# SUMO - More on... Software Tests

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# Chapter 1. Introduction

## Document Information

This document is a part of *SUMO* - *S*imulation of *U*rban *MO*bility. SUMO is an open source microscopic road traffic simulation. It can be found under http://sumo.sourceforge.net/.

This document fits to version 0.9.5. We will try to keep it up-to-date with the next versions.

## Document Scope

Since version 0.9.3 we support some basic tests which prove the software functionality. The number of the available tests is not that large, yet, but it will hopefuly grow with time. Ths chapter describes how to set up the testing system and how to use it.

## Document Audience

This document contains information for *developers* who extend SUMO and want to assure their changes work properly.

## Document Structure

At first, the acceptance tests that come with the package are described.

# Chapter 2. Acceptance Testing using TextTest

## About

We use "TextTest [http://texttest.carmen.se/]" to test whether the sosftware still behaves as expected. What this application does is simply to compare an application's output (both normal and errors) and optionally also the files written by the application with previously generated files.

There are some advantages and disadvantages of this approach. On the one hand, you can guarantee that the application is doing what is wanted by comparing all outputs with files you think are right. But this is also the problem with this approach: you do not have the assurance that the files you are comparing the current outputs to ARE right - you have to check these by hand.

Anyhow, for the current progress stage, this approach should be used, because a) the tests are quite small and errors can be easily seen b) it is working.

## Install

At first, you have to download and install "TextTest [http://texttest.carmen.se/]" from http://texttest.carmen.se/. The installation seems to be not that easy at first, but if you just follow the steps described in TestText's documentation, you'll have the system up and running in some minutes. Before continuing, please check whether the tests included with the TextTest distribution run before proceeding.

After installing TextTest, you have to set an environment variables in order to make the system run:

- `TEXTTEST_HOME`

  Set it to the path SUMO-tests are located in (`<SUMO_DIST>/tests` for the tests that come with the distribution)

This environment variable forces TextTest to use the specified directory as source of tests.

This should be all on installing the tests-subsystem so far...

## Running the Tests

Within the `<SUMO>/tests` - folder you can find batch-files which start TextTest. "runAllTests.bat" starts TextTest for testing all apllications located in the folder, "`runNetconvertTests.bat`" will only show tests for NETCONVERT, "`runDuarouterTests.bat`" only those for DUAROUTER etc.

## Setting up new Tests

Please follow the instructions for TextTest. In the following, the TextTest configuration for each application will be discussed.

## Coverage

As said before, further tests have to be added. The following tests are currently available:

# DFROUTER

### Table 2.1. Tests for DFROUTER

| **Test Set Description** | |
|---|---|
| *Tests whether showing meta-information works* | |
| **Path** | **Description** |
| `dfrouter/meta/help` | checks whether printing help works |
| `dfrouter/trips/noop` | checks what happens when no argument is given |
| | |
| *Checks whether the detector types are computed properly* | |
| **Path** | **Description** |
| `dfrouter/detector_types/messstrecke` | Example using the dlr-testtrack |
| | |
| *Checks whether the detector pois are written correctly* | |
| **Path** | **Description** |
| `dfrouter/detector_pois/messstrecke` | Example using the dlr-testtrack |
| | |
| *Checks whether the routes are computed correctly* | |
| **Path** | **Description** |
| `dfrouter/routes/messstrecke` | Example using the dlr-testtrack |
| | |
| *Checks whether error handling works* | |
| **Path** | **Description** |
| `dfrouter/errors/false_net` | Tests what happens if an unknown network is passed |
| `dfrouter/errors/no_output` | Tests what happens if no output is given |
| `dfrouter/errors/unknown_option` | Tests what happens if an unknown option is passed |
| | |

Recent changes:

- Test for `--version` was removed in version 0.9.5

# DUAROUTER

### Table 2.2. Tests for DUAROUTER

| **Test Set Description** | |
|---|---|
| *Tests whether showing meta-information works* | |
| **Path** | **Description** |
| `duarouter/meta/help` | checks whether printing help works |
| `duarouter/trips/noop` | checks what happens when no argument is given |
| | |
| *Checks whether the import of route alternatives works* | |

| **Test Set Description** | |
|---|---|
| **Path** | **Description** |
| `duarouter/alternat-ives/increasing_time` | plain old style alternatives with increasing departue time |
| `duarouter/alternat-ives/newstyle_colorcheck` | as below, but color information is provided |
| `duarouter/alternat-ives/newstyle_noid_increasing_time` | new style alternatives with increasing departure times |
| `duarouter/alternat-ives/newstyle_noid_one_time` | new style alternatives with one departure time |
| `duarouter/alternat-ives/newstyle_noid_unsorted_time` | new style alternatives with random departure time with and `--unsorted` set |
| `duarouter/alternat-ives/newstyle_with_vehtype` | `newstyle_noid_increasing_time`, but a (defined) vehicle type is used |
| `duarouter/alternat-ives/newstyle_with_vehtype_nodef` | `newstyle_noid_increasing_time`, but an (undefined) vehicle type is used |
| `duarouter/alternat-ives/new-style_with_vehtype_with_class` | `newstyle_with_vehtype`, but the vehicle type has a class |
| `duarouter/alternatives/one_time` | plain old style alternatives with one departue time |
| `duarouter/alternatives/unsorted_time` | plain old style alternatives with random departure time and `--unsorted` set |
| *Checks whether the import of flows works* | |
| **Path** | **Description** |
| `duarouter/flows/flows2routes` | simple test with 100 vehicles and one departure time |
| `duarouter/ flows/flows2routes_100s_interval` | simple test with 100 vehicles with departure interval between 0 and 100s |
| `duarouter/ flows/flows2routes_100s_interval_ext` | The same as flows2routes_100s_interval but the interval is specified using an enclosing element |
| `duarouter/ flows/ flows2routes_100s_interval_typedefin ed` | flows2routes_100s_interval, but with a defined vehicle type |
| `duarouter/ flows/ flows2routes_100s_interval_withcolor` | flows2routes_100s_interval, but with an additional color information |
| `duarouter/ flows/ flows2routes_100s_interval_withtype` | flows2routes_100s_interval, but with an undefined vehicle type |
| `duarouter/ flows/ flows2routes_100s_interval_withtype_ withclass` | flows2routes_100s_interval_typedefined,but the vehicle type has a class |
| `duarouter/ flows/flows2routes_200s_interval` | simple test with 100 vehicles with departure interval between 0 and 200s |
| `duarouter/ flows/flows2routes_200s_interval_ext` | The same as flows2routes_200s_interval but the interval is specified using an enclosing element |
| `duarouter/ flows/ flows2routes_100s_interval_withcolor` | Checks whether defining colors works |
| `duarouter/ flows/ flows2routes_100s_interval_withtype` | Checks whether a given type is passed further |

| **Test Set Description** | |
|---|---|
| **Path** | **Description** |
| `duarouter/flows/flows2routes_100s_interval_typedefined` | Checks whether a defined type is passed further |
| `duarouter/flows/flows2routes_100s_interval_withtype_withclass` | flows2routes_100s_interval_typedefined, but the vehicle type has a class |
| | |
| *Checks whether the import of trips works* | |
| **Path** | **Description** |
| `duarouter/trips/increasing_time` | 100 trips, departure time is increasing |
| `duarouter/trips/increasing_time_notype` | same as increasing_time, but no type is given in the trips |
| `duarouter/trips/increasing_time_typedefined` | same as increasing_time, but a type is given and defined in the trips |
| `duarouter/trips/increasing_time_typedefined_withclass` | same as increasing_time_typedefined, but the type has a class |
| `duarouter/trips/increasing_time_unsorted` | same as increasing_time, but with `--unsorted` set |
| `duarouter/trips/increasing_time_withcolor` | same as increasing_time, a color is given partially |
| `duarouter/trips/one_time` | 100 trips, one departure time |
| `duarouter/trips/one_time_notype` | same as increasing_time, but no type is given in the trips |
| `duarouter/trips/one_time_typedefined` | same as increasing_time, but a type is given and defined in the trips |
| `duarouter/trips/one_time_unsorted` | the same, but with `--unsorted` set |
| `duarouter/trips/unsorted_time` | 100 trips, random departure time, `--unsorted` set |
| `duarouter/trips/unsorted_time_notype` | same as unsorted_time, but no type is given in the trips |
| `duarouter/trips/unsorted_time_typedefined` | same as unsorted_time, , but a type is given and defined in the trips |
| | |
| *Checks whether the import of routes (SUMO) works* | |
| **Path** | **Description** |
| `duarouter/routes/increasing_time` | 100 routes (old style), departure time is increasing |
| `duarouter/routes/one_time` | 100 routes (old style), one departure time |
| `duarouter/routes/unsorted_time` | 100 routes (old style), random departure time, `--unsorted` set |
| `duarouter/routes/newstyle_withid_increasing_time` | 100 routes (new style, routes have an id), departure time is increasing |
| `duarouter/routes/newstyle_withid_one_time` | 100 routes (new style, routes have an id), one departure time |
| `duarouter/routes/newstyle_withid_unsorted_time` | 100 routes (new style, routes have an id), random departure time, `--unsorted` set |
| `duarouter/routes/newstyle_noid_increasing_time` | 100 routes (new style, routes have no id), departure time is increasing |

| **Test Set Description** | |
|---|---|
| **Path** | **Description** |
| `duarouter/routes/newstyle_noid_one_time` | 100 routes (new style, routes have no id), one departure time |
| `duarouter/routes/newstyle_noid_increasing_time` | 100 routes (new style, routes have no id), increasing departure time |
| `duarouter/routes/newstyle_noid_unsorted_time` | 100 routes (new style, routes have no id), random departure time, `--unsorted` set |
| `duarouter/routes/newstyle_increasing_colors` | same as newstyle_noid_increasing_time, but colors are supplied partially |
| `duarouter/routes/newstyle_with_vehtype` | Another (!!!) color check |
| `duarouter/routes/newstyle_with_vehtype` | newstyle_withid_one_time, but the with a defined vehicle type |
| `duarouter/routes/newstyle_with_vehtype_nodef` | newstyle_withid_one_time, but the with an undefined vehicle type |
| `duarouter/routes/new-style_with_vehtype_withclass` | newstyle_with_vehtype, but the vehicle type has a class |
| | |
| *Checks whether the DUA works* | |
| **Path** | **Description** |
| `duarouter/dua/newstyle_dua3s_step1` | the first step of the dua3s-example using current (new style) output; converts trips to routes and alternatives |
| `duarouter/dua/newstyle_dua3s_step2` | the second step of the dua3s-example using current (new style) output; converts alternatives from step 1 to routes and alternatives using weights |
| `duarouter/dua/newstyle_dua3s_step3` | the third step of the dua3s-example using current (new style) output; converts alternatives from step 2 to routes and alternatives using weights |
| `duarouter/dua/oldstyle_dua3s_step2` | the second step of the dua3s-example using old (style) output; converts alternatives from step 1 to routes and alternatives using weights |
| `duarouter/dua/oldstyle_dua3s_step3` | the third step of the dua3s-example using old (style) output; converts alternatives from step 2 to routes and alternatives using weights |
| | |
| *Checks whether error handling works* | |
| **Path** | **Description** |
| `duarouter/errors/no_net` | Tests what happens if the net is not given |
| `duarouter/errors/false_net` | Tests what happens if the net is not available |
| `duarouter/errors/no_output` | Tests what happens if the output is not given |
| `duarouter/errors/false_output` | Tests what happens if the output can not be written |
| `duarouter/errors/no_input` | Tests what happens if the input is not given |
| `duarouter/errors/unknown_option` | Tests what happens if an unknown option is passed |
| | |

Recent changes:

- Test for `--version` was removed in version 0.9.5

# JTRROUTER

### Table 2.3. Tests for JTRROUTER

| **Test Set Description** | |
|---|---|
| *Tests whether showing meta-information works* | |
| **Path** | **Description** |
| `dfrouter/meta/help` | checks whether printing help works |
| `dfrouter/trips/noop` | checks what happens when no argument is given |
| *Checks plain functioning* | |
| **Path** | **Description** |
| `dfrouter/plain/plain` | A basic test |
| `dfrouter/plain/no_turnarounds` | As plain, but turning around is prohibited (by setting the probability to zero) |
| `dfrouter/plain/straight_only` | As plain, but only moving forward is allowed (by setting all other probabilities to 0) |
| `dfrouter/plain/straight_only` | As straight_only, but the ending edge is a sink |
| *Checks whether the processing of turn definitions works* | |
| **Path** | **Description** |
| `dfrouter/turns/definite_xml` | Description of two routes using turn definitions in XML |
| `dfrouter/turns/definite_csv` | Description of two routes using turn definitions in CSV |
| *Checks whether error handling works* | |
| **Path** | **Description** |
| `dfrouter/errors/no_net` | Tests what happens if the net is not given |
| `dfrouter/errors/false_net` | Tests what happens if the net is not available |
| `dfrouter/errors/no_output` | Tests what happens if the output is not given |
| `dfrouter/errors/false_output` | Tests what happens if the output can not be written |
| `dfrouter/errors/no_input` | Tests what happens if the input is not given |
| `dfrouter/errors/unknown_option` | Tests what happens if an unknown option is passed |

Recent changes:

- Test for `--version` was removed in version 0.9.5

# NETCONVERT

### Table 2.4. Tests for NETCONVERT

| **Test Set Description** | |
|---|---|
| *Tests whether showing meta-information works* | |
| **Path** | **Description** |
| `netconvert/meta/help` | checks whether printing help works |
| `netconvert/trips/noop` | checks what happens when no argument is given |
| *Checks whether --speed-in-kmh works (in XML)* | |
| **Path** | **Description** |
| `netconvert/XML2/speed_in_kmh/cross_notypes_kmh` | no types, speed in kmh |
| `netconvert/XML2/speed_in_kmh/cross_notypes_kmh_v` | the same, with verbose output |
| `netconvert/XML2/speed_in_kmh/cross_usingtypes_kmh` | types, speed in kmh |
| `netconvert/XML2/speed_in_kmh/cross_usingtypes_kmh_v` | the same, with verbose output |
| | |
| *Checks whether types may be used to describe edges (in XML)* | |
| **Path** | **Description** |
| `netconvert/XML2/types/cross_notypes` | no types |
| `netconvert/XML2/types/cross_notypes_v` | the same, with verbose output |
| `netconvert/XML2/types/cross_usingtypes` | with types |
| `netconvert/XML2/types/cross_usingtypes_v` | the same, with verbose output |
| | |
| *Checks whether description of edge shapes works (in XML)* | |
| **Path** | **Description** |
| `netconvert/XML2/shapes/hokkaido-japan` | a simple test for the hokkaido-network |
| | |
| *Checks whether setting connections and disabling addition of turnaround work* | |
| **Path** | **Description** |
| `netconvert/XML2/connections/cross3l_edge2edge_conns` | a simple test for setting connections edge-wise |
| `netconvert/XML2/connections/cross3l_lane2lane_conns` | a simple test for setting connections lane-wise |
| `netconvert/XML2/connections/cross3l_no_turnarounds` | a simple test to check whether appending turnarounds may be disabled |
| | |
| *Checks whether error handling works* | |
| **Path** | **Description** |
| `netconvert/errors/false_output` | Tests what happens if the output can not be written |

| Test Set Description | |
|---|---|
| **Path** | **Description** |
| `netconvert/errors/no_output` | Tests what happens if no output is given |
| `netconvert/errors/xml_false_edg` | Tests what happens if xml-edges can not be read |
| `netconvert/errors/xml_no_edg` | Tests what happens if no xml-edges are given |
| `netconvert/errors/xml_false_nod` | Tests what happens if xml-nodes can not be read |
| `netconvert/errors/xml_no_nod` | Tests what happens if no xml-nodes are given |
| `netconvert/errors/unknown_option` | Tests what happens if an unknown option is passed |
| | |

Recent changes:

- Test for `--version` was removed in version 0.9.5

# SUMO

### Table 2.5. Tests for SUMO

| Test Set Description | |
|---|---|
| *Tests whether showing meta-information works* | |
| **Path** | **Description** |
| `sumo/meta/help` | checks whether printing help works |
| `sumo/trips/noop` | checks what happens when no argument is given |
| | |
| *Checks whether routes are read* | |
| **Path** | **Description** |
| `sumo/routes/new_style` | checks whether newstyle routes are read properly |
| `sumo/routes/old_style` | checks whether oldstyle routes are read properly |
| | |
| *Checks whether outputs are generated properly* | |
| **Path** | **Description** |
| `sumo/routes/output/cross3ltl_emissions` | checks whether emissions are written |
| `sumo/routes/output/cross3ltl_meandata_edges` | checks whether mean data are written (edge-based) |
| `sumo/routes/output/cross3ltl_meandata_lanes` | checks whether mean data are written (lane-based) |
| `sumo/routes/output/cross3ltl_meandata_edges_constrained` | checks whether mean data can be contstrained (edge-based) |
| `sumo/routes/output/cross3ltl_meandata_lanes_constrained` | checks whether mean data can be constrained (lane-based) |
| `sumo/routes/output/cross3ltl_rawdump` | checks whether raw dump is written |

| **Test Set Description** | |
|---|---|
| **Path** | **Description** |
| `sumo/routes/output/cross3ltl_rawdump_withempty` | checks whether raw dump is written (with `--dump-empty-edges`) |
| `sumo/routes/output/cross3ltl_tripinfo` | checks whether tripinfos are written |
| `sumo/routes/output/cross3ltl_vehroutes` | checks whether vehroutes are written (buggy); see also `sumo/extended/rerouter` |
| | |
| *Checks whether variable speed signs work* | |
| **Path** | **Description** |
| `sumo/extended/variable_speed_signs/b0_offset_100` | a scenario with begin time=0, first change at time=100 |
| `sumo/extended/variable_speed_signs/b100_offset_0` | a scenario with begin time=100, first change at time=0 |
| `sumo/extended/variable_speed_signs/b100_offset_50` | a scenario with begin begin time=100, first change at time=50 |
| `sumo/extended/variable_speed_signs/b100_offset_100` | a scenario with begin begin time=100, first change at time=100 |
| `sumo/extended/variable_speed_signs/b100_offset_200` | a scenario with begin time=100, first change at time=200 |
| `sumo/extended/variable_speed_signs/begin_0` | a scenario with begin time=0, first change at time=0 |
| | |
| *Checks whether other emitters work* | |
| **Path** | **Description** |
| `sumo/extended/emitter/10_time_0_1_start0_0types_1route_noid` | ten vehicles, one second between starting at 0, random vehicle type (from 1), one route, no id |
| `sumo/extended/emitter/10_time_0_1_start5_0types_1route_noid` | ten vehicles, one second between starting at 0, random vehicle type (from 1), one route, no id, sim start at 5 (check whether previous vehicles are discarded) |
| `sumo/extended/emitter/base_vehtype1from2` | as 10_time_0_1_start0_0types_1route_noid, but with a chosen vehicle type |
| `sumo/extended/emitter/base_vehtype2from2` | as 10_time_0_1_start0_0types_1route_noid, but with two randomly chosen vehicle type |
| `sumo/extended/emitter/base_withid` | as 10_time_0_1_start0_0types_1route_noid, but with ids |
| `sumo/extended/emitter/base_period10` | as 10_time_0_1_start0_0types_1route_noid, but with a period of 10s |
| `sumo/extended/emitter/base_otherroute` | as 10_time_0_1_start0_0types_1route_noid, but another route is used |
| `sumo/exten-` | as 10_time_0_1_start0_0types_1route_noid, but a ran- |

| **Test Set Description** | |
|---|---|
| **Path** | **Description** |
| `ded/emitter/base_2randomroutes` | dom route is used |
| `sumo/extended/emitter/base_exp_routes` | as 10_time_0_1_start0_0types_1route_noid, with explicit routes |
| | |
| *Checks whether other additional structures work* | |
| **Path** | **Description** |
| `sumo/extended/rerouter` | Tests whether rerouter work; checks also whether vehroutes work properly when vehicles are rerouted |
| | |
| *Checks whether error handling works* | |
| **Path** | **Description** |
| `sumo/errors/unknown_option` | Tests what happens if an unknown option is passed |
| `sumo/errors/meandata_edges_missing_begin1` | Tests what happens if the first begin time is missing |
| `sumo/errors/meandata_edges_missing_begin2` | Tests what happens if the second begin time is missing |
| `sumo/errors/meandata_edges_missing_begin_divider` | Tests what happens if a divider is given but no value in begins |
| `sumo/errors/meandata_edges_missing_end1` | Tests what happens if the first end time is missing |
| `sumo/errors/meandata_edges_missing_end` | Tests what happens if the second end time is missing |
| `sumo/errors/meandata_edges_missing_end_divider` | Tests what happens if a divider is given but no value in ends |
| `sumo/errors/meandata_edges_false_order` | Tests what happens if a begin is larger than an end |
| | |

Recent changes:

- Test for `--version` was removed in version 0.9.5