

Guide on UrbanSim usage of the travel model plug-in

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Note that the current travel model plug-in implementation is applicable for PSRC¹ parcel, Seattle parcel and Zurich parcel scenario.

Please check for the latest version of this user guide in the subdirectory *opus-matsim/docs* in your opus source directory. Some of the instructions will change until the travel model plug-in final release.

1 Prerequisites

You must have installed UrbanSim, before getting started with the travel model plug-in. The following provides an entry point to install UrbanSim and continues with installation instructions for additional software packages required by the travel model plug-in.

1.1 Hints for installing UrbanSim

To install UrbanSim please follow the *UrbanSim Downloads and Installation Instructions* on <http://urbansim.org/Download/>.

When installing OPUS and UrbanSim manually² please make sure to get the source code for the latest stable release from <https://svn.urbansim.org/src/tags/latest-stable-release/> as described in *Getting the Sample Data and Source Code for Stable Release* on:

<http://urbansim.org/Download/DownloadingSampleDataAndSourceCode>.

Windows users using the installer automatically get the source code for the stable release.

Finally make sure that all UrbanSim environment variables, meaning *OPUS_HOME*, *OPUS_DATA_PATH* and *PYTHONPATH*, are set as described in the installation instructions, see <http://urbansim.org/Download/SixtyFourBitMachines> for Windows, <http://urbansim.org/Download/MacintoshInstallation> for Mac or <http://urbansim.org/Download/LinuxInstallation> for Linux.

Note for users installing UrbanSim manually: For using the travel model plug-in it is sufficient only to install the *required* Python packages, i. e. numpy, scipy, lxml, sqlalchemy and elixir.

¹Puget Sound Region Council

²Windows users may require an additional svn client, e. g. tortoiseshvn that is available for free at <http://tortoiseshvn.tigris.org/>

1.2 MATSim4UrbanSim prerequisites

In addition to the UrbanSim installation the MATSim travel model plug-in requires the following software installed:

- **Java JDK 1.6 or newer:** Download and install the newest version of the *Java SE Development Kit (JDK)* for your operating system from <http://www.oracle.com/technetwork/java/javase/downloads/index.html>.

Make sure adding Java's */bin* directory to the *PATH* environment variable.

- **Python XML Schema Bindings (PyXB):** Download the PyXB distribution file from <http://sourceforge.net/projects/pyxb/> and extract it to a convenient place. Windows users may use Win-Rar to extract tar or gz files, which is available for free at www.win-rar.com/download.

Open a command prompt (Windows) or a terminal (Mac, Linux), go into the extracted directory and type

```
python setup.py install
```

to install PyXB (this may requires administrator or root privileges).

- **Python for Windows extensions (optional):** Installing this extension is optional and only concerns Windows users who wish to use the MATSimUrbanSim installer (see Section 2.1).

To download the python extension (pywin32) go to <http://sourceforge.net/projects/pywin32/files/pywin32/>. Select the latest pywin32 version, than choose the right installer executable that corresponds to the Python you have installed (e.g. if you have a 64bit Windows but a 32bit Python you must install the 32bit version of pywin32).

To install the extensions execute the downloaded installer (this may requires administrator privileges).

2 MATSim4UrbanSim installation

This section describes how to install MATSim4UrbanSim. For more information about MATSim please visit www.matsim.org.

2.1 Automatic installation

Note for Windows users: Make sure to have *Python for Windows extensions* installed in order to use the MATSim4UrbanSim installer (see Section 1.2).

Make sure to have the Python lib directory included to the *PYTHONPATH*. This is the directory that contains the site-package directory that is already included in the *PYTHONPATH*. The lib directory should be something like

```
/Library/Frameworks/Python.framework/Versions/2.6/lib
```

for Mac or

```
C:\Python2.6\libs
```

for Windows.

To install MATSim4UrbanSim open command prompt (Windows) or a terminal (Mac, Linux) and navigate to *opus_matsim/configs* in the opus source directory (*PYTHON-PATH*). Then type

```
python install_matsim4urbansim.py
```

This creates the subdirectories *matsim4opus/jar*, loads required MATSim executables and libraries and configures them. After the installation the file/directory structure should look something like Figure 1.

To test whether the MATSim4UrbanSim installation was successful follow the instructions described in Section 2.3.

Note: This installer also updates existing MATSim4UrbanSim executables and libraries. In this case older executables still remain and are not removed, older libraries will be replaced.

2.2 Manual installation

In case that the automatic installation does not work follow these instructions:

- Go into OPUS_HOME directory and create the subdirectories *matsim4urbansim/jar*.
- Download the following files from <http://www.matsim.org/files/builds/> into the *matsim4urbansim/jar* directory:
 - MATSim_rXXXXX.jar (where XXXXX refers the current revision)
 - MATSim_libs.zip
 - matsim4urbansim-0.4.0-SNAPSHOT-rXXXXX.zip (where XXXXX refers the current revision)
- Extract the zip files MATSim_libs.zip and matsim4urbansim-0.4.0-SNAPSHOT-rXXXXX.zip directly into *matsim4urbansim/jar*. After that the zip files can be removed.
- Go into the *matsim4urbansim/jar* directory and create a symbolic link (Mac, Linux) or short cut (Windows) for *matsim4urbansim-0.4.0-SNAPSHOT.jar* located in the extracted *matsim4urbansim-0.4.0-SNAPSHOT-rXXXXX* directory. Name the symbolic link or short cut “*matsim4urbansim.jar*”.
- Also create a symbolic link or short cut for *MATSim_rXXXXX.jar* in the *matsim4urbansim/jar* directory named “*matsim.jar*”.

After the installation the file/directory structure in *matsim4opus/jar* should look something like Figure 1. To test whether the MATSim4UrbanSim installation was successful follow the instructions described in Section 2.3.

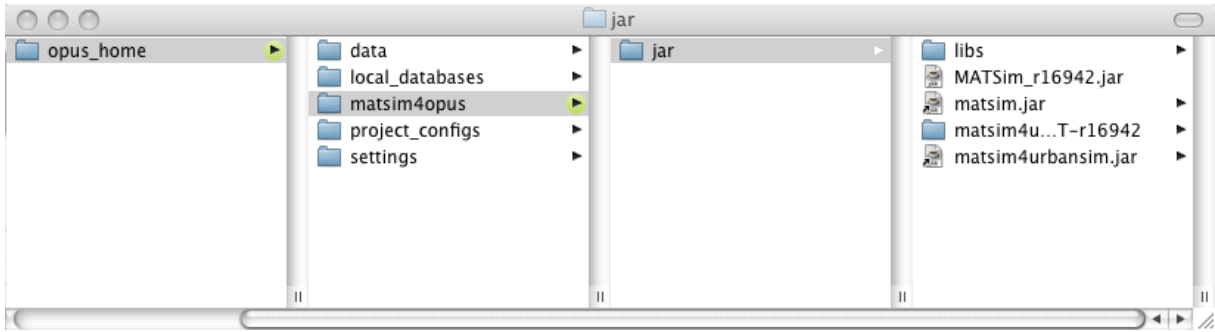


Figure 1: The *matsim4opus/jar* directory should contain the depicted files and subdirectories after the installation.

2.3 Test your MATSim4UrbanSim installation

To test your installation open a command prompt (Windows) or a terminal (Mac, Linux) and navigate to *opus_matsim/tests* in the opus source directory (PYTHONPATH). Then type

```
python travel_model_test.py
```

This starts a test scenario. If the test completes without errors, your travel model plug-in should be working.

3 Using MATSim for UrbanSim

In a recent effort the MATSim configuration is embedded into UrbanSim. All necessary or basic options to run MATSim can be now configured via OPUS GUI. This requires the *travel_model_configuration* section in the UrbanSim configuration as depicted in Figure 2 to enable the MATSim configuration.

Sample configurations, including the travel model configuration section, can be found for the Seattle_parcel (seattle_parcel.xml) and PSRC_parcel (psrc_parcel.xml) scenario in the opus source directory (PYTHONPATH) at *opus_matsim/configs*.

The following subsection explain how to configure the travel model plug-in at the example of the Seattle_parcel scenario.

3.1 Travel Model configuration options

This sections explains step by step the MATSim configuration options provided by the travel model plug-in.

Launch the OPUS GUI and open the Seattle_parcel sample configuration located at *opus_matsim/config/seattle_parcel.xml* in opus source directory. Switch to the *Models* tab to get to the *travel_model_configuration* section as shown in Figure 3. The following options are available:

```

<travel_model_configuration type="dictionary">
  <models type="selectable_list">
    <selectable name="opus_matsim.models.get_cache_data_into_matsim" type="selectable">True</selectable>
    <selectable name="opus_matsim.models.run_travel_model" type="selectable">True</selectable>
    <selectable name="opus_matsim.models.get_matsim_data_into_cache" type="selectable">True</selectable>
  </models>
  <matsim4urbansim type="dictionary">
    <sampling_rate type="float">0.01</sampling_rate>
  </matsim4urbansim>
  <matsim_config type="dictionary">
    <common type="dictionary">
      <matsim_network_file type="file">matsim4opus/data/psrc/network/psrc.xml.gz</matsim_network_file>
      <last_iteration type="integer">1</last_iteration>
    </common>
  </matsim_config>
  <years_to_run key_name="year" type="category_with_special_keys">
    <run_description type="dictionary">
      <year type="integer">2001</year>
    </run_description>
  </years_to_run>
</travel_model_configuration>

```

Figure 2: Adding the *travel_model_configuration* section into an UrbanSim configuration enables MATsim configuration options within OPUS GUI.

- **Models:** The models section contains tree models integrating MATSim into UrbanSim:
 - *Get_cache_data_into_matsim* generates input data for MATSim and stores it a specified location.
 - *Run_travel_model* executes MATSim.
 - *Get_matsim_data_into_cache* imports the results of the traffic simulation for the next UrbanSim iteration.

By default all models are enabled. Only disable models if you know what you are doing.

- **MATSim4UrbanSim:** This section contains options concerning the interaction of both simulation models MATSim and UrbanSim.
 - The *sampling_rate* determines the percentage of considered travellers for a MATSim run. 0.01 means that only one percent of travelers are considered for the traffic simulation. This option allows to speed up computations on the MATSim side, e. g. during testing a scenario.
Note that low sampling rates cause some peculiarities in terms of realism. In this situation results are useful for sketch planning only, not fore quantitative analysis. Higher sampling rates need more ram and hard drive space.
- **MATSim_Config:** The *common* subsection provides some basic configuration option for MATSim.
 - The *matsim_network_file* points, as the name implies, to a road network in MATSim format. This expects a relative path to the network file located in the OPUS_HOME directory.
 - Determine the number of MATSim iterations with the item *last_iteration*. In MATSim iterations start at zero.

- **Years_To_Run:** This defines the years in which the travel model should run.

Adding additional years requires to edit the configuration file directly, e. g. with a xml editor, within the *year_to_run* section in the *travel_model_configuration*. Make sure that each year you are adding is surrounded by the *run_description* tags like this:

```
<run_description type="dictionary">
  <year type="integer">2002</year>
</run_description>
```

All configuration options can be easily edited in the OPUS GUI by clicking on the value or check box on the right hand side.

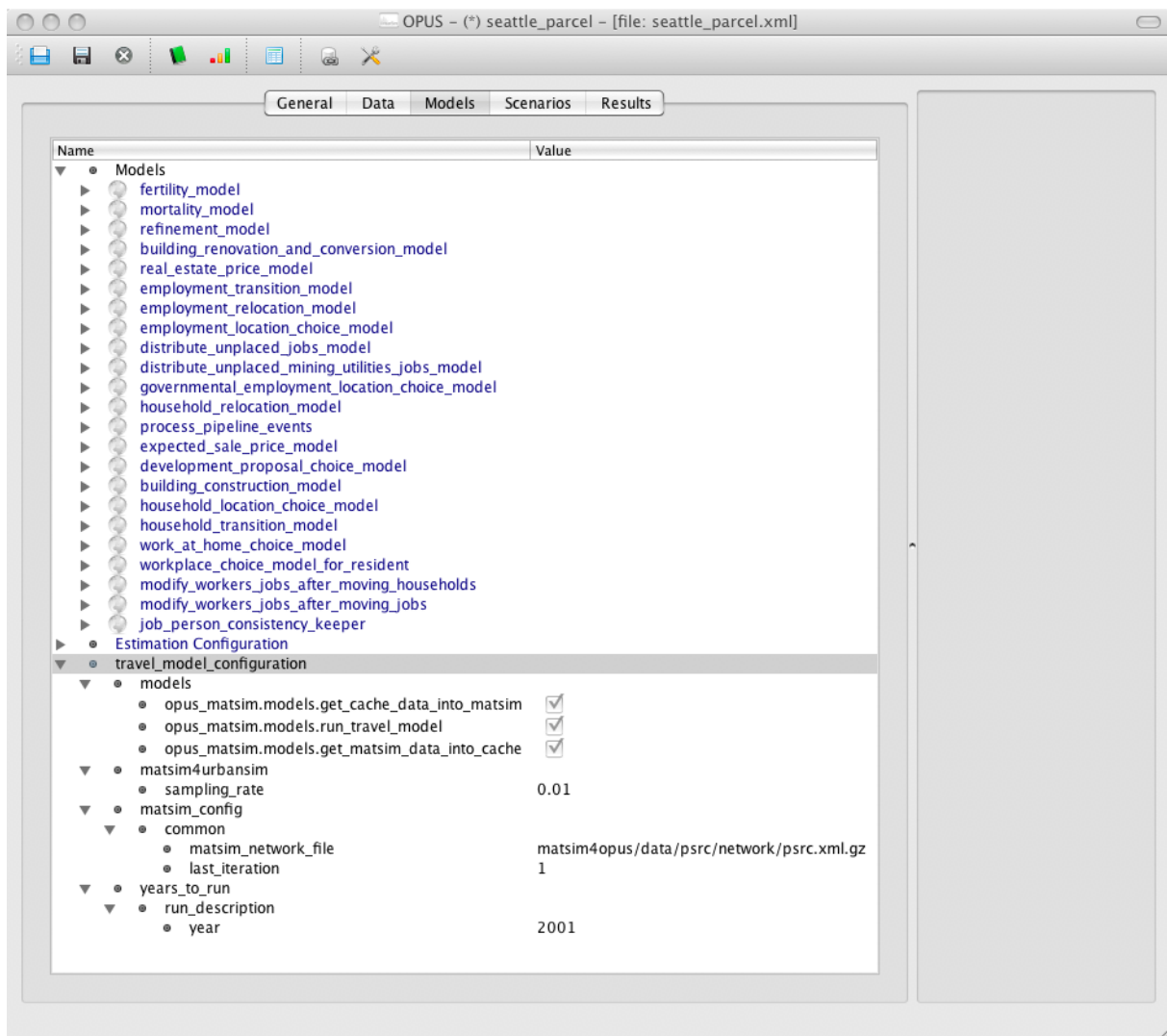


Figure 3: Configuring MATSim via the *travel_model_configuration* section in OPUS GUI.

4 Limitations

The Java virtual machine (VM) can't allocate more than 1.5 GB on Windows systems, no matter how much RAM is available in your computer. For this reason the travel model

plug-in runs MATSim with 1.5 GB on Windows and with 2 GB on Mac and Linux systems by default. This may cause longer computing times on Windows computers.