TRANSIMS Version 5
Demand Files

January 20, 2011

David Roden – AECOM

Topics

- Overall goals and objectives

- Primary changes

- Trip, tour and activity models

- New data fields and features

- Presentation graphics

Overall Goal and Objectives

- Simplify and clarify the user interface
  - Standardize control keys and key definitions
  - Reduce the number of file types and data dependencies

- Minimize application complications
  - Streamline the application process and make it more robust

- Improve accuracy and fidelity
  - Preserve more information for analysis and decision making
    - Minimize estimates and approximations

- Expand functionality and flexibility
  - Add fields to incorporate tour-based controls
  - Improve feedback options for activity/tour-based models

Primary Changes

- Plan file structure and level of detail
- Combined activity and trip files
- Combined household and population files
- Consistent mode codes
- Volume → flow rate
- Vehicle type codes
- Vehicle numbering
- Record selection structure

Trip, Tour and Activity Models

- **Activity Models**
  - Travel is a bi-product
    - Travel time is implied
  - Example:
    - Activity 1 – home
      - Start, end, location
    - Activity 2 – work
      - Start, end, location, mode
    - Activity 3 – lunch
      - Start, end, location, mode
    - Activity 4 – work
      - Start, end, location, mode
    - Activity 5 – home
      - Start, end, location, mode

- **Trip/Tour Models**
  - Activities are a bi-product
    - Activity duration is implied
  - Example:
    - Trip 1 – home to work
      - Start, end, org, des, mode
    - Trip 2 – work to lunch
      - Start, end, org, des, mode
    - Trip 3 – lunch to work
      - Start, end, org, des, mode
    - Trip 4 – work to home
      - Start, end, org, des, mode

TRANSIMS Evolution

- **TRANSIMS Versions 1-3**
  - Only Activities (itinerate/vehicle trips → two activities)
  - Activity Generator → Activity file

- **TRANSIMS Version 4**
  - Supports Activity and Trip files
  - ActGen → Activity file and ConvertTrips/ConvertTours → Trip files
    - Most simulation studies use only trip files
  - Router processes the Trip file and then the Activity file
    - Vehicle files must be merged

- **TRANSIMS Version 5**
  - Only Trips (with activity durations and scheduling constraints)
    - Simplify processing and focus on travel considerations

Trip File

- ## Version 5 changes
  - Trip and activity files consolidated into an enhanced trip file
    - OD location/time + activity duration and scheduling constraints
  - Simplifies user interface, data processing, and software applications

Activity-Related Data		Trip-Related Data	
Household	10	Trip Number	1
Person Number	1	Trip Start Time	8:32:05
Tour Number	1	Trip End Time	8:58:10
Activity Duration	0:00	Origin Location	123
Activity Purpose	1	Destination Location	543
Activity Constraint	Start	Travel Mode	Drive
Activity Priority	Medium	Vehicle Number	1
Traveler Type	0	Num. of Passengers	0

Version 4 Mode Codes

- **Trip Modes**
  - 1 = Walk
  - 2 = Drive alone
  - 3 = Transit (bus)
  - 4 = Transit (rail)
  - 5 = Park-&-ride outbound
  - 6 = Park-&-ride inbound
  - 7 = Bicycle
  - 8 = Magic move
  - 9 = School bus
  - 10 = 2 person carpool
  - 11 = 3 person carpool
  - 12 = 4+ person carpool
  - 13 = Kiss-&-ride outbound
  - 14 = Kiss-&-ride inbound

- **Plan Modes**
  - 0 = Drive
  - 1 = Transit
  - 2 = Walk
  - 3 = Bicycle
  - 4 = Activity
  - 5 = Other
  - 6 = Magic move
  - 7 = Carpool
  - 8 = Transit driver

Version 5 Mode Codes

- **Trip and Plan Modes**

  0 = Wait (transit stops or activities)

  1 = Walk

  2 = Bicycle

  3 = Drive

  4 = Ride (auto passenger)

  5 = Transit

  6 = Park-&-ride outbound

  7 = Park-&-ride inbound

  8 = Kiss-&-ride outbound

  9 = Kiss-&-ride inbound

  10 = Taxi

  11 = Other (magic move, …)

  12 = 2 person carpool (HOV2)

  13 = 3 person carpool (HOV3)

  14 = 4+ person carpool (HOV4)

Household File

- Version 5 changes
  - Household and Population files → nested Household file
    - Tighter record management and fewer coding inconsistencies
    - Provides traveler type scripts with access to household and person attributes
  - Few default fields – user-defined fields added as needed

HHold	Location	Persons	Workers	Vehicles	
Person	Age	Relate	Gender	Work	Drive
1	3968	1	1	1	
1	25	1	Male	True	True
2	1862	1	1	1	
1	25	1	Male	True	True

Vehicle File

- ## Version 5 changes
  - Vehicle ID → household number and household vehicle number
    - Default Version 4 conversion: if (ID > 9) vehicle = ID % 10 + 1
  - Location → parking (same value, different field name)
  - Version 4 vehicle type and subtype → Version 5 vehicle type
    - Default Version 4 conversion: type = vehtype * 10 + subtype
      - Problematic for vehicles types > 9 (often used for HOV)

HHold	Vehicle	Parking	Type
1	1	3968	1
2	1	1862	1
3	1	3966	1

Vehicle Type File

- ## Version 5 changes
  - Subtype removed → simple type index (1..99)
    - Default Version 4 conversion: type = vehtype * 10 + subtype
  - Operating cost and vertical grade impacts added

Vehicle Attributes	Passenger Processing
Type Number	Capacity
Vehicle Length	Loading Rate
Maximum Speed	Unloading Rate
Maximum Acceleration	Loading Method
Maximum Deceleration	Minimum Dwell Time
Use Restrictions	Maximum Dwell Time
Operating Cost	
Grade 1..10	

Selection File

- ## Version 5 changes
  - Household list and household record files → selection file
  - Household, person, tour, and trip selection options
    - If person, tour, or trips fields are zero, selects all records
      - Person = 0 → selects all persons in the household
  - May also include a traveler type and partition number fields

HHold	Person	Tour	Trip	Type	Partition
174	1	1	1	0	0
174	2	1	1	1	0
194	1	1	1	1	0
225	1	1	1	1	1
226	1	1	1	1	2

Partitions

- ## Version 5 changes
  - Household, Trip, Vehicle, Selection, Plan, Problem, and Skim files may be partitioned
  - Partitioned files use the partition number as a filename extension
    - name.0, name.1, name.*, …
    - Improve clarity and minimize case sensitive issues for Linux filenames
  - Partition extensions are no longer implied in control keys
    - Must include name.* or a partition number in the filename
  - Version 4 partition extensions can be read as input files
    - name.tAA, name.tAB, name.t*, …
    - name.AA, name.AB, name.*, …

Plan File

- ## Version 5 changes
  - Version 4 Plan files must be converted for use in Version 5
    - NewFormat program
  - Node/Link types and traveler scaling factor problems are eliminated
  - All trip data and path legs are stored in a single nested record
    - Eliminates problems created by incomplete trips
    - Simplifies comparisons, update processing and sorting
  - Stores detailed information about each component of the path
    - Provides greater accuracy and fidelity
    - Eliminates data estimates and approximations
    - Facilitates more detailed analysis of congested locations
  - Significantly larger plan file with much more information
    - Binary format should be used for most production runs

Plan File Structure

- The primary trip record includes
    - A full copy of the input trip file record
    - Path departure and arrival times
    - Trip travel time by mode (walk, drive, transit, wait, other)
    - Total trip length, cost, and impedance

- The nested path records include
    - Mode, ID type, facility ID, travel time, distance, cost and impedance for each leg / link on the path

Plan Data Fields

Primary Trip Record			Nested Records
Activity-Related Data	Trip-Related Data	Router-Related Data	Path-Related Data
Household	Trip Number	Departure Time	Leg Mode
Person Number	Trip Start Time	Arrival Time	Leg Type
Tour Number	Trip End Time	Activity Time	Leg Record ID
Activity Duration	Origin Location	Total Walk Time	Leg Travel Time
Activity Purpose	Destination Location	Total Drive Time	Leg Length
Activity Constraint	Travel Mode	Total Transit Time	Leg Cost
Activity Priority	Vehicle Number	Total Waiting Time	Leg Impedance
Traveler Type	Num. of Passengers	Total Other Time	
		Trip Length	
		Total Cost	
		Total Impedance	
		Number of Path Legs	

Primary Trip Record – Start Constraint

- Forward path building → travel time → end time

Activity-Related Data		Trip-Related Data		Router-Related Data	
HHold	3	Trip	1	Depart	**0:06:59**
Person	1	Start	**0:06:59**	Arrive	0:08:43
Tour	1	End	0:10:44	Activity	0:00
Duration	0:00	Origin	12	Walk	30.4
Purpose	1	Destination	20	Drive	23.4
Constraint	**START**	Mode	DRIVE	Transit	0
Priority	MEDIUM	Vehicle	1	Wait	0
Type	0	Passengers	0	Other	50
				Length	1100
				Cost	202.4
				Impedance	7300
				Num_Legs	7

Primary Trip Record – End Constraint

- Backward path building → travel time → start time

Activity-Related Data		Trip-Related Data		Router-Related Data	
HHold	3	Trip	1	Depart	0:09:00
Person	1	Start	0:06:59	Arrive	**0:10:44**
Tour	1	End	**0:10:44**	Activity	0:00
Duration	0:00	Origin	12	Walk	30.4
Purpose	1	Destination	20	Drive	23.4
Constraint	**END**	Mode	DRIVE	Transit	0
Priority	MEDIUM	Vehicle	1	Wait	0
Type	0	Passengers	0	Other	50
				Length	1100
				Cost	202.4
				Impedance	7300
				Num_Legs	7

Sample Path Legs

- Walk→Parking→Drive→Parking→Walk
  - walking on location setback links
  - drive link path with travel time, distance, auto operating cost, and impedance for each link
  - time to unpark and park the car plus a $2.00 parking fee.

LEG_MODE	LEG_TYPE	LEG_ID	LEG_TIME	LEG_LENGTH	LEG_COST	LEG_IMPED
WALK	LOCATION	12	15.2	50	0	304
OTHER	PARKING	12	20	0	0	300
DRIVE	LINK	12	7.8	333	0.8	632
DRIVE	LINK	13	11.7	500	1.2	993
DRIVE	LINK	14	3.9	167	0.4	316
OTHER	PARKING	20	30	0	200	4450
WALK	LOCATION	20	15.2	50	0	304

Chicago RTSTEP TRANSIMS Model

Skim File

- ## Version 5 changes
  - Skim files include OD size and time period meta-data
  - Partitioned time periods or merged time periods
  - Location or zone-based origins and destinations
  - Total travel time or time components (walk, drive, transit, wait, other)
  - Trip length, cost, and impedance
  - User-specified output units (e.g., minutes, miles)

NUM_ORG=16, NUM_DES=16, PERIODS=9:00..10:00, 11:00..12:00							
ORIGIN	DESTIN.	PERIOD	COUNT	TIME	LENGTH	COST	IMPED.
1	1	0	16	0.92	2117	0	3856
1	2	0	64	2.33	5297	0	9623
16	16	0	64	0.81	1690	0	3139
1	1	1	16	0.92	2117	0	3856

Link Delay and Performance Files

- **Version 5 changes**
  - Version 3 link-delay files are no longer supported
  - Version 4 link-delay files → Version 5 performance files
  - Volume → flow rates
    - Vehicles exiting the link → vehicle-miles / link length (flow rate)
  - Version 5 link-delay file → flow rates and travel times only

LINK	DIR	START	END	FLOW	TIME	NCONNECT
OUT_LINK	OUT_FLOW	OUT_TIME				
7	0	0:00	0:15	36.8	4	1
10	49	4				
10	0	0:00	0:15	71.2	11	1
11	75.9	11.2				

Snapshot File

- ## Version 5 changes
  - Vehicle ID → Household + vehicle number
  - Vehicle type / subtype → vehicle type index
  - Driver, acceleration, and user fields dropped
  - X, Y, Z, and bearing fields are optional
  - Records for each vehicle cell position are optional

HHOLD	VEHICLE	CELL	TIME	LINK	DIR	LANE	OFFSET	SPEED	PASS.	TYPE
953	1	0	0:00:45	13	0	1	200	34.1	0	1
3066	1	0	0:00:45	12	0	3	450	34.1	0	4
3066	1	1	0:00:45	12	0	3	425	34.1	0	4
3066	1	2	0:00:45	12	0	3	400	34.1	0	4
953	1	0	0:00:46	13	0	1	250	34.1	0	1

Presentation Graphics

OCCUPANCY

- 3 - 43
- 44 - 95
- 96 - 138
- 139 - 172
- 173 - 238

Truck

15

Auto