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List of abbreviations

The following table shows the abbreviations used throughout the deliverable with the meaning of the abbreviation.

Abbreviation	Explanation
csv	Comma Separated Values, text file format.
DTU	Technical University of Denmark
GB	Gigabyte
GP	Geoprocessing, name of the system for building the calculation models.
GPlog	Log of model runs using Geoprocessing
LoS	Level-of-Service
LTM	National Danish transport model (in Danish: "Landstrafikmodellen")
MSA	Method of Successive Averages
RC	Route Choice
SCN	Scenario, used as prefix in table names.
ToD	Time of Day, used in LTM.
TT	Transtools
TT1	Transtools version 1
TT2	Transtools version 2
TT2.5	Transtools version 2.5
TT3	Transtools version 3
WD	Whole Day, used in LTM
WP	Work package

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Summary

Scope

The scope of this deliverable is to document the design of the user interface for configurations in TT3. The objective is not to document specific configurations or parameters that are dependent on other work packages.

Methodology

The Methodology followed in preparation of this deliverable has been to combine the need for easy configurations in Transtools 1 and Transtools 2 with the well-functioning configuration user interface in the National Danish Transport Model.

Results

The result of this deliverable is a robust system of parameters and configurations that ensures that users always have to choose a configuration when running the model. All model runs are logged in the scenario database, including the configurations used for the model run.

It is also a flexible system allowing users to create new configurations when needed. The flexibility also arises from the extensive set of parameters that can be controlled by the users.

Next Step

The implementation will take part in Work Package 4. During the implementation phase and calibration of the model, some of the parameters and configurations might be changed to adapt to the new conditions, if necessary.

1. Introduction

This deliverable is produced under WP3: Architecture and configuration. The note describes the configurations in Transtools 3 (TT3).

This note builds on the previous work (Brun & Nielsen, Transtools 3 Deliverable 3.1 Guidelines for model configurations, 2012) and (Brun, Transtools 3 Deliverable 3.2 User Interface Design, 2012)-

Already at the stage of application for the TT3 project it was realised that some changes to the overall structure of the Transtools modelling system were needed in order to ensure a modular and flexible model implementation. Improvements were foreseen within four areas:

- Model configuration
- User interface design
- Software architecture and data structure, and
- Documentation of process and results

How to improve the basis for model configuration under the TT3 project was described in deliverable D3.1 (submitted to and approved by the EU Commission). In the present note, the user interface part of the configurations is described.

The overall model logic in previous Transtools versions TT1 and TT2 was implemented in the ArcGIS Geoprocessing framework. Consequently, the user interface for TT1 and TT2 has simply been ArcGIS (mainly the ArcCatalog application). This has given all users flexibility to manipulate the model structure and its detailed composition as well as the precise sequencing of all of its individual steps. Some users have, however, had objections to this singular strategy: ArcGIS can be somewhat complex to get started with and there is a cost of roughly EUR 2,000 to acquire a new license to ArcGIS.

To alleviate these objections, TT3 will include a new interface for executing TT model runs, which is much easier to operate than the one available in previous Transtools versions; also for model users who are not experienced ArcGIS users – this is the standard user interface that users will see in normal operations.

Since the model is open, any user can use the original method to configure new model flows, should they decide to do so. However, with the introduction of configurations, the standard user interface will include possibilities for choosing configurations and create new ones. These configurations will be able to control large parts of the model flow.

1.1 Objective of the deliverable

The objective of this deliverable is to document the design of the user interface for configurations in TT3. The objective is not to document specific configurations or parameters that are dependent on other work packages.

1.2 Methodology and results

The process followed in preparation of this deliverable has been to combine the need for easy configurations in Transtools 1 and Transtools 2 with the well-functioning configuration user interface in the National Danish Transport Model.

The need for configurations in Transtools is drawing upon lessons from TT1, TT2 and TT2.5, as well as listening to all of the different groups of users and stakeholders in many projects, conducting training classes, and answering hundreds of user questions in the TT web based discussion forums.

Transtools 3 will reap the benefits of the work put into the National Danish Transport Model. This will enable users of the user interface to have the flexibility needed for performing most tasks. If further possibilities for altering the model are required, the users can take advantage of the advanced user interface.

Challenges in preparation of this deliverable have included assessing the need for specific configurations.

Rapidis is main responsible for developing and implementing the user interface for configurations. DTU is responsible for defining the final sets of configurations.

1.3 Perspective of the deliverable

The implementation of the user interface for configurations described in this document is conducted in work package 4.

All details are subject to change during the implementation process or during model testing. The parameters and configurations described here are the current configurations at the time of writing.

1.4 Reading guidance

Chapter 2 describes the TT3 user interface for configurations

Chapter 3 describes the configurable parameters

Chapter 4 describes the initial set of configurations

Chapter 5 describes the technical implementation of configurations in the model flow and the user interface

Chapter 6 concludes the deliverable and outlines the state of play and next steps.

2. User interface for configurations

The architecture for Transtools 3 (Rapidis, 2013) allows Transtools to reuse a very well-functioning structure for configurations that can control the model flow.

The user interface was discussed in Deliverable 3.2. (Brun, Transtools 3 Deliverable 3.2 User Interface Design, 2012) This deliverable will elaborate only the part of user interface relevant for configurations. Much of this is based on experience from the National Danish Transport Model, which uses a very similar architecture and user interface for configurations. The users of the National Danish Transport Model have received the configurations very well and have also created their own configurations.

At the time of preparing this deliverable only “behind-the-scenes” parts of the TT3 user interface are operational, so the illustrations of the user interface in this chapter are from the National Danish Transport Model. The final look and feel of the user interface will probably not change much from the illustrations, but the texts and options will be different.

Users of TT3 will not see ArcGIS model builder in the new User Interface.

Users will be able to inspect and choose configurations for model runs in the user interface, see Figure 1.

Yellow dots ■ mark configurations. When clicking on the little triangle next to “Configuration” all current configurations are shown. When selecting a specific configuration, the details for that configuration are displayed on the right side. See Figure 1 below from LTM (The National Danish Transport Model). On the left, items in the model are shown in a tree. The branch for Configurations is expanded and one of the predefined configurations is selected. The right side displays the selected configuration in detail.

A configuration always has an ID automatically assigned. Name and Description are provided by the user when creating a configuration.

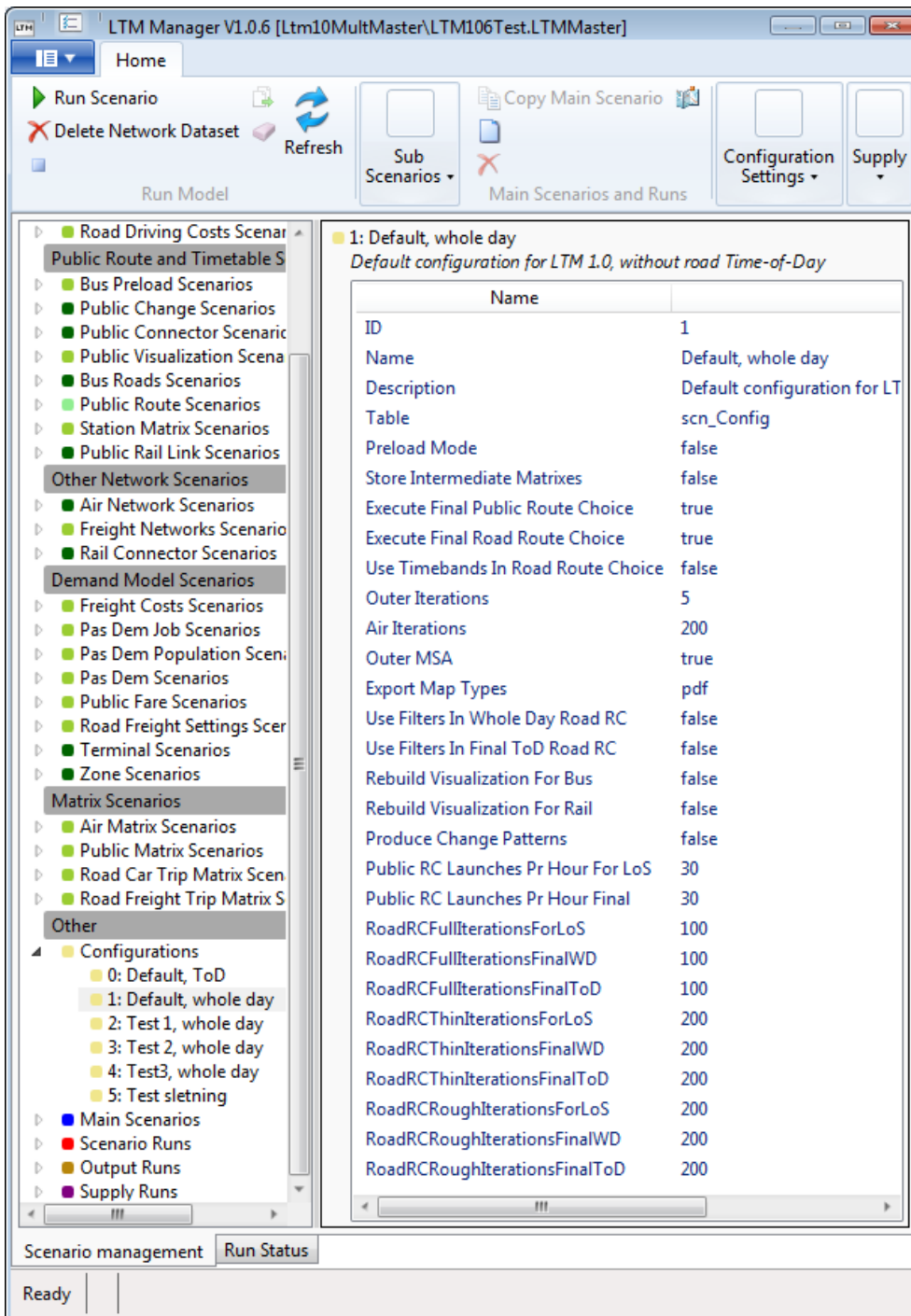


Figure 1 The standard user interface displaying configurations in LTM.

2.1 Selecting configuration for run

In the user interface, users can choose between predefined configurations before starting a run. Choosing a configuration will be as easy as selecting the configuration name on a list.

The user creates a Main Scenario consisting of a configuration and the data scenarios. Deliverable 3.2 explained data scenarios. Deliverable 4.1 will explain how to create and edit data scenarios, as well as create main scenarios.

Figure 2 below shows the dialog for Creating a Main Scenario. This shows how predefined configurations are selected in the National Danish Transport Model. Transtools 3 will reuse the technology to do so. The configurations in themselves will of course be adapted to fit the Transtools 3 model. The dialog has a drop down for selecting a configuration. In the image, configuration 0, with the name “Default, ToD” is selected. One configuration must always be selected when creating a Main Scenario.

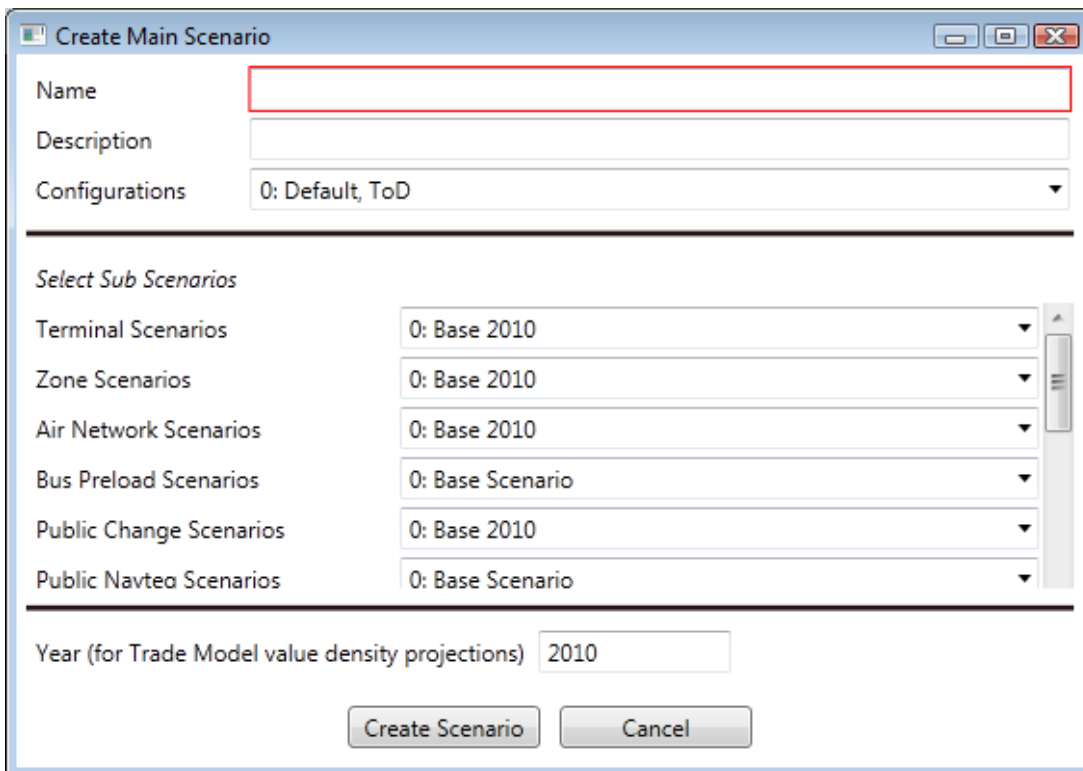


Figure 2 Dialog for creating a Main Scenario in LTM

When users perform a model run, it is done on a Main Scenario. A Main Scenario can be run several times. Each time a Main Scenario is run, a Scenario Run is created. The Main Scenario has a configuration that is decided when the Main Scenario is created, so all Scenario Runs on the Main Scenario use the same configuration.

2.2 Documentation of previous model runs

The user interface is not only useful for defining data scenarios and configurations in new model runs but also a practical way to access exact information about the premises for previous model runs.

Figure 3 shows the User Interface displaying a Scenario Run. On the left, we can see that Scenario Run ID 10000 is a run of Main Scenario 101. The bottom on the right side displays information about the Main Scenario and the configuration. We can see that Main Scenario 101 uses configuration ID 2 and that it includes three outer iterations. Outer iterations are for balancing of supply and demand. The top right side displays the log from running the scenario.

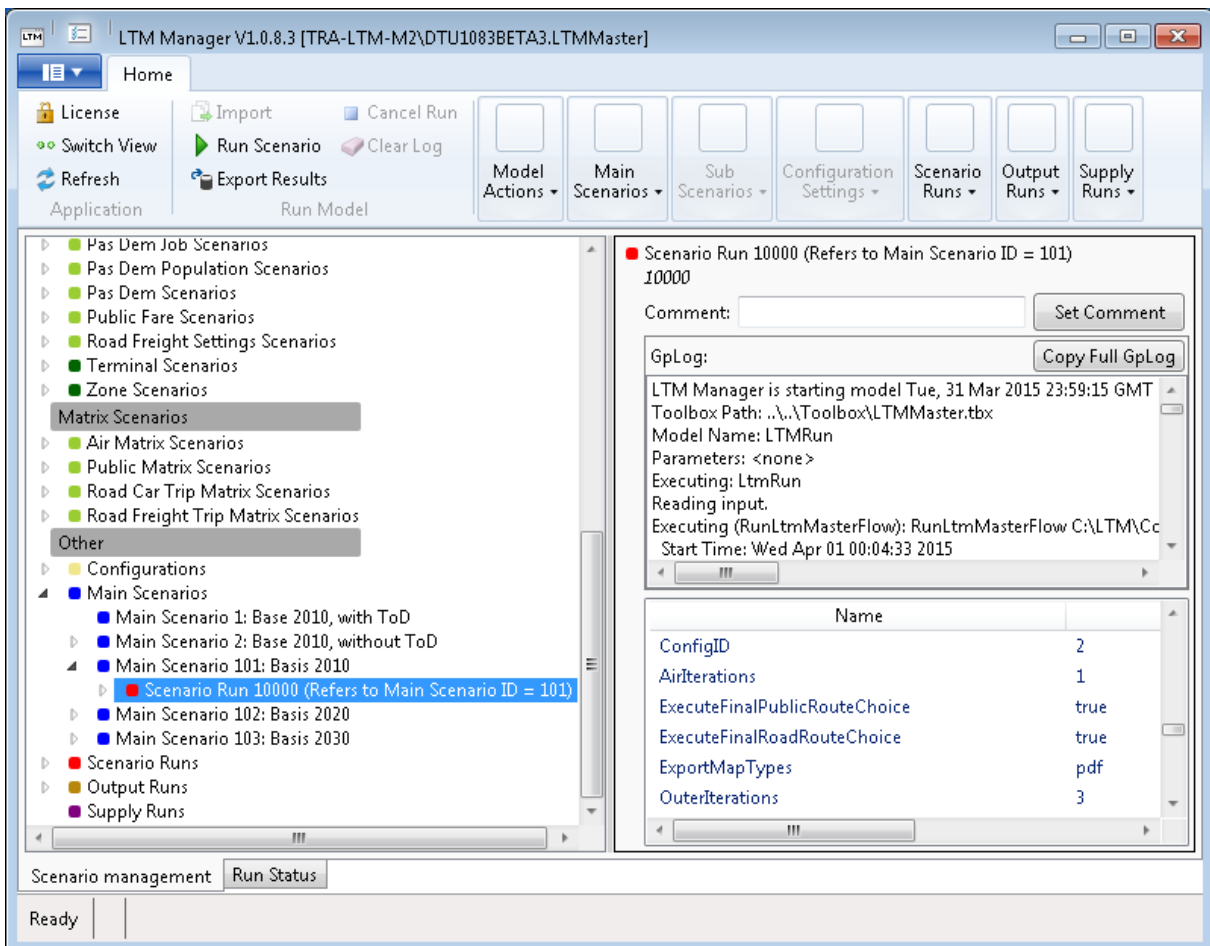


Figure 3 User Interface displaying a Scenario Run in LTM

The results of Scenario Runs can be compared using an Output Run.

2.3 Creating custom configurations

Advanced users will have the possibility to create custom configurations. The definition of a configuration will be stored in one of the Transtools 3 databases, and new configurations can be created by using the user interface.

Users can create new configurations for running the model in certain ways either to test specific parts of the model or for running the model more or less accurately if so desired.

A new configuration can be created by right clicking on an existing configuration and select “Copy Configuration”, the Create configuration dialog is shown with the parameters from the original configuration. Name and Description are not copied.

The following Figure 4 shows the dialog for creating a new configuration for the National Danish Transport Model. The dialog window will be altered to show the parameters configurable for Transtools 3. At the top, Name and Description can be entered. In the middle, checkmarks can be set to turn on or off specific parts of the model run. At the bottom, number of iterations can be set for the different modes and phases. The figure shows how it is done in LTM. TT3 will not have the same parameters. The set of parameters for controlling convergence, will be decided in work package 9 (Nielsen, Rasmussen, & Pedersen, 2016) or in the calibration phase.

LTM Create Configuration

Name

Description

Preload Mode Execute Final Road Route Choice

Store Intermediate Matrixes Use Filters In Whole Day Road Route Choice

Execute Final Public Route Choice Use Timebands In Road Route Choice

Enable Outer MSA Use Filters In Final Timeband Road Route Choice

Produce Change Patterns Rebuild Visualization For Bus

Rebuild Visualization For Rail

Public RC Launches Pr Hour For LoS

Public RC Launches Pr Hour Final

Outer Iterations

RoadRCFullIterationsForLoS

RoadRCFullIterationsFinalWD

RoadRCFullIterationsFinalToD

RoadRCThinIterationsForLoS

RoadRCThinIterationsFinalWD

RoadRCThinIterationsFinalToD

RoadRCRoughIterationsForLoS

RoadRCRoughIterationsFinalWD

RoadRCRoughIterationsFinalToD

Air Iterations

Figure 4 Dialog for creating a new Configuration in LTM

3. Configurable parameters

This chapter discusses configurable parameters compared with the parameters in the National Danish Transport Model and the guidelines for configurations in Deliverable 3.1.

A model run can be customized by altering a number of parameters. A configuration is a set of parameter values that define a certain behaviour for the model. The Transtools 3 model will be delivered with an initial set of configurations. Users can create new configurations.

Transtools 2.5 (Hansen, Implementing Scenarios, TRANS-TOOLS v2.0 Documentation, 2011) allowed users to create user specific model executions by using the Model Builder to alter the Geoprocessing models that controlled the overall model flow.

Using the standard released version of Transtools 2.5, users had to run supply models and demand models manually until reaching the desired number of outer iterations. (Hansen, User Guide, TRANS-TOOLS v2.0 Documentation, 2011). This would also be much easier with the new interface, when just specifying a configuration and starting a model run will let the system take care of running the sub models specified in the configuration.

In Transtools 3, it will be possible to decide if larger parts of the model should be omitted (e.g. the freight model or the passenger model, or map output generation) (de Jong, et al., 2015) and (Berglund & Algers, 2015). Depending on the findings in the work packages, it may also be possible for users to decide level of convergence. This is most likely relevant for assignment (Nielsen, Rasmussen, & Pedersen, 2016).

Configurations allow the model developers to present options to the model users. However, the documentation of the sub models should cover the expected changes to convergence, should the user choose to apply other options than standard calculation.

The impact from the selected configuration on the entire model, regarding calculation time and convergence, is entirely dependent on the other work packages, and the calibration phase later in the project. Preliminary work indicates that sub models comparable to TT2 will reduce the computation time, but the increased complexity and detail in other parts of the model will increase the computation time.

3.1 Example of configurable parameters

To start defining the parameters to be configurable in Transtools 3, we start by looking at a configuration in an existing model (Brun, LTM Manger User Guide, LTM 1.0.6, 2013), which includes the following information:

- ID, automatically assigned.
- Name, assigned when creating a new configuration
- Description, assigned when creating a new configuration, also shown at the top of the right pane
- Table, where configurations are stored.

- Store intermediate matrices, if true, then trip and LoS matrices for each outer loop will be stored.
- Execute Final Road Route Choice, can be omitted if only interested in other modes.
- Outer Iterations: Number of outer iterations loop supply and demand iteratively
 - Minimum 1, this means running initial LOS, freight and passenger demand and final assignments. The demand model runs 1 time.
 - Outer Loops = 2 inserts an extra iteration between road assignment and the passenger demand. The passenger demand model runs 2 times.
 - Outer Loops = 3 inserts an extra iteration between road assignment and the passenger demand. The passenger demand model runs 3 times.
 - Can be any number larger than 0, an extra loop takes about 4 hours.
- Outer MSA, this will ensure that the LoS matrices are averaged between outer loops.
- Use Filters In Whole Day Road RC
- Assignment iterations for Road and Air.
 - If you are not experimenting with convergence for the specific assignment models, leave the default values.

We note that almost all parameters of the configuration deal with saving time by using a less detailed model or by controlling the amount of output. Important aspects include Outer iterations and Assignment iterations. Transtools 3 will contain similar configurable parameters as discussed below.

3.2 Guidelines for configurations

Deliverable 3.1 (Brun & Nielsen, Transtools 3 Deliverable 3.1 Guidelines for model configurations, 2012) thoroughly discussed possible parameters that could be configurable in the Transtools 3 model.

The Deliverable extracted the need for user-friendly configurations from the experiences with TT1 and TT2, and suggested a range of different ways to configure the individual models of the full Transtools 3 Model system.

A configuration parameter for a demand model would have to possible values.

- Run the demand model
- Do not run the demand model

Assignment models could be parameterized in a number of ways where the developers of the assignment models would choose the most relevant one(s).

Overall mode runs suggested several different options, the outcome of which could be hard to compare given that it could use very different sub models.

3.3 Configurable parameters in Transtools 3

Previous experience and Deliverable 3.1 lead to the following recommendations:

General parameters controlling running parts of the model, e.g. only the assignment models or only the demand models are very useful.

Running only the assignment model can be used to see effects on route choice on changed network without allowing changes in demand. It can also be used to see how a specific demand matrix will be assigned to a network. Furthermore, it is very useful for test and validation of the base year.

Running only the demand model can be used to quickly see effects of socioeconomic changes assuming the level of service from the assignment models is fixed. It can also be used to test and validate the demand models.

Extra output from the models for validation or calibration purposes is well suited for parameterization, so that it could be disabled in most model run configurations.

Number of outer loops will be configurable.

Geographical refinement is very difficult to parameterize consistently. It might still be part of a configuration, but it will not be decided until test runs of the TT3 model have shown if this will be relevant.

3.4 Assignment models

For each assignment model, several parameters can be configured:

- Number of iterations. The road assignment uses an iterative method for balancing congestion effects. Adjusting the number of iterations may use more calculation time to increase the accuracy of the assignment.
- Some assignment modes will allow different settings for route choice to model preferences and network knowledge. (Nielsen, Rasmussen, & Pedersen, 2016).
- Running a particular mode. Some modes will allow that only one mode is assigned. This is relevant for the final assignment procedures or for running only one assignment. This will allow creating configurations for modelling freight demand only or for modelling passengers demand only, while keeping demand fixed for other modes. Shared infrastructure will thus still have flows from both freight and passengers.

The interaction between assignment models could also be parameterized, e.g. running the access-egress model between air assignment and road and rail assignments.

3.5 Demand models

The most important parameters are decisions whether to run this particular model or not.

Further refinement of parameterization of the demand models might be introduced later, when design of the demand models is fixed. A possible parameter for demand models could include sampling sizes. Adjusting this can improve demand model results at the price of increased calculation time.

3.6 Output

During the execution of a TT3 model, key figures and maps are produced. The configurations can control which maps are printed and which key figures are produced.

Key figures (aggregated numerical results) are calculated in each model run where applicable, depending on configurations. With configurations, users can decide to have the key figures exported to a file in csv or excel format. Below in Figure 5 is shown an example of key figures.

Scenario	OuterIteration	CountryCode	Country	GpkmRoad	GpkmRail	GtkmTruck	GtkmRail	GtkmIWW	GvkmCar	GvkmTruck
TS_2030_Baseline_K	4	AL	Albania	13.6	0.1	2.1	0.1	-	7.0	0.2
TS_2030_Baseline_K	4	AT	Austria	88.6	14.2	49.6	25.2	1.5	60.3	5.3
TS_2030_Baseline_K	4	BA	Bosnia	17.2	0.2	7.6	0.5	0.2	8.7	0.8
TS_2030_Baseline_K	4	BE	Belgium	128.3	14.3	42.6	24.2	16.1	88.6	4.4
TS_2030_Baseline_K	4	BG	Bulgaria	49.6	3.2	42.2	15.1	4.6	28.1	4.4
TS_2030_Baseline_K	4	BY	Belarus	49.6	8.9	111.7	2.7	-	25.4	8.7
TS_2030_Baseline_K	4	CH	Switzerland	131.2	29.7	23.2	12.9	0.0	90.5	2.0
TS_2030_Baseline_K	4	CY	Cyprus	7.6	0.0	-	-	-	4.0	-
TS_2030_Baseline_K	4	CZ	Czech Republic	82.2	13.2	61.4	21.4	0.1	46.6	5.1
TS_2030_Baseline_K	4	DE	Germany	922.4	122.3	499.0	175.3	70.2	630.7	53.9
TS_2030_Baseline_K	4	DK	Denmark	57.2	8.0	13.4	6.0	-	39.8	1.3
TS_2030_Baseline_K	4	EE	Estonia	12.3	0.4	7.9	2.1	-	6.5	0.8
TS_2030_Baseline_K	4	ES	Spain	469.6	50.4	242.4	10.9	-	293.2	22.6
TS_2030_Baseline_K	4	FI	Finland	70.9	5.2	57.5	14.8	-	49.1	5.0
TS_2030_Baseline_K	4	FR	France	848.6	133.3	357.4	86.2	28.6	532.1	35.5
TS_2030_Baseline_K	4	GR	Greece	108.5	1.9	43.6	4.7	-	67.7	4.0
TS_2030_Baseline_K	4	HR	Croatia	34.1	1.7	19.2	3.2	0.0	20.9	1.6
TS_2030_Baseline_K	4	HU	Hungary	68.1	12.0	30.7	18.9	2.2	42.0	3.0
TS_2030_Baseline_K	4	IE	Ireland	56.8	2.5	25.3	0.5	-	40.8	1.9
TS_2030_Baseline_K	4	IS	Iceland	7.0	0.0	-	-	-	4.9	-
TS_2030_Baseline_K	4	IT	Italy	705.3	78.3	227.9	26.9	-	440.0	24.5
TS_2030_Baseline_K	4	LI	Liechtenstein	0.5	0.0	0.1	0.0	-	0.4	0.0
TS_2030_Baseline_K	4	LT	Lithuania	35.9	0.7	24.6	18.4	0.0	18.5	2.6
TS_2030_Baseline_K	4	LU	Luxembourg	8.5	0.5	1.3	2.1	-	6.4	0.1
TS_2030_Baseline_K	4	LV	Latvia	17.9	1.1	24.3	8.8	0.0	9.1	2.5
TS_2030_Baseline_K	4	MD	Moldavia	11.2	0.6	49.5	1.7	-	5.9	3.9
TS_2030_Baseline_K	4	ME	Montenegro	9.1	0.1	1.2	-	-	4.7	0.1
TS_2030_Baseline_K	4	MK	Macedonia	7.5	0.2	2.9	0.4	-	4.7	0.2
TS_2030_Baseline_K	4	MT	Malta	2.4	0.0	-	-	-	1.2	-
TS_2030_Baseline_K	4	NL	Netherlands	167.8	19.9	63.2	13.5	50.9	126.0	6.5
TS_2030_Baseline_K	4	NO	Norway	104.5	4.6	61.5	13.5	-	71.2	3.4
TS_2030_Baseline_K	4	PL	Poland	384.7	38.1	190.0	78.9	2.0	214.5	19.4
TS_2030_Baseline_K	4	PT	Portugal	97.3	7.5	21.5	1.3	-	67.5	2.3
TS_2030_Baseline_K	4	RO	Romania	106.3	12.7	71.6	31.5	4.0	54.0	7.7
TS_2030_Baseline_K	4	RU	Russia	1'021.5	96.8	1'224.9	35.4	-	526.5	95.3
TS_2030_Baseline_K	4	SE	Sweden	120.2	14.9	51.9	40.3	-	83.4	4.2
TS_2030_Baseline_K	4	SI	Slovenia	27.8	1.1	6.1	4.0	-	15.3	0.6
TS_2030_Baseline_K	4	SK	Slovak Republic	40.8	4.2	25.6	9.2	0.2	23.1	2.1
TS_2030_Baseline_K	4	TR	Turkey	240.7	10.8	246.9	30.7	-	151.7	25.0
TS_2030_Baseline_K	4	UA	Ukraine	258.2	38.9	248.9	46.9	-	133.4	22.4
TS_2030_Baseline_K	4	UK	United Kingdom	782.7	70.8	211.5	26.7	0.2	544.8	22.0
TS_2030_Baseline_K	4	YU	Serbia	66.3	1.0	21.3	6.2	2.5	34.0	2.0

Figure 5 Transtools version 2.5 key figures

Maps are produced from flows from the assignment models. The flows are produced each time the assignment models are run. Production of maps from the flows uses calculation time, so it is up to the users to choose a configuration where maps are produced only if necessary. Below in Figure 6 is

shown an example of an auto-generated map. Maps could also show filters for traffic using certain bottlenecks or between sets of zones.

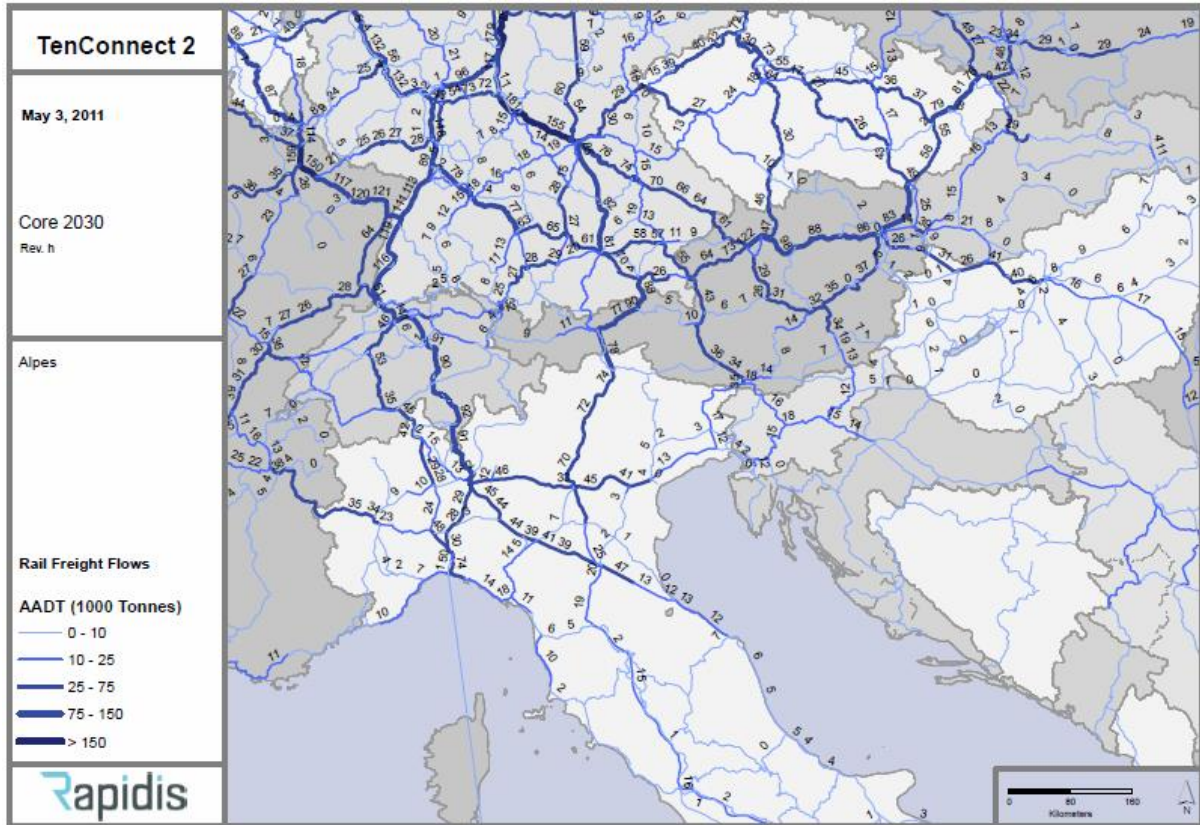


Figure 6 Transtools version 2.5 auto-generated map

Deliverable 4.1 will describe the maps and key figures, and how the users take advantage of them.

3.7 Parameters in TT3 Configurations

The following list of parameters is the expected set at time of preparation of this deliverable. Some changes might occur later in the project as result of other work packages and the calibration process.

3.7.1 StoreIntermediateData

This will save trip and LoS matrices for each outer iteration. The intermediate matrices contain information on supply (LoS matrices) and demand (Trip matrices) between the outer iterations. This can produce more than 100 GB of data that need not be stored during normal model runs. The information in the Intermediate matrices can be used to investigate how the outer iterations converge.

3.7.2 DoLosRouteChoice

Import initial OD matrices and start the calculation with a route choice assignment to produce Level of Service. If this is false, initial LoS matrices must be imported and the calculation starts with demand models.

3.7.3 DoFinalRouteChoice

Assign flows to the networks after final demand model. If the assignments or some of the assignments take a long time, then users only interested in overall key figures that can be calculated from the demand output, could use this to avoid spending time on the final route choice.

3.7.4 DoPassengerDemand

If this is false, then the passenger demand model including LoS calculation specific for passengers will be skipped. Fixed passenger demand matrices must be imported. For further description see (Berglund & Algers, 2015)

3.7.5 DoFreightDemand

If this is false, then the freight demand model including LoS calculation specific for freight will be skipped. Fixed freight demand matrices must be imported. For further description see (de Jong, et al., 2015)

3.7.6 OuterIterations

The number of outer iterations to balance supply and demand.

3.7.7 OuterMSA

Use method of successive averages to fit demand and supply.

3.7.8 ExportMapTypes

Automatically produce output maps.

3.7.9 UseFiltersInRoadRC

Allows users to extract more detailed results from the assignments for specific geographic areas.

3.7.10 RoadIterationsLoS

The number of iterations to control level of convergence for Road assignments for production of Level of Service matrices. Work package 9 and the calibration process will determine if this is relevant.

3.7.11 [RoadIterationsFinal](#)

The number of iterations to control level of convergence for Road assignments for production of Flows. Work package 9 and the calibration process will determine if this is relevant.

3.7.12 [AirIterationsLoS](#)

The number of iterations to control level of convergence for Air assignments for production of Level of Service matrices. Work package 9 and the calibration process will determine if this is relevant.

3.7.13 [AirIterationsFinal](#)

The number of iterations to control level of convergence for Air assignments for production of Flows. Work package 9 and the calibration process will determine if this is relevant.

3.7.14 [RailIterationsLoS](#)

The number of iterations to control level of convergence for Rail passenger assignments for production of Level of Service matrices. Work package 9 and the calibration process will determine if this is relevant.

3.7.15 [RailIterationsFinal](#)

The number of iterations to control level of convergence for Rail passenger assignments for production of Flows. Work package 9 and the calibration process will determine if this is relevant.

4. Configurations

Using the configurable parameters described above, the base configurations to be deployed with the model are as explained below.

The set of configurations is determined on the basis of the requirements in the Transtools 3 Description of Work, and the most used configurations in the National Danish Transport Model. Table 1 below shows the configurations and parameters. Each row is a configuration; the columns (after “Description”) are parameters, see section 3.7. Below the initial configurations are explained. Advanced users can create additional configurations.

ID	Name	Description	StoreIntermediateData	DoLosRouteChoice	DoFinalRouteChoice	DoPassengerDemand	DoFreightDemand	OuterIterations	OuterMSA	ExportMapTypes	UseFiltersInRoadRC	RoadIterationsLoS	RoadIterationsFinal	AirIterationsLoS	AirIterationsFinal	RailIterationsLoS	RailIterationsFinal
0	Default	Default configuration with road Time-of-Day	0	1	1	1	1	5	1	pdf	0	200	200	1	1	200	200
1	FastTest	Running All Models fast	0	1	1	1	1	1	1	pdf	0	1	1	1	1	1	1
2	Full	Full configuration with all outputs	1	1	1	1	1	5	1	pdf	1	200	200	1	1	200	200
3	AssignmentOnly	Assignment Only No Demand	0	0	1	0	0	0	1	pdf	0	200	200	1	1	200	200
4	RoadAssignmentOnly	Road Assignment Only No Demand	0	0	1	0	0	0	1	pdf	0	0	200	0	0	0	0
5	FreightDemandOnly	Freight Demand only No Assignments	0	0	0	0	1	1	1	pdf	0	200	200	1	1	200	200
6	PassDemandAndAssign	Passenger Demand only No initial LoS Assignments	0	0	1	1	0	1	1	pdf	0	200	200	1	1	200	200

Table 1 Base configurations in TT3

4.1 Default configuration

This is the configuration used for calibration and normal model runs. This configuration runs all the sub models and iterates supply and demand for balancing congestion. The standard model run outputs are produced.

Sub models like assignments use standard number of iterations.

This configuration is also used for Matrix estimation and demand calibration.

4.2 Fast test configuration

This is a configuration that runs all sub models but only once and with reduced level of detail. For Assignment models, number of iterations is set to one.

This configuration is used for testing the model structure, testing installed versions, and for testing new data sets. Standard model run outputs are produced. The results of Scenario runs using this configuration should only be used to check that all parts of the model works.

4.3 Full output configuration

This is a variation of the standard configuration with extra outputs enabled. Examples of the extra output are intermediate matrices and filter loads.

Intermediate matrices contain information on supply and demand between the outer iterations. This produces full demand and LoS matrices for each outer iteration that need not be stored during normal model runs. The information in the Intermediate matrices can be used to investigate how the outer iterations converge.

Filter loads are extra outputs from the assignments that can be used to validate the route choice. It can for example be all paths passing a certain link or all paths between a set of zones.

4.4 Assignment only

This configuration assigns the matrices to the network without changing the demand. The matrices may result from a previous model run with demand calculation.

This can be used as a very quick model for evaluating network changes. It is useful for quality assurance of the networks, both the baseline networks and projects coded as scenarios in the networks.

4.5 Road Assignment only

This configuration assigns the road matrices to the network without changing the demand. The road matrices may result from a previous model run with demand calculation.

This can be used as a very quick model for evaluating road network changes. It is useful for quality assurance of the road networks, both the baseline networks and projects coded as scenarios in the networks. This is especially relevant for road networks with capacity constraints that cause congestion.

4.6 Freight Demand only without final assignment

This configuration calculates freight demand based on imported Level of Service matrices. It does not run the assignment models for calculating Level of Service; nor does it to run Assignment models after demand to assign the flows to the network.

This can be used as a very quick model for evaluating economic changes. Output is sums from the matrices.

4.7 Passenger Demand only with final assignment

This configuration calculates passenger demand based on imported Level of Service matrices. It does not run the assignment models for calculating Level of Service.

Assignment models run after demand to assign the flows to the network.

This can be used as a very quick model for evaluating socioeconomic changes. Output will include maps of flows on the network.

5. Implementation of Configurations

This chapter delves into the technical details of how the configurations are implemented. The chapter is included for interested readers. It is not necessary to read this chapter, in order to operate the model.

Configurations are implemented in:

- Tables in the Scenario database
- The User interface
- Tables in the Calculation database
- The Geoprocessing models controlling the model flow.

All of this binds together the use of configurations as a mean of letting users control the model flow.

5.1 Tables in the Scenario database

The following tables in the Scenario Database are relevant for configurations:

- [scn_Config]
- [scn_MainScenarios]

The table [scn_Config] contains the defined configurations. The contents can be seen in Table 1.

The configuration table (Table 1) contains the 7 different configurations described in chapter 4. Each row is a configuration. The columns contain the parameters that can be set for each configuration. When users create a new configuration, the user interface stores the configuration in this table.

The table [scn_MainScenarios] contains the main scenarios. It looks like the following:

ID	Name	Year	AirMatrixScenarioID	AirNetworkScenarioID	FreightCostsScenarioID	FreightNetworksScenarioID	JobScenarioID	PasDemScenarioID	PopScenarioID	RailConnectorScenarioID	RailLinkScenarioID	RoadCarTripMatrixScenarioID	RoadConnectorScenarioID	RoadFreightSettingsScenarioID	RoadFreightTripMatrixScenarioID	RoadLinkScenarioID	TerminalScenarioID	ZoneScenarioID	ConfigID	RoadFilterScenarioID	RoadDrivingCostsScenarioID	CarOwnershipScenarioID	FreightConsolScenarioID
1	Base 2010	2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Base 2010, Fast	2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
100	Base 2020	2020	0	0	0	0	1	1	2	0	0	0	1	0	0	1	0	1	0	0	1	2	0

Table 2 Table of Main Scenarios

The displayed [scn_MainScenarios] table (Table 2) contains three main scenarios. The column “ConfigID” contains information on which configuration is selected for each main scenario. Main Scenarios ID 1 and 100 use the default configuration. Main Scenario ID 2 uses the Fast configuration.

5.2 Implementation in the User interface

Implementation of configurations in the user interface, seen from the user’s perspective is described in chapter 2.

When the user creates a new configuration, the user interface stores the configuration in [scn_Config].

When the user creates a new Main Scenario, the user interface stores the main scenario in [scn_MainScenarios].

The user runs the model by running a main scenario. The user creates a scenario run by inserting a row in the table [scn_ScenarioRuns] and imports the selected data to the calculation database. The selected scenario run is transferred to the table [in_CurrentScenarioRun] in the calculation database.

5.3 Implementation in calculation database

The calculation database always contains only one scenario. The [in_CurrentScenarioRun] table contains the definition of the current scenario run, including the main scenario and the parameters of the configuration chosen in the main scenario.

[in_CurrentScenarioRun] only has one row. It has the following columns:

- MainScenarioID
- StartTime
- FinishTime
- CalcComputerName
- Username
- GPkey
- Name
- Year
- AirMatrixScenarioID
- AirNetworkScenarioID
- FreightCostsScenarioID
- FreightNetworksScenarioID
- JobScenarioID
- PasDemScenarioID
- PopScenarioID
- RailConnectorScenarioID
- RailLinkScenarioID
- RoadCarTripMatrixScenarioID
- RoadConnectorScenarioID
- RoadFreightSettingsScenarioID
- RoadFreightTripMatrixScenarioID
- RoadLinkScenarioID
- TerminalScenarioID
- ZoneScenarioID
- ConfigID
- StoreIntermediateMatrixes
- DoLosRouteChoice
- DoFinalRouteChoice
- DoPassengerDemand
- DoFreightDemand
- OuterIterations
- AirlIterations
- Description
- StationMatrixScenarioID
- Comment
- OuterMSA
- ExportMapTypes
- UseFiltersInRoadRC
- RoadFilterScenarioID
- RoadDrivingCostsScenarioID
- RoadIterationsLoS

- RoadIterationsFinal
- AirlterationsLoS
- AirlterationsFinal
- RaillterationsLoS
- RaillterationsFinal
- CarOwnershipScenarioID
- FreightConsolScenarioID

The information from the configuration is included in the [in_CurrentScenarioRun] table. This can be used from the Geoprocessing models controlling the model flow.

5.4 Implementation in geoprocessing models

The model flow is controlled by geoprocessing models, as it was in TransTools1 and TransTools2. This can be used directly as the advanced user interface. Below are two examples of geoprocessing models controlling assignment models. Figure 7 shows an overall model with a sequential flow.

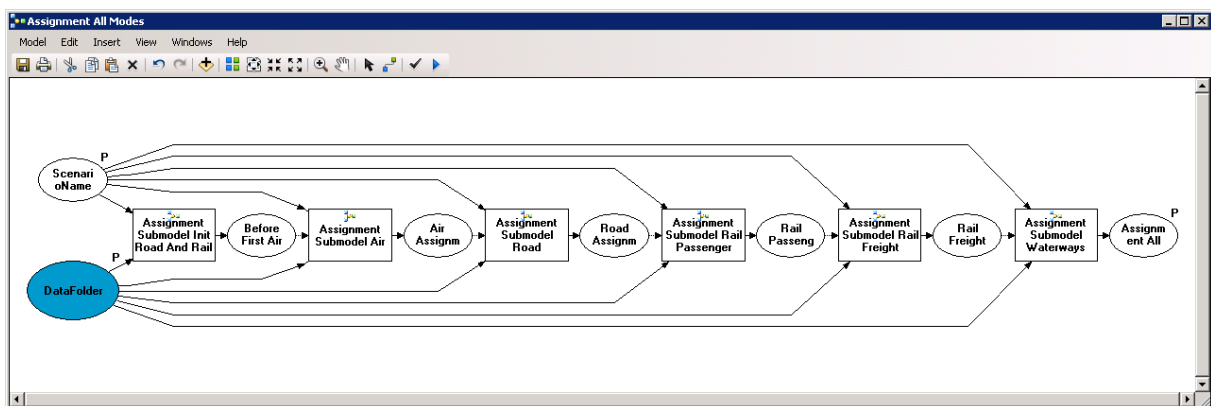


Figure 7 The TT2 assignment model flow using geoprocessing

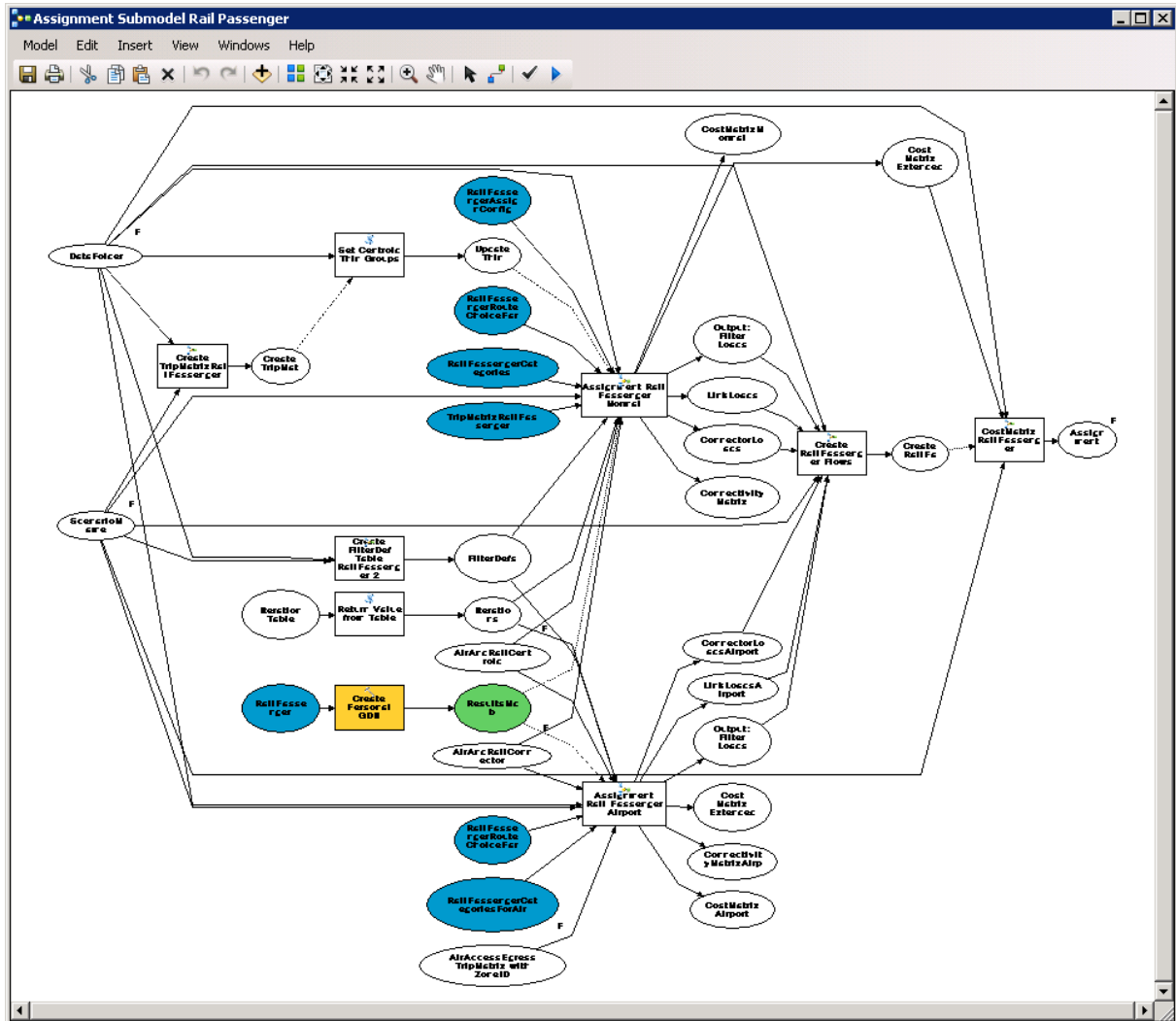


Figure 8 Sub model flow using geoprocessing

Figure 8 shows a sub model combining several tools and data sets.

Inside a geoprocessing model, the [in_CurrentScenarioRun] table can be read, and specific parameters of the chosen configuration thus be used. This can control whether a sub model is used in the current scenario run, an example is "DoFinalRouteChoice". Another use is directly as input to specific models, an example of which is "RoadIterationsLoS".

5.5 Deployment

The base configurations described in chapter 4 and above will exist in the model when it is installed.

6. Conclusions and next steps

The system of parameters and configurations is a robust system that ensures that users always have to choose a configuration when running the model. All model runs are logged in the scenario database, including the configurations used for the model run.

It is also a flexible system allowing users to create new configurations when needed. The flexibility also arises from the extensive set of parameters that can be controlled by the users.

The technology for enabling configurations and allowing users to use them and create new configurations is already implemented in the National Danish Transport Model. Transtools 3 will reuse this implementation with alterations to fit the Transtools 3 model. This ensures that the methodology is both tested and well received.

The implementation will take part in Work Package 4. During the implementation phase and calibration of the model, some of the parameters and configurations might be changed to adapt to the new conditions, if necessary.

7. References

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