Contents

Chapter 1 • About This Documentation ................................................................. 1
  Tutorials, Examples, and Other SAS Visual Investigator Resources .............. 1

Chapter 2 • Alert Triage and Disposition ........................................................... 3
  How the Alert Lifecycle Works ........................................................................ 3
  Reviewing Alert Details .................................................................................. 4
  Applying a Disposition Method ....................................................................... 4
  Reviewing Standard Alert Disposition Methods ............................................ 5
  Understanding Suppressed and On-Hold Alert Statuses .............................. 5
  Using a Workspace to Explore Data ............................................................... 6
  Using Insights to Document Investigation Findings ...................................... 7
  Using Selection Tools .................................................................................... 8

Chapter 3 • View Exploration .............................................................................. 11
  Understanding Data Views .............................................................................. 11
  View Data in Detail ......................................................................................... 12
  View Data in a Map ......................................................................................... 13
  View Data in a Timeline .................................................................................. 14
  View Data in a Network .................................................................................. 14
  View Data in a Table ....................................................................................... 15

Chapter 4 • Search and Discovery ..................................................................... 17
  Performing a Free-Text Search ....................................................................... 17
  Performing a Form-Based Search ................................................................... 18
  Perform Map-Based Search ............................................................................ 18
  View Search Results ....................................................................................... 19

Chapter 5 • Network Management .................................................................... 21
  Managing a Network Diagram ....................................................................... 21
  Setting Network Pan or Select Mode .............................................................. 23
  Specifying Double-Click Behavior for Nodes ............................................... 23
  Specifying Node and Label Text Display Options ....................................... 24
  Showing or Hiding the Network Node Legend .............................................. 24
  Applying a Timeline to the Network View ..................................................... 25
  Expanding Nodes ........................................................................................... 25
  Adding and Deleting Node and Group Links ................................................. 27
  Adding and Deleting Nodes .......................................................................... 28
  Grouping and Ungrouping Network Nodes .................................................. 29
  Hiding and Revealing Nodes ......................................................................... 29
  Applying Network Analytics ......................................................................... 30
  Using Selection Tools .................................................................................... 31

Chapter 6 • Advanced Tutorials ....................................................................... 33
  Designing Page Templates ............................................................................ 33
  Configure a New Entity Type ......................................................................... 35
  Ad Hoc Data Import ....................................................................................... 36
  Configuring Strategies ................................................................................... 38
  Configuring Queues ....................................................................................... 39
  Importing Custom Map and Pin Icons .......................................................... 39
  What Are Relationships and When Are They Used? .................................... 40
  What Are Traversals and When Are They Used? ........................................... 42
How and When to Re-index or Resolve Entities ........................................ 42
Chapter 1
About This Documentation

Tutorials, Examples, and Other SAS Visual Investigator Resources

Tutorials, Examples, and Other SAS Visual Investigator Resources

The documentation included in Tutorials and Examples highlights some of the features of SAS Visual Investigator to help you get started. To access all documentation for SAS Visual Investigator and see more details about these and other tasks, go to http://support.sas.com/documentation/prod-p/visgator/index.html.
How the Alert Lifecycle Works

This SAS Visual Investigator tutorial explains what an alert lifecycle is and provides a few examples of typical alert lifecycle paths.

Alerts can exist in several states. Alerts move through these states in a lifecycle that is based on user interaction and applied disposition methods. Alerts can be either open or closed. When open, alerts can be active, on hold, or suppressed.

Here are several alert lifecycle examples.

**Lifecycle Process: Alert Not Worked On**

1. The alert is created and routed to a queue.

   *Note:* The alert created might be a new alert, a suppressed alert, or an on-hold alert.

2. The alert sits in the queue without being worked on.

3. The time limit for the alert is reached.

4. The alert is closed automatically by the system.

**Lifecycle Process: Alert Suppressed**

1. The alert is created and routed to a queue.

2. The alert sits in the queue without being worked on.

3. The investigator suppresses the alert for a specific amount of time.
4. The time limit for the suppressed alert is reached.
5. The alert is closed automatically by the system.

- **Lifecycle Process: Alert on Hold**
  1. The alert is created and routed to a queue.
  2. The alert sits in the queue without being worked on.
  3. The investigator puts the alert on-hold for a specific amount of time.
  4. The time limit for the on-hold alert is reached.
  5. The alert is reactivated by the system and is redisplayed in the queue.

---

**Reviewing Alert Details**

This SAS Visual Investigator tutorial describes the process for accessing details related to a specific alert.

The **Alert Details** tab is a custom view of the alert. Administrators can also define the **Alert Details** view to open other tabs containing more details or a different view of existing details.

1. On the **Alerts** page, select the alert of interest.
2. If it is available, review the summary information related to the selected alert.
3. To open an alert, double-click the alert of interest on the **Alerts** page.

   *Note:* An alert can be open for editing by one person at a time. If the alert is opened by subsequent users, a message indicating that the alert is currently being edited by another user is displayed at the top of the page, and the alert is opened as read-only to the other users.

   The **Alert Details** tab is displayed, and if an associated network is assigned, then the network opens in a **Workspace** tab by default.

4. Explore the information available at the **Alert Details** tab and any other associated tab that is open in this view.

   In general, investigation of an alert and the associated details can be followed by applying an alert action (that is, a disposition method) or continuing the investigation by evaluating the alert in other views.

---

**Applying a Disposition Method**

This SAS Visual Investigator tutorial describes the process for addressing an alert by applying a disposition method to determine how an alert is handled.

You can apply a disposition method to an editable alert from the alert list pane or from an open alert.

*Note:* An alert can be open for editing by one person at a time. If the alert is opened by subsequent users, a message indicating that the alert is currently being edited by
another user is displayed at the top of the page, and the alert is opened as read-only to the other users.

1. With an alert selected in the alert list pane or opened in an Alert Details tab, expand the options in the disposition menu.

2. Apply a disposition method from the available options.

3. If prompted, enter a date indicating the termination of an applied suppression or hold disposition method.

4. If prompted, enter a comment.

5. Click Submit to continue.

You can then select the next alert in the queue and repeat the triage and disposition process.

---

### Reviewing Standard Alert Disposition Methods

This SAS Visual Investigator tutorial lists and describes the most common disposition methods generally available to apply to an alert.

Here are options that might be available:

- Close. The alert is resolved. No additional action is required and the alert is removed from the list.

- Suppress. The alert is hidden from view and will be closed after a specified length of time.

- Hold. The alert becomes inactive for the length of time indicated. After the time limit is reached, the alert becomes active.

- Create document. Selecting this option enables you to create a new document linked to the alert.

- Create external case. Selecting this option enables you to create a case in an external case management system.

---

### Understanding Suppressed and On-Hold Alert Statuses

This SAS Visual Investigator tutorial describes the suppressed and on-hold alert states, which are updated by the system when the time limit is reached.

Suppressed and on-hold alerts retain their status for a finite time period. The time period is set by the user during alert disposition.

**Suppressed Alert**

When an alert does not require immediate attention, it sometimes makes sense to suppress the alert for a finite amount of time and then revisit it before that time has passed.
When an alert is suppressed, it is closed by the system after the investigator’s imposed time period has passed.

**On-Hold Alert**

When an alert does not require immediate attention, it sometimes makes sense to put the alert on hold for a specified amount of time, pending additional information.

When an alert is placed on hold, it is reactivated by the system after the investigator’s imposed time period has passed. Any of the disposition methods can be applied to the reactivated alert.

---

**Using a Workspace to Explore Data**

This SAS Visual Investigator tutorial describes a workspace and includes instructions for adding objects to a workspace.

A workspace enables you to gather items of interest to your investigation from your data repository. A workspace is always associated with an existing object within SAS Visual Investigator, typically one that represents an investigation or an alert. Since a workspace is a living object, if the underlying data changes, the information displayed in your workspace also changes.

**Adding an object to a workspace:** You can add many different types of information to a workspace to enable you to develop your investigation (for example, objects, network diagrams, and so on).

1. When you identify a piece of information that you want to add to a workspace, right-click the object and select **Add object to Workspace** from the pop-up menu.

2. From the Add Object to Workspace window, select the workspace to which the object is to be added.

3. Click **OK** to add the object to the selected workspace.

After an object has been added to a workspace, the object can be visualized in a variety of views, thereby enabling you to see relationships between objects and information from different perspectives. In addition, objects can be added to an **Insights** tab.
Using Insights to Document Investigation Findings

This SAS Visual Investigator tutorial describes insights and includes instructions for adding items to an insight.

Insights are static representations of selected parts of an investigation at a specific point in time. The **Insights** tab acts as a container for information from within your data repository and from external data sources. These items can be moved around and resized as needed. Because an **Insights** tab is a static representation of information, if the underlying data changes, the information displayed in an **Insights** tab does not change to reflect the underlying data change.

**Adding Items to an Insights tab:** You can add many different types of information to an **Insights** tab to represent your investigation at a particular point in time.

1. When you identify a piece of information that you want to add to an **Insights** tab, right-click the object and select *Add <item type> to Insights* from the pop-up menu.

2. From the Add to Insights window, select the **Insights** tab to which the item is to be added.

3. Click **OK** to add the item to the selected **Insights** tab.

The item is added to the indicated **Insights** tab.

You can also add text and images to an **Insights** tab to further enhance your investigation documentation.

To add notes to an **Insights** tab:

- Click anywhere in an empty cell and simply start typing.

To add an image to an **Insights** tab:

- Move your mouse pointer over an empty cell and click *Add Image*. The Open dialog box is displayed. Navigate to the image that you want to add, and click **Open**. The image is displayed in the selected cell.

To paste data from the Microsoft Windows clipboard into an **Insights** tab:

- Move your mouse pointer over an empty cell and click *Paste*. The data from the clipboard is displayed in the selected cell.
Insights tabs can be printed to retain a hard copy of your investigation information.

Using Selection Tools

This SAS Visual Investigator tutorial describes how to use the selection tools to view only a subset of your data.

When investigating, you often want to select a subset of your data (for example, to add to a workspace or an Insights tab for further examination). SAS Visual Investigator provides several ways to select objects in any of the visualization views. When an object is selected, navigating to the Tools pane and selecting Selection from the drop-down menu reveals options for making selections from the displayed data.

The selection tools available at the Tools pane differ based on the view selected. When you view an object in Network View, you can do the following:

• see a count of the number of objects currently selected
• select check boxes to select objects by type
• enter text to select objects that have labels containing this text
• clear all selected objects
• invert the selection, meaning that all objects currently selected are deselected, and all objects not currently selected are selected.

Note: Inverse selection is not supported for custom nodes on a network diagram — that is, nodes that you have manually added yourself.

• select edge nodes, meaning that all objects connected to only one other object are selected
• select detached nodes, meaning that all objects not connected to any others are selected

When you view the same data in all other views, you see the same options, except for the options for selecting edge or detached nodes. These two options apply to Network View only.

The following figure shows the selection tools available in Network View:
Understanding Data Views

This SAS Visual Investigator tutorial describes the different ways that you can view your data to get a better understanding of the investigation.

SAS Visual Investigator enables you to view your data, such as the results of a search or the contents of a workspace, in multiple ways.
Switching between different views can help you understand your data. When you change views, the layout of the details pane changes accordingly. Any items selected in the original view remain selected in the new view.

You can select the following views from the search results toolbar or from the Workspace tab’s menu:

- **Detail View** is the default view. Detail View displays a summary of your data to enable you to easily see information relevant to your investigation.

- **Map View** enables you to view locations associated with your data plotted on a map.

- **Timeline View** enables you to view events associated with your data plotted on a timeline.

- **Network View** enables you to view relationships within your data and to expand connections for additional information.

- **Table View** enables you to view your data in table format.

Not all views are available from all parts of SAS Visual Investigator.

---

### View Data in Detail

This SAS Visual Investigator tutorial describes how to view your data in **Detail View**.

Detail View is the default data view for search results and in a workspace. In Detail View, the details pane shows the objects that you are viewing, with an individual tile that shows summary information for each object.

To display data in **Detail View**, from a search result or from within a workspace, select **Detail View** from the view menu.
View Data in a Map

This SAS Visual Investigator tutorial describes viewing data in Map View.

In Map View, the objects that you are viewing are associated with locations on a map. This enables you to see your objects in relation to one another in a geographical context. If an object contains multiple pieces of geographical data (latitude and longitude), they are all plotted on the map. If you then select one of these items, all the other items associated with that particular object are also selected.

To display data in Map View, from a search result or from within a workspace, select Map View from the view menu.

Data is displayed on the map either as individual points marked with pins or as clusters of points marked with blue circles.

Pins display an icon to indicate which type of object they mark. Clusters display a number to indicate how many points are grouped together in that area. If you zoom in on a cluster, it expands to display individual points where possible.
You can double-click on a cluster to zoom in on it. If there are multiple objects at the same exact location, the pin icon displays a number indicating how many objects are located there.

---

**View Data in a Timeline**

This SAS Visual Investigator tutorial describes viewing data in **Timeline View** and how to display data in the view.

In **Timeline View**, the details pane displays the date and time of events associated with the objects that you are viewing. This enables you to see the chronological relationship between the objects. If an object does not have any associated date/time data, it is not displayed on the timeline.

To display data in **Timeline View**, from within a workspace, select **Timeline View** from the view menu.

Data is displayed on the timeline as individual events marked with dots and labeled to describe the event.

You can use your mouse wheel to zoom in and out, or click the plus symbol to zoom in and the minus symbol to zoom out.

You can click on the timeline, hold the mouse button, and then move your mouse pointer to pan horizontally to another section of the timeline. The time slider at the bottom shows the currently displayed time period between two time bars.

---

**View Data in a Network**

This SAS Visual Investigator tutorial describes using **Network View**.

**Network View** enables you to view and examine the connections and relationships within your data. You can focus in on areas of interest, expand nodes to see which other nodes they are related to, and manipulate the display of your data to provide additional information.

To display data in **Network View**, from within a workspace, select **Network View** from the view menu.

By default, each node has a label to identify it, although you can switch off the display of labels in the network properties tool.

Links are shown as lines between the nodes. If a node is related to other objects that are not visible on the diagram because they reside in a different level, then the icon displays a number beside it to show the number of Level 1 related objects. The Node Legend maps object types to the icon that each represents. If the Node Legend is not visible, you can use the network properties tool to display it.
View Data in a Table

This SAS Visual Investigator tutorial describes how to view data in **Table View**.

In **Table View**, the details pane displays your data in a table with one object in each row. Your solution administrator can configure which columns are available for each object type.

To display data in **Table View**, from a search result or from within a workspace, select **Table View** from the view menu.

To view additional information about an object, click an individual row in the table to display the object in the object inspector.

**Note:** If your table contains more than one type of object, only the common columns Label and Type are available.

**Note:** You can use the Shift key and click to select multiple objects only on the currently displayed page of the table. In addition, you can use the **Selection** tool to make more complex selections.
Chapter 4
Search and Discovery

Performing a Free-Text Search

This SAS Visual Investigator tutorial describes using the free-text search.

Depending on how your solution administrator has configured your system, you might be able to enter your search directly into the Search box on your Home page or through a search form on the Home page. This is equivalent to performing a free-text search in the Search page’s Detail View.

To find information from the Search page:

1. Click Search on the main menu. The Search page is displayed.
2. Enter your search term into the Search box.
3. Press Enter, or click  

Your search results are displayed in the currently selected view. The search term is shown in bold. Choose a different view to see your results displayed in that view.

To find information from the Search box on the Home page:

1. Enter your search term into the Search box.
2. Press Enter, or click  

Your search results are displayed in the currently selected view. The search term is shown in bold. Choose a different view to see your results displayed in that view.
Performing a Form-Based Search

This SAS Visual Investigator tutorial describes how to search directly from the **Home** page rather than the **Search** page.

Search functionality enables you to search directly from your **Home** page rather than accessing the **Search** page to initiate the search. A form-based search (represented by a custom search form) might be available. Initiating a search from the **Home** page takes you directly to the **Search** page.

Here is an example showing an **Individual Customers Search** form populated with ‘Closed’ as the **Customer Status**. Clicking **Search** initiates the search and displays the **Search Results** page with the list of matches.

![Example Search Form]

The **Search** box contains the search criteria and can be edited to refine the search if needed.

Perform Map-Based Search

This SAS Visual Investigator tutorial describes how to perform a search within specified areas in a **Map View**.

To reveal search results in **Map View**, do one of the following:

- If a standard search indicates some areas of particular interest, you can draw shapes on the map to mark those areas. You can then search again to return only locations within the bounds of the shapes.

  Or
• Start from a map with no search results displayed, draw your search shapes, and then enter your search terms to search only in the selected areas.

View Search Results

This SAS Visual Investigator tutorial describes how to view the search results and apply different visualizations to the results.

The solution administrator configures the operation of the search feature and controls what is searchable as part of an entity. As a result of this configuration, all data fields might not be searchable and therefore will not surface as search results. However, if the search term represents valid entries, then the results are displayed in **Detail View** by default, and different visualizations can be applied to the results.

To reveal information about a search result item:

• Select the item and then choose **Object Inspector** from the **Tools** selector.

To select a subset of results:

• Select **Selection from the Tools** selector and then indicate the items from the results tree that you want to see selected in the search results. Selected items are shown highlighted.

To sort by either relevance or date:

1. Make sure the search results for which you want to apply display preferences are active.

2. Ensure that **Detail View** is the active view for the search results.

3. Select the appropriate option, either **Relevance** or **Date created**, from the **Sort results by** drop-down menu.

   When sorting by date, the search results are displayed in the order in which the record for the object was created, listing the search results by the newest item first.

To change the number of results that are displayed after obtaining results from a search:

1. Make sure the search results for which you want to apply display preferences are active.

2. Ensure that **Detail View** is the active view for the search results.

3. Select an option from the **Results per page** selection menu.
Chapter 5
Network Management

Managing a Network Diagram .......................................................... 21
Setting Network Pan or Select Mode ................................................. 23
Specifying Double-Click Behavior for Nodes ................................. 23
Specifying Node and Label Text Display Options .............................. 24
Showing or Hiding the Network Node Legend ................................. 24
Applying a Timeline to the Network View ........................................ 25
Expanding Nodes ............................................................................ 25
Adding and Deleting Node and Group Links ...................................... 27
Adding and Deleting Nodes .............................................................. 28
Grouping and Ungrouping Network Nodes ....................................... 29
Hiding and Revealing Nodes ............................................................ 29
Applying Network Analytics ............................................................ 30
Using Selection Tools ..................................................................... 31

Managing a Network Diagram

This SAS Visual Investigator tutorial describes how to manage a network diagram.

Exploration of the network diagram and its associated objects is performed within a workspace. From within the workspace, there are several tools and areas that enable you to view and manage different aspects of a network diagram.
<table>
<thead>
<tr>
<th>Area</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Workspace menu</td>
<td>Many network management options, including adding a snapshot to an insight, can be implemented from the Workspace menu.</td>
</tr>
<tr>
<td>2</td>
<td>Floating toolbar</td>
<td>The floating toolbar enables you to zoom in or out, fit to the canvas, and apply a timeline to the visualization.</td>
</tr>
<tr>
<td>3</td>
<td>Network diagram</td>
<td>The network diagram contains nodes and links and can be customized to reflect the relevant information that you want to display. Selecting an item in the network diagram often displays additional information about that item in the Object Inspector of the <strong>Tools</strong> pane. Functions, such as the application of network analytics in the form of single-click centrality measures, are generally performed from the <strong>Tools</strong> menu within the <strong>Tools</strong> pane.</td>
</tr>
<tr>
<td>4</td>
<td>Canvas</td>
<td>By right-clicking the canvas, you can retrieve a pop-up menu that provides access to a variety of network management features.</td>
</tr>
</tbody>
</table>
### Setting Network Pan or Select Mode

This SAS Visual Investigator tutorial describes navigating a network diagram based on the mode selected.

How you move around the network diagram to view different areas differs depending on whether you are in pan mode or select mode. In pan mode, which is enabled by default, you can click on the background of the network diagram, hold the mouse button, and then move your mouse to pan to another area of the diagram. In select mode, these behaviors are reversed. If you click and drag, you draw a selection rectangle on the network diagram.

To switch between pan mode and select mode, right-click the background of the network diagram and select **Pan** mode or **Select** mode from the pop-up menu.

The currently active mode has a check mark next to it on the pop-up menu.

### Specifying Double-Click Behavior for Nodes

This SAS Visual Investigator tutorial describes how to specify what actions are displayed when double-clicking a node.

You can specify the results of double-clicking a node. The specifications are saved with the network and are active each time the network is accessed.

To specify the action that results when a node is double clicked:

1. Make sure that the network for which the double-click action preference is to be specified is displayed in the active **Workspace** tab.
2. Select **Network properties** from the **Tools** menu.
3. At the **Double-click on node to** option, do one of the following:
   - Select **Expand** to cause the node to expand to its maximum expansion level whenever a double-click action is applied.
     
     *Note:* If no further expansion can be performed, then double-clicking the node has no effect.
   - Select **Open** to cause the node’s associated form to open to show information about the node.
Specifying Node and Label Text Display Options

This SAS Visual Investigator tutorial describes how to show or hide node text. Nodes might have associated text in the form of annotations or labels. Links might have associated text in the form of labels. You can indicate whether the text associated with nodes and links should be displayed in the network.

<table>
<thead>
<tr>
<th>Task</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Show node annotations</td>
<td>Select the <strong>Show node annotation</strong> option</td>
</tr>
<tr>
<td>Hide node annotations</td>
<td>Deselect the <strong>Show node annotation</strong> option</td>
</tr>
<tr>
<td>Show node labels</td>
<td>Select the <strong>Show node labels</strong> option</td>
</tr>
<tr>
<td>Hide node labels</td>
<td>Deselect the <strong>Show node labels</strong> option</td>
</tr>
<tr>
<td>Show link labels</td>
<td>Select the <strong>Show link labels</strong> option</td>
</tr>
<tr>
<td>Hide link labels</td>
<td>Deselect the <strong>Show link labels</strong> option</td>
</tr>
</tbody>
</table>

When you make a selection, the network updates to reflect the change. The network is saved and retrieved with the options specified.

Showing or Hiding the Network Node Legend

This SAS Visual Investigator tutorial describes how to show or hide the node legend. A node legend can be associated with each network diagram. The legend is updated in real time as nodes are added to and removed from the network.

To indicate your preference for visibility of the network legend:

1. Make sure that a network is displayed in a **Workspace** tab.
2. Select **Network properties** from the **Tools** menu.
3. Do one of the following:
   - To indicate that the node legend is to be displayed with the network, select the **Show legend** option.
   - To indicate that the node legend is not to be displayed with the network, deselect the **Show legend** option.

When you make a selection, the network updates to reflect the change. The network is saved and retrieved with the options specified.

**Note:** In pan mode or in select mode, if nodes are behind the **Node Legend**, you can click the legend and drag the mouse pointer to move the entire network.
Applying a Timeline to the Network View

This SAS Visual Investigator tutorial describes using a time slider to view only particular nodes for a specified time.

In many instances, the nodes of a network represent the entry of a person into the investigative arena, the beginning of an activity, or another type of object for which a time stamp can be applied. When nodes have a time or interval component, it is helpful to view the nodes against a time slider. Adjusting the time slider shows the entrance and exit of nodes and enables you to see only the nodes that are active at a particular time.

To view nodes with respect to a time slider, where inactive nodes are dimmed:

1. Make sure that a network displayed in a Workspace tab.
2. Make sure that the time slider is visible at the base of the network.
   
   To toggle the time slider on and off, click the Time slider icon in the network floating toolbar.
3. Select Network Properties from the Tools menu.
   
   When the time slider is displayed, the Network Properties options include a Time slider range selection. This enables you to specify which nodes are included (visible) in the range indicated by the time slider.
4. Do one of the following:
   
   • To indicate that inactive nodes should be dimmed, select the Exclude nodes starting before option in the Time slider range area.
   
   • To indicate that all nodes should be active regardless of entry point, deselect the Exclude nodes starting before option in the Time slider range area.

Expanding Nodes

This SAS Visual Investigator tutorial describes expanding nodes to view the connections between certain objects.

The expansion feature enables you to investigate and explore your data by following connections between objects.

Here is an example showing a single object, Customer: ANGUS FOCKEN, on an unexpanded network diagram. This customer is linked to nine other objects that are not yet visible on the diagram.

When an expansion of a node occurs, you might notice that the values of other unexpanded nodes have changed or been removed. This is normal and indicates that
when the source node was expanded, it caused expansion of nodes associated with other nodes. The values attached to the nodes adjust to retain an accurate depiction of the state of the node relationships.

Note: The solution administrator can set a limit on the total number of objects an expansion can add to a network diagram. If you attempt an expansion that exceeds this limit, a prompt asks you to confirm that you want to proceed. Resolved entities with more than 2000 linked objects cannot be expanded. If the number of objects linked to a node exceeds this limit, the node displays “X” instead of the number of linked objects.

To display any objects linked to a node on the network diagram, right-click the node, select **Expand**, and then select the expansion level that you want.

The network diagram is refreshed and redrawn each time you expand a node in a workspace. If the underlying data has changed, the updates are reflected in the network diagram.

To display any objects directly linked to a node on the network diagram, right-click the node and select **Expand ⇒ 1 level** from the pop-up menu.

This image shows the Customer: ANGUS FOCKEN node expanded one level to show the nine linked objects.

To display directly linked objects and also objects directly linked to those objects in turn (that is, objects that are at two removes from the original node), select **Expand ⇒ 2 levels** from the pop-up menu.

If you select multiple nodes, you can expand them at the same time.

To expand by object type (that is, expand to display only links to nodes of a specified type), select the nodes that you want to expand, and select **Expand ⇒ By object type ⇒ required object type** from the **Workspace** tab’s menu.

Only object types linked to the selected node and not already expanded are listed in the menu options.
The following figure shows the node from the previous example expanded to show only the accounts linked to the customer. The number five indicates that there are five objects not yet displayed on the diagram that are linked to the same customer.

By default, you can double-click a node to expand it by one level. You can change this behavior in the network properties tool.

---

### Adding and Deleting Node and Group Links

This SAS Visual Investigator tutorial describes adding a removing links from nodes. The links between objects in a network diagram represent connections between the linked objects. Your investigation, however, might indicate that there are object connections not represented accurately by the data or that a linkage is not relevant for the investigation. SAS Visual Investigator enables you to add links to and remove links from the diagram to more fully represent the investigative results.

#### Managing Node Links

You can link new nodes to existing nodes on the network diagram or link existing nodes to other existing nodes.

*Note:* Linking group nodes has a subset of issues that are not relevant for linking single nodes.

To add a link between nodes:

1. Right-click the node representing the **From** node, and select **Link node to** from the pop-up menu.
   - A link now connects your selected node and your cursor.
2. Click the node to which you want this node to be linked.
   - A link now connects the two nodes.

   *Note:* Nodes can have many links to many nodes.

You can edit your new link’s display properties in the link properties tool in the **Tools** pane.

To remove a link between nodes:

- Right-click the link that you want to remove from the node relationship and select **Delete Link** from the pop-up menu.
Managing Group Links

You can link new groups to existing nodes or groups on the network diagram or link existing groups to other existing nodes and groups.

Note: When a group is linked to any object, all members of the group are individually linked to the destination object. This becomes obvious when groups are ungrouped.

To add a link between a group node and any other type of node:

1. Right-click either the group or object node representing the From node, and do one of the following:
   • If the selected node is an object node, select Link node to from the pop-up menu.
   • If the selected node is a group node, select Link members to from the pop-up menu.

   A link is tethered to the source node.

2. Click the object node or the group node to which you want this node to be linked.

   A link now connects the two nodes.

Note: Nodes can have many links to many nodes.

You can edit your new link’s display properties in the link properties tool in the Tools pane.

To remove a link between nodes:

• Right-click the link that you want to remove from the node relationship and select Delete Link from the pop-up menu.

   The nodes are no longer connected by the link.

Adding and Deleting Nodes

This SAS Visual Investigator tutorial describes adding and deleting nodes from a network diagram.

The nodes of the network diagram represent objects in the connected data source displayed in the workspace. Your investigation, however, might take you outside of the boundaries of the data source. SAS Visual Investigator enables you to add nodes to the diagram to more fully represent the investigative results. Likewise, during an investigation, you might be able to eliminate objects based on lack of relevant interaction with the objects of interest in the network. In this case, it might be worthwhile to delete the node from the diagram.

To add a node to a diagram:

1. Right-click the canvas of the network diagram and select New custom node from the pop-up menu.

   The cursor carries the silhouette of the new node which, by default, is a pentagon shape.

2. Click the canvas where you want the node to be placed.
After the node is on the canvas, you can move the node around and link the node to other nodes in the network.

To remove a node from a diagram:

- Select the nodes that you want to delete and select **Object ➤ Remove object from Workspace** from the **Workspace** tab’s menu.

  *Note:* Deleting a node from the network diagram removes the object from the diagram only; the object itself is not deleted. Any links the node has to other nodes are also removed from the diagram.

---

**Grouping and Ungrouping Network Nodes**

This SAS Visual Investigator tutorial describes organizing your network objects by grouping and ungrouping them.

Grouping nodes (that is, combining a collection of nodes as an apparent single node) enables you to treat the collection as one object. This is one way to organize network objects and to present the network as less crowded.

To create a grouped node:

1. Select the nodes that you want to group.

   *Note:* You cannot create a group with more than one group. That is, nested groups are not allowed.

2. Right-click a node in the selection and choose **Group nodes** from the pop-up menu.

   The selected nodes collapse into a single group node, represented by the Group icon.

You can modify the properties of the group by using the **Node properties** options available at the **Tools** menu.

---

**Hiding and Revealing Nodes**

This SAS Visual Investigator tutorial describes hiding and showing nodes.

You can make space on a network diagram by temporarily hiding selected nodes.

To hide nodes:

1. Select the nodes that you want to hide.

2. Select **Object ➤ Hide** node from the **Workspace** tab’s menu.

   The object is hidden from view.

Depending on how a network is configured, it might open with some nodes hidden. Or, during the process of your investigation, you might hide nodes to remove them from view. Hidden nodes can be revealed as needed.

*Note:* If the network diagram does not contain hidden nodes, then the option to show hidden nodes is unavailable on the menu.
To show hidden nodes:

- Right-click an empty area of the network canvas and select **Show hidden nodes** from the pop-up menu.

When hidden nodes are shown, they are displayed at the location that they were in when they were hidden.

---

**Applying Network Analytics**

This SAS Visual Investigator tutorial describes the **Centrality** option and how to apply it to the network visualization. The **Centrality** option needs to be enabled in order to use it.

In SAS Visual Investigator, entity analytics such as centrality measures can be applied to the network visualization when the **Centrality** option is enabled for your deployment.

If the **Centrality** option does not appear on the **Tools** menu, then the feature is not enabled for your deployment. Contact your solution administrator to enable the option if it is needed.

The following figure shows the **Tools** menu with the **Centrality** option enabled and not enabled.

To apply a centrality measure to an active network:

1. Select **Centrality** from the **Tools** menu.
2. Choose one of the available centrality measures.

The network diagram updates to show the relationship significance with respect to the indicated centrality measure.
Using Selection Tools

This SAS Visual Investigator tutorial describes how to use the selection tools to view only a subset of your data.

When investigating, you often want to select a subset of your data (for example, to add to a workspace or an Insights tab for further examination). SAS Visual Investigator provides several ways to select objects in any of the visualization views. When an object is selected, navigating to the Tools pane and selecting Selection from the drop-down menu reveals options for making selections from the displayed data.

The selection tools available at the Tools pane differ based on the view selected.

When you view an object in Network View, you can do the following:

• see a count of the number of objects currently selected
• select check boxes to select objects by type
• enter text to select objects that have labels containing this text
• clear all selected objects
• invert the selection, meaning that all objects currently selected are deselected, and all objects not currently selected are selected.

Note: Inverse selection is not supported for custom nodes on a network diagram — that is, nodes that you have manually added yourself.
• select edge nodes, meaning that all objects connected to only one other object are selected

• select detached nodes, meaning that all objects not connected to any others are selected

When you view the same data in all other views, you see the same options, except for the options for selecting edge or detached nodes. These two options apply to Network View only.

The following figure shows the selection tools available in Network View:
Chapter 6
Advanced Tutorials

Designing Page Templates

This SAS Visual Investigator tutorial describes using Page Builder to design templates using the drag-and-drop method.

Page Builder enables product administrators to design and implement the pages that are used when working with data within SAS Visual Investigator. Its drag-and-drop interface enables pages to be constructed quickly and easily without the need for coding or manual changes to configuration files and page definitions.

Before You Begin

Although it is easy to edit page templates after they have been created, it is a best practice to give thought to your design before you begin. Think about how the end user will interact with the page and make an attempt to design the page for ease of use and logical flow.

Creating or Editing a Page Template

You can create and edit pages from several areas within SAS Visual Investigator. The primary area for page development is the Page Builder interface, available by selecting Pages in the administration interface. When configuring entities or resolved entities on the Data Objects page, you can also create or edit page templates.

To create a new page:

1. On the Pages page, click New Page ( ).
Note: If an entity or resolved entity has been saved, you can also create or edit a new page from those pages by selecting the entity or resolved entity at the Data Objects page, accessing the Page tab from the entity or resolved entity, and then clicking the Create Page option at the Page tab of the entity or resolved entity.

2. Start to design your page by dragging layout options and controls onto the canvas. Each time you add a new layout option or control to the canvas, the properties pane updates, enabling you to configure parameters specific to that control. For example, when you add a 3 Columns option to the canvas, you can define the width of each of the columns as they will appear for SAS Visual Investigator users. After adding a Map control, the properties pane updates, enabling you to define the data source for location information, using either GeoJSON or latitude and longitude data.

3. Click Save to save the page as you design the template.

The basic page is designed and saved. You can expand the basic functionality of the page by configuring additional tabs that will be associated with the base page.

To configure a page:

1. After you have finished adding controls to the canvas or if you are editing an existing page, click Page Settings.

   The Configure page window appears. Using this window, you can configure the following:

   • Allow Workspace Creation — Provides functionality to enable users to create workspaces from this record.

   • Allow Insights Creation — Provides functionality to enable users to create insights from this record.

   • Tabs — You can extend the functionality of the base page by adding one or more of the following types of tabs:

     • Standard — Adds an additional page, which can be designed using the Page Builder layout options and controls.

     • Alert Trigger — Adds a new page containing an Alerts Trigger control, which displays a description of the conditions and rules that caused an alert to trigger. Unlike a standard page, you cannot add additional layout options or controls to this page.

     • All Transactions Grid — Adds a new page containing an All Transactions Grid control, which can be configured to display transactions relevant to the base page that you are viewing. Unlike a standard page, you cannot add additional layout options or controls to this page.

     • Comments Manager — Adds a new page containing Comments Manager functionality. Comments Manager can be configured to be one of two types: Supervisory and User. This enables you to store comments under one of these types. For example, you can configure one control as Supervisory, and another as Users. Entering a comment in either control associates the comment with the respective type. Therefore, the comment shows only in that container. Unlike a standard page, you cannot add additional layout options or controls to this page.

     • IFrame — Adds a new page containing an IFrame control, which allows HTML documents to be embedded in the current HTML document (current page template).
Configure a New Entity Type

This SAS Visual Investigator tutorial describes configuring entities as well as elements and resolved entities.

The Data Objects page enables administrators to configure entities, as well as elements, resolved entities, and relationships between different entities.

<table>
<thead>
<tr>
<th>Entity Type</th>
<th>Entity Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>External entity</td>
<td>Represent data from source systems external to SAS Visual Investigator (for example, an insurance policy, a bank account application, or a tax return).</td>
</tr>
<tr>
<td>Internal entity</td>
<td>Represent data managed by SAS Visual Investigator (for example, an intelligence report or investigation).</td>
</tr>
<tr>
<td>Child entity</td>
<td>The data describing an external or internal entity might be broken into multiple child entities. Each refers to a particular component, often an individual party, or can be used for repeating information.</td>
</tr>
<tr>
<td>Resolved entity</td>
<td>The result of entity resolution is a new set of objects that are extracted from internal or external entities and combined to form a resolved entity. Resolved entities represent real-world objects and are created using a combination of elements to create a compound.</td>
</tr>
</tbody>
</table>

To create a new internal, external, or child entity:

1. At the Entities tab of the Data Objects page, select New from the menu. Depending on the type of entity that you want to create, choose either New Internal Entity, New External Entity, or New Child Entity from the options available at the New menu.

2. Complete the entity creation configuration.

   • New Internal Entity – Configure Settings, Fields, Views, Dates and Locations, and Filter Facets. Add child entities if needed.

   • New External Entity – Configure Settings, Fields, Views, Dates and Locations, and Filter Facets. Add child entities if needed.

   • New Child Entity – Configure Settings, Fields, and Dates. Make sure that the correct Parent Entity option is indicated

3. Click Save entity to save your changes.
To create a new resolved entity:

1. At the Resolved Entities tab of the Data Objects page, select New Resolved Entity from the menu.

2. Complete the entity creation configuration.
   - New Resolved Entity – Configure Settings, Views, and Dates and Locations. Make sure that you select at least one compound from the Compounds area at the Settings tab.

3. Click Save to save your changes.

Entities are displayed in the Data Objects and Entities tab and resolved entities are displayed at the Data Objects Resolved Entities tab.

To edit entities or resolved entities:

1. Locate the item of interest on the Data Objects, Entities tab, or the Data Objects, Resolved entities tab.

2. Double-click the item.
   - The item opens and can be edited.

3. Click Save <itemType> from the menu.
   - If needed, re-index in order for your changes to take effect.
   - You can also import entity data.

---

**Ad Hoc Data Import**

This SAS Visual Investigator tutorial describes importing a flat file into the product or connecting to an external database.

The data object import feature provides a way to import a flat file into the product or to connect to an external database in order to add entities (rather than create them manually). When importing data from a file or connecting to a database using the import feature, you are creating a new data object, an entity, that you can manage and configure from within the administration interface of SAS Visual Investigator. Imported data is analyzed to present data type suggestions, is validated against the declared data type, and is indexed for search by default.

*Note:* The behavior and limitations of a flat-file import are different from those of a connected database. In addition, there are differences between database table and database view source import.

One way to import a data object is to upload a file containing data in a supported, delimited format. Supported delimited types are comma-separated, tab-separated, and pipe-separated.

To add a data object from a file:

1. Make sure that you have a supported file accessible to SAS Visual Investigator.

2. Navigate to the Import page of the administrator interface and make sure that the Upload option is selected.

3. Drag and drop a file onto the Drop Data Here area.
When data import is initiated using a flat file as the source, data is analyzed to
determine the data type of each column, and data details and a read-only list of the
fields are displayed in the window.

4. Review the data details.
   The information that is displayed, including the column names, is read-only in this
   view. The import feature makes an intelligent guess at whether the imported flat file
   contained a header row.

5. If the selection for First row header is incorrect, change the value of the First row
   header check box as appropriate.
   If you do not indicate a first row header, columns will be named Var1, Var2, Var(n).

6. Click Next to go to a preview page that shows the data that you will be importing.
   Icon indicators reveal information about the fields, such as data type, data
   associations, and unique field identifiers.

7. On the preview page, configure the data to be imported.
   Configuration is done on a per-column basis by clicking the cell beneath the column
   heading of the column that you want to configure. This displays a window that
   enables you to view or modify field characteristics for the selected column.

8. Click Next to configure additional properties of the new entity.
   Configuration properties include those related to entity identification, detail view
   fields, and table view fields as described in the following list:
   • the icons and pin color for the entity.
   • a display label for the entity type.
   • the object label. This is how individual entities of this type will be labeled in
     places such as the node link diagram.
   • the set of fields to display in search results for both Detail View and Table View.

9. Click Finish.
   This creates a new object type in SAS Visual Investigator and starts indexing the
   new object in a background process. You can access the object at the Entities tab of
   the Data Objects page, where you can continue to configure the entity.

Besides flat files, you can also import new entities from database tables or views that are
visible in a data store. Supported databases are PostgreSQL and Oracle (versions 11x
and 12x).

To add a data object from a database:
1. Navigate to the Import page of the administrator interface.
2. Click Connect.
3. Choose a source from the Data store drop-down menu, and click Show Data.
   If the data store does not contain any tables, you are prompted to select another data
   store.
4. Select a table or a view, and then click Connect at the base of the list of tables and
   views.
   Tables are indicated by an icon and views are indicated by an icon.
In some instances, not all tables are presented. Tables where the names are greater than 30 characters long, the name contains character such as $, #, or the name starts with a number are not included in the list of displayed tables. Only tables that have not yet been configured through the **Properties** page are available for selection.

5. On the preview page, configure the data to be imported.

   *Note:* Data store tables on remote customer sites can contain column data types that are not supported by SAS Visual Investigator. In those instances, those columns are not imported when the table is registered. You will notice that those columns are not displayed in the preview page.

   Configuration is done on a per-column basis by clicking the cell beneath the column heading of the column that you want to configure. This displays a window that enables you to view or modify field characteristics for the selected column. For tables and views, you can change only the field label, matching element, and field role value.

6. Click **Next** to configure additional properties of the new entity. Configuration properties include those related to entity identification, detail view fields, and table view fields as described in the following list:
   - the icons and pin color for the entity.
   - a display label for the entity type.
   - the object label. This is how individual entities of this type will be labeled in places such as the node link diagram.
   - the set of fields to display in search results for both **Detail View** and **Table View**.

7. Click **Finish**.

   This creates a new object type in SAS Visual Investigator and starts indexing the new object in a background process.

8. Navigate to the **Data Objects** page and select the object that you imported from the list of entities. You can continue to customize the entity.

---

### Configuring Strategies

This SAS Visual Investigator tutorial describes configuring strategies.

1. To create strategies, click **New Strategy** on the **Strategies** page. On the **Strategies** tab of the **New Strategies** page, provide information in the following sections:

<table>
<thead>
<tr>
<th>Strategies Configuration Parameters</th>
<th>Parameter Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategy Details</td>
<td>General information about the new strategy.</td>
</tr>
<tr>
<td>Alert Recipients</td>
<td>Group that this strategy will be associated with. This will route the alerts within this strategy to the appropriate users.</td>
</tr>
<tr>
<td>Alert Actions</td>
<td>Disposition actions.</td>
</tr>
<tr>
<td>Strategies Configuration Parameters</td>
<td>Parameter Description</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Alert Grid</td>
<td>Fields that appear in the alert list, as well as the field that will be sorted by default and the sort order.</td>
</tr>
</tbody>
</table>

2. Click when you have finished.

After you have saved the strategy, you can select Associated Queues to create or associate a queue with the strategy.

## Configuring Queues

This SAS Visual Investigator tutorial describes configuring queues to associate with a strategy.

To create queues, click under Queues for Customer Profile on the Strategies page. Provide information for the following sections:

<table>
<thead>
<tr>
<th>Queues Configuration Parameters</th>
<th>Parameter Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Queue Details</td>
<td>General information about the new queue.</td>
</tr>
<tr>
<td>Associated Pages</td>
<td>Page to associate with this queue from the drop-down boxes. You can use an existing page or create new pages.</td>
</tr>
<tr>
<td>Routing Rules</td>
<td>Create rules to determine the qualifications that must be met for an alert to be routed into this queue. When the value of a column meets the condition, the alert is routed into this queue.</td>
</tr>
<tr>
<td>Settings</td>
<td>Fields that appear in the alert list, as well as the field that will be sorted by default and the sort order.</td>
</tr>
</tbody>
</table>

## Importing Custom Map and Pin Icons

This SAS Visual Investigator tutorial describes how to upload custom icons and map pins.

A set of default icons is supplied as part of your SAS Visual Investigator system. However, you can create and upload your own icons, in SVG format, to better match your organization’s requirements. The Manage Icons and Map Pins window is opened from the Views tab in the Data Objects page when you are working with entities. This window enables you to upload icons, rename or replace icons, and delete existing icons.
Note: You can delete only icons immediately after uploading them—that is, before clicking OK to close the Manage Icons and Map Pins window.

To manage icons and map pins:
1. With an entity open on the Data Objects page, click the Views tab.
2. In the Icons & Label area, click Manage icons and map pins. The Manage Icons and Map Pins window is displayed:

Using the Manage Icons and Map Pins window, you can perform the following tasks:

• Click Upload to navigate to any custom icons saved on your local computer or local network.
  The icon that you are uploading should be in SVG format.

• Click Rename to change the name of an existing icon or map pin. Icon and map pin names can contain alphanumeric characters and underscore characters only, cannot start with a number or underscore, and must be no longer than 25 characters in length.

• Click Replace to navigate to an updated icon saved on your local computer or local network.

• Click Delete to remove an icon from the list.

• Change the icon type between Icon and Map Pin by selecting from the Set type for selected row list.
  You cannot change the type of an icon that is already associated with an entity or resolved entity.

3. Click OK when you have finished managing icons and map pins.

What Are Relationships and When Are They Used?

This SAS Visual Investigator tutorial describes what relationships are and when they should be used.

Relationships represent a connection between entities. Types of relationships include one-to-one, one-to-many, many-to-one, or many-to-many.

Configuring Relationships

When you create relationships, string fields can be joined only with fields of the same type. Small integer, integer, long, and numeric fields can also be joined to fields of the same type, as well as to other types of field. In addition, when creating a relationship, the “one” side must be the entity’s key field. The “many” side of a relationship can be any compatible field.

1. On the Data Objects toolbar, click Relationships. The Relationships Object List is displayed
2. Click to create a new relationship. Alternatively, double-click an existing relationship to edit it.

  The Relationship Detail page is displayed.
3. From the entity type drop-down lists, select the From entity and To entity for which you want to create a relationship.

4. From the Cardinality drop-down list, select One to One, One to Many, Many to One, or Many to Many.
   If you selected One to One or Many to Many, you can select Non-directional (that is, the relationship is the same in both directions).

5. In the Label area, enter a label to describe the relationship. If the Non-directional check box is clear, you can add a label for both directions of the relationship.

6. In the Relationship Condition area, select the Bridge table type:
   - Internal. Relationships between internal entities are always of the type Internal, and are always stored in the default data store. If you select Internal, the Bridge table name and Join conditions are populated automatically.
   - External. Relationships between external entities can be of the type External or Internal. If you select External, you must specify the data store in which the relationship will be saved, as well as the Bridge table name and Join conditions.
   - None. Relationships between external entities from the same data store (for all cardinalities except many-to-many) are always set to None.

   Note: Relationships between external entities and internal entities, and between external entities from different data stores, must be internal. Internal relationships between records can be created only by using the SAS Visual Investigator application, whereas external relationships can be created by using existing primary/foreign key relationships in the database.

7. When you have finished creating the relationship, click .

Configuring Heterogeneous Relationship

Heterogeneous relationships can be created for external entities only, and for One to One and Many to One cardinalities. Heterogeneous relationships allow relationships to be created between many different entities that share a common field. This means that when defining a relationship, only the starting entity is needed.

To configure heterogeneous relationships:

2. Click to create a new relationship. Alternatively, double-click an existing relationship to edit it.
3. From the From entity drop-down list, select an external entity.
4. From the Cardinality drop-down list, select either One to One or Many to One.
5. From the To entity drop-down list, select (multiple types).
   The Entity field drop-down list containing a list of string fields on the From entity is displayed.
6. From the Entity field drop-down list, select the field to be used as the field common to entities in the relationship.
7. In the Primary field in the Label area, enter a name for this relationship.
8. From the Join condition drop-down list in the Relationship Condition area, select the field that will contain the ID of the linked entity.
9. When you have finished creating the relationship, click .
What Are Traversals and When Are They Used?

This SAS Visual Investigator tutorial describes when and how to use traversals.

Traversals offer a flexible way for you to describe a path through existing relationships between entities and resolved entities, to return objects of a specified type. For example, a network of companies can be related through transactions to a fraudulent activity.

A traversal starts from the current object, and can follow any number of defined steps to its endpoint, for example:

![Traversal Diagram]

To configure traversals:
1. Click Traversals on the application toolbar. The Traversals Details window appears. In a new SAS Visual Investigator installation, no traversals appear until the administrator creates them.
2. Click to create a new traversal. Alternatively, to edit an existing traversal, double-click a traversal in the summary list. The New Traversal window is displayed.
3. Enter a name for the traversal, and then click OK. The Traversal Designer window is displayed.
4. From the Entities list, drag an entity or resolved entity onto the canvas. A new node is linked to the Root node.
5. Continue to add nodes to the traversal configuration. Each node that you add is automatically added as the last node in the configuration.
6. When you have finished adding nodes to the configuration, click . Alternatively, if you are editing an existing configuration, click to save the traversal configuration with a new name.

How and When to Re-index or Resolve Entities

This SAS Visual Investigator tutorial defines re-indexing and resolving entities and discusses when to re-index and when to resolve.

Indexing data makes the contents of data loaded into your system available to SAS Visual Investigator users. When you perform a re-index and resolve of all entities, the contents of the search index are deleted, entity data is loaded, and all entities are resolved. When you re-index a selected entity, the contents of the search index are
deleted for that entity, the entity data is loaded, but no entities are resolved. You can manually force a re-index of some or all objects on the Data Objects page.

Only objects that have been marked for index inclusion on the Data Objects page can be re-indexed.

To index or re-index data:

1. In the administrative application, click Data Objects on the menu.

2. Do one of the following:
   - To index a new object, ensure that the Indexed for search option is selected.
   - To re-index an existing entity, either select or open the entity from the Entities tab of the Data Object page and then select the index option from the menu.
   - To re-index all, select Re-index all and resolve entities from the menu.

If a message is displayed indicated that re-indexing documents and resolved entities might take a long time, click Yes to continue.

When re-indexing is complete, SAS Visual Investigator users are able to access any new or updated objects.

Note: When an entity is indexed, its associated links are also indexed. For example, if an entity is the From or To entity in a relationship, then the links for those relationships are automatically indexed.
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