

# BikeSim 2021.0 New Features

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This document lists notable new features in BikeSim version 2021.0.

## VS Solver: Architecture

Improvements were made in the handling of VS Commands.

1. Parsing of VS Commands has been extended and reworked to provide more informative error messages, and to provide a foundation for more for more user-defined features.
2. The expression evaluator and calculator for the VS Commands has been re-written to improve performance.
3. The `DEFINE_VARIABLE` command has been extended to support the creation of new single-index arrays, e.g.,

```
DEFINE_VARIABLE MY_ARRAY(10)
```

## VS Solver: Models

Improvements were made in the BikeSim Math Model.

### Linux versions BikeSim Solvers

The BikeSim Solvers are now available for use running on the following Linux versions:

- Red Hat Enterprise Linux 7.2 64-bit

- CentOS 7 64-bit
- SUSE Linux Enterprise Server 12 (does not support USB dongles)
- openSUSE 42.3 Leap (does not support USB dongles)
- Ubuntu 18 LTS 64-bit (does not support USB dongles)
- Ubuntu 16 LTS 64-bit (does not support USB dongles)

## Miscellaneous

1. A new import variable, `IMP_AT_CLUTCH`, has been added to control the automatic transmission lock up clutch. Previously, the clutch could only be controlled by table (`LOCK_AT_TABLE`) or by manipulating the clutch capacity on the fly (`IMP_M_LOCKUP_CLUTCH_CAP`).
2. The VS Math Model will write a warning in the log file if it detects potential issues with the straight-line distance approximation of station that is used for X-Y spline segments.

## VS Browser: Graphic User Interface (GUI)

### Procedures Screen

The Procedures screen was simplified slightly by replacing a set of four initialization-related checkboxes with a single one. As a result of changes in the past few years in the architecture of VS Math Models, the options to start the vehicle in approximate equilibrium (with the parameter `OPT_INIT_CONFIG = 1`) and with the wheel and powertrain spin rates synchronized to the vehicle speed (`OPT_INIT_SPEED = 1`) are always recommended when starting a simulation. Checkboxes to turn off these options were removed.

The remaining option, to locate the vehicle using Path station (`OPT_INIT_PATH`) is still an option that can be disabled if the user wishes to locate the vehicle by setting X, Y, and Yaw values directly.

### Tire (External) Screen

On the Tire (External) screen, a new drop-down menu for the **Temperature mode** (with root keyword `DELFT_TYRE_TVM`) has been added under **Siemens MF-Tyre/MF-Swift v2020.2** tire model. The detail of setting is described in the separate Tire Models document.

## Other Tools: Stacks

### RT Platforms

From version 2021.0 BikeSim supports new Real-Time system: Linux-RT (from dSPACE release 2020B) on dSPACE SCALEXIO including DS6001.

On the NI Linux RT now you can run parallel solvers with LibVIEW and VeriStand.

## FMU for Linux System

From version 2021.0 BikeSim can generate the FMU running on Windows, Linux or on both systems.

## VS Scene Builder Proving Ground Tile

A new proving ground tile has been created for the VS Scene Builder. This tile provides a complete environment with nine testing areas, including: a five mile circle track, a hill grade surface, an on-grade split-mu surface, a split-mu surface, a rough road section, a 1000m straight, a 500m skid pad, a handling course, and an urban multi-lane environment. Use the over 600 built-in paths or create your own in the VS Scene Builder.

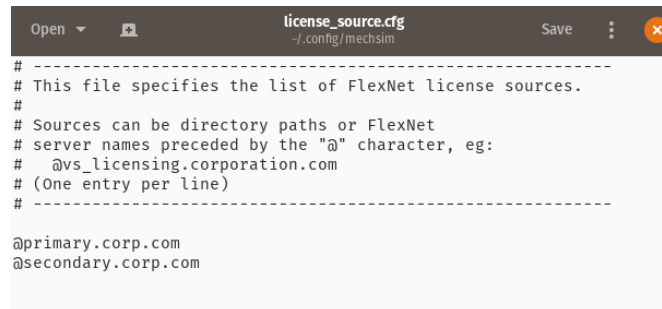
## VS SDK

The VS SDK is a Software Development Kit. This means that it includes all the tools, libraries, documentation, and example projects necessary to get working on a project with as little configuration as possible. With nothing but the contents of the SDK, a valid license for a VehicleSim product, and a development environment for your language of choice you can get to work building and extending various aspects of the simulation architecture.

The VS SDK was created in conjunction with the 2019.1 release with the goal of supporting end-users who are building tools around a VehicleSim product using the VS API. For the 2021.0 release, the VS SDK has extended to include support for the BikeSim solver libraries.

## Licensing

An improvement has been made to the way the license feature selections can be configured with the `bs-lm-cli` utility. This change will allow users to specify a source preference for each individual feature being checked out. For example, in the `license_source.cfg` file, given the following data:



```
Open  license_source.cfg  Save  x
~/config/mechsims
# -----
# This file specifies the list of FlexNet license sources.
#
# Sources can be directory paths or FlexNet
# server names preceded by the "@" character, eg:
#   @vs_licensing.corporation.com
# (One entry per line)
# -----
@primary.corp.com
@secondary.corp.com
```

This will allow the `requested_licenses.cfg` file to be configured as such:

```
requested_licenses.cfg
-/.config/mechsims

# -----
# This file specifies the list of licenses to check out from
# FlexNet license sources.
#
# File Format:
# <Feature String> <Optional Source String>
# <Optional Count Integer> <Optional Version Integer>
# (One entry per line)
# -----

carsimlinuxsolverxx    @primary.corp.com    1
carsimtxx              @primary.corp.com    1

carsimfxx              @secondary.corp.com  1
carsimparallelsolverxx @secondary.corp.com  1000
```

With this configuration, carsimlinuxsolverxx and carsimtxx features will be selected from the @primary.corp.com license source, while the carsimfxx and carsimparallelsolverxx features will be selected from the @secondary.corp.com license source.

## Documentation

The following documents have been added to the **Help** menu:

1. Modular Vehicle Models (Technical Memos sub-menu)
2. VS Table Tool Introduction (Reference Manuals sub-menu)
3. VS Table Tool Usage (Technical Memos sub-menu)

The following Guides and Tutorials have been updated:

4. Introduction to CarSim (and BikeSim)

The following Reference Manuals have been updated:

5. System Parameters in VS Math Models (former title: System Parameters in VS Solvers)
6. VS Browser (GUI and Database)
7. VS COM Interface
8. VS Commands
9. VS Commands Summary
10. VS Math Models (former title: VS Solver Programs)
11. VS SDK
12. VS Visualizer

The following Screen documents have been updated:

13. Aerodynamics
14. Animator: Camera Setup
15. Atlas GPS Tool (in Paths, Road Surfaces, and Scenes sub-menu)
16. Data Groups (in Generic Data Screens sub-menu)
17. External Models and RT Systems (in Model Extensions and RT Systems sub-menu)
18. Home: The Run Screen
19. Import and Export Variables (in Model Extensions and RT Systems sub-menu)
20. Parallel VS Math Models (in Tools sub-menu)
21. Paths and Road Surfaces (in Paths, Road Surfaces, and Scenes sub-menu)
22. Powertrain
23. Preferences (in Tools sub-menu)
24. Procedures and Events
25. Rider Controls
26. Run Control Screen
27. Tire Models
28. VS Scene Builder (in Paths, Road Surfaces, and Scenes sub-menu)
29. VS Terrain (in Paths, Road Surfaces, and Scenes sub-menu)

The following Technical Memos have been updated:

30. HPC Licensing
31. Modular Vehicle Models
32. Numerical Integration in VS Math Models (former title: Numerical Integration in VS Solvers)

The following Real-Time and DS System documents have been updated:

33. DS6001 Network Settings
34. NI RT Target Systems

# Database

## New and Updated Examples

The following subsection titles correspond to categories for new examples that all share the prefix “\* BS 2021.0,” e.g., \* **BS 2021.0 – New Proving Ground**.

### *New Datasets to Highlight New Animator Assets*

Two new datasets have been added to highlight new or updated animator assets taken from TruckSim. These visual assets can also be used as traffic objects after linking to them with an Animator: Shape File Link dataset. The assets are:

- Improved Cab shape for 3A Sleeper Cab lead unit
- New flatbed trailer
  - New trailer body
  - New landing gear
  - New axle and air suspension components
  - New mudflaps
  - New 41k lbf Coiled Steel payload
- New shipping container trailer
  - Front, Mid, and Rear components for different length containers
  - Containers can be added as part of the object (for traffic) or as custom payloads (Ego vehicle)

### *New Datasets to Demonstrate the New Proving Ground Tile*

The new proving ground scene is demonstrated with the following examples:

- BS 2021.0 - New Proving Ground > Handling Course
- BS 2021.0 - New Proving Ground > Sine Bumps: In-Phase
- BS 2021.0 - New Proving Ground > Urban Test Area

These examples don't show all available sections of the new proving ground, which has nine testing areas including a five mile circle track, a hill grade surface, an on-grade split-mu surface, a split-mu surface, a rough road section, a 1000m straight, a 500m skid pad, a handling course, and an urban multi-lane environment. Additional reference paths, for other test sections, are set up in the Scene: External Import dataset for the proving ground, which you can view there. You can also open the VS Scene Builder to view the new proving ground's tile, where over 600 paths are available for export.