

## SUBPART ONE

# **Input Data Preparation**



## CHAPTER 6

# MATSim Data Containers

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### 6.1 Time-Dependent Network

The network container was already described in Section 4.1.1. An important additional feature of the network module is using time-dependent network attributes. Network state changes can thus be considered, as e.g., implied by accidents, or adaptive traffic control, with varying speed limits or driving directions of lanes on multi-lane roads with heavily unbalanced loads over the course of a day. Attributes that can be adapted are “free speed”, “number of lanes” and “flow capacity”.

The adaptation can be specified by adding the following two lines to the network config file section:

```
<param name="timeVariantNetwork" value="true" />
<param name="inputChangeEventsFile"
  value="path_to_change_events_file" />
```

An example snippet setting the free speed of three network links to zero looks something like this:

```
<networkChangeEvent startTime="03:06:00">
  <link refId="12487"/>
  <link refId="12489"/>
  <link refId="12491"/>
  <freespeed type="absolute" value="0.0"/>
</networkChangeEvent>
```

For a working example, see the file `networkChangeEvents.xml` in the `examples/equil-extended` directory in the MATSim directory tree.

Alternatively, network change events can be added directly to the code. An example can be found in the `RunTimeDependentNetworkExample` class under <http://matsim.org/javadoc> → main distribution.

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#### How to cite this book chapter:

Rieser, M, Nagel, K and Horni, A. 2016. MATSim Data Containers. In: Horni, A, Nagel, K and Axhausen, K W. (eds.) *The Multi-Agent Transport Simulation MATSim*, Pp. 55–60. London: Ubiquity Press. DOI: <http://dx.doi.org/10.5334/baw.6>. License: CC-BY 4.0

Note that change values of type absolute need to be given in SI units, which means speeds in meters per second and flow capacities in vehicles per second.

## 6.2 Person Attributes and Subpopulations

The population container was also already discussed earlier, in Section 4.1.2. A powerful extension of a standard population can be achieved by specifying further agent attributes in an `ObjectAttributes` file input to MATSim by the parameter `inputPersonAttributesFile`.

See <http://matsim.org/javadoc> → main distribution → `RunSubpopulationsExample` class for an example. That example looks as if coding in Java is necessary, but this is really not the case; Java is just used to generate the subpopulations, which could also be done by other means.

## 6.3 Counts

By providing a counts input file and configuring the counts config file section, MATSim plots link volume comparisons between hourly simulated and counted values for motorized individual traffic (Horni and Grether, 2007).

Simulating sample populations requires scaling simulated volumes by the `countsScaleFactor` parameter, e.g., for a 10 % population this parameter needs to be set to 10.

**Input** The following listing shows an example of a `counts.xml` input file required for traffic count comparisons.

```
<?xml version="1.0" encoding="UTF-8"?>
<counts name="example" desc="example counting stations" year="2015">
  <count loc_id="2" cs_id="005">
    <volume h="1" val="10.0"></volume>
    <volume h="2" val="1.0"></volume>
    <volume h="3" val="2.0"></volume>
    <volume h="4" val="3.0"></volume>
    <volume h="5" val="4.0"></volume>
    <volume h="6" val="5.0"></volume>
    <volume h="7" val="6.0"></volume>
    <volume h="8" val="7.0"></volume>
    <volume h="9" val="8.0"></volume>
    <volume h="10" val="9.0"></volume>
    <volume h="11" val="10.0"></volume>
    <volume h="12" val="11.0"></volume>
    <volume h="13" val="12.0"></volume>
    <volume h="14" val="13.0"></volume>
    <volume h="15" val="14.0"></volume>
    <volume h="16" val="15.0"></volume>
    <volume h="17" val="16.0"></volume>
    <volume h="18" val="17.0"></volume>
    <volume h="19" val="18.0"></volume>
    <volume h="20" val="19.0"></volume>
    <volume h="21" val="20.0"></volume>
    <volume h="22" val="21.0"></volume>
    <volume h="23" val="22.0"></volume>
    <volume h="24" val="23.0"></volume>
  </count>
</counts>
```

For a working example, check the `examples/equil` directory in the MATSim directory tree (cf. Section 2.1.1).

It starts with a header containing general descriptive information about the counts, including a year to describe how current the data is. Next, for each link having real world counts data, hourly

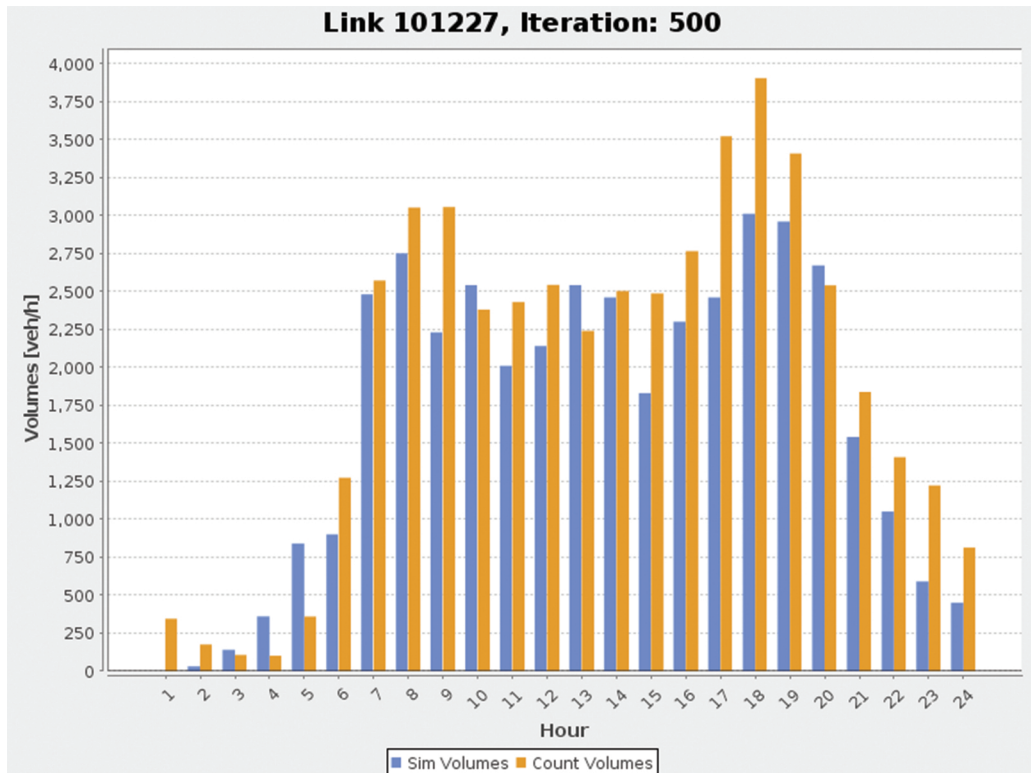
volumes can be specified. The network-link is referenced by the `loc_id` attribute; in the example, it is link 2. The attribute `cs_id` (counting station identifier) can be used to store an arbitrary description of the counting station. Most often, it is used to note the original real world counting station to simplify future data comparison. The hourly volumes, specified by the hour of the day and its value, are optional: That is, a value does not have to be given for every hour. If, for a counting station, data is only available for certain hours of the day (e.g., only during peak hours), it is possible to omit the other hours from the XML listing. Note that the first hour of the day, from 0:00 am to 1:00 am, is numbered as “1”, and *not* by “0” as is often the case in computer science.

**Output** The counts module prints overview summaries for the whole network, but also analyzes for individual links. Also, a google maps-based visualization is available, showing each station with a its load curve (see the example in Figure 6.1) in a pop-up window.

Balmer et al. (2009a) have performed link volume comparisons for the Zürich scenario, with data based on city level, cantonal level and national level (ASTRA, 2006). Usually, it is helpful to exclude a substantial part of the outer range of the modeled study region in order to remove boundary effects.

## 6.4 Facilities

Facilities are an optional element of MATSim; some modules, such as the destination innovation module (Chapter 27), depend on it. If MATSim facilities are used, agents perform their activities in a specific facility attached to a network link.



**Figure 6.1:** Example for a link volumes comparison between simulation and road count values.

Facilities are included in the scenario by defining the facilities config file section and providing a facilities file, approximately as follows.

```
...
<facilities name="test facilities for triangle network">
  <facility id="1" x="60.0" y="110.0">
    <activity type="home" />
  </facility>
  <facility id="10" x="110.0" y="270.0">
    <activity type="education" />
  </facility>
</facilities>
```

An example is given in <http://matsim.org/javadoc> → main distribution → RunWithFacilitiesExample class.

In addition to activities that can be done in the facility, further location attributes, such as opening times, can be specified. A working facilities example file can be found in the MATSim directory tree in the examples/siouxfalls-2014 directory.

Facilities are mostly used by the MATSim Zürich group, in particular in the Zürich scenario, where they are derived from the Federal Enterprise Census 2001 (Swiss Federal Statistical Office (BFS), 2001) providing hectare level information. Detailed technical description of facilities generation is given by Meister (2008). Comparable data is available in most countries from official sources, such as censuses, and commercial sources, such as navigation network providers, yellow pages publishers or business directories, and last but not least google and OSM (OpenStreetMap, 2015).

Note that loading a facilities file into MATSim by itself does not mean they will be used; the functionality needs to be switched on by other means. Currently, this is only possible by using some class with a main method.

## 6.5 Households

Households are another optional element of MATSim. To load households into a scenario, the config file must contain a section households. This section should specify the paths to a file containing households (parameter inputFile) and a file containing further household attributes (parameter inputHouseholdAttributesFile).<sup>1</sup>

Again, loading the households file does not mean that it is used anywhere in the code; such functionality needs to be switched on separately. Currently, no such functionality can be switched on from the config file alone.

## 6.6 Vehicles

Vehicles are an optional element of MATSim. To load vehicles into a scenario, a config section

```
<module name="vehicles" >
  <param name="vehiclesFile" value="/path/to/vehicles.xml.gz" />
</module>
```

needs to be added.<sup>2</sup>

<sup>1</sup> There used to be an additional "useHouseholds" config switch. In release 0.8.x, that switch will be gone.

<sup>2</sup> There used to be an additional "useVehicles" config switch. In release 0.8.x, that switch will be gone.

Once more, just loading the vehicles does not use them; that needs to be configured separately. See Section 11.1 for details.

## 6.7 Scenario

Scenario is a super-container containing all the other data containers, accessible, for example, as `scenario.getNetwork()`. It used to have configuration options, but these are all gone now, so Scenario is only visible once you are programming in Java.

