# Quadstone Paramics V4.2
# Processor User Manual

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# 1   Introduction

Paramics Processor is a simulation configuration and batch execution tool. It allows the user to specify the settings for a number of simulation runs and subsequently run the simulations one after the other in a continual and uninterrupted process.

The underlying simulation engine utilised by Processor is identical to that used in Paramics Modeller tool and so the data produced by Processor is identical to that produced by Modeller. In order to produce results as quickly as possible, Processor provides no visualisation of simulation runs.

This guide works through the most important aspects of Processor and contains user exercises designed to familiarise the reader with the Processor package and it's functionality.

This manual does not explain the installation, set-up and basic use of Paramics. These are described in the Paramics Software Installation Guide and the Modeller User Guide. To install Processor, follow the installation instructions, selecting the Processor component in addition to the Modeller component. A valid Processor license is required to execute the application.

This manual assumes that the user is acquainted with the X/Motif windowing system in terms of moving, maximising and minimising windows. Also, it is assumed that the user understands the use of toggle buttons, sliders, text fields and other standard control mechanisms supported by the windowing system.

The Paramics software development is an ongoing process, with additional functionality being created to meet customer needs or to match further developments in ITS or traffic planning processes. If you have any comments on Processor or on the contents of this manual, please access Quadstone's Paramics web site at:

<div align="center">http://www.paramics-online.com</div>

## 2   Before You Begin

This user guide contains two tutorials that are designed to introduce the user to the functions within Paramics Processor. It is assumed that the user has completed the exercises in the *Modeller User Guide* and is therefore familiar with Paramics networks and the *X/Motif* windowing system.

The tutorials are laid out in a similar manner to the *Modeller User Guide* tutorials, containing sections and exercises.

# 3   Getting Started

## 3.1   Processor Start-up

Processor is available for a wide range of systems including Windows NT/95/98/2000/XP/ME, Sun Microsystems/Solaris and Silicon Graphics/IRIX. To install the software, please refer to the instructions given in the *Paramics Software Installation Guide* and ensure the toggle to load Processor is checked. To run Processor, a valid licence file is required.

After installing the software on a PC, a Processor icon will appear on the desktop. To start a Processor session, double click on this icon using the left mouse button. On a Unix workstation simply type:

```
processor &
```

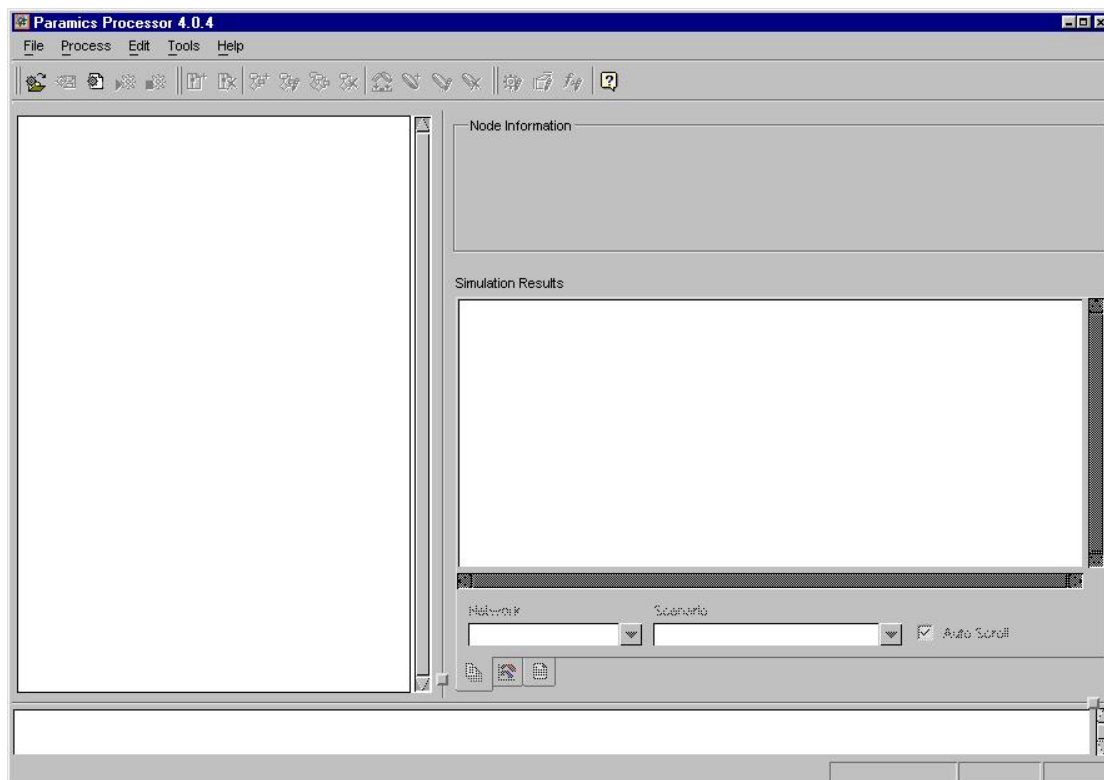followed by return in a Unix shell window. The main window will appear, similar to the one presented below.



Figure 1: The Processor Main Window

## 3.2    Layout of Processor Window

In Processor, the main window is composed of a number of items. The title bar of the main window displays the Processor software version number and the name of the current Processor workspace (if one is loaded). The menu bar is positioned immediately below the title bar and contains the Paramics dropdown menus: File, Process, Edit, Tools and Help. The contents of each menu are described in detail in the *Processor Reference Manual v4.2*. Below the menu bar is the toolbar, which contains buttons for the most commonly used Processor tasks.

The left hand side of the main window contains an area in which the Processor workspace tree is constructed; this tree specifies the simulation runs that are to be executed by Processor.

The right hand side of the main window contains a tabbed panel. This panel allows the user to switch between different views of the simulation performance results as Processor is producing them.
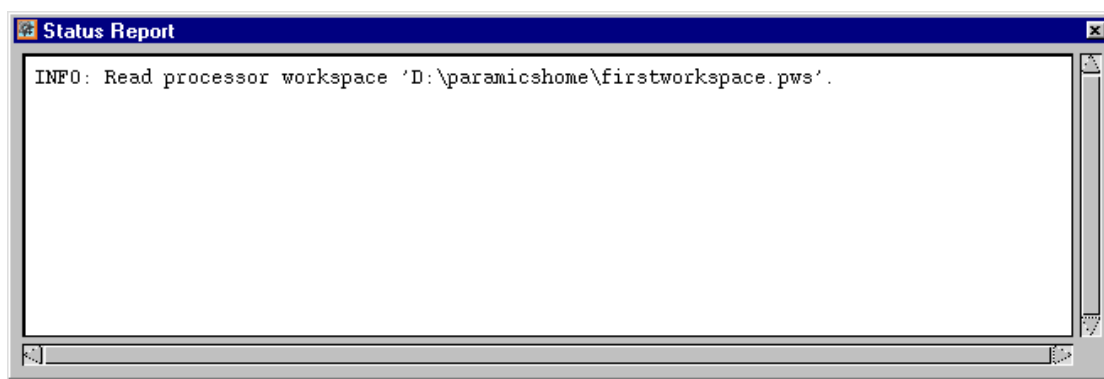


The Reporter window is "docked" below the Processor window, and its size can be controlled using the adjustable pane control. This window displays any information and warning messages generated by Processor. See the *Processor Reference Manual v4.2* for information on how to control this window.


## 3.3    Help facilities

There are three methods of getting help from the Processor application. These are described below.

1. Tooltips. When the mouse pointer is held over a toolbar button, a small window describing the function of the button is displayed.
2. "What's this" help. Pressing the right mouse button when the mouse pointer is over a control e.g. a button, displays a window describing the function of the control.
3. Help buttons. These appear on most windows and launch a browser application displaying on-line help.

# 4   Tutorial 1

This tutorial describes how to manage Processor workspaces, build a workspace tree and examine the output produced by Processor. A Processor workspace tree example is developed over the next few sections using the `demo` network.

Before beginning this tutorial, it is assumed that you have followed the instructions in Section 3.1 and have a newly running Processor application in front of you.

## 4.1   Managing workspaces

Processor workspaces contain all of the simulation configuration information required to execute a series of simulation runs. This section describes how to create, save and open a Processor workspace.

### 4.1.1   Creating a workspace

The first stage of building a Processor workspace tree is to create a Workspace node. This is achieved by selecting **File>>New Workspace**. This creates a Workspace node called `Workspace 1` in the workspace tree window; this node represents one Processor workspace.

### 4.1.2   Saving the workspace

At this stage, the workspace tree created so far can be saved. It is good practice to save the workspace on a regular basis, particularly when building large trees.

To save the workspace, select **File>>Save Workspace**. This will display a file selector window allowing you to name and save the workspace. Navigate to a directory where you want to store your workspaces, type **firstworkspace.pws** into the **File name** field and then press the **Save** button. The workspace will now have been saved to the specified directory.

### 4.1.3   Opening a workspace

To demonstrate opening a workspace, first of all exit from Processor by selecting **File>>Exit**. To run the Processor application, follow the instructions given in Section 3.1.

Now select **File>>Open Workspace...**; the file selector window appears. Navigate to the directory where you saved the `firstworkspace.pws` file, select the file and then press **Open**. The Workspace node created in Section 4.1.1 will appear.

## 4.2   Constructing the tree

This part of the tutorial shows how to add nodes to the workspace tree. These nodes specify both the structure and simulation parameters for the simulation batch run.

### 4.2.1   Adding network nodes

To add a Network node, first select the Workspace node if it is not already selected. Now select **Process>>Add Network...**; this displays a file selector allowing you to choose a network. Navigate to the location of the `demo` network

and select it and press the **Open** button. At this stage, the tree should like the one shown in *Figure 2*.



Figure 2: Tree with one network attached

### 4.2.2   Adding Scenario nodes

To add a Scenario node, first select the Scenarios node, which is attached to the Network node. Now select **Process>>Add Scenario**. This adds a Scenario node called `Scenario 1` to the Scenarios node.

Now double click the Scenario node. This will "expand" the Scenario node and will show all of the automatically generated nodes that are attached to the Scenario node.

### Exercise 1

Add another Scenario node to the workspace tree.

Once you have created the Scenario node, double click it to expand it.

### 4.3   Varying the simulation parameters

Having followed the tutorial and exercises so far, the workspace tree should now look like the one shown in *Figure 3*.
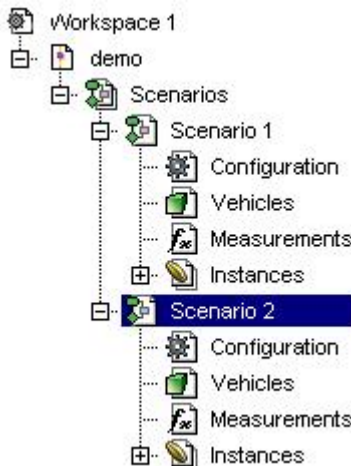


Figure 3: Tree with two scenarios attached

The two scenarios defined in the workspace tree each contain a set of nodes, each of which represents the contents of particular network files contained within the `demo` network directory. To see this, select the Configuration node in

Scenario 1 and select **Edit>>Edit Configuration**. This will display the **Configuration Manager** familiar to Modeller users. This window contains all of the fields and values of the demo network configuration file. Press the **Cancel** button to close this window. *Figure 4* shows the mapping between Paramics network files and the nodes contained within a scenario.
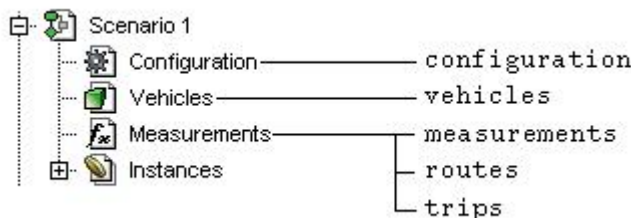


Figure 4: Mapping between nodes and Paramics network files

**Exercise 2**

Look at the data associated with the Vehicles node and the Measurements node. This can be achieved in a similar way to viewing the data associated with the Configuration node.

**Exercise 3**

A quick way of looking at the data associated with the Configuration, Vehicles or Measurements nodes is to double click the nodes. Try this these nodes.

The data associated with the nodes contained within a scenario defines a set of simulation parameters that is a variant of the parameters contained within particular Paramics network files. Therefore, a scenario specifies precisely *one* simulation run that will be executed as part of the simulation batch run.

**Exercise 4**

Change some of the simulation parameters associated with the Configuration and Measurements nodes to produce a variant of the original network simulation parameters.

### 4.3.1   Adding Instance nodes

The simulation parameters can be varied further by adding Instance nodes to a scenario. Each Instance node has a seed value associated with it that overrides the seed value specified by the Configuration node contained in the scenario.

An instance defines a set of simulation parameters: the simulation parameters defined by the enveloping scenario and the overriding seed value. Therefore, an

instance specifies precisely *one* simulation run that will be executed as part of the simulation batch run.

To add an Instance node, first select the Instances node attached to the Scenario 1 node. Now select **Process>>Add Instance**. This will attach an Instance node to the selected Instances node.
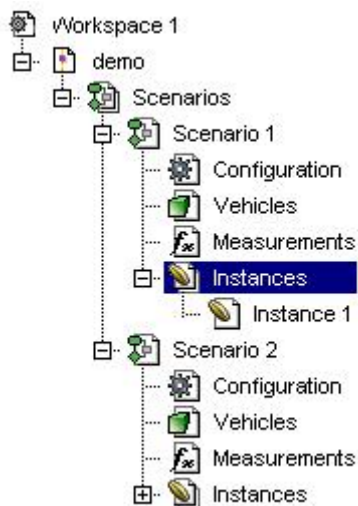


Figure 5: Tree with one instance

**Exercise 5**

> Add another instance to Scenario 1.

### 4.3.2  Altering instance seed values

To change the seed value associated with an Instance node, select the Instance 1 node and then select **Process>>Edit Instance...**. This will display the **Edit Instance** window. Change **Seed Value** to 2 and then press **Ok**.



Figure 6: Edit Instance window

**Exercise 6**

> Change the seed value of the Instance 2 node to 3.

## 4.4    Interpreting the tree

First of all, the meaning of a *process* is defined. A process is another name for a simulation run. In terms of the workspace tree, either a single scenario (with no instances) or an instance contained within a scenario causes one simulation run or process to be executed.

The Processor workspace tree developed so far defines a series of simulation runs all based upon the `demo` network. When the simulations defined by the tree are executed, three sets of simulation results will be produced since the tree contains three processes. The first two processes are defined by the two instances (`Instance 1` and `Instance 2`) contained in `Scenario 1`. `Scenario 2` defines the third process.

## 4.5    Running the simulations

This section describes how to run the simulations defined by the processor workspace tree, constructed in the previous sections.

To run the simulations defined by the workspace tree, select **Process>>Start Simulation Runs**.

## 4.6    Examining the results

To run the simulations defined by the workspace tree, follow the instructions given at the start of this section. As the simulation is running, various forms of output will be produced within the main window; these will be explored in Section 4.7.

As the simulations are running, the results from each one are being written out to a series of automatically created directories. In general, for each process that exists in the tree, the results generated by that process are output to the following directory:

<network>/Log/run-xxx/process-yyy

Here, `<network>` refers to the network directory where the network files are stored. The `xxx` sequence number identifies the complete simulation batch run and the `yyy` number identifies a particular process within the tree.

In the case of the example workspace tree, the results for each of the processes are output to the following directories[1]:

|   | Process |  | Output Directory |
|---|---------|--------------|------------------|
| 1 | Scenario 1 | Instance 1 | <path>/demo/Log/run-001/process-001 |
| 2 | Scenario 1 | Instance 2 | <path>/demo/Log/run-001/process-002 |
| 3 | Scenario 2 |  | <path>/demo/Log/run-001/process-003 |

where `<path>` is the directory containing the `demo` network.

If only one process existed for the `demo` network, the results would be saved to the `/demo/Log/run-001` directory.

---

[1] Note that you may have a different run-xxx number as previous runs may have been executed in this directory, either by using Processor or Analyser.

**Exercise 7**

Verify that you can find the simulation results for the runs just executed.

## 4.7    Examining performance results

As the simulations are running, the number of vehicles and the speedup per simulation minute are being output in both tabular and graphical form. These various forms of output are described in the following sections. It is assumed that the simulation runs have all completed.

### 4.7.1   Performance results

Ensure that the simulation results panel is displayed by pressing the **Simulation Results** tab in the lower right hand side of the main window. This panel contains a window that displays the results, and three controls that determine which particular result is displayed in the window.

When **Auto Scroll** is checked and the simulations are running, the most recent result produced will appear at the bottom of the window. When it is unchecked, either the **Network** or **Process** combo boxes, or the scroll bar can be used to jump to a specific result within the window.
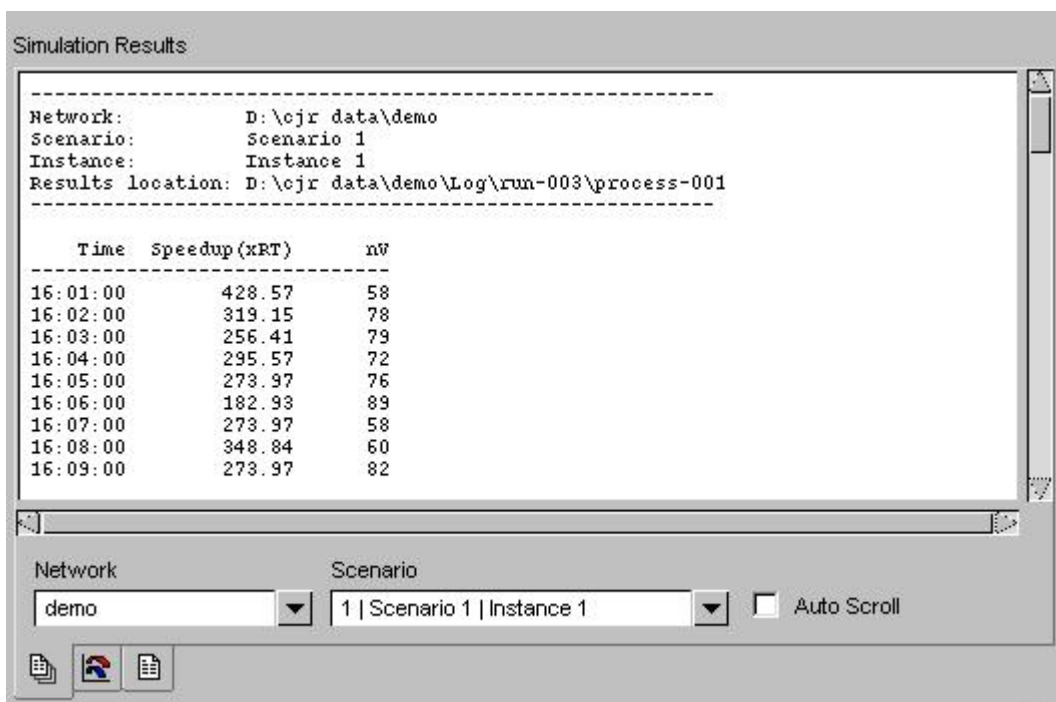


Figure 7: Simulation results window

To jump to the result produced by Scenario 1 and Instance 2, first uncheck **Auto Scroll**. Now select demo from the **Network** combo box; selecting a network jumps to the first result produced by that network. Next select 1 | Scenario 1 | Instance 2 from the **Scenario** combo box. The result for this process will be displayed in the window.

**Exercise 8**

> Jump to the result produced by the `Scenario 2` process.

Preceding each result is a header describing which combination of network, scenario and instance produced the subsequent result. This header also contains the name of the directory where the results from the simulation were written.

The performance results for each process are written to the simulation output directory for that process in a file called `sim-performance.csv`. These files can be opened in another application that can read CSV format files e.g. *Microsoft® Excel*.

**Exercise 9**

> If a spreadsheet application is available on your system, open one of the `sim-performance.csv` files.

### 4.7.2  Results summary

Ensure that the simulation summary results panel is displayed by pressing the **Simulation Summary Results** tab in the lower right hand side of the main window. For each process, this window displays the minimum, maximum and mean for both the number of vehicles and the speedup.

### 4.7.3  Graphs

Ensure that the simulation graph panel is displayed by pressing the **Simulation Graph** tab in the lower right hand side of the main window. This panel contains a window that displays the performance results in graphical form.

The graph can be switched between 2D and 3D views by pressing the **3D** toggle. The appearance of the graph can be altered in many ways by using the controls available from the **Graph Options** and **Graph Data** windows (these can be displayed by pressing the **Options...** and **Data...** buttons, respectively). See the *Processor Reference Manual v4.2* for more information on these controls.

To control which process results are displayed in the graph, press the **Data...** button. This displays the **Graph Data...** window. Ensure that **Show last** is unchecked. Now select `2 | Scenario 1 | Instance 2`. The graph will immediately show the performance results for this process.

**Exercise 10**

> Display the performance results from the first and third process. Use the :
> control key <ctrl> to make multiple selections.

**Exercise 11**

Run the simulation again but ensure that **Show last** is checked. As the simulation is running, this will only show the last *N* processes where *N* is the number displayed in the combo box. This is useful when you want to display the results from the currently running process and a number of its predecessors.
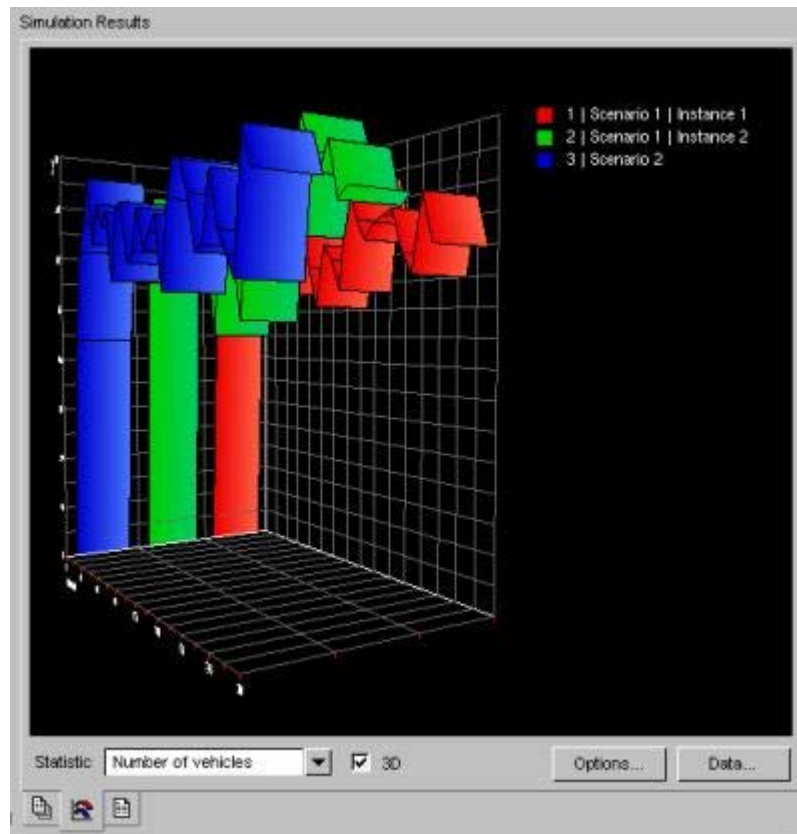


Figure 8: Performance Results graph

# 5   Tutorial 2

This tutorial involves adding the `demo3` network and some scenarios to the workspace tree constructed in Tutorial 1. This time, some quick methods will be introduced so as to reduce the time it takes to construct and execute the workspace tree.

## 5.1   Opening the workspace

A quick way of opening a Processor workspace is to use the recent files functionality, available from the **File** menu. Select the **File** menu and locate the menu button that contains the name of the Processor workspace file that was developed in the Tutorial 1 i.e. `firstworkspace.pws`. Press this button and the workspace will be opened immediately.

## 5.2   Adding nodes

In general, any node (apart from automatically generated ones) can be added to the tree using the dropdown menus, the right click menus or the toolbar. The details concerning the latter two methods can be found in the *Processor Reference Manual v4.2*.

To add another network to the tree using the right click menus, select the Workspace node, press the right mouse button and select **Add Network...** from the menu that appears. This displays a file selector; navigate to the `demo3` network and open it. A Network node will appear in the tree.

To add a scenario to this network using the toolbar, select the Scenarios node attached to the `demo3` Network node. Use the **Add scenario** toolbar button; this will create a new Scenario node named `Scenario 1`.

### Exercise 12

Add another scenario to the `demo3` network using either the right click menu or toolbar method.

### Exercise 13

Add two instances to each of the scenarios attached to the `demo3` network. To do this you will need to expand the Scenario nodes by double clicking them.

### Exercise 14

Modify the scenarios in any way you choose by changing values in the Configuration, Vehicles and/or Measurements nodes.

The tree created so far should look like the one shown in *Figure 9*. Note that the `demo` Network node has been collapsed.
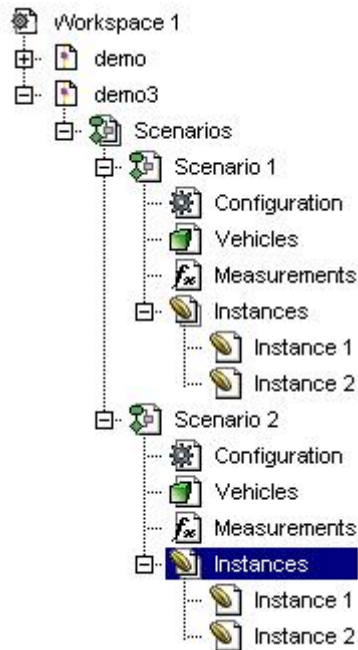
Figure 9: Tree showing two networks

## 5.3   Copying scenarios

Copies of Scenario nodes can be created within the workspace tree. This is useful if two similar scenarios are to be created which only differ by a few parameters.

To copy a Scenario node, select it and then select **Process>>Copy Scenario**. This will add a copy of the Scenario node to the tree. Alternatively, use the right click menu or the toolbar.

**Exercise 15**

> Make a copy of any one of the `demo3` Scenario nodes.

## 5.4   Assigning seeds

Rather than setting seed values for each Instance node by using **Process>>Edit Instance...**, the **Assign Seeds** window can be used. This allows the seed values for each Instance node contained within an Instances node to be set to either the system time (a value of zero) or a unique integer. This method provides a quick way of specifying seed values for a large number of instances.

To assign unique seed values to the Instance nodes attached to `Scenario 1`, select the Instances node and then select **Process>>Assign Seeds...**. This displays the **Assign Seeds** window (see *Figure 10*). Choose the base seed value method from **Assign Using**, set the **Base Seed Value** to `2`, set the **Seed Step Value** to `1` and
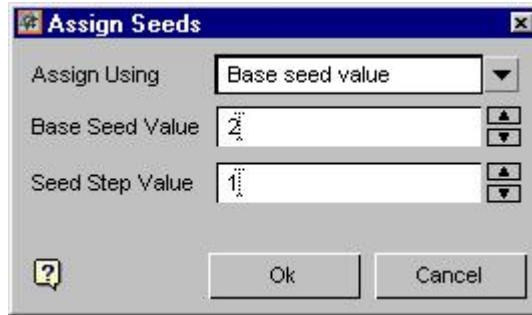
Figure 10: Assign Seeds window

then press **Ok**. In this case, Instance 1 will be assigned a seed value of 2 and Instance 2 will be assigned a seed value of 3.

**Exercise 16**

Verify that the Instance nodes now contain the seed values described above.

**Exercise 17**

Assign seed values to the Instance nodes attached to Scenario 2 using the system time method. Verify that these Instance nodes each contain a value of zero.

## 5.5   Removing nodes

All of the nodes, except the Workspace node and any automatically generated ones can be removed from the workspace tree. To do this, select the node to be removed and then use the appropriate **Process** menu item e.g. **Process>>Remove Instance**.

**Exercise 18**

Remove the demo3 Scenario 1 node from the workspace tree.

## 5.6   Changing node names

More meaningful names can be assigned to the Scenario and Instance nodes. To rename a Scenario node, select it and then select **Process>>Rename Scenario...**. This will display a window allowing the new name to be entered. Instance nodes can be renamed in a similar way but the **Process>>Edit Instance...** menu item is used instead.

## 5.7    Running the simulation

There are two quick methods available that provide shortcuts for running the simulations. Either press the **Start simulation runs** toolbar button or select and right click the Workspace node and select **Start Simulation Runs** from the menu that appears.

**Exercise 19**

Run the simulation using either of the methods presented above.

## 5.8    Aborting the simulation

The running simulations can be aborted at any time by either selecting **Process>>Abort Simulation Runs** or pressing the **Abort simulation runs** toolbar button. This will display a window asking for confirmation; if confirmed, the simulation runs will be aborted once the current simulation completes.

**Exercise 20**

Start the simulation runs and then abort them using either of the methods described above.

# 6  Paramics Support

For more detailed information and online support access Quadstone's Paramics web site at:

<div align="center">

http://www.paramics-online.com

</div>

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