Real Time Tracking Tool (RT3)

The *STK/Real Time Tracking Tool* (*RT3) Extension* is an off-the-shelf solution for displaying and analyzing live and simulated data feeds in *STK*; its user interface has the same appearance in both applications. An *RT3* license is required to use the *RT3 Extension*, and you must install the *RT3 Extension* to add it to your STK.

The *RT3 Extension*'s user interface is comprised of six components - the *Display Manager*, the *Archive Player*, the *Event Manager*, the *Event Log*, the *Output* tool, and the *Display Setting*s tool - that allow you to select data sources, replay archived data, refine output by utilizing queries, and monitor data by establishing events. You can access each of the components from the *RT3* menu or toolbar.

DSim

DSim is a separately licensed extension to *RT3* that provides an IEEE-compliant *Distributed Interactive Simulation (DIS*) and *High Level Architecture* (*HLA*) interface for reading data feeds from distributed simulations. *DSim* uses *MÄK Technology's VR-Link* toolkit to interact with the *HLA* and *DIS* feeds.

RT3 Display Manager

The *Display Manager* is the primary interface for selecting real-time data feeds and defining how they will be displayed and tracked in the *RT3 Extension*.

1. Ensure the RT3 Toolbar () is visible in the STK Workspace.

2. Select the *RT3 Display Manager* (). It is added to the lower section of the Object Browser by default.

Select a Provider

A provider is an interface to a specific real-time data source. Providers convert the source data stream into fields of data, which can be information about the source or individual real-time data items being provided by that source.

For this scenario, you will use *Distributed Interactive Simulation (DIS)* since the data provided was produced by *DSim* to be *DIS* data.

1. Select the *Distributed Interactive Simulation* provider from the topmost drop-down menu in the *RT3 Display Manager* () if it is not already.

2. Click the  button beside *Distributed Interactive Simulation*.

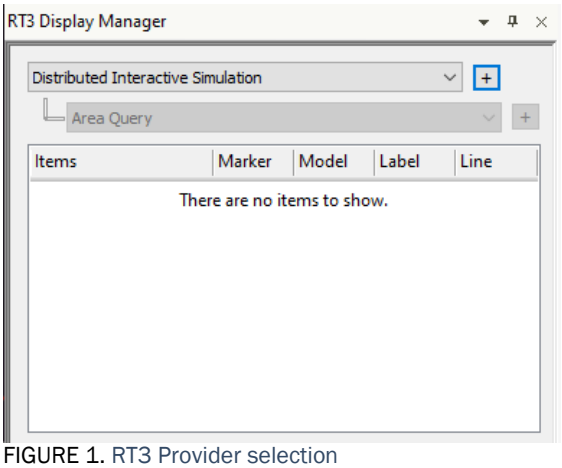


FIGURE 1. RT3 Provider selection

When you insert a provider element in the *Display Manager*, the *Provider Configuration* window opens. The options available vary depending on the provider.

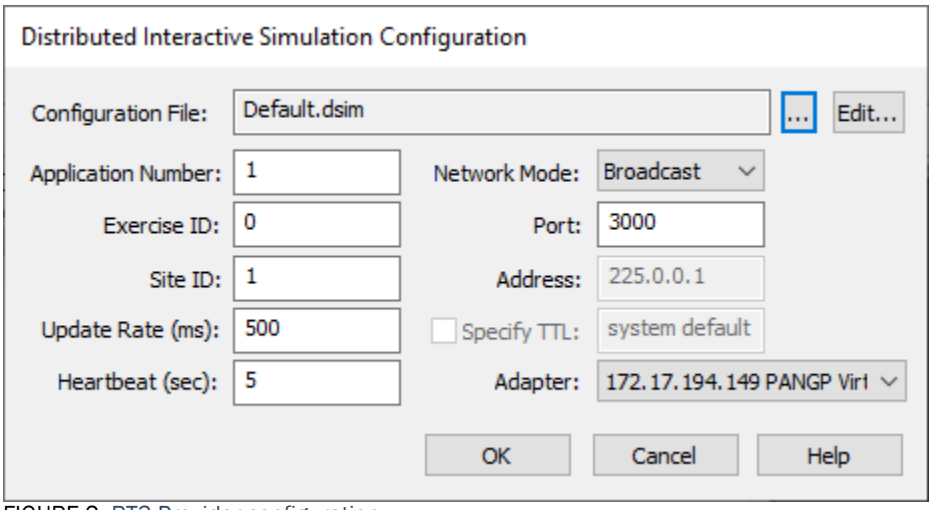


FIGURE 2. RT3 Provider configuration

The *Distributed Interactive Simulation* (*DIS*) provider is used to read *DIS* data feeds. The options here tell STK how to "hear" for the external data (with update rate information, port numbers, etc.).

Parameter	Description
Application Number	The application identifier.
Exercise ID	The exercise identifier.
Site Id	The site identifier.
Update Rate	The rate at which RT3 receives data updates from the feed.
Heartbeat	The length of time, in seconds, that STK should wait for data from an object before being considered deleted from the scenario
Network Mode	Select from: • Broadcast - A transmission mode in which a single message is sent to all network destinations (i.e., a one-to-all relationship). • Multicast - Transmission mode in which a single message is sent to multiple network destinations (i.e., a one-to-many relationship).

	• Unicast - A transmission mode in which a single message is sent to a single network destination (i.e., a one-to-one relationship).
Port	The connecting port number for the feed.
Address	The IP Address to use for a multicast or unicast network mode.
Specify TTL	Select to specify the distance, in network multicast terms, that the data will be streamed; the value range for this field is 0 - 255. A value of 1 means that data will only be distributed to clients connected directly to the feed server, while a value of 255 means that the feed server will attempt to distribute the data to the entire network.

Table 1. DIS Provider Configuration Options

You can edit or create a configuration file using the *Configuration File Editor*.

DSim Configuration File Editor

The *Configuration File Editor* can be used to customize the mapping of entity classes to specific markers and models for display in STK, and to define object templates to model entities received through a *DSim, DIS,* or *HLA* entity provider. STK ships with a default configuration file (Default.dsim). The fields and values all conform to *SISO* standards. Let's take a look at the defaults provided.

1. Click the *Edit...* button.

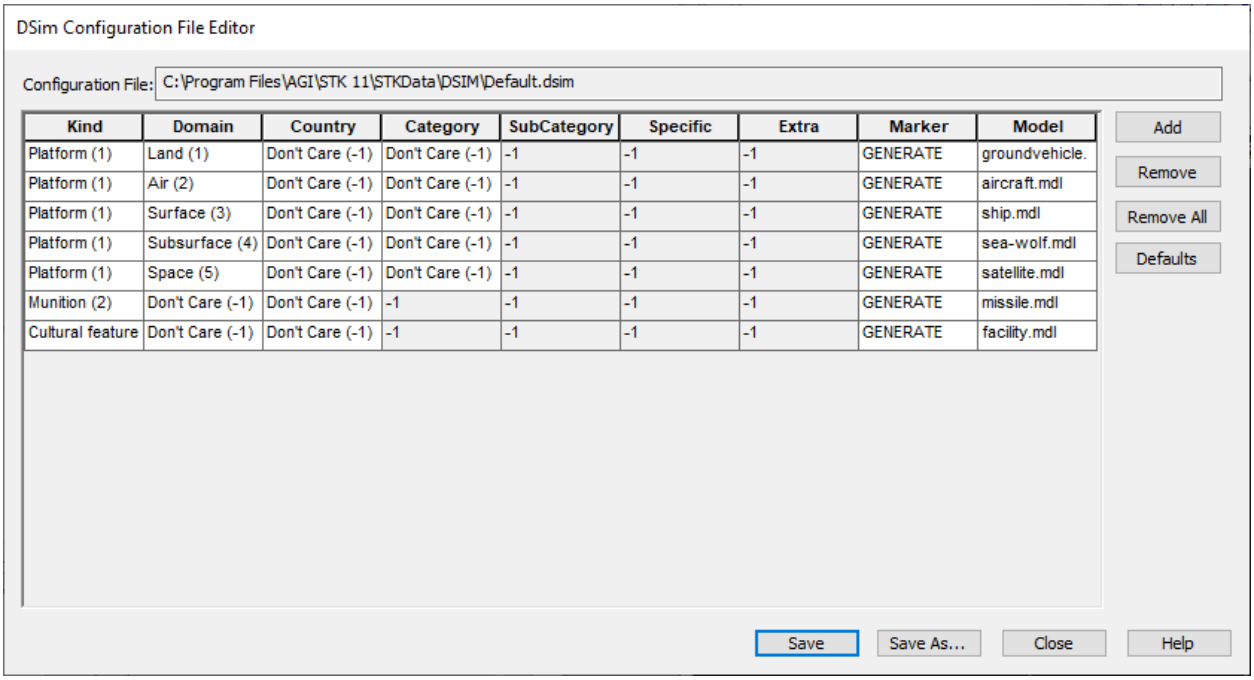


FIGURE 3. DSim Configuration File Editor

The *Kind*, *Domain*, *Country*, and *Category* fields have been populated with selections consistent with these standards. The *SubCategory*, *Specific*, and *Extra* fields can be manually populated with compliant data. The Marker and Model fields can be edited by clicking once and then manually entering a value, or by double-clicking to open the Marker Settings or Model & Template Settings

window. The *Marker Settings* window provides four options for defining the marker to be used for an entity (no marker, 2525B symbology, fixed marker). The *Model & Template Settings* window provides three options for defining the model to be used for an entity.

2. Click *Save As...* to save changes made in the *Configuration Manager*. Click *Close* to dismiss the *Configuration Manager* and use the default settings.

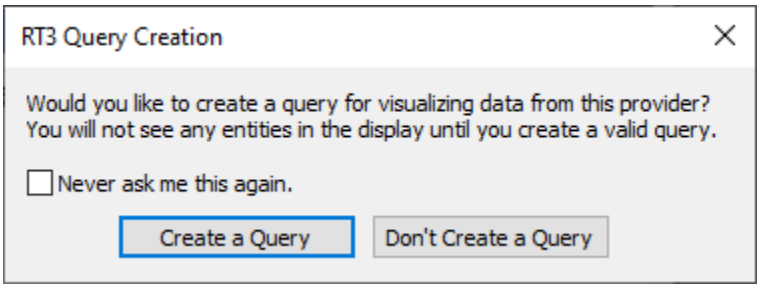
3. When you return to the *DIS Configuration* window, click *OK* to accept the values.

Create a Query

Immediately after configuring a provider connection, you will be prompted to create a query. By default, none of a provider's entities are displayed when the provider is first added; you must create a query to begin viewing data.

A query is a real-time element that filters a provider's data to display specific subsets of it, called entities. By default, none of a provider's entities are displayed when the provider is first added; you must create a query to begin viewing data. RT3 provides three types of queries: *Area*, *Distance*, and *Simple*. You may have more query types available to you if your RT3 integrator has created some. Any query can be configured as an event in addition to its standard form.

1. When the *RT3 Query Creation* dialog appears, click *Create Query*.



FIGUR E 4. RT3 Query Creation

Creating a query will open the *Query Configuration* window. By default, a *Simple Query* is created. A simple query is a basic data filter that utilizes a SQL-based set of expressions and operands to determine what data will be displayed. The options here allow you to define the data that you want to display - by comparing the data - and the manner in which it will be displayed.

2. When the *Query Configuration* window opens, name the query.

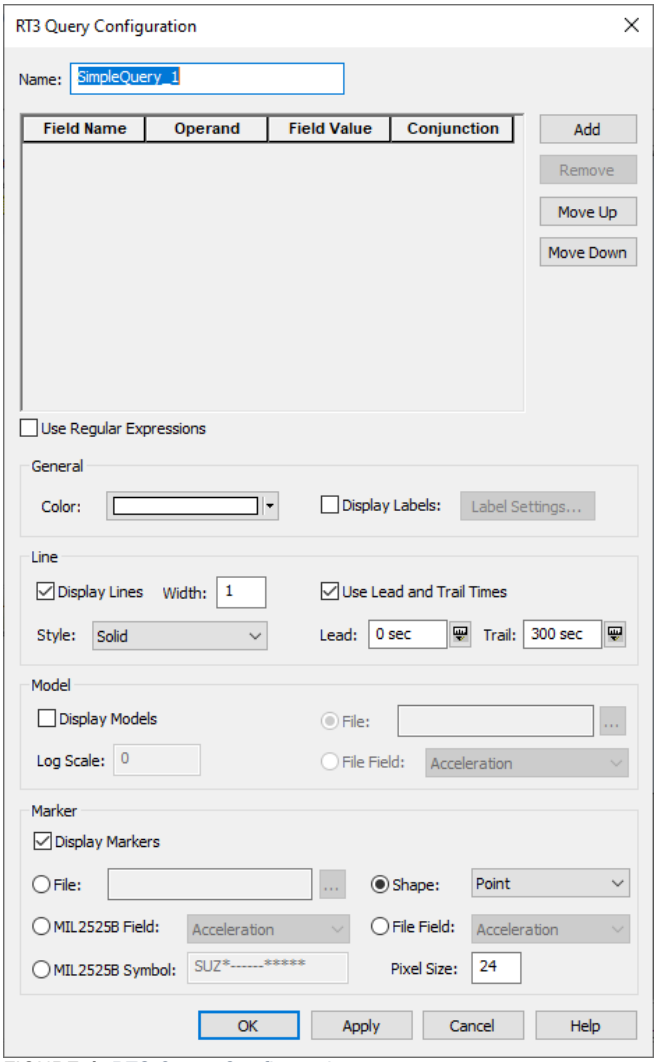


FIGURE 4. RT3 Query Configuration

Now, let's define a clause that tells *RT3* to acknowledge all data for aircraft objects. You can use the mappings outlined in the *DSim* configuration file to differentiate entities.

3. Click the *Add* button to add a clause to the simple query.

You can double-click any field of an existing clause to edit it. Click *Remove* to delete the currently selected clause. Click *Apply* to save the changes you have made, or click *OK* to save the changes you have made and close the window, or click *Cancel* to close the window without saving changes.

4. Set the following:

Parameter	Description
Field Name	Select the data field you wish apply the clause to; the list of available fields is dependent on the provider.
Operand	Select an operand to apply to the field value; the operand can be =, !=, >, >=, <, or <=.
Field Value	Enter the value to be compared to the data field, using the selected operand.
Conjunction	Select a conjunction to relate the clause to the subsequent clause in the table; the conjunction can be AND, OR, or NONE.

TABLE 2. Simple query clause

The options below the clauses define the display of the entities that are acknowledged. Each standard query can be configured to display entities in *STK* with general, line, model, and marker display options.

General Display Options

The *General* display options allow you to customize the color and label for the entities that meet the criteria defined. The *Line* display options allow you to customize the line width, style, and the lead & trail length (in seconds).

Models & Markers

Using the display options that *RT3* provides, you can make more meaningful representation of objects. You can define a detailed model for viewing at close range and a standard *Mil2525B* marker for distance viewing.

5. Click *OK*.

Repeat this process to create as many queries as needed for the data streaming into STK.

6. When you return to the *Display Manager* (), ensure that the following are enabled:
- *Distributed Interactive Simulation* provider
- *Your created* query(ies)
- *Marker, Model*, *Label* and *Line* display options

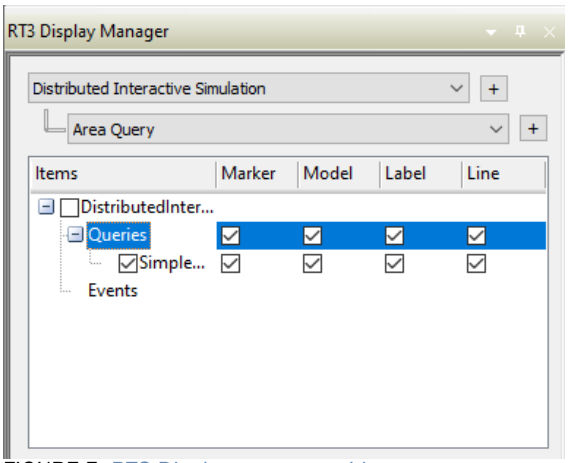


FIGURE 5. RT3 Display manager with query

Start the Simulation

When visualizing data with *RT3 or DSim*, it is important that the STK animation time matches the timestamp of the incoming data feed. If you are viewing live data, this is most easily accomplished by making sure your system time is accurate and that you are running STK in *Real-Time* animation mode. When viewing archived data, set the animation mode to *X-Real-Time* and animate from the beginning of the archived feed.

1. Ensure that STK is in *Real-Time Animation Mode* ( ).

2. Ensure that both the *Object Browser* and the *3D Graphics Window* are clearly visible.

3. Begin the simulation sending the DIS data.

NOTE: If several networked computers are accessing data from the same source, only one of those computers needs to run the data feed from the network.

4. Bring *STK* to the front.

5. *Play* ( ) the animation.

6. Bring the *Object Browser* to the front.

Entities populate the *Object Browser*. You can see aircraft and ships entering the scenario. Once you bring in entities from your *DIS* or *HLA* data feed, any siblings associated with the objects (prebuilt or designed by you) can now be used with those objects.

Entities & Objects

We have created queries that display entities differently based on their domain, but every entity that shares a domain is the same color and model. The entities are not very visually dramatic.

If you wanted each object to show up with it's own model, you could do one of two things:

• Create a separate query for each object and customize the associated display properties when you define the query;

Or

• Promote the entity to a savable STK object, and define display properties that can be saved with the object even when the simulation is not active.

Get Info Tool

You can use the *Get Info Tool* to return data from the *3D Graphics* window. Currently it can be used to return information about and act on *STK*, *GIS*, and *RT3* objects. You can launch the *Get Info Tool* for an entity directly from the *Get Info Tool* button () on the *Default* toolbar or from the RT3 Display Manager (as discribed here).

NOTE: You may need to add the Get Info Tool to the Default toolbar from the Add or Remove Buttons.

1. Bring the *RT3 Display Manager* ( ) to the front, again.

2. Right-click on one of the queries.

3. Select *View Query Entities*.

4. When the *Get Info Tool* opens, select *STK Objects* from the *Layers* drop-down.

5. Expand the layers tree.

6. Click on any object to display information about that object.

All of the entities might be listed under the *Query Name* heading as *STK Objects*.

• How can that be? We haven't promoted them.

By default, the *Auto Promotion* option is enabled in RT3. When this option is active, entities with attitude data will automatically be promoted heavy objects. If the data that we are using contains attitude for the vehicles, it will be created as STK Objects.

7. When you finish, close the *Get Info Tool*.

Stop the Simulation

1. *Reset* () the animation in STK.

2. Stop the simulation sending the DIS data.

3. Bring the *Object Browser* and the *3D Graphics* window to the front.

• What happened to the objects created for you?

When STK stops receiving attitude data for a vehicle it is no longer a part of the STK scenario unless the data was stored with the object, it is not stored by default.

Promoting Entities

The entities in the data are automatically promoted to STK objects, which is nice, but we would also like to be able to stop the clock and perform more in-depth analysis and perhaps save still images of various aspects of the rescue operation. If the objects disappear we can't do that unless we hurry to perform analysis and snap images while the scenario is in motion. That might not always be realistic.

Display Settings

The *RT3 Display Settings* allows you to configure the behavior of *RT3* in STK. From here you can control various aspects of entity and object display.

1. Click the *Display Settings* button ( ) on the *RT3* toolbar.

When you click the *Display Settings* button will launch the *STK Broker Configuration* dialog. *STK Broker* provides the ability to manage large numbers of tracks within STK. This includes graphics level of detail control (changing models, symbols, etc). *STK Broker* allows switching from tracks with sensors (heavy objects), to a light object (track and label only) dynamically with the objective to optimize hardware resources.

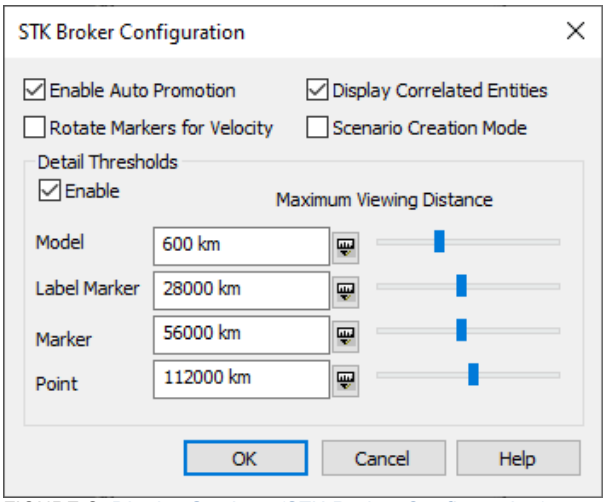


FIGURE 6. Display Settings (STK Broker Configuration)

The options available are outlined in the table following:

Parameter	Description
Enable Auto Promotion	If selected, entities with attitude data will automatically be promoted heavy objects.
Rotate Markers for Velocity	If selected, markers in the 2D and 3D graphics windows will be rotated to maintain a facing in the direction of the entity's velocity. By default, markers are oriented to the right.

Display Correlated Entities	If selected, entities that have been identified as secondary correlated entities by an entity processor will be displayed in addition to the primary correlated entity.
Scenario Creation Mode	If selected, objects that are removed from the broker will not be deleted from the scenario; this will allow you to preserve the objects for later offline analysis.
Detail Thresholds	If enabled, controls that allow you to apply detail thresholds and then define threshold distances for the display of the model, label and marker, marker, and point levels of detail for entities. If you haven't defined a level of detail, RT3 will skip to the next level of detail in that direction. For example, if you haven't defined a marker for the entity, when you zoom out beyond the threshold for model display RT3 will jump to the point level of detail to ensure that the entity remains visible in some capacity at all times.

TABLE 3. RT3 Display Settings (Broker Configuration)

2. Enable the *Scenario Creation Mode* option.

3. Click *OK*.

Restart the Simulation

1. Ensure that STK is in *Real-Time Animation Mode* ().

2. Ensure that both the *Object Browser* and the *3D Graphics Window* are clearly visible.

3. Begin the simulation sending the DIS data.

4. Bring *STK* to the front.

5. *Play* () the animation.

6. Bring the *Object Browser* to the front.

When You Finish

1. *Save* () your work.
2. Close the scenario ().