Steps to Setup and Run the Trip-Based Model (beginning with c23q4)

# What’s New

* Additional model run parameters are now included in Database\batch\_file.yaml.
* The setup incudes a full integration of multiple select link analysis procedures within the SOLA assignment and select line analysis following transit assignment.
* The batch file to submit the model includes a call to post\_macros\punchmovesdata.py.
* The [cmap\_trip-based\_model](https://github.com/CMAP-REPOS/cmap_trip-based_model) GitHub repo is now the source of the latest version of the model. Some files and folders are too large to include in the repo or vary by scenario. Use [copy\_scenario\_data.ps1](#copy_data) to complete the project directory or set up another scenario.

# Tips and Troubleshooting

* **Running this model setup for the first time on a server** – to avoid any issues with the new DISTR/M01 file procedures, manually install the R packages “sf”, “tidyverse” and “foreign” (and their dependencies) on the server. An easy way to do this is to open RStudio and use Tools > Install. If these packages have been installed, they do not need to be reinstalled.

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Reinstalling a package that has already been installed will not cause any issues.

* **Instructions on installing the new trip-based model on a server** – use [these instructions](Trip-Based%20Model%20Installation%20instructions.docx).
* **Using Emme for the first time on a specific server** – open Emme and accept the software user agreement.
* **Using Emme for the first time after a new version has been installed** – open Emme and accept the software user agreement.
* **The command prompt states that emme is not recognized** – Set the Windows environment variable using [these instructions](http://wiki.cmap.local/mediawiki/index.php/Fixing_Emme_path_in_Windows_environment_variables).
* **The destination-mode choice model does not run** – do **NOT** rebuild the conda environment. The c23q4 setup uses a different conda environment (CMAP-TRIP2) than prior versions because it contains changes to the model source code.
  + If you have never created a CMAP-TRIP2 environment, open an Anaconda prompt and submit these commands:
    - conda create --name CMAP-TRIP2 --clone CMAP-TRIP  ##*[since CMAP-TRIP works, start by making an exact copy of it]*
    - navigate to the drive where the model setup resides (E:, D: or F:)
    - cd {path}\cmap\_trip-based\_model    ##*[navigate to this folder in the model setup]*
    - conda activate CMAP-TRIP2
    - pip install -e src\Mode-Dest-TOD   ##*[Update source code in environment]*
    - pip install -e src\Mode-Dest-TOD\sharrow   ##*[Update source code in environment]*
    - conda deactivate  ##*(and close prompt)*
  + If you have created CMAP-TRIP2 already but the current model setup is not working:
    - Follow the steps above except for cloning CMAP-TRIP again.

# Conformity Quick Start Guide (assumes Anaconda, git, and all required R packages are installed on the server and the CMAP-TRIP environment has been created)

To run additional scenarios after setting up the first, copy the first scenario before submitting it and repeat the steps below starting from step 1b. Make sure Anaconda Prompt is working in ../cmap\_trip-based\_model/ before the command in 1b is used.

1. With Anaconda Prompt in the target directory on a modeling server local drive:

>git clone https://github.com/CMAP-REPOS/cmap\_trip-based\_model.git  
>cd cmap\_trip-based\_model  
>git checkout develop  
>conda activate CMAP-TRIP2  
>pip install -e src\Mode-Dest-TOD  
>pip install -e src\Mode-Dest-TOD\sharrow



>powershell -file copy\_scenario\_data.ps1 -recent\_conformity c22q4 -scenario 100

Copies emmebank, emmemat, and large input files and folders not included in the repo from M:\catslib\modelprod. Replaces files and folders that already exist in model run from which it is being called. The arguments 22q4 and 100 in the command above are just to show syntax, replace them with the values described here:

**-recent\_conformity**  
 Conformity code of source scenario (e.g., c22q4)  
 This should be the last completed conformity available in M:\catslib\modelprod

**-scenario**  
 Scenario code of source scenario (e.g., 100)  
 This should be the same scenario that is being set up

1. Update the project name in Emme > File > Project Settings and rename the .emp and .emp.prj files to match.
2. Update [Database\batch\_file.yaml](#batch_file)
3. Update growth rate in [prep\_macros\distribute.trucks](#trucks) and  
    [prep\_macros\distribute.poes](#poes)
4. Update file location in [prep\_macros\build\_tod\_transit](#build_transit) and  
    [prep\_macros\initialize.scenarios](#initialize)
5. Update [visitor\_trips\_growth\_factor](#visitor_growth) and [downtown surcharge\_rates](#tnc_surcharge) for TNC and TNC\_pooled in Database\cmap\_trip\_config.yaml
6. Make a copy of the previous Conformity scenario. Copy useful\_macros\input\_data.mac from the model run being set up to Database\ in the previous scenario copy. Run the macro in the previous scenario using Emme Prompt ~<input\_data.mac. Copy the resulting [preload congested travel time files](#preload) (those with preload or timau in the name) to Database\default\_base\_year in the scenario to be run.
7. Run [trip\_gen.bat](#trip_gen) module 3
8. Run run\_cleanup\_script.bat,  
    prep\_macros\build\_tod\_transit,  
    useful\_macros\delete.initial.batchin.scenarios, and  
    prep\_macros\initialize.scenarios to [update networks](#update_net)
9. Run [Submit\_Full\_Regional\_Model\_SOLA.bat](#submit_run) mode 2

# Setting up the scenario

Table 1 — ON TO 2050 Plan Update Scenarios

|  |  |  |
| --- | --- | --- |
| **Scenario number** | **Analysis year** |  |
| 100 | 2019 |  |
| 200 | 2025 |  |
| 300 | 2030 |  |
| 400 | 2035 |  |
| 500 | 2040 |  |
| 600 | 2045 | *Used for UrbanSim but not Conformity analyses* |
| 700 | 2050 |  |

Start by updating necessary values in **batch\_file.yaml.**

Parameters:

* **Scenario**: three-digit scenario number (see Table 1 above for correct value)
* Work from home module information for the trip generation model:
  + **Validationfiles**: N to not produce the validation files (standard option), Y to produce the validation files
  + **Usualwfhpct**: enter the percentage of workers who usually work from home (see [Table 2](#Table2) below for correct value)
  + **Tc14pct**: enter the percentage of workers who work from home 1-4 days per week (see [Table 2](#Table2) below for correct value)
* Select link analysis information:
  + **selectLinkFile**: enter the name(s) of the file(s) storing the links to be used for the select link analysis (note: file(s) **must** reside in the Database\Select\_Link\ folder). If no select link analysis will be performed, enter None (or None,None,None,None,None) for this parameter.
  + Up to five select link files may be listed: they must be comma-separated with no spaces in the names. “None” can be interspersed among the file names.
  + If you use the RSP flag, please format the name of the select link file like this: rsp##\_links.txt
  + The select link file must be formatted for Emme to read the links, like this:

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Beginning a line with “~#” or “~/” indicates to Emme it is a comment line, and it will be ignored. This is optional but is useful to identify a specific project. Links should be identified in the format l=<*inode*>,<*jnode*>

* Transit assignment information:
  + **runTransitAsmt**: flag to run transit assignment after traffic assignment is complete (default is False).
  + **transit\_file\_path**: enter the path to the transit network transaction files enclosed in “”. The path should stop at the directory above transit\ (ex: “M:\catslib\c23q2”). Spaces in the path name are OK; do not include a slash at the end. This is only used if a separate transit assignment is run so it could be left blank when submitting a full model run. *This cannot be left blank if* ***runTransitAsmt*** *is True.*
  + **transitSelectFile**: enter the name of a file storing the transit lines to be used in a select line analysis (note: this file **must** reside in the Database\Select\_Line\ folder). If no select link analysis will be performed, enter None for this parameter. If the select line analysis is for an RSP, format the name of the select line file like this: rsp##\_lines.txt
* Utility files flag:
  + **util\_files**: In addition to writing trip parquet files to the cache folder, the destination choice-mode choice model also writes trip utility files to the folder (requiring about 4.5 GB of additional storage space). This flag identifies whether to keep (True) or delete (False) these files. The default value for this parameter is False.
* UrbanSim zonal travel time file:
  + **UrbanSim\_file**: As one of the final steps in a model run, a file of congested zone-zone travel times by auto and transit may be generated for input into UrbanSim. This flag identifies whether the file is created (True) or not (False). The default value for this parameter is False. *Following a completed model run, this file may be created at any time by running tg\scripts\urbansim\_skims.py*.
* RSP flag:
  + **RSP:** a flag for whether selected RSP performance metrics will be created for the model run (mostly select link results). *When this flag is True only the first select link file listed will be processed, regardless of the number entered.*
* ***Processing rules***
  + ***If Rsp is True and runTransitAsmt is True, no select link analysis will be performed even if it is requested in batch\_file.yaml.***
  + ***If Rsp is True and multiple select link files are identified in batch\_file.yaml, a select link analysis will only be conducted for the first file listed.***

# Setting up and running the Trip Generation model

## Input files and settings

* 1. **UrbanSim files (..\Database\tg\UrbanSim\_inputs)**(These are not included in the repo. They may be copied from the previous Conformity scenario unless they have been updated more recently.)

All appropriate UrbanSim files for the scenario must be stored in the folder (no other files should be present). The set of files should have the same scenario year and UrbanSim run number. File labels may differ from those shown below but each of the seven files must be present and contain one of the key words in the file name:

* buildings – the seven-county building file (used for heavy commercial vehicle trip allocation)
* hhtm, xhhtm – household files for the seven-county area and the external modeling area
* persons, xpersons – person files for the seven-county area and the external modeling area
* subzonetm, xsubzonetm – subzone files for the seven-county area and the external modeling area

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* 1. **Heavy commercial vehicle allocation files (..\Database\data)**(These are included in the repo. They are the same for all scenarios.)

These files are required to develop the heavy commercial vehicle trip allocation weights.

* hcv\_building\_naics\_corresp.csv – correspondence between building type and NAICS industry.
* hcv\_intermodal.csv – estimate of 2018 truck trips for intermodal facilities in the region, which would not be reflected by relying on truck trips by building type from UrbanSim.
* hcv\_sqft\_per\_job.csv – average square feet per job (by building type) used to inform UrbanSim.
* hcv\_tg\_rates.txt – heavy truck trip generation rates (per 1,000 SQFT of space by building type) from NCHRP 298, which uses Quick Response Freight Manual rates.
  1. **UrbanSim data processing scripts (..\Database\tg\scripts)**(The socec input files ATTR\_IN.TXT, HH\_IN.TXT, GQ\_IN.TXT, and POPSYN\_HH.CSV in ..\Database\tg\fortran\ are not included in the repo. The files may be copied from the previous Conformity scenario unless they have been updated more recently.)

Two scripts are required to process the UrbanSim files into data usable by the trip generation model:

* urbansim\_hcv\_allocation.py – creates the heavy truck trip allocations weights, written to ..Database\data\mo20.txt.
* urbansim\_update\_tg\_input\_files.py – creates ATTR\_IN.TXT, HH\_IN.TXT and POPSYN\_HH.CSV from the trip generation model. It also creates files of synthetic households and persons for the work from home allocation model.
  1. **Airport and school files (..\Database\tg\fortran)**(These are not included in the repo. They may be copied from the previous Conformity scenario unless they have been updated more recently.)

Ensure scenario-appropriate versions of these files are in place:

* Airport\_sz.csv – identifies airport subzones (future scenarios include the South Suburban Airport).
* School\_in.csv – lists subzone level school enrollment (high school and college combined).
  1. **Work from home allocation model**(..\Database\tg\fortran\wfhmodule\indusmix.csv is not included in the repo. The file may be copied from the previous Conformity scenario unless it has been updated more recently.)

This model identifies specific synthetic households that include at least one worker who works from home on the simulated day. The work from home allocation model is controlled by two rates: the overall share of workers who usually work from home (*usualwfhpct*) and the overall share of workers who work remotely 1-4 days per week (*tc14pct*). These rates must be set in **batch\_file.yaml** before submitting the trip generation model. The *usualwfhpct* and *tc14pct* values vary by scenario.

Table 2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **2019** | **2025** | **2030** | **2035** | **2040** | **2045** | **2050** |
| usualwfhpct | 0.0510\* | 0.0869 | 0.0875 | 0.0880 | 0.0884 | 0.0884 | 0.0882 |
| tc14pct | 0.1031 | 0.1257 | 0.1263 | 0.1270 | 0.1273 | 0.1272 | 0.1269 |

\* Uses ACS rate rather than My Daily Travel.

The appropriate industry mix file (*indusmix.csv*) for the scenario must be copied into the wfhmodule folder. This file lists the *usualwfhpct* and *tc14pct* values for each industry.

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* 1. **Growth rates**

The growth factors in the following scripts must reflect simple 1% growth per year from a 2000 base year. So the growth factor for a 2035 scenario is 1.35.

* prep\_macros\distribute.trucks– ~r104 variable must be updated.
* prep\_macros\distribute.poes– ~r5 variable must be updated.

## Submitting trip generation

There are three modules that can be selected to execute; running module 3 is recommended as it will execute all tasks.

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Processing the UrbanSim files looks like this:

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Work from home module processing looks like this:

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# Setting up the full model

## Updating scenario networks

* 1. Submit run\_cleanup\_script.bat (which calls useful\_macros\cleanup\_for\_rerun.py): Deletes extraneous scenarios, matrices, and report files.
  2. Submit prep\_macros\build\_tod\_transit <3-digit scenario>: Creates the transit network from the batchin files.
     1. ~t2 variable must be changed to the location of the files.
     2. Calls *prep\_macros\build\_transit\_error\_check.bat* to verify successful batchin file import.
  3. Submit useful\_macros\delete.initial.batchin.scenarios <3-digit scenario>: Removes any remaining highway network scenarios, leaving only transit.
  4. Submit prep\_macros\initialize.scenarios <3-digit scenario>: Builds time-of-day highway networks.
     1. ~t2 variable must be changed to the location of the batchin files.
     2. Calls *prep\_macros\call\Ftime.Capacity* to calculate link capacity.
     3. Calls *prep\_macros\call\Arterial.Delay* to calculate intersection delay.

## Input files and settings

* + **Visitor trip growth rate**

The new model includes a base year visitor demand table developed using location-based services data. The following factors should be used the increase his demand in future year scenarios.

|  |  |
| --- | --- |
| Scenario Year | Visitor trip growth factor |
| 2019 | 1.00 |
| 2025 | 1.05 |
| 2030 | 1.18 |
| 2035 | 1.34 |
| 2040 | 1.51 |
| 2045 | 1.70 |
| 2050 | 1.92 |

This value is updated in ..Database\cmap\_trip\_config.yaml.



* + **TNC Surcharge**

The file ..Database\cmap\_trip\_config.yaml includes the pricing structure for TNC trips (both regular and pooled service). The City of Chicago implemented a downtown surcharge in 2020 that should be reflected in all scenarios after 2019. This surcharge should be 175 ($1.75 in cents) and is applied to both single rider and pooled service, so values on lines 124 and 165 must be updated.

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* + **Pre-load congested travel times**(These are not included in the repo. They must be created and copied from the previous Conformity scenario unless there is another completed scenario that is a closer match.)

A set of files used to pre-load congested travel times is stored in Database\default\_base\_year. By providing reasonable congested conditions for global iteration 0 of the model, it allows us to run fewer global iterations and provides for greater stability between model iterations. These files must be loaded or updated when a new model scenario is created. Congested files for a 2050 RSP scenario can come from the 2050 scenario of the most recent Conformity runs.

Copy *useful\_macros\input\_data.mac* from the new model setup into the source Emmebank and run the macro. The output files can then be copied into the new model run.

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# Submitting the full model

Submit\_Full\_Regional\_Model\_SOLA.bat offers two options on running the destination choice-mode choice model.

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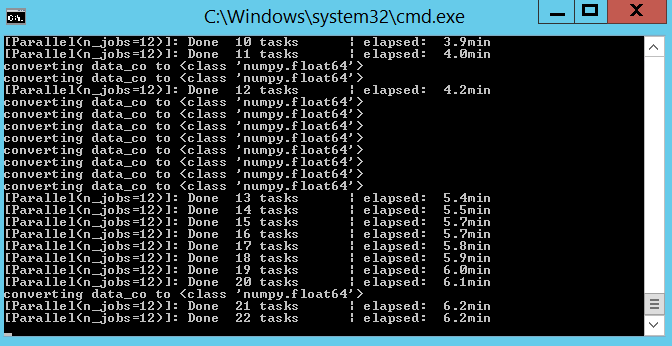
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Option 1 is recommended to submit a single model run and have it finish as quickly as possible. It will take advantage of the processors available on the servers and will use most of the server’s RAM.

Option 2 is recommended for submitting two model runs simultaneously. Do **NOT** submit more than two runs at a time.

Model run steps summary:

1. Verifies select link files identified in batch\_file.yaml exist.
   * Calls macros\verify\_select\_link.py to confirm files(s) exist. Also updates emmebank dimensions for extra attributes and full matrices, if needed.
2. Submits the procedures to update the DISTR and M01 files.
   * DISTR files contain zonal transit approach distribution parameters, which are used by the destination-mode choice model. The M01 file contains zonal transit availability information and zonal median household income used by the destination-mode choice model. Updating these files ensures they reflect any changes in transit service or changes in the socioeconomic files.
   * Callsprep\_macros\distr\_m01\_data.py to punch transit network attributes and store files in prep\_macros\temp\.
   * Calls prep\_macros\create\_distr\_m01\_files.R to perform the spatial analysis and create the final files.
   * All temporary files used for the analysis are written to prep\_macros\temp\, which is deleted are the end of the processing.
   * Two shapefiles and a .dbf file must be present in Database\data\distr\:
     1. A shapefile of the current zone system (including a SQMI field).
     2. A shapefile of the current subzone system centroids (including a ZONE field).
     3. DBF file of zone centroid coordinates (zncntrd.dbf)
3. Submits useful\_macros\cleanup\_for\_rerun.py and prep\_macros\free.skim.mac.
4. Checks for a set of files stored in ..\defaults\_base\_year\ to pre-load congested travel times and distances into Emme.
   * If all of the files are present, prep\_macros\preload\_congested\_times.mac is submitted to replace the free skim macros with congested times and distances (this is the preferred option).
5. Submits macros\skim.transit.all to do the transit skimming.
   * Calls macros\transit\_skim\_final\_matrices1.py – performs the matrix convolution portion of the transit skimming procedures for the AM peak period.
   * Calls macros\transit\_skim\_final\_matrices2.py – performs the matrix convolution portion of the transit skimming procedures for the midday period.
   * Calls macros\finish.transit.skims – moves transit skim matrices into final locations.
6. Runs macros\init\_HOVsim\_databk.mac to initialize the matrices in the emmebank.
7. Activates the CMAP-TRIP2 environment and runs the destination choice-mode choice-time of day choice model.
   * Calls cmap\_modedest with arguments:
     1. --njobs: Number of jobs to process in parallel.
     2. --max\_zone\_chunk: Maximum number of zones to process in one chunk.



1. Runs the time-of-day procedures.
   * Calls macros\ttables.mac – creates time-of-day user class demand matrices (trucks and external trips).
   * Calls macros\net5I\_7c.mac – prepares time-of-day highway networks.
   * Calls macros\SOLA\_assignment.py – performs the time-of-day SOLA traffic assignments. Conditional logic:
     1. If time period is 3 (AM peak) or 5 (midday) in any Global Iteration – tolled path information is saved for use in the destination choice-mode choice utility calculations.
     2. During the final Global Iteration:
        1. The time-of-day assignments capture the link volumes for medium and heavy truck trips of 200+ miles, used as an input to MOVES 2.
        2. If select link analyses are indicated in batch\_file.yaml, the appropriate matrices and link attributes are created, and the vehicle class select link analyses are included in the SOLA specification.
   * Calls macros\balance5I\_7c.mac – balances user class link volumes (with the assignment from the prior Global Iteration) using the Method of Successive Averages.
   * Calls macros\tod\_skim\_setup.mac – sums class average volumes into extra attribute @avtot.
   * Calls macros\tod\_skim.py – creates travel time skims for each time-of-day period, which are used in the utility calculations in the time-of-day model.
   * After the last time period is assigned:
     1. Calls macros\ MSA\_iteration\_skims.py – creates time and distance skims for the AM peak and midday periods, used to inform the Destination Choice-Mode Choice model.
2. After the final global iteration, runs macros\Daily.Total.Asmt5I\_7c.mac, which tabulates time-of-day link volumes from the final Global Iteration runs into daily link volumes (stored in scenario x0029).
   * Calls macros\call\vht.summary\_v3\_7c.mac – calculates vehicle hours of travel for each time-of-day period in the final Global Iteration and stores the accumulated values in scenario xxxx9.
3. If a select link analysis was run: calls macros\complete\_select\_link.py – accumulates the time-of-day vehicle class select link values (VEQs) into daily totals in vehicles.
4. Calls post\_macros\punchmovesdata.py – writes link-level data for MOVES emissions analysis.
5. Calls post\_macros\final\_run\_statistics.py – writes model run summary results.

# Select Link Analysis results

Select link trip demand is stored in the following matrices:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Proj1** | **Proj2** | **Proj3** | **Proj4** | **Proj5** | **Temp1** | **Temp2** | **Temp3** | **Temp4** | **Temp5** |
| Class 1 | 61 | 601 | 611 | 621 | 631 | 640 | 647 | 654 | 661 | 668 |
| Class 2 | 62 | 602 | 612 | 622 | 632 | 641 | 648 | 655 | 662 | 669 |
| Class 3 | 63 | 603 | 613 | 623 | 633 | 642 | 649 | 656 | 663 | 670 |
| Class 4 | 64 | 604 | 614 | 624 | 634 | 643 | 650 | 657 | 664 | 671 |
| Class 5 | 65 | 605 | 615 | 625 | 635 | 644 | 651 | 658 | 665 | 672 |
| Class 6 | 66 | 606 | 616 | 626 | 636 | 645 | 652 | 659 | 666 | 673 |
| Class 7 | 67 | 607 | 617 | 627 | 637 | 646 | 653 | 660 | 667 | 674 |
| Total | 60 | 600 | 610 | 620 | 630 |  |  |  |  |  |
| Cl1-4p3 | 68 | 608 | 618 | 628 | 638 |  |  |  |  |  |
| Cl5-7p3 | 69 | 609 | 619 | 629 | 639 |  |  |  |  |  |

* mf60: select link daily total vehicle demand
* mf68: select link period 3 auto vehicle demand (user classes 1-4)
* mf69: select link period 3 truck vehicle demand (user classes 5-7)

Select link volumes are stored in the following attributes in scenario x0029:

* @slvol – select link daily total volumes (VEH)

*Select link vehicle class VEQs are available in scenarios x0021-x0028 but represent time-of-day volumes.*

# Matrix documentation

See [here](https://cmapil.sharepoint.com/:x:/r/sites/TransportationModelingResources/_layouts/15/Doc.aspx?sourcedoc=%7BC3CEB41D-7A42-4C1B-9AFC-DB33E2267009%7D&file=matrix%20documentation.xlsx&action=default&mobileredirect=true) for a list of matrices used by the model.

# Post model run procedures

## Process MOVES Model Input Data

* + Run ***post\_macros\createMOVESinputfile.ipynb*** (in Visual Studio Code, for example) to create final MOVES data file.
    - Select the CMAP-TRIP2 environment.

## Run a Transit Assignment following the full TOD Model Run

A transit assignment can be run automatically following a full model run by setting the parameters in batch\_file.yaml. However, a transit assignment can be run anytime following the completion of a full model run using these steps:

* In **batch\_file.yaml**:
  + Set runTransitAsmt to True
  + Set transit\_file\_path to the location of the transit network transaction files
  + If appropriate, provide the name of the transit select line file in transitSelectFile
  + if appropriate, set RSP to True
* Submit transit\_asmt\_macros\**create\_transit\_demand.bat** to prepare the transit networks and demand.
  + 1. Calls **setup\_transit\_asmt\_1\_build\_transit\_asmt\_networks.mac** to create the transit networks. For scenario 100, the transit assignment scenarios are 121 (6pm-6am), 123 (6am-9am), 125 (9am-4pm) and 127 (4pm-6pm).
    2. Calls **setup\_transit\_asmt\_2\_initialize\_matrices.py** to initialize matrices to hold time-of-day transit demand:
       1. MF501: Period NT transit demand (O-D format) - VOT 1
       2. MF502: Period NT transit demand (O-D format) - VOT 2
       3. MF503: Period NT transit demand (O-D format) - VOT 3
       4. MF504: Period AM transit demand (O-D format) - VOT 1
       5. MF505: Period AM transit demand (O-D format) - VOT 2
       6. MF506: Period AM transit demand (O-D format) - VOT 3
       7. MF507: Period MD transit demand (O-D format) - VOT 1
       8. MF508: Period MD transit demand (O-D format) - VOT 2
       9. MF509: Period MD transit demand (O-D format) - VOT 3
       10. MF510: Period PM transit demand (O-D format) - VOT 1
       11. MF511: Period PM transit demand (O-D format) - VOT 2
       12. MF512: Period PM transit demand (O-D format) - VOT 3
       13. If the RSP flag is True, an additional set of matrices (mf513-524) will be created to store HBW trip demand.
    3. Calls **setup\_transit\_asmt\_3\_TOD\_transit\_demand.py** to develop time-of-day transit demand and populate the matrices. Transit trips are enumerated and are assigned to time-of-day periods and value of time categories. Where necessary trips are moved from Origin zone to Boarding zone and final values are written to the matrices.
    4. Calls **verify\_select\_link.py** to update emmebank dimensions for extra attributes and full matrices, if needed.
  + Submit **run\_transit\_assignment.bat** to perform the assignment.
    1. Calls **cmap\_transit\_assignment\_runner.py** which identifies the scenarios to be assigned.
    2. Calls **cmap\_transit\_assignment.py** to conduct the capacitated transit assignment using journey levels.
    3. Calls **summarize\_transit\_boardings.mac** to write a summary file (transit\_asmt\_macros\report\Boarding\_summary.csv) of transit boardings by service and time-of-day.
    4. Calls **delete\_transit\_skims.py,** which removes the following matrices:
       1. mf1100-1154
       2. mf1300-1354
       3. mf1500-1554
       4. mf1700-1754