

Introduction to ERD diagramming using Popkin System Architect Student Edition Version 8.8.16

Original version by

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1. Introduction

1.1. Where to obtain the software

You can obtain the latest version of the student edition of System Architect on CD-Rom from:

<http://vig.prenhall.com/catalog/academic/product/0,4096,0131423533,00.html>

ISBN: 0-13-142353-3 (although this comes up blank in both amazon.co.uk and .com)

The cost is rather variable based upon where you live, for example in the US it is \$34 but when posted to the UK has an additional \$30 shipping import charge (= £40.13 total). Therefore you may want to make arrangements between yourselves for obtaining copies.

1.2. Before you begin this tutorial?

Before you work through this tutorial you should have the following knowledge and skills:

- A basic understanding of the systems development life cycle
- Knowledge of what an Entity Relationship Diagram is and be able to draw one by hand
- An understanding of the basic terminology used in Entity Relationship Diagrams.
- A working knowledge of Microsoft Windows (98, ME, NT or 2000) including working with multiple applications and windows, dialog boxes, and so on
- Preferably some experience with using a DataBase Management System such as Access or Oracle, although this is not assumed in this tutorial.

If you feel that you are unable to answer yes to any of the above criteria a good starting point it to work through either Robin Beaumont's ERD tutorial at

http://www.robinbt2.free-online.co.uk/virtualclassroom/chap11/s9/erds_1.pdf

or Richard Holowczak's at

<http://cisnet.baruch.cuny.edu/holowczak/classes/3400/entityrelationship/>

1.3. What are the aims of this tutorial?

This tutorial is the first in a series to introduce you to using a specific CASE tool, Popkin's Systems Architect Student Edition (SA/SE). Because this is the first tutorial it provides you with screen by screen details of what to do. The aim being to familiarise you with the most common, basic features of SA. By the end of this tutorial you will be feel confident with navigating around SA and with the basics of drawing diagrams. Subsequent tutorials assume you have this knowledge and therefore provide less detailed instructions.

While the complete CASE tool has hundreds of features capable of addressing the complete systems development life cycle, this tutorial will focus only on a small, but important subset that of creating a ERD (Entity Relationship Diagram).

2. Starting Up SA/SE

It is assumed that you have SA/SE installed

In this section, the basic techniques for starting up the Popkin Systems Architect Student Edition (SA/SE for short) will be described. SA/SE is a Windows software application that runs within the Microsoft Windows 98, ME, NT, XP or Windows 2000 operating system. As with most Windows applications, starting SA/SE is simply a matter of clicking the left mouse button on the Windows Start menu as shown here:



Start the program by going to "Start" menu, selecting (All) Programs, then **Popkin Software** then **System Architect** by clicking on it as shown in Figure 1:

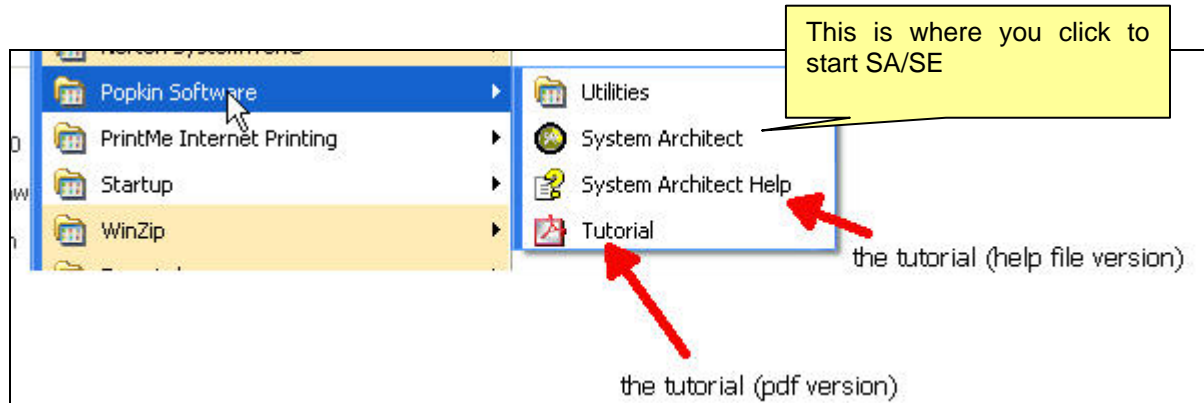


Figure 1 Windows Start menu showing SA/SE menus and icon

Note that on your own PC or in your School's computer lab, this menu may appear slightly different. When the software is started for the first time, two dialog boxes appear a Student version warning and a Configuration dialog box as shown below in Figure 2.

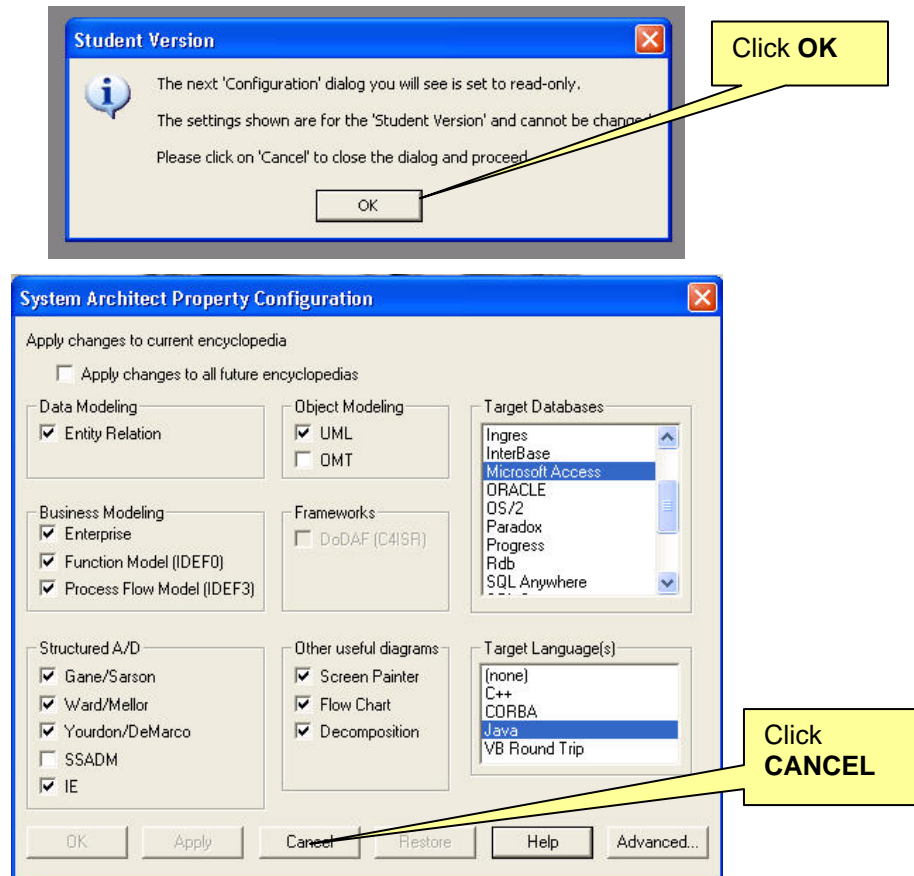


Figure 2 SA/SE Student version warning and Property Configuration

For the Student Edition of SA/SE, simply click on the Cancel button. Once this is done, this dialog box may hopefully not appear and irritate you in the future.

Next, you may see a SA/SE "Tip of the Day". Click on the Close button to close this dialog box.

Finally, you may also see the Audit ID dialog box as shown in Figure 3. Type in any integer (whole number) for this Audit ID and then click on the OK button to close the dialog box. As with the Configuration dialog box above, this may only appear once.

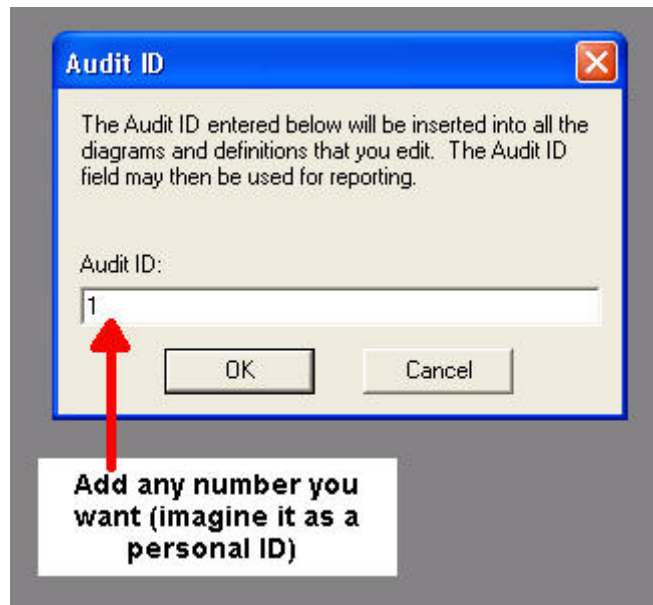


Figure 3 The Audit ID Dialog Box

Once these few startup dialog boxes have been dismissed, the main SA/SE screen should appear. The main screen is shown in Figure 4.

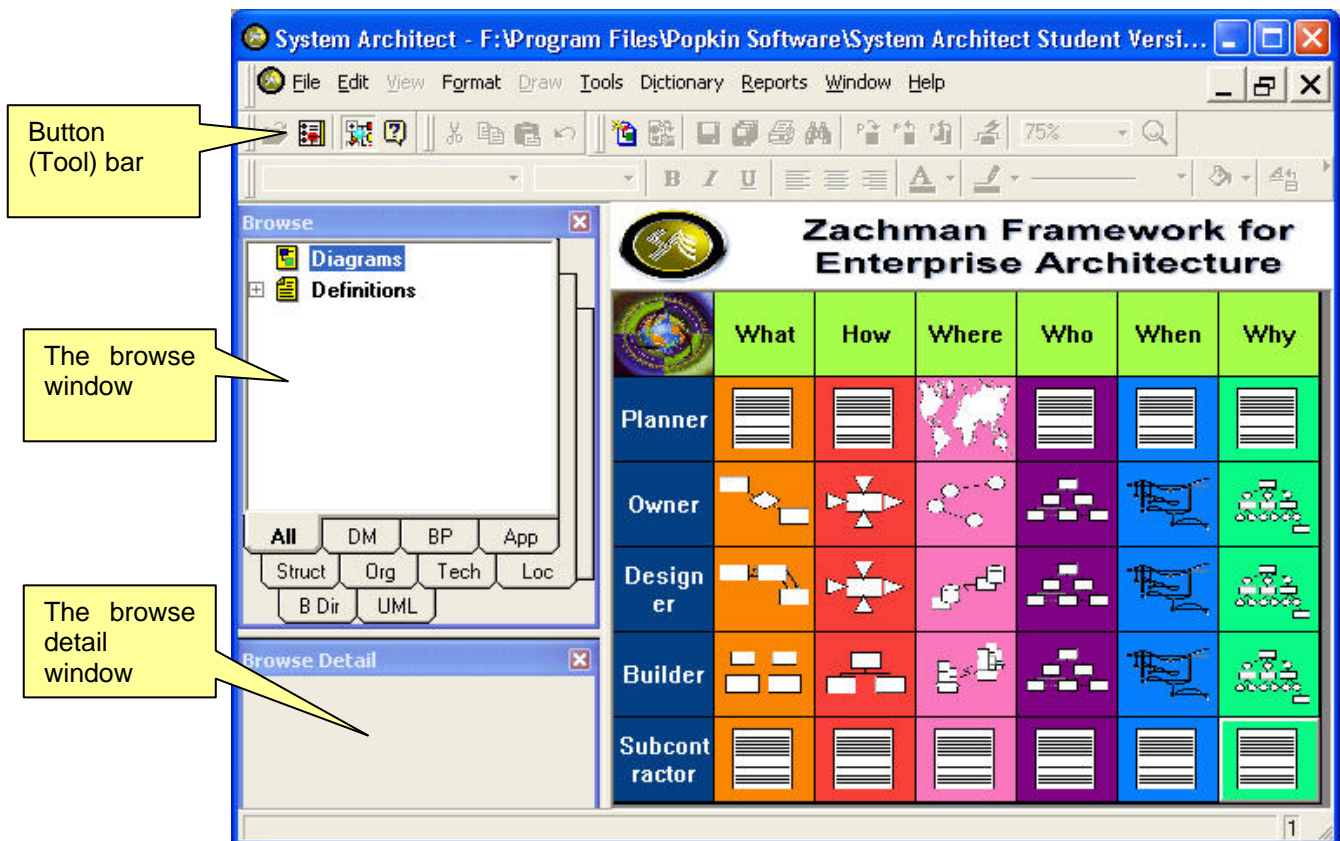


Figure 4 Main SA/SE Screen

The SA/SE main screen is divided into four main sections. Along the top are a series of menus and a button bar. The *Browser* appears on the left hand side and *Browse Detail* appears in a small window below it. The right hand side of the screen is reserved to display diagrams and models.

The Browser is organized into a series of tabbed sheets as can be seen in Figure 4. By default, the *All Methods* sheet is displayed. For this tutorial, we will make use of the Data Modeling tab to create an Entity Relationship diagram. Depending on the size and resolution of the PCs screen, the application window may appear smaller and this may cause the Browser to display only abbreviations (e.g., "AM" for All Methods) on the tabs. If this is the case, try maximizing the main application window or drag the separator between the Browser window and the diagram display to the right to expand the Browser window.

All of the related models for a project are stored in a SA/SE *Encyclopedia*. This is also called a Data Dictionary or Repository in most CASE tools and in systems analysis textbooks. In the full version of SA/SE, the user may save a related set of models for a project into an encyclopedia that they name. However, in the Student Edition of SA/SE, only four such encyclopedias are available. These are named: Project1 to Project4. There are also to other encyclopaedias one provides examples of the various diagrams and the other is the official SA/SE tutorial provided by Pokins.

Before we begin work it is a good idea to clear the screen of clutter by closing the 'Zachman Framework' window as shown in the diagram below.

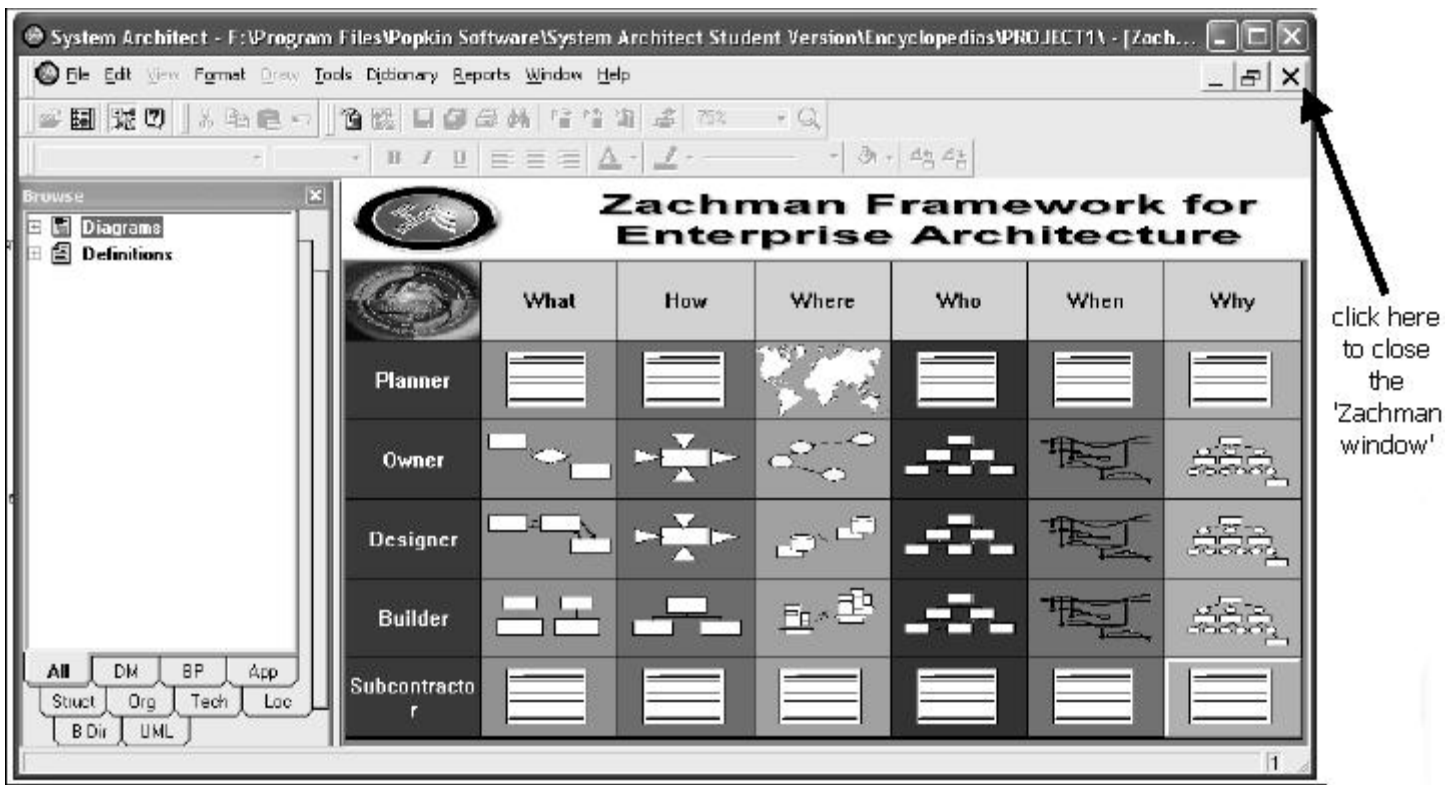


Figure 5 Closing the Zachman Framework window

We are now ready to begin. For the purposes of this tutorial, Project1 is assumed to be empty (and will be if no one else has used it), we will use this encyclopedia to create different but related models.

To make certain the proper encyclopedia has been chosen, at this time, pull down the File menu and select the Project1 menu item as shown in Figure 6.

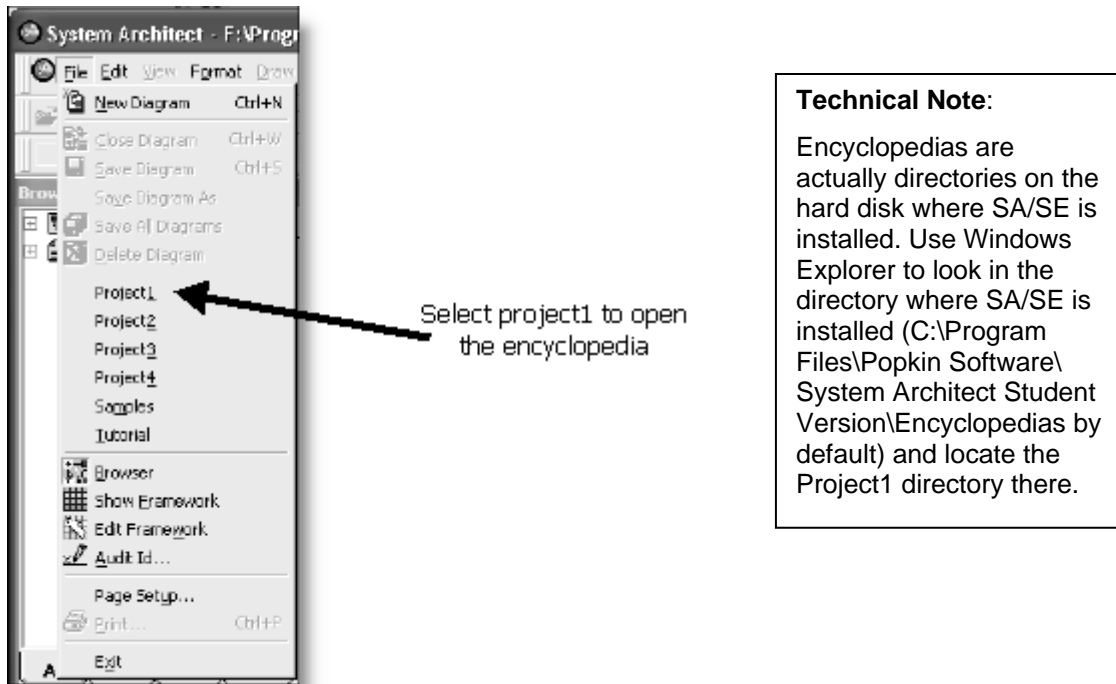


Figure 6 Selecting the Project1 Encyclopedia

After selecting the Project1 encyclopedia should the Configuration dialog box appear (as in Figure 2), simply click Cancel to close it.

In the next section, a basic Entity Relationship diagram will be defined using the Data Modeling tab in the browse window.

3. Data Modeling using Entity Relationship Diagrams

The following section is based on materials from these popular SA&D textbooks:

- Whitten, Bentley and Dittman 5th edition. Chapter 7 Data Modeling and Analysis
- Kendall and Kendall 4th edition. Chapter 17
- Hoffer, George and Valacich 2nd edition. Chapter 10

In this section, a basic Entity Relationship data model will be created with two entities and a simple relationship between them. Make certain that the Project1 encyclopedia is currently selected and that it contains no other models.

The business we are modeling is a Travel Agency. In the Agency, a Travel Agent will make a Reservation for a Customer. In this section we model the Travel Agency and the Reservation entities. The resulting diagram should appear as in Figure 7.

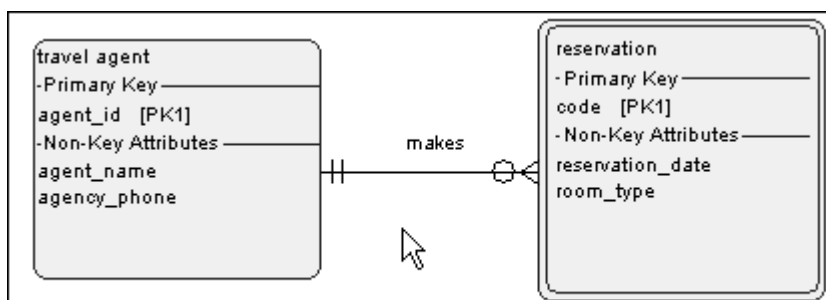


Figure 7 The Completed Entity Relationship Diagram

3.1. Creating a new diagram

There are several ways to create a new diagram and one of the easiest ways is to click on the New diagram icon on the tool bar as shown below.

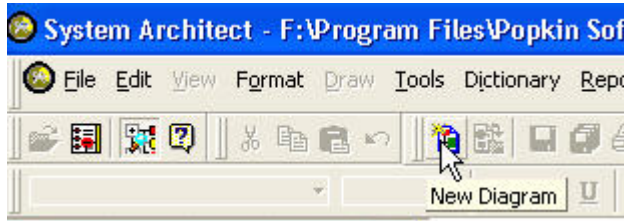
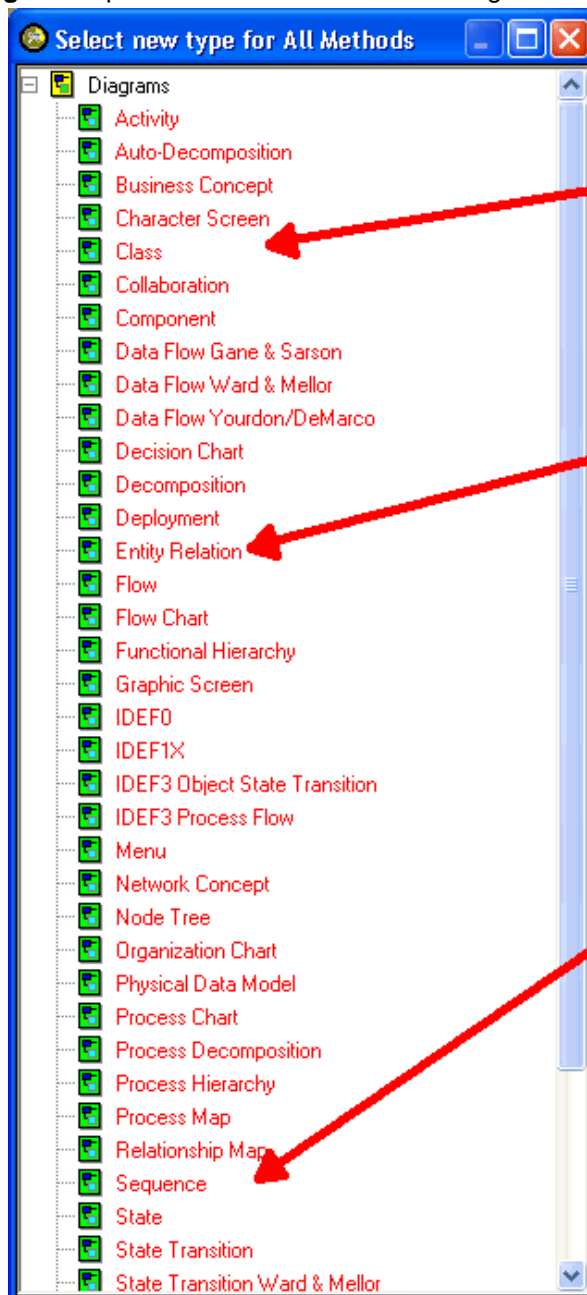
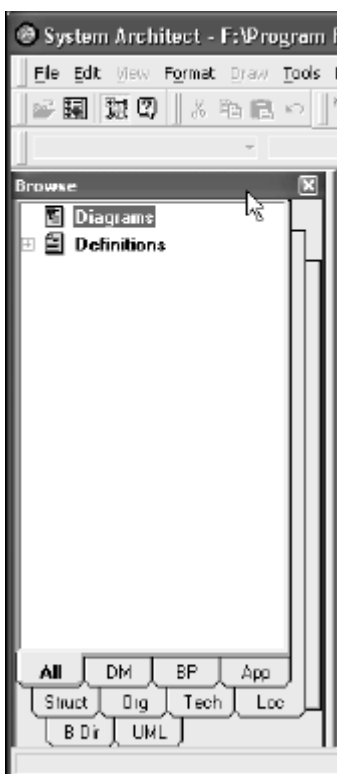


Figure 8 The New Diagram icon

The important thing to realise is that the list of the various diagrams you are offered depends on what you have selected in the browse window previously. Try the following experiment.

Click on the **All** tab then the **Diagrams** option. Then click on the new diagram icon where you should be presented with a list similar to the one below. When you have finished scrolling up and down the list close the window by clicking the **X**



Class diagram
(you will need this latter)

Entity
relationship
diagram

Sequence diagram
(you will need this latter)

Figure 9 The complete set of Diagrams available to you

For our project1 we will use the type of diagram appropriate to data modelling – the Entity Relationship Diagram (ERD for short) and to ensure this we will select the **Data modelling (DM)** tab first.

Click on the Data Modelling tab in the browse window. The entries Models and Shared should appear. Click on the **models** entry with the Right mouse button and select **New** from the pop-up menu. Select the **Entity Relation** item by double clicking on it in the list as shown in Figure 10.

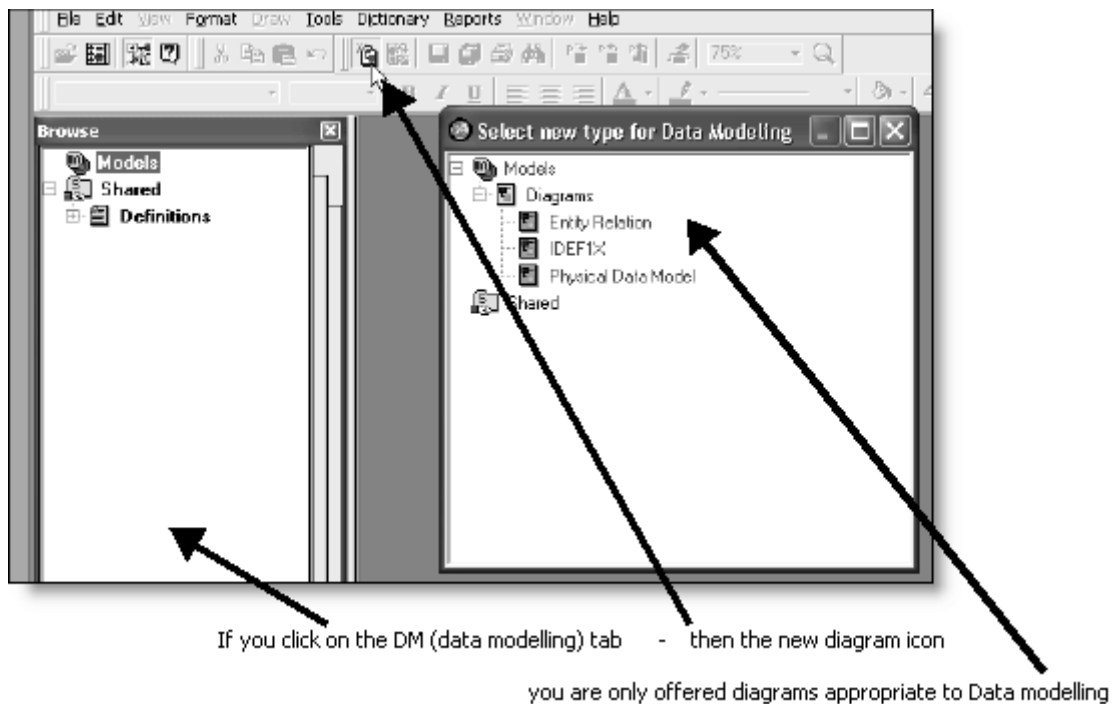


Figure 10 Selecting an appropriate Diagram

A dialog box should appear asking for a name of the new diagram. Name this diagram **Travel Agency 1** and click on the OK button. More than one diagram may belong to a data model so SA/SE needs to know in which model this particular diagram resides. Therefore another dialog box appears and prompts for the name of the data model. For this example, type **Project Data Model 1** and click on the OK button. No other options need to be selected at this time. The following diagram shows the two dialog boxes.

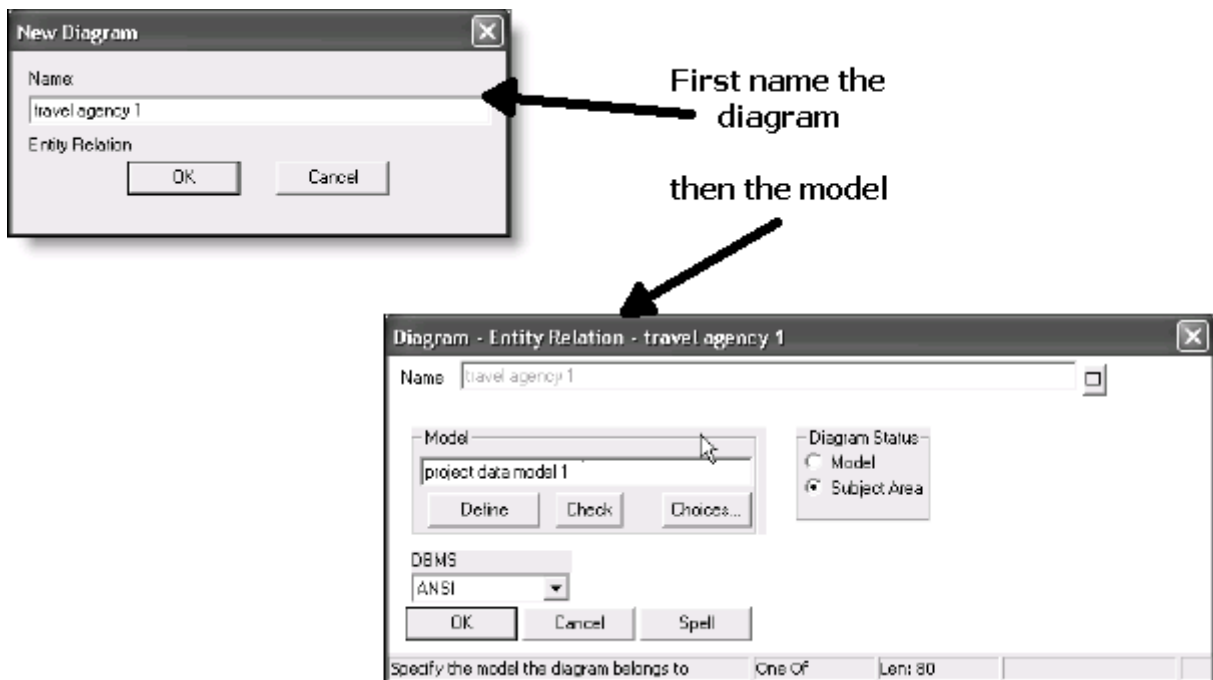


Figure 11 Naming the ERD and the Model

At this point, several new objects are created in the Project1 encyclopedia. To see the new entries, go to the Browse window and click on the + signs next to Models and open up the sub entries of Diagrams and Entity Relation under Project Data Model 1. They should appear as in Figure 12.

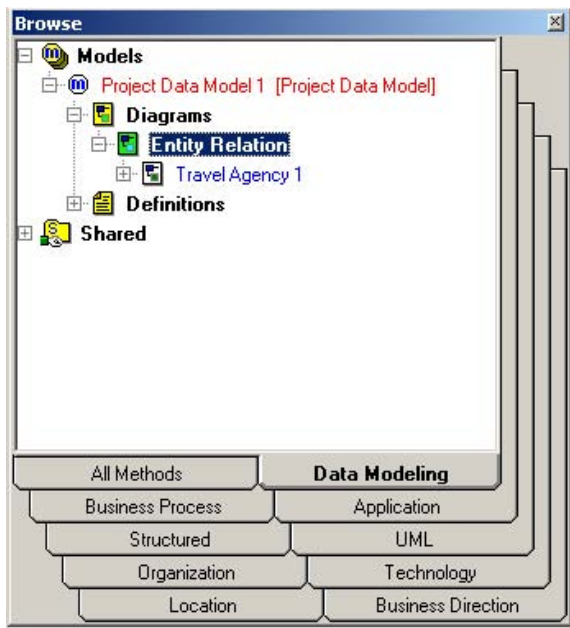


Figure 12 New Data Model and ER diagram

To start drawing the actual ER diagram, double click on the Travel Agency 1 entry (as shown above). You should now note two things:

- the Browse Detail window (bottom left hand corner of the screen) shows a blank white rectangle
- the right hand window (the drawing panel) is also blank and ready for drawing.

In this example two entities called "Travel Agent" and "Reservation" will be created as seen above in Figure 7. To begin creating an entity, locate the Entity icon on the button bar as shown in Figure 13 and click on it. The mouse cursor should change to a pen

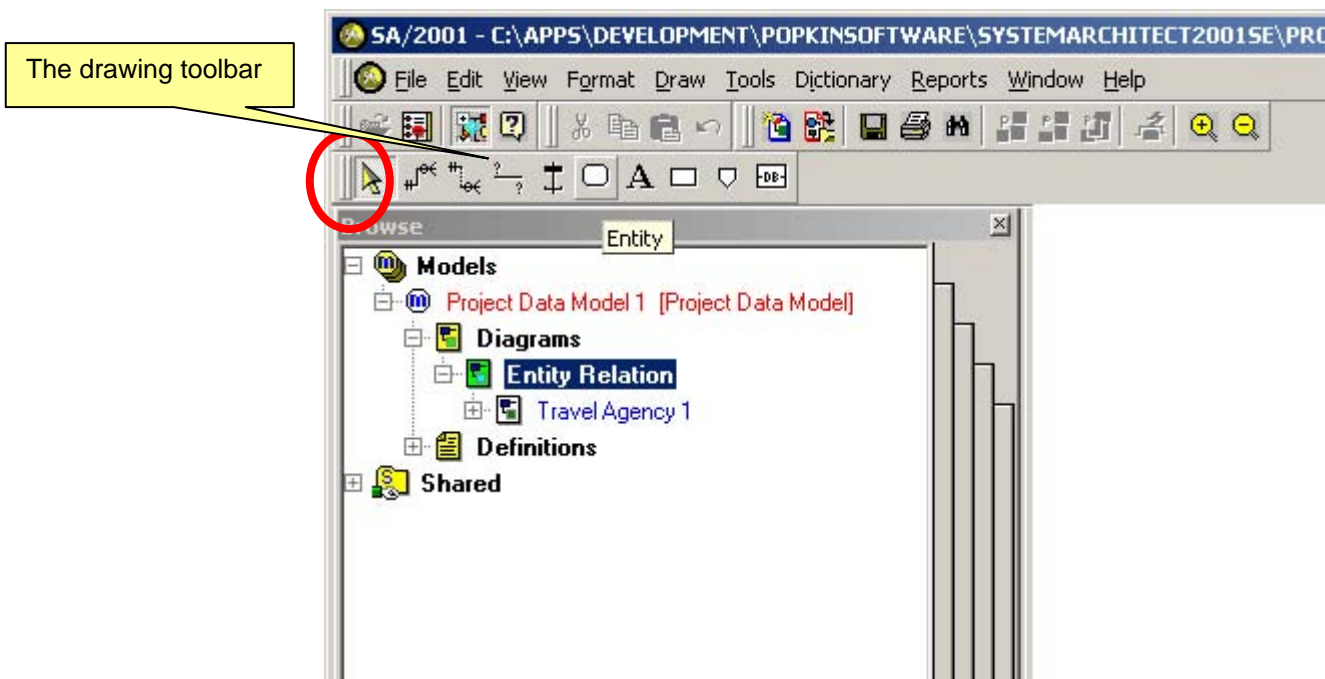


Figure 13 The drawing toolbar for Entity Relation diagrams with the Entity tool highlighted

Using the Entity tool, click on the empty space in the right hand window. When the new entity appears, it is given a default name. Type over this name with the new name of the entity: **Travel Agent** as shown in Figure 14



Figure 14 Naming the new entity travel agent

Click the entity tool once more to the right of the Travel Agent entity and name this new entity **Reservation**. Should you forget to rename the entities or mistype their new names, edit the names as described in the following paragraph. You should now have a diagram similar to the one below.

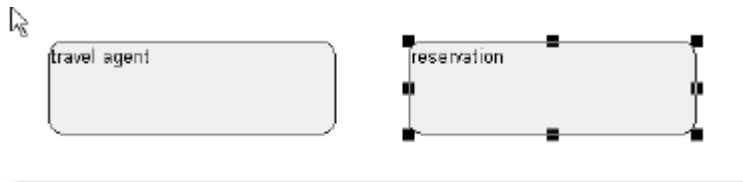



Figure 15 The two new entities

3.2. Editing Names and Attributes for the Entities

Go back to the drawing toolbar and get rid of the pen-shaped cursor by clicking on the “Select-Mode” icon (the arrow  on the very far left, alternatively you can press the **Esc** key. Now the selection cursor should be back in effect. This selection cursor can be used to drag and move the entities around, for example, if you created them too close together. The selection arrow can also be used to edit the name of an entity as well as to add attributes to the entity.

In this example, attributes will be added to the Travel Agent entity. Position the cursor over the Travel Agent entity and click with the right mouse button. Then choose the Edit item from the pop-up menu. In the dialog box that appears, the entity name can be changed or corrected if necessary and the space below the entity can be used to add attributes. For this example, the following attributes will be added:

Name	Primary Key (PK)	Data Type	Qualifier
Agent_id	Yes	character	10
Agent_name	No	character	30
Agency_phone	No	character	12

Fill in the dialog box as it appears in Figure 16. Be certain to check off the PK column for the Agency_ID as this will indicate Agency_ID is the primary key (or identifier) of the Travel Agent entity.

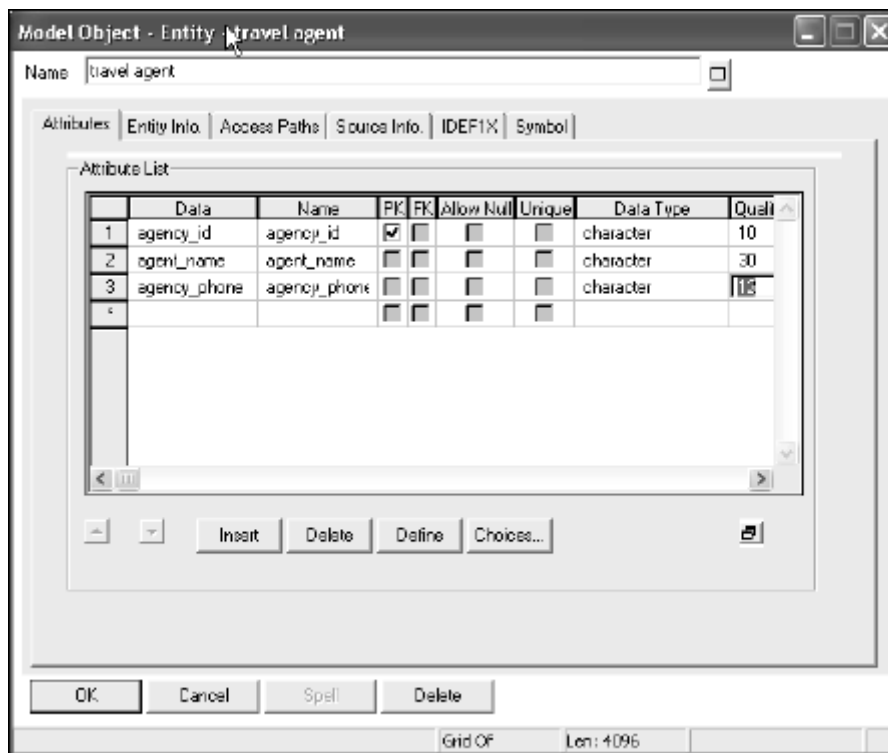


Figure 16 Adding attributes to the travel agency entity

Once the attributes have been added, click on the OK button to close the dialog box. The display should now change to show the attributes for the Travel Agent entity.

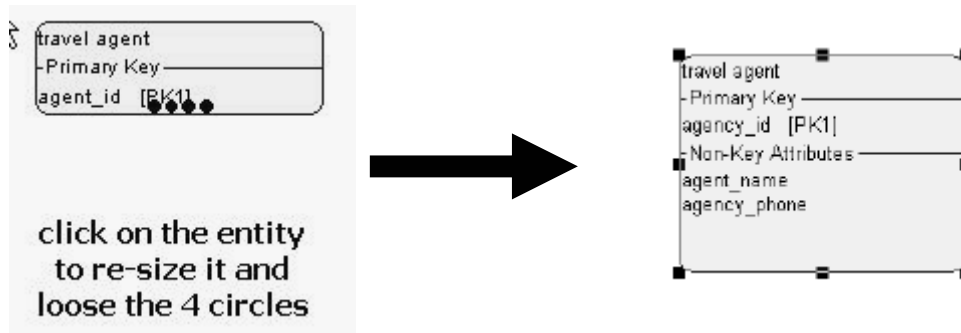


Figure 17 Resizing the entity to show all the attributes

Repeat the above exercise by adding the following attributes to the reservation entity.

Name	Primary Key (PK)	Data Type	Qualifier
code	Yes	character	10
Reservation_date	No	date	10
Room_type	No	character	10

You may be wondering why the data type has a qualifier (i.e.length) of 10. Basically this is so that it conforms to the Date type as defined in ISO 8601 concerning format, For example: "1994-11-05". This information was taken from the excellent SA help file, with which you should make yourself familiar.

3.3. Defining a Relationship among the Entities

At this point, two entities have been defined. Now it is time to link these entities in a relationship. In this example, we will link the entities with a one-to-many identifying relationship.

Before actually drawing the relationship take a look at what the SA/SE's help file has to say on the topic of "relation lines". You can see this by opening the help file menu option Help -> contents tab -> Data modelling -> The entity relation model -> objects included in an ERD -> relation line -> introduction. The figure below shows this.

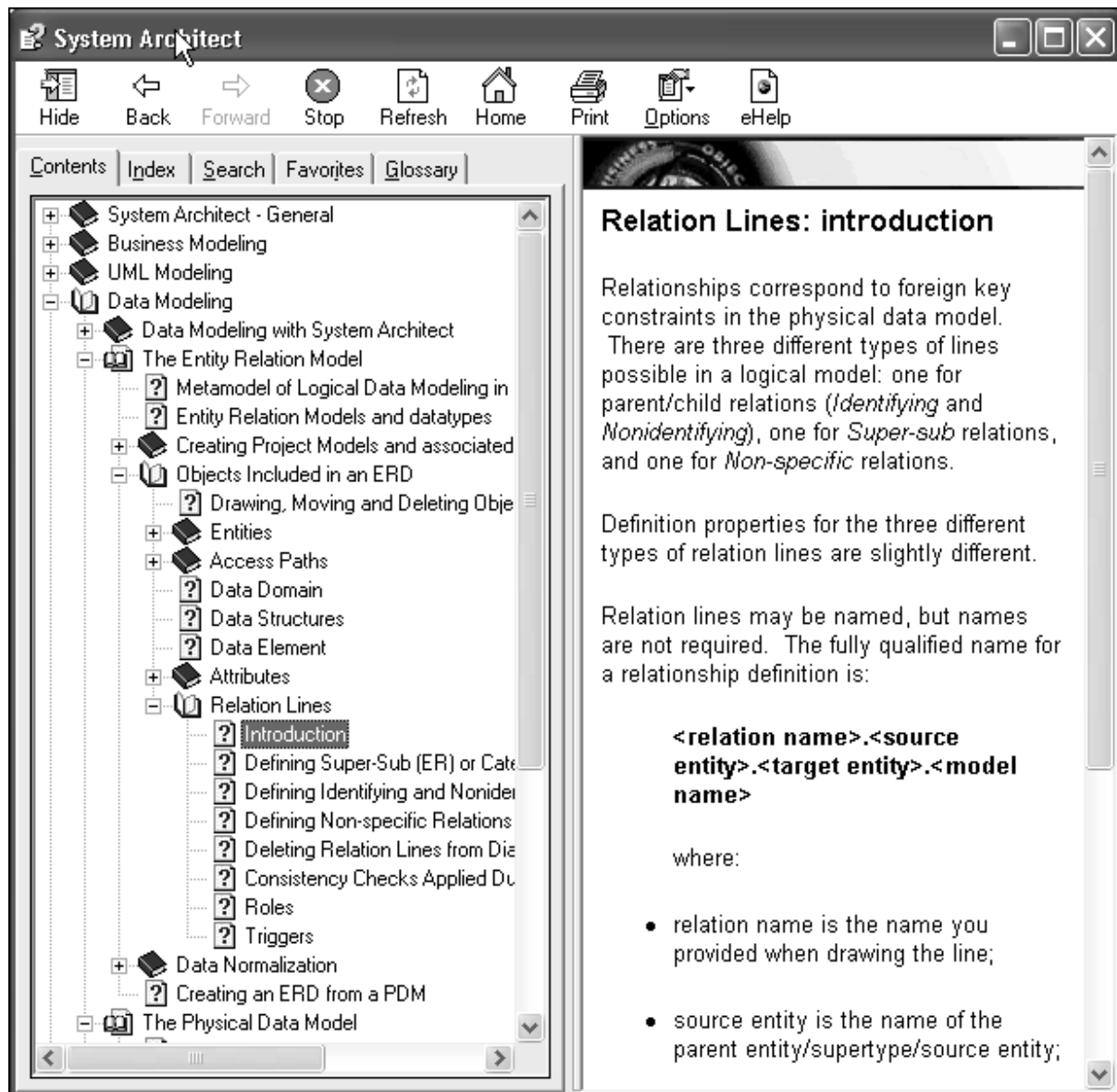


Figure 18 Help about relation(ship) lines in ERDs

Basically a identifying relationship is one where the child is dependent upon the parent entity. Do not worry at this stage if you find the variety of lines offered confusing.

Now let's draw the line! Return to the drawing toolbar and select the identifying relationship tool:



Note that this is next to the selection tool button. The mouse cursor will take on the shape of a pen with a jagged line next to it.

Place the cursor over the Travel Agent entity and click the left mouse button once. Then position the cursor over the Reservation entity and click the left mouse button again. It is not necessary to hold the mouse button down while moving to the second entity.

A line representing the relationship will automatically be drawn between the two entities and a space will appear upon which the name of the relationship can be entered. Type the word **makes** as the title of this relationship. We would like to imply that the travel agent “makes” the reservation (or in this case, many reservations). The relationship name can be changed or corrected by editing the relationship as described next.

To edit the relationship, return to the tool bar and select the selection tool (the arrow). Right click on the relationship line and choose the Edit item from the pop-up menu. The Relationship dialog box will appear looking very similar to the one shown in Figure 19. Make any necessary changes to the names of the relationship and also add a relationship name for the reverse direction (called the Reverse Phrase).

Figure 19 Relationship dialog box (SA/SE 2001 version)

After defining an identifying relationship, the child entity (reservation) will be considered as a dependent of the parent entity (travel agent) and therefore will be presented by double border.

If a relationship is specified incorrectly (for example if it is drawn in the wrong direction or between the wrong entities), it can be deleted by highlighting the relationship with the select tool and by then pressing the Del (Delete) key on the keyboard (or by pulling down the Edit menu and choosing the Delete menu item).

Important:

To save the work completed thus far, press CTRL + S or pull down the File menu and choose the Save Diagram menu item. Click “Yes” when asked to confirm.

3.4. Completing the diagram

This is an exercise for you, an additional entity called Property will be created in the above diagram and then related to the existing Reservation entity. An outline of the steps follows:

- Use the Entity tool to add a new entity named “**Hotel Room**”. Place this below the Reservation entity.
- Add the following attributes to the Hotel Room entity:

Name	Primary Key (PK)	Data Type	Qualifier
Property_code	Yes	character	10
Unit_number	Yes	integer	10
unit_type	No	character	10
Owner_id	No	character	10

- Create an identifying relationship from Hotel Room to Reservation. Label this relationship “is reserved by” (reverse phrase is “a reservation for”)

The final result should look like the figure below.

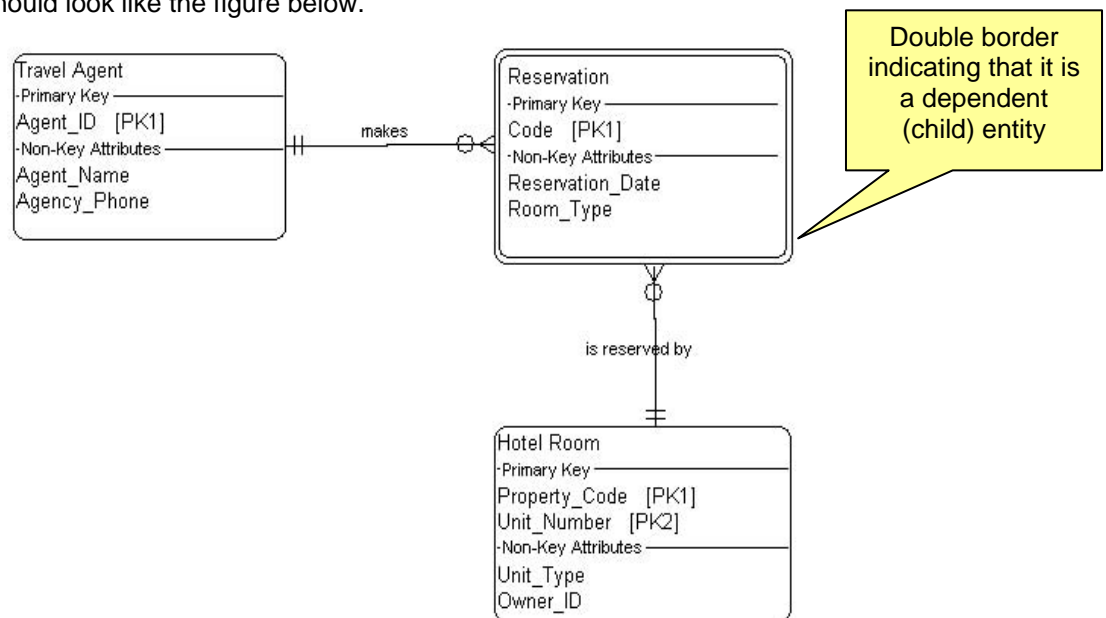


Figure 20 Completed Entity Relationship modelling exercise

You have now completed this tutorial, you can find additional exercises below along with tips and tricks in SA/SE.

Important:

To save the work completed thus far, press **CTRL + S** or pull down the **File** menu and choose the **Save Diagram** menu item. Click “**Yes**” when asked to confirm.

4. Exercises

You are urged to practice developing ERDs in system architect to gain experience. Here are some suggestions:

Convert the pen and paper exercises in the ERD tutorial at http://www.robinbt2.free-online.co.uk/virtualclassroom/chap11/s9/erds_1.pdf to SA/SE Erd's.

Work through the excellent data modelling tutorial in SA/SE. Besides the more up-to-date help file version, shown below, which has references to the student edition the PDF version can be used. I find this easier, printing it out and making notes on it while working at the computer, perhaps I'm just old fashioned! See figure 1 to see how to locate the pdf version, you should start at chapter 14 logical data modelling page 187.

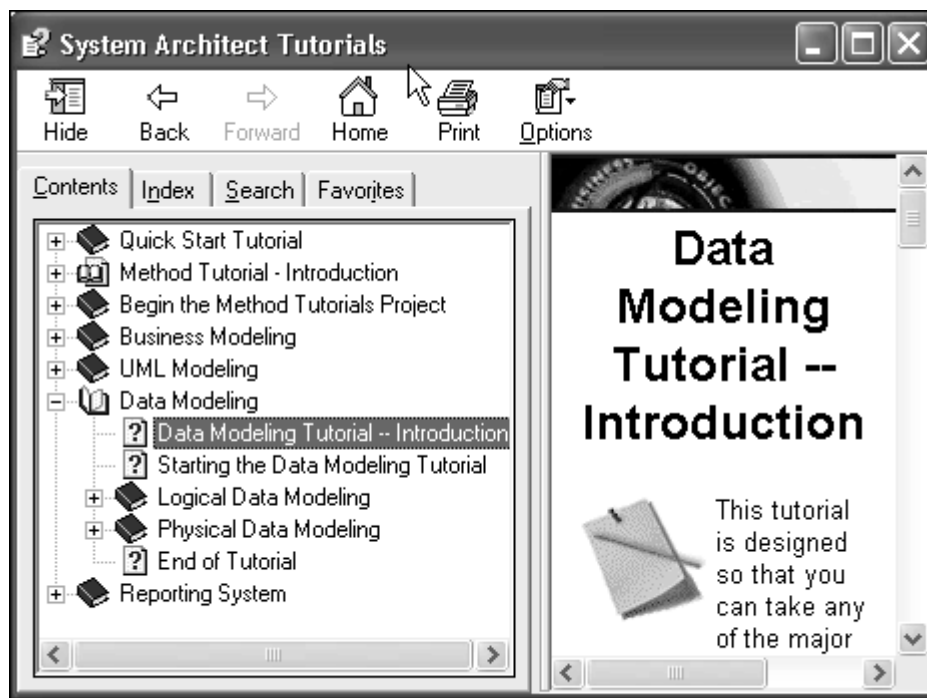


Figure 28 System Architect online help and the Data Modelling tutorial

5. Conclusions for this Tutorial

In this tutorial, you learnt the basic steps for creating and manipulating ERD's. The SA/SE product has an extensive number of additional model types as well as reporting tools. You should look at Popkin's web site (see references section below) and also the excellent documentation and tutorials that are part of SA/SE to find out more.

Most of this tutorial is the work of Dorothy Dologite and Richard Holowczak at the City University of New York you can see the original version at <http://cisnet.baruch.cuny.edu/holowczak/classes/>

The appendix contains useful tips for using SA/SE

Robin Beaumont 03/01/2004 13:00

6. Tips and tricks

6.1. Copying a diagram to a Word document

To copy an ER Diagram, or any type for that matter!

1. Open up the diagram
2. Pull down the **Edit** menu and choose the **Select All** menu item. This will highlight all of the entities and relationships in the diagram.
3. Pull down the **Edit** menu again and select the **Copy** menu item. This will place a copy of the diagram on the Windows clipboard in Enhanced Metafile format (this is usually the best format to use).
4. Switch over to MS Word or other word processor, pull down the Edit menu and select the Paste menu item.

If the picture is too large in your document, in SA/SE pull down the **edit** menu and select **Clipboard format** and select the required scale. Similarly you can also change the format of the picture using this option.

6.2. Changing the colours and fonts of diagrams

It is possible to change the background color, line color and fonts (type style and size) for virtually any object in any of the diagrams SA/SE provides. One reason to change some of the colours is that they may not print clearly on black and white printers or may not photocopy well.

To change the colours:

1. Open up any diagram and select an object (e.g., an Entity or a Function).
2. Pull down the **Format** menu, highlight the Symbol Style item
3. Choose **Colour** from the fly-out menu. Choose the colours for the outline Pen, background Fill and font colours by clicking on the appropriate **Colors** button.
4. Click the OK button when finished.

In a similar fashion, the font can be changed by pulling down the **Format** menu, highlighting the **Symbol Style** item and then by choosing **Font** from the fly-out menu.

To change the colours, fonts or other display attributes for a group of objects on a diagram, select multiple objects first (hold down the shift key while clicking on additional objects) and choose the appropriate menu item as described above.

6.3. Linking Diagrams

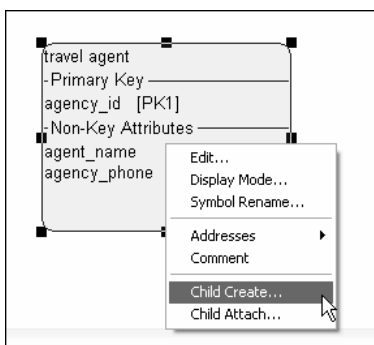


Figure 21

In the previous sections, we created and manipulated a single Entity Relationship diagram. However, there are often relationships among different diagrams. For example, a single ER diagram may represent only a few of the entities being modelled and some of the entities on the diagram may have links with others on another diagram or even a different type of diagram. Similarly an entity in one 'high level' diagram may be exploded ('nested') in another one to show more detail. Linking diagrams enables system analysis and designers to quickly navigate between relevant portions of each of the different types of diagrams as well as make the connections between the models explicit. You can easily link diagrams by Right mouse clicking on the object you wish to create the link from and then selecting either **child create** or **child attach**.

6.4. Project and Diagram Management

The SA/SE provides only four encyclopedias named, tutorial, examples and Project1 to Project4. It is possible to “install” additional projects such as those passed along by a team member or provided from the class instructor. In the following exercise, assume a .ZIP file containing all of the encyclopedia files for a project have been made available to the student and have been downloaded to the local users hard disk.

Make certain that SA/SE is not running

Make a backup of existing projects by using the Windows Explorer to navigate to the C:\Program Files\Poplin Software\System Architect student version\ directory (this is the default directory used during the installation). Copy the Project1 and Project2 directories to another disk or another directory on the same hard disk for safekeeping.

Use an unzip utility (such as WinZIP) to unzip the new project and its files. Again using Windows Explorer copy the set of files into the appropriate project directory such as C:\Program Files\Poplin Software\System student version\Project2

The next time SA/SE runs, it will find these new project encyclopedia files in this directory and will automatically make use of them.

6.5. Managing Diagrams within a Project

While working on a project, it is often desirable to save several different version of the same diagram. For example, before embarking on a series of major changes to a diagram, one might wish to save off the current version for safekeeping or to reference as the subsequent changes are made. This can be accomplished by using the Save Diagram As menu item on the File menu.

For example, suppose the designer wished to continue expanding the “Travel Agency 1” ER diagram created earlier in this tutorial while retaining the original. With this diagram open, pull down the File menu and choose the SaveDiagram As menu item. Provide a new name for this diagram (such as Travel Agency 2) and select the appropriate type of model as shown in the Figure below.

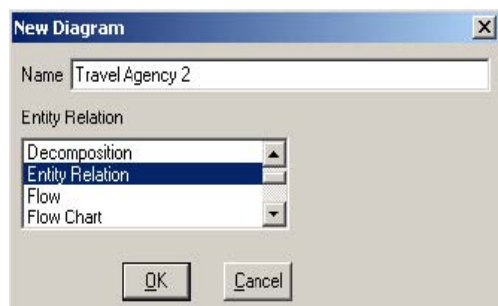


Figure 22

Once the name and type are chosen, click on the OK button. The Project Data Model dialog box may appear next. In this example, this new diagram will be saved in the same data model that was first created at the start of this tutorial (“Project Data Model 1”). This is shown in the Figure below. Click on the OK button and the newly named diagram will appear in the right hand window.

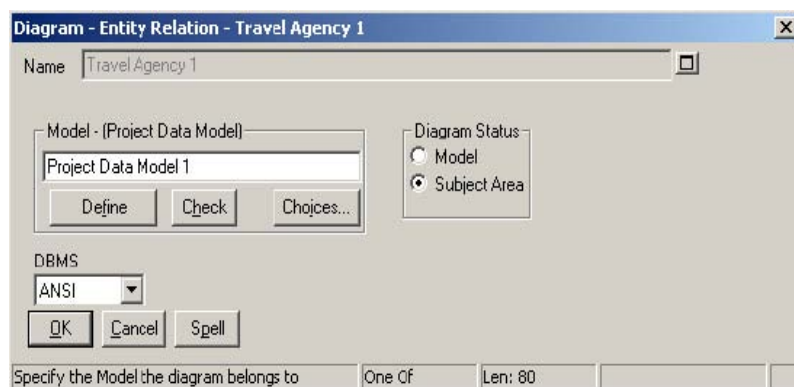


Figure 23

6.6. Additional Features of SA/SE

The SA/SE product has a vast number of features. In this section a collection of tips for using some of the more helpful features are briefly introduced.

1.1.1. ER Model Display Mode Options

In this tutorial an ER model was created that included the display of attributes with primary key descriptions. It is also possible to change how ER diagrams are displayed. Try the following exercise.

Open up the ER Diagram (Go to the All Methods tab, Diagrams, Entity Relation and then double click on the "Travel Agency 1" diagram).

Highlight/select one of the entities on the diagram, pull down the **View** menu and choose the **Display Options** menu item. The resulting dialog box is shown below. The display mode choices are as follows:

Entity Relation – Only entities with titles and relationships are shown

Key Based – Entities with titles and their identifiers (keys) with relationships are shown

Fully Attributed – Entities with all attributes including keys and relationships are shown

Physical – Same as Fully Attributes with the addition that data types for each attribute are shown

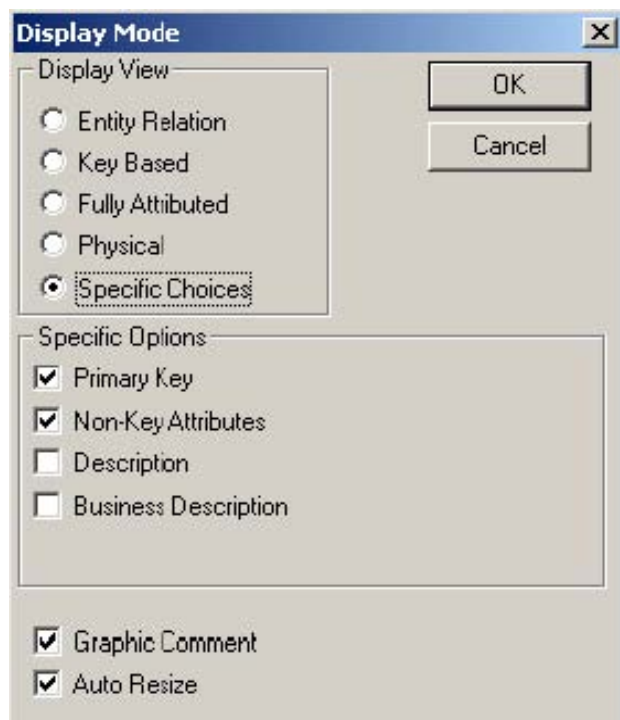


Figure 24

1.1.2. Including Foreign Keys in ER Diagrams

Foreign keys are general not shown in traditional ER modeling. However, prior to creating a physical data model based upon the conceptual ER model, the designer may wish to view how foreign keys will be propagated through the model. To perform this change in SA/SE:

1. Open up an ER Diagram and make certain the Fully Attributed display mode is set.
2. Pull down the Dictionary menu and select the Update FKs menu item.
3. A dialog box will appear showing a log of the changes made to the diagram. Upon dismissing this dialog box, the ER Diagram will redraw with the foreign keys in place.

To remove the foreign keys, pull down the Dictionary menu and select the Remove FKs menu item.

1.1.3. Changing the Symbol Style for ER Diagrams

The default symbol style for the ER diagrams is called the “Crow’s feet” notation. In this notation a single relationship line indicates a maximum relationship cardinality of “1” while the crows foot (three small lines at the end of the relationship line) indicates a maximum relationship cardinality of “Many”. There are other notations that explicitly give the minimal and maximal cardinalities in terms of number and in terms of other types of symbols. To change the notation used for the ER Diagram:

1. Open up the diagram
2. Pull down the **Format** menu, choose **Diagram style** and finally **Notation** from the flyout menu.
3. The Notation options dialog box is shown below. To see the differences in notation, try selecting C-Y (short for Coad-Yourdon) or Unified for example.

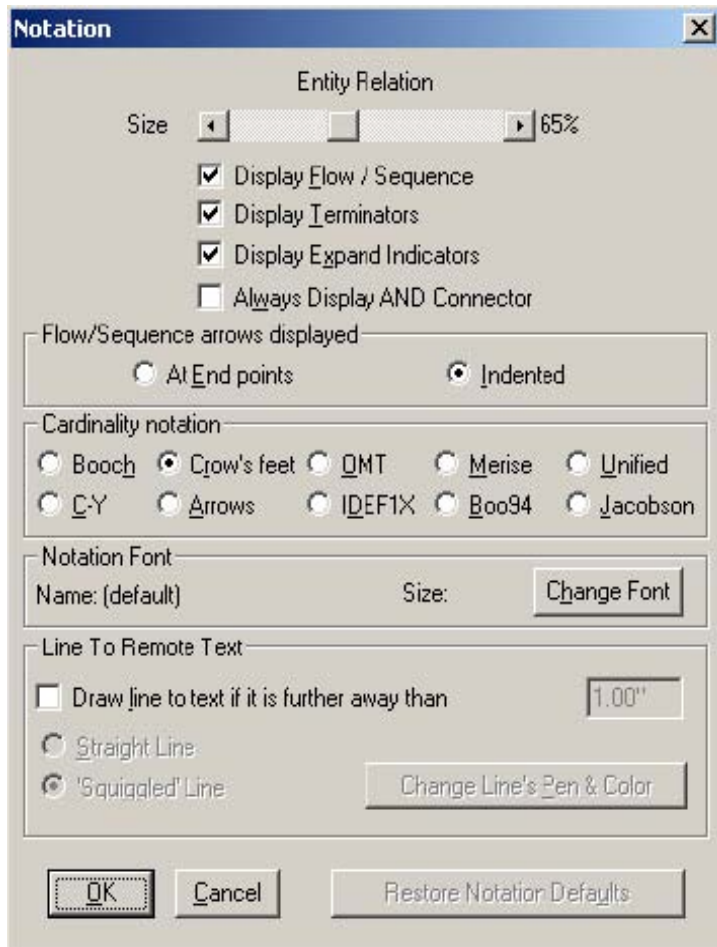


Figure 25

1.1.4. Adding Documentation to a Diagram

It is important to include documentation on each diagram so that they can be easily identified. Documentation can be easily and automatically added to any diagram using the “Doc Block” drawing tool (shown below). Open up any diagram and select the Doc Block icon or, pull down the Drawing menu and choose the Doc Block menu item. The cursor should change to a pen.

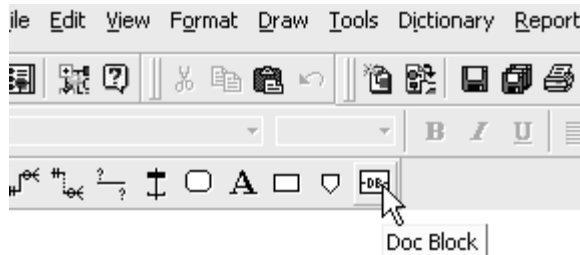


Figure 26

Find some open space on the diagram and click once. The documentation block is automatically added. Once created, the documentation block can be re-sized and re-positioned using the selection tool. Additional comments can be added by right-clicking on the block and choosing the Edit menu item from the pop-up menu as shown below.

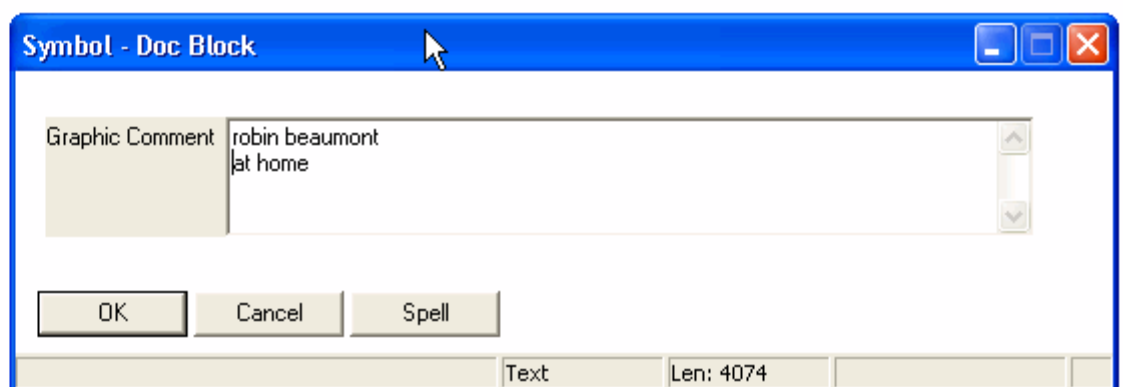
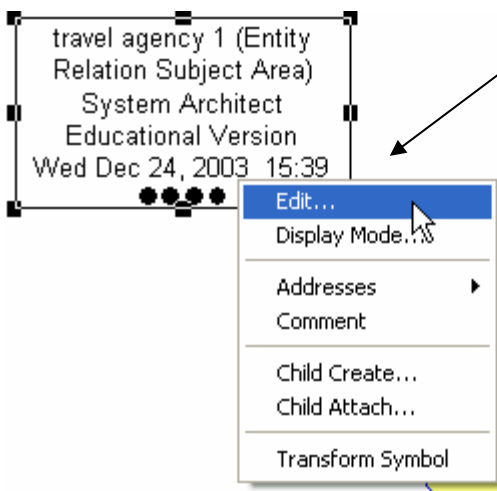



Figure 27

Robin Beaumont 24/12/2003 16:09



7. References

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Popkin System Architect Product Web Site: <http://www.popkin.com/>

Popkin System Student Edition – additional Help Files and Tutorials Web site: http://www.popkin.com/products/sa_student_edition/sa_student_edition.htm