Micro Focus®

Modernization Workbench™

Analyzing Projects

MICRO FOCUS®

Contents

Managing Tags

You use a simple tagging language to identify workspace objects as members of functional, structural, or other types of groupings. After you set up these groupings, you can chart them in EV or "black-box" them in the Diagrammer.

Each member of a grouping is identified by a tag, "Payroll," for example. Each grouping can, in turn, reference a more inclusive grouping, "HR," for instance. The figure below shows the tag hierarchy for a typical enterprise:
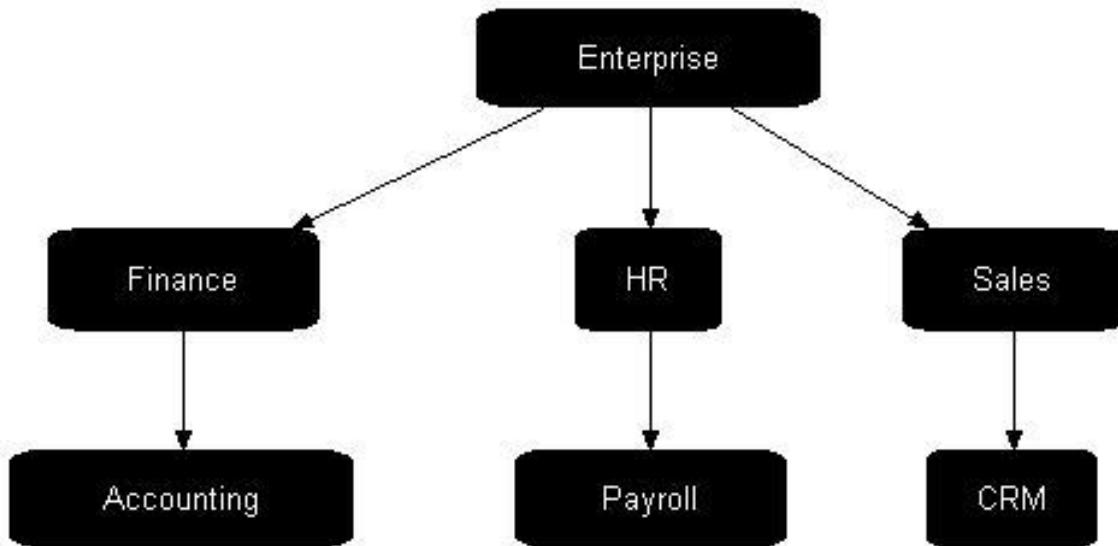
In fact, this is the default tag structure that ships with MW. The "Enterprise" tag is the root of the structure. The "Finance," "HR," and "Sales" tags represent departments in the enterprise. The "Accounting," "Payroll," and "CRM" tags are the applications owned by the departments.

Understanding the Tag Manager Window

Use the Tag Manager to create and assign tags to objects, and create relationships between tags. To open the Tag Manager, choose **Analyze > Tag Manager**.

The figure below shows the Tag Manager window. The Objects List pane shows repository objects and their tags. Your selections in the other Tag Manager panes filter the objects displayed in the Objects List pane.

By default, all Tag Manager panes are displayed. Select the appropriate choice in the **View** menu to hide a pane. Select the choice again to show the pane.
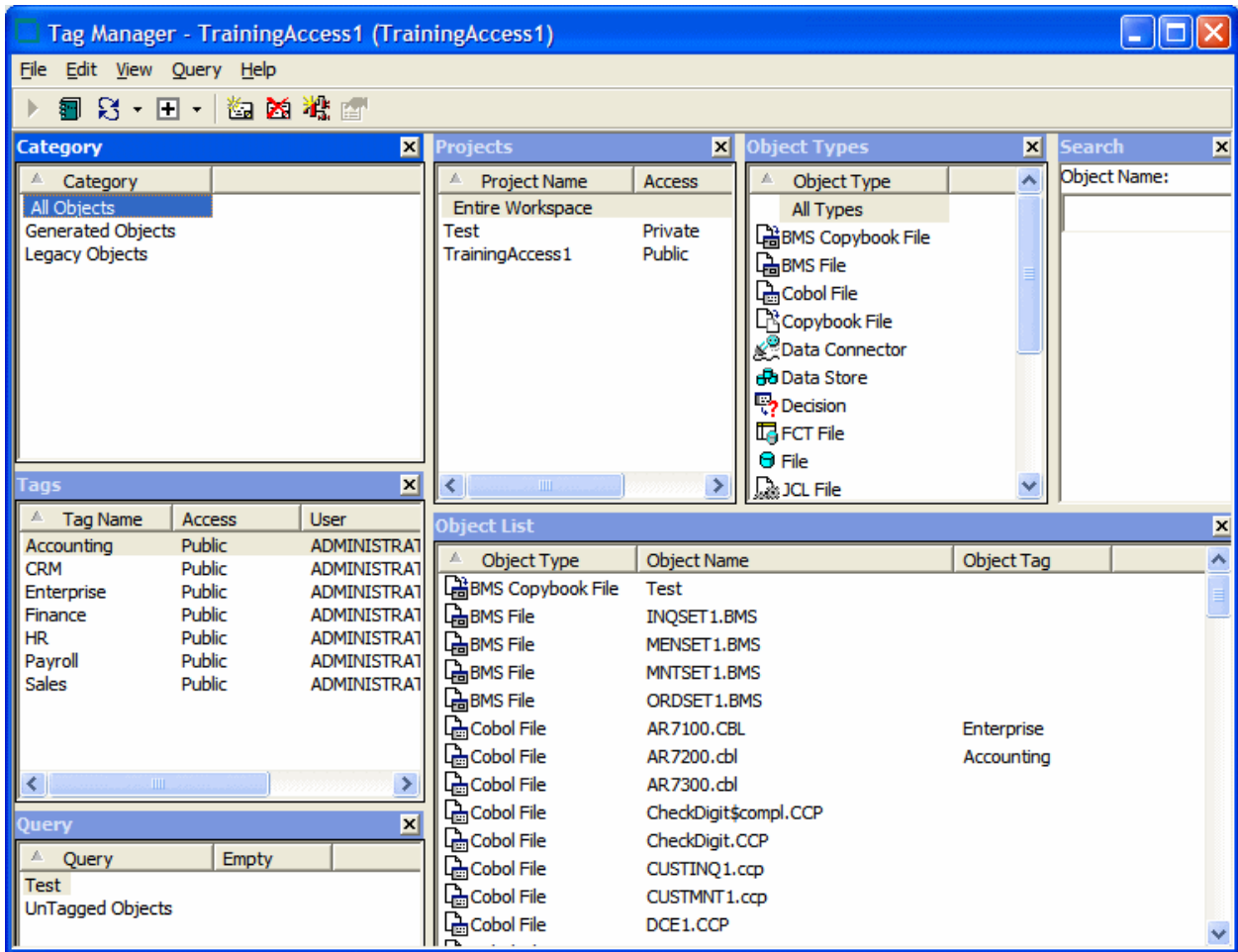
Object List Pane

The Object List pane displays workspace objects filtered by your selections in the Category, Project, Object Types, Search, and/or Query panes; or by your selections in the Tags pane.

By default, the Object List pane displays up to 100 repository objects and their tags. Click the ▼ button next to the ⊞ icon on the toolbar and choose:

- **More Objects** in the drop-down menu to display the next 100 objects that match the filter criteria.
- **All Objects** in the drop-down menu to display all the objects that match the filter criteria.

Category Pane

The Category pane displays the categories you can use to filter objects in the Object List pane:

- All Objects comprises source and generated objects in the workspace.
- Generated Objects comprises generated objects in the workspace.
- Legacy Objects comprises source objects in the workspace.

Projects Pane

The Projects pane displays the workspace projects you can use to filter objects in the Object List pane. Entire Workspace comprises all the projects in the workspace.

Object Types Pane

The Object Types pane displays the objects types you can use to filter objects in the Object List pane.

Search Pane

The Search pane lets you filter the objects in the Object List pane using wildcard patterns allowed in LIKE statements by Visual Basic for Applications (VBA). Enter the pattern in the **Object Name** field. The Object List pane is refreshed as you type.

Note: In large repositories, the Object List pane may not immediately refresh as you type. Press the Enter key to instantly display matching objects for the current string.

Query Pane

The Query pane lets you filter the objects in the Object List pane using complex queries. Select a query to filter the Object List by its terms. Select another query and choose:

*   **Add Tags > with <And>** in the right-click menu to AND its results with the results of previous queries.
*   **Add Tags > with <Or>** in the right-click menu to OR its results with the results of previous queries.

Tags Pane

The Tags pane lists the tags in the workspace. Select one or more tags to display the objects assigned the tags in the Object List pane.

Creating Tags

To create a tag, choose **Edit > Create** in the Tag Manager window. A dialog box prompts you to enter the name of the new tag. Enter the name and click **OK**. The tag is displayed in the Tags pane.

Specifying Access to Tags

By default, the tags you create are public. To make a tag private, that is, visible only to you, select it and choose **Set Access > Private** in the right-click menu. To make the tag public again, choose **Set Access > Public** in the right-click menu.

Note: Tags shipped with the workbench are always public. You cannot change their access.

Assigning Tags

You can assign tags to objects individually, or to all the objects generated from a source file. You can also assign tags to objects in the Repository pane, by selecting the objects and choosing **Assign/Remove Tags** in the right-click menu. Select a project or folder to assign tags to every first-level object in the project or folder.

1. In the Object List pane, select the object(s) you want to assign a tag and choose **Edit > Assign/Remove Tags**. The Entity Tag Browser window opens.
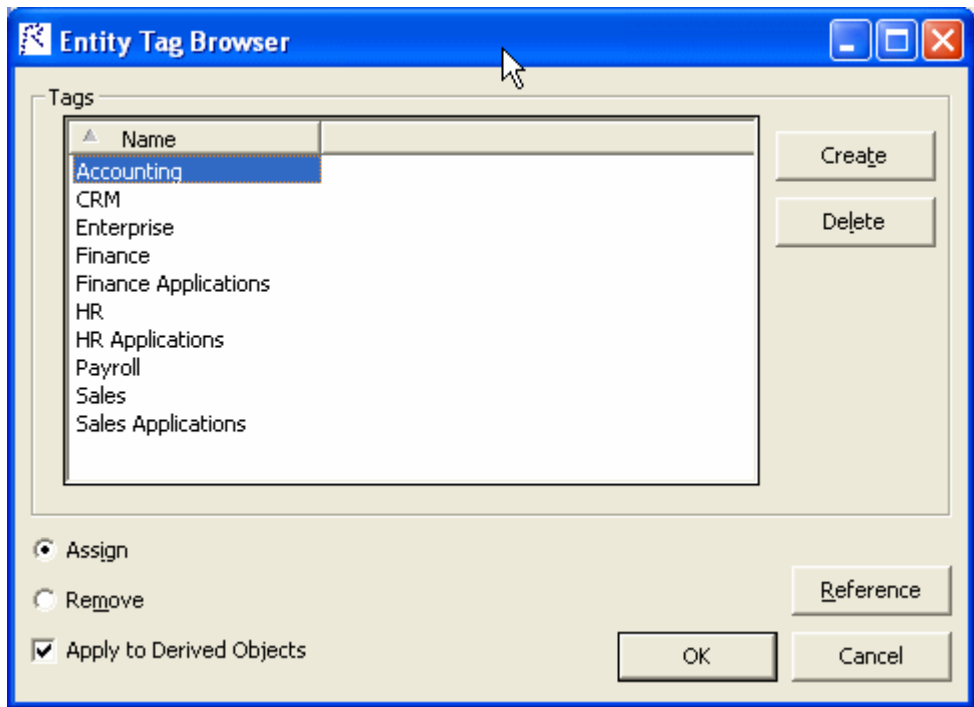
2. In the Entity Tag Browser window, select the tag(s) you want to assign and click the **Assign** button.
3. If you are assigning a tag to a legacy source file, check **Apply to Derived Objects** to assign the selected tag(s) to all objects generated from the source file.
4. Click **OK** to assign the selected tags.

The Object Tag column for the selected object(s) is updated to show the assigned tag(s) in the Objects List pane.

Removing Tags

Removing a tag simply "unassigns" the tag from the selected object. The tag is not deleted from the repository. You can also remove tags from objects in the Repository pane, by selecting the objects and choosing **Assign/Remove Tags** in the right-click menu. Select a project or folder to remove tags from every first-level object in the project or folder.

1. In the Object List pane, select the object(s) for which you want to remove tags and choose **Edit > Assign/Remove Tags**. The Entity Tag Browser window opens.
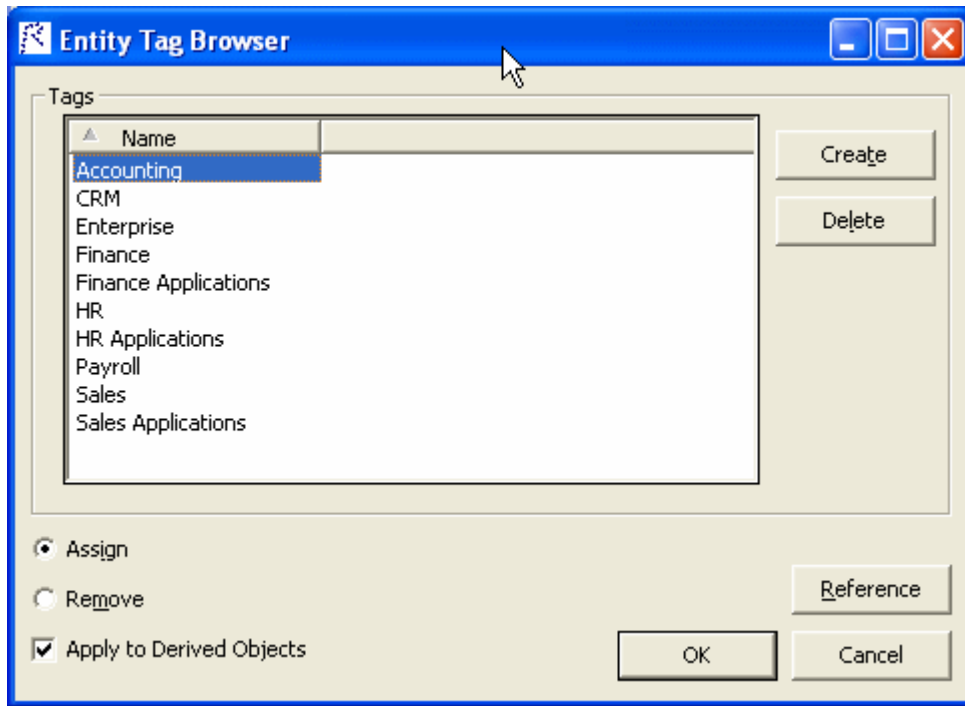
2. In the Entity Tag Browser window, select the tag(s) you want to remove and click the **Remove** button.
3. If you are removing a tag from a legacy source file, check **Apply to Derived Objects** to remove the selected tag(s) from all objects generated from the source file.
4. Click **OK** to remove the selected tags.

The Object Tag column for the selected object(s) is updated in the Objects List pane.

Creating Relationships Between Tags

The relationships between tags define the tag hierarchy. Create relationships between tags as described below.

1. Choose **Edit > Reference** in the Tag Manager window. The References window opens.
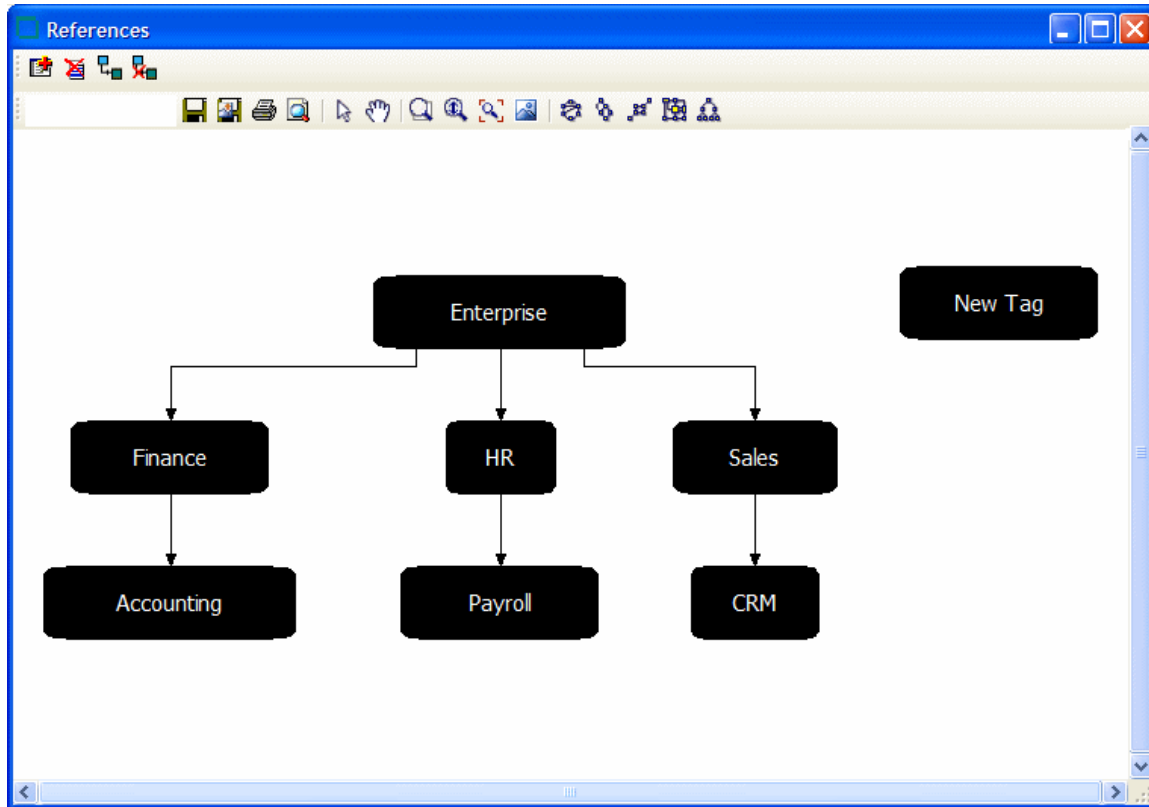
2. In the References window, click the ⬚ button on the toolbar.

3. The Select dialog opens. Select the tags you want to create relationships between and click **OK**.

> 🖉 **Note:** You can also draw relationships between tags by clicking the 🖼 button on the toolbar. Select the first tag in the relationship and drag the mouse to the second tag in the relationship, then release the mouse button. See the Diagrammer help for instructions on how to use the other diagramming functions in the References window.

The tool draws a line between the referenced tags. To delete a relationship line, select it and click the 🗙 button on the toolbar.

Deleting Tags

To delete tags from the repository, select them in the Tags pane and choose **Edit > Delete Tags**. You can also delete tags in the References window, by selecting them and clicking the 🗙 button on the toolbar.

Creating Tag Queries

Use tag queries to filter the objects in the Object List pane in more complex ways than the other panes allow. Create a tag query as described below.

1. Choose **Query > New Query** in the Tag Manager window. A dialog box prompts you to enter the name of the new query. Enter the name and click **OK**. The query is displayed in the Query pane.

2. Select the query in the Query pane and choose **Query > Edit Query**. The Query window opens.
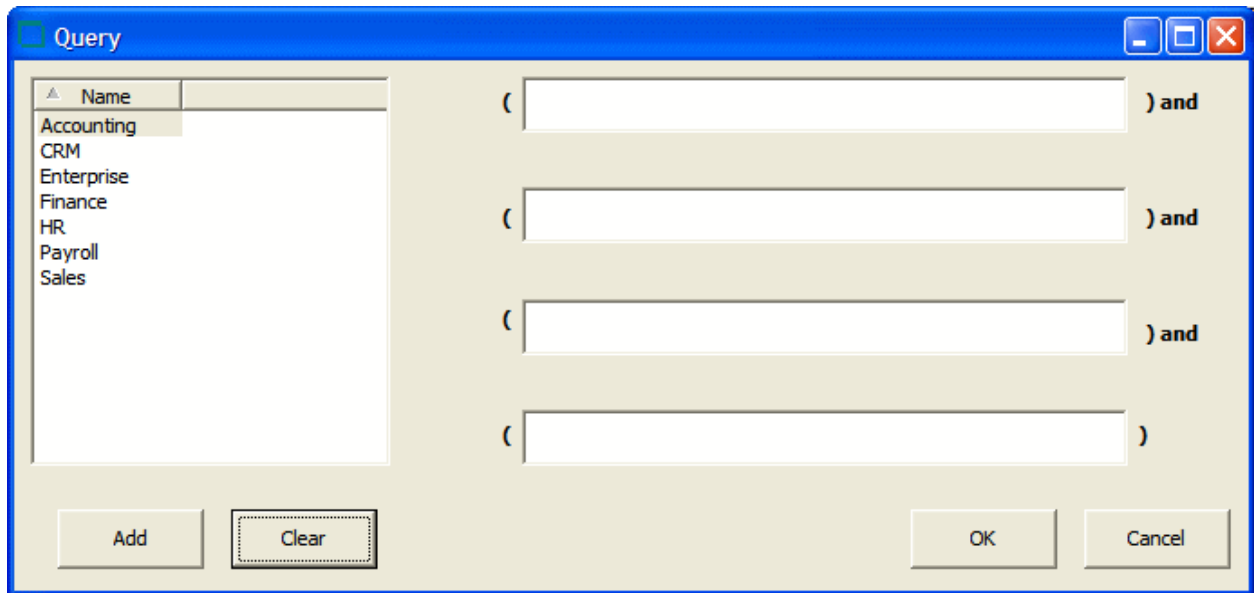
3. Define the terms of the query. Click in the term field you want to define, then select the tag you want to add to the term definition and click **Add**. Tags added to the same term are ORed. Tags added to a different term are ANDed. Click **Clear** to clear the term definition.

4. When you are satisfied with the query definition, click **OK**.

Deleting Tag Queries

To delete a tag query, select it and choose **Delete** in the right-click menu.

Refreshing the Tag Manager Window

To refresh the Tag Manager window with the latest information from the repository, including changes made by other users, click the ▾ button next to the ⟳ button on the toolbar and choose **Refresh** in the drop-down menu. If objects have been deleted from the repository, they will remain visible in the Object List pane until you clean up the Tag Manager window.

Cleaning Up the Tag Manager Window

When objects are deleted from the repository, Tag Manager continues to display them in the Object List pane until you *clean up* the Tag Manager window. To clean up the window, click the ▾ button next to the ⟳ button on the toolbar and choose **Clean Up** in the drop-down menu.

Note: This feature is only available to master users. Running a clean up may take several minutes, depending on the size of your repository.

Generating Reports

To generate an HTML report for all objects currently displayed in the Object List pane, choose **File > Save Report**.

Analyzing Relationship Flows

Use the Diagrammer to view the relationships between objects in a scope, a data flow or call map, for example. These relationships describe the ways in which objects in the scope interact. In the data flow fragment below, for example, the GSS2 program reads the file GSS2.STATEMS. The file, in turn, is assigned to the CXXCP.OPK00.SNFILE data store.
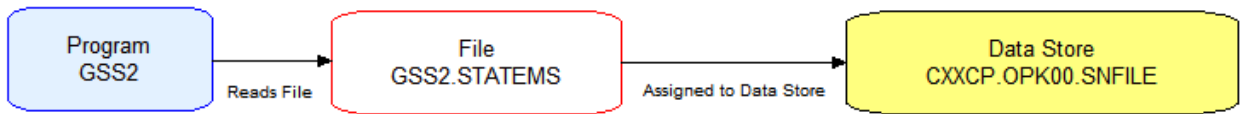
The Diagrammer's high-level analysis of relationships lets you quickly trace the flow of information in an application. You can use it to view program to program calls; program, transaction, and screen flows; job, program, and data store flows; and much more.

Understanding Relationship Flow Diagrams

Relationship flow diagrams use boxes and lines to show the relationships between objects in a scope. Depending on the Diagrammer mode, you can display the relationships for:

- All the objects in the selected project.
- Only the objects you copy and paste onto the canvas.

In each mode, all related workspace objects are included in the diagram. In copy-and-paste mode, you can add objects to an existing diagram and expand the diagram one level at a time.

Objects are color-coded, based on a color scheme of your choosing. If you have assigned business names to objects, their business names appear in the diagram as well as their technical names. You can "black-box" items in higher-level groupings that make it easy to visualize their roles in your application, cluster highly related objects, filter drivers and utilities, and much more.

Understanding Diagram Scopes

The *scope* of a diagram determines the relationships it displays. To view a diagram of the relationships, select the scope in the **Scope** drop-down and choose **Scope > View Scope**.

The Diagrammer provides default scopes that you can use for most analysis tasks, but you can create your own scopes if you like. You might want to exclude data stores from a data flow, or include source files in a call map. Use the Scope Editor to create your own scopes.

Understanding Diagram Layouts

Diagrammer layout styles are designed to produce aesthetically pleasing, easy-to-understand diagrams for a wide variety of needs. To choose a layout style, click the ▼ symbol on the button for the active layout style, then select the layout style in the drop-down menu. The following styles are available:

• The *symmetric* layout style (the default) organizes nodes based on symmetries detected in their relationships. Click the ⬡ button to choose the symmetric layout style.

  🖉 **Note:** The symmetric style typically offers the best performance for very large diagrams.

• The *hierarchical* layout style organizes nodes in precedence relationships, with levels for parent and child object types. Click the ✧ button to choose the hierarchical layout style.

• The *orthogonal* layout style organizes nodes in relationships drawn with horizontal and vertical lines only. Click the ⬚ button to choose the orthogonal layout style.

• The *tree* layout style organizes nodes in parent-child relationships, with child nodes arranged on levels farther from the root node than their parents. Click the ⬦ button to choose the tree layout style.

• The *circular* layout style organizes nodes in clusters of related objects. Click the ⬤ button to choose the circular layout style.

Click a layout style button in the drop-down to change the style after a diagram is drawn.

Generating a Diagram for the Selected Project

Follow the instructions below to generate a relationship flow diagram for the selected project. You can exclude related workspace objects that are not in the project, colorize project boundaries, and show incomplete relationship chains. You can use tags to "black-box" objects in the diagram.

1. In the **Scope** drop-down, choose the scope of the diagram.
2. On the Diagram pane tool bar, choose the layout style for the diagram.
3. in the **Project** drop-down or Browser pane, select the project.
4. Click the ⬚ button on the Diagrammer tool bar

Generating a Diagram for Objects Copied and Pasted onto the Canvas

Follow the instructions below to generate a relationship flow diagram for objects copied and pasted onto the canvas. In this mode, you can expand the diagram one level at a time and add objects to an existing diagram. You can exclude related workspace objects that are not in the project, colorize project boundaries, and show incomplete relationship chains. You can use tags to "black-box" objects in the diagram.

1. In the **Scope** drop-down, choose the scope of the diagram.
2. On the Diagram pane tool bar, choose the layout style for the diagram.
3. in the Browser pane, select the startup objects for the diagram, then press CTRL-C to copy them onto the clipboard.

   > **Note:** Make sure to select startup objects in the diagram's intended scope. Most scopes include logical objects rather than source files.

4. To show the entire relationship flow for the selected objects, choose **View > Auto Expand**. Turn off **Auto Expand** if you want to expand the diagram one level at a time after it is drawn. Only immediate relationships of the selected objects are drawn initially.
5. Click in the Diagram pane, then choose **Diagram > Paste** or press CTRL-V to paste the objects onto the Diagrammer canvas.
6. Repeat the preceding step for each object whose relationships you want to add to the diagram. The diagram is automatically redrawn.

Understanding the Diagrammer Window

Use the Diagrammer to view the relationships between application objects interactively. To open the Diagrammer, select a project in the Repository Browser and choose **Analyze > Diagram**.

The figure below shows the Diagrammer window. By default, all Diagrammer panes are displayed. Select the appropriate choice in the **View** menu to hide a pane. Select the choice again to show the pane.
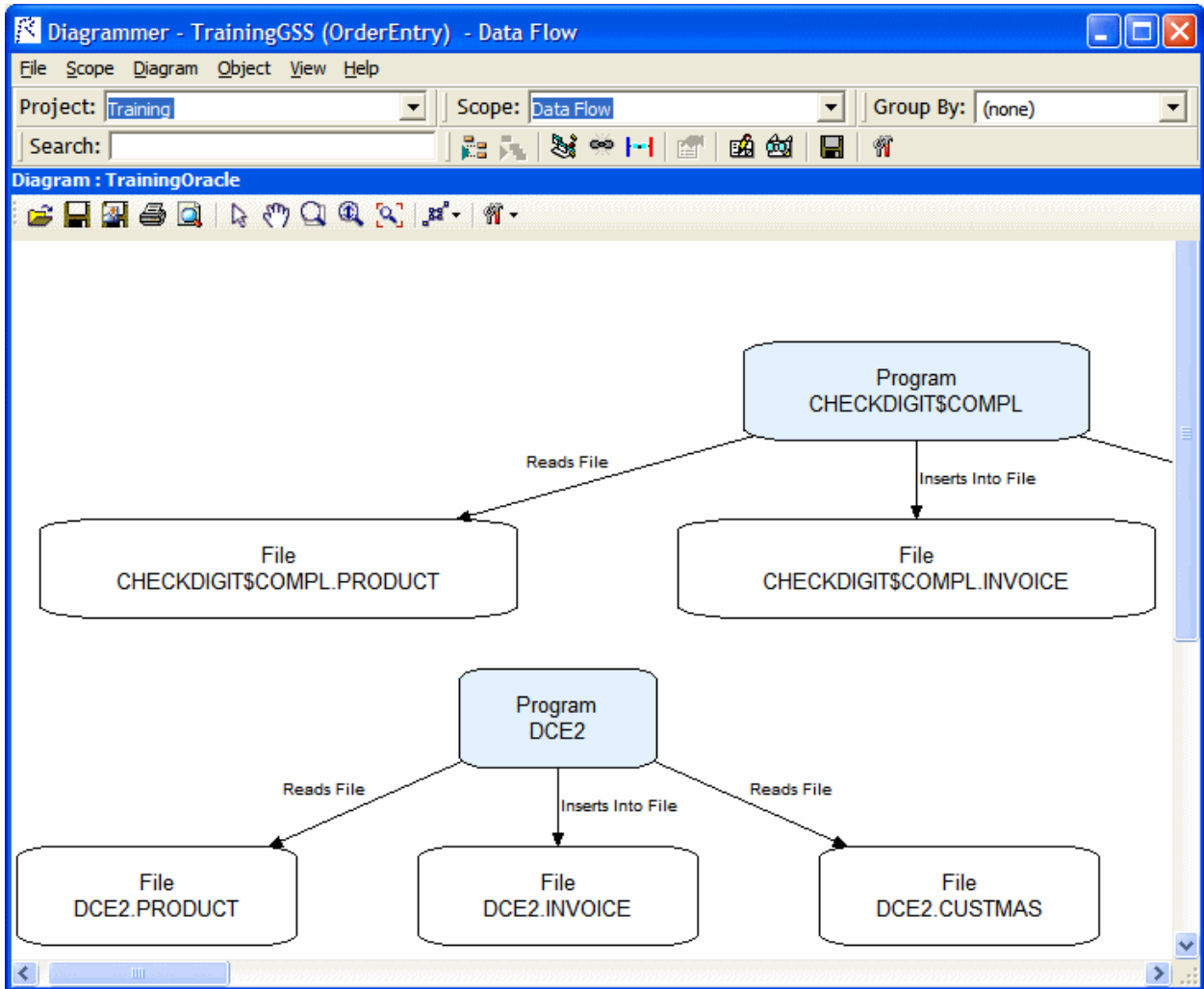
Diagram Pane

The Diagram pane displays the diagram for the selected scope. To save a diagram in one of the supported diagram formats, click the 🖫 on the Diagram pane tool bar. To save a diagram in one of the supported image formats, click the 🖼 on the Diagram pane tool bar.

To print a diagram, click the 🖨 button on the Diagram pane tool bar. To preview the printed diagram, click the 🔍 button on the Diagram pane tool bar.

Selecting an Object or Relationship

To enable select mode, click the 🖱 button on the Diagram pane tool bar.

- To select an object in a diagram, click it on the diagram canvas. Use Ctrl-click to select multiple objects, or click a blank area of the canvas, then drag the mouse over multiple objects to "lasso" the objects. Selected objects are displayed with handles that you can use to size the object.
- To select a relationship in a diagram, click it on the diagram canvas. The selected relationship is displayed in blue.

Searching for an Object

To search for an object in a diagram, enter the text you want to match in the **Search** field on the Diagrammer tool bar and press Enter. You can use wildcard patterns allowed in LIKE statements by Visual Basic for Applications (VBA).

Navigating to an Object from a Relationship

To navigate to the diagram object on the left side of a relationship, select the relationship and choose **Locate Left** in the right-click menu. To navigate to the diagram object on the right side of a relationship, select the relationship and choose **Locate Right** in the right-click menu.

Note: Use the Overview pane to navigate to general locations in a diagram.

Expanding and Collapsing Relationships

To expand the incoming relationships for an object in a diagram generated in copy-and-paste mode, select the object on the diagram canvas and choose **Expand > Expand Incoming** in the right-click menu. To expand the outgoing relationships, select the object on the diagram canvas and choose **Expand > Expand Outgoing** in the right-click menu.

To collapse the incoming relationships for an object, select the object on the diagram canvas and choose **Collapse > Collapse Incoming** in the right-click menu. To expand the outgoing relationships, select the object on the diagram canvas and choose **Collapse > Collapse Outgoing** in the right-click menu.

Moving an Object or Relationship

To move an object or relationship in a diagram, select it and drag it to the desired location on the diagram canvas.

Resizing an Object

To resize an object in a diagram, select it on the diagram canvas and drag one of its handles to the desired location.

Hiding an Object

To hide objects on the canvas, select an object and choose:

- **Hide > Selected** in the right-click menu to hide the selected object.
- **Hide > Incoming** in the right-click menu to hide incoming nodes of the selected object.
- **Hide > Outgoing** in the right-click menu to hide outgoing nodes of the selected object.

To display the object again, double-click the ➕ button for a related object.

Deleting an Object or Relationship

To delete an object in a diagram, select the object on the diagram canvas and choose **Delete Node** in the right-click menu. To delete a relationship in a diagram, select the relationship on the diagram canvas and choose **Delete Edge** in the right-click menu.

Assigning Tags

You can assign tags manually in Diagrammer or automatically, to all the objects in a cluster. Follow the instructions below to assign tags manually.

1. Select the objects you want to assign tags on the diagram canvas and choose **Assign Tags** in the right-click menu. The Entity Tag Browser window opens.
2. In the Entity Tag Browser window, select the tag(s) you want to assign and click the **Assign** button.
3. If you are assigning a tag to a legacy source file, check **Apply to Derived Objects** to assign the selected tag(s) to all objects generated from the source file.
4. Click **OK** to assign the selected tags.

Assigning Business Names

To assign a business name and business description to an object, select the object and choose **Set Business Attributes** in the right-click menu. A dialog box opens, where you can enter the business name and business description. To unassign a business name or business description, simply delete the value in the dialog box.

Note: If multiple objects are selected, Diagrammer displays the dialog box as many times as there are objects.

Displaying Labels for Multiple Relationships

The Diagrammer denotes that an object has multiple relationships with another object by displaying a number in parentheses (*n*) along the relationship line, where *n* represents the number of relationships. Double-click the parenthesis to display the relationship labels. Double-click the relationship labels to hide them again.

Hiding Relationship Labels

To hide relationship labels on the canvas, click the button on the tool bar and choose **Hide Relationship Labels** in the drop-down menu. To show the relationship labels again, click the button on the tool bar and choose **Show Relationship Labels** in the drop-down menu. To show hidden nodes as well as hidden relationship labels, click the button on the tool bar and choose **Unhide All** in the drop-down menu.

Displaying the Legend for a Diagram

To display the legend for a diagram, click the button on the tool bar and choose **Show Legend** in the drop-down menu.

Zooming

To zoom in interactive mode, click button on the Diagram pane tool bar, then drag the mouse over the diagram to zoom on it.

To zoom in marquee mode, click button on the Diagram pane tool bar, then drag the mouse over the diagram to draw a marquee. The Diagrammer displays the portion of the diagram inside the marquee.

To fit the diagram in the Diagram pane, click the button on the Diagram pane tool bar.

Moving a Diagram

To move a diagram in the Diagram pane, click the button on the Diagram pane tool bar to choose panning mode, then hold down the left mouse button and drag the mouse to move the diagram.

Clearing a Diagram

To clear the Diagram pane, choose **Diagram > Clear**.

Saving a Diagram

Click the button on the Diagram pane tool bar to save a diagram in one of the supported image types. A Save As dialog opens, where you can specify the image type and characteristics. Click the button on the Diagram pane tool bar to save a diagram in one of the supported diagram types. A Save dialog opens, where you can specify the name, type, and location of the file.

Printing a Diagram

Click the button on the Diagram pane tool bar to print a diagram. A Print dialog opens, where you can specify the properties of the print job. Click the button to preview the printed diagram.

Generating Diagram Reports

Choose **File > Save** *Type* **Report** to display a printable report based on a diagram. Choose **File > Save Blackbox Interface Report** to display a printable report showing the relationship of black boxes in a diagram to each other and to other diagram objects. In the printable report, click **Print** to print the report. Click **Save** to export the report to HTML, Excel, RTF, Word, or formatted text.

Browser Pane

The Browser pane displays the workspace repository in tree form. The current project is expanded one level when you first open the Diagrammer.

Note: To improve Diagrammer startup performance in your next session, hide the Browser pane before you end your current session. Click the close box in the upper righthand corner to hide the pane. To show the pane again, choose **View > Browser**.

Relationships Pane

The Relationships pane displays the relationships in the selected scope, as they appear from left to right in the diagram. Select the relationship for an object in the Relationships pane to navigate to the object in the Diagram pane.

The list includes relationship chains, or *composite relationships*, such as Program[IsDefinedInCobol]Cobol[Includes]Copybook[GeneratesTargetXml]TargetXML. If you chose **View > Potential Incomplete Composite Relationships** when you drew the diagram, the list shows incomplete relationship chains, in which the final object in the chain is unresolved or otherwise unavailable.

Quick View Pane

The Quick View pane lets you browse HyperView information for the object selected in the Diagram pane. The information available depends on the type of object selected. You see only source code for a copybook, for example, but full HyperView information for a program. Choose the information you want to view for the object from the drop-down in the upper lefthand corner of the pane.

Overview Pane

The Overview pane lets you navigate to a general location in a diagram. It displays the entire diagram, with a frame surrounding the portion of the diagram visible in the Diagram pane. Drag the frame to the area of the diagram you want to view in the Diagram pane. Diagrammer displays the selected area in the Diagram pane.

Excluding Objects Outside the Project

To restrict the diagram to related objects in the current project, choose **View > Exclude Objects Outside Project**. Otherwise, all related workspace objects are included in the diagram.

Showing Incomplete Composite Relationships

A *composite relationship* defines the indirect interaction of two objects. If a job runs a program entry point that belongs to a program, for example, the relationship between the job and program is said to be composite: defined by the chain of relationships between the job and program.

To show incomplete relationship chains in the diagram and list of relationships, choose **View > Potential Incomplete Composite Relationships**. Intermediate objects in the chain are displayed even if the final object in the chain is unresolved or otherwise unavailable. Relationships are displayed in red in the diagram.

Colorizing Project Boundaries

Boundary objects are objects with relationships to objects outside the project. To colorize boundary objects in the diagram, choose **View > Project Boundary Entities**. Boundary objects are displayed in the diagram with a red border. Related external objects are displayed in the diagram with a blue border.

Showing and Hiding Object Labels

The **View > Show in Label** menu choice controls the labels displayed for objects in a diagram. Choose:

- **View > Show in Label > Show Type** to display the type of an object in its label.
- **View > Show in Label > Show Name** to display the name of an object in its label.
- **View > Show in Label > Show Business Name** to display the business name of an object in its label.
- **View > Show in Label > Show Business Description** to display the business description of an object in its label.

A check mark next to a choice means that the label will be displayed. The choices are toggles. Click the choice again to hide the information in the label.

Working with Groups

Grouping objects reduces diagram clutter and makes it easy to visualize the roles of the grouped objects in your application. Groups are automatically created when you black-box tagged objects and when you filter or cluster objects.

Grouping and Ungrouping Objects

To group objects manually, select the objects on the diagram canvas, then click the button on the tool bar and choose **Group Selected** in the drop-down menu. Inclusive groups are allowed.

To ungroup objects, select the group on the diagram canvas, then click the button on the tool bar and choose **Ungroup Selected** in the drop-down menu.

Expanding and Collapsing Groups

Expand a group to view its contents. Collapse a group to hide its contents.

- If a group is collapsed (including a group in a more inclusive group), double-click it to expand its contents. To expand all the groups in an inclusive group, select the group on the diagram canvas, then click the ![icon] button on the tool bar and choose **Expand Groups** in the drop-down menu.
- If a group is expanded (including a group in a more inclusive group), double-click it to collapse it. To collapse all the groups in an inclusive group, select the group on the diagram canvas, then click the ![icon] button on the tool bar and choose **Collapse Groups** in the drop-down menu.

To view a diagram consisting only of objects in a group, select the group and choose **Navigate to Child Diagram** in the right-click menu. To restore the full diagram, click the ![icon] button on the tool bar and choose **Return to Parent** in the drop-down menu.

Moving Objects Between Groups

To move objects between groups, expand the groups, then click the ![icon] button on the toolbar. Select the object you want to move and drag it to the new group.

Naming Groups

To rename a group, select it and choose **Rename Group** in the right-click menu.

Note: The name does not persist after ungrouping. You cannot rename a black box.

Deleting Groups

To delete a group, select it and choose **Delete Group** in the right-click menu. You are prompted to confirm the deletion. Click **Yes**.

Black-Boxing Tagged Objects

The deeper your understanding of your application, the more confidently you can abstract from its lower-level details to a "bigger picture" view, one that organizes related programs in functional, structural, or other types of groupings: a Customer Maintenance subsystem, for example, in an Order Acceptance application. This is the kind of view a subject matter expert uses to evaluate whether an application does everything it is supposed to do, in the appropriate order.

The Diagrammer *black-box* feature lets you assign lower-level objects to higher-level groupings that make it easy to visualize their roles in your application. Your diagram might have one black box for the Customer Maintenance subsystem, another for the Order Entry subsystem, and so forth. Because the details of these relationships are hidden in the black box until you need to view them, the subject matter expert can home in quickly on the higher-order functions you have abstracted from them.

You use the Tag Manager to identify the items in each higher-level grouping. Each grouping can, in turn, reference a more inclusive grouping. If you assign the Customer Maintenance tag to one set of programs, for example, and the Order Entry tag to another, and both tags reference the Application Functions tag, then when you choose Application Functions in the Diagrammer **Group By** drop-down, the Diagrammer puts the

programs in black boxes named Application Functions Customer Maintenance and Application Functions Order Entry.

1. To black-box objects in a diagram, choose the tag for the objects in the **Group By** drop-down.

   🖉 **Note:** To show only top-level tags in the drop-down, choose **View > Root Tags Only**.

2. Generate the diagram in project or copy-and-paste mode. The figure below shows expected results.
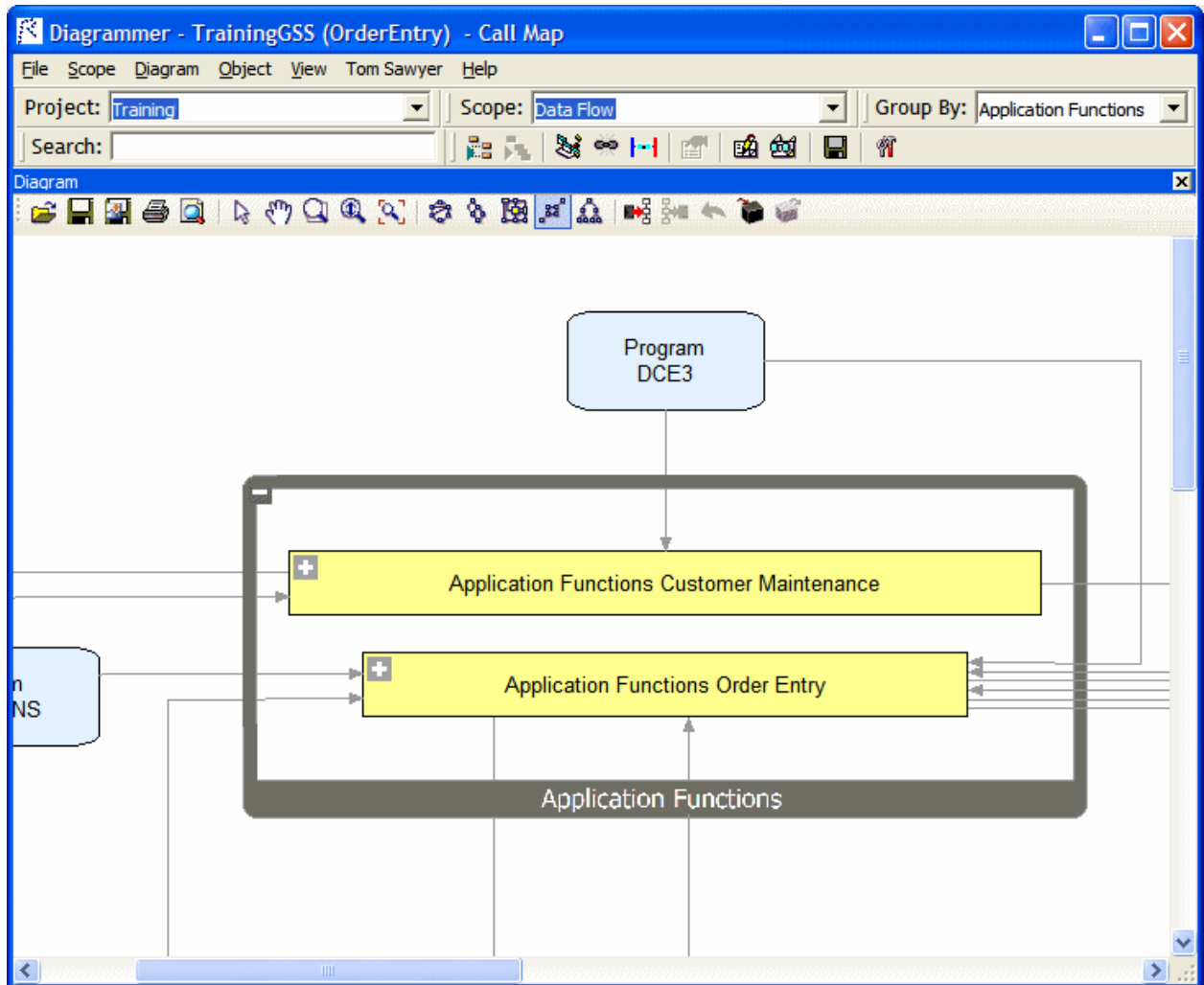
Filtering Objects

A *driver* is an object with many outputs, a startup program, for example. A *utility* is an object with many inputs, DATEFMT, for example. Filtering drivers and utilities from large diagrams reduces diagram clutter and typically provides a better picture of what your application does.

You set thresholds for filtering in the Diagrams User Preferences. If you set the driver threshold for outgoing relationships to 40, for example, then any object with 40 or more outgoing relationship will be considered a driver and displayed outside the main relationship flow. The driver and its related nodes in the relationship

flow appear with a ◘ symbol in the diagram. Click the ◘ symbol to display the relationships for the driver and its related nodes again.

You generate a filtered diagram the same way you generate any diagram. The only difference is that when the filtering thresholds are met, Diagrammer displays the Large Dataset Returned dialog. Choose **Enable Node Filtering** in the dialog to draw the diagram with the filter applied. Choose **Disable Node Filtering and Clustering** in the dialog to draw the diagram without the filter applied. A ▼ symbol on the tool bar indicates that a diagram is filtered.

💡 **Tip:** Use the **Filter Override** options on the 🔧▾ drop-down menu to override the thresholds in the Diagrams User Preferences. If the diagram has already been generated, choosing an override option redraws the diagram with the new filter applied.

Setting Filter Overrides

Use the Filter Override Options window to override the filtering thresholds in the Diagrams User Preferences. If the diagram has already been generated, choosing an override option redraws the diagram with the new filter applied.

✏️ **Note:** These settings do not persist between Diagrammer sessions.

1. Click the 🔧▾ button on the tool bar and choose **Filter Override** in the drop-down. The Filter Override Options window opens.
2. Select **Filters Enabled** to enable filtering.
3. Select **Hide Utilities** to hide objects with many inputs, DATEFMT, for example. Specify the filtering thresholds for inputs and outputs:

    -   In the **Incoming Relationships** field, enter the filtering threshold for incoming relationships.
    -   In the **Outgoing Relationships** field, enter the filtering threshold for outgoing relationships.
4. Select **Hide Drivers** to hide objects with many outputs, a startup program, for example. Specify the filtering thresholds for inputs and outputs:

    -   In the **Incoming Relationships** field, enter the filtering threshold for incoming relationships.
    -   In the **Outgoing Relationships** field, enter the filtering threshold for outgoing relationships.
5. Select **Hide High Input Nodes** to hide objects with many inputs that do not meet the incoming relationship threshold for utilities. Specify the thresholds for inputs in the **With Incoming Relationships** field.
6. Select **Hide High Output Nodes** to hide objects with many outputs that do not meet the outgoing relationships threshold for drivers. Specify the thresholds for outputs in the **With Outgoing Relationships** field.

> 💡 **Tip:** Select **Reset Values** to restore the filtering thresholds to their settings in the Diagrams User Preferences.

Clustering Objects

Clustering objects on a diagram groups them by their degree of relatedness. Once clusters are generated, you can move objects in and out of the groups, name the groups, and create new clusters as needed. When

you are satisfied that a cluster meets your needs, you can assign an existing tag to its members or generate a tag from the cluster itself, each member of which receives the tag.

You enable clustering in the Diagrams User Preferences. Use the **Clustering** options on the drop-down menu to specify clustering factors. Assuming the appropriate filtering thresholds are me, drivers and utilities are grouped in special clusters named "Drivers" and "Utilities." A third special cluster, "Miscellaneous Components," contains relationship flows with too few objects to cluster.

You generate a clustered diagram the same way you generate any diagram. The only difference is that Diagrammer displays the Large Dataset Returned dialog. Choose **Enable Node Clustering** in the dialog to draw the diagram with clustering applied. Choose **Disable Node Filtering and Clustering** in the dialog to draw the diagram without clustering applied.

Creating Clusters Manually

To create a cluster manually, right-click on white space on the Diagrammer canvas. The Clustering dialog opens. Select **Create New Cluster**, then enter the cluster name in the **Cluster Name** field. Click **OK**.

Generating Tags from Clusters

To generate tags based on cluster names, right-click on white space on the Diagrammer canvas. The Clustering dialog opens. Select **Create Tags from Clusters**, then enter the name of the parent tag in the **Top Level tag** field.

> **Note:** The parent tag is required.

Click **OK**. Each member of a cluster is assigned a tag based on the cluster name.

Setting Clustering Factors

Use the Clustering Options window to specify values by which the degree of relatedness between clustered objects is factored.

> **Note:** These settings do not persist between Diagrammer sessions.

1. Click the button on the tool bar and choose **Clustering** in the drop-down. The Clustering Options window opens.
2. In the **Quality** drop-down, select:
   - **Draft** for the lowest clustering quality and best performance.
   - **Proof** for the highest clustering quality and worst performance.
   - **Medium** for the best balance of clustering quality and performance.
3. In the **Balance** combo box, specify the clustering balance factor. The higher the balance factor, the lower the number of relationships between objects in different clusters.
4. In the **Cluster Size Factor** combo box, specify the clustering size factor. The higher the clustering size factor, the larger and fewer the clusters.

5. In the **Max Number of Clusters** combo box, specify the maximum number of clusters. A value of 0 means any number of clusters.

6. In the **Min Number of Clusters** combo box, specify the minimum number of clusters. A value of 0 means any number of clusters.

Setting Diagrams User Preferences

Use the Diagrams tab of the User Preferences window to specify the color-coding used in relationship flow diagrams, the thresholds for clustering and filtering, and performance limits for large diagrams.

1. Choose **Tools > User Preferences**. The User Preferences window opens. Click the Diagrams tab.

2. Select **Prompt When Diagram Mode Changes** to be prompted when you switch between a diagram generated for a project and a diagram generated for copied-and-pasted objects.

3. In the Color Scheme pane, click the object type whose color you want to edit. The current background color of the type (if any) is displayed in the Color drop-down.

4. Click the adjacent ⏷ button and choose **ForeColor** from the pop-up menu if you want to specify the color of the caption for the object type, or **BackColor** if you want to specify the color of the background for the object type.

5. In the **Shape** drop-down, select the shape of the object type in the diagram. Select **Lock Shape Aspect** to specify that the shape not be adjusted to fit the caption.

6. Click the **Performance** button. The Performance Option Limits dialog opens.

7. Deselect **Relayout Subgraphs** if you do not want child groups to be redrawn when you choose a new layout style.

   🖉 **Note:** Selecting this option may result in poor performance for very large diagrams.

8. In the **Maximum relationships to return from repository** field, enter the maximum number of relationships to display in the diagram. Relationships are truncated when the maximum is exceeded.

   🖉 **Note:** Setting this option too high may result in poor performance for very large diagrams.

9. In the **Force Symmetric Layout (all relationships)** field, enter the maximum number of relationships to display in the diagram before forcing symmetric layout style.

   🖉 **Note:** Symmetric layout style typically offers the best performance for very large diagrams. Setting this option too high may result in poor performance for very large diagrams.

10. In the **Offer Auto Clustering Layout (all relationships)** field, enter the maximum number of relationships to display in the diagram before offering to perform clustering.

11. Select **Filter Options Enabled** to enable filtering.

12. In the **Hide Drivers (all relationships)** field, enter the maximum number of relationships to display in the diagram before filtering drivers. (A *driver* is an object with many outputs, a startup program, for example.) Specify the filtering thresholds for inputs and outputs:

    • In the **Incoming Relationships** field, enter the filtering threshold for incoming relationships.
    • In the **Outgoing Relationships** field, enter the filtering threshold for outgoing relationships.

13. In the **Hide Utilities (all relationships)** field, enter the maximum number of relationships to display in the diagram before filtering utilities. (A *utility* is an object with many inputs, DATEFMT, for example.) Specify the filtering thresholds for inputs and outputs:

    • In the **Incoming Relationships** field, enter the filtering threshold for incoming relationships.
    • In the **Outgoing Relationships** field, enter the filtering threshold for outgoing relationships.

14. In the **Hide High Output Nodes (all relationships)** field, enter the maximum number of relationships to display in the diagram before filtering objects with many outputs that do not meet the outgoing relationships threshold for drivers. Specify the filtering thresholds for outputs in the **Outgoing Relationships** field.

15. In the **Hide High Input Nodes (all relationships)** field, enter the maximum number of relationships to display in the diagram before filtering objects that do not meet the incoming relationship threshold for utilities. Specify the filtering threshold for inputs in the **Incoming Relationships** field.

Using the Scope Editor

Use the Scope Editor to manage the scopes in your repository, create custom composite relationships, and define relationship filters. To open the Scope Editor, choose **Scope > Scope Editor**. The Scope Editor opens, with the workspace scopes listed in the lefthand pane and their relationships in the righthand pane. The figure below shows the Scope Editor.
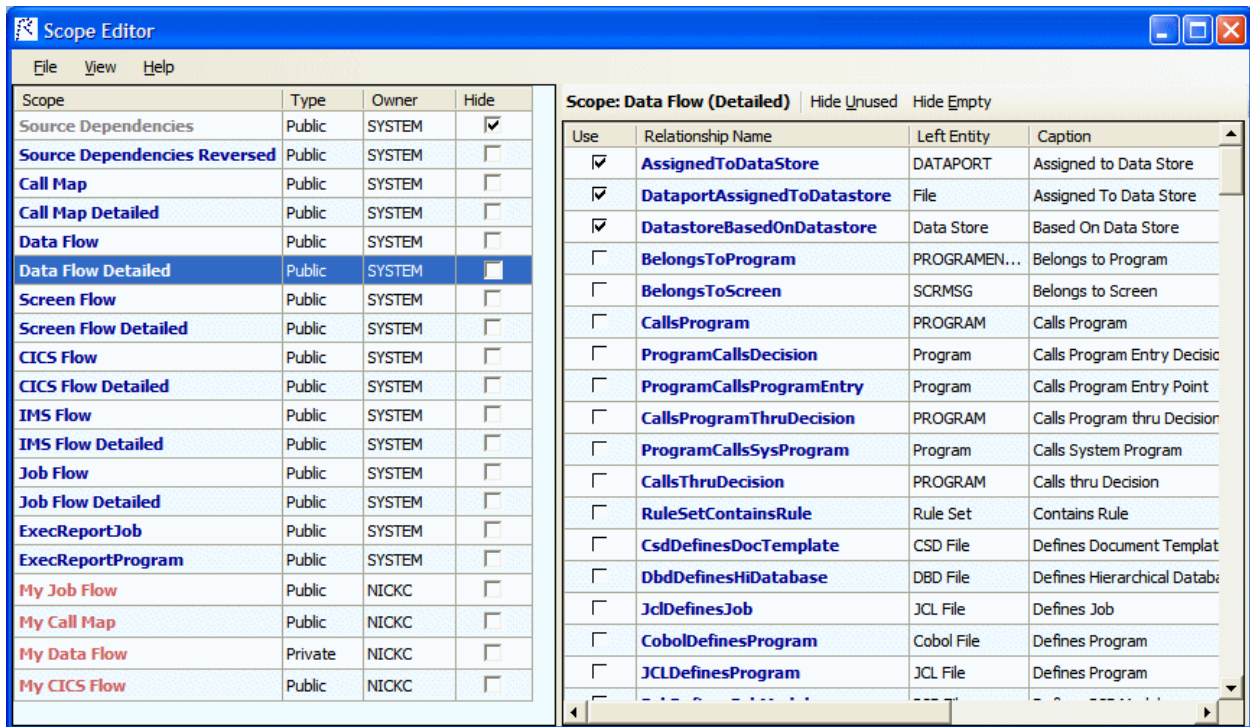
Understanding the Lefthand Pane of the Scope Editor

The lefthand pane of the Scope Editor window lists every scope in the repository. The table below describes the columns in the lefthand pane.

Column	Description
Scope	The name of the scope. Scopes are color-coded as follows:

Column	Description
	• Blue means that the scope is available in the Diagrammer **Scope** drop-down. • Gray means that the scope is not available in the **Scope** drop-down, because it is hidden or because it is a private scope owned by another user. You can copy a private scope, then edit it as you would your own scope • Red means that the scope has no relationships associated with it.
Type	The type of the scope, public or private. The type determines availability of the scope in the Diagrammer **Scope** drop-down: • A public scope is available to every user of the workspace. • A private scope is available only to its owner. You can copy a private scope, then edit it as you would your own scope.
Owner	The owner of the scope. SYSTEM denotes a default scope.
Hide	Whether the scope is hidden in the Diagrammer **Scope** drop-down. A check mark means that the scope is hidden.

Understanding the Righthand Pane of the Scope Editor

The righthand pane of the Scope Editor window lists every relationship in the repository. The table below describes the columns in the righthand pane.

Column	Description
Use	Whether the relationship is used in the selected scope. A check mark means that the relationship is used.
Relationship Name	The name of the relationship. Relationships for which a filter has been defined are color-coded magenta.
Left Entity	The entity on the left end of the relationship. Entities for which a relationship filter has been defined are color-coded magenta. A tool tip displays the text of the condition.
Caption	The caption of the relationship.
Right Entity	The entity on the right end of the relationship. Entities for which a relationship filter has been defined are color-coded magenta. A tool tip displays the text of the condition.
Class	The class of the relationship, basic or composite: • A basic relationship defines the direct interaction of two objects: a program and a program entry point, for example. • A composite relationship defines the indirect interaction of two objects. If a job runs a program entry point that belongs to a program, for example, the relationship between the job and program is said to be composite: defined by the chain of relationships between the job and program.

Column	Description
Occurs	The number of times a basic relationship occurs in the repository. For composite relationships, N/A, indicated with an asterisk (*).

Managing Scopes

Use the Scope Editor to edit the Diagrammer **Scope** drop-down, view scope diagrams, create, edit, copy, and delete scopes, import and export scopes, and more.

Hiding a Scope in the Scope Dropdown

To hide a scope in the Diagrammer **Scope** drop-down (but not remove it from the repository), select the scope in the Scope Editor and put a check mark next to it in the **Hide** column.

Displaying Only the Relationships Used in a Scope

To display only the relationships used in a scope, select the scope in the Scope Editor and click the **Hide Unused** button in the righthand pane.

Hiding Empty Relationships

To hide relationships that have no instances in the repository, click the **Hide Empty** button in the righthand pane.

Viewing a Diagram of a Scope

To view the diagram of a scope, select the scope in the Scope Editor and choose **File > Diagram**. You can also view a scope diagram by selecting the scope in the Diagrammer **Scope** drop-down and choosing **Scope > View Scope**.

Viewing a Diagram of a Composite Relationship

To view the diagram of a composite relationship, select the relationship in the Scope Editor and choose **Diagram** in the right-click menu.

Creating a Scope

To create a scope, choose **File > New Scope**. A dialog box prompts you to enter the name, optional caption, class, and owner of the scope. Enter the requested information and click **Save**.

Specifying the Relationships in a Scope

To specify the relationships in a scope, select the scope in the Scope Editor and put a check mark in the **Use** column next to each relationship you want to include in the scope. To save the scope, choose **File > Save**.

Note: You can specify relationships only for a scope you own.

Editing Scope Details

To edit the name, caption, class, and owner of a scope, select the scope in the Scope Editor and choose **File > Edit**. A dialog box displays the current details for the scope. Enter the new information and click **Save**.

Note: You can edit details only for a scope you own.

Copying a Scope

To copy a scope, select the scope in the Scope Editor and choose **File > Copy**. A dialog box prompts you to enter the name, optional caption, class, and owner of the new scope. Enter the requested information and click **Save**. You can copy default scopes and public or private scopes owned by another user, then edit them as you would your own scope.

Deleting a Scope

To delete a scope, select the scope in the Scope Editor and choose **File > Delete**.

Note: You can delete only a scope you own.

Deleting a Composite Relationship

To delete a composite relationship, select the relationship in the Scope Editor and choose **Delete** in the right-click menu.

Note: You can delete only a composite relationship you own.

Importing and Exporting Scopes

To import a scope from an XML file, choose **File > Import**. A dialog opens, where you can specify the scope you want to import. The type of an imported scope defaults to public. The owner defaults to the current user.

Note: If a scope or relationship being imported conflicts with an existing scope or relationship, you are notified and the conflicting item is ignored.

To export a scope to an XML file, select the scope in the Scope Editor and choose **File > Export Selected**. A Save dialog opens, where you can specify the name and location of the scope. To export all the scopes in the repository to an XML file, choose **File > Export All**.

Hiding Columns in the Scope Editor

To hide a column in the Scope Editor, deselect the column name in the **View** menu.

Creating Custom Composite Relationships

A *composite relationship* defines the indirect interaction of two objects. If a job runs a program entry point that belongs to a program, for example, the relationship between the job and program is said to be composite: defined by the chain of relationships between the job and program.

You can use the default composite relationships provided with the system, or use the Scope Editor to create custom composite relationships. Custom composite relationships are available to all users of the workspace.

Note: Custom composite relationships are not copied or exported when a scope is copied or exported.

1. In the Scope Editor, choose **File > New Relationship**.
2. The New Relationship Wizard opens. In the **Enter Relationship Name** field, enter the name of the composite relationship, then select the object you want to appear on the left side of the relationship chain in the Select First Entity pane. Click **Next**.
3. In the Select relationship pane, select the relationship you want to appear next in the relationship chain. Click **Next**.
4. Repeat the preceding step for each relationship you want to include in the chain. When you are satisfied with your choices, click **Finish**.
   The New Relationship Wizard closes and the new composite relationship is added to the Scope Editor window.

Defining a Relationship Filter

You can define a relationship filter by setting conditions for either side of the relationships defined in a scope you own. You might want a scope to be restricted to programs that have a cyclomatic complexity greater than 300 and that are defined in COBOL source files, for example. The example below shows you how to do that step by step.

Condition definitions are based on the Repository Exchange Protocol (RXP), an XML-based API that you can use to interact with application-level information in the workspace repository.

In the Scope Editor, relationships and entities for which a filter has been defined are color-coded magenta. A tool tip over the filtered entity displays the text of the condition.

1. In the Scope Editor, select the relationship you want to set conditions for and choose:

   * **Left Cond** in the right-click menu to qualify the entity on the left side of the relationship.
   * **Right Cond** in the right-click menu to qualify the entity on the right side of the relationship.
2. The Condition window opens. In the Condition window, click:

   * **attribute** to qualify the entity according to the value of a given attribute. Programs that have a cyclomatic complexity greater than 300, for example.
   * **has (not) related object** to qualify the entity according to a given relationship type. Programs defined in COBOL source files, for example.
   * **add AND condition** to qualify the entity according to inclusive criteria using an AND operator. Programs that have a cyclomatic complexity greater than 300 and that are defined in COBOL source files, for example.
   * **add OR condition** to qualify the entity according to exclusive criteria using an OR operator. Programs that have a cyclomatic complexity greater than 300 or that are defined in COBOL source files, for example.

3. The Condition window displays the shell definition for the selected condition. The following steps describe how to qualify the program entity using an AND operator. The procedure for other entities and conditions is similar.

4. In the definition for the AND condition, click **attribute**. The definition for the attribute condition is displayed:

```
<attr name="..." op="..." arg="..." negate="..."/>
```

> **Note:** Click the X in a definition to delete the condition.

5. Click the ellipsis (…) in `name="…"`. The User Input dialog opens. In the User Input dialog, select the Program entity in the **Choose entity** drop-down and the Cyclomatic Complexity attribute in the **Attributes for Program** drop-down, then click **OK**. The attribute is added to the condition definition.

> **Note:** Click **Delete** in the User Input dialog to delete the criterion defined in the dialog.

6. Click the ellipsis (…) in `op="…"`. The User Input dialog opens. In the **Choose new value** drop-down, choose the greater than (>) symbol, then click **OK**. The greater than symbol is added to the condition definition.

7. Click the ellipsis (…) in `arg="…"`. The User Input dialog opens. In the **Enter new value** drop-down, enter 300, then click **OK**. The new value is added to the condition definition:

```
<attr name="Cyclomatic Complexity" op=">" arg="300"
negate="..."/>
```

> **Note:**
>
> In a condition definition, `negate` means "not the specified criterion." Programs that do not have a cyclomatic complexity greater than 300, for example. Click the ellipsis (…) in `negate="…"` to set its value to true. Ignore the field otherwise.

8. In the definition for the AND condition, click **has (not) related object**. The definition for the relationship type condition is displayed:

```
<hasrelated negate="...">
```

9. In the choices for the relationship type condition, click **define relationship type**.

10. The choices for the relationship type are displayed. Click **define relationship**. The definition for the relationship type is displayed:

```
<rel name="..." negate="..."/>
```

11. Click the ellipsis (…) in `name="…"`. The User Input dialog opens. In the **Choose entity** drop-down, select the Program entity. In the **Relations for Program** drop-down, select the IsDefinedInCobol relationship, then click **OK**. The relationship is added to the condition definition:

```
- <hasrelated negate="...">
- <reltype>
<rel name="IsDefinedInCobol" negate="..."/>
</reltype>
</hasrelated>
```

12. The AND condition is now complete. The diagram scope will be restricted to programs that have a cyclomatic complexity greater than 300 and that are defined in COBOL source files. The full condition looks like this:

```
- <cond>
<and negate="...">
```

```
<attr name="Cyclomatic Complexity" op=">"
arg="300" negate="..."/>
- <hasrelated negate="...">
- <reltype>
<rel name="IsDefinedInCobol"
negate="..."/>
</reltype>
</hasrelated>
</and>
</cond>
```

Pruning a Scope

You can prune relationships from a scope you own directly in the Diagrammer window. When you prune a scope, keep in mind that:

- You are deleting relationships from the current scope exactly as if you were deleting them in the Scope Editor window. For that reason, you might want to save the original scope with a different name and use the renamed scope as the basis for the pruned diagram.
- All the relationships of the selected type are deleted for the selected object, not just the single relationship you selected in the diagram.

1. To prune a scope, select the relationship you want to prune in the diagram and choose:

   - **Prune type for right object** in the right-click menu to delete from the current scope all relationships of the selected type for the right object in the relationship.
   - **Prune type for left object** in the right-click menu to delete from the current scope all relationships of the selected type for the left object in the relationship.

2. Generate the diagram in project or copy-and-paste mode. The Diagrammer deletes the relationships from the redrawn diagram.

Mirroring a Scope

By default, Diagrammer shows the flow of relationships from a diagrammed object rather than to a diagrammed object. Choose **Scope > Mirror Scope** to show the flow of relationships to the object. Choose **Scope > Mirror Scope** again to return to the original view.

Analyzing Global Data Flows

The Global Data Flow tool traces incoming and outgoing data flows for a program variable up to a *dataport*, an I/O statement or call to or from another program. You can view the memory allocation and offset for the variable to determine how changes to the variable may affect other variables, and trace assignments to and from the variable across programs.

Note: Projects must have been verified with the **Enable Data Element Flow** option set in the Project Verification options.

The Global Data Flow tool is implemented as both a standalone and HyperView-based tool. This section describes the standalone version. Usage is identical for the HyperView tool.

Understanding the Global Data Flow Window

Use the Global Data Flow tool to trace incoming and outgoing data flows for a program variable up to a *dataport*, an I/O statement or call to or from another program. To open the Global Data Flow tool, select a program in the Repository Browser and choose **Analyze > Data Flow**.

The figure below shows the Global Data Flow window. By default, all Global Data Flow panes are displayed. Select the appropriate choice in the **View** menu to hide a pane. Select the choice again to show the pane.
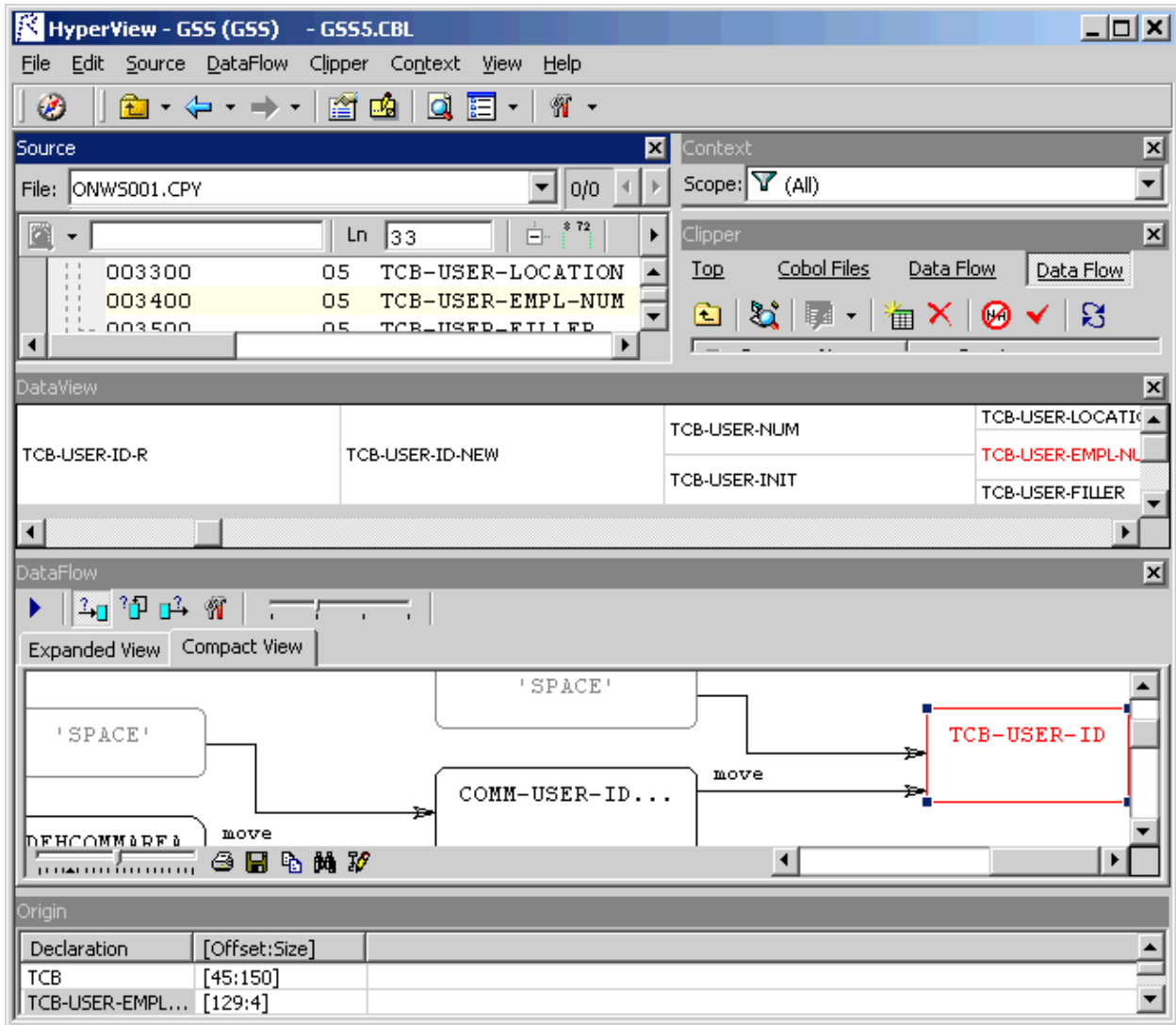
Data View Pane

For the selected program, the Data View pane shows variable structures, substructures, and fields in hierarchical order from left to right. Double-click a variable name to generate a data flow diagram for the variable in the Data Flow pane, and a list of offsets and memory allocations for the variable and any related variables in the Origin pane.

Data Flow Pane

For the variable selected in the Data View pane, the Data Flow pane displays a diagram that traces its incoming and outgoing data flows up to a *dataport*, an I/O statement or call to or from another program. The selected variable is displayed in red, constants in gray, and dataports in blue.

Note: Make sure you have enabled incoming and/or outgoing data flows appropriately in the Global Data Flow project options.

Two diagram views are available:

- The Expanded View displays as many nodes for the selected variable as it has assignments.
- The Compact View displays a single node, regardless of the number of assignments.

Click the tab for the view you want to display.

Select a dataport and choose **Data Flow > Reconstruct** to display the data flow diagram for the variable identified at the dataport. Select a relationship line to display all the statements that determine the data flow between variables in the Origin pane.

Place your cursor over a variable for a moment to display a tool tip that identifies the memory offset and allocation for the variable. The diagram uses Modernization Workbench common diagramming features.

Origin Pane

For the variable selected in the Data View or Data Flow panes, the Origin pane displays a list of offsets and memory allocations for the variable and any related variables. For the dataport selected in the Data Flow pane, it displays related variables. For the relationship selected in the Data Flow pane, it displays the intraprogram or interprogram relationship detected by data flow analysis.

Data Flow Relationships

The table below describes the intraprogram and interprogram relationships detected by the data flow analysis tools.

Relationship	Definition	Type	Icon	Description
calls	N/A	interprogram	N/A	A parameter passed in a call to another program.
cast	MOVE A TO B with data conversion	intraprogram		A data item moved to a data item of a different type.
common area transitions	N/A	interprogram	N/A	For Unisys 2200 Cobol, a common-storage data area item passed in a call to another program. **Perform Unisys Common-Storage Area Analysis** must be set in the project verification options.
comp	STRING A ... INTO B	intraprogram		An arbitrary computation. The result is produced by applying complex rules to the argument, such as STRING.
comp+	ADD A TO B	intraprogram		An addition-like operation: ADD, SUBTRACT, or corresponding parts of COMPUTE.
comp*	MULTIPLY A BY B	intraprogram		A multiplication-like operation: MULTIPLY, DIVIDE, or corresponding parts of COMPUTE.

Relationship	Definition	Type	Icon	Description
comp@	MOVE ARRAY (IDX) TO A	intraprogram		An operation with array elements.
cond	IF A = B ...	intraprogram		Comparison of data items with a symmetric relationship.
cond*	IF A * X = B ...	intraprogram		Comparison of a multiple of a data item with another data item.
const cond	IF A = 1 ...	intraprogram		Comparison of a data item with a constant.
const.move	MOVE 1 TO B	intraprogram		A constant moved into a data item.
const.comp	ADD 1 TO B	intraprogram		An arithmetic operation with constants.
const.init	03 A ... VALUE 1	intraprogram		A data item initialized by a constant.
DMS records	N/A	interprogram	N/A	For Unisys 2200 Cobol, data communication via Unisys DMS database records.
files	N/A	interprogram	N/A	Data communication via files. Traced only when corresponding JCL, ECL, FCT, or CSD files are verified.
files in jobs	N/A	interprogram	N/A	Data flow in JCL datasets when *files* is selected.
input port	N/A	intraprogram		A data item in which data is received.
move	MOVE A TO B	intraprogram		A data item moved to a data item of the same type.
network records	N/A	interprogram	N/A	For Unisys 2200 Cobol, data communication via network records.
output port	N/A	intraprogram		A data item from which data is sent.
screens	N/A	interprogram	N/A	Data sent to a screen by one program and received in a screen by another.
screen definitions	N/A	interprogram	N/A	Data flow in screen fields when *screens* is selected.
start	N/A	intraprogram		The startup item in an Impact pane consolidated analysis.

Relationship	Definition	Type	Icon	Description
used	MOVE ... TO A ... MOVE A TO ...	intraprogram		A value assigned in a statement used as an argument in another statement.

Assigning Business Names Manually

To assign a business name and business description to an object, select the object and choose **Set Business Attributes** in the right-click menu. A dialog box opens, where you can enter the business name and business description. To unassign a business name or business description, simply delete the value in the dialog box.

Setting Global Data Flow User Preferences

Use the HyperView > Data View tab of the User Preferences window to specify the color-coding used in the Data View pane and the order of display of variables with the same offset.

1. Choose **Tools > User Preferences**. The User Preferences window opens. Click the HyperView tab, then the Data View tab.
2. In the Same offset order group box, specify the order you want variables with the same offset to be displayed in the Data View pane. Choose:
   - **Data item size** if you want variables with the same offset to be displayed in size order, largest to smallest.
   - **Appearance in the source code** if you want variables with the same offset to be displayed in the order they appear in the source code.
3. Click the arrow beside the drop-downs for **Free Space Color**, **Used Space Color**, and **FILLER Color** to specify the color of each item in the Data View pane.
4. Select **Display Business Names** to display business names for objects in the Data View pane.

Setting Global Data Flow Project Options

Use the Global Data Flow tab of the Project Options window to specify whether data flow diagrams include literals, variable values set at initialization, and Unisys Cobol common storage variables; whether they show incoming, outgoing, and recursive data flows; and the number of nodes they display.

1. Choose **Tools > Project Options**. The Project Options window opens. Click the Global Data Flow tab.
2. In the Relationships pane, choose any combination of:

- **Literal Flow** to include literals in the data flow diagram for the selected variable
- **Initial Values** to include variable values set at initialization in the data flow diagram for the selected variable.
- **Common Area Transition** to include Unisys Cobol common storage variables in the data flow diagram for the selected variable. Common storage variables are not explicitly declared in CALL statements.

    Note: To include Unisys Cobol common storage variables, you must have verified the project with the **Perform Unisys Common-Storage Analysis** option set in the project verification options.

3. In the Directions pane, choose any combination of:

- **Causes** to generate data flows into the selected variable.
- **Consequences** to generate data flows from the selected variable.
- **Self-Dependencies** to show recursive data flows for the selected variable.

4. In the **Node Limit** combo box, enter the maximum number of diagram nodes you want to display. You might restrict the number of nodes to improve performance or make the diagram easier to read. You can also use the slider on the Node Limit tool bar to adjust the number of displayed nodes.

    Note: All children of a parent node are displayed even if some of them exceed the specified maximum.

Analyzing Batch Applications

The Batch Application Viewer lets you perform low-level analysis of batch processes. Use the Batch Application Viewer's rich set of tables and diagrams to determine if batch jobs are dependent on one another, the programs that use a data store, and the flow of data into or out of a data store.

Note: Batch Application Viewer analyzes JCL and ECL jobs. Usage is identical except for language-specific differences in terminology.

Understanding the Batch Application Viewer Window

Use the Batch Application Viewer to determine if batch jobs are dependent on one another, the programs that use a data store, and the flow of data into or out of a data store. To open Batch Application Viewer, select a project in the Repository Browser and choose **Analyze > Batch Application**.

The Batch Application Viewer window displays job, procedure, and data set views of the batch application. Your selection in the current view, displayed in the lefthand pane, filters the objects displayed in the other two views. Click the appropriate tab at the bottom of the window to make a view current. To generate a report for the current view in HTML, choose **File > Report**.

Use the ![icon] button and adjacent field on the toolbar to perform a standard HyperView search of the current view. In any view or diagram, select an object and click **HyperView** at the bottom of the window to view the object in HyperView.

You can hide a view by clicking the close box in the upper righthand corner. Select the appropriate choice in the **View** menu to show the view again. The figure below shows the Batch Application Viewer window.
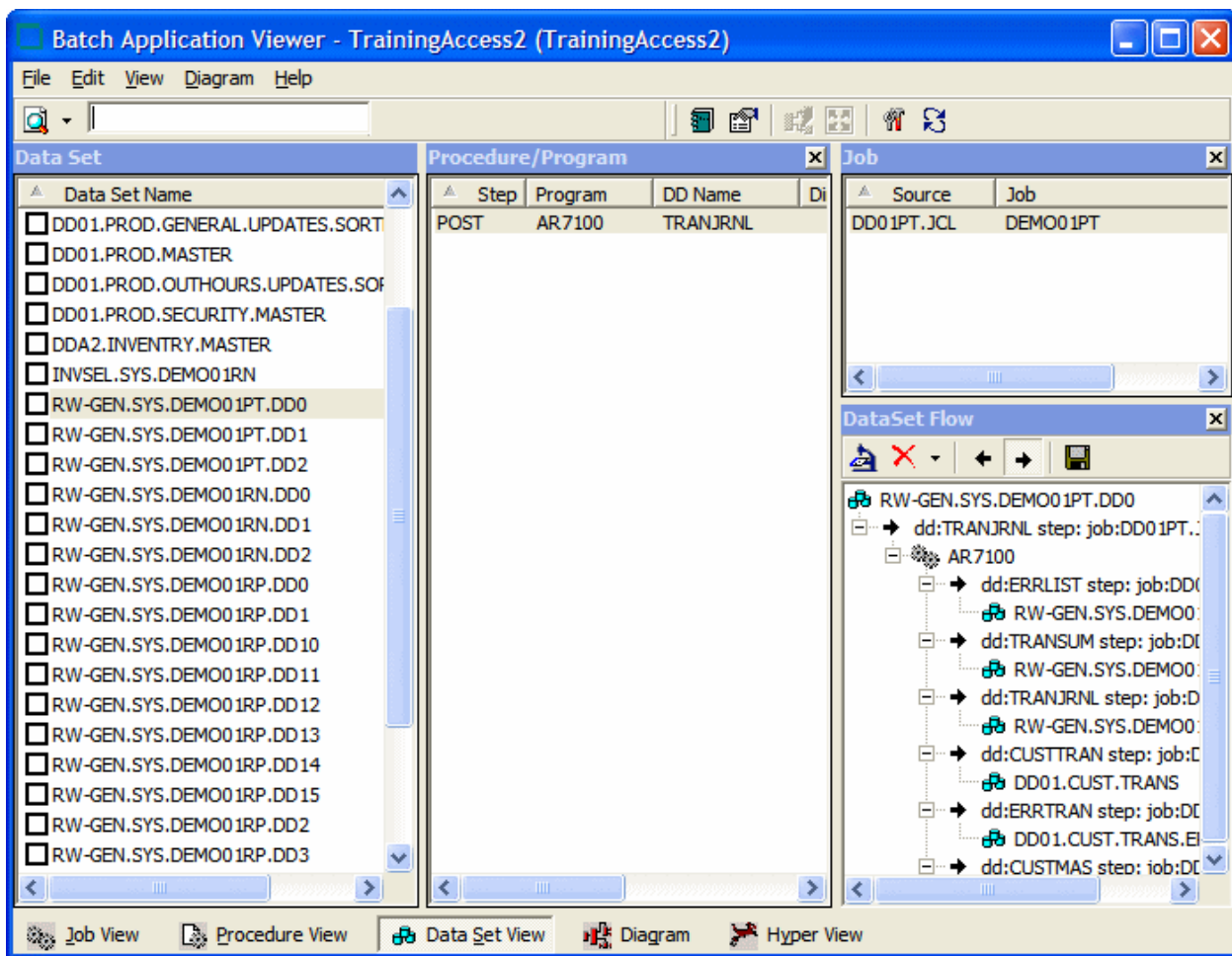
Job View

When the Job View is current, select a job to view the steps the job uses, the procedure or program each step executes, and the data stores each procedure or program reads from or writes to.

Procedure View

When the Procedure/Program View is current, select a procedure or program to view the jobs and steps that execute it, and the data stores programs read from or write to.

✎ **Note:** For programs executed by procedures, Batch Application Viewer displays data stores referenced by DD statements added after the substitution of the procedure.

Dataset View

When the Dataset View is current, select a dataset to view the procedure or program that reads from or writes to it, the step that executes the procedure or program, and the job that contains the step.

To view the flow of data into or out of a dataset, select the dataset in the Dataset View and a step in the Procedure/Program View, then click the ![icon] button in the Data Set Flow pane. Click the ← button in the Data Set Flow pane to view the flow of data into the dataset, click the → button to view the flow of data out of the dataset.

Generating Batch Application Diagrams

Batch application diagrams show the relationships between jobs, programs or procedures, and data stores. The diagram uses Modernization Workbench common diagramming features.

1. In the current view, mark the objects you want to diagram.
2. In the **Diagram** menu, choose the relationships you want to view in the diagram:

   - **Job Dependencies** shows dependencies between jobs. Jobs are regarded as dependent if one writes to a dataset and the other reads from the same dataset.
   - **Data Set Usage** shows interactions with datasets.
   - **JCL Procedures Usage** shows interactions with procedures.
   - **Program Usage** shows interactions with programs.

   📝 **Note:** The menu choice is grayed out with a check mark beside it if the relationship must be displayed in the diagram. You can also set these choices after you display the diagram.

3. Click **Diagram** at the bottom of the Batch Application Viewer window.

The diagram is displayed in the Diagram View.

Assigning Business Names Manually

To assign a business name and business description to an object, select the object and choose **Set Business Attributes** in the right-click menu. A dialog box opens, where you can enter the business name and business description. To unassign a business name or business description, simply delete the value in the dialog box.

Marking Items

To mark an item, place a check mark next to it. To mark all the items in the current view, choose **Edit > Check All**. To unmark all the items in the current view, choose **Edit > Uncheck All**.

To mark selected items, select the items and choose **Edit > Check Selected**. To unmark selected items, choose **Edit > Uncheck Selected**.

Creating Job Dependencies in Batch Application Diagrams

Batch Application Viewer treats jobs as dependent if one writes to a dataset and the other reads from the same dataset. Occasionally, you may want to define dependencies between jobs based on other criteria:

administrative needs such as scheduling, for example. Batch Application Viewer modifies the diagram only, not the repository.

Defining Dependencies Between Jobs

To define dependencies between jobs in a batch application diagram, hold down the Alt key, select either job, and drag-and-drop the relationship to the other job. The relationship is displayed in red with three plus (+) signs at either end of the relationship line.

Importing and Exporting Job Dependencies

To import job dependencies from a file, choose **File > Import Dependency Changes**. A dialog opens, where you can specify the file you want to import.

To export job dependencies to a file, choose **File > Export Dependency Changes**. A Save As dialog opens, where you can specify the name and location of the file.

Removing Job Dependencies

To remove all user-defined dependencies from a batch application diagram, choose **File > Clean Up Dependencies**.

Note: In certain circumstances (jobs that use cataloged file generation, for example), Batch Application Viewer may create false dependencies. You must remove these relationships manually by right-clicking the dependency and choosing **Remove** from the pop-up menu.

Creating User Names for Objects in Batch Application Diagrams

You can give diagram objects friendlier names, called *user names.* Batch Application Viewer modifies the diagram only, not the repository.

Note: To display user names in a diagram, select **User Names** in the Batch Application Viewer workspace options.

Specifying User Names

To specify a user name for an object in a batch application diagram, select the object and choose **View > User Name**. The User Name dialog opens, where you can specify the user name.

Importing and Exporting User Names

To import user names from a file, choose **File > Import User Names**. A dialog opens, where you can specify the file you want to import.

To export juser names to a file, choose **File > Export User Names**. A Save As dialog opens, where you can specify the name and location of the file.

Removing User Names

To remove all user names from a batch application diagram, choose **File > Clean Up User Names**.

Setting Batch Application Viewer Options

Use the Batch Application Viewer tab of the Workspace Options window to specify the color-coding used for relationship lines in batch application diagrams. Diagram objects are color-coded based on the color scheme in the Diagrams User Preferences.

1. Choose **Tools > Workspace Options**. The Workspace Options window opens. Click the Batch Application Viewer tab.
2. In the Diagram Relations pane, click the relationship type whose color you want to specify, then specify the color in the **Edge Color** drop-down.
3. To display user names in a diagram, select User Names.
4. In the **Node Limit** combo box, enter the maximum number of diagram nodes you want to display. You might restrict the number of nodes to improve performance or make the diagram easier to read. You can also use the slider on the Node Limit tool bar to adjust the number of displayed nodes.

   Note: All children of a parent node are displayed even if some of them exceed the specified maximum.

Estimating Complexity and Effort

Modernization Workbench Legacy Estimation tools let you compare programs based on weighted values for selected complexity metrics. The metrics used in the calculation are a combination of industry standard and Modernization Workbench-generated statistics. Based on the comparison, you can develop a credible estimate of the time required to satisfy a change request or perform other maintenance tasks.

Note: For definitions of the supported complexity metrics, see the "Complexity Metrics" section of this help.

Viewing Complexity Metrics

Use the Complexity Metrics report to compare raw complexity values for the objects in your project. To open the Complexity Metrics report, select a project in the Repository Browser and choose **Analyze > Complexity**.

When the Complexity Metrics window opens, choose the type of object you want to compare in the **Entity Type** drop-down. To generate the report in HTML, choose **File > Report**. The figure below shows the Complexity Metrics window.

Name	Source Name	Lines Of Code	Executable Statements	Operators	Op
AR7100	AR7100.CBL	277	25	25	
AR7200	AR7200.cbl	265	30	30	
AR7300	AR7300.cbl	371	30	30	
CHECKDIGIT	CheckDigit.CCP	130	29	103	
CHECKDIGIT$COMPL	CheckDigit$compl.CCP	741	290	434	
CUSTINQ1	CUSTINQ1.ccp	304	55	71	
CUSTMNT1	CUSTMNT1.ccp	727	231	286	
DCE1	DCE1.CCP	788	316	534	
DCE2	DCE2.CCP	788	316	534	
DCE3	DCE3.CCP	251	45	62	
DCE4	DCE4.CBL	197	25	25	
DECISIONS	DECISIONS.CBL	64	8	8	
FAAPLTPI	FAAPLTPI.ccp	124	14	14	
GETINV	GETINV.ccp	99	9	9	
INVMENU	INVMENU.ccp	300	45	62	
NUMEDIT	NUMEDIT.cbl	118	30	47	
ORDRENT1	ORDRENT1.ccp	878	316	534	
PRODFILL	PRODFILL.ccp	257	24	24	
PRODMNT1	PRODMNT1.ccp	727	231	286	
SYSERR	SYSERR.ccp	123	9	9	

Setting Complexity Metrics User Preferences

Use the Complexity Metrics tab of the User Preferences window to specify the metrics displayed in the Complexity Metrics report for each type of object in your application.

1. Choose **Tools > User Preferences**. The User Preferences window opens. Click the Complexity Metrics tab.
2. In the **Source Type** drop-down, select the type of object you want to display complexity metrics for.
3. In the Attributes pane, select each complexity metric you want to be displayed for the selected object type.

Estimating Effort

Use the Effort Estimation tool to compare source files based on weighted values for selected complexity metrics. To open the Effort Estimation tool, select a project in the Repository Browser and choose **Analyze > Effort**.

Select the source files types to be included in the calculation and the weighted values for the metrics in the Effort Estimation options. When you are satisfied with your selections, choose **File > Compute Effort**.

When the effort estimation report is displayed, select a source file in the Effort pane to show the effort statistics for its generated objects in the Details pane and the HyperView information for the file in the Preview pane. To generate the report in HTML, choose **File > Report**. The figure below shows the Effort Estimation window.
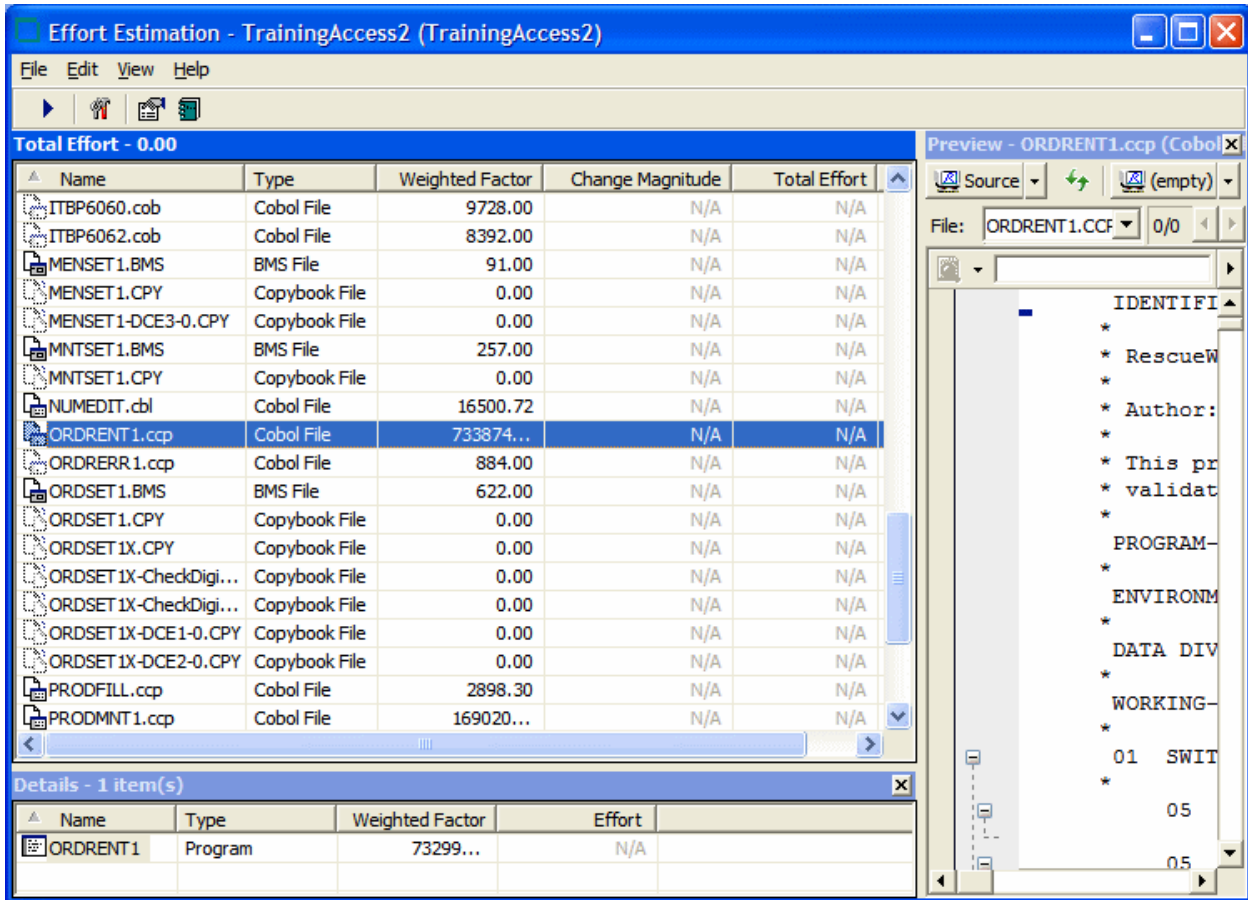
Setting Effort Estimation Options

Use the Effort Estimation tab of the Project Options window to specify the file types included in the effort estimation calculation and the complexity metrics for each type. These options also control the percentage factor for the change magnitudes used in the calculation.

1. Choose **Tools > Project Options**. The Project Options window opens. Click the Effort Estimation tab.

2. In the Factors pane, select each source file type you want to include in the calculation.

3. For each source file type selected in the Factors pane, click **Attributes** to edit the complexity metrics used in the calculation.

4. In the Attributes window, select each complexity metric you want to use in the calculation, then enter its weight in the **Weighting Factor** field. For example, if you want Cyclomatic Complexity to have twice the weight of Conditional Complexity, set the weighting factor for Cyclomatic Complexity to 2 and the weighting factor for Conditional Complexity to 1.

5. To set the percentage factor for the change magnitudes used in the calculation, enter the percentage you want to be applied in the combo box for each change magnitude.

Specifying the Change Magnitude for a Source File

Suppose you are planning to implement a change request and want to know how long it will take to complete the change. In that situation, you typically run an effort estimation report for your project based on weighted values for selected complexity metrics.

But what if your own analysis of the project shows that a given program will actually take much less time to change than the weighted calculation would suggest. The program might have thousands of source lines, for example, increasing its calculated complexity, while actually being very easy to modify.

A change magnitude is a way of overriding the calculated value for a source file. Your "subjective" estimate of the effort involved, Small, Medium, Large, Extra Large, becomes an input to the effort calculation, along with the weighted values.

You can specify a change magnitude in the HyperView Source or Context pane, or in the Effort Estimation tool itself. Select the source file and choose **Set Change Magnitude** in the right-click menu. Set the change magnitude to S for Small, M for Medium, L for Large, or XL for Extra Large. The effort estimation calculation for the selected file is automatically updated.

Identifying Classes of Data Items

Change Analyzer identifies the *class* of data items used to perform a business function in a legacy application. Among other uses, it lets you answer the kinds of "What if?" questions posed in the past by industry-wide changes for Y2K, Zip+4, and the Euro dollar: "What if I change the type of this variable, or the length of this field? What other fields in the class will I also have to change?"

For each field in the class, you can use Change Analyzer to perform an impact trace that shows the flow of data to the field, and to detect and resolve program ports. You can generate reports showing source entities that may require modification, lines of affected code, and the like.

> **Note:** Projects must have been verified with the **Enable Data Element Flow** option set in the Project Verification options. Project options on the Impact > Relationships tab control the relationships detected during synonym and impact trace processing.

Understanding Data Item Classification

Suppose your organization is considering adding support for a new currency and that you are going to have to expand the existing exchange rate data field from 9(5)V9(3) to 9(5)V9(6) to accommodate the currency. You will need to know the data fields that are affected in the database, intermediate fields that may contain or use the exchange rate field in calculations, and so forth.

Seed Fields

Use Change Analyzer to search for the exchange rate field. The object of the search is called a *seed field*:

- If the application uses field names like EX-RATE, EXCH-RATE, EXCHANGE-RATE, and RATE-OF-EXCHG, you would search for data names that contain *EXCH* or *RATE*.
- If you know that some fields already contain the required number of decimal positions and are interested only in those that don't, you might further limit the search by filtering on the PICTURE clause format of the variable, selecting only data items that have a format of 9(5)V9(3).
- You might limit the search even further by choosing fields that have a given initial value.
- If you know there are data fields that will meet the search criteria for name, but are not what you are looking for, you might set up a list of names to exclude, such as INTEREST-RATE and *PRORATE*.

Synonyms

Once you have found the exchange rate field, you can use Change Analyzer to detect its *synonyms*. A synonym is a data field whose value is related to the value of a seed field: a field whose value is assigned by a MOVE or REDEFINE statement, for example. In these cases, if you increase the size of the seed field, you probably will need to increase the size of its synonyms as well.

Analyzing Seed Fields and Synonyms

Not every seed field or synonym will be affected by a proposed change. You need to examine the source code for each instance of the field carefully in the Change Analyzer Source pane and in the HyperView tools accessible from the Source pane. You may want to perform an impact trace showing the flow of data to the field as documentation, or to ensure that you have accounted for each instance.

Seed Lists

Once you determine which fields are affected by a proposed change, you can move the fields between seed lists: Working and Affected, for example. You can generate reports based on your lists, as well as reports showing the affected source code in context.

Getting Started in Change Analyzer

This section describes a sample use of Change Analyzer that should help you get oriented in the tool. Assume that you want to evaluate the impact of changing the YEAR field in your application.

1. In the Repository Browser, select the project you want to analyze and choose **Analyze > Change Analyzer**.
2. The Change Analyzer window opens. Click in the Lists pane and choose **Add List** in the right-click menu. Change Analyzer creates a list named NewList 1. Select NewList 1 and choose **Rename List** in the right-click menu. In the Rename List dialog, enter Working in the **New Name** field and click **OK**. Follow the same procedure to create another list named Affected.
3. Choose **File > Apply Filter**. The Select List dialog opens. Select the Working list and click **OK**.
4. The Search window opens. Click the Change Analyzer tab to view a list of recognized search criteria.

   Click the ☐ button on the tool bar to define a new criterion. In the New Criterion dialog, enter YEAR and click **OK**. The YEAR criterion is displayed in the list of recognized criteria in the Change Analyzer tab in the Search window.
5. In the Change Analyzer tab, select the YEAR criterion, enter the search text for the criterion in the Name Like tab, and click **Find All Constructs**. Change Analyzer returns the seed fields for the criterion in the Working list.
6. Select a program in the Programs pane to view its seed fields in the Working list. Select a seed field to navigate to its declaration in the Source pane. Examine the declaration to determine whether the field will be affected by the proposed change.
7. In the Working list, select each field that will be affected by the change and choose **Edit > Move to...**. The Move/Copy List Items dialog opens. In the **Select Method** drop-down, select **Move**. In the To List: pane, select the Affected list and click **OK**. Change Analyzer moves the fields to the Affected list.
8. Select a seed field in the Affected list and choose **Find Synonyms** in the right-click menu. The Find Synonyms dialog opens. Specify the depth of synonym processing in the **Depth** combo box, then click **OK**. Change Analyzer displays the synonyms for the selected field on the Synonyms tab in the Synonyms and Ports pane.
9. Examine the declaration for each synonym to determine whether the field will be affected by the proposed change. Use the procedure described above to move the affected fields to the Affected list. Find synonyms for these fields the same way you found synonyms for seed fields.
10. Choose **File > Reports**. The Report Selection dialog opens. In the **Report Type** drop-down, select **Report on the Whole List**. In the Select List pane, select the Affected list and click **OK**. Change Analyzer displays the report for the Affected list.

Understanding the Change Analyzer Window

Use the Change Analyzer to identify classes of data items. To open the Change Analyzer, select a project in the Repository Browser and choose **Analyze > Change Analyzer**.

The figure below shows the Change Analyzer window after searching for seed fields, detecting synonyms, and moving items between lists. The current contents of Change Analyzer lists are stored in the Change Analyzer folder in Clipper.
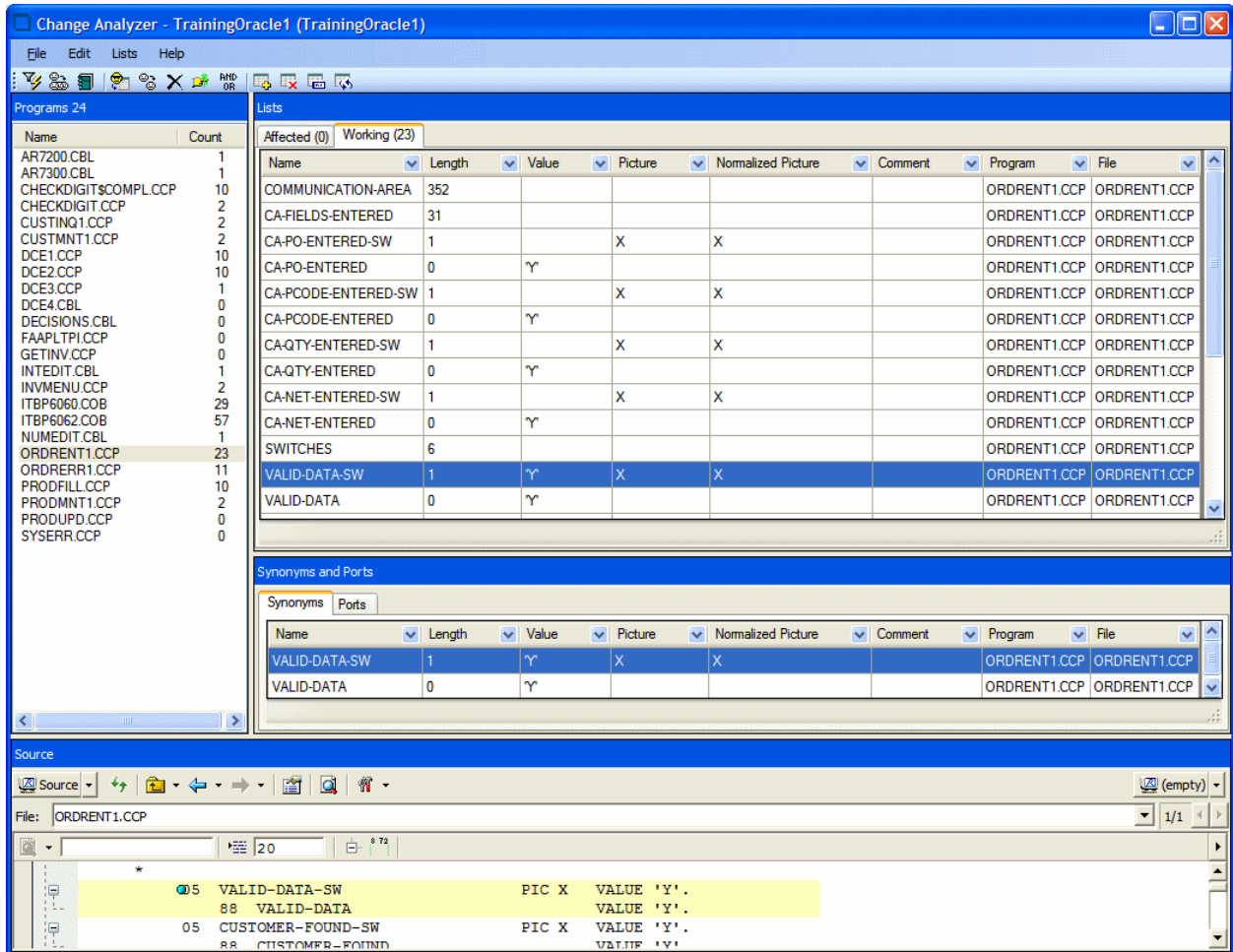
Programs Pane

The Programs pane lists each program in the selected project and the number of fields the program has in the selected list.

Lists Pane

The Lists pane displays the lists for the project. The number in parentheses after the list name indicates the number of fields the list contains for the selected program.

Click the appropriate tab to view a list. Select a field to navigate to its declaration in the Source pane.

The table below describes the columns in the Lists pane. You can filter a column by clicking an item in the ⌄ drop-down for the column.

Tip: The Comment column is especially useful for filtering lists.

Column	Description
Name	The name of the field.
Length	The length of the field.
Value	The value of the field.
Picture	The format of the field.
Normalized Picture	The normalized picture of the field.
Comment	The comment for the field.
Program	The program in which the field is used.
File	The source file that contains the declaration for the field.

Creating Lists

To create a list, click in the tool bar of the Lists pane and choose **Add List** in the right-click menu. Change Analyzer creates a list named NewList *n*.

To rename the list, select it and choose **Rename List** in the right-click menu. In the Rename List dialog, enter the name of the list in the **New Name** field and click **OK**.

Deleting Lists

To delete a list, select it and choose **Remove List** in the right-click menu. You are prompted to confirm that you want to delete the list. Click **Yes**.

Selecting Fields

Click a field to select it. Use Ctrl-click to select multiple fields. Use Shift-click to select a range of fields. To select all the fields on a list, click the tab for the list and choose **Edit > Select All**.

Editing the Comment for a Field

To edit the comment for a field, select it and choose **Edit > Comment**. A dialog opens where you can edit the comment.

Moving Fields Between Lists

To move fields between lists, select the fields, then choose **Edit > Move to**. The Move/Copy List Items dialog opens. In the **Select Method** drop-down, select **Move** to move the selected fields or **Copy** to copy the fields. In the To List: pane, select the target list and click **OK**.

Performing Set Operations with Lists

To join lists using AND or OR operations, or to subtract the contents of one list from another, choose **Edit > Set Operations**. The List Set Operations dialog opens. In the Left pane, select the list on the left side of the set operation. In the Right pane, select the list on the right side of the set operation. In the Destination pane, select the target list. Select the operation you want to perform in the **Choose Operation** drop-down and click **OK**.

Deleting Fields

To delete a field, select it and choose **Edit > Delete**.

Synonyms and Ports Pane

The Synonyms and Ports pane displays two tabs:

- The Synonyms tab displays the synonyms for the field selected in the Lists pane and/or the impact trace for the field. Select a synonym to navigate to its declaration in the Source pane. Select a field in an impact trace to navigate to its use in the Source pane.

  Note: Batch-detected synonyms are displayed in the target list, not on the Synonyms tab.

- The Ports tab displays the field selected in the List pane, if Change Analyzer has detected a port in which the field is used. Select the field to navigate to the port in the Source pane.

Click the appropriate tab to view an item. The table below describes the columns in the Synonyms and Ports pane.

Column	Description
Name	The name of the field.
Length	The length of the field.
Value	The value of the field.
Picture	The format of the field.
Normalized Picture	The normalized picture of the field.
Comment	The comment for the field. **Note:** The comment reads "Port found" on the Ports tabs when a port has been detected.
Program	The program in which the field is used.
File	The source file that contains the declaration for the field.

Source Pane

The Source pane lets you browse the source code for the selected program and the declaration for the selected field or synonym. When an impact trace is displayed in the Synonyms tab, select a field in the trace

to navigate to its use in the Source pane. When a field is listed on the Ports tab, select the field to navigate to the port in which the field is used.

Usage is similar to that for the Source pane in HyperView. For HyperView usage information, see *Analyzing Programs* in the workbench documentation set.

Searching for Seed Fields in Change Analyzer

The Change Analyzer search facility contains two tabs:

* The General tab opens the HyperView advanced search facility.
* The Change Analyzer tab opens a scoped version of the advanced search facility for Change Analyzer.

Ordinarily, the scoped version of the tool should be sufficient for most searches. If you are already familiar with the advanced search facility, however, you may want to use it instead of the scoped tool.

Note: For Cobol programs, Change Analyzer returns only constants and literals found in the Procedure section.

1. Choose **File > Apply Filter**. The Select List dialog opens. Select the target list for seed fields and click **Select**.
2. The Change Analyzer Search window opens. Click the Change Analyzer tab. The Change Analyzer tab displays a list of recognized search criteria.

   Note: Define a new criterion as described in the help for the advanced search facility.

3. Select a criterion to edit its definition in the tabs in the righthand portion of the window. Each tab specifies a condition in the definition. The definition can consist of any combination of conditions.
4. For each condition, enter a list of patterns you want to match, one pattern per line. You can use wildcard patterns allowed in LIKE statements by Visual Basic for Applications (VBA). Select:

   * Name Like to specify patterns that are like the name of the field you are searching for.
   * Name Not Like to specify patterns that are unlike the name of the field you are searching for.
   * Picture Like to specify patterns that are like the format of the field you are searching for.
   * Value Like to specify patterns that are like the initial value of the field you are searching for.
5. Select **Use OR Connection Between Lists** if you want the conditions defined in the tabs to be ORed. If you do not select this option, the conditions are ANDed.
6. Select **Used Data Items Only** if you want the search results to consist only of fields that are used in the selected programs. If you do not select this option, search results include fields that are declared but not used.
7. In the **Search In** drop-down on the tool bar, choose:

   * **All Objects** if you want to execute the search against all the source files in the project.
   * A Clipper list if you want to execute the search only against the source files on the list.
8. Click **Find All Constructs** to execute the search.

Change Analyzer returns the seed fields for the criterion in the target list. The results are added to any previous results.

Detecting Synonyms

To detect synonyms for fields, select the fields in the Lists or Synonyms and Ports pane and choose **Find Synonyms** in the right-click menu. The Find Synonyms dialog opens. Specify the depth of synonym processing in the **Depth** combo box, then click **OK**. Change Analyzer displays the synonyms for the selected field on the Synonyms tab.

Batch-Detecting Synonyms

Follow the instructions below to batch-detect synonyms for fields. You can batch-detect synonyms for the selected program or for all the programs in the project. Bear in mind that batch-detecting synonyms for a project can be quite time-consuming.

1. In the Programs pane, select the program for which you want to find synonyms. Select any program if you want to find synonyms for all the programs in the project.
2. Choose **File > Batch Find Synonyms**. The Find Synonyms dialog opens.
3. In the Find In pane, select the list of seed fields whose synonyms you want to find. In the Add Synonyms To pane, select the list to which you want to add the synonyms.

   💡 **Tip:** The lists may and often will be the same. To create a new list, enter the name of the list in the **New List** field and click **Create List**.
4. Specify the depth of synonym processing in the **Depth** combo box.
5. Choose:
   - **From selected program** if you want to batch-detect synonyms for the selected program.
   - **From all programs** if you want to batch-detect synonyms for all the programs in the project.
6. Click **OK**.

Change Analyzer adds the synonyms to the target list.

Performing an Impact Trace

The impact trace for a field displays the flow of data to the field: how data items exchange values, use each other in computations, and so forth. Perform an impact trace when you want to document your analysis, or to ensure that you have accounted for each instance of a field.

To perform an impact trace for a field, select the field in the Lists or Synonyms and Ports pane and choose **Find Synonyms** in the right-click menu. The Find Synonyms dialog opens. Click **Show Impacts**, then specify the depth of the trace in the **Depth** combo box. Click **OK**. Change Analyzer appends the impact trace to the Synonyms tab.

Viewing and Resolving Ports

When Change Analyzer detects synonyms for a field, it also detects any ports in which the field is used. It displays the declaration for the port in the Ports tab with the comment "Port found" along with the Hyperview information for the port. Select the declaration to navigate to the port in the Source pane.

Resolving a port identifies the port with which the detected port communicates. By tracking communications between ports, you can analyze affected fields across programs. Follow the instructions below to resolve a port.

1. In the Ports pane, select the declarations for the ports you want to resolve and choose **Resolve Ports** in the right-click menu. The Resolve Ports dialog opens.
2. Select the list to which you want the declarations for the communicating ports to be added.

   💡 **Tip:** To create a new list, enter the name of the list in the **New List** field and click **Add List**.

3. Click **OK**.

Change Analyzer adds the declarations for the communicating ports to the target list.

Creating Projects in Change Analyzer

You can create a project directly in Change Analyzer from the results of your analysis. The project contains only source files with fields in the selected list.

1. Select a list and choose **Create Project** in the right-click menu.
2. The New Project dialog opens. Enter the name of the new project in the text field and click **OK**.
3. The Change Magnitude window opens. Select **Automatically calculate change magnitude** if you want Change Analyzer to set change magnitudes for the listed source files based on the ranges specified in the fields below the check box. The Change Analyzer settings will override any existing change magnitudes for the files.

Setting Change Analyzer Options

Use the Change Analyzer tab of the Project Options window to specify the default depth of synonym and impact trace processing and the amount of information to display in the Affected Code report.

1. Choose **Tools > Project Options** . The Project Options window opens. Click the Change Analyzer tab.
2. In the Synonyms pane, specify the depth of synonym and impact trace processing in the **Default Depth** combo box. Click **Show Impacts Default Setting** if you want to display the default setting in the Change Analyzer dialog boxes you use to detect synonyms and perform impact traces.

   💡 **Tip:** You can override the default depth setting in these dialog boxes.

3. In the Affected Code Report pane, specify in the **Neighborhood Size** combo box the number of lines of unaffected code you want the Affected Code report to display above and below the line of affected code.

(The line of affected code is displayed in bold in the report.) Choose **Show unused datanames** if you want the report to include unused data fields.

Generating Change Analyzer Reports

To generate HTML reports in Change Analyzer, choose **File > Reports**. The Report Selection dialog opens. In the Select Lists pane, select the list you want to report on, then select the report type in the **Report Type** drop-down. Choose:

* **Report on the Whole List** to report the contents of the list.
* **Report on Selected Program** to report the contents of the list filtered by the program selected in the Programs pane.
* **Metrics Report** to report, for each program with a list item, the percentage of declarations in the list relative to the total number of declarations in the program.
* **Affected Code Report** to report, for each program with a list item, code that would be impacted by changing the definition or usage of items in the list. The line of affected code is displayed in bold in the report.

    Note: Use Change Analyzer project options to specify the amount of information to display in the Affected Code Report.

Click **Generate Report**. Change Analyzer displays the report.

Repository Exchange Protocol Syntax

The Repository Exchange Protocol (RXP) is an XML-based API that you can use to interact with application-level information in the workspace repository. This appendix describes the RXP query syntax and provides examples of its use.

Query Syntax

An RXP query consists of the tags and attributes described in this section.

Query

```
<query [name='QueryName']> { Object } </query>
```

Objects

```
<object [global='false']>
[ <objecttype> ObjectTypeCondition </objecttype> ]
[ <cond> Condition </cond> ]
[ <fetchtype as='FieldName'/> ]
[ <fetchid as='FieldName'/> ]
[ <fetchdisplay as='FieldName'/> ]
[ <fetchorigin as='FieldName'/> ]
[ <fetchsource as='FieldName'/> ]
[ <fetchsize as='FieldName'/> ]
{ <fetchconst type='FieldType' value='Constant'
as='FieldName'/> }
{ <fetchattr attr='AttrName' as='FieldName'/> }
[ <related [countas='FieldName'][optional='true']>
RelatedSpec
</related>]
</object>
```

ObjectTypeCondition

```
<typeset flag='FlagName' [negate='true']/>
| <type name='EntityName' [negate='true']/>
| <and [negate='true']> { ObjectTypeCondition }
</and>
| <or [negate='true']> { ObjectTypeCondition }
</or>
```

RelatedSpec

```
[ <reltype> RelTypeCondition </reltype> ]
[ <cond> Condition </cond> ]
[ <fetchtype as='FieldName'/> ]
```

```
{ <fetchattr attr='AttrName' as='FieldName'/> }
Object
```

RelTypeCondition

```
<relset flag='RelFlagName' [negate='true']
[incoming='true']/>
 | <rel name='RelationName' [negate='true']/>
 | <and [negate='true']> { RelTypeCondition } </and>
 | <or [negate='true']> { RelTypeCondition } </or>
```

Condition

```
<attr name='AttrName' op='Operation'
arg='Argument' [negate='true']/>
 | <hasrelated [negate='true']> RelatedSpec
</hasrelated>
 | <id equals='Integer' [negate='true']/>
 | <id in='Integer{,Integer}' [negate='true']/>
 | <source equals='String' [negate='true']/>
 | <source in='String{,String}' [negate='true']/>
 | <origin equals='SID' [negate='true']/>
 | <origin in='SID{,SID}' [negate='true']/>
 | <and [negate='true']> { Condition } </and>
 | <or [negate='true']> { Condition } </or>
```

EntityName

The name of a repository entity.

AttrName

The name of an entity attribute.

FieldName

The field name of the returned record set.

Operation

= | <> | > | >= | < | <= | like | in | between

FlagName

LEGACY | PROGRAMCODE | SYSTEM | KNOWLEDGE | GENERATED | EXTRACT | COMPOSITE

RelFlagName

REFER | USE | GENERATE | PRODUCE

RelationName

The name of a relationship.

Argument
The argument of the operation. Depends on both argument type and operation.

QueryName

A string.

Example 1

This example queries the repository for the object ID and parse status of the GSS.cbl source file:

```
<query name="Select a COBOL object by name">
  <object>
    <objecttype>
      <type name="COBOL"/>
    </objecttype>
    <fetchid as="ID"/>
      <fetchattr name="ParseStatus" as="Parsed"/>
    <cond>
      <attr name="Name" op="=" arg="GSS.cbl"/>
    </cond>
  </object>
</query>
```

Example 2

This example queries the repository for copybooks used in three Cobol programs:

```
<query name="Find COPYBOOKs used in given programs">
  <object>
    <objecttype>
      <type name="COBOL"/>
    </objecttype>
    <cond>
      <attr name="Name" op="in"
       arg="'GSS1.CBL','GSS2.CBL','GSS3.CBL'"/>
    </cond>
    <related>
      <reltype>
        <relset flag="USE"/>
      </reltype>
      <object>
        <fetchid as="ID2"/>
        <fetchtype as="ObjectType2"/>
        <fetchdisplay as="ObjectName2"/>
      </object>
    </related>
  </object>
</query>
```

Common Diagramming Features

This appendix describes features shared by many of the workbench diagramming tools (although not the Diagrammer itself). Use these features to edit diagrams, save diagrams in standard formats, print diagrams, and more.

Zooming

Use the slider ▭▭▭▭ on the tool bar in the lower lefthand corner of the tool window to zoom in or out on a diagram. Click the ⊞ button on the tool bar to restore the 100% zoom level.

Printing Diagrams

Click the 🖨 button on the tool bar in the lower lefthand corner of the tool window to print the diagram. The Print Preview window opens, where you can change the zoom factor for the diagram to control the number of pages in the print job.

Saving Diagrams

Click the 💾 button on the tool bar in the lower lefthand corner of the tool window to save a diagram to BED, bitmap, JPEG, Visio, Visio XML, DOT, or EMF.

🖊 **Note:** Visio 2002 must be installed to save a diagram to Visio. Visio 2002 is not required to save to Visio XML.

Copying Diagrams

Click the 📋 button on the tool bar in the lower lefthand corner of the tool window to copy the diagram to the clipboard in EMF format. You can paste the diagram from the clipboard to a document in a third-party tool such as Word.

Performing Basic Tasks in the Diagram Editor

Use the built-in Diagram Editor to edit diagrams, change the appearance of diagrams, cut-and-paste from a diagram, and other tasks.

Opening a Diagram in the Diagram Editor

Click the �'button on the tool bar in the lower lefthand corner of a diagramming tool window. The diagram on view in the tool opens in the Diagram Editor.

Creating a Diagram in the Diagram Editor

To create a new blank diagram, choose **File > New Diagram**.

Using the Locate Facility

Use the Locate facility to navigate to general locations in a diagram. To invoke the Locate facility, click **View > Locate**. The Locate window opens.

The Locate window displays the entire diagram on view in the Diagram Editor main window. A frame surrounds the portion of the diagram visible in the main window.

Drag the frame to the area of the diagram you want to view. The Diagram Editor displays the selected area in the main window.

Using the Quick Search Facility

Use the Quick Search facility to navigate to objects in a diagram. To invoke Quick Search, choose **View > Search pane.** The Quick Search facility opens at the top of the window.

Enter the text for the search in the **Quick Search** field. You can use wildcard patterns allowed in LIKE statements by Visual Basic for Applications (VBA).

Using the Search and Replace Facility

Use the Search and Replace facility to modify captions or tool tips globally. The Diagram Editor modifies the diagram only, not the repository.

To use the search and replace facility, choose **Edit > Replace**. The Replace window opens. Enter the text you want to replace in the **Find** field. Enter the text you want to substitute in the **Replace** field. Select **Match case** if you want to match the case of the entered text.You can apply the change to any combination of object captions, relationship captions, or tool tips by selecting the appropriate choices in the **Apply to** pane. If you apply the change to object captions, select the appropriate choice in the Scope pane to apply the change to all the objects that contain the text or only the selected objects that contain the text.Click **Replace** to run the operation and dismiss the Replace window.

Selecting Objects in the Diagram Editor

Select an object or relationship in the Diagram Editor by clicking it. Deselect an object by clicking on white space or selecting another object. To select all the objects in the diagram, choose **Edit > Select All**.

To select a range of objects, click in the diagram, hold down the right mouse button, drag the selection box over the objects you want to select, and release the mouse button. To select objects that are not in a range, hold down the Control key, then click each object you want to select.

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