QuARS
User Manual (version 0.5)

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Abstract. *The QuARS (Quality Analyzer of Requirements Specifications) tool makes it easier to extract structured information and metrics for detecting linguistic inaccuracies and defects in software requirements expressed in Natural language. In the following is presented the user manual.*

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Introducing QuARS

Introduction

The **QuARS**(**Qu**ality **A**nalyzer for **R**equirement **S**pecifications) is an automatic tool that support the analysis of requirements documents written in Natural Language.
The functionalities provided by **QuARS**are:

- **1.** Defect identification
- **2.** Requirements clustering
- **3.** Metrics derivation

- **1. Defect identification**
  QuARS performs a linguistic analysis of a requirement document in plain text format and points out defects belonging to the following categories:
  - - **Ambiguity**: defects belonging to this category are pointed out when are detected sentences:
    - a. containing terms inherently vague, optional parts or weak verbs,
    - b. expressing personal opinions or feelings,
    - c. having the subject or object generically expressed,
  - - **Specification completion**: defects belonging to this category are pointed out when sentences containing generic unspecified objects are detected
  - - **Understandability**: defects belonging to this category are pointed out when sentences with multiple subject or main verb are detected
- **2. Requirements clustering**
  QuARS is able to extract subsets of the requirements document composed of sentences dealing with a specific topic.
  A possible use of this functionality is the extraction of a class of non-functional requirements (e.g. those requirements dealing with a property of the system to be developed).
  The derived clusters are recorded and made available to the user.
- **3. Metrics derivation**
  QuARS calculates metrics during the analysis of a requirements document.
  The available metrics are:
  - - The Coleman-Liau Formula readability metrics: ([5.89*chars/wds-0.3*sentences/(100*wds)-15.8]).
    The reference value of this formula for an easy-to-read technical document is 10, if it is>15 the document is difficult-to-read.
  - - The defect rate related to the defects described in 1.

The QuARS's key components are special text files called Dictionaries.
Two types of Dictionary exist: the defect-related dictionaries and the domain-dictionaries.
- - The defect-related dictionaries contain the terms able to reveal a defect according to what stated in 1.
- - the domain-dictionaries contain the terms belonging to a specific domain and that determine if a sentence is to be included in a cluster or not.

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Installing QuARS

QuARScomes as a unique self-extracting executable file with all is needed packed inside.
To install **QuARS**(version 4.1) starting from the **QuARS.v41 setup.exe**file please follow these simple steps:

- **1.** Navigate your file system to where you downloaded the self-extracting executable file **QuARS.v41 setup.exe**.

- **2.** Double clicking on the file **QuARS.v41 setup.exe** a new directory named QuARS.v41 will be created in the same place.
- **3.** If you please, you can now delete the **QuARS.v41 setup.exe** file.
- **4.** Come inside the new **QuARS.v41** directory: **QuARS** environment is already prepared to start analyzing requirements files.
- **5.** If you prefer you may move the directory **QuARS.v41** where you prefer onto your Hard Disk: **QuARS** will work anyway.

Uninstalling QuARS

Uninstallation Instructions

- Simply remove the installation "***QuARS.v41***" directory where you installed **QuARS**.

System Requirements

- **Operating Systems°**
  - Windows 95
  - Windows 98
  - Windows 98SE
  - Windows ME
  - Windows NT 4.0
  - Windows 2000 (Recommended)
  - Windows XP
- **Minimum Hardware**
  - Pentium 233 MHz (Recommended: Pentium 500MHz or greater)
  - 64 MB RAM (Recommended: 128 MB RAM or greater)
  - 25 MB hard drive space
- **Recommended Screen Resolution: 1024x768**
  Best View: 1152x864

°Note: At this moment **QuARS** runs only on Microsoft Windows systems.

QuARS User Manual

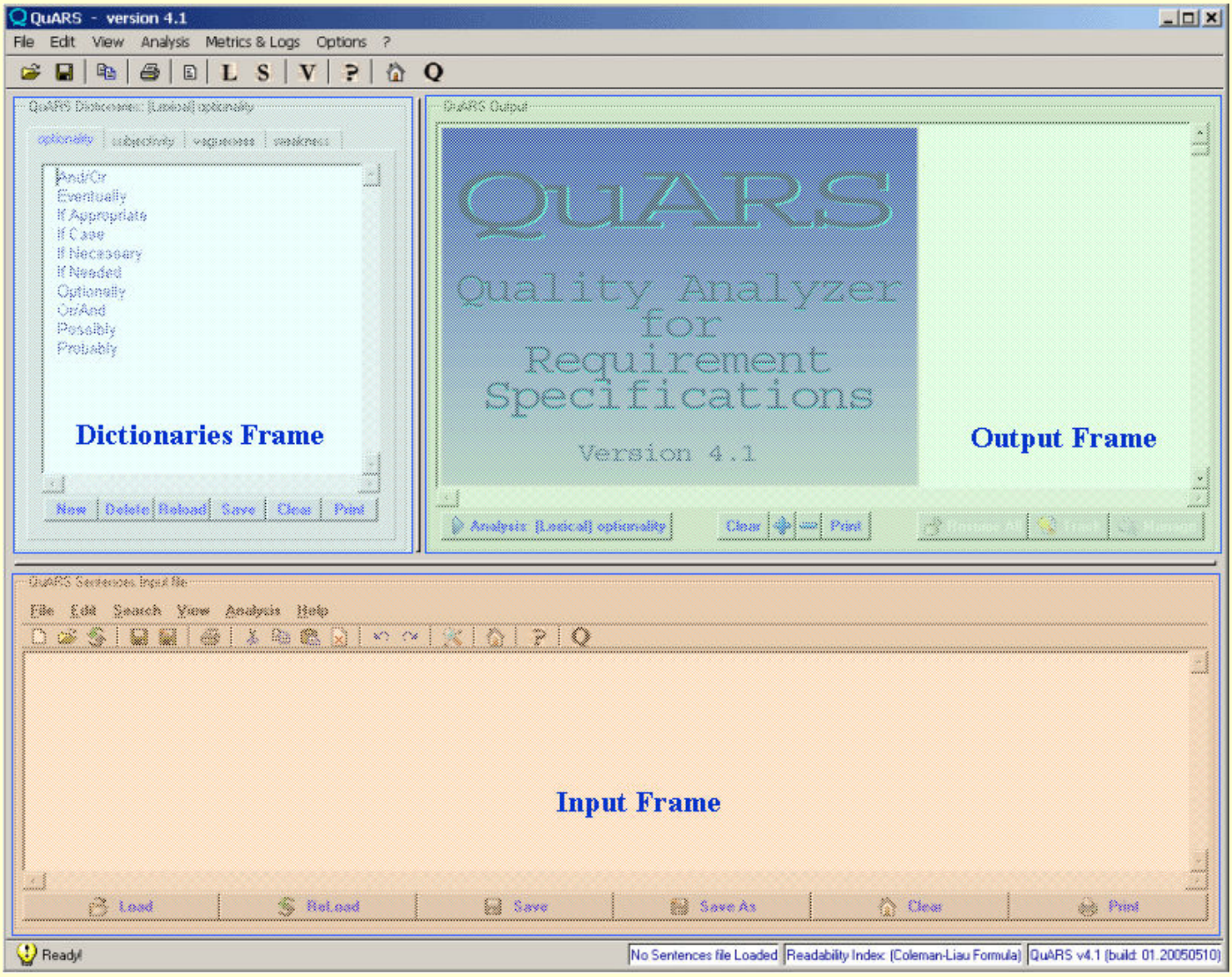
QuARS User Manual

QuARS: Getting Started

QuARS GUI overview

The QuARS's GUI is composed of three main frames:

- **Input Frame**: by this frame it is possible to load and display the plain text file containing the requirements to be analyzed. The input frame provides the principal functions (buttons) for editing the input requirements.
- **Dictionary Frame**: this frame allows to select, display, modify or create the dictionary corresponding to the type of analysis of interest.
- **Output Frame**: in this frame the results of the analysis are displayed.

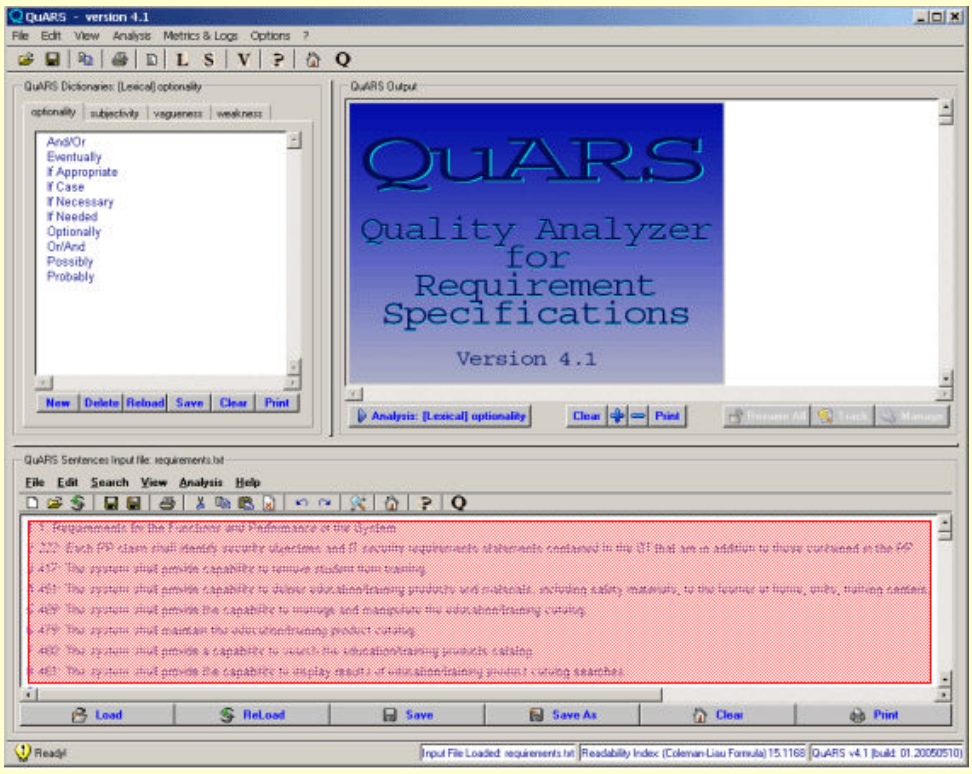


Getting Started

In the following the initial steps for starting up the analysis of textual requirements with **QuARS**are described. Only the main functions of **QuARS**are described here, for more detailed user guidance see the complete **User Manual**section of this help.

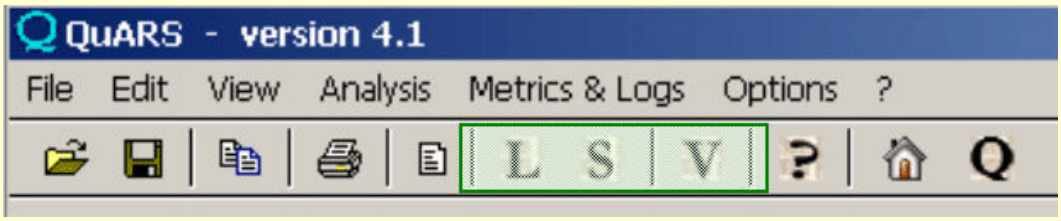
- Step 1: **LOAD A FILE**

Click the "*Load*" button and browse the file system to select a ***plain text file***containing the requirements to be analyzed.



The selected file is displayed in the input frame.

-
- Step 2: **SELECT THE TYPE OF THE ANALYSIS**
  Three types of analysis are available: **Defect Identification** using ***Lexical Analysis*** ("**L**" button on the top of the GUI), **Defect Identification** using ***Syntax Analysis*** ("**S**" button on the top of the GUI) and ***Views Derivation*** - ***Clustering*** ("**V**" button on the top of the GUI)



  - **L** - ***Lexical Analysis*** for defect identification:
    This function points out the occurrences of the special defect-revealing terms contained in the dictionaries associated to this type of analysis.
    It is possible to modify the content of the dictionaries associated to this function and also to add new dictionaries.
    The default set of available lexical analyses is composed of four dictionaries ***optionality***, ***subjectivity***, ***vagueness***, ***weakness***

- **S** - ***Syntax Analysis*** for defect identification:
  This function identifies defective sentences in terms of ***implicity***, ***multiplicity*** and ***underspecification***.
  For doing that the syntactical structure of each sentence in the input requirement document is derived.
  It is possible to modify the content of the dictionaries associated to this function but not add new dictionaries.
- **V** - ***Views Derivation*** - Requirements clustering:
  This function extracts those sentences dealing with a particular topic from the input requirements document and puts them in a special cluster, called View.
  The view derivation is based on the existence of domain-specific dictionaries, called View-dictionaries.
  It is possible to modify existing and create new View-dictionaries.

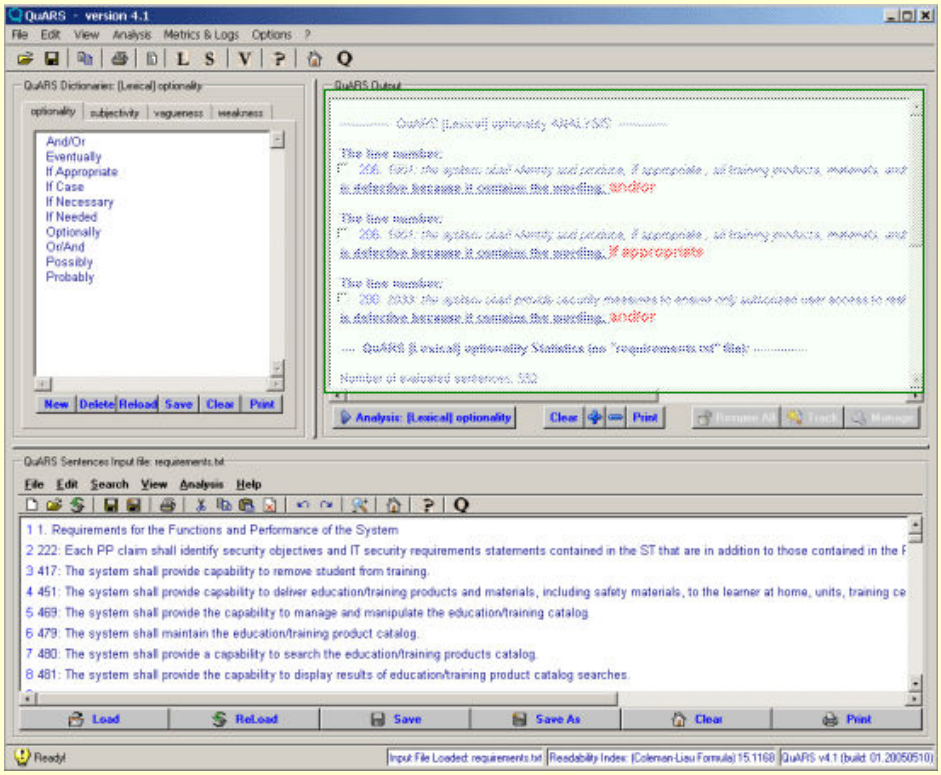
  ⚠ Since the "*View Derivation*" is based on the identification of (sub)sections, to perform this kind of analysis it is mandatory that the requirements document is divided into sections according to the following format:
  1.
  1.1
  1.1.1
  .
  .
  .
  1.2
  .
  .
  .
  n.
  .
  .
  .

For an explanation of the meaning of the Indicators see "Indicators Explanation"

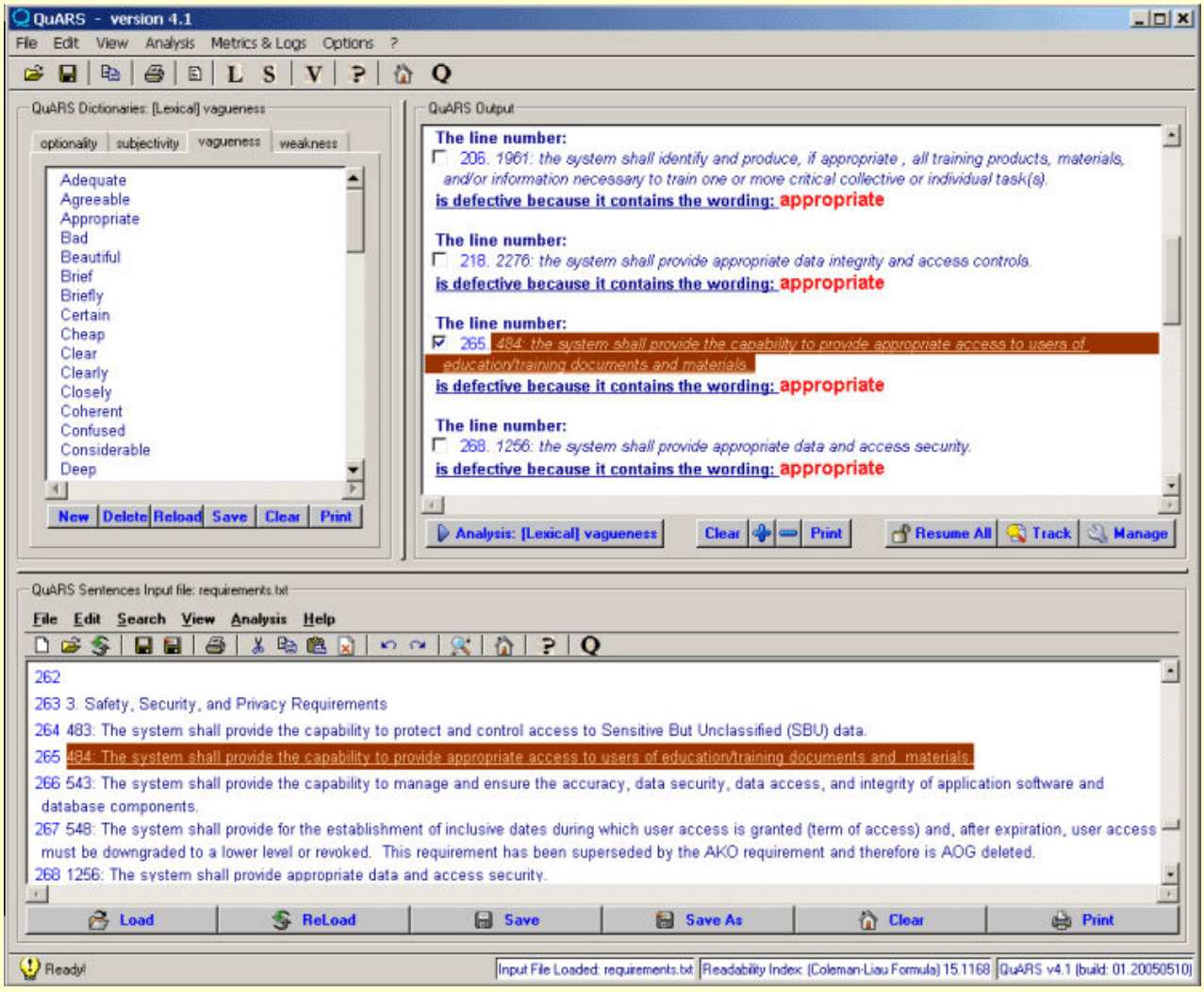
- Step 3: **START ANALYSIS**

Once the requirements document to be analyzed has been loaded and the type of analysis selected, push the Analysis button to start the analysis.

- Step 4: **MANAGE RESULTS**
  - *Managing results of Lexical analysis for defect identification*
    The results of this type of analysis consist of a set of sentences containing defect-revealing words.
    This set is displayed on the output frame.



Defective sentences are displayed and the defect-revealing terms are highlighted.

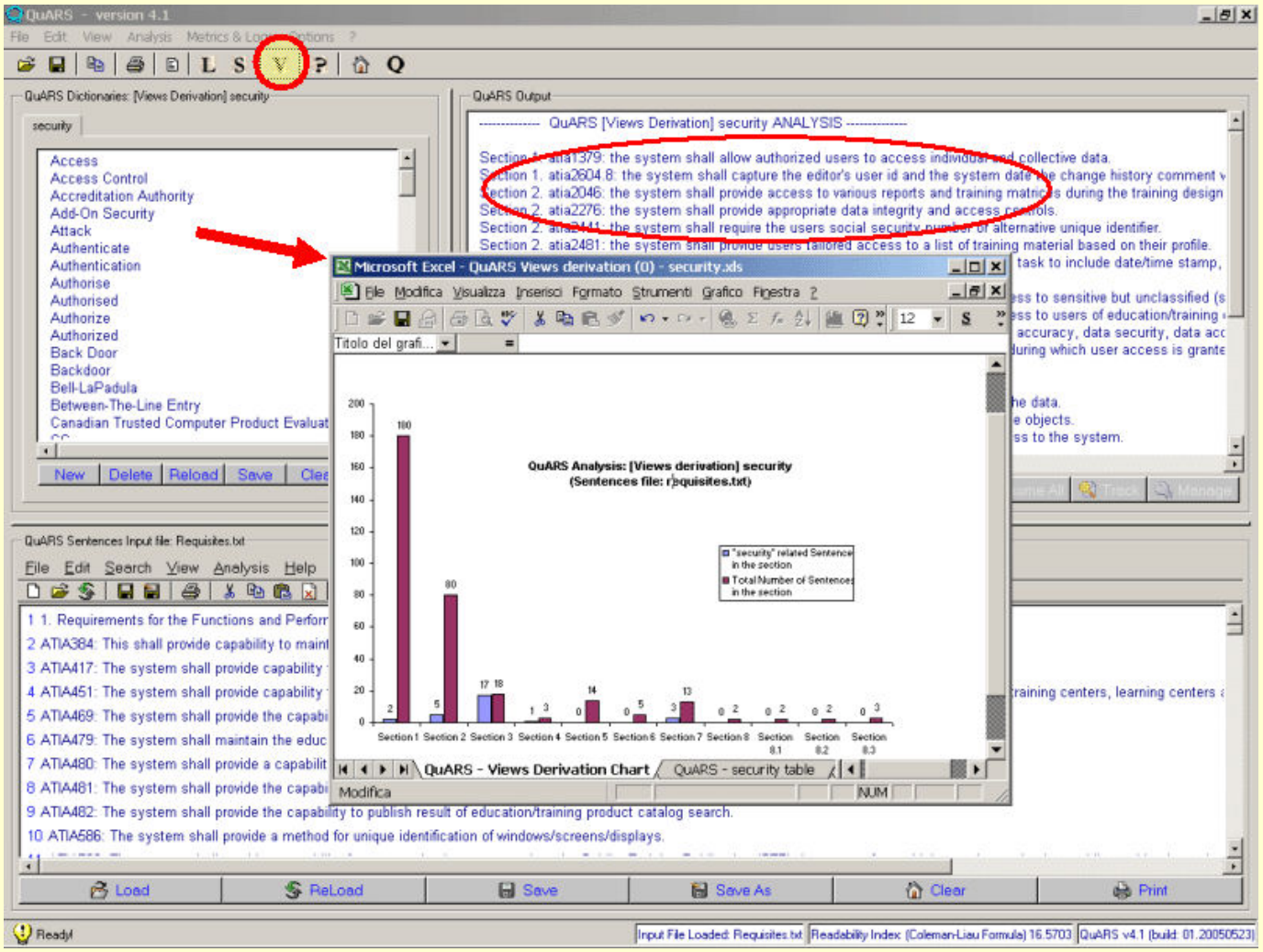


The defective sentences can be tracedon the input document by clicking on the identification number.
This feature facilitates the correction of the found defect.

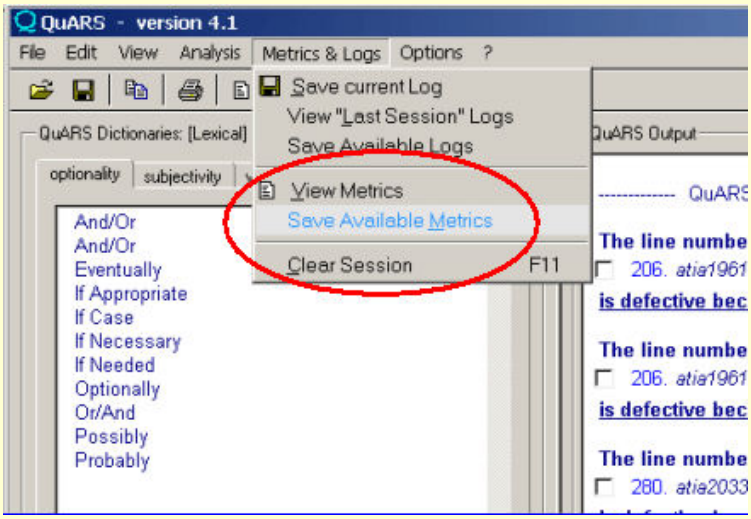
- *Managing results of Syntax analysis for defect identification*
  The results of this type of analysis consist of a set of defective sentences according to the selected type of syntax analysis.
  The way the results of syntax analysis for defect identification are displayed and managed is the same than the lexical analysis.
- *Managing results of the Views derivation*
  The result of the View derivation consists of:
  - - the cluster of the sentences belonging to the View (i.e. those sentences dealing with the topic the View is related to).

The cluster is displayed in the output frame.
Each sentence of the cluster is displayed preceded by the number of its section in the requirement document.

- - the graphic representation of the number of the sentences belonging to a view in each section of the requirements document is displayed.
  This is provided as a MS Excel graph.



- *Metrics Calculation*

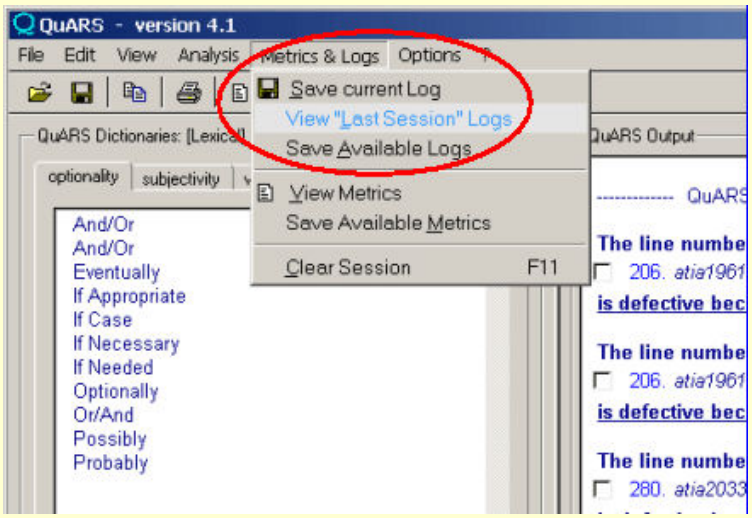


During the performance of the analysis **QuARS** calculates some metrics.
The available metrics are:

- - Defect rate: for each Lexical/Syntactical analysis for defect identification performed, the rate between the found defects and the total number of sentences the requirements document is composed of is calculated.
- - The Coleman-Liau readability metric is calculated when a file is loaded.
- The metrics above are made available in the following ways:
  - - They are displayed on the bottom of the output frame after along with the analysis results.
  - - They can be all displayed in isolation selecting the "*View Metrics*" option from the "*Metrics & Log*" menu.
  - - They can be saved in a special log file selecting the "*Save Available Metrics*" option from the "*Metrics & Log*" menu

- Step 5: **SAVE LOGS**

The results of the performed analysis in the current session can be saved as text files using the function in the "*Metrics & Log*" menu.



QuARS analyses one paragraph at a time, considering a paragraph delimited by the special "end line" char ¶ independently of the number of sentences it contains.

TIP: in the case of long paragraphs containing several sentences, it's preferable for a more accurate analysis to break them into single-sentence paragraphs.

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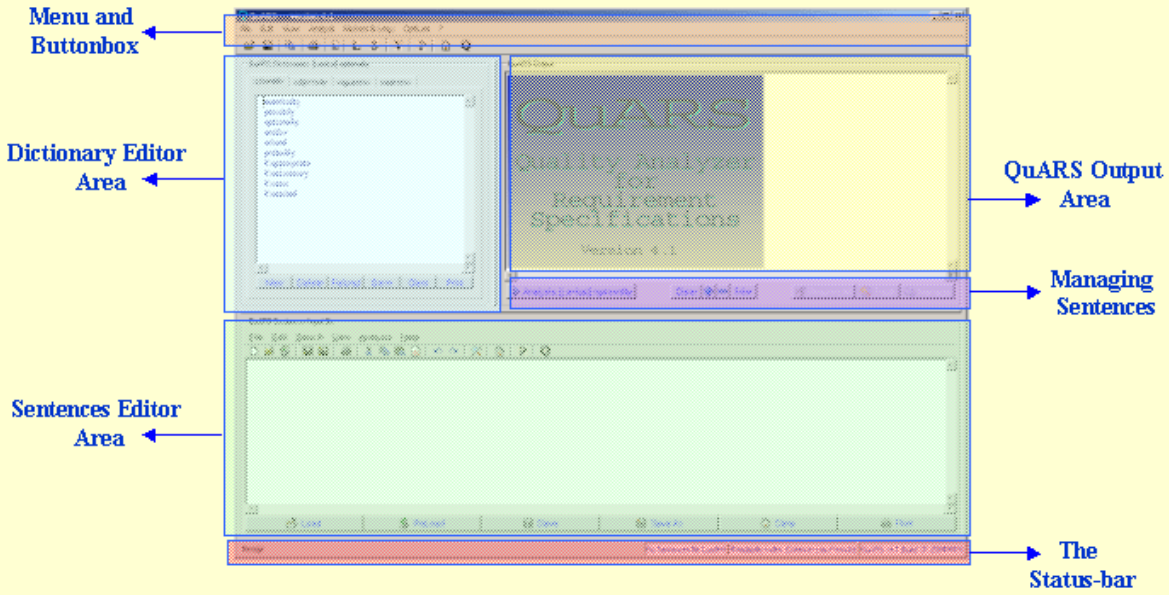
QuARS User Interface



For a detailed description of the QuARS User Interface by meaning of a function-based division, please refer the links below:

- Menu and Buttonbox: Menu Reference, Menu Reference Summary, Buttonbox Reference
- Dictionary Editor Area
- Sentences Editor Area
- Output Frame
- The Status-Bar

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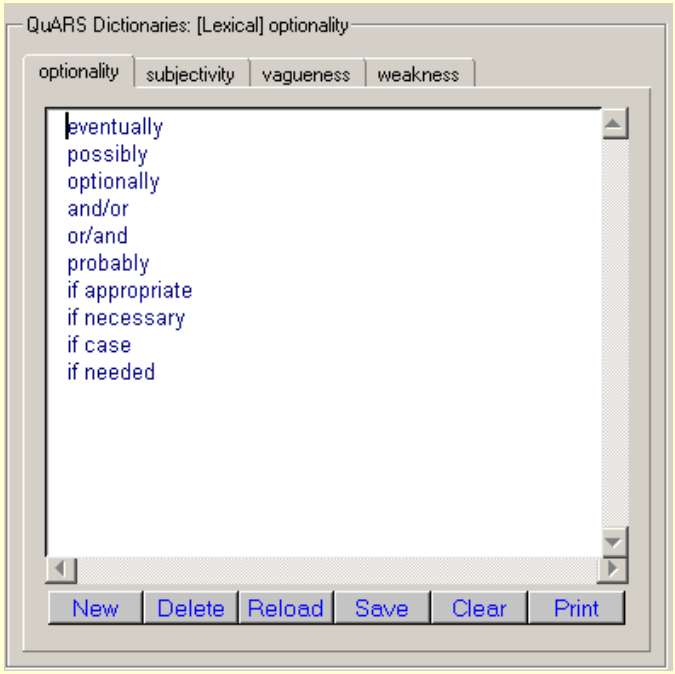
QuARS Dictionary Editor Reference



The **QuARS**dictionary frame is indeed a complete editor:
you can select text area for *cut and paste*and exploit the provided *drag and drop*functionality.

Buttons functionality:

- **New**: pops up the **QuARS Dictionary Wizard** allowing the creation of a new dictionary that will be displayed among the others
- **Delete**: deletes the file related to the displayed dictionary and the dictionary itself from the current set
- **ReLoad**: loads again the file being displayed
  if there isn't actually a file loaded, it behaves like **Load**
- **Save**: saves the editor content without prompting for the name
  if the name of the file to save is not known (e.g. via a *New* command) it behaves like **Save As**
  if the file already exists, an overwrite confirmation will be asked
- **Clear**: clears editor content setting it up for a new blank file
- **Print**: prints the editor content

As you can see in the image above, every kind of analysis (Lexical", "Syntactic" and the "View Derivation") can be performed by means of several Dictionaries.
The Dictionaries Area is "*notebook*" organized:

- - every notebook represents a kind of analysis
- - every page in a notebook represents a Dictionary
- - pages (Dictionaries) can be added!
- - switching from a page to another automatically the related analysis will be performed using the "***Analysis: [Kind] dict-name*** button.
- - obviously, notebooks cannot be added: at this moment only three kind of analysis are available

Please refer to this **Keyboard Shortcuts**list for all the others functionalities and hereforthe Dictionary name format and limitations.

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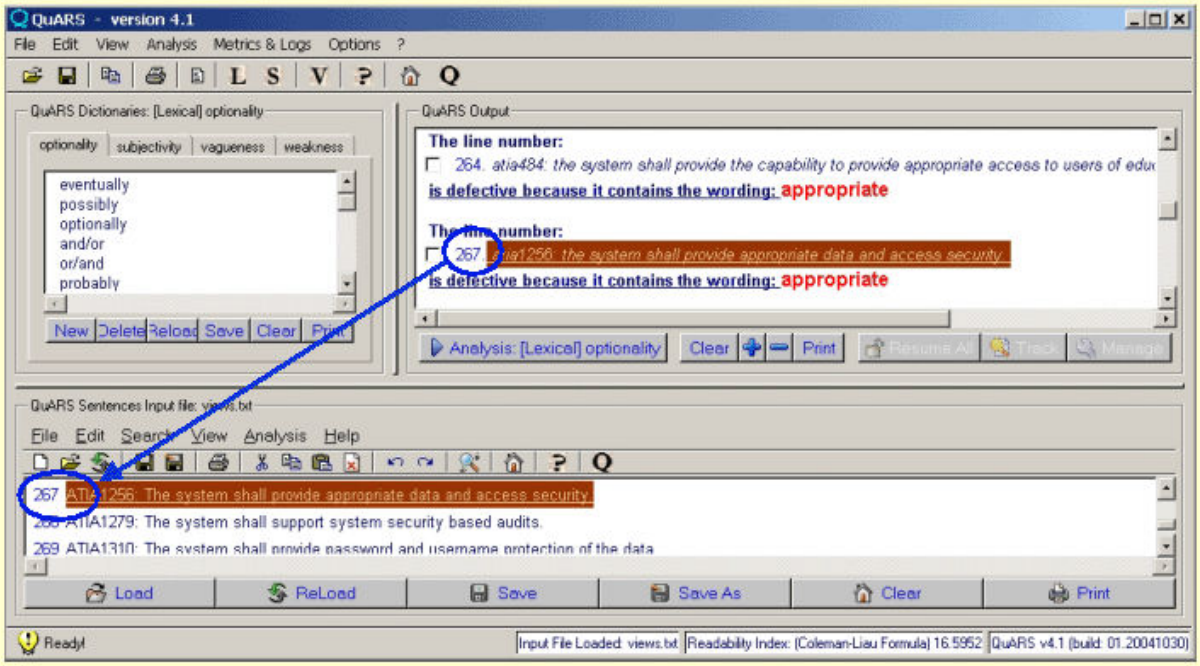
QuARS Output Frame: managing Sentences

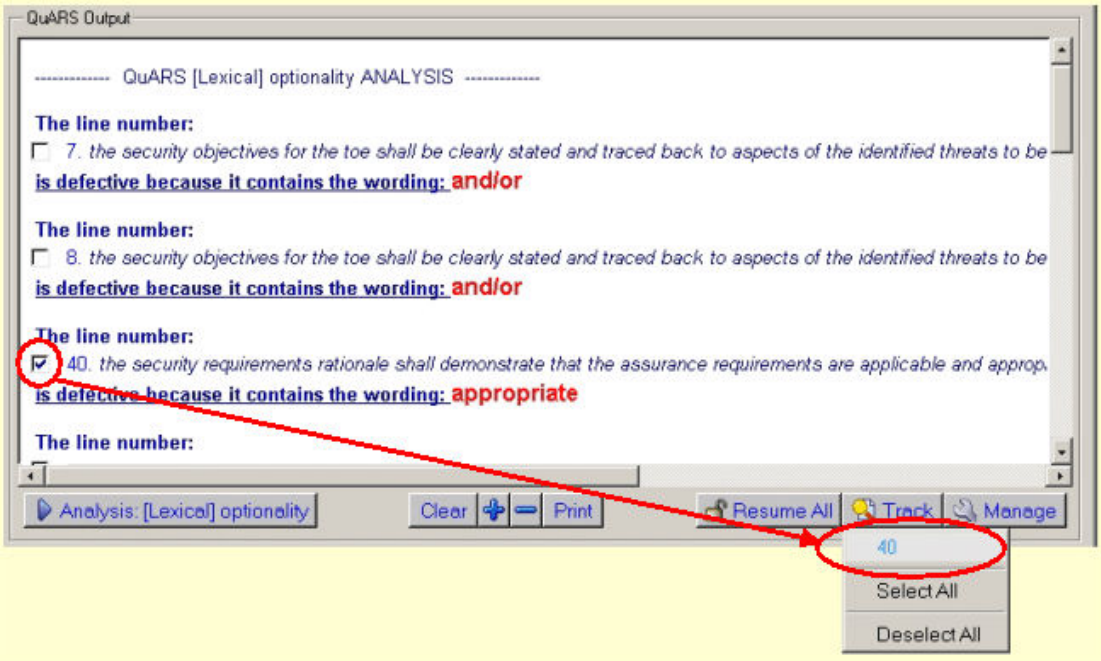
Result Tracing

The single defective sentences pointed out in the **QuARS**output frame as result of the **Defect Identification**function, can be traced on the input file by clicking the corresponding line number in the output frame. Once the line number has been clicked, the corresponding sentence is highlighted in the input frame, ready for correction.



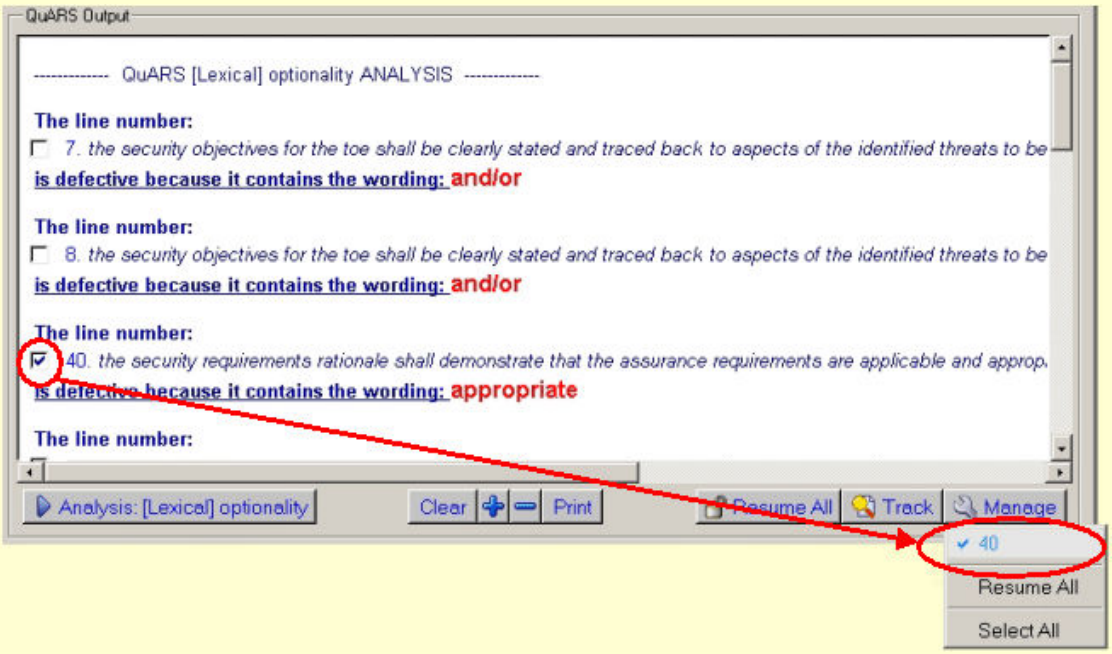
Hide Results (Tracking *False-Positives*)

It is possible to hide the false positives (i.e. sentences pointed out by **QuARS**as defective but actually considered correct by the user) by marking the check-button in the output window corresponding to the sentence to be hidden .
Once a sentence has been checked, when the analysis is performed again, this sentence will be not more displayed in the **QuARS**output window even though still defective.



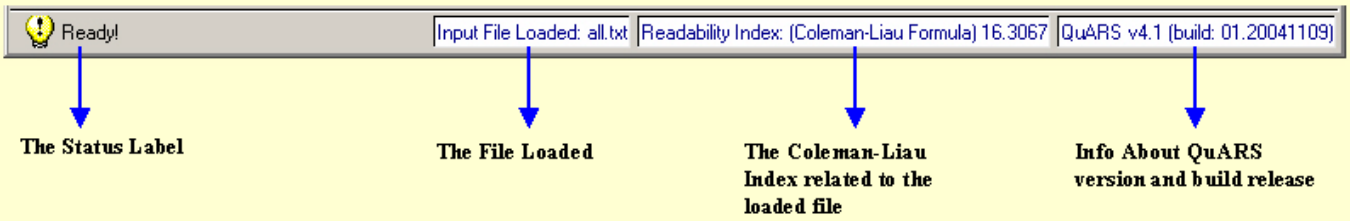
To see what sentences are hidden, click the **Track** button in the **QuARS** output frame: a list of all hidden sentences will be shown.
By clicking on the entry "*Select All*", all hidden sentences will be selected in a brown background color,
by clicking on the entry "*Deselect All*", all sentences will be selected in a brown background color,

To let a hidden sentence be displayed again, click the "*Manage*" button in the **QuARS**output frame and deselect from the list the related entry.



To let all the hidden sentences be displayed again, click the "*Resume All*" button
or the "*Resume All*" entry of the "*Manage*" button.
Use the "*Select All*" entry of the "*Manage*" button to hide all the sentences from analysis (useful in high-grade of false-positive documents).

QuARS Status-Bar



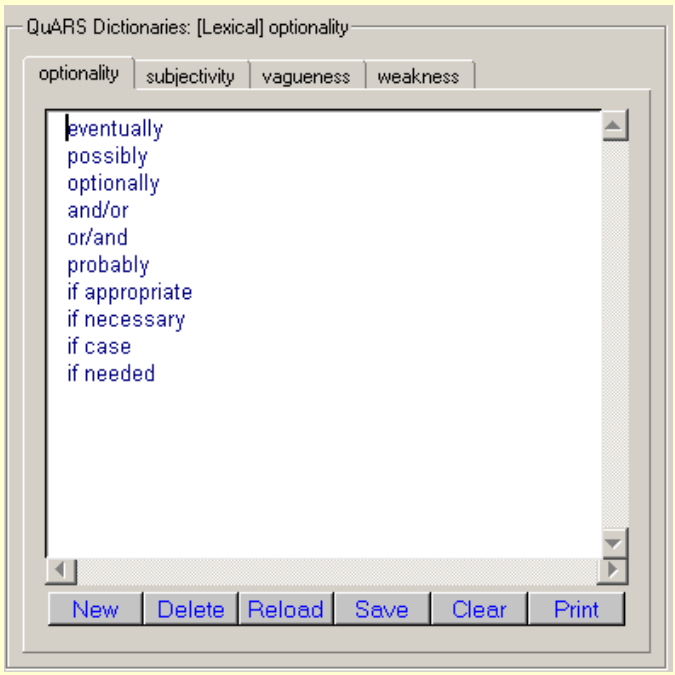
The **QuARS**Status-Bar shows several information about the current **QuARS**session.
Starting from left to right, the "Status Label" and its related icon show **QuARS**internal status, the actual activity and possible errors or troubles.
The second item shows the current loaded Sentences file ready to be analyzed or the "No Sentences File Loaded" message.
The third information is about the Coleman-Liaureadability index related to the current file being shown in the **QuARS**Editor window.
The last information is about **QuARS**itself, *version*and current *build release*

The possible messages shown by the Status label are:

#	Status Label	Status Description
01	Ready!	**QuARS** is ready to start the next analysis
02	Starting Computation...Setting Up Environment	A necessary step preceding any analysis: files and environment variables are ready for being analysed
03	QuARS Engine: Analysis.....	Analysis lastly starts....
04	QuARS Engine: Lexical Analysis...	A Lexical Analysis has been requested
05	QuARS Syntactic Analysis: Parsing...	A Syntactical Analysis has been requested: this is the syntactic parsing step
06	QuARS Engine: Syntactic Analysis...	A Syntactical Analysis has been requested: this is the syntactic defects check step

07	QuARS Engine: Creating View Derivation...	A View Derivation generation has been requested
08	QuARS: Publishing Output...	**QuARS** is attempting to show the Analysis result
09	QuARS, Publishing Output: building Excel graph...	A View Derivation generation has been requested: **QuARS** is attempting to show the result
10	QuARS, Publishing Output: Excel trouble...	A View Derivation generation has been requested: unfortunately there is some kind of trouble with Excel not allowing to build the View Derivation Graphic
11	Loading Input File...	**QuARS** is uploading the file to analyze in the Editor output area
12	Re-Loading Input File...	The **QuARS** Editor is loading again the current file
13	Saving Input File...	The **QuARS** Editor is saving the current shown file with the same name
14	Saving Input File As...	The **QuARS** Editor allows to save the current shown file changing its name
15	Printing Input File...	The **QuARS** Editor is printing the current shown file
16	QuARS Internal Error!	An internal error occurred: **QuARS** will try to recovery current section allowing to proceed with the analyses

Dictionary Handling



The tool **QuARS**has been designed to be highly tailorable according to particular application domain and different user needs.
The main aspect of the **QuARS**tailorability is its capability to handle the dictionaries.
In fact, it possible to modify an existing dictionary and make permanent these modifications.
It is possible also, for all the types of analysis but the syntax-based one, to create new dictionaries and delete existing ones.
For this purpose a set of function buttons are available in the Dictionaries frame

In the following they are described in detail:

- **New**: this function allows the creation of a new dictionary.
  This function is not allowed for the syntax-based analysies. The capability of adding new dictionaries for lexical-based analysis and View derivation allows the **QuARS** tool to be adapted to particular application domain and user needs.
- **Delete**: this function allows a dictionary to be deleted.
  This function is not allowed for syntax-based analyses.
- **Reload**: this function allows to return to the last saved version of a dictionary.
- **Save**: dictionaries are modifiable by editing their content in the Dictionary frame directly.

After a modification has been made on a dictionary, this function makes permanent the new version of the dictionary.

- **Clear**: this function cancel the content of a dictionary, this cancellation becomes permanent when the Save function is selected.
- **Print**: this function allows a dictionary to be printed out.
- **Drag and Drop**: it is possible to "*drag and drop*" a text file over the **QuARS** dictionaries frame: automatically, as soon as the left mouse button is released, a new dictionary will be created with the first 15 characters of the name of the dragged file (and with spaces converted to underscore) and with the same content of the dragged file.
  This function is not allowed for the Syntactical Analysis.

A more detailed guide on "How to create a new Dictionary" is available here.

Input Handling

Loading input files

QuARSanalyzes files in plain text (.txt) format. For loading texts for the analysis the following steps have to be followed.

- Click the **Load** button on the Input frame of the **QuARS** GUI
- Browse the file system and select the textual file containing the requirements to be analyzed
- Click the **Open** button

The content of the text file to be analyzed is displayed in the input frame of the **QuARS**GUI.
Each line of the input file is numbered on the input frame in order to facilitate the identification of the defective sentences found.

Editing of the input file

The input file can be edited on the input frame of the **QuARS**GUI.
The most common functions of a text editor are available in the Input Frame Toolbar.

Once the text has been edited, it is possible:

- to save the changes made by clicking the **Save** button
- to save the changed file with a new name by clicking the **Save As** button.

To came back to the last saved version of the input file the **ReLoad**button has to be clicked.
The **Clear**button cancels the contents of the input file.
The **Print**button allows to print out the input file.

Converting an input file in the suitable format

If the format of the input file is not plain text, it has to be converted.
In the following the procedure to be followed for the most common commercial text formats:

- **MS Word** (.doc)
  - **Export the entire file**
    - Select from the menubar "*File*" --> "*Save as*"
    - Select "*text file* (.txt)" as saving file format
    - Select where saving the file
    - Click the "*Save*" button
  - **Export an excerpt of the file**
    - Select the text of interest
    - Copy the selected text
    - Past the copied text in a plain text file
- **Adobe Acrobat** (.pdf):

- **Export the entire file**
  - Select from the menubar "*File*" --> "*Save as Text*"
  - Select where saving the file
  - Click the "*Save*" button
- **Export an excerpt of the file**
  - Select the "*Select Text*" tool button in the *Adobe Acrobat Reader* buttonbox
  - Select the text of interest
  - Copy the selected text
  - Past the copied text in a plain text file
  - Deselect the "*Select Text*" tool button to come back to the normal *Acrobat Reader* view

- **HTML** (.htm, .html):
  - **Export the entire file**
    - Select from the menubar "*File*" --> "*Save as*"
    - Select "*text file* (.txt)" as saving file format
    - Select where saving the file
    - Click the "*Save*" button
  - **Export an excerpt of the file**
    - Select the text of interest
    - Copy the selected text
    - Past the copied text in a plain text file

The file is now in the suitable format for being analyzed by QuARS.
The editorial format, in case of bullets, tables, pictures, will be lost in the new plain text file°.

⚠ °**Note**: The consequences of that can be relevant.
In particular, it can be difficult to maintain the alignment between the original input file and the new version.

Performing Analysis

> ⚠ **QuARS** analyses one paragraph at a time, considering a paragraph delimited by the special "end line" char "¶" independently of the number of sentences it contains.
>
> 💡 **TIP**: in the case of long paragraphs containing several sentences, it's preferable for a more accurate analysis to break them into single-sentence paragraphs.

Defect Identification

Lexical analysis

To perform one of the lexical-based analysies it is necessary to select the **L**button on the top tool bar of **QuARS**(arrow 1 in figure A1).
Once the lexical-based analysis has been selected, in the Dictionaries frame the dictionaries corresponding to all the available lexical-based analysies are shown (arrow 2 in figure A1).
The default set of analysies is composed of four dictionaries: ***Optionality***, ***Subjectivity***, ***Vagueness***, ***Weakness***.
Additional dictionaries can be created to enlarge the set of available analyses.
It is possible to select the kind of analysis of interest by selecting the correspondent dictionary book-mark in the Dictionaries frame.

Before starting the analysis the text file containing the requirements has to be loaded.
Once the input file has been selected, its content appears in the Input frame.
The analysis starts when the Analysis button is pushed (arrow 3 in figure A1).

In the Output frame those sentences containing the particular defect we are investigating on are shown along with the indication of the individual term that makes the sentence defective (according to the kind of analysis selected).
The defective sentences can be now corrected.

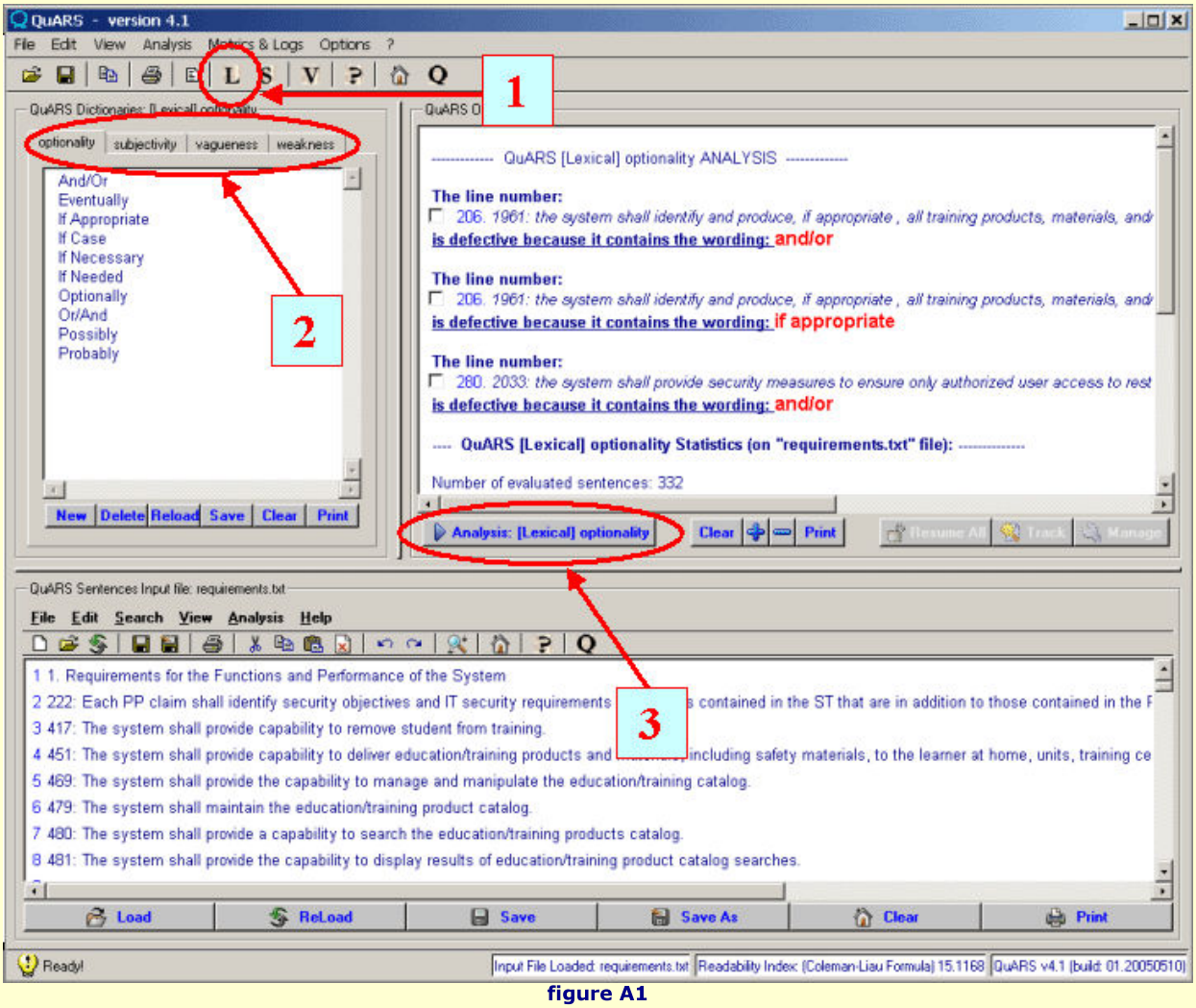


figure A1

Syntactic analysis

To perform the syntax-based expressiveness analysis the **S**button on the top tool-bar of the **QuARS**GUI (arrow 1 in figure A2).

Once the syntax-based analysis has been selected, in the Dictionaries frame the possible dictionaries of each type of the available syntax-based analysies are shown (arrow 2 in the figure).
It is possible to select the type of analysis of interest by selecting the correspondent dictionary tab in the Dictionaries frame (note that the multiplicity analysis doesn't need any dictionary, for this reason it is void).
The available analysies are: **Implicity**, **Multiplicity**and **Underspecification**.

Before starting the analysis the text file containing the requirements has to be loaded.
Once the input file has been selected, its content appears in the Input frame.
The analysis starts when the Analysis button is pushed (arrow 3 in figure A2) or ***[Syntactic] name of the analysis***is selected from the **Analysis**menu on the top of the GUI.
In the Output frame those sentences containing the particular defect we are investigating on are shown along with the indication of the individual term that makes the sentence defective (according to the kind of analysis selected).
The defective sentences can be now corrected.

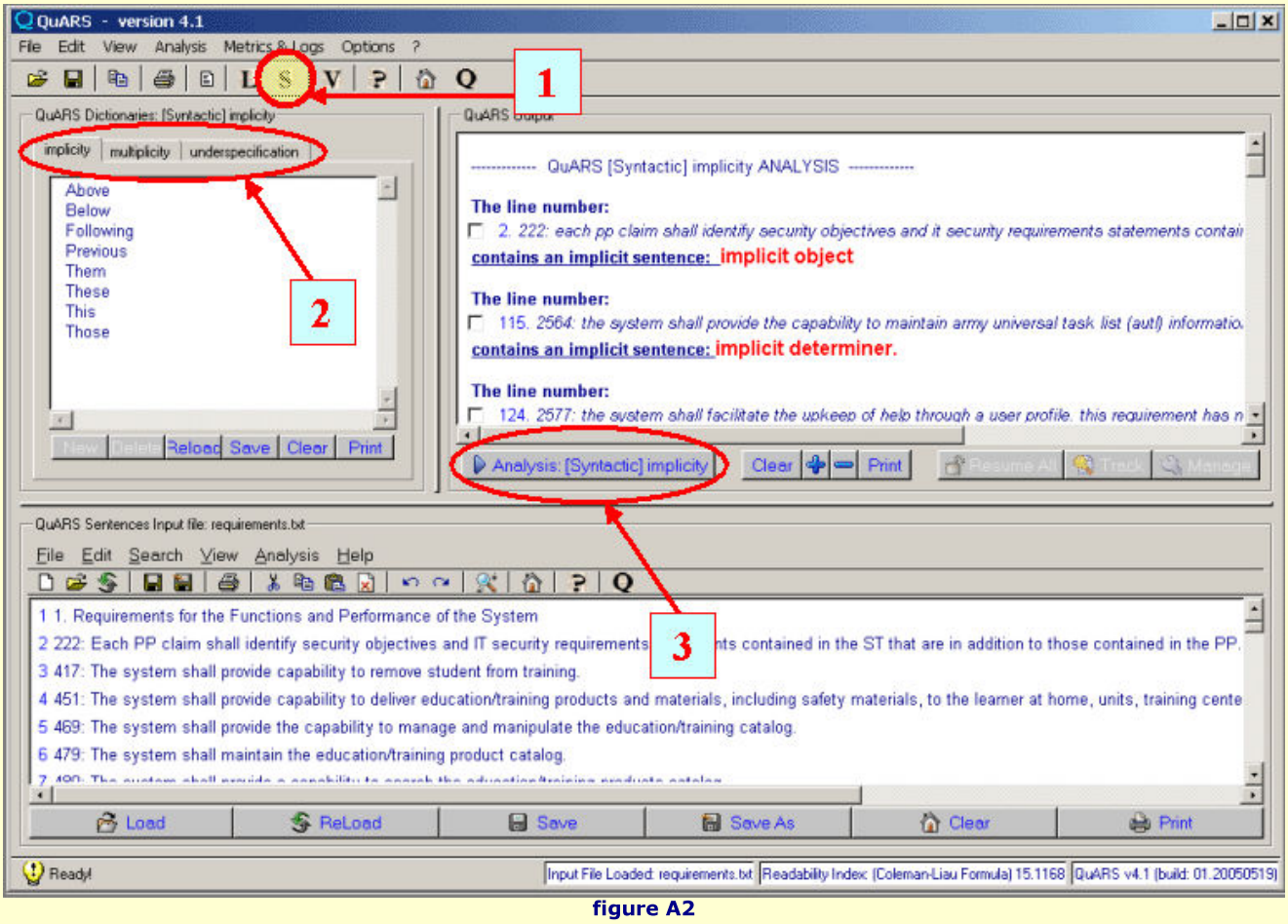


figure A2

⚠ ***Note***: the way the analysis is performed is the same than the lexical-based analysis.
The difference between the two types of analysies is transparent to the user.
In fact, for performing these analysies the tool, first derive the syntactical structure of each sentence in the input file.
Anyway, the syntactical structure of the sentences is not displayed.
While for the implicity and underspecification analysis dictionaries are necessary, the multiplicity analysis, even though it relies on the syntax structure of the sentences, for its nature, doesn't need any dictionary.

💡 You can even refer to a detailed description of the meaning of the Indicators here

---

Views Derivation

The **Views Derivation**relies again on dictionaries.
The Dictionaries of the Views (V-Dictionaries) contain domain-related terms (instead of defect-related terms).
A V-Dictionary is the sets of *all*the terms dealing with a particular View, i.e. those terms that, if contained in a sentence, indicate that this sentence is dealing with the argument the View is referred.
To select the View derivation functionality of the **QuARS**tool the **V**button on the top buttonbox of the GUI has to be clicked (arrow 1 in figure A3).
Once the View derivation functionality has been selected, in the Dictionaries frame the available dictionaries are shown (arrow 2 in figure A3).
Each dictionary in the Dictionaries frame corresponds to a particular View that can be derived.
It is possible to select the View of interest by selecting the correspondent V-Dictionary.
Once the requirements file is loaded, the View derivation can be started.
To start the View derivation push the Analysis button or select **[View derivation] name of the view**form the **Analysis**menu on the top of the GUI.

> ⚠ Since the "*View Derivation*" is based on the identification of (sub)sections, to perform this kind of analysis it is mandatory that the requirements document
> is divided into sections according to the following format:
> **1.**
> **1.1**
> **1.1.1**
> **.**
> **.**
> **.**
> **1.2**
> **.**
> **.**
> **.**
> **n.**

n.1
.
.
.

The output of the View derivation is composed of:

- A cluster of the sentences, extracted from the input requirements file, dealing with the specific topic the View is referred to (arrow 3 in figure A3).
- A MS Excel graph, showing the total number of sentences and the number of those sentences belonging to a view contained in each section of the document analyzed (arrow 4 in figure A3).

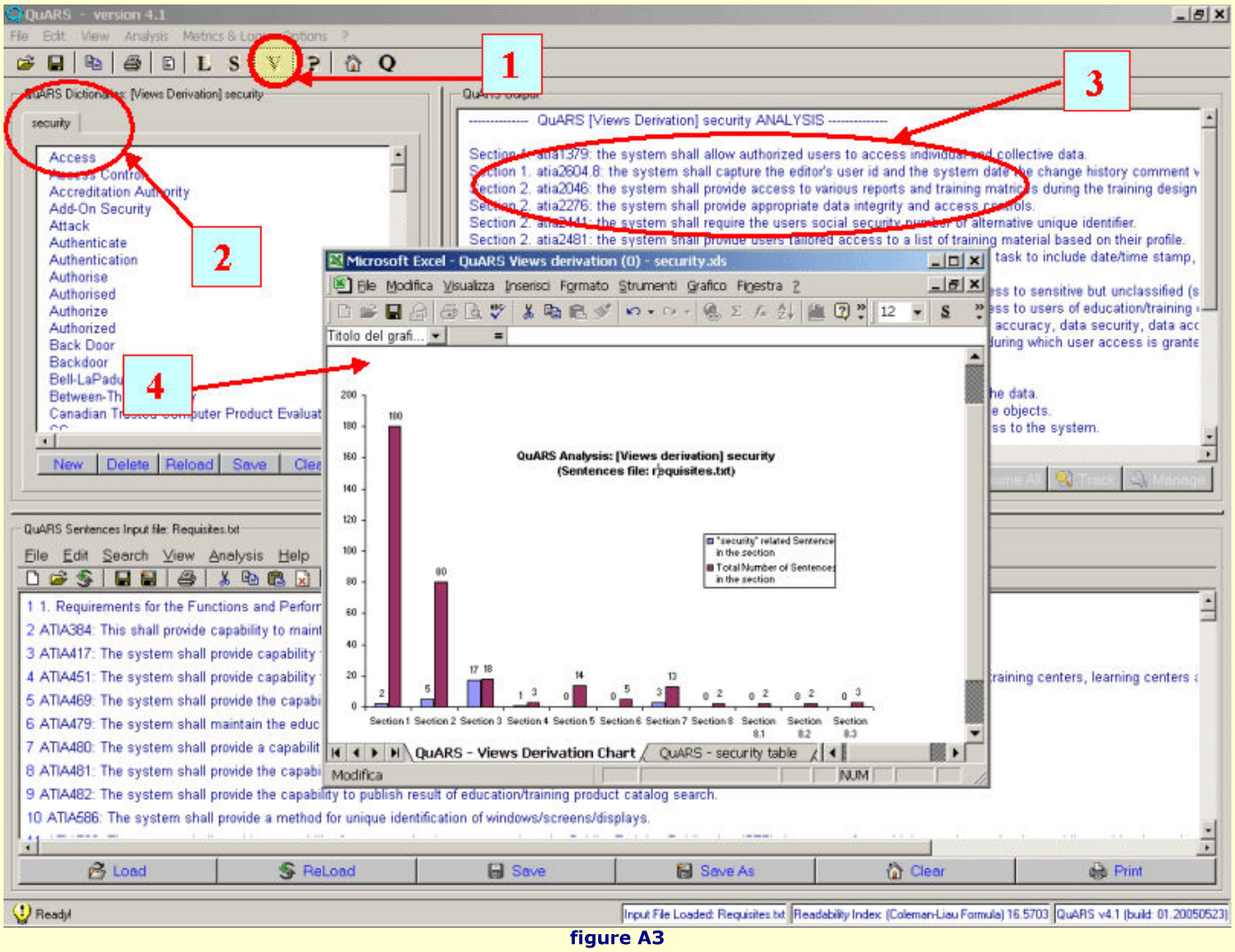


figure A3

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Results Handling

Result Description

QuARS provides two types of results:

- **1. Defect Identification**
  The Defect Identification is the result of the application of the Lexical and Syntactical analysis.
  The format of the output differs according to the type of analysis performed.
  The results of the following analyses:
  - **optionality**
  - **subjectivity**
  - **vagueness**
  - **weakness**
  - **implicity**
  - **underspecification**

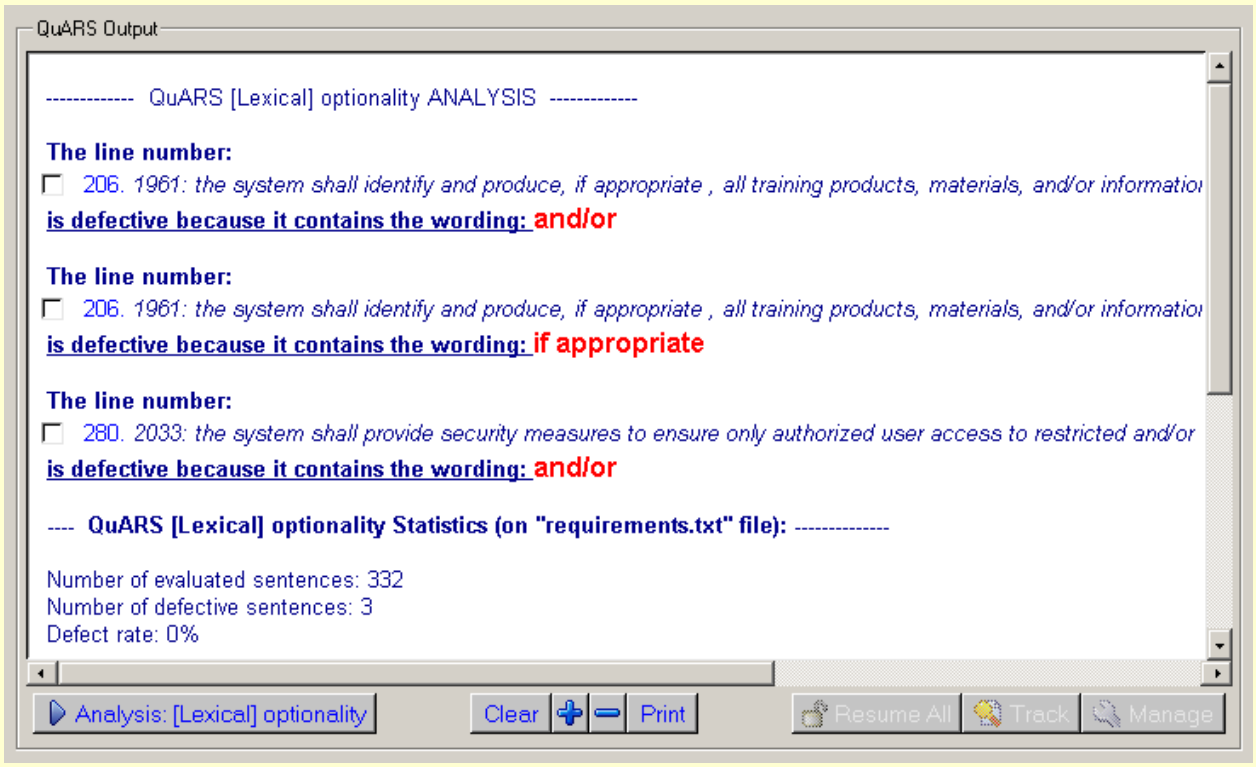
  are displayed with the following standard format:

  ```
  ------ QuARS [type of analysis] ANALYSIS ------
  ```

After the initial line the list of the lines of the document under analysis is provided.
Each potentially defective line is displayed according to the following formats.

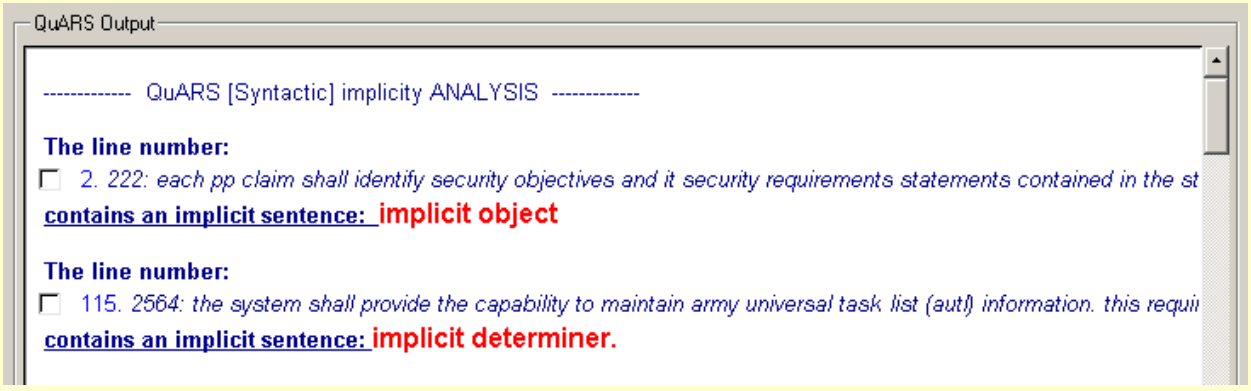
- For the **lexical analysis**, the format is:

```
The line number:
[the number of the potentially defective line in the requirements document is displayed here] [the entire line is displayed here]
is defective because it contains the wording: [the found indicator (single word or multiple words) that causes the defect is displayed here]
```



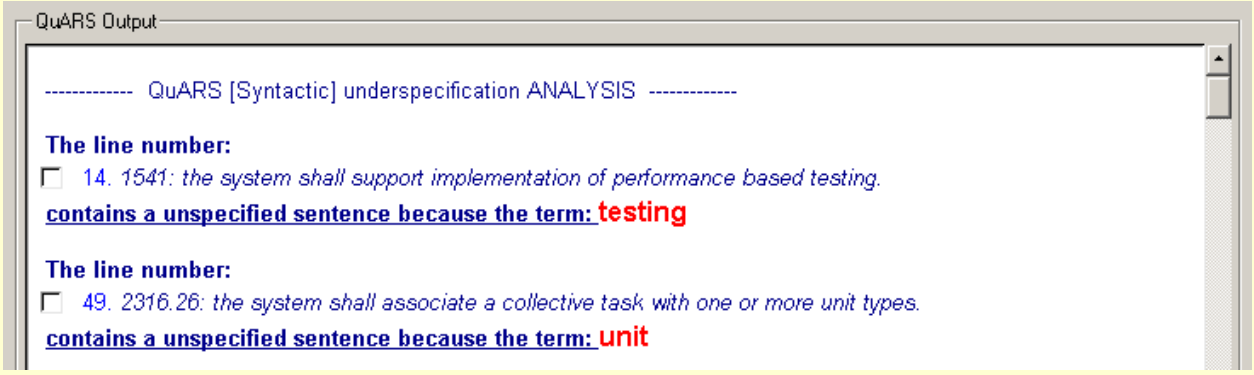
- The format of the results of the **implicity analysis** is:

```
The line number:
[the number of the potentially defective line in the requirements document is displayed here] [the entire line is displayed here]
contains an implicit sentence: [the kind of defect is displayed here]
```

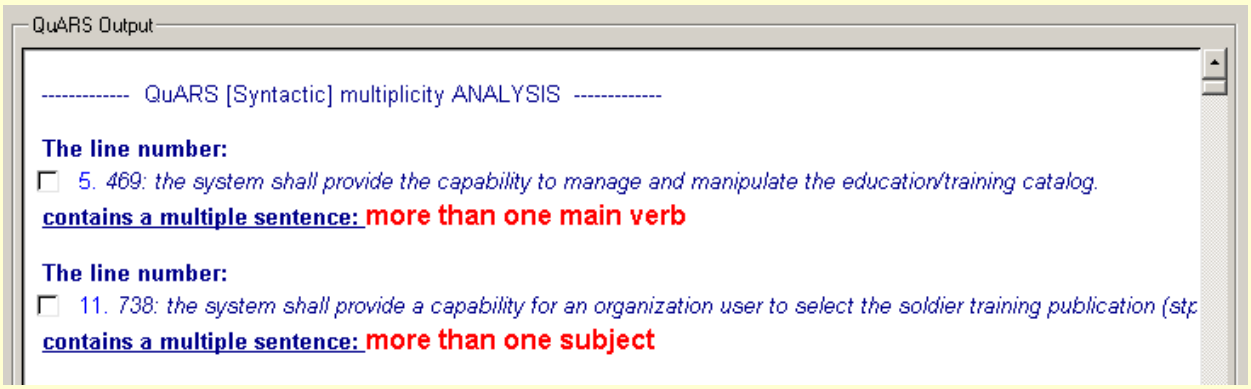


- The format of the results of the **underspecification analysis** is:

```
The line number:
[the number of the potentially defective line is displayed here] [the entire line is displayed here]
contains a underspecified sentence because the term: [the kind of defect underspecified term is displayed here]
```



- The format of the results of the **multiplicity analysis** is:
  `The line number:`
  `[the number of the potentially defective line is displayed here]`
  `[the entire line is displayed here]`
  `contains a multiple sentence because the term: [the kind of defect is displayed here]`

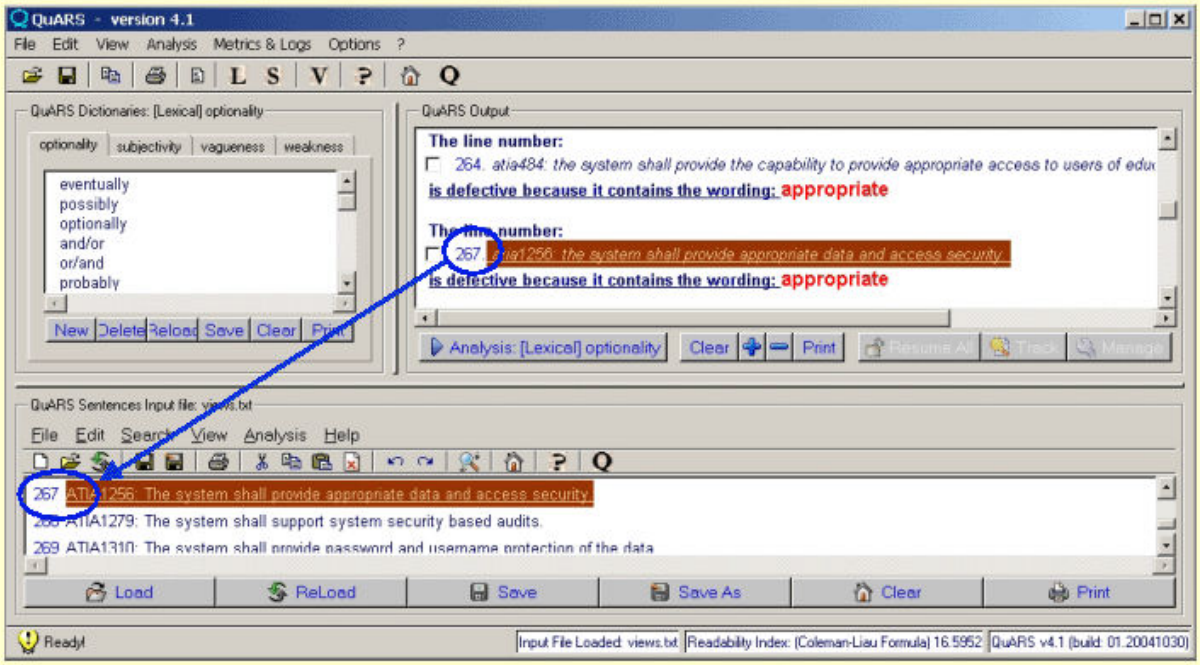


- **2. View Collection**

see View Derivation

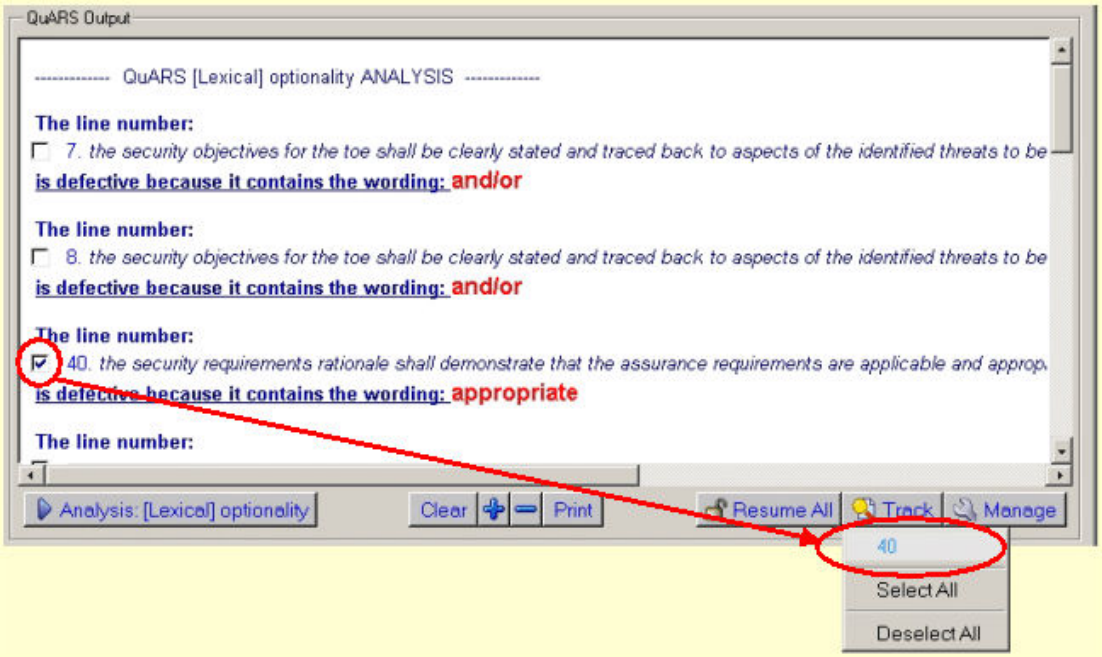
Result Tracing

The single defective sentences pointed out in the **QuARS**output frame as result of the **Defect Identification**function, can be traced on the input file by clicking the corresponding line number in the output frame. Once the line number has been clicked, the corresponding sentence is highlighted in the input frame, ready for correction.

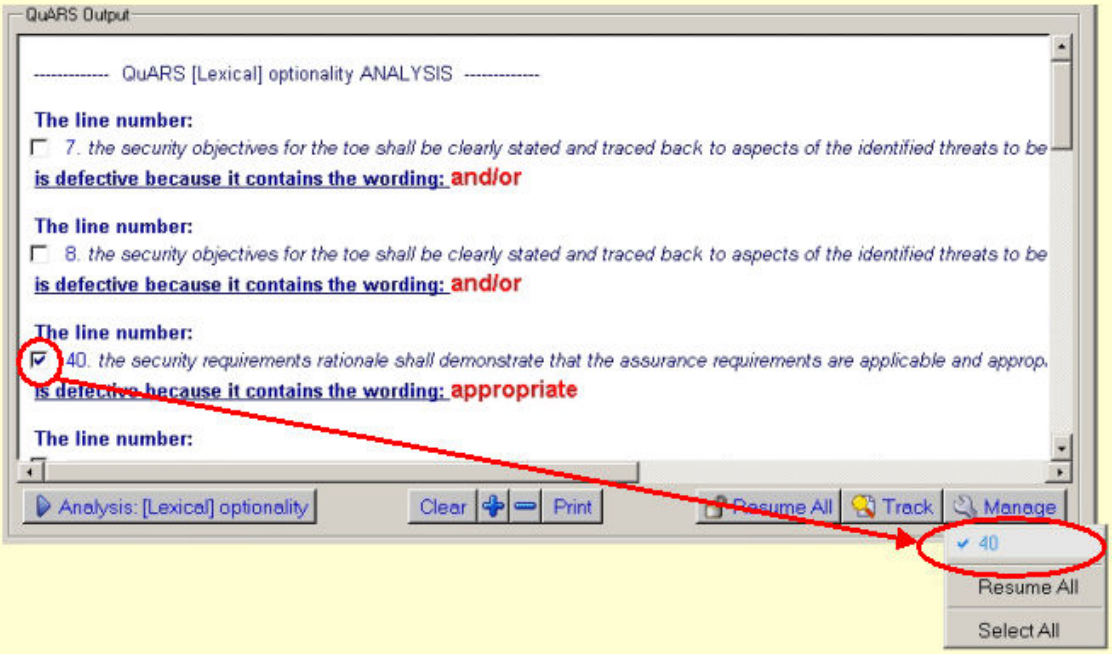


Hide Results (Tracking *False-Positives*)

It is possible to hide the false positives (i.e. sentences pointed out by **QuARS**as defective but actually considered correct by the user) by marking the check-button in the output window corresponding to the sentence to be hidden .
Once a sentence has been checked, when the analysis is performed again, this sentence will be not more displayed in the **QuARS**output window even though still defective.



- - To see what sentences are hidden, click the **Track** button in the **QuARS** output frame: the list of all actually hidden sentences will be shown.
- - By clicking on the entry "*Select All*", all hidden sentences will be selected in a brown background color
- - by clicking on the entry "*Deselect All*", all sentences will be de-selected
- - To let a hidden sentence be displayed again, click the "*Manage*" button in the **QuARS** output frame and deselect from the list the related entry



- - To let all the hidden sentences be displayed again, click the "*Resume All*" button or the "*Resume All*" entry of the "*Manage*" button
- - Use the "*Select All*" entry of the "*Manage*" button to hide all the sentences from analysis (useful in high-grade of false-positive documents)

Saving Results

The log containing the results of the analyses performed with **QuARS**can be saved in special log files.
To save the current log (i.e. the results of the last analysis performed select.
Metrics&Logs-> ***Save Current Log***.

To save the logs of the current analysis session select.
Metrics&Logs-> ***Save Available Logs***.

Menu Reference

This menu reference describes each menu item in the **QuARS** main window menu.
You can even refer to the bird-eye summary table here.

File

Load Sentences File

Displays the *Open File*dialog where you can select a file from your local disk file system.
At this moment the supported File Type is plain text only.

Print QuARS Output

Displays the *Print*dialog, where you can specify the number printed copies, etc.
Press OK to print the **QuARS**output window content.

Page Setup

Displays a *Page Setup*dialog where you can specify printing options such as margins, headers/footers and page orientation.

Quit

Closes **QuARS**window and exits **QuARS**completely.

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Edit

Copy Selection

Copies the selected text in the **QuARS**Output window to the clipboard.
You can paste the text somewhere else by using the usual menu entry *Paste*or keyboard shortcut`Control-v`.

Copy QuARS output

Copies the whole content of the **QuARS**Output window he selected text to the clipboard.
You can paste the text somewhere else by using the usual menu entry *Paste*or keyboard shortcut`Control-v`.

Clear QuARS Output

Clears **QuARS**output window deleting its content.
This operation doesn't affect the session that will not be cleaned.

Select All

Selects all text in the **QuARS**output window.

Deselect

Deselects all selected text in the **QuARS**output window.

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View

Wrap/Unwrap Text

This command allows to switch in and out of word-wrapping mode on the text shown in the **QuARS**output window.

Increase Text Size

Makes the text shown in the **QuARS**output window larger.
You can also do this pressing `Control`and `+`to render the text in a larger text font.

Decrease Text Size

Makes the text shown in the **QuARS**output window smaller.
You can also do this pressing `Control`and `-`to render the text in a smaller text font.

Style

Each style item organizes the resulting sentences in the **QuARS**output window in different visual styles.

- *on-line*: a line for any resulting sentence, without marked text.
  In *on-line* mode the *Track text* and *hide false-positives (Track)* functions are not available.
- *plain*: several lines for any resulting sentences, without marked text.
  In *on-line* mode the *Trace text* and *hide false-positives (Track)* functions are not available.
- *tagged*, *tagged 2*, *tagged 3*: this are different ways to organize text with several lines (less in "*tagged*" more in "*tagged 3*") for any resulting sentences and text marked by color.

In this modes the useful *Trace text* and *hide false-positives (Track)* functions are now available.
QuARS defaults to *tagged 2*text visualization style.

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Analysis

Create New Dictionary

Pops up the *Dictionary Wizard*window allowing to create a new dictionary.
The same can be done exploiting *Drag and Drop*capability of the Dictionary Frame.
It is not allowed to add a new Dictionary for the syntactical analysis.

Switch to Lexical Analysis

Switches the **QuARS**interface to the *Lexical*mode.

Switch to Syntactic Analysis

Switches the **QuARS**interface to the *Syntactic*mode.

Switch to Views Derivation

Switches the **QuARS**interface to the *Views Derivation*mode.

(Dynamic) List of Available Lexical Analysis

This is a dynamic list of Lexical Analyses: an entry related to any single Lexical Dictionary is shown and by means of left-mouse-button-click the related analysis is performed.

(Dynamic) List of Available Syntactic Analysis

This is a dynamic list of Syntactic Analyses: an entry related to any single Syntactic Dictionary is shown and by means of left-mouse-button-click the related analysis is performed.

(Dynamic) List of Available Views Derivations

This is a dynamic list of View Derivations: an entry related to any single View Derivation Dictionary is shown and by means of left-mouse-button-click the related analysis is performed.

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Metrics & Logs

Save Current Log

Pops up the "*Save File*" dialog window allowing to save the **QuARS**output as a plain text log file.

View "Last Session" Log

Pops up the "*Save File*" dialog window allowing to save the **QuARS**output as a plain text log file.

Save Available Logs

Pops up the "*Save File*" dialog window allowing to save still available past analysis results as a unique plain text log file.
QuARS stores the latest result of any single analysis till the "Menu/Metrics & Logs/Clear Session" entry is pressed.

View metrics

Shows saved available metrics of the latest analyses in the **QuARS**output window.

Save Available Metrics

Pops up the "*Save File*" dialog window allowing to save still available past metrics as a unique plain text log file.
QuARS stores the latest result of any single analysis till the "Menu/Metrics & Logs/Clear Session" entry is pressed.

Clear Session

Clears present and past sessions available data deleting current and past information about analysis and metrics

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Options

Font Settings

Pops up the *chooser*allowing to change font type and size for nearly all graphic elements of **QuARS**graphical interface.

Default Font

Restores default **QuARS**Interface font.

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? (Help)

QuARS Help Topics

Pops up the main **QuARS**on-line help interface showing **QuARS**Help topics summary.

QuARS Help: Getting Started

Pops up the **QuARS**on-line help interface showing **QuARS**Help *Getting Started* topic.

QuARS Help: Editors

Pops up the **QuARS**on-line help interface showing Help topics related to the ***QuARS Editors***.

QuARS Help-on-Help

Pops up the **QuARS**on-line help interface showing Help about using Help itself.

QuARS License

Show the **QuARS**License.

Splashscreem

Pos up the **QuARS**starting Splashscreen.

About

Pops up the **QuARS**info window.

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Menu Reference Summary

Menu item	*Item entry*	*Accelerator*	*Keyb. Shortcut*
File	Load a Sentences File	L	Control+l
	Print **QuARS** Output	P	Control+P

	Page Setup	S	Control+g
	Quit	Q	Control+q

Edit	Copy Selection	C	Control+C
	Copy **QuARS** Output	O	--
	Clear **QuARS** Output	r	Control+r
	Select All	S	Control+/
	Deselect	D	Control+\

View	Wrap/Unwrap Text	W	Control+w
	Increase Text Size	I	Control +
	Decrease Text Size	D	Control -
	style	s	--

Analysis	Create New Dictionary	C	Control+N
	Switch to Lexical Analysis	L	Control+L
	Switch to Syntactic Analysis	S	Control+S
	Switch to Views Derivation	V	Control+V
	(Dynamic) List of Available Lexical Analysis	--	--
	(Dynamic) List of Available Syntactic Analysis	--	--
	(Dynamic) List of Available Views Derivations	--	--

Metrics & logs	Save Current Log	S	--
	View "Last Session" Log	L	--
	Save Available Logs	A	--
	View Metrics	V	--
	Save Available Metrics	M	--
	Clear Session	C	F11

Options	Font Settings	F	--
	Default Font	D	--

? (Help)	**QuARS** Help: Topics	T	Control+H
	QuARS Help: Getting Started	G	--
	QuARS Help: Editors	E	--
	QuARS Help-on-Help	H	--
	QuARS License	L	--
	Splashscreen	S	--
	About	A	Control+B

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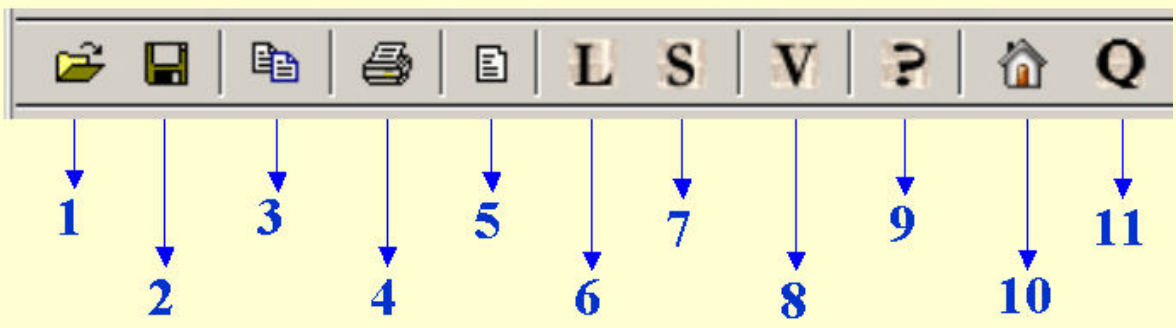
Buttonbox Reference



- **1.** (**Load**) pops up the file system browser to open a file in the editor
- **2.** (**Save**) saves the output frame content to a file
- **3.** (**Copy**) copy to clipboard selected (in the dictionary editor, in the sentences editor or in the output frame) text
- **4.** (**Print**) prints the output frame content
- **5.** (**View Metrics**) displays the available metrics by meaning of the latest analysis session
- **6.** switches to the **Lexical Analysis**
- **7.** switches to the **Syntactic Analysis**
- **8.** switches to the **Views Derivation**
- **9.** (**Help**) pops up the **QuARS on-line Help**
- **10.** (**Clear**) clears **QuARS** Analysis Session
- **11.** (**Quit**) quits **QuARS** User Interface

Keyboard Shortcuts

Main Frame QuARS Keyboard Shortcuts

- **Control +** increase dictionary text size.
- **Control -** decrease dictionary text size.
- **Control-l**: (Load) pops up the file system browser to open a file in the sentences editor
- **Control-P**: prints the editor content
- **Control-g**: pops up the *page setup* printer interface
- **Control-q**: quits **QuARS** User Interface
- **Control-w**: wraps/unwraps displayed text
- **F11**: clears the actual **QuARS** Analysis session
- **Control-H**: pops up the on-line **QuARS Help**
- **Control-B**: pops up the *About* window with info about **QuARS** and its authors

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For a complete list of Keyboard Shortcuts
related to the **QuARS**editing areas, please refer to:

- **QuARS** Sentences Editor Shortcuts
- **QuARS** Dictionary Editor Shortcuts

Dictionary Editor Keyboard Shortcuts

- **Control +** increase dictionary text size.
- **Control -** decrease dictionary text size.
- **Clicking mouse button 1** positions the insertion cursor just before the character underneath the mouse cursor, sets the input focus to this widget, and clears any selection in the widget.
  Dragging with mouse button 1 strokes out a selection between the insertion cursor and the character under the mouse.
- **Double-clicking with mouse button 1** selects the word under the mouse and positions the insertion cursor at the beginning of the word.
- **Dragging after a double click** will stroke out a selection consisting of whole words.
- **Triple-clicking with mouse button 1** selects the line under the mouse and positions the insertion cursor at the beginning of the line.
- **Dragging after a triple click** will stroke out a selection consisting of whole lines.
- The ends of the selection can be adjusted by **dragging with mouse button 1 while the Shift key is down**; this will adjust the end of the selection that was nearest to the mouse cursor when button 1 was pressed.
  If the button is double-clicked before dragging then the selection will be adjusted in units of whole words; if it is triple-clicked then the selection will be adjusted in units of whole lines.
- **Clicking mouse button 1 with the Control key down** will reposition the insertion cursor without affecting the selection.
- If any normal printing characters are typed, they are inserted at the point of the insertion cursor.
- The view in the widget can be adjusted by **dragging with mouse button 2**.
- If **mouse button 2 is clicked without moving the mouse**, the selection is copied into the text at the position of the mouse cursor.
- The **Insert key** also inserts the selection, but at the position of the insertion cursor.
- If the **mouse is dragged out of the widget while button 1 is pressed**, the entry will automatically scroll to make more text visible (if there is more text off-screen on the side where the mouse left the window).
- The **Left and Right keys** move the insertion cursor one character to the left or right; they also clear any selection in the text.
- If **Left or Right is typed with the Shift key down**, then the insertion cursor moves and the selection is extended to include the new character.
- **Control-Left** and **Control-Right** move the insertion cursor by words.

- **Control-Shift-Left** and **Control-Shift-Right** move the insertion cursor by words and also extend the selection.
- **Control-b** and **Control-f** behave the same as **Left** and **Right**, respectively.
- The **Up and Down keys** move the insertion cursor one line up or down and clear any selection in the text.
- If **Up or Right is typed with the Shift key down**, then the insertion cursor moves and the selection is extended to include the new character.
- **Control-Up** and **Control-Down** move the insertion cursor by paragraphs (groups of lines separated by blank lines).
- **Control-Shift-Up** and **Control-Shift-Down** move the insertion cursor by paragraphs and also extend the selection.
- **Control-p** and **Control-n** behave the same as **Up** and **Down**, respectively.
- The **Next** and **Prior** keys move the insertion cursor forward or backwards by one screenful and clear any selection in the text.
- If the **Shift key is held down while Next or Prior is typed**, then the selection is extended to include the new character.
- **Control-v** moves the view down one screenful without moving the insertion cursor or adjusting the selection.
- **Control-Next** and **Control-Prior scroll** the view right or left by one page without moving the insertion cursor or affecting the selection.
- **Home** and **Control-a** move the insertion cursor to the beginning of its line and clear any selection in the widget.
- **Shift-Home** moves the insertion cursor to the beginning of the line and also extends the selection to that point.
- **End** and **Control-e** move the insertion cursor to the end of the line and clear any selection in the widget.
- **Shift-End** moves the cursor to the end of the line and extends the selection to that point.
- **Control-Home** move the insertion cursor to the beginning of the text and clear any selection in the widget.
- **Control-Shift-Home** moves the insertion cursor to the beginning of the text and also extends the selection to that point.
- **Control-End** move the insertion cursor to the end of the text and clear any selection in the widget.
- **Control-Shift-End** moves the cursor to the end of the text and extends the selection to that point.
- The **Select key** and **Control-Space** set the selection anchor to the position of the insertion cursor. They don't affect the current selection.
- **Shift-Select** and **Control-Shift-Space** adjust the selection to the current position of the insertion cursor, selecting from the anchor to the insertion cursor if there was not any selection previously.
- **Control-/** selects the entire contents of the widget.
- **Control-** clears any selection in the widget.
- The **F16 key** copies the selection in the widget to the clipboard, if there is a selection.
- The **F18 key** inserts the contents of the clipboard at the position of the insertion cursor.
- The **Delete key** deletes the selection, if there is one in the widget. If there is no selection, it deletes the character to the right of the insertion cursor.
- **Backspace** and **Control-h** delete the selection, if there is one in the widget. If there is no selection, they delete the character to the left of the insertion cursor.
- **Control-d** deletes the character to the right of the insertion cursor.
- **Control-k** deletes from the insertion cursor to the end of its line
- If the insertion cursor is already at the end of a line, then **Control-k** deletes the newline character.
- **Control-x** deletes whatever is selected in the text widget.
- **Control-t** reverses the order of the two characters to the right of the insertion cursor.
- **Control-o** opens a new line by inserting a newline character in front of the insertion cursor without moving the insertion cursor.

The QuARS Editor

 The QuARS Editor

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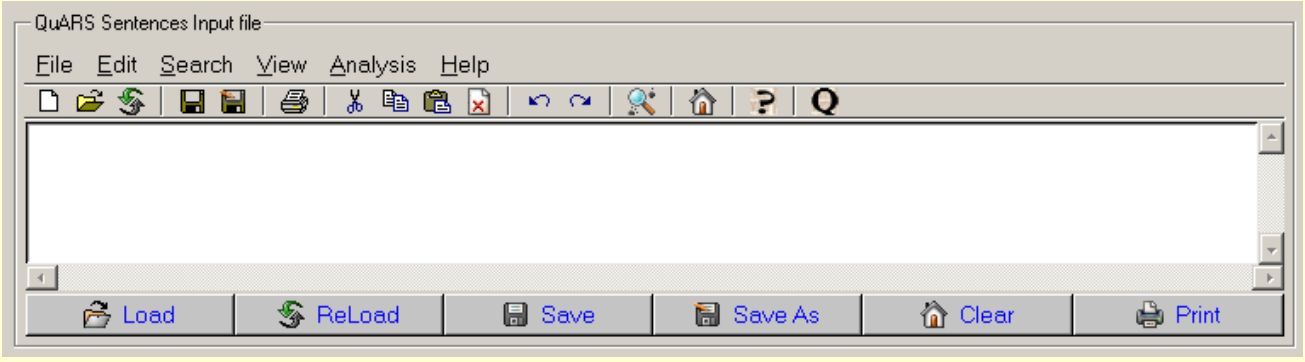
QuARS Editor User Interface



The **QuARS**editor is a specialized editor oriented to the **QuARS**functions and to the file the formats **QuARS**uses.
You can select text area for *cut and paste*and exploit the provided *drag and drop*functionality.

Buttons functionality:

- **Load**: pops up the file system browser to open a file in the editor
- **ReLoad**: loads again the file being displayed
  if there isn't actually a file loaded, it behaves like **Load**
- **Save**: saves the editor content without prompting for the name
  if the name of the file to save is not known (e.g. via a *New* command) it behaves like **Save As**
  if the file already exists, an overwrite confirmation will be asked
- **Save As**: pops up the file system browser to choose the file name by which the textual content displayed has to be saved.
  You can choose an existent file or insert your own name.
  If the file exists, the it will ask an overwrite confirmation
- **Clear**: clears editor content setting it up for a new blank file
- **Print**: prints the editor content

Please refer to the **Editor Menu Reference**, **Editor Menu Reference Summary**, **Buttonbox Reference**and **Keyboard Shortcuts**for the others functionalities.

QuARS Editor: Menu Reference

This menu reference describes each menu item in the **QuARS Editor** window menu.
You can even refer to the bird-eye summary table here.

- **File**
  - New
  - Load
  - Reload
  - Save
  - Save As
  - Print
  - Page Setup
  - Quit
- **Edit**
  - Undo
  - Redo
  - Clear Undo/Redo Stack
  - Cut
  - Copy
  - Paste
  - Delete
  - Select All
  - Deselect
  - Time/Date
  - Clear
- **Search**
  - Search Window
  - Replace Window
  - Deselect
  - Help On Search Function
  - Help On Replace Function
  - Close Search/Replace Window
- **View**
  - Wrap/Unwrap Text
  - Hide/Show Sentences Numbers
  - Renumber Sentences
  - Increase Text Size
  - Decrease Text Size
- **Analysis**

- Create New Dictionary
- Switch to Lexical Analysis
- Switch to Syntactic Analysis
- Switch to Views Derivation
- (Dynamic) List of Available Lexical Analysis
- (Dynamic) List of Available Syntactic Analysis
- (Dynamic) List of Available Views Derivations

- **Help**
  - **QuARS** Editor Help: Topics
  - **QuARS** Editor Help: Search Function
  - **QuARS** Editor Help: Replace Function

File

New

Displays the *Open File*dialog where you can select a file from your local disk file system.
At this moment the supported File Type is plain text only.

Load

Displays the *Open File*dialog where you can select a file from your local disk file system.
At this moment the supported File Type is plain text only.

Reload

Loads again (re-loads) the original file.
This is useful to verify that modifications in the shown text are rightly saved in the original file.
Nevertheless if modifications have not been previously saved, they will be lost.

Save

Saves the **QuARS**Editor content with the current file name.

Save As

Pops up the "*Save File*" dialog window allowing to save the **QuARS**Editor content as a plain text log file allowing to choose the file name too.

Print

Displays the *Print*dialog, where you can specify the number printed copies, etc.
Press OK to print the **QuARS**Editor window content.

Page Setup

Displays a *Page Setup*dialog where you can specify printing options such as margins, headers/footers and page orientation for the **QuARS**Editor content window.

Quit

Closes **QuARS**window and exits **QuARS**completely.

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Edit

Undo

Cancels (undo) the last edit command.

Redo

Cancels (redo) the last Undocommand.

Clear Undo/Redo Stack

Clears the *Undo/Redo actions*memory: after this it will not be possible none past undo/redo action anymore.

Cut

Cuts the selected text in the **QuARS**Editor window from the document and saves it on the clipboard.
You can paste the text somewhere else by means of menu entry *Paste*or keyboard shortcut`Control-v`.

Copy Selection

Copies the selected text in the **QuARS**Editor window to the clipboard.
You can paste the text somewhere else by means of menu entry *Paste*or keyboard shortcut`Control-v`.

Paste

Inserts memorized text on the clipboard in the **QuARS**Editor window in the current cursor position.

Delete

Deletes selected text in the **QuARS**Editor window.

Select All

Selects all text in the **QuARS**Editor window.
(**Note**: The left side line numbers will be not selected, neither copied nor pasted).

Deselect

Deselects all selected text in the **QuARS**Editor window.

Time/Date

Inserts in the current cursor position the actual time and date.

Clear

Clears the **QuARS**Editor window deleting its content.

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Search

Search Window

Pops Up the *Search*window.

Replace Window

Pops Up the *Search and Replace*window.

Deselect

Deselects selected text in the **QuARS**Editor window.

Help on Search Function

Pops up the **QuARS**Help window showing the *Help on Search Window*topic.

Help on Replace Function

Pops up the **QuARS**Help window showing the *Help on Replace Window*topic.

Close Search/Replace Window

Closes the *Search*or *Replace*window.

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View

Wrap/Unwrap Text

This command allows to switch in and out of word-wrapping mode on the text shown in the **QuARS**Editor window.

Hide/Show Sentences Number

Shows/Hides left sentences numbering.

Renumber Sentences

Re-numbers the shown sentences by means of a left-sided column of blue numbers.

Increase Text Size

Makes the text shown in the **QuARS**Editor window larger.
You can also do this pressing `Control`and `+`to render the text in a larger text font.

Decrease Text Size

Makes the text shown in the **QuARS**Editor window smaller.
You can also do this pressing `Control`and `–`to render the text in a smaller text font.

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Analysis

Create New Dictionary

Pops up the *Dictionary Wizard*window allowing to create a new dictionary.
The same can be done exploiting *Drag and Drop*capability of the Dictionary Frame.
It is not allowed to add a new Dictionary for the syntactical analysis.

Switch to Lexical Analysis

Switches the **QuARS**interface to the *Lexical*mode.

Switch to Syntactic Analysis

Switches the **QuARS**interface to the *Syntactic*mode.

Switch to Views Derivation

Switches the **QuARS**interface to the *Views Derivation*mode.

(Dynamic) List of Available Lexical Analysis

This is a dynamic list of Lexical Analyses: an entry related to any single Lexical Dictionary is shown and by means of left-mouse-button-click the related analysis is performed.

(Dynamic) List of Available Syntactic Analysis

This is a dynamic list of Syntactic Analyses: an entry related to any single Syntactic Dictionary is shown and by means of left-mouse-button-click the related analysis is performed.

(Dynamic) List of Available Views Derivations

This is a dynamic list of View Derivations: an entry related to any single View Derivation Dictionary is shown and by means of left-mouse-button-click the related analysis is performed.

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Help

QuARS Editor Help: Topics

Pops up the main **QuARS**on-line help interface showing **QuARS**Help topics summaryabout the **QuARS**Editor.

QuARS Editor Help: Search Function

Pops up the **QuARS**Help window showing the *Help on the Search Window*topic.

QuARS Editor Help: Replace Function

Pops up the **QuARS**Help window showing the *Help on the Replace Window*topic.

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QuARS Editor: Menu Reference Summary

Menu item	*Item entry*	*Accelerator*	*Keyb. Shortcut*
File	New	N	Control+N
	Load	L	Control+l
	Reload	R	--
	Save	S	Control+s
	Save As	A	F12
	Print	P	Control+P
	Page Setup	g	Control+g
	Quit	Q	Control+q
Edit	Undo	U	Control+z
	Redo	R	Control+y
	Clear Undo/Redo Stack	l	F10
	Cut	t	Control+x
	Copy	C	Control+c
	Paste	P	Control+v
	Delete	D	DEL
	Select All	A	Control+/
	Deselect	s	Control+\
	Time/Date	i	Control+T
	Clear	e	Control+C
Search	Search Window	S	Control+f
	Replace Window	R	F8
	Deselect	D	Control+D
	Help On Search Function	e	Control+H
	Help On Replace Function	p	--
	Close Search/Replace Window	C	Esc
View	Wrap/Unwrap Text	W	Control+w
	Hide/Show Sentences Numbers	H	F9
	Renumber Sentences	R	Control+r
	Increase Text Size	I	Control +
	Decrease Text Size	D	Control -
Analysis	Create New Dictionary	C	Control+N
	Switch to Lexical Analysis	L	Control+L
	Switch to Syntactic Analysis	S	Control+S
	Switch to Views Derivation	V	Control+V

	(Dynamic) List of Available Lexical Analysis	--	--
	(Dynamic) List of Available Syntactic Analysis	--	--
	(Dynamic) List of Available Views Derivations	--	--

Help	**QuARS** Editor Help: Topics	Q	Control+H
	QuARS Editor Help: Search Function	S	--
	QuARS Editor Help: Replace Function	R	--

QuARS Editor: Keyboard Shortcuts

Here is a complete list of bindings and keyboard short-key that resume the functionalities provided by the **QuARS**editor.

Main Editor Shortcuts

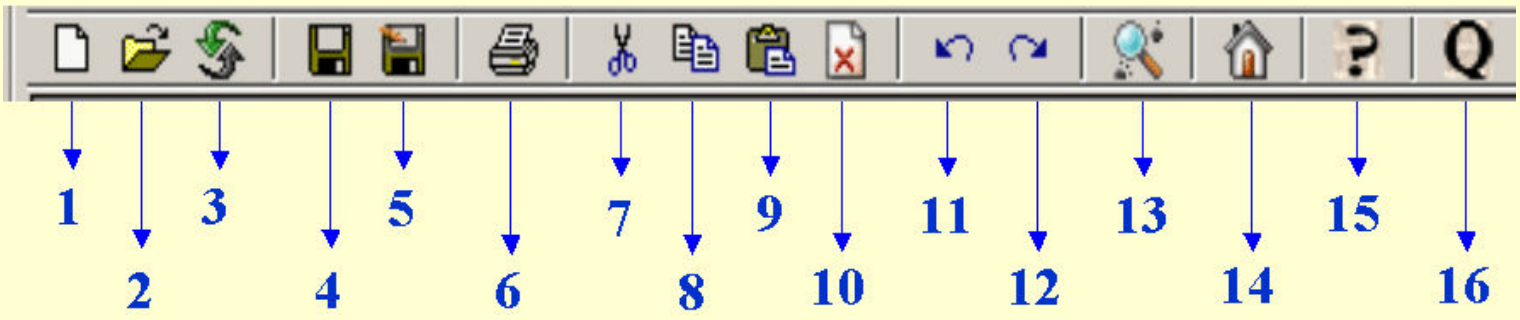
- **Control +** increase dictionary text size.
- **Control -** decrease dictionary text size.
- **Control-N**: (New) sets a new file in the editor
- **Control-l**: (Load) pops up the file system browser to open a file in the editor
- **Control-s**: (Save) saves the editor content, if the name of the file to save is not known (via a *New* command) it behaves as **Control-l**
- **F12**: (Save As) saves the editor content popping up the file system browser allowing to choose a different file name
- **Control-P**: prints the editor content
- **Control-g**: pops up the *page setup* printer interface
- **Control-q**: quits **QuARS** User Interface
- **Control-z**: undo latest change
- **Control-y**: redo latest change
- **F10**: clear Undo/Redo stack
- **Control-x**: cuts selected text
- **Control-c**: copies selected text
- **Control-v**: pastes selected text
- **Del**: deletes selected text
- **Control-/**: selects all the text
- **Control-**: de-selects all the text
- **Control-T**: inserts time and date
- **Control-C**: clears editor content setting it up for a new blank file
- **Control-f**: pops up the **QuARS** *search* window
- **F8**: pops up the **QuARS** *Search and Replace* window
- **Control-D**: clears the editor content from all the selections
- **Control-H**: pops up the **QuARS on-line Help**
- **Esc**: closes *Search/Replace* window
- **Control-w**: wraps/unwraps displayed text
- **F9**: hides/shows sentences number
- **Control-r**: renumbers sentences lines
- **Control-N**: pos up the **QuARS Dictionary Wizard**
- **Control-L**: switches to the Lexical Analysis
- **Control-S**: switches to the Syntactic Analysis
- **Control-V**: switches to the Views Derivation
- **Control-H**: pops up the on-line **QuARS Help**

Other Editor Shortcuts

- **Clicking mouse button 1** positions the insertion cursor just before the character underneath the mouse cursor, sets the input focus to this widget, and clears any selection in the widget.
  Dragging with mouse button 1 strokes out a selection between the insertion cursor and the character under the mouse.
- **Double-clicking with mouse button 1** selects the word under the mouse and positions the insertion cursor at the beginning of the word.
- **Dragging after a double click** will stroke out a selection consisting of whole words.
- **Triple-clicking with mouse button 1** selects the line under the mouse and positions the insertion cursor at the beginning of the line.
- **Dragging after a triple click** will stroke out a selection consisting of whole lines.
- The ends of the selection can be adjusted by **dragging with mouse button 1 while the Shift key is down**; this will adjust the end of the selection that was nearest to the mouse cursor when button 1 was pressed.
  If the button is double-clicked before dragging then the selection will be adjusted in units of whole words; if it is triple-clicked then the selection will be adjusted in units of whole lines.
- **Clicking mouse button 1 with the Control key down** will reposition the insertion cursor without affecting the selection.
- If any normal printing characters are typed, they are inserted at the point of the insertion cursor.
- The view in the widget can be adjusted by **dragging with mouse button 2**.

- If **mouse button 2 is clicked without moving the mouse**, the selection is copied into the text at the position of the mouse cursor.
- The **Insert key** also inserts the selection, but at the position of the insertion cursor.
- If the **mouse is dragged out of the widget while button 1 is pressed**, the entry will automatically scroll to make more text visible (if there is more text off-screen on the side where the mouse left the window).
- The **Left and Right keys** move the insertion cursor one character to the left or right; they also clear any selection in the text.
- If **Left or Right is typed with the Shift key down**, then the insertion cursor moves and the selection is extended to include the new character.
- **Control-Left** and **Control-Right** move the insertion cursor by words.
- **Control-Shift-Left** and **Control-Shift-Right** move the insertion cursor by words and also extend the selection.
- **Control-b** and **Control-f** behave the same as **Left** and **Right**, respectively.
- The **Up and Down keys** move the insertion cursor one line up or down and clear any selection in the text.
- If **Up or Right is typed with the Shift key down**, then the insertion cursor moves and the selection is extended to include the new character.
- **Control-Up** and **Control-Down** move the insertion cursor by paragraphs (groups of lines separated by blank lines).
- **Control-Shift-Up** and **Control-Shift-Down** move the insertion cursor by paragraphs and also extend the selection.
- **Control-p** and **Control-n** behave the same as **Up** and **Down**, respectively.
- The **Next** and **Prior** keys move the insertion cursor forward or backwards by one screenful and clear any selection in the text.
- If the **Shift key is held down while Next or Prior is typed**, then the selection is extended to include the new character.
- **Control-v** moves the view down one screenful without moving the insertion cursor or adjusting the selection.
- **Control-Next** and **Control-Prior scroll** the view right or left by one page without moving the insertion cursor or affecting the selection.
- **Home** and **Control-a** move the insertion cursor to the beginning of its line and clear any selection in the widget.
- **Shift-Home** moves the insertion cursor to the beginning of the line and also extends the selection to that point.
- **End** and **Control-e** move the insertion cursor to the end of the line and clear any selection in the widget.
- **Shift-End** moves the cursor to the end of the line and extends the selection to that point.
- **Control-Home** move the insertion cursor to the beginning of the text and clear any selection in the widget.
- **Control-Shift-Home** moves the insertion cursor to the beginning of the text and also extends the selection to that point.
- **Control-End** move the insertion cursor to the end of the text and clear any selection in the widget.
- **Control-Shift-End** moves the cursor to the end of the text and extends the selection to that point.
- The **Select key** and **Control-Space** set the selection anchor to the position of the insertion cursor. They don't affect the current selection.
- **Shift-Select** and **Control-Shift-Space** adjust the selection to the current position of the insertion cursor, selecting from the anchor to the insertion cursor if there was not any selection previously.
- **Control-/** selects the entire contents of the widget.
- **Control-** clears any selection in the widget.
- The **F16 key** copies the selection in the widget to the clipboard, if there is a selection.
- The **F18 key** inserts the contents of the clipboard at the position of the insertion cursor.
- The **Delete key** deletes the selection, if there is one in the widget. If there is no selection, it deletes the character to the right of the insertion cursor.
- **Backspace** and **Control-h** delete the selection, if there is one in the widget. If there is no selection, they delete the character to the left of the insertion cursor.
- **Control-d** deletes the character to the right of the insertion cursor.
- **Control-k** deletes from the insertion cursor to the end of its line
- If the insertion cursor is already at the end of a line, then **Control-k** deletes the newline character.
- **Control-x** deletes whatever is selected in the text widget.
- **Control-t** reverses the order of the two characters to the right of the insertion cursor.
- **Control-o** opens a new line by inserting a newline character in front of the insertion cursor without moving the insertion cursor.

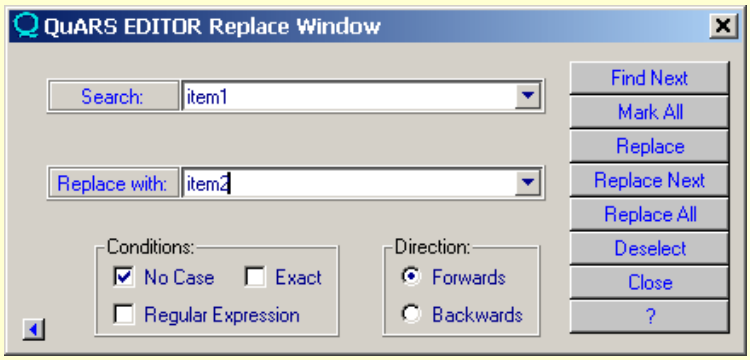
QuARS Editor: Buttonbox Reference



- **1.** (**New**) sets a new file in the editor
- **2.** (**Load**) pops up the file system browser to open a file in the editor
- **3.** (**ReLoad**) loads again the file being displayed
- **4.** (**Save**) saves the editor content, if the name of the file to save is not known (via a *New* command) it behaves as **Control-l**
- **5.** (**Save As**) saves the editor content popping up the file system browser allowing to choose a different file name
- **6.** (**Print**) prints the editor content
- **7.** (**Cut**) cuts selected text
- **8.** (**Copy**) copies selected text
- **9.** (**Paste**) pastes selected text
- **10.** (**Delete**) deletes selected text
- **11.** (**Undo**) undo latest change

- **12.** (**Redo**) redo latest change
- **13.** (**Search**) pops up the **QuARS** search window
- **14.** (**Clear**) clears editor content setting it up for a new blank file
- **15.** (**Help**) pops up the **QuARS on-line Help**
- **16.** (**Quit**) quits **QuARS** User Interface

QuARS Editor: Search & Replace Function



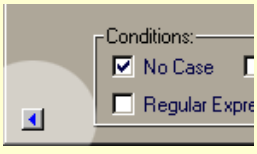
Use this function to find and replace each occurrence of a combination of any characters, including uppercase and lowercase characters, whole words, or parts of words, or regular expression.

- **"Search" box**:
  - this a "*combo box*" memorizing latest search items you inserted: use this line to specify a text search string.
- **"Replace" box**:
  - this a "*combo box*" memorizing latest replace items you inserted: use this line to specify a text replace string.

- **Buttons**
  - **Find Next**: finds next occurrence of the searching string and select it in a green background color.
  - **Mark All**: marks all occurrences of the searching string by means of a green selection.
  - **Replace**: replaces the current .
  - **Replace Next**: deselect selected text in the **QuARS** Editor window.
  - **Replace All**: deselect selected text in the **QuARS** Editor window.
  - **Deselect**: deselect selected text in the **QuARS** Editor window.
  - **Close**: closes the *Search* window.
  - **?**: pops up the **QuARS** Help showing this item.

- **Conditions**
  - **No Case**: this is the default
  - **Exact**: use exact matching. The characters in the matching range must be identical to those in pattern.
  - **Regular Expression**: treat pattern as a regular expression and match it against the text using the rules for regular expressions (see the *Regular Expression* item for details).

- **Direction**:
  - **Backwards**: the search will proceed backward through the text.
  - **Forwards**: the search will proceed forward through the text.
    This is the default.

- **Go to the Search Function**:
  - 

click this button to switch to the Search window

QuARS Editor: Search Function

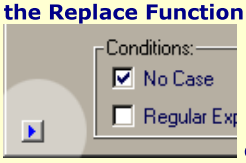
Use this function to find each occurrence of a combination of any characters, including uppercase and lowercase characters, whole words, or parts of words, or regular expression.

- **"Search" box**:
  - this a "*combo box*" memorizing latest search items you inserted: use this line to specify a text search string.

- **Buttons**
  - **Find Next**: finds next occurrence of the searching string and select it in a green background color.
  - **Mark All**: marks all occurrences of the searching string by means of a green selection
  - **Deselect**: deselect selected text in the **QuARS** Editor window.
  - **Close**: closes the *Search* window.
  - **?**: pops up the **QuARS** Help showing this item.

- **Conditions**
  - **No Case**: this is the default
  - **Exact**: use exact matching. The characters in the matching range must be identical to those in pattern.
  - **Regular Expression**: treat pattern as a regular expression and match it against the text using the rules for regular expressions (see the *Regular Expression* item for details).

- **Direction**:
  - **Backwards**: the search will proceed backward through the text.
  - **Forwards**: the search will proceed forward through the text.
    This is the default.

- **Go to the Replace Function**:
  - 

click this button to switch to the Replace window

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HOW TOs

HOW TOs

- *How To* Convert an input file in the suitable file format
- *How To* create a new Dictionary

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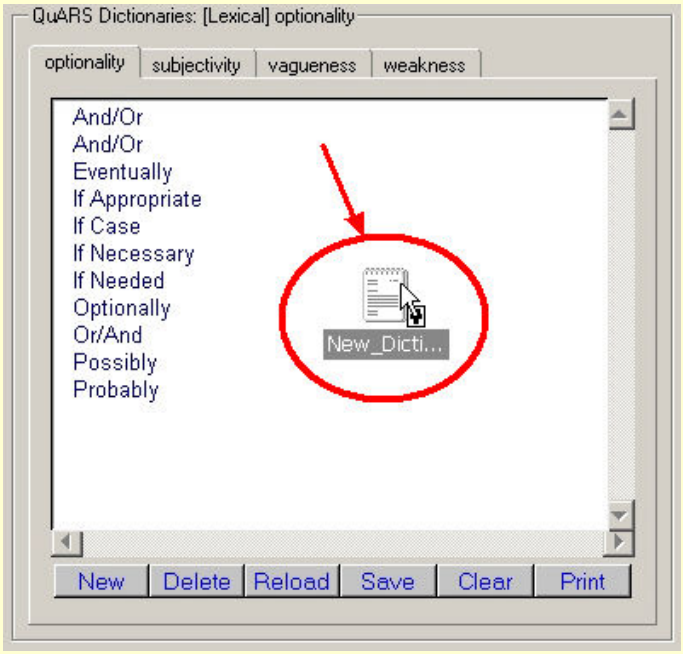
How To create a new Dictionary

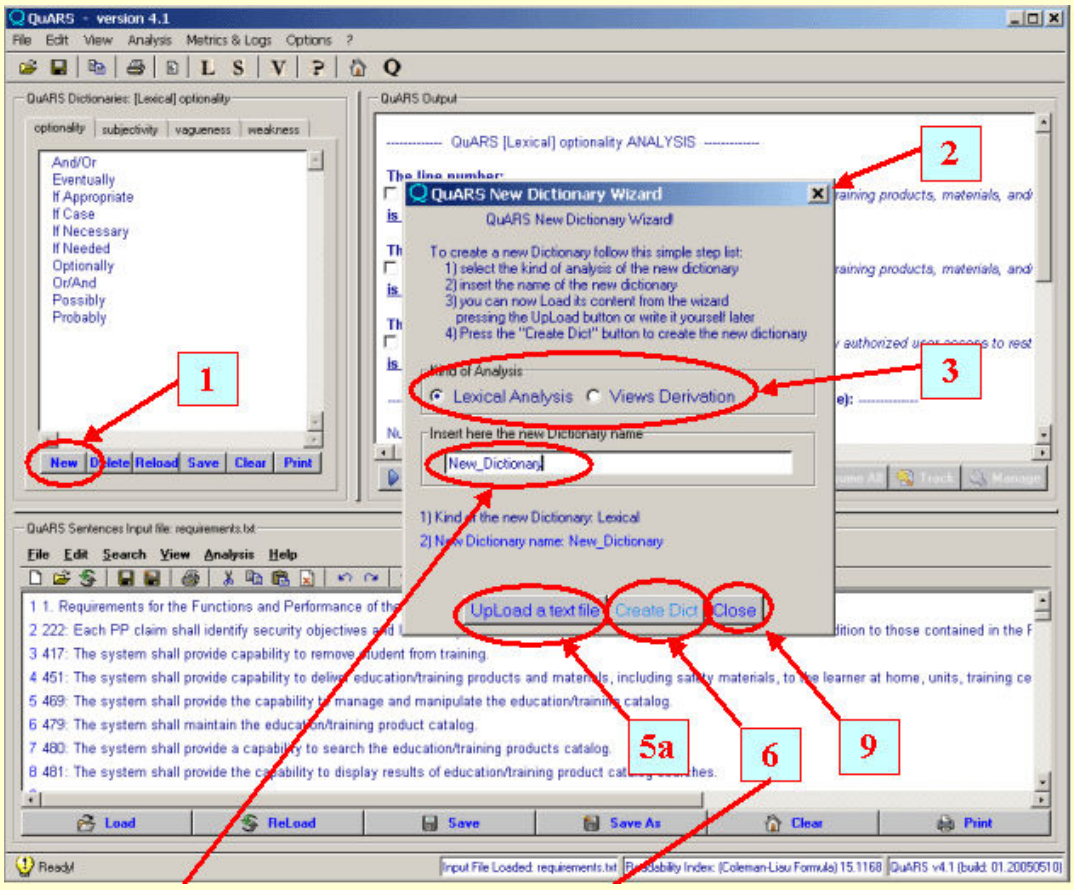
To create a new Dictionary you can:
- **(1a)** drag & drop the text file over the "***QuARS*** *Dictionary Area*" and skip next points.

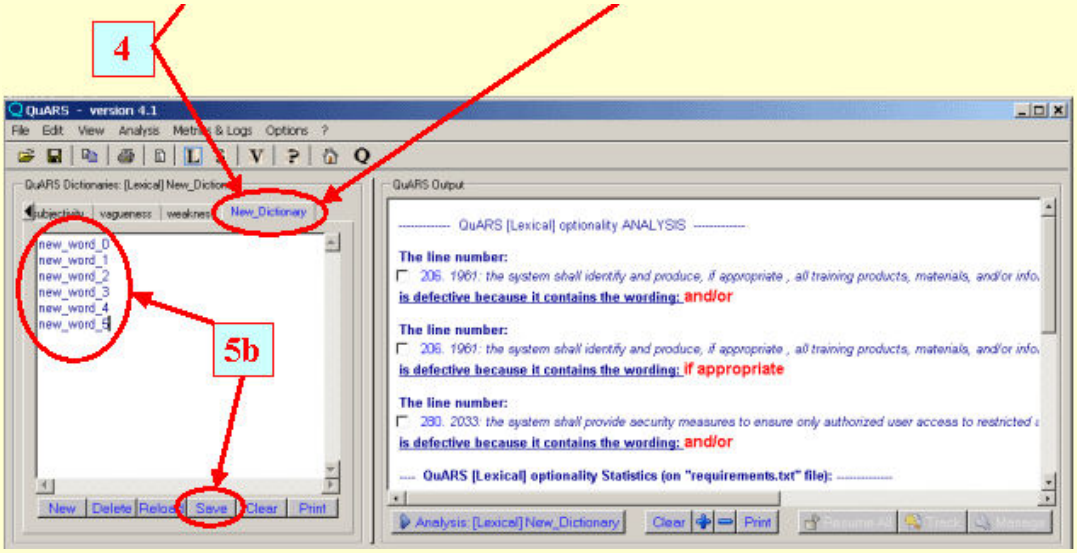


The content of the dictionary will be uploaded from the dragged file.

⚠ There is no control on the type of the file in that way uploaded, so be sure that its content is *pure plain ascii text*.

- **(1b)** press the "**New**" button in the "***QuARS*** *Dictionary Area*"
- **(2)** The "***QuARS*** *Dictionary Wizard*" will pop up
- **(3)** (mandatory) select the kind ("Lexical" or "View Derivation") of the new dictionary
- **(4)** (mandatory) insert the new dictionary name
- **(5a)** (optional) you can upload a text file from the file system using the wizard button "Upload a text file" (a file manager will pop up) or choose to fill manually later the dictionary by means of the **QuARS** Dictionary Editor
- **(5b)** (optional) at any time you can update the content of any dictionary and save it using the ***QuARS*** *Dictionary Area* button "Save"
- **(6)** press the "**Create Dict**" button or the "Enter" key: if a dictionary with the chosen name still exists an error message is shown and the name can be changed
- **(7)** the new Dictionary will appear in the ***QuARS*** *Dictionary Area*
- **(8)** if you need to create another new Dictionary repeat points 3x-7 or 1a
- **(9)** close the ***QuARS*** *Dictionary Wizard* using the "Close" button





Dictionaries name format and limitations:

- at this moment, the supported file type for the **QuARS** Dictionaries is only plain text file.
  So, no .doc, .rtf, .html, .pdf or whatever file types except for *pure plain ascii text files* are allowed.
  See here How To Convert an input file in the suitable file format.
- ⚠ There is no control on the type of the file uploaded, so be sure that its content is *pure plain ascii text*
- Moreover the name of a new dictionary has to respect a some rules:
  - can be at most 15 chars long (excluding extension)
  - spaces are NOT allowed
  - the ***QuARS*** *Dictionary Wizard* does not allow to insert special characters or spaces
  - if the name of a text file, dropped to create a new dictionary, contains spaces they are automatically converted to underscores
  - the ***QuARS*** *Dictionary Wizard* does not allow to more than 15 characters in the new Dictionary name entry
  - if the name of a text file, dropped to create a new dictionary, is longer than 15 chars, the last chars are automatically cropped to fit the legal 15-chars length

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How To Convert an input file in the suitable file format

If the format of the input file is not plain text, it has to be converted.
In the following the procedure to be followed for the most common commercial text formats:

- **MS Word** (.doc)
  - **Export the entire file**
    - Select from the menubar "*File*" --> "*Save as*"
    - Select "*text file* (.txt)" as saving file format
    - Select where saving the file
    - Click the "*Save*" button
  - **Export an excerpt of the file**
    - Select the text of interest
    - Copy the selected text
    - Past the copied text in a plain text file
- **Adobe Acrobat** (.pdf):
  - **Export the entire file**
    - Select from the menubar "*File*" --> "*Save as Text*"
    - Select where saving the file
    - Click the "*Save*" button
  - **Export an excerpt of the file**
    - Select the "*Select Text*" tool button in the *Adobe Acrobat Reader* buttonbox
    - Select the text of interest
    - Copy the selected text
    - Past the copied text in a plain text file
    - Deselect the "*Select Text*" tool button to come back to the normal *Acrobat Reader* view
- **HTML** (.htm, .html):
  - **Export the entire file**
    - Select from the menubar "*File*" --> "*Save as*"
    - Select "*text file* (.txt)" as saving file format
    - Select where saving the file
    - Click the "*Save*" button
  - **Export an excerpt of the file**
    - Select the text of interest
    - Copy the selected text
    - Past the copied text in a plain text file

The file is now in the suitable format for being analyzed by QuARS.
It has be noticed that the editorial formatting (bullets, tables, pictures,) will be lost in the new plain text file°.

⚠ **°Note**: The consequences of that can be relevant.
In particular, it can be difficult to maintain the alignment between the original input file and the new version.

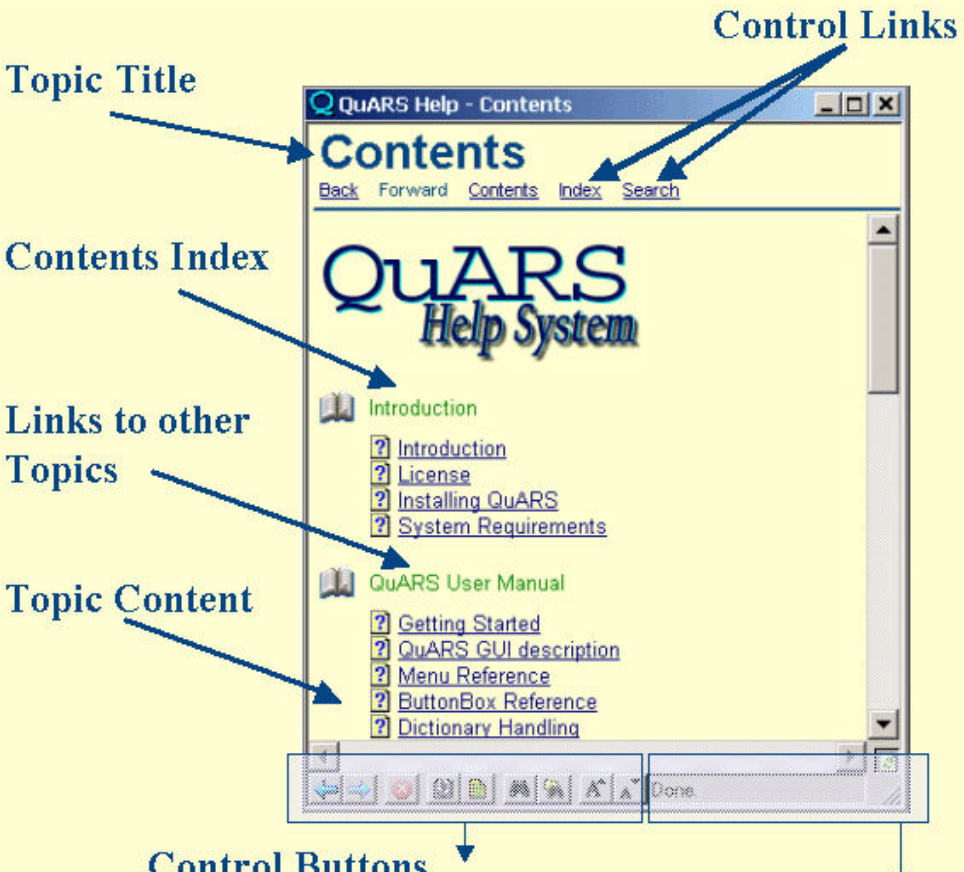
QuARS Help-On-Help: The User Interface (usage)

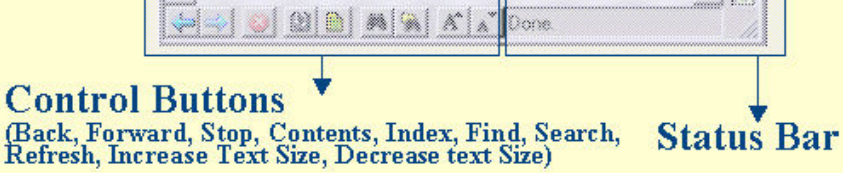
The main Help window provides a user-friendly view of the help text, with standard controls (Back, Forward, Index, Contents and etc.). The main window includes a context menu, which is invoked by clicking the right mouse button.

Keyboard shortcuts:

- Backspace or Alt-Left or Alt-F5
  Back to previous topic.
- Alt-Right
  Forward to next topic.
- Escape
  Stop loading current topic.
- Control-F
  Find text in current topic.
- Control-S
  Find text in all topics.
- Control-R
  Refresh screen.
- Control-L
  Reload help file(s).
  ⚠ *All history information will be lost.*
- Control-plus
  Decrease font size.
- Control-minus
  Increase font size.
- Control-O
  Open another help file. "Open file" dialog will appear.

Screenshot of "HelpSystem" window:



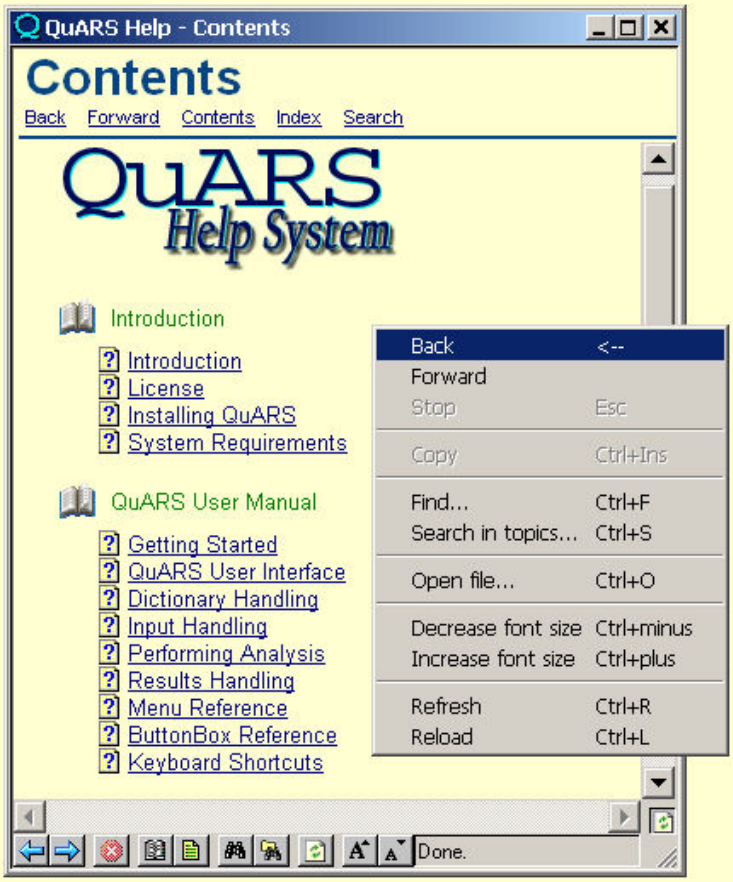


The Right-Click menu

The "Right menu button" provides a menu with several useful functions:

- Back
  Back to previous topic.
- Forward
  Forward to next topic.
- Stop
  Stops loading current topic.
- Find
  Pops up the "Find window": the specified item will be sought through the displayed page.
- Search in topics...
  Pops up the "Finds window": the specified item will be sought all over the pages.
- Open File
  Open another help file. "Open file" dialog will appear.
- Decrease font size
  Decrease displayed font size.
- Increase font size
  Increase displayed font size.
- Refresh
  Refresh screen.
- Reload
  Reload current help file(s).

  All history information will be lost.



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About QuARS

QuARS: **Qu**ality **A**nalyzer for **R**equirement **S**pecifications
Version 4.1 (build 01.20050621)
design and Development by:
Giuseppe Lami Gianluca Trentanni

CONSIGLIO NAZIONALE DELLE RICERCHE

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---

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About QuARS Help System

The QuARS Help System is Powered by:

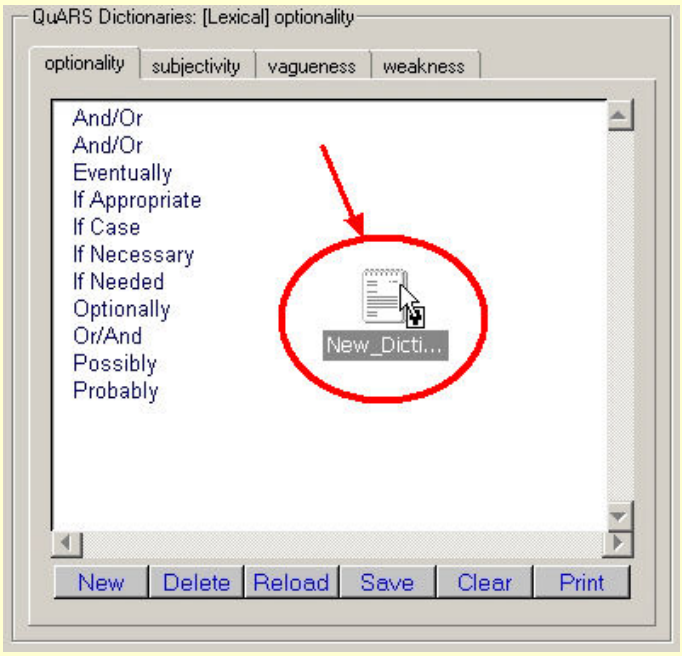
Help System

Special thanks to:

- J.W.Schmitz-Hübsch
  for implementations of additional features
- Dave Clews
  for help in translation of in-line documentation

Dictionaries name format and limitations

To create e new Dictionary (as seen here) you can "drag and drop" a file over the "***QuARS*** *Dictionary Area*"



or push the "Upload a File" button in the "***QuARS*** *Dictionary Wizard*".
In both cases, at this moment, the supported file type for these actions is only plain text file.
So, no .doc, .rtf, .html, .pdf or whatever file types except for *simple ascii text files*are allowed.
And no control Moreover the name of a new dictionary can be at most 15 chars long and are allowed only numbers, letters (both uppercase and lowercase) and the underscore.
Neither spaces are allowed: if the name of a text file, dropped to create a new dictionary, contains spaces they are automatically converted with underscores.

Indicators Explication

Indicator	***Notes***
Vagueness	The occurrence of this Indicator is due to the existence of Vagueness-revealing wordings as for example: clear, easy, strong, good, bad, useful, significant, adequate, recent,....
Subjectivity	The occurrence of this Indicator is due to the existence of Subjectivity-revealing wordings as for example: similar, similarly, having in mind, take into account, as [adjective] as possible,...
Optionality	The occurrence of this Indicator is due to the existence of Optionality-revealing words as for example: possibly, eventually, if case, if possible, if appropriate, if needed, ...
Implicity	The occurrence of this Indicator is determined by the existence of: Implicit Subject or Object: sentences having the subject or object complements expressed by means of: Demonstrative adjective (this, these, that, those) or Pronouns (it, they...) [examples: those shall run in a safe mode - the system shall display it in the main screen] Implicit Determiner: terms having the determiner expressed by a demonstrative adjective (this, these, that, those) or implicit adjective (as for example previous, next, following, last...) or preposition (as for example above, below...) [example: the system shall produce the previous results]
Weakness	The verbs that determine the occurrence of this indicator are the Weak verbs: could, might, may.

Under-specification	This Indicator occurs when words needing to be instantiated are detected. [e.g.: flow instead of data flow, control flow - access instead of write access, remote access, authorized access - testing instead of functional testing, structural testing, unit testing, etc.]
Multiplicity	This indicator occurs when a multiple sentences is found. A multiple sentence has more than one subject [e.g. the mean time to remove a faulty board and the time to restart shall be less than 30 minutes] or more than one main verb. [e.g.: the mean time needed to remove a faulty board and restore service shall be less than 30 minutes]
Readability	It correspond to the actual value of the Coleman-Liau formula.

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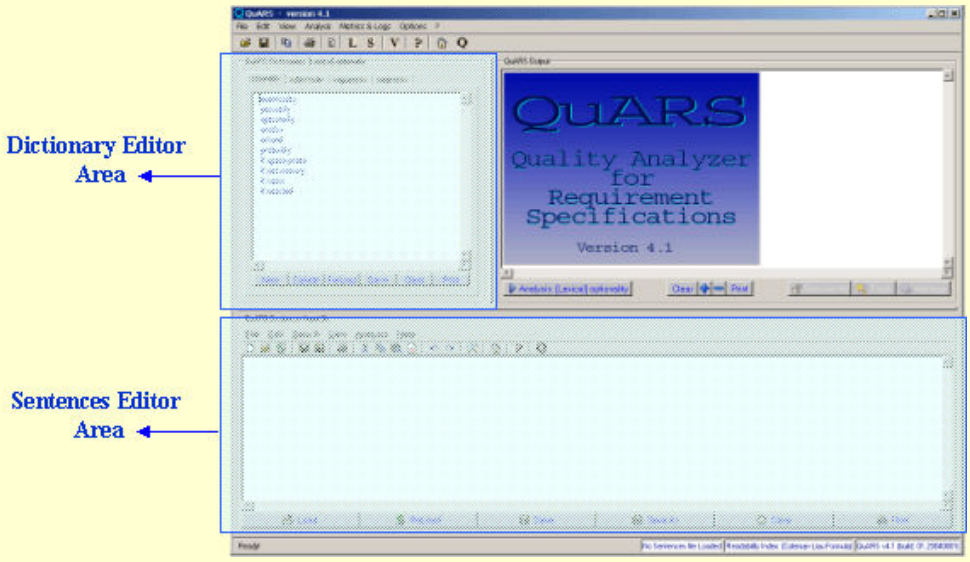
Drag & Drop

In some areas of the **QuARS**GUI is enabled the "*drag and drop*" function/capability.
These areas are:

- **The Dictionary Editor area**: you can drag&drop e plain text file onto this area to add a Dictionary to the **QuARS Dictionary Set**
  This capability is enabled only for the **Lexical** type of analysis and the **Views Derivation** function.
  At the end of the session, quitting **QuARS**, the new dictionary will be saved and in the next session you will find it again.
- **The Sentences Editor Area**: you can drag&drop a plain text file onto this area to load the file to analyze.



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The "Coleman-Liau" readability index

The Coleman-Liau Formula usually gives a lower grade than Kincaid, ARI and Flesch when applied to technical documents.

"Coleman-Liau formula" = 5.89 * letters over words - 0.3 * sentences over { 100 * words } - 15.8

- **Reference**:
  - *Coleman, M., & Liau, T. L.* (1975).
    A computer readability formula designed for machine scoring.
    Journal of Applied Psychology, 60, 283-284.

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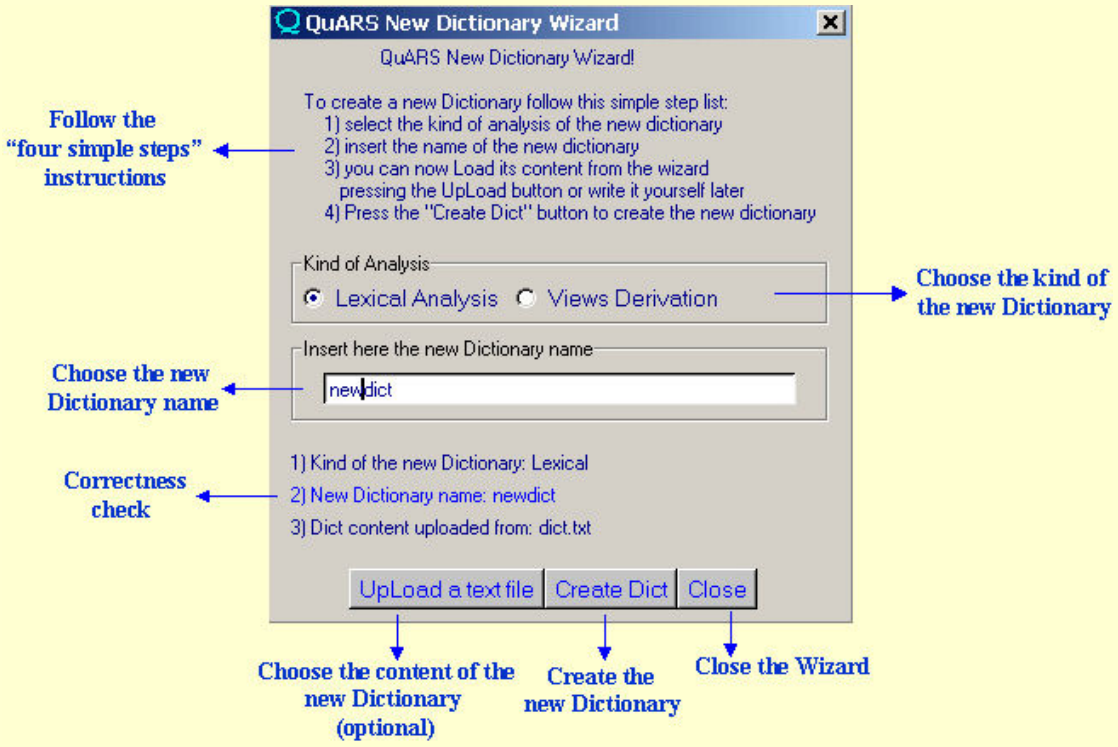
Dictionary Wizard

The **QuARS Dictionary Wizard**allows to create quickly a correct new **QuARS**dictionary that will be inserted and displayed at once among the

others.
Its content can be filled in two ways:

- by uploading -before having created it- a text file clicking on the **Upload a text File** button
- filling it by hands -after having created it- by means of a *cut & paste* action or typing it word by word

Otherwise you can drag & dropa plain text file onto the ***QuARS*** *Dictionary Area*.



A detailed *"How To" create a new dictionary*can be found here

QuARS Editor: Regular Expressions in Search/Replace Window

In the **QuARS**Editor Searchand Replacewindows you can check the checkbox "*Regular Expression*" allowing the use of TCL/TK regexin the search/replace functions.
Here it is a summary of regular expression grammar and examples of use excerpt from the TCL on-line manual

---

A *regular expression* describes strings of characters. It's a pattern that matches certain strings and doesn't match others.

DIFFERENT FLAVORS OF REs

Regular expressions (``RE''s), as defined by POSIX, come in two flavors: *extended* REs (``EREs'') and *basic* REs (``BREs''). EREs are roughly those of the traditional *egrep*, while BREs are roughly those of the traditional *ed*. This implementation adds a third flavor, *advanced* REs (``AREs''), basically EREs with some significant extensions.

This manual page primarily describes AREs. BREs mostly exist for backward compatibility in some old programs; they will be discussed at the end. POSIX EREs are almost an exact subset of AREs. Features of AREs that are not present in EREs will be indicated.

REGULAR EXPRESSION SYNTAX

Tcl regular expressions are implemented using the package written by Henry Spencer, based on the 1003.2 spec and some (not quite all) of the Perl5 extensions (thanks, Henry!). Much of the description of regular expressions below is copied verbatim from his manual entry.

An ARE is one or more *branches*, separated by `**|**', matching anything that matches any of the branches.

A branch is zero or more *constraints* or *quantified atoms*, concatenated. It matches a match for the first, followed by a match for the second, etc; an empty branch matches the empty string.

A quantified atom is an *atom* possibly followed by a single *quantifier*. Without a quantifier, it matches a match for the atom. The quantifiers, and what a so-quantified atom matches, are:

*****
a sequence of 0 or more matches of the atom
+
a sequence of 1 or more matches of the atom
?
a sequence of 0 or 1 matches of the atom
{*m***}**
a sequence of exactly *m* matches of the atom
{*m***,}**
a sequence of *m* or more matches of the atom
{*m***,***n***}**
a sequence of *m* through *n* (inclusive) matches of the atom; *m* may not exceed *n*
? +? ?? {m***}? {***m***,}? {***m***,***n***}?**
non-greedy quantifiers, which match the same possibilities, but prefer the smallest number rather than the largest number of matches (see MATCHING)

The forms using **{** and **}** are known as *bound*s. The numbers *m* and *n* are unsigned decimal integers with permissible values from 0 to 255 inclusive.

An atom is one of:

(*re***)**
(where *re* is any regular expression) matches a match for *re*, with the match noted for possible reporting
(?:*re***)**
as previous, but does no reporting (a ``non-capturing'' set of parentheses)
()
matches an empty string, noted for possible reporting
(?:)
matches an empty string, without reporting
[*chars***]**
a *bracket expression*, matching any one of the *chars* (see BRACKET EXPRESSIONS for more detail)
.
matches any single character
*****k*
(where *k* is a non-alphanumeric character) matches that character taken as an ordinary character, e.g. \\ matches a backslash character
*****c*
where *c* is alphanumeric (possibly followed by other characters), an *escape* (AREs only), see ESCAPES below
{
when followed by a character other than a digit, matches the left-brace character `**{**'; when followed by a digit, it is the beginning of a *bound* (see above)
x
where *x* is a single character with no other significance, matches that character.

A *constraint* matches an empty string when specific conditions are met. A constraint may not be followed by a quantifier. The simple constraints are as follows; some more constraints are described later, under ESCAPES.

^
matches at the beginning of a line
$
matches at the end of a line
(?=*re***)**
positive lookahead (AREs only), matches at any point where a substring matching *re* begins
(?!*re***)**
negative lookahead (AREs only), matches at any point where no substring matching *re* begins

The lookahead constraints may not contain back references (see later), and all parentheses within them are considered non-capturing.

An RE may not end with `****'.

BRACKET EXPRESSIONS

A *bracket expression* is a list of characters enclosed in `**[ ]**'. It normally matches any single character from the list (but see below). If the list begins with `**^**', it matches any single character (but see below) *not* from the rest of the list.

If two characters in the list are separated by `**-**', this is shorthand for the full *range* of characters between those two (inclusive) in the collating sequence, e.g. **[0-9]** in ASCII matches any decimal digit. Two ranges may not share an endpoint, so e.g. **a-c-e** is illegal. Ranges are very collating-sequence-dependent, and portable programs should avoid relying on them.

To include a literal **]** or **-** in the list, the simplest method is to enclose it in **[.** and **.]** to make it a collating element (see below). Alternatively, make it the first character (following a possible `**^**'), or (AREs only) precede it with `****'. Alternatively, for `**-**', make it the last character, or the second endpoint of a range. To use a literal **-** as the first endpoint of a range, make it a collating element or (AREs only) precede it with `****'. With the exception of these, some combinations using **[** (see next paragraphs), and escapes, all other special characters lose their special significance within a bracket expression.

Within a bracket expression, a collating element (a character, a multi-character sequence that collates as if it were a single character, or a collating-sequence name for either) enclosed in **[.** and **.]** stands for the sequence of characters of that collating element. The sequence is a single element of the bracket expression's list. A bracket expression in a locale that has multi-character collating elements can thus match more than one character. So (insidiously), a bracket expression that starts with **^** can match multi-character collating elements even if none of them appear in the bracket expression! (*Note:* Tcl currently has no multi-character collating elements. This information is only for illustration.)

For example, assume the collating sequence includes a **ch** multi-character collating element. Then the RE **[[.ch.]]*c** (zero or more **ch**'s followed by **c**) matches the first five characters of `**chchcc**'. Also, the RE **[^c]b** matches all of `**chb**' (because **[^c]** matches the multi-character **ch**).

Within a bracket expression, a collating element enclosed in **[=** and **=]** is an equivalence class, standing for the sequences of characters of all collating elements equivalent to that one, including itself. (If there are no other equivalent collating elements, the treatment is as if the enclosing delimiters were `**[.**' and `**.]**'.) For example, if **o** and **ô** are the members of an equivalence class, then `**[[=o=]]**', `**[[=ô=]]**', and `**[oô]**' are all synonymous. An equivalence class may not be an endpoint of a range. (*Note:* Tcl currently implements only the Unicode locale. It doesn't define any equivalence classes. The examples above are just illustrations.)

Within a bracket expression, the name of a *character class* enclosed in **[:** and **:]** stands for the list of all characters (not all collating elements!) belonging to that class. Standard character classes are:

> **alpha** A letter. **upper** An upper-case letter. **lower** A lower-case letter. **digit** A decimal digit. **xdigit** A hexadecimal digit. **alnum** An alphanumeric (letter or digit). **print** An alphanumeric (same as alnum). **blank** A space or tab character. **space** A character producing white space in displayed text. **punct** A punctuation character. **graph** A character with a visible representation. **cntrl** A control character.

A locale may provide others. (Note that the current Tcl implementation has only one locale: the Unicode locale.) A character class may not be used as an endpoint of a range.

There are two special cases of bracket expressions: the bracket expressions **[[:<:]]** and **[[:>:]]** are constraints, matching empty strings at the beginning and end of a word respectively. A word is defined as a sequence of word characters that is neither preceded nor followed by word characters. A word character is an *alnum* character or an underscore ( ). These special bracket expressions are deprecated; users of AREs should use constraint escapes instead (see below).

ESCAPES

Escapes (AREs only), which begin with a **** followed by an alphanumeric character, come in several varieties: character entry, class shorthands, constraint escapes, and back references. A **** followed by an alphanumeric character but not constituting a valid escape is illegal in AREs. In EREs, there are no escapes: outside a bracket expression, a **** followed by an alphanumeric character merely stands for that character as an ordinary character, and inside a bracket expression, **** is an ordinary character. (The latter is the one actual incompatibility between EREs and AREs.)

Character-entry escapes (AREs only) exist to make it easier to specify non-printing and otherwise inconvenient characters in REs:

\a
: alert (bell) character, as in C

\b
: backspace, as in C

\B
: synonym for **** to help reduce backslash doubling in some applications where there are multiple levels of backslash processing

\c*X*
: (where X is any character) the character whose low-order 5 bits are the same as those of *X*, and whose other bits are all zero

\e
: the character whose collating-sequence name is `**ESC**', or failing that, the character with octal value 033

\f
: formfeed, as in C

\n
: newline, as in C

\r
: carriage return, as in C

\t
: horizontal tab, as in C

\u*wxyz*
: (where *wxyz* is exactly four hexadecimal digits) the Unicode character **U+***wxyz* in the local byte ordering

\U*stuvwxyz*
: (where *stuvwxyz* is exactly eight hexadecimal digits) reserved for a somewhat-hypothetical Unicode extension to 32 bits

\v
: vertical tab, as in C are all available.

\x*hhh*
: (where *hhh* is any sequence of hexadecimal digits) the character whose hexadecimal value is **0x***hhh* (a single character no matter how many hexadecimal digits are used).

\0
: the character whose value is **0**

*****xy*
: (where *xy* is exactly two octal digits, and is not a *back reference* (see below)) the character whose octal value is **0***xy*

*****xyz*
: (where *xyz* is exactly three octal digits, and is not a back reference (see below)) the character whose octal value is **0***xyz*

Hexadecimal digits are `**0**'-`**9**', `**a**'-`**f**', and `**A**'-`**F**'. Octal digits are `**0**'-`**7**'.

The character-entry escapes are always taken as ordinary characters. For example, **\135** is **]** in ASCII, but **\135** does not terminate a bracket expression. Beware, however, that some applications (e.g., C compilers) interpret such sequences themselves before the regular-expression package gets to see them, which may require doubling (quadrupling, etc.) the `****'.

Class-shorthand escapes (AREs only) provide shorthands for certain commonly-used character classes:

\d
: **[[:digit:]]**

\s
: **[[:space:]]**

\w
[[:alnum:]] (note underscore)
\D
[^[:digit:]]
\S
[^[:space:]]
\W
[^[:alnum:]] (note underscore)

Within bracket expressions, `**\d**', `**\s**', and `**\w**' lose their outer brackets, and `**\D**', `**\S**', and `**\W**' are illegal. (So, for example, **[a-c\d]** is equivalent to **[a-c[:digit:]]**. Also, **[a-c\D]**, which is equivalent to **[a-c^[:digit:]]**, is illegal.)

A constraint escape (AREs only) is a constraint, matching the empty string if specific conditions are met, written as an escape:

\A
matches only at the beginning of the string (see MATCHING, below, for how this differs from `**^**')
\m
matches only at the beginning of a word
\M
matches only at the end of a word
\y
matches only at the beginning or end of a word
\Y
matches only at a point that is not the beginning or end of a word
\Z
matches only at the end of the string (see MATCHING, below, for how this differs from `**$**')
*****m*
(where *m* is a nonzero digit) a *back reference*, see below
*****mnn*
(where *m* is a nonzero digit, and *nn* is some more digits, and the decimal value *mnn* is not greater than the number of closing capturing parentheses seen so far) a *back reference*, see below

A word is defined as in the specification of **[[:<:]]** and **[[:>:]]** above. Constraint escapes are illegal within bracket expressions.

A back reference (AREs only) matches the same string matched by the parenthesized subexpression specified by the number, so that (e.g.) **([bc])\1** matches **bb** or **cc** but not `**bc**'. The subexpression must entirely precede the back reference in the RE. Subexpressions are numbered in the order of their leading parentheses. Non-capturing parentheses do not define subexpressions.

There is an inherent historical ambiguity between octal character-entry escapes and back references, which is resolved by heuristics, as hinted at above. A leading zero always indicates an octal escape. A single non-zero digit, not followed by another digit, is always taken as a back reference. A multi-digit sequence not starting with a zero is taken as a back reference if it comes after a suitable subexpression (i.e. the number is in the legal range for a back reference), and otherwise is taken as octal.

METASYNTAX

In addition to the main syntax described above, there are some special forms and miscellaneous syntactic facilities available.

Normally the flavor of RE being used is specified by application-dependent means. However, this can be overridden by a *director*. If an RE of any flavor begins with `**\*\*\*:**', the rest of the RE is an ARE. If an RE of any flavor begins with `*****=**', the rest of the RE is taken to be a literal string, with all characters considered ordinary characters.

An ARE may begin with *embedded options*: a sequence **(?***xyz***)** (where *xyz* is one or more alphabetic characters) specifies options affecting the rest of the RE. These supplement, and can override, any options specified by the application. The available option letters are:

b
rest of RE is a BRE
c
case-sensitive matching (usual default)
e
rest of RE is an ERE
i
case-insensitive matching (see MATCHING, below)
m
historical synonym for **n**
n
newline-sensitive matching (see MATCHING, below)
p
partial newline-sensitive matching (see MATCHING, below)
q
rest of RE is a literal (``quoted'') string, all ordinary characters
s
non-newline-sensitive matching (usual default)
t
tight syntax (usual default; see below)
w
inverse partial newline-sensitive (``weird'') matching (see MATCHING, below)
x
expanded syntax (see below)

Embedded options take effect at the **)** terminating the sequence. They are available only at the start of an ARE, and may not be used later within it.

In addition to the usual (*tight*) RE syntax, in which all characters are significant, there is an *expanded* syntax, available in all flavors of RE with the **-expanded** switch, or in AREs with the embedded x option. In the expanded syntax, white-space characters are ignored and all characters between a **#** and the following newline (or the end of the RE) are ignored, permitting paragraphing and commenting a complex RE. There are three exceptions to that basic rule:

a white-space character or `**#**' preceded by `****' is retained

white space or `**#**' within a bracket expression is retained

white space and comments are illegal within multi-character symbols like the ARE `**(?:**' or the BRE `**\(**'

Expanded-syntax white-space characters are blank, tab, newline, and any character that belongs to the *space* character class.

Finally, in an ARE, outside bracket expressions, the sequence `**(?#***ttt***)**' (where *ttt* is any text not containing a `**)**') is a comment, completely ignored. Again, this is not allowed between the characters of multi-character symbols like `**(?:**'. Such comments are more a historical artifact than a useful facility, and their use is deprecated; use the expanded syntax instead.

None of these metasyntax extensions is available if the application (or an initial *****=** director) has specified that the user's input be treated as a literal string rather than as an RE.

MATCHING

In the event that an RE could match more than one substring of a given string, the RE matches the one starting earliest in the string. If the RE could match more than one substring starting at that point, its choice is determined by its *preference*: either the longest substring, or the shortest.

Most atoms, and all constraints, have no preference. A parenthesized RE has the same preference (possibly none) as the RE. A quantified atom with quantifier **{***m***}** or **{***m***}?** has the same preference (possibly none) as the atom itself. A quantified atom with other normal quantifiers (including **{***m***,***n***}** with *m* equal to *n*) prefers longest match. A quantified atom with other non-greedy quantifiers (including **{***m***,***n***}?** with *m* equal to *n*) prefers shortest match. A branch has the same preference as the first quantified atom in it which has a preference. An RE consisting of two or more branches connected by the **|** operator prefers longest match.

Subject to the constraints imposed by the rules for matching the whole RE, subexpressions also match the longest or shortest possible substrings, based on their preferences, with subexpressions starting earlier in the RE taking priority over ones starting later. Note that outer subexpressions thus take priority over their component subexpressions.

Note that the quantifiers **{1,1}** and **{1,1}?** can be used to force longest and shortest preference, respectively, on a subexpression or a whole RE.

Match lengths are measured in characters, not collating elements. An empty string is considered longer than no match at all. For example, **bb*** matches the three middle characters of `**abbbc**', **(week|wee)(night|knights)** matches all ten characters of `**weeknights**', when **(.*).*** is matched against **abc** the parenthesized subexpression matches all three characters, and when **(a*)*** is matched against **bc** both the whole RE and the parenthesized subexpression match an empty string.

If case-independent matching is specified, the effect is much as if all case distinctions had vanished from the alphabet. When an alphabetic that exists in multiple cases appears as an ordinary character outside a bracket expression, it is effectively transformed into a bracket expression containing both cases, so that **x** becomes `**[xX]**'. When it appears inside a bracket expression, all case counterparts of it are added to the bracket expression, so that **[x]** becomes **[xX]** and **[^x]** becomes `**[^xX]**'.

If newline-sensitive matching is specified, **.** and bracket expressions using **^** will never match the newline character (so that matches will never cross newlines unless the RE explicitly arranges it) and **^** and **$** will match the empty string after and before a newline respectively, in addition to matching at beginning and end of string respectively. ARE **\A** and **\Z** continue to match beginning or end of string *only*.

If partial newline-sensitive matching is specified, this affects **.** and bracket expressions as with newline-sensitive matching, but not **^** and `**$**'.

If inverse partial newline-sensitive matching is specified, this affects **^** and **$** as with newline-sensitive matching, but not **.** and bracket expressions. This isn't very useful but is provided for symmetry.

LIMITS AND COMPATIBILITY

No particular limit is imposed on the length of REs. Programs intended to be highly portable should not employ REs longer than 256 bytes, as a POSIX-compliant implementation can refuse to accept such REs.

The only feature of AREs that is actually incompatible with POSIX EREs is that **** does not lose its special significance inside bracket expressions. All other ARE features use syntax which is illegal or has undefined or unspecified effects in POSIX EREs; the ******* syntax of directors likewise is outside the POSIX syntax for both BREs and EREs.

Many of the ARE extensions are borrowed from Perl, but some have been changed to clean them up, and a few Perl extensions are not present. Incompatibilities of note include `**\b**', `**\B**', the lack of special treatment for a trailing newline, the addition of complemented bracket expressions to the things affected by newline-sensitive matching, the restrictions on parentheses and back references in lookahead constraints, and the longest/shortest-match (rather than first-match) matching semantics.

The matching rules for REs containing both normal and non-greedy quantifiers have changed since early beta-test versions of this package. (The new rules are much simpler and cleaner, but don't work as hard at guessing the user's real intentions.)

Henry Spencer's original 1986 *regexp* package, still in widespread use (e.g., in pre-8.1 releases of Tcl), implemented an early version of

today's EREs. There are four incompatibilities between *regexp*'s near-EREs (`RREs' for short) and AREs. In roughly increasing order of significance:

In AREs, **** followed by an alphanumeric character is either an escape or an error, while in RREs, it was just another way of writing the alphanumeric. This should not be a problem because there was no reason to write such a sequence in RREs.

{ followed by a digit in an ARE is the beginning of a bound, while in RREs, **{** was always an ordinary character. Such sequences should be rare, and will often result in an error because following characters will not look like a valid bound.

In AREs, **** remains a special character within `**[ ]**', so a literal **\** within **[ ]** must be written `****'. **** also gives a literal **** within **[ ]** in RREs, but only truly paranoid programmers routinely doubled the backslash.

AREs report the longest/shortest match for the RE, rather than the first found in a specified search order. This may affect some RREs which were written in the expectation that the first match would be reported. (The careful crafting of RREs to optimize the search order for fast matching is obsolete (AREs examine all possible matches in parallel, and their performance is largely insensitive to their complexity) but cases where the search order was exploited to deliberately find a match which was *not* the longest/shortest will need rewriting.)

BASIC REGULAR EXPRESSIONS

BREs differ from EREs in several respects. `**|**', `**+**', and **?** are ordinary characters and there is no equivalent for their functionality. The delimiters for bounds are **\{** and `**\}**', with **{** and **}** by themselves ordinary characters. The parentheses for nested subexpressions are **\(** and `**\)**', with **(** and **)** by themselves ordinary characters. **^** is an ordinary character except at the beginning of the RE or the beginning of a parenthesized subexpression, **$** is an ordinary character except at the end of the RE or the end of a parenthesized subexpression, and ***** is an ordinary character if it appears at the beginning of the RE or the beginning of a parenthesized subexpression (after a possible leading `**^**'). Finally, single-digit back references are available, and **\<** and **\>** are synonyms for **[[:<:]]** and **[[:>:]]** respectively; no other escapes are available.

Analysis: Views Derivation

⚠ Since the "*View Derivation*" is based on the identification of (sub)sections, to perform this kind of analysis it is mandatory that the requirements document
is divided into sections according to the following format:
1.
1.1
1.1.1
.
.
.
1.2
.
.
.
n.
n.1
.
.
.

The **Views Derivation**relies again on dictionaries.
The Dictionaries of the Views (V-Dictionaries) contain domain-related terms (instead of defect-related terms).
A V-Dictionary is the sets of *all*the terms dealing with a particular View, i.e. those terms that, if contained in a sentence, indicate that this sentence is dealing with the argument the View is referred.
To select the View derivation functionality of the **QuARS**tool the **V**button on the top buttonbox of the GUI has to be clicked (arrow 1 in figure A3).
Once the View derivation functionality has been selected, in the Dictionaries frame the available dictionaries are shown (arrow 2 in figure A3).
Each dictionary in the Dictionaries frame corresponds to a particular View that can be derived.
It is possible to select the View of interest by selecting the correspondent V-Dictionary.
Once the requirements file is loaded, the View derivation can be started.
To start the View derivation push the Analysis button or select **[View derivation] name of the view**form the **Analysis**menu on the top of the GUI.

The output of the View derivation is composed of:

- A cluster of the sentences, extracted from the input requirements file, dealing with the specific topic the View is referred to (arrow 3 in figure A3).
- A MS Excel graph, showing the total number of sentences and the number of those sentences belonging to a view contained in each section of the document analyzed (arrow 4 in figure A3).

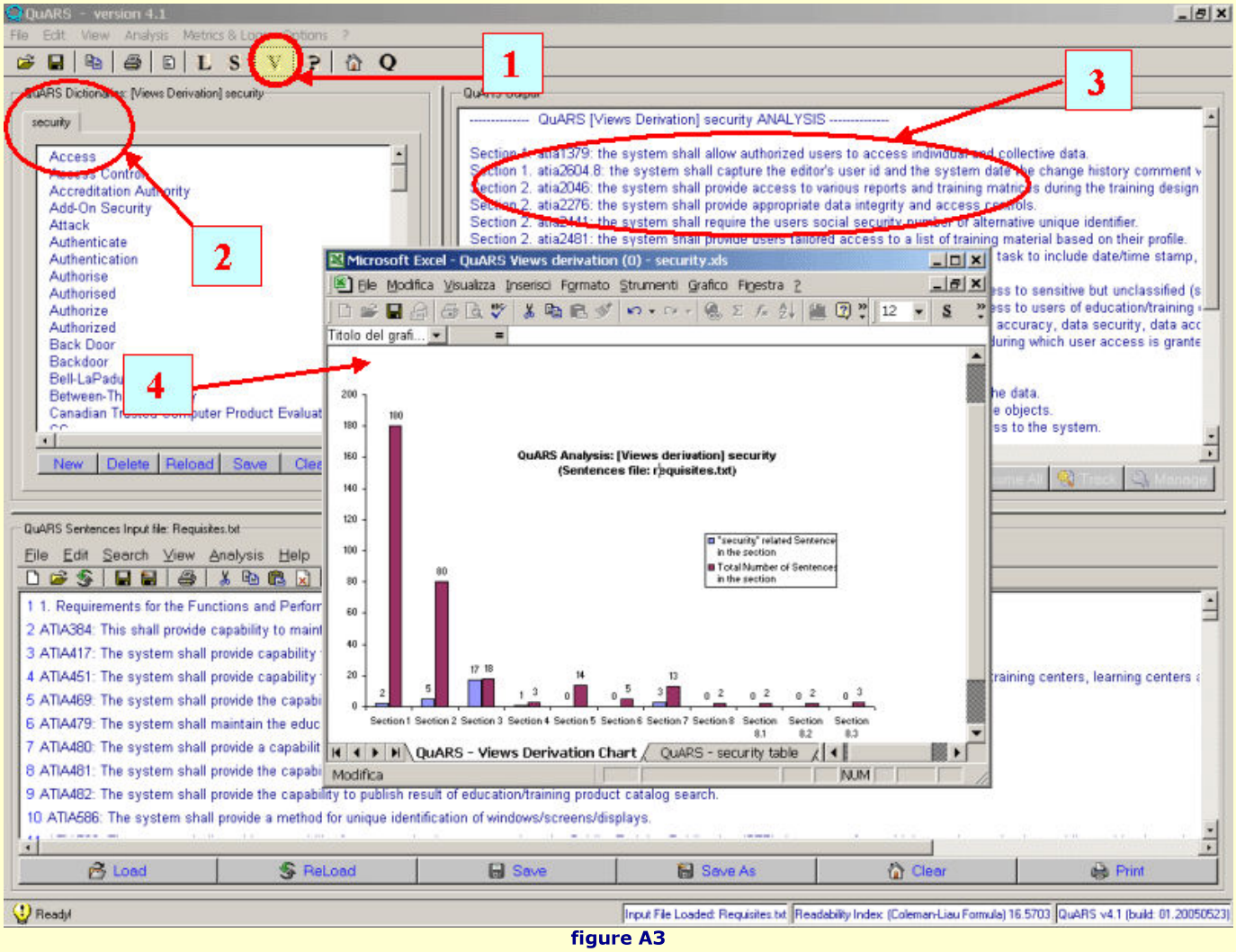


figure A3

Analysis: Defect Identification

Lexical analysis

To perform one of the lexical-based analysies it is necessary to select the **L**button on the top tool bar of **QuARS**(arrow 1 in figure A1).
Once the lexical-based analysis has been selected, in the Dictionaries frame the dictionaries corresponding to all the available lexical-based analysies are shown (arrow 2 in figure A1).
The default set of analysies is composed of four dictionaries: ***Optionality***, ***Subjectivity***, ***Vagueness***, ***Weakness***.
Additional dictionaries can be created to enlarge the set of available analysies.
It is possible to select the kind of analysis of interest by selecting the correspondent dictionary book-mark in the Dictionaries frame.

Before starting the analysis the text file containing the requirements has to be loaded.
Once the input file has been selected, its content appears in the Input frame.
The analysis starts when the Analysis button is pushed (arrow 3 in figure A1).

In the Output frame those sentences containing the particular defect we are investigating on are shown along with the indication of the individual term that makes the sentence defective (according to the kind of analysis selected).
The defective sentences can be now corrected.

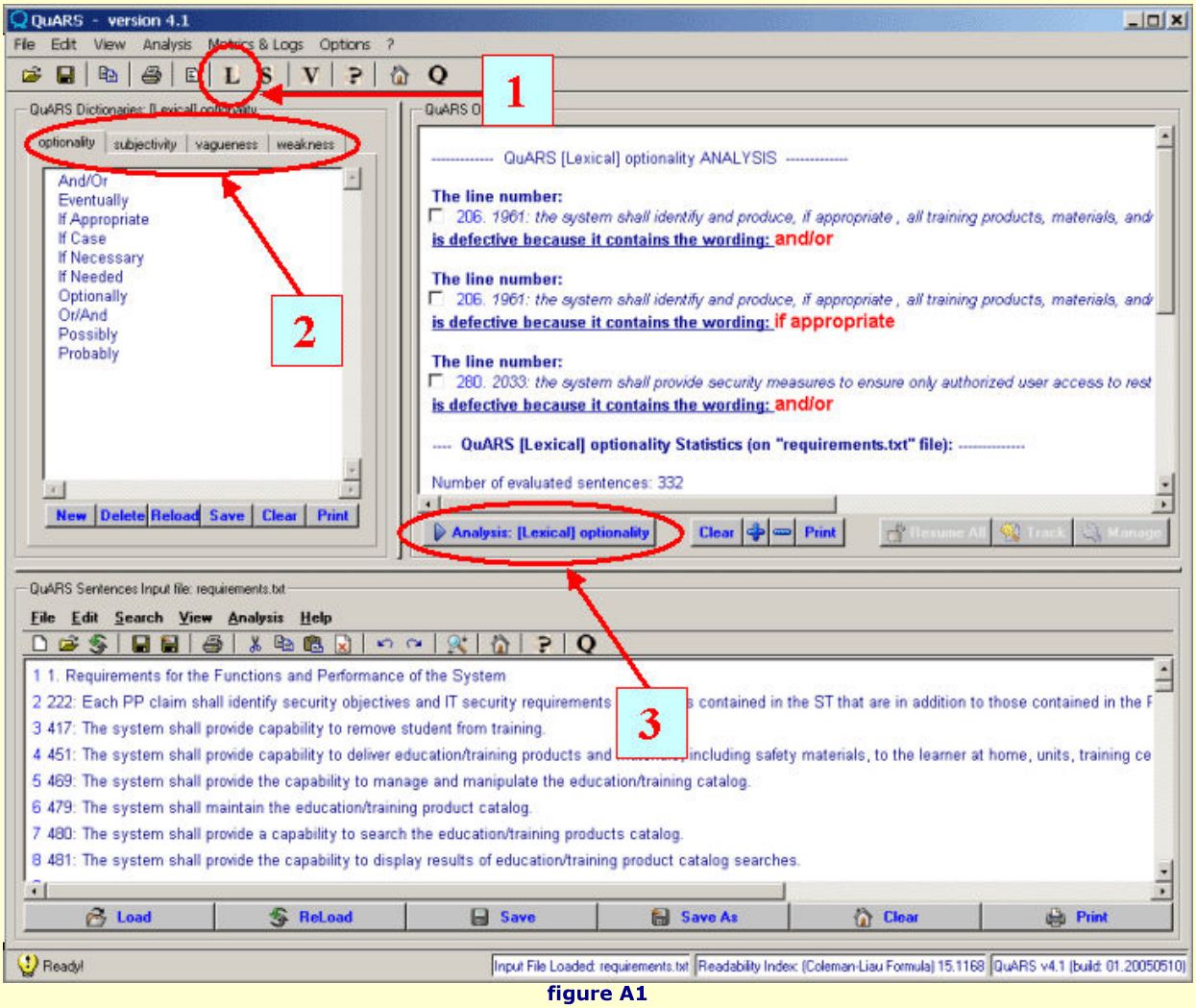


figure A1

Syntactic analysis

To perform the syntax-based expressiveness analysis the **S**button on the top tool-bar of the **QuARS**GUI (arrow 1 in figure A2).

Once the syntax-based analysis has been selected, in the Dictionaries frame the possible dictionaries of each type of the available syntax-based analysies are shown (arrow 2 in the figure).
It is possible to select the type of analysis of interest by selecting the correspondent dictionary tab in the Dictionaries frame (note that the multiplicity analysis doesn't need any dictionary, for this reason it is void).
The available analysies are: **Implicity**, **Multiplicity**and **Underspecification**.

Before starting the analysis the text file containing the requirements has to be loaded.
Once the input file has been selected, its content appears in the Input frame.
The analysis starts when the Analysis button is pushed (arrow 3 in figure A2) or ***[Syntactic] name of the analysis***is selected from the **Analysis**menu on the top of the GUI.
In the Output frame those sentences containing the particular defect we are investigating on are shown along with the indication of the individual term that makes the sentence defective (according to the kind of analysis selected).
The defective sentences can be now corrected.

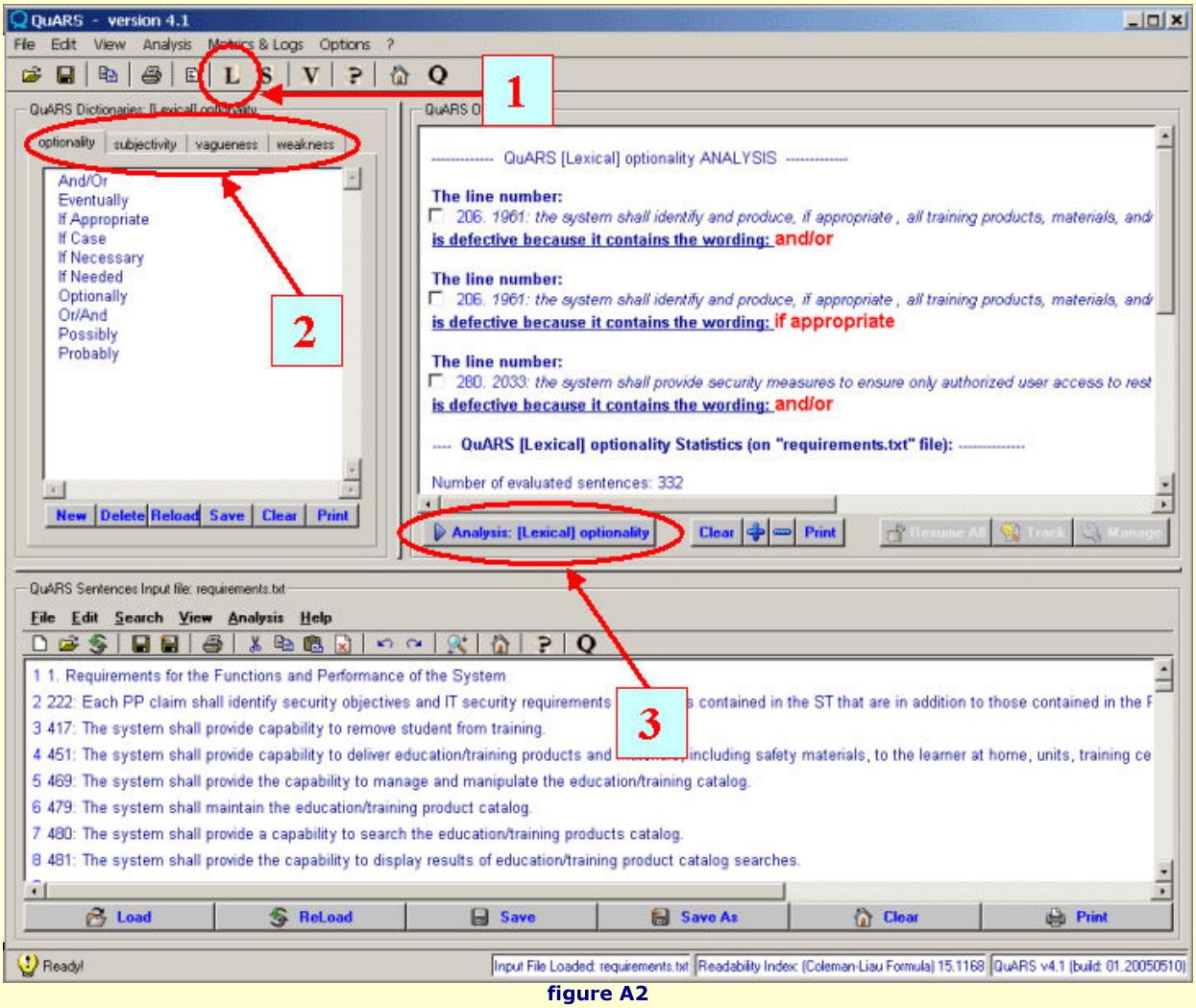


figure A2

⚠ ***Note***: the way the analysis is performed is the same than the lexical-based analysis.
The difference between the two types of analysies is transparent to the user.
In fact, for performing these analysies the tool, first derive the syntactical structure of each sentence in the input file.
Anyway, the syntactical structure of the sentences is not displayed.
While for the implicity and multiplicity analysis dictionaries are necessary, the multiplicity analysis, even though it relies on the syntax structure of the sentences, for its nature, it doesn't need any dictionary.

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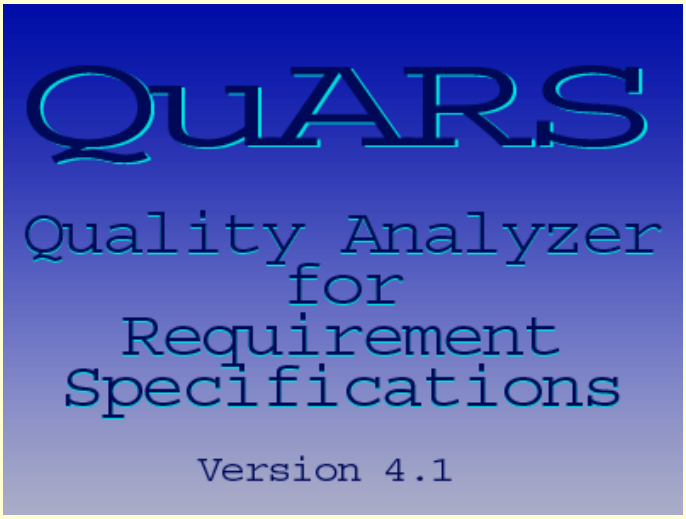
QuARS Splashscreen



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QuARS Help System
Version 0.5 (build 01.20050621)

Latest Update: 21 June, 2005