Caltrans District 6 & 10 Forecasting On-Call
Statewide Model and Air Quality
Wednesday, May 24, 2017
2:00 pm – 4:00 pm – On-line Meeting*
(reserved 2hrs to allow Q&A, with primary content targeted at 1hr)

1. **Introductions – 5 minutes**
   - Caltrans D6, D10, HQ
   - Amador, Calaveras, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin, Stanislaus, Tulare, Tuolumne
   - Consultants

2. **Questions on Homework Assignment – 10 Minutes**

3. **Air Quality – 10 Minutes**
   - Regional and Local Travel Model Output
   - Emissions Model and Auto Operating Cost

4. **Accessing Statewide Model – 10 Min**
   - Cube Cloud
   - Models
   - Contracts

5. **Downloading and Extracting Information– 20 Min**
   - Off-the shelf model files
   - Desktop and Cloud post-processing

6. **Modifying Inputs and Running Statewide Model – 20 Min**
   - Transportation System
   - Land Use
   - Running Model Scenario

7. **Integrating Statewide Model with Local Models – 20 Min**
   - Internal\External Gateway Weights
   - Through Trips

8. **Other Items and Wrap Up**

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https://global.gotomeeting.com/join/534416733

Use your microphone and speakers (VoIP) - a headset is recommended. Or, call in using your telephone.

Dial +1 (669) 224-3412
Access Code: 534-416-733

CAMBRIDGE SYSTEMATICS

California Statewide Travel Demand Model, Version 2.0

Model Development User's Guide

final system documentation:

technical note

prepared for

California Department of Transportation

prepared by

Cambridge Systematics, Inc.

with

HBA Specto, Inc.

June 2014

www.camsys.com

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Cambridge Systematics, Inc.
555 12th Street, Suite 1600
Oakland, CA 94607

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HBA Specto, Inc.

date

June 2014

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1.0 Introduction

This Users Guide is an update to the documentation for the 2009 California Statewide Travel Demand Model (CSTDM09), and includes any changes to the model application that Cambridge Systematics, Inc. (CS) implemented. The User Guide describes how the model is applied in the CUBE software environment to produce travel demand forecasts and resulting network loading outputs for a particular scenario. It is intended to serve as a reference document for travel modeling personnel using the model.

The complete CSTDM, Version 2.0 (CSTDMv2.0) documentation includes the 19 documents reported in Table 1.1, which were produced by Cambridge Systematics, Inc. and HBA Specto, Inc.

Table 1-1 Overview of CSTDMv2.0 Documentation

Document	File Name
Executive Summary	
Model Overview	*CSTDMv2_ModelOverview_Final.pdf*
Transportation Analysis Zones	*CSTDMv2_TAZ_LUZ_Final.pdf*
Network Preparation and Coding	*CSTDMv2_Networks_Final.pdf*
Zonal Properties	*CSTDMv2_ZonalProperties_Final.pdf*
Population, Employment School Enrollment	*CSTDMv2_Population_Final.pdf*
Parking Costs	*CSTDMv2_ParkingCost_Final.pdf*
Short Distance Personal Travel Model (SDPTM) Part 1	*CSTDMv2_SDPTM_Part1_Final.pdf*
Short Distance Personal Travel Model (SDPTM) Part 2	*CSTDMv2_ SDPTM_Part2_Final.pdf*
Short Distance Personal Travel Model (SDPTM) Part 3	*CSTDMv2_ SDPTM_Part3_Final.pdf*
Long Distance Personal Travel Model (LDPTM)	*CSTDMv2_LDPTM_Final.pdf*
Short and Long Distance Commercial Vehicle Model (LDCVM)	*CSTDMv2_LDCVM_Final.pdf*
External Travel Model (ETM)	*CSTDMv2_ETM_Final.pdf*
Travel Behavior Datasets	*CSTDMv2_TravelBehavior_Final.pdf*
Model Validation	*CSTDMv2_Validation_Final.pdf*
User Guide	*CSTDMv2v2_UserGuide_Final.pdf*

For additional information on the CSTDM travel model components, please refer to the documents reported in Table 1.1, which describe the individual model components in more detail.

The User Guide assumes a basic knowledge of the CUBE package of programs for travel model operation (CUBE Base, CUBE Voyager, and CUBE Cluster), as well as the ability to manipulate data in database formats.

2.0 Model Overview

The California Statewide Travel Demand Model, Version 2.0, forecasts all personal travel made by every California resident, plus all commercial vehicle travel, made on a typical weekday in the fall/spring (when schools are in session). It has five demand models:

1. A Short Distance Personal Travel Model (for intra-California trips) (SDPTM);
2. A Long Distance Personal Travel Model (for intra-California trips) (LDPTM);
3. A Short Distance Commercial Vehicle Model (for intra-California trips) (SDCVM);
4. A Long Distance Commercial Vehicle Model (for intra-California trips) (LDCVM); and
5. An External Vehicle Trip Model (for trips with an origin and/or destination outside California).

The State is subdivided into 5,454 transportation analysis zones (TAZ). In addition, there are 53 external zone vehicle entry/exit points on roads on the state boundary, including three external zone seaports whose import/export activities generate significant truck activity (Long Beach, Los Angeles, and Oakland). The zones nest both within the 58 California counties and the 524 land use zone (LUZ) system used in the California PECAS spatial economic model. Figure 2.1 illustrates the CSTDMv2.0 TAZ system.

Figure 2.1 TAZ System

The cut-off distance between short- and long-distance personal travel models is 100 miles (defined by the straight-line distance between TAZ centroids). This 100-mile definition is consistent with that used for the California High-Speed Rail Travel Model for person trips. All TAZ-to-TAZ personal travel movements within 100 miles are forecast by the SDPTM; and all TAZ-to-TAZ personal travel movements 100 miles and longer are forecast by the LDPTM.

The cut-off distance between short- and long-distance commercial vehicle models is 50 miles (defined by the straight-line distance between TAZ centroids).

This 50-mile definition is consistent with the depot spacing for commercial shippers.

All TAZ-to-TAZ commercial vehicle movements within 50 miles are forecast by the SDCVM; and all TAZ-to-TAZ commercial movements 50 miles and longer are forecast by the LDCVM.

The External Vehicle Trip model forecasts car and commercial vehicle trips made between the external zones and the internal TAZs.

The five demand models use as inputs:

1. Demographic data for each TAZ (population and household characteristics, employment by industry and occupation, school enrolment).
2. Other zonal attributes (area, area type, population and population density, parking costs, region).
3. Travel cost data (fuel costs, public transit fares, road tolls); commodity flow movements (for the LDCVM).
4. Observed vehicle flows and growth factors by type and time period (for the External Vehicle Trip model).
5. TAZ-to-TAZ travel times and costs by mode and time period (obtained from the CUBE network descriptions referenced below).

The weekday timeframe of the models is split into four time periods for demand modeling and travel assignment purposes:

1. An AM Peak Period (6:00 a.m. to 10:00 a.m.);
2. A Midday Period (10:00 a.m. to 3:00 p.m.);
3. A PM Peak Period (3:00 p.m. to 7:00 p.m.); and
4. An Offpeak Period (12:00 a.m. to 6:00 am., plus 7:00 p.m. to midnight).

The demand models generally further subdivide the Offpeak period into an Early time period and a Late time period. The Early period is defined as being between 3:00 a.m. and 6:00 a.m.; and the Late time period as being between 7:00 p.m. and 3:00 a.m. These definitions are consistent with the data collection approach for household travel surveys, where the travel survey day is defined as starting at 3:00 a.m. For the purposes of the model assignment and skim extraction, this subdivision is not considered, and both Early time period and Late time are always considered in the aggregated Offpeak Period.

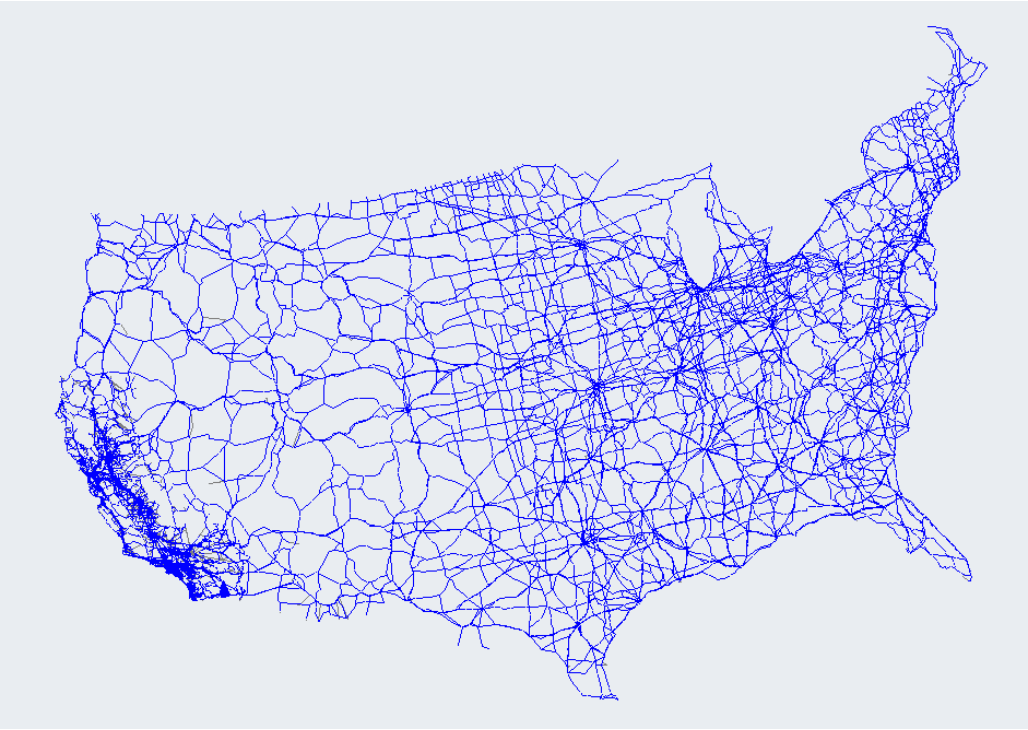
Each of the travel demand submodels considers a different set of travel modes relevant to their travel type:

- **The SDPTM considers eight travel modes –** Single-occupant car (SOV); high-occupant car with two persons in the car (HOV2); high-occupant car with more than three persons in the car (HOV3); walk access local transit (bus, light rail, heavy rail); drive access local transit (where access to or egress from a rail station is by car); walk; bicycle; and school bus.

- **The LDPTM considers four travel modes –** Car, air, conventional rail, and high speed rail.
- **The SDCVM considers three commercial vehicle types –** Light commercial vehicle, medium truck, and heavy truck.
- **The LDCVM considers one commercial vehicle type –** Heavy Truck.
- **The External vehicle Trip model considers five travel modes –**SOV, HOV2, HOV3, medium truck, and heavy truck.

Road network descriptions for each time period are coded in the standard CUBE format. For the road network, all freeway, expressway, and most arterial roadways are explicitly represented, with collector and local roads mostly covered through zone centroid connector links. Link distances, free-flow speeds, and capacities are explicitly coded. Figure 2.2 illustrates the master network, which includes a freight network and major freeways outside of California, which will accommodate the California Statewide Freight Forecasting Model (CSFFM) when it is integrated with the CSTDM. The overall network contains more than 125,000 nodes and 325,000 links.

Figure 2.2 Base Road Network



For public transit, all air and rail lines and services are explicitly coded using the standard CUBE format. For local bus transit, a simplified model is used to give level of service times and costs, based on road network speeds, land use

variables, and transit operator service measures. Walk and bicycle times are derived from road network distances.

The forecast vehicle trip tables from each submodel are grouped for each of the four main time periods (AM, Midday, PM, and Offpeak); and assigned to the road network.

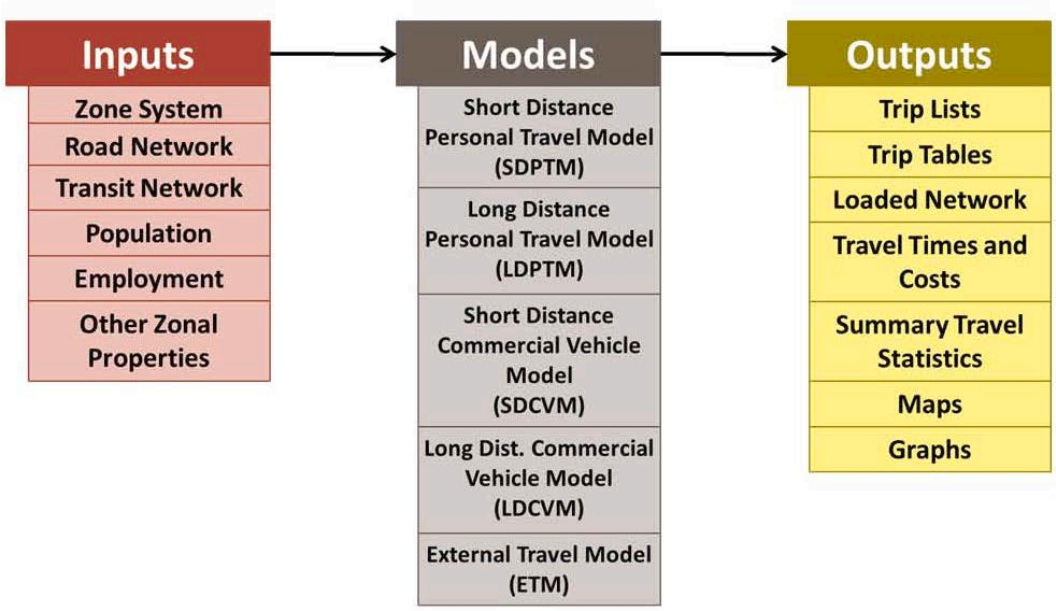
Overall model output includes:

- TAZ-to-TAZ travel demands by mode by time period, which can be summed by any geography, for example to give intraregional and interregional flows;
- "Loaded" road networks by time period, giving link flows by vehicle type and link operating performance; and
- TAZ-to-TAZ travel times and costs by mode and time period.

This output can be presented graphically. It can also be broken down by person type as required, for equity considerations.

Figure 2.3 summarizes the CSTDM model system operation.

Figure 2.3 Overall CSTDM Operations



The overall model is run within the CUBE program environment, with the following major steps:

1. Prepare all required input data.
2. Run CUBE scripts to assign vehicle trip tables, and obtain initial TAZ-to-TAZ travel skims (times and costs) for each mode for each time period, often referred to as a warm start. (In practice skims from a previous model run may be available for use, and this step can be omitted).
3. Run each of the Demand models separately using the input data from Step 1 and the initial travel skim inputs from Step 2.
4. Combine the resulting vehicle trip table outputs by each vehicle type and time period, run CUBE scripts to assign vehicle trip tables, and obtain updated TAZ-to-TAZ travel skims (times and costs) for each mode for each time period.
5. Run each of the demand models separately using the input data from Step 1 and the revised travel skim inputs from Step 4.
6. Repeat Steps 4 and 5 in an iterative process until model convergence is reached. Convergence is achieved when the forecasts of travel demand and associated travel times and costs do not differ significantly between successive iterations of the entire model. The current implementation of the CSTDM runs the demand model/travel assignment and skims process three times for this convergence process. This limit on the number of iterations is required because of the need to put a limit on computer run times for the demand models and trip assignment (see below).
7. Produce required outputs from the final run of the model.

3.0 Hardware Requirements

CSTDM is a very complex and computationally intensive application. It is essential that it be run on a very powerful computer. The user experience on any desktop available as of the release of the model is unlikely to be satisfactory. A server is the recommended physical platform.

The CSTDM was developed on a server with the following specifications:

- Manufacturer: Silicon Mechanics;
- Processors: 2 Intel E5520 (Quad core) processors with a 2.27GHz clock speed;
- RAM: 24 Gigabytes;
- Hard Drives: 8 Terabytes; and
- Operating System: Windows Server 2008 Enterprise, Service Pack 2, with Client Access Licenses for each user.

These are not technically minimum requirements for CSTDM, but should be viewed as such because the run times that would result from a lower system specification will not be practical for use.

The operating system must be a 64Bit Windows operating system. The CSTDM should work on 64Bit versions of Windows XP, Windows 7, Windows Server 2008, or a more recent Microsoft Windows Operating system supported by Citilabs, Java, and Python.

The CSTDM is distributed with settings appropriate to a computer that has 16 threads available through the CPUs. On the development server, this was two 4-core processors, each of which used Intel's hyper threading technology to process 2 threads for a total of 16 threads. Adjustments can be made to adjust the number of threads used. See Section 5.4 for more information on the model run in the multithread environment. Appendix D, at the end of this document, provides additional information on the adjustments required to run the model in case of hardware specifications with a different number of threads.

4.0 Software Requirement, Installation, and Basic Operation

The CSTDM makes use of three software environments. CUBE produced by Citilabs Inc. (www.citilabs.com) with its components of Base, Voyager and Cluster handles the vast majority of the highway assignment, public transport, skimming operations, and controls the flows of data between the demand model components running in the free programming languages of Python (www.python.org) and Java (www.java.com). CUBE Cluster allows for multiple CPUs in the server to be used simultaneously to speed up the CUBE based portions of the travel model or to enable the activation of the non CUBE demand models in parallel with each other.

4.1 SOFTWARE REQUIREMENTS

The following software is required to run the CSTDM:

- CUBE (Version 6.0.2): www.citilabs.com
  - Base,
  - Voyager, and
  - Cluster.
- Python (Version 2.7[1], 64 bit):
  - Numpy (version 1.4.1): http://numpy.scipy.org/;
  - Numexpr (version 1.4): http://code.google.com/p/numexpr/;
  - Tables (version 2.2): http://www.pytables.org/; and
  - dbfpy (version 1.7): http://sourceforge.net/projects/dbfpy/.
- Java 6 (Update 18, 64 bit): http://www.java.com/en/download/manual.jsp

[1] Note: Python Version 2.6 is also an option, but Version 2.7 may provide more efficient performance running the model.

The following software is recommended for use with the CSTDM:

- Microsoft Excel (for viewing screenline data); and
- Adobe Acrobat Reader (for viewing documentation).

In each case where 64-bit software is identified, it is important that the 64-bit version of the software be installed, and not a 32-bit version, or the model will fail.

4.2 INSTALLATION INSTRUCTIONS

To install the CSTDM, identify space on a disk with a minimum of a Terabyte (1,000 Gigabytes) of free space. This space should be on the same server as the software is installed. Do not try to run this application across a network connection. Doing so will adversely affect run times.

To install the CSTDM, the following steps are required:

1. Install Java (Version 6, 64 bit) as a standard installation.
2. Install Python 2.6 (64 bit) as a standard installation.
3. Install each of the Python extensions (Numpy, Numexpr, Tables) as a standard installation.
4. Install CUBE with Voyager and Cluster, and ensure that the license manager is configured and licensed for the computer that will be running the CSTDM. As of the writing of this manual, all Citilabs products are licensed by the number of CPUs and are tied to a USB-based key that enables their operation. Forthcoming versions of Citilabs software may change the licensing system.
5. Copy all of the CSTDM files from the distribution source into a directory prepared for its use. In this documentation, we will reference our installation directory, which is: E:\CSTDM2009.
6. Edit user programs and model files to reference the correct directory, as detailed in Appendix E.

4.3 RUNNING THE MODEL

Running the model can happen in multiple ways depending on the goals. ULTRANS/HBA has generally run the CSTDM in one of four ways:

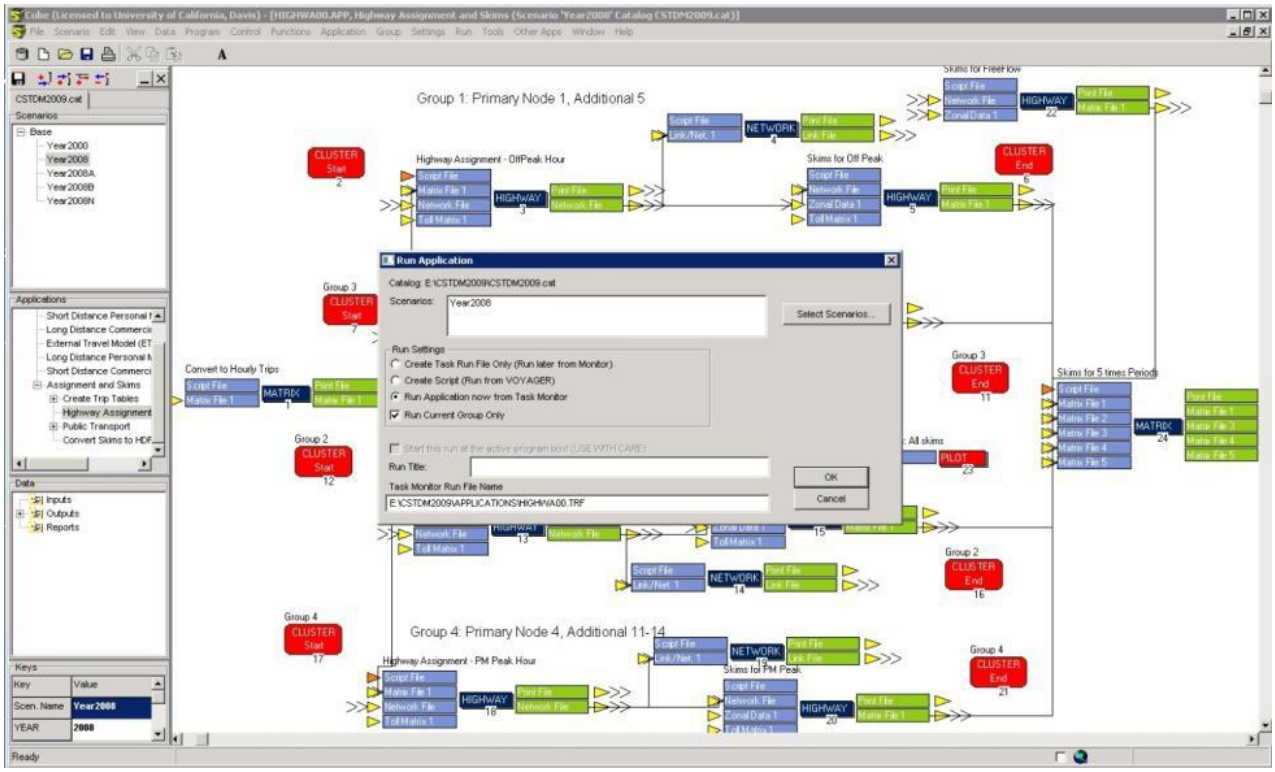
1. Running the entire model from start to finish with all of its components;
2. Running a subsection of the model;
3. Running an individual process; and
4. Running the entire model with the exception of a specific component.

In each case, you must select the scenario to be run in the catalog view. To run the entire model from start to finish, open the catalog (CSTDMv2.cat). Start the Cluster (as described in Section 5.2). Then select the Application menu->Run Application. The Run Application dialog will appear (Figure 4.1).

Figure 4.1 Run Application Dialog

To run the entire model, leave all settings as you see here. These are the default settings. When you click OK, the application script will be assembled and you will be presented with a second dialog box that either informs you of any errors in the script assembly, or allows you to start the run. Any errors encountered during the compiling are likely to be missing files referenced within the catalog. It is worth reviewing these. Some of these files may be inputs, and these errors must be fixed. Others may be just notifications that files do not exist. If these files are outputs from earlier steps of the mode, these can be ignored (such as loaded networks or skims). You are most likely to encounter this when establishing a new scenario, or if you have removed outputs skims or loaded networks from the run folder.

Figure 4.2 Running a Subsection of the Model



Note: The checked box "Run Current Group Only".

To run a subsection of the model, the process is almost identical to running the entire model, except that you view the catalog at a group level. For example, if you wished to run only the assignment and road network skims, you would select the Assignment and Skims under the application manager (part of the catalog), double-click on it so that you could view it. Then make sure that cluster is started and open the Run Application dialog from the Application menu.

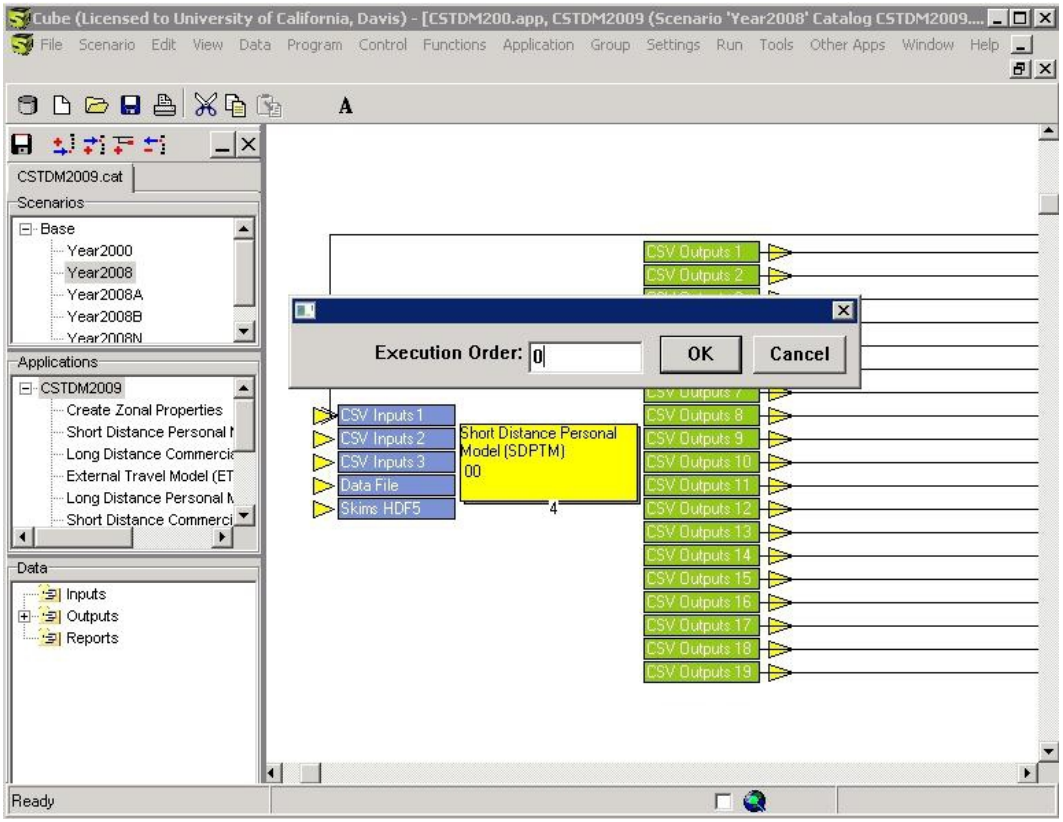
To run only the portion of the model you are viewing, check the "Run Current Group Only" check box (Figure 4.3) before clicking OK and starting the run.

If you wish to run only an individual process, you can simply double-click on it in the catalog.

Figure 4.3 Run Application Dialog to Run Current Group Only

In a case where you wish to run the majority of the model, but desire to omit one process, you can do so by setting the execution order of that step to zero. Do this by right clicking on the process step you wish to omit, select set execution order, and set it to zero (Figure 4.4). You may receive a notice that the execution orders of other components are being adjusted. Running the model will now be the same as for running the full model. Follow a similar procedure for omitting more than one process by setting their execution order to zero. Just be careful to document which components are disabled, and be sure that all of the outputs are available for any subsequent processes. This method of running the model is most commonly used for debugging, or for using the same demand model outputs for the remainder of the model run (i.e., one or more demand model is disabled so that prior results will be reused).

Figure 4.4 Excluding a Step from the Run



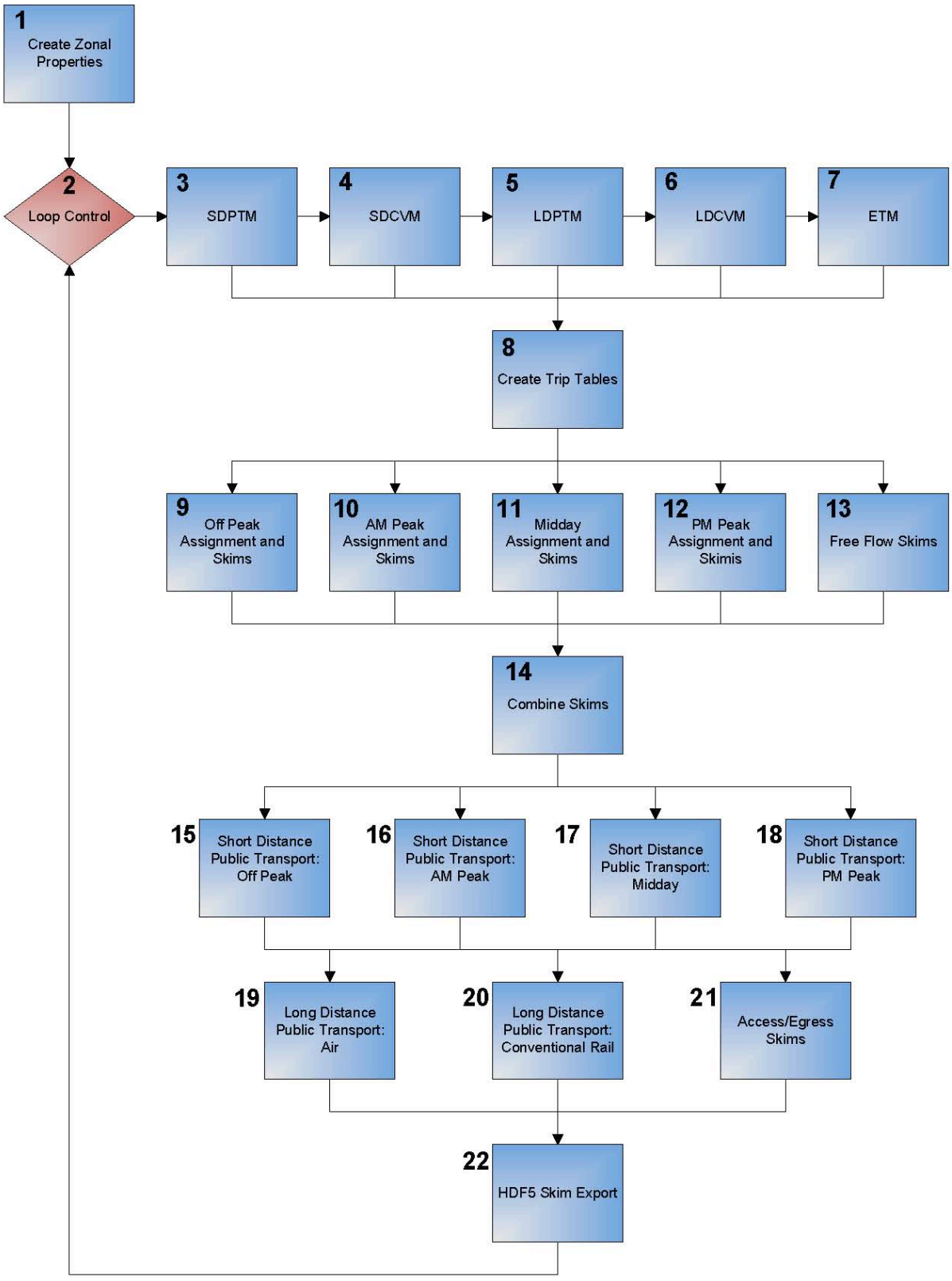
5.0 Model Structure

5.1 NARRATIVE

The CSTDM follows the following pattern as it runs:

1. (Step 2 in Figure 5.1) The initial zonal data is processed from the main zonal properties file into individual zonal properties files for each of the demand models. This reduces the total amount of data that is read in by each model, and simplifies the data import process.
2. (Step 2 in Figure 5.1) The iteration loop begins. If only a single iteration is desired, then the loop value can be set to 1, but if multiple iterations are needed, the number can be manually controlled.
3. (Step 3 in Figure 5.1) Short Distance Personal Travel Model (SDPTM). The short-distance personal travel model runs as the only computational process, while CUBE waits for completion.
4. (Step 4 in Figure 5.1) Short Distance Commercial Vehicle Model (SDCVM). This runs in parallel with the Long Distance Personal Travel Model (LDPTM).[2]
5. (Step 5 in Figure 5.1) Long Distance Personal Travel Model (LDPTM). This runs in parallel with the Short Distance Commercial Vehicle Model (SDCVM).
6. (Step 6 in Figure 5.1) Long Distance Commercial Vehicle Model (LDCVM). This is a placeholder for a model external to the CSTDM to provide data for freight transportation. This may come from a State Freight Model, or as currently used, a commodity movement dataset exported from the CALSIM (PECAS) model and reprocessed to suit the LDCVM.
7. (Step 7 in Figure 5.1) External Model (ETM). The external gateways model.
8. (Steps 8 to 14 in Figure 5.1) Assignment and Skimming. The outputs from all of the demand models are assembled into a set of Origin-Destination (OD) matrices for assignment. Each of the four time periods (Off Peak, AM Peak, Midday, and PM Peak) are assigned, have screen lines counts extracted, and then skimmed as simultaneous parallel processes. The skims from each time period are then combined with a set of free-flow skims.
9. (Steps 15 to 18 Figure 5.1) Short Distance Public Transport covers trips less than 100 miles and is computed by time period. Short distance public transport includes bus and local rail.

Figure 5.1 Model Diagram



10. (Step 19 to 21 Figure 5.1) Long Distance Public Transport covers trips greater than 100 miles. Air, conventional rail, and high speed rail skims for long-distance transport are calculated.

11. (Step 22 Figure 5.1) HDF Skim Compilation. All skims are combined into a HDF5 formatted file, and are made available for use as the initial skims by the next iteration of the demand models. The HDF5 format[2] is a data model, library, and format that focuses on improved I/O (in/out) speed and reliability for large and complex datasets. HDF5 is a free and open-source format.

5.2 CUBE KEY INPUTS

Catalog keys define items that vary each time an application in a catalog is run. The keys allow the user to easily input scenario-specific items without modifying the application files. Table 5.1 lists the input keys, their definitions, and their default values.

Table 5-1 Cube Key Definitions

Field Name	Description	Default Value
Scen. Name	Scenario (folder) name	None
YEAR	Scenario year	2010
Year_Short	Last two digits of scenario year	_10
Zones	Number of zones	7000
opCost	Auto operating costs (2010 dollars)	0.23
MasterNetwork	Name of master network	CSTDMMaster_v2.net
AIRZONES	Maximum number of airports	20
CVRZONES	Maximum number of CVR stations	300
HSRZones	Maximum number of HSR stations	48
HSR_Available	Indicates if HSR is available	0
Hwy_MaxIters	Maximum number of iterations in highway assignment	50
RelativeGap	Relative gap criteria in highway assignment	0.005
StartNetNodNu	First non-zone network node number	7001
MaxNetNodNu	Highest network node number	500000

[2] http://www.hdfgroup.org/HDF5

Field Name	Description	Default Value
ZoneSystem	Zone System for Model Run	2012TAZs
HOVAutoOcc	Average number of person in HOV 3+ vehicles	3.6

5.3 ITERATION

The CSTDM supports running the model in iterations. By allowing the model to iterate the mode choice and time period assignments feedback into the demand models to allow a more equitable demand assignment.

To control the number of iterations, right click on the "Loop" control (Process Step 2, Figure 5.1), and change the number of iterations. Each iteration takes the full model run time, so if a single run takes 24 hours, three iterations will take 72, though there may be variations in run times between iterations.

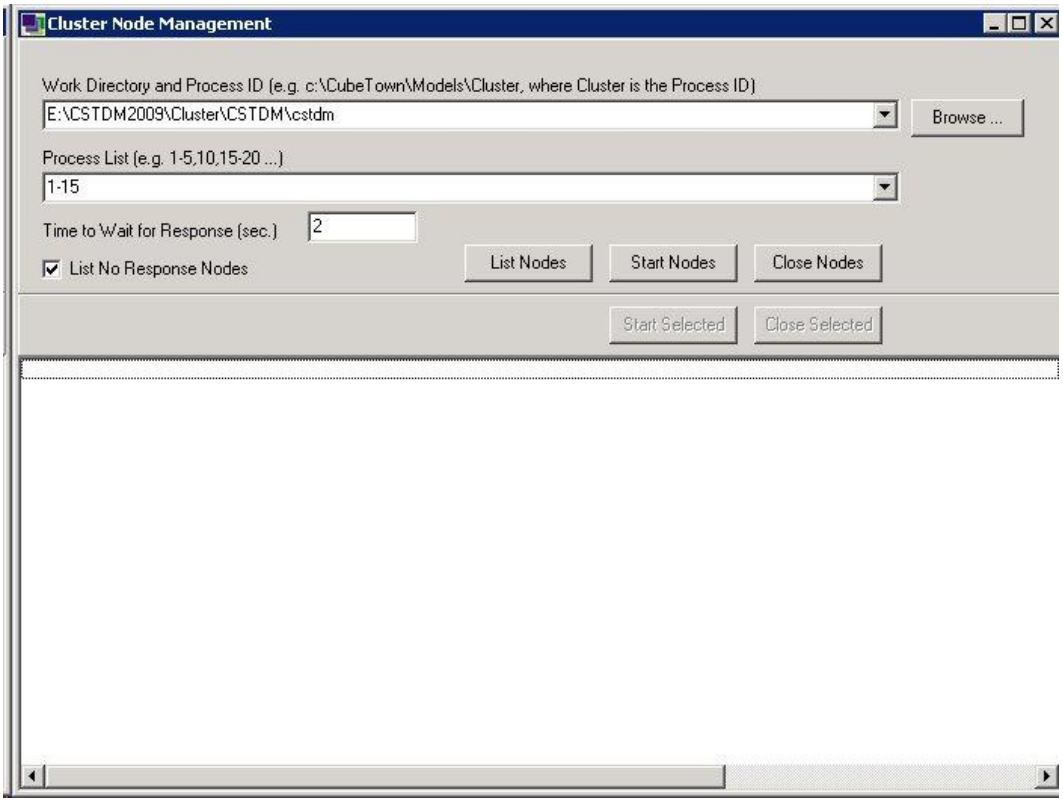
5.4 CLUSTER

CUBE Cluster is an add-on produced and sold by Citilabs for CUBE. Cluster allows the user to use more than a single CPU for running the model. Without Cluster, the entire model will run on a single CPU and will take several times as long to run. Running CSTDM without Cluster is not recommended as run times for the assignment and skimming portions of the model (not including the demand models) will increase from approximately 10 hours to more than 30.

Each node is a numbered CPU that is waiting for a set of commands to be given to it. In the CSTDM, we start nodes 1 through 15, so that we have 16 CPUs available for our use in CUBE: the initial CPU that started CUBE, and 15 nodes.

To use Cluster in CSTDM, one must first start the nodes before starting the model run. This is done by selecting the tools menu, and then Cluster Node Management. The Cluster Node Management panel will open (Figure 5.2). Step 1 in the model system starts the nodes for the user, but the Cluster Node Management panel is helpful when closing all nodes or checking the availability of specific nodes.

Figure 5.2 Cluster Node Management



The work directory and process ID must follow the following structure in CSTDM. "<CSTDM Directory>\Cluster\CSTDM\cstdm".

<CSTDM Directory> is the installation directory for the CSTDM (in our case E:\CSTDM2009). If the installation process has worked correctly, there should be a folder called Cluster in this directory, and nested within cluster will be another directory called CSTDM. This is where Cluster will put control scripts for the other nodes.

Cluster has proven to be sensitive to disruptions. In our multiuser, remote desktop accessed platform, we have found that cluster does not respond well to having the remote desktop connection closed and reopened. If possible, we recommend leaving the remote desktop connection active for the duration of the model run.

CUBE Cluster can make use of these nodes in two ways.

1. It can run processes that do not depend on each other in parallel so that the total time taken is the run time required by the longest of the processes. This is called Multistep Distributed Processing, or MDP.
2. It can apply multiple nodes to the same computation to speed up the run time for the process. This is called Intrastep Distributed Processing or IDP.

IDP can only be used within the HIGHWAY and MATRIX programs within CUBE.

In some cases, these two techniques can be combined as it is done in the highway assignment and skimming component of the model.

5.5 THREADS

Threads are very similar to nodes. In fact, each node is actually a thread. Within the context of this document, a thread will be used to describe the set of work being done by one CPU. The demand models are written in either JAVA or Python, both of which can make use of multiple threads. Because each of the demand models runs in its own environment after CUBE starts it, they control their own thread usage. Each of these applications has a configuration file that controls how many threads it will use. In this way, we can either allow a demand model to use all available CPUs as we do with the SDPTM, or to throttle it back to use only a subset as we do with the SDCVM and LDPTM, which we then run in parallel.

5.6 USER GUIDE CONVENTIONS

The following conventions are used within this user guide. In paths that might change depending on the installation or the scenario being run, text inside carrots (<>) can be thought of as a variable. These are most commonly:

- <CSTDM_Directory>, the parent directory containing all of the CSTDM data and code. <Scenario>, the scenario being run.
- <Year>, the year that applies to the scenario
- <time period>, the time period within the day being modeled. Most frequently this is “Off Peak”, “AM Peak”, “Midday”, or “PM Peak”, but it can vary slightly in some portions of the model that deal only with “Peak” and “Off Peak”.

5.7 INPUT FILES REQUIRED TO RUN MODEL

A number of files in various folders are required in order to start a model run. In order to minimize potential error, it is recommended that only the inputs files required are placed in any new scenario’s folders when executing a run.

Appendix F lists all of the input files required, as well as a brief description of the type of file (creation of folder, scenario-specific inputs, model parameters, warm start files, etc.). The table also contains some guidance on which files may require changes, depending on the type of scenario change. Additionally, a batch file was created to reduce the manual effort required in creating the

scenario folders, as well as copying inputs and warm start files from previous runs. Appendix F also contains the text from that batch file.

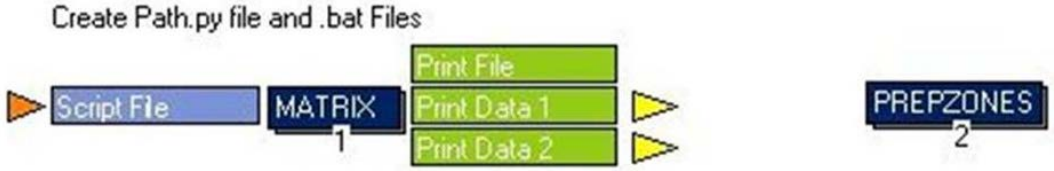
6.0 Create Zonals

6.1 DESCRIPTION

The Create Zonals model component takes the base zonal properties file in <CSTD Directory>/Base/<Scenario>/Controls/Zonal Properties Base <Year>.csv; and subdivides it in to the zonal properties files needed for the SDPTM, SDCVM, LDPTM, and ETM models. It is recommended that, if you are going to change any of the zonal properties for the CSTDM, you change them in the base zonal properties file. All other zonal properties files (for the individual demand models) will be overwritten during this step with new versions extracted from the base file.

Like all of the components that run in external programming environments, the process works in two steps. The first creates a batch (.bat) file and possibly some control files, and the second executes the batch file. This is illustrated in Figure 6.1.

Figure 6.1 Create Zonals



As part of the process, several additional values are calculated for each TAZ using data from the base zonal properties file and the synthetic population. These include total employment, households, population, income, densities, parking costs, land use totals by type, intrazonal auto speed, and area types.

6.2 INPUTS

The input for this procedure is the base zonal properties file with records for each TAZ that include the fields identified in Table 6.1.

Table 6-1 Base Zonal Properties Table: Fields and Descriptions

Field Name	Description
TAZ	Transportation Analysis Zone Number
Prim_Sec	Industry: Number of Primary and Secondary Manufacturing workers
Whole	Industry: Number of Wholesale workers
Tran_U	Industry: Number of Transportation and Utilities workers
Office	Industry: Number of Office Worker workers
Retail	Industry: Number of Retail workers
EduMed	Industry: Number of Education or Medical workers
LeisHosp	Industry: Number of Leisure and Hospitality workers
OthServ	Industry: Number of Other Service workers
Military	Industry: Number of Military workers
BluCol	Occupation: Number of Blue Collar workers
Clerical	Occupation: Number of Clerical workers
Education	Occupation: Number of Education workers
Health	Occupation: Number of Health workers
ManBus	Occupation: Number of Management and Business workers
ServNS	Occupation: Number of Non-Sales Service workers
ProfTech	Occupation: Number of Professional and Technical workers
SalesFE	Occupation: Number of Sales, Food and Entertainment workers
E_K8	Education: Number of K-8 grade students
E_912	Education: Number of 9-12 grade students
E_PSE	Education: Number of Post Secondary Education Students
Area_SqMi	TAZ area in square miles
Long	TAZ centroid Longitude
Lat	TAZ centroid Longitude
x-meters	TAZ centroid in California Albers, NAD83
y-meters	TAZ centroid in California Albers, NAD83
Park_Add_Base	Base parking cost for one day
Park_Add_Day	Parking cost for an additional day
County	County Name
FAF_Area	Freight Analysis Framework Area
Calib_5_Name	5 district calibration region name
Calib_7_Name	7 district calibration region name

Field Name	Description
Calib_8_Name	8 district calibration region name
Calib_22_Name	22 district calibration region name
Calib_36_Name	36 district calibration region name
Calib_5	5 district calibration region number
Calib_22	22 district calibration region number
Calib_36	36 district calibration region number
LUZ	PECAS Land Use Zone
NP_Area	National Park Area (square miles)
Coastline	Indicator that zone is Coastal
Disney	Indicator that zone is Disneyland
Ski	Indicator that zone is Ski Resort Area
ConvCent	Indicator that zone is Convention Center

6.3 OUTPUTS

The zonal properties for use within CUBE are written to <CSTDM_Directory>/Base/<Scenario>/Controls/Zonal properties_<Year>.csv and.dbf with the fields indicated in Table 6.2.

Table 6-2 CUBE Zonal Properties

Field Name	Description
TAZ	Transportation Analysis Zone number
EmpDens	Employee density
PopDens	Population density
Area_SqMi	TAZ area in square miles
AutoSpd	Intrazonal auto speed

The zonal properties for the LDPTM are written to <CSTDM_Directory>\Models\LDPTM\<Scenario>\Inputs\Zonal_Properties_LDPTM.csv with the fields in Table 6.3.

Table 6-3 LDPTM Zonal Properties

Field Name	Description
TAZ	Transportation Analysis Zone number
County	County
FAF_Area	Freight Area Framework area
Calib_5_Name	5 district calibration region name
Calib_7_Name	7 district calibration region name
Calib_8_Name	8 district calibration region name
Calib_22_Name	22 district calibration region name
Calib_36_Name	36 district calibration region name
Calib_5	5 district calibration region number
Calib_22	22 district calibration region number
Calib_36	36 district calibration region number
LUZ	PECAS Land Use Zone
Lat	TAZ Latitude
Long	TAZ Longitude
Area_SqMi	TAZ area
Pop	TAZ population
HH	TAZ households
TotEmp	Total Employment
Prim_Sec	Industry: Number of Primary and Secondary Manufacturing workers
Whole	Industry: Number of Wholesale workers
Tran_U	Industry: Number of Transportation and Utilities workers
Office	Industry: Number of Office Worker workers
Retail	Industry: Number of Retail workers
EduMed	Industry: Number of Education or Medical workers
LeisHosp	Industry: Number of Leisure and Hospitality workers
OthServ	Industry: Number of Other Service workers
Military	Industry: Number of Military workers
EmpDens	Employment density
PopDens	Population density

Field Name	Description
PopEmpDens	Population and Employment density
Park_Base	Base parking cost
Park_Day	Cost to park all day
NP_Area	National Park Area (square miles)
Coastline	Indicator that zone is Coastal
Disney	Indicator that zone is Disneyland
Ski	Indicator that zone is Ski Resort Area
ConvCent	Indicator that zone is Convention Center
DensBufEmp_2.0	Employment density within 2.0 mile buffer
BufEmp_2.0	Employment within 2.0 mile buffer
PropHops_5.0	Proportion of employment within 5 miles of leilsure/hospitality industry

The zonal properties for the ETM are written to <CSTDM_Directory>\Models\ETM\<Scenario>\Inputs\Zonal Properties ETM.csv with the fields in Table 6.4.

Table 6-4 ETM Zonal Properties

Field Name	Description
TAZ	Transportation Analysis Zone number
FAF_Area	Freight Area Framework area
Pop	Population
TotEmp	Employment
CVM_IN	Industrial employment
CVM_RE	Retail employment
CVM_SV	Service employment
CVM_TH	Transportation and Utilities employment
CVM_WH	Wholesale employment

The zonal properties for the SDPTM are written to <CSTDM_Directory>\Models\SDPTM\<Scenario>\Inputs\Zonal Properties SDPTM.csv with the fields in Table 6.5.

Table 6-5 SDPTM Zonal Properties

Field Name	Description
TAZ	Transportation Analysis Zone number
County	County
FAF_Area	Freight Area Framework area
Calib_5_Name	Five district calibration system district name
Calib_22_Name	Twenty two district calibration system district name
Calib_5	Five district calibration system district number
Calib_22	Twenty two district calibration system district number
LUZ	PECAS Land Use Zone
Lat	TAZ Latitude
Long	TAZ Longitude
Area_SqMi	TAZ area
Pop	TAZ total population (includes group quarters)
HH	TAZ households
E_K8	K-8 grade student total
E_912	9-12 grade student total
E_PSE	Post Secondary Education total
TotEmp	Total Employment
Prim_Sec	Industry: Number of Primary and Secondary Manufacturing workers
Whole	Industry: Number of Wholesale workers
Tran_U	Industry: Number of Transportation and Utilities workers
Office	Industry: Number of Office Worker workers
Retail	Industry: Number of Retail workers
EduMed	Industry: Number of Education or Medical workers
LeisHosp	Industry: Number of Leisure and Hospitality workers
OthServ	Industry: Number of Other Service workers
Military	Industry: Number of Military workers
BluCol	Occupation: Number of Blue Collar workers
Clerical	Occupation: Number of Clerical workers
Education	Occupation: Number of Education workers

Field Name	Description
Health	Occupation: Number of Health workers
ManBus	Occupation: Number of Management and Business workers
ServNS	Occupation: Number of Non-Sales Service workers
ProfTech	Occupation: Number of Professional and Technical workers
SalesFE	Occupation: Number of Sales, Food and Entertainment workers
EmpDens	Employment density
PopDens	Population density
PopEmpDens	Population and Employment density
Park_Base	Base parking cost
Park_Day	Cost to park all day
Park_1H	Cost to park 1 hour
Park_2H	Cost to park 2 hours
Park_3H	Cost to park 3 hours

Zonal properties for the commercial vehicle models are written to <CSTDM_Directory>\models\SDCVM\<Scenario>\Inputs\Zonal Properties SDCVM.csv with the fields in Table 6.6.

Table 6-6 SDCVM Zonal Properties

Field Name	Description
TAZ	Transportation Analysis Zone
Pop	Population
Income	Income
Area_SqMi	TAZ area in square miles
Lat	Latitude of TAZ centroid
Long	Longitude of TAZ centroid
x-meters	Projected X coordinate of TAZ centroid (California Albers NAD 83)
y-meters	Projected Y coordinate of TAZ centroid (California Albers NAD 83)
EmpDens	Employee density
PopDens	Population density
TotEmp	Total employment
Military	Military employment
CVM_IN	Industrial employment
CVM_RE	Retail employment
CVM_SV	Service Employment
CVM_TH	Transportation and Utilities Employment
CVM_WH	Wholesale Employment
CVM_LU_Type	Land use type
SqrtArea	Square root of the area
CVM_LU_Low	Low density land use flag
CVM_LU_Res	Residential land use flag
CVM_LU_Ret	Retail/commercial land use flag
CVM_LU_Ind	Industrial land use flag
CVM_LU_Emp	Other land use flag
Emp_LU_Lo	Total employment if CVM_LU_Low = 1
Emp_LU_Re	Total employment if CVM_LU_Res = 1
Emp_LU_RC	Total employment if CVM_LU_Ret = 1
Emp_LU_In	Total employment if CVM_LU_In = 1
Emp_LU_EN	Total employment if CVM_LU_Emp = 1

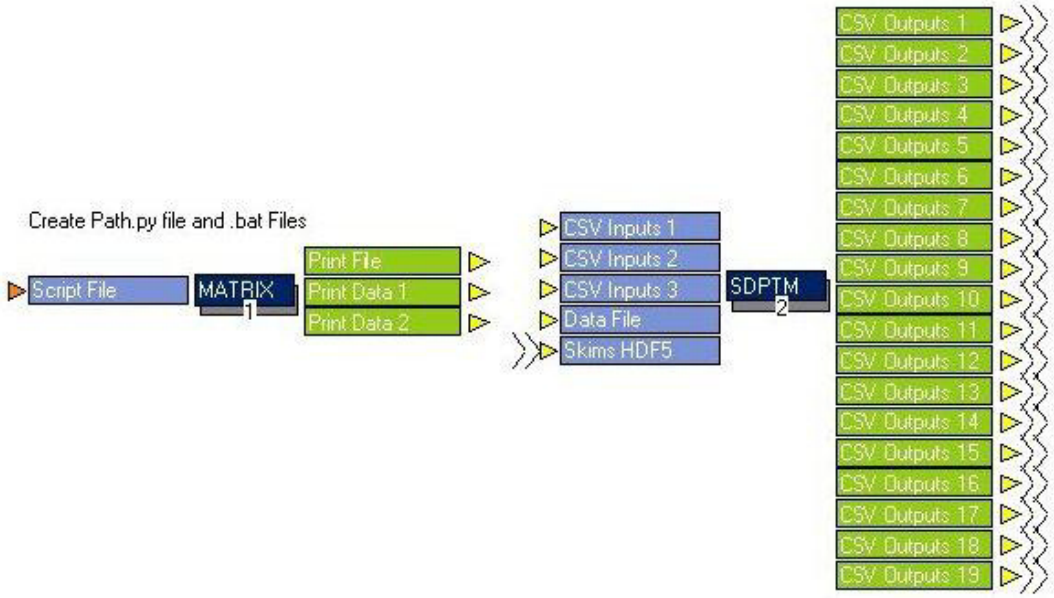
7.0 SDPTM

7.1 DESCRIPTION

The Short Distance Personal Travel Model (SDPTM) executes the python code that produces the output trip lists that will be compiled into the zone-to-zone volumes. This is a two part process with the first step producing <CSTDM_Directory>\code\sdptm.bat and paths.py, and the second executing the .bat file, as illustrated in Figure 7.1.

For a complete description of the SDPTM model component, please refer to the three documents that describe the development and estimation of this model.

Figure 7.1 Short Distance Personal Travel Model



7.2 INPUTS

The SDPTM uses five input files housed in <CSTDM_Directory>\Models\SDPTM\<Scenario>\Inputs\:

1. Cali.sqlite contains the synthetic population for the year;
2. Day_Patterns.csv contains the list and proportions of day patterns;
3. tazListI.csv contains a list of TAZ, district, latitude and longitude for 19 districts;

4. Zonal Properties SDPTM.csv contains all of the zonal properties for each TAZ; and
5. Skims in a hdf5 format and stored in <CSTDM_Directory>\base\<Scenario>\skims\skims.h5.

7.3 OUTPUTS

There are two main outputs from the SDPTM:

1. A trip list file (<CSTDM_Directory>\Models\SDPTM\<Scenario>\Outputs\trips_Y.csv, where Y is the district) for each of the 19 districts and 4 external regions, containing zone-to-zone trips by mode and travel for short-term destinations (retail, recreation, etc.); and
2. A long-term destination file for work and school choices (<CSTDM_Directory>\Models\SDPTM\<Scenario>\Outputs\WorkOD_Y.csv, where Y is the district).

The fields in the trip table are described in Table 7.1 and the fields for the long term decision model are in Table 7.2.

Table 7-1 Short-Term Trip Table Fields (Trips_Y.csv)

Field Name	Description
Model	Model ID
SerialNo	House ID
Person	Person ID
Trip	Trip ID
Tour	Tour ID
HomeZone	Home TAZ
ActorType	Actor Type
OPurp	Purpose key for origin
DPurp	Purpose key for destination
I	Origin zone
J	Destination zone
Time	Time period
Mode	Trip Mode
Leg	Tour leg
TourPurp	Purpose key for tour
Dist	Distance in miles
License	Driver's license
Grade	School grade
TourMode	Tour mode

Table 7-2 Long-Term Trip Table Fields (WorkOD_Y.csv)

Fields	Description
TAZ	Transportation Analysis Zone
Type	Trip type (Work or School)
Zone	Destination zone
Kind	Type of work or school (School class or occupation)
IncGrp	Income group
Income	Income
Dist	Distance traveled

In addition, specific tables are the results from the auto ownership and driver's license models that are part of the SDPTM and feed into the final trip generation. Table 7.3 lists fields from the auto ownership model outputs, and Table 7.4 lists fields from the driver's license model outputs.

Table 7-3 Auto Ownership Model Outputs (AutoOwn_Y.csv)

Field Name	Description
Zone	Transportation Analysis Zone
Unique	A unique number for each modeled person
Serial	House ID
Drivers	Number of drivers in the house
Inc	Income class
Veh	Number of vehicles
GQ	General Quarters flag
Persons	Number of persons in the household
Adults	Number of adults in the household

Table 7-4 Driver's License Model Outputs (License_Y.csv)

Field Name	Description
Zone	Transportation Analysis Zone
Unique	Unique ID
Serial	Household ID
Per	Person number
Type	Person type
Lic	License flag
Age	Person age

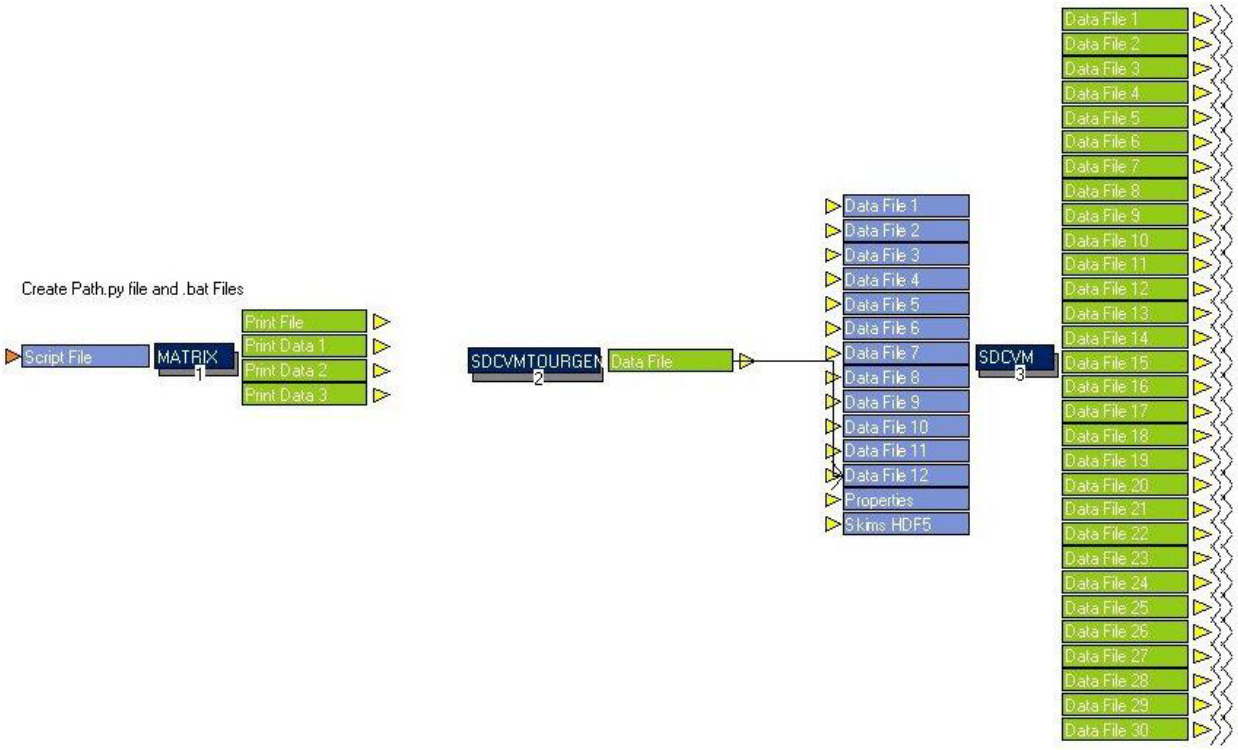
8.0 SCDVM

8.1 DESCRIPTION

The Short Distance Commercial Vehicle Model (SDCVM) operates in three steps. The first generates <CSTDM_Directory>\code\paths.py, sdcvm.bat, and sdcvmtourgen.bat. The second executes sdcvmtourgen.bat to produce the tours for the SDCVM, which is executed in the third step as shown in Figure 8.1. The SDCVM is written in Java, and generates short-distance (less than 50 miles) commercial vehicle trips.

For a complete description of the SDCVM model, please refer to the specific document describing the SDCVM model development.

Figure 8.1 Short Distance Commercial Vehicle Model



8.2 INPUTS

The inputs for the SDCVM include three different forms of table. The first sets the model parameters for each of the five time periods (Offpeak Early [OE.csv],

AM Peak [AM.csv], Midday [MD.csv], PM Peak [PM.csv], and Offpeak Late [OL.csv]). The second form specifies the parameters that apply by the industry generating the trip (Fleet Allocator [FA.csv], Primary and Secondary manufacturing [IN.csv], Retail [RE.csv], Service [SV.csv], Transportation and Utilities [TH.csv], Wholesale [WH.csv]). The final input type is Zonal Properties SDCVM.csv generated from the Create Zonal Properties (Section 6.0).

The SDCVM also uses skims in an hdf5 format and stored in <CSTDM_Directory>\base\<Scenario>\skims\skims.h5.

8.3 OUTPUTS

The outputs from the SDCVM are a set of trip tables for each combination of industry and time period. For example, the trip table for AM peak retail trips is: <CSTDM_Directory>\models\SDCVM\<Scenario>\Outputs\trips_RE_AM.csv with the fields that are described in Table 8.1.

Table 8-1 SDCVM Output Structure

Field Name	Description
Model	Model ID
SerialNo	Household ID
Person	Person ID
Trip	Trip ID
Tour	Tour ID
HomeZone	Home TAZ
ActorType	Actor Type
OPurp	Origin Purpose
DPurp	Destination Purpose
I	Trip Origin
J	Trip Destination
Time	Time period
Mode	Model ID
StartTime	Start time
EndTime	End time
StopDuration	Stop duration
TourType	Tour Type
OriginalTimePeriod	Time period for tour start

9.0 LDPTM

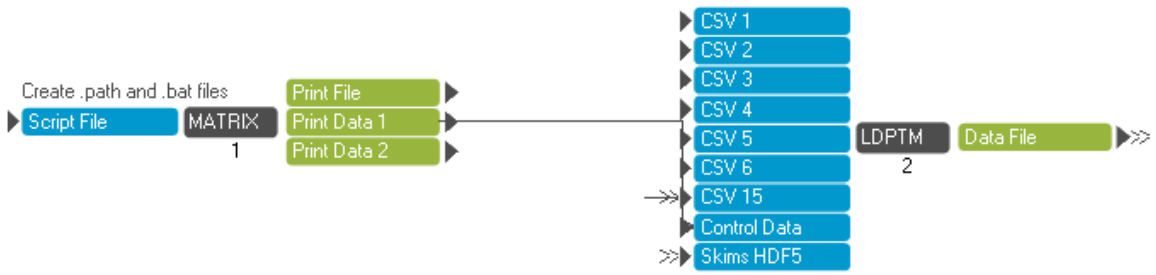
9.1 IMPLEMENTATION IN CSTDMV2.0 MODEL FRAMEWORK

The LDPTM model is implemented using a specially-written Java program. It requires the following inputs:

- A **zone properties** file in the .csv format containing the populations and other properties of the TAZs.
- **LDPTM Top** Files
- Logsums
- A **stations** file that identifies airport and rail (conventional and HSR, if applicable to the scenario) by node, name, mode, and TAZ.
- Airports.csv
- **Skims** files in the HDF5 format.
- **Station to station** skims for LDPTM modes and **station assignments** for each TAZ-to-TAZ movement.

This is a two-step process: the first step creates the .bat file, and the second executes it (Figure 9.1).

Figure 9.1 Long Distance Personal Travel Model



9.2 ZONAL PROPERTIES FILE

The Zonal Properties file is a .csv file with a record for each TAZ in the zone system. Table 9.5 summarizes the fields that should appear in each record in the order given.

Table 9-1 Fields in the Zonal Properties File

Field Name	Description
TAZ	Transportation Analysis Zone number
County	County
FAF_Area	Freight Area Framework area
Calib_5_Name	5 district calibration region name
Calib_7_Name	7 district calibration region name
Calib_8_Name	8 district calibration region name
Calib_22_Name	22 district calibration region name
Calib_36_Name	36 district calibration region name
Calib_5	5 district calibration region number
Calib_22	22 district calibration region number
Calib_36	36 district calibration region number
LUZ	PECAS Land Use Zone
Lat	TAZ Latitude
Long	TAZ Longitude
Area_SqMi	TAZ area
Pop	TAZ population
HH	TAZ households
TotEmp	Total Employment
Prim_Sec	Industry: Number of Primary and Secondary Manufacturing workers
Whole	Industry: Number of Wholesale workers
Tran_U	Industry: Number of Transportation and Utilities workers
Office	Industry: Number of Office Worker workers
Retail	Industry: Number of Retail workers
EduMed	Industry: Number of Education or Medical workers
LeisHosp	Industry: Number of Leisure and Hospitality workers
OthServ	Industry: Number of Other Service workers
Military	Industry: Number of Military workers
EmpDens	Employment density

Field Name	Description
PopDens	Population density
PopEmpDens	Population and Employment density
Park_Base	Base parking cost
Park_Day	Cost to park all day
NP_Area	National Park Area (square miles)
Coastline	Indicator that zone is Coastal
Disney	Indicator that zone is Disneyland
Ski	Indicator that zone is Ski Resort Area
ConvCent	Indicator that zone is Convention Center
DensBufEmp_2.0	Employment density within 2.0 mile buffer
BufEmp_2.0	Employment within 2.0 mile buffer
PropHops_5.0	Proportion of employment within 5 miles of leilsure/hospitality industry

9.3 TOP AND LOGSUM FILES

Table 9-2 Fields in the Top Files

Column Header	Field Description
SerialNo	
TAZ	
Purp	
PartySize	
Duration	
Direction	
Income	
HHSize	
Workers	
AutoOwn	
Occupation	
Members	
Ages	

Table 9-3 Fields in the Logsums Files

Column Header	Field Description
TAZ	
Type	
DC Logsum	

9.4 SKIMS FILES

The skims files are all HDF5 files with various record structures. They are divided into five types: car skims, station correspondence files, passenger mode stops files, station-to-station skims, and access/egress skims.

The car skims provide the level of service by car between every pair of zones. There is a car skims file for each of the time periods. Table 9.6 shows the fields that should appear in each record in the order given.

Table 9-4 Fields in the Car Skims Files

Column Header	Field Description
I	The TAZ number of the origin zone
J	The TAZ number of the destination zone
TIME	The travel time by car between the zones, in minutes
TOLL	The total road toll between the zones, in dollars
DIST	The road distance between the zones, in miles

Each airport and rail station has 3 numbers associated with each station:

1. An internal station number (usually the numbers from 1 to the number of airports/stations);
2. A node number used in the network encoding; and
3. A "dummy zone" used to generate skims to each individual station.

The station correspondence files map these representations to each other. Table 9.5 shows the fields that should appear in each record in the order given.

Table 9-5 Fields in the Station Correspondence File

Column Header	Field Description
Station	The internal station number
Node	The node number
Name	The 3-letter airport code or rail station name
Long name	Additional name information
Active	Indicator that the station or airport is active
TAZ	TAZ or dummy TAZ connected to airport or station
Mode	Air, CVR, or HSR

Section here about rail skims

The passenger rail mode stops files tell which stations will be used for trips between each pair of zones for which that mode is available. There is a rail station stops file for the peak period. The fields are listed in Table 9.6.

Table 9-6 Fields in the CVR and HSR Passenger Mode Stops Files

Column Header	Field Description
I	The TAZ number of the origin zone
J	The TAZ number of the destination zone
ACC_STATION	The node number of the airport/station where the passenger transfers from the access mode to the main mode (the *origin* airport/station)
EGR_STATION	The node number of the airport/station where the passenger transfers from the main mode to the egress mode (the destination airport/station)

The station-to-station skims files provide the level of service by rail between each pair of stations. There is a rail station-to-station file for the peak period. The fields are listed in Table 9.7.

Table 9-7 Fields in the CVR and HSR Station-to-Station Skims Files

Column Header	Field Description
I	The internal station number (NOT the node number) for the origin airport/station
J	The internal station number for the destination airport/station
FARE	The fare, in dollars, to ride the passenger mode between the two airports/stations
IVTIMES	The travel time in minutes between the two airports/stations – zero indicates no route available
HEADWAY	The average time, in minutes, between departures from the origin airport/station to the destination airport/station

9.5 OUTPUT

The output for the LDPTM consists of a trip list in the csv format; each record is a single trip. The fields used for the trip list are consistent with the other components of the CSTDM. Table 9.11 lists the fields and explains how they are adapted to the LDPTM.

Table 9-8 Fields in the LDPTM Trips Output Format

Column Header	Field Description
Model	Always 2 for the LDPTM
SerialNo	A unique number assigned to each trip, starting at 1 and incrementing
Person	Always 1 for the LDPTM
Trip	Always 1 for the LDPTM
Tour	Always 1 for the LDPTM
HomeZone	The origin zone for the trip
ActorType	Always “Person” for the LDPTM
OPurp	The purpose of the trip: “Bus” for business, “Com” for commute, “Rec” for recreation, “OtL” for other
DPurp	Same as OPurp for the LDPTM
I	The origin zone for the trip if the direction is “from home”, otherwise the destination zone for the trip
J	The destination zone for the trip if the direction is “from home”, otherwise the origin zone for the trip
Time	The time period that the trip occurs in: 2 for AM peak, 3 for midday, 4 for PM peak, 5 for late off-peak
Mode	The main mode, with occupancy indicated for car trips: “SOV”, “HOV2”, or “HOV3” for car trips of the corresponding occupancy, “Air” for air, “Rail” for rail, “HSR” for high-speed rail
OStation	The origin airport/station internal reference number

Column Header	Field Description
DStation	The destination airport/station internal reference number
AccMode	"Park" for Drive and Park, "Rent" for Rental Car, "Drop" for Drop Off, "Taxi" for Taxi, "Trans" for Transit, "Walk" for Walk
EgrMode	"Park" for Drive and Park, "Rent" for Rental Car, "Drop" for Pick Up, "Taxi" for Taxi, "Trans" for Transit, "Walk" for Walk
Direction	
HHSize	Household size (1, 2, 3, or 4; 4 indicates 4 or more)
HHWks	Number of workers in household (0, 1, or 2; 2 indicates 2 or more)
HHInc	"Low" for low income, "Med" for medium income, "High" for high income
HHCars	Number of cars in the household (0, 1, or 2; 2 indicates 2 or more)
Dist	

Table 9-9 Fields in the LDPTM Access/Egress Output Format

Column Header	Field Description
Model	Always 2 for the LDPTM
SerialNo	A unique number assigned to each trip, starting at 1 and incrementing
Person	Always 1 for the LDPTM
Trip	Always 1 for the LDPTM
Tour	Always 1 for the LDPTM
HomeZone	The origin zone for the trip
ActorType	Always "Person" for the LDPTM
OPurp	The purpose of the trip: "Bus" for business, "Com" for commute, "Rec" for recreation, "OtL" for other
DPurp	Same as OPurp for the LDPTM
I	The origin zone for the trip if the direction is "from home", otherwise the destination zone for the trip
J	The destination zone for the trip if the direction is "from home", otherwise the origin zone for the trip
Time	The time period that the trip occurs in: 2 for AM peak, 3 for midday, 4 for PM peak, 5 for late off-peak
Mode	The main mode, with occupancy indicated for car trips: "SOV", "HOV2", or "HOV3" for car trips of the corresponding occupancy, "Air" for air, "Rail" for rail, "HSR" for high-speed rail
OStation	The origin airport/station internal reference number
DStation	The destination airport/station internal reference number
Dest	
AccMode	"Park" for Drive and Park, "Rent" for Rental Car, "Drop" for Drop Off, "Taxi" for Taxi, "Trans" for Transit, "Walk" for Walk

Column Header	Field Description
EgrMode	"Park" for Drive and Park, "Rent" for Rental Car, "Drop" for Pick Up, "Taxi" for Taxi, "Trans" for Transit, "Walk" for Walk
MainMode	

Note: The Access and Egress modes given in the output are those used for the original outbound trip from home to the airport/rail station, even when the trip record contains data on the return trip back to home.

The car trips for each car mode and time period in the above trip list are combined with car trips from the other model components of the CSTDM, and assigned to the road networks for each time period.

10.0 LDCVM

10.1 DESCRIPTION

The Long Distance Commercial Vehicle Model imports a set of origin-destination tables that originate from the CALSIM (PECAS) in this case. In the future other viable sources (e.g., a dedicated Freight Transportation Model for California) may exist to supplement or replace PECAS in this role.

A complete description of the LDCVM model component is contained in the LDCVM document, which provides detailed information on the development of this model component.

10.2 OUTPUTS

As setup for delivery of the model, the LDCVM does not include processing. It essentially provides an external table of trips with the fields in Table 10.1 to the Assignment and Skimming process.

Table 10-1 LDCVM Input File Description

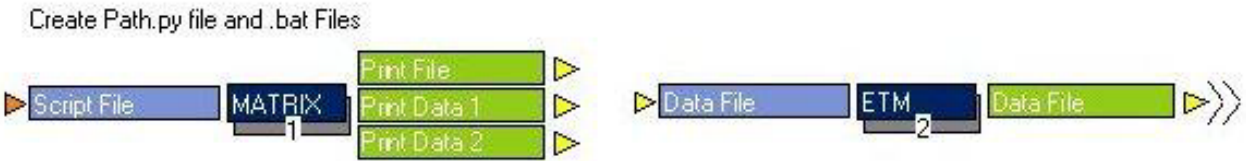
Field Name	Description
origin	Origin TAZ
destination	Destination TAZ
type	Load Type

11.0 ETM

11.1 DESCRIPTION

The External Travel Model operates in two phases as shown in Figure 11.1. The first produces <CSTDM_Directory>\code\etm.bat and path.py. The second executes the batch file to run the External Travel Model, which is written in Java.

Figure 11.1 External Travel Model



A complete description of the ETM model component can be found in the ETM document, which provides detailed information on the development of this model component.

11.2 INPUTS

Inputs to the ETM consist of two tables and network skims:

- Externals.csv with targets for the External Travel Model;
- Zonal Properties ETM.csv with zonal properties; and
- Skims in an hdf5 format and stored in <CSTDM_Directory>\base\<Scenario>\skims\skims.h5.

Externals.csv contains the fields, as described in Table 11.1. The Zonal Properties for the ETM model component are in Table 11.2.

Table 11-1 Fields in Externals.csv

Field Name	Description
TAZ	Transportation Analysis Zone
ExtDist	External District
Name	Name of external district
Volume	Total Volume
E-I	Proportion of volume that is external to internal
I-E	Proportion of volume that is internal to external

Field Name	Description
E-E	Proportion of volume that is external to external
CarLocal	Proportion of volume that is local car trips
CarLong	Proportion of volume that is long distance car trips
Medium	Proportion of volume that is medium trucks
Heavy	Proportion of volume that is heavy trucks
Time_1_IE	Proportion of volume that is in off peak early as internal to external
Time_2_IE	Proportion of volume that is in am peak as internal to external
Time_3_IE	Proportion of volume that is in midday as internal to external
Time_4_IE	Proportion of volume that is in pm peak as internal to external
Time_5_IE	Proportion of volume that is in off peak late as internal to external
Time_1_EI	Proportion of volume that is in off peak early as external to internal
Time_2_EI	Proportion of volume that is in am peak as external to internal
Time_3_EI	Proportion of volume that is in midday as external to internal
Time_4_EI	Proportion of volume that is in pm peak as external to internal
Time_5_EI	Proportion of volume that is in off peak late as external to internal
EE_4	Proportion of external to external trips to external zone 4
EE_14	Proportion of external to external trips to external zone 14
EE_16	Proportion of external to external trips to external zone 16
EE_31	Proportion of external to external trips to external zone 31
EE_35	Proportion of external to external trips to external zone 35
EE_39	Proportion of external to external trips to external zone 39
EE_42	Proportion of external to external trips to external zone 42
EE_43	Proportion of external to external trips to external zone 43
EE_44	Proportion of external to external trips to external zone 44
EE_45	Proportion of external to external trips to external zone 45
EE_46	Proportion of external to external trips to external zone 46
EE_47	Proportion of external to external trips to external zone 47
EE_48	Proportion of external to external trips to external zone 48
EE_49	Proportion of external to external trips to external zone 49
EE_50	Proportion of external to external trips to external zone 50
EE_51	Proportion of external to external trips to external zone 51

Table 11-2 Fields in Zonal Properties ETM.csv

Field Name	Description
TAZ	Transportation Analysis Zone number
FAF_Area	Freight Area Framework area
Pop	Population
TotEmp	Employment
CVM_IN	Industrial employment
CVM_RE	Retail employment
CVM_SV	Service employment
CVM_TH	Transportation and Utilities employment
CVM_WH	Wholesale employment

11.3 OUTPUTS

The outputs from the ETM are a table of trips with the fields described in Table 11.3.

Table 11-3 ETM Output Fields

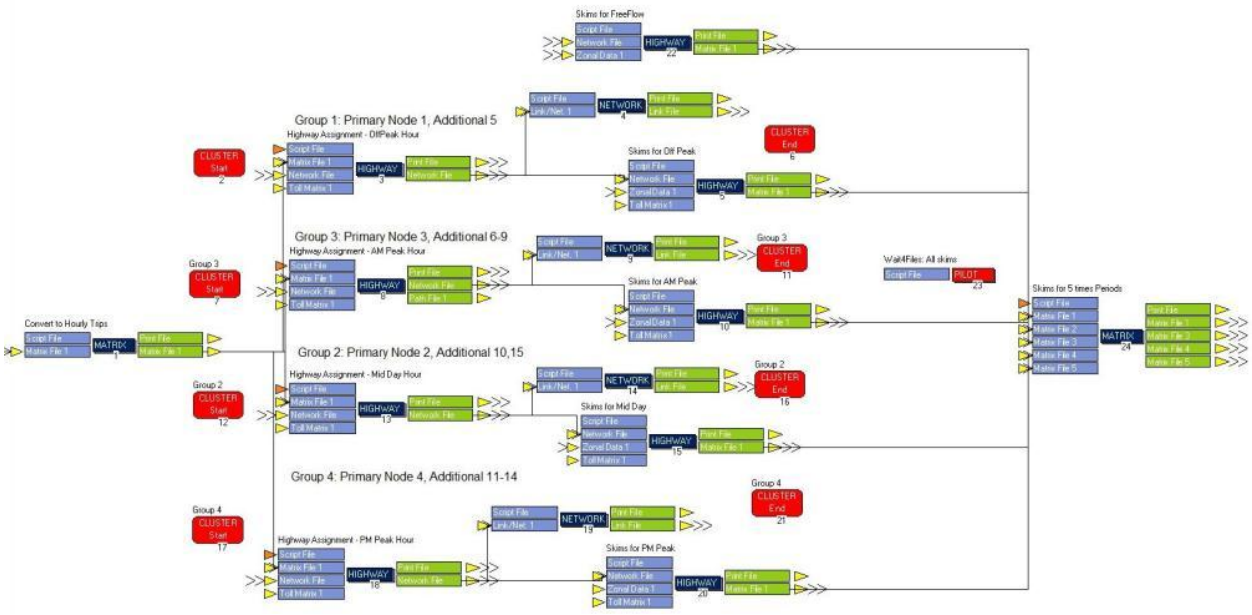
Field Name	Description
Model	Model ID
SerialNo	Household ID
Person	Person ID
Trip	Trip ID
Tour	Tour ID
HomeZone	Home TAZ
ActorType	Actor type
OPurp	Origin purpose
DPurp	Destination purpose
I	Origin TAZ
J	Destination TAZ
Time	Time period
Mode	Mode
Ext	External zone name
Int	Internal region name

12.0 Assignment and Skimming

12.1 DESCRIPTION

The Assignment and highway skimming portion of the CSTDM has three primary segments as shown in Figure 12.1. The first converts trip tables into OD tables for assignment by time period. The second section assigns those trips to the highway network by each time period, extracts screenline data, and produces skims for the time period. A set of free-flow skims is also generated. The last section compiles all of the skims to a single dataset.

Figure 12.1 Assignment and Skimming



In this portion of the model, each of the assignment and skimming processes by time period is run in parallel on a separate set of nodes. The number of nodes has been assigned to try to equalize the run times for each of the time periods.

12.2 INPUTS

Inputs to the trip table conversion are the trip tables from each of the five demand models. These are combined to create a matrix that will be loaded onto the networks by time period and mode.

The highway assignment step requires a network for each time period, and a toll matrix that includes the tolls for each tolled road link. The attributes of each of these files are documented in the Network documentation.

Highway networks are located in <CSTDM_Directory>\base\<Scenario>\HwyNetworks\AlphaNetwork_<time period>_<year>.net and have the fields described in Table 12.1. For details please see the network documentation.

Table 12-1 Fields in the Network Files

Field Name	Description
A	A node for 1-way link
B	B node for 1-way link
DISTANCE	Link length (miles)
LANES	Number of lanes (1 direction)
SPEED	Free flow speed (mph)
CAPACITY	Vehicles per lane per hour
FTYPE	Facility type (see Table 2.2)
USE	Vehicles allowed
TOLL	Flag for link with toll
ONRAMP	Flag for link with toll
OFFRAMP	Flag for link with toll
TIME_INIT	Initial travel times (minutes)
SCREENLINE	Flag for identifying links in screenlines
STREET_NAME	Street name
CT_ROUTE	State highway route number
ITSP	ITSP route designation
COUNTY_1	County in which link resides
REGION	Region in which link resides
WIM	A number of CSFFM attributes related to WIM counts
FR_TOLL_ID	Truck toll ID
FR_TOLL	Truck tolls
FR_RAIL	Flag if link is part of freight rail network
FR_HIGHWAY	Flag if link is part of freight rail network
FR_SPEED	Truck speed
CSFFM	Flag if link is part of CSFFM network

Toll matrices are in <CSTDM_Directory>\base\<Scenario>\HwyNetworks\tolls_<time period>.dbf and have the structure described in Table 12.2.

Table 12-2 Toll File Structure

Field Name	Description
ON_RAMP	Toll ID
OFF_RAMP	Toll ID
TOLL	Toll ID
COST_SOV	Cost for a SOV
COST_HOV2	Cost for a HOV2
COST_HOV3	Cost for a HOV3
COST_TRUCK	Cost for a Truck

12.3 OUTPUTS

Outputs include the Loaded networks for each time period as <CSTDM_Directory>\base\<Scenario>\LoadedNetworks\HwyNetwork_Loaded_<time period>_<year>.NET.

The attributes contained in the loaded network include all attributes from Table 12.3 and the following attributes in Table 12.4.

Table 12-3 Loaded Network Fields in Addition to those from the Unloaded Network

Field Name	Description
V_2	Total volume
Time_2	Travel time on link
VC_2	Volume/capacity ratio
CSPD_2	Congested speed
VDT_2	Vehicle-distance traveled
VHT_2	Vehicle-hours traveled
V1_2	Volume, SOV, short distance
V2_2	Volume, HOV2, short distance
V3_2	Volume, HOV3, short distance
V4_2	Volume, Light truck, short distance
V5_2	Volume, Medium truck, short distance
V6_2	Volume, Heavy truck, short distance

Field Name	Description
V7_2	Volume, SOV, long distance
V8_2	Volume, HOV2, long distance
V9_2	Volume, HOV3, long distance
V10_2	Volume, Heavy truck, long distance
V11_2	Volume, SOV, external trips
V12_2	Volume, HOV2, external trips
V13_2	Volume, HOV3, external trips
V14_2	Volume, Medium truck, external trips
V15_2	Volume, Heavy truck, external trips
V1T_2	The volume in the opposite direction
V2T_2	The volume in the opposite direction
V3T_2	The volume in the opposite direction
V4T_2	The volume in the opposite direction
V5T_2	The volume in the opposite direction
V6T_2	The volume in the opposite direction
V7T_2	The volume in the opposite direction
V8T_2	The volume in the opposite direction
V9T_2	The volume in the opposite direction
V10T_2	The volume in the opposite direction
V11T_2	The volume in the opposite direction
V12T_2	The volume in the opposite direction
V13T_2	The volume in the opposite direction
V14T_2	The volume in the opposite direction
V15T_2	The volume in the opposite direction

Other outputs include:

- Skims for each time period by mode <CSTDM_Directory>\base\<Scenario>\skims\Auto; and
- A combined set of skims for auto travel <CSTDM_Directory>\base\<Scenario>\skims\Auto.

13.0 Travel Skims Extracted

The following sections describe the zone-to-zone travel skims extracted from the CUBE network descriptions and assignment results for use in the different submodels of the CSTDM.

13.1 Travel Skims Extracted for the SDPTM

In total 76 zone origin to destination travel skims are extracted for this submodel, by mode, time period, and skim property. Table 13.1 summarizes these skims.

Table 13-1 Travel Skim Matrices Extracted for the Short Distance Personal Travel Model

Mode	Property	AM	PM	Mid	Off	Freeflow
SOV	Time	1	1	1	1	1
SOV	Distance	1	1	1	1	
SOV	Toll	1	1	1	1	
HOV2	Time	1	1	1	1	1
HOV2	Distance	1	1	1	1	
HOV2	Toll	1	1	1	1	
HOV3+	Time	1	1	1	1	1
HOV3+	Distance	1	1	1	1	1
HOV3+	Toll	1	1	1	1	
Walk	Time	From HOV3 freeflow distance				
Bike	Time	From HOV3 freeflow distance				
SchBus	Time	HOV3	HOV3	HOV3	HOV3	
TranWalk	In Time	1	1	1	1	
TranWalk	Out Time	1	1	1	1	
TranWalk	Fare	1	1	1	1	
TranAutoAccess	In Time	1	1	1	1	
TranAutoAccess	Out Time	1	1	1	1	
TranAutoAccess	Fare	1	1	1	1	
TranAutoEgress	In Time	1	1	1	1	
TranAutoEgress	Out Time	1	1	1	1	
TranAutoEgress	Fare	1	1	1	1	

13.2 Auto Skims

The 40 "auto skims" are extracted from the results of separate multiclass assignments run for each of the four model time periods (AM peak, PM peak, Midday, and Off-peak).

Travel demand by time period for each of the vehicle modes used in the CSTDM (single-occupant "auto" (SOV), high-occupant "Auto" with 2 persons in the vehicle (HOV2), high-occupant "auto" with 3+ persons in the vehicle (HOV3+), and truck) are assigned to the road network. A multiclass equilibrium assignment is run in CUBE for each time period; and resulting "loaded" travel times, distances, and toll skims extracted. The assignment and skim process has the following features:

- Truck volumes are converted to passenger car equivalent (pce) volumes for assignment purposes, using an average truck pce factor of 1.5 for single-unit (medium) trucks and 2.0 for multiunit (heavy trucks);
- The link USE field is used to identify availability of links for auto modes:
  - USE = 1 identifies links available for all autos;
  - USE = 2 identifies links only available for autos with 2+ occupancy;
  - USE = 3 identifies links only available for autos with 3+ occupancy;
  - USE = 4 identifies links not available for trucks;
  - USE = 5 and 6 – transit line/connector links NOT used in auto assignment;
  - USE = 7 identifies tolled links; and
  - USE = 8 identifies link only available for trucks.
- The primary convergence criteria for the multiclass assignment is a "relative gap" < 0.005 (0.5 percent);
- Intrazonal distances are calculated as:

$$1/3 * \text{square root of zonal area}$$[3]

Intrazonal auto times are calculated using the intrazonal distance, using a speed value based on zonal density (defined as (Population + Employment)/Area in square miles). Intrazonal speed classes are defined in Table 13.2. Intrazonal auto times are capped at 10 minutes.

[3] This formula was estimated empirically from data from census "On the Map" Journey to work data.

Table 13-2 Intrazonal Auto Speed Classification

Intrazonal Speed Class	Name	Minimum Density	Maximum Density	Auto Speed (mph)
1	Rural	0	200	50
2	Exurban	200	2,000	35
3	Suburban	2,000	20,000	25
4	Urban	20,000	n/a	15

Tolls for each origin-destination pair are obtained using the CUBE path skimming process for path-based tolls. Each toll is specified in the road network as a "closed system" with an on-gate link, a toll-road link, and an off-gate link. By convention for the CSTDM, three consecutive links are identified at each location, and the same unique number coded in the relevant link ENTRYGATE, TOLL, OR EXITGATE field. In addition, an input database file is read in for each time period giving the tolls for autos and trucks for each toll location, with the following fields:

- ENTRYGATE (e.g., 1);
- EXITGATE (e.g., 1);
- Toll for Auto (e.g., $2.00); and
- Toll for Truck (e.g., $10.00): The toll for 4-axle trucks is used to represent truck tolls.

The path-building process converts these tolls into "equivalent minutes" using values of time factors for each vehicle mode. Time-based Assignment paths for each O-D zone pair are then determined, taking into account the additional "equivalent time" penalty associated with the toll. The path skimming process then sums the $ value of all toll links on the shortest "time" path for each O-D pair. Value of time factors are "hard-coded" in the CUBE path-building script:

- Six minutes per toll $ for SOV (single-occupant vehicle auto);
- Three minutes per toll $ for HOV2 (two occupant vehicle auto);
- Two minutes per toll $ for HOV3 (3+ occupant vehicle auto, using 3.6 average occupancy); and
- Three minutes per toll $ for trucks.

Additional features used in the assignment and skimming process are:

- Walk and Bike skim times are derived from the HOV3+ distance skims, assuming an average walking speed of 2.5 mph and an average bicycle speed of 11 mph.

- Auto operating cost skims are derived by multiplying the SOV auto distance skim by an average auto operating cost.
- Nonhome destination zone parking costs for each O-D pair are added during the short distance personal travel model estimation process (see separate Technical Note on Parking Costs).

13.3 TRANSIT SKIMS

The 36 "transit skims" identified in Table 12.5, used in the SDPTM are similar to the auto skims. In-vehicle transit time, out of vehicle transit time, and transit fare are extracted for each of the three transit modes (transit with walk access AND egress, transit with auto access and walk egress, and transit with walk access and auto egress) for each of the four model time periods (AM, PM, Midday, Offpeak).

A hybrid method is being used to represent local transit in the CSTDM. Rail services available for "local" travel are explicitly coded into the CUBE network. Local "bus service" is represented indirectly through a model relating bus times to auto time from CUBE. This model used for the representation of local bus transit is documented in a separate Technical Note. It is applied to a series of catchment area O-D pairs with a separate catchment area for each operator or group of operators serving regions or communities.

For local transit with walk access and egress, five transit alternatives are available:

1. Local bus all the way with walk access and egress (transit travel times and costs estimated using the indirect transit time model and the CUBE auto time).
2. Local rail all the way with walk access and egress (transit travel times and costs extracted using CUBE).
3. Local bus (with walk access) access to a rail station with walk egress (transit travel times and costs for Local bus component estimated using the indirect transit time model; rail and walk egress times and costs extracted using CUBE).
4. Walk access to a rail station with local bus to destination (with walk egress) (transit travel times and costs for Local bus component estimated using the indirect transit time model; rail and walk access times and costs extracted using CUBE).

- Local bus (with walk access) access to a rail station with local bus to destination (with walk egress) (transit travel times and costs for Local bus component estimated using the indirect transit time model; rail times and costs extracted using CUBE).

Transit travel times and fares are extracted using CUBE for each of the five alternatives. The alternative with the lowest "generalized cost" is selected as the

best alternative. Transit in-vehicle time, out of vehicle time (including auto access/egress times as relevant), and travel cost (including transit fare and auto operating costs as relevant) are extracted for that alternative.

The generalized cost formulation for each alternative is in time units of equivalent in-vehicle time and uses the following factors:

- Transit and auto in-vehicle time weighted by factor of 1.0.
- Transit walk, wait, transfer, and access time weighted by 2.89 (This factor is taken from the factor estimated in the Sacramento SACSIM Activity-Based Travel Forecasting Model for SACOG (derived from Table 8 – Simplified Mode choice Model for Calculating Aggregate Logsum, Technical Memorandum #4 Mode Choice Models, SACSIM05, August 2006.).
- Transit fare costs converted to time units by applying a value of time of $8.21 per hour (i.e. $1 is equivalent to 7.30 minutes (This value of time also is taken from the SACSIM model).

For local transit with auto access to a rail station and walk egress, the following two transit alternatives are available:

- Auto to rail station and walk egress (transit travel times and costs extracted using CUBE); and
- Auto to rail station and local bus to destination with walk egress (auto access and rail transit travel times and costs extracted using CUBE, transit travel times and costs for Local bus component estimated using the indirect transit time model).

For local transit with walk access to a rail station and auto egress to destination the following two transit alternatives are available:

- Walk access to rail station and auto egress (transit travel times and costs extracted using CUBE); and
- Local bus access to rail station and auto egress (auto egress and rail transit travel times and costs extracted using CUBE; transit travel times and costs for Local bus component estimated using the indirect transit time model).

Skims for the best alternatives for the above two transit mode options are extracted as described above.

13.4 TRAVEL SKIMS EXTRACTED FOR OTHER CSTDM MODEL COMPONENTS

The long distance personal travel model, the short distance commercial vehicle model, and the external vehicle model directly use the auto skims extracted.

The long distance personal travel model also uses transit skims for long distance rail and air service. The long distance rail skims are extracted directly from

CUBE for two time periods (AM peak and Midday) using the explicit CUBE rail line coding. The long distance air skims are extracted directly from CUBE for one time period (AM peak) using the explicit CUBE air line coding.

Access and Egress skims to long distance rail and air by auto, local transit, and walk are also required. These are also extracted from CUBE using the methods identified in Section 12.7 above.

The short distance commercial vehicle model, the long distance commercial vehicle model, and the external vehicle model also use truck skims, which are extracted in a similar fashion to the auto skims. Table 13.3 identifies the 14 truck skims extracted.

Table 13-3 Truck Travel Skim Matrices Extracted

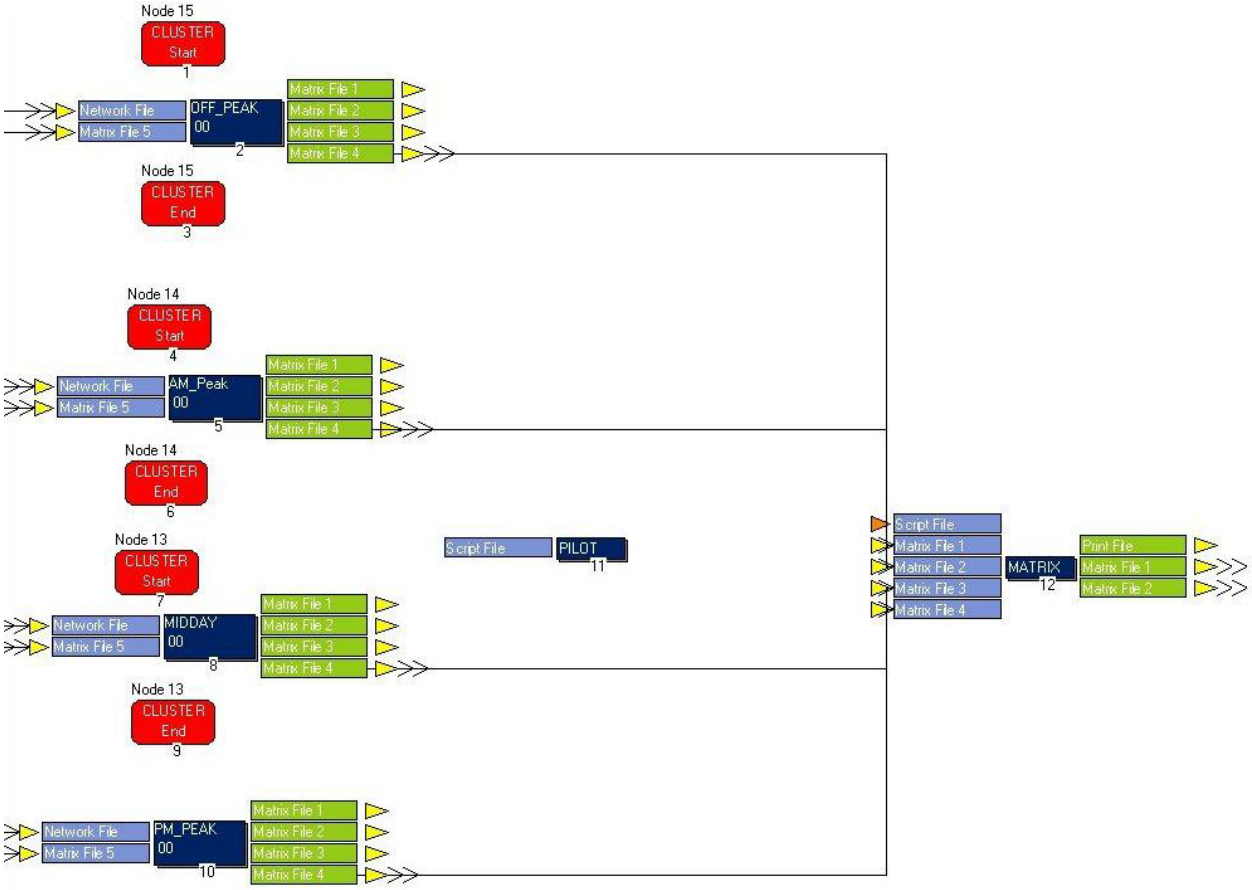
Mode	Property	AM	PM	Mid	Off	Freeflow
Truck	Time	1	1	1	1	1
Truck	Distance	1	1	1	1	1
Truck	Toll	1	1	1	1	

14.0 Public Transport: Short Distance

14.1 DESCRIPTION

Short distance public transport makes use of the loaded network and produces ridership on local fixed guideway rail, and bus services for each time period. The process flow is illustrated in Figure 14.1.

Figure 14.1 Short Distance Public Transport



14.2 INPUTS

For each time period, the inputs include:

- Loaded network file <CSTDM_Directory>\base\<Scenario>\LoadedNetworks\HwyNetwork_Loaded_<time period>_<year>.NET.
- Line files for each service. The process for creating these is described in the network documentation. The line files are found in <CSTDM_Directory>\base\<Scenario>\Controls\system_cstdm2009_<year>.pts. Listings of the line files are in Tables 14.2 and 15.1.
- System files. They identify each transit system and the lines that apply to it. <CSTDM_Directory>\base\<Scenario>\transit\tfares\farein_cstdm2009_2008.far.
- Fare file. This is a list of the fare system type for each transit system and cost if the system is a flat rate. If the system is a zone to zone system, then it contains the reference to the correct fare matrix <CSTDM_Directory>\base\<Scenario>\transit\tfares\farein_cstdm2009_2008.far.
- Fare Matrices. The zone-to-zone costs for each transit system that uses a zone-to-zone fare system <CSTDM_Directory>\base\<Scenario>\transit\tfares\.
- Factor File. This file sets properties for the transit assignment, including the maximum number of transfers, wait curves, boarding and transfer penalties. <CSTDM_Directory>\base\<Scenario>\Controls\fact_cstdm2009_<year>.dat the factor file includes the factors described in Table 14.1.

Table 14-1 Factors Included in the Factor File

Factor	Description	Value in CSTDM2009
FARESYSTEM	Number of fare model that applies to operators selected with OPERATOR keyword	11-16; 31-35; 41-43; 52; 54
SPREADFUNC	Integer of the function that computes SPREAD in route enumeration – SPREAD defines an upper cost limit for routes between an O-D pair	1 Max of Minimum O-D time * SPREADFACT; minimum O-D time + SPREADCONST
SPREADFACT	Factor that minimum O-D time is multiplied by	1.2
SPREADCONST	Time added to minimum O-D	0.0
MAXCOMPD	# components generated during route enumeration	1,000,000
MAXFERS	Maximum # transfers between O-D	2
AONMAXFERS	Maximum # transfers between O-D for O-D with only one enumerated route	2
EXTRAXFERS1	# of transfers at which program stops exploration less direct routes	2

Factor	Description	Value in CSTDM2009
EXTRAXFERS2	Max # of transfers explored in excess of the # required by minimum cost route	2
RUNFACTOR	Mode specific weighting factors applied to transit in-vehicle times and non-transit leg times in route enumeration	2.89 for modes 1-5 – walk and auto access and egress plus walk transfer
BRDPEN	Mode specific boarding penalty in minutes (for transit modes only)	5 for all transit modes
WAITFACTOR	Node specific wait-time weighting factor	2.89 for all non-TAZ nodes
IWAITCURVE	Wait curve used to calculate initial wait time for nodes specified by NODES keyword	1 for all non-transit nodes except 18501-18518 4 for nodes 18501-18518 (Air)
XWAITCURVE	Wait curve used to calculate transfer wait time at nodes	Same as IWAITCURVE
XFERPEN	Transit mode to transit mode transfer penalty, in minutes	10, for all transit mode transfers

At present, line files are in use for the systems with fare structure reported inTable 14.2.

Table 14-2 Line Files with Fare Structure

Transit Line File	Fare Structure Type
BART_CSTDM09_<Year>.lin	FROMTO
SACOG_LRT_CSTDM09_<Year>..lin	FLAT
SANDAG_LRT_CSTDM09_<Year>..lin	FLAT
VTA_LRT_CSTDM09_<Year>..lin	FLAT
Muni_Metro_CSTDM09_<Year>..lin	FLAT
SCAG_Urban_Rail_CSTDM09_<Year>..lin	FLAT
SANDAG_Sprinter_CSTDM09_<Year>..lin	FLAT
SANDAG_Rail_CSTDM09_<Year>..lin	COUNT
Metrolink_Orange-CSTDM09_<Year>..lin	FROMTO
SCAG_Metrolink_Other_CSTDM09_<Year>..lin	FROMTO
ACE_CSTDM09_<Year>..lin	FROMTO
CALTRAIN_CSTDM09_<Year>..lin (includes SMART and Dumbarton Rail, when applicable)	COUNT
Pacsurf_CSTDM09_<Year>..lin (includes HSR, when applicable)	FROMTO
AMTRAK_Capital_CSTDM09_<Year>..lin	FROMTO
AMTRAK_SJQ_CSTDM09_<Year>..lin	FROMTO

14.3 OUTPUTS

The outputs for each time period are four matrices each with separate subpages or skims. Each of these skims contains all of the zone-to-zone costs. In cases where no access is possible, the value of -99999.00 is used to represent a null value. Each of these matrices can be found in <CSTDM_Directory>\Base\<Scenario>\Skims\Transit\<time period>\.

In the matrix and skim names the following conventions are used:

W = Walk, R = Ride fixed-route transit (light or heavy rail), T = Transit using the synthetic local transit, and D = drive. These values are combined to create patterns such as "WRW", which indicates that the skim contains the times for Walking to a Ride trip, and then Walking to the final destination.

- **W_W_<time period>.mat.** This matrix contains the walk access/walk egress skims of times for the following use patterns:
  - WRW. Walk to rail then walk to final destination,
  - WRT. Walk to rail then transit to final destination,
  - TRW. Transit to rail then walk to final destination,
  - TRT. Transit to rail then transit to final destination, and
  - TTT. Transit for the entire trip.
- **D_W_<time period>.mat.** This matrix contains the walk access/walk egress skims of times for the following use patterns:
  - DRW. Drive to rail then walk to final destination, and
  - DRT. Drive to rail then transit to final destination.
- **W_D_<time period>.mat.** This matrix contains the walk access/walk egress skims of times for the following use patterns:
  - WRD. Walk to rail then drive to final destination, and
  - TRD. Transit to rail then drive to final destination.
- **Costs_<time period>.mat.** This matrix contains the walk access/walk egress skims of times for the following use patterns:
  - WW_TIVT. Walk access/walk egress time in vehicle,
  - WW_TOVT. Walk access/walk egress time out of vehicle,
  - WW_TFARE. Walk access/walk egress total fare,
  - DW_TIVT. Drive access/walk egress time in vehicle,
  - DW_TOVT. Drive access/walk egress time out of vehicle,
  - DW_TFARE. Drive access/walk egress total fare,
  - WD_TIVT. Walk access/drive egress time in vehicle,

- WD_TOVT. Walk access/drive egress time out of vehicle, and
- WD_TFARE. Walk access/drive egress total fare.

14.4 PUBLIC TRANSPORT LINE MANAGEMENT

Public transport scenarios and network updates can be created in a rather straightforward way in CSTDM. Appendix B provides an example that guides through the modifications of line files for public transportation. Updates introduced in the line files need to be accompanied by the necessary updates also in the related CSTDM input files used for public transportation described in the Technical Note on "Networks".

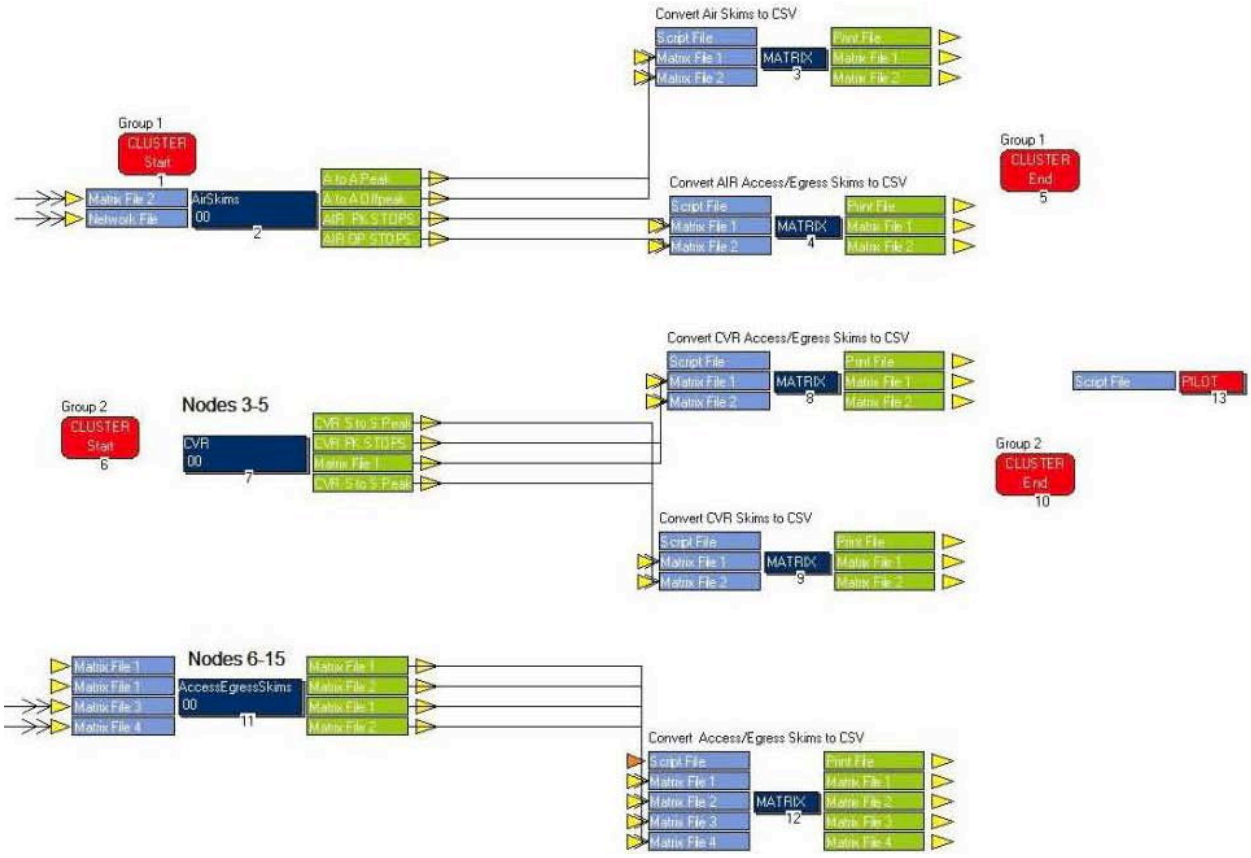
As described in the Technical Note on "Local Transit Functions", one of the advantages of the use of the synthetic methodology for the representation of local bus transit is the easier maintenance required for the update of the local transit network. Appendix C provides a simple example of the process required to update the information for the local transit component used in the SDPTM.

15.0 Public Transport: Long Distance

15.1 DESCRIPTION

The long distance public transport component of the CSTDM addresses the use of air travel and conventional rail for passenger interregional trips. Air skims and conventional rail skims are prepared separately and are run in parallel with each other to save time as shown in Figure 15.1.

Figure 15.1 Long Distance Public Transport



15.2 INPUT

The air skims component makes use of the line files for the 10 intraregional rail services, the fare matrices that apply, a fare file that identifies the fare structure for each of the access modes, and reuses the same system file as it is used for the short distance public transport calculations. The line files used for the air and rail access/egress skimming are listed in Table 15.1.

Table 15-1 Line Files Used for Air and Rail Skims

Service	Line File
BART	Bart_CSTDM09_<year>.lin
SacRT	SACOG_LRT_CSTDM09_<year>.lin
San Diego Metropolitan Transit Authority (Trolley)	SANDAG_LRT_CSTDM09_<year>.lin
Santa Clara Valley Transit Authority	VTA_LRT_CSTDM09_<year>.lin
San Francisco Municipal Transit Agency	Muni_metro_CSTDM09_<year>.lin
LA Metro	SCAG_Urban_Rail_CSTDM09_<year>.lin
San Diego Coaster	SANDAG_Rail_CSTDM09_<year>.lin
Metrolink	SCAG_Metrolink_Other_CSTDM09_<year>.lin
Caltrain	Caltrain_CSTDM09_<year>.lin
SMART (Future Rail)	Caltrain_CSTDM09_<year>.lin
Dumbarton (Future Rail)	Caltrain_CSTDM09_<year>.lin
Amtrak Pacific Surfliner	Pacsurf_CSTDM09_<Year>..lin
HSR (Future Rail)	Pacsurf_CSTDM09_<Year>..lin
Amtrak Capitol Corridor	AMTRAK_Capital_CSTDM09_<Year>..lin
Amtrak San Joaquins	AMTRAK_SJQ_CSTDM09_<Year>..lin
Air service	Air_CSTDM09_<year>.lin

The conventional rail component uses all of the line files from the short distance public transport. The system file, fare file, and fare matrices are applied unchanged from the short distance personal travel model.

The access/egress skims process for air and conventional rail uses auto skims for AM peak and midday time with time, tolls, distance, and cost for transit.

- **Auto Skims.** <CSTDM_Directory>\Base\<Scenario>\Skims\Auto\Skims_<timeperiod>_<year>.mat; and
- **Transit cost.** CSTDM_Directory>\Base\<Scenario>\Skims\Transit\<time period>\Costs_<time period>_<year>.mat.

15.3 OUTPUTS

Outputs from the long distance public transport include matrices as .csv files for peak and off peak times for:

- **Airport-to-airport in-vehicle times, fares, headways, and reliabilities.** <CSTDM_Directory>\Models\LDPTM\<Scenario>\Inputs\Airport_to_airport_<time period>_<year>.csv;
- **Air access and egress skims.** <CSTDM_Directory>\Models\LDPTM\<Scenario>\Inputs\Air _<time period>_stops_<year>.csv
- **Conventional rail access and egress skims.** CSTDM_Directory>\Models\LDPTM\<Scenario>\Inputs\CVR _<time period>_stops_<year>.csv;
- **Conventional rail times, fare, headway and reliability.** <CSTDM_Directory>\Models\LDPTM\<Scenario>\Inputs\Station_to_station_<time period>_<year>.csv;
- **Access/egress skims.** <CSTDM_Directory>\Models\LDPTM\<Scenario>\Inputs\ <time period>_Access_egress_<year>.csv; and
- **Access/egress skims for conventional rail.** <CSTDM_Directory>\Models\LDPTM\<Scenario>\Inputs\ <time period>_Access_egress_CVR_<year>.csv.

15.4 PUBLIC TRANSPORT LINE MANAGEMENT

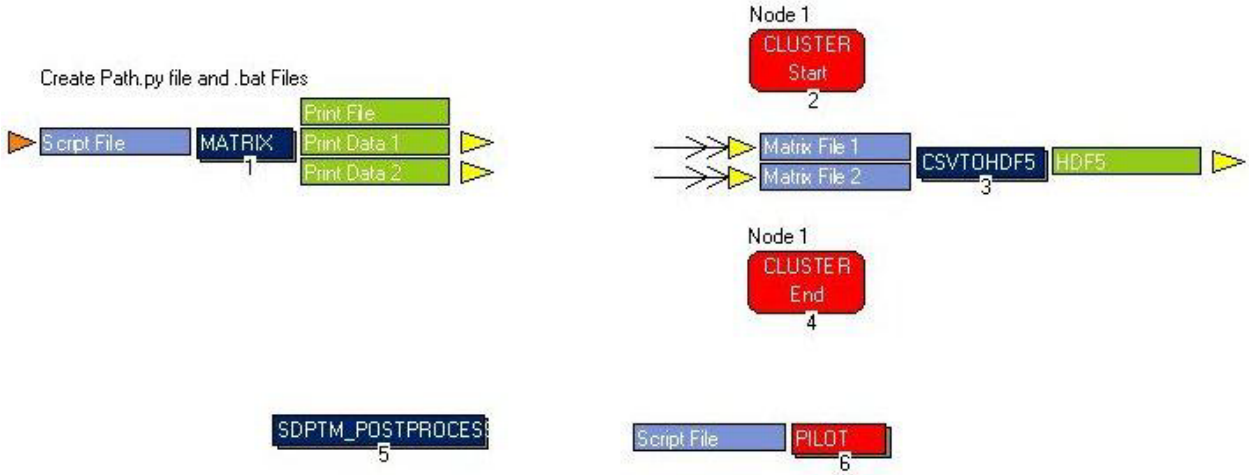
Public transport scenarios and network updates can be created in a rather straightforward way in CSTDM. Appendix B provides an example that guides through the modifications of line files for public transportation. Updates introduced in the line files need to be accompanied by the necessary updates also in the related CSTDM input files used for public transportation described in the Technical Note on “Networks”.

16.0 Export to HDF5

16.1 DESCRIPTION

The export to HDF5 process compiles all skims from the model and exports them to a single HDF5 file for use in the next run iteration. This is a python application with two steps, as shown in Figure 16.1. The first creates <CSTDM_Directory>\models\HDF5\CSV\prepskims.bat and <CSTDM_Directory>\models\HDF5\CSV\path.py. The second executes the .bat file. An additional step runs in parallel and produces some post-processed results for the short distance personal travel model.

Figure 16.1 HDF5 Export and SDPTM Post-Processor



16.2 INPUTS

All skims for the CSTDM run.

16.3 OUTPUTS

<CSTDM_Directory>\base\<Scenarios>\skims\skims.h5.

17.0 Scenario Summaries and Performance Metrics

In a collaborate effort with Caltrans staff, a number of scripts were created to extract model run data and performance metrics for evaluating the scenario. The following lists those items and provides a brief description of the basic methodology:

- Interregional Trips Summary
  - Interregional Trips by Time Period[4]
    - » Combines all passenger and commercial auto vehicle trips for each time period
    - » Can be aggregated at the following levels: County, MPO/RTPA, and Caltrans District
  - Interregional Trips by Time Period by Vehicle Type
    - » Combines all passenger and commercial auto vehicle trips for each time period by vehicles types (SOV, HOV 2, HOV 3+, Light Commercial Vehicle, Medium Commercial Vehicle, and Heavy Commercial Vehicle)
    - » Can be aggregated at the following levels: County, MPO/RTPA, and Caltrans District
  - Interregional VMT
    - » Computes skim-based VMT by time period
    - » Can be aggregated at the following levels: County, MPO/RTPA, and Caltrans District
- VMT Summary
  - VMT by Speed Bin
    - » Interzonal VMT by Speed Bin for Vehicles and Trucks
      - Aggregates link-based VMT by user-specified (in the script) speed bins by time period

[4] Daily trips include application of factors to convert hourly trips into total trips for that time period (5.4259 for off-peak, 3.4722 for AM peak, 4.8733 for midday, and 3.9841 for PM Peak).

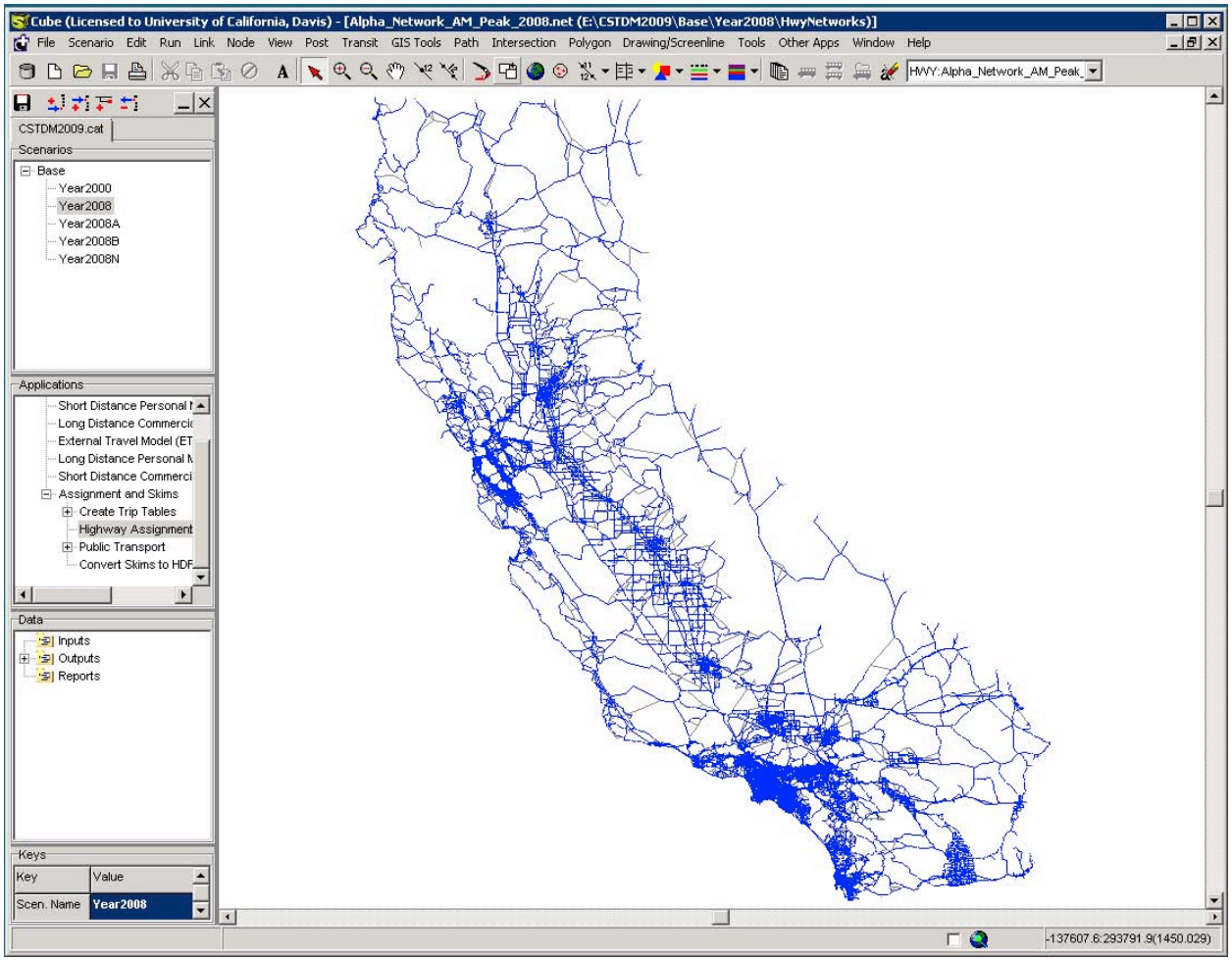
    - » Intrazonal VMT by Zone
        - Intrazonal distance is estimated as 1.5 times the radius of a TAZ, assuming each TAZ is a circle.
  - Loaded Network ADT
    - » ADT by Time Period
        - Combines total volumes by time period and daily volumes onto single loaded network
    - » Calculate Maintained Miles and Lane Miles for All Time Periods
        - Exports total roadway miles and lane files for all roadway facilities
  - Vehicle Hours of Delay
    - » Delay is calculated as the difference between congested and free-flow travel time
- Person Trips Summary
  - Stratified Personal Trip Purpose
  - Stratified Personal Trip Mode
  - Trips by Activity-Purpose (SDPTM and LDPTM)
  - Person Trips by Purpose by Mode
  - Person Trips by Purpose and Mode PA

A. Editing Highway Network

The following section describes simple instructions useful for some process of updates of the network links. This section is specifically designed to provide some explanatory cases, and does not include all possible changes that could be introduced in the model networks. Due to the complexity of the CSTDM model, a broad variety of possible cases for network updates and modifications is possible, and the user/developer can develop specific cases using predefined CUBE commands, specific scripts and additional integration with external software packages. No user manual can cover all possible applications, but this and the following appendices provide a very brief introduction and demonstration of some of these capabilities.

The following figures present the CUBE Windows and commands used for some basic network editing procedures. Figure A.1 contains a screenshot with the CUBE Network window in which the road network layers are visible.

Figure A.1 CUBE Network Window



The command:

Link > Browse Links (Browse nodes) opens a dialog box listing nodes in the road network. Figure A.2 shows a screenshot with the "Browse Link" mode.

Figure A.2 CUBE "Browse Link" Command

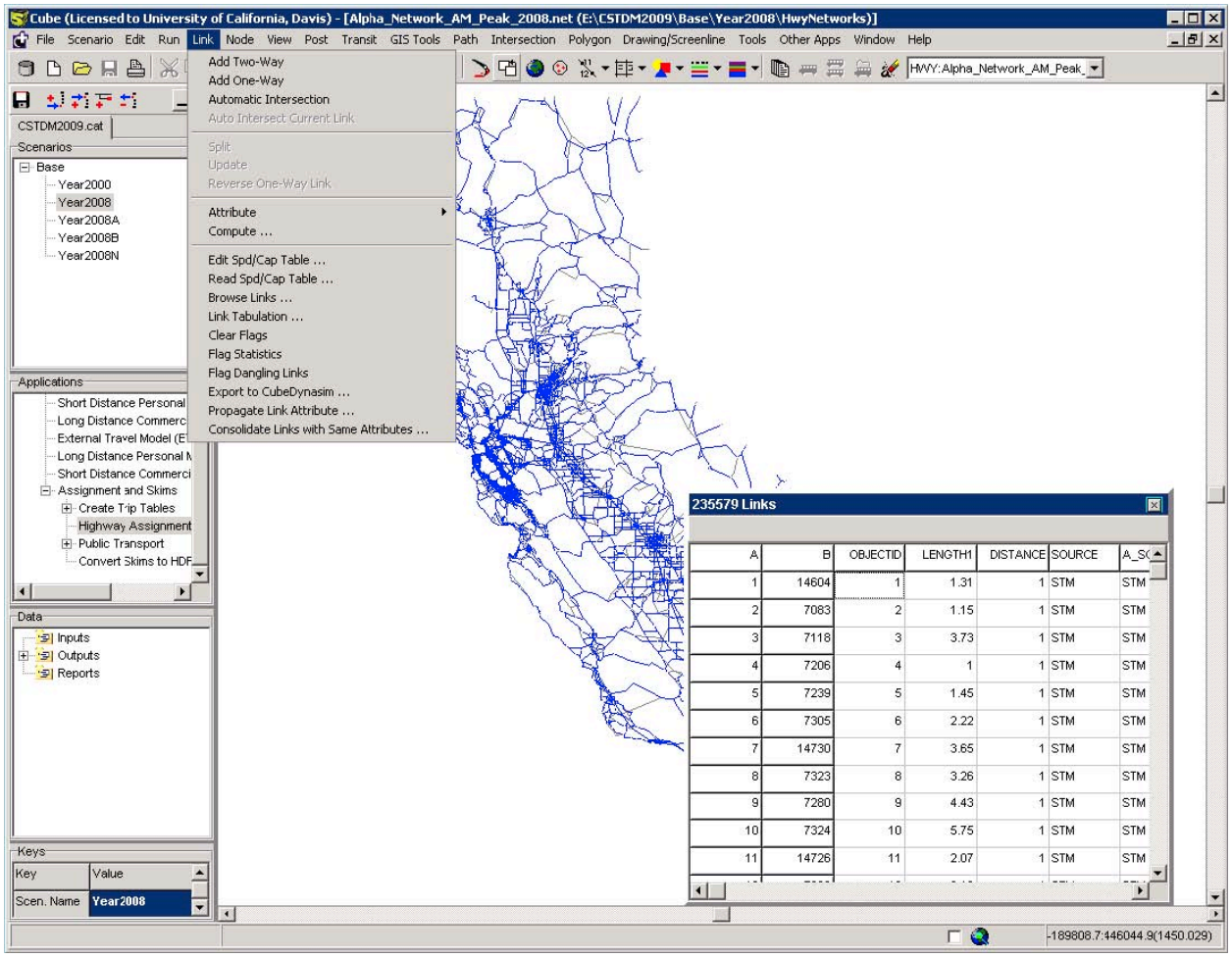


Figure A.3 shows a single sequence to add a link to the network. Select the command:

Link > Add Two-Way Link

or

Link > Add One-Way Link

to add a link to the network or introduce a new road to the network.

Figure A.3 "Add a Link" Command

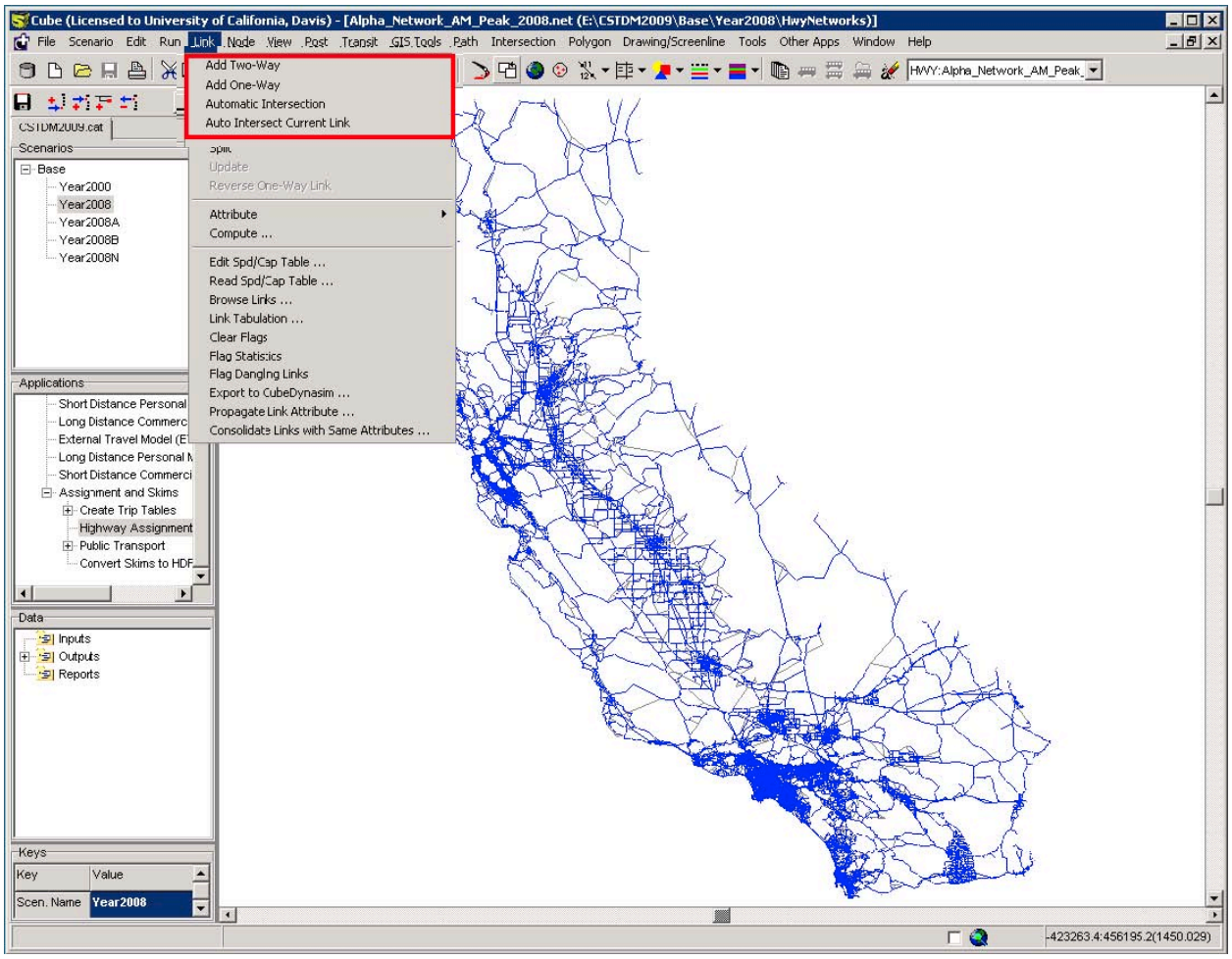
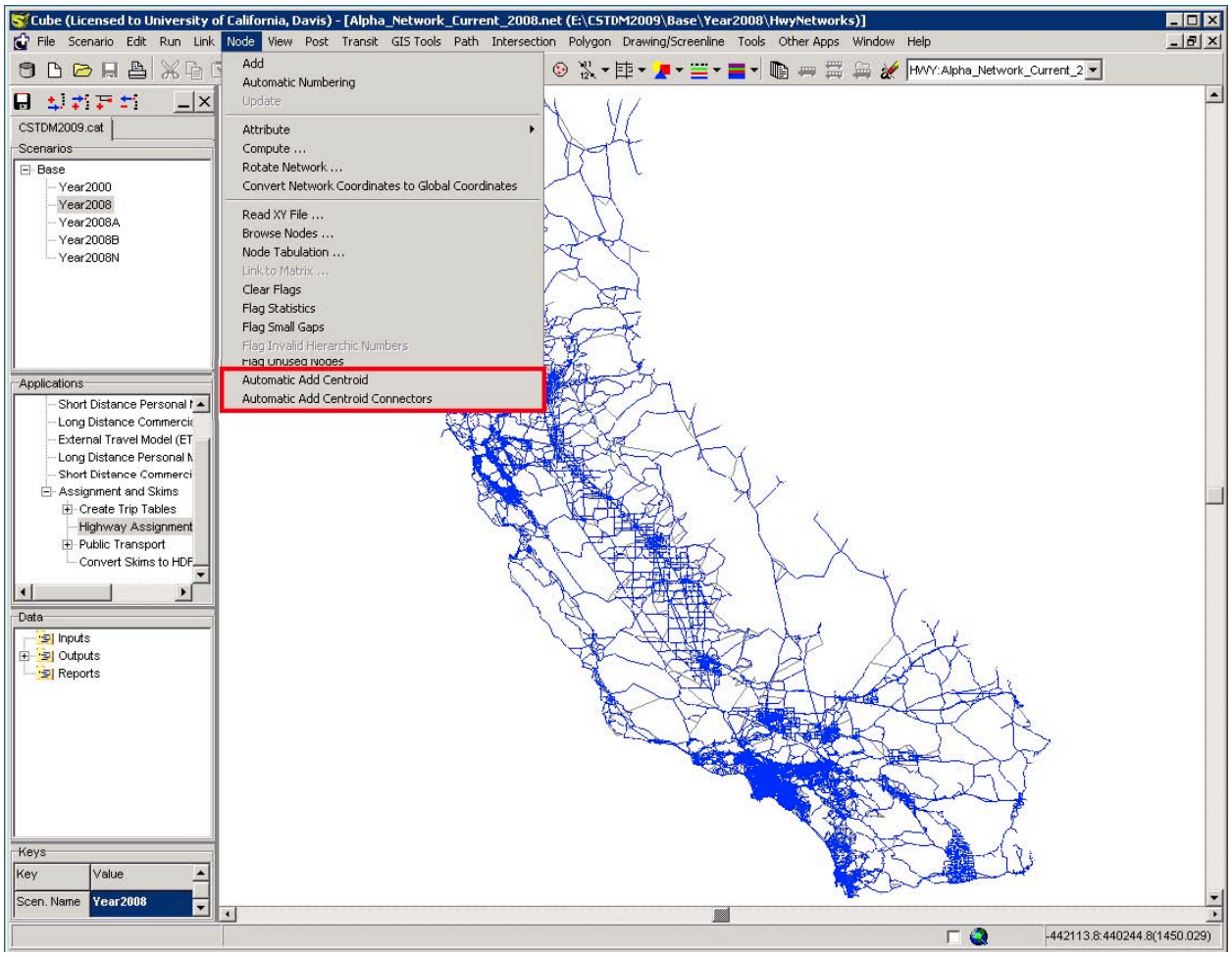


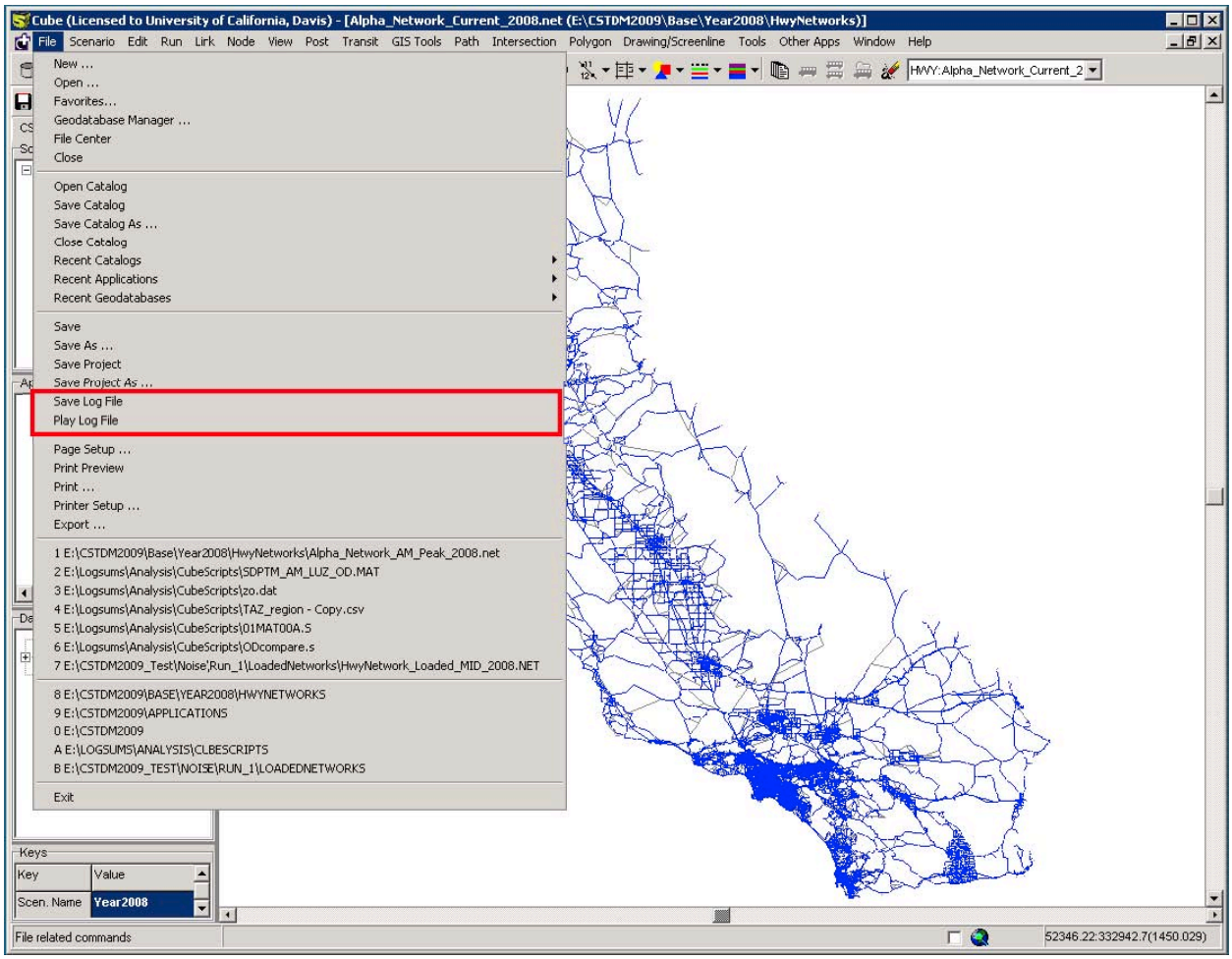
Figure A.4 shows the process to Add/Edit centroid connectors in the road network.

Figure A.4 "Add/Edit Centroid" Command



After the process of editing is completed, the command "Save Log File" can be used to save the log file correspondent to the introduced changes (See Figure A.5. Besides, please refer to the Technical Note on Networks for the use of Log File in CUBE to create/update Networks.).

Figure A.5 "Save Log File/Play Log File" Command



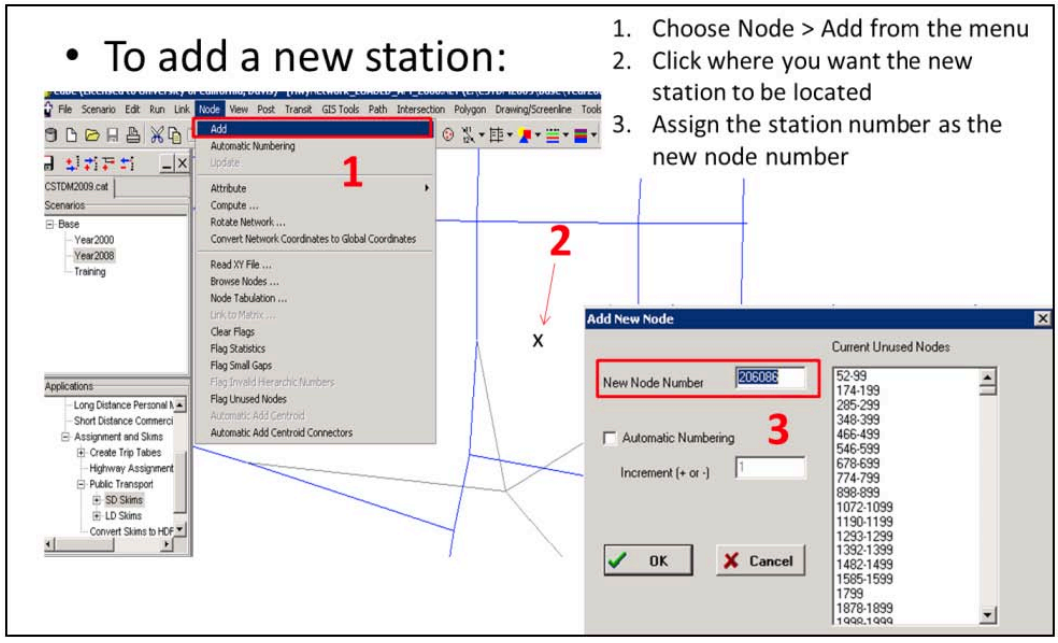
B. Editing Transit Network

The following figures present a simple example involving the update of the Public Transportation Line Files.

Section 1. Adding a New Transit Station to the Network

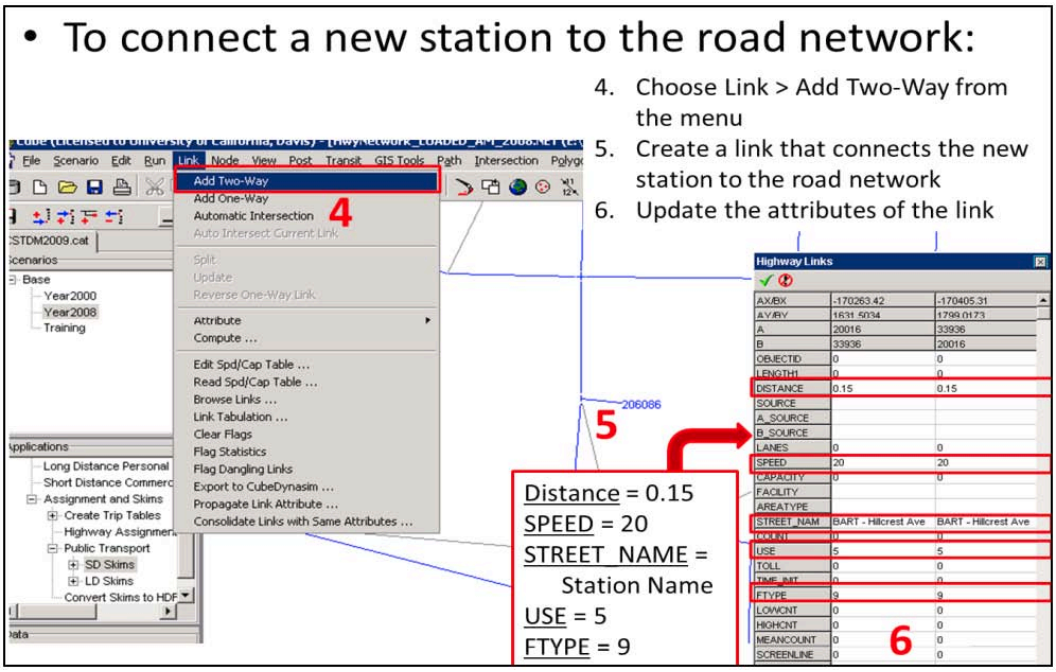
To begin with, the user needs to add a node that represents the transit station. Figure B.1 displays the three steps required to add a node to the network. If the transit operator that uses this station uses a FROMTO or COUNT fare structure, a node attribute will need to be added. In the case of a FROMTO fare structure, a unique node attribute will be used to identify each station. For operators who use a COUNT fare structure, the node attribute will be used to identify what fare zone the station is in.

Figure B.1 Adding a New Station to the Road Network in CUBE



Once a node has been added to the network, a special link (special link refers to the unique link attributes) needs to be added to connect the station to the road network. Figure B.2 displays the three steps required to do this.

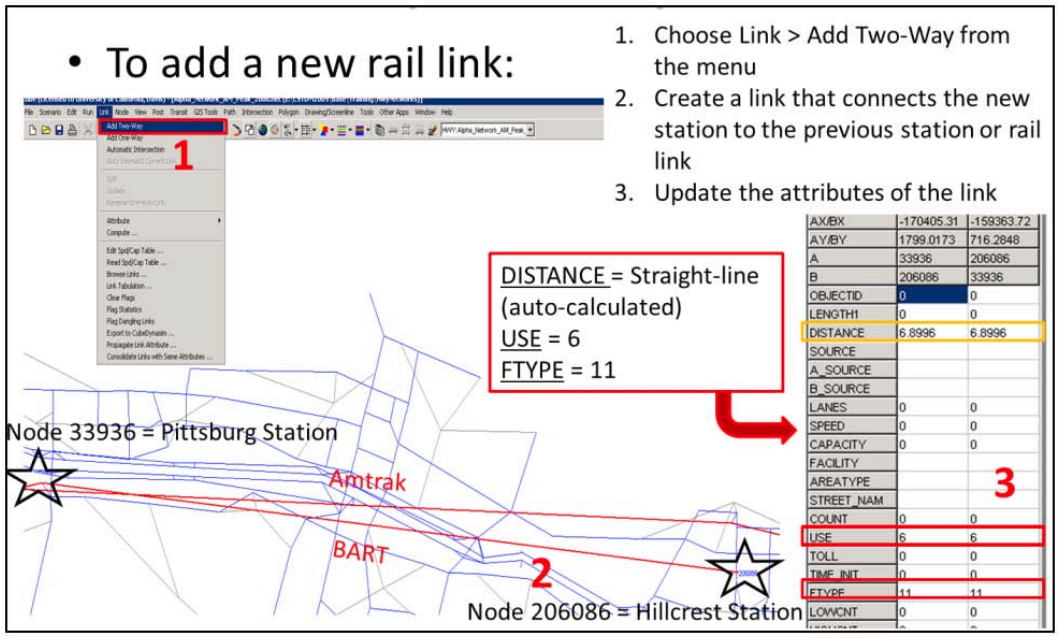
Figure B.2 Connecting a Node Representing a Transit Station to the Road Network



Section 2. Creating Rail Links

Now that a station has been created and connected to the network, the stations along the transit line need to be connected. This is accomplished by adding a special link (special link refers to the unique link attributes) that represents the straight line connection between stations. Figure B.3 displays the three steps required to create these links.

Figure B.3 Connecting Stations along a Transit Route



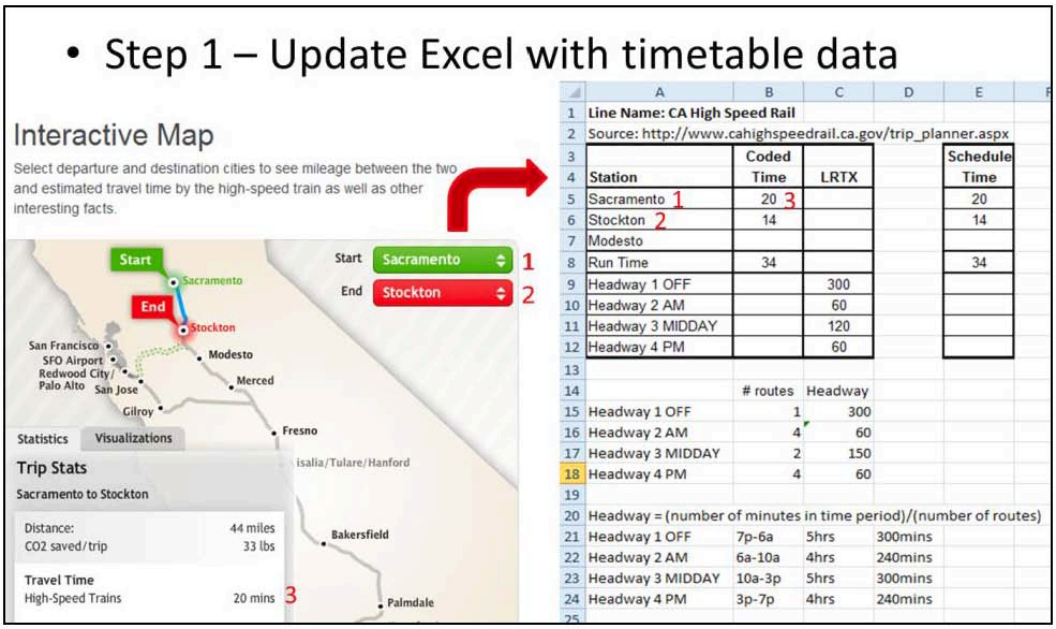
Section 3. Creating Line Files

In order for CUBE to use the newly created stations and rail links, a transit line file needs to be created. In the case that the user is updating an existing transit route (for example, a new station has been added to an existing route), the existing transit line file needs to be updated. In this section, the process of adding a new transit line file will be explained for a simple route with only three stations, but the process to modify an existing transit route uses the same steps (just fewer of them).

Step 1. Update MS Excel with timetable data.

Timetable data can be acquired from transit operators. From these timetables, the user will want to determine two things: the headway of the transit route in the four time periods, and the time between stations along the route. Once these have been determined, it is recommended to organize this information in MS Excel in a format that mimics the format that CUBE requires. Figure B.4 displays an example of this process.

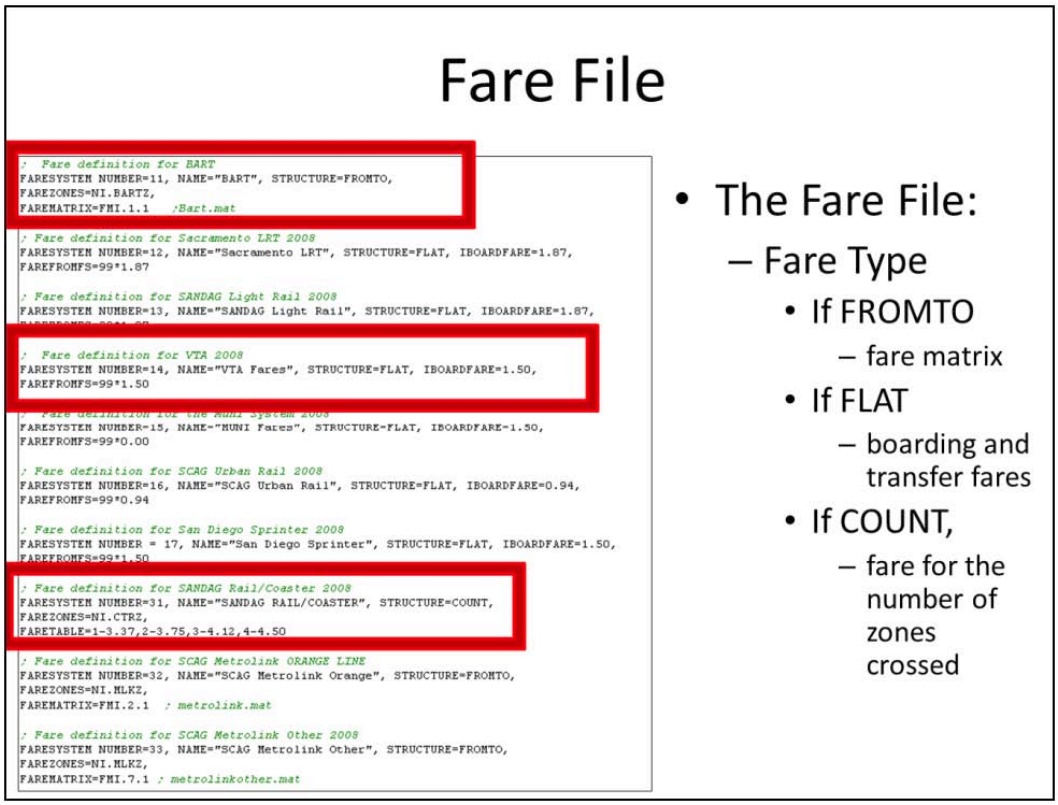
Figure B.4 Translating Timetable Data into CUBE Transit Line File Format



Step 2. Update MS Excel with Fare Data

Fare information can be acquired from the transit operators. There are three main types of fare structure: FROMTO, COUNT, and FLAT. For a detailed explanation of these three types, please see Section 3.4 in the documentation on Networks (CSTDM09_Networks_Final.pdf). For transit authorities that use a COUNT (zone) system or a FLAT fare system, these fares need to be recorded so they can be added to the Fare File. Figure B.4 displays how the three different types of fate structures are used within the CUBE Fare File.

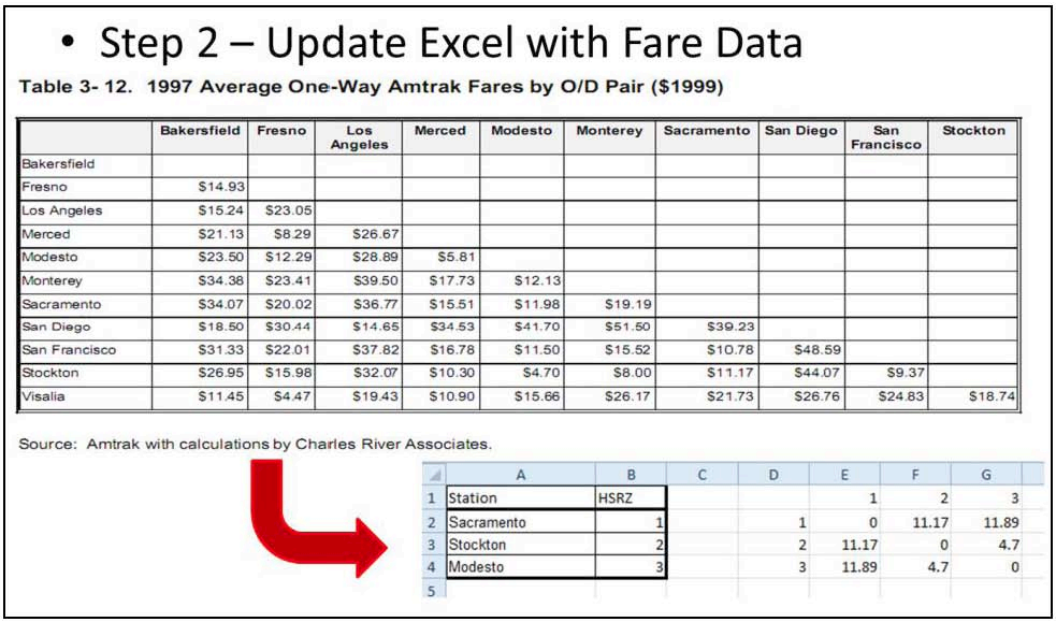
Figure B.5 Examples of the Three Fare Types in the CUBE Fare File



As you can see in Figure B.5, COUNT and FLAT fare rates are simply added to the code. For operators that use a FROMTO fare structure, a matrix is referred to. Figure B.6 provides an example of how to convert fares between stations to a fare matrix in MS Excel.

It is important to remember that CSTDM09 has all fares in 2000 U.S. dollar equivalents. So if the user is adding fare data for 2008, it needs to be converted to 2000 dollars.

Figure B.6 Translating Station-to-Station Fares to a Fare Matrix in MS Excel



	Bakersfield	Fresno	Los Angeles	Merced	Modesto	Monterey	Sacramento	San Diego	San Francisco	Stockton
Bakersfield										
Fresno	$14.93									
Los Angeles	$15.24	$23.05								
Merced	$21.13	$8.29	$26.67							
Modesto	$23.50	$12.29	$28.89	$5.81						
Monterey	$34.38	$23.41	$39.50	$17.73	$12.13					
Sacramento	$34.07	$20.02	$36.77	$15.51	$11.98	$19.19				
San Diego	$18.50	$30.44	$14.65	$34.53	$41.70	$51.50	$39.23			
San Francisco	$31.33	$22.01	$37.82	$16.78	$11.50	$15.52	$10.78	$48.59		
Stockton	$26.95	$15.98	$32.07	$10.30	$4.70	$8.00	$11.17	$44.07	$9.37	
Visalia	$11.45	$4.47	$19.43	$10.90	$15.66	$26.17	$21.73	$26.76	$24.83	$18.74

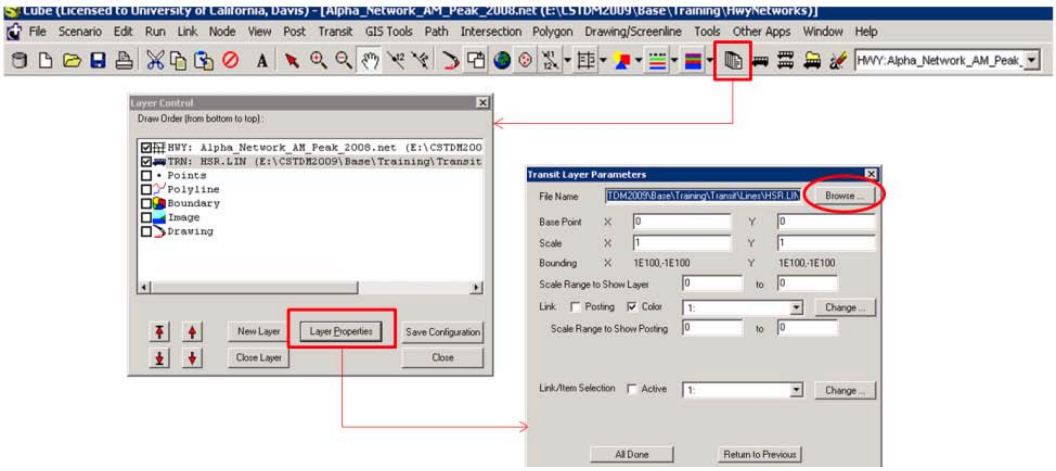
	A	B	C	D	E	F	G
1	Station	HSRZ			1	2	3
2	Sacramento	1		1	0	11.17	11.89
3	Stockton	2		2	11.17	0	4.7
4	Modesto	3		3	11.89	4.7	0
5							

Step 3. Create a New Operator in CUBE

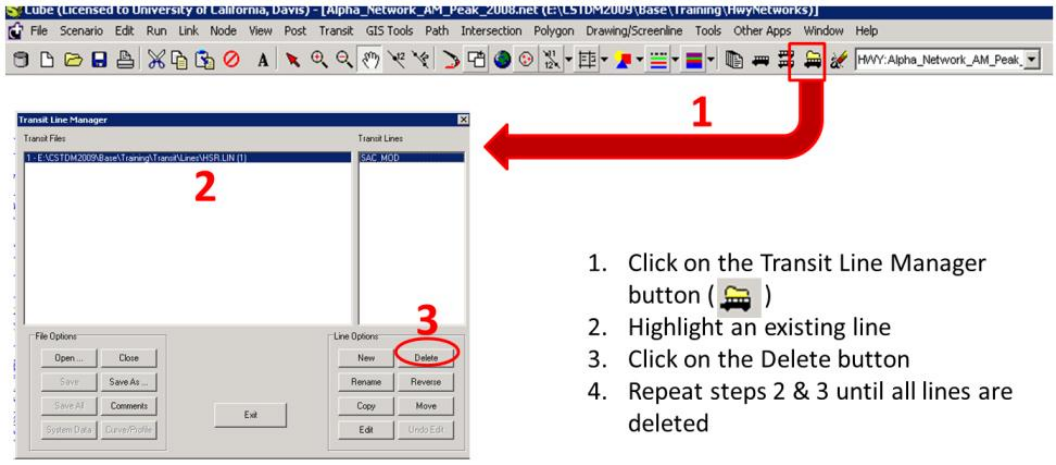
Once MS Excel has been used to translate timetable and fare information from the transit operator into formats that CUBE requires, it is time to start adding this information to CUBE. To begin, the user needs to create a new line file. There should only be one line file per transit operator. If there is more than one route that the transit operator offers, individual lines (routes) are added within the line file. The easiest way to add a new line file is to copy an existing line file to a new name, empty it, and then populate it with the information set up in Steps 1 and 2. Figure B.7 explains how to do this.

Figure B.7 Creating a New Operator (Line File) in CUBE

- Step 3 – Create a new operator in CUBE
  a. Copy an existing line file and rename to ***.lin in Windows Explorer
     a. *** = a unique name for the new operator
  b. Open CUBE, add the ***.lin file as the Transit line within Layer Control (see below)



c. Delete the existing lines within the HSR line file

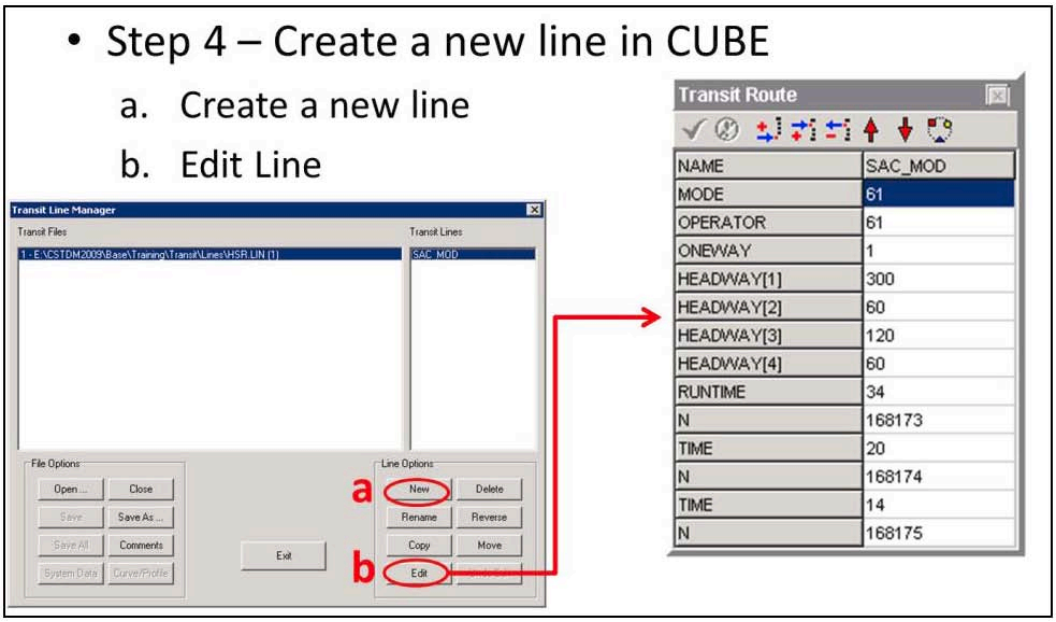


1. Click on the Transit Line Manager button ( )
2. Highlight an existing line
3. Click on the Delete button
4. Repeat steps 2 & 3 until all lines are deleted

Step 4. Create a New Line (Route) in CUBE

For each unique route (line) that an operator provides, a line needs to be added to the line file. In our simple example with three stations, we only have one line, but this process can be repeated for as many lines an operator provides. Figure B.8 displays how to create a new line and then edit the contents.

Figure B.8 Create a New Line within a Line File

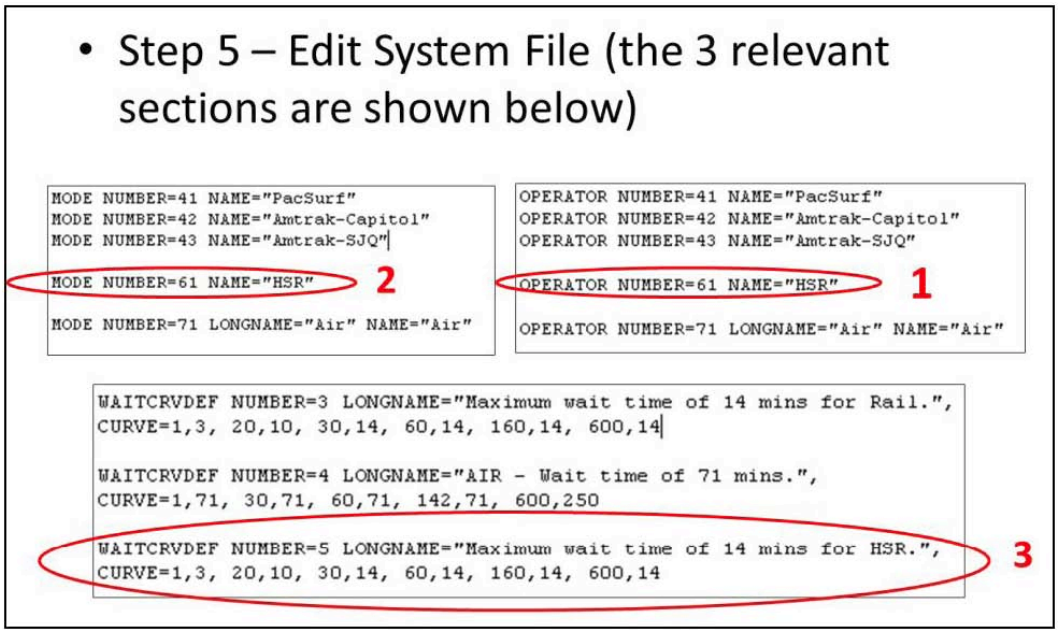


Now that a line file has been created for the operator with at least one line (route), three scripts within CUBE need to be updated to allow the new operator to be available for transit trips. These three files are the System File, Factor File, and Fare File.

Step 5. Edit the System File

The System File requires two additions for a new operator and one optional addition. These additions can be seen in Figure B.9 below. The first is to add a new OPERATOR and give it a NUMBER (unique ID) and a NAME (1 in Figure B.9). Next, the same NUMBER and NAME needs to be added as a MODE (2 in Figure B.9). For simplicity, we have coded all MODEs and OPERATORs with the same NUMBER and NAME. Number 3 in Figure B.9 is optional. If the new operator uses a different wait curve than the existing transit operators, a new wait curve can be added to the System File. Wait curves are linked to operators in the Factor File (explained in Step 6 below).

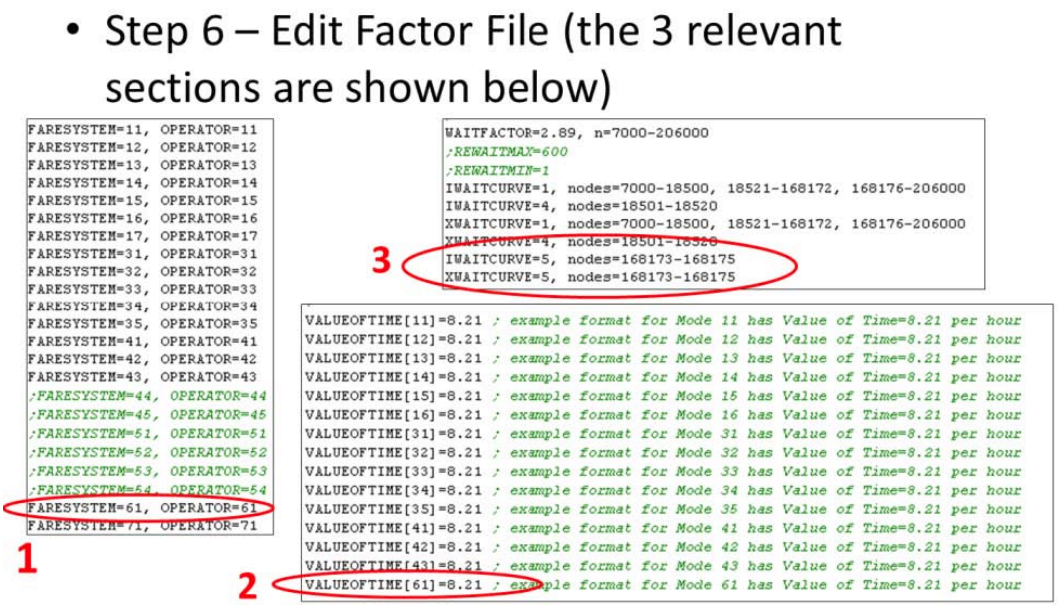
Figure B.9 Editing the System File for New Operators



Step 6. Edit the Factor File

The Factor File requires three additions for a new operator. These additions can be seen in Figure B.10 below. The first is to link the new OPERATOR to a FARESYSTEM (1 in Figure B.10). A new FARESYSTEM number should be added here and noted, so that the user can input it during the next step (editing the Fare File). Next, a VALUEOFTIME needs to be assigned to the OPERATOR (2 in Figure B.10). Finally, the node numbers (stations) that are used in the line file need to be added to a wait curve, both IWAITCURVE and XWAITCURVE (3 in Figure B.10). As you can see in Figure B.10, this can be ranges of node numbers or individual nodes separated by commas.

Figure B.10 Editing the Factor File for New Operators



Step 7. Edit the Fare File

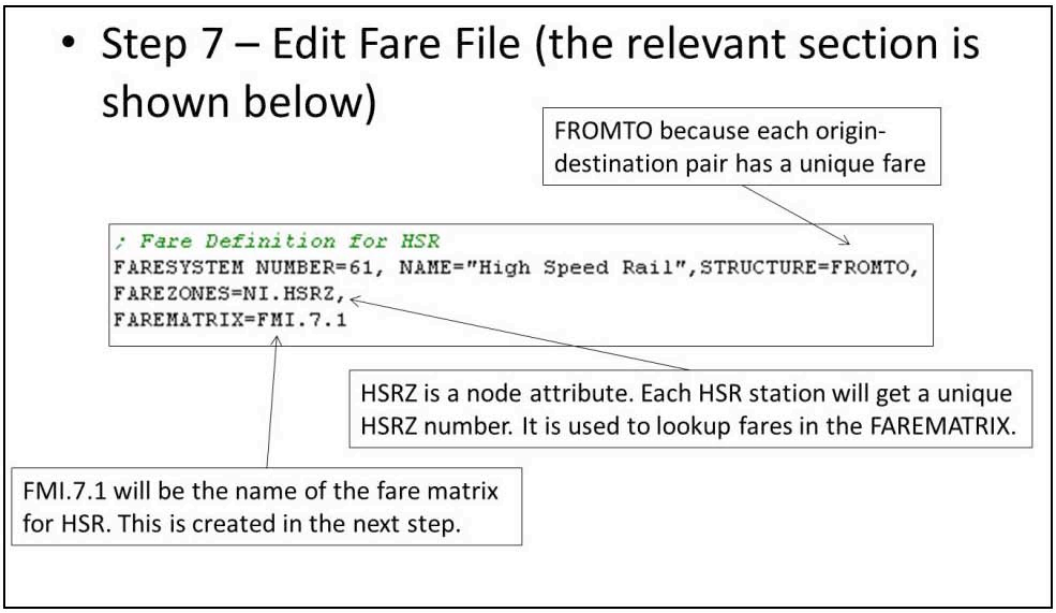
The Fare File requires one addition for a new operator. These additions can be seen in Figure B.11 below for operators that use a FROMTO fare structure, and in Figure B.5 for ones that use FLAT or COUNT fare structures.

FROMTO (Figure B.11). In the first line of code, the FARESYSTEM NUMBER, operator NAME, and STRUCTURE=FROMTO need to be added. On the second line of code a FAREZONES variable needs to be set that links the fare matrix to the nodes (stations) in the network. In the third line of code, the FAREMATRIX needs to be linked to the new operator. Creating a FAREMATRIX and adding it to CUBE are explained in the next two steps (Steps 8 and 9).

FLAT (Figure B.5). In the first line of code the FARESYSTEM NUMBER, operator NAME, STRUCTURE=FLAT, and the IBOARDFARE need to be added. IBOARDFARE is the fare the operator charges to board the transit system in dollars. On the second line of code, the transfer fare amount needs to be added in the following format: FAREFROMFS=99*<Transfer Fare in dollars>.

COUNT (Figure B.5). In the first line of code, the FARESYSTEM NUMBER, operator NAME, and STRUCTURE=COUNT need to be added. On the second line of code a FAREZONES, variable needs to be set that links the fares in the third line of code to the access\egress nodes (stations) used on the trip. In the third line of code, the fare charged for the number of zones crossed needs to be entered in the following format: FARETABLE=<# Zones crossed>-<Fare in dollars>,<# Zones crossed>-<Fare in dollars>… until the maximum number of zones has been reached.

Figure B.11 Editing the Fare File for New Operators Using FROMTO Fare Structure

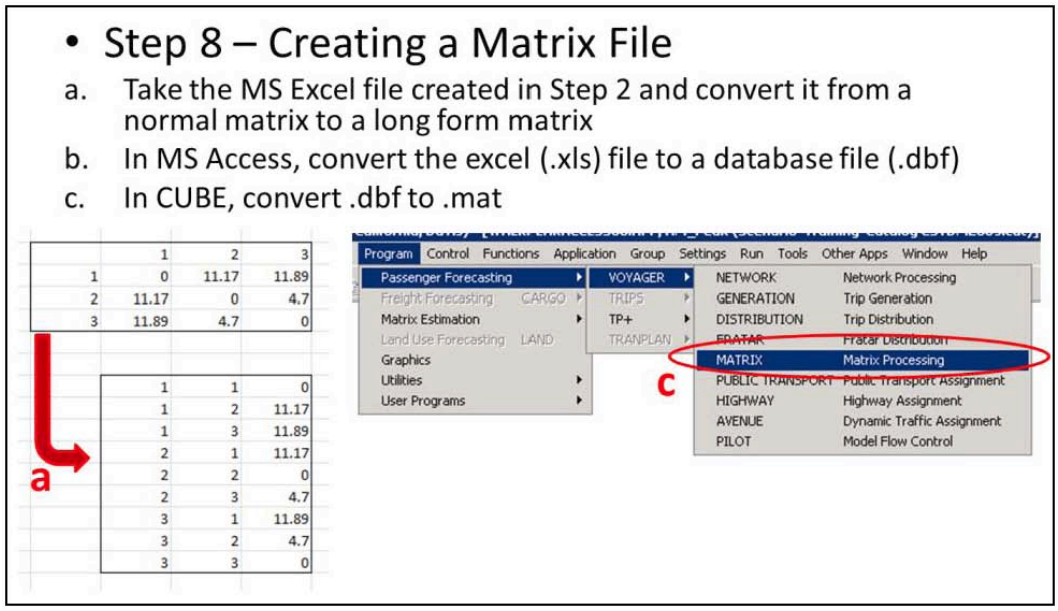


If the new operator used a COUNT or FLAT fare structure, the user can stop here. If the new operator uses a FROMTO structure, the next two steps need to be executed to create a fare matrix and add this matrix to the CUBE catalog.

Step 8. Create a Matrix File

Figure B.12 displays the three steps required to convert the fare matrix created in MS Excel (Step 2) to the format that CUBE requires.

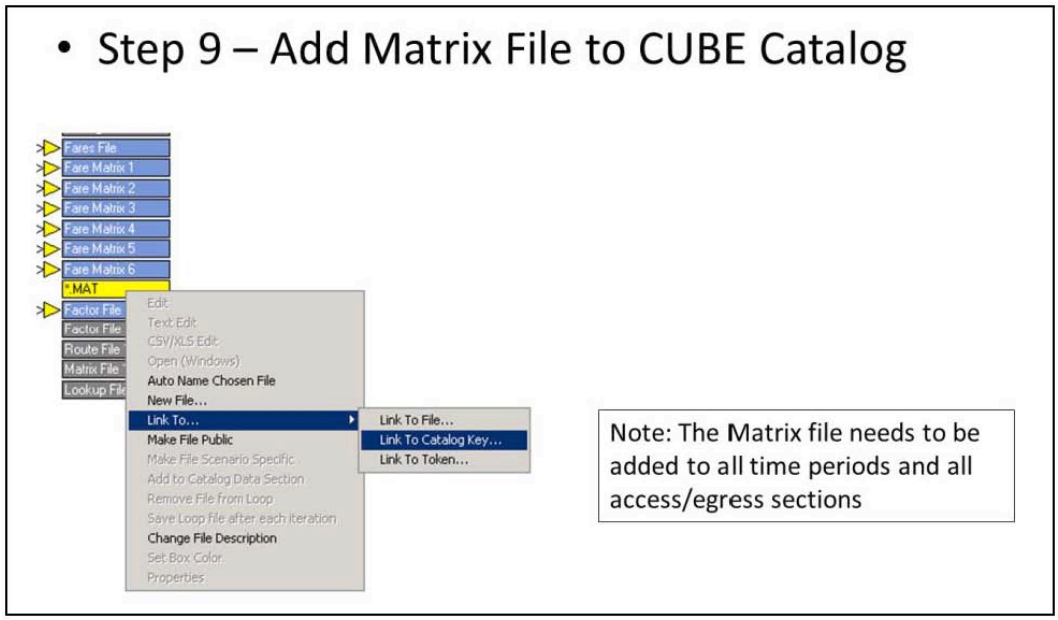
Figure B.12 Creating a CUBE Matrix File (.mat)



Step 9. Add a CUBE Matrix File to the CUBE Catalog

The final step takes the matrix file created in Step 8 and adds it to the CUBE catalog. Figure B.13 displays the steps needed to accomplish this. Once it has been added, the user should note the Fare Matrix Number that CUBE assigned it (in the example below, 1 to 6 have already been assigned, so the next one will be 7) and add this number to the Fare File (Figure B.11) in the third line of code.

Figure B.13 Adding a CUBE Matrix File (.mat) to the CUBE Catalog



C. Editing Local Bus Service

This part provides an example of the process required to update the local bus system inputs. In the CSTDM, the local bus system is represented through a synthetic methodology that allows for an easier process of update and maintenance of the local transit inputs in the model.

The synthetic methodology for local bus transit computes all information related to the local transit model through four script files (the same for all scenarios). The data inputs for this model are found in the file LocalBus_{year}.dbf, which provides information for catchment areas (transfer and service areas), level of service (LOS) and fares associated to the operators providing service for each TAZ. Figure C.1 shows an example of the fields contained in the file LocalBus_{year}.dbf.

If you need to update the information for one or more local bus transit operators, for instance to account for an increase in the quantity of service provided by the operator servicing a specific area, you will need to compute the adjusted LOS for that operator (please refer to the Technical Note on Local Transit Functions for more details). Then, the process of updates will simply require updating the input file LocalBus_{year}.dbf with the updated information for all those TAZs that are included in the service area served by that operator. A similar approach can be followed in case of a change in the fare charged by the local transit operator.

If a new transit operator starts service in an area that previously was not served by local bus transit, you need to introduce a new catchment area in the system. To do this, first determine the TAZs that are served by the new operator (service area) to account for the presence of the new operator (please refer to the Technical Note on Local Transit Functions for the guidelines on how to determine transfer and service areas in CSTDM). Then, you need to update the data input file LocalBus_{year}.dbf, reporting the information for the new catchment area for all TAZs served by the new operator, the information on LOS and fare.

Figure C.1 The File LocalBus_{year}.dbf Contains All Relevant Information for the Synthetic Local Bus System

LocalBus_2008

TAZ	COUNTY	OPERATOR	CATCHMENT	LOS	FARE
100	Del Norte	1	1	200	1.12
101	Del Norte	1	1	200	1.12
102	Del Norte	1	1	200	1.12
103	Del Norte	1	1	200	1.12
104	Del Norte	0	0	9999	9999
105	Humboldt	2	2	200	1.35
106	Humboldt	2	2	200	1.35
107	Humboldt	2	2	200	1.35
108	Humboldt	2	2	200	1.35
109	Humboldt	0	0	9999	9999
110	Humboldt	2	2	200	1.35
111	Humboldt	2	2	200	1.35
112	Humboldt	2	2	200	1.35
113	Humboldt	2	2	200	1.35
114	Humboldt	2	2	200	1.35
115	Humboldt	2	2	200	1.35
116	Humboldt	2	2	200	1.35
117	Humboldt	0	0	9999	9999
118	Humboldt	0	0	9999	9999
119	Humboldt	0	0	9999	9999
120	Humboldt	2	2	200	1.35
121	Humboldt	2	2	200	1.35
122	Lassen	0	0	9999	9999
123	Lassen	0	0	9999	9999
124	Lassen	3	3	200	0.75
125	Lassen	3	3	200	0.75
126	Lassen	3	3	200	0.75
127	Lassen	3	3	200	0.75
128	Modoc	0	0	9999	9999

D. Multithreading Setup

Appendix D provides guidance on setting up the CSTDM to use a number of cores other than the default of 16. Note that each machine setup for a different number of cores is unique to the configuration of that machine, and is based on the number of cores, whether the CPUs are capable of hyperthreading, and the amount of RAM on the system.

The default setup of the CSTDM works well and is tuned for 16 simultaneous threads with 24GB of RAM. Modifying this setup will be subject to some initial guess work followed by testing.

Adjustments to the Demand Models

Setting the demand models (SDPTM, LDPTM, SDCVM) to use an alternate number of cores is a matter of understanding which programming language they use, and the configuration files that manage their settings.

Python Demand Models

The short distance personal travel model (SDPTM) number of threads is controlled by the "num_processes=" setting in the file "settings.py" in the Models\Code folder. The default CSTDM settings use seven processes, because each of the processes uses approximately 3GB of RAM, and increasing the number of processes to the point where all RAM is consumed will cause a system failure. You should also note that the "districts" list (districts = [2,1, 19….]) has been ordered to ensure that the largest and most time consuming districts covering the Bay Area, LA, and San Diego are executed early in the process to avoid having them left for last, or have all of the big areas run simultaneously, extending the run time.

It is possible to alter the number of districts used for the SDPTM, but altering the number or contents of the districts requires substantial changes to the scripts that aggregate the results and is not described here.

The number of threads used by the short distance commercial vehicle model is controlled by the nThreads= setting in the text file sdcvm.settings found in \Models\SDCVM\YearXXXX\Inputs. Note that this setting must be changed for each scenario created.

There are fewer restrictions on what this can be set to, but you still want to avoid using all of the system RAM. We found that for the 24GB on our systems, 8 threads was the best setting to minimize runtime, since we were running it simultaneously with the Java-based LDPTM.

Java Demand Model (LDPTM)

The long distance personal travel model is executed in Java and requires that the CUBE script that sets the configurations be edited to change the number of processes. This can be done through CUBE by editing the "Print PRINTO=1 List="NTHREADS 8" line in the script(LPMAT00A.S) that creates the control file within the LDPTM program group. To increase or decrease the number of threads, just edit the number at the end of the line. In this case, 8 threads were used because it was run simultaneously with the SDCVM, which used the remainder of the threads.

Adjustments to the CUBE Cluster Configuration

CUBE Cluster, as implemented in the CSTDM, requires that you start up a known number of threads and that you assign tasks to them. When making changes to the thread use, we recommend carefully diagramming out what each thread will be doing.

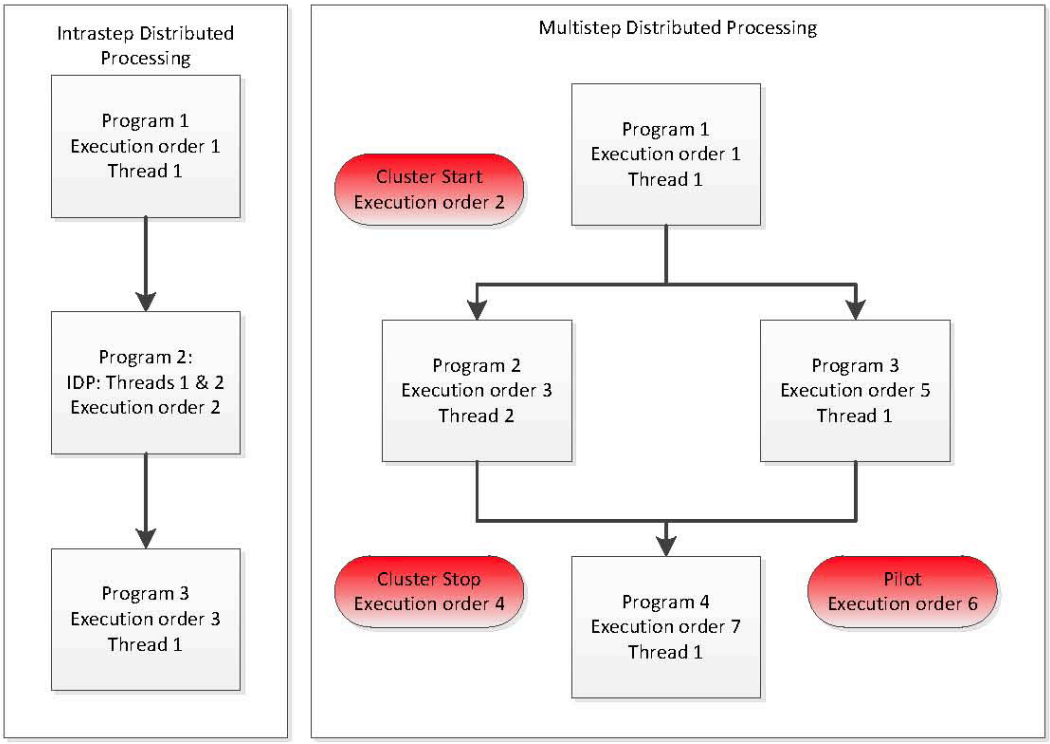
It is also important to note that threads can be used as parts of two different multiprocessing methods: Intrastep distributed processing (IDP) and Multistep distributed processing (MDP). Given the choice between using a thread for IDP and MDP, MDP will almost always yield greater benefits.

See an example in Figure D.1 showing the difference between IDP and MDP. In the figure, both the IDP and MDP could use 2 threads. In IDP, the first thread completes Program 1, and moves to Program 2, where it encounters the start command for the IDP and hands a portion of the processing to Thread 2. When the combination of Threads 1 and 2 finishes Program 2, then Thread 2 stops and Thread 1 moves onto Program 3.

MDP is more complicated. Thread 1 completes Program 1, then it moves to the Cluster start, and hands off the tasks surrounded by the cluster start and cluster end commands to Thread 2. Then Thread 1 moves on and does Program 3, and then waits at the Pilot step for the signal that Thread 2 is done with Program 2. At the same time, Thread 2 is working on Program 2. When that is completed, the cluster group closes, and Thread 2 becomes inactive. When Thread 1 gets the signal that Thread 2 has completed its tasks, it moves on from the Pilot step to Program 4. It is possible that Thread 2 will have completed its tasks very quickly, and the notification of its completion will be waiting for Thread 1 when it completes Program 3, and it will not wait at all before starting Program 4.

- **IDP** distributes a single set of calculations across multiple processors. This can only be applied to matrix and highway assignment process steps.
- **MDP** distributes sets of independent processing to separate processors letting them run in parallel. Any process step can theoretically be part of an MDP thread.

Figure D.1 IDP and MDP, Both with Two Threads



Modifications to IDP processes are made within the scripts that call the processes. For example in a highway assignment program, following the FILEI and FILEO statements you will see a statement like:

DISTRIBUTEINTRASTEP PROCESSID=cstdm PROCESSLIST=6-9
COMMPATH={CATALOG_DIR}\Cluster\CSTDM\

This statement is comprised of the following components:

- DISTRIBUTEINTRASTEP. This initiates the intrastep process.
- PROCESSID. This is the name of the process id set in the Cluster Node Management settings.
- PROCESSLIST. This is the numbers that identify the individual threads that will be used. In the above example, Threads 6 through 9 would be used. If you also wished to use Thread 11, it could be rewritten as "6-9,11".
- COMMPATH. This is the location where the scripts to be used by each thread are created automatically. This must match the setting in the Cluster Node Management.

This statement is all that is needed to implement IDP for a Highway Assignment or Matrix program in CUBE. Note that the PROCESSLIST contains the threads in addition to the one that originally starts the program.

MDP requires that you insert control programs into the Catalog View. These control the assignment of sets of programs to threads that will be run in parallel, and how the threads will wait for others to complete.

CLUSTER start. Starts a cluster (a set of Programs assigned to a certain thread), an assigns its "manager thread", and the COMMPATH and PROCESSID.

CLUSTER end. Concludes the cluster. Cluster start and end commands are always in matched pairs.

PILOT includes a script that forces execution of threads to pause when the execution order is reached. This is necessary so that the first thread to finish will wait for other threads to prepare needed input data for a next step. The PILOT will contain a script that looks like:

WAIT4FILES FILES=cstdm1.script.end,cstdm2.script.end, cstdm3.script.end, cstdm4.script.end

The files mentioned in the script are PROCESID + THREADID + ".script.end." The above example will cause the process to halt until Threads 1, 2, 3, and 4 have signaled that they have completed their individual tasks.

Needed Modifications for Cluster in CSTDM to Reduce the Number of Threads

Many portions of the default setup for the CSTDM use all 16 threads (1 primary plus 15 compute nodes). These are primarily in the Highway Assignment and Public Transport components of the model.

Highway Assignment uses all 16 threads in a combined IDP, MDP setup. IDP is used in both the first and last MATRIX operation. MDP is used to run each time period, and IDP is used in the highway assignment within each of the time periods. The number of threads assigned to each highway assignment was balanced iteratively to minimize the total run time by moving threads from the fastest time period to the slowest.

To reduce the number of threads, the easiest would be to remove the IDP threads from highway assignments and rebalance the remaining free threads for IDP.

Public Transport will be complicated to refactor for fewer cores because many portions of the code fit the use of 16 cores very well. There are also several places in the LD Skims section of Public Transport that use IDP, for the most part, those can be eliminated or reduced easily.

The SD Skims section of public transport uses a structure where there are four time periods, each of which has four access modes. The combination of these is suited very well to 16 threads, since none of the public transport programs can use IDP. To restructure this section to fewer threads, our suggestion is that you keep the structure largely intact, but break the time periods so that the AM and PM time periods are run in parallel (MDP), and the Off peak and midday time periods are run following this; also in parallel with each other. Remember that

each of the sets processes involved in MDP will take as long as the longest running piece, so it makes sense to run the two time-consuming sections together. See Figures D.2 and D.3. Note that for simplicity in the diagrams, threads are labeled 1-X. In reality you will not see Thread 1; it is the thread that starts all of the processes, and manages the reconnection of all processes. The threads that you are assigning will actually be Threads 2 to 16, but you will be calling them as if their number were 1 lower (1 to 15). The start time is at the top of each figure, and the further down each figure the step is, the later in time it is started. All threads wait for the completion of all previously started threads at each pilot step.

Figure D.2 Diagram of Flow with 16 Threads

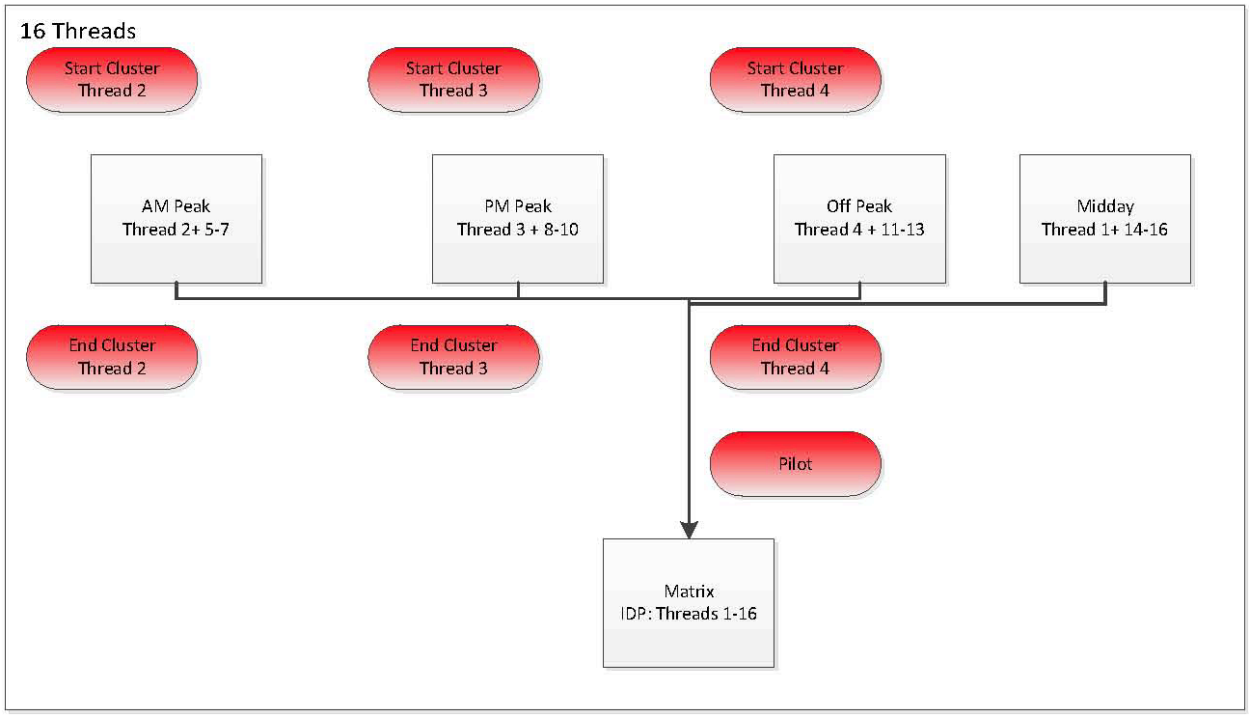
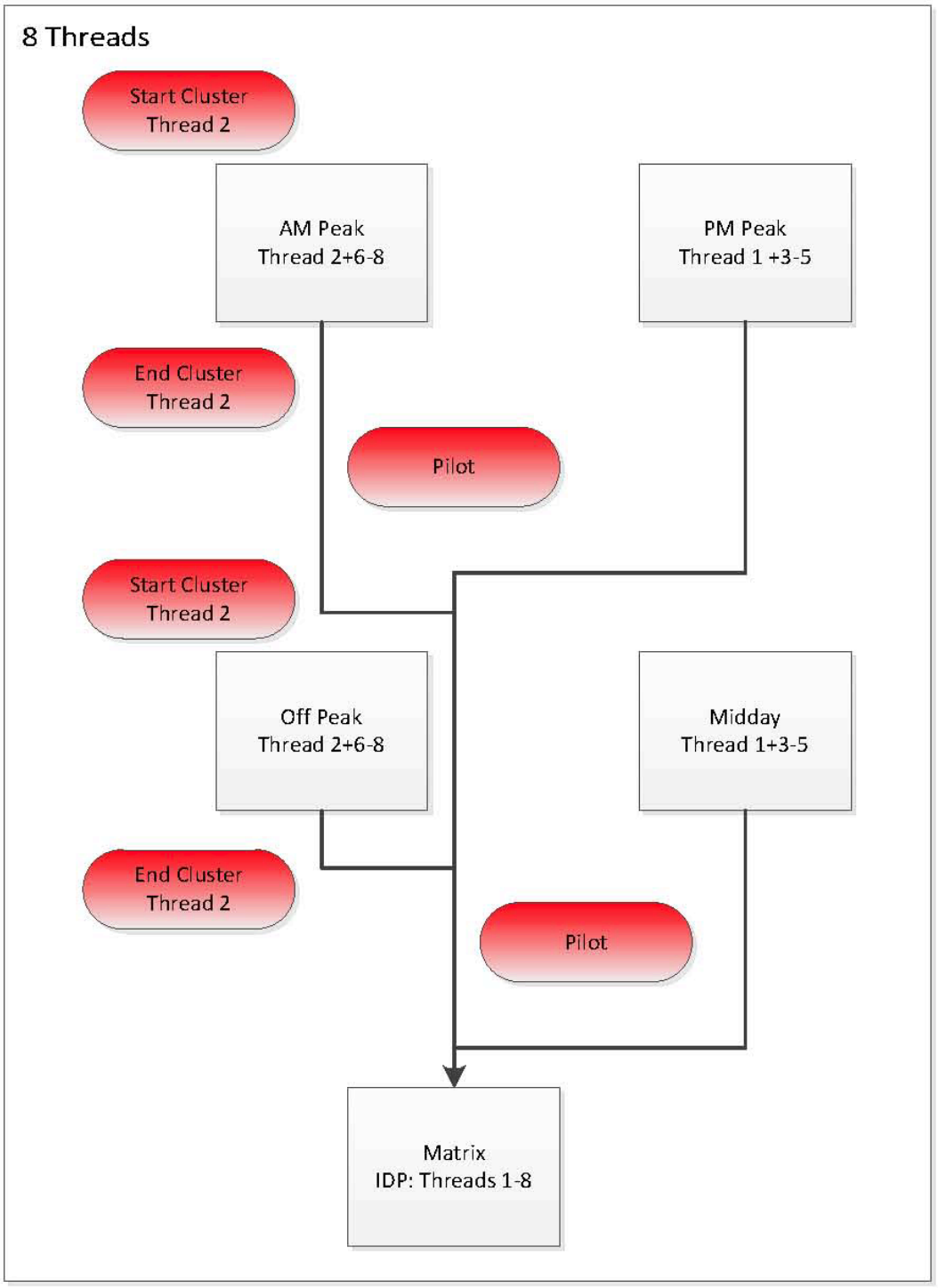


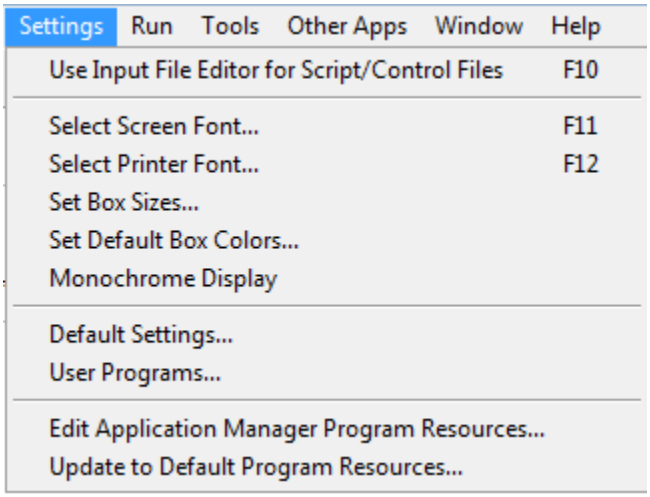
Figure D.3 Diagram with Eight Threads



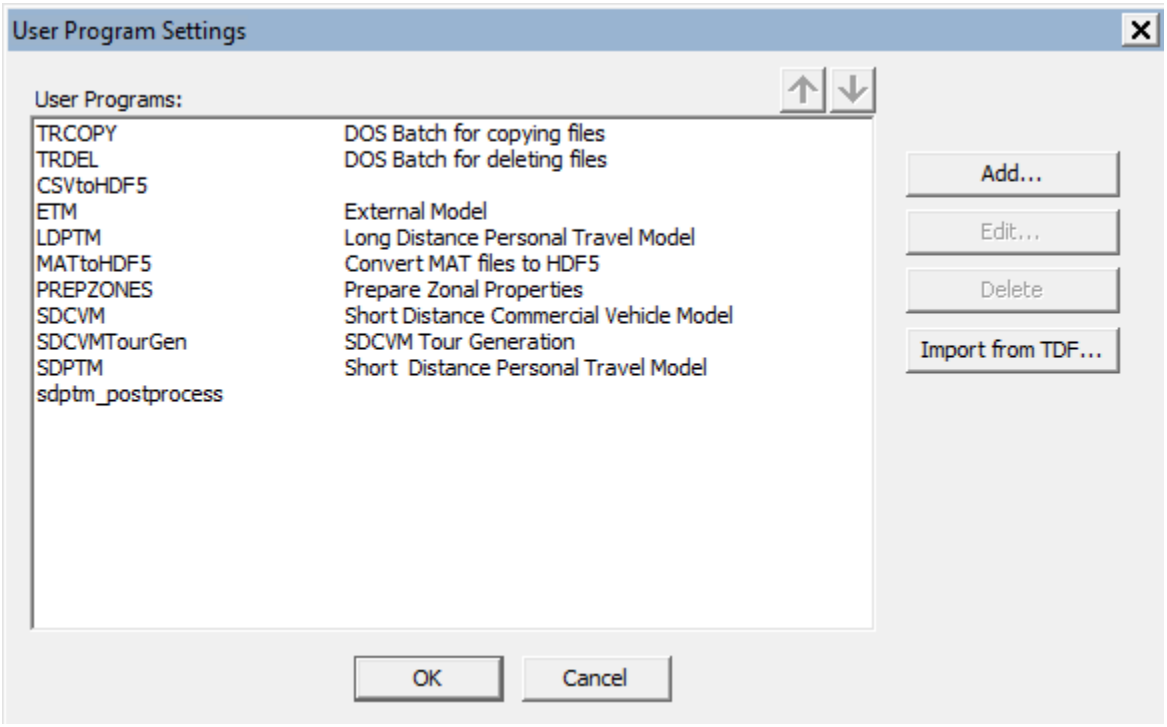
E. CSTDM Modifications When Changing Directories

Batch File Edits

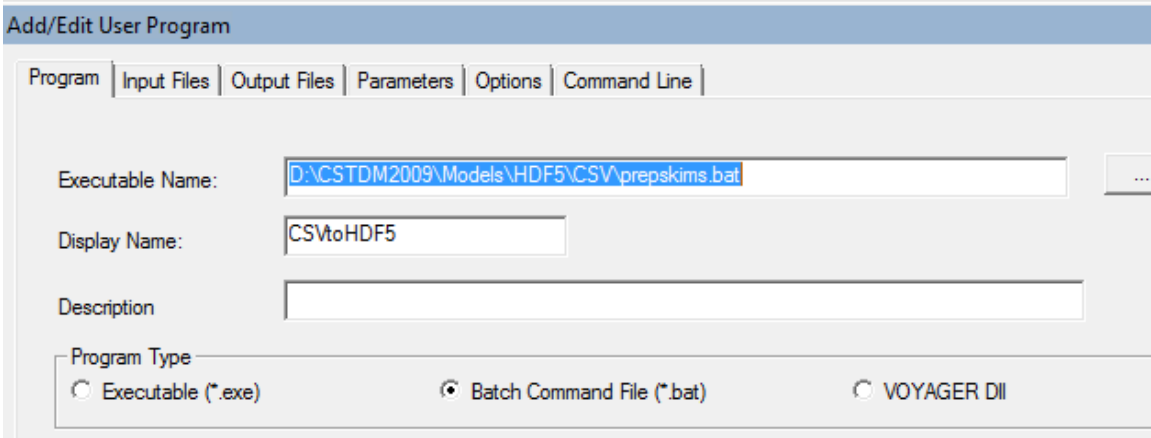
1) User Programs
   a) Open up the CSTDM catalog file in CUBE and click on the Settings tab and then select "User Programs…"



b) Select CSVtoHDF5 and click on the "Edit…" button.



c) Edit the "Executable Name:" entry to reflect the drive letter and directory where the model is being run from.



d) Click on the OK button to close out the dialog box.

e) Repeat steps b through d for ETM, LDPTM, AirSkims, MATtoHDF5, PREPZONES, SDCVM, SDCVMTourGen, SDPTM, sdptm_postprocess, AirSkims, and Matrixt to HDF5 2 (it would be wise to check all user programs shown under step b just in case a new user program has been added since this document was written)

Log4j.XML File Edits

1) Open windows explorer and navigate to your mail model directory and then navigate to the ..\Models\SDCVM\{Scen. Name}\Inputs subdirectory.
2) Edit line 19 of the file named log4j.xml that reads something like "<param name="File" value="D:/CSTDM2009/Models/SDCVM/{Scen. Name}/Inputs/event.log"/>" to make it match your model drive letter and directory naming.
3) Copy this newly edited log4j.xml file to any other ..\Models\SDCVM\{Scen. Name}\Inputs subdirectories that exist.

F. Model Input Descriptions

Table F.17-1 Model Input Files, Descriptions, and Guidance

The following text can be used as a batch file to create all the directories for a scenario and copy files for a warm start run. Caution should be used in checking all the model input files from previous runs to make sure it is what's needed for the desired run.

```
:: Create folders for new scenario
:: Copy in model/system files from previous run
:: Copy in input files from previous run, if you want to

:: ----------Set Scenario File Location
set CATALOGDIR=D:\CSTDM_v2\
set SCENARIO=Year2040_hightransit
set YEAR=2040

:: ----------Set Warm Start scenario definition
set WARMSTART=Year2040_8cent
set WSYEAR=2040

:: set to YES if you want to pull all the input files from the warm start run
set INPUTS=YES

:: ----------Create Folders
: CreateFolders
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\Controls MKDIR %CATALOGDIR%\Base\%SCENARIO%\Controls
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\HwyNetworks MKDIR %CATALOGDIR%\Base\%SCENARIO%\HwyNetworks
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\LoadedNetworks MKDIR %CATALOGDIR%\Base\%SCENARIO%\LoadedNetworks
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\Output MKDIR %CATALOGDIR%\Base\%SCENARIO%\Output
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\PrintFiles MKDIR %CATALOGDIR%\Base\%SCENARIO%\PrintFiles
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\screenlines MKDIR %CATALOGDIR%\Base\%SCENARIO%\screenlines
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\EMFAC MKDIR %CATALOGDIR%\Base\%SCENARIO%\EMFAC
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\EMFAC\Inputs MKDIR %CATALOGDIR%\Base\%SCENARIO%\EMFAC\Inputs
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\EMFAC\Outputs MKDIR %CATALOGDIR%\Base\%SCENARIO%\EMFAC\Outputs
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\Skims MKDIR %CATALOGDIR%\Base\%SCENARIO%\Skims
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\Skims\Auto MKDIR %CATALOGDIR%\Base\%SCENARIO%\Skims\Auto
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\Skims\Air MKDIR %CATALOGDIR%\Base\%SCENARIO%\Skims\Air
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\Skims\CVR MKDIR %CATALOGDIR%\Base\%SCENARIO%\Skims\CVR
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\Skims\HSR MKDIR %CATALOGDIR%\Base\%SCENARIO%\Skims\HSR
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\Skims\Transit MKDIR %CATALOGDIR%\Base\%SCENARIO%\Skims\Transit
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\Skims\Transit\AMPEAK MKDIR %CATALOGDIR%\Base\%SCENARIO%\Skims\Transit\AMPEAK
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\Skims\Transit\MIDDAY MKDIR %CATALOGDIR%\Base\%SCENARIO%\Skims\Transit\MIDDAY
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\Skims\Transit\PMPEAK MKDIR %CATALOGDIR%\Base\%SCENARIO%\Skims\Transit\PMPEAK
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\Skims\Transit\OFFPEAK MKDIR %CATALOGDIR%\Base\%SCENARIO%\Skims\Transit\OFFPEAK
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\Transit MKDIR %CATALOGDIR%\Base\%SCENARIO%\Transit
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\Transit\Lines MKDIR %CATALOGDIR%\Base\%SCENARIO%\Transit\Lines
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\Transit\tfares MKDIR %CATALOGDIR%\Base\%SCENARIO%\Transit\tfares
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\Transit\tnetworks MKDIR %CATALOGDIR%\Base\%SCENARIO%\Transit\tnetworks
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\TripTables MKDIR %CATALOGDIR%\Base\%SCENARIO%\TripTables
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\TripTables\ETM MKDIR %CATALOGDIR%\Base\%SCENARIO%\TripTables\ETM
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\TripTables\LDCVM MKDIR %CATALOGDIR%\Base\%SCENARIO%\TripTables\LDCVM
```

```
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\TripTables\LDPTM MKDIR %CATALOGDIR%\Base\%SCENARIO%\TripTables\LDPTM
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\TripTables\SDCVM MKDIR %CATALOGDIR%\Base\%SCENARIO%\TripTables\SDCVM
IF NOT EXIST %CATALOGDIR%\Base\%SCENARIO%\TripTables\SDPTM MKDIR %CATALOGDIR%\Base\%SCENARIO%\TripTables\SDPTM

IF NOT EXIST %CATALOGDIR%\Models\ETM\%SCENARIO% MKDIR %CATALOGDIR%\Models\ETM\%SCENARIO%
IF NOT EXIST %CATALOGDIR%\Models\ETM\%SCENARIO%\Inputs MKDIR %CATALOGDIR%\Models\ETM\%SCENARIO%\Inputs
IF NOT EXIST %CATALOGDIR%\Models\ETM\%SCENARIO%\Outputs MKDIR %CATALOGDIR%\Models\ETM\%SCENARIO%\Outputs

IF NOT EXIST %CATALOGDIR%\Models\LDCVM\%SCENARIO% MKDIR %CATALOGDIR%\Models\LDCVM\%SCENARIO%
IF NOT EXIST %CATALOGDIR%\Models\LDCVM\%SCENARIO%\Outputs MKDIR %CATALOGDIR%\Models\LDCVM\%SCENARIO%\Outputs

IF NOT EXIST %CATALOGDIR%\Models\LDPTM\%SCENARIO% MKDIR %CATALOGDIR%\Models\LDPTM\%SCENARIO%
IF NOT EXIST %CATALOGDIR%\Models\LDPTM\%SCENARIO%\Inputs MKDIR %CATALOGDIR%\Models\LDPTM\%SCENARIO%\Inputs
IF NOT EXIST %CATALOGDIR%\Models\LDPTM\%SCENARIO%\Outputs MKDIR %CATALOGDIR%\Models\LDPTM\%SCENARIO%\Outputs

IF NOT EXIST %CATALOGDIR%\Models\SDCVM\%SCENARIO% MKDIR %CATALOGDIR%\Models\SDCVM\%SCENARIO%
IF NOT EXIST %CATALOGDIR%\Models\SDCVM\%SCENARIO%\Inputs MKDIR %CATALOGDIR%\Models\SDCVM\%SCENARIO%\Inputs
IF NOT EXIST %CATALOGDIR%\Models\SDCVM\%SCENARIO%\Outputs MKDIR %CATALOGDIR%\Models\SDCVM\%SCENARIO%\Outputs

IF NOT EXIST %CATALOGDIR%\Models\SDPTM\%SCENARIO% MKDIR %CATALOGDIR%\Models\SDPTM\%SCENARIO%
IF NOT EXIST %CATALOGDIR%\Models\SDPTM\%SCENARIO%\Inputs MKDIR %CATALOGDIR%\Models\SDPTM\%SCENARIO%\Inputs
IF NOT EXIST %CATALOGDIR%\Models\SDPTM\%SCENARIO%\Outputs MKDIR %CATALOGDIR%\Models\SDPTM\%SCENARIO%\Outputs

:: ----------------------Grab and Copy Model System Files
:ModelFilesCopying
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\taztaz_dist.csv" "%CATALOGDIR%\Base\%SCENARIO%\Skims\taztaz_dist.csv"
:: LDPTM
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\Air\Airports.csv" "%CATALOGDIR%\Base\%SCENARIO%\Skims\Air\Airports.csv"
COPY "%CATALOGDIR%\Models\LDPTM\%WARMSTART%\Inputs\taztaz_dist.csv" "%CATALOGDIR%\Models\LDPTM\%SCENARIO%\Inputs\taztaz_dist.csv"
COPY "%CATALOGDIR%\Models\LDPTM\%WARMSTART%\Inputs\Stations.csv" "%CATALOGDIR%\Models\LDPTM\%SCENARIO%\Inputs\Stations.csv"
:: SDCVM
XCOPY %CATALOGDIR%\Models\SDCVM\%WARMSTART%\Inputs %CATALOGDIR%\Models\SDCVM\%SCENARIO%\Inputs /i
:: SDPTM
COPY "%CATALOGDIR%\Models\SDPTM\%WARMSTART%\Inputs\tazListI.csv" "%CATALOGDIR%\Models\SDPTM\%SCENARIO%\Inputs\tazListI.csv"
COPY "%CATALOGDIR%\Models\SDPTM\%WARMSTART%\Inputs\Daypat_Coeffs.csv" "%CATALOGDIR%\Models\SDPTM\%SCENARIO%\Inputs\Daypat_Coeffs.csv"
COPY "%CATALOGDIR%\Models\SDPTM\%WARMSTART%\Inputs\day_patterns_full.csv" "%CATALOGDIR%\Models\SDPTM\%SCENARIO%\Inputs\day_patterns_full.csv"
:: ----------------------Grab and Copy Warm Start Files
:WarmStartCopying
:: Loaded  Networks
COPY "%CATALOGDIR%\Base\%WARMSTART%\LoadedNetworks\HwyNetwork_Loaded_AM_%WSYEAR%.net"
"%CATALOGDIR%\Base\%SCENARIO%\LoadedNetworks\HwyNetwork_Loaded_AM_%YEAR%_PrevIt.net"
COPY "%CATALOGDIR%\Base\%WARMSTART%\LoadedNetworks\HwyNetwork_Loaded_MID_%WSYEAR%.net"
"%CATALOGDIR%\Base\%SCENARIO%\LoadedNetworks\HwyNetwork_Loaded_MID_%YEAR%_PrevIt.net"
COPY "%CATALOGDIR%\Base\%WARMSTART%\LoadedNetworks\HwyNetwork_Loaded_OFF_%WSYEAR%.net"
"%CATALOGDIR%\Base\%SCENARIO%\LoadedNetworks\HwyNetwork_Loaded_OFF_%YEAR%_PrevIt.net"
COPY "%CATALOGDIR%\Base\%WARMSTART%\LoadedNetworks\HwyNetwork_Loaded_PM_%WSYEAR%.net"
"%CATALOGDIR%\Base\%SCENARIO%\LoadedNetworks\HwyNetwork_Loaded_PM_%YEAR%_PrevIt.net"
:: Skims
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\skims.h5" "%CATALOGDIR%\Base\%SCENARIO%\Skims\skims.h5"
:: Auto Skims
```

```
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\Auto\Skims_AMPeak_%WSYEAR%.mat" "%CATALOGDIR%\Base\%SCENARIO%\Skims\Auto\Skims_AMPeak_%YEAR%.mat"
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\Auto\Skims_AMPeak_%WSYEAR%.mat" "%CATALOGDIR%\Base\%SCENARIO%\Skims\Auto\Skims_AMPeak_%YEAR%_PrevIt.mat"
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\Auto\Skims_Midday_%WSYEAR%.mat" "%CATALOGDIR%\Base\%SCENARIO%\Skims\Auto\Skims_Midday_%YEAR%_PrevIt.mat"
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\Auto\Skims_PMPeak_%WSYEAR%.mat" "%CATALOGDIR%\Base\%SCENARIO%\Skims\Auto\Skims_PMPeak_%YEAR%_PrevIt.mat"
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\Auto\Skims_OffPeak_%WSYEAR%.mat" "%CATALOGDIR%\Base\%SCENARIO%\Skims\Auto\Skims_OffPeak_%YEAR%_PrevIt.mat"
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\Auto\Skims_AMPeak_%WSYEAR%.mat" "%CATALOGDIR%\Base\%SCENARIO%\Skims\Auto\Skims_AMPeak_PrevRun_%YEAR%.mat"
:: Transit Skims
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\Transit\AMPEAK\COSTS_AMPEAK_%WSYEAR%.mat"
"%CATALOGDIR%\Base\%SCENARIO%\Skims\Transit\AMPEAK\COSTS_AMPEAK_%YEAR%_PrevIt.mat"
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\Transit\MIDDAY\COSTS_MIDDAY_%WSYEAR%.mat"
"%CATALOGDIR%\Base\%SCENARIO%\Skims\Transit\MIDDAY\COSTS_MIDDAY_%YEAR%_PrevIt.mat"
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\Transit\OFFPEAK\COSTS_OFFPEAK_%WSYEAR%.mat"
"%CATALOGDIR%\Base\%SCENARIO%\Skims\Transit\OFFPEAK\COSTS_OFFPEAK_%YEAR%_PrevIt.mat"
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\Transit\PMPEAK\COSTS_PMPEAK_%WSYEAR%.mat"
"%CATALOGDIR%\Base\%SCENARIO%\Skims\Transit\PMPEAK\COSTS_PMPEAK_%YEAR%_PrevIt.mat"
:: TripTables
COPY "%CATALOGDIR%\Base\%WARMSTART%\TripTables\OD_%WSYEAR%.mat" "%CATALOGDIR%\Base\%SCENARIO%\TripTables\OD_%YEAR%_PreIt.mat"
COPY "%CATALOGDIR%\Base\%WARMSTART%\TripTables\OD_DAILY_%WSYEAR%.mat" "%CATALOGDIR%\Base\%SCENARIO%\TripTables\OD_DAILY_%YEAR%_PreIt.mat"
COPY "%CATALOGDIR%\Base\%WARMSTART%\TripTables\SDPTM\TRIPS_SDPTM_%WSYEAR%.mat" "%CATALOGDIR%\Base\%SCENARIO%\TripTables\SDPTM\TRIPS_SDPTM_%YEAR%_PreIt.mat"
COPY "%CATALOGDIR%\Base\%WARMSTART%\TripTables\LDPTM\TRIPS_LDPTM_%WSYEAR%.mat" "%CATALOGDIR%\Base\%SCENARIO%\TripTables\LDPTM\TRIPS_LDPTM_%YEAR%_PreIt.mat"
:: LDPTM Skims
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\Air\Air Pairs.csv" "%CATALOGDIR%\Base\%SCENARIO%\Skims\Air\Air Pairs.csv"
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\Air\Air to Air Skims.csv" "%CATALOGDIR%\Base\%SCENARIO%\Skims\Air\Air to Air Skims.csv"
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\CVR\CVR_PEAK_STOPS.csv" "%CATALOGDIR%\Base\%SCENARIO%\Skims\CVR\CVR_PEAK_STOPS.csv"
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\CVR\CVR_STATION_TO_STATION_peak.csv" "%CATALOGDIR%\Base\%SCENARIO%\Skims\CVR\CVR_STATION_TO_STATION_peak.csv"
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\HSR\HSR_PEAK_STOPS.csv" "%CATALOGDIR%\Base\%SCENARIO%\Skims\HSR\HSR_PEAK_STOPS.csv"
COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\HSR\HSR_STATION_TO_STATION_peak.csv" "%CATALOGDIR%\Base\%SCENARIO%\Skims\HSR\HSR_STATION_TO_STATION_peak.csv"

:: ----------------------Copy Input Files
:: Warning - if the warm start is different year than scenario, you'll have to rename many files in the following folders
:CopyInputFiles
if %INPUTS%==YES XCOPY %CATALOGDIR%\Base\%WARMSTART%\Controls %CATALOGDIR%\Base\%SCENARIO%\Controls /i
if %INPUTS%==YES XCOPY %CATALOGDIR%\Base\%WARMSTART%\HwyNetworks %CATALOGDIR%\Base\%SCENARIO%\HwyNetworks /i
if %INPUTS%==YES XCOPY %CATALOGDIR%\Base\%WARMSTART%\Transit\Lines %CATALOGDIR%\Base\%SCENARIO%\Transit\Lines /i
if %INPUTS%==YES XCOPY %CATALOGDIR%\Base\%WARMSTART%\Transit\tfares %CATALOGDIR%\Base\%SCENARIO%\Transit\tfares /i
if %INPUTS%==YES XCOPY %CATALOGDIR%\Base\%WARMSTART%\Transit\tnetworks %CATALOGDIR%\Base\%SCENARIO%\Transit\tnetworks /i
if %INPUTS%==YES COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\Air\DB1B Fares.csv" "%CATALOGDIR%\Base\%SCENARIO%\Skims\Air\DB1B Fares.csv"
if %INPUTS%==YES COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\Air\Airfare function.csv" "%CATALOGDIR%\Base\%SCENARIO%\Skims\Air\Airfare function.csv"
if %INPUTS%==YES COPY "%CATALOGDIR%\Base\%WARMSTART%\Skims\Air\Direct Flights.csv" "%CATALOGDIR%\Base\%SCENARIO%\Skims\Air\Direct Flights.csv"
if %INPUTS%==YES COPY "%CATALOGDIR%\Models\ETM\%WARMSTART%\Inputs\externals.csv" "%CATALOGDIR%\Models\ETM\%SCENARIO%\Inputs\externals.csv"
if %INPUTS%==YES COPY "%CATALOGDIR%\Models\LDCVM\%WARMSTART%\Outputs\tazTrips%WSYEAR%.csv" "%CATALOGDIR%\Models\LDCVM\%SCENARIO%\Outputs\tazTrips%YEAR%.csv"
if %INPUTS%==YES COPY "%CATALOGDIR%\Models\SDPTM\%WARMSTART%\Inputs\cstdm10.sqlite" "%CATALOGDIR%\Models\SDPTM\%SCENARIO%\Inputs\cstdm10.sqlite"

:Done
```

Cube Cloud User Guide

California Statewide Travel Demand Model

Citilabs

05/18/2017

1 CONTENTS

2 WELCOME

Welcome to the Cube Cloud User Guide!

This guide will describe everything you need to get up to speed with Cube Cloud. In this chapter, there are sections on:

- About Cube Cloud
- Getting Starting with Cube Cloud
- Chapters in this Guide

2.1 About Cube Cloud

Cube Cloud provides traffic analysts, engineers and planners the ability to run and share their transportation analysis and forecasting models within a cloud computing environment. Models are designed within Desktop Cube and published to the cloud.

Users are invited to access the models, create and run tests, undertake analysis of the data using maps and charts and manage the associated information.

The client remains the owner of their data and models, but may easily and safely invite others to use their tools to test scenarios and to get model results. It is the perfect environment for sharing tools within work teams and with stakeholders.

Models run much faster in Cube Cloud since the calculations are spread, using Citilabs' Cube Cluster technology, across many cores located within the cloud. The computing and storage environment of Cube Cloud is provided by Amazon Elastic Compute Cloud. The cloud offers essentially unlimited resources enabling the running of many analyses simultaneously.

If your model or analysis uses specialized programs, these can be uploaded to Cube Cloud and used along with Cube modules to support your complete process.

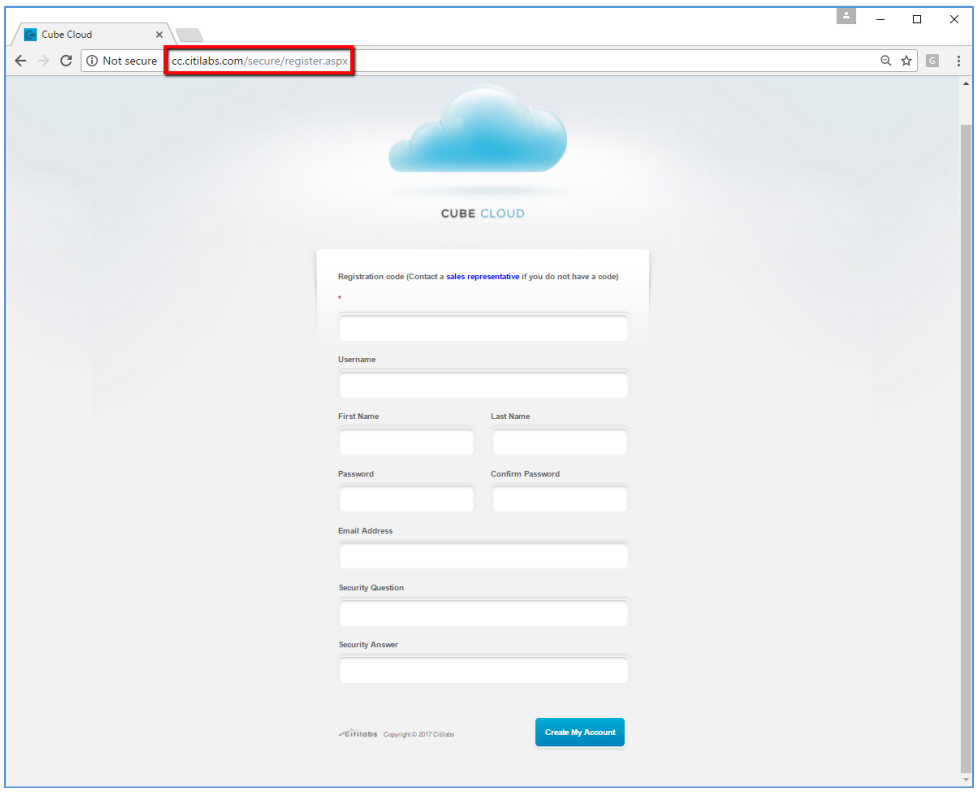
2.2 Getting Starting with Cube Cloud

In this section, you can find introductory information on:

- Signing up for Cube Cloud
- Obtaining a Contract
- Exporting and Uploading Your Model

2.2.1 Signing up for Cube Cloud

To get started with Cube Cloud, please visit **http://cc.citilabs.com** and click **sign up**. The registration code is **CUBE2012**. You may also request a free demonstration account from Citilabs by visiting **http://www.citilabs.com/cloud**.



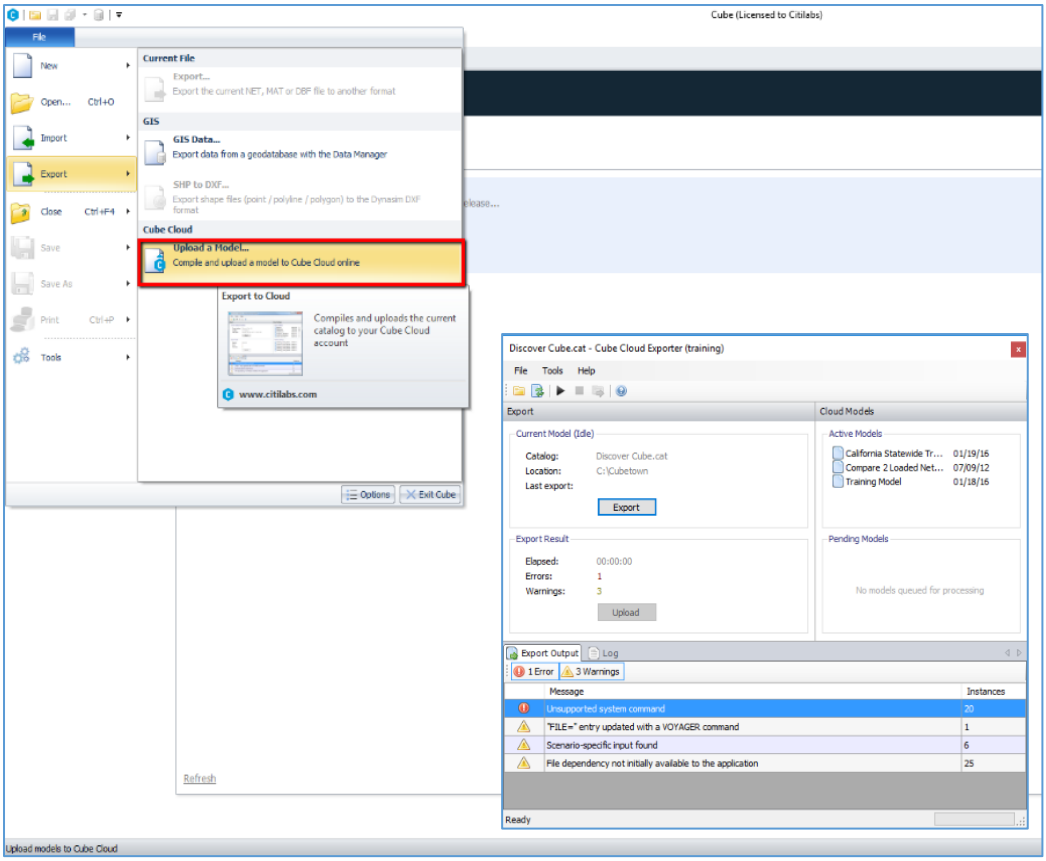
2.2.2 Obtaining a Contract

For model runs as a regular user, your organization will need a contract from Citilabs. For more on contracts, please see **Contracts** on page 8.

2.2.3 Exporting and Uploading Your Model

Once you have obtained a contract, you may export your model from Cube Desktop to the cloud. Open the desired catalog in Cube Desktop, then go to File > Export > Export a Model.

1. The export process converts the model to a format compatible with Cloud, but does not upload it. You will need to log in to Cloud from the exporter before uploading the model. Go to **File** and uncheck **Work Offline**. You will be prompted to log in.
2. From the exporter, click **Export**. The exporter will convert the model to a format readable by Cube Cloud.
3. Check the **Export Output** tab. Any warnings or errors will be listed.
4. Finally, click **Upload**. The model will appear under **Models** next time you log in to Cube Cloud.



2.3 Chapters in this Guide

This User Guide contains the following chapters.

- Overview
- Contracts
- haring Data and Inviting Users
- Working with Scenarios
- Analysis
- Data Management
- Store
- Administration

3 OVERVIEW

This chapter provides an overview of Cube Cloud and its features. Sections include:

- Overview of Cube Cloud Features

3.1 Overview of Cube Cloud Features

The core features of Cube Cloud include:

- Contract accounts are created with Citilabs, to store, run and share your models. See **Contracts** on page 8.
- You may invite users to join your contract and models and manage their access rights. You may also publish and share your data with other users. For more see **Sharing Data and Inviting Users** on page 9.
- Administrators may configure models to use a variable number of processors.
- Cloud allows multiple scenarios to run simultaneously. Please see **Working with Scenarios** on page 11.
- You may perform analysis using mapping and charting tools. For more see **Analysis** on page 18.
- Cube Cloud features data management tools, for managing the files used and created by your model. Please see **Data Management** on page 29.
- You may download your results and view them within Cube Desktop.
- You may browse a Store to obtain models, data and resources to incorporate into your own model. See **Store** on page 36.
- Comprehensive Administrative tools, for managing contracts, users and permissions. For more, see **Administration** on page 38.

4 CONTRACTS

This chapter describes the contracts required to run Cube Cloud. Sections include:

- About Contracts
- Obtaining a Contract

4.1 About Contracts

A Cube Cloud contract is an agreement between the user and the cloud service provider (i.e., Citilabs). It is also a component in the Cube Cloud system and defines the number of hours, users, amount of storage, etc. All model runs are charged against a contract which the user selects. A user can have access to multiple contracts and contracts can be shared between users. You may log into Cube Cloud as Contract Administrator, where you may allocate hours between the users under your contract.

For more on the Administrative tools available in Cube Cloud, please see **Administration** on page 38.

4.2 Obtaining a Contract

To obtain a contract, please contact your sales representative at http://www.citilabs.com/contact/

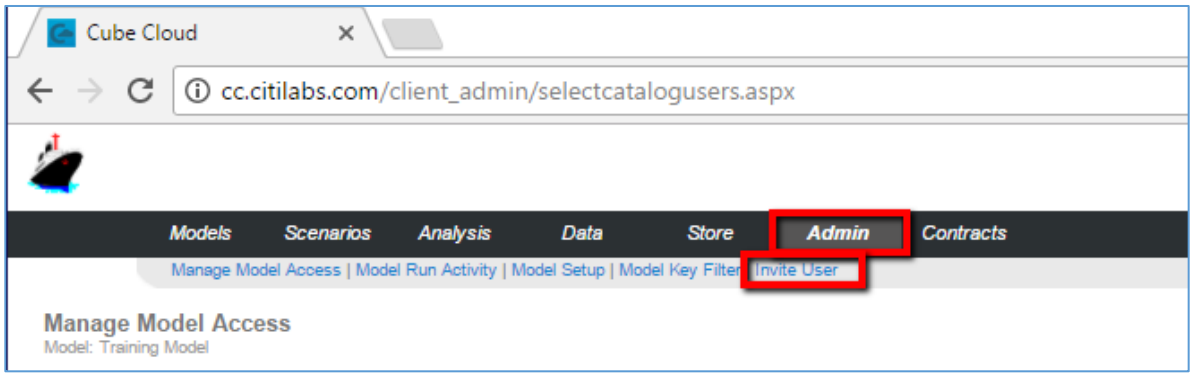
5 SHARING DATA AND INVITING USERS

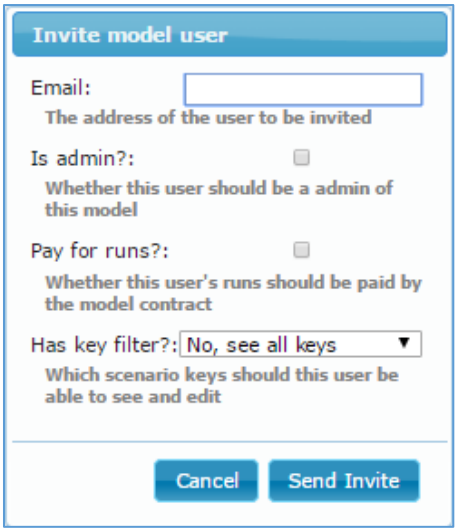
This chapter describes the ways you can share models and data with other users. Topics include:

- How to Invite Users
- About Core Hours

5.1 How to Invite Users

1. From the main menu bar, select **Models**.
2. Choose the desired model.
3. Click **Admin**.
4. Then, choose **Invite Model Users**. From there, you may enter the email address of the user, and select whether:
    a. They will have administrative rights
    b. You will share the contract hours with this user





5.2 About Core Hours

Citilabs offers several different contract levels from a few core-hours per year for smaller agencies to very high numbers of core-hours for large agencies and consultants. When sharing your model with others, you can choose to have their runs charged to your contract or the user's own contract. This pricing approach gives transportation analysts and administrators improved flexibility in managing the costs of sharing transportation models with others.

To control the payment of core hours, please see **How to Invite Users** on page 9, above.

6 WORKING WITH SCENARIOS

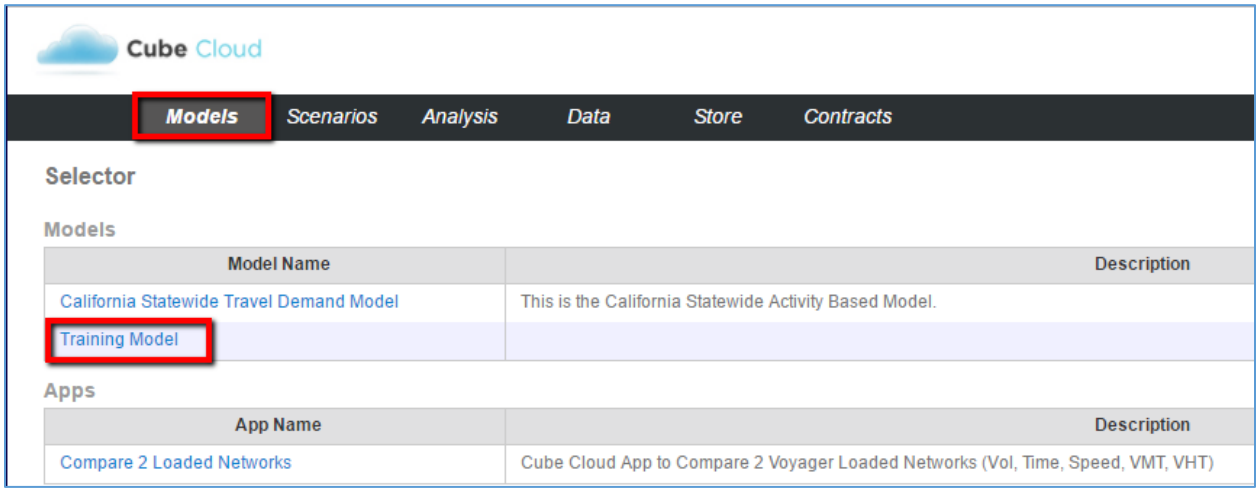
This chapter describes the ways you can work with Scenarios on Cube Cloud. Topics include:

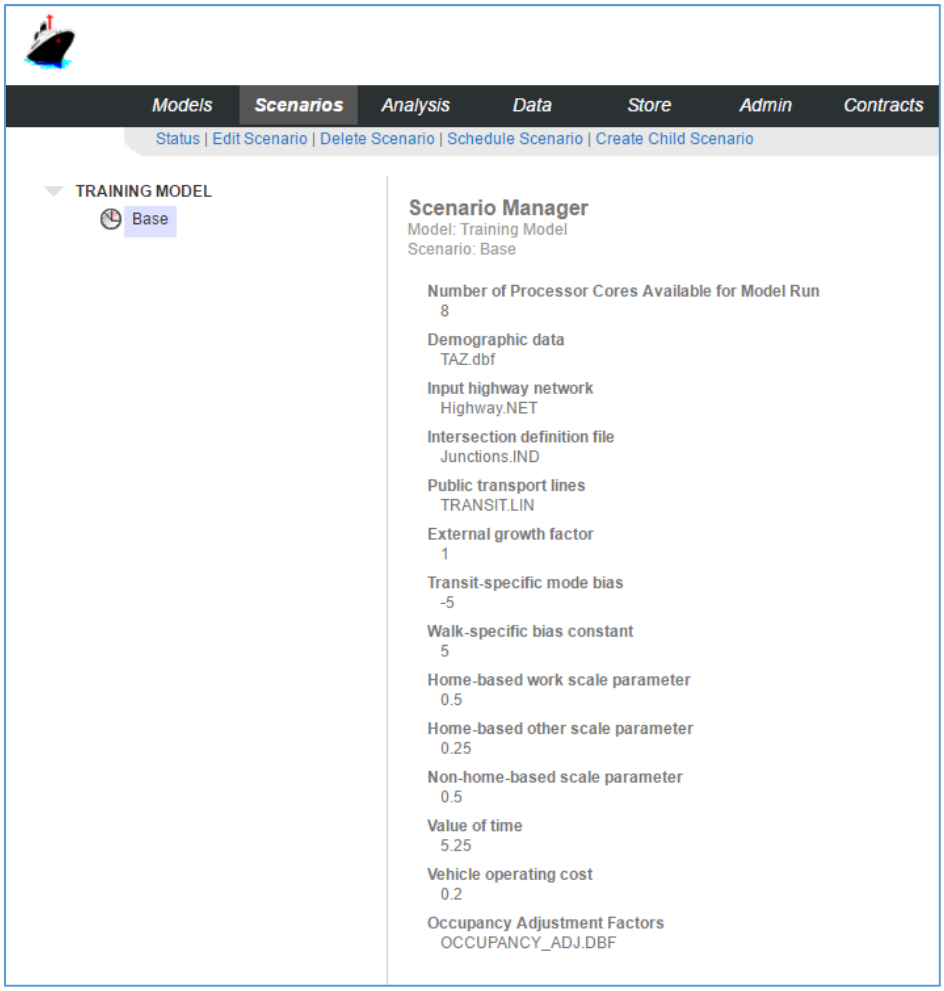
- Scenario Manager

6.1 Scenario Manager

The Cube Cloud Scenario Manager works in much the same way as scenario manager in Cube Base. To access scenario manager:

1. Click **Models** on the top menu.
2. Choose the desired model under **Selector**.
3. You may also choose from content obtained at the **Store**.
4. Scenario Manager will open for this model. From Scenario Manager, you may:
    - Check Scenario Run State
    - Check Scenario Status
    - Edit and View Scenarios
    - Delete Scenarios
    - Schedule Scenarios
    - Create Child Scenarios

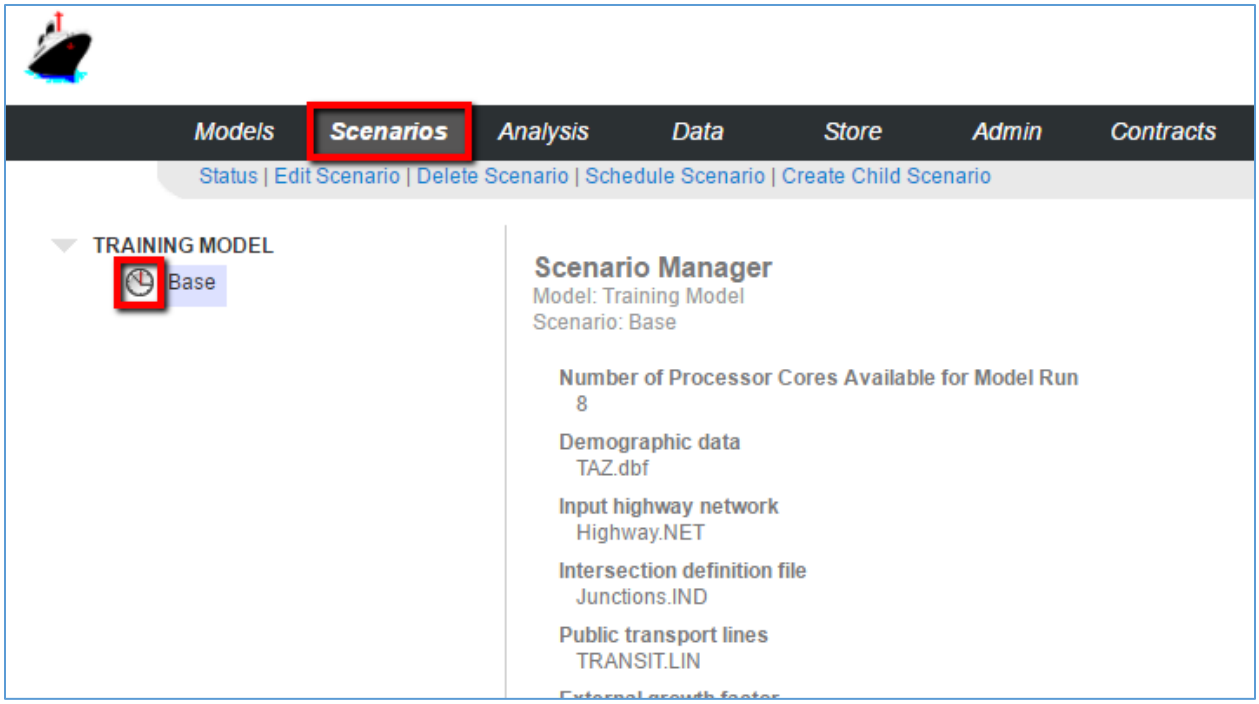




6.1.1 Check Scenario Run State

Select the scenario you wish to work with from the left-hand column. The selected scenario is highlighted in blue. The key values for the selected scenario will be updated on the right-hand column. The scenario's icon will vary depending on its status. These are:

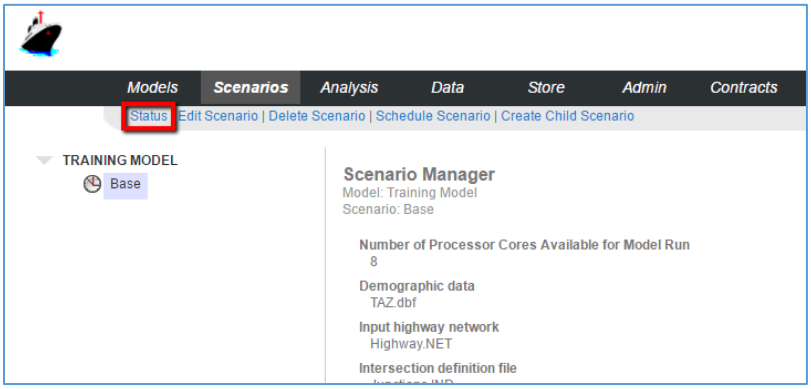
- Scenario not run; no information available
- Scenario scheduled
- Scenario run complete
- Scenario run complete, with warning
- Scenario run failed

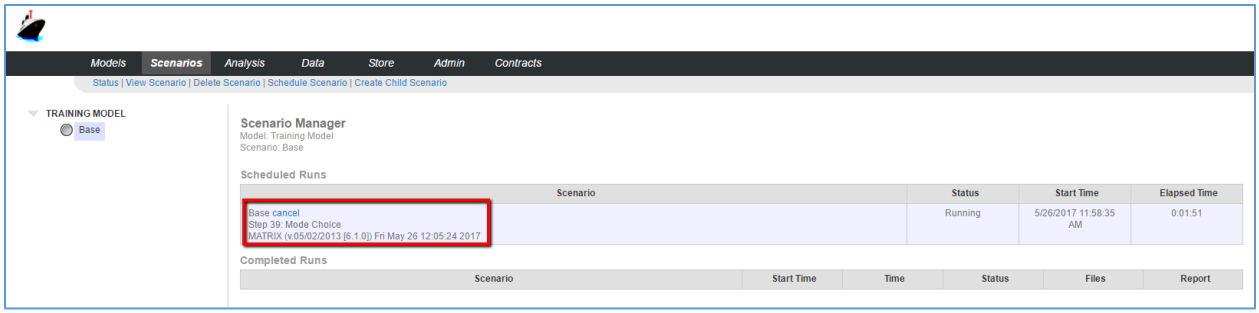


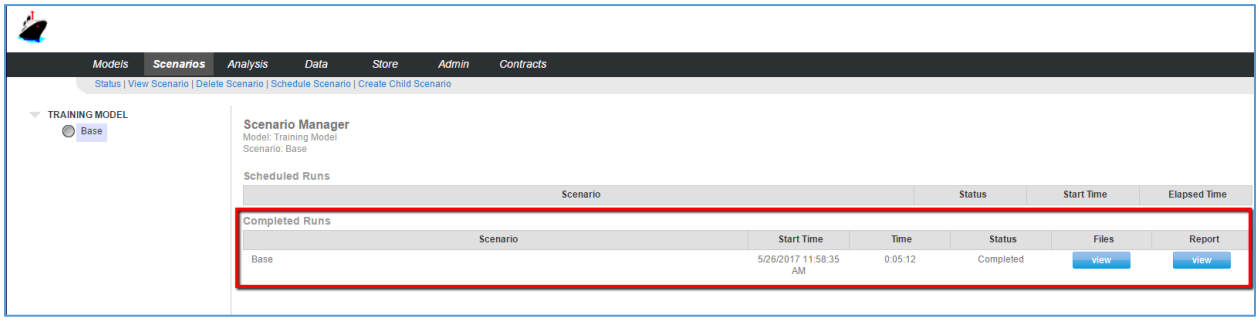
6.1.2 Check Scenario Status

Select the scenario you wish to work with from the left-hand column. The selected scenario is highlighted in blue. Then select **Status** on the secondary menu. From there you may view:

- **Scheduled Runs** — These are the scenario runs which are currently pending, or running. Here you may view the current step of the running model, and the status of the scheduled run (including Pending, Running and Completed) and elapsed time if applicable. Cancel a scheduled run by clicking **cancel**.
- **Completed Runs** — These are the scenario runs which have finished. You can view the total run time of the scenario and the final status of the model run (including Completed and Canceled by user). Click under **Files** to launch the data page (File Manager). Or, click under **Report** to view the run report for this scenario.



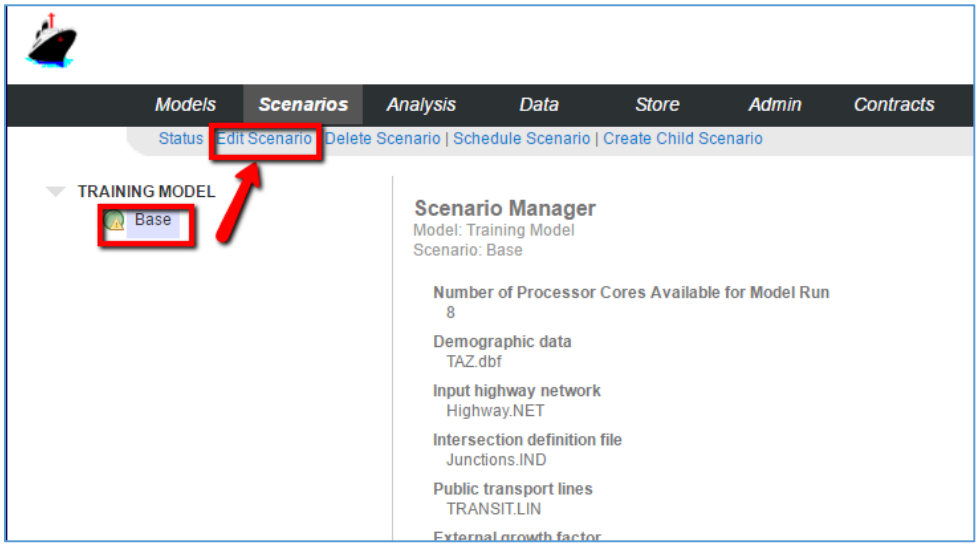




6.1.3 Edit and View Scenarios

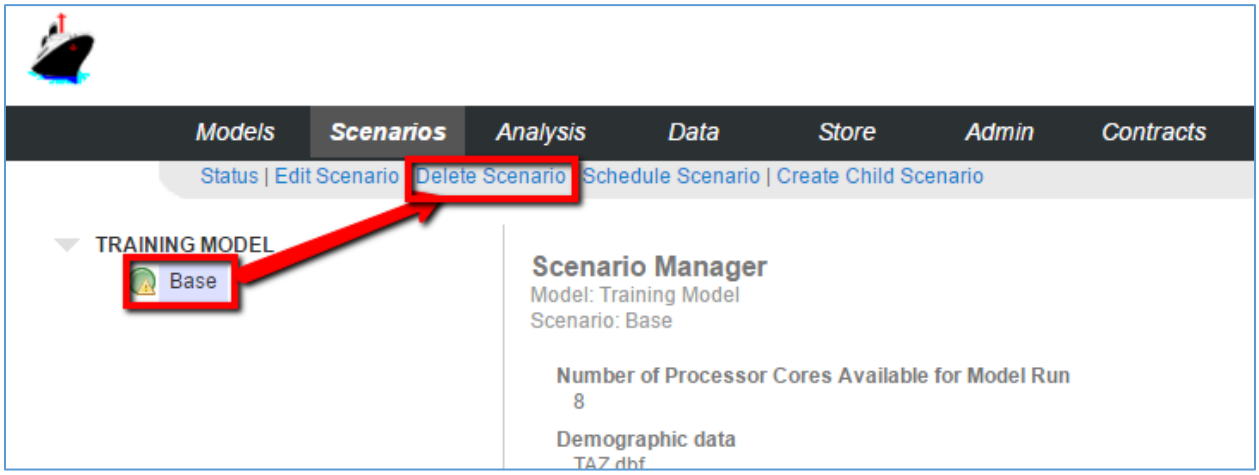
Select the scenario you wish to work with from the left-hand column. The selected scenario is highlighted in blue. Then select, on the secondary menu:

- **View Scenario** — Click to review the input files and key values for the scenario.
- **Edit Scenario** — Click to edit the input files and key values for the scenario.



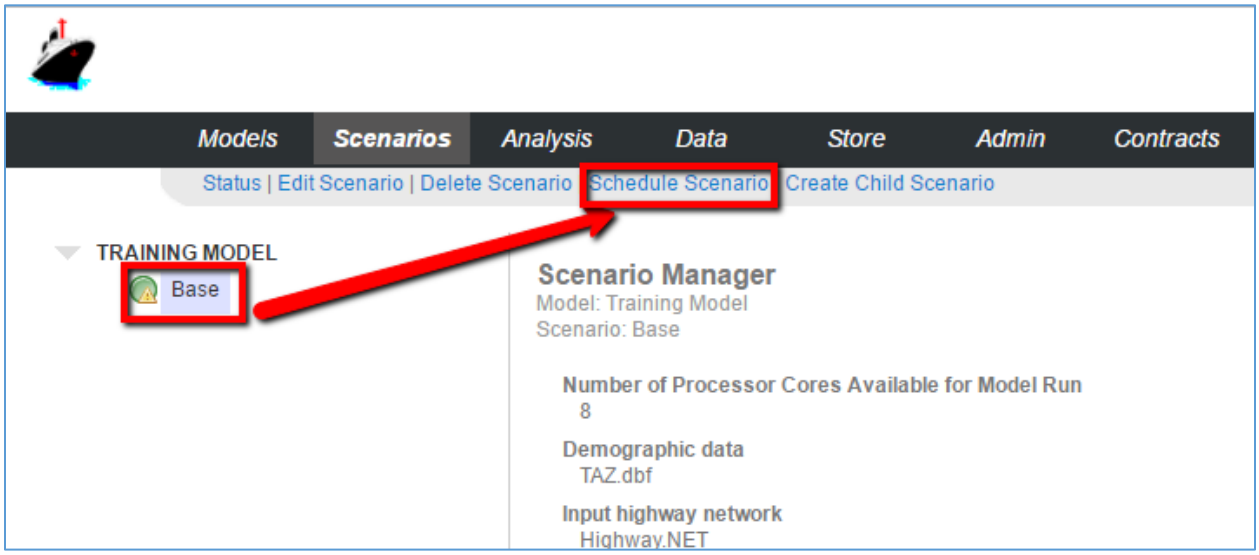
6.1.4 Delete Scenarios

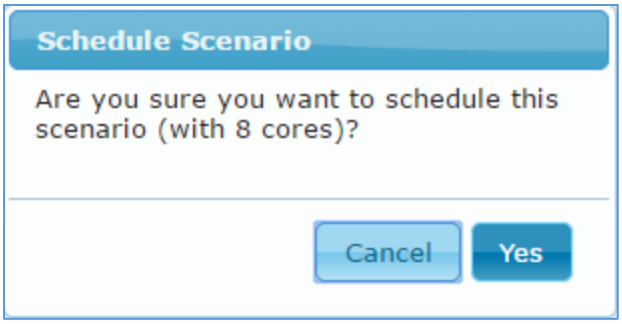
Select the scenario you wish to work with from the left-hand column. The selected scenario is highlighted in blue. Click **Delete Scenario** from the secondary menu. You will be prompted to confirm or cancel the action.



6.1.1 Schedule Scenarios

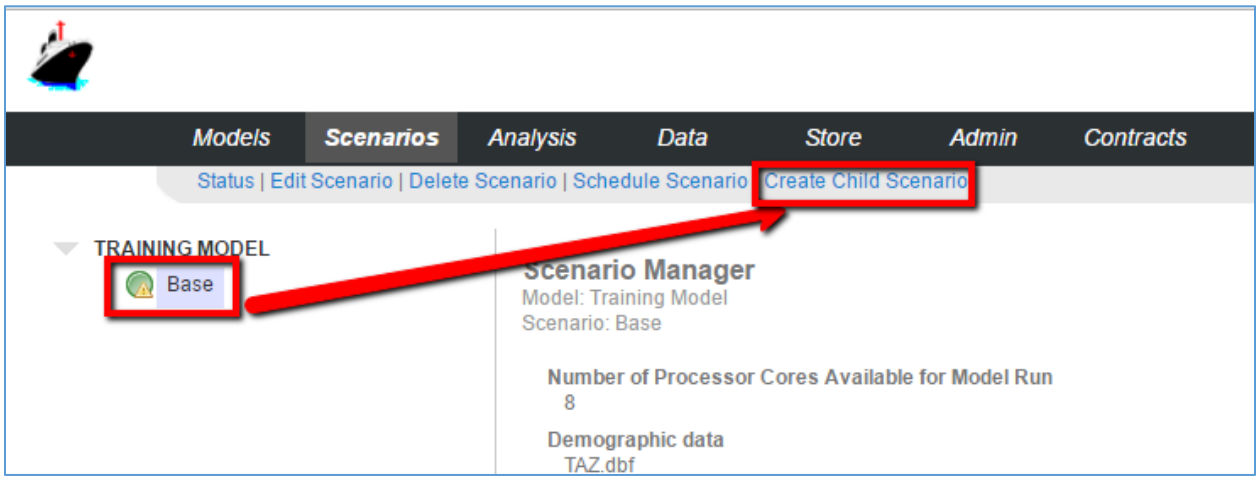
Select the scenario you wish to work with from the left-hand column. The selected scenario is highlighted in blue. Click **Schedule Scenario** from the secondary menu to schedule a run for the selected scenario. You will be prompted to confirm or cancel the action.

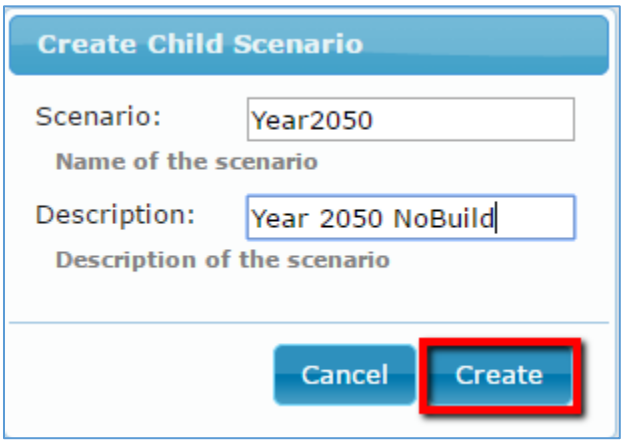


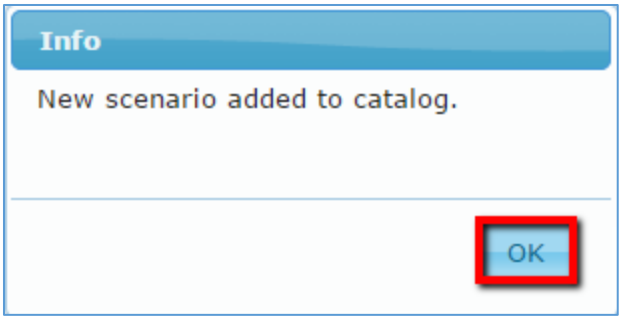


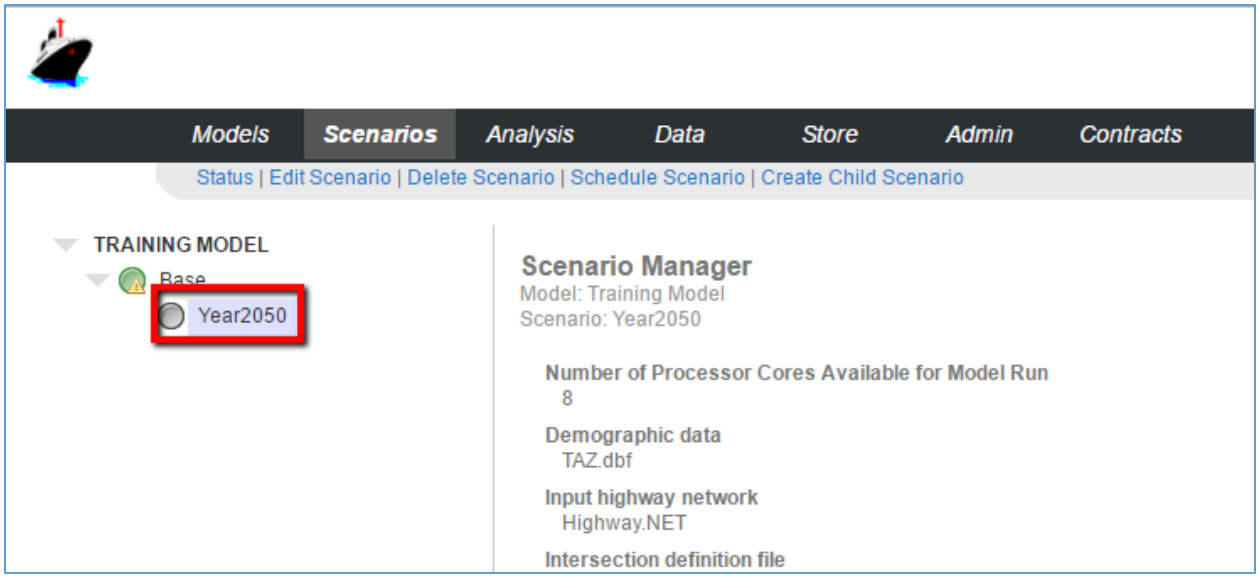
6.1.2 Create Child Scenarios

Select the scenario you wish to work with from the left-hand column. The selected scenario is highlighted in blue. Click **Create Child Scenario**. You will be prompted for the scenario name and description.






Info
New scenario added to catalog.
OK


Models
Scenarios
Analysis
Data
Store
Admin
Contracts
Status | Edit Scenario | Delete Scenario | Schedule Scenario | Create Child Scenario
TRAINING MODEL
Base
Year2050
Scenario Manager
Model: Training Model
Scenario: Year2050
Number of Processor Cores Available for Model Run
8
Demographic data
TAZ.dbf
Input highway network
Highway.NET
Intersection definition file

7 ANALYSIS

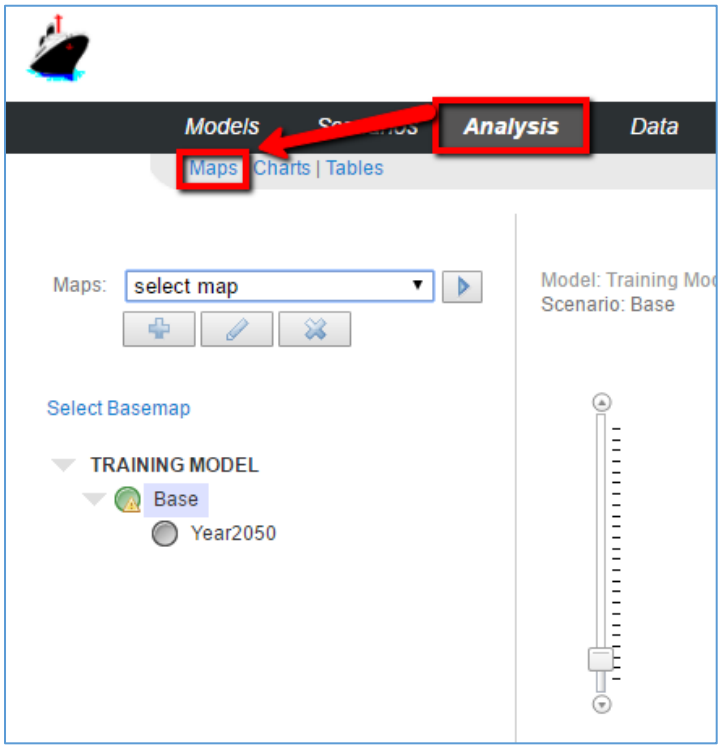
This chapter describes the powerful analysis tools in Cube Cloud, where you can produce informative, colorful maps and charts. Topics include:

- Maps
- Charts

7.1 Maps

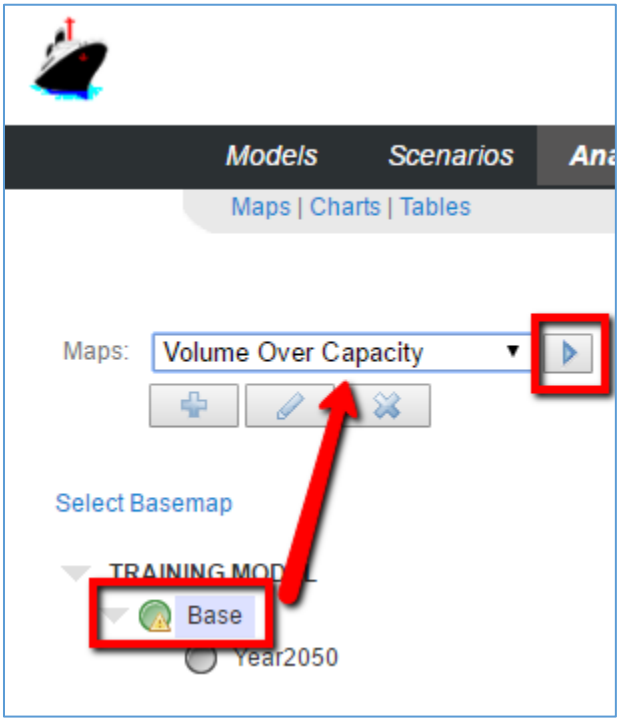
To view maps for completed scenario run, click **Models** on the top menu and choose the model. Then, pick a completed scenario (green icon). Click **Analysis** on the top menu and then, on the secondary menu, Maps. From there, you may:

- Draw a Map
- Create a Map
- Edit a Map
- Delete a Map
- Select the Base map



7.1.1 Draw a map

Select a map from the Maps drop-down found in the page margin, and click the **Draw Map** button to the right. Either select a scenario from the scenario tree to specify a database from a different set of output data (this option requires the selected scenario to have a database of the same name, network and fields), or click the refresh button to use the current scenario.



7.1.2 Create a Map

Below the dropdown found in the left-hand column, click the **Add Map** button. The map-creation pop-up window will appear. Enter the following information:

1. **Map Name** (required) — identifies the map in the map-selection dropdown.

2. **Visibility** — specifies how other users will be able to access the map. Available options are:
    a. PRIVATE: prevents other users from seeing the map template.
    b. PUBLIC: can be viewed by all users and applied to their scenario data
    c. OFFICIAL: can be viewed by all users and applied to their scenario data - selected by the model administrator only.

3. **Map Type** (required) — select the type of map. Supported types include:
    a. Network Quality - Value Range: categorizes links based on ranges of values of the selected Attribute (under Data). A value range is appropriate when visualizing volumes, for example.
    b. Network Quality - Fixed Value: categorizes links based on exact values of selected Attribute (under Data). A fixed value is appropriate when visualizing number of lanes, for example.

You may choose the color scheme for the values by clicking **Edit Symbology** underneath **Legend**.

4. **Data** — browse the databases and data sets available to this model, which will be the basis of the new map.
    - Input type — you may select:
        - Shapefile: Use an ArcGIS shapefile & associated data
            - Links: browse for a link shapefile in the scenario data
            - Nodes: browse for a node shapefile in the scenario data
            - Attribute: The attribute from the Link dataset you wish to visualize in the map
            - Zones: the number of zones in the shapefile
        - Geodatabase: Use a network in a Geodatabase.
            - Network: click to browse for the geodatabase and dataset in the scenario data
            - Attribute: The attribute from the network you wish to visualize in the map

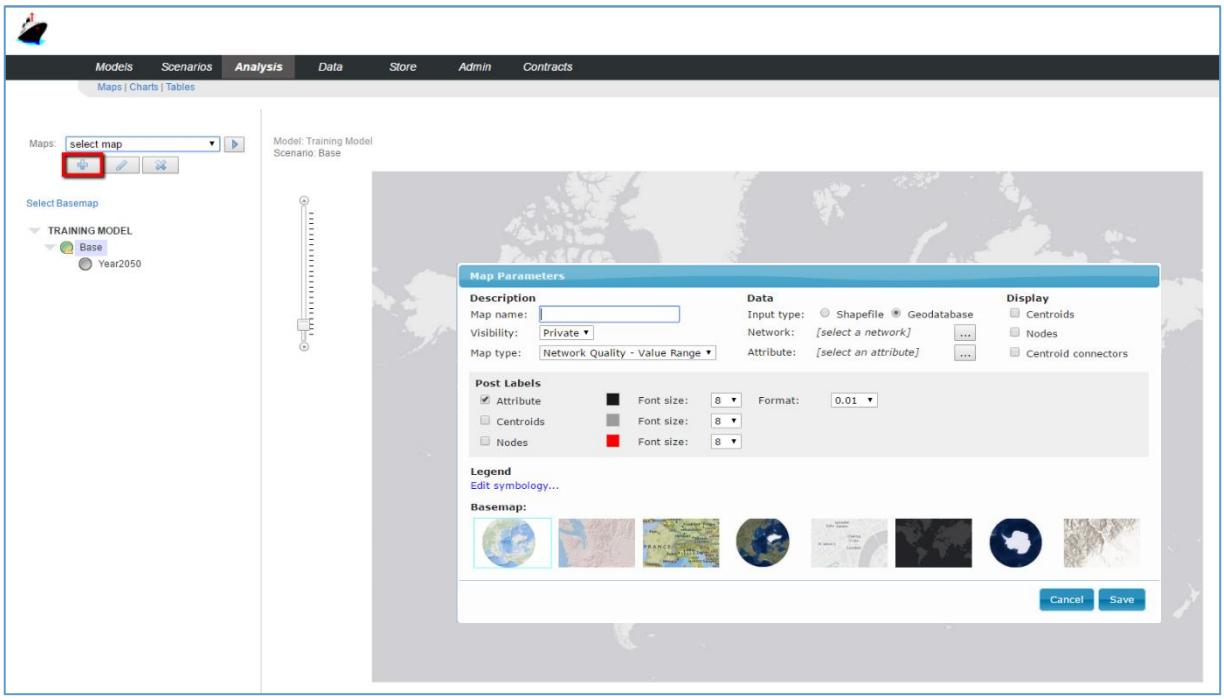
5. **Display** — control the network elements which appear in the map.
    a. Centroids: formats links and nodes within the maximum zone number threshold as Centroid
    b. Nodes: displays the node layer
    c. Centroid connectors: toggle display of centroid connectors

6. **Post Labels** — these options control display of labels in the map.
    a. Attribute: you may select both the color and font size of the attribute selected under Data. Further, you may select a numeric Format which determines the rounding of the attribute's label.
    b. Centroids: you may select both the color and font size of centroids in the map.
    c. Nodes: you may select both the color and font size of nodes in the map.

7. **Legend** — click **Edit Symbology** to configure the display of items in the map legend (in the Symbology popup box)
    a. **Legend Title**: title of the legend
    b. Select **colors** and their corresponding **values** which define the map legend. For a value range map, enter the cutoffs between the ranges. For a fixed value map, enter the values to be visualized.
    c. **Line Width**: select the width (in pixels) of the links plotted on the map.
    d. **Reverse**: click to invert the color order on this legend.
    e. **Done**: click to confirm the settings

8. **Basemap** — displays a list of base maps which are available. Click to choose the desired background for this map.

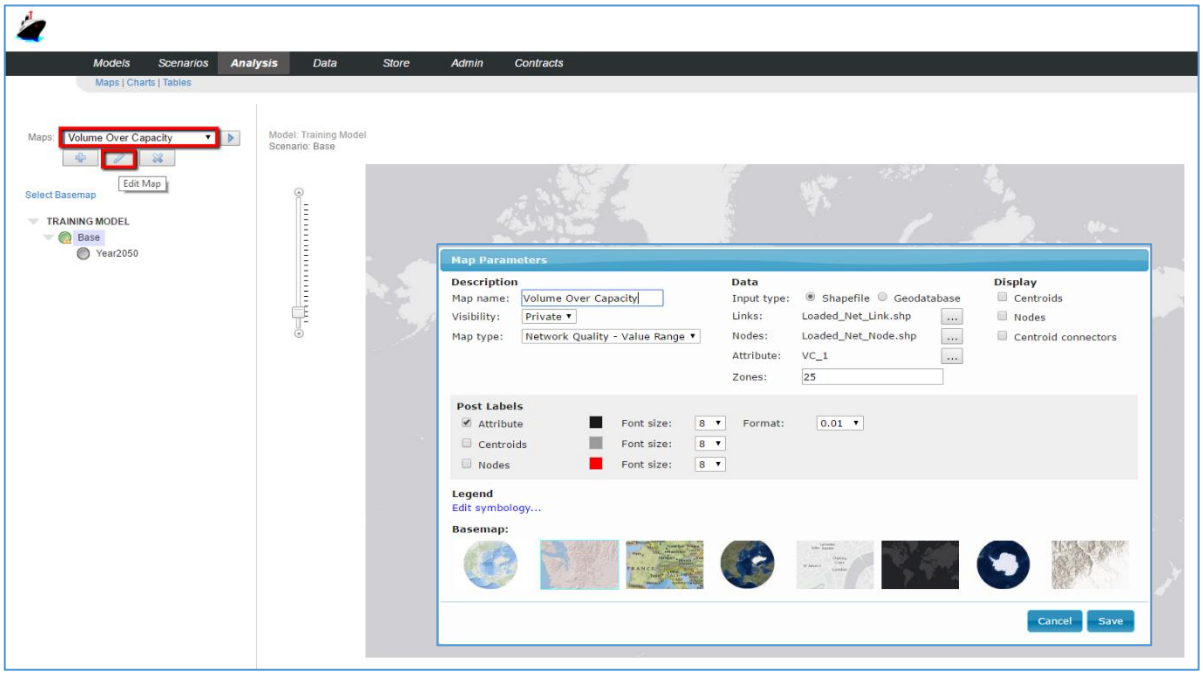
9. **Save** — click to save these settings and display the new map in the page's center column, or, click **Cancel** to undo.



7.1.3 Edit a Map

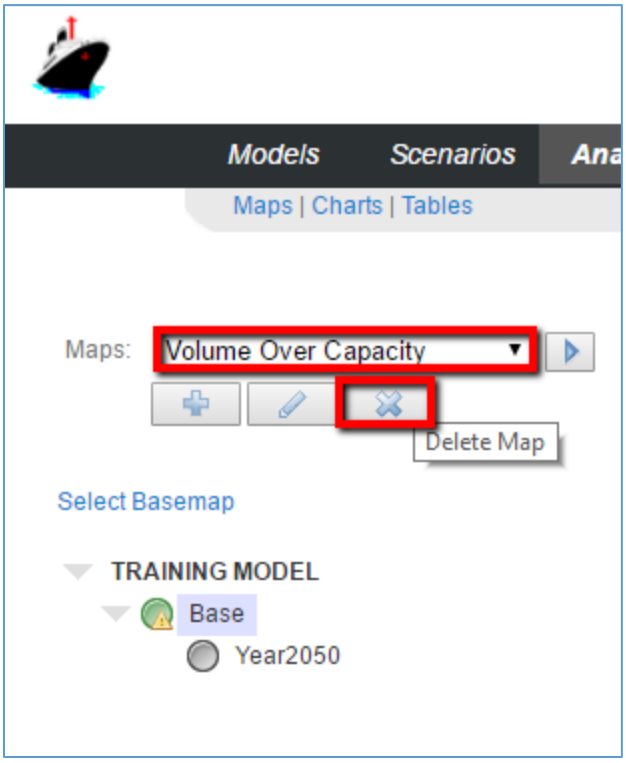
1. Select a map from the map dropdown found in the page margin.
2. Click the **Edit Map** button located below the map dropdown. The same dialog used to create a map will appear.

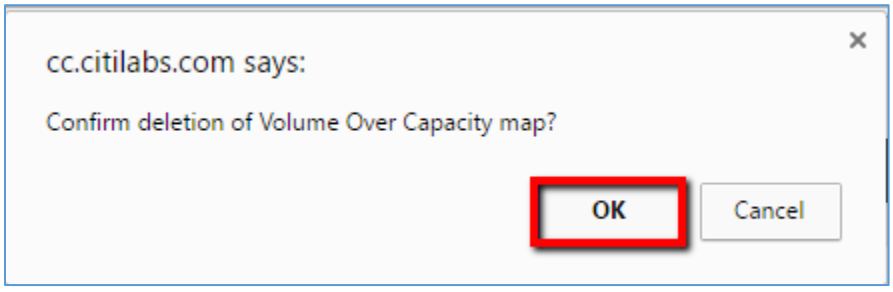
NOTE: Note: to change the selected field, the database and network need to be re-selected.



7.1.4 Delete a Map

1. Select a map from the dropdown found in the page margin.
2. Click the **Delete Map** button located below the map dropdown. You will be prompted to confirm or cancel the action.





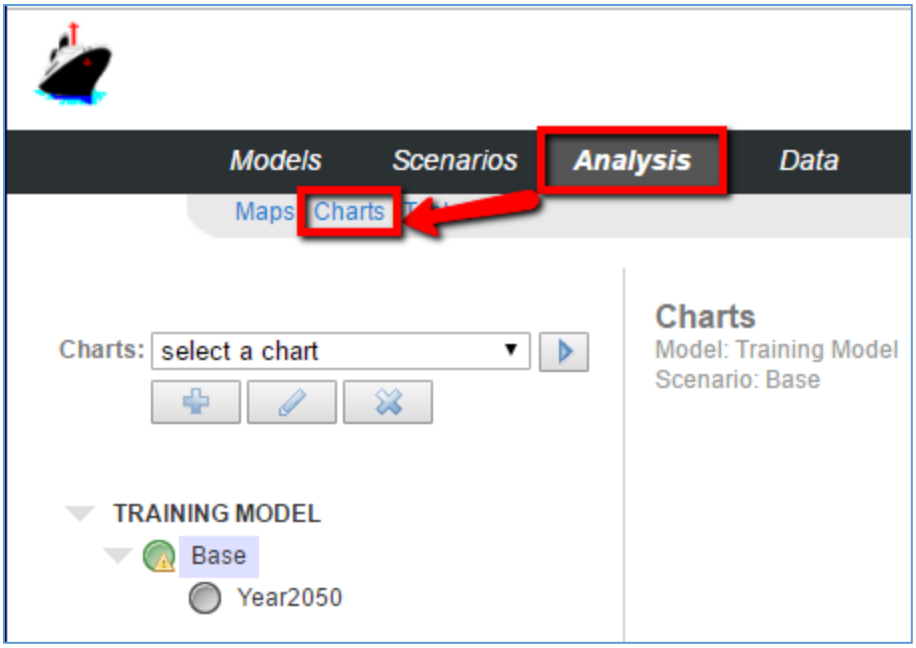
7.1.5 Select the Base map

Click **Select Basemap** to view a list of base maps which are available for this map.

7.2 Charts

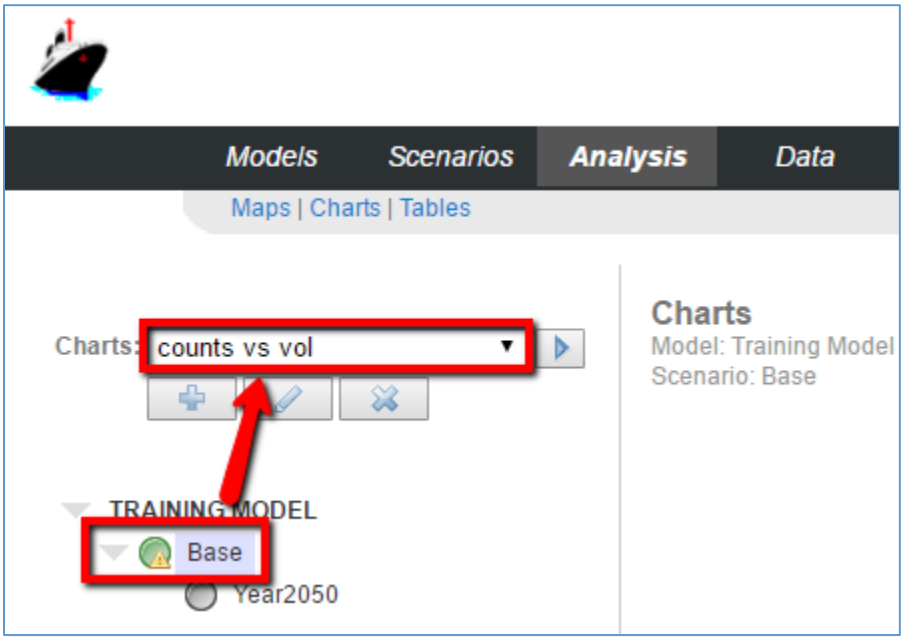
To view charts for completed scenario run, click **Charts** on the top menu and choose the model. Then, pick a completed scenario (green icon). Click **Analysis** on the top menu and then, on the secondary menu, **Charts**. From there, you may:

- Draw a Chart
- Create a Chart Template
- Edit a Chart Template
- Delete a Chart Template



7.2.1 Draw a chart

Select a chart from the chart dropdown found in the page margin and click the **Draw Chart** button. Select a scenario from the scenario tree to specify a database from a different set of output data. This option requires the selected scenario to have a database of the same name, table and fields.



7.2.2 Create a Chart Template

Below the dropdown found in the left-hand column, click the **Create Chart Template** button. The chart-creation pop-up window will appear. Enter the following information:

1. **Title** (required) — identifies the chart in both the chart-selection dropdown and in the data table header.

2. **Description** (required) — extra details to associate with the chart.

3. **Type** (required) — select from four types of charts:
    - Pie Chart — display the percentage of items from different categories:
        - CATEGORY: each unique category represents a pie slice; duplicates have their totals summed. A category chart would be appropriate for the Mode of travel.
        - QUANTITY: the share of the pie for each classification within the category; for example, the share between public transport, walking and car-based travel within the Mode category.
    - Stacked Bar Chart — display a breakdown of values for each column:
        - CATEGORY: groups the set of values to stack in each column
        - COLUMNS: a numeric value identifying a column for each record
        - VALUE: a numeric value used to calculate the size of each category in the given column
    - Scatter Chart — plot one set of values against another; includes a correlation line:
        - CATEGORY: each unique category is marked with a specific color
        - X-AXIS: a numeric field for plotting points along the x-axis
        - Y-AXIS: a numeric field for plotting points along the y-axis
    - Line Chart — display a list of steps as they change over time:
        - CATEGORY: data associated with a group is displayed along the same line
        - COLUMNS: a numeric field for plotting (stepped) values along the line's x-axis
        - VALUE: a numeric field for plotting values along the line's y-axis

4. **Size** (required) — specify the size of the chart
    - SMALL: fixed chart at 400 x 300
    - MEDIUM: fixed chart at 800 x 600
    - LARGE: flexible chart starting at 800 x 600 or wider based on the browser size when chart is created

5. **X-Axis Label** — text displayed along the x-axis

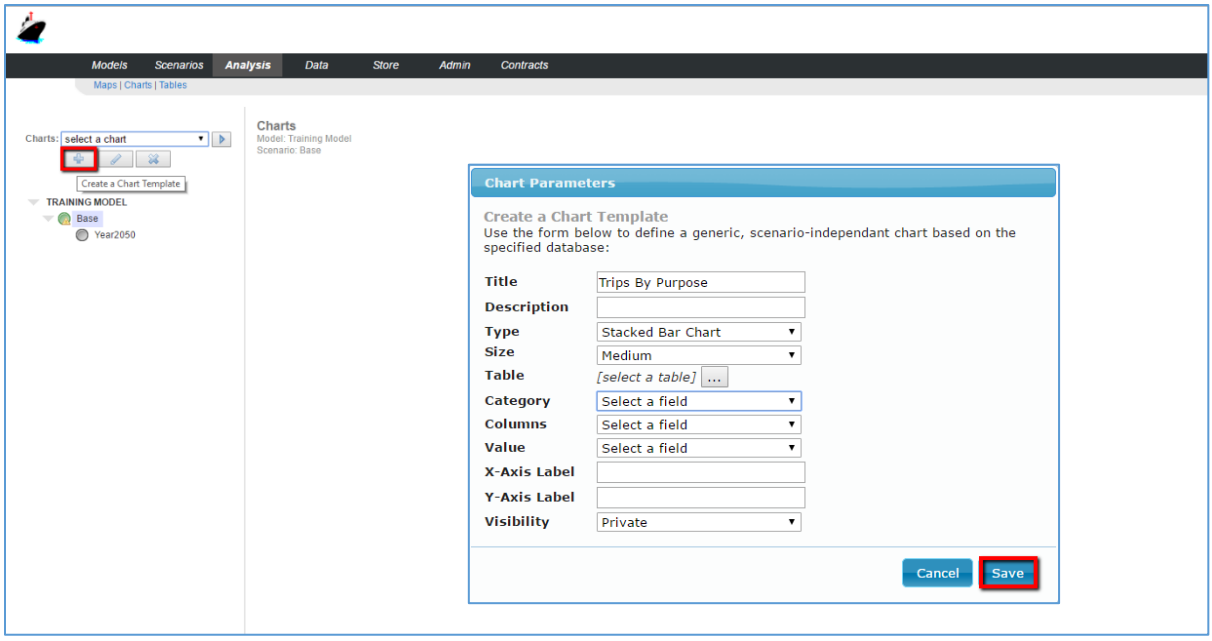
6. **Y-Axis Label** — text displayed along the y-axis

7. **Table** — browse the databases and data sets available to this model, which will be the basis of the new chart

8. **Visibility** — specify how other users can access the chart
    - PRIVATE: the chart can only be viewed and edited by the person who created it. This prevents other users from seeing the chart template.
    - PUBLIC: can be viewed by all users and applied to their scenario data.

- OFFICIAL: can be viewed by all users and applied to their scenario data - selected by the model administrator only.

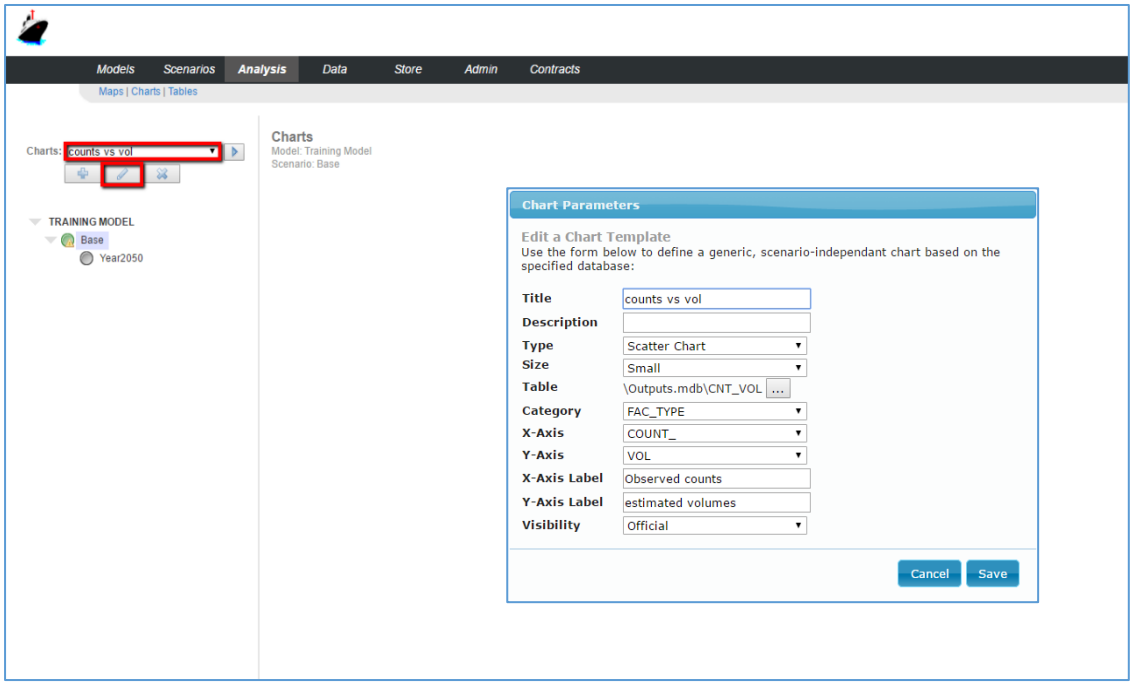
9. **Save** — click to save these settings and display the new map in the page's center column, or, click **Cancel** to undo.



7.2.3 Edit a Chart Template

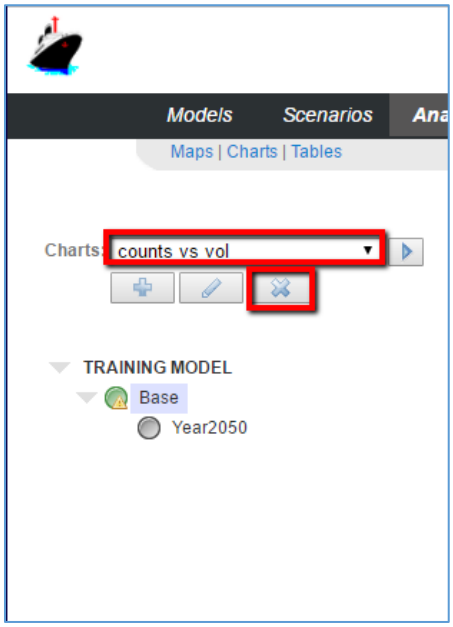
1. Select the chart from the dropdown found in the page margin.
2. Click the **Edit a Chart Template** button located below the chart dropdown. The same dialog used to draw a chart will appear.

NOTE: To change the selected field, the database and table need to be re-selected.



7.2.4 Delete a Chart Template

1. Select the chart from the dropdown found in the page margin.
2. Click the **Delete Chart Template** button located below the chart dropdown. You will be prompted to confirm or cancel the action.




cc.citilabs.com says:
Delete 'counts vs vol'?
OK
Cancel

8 DATA MANAGEMENT

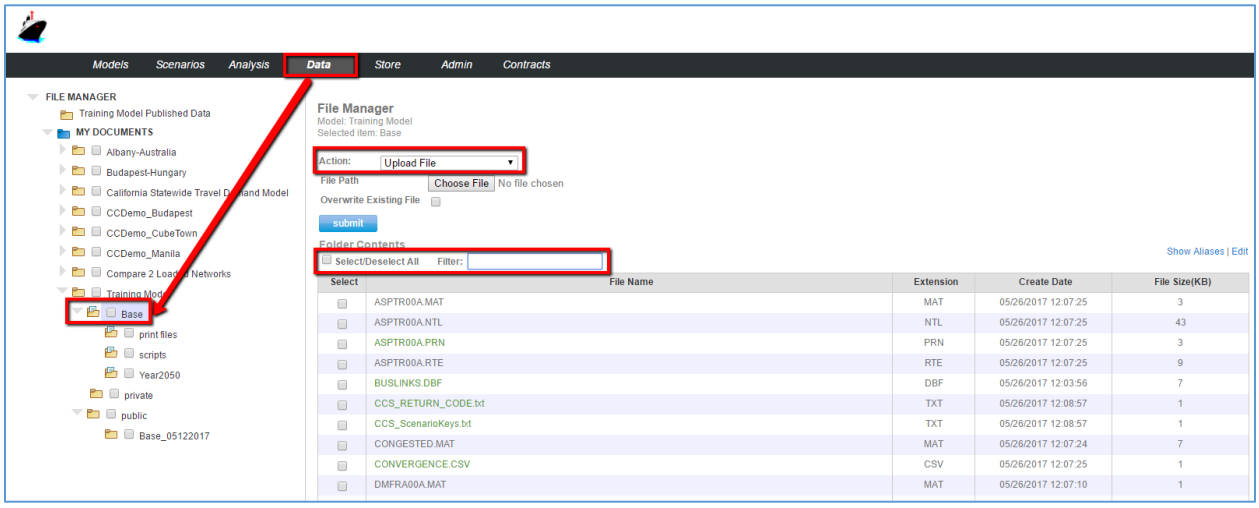
This chapter describes the data management tools available in Cube Cloud. Topics include:

- View a Folder
- Upload a File
- Copy a File
- Download a File or Folder
- Delete a File or Folder
- Create a New Folder
- Working with Aliases

8.1 View a folder

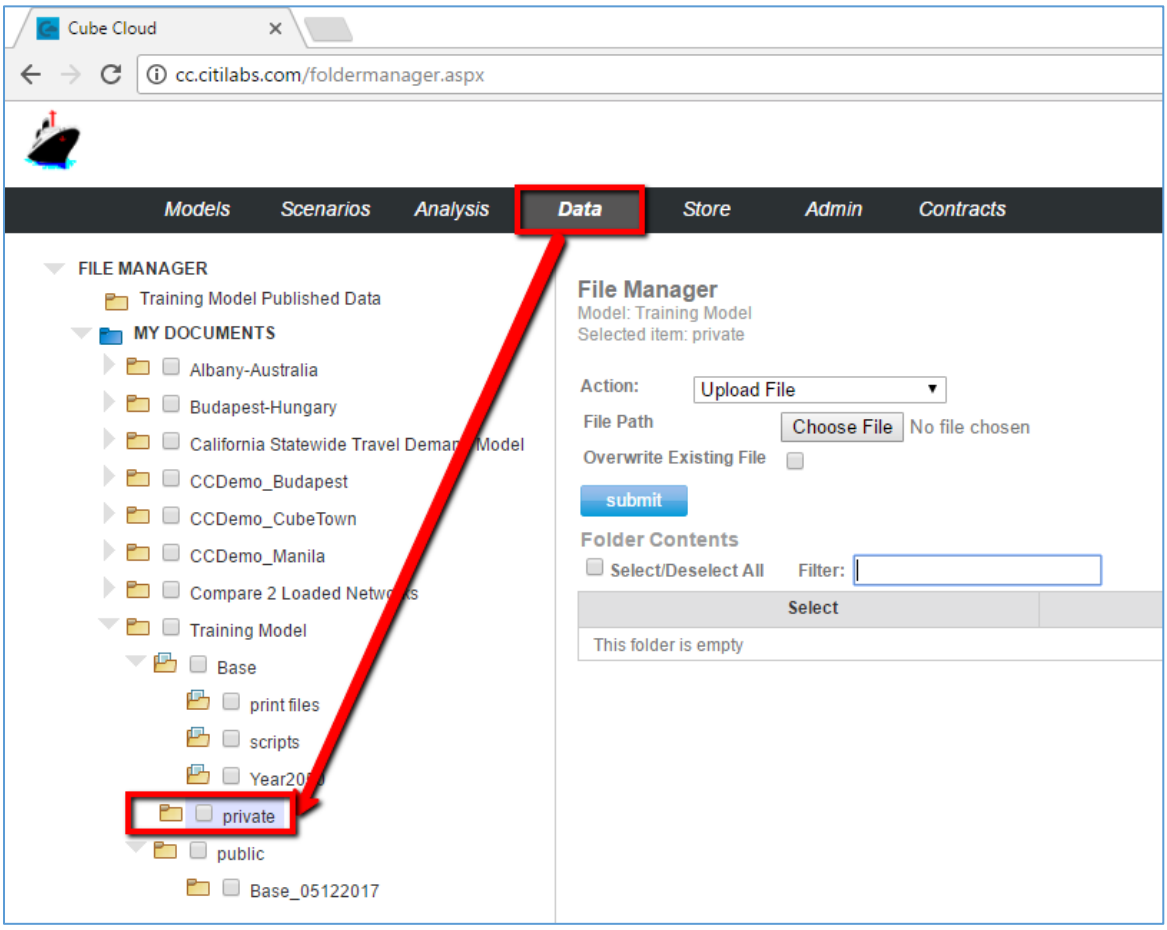
Select the model you wish to work with under Models. Then, click **Data** on the top menu. Choose the desired folder from the folder tree, which maps out the folders available to the model. The selected folder will be highlighted blue. The list of files in the selected folder will appear on the right in File Manager.

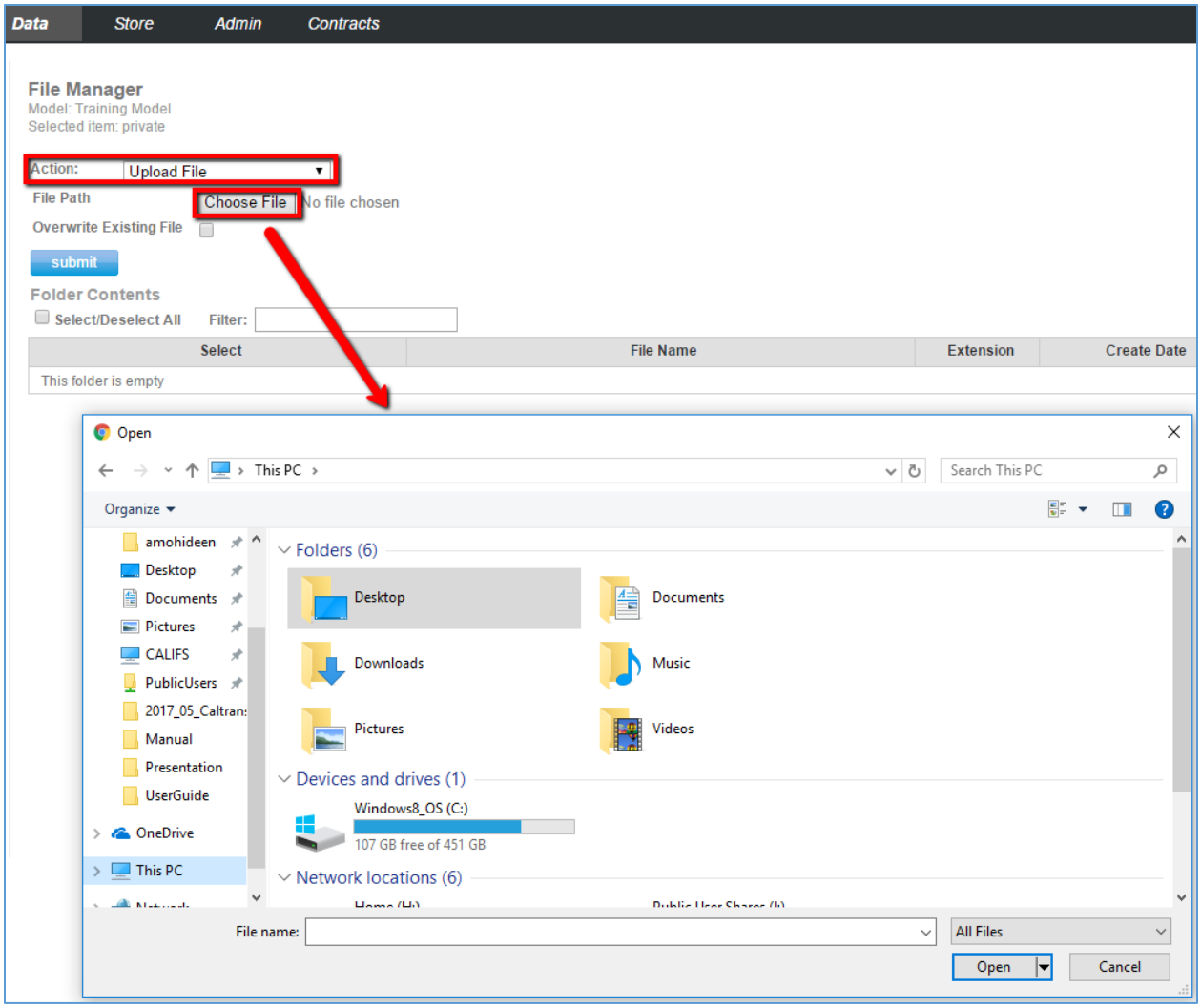
- **Filter** — enter part of a filename, or a date, to narrow the list down to those entries matching the entry.
- **Select/Deselect All** — check (or uncheck) this box to select (or deselect) all files. Selected files can be copied, deleted or downloaded. For more, please see:
    - Copy a File
    - Download a File or Folder
    - Delete a File or Folder

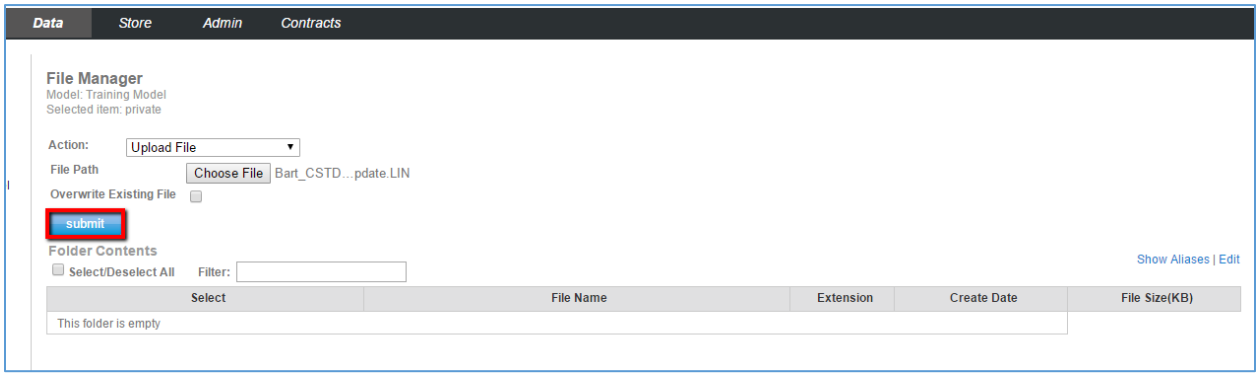


8.2 Upload a File

1. Select the model you wish to work with under Models. Then, click **Data** on the top menu.
2. Select the desired folder from the folder tree.
3. Select **Upload File** from the **Action** dropdown.
4. Click **Choose File** to browse your local system for the desired file. You must check **Overwrite Existing File** to override an existing file of the same name in the current folder.
5. Click **Submit**.

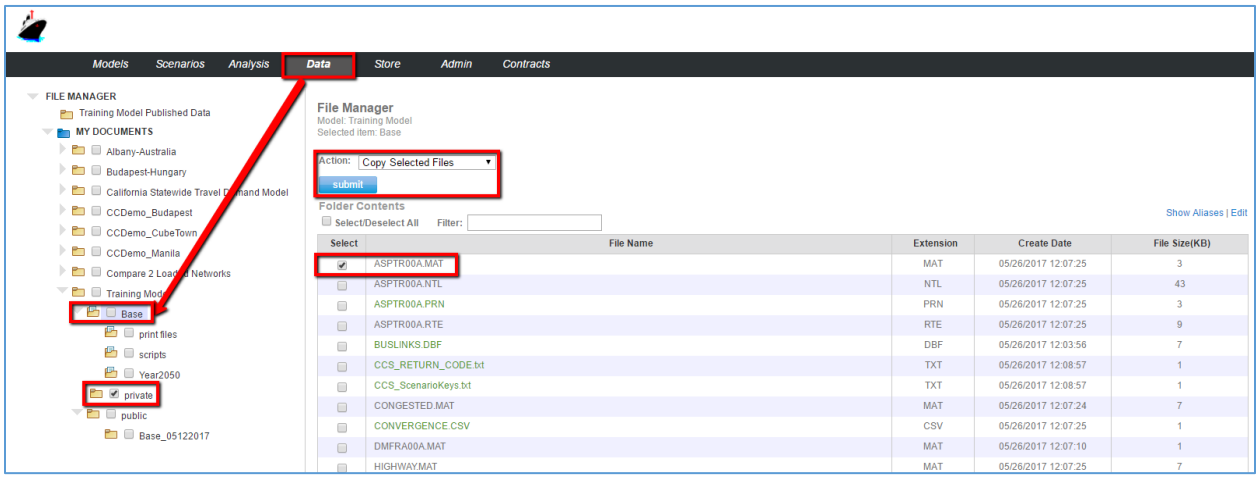



Data
Store
Admin
Contracts
File Manager
Model: Training Model
Selected item: private
Action:
Upload File
File Path
Choose File
No file chosen
Overwrite Existing File
submit
Folder Contents
Select/Deselect All
Filter:
Select
File Name
Extension
Create Date
This folder is empty
Open
This PC
Search This PC
Organize
amohideen
Desktop
Documents
Pictures
CALIFS
PublicUsers
2017_05_Caltran
Manual
Presentation
UserGuide
OneDrive
This PC
Folders (6)
Desktop
Documents
Downloads
Music
Pictures
Videos
Devices and drives (1)
Windows8_OS (C:)
107 GB free of 451 GB
Network locations (6)
File name:
All Files
Open
Cancel


Data
Store
Admin
Contracts
File Manager
Model: Training Model
Selected item: private
Action:
Upload File
File Path
Choose File
Bart_CSTD...pdate.LIN
Overwrite Existing File
submit
Folder Contents
Select/Deselect All
Filter:
Show Aliases | Edit
Select
File Name
Extension
Create Date
File Size(KB)
This folder is empty

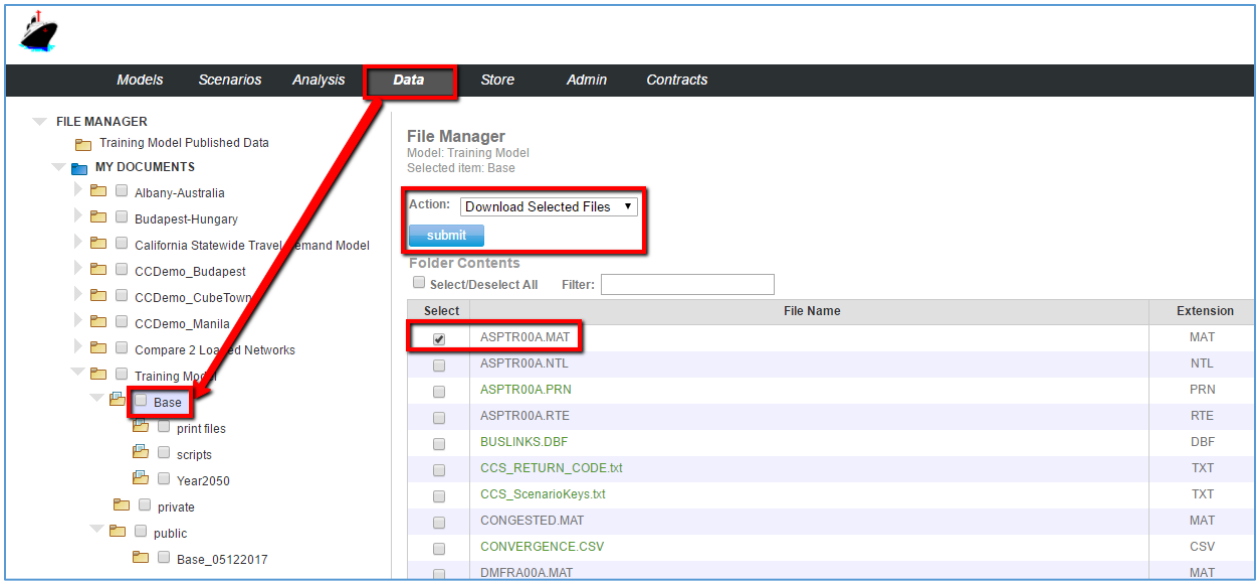
8.3 Copy a File

1. Select the model you wish to work with under Models. Then, click **Data** on the top menu.
2. Select the folder that contains the file(s) you wish to copy from the folder tree on the left margin. The folder will be highlighted blue, and its contents will appear in File Manager.
3. Check the box next to the desired file(s) in the folder contents list.
4. Select the destination folder by clicking the checkbox next to it in the folder tree.
5. Select **Copy Selected Files** from the **Action** dropdown.
6. Click **Submit**.



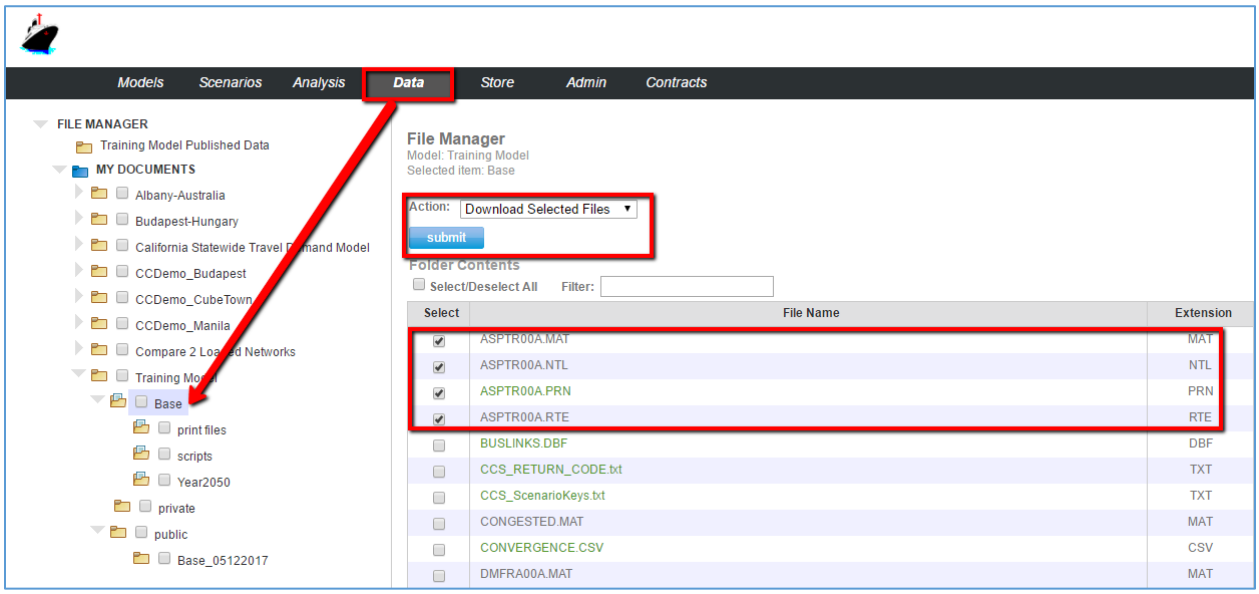
8.4 Download a File or Folder

1. Select the model you wish to work with under Models. Then, click **Data** on the top menu.
2. In the folder tree, browse to the desired folder. It will be highlighted blue.
3. If downloading file(s), select them from the folder contents list.
4. From the **Action** dropdown, choose **Download Selected Files** or **Download Selected Folder**.
5. Click **Submit**. You may be prompted to enable popups in your browser. The data will download as a Zip file in a popup window.



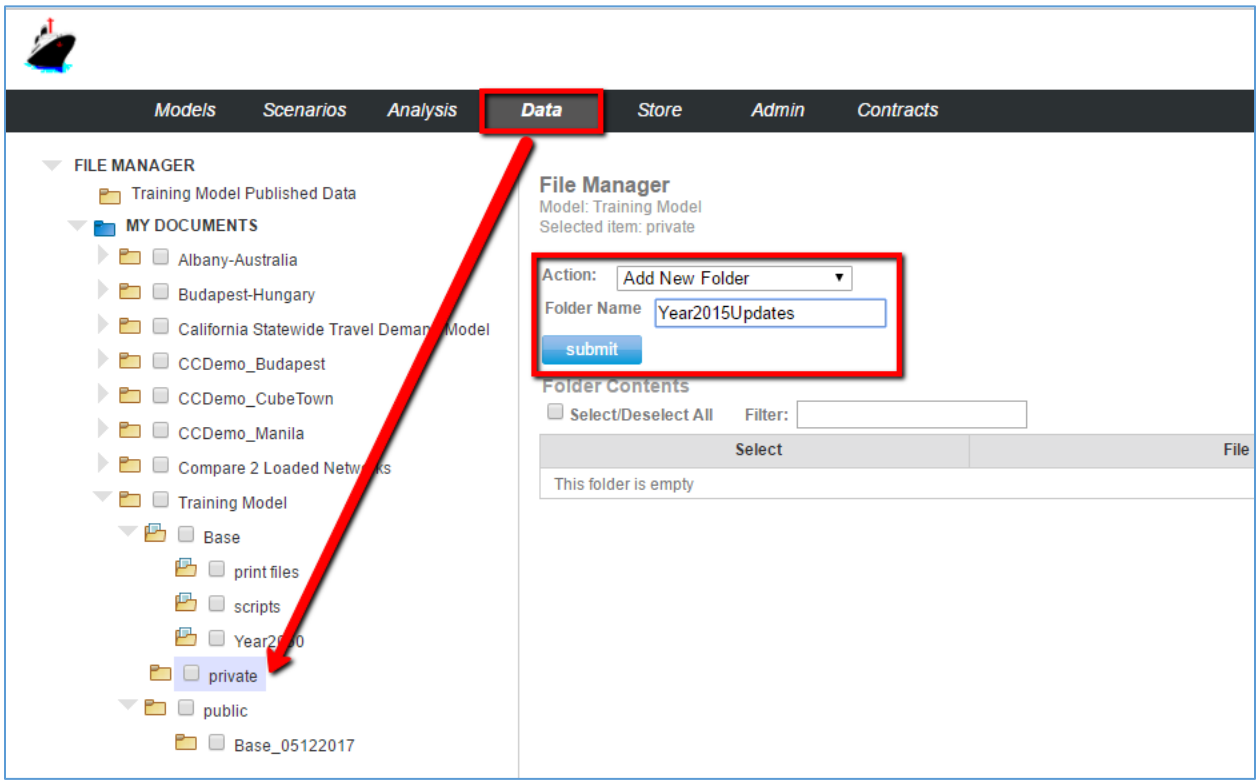
8.5 Delete a File or Folder

1. Select the model you wish to work with under Models. Then, click **Data** on the top menu.
2. In the folder tree, browse to the desired folder. It will be highlighted blue.
3. If deleting file(s), select them from the folder contents list.
4. From the **Action** dropdown, choose **Delete Selected Folder** or **Delete Selected Files**.
5. Click **Submit**.



8.6 Create a New Folder

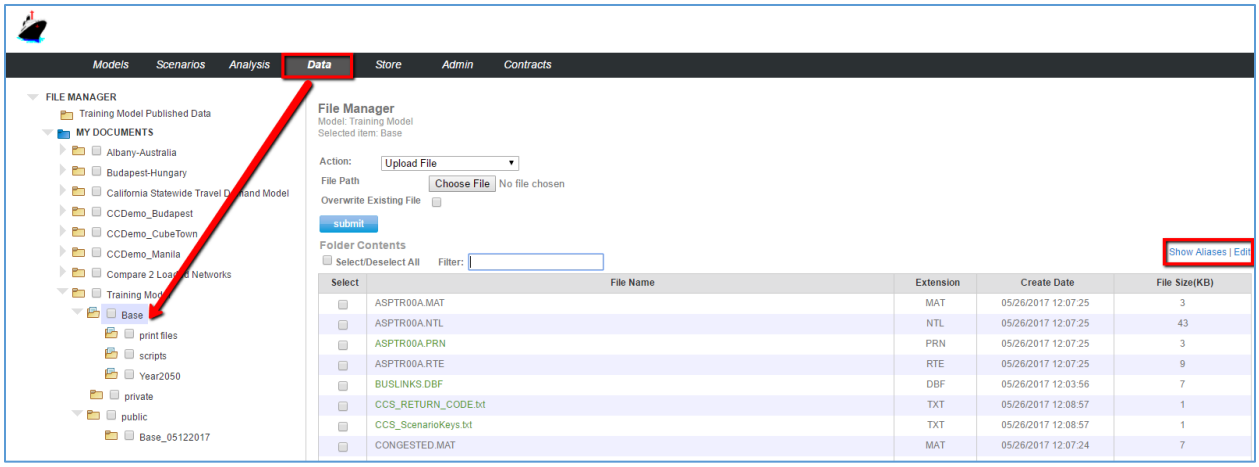
1. Select the model you wish to work with under Models. Then, click **Data** on the top menu.
2. In the folder tree, select the folder where you wish to create a subfolder. It will be highlighted blue.
3. From the **Action** dropdown, select **Add New Folder**.
4. Enter the name of the new folder.
5. Click **Submit**.



8.7 Working with Aliases

Aliases are convenient, shorthand names for existing files. To manage aliases, first select the model you wish to work with under **Models**. Then, click **Data** on the top menu.

- **Enable Aliases** — To toggle the display of Aliases you've defined for your files, simply click **Show Aliases** and **Hide Aliases**.
- **Edit Aliases** — to define file aliases for the model, click Edit.


Models
Scenarios
Analysis
Data
Store
Admin
Contracts
FILE MANAGER
Training Model Published Data
MY DOCUMENTS
Albany-Australia
Budapest-Hungary
CCDemo_Budapest
CCDemo_CubeTown
CCDemo_Manila
Base
print files
scripts
Year2050
private
public
Base_05122017
File Manager
Model: Training Model
Selected item: Base
Action:
Upload File
File Path
Choose File
No file chosen
Overwrite Existing File
submit
Folder Contents
Select/Deselect All
Filter:
Show Aliases | Edit
Select
File Name
Extension
Create Date
File Size(KB)
ASPTR00A.MAT
MAT
05/26/2017 12:07:25
3
ASPTR00A.NTL
NTL
05/26/2017 12:07:25
43
ASPTR00A.PRN
PRN
05/26/2017 12:07:25
3
ASPTR00A.RTE
RTE
05/26/2017 12:07:25
9
BUSLINKS.DBF
DBF
05/26/2017 12:03:56
7
CCS_RETURN_CODE.txt
TXT
05/26/2017 12:08:57
1
CCS_ScenarioKeys.txt
TXT
05/26/2017 12:08:57
1
CONGESTED.MAT
MAT
05/26/2017 12:07:24
7

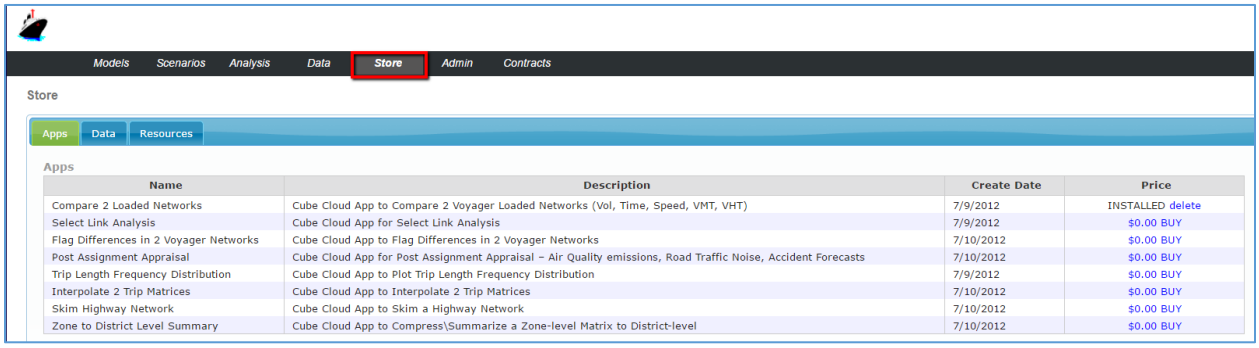
9 STORE

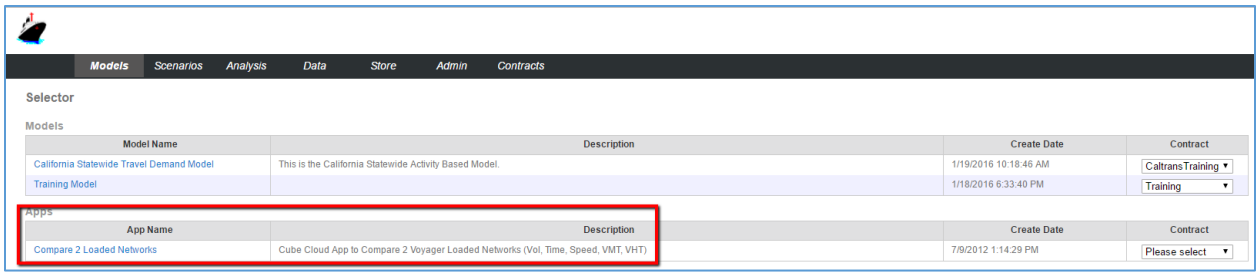
From Cube Cloud, you may browse the Store to obtain models, data and resources to incorporate into your own model. You may access the store at any time by clicking **Store** on the top menu. Topics in this chapter include:

- Apps
- Data
- Resources

9.1 Apps

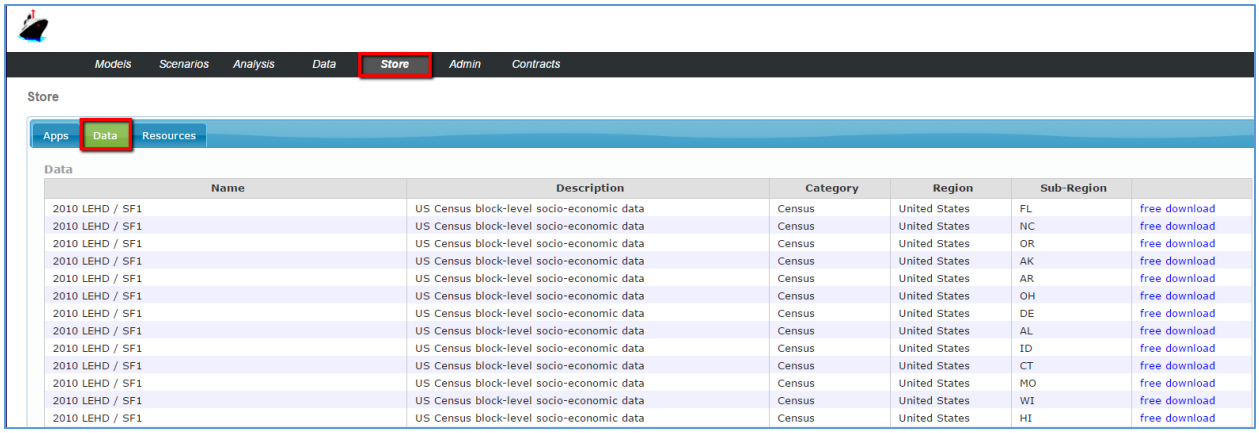
You may access the apps, or sample models, by clicking the **Apps** tab from within the **Store**. Apps include data and scenarios — plus charts and maps you may customize. Or, you can add your own charts and maps. You may view their Name, Description, Create Date and Price. If the App is already installed, you may elect to delete it. Any apps you buy and install will appear under your Models section.





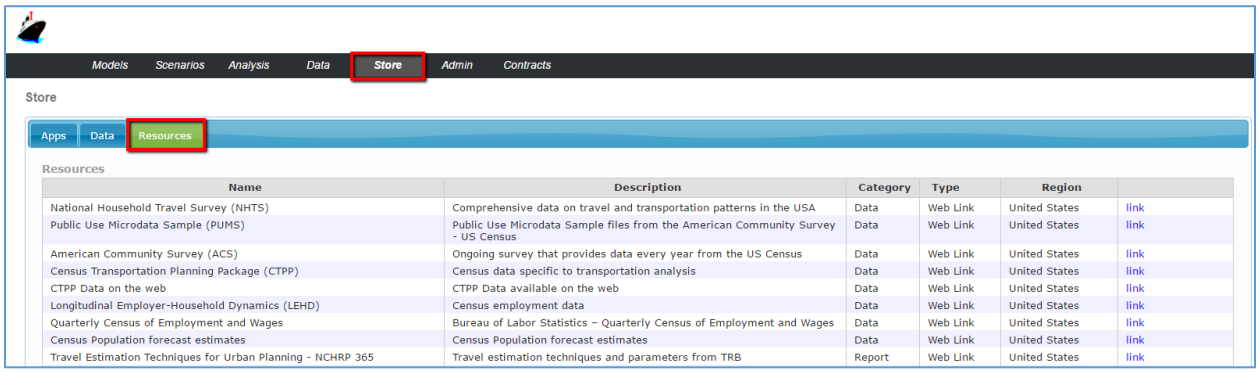
9.2 Data

You may access data sets from the store by clicking the **Data** tab from within the Store. There you will find a list of data sets. You may view their Name, Description, Create Date and Price.



9.3 Resources

The cloud Store includes freely-available datasets you may employ in your model. These include census data, survey information, and more, available for reference. To access these resources, click the **Resources** tab from within the store. From there, you may browse a table listing the Name of the resource, a short Description, the Category (e.g., data), the Type (for example, a web link) and finally the resource's applicable Region.



10 ADMINISTRATION

This chapter describes the powerful administrative tools included with Cube Cloud, which help you manage contracts, users and permissions. Topics include:

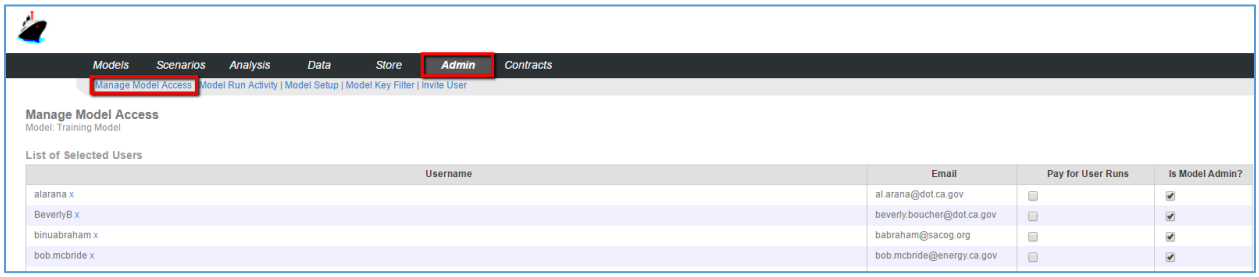
- Managing Model Access
- Viewing Run Activity
- Model Setup
- Inviting Model Users
- Contract Administration

10.1 Managing Model Access

Select the model you wish to work with under **Models**. Then, click **Admin** on the top menu, and finally, **Manage Model Access**. From this screen, you can manage the users who currently have access to the selected model.

- **Username** — a user who has access to the model. Administrators may click the X next to the User Name to remove that user's access to the model.
- **Email** — the user's email address
- **Pay for User Runs** — Provides the user with an option to deduct their hourly usage from this model's contract; unchecking this option has the user pay for runs using their own contract.
- **Is Model Admin** — Check to grant administrative access to a user. Administrators can manage model access, view run activity, manage the model setup and invite users.

Note: The Admin link is only available for models the user is an admin of.

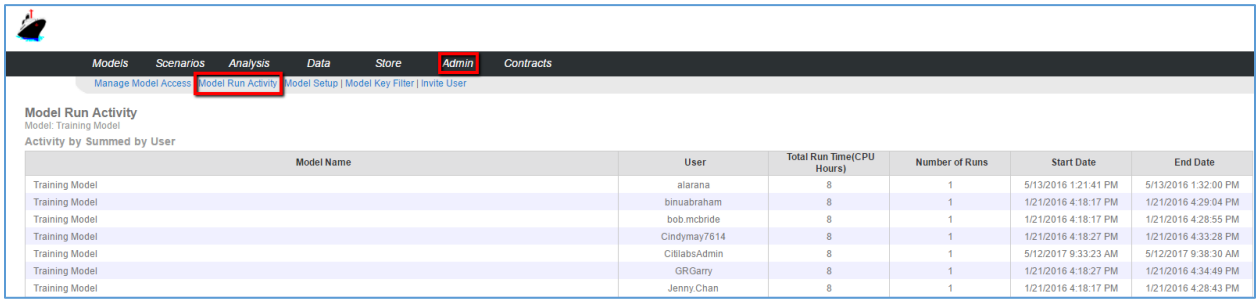


10.2 Viewing Run Activity

Select the model you wish to work with under Models. Then, click **Admin** on the top menu, and finally, **Model Run Activity**. From this screen, you can view the activity of all models you administer.

- **Activity Summed by User** — this table lists the model run statistics by each user for the current model:
  - CPU Hours — total contract hours used by each user for running this model
  - Number of Runs — total number of model runs by each user
  - Start Date — the date and time the first run began
  - End Date — the date and time the final run ended
- **All activity** — this table breaks down information for each individual run.

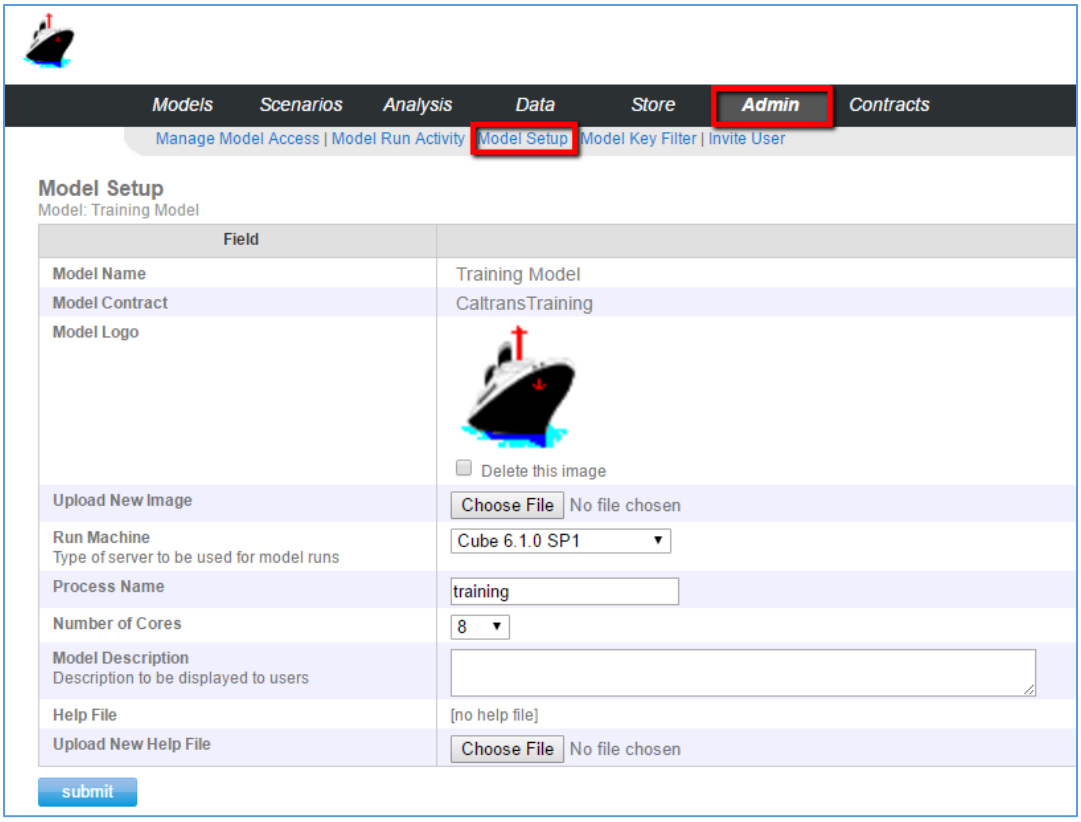
- Start Time — the date and time the run began
- End Time— the date and time the run ended
- User — the user of run
- Scenario — the scenario that was run
- Result — the result of the run. It may be Completed, or Cancelled by User.
- # CPUs — the number of cores used for the model runs
- Run Time — the actual model runtime in hours
- CPU Hours — the aggregate hours used for the run (equals #CPUs times Run Time).



10.3 Model Setup

Select the model you wish to work with under Models. Then, click **Admin** on the top menu, and finally, **Model Setup**. From this screen, you can view and configure basic details of the current model. Click **Submit** at the bottom to confirm these choices.

- **Model Name** — displays the name of the model
- **Model Contract** — contract associated with the model
- **Model Logo** — displays the current banner graphic for the model. Check Delete this image to remove the image after submitting the form.
- **Upload New Image** — click Choose File to browse your local system for a new banner graphic to represent the model.
- **Run Machine** — the version of Cube used to run the model.
- **Process Name** — the Cube Cluster Process ID that the model will use
- **Number of Cores** — the maximum number of cores used by model runs
- **Model Description** — enter a descriptive phrase for the model which will be displayed to users.

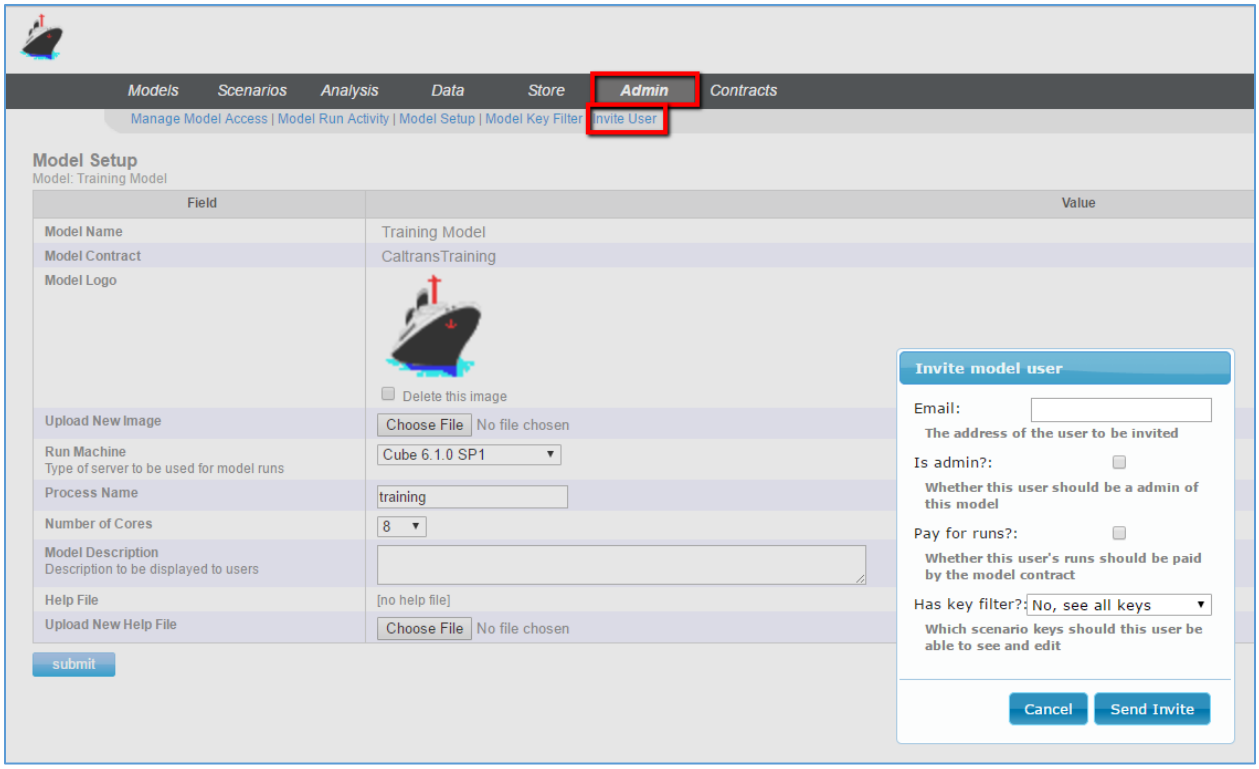


10.4 Inviting Model Users

Select the model you wish to work with under Models. Then, click **Admin** on the top menu, and finally, **Invite User**. Use this screen to invite new users for the current model. Click **Submit** at the bottom to confirm these choices.

- **Email Address** — the new user's email address
- **Is Admin?** — check or uncheck this option to control whether the user will have Administrative Access to the model.
- **Pay for Runs?** — check or uncheck this option to control whether the user pays for runs.

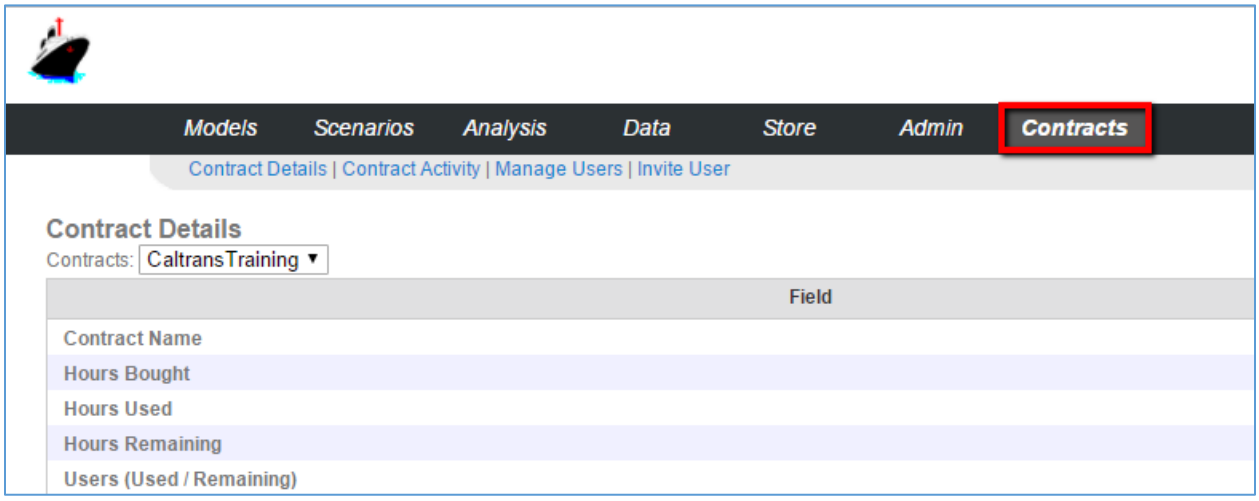
Once you have entered the data, you may confirm with **Send Invite**, or **Cancel**.



10.5 ContractAdministration

Administrative accounts can access these functions by selecting **Contracts** on the top right menu. From there, you may select:

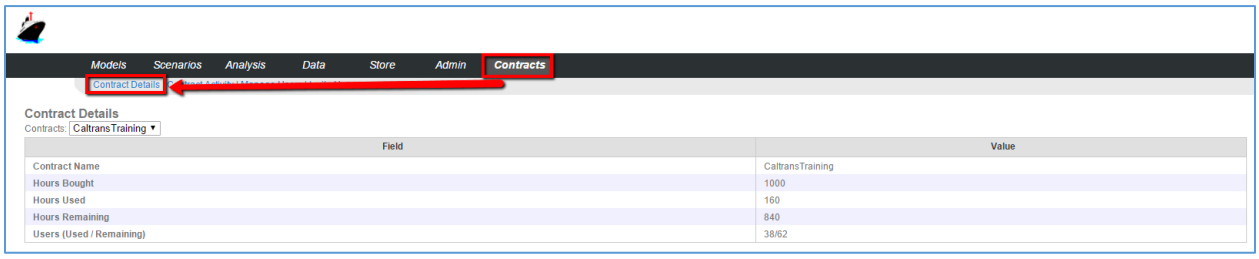
- Contract Details
- Contract Activity
- Manage Users
- Invite User



10.5.1 Contract Details

From this screen, you may view details about the contacts you administer.

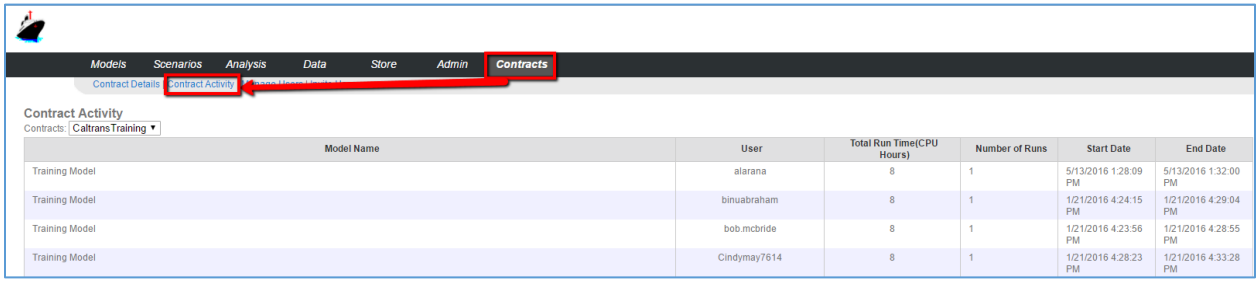
- **Contracts** — select the desired contract from this dropdown.
- **Hours Bought** — the number of hours purchased for this contract
- **Hours Used** — the number of hours used on this contract so far
- **Hours Remaining** — number of hours remaining on this contract.
- **Users** — number of users on the contract out of total allowed



10.5.2 Contract Activity

From this screen, you may view activity on the contacts you administer.

- **Contracts** — select the desired contract from this dropdown.
- **Model Name** — name of the model
- **User** — user name
- **Total Run Time** (CPU Hours) — the number of CPU hours used by the user for each model
- **Number of Runs** — the number of times the model has been run by the user
- **Start Date** — the date and time the first run began
- **End Date** — the date and time the final ended

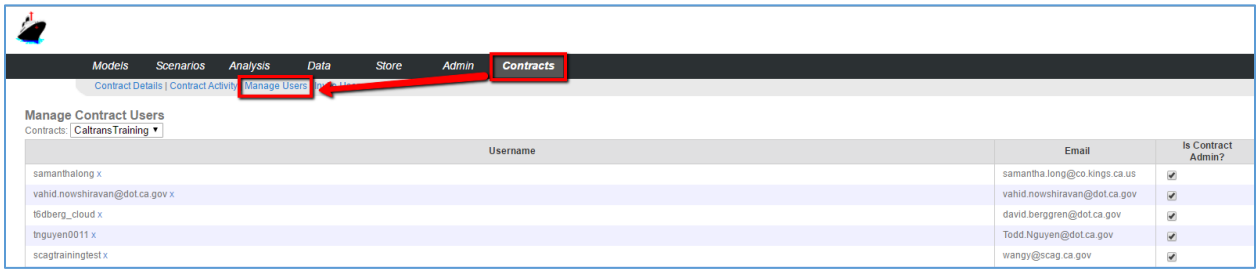


10.5.3 Manage Users

If you log in as a Contract Administrator, this screen will allow you to manage users who have access to the Contract.

- **Contracts** — select the desired contract from this dropdown.
- **Username** — the user name. To remove a user from the contract, click the X.
- **Email** — the user's email address

- **Is Contract Admin?** — check or uncheck this box to grant or revoke contract administrative privileges for the user.



10.5.4 Invite User

From this screen, you may add additional users to a contract.

- **Contract** — select the desired contract from this dropdown.
- **Email** — email address for the new user
- **Is Admin?** — check if you wish to grant administrative rights to the new user.