Router

Version 5.0.54

Revision History
April 2012 - Created by Volpe Center
June 2013 – Revised by Volpe Center

The **Router** program is used to:
1. Generate travel plans and link delays for household and itinerant trips by walk, drive, transit, park-&-ride, kiss-&-ride, bicycle, and magic move modes.
3. Build travel plans from specified origins to specified destinations at specified times of day using a specified travel mode.
4. Selectively route activities or trips from specified origins, to specified destinations, at specified times of day, and\or by specified modes.
5. Generate problem files for those activities or trips that could not be routed for specific reasons.
6. Implement an incremental capacity restrained assignment algorithm.
7. Re-route selective trips with a household person's tour.
8. Update the plans in an input plan file.
9. Routing by selected trip purposes.

Syntax is Router [-flag] [control_file]

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

Optional Flags:
-Q[uiet] = execute without screen messages
-H[elp] = show program syntax and control keys
-C[ontrol] = create/update a default control file
-K[eyCheck] = list unrecognized control file keys
-P[ause] = pause before exiting
-N[oPause] = never pause before exiting
-D[etail] = execute with detailed status messages
-X[ML] = write an XML file with control keys

The program automatically creates a printout file based on the control file name. If the filename includes an extension (e.g., ".ctl"), the extension is replaced with ".prn". The printout file will be created in the current working directory and will overwrite an existing file with the same name.

Version 5 Features

Creation of Link_Delay files

The version 5 Router creates both plan and link_delay files. This simplifies the Router stabilization process (Figure 1) to use 2 programs: the Router and PlanSelect. Inputs to the Router include an (optional) LinkDelay file, and either a TripFile

or a set of TravelPlans. Outputs from the Router include a new LinkDelay file and a new set of TravelPlans. These Link-Delay and TravelPlan files are then used by PlanSelect to select trips for re-routing.

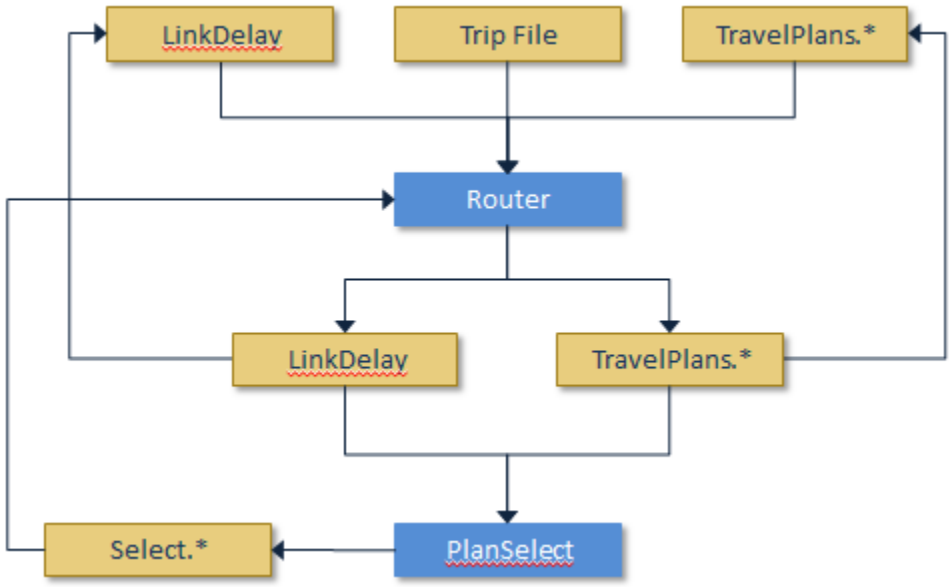

Figure 1 Router Stabilization

With these new link delay files, the user can independently control the update of link flows and link travel-times. New link delays can be built upon input flows / travel times (via an input plan or link delay file) or can start from free-flow conditions. There is a choice of periodic versus single final updates.

Additional Path Building Controls

New controls and features include the following:

- Forward or backward path building with trip end constraints
- Expanded selection criterion
  - Time, location, zone, traveler type, mode, household, etc.
  - Build paths for individual travelers or trips within a household
- More rigorous path building algorithm available to minimize transit transfer anomalies
- Parking and vehicle operating costs included in path building. They can be varied by vehicle type
- Traveler type script for traveler-specific path building parameters
- Local impedance factor to avoid hard-limit effects
- Multi-step incremental loading can be replaced with single application
- Integrated Plan merging (PlanPrep), enabling a subset of input plans to be replaced with selective re-routing/update

To support these changes, a number of keys were changed or added:

MODEL_TIME_INCREMENT was added to create the time increment used for routing and link delay processing. The SUMMARY_TIME_RANGES and SUMMARY_TIME_INCREMENT keys are now used for data summaries and report processing.

REROUTE_FROM_TIME_POINT key was added to re-route plans starting from their location within an existing plan file at a specified point in time.

UPDATE_TURNING_MOVEMENTS key was included to accumulate turning movements. CLEAR_INPUT_FLOW_RATES, UPDATE_FLOW_RATES and UPDATE_TRAVEL_TIMES were added to better control the creating of new plans versus the re-skimming of existing plans. Either the UPDATE_FLOW_RATES or UPDATE_TRAVEL_TIMES key must be true for a new link delay file to be created.

The sort type of the input trip or plan file is posted on the output plan file. If the input trip and plan files are not sorted in the same way, an error message is generated. Applications with both trip and input plan files can now match the records using a time sort.

DELETION_FILE, DELETION_FORMAT, DELETE_HOUSEHOLDS, DELETE_MODES, and DELETE_TRAVELER_TYPES keys were activated to delete selected trips from the input trip or input plan files.

The local access impedance factor model was changed to include a smooth transition and a non-linear impact beyond the local access distance. WALK_PENALTY_DISTANCES, WALK_PENALTY_FACTOR, BIKE_PENALTY_DISTANCES, BIKE_PENALTY_FACTOR, WAIT_PENALTY_TIMES, and WAIT_PENALTY_FACTOR keys were added to implement the same impedance factoring model to minimize cliff effects. Initial implementation of transit path building was included.

A number of control key names were modified or corrected for consistency. The TRAVELER_PARAMETER_FILE key was added to permit the user to enter the traveler-related key values through an input file. This file operates like other control files, but can include multiple columns and column field names to help clarify the values assigned to a given traveler type. Up to 100 travel types can be provided. To more completely support traveler-related path building parameters, facility bias, penalty factor, and drive access keys were expanded and renamed. The key names are now: WALK_PENALTY_FACTORS, BIKE_PENALTY_FACTORS, WAIT_PENALTY_FACTORS, KISS_RIDE_TIME_FACTORS, MAX_PARK_RIDE_PERCENTS, and MAX_KISS_RIDE_PERCENTS. The FACILITY_BIAS_FACTORS key was previously a list of impedance adjustment factors by facility type. This key is replaced by FREEWAY_BIAS_FACTORS and EXPREESWAY_BIAS_FACTORS that vary by traveler type. The HOUSEHOLD_TYPE_SCRIPT key was changed to TRAVELER_TYPE_SCRIPT to more accurately identify the purpose of the script. Improvements were made to the transit path tracing logic to include additional information in the output plan file. Park-&-Ride, Kiss-&-Ride, Magic Move (ride and other), and Taxi travel mode processing was implemented. Logic was added to adjust the activity duration for the previous trip made by a traveler when the current trip has an arrival time constraint and the estimated trip start time is earlier than the trip data anticipated.

ADJUST_ACTIVITY_SCHEDULE and IGNORE_ACTIVITY_DURATION keys were added to globally control how early and late arrivals are handled. If a trip's travel time is less than expected, the schedule adjust key will permit the activity to move forward in time, but keep the activity duration the same. If a trip's travel time is greater than expected, the ignore durations key will permit the activity duration to be reduced to as little as one minute to enable the next trip to start as close to the original time schedule as possible. The ignore durations key also drops activity records from the output plan file. These keys can be applied separately or in combination.

Negative or huge start and arrival times included in trip and activity files are now addressed with warning messages rather than error messages to enable the program to skip the erroneous record and continue processing. INTERPOLATE_LINK_DELAYS key was added to enable interpolate of the link travel time based on the time of day the path enters the link and the mid-points of the two closest time periods in the link delay file.

SAVE_LANE_USE_FLOWS key was added to the file service. A Type field was added to the Link Delay and Performance files to split link flows and travel times into two lane use groups. The Flow Index method was added to the directional link data class to store the index into the flow vectors for the second lane use group. These changes enable the Router to track volume and calculate speeds for links with use restrictions on a subset of lanes. For example, an HOV or HOT lane on a mixed use freeway link. The Performance file and data classes were modified to inherit the attributes of the Link Delay classes to ensure processing consistency.

Option of Built-in Multiple Runs for Convergence

In Version 4, the Router would effectively function as a shortest-path algorithm, with multiple runs required to attain user equilibrium. The Version 5 Router offers the option of implementing multiple iterations within a single router run, to attain either link-based or trip-based convergences. To support this option, the control keys MAXIMUM_NUMBER_OF_ITERATIONS, LINK_CONVERGENCE_CRITERIA, TRIP_CONVERGENCE_CRITERIA, INITIAL_WEIGHTING_FACTOR, ITERATION_WEIGHTING_INCREMENT, MAXIMUM_WEIGHTING_FACTOR, NEW_LINK_CONVERGENCE_FILE, NEW_TRIP_CONVERGENCE_FILE, LINK_GAP_REPORT, TRIP_GAP_REPORT and ITERATION_PROBLEMS report types were added.

Default values for these keys are listed below

Key	Default	Range	Comment
MAXIMUM_NUMBER_OF_ITERATIONS	0	0..100	Multiple runs is active when this is > 0
LINK_CONVERGENCE_CRITERIA	0	0..10	Defines when sufficient convergence is reached
TRIP_CONVERGENCE_CRITERIA	0	0..10	Defines when sufficient convergence is reached
INITIAL_WEIGHTING_FACTOR	1.0	0.0 or >= 0.5	The initial weighting factor used for link_delay averaging
ITERATION_WEIGHTING_INCREMENT	1.0	0.0..5.0	The increment between initial and maximum weighting factors.
MAXIMUM_WEIGHTING_FACTOR	20.0	0.0 or >= 2.0	The maximum weighting factor used for link_delay averaging

This version implements multiple iterations of the path building and loading process based on link delay averaging and exits when the convergence criteria are met. The trip gap measure is calculated at the trip level[1], using the following measure

$$\sum_s (c_{xs}(\{c_{at}\} - c_{ys}(\{c_{at}\}) / \sum_s c_{xs}(\{c_{at}\})$$

where

s indexes trips

$\{c_{at}\}$ is an updated set of time-dependent link costs after combining new trip routes for a subset of household with previous iterations' routes for the other households

c_{xs} is the cost of the trip s along the path that was used for the calculation of $\{c_{at}\}$

c_{ys} is the cost of the trip s along its shortest path, assuming $\{c_{at}\}$

Control Key List

[1] Castiglione, Joe, et al, "Building and Integrated Activity Based and Dynamic Network Assignment Model," downloaded from http://jbowman.net/papers/2010.Castiglione_et_al.Integrated_Activity-Based_and_DTA.pdf, on 10 April 2012.

The list of control file keys appears in the tables below:

- Req / Opt indicates whether the key is **req**uired or **opt**ional
- The types include **Text**, Input **File**name, **New** file, **Bool**ean, **Path** (to a file), **Time**, **Int**eger, **Dec**imal, and **List** of items
- The Default is the default value, used if the key does not appear in the control file.
- I/O/P indicates Input, Output or Parameter.

For a more detailed description of the Parameter control keys, refer to the Parameter Reference. For a more detailed description of the Input or Output control keys, refer to the File Reference. These two documents also provide the possible values or range of values allowed for each control key listed below. For instance, files can usually be output to numerous formats beyond TAB_DELIMITED for additional post-processing / file manipulation actions.

Configuration Keys

Control File Keys:	Req/Opt	Type	Default	I/O/P
TITLE	Opt	Text		P
REPORT_FILE	Opt	File		O
REPORT_FLAG	Opt	Bool	FALSE	P
PROJECT_DIRECTORY	Opt	Path		P
DEFAULT_FILE_FORMAT	Opt	Text	TAB_DELIMITED	P
TIME_OF_DAY_FORMAT	Opt	Text	DAY_TIME	P
MODEL_START_TIME	Opt	Time	0:00	P
MODEL_END_TIME	Opt	Time	24:00:00	P
MODEL_TIME_INCREMENT	Opt	Time	15 minutes	P
UNITS_OF_MEASURE	Opt	Text	METRIC	P
RANDOM_NUMBER_SEED	Opt	Int	0	P
MAX_WARNING_MESSAGES	Opt	Int	100000	P
MAX_WARNING_EXIT_FLAG	Opt	Bool	TRUE	P
MAX_PROBLEM_COUNT	Opt	Int	0	P
NUMBER_OF_THREADS	Opt	Int	1	P

System File Keys

Control File Keys:	Req/Opt	Type	Default	I/O/P
NODE_FILE	Req	File		I
NODE_FORMAT	Opt	Text	TAB_DELIMITED	P
LINK_FILE	Req	File		I
LINK_FORMAT	Opt	Text	TAB_DELIMITED	P
CONNECTION_FILE	Req	File		I
CONNECTION_FORMAT	Opt	Text	TAB_DELIMITED	P
LOCATION_FILE	Req	File		I
LOCATION_FORMAT	Opt	Text	TAB_DELIMITED	P
POCKET_FILE	Opt	File		I
POCKET_FORMAT	Opt	Text	TAB_DELIMITED	P
LANE_USE_FILE	Opt	File		I

Control File Keys:	Req/Opt	Type	Default	I/O/P
LANE_USE_FORMAT	Opt	Text	TAB_DELIMITED	P
TURN_PENALTY_FILE	Opt	File		I
TURN_PENALTY_FORMAT	Opt	Text	TAB_DELIMITED	P
PARKING_FILE	Opt	File		I
PARKING_FORMAT	Opt	Text	TAB_DELIMITED	P
ACCESS_FILE	Opt	File		I
ACCESS_FORMAT	Opt	Text	TAB_DELIMITED	P
TRANSIT_STOP_FILE	Opt	File		I
TRANSIT_STOP_FORMAT	Opt	Text	TAB_DELIMITED	P
TRANSIT_FARE_FILE	Opt	File		I
TRANSIT_FARE_FORMAT	Opt	Text	TAB_DELIMITED	P
TRANSIT_ROUTE_FILE	Opt	File		I
TRANSIT_ROUTE_FORMAT	Opt	Text	TAB_DELIMITED	P
TRANSIT_SCHEDULE_FILE	Opt	File		I
TRANSIT_SCHEDULE_FORMAT	Opt	Text	TAB_DELIMITED	P
TRANSIT_DRIVER_FILE	Opt	File		I
TRANSIT_DRIVER_FORMAT	Opt	Text	TAB_DELIMITED	P
HOUSEHOLD_FILE	Opt	File		I
HOUSEHOLD_FORMAT	Opt	Text	TAB_DELIMITED	P
SELECTION_FILE	Opt	File		I
SELECTION_FORMAT	Opt	Text	TAB_DELIMITED	P
TRIP_FILE	Opt	File		I
TRIP_FORMAT	Opt	Text	TAB_DELIMITED	P
LINK_DELAY_FILE	Opt	File		I
LINK_DELAY_FORMAT	Opt	Text	TAB_DELIMITED	P
VEHICLE_FILE	Opt	File		I
VEHICLE_FORMAT	Opt	Text	TAB_DELIMITED	P
VEHICLE_TYPE_FILE	Opt	File		I
VEHICLE_TYPE_FORMAT	Opt	Text	TAB_DELIMITED	P
PLAN_FILE	Opt	File		I
PLAN_FORMAT	Opt	Text	TAB_DELIMITED	I
NEW_PLAN_FILE	Opt	New		O
NEW_PLAN_FORMAT	Opt	Text	TAB_DELIMITED	P
NEW_PROBLEM_FILE	Opt	New		O
NEW_PROBLEM_FORMAT	Opt	Text	TAB_DELIMITED	P
NEW_LINK_DELAY_FILE	Opt	New		O
NEW_LINK_DELAY_FORMAT	Opt	Text	TAB_DELIMITED	P
NOTES_AND_NAME_FIELDS	Opt	Bool	FALSE	P
SAVE_LANE_USE_FLOWS	Opt	Bool	FALSE	P

Data Service Keys

Control File Keys:	Req/Opt	Type	Default	I/O/P

Control File Keys:	Req/Opt	Type	Default	I/O/P
DAILY_WRAP_FLAG	Opt	Bool	FALSE	P
SUMMARY_TIME_RANGES	Opt	Text	ALL	P
SUMMARY_TIME_INCREMENT	Opt	Time	15 minutes	P

Select Service Keys

Control File Keys:	Req/Opt	Type	Default	I/O/P
SELECT_HOUSEHOLDS	Opt	List	ALL	P
SELECT_MODES	Opt	List	ALL	P
SELECT_PURPOSES	Opt	List	ALL	P
SELECT_START_TIMES	Opt	List	ALL	P
SELECT_END_TIMES	Opt	List	ALL	P
SELECT_ORIGINS	Opt	List	ALL	P
SELECT_DESTINATIONS	Opt	List	ALL	P
SELECT_TRAVELER_TYPES	Opt	List	ALL	P
SELECT_ORIGIN_ZONES	Opt	List	ALL	P
SELECT_DESTINATION_ZONES	Opt	List	ALL	P
SELECTION_PERCENTAGE	Opt	Dec	100.0 percent	P
DELETION_FILE	Opt	File		I
DELETION_FORMAT	Opt	Text	TAB_DELIMITED	P
DELETE_HOUSEHOLDS	Opt	List	NONE	P
DELETE_MODES	Opt	List	NONE	P
DELETE_TRAVELER_TYPES	Opt	List	NONE	P

Path Building Service Keys

Control File Keys:	Req/Opt	Type	Default	I/O/P
IMPEDANCE_SORT_METHOD	Opt	Bool	FALSE	P
SAVE_ONLY_SKIMS	Opt	Bool	FALSE	P
WALK_PATH_DETAILS	Opt	Bool	FALSE	P
IGNORE_VEHICLE_ID	Opt	Bool	FALSE	P
LIMIT_PARKING_ACCESS	Opt	Bool	TRUE	P
IGNORE_TIME_CONSTRAINTS	Opt	Bool	FALSE	P
END_TIME_CONSTRAINT	Opt	Time	0 minutes	P
IGNORE_ROUTING_PROBLEMS	Opt	Bool	FALSE	P
PERCENT_RANDOM_IMPEDANCE	Opt	Dec	0.0 percent	P
TRAVELER_TYPE_SCRIPT	Opt	File		I
TRAVELER_PARAMETER_FILE	Opt	File		I
WALK_SPEED	Opt	Dec	1.0 mps	P
BICYCLE_SPEED	Opt	Dec	4.0 mps	P
WALK_TIME_VALUES_*	Opt	List	20.0 impedance/second	P
BICYCLE_TIME_VALUES_*	Opt	List	15.0 impedance/second	P
FIRST_WAIT_VALUES_*	Opt	List	20.0 impedance/second	P

Control File Keys:	Req/Opt	Type	Default	I/O/P
TRANSFER_WAIT_VALUES_*	Opt	List	20.0 impedance/second	P
PARKING_TIME_VALUES_*	Opt	List	0.0 impedance/second	P
VEHICLE_TIME_VALUES_*	Opt	List	10.0 impedance/second	P
DISTANCE_VALUES_*	Opt	List	0.0 impedance/meter	P
COST_VALUES_*	Opt	List	0.0 impedance/cent	P
FREEWAY_BIAS_FACTORS_*	Opt	List	1	P
EXPRESSWAY_BIAS_FACTORS_*	Opt	List	1	P
LEFT_TURN_PENALTIES_*	Opt	List	0 impedance	P
RIGHT_TURN_PENALTIES_*	Opt	List	0 impedance	P
U_TURN_PENALTIES_*	Opt	List	0 impedance	P
TRANSFER_PENALTIES_*	Opt	List	0 impedance	P
STOP_WAITING_PENALTIES_*	Opt	List	0 impedance	P
STATION_WAITING_PENALTIES_*	Opt	List	0 impedance	P
BUS_BIAS_FACTORS_*	Opt	List	1	P
BUS_BIAS_CONSTANTS_*	Opt	List	0 impedance	P
RAIL_BIAS_FACTORS_*	Opt	List	1	P
RAIL_BIAS_CONSTANTS_*	Opt	List	0 impedance	P
MAX_WALK_DISTANCES_*	Opt	List	2000 meters	P
WALK_PENALTY_DISTANCES_*	Opt	List	2000 meters	P
WALK_PENALTY_FACTORS_*	Opt	List	0	P
MIN_WAIT_TIMES_*	Opt	List	0 seconds	P
MAX_NUMBER_OF_TRANSFERS_*	Opt	List	3	P
MAX_PARK_RIDE_PERCENTS_*	Opt	List	50 percent	P
MAX_KISS_RIDE_PERCENTS_*	Opt	List	35 percent	P
KISS_RIDE_TIME_FACTORS_*	Opt	List	2.5	P
KISS_RIDE_STOP_TYPES	Opt	Text	EXTERNAL	P
MAX_KISS_RIDE_DROPOFF_WALK	Opt	Dec	100 meters	P
TRANSIT_PENALTY_FILE	Opt	File		I
PARKING_PENALTY_FILE	Opt	File		I
DEFAULT_PARKING_DURATION	Opt	Time	0.0 hours	P
MAX_NUMBER_OF_PATHS	Opt	Int	4	P
MAX_LEGS_PER_PATH	Opt	Int	1000	P
FARE_CLASS_DISTRIBUTION	Opt	List	0	P
LOCAL_ACCESS_DISTANCE	Opt	Dec	2000 meters	P
LOCAL_FACILITY_TYPE	Opt	Text	EXTERNAL	P
LOCAL_IMPEDANCE_FACTOR	Opt	Dec	0	P
MAX_CIRCUITY_RATIO	Opt	Dec	0	P
MIN_CIRCUITY_DISTANCE	Opt	Dec	2000 meters	P
MAX_CIRCUITY_DISTANCE	Opt	Dec	20000 meters	P
MIN_DURATION_FACTORS	Opt	List	0.1, 0.5, 0.8, 1.0	P

Flow Time Service Keys

Control File Keys:	Req/Opt	Type	Default	I/O/P
UPDATE_FLOW_RATES	Opt	Bool	FALSE	P
CLEAR_INPUT_FLOW_RATES	Opt	Bool	FALSE	P
UPDATE_TURNING_MOVEMENTS	Opt	Bool	FALSE	P
UPDATE_TRAVEL_TIMES	Opt	Bool	FALSE	P
LINK_DELAY_UPDATE_RATE	Opt	Int	0	P
LINK_DELAY_FLOW_FACTOR	Opt	Dec	1	P
EQUATION_PARAMETERS_*	Opt	List	BPR, 0.15, 4.0, 0.75	P

Router Control Keys

Control File Keys:	Req/Opt	Type	Default	I/O/P
UPDATE_PLAN_RECORDS	Opt	Bool	FALSE	P
REROUTE_FROM_TIME_POINT	Opt	Time	0:00	P
PRINT_UPDATE_WARNINGS	Opt	Bool	FALSE	P
MAXIMUM_NUMBER_OF_ITERATIONS	Opt	Int	0	P
LINK_CONVERGENCE_CRITERIA	Opt	Dec	0.0	P
TRIP_CONVERGENCE_CRITERIA	Opt	Dec	0.0	P
INITIAL_WEIGHTING_FACTOR	Opt	Dec	1.0	P
ITERATION_WEIGHTING_INCREMENT	Opt	Dec	1.0	P
MAXIMUM_WEIGHTING_FACTOR	Opt	Dec	20.0	P
NEW_LINK_CONVERGENCE_FILE	Opt	New		O
NEW_TRIP_CONVERGENCE_FILE	Opt	New		O
ROUTER_REPORT_*	Opt	Text		P

Report Options:
TRAVELER_TYPE_SCRIPT
TRAVELER_TYPE_STACK
LINK_GAP_REPORT
TRIP_GAP_REPORT
ITERATION_PROBLEMS

Notes

Each '_FILE' key has a corresponding '_FORMAT' key. The following file formats can be used for input and ouput files: TEXT, BINARY, FIXED_COLUMN, COMMA_DELIMITED, SPACE_DELIMITED, TAB_DELIMITED, CSV_DELIMITED, DBASE, SQLITE3, VERSION3

Control Key Changes in Router Version 5

A number of network keys have changed from V4 to V5. Refer to the File Reference and Parameter Reference documents for additional details. Some specific examples include the following control key and file name changes (V4 → V5):

- NET_NODE_TABLE → NODE_FILE
- NET_ZONE_TABLE → ZONE_FILE
- NET_SHAPE_TABLE → SHAPE_FILE
- NET_LINK_TABLE → LINK_FILE

- NET_PARKING_TABLE → PARKING_FILE
- NET_PROCESS_LINK_TABLE -> ACCESS_FILE
- NET_ACTIVITY_LOCATION_TABLE -> ACTIVITY_FILE
- NET_LANE_CONNECTIVITY_TABLE -> CONNECTION_FILE
- NET_POCKET_LANE_TABLE -> POCKET_FILE
- NET_LANE_USE_TABLE -> LANE_USE_FILE
- NET_TURN_PROHIBITION_FILE -> TURN_PENALTY_FILE
- NET_TRANSIT_STOP_TABLE -> TRANSIT_STOP_FILE
- NET_TRANSIT_FARE_TABLE -> TRANSIT_FARE_FILE
- NET_TRANSIT_ROUTE_TABLE -> TRANSIT_ROUTE_FILE
- NET_TRANSIT_SCHEDULE_TABLE -> TRANSIT_SCHEDULE_FILE
- HOUSEHOLD_LIST -> SELECTION_FILE
- HOUSEHOLD_TYPE_SCRIPT -> TRAVELER_TYPE_SCRIPT
- VEHICLE_TYPE -> VEHICLE_TYPE_CODE
- ROUTE_SELECTED_MODES -> SELECT_MODES
- ROUTE_SELECTED_PURPOSES -> SELECT_PURPOSES
- ROUTE_AT_SPECIFIED_TIMES -> SELECT_START_TIMES
- ROUTE_FROM _SPECIFIED_LOCATIONS -> SELECT_ORIGINS
- ROUTE_TO_SPECIFIED_LOCATIONS -> SELECT_DESTINATIONS
- LINK_DELAY_VOL_FACTOR -> LINK_DELAY_FLOW_FACTOR
- MAX_ROUTING_PROBLEMS -> MAX_PROBLEM_COUNT

The following keys, used in version 4, are not used in version 5:

NET_DIRECTORY
ARCVIEW_PROBLEM_DUMP - does not exist in version 5
ROUTE_WITH _SPECIFIED _MODE
SORT_VEHICLES
ACTIVITY_FILE
NODE_LIST_PATHS
MAX_LINK_DELAY_ERRORS

Examples

Control File

```
TITLE                          Route the Highway and Transit Trips for 1.Router
DEFAULT_FILE_FORMAT            TAB_DELIMITED
PROJECT_DIRECTORY              ../

NODE_FILE                      network/Node.txt
LINK_FILE                      network/Link.txt
POCKET_FILE                    network/Pocket.txt
PARKING_FILE                   network/Parking.txt
CONNECTION_FILE                network/Connection.txt
LOCATION_FILE                  network/Location.txt
#ACCESS_FILE                    network/Access_Link.txt
SELECTION_FILE                 demand/Select.txt
LINK_DELAY_FILE                NULL
```

```
TRIP_FILE                        demand/Trip.txt

TIME_OF_DAY_FORMAT               HOUR_CLOCK
VEHICLE_FILE                     demand/Vehicle.txt

## (not needed in 4.0)
VEHICLE_TYPE_FILE                ../input/Vehicle_Type.txt

##PLAN_FILE                              NULL
NEW_PLAN_FILE                    demand/1.Trip.Plans.*
NEW_PROBLEM_FILE                 results/1.Trip.Problems

NEW_LINK_DELAY_FILE                 results/1.Trip.LinkDelay

UPDATE_FLOW_RATES             YES
CLEAR_INPUT_FLOW_RATES        YES

UPDATE_TRAVEL_TIMES              YES
LINK_DELAY_UPDATE_RATE         -1
##LINK_DELAY_FLOW_FACTOR           3.0

EQUATION_PARAMETERS_1               BPR, 0.15, 4.0, 0.75    //---- BPR, 0.15, 4.0, 0.75
EQUATION_PARAMETERS_2               BPR, 0.10, 4.5, 0.75

LIMIT_PARKING_ACCESS             YES
IGNORE_TIME_CONSTRAINTS          YES
WALK_PATH_DETAILS                YES
WALK_SPEED                       1.0            //---- meters / second ----
WALK_TIME_VALUE                  20.0           //---- imped / second ----
VEHICLE_TIME_VALUE               10.0           //---- imped / second ----
FIRST_WAIT_VALUE                 20.0           //---- imped / second ----
TRANSFER_WAIT_VALUE              20.0           //---- imped / second ----
DISTANCE_VALUE                   1.0            //---- imped / meter ----
COST_VALUE                       5.0            //---- imped / cent ----
TRANSFER_PENALTY                 1200           //---- impedance ----
MAX_WALK_DISTANCE                2000           //---- meters ----
MIN_WAIT_TIME                    60             //---- seconds ----
LEFT_TURN_PENALTY                300            //---- impedance ----
UTURN_PENALTY                    5000           //---- impedance ----
PARKING_HOURS_BY_PURPOSE         8.5, 2.5, 1.0, 1.0          //---- hours ----
```

Resulting .prn file from the above control file

```
****************************************
|                                      |
|         Router - Version 5.0.36      |
|  Copyright 2012 by TRANSIMS Open-Source  |
|         Mon Apr 09 09:33:50 2012     |
|                                      |
****************************************

Control File = 1.Router.ctl
Report File  = 1.Router.prn (Create)

Route the Highway and Transit Trips for 1.Router

Project Directory = ../
Default File Format = TAB_DELIMITED
Time of Day Format = HOUR_CLOCK
```

```
Model Start Time = 0:00
Model End Time = 27:00
Units of Measure = METRIC
Random Number Seed = 1333978430
Number of Threads = 1

Input System Network Files:
Node File = ../network/Node.txt
Link File = ../network/Link.txt
Pocket File = ../network/Pocket.txt
Connection File = ../network/Connection.txt
Parking File = ../network/Parking.txt
Location File = ../network/Location.txt

Input System Demand Files:
Selection File = ../demand/Select.txt
Vehicle Type File = ../../input/Vehicle_Type.txt
Vehicle File = ../demand/Vehicle.txt
Trip File = ../demand/Trip.txt

Output System Demand Files:
New Link Delay File = ../results/1.Trip.LinkDelay
New Problem File = ../results/1.Trip.Problems
New Plan File = ../demand/1.Trip.Plans.*

Notes And Name Fields = TRUE

Data Service Controls:

Number of Time Periods = 108

Flow-Time Service Controls:
Update Flow Rates = TRUE

Update Travel Times = TRUE
Link Delay Update Rate = -1

Equation Parameters 1 = BPR, A=0.15, B=4.00, C=0.75
Equation Parameters 2 = BPR, A=0.10, B=4.50, C=0.75

Path Building Parameters:
Walk Path Details = TRUE
Limit Parking Access = TRUE
Ignore Time Constraints = TRUE

Walk Speed = 1.00 mps

Select Service Controls:

Router Control Keys:

Number of Node File Records = 23

Number of Link File Records = 24
Number of Directional Links = 37

Number of Pocket File Records = 7

Number of Vehicle Type File Records = 15
Number of Connection File Records = 49
```

```
Number of Parking File Records = 60
Number of Location File Records = 60
Number of Selection File Records = 97008
Number of Vehicle File Records = 97001
Link Convergence Gap = 0

New Link Delay File Records = 3348

Number of Travel Time Updates = 1

Number of Trip File Records    = 97008
Number of Trip File Households = 97001
Number of Trip File Persons    = 97001
Number of Trip File Tours      = 97002
Number of Trip File Trips      = 97008

Number of Trip File Records = 97008

Number of New Plan File Partitions = 2
Number of New Plan File Records    = 1014578
Number of New Plan File Households = 96830
Number of New Plan File Persons    = 96830
Number of New Plan File Tours      = 96831
Number of New Plan File Trips      = 96837

Number of New Problem File Records    = 171
Number of New Problem File Households = 171
Number of New Problem File Persons    = 171
Number of New Problem File Tours      = 171
Number of New Problem File Trips      = 171

Total Number of Problems = 171 (0.2%)
Number of Path Building (#1) Problems = 171 (100.0%)

Mon Apr 09 09:34:02 2012 -- Process Complete (0:00:12)
```

Control File Using Iterations

```
TITLE                           Route the Highway and Transit Trips for 1.Router
DEFAULT_FILE_FORMAT             TAB_DELIMITED
PROJECT_DIRECTORY               ../

NODE_FILE                       network/Node.txt
LINK_FILE                       network/Link.txt
POCKET_FILE                     network/Pocket.txt
PARKING_FILE                    network/Parking.txt
CONNECTION_FILE                 network/Connection.txt
LOCATION_FILE                   network/Location.txt
#ACCESS_FILE                     network/Access_Link.txt
SELECTION_FILE                  demand/Select.txt
LINK_DELAY_FILE                 NULL

TRIP_FILE                       demand/Trip.txt

TIME_OF_DAY_FORMAT              HOUR_CLOCK
VEHICLE_FILE                    demand/Vehicle.txt
```

```
## (not needed in 4.0)
VEHICLE_TYPE_FILE               input/Vehicle_Type_v5.txt

##PLAN_FILE                             NULL
NEW_PLAN_FILE                   demand/C.Trip.Plans.*
NEW_PROBLEM_FILE                results/C.Trip.Problems

NEW_LINK_DELAY_FILE                results/C.Trip.LinkDelay
## (no 4.0 equivalance)

UPDATE_FLOW_RATES             YES
CLEAR_INPUT_FLOW_RATES        YES

UPDATE_TRAVEL_TIMES              YES
LINK_DELAY_UPDATE_RATE          -1
LINK_DELAY_FLOW_FACTOR        1.0

EQUATION_PARAMETERS_1        BPR, 0.15, 4.0, 0.75    //---- BPR, 0.15, 4.0, 0.75
EQUATION_PARAMETERS_2        BPR, 0.10, 4.5, 0.75

LIMIT_PARKING_ACCESS             YES
IGNORE_TIME_CONSTRAINTS          YES
WALK_PATH_DETAILS                YES
WALK_SPEED                       1.0             //---- meters / second ----
WALK_TIME_VALUE                  20.0            //---- imped / second ----
VEHICLE_TIME_VALUE               10.0            //---- imped / second ----
FIRST_WAIT_VALUE                 20.0            //---- imped / second ----
TRANSFER_WAIT_VALUE              20.0            //---- imped / second ----
DISTANCE_VALUE                   1.0             //---- imped / meter ----
COST_VALUE                       5.0             //---- imped / cent ----
TRANSFER_PENALTY                 1200            //---- impedance ----
MAX_WALK_DISTANCE                2000            //---- meters ----
MIN_WAIT_TIME                    60              //---- seconds ----
LEFT_TURN_PENALTY                300             //---- impedance ----
UTURN_PENALTY                    5000            //---- impedance ----
PARKING_HOURS_BY_PURPOSE         8.5, 2.5, 1.0, 1.0          //---- hours ----

MAXIMUM_NUMBER_OF_ITERATIONS  10
NEW_LINK_CONVERGENCE_FILE     results/LinkConvergence.txt
NEW_TRIP_CONVERGENCE_FILE     results/TripConvergence.txt
ROUTER_REPORT_1                    LINK_GAP_REPORT
ROUTER_REPORT_2   TRIP_GAP_REPORT
ROUTER_REPORT_3   ITERATION_PROBLEMS
```

Resulting .prn file from the Control File with Iterations

```
*****************************************
|                                       |
|         Router - Version 5.0.36       |
|  Copyright 2012 by TRANSIMS Open-Source  |
|         Thu Apr 26 09:48:13 2012      |
```

```
|                                          |
******************************************

Control File = C.Router.ctl
Report File  = C.Router.prn (Create)

Route the Highway and Transit Trips for 1.Router

Project Directory = ../
Default File Format = TAB_DELIMITED
Time of Day Format = HOUR_CLOCK
Model Start Time = 0:00
Model End Time = 27:00
Units of Measure = METRIC
Random Number Seed = 1335448093
Number of Threads = 1

Input System Network Files:
Node File = ../network/Node.txt
Link File = ../network/Link.txt
Pocket File = ../network/Pocket.txt
Connection File = ../network/Connection.txt
Parking File = ../network/Parking.txt
Location File = ../network/Location.txt

Input System Demand Files:
Selection File = ../demand/Select.txt
Vehicle Type File = ../input/Vehicle_Type_v5.txt
Vehicle File = ../demand/Vehicle.txt
Trip File = ../demand/Trip.txt

Output System Demand Files:
New Link Delay File = ../results/C.Trip.LinkDelay
New Problem File = ../results/C.Trip.Problems
New Plan File = ../demand/C.Trip.Plans.*

Notes And Name Fields = TRUE

Data Service Controls:

Number of Time Periods = 108

Flow-Time Service Controls:
Update Flow Rates = TRUE

Update Travel Times = TRUE
Link Delay Update Rate = -1
Link Delay Flow Factor = 1

Equation Parameters 1 = BPR, A=0.15, B=4.00, C=0.75
Equation Parameters 2 = BPR, A=0.10, B=4.50, C=0.75

Path Building Parameters:
Walk Path Details = TRUE
Limit Parking Access = TRUE
Ignore Time Constraints = TRUE
Walk Speed = 1.00 mps

Select Service Controls:
```

```
Router Control Keys:

Maximum Number of Iterations = 10
New Link Convergence File = ../results/LinkConvergence.txt
New Trip Convergence File = ../results/TripConvergence.txt

Router Reports:  1. LINK_GAP_REPORT
                 2. TRIP_GAP_REPORT
                 3. ITERATION_PROBLEMS


Number of Node File Records = 23
Number of Link File Records = 24
Number of Directional Links = 37
Number of Pocket File Records = 7
Number of Vehicle Type File Records = 16
Number of VehType Data Records = 15
Number of Connection File Records = 49
Number of Parking File Records = 60
Number of Location File Records = 60
Number of Selection File Records = 97000
Number of Vehicle File Records = 97000

Iteration Number 1:  Weighting Factor = 1
Link Convergence Gap = 1
Trip Convergence Gap = 1

Total Number of Problems = 181 (0.2%)
Number of Path Building (#1) Problems = 181 (100.0%)

Iteration Number 2:  Weighting Factor = 2
Link Convergence Gap = 0.552474
Trip Convergence Gap = 0

New Link Delay File Records = 3348

Link Gap Report

          -------------- Link Gap --------------     %     ---------- VHT ----------
Iteration        Total      Std.Dev      Maximum    RMSE     Difference         Total

     1        1.000000     2.657797     1.000000    283.9          4380          4380
     2        0.552474     1.683919     0.619440    177.2          2420          4380

Trip Gap Report

          -------------- Trip Gap --------------     %     ----- Impedance/100 -----
Iteration        Total      Std.Dev      Maximum    RMSE     Difference         Total

     1        1.000000     0.153120     1.000000    101.2       2318640       2318640
     2        0.000000     0.000000     0.000000      0.0             0       2318640

Number of Travel Time Updates = 2

Number of Trip File Records    = 97000
Number of Trip File Households = 97000
Number of Trip File Persons    = 97000
Number of Trip File Tours      = 97000
Number of Trip File Trips      = 97000
```

```
Number of Trip File Records = 97000

Number of New Plan File Partitions = 2
Number of New Plan File Records    = 1014341
Number of New Plan File Households = 96819
Number of New Plan File Persons    = 96819
Number of New Plan File Tours      = 96819
Number of New Plan File Trips      = 96819

Number of New Problem File Records    = 181
Number of New Problem File Households = 181
Number of New Problem File Persons    = 181
Number of New Problem File Tours      = 181
Number of New Problem File Trips      = 181

Total Number of Problems = 181 (0.2%)
Number of Path Building (#1) Problems = 181 (100.0%)

Thu Apr 26 09:48:49 2012 -- Process Complete (0:00:36)
```

Control File to Update Travel Times in Existing Plans

```
TITLE                          Router Test

SELECTION_FILE                 demand/select.txt

TRIP_FILE                      demand/trip.txt
VEHICLE_FILE                   demand/vehicle.txt
VEHICLE_TYPE_FILE              inputs/vehicle_type.txt

NODE_FILE                      network/node.txt
LINK_FILE                      network/link.txt
CONNECTION_FILE                network/connection.txt
POCKET_FILE                    network/pocket.txt
PARKING_FILE                   network/parking.txt
LOCATION_FILE                  network/location2.txt

LINK_DELAY_FILE                results/1.linkdelay.txt

PLAN_FILE                demand/1.plans.*
NEW_PLAN_FILE                  demand/2.plans.*
NEW_PROBLEM_FILE               demand/router_problems.txt
NEW_LINK_DELAY_FILE            results/2.linkdelay.txt

UPDATE_FLOW_RATES             NO
CLEAR_INPUT_FLOW_RATES         NO
UPDATE_TRAVEL_TIMES                YES
LINK_DELAY_UPDATE_RATE         -1
IMPEDANCE_SORT_METHOD          FALSE
WALK_PATH_DETAILS              TRUE
LIMIT_PARKING_ACCESS           TRUE
IGNORE_TIME_CONSTRAINTS        TRUE
END_TIME_CONSTRAINT            20
PERCENT_RANDOM_IMPEDANCE       0
WALK_SPEED                     1
```

```
MAX_WALK_DISTANCIES           2000
DEFAULT_PARKING_DURATION      2
LOCAL_ACCESS_DISTANCE         1000
LOCAL_FACILITY_TYPE           EXTERNAL
LOCAL_IMPEDANCE_FACTOR        2.0
MAX_CIRCUITY_RATIO            0.0
MIN_CIRCUITY_DISTANCE         1000
MAX_CIRCUITY_DISTANCE         100000
```

Resulting .prn file

```
*****************************************
|                                       |
|         Router - Version 5.0.54       |
|  Copyright 2012 by TRANSIMS Open-Source  |
|         Wed May 29 10:23:00 2013      |
|                                       |
*****************************************

Control File = Router.ctl
Report File  = Router.prn (Create)

Router Test

Project Directory = ../
Default File Format = TAB_DELIMITED
Time of Day Format = HOUR_CLOCK
Model Start Time = 6:00
Model End Time = 10:00
Units of Measure = ENGLISH
Random Number Seed = 1369837380
Number of Threads = 2
Warning: Router is Not Thread Enabled

Input System Network Files:
Node File = ../network/node.txt
Link File = ../network/link.txt
Pocket File = ../network/pocket.txt
Connection File = ../network/connection.txt
Parking File = ../network/parking.txt
Location File = ../network/location2.txt

Input System Demand Files:
Selection File = ../demand/select.txt
Link Delay File = ../results/1.linkdelay.txt
Vehicle Type File = ../inputs/vehicle_type.txt
Vehicle File = ../demand/vehicle.txt
Trip File = ../demand/trip.txt
Plan File = ../demand/1.plans.* (2 partitions)

Output System Demand Files:
New Link Delay File = ../results/2.linkdelay.txt
```

```
New Problem File = ../demand/router_problems.txt
New Plan File = ../demand/2.plans.*

Notes And Name Fields = TRUE

Data Service Controls:
Number of Time Periods = 16

Flow-Time Service Controls:
Update Flow Rates = FALSE

Update Travel Times = TRUE
Link Delay Update Rate = -1

Equation Parameters 1 = BPR, A=0.15, B=4.00, C=0.75

Path Building Parameters:
Impedance Sort Method = FALSE
Walk Path Details = TRUE
Limit Parking Access = TRUE
Ignore Time Constraints = TRUE
Percent Random Impedance = 0.00 percent

Walk Speed = 3.28 fps

Default Parking Duration = 2.0 hours

Local Facility Type = EXTERNAL
Max Circuity Ratio = 0

Select Service Controls:
Router Control Keys:
Number of Node File Records = 57
Number of Link File Records = 72
Number of Directional Links = 114
Number of Pocket File Records = 30
Number of Vehicle Type File Records = 14
Number of Connection File Records = 190
Number of Parking File Records = 192
Number of Location File Records = 192
Number of Selection File Records = 28251
Number of Link Delay File Records = 1021
Number of Link Direction Records = 1021
Number of Link Connection Records = 0

Number of Summary Time Periods = 16
Percent of Link Periods with Travel Time Data = 56.0%
Percent of Time Periods with Link Delay Data = 56.3%

Number of Vehicle File Records = 28251

Link Convergence Gap = 0
Trip Convergence Gap = 0.0705539
```

```
New Link Delay File Records = 0

Number of Travel Time Updates = 1

Number of Trip File Records    = 28251
Number of Trip File Households = 28251
Number of Trip File Persons    = 28251
Number of Trip File Tours      = 28251
Number of Trip File Trips      = 28251
Number of Plan File Partitions = 2
Number of Plan File Records    = 315122
Number of Plan File Households = 28251
Number of Plan File Persons    = 28251
Number of Plan File Tours      = 28251
Number of Plan File Trips      = 28251

Number of New Plan File Partitions = 2
Number of New Plan File Records    = 310187
Number of New Plan File Households = 28251
Number of New Plan File Persons    = 28251
Number of New Plan File Tours      = 28251
Number of New Plan File Trips      = 28251

Wed May 29 10:23:07 2013 -- Process Complete with 1 Warning (0:00:07)
```