

VISSIM-MOVES Integration

This guide covers the basic steps to integrate output from VISSIM and MOVES.

1.0 Contents

1.0	Contents.....	1
2.0	Configuration of VISSIM (or Translation of Microsimulation Output).....	2
2.1.	Expected Microsimulation Output File	2
2.2.	Enable Direct Output	2
2.3.	Configure the Time Step	4
2.4.	Configure the Attributes Recorded in the Output	5
3.0	Configuration of the VISSIM-MOVES Integrator	6
3.1.	Load VISSIM files into the integrator	6
3.2.	Configure the “Time Offset”, “CountyID” and “Road Type”	7
3.3.	Configure Clustering Options	7
3.4.	Review the Output from the Integrator.....	8
3.5.	Custom Configurations	9
4.0	Configuration of MOVES	10
4.1.	Select Project as the Scale of Analysis	10
4.2.	Select a One-Hour Time Period for Analysis	10
4.3.	Select the Correct County for Analysis	12
4.4.	Select the Correct Vehicle Types for Analysis	13
4.5.	Select the Correct Road Types for Analysis	14
4.6.	Load the Project Data Manager and use it to Import the Integrator Files	14

2.0 Configuration of VISSIM (or Translation of Microsimulation Output)

2.1. Expected Microsimulation Output File

In order to use the integration program, VISSIM must be configured to give proper output. Any microsimulation platform can be used by the program, but output must be structured in the following manner:

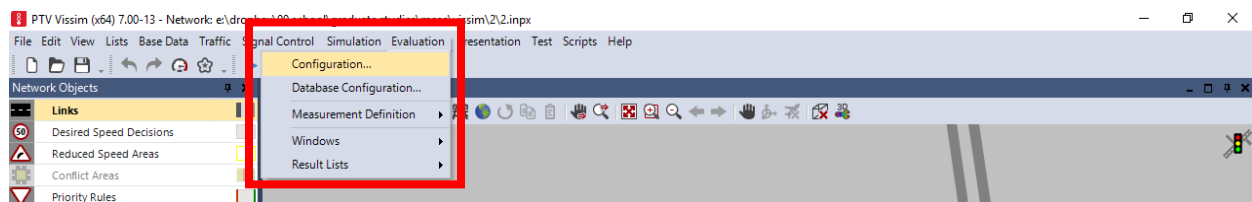
```
* LINES WITH A * Are Ignored, comments.
* This style of file is outputted by VISSIM. The next lines start with a
* header that identifies the columns, and then the values themselves.
* $VEHICLE: marks the file as a vehicle record, and the remaining are labels.
$VEHICLE:SIMSEC;NO;LANE\LINK\NO;LANE\INDEX;ACCELERATION;SPEED;POS;POSLAT;VEHTYPE\CATEGORY
200.20;63;6;1;-0.04;18.88;632.51;0.50;Car
200.20;65;6;1;-0.22;16.63;553.90;0.50;Car
200.20;67;6;1;-0.22;16.83;532.60;0.50;Car
```

Listing 1 – Sample Microsimulation Text Output File (Required Information highlighted in Red)

The program **requires** simulation timestamp (exactly one record per second), vehicle number, lane number, vehicle type, vehicle speed (m/s) and acceleration (m/s²). All data must be semi-colon delimited. These values can come in any order in the file, but must have the following header names: SIMSEC; NO; LANE\LINK\NO; LANE; VEHTYPE\CATEGORY; SPEED; ACCELERATION.

2.2. Enable Direct Output

Output in this format can be configured in VISSIM. To enable this navigate to “Evaluation > Configuration” as shown in the picture below.



Evaluation Configuration [X]

Evaluation output directory: e:\dropbox\00 school\graduate studies\masc\visim\2\output ...

Result Management Result Attribute **Direct Output**

	Write to file	Write database	From time	To time	
Area measurements (raw data)	<input type="checkbox"/>		0	99999	
Convergence	<input type="checkbox"/>				
Data collection (raw data)	<input type="checkbox"/>		0	99999	
Discharge record	<input type="checkbox"/>		0	99999	
Green time distribution	<input type="checkbox"/>		0	99999	
Lane changes	<input type="checkbox"/>		0	99999	More...
Managed lanes	<input type="checkbox"/>				
Nodes (raw data)	<input type="checkbox"/>	<input type="checkbox"/>	0	99999	More...
Pedestrian record	<input type="checkbox"/>	<input type="checkbox"/>	0	99999	More...
Pedestrian travel times (OD data)	<input type="checkbox"/>		0	99999	More...
Pedestrian travel times (raw data)	<input type="checkbox"/>		0	99999	
Public transport waiting times	<input type="checkbox"/>				
Signal changes	<input type="checkbox"/>	<input type="checkbox"/>			
Signal control detector record	<input type="checkbox"/>				
SSAM	<input type="checkbox"/>				
Vehicle input data	<input type="checkbox"/>				
Vehicle record	<input checked="" type="checkbox"/>	<input type="checkbox"/>	200	3800	More...
Vehicle travel times (raw data)	<input type="checkbox"/>	<input type="checkbox"/>	0	99999	

OK Cancel

After selecting configuration, the “Evaluation Configuration” dialog box will appear. Navigate to the “direct output” tab and check the box next “write to file”. The columns “From time” and “To time” control the length of the record file. These should be set to capture a duration of time that spans 1 hour (MOVES can only model 1 hour increments). If you use default simulation options, this will correspond to a “To time” of 3600 and “From time” of 0. Refer to the figure above. Select and take note of the output directory (highlighted with the blue box) as the record file will be saved here. After finishing the previous step, click on the button labelled “More...” to configure additional options.

NOTE: If “From time” is not 0, it will need to be entered into the VISSIM-MOVES integrator (see step 3.2)

2.3. Configure the Time Step

Vehicle record [X]

Resolution Time step(s)

☐ Including parked vehicles

Vehicle filter

☒ All vehicles

☐ Filter by classes

10: Car
20: HGV
30: Bus
40: Tram
50: Pedestrian
60: Bike

☐ Filter by sections

☐ Filter by individual vehicles

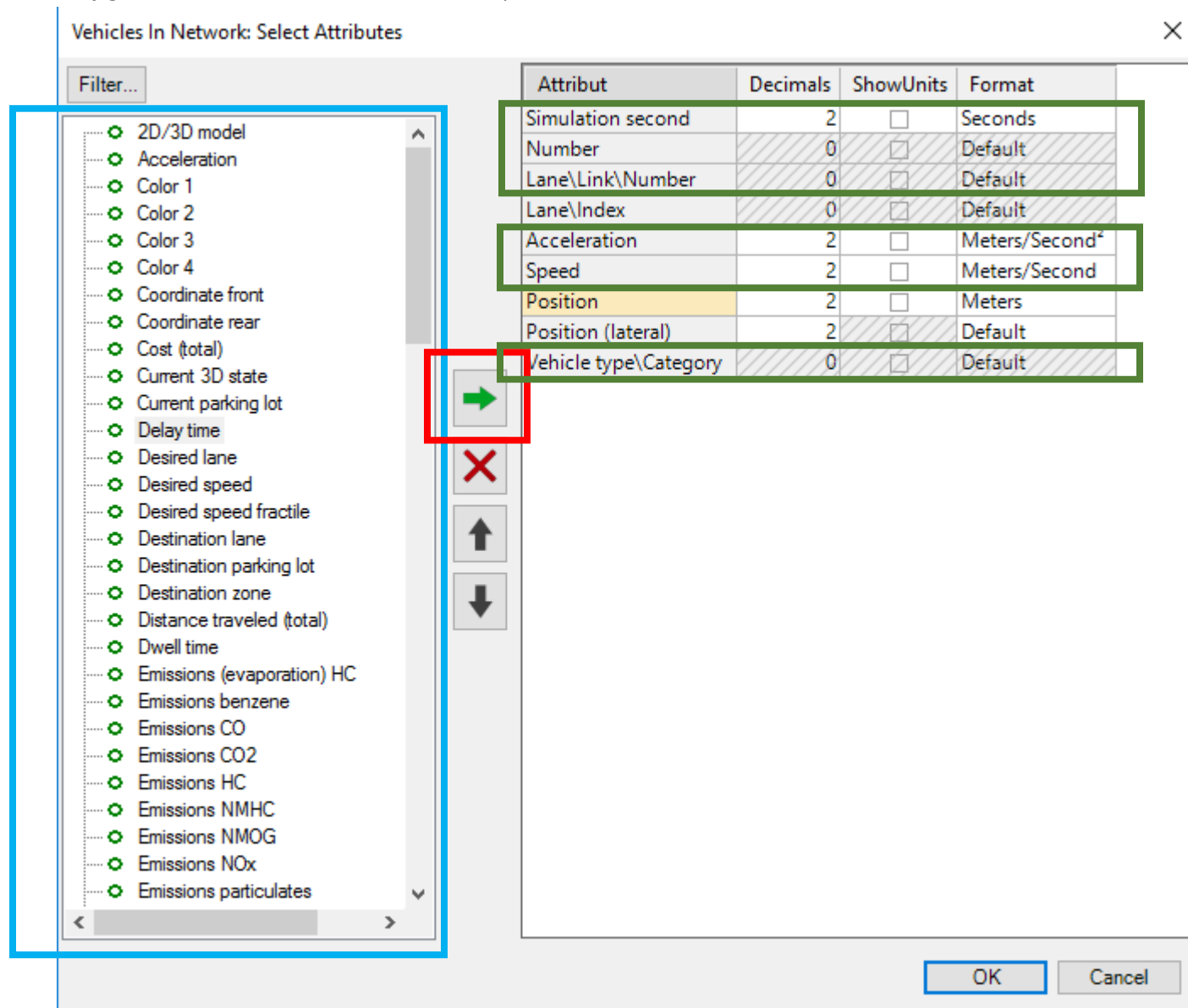
Co No

Attribute selection

The “Vehicle Record” dialog appears, as shown above. The resolution parameter controls the frequency of data collection. MOVES only analyses per-second data. This parameter must be changed based on the simulation resolution employed. By default, each simulation step in VISSIM is 0.2s. To achieve a data resolution of 1s, this value would then be 5. If you have used a different simulation step, this parameter must be changed accordingly.

When you are done, select the “Attributes” button to configure the records that will be included.

2.4. Configure the Attributes Recorded in the Output



The “Select Attributes” dialog should appear (shown above). You must configure the vehicle record to include the attributes discussed in step 2.1 of this document. To add an attribute, find it in the list on the left (blue box in above figure) and press the green arrow button to add it to the panel on the right. The entry text should match what is shown above. The required items are highlighted with a green box in the above figure. Ensure that the format for Simulation second is in seconds, acceleration is in Meters/Second² and speed is in Meters/second. (See section 4.4 for discussion on vehicle types)

When you are done, press okay on every dialog box to close them and return to VISSIM. You may now run the simulation and generate the output.

3.0 Configuration of the VISSIM-MOVES Integrator

Run the VISSIM-MOVES integrator. When it is run, the following dialog appears.

3.1. Load VISSIM files into the integrator

VISSIM MOVES Integrator

Vissim Trajectory: C:\vissim\2_001.fzp

Output Folder: C:\output\integrator

Project Name: test

200 Time Offset (VISSIM time stamp in seconds of the first trajectory element)

36029 MOVES CountyID (Refer to MOVES Manual for a list. Default = Erie County, NY)

5 Road Type. This is not currently analysed from VISSIM. Default is Urban Unrestricted Access.

☒ Enable Clustering for Complex Analyses

Clustering Options

10 Total k-means clusters to generate (over all OD pairs, or maximum for each link)

Subdivide Cluster Count by...

☐ O-D Paths ☒ Links ☐ No Subdivision

Final Empty Cluster Resolution

☒ Remove and Warn ☐ Throw Error

Select a MOVES Trajectory file and an output folder using the buttons provided. Input the time offset and County ID. Three output files are provided for a project level MOVES run. Vehicle Inputs for speed and acceleration must be in m/s and m/s/s respectively. Output to MOVES will be given in mph for speed. !!!IMPORTANT!!! Frequency for Data Input should NOT EXCEED 1 record per second. MOVES only takes per-second data. No check is made to eliminate what will be duplicate data entries per second. MAKE SURE THE RESOLUTION FOR THE DATA COLLECTION IS SET CORRECTLY.

Run Close

The first three text boxes are used to load the VISSIM output file, configure where output from the integrator should be put, and add a name that will be used as a prefix in all output files. To load a VISSIM input file, click the “Vissim Trajectory” button and navigate to the location you configured in VISSIM (see step 2.2). This file should have an extension “.fzp”.

3.2. Configure the “Time Offset”, “CountyID” and “Road Type”

<input type="text" value="200"/>	Time Offset (VISSIM time stamp in seconds of the first trajectory element)
<input type="text" value="36029"/>	MOVES CountyID (Refer to MOVES Manual for a list. Default = Erie County, NY)
<input type="text" value="5"/>	Road Type. This is not currently analysed from VISSIM. Default is Urban Unrestricted Access.

Set the “Time Offset” to the record collection starting time configured in VISSIM (See step 2.2). This value is required as adjustment of the timestamps is necessary for importing into MOVES.

The MOVES CountyID should be set to correspond to the county you choose to model in MOVES (see step 4.3). This is required and MOVES will not import the data if this value is not set to the same county used in MOVES for the analysis.

The Road type is not analyzed from VISSIM. The “Road Type” field allows specification of the number of the type of road to be assigned to every vehicle. The default is 5, which corresponds to an Urban Unrestricted Access road in MOVES.

3.3. Configure Clustering Options

<input checked="" type="checkbox"/> Enable Clustering for Complex Analyses	
Clustering Options	
<input type="text" value="10"/>	Total k-means clusters to generate (over all OD pairs, or maximum for each link)
Subdivide Cluster Count by...	
<input type="radio"/> O-D Paths <input checked="" type="radio"/> Links <input type="radio"/> No Subdivision	
Final Empty Cluster Resolution	
<input checked="" type="radio"/> Remove and Warn <input type="radio"/> Throw Error	

The integrator always provides files to simulate each vehicle individually on in MOVES. The final options can be used to configure an additional clustering analysis that can be used on complex networks. Vehicle trajectories are analyzed on a per-link or per-Origin/Destination (this is controlled by the “Subdivide cluster Count by...” option) and are grouped together based on similarities in their paths. The default is to create 10 path groups for each Link. Optimal selection of k will depend on the network condition and computational power available for analysis. The k-means algorithm allows the possibility of 0 size clusters to be generated. The algorithm employs a number of tactics to avoid this, but cases may arise where it is not possible to divide the volume into the requested number of clusters (e.g. if cluster count is greater than volume). The program can be configured to halt and throw an error (not recommended) or remove the cluster and display a warning to the screen.

3.4. Review the Output from the Integrator

test_clustered_drivesched.csv	8/17/2016 11:46 AM	Microsoft Excel C...	165 KB
test_clustered_linksched.csv	8/17/2016 11:46 AM	Microsoft Excel C...	21 KB
test_clustered_linksources.csv	8/17/2016 11:46 AM	Microsoft Excel C...	9 KB
test_clustered_stats.csv	8/17/2016 11:46 AM	Microsoft Excel C...	1 KB
test_raw_drivesched.csv	8/17/2016 11:46 AM	Microsoft Excel C...	4,761 KB
test_raw_linksched.csv	8/17/2016 11:46 AM	Microsoft Excel C...	194 KB
test_raw_linksources.csv	8/17/2016 11:46 AM	Microsoft Excel C...	29 KB

Final Output from the integrator comes in the form of 7 files. If the clustered analysis is not performed, the *_clustered_* files will have size 0, but will still be present. Three files for use in the subsequent MOVES analysis are generated. They are shown below.

	A	B	C	D
1	linkID	secondID	speed	grade
2	182	0	30.51186	0
3	182	1	33.86727	0
4	182	2	35.09759	0
5	182	3	35.61208	0

test_raw_drivesched

	A	B	C	D	E	F	G	H	I
1	linkID	countyID	zoneID	roadType	linkLength	linkVolum	linkAvgSp	linkDescri	linkAvgGrade
2	182	36029	360290	5	0.605973	1	23.4279	vehicle_g	0
3	183	36029	360290	5	0.605921	1	23.43528	vehicle_g	0
4	188	36029	360290	5	0.603693	1	24.16682	vehicle_g	0
5	189	36029	360290	5	0.606101	1	24.26736	vehicle_g	0

test_raw_linksched

	A	B	C	D
1	linkID	sourceType	sourceTypeHourFraction	
2	182	21	1	
3	183	21	1	
4	188	21	1	
5	189	21	1	

test_raw_linksources

The drivesched (drive schedule) file provides a second-by-second trace of the vehicles in a format that can be understood by MOVES. Grade is included by not analyzed from VISSIM. Speed here is in mph.

The linksched (table of links) file summarizes the links that will be analyzed in MOVES. In the _raw_ file these links will all have a volume of 1 (each vehicle is modelled as individually). In the _clustered_ file, these links will have the volume of the cluster that the trajectory represents.

The linksources (table of vehicle types) contains the fraction of vehicle types that will be modelled as determined from the VISSIM output. At present only gasoline powered trucks and cars are translated from the VISSIM output, additional vehicles can be added. In the `_raw_` file, the “sourceTypehourFraction” value will always be “1” and there will only be a single entry for each linkID. In the `_clustered_` files, the sourceTypeHourFraction will vary from 0 to 1 based on the proportion of each vehicle type, and there will be multiple entries for each.

3.5. Custom Configurations

The integrator supports two configuration files which should be provided in JavaScript Object Notation (JSON). These files are “vehiclemap.json” and “vissim.json” and allow fine-tuning of the behaviour of the integrator. Default values are loaded if these files are not present.

In vissim.json, shown below, you can define which columns in your VISSIM output the program will index. The names of the columns you want to index in the file should match here. If your columns in your VISSIM output have different names than the values below, you can change them. {

```
{
  "SimulationSecond": "SIMSEC",
  "VehicleNumber": "NO",
  "LinkIndex": "LANE\\LINK\\NO",
  "RouteIndex": "ROUTENO",
  "Position": "POS",
  "Speed": "SPEED",
  "Acceleration": "ACCELERATION",
  "VehicleType": "VEHTYPE\\CATEGORY"
}
```

vissim.json – sample file equivalent to defaults

For example, if the vehicle type should be “VEHTYPE” you could change the value listed here from VEHTYPE\\CATEGORY to VEHTYPE. You should not remove rows from this file, as the program needs all of these items listed here to function. Note, however, that the program only requires SimulationSecond, VehicleNumber, Speed, LinkIndex, Acceleration, VehicleType to correctly match to columns in VISSIM (routeindex does not need to match to a valid column in your VISSIM input).

If you define any values you must follow JSON conventions for strings. This means that quotations and backslashes must be escaped. For example, if the category name is “VEHTYPE\\CATEGORY” in your file, you must type “VEHTYPE\\CATEGORY” in the JSON file (to escape the backslash).

In addition to customising the categories, you can redefine which vehicles are equivalent in VISSIM and MOVES. This file, vehiclemap.json is loaded and functions as the relationship. The value on the left is the value in VISSIM and the value on the right is what it will be converted to for MOVES, as below.

```
{
  "Car": "21",
  "HGV": "32"
}
```

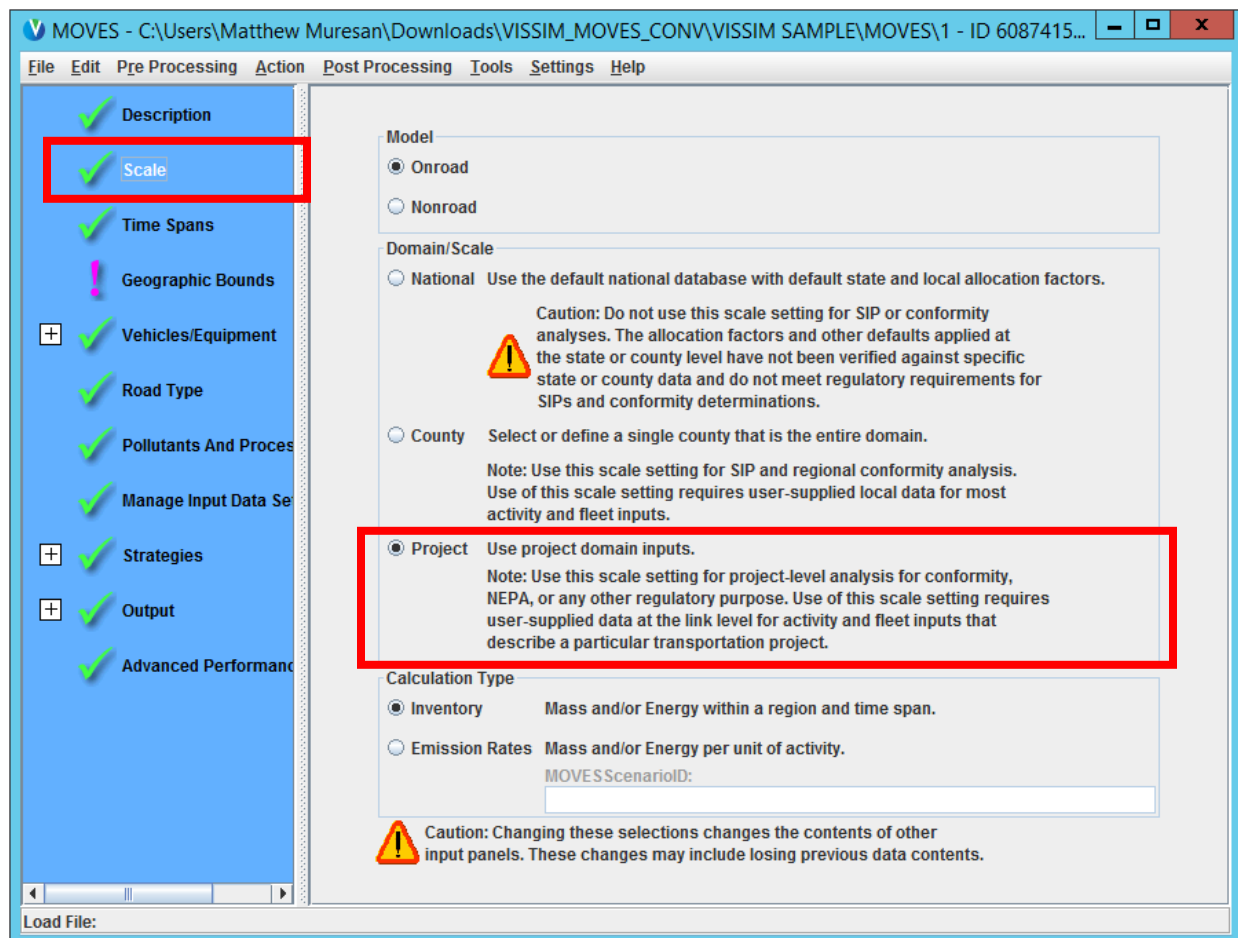
vehiclemap.json – sample file equivalent to defaults

All values defined in this file should be strings (in quotes) and identical to the output you want. You may add as many lines as you want to this file, or remove any lines you do not want; however, you must follow JSON conventions. In particular the last line should not have a comma, but all previous lines should.

4.0 Configuration of MOVES

This section briefly discusses important elements of the MOVES configuration process as they relate to this integration. For more in-depth instructions please refer to the user manual.

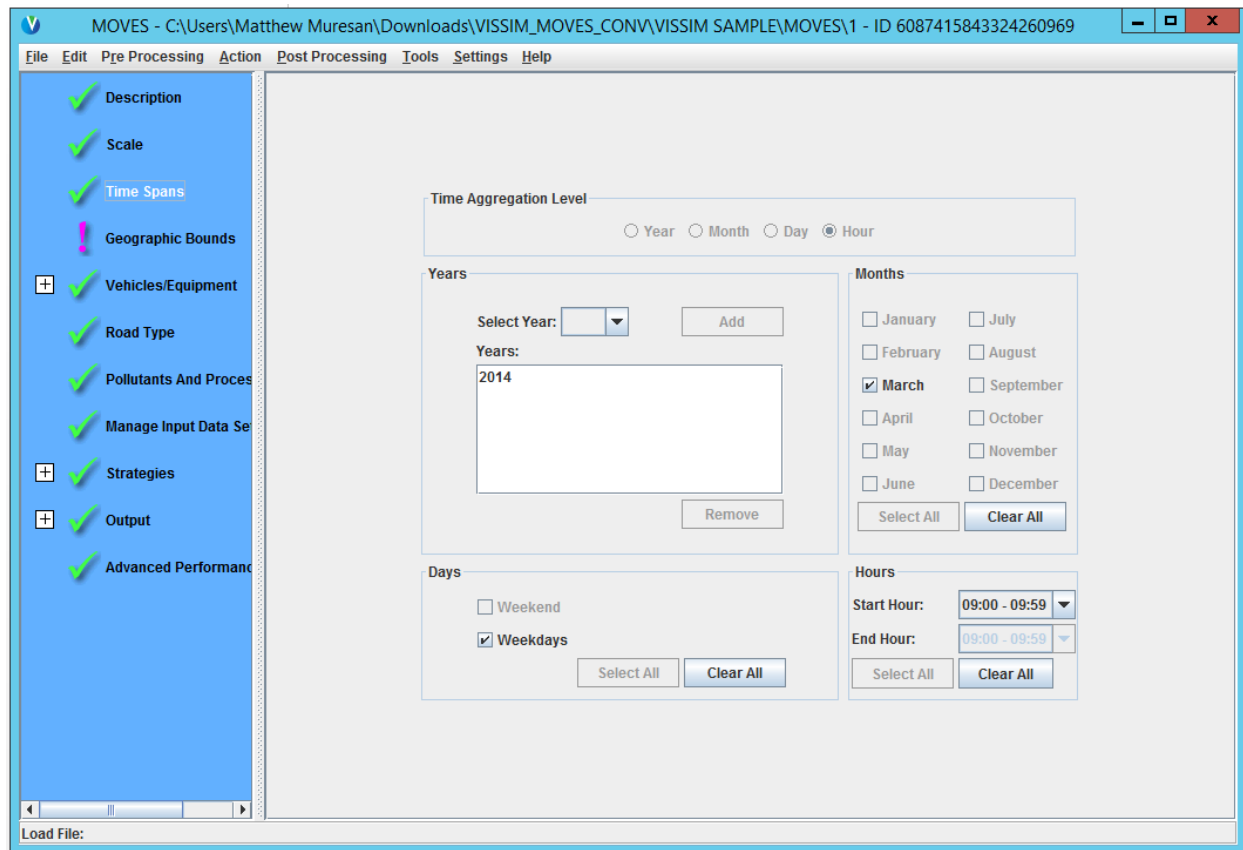
4.1. Select Project as the Scale of Analysis



Configuration of MOVES through the GUI is controlled by configuring each of the options listed on the left panel. These options start out with large X's beside them, and switch to green checkmarks when complete.

The integration framework is based on a project-level analysis, so this option must be selected in MOVES.

4.2. Select a One-Hour Time Period for Analysis

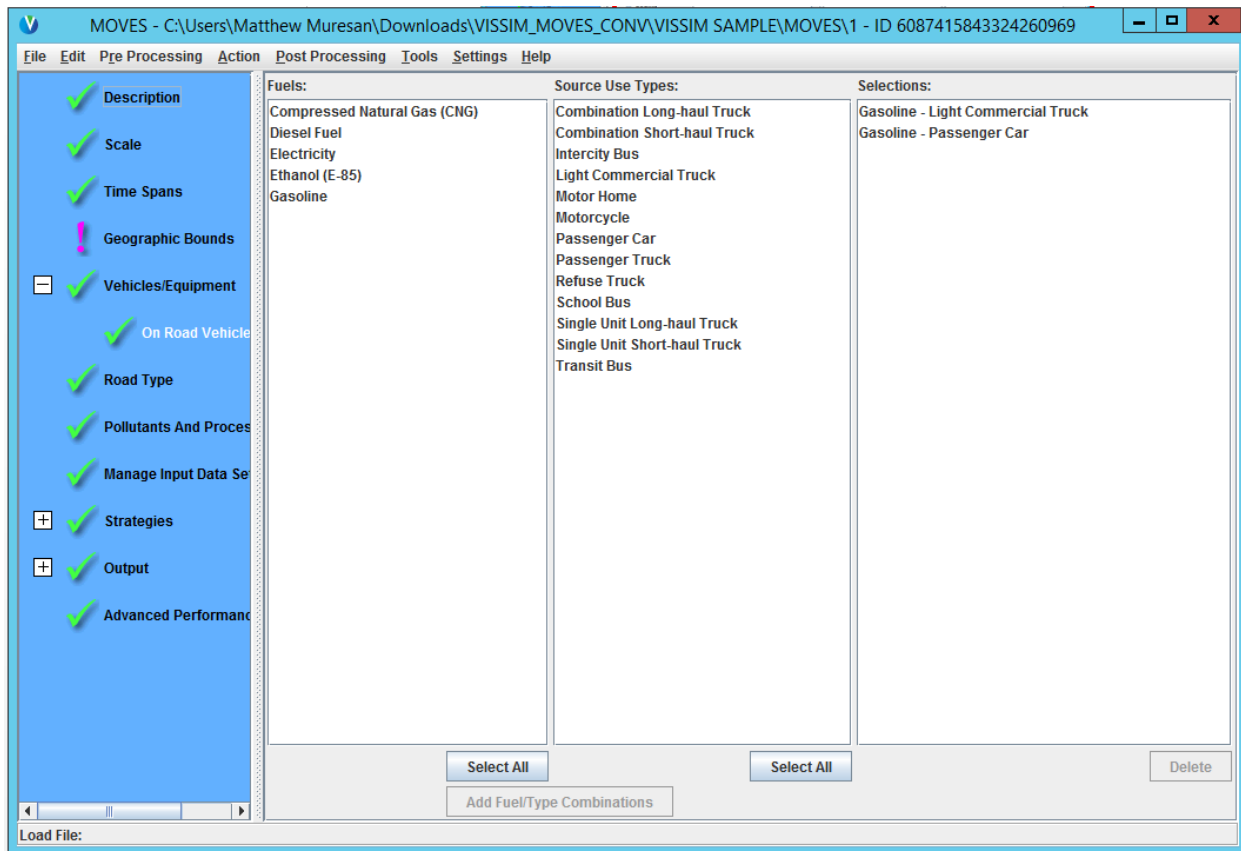


In a project analysis you can only make an analysis for a single hour. To analyze multiple hours, you will need to do multiple analyses. Use this screen to select a time period for a particular year/day/month combination. If you supply custom weather data, this time period must match that data.

4.3. Select the Correct County for Analysis

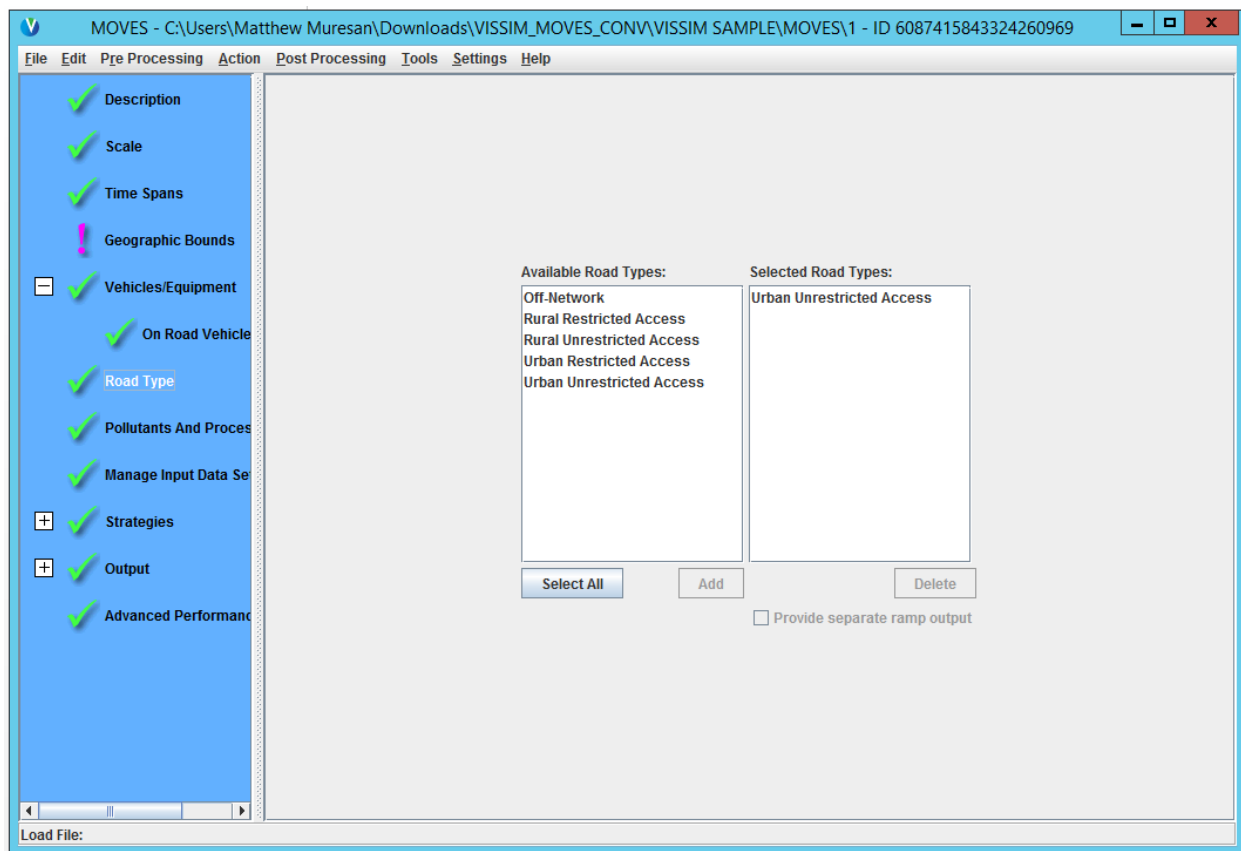
As discussed on step 3.2, in the VISSIM-MOVES integrator a county code was manually entered. If you select an existing county from the MOVES database, you must lookup its corresponding county code and enter it into the integrator. Add that county to the analysis by finding its state and name using the listboxes (highlighted with red boxes in the above figure). If you use a custom county (see blue boxed figure) the county code you enter into the VISSIM-MOVES integrator is 99XXX where XXX corresponds to the county ID you define (e.g. a county ID of 1 would be 99001).

4.4. Select the Correct Vehicle Types for Analysis



At present the integrator only analyzes two types of vehicles from VISSIM. Vehicle types “Car” and “HGV” are mapped to “Gasoline – Passenger Car” and “Gasoline – Light Commercial Truck” by default. Configuration for vehicle types through the GUI is a planned feature of the Integration Application and will be added soon.

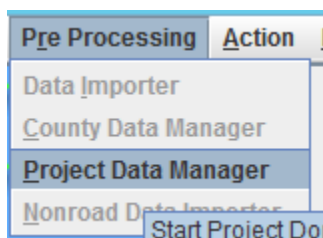
4.5. Select the Correct Road Types for Analysis



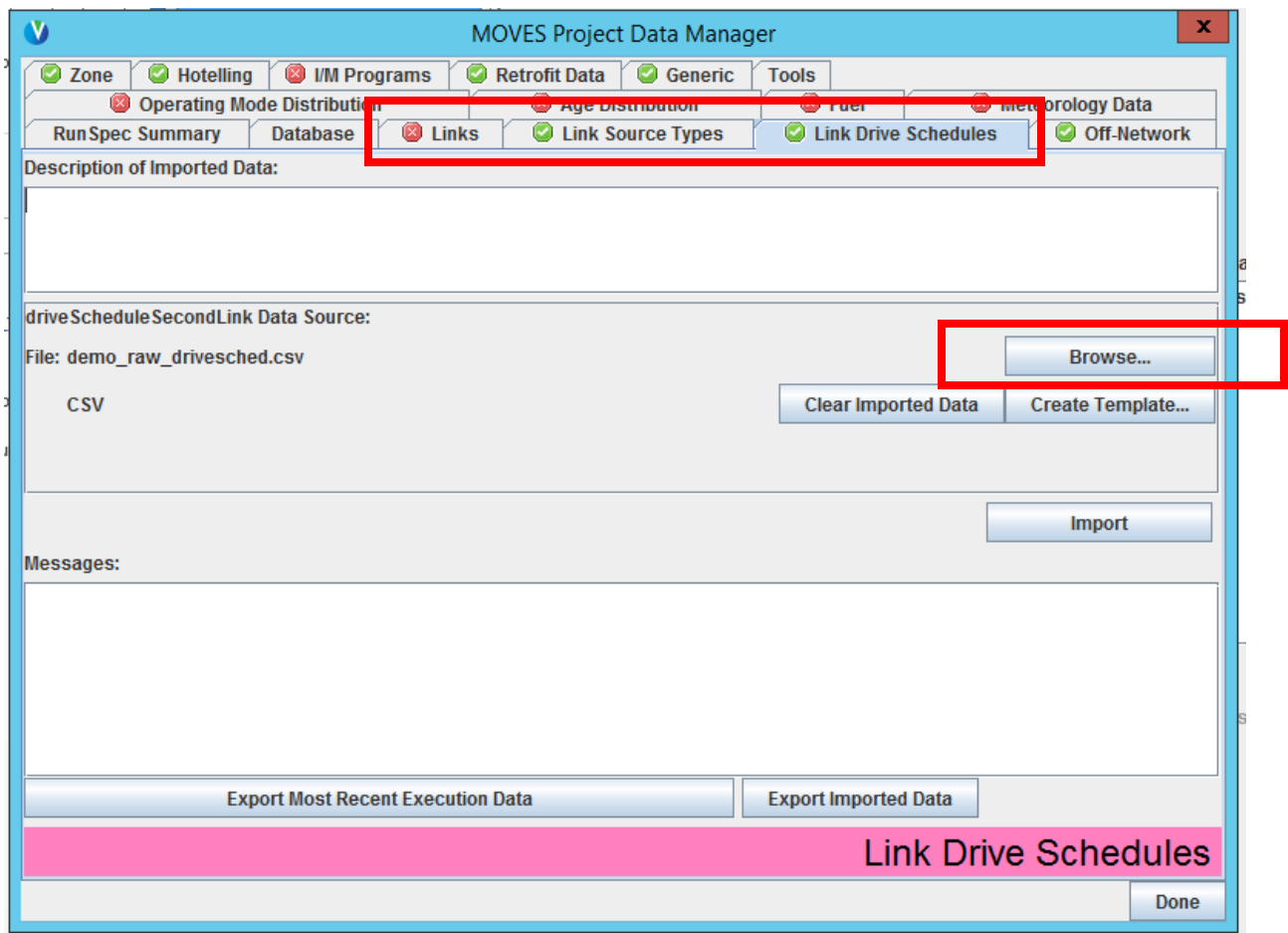
Only one road type should be included in the analysis. This is controlled through an option in the VISSIM-MOVES Integrator, and here you should select the corresponding road type and add it. The default option is “Urban Unrestricted Access”, which are Urban Roads that do not use interchanges to limit vehicles from entering.

4.6. Load the Project Data Manager and use it to Import the Integrator Files

When you have finished adding all other required information, you will be ready to use the “Project Data Manager”. Select it from the “Pre Processing” dropdown menu. This option can only be selected when all other options are configured correctly (check marks beside all MOVES menu options). If it is greyed out, you may have an error in your configuration, or your database may be improperly setup.



When you select this, the Project Data Manager will appear.



The project data manager contains a number of tabs used to import needed data. Data from the integrator should be imported using the “Links” “Link Source Types” and “Link Drive Schedules” tab. Use the brows button to navigate to the correct file and press import on each of these tabs. If successful, the label next to the tab should change from a red x to a green check. If there are errors, they will be displayed in the “Messages” section. The following should also be configured and should not have a red “x” next to them.

- Links, Link Source Types, Link Drive Schedules (using the files from the integrator)
- Meterology Data (weather), Fuel (can be configured to use default data from MOVES if using an existing county by clicking “export default data”)
- Age Distribution (provide a statistical distribution showing how old vehicles are)

All other options can be configured if needed. Do not configure the “Operating Mode Distribution” section.

When you are done, run the file to obtain estimates.