GraphXR Explorer for Spanner

Quick Start Guide

About GraphXR Explorer

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GraphXR Explorer for Spanner provides property graph visualization and analytics in a collaborative workspace. In minutes and with no need to replicate or move data, you can securely connect Spanner Graph to a GraphXR project, build and run graph queries, and explore a visual graph.

Before you begin...

Before you can use GraphXR Explorer, you need:

- A Google Cloud Spanner account
- A Spanner database and Spanner Graph property graph database based on it.
  Note: If you want to try SpannerGraph and don't yet have databases set up already, you can start with Spanner demo data available for free trial here.

Connect to Spanner Graph

Connect to Spanner Graph

To connect GraphXR Explorer securely to a specific Spanner Graph database, you:

- Launch and Deploy GraphXR Explorer from the GCP Marketplace.
- Login to GraphXR Explorer, and connect to your GCP Spanner deployment:
  - Create and upload a Service Account Key that authorizes the connection
  - Review database connection details for accuracy

Launch & Deploy from GCP Marketplace

Launch and Deploy from GCP Marketplace

1. On the Google Cloud Marketplace, open the GraphXR Explorer page.
2. Launch and configure a GraphXR Explorer deployment
   a. Click **Launch** to configure your deployment.
   The **GraphXR Explorer for Spanner** deployment page opens.
   b. Enter a **Deployment name**
   c. Under **Deployment Service Account**, click **New Account**.
   This creates a new Service Account with three default roles. Enter:
      i. Service account name
      ii. Service account ID
      iii. Service account description
      iv. Zone (us-central-c)
      v. Under Firewall, click **Allow HTTP** and **Allow HTTPS** checkboxes.
   d. Click **Deploy.**
   On the deployment page, deployment progress is indicated under **Solution Deployments**. This may take several minutes. When finished, **Resources** and **Details** tabs display details for the deployment.
3. Open the deployment **Details** tab, and scroll down to **Outputs:**

a. On **Admin Password**, click the **Copy Link icon**. You'll need this to log in to GraphXR Explorer**.**
b. Click **Site Url** to open the GraphXR Explorer **Login** page.

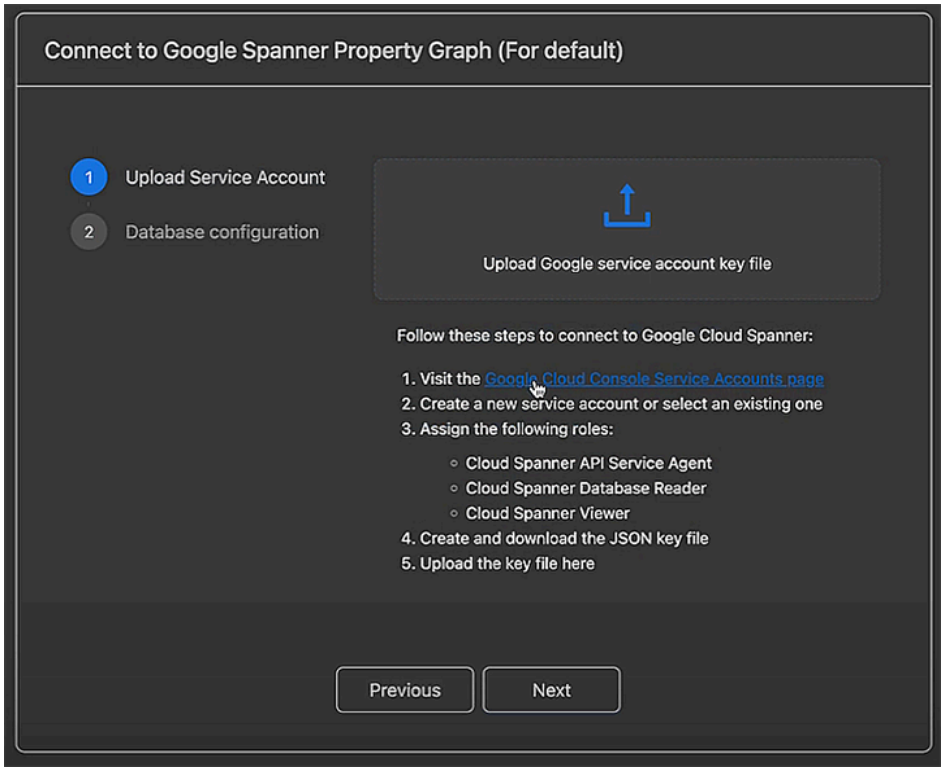
Login and connect to Spanner Graph

Log in and connect to Spanner Graph

You'll now log in to GraphXR Explorer and use its connection wizard to:

- Create and upload a Service Account Key that authorizes the connection
- Review database connection details for accuracy

1. In the GraphXR Explorer login, enter your userID and password and click ***Login***.
2. Follow steps in the connection wizard to connect to your Spanner Graph project and database.



Obtain Service Account Credential (Key)

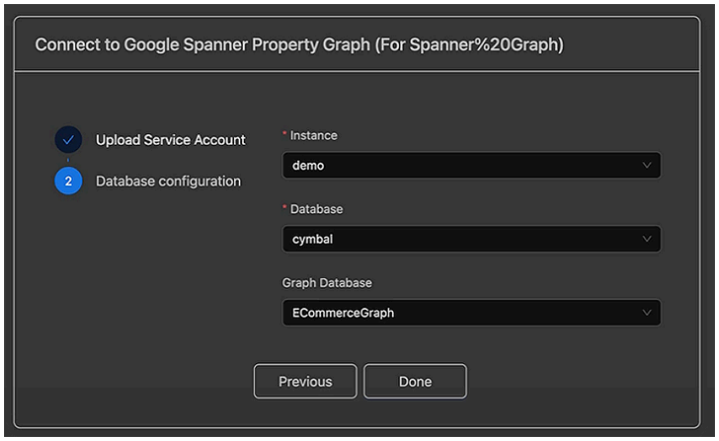
a. **Upload Service Account**. The wizard provides a connection to your Google Cloud account, and lists 5 steps to connect to Spanner:
   i. Visit the Google Cloud Console Service Accounts page. Here you select your project to open the service accounts page.
   ii. Create a new service account (or select an existing one). Click **Create Service Account**, and enter a name, ID, and description. Click **Create and Continue**.
   iii. Assign the following roles: Under Permissions, add **Cloud Spanner API Service Agent**, **Cloud Spanner Database Reader**, and **Cloud Spanner Viewer** roles, and click **Continue**. Optionally, specify Principals with access (no need to here). Click **Done** to create the service account and return to the **Service accounts** page. Now we'll create the key file we need.

iv. Create and download the JSON key file.
   1. Under the correct service account, click the 3 dots at the far right and select **Manage Keys** from the dropdown menu.
   2. In the **Keys** page, click **Add key** and select **Create new key.**
   3. Select **JSON**, and click **Create.**
      The JSON key file is downloaded to your system.

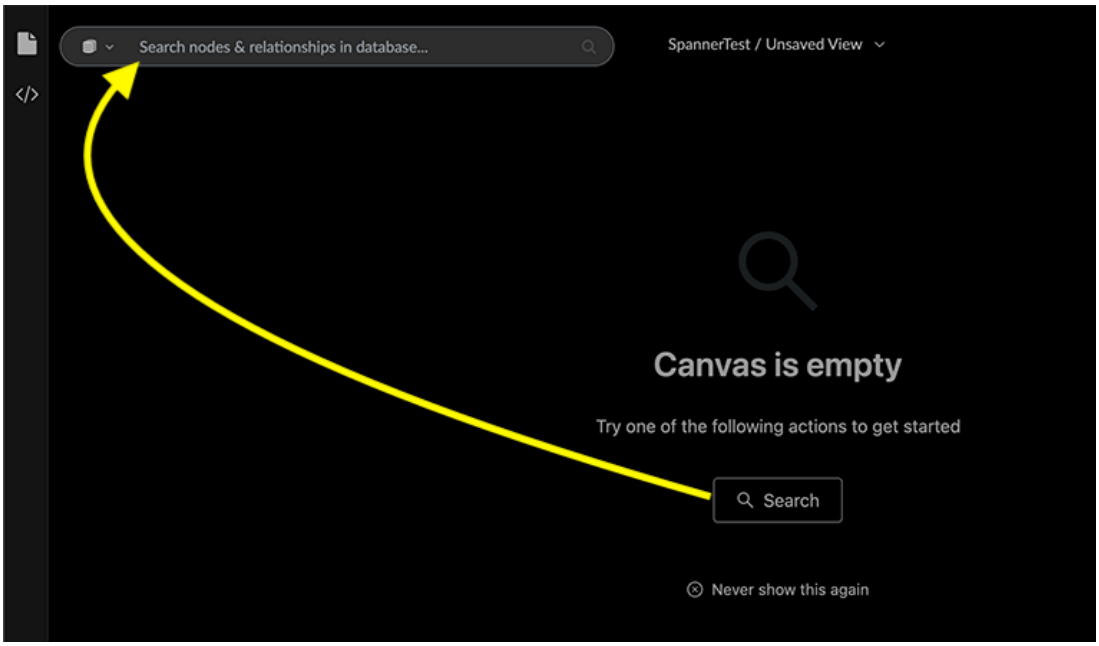
v. Upload the key file (drag it to the upload location in the GraphXR Explorer wizard, then click **Next**.

Review DB Configuration Details

b. Database Configuration: The Instance, Database, and Graph Database name should be automatically filled out. Review, and click **Done**.



GraphXR Explorer creates and opens a project connected to the specified SpannerGraph database. The project canvas is empty when it's opened.
You're now ready to begin exploring the graph. To do that quickly, click Search to use the point-and-click query builder available in the project search bar.

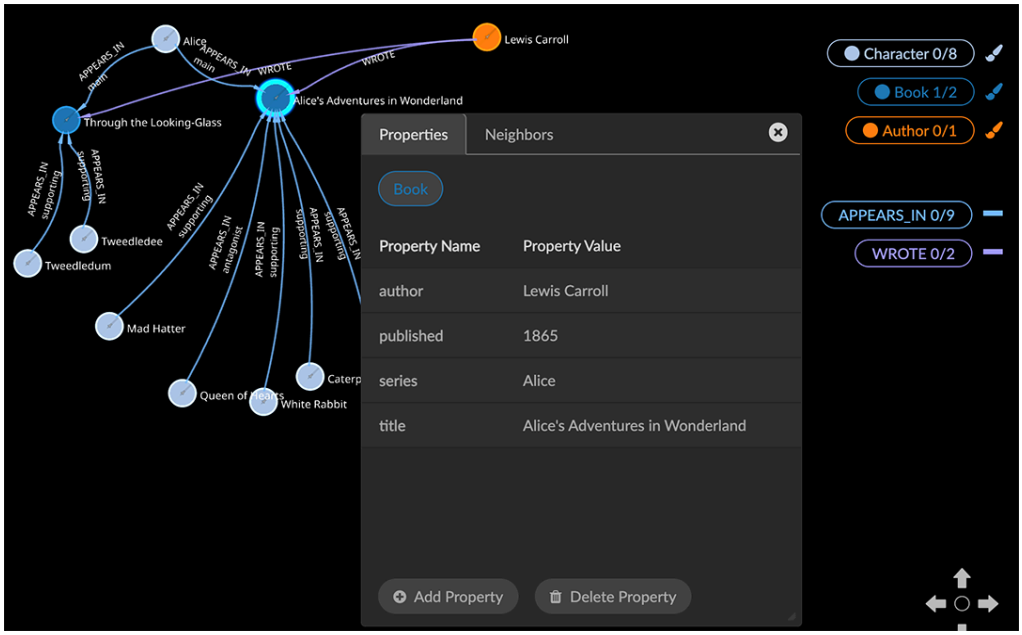


About Property Graphs

Property Graphs in GraphXR

Here's a brief look at what a property graph is and how its elements are rendered in GraphXR. A property graph consists of

- **Nodes** labeled with a specific **category**, rendered as circles.
- **Edges** labeled with a specific **relationship**, a **source node ID** and a **destination node ID**. An edge is rendered as a line connecting two nodes. Unconnected (floating) nodes can exist; unconnected edges cannot.
- **Properties**, key-value pairs consisting of a **property name** and its **property value**, labeled with a specific category or relationship, and associated with a specific node or edge. A node or edge can include as many properties as desired.
  For example, the selected node of the *Book* category shown below includes *author*, *published*, *series*, and *title* properties, each with its property value.
  In practice, a property graph is often modeled so that nodes (or edges) of the same category (or relationship) include the same set of properties, but it is not required.



To inspect and work with properties in GraphXR you can:

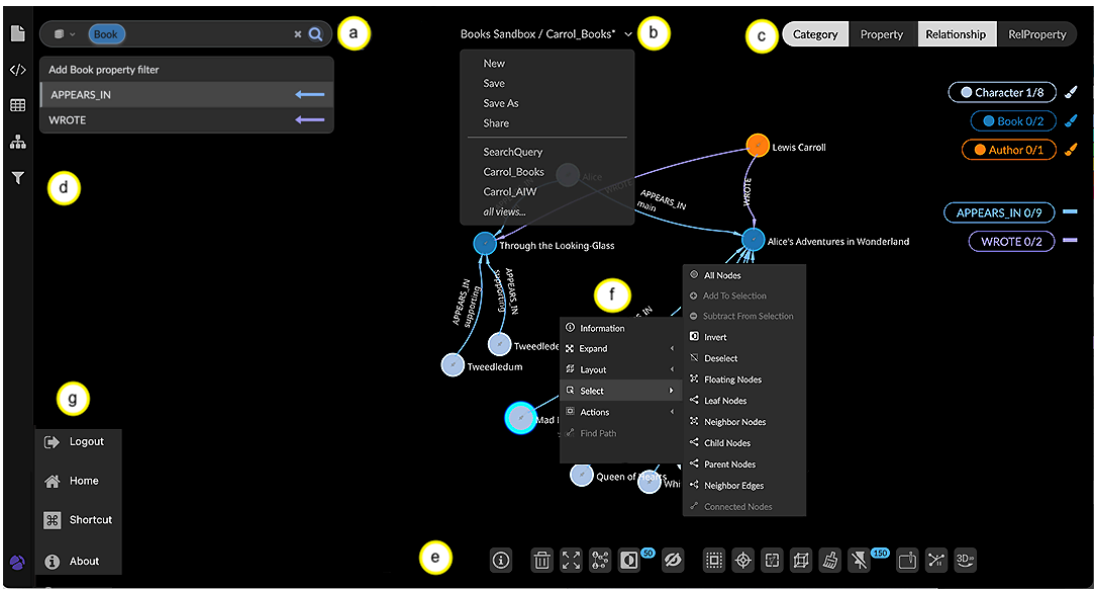
- Double-click a node or edge (or right-click and select **Information) to** display the **Information** panel, which includes an editable list of properties and their values.
- Go to the Legend and click **Property** (or **RelProp**) to see the selectable list of node (or edge) properties and their unique values.
- Open a **Table** to view properties for the nodes (or edges) of a Category (or Relationship).
- Set property values as captions. In the example above, ***Character***, ***Author***, and ***Book*** nodes and *APPEARS_IN* edges are all captioned with property values.

TIP If necessary, you can encrypt captions or other property values displayed on the graph. To toggle between encrypted and decrypted property values, use the shortcut *shift*+***E***.

Project Workspace

The Project Workspace

The project is a virtual 3D workspace. The graph is rendered as a **view** on the project canvas with nodes (as circles) connected by edges (as lines).
The workspace provides the tools and functions needed to navigate, select, filter, inspect, lay out, save, and share graph views:



A. **Search Bar** to query the connected database, or search the graph on the canvas.
B. **View** menu to save the current graph as a view, or load or share a saved view.
C. **Legend** and list at the upper right to see and select the number of nodes or edges of each category or relationship or the number of nodes or edges with specific property values, and how many of each are currently selected on the canvas.
   - Click an item to select nodes and/or edges.
   - Style categories, relationships, and properties with color and icons, and set captions, relative node size, or edge bind width based on property values.
D. Panels for detailed **Project**, **Query**, **Table**, **Layout**, and **Filter** functions. Click a menu icon on the left edge of the project to open a panel.
   - ***Project***: Views, Category, Relationship, Settings sub-panels.
   - ***Query***: Enter and run GQL or SQL queries.
   - ***Table***: Tables of nodes by Category, or edges by Relationship
   - ***Layout***: Fine control of the default force-directed layout.
   - ***Filter***: Filter and select by node or edge property value.
E. Contextual **Toolbar** along the bottom of the canvas with one-click icons for graph selection, navigation, layout, and information. Items found only on the toolbar are: ***Select Visible***, ***Hide***, ***Show Hidden***, ***CenterTo***, ***FlyOut***, ***Quick Info***, and ***2D/3D*** toggle. Other toolbar actions are also available on the right-click menu.
F. **Right-click menu** for often-used ***Expand***, ***Find Path***, basic ***Layout***, ***Select***, and ***Action*** functions, so that you need not go to the toolbar or open a panel.
G. ***Shortcut*** reference to the mouse + keyboard controls for navigation and selection.

Import via no-code query

Search Bar Query

No-code Query from Spanner Graph

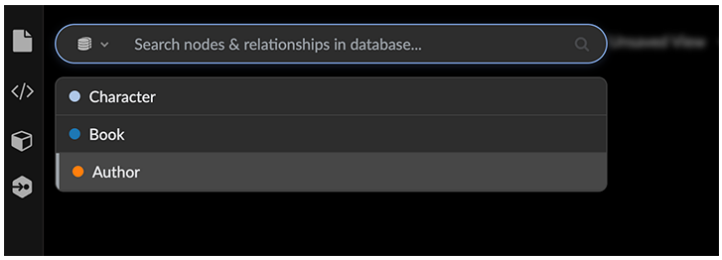
To use a no-code query to deliver data from SpannerGraph:

- Build and run a visual query in the project query/search bar
- **Expand** with relationships (with at least one node on the project canvas)

Query/Search Bar

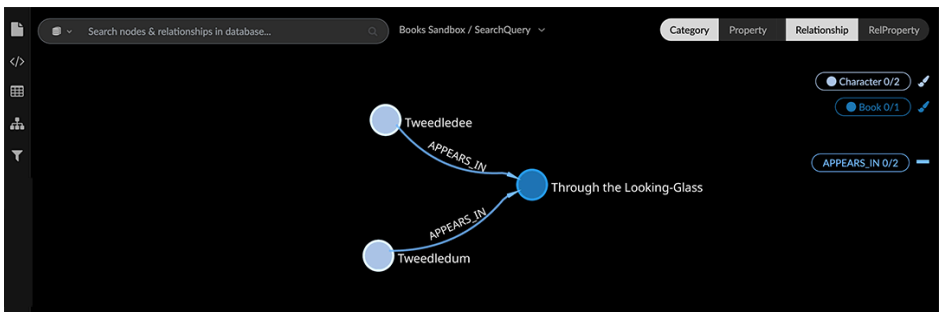
With the no-code query builder in the project search bar, it's fast and easy to build a graph pattern and import matching nodes and edges from the database. Instead of writing a GQL query on your own, just select available categories, relationships and properties from the dropdown menu.

1. Click ***Search*** (or click in the project search bar at the upper left of the canvas) to see the query builder dropdown menu.
2. Click to select a category from the menu. Optionally, select and specify one or more property values.



   The menu then shows the relationships connected to that category.
3. Select a relationship, and the categories connected to it appear.
   Here we query a database of books by Lewis Carroll to return ***Character*** nodes with a ***name*** property containing *Tweedle*, connected through ***APPEARS_IN*** edges to any ***Book*** node.

4. Click the search icon at the right end of the search bar to run the query.
   Matching nodes and edges are displayed on the project canvas.



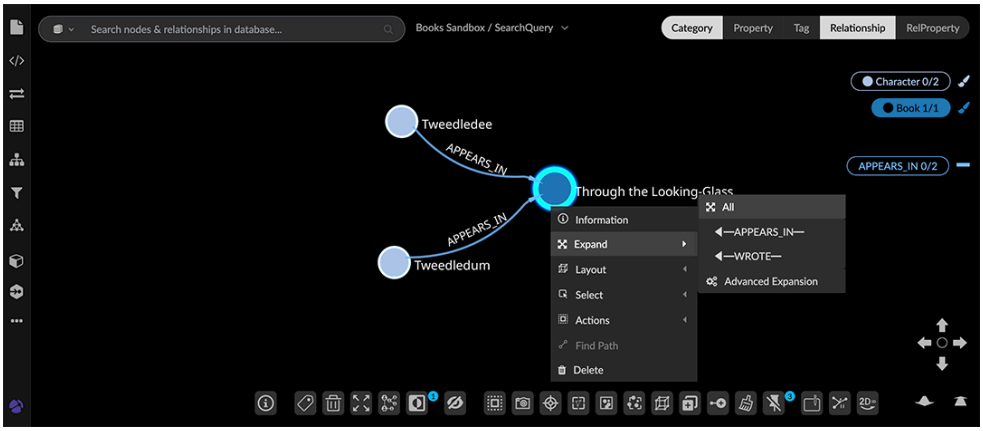
   You can continue to query for additional patterns. A message is displayed when all the data matching a query have been loaded.

Expand with Relationships

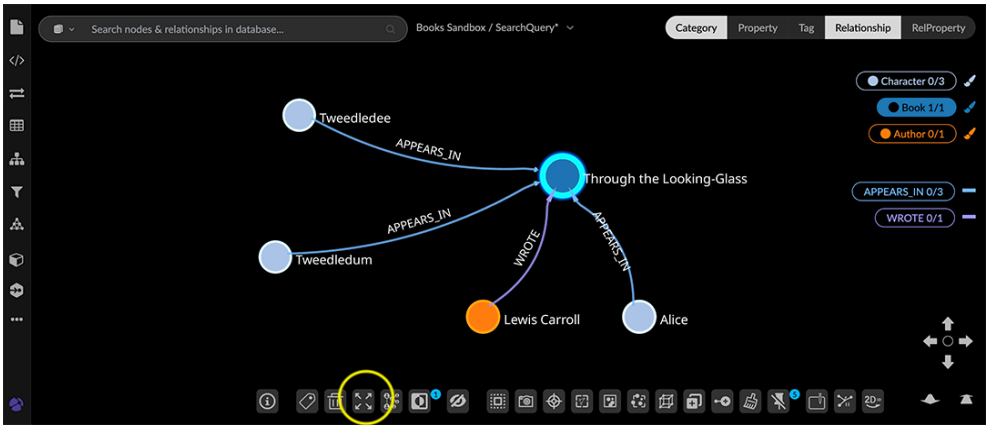
Expand with Relationships

Once at least one node is on the canvas, you can use **Expand** to select one or more nodes and query for additional nodes connected through the relationships you choose.

1. Select the node (or nodes) to expand on.
2. Right-click, and choose **Expand** from the menu.



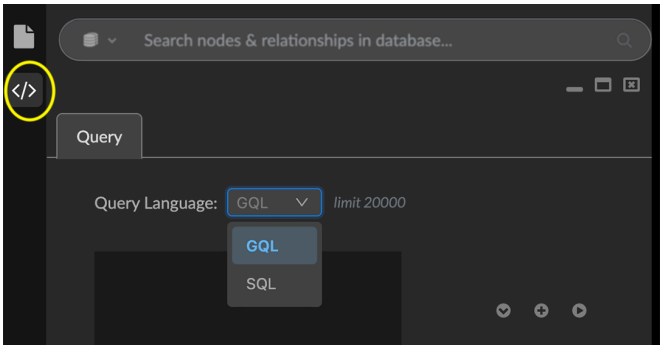
3. Choose **All**, or just the relationship you want. For more detailed control, you can choose **Advanced Expansion** from the menu or the **Expand** icon on the toolbar.



GQL or SQL Query

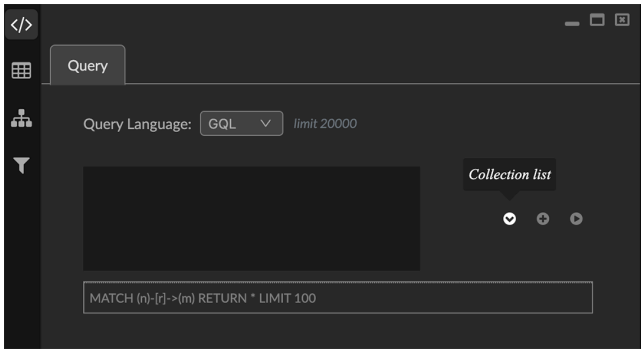
GQL or SQL Query

Open the **Query** panel to enter and run a GQL or SQL query, and to save your queries in the project.

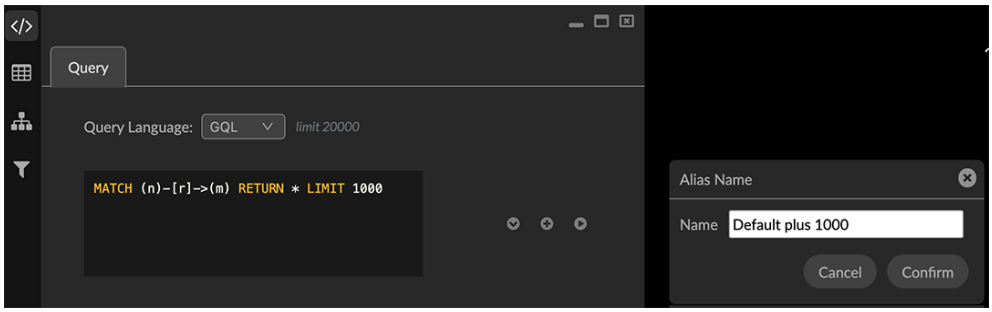


1. Choose the query language (***GQL*** or ***SQL***) from the dropdown menu.

2. Enter a query in the window below.
   OR
   Click ***Collection list*** (*dropdown arrow icon*) to show the default query that's provided and any saved queries. Click to add a query to the query window, where you can (optionally) edit it and then run it.



3. Click ***Run*** (*rightmost arrow icon*) to query the database.
4. You can click ***Add to collection*** (*plus icon*) to save a new or edited query.
5. In the ***Alias Name*** dialog, enter a descriptive name for the query and click ***Confirm***.



Saved queries persist in the project (i.e. when you log out and log back in).

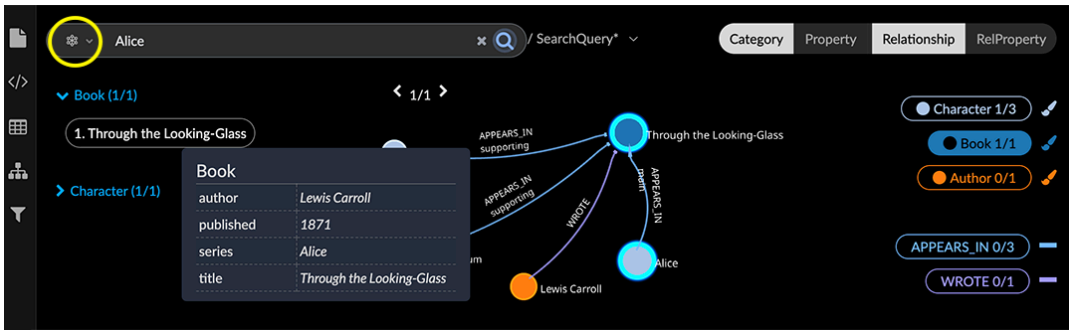
Full-text Search

Full-text search for specific nodes

Full-text search is available for property values of the nodes on the project canvas.

NOTE: Full-text search on the database is available only if it has been implemented and indexed.

1. In the search bar, choose ***Canvas*** on the dropdown selector at the far left.
2. Enter search text (e.g. *Alice*)
3. Click the search icon to see a list of all nodes that include that text as a property value.



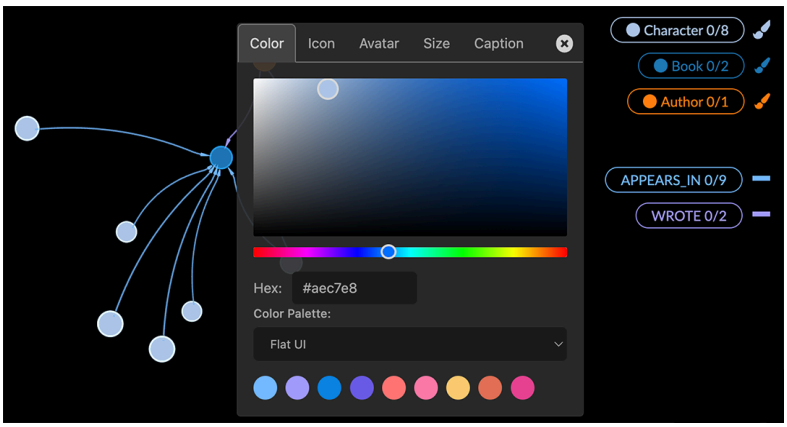
Style nodes and edges

Style nodes and edges

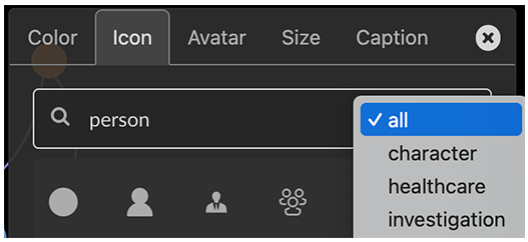
In the Legend list, click the colored dot, line, or paintbrush icon next to a list item to display the **Style Setting** dialog for that set of nodes or edges. Tabs in the dialog let you select a ***Color*** and ***Icon*** for nodes, and select properties that supply ***Avatar*** image urls, relative node ***Size*** or edge ***Bind Width***, and ***Captions*** on nodes or edges.

Style a Category or Property

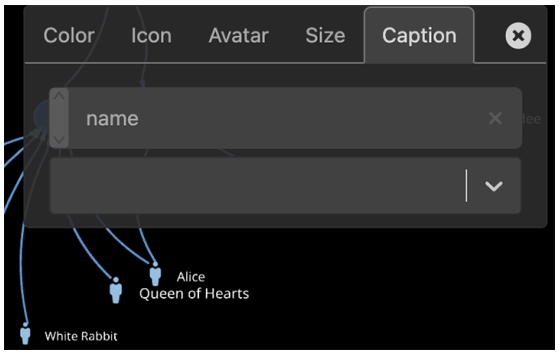
In the Legend, click ***Category*** or ***Property***, then the paintbrush or dot next to a list item.



- ***Color***: Use the color picker, click a color spot on the default color palette, or select a custom color palette and choose a color from it.
- ***Icon***: Choose an icon set from the menu, or enter a search for an icon. Then click to select the icon you want.

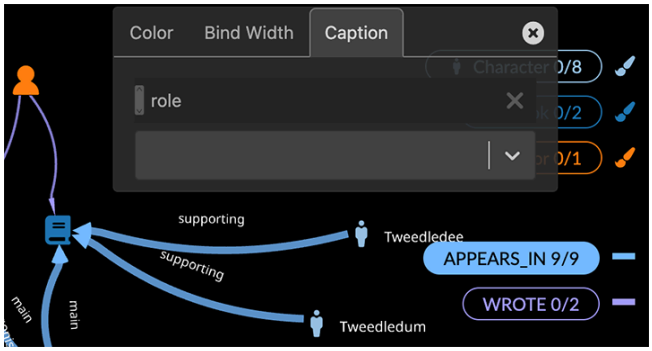


- ***Avatar*:** Choose a property that includes a url for an avatar image.
- ***Size***: Choose a property with numerical values to set relative node size.
- ***Caption***: Choose one or more properties to label the nodes. Multiple captions are displayed in the order you select.



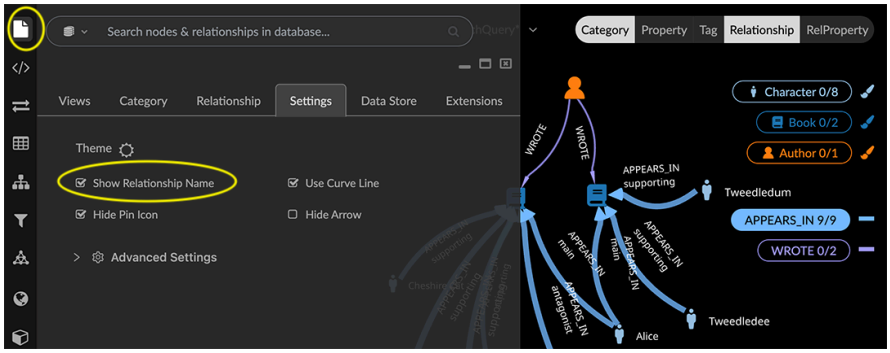
Style a Relationship

- Click ***Relationship*** in the legend, then line next to an item in the relationship list.
    - ***Color*:** Use the color picker to select a color.
    - ***Bind Width***: Choose a property with numerical values to set the bind width of edges.
    - ***Caption***: Choose one or more properties to label the edges.



NOTE: An initial graph model may not include properties on relationships.

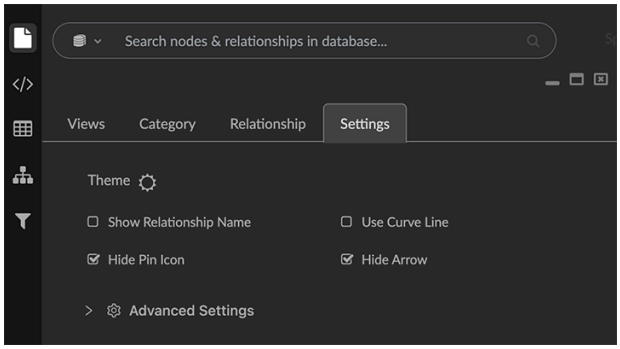
Often, the relationship label (or name) is the most useful text caption for an edge. To display it on all edges, open the ***Project>Settings*** panel and click the ***Show Relationship Name*** checkbox.



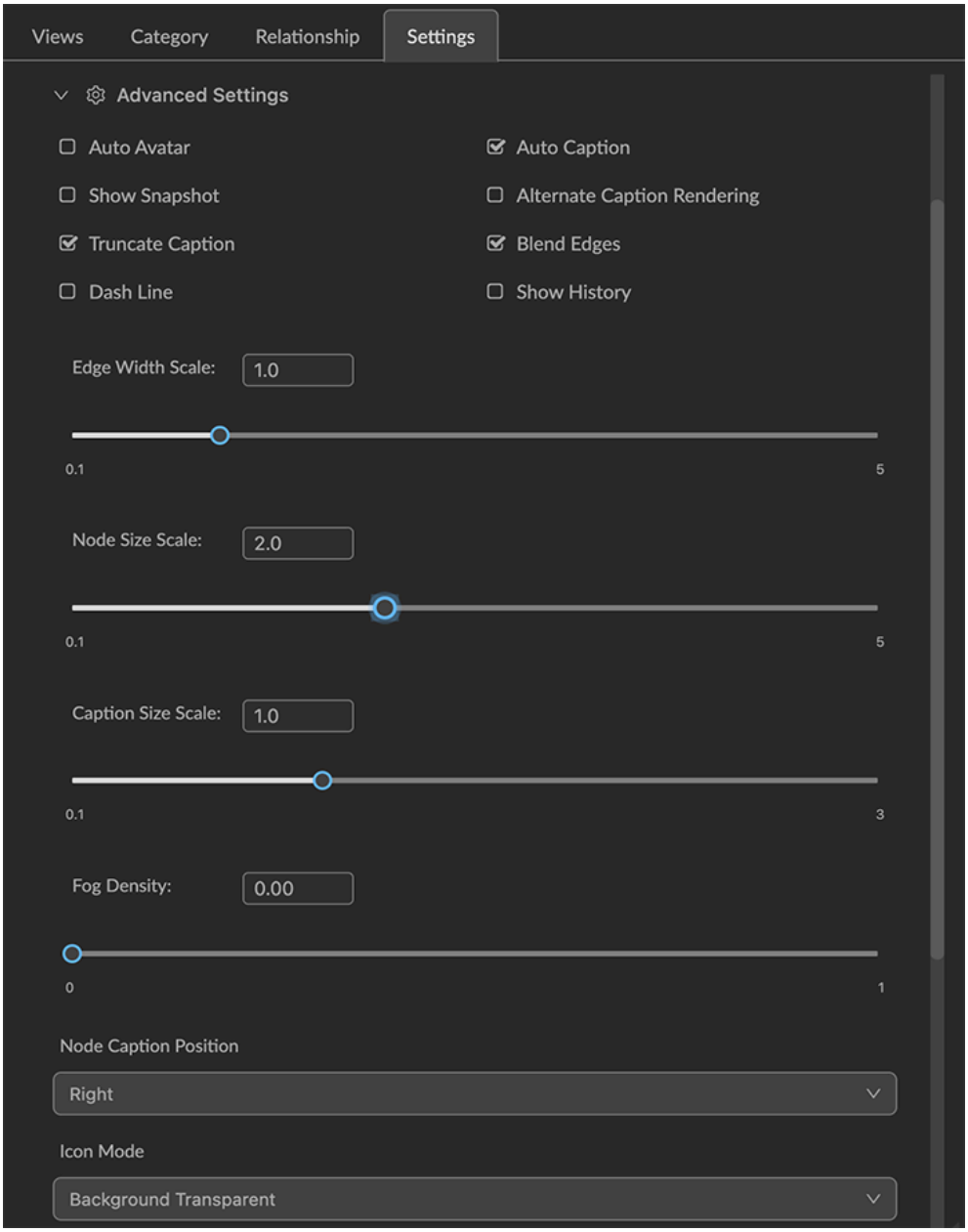
Adjust overall display of nodes and edges

Open the ***Project>Settings*** panel for options to set overall display, including:

- ***Theme*** selector to choose dark or light mode,
- ***Hide Pin Icon*** checkbox to show or hide the pin icons on all nodes,
- ***Use Curve Line*** checkbox to display edges as either straight or curved lines,
- ***Hide Arrow*** checkbox to show or hide the directional arrowheads on all edges.



- The ***Advanced Settings*** dropdown provides additional control of visual display:
  - Checkboxes to display ***Dash Line, Blend Edges, Auto Caption***, ***Truncate Captions***, and ***Alternate Caption Rendering*** (for faster display of captions on large data sets).
  - Sliders for scaling overall ***Edge Width***, ***Node Size*** and ***Caption Size***, and for setting ***Fog Density*** in the 3D rendering on the canvas.
  - ***Node Caption Position*** menu (***right, left, bottom left, bottom center, top left, top center, or vertical***),
  - ***Icon Mode*** menu for display of icons (background transparent, icon transparent, or mix color),



Navigate and Focus the Graph

Navigate and Focus the Graph

You can navigate the graph, and select, inspect, edit, and focus on all or part of it using:

- Navigation with manual mouse and keyboard controls to Pan, Zoom, and move the graph, and one-click ***Fly Out*** and ***CenterTo*** icons in the toolbar.
- Selection with manual mouse and keyboard controls
- Selection and actions based on node or edge criteria including:
  - Legend selection by category, relationship, or property value
  - Selecting and inverting using the right-click ***Select*** menu
  - Toolbar-only selection and navigation options
  - Isolating a path using right-click ***Find Path*** or toolbar ***Trace neighbor*** options
  - **Filter** nodes on property values
  - Open a **Table** to select and highlight nodes on the canvas

Mouse and Keyboard controls

Mouse and Keyboard controls

Mouse and keyboard controls are provided to navigate the whole graph or a selection of it, and to select nodes and edges manually. Often-used controls include:

- Navigate the graph:
  - **Pan** (*left mouse click-drag*)
  - **Zoom** in and out (*mouse wheel*)
  - **Move Stepwise** (*arrow key-click right, left, up or down*)
  - **Move a selection** (*left mouse click-drag*)

  TIP: Click the toolbar **Fly Out** (*alt+shift-**R***) to fit the entire graph on the canvas, or **CenterTo** (c + *left mouse double click*) to center the graph on a selection (or the whole graph).
- Select nodes and edges:
  - **Select one node or edge** *(left mouse click*)
  - **Select multiple** nodes and edges (*shift+left mouse click-drag*)
  - **Add** a node to a selection(*ctrl-left mouse click*)
  - **Subtract** a node from a selection (*alt+left mouse click)*
  - **Select** all nodes (*ctrl-**A***) or Deselect all nodes (*alt+**A*** or *double click* empty space)
  - **Invert** a selection (***I***)
  - **Undo** (*ctrl+**Z***) and **Redo**(*ctrl+**Y***), or show a **History** pane (*ctrl-shift+**H***)to revert to a former state of the graph.

Once you have selected nodes and edges, you can:

- **Move** the selection away from unselected nodes (*left mouse click-drag*)
- **Refine** your selection further using toolbar icons (**Invert**, **Hide**, **Trace Neighbor+Select Visible**), and/or right-click **Select** menu options.
- **Lay out** selected nodes in one click with the right-click **Layout** or toolbar **Quick Layout** menu, which provide various geometric or hierarchical layouts.

To display shortcut information within GraphXR Explorer:

- On the project menu click the **Kineviz logo** at the lower left, and choose **Shortcut**.

The following table shows all the current mouse-keyboard shortcuts.

Shortcut Keys for Navigation, Selection, and Editing

Action	Shortcut
Delete selection	delete
Clear graph	ctrl+shift+**C**
Undo	ctrl+**Z**
Redo	ctrl+**Y**
History	ctrl + shift + **H**
Save	ctrl + **S**
Pan	left mouse click-drag OR **1**+Left mouse click-drag
Zoom	mouse wheel OR **2**+left mouse click-drag
Fast zoom	ctrl+mouse wheel
Fly Out (Reset view)	alt+shift+R
Center on a selected node	**c**+left mouse double click
Rotate (Manual)	right mouse click-drag OR **3**+left mouse click-drag
Toggle Rotate (Automatic)	ctrl+**O**
Toggle Orbit (Automatic) around x- axis	ctrl+alt+shift+**o**
Toggle Orbit (Automatic) around y- axis	ctrl+**o**
Toggle Orbit (Automatic) around z- axis	ctrl+shift+**o**
Stepwise Move	Arrow key click (right, left, up, or down)
Move a selection	left mouse click-drag
Toggle Pin / Release	ctrl+**P**
Information	ctrl+**I** OR left mouse double click
Expand with Relationships	ctrl+**X**
Display Enhanced Table	shift + **T**
Run Degree Centrality Algorithm	shift + ctrl + **D**
Toggle Encrypt/Decrypt Text Property Values	shift + **E**

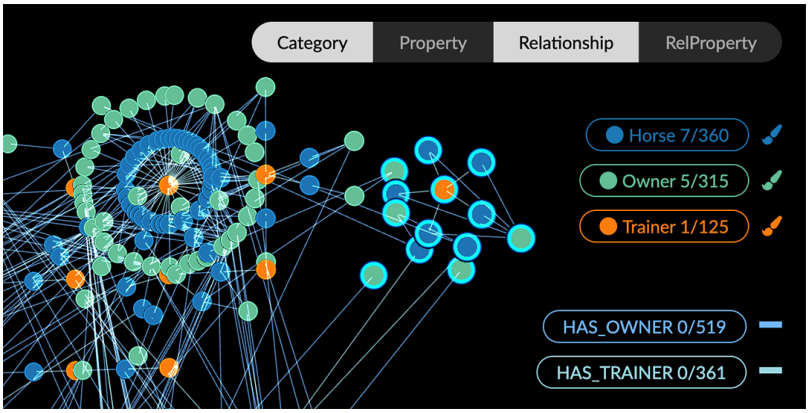
Action	Shortcut
Select all nodes	ctrl+**A**
Deselect all nodes	alt+**A** OR double click empty space
Select a node or edge	left mouse click
Select multiple nodes and edges	shift+left mouse click-drag
Add a node to a selection	ctrl+left mouse click
Add multiple nodes to a selection	ctrl+left mouse click-drag
Subtract a node from a selection	alt+left mouse click
Subtract multiple nodes from a selection	alt+left mouse click-drag
Select all orphaned (floating) nodes	shift+**D**
Invert selection	**I**
Invert selection for selected node categories	shift + **I**
Toggle Leaf Trimming	ctrl+**L**
Full Screen	ctrl+**F**
Hide menu	esc

Select in the Legend

Select using the Legend

Use the Legend to show and select all the nodes or edges of one or more categories or relationships, or unique property values for either categories (**Property**) or relationships (**RelProperty**).

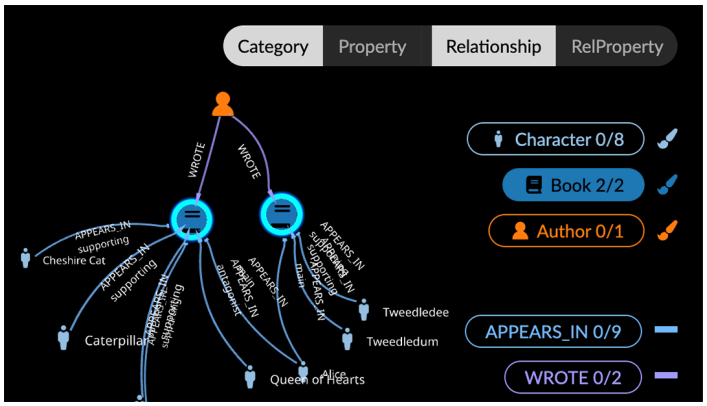
The legend list bubble shows the total number of nodes (or edges), and the number that are currently selected.



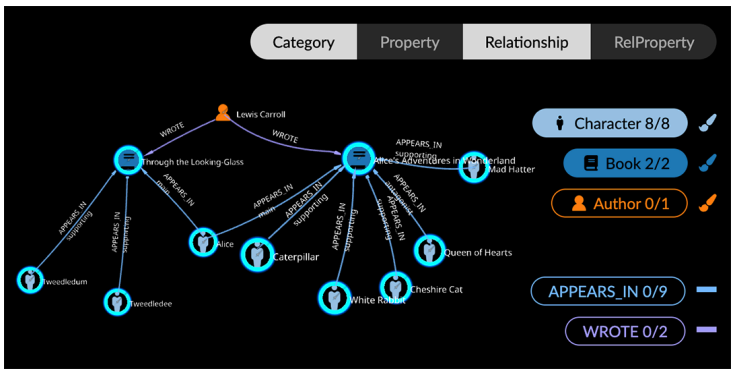
Select by Category or Relationship

To select by ***Category*** or ***Relationship***:

1. Click the appropriate section in the legend (***Category*** and/or ***Relationship***) to show the list of items. You can show both at once.
2. Click a list bubble to select its items on the canvas.



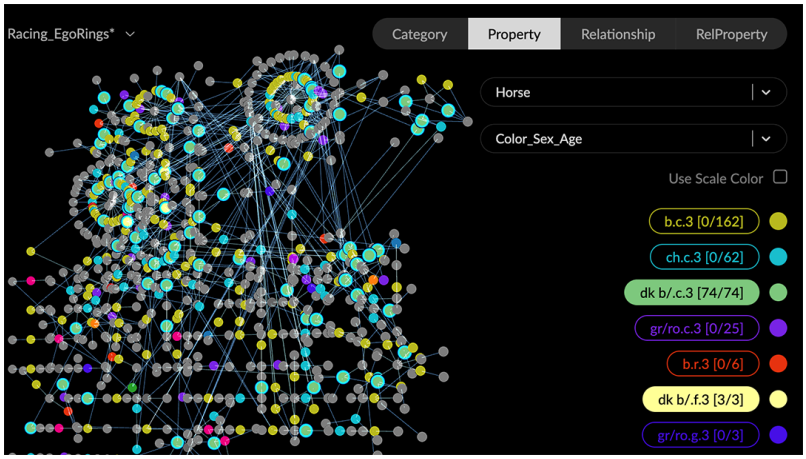
Or Ctrl+Click to select more than one list item.



Select by Property Value

To select by a category (or relationship) property value:

1. Click the appropriate section in the legend (***Property*** or ***RelProperty***).
2. In the dropdown menus below the legend, select a category or relationship and the property you want (e.g. the *Horse* category, and its *Color_Sex_Age* property).
   The list displays unique values for that property, and the number of nodes (or edges) that have that property value.
3. Click a list bubble, or *ctrl-click* to select one or more list items.



The selected nodes are highlighted, and you can now work with the selection. For example, left-click drag to move the nodes to another part of canvas, invert and hide or delete the inverted selection, apply a layout, etc.

Right-Click Selection

Right-click Selection and Action

The right-click ***Select*** and ***Actions*** menus provide efficient ways to select and isolate graph entities that you want to focus on, hide temporarily, or delete from the canvas.

Select nodes and edges by connection type

1. Except for ***Floating nodes*** and ***Leaf nodes***, you must first select one or more nodes or edges.
2. Right-click anywhere on the project canvas, and on the ***Select*** submenu, choose from the following types of nodes or edges:
   - ***Floating nodes***, to select all nodes that have no connecting edges.
   - ***Leaf nodes***, to select all nodes connected to only one other node.
   - ***Neighbor nodes***, to select nodes connected through one edge to the selected node(s).
   - ***Parent*** or ***Child nodes***, to select nodes connected to the selected node(s) by a directed relationship, indicated by the arrowhead on the edge pointing from a parent to a child node.
   - ***Neighbor Edges***, to select all edges connected to the selected node(s)
   - ***Connected nodes***, to select nodes connected to the selected edge(s)

   The nodes or edges you first selected are de-selected and those with the chosen connection type are selected and highlighted.

Add (or subtract) connection types to a selection

You can repeat and combine ***Select*** menu options to select the specific subgraph you want. For example, you can choose ***Neighbor nodes*** several times to add nodes a specific number of hops away from an initial selection.
To add to a current selection:

- Right click, press ***ctrl***, and choose from the ***Select*** menu.

To subtract from a current selection:

- Right-click, press ***alt***, and choose from the ***Select*** menu.

Invert a selection

Inverting a selection is often used to focus on a subgraph by hiding the other nodes temporarily or deleting them.

- With nodes selected, right-click, choose ***Select>Invert***.
  You can now go to the toolbar and click ***Hide Selection***, or ***Delete***.

Toolbar-only functions

Toolbar-only functions

Various selection, navigation, and layout options are available only through toolbar icons. These (and the shortcut key if any) are:

- Selection
  - ***Trace Neighbor***
  - ***Select Visible***
  - ***Hide Selection*** and ***Show Hidden***
  - ***Delete*** a selection (*delete* key)
  - ***Clear*** the graph (*ctrl-shift*+***C***)
- Navigation
  - ***CenterTo***, to center the graph on one or more selected nodes. (**c**+*left mouse double click*)
  - ***FlyOut,*** to fit the entire graph on the canvas. (*alt*+*shift*-***R***)
- Display and Layout
  - ***2D/3D*** toggle, to switch between 3D and a flat 2D rendering of the graph, useful for preparing 2D visualizations for reports and presentations.
  - ***Enable/Disable Force Layout*** toggle, to turn default force layout off or on.
  - ***Quick information*** toggle, to control display of a simplified information rollover for a node or edge.

NOTE ***Pin/Release***, ***Expand***, ***Quick Layout***, and ***Information*** functions are also available through the right-click menu and shortcut keys.

Find Paths and Analyze Connection

Find Paths and Analyze Connection

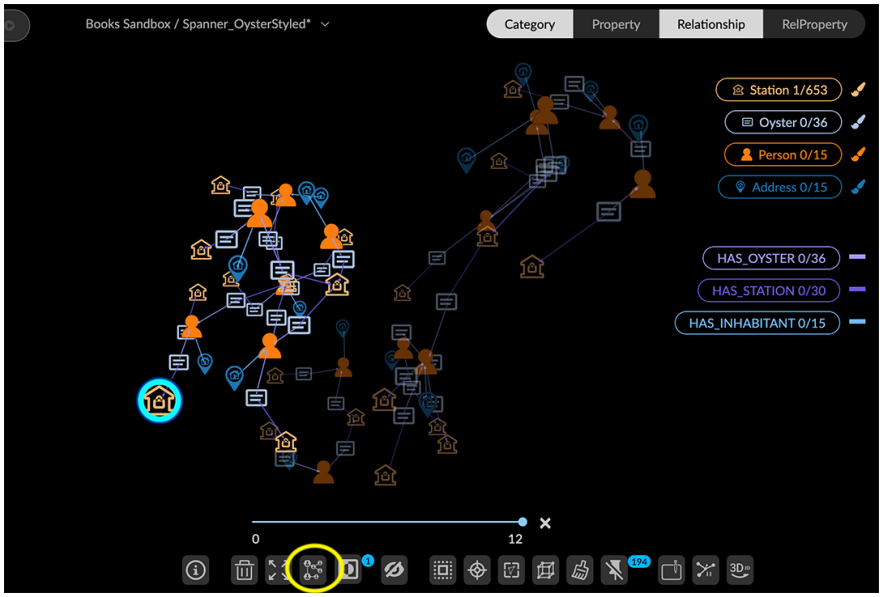
Paths between nodes in a graph can reveal unsuspected connections that are otherwise difficult to bring to the surface. In GraphXR Explorer, you can

- Trace neighbor nodes a specific number of hops away from a selection, and isolate the path.
- Find a path, if one exists, between two nodes.
- Measure connectedness of nodes via the Degree Centrality algorithm.

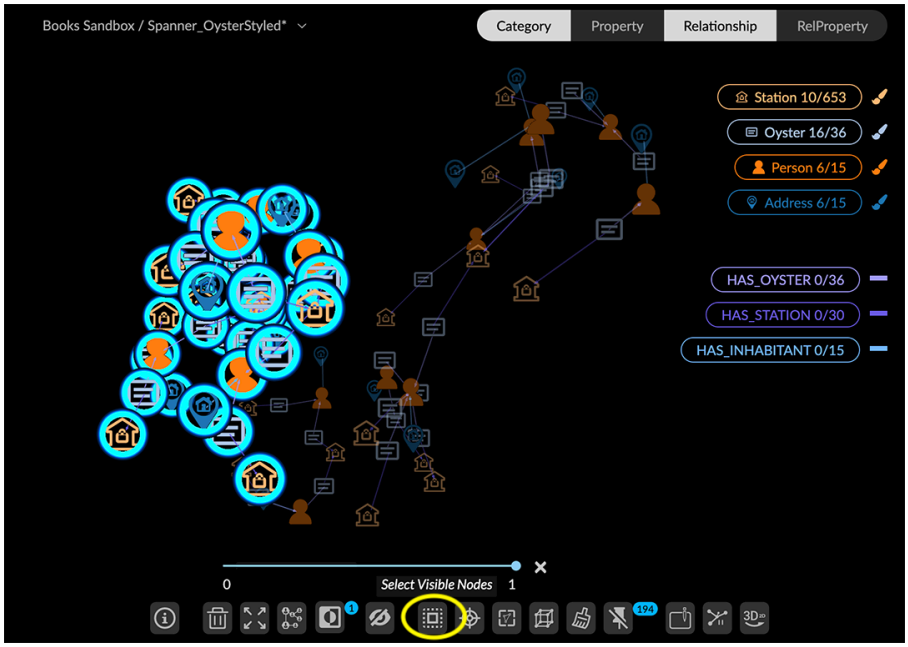
Trace and Isolate a path

Use the toolbar ***Trace Neighbor*** and ***Select Visible*** icons to highlight and select paths through the graph.

1. Select the initial nodes, and click ***Trace Neighbor***.
   A slider displays the total number of hops to other parts of the graph.
2. Move the slider to the number of hops (connections) you want to trace.
   The connected nodes are highlighted, but not selected.



3. Click the ***Select Visible*** icon to select the highlighted nodes.

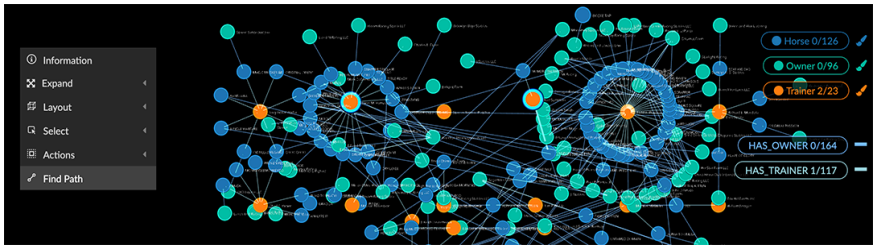


4. Click the ***Inverse*** icon to invert the selection.
5. Click the ***Hide Selection*** (or ***Delete)*** icon to remove the nodes not on the paths.

Find a path between two nodes

Use the right-click ***Find Path*** item to find and select the path between two nodes.

1. Click to select a node, then *ctrl-click* a second node to add it.
2. Right-click, and select ***Find Path***.
   The path, if any, is highlighted and selected.



3. On the toolbar click the ***Inverse*** icon to invert the selection. (Or right click and choose ***Select>Invert***)
4. Click the ***Hide Selection*** (or ***Delete)*** icon to remove the nodes not on the paths from the canvas.

Measure degree centrality

Degree Centrality is a graph algorithm that measures the connectedness of each node by counting the number of edges it is connected to.

- Use the keyboard shortcut: *ctrl-shift+**D***
  The degree centrality algorithm is run on the entire graph currently shown on the project canvas.
  The result is added to each node as a new *degree* property with the edge count as its numerical property value.
  NOTE If part of the graph is currently hidden, the hidden nodes will have a *degree* property with a value of zero.

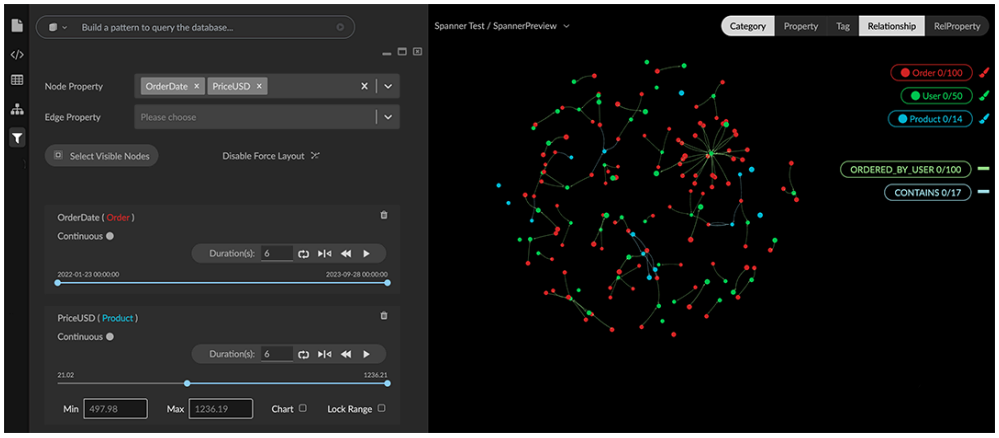
To work with the new property, you can select by property value in the legend, add it as a caption to nodes, filter on its value, inspect it in tables, and so on.

Filter Nodes

Filter nodes

Open the ***Filter*** panel to create multiple independent filters that filter on node or edge property values.

1. Select properties to filter one or more ***Node Property*** or ***Edge Property*** values (e.g. *OrderDate* and *PriceUSD*).



2. A **continuous** filter with a slider control is provided for numeric, date-time, or lat-long property values. Use it to:
    - Manually scrub through continuous property values, or use playback controls to filter in either direction, or in a continuous loop.
    - Set the values to be filtered (e.g. a date or specific price point).
    - Set a range of values and click the ***Lock Range*** checkbox.
    - Click the ***Chart*** checkbox to display a bar chart of filtered values.

    A **discrete** filter is provided for filtering strings or text. Use it to:
    - Enter text search (including wildcard or regex patterns) to select property values to be included.
    - Click the checkbox next to a property value to include it. By default, all values are selected.
3. If your filter retains the data you want, you can close the filter panel and begin working with it, or save it as a view.

    OR

    If you filtered out the data you want, click ***Select Visible*** in the ***Filter*** panel or toolbar, then delete the filter(s) to show all the data.

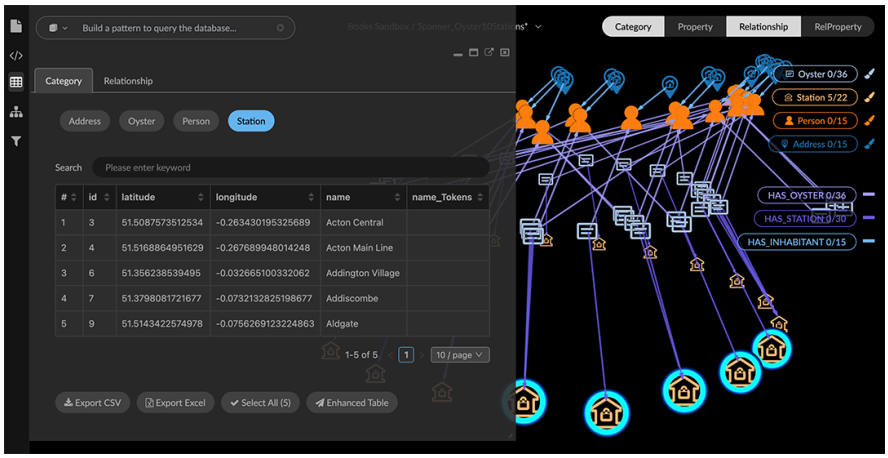
    The data you don't want is still selected, so in the toolbar, click ***Invert*** and then ***Hide*** or ***Delete***.

    NOTE Filters persist when you close the panel, until you exit the project. This lets you work with a filtered subgraph. To return to the full graph, delete the filters that are in effect.

Explore from a Table

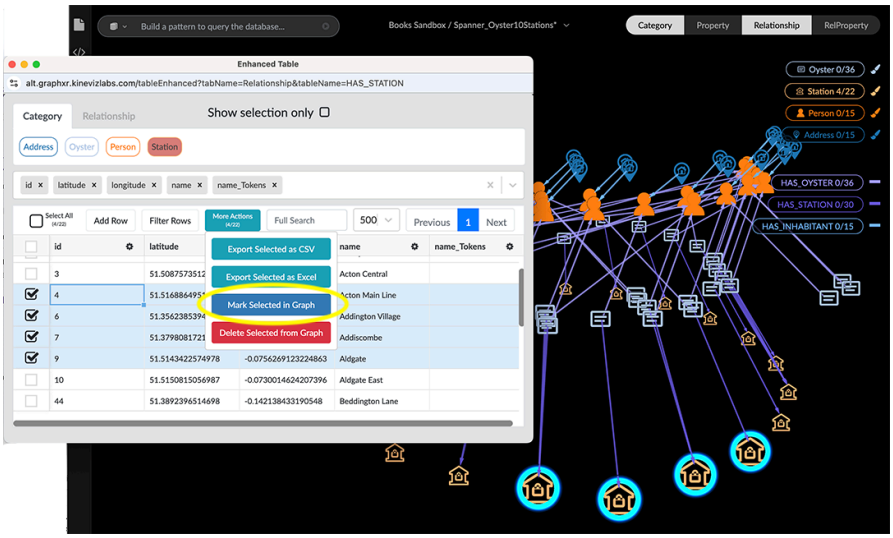
Explore and select from a Table

You can use tables to inspect properties associated with each category or relationship, and to select and highlight nodes on the canvas.



- Open the ***Table*** panel, choose ***Category*** or ***Relationship***, and click a label to open a table of those nodes or edges. You can
  - Click a table item to center the node or edge on the canvas.
  - Click ***Select All*** to select all the items of that type on the canvas.

    NOTE The table shows selected nodes (or edges), or all items if nothing is selected.
- Click ***Enhanced Table*** to open an editable table where you can:
  - Click the Arrow icon at the upper right to pop the table out into a separate browser window
  - Select and mark (highlight) nodes on the canvas.



  - You can also:
    - Edit Category and Relationship names
    - Edit and delete the property values in the table
    - Search the table
    - Export data as CSV or Excel
    - Delete data on the graph

Lay out the graph

Lay out the Graph

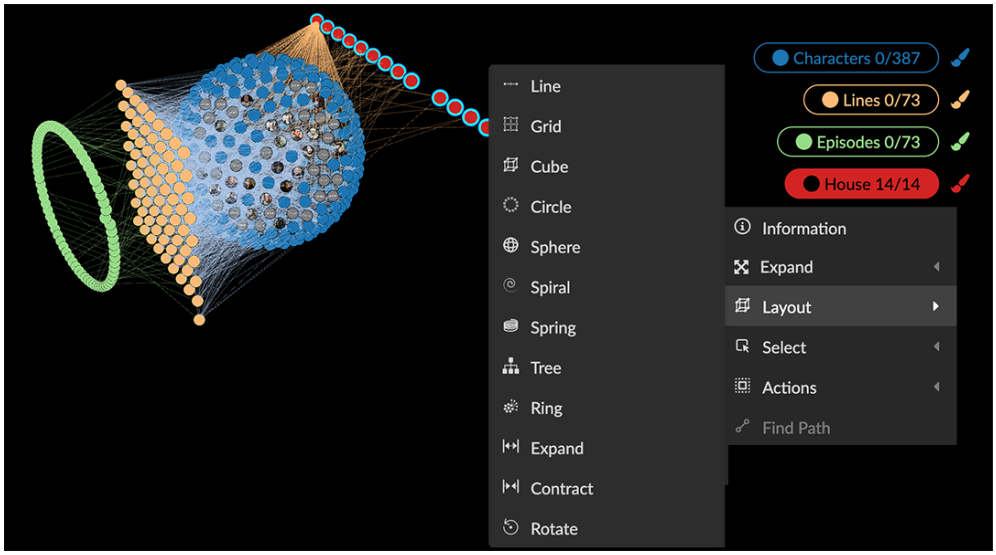
GraphXR Explorer provides a variety of quick layouts that help you focus on subgraphs and key insights, and communicate results effectively. You can apply any layout to any selection of nodes, or to the entire graph.

TIP To lay out results in 2D for reports or presentation, click the ***2D/3D*** toggle icon in the toolbar. You may also want to switch to light mode. In ***Project>Settings***, click the ***Theme*** icon to toggle between modes.

Geometric Layouts

1. Select nodes to lay out using any selection method.
2. Right-click***>Layout*** (or click the toolbar ***Quick Layout*** icon) and choose a ***Line***, ***Grid***, ***Cube***, ***Circle***, ***Spiral***, ***Sphere***, or ***Spring*** layout.

   NOTE If you are in 2D mode, the 3D layout options (Cube, Spiral, Sphere, and Spring) will be grayed out.
3. The layout is displayed in a default location on the canvas. With the nodes still selected, move them on the canvas (left click-drag) to where you want them.
4. Optionally, right-click and choose ***Layout>Expand*** or ***Layout>Contract*** to expand (or contract) the selected layout, or ***Rotate*** to rotate the layout counterclockwise 90 degrees.



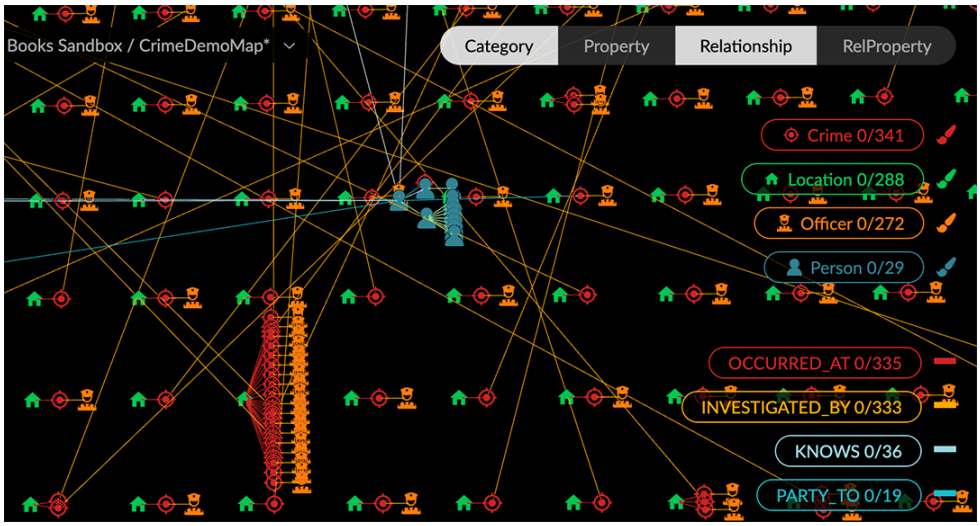
Hierarchical Ring or Tree Layouts

Ring or ***Tree*** layouts arrange nodes in hierarchical levels around selected central nodes. Most often, you'll want to select nodes of a particular category for the centers, but any selection (or none) works.

When choosing a hierarchical layout, consider how many levels of connection there are in the graph, and how many connections the central nodes have. Generally, tree layouts are easier to interpret if most of the central nodes have a small number of connections. When central nodes have many connections, a ring layout is usually a better choice.

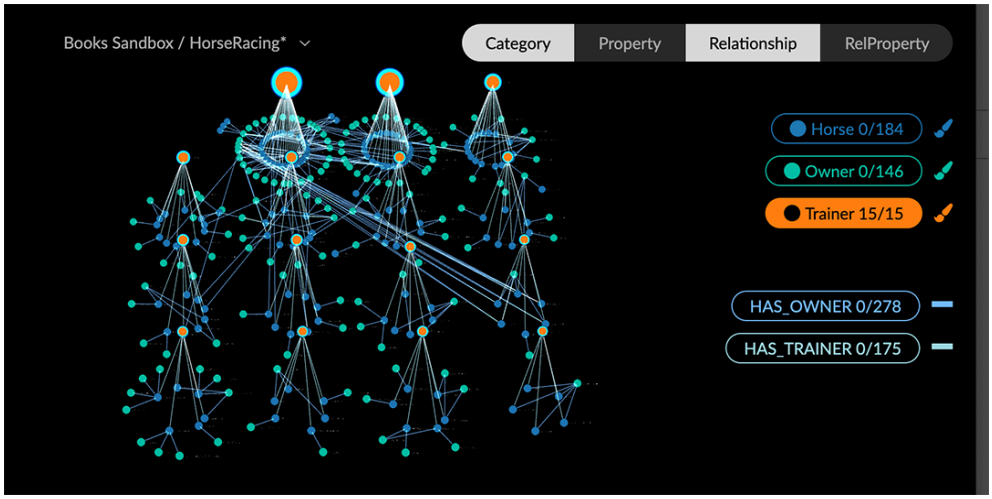
To apply a ring or tree hierarchy:

1. Select the nodes to be the centers of the hierarchy.
2. Optionally, apply a geometric layout, such as a line, grid, or circle to the selection, and orient it so that the ring or tree layout can be easily seen.
   You may need to expand (or contract) the selected geometric layout (***Layout>Expand*** or ***Layout>Contract***) to make enough room.
3. Right click and select ***Layout>Tree***



OR

Right click and select ***Layout>Ring***



Nodes one hop away from the central nodes are arranged in the first level, those two hops away are at the second level, and so on.

TIP A ring or tree layout is flat, but in 3D mode, you can move nodes up or down on the canvas. Doing so can help make complicated connections more visible.

Pin or Release nodes

Nodes are automatically pinned to a specific spot on the canvas if you move them manually or apply a quick layout.
Pinned nodes are not included when applying force layout, and you may want to pin some nodes to prevent them from being automatically moved, or release some or all pinned nodes to return that part of the graph to a default force layout.

- The toolbar ***Pin/Release*** icon shows how many nodes are currently pinned. Click the icon to toggle between pinning and releasing all pinned nodes (or a selection) in one click. Released nodes are rendered in the default force layout.
- A pin icon is displayed on any pinned nodes, but you can hide it if desired. Simply go to ***Project>Settings*** and click the ***Hide Pin Icon*** checkbox.

To pin selected nodes:

1. Select the nodes you want to pin.
2. Right click, and select ***Actions>Pin***.

To release selected nodes:

1. Select the nodes you want to release.
2. Right click, and select ***Actions>Release***.

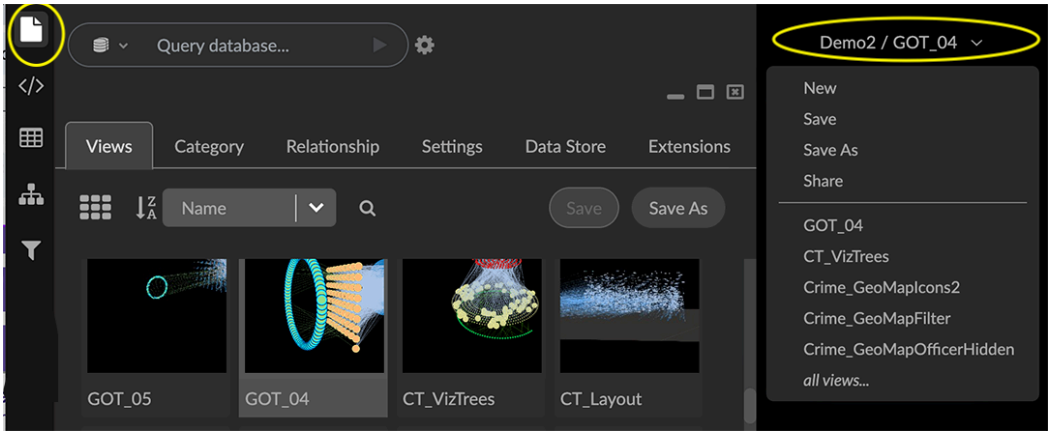
Save Graph Views

Save Views

At any time, you can save the state of the graph as a live view. This is particularly useful for saving

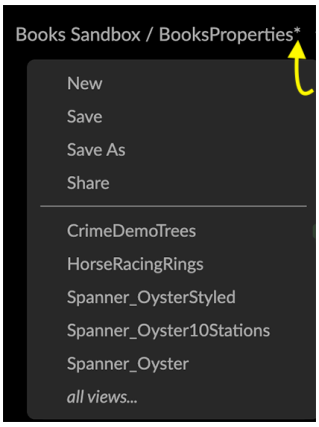
- the starting point of an exploration that's likely to go in different directions,
- results of focused analysis, and
- layouts that communicate key insights.

Saved views are displayed in the ***Project>Views*** tab.
However, the dropdown view menu lets you create, save, share, and load views without opening the Project panel.



Saving or loading from the view menu

When you open the project, the canvas is empty, and the view on the menu is labeled *Unsaved View*. Once you have imported graph data or loaded a previously saved view, an asterisk is displayed on the menu indicating that the view has changed.



Click the dropdown view menu and choose

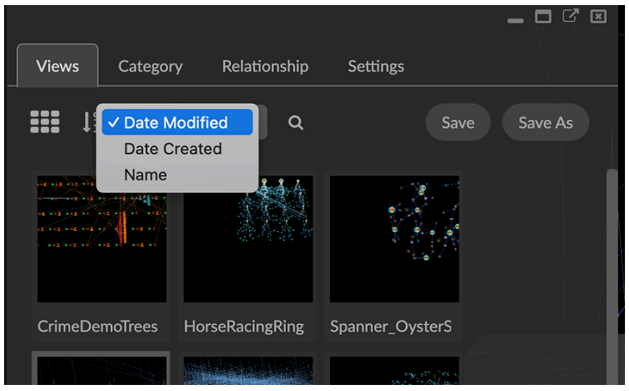
- ***Save*** to save and replace the current view
- ***Save As*** to save the current view as a new view. In the dialog, enter a descriptive view name and click ***Submit*** (or ***Cancel***).
- ***New***, to clear the current graph and create a new empty view.
- Choose a view from the list of the last five saved views, or click ***all views...*** at the bottom to choose from a list of all saved views.

  NOTE If the current view you are replacing has unsaved changes, a dialog prompts you to Save, Save As, or Don't Save.

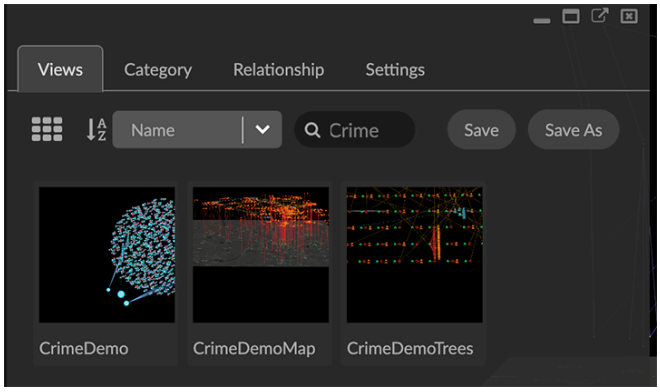
Manage Saved Views

The ***Project*** panel and ***Views*** tab includes additional options to work with saved views.

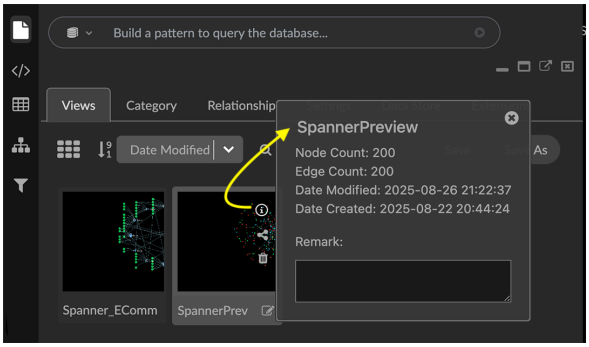
- Click the tile/list icon to display views as tiles with thumbnail images, or as a list.
- Click a tile or list to load a view to the canvas.
- Sort by name, date created or date modified, in ascending or descending order.



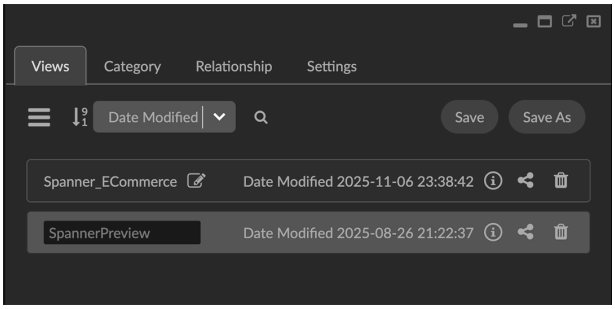
- Search for a view. Click the search icon to filter on the view name.



- Click icons on the view tile or list to
  - Show and annotate view Information



  - Share a view
  - Delete a view
  - Edit a view name



Share a View

Share a View

You can share a view that's on the project canvas, or share any saved view.

Share the view on the project canvas

1. Choose ***Share*** on the view dropdown menu.
2. Optionally, require authentication and enter a password.
3. Click ***Copy Link***, and send it and the password (if any) to your colleagues.

Share a saved view

1. Open the ***Project*** panel and ***Views*** tab, locate the view, and click its share icon.
2. Complete steps 2 and 3 above.

Add GraphXR Features

Add GraphXR features to Explorer

The default Explorer user interface includes the basic features needed to visualize, explore, and share graph data. For even more powerful graph modeling and analysis, you can freely access a full range of additional GraphXR features through the Project's **UI Configuration** panel. It's where you select additional GraphXR panels, toolbar items, and right-click menu items that will then appear in your project. Features you may want to add include:

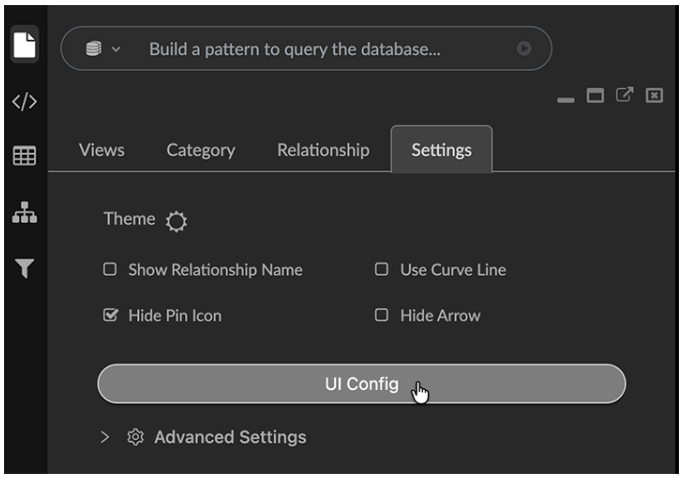
- Layout (**Distribution** and **Label** layouts), which let you sort nodes in your geometric layouts by property value.
- **Map**, for a panel to drop nodes with lat-long property values on a world map.
- Property graph modeling features
  - The **Transform** panel and its **Formula**, **Extract**, **Link**, **Aggregate**, **Merge**, and **Shortcut** tabs).
  - The **Graph Composer** Extension to model collections of relational tables or CSVs as a property graph.
- The **Grove** Extension, for building and sharing Observable-based notebooks.

An overview of each of these features is included in this guide. More detailed information on their use is available at the Kineviz Help Center.

Configure your Project UI

To change the project's UI configuration:

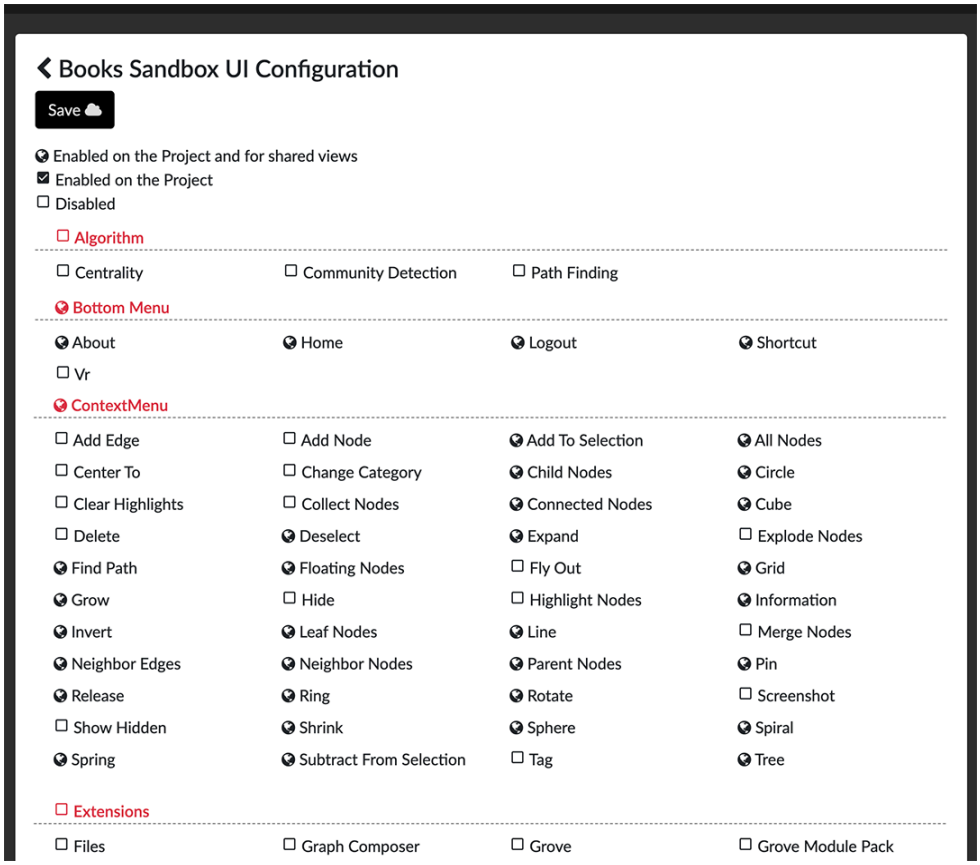
1. Open the **Project** panel and **Settings** tab, and click the **UI Config** button.



2. UI elements are organized into functional groupings listed alphabetically (e.g., *Algorithms*, *Bottom Menu*, *Context Menu*, etc.). Scroll down to see all the elements.

   The icon next to an element indicates its current status: *Disabled*, *Enabled on the Project*, or *Enabled on the Project and for Shared Views*.

3. Click the icon next to a group or an individual element to change its status.



4. When you are done, go to the top of the window and click **Save** to update the UI configuration and return to your project.

Sorting by Property Value in Geometric Layouts

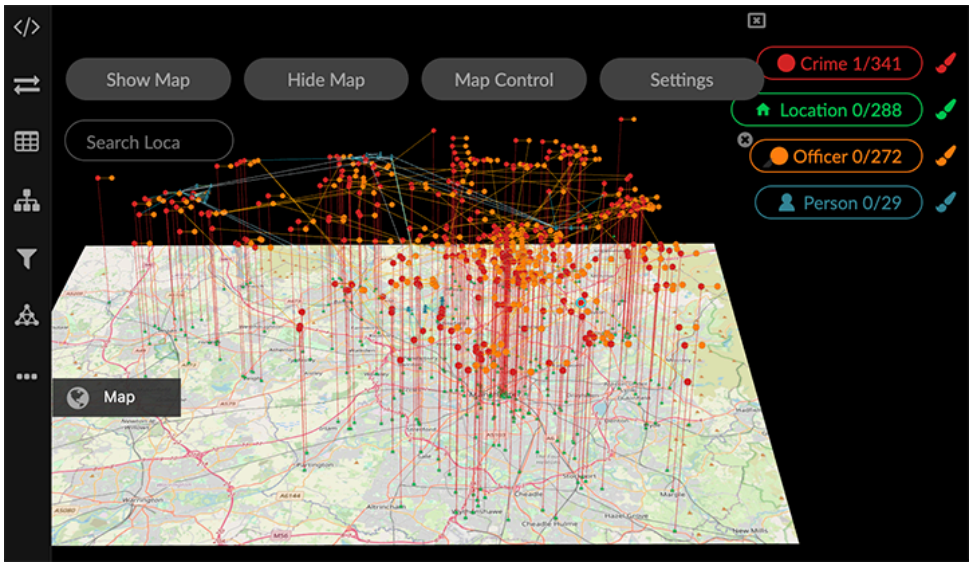
Sorting or distributing nodes on the canvas by property value can greatly enhance the visual impact of a graph. Along with many other detailed layout controls, this capability is only available in the **Geometric** tab of the **Layout** panel.

1. In **UI Configuration**, scroll to the **Layout** section and click **Distribution Layout** and **Label Layout**). Click **Save** to return to the project.
2. Open the **Layout** panel. You now see the **Geometric** layout tab, and its many options for controlling layout of nodes on the canvas.
3. To sort nodes in a layout by property value, select the nodes, and under the **Layout** section, click the **Order by Property Value** checkbox.
4. Select a **Category** and **Property**, and click the **Ascend** or **Descend** checkbox.
5. Click a geometric layout (**Line**, **Circle**, etc.) to apply the layout with sorted nodes.
   NOTE: The steps are the same for the **Distribution** layout function.

Geographic Map

The **Map** panel is hidden in Explorer by default. However if some of your nodes include lat-long property values, you'll probably want to display them on a world map.

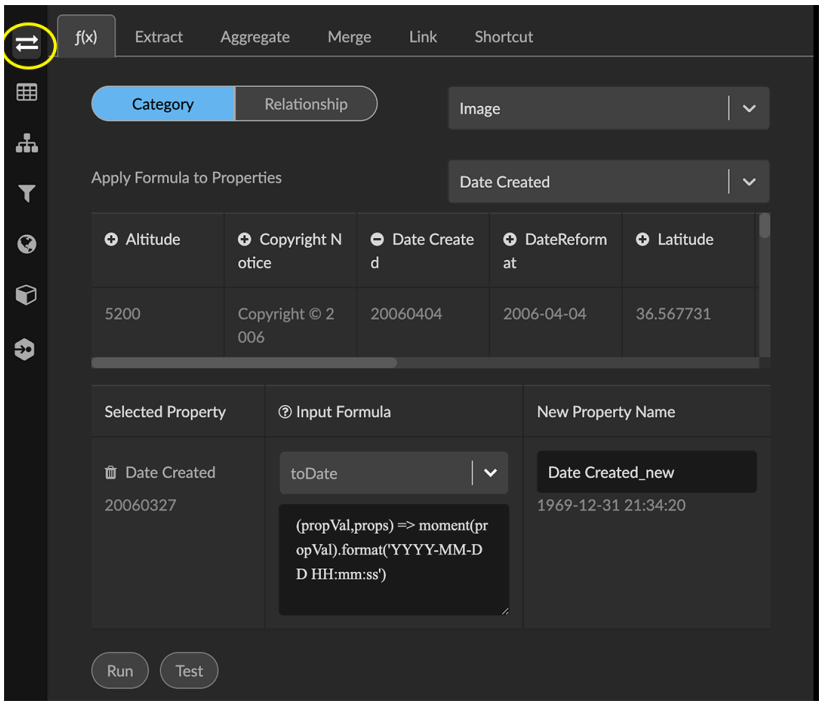
1. In **UI Configuration**, scroll to the **Map** element and click to enable it. Click **Save** to return to the project.
2. The left menu now displays the **Map** icon.
3. Click to open the **Map** panel and click **Show Map** to drop nodes with latitude and longitude property values on a world map.



Property Graph Modeling

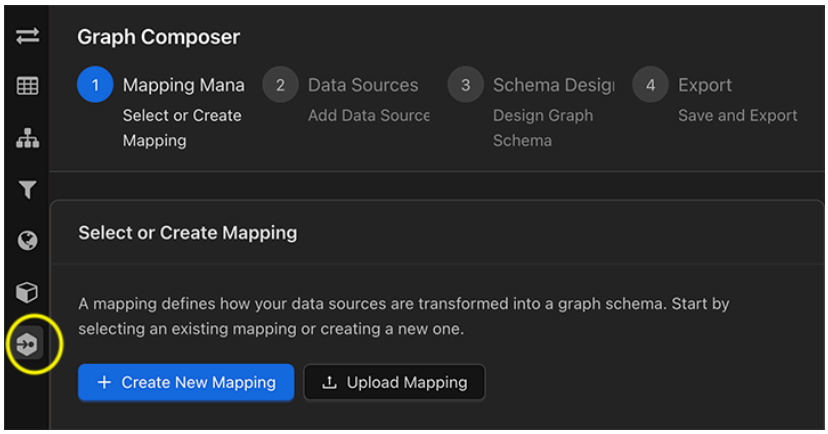
Explorer's basic connection to a Spanner Graph database provides fast intuitive visualization and exploration of the graph as it exists in the source database. You may want to re-model the graph in your project, for example to extract new categories, link data, simplify the graph, or add new data from various sources. You can do this using features in GraphXR's **Transform** panel and the **Graph Composer** extension.

1. In **UI Configuration**, scroll to the **Extensions** element and click **GraphComposer** to enable it.
2. Then scroll to the **Transforms** section, and click to enable everything except **Connections**.
3. Click **Save** to return to the project. The left menu now displays:
   - A **Transforms** icon. Click to open its panel and see the Function (**f(x)**), **Extract**, **Aggregate**, **Merge**, **Link**, and **Shortcut** tabs.



For information on using these features, see Transform Data documentation.

- A **Graph Composer** icon. Click to open its panel.



You are prompted to complete a multi-step process to create mappings that model data from relational tables, CSVs, and other sources as a property graph, preview the results, and save the mappings and the modeled graph.
For more information, see GraphComposer documentation.

Grove Notebook Extension

Grove is a GraphXR extension for building repeatable workflows in an Observable-based notebook environment. A full-featured GraphXR API enables most GraphXR actions to be performed in the notebook.

1. In **UI Configuration**, scroll to the **Extensions** element and click **Grove** to enable it. Click **Save** to return to the project.
2. The left menu now displays a **Grove** icon. Click to open the panel. A demo notebook is available to provide an overview of Grove capabilities.
   For more information, see Grove documentation.

Install a Spanner Demo

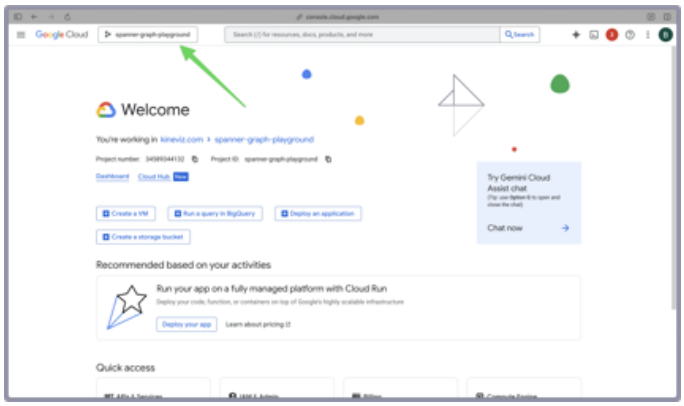
What if I don't have a Spanner graph database yet?

A Spanner Graph project and database must be created on the Google Cloud Platform before you can connect it to a GraphXR project. If you don't have a database set up, you can sign up for a GCP account, and get a free demo database that you can use for up to 90 days.

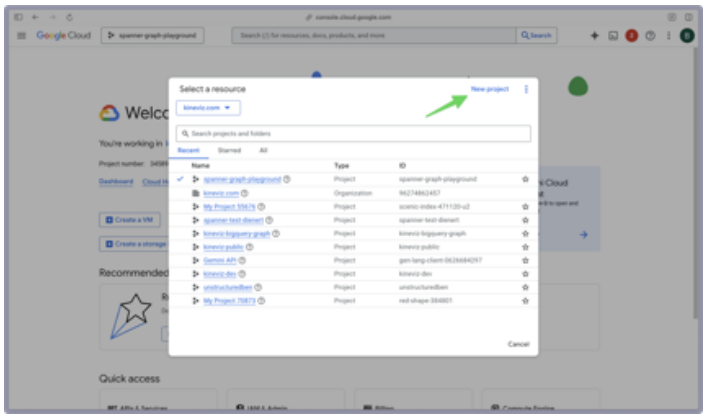
NOTE For details, see Google Cloud Spanner documentation.

1. Visit GCP https://console.cloud.google.com/
2. Open the project picker to create a project, or choose an existing one. We'll create a new project.

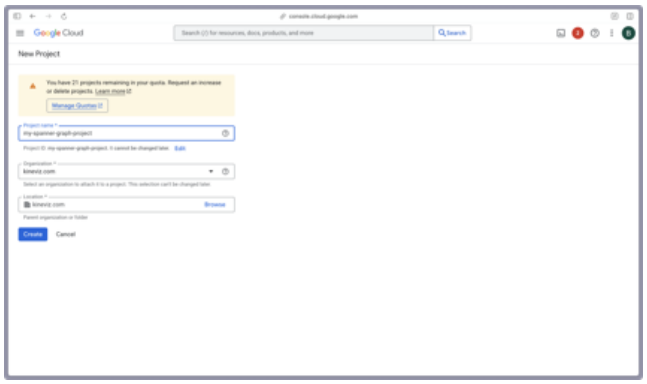
   IMPORTANT The project must be connected to a billing account, even though creating and using the demo project is free.



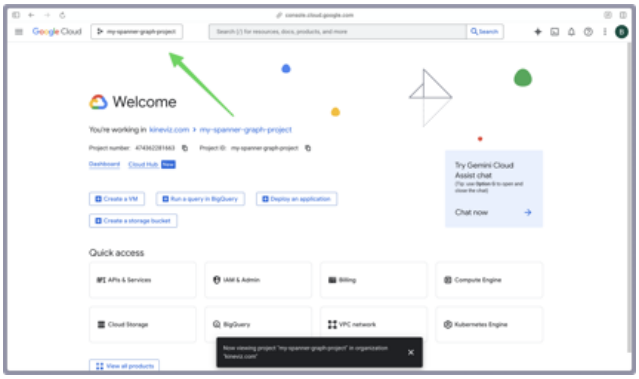
3. Click the **New project** button.



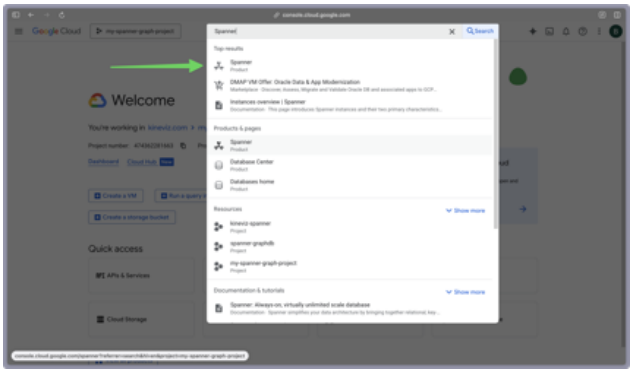
4. Enter a project name.



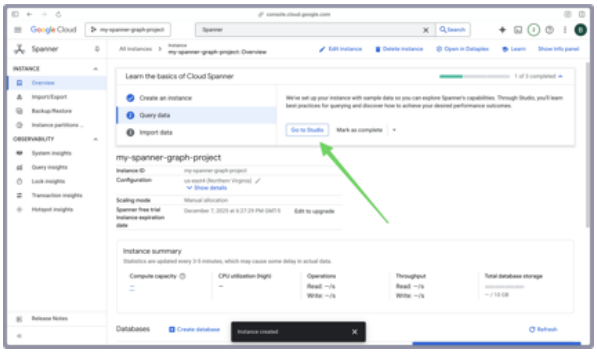
5. After creating the project, select it with the project picker.



6. Use the search bar to find and select Spanner.



7. Enter an **Instance name**, **Instance ID**, and choose a **region**. (e.g. **us-east4**)
8. Click **Create free instance**.
9. Now go to the GCP **Studio**.



10. Choose a sample query for the **ECommerceGraph** and try it out.