NETWORKS

The purpose of network is to link two or more GeoLocs. This is done by Mode of Transportation (MOT) and the design is a succession of edges and/or trails. They have attached properties to allow time and congestion calculations to be made taking in to account any restrictions, maximum capacity, grade and other parameters.
Some LOGFAS functions use transportation networks and trails to perform calculations for planning and analysis. While the main user of networks and trails is the M&T community, other LOGFAS specialists, including sustainment planners working with the Supply Distribution Model (SDM), can use them to assist with their work.

ADAMS, EVE and CORSOM users can work with Networks within the respective modules: other LOGFAS users can use the GeoMan to access Networks if it assists with their work.

**Loading Existing Networks**

To enable EVE, CORSOM and ADAMS Users to view, plan and calculate timings, and for SDM to model a sustainment plan, they need to use a Network. Networks are created, managed and loaded in the GeoMan and can then be worked using the Map Objects panel. Each Network must be loaded to the Map Project and only one network for each mode of transport (MOT) can be loaded into the Map Project at any time.

To load an existing network, CLICK on Tools on the main menu and then SELECT the Networks option. From the sub menu SELECT the Load Existing option and the Select Network to Load window will open. Here all of the Networks that are in the database will be displayed and these are indexed by Mode of Transport as shown if Figure 2.107.

![Figure 2.107](image)

For the Tutorial ACTIVATE the Mode of Transport of Road radio button and SELECT the TUT_Road: Atlantis Road option in the list view as shown in Figure 2.108.

![Figure 2.108](image)

Then CLICK the OK button to load the network to the plan. The program will now load the networks and set them as the active Network as shown in Figure 2.109.
For the Tutorial LOAD all existing tutorial networks, they all have the Prefix TUT_ before the MOT in the name, so that they can be used later. LOOK at each of them in turn and you will see that there are some differences in how they look; these will be explained later.

The Networks can be toggled on and off by CLICKING on the Network Visible/Hidden button on the main menu as shown in Figure 2.110.

Alternatively, in the Map Objects panel SELECT or DESELECT the relevant Tick Box in the Networks list the as shown in Figure 2.111.

If a Road Route was created (how this is done is described in the CORSOM Tutorial), it appears in the tree of the Road Network, so that the user can see and work with the individual parts of the network. For the Tutorial, DESELECT the Network named CORSOM_TUT_1.
Create New Networks

There are two main methods available to allow the user to build a network, depending on the data that is available. We will examine these in sequence.

The first one is valid only for rail and road networks and is mainly used by the M&T Users of LOGFAS: The GeoMan is able to extract the data used to display road and rail infrastructure when creating maps that are shown in the Map Display View. The data used are the *.bin (Binary) files located in the LOGFAS/Common/DCW/rail and DCW/roads folders.

The second method is for the user to manually build the detail of the required network on an existing map.

New Network from Map Data

To build a Network from Map Data you need:

First, a map for the area that applies to the network being created. The required data will be extracted from the roads/rail layer for the selected area.

For the Tutorial we will create a road network in BROWNLAND SOUTH EAST. SELECT the map South Atlantis in the Atlantis Map Project.

Second, you need an empty network activated ready to be populated, or an existing network activated. The network will have extracted data added automatically.

For the Tutorial we will populate a new and therefore empty network. CLICK on the Tools menu, then SELECT the Networks option and from the sub menu SELECT the Create option as shown in Figure 2.112.

![Figure 2.112]

This will open the Select Network from DB window, this is similar to the window used when loading an existing network but it will not display any detail. For the Tutorial SELECT the Mode of Transport as Road and INSERT the Network Name to Save as TUT_Test; INSERT some detail for the Network Description. The screen should look similar to Figure 2.113 and then CLICK the OK button.

![Figure 2.113]
The TUT_Test network now exists in database. Now we must load it to the Map Project so that it can be activated. In the Map Objects panel, RIGHT CLICK on Networks option to SELECT the Load Existing Network option as shown in Figure 2.114.

![Figure 2.114](image)

The Select Network from DB dialog will reopen. SELECT Road button and TUT_Test network. CLICK on OK button. The Network named TUT_Test is now available and activated as shown in Figure 2.115.

![Figure 2.115](image)

It is now possible to populate our new network. From the main menu SELECT the Tools/Networks/Build from Map Data option as shown in Figure 2.116.

![Figure 2.116](image)

Once the option has been activated, a dotted square will be added to the cursor and you will be able to define a region or area of interest where the network will be created. To do this MOVE the Cursor on to the displayed map where you want the area of interest to start, HOLD DOWN the Left Mouse Button and then DRAG your Mouse until the area of interest is defined.

For the Tutorial from map South Atlantis in Atlantis Map Project, ENLARGE an area as illustrated in Figure 2.117.

![Figure 2.117](image)

A dialog with a time warning will open as shown in Figure 2.118.
CLICK on Yes or OK button (the options will depend on your computer configuration). The GeoMan will now extract the required data and create the network. When this is completed you will see the created network as shown in Figure 2.119.

You can now work with the network as already described.

Creating a Network Manually

The process for creating a network manually is the same regardless of the MOT requirements. However, it should be noted that the correct selection of the MOT is important because the M&T Modules use this to apply parameters when calculating travel time (distance divided by speed equals time).

For the Tutorial we will build an (Inland Water Ways (IWW) network in BROWNLAND that links GEET BEACH and DUNSTON RH.

If not already activated, OPEN the GeoMan and ACTIVATE the Map Project named ATLANTIS. Use the Query GeoLocs functions to locate the required locations that will be linked by our IWW network. SELECT and DISPLAY the Locations named GEET BEACH and DUNSTON RH on the map South Atlantis. If you need or want to, ENLARGE the map to have a good view of the environment as shown at Figure 2.120.
To create a New Network you have to add a new network to the database and then use the Draw or Repair Network function to insert the detail required.

CLICK on the Tools menu; SELECT the Networks and Create New options. The Select Network from DB window will open. To create the New Network in the database you must:

- Allocate the correct MOT: SELECT the MOT as IWW by activating the Radio Button.
- Insert a Network Name to Save in the database for the network: INSERT the Name as TRG_Waterway.
- Insert a Network Description: INSERT the Network Description as For Training.

When you have completed these processes and inserted the required detail the Select Network from Database window should look as shown in Figure 2.121.

CLICK on OK button. The Select Network from Database window will close, the detail will be added to the database, the network will be activated and you can now add the detail required.

To add the detail of the network CLICK on the Draw or Repair Network icon as shown at Figure 2.122.
We can now insert the detail to show the route that the network is to follow. Move the Cursor onto the Map Display View, you will see that it becomes a cross mark. Now you can click along the route for the network.

Start from GEET BEACH CLICK to create a series of points that will draw a Line to DUNSTON RH passing through the lake as shown at Figure 2.123.

When you have added the points for the network, PLACE the Cursor on the drawn line and RIGHT CLICK. The sub-menu dialog shown at Figure 2.124 will appear with a number of options, SELECT the Save Drawn Object option.

The Save As... dialog as shown in Figure 2.125 will open. This has two options for saving the network and we will first have a look at the Add As Edges Option. CLICK on the Add As Edges button.

The created network is now saved to the database and is displayed in the Map Display View with all edges visible.

Note: The properties and modifications that can be applied to the edges will be detailed later.

As you can see at Figure 2.126 the saved network has a number of elements:
The elements are:

- The Nodes: These are the Black Edged boxes and they are the points on the displayed map where the cursor was clicked to create the network.
- The Edge, This is the connecting White Line that is displayed between two nodes.
- Access Edge Properties: These are the Red Edged boxes and allow you to activate an individual edge and allocate attributes to the edge using the Object Properties panel.

If required you can add more edges to the network until it is the way that you want it to be. For the Tutorial we will add an additional IWW route between the displayed locations.

CLICK again on the Draw or Repair Network icon. Start from GEET BEACH and CLICK a Series of Points to draw a line to DUNSTON RH passing to the North of the previous network as shown at Figure 2.127. Remember that this is illustrative and does not have to be exactly the same as shown in the Figure.

When you have established the route to be followed, PLACE the Cursor on the drawn line and RIGHT CLICK; The sub-menu dialog shown at Figure 2.127 will appear with a number of options, SELECT the Save Drawn Object option.

The Save As … dialog will open. For this part of the Tutorial SELECT the Add As Trail option and CLICK the button.
As you can see illustrated in Figure 2.128, the network as it was created is now visible but there is only one edge. CLICK on the Red Bordered-White Square in the centre of the edge; the Edge will be activated and will be highlighted.

RIGHT CLICK with the cursor over the red line and you will see the different options available.

One of these is to Enter Data (Selected Edge). If you did this you would notice that while the displayed Edge shows the network segment as a single, straight line that the distance displayed shows the total following the trail, the point that were clicked.

![Figure 2.128](image)

We will examine the options one by one; this will also give us the opportunity to redesign the North Branch of this IWW Network.

- Delete Edge option: This will delete the selected Edge but there is no warning, the program will complete the deletion of the selected edge.

- Redraw Edge option: This option allows you to move a node to a new position on the displayed map as shown at Figure 2.129.

![Figure 2.129](image)

When you have repositioned the node, RIGHT CLICK and SELECT the Save Drawn Object option. The node will reposition and the edges linked to it will be realigned.

- Split Selected Edge option: This option allows you to slit and existing edge into two parts and is used to add further detail if required into a smaller part of the network. SELECT the Split Selected Edge option and as shown at Figure 2.130 the selected edge is now split in to two edges.
Enter Data (Selected Edge) option: This option allows you to access the data for the selected edge and then you can insert attributes that will be applied to it. SELECT the Enter Data (Selected Edge) option. CLICK on the Object Properties panel. As you can see in Figure 2.131 there is an example of the required data entered for the edge that is an EU Class 3 IWW. CLICKING on Direction B will give the same properties for both ways.

**Note:** When activating the Selected Edge Direction A is indicated by the Arrow Head.

![Object Properties](image)

As you can see there are a number of options for entering the required restrictions that will apply to the Selected Edge, these include:

- **Regular Throughput (convoys option):** This allows you to set a regular level of throughput. Mainly used by CORSOM to assist in the control of traffic. The level set can assist in the analysis of the flow of traffic using the Regular Throughput as the average or mean.

  **Note:** Although the word convoys is used the principle can be applied to all MOT and Asset Types.

- **Maximum Throughput (convoys per hour):** This allows you to set a maximum level of throughput. Mainly used by CORSOM to assist in the control of traffic. The level set can assist in the analysis of the flow of traffic using the Maximum Throughput to show where this is being exceeded.
Note: Although the word convoys is used the principle can be applied to all MOT and Asset Types.

- **Max. Cargohight (CM):** This option is used mainly when there are tunnels or other obstacles that cause a restriction to the traffic flow. It allows the movement planners to find a route along the network where the restriction does not apply.
  
  **Note:** Mainly applied to the MOTs of Road, Rail and IWW the expression of Cargohight refers to equipment itself and when loaded to each other then the overall height is used.

- **Max. Cargowidth (CM):** This option is used mainly when there are tunnels or other obstacles that cause a restriction to the traffic flow. It allows the movement planners to find a route along the network where the restriction does not apply.
  
  **Note:** Mainly applied to the MOTs of Road, Rail and IWW the expression Cargowidth refers to equipment itself and when loaded to each other then the overall width is used.

- **Max. Cargolength (CM):** This option is used mainly when there are bends or other obstacles that cause a restriction to the traffic flow. It allows the movement planners to find a route along the network where the restriction does not apply.
  
  **Note:** Mainly applied to the MOT of Road the expression Cargolength refers to equipment itself and when loaded to each other then the overall length is used.

- **Max. Cargoweight (Tons):** This option is used mainly when there are bridges or other obstacles, such as weak road surfaces, that cause a restriction to the traffic flow. It allows the movement planners to find a route along the network where the restriction does not apply.
  
  **Note:** Mainly applied to the MOTs of Road and Rail the expression Cargoweight refers to equipment itself and when loaded to each other then the overall weight is used.

- **Max. Vehicles Speed (Km per hour):** This option allows the movements planner to impose a speed limit to the edge and this will be applied to movement components (overriding the parameters) or to assets (overriding the asset speed) if it is less than the normal speed setting.
  
  **Note:** If the speed setting of the component or asset is less than the Max. Vehicles speed then the lower setting will be applied.

- **Est. Traveltime (hours):** This option allows the movements planner to set an estimated amount of time to travel the distance represented by the Edge and this will be applied to movement components (overriding the speed shown in the parameters) or to assets (overriding the asset speed) if it is less than what could be achieved.
  
  **Note:** If the speed setting of the component or asset means that the time taken will be more than the Est. Traveltime then the worst case timing will be applied.

- **Restrictions option:** This option allows the user to insert any other restriction that may apply. These are for information only and are not enforced by the programs.
- **Number of Lanes/Tracks option**: This option allows the user to show the number of lanes for road movement and tracks for rail movement to assist with traffic flow calculations. This option is mainly used by CORSOM.

- **Max. Grade (percentage)**: This option is mainly used by CORSOM to impose additional (and normally temporary) restrictions against the normal conditions and is applied to the Max. Cargohight, Max. Cargowidth, Max. Cargolength and Max. Cargoweight restrictions. This means that the baseline setting do not have to be adjusted.

- **Traffic Throughput (percentage)**: This option is mainly used by CORSOM to impose additional (and normally temporary) restrictions against the normal conditions and is applied to the Regular Throughput and Maximum Throughput restrictions. This means that the baseline setting do not have to be adjusted.

These setting can be applied and they can be different for each direction. However, if they are equal in both directions they can be applied easily by clicking on the *Click to copy to other direction* button.

For the next section **SELECT** the Map named SOUTH ATLANTIS.bmp.

### Show Connected Edges

As you have seen creating networks is easy regardless if this is done using map data or manually. But it is possible that you could create a number of edges that look right but there is a disconnection between them.

Then as you plan using the Network, if there is a disconnection it will cause delays and affect the timings between locations. Remember that these disconnections may not be visible on the displayed map in the Map Display View.

Using the Show Connected Edges functionality allows you to check the Networks by showing all the connected edges of a Network and this will save you time and effort.

To check the connections within a network it must be visible in the Map Display View; you need to activate the Network you want to check by using the Map Objects panel and activating the Network required.

For the Tutorial **ACCESS** the Map Objects panel and **SELECT** the Network named TUT_Test (Road). With the network selected **RIGHT CLICK** and from the sub menu dialog **SELECT** the Show Connected Edges option as shown in Figure 2.132.

![Figure 2.132](image)

The Network will now be displayed in the Map Display View. You can see that each part of the disconnected network are displayed in different colours as shown in Figure 2.133.
The disconnection may be for any number of reasons, the main ones are that there was no single Network available, that your network was a combining of other work, or an edge was not created during the building of the Network.

In the network shown for this part of the Tutorial, naturally the islands are disconnected, because there are no bridges.

**Connecting Networks**

If a connecting edge is missing, you can draw in the missing edge and save it to the Network. We will do it for the Tutorial.

**ZOOM IN** to the affected area of the network as indicated in Figure 2.134. Remember that the colours for the network parts could be different on your screen.

To connect a Network an edge needs to be drawn between the two points that are causing the disconnection.

**Note:** With the Network active and displayed in the Map Display View it is recommended that you use the Zoom In function so that the disconnection can be clearly seen.
CLICK on the Draw or Repair Network icon, as before the cursor will now change to a crosshair. Move it on to the Node that you want to use as the starting point to repair the network. This will normally be the nearest one to the disconnection between the networks.

Now CLICK on it and then you can CLICK along the route you want to use to create the required edges until the networks are connected. As the new edges are created a red line will appear, as shown in Figure 2.135.

![Figure 2.135](image)

When you have the required edges displayed in the Map Display View, RIGHT CLICK and in the sub-menu dialog that opens SELECT the Save Drawn Object option. For the Tutorial SELECT the Add As Edges option. The network should now be connected; to prove that, SELECT the Show Connected Edges option again and the network should appear in a single colour as at Figure 2.136.

![Figure 2.136](image)

If the line that has been drawn is not correct SELECT the Undo option and start the process again.

**Copy/Merge Networks**

The LOGFAS introduces capability of merging networks that are the same MOT. This is useful when you have two or more networks and want to combine them and use the overall network. For example, when you have a DDP that is using different areas, each with separate networks, by combining them the time/distance calculations will use all of the details in the global network.

Remember that our generic scenario is to deploy a force from BROWNLAND to BLUELAND. For the Tutorial we will merge the two networks, these are named TUT_Road in BlueLand and TUT_Test in BrownLand. All calculations in the DDP, whether in ADAMS, EVE or CORSOM will be done using the merged network.

If we did not merge the networks and because in the modules you can only have one activated network for each MOT we would have wrong results for time/distance calculations. Part or the calculations would be achieved using the distances and restrictions with the selected network and the other part will be done using the arc distance where there is no network.
CLICK on the Tools menu and SELECT the Networks and Copy/Merge options as shown at Figure 2.137.

![Figure 2.137](image)

This will open the Merge or Copy Dialog as shown at Figure 2.138.

![Figure 2.138](image)

For the Tutorial we will merge TUT_ROAD into TUT_Test network.

CLICK on the OK button and the Select Network dialog will open. This shown at Figure 2.139.

![Figure 2.139](image)

Now we can select the first Network, SELECT the Network named TUT_ROAD in the list and then CLICK on the OK button. This will open the Merge or Copy Dialog as shown at Figure 2.140.

![Figure 2.140](image)

CLICK on the OK button and the Select Network window will reopen; now SELECT the Network named TUT_Test. The program will confirm the selections in the Network Merge dialog as shown at Figure 2.141.
CLICK on the OK button and the program will complete the merge of data. When the process is completed the Network Merge dialog as shown at Figure 2.142 will open to confirm that the work is completed.

CLICK on the OK button to close the dialog. To show the result of merge, in the Map Display View, DISPLAY the Map named GENERAL ATLANTIS and then LOAD the Network named TUT_ROAD and as shown in Figure 2.143, both networks will be displayed.

Delet ing Networks
To Delete a Network from the database, CLICK the Tools main menu, SELECT the Networks option and from the sub menu SELECT the Delete option as shown in Figure 2.144.
This will open the Select Network to Delete window. For the Tutorial SELECT the Mode of Transport as Road and then SELECT the Network named TUT_Test as shown in Figure 2.145.

Note: You will receive no warnings asking you if you are sure you want to delete this network. Once you have clicked OK it will be deleted and removed from the database.

For the Tutorial CLICK on the OK button and the selected network will be deleted from the database.

Another way to delete the Network is by using the Map Objects panel. CLICK on the Map Objects panel and then SELECT the Network you want to delete. With the Network set as Active RIGHT CLICK and from the sub menu and SELECT the Delete option.