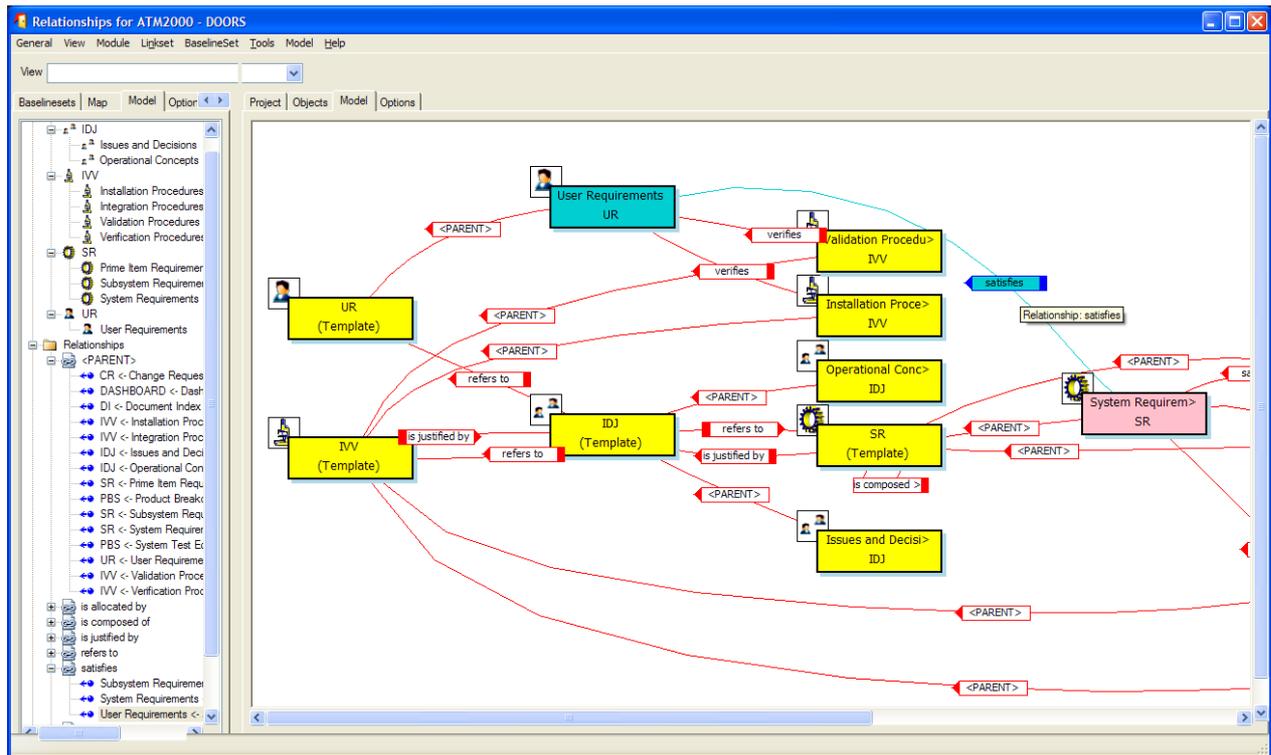


Figure 17 : Explorer (template and module type levels)

This tool allows you to display different views of your RMF Project Model, according to your process. You may examine for example what is the expected traceability between the different module types and module templates. To have more information about this tool you should read the description of the **Explorer** tool.

The model defines an **abstract data model**, allowing to understand the nature of the information, the project contains the concrete data model.

3.2.2 CREATE A NEW RMF Module

Each time you need to create a module, you have to determine the required module type to describe the information contained into the module.

Having done that, you can instantiate the module from the model, by choosing the corresponding RMF template and type. Then you will have to configure the traceability between this new module and the already existing modules into the project.

Note that for document importation into DOORS, in particular for Microsoft Word document, you can start to export the document (using the specific icon for Word) into DOORS. A DOORS module is then created. In a second step, you have to tag this DOORS module into one of the RMF module types list (see next paragraph).

To create a new RMF module:

- First select its directory location with the DOORS Explorer (left part of the “Database window”),
- Run the menu “RMF ->Create/Tag a RMF module”,

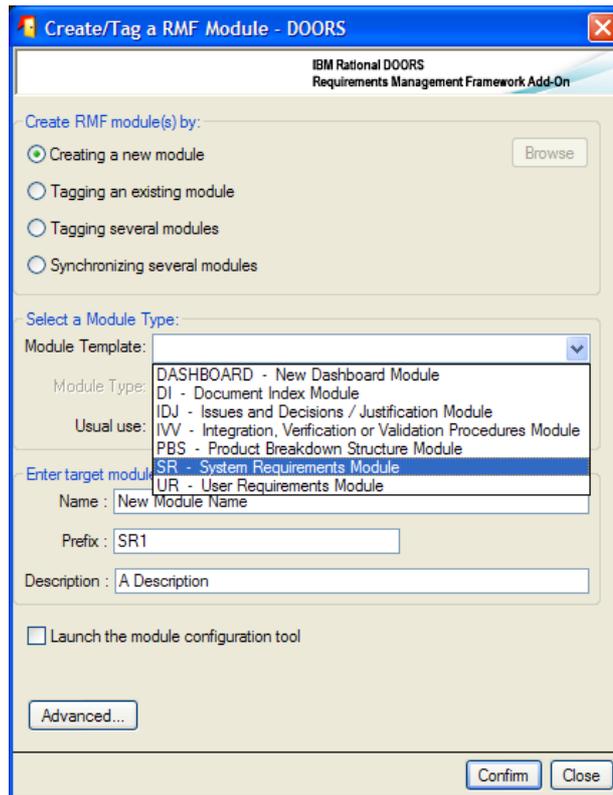
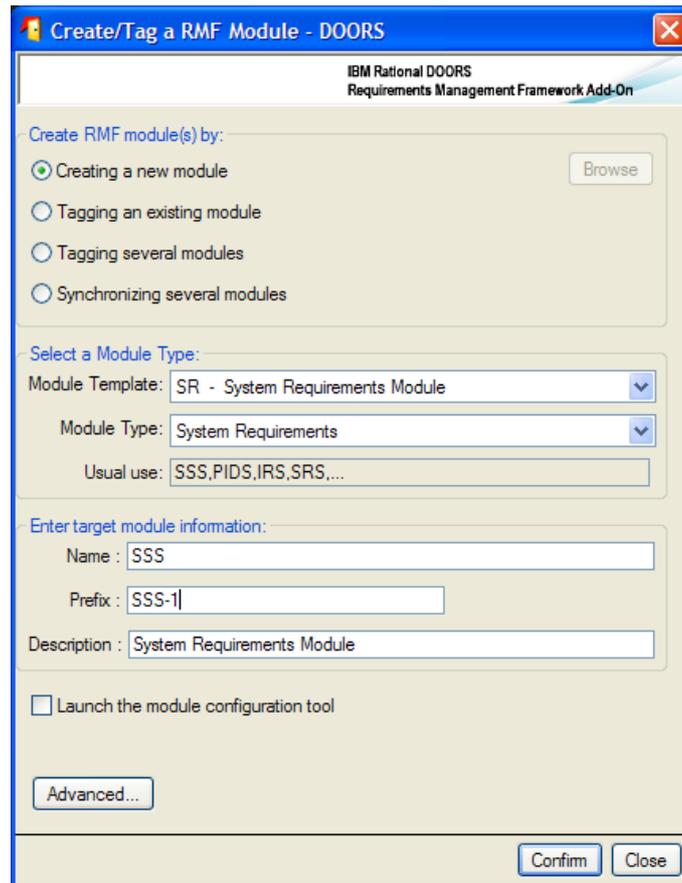


Figure 18: RMF module creation window

- Select the appropriate template in the list. The followings are example provided by the generic data model:
 - UR for Users Requirements,
 - SR for System Requirements,
 - IDJ for Issues & Decisions and Justifications,
 - PBS for Product Breakdown Structure,
 - IVV for Integration, Verification & Validation,
 - DI for Document Index,
 - DASHBOARD for dashboard module.
- Select the appropriate module type amongst the list of available types according to the selected template
- Give a name, a prefix and a description to the new module. Only name field is mandatory, RMF will put a default description if the field is left empty. Note that the module name and description can be modified later.
- Click on the 'Create' button, if successful, an acknowledgement window is then displayed.



The tool supports also other functionalities:

- **Tagging an existing module:** to add the RMF definitions of the selected module type to an existing module. Can be used also to upgrade a module after an evolution of the model.
- **Tagging several modules:** to add the RMF definitions of the selected module types to a set of modules.
- **Synchronizing several modules:** to upgrade a set of modules after an evolution of the model.

The **Advanced** button allows the selection of the definitions to add to the module to tag.

You may also create a new module from the **Explorer** tool, by calling the operation “Create module” from the selected type:

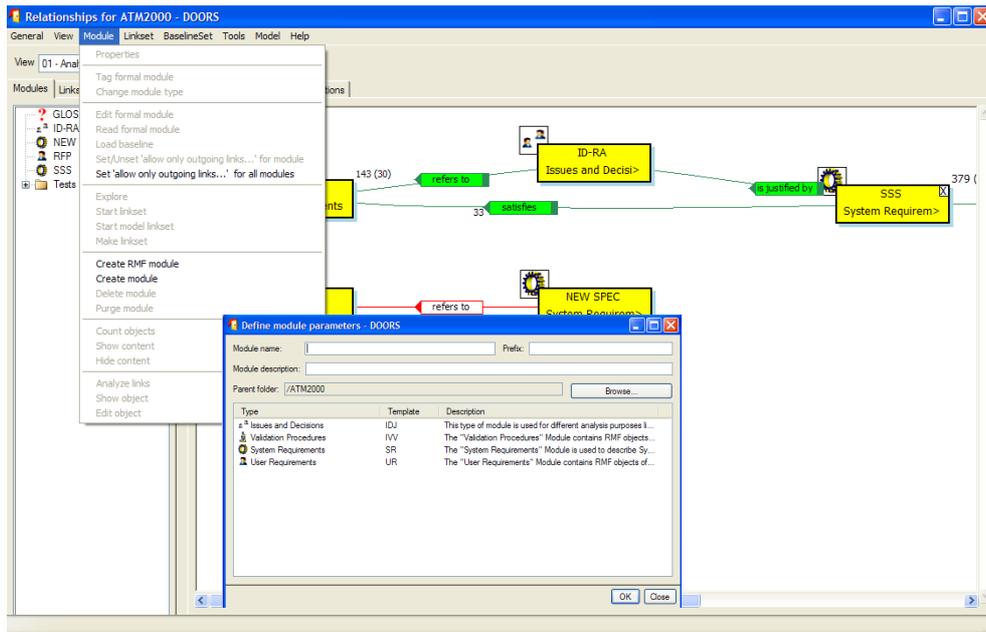


Figure 19 : Create module in Explorer

This operation calls the “RMF ->Create/Tag a RMF module” with some predefined parameters. The new module is created in the folder from which the **Model Explorer** has been executed. The **IE Mod Type** attribute is automatically set to the right value, you have not for example to change the “System Requirements” default value into “Subsystem Requirements”.

At this point, you can create the default linkset pairing making use of a DOORS feature (refer to § 3.3 DEFINE THE DEFAULT LINKSET PAIRING).

3.2.3 MIGRATE A EXISTING DOORS MODULE INTO RMF FORMAT

To migrate an existing DOORS module to a RMF structured Module Type, you have to proceed with the same manner as described in the previous paragraph for RMF module creation, but this time select the toggle "Tagging an existing module" and browse to find the module to tag.

Alternatively you can also:

- Select a module in the database browser interface
- Launch the “RMF -> Create/tag a RMF module” command

This way, the option “Tagging an existing module” is already selected and you don’t need to browse the module to tag.

Example:

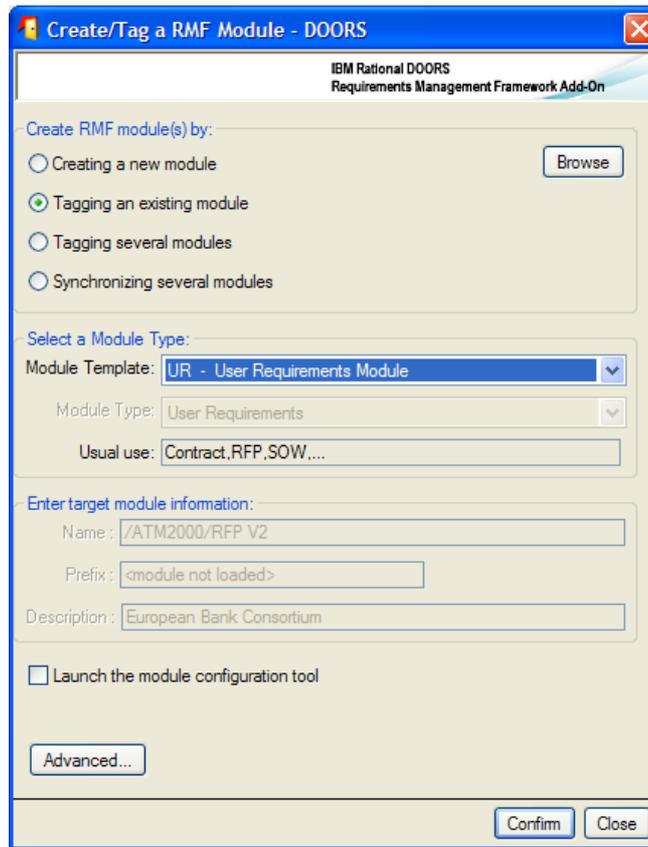


Figure 20 : Create/Tag a RMF Module

An alternative way is the call of the operation “Tag module” in the **Explorer** tool:

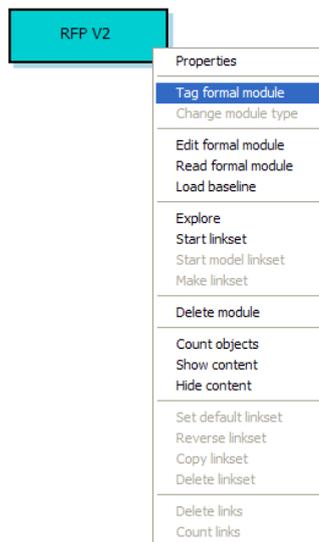


Figure 21 : Tag module in Explorer

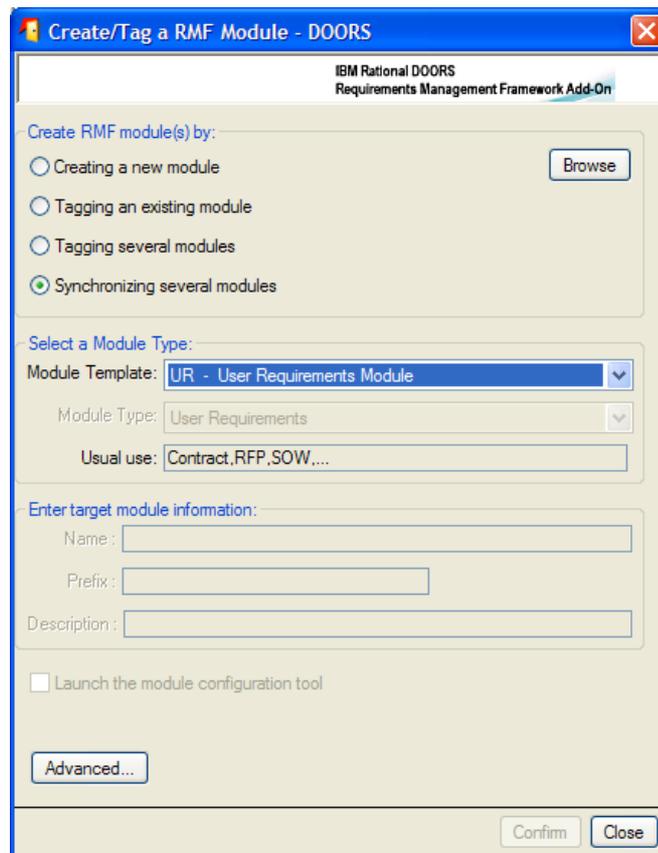
This operation calls the “RMF ->Create/Tag a RMF module” with some predefined parameters.

The **IE Mod Type** attribute is automatically set to the right value, you have not for example to change the “System Requirements” default value into “Subsystem Requirements”.

3.2.4 MIGRATE SEVERAL EXISTING DOORS MODULES INTO RMF FORMAT

This is also possible by using the third option “Tagging several modules”:

- Launch the “Create/tag a RMF module” command
- Select the “Module Type” value in the list
- Select the “Tagging several modules” option



- Click the “Browse” button, the following dialog box appears:

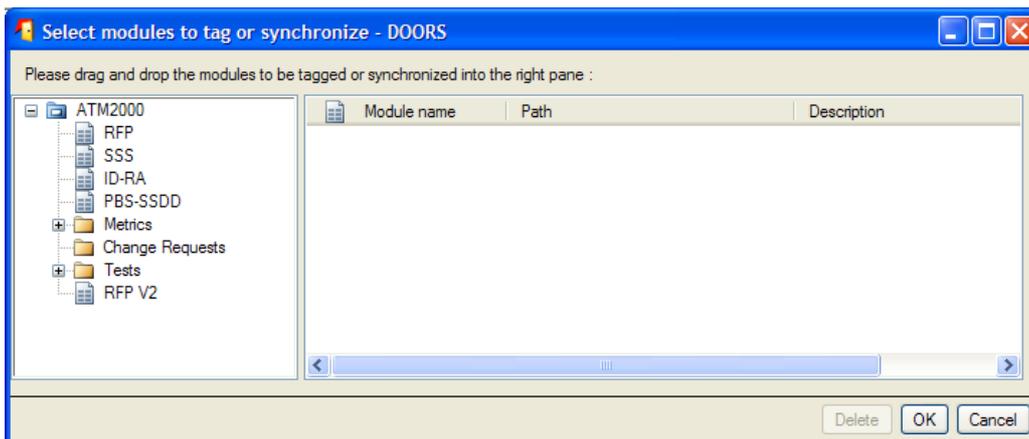


Figure 22 : Browse dialog (1) in Create/Tag a RMF module

Select the modules that you want to synchronize with the same module type by dragging and dropping them in the right pane:

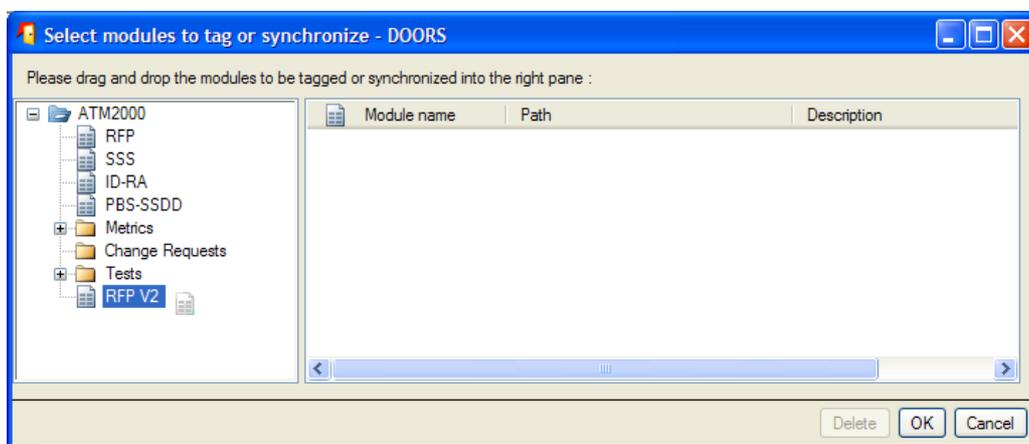


Figure 23 : Browse dialog (2) in Create/Tag a RMF module

The dragged module shows in the right pane, as follows:

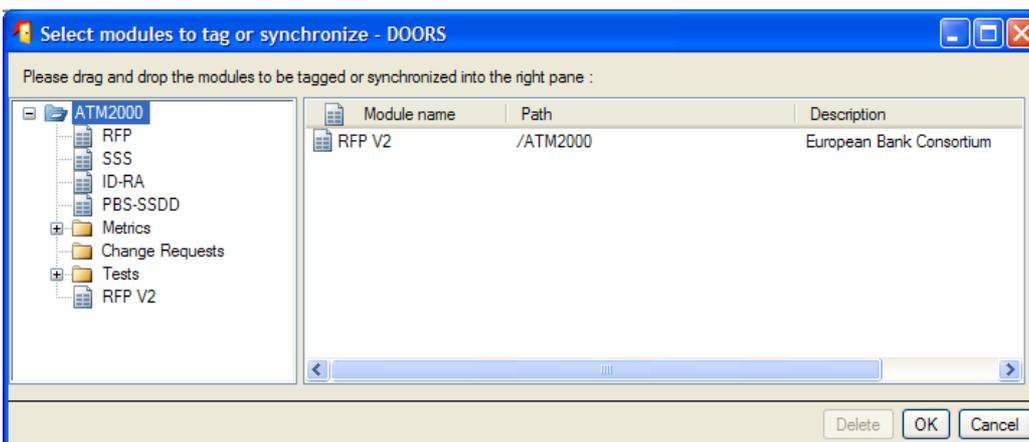


Figure 24 : Browse dialog (3) in Create/Tag a RMF module

Then click on the “OK” button. The browse dialog disappears.

Select the module type to use as a model and then click on the “Create” button of the main dialog box.

You may drag several modules in only one operation by dragging a folder or a project: all the modules contained by the folder or the project are automatically dragged.

The operation “Synchronizing several modules” has a different behaviour: when selecting this mode, the tagging operation is applied only to the modules that have already been tagged with the selected type. This mode should be used to propagate an evolution in the model (new attributes or new views) to the already existing modules.

3.2.5 RMF MODULE CONFIGURATION

IRDRMFAO allows the definition of some parameters that are applied at module level. Some are defined at project level but you may modified them locally.

To configure parameters applicable to a particular RMF module,

- Open the module,
- Run the menu “RMF ->Configure Module”,

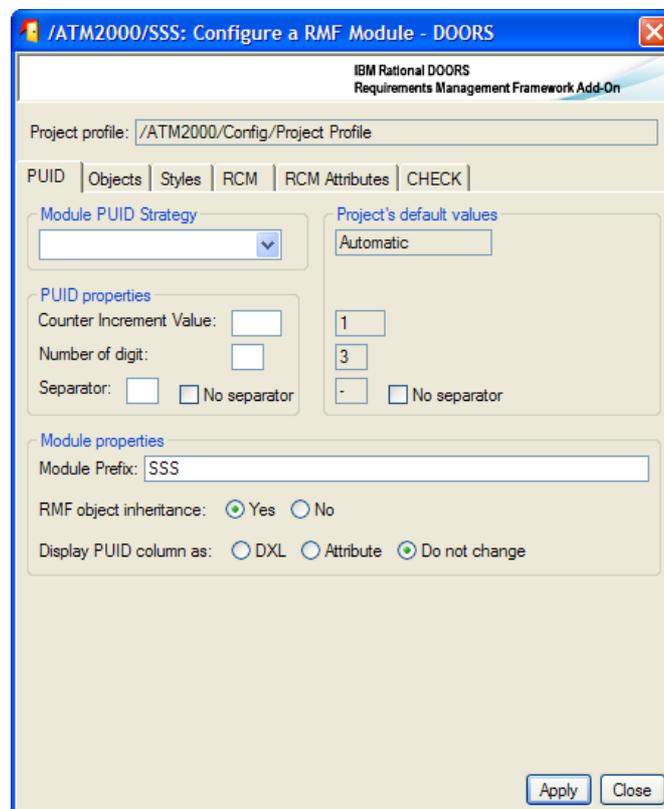


Figure 25 : RMF module configuration window

The different items of the module configuration are visible into different tabs.

3.2.5.1 PUID

This tab contains all the PUID configuration options.

Top part of the window : concerns overridable project parameters. Refers to § 3.1.3 RMF PROJECT CONFIGURATION to know more about PUID meaning, setting strategy and properties.

Module Prefix: In Automatic mode, defined the Prefix part of the PUID (Refers to § 3.1.3 RMF PROJECT CONFIGURATION).

RMF Object inheritance: « Yes » makes the attribute « IE Object Type » to be inherited... by default choose this option except if you want to make some chapter object to be identified (not recommended, but usefull for PBS module objects).

Display PUID column: "DXL" option allows to prevent direct modification of PUID displayed in views whereas "Attribute" option allows it. All the views of this module are going to be checked and modified. The option "Nor" let the views as they are.

3.2.5.2 Objects

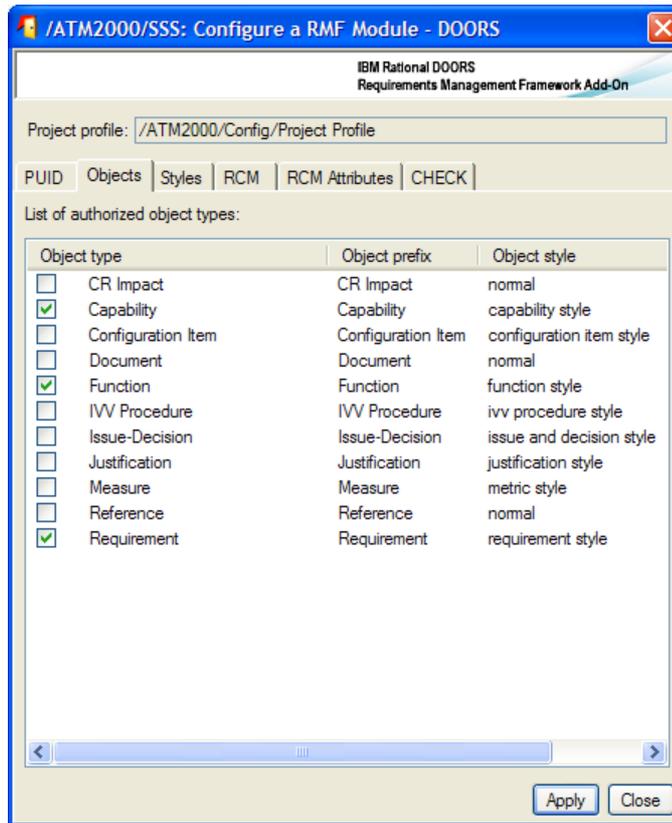


Figure 26 : RMF module configuration Objects tab

This is the list of the Object Types that you can identify. By default, the checked boxes are those allowed according to the Module Type. It can be modified by checking/unchecking the boxes.

3.2.5.3 Styles

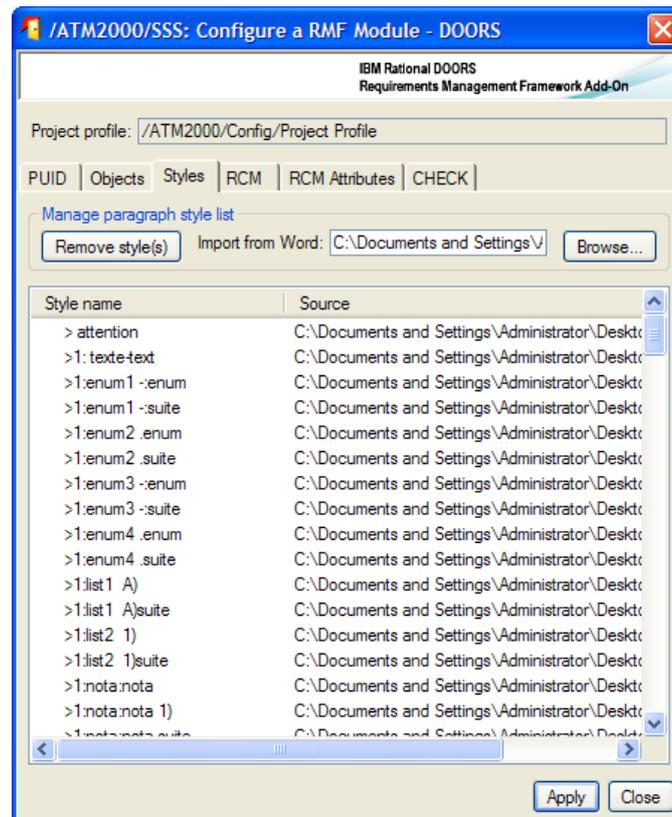
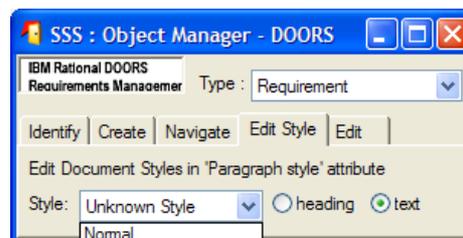
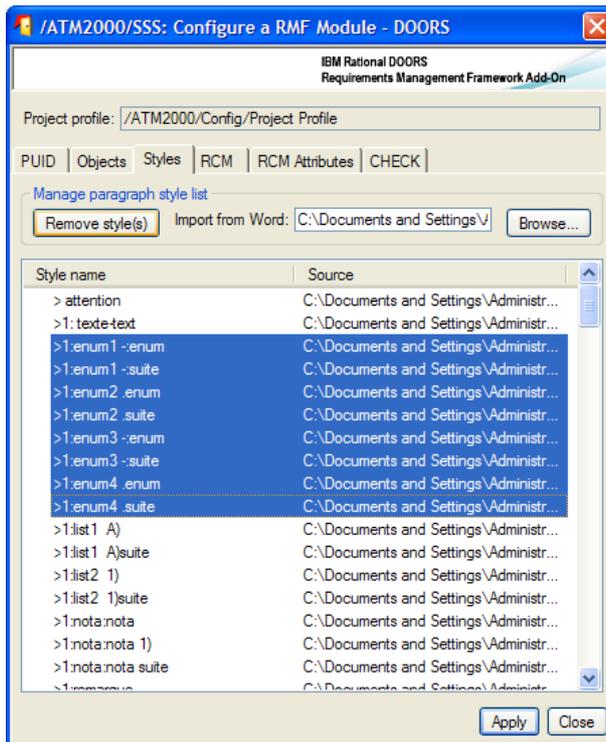


Figure 27 : RMF module configuration Styles tab

You can use the browse operation to pick all paragraph styles defined into a document template. The styles are then usable into the **Manage Object** dialog to associate a Word paragraph style with an object text.

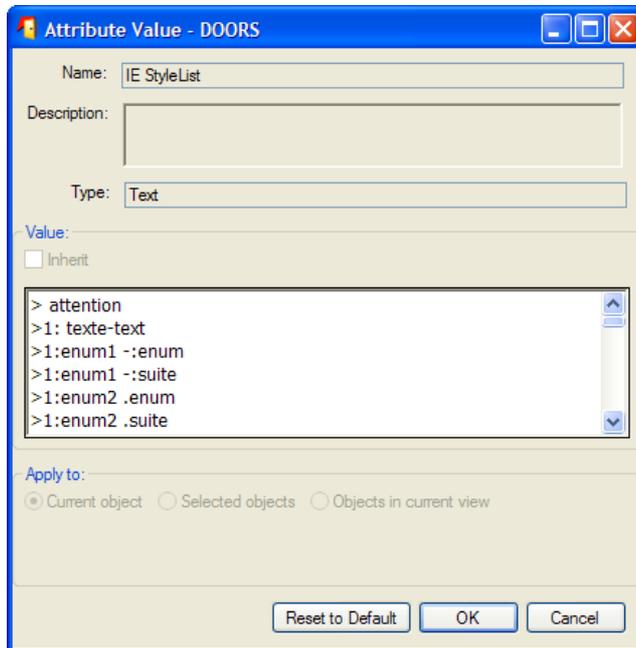


You may also remove some defined styles by selecting the style names into the list, and then click the **Remove style(s)** button.



The list contains only the style name, the style definition is only in the Word template, and the styles must be defined in the templates used by the document generation.

This information is saved into the module attribute "IE Style List":



3.2.5.4 RCM and RCM attributes

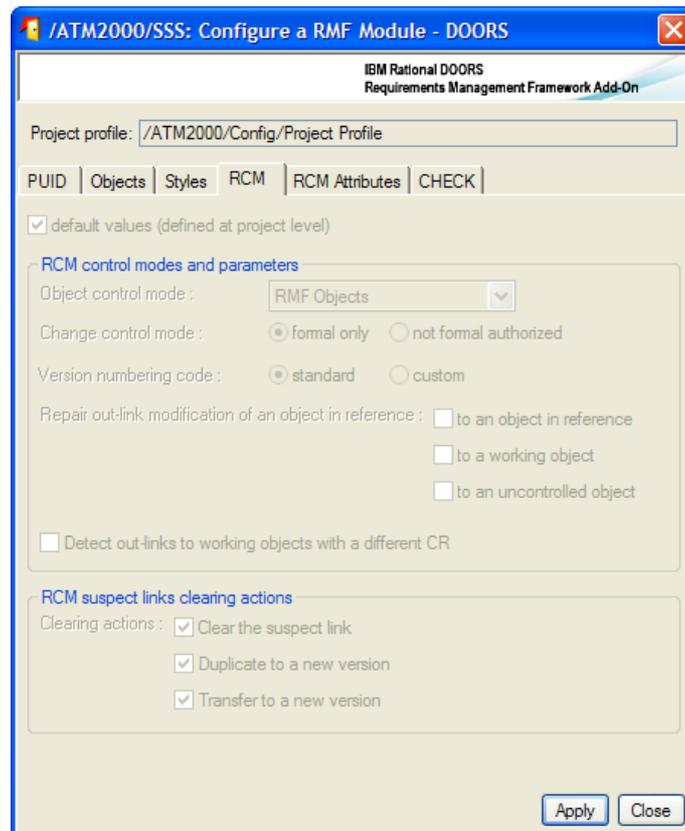


Figure 28 : RMF module configuration RCM tab

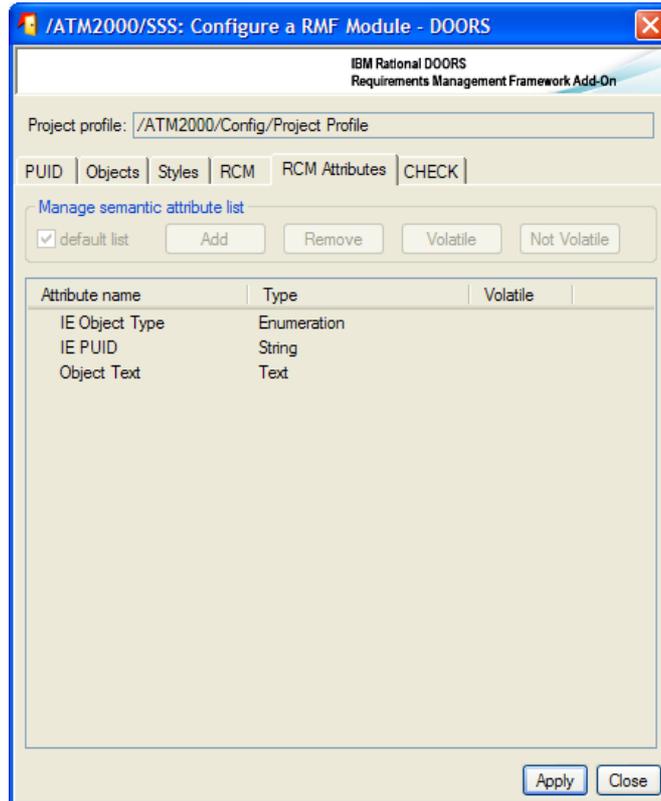


Figure 29 : RMF module configuration RCM attributes tab

You should consult the RCM documentation to understand the use of these parameters. They are accessible only if RCM is initialized into the project and if the module is under RCM control. Only a user defined into the project as a RCM administrator is able to modify these parameters.

3.2.5.5 Check

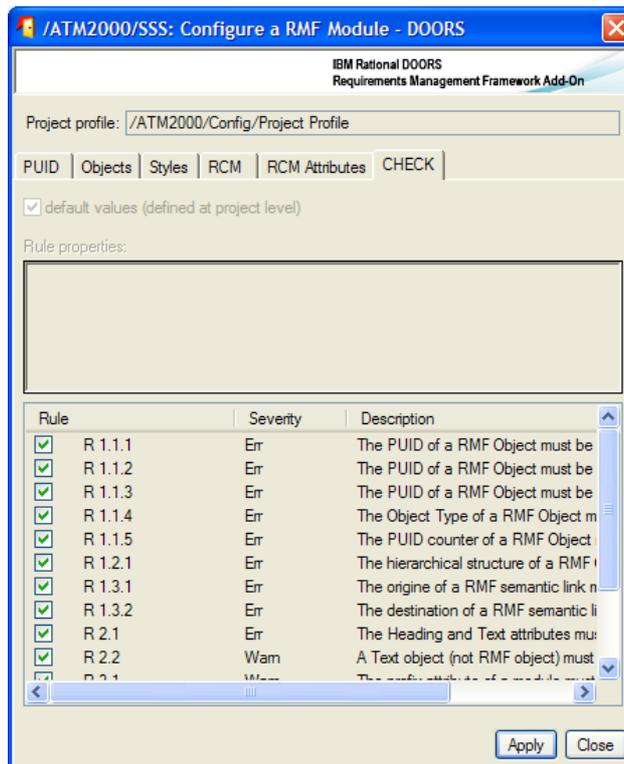


Figure 30 : RMF module configuration Check tab

This window can be used to modify the Integrity Check configuration specifically for a module. It is possible only:

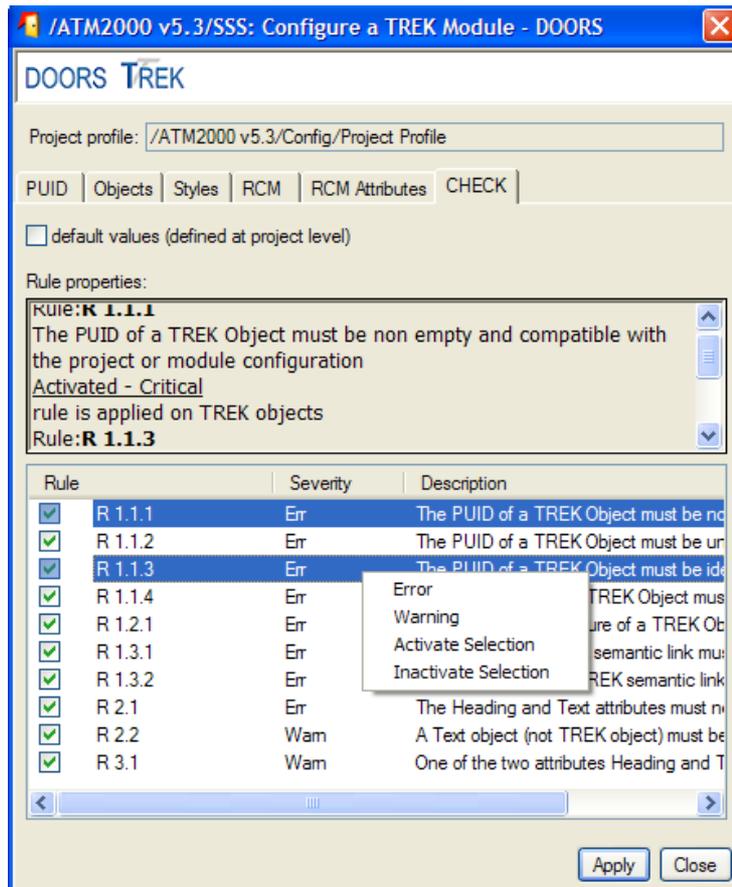
- Integrity Check is already configured at project level
- You have the role Integrity Check Manager for the current project

To define the Integrity Check configuration you must first uncheck the toggle “default values” at the top of the window.

The configuration dialog allows you to:

- Activate or inactivate a rule. By default the activation state is inherited from the project level activation state
- Change the severity level of the rule. The severity level may be Error or Warning. By default it is inherited from the project level severity level.

You may select one or several integrity rules, and use the operations from the contextual menu (right button of the mouse) to change the status of a rule, or you can check or uncheck the check box associated with each rule to activate or inactivate the rule.



TBU

To get more information on the Integrity Check functionality, refers to chapter § 4.5 CHECK DATA CONSISTENCY.

3.3 DEFINE THE DEFAULT LINKSET PAIRING

Once, you have created several modules in your project, you have to teach to DOORS which link types should be used by default (or be prohibited !) between pairs of module: DOORS allows this (this is not a IRDRMFEO feature). For each pair of modules, you have to define the default link modules between this module and the others that are used whenever anyone creates a link between them.

To do this, run "File->Module properties...", select "Linksets" tab and add all the default linkset pairings (only the outgoing links from that current module). Remember to define all links in the 'upward' direction.

Example:

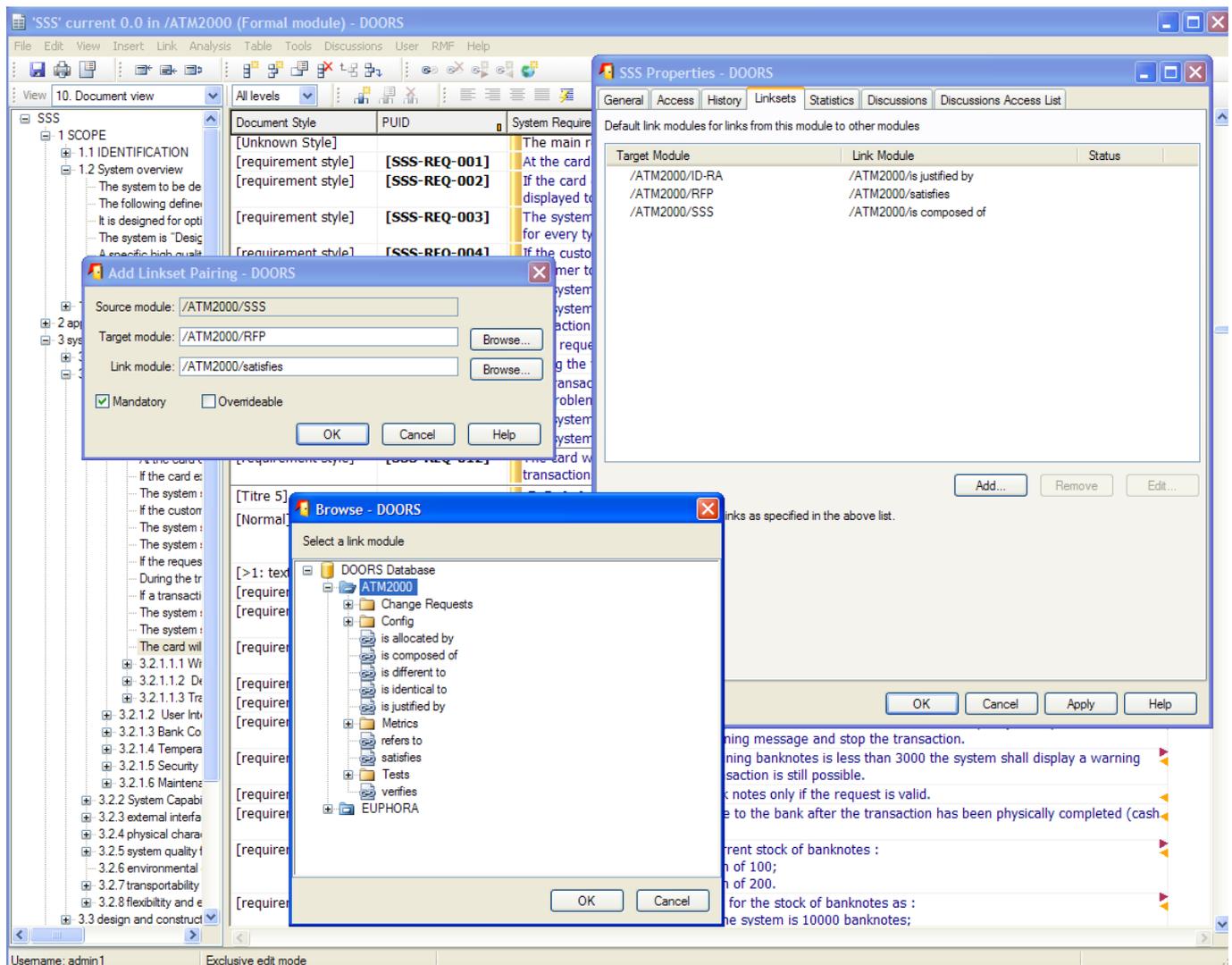


Figure 31 : linkset pairing configuration with DOORS

Why IRDRMFAO can't do it automatically ?

To do this, you need a macro-vision of your data model that IRDRMFAO can't determine alone: for example, you can have 3 ranks of SR modules and authorize "satisfies" links between rank n & n-1, and n-1 & n-2, but prevent direct link between n & n-2.

With IRDRMFAO , there is now a better support to do this operation: you may use the **Explorer** tool to display a map of your project, and to manage the dependencies between modules. The tool shows you what are the linksets compatible or not compatible with your RMF Project Model.

Example:

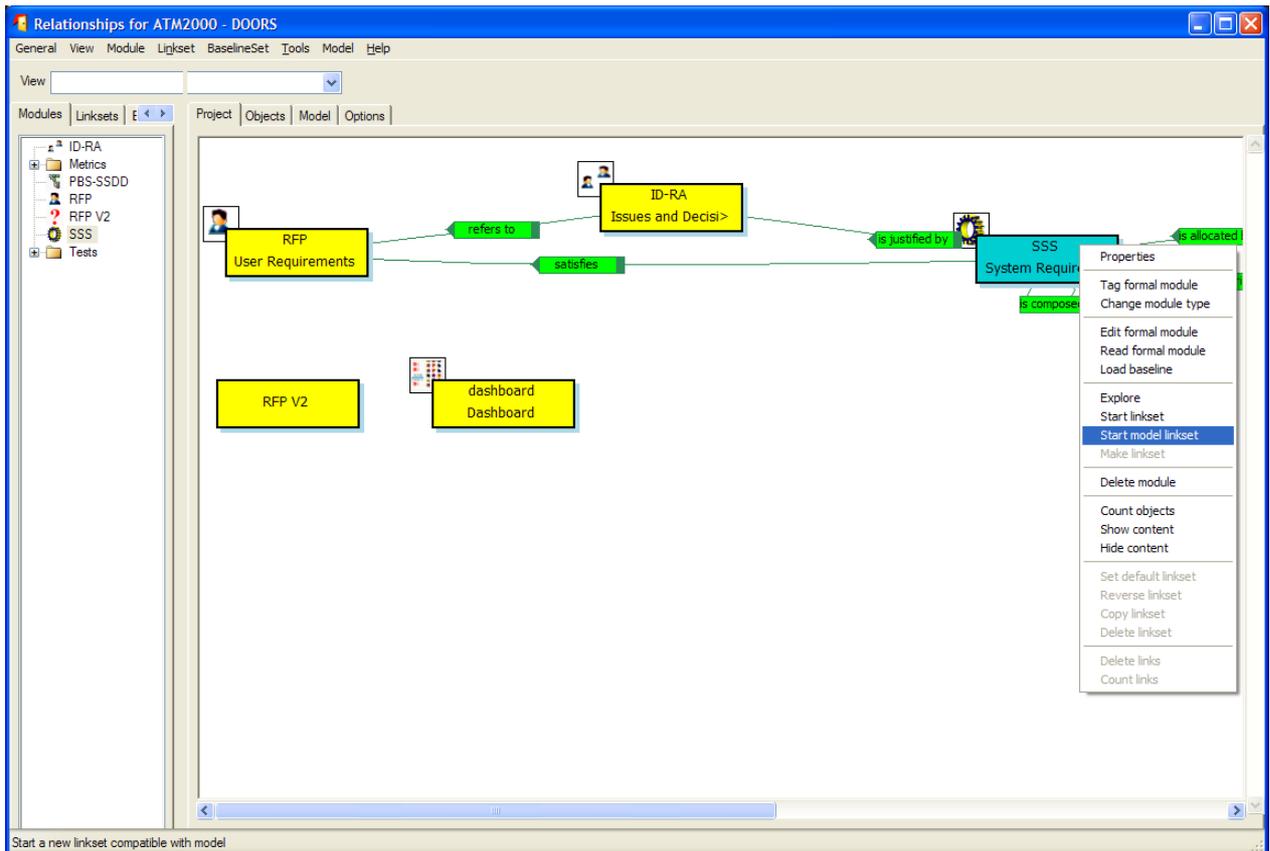


Figure 32 : Start model linkset in Explorer

You may use the operations “Start model linkset” and “Make linkset” to create a new default linkset, compatible with the RMF Project Model, between two modules. To have more details about this tool you should read the document describing the **Explorer** tool. The **Explorer** has a lot of other functionalities.

4 Requirement analysis

4.1 CHARACTERIZE REQUIREMENTS

Once your RMF objects (i.e. requirements, capabilities, configuration items,...) have been identified in your module, you have to manage them by making use of attributes. For this, all RMF module types make available at least an “Analysis” view, and sometime specific analysis views like “Critical requirement list”. In addition, most of the traceability matrix views add columns with attributes for analysis. For more details on the contents of views and the attribute meanings, refer to the appendix A. To customize attributes, refer to § 7.2 ADAPTING MODULE ATTRIBUTES.

The following table summarizes the availability and intended usage of the views that you will find in RMF predefined module types.

Tableau 2: List of standard RMF views

	View name	UR	SR	PBS	ID	IVV	Remarks
Document approach	Document view	X	X	X	X	X	
Generic Analysis Views	Requirements analysis	X	X				
	Configuration item analysis			X			
	IVV procedure analysis					X	
	Issues and Decisions analysis				X		
Specific Analysis Views to point out a particular aspect	Critical requirements list	X	X				
	Key requirements list	X	X				
	Requirements in negotiation	X	X				
Traceability Matrix Views	Associated issues	X	X	X		X	
	Compliance matrix	X	X				
	Verification/Validation matrix	X	X				
	IVV matrix					X	
	Allocation matrix		X				
	Justification		X	X		X	
	Upper requirements satisfy		X				
	Allocated requirements			X			
	Decisions justify				X		
Issues refers to				X			

4.2 DEFINE ISSUES AND DECISIONS

In order to keep track of significant issues encountered during your analysis and to record the decisions taken, it is highly recommended that the “Issues and Decisions” module (ID) type is used.



The IDJ module provides enriched traceability between a pair of modules, as for example between the following pairs: UR-SR, IVV-UR, IVV-SR or PBS-SR.

The IDJ module connects together only relevant RMF objects with issues, not the whole module. So it is not necessary to have links to all objects in the “incoming” module. In the same way, reference links to all objects in the “outgoing” module are not mandatory.

For significant issues with impact outside the local team (customer, subcontractor, business, major tradeoffs, etc) use the "Issue - Decision" construct in the Requirements Analysis and Design Analysis modules to capture the issue and, when resolved, the decision. It is useful to manage negotiation with customer using the “status” attribute and/or other attributes you may want to create.

Notice also that a "Rationale" object attribute field exists in the User Requirement and System Requirement modules for "routine" decisions and issues within the responsibility of individual engineers or co-located teams. It is recommended that this mechanism is used to record less significant issues and decisions.

4.3 Identify RISK and key requirements

4.3.1 Introduction

IRDRMFAO provides specific facilities to assist in the management of requirements which are particularly important to the project, either because they are risky or because they are key for another reason (e.g. stage payment milestones). The former category are called ‘Critical requirements’ and the latter are called ‘Key requirements’, and of course some requirements can be in both categories.

4.3.2 critical requirements

During requirements analysis, you may identify some requirements as being particularly risky for the project. To lend weight to them and allow you to follow them closely, IRDRMFAO provides a dedicated view “Critical requirements list”.

The procedure is:

- First step, in the view “Requirements analysis”, set the enumerated “risk impact” attribute. Setting this attribute both marks the requirement as risky and qualifies the type of risk (Technology, performance, cost, delivery,...). Notice that the attribute can take several values.
- Second step, in the view “Risk analysis” (which is filtered on risk, see figure below), you can additionally quantify the level of risk by setting the attribute “Risk Level”, and quantify the probability of the risk occurring by setting the “IE Risk Probability” attribute. A graphic bar chart allows you to quickly spot risk visually,

as 'risky' requirements have a coloured border. This is particularly useful when you unset the filter icon and see the critical requirements among all others.

Risk	PUID	Request for Proposal Module	Status	Risk Impact	Risk Conse...	Risk Probability
	[RFP-REQ-013]	The notes shall be of 10, 50 and 100 units.	Analysis	Cost Delivery	Catastrophic	
	[RFP-REQ-003]	Any blind customer shall be able to use the HMI without any specific help.	Accepted	Technology	Severe effect	
	[RFP-REQ-015]	The customer shall be able to type the requested withdrawal amount : with a simple touch-screen operation, with 3 digits.	Analysis	Technology	Minor effect	
	[RFP-REQ-021]	In order to maintain compatibility with the computer at the bank, the modem speed must be 300 Baud's	Analysis	Performance	Negligible	
	[RFP-REQ-005]	To increase ATM security, the bank should install cameras, rear-view mirrors, panic buttons and special signs.	Accepted	Cost		
	[RFP-REQ-009]	The ATM shall detect any burglary attempt the best way possible taking care of the reliability of the involved security system; for example, surveying with specific sensors any burglary attempts such as introducing inappropriate objects inside any interface to be able to switch off the MMI (out of order), switching on the ATM will then be allowed only by an operator,	Analysis	Operational Use		

4.3.3 Key requirements

During requirements analysis, you can identify some requirements as key for the project. To lend weight to them and allow you to follow them closely, IRDRMFAO provides another dedicated view "Key requirements list".

The procedure is:

- First step, in the view "Requirements analysis", for the key requirements set the boolean "Key requirement" to true.
- Second step, display the view "Key requirement list".

4.4 LINK RMF OBJECTS

Once RMF objects have been identified (Requirements, functions,...), you will have to link them according to the RMF data model (See §2.2 RMF GENERIC DATA MODEL) or your own customization.

There are two steps to link objects:

- Select a link name (optional),
- Link objects.

4.4.1 LINK SET SELECTION

Most of the time, you will not need to select the link name because you will use the default linkset you had already defined (Refers to § 3.2.2 CREATE A NEW RMF Module).

If you have not define the default link set or want to use another one, select a link module which will be the default link set for all links you will make in the current session, until you select another one.

To select a link module, activate the utility by the menu "RMF ->Define default link module" from database window or the module window.

4.4.2 LINKING RMF OBJECTS

4.4.2.1 GENERAL PRINCIPLES

RMF objects are linked with the standard way of DOORS.

Notice that if your RMF objects have a hierarchy, the incoming or outgoing links must connect the main object (father, not children objects).

Caution : Pay attention to respect the directions of the data model links. Notice that in the data model the links are bottom-up oriented. This is not a coincidence, it is for traceability convenience!

Badly oriented links can be corrected with the utility “*Explore -> Project*” (see §4.4.3), from the RMF menu in the DOORS Database window. This tool will point out the linksets that are not compatible with your RMF Project Model.

As you put links inside your project, you will be quickly able to see the effect by displaying the predefined traceability views. Refer to the table §4.1 “*List of standard RMF views*” to quickly locate the right view according to module type and link module.

4.4.2.2 REQUIREMENTS SATISFY UPPER LEVEL REQUIREMENTS

Typically System Requirements (SR) satisfy User Requirements (UR). This is the typical use of the link module “satisfies”, but the data model also allows a cascade of modules of the “*System Requirement*” module type. For example sub-system requirements satisfy system requirements. The link module “satisfies” should also be used in this situation between pairs of modules of the SR type.

4.4.2.3 REQUIREMENTS / FUNCTIONS ARE ALLOCATED TO CONFIGURATION ITEMS

System Requirements are allocated to Functions and Functions are allocated to Configuration Items, both using the link module “is allocated by” . This is the correct methodology. IRDRMFAO also allows Requirements to be allocated directly Configuration Items, again by using the “is allocated by” link module.

4.4.2.4 LINK RMF OBJECTS WITHIN A SAME MODULE

It is possible to link objects within a same module. One use of a such links is to model an additional hierarchy. to that modelled by standard DOORS headings, for example if the DOORS hierarchy is used to model a functional decomposition, explicit links could be used to model a physical hierarchy.

Another use is to mimic the implicit DOORS hierarchy with an explicit one created from links, because this greatly facilitates the creation of traceability or impact views, without DXL development. For this situation, IRDRMFAO provides a utility which will automate the process.

For example, if your document structure in DOORS, reflects the decomposition between Capabilities and Requirements, it is possible to automatically generate explicit links between them.

4.4.3 CHECK THAT YOUR PROJECT LINKS CONFORM WITH DATA MODEL

Users working with DOORS may have several DOORS *Link Modules*, either from the RMF Data Model or defined by the users.

The creation of links using for example drag and drop mouse operation will sometimes result in inconsistencies such as being in the wrong direction or being created in the wrong link module.

No automatic consistency checks are provided by DOORS and the only way to ensure the links are compliant with the Project Data Model, is to do check by hand or to use a specific tool. Within IRDRMFAO , this functionality is supported by the **Relationship Manager** tool. This tool allows you to examine your project from the dependencies point of view.

Example:

In the example, you can see that the selected linkset (from “SSS” to “RFP V2”) is not compatible with the model because of three displayed information:

- The arrow containing the name of the link module is “opened” (i.e. no square at the opposite extremity of the arrow)
- The linkset has the symbol **?** in the link module/linkset explorer
- When using the operation “Properties”, the field “Model” has the value “No”

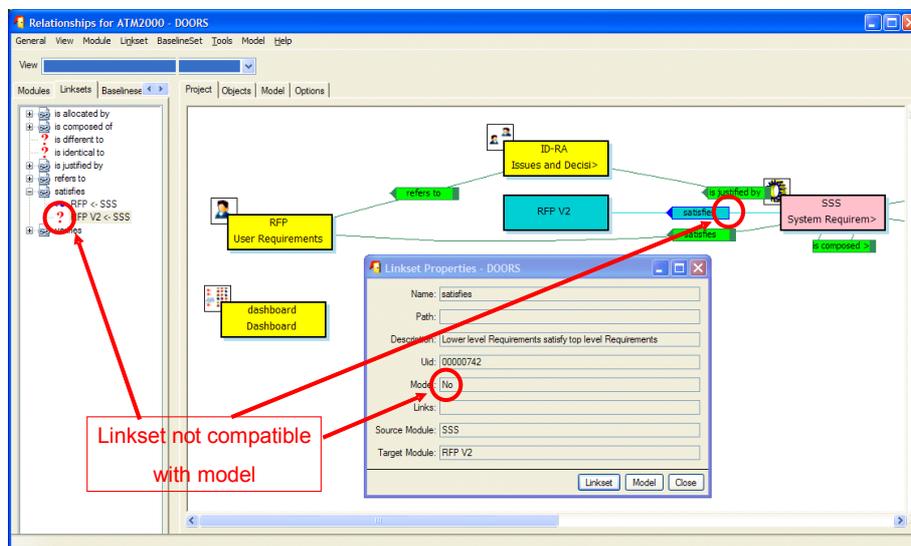


Figure 33 : Invalid linkset in Relationship Manager

The tool offers you a set of operations allowing to manage the linksets in order to make your project consistent with the RMF Project Model:

- Reverse the direction of the links/linkset

- Copying the links/linkset into a different link module
- Deleting the links/linkset
- ...

Refers to the **Relationship Manager** user manual for more details on this tool.

4.5 CHECK DATA CONSISTENCY

When you have identified and linked your requirements, you need to check and validate your data, to detect and correct errors.

This verification may be manual, only by reading the information saved in DOORS, but before this manual task you may detect a lot of errors by using at least one of the two functionalities provided by IRDRMFAO.

- The check project or module consistency tool is able to check a set of some predefined rules.
- The new functionality Integrity Check has been designed to be flexible and opened, allowing the users of IRDRMFAO to define their own integrity rules, specific of the process or of the data model deployed, in order to complement the generic rules already provided by IRDRMFAO.

The two functionalities are different and not compatible. The old one (check consistency tool) will be probably removed from IRDRMFAO in some future version.

4.5.1 CHECK PROJECT AND MODULE CONSISTENCY TOOL

This tool should be used to verify that:

- The unicity of the requirement identifiers
- The model links are only between RMF objects
- The links associated with the RCM objects in the Working or Deleted state.

This tool may be executed at project level or at module level. When executed at project level, all the modules are scanned, and the unicity of a requirement identifier is verified in all the project. At module level, the unicity is checked only in the scope of the module.

To check the consistency of a module, calls the “Consistency check” operation. It opens a dialog box such as :

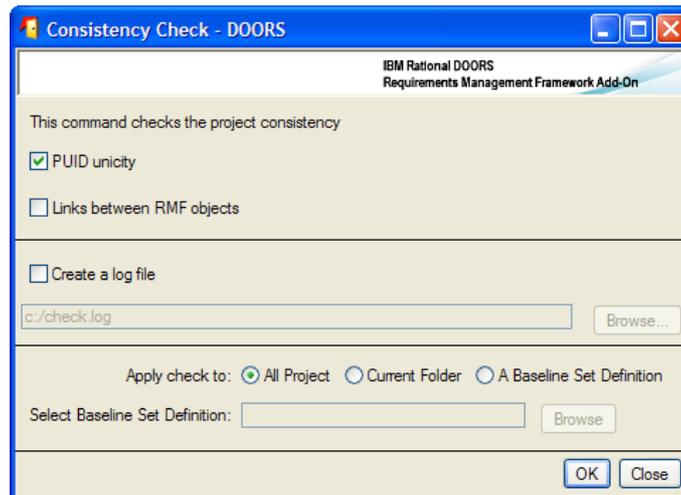


Figure 34 : Consistency check (no RCM configured)

The corresponding check rules are:

- **PUID unicity**: check that each RMF object in the selected scope as a unique RMF identifier (the prefix of each module must be unique)
- **Links between RMF objects**: check that the semantic links (i.e. the relationships defined in the project model) are only between RMF objects. A RMF object is an object with the an “IE Object Type” attribute value non empty.

If the RCM management is activated for the current project, the dialog box will be such as:

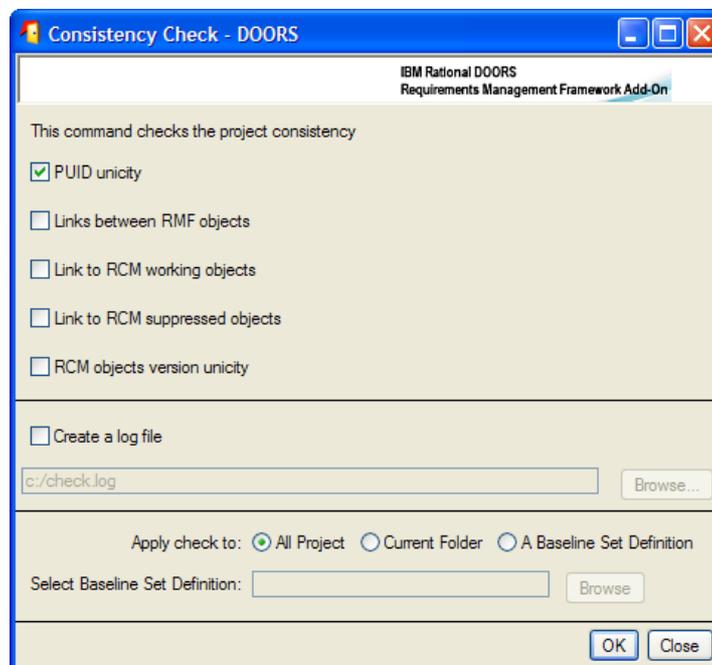


Figure 35 : Consistency check (with RCM configured)

The complementary check rules are:

- **Links to RCM working objects:** check that they are no links to objects with the **Working** RCM status in modules under RCM control .
- **Links to RCM obsolete objects:** check that they are no links to objects with the **Obsolete** RCM status in modules under RCM control .
- **RCM objects version unicity:** check that if there is a link to an object in a module under RCM control, they are no links to another object of the same version graph (for example links to the version 1 and to the version 2 of a requirement).

To have more details about the RCM behaviour you should look at the RCM manual.

The next option allows the definition of a Log file, to memorize the rules violations detected by the consistency check.

The last option is the definition of the part of the project in which the consistency check should be executed. It is possible to select:

- The all project
- A sub-folder inside the project
- A baseline set definition, i.e. a set of modules in the project

After having defined the options, click on the OK button. You get a dialog such as:

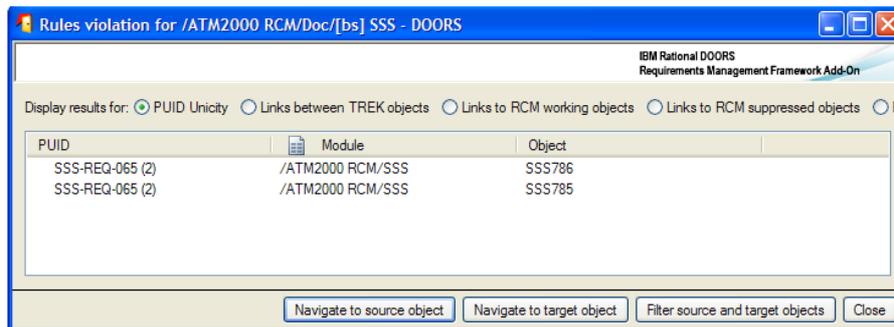


Figure 36 : Violated rules for “PUID unicity”

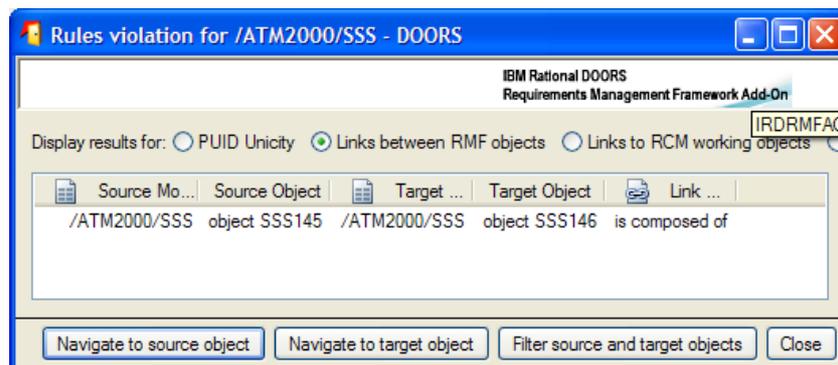


Figure 37 : Violated rules for links

The result list displays the violated rules. To see the different types of violations you must select the rule that you want to examine. The information displayed is not the same, if the violated rule is associated to an object (“PUID unicity”) or to a link (all other rules).

A violation associated with an object contains only the reference of the object (source module and object reference), a violation for a link contains the description of the source and target modules and objects, and also the link module.

The object is described by the RMF identifier if any, or by the DOORS identifier. For an object under RCM control, the version or the status of the object is added to the PUID.

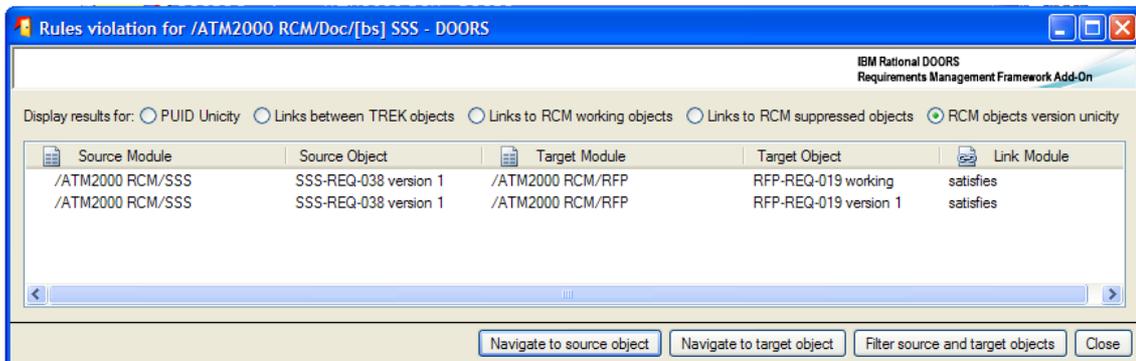


Figure 38 : Violated rules in “RCM objects version unicity”

Example of log file:

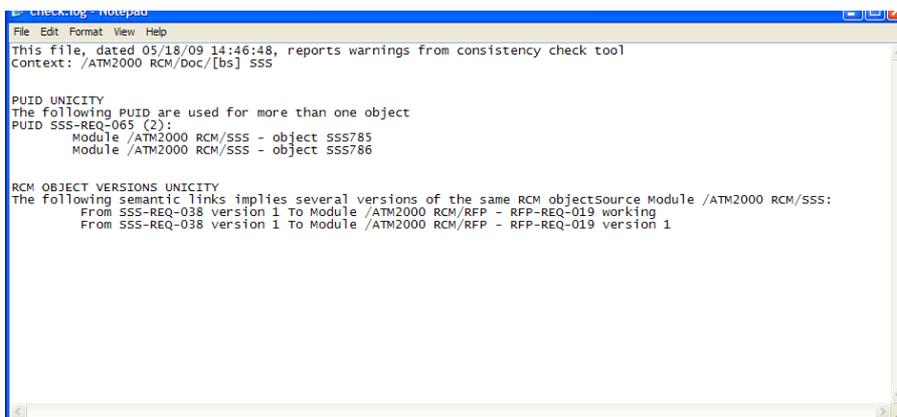


Figure 39 : consistency check log file

To examine the violation you can use the different buttons or execute a double-click on a rule violation. The double-click is equivalent to the “Navigate to object” operation.

The available operations are:

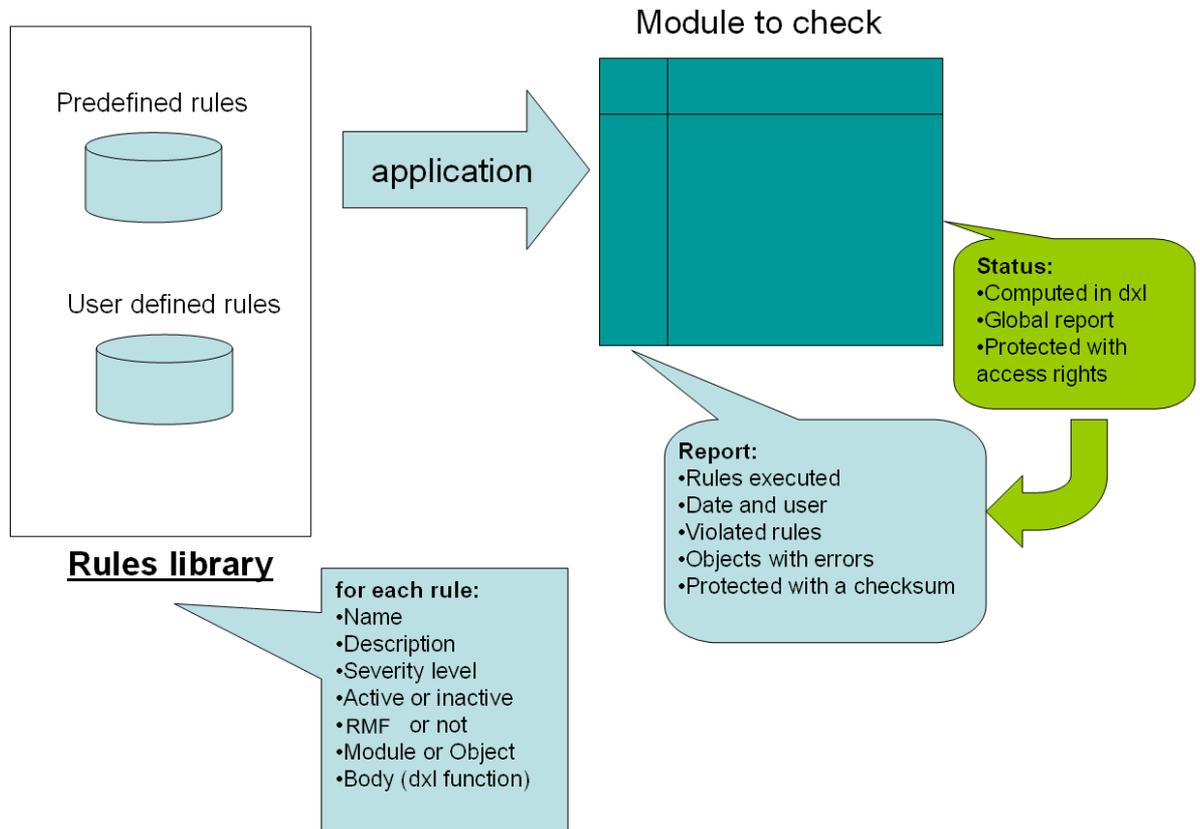
- **Navigate to source object:** open the source module and the source object corresponding to the selected violation
- **Navigate to target object :** open the target module and the target object corresponding to the selected violation
- **Filter source and target objects:** open all source and target modules and filter the objects listed in the violations

You may execute the tool from a module, in this case you do not have the “Apply check” and “Baseline set” fields defined in the dialog box. The scope of the check is implicitly the current module.

4.5.2 INTEGRITY CHECK

A new data verification mechanism has been . This mechanism is more flexible, more automatic and more secure than the previous tool.

Architecture of the Integrity Check:



The rules are defined by coding some DXL functions with an interface like:

```
bool rmf_object_puid_syntax_ (Module, Object, DxlObject)
```

The first parameter is a module to check, the second may be null if the rule is at module level, or it is the current object is the rule is at object level. The third parameter is a DxlObject allowing to store information during the execution of the rule. The result is TRUE if no violation is detected, and FALSE if a violation is detected.

The rules are “linked” with the Integrity Check mechanism, and associated with some information allowing to manage the rule. The different information associated with the rules are:

- The name of the rule. For example “R 1.1.1”.
- The description of the rule. For example “The PUID of a RMF Object must be non empty and compatible with the project or module configuration”.
- The level of the rule: it can be module level or object level.

- The RMF level of the rule: it can be RMF , i.e. only a RMF module or a RMF object should be verified, or not RMF. In this last case any module or object may be verified.
- The severity level. It can be a critical violation (Error) or a non critical violation (Warning).
- The activation status. If the rule is inactive, it can not be seen in the configuration or applied to a module.

The name associated with a rule should be unique for the set of rules (predefined AND user defined).

This information is already defined for the predefined rules, but it is possible to change these values, the corresponding DXL file is not encrypted. The code itself is not public. To modify the behaviour of a predefined rule, you have to inactive it or not to “link” it, and to write a new DXL function to replace it.

At execution time, the set of active rules is applied on the module to verify. The verification of one module is independent of the verification of the other ones: it is not possible for example to check the unicity of the PUID on a set of modules with this mechanism.

When executed on a module, two module attributes will be created if required, and initialized.

IE Check Report	[Warnings] R 2.2=132,359,...
IE Check Status	WARNING

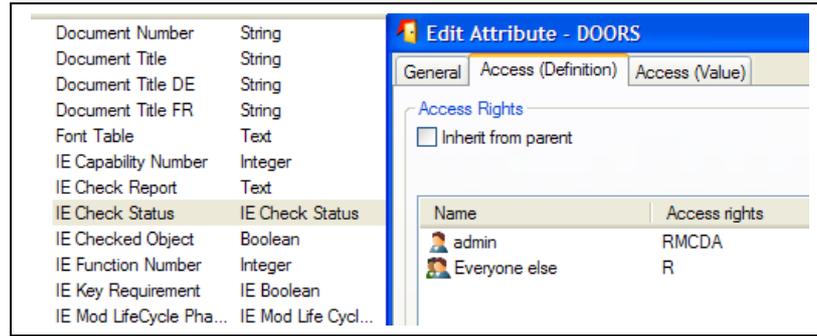
- **IE Check Report** is a Text attribute. It contains the execution report in a compact format.

Example:

```
[Warnings]
R 2.2=132,359,668
[Errors]
[LastVerification]
Author=admin
Date=1232552174
Elapse=1
Rules=R 1.1.1,R 1.1.2,R 1.1.3,R 1.1.4,R 1.2.1,R 1.3.1,R 1.3.2,R 2.1,R 2.2,R 3.1
[Checksum]
Date=1232552174
Value=1303303858
```

The information contained is:

- The list of executed rules
- The date and time of the last execution, with the user and the elapse time
- The violated rules, and the objects on which the rules are violated
- The checksum value
- **IE Check Status** is a DXL enumerated attribute. The code of the attribute is located into IRDRMFAO code and encrypted. The goal is to protect the attribute from any manual modification. The attribute definition is protected with access rights.



Value	Related nu
UNDEFINED	0
OBSOLETE	1
CORRUPTED	2
SUCCEED	3
JUSTIFIED	4
WARNING	5
ERROR	6

The algorithm implemented in the DXL status attribute has been defined to be able to detect any corruption or modification. The different possible values are:

- **UNDEFINED:** no report yet. The rules have not been executed.
- **OBSOLETE:** some modification has been done into the module since the last verification. This status is based on the history. A modification not recorded into the history will not be taken into account.
- **CORRUPTED:** the report checksum is invalid or the format of the report is wrong.
- **SUCCEED:** no integrity violation has been detected.
- **JUSTIFIED:** some integrity violation has been detected, but a Check Manager has “accepted” the report.
- **WARNING:** at least one not critical integrity violation has been detected.
- **ERROR:** at least one critical integrity violation has been detected.

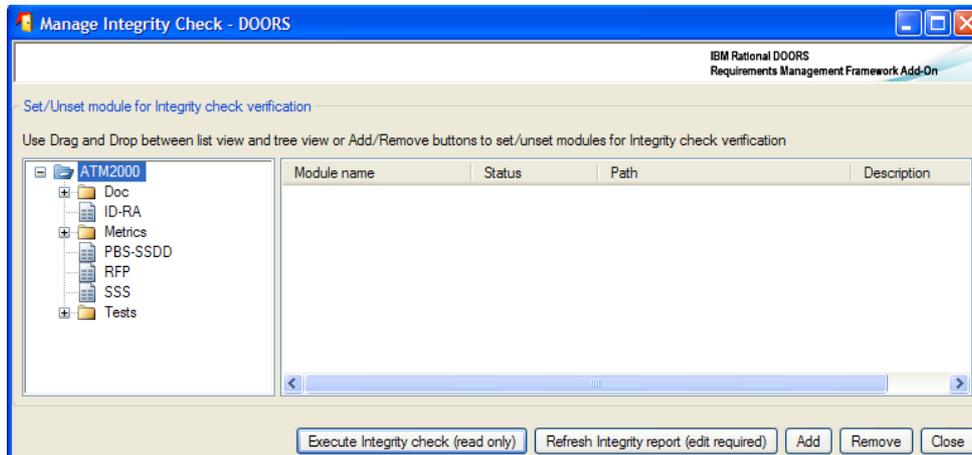
Several possibilities are provided by IRDRMFAO to apply the integrity rules on a given module. You may execute the rules through triggers. In this case the trigger is a module close trigger, applied only if the module has been opened in Visible Edit mode. The trigger must be defined locally for some modules. It is also possible to execute the check directly on user decision, by calling an operation from the graphic user interface. You can apply the check on the current module, it can be also on a set of selected modules.

In any case, you must first define the integrity check configuration at project level to be able to use any of the integrity check functions.

4.5.2.1 Integrity check at project level

You may execute the operation “Manage Integrity Check”. Only a “Check Manager” may use this operation. You should use it only on small size projects, if the majority of users are not well trained.

A dialog box opens:

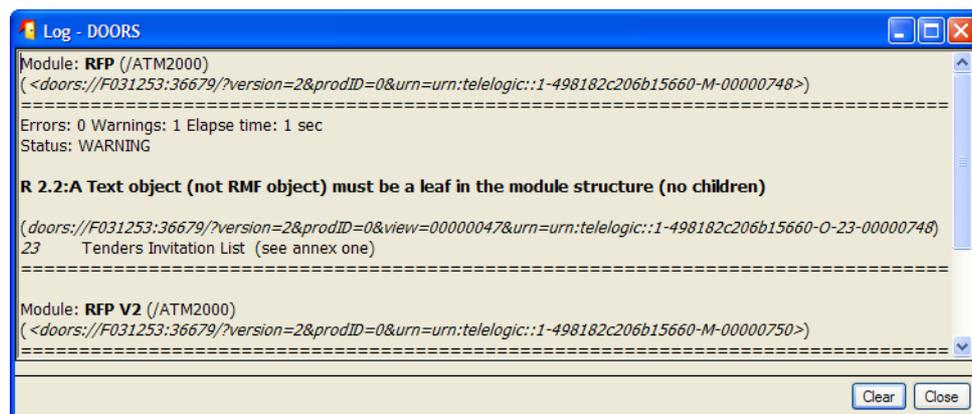


To check the integrity status of a set of modules, you must drag the modules from the tree view to the list view, select one or several modules in the list view and then you may click the button “Execute Integrity check (read only)” or the button “Refresh integrity report (edit required)”.

You may drag a folder or the all project to initialize the list view with all contained modules. You may also select an item in the tree view and click to the “Add” button.

To clear the list view, you may also drag the modules from the list to the tree view, or select one or several list elements and click the “Remove” button.

Example:



Each detected violation is written into the Log window. This window may be saved into a text file or printed. In this mode of operation, no attribute is created into the checked module.

The operation “Execute Integrity check” do not create any report or status attribute into the checked modules, that are opened in read mode. The report is in the log window and the status is in a column of the list view.

The operation “Refresh Integrity report” creates and initializes the report and the status attribute into the checked modules, that are opened in edit mode. The report is also in the log window and the status is also in a column of the list view.

4.5.2.2 Integrity check at module level

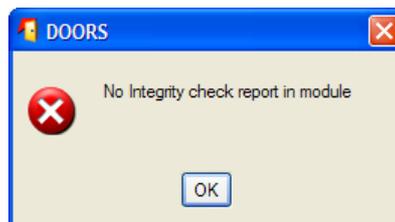
Different operations are possible at module level. The two main operations are “Integrity Check” → “Execute Rules” and “Integrity Check” → “Display Report”.

“Execute Rules” should be used to apply the configured integrity rules for the module. This list of rules to execute may be defined from the project configuration, or from the module configuration if it has been defined locally.

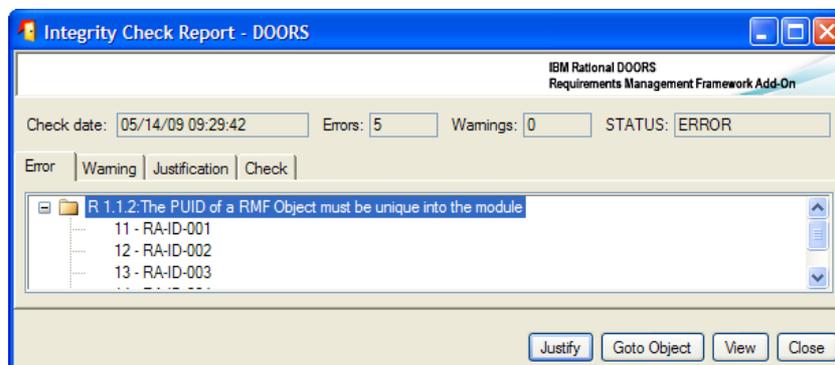
The rules may be executed in Edit mode or in Read mode, and even in a baseline of a module. The report and status attributes are created or refreshed only in Edit mode.

At the end of the execution:

- If no violation is detected, a message is displayed



- If at least one violation is detected, the report display tool is opened:



In Edit mode, the result of the verification is saved into the report module attribute, and it is possible to consult it even after having closed the session, by using the operation “Integrity Check” → “Display Report”. In Read mode, the report is not saved and you will have to execute again the check to find the violations.

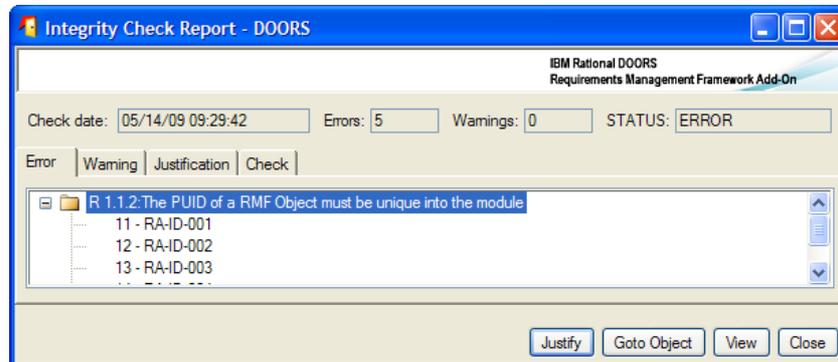
You can also use the operations “Integrity Check” → “Create trigger” and “Integrity Check” → “Delete trigger” to manage the integrity check trigger of the module. It is possible only in Edit mode.

The “Create trigger” operation defines a module close trigger that will apply the integrity rules each time the module is closed after an edit session in visible mode.

4.5.2.3 Integrity check report dialog

This dialog is dedicated to the analysis of the integrity check report information. The information find into the report attribute (or from another source in case of read mode) is compared with the configuration and displayed in a more readable form.

Example of display:



The meaning of the fields in the top of the window is:

- **Check date:** contains the date of the last execution of the integrity check.
- **Errors:** number of critical integrity rules violated
- **Warnings:** number of not critical integrity rules violated
- **STATUS:** global integrity status of the module (identical to the status module attribute)

The different tabs contain the information required to execute a fine grain analysis of the problems.

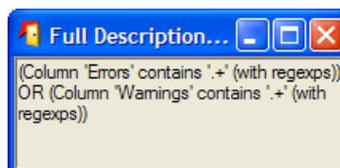
- **Error:** contain the list of violated critical rules, and the objects violating the rules for object level rules

This tab and the **Warning** tab may be used to find easily the wrong objects. You can click on one object visible below a violated rule, or click the “Goto object” button. The corresponding object is selected into the module.

You may also click the “View” button. The current view of the module is modified to display all anomalies into the module:

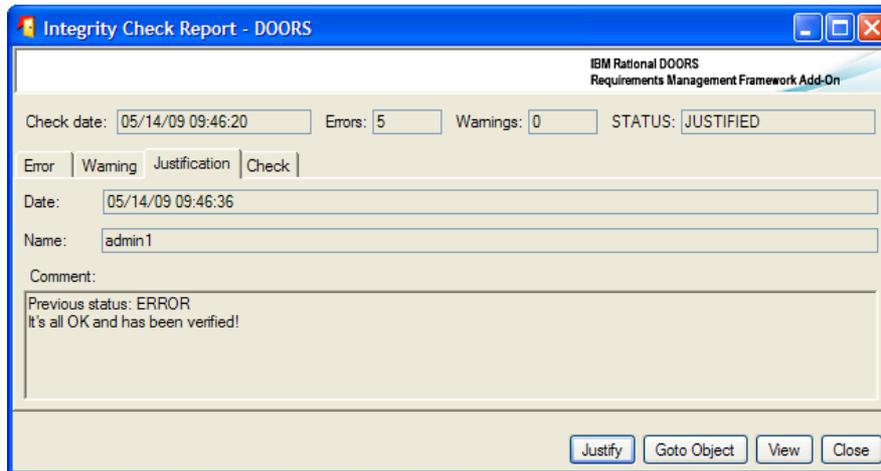
Two DXL columns are added before the main column, to display the rules violated by each object. One column for critical rules and another for non critical rules. These columns are DXL columns pointing to the IRDRMFAO code.

A filter is also created:

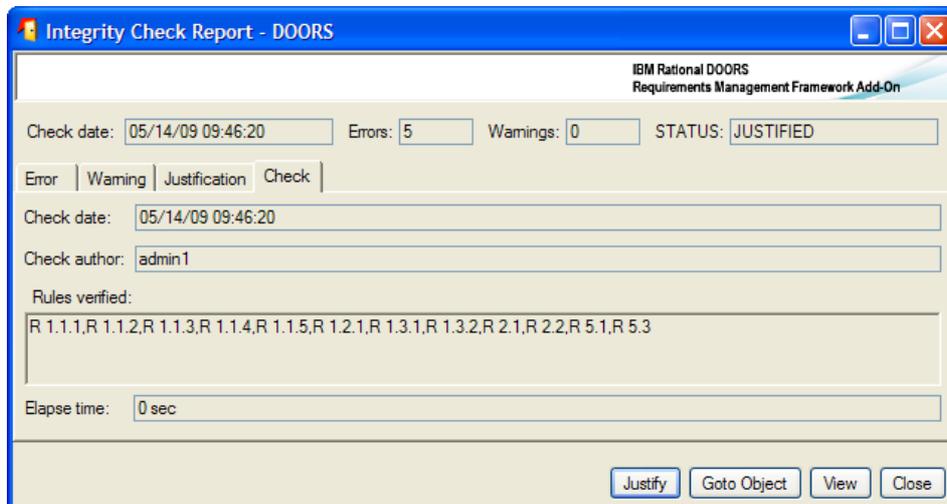


The columns and the filter may be saved into a view. They will be automatically refresh in case of modification of the integrity check report embedded into the module.

- **Warning:** contain the list of violated not critical rules, and the objects violating the rules for object level rules
- **Justification:** if a Check Manager has accepted the report, contains the information required to validate the acceptance. By default this tab do not contain any information. It is not empty only if the integrity check report has been accepted, even in case of error, by clicking the button “Justify”. The definition of a “comment” is mandatory.



- **Check:** contains some useful information about the last integrity check (check date, user, rules in the configuration , elapse time of the check)

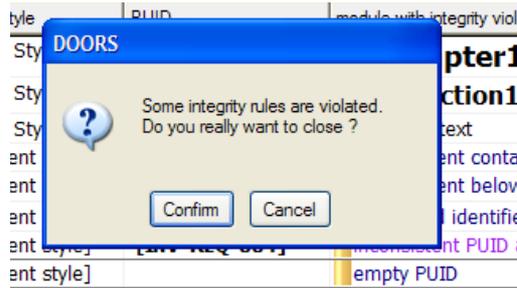


4.5.2.4 Integrity check in triggers

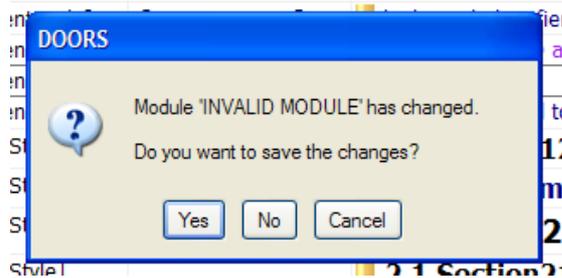
If an integrity check trigger has been defined for a module, at project level or locally at module level, it is a module close trigger that will be executed:

- If all configuration information is consistent
- If the module is in Edit mode and if it is visible
- If the check status is not JUSTIFIED

In case of detection of an error, a confirm message is displayed to prevent from closing the module:



In general, even in case of save before the execution of the close, the execution of the trigger modifies the data inside the module, and you need to save again the module:



If you choose “Cancel” for the first message, the module will not be closed and the check report display box is automatically opened to allow you to repair the errors.

4.5.2.5 Predefined integrity rules

IRDRMFAO contains a set of predefined integrity rules. These rules are generic, and applicable to any project, even if the data model is different from the default RMF model. This set of rules will be extended in the next versions of IRDRMFAO to cover the maximum number of errors.

Name	Description	Level	RMF Level	Criticality
R 1.1.1	The PUID of a RMF Object must be non empty and compatible with the project or module configuration	Object	IRDRMFAO	Error
R 1.1.2	The PUID of a RMF Object must be unique into the module	Object	IRDRMFAO	Error
R 1.1.3	The PUID of a RMF Object must be identical compared to the last Major baseline	Object	IRDRMFAO	Error
R 1.1.4	The Object Type of a RMF Object must be identical compared to the last Major baseline	Object	IRDRMFAO	Error
R 1.2.1	The hierarchical structure of a RMF Object must be compatible with the project or module configuration	Object	IRDRMFAO	Error
R 1.3.1	The origine of a RMF semantic link must be a RMF object	Object	DOORS	Error
R 1.3.2	The destination of a RMF semantic link must be a RMF object	Object	DOORS	Error

R 2.1	The Heading and Text attributes must never be defined together	Object	DOORS	Error
R 2.2	A Text object (not RMF object) must be a leaf in the module structure (no children)	Object	DOORS	Warning
R 3.1	The prefix attribute of a module must not be empty	Module	DOORS	Warning

If you want to modify the parameters associated with the different rules, you have to open the DXL source file:

[IRDRMFAO DIR]/lib/dxl/addins/irdrmfao/check/predefdcl.inc

The file contains a sequence of declarations like :

```
{
    int idx = CheckRuleDeclare(
        "R 1.1.1" ,
        "The PUID of a RMF Object must be non empty and
compatible with the project or module configuration",
        false,
        true,
        true,
        true)
    if(idx != -1)
        put(CHECK_RULE_TABLE,
            rmf_object_puid_syntax_
            , idx, CHECK_RULE_FUNCTION_FIELD)
}
```

You may modify the different parameters of the call to the function « CheckRuleDeclare », but do not modify the « put » instruction.

The order of the parameters is :

- Name
- Description
- Module or Object level (true is Module level and false is Object level)
- RMF or not RMF (true is IRDRMFAO level and false is DOORS level)

- Criticality (true is Error and false is Warning)
- Activation (true is active and false is inactive)

4.5.2.6 User defined integrity rules

You may replace predefined rules or complete the set of rules by inserting your own rules into the DXL source file:

[IRDRMFAO DIR]/lib/dxl/addins/irdrmfao/check/userdef.inc

This file contains already three examples of rules:

- R 5.1. This rule checks that an object is not empty, i.e. that the Object Heading or the Object Text attributes have a value. The rule is an object level, IRDRMFAO level, not critical rule.
- R 5.2. This rule checks that the module attribute “ModStatus” is not empty if it is defined into any module (RMF and not RMF). The rule is a module level, not IRDRMFAO level, critical rule.
- R 5.3. This rule checks that the object attribute “ReqStatus” is not empty for a RMF object, if it is defined into a RMF module. The rule is an object level, IRDRMFAO level, critical rule.

The interface of all rules is identical:

```
bool <function_name> (
    Module curMod,
    Object curObj,
    DxlObject context
)
```

The call of the function by the integrity check mechanism depends on the declarations associated with the function:

- **Module level**

The *curObj* and *context* parameters are not used. The function is called only once for a module.

- **RMF level**

The function is called only for a RMF module, i.e. a module with the module attribute “IE Mod Type” not empty.

- **Not RMF level**

The function is called for any module.

- **Object level**

All parameters are used. The parameter *context* is always defined. The function is called a first time with *curMod* defined and *curObj* null. The goal is to give the ability to the function developer to initialize some data that are saved into the DxlObject object, for example a skip list to memorize a list of values. Then the function is called on the different objects to check. Finally, the function is called with *curMod* null. The goal is to give the ability to the function developer to release the data saved into the DxlObject during initialization or function execution. The DxlObject object itself must not be

deleted. You can also test the execution of the constructor by using the “init” field of the DxlObject. It is defined to “false” by IRDRMFAO before calling the constructor, and to “true” after.

- **RMF level**

The function is called on non deleted RMF objects (only the root in case of a composite RMF object).

- **Not RMF level**

The function is called on all non deleted objects.

When developing new rules, you must pay attention to their robustness and efficiency, because it can be executed many times and on any module of your project, specifically if you decide to check integrity rules with triggers at module or project level.

5 Defining the IVV solution

5.1 Introduction

Each RMF object identified as a “Requirement” in UR/SR modules is a "Reference Requirement" and should be formally tested (Refer to SYS-EM methodology). The test is described as an Integration, Verification or Validation test according to its level (Refer to SYS-EM methodology), in summary the terms are applied as follows:

- User Requirements are proven by Validation testing,
- System Requirements are proven by Verification testing, and
- Design Requirements/Specifications are proven Integration testing

Each test should be defined in terms of (1) its method, (2) who the approval authority will be and (3) where (i.e. at what level) the test will be performed. The collection of these three definitions for a requirement is termed its 'IVV solution'. In addition, the IVV solution usually contains some form of textual description of the scope of the testing, which acts as a constraint on customer aspirations for unnecessarily rigorous test regimes.

The RMF object that holds the IVV solution is called a test procedure. These procedures are typically located and identified in modules of the IVV type, and are linked to requirements with a “Verifies” link.

This means that each "Reference Requirement" must be reached by at least one "Verifies" link from an IVV module. The end objective is to ensure that the customer and contractor are both satisfied that the IVV solution defined is adequate to prove the requirement, and therefore a good basis for progressive project sign-off.

The standard RMF datamodel reflects these three levels of IVV solution, but uses the same generic module type “IVV” for initializing any level.

Comments: In the case of a SSS document, Section 4 requirements are very general and not linked requirement by requirement to section 3. In the SSS section 4, we found a verification matrix (method used for each Req.) which corresponds in DOORS to a devoted view "Verification matrix" in SR module. The Enhanced Word Exporter is able to generate this matrix in SSS section 4.

The following sections describe how the various aspects of the IVV solution should be defined and controlled, and how RMF attributes and views can assist. The detailed definition of the attributes, relationships and views of the IVV module type are given in Appendix A Section 5.

5.2 IVV OBJECT ATTRIBUTES

5.2.1 IE Object type

The default setting of this attribute is “IVV Procedure”.

Suggestion: Small projects may find it convenient to customize their IVV module by introducing three different object types for Integration, Verification and Validation Procedures; rather than having three separate modules, one of each module type.

5.2.2 IE PUID

This attribute is the unique RMF object identifier, generated automatically by IRDRMFAO . Identifiers are not normally re-used, unless the utility “Renumber objects PUID” is invoked. The structure is detailed in Appendix A Section 5.

5.2.3 IE IVV Type

This attribute defines whether the IVV procedure applies to design or production testing, or both.

5.2.4 IE IVV Test Method

A test method (Inspection, Analysis, Demonstration or Test) is associated with each procedure.

This information is accessible by means of the “IVV matrix” view within any module type (not only in IVV module type).

Comments: The method information (LADT) is located in IVV module for a methodology reason: test choices are very important, and bad choice could be catastrophic in term of cost. So, this way obliges the system engineer to create a "test procedure" object before setting the method attribute and he is thus forced to consider the testability whilst defining the requirement. The alternative (which is not prohibited in IRDRMFAO) is to create an attribute "method" in SR module but with the risk that it is either never set or remains at its default value. The recommendation to enter a scoping constraint in the test procedure object reinforces the need to consider testability as the requirement is phrased.

5.2.5 IE IVV APPROVAL LEVEL

The objective is to persuade the customer that only specific key requirement testing need be approved by the customer, and that the tests for many requirements may be approved by the prime contractor or sub-contractors under their enterprise level QA accreditation.

Approval by the customer implies the need for approval of each test specification, each test execution and each test result document. This not only causes much cost to the customer but also adds risk to the programme as more of the customer’s activities get onto the critical path and out of the control of the Project Manager.

The delivered IRDRMFAO offers an enumerated list of four levels, but projects should customize this as appropriate.

5.2.6 IE IVV responsible

This attribute is used to record the name of the person responsible for the IVV procedure, who will usually be from the test or engineering departments.

5.2.7 IE IVV SKILLS

This attribute is used to list any specific skills that are necessary to conduct the tests called up by the procedure.

Suggestion: projects may wish to make this an enumerated field so that filters for specific skill requirements may be set up.

5.2.8 IE IVV EVENT

The third important aspect of the proposed test solution is where or at what event the test is proposed to take place. This could range from a design-proving test on an equipment or software package at a subcontractor's premises through to a system user trial conducted on the whole system by the customer's end user.

IRDRMFAO as delivered sets this attribute as a 'string'. It is recommended that projects customize it to an enumerated list, which should be tailored to suit the particular project being supported. For example, the complete list of factory, harbour and sea trials planned for a naval project could be made an enumerated list type.

5.2.9 IE IVV EVENT PROVIDER

This attribute defines which party to the contract is responsible for planning, providing and/or conducting the IVV Event.

IRDRMFAO as delivered provides an enumerated list of 'Customer', 'Prime Contractor' and 'Sub-contractor'. Projects should customize this enumerated type to define, at least, the names of the sub-contractors.

5.2.10 IE IVV Non Regression

This attribute records whether it is unlikely that a test procedure would need to be repeated in the event of a future change to the system. It is a binary; set to 'True' if the procedure is unlikely to be part of a regression test.

5.2.11 IE IVV Test SCOPE

Documenting and agreeing the objectives and scope of a test are very important; often the customer and contractor have very different views on the extent of testing necessary. For example, if the operating temperature range and the vibration performance are specified in separate requirements, the contractor might assume that vibration tests need only be conducted at standard temperatures whereas the customer might insist on vibration tests across the whole temperature range. The scoping statement would document the agreement on this, and in effect, it becomes an extension of the requirements.

Another example might be where the customer aspiration is for an actual network test with a large number of nodes, whereas the contractor anticipated a small network test and an analysis to justify the performance of the larger network.

5.3 IVV RELATIONSHIPS

5.3.1 JUSTIFICATION

The 'Justification' relationship is used to link the procedure to some rationale in an Issue/Decision module that explains why any attribute of the IVV object has been set in the way it has. Typical usage might be to record why the customer felt it important to conduct vibration testing at temperature extremes.

Initially the relationship would point to an outstanding issue, when the issue is resolved and the resolution is recorded as a decision, the relationship becomes one of "Justification".

According to the standard RMF data model, this relationship is only used for issues with requirements, but projects may customize this model.

5.3.2 UNDER ISSUE PROCESS

The ‘Under Issue Process’ relationship is used to link the procedure to a problem statement in an Issue/Decision module, from which the progress of the Issue/Decision process can be determined. The usual situation is that some attribute of the IVV object cannot be completed until the issue is resolved.

According to the standard RMF data model, this relationship is only used for issues with test support equipment, but projects may customize this model.

5.3.3 VERIFICATION

The ‘Verification’ relationship is used to link the procedure to one or requirements that it verifies, in a Requirement module.

5.3.4 ALLOCATION

The ‘Allocation’ relationship is used to link the procedure to Test Equipment that is necessary in order to execute the procedure.

5.4 IVV VIEWS

5.4.1 STANDARD VIEW

This view is the DOORS standard default view and shows the DOORS unique Object Identifier and the Object Heading/Text, only.

5.4.2 IVV ASSOCIATED ISSUES VIEW

This view is used when it is required to determine whether any issues have been raised about any IVV procedures. It directly provides the identity and description of any issues raised; it is necessary to follow the DOORS link to determine the status and decision of each issue.

Because the view is derived from traceability via incoming “refers to” links, it is most useful when analyzing issues that may have been raised over the allocation of test equipment, for example. Issued raised in the context of how the procedure verifies requirements, should be analyzed using the IVV Justification View.

5.4.3 IVV DOCUMENT VIEW

This view is useful to initiate a standard DOORS export to Word (File, Export, Microsoft Office, Word). The Document Style is used to pick up the Paragraph Styles in the template (e.g. normal.dot), the PUID is ignored and the Object Header/Object text field is printed

5.4.4 IVV MATRIX VIEW

The IVV matrix view is useful to show which requirements an IVV procedure is required to verify. It directly provides the identity and text of each requirement to be verified, from these the standard DOORS links can be followed for more information about particular requirements.

5.4.5 IVV PROCEDURES DEFINITION VIEW

This view is used for the initial definition of the IVV procedure, particularly when agreeing the IVV solution with a customer or a supplier. In addition to the procedure PUID and

Object Text, it shows the attributes most relevant to this phase of a project. It is probably the view that may need to be exported, printed and made contractual.

5.4.6 IVV PROCEDURES PLANNING VIEW

The IVV Procedures Planning View is useful during the progress of the contract to assist in the management of the IVV planning and preparation phases. In addition to the procedure PUID and Object Text, it shows the attributes most relevant to this phase of a project

5.4.7 IVV JUSTIFICATION VIEW

The Justification view is a useful view to use when analyzing why particular IVV procedures are claimed to verify particular requirements. The descriptions of any issues previously raised are directly presented; it is necessary to follow the DOORS link to determine the status and decision of each issue.

Because the view is derived from traceability via outgoing “is justified by” links, it is most useful when analyzing issues that may have been raised in the context of how the procedure verifies requirements. Any issues that may have been raised over the allocation of test equipment, for example, should be analyzed using the IVV Associated Issues View.

5.4.8 IVV TEST EQUIPMENT VIEW

The IVV Test equipment view is used to analyse what test or other support equipment and/or facilities have been allocated to a procedure. The allocation may be amended by adding or deleting links, remember to define the default link module first, and to source any new links in the other (PBS) module.

The descriptions of any test equipment or facility are directly presented; it is necessary to follow the DOORS link to determine any more detail about the support item. These descriptions are derived from incoming “is allocated to” links.

6 Managing your data from a document point of view

6.1 Introduction

In the IRDRMFAO workbench, the data reference is the DOORS database, it is not any documents produced from the database. Data, however, may be imported from word processed documents (e.g. import an external customer document), or data may be output to a word processor and formatted in a pleasing style (e.g. to produce final or intermediate results).

For some people, it could be more convenient to write the major part of a new document outside DOORS with a word processor tool and then import it. Once such a document is imported into DOORS, the DOORS Database becomes the reference. As far as possible, textual modifications should be done within DOORS. Editing DOORS reference data by export from DOORS to a publication tool, and re-importing, is always possible but probably never cost-effective and should be done for consulting only.

Recognising this position, IRDRMFAO provides specific functionality to improve the exchange of DOORS data with external document formats..

6.2 The document view

According to the introduction § 2.3 “DATABASE AND DOCUMENT APPROACHES” each RMF module type provides a view named “Document view” that is set as the default view. This view displays the paragraph style, the PUID and the object text attributes, as shown in Figure 8.1 below. These attributes are there by default in the standard RMF modules and support the standard DOORS export to Word.

The view allows the paragraph style assigned to each object to be viewed, in the column headed ‘Document Style’. Provided this style name exists in the template of the document being exported to, each object will be displayed and printed according to that style definition in Word.

The style for each object may be changed in the Document View using the IRDRMFAO utility “Edit Document Styles”

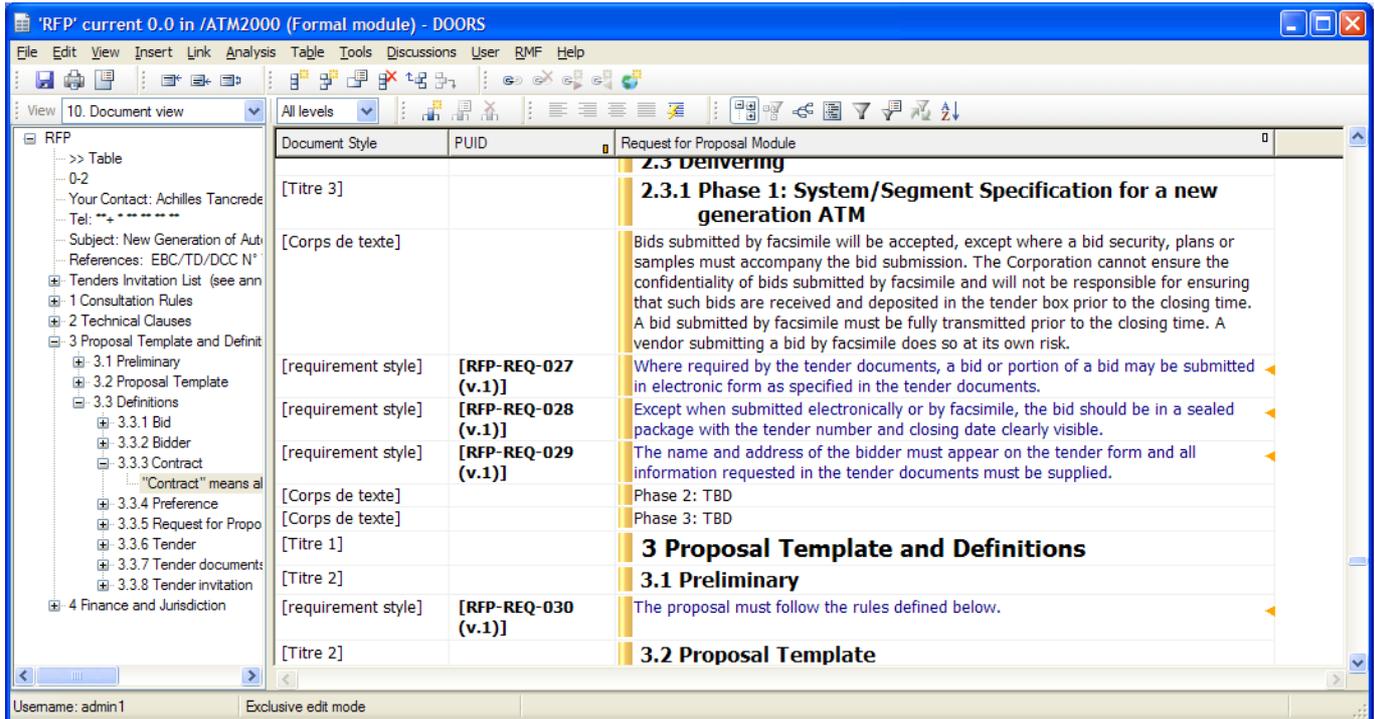


Figure 40 : Example of Document View

6.3 Editing paragraph styles

6.3.1 Using The IRDRMFAO Utility “EDIT STYLE”

The paragraph style for an object, can be modified by using the IRDRMFAO utility “Manage Objects” (the “Edit Style” tab), which provides an enumerated drop down list to choose from. It is also possible to change the object attribute containing the text value, that can be the “Object Heading” or the “Object Text” attribute. The chosen style is applied to the chosen attribute.

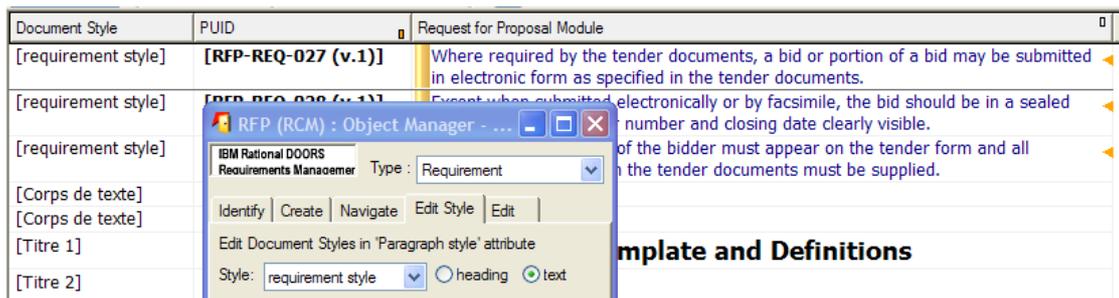


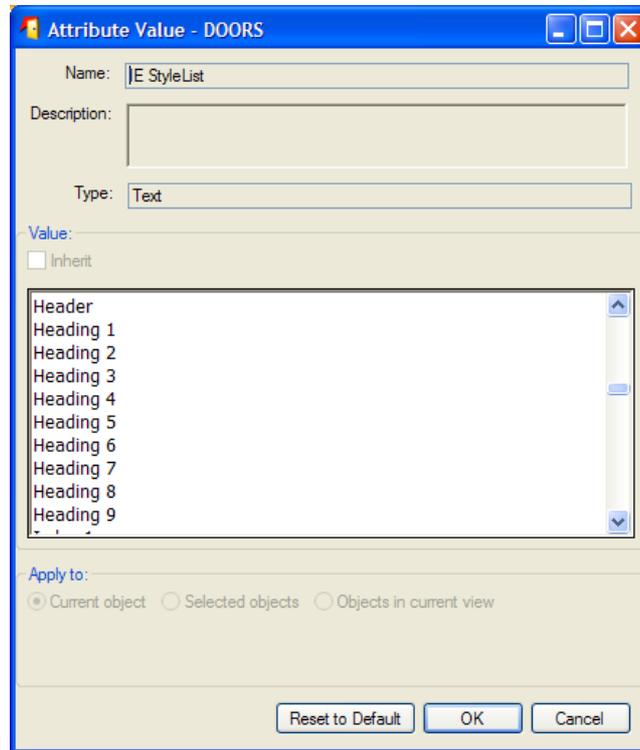
Figure 41 : Edit Document Styles dialog box

The list of paragraph styles offered by the utility comes

- from the Module definition object in the Project Profile module. (The Object definition objects in the Project Profile module define the default paragraph style used when a RMF object is first created or identified). By this means, the enterprise or project documentation formatting style is enforced by IRDRMFAO.

and, also

- from the Module attribute “IE StyleList” value that allows you to let additional styles be available in this module. You shall enter those additional styles as in the example below :



6.3.2 the DOORS standard tool “Edit paragraph style attribute”

DOORS supports the concept of assigning a different paragraph style to each attribute in each object, but this feature is not encouraged under IRDRMFAO. IRDRMFAO recommends a single style for all attributes within each object type, using only the styles defined in the Project Profile module.

The “Edit Paragraph Style Attribute” DOORS tool allows the user to type in Style names for individual attributes. For more information, refer to the Style Definition.

6.4 Exporting a WORD document

There are two ways to export data to WORD: (1) using the standard DOORS Word Exporter or (2) using the IRDRMFAO Enhanced Word Exporter. Briefly, use the first one if you want a quick export but with limited possibilities and if you are not too demanding on the final result. Use the second, if you want to build complex documents, which are updated and edited regularly, with a nice final result and needing practically no retouching on the output.

6.4.1 The standard DOORS WORD exporter

The standard DOORS “Export to Word tool” creates a Microsoft Word document, and exports the current view to it. The structure of the document is the same as the structure of the current view.

You can export in Table format (the document looks like the view you are exporting) or export in Book format (Object Text and Object Headings only, with style applied). Enhanced Word Exporter (WEXP)

6.4.1.1 Introduction

The Enhanced Word Exporter (WEXP) provides many extra features as listed below. It needs to be configured for the particular document you want to create, but once this has been done, the exporter is simple to invoke. This makes it ideal for reports that need to be re-issued at regular intervals.

There are two aspects to the configuration of the customised exporter:

- setting up an appropriate Word Document Template (.DOT) file,
- setting up appropriate RMF views and attributes (at both module and object levels).

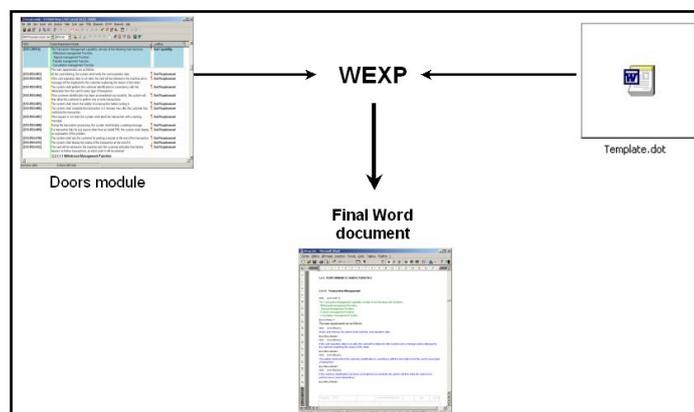


Figure 42 : WEXP representation.

These two aspects are described in the following sections. In addition, the complete example provided in the ATM2000 project example, (inside the “SSS” module), is summarised.

The IRDRMFAO Enhanced Word Exporter actually implements a subset of the facilities available from the full DOORS enhanced export utility.

6.4.1.2 The enhanced WORD EXPORTER

The Enhanced Word Exporter adds lots of new features in comparison to the standard DOORS exporter. The complete features are exposed in the Word Exporter reference Manual . Here are listed some of them:

- Ability to export to a Word Document Template
- Ability to export to a (partially complete) Word Document
- Ability to specify the paragraph style for individual objects and attributes
- Ability to specify a template for the export of different types of object, based on the positioning of object attributes
- Ability to specify the position of arbitrary page breaks in a document
- Ability to export some objects from different DOORS views as Word tables embedded in normal paragraph text
- Ability to export complete views from named modules into the Word document
- Ability to set a filter to export a view different from the view filter (filter defined by another view or by an attribute value)
- Ability to export views constructed from linked objects in named modules into the Word document

Ability to export module attributes into the title page
Ability to export module attributes into headers and footers
Ability to export sections of modules into appendices, or other sections of Word Document Templates
Ability to export attributes as in-line text following the object paragraph
Ability to export attributes as labels on paragraphs
Ability to export requirement numbers against requirements paragraphs
Ability to make one or more indexes of requirements, distinguishing defining occurrences from others
Ability to export multiple modules into a single Word Master Document
Ability to place page breaks at certain places
Ability to place section breaks at certain places with odd even page boundaries
Ability to switch the orientation of the page between portrait and landscape
Ability to rotate the text of headings in tables
Ability to export multiple spanning table headings
Ability to name the repeating header rows in tables
Ability to shade selected table cells
Ability to export embedded OLE objects
Ability to specify the size of OLE objects in the Word document.
Ability to define a figure caption for OLE objects.
Ability to make specific enhancements to the exporter.
Ability to align pages to odd and even numbers.
Ability to place a rubric on blank pages used to align to odd and even numbers.
Ability to scale tables to fit into width of page
Ability to place revision marks on attributes that have changed since a named baselines of the same module
Ability to export a named bookmark at a points in the document
Ability to export hyper-links to other documents
Ability to export hyper-links to within the exported document
Ability to export hyperlinks
Ability to export attributes as footnotes
Ability to export from the current filter in the module
Ability to export from baselines
Ability to export without having to set any DOORS attributes at all
Ability to export entirely in table mode
Ability to export views based on objects linked to the current object
Ability to execute a Word Visual Basic macro after export
Ability to export in non interactive or batch mode
Ability to extract diagrams from UML tools (or more generally external tool).

6.4.2 Creation of a basic Word template (.dot)

6.4.2.1 Style Definition

6.4.2.1.1 Definition of the style used in Doors Modules:

To access to the style definition of objects types, there are declared in the "Config\Project Profile" module; view: "Definitions of the Objects types". You will find the definition of the default types and their style: i.e. "requirement style", "function style", "capability style", etc...

Definitions applying to the current project	IE Object Type	IE Object Prefix	IE Object Document Style
2.1 Requirement object definition	Requirement	REQ	requirement style
2.2 Function object definition	Function	FUNC	function style
2.3 Capability object definition	Capability	CAPA	capability style
2.4 Issue and Decision object definition	Issue-Decision	ID	issue and decision style
2.5 Configuration Item object definition	Configuration Item	CI	configuration item style
2.6 IVV Procedure object definition	IVV Procedure	IVVP	iw procedure style
2.7 Dashboard measure object definition	Measure	METRIC	metric style

Figure 43 : "Project Profil" module view "Definitions of the Objects Types".

Once you have defined styles for a type in the previous module, you can affect objects with these styles with the "RMF -> Manage Object" function of the RMF menu (described above:Editing paragraph styles):



Figure 44 : Edit Document Style.

You can also change object style by changing its attribute "Paragraph Style".

To do so, select the object; display its properties (right click, properties). Then edit the paragraph style field. For example, you want to affect an object to the "OLE style". Fill the attribute with the following text: <Attribute Name:Style Name> (i.e. <ObjectText:requirement style>)

"Style Name" has the exact spelling of a style defined in the template (cf.Style definition in MS Word:).

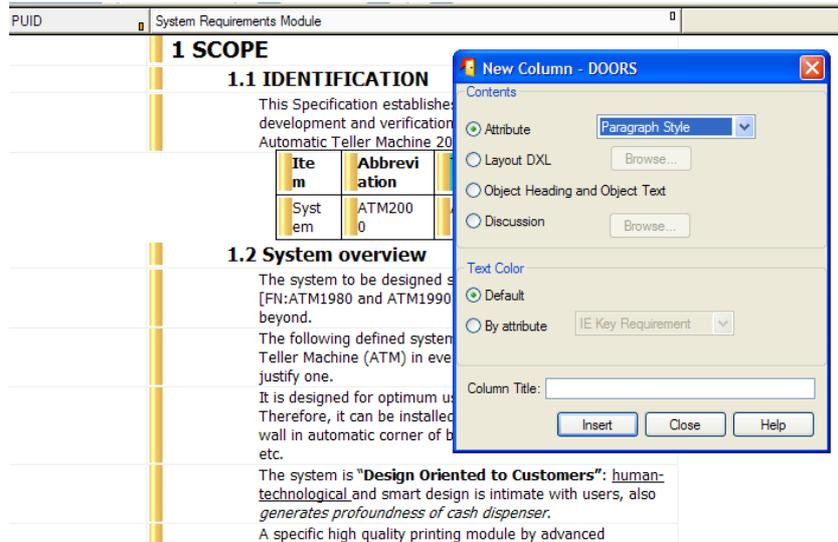


Figure 45 : Creation of the new column with the "Paragraph Style" attribute.

All styles used in Doors have to be defined in the template that you will use for exportations.

6.4.2.1.2 Style definition in MS Word:

To access the style definition, click on the pop up menu: Format/Style.

And the window on the right should appear.

You have to define all styles used in your project, otherwise, the exporter will use the default style: Normal.

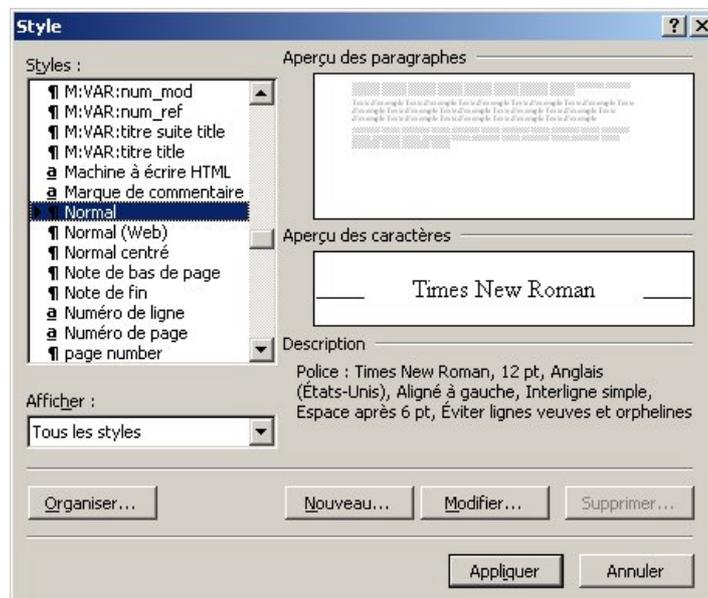


Figure 46 : Editing style in MS Word.

6.4.2.2 Insertion of attributes

6.4.2.2.1 Insertion of attributes in templates

To insert an attribute in templates you need to insert its name in angle brackets: i.e. to insert the document title attribute on the front page: <<Document title >>. While the exportation, WEXP will recognize this "macro" and insert the value of the attribute instead of the "macro". The style used, will be the same as "macro" style of the template.

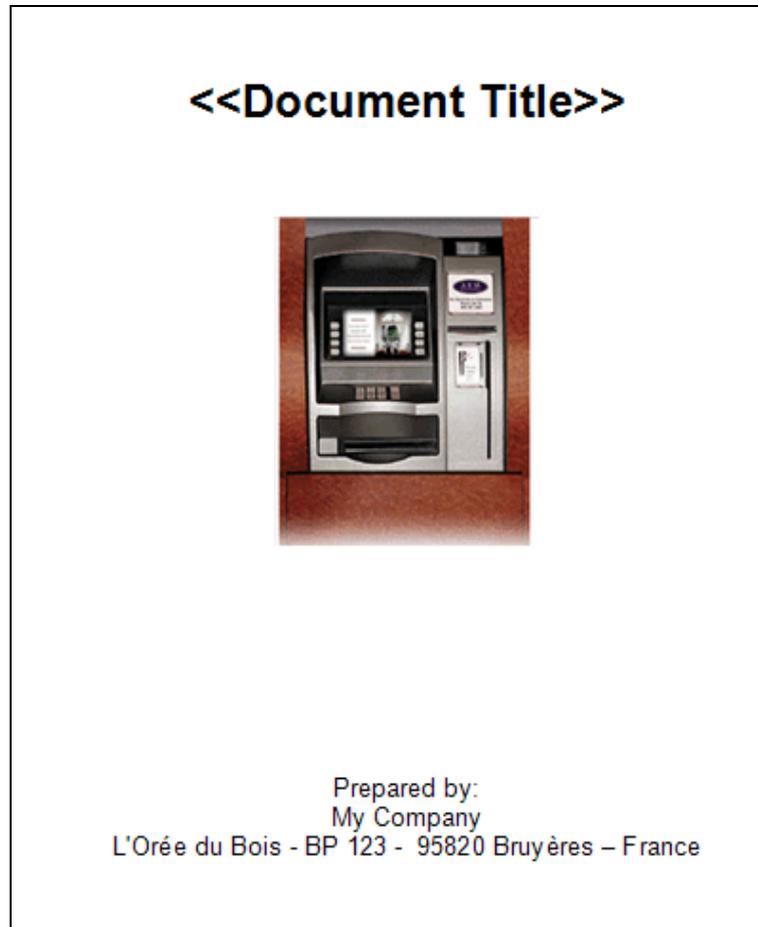


Figure 47 : ATM2000 title page, in the template file.

6.4.2.2.2 example of application:

You can add attributes in headers & footers:

Header:



Figure 48 : ATM2000 header, in the template file

Footer:

Premier pied de page -Section 1 -

UNCLASSIFIED				fr
MY COMPAGNY LOGO	NUMERO DOCUMENT / DOCUMENT NUMBER		FORMAT / SIZE	PAGE
	<<Document Number>>		A4	1/10
				- REV
				←
<small>Ce document et les informations qu'il contient sont confidentiels et sont la propriété exclusive de XXXXXXXX. Ils ne doivent être communiqués qu'aux personnes ayant à en connaître et ne peuvent être reproduits ni divulgués à toute autre personne sans l'autorisation préalable écrite de XXXXXXXX.</small>		<small>This document and the information it contains are property of XXXXXXXX and confidential. They shall not be reproduced nor disclosed to any person except to those having a need to know them without prior written consent of XXXXXXXX.</small>		

Figure 49 : ATM2000 footer, in the template file.

6.4.2.3 Insertion of "Table of contents" & "Table of figures"

6.4.2.3.1 Table of contents:

You can insert a table of contents, which will be updated after an exportation. To insert a table from the pop up menu: Insertion/Tables & Index, then select the "Table of Contents" tab.

Then specify a table as you wish, don't forget to specify the depth of the table in the option:

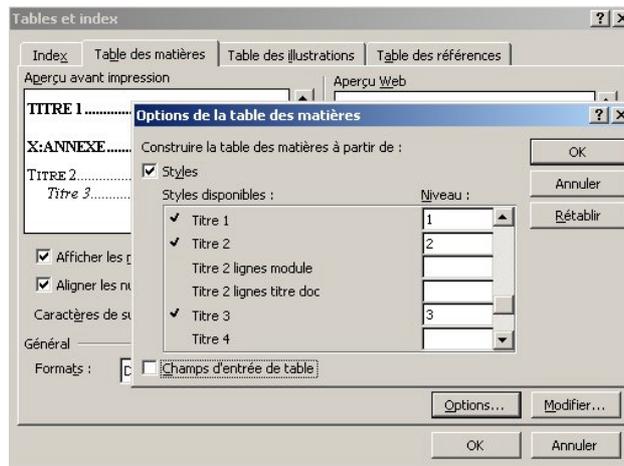


Figure 50 : Table of contents, depth options.

6.4.2.3.2 Table of figures

Like for a table of contents, you can insert a table of figures, which will be updated after the exportation. From the pop up menu: Insertion/Tables & Index, Tables of figures tab.

Then you will have to specify the style to be selected as figures comment in the options, i.e. select the ">fig:titre-title" style, which is the same style used in your Doors Project.

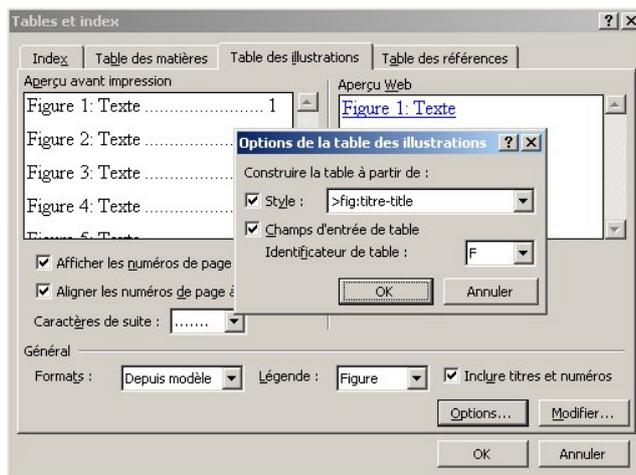


Figure 51: Table of figures, style selection.

Alternatively, you may set the attribute “WEXP Figure Caption” of the object containing the OLE object to specify the title of the figure.

6.4.2.3.3 Display options:

You can change the options of the tables by modifying their "Field Code". To access them, right click a table, then "Toggle macro code"; or from the pop up menu: Tools/options View tab, then check "Field code", or simply update them by calling back the corresponding windows (cf. previous paragraphs).

For the table of figures, when you are displaying the "Field Code", you can modify your choice of style by changing the selected style between quotes.

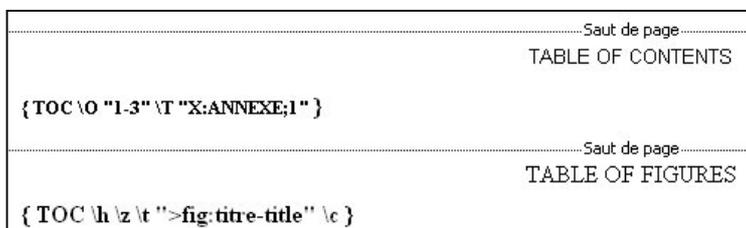


Figure 52 : Field codes of both tables

6.4.2.4 Insertion of bookmarks

6.4.2.4.1 Required Bookmark

If you don't insert any bookmark to your template, WEXP will export object text at the beginning of the document, therefore all your tables, revision marks will be moved to the end of your document. To avoid this, will have to add at least one bookmark to your template, generally after tables.

6.4.2.4.2 In the template file

Use the pop up menu: Insertion/Bookmark, and you will get the window on right. As you can see, there are several bookmark declared, you can see two of them (in the red ellipse, to allow the display of the bookmark symbol, go the pop up menu: Tools/options, View tab, then check "Bookmark").

The first bookmark, called "documentBegin" is placed after the last table and the second one is placed in an appendix to export a matrix (in this case, the upper Requirement Matrix of the ATM2000 project).

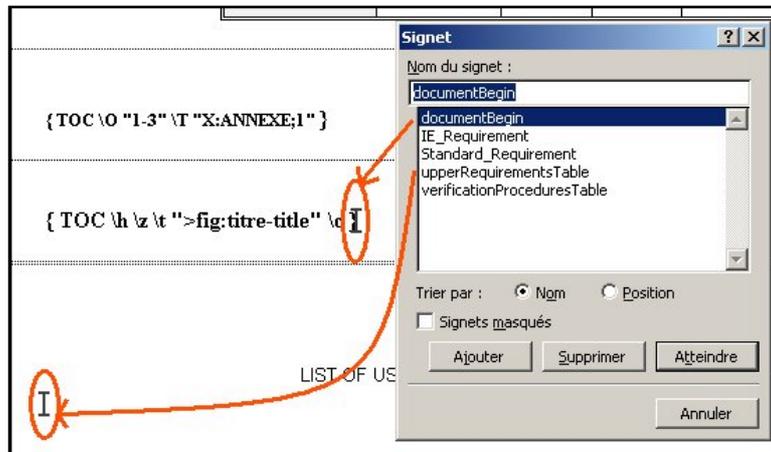


Figure 53 : Visualization of the template bookmarks.

You can add as many bookmarks as you need.

6.4.2.4.3 In DOORS

The configuration in Doors is very simple, I just have to insert the bookmark in the WEXP attribute called: "WEXP BookMark" to the object you want. i.e. The first object of the exported module should have the "DocumentBegin" bookmark. For more information about the WEXP bookmark attribute, please refer to Bookmark attribute..

Object Text	Bookmark	Module View
1 SCOPE	documentBegin	
1.1 IDENTIFICATION		
This Specification establishes the performance, design, development and verification requirements for the		

Figure 54 : ATM200 project, SSS module, configuration of the "WEXP Bookmark" attribute.

6.4.3 Setting up the appropriate RMF Views and Attributes

The Enhanced Word Exporter needs at least two additional views: "*WEXP document export view*" and "*WEXP document maintenance*" view and several additional module attributes and object attributes.

These are initialized for a given module by performing only once the RMF command "*RMF->Enhanced Word Exporter ->WEXP views initialization*", as shown in Figure 37.

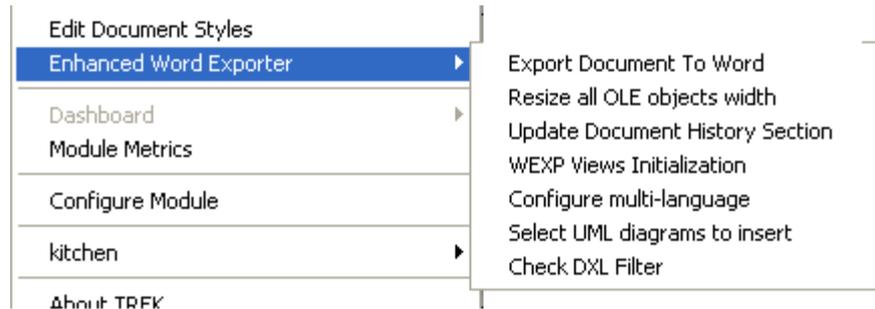


Figure 55 : Initialazing WEXP views

This utility creates:

- The “**WEXP document export view**”: this is the main view used to initiate the export. The Object Heading and Object Text are exported as heading and paragraph, and the values in all other columns, if non-null, are exported as labelled in-line paragraphs underneath. Notice that by default, this view contains a “PUID” column in order to write the identification at the beginning of RMF objects (Requirements,...), and also contains a “End requirement” column to mark it in the generated document. This last column is a calculated one. It takes into account RMF objects composed of an hierarchy of objects. If you don’t want to have all this information (for example if the PUID is already part of the text), you have just to delete one or both columns, and do not forget to save the view.
- The “**WEXP document maintenance“ view**: this is the view for setting the export control parameters, by editing the relevant attributes defined in the next chapter.
- These **object attributes** are needed by the Enhanced Word Exporter and are automatically created if they do not already exist. They are used to control formatting.
- The following **module attributes** are also needed by Enhanced Word Exporter and are automatically created if they do not already exist.

"**Export view name**": Select the view to export.

"**Template name**": Pathname of the template to use

"**Existing document**": If set to a pathname, append in this document.

"**Export file name**": Pathname of the output file.

These values are modifiable in the graphical user interface of the tool. The modifications are stored as default values for the next session.

Additional **module attributes** may be created by the user and used to transmit data fields to the exported document, for example the document name and issue could be inserted on the title page and footer, refer to Wexp reference manual for full details.

6.4.3.1 Extracting UML diagrams

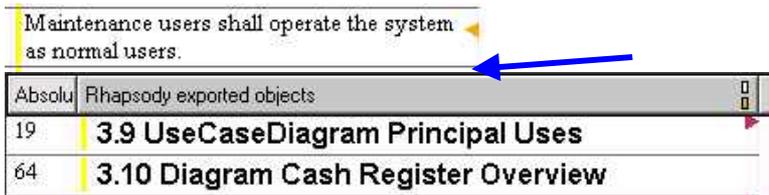
6.4.3.1.1 Foreword

Currently, only one single UML modeling tool is “natively” supported : Rhapsody. However this functionality was designed so that you can design yourself other interfaces towards other modeling tools. Contact the IRDRMFAO support to get the relevant information.

6.4.3.1.2 Setup

First of all, a surrogate module should be imported from the modeling tool. This module is a kind of table of content of the UML tool data. Use the integration with your modeling tool to do so.

You need then to establish the traceability between your module (to be exported to Word) with the surrogate module data (references to UML diagrams). You have to create those links from the surrogate module to your module. But you can use any link module.

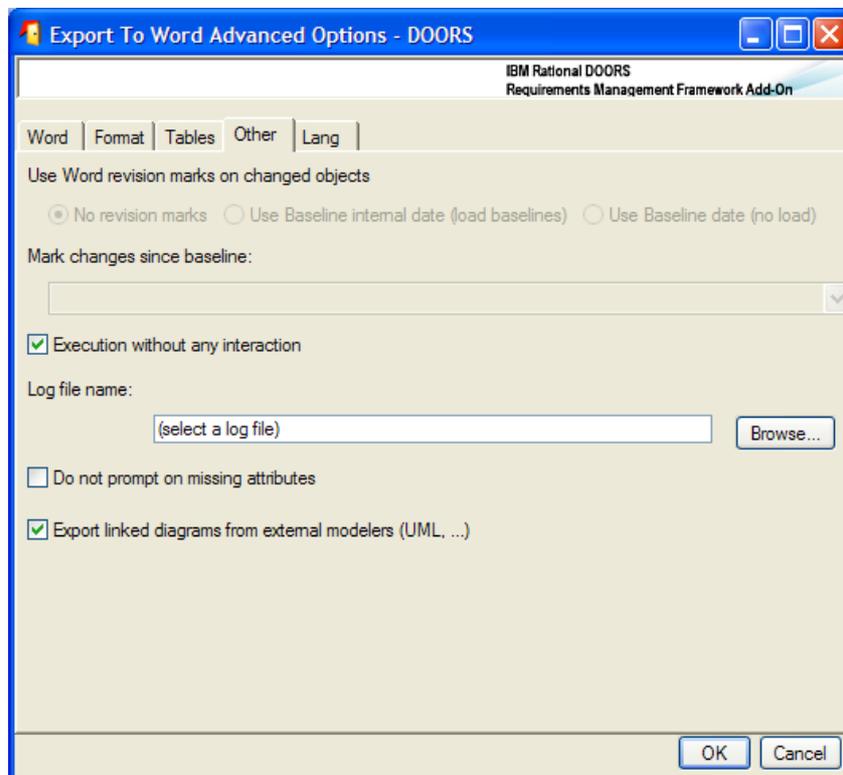


Establish the traceability between the surrogate module and your module

Then select which diagrams should be extracted for each objects which has traceability links from the surrogate module. Run “Select UML diagrams to insert” (RMF ->Enhanced Word Exporter-> Select UML diagrams to insert).

6.4.3.1.3 Export

By default, such diagrams are not extracted. You can have WEXP extract them by checking the advanced option “Export linked diagrams from external modelers (UML, ...)” in the “Other” tab :



6.4.3.2 Bookmark & Export Bookmark

6.4.3.2.1 Bookmark attribute:

As explain in the paragraph: "Insertion of bookmarks", you can decide to export Objects wherever you want in the word document, but you will need to define bookmarks into the template file, and insert those defined bookmarks into the Wexp attribute called "WEXP Bookmark" on the cooresponding object.

The following screen shot shows that the first object will be placed on the "documentBegin" bookmark.

Warning: bookmarks are case sensitive, and do not tolerate space: i.e. "Document Begin" is not a valid bookmark.

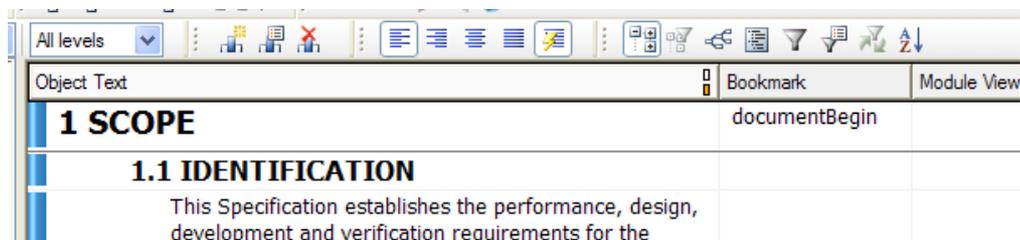


Figure 56 : ATM200 project, SSS module, configuration of the "WEXP Bookmark" attribute

The next screen shot shows that matrixes will be exported in defined places, in this case in appendix A for the "Satisfy Matrix" and Appendix B for the "Verification Matrix":

<i>Enhanced Word Exporter example: insertion of a complete view (Wexp example table UR satisfied) in appendix A. The location is specified in the template by a bookmark ("Signet" in french) named "upperRequirementsTable" . This object text will not be exported.</i>	upperRequirementsTable	SSS	Wexp RFP satisfied Matrix
<i>Enhanced Word Exporter example: insertion of a complete view (Wexp example table Verification) in appendix B. The location is specified in the template by a bookmark ("Signet" in french) named "verificationProceduresTable" . This object text will not be exported.</i>	verificationProceduresTable	SSS	Wexp verification Matrix

Figure 57 : Configuration of bookmarks for exporting matrixes in appendix.

6.4.3.2.2 Export Bookmark attribute:

A named bookmark can be inserted into the Word document as user-determined points.

This is achieved by placing a single bookmark name into the attribute "WEXP Export Bookmark" on the appropriate object.

Word will not accept bookmark names with spaces in them, so the exporter will do a conversion by replacing spaces by underscores. The user is prompted to accept and save such conversions.

6.4.3.3 Module Name \ Module view \ Export Style

You will need to configure these attributes to export an object from on a different view, or a whole view.

6.4.3.3.1 Export Style

When exporting a view, you have the choice to export this view as a book or a table.

As a book means that each columns will be exported as a new paragraph and exporting as a table means that the exportation will keeps the table view configuration.

For example, these objects:

PUID	System Requirements Module	Physical characteristics	IE Req Category
	<i>THE FOLLOWING TABLE IS JUST HERE TO GIVE AN EXAMPLE OF THE ENHANCED WORD EXPORTER CAPABILITY: INCLUDING A TABLE IN A DOCUMENT FOR SOME OBJECTS.</i>		
SSS-REQ-084	Communication	RS-232/422 X25	Performance
	CCTV Camera	Option	Security
	Dimension	580(W) x 835(D) x 1352(H)	
	Power Supply	220/110V, 60Hz	

Figure 58 : Portion of the "Hardware characteristic" view of the SSS module, ATM2000 Project

Result of the exportation in book format: (cf. Description of columns options)

System Requirements Module: CCTV Camera

Physical characteristics: Option

IE Req Category: Security

System Requirements Module: Dimension

Physical characteristics: 580(W) x 835(D) x 1352(H)

IE Req Category:

System Requirements Module: Power supply

Physical characteristics: 220/110, 60Hz

IE Req Category:

And in table format :

System Requirements Module	Physical characteristics	IE Req Category
Module: CCTV Camera	Option	Security
Dimension	580(W) x 835(D) x 1352(H)	
Power supply	220/110, 60Hz	

6.4.3.3.2 Module View

For an object, if you leave the attribute "Module Name" empty and you fill in the "Module view" attribute, you will export this object as it is displayed in named view, in function of the "Export Style" attribute.

For example, in the export view we have:

_PUID style	System Requirements Module	_endReq
	<i>THE FOLLOWING TABLE IS JUST HERE TO GIVE AN EXAMPLE OF THE ENHANCED WORD EXPORTER CAPABILITY: INCLUDING A TABLE IN A DOCUMENT FOR SOME OBJECTS.</i>	
[SSS-REQ-084]	Communication	End Requirement
	CCTV Camera	
	Dimension	
	Power Supply	
3.2.5 system quality factors		

Figure 59 : Portion of the "WEXP Document export view" of the SSS module, ATM2000 Project

But we want to export the hardware characteristics described in the "Hardware Characteristic" view:

PUID	System Requirements Module	Physical characteristics	IE Req Category
	<i>THE FOLLOWING TABLE IS JUST HERE TO GIVE AN EXAMPLE OF THE ENHANCED WORD EXPORTER CAPABILITY: INCLUDING A TABLE IN A DOCUMENT FOR SOME OBJECTS.</i>		
SSS-REQ-084	Communication	RS-232/422 X25	Performance
	CCTV Camera	Option	Security
	Dimension	580(W) x 835(D) x 1352(H)	
	Power Supply	220/110V, 60Hz	

Figure 60 : Portion of the "Hardware characteristic" view of the SSS module, ATM2000 Project

So, in the maintenance view we affect the "Module view" attribute to "Hardware Characteristic":

Object Text	Bookmark	Module View	View Name	View Filter
Communication			Hardware characteristic	
CCTV Camera			Hardware characteristic	
Dimension			Hardware characteristic	
Power Supply			Hardware characteristic	
3.2.5 system quality factors				
3.2.5.1 Reliability				
The design based on Innovative function and				

Figure 61 : Portion of the "WEXP document Maintenance" view of the SSS module, ATM2000 Project

Here is the result of the exportation:

PUID	System Requirements Module	Physical characteristics	IE Req Category
SSS-REQ-084	Communication	RS-232/422 X25	Performance
	CCTV Camera	Option	Security
	Dimension	580(W) x 835(D) x 1352(H)	
	Power Supply	220/110V, 60Hz	

6.4.3.3.3 Module name

To export an entire view, like a matrix. You need to fill in the three following attributes:

"Module Name": name of the module where the matrix or the view to export is.

"Module View": name of the view of the matrix or of the required view.

"Export Style": either "Book" or "Table", in function of your needs.

Object Text	Bookmark	Module View	View Name	View Filter
Enhanced Word Exporter example: insertion of a complete view (Wexp example table UR satisfied) in appendix A. The location is specified in the template by a bookmark ("Signet" in french) named "upperRequirementsTable". This object text will not be exported.	upperRequirementsTable	current	Wexp RFP satisfied Matrix	
Enhanced Word Exporter example: insertion of a complete view (Wexp example table Verification) in appendix B. The location is specified in the template by a bookmark ("Signet" in french) named "verificationProceduresTable". This object text will not be exported.	verificationProceduresTable	current	Wexp verification Matrix	
Enhanced Word Exporter example: insertion of a complete view from RFP module (Wexp example compliance table) in	complianceTable	RFP	Wexp compliance Matrix	

Figure 62 : Complete configuration to export an other view (Matrixes)

If the module containing the view is the current module, you can simply enter "current" in the "Module Name" column.

If a module is not in the same folder or project, you shall enter the full pathname of the module in the "Module Name" column like the following example: "/ATM2000/SSS" instead of "SSS".

The result is a table such as the example below:

PUID	System Requirements Module	User Requirements		
SSS-REQ-012	The card will be retained in the machine until the customer indicates that he/she desires no further transactions, at which point it will be returned	RFP	§2.2.1.2.2	[RFP-REQ-007] The dialog sequences shall be secured in a way to avoid the credit card let inside the ATM in case of any swindler disturbing the customer. This means, to shorten the credit card stay inside the ATM and delay any kind of operation after the credit card release.
SSS-REQ-013	The requested amount for a withdrawal shall be approved by the bank in order to be accomplished.	RFP	§2.2.1.5	[RFP-REQ-016] The ATM shall verify that customer's Withdrawal amount is authorized by the Withdrawal amount; if not, the HMI shall present the maximum compatible amount authorized by the Withdrawal amount.
SSS-REQ-014	In case of no specific information from the bank on the max amount authorized for the given customer, the system shall apply a max amount of 1000.	Appen dices	§2.2.1.8	[APP-REQ-123] The maximum amount that can be retrieved should not excess 1000, unless specifically stated.
		RFP	§2.2.1.2.1	[RFP-REQ-006] The bank shall be able to limit the amount of cash that can be withdrawn on a daily basis.
			§2.2.1.5	[RFP-REQ-016] The ATM shall verify that customer's Withdrawal amount is authorized by the Withdrawal amount; if not, the HMI shall present the maximum compatible amount authorized by the Withdrawal amount.

You can notice that some cells can be split. For more information on this subject, please refer to the WEXP Reference Manual (wexprefman.doc)

6.4.3.4 Page break, Section break & Blank page rubrics

6.4.3.4.1 Page break:

Page breaks can be inserted into the exported document using the enumerated object attribute "WEXP Page Break". The attribute can have the following values:

- Next Page - insert an ordinary page break
- Even Page - insert a section break that aligns to the next even page
- Odd page - insert a section break that aligns to the next odd page

All page breaks are applied before exporting the object text.

6.4.3.4.2 section Break

Section breaks can be inserted into the exported document using the enumerated object attribute "WEXP Section Break". The only purpose for doing this at present is to change the orientation of the page to landscape or portrait. The value of the attribute can therefore be "Portrait" or "Landscape", to indicate the desired orientation.

To affect a page or section break just before a table, the break may be placed on the first cell of the table.

If page orientation is changed to enable a wide table to fit on the page, then the section break attribute should be set on the objects immediately before and after the table, and not on table cells.

If the attribute is not specified, it will keep exporting in the same orientation.

6.4.3.4.3 Blank page rubrics

It is frequently required to place a text on blank pages, such as "This page intentionally left blank."

This can be arranged by switching on the advanced option "Insert blank page rubric on alignment pages", and by placing the text of the rubric in the module attribute "WEXP Blank Page Rubric". The format for this is "Text:Paragraph style".

For instance, the "WEXP Blank Page Rubric" attribute defaults to "(This page intentionally left blank.): WEXP Blank Page Rubric".

The effect of this is to export the text "(This page intentionally left blank.)" as the only paragraph on the blank page using the style "WEXP Blank Page Rubric".

So positioning of the rubric is achieved by creating and using a Word style defined in the DOT file. This style, for instance, can center the text on the page (cf. Style Definition).

6.4.3.5 Index On

The main use of this attribute is the possibility to create a indexes of attributes. The following example explains how to do it.

6.4.3.5.1 Creation of a simple index of attributes (I.E. index of PUID)

To create an index of attribute, you will have to define the attribute "WEXP Index On". You can define it with an attribute name (i.e. IE PUID) followed by a semi-colon. If you forget the semi-colon, it won't be interpreted it as an attribute, but as text.

Object Text	Index On
- Get the envelop from the customer and; - Manage the UI for get envelope operation.	
The main requirements are as follows:	
The system shall ask the customer for the amount of the deposit.	◀ IE PUID:
The system accepts only special envelope (format 22 x 30).	◀ IE PUID:
If the envelope is not in the right format the system displays a warning message and does not accept it.	◀ IE PUID:
3.2.1.2.10 Screen Display Function	
The Screen Display Function shall have the capabilities necessary to display messages to the screen.	▶ IE PUID:

Figure 63 : Configuration of the WEWP attribute "WEXP Index On"

In the template, insert an Index via the pop up menu: Insertion/Tables & Index, Index tab. You don't need the specify any entries, it will take all PUID because it is the only entry.

Example of the result after an exportation:

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UNCLASSIFIED

INDEX TABLE

SSS-CAPA-1, 16	SSS-REQ-003, 16
SSS-CAPA-2, 21	SSS-REQ-004, 16
SSS-CAPA-3, 27	SSS-REQ-005, 16
SSS-CAPA-4, 29	SSS-REQ-006, 16
SSS-CAPA-5, 30	SSS-REQ-007, 16
SSS-FUNC-001, 17	SSS-REQ-008, 17
SSS-FUNC-002, 19	SSS-REQ-009, 17
SSS-FUNC-003, 20	SSS-REQ-010, 17
SSS-FUNC-004, 22	SSS-REQ-011, 17
SSS-FUNC-005, 23	SSS-REQ-012, 17

Figure 64 : Portion of the resulting index of requirements

6.4.3.5.2 creation of several indexes

It is possible to distinguish some index entries from others. To do so, add a "::" after the attribute name and add also a comment, i.e. "IE PUID::CAPA" for a capability object and "IE PUID::FUNC" for a functionality object.

Then in the template, it is possible to create multiple indexes by using the Word "\f <index name>" option on the "INDEX" field code (to display the field code: right click, then "Toggle Field Code").

For example, "WEXP Index On" = "IE PUID::CAPA" causes the index entry to be generated as {XE "....." \f " CAPA"}. The Word index can then be built using {INDEX \f " CAPA"} to contain just those index entries label with " CAPA".

With this example, you will have three indexes:

- One with all requirements
- One with all capacity
- One with all functionality

Appendix D	
INDEX OF ALL CAPABILITY	
SSS-CAPA-1	10
SSS-CAPA-2	14
SSS-CAPA-3	18
SSS-CAPA-4	19
SSS-CAPA-5	20

Figure 65 : Result of the index of capability

6.4.3.6 Footnotes

There are two different ways to insert footnotes in a documents:

6.4.3.6.1 First method, in object text

Insertion of a footnote is very easy, you just need to add in square brackets "FN:" followed by the footnote comment. For example:

We can make footnotes like that [FN: footnote declared in the object text].

6.4.3.6.2 Second method, with Wexp attribute

In the "Object Text" you can add footnotes represented by a number as well by text. Simply add "[FOOTNOTE x]" or "[FOOTNOTE text]" where "x" is a number and "text" is any word.

Then in the "WEXP Footnote" attribute, insert the exact name of the footnote followed by semi-columns and the footnote comment. Note that if you have several footnotes for a single object, you will have to separated each footnote with a carriage return (in the "footnote" attribute):

This Object Text[FOOTNOTE1] is used to show the use of "renvoi en bas de page"[FOOTNOTE fred] We can also make footnotes like that[FN: footnote declared in the object text]	FOOTNOTE1: Comment about this Object Text. FOOTNOTE fred: Footnote in French
---	--

Figure 66 : Example of configuration for footnotes

Here is the resulting output:

This Object Text¹ is used to show the use of "renvoi en bas de page"²
 We can also make footnotes like that³

¹ Comment about this Object Text.
² Footnote in French
³ footnote declared in the object text

Figure 67 : Visualization of the result of the exportation

6.4.3.7 OLE Width & OLE Height

OLE objects embedded in DOORS objects are exported into the Word document. Using the DOORS object attributes called "WEXP Width" and "WEXP Height" can control the size of the objects in Word. The measurement units are millimetres. For DOORS 6/7/8, these attributes are valid only if the object text contains only one OLE object without any text.

If these attributes are not set, it will export the OLE object to its real size.

Example of OLE configuration:

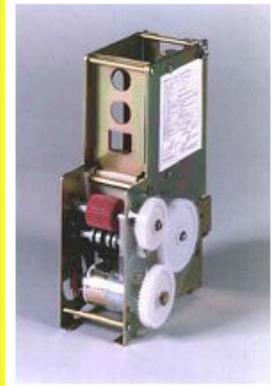
Object Text	OLE Width	OLE Height
	40	80

Figure 68 : Configuration of the size of a OLE object

These attributes are available only for OLE objects compatible with the DOORS 5 format (i.e. only one OLE object at the end of the "Object Text attribute").

A better solution is to use the operation "Resize all OLE object width". The width of all OLE objects will be decrease to be inferior to the width of the main column in the current view.

6.4.3.8 OLE Caption

Object texts containing one OLE object may be exported with a figure or table caption, by setting one of the two attributes "WEXP Figure Caption" or "WEXP Table Caption". The corresponding caption will be automatically inserted into the Figure Index or Table Index.

6.4.3.9 Object Template

Thanks object templates you can export objects with a desired format in few steps.

6.4.3.9.1 In the template

First, we have to define your format in the template.

- At the end of the template file, add a new section.
- Then add a new title called: OBJECT TEMPLATE.
- The next lines will be your object template name followed your the format specification.

For example you want to export each requirement in a formal format:

```

OBJECT TEMPLATES
Template_Name: IE_Requirement

<<IE PUID>>: <<IE Object Type>>

<<Object Text>>

  Author:          <<Created By>>
  Date of creation: <<Created On>>
  Last Modification: <<Last Modified On>>
  Version:         <<IE Req Version>>
  Status:          <<IE Req Status>>

End Requirement

```

Figure 69 : Definition of a object template, in the last section of the template file.

Then select all your format and set it as a bookmark called with the name of your object template (i.e. here, set the bookmark to: IE_Req):

You can declare as many object templates as you want by repeating the 2 last steps.

During the exportation, the object template will be pasted into the document, and then the attribute field will be filled.

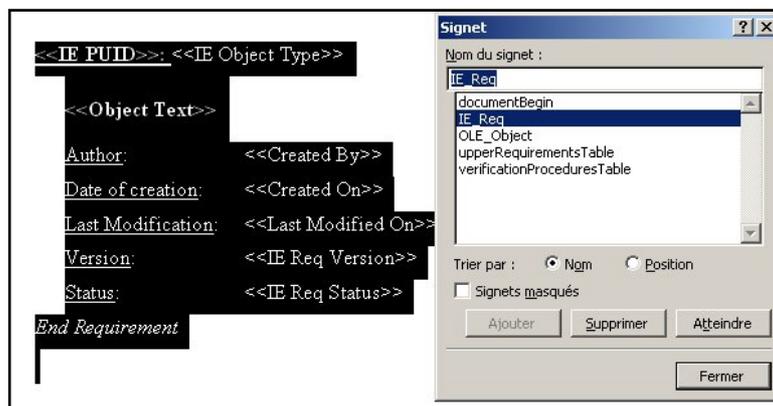


Figure 70 : Affectation of the object template to a bookmark with the same name.

6.4.3.9.2 In Doors

In Doors, fill in the attribute "WEXP Template" with your object template for all desired objects.

Template "Requirement" example:

```

[<<IE PUID>>]
<<Object Text:richtext>>
End Requirement ]

```

For example, select all requirements, edit the properties of one and change its "WEXP Template" attribute and apply the modification to all the selection:

Object Text	Template
regulations for handicapped access to the teller machines, including use by blind customers.	
3.3.2 System Security	
The ATM must have a protection mechanism that ensures that no one can see the number typed by the customer.	requirement
In order to decrease possibility of robbery, the ATM shall be connected to a CCTV camera.	requirement
To protect from network hacking, any data shall be encrypted inside the ATM; in addition, the consistency of any data input shall be verified.	requirement
Special RF-card-key assigned safe that meet UL291 regulation	requirement
The vault shall be electronically monitored in order to provide records and notification of vault entry : in	requirement

Figure 71 : Configuration of the "WEXP Template" attributes.

After the exportation, the last section, corresponding to Object templates, will be removed from the document.

Example of the resulting document:

```

3.3.2 SYSTEM SECURITY

[SSS-REQ-091]
The ATM must have a protection mechanism that ensures that no one can see the number typed b
End Requirement

[SSS-REQ-092]
In order to decrease possibility of robbery, the ATM shall be connected to a CCTV camera.
End Requirement

[SSS-REQ-093]
To protect from network hacking, any data shall be encrypted inside the ATM; in addition, the consi:
End Requirement

```

Figure 72 : Result of an exportation with an object template IE_Req

6.4.3.10 **Filename**

There are two ways to insert a subdocument (but only ".doc" files) into the export file:

6.4.3.10.1 **First Method, with attribute**

A sub-document can be inserted into a Word document at given positions by using the "WEXP File Name" attribute. If this attribute has a value, it is supposed to be the name of a Word document to be inserted at the current position as a sub-document.

The name of the Word document in "WEXP File Name" may be an absolute path, or a path relative to the path of the master document:

Object Text	File Name
Test of insertion of a file placed on a different drive	D:\temp\empty.doc

Figure 73 : Configuration on a "WEXP Filename" attribute to export a subdocument

6.4.3.10.2 Second method, in the Object Text

In the "Object text", add the following syntax "[document file:/" then complete with the full path of the file:

Object Text	File Name
Other possibility to include a file: [document file://d:/temp/empty.doc]	

Figure 74 : Configuration on a "Object Text" to also export a subdocument

If you already have document referenced, you don't need to change the object text with the previous syntax. There is a special command in the WEXP Advanced Options **infra**.

6.4.3.10.3 Creation of a master document

The procedure for combining several modules into a master document is as follows:

1. Export each of the DOORS modules into Word files.
2. Create a master DOORS module that is an index to the DOORS sub-modules. This should contain one object per module to be included, with the "WEXP File Name" attribute set to the name of the file name of the exported sub-document (see tool for assisting in this).
3. Export the master DOORS module.

Thereafter, individual sub-modules can be re-exported without the need to re-export the master module; Word will take care of updating the Master Document.

6.4.3.11 Hyperlinks

DOORS permits hyperlinks to be inserted into attribute text. In the standard DOORS Word exporter, these are exported as ordinary text. WEXP automatically exports these as hyperlinks in the Word document without any special action.

DOORS does not, as standard, allow hyperlinks to be defined with highlighted text different from the hyperlink address, whereas Word 2000 does. Therefore, the exporter recognizes the following pattern enclosed in square brackets as a specification of text to be displayed and highlighted:

Attribute text here [hyperlink text to be displayed "type://www.telelogic.com"] followed by more attribute text.

Where "type" is one of "http", "file" or "ftp".

NOTE: the quote marks surrounding the hyperlink address are optional. If absent, there has to be a space between the hyperlink and the closing square bracket in the DOORS text.

This will result in the following being exported into Word:

Attribute text here [hyperlink text to be displayed](#) followed by more attribute text.
with a hyperlink attached to the underlined text.

A hyperlink within the same document can also be created. The target must be a bookmark, and the address is of the form "#bookmark".

Word 97, like DOORS, does not have this displayed text feature. If exporting to Word 97, the displayed text will be exported followed by the hyperlink.

6.4.3.12 References

The exporter can cause Word to create references on bookmarks. The bookmark may be defined in the template file, or it can be exported by WEXP.

The syntax is similar to the syntax of the hyperlinks:

Attribute text here [refer to "*type:bookmark*"] followed by more attribute text.

where *type* is one of **text**, **title** or **bookmark** and *bookmark* should be replaced by the name of a bookmark.

The nature of the generated reference depends on the type value.

NOTE: when using bookmarks generated by WEXP and generated into text objects, there is no text associated with the reference because WEXP do not generate bookmarks containing text.

6.4.3.13 Description of cells options

6.4.3.13.1 Three possible options:

- "Shaded" with "WEXP Cell shade" attribute: to shade a cell.
- "Rotated Cell" with "WEXP Cell rotate" attribute: to rotated the text of the cell, it can improve the space used in cells.
- "Row header" with "WEXP Row Header" attribute: to make the selected row to be repeated on each new page when tables are greater than a page.

6.4.3.13.2 Affectation of these options

To change a cell option, select it and edit its properties via (Edit/Object/Properties, or Ctrl + E or right click and select properties). Then select the attribute tab, and modify the Wexp attributes as you wish.

For example the following table if the ATM2000 project:

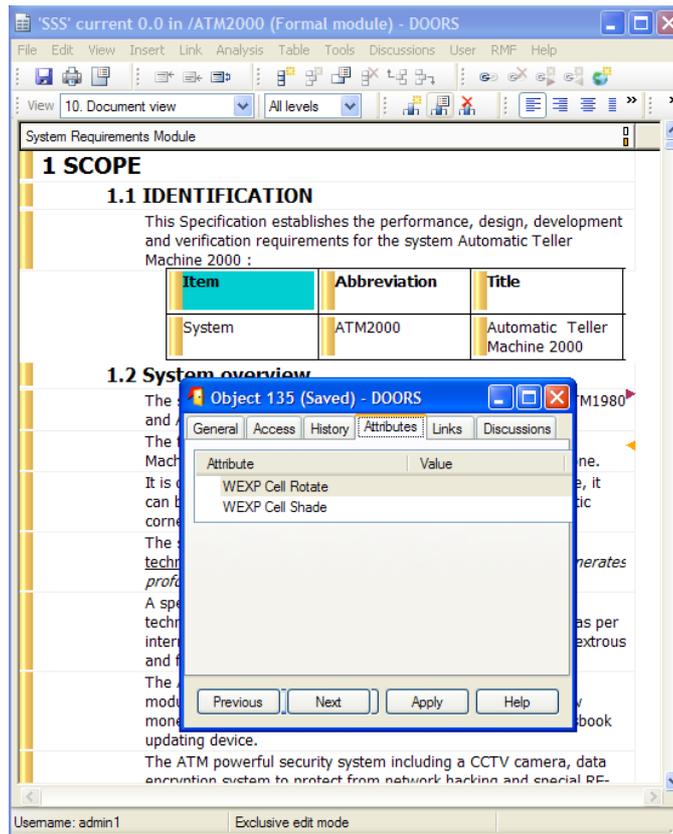


Figure 75 : Accessing cell properties

Result in:

Item	Abbreviation	Title	Identification no.
System	ATM2000	Automatic Teller Machine 2000	
		Example of rotated cell between two shaded cells	

Figure 76 : Exportation result of the previous table

6.4.3.14 Description of columns options

Columns options are used to apply styles to their title and attributes. They are only set to the columns title but are applicable for both title and column. To access this options, you have to display the properties window of columns as shown of figure 9.37.

Here are the different possibilities:

- "Title" : Export "Title : Object Value" as a separate paragraph.
- "Title:style": define a style for both title and objects values.
- "Title;join(\t)": The column will be exported in the same paragraph that its right column but separated by the symbol in brackets.

- "_:style" : export "values" of the column in a separate paragraph in Word Style style.
- "_": Columns title not exported.
- "Title:noexport": Column not exported.
- “span:style”: the header cell shall be merged with the previous one, and the MS Word style “style” be applied to the content of the column
- “span\ntext”: multiple table header rows should be generated (see the WEXP Reference Manual (wexprefman.doc) for more details) (not supported if the table is exported in RTF format).
- "Title R": Rotate the column title (not supported if the table is exported in RTF format).

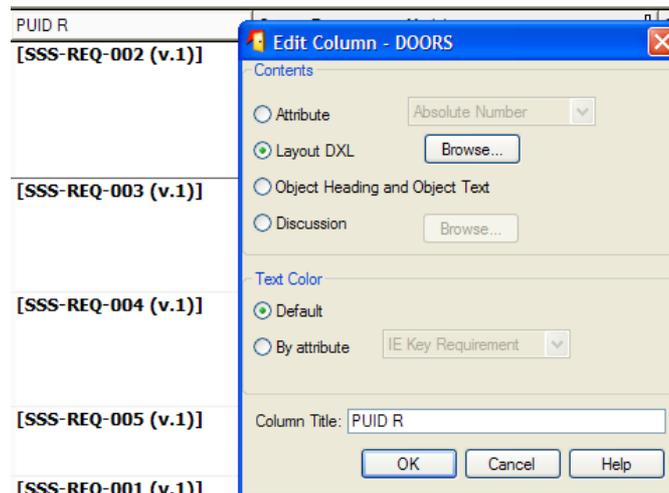


Figure 77 : Editing a title to be rotated

Warning, the style definition of columns on the left of the main column is only applicable if the Wexp Advanced option "Join columns on the left of main column" is not set. (cf WEXP Advanced Options *infra*)

The ATM2000 project example:

To illustrate the Enhanced Word Exporter, IRDRMFAO provides an example of implementation.

☞ Restore the project ATM2000 (File->Restore->Project, Browse <DOORS_HOME>/IRDRMFAO /examples /ATM2000.dpa) and open the module SSS.

👁 Watch the views:

“*WEXP document export view*” and “*WEXP document maintenance*” as described above,

“*Wexp example table UR satisfied*” and “*Wexp example table verification*”: example of insertion of complete views as tables in appendix A and B.

“*Hardware characteristic*”: example of a view used to export a table format for some objects in particular in the §3.2.4.6 of SSS.

Indexes in appendix C,D & E.

☞ Watch the template (<DOORS_HOME>/IRDRMFAO /examples/template.dot):

Bookmarks, attributes in macro, styles, sections, appendix, headers & footers ...

☞ Run the Enhanced Word Exporter and Insert in the appropriate field the valid template pathname installed on your system (<DOORS_HOME>/IRDRMFAO/examples/template.dot), 8.4.

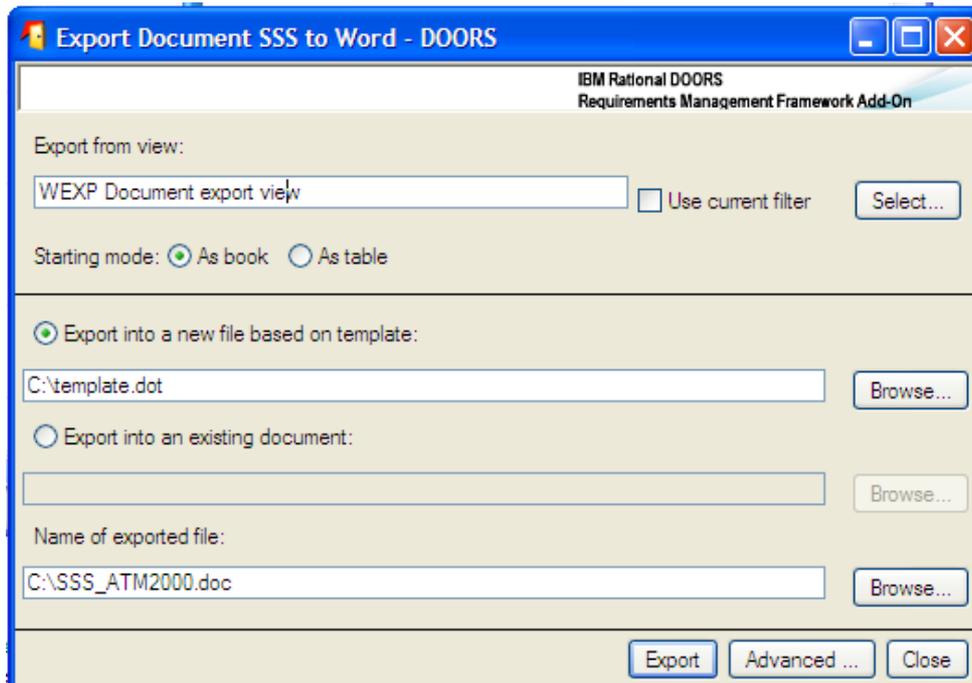


Figure 78 : Enhanced Word Export Dialog Box

In the case of a module under RCM control:

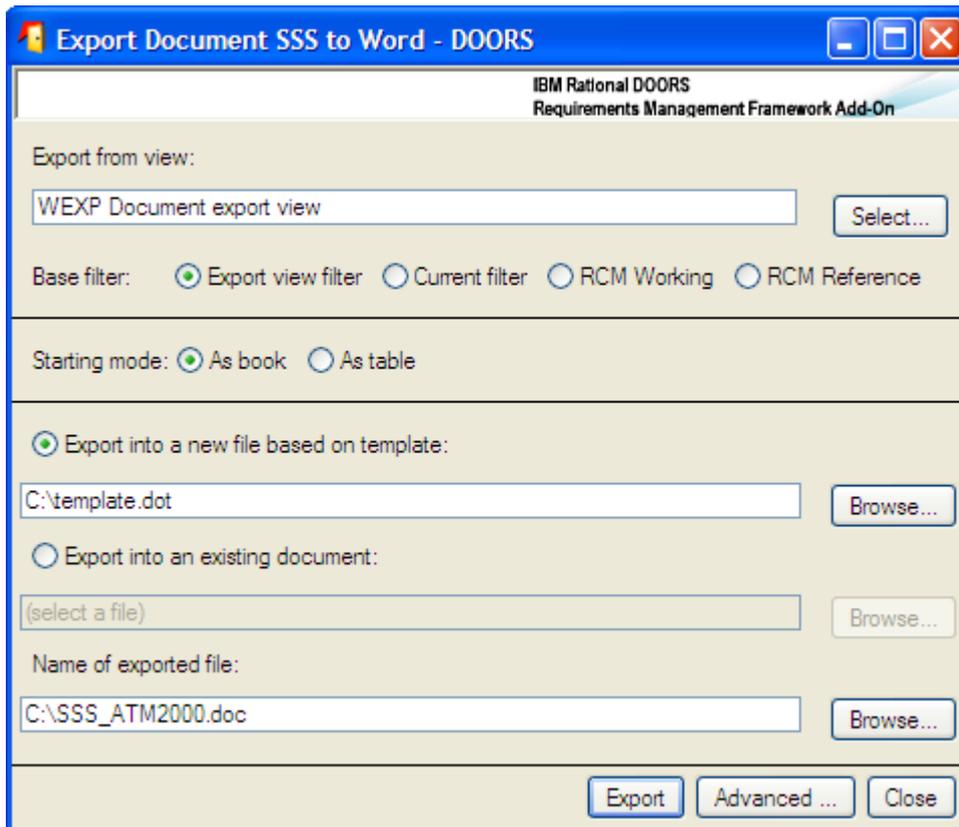


Figure 79 : Enhanced Word Export Dialog Box (RCM)

WEXP Advanced options: look in the WEXP manual to have the list of advanced options.

- 1 The first two options relate to the export of master and subdocuments. By default, the only document exported from the module is the one based in the data of the module itself. You can also ask for all the subdocuments defined in the current module to be exported separately, by selecting the "Export subdocuments referenced in this module" option. Just the subdocuments can be exported by deselecting the "Export document from this module" option.
- 2 By default, the exporter switches off the Word screen update and the window display to speed up the export. You can manually switch the screen update on by clicking in the check box marked "Refresh window".
- 3 You can tell the exporter to execute a Word Visual Basic macro after the export. The macro should exist in the named Word DOT file. The exact name must be placed in the macro name field.
- 4 You can ask the exporter to retain the object templates in the last section of the document to allow subsequent exports into the same document.

exporter will not use RTF format for the inserted views in table format

7 Datamodel customization

7.1 DESCRIPTION OF A RMF PROJECT STRUCTURE

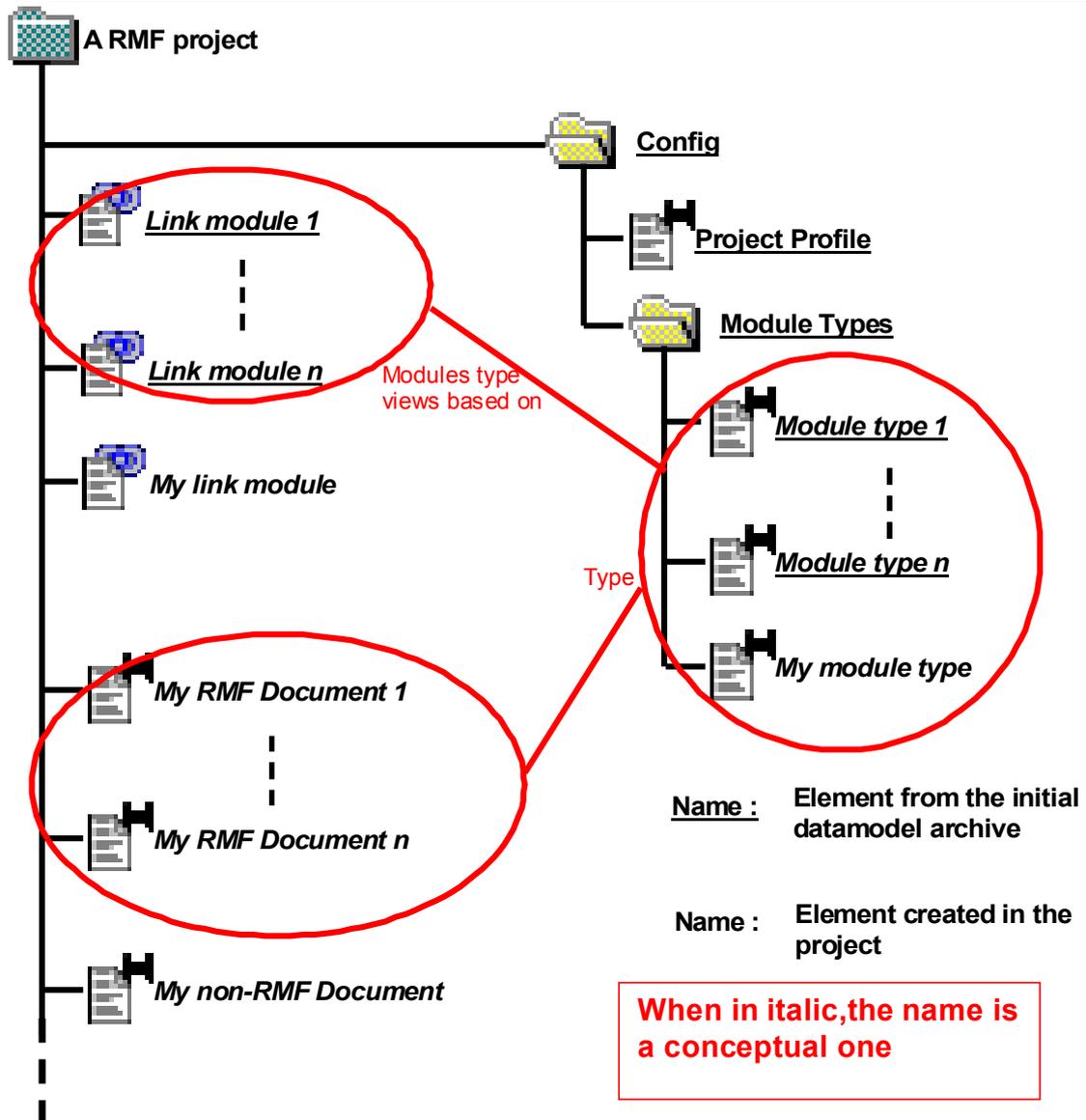


Figure 80 : RMF project structure

When you create a new RMF project, you have a "Config" folder under the root project folder, and a set of link module to build your datamodel for the current project.

The "Config" folder contains a formal module named "Project Profile". This module describes the metamodel used to define the datamodel for the current project. In this module you'll be able to define:

- a reference of each module type allowed by IRDRMFAO in the current project; the template of each module type is stored in the “Module Types” (cf. §7.3.2). In each module type, can be defined some default views, and these views can contains some DXL columns based on link modules; these module are stored in the project root directory.
- a reference of each object type allowed to create (or identify) within a RMF module
- a reference of each relationship name supported by RMF , and the definition of the linksets allowed by the model.

It's possible to modify this “Project Profile” to adapt the meta-model for your project (cf. §7.3).

7.2 ADAPTING MODULE ATTRIBUTES

The default attributes proposed in module types may be not relevant for your project. Then, according to your need, you can delete, modify or add attributes in RMF module types, except for reserved RMF attributes as described below.

Reserved RMF attributes

All the formal modules of an RMF project, except the *Project Profile* formal module, will have at least four main, reserved, attributes.

The IRDRMFAO utilities use these four main attributes, and they should not be modified manually.

Module attribute:

Each module has the following attribute defined as a DOORS module attribute:

Attribute name	Type	Description
IE Mod Type	enum	This attribute represents the type of the current module. The <i>Project Profile</i> module contains the list of all the possible values defined for the current project. But for a given module, this attribute will have a value assigned once and for all. The value should be one from the list defined in the <i>Project Profile</i> .

Object attributes:

Each module has the following attributes defined as DOORS object attributes

Attribute name	Type	Description
IE Object Type (inherited attribute)	enum	This attribute represents the type of the object. The <i>Project Profile</i> module contains the list of all the possible values defined for all the modules within the current project. The value should be one from the list defined in the <i>Project Profile</i> .
IE PUID	string	Project Unique ID. This attribute represents the identification of the object. It is managed either: - automatically using IRDRMFAO utility <i>Renumber All Objects</i> , - or by hand.
Paragraph Style	string	This attribute is not an RMF attribute. It comes from DOORS. You can capture the style formatting of paragraphs in your Word document, and store it in the <i>Paragraph Style</i> attribute. If you later export the module to a new Word document, the styles named in the <i>Paragraph Style</i> attribute are used to format the document.

7.3 ADAPTING PROJECT PROFILE

The *Project Profile* formal module describes the available templates, object types and module types in the project. The Project Profile module must be modified, as described below, if new object, module type or template is added to the project.

A RMF project always contains a *Project Profile* formal module.

- The “object types” represent all the data suitable for System Engineering, like requirements, capabilities, issues and decisions, etc. The possible values for Object Type are: Requirement, Function, Capability, Issue-Decision, Configuration Item, IVV Procedure.

Definitions applying to the current project	Object Type	Object Prefix	Object Document Style	Undefined PUID Keyword
2 Definition of the Object Types				
2.1 Requirement object definition	Requirement	REQ	requirement style	TBD
2.2 Function object definition The "Function" object definition describes a functionality provided by the system. This object definition is not mandatory but will provide a high-level object grouping mechanism for allocation to Configuration Items. Instead of allocation of basic System Requirements, the Function containing Requirements will be allocated to Configuration Items defined into the PBS module.	Function	FUNC	function style	TBD
2.3 Capability object definition	Capability	CAPA	capability style	TBD
2.4 Issue and Decision object definition	Issue-Decision	ID	issue and decision style	TBD
2.5 Justification object definition	Justification	JUST	justification style	TBD
2.6 Configuration Item object definition	Configuration Item	CI	configuration item style	TBD
2.7 IVV Procedure object definition	IVV Procedure	IVVP	ivv procedure style	TBD

Enumeration for « IE Object Type » attribute for RMF modules

Prefix used for object identification

Word style used by default with Word Exporter

String used to initialize the number part of PUID when manual strategy set

- The “templates” are the available models when creating a new module in the project.
- Each template has one or several “module types”.

Exemple:

- The Module Types of the template “SR” are:
 - System Requirements,
 - Subsystem Requirements,
 - Prime Item Requirements,

- The Module Types of the template “IDJ” are:
 - Issues and Decisions,
 - Operational Concepts.

ID	Definitions applying to the current project	Template	Not Instanciable	Attribute Name	is Semantic	is Volatile	Is Contextual
PP81	4 Definition of the Module Templates						
PP82	4.1 Template User Requirements	UR					
PP83	Requirement text attribute.			Object Text	True	False	False
PP84	T-REK Object Type attribute.			IE Object Type	True	False	False
PP123	T-REK identifier attribute.			IE PUID	True	False	False
PP85	4.2 Template System Requirements	SR					
PP86	Requirement text attribute.			Object Text	True	False	False
PP87	T-REK Object Type attribute.			IE Object Type	True	False	False
PP124	T-REK identifier attribute.			IE PUID	True	False	False

Definitions applying to the current project	Module Type	Template	Not Instanciable	Module Document Styles	Bitmap
3 Definition of the Module Types					
3.1 User Requirements module definition	User Requirements	UR		Normal requirement style function style capability style	ur.bmp
The "User Requirements" Module contains TREK objects of type "Requirement". The data structure for each such object is a tree. The root DOORS object is the User Requirement itself. It carries all the attributes applying to the User Requirement, it is the only DOORS object in the tree, which can be identified as a TREK object and gain a PUID. All links to and from the object should be attached to the root object. The leaves of the tree are DOORS objects which inherit the attribute "IE Object Type", which for a User Requirements, has the value "Requirement". The leaf DOORS objects should only be used for descriptive or explanatory material, and all of their TREK attributes should be set to 'blank'. Leaf objects cannot be assigned a PUID, and should not be linked using standard TREK linksets.					
3.2 System Requirements module definition	System Requirements	SR		Normal requirement style function style capability style	sr.bmp
The SR Module is used to describe System specification document. It could also be used for Subsystem or Prime Item specification documents. The "System Requirements" Module contains TREK Objects of types "Capability", "Requirement", and/or "Function". The data structure for each such object is a tree. The root DOORS object is the TREK Object itself. It carries all the attributes as it is the only DOORS object in the tree, which can be identified as a TREK object and gain a PUID. All links to and from the object should be attached to the root object. The leaves of the tree are DOORS objects which inherit the attribute "IE Object Type", may have the value "Capability", "Requirement", or "Function". The leaf DOORS objects should only be used for descriptive or explanatory material, and all of their TREK attributes should be set to 'blank'. Leaf objects cannot be assigned a PUID, and should not be linked using standard TREK linksets.					
3.3 Subsystem Requirements module definition	Subsystem Requirements	SR		Normal requirement style function style capability style	sr.bmp

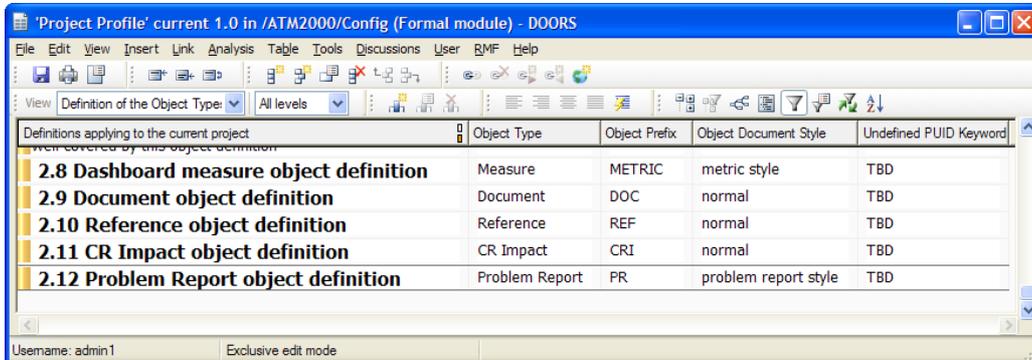
7.3.1 ADD A NEW OBJECT TYPE

To add a new object type, follow the steps below.. The example shows the creation of an object type "Problem Report".

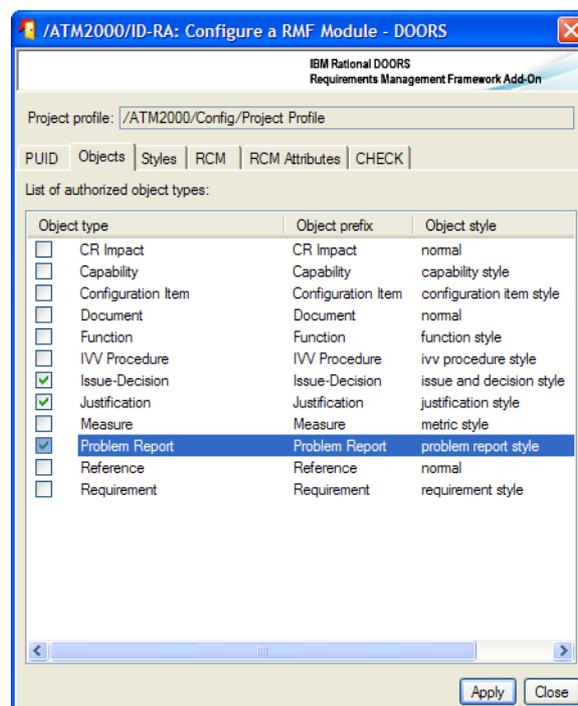
- Within DOORS, open the *Project Profile* module and select the view "definition of the object types".
- Select the last object, and create a new object (Menu "Object->New"). Fill the attributes:

Text = "Problem Report object definition",

Object type = "Problem Report"
 Object prefix = "PR"
 Object document style = "problem report style"
 Undefined PUID keyword = "TBD"



- Save the *Project Profile* module.
- Now, to use this new object, you have to declare it in each module you want to use it. Let's take as example that you want to use it in a existing UR module type.
- Open the UR type module, and run the menu "RMF ->Configure module...".
- Click on the type name you want to use in this RMF module



7.3.2 ADD A NEW TEMPLATE

IRDRMFAO provides several standard module types : UR, SR, PBS,...but if you need to add a specific module type for your project, follow the steps shown below. The example shows the creation of a new template named "PR" for "Problem Report".

- Within DOORS, open the *Project Profile* module and select the view "definition of the templates".

- Duplicate the object 4.1 with its descendatnts (copy with hierarchy + Paste)
- Modify the new first pasted object as below :

Heading =	"Template Problem Reports",
Template =	"PR"
Not instanciabile =	<leave blank>

ID	Definitions applying to the current project	Template	Not Instanciabile	Attribute Name	is Semantic	is Volatile	Is Contextual
PP01	4 Definition of the Module Templates						
PP215	4.1 Template Problem Reports	PR					
PP216	Requirement text attribute.			Object Text	True	False	False
PP217	T-REK Object Type attribute.			IE Object Type	True	False	False
PP218	T-REK identifier attribute.			IE PUID	True	False	False
PP82	4.2 Template User Requirements	UR					
PP83	Requirement text attribute.			Object Text	True	False	False
PP84	T-REK Object Type attribute.			IE Object Type	True	False	False
PP123	T-REK identifier attribute.			IE PUID	True	False	False

- Optionally add new semantic attributes. Do not remove one of the tree default semantic attributes (Object Text, IE Object Type, IE PUID)

Object Text =	"attribute description",
IE Attribute Name =	<attribute name>
IE Is Semantic =	True
- Save the *Project Profile* module.

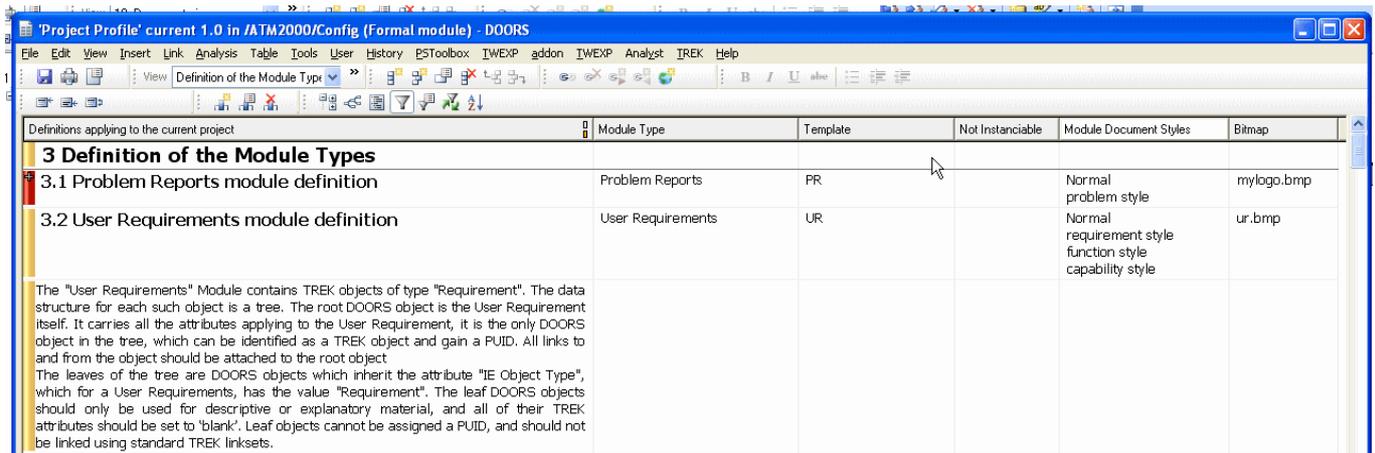
A template must have at least one module type. So you must also declare a module type. In the example below, the module type “Problem Reports” will be created for the template “PR”.

7.3.3 ADD A NEW MODULE TYPE

The example shows the declaration of a module type named "Problem Report" available in the template “PR”.

- Within DOORS, open the *Project Profile* module and select the view "definition of the module types".
- Select the last object, and create a new object (Menu "Object->New"). Fill the attributes:

Object Heading =	"Problem Report module definition",
IE Module type =	"Problem Reports"
IE Template =	"PR"
IE Module word styles =	<list of the styles that can be chosen>
IE Bitmap =	<bitmap file name (for the relationship manager)>



- Save the *Project Profile* module.

From now, you are able to create a formal module of type "Problem Reports" using the template "PR".

You can create the template "PR" from an existing RMF standard module or create it from scratch but do not forget to create and set mandatory RMF attributes. Refer to § *Adapting module attributes*. In particular, the attribute "**IE Mod Type**" defined at the module level with the value "Problem Reports", and the attribute "**IE Object Type**" defined at the object level with at least the value "Problem Report" in our example.

You may also set a value to the attribute "**IE Bitmap**" to define the bitmap associated with the module type and displayed by the **Relationship Manager**.

7.3.4 ADD A NEW RELATIONSHIP

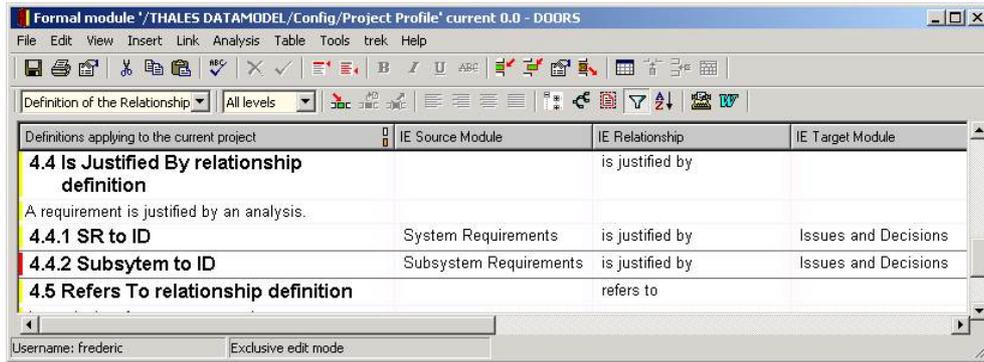
The Relationship Manager utility of IRDRMFAO introduced in version 3.2 allows to check that the relationships in your project conform to a definition made into the project profile. It also provides several means to fix any problem.

You may add a new relationship, or a new linkset in an existing relationship.

To add a new relationship:

- Add a new object after the last relationship object. Set the heading of the object with a short description of the relationship. Set the attribute "IE Relationship" with the name of the relationship (this attribute is mandatory).
- For each linkset (i.e. a pair source module type, target module type), create a new object under the relationship object. Enter in the heading a short description of the linkset. Set the attribute "IE Relationship" with the name of the relationship. Set the attribute "IE Source Module" with the name of the source module type. Set the attribute "IE Target Module" with the name of the target module type.
- You may add text objects under the relationship object and the linkset objects to enter comments.

View of the project profile:



- Save the *Project Profile* module.

From now on, any “is justified by” link between those two kinds of module will be recognize by the Relationship Manager as correct.

7.3.5 ERROR HANDLING

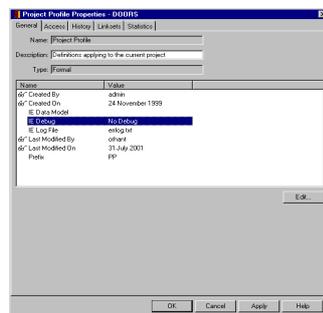
The *Project Profile* formal module also allows to switch the IRDRMFAO debug mode on to control the handling of error messages from the utilities.

Use this advanced feature only if you are an experienced user or if your support team wants to track a bug.

To change the debug mode, edit the *Project Profile* attributes (menu *File->Module properties...*) and set “IE Debug” to

- No Debug (default value),
- DXL window (to make appear the DXL program when a problem occurs),
- Log file (to send the output error messages in a log file),
- Window and Log (to send the output error messages in a log file and on the screen),
- Ack and Log (to send the output error messages in a log file and a screen problem acknowledgement).

Set the attribute “IE Log File” to define the name and the location of the output errors messages (default is “errlog.txt”)



8 Acquisition and identification of RMF objects

8.1 Introduction

RMF objects are DOORS objects with specific values in their type and identification attributes. The permissible values for the RMF object type(s) in each RMF module type, are defined in the Project Profile module, see para 4.2.3.

RMF objects are acquired by either 'Identifying' an existing DOORS object, or by 'Creating' a new RMF object, or by a combination of both.

Establishing an appropriate hierarchical structure of the RMF objects is an important issue, and the significant differences between requirement modules and breakdown structure modules are outlined below.

The detailed operation of the IRDRMFAO utilities is described in the Reference Manual, a summary of their usage is described here.

8.2 RMF Object structure within a module

8.2.1 requirement Type Structures

It is an important methodology issue that requirement statements do not have a hierarchy, they must be self-contained verifiable statements. (Any decomposition of the requirement into sub-requirements in lower level entities should be held in different modules, and linked back to the parent requirement object.)

However, it is also necessary to structure long lists of requirement statements into sections and sub-sections for clarity and ease of use.

These two objectives are achieved within IRDRMFAO by using the DOORS concepts of 'Heading' or 'Normal Text'. All requirement statements are 'Normal Text', grouped at the same DOORS level under a particular heading.

A DOORS hierarchy of 'Headings' (ie Object text is blank) should be established to aid clarity,

IRDRMFAO enforces this methodology in requirement type modules by only allowing 'Normal Text' objects (i.e. not 'Headings') to be created or identified as RMF Objects, and by not allowing RMF objects to be created or identified if a parent or ancestor object is already a RMF object.

The IRDRMFAO 'Manage Objects' tool will create a new RMF object at the same level as the current object if the current object is 'Normal Text'; and will create a new RMF object one level below if the current object is a 'Heading'.

In addition, requirements may be structured into Functions and Capabilities, as described in para 5.4.4.

8.2.2 Breakdown Type Structures

In equipment or system breakdown structure type modules there is no methodology restriction on the object hierarchy, in fact configuration objects may need to be related in more than one hierarchy. For these modules, such as the PBS module type, IRDRMFAO allows the natural DOORS level hierarchy to be used. Additional hierarchical relationships between the objects can be set up using the “is composed of” or additional project-specific linksets.

Configuration objects should be entered as ‘Headings’, i.e. with the Object Text blank and with the name in the Object Heading attribute. DOORS will then assign outline paragraph numbering and display the hierarchy in the DOORS Explorer window. Note that this numbering may change if items are added, moved or deleted.

IRDRMFAO provides a utility under ‘Kitchen Tool Box’, ‘Objects’ to convert the current object to a heading, which may be useful if the structured is initially imported.

If the current object is a ‘Heading’, the IRDRMFAO ‘Manage Objects’ tool will create a new ‘Normal Text’ RMF object at one level below the current object, the new object should then be converted to a heading.

Because of the volatility of the outline numbering, the RMF PUID should be used as the principal referencing system, but note the behavior of the PUID numbering in a shared-edit environment as described below. Projects should also add an attribute to hold a part number as assigned by the company PDM system.

The DOORS outline hierarchy is recommended for the design hierarchy of a system, and physical structures should be created using explicit RMF “is composed of” links between the objects. Within the design hierarchy, a configuration item should only appear once, within a physical hierarchy it may appear in several places. The use of links internal to the module allows this. If required, a project could define more link types and use them to represent more hierarchies, such as integration threads for example.

8.2.3 Issue/Decision Type Structures

In the common case, Issue/decision type modules are linear lists of objects that do not need an implicit structure. They are accessed via explicit links from relevant requirement or configuration objects in other modules; reports are usually generated using sorting and/or filtering on specific attributes. A long list of objects at a single level is not a problem. One only reason for imposing a structure might be to divide the module into sections to enable multi-user access under DOORS, but this is an implementation solution rather than a methodology imperative. Issue/decision RMF objects should therefore be created as ‘Normal Text’, with ‘Headings’ only used if required to divide the module into shareable sections.

In other cases, Issue/decision type modules could be structured to produce document such as Justification documents.

8.3 HOW TO Import a document into DOORS

Often the first action you will carry out will be to import a document into DOORS, this will create a set of general DOORS objects, which must subsequently be ‘Identified’ as RMF objects.

The imported documents can be:

- the customer requirements (into a UR Module),

- existing documents in a reuse case (e.g.: the existing specification of a previous system that is close to your customer needs (into an SR Module)).

In all case, you need the electronic format of the document to be available.

The procedure is:

- First, always start by creating an appropriate RMF module type to receive the document,
- Second, use the standard DOORS utilities to Import (From DOORS menu “File-> Import” or from WORD application using the “Export to DOORS” icon ).
- Once the document is imported into a RMF module, it must be structured as described in the previous section and the objects identified as RMF objects.

8.4 HOW TO IDENTIFY RMF OBJECTS: REQUIREMENTS, FUNCTIONS,

8.4.1 Introduction

There are two basic methods of achieving an identified RMF object, as follows:

- Identify a ‘Normal Text’ DOORS object, or
- Create a new RMF object.

8.4.2 Identifying an existing DOORS object

To identify an RMF object, select a DOORS object or several and activate the utility “Manage Objects” in the current module menu “RMF”. Notice that the dialog window stays displayed in front of the screen, allowing quick repeated object identification, scanning the DOORS module. The same dialog box can also be used to identify objects in other modules, and be used to create RMF objects as well.

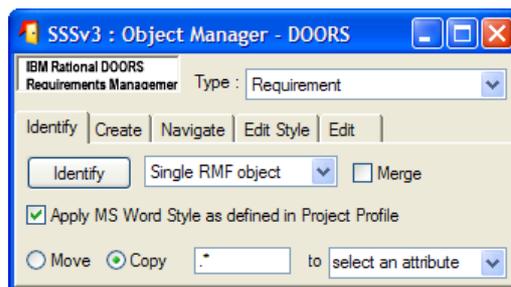


Figure 81 : “Manage Objects” Identify Tab

8.4.2.1 Identifying a selection of objects

The identification tool provides two different modes:

- Single RMF object (default mode)
- Several RMF objects

In “Single RMF object” mode, only one RMF object is created.

In “Several RMF objects” mode, the tool creates as many RMF objects as there are selected objects (except if some objects can’t be identified).

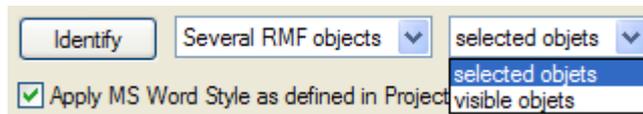
Each mode provides its options :

- “Single RMF object” mode options :



<i>Option</i>	<i>description</i>
Merge objects ON	The tool merges the selected objects and then identify if.
Merge objects OFF (default)	The tool identifies the first selected object and move the following objects so that they become childs of the newly identified object.

- “Several RMF objects” mode options:



<i>Option</i>	<i>description</i>
Visible objects	The tool identifies all the visible objects.
Selected objects (default)	The tool identifies the selected objects.

8.4.2.2 Applying a MS Word Style

By default the option “Apply MS Word Style as defined in Project Profile” is checked.

Therefore the paragraph style of the new object is set with the value defined in "*Project Profile*" module.

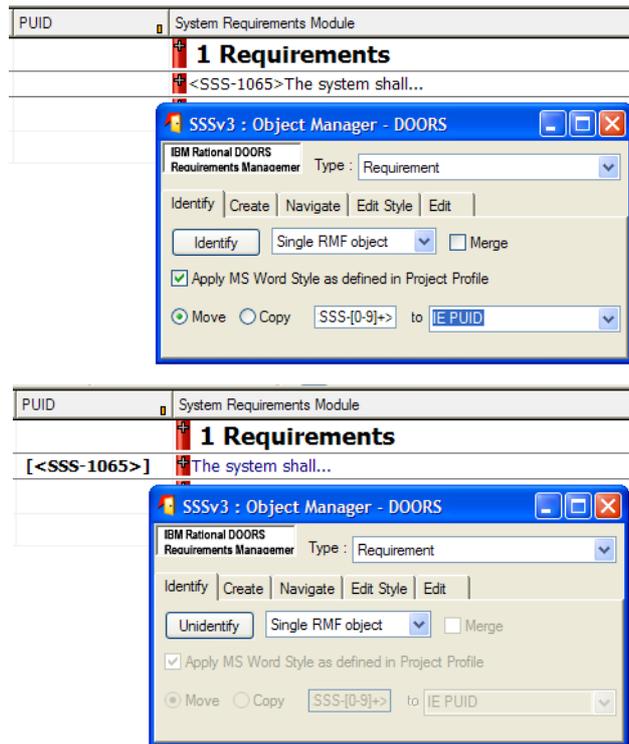
8.4.2.3 Parsing the text of the identified object

The tool allows to move or copy a piece of the “Object Text” attribute value of the identified object, into an attribute to be selected.

The pattern to look for shall be described as a regular expression. Please refer to the DOORS inline help for a comprehensive explanation on the regular expressions syntax.

The tool allows to copy or move only a subset of the pattern to look for. To do so, insert brackets before and after this subset.

For instance, in the example below, the pattern to look for is <SSS-[0-9]+>, but the characters “<” and “>” shall not be moved (or copied). This can be achieved by adding bracket so that the regular expression becomes <(SSS-[0-9]+)>.



8.4.3 Creating new RMF objects

To create an RMF object, select a DOORS object and activate the utility “RMF ->Manage Object”. Then choose the “Create” Tab.

Notice that the dialog window stays displayed in front of the screen, allowing repeated object creation with single mouse clicks. Notice also that you cannot create a RMF object within a hierarchy of DOORS ‘Normal Text’ objects with this utility.

This utility creates a new RMF object after the selected DOORS object:

- at the same level if the current is an object text,
- below if the current is a heading.

The paragraph style of the new object is set with the value defined in "*Project Profile*" module, and the PUID is generated. The new ‘object text’ field is initialized with the PUID but it should then be replaced by the desired text.

Once the requirements have been captured and identified as RMF objects, they should be rationalized. Rationalization means splitting up, rephrasing or joining requirements in accordance with the guidelines given in the DOORS 5 booklet from Telelogic “Writing Better Requirements”.

Splitting a requirement into two or more requirements is best achieved by 'Creating' one or more new requirement objects and cut and pasting the required text.

Joining two requirements can be achieved by cutting and pasting the text from one requirement into another, and then deleting the empty requirement. Alternatively you can also use the same “manage Object” dialog box that provides a button labelled “Join Text of Selected Objects”, which is useful for DOORS objects, prior to them being identified as RMF objects.

In addition, IRDRMFAO allows requirements to be grouped within Functions, which in turn may be grouped within Capabilities, if this aids clarity and understanding. Note that

'Requirement', 'Function' and 'Capability' are just RMF Object Types and that they must all exist at the same DOORS level within a DOORS Heading. The IRDRMFAO utility "Create Links from Object Hierarchy" can be used to aid in the creation of a hierarchy within IRDRMFAO using links such as "is composed of".

Once the requirements have been initially rationalized, the PUID numbering will appear to be randomized or even be absent if editing has been in shared mode. At a convenient time, before releasing the requirements, when 'Exclusive Edit' mode is available, they should be renumbered using the IRDRMFAO utility "Renumber Objects PUID", and the module baselined.

8.5 WORKING IN EDIT SHAREABLE MODE

The "Edit Shareable" mode is a DOORS feature allowing several users on a network to simultaneously modify different sections in the same module. If you are working in such a mode, some of the IRDRMFAO commands have a different behavior than in simple and exclusive "Edit" mode. All of those commands involve allocation or calculation of a PUID, which is impossible in this mode. So the different behavior is the setting of "IE Object Type" and the "PUID" attribute, which has to be decoupled in «Edit Shareable» mode.

- The "*Manage objects*" utility sets the "IE object type" attribute but sets the PUID to a keyword ("TBD",..., or empty) defined in the "*Project Profile*" module (.view "definition of the object types", attribute "IE Undefined PUID Keyword").
- The "*Renumber object*" and "*Update Version Attribute*" utilities are disabled in "Edit Shareable" mode.

Then, to complete the setting of PUID attribute, the module must be open in simple "Edit" mode. The "Renumber object" utility is able to only calculate an appropriate PUID for any objects whose "IE object type" attribute is set and which have a PUID set to the predefined keyword or empty.

8.6 Defining IRDRMFAO behaviour for New module Types

As described above, IRDRMFAO behaves differently in Requirement type modules from Breakdown structure type modules. This is due to the inheritance setting of the RMF attribute "IE Object Type".

In requirement type modules, the "IE Object Type" is set to inherit its value from its parent, in Breakdown type modules it is not.

To modifying this setting of the attribute "IE Object Type" in a new module type:

- Open the module, activate the menu "Edit->Attribute", select in the list the attribute "IE Object Type" and set or unset the "Inherit value" property.

9 Using the dashboard

The Dashboard is a module that can be integrated to each DOORS project in order to visualize metrics.

You can have as many Dashboard modules you want within a DOORS project

[A dedicated manual is available. Please refer to it \(dashboardman.doc\).](#)

10 Managing requirement changes

10.1 Introduction

By definition, changes to requirements will occur either outside or inside the IRDRMFAO environment. This section describes how IRDRMFAO assists in the control of both situations.

Changes occurring outside the DOORS environment will in general result in the System Engineer being presented with a later edition of a document which has already been imported and processed within IRDRMFAO , and the changes will probably not be annotated.

Changes occurring inside the DOORS environment will be formally controlled and, if approved, will be applied directly to the reference data.

10.2 Managing changes originating outside doors

10.2.1 INTRODUCTION

This paragraph deals with the problem of source documents already imported into DOORS and analysed within IRDRMFAO , but subsequently modified and up-issued outside DOORS. Typically, such documents come from the customer or other stakeholder.

The IRDRMFAO goal is to reduce as far as possible the work of re-engineering the data by copying the already done analysis on unchanged parts of the document. Unchanged data should not be analysed a second time and existing analysis shall be applied to the new version of the source document module in DOORS.

The process is decomposed into 3 phases:

- The changes to the source document are tracked by comparison mechanisms,

NB: Since the 3.2 version a second comparison algorithm featuring different functionalities is available.

- Then a human analysis completes the comparison,
- The analysis is transferred to the new document module, including links, attributes and views.

To understand the process, assume that we already have a document called “RFP” for example at release V1. This document has already been analysed within a RMF module, as shown in Figure 82. And we’ve just received a new release (V2) of the document.



Figure 82 : A source document has been analysed within IRDRMFAO

10.2.2 1st step: import of a new version of the source document

This step uses the standard importer depending on the format of the new version of the source document. The document is imported into a new module.



Figure 83 : The new version of the source document is imported

10.2.3 2nd step: comparison of the two versions of the source document

From the 5.2 version on:

- the former “*Original*” algorithm shall be called the “**Classic**” one;
- the former “*New*” algorithm shall be called the “**Hierarchical**” one, for it’s much more based upon structural considerations than on textual ones.

10.2.3.1 GUI and setup

The comparison functions have been enhanced and now converge to a single module level menu command: “RMF – **Compare Modules**”, and to a single graphic user interface hereafter displayed (Figure 84).

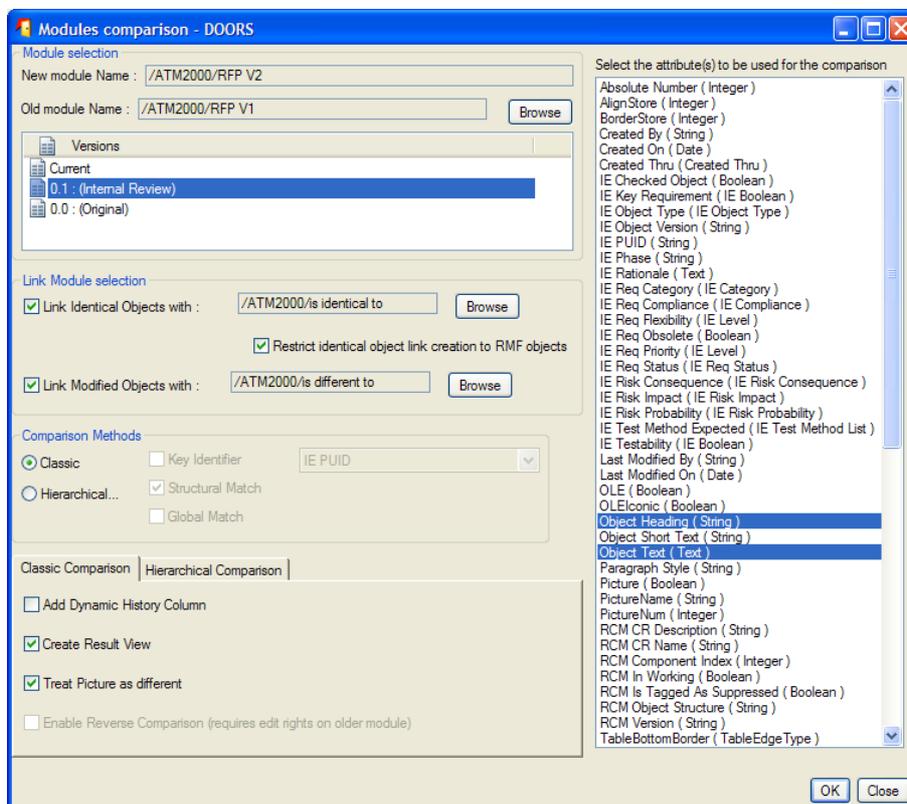


Figure 84 : “Compare Modules” Graphic User Interface

The main features of the “Compare Modules” function are:

- Compare a module current version to any module current version or baseline.
- Create links between the two compared modules to track the changed or unchanged objects. These links are created **from the New module to the Old one**, whatever the chosen algorithm.

There is an important difference between running the tool in the New-Old direction, and in the reverse direction (Old-New). If running in the direction New-Old, the tool generates some new attributes and views in the New module, to which it must therefore have write access. It will be incapable of displaying any objects unique to the Old module, that is to say it cannot display any objects that were deleted between the old and new issues of the document.

To run in the direction **New-Old**, open the new module (RFP V2), and launch the “**Compare Modules**” command in RMF menu..

To run in the direction **Old-New**, open the old module (RFP V1), and launch the “**Compare Modules**” compare in RMF menu.

The various parameters to be defined are:

- **Select the new module.** Use the RMF - “Compare Modules” from the RFP V2 module; then the New Module Name will automatically be “RFP V2”, and there is no way to change it.

New module Name :

- **Select the old module and its version.** Use the browse button to select the old module, and use the list to select the version.



- **Select the attributes to be used for the comparison.** The default selection is “Object Heading” and “Object Text”.

Select the attribute(s) to be used for the comparison

Last Modified On (Date)

OLE (Boolean)

OLEIconic (Boolean)

Object Heading (String)

Object Heading DE (String)

Object Heading FR (String)

Object Short Text (String)

Object Text (Text)

Object Text DE (Text)

Object Text FR (Text)

Paragraph Style (String)

Picture (Boolean)

PictureName (String)

PictureNum (Integer)

- **Select Link Module for identical objects.** It is the link module to be used to link the **identical** objects between the two modules. If no link module is selected, the identical objects won't be linked together. Default value is "is identical to"
- **Select Link Module for modified objects.** It is the link module to be used to link the **similar** objects between the two modules. If no link module is selected, the similar objects won't be linked together. Default value is "is different to"

"Identical Objects" and "Modified Objects" links are created from the new module to the old one, and are stored as specified.

The following figure shows how links are created:



Figure 85 : Links created between V1 and V2

- **Select the algorithm to be used.** Select the "Classic" or the "Hierarchical" comparison method using the "Comparison Methods" radio buttons:

10.2.3.2 Pre-processing verifications

Before trying to process the comparison, tests are made regarding the linkset pairing definition.

- If no comparison link creation is required no tests are made.
- If comparison link creation is required:
 - When the linkset pairing **is not enforced** then links will be created.
 - When the linkset pairing **is enforced**:
 - Either **you have the “administrate right”** on the folder containing the new module; then the enforcement will be cleared and restored. The action will be notified in the log window.

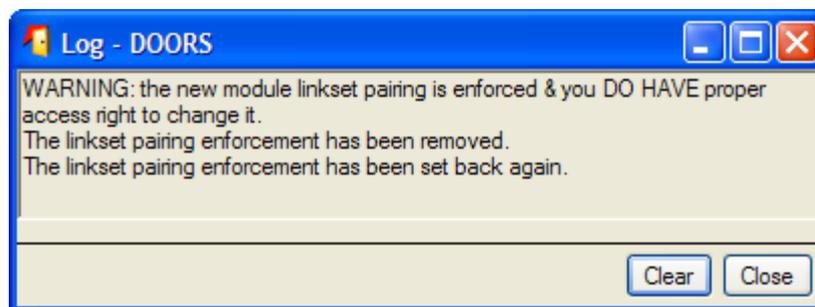
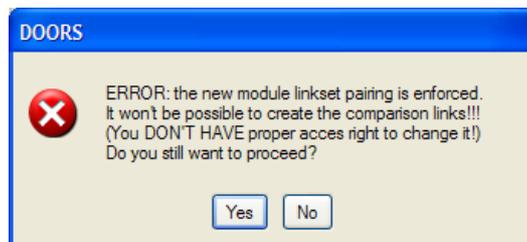


Figure 86 : pre-processing log example (temporary linkset pairing unenforcement)

- Or **you don't have the “administrate right”** on the folder containing the new module; then the following window is displayed, which allows you to go on (in which case errors will occur) or not to launch the comparison. The choices made will be logged.



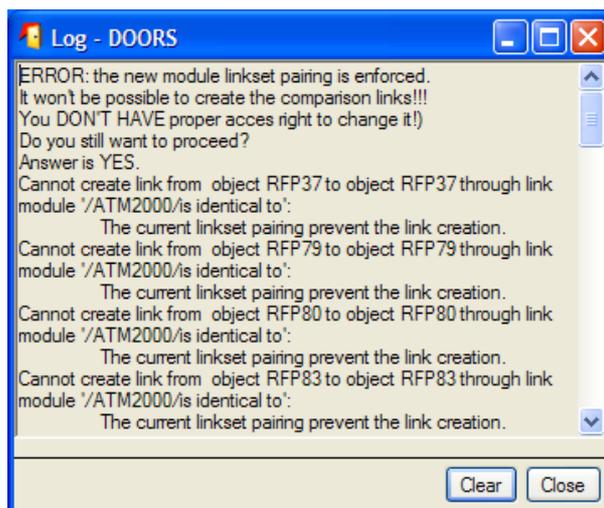


Figure 87 : pre-processing error window and log example (linkset pairing prevents link creation)

10.2.3.3 Processing verifications and log window

If errors occur during the link creation, you'll be asked to skip the current single error, or to skip all the errors, or to cancel the comparison.

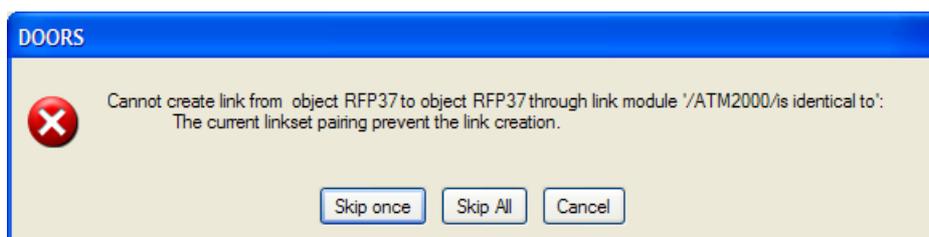


Figure 88 : processing error confirmation window example

A log window is displayed at the end of the processing to keep trace of all the errors that occurred:

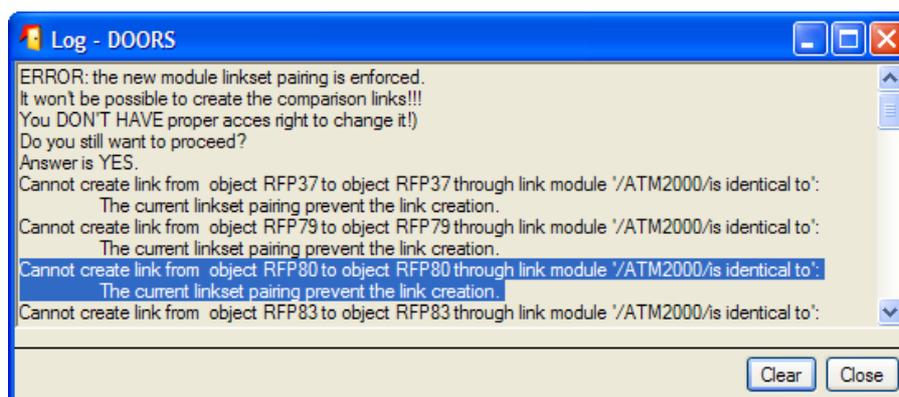


Figure 89 : processing log window example

10.2.3.4 Classic algorithm

10.2.3.4.1 Use and Parameters

The specific parameters for this algorithm are the ones displayed in the “Classic Comparison” tab.

Classic Comparison

Hierarchical Comparison

Add Dynamic History Column

Create Result View

Treat Picture as different

Enable Reverse Comparison (requires edit rights on older module)

- **Add Dynamic History Column.** If checked, a dynamic DXL column will be added to the current view (in the far right-end position) and shall display the differences between the old and the new module. Standard rules are used to mark the differences relative to the non-current module. Deleted text is struck through and inserted text is underlined. For example, if some text has been added to the new module it is underlined when the new module is current (i.e. Compare has been run in the direction New→Old). On the other hand, if the old module is current (i.e. Reverse Compare has been run), this same text is struck through.

Dynamic Comparison	
Request for Proposal Module	After phase 1, remaining bidders shall produce <u>up to 5</u> prototypes, and not less than 2 for this new ATM. All failures will be analysed during the first deployment (about 6 months) and registered for safety and reliability analysis.
IE Req Category Modifications:	Operational Objective <u>Management</u> <u>Operational Scenario</u> Development
Current Module	The current ATM model actually in use all over Europe satisfied our needs-5 <u>needs10</u> years ago. Unfortunately, some specific ATM components, particularly all mechanical parts of the Human Machine Interface (HMI) are getting older much faster than expected. For this reason, the ATM HMI should avoid as much as possible any mechanical ageing due to a reasonable use of the customer interface.
IE Req Category Modifications:	<u>Function</u> <u>Data</u> Reliability

Figure 90 : Example of Dynamic comparison column for classic comparison

- **Create Result View.** If checked, a specific view including the DXL Column “Dynamic History” is created and saved. A filter will automatically be set to show only modified, new or deleted objects.

Match [%]	Diff Type	Request for Proposal Module	Dynamic Comparison
80	MODIFIED	After phase 1, remaining bidders shall produce up to 5 prototypes and not less than 2 for this new ATM. All failures will be analysed during the first deployment (about 6 months) and registered for safety and reliability analysis.	After phase 1, remaining bidders shall produce <u>up to 5</u> prototypes, and not less than 2 for this new ATM. All failures will be analysed during the first deployment (about 6 months) and registered for safety and reliability analysis. IE Req Category Modifications: Operational Objective <u>Management</u> <u>Operational Scenario</u> Development
80	MODIFIED	The current ATM model actually in use all over Europe satisfied our needs10 years ago. Unfortunately, some specific ATM components, particularly all mechanical parts of the Human Machine Interface (HMI) are getting older much faster than expected. For this reason, the ATM HMI should avoid as much as possible any mechanical ageing due to a reasonable use of the customer interface.	The current ATM model actually in use all over Europe satisfied our needs-5 <u>needs10</u> years ago. Unfortunately, some specific ATM components, particularly all mechanical parts of the Human Machine Interface (HMI) are getting older much faster than expected. For this reason, the ATM HMI should avoid as much as possible any mechanical ageing due to a reasonable use of the customer interface. IE Req Category Modifications: <u>Function</u> <u>Data</u> Reliability
0	NEW	The ATM shall have all the previous model abilities.	The ATM shall have all the previous model abilities. IE Req Category Modifications: <u>functional</u>

Figure 91 : Example of a result view for classic comparison

- **Treat Picture as different.** As the algorithm is not able to compare pictures, it’s possible to force pictures to be considered as different, and a human analysis shall be done to set the result attribute to identical or modified regarding the applied modifications to the pictures.

➤ **Enable Reverse Comparison.**

To be able to see deleted objects within a result view, the Classic method offers the 'reverse compare' option – when run in the direction Old–New, deleted objects will be displayed, but conversely objects added to the new module will not.

10.2.3.4.2 Final result window

At the end of the comparison a log window displays some figures that can be exported to a text file.

10.2.3.4.2.1 Standard (ie non reverse) comparison

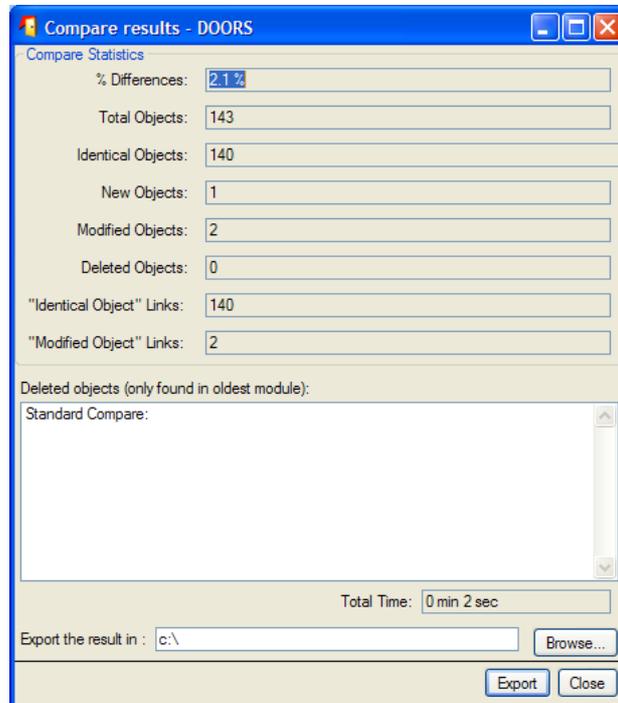


Figure 92 : Final result window for (classic) non reverse comparison

10.2.3.4.2.2 Reverse comparison

In this case, the final result window is slightly different.

For each figure, the result for the standard comparison and the one for the reverse comparison are displayed separated with a slash character. The first value is for the standard comparison and the second one is for the reverse comparison.

As for the "Deleted objects" list, you have a Standard Compare set of deleted objects AND a "Reverse Compare" set of deleted objects.

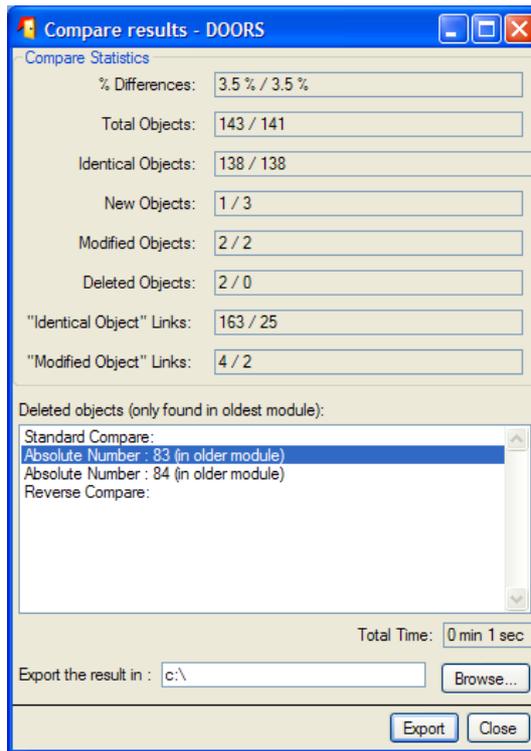


Figure 93 : Final result window for (classic) reverse comparison

10.2.3.5 Hierarchical algorithm

In comparison with the “Classic” algorithm, this one can:

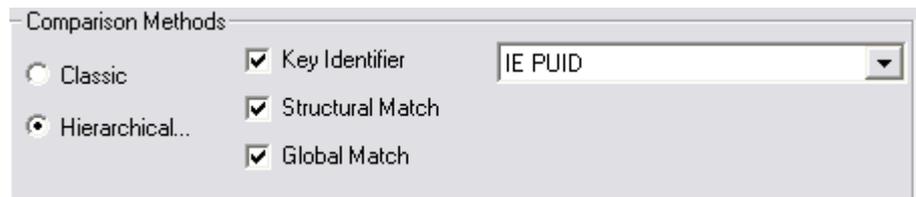
- handle requirements in a special way: as requirements have an identifier which should remain unchanged, the algorithm can look for requirements knowing their identifying attribute,
- perform a comparison based on the structure of the modules (for non-requirement objects). This option dramatically speeds up the comparison, but requires that the structure of the two modules compared is rather similar.

This tool cannot:

- compare graphical objects and OLE objects (In general this is not a restriction insofar as these objects do not contain requirements. If they do, they should be treated manually).

10.2.3.5.1 Use and Parameters

For this algorithm you can mingle several comparison methods: key identifier, structural match and global match.



- **Key Identifier.** Activation or not of the research algorithm using an identifier attribute. Simply check the “Key Identifier” box to enable this functionality and select the attribute (only integer and string attribute are listed in this choice list). Whenever this attribute is not empty, it is supposed to be a single and stable identifier of the current object, and can be used to find the equivalent object in the other document. Default value is “IE PUID”.
- **Structural Match.** Activation or not of the structural research algorithm. This research is based upon the structure of the document. Two objects are equivalent if their parents are equivalent and if the values of their compared attributes are equal or similar. This option is active by default.
- **Global Match.** Activation or not of the full research algorithm. By default it is not selected. If the difference between the two modules is light, and in particular if there is no difference in structure, this additional stage is not necessary. If the number of objects remaining after the first stage is important (more than one thousand), then this second stage can be time consuming.

Other parameters are available in the “Classic Comparison” tab. As soon as one of the following parameter is set “on”, a view named “Compare(Hierarchical)Result” is created and automatically saved, if ever you ask it to be at the end of the comparison.

Classic Comparison Hierarchical Comparison

Add Dynamic History Column

Create Static History Attribute

Create Static Result Attribute

Filter New Objects

- **Add Dynamic History.** If activated a DXL column is created in the current view. It shows the differences between the old and the new objects in a dynamic way. The “Old” attributes are created and initialized with the values found in the old module. This column is automatically updated whenever a modification is made in the text of the new module.

System Requirements Module				Dynamic History
1 SCOPE				
1.1 IDENTIFICATION				
This Specification establishes the performance, design, development and verification requirements for the system Automatic Teller Machine 2000 :				
Item	Abbreviation	Title	Identification no.	
System	ATM2000	Automatic Teller Machine 2000		
1.2 System overview				
The system to be designed shall replace ATM Systems [FN:ATM1980 and ATM1990] for service in 2005 and beyond.			The system to be designed shall replace ATM Systems [FN:ATM1980 and ATM1990] for service in 2001-2003 and beyond.	
Cmp_DXLAttribute : 01			Cmp_DXLAttribute : 01	
This is a new Object. I don't have a specific text right now !!!			This is a new Object. I don't have a specific text right now !!!	
Cmp_DXLAttribute : 3			Cmp_DXLAttribute : 3	
Cmp_Date : 10 August 1972			Cmp_Date : 10 August 1972	

Figure 94 : Example of “dynamic history” column for hierarchical comparison

- **Create Static History Attribute.** Same as last parameter, but the difference is computed only once and recorded into the attribute “Static Difference”.

Static Difference RFP V2/RFP V1	System Requirements Module
1 SCOPE	
1.1 IDENTIFICATION	
This Specification establishes the performance, design, development and verification requirements for the system Automatic Teller Machine 2000 :	
Item	Abbreviation Title Identification no.
System	ATM2000 Automatic Teller Machine 2000
1.2 System overview	
The system to be designed shall replace ATM Systems [FN:ATM1980 and ATM1990] for service in 2001-2003 and beyond.	The system to be designed shall replace ATM Systems [FN:ATM1980 and ATM1990] for service in 2005 and beyond.
Cmp_DXLAttribute : 01	
<NEW>	This is a new Object. I don't have a specific text right now !!!
Cmp_DXLAttribute : 3	
Cmp_Date : 10 August 1972	
	The following defined system is a full-service Automatic Teller Machine (ATM) in every location where the traffic can justify one. It is designed for optimum usage of available space. Therefore, it can be installed as stand-alone or through-the-wall in automatic corner of bank, airport, shopping arcades, etc.

Figure 95 : Example of “static difference” column for hierarchical comparison

- **Create Static Result Attribute.** If activated, the attribute “CompareHierarchicalResult” is created and records for each object whenever it is changed, unchanged or new. It is displayed in the “Diff Type” column.

Diff Type	System Requirements Module								
IDENTICAL	1 SCOPE								
IDENTICAL	1.1 IDENTIFICATION								
IDENTICAL	This Specification establishes the performance, design, development and verification requirements for the system: Automatic Teller Machine 2000 :								
	<table border="1"> <thead> <tr> <th>Item</th> <th>Abbreviation</th> <th>Title</th> <th>Identification no.</th> </tr> </thead> <tbody> <tr> <td>System</td> <td>ATM2000</td> <td>Automatic Teller Machine 2000</td> <td></td> </tr> </tbody> </table>	Item	Abbreviation	Title	Identification no.	System	ATM2000	Automatic Teller Machine 2000	
Item	Abbreviation	Title	Identification no.						
System	ATM2000	Automatic Teller Machine 2000							
IDENTICAL	1.2 System overview								
MODIFIED	The system to be designed shall replace ATM Systems [FN-ATM1980 and ATM1990] for service in 2005 and beyond.								
NEW	This is a new Object. I don't have a specific text right now !!!								
IDENTICAL	The following defined system is a full-service Automatic Teller Machine (ATM) in every location where the traffic can justify one.								
IDENTICAL	It is designed for optimum usage of available space. Therefore, it can be installed as stand-alone or through-the-wall in automatic corner of bank, airport, shopping arcades, etc.								

Figure 96 : Example of “static result attribute” column for hierarchical comparison

- **Filter new objects.** If activated only the objects without equivalents will show in the two modules after the comparison (objects destroyed in the old version and created in the new).

Diff Type	System Requirements Module	Dynamic History
NEW	This is a new Object. I don't have a specific text right now !!!	<u>This is a new Object. I don't have a specific text right now !!!</u> OCmp_DXLAttribute: <u>3</u> OCmp_Date: <u>10 August 1972</u>
NEW	[2] New customer document !!!!	<u>[2] New customer document !!!!</u> OCmp_DXLAttribute: <u>2</u>

Figure 97 : Example of filtered view for hierarchical comparison

The color of the objects has the following meaning:

- The black-colored objects are unchanged and may have outgoing links stored in the “is identical to” link module (or similar).
- The blue-colored objects are changed as compared to the object of the other module and may have outgoing links stored in the “is different to” link module (or similar).
- The red-colored objects are new and won't have newly created link.

Views can be created to display the results of the comparison by using:

- The links, (and possibly traceability columns)
- The attribute “**CompareHierarchicalResult**” (whose values are IDENTICAL, MODIFIED or NEW)
- The attribute Static History, which shows the differences in the text between the new and the old versions, using various styles:

- Strike-through for deleted characters,
 - Underlined for additional characters
 - The “**Dynamic History**” column (similar to the “**Static Difference**” attribute) and the “Old” attributes.
-

10.2.3.5.2 Save confirmation window

At the very end of the comparison, a confirmation window is displayed:

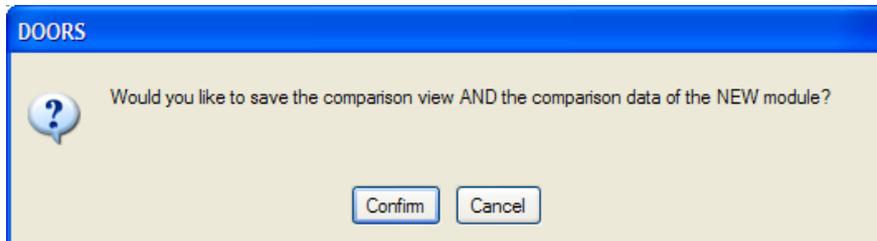


Figure 98 : Final confirmation window for a non reverse comparison

In this case it means: “Do you want to save the comparison view in the new module?” and “Do you want to save the new module?”

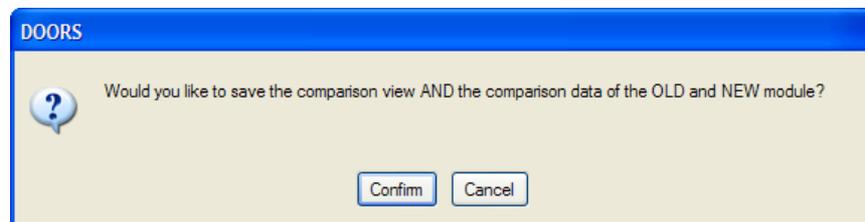


Figure 99 : Final confirmation window for a reverse comparison

In this case it means: “Do you want to save the comparison view in the old and in the new module?” and “Do you want to save the old and the new module?”

Be careful, if you decide not to save (i.e. click on the “Cancel” button), just avoid saving the views without the related modules or else the views will generate DXL errors, for views will miss useful attributes.

10.2.4 3rd step: Human check

At this phase, just before transfer analysis, if needed the user may create additional “is identical to” or “is different to” links in order to link objects he wants to be treated as unchanged (even if the text has been changed, due to spelling, paragraph styles, ...).

10.2.5 4th step: Transfer analysis

This step uses a utility: “**Transfer Analysis**”.

From the 5.2 version on, there is only a single “Transfer Analysis” function. Henceforth it only deals with links from the new version to the old one.

It’s possible to transfer attribute type, definitions and values, links and views. As for views and attribute definition, the behaviour is now based upon the synchronization mechanism.

Notice that composite “objects” would be restructured under certain conditions:

- The old module is a RMF module
- The old “object” is a RMF composite “object”
- All the objects part of the composite “object” shall have comparison links
- All the linked new objects shall be contiguous and in the same relative position.

10.2.5.1 Graphic User interface

10.2.5.1.1 Simple GUI (i.e. collapsed advanced panel)

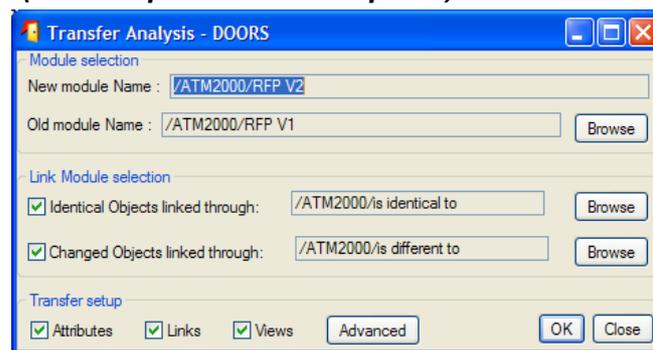


Figure 100 : Simple Graphic User Interface for Transfer Analysis

10.2.5.1.2 Advanced GUI i.e. (including the advanced panel)

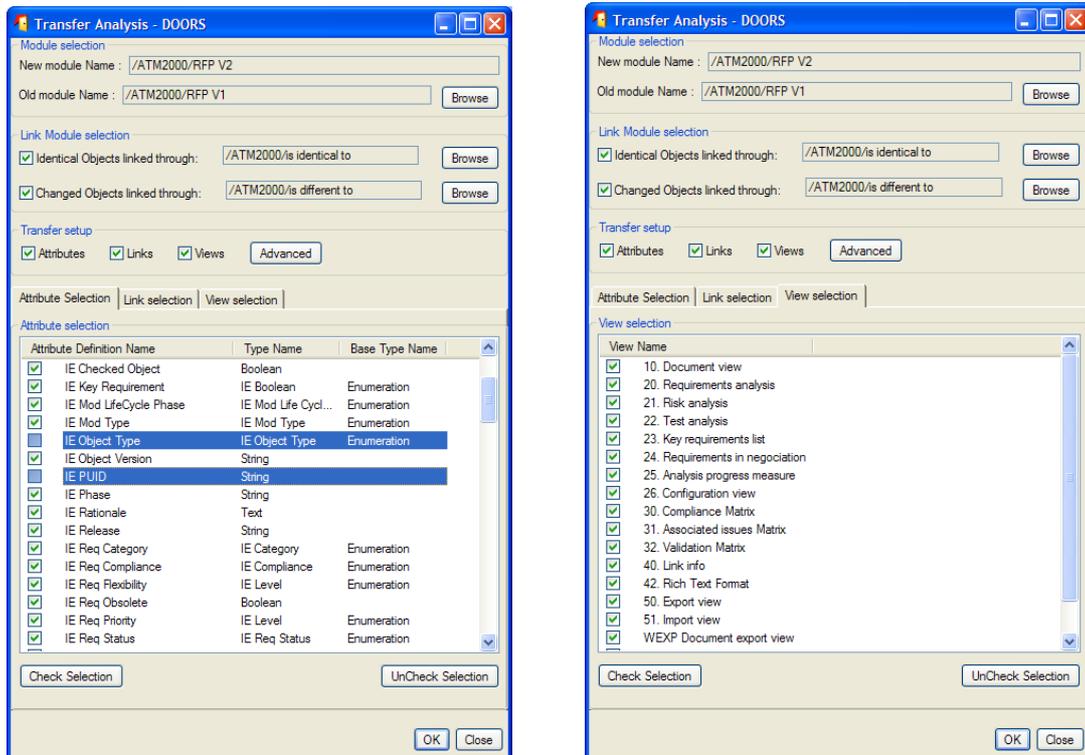


Figure 101 : Advanced Graphic User Interface for Transfer Analysis: Attribute & View selection

Notice that system attributes that are read only (for instance the “Absolute Number” attribute) in the target module are not proposed.

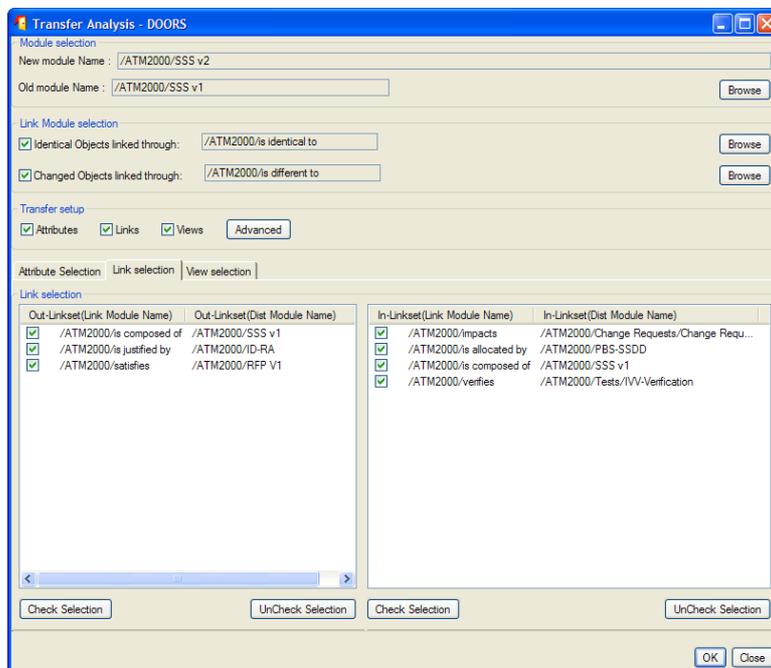


Figure 102 : Advanced Graphic User Interface for Transfer Analysis: Linkset selection

10.2.5.2 Use and Parameters

The “Transfer” parameters are hereafter described.

- **Select the new module.** Use the RMF - “Compare Modules” from the RFP V2 module; then the New Module Name will automatically be “RFP V2”, and there is no way to change it.

New module Name : /ATM2000/RFP V2

- **Select the old module.** Use the browse button to select the old module.

Old module Name : /ATM2000/RFP V1

- **Select Link Modules for identical objects.** It is the link module to be used to find the old object information to be transferred, for new identical objects.
- **Select Link Module for modified objects.** It is the link module to be used to find the old object information to be transferred, for new similar objects.

Link Module selection

Identical Objects linked through: /ATM2000/is identical to

Changed Objects linked through: /ATM2000/is different to

- **Transfer setup.** Just check the boxes in order to define what shall be transferred from the old module to the new.

Transfer setup

Attributes Links Views

- **Advanced Transfer setup.** Specify amongst all the possible data what data you want to transfer. For instance you can transfer a subset of all the available attributes, only specific links (chosen amongst linksets), and a subset of all the available views. The lists of attributes, links and views are built in order to propose the old module data. See advanced GUI screen shots.

Be cautious using these attributes for it may result in inconsistent configuration, especially between attributes and views.

So, in our example, it copies to RFP V2 the attributes and the links of RFP V1 unchanged objects in RFP V2, as shown in Figure 103. Note that if they exist, both incoming and outgoing links can be copied.

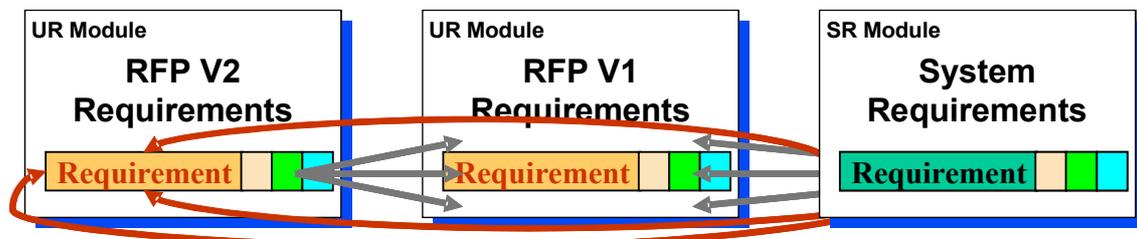


Figure 104 : Attributes and Links copied from comparison of RFP V1 and V2

Notice that the default selections are set as followed:

- **Attribtues:**
 - If the *old module is NOT RMF* and *the new one is NOT RMF*
 - All the attributes are selected except “Object Heading”, “Object Text”, and “Paragraph Style”.
 - If the *old module is NOT RMF* and *the new one is RMF*
 - All the attributes are selected except “Object Heading”, “Object Text”, and “Paragraph Style”
 - If the *old module is RMF* and *the new one is NOT RMF*
 - All the attributes are selected except “Object Heading”, “Object Text”, “Paragraph Style”, RCM and PFM attributes (the “IE PUID” and “IE Object type” attributes are selected).
 - If the *old module is RMF* and *the new one is RMF*
 - All the attributes are selected except “Object Heading”, “Object Text”, “Paragraph Style”, RCM and PFM attributes, “IE PUID” and “IE Object type” attributes.
- **Linksets**
 - The default selection includes all the linksets save the comparison ones.
- **View**
 - The default selection includes all the views.

Notice too, that default selections can be changed through a modification of user callout functions. See the comments in the code to know how to use them.

The functions are located at:

```
“[IRDRMFAO HOME]\lib\dxl\addins\IRDRMFAO  
\brandnewtransfer\includes\usercallouts.inc”
```

The functions are :

- ***processDefaultAttributeSelection***: function to be modified (see the end of the function for an example) to change the default attribute selection.
- ***processDefaultLinksetSelection***: function to be modified (see the end of the function for an example) to change the default linkset selection.
- ***processDefaultViewSelection***: function to be modified (see the end of the function for an example) to change the default view selection.

processCheckBeforeExecution: function to be modified (see the end of the function for an example) to add a specific check before the transfer execution.

The “Paragraph Style” attribute is copied in a specific way:

- If the attribute is transferred from a RMF object, the local value is not modified (no transfer)
 - If the attribute is transferred from a non RMF object, the local value is replaced by the transferred value.
-

Notice the following constraint:

To transfer incoming links, you need **write access rights** to the **source module(s)** of those links.

10.2.5.3 Pre-processing verifications and log window

Before trying to process the transfer, tests are made regarding the linkset pairing definition.

- If no link transfer is required no test are made.
- If link transfer is required, the linkset pairing will be checked for all the necessary couples of modules. Interesting events and modifications will be logged in a log window.
 - Generally, the transfer script will try to update the linkset pairing so that to reproduce the “same” new module linkset pairing as the old module one. It can be an update of:
 - either the new module linkset pairing itself in the case of an outgoing link transfer
 - or a reference to the new module in another module linkset pairing in the case of incoming link transfer
 - When the linkset pairing **is not enforced**
 - Either **you have the “administrate right”** on the proper folder; then the linkset pairing will be updated only if ever a linkset pairing was defined for the old module. If not, there will just be a link transfer.
 - Or **you don’t have the “administrate right”** on the proper folder. You will then be informed of the situation in the log window. The links will be transferred anyway.
 - When the linkset pairing **is enforced**:
 - Either **you have the “administrate right”** on the proper folder. In this case the linkset pairing will be updated only if ever a linkset pairing was defined for the old module. If not, the enforcement will be temporarily removed.
 - Or **you don’t have the “administrate right”** on the proper folder. In this case the link won’t be transferred but you can go on still. The Errors will be logged (see § 10.2.5.4).

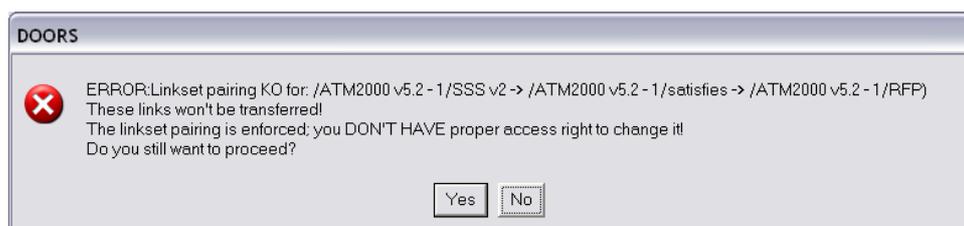


Figure 105 : Linkset pairing error example

10.2.5.4 Processing verifications and log window

If errors occur during the attribute transfer, the log window will list the errors.

If errors occur during the link creation, you'll be asked to skip the single current error, or to skip all the errors, or to cancel the transfer.

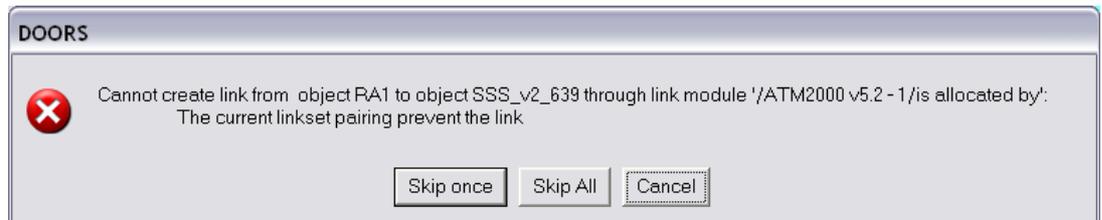


Figure 106 : processing error window example (linkset pairing prevent link transfer)

A log window is displayed at the end of the processing to keep trace of all the errors that occurred, including informations from the pre-processing verifications:

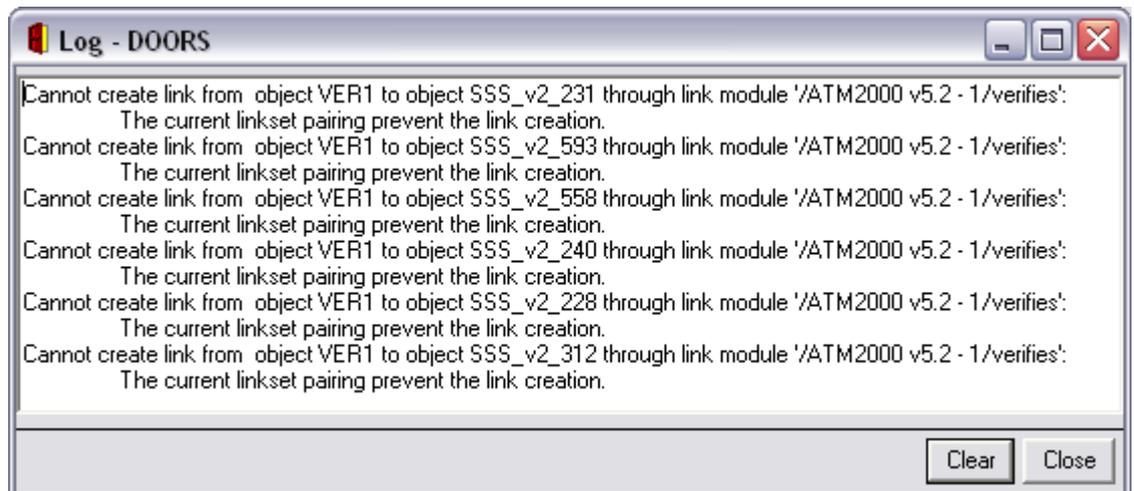


Figure 107 : processing log window example (linkset pairing prevent link transfer)

10.2.6 5th step: optional deletion of the older version of the source document

Now RFP V1 could be deleted, or archived (in order to keep trace of the history), because it is no longer necessary for the traceability from System Requirements to new version of RFP V2. Its continued presence in the list of modules in a project becomes a source of potential confusion.

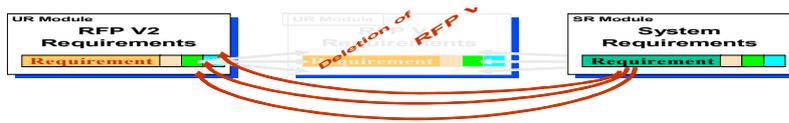


Figure 108 : Deletion of old version of the DOORS module.

NB: you can use the relationship manager to do this easily.

10.3 Managing change within DOORS

10.3.1 Introduction

Within a DOORS environment, change is best managed on a change by change basis, rather than having to first find and then process a batch of changes as described in the previous section. Change proposals will originate from any stakeholder or system engineer, but only those approved by the relevant authorities should be applied. Each change proposal should also contain details of any implied changes to existing analysis (eg links). The standard DOORS feature : “Change Proposal System” should be used in this situation. The process is summarised below in Figure 9.8

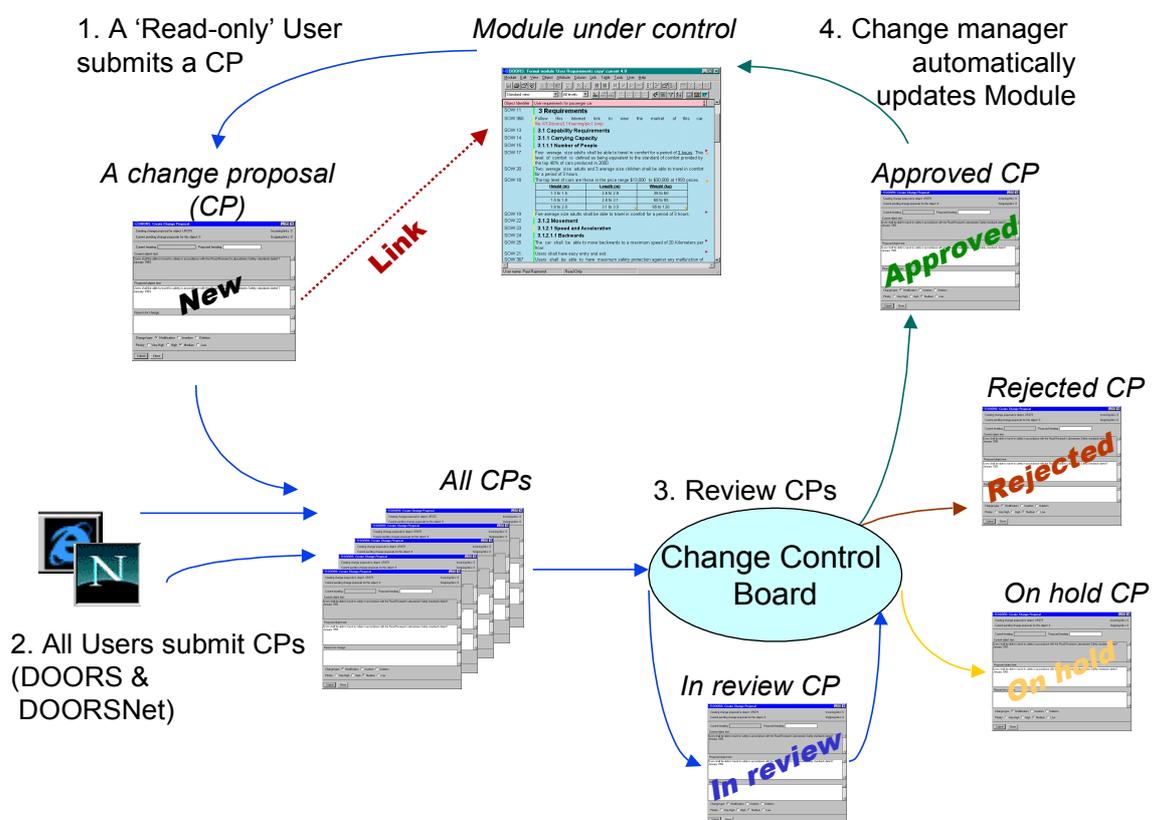


Figure 109 : The formal change proposal cycle

The DOORS CP system recognises three types of users, who are given different access rights, as follows;

- ‘Standard’, who carry out activities 1 and 2 in Figure 9.8,
- ‘CP Reviewer’, who carry out activity 3 in Figure 9.8, and
- ‘CP Manager’, who carries out activity 4 in Figure 9.8, plus overall administration..

10.3.2 CPS Administration

The module under control should be set up so that Standard users only have read access rights, but the Change Manager should have write access. This will enable any user to raise a CP, and the Change Manager to launch the automatic application of Approved CPs.

The action of raising a CP causes a change object to be created in a CP partner module, which will have a name that begins with 'proposals' followed by a number, e.g. 'Proposals 35'. The CP partner module is divided into edit shareable sections, one per user who is entered into the CPS system (by the CP manager). The access rights to these sections should be set up so that Standard users can read each others CPs but only create and modify their own.

The CP Reviewers should be able to modify all CPs, since it is often convenient for a review meeting to make changes without having to involve the originator. The CP status attribute should be set so that Standard users only have read access.

When the CPS is being configured for a particular 'module under control', the default is to provide change control over the Object Text and Object Heading only. Any other attributes over which change control is required must be specifically selected.

10.3.3 CPS limitations

The CPS can be cumbersome when there are a large number of changes to be reviewed, and it may be more convenient to export a view of a change module to a spreadsheet in order to review a large number of changes off-line. The results of the review should then be input back into the CPS by a CP Reviewer login, without involving the whole Review Board in a protracted on-line session.

The DOORS CPS allows the five status values shown diagonally across the screen shots in Figure 9.8, plus 'Applied'. This set is adequate for a single level approval process, but is inadequate for more levels. For example it is often necessary to approve a change proposal internally before it is submitted to the customer for his approval. The solution is either to pay Telelogic for an enhancement (on a previous version of DOORS this took around 5 days of consultancy), or to raise a new change for each additional level of approval.

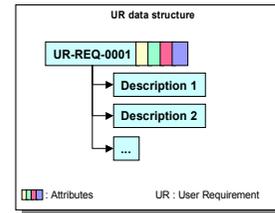
APPENDIX A : MODULE DESCRIPTION FORMS

Appendix A. User Requirements Module Description Form

This module description form contains information about DOORS formal module of type "User Requirements".

The "User Requirements" Module contains RMF objects of type "Requirement". The data structure for each such object is a tree. The root DOORS object is the User Requirement itself. It carries all the attributes applying to the User Requirement, it is the only DOORS object in the tree, which can be identified as a RMF object and gain a PUID. All links to and from the object should be attached to the root object

The leaves of the tree are DOORS objects which inherit the attribute "IE Object Type", which for a User Requirements, has the value "Requirement". The leaf DOORS objects should only be used for descriptive or explanatory material, and all of their RMF attributes should be set to 'blank'. Leaf objects cannot be assigned a PUID, and should not be linked using standard RMF linksets. The enumerated lists shown in the following tables are the defaults supplied with the delivered IRDRMFAO. They should all be customised to be appropriate to the individual project



Typical setup/process for the "User Requirements" Module

Assumption : Originating Document is available from WORD. It could be any other format readable by DOORS (see import format supported).

- 1) Create a new empty "User Requirements" module, by restoring (using file>restore>module in the Database Window) the file UR.dma.
- 1) From WORD, export the document to DOORS, by clicking the "Export To Doors" icon in the WORD tool bar,
- 2) Within DOORS, select paragraphs that represent a user requirement and use the IRDRMFAO command "Manage Objects" to identify Requirements,
- 4) For each user requirement identified, fill the attributes using the DOORS views.

Module attributes of User Requirements module

Attribute name	Type	Value	Description
IE Mod Type	enum	User Requirements	Type of the module, always "User Requirements" in this case. For the whole list of values, see the "Project Profile" Module Description.
IE Mod LifeCycle Phase	enum	Feasibility Study Model Simulation Demonstrator	Represents the life cycle phase of the project to which the requirements identified in the module apply. .

		Prototype Full Development Production Operation & Support	
IE Requirement Number	Integer		An internal counter used by IRDRMFAO, do not edit.
IE Release	string	see description	Stores the IRDRMFAO release which has been used to create this module.

Object attributes of User Requirements module

These attributes apply to the requirements (i.e. "IE Object Type" attribute is "Requirement")

Attribute name	Type	Value	Description
IE Object Type	enum	Requirement	Type of the object, always "Requirement" in this case, or null. For the whole list of values, see the "Project Profile" Module Description.
IE PUID	string	see description	Project Unique ID. This attribute is automatically set with the following concatenation rule : [module prefix]-[requirement prefix]-[number] - the [module prefix] is obtained from the DOORS module attribute "Module Prefix", - the [requirement prefix] is obtained from the DOORS attribute "IE Object Prefix" (see the "Project Profile" Module Description), - the [number] is incremented by one every new requirement.
IE Req Priority	enum	Low Medium High	Represents the level of priority the customer has set to the requirement.
IE Req Compliance	enum	Not Met Partially Met Met	Represents the level of compliance obtained with the System Requirements (see "System Requirements" Module Description) against the customer requirement.
IE Req Flexibility	enum	Low Medium High	Represents the level of flexibility the customer could have when negotiating the requirement.

Attribute name	Type	Value	Description
IE Req Category	Enum multival	<ul style="list-style-type: none"> ■ Mission ■ Operational Objective ■ Operational Scenario ■ Contract ■ Management ■ Functional ■ - Function ■ - Data ■ - Behavior ■ Performance ■ Dependability ■ - Reliability ■ - Availability ■ - Maintainability ■ - Security ■ - Safety ■ Constraints ■ - Cost ■ - Schedule ■ - Architecture ■ - IV&V ■ - Development ■ - Production ■ - Delivery ■ - Ergonomy ■ - Installation 	<p>Allow categorization of requirements. The categories are colored for user interface purpose.</p> <p>Note that a requirement may be assigned to several of these categories.</p> <p>The principle use of this attribute is to allow filtering within the various views, in order to manage large sets of requirements efficiently.</p>
IE Risk Impact	enum multival	<ul style="list-style-type: none"> Operational Use Performance Cost Timescale Technology Organization Delivery 	<p>This attribute is used to classify the type of risk, if any, associated with a requirement.</p> <p>Note that a requirement may be assigned to several of these categories.</p>
IE Risk Consequence	enum	<ul style="list-style-type: none"> Negligible Marginal Significant Critical Catastrophic 	<p>This attribute is used to assign an impact level to the risk.</p>

Attribute name	Type	value	Description
IE Risk Probability	enum	Negligible Low Likely very Likely Inevitable	This attribute is used to assign a probability of occurrence to a risk.
IE Key Requirement	enum	true false	This attribute is used to identify the given Requirement as a key Requirement. Alternatively, a project could delete this attribute and add "Key" to the "IE Req Priority" enumerations in the "IE Level" type.
IE Phase	string	see description	This attribute is used to define the increment phase in which the requirement is implemented into a system/product. Typically it is used to define the future release at which new functionality will be available. It may be appropriate for some projects to control this attribute more precisely by setting up an enumerated list of approved future releases.
IE Req Status	enum	In negotiation Accepted Analysis Obsolete	This attribute is used to define the progress status of the requirement analysis activity..
IE Object Version	string	see description	This attribute is managed by DXL, specifically by the "Update Version Attribute " utility. The attribute holds the designation of the baseline of the module in which the object was last changed.
IE Rationale	Text		This attribute is used to record "routine" decisions and issues within the responsibility of individual engineers or co-located teams. (Major issues and decisions should be recorded in the associated issue/ Decision module)

Available relationships for User Requirements objects

link	link way	target type	link module	Description
Compliance	Incoming	Requirement	satisfies	The linked requirements satisfy the given User Requirement.
Issue raised	Incoming	Issue-Decision	refers to	Shows that this User Requirement is to be (or has been) analyzed through a Issue and Decision process.
Verification	Incoming	IVV Procedure	verifies	The linked IVV Procedures verify the given User Requirement.

Available views of User Requirements module

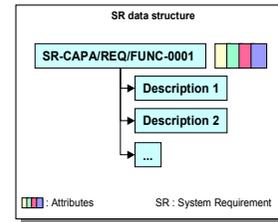
View name	filter/sort available	Description
Standard view	none	DOORS default view, which shows the DOORS ID and Object Heading/Text.
Associated issues	inactive filter, no sort: IE Object Type == Requirement	Displays the attributes: PUID, Object Text, Compliance, Status, Flexibility, Priority, Risk Impact, Rationale, and also a traceability column obtained with the objects reached by an incoming "refers to" link. This traceability column is headed "referred by..." and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text.
Compliance matrix	active filter, no sort: IE Object Type == Requirement	Displays the attributes: PUID, Object Text, Category, Compliance, Priority, Phase, Risk Impact, and also a traceability column obtained with the objects reached by an incoming "satisfies" link. This traceability column is headed "satisfied by..." and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text.
Critical requirements list	active filter and active sort: IE Object Type == Requirement and IE Risk Impact != NULL sorting by IE Risk Consequence	Displays the attributes: Risk Level (as a LED chart), PUID, Object Text, Category, Status, Risk Impact, Risk Level and probability of occurrence.
Document view	inactive filter, no sort: IE Object Type == Requirement	Displays the attributes: Document Style, PUID and Object Heading/Text.
Key requirements list	active filter, no sort: IE Object Type == Requirement and IE Key Requirement == true	Displays the attributes: PUID, Key Requirement, Object Text, Category, Compliance, Status, Flexibility, Priority, Phase and Risk Impact.
Requirements analysis	inactive filter, no sort: IE Object Type == Requirement	Displays the attributes: PUID, Object Text, Category, Compliance, Status, Flexibility, Priority, Key Requirement, Phase, Risk Impact and Rationale.
Requirements in negotiation	active filter, no sort: IE Object Type == Requirement and IE Req Status == in negotiation	Displays attributes PUID, Object Text, Category, Compliance, Status, Flexibility, Priority, Phase and Risk Impact.
Validation matrix	active filter, no sort: IE Object Type == Requirement	Displays the attributes: PUID, Object Text, Flexibility, Compliance, Status, Priority, Risk Impact and Risk Level, and also 2 traceability columns obtained with the IVV Procedures reached by an incoming "verifies" link, one for the IVV Procedures description and one for the Verification Method. The first traceability column is headed "verified by..." and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text. The second traceability column is headed "Verification Method" and just shows the code I, A, T, D or null as appropriate.

Appendix B. System Requirements Module Description Form

This module description form contains information about DOORS formal module of type "System Requirements". SR Module is used to describe System specification document. It could also be used for Subsystem or Prime Item specification documents.

The "System Requirements" Module contains RMF Objects of types "Capability", "Requirement", and/or "Function". The data structure for each such object is a tree. The root DOORS object is the RMF Object itself. It carries all the attributes as it is the only DOORS object in the tree, which can be identified as a RMF object and gain a PUID. All links to and from the object should be attached to the root object. The leaves of the tree are DOORS objects which inherit the attribute "IE Object Type", may have the value "Capability", "Requirement", or "Function". The leaf DOORS objects should only be used for descriptive or explanatory material, and all of their RMF attributes should be set to 'blank'. Leaf objects cannot be assigned a PUID, and should not be linked using standard RMF linksets.

The enumerated lists shown in the following tables are the defaults supplied with the delivered IRDRMFAO. They should all be customised to be appropriate to the individual project.



Typical setup/process for the "System Requirements" Module

- 1) Assumption : Originating Document is available from WORD. It could be any other format readable by DOORS (see import format supported).
- 2) Create a new empty "User Requirements" module, by restoring (using file>restore>module in the Database Window) the file SR.dma.
- 3) From WORD, export the document to DOORS, by clicking the "Export To Doors" icon in the WORD tool bar,
- 4) Within DOORS, select paragraphs that represent capabilities, requirements or functions and use the IRDRMFAO interface "Manage Objects" to assign the appropriate object type.
- 5) For each RMF object, fill in the attributes using the DOORS views..

Module attributes of System Requirements module

Attribute name	Type	value	Description
IE Mod Type	enum	System Requirements Subsystem Requirements Prime Item Requirements	Type of the module : "System Requirements", "Subsystem Requirements" or "Prime Item Requirements". The Value is set by default to "System Requirements" but could be changed on need. For the whole list of values, see the "Project Profile" Module Description.
IE Mod LifeCycle Phase	enum	Feasibility Study Model Simulation Demonstrator Prototype Full Development Production Operation & Support	Represents the life cycle phase of the project to which the objects identified in the module apply.
IE Capability Number	Integer		An internal counter used by IRDRMFAO, do not edit.
IE Requirement Number	Integer		An internal counter used by IRDRMFAO, do not edit.
IE Function Number	Integer		An internal counter used by IRDRMFAO, do not edit.
IE Release	string	see description	Stores the IRDRMFAO release which has been used to create this module.

Object attributes of System Requirements module

These attributes apply mostly to the requirements (i.e. "IE Object Type" attribute is "Requirement"). It may not be appropriate to apply all of them to capabilities or functions (i.e. "IE Object Type" attribute is "Capability" or "Function") .

Attribute name	Type	value	Description
IE Object Type	enum	Requirement Function Capability	Type of the object, null if object is not identified as a RMF root object.. For the whole list of values, see the "Project Profile" Module Description.
IE PUID	string	see description	Project Unique ID. This attribute is automatically set with the following concatenation rule : [module prefix]-[object prefix]-[number] - the [module prefix] is obtained from the DOORS module attribute "Module Prefix", - the [object prefix] is obtained from the DOORS attribute "IE Object Prefix" (see the "Project Profile" Module Description), - the [number] is incremented by one every new RMF object.
IE Req Priority	enum	Low Medium High	This attribute represents the level of priority the System Engineer has set to the requirement.
IE Req Compliance	enum	Not Met Partially Met Met	This attribute represents the level of compliance obtained from the succeeding level in the design hierarchy. If compliance is not "Met", there should be a commentary in the "Rationale" attribute or a specific issue raised in the appropriate Issue-Decision module.
IE Req Flexibility	enum	Low Medium High	Represent the level of flexibility the system engineer could have when negotiating the requirement with a sub-contractor.

Attribute name	Type	value	Description
IE Req Category	enum	■ Mission	Allow categorization of capabilities, requirements and functions. The categories are colored for user

	multival	<ul style="list-style-type: none"> Operational Objective Operational Scenario Functional - Function - Data - Behavior Performance Dependability - Reliability - Availability - Maintainability - Security - Safety Constraints - Cost - Schedule - Architecture - IV&V - Development - Production - Delivery - Ergonomy - Installation 	interface purpose.
IE Risk Impact	enum multival	<ul style="list-style-type: none"> Operational Use Performance Cost Timescale Technology Organization Delivery 	<p>This attribute is used to classify the type of risk, if any, associated with a capability, requirement or function.</p> <p>Note that several classifications may be assigned a single RMF object.</p>
IE Risk Level	enum	<ul style="list-style-type: none"> Negligible Marginal Significant Critical Catastrophic 	This object is used to assign an impact level to the risk.

Attribute name	Type	value	Description
IE Risk Probability	enum	Negligible Low Likely Very Likely Inevitable	This attribute is used to assign a probability of occurrence to a risk.
IE Key Requirement	enum	true false	This attribute is used to identify the given Capability, Requirement or Function as a Key requirement. This usually means that the requirement has a strong influence on cost, schedule, functionality, risk or performance.
IE Phase	string	see description	This attribute is used to define the increment phase in which the requirement is implemented into a system/product. Typically it is used to define the future release at which new functionality will be available. It may be appropriate for some projects to control this attribute more precisely by setting up an enumerated list of approved future releases.
IE Req Tolerance	string	see description	This attribute defines the tolerance for the requirement (performance requirements only).
IE Req Status	enum	In negotiation Accepted Analysis Obsolete	This attribute is used to define the progress of the requirement analysis and/or system design activity.
IE Req Type	enum	Originating Deriv:ed Induced Calculated	This attribute defines the type of the requirement, it is useful to record how the requirement was created. The following definitions, derived from SYS-EM, are offered as IRDRMF AO standards: <u>Originating</u> : Can be traced with little or no modification to a higher level requirement. <u>Derived</u> : The result of functional partitioning of a higher level requirement. <u>Induced</u> : A new requirement produced as a result of a design decision at this level. <u>Calculated</u> .. The result of numerical partitioning of a higher level performance parameter.
IE Object Version	string	see description	This attribute is managed by DXL, specifically by the "Update Version Attribute" utility. The attribute holds the designation of the baseline of the module in which the object was last changed.
IE Rationale	Text	See description	This attribute records "routine" decisions and issues within the responsibility of individual engineers or co-located teams.

Available relationships for System Requirements objects

Link	link way	target type	link module	Description
Allocation	incoming	Configuration Item	is allocated by	the given capability, requirement or function is allocated to the linked configuration items.
Compliance	outgoing	Requirement	satisfies	the linked upper requirements are satisfied by the given requirement or function.
Justification	outgoing	Issue-Decision	is justified by	represent the justification of the Capability/Requirement/function object, i.e. link to a decision.
Issue raised	incoming	Issue-Decision	refers to	Shows that the Capability/Requirement/Function is to be (or has been) analyzed through an Issue and Decision process.
Verification	incoming	IVV Procedure	verifies	Shows which IVV procedures verify the given Capability/Requirement/Function.
Composition	internal	Capability/ Requirement/ Function	Is composed of	An internal link to the SR module which is used to establish a Capability > Requirement > Function hierarchy. Each link should be sourced at the higher level object (which is contrary to the convention established for external links).

Available views of System Requirements module

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View name	filter/sort available	Description
Standard view	none	The DOORS default view, which shows the DOORS ID and Object Heading/Text.
Allocation matrix	active filter, no sort: IE Object Type != NULL	Displays the attributes: PUID, Object Text, Category, Compliance, Status, Priority, Phase, Risk Impact, and also a traceability column obtained with the objects reached by an incoming "is allocated by" link. This traceability column is headed "allocated to..." and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text.
Associated issues	inactive filter, no sort: IE Object Type != NULL	Displays the attributes: PUID, Object Text, Compliance, Type, Status, Flexibility, Priority, Risk Impact, and also a traceability column obtained with the objects reached by an incoming "refers to" link. This traceability column is headed "referred by..." and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text.
Compliance matrix	active filter, no sort: IE Object Type == Requirement	Displays the attributes: PUID, Object Text, Category, Compliance, Status, Priority, Phase, Risk Impact, and also a traceability column obtained with the objects reached by an incoming "satisfies" link. This traceability column is headed "satisfied by..." and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text.
Critical requirements list	active filter and active sort: IE Object Type == Requirement and IE Risk Impact != NULL sorting by IE Risk Level	Displays the attributes: Risk Level (as a LED chart), PUID, Object Text, Status, Risk Impact, Risk Level and probability of occurrence.
Document view	inactive filter, no sort: IE Object Type != NULL	Displays the attributes: Document Style, PUID and Object Text.
Justification	inactive filter, no sort: IE Object Type != NULL	Displays the attributes PUID, Object Text, rationale, Compliance, Type, Status, Flexibility, Priority, Risk Impact, and also a traceability column obtained with the objects reached by a "is justified by" outgoing link. This traceability column is headed "is justified by..." and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text.
Key requirements list	active filter, no sort: IE Object Type == Requirement and IE Key Requirement == true	Displays the attributes: PUID, Key Requirement, Object Text, Category, Compliance, Type, Status, Flexibility, Tolerance, Priority, Phase and Risk Impact.
Requirements analysis	inactive filter, no sort: IE Object Type != NULL	Displays the attributes: PUID, Object Text, Category, Compliance, Type, Status, Flexibility, Tolerance, Priority, Phase, Key Requirement, Risk Impact and Rationale.
Requirements in negotiation	active filter, no sort: IE Object Type == Requirement and IE Req Status == in negotiation	Displays the attributes: PUID, Object Text, Category, Compliance, Status, Flexibility, Priority, Phase and Risk Impact.
Upper requirements satisfied	active filter, no sort: IE Object Type == Requirement	Displays the attributes: PUID, Object Text, Category, Type, Status, Phase and Risk Impact, and also a traceability column obtained with the objects reached by a "satisfies" outgoing link. This traceability column is headed "satisfies..." and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text.
Verification matrix	active filter, no sort: IE Object Type == Requirement	Displays the attributes: PUID, Object Text, Flexibility, Compliance, Status, Priority, Risk Impact and Risk Level, and also 2 traceability columns obtained with the IVV Procedures reached by an incoming "verifies" link, one for the IVV Procedures description and one for the Verification Method. The first traceability column is headed "verified by..." and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text. The second traceability column is headed "Verification Method" and just shows the code I, A, T, D or null as appropriate

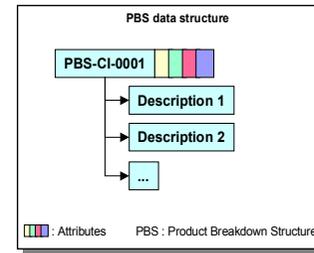
Appendix C. PBS Module Description Form

This module description form contains information about DOORS formal module of type "Product Breakdown Structure" (PBS).

The "PBS" Module contains RMF Objects of type "Configuration Item". The data structure for each such object is a tree. The root DOORS object is the RMF Object itself. It carries all the attributes as it is the only DOORS object in the tree, which can be identified as a RMF object and gain a PUID. All links to and from the object should be attached to the root object

The leaves of the tree are DOORS objects which inherit the attribute "IE Object Type", may have the value "Configuration Item". The leaf DOORS objects should only be used for descriptive or explanatory material, and all of their RMF attributes should be set to 'blank'. Leaf objects cannot be assigned a PUID, and should not be linked using standard RMF linksets.

The enumerated lists shown in the following tables are the defaults supplied with the delivered IRDRMFAO. They should all be customised to be appropriate to the individual project



Typical setup/process for the "Product Breakdown Structure" Module

- 1) Assumption : Originating Document is available from WORD. It could be any other format readable by DOORS (see import format supported).
- 2) Create a new empty "PBS" module, by restoring (using file>restore>module in the Database Window) the file PBS.dma.
- 3) From WORD, export the document to DOORS, by clicking the "Export To Doors" icon in the WORD tool bar,
- 4) Within DOORS, select paragraphs that configuration items and use the IRDRMFAO interface "Manage Objects" to assign the appropriate object type.

For each RMF object, fill in the attributes using the DOORS views..

Module attributes of PBS module

Attribute name	Type	value	Description
IE Mod Type	enum	Product Breakdown Structure	Type of the module, always "Product Breakdown Structure" in this case. For the whole list of values, see the "Project Profile" Module Description.

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IE Mod LifeCycle Phase	enum	Feasibility Study Model Simulation Demonstrator Prototype Full Development Production Operation & Support	Represents the life cycle phase of the project to which the objects identified in the module apply.
IE Configuration Item Number	Integer		An internal counter used by IRDRMFAO, do not edit.
IE Release	string	see description	Stores the IRDRMFAO release which has been used to create this module.

Object attributes of PBS module

These attributes apply to the "Configuration Item" objects (i.e. "IE Object Type" attribute is "Configuration Item")

Attribute name	Type	value	Description
IE Object Type	enum	Configuration Item	Type of the object, always "Configuration Item" in this case, or null. For the whole list of values, see the "Project Profile" Module Description.
IE PUID	string	see description	Project Unique Identifier. This attribute is automatically set with the following concatenation rule : [module prefix]-[CI prefix]-[number] - the [module prefix] is obtained from the DOORS module attribute "Module Prefix", - the [CI prefix] is obtained from the DOORS attribute "IE Object Prefix" (see the "Project Profile" Module Description), - the [number] is incremented by one every new RMF Object.
IE CI Type	enum	System Subsystem Prime Item HWCi CSCI Interface NDI COTS	Represent the type of the Configuration Item. This list shows sample items, each project should define an appropriate list. A 'Platform' CI type is often useful.
IE CI Serial Number	string	see description	Represent the identification of the Configuration Item as identified by the Configuration Management function. The numbering will be project specific.
IE CI Version Number	string	see description	Represent the version of the Configuration Item as identified by the Configuration Management function. The numbering will be project specific.
IE CI Revision Number	string	see description	Represent the revision of the Configuration Item as identified by the Configuration Management function. The numbering will be project specific.
IE CI Supplier Id	string	see description	Represent the identification of the Supplier of the Configuration Item as identified by the Configuration Management function.
IE Object Version	string	see description	This attribute is managed by DXL, specifically by the "Update Version Attribute" utility. The attribute holds the designation of the baseline of the module in which the object was last changed.

Available relationships for PBS objects

link	link way	target type	link module	Description
allocation	outgoing	Capability , Requirement,or Function	is allocated by	The linked capabilities, requirements or functions are allocated to the given configuration item.

justification	outgoing	Issue-Decision	is justified by	Represents the justification of the Configuration Item object, i.e. link to a decision.
Issueraised	incoming	Issue-Decision	refers to	Shows that the Configuration Item is to be (or has been) analyzed through a Issue and Decision process.
Design hierarchy	None	Configuration Item	None	The DOORS Outline heading numbering can be used to establish a design hierarchy for a system.

Available views of PBS module

View name	Filter	Description
Standard view	None	The DOORS default view, which shows the DOORS ID and Object Heading/Text.
Allocated requirements	active filter, no sort: IE Object Type == Configuration Item	Displays the attributes: PUID, Object Text, Type, and also a traceability column obtained with the objects reached by a "is allocated by" outgoing link. This traceability column is headed "allocated by..." and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text.
Associated issues	inactive filter, no sort: IE Object Type == Configuration Item	Displays the attributes: PUID, Object Text, Type, and also a traceability column obtained with the objects reached by an incoming "refers to" link. This traceability column is headed "referred by..." and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text.
Configuration Item Analysis	active filter, no sort : IE Object Type == Configuration Item	Displays the attributes: PUID, Object Text, Type, Supplier, CM identification, CM version and CM revision.
Document view	inactive filter, no sort : IE Object Type == Configuration Item	Displays the attributes: Document Style, PUID and Object Text.
Justification	inactive filter, no sort: IE Object Type == Configuration Item	Displays the attributes: PUID, Object Text, Type, and also a traceability column obtained with the objects reached by a "is justified by" outgoing link. This traceability column is headed "is justified by..." and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text.

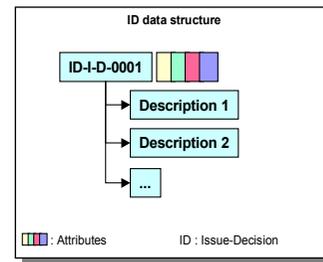
Appendix D. Issues and Decisions and Justifications Module Description Form

This module description form contains information about DOORS formal module of type "Issues and Decisions" and Justifications. This type of module is used for different analysis purposes like Requirements Analysis, Design Analysis, etc.

The "IDJ" Module contains RMF Objects of type "Issue-Decision". The data structure for each such object is a tree. The root DOORS object is the RMF Object itself. It carries all the attributes as it is the only DOORS object in the tree, which can be identified as a RMF object and gain a PUID. All links to and from the object should be attached to the root object

The leaves of the tree are DOORS objects which inherit the attribute "IE Object Type", may have the value "Issue-Decision". The leaf DOORS objects should only be used for descriptive or explanatory material, and all of their RMF attributes should be set to 'blank'. Leaf objects cannot be assigned a PUID, and should not be linked using standard RMF linksets.

The enumerated lists shown in the following tables are the defaults supplied with the delivered IRDRMFAO. They should all be customised to be appropriate to the individual project



Typical setup/process for the "Issue-Decision" Module

- 1) Assumption : Originating Document is available from WORD.
- 2) Create a new empty "IDJ" module, by restoring the file IDJ.dma.
- 3) From WORD, export the document to DOORS, by clicking on the "Export To Doors" icon,
- 4) Within DOORS, use the IRDRMFAO interface "Manage Objects" to assign appropriate type.

Module attributes of Issues and Decisions module

Attribute name	Type	value	Description
IE Mod Type	enum	Issues and Decisions Requirement Analysis ID Design Analysis ID Operational Concepts	For the whole list of values, see the "Project Profile" Module Description.
IE Mod LifeCycle Phase	enum	Feasibility Study Model Simulation Demonstrator Prototype Full Development Production Operation & Support	Represents the life cycle phase of the project to which the objects identified in the module apply.
IE Issue-Decision Number	Integer		An internal counter used by IRDRMFAO , do not edit.
IE Release	string	see description	Stores the IRDRMFAO release which has been used to create this module.

Object attributes of Issues and Decisions module

These attributes apply to the "Issue and Decision" objects (i.e. "IE Object Type" attribute is "Issue-Decision")

Attribute name	Type	value	Description
IE Object Type	enum	Issue-Decision Justification	Type of the object, always "Issue-Decision" in this case, or null. For the whole list of values, see the "Project Profile" Module Description.
IE PUID	string	see description	Project Unique IDentifier. This attribute is automatically set with the following concatenation rule : [module prefix]-[I-D prefix]-[number] - the [module prefix] is obtained from the DOORS module attribute "Module Prefix", - the [I-D prefix] is obtained from the DOORS attribute "IE Object Prefix" (see the "Project Profile" Module Description), - the [number] is incremented by one every new Issue-Decision RMF object.
IE I-D Priority	enum	Low Medium High	This attribute represents the level of priority set to the Issue-Decision.
IE I-D Decision	text	see description	This attribute records the decision associated with the Issue-Decision.
IE I-D Decision date	date	see description	This attribute records the date of the decision associated with the Issue-Decision.
IE I-D Status	enum	In negotiation Accepted Analysis Obsolete	This attribute is used to define the progress of the Issue-Decision.
IE Object Version	string	see description	This attribute is managed by DXL, specifically by the "Update Version Attribute" utility. The attribute holds the designation of the baseline of the module in which the object was last changed.

Available relationships for Issues and Decisions objects

link	link way	target type	link module	Description
justification	incoming	All types of object, except Issue-Decision objects	is justified by	This relationship represents the justification for an object, i.e. a decision. The Issue-Decision object justifies the linked source objects.
Issue raised	outgoing	All types of object, except Issue-Decision objects .	refers to	This relationship represents the fact that he linked target objects are (or have been) the subject of an issue-decision process.

Available views of Issues and Decisions module

View name	filter	Description
Standard view	none	The DOORS default view, which shows the DOORS ID and Object Heading/Text..
Decisions justify...	active filter, no sort : IE Object Type == Issue-Decision	Displays the attributes: PUID, Object Text, Status, and also a traceability column obtained with the objects reached by a "is justified by" incoming link. This traceability column is headed "decision justifies..." and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text.
Document view	inactive filter, no sort : IE Object Type == Issue-Decision	Displays the attributes: Document Style, PUID and Object Text.
Issues and Decisions Analysis	inactive filter, no sort : IE Object Type == Issue-Decision	Displays the attributes: PUID, Object Text, Decision, Priority, Status and Decision Date
Issues refer to...	active filter, no sort : IE Object Type == Issue-Decision	Displays the attributes: PUID, Object Text, Status, and also a traceability column obtained with the objects reached by a "refers to" outgoing link. This traceability column is headed "Issue refers to..." and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text.

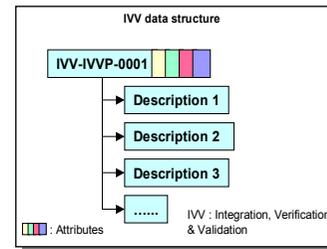
Appendix E. IVV Procedures Module Description Form

This module description form contains information about the DOORS formal module of type "Integration, Verification or Validation Procedures", as delivered with IRDRMFAO.

The "IVV Procedures" Module contains RMF objects of type "IVV Procedure". The data structure for each such object is a tree. The root DOORS object is the IVV Procedure itself. It carries all the attributes applying to the IVV Procedure, it is the only DOORS object in the tree, which can be identified as a RMF object and gain a PUID. All links to and from the object should be attached to the root object

The leaves of the tree are DOORS objects which inherit the attribute "IE Object Type", which for an IVV Procedure, has the value "IVV Procedure". The leaf DOORS objects should only be used for descriptive or explanatory material, and all of their RMF attributes should be set to 'blank'. Leaf objects cannot be assigned a PUID, and should not be linked using standard RMF linksets.

The standard IRDRMFAO 'as delivered' module attributes, object attributes, attribute types, link relationships and views are defined in the following tables. These should all be tailored to the particular project when it is set up..



Suggestion: - The basic RMF IVV Procedure is designed to specify a group of tests which can be planned and approved as a whole. At a later stage individual tests will need to be specified in sufficient detail that test engineers can execute them and the results can be validated. The operating instructions and expected results for the detailed tests could be entered as leaves within the RMF IVV object, and a test specification document created using the Enhanced Word Exporter utility.

Module attributes of IVV Procedures template module

Attribute name	Type	Value	Description
IE Mod Type	Enum	Integration Procedures Verification Procedures Validation Procedures	Type of the module, based on the IVV template. Additional types could be added, but these must be first defined as Module Types in the "Project Profile" Module Description.
IE Mod LifeCycle Phase	Enum	Feasibility Study Model Simulation Demonstrator Prototype Full Development Production Operation & Support	Represents the life cycle phase of the project applying to the verification procedures identified in the module.
IE Release	String	See description	Stores the IRDRMFAO release which has been used for create this module.
IE IVV Procedure Number	Integer		An internal counter used by IRDRMFAO, do not edit.
Prefix	String	IVV	Module prefix, used by IRDRMFAO to generate the PUID. In IRDRMFAO v2.0, this must be edited manually if necessary. In later versions it may be driven from the Module Object in the "Project Profile" Module Description

Object attributes of IVV Procedures module

These attributes apply to the IVV Procedures (i.e. "IE Object Type" attribute is "IVV Procedure")

Attribute name	Type	Value	Description
IE Object Type	Enum	IVV Procedure	Type of the object, always "IVV Procedure" in the delivered IRDRMFAO, or null. Additional types could be added, but these must first be defined as Object types in the "Project Profile" Module Description.
IE PUID	String	See description	Project Unique ID. This attribute is automatically set with the following concatenation rule: [module prefix]-[IVV prefix]-[number] - the [module prefix] is obtained from the DOORS module attribute "Module Prefix". - The [IVV prefix] is obtained from the DOORS object attribute "IE Object Prefix" (see the "Project Profile" Module Description). - The [number] is incremented by one every new verification procedure object created or identified.
IE IVV Type	Enum	Prototype production prototype and production	For each IVV Procedure, this attribute records the kind of the procedure. Production tests are those intended to prove that each product has been built correctly to its design, prototype tests are intended to prove that the design meets the product specifications.
IE IVV Approval Level	Enum	Customer Prime Contractor Sub-Contractor Independent Test House	For each IVV Procedure, this attribute defines which party to the contract is to be responsible for the approval of the test specifications and the test results.
IE IVV Responsible	String		Use this attribute to store the identification of the person responsible in charge of the given IVV Procedure (from the engineering or test organizations).
IE IVV Skills	Text		Represents the list of specific skills needed for the IVV procedure, or identification of the people having these specific skills (for instance, special operation or equipment skills).
IE IVV Event	String		Defines the event or location at which the procedure will be executed. Examples are 'supplier factory test', 'customer platform test', 'prime contractor integration facility'.

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			Suggestion: - Projects could set this attribute up as an enumerated type.
IE IVV Event Provider	Enum	customer prime contractor sub contractor	Represents the party responsible for the conduct of the IVV event.). Suggestion: - Projects could set this attribute up as an enumerated type, giving named sub-contractors etc.
IE IVV Non Regression	Enum	true false	Allow identification of non-regression IVV procedures. These are procedures that are unlikely to have to be repeated in the event of a change to the system.
IE IVV Method	Enum	I A D T	Identify the verification method of the requirements (I, A, D, T methods) : Inspection (for example, inspection of drawings), Analysis (for example, using simulation or virtual reality prototype), Demonstration (for example, using mock-ups or physical models), or Test (for example, by testing physical prototypes, breadboards)
IE IVV Scope	Text		This attribute is used to record agreement with customers and suppliers on the general scope and objectives of the IVV activity before too much effort is expended on the creation of detail test specifications.
IE IVV Pre and Post test Actions	Text		This attribute is used define and constrain significant actions necessary before and after the execution of the IVV procedure. Examples are commitment to deliver specifications for approval at a minimum time ahead of the event, and similarly commitments to approve documents in specific timescales.
IE IVV Acceptance criteria	Text		Used to define general principles of acceptance criteria for the group of tests within this procedure, for example 'what statistical confidence level needs to be achieved', 'what allowance for instrument error is acceptable?'
IE Object Version	String	See description	This attribute is managed by DXL, specifically by the "Update Version Attribute " utility. The attribute holds the designation of the baseline of the module in which the object was last changed.

Available relationships for IVV Procedures objects

Link	Link way	target type	Link module	Description
Justification	Outgoing	Issue-Decision	is justified by	Represents the justification of the IVV Procedure objects i.e. link to a decision.
under issue process	Incoming	Issue-Decision	Refers to	Shows that this IVV Procedure is to be (or has been) analyzed through an Issue and decision process.
Verification	Outgoing	Requirement	Verifies	Shows which requirements are verified by this IVV procedure.
Allocation	Incoming	PBS (test equip)	Is allocated by	Shows which test or other support equipment is allocated to this procedure.

Available views of IVV Procedures module

View name	Filter/sort available	Description
Standard view	None	DOORS default view, which shows the DOORS ID and Object Heading/Text
Associated issues	Inactive filter, no sort: IE Object Type == IVV Procedure	Display attributes PUID, Object Text, Method, Type, and also a traceability column obtained with the objects reached by an incoming "refers to" link. This traceability column is headed "referred by..." and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text
Document View	Inactive filter, no sort: IE Object Type == IVV Procedure	Displays the attributes: Document Styles, PUID and Object Header/Text.
IVV Matrix View	Active filter, no sort: IE Object Type == IVV Procedure	Displays the attributes: PUID, Object Text, Method, Type, and also a traceability column obtained with the Requirements reached by an incoming "verifies" link. . This traceability column is headed "verifies..."

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		and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text
IVV Procedure Definition View	Inactive filter, no sort: IE Object Type == IVV Procedure	Displays the attributes: PUID, Object Text, Scope/Objectives, Method, Type, Approval, Acceptance Criteria, Pre & Post Event Actions.
IVV Procedure Planning View	Inactive filter, no sort: IE Object Type == IVV Procedure	Displays the attributes: PUID, Object Text, Responsible, Event, Event provider, Specific skills needed and Non-Regression.
Justification View	Inactive filter, no sort: IE Object Type == IVV Procedure	Displays the attributes: PUID, Object Text, Method, Type, and also a traceability column obtained with the objects reached by a "is justified by" outgoing link. This traceability column is headed "is justified by..." and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text
Test Equipment View	Inactive filter, no sort: IE Object Type == IVV Procedure	Displays the attributes: PUID, Object Text, Method, Type and also a traceability column obtained with the objects reached by a "is allocated by" incoming link. This traceability column is headed "Support items needed" and (for each link found) shows the name of the module referred to, the PUID of the object referred to, and its Object Text

Appendix F. Project Profile Module Description Form

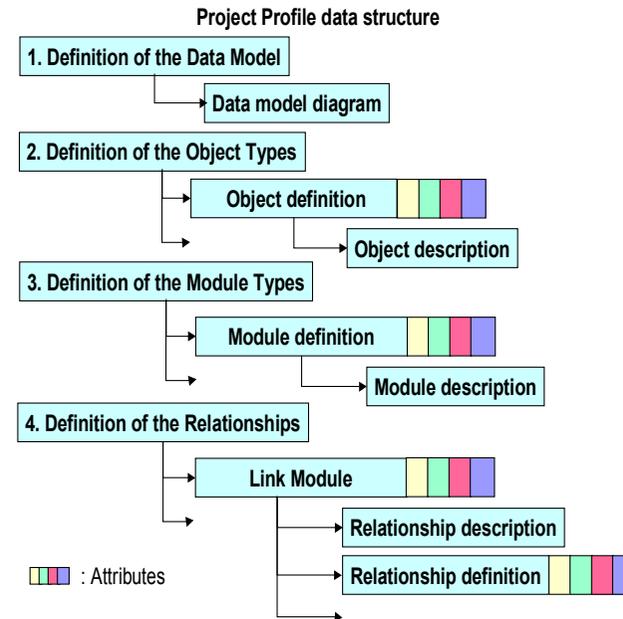
This module description form contains information about DOORS formal module named "Project Profile".

The "Project Profile" module defines the available object types, module types and relationships usable for the current RMF project, together with other project standards such as paragraph styles. In general it controls the DOORS project by defines the drop down lists presented by the IRDRMFAO utilities. The objects represent all the data suitable for System Engineering, like requirements, capabilities, critical issues, etc. The modules contain the objects. Typical modules are User Requirements, System Requirements, Issue-and Decision, etc.

Typical setup/process for creating a new project

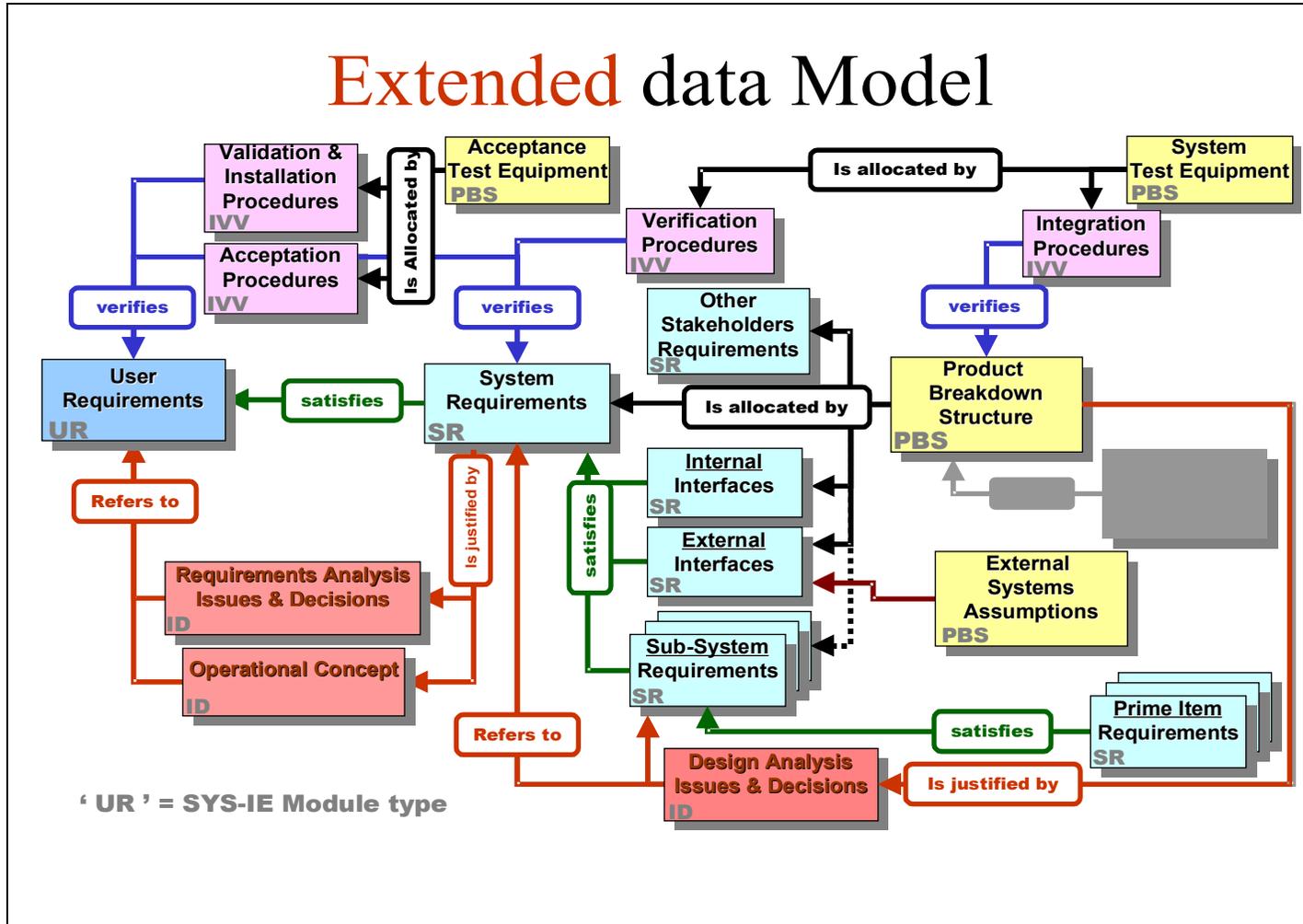
- 1) To create a new RMF project , run DOORS and from the DOORS Database window, run the IRDRMFAO utility "Create a new RMF project". Type the project name and description when prompted by the utility.
- 2) Your project contains now a formal module named "Project Profile" and-eight link modules "is allocated by", "is composed of", "is different to", "is identical to", "is justified by", ,refers to", ."satisfies", and "verifies".

Read the descriptive paragraphs in the Project Profile module which define the default customization provided with IRDRMFAO, as delivered. If necessary, change the values of attribute types, add new object types or new module types in order to further customize the model for your project. Do not forget to update the data model diagram as necessary.



Definition of the Data Model

One Data Model currently supported by this IRDRMFAO version is shown below. The diagram provided within the delivery of IRDRMFAO shows a slightly simpler model. Projects should produce a specific data model which represents how System Engineering is to be carried out. It is anticipated that the project data model should be defined, documented and approved as part of the Systems Engineering Management Plan (SEMP)



Module attributes of Project Profile module

These attributes apply to the module, and are interpreted to apply throughout the project by IRDRMFAO utilities.

Attribute name	Type	value	Description
IE Log File	string	See description default is errlog.txt	Pathname of log file (full or not, e.g. C:\doors\errlog.txt or errlog.txt), which can be set by the user if desired. The default path is DOORSHOME errlog.txt which is always used if the Project Profile module is missing or the Log File attribute is missing from it.
IE Debug	enum	No Debug DXL Window Log File Ack and Log Window and Log	Flag indicating where error messages should be directed. In No Debug mode, tools ack and halt. Otherwise they attempt to continue.
IE Data Model	text	See description	This attribute holds a description of the Data Model of your project, by means of definition of every linkset used. This attribute is used by, and the data model maintained by, the "Manage LinkSets" command. The format of each linkset definition is:- /<<projectname>>/<<linkmodulename>>: /<<sourceprojectname>>/<<sourcemodulename>> > /<<sinkprojectname>>/<<sinkmodulename>>>➤

Object attributes of Project Profile module

The following attributes apply to the definition of objects, and are set to null in other objects.

Attribute name	Type	value	Description
IE Object Type	string enum	see description. Typical values are Requirement, Capability, Issue-Decision, Configuration Item, IVV Procedure.	Represents an object type usable in the current project. The objects with this attribute set to a value (i.e. not NULL) describe the data definition of objects suitable for System Engineering, like requirements, capabilities, issues, configuration items, IVV procedures, etc.
IE Object Prefix	string	see description	Used to set the Project Unique ID attribute within formal modules. Note that the PUID is calculated with the following rule : [module prefix]-[object prefix]-[number] - the [module prefix] is obtained from the DOORS module attribute "Module Prefix" of the formal module, - the [object prefix] is obtained from this attribute ("IE Object Prefix"), for the appropriate object type - the [number] is incremented by one every new Object. Thus for a given Object Type, the object prefix is the same for the whole project, as it is defined once in the PP module
IE Object Word Style	string	see description	This attribute defines the paragraph style to applied to each RMF object when it is created. This style is used if the object is exported to Word, and a style definition with the same name is found in the Word template.

The following attributes apply to the definition of modules, and are set to null in other objects

Attribute name	Type	value	Description
IE Module Type	string	see description	Represents a module type usable in the current project. The objects with this attribute set to a value (i.e. not NULL) describe the data definition of modules suitable to build the project structure. The modules contain the objects. Typical modules are User Requirements, System Requirements, Issues and Decisions, PBS, IVV Procedures, etc.
IE Module Word Styles	text	see description	This attribute is used to record the list of possible Document (ie Paragraph) styles which may be applied to objects within the given Module Type. Each line of this text attribute represents a style.
IE undefined PUID keyword	string	See description	Contains the keyword to set in the PUID attribute when the Manage objects tool is used in a particular context: module open in edit shareable mode. PUIDs can only be assigned in Exclusive Edit mode, so in the Edit Shareable mode context it is assigned to the default value set by this attribute. It can be an empty keyword. The "Re-number object" tool can complete the PUID later, but it is recommended that it is set to a meaningful reminder, such as "PUID TBD later"
IE Bitmap	string	A bitmap filename with a .bmp extension	Name of a file containing a bitmap associated with the current module type and which will be displayed in the Relationship Manager.

The following attributes apply to the definition of relationships, and are set to null in other objects

Attribute name	Type	value	Description
IE Relationship	string	see description	Represents the name of a link module It must be one of the link module available in the current project.
IE Source Module	string	see description	Represents the source module of an authorized relationship. It must be a module type usable in the current project. Typical values are User Requirements, System Requirements, Issues and Decisions, PBS, IVV Procedures, etc.
IE Target Module	string	see description	Represents the target module of an authorized relationship. It must be a module type usable in the current project. Typical values are User Requirements, System Requirements, Issues and Decisions, PBS, IVV Procedures, etc.
IE Mapping	string	Many-to-Many, Many-to-One, One-to-Many, One-to-One	Describes the authorized cardinality of the relationship

Available relationships for Project Profile objects

none

Available views of Project Profile module

View name	Filter	Description
standard view	None	DOORS default view, which shows the DOORS ID and Object Heading/Text.
definition of the module types	IE Module Type != NULL	Displays the attributes: Object Text, IE Module Type, IE Module Document Styles and IE Bitmap.
definition of the object types	IE Object Type != NULL	Displays the attributes: Object Text, IE Object Type, IE Object Prefix, IE Object Document Style and IE undefined PUID keyword.
Definition of the Relationships	include object 41 show descendants	Displays the attributes: Object Text and Heading, IE Relationship, IE Source Module, IE Target Module, IE Mapping.
Project Data Model representation	include object 17 show descendants	Displays the picture showing a graphical representation of the project data model.

Appendix G. FREQUENTLY ASKED QUESTIONS (FAQ)

Why it is impossible to identify a RMF object within a table ?

Because this is not convenient and practical to manage data in tables with DOORS :

- No direct display of the attributes of cells (no analysis view),
- Table can't be displayed in traceability matrix (DXL column),
- DOORS does not allow the selection of multiple cells or a row, so it's not possible to identify such requirements or make join operations. DOORS only allows the selection of one cell or the complete table.

Note : A complete table can be identified as a requirement.

After installing DOORS, I did not obtain the « Export to Word » icon in my WORD application. How can I remedy this?

When you launch WORD, it loads all the files located in the start directory (path defined as an option in WORD menu). DOORS installation attempts to put a file "doors.dot" in this directory.

- 1) Run WORD and check the start directory path in WORD option (French release: menu outil->Option / Dossiers par défaut/ Fichiers de démarrage),(English release: menu Tools->Options>File Locations->Startup).
- 2) With an explorer, check if the file "doors.dot" has been copied to the located directory. If not, copy it yourself or by an administrator. You will find it in <DOORS_HOME>/lib/word.

I specified colors for my enumerated attribute and they are not displayed in the views. Why ?

Check if in the column properties, the option "Color by attribute" is set. Don't forget to save the view.

How can I change the color of the text of RMF Objects in a view to distinguish them from ordinary text ?

First, define colors for the type "IE Object type" and then in the text column of a view, edit the column properties in order to set the option "Color by attribute" selecting the attribute "IE Object type". Don't forget to save the view. Notice that the chosen enumerated attribute must not be multi-valued.

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