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What’s New in SAS Lineage
3.3

Overview

The user interface for SAS Lineage has been rewritten in HTML5. Previously, applications in SAS 9.4 – and many SAS solutions that are based on SAS 9.3 and SAS 9.4 – used the Adobe Flash Player to provide interactive user interfaces. Adobe announced that it intends to end support for Flash technology and will cease to update and distribute the Flash Player at the end of 2020. Browser vendors will disable Flash by default in 2019. For more information about Adobe Flash end-of-life, see SAS Software and Its Use of the Adobe Flash Player.

Features of the HTML5 Interface

The HTML5 interface for SAS Lineage is displayed in a window that contains the following components:

- Diagram Pane
- Manage Views Pane
- Details Pane
- Filter Pane
Accessibility Features of SAS Lineage

Overview

SAS Lineage has not been tested for compliance with U.S. Section 508 standards and W3C web content accessibility guidelines. If you have specific questions about the accessibility of SAS products, send them to accessibility@sas.com or call SAS Technical Support.

Documentation Format

Please contact accessibility@sas.com if you need this document in an alternative digital format.

Keyboard Shortcuts

The keyboard shortcuts listed in the following table are available for SAS Lineage:

*Keyboard Shortcuts for SAS Lineage*

<table>
<thead>
<tr>
<th>Action</th>
<th>Shortcut</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td></td>
</tr>
<tr>
<td>Invert app colors</td>
<td>Ctrl+`</td>
</tr>
<tr>
<td>Open the context menu</td>
<td>Shift+F10</td>
</tr>
<tr>
<td>Select (nodes and lines)</td>
<td>Spacebar</td>
</tr>
<tr>
<td>Open Landmarks</td>
<td>Ctrl+F6</td>
</tr>
<tr>
<td>Display keyboard shortcuts</td>
<td>Ctrl+F9</td>
</tr>
<tr>
<td>Canvas</td>
<td></td>
</tr>
<tr>
<td>Zoom in (10%)</td>
<td>Ctrl+numeric keypad Plus Sign</td>
</tr>
<tr>
<td>Action</td>
<td>Shortcut</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Zoom out (10%)</td>
<td>Ctrl+numeric keypad minus sign</td>
</tr>
<tr>
<td>Reset the zoom (100%)</td>
<td>Ctrl+numeric keypad 0</td>
</tr>
<tr>
<td>Zoom to fit</td>
<td>Shift+Z</td>
</tr>
<tr>
<td>Free form panning-up</td>
<td>X+up arrow</td>
</tr>
<tr>
<td>Free form panning-down</td>
<td>X+down arrow</td>
</tr>
<tr>
<td>Free form panning-left</td>
<td>X+left arrow</td>
</tr>
<tr>
<td>Free form panning-right</td>
<td>X+right arrow</td>
</tr>
<tr>
<td>Pan up (one viewpoint distance)</td>
<td>Page Up</td>
</tr>
<tr>
<td>Pan down (one viewpoint distance)</td>
<td>Page Down</td>
</tr>
<tr>
<td>Print</td>
<td>Ctrl+P</td>
</tr>
</tbody>
</table>

**Common Diagram Navigation**

<table>
<thead>
<tr>
<th>Action</th>
<th>Shortcut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select subject</td>
<td>Ctrl+Home or Home</td>
</tr>
<tr>
<td>Move to next relationship (node selected)</td>
<td>Tab</td>
</tr>
<tr>
<td>Move to last item on diagram</td>
<td>Ctrl+End or End</td>
</tr>
</tbody>
</table>

**Network Diagram Navigation**

<table>
<thead>
<tr>
<th>Action</th>
<th>Shortcut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Move to parent (upstream)</td>
<td>up arrow</td>
</tr>
<tr>
<td>Move to child (downstream)</td>
<td>down arrow</td>
</tr>
<tr>
<td>Move to next sibling</td>
<td>left arrow</td>
</tr>
<tr>
<td>Move to previous sibling</td>
<td>right arrow</td>
</tr>
</tbody>
</table>

**Impact Analysis Diagram Navigation**

<table>
<thead>
<tr>
<th>Action</th>
<th>Shortcut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Move to parent (upstream)</td>
<td>left arrow</td>
</tr>
<tr>
<td>Move to child (downstream)</td>
<td>right arrow</td>
</tr>
<tr>
<td>Move to next sibling</td>
<td>down arrow</td>
</tr>
<tr>
<td>Move to previous sibling</td>
<td>up arrow</td>
</tr>
</tbody>
</table>
Chapter 1
Introduction to SAS Lineage

What Is SAS Lineage?

SAS Lineage is a web-based diagram component for visualizing relationships between objects. It is used as a stand-alone lineage and relationship viewer that can be accessed by SAS database management and business intelligence applications. The component displays three types of diagrams:

• a network diagram that displays all relationships.
• a governance diagram that displays data governance information.
• an impact analysis diagram that displays the objects that are affected by a change to the diagram’s subject. The *Is dependent on* relationship appears the most frequently in the impact analysis diagram.

The relationship information displayed in these diagrams is drawn from the Relationship database that is a part of the Web Infrastructure Platform Data Server. These diagram types are generated by specific groups of relationship types:

<table>
<thead>
<tr>
<th>Relationship Type</th>
<th>Diagram Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is dependent on</td>
<td>Network, Governance, Impact Analysis</td>
</tr>
<tr>
<td>Contains</td>
<td>Network, Governance, Impact Analysis</td>
</tr>
<tr>
<td>Is parent of</td>
<td>Network, Governance, Impact Analysis</td>
</tr>
</tbody>
</table>
SAS Lineage can display most types of SAS metadata. This includes data objects, including columns, tables, external files, information maps, reports, stored processes, and the levels and measures in OLAP cubes. You can also display objects created in SAS Business Data Network, such as terms, tags, and associated items.

### Benefits of SAS Lineage

SAS Lineage includes:

- A shared store for all relationship information, called the SAS relationship service. Most SAS products and object types are now integrated into the SAS relationship service.
- The ability to import content from third-party sources.
- A relationships web viewer that supports views for displaying information stored in the relationship service. These views can display all the relationships in the relationship service and data governance information. They are named All Relationships, Governance, and Impact Analysis.

You can also create your own views using the filtering capabilities of the viewer. This can help you subset the information to only the objects and relationships that you want to see. In addition, there are helpful features such as cluster nodes, which enable you to expand on demand, and an overview window with details of objects.

### Roles and Capabilities in SAS Lineage

#### Overview

When you log on to SAS Lineage from SAS data management applications, you are granted access to applications and features based on the roles and capabilities that are associated with your login. Typically, these roles are assigned to a group to which you belong. For example, by default, members of the Data Management Business Users group have the Data Management: Lineage role. This role has one capability, ViewApplication, which enables access to SAS Lineage. Without this capability, you cannot display a SAS Lineage diagram.

#### Default Groups, Roles, and Capabilities

The following groups, roles, and capabilities are installed in SAS Management Console when SAS Lineage is installed.

<table>
<thead>
<tr>
<th>Relationship Type</th>
<th>Diagram Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is associated with</td>
<td>Network, Governance</td>
</tr>
<tr>
<td>Is equal to</td>
<td>Network, Governance, Impact Analysis</td>
</tr>
<tr>
<td>Is synonymous with</td>
<td>Network, Governance, Impact Analysis</td>
</tr>
</tbody>
</table>
Table 1.2  Default Groups, Roles, and Capabilities

<table>
<thead>
<tr>
<th>Role Name</th>
<th>Role Description</th>
<th>Capability IDs</th>
<th>Groups That Get This Role by Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Management: Lineage</td>
<td>Provides default access to the SAS Lineage application.</td>
<td>ViewApplication</td>
<td>Data Management Stewards, Data Management Business Users, Data Management Business Approvers, Data Management Power Users, and Data Management Executives</td>
</tr>
<tr>
<td>Lineage: Administration</td>
<td>Provides all functionality related to administrative activities for the SAS Lineage application.</td>
<td>ViewApplication, UpdateRelationships</td>
<td>Data Management Administrators</td>
</tr>
</tbody>
</table>

- The ViewApplication capability gives you default access to SAS Lineage. Without this capability, the SAS Lineage application link is not present for this user.
- The UpdateRelationships capability enables you to apply changes to the Relationship Service (for example, Import Relationships). This capability is intended to control access to the Import Relationships window and to the user interface’s facility for creating equivalent relationships. If the capability is not granted to you as the current user, the Import Relationships and Create Equivalent Relationships actions are disabled.
- The Data Management: Lineage role should be assigned to any user who needs access to the SAS Lineage application but who is not permitted to update any relationship data. These users cannot import relationships.
- The Lineage: Administration role should be assigned to any user who needs full access to the SAS Lineage application. This full access includes the ability to import relationship via the SAS Lineage user interface.

Define Users and Link Them to Groups (and Roles)

SAS Lineage is installed as part of a bundle of products. After installation, an administrator uses SAS Management Console to perform the following tasks:

- Create a user definition for each person who uses SAS Lineage.
- Create any custom groups (and roles) that you might require if the default groups provided by SAS Lineage do not meet your needs.
- Assign each user to one or more of the default or custom groups in order to grant each user the capabilities that he or she requires.

For more information about defining users and groups in SAS Management Console, see *SAS Management Console: Guide to Users and Permissions.*
Usage Notes for Roles and Capabilities

Capabilities cannot grant privileges in excess of those that are granted by other, relevant systems. For example, suppose that you have the capability called UpdateRelationships. This capability alone is not sufficient to update relationships in another application. To do that, you (or a group to which you belong) must be a member of an appropriate group for that application.

Connecting SAS Lineage to Applications

You must supply the information needed to connect the applications that use SAS Lineage to SAS Lineage itself. Consult the documentation for those applications for more information.

Note: The SAS Relationship Content Service must be loaded automatically. The automatic relationship loading option is off by default. For more information about configuring automatic loading, see the "Configuring Automatic Relationship Loading" topic in the SAS Intelligence Platform: System Administration Guide. This book is available from the following page: http://support.sas.com/documentation/onlinedoc/intellplatform/tabs/admin94.html.
Chapter 2
Accessing SAS Lineage

Overview

You can access SAS Lineage in two ways.

- “Use a Standard URL” on page 5
- “Connect from Another Application” on page 6

Use a Standard URL

You can access SAS Lineage from a standard URL that has the following format: http://hostname/SASLineage.

If your site is not using the default port for SAS Lineage, you must specify the port in the URL. For example, if the port is 7980, you can access SAS Lineage from the following URL: http://hostname:7980/SASLineage.

1. Click the URL that is supplied by your system administrator, or paste it into the address field of your browser.
2. Enter your user ID and password in the appropriate fields.
   
   Note: Your password is case-sensitive. Your user ID might be case-sensitive, depending on the operating system that is used to host the web application server. If you need assistance, contact your system administrator.

3. Click **Sign In** to access SAS Lineage in a browser window.
4. To log off from SAS Lineage, click the icon that represents your user name in the upper right of the SAS Lineage window. Then, click **Sign out** in the drop-down menu.

   Note: When you click **Sign out**, you are logged off from all tabs opened by SAS Lineage.
Note: Be careful when you log on to SAS Lineage in one browser tab and then log on to SAS Lineage (or a different SAS web application) in another browser tab. The same credentials are used automatically for subsequent authentication attempts.

**Connect from Another Application**

SAS Lineage can be accessed from buttons and links that you can find in SAS database management applications, SAS business intelligence applications, and related third-party applications. If you have already logged on to one of the SAS applications, you will be taken directly to SAS Lineage. If you have not logged on to a SAS application, you will see the Sign In window explained in “Use a Standard URL” on page 5. Follow the same steps to log on to SAS Lineage.
Chapter 3
Understanding the Interface

SAS Lineage Interface

Overview

SAS Lineage can display the following types of tabs:

- “Diagram Tab” on page 7
- “Details Tab” on page 10
- “Manage Views Tab” on page 10
- “Filter Tab” on page 11

This tabbed structure gives you the flexibility to display multiple subjects and enter the settings that you need for each of these subjects. For example, you can display one subject in an all relationships view and another subject in an impact analysis view. You can also display object details and set filters independently for each subject.

Diagram Tab

The Diagram tab displays the diagram for the object that you selected as a subject in the Search for Subjects window. You can select multiple subjects to display as many Diagram tabs as you need. Each Diagram tab displays the name of the subject of the diagram, unless a subject has not been selected. In that case, the Diagram tab is named New Diagram.
If you close the Search for Subjects window without searching for one or more subjects, a **New Diagram** tab is displayed with a **Search for Subjects** button. See *Search for Subjects* on page 15 for more detailed information about searching.

The tab shows the selected subject in the all relationships standard view. For information about changing the standard view, see “Choosing a Standard View” on page 18.

You can use the following functions to manage the **Diagram** tab:
### Table 3.1  Diagram Tab Management

<table>
<thead>
<tr>
<th>Function</th>
<th>Location</th>
<th>Component</th>
</tr>
</thead>
</table>
| ![](image) | Top of the Diagram tab | Lists available options:  
• Search for subject. See Search for Subjects on page 15.  
• Close  
• Close all  
• Import Relationships  
• Print  
• Refresh  
• Keyboard shortcuts  
• Landmarks (enables you to use the Up and Down keys to move between areas in the tab)  
Import Relationships enables you to load an XML relationship file. |
| ![](image) | Top of the Diagram tab | Opens a new Diagram tab. |
| ![](image) | Upper right corner of the Diagram tab | Contains diagram display controls:  
• Auto-layout  
• Highlight path  
• Zoom  
You can right-click in any blank space in the Diagram tab to access the zoom and reset layout settings. |
| ![](image) | Top right edge of the Diagram tab | Displays the Details tab. See “Details Tab” on page 10. |
| ![](image) | Top right edge of the Diagram tab | Displays the Manage Views tab. See “Manage Views Tab” on page 10. |
| ![](image) | Top right edge of the Diagram tab | Displays the Filter tab. See “Filter Tab” on page 11. |
| ![](image) | Top left edge of an opened tab | Closes an opened Details, Manage Views, or Filter tab. |
| ![](image) | Lower left corner of the Diagram tab | Displays a Legend, which lists relationship types:  
• Is dependent on  
• Contains  
• Is parent of  
• Is associated with  
• Is equal to  
• Is synonymous with |
Details Tab

The **Details** tab is displayed when you select an object in a diagram and click **Object details**.

*Figure 3.2 Details Tab*

Click  
 to open the selected item as the subject of a new **Diagram** tab. This option is not available if the subject of the current diagram is selected. Click  
 to open the selected item in a linked application.

The information in the **Details** tab is divided into sections that cover the following:

- Object type
- Extended Properties
- Relationships

When the mouse pointer is hovered over an object, its object type and ID are displayed.

Manage Views Tab

The **Manage Views** tab is displayed when you click  
:
The tab contains:

- A list of the standard view types: All Relationships, Governance, and Impact Analysis
- A New view button, which displays the New View window.
- A View properties button, which displays the View Properties window.
- A Set as default button.
- An Actions button, which enables you to duplicate a standard or user-defined view. You can also delete user-defined views and move them up or down in the list.
- A list of user-defined views, when present. See “Creating and Managing User-Defined Views” on page 23.

**Filter Tab**

The Filter tab is displayed when you click 🗂️:
You can create filter conditions based on object types and relationship types:

- **Apply** applies the filter conditions to the current diagram.
- **Clear** clears the selection boxes of all of the conditions.
- **New View** displays the New View window, which you can use to create a new view that is added to the list of views in the **Manage Views** tab. For more information, see “Create a User-Defined View” on page 23.

**Note:** You can use the **Filter** field to find object types, scroll down the list of object types, and click **More** to access the Object Types window. This window contains selection tools that make searching for the correct object types easier. You can also reset both the object type and the relationship type lists.
To access the Settings window, click the icon that represents your user name in the upper right of the SAS Lineage window. Then click Settings in the drop-down menu to specify user locale, theme, and accessibility preferences for SAS Lineage.


Chapter 4
Working with SAS Lineage

Search for Subjects

You can use the Search for Subjects window in SAS Lineage to search for the subject of a SAS Lineage diagram.

1. Click Search for subjects to access the Search for Subjects window.

2. If you want to search without using a keyword to limit the scope of your search, leave the Keyword field blank.
3. Click **Submit Search** to run the search. This search returns the first 10,000 available subjects from the included data types.

4. You can also limit the scope of your selection. For example, you can enter *data* into the **Keyword** field and leave the **Types** section unchanged.
You can use the list of types in the **Types** field to review and select the types that you want to filter on in your search. To remove a type from the available search types, click next to the item type that you do not want included in your search.

The **Types** field is shown in the following figure:

If you do not see the data type that you need, you can enter the data type name in the **Filter** field or scroll down the list until you see your data type. You can also click **Choose** to access the Choose Types window, where you can review and filter the available data types. Enter a value such as *job* into the **Filter** field to restrict the list of data types.
Figure 4.5  Choose Data Types

You can click Select all or Deselect all at the bottom of the Choose Types window to help you modify the set of data types included in your search.

After you enter all of the values that you need, you can click OK to save the filtered data types. Once, you have selected the data types, click Submit Search to run the search.

Choosing a Standard View

Overview

Once you have selected a subject of a SAS Lineage diagram, you can choose a view. SAS Lineage is shipped with the following standard views:

- “All Relationships” on page 20
- “Governance” on page 21
- “Impact Analysis” on page 21

All three of these views are based on information included in the Relationship database that is a part of the Web Infrastructure Platform Data Server. The All Relationships view displays all the relationships in the Relationship database for a selected subject item in a network diagram.

The Governance and Impact Analysis views are left-to-right dependency views that are displayed in impact diagrams. These diagrams display a subject item and all its related items in a left-to-right dependency view. Items to the left of the subject are considered predecessor or upstream. Items to the right of the subject are considered successor or downstream. All relationships in the diagram have a direction and all items related to the subject are placed either upstream or downstream based on that direction. These views also have grouping capabilities, so that included items appear inside a group node that represents the parent item.

Governance helps organizations maintain a single, consistent set of policies and processes for developing, monitoring and managing corporate data. The Governance view shows you the data that you need to use capabilities such as data profiling, data integration, common language creation, and hierarchy management.
Adult Corrections is the subject of this Governance view:

**Figure 4.6 Governance View**

The Impact Analysis view includes SAS Business Data Network terms, but it does not include the *is associated with* relationship to the terms. Therefore, it does not display objects connected with that relationship. Impact analysis identifies the tables, columns, jobs, and transformations that are affected by a change to a selected table or column. Use impact analysis before changing or deleting a metadata object to see how that change can affect other objects. The Impact Analysis view of Adult Corrections gives a different perspective:

**Figure 4.7 Impact Analysis View**

The Governance view and the Impact Analysis both have the SAS Business Data Network term Adult Corrections as a subject. However, the Governance view supports the *is associated with* relationship and includes SAS Business Data Network tags, links, and terms such as Suppliers, Policies, and Health Care. These objects are not included in the Impact Analysis view because it does not support the *is associated with* relationship. Therefore, the only object to the left of Adult Corrections is CreateTermFeb8Term1, which is connected to Adult Corrections with the *is parent of* relationship.

All of the views handle related items in the same way. When an item has related items, an **Expand** button (+) is available on that item. Click the **Expand** button to display that item's related items. This process is repeated for each item displayed. The subject item in an All Relationships view initially does not have an **Expand** button because this view is always expanded when the diagram is brought up.
You can also create and save custom user-defined views. However, these views cannot be shared with other users. See “Creating and Managing User-Defined Views” on page 23 for information about user-defined views.

All Relationships

The All Relationships view for a DB2 PK FK Job search opens in an uncomplicated network diagram:

Figure 4.8  All Relationships View

You can drill down into the view to see more detail or filter it by item type or relationship to remove items that you do not need to consider. You can point to an object to display the object type and object ID. Finally, you can select an object and click to display the Details pane for the object. See “Details Tab” on page 10.

This All Relationships diagram has been drilled-down a level:

Figure 4.9  All Relationships Drill-Down View
Governance

You can generate an unexpanded Governance view to get a high-level understanding of the elements:

*Figure 4.10 Unexpanded Governance View*

![Unexpanded Governance View](image)

You can expand the view to see upstream and downstream items. For example, you can expand the State Health Plan and Adult tables to see the columns:

*Figure 4.11 Expanded Governance View*

![Expanded Governance View](image)

Impact Analysis

Parent objects in impact analysis diagrams have two states, open and closed, that take advantage of grouping capabilities. The diagrams also support an *include* relationship. When a diagram is closed, the included items are displayed inside a group node that represents the parent item. In this case, the two DB2 Bulk Table Loader transformation objects are contained inside the DB 2PK FK Job object. You can open the diagram by clicking the **Expand** controls on the left and right side of the group object. This action displays the upstream and downstream objects in the diagram. Upstream objects come before the diagram subject, and downstream objects come after the subject.

This is an unexpanded Impact Analysis view of a job:
You can see more detail if you expand the view:

The tables in this example are displayed in a format that lists the columns that they contain.

Note: Both network and impact diagrams support the ability to designate an object in the diagram as the subject for a new diagram that is opened in a separate tab. Right-click an object and click the Lineage item in the contextual menu. For example, the DB_case table object in the diagram above can be designated as the subject for the following impact diagram:
You can apply the views listed in the Manage Views tab to display this new subject in a different type of diagram.

Creating and Managing User-Defined Views

Overview

• “Create a User-Defined View” on page 23
• “Manage User-Defined Views” on page 25

Create a User-Defined View

You can create a user-defined view. A user-defined view functions as a filter that controls the objects included in the current SAS Lineage diagram. You can save these views, which adds them to the list in the Manage Views tab. Then, you can work with a saved view at a later time. User-defined views are available only to the user who created them.

1. Open SAS Lineage.
2. Click  to access the Manage Views tab.
3. Click New View to access the New View window. You can also save the settings in the Filters tab as a view.
4. Enter a name for the view, such as Remove Job Transforms, in the View name field.
5. Specify an Impact diagram or Network diagram display type for the view. Click Network diagram for this example.
6. Select Relationship Types for the view filter. The Remove Job Transforms view uses all of the available relationship types. You can enable, disable, or hide the selected items.
7. Select the **Object Types** for the view filter. This view uses the **Job Transformation** type. Note that you can also enable, disable, or hide object types.

8. Click **OK** to save the view and add it to the drop-down list in the **View** field.

**Figure 4.15  User-Defined View Definition**

Note the presence of the Table Loader job transformation at the bottom of the All Relationships view:

**Figure 4.16  All Relationships View**

The job transformation object type is not included in the Remove Job Transforms user-defined view, and Table Loader object is not present when the view is applied to the diagram for the term:
You can use the Remove Job Transforms user-defined view to filter job transformation out of the diagrams generated by any subject that you select.

You can use the items in the toolbar to perform the following functions:

- create a new user-defined view
- edit the properties of a selected user-defined view
- set a selected standard or user-defined view as the default view
- move a selected user-defined view up or down in the list
- copy the settings from a selected user-defined view into a new user-defined view
- delete a selected user-defined view

**Manage User-Defined Views**

You can manage an existing user-defined view in the Manage Views pane:

1. Open SAS Lineage.
2. Click to access the Manage Views pane.
3. Click to edit the properties of the view:
You cannot change the properties of the All Relationships, Governance, and Impact Analysis views.

4. Select a view in the list and click 🔄 to set the selected view as the default view.

5. Click 🔧 to do the following:
   - copy
   - delete
   - move up
   - move down

The only task in this list that you can perform with the All Relationships, Governance, and Impact Analysis views is copy.

---

**Specialized Object Types**

**Overview**

Lineage supports object types that have specialized characteristics:

- “Recurrence Objects” on page 26
- “Clustered Objects” on page 27
- “Equivalent Objects” on page 30

**Recurrence Objects**

Because of the way that relationships work, diagrams can include recurrence objects, such as the same job displayed, as a source and a target. These recurrence objects are displayed in only the Impact Analysis and Governance diagrams. They are not displayed in All Relationships diagrams.
An example of a diagram that displays recurrence objects is a transformation that can both read from and write to the same table. Objects representing the table appear both upstream from the transformation node and downstream from the transformation node in the diagram. The recurrence objects are identified by a red flag icon on the right side of the node. The only special action associated with recurrence objects is that selecting one of the recurrence objects in the diagram causes its matching node or nodes to be also highlighted.

**Figure 4.18  Recurrence Objects in a Diagram**

This portion of an impact analysis diagram shows two pairs of recurrences that are marked with red flag icons: MS (rec_complex_C2) objects and SR—R (rec_complex_C2) objects. One of the SR—R (rec_complex_C2) objects has been selected and highlighted, so its recurrence is also highlighted.

Any action that you take on a selected recurrence node impacts only that selected instance of the node. If, for example, you open a table node to display its columns, any recurring instances of that node are not opened. Only the selected recurrence is impacted.

**Clustered Objects**

Objects can also be clustered in the diagram. Objects are clustered based on their types, relationship to the expanded object, and direction of that relationship. If enough objects of the same type are related to the expanded object with the same relationship type and relationship direction, these objects are clustered together as one node in a network diagram.

The clustered node name adopts the object type name of the clustered items. In the diagram below, all of the clustered items have an application object type.
The number of clustered items is shown in the icon on the bottom right corner of the icon for the clustered object (Application, in this case). Because the cluster of these Application objects has been selected, its Detail tab is displayed. This tab contains a list of the clustered items and three buttons to manage them:

- + (Add to diagram)
- + (Add all to diagram)
- (Recluster all)

Click + to add all the members of the cluster to the diagram:
You can uncluster a clustered object by adding all of its objects to a diagram. Then, the diagram displays all of the relationships that its member objects are a part of, except relationships between member objects. Unclustering a clustered object is similar to unclustering each member object individually. If you uncluster a clustered object for which any of its members are unclustered, those objects are added to the diagram in a fully unclustered state. If a clustered object has not been unclustered by adding all of its members to the diagram, any member objects that are added to the diagram are displayed in a clustered state.

To recluster an unclustered object, right-click it and click **Recluster selected** in the contextual menu:

The selected **C09 (cluster_rec)** object is reclustered under the **Application** clustered object:
You can also recluster all of the unclustered objects. Right-click Application and select Recluster all or click the button in the Details tab.

*Note:* Clustered objects are not marked with a numbered badge in impact diagrams. The name of the object is prefixed with the number of cluster object in parentheses. For example, an Application node with 10 clustered application objects is named 

Equivalent Objects

Equivalent nodes represent two or more resources in the relationship service that have a relationship of *Is equal to*. An object is equivalent to another when both objects represent the same object but they are accessed through another method or system:

The *AI (e_g_complex)* scheduling server object near the bottom of this diagram is merged into a group of ten equivalent items. This object is marked with a red badge that specifies the number of equivalent items. The equivalent items are listed in the Details tab. By default, equivalent objects are merged into a single node when the diagram loads. Then you can separate equivalents through the context menu or the toolbar in the Details tab. Equivalent nodes do not qualify for inclusion in cluster nodes.
A primary equivalent object is the equivalent object that has the relationship to the subject. The equivalent node displays that primary object name for the merged equivalent node. That item's equivalents might not have a relationship to the subject on the current diagram. In the diagram above, A1 (e_g_complex) is the primary equivalent.

A primary equivalent is determined based on the equivalent with the closest relationship to the subject. If two or more equivalents are the same distance from the subject node, then the last modified date is used to determine the primary equivalent.

Click `A`:

**Figure 4.24  Separated Equivalent Objects**

The A1 (e_g_complex) and A2 (e_g_complex) objects are both included in the Equivalent items list in the Details tab. Note that they are also connected with the Is equal to relationship. You can click `Y` in the Details tab or right-click any of the equivalent items in the diagram and select Merge equivalents to merge the equivalent items.

SAS Lineage can display equivalent nodes for nodes that are also group nodes. For example, you could have a Job1 that includes 3 tables and a Job2 that includes 2 tables.
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