SACSIM/08
Activity-Based Travel Forecasting Model for SACOG
Featuring ***DaySim***—the Person Day Activity and Travel Simulator

Technical Memo Number 10
DaySim08 Documentation
August 13, 2008 – Draft 8

Prepared for

Sacramento Area Council of Governments

Prepared by

John L. Bowman, Ph. D.
Transportation Systems and Decision Sciences
28 Beals Street, Brookline, MA 02446 USA
+1-617-232-8189 John_L_Bowman@alum.mit.edu http://JBowman.net

Mark Bradley
Bradley Research & Consulting
524 Arroyo Ave., Santa Barbara, CA 93109, USA.
+1-805-564-3908 mark_bradley@cox.net

This memo updates the previous draft to reflect DaySim enhancements incorporated into the 2008 version of DaySim, called DaySim08. The memo contains the following sections:

- A summary of the structure of the DaySim simulation program
- Summaries of the DaySim input and output files
- Instructions for running the DaySim program.

This memo does not describe how the DaySim executable program is implemented inside the Cube/TP+ framework. That is the subject of a separate technical memo.

Summary of the DaySim Program Structure

DaySim is a custom program written in the Delphi 2005 Pascal language for the Windows 32 bit platform. (Note that he Delphi 2005 Environment can compile both Pascal and C code within the same executable.)

Figure 1 is a summary of the program logic and looping structure.

Figure 1—DaySim models (numbered) within the program looping structure

Begin
  {Read run controls, model coefficients, TAZ data, LOS matrices,
    population controls, and Parcel data into memory}
  {Draw a synthetic household sample if specified}
  {Pre-calculate destination sampling probabilities}
  {Pre-calculate (or read in) TAZ aggregate accessibility arrays}
  {Open other input and output files}
  {Main loop on households}
    {Loop on persons in HH}
      {Apply model **1.1 Work Location for workers**}
      {Apply model **1.2 School Location for students**}
      {Apply model **1.1 Work Location for students**}
    {End loop on persons in HH}
    {Apply model **1.3 Household Auto Availability** }
    {Loop on all persons within HH}
      {Apply model **2.1 Activity Pattern** (0/1+ tours and 0/1+ stops)
        and model **2.2 Exact Number of Tours** for 7 purposes}
      {Count total home-based tours and assign purposes}
      {Initialize tour and stop counters and time window for the person-day before looping on tours}
      {If there are tours, loop on home-based tours within person in tour priority sequence,
          with tour priority determined by purpose and person type}
        {Increment number of home-based tours simulated for tour purpose (including current)}
        {Apply model **3.1 Tour destination**}
        {If work tour, apply model **3.2 Number and purpose of work-based subtours**}
        {Loop on predicted work-based sub tours and insert then tour array after current tour}
        {Apply model **3.3 Tour mode**}
        {Apply model **3.4 Tour primary destination arrival and departure times**}
        {Loop on tour halves (before and after primary activity)}
          {Apply model **4.1Half tour stop frequency and purpose**}
          {Loop on trips within home-based half tour (in reverse temporal order for 1st tour half)}
            {Increment number of stops simulated for stop purpose (including current)}
            {Apply model **4.2 Intermediate stop location**}
            {Apply model **4.3 Trip mode**}
            {Apply model **4.4 Intermediate stop departure time**}
            {Update the remaining time window}
          {End loop on trips within half tour}
        {End loop on tour halves}
      {End loop on tours within person}
      {Write output records for person-day and all tours and trips}
    {End loop on persons within household}
  {End loop on Households}
  {Close files}
  {Create usual work location flow validation statistics}
End.

Summary of the DaySim Input and Output Files

File 1: Parcel data input file. (File for year 2000. PARCEL00.DBF, has 703,799 records.)

IMPORTANT: DaySim can read these variables in any order, but the variable names must remain the same as given below: All values from the file are read in as integers, with no decimal.

Label	Definition
PARCELID	Parcel ID number
X_COORD	Xcoordinate – state plane feet
Y_COORD	Y coordinate – state plane feet
AREA_SQF	Area – square feet
TAZ	TAZ number
HOUSESP	Housing units – parcel (x 100)
HOUSESQ	Housing units – quarter mile radius (x 100)
HOUSESH	Housing units – half mile radius (x 100)
STUDK12P	Students K-12- parcel (x 100)
STUDK12Q	Students K-12– quarter mile radius (x 100)
STUDK12H	Students K-12– half mile radius (x 100)
STUDUNIP	Students University– parcel (x 100)
STUDUNIQ	Students University – quart. mile radius (x 100)
STUDUNIH	Students University – half mile radius (x 100)
NODES1Q	1 link nodes– quarter mile radius
NODES1H	1 link nodes– half mile radius
NODES3Q	3 link nodes– quarter mile radius
NODES3H	3 link nodes– half mile radius
NODES4Q	4+ link nodes– quarter mile radius
NODES4H	4+ link nodes– half mile radius
DIST_LRT	Distance to nearest LRT stop (miles x 100 -1 if none)
DIST_BUS	Distance to nearest bus stop (miles x 100, -1 if none)
PARKDY_P	Daily paid parking spaces- parcel
PARKDY_Q	Daily paid parking spaces- quarter mile radius
PARKDY_H	Daily paid parking spaces- half mile radius
PPRICDYP	Avg price daily parking- parcel (cts)
PPRICDYQ	Avg.price daily parking- quarter mile (cts)
PPRICDYH	Avg.price daily parking- half mile (cts)
PARKHR_P	Hourly paid parking spaces- parcel
PARKHR_Q	Hourly paid parking spaces- quarter mile radius
PARKHR_H	Hourly paid parking spaces- half mile radius
PPRICHRP	Avg price hourly parking- parcel (cts)
PPRICHRQ	Avg.price hourly parking- quarter mile (cts)
PPRICHRH	Avg.price hourly parking- half mile (cts)
EMPEDU_P	Education jobs – parcel (x 100)
EMPFOODP	Food service jobs – parcel (x 100)
EMPGOV_P	Government jobs – parcel (x 100)
EMPOFC_P	Office jobs – parcel (x 100)
EMPOTH_P	Other jobs – parcel (x 100)
EMPRET_P	Retail jobs – parcel (x 100)
EMPSVC_P	Service jobs – parcel (x 100)
EMPMED_P	Medical jobs – parcel (x 100)

EMPIND_P	Industrial jobs – parcel (x 100)
EMPTOT_P	Total jobs – parcel (x 100)
EMPEDU_Q	Education jobs – quarter mile radius (x 100)
EMPFOODQ	Food service jobs – quarter mile radius (x 100)
EMPGOV_Q	Government jobs – quarter mile radius (x 100)
EMPOFC_Q	Office jobs – quarter mile radius (x 100)
EMPOTH_Q	Other jobs – quarter mile radius (x 100)
EMPRET_Q	Retail jobs – quarter mile radius (x 100)
EMPSVC_Q	Service jobs – quarter mile radius (x 100)
EMPMED_Q	Medical jobs – quarter mile radius (x 100)
EMPIND_Q	Industrial jobs – quarter mile radius (x 100)
EMPTOT_Q	Total jobs – quarter mile radius (x 100)
EMPEDU_H	Education jobs – half mile radius (x 100)
EMPFOODH	Food service jobs – half mile radius (x 100)
EMPGOV_H	Government jobs – half mile radius (x 100)
EMPOFC_H	Office jobs – half mile radius (x 100)
EMPOTH_H	Other jobs – half mile radius (x 100)
EMPRET_H	Retail jobs – half mile radius (x 100)
EMPSVC_H	Service jobs – half mile radius (x 100)
EMPMED_H	Medical jobs – half mile radius (x 100)
EMPIND_H	Industrial jobs – half mile radius (x 100)
EMPTOT_H	Total jobs – half mile radius (x 100)

File 2: Zonal data input file: (The file for 2000, ZONDAT00.DBF, has 1309 records).

IMPORTANT: DaySim can read these variables in any order, but the variable names must remain the same as given below: All values from the file are read in as integers, with no decimal.

Label	**Definition**
TAZ	Zone number
AUTACC	Auto access time (min x 100) *
AUTEGR	Auto egress time (min x 100) *
PRKCOST	Parking cost in zone (cents/hour) *
DAVIS	Davis dummy (0/1)
PEDENV	Pedestrian environment score *
PUMA	PUMA code for zone
RAD	RAD code for zone
XCORD	X coordinate of zone centroid (state plane ft)
YCORD	Y coordinate of zone centroid (state plane ft)
PKNRCOST	Park and ride lot cost in zone (cents)
SQFT_Z	Area of zone (square feet)

* not used in models

Level of service files

Currently, all level of service files are space delimited ASCII files with no header record. All values are integer values, with no decimal.

File 3: Walk skim file

Label	Definition
ORIG	Origin zone
DEST	Destination zone
WALKDIST	Walk distance (miles x 100)

Files 4 and 5: AM peak and PM peak highway skims

Label	Definition
ORIG	Origin zone
DEST	Destination zone
D1TIME	SOV time (minutes x 100)
D1DIST	SOV distance (miles x 100)
D1EXTT	SOV congested time 1 (minutes x 100)
D1EXTT2	SOV congested time 2 (minutes x 100)
D1TOLL	SOV toll (cents)
D2TIME	HOV+ time (minutes x 100)
D2DIST	HOV distance (miles x 100)
D2EXTT	HOV congested time 1 (minutes x 100)
D2EXTT2	HOV congested time 2 (minutes x 100)
D2TOLL	HOV toll (cents)

File 6 and 7: Midday and evening highway skims

Label	Definition
ORIG	Origin zone
DEST	Destination zone
D1TIME	SOV time (minutes x 100)
D1DIST	SOV distance (miles x 100)
D1EXTT	SOV congested time 1 (minutes x 100)
D1EXTT2	SOV congested time 2 (minutes x 100)
D1TOLL	SOV toll (cents)

Note: Only the peak periods have separate HOV skims. HOV 2 is set to equal SOV for the off-peak periods. HOV 3+ is set to equal HOV 2 for all periods.

Files 8-10: AM peak, midday and evening walk to transit skimw (only OD pairs with valid transit paths have records in the file)

Label	Definition
ORIG	Origin zone
DEST	Destination zone
XFNUMW	Number of transfers
XFTIMW	Transfer time (min. x 100)
FWTIMW	First wait time (min. x 100)
FAREW	Fare (cents)
TRDISW	In-vehicle distance (miles x 100) *
WATIMW	Walk time (min x 100) *
TRTIMW	In-vehicle time (min x 100)

* not used in models

The reverse directions of the AM peak paths are used for the PM peak. Walk time is not used in the models because we have parcel-specific walk distances to transit.

Files 11 and 12: Peak and off-peak drive to transit skims (only OD pairs with valid transit paths have records in the file)

Label	Definition
ORIG	Origin zone (Drive end)
DEST	Destination zone (Walk end)
PKTAZD	Park and ride lot zone number
XFTIMD	Transfer time (min x 100)
FWTIMD	First wait time (min x 100)
DRTIMD	Drive access time (min x 100)
FARED	Fare (cents)
DRDISD	Drive access distance (miles x 100)
TRDISD	In-vehicle distance (miles x 100) *
WATIMD	Walk egress time (min x 100) *
XFNUMD	Number of transfers
TRTIMD	In-vehicle time (min x 100)

* not used in models

The reverse directions of the AM peak paths are used for the PM peak, but the drive portion is assumed to be egress in the PM peak. Walk time is not used in the models because we have parcel-specific walk distances to transit.

Files for generating synthetic population

File 13: CTPP Table 1-75 file:

The CTPP table is read from file a dBase IV-format file with 66 data fields for each of the 1309 SACOG zones:

- 1: The TAZ number
- 2-66: The number of households in the TAZ in 2000 for each of the 65 non-empty sampling cells. (Loop on HH size, then HH workers, then HH income)

File 14: PUMS data input file PUMSSRT, 95,684 records, sorted by PUMA and SCELL . All values are integer.

Variable	Definition	Minimum	Maximum	Mean
1. SERIALNO	PUMS household ID	290	9999952	5030100.77
2. PNUM	Person number within household	1	16	2.27
3. PUMA	PUMA code	800	1700	1398.33
4. SCELL	Sampling cell	1	80	50.16
5. PERSONS	# of persons in household	1	16	3.55
6. TENURE	Ownership status	0	4	1.83
7. BLDGSZ	Residence building size/type	0	10	2.83
8. P65	# of persons age 65+	0	6	.24
9. P18	# of persons age under 18	0	12	1.32
10. NPF	# of persons part of family	0	15	3.16
11. NOC	# of own children in the household	0	12	1.16
12. HINC	Household income ($)	-20000	838900	62698.89
13. VEHICL	# of vehicles owned by household	0	6	1.93
14. RELATE	Relationship to householder	1	23	3.77
15. SEX	Gender	1	2	1.51
16. AGE	Age	0	93	35.21
17. GRADE	Current education school type	0	7	1.28
18. HOURS	Hours worked per week	0	99	19.97
19. WORKER	Employed worker?	0	1	.44
20. STUDENT	Enrolled student?	0	1	.30
21. NWORKERS	# of employed workers in household	0	8	1.41
22. NSTUDENT	# of enrolled students in household	0	10	1.31
23. EXFAC	Expansion factor (assigned later)	1	1	1.00

File 15: Synthetic sample output file: This is the output file from the synthetic sample generator. The name of the file is given when the file is created by that program. The exact households in the file will change if the generator is run with a different random seed. The number of households in the file will change, and the EXFAC values will change, if the generator is run with a different expansion factor. The fields in the file are identical to those in the PUMSSRT input file, with the following exceptions:

Item 3: PUMA is replaced by HHTAZ – the residence TAZ number.

Item 4: SCELL is replaced by HHCEL – the residence parcel number.

Codes for the categorical variables are:

TENURE 0 'vacant or GQ' 1 'owned with mortgage' 2 'owned free and clear' 3 'rented with payment' 4 'rented free of charge'.

BLDGSZ 1 'mobile home' 2 'detached house' 3 'attached house' 4 '2 unit apartment bldg' 5 '3-4 unit apartment bldg' 6 '5-9 apartment bldg; 7 '10-19 apartment bldg' 8 '20-49 apartment bldg' 9 '50+ apartment bldg' 10 'boat, RV, van, etc'

RELATE 1 'householder' 2 'spouse' 3 'child' 4 'adopted' 5 'stepchild' 6 'sibling' 7 'parent' 8 'grandchild' 9 'parent in law' 10 'child in law' 11 'other relative' 12 'sibling in law' 13 nephew/niece' 14 'grandparent' 15 'aunt/uncle' 16 'cousin' 17 'boarder' 18 'housemate' 19 unmarried partner' 20 'foster child' 21 'other non-rel' 22 'inst GQ' 23 'non-inst GQ'

SEX 1 'male' 2 'female'/

GRADE 0 'not enrolled' 1 'nursery/preschool' 2 'kinderg.' 3 'grade1-4' 4 'grade5-8' 5 'grade 9-12' 6 'college undergrad' 7 'grad school'

We will add the variable PERSTYPE, which has the following codes:
PERSTYPE 1 'full time worker' 2 'part time worker' 3 'retired' 4 'other non-worker' 5 'university student' 6 'driving age child' 7 'child 5-15' 8 'child under 5'

Input file of travel by external workers and university students

File 16: Input file of external workers and university students. (ix-xi text file)

This is a space- or tab-delimited ascii file with no header record, having one record per pair of external gateway zone and internal zone. Each record has the following data items:

Data item	format
1 External gateway zone	integer
2 Internal zone	integer
3 workers ix	real
4 workers xi	real
5 personal business trips ix	real
6 personal business trips xi	real
7 shop trips ix	real
8 shop trips xi	real
9 social-recreational trips ix	real
10 social-recreational trips xi	real
11 university students ix	real
12 university students xi	real

Each record provides DaySim with estimates of the numbers of:

- workers living in the internal zone who travel via the gateway zone to work outside the region (workers ix)
- workers living outside the region who travel via the gateway zone to work in the internal zone (workers xi)
- university students living outside the region who travel via the gateway zone to school in the internal zone (university students xi)

DaySim uses only data items 1, 2, 3, 4, and 12, but requires them to be in those positions.

Output Files

The person, tour and trip level output files contain all of the variables predicted by DaySim, plus enough ID variables to cross-reference each other and the input data files in order to append more information if necessary.

File 17: DaySim output file at person-day level. Name supplied by user There will be as many records as there are input records in the synthetic sample, unless households are sub-sampled within DaySim.

(File structure defined in PFILETEMPLATE.DBF)

Label	Definition
SAMPN	Household ID (same as input SAMPNO)
PERSN	Person sequence number within HH (same as input PNUM)
HHTAZ	Residence zone (same as input HZONE)
HHCEL	Residence parcel ID (same as input HPARCEL)
HHSIZE	# persons in the household (same as input PERSONS)
HHCARS	# vehicles in the household – predicted
UWTAZ	Usual work zone – predicted
UWCEL	Usual work parcel – predicted
USTAZ	Usual school zone – predicted
USCEL	Usual school parcel – predicted
NTOURS1	Number of work tours – predicted
NTOURS2	Number of school tours – predicted
NTOURS3	Number of escort tours – predicted
NTOURS4	Number of personal business tours – predicted
NTOURS5	Number of shopping tours – predicted
NTOURS6	Number of meal tours – predicted
NTOURS7	Number of social/recreation tours – predicted
NSTOPS1	Number of work stops – predicted
NSTOPS2	Number of school stops – predicted
NSTOPS3	Number of escort stops – predicted
NSTOPS4	Number of personal business stops – predicted
NSTOPS5	Number of shopping stops – predicted
NSTOPS6	Number of meal stops – predicted
NSTOPS7	Number of social/recreation stops – predicted
WBTOURS	Number of work-based subtours – predicted
EXPFAC	Expansion factor (same as EXFAC x subsample rate)
WORKER	Worker dummy variable
PERSTYPE	Person type code
HHINCOME	Household income ($)
HHWORKERS	Household # workers

PERSTYPE codes 1 = full time worker, 2 = part time worker, 3 = non-worker age 65+, 4 = other non-worker/non-student adult, 5 = university student, 6 = grade school student age 16+, 7 = child age 5-15, 8 = child age 0-4

File 18: DaySim output file at tour level: One output record per tour. Named by user.

(File structure defined in TFILETEMPLATE.DBF)

Label	Definition
SAMPN	Household ID (same as input SAMPNO)
PERSN	Person sequence number within HH (same as input PNUM)
TOURNO	Tour sequence number within person day
TOURPURP	Tour purpose (1 to 7)
PRNTTOUR	Work-based subtour "parent" work tour ID (0 for home-based)
PDTAZ	Tour primary destination zone – predicted
PDCEL	Tour primary destination parcel – predicted
TIMARRPD	Tour primary destination arrival time (HHMM) – predicted
TIMDEPPD	Tour primary destination departure time (HHMM) – predicted
MAINMODE	Tour main mode – predicted
TRIPSH1	Tour # of trips in first half tour – predicted
TRIPSH2	Tour # of trips in second half tour – predicted
SUBTOURS	Tour # of subtours – predicted
EXPFAC	Expansion factor (same as EXFAC x subsample rate)

File 19; DaySim output file at trip segment level: One output record per trip. Named by user.

(File structure defined in SFILETEMPLATE.DBF)

Label	Definition
SAMPN	Household ID (same as input SAMPNO)
PERSN	Person sequence number within HH (same as input PNUM)
TOURNO	Tour sequence number within person day
TOURHALF	Tour half (1=outbound, 2=return)
TRIPNO	Trip sequence number within half-tour
OTAZ	Trip origin zone – predicted
OCEL	Trip origin parcel – predicted
DTAZ	Trip destination zone – predicted
DCEL	Trip destination parcel – predicted
MODE	Trip mode – predicted
OPURP	Trip origin activity purpose (1-7 as above, or 8=home)
DPURP	Trip destination activity purpose (1-7 as above, or 8=home)
DEPTIME	Trip departure time – predicted (HHMM)
ARRTIME	Trip arrival time – predicted (HHMM)
TRAVTIME	Trip door-to-door travel time (min)
TRAVTIME	Trip travel distance (miles)
EXPFACT	Expansion factor (same as EXFAC x subsample rate)

TOURPURP, OPURP and DPURP codes 1 'work' 2 'school' 3 'escort' 4 'personal bus' 5 'shopping' 6 'meal' 7 'social/recreation' 8 'home'

MAINMODE and MODE codes 1 'drive-transit-walk' 2 'walk-transit-drive (NA to tours)' 3 'walk- transit-walk' 4 'school bus' 5 'shared ride 3+' 6 'shared ride 2' 7 'drive alone' 8 'bike' 9 'walk'

The Coefficient File

The coefficient file is a text file that can be edited by the user to change calibration parameters, etc. The rules for editing the file are listed below, as illustrated in the example for the escort tour mode choice model:

- Each new model is headed by the line beginning with 'MOD' and the model number. The model number is fixed and should not be changed.
- After the next END line, the coefficients for the model are read in until the coefficient number -1 is encountered.
- Each coefficient line has the following format:
    - The coefficient number
    - Text, which can take up to 13 columns following the coefficient number (this text is not used by the program, but is left in to identify the coefficients to the user).
    - The coefficient value.
    - Any number or text following the coefficient value are ignored.

This format is used because it allows ALOGIT F12 results files to be easily cut and paste into the document. The user may add any notation or change any text as long as the formatting rules above are maintained.

```
-1

MOD 11  Escort tour mode choice
escort tours/trips
Created by ALOGIT version 4                              8:49:55 on  8 Sep 05
END
   7  gentime   F   -.502636132834E-01   .859295510405E-02
  30  s3-const  F   -.629282751265       .744354067396
  31  s3-hhcu5  F    .914561417054       .158496547918
  32  s3-hh515  F    .469400739150       .663633902320E-01
  33  s3-hhdas  F   -.372189286652       .133592974523
  40  s2-const  F    .267161741959       .738326108546
  41 sr-nocars  F   -5.91396318749       1.72117862426
  73 wk-ageo50  F   -.702700257428       .731158280759
  76  wk-dintd  F    .200904651012E-01   .704090953980E-02
  81  wk-hhcu5  F    .986136967403       .365736474452
  82  wk-hh515  F    .437492616128       .189918080282
  83  wk-hhdas  F   -1.62564334857       .564280951324
  -1

MOD etc…
```

Running DaySim

The current version of the DaySim program is DaySim08.

The program is run from the DOS-type command line, using the command

DAYSIM08.EXE [control file name] [param1=x] [param2=y] ….

The control file name is the name of a text file containing various switch and file name settings. If no control file name is given, the default name is DAYSIM.CTL, in the same directory as the executable.

The option parameters are the same control codes that are in the control file, and must be in the format CODE=argument, with no spaces, where CODE is the 6 letter control code as listed below, and argument is the text (filename or directory name) or integer value that is expected according to the code. For example, the command

DAYSIM08.EXE run22.ctl HHSRAT=10 HHSBEG=3

will use only the 3rd out of every 10 households in the synthetic sample (and will multiply the expansion factors by 10 to adjust for the sampling rate). Any control that can be put in the control file can also be put on the command line.

The following two pages show example lines from a control file with all of the codes recognized by DaySim. The default value and a description are shown for each control.

All of the lines except for the italicized ones would be valid lines in a control file. The formatting rules for a control line are:

- A valid six letter code (can be any combination of upper and lower case)
- One or more spaces and/or equals signs
- The code argument – an integer or a file name or a directory name
- One or more spaces
- Any comment or blank (this is ignored by the program)
- Only the RUNLAB argument with the run name can include spaces.

Following the example control statements are additional explanations of how the user control various aspects of DaySim via the control file.

CODE Default value Comment

Run label (can include spaces)

```
RUNLAB DaySim run
```

Directory and file name controls (files are shown grouped with their parent directory)

```
PRFDIR c:\daysim\     /Directory supplying string substitute for ? in control file filenames
PREFFN TPPL.prj       / name of text file supplying string substitute in its first line of text
PREFPO 1              / position in first line of PREFFN on which string substitute starts
PREFLE 4              / Length of string substitute on first line of PREFFN

RUNDIR c:\daysim\     / main directory holds executable and scenario-independent parameter files
COEFFI coeffs.txt     / model coefficient file

LOSDIR c:\daysim\     / level of service data file directory
LOSFTY 1              / level of service file type  1 = text  2 = TP+ (not currently supported)
WALKFN skwalk.txt     / walk skim matrix file
AMHWFN skauam.txt     / am peak highway skim matrix file
MDHWFN skaumd.txt     / midday highway skim matrix file
PMHWFN skaupm.txt     / pm peak highway skim matrix file
EVHWFN skauev.txt     / evening highway skim matrix file
PKWTFN sktwam.txt     / AM peak walk to transit skim matrix file (PM peak is transpose)
OPWTFN sktwmd.txt     / midday walk to transit skim matrix file
EVWTFN sktwmd.txt     / evening walk to transit skim matrix file
PKDTFN sktdam.txt     / AM peak drive to transit skim matrix file
OPDTFN sktdmd.txt     / off peak drive to transit skim matrix file
IXXIFN ixximat.txt    / ix-xi text file
HWFLFN hwflows.txt    / Validation input file with CTPP commuter flows

PCLDIR c:\daysim\     / parcel and zonal data  file directory
PCLFTY 2              / parcel file type  1 = text  2 = dBF
PARCFN pcl.dbf        / parcel file name
ZONEFN taz.dbf        / zonal fle name  (always a dbf file)

SAMDIR c:\daysim\     / population sample file directory
SAMFTY 2              / sample file type  0 = none 1 = HH survey sample  2 = synthetic sample
SAMPFN shh.dbf        / sample file name (if file type=2. If type=1 then file names are fixed)

CENDIR c:\daysim\     / census data directory for pop.syn.
CTPPFN marg.dbf       / CTPP table 1-75 data file
PUMSFN pumssrt.dbf    / PUMS records file for sampling

INPDIR c:\daysim\     / input file directory (for prior partial run results to be used as inputs)
PINPFN pin            / person-day file (dbf file, name automat. extended by THISND, and by '.dbf')
TINPFN tin            / tour file (dbf file, name automat. extended by THISND, and by '.dbf')
SINPFN sin            / trip file (dbf file, name automat. extended by THISND, and by '.dbf')

OUTDIR c:\daysim\     / output file directory
PRNTFN daysim         / print file (name automat. extended by THISND for Clusternode mode, and by .prn)
SHADFN shadowprice.dbf /shadow price file name (always a dbf file)
POUTFN pout           / person-day file (dbf file, name automat. extended by THISND, and by '.dbf')
TOUTFN tout           / tour file (dbf file, name automat. extended by THISND, and by '.dbf')
SOUTFN sout           / trip file (dbf file, name automat. extended by THISND, and by '.dbf')
POUVFN pout1          / person outp. to be validated (implicit '.dbf'; add '1' to POUTFN for local run)
ZOUTFN zout.dbf       / zonal validation file
EOUVFN celpred        / pred usu. work,K12 & Uni choices (parcel level) (name automat. extended by '.dbf')
EOUTFN eout.dbf       / employment validation file (parcel level)
V1OUFN hwflowrad.dbf  / Validation output file with Rad commuter flows
V2OUFN hwflowdist.dbf / Validation output file with District commuter flows
```

Process and model controls

```
RNMODE 1              / run mode  (1=local; 2=ClusterNode; 3=ClusterMerge)
CMMODE 1              / cluster merge mode (2=keep merged p,s,t output; 3=keep merged & node p,s,t output)
NCLNDS 1              / Number of nodes in cluster
THISND 1              / ID of this node (must satisfy 1<=THISND<=NCLNDS)

FIRSTM 1              / 1st & last models to run: 1-syn sampl;2-usuWork&Schl;3-autOwn;4-dayPatt;
FINALM 12             / 5-TDest;6-WBTGen;7-TMode;8-TTOD;9-SFreq;10-SLoc;11-TripMode;12-TripTime
PINPSW 0              / person-level file read switch (0=off, 1=on) required on for FIRSTM>2
TINPSW 0              / tour level file read switch (0=off, 1=on) required on for FIRSTM>5
SINPSW 0              / trip segment level file read switch (0=off, 1=on) required on for FIRSTM>9

PRINTS 1              / print log detail switch (0=almost none; 1=standard; 2-7=extra details)
POUTSW 1              / person-level file write switch (0=off, 1=on)
TOUTSW 1              / tour level file write switch (0=off, 1=on)
SOUTSW 1              / trip segment level file write switch (0=off, 1=on)
EOUTSW 0              / employment validation file & usu. w/s/u prediction file write switch (0=off, 1=on)
SHADSW 1              /shadow pricing switch (1=adjust shadow prices with local run or merge)
THLDUW 5              /if parcel tot empl.t>=THLDUW then UW shad price based on parcel, else based on zone
THLDUS 5              /if parcel k12 enrol.>=THLDUS then US shad price based on parcel, else based on zone
THLDUU 5              /if parcel uni enrol.>=THLDUU then UU shad price based on parcel, else based on zone
TOLPUW 10             /Targeted Percent tolerance for usual work loc prediction vs target (integer >=0)
TOLAUW 0              /Targeted Absolute tolerance for usual work loc prediction vs target (integer >=0)
TOLPUS 10             /Targeted Percent tolerance for usual k12 loc prediction vs target  (integer >=0)
TOLAUS 0              /Targeted Absolute tolerance for usual k12 loc prediction vs target  (integer >=0)
TOLPUU 10             /Targeted Percent tolerance for usual univ loc prediction vs target (integer >=0)
TOLAUU 0              /Targeted Absolute tolerance for usual univ loc prediction vs target (integer >=0)
NRPDIF 10             /Num parcels included in print file rpts of large pct and abs diffs (integer >=0)

VALIDS 0              / switch to run long term model validation output (0=off, 1=on)

PSSEED 12345          / random seed for pop sampling to generate synthetic population
NSBINS 9              / number of bins to use in pop.sampling to gerate synthetic population
SEXFAC 1              / pop.sampling expansion factor in synthetic population (currently fixed at 1)

RNSEED 12345          / seed for random number generator
HHSRAT 1              / hh sample sampling ratio (e.g 10 = simulate every 10th household)
HHSBEG 1              / hh sampling - postion first hh to use (e.g. 5 = start with 5th household)

WKLSSZ 100            / work location model dest. sample size
SCLSSZ 100            / school location model dest. sample size
WTDSSZ  50            / work tour destination model dest. sample size
OTDSSZ  50            / other tour destination model dest. sample size
ISLSSZ  50            / int. stop location model dest. sample size

DEBUGS 0              / debug switch (0=no debug, 1=debug mode)
SHOWID 0              / show current household number on screen (0=don't show, 1=show)
WAITEX 1              / wait at end of program (0=don't wait, 1=wait)
AGGLGS 1              / aggregate logsum switch  (1=calculate w/out writing, 2-calculate & write, 3=read)

AOCOST 12             / auto ownersip costs/mi(cts) ‘00:12; ‘05:15=25% real incr.; ‘35:20=66% real incr.
SOVAMT 0              / SOV am cordon toll
HOVAMT 0              / HOV am cordon toll
ND1PCT 0              / pct change in number of 1-link intersection nodes
ND3PCT 0              / pct change in number of 3-link intersection nodes
ND4PCT 0              / pct change in number of 4-link intersection nodes
```

User Control Enabled in the Control File

The following sections describe how the user can control DaySim via the control file. The notes appear in the same order as the controls to which they refer in the example control file.

Prefixes. If a file name or directory name contains a question mark (?), this is replaced by a prefix read from a file specified in the control file. By default it reads the first 4 characters in file TPPL.PRJ.

Directory and File Name Controls. Many controls identify for DaySim the directories and filenames of files that it uses and/or produces. In the control file example, all files are listed immediately after the directory in which DaySim assumes they reside.

Distributed Processing. A single run of DaySim can be divided among multiple processors by running in ClusterNode mode, with a separate run and customized controls for each node. The results can then be combined by running in ClusterMerge mode. (Note: Shadow prices are set during the ClusterMerge run and not during ClusterNode runs, because the combined results are required for setting the shadow prices.)

Partial Runs. By default, DaySim runs all of its models, in twelve steps, in the following sequence:

1- Synthetic sample generator
2- Usual work and school locations
3- Auto ownership
4- Day pattern / exact number of tours
5- Tour destination
6- Work-based subtour generation
7- Tour mode
8- Tour time of day
9- Stop frequency and purpose
10- Stop location
11- Trip mode
12- Trip departure time

However, the user can control the first and last models that are run, using the control switches **FIRSTM** and **FINALM**. DaySim will start with FIRSTM and run all subsequent models through FINALM. The following partial runs are likely to be especially useful:

FIRSTM	FINALM	USE
1	12	Run then entire model
2	12	Do multiple runs using the same synthetic population
2	3	Reiterate the long-term models so that usual work and school location models approach distribution targets using their shadow-pricing feature.
4	12	Analyze short-term effects by running short-term models only
7	12	Conduct FTA NewStarts alternatives analysis: Hold tour generation and destination choice fixed, while allowing tour mode and timing, and intermediate stop models to vary across alternative scenarios.

For partial runs, the user must supply input files that have been produced in prior runs:

Input File	FIRSTM NOT requiring the input file	FIRSTM requiring the input file
Person-day	1-2	3-12
Tour	1-5	7-12
Trip	1-9	10-12

The following **additional requirements** and restrictions apply:

1 The prior run supplying the input files must have run at least through the model immediately preceding FIRSTM, so that it provides all the needed inputs for the current run.

2 The prior and current runs must use the same sampling controls HHSRAT and HHSBEG, so that they work with the same households.

3 IF FINALM is 5 or greater, then the model system will automatically run through model 12, because the tour destination choice depends on time availability restrictions imposed by higher priority tour outcomes of models 6-12.

4 IF user selects FIRSTM of 6, then the model system will instead start with model 5 because model 5 determines tour destination for work-based tours after model 6 generates those tours.

Shadow Pricing. DaySim uses shadow pricing to balance the predictions of usual work and usual school locations with the exogenous distribution of employment and school enrollment (K-12 and university). A shadow price is a value that is added to the utility function of a parcel in the choice model, to increase or decrease its attractiveness. If a shadowprice file (containing all the shadow prices) is present in the output directory, DaySim uses it. If the shadow pricing switch in the control file is turned on (when DaySim is being run in Local Mode or ClusterMerge Mode), DaySim compares aggregate predictions to actual for each geographic unit, and creates or updates the shadow price file to be used the next time DaySim runs . (Note: Shadow prices are set during the ClusterMerge run and not during ClusterNode runs, because the combined results are required for setting the shadow prices.) For parcels with employment below a user-controlled threshold the shadow price is based on zonal employment and predictions; above the threshold it is based on the parcel employment and predictions. The same occurs for school and university enrollment.

In addition to setting the thresholds, the user can set parameters that are percentage and absolute tolerance levels above or below the exogenous employment and enrollment targets. These adjust the shadow pricing targets as follows.

If the prediction (Predict) is HIGHER than the original target (Target), then
New Target = MIN(Predict, Target x (1+P/100), Target + A)

If the prediction (Predict) is LOWER than the original target (Target), then
New Target = MAX(Predict, Target x (1-P/100), Target - A)

Note that if both P and A are set at 0, then the new target always equals Target. If P and A are set very large, then the new target always equals Predict, so the shadow price increment will be 0. The resulting shadow price is equal to LN(target/predicted).

Other input files

There are several required input files not listed in the control file that must be named as follows and included in the run directory:

- Pfiletemplate.dbf: Template for person level output file
- Tfiletemplate.dbf: Template for tour level output file
- Sfiletemplate.dbf: Template for trip level output file
- Zouttemplate.dbf: Template for zone level employment output file
- Eouttemplate.dbf: Template for parcel level employment output file
- Hwflowradtemplate.dbf: Template for rad level commute output file
- Hwflowdisttemplate.dbf: Template for district level commute output file
- celpredfiletemplate.dbf: Template for parcel predictions used for shadow pricing
- shadfiletemplate.dbf: Template for long term model shadow price file
- Trgen0702x.dat: Household survey data person-level input file
- Tours0702.dat: Household survey data tour-level input file
- Tsegs0702.dat: Household survey data trip-level input file

The last three files are only needed if the switch SAMFTY is set at 1 to use the household survey instead of a synthetic sample.