TestNet_4.0.06 How-To

This document provides basic information on preparing and running the TRANSIMS programs using the TestNet_4.0.06 dataset. This dataset includes input data files and control and batch files to demonstrate GIS shapefile conversions, 3D coordinate systems, synthetic data generation for highway and transit networks, trip table conversions, Router-Microsimulator iterations, transit schedule adjustments, and subarea windowing.

Revision History

4/28/2008	Created by AECOM Consult, Inc.
8/19/2008	Updated by AECOM Consult. Inc.
4/26/2010	Edited by RSG, Inc.

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1.0 Assumptions and Prerequisites

This document assumes you have installed TRANSIMS Version 4.0.06 (December 2009) on a Windows or Linux computer system and that you understand the basic procedures and terminology for executing TRANSIMS programs. Files with *.bat extensions are designed to work with Windows operating systems. Files with *.sh extensions are designed to work with most Linux operating systems. The following discussion describes the Windows process. The TestNet_4.0.06 test case data has been packed with the v4.0.06 32-bit Windows compiled executables. 64-bit or Linux compiled executables can be downloaded from the SourceForge site.

Text files are used to store the input and output information. You need to be able to review and edit these files using a standard text editor (e.g., vi, Pico, WordPad) or other software that can manipulate tab-delimited files (e.g., Excel).

The process generated ArcView shapefiles to display information in map format. Familiarity with software that can read and display ArcView shapefiles is desirable, but not necessary. Several *.mxd files for ArcGIS 9.2 are provided to show typical outputs.

1.1 Download Test Data

This How-To document uses information from the TestNet_4.0.06 dataset. To download the TestNet data to your computer or local area network, select http://sourceforge.net/projects/transims/files/ → test data → 4.0.06 Test Cases → TestNet_4.0.06.zip

It assumes access to the TRANSIMS executables from a directory called "bin" at the same level as the TestNet directory. For example, if the TRANSIMS executables are installed in the following location:

c:\TRANSIMS\bin	(Windows)
/home/TRANSIMS/bin	(Linux)

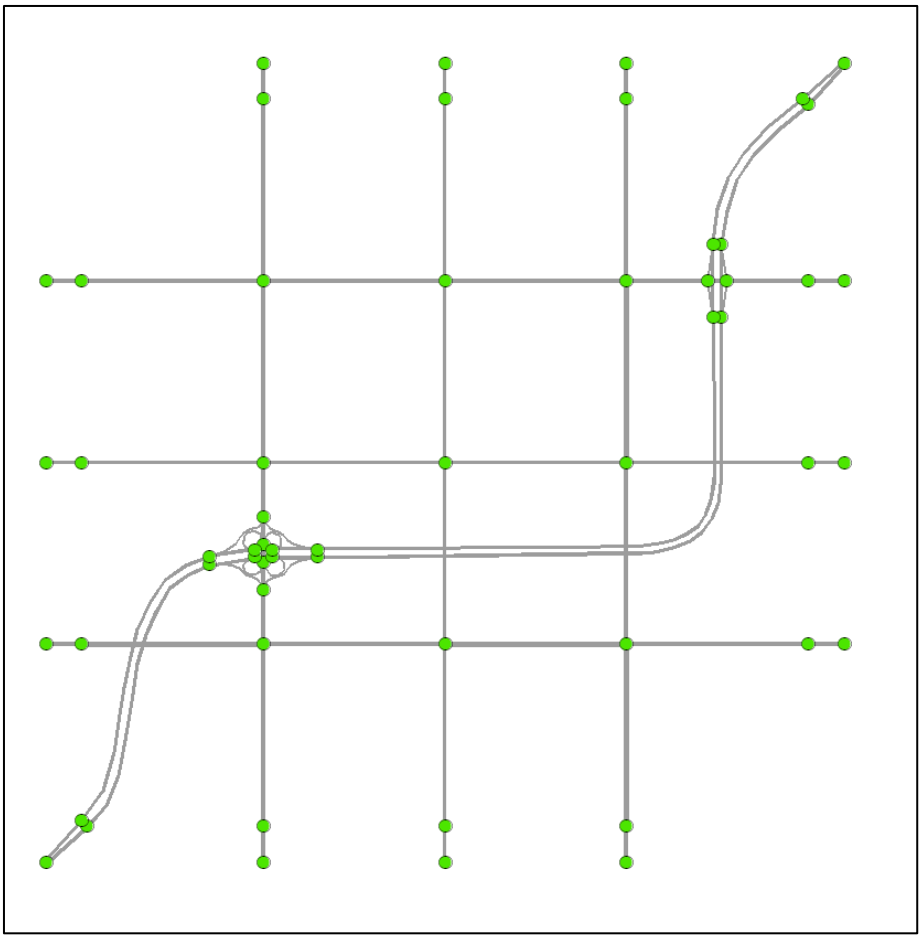
The TestNet data should be copied to:

c:\TRANSIMS\TestNet	(Windows)
/home/TRANSIMS/TestNet	(Linux)

Unzipping the TestNet_4.0.06.zip file will create a TestNet directory with the following subdirectories:

3D		
batch		
control		
demand		
inputs	/arcview	
network	/arcview	
results	/arcview	
setup	/arcview	/master
subnet	/arcview	

The TestNet_4.0.06 test case data uses a small fictional network with only 72 links and roughly 30,000 trips. The intent of the TestNet test case data is to illustrate the use of the various tools and how they are applied in series to develop a complete TRANSIMS model simulation. The full model runs in less than 5 minutes on a typical desktop machine. The TestNet_4.0.06 network (links and nodes) is illustrated below. The Alexandria_4.0.06 test case data applies a similar methodology to the one described in this How-To, but provides a "real-world" application using actual data from the City of Alexandria, Virginia.



2.0 TRANSIMS Overview

TRANSIMS is a console-based suite of programs that run in a command window on either Windows or Linux operating systems. The command syntax is

Program [-flag] [control_file] [partition/parameter]

The control_file is the file name of an ASCII file that contains the control strings expected by the program. If a file name is not provided on the command line, the program will prompt the user to enter the name of the control file. The flag parameters are optional. Any combination of the following flag parameters can be included on the command line:

-Q[uiet] = execute without screen messages
-H[elp] = show program syntax and control keys
-K[eyCheck] = list unrecognized control file keys
-P[ause] = pause before exiting
-N[oPause] = never pause before exiting
-B[atch] = execute in batch processing mode

A number of programs also permit the user to enter a partition number or a parameter string. A partition number is used to run the program for a specific partition when data is distributed in a computer cluster.

A typical TRANSIMS application involves the execution of a number of programs in a sequential or iterative way. Numerous utility programs are also provided to assist with data processing or report and map generation. A TRANSIMS model is defined by the sequence of steps and the parameters used within each step that are calibrated for a given region or application. These steps are typically executed using batch files or scripts to ensure consistency from one run to the next and reduce the dependency on the modeler to start each program one at a time within the model chain.

2.1 RunSetup

RunSetup is a special purpose program included in the TRANSIMS suite to help automate the generation of control files and batch scripts that execute a series of programs. RunSetup accepts a control file like all other TRANSIMS programs. The control file specifies the sequence of programs to be executed in order using a specified batch file. A master control file is read for each program, customized for the given application, and written to the control directory for execution. Special control keys are provided within the RunSetup control file to replace special keywords in the master control file. Special keywords are identified using @ symbols. For example, every place in the master control file where @RUN@ is found, the program will replace the keyword with the text assigned to the RUN_NAME key in the RunSetup control file.

The RunSetup approach enables the modeler to create master control files that define the calibrated parameters and default settings for a given program application. Keywords are then added to the master control file to identify the parameters the user needs to change or set for a particular application. This minimizes the likelihood that global search and replace commands will distort the model run. It also documents the program sequence and helps ensure that the modeler does not forget to execute critical steps in the modeling process.

RunSetup can also execute a sequence of RunSetup control files to create batch files for larger model runs. The SETUP_CONTROL_FILE_# key is used to tell RunSetup to process the referenced file as a RunSetup control file and add the referenced commands to the master batch file for the model.

3.0 Prepare Application Files

The setup directory within the TestNet dataset includes control files and batch files for executing the RunSetup program. Each batch file can be executed one at a time or the RunAll.bat(.sh) file can be executed to generate all of the scripts at one time. The RunAll.bat(.sh) file merges the batch commands into a master batch file called RunAll.bat(.sh). It also copies the ArcGIS 9.2 *.mxd files from the arcview subdirectory to the batch directory. Once the RunAll batch file is executed the user should be able to run the full model and visualize the results from within the batch directory.

3.1 Master Control Files

The master control files for the RunSetup applications are stored in the setup/master directory. This directory includes master control files for 19 different TRANSIMS programs. Note that here are three master control files for ArcNet processing and two master control files for PlanPrep processing. For these programs, it was more convenient to define different master control files than attempt to account for major application differences using RunSetup replacement keys.

The two master control files for PlanPrep are shown below as an example. The first file is called PlanPrep_Sort.ctl which is used to convert a traveler sorted plan file generated by the Router into the time sorted plan file needed by the Microsimulator. The second file is called PlanPrep_Merge.ctl which is used to merge plans from an incremental Router application into the full plan file.

PlanPrep_Sort.ctl

```
TITLE      Sort the Plan Files for Simulation @RUN@.@ALT@ Year @YEAR@
DEFAULT_FILE_FORMAT @FORMAT@
PROJECT_DIRECTORY   @PROJECT@

INPUT_PLAN_FILE     demand/@RUN@.@ALT@.@YEAR@.@MODEL@.TravelPlan.txt
OUTPUT_PLAN_FILE    demand/@RUN@.@ALT@.@YEAR@.@MODEL@.TimePlan.txt
PLAN_SORT_OPTION    TIME
```

PlanPrep_Merge.ctl

```
TITLE      Merge the Re-Routed Plans from @RUN@.@ALT@ Year @YEAR@
DEFAULT_FILE_FORMAT @FORMAT@
PROJECT_DIRECTORY   @PROJECT@

INPUT_PLAN_FILE     demand/@PREVIOUS@.@ALT@.@YEAR@.@MODEL@.TravelPlan.txt
MERGE_PLAN_FILE     demand/@RUN@.@ALT@.@YEAR@.@MODEL@.Plan.txt
OUTPUT_PLAN_FILE    demand/@RUN@.@ALT@.@YEAR@.@MODEL@.TravelPlan.txt
```

The two master control files show how the keywords are used to generate unique filenames for a given run. The filename include the run number, alternative name, analysis year, and model name. The previous run number is used to define the filename from the previous model iterations. Within a given iteration, the sorting step followings the merging step. In this case the output plan file from the merge application becomes the input plan file for the sort application.

3.2 RunSetup Control Files

The RunSetup control file for a Router-Microsimulator iteration called MsimRun.ctl and is listed below.

```
TITLE                       Run Setup Controls
PROJECT_DIRECTORY           ../
PROGRAM_DIRECTORY           ../../bin
NETWORK_DIRECTORY           network
CONTROL_DIRECTORY           control
BATCH_DIRECTORY             batch
```

```
BATCH_NAME                  MsimRuns
ALTERNATIVE_NAME            Test
RUN_NAME                    2
PREVIOUS_RUN_NAME           1
PARAMETER1                  _2  //---- parking/process link number
PARAMETER2                  _3  //---- activity location number ----

MASTER_CONTROL_FILE_1       master/PlanSelect.ctl
DESCRIPTION_1               ---- Feedback Run @RUN@ ----
PROGRAMS_1                  PlanSelect
PARAMETER_1                 1.25  //---- select V/C ratios ----
COMMENT_FLAG_1              YES   //---- NO = select by V/C ratios
PARAMETER2_1                10.0  //---- percent time difference
COMMENT2_FLAG_1             NO    //---- NO = select by time diff

MASTER_CONTROL_FILE_2       master/Router.ctl
PROGRAMS_2                  Router

MASTER_CONTROL_FILE_3       master/PlanPrep_Merge.ctl
PROGRAMS_3                  PlanPrep
CONTROL_NAME_3              PlanMerge

MASTER_CONTROL_FILE_4       master/PlanPrep_Sort.ctl
PROGRAMS_4                  PlanPrep
CONTROL_NAME_4              PlanSort
PARAMETER_4                 Travel

MASTER_CONTROL_FILE_5       master/Microsimulator.ctl
PROGRAMS_5                  Microsimulator
CONTROL_NAME_5              Msim
```

The control file defines a number of global parameters such as the project, program, network, control and batch directories. By default, these directories are all relative to the program directory. If a given key value includes directory symbols (\ or /), the key is interpreted as a full path string and the project directory is not added to the beginning of the key.

The output batch file for this application is a file called MsimRuns.bat(.sh) in the ../batch directory. The first line of the batch file sets the path to the executable programs. For Windows the command is:

```
path=%PATH%;../../bin
```

Other default or global parameters include alternative name, analysis year, run_name, parameter, parameter1 and parameter2. These key values will replace keywords @ALT@, @YEAR@, @RUN@, @PARAM@, @PARAM1@, and @PARAM2@ in each of the master control files.

The MsimRuns batch executes five programs as defined by the five master control file groups. The first file group reads the master control file called PlanSelect.ctl in the setup/master directory. Before the command is added to the batch file, DESCRIPTION_1 is added using the Windows remark command “rem ---- Feedback Run 2 ----“. The PlanSelect executable (as defined by the PROGRAMS_1 key) is then than called with a control file named 2.Test.PlanSelect.ctl stored in the

control directory. This name is constructed using the run number, the alternative name, and the program name.

The second program is the Router using the Router.ctl master control file and outputting the control file 2.Test.Router.ctl in the control directory.

The third program is PlanPrep using the PlanPrep_Merge.ctl shown above. The output control file name will be 2.Test.PlanMerge.ctl as specified by the CONTROL_NAME_3 key. Given the keyword codes shown in the master control file above, the resulting control file will have the following keys.

```
TITLE      Merge the Re-Routed Travel Plans for 2.Test Year
DEFAULT_FILE_FORMAT    TAB_DELIMITED
PROJECT_DIRECTORY      ../

INPUT_PLAN_FILE        demand/1.Test.TravelPlan.txt
MERGE_PLAN_FILE        demand/2.Test.Plan.txt
OUTPUT_PLAN_FILE       demand/2.Test.TravelPlan.txt
```

Notice that the year and model keys are not defined in the RunSetup control file, so RunSetup ignores these replacement keywords in the output control file.

The fourth program is PlanPrep using the PlanPrep_Sort.ctl file and generating a control file called 2.Test.PlanSort.ctl in the control directory.

The last program is the Microsimulator with an output control file name of 2.Test.Msim.ctl.

3.3 RunSetup Batch Files

As mentioned above, executing RunSetup with the MsimRuns.ctl control file creates a batch file called MsimRuns.ctl in the control directory. Given the keys built into the RunSetup program, this file will have the following commands:

```
path=%PATH%;../../bin

rem ---- Feedback Run 2 ----

PlanSelect.exe  ../control/2.Test.PlanSelect.ctl
if %ERRORLEVEL% == 1 exit 1

Router.exe  ../control/2.Test.Router.ctl
if %ERRORLEVEL% == 1 exit 1

PlanPrep.exe  ../control/2.Test.PlanMerge.ctl
if %ERRORLEVEL% == 1 exit 1

PlanPrep.exe  ../control/2.Test.PlanSort.ctl
if %ERRORLEVEL% == 1 exit 1

Microsimulator.exe  ../control/2.Test.Msim.ctl
if %ERRORLEVEL% == 1 exit 1
```

It starts with the path defined in the PROGRAM_DIRECTORY key and is followed by the comment defined by the DESCRIPTION_1 key. This is followed by the PROGRAMS_1 value and the control file name. The control file name is composed of the PROJECT_DIRECTORY and CONTROL_DIRECTORY values, the RUN_NAME and ALTERNATIVE_NAME (if not NULL) values separated by periods, and the program name followed by ".ctl". Since the EXIT_CHECK key is not specified, the default exit commend for Windows is added to the batch file. The process is repeated with the keys from groups 2 thru 5.

3.4 Multiple Iterations

In addition to the sequential types for applications outlined above, RunSetup can be used to implement multiple iterations of a standard feedback process. This is done by adding a parameter string to the end of the command line as is demonstrated in the batch file called MsimRuns_6-10.bat. This file contains the following commands:

```
path=%PATH%;../../bin

RunSetup.exe -h -k -p MsimRuns.ctl  6..10
```

The parameter "6..10" specifies the sequence of run numbers that are used for each iteration of the MsimRuns.ctl command sequence described above. In the first iteration, the RUN_NAME key value is overridden by the value "6" and the PREVIOUS_RUN_NAME key is overridden by the value "5". The sequence is then repeated with RUN_NAME equal to "7" and PREVIOUS_RUN_NAME equal to "6". The process is repeated for runs 8 thru 10 as well.

The output batch file includes the parameter value convert to 6-10.Test.MsimRuns.bat in the batch file name and the program calls for all five iterations. Since the description key in the MsimRuns.ctl file includes the @RUN@ keyword, the comment field for each iteration is also updated in the batch file. The resulting batch file is shown below.

```
path=%PATH%;../../bin

rem ---- Feedback Run 6 ----

PlanSelect.exe  ../control/6.Test.PlanSelect.ctl
if %ERRORLEVEL% == 1 exit 1

Router.exe  ../control/6.Test.Router.ctl
if %ERRORLEVEL% == 1 exit 1

PlanPrep.exe  ../control/6.Test.PlanMerge.ctl
if %ERRORLEVEL% == 1 exit 1

PlanPrep.exe  ../control/6.Test.PlanSort.ctl
if %ERRORLEVEL% == 1 exit 1

Microsimulator.exe  ../control/6.Test.Msim.ctl
if %ERRORLEVEL% == 1 exit 1

rem ---- Feedback Run 7 ----
```

```
PlanSelect.exe  ../control/7.Test.PlanSelect.ctl
if %ERRORLEVEL% == 1 exit 1

Router.exe  ../control/7.Test.Router.ctl
if %ERRORLEVEL% == 1 exit 1

PlanPrep.exe  ../control/7.Test.PlanMerge.ctl
if %ERRORLEVEL% == 1 exit 1

PlanPrep.exe  ../control/7.Test.PlanSort.ctl
if %ERRORLEVEL% == 1 exit 1

Microsimulator.exe  ../control/7.Test.Msim.ctl
if %ERRORLEVEL% == 1 exit 1

rem ---- Feedback Run 8 ----

PlanSelect.exe  ../control/8.Test.PlanSelect.ctl
if %ERRORLEVEL% == 1 exit 1

Router.exe  ../control/8.Test.Router.ctl
if %ERRORLEVEL% == 1 exit 1

PlanPrep.exe  ../control/8.Test.PlanMerge.ctl
if %ERRORLEVEL% == 1 exit 1

PlanPrep.exe  ../control/8.Test.PlanSort.ctl
if %ERRORLEVEL% == 1 exit 1

Microsimulator.exe  ../control/8.Test.Msim.ctl
if %ERRORLEVEL% == 1 exit 1

rem ---- Feedback Run 9 ----

PlanSelect.exe  ../control/9.Test.PlanSelect.ctl
if %ERRORLEVEL% == 1 exit 1

Router.exe  ../control/9.Test.Router.ctl
if %ERRORLEVEL% == 1 exit 1

PlanPrep.exe  ../control/9.Test.PlanMerge.ctl
if %ERRORLEVEL% == 1 exit 1

PlanPrep.exe  ../control/9.Test.PlanSort.ctl
if %ERRORLEVEL% == 1 exit 1

Microsimulator.exe  ../control/9.Test.Msim.ctl
if %ERRORLEVEL% == 1 exit 1

rem ---- Feedback Run 10 ----

PlanSelect.exe  ../control/10.Test.PlanSelect.ctl
if %ERRORLEVEL% == 1 exit 1

Router.exe  ../control/10.Test.Router.ctl
if %ERRORLEVEL% == 1 exit 1
```

```
PlanPrep.exe  ../control/10.Test.PlanMerge.ctl
if %ERRORLEVEL% == 1 exit 1

PlanPrep.exe  ../control/10.Test.PlanSort.ctl
if %ERRORLEVEL% == 1 exit 1

Microsimulator.exe  ../control/10.Test.Msim.ctl
if %ERRORLEVEL% == 1 exit 1
```

4.0 Run the Program Tests

To initialize the run, double-click the RunAll.bat in the \setup\ directory. This batch file will create the control files and batch files needed to execute the model. Once this execution has terminated successfully, navigate to the \batch\ directory and double-click the RunAll.bat. This will run the entire TestNet_4.0.06 TRANSIMS model simulation.

The program tests are run from the batch directory. The RunAll.bat(.sh) file will run each step in the testing process in order. This batch file was created by a special application of the RunSetup program using SETUP_CONTROL_FILE_# keys. The RunAll batch file included in the setup directory has the following control keys. These commands instruct the RunSetup program to process each of the RunSetup control file in order and generate a master batch file called RunAll.bat(.sh) in the batch directory.

```
TITLE                       Batch Control for Running Test Models
PROJECT_DIRECTORY           ../
PROGRAM_DIRECTORY           ../../bin
BATCH_DIRECTORY             batch

BATCH_NAME                  RunAll

SETUP_CONTROL_FILE_1        GISTests.ctl

SETUP_CONTROL_FILE_2        ConvertNet.ctl

SETUP_CONTROL_FILE_3        ConvertTrips.ctl

SETUP_CONTROL_FILE_4        RouteAll.ctl

SETUP_CONTROL_FILE_5        RouterRuns.ctl
SETUP_PARAMETER_5           2..5

SETUP_CONTROL_FILE_6        MsimRuns.ctl
SETUP_PARAMETER_6           6..10

SETUP_CONTROL_FILE_7        OutputSum.ctl
SETUP_PARAMETER_7           6

SETUP_CONTROL_FILE_8        OutputSum.ctl
SETUP_PARAMETER_8           10

SETUP_CONTROL_FILE_9        Emissions.ctl
SETUP_PARAMETER_9           10
```

```
SETUP_CONTROL_FILE_10        Reschedule.ctl

SETUP_CONTROL_FILE_11        Subarea.ctl
```

Alternatively, each batch file may be run independently. The appropriate order is list below.

GIS.GISTests.bat
Test.ConvertNet.bat
Test.ConvertTrips.bat
Test.RouteAll.bat
2-5.Test.RouterRuns.bat
6-10.Test.MsimRuns.bat
6.Test.OutputSum.bat
10.Test.OutputSum.bat
10.Test.Emissions.bat
Test.Reschedule.bat
Test.Subarea.bat

The printout files (*.prn) for each step in each process will be written to the control directory.

Several ArcGIS 9.2 control files are copied to the batch directory for displaying ArcView shapefile output. The GIS.mxd and 3D.mxd files relate to the output of the GISTests.bat procedure. Inputs.mxd, Network.mxd, and Transit.mxd relate to the output of the ConvertNet.bat process. Nework3.mxd displays the output of the ConvertTrips.bat process. Performance.mxd and Ridership.mxd display the results of the first simulation generated by the 6.OutputSum.bat. These setups can also be used to show the output of the 10.OutputSum.bat process by modifying the source filenames. SubNet.mxd shows the result of the Subarea.bat set.