



VR-Forces 4.6 Release Notes

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Systems Supported

VR-Forces 4.6 is available for the platforms listed in [Table 1](#). For toolkit users, application code must be built with the indicated compilers in order to link to VR-Forces libraries.

Table 1: Platforms supported

Operating System	Compiler
Windows 7, Windows 8, Windows 10	Microsoft Visual C++ 12.0 (64 bit) Microsoft Visual C++ 15.0 (64 bit)
Red Hat Enterprise Linux 7 (64 bit libraries)	default compiler

3D Video Cards Supported

VR-Forces 4.6 supports NVIDIA graphics cards that support OpenGL 3.3 VR-Forces does not support AMD (formerly ATI) graphics hardware.



VR-Forces strives to provide the best 3D scene quality possible and cutting edge visualization effects. To provide this functionality, VR-Forces takes advantage of OpenGL features that may not be supported on older video cards. When this is the case, you can disable these features, allowing VR-Forces to run in 3D modes.

OpenGL 3.3 is the minimum requirement for rendering a 3D scene in VR-Forces. For the best visual quality and highest performance you should use the most recent NVIDIA GeForce card.

Some laptops have an NVIDIA graphics card and an Intel graphics card. You must configure your computer to use the NVIDIA card. To do so:

1. Open the NVIDIA Control Panel (in the System Tray).
2. Select Manage 3D Settings.
3. Select Global Settings.
4. Select Preferred Graphics Processor.
5. Select High-performance NVIDIA Processor.



You should always try to use the latest drivers available for your video board.

Using Kepler Series Quadro Cards

There is a known issue with the Quadro drivers on Kepler series Quadro cards. NVIDIA says its related to the fact that the default profile optimizes for a fixed eyepoint (for applications like CAD). To run on these cards, you must change the global profile for the driver, as follows:

1. Open the NVIDIA Control Panel.
2. Select the Manage 3D Settings page.
3. Select the Global Settings tab.
4. In the list of driver profiles, select Workstation App - Dynamic Streaming.

We are working with NVIDIA to have their drivers recognize our applications and apply this profile automatically. In the meantime, Kepler series Quadro you must make this change manually.

Disk Space Requirements

A full installation of VR-Forces requires approximately 15 GB of disk space.

Compiler Compatibility on Windows

MAK provides versions of product releases that have been compiled with different versions of Microsoft Visual C++ (for example, 10.0, 11.0, and 12.0). When you run MAK products together on the same computer, for example, VR-Forces and VR-Vantage Stealth, we strongly recommend that you run versions compiled with the same compiler. Mixing products compiled with different versions of the compiler can result in program instability.

Required Software for Toolkit Users

If you plan to build VR-Forces applications using the VR-Forces Toolkit, you must download and install VR-Link 5.4. Please contact your MAK salesperson or support@mak.com for download links.

If you plan to build the VR-Forces GUI, you must download and install QT 5.5.1. You can download it at: <https://www.mak.com/support/bonus-material>.

Qt is also available as a free download under the LGPL version 2.1 license at qt.digia.com. This version should be satisfactory for most VR-Forces customers. If you need a Qt commercial license, you must purchase the license from Digia.

MAK Product Compatibility

To build VR-Forces applications, you must link with VR-Link 5.4. If you are building for HLA and want to link with the MAK RTI, use MAK RTI 3.x or later, although we recommend use of the latest release. If you are building for HLA Evolved, you must use MAK RTI 4.0.4 or later.

License Manager

VR-Forces 4.6 uses FLEXlm 11.13.0.2.

The License Manager files are not part of the VR-Forces installer. You can download them at:

- ♦ Windows: <ftp://ftp.mak.com/out/MAKLicenseManager-win64-setup.exe>
- ♦ Linux: <ftp://ftp.mak.com/out/MAKLicenseManager-linux64-setup.tar.gz>

A license manager FAQ is available at:

<https://www.mak.com/support/license-support>

Third Party Library Support

VR-Forces 4.6 uses the indicated versions of the following libraries:

- ♦ VR-Link 5.4
- ♦ Qt 5.5.1
- ♦ OpenSceneGraph 3.4.0
- ♦ Boost 1.46.1
- ♦ FreeGlut 2.4.0
- ♦ GL-Studio 5.0.2 (VC 12), 5.1.2 (VC 15)
- ♦ DI-Guy 13.3 (development version)
- ♦ Triton 3.73
- ♦ SilverLining 5.005
- ♦ SpeedTree 6.3.2
- ♦ Oculus Rift CV1
- ♦ Oculus Rift Development Kit 1.8
- ♦ CDB API 2.2
- ♦ osgEarth 2.9.0.

Using MAK Products on Virtual Machines

In general, MAK products run on virtual machines (VM) without any problems. The exception to this statement is that applications that use 3D graphics, such as VR-Vantage and the VR-Forces front-end, require a graphics card. Standard graphics cards typically do not work with VMs. To use a 3D enabled environment in a VM, please contact your VM vendor for options. NVidia produces the NVidia GRID card, which is designed to solve this problem. Your VM vendor may have additional information. For more information on NVidia GRID, please see <http://www.nvidia.com/object/virtual-gpus.html>

Network Compatibility

HLA only

VR-Forces 4.6 was built against VR-Link 5.4 and is compliant with:

- ♦ RPR-FOM 1.0 and 2.0.
- ♦ MAK RTI 3.x, 4.x, and other RTIs that meet the HLA 1.3, IEEE 1516 SISO DLC API, or HLA Evolved specifications and are built with the same compilers as VR-Forces.

VR-Forces 4.6 is compatible with applications that use earlier versions of VR-Link if they support versions of the RPR FOM listed.

DIS only

VR-Forces 4.6 supports DIS 4, 5, 6, and 7, and can therefore interoperate with DIS applications of any of these versions.

Backwards Compatibility

The VR-Forces 4.6 APIs are not compatible with VR-Forces 3.x or earlier. It is largely compatible with the 4.3.x API. Small changes may be necessary to migrate from 4.3.

Scenarios created with VR-Forces 3.12 and 4.x are forward compatible.

Support for MAK Data Logger Recordings

VR-Vantage 2.3 will work seamlessly with MAK Data Logger 5.5.1 (which will be out very shortly). Older versions of the Logger may have two problems:

- ♦ There are known issues with DIS 7 extended attribute packets. These have been fixed in VR-Forces 4.6, VR-Vantage 2.3, and MAK Data Logger 5.5.1. When using an older Data Logger with either VR-Forces 4.6 or VR-Vantage 2.3, DIS 7 configurations can lead to crashes.
- ♦ There have been minor updates to the FOMs that are distributed with VR-Forces 4.6 or VR-Vantage 2.3. These FOMS are available with MAK Data Logger 5.5.1, but were not available in older Loggers. Older Loggers work, but you must configure the Logger to use the correct FOM, which should be copied from the newer VR-Vantage or VR-Forces.

Users using MAK Data Logger 5.5.1 will have no problems.

RPR FOM Versions Supported

VR-Forces 4.6 has built-in support for versions 1.0 and 2.0 (drafts 6, 17, and 20) of the RPR FOM and RPR FOM 2.0, draft 17 with DI-Guy extensions. It also supports VR-Link's ability to support alternative FOMs through the FOM Mapper. By default, VR-Forces 4.6 uses RPR FOM 2.0.

If you are building an application with the VR-Forces toolkit and you want to specify a version of the RPR FOM through code, pass the version number (for example, 2.0006) to the *DtFedAmbWrapper* constructor and pass the resulting object to the *DtExerciseConn* constructor. Also, make sure you are using a federation execution name that corresponds to the right FED file. For example:

```
DtExerciseConn conn("VR-Link20006", "MyApp", new DtRprFomMapper(2.0006));
```

In order to support RPR FOM 1.0, we have added the following extensions (which are supported in later versions of the RPR FOM):

- ♦ EnvironmentProcess
- ♦ GriddedData
- ♦ EmbeddedSystem.IFF
- ♦ EmbeddedSystem.IFF.NatoIFF
- ♦ EmbeddedSystem.IFF.NatoIFF.NatoIFFTransponder
- ♦ EmbeddedSystem.IFF.NatoIFF.NatoIFFInterrogator
- ♦ EmbeddedSystem.IFF.SovietIFF
- ♦ EmbeddedSystem.IFF.SovietIFF.SovietIFFTransponder
- ♦ EmbeddedSystem.IFF.SovietIFF.SovietIFFInterrogator
- ♦ EmbeddedSystem.IFF.RRB
- ♦ BaseEntity.AggregateEntity
- ♦ ObjectRoot.BaseEntity.PhysicalEntity.Lifeform.

For both RPR FOM 1.0 and 2.0 VR-Forces 4.6 relies on the Controlling and ViewControl custom MAK extensions.

New FED File Naming Convention

VR-Forces 4.6 uses the FED file naming conventions introduced in VR-Link 5.2. This section describes these changes.

Historically, VR-Link has named FED files using the convention *VR-Link<RPR FOM version>.fed* or *VR-Link<RPR FOM version>.xml*. For example, the FED file for RPR FOM 2, draft 17 was *VR-Link20017-1.fed*. This naming scheme has two problems. First, it is confusing for end-users of applications that use VR-Link (but who are not themselves VR-Link customers) to be using a FOM named that way. Second, the filename was not versioned, so any updates that we would make to the existing FOMs could cause compatibility problems. In fact for this latter reason, we had refrained from fixing a few minor bugs that we found over the years until now.

Effective with this release, VR-Link introduces a new naming convention: MAK-*<FOM name><FOM revision><FOM version>.fed* (or *.xml*, or *_evolved.xml*, as appropriate). For example, *VR-Link20017-1.fed* has been renamed *MAK-RPR20017-1-1.fed*.

Additionally, given the power of HLA Evolved FOM Modules, starting with RPR 2.0 we are now providing the RPR standard FOM for HLA Evolved, currently named *RPR_FOM_v2.0_1516-2010*. MAK's extensions, are in FOM Modules that our software will automatically add to an exercise. This means that if you have another RPR-based FOM, such as NETN or NASMP, you will have a much easier time using it without needing to modify the FOM.

VR-Link continues to include FED files and XML files using the old convention, so you do not have to change any existing scripts or code.

[Table 1-1](#) lists legacy FED files and how they map to new FED files. Many of the FED files delivered in previous releases do not have updated versions, usually because they are rarely used.

Table 1-1: Old FED file to new FED file mappings

Old FED File	New FED File
HLA 1.3	
DI-Guy-13_0.fed	
DI-Guy.fed	
VR-Link.fed	MAK-RPR1-1-1.fed
VR-Link05.fed	
VR-Link07.fed	
VR-Link08.fed	
VR-Link10.fed	MAK-RPR1-1-1.fed
VR-Link16.fed	
VR-Link20006.fed	
VR-Link20014.fed	
VR-Link20017-1.fed	MAK-RPR20017-1-1.fed
VR-Link20017-6.fed	MAK-RPR20017-6-1.fed
VR-Link20017.fed	
VR-Link20020.fed	MAK-RPR2-1-1.fed
VR-LinkBOML16.fed	
VR-LinkDDM.fed	
VR-LinkMC02.fed	MAK-RPR1-MC02-1-1.fed
VR-LinkTM.fed	MAK-RPR1-TimeManagement-1-1.fed
VRL-20017-1-Link16.fed	
VRL-DIGuy20017.fed	

Table 1-1: Old FED file to new FED file mappings

Old FED File	New FED File
VRL-DIGuy20017DDM.fed	
1516-2000	
DI-Guy-13_0.xml	
DI-Guy.xml	
VR-Link.xml	MAK-RPR1-1-1.xml
VR-Link20014.xml	
VR-Link20017-1.xml	MAK-RPR20017-1-1.xml
VR-Link20017-6.xml	MAK-RPR20017-6-1.xml
VR-Link20020.xml	MAK-RPR2-1-1.xml
VR-LinkBOML16.xml	
VR-LinkDDM.xml	
VR-LinkTM.xml	MAK-RPR1-TimeManagement-1-1.xml
VRL-DIGuy20017.xml	
VRL-DIGuy20017DDM.xml	
HLA Evolved	
DIGuyModule_1300.xml	MAK-DIGuy-1_evolved.xml
DIGuyModule_1302.xml	
RPR_FOM_v2.0_draft20_1516-2010.xml	RPR_FOM_v2.0_1516-2010.xml
VR-Link20014_base_evolved.xml	
VR-Link20014_evolved.xml	
VR-Link20017-1_base_evolved.xml	MAK-RPR20017-Base-1-1_evolved.xml
VR-Link20017-1_base_evolved_with-UpdateRate.xml	
VR-Link20017-1_evolved.xml	MAK-RPR20017-1-1_evolved.xml
VR-Link20017-1_evolved_withUpdateRate.xml	
VR-Link20017-6_base_evolved.xml	MAK-RPR20017-Base-6-1_evolved.xml
VR-Link20017-6_evolved.xml	MAK-RPR20017-6-1_evolved.xml
VR-LinkDDM_base_evolved.xml	
VR-LinkDDM_evolved.xml	
VR-Link_LgrControl_evolved.xml	MAK-LgrControl-1_evolved.xml
VR-Link_ViewControl_evolved.xml	

Table 1-1: Old FED file to new FED file mappings

Old FED File	New FED File
VR-Link_VrlExt_evolved.xml	MAK-VRFExt-1_evolved.xml
VR-Link_base_evolved.xml	MAK-RPR1-Base-1-1_evolved.xml
VR-Link_evolved.xml	MAK-RPR1-1-1_evolved.xml
VRL-DIGuy20017DDM_evolved.xml	
VRL-DIGuy20017_evolved.xml	
updateRate.xml	MAK-updateRate-1_evolved.xml
VR-LinkBOML16_module.xml	MAK-BOML16-1_evolved.xml
	MAK-VRFAggregate-1_evolved.xml

New Features and Updates

VR-Forces 4.6 has the following new features and updates.

Installation and Application Management

- ♦ The data package is now provided as multiple data package files plus a terrain package instead of one inclusive file. All files must be installed to use VR-Forces. On Windows, the MAK Data Setup utility installs them automatically if they are in the same directory as the application installer.
- ♦ The behavior of the `--targetFrameRate` command line option and `vrfSim.mtl` parameter has changed. Previously it used the average frame rate. It now measures the instantaneous frame rate of the current frame and extends it by sleeping if the frame is too short (as defined by the target frame rate).
- ♦ A new command-line option and configuration parameter have been added. `--reportedHostAddressString` is a new option for `vrfGui`. `reportedHostAddressString` is a new option in `vrfSim.mtl`). They change how VR-Forces reports its IP address to another VR-Forces application for the purpose of file transfers. It is for use when you have a GUI or remote controller on one side of a router and a simulation engine on the other, and there is some kind of network address translation occurring whereby they have to connect to one another using an IP address other than the one they recognize themselves at locally. Most users will never need to use this option.
- ♦ The `--allowCoupledPdus` command line option enables coupled PDUs for DIS even if you are not using DIS 7.
- ♦ The `--forceVBO` command line option enables vertex buffer objects, which can help when debugging using NVIDIA nSight.

Scenario Management

- ♦ Order of Battle. The ability to create, export, and import orders of battle. For details, please see Chapter 21, [Creating and Using an Order of Battle](#), in *VR-Forces Users Guide*. The Order of Battle is displayed in the Order of Battle Panel.
- ♦ The Objects View in the Objects List Panel now shows simulation objects hierarchically and allows you to reorganize objects in the hierarchy. It also lists tactical graphics. The Echelon View and Environmental View have been removed.
- ♦ The object creation palettes have been redesigned for quicker selection of forces and more robust filtering. For details, please see Section 14.2.3, [“Filtering Object Creation Palettes,”](#) in *VR-Forces Users Guide*.
- ♦ The VR-Forces Launcher now has an option to specify the session ID.
- ♦ The Spawn Pattern Manager now lets you specify the overlay on which to create spawned entities.
- ♦ The Scenario Information dialog box has been replaced by the Scenario Properties dialog box. Scenario properties are now editable in the GUI. For details, please see Section 7.2.4, [“Editing Scenario Properties,”](#) in *VR-Forces Users Guide*. As part of this change the Set Scenario End Time command has been removed from the Simulation menu. It is now set as part of Scenario Properties.
- ♦ You can now associate saved views with a terrain. You can specify a default saved view that is used when the terrain is loaded. For details, please see Section 50.12.3, [“Loading Views Automatically When You Load a Terrain,”](#) in *VR-Forces Users Guide*.
- ♦ You can enable and disable scenario events. For details, please see Section 8.6, [“Enabling and Disabling Scenario Events,”](#) in *VR-Forces Users Guide*.
- ♦ The scenarios directory has been reorganized.
- ♦ You can now import point, linear, and areal objects that are defined in a CSV file. For details, please see Section 7.1.6, [“Importing Scenario Objects from CSV Files,”](#) in *VR-Forces Users Guide*.
- ♦ The way in which time of day is displayed prior to creation of the first simulation object has changed. You can now also specify whether the starting time of day should be based on the location of the first created simulation object or whether it should be independent of the location of that object. For details, please see Section 7.1.3, [“Setting the Scenario Starting Date and Time,”](#) in *VR-Forces Users Guide*.

Tasks and Sets

- ♦ Support for using Qt Designer to lay out dialog boxes for scripted tasks and sets. The automatic dialog box creation is still supported.
- ♦ VR-Forces now saves all Lua system script meta data files (*.xml*) as lower case and internally converts all script IDs to lower case. If you edit a script that used mixed case, it will get saved as lower case.
- ♦ VR-Forces now alphabetizes all menus and commands on the Task and Set menus. For details, please see Section 83.2.1, “[Alphabetizing the Task and Set Menus](#),” in *VR-Forces Users Guide*.
- ♦ New parameter types for Lua scripts:
 - Active Sonar Mode.
 - Choice (Image Drop-Down List).
 - DI-Guy Gesture.
 - Jammer Selector.
 - Jamming Mode.
 - Radar Selector.
 - Radar Mode

For details, please see Section 32.2.5, “[Specifying Script Parameters](#),” in *VR-Forces Users Guide*.

- ♦ Support for parachuting and related tasks.
- ♦ The Aircraft Hold task has been improved. You now configure the pattern as time-based or by length and width.
- ♦ The DI-Guy Animation task has moved to the Movement menu. Set DI-Guy Hand Item is now called Hand Item.
- ♦ The Jam Targets set data request has been replaced with new jamming set data requests.
- ♦ New tasks:
 - Air Drop. Causes an aircraft to disembark paratroop entities. For details, please see Section 30.1.4, “[Air Drop](#),” in *VR-Forces Users Guide*.
 - Circle Around Location. This task causes the members of a unit or crowd to form a circle around the specified location, at the specified radius. For details, please see Section 29.1, “[Circle Around Location](#),” in *VR-Forces Users Guide*.
 - DI-Guy Gesture. This task allows you to assign specific gestures to a human character. For details, please see Section 29.11, “[DI-Guy Gesture](#),” in *VR-Forces Users Guide*.
 - Find Cover. Causes a human entity to find a location behind which a threat entity cannot see it. For details, please see Section 29.13, “[Find Cover](#),” in *VR-Forces Users Guide*.
 - Find Firing Position. Causes a human entity to find a location behind which a threat entity cannot see it, but from which it can easily move from and fire at the threat. For details, please see Section 29.14, “[Find Firing Position](#),” in *VR-Forces Users Guide*.

- Move to Location Using Cover. For details, please see Section 29.16, [“Move Between Cover to Location,”](#) in *VR-Forces Users Guide*.
- Parachute to Target. Causes paratrooper entities to disembark from an aircraft and parachute to a target. For details, please see Section 29.19, [“Parachute to Target,”](#) in *VR-Forces Users Guide*.
- Release Next Entity From Queue. This task causes a queue tactical graphic to release the entity at the front of the queue to move on to its next task. For details, please see Section 30.9, [“Release Next Entity From Queue,”](#) in *VR-Forces Users Guide*.
- Wait in Queue. Causes humans to line up in a queue line and move forward in the queue until they are released from it. For details, please see Section 29.22, [“Wait in Queue,”](#) in *VR-Forces Users Guide*.
- Zig Zag to Heading. Moves a ship towards a heading using a zig zag pattern. For details, please see Section 27.36, [“Zig Zag to Heading,”](#) in *VR-Forces Users Guide*.
- ♦ New sets:
 - Add Jamming Target. For details, please see Section 35.4, [“Add Jamming Target,”](#) in *VR-Forces Users Guide*.
 - AI Enabled. Lets you disable intelligent decision making by entities, such as avoiding obstacles or firing at targets. For details, please see Section 35.5, [“AI Enabled,”](#) in *VR-Forces Users Guide*.
 - Automatically Close Doors. If a human entity walks through a door and no one is behind it, the door closes automatically. For details, please see Section 35.12, [“Automatically Close Doors,”](#) in *VR-Forces Users Guide*.
 - Enable TDL Messages. Enables or disables reception of TDL messages. For details, please see Section 35.74, [“TDL Messaging,”](#) in *VR-Forces Users Guide*.
 - Invisible. Makes the simulation object invisible in the scene or map display. For details, please see Section 35.35, [“Invisible,”](#) in *VR-Forces Users Guide*.
 - Jammer State. For details, please see Section 35.37, [“Jammer State,”](#) in *VR-Forces Users Guide*.
 - Jamming Mode. For details, please see Section 35.38, [“Jamming Mode,”](#) in *VR-Forces Users Guide*.
 - Look At. Causes a human entity to look at a point, object, or angle. For details, please see Section 35.42, [“Look At,”](#) in *VR-Forces Users Guide*.
 - Markings. Lets you add images to simulation objects that are configured with dynamic texture maps. For details, please see Section 35.43, [“Markings,”](#) in *VR-Forces Users Guide*.
 - Navigation Enabled. Lets you disable use of navigation data for specific simulation objects. For details, please see Section 35.46, [“Navigation Enabled,”](#) in *VR-Forces Users Guide*.
 - Remove Jamming Target. For details, please see Section 35.55, [“Remove Jamming Target,”](#) in *VR-Forces Users Guide*.

Simulation Object Modeling

- Support for adding simulation object state properties by editing OPE files. No C++ coding is required. For details, please see Section 73.6, “[State Properties and Parameter Properties](#),” in *VR-Forces Users Guide*.
- Fixed wing aircraft no longer move immediately to the altitude of the next route vertex when following a route. They now change altitude gradually between vertices as if following along a straight line between them.
- Fixed-wing aircraft now have a look-ahead capability that lets them maintain a safe altitude above the earth when they are following routes that have segments below ground level. This is not a nap-of-the-earth capability.
- Support for illumination flares. Flares are fired as munitions by artillery entities or as the munition for indirect artillery.
- Added a new detonation power determinant - equivalent-tnt-mass. It calculates explosive damage for a given mass of TNT. For details, please see “[Determinant Types](#),” under Section 76.8.1, “[Configuring the Power of a Detonation](#),” in *VR-Forces Users Guide*.
- Missile launchers can now use hit probability tables. Previously the launcher would simply create the missile entity and initialize it to fly to its target. Now there is an option to configure them to use hit tables as other weapons do. If the entity type of the target of the attack is in the hit probability table, then it is used. Otherwise, the standard missile behavior is used. For details, please see Section 76.3, “[Configuring Missile Systems](#),” in *VR-Forces Users Guide*.
- You can now display track histories for spot reports. For details, please see Section 9.1.7, “[Displaying Track Histories for Spot Reports](#),” in *VR-Forces Users Guide*.
- Support for paratroopers who can parachute from aircraft. See the Air Drop and Parachute to Target tasks mentioned in the Tasks and Sets list.
- Support for human characters to line up in a queue. When the first human in the queue is released from it, the following members of the queue move up. For details, please see the Wait in Queue and Release Next Entity From Queue tasks in the Tasks and Sets list.
- Support for Tactical Data Link messages. Display of TDL messages is similar to that of spot reports. For details, please see Section 9.2, “[Displaying Tactical Data Link Messages](#),” in *VR-Forces Users Guide*. This feature is ITAR controlled. Please contact your MAK salesperson for details.
- Gimbaled sensors can now rotate through 360 degrees. For details, please see “[Configuring a Gimbaled Sensor’s Azimuth](#),” under Section 52.4.2, “[Controlling the Sensor View](#),” in *VR-Forces Users Guide*.
- When you aggregate individual entities into a unit, you can now include non-VR-Forces entities. These entities will be included for the purposes of calculating the bounding volume of the unit and for expanding and collapsing the display of unit members. However, tasks and set data requests issued by the unit will not affect the non-VR-Forces entities.

Tactical Graphics

- ♦ The Hazards/Obstacles Palette has been removed. The objects that were on it are now on the Tactical Graphics Palette.
- ♦ Queue. The queue tactical graphic is a line along which humans can form a queue.
- ♦ Projected areas (all areas except extruded areas) are now drawn so that the vertices have the same altitude as the first vertex drawn. They are not forced to ground level. This is just a visual display issue. The boundary of the area still represents a projection from ground level to an infinite height.

Terrain

- ♦ Support for dynamically regenerating navigation data. For details, please see Section 60.3.4, [“Automatic Regeneration of Navigation Data,”](#) in *VR-Forces Users Guide* and additional notes in [“Generating Navigation Data,”](#) on page 1-18.
- ♦ Ability to generate navigation data in sectors, rather than over an entire navigation area. For details, please see Section 60.2, [“Navigation Areas,”](#) in *VR-Forces Users Guide*.
- ♦ Support for CDB terrains.
- ♦ Improved MetaFlight support for large terrains.
- ♦ General improvements to terrains provided with VR-Forces.
- ♦ Procedural road flattening.
- ♦ Procedural elevation noise.
- ♦ Ability to simulate entities on procedural terrains.
- ♦ Support for embedding cultural features in the terrain. For details, please see Section 68.1.7, [“Configuring Cultural Features to Be Embedded in the Terrain,”](#) and Section 14.12.1, [“Embedding Cultural Features in the Terrain,”](#) in *VR-Forces Users Guide*.

Performance

- ♦ Support for alpha to coverage rendering. This improves the quality of models and terrain patches that use transparency. For details, please see Section 6.8.1, [“Alpha to Coverage,”](#) in *VR-Forces Users Guide*.
- ♦ Improved shadows.
- ♦ Improved thread safety.
- ♦ Many performance improvements.
- ♦ Ability to preload cloud layers. For details, please see [“Calculating Cloud Positions Before You Load a Terrain,”](#) under Section 11.4.5, [“Specifying Cloud Cover,”](#) in *VR-Forces Users Guide*.
- ♦ Support for indirect rendering.
- ♦ SpeedTrees are loaded more quickly.
- ♦ Improved statistics display.

Visualization Changes

- Support for rendering SpeedTrees in planar reflections. For details, please see Section 44.4.1, “[Configuring Ocean Planar Reflections](#),” in *VR-Forces Users Guide*.
- Improved support for and simplified configuration of light points on models and the terrain.
- Improved lighting on water.
- Support for effects maps on procedural buildings.
- The maximum ocean LOD was increased from 20,000 feet to 100,000 feet.
- Improvements to rendering and configuring shadows.

Simulation Object Editor Updates

- Added articulated parts to the switch node section. They animate at 5 times minimum rotation or translation speed.
- You can import and export a list of simulation objects along with some information about them. For details, please see Section 66.11, “[Importing and Exporting Object Information](#),” in *VR-Forces Users Guide*.
- As part of the changes to filtering objects in the object creation palettes and the object list in the Simulation Object Editor, the ability to create categories and assign objects to them has been changed to the ability to create tags and assign objects to them. For details, please see Section 66.12, “[Editing the Tags List](#),” in *VR-Forces Users Guide*.
- The Used By Country list is now simply called the Country list.
- Simulation objects that do not have 3D models no longer have the text (No 3D) in their names. Objects that have 3D models now have the 3D Model tag and if you want to restrict yourself to using objects that have 3D models, you can filter the Simulation Objects Palette with that tag.
- Simulation objects that are part of included SMSs are now hidden by default in the Simulation Object Editor object list.
- By default, the SMSs provided with VR-Forces are read-only. For details, please see Section 66.3.2, “[Enabling and Disabling Read Only Status for SMSs](#),” in *VR-Forces Users Guide*.
- Various changes have been made to simplify the SMS upgrade process. For details, please see Section 66.5, “[Upgrading Old Simulation Model Sets](#),” in *VR-Forces Users Guide*.
- You can now set the notification level for messages from the Simulation Object Editor with the `-n | --notifyLevel` command-line argument.

Visual Modeling Changes

- ♦ Many new and updated models, including:
 - Canadian, Singaporean, and Israeli soldiers.
 - Paratroopers.
 - Barracks and concrete buildings with interior spaces.
 - Targets (bulls-eye, silhouette, and poster).
 - 180 new SpeedTrees.
- ♦ In the previous release, element definition files were loaded in reverse alphabetical order. Now they are loaded in alphabetical order.
- ♦ Added 180 new SpeedTree types.
- ♦ Support for light point groups.

API Changes

- ♦ You can now add command-line arguments through a plug-in. The plug-in modules now have a new entry point – `initializeCommandLineArguments` – that takes a `makVrf::DtVrfGuiCommandLineParser*` as an argument, so you can add a command line argument as follows:

```
void initializeCommandLineArguments(makVrf::DtVrfGuiCommandLineParser*
    parse)
{
    theUiType = new ValueArg<int>("", "uiType", "Type of UI to use (
        0 - Normal, 1 - Simple Scenario, 2 - Scenario Viewer,
        3 - Map Area Only", false, -1, "int");
    parse->addAdditionalCommandLineArgument(theUiType);
}
```

The `interfaceManipulation` example shows how to do this.

- ♦ Naming of Lua functions has been standardized.
- ♦ An API for creating TDL messages has been added.

Documentation Updates

Documentation has been updated for this release. Descriptions of how to configure various types of systems have been broken out into specific chapters, such as weapon systems, movement systems, and emitters and radios. More detail is available for configuring weapon systems.

Generating Navigation Data

This release makes changes to how navigation data is generated. These changes can cause generation to take a very long time or fail completely, crashing the generation tool. This is most likely to happen when the navigation area is large and the terrain is complex. You can affect the amount of time it takes to generate navigation data by how you specify sectors and calculation of cover points, as follows:

- ♦ **Sectors:** Sectors are subdivisions of the navigation area. Increasing the number of sectors slows down generation of navigation data. However, it also speeds up run-time regeneration if dynamic terrain is being used, so you must balance the relative importance of initial generation time and runtime regeneration. The navigation data generation process can fail if any single sector is too large, too complex, or both. To generate a maximum size navigation area, you must use multiple sectors.
- ♦ **Cover Point Generation:** By default, when you generate navigation data for lifeforms, VR-Forces calculates cover points. For large and complex terrains, this process can be very slow. MAK has recorded this taking 1 week to finish on a maximum size navigation area. You can disable calculation of cover points in the navigation profile. However, if you disable calculation of cover points, tasks that use cover points will not work in the navigation area.

For details about generating navigation data, please see Chapter 60, [*Generating Navigation Data*](#), in *VR-Forces Users Guide*.

Fixed Bugs

The following problems identified in previous releases have been fixed:

- ♦ Fixed a typographical error in GSh-301-cannon.sysdef.
- ♦ When editing a Fire for Effect task in a plan, the dialog box always defaulted to showing the first weapon instead of the weapon specified by the existing task. 60257
- ♦ The Munition Targets dialog box is now disabled in aggregate-level scenarios. 55118
- ♦ The spot report receiver shows up on the Set / Sensors / Enabled command menu, but it cannot be enabled or disabled this way. 59724
- ♦ The chord intersection tests in the terrain interface test intersection with global water, but they assume no intersection if both ends of the chord are above or below the water level. 60364
- ♦ The Indirect Fire Controller ends tasks prematurely when waiting for terrain. 60409
- ♦ If the sea level is not 0, then ships may sink too quickly, or not quickly enough. 60580
- ♦ Humans do not prefer crosswalks in the VR-TheWorld MAK Earth terrain. 56096
- ♦ If the terrain has a water surface with a second water surface underneath it, then when a lifeform moves or is placed in that location, it will sink down to the bottom water surface and float on that. 61261
- ♦ If a human entity changed its posture, but was otherwise not moving, it might not be correctly aligned with the terrain. 60558
- ♦ Bounding volumes in aggregate-level scenarios were incorrect. 59146
- ♦ DtBoundingVolumeTerrainSourceTracker just returned all nodes for spheres and shapes. 59888
- ♦ When configuring embarkation slots, if you associate an ingress point with a slot, you can't set the field back to blank. 60174
- ♦ Embarking entities did not always go to an empty slot. 60175
- ♦ In the Simulation Object Editor, when creating a new entity, it is possible to select inappropriate schema for model sets. 60177
- ♦ When creating or editing entities in Plan View mode, if orientation North is disabled, the orientation of the icon may not match the heading indicator. 60210
- ♦ M830 HEAT rounds have too much explosive power. 60292
- ♦ *surfChar.map* not finding external reference texture name. 60307
- ♦ When setting the height of all points in a line to above ground level, the points were actually set to above sea level. 60308
- ♦ Shrub and plant simulation models do not have a texture, so the *surfChar.map* did not work for them. 60309
- ♦ If an emitter volume was displayed, it was treated as a surface that entities could be placed on. 60316
- ♦ The plan condition dialog for selecting a scenario event includes an option for choosing a plan variable, which doesn't make any sense. 60323

- ♦ Errors in documentation of `vrfLauncher` and `vrfGui` command line arguments. 60334
- ♦ Navigation Area overlay does not show up on status bar. 60350
- ♦ Fixed-wing entities did not follow remote entities. 60382
- ♦ If you lock an overlay and right-click the vertex of an object, the Edit option is available instead of being grayed out. However it doesn't do anything if you select it - you can't move the vertex. However, you can delete points and add points. 60400
- ♦ After dragging an entity onto a parent entity and having it auto-embark, the parent entity does not show the white selection box when it is clicked. 60411
- ♦ In the Display Settings, Sensor tab, if you click on the Restore to Startup button, the dialog box for the sensors gets blanked. 60422
- ♦ Fixed a problem creating circles and ellipses. 60437
- ♦ When an entity with a laser guided missile launcher is tasked to fire multiple missiles at a target, and one of them destroys the target, an additional missile is launched anyway. 60469
- ♦ If you changed the posture of a DI multiple times while the scenario was paused, the DI did not have the last posture assigned. 60471
- ♦ `vrfMsgDump` did not print out timestamps. 60476
- ♦ `vrfMsgDump` did not decode `DtRequestVrfObjectData` messages. 60477
- ♦ There was a mismatch between the Supplies-Offered field in the aggregate-level OPE and the HLA FOM. 60570
- ♦ Resolved a problem that occurred if a panel was positioned on a separate screen in a two-screen layout and VR-Forces was then opened on a single screen. 60573
- ♦ Fixed layout problems in the Simulation Object Editor. 60589
- ♦ If you collapse a unit, perform an Embark On, then disembark it, the unit remains invisible. 60622
- ♦ In aggregate level scenarios, there was a mismatch between the FOM and OPE for Casualties-Per-Attacker. 60623
- ♦ The scenario event viewer fits pictures to the window even though the option was not selected. 60628
- ♦ When the GUI terrain and the simulation terrain are different, the simulation terrain should be passed to the navigation generator. Currently the GUI passes the GUI terrain instead. 60703
- ♦ In the ground joy move controller, whenever `calcAndSetPortValues` is called for a brake function, the throttle port is set to 0. If the brake is being released, the true throttle value should be set. 60722
- ♦ The `DtPhysicalWorld` LOS/LOF test functions can take "primary object" and "secondary object" arguments. These normally correspond to the observer/firer and the target. The check functions ignore LOS/LOF blockage by these entities. 60877
- ♦ If you change the notification level for an aggregate in its info panel, all its subordinates light up with the yellow notification icon. 61234
- ♦ Fixed a problem with `DtSpatialFilterEvaluatorList::maximumRange()`. 61324

- ♦ The human collision avoidance controller deactivates itself if the entity is in a navigation area and has a navigation interface. This is incorrect when the entity is executing a follow-entity task, because that task does not use the navigation interface. 61380
- ♦ If an RWA is embarked (e.g. on a ship) and is not moving, its position relative to the parent entity can drift over time. 61381
- ♦ DI-Guys did not have a dead animation. 61484
- ♦ Object console messages using translation that are longer than 512 characters will crash the GUI because the VRL function DtReplaceSubstring only allocates buffers of 512 bytes. The issue in this particular case seems to be an inability to run the flee task, in particular a flee task that is trying to flee from a lot of points (due to flee from explosion). 61503
- ♦ Go to create an entity, hold down both shift and alt key and try to change altitude. It will change, you can create your entity but after that you can't navigate terrain either by mouse or keyboard. 61510
- ♦ If you create a unit using Aggregate As and the unit type does not have any formations defined, the Aggregate/Disaggregate option did not work. 61517
- ♦ Setting sensor signatures in the Simulation Object Editor was not documented. 61531
- ♦ The Simulation Object Editor did not have a command line option for setting the notify level. 61592
- ♦ The entityList example did not work with plan variables. 61713
- ♦ Task visualization with many points could hang the GUI. 61734
- ♦ The release bomb tasks only worked on terrains in the northern hemisphere. 62081
- ♦ Clearing the navigation data button in the Simulation Object Editor did not change anything. 62347
- ♦ Civilian characters moved jerkily in many situations. 58921
- ♦ On Linux, the GUI occasionally crashed after mousing over a menu or a list option. 59835
- ♦ Setting a joystick's maximum and minimum in configuration menu causes slider to jump. 59909
- ♦ Rotary-wing movement was not stable in long ticks. 61986
- ♦ When changing a filled area to a non-filled area and changing the line width, the outline of the area of the area disappears leaving just the vertices. 61175
- ♦ The numbers at the end of spawn/sink point names are not resetting or incrementing correctly. 60025
- ♦ On Linux, when an entity doesn't find a point to move to in a navigation area you get the message generate points job failed: DtLuaNavRandom-PointJob - start not in NavData. At the end of the error message sentence you get a little square character. 60027
- ♦ The NavData generation fails on Linux when you try to generate a 20km x 20km navigation area. 60049
- ♦ Last-clicked-location panel has "altitude" label for Z in geocentric display mode. 60088

- Active sonars that are in "off" mode can still detect. 60113
- When loading up the saved state of global Lua variables that were component systems, the owning entity's UUID was put in the wrong place. 60104
- Cannot set floor or ceiling for a extruded TG when creating it via a plan. 60106
- Many miscellaneous GUI formatting issues.
- Many miscellaneous minor errors in documentation.
- Under certain circumstances, entities in an aggregate can get created partially underground. 60141
- Gui crash when cars have their lights on - dynamic lighting. 60148
- If you click the rollback button to rollback to a snapshot/checkpoint in a scenario via the snapshot manager you will not be prompted to keep a Lua script that was not promoted to a system script. 60149
- After-images of vehicle headlights/tail lights appear on terrain when HDR is enabled. 60165
- If you change a crowd's force type at the top level every entity in the crowd will drop their task. 60841
- Running VR-Forces with the --dataDir command line argument to redirect references to a different directory doesn't work for all references. 61329
- Spot reports could not be selected under certain circumstances. 60355
- When multiple waypoints are selected and 'Move' is used from the right-click menu, the waypoints move to a single point far below the terrain rather than keeping their formation. 61148
- Embarked entities took collateral damage. 60230
- Lua sendReport doesn't handle recipients. 60238
- Force (1 Force) does not translate correctly due to incorrect use of string manipulation in Qt. 60243
- Range Rings, Bounding Volumes, Task Visualization and Sensor Contact Lines were not getting translated. 60247
- Setting a location without an altitude did not work properly. 60249
- Movement systems and position element not translating in the Simulation Object Editor. 60261
- There was a problem configuring the spot report generator in the OPD Editor. 61542
- The altitude returned when clicking on the ground was incorrect. 61737
- The condition editor in the plan language sometimes did not work with compound statements. 60200
- The Launcher doesn't use correct FOM revision if not included in combo box entry. 60284
- On some terrains that had land and ocean layers on top of each other, some helicopters clamped to the ocean layer rather than the land layer. 60290
- If objects get discovered before the fog of war handler gets initialized, a deadlock can occur. 60310
- Plan variables are filtered out due to fog of war. 60324
- In certain cases copying a model to a new model in the Simulation Object Editor and trying to edit caused the SOE to crash. 60328

- ♦ It wasn't possible for the GUI to load a different terrain from the simulation engine if the GUI was started from the command line. 60336
- ♦ Changing the visual type for an entity in the Simulation Object Editor caused the model to detach. 60339
- ♦ When you changed the wake model in the Simulation Object Editor for an entity, the visualization of those changes did not persist after leaving the entity and then returning to it. 60346
- ♦ Fixed a problem translating the names of overlay layers. 60354
- ♦ Editing a tactical graphic vertex started in Attach to Mouse mode, which was a usability issue. 60372
- ♦ It was difficult to edit vertices of embarked routes. 60376
- ♦ Fixed a problem placing aircraft on an aircraft carrier. 60377
- ♦ Fixed a problem with sliders for setting the wake attributes in the Simulation Object Editor. 60415
- ♦ Fixed a problem embarking a waypoint below entity geometry. 60421
- ♦ Fixed a problem with slow scenario loading due to how UUIDs and default list filters interacted. 60470
- ♦ Discovering entities before the first back-end status update causes entities to not be discovered as VRF entities. 60490
- ♦ The automotive actuator did not work correctly when going in reverse. 60721
- ♦ Scenario rollback did not handle simulation object groups correctly. 60969
- ♦ Fixed a problem with munition detonations in extruded areas. 60996
- ♦ Triggers in issued plans were not visible in the trigger pane. 61005
- ♦ Move along route tasks in a plan for ground vehicles were being skipped with a Route Does Not Exist error. 61157
- ♦ Problem pasting units that were created by aggregating copies of other units. 61571
- ♦ Specifying the simulation object name in a Set Spot Report dialog box did not work. 61752
- ♦ Some models shared process state repositories and deleting one caused the other to be deleted. 61982
- ♦ If an embarked entity published itself before its parent was published, the GUI crashed. 62240
- ♦ If a unit had a movement task inside a navigation area and a target location for one of its subordinates was outside the navigation area, the task failed. 60004
- ♦ When changes the altitude for all points in a route, only the currently selected point got changed in the Edit Route dialog box. 60139
- ♦ Fixed a "hitch" in takeoff animation for fixed-wing aircraft. 59854
- ♦ A value for a route set in the edit dialog box did not get applied. 61816
- ♦ Rewinding a scenario from the remote controller did not take into account changes made for scenario rollback, so it did not work. 60742
- ♦ Could not send a task to an entity defined by a plan variable. 60137
- ♦ Creating favorites added too many menus to the Create menu. 62303

- ♦ Sometimes humans jumped to incorrect levels in multi level terrains. 62445

Known Problems

- ♦ Feature indexing for model layers in osgEarth terrains is not supported by VR-Vantage and must be disabled on all model layers to avoid performance issues and the possibility of crashes:

```
<model>
  <feature_indexing enabled="false"/> <!-- include this with every model
    section for VR-Vantage. If enabled, feature_indexing causes performance
    issues and crashes on Linux -->
  <!-- rest of model layer setup here-->
</model>
```

- ♦ Turning on the headlights of DI-Guy vehicles may cause a crash. (Most civilian vehicles are DI-Guy vehicles. Military vehicles do not have this problem.) Therefore automatic turning on of headlights at dusk has been disabled. This problem seems to be primarily on Linux, so it might not be a problem on Windows.
- ♦ VR-Forces 4.5 will not display remote objects generated by applications using the vrvControlToolkit that were built with VR-Vantage 2.1 or VR-Forces 4.4.x. Customers will have to rebuild their application on top of VR-Vantage 2.1 or VR-Forces 4.4.x to remotely draw objects to VR-forces 4.5.