Application Preferences Dialog

The Preferences command brings up a dialog for setting application preferences.   These preferences are saved when quitting the application and loaded when launching it.

When enabled, the Disk Space Warning checkbox warns if there is low disk space on drive C when launching the application.   Low disk space can prevent the operating system or application from running properly.   This warning may not be appropriate for some configurations where Windows clients on a UNIX system are running software on an NT server.

The Auto-save feature allows open documents to be periodically saved.   Auto-save does not save the Report window since it usually is used as a temporary workspace.

Use the Text Tab Stops edit fields to indicate the character spacing of each tab stop in a Text or Report window.

Document Defaults

Use the Document Defaults dialog to define the default width and height of new diagram objects.   Some options on the Arrange Cards and Scenarios dialog also use these default sizes.

Most models will be easiest to work with if they are not Case Sensitive.   To confine the size of card and scenario objects, select the Confine Object Size checkbox.   When checked, cards and scenarios cannot be individually resized by dragging the selection knobs.

When cards are cut or cleared from a diagram, references to the card from other cards can optionally be removed. Use the corresponding checkbox, to prompt the user for what do about references.   It may be desirable to leave references if a card is being cut and pasted to a different diagram in the document.   If unchecked, existing references from other cards will be removed.

About Dialog

This dialog displays the application name and version number.   It also contains information typed into the Registration dialog presented when the application is originally launched.

Registration Dialog

This dialog is only presented the first time you launch QuickCRC.

- Name - Type your name here.
- Organization - Type your company, government agency or university name here.
- ID Number - Type your unique identification number here.   It can be found on the Registration Card.

Find Dialog

For a text window, enter the text to locate in the edit field below Find what string.   Select the Case Sensitive checkbox if you want to require an exact match of upper and lower case letters.

For a CRC diagram window, search for a whole or partial name of the specified object type.   If the object is found on any diagram in the document, the diagram window is switched to that diagram and positioned so that the object is visible in the diagram.

Replace Dialog

Use this dialog to replace a found string with a replacement string.   Type text into the Find and Replace fields and check the Case Sensitive checkbox to require an exact match on the found string.   Click the Replace button to dismiss and replace the next occurrence.

Export Dialog

This dialog allows all selected cards, all card in the active diagram or all cards in the entire document to be listed as dictionary entries to the Report window.   Each card produces an entry for the class itself, followed by entries for each class attribute and class operation.

Import Dialog

Dictionary entries can be imported into an existing or empty CRC model.   The Replace option overwrites any existing cards with new dictionary entries of type class having the same name.   The Ignore option will retain the existing card if a duplicate name is found.   The Abort Import option will import dictionary entries until a duplicate is found, then abort the import.   Use the Select New Cards option to select all new cards so they can be easily moved or cleared from the diagram if needed.

List Cards and Scenarios Dialog

Use this dialog to list specific information about cards and scenarios to the Report window.   Objects can be listed alphabetically or in the back to front order that they are shown on the screen.   The generated text is appended to the Report window.   This is often the most useful approach for getting information about your model into a useful format to print, review or distribute.

Simulate Dialog

The Simulate dialog shows the scenario stack at the top with the active scenario highlighted.   Select any scenario in the stack to jump to that spot. The following buttons are enabled if applicable at the current step in the simulation.

Back To Caller   Click to return to the calling line of the calling scenario.

|<<   Click to step backward to the start of the active scenario.

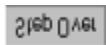<   Click to step backward one step.

>   Click to step forward one step.

>>| Click to step forward to the end of the active scenario.

Step Over   Click to step over the call to a subscenario.

A scenario can use a subscenario by referring to its root class in the Server field and to the scenario name in the Responsibility field of a step.   The server class name is the name of the server class used on step one of the subscenario.

If the Client field of a scenario step is called AnyClient, then the name of the client is derived from the name of the client in the referencing step of the calling scenario.

Arrange Cards and Scenarios Dialog

This dialog is used to arrange card and scenario objects in various ways to explore relationships between them. To fill in this dialog work from the top left corner to the bottom right indicating which objects you want to affect, how to size and position them and what to do about the remaining leftover objects. This command does not modify or remove any information in your design, it simply rearranges the visual presentation of objects on the diagram to help you focus attention on specific issues. If your document contains multiple diagrams, only those objects on the active diagram are affected.

Some of the choices on the dialog are affected by options you've selected on the Document Defaults dialog for your CRC document. The default width and height of each newly created card, scenario and Subdiagram object can be specified on the Document Defaults dialog. The Confine Object Size checkbox allows you to force all objects to the default size and prevent them from being individually resized. When this option is checked, some of the resizing options on the Arrange Cards and Scenarios dialog are disabled.

Verify CRC Dialog

Use this dialog to turn individual checks on or off for the Verify CRC command.   Depending on the specific characteristics of the model some messages may not necessarily indicate errors.

The `Duplicate or Similar Names` check can detect class, attribute or scenario names that are identical once spaces are stripped from the name.   Using the same name for different things will likely be problematic.   It might be acceptable, however, to have the same attribute name in different classes refer to a common object.

The `Long Names` check will detect class attribute or class operation names that exceed 40 characters and would be truncated when generating a dictionary entry list for use by WinA&D.

The `Undefined Card References` and `Undefined Scenario References` checks can locate references to classes, responsibilities or scenarios that were never created, have been deleted or renamed.

The `Responsibilities Not Referenced From Scenarios` check often reveals responsibilities that are not needed or have not been completely exercised from the existing scenarios.   Likewise the `Cards Unused In Collaborations` check often reveals unneeded classes or incomplete modeling.

External Agents Dialog

Use this dialog to define external entities and interfaces to the system under design.   To rename an existing agent or enter a description, double-click its name or select it and click the Define button.

Agent names can be used on cards and scenarios in place of a class name.   By default, a new document will already contain one agent name, AnyClient.   This name is used to generically refer to any calling class from a step in a subscenario.   During a simulation, the name AnyClient gets replaced with the actual name of the calling class.

Definition Dialog

Use this dialog to define the name and description of an item.

Caption Property Dialog

Use this dialog to type in the text of the caption and set other options such as its text style and justification. Pressing Return or clicking OK will dismiss the dialog and place the caption on the diagram.

Captions consist of one or more lines of explanatory text and can be drawn in various text fonts, styles and sizes. The text of a caption is enclosed within an invisible display rectangle which can be adjusted in size using the Selection Arrow.   Captions can also be bordered.

Card Property Dialog

Use this dialog to define the front and back sides of the card.   A card contains information about an object class including its name, description, subclasses, superclasses, class attributes, responsibilities and their collaborating objects.

Information entered on one card can affect other cards.   For example, if new undefined classes are referenced as subclasses, superclasses or collaborators, those classes are automatically created when you click OK on the Property dialog.   Likewise, subclass and superclass changes get reflected on the associated cards.

The Subclass, Superclass or Collaborator fields usually refer to other cards, but they can refer to external agents. External agents are defined in the External Agent dialog to provide a disciplined approach to defining the external interface of a system.

Subdiagram Property Dialog

Use this dialog to define a subdiagram symbol that explodes to a child diagram.   This symbol name becomes the default title in the child diagram.   The child diagram's title can later be modified using the Diagram Parameters dialog accessible from the Diagram Manager.

A Subdiagram symbol is drawn as double rectangles with an associated name and number.   The child diagram is accessible by double-clicking on the symbol with the Selection Arrow.   Double-clicking on the child diagram with the Shift key pressed will return you to the original parent diagram.

Subdiagram symbols allow complex diagrams to be leveled.   This symbol is also produced using the Collapse Objects command which creates a child diagram from a selected group of objects.

Scenario Property Dialog

Use this dialog to define a sequence of steps that exercise a mechanism in the design. Each step in the scenario consists on a client class, a server class and the responsibility of the server class being used. To define a new step select or type names in each edit field and then once all three fields are filled in, click the New button.

Once a series of steps have been defined, their order can be rearranged by dragging the steps around in the list. To modify an existing step, select it and click Define or simply double-click the step.

Any step of a scenario can also call another scenario. Defining a subscenario can be useful if a series of steps gets reused in several mechanisms. A subscenario usually begins with AnyClient as the name of the client class in the first step. The name of the server class for step one in the subscenario is also the name of the server class on the referencing step of the parent scenario.

Scenarios are often initiated by external agents or reference external interfaces to the system being designed. Any client or server field of a step can references the name of an external agent. External agents are defined in the External Agents dialog to provide a disciplined approach to defining the external interface of a system.

Diagram Manager Dialog

Use this dialog to navigate or change information about diagrams in a document.   Each CRC model can have up to 250 separate diagrams.   By default, the first diagram in a CRC model is titled main.   The dialog shows a list of the numbers and titles of diagrams in the active document.   Double-click on a diagram title to switch to that diagram.

Multiple diagrams can be selected by pressing the Shift key while clicking the diagram titles.   Click the Delete or Print buttons to remove or print the selected diagrams.   Click the Create button to add a new diagram and fill in its' Diagram Parameters dialog.

Diagram Parameters Dialog

Use the Diagram Parameters dialog to change the diagram number, diagram title and number of horizontal and vertical pages for that diagram.   The diagram number and title is displayed in the title bar of the CRC window.

Step Definition Dialog

Use the Step Definition dialog to change information about the selected step in a scenario.   The Client field is the name of a class or external agent that initiates the action.   The Server field names the class or external agent that provides a service.   The Responsibility field contains the name of a responsibility of the server class or the name of a subscenario.   The description of a server class responsility can be edited, but the description of a scenario cannot.

Size and Location Dialog

Use the Size and Location dialog to see the file location of the active CRC document and the number of objects of each type that it contains.

User Name Dialog

Use this dialog to identify the user of the application.   The user name is used in a multi-user environment to locate user specific application preference information.   See the section Sharing a Common Executable in the manual for information on creating a QuickCRC.Users file for a multi-user, single executable environment.

Confirmation Dialog

Use this dialog to indicate how references from other cards to the removed card(s) should be handled. If you are cutting a card from one diagram and pasting it into another diagram of the same document, you will most likely want to retain the references.

Inheritance Window

The inheritance graph is an instant reflection of existing data in the CRC model so it is never edited or saved to disk. The graph can be generated starting from any root class and includes all its subclasses.   To create a graph, type the root class name into the Root field and press Return or click the Generate button.   Use the drop down menu to select from existing class names.   After editing data in the CRC window, you can regenerate an inheritance graph by clicking the Generate button.

The inheritance path of a specific subclass can easily be identified by clicking on a class name in the graph or using the Select field and Find button.   To edit the Card Property dialog of an existing card, double-click its name in the inheritance graph.

CRC Window

The CRC window shows one of up to 250 diagram levels within a CRC document.   The Contents view can be shown or hidden using the Show Contents command.   Click the name of a diagram within the Contents view or use the Diagram Manager dialog to switch between diagram levels.

How To Contact Excel Software

Excel Software develops and markets software engineering tools used by thousands of developers in over twenty countries.   Products include MacAnalyst, MacA&D, MacTranslator and QuickCRC for Macintosh, Solaris and HP-UX computers and WinA&D, WinTranslator and QuickCRC for Windows 95/NT computers.   We constantly strive to improve our products and welcome your comments and suggestions.   Contacts for bug reports, enhancement requests and technical support are included here:

Excel Software
Ph. 515-752-5359
Fax 515-752-2435
info@excelsoftware.com
http://www.excelsoftware.com

What is QuickCRC

QuickCRC is a development tool for discovering the objects and related information to model an object-oriented system.   The core concepts in the model are the CRC card which represents an object class and its properties and scenarios for exploring the interactions between classes.   Creating CRC cards with QuickCRC is a very intuitive approach for designing object-oriented software.

Several books have been published that demonstrate the CRC card technique including:

Designing Object-Oriented Software, by Rebecca Wirfs-Brock, Brian Wilkerson, and Laura Wiener.   Prentice Hall, 1990.

Using CRC Cards: An Informal Approach to O-O Software Development, by Nancy M. Wilkinson.   SIGS Books, New York, 1995.

```
The CRC Card Book, by David Bellin and Susan Suchman Simone.  Addison Wesley
Longman, 1997.
```

QuickCRC can be used as a stand-alone design tool for object-oriented projects.   If your project requires the full modeling and code generation power of WinA&D, click one command to export your design.   Your design information can now be used within WinA&D to automatically generate class diagrams and provide the basis for further detailed design and code generation activities. WinA&D supports system analysis, requirements specification, many popular modeling methods and code generation.   Likewise, WinA&D's class diagram and dictionary information can also be exported to text and imported into QuickCRC.

WinTranslator is a reengineering tool that extracts design information from existing source code.   That information is typically imported into WinA&D to populate the data dictionary and automatically generated class diagrams or structure charts.   The text output produced by WinTranslator for object-oriented source code like C++, Object Pascal or Delphi can also be imported into QuickCRC to automatically generate CRC cards.

The SimpApp Tutorial

In this tutorial, the user will model a software application called SimpApp.   SimpApp allows the user to edit a diagram document using a tool palette for drawing box and circle shapes.   The user will create classes, establish relationships, assign responsibilities and attributes, define and simulate scenarios, verify the model, arrange and list cards and scenarios and finally export design information to WinA&D.

Go to Step 1

Create CRC Document

A CRC project is usually performed by an individual or small, core group of designers during the early phase of an object-oriented development project.   Choose QuickCRC from the Program menu to start the application.

[icon]   Click the New File button and choose CRC.   A new unnamed document is created with one empty diagram titled Main.   Notice that the tool palette at the left side of the window contains a Selection Arrow, Caption tool, Card tool, Subdiagram tool and Scenario tool.

[icon]   Pick the Card tool and click the diagram to define the TShape class.   Fill in the dialog as show here to indicate that TShape has a superclass called TObject and two subclasses, TBox and TCircle.   To add an item to a listbox, type its name and then click the New button below the list box to add it.

Card Property Dialog

Now click the OK button to dismiss the Property dialog.   Each class we referenced that doesn't exist yet will be added and the corresponding superclass and subclass relationships filled in.   Use the Card tool to define two more classes TList and TWindow each derived from the superclass TObject.   The arrangement of your cards may appear somewhat different.   We will discuss later how QuickCRC can arrange cards for you to highlight various relationships in the design.
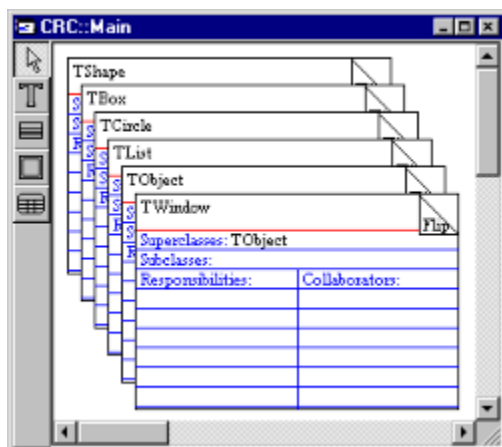
CRC Window

Obvious relationships can be added at the beginning of a card session.   However, if designers are uncertain as to whether or not a relationship exists, it is better to keep classes separate, and see if a superclass or collaboration relationship arises out of the project scenarios.   Assuming a relationship too early may force a particular decision and bias the distribution of responsibilities.   The emphasis and strength of the CRC Card technique and responsibility design in general lies in deriving the behavior of the class and not the structure.

External Agents are used to identify users or external interfaces to the system being defined.   Use the External Agents command on the Option menu.   External Agents can be used in place of class names when defining cards and scenarios.

Go to Step 2

Assign Responsibilities

Once a set of classes are defined, behaviors can be assigned that will provide the functions of the application. Responsibilities that are derived from the requirements or that are obvious from the name of the class can be listed before any scenario execution commences.   When in doubt, only add new responsibilities to a class when a design scenario dictates its need, otherwise cards will contain responsibilities that are unnecessary to solve the problems at hand.

   Using the Selection Arrow, locate and double-click on the TShape card.   You may need to move other cards out of the way to see it, by positioning over a card, pressing the mouse button and dragging.   To show this card on top of others in the diagram, select it and click the right mouse button and then choose command Bring To Front. This class and its subclasses have some fairly obvious responsibilities like Initialize to create it, Free to dispose of its memory, Read to load its data from disk into memory, Write to save it to disk and Draw to illustrate it on the diagram.   Type each responsibility into the listbox and press the Insert key to add it.   Other responsibilities may be discovered later when we create scenarios to work through the mechanisms in our design.

Once responsibilities have been added to the list, you can define a short description of each.   Select the responsibility name in the list and click the Define button or simply double-click the name.   Use the Definition dialog that is presented to rename or change the description of each responsibility as indicated below.   Notice that some responsibilities of TShape are just virtual placeholders for the actual responsibilities to be added later by subclasses TBox and TCircle.

Initialize - virtual function allocates shape memory

Free - release memory allocated to shape

Read - virtual function to read shape

Write - virtual function to write shape

Draw - virtual function to draw shape

Add Attributes

Attributes of classes may also be identified early in a CRC session.   Often, nouns that are not classes but rather characteristics of classes are best represented as attributes.   Attributes can be assigned to classes as they are discovered, but should be done in moderation and only when it becomes apparent that the class must know that information.

Use the Card Property dialog to add attributes fPosition, fType and fSelected.   This information is added to the back side of the card using the Back tab in the dialog.   You can also add descriptions for each attribute by double-clicking its name in the attribute listbox to access the Definition dialog.   Alternatively, you can just type into the Description field at the right of a selected attribute.
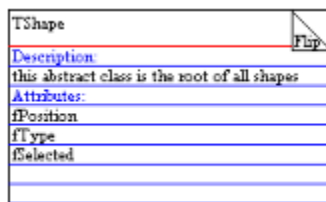
fPosition - center point of shape

fType - identifies shape as BoxType or CircleType

fSelected - boolean set true if shape selected

The Description field at the top on the Back tab of the Card Property dialog can be used to describe the card itself.   Enter "this abstract class is the root of all shapes" into the field.   Click the OK button to dismiss the Property dialog.

Using the Selection Arrow you can alternate between showing the front or back side of a card on the diagram by clicking on the Flip tab.

Back Side of TShape Card

Define a Scenario

A scenario describes a sequence of steps to define a mechanism in the design using the responsibilities of a group of collaborating classes.   We assign responsibilities to classes by simulating how the system responds to external events.

Scenarios are detailed examples of the functions of the system, where each function refers to visible, testable behavior.   The function of a scenario describes what happens in the system from a high-level, user point of view. The goal of walking through scenarios is to discover where additional classes, responsibilities and collaborations are required, or where existing items have become redundant.

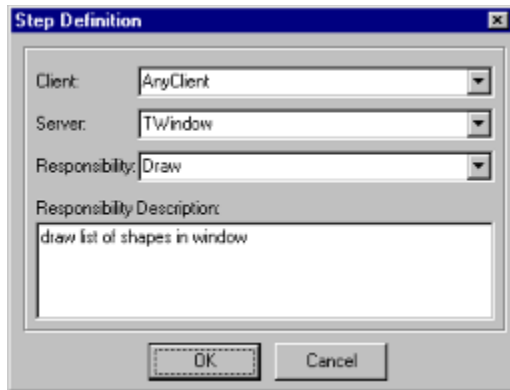⊞   With the Scenario tool, click to create the Draw Window scenario.
Name this scenario Draw Window and describe it by typing "draw document's window" into the edit box.   The TWindow class draws itself by looping through a list of shapes in the document drawing each one and then drawing the tool palette.

Using the edit fields at the bottom of the Scenario Property dialog you can add a step to the scenario by selecting the Client, Server and Responsibility names with the drop down list boxes and then clicking the New button to add that step.   For example, select AnyClient to indicate that we are not sure yet which class will initiate this scenario. Select TWindow as the server class.   Normally at this point the Responsibility drop down listbox would show all the responsibilities of the server class TWindow, but since none are defined yet, just type the name Draw into the edit field.   Click the New button to add this step to the scenario.
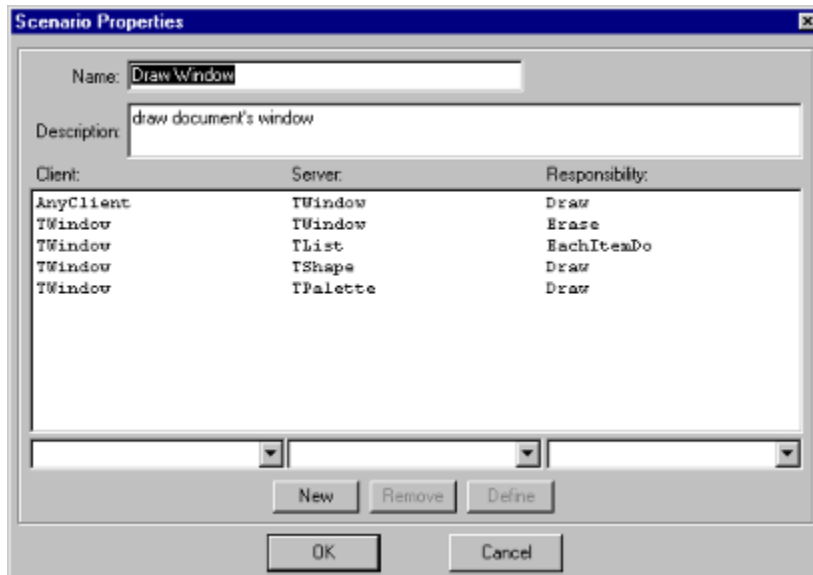
Scenario Property Dialog

If you make a mistake or need to change any step, double-click on that line in the list of steps to access the Step Definition dialog shown below for the first step.   This dialog also allows you to describe any new responsibilities you've created.

Step Definition Dialog

Add the remaining steps to the scenario as indicated in the Property dialog above. The new responsibilities Draw and Erase are added and defined for TWindow.

Draw - draw list of shapes in window

Erase - clear contents of the window before drawing it

The new responsibility EachItemDo is added for TList.

EachItemDo - this boolean function is true if another item in list and returns pointer to item.

The existing Draw responsibility is selected for TShape.

The server class TPalette and its Draw responsibility don't exist yet in our design so just type the name in now. Once the step is added, use the Step Definition dialog to describe it "draw the tool palette". Your scenario is now done so click the OK button. Cards are added or updated for you to reflect the editing changes you've made.

Scenario Object on Diagram

Simulate the Scenario

We have already stepped through a scenario and made some decisions.   However, the process will need to be repeated at later stages, to confirm that the design still works as it evolves and more detail is added.

   Select the Draw Window scenario and click the Simulate button.   The Simulate dialog is presented allowing you to step through the scenario and get a clear picture of what actions take place at each step.   Later in this tutorial we will explore a more complex example where one scenario can use other scenarios to complete its job.

Click the small arrow buttons at the bottom of the dialog to step to the beginning, step backwards, step forwards or step to the end of a scenario.
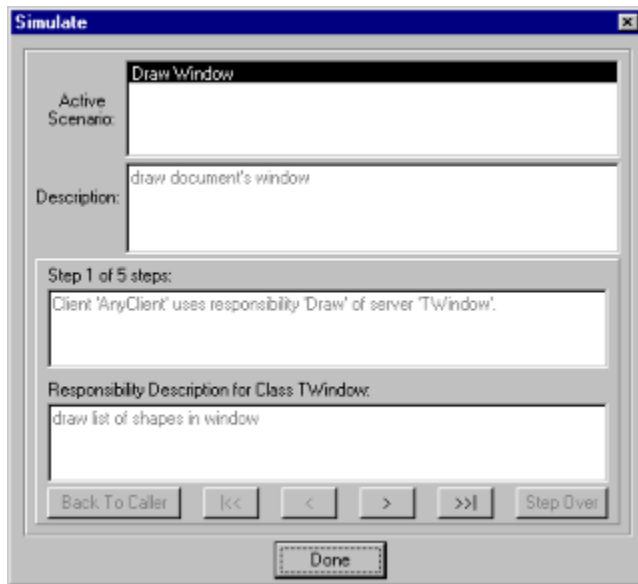
Simulate Dialog

Complete the Design

You've now created the basic components of a QuickCRC design, its cards and scenarios.   We will now explore some of the other capabilities of the tool using a more complete design for SimpApp that has already been built for you.   Click the close box in your CRC window to discard the document without saving.

🖘   Click the Open File button and double-click the document SimpApp.crc to display the more complete CRC design.   Notice that the TWindow card has some collaborating objects listed for its Draw responsibility.   Collaborating objects are added to a card by selecting a responsibility in the Card Property dialog, typing a collaborating object name into the Collaboration edit field and clicking the New button to add it.

You may notice that the diagram shows all cards stacked on the left in alphabetical order and scenarios stacked on the right.   Objects on the diagram can easily be arranged by positioning the Selection Arrow over the object's name, pressing the mouse button and dragging the object.   To change the front to back ordering, click to select an object and click the right mouse button to access a popup menu.

It is often useful to rearrange cards in various ways to explore relationships between them.   As an example, select the single card, TShape and choose the Arrange Cards and Scenarios command from the Option menu and fill in the dialog exactly as shown here.   The TShape card and its subclass are positioned on the left of the diagram and everything else gets stacked on the right side of the diagram.
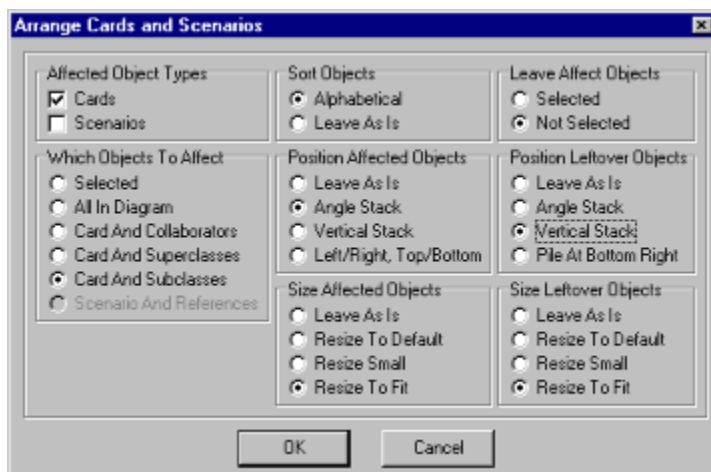
Arrange Cards and Scenarios Dialog

To fill in this dialog work from the top left corner to the bottom right indicating which objects you want to affect, how to size and position them and what to do about the remaining leftover objects.   This command does not modify or remove any information in your design, it simply rearranges the visual presentation of objects on the diagram to help you focus attention on specific issues.

As the options on this dialog reveal, QuickCRC gives you the flexibility to easily arrange, size or position the objects on your diagram.   Some of the choices on the Arrange Cards and Scenarios dialog are affected by options you've selected on the Document Defaults dialog for your CRC document.

Choose the Document Defaults command now to show the dialog.   The default width and height of each newly created card, scenario and subdiagram object can be specified here.   The Confine Object Size checkbox allows you to force all objects to the default size and prevent them from being individually resized.   When this option is checked, some of the resizing options on the Arrange Cards and Scenarios dialog are disabled.

Document Defaults Dialog

Simulate With Subscenarios

As mentioned earlier some scenarios can use other subscenarios to get their work done.   Initialize Document and Read Document are both subscenarios related to the server class TDocument.   For example, the Open Document scenario references the Initialize Document subscenario in step 2, by specifying its server class TDocument in the server field and its scenario name in the Responsibility field.   The first step in the Initialize Document subscenario uses TDocument as the server class name.

Open Document		
open an existing document by creating it and reading it		
Client:	Server:	Responsibility:
AnyClient	TDocument	Open
TApplication	TDocument	Initialize Document
TApplication	TDocument	Read Document

Scenario Using Other Subscenarios

Select the Open Document scenario and click the Simulate button.
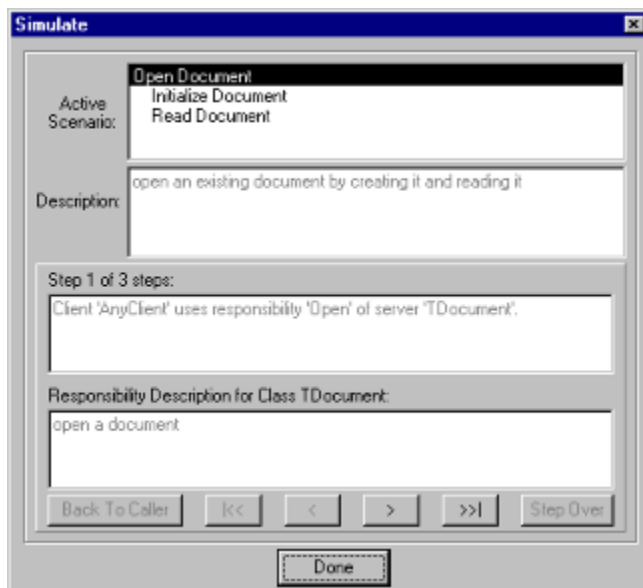
Simulate Dialog

Within the Simulate dialog, click the Step Forward button to step into and step through each scenario. Notice that the Active Scenario list at the top shows your position within a hierarchical stack of scenarios.   This list helps you keep your bearings in a complex simulation and even allows you to change to a different spot in the simulation path by clicking an item in the list.

Verify Your Work

Creating and simulating scenarios will help verify that your CRC design is correct and complete.   The Verify CRC command also has several error checks to help locate problems in your design.   It presents the following dialog allowing individual checks to be selectively turned on or off.   Depending on the specific characteristics of the model, some messages may not necessarily indicate errors, but often they will reveal inconsistent or incomplete areas of the model.

The Duplicate or Similar Names check can detect class, attribute or scenario names that are identical once spaces are stripped from the name.   Using the same name for different things will likely be problematic.   It might be acceptable, however, to have the same attribute name in different classes, as in this model where fDocument refers to a TDocument object from the TApplication and TWindow classes.
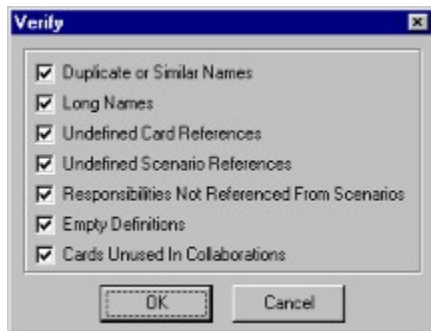
Verify CRC Dialog

The Long Names check will detect class attribute or class operation names that exceed 40 characters and would be truncated when generating a dictionary entry list for use by WinA&D.

The Undefined Card References and Undefined Scenario References checks can locate references to classes, responsibilities or scenarios that were never created, have been deleted or renamed.

The Responsibilities Not Referenced From Scenarios check often reveals responsibilities that are not needed or have not been completely exercised from the existing scenarios.   Likewise the Cards Unused In Collaborations check often reveals unneeded classes or incomplete modeling.   The error messages that remain in our model are okay however since they refer to the TBox and TCircle subclasses of the TShape class which itself has been exercised by our scenarios.

Go to Step 9

List Cards and Scenarios

On the Report menu, the List Cards and Scenarios command presents a dialog for listing specific information about cards and scenarios to a text window.   This is often the most useful approach for getting information about your model into a format to print, review or distribute.
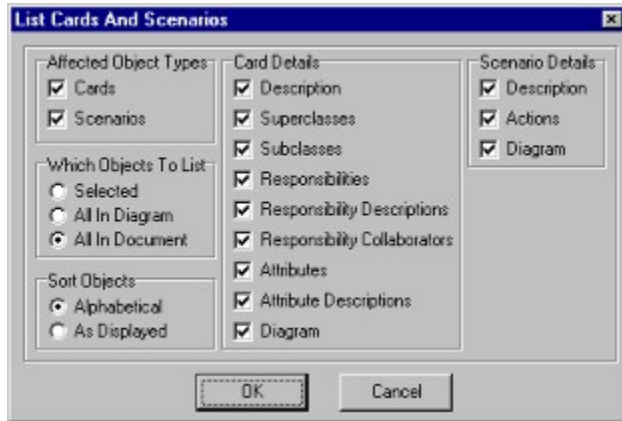
List Cards And Scenarios Dialog

The Report window to which reports are generated can then be saved to disk and used by other word processing applications or printed using the Print command.   By the way, you may notice that if you open multiple text windows the first one is named Report and each additional text window is named Text.   The window named Report is special because that is where your reports list out to or from which information is imported.

The Export Dictionary Entries command puts information about your design into a format that can be used by WinA&D.   Likewise, information from WinA&D or WinTranslator can be imported using the Import Dictionary Entries command.

Go to Step 10

Partition Your Design

Separate diagrams are often useful for partitioning your model into subject areas, each on its own diagram within the same CRC document.   The Diagram Manager dialog and Contents view within the CRC window can be used to navigate or change information about each diagram.

We will now create a separate diagram level containing the cards and scenarios related to shapes.   With the Shift key pressed, click on cards `TShape`, `TBox`, `TCircle` and scenarios `Create Shape` and `Delete Shape`. Choose the Collapse Objects command to push the selected objects to a child diagram and place a subdiagram symbol named `Shapes` on the parent diagram.   To see the newly created child diagram double-click the `Shapes` subdiagram with the Selection Arrow.   To return to the parent diagram, press the Shift key and double-click on white space in the child diagram.

Now select cards `TDocument`, `TWindow`, `TPalette` and scenarios `Initialize Document`, `Close Document`, `Open Document`, `Read Document`, `Write Document` and `Draw Window`.   Choose the Collapse Objects command again to create the subdiagram called `Document`.

Choose the Diagram Manager command from the Window menu to present a dialog that lists all the diagrams in your CRC document.   To switch to a different diagram, click its name in the list.   This dialog can be used to change a diagram title or to print diagrams.   To print several diagrams at once, press the Shift key and click to select each title, then click the Print button.   Click OK to dismiss the dialog.

Choose the Show Contents command from the Window menu to present a Contents view within the CRC window.

Contents View Showing Three Diagram Levels
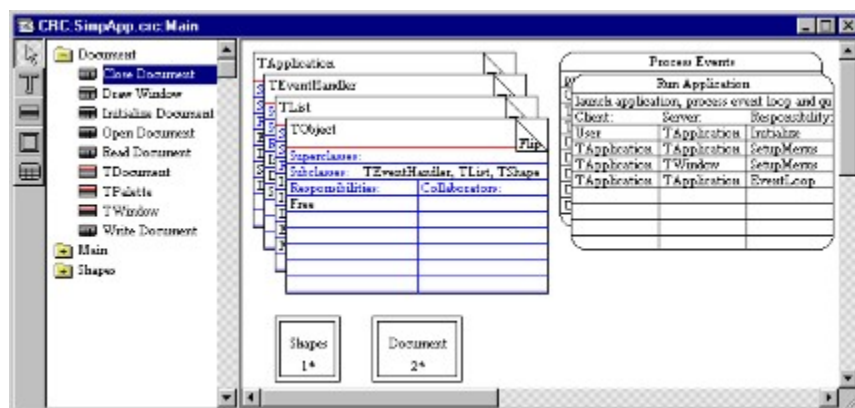
The Contents view shows a folder to represent each diagram level.   Click the folder icon to show or hide the list of objects it contains.   To switch diagram levels, click on the diagram title within the Contents view or click on any card, scenario or caption listed within the diagram.   To quickly present the Card Property or Scenario Property dialog, double-click on the named item in the Contents view.

Card, Scenario and Caption objects can easily be dragged between diagram levels using the Contents view.   To illustrate, position the Selection Arrow over a card or scenario item, press and drag it over to the name of another diagram or over any listed card or scenario in that diagram, then release the mouse button.

Inheritance Graph

Choose the <u>Inheritance Graph</u> command from the Window menu.   Use the drop down menu in the Root field at the top of the window to select the `TObject` class.   Alternatively, you can type the name of a class and press Return to generate a graph.   This diagram can concisely illustrate the big picture of a very large project containing hundreds of classes and diagrams.
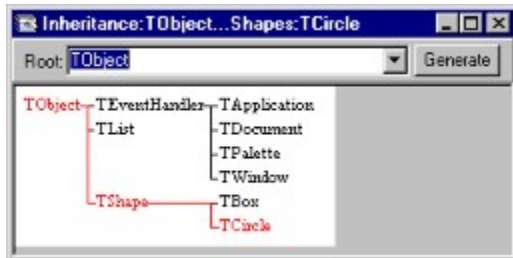
Inheritance Graph Outlining Path to TCircle

To see the inheritance path of a specific class on a generated graph, click that class and a red line will outline its path back to the root class.   Double-click a class name to edit its properties.

The Inheritance Graph command is enabled whenever a CRC document is active.   Several Inheritance windows can be displayed for the same CRC document.

<u>Go to Step 12</u>

End of Tutorial

This completes the tutorial.   You can now close the documents you've created without saving changes.   This tutorial has touched upon many of the features of QuickCRC.   Choose Exit from the File menu if you want to quit.

New file

Click this button to open a new, untitled CRC model or text document.   The new document is named the first time you save it.

Open file

Click this button to open an existing CRC model or text document.   A dialog box appears with a list of all the documents of the specified type on the disk within the current folder.   Refer to the <u>Open</u> command for more information.

Save file

Click this button to save a copy of the active document to disk, replacing the document that has the same name. When saving for the first time, the Save As dialog is presented to name the document.

Print file

Click this button to present the Print dialog for selecting a printer, page range and number of copies to print.   Refer to the <u>Print</u> command for more information.

Property

Click this button to do the <u>Properties</u> command and present the Property dialog for the selected diagram object.

Simulate

Click this button to exercise the selected scenario object using the <u>Simulate</u> dialog.

New

This command lets you open a new, untitled CRC model or text document.   The new document is named the first time you save it.

Open

This command lets you open an existing CRC model or text document.   A dialog box appears with a list of all the documents of the specified type on the disk within the current folder.   Click the name of the document that you want in the list, scrolling it or changing folders if necessary, to find the name you want.   The document can be opened by double-clicking on the name or selecting it and clicking Open.   Use the Files Of Type popup menu to selectively filter the document type of interest.

Close

This command closes the current window.   A dialog asks if you want to save the associated document if you've made changes.

Save

This command saves a copy of the active document to disk, replacing the document that has the same name.   When saving for the first time, the Save As dialog is presented to name the document.   This dialog also allows the user to change folders or drives or create a new folder.   A ":" or "/" cannot be used as part of a document name.

Save As

This command lets you save the active document under a different name or on a different disk.   It creates a new document, leaving the original unchanged.   Any further changes you make will be saved to this new document when you use the Save command.

Print Setup

This command brings up the Print Setup dialog for selecting the printer, its properties and setting the paper orientation.

Print

This command brings up the Print dialog for selecting a printer, page range and number of copies to print. QuickCRC uses device independent API printing calls when formulating and printing pages.   Instead of issuing device-specific commands to draw output on a particular printer or plotter, the application calls high-level functions. The print driver then translates the device independent page description to specific commands required to drive a particular printer.

Some existing printers were supplied with device drivers that are not fully compatible with the Windows 95/NT printing API and can produce unreliable and unpredictable results.   For example, older printer drivers may print okay for some applications and hang up other applications or the operating system.   Other characteristics of an incompatible driver include pages that print blank or a printer that goes busy and never outputs the page.

Most printer manufacturers have Internet sites from which updated printer drivers can be downloaded.

Exit

This command quits the application.   If you have made changes to any documents since you last saved, you will be given a chance to save them before quitting.

Undo

This command is used to undo or redo the effects of the most recent text editing change.

Cut

This command removes a graphic or text selection and places it on the clipboard.   It replaces the current clipboard contents.

Copy

This command copies a graphic or text selection and places it on the clipboard.   It replaces the current clipboard contents.

Paste

This command places a copy of the clipboard contents into your document.   For graphic selections, the newly pasted copy is selected and centered in the visible portion of the window and any previous selection is deselected. CRC diagram data in the clipboard must have the same presentation defaults as the document before it can be pasted.   Refer to the Document Defaults dialog for additional information.

If text is being pasted into a text window, it will replace the current selection or be inserted at the insertion point if there is no selection.

Delete

This command deletes the current graphic or text selection.   Selected text or objects can also be cleared using the Delete key.

Select All

This command selects all the objects in an active diagram window or all the text in a text window.

Bring To Front

This command is used to move selected objects in front of other objects in a diagram window.

Send To Back

This command is used to move selected objects behind other objects in a diagram window.

Properties

This command is used to specify properties of a selected <u>caption</u>,   <u>card</u>, <u>subdiagram</u> or <u>scenario</u> object using a Property dialog.

Find

This command presents the <u>Find</u> dialog to locate a string of characters in the active text window or to find a diagram object in the CRC model.   In a text window, select the insertion point where you want the search to start.   Type the characters you want to find and click the OK button or press Return.

Find Same

This command is the same as the Find command except it does not bring up the Find dialog box.   The previous text string is used.   If no other strings or objects are found, an information dialog will be presented.   This command can also be issued by pressing the F3 key.

Replace

This command presents the <u>Replace</u> dialog to find a string of characters in a text document and replace it with a different string of characters.   Type the string of characters to find into the field under "Find what string?".   Use the Tab key to place the cursor into the replacement field, type in the characters which should replace the found string and click OK or press Return.

Replace Same

This command is the same as the Replace command except it does not bring up the Replace dialog box.   The previous Find and Replace strings are used.

Show Clipboard

This command presents the Clipboard window for viewing its contents.

Verify CRC

This command is enabled when a diagram document is active.   It presents the <u>Verify CRC</u> dialog of error checks that can be selectively turned on or off.   It checks for potential problems or inconsistencies in the model.   If no Report window is open, an empty file will be created.

List Cards and Scenarios

This command presents the <u>List Cards and Scenarios</u> dialog to selectively list information about cards and scenarios to the Report window.   If no Report window is open, an empty file will be created.

List Diagrams

This command generates a textual representation of the information in the active CRC model.   This text information can later be imported to generate a new CRC document or potentially used to transfer design information to a different application such as WinA&D.

Export Dictionary Entries

This command presents the Export dialog to selectively generate dictionary entries from cards in a CRC model. The exported file can be saved to disk and imported into WinA&D to generate a dictionary and class diagrams.   If no Report window is open, an empty file will be created.

Import Dictionary Entries

This command presents the <u>Import</u> dialog to import dictionary entries and generate a CRC model.   A dictionary entry list can be produced by WinA&D or WinTranslator.

Import Diagrams

This command generates a new CRC document from textual information in the Report window.   The imported information is assumed to be syntactically and symantically correct.

Tile

This command positions and sizes the open windows so they utilize the space available to the application window frame without overlapping.

Cascade

This command positions and sizes the open windows so that they are all visible but overlapping within the application window frame.

Arrange Icons

This command is used to arrange minimized window icons neatly within the application window frame.

Diagram Manager

This command is enabled when a diagram document is active.   It presents the <u>Diagram Manager</u> dialog which shows each diagram title and allows diagram parameters to be changed or selected diagrams to be printed or deleted.

Show Contents

This command is enabled when a diagram document is active.   It shows or hides the Contents view of the active CRC document.

Inheritance Graph

This command presents the <u>Inheritance window</u> to view an inheritance graph of information in the active CRC document.   Several Inheritance windows can be active for the same CRC document.

½ Scale

This command toggles the contents of a diagram window between half scale and full size.   Editing operations are available at either scale.

Show Size and Location

This command presents a dialog showing the number and type of objects in the active document and its disk location.

Arrange Cards and Scenarios

This command presents the Arrange Cards and Scenarios dialog for selectively sorting, positioning and sizing card and scenario objects on the active diagram.

Collapse Objects

This command is used to collapse a selected group of objects to a child diagram.   On the current diagram, the removed objects are replaced with a single parent subdiagram symbol.   This command is only enabled when objects have been selected.

External Agents

This command presents the <u>External Agents</u> dialog to define external entities and interfaces that interact with the system being designed.   Refer to the External Agents section of the CRC Models chapter for more information.

Simulate

This command is enabled when a single scenario object is selected.   It presents the <u>Simulate</u> dialog to step through the actions of a scenario.

Document Defaults

This command presents the <u>Document Defaults</u> dialog box for customizing the application and default object sizes.

Preferences

This command presents the <u>Application Preferences</u> dialog for setting document independent, application preferences.   Options on this dialog allow documents to be periodically saved and tab stops to be set for text documents.

Help Topics

This command is used to access the online help system for QuickCRC.   Standard Windows conventions are used for navigating between Contents, Index and Topics in the Help system.

About

This command shows the registered owner's name, organization, product identification number, version number and license type.   The owner's name, organization and product identification number are entered into the Registration dialog when the application is initially launched.   The product identification number is provided on the Registration Card.

Menu Command

This command presents a popup menu of specific commands.   Place your cursor over a specific command and press F1 to see context sensitive help for that command.