

## Chapter 12      *The Traffic Manager*

### 1. Behavior

The Traffic Manager (TM) is responsible for generating ambient traffic around the simulator driver. In this context, ambient traffic consists of one or more ADOs that are created and deleted by the TM at runtime to ensure that a pre-specified amount of traffic is surrounding the simulator driver at all times. The composition of traffic, the traffic density and other parameters are grouped into Traffic Manager Input Sets (TMIS). To provide maximum flexibility, multiple TMIS can be specified and the active one can be dynamically selected at runtime through triggers. This allows having different ambient traffic properties at different places or times during the simulation.

The operation of the TM is rather simple. At runtime, the TM counts the number of vehicles around the driver and computes the traffic density. If the density is lower than specified, the TM creates a few ADOs to increase the density. If the density is higher than specified, the TM deletes a few ADOs to lower the density. If the density is roughly equal to the value specified, no action is performed. This evaluation and adjustment takes place continuously.

#### 2. (not really necessary to understand what it does...) Measuring Traffic Density

The TM measures traffic density by looking at road segments near the driver in order to count both the total length of the road segments and the number of vehicles in these road segments. All road segments begin at the current location of the driver and terminate at a location whose linear distance is equal to the Creation Distance. Dividing the number of vehicles by the road length provides a measure of traffic density in vehicles per mile. Note that this approach of computing traffic density does not take into account the number of lanes. In other words, 4 vehicles on a one-way single lane road provide the same density as 4 vehicles on a 5 lane interstate segment. Also, all ADOs on the road network are counted for purpose of determining traffic density, even if they were created by some method other than the TM. This ensures that the actual traffic density will be what was specified independent of how many additional ADOs are created at runtime.

To minimize oscillatory creations and deletions when the actual density is within a single count of the desired density, the actual desired density is specified using a lower and an upper limit.

### 3. Authoring Traffic Manager Input Sets

To specify the parameters of the TLM, pick the menu option "Insert->Global Scenario Elements->Coordinators->Traffic Manager", or click the  button in the appropriate toolbar. The dialog box illustrated in Figure 7.3.f appears.

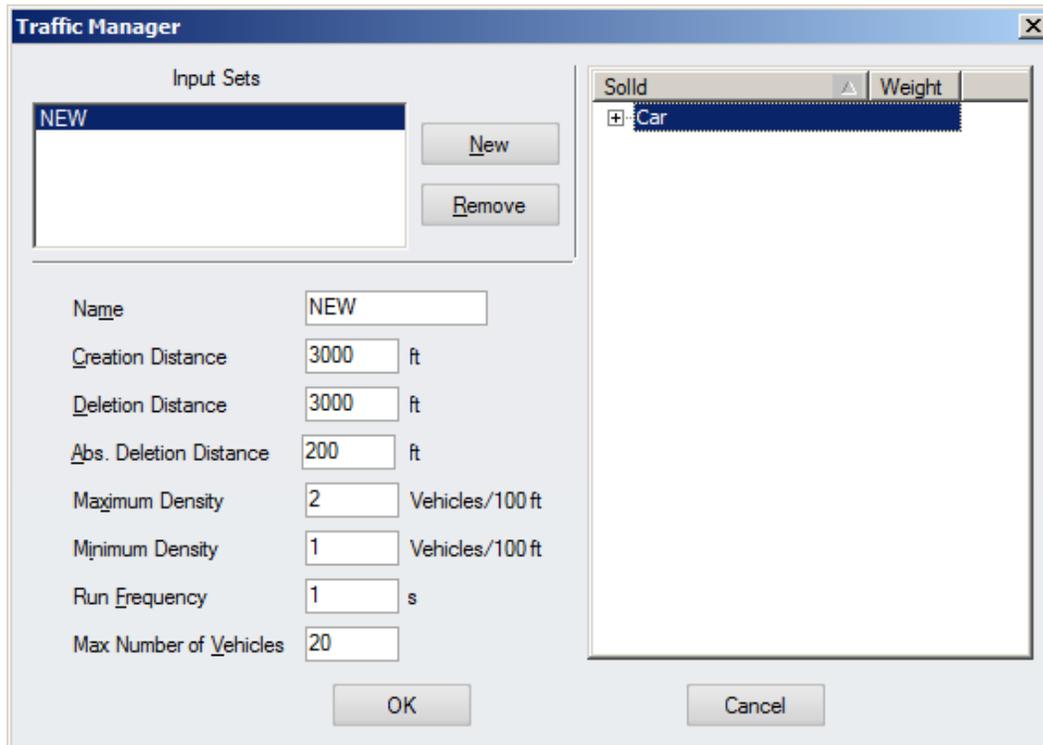


Figure 7.3.f – Traffic Manager Definition Dialog.

The list box titled Input Sets contains the existing TMISs. To create a new TMIS press the New button. By default, the name of each new TMIS is "NEW". Select the name of the TMIS within the list box to show the associated parameters. While a TMIS is selected, press the Remove Button to eliminate the specified TMIS. To change the default name of a TMIS, simply edit the name in the text field titled Name. Name changes are instantaneously propagated to the list box. By default, the values for the first TMIS are used when more than one TMIS is defined, unless an alternative TMIS is selected at runtime though use of triggers. See chapter 10 for more information on how triggers can select a TMIS.

The remainder of the dialog box allows specification of the various input parameters whose meaning has been provided in an earlier section. The selection list on the bottom of the dialog box allows the specification of the weights that define the probability of creation of the various ADO types. There are two columns shown; the column on the left shows the applicable SOL categories and the column on the right shows the weights associated with each element. To show individual elements within each SOL category, click on the + sign to the left of the category name. To modify the weight, double-click on the weight column and type in the new weight. Figure 7.3.g illustrates the look of this list box with some of the SOL categories expanded.

Sold	Weight
Car	
Audi	11
ChevyBlazer	11
BMW_StationWagon	0
CementTruck	0
Deville	22
DodgeNeon	0
DumpTruck	0
Escape	15
FordTaurus	0
GarbageTruck	27
MailTruck	0
PhoneTruck	11
Towncar	0
Windstar	0
WindstarTarget	0
TestCar	0
AudiTest	0
Truckcrann DAF	0

Figure 7.3.g – Expanded SOL Categories.

Use the scrollbar on the right hand side of the selection list to view the weights of all expanded entries. Press the title of the column to sort the list according to the entries in that column. Note that when clicking on the weight column, the list is sorted according to the weights but for each category separately. Editing the weight associated with the category (i.e., Vehicle) as opposed to individual entries in the category, has the effect of setting the weight for all entries in the category.

## 4. Use of The Traffic Manager Building Scenario Events

The TM provides a very convenient way to populate the virtual environment with a known quantity of traffic. Without the TM, producing a dense traffic would require the use of numerous ADOs with an activation radius combined with the use of various triggers and other coordinators. For scenarios during which the simulator driver covers a long distance, the number of hand authored elements required to produce dense traffic can be daunting. As a result, it is expected that the TM would be part of most scenarios developed by users. There are, however, a few issues that require attention when using the TM as part of a scenario. These are listed below.

By far the aspect requiring the most attention is tuning the Creation and Deletion distance to ensure that the simulator driver cannot observe new ADOs popping up or disappearing during the simulation. In general, using a large Creation Distance minimizes the visual impact but increases the area that is populated by traffic which in turns increases the number of ADOs necessary to meet the desired density. If the total number of vehicles exceeds the computational capacity of the scenario control computer, the overall system will jitter, something that is rather undesirable. Setting the Maximum Number of Vehicles can safeguard against that, however, using a low number of Maximum Number of Vehicles but with a large Creation Distance is likely to either cause deletions near the driver or produce density that is far lower than the desired. Optimally, the density should be set to a value such that the number of vehicles required to achieve that density within Creation Distance of the driver is less than or equal to Maximum Number of Vehicles.

That way, no deletions will be forced because of too many vehicles, and the vehicles that wonder beyond the Deletion Distance will be deleted and replaced by new vehicles created at Creation Distance. One can see that the best value for the various parameters can vary depending on the nature of the road network. Dense road networks, as found in city or rural areas require a lot of vehicles but provide more opportunities for using short distances, since curved roads and buildings hide large part of the road network. Highways and interstates, especially long straight ones, present a problem since visibility can be very long which makes it hard to hide creations and deletions. Using multiple TMISs can help fine tune the parameters of the TM for various parts of a scenario.

In addition to parameter tuning, when using the TM one must pay attention to the potential interaction between the TM generated ADOs and other vehicles that are part of a scenario events (actors). There are two approaches to developing scenario events that require interaction between actors and TM-generated vehicles. The actors can be explicitly specified in the scenario file or actors can be selected among the ADOs produced by the traffic manager. In the first case, there is little to do other than be aware of the possibility of having TM produced ADOs interfere with the scenario. Usually, triggers can be used to eliminate the possibility. Picking actors among TM-generated traffic is an advanced technique and is not recommended until a lot of experience has been gained in using the NADS SDC software.

Finally, do not forget that the TM will only operate when a simulator driver is part of the scenario. To allow testing while in rehearsal mode on the ISAT, one can define an "Own Vehicle" and provide a path for that vehicle. During rehearsal mode, the "Own Vehicle" will utilize an ADO behavior to simulate the simulator's human driver, which in turn allows testing of the TM parameters.