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**Deliverable 3.4 - “Data Structure”**

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List of abbreviations

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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calc</td>
<td>Calculation, used as name for the temporary data used during model calculation.</td>
</tr>
<tr>
<td>FGDB</td>
<td>File Geodatabase, a format for storing spatial and tabular data.</td>
</tr>
<tr>
<td>GB</td>
<td>Gigabyte</td>
</tr>
<tr>
<td>.gdb</td>
<td>File system extension for File Geodatabase.</td>
</tr>
<tr>
<td>GP</td>
<td>Geoprocessing, name of the system for building the calculation models.</td>
</tr>
<tr>
<td>LTM</td>
<td>National Danish transport model (in Danish: “Landstrafikmodellen”)</td>
</tr>
<tr>
<td>MDF</td>
<td>Master Database File, a Microsoft SQL Server file type.</td>
</tr>
<tr>
<td>PDF</td>
<td>Portable Document Format</td>
</tr>
<tr>
<td>RC</td>
<td>Route Choice</td>
</tr>
<tr>
<td>SCN</td>
<td>Scenario, used as prefix in table names.</td>
</tr>
<tr>
<td>SQL</td>
<td>Structured Query Language</td>
</tr>
<tr>
<td>SQL Server</td>
<td>Database product from Microsoft.</td>
</tr>
<tr>
<td>SQL Server Express</td>
<td>Database product from Microsoft.</td>
</tr>
<tr>
<td>TT</td>
<td>Transtools</td>
</tr>
<tr>
<td>TT3</td>
<td>Transtools version 3</td>
</tr>
<tr>
<td>WP</td>
<td>Work package</td>
</tr>
</tbody>
</table>

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Summary

Scope

The scope of this deliverable is to document the data structure in TT3. The objective is not to document specific table schemas, or the content of tables.

Methodology

The methodology for the data structure in Transtools 3, has been applying the data structure principles of master and calculation data, from the national Danish model to Transtools.

Results

The results of the data structure effort, is a system of master and calculation data. The master data supports easy scenario management and editing. The calculation data supports a fixed structure for the model calculation. The data structure is now defined and organised, so specific model implementation can adhere to the structure in building the remaining parts of the model.

Next Step

The defined data structure is now being used for structured model implementation. This documentation deliverable will be used by other deliverables for reference.
1. Introduction

This deliverable is produced under WP3: Architecture and configuration. The note describes the structure of data used in operation of the Transtools 3 (TT3) model.

This note builds on the design sketched in the Transtools 3 Description of Work, Work Package 3. (Transtools Consortium, 2010) 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

This deliverable describes the data structure.

1.1 Objective of the deliverable

The objective of this deliverable is to document the data structure in the TT3 model. The deliverable will not discuss using the model or the structure of the model calculations.

The deliverable will not document specific table schemas and table contents. This information is not fully determined for a majority of the datasets at the time of preparation for this deliverable.

This deliverable will be used as reference for future deliveries.

1.2 Methodology and results

The process followed in preparation for this deliverable has been applying the data structure principles of master and calculation data, from the national Danish model to Transtools, as described in the Description of Work (Transtools Consortium, 2010).

The results of the data structure effort, is a system of master and calculation data. The master data supports easy scenario management and editing. The calculation data supports a fixed structure for the model calculation.

1.3 Perspective of the deliverable

The perspective of this deliverable is to enable users to understand the data structure used in the Transtools 3 model.
The defined data structure is now being used for structured model implementation. Tables are being added to the databases or altered to fit changing needs, the data structure ensures that model implementers can follow naming scheme and determine correct location for placing new tables.

1.4 Reading guidance

Chapter 2 describes the overall Transtools 3 data structure.

Chapter 3 describes the Master data containing scenarios and results.

Chapter 4 describes the Calc data containing the current scenario being calculated and the result of that calculation.
2. Overall Structure

The data structure in the Transtools 3 model is primarily defined by the separation of calculation data from scenario data and results. The design of the data structure is inspired by the data structure in the National Danish Transportation Model (Brun, LTM Manager User Guide, LTM 1.0.6, 2013).

The data structure can basically be sketched as:

- Master data, containing data the user sees and edits:
  - Scenarios
  - Results
- Calc data, containing temp data for the scenario being calculated

The databases divided by Master and Calc can be seen in Figure 1.

![Figure 1 Databases in Master and Calc](image)

The figure shows different databases used in the TT3 data structure, and also the different database types.

- SQL Server, containing non-spatial master data
- SQL server Express, containing non-spatial calc data.
- FileGeodatabase (FGDB), containing spatial data for both master and calc
Chapters 3 and 4 will describe which data is placed in the specific types of databases.

The new simple user interface in Transtools 3 will create scenarios in master data, and start calculations, which will include importing calculation scenario from master to calc, running the model, and exporting results to master. The new user interface is described in (Brun, Transtools 3 Deliverable 3.2 User Interface Design, 2012). The user interface will also manage configurations, described in (Brun, Transtools 3 Deliverable 3.3 Model Configurations, 2016).

2.1 Installation on separate computers

Master and Calc can be installed on separate computers or on the same computer.

Using separate computers, multiple computers with the Calc structure can share the same master data, this is illustrated in Figure 2.

In the following, it is assumed that Transtools has been installed in “C:\TT”, both Calc and Master data.

2.2 File system folder structure

The Transtools 3 file system structure allows Calc and Master to be installed on same or separate computers.

Calc data folder structure under C:\TT has the following subfolders:
• Connections [Contains ArcGIS connection files to the databases]

• Data
  o Calc
    • DB [Contains SQL Express MDF database files]
      • CalcAir.gdb
      • CalcGeo.gdb
      • Calclww.gdb
      • CalcOutput.gdb
      • CalcRailFreight.gdb
      • CalcRailPas.gdb
      • CalcRoad.gdb
      • CalcRoro.gdb
      • CalcSea.gdb

• Maps [PDF files produced during scenario runs]

• Mxds
  o Editing [map documents for editing]
  o Templates [map documents for PDF maps]

• Programs
  o DemandModels
  o Install
  o MapExport
  o MxdDataSourceUtility

• Toolbox
  o Scripts

• User Guide

Master data folder structure under C:\TT contains the following sub folders:

• Data
  o Master
    • DB
      • Air001.gdb
      • Geo001.gdb
      • lww001.gdb
      • Rail001.gdb
      • Rail002.gdb
      • Road001.gdb
      • RoRo001.gdb
      • Sea001.gdb
    • ScenariosRunResults
      • ScenarioRun10001
        o Maps [PDF map files produced during scenario runs]
        o Mxds [map documents for viewing results in ArcMap]
        o OutputData [output features from scenario run]
      • ScenarioRun10002
        o Maps [PDF map files produced during scenario runs]
        o Mxds [map documents for viewing results in ArcMap]
        o OutputData [output features from scenario run]

• Programs
  o Install

The file geodatabases under C:\TT\Data\Master\Scenarios has a numbering scheme which allows creating and delivering additional data, without merging changes to existing scenario data. This will be further described in Deliverable 6.1 Scenario Generation (Rich & Cochrane, 2016), (Brun & Cochrane, Forthcoming: Deliverable 4.1 A technical documentation of the model structure and operation, 2016), Deliverable 12.1 TT3 User Guide (Cochrane).
2.3 Naming scheme

Tables and FeatureClasses are as much as possible named according to the following naming scheme: “Prefix_ModelName_DataName”.

2.3.1 Prefix

First part of the name gives the type, it must be one (and only one) of the following abbreviations:

- in: Input data from users, i.e. data that users can edit.
- cfg: configuration tables for defining the model.
- sys: model system parameters, set by model developers, should not be edited by users.
- out: Output data from model. Data that at the end of scenario runs are exported from Calc to Master.
- tmp: Temporary data, that never are exported from Calc to Master. Tmp data are cleared before each scenario run.
- scn: Tables for scenario management on master database.
- inout: Tables, where output from one scenario run can be used as input for a later scenario run.
- man: Tables used by the user interface to organize and display the structure of the model and scenarios.
- ver: versioning of databases.

2.3.2 ModelName

Second part of the name is the submodel that the data belongs to. Often data will be used in more than one model, e.g. as output from one model and input of another mode. In that case the data should be named by the model that produces the data.

- AirRC: Air Route Choice
- RailFreightRC: Rail Freight Route Choice
- RailPasRC: Rail Passenger Route Choice
- RoadRC: Road Route Choice
- SeaRC: Sea Route Choice
- IwwRC: Inland waterways Route Choice
- TradeDem: Trade Demand and logistics model
- ChainChoiceSet: Chain Choice Set Generator
- PasDem: Passenger Demand Model
- KF: Key Figures,
- Map: Maps

Some data sets will be generic and cannot be attributed to a single model. In that case the can be named by “Prefix_DataName”, (e.g. in_Zones).

2.3.3 DataName

The third and last part of the table name is a descriptive name for the data set.

2.3.4 Views

Views are in principle named as tables in the form of “Prefix_ModelName_DataName”. For views the Prefix can only be one of the following values:

- out: Output data, results that will be copied to the master database.
- view: All other views.

2.3.5 Stored procedures and functions

All stored procedures have prefix “proc_”, All functions have prefix “func_”.
3. Master data

The master data contains data, that the user edits to create scenarios, installed scenario data, and the results of calculations.

Technically, the master data is stored in a SQL Server and a series of File Geodatabases.

3.1 SQL Server database

The SQL Server database belonging to Master data contains non-spatial data; input tables, output tables and scenario management tables.

Location of MDF file: C:\TT\Data\Master\DB\MSSQL12.TTMASTER\MSSQL\DATA\TTmaster.mdf

Location of ArcGIS Connection file: C:\TT\Connections\TTMaster.odc

Tables currently in TTMaster database at time of preparation of this deliverable, can be seen below in Table 1. More input and output tables will be added during the model development.

<table>
<thead>
<tr>
<th>Table Name</th>
<th>Type</th>
<th>Explanation</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>scn_Configurations</td>
<td>scn</td>
<td>Configurations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>inout_RoadRC_CarTripMatrix</td>
<td>inout</td>
<td>User input, output data</td>
<td>RoadRC</td>
<td>car trip matrix</td>
</tr>
<tr>
<td>scn_MainScenarios</td>
<td>scn</td>
<td>MainScenarios</td>
<td></td>
<td></td>
</tr>
<tr>
<td>scn_ScenarioRuns</td>
<td>scn</td>
<td>Finished Scenario Runs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in_RoadRC_FilterDefinition</td>
<td>in</td>
<td>User input data</td>
<td>RoadRC</td>
<td>Road filters</td>
</tr>
<tr>
<td>inout_RoadRC_FreightTripMatrix</td>
<td>inout</td>
<td>User input, output data</td>
<td>RoadRC</td>
<td>Freight trip matrix</td>
</tr>
<tr>
<td>cfg_ScenarioManagerConfigTable</td>
<td>cfg</td>
<td>Configuration tables</td>
<td>RoadRC</td>
<td></td>
</tr>
<tr>
<td>cfg_TreeViewHeaders</td>
<td>cfg</td>
<td>Configuration tables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cfg_DataScenarioTypes</td>
<td>cfg</td>
<td>Configuration tables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cfg_DataScenarioInstances</td>
<td>cfg</td>
<td>Configuration tables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cfg_ConfigurationParameters</td>
<td>cfg</td>
<td>Configuration tables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cfg_GpModelDefinitions</td>
<td>cfg</td>
<td>Configuration tables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cfg_DataScenarioTypeTableDefinitions</td>
<td>cfg</td>
<td>Configuration tables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>scn_RoadRC_CarTripMatrixScenarios</td>
<td>scn</td>
<td>Scenario management</td>
<td>RoadRC</td>
<td>Road trip matrices</td>
</tr>
</tbody>
</table>

Table 1 Tables in Master database
3.2 Scenario file geodatabases

Spatial scenario data is stored in file geodatabases.

3.2.1 Air001.gdb

Primary use: Input feature classes with scenarios for Air Assignment.

Location of file Geodatabase: C:\TT\Data\Master\Scenarios\Air001.gdb

Tables in the file geodatabase for air can be seen in Table 2. The spatial data is in a feature dataset. There is also a scenario management table to describe the scenarios.

Table 2 Tables in scenario data for Air

<table>
<thead>
<tr>
<th>TableName</th>
<th>Feature-Dataset</th>
<th>Type</th>
<th>Explanation</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>scn_AirNetworkScenarios</td>
<td>scn</td>
<td>Scn</td>
<td>Scenario management</td>
<td>AirRC</td>
<td>AirRC</td>
</tr>
<tr>
<td>in_AirRC_Links</td>
<td>AirFDS</td>
<td>In</td>
<td>Input data</td>
<td>AirRC</td>
<td>Air links</td>
</tr>
<tr>
<td>in_AirRC_Airports</td>
<td>AirFDS</td>
<td>In</td>
<td>Input data</td>
<td>AirRC</td>
<td>Airports</td>
</tr>
<tr>
<td>in_AirRC_Connectors</td>
<td>AirFDS</td>
<td>In</td>
<td>Input data</td>
<td>AirRC</td>
<td>Zone to airport connectors</td>
</tr>
</tbody>
</table>

3.2.2 Geo001.gdb

Primary use: Input feature classes with scenarios that are not mode specific, e.g. zones and terminals.

Location of file Geodatabase: C:\TT\Data\Master\Scenarios\Geo001.gdb

Tables in this file geodatabase can be seen in Table 3. The spatial data is in a feature dataset. There are also scenario management tables to describe the scenarios.

Table 3 Tables in scenario data for zones and terminals

<table>
<thead>
<tr>
<th>TableName</th>
<th>Feature-Dataset</th>
<th>Type</th>
<th>Explanation</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>scn_ZoneScenarios</td>
<td>scn</td>
<td>scn</td>
<td>Scenario management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>scn_FreightTerminalScenarios</td>
<td>scn</td>
<td>scn</td>
<td>Scenario management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in_Zones</td>
<td>ZoneFDS</td>
<td>In</td>
<td>Input data</td>
<td></td>
<td>Zones</td>
</tr>
<tr>
<td>in_Freight_Terminals</td>
<td>ZoneFDS</td>
<td>In</td>
<td>Input data</td>
<td></td>
<td>Freight terminals</td>
</tr>
</tbody>
</table>

3.2.3 Iww001.gdb

Primary use: Input feature classes with scenarios for Inland water ways Assignment.
Tables in the file geodatabase for IWW can be seen in Table 4. The spatial data is in a feature dataset. There is also a scenario management table to describe the scenarios.

### Table 4 Tables in scenario data for inland waterways

<table>
<thead>
<tr>
<th>TableName</th>
<th>Feature-Dataset</th>
<th>Type</th>
<th>Explanation</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>scn_IwwNetworkScenarios</td>
<td>scn</td>
<td>scn</td>
<td>Scenario management</td>
<td>IwwRC</td>
<td>Inland waterway links</td>
</tr>
<tr>
<td>in_IwwRC_Links</td>
<td>IwwFDS</td>
<td>in</td>
<td>Input data</td>
<td>IwwRC</td>
<td>Inland waterway links</td>
</tr>
<tr>
<td>in_IwwRC_TerminalConnectors</td>
<td>IwwFDS</td>
<td>in</td>
<td>Input data</td>
<td>IwwRC</td>
<td>Inland waterway terminal connectors</td>
</tr>
</tbody>
</table>

3.2.4 Rail001.gdb

Primary use: Input feature classes with scenarios for Rail freight and Rail Passenger Assignment.

Tables in the file geodatabase for rail can be seen in Table 5. The spatial data is in a feature dataset. There is also a scenario management table to describe the scenarios.

### Table 5 Tables in scenario data for rail

<table>
<thead>
<tr>
<th>TableName</th>
<th>Feature-Dataset</th>
<th>Type</th>
<th>Explanation</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>scn_RailNetworkScenarios</td>
<td>scn</td>
<td>scn</td>
<td>Scenario management</td>
<td>RailRC</td>
<td>Rail links</td>
</tr>
<tr>
<td>in_RailRC_Links</td>
<td>RailFDS</td>
<td>in</td>
<td>Input data</td>
<td>RailRC</td>
<td>Rail links</td>
</tr>
<tr>
<td>in_RailRC_AirConnectors</td>
<td>RailFDS</td>
<td>in</td>
<td>Input data</td>
<td>RailRC</td>
<td>Airport to Rail connectors</td>
</tr>
<tr>
<td>in_RailRC_Nodes</td>
<td>RailFDS</td>
<td>in</td>
<td>Input data</td>
<td>RailRC</td>
<td>Rail stations</td>
</tr>
<tr>
<td>in_RailRC_TerminalConnectors</td>
<td>RailFDS</td>
<td>in</td>
<td>Input data</td>
<td>RailRC</td>
<td>Terminal to Rail connectors</td>
</tr>
<tr>
<td>in_RailRC_ZoneConnectors</td>
<td>RailFDS</td>
<td>in</td>
<td>Input data</td>
<td>RailRC</td>
<td>zone to Rail connectors</td>
</tr>
</tbody>
</table>

3.2.5 Road001.gdb

Primary use: Input feature classes with scenarios for Road Assignment.

Tables in the file geodatabase for road can be seen in Table 6. The spatial data is in a feature dataset. There is also a scenario management table to describe the scenarios.
Table 6 Tables in scenario data for road

<table>
<thead>
<tr>
<th>TableName</th>
<th>Feature-Dataset</th>
<th>Type</th>
<th>Explanation</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>scn_RoadNetworkScenarios</td>
<td>scn</td>
<td>scn</td>
<td>Scenario management</td>
<td>RoadRC</td>
<td></td>
</tr>
<tr>
<td>in_RoadRC_Links</td>
<td>RoadFDS</td>
<td>in</td>
<td>Input data</td>
<td>RoadRC</td>
<td>Road links</td>
</tr>
<tr>
<td>in_RoadRC_TerminalConnectors</td>
<td>RoadFDS</td>
<td>in</td>
<td>Input data</td>
<td>RoadRC</td>
<td>Terminal to Road connectors</td>
</tr>
<tr>
<td>in_RoadRC_ZoneConnectors</td>
<td>RoadFDS</td>
<td>in</td>
<td>Input data</td>
<td>RoadRC</td>
<td>Zone to Road connectors</td>
</tr>
<tr>
<td>in_RoadRC_AirConnectors</td>
<td>RoadFDS</td>
<td>in</td>
<td>Input data</td>
<td>RoadRC</td>
<td>Airport to Road connectors</td>
</tr>
</tbody>
</table>

3.2.6  RoRo001.gdb

Primary use: Input feature classes with scenarios for Roro.

Location of file Geodatabase: C:\TT\Data\Master\Scenarios\RoRo001.gdb

Tables in the file geodatabase for Roro can be seen in Table 7. The spatial data is in a feature dataset. There is also a scenario management table to describe the scenarios.

Table 7 Tables in scenario data for RoRo

<table>
<thead>
<tr>
<th>TableName</th>
<th>Feature-Dataset</th>
<th>Type</th>
<th>Explanation</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>scn_RoRoNetworkScenarios</td>
<td>scn</td>
<td>scn</td>
<td>Scenario management</td>
<td>RoRo</td>
<td></td>
</tr>
<tr>
<td>in_RoRo_Links</td>
<td>RoRoFDS</td>
<td>in</td>
<td>Input data</td>
<td>RoRo</td>
<td>Roro links</td>
</tr>
</tbody>
</table>

3.2.7  Sea001.gdb

Primary use: Input feature classes with scenarios for Sea Assignment.

Location of file Geodatabase: C:\TT\Data\Master\Scenarios\Sea001.gdb

Tables in the file geodatabase for sea transport can be seen in Table 8. The spatial data is in a feature dataset. There is also a scenario management table to describe the scenarios.

Table 8 Tables in scenario data for sea

<table>
<thead>
<tr>
<th>TableName</th>
<th>Feature-Dataset</th>
<th>Type</th>
<th>Explanation</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>scn_SeaNetworkScenarios</td>
<td>scn</td>
<td>scn</td>
<td>Scenario management</td>
<td>SeaRC</td>
<td></td>
</tr>
<tr>
<td>in_SeaRC_Links</td>
<td>SeaFDS</td>
<td>in</td>
<td>Input data</td>
<td>SeaRC</td>
<td>Sea links</td>
</tr>
</tbody>
</table>
3.3 Result file geodatabases

The results from a scenario run contains both spatial FeatureClasses and non-spatial tables. The spatial data are stored in file geodatabases organized in folders.

Location of output spatial data (in this example for scenario run number 2):
C:\TT\Data\Master\Results\ScenarioRun002\OutputData\CalcOutput.gdb

Each CalcOutput.gdb contains the same featureclasses, links and connectors for various modes, with added attributes containing flow values resulting from the scenario run. Table 9 shows the output flow tables currently being produced. More tables will be added during model development.

Table 9 Tables in output file geodatabase

<table>
<thead>
<tr>
<th>TableName</th>
<th>Feature-Dataset</th>
<th>Type</th>
<th>Explanation</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>out_IwwRC_ConnectorsWithFlows</td>
<td>OutputFDS</td>
<td>out</td>
<td>output data</td>
<td>IwwRC</td>
<td>Connectors with flows</td>
</tr>
<tr>
<td>out_IwwRC_TerminalsWithVolumes</td>
<td>OutputFDS</td>
<td>out</td>
<td>output data</td>
<td>IwwRC</td>
<td>Terminals with volumes</td>
</tr>
<tr>
<td>out_IwwRC_LinksWithFlows</td>
<td>OutputFDS</td>
<td>out</td>
<td>output data</td>
<td>IwwRC</td>
<td>Links with flows</td>
</tr>
<tr>
<td>out_RailFreightRC_LinksWithFlows</td>
<td>OutputFDS</td>
<td>out</td>
<td>output data</td>
<td>RailFreightRC</td>
<td>Links with flows</td>
</tr>
<tr>
<td>out_RailFreightRC_ConnectorsWithFlows</td>
<td>OutputFDS</td>
<td>out</td>
<td>output data</td>
<td>RailFreightRC</td>
<td>Connectors with flows</td>
</tr>
<tr>
<td>out_SeaRC_LinksWithFlows</td>
<td>OutputFDS</td>
<td>out</td>
<td>output data</td>
<td>SeaRC</td>
<td>Links with flows</td>
</tr>
<tr>
<td>out_SeaRC_ConnectorsWithFlows</td>
<td>OutputFDS</td>
<td>out</td>
<td>output data</td>
<td>SeaRC</td>
<td>Connectors with flows</td>
</tr>
<tr>
<td>out_RoadRC_LinksWithFlows</td>
<td>OutputFDS</td>
<td>out</td>
<td>output data</td>
<td>RoadRC</td>
<td>Links with flows</td>
</tr>
<tr>
<td>out_RoadRC_ConnectorsWithFlows</td>
<td>OutputFDS</td>
<td>out</td>
<td>output data</td>
<td>RoadRC</td>
<td>Connectors with flows</td>
</tr>
</tbody>
</table>

Next to the output file geodatabase are located automatically generated map PDF’s in
C:\TT\Data\Master\Results\ScenarioRun002\Maps and mxd files for viewing results in ArcMap located in C:\TT\Data\Master\Results\ScenarioRun002\Mxds.
4. Calc data

The calc (calculation) data contains temporary data used during model calculations, users will not need to access the calc database. Users will use the new simple user interface which is installed on calculation computers. The user interface handles the data import and export between master and calc data.

As the calculation data is only temporary, only the broad structure will be described here. Technically the calc data are stored in a SQL Server Express instance containing a number of SQL Server Express databases and a series of File Geodatabases.

4.1 SQL Server Express database

The SQL server instance uses multiple databases because the free Express version has a size limit of 10 GB for each database. A database is a MDF attached to the instance. Since putting the data in databases is necessary, some organization of the tables in the databases has been instigated. This is more a convenience since data can easily be accessed across databases.

4.1.1 TTCalcAssign

Primary use: input and temporary tables used in assignment models.
Location of MDF file: C:\TT\Data\Calc\DB\MSSQL12.TTCALC\MSSQL\DATA\TTCalcAssign.mdf
Location of ArcGIS Connection file: C:\TT\Connections\TTCalcAssign.odc
The initial design for tables is described in deliverable 9.1 (Nielsen, Rasmussen, & Pedersen, 2016).

4.1.2 TTCalcBase

Primary use: system tables of base values used in pivoting and growth factor models. Values are set during model calibration. Users should not edit the data.
Location of MDF file: C:\TT\Data\Calc\DB\MSSQL12.TTCALC\MSSQL\DATA\TTCalcBase.mdf

4.1.3 TTCalcChainChoice

Primary use: input, output and temporary tables used in freight chain choice model.
Location of MDF file: C:\TT\Data\Calc\DB\MSSQL12.TTCALC\MSSQL\DATA\TTCalcChainChoice.mdf
Location of ArcGIS Connection file: C:\TT\Connections\TTCalcChainChoice.odc
4.1.4  TTCalcChainChoiceOut

Primary use: temporary tables used in freight chain choice model. The Chain Choice model produced more data than the 10 GB, that can be stored in a single SQL Server Express database, forcing the data related to that model be split over several databases.

Location of MDF file: C:\TT\Data\Calc\DB\MSSQL12.TTCALC\MSSQL\DATA\TTCalcChainChoiceOut.mdf
Location of ArcGIS Connection file: C:\TT\Connections\TTCalcChainChoiceOut.odc

4.1.5  TTCalcChainChoicePath

Primary use: output table from freight chain choice model. The Chain Choice model produced more data than the 10 GB, that can be stored in a single SQL Server Express database, forcing the data related to that model be split over several databases.

Location of MDF file: C:\TT\Data\Calc\DB\MSSQL12.TTCALC\MSSQL\DATA\TTCalcChainChoicePath.mdf
Location of ArcGIS Connection file: C:\TT\Connections\TTCalcChainChoicePath.odc

4.1.6  TTCalcSys

Primary use: Transtools system tables containing parameters for model calculation. These tables are set by model developers. Users should not edit these tables.

Location of MDF file: C:\TT\Data\Calc\DB\MSSQL12.TTCALC\MSSQL\DATA\TTCalcSys.mdf
Location of ArcGIS Connection file: C:\TT\Connections\TTCalcSys.odc

4.1.7  TTCalcFreightDem

Primary use: input, output and temporary tables used in freight demand model.

Location of MDF file: C:\TT\Data\Calc\DB\MSSQL12.TTCALC\MSSQL\DATA\TTCalcFreightDem.mdf
Location of ArcGIS Connection file: C:\TT\Connections\TTCalcFreightDem.odc

4.1.8  TTCalcPasDem

Primary use: input, output and temporary tables used in passenger demand model.

Location of MDF file: C:\TT\Data\Calc\DB\MSSQL12.TTCALC\MSSQL\DATA\TTCalcPasDem.mdf
Location of ArcGIS Connection file: C:\TT\Connections\TTCalcPasDem.odc
4.2 File Geodatabases

The Calc File geodatabases contains spatial data pertaining to the current scenario. The import process imports “in_” - featureclasses from Master. Data in “tmp_” featureclasses is created during the import process or the calculation. Data in “out_” - featureclasses is created at the end of the calculation process, it contains output featureclasses for displaying results in maps.

4.2.1 CalcAir.gdb

Primary use: Featureclasses and network for Air Assignment.

Location of file Geodatabase: C:\TT\Data\Calc\CalcAir.gdb

The initial design for tables is described in deliverable 9.1 (Nielsen, Rasmussen, & Pedersen, 2016), tables in the file geodatabase at time of preparation of this deliverable can be seen in Table 10.

Table 10 Tables in Calc file geodatabase for Air

<table>
<thead>
<tr>
<th>TableName</th>
<th>Feature-Dataset</th>
<th>Type</th>
<th>Explanation</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>in_AirRC_Airports</td>
<td>AirFDS</td>
<td>in</td>
<td>Input data</td>
<td>AirRC</td>
<td>Airports</td>
</tr>
<tr>
<td>in_AirRC_Connectors</td>
<td>AirFDS</td>
<td>in</td>
<td>Input data</td>
<td>AirRC</td>
<td>Connectors</td>
</tr>
<tr>
<td>in_AirRC_Links</td>
<td>AirFDS</td>
<td>in</td>
<td>Input data</td>
<td>AirRC</td>
<td>Links</td>
</tr>
<tr>
<td>tmp_AirRC_Centroids</td>
<td>AirFDS</td>
<td>tmp</td>
<td>Temporary data</td>
<td>AirRC</td>
<td>Centroids</td>
</tr>
</tbody>
</table>

4.2.2 CalcGeo.gdb

Primary use: Featureclasses that are not mode specific, e.g. zones and terminals.

Location of file Geodatabase: C:\TT\Data\Calc\CalcGeo.gdb

Tables in the file geodatabase at time of preparation of this deliverable can be seen in Table 11.

Table 11 Tables in Calc file geodatabase for Zones and Terminals

<table>
<thead>
<tr>
<th>TableName</th>
<th>Feature-Dataset</th>
<th>Type</th>
<th>Explanation</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>in_Zones</td>
<td>ZoneFDS</td>
<td>in</td>
<td>Input data</td>
<td></td>
<td>Zones</td>
</tr>
<tr>
<td>sys_Zone_Centroids</td>
<td>ZoneFDS</td>
<td>sys</td>
<td>Input and output data</td>
<td>Zone</td>
<td>Centroids</td>
</tr>
<tr>
<td>sys_AirRC_Centroids</td>
<td>ZoneFDS</td>
<td>sys</td>
<td>Input and output data</td>
<td>AirRC</td>
<td>Centroids</td>
</tr>
<tr>
<td>in_Freight_Terminals</td>
<td>ZoneFDS</td>
<td>in</td>
<td>Input data</td>
<td>Freight</td>
<td>Terminals</td>
</tr>
</tbody>
</table>
4.2.3  CalcIww.gdb

Primary use: Featureclasses and network for Inland waterways assignment.

Location of file Geodatabase: C:\TT\Data\Calc\CalcIww.gdb

The initial design for tables is described in deliverable 9.1 (Nielsen, Rasmussen, & Pedersen, 2016), tables in the file geodatabase at time of preparation of this deliverable can be seen in Table 12.

Table 12 Tables in Calc file geodatabase for inland waterways

<table>
<thead>
<tr>
<th>TableName</th>
<th>Feature- Dataset</th>
<th>Type</th>
<th>Explanation</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>in_IwwRC_Links</td>
<td>IwwFDS</td>
<td>in</td>
<td>Input data</td>
<td>IwwRC</td>
<td>Links</td>
</tr>
<tr>
<td>in_IwwRC_TerminalConnectors</td>
<td>IwwFDS</td>
<td>in</td>
<td>Input data</td>
<td>IwwRC</td>
<td>TerminalConnectors</td>
</tr>
<tr>
<td>tmp_IwwRC_TerminalCentroids</td>
<td>IwwFDS</td>
<td>tmp</td>
<td>Temporary data</td>
<td>IwwRC</td>
<td>TerminalCentroids</td>
</tr>
<tr>
<td>tmp_Iww_ND</td>
<td>IwwFDS</td>
<td>tmp</td>
<td>Temporary Network</td>
<td>Iww</td>
<td>ND</td>
</tr>
<tr>
<td>tmp_Iww_ND_Junctions</td>
<td>IwwFDS</td>
<td>tmp</td>
<td>Temporary data</td>
<td>Iww</td>
<td>Network Junctions</td>
</tr>
</tbody>
</table>

4.2.4  CalcOutput.gdb

Primary use: Featureclass results from scenario run, e.g. flows on links and connectors.

Location of file Geodatabase: C:\TT\Data\Calc\CalcOutput.gdb.

This is the temporary version of spatial data described in section 3.3. when the calculation of a scenario is finished, this file geodatabase is copied to a folder in master data containing results for the scenario run.

Tables in the file geodatabase at time of preparation of this deliverable can be seen in Table 9.

4.2.5  CalcRailFreight.gdb

Primary use: Featureclasses and network for Rail freight Assignment.

Location of file Geodatabase: C:\TT\Data\Calc\CalcRailFreight.gdb

The initial design for tables is described in deliverable 9.1 (Nielsen, Rasmussen, & Pedersen, 2016), tables in the file geodatabase at time of preparation of this deliverable can be seen in Table 13.
Table 13 Tables in Calc file geodatabase for rail freight

<table>
<thead>
<tr>
<th>TableName</th>
<th>Feature-Dataset</th>
<th>Type</th>
<th>Explanation</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>in_RailRC_Links</td>
<td>RailRC</td>
<td>in</td>
<td>Input data</td>
<td>RailRC</td>
<td>Input common rail links</td>
</tr>
<tr>
<td>in_RailFreightRC_TerminalConnectors</td>
<td>RailFreightFDS</td>
<td>in</td>
<td>Input data</td>
<td>RailFreightRC</td>
<td>TerminalConnectors</td>
</tr>
<tr>
<td>tmp_RailFreightRC_Links</td>
<td>RailFreightFDS</td>
<td>tmp</td>
<td>Temporary data</td>
<td>RailFreightRC</td>
<td>RailFreight Links</td>
</tr>
<tr>
<td>tmp_RailFreightRC_TerminalCentroids</td>
<td>RailFreightFDS</td>
<td>tmp</td>
<td>Temporary data</td>
<td>RailFreightRC</td>
<td>TerminalCentroids</td>
</tr>
<tr>
<td>tmp_RailFreight_ND</td>
<td>RailFreightFDS</td>
<td>tmp</td>
<td>Temporary Network</td>
<td>RailFreight</td>
<td>ND</td>
</tr>
<tr>
<td>tmp_RailFreight_ND_Junctions</td>
<td>RailFreightFDS</td>
<td>tmp</td>
<td>Temporary data</td>
<td>RailFreight</td>
<td>Network Junctions</td>
</tr>
</tbody>
</table>

4.2.6 CalcRailPas.gdb

Primary use: Featureclasses and network for Rail Passenger Assignment.

Location of file Geodatabase: C:\TT\Data\Calc\CalcRailPas.gdb

The initial design for tables is described in deliverable 9.1 (Nielsen, Rasmussen, & Pedersen, 2016), tables in the file geodatabase at time of preparation of this deliverable can be seen in Table 14.

Table 14 Tables in Calc file geodatabase for rail passenger

<table>
<thead>
<tr>
<th>TableName</th>
<th>Feature-Dataset</th>
<th>Type</th>
<th>Explanation</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>in_RailRC_Links</td>
<td>RailPasFDS</td>
<td>in</td>
<td>Input data</td>
<td>RailPasRC</td>
<td>Input common rail links</td>
</tr>
<tr>
<td>in_RailPasRC_ZoneConnectors</td>
<td>RailPasFDS</td>
<td>in</td>
<td>Input data</td>
<td>RailPasRC</td>
<td>ZoneConnectors</td>
</tr>
<tr>
<td>in_RailPasRC_AirConnectors</td>
<td>RailPasFDS</td>
<td>in</td>
<td>Input data</td>
<td>RailPasRC</td>
<td>AirConnectors</td>
</tr>
<tr>
<td>tmp_RailPasRC_AllCentroids</td>
<td>RailPasFDS</td>
<td>tmp</td>
<td>Temporary data</td>
<td>RailPasRC</td>
<td>AllCentroids</td>
</tr>
<tr>
<td>tmp_RailPasRC_AllConnectors</td>
<td>RailPasFDS</td>
<td>tmp</td>
<td>Temporary data</td>
<td>RailPasRC</td>
<td>AllConnectors</td>
</tr>
<tr>
<td>in_AirRC_Airports</td>
<td>RailPasFDS</td>
<td>in</td>
<td>Input data</td>
<td>AirRC</td>
<td>Airports</td>
</tr>
</tbody>
</table>
4.2.7 CalcRoad.gdb

Primary use: Featureclasses and network for Road Assignment.

Location of file Geodatabase: C:\TT\Data\Calc\CalcRoad.gdb

The initial design for tables is described in deliverable 9.1 (Nielsen, Rasmussen, & Pedersen, 2016), tables in the file geodatabase at time of preparation of this deliverable can be seen in Table 15.

<table>
<thead>
<tr>
<th>TableName</th>
<th>Feature-Dataset</th>
<th>Type</th>
<th>Explanation</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>in_AirRC_Airports</td>
<td>RoadFDS</td>
<td>in</td>
<td>Input data</td>
<td>AirRC</td>
<td>Airports</td>
</tr>
<tr>
<td>in_RoadRC_AirConnectors</td>
<td>RoadFDS</td>
<td>in</td>
<td>Input data</td>
<td>RoadRC</td>
<td>AirConnectors</td>
</tr>
<tr>
<td>in_RoadRC_Links</td>
<td>RoadFDS</td>
<td>in</td>
<td>Input data</td>
<td>RoadRC</td>
<td>Links</td>
</tr>
<tr>
<td>in_RoadRC_TerminalConnectors</td>
<td>RoadFDS</td>
<td>in</td>
<td>Input data</td>
<td>RoadRC</td>
<td>TerminalConnectors</td>
</tr>
<tr>
<td>in_RoadRC_ZoneConnectors</td>
<td>RoadFDS</td>
<td>in</td>
<td>Input data</td>
<td>RoadRC</td>
<td>ZoneConnectors</td>
</tr>
<tr>
<td>tmp_RoadRC_AllCentroids</td>
<td>RoadFDS</td>
<td>tmp</td>
<td>Temporary data</td>
<td>RoadRC</td>
<td>AllCentroids</td>
</tr>
<tr>
<td>tmp_RoadRC_AllConnectors</td>
<td>RoadFDS</td>
<td>tmp</td>
<td>Temporary data</td>
<td>RoadRC</td>
<td>AllConnectors</td>
</tr>
<tr>
<td>tmp_RoadFDS_ND_Junctions</td>
<td>RoadFDS</td>
<td>tmp</td>
<td>Temporary data</td>
<td>RoadFDS</td>
<td>Network Junctions</td>
</tr>
<tr>
<td>tmp_RoadFDS_ND</td>
<td>RoadFDS</td>
<td>tmp</td>
<td>Temporary Network</td>
<td>RoadFDS</td>
<td>ND</td>
</tr>
</tbody>
</table>
4.2.8 **CalcRoro.gdb**

Primary use: Featureclasses for Roro freight.

Location of file Geodatabase: C:\TT\Data\Calc\CalcRoro.gdb

Tables in the file geodatabase at time of preparation of this deliverable can be seen in Table 16.

<table>
<thead>
<tr>
<th>TableName</th>
<th>Feature-Dataset</th>
<th>Type</th>
<th>Explanation</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>in_RoRo_Links</td>
<td>RoRoFDS</td>
<td>in</td>
<td>Input data</td>
<td>RoRo</td>
<td>Links</td>
</tr>
</tbody>
</table>

4.2.9 **CalcSea.gdb**

Primary use: Featureclasses and network for Sea Freight Assignment.

Location of file Geodatabase: C:\TT\Data\Calc\CalcSea.gdb

The initial design for tables is described in deliverable 9.1 (Nielsen, Rasmussen, & Pedersen, 2016), tables in the file geodatabase at time of preparation of this deliverable can be seen in Table 17.

<table>
<thead>
<tr>
<th>TableName</th>
<th>Feature-Dataset</th>
<th>Type</th>
<th>Explanation</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>in_SeaRC_Links</td>
<td>SeaFDS</td>
<td>in</td>
<td>Input data</td>
<td>SeaRC</td>
<td>Links</td>
</tr>
<tr>
<td>in_SeaRC_TerminalConnectors</td>
<td>SeaFDS</td>
<td>in</td>
<td>Input data</td>
<td>SeaRC</td>
<td>TerminalConnectors</td>
</tr>
<tr>
<td>tmp_SeaRC_LinkFlows</td>
<td>SeaFDS</td>
<td>tmp</td>
<td>Temporary data</td>
<td>SeaRC</td>
<td>LinkFlows</td>
</tr>
<tr>
<td>tmp_SeaRC_TerminalCentroids</td>
<td>SeaFDS</td>
<td>tmp</td>
<td>Temporary data</td>
<td>SeaRC</td>
<td>TerminalCentroids</td>
</tr>
<tr>
<td>tmp_SeaFDS_ND</td>
<td>SeaFDS</td>
<td>tmp</td>
<td>Temporary Network</td>
<td>SeaFDS</td>
<td></td>
</tr>
<tr>
<td>tmp_SeaFDS_ND_Junctions</td>
<td>SeaFDS</td>
<td>tmp</td>
<td>Temporary data</td>
<td>SeaFDS</td>
<td>Network Junctions</td>
</tr>
</tbody>
</table>
5. References


*Transtools-3 (266182) 2016-02-11, "Research and development of the European Transport Network Model - Transtools version 3", Annex I - Description of work.*