



VR-Forces 4.5 Release Notes

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Systems Supported

VR-Forces 4.5 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++ 10.0 SP 1 (64 bit) Microsoft Visual C++ 12.0 (64 bit)
Red Hat Enterprise Linux 6 (64 bit libraries)	default compiler

3D Video Cards Supported

VR-Forces 4.5 supports NVIDIA graphics cards that support OpenGL 3.3 VR-Forces does not support AMD (formerly ATI) graphics hardware.



The recommended NVIDIA drivers for VR-Vantage 2.2 are those as close to 376.53 as possible, but no later. Drivers after that date have a minor memory leak issue when running Triton ocean with moving boats. This was a problem with drivers as recent as 378.78. This problem may be fixed in future versions of NVIDIA drivers, but it is safest to use the drivers nearest to 376.53.



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 5.3.1. You can download it from:

- ♦ <ftp://ftp.mak.com/out/products/vrlink5.3.1-win-vc10.exe>
- ♦ <ftp://ftp.mak.com/out/products/vrlink5.3.1-win64-vc12.exe>
- ♦ <ftp://ftp.mak.com/out/products/vrlink5.3.1-linux-rhe6.tar.gz>

If you plan to build the VR-Forces GUI, you must download and install QT 5.5.1. You can download it at: <http://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 5.3.1. 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 4.5 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:

<http://www.mak.com/license-support.html>

Third Party Library Support

VR-Forces 4.5 uses the indicated versions of the following libraries:

- ♦ VR-Link 5.3.1
- ♦ Qt 5.5.1
- ♦ OpenSceneGraph 3.4.0
- ♦ Boost 1.46.1
- ♦ FreeGlut 2.4.0
- ♦ GL-Studio 5.0.2
- ♦ DI-Guy 13.2
- ♦ Triton 3.73
- ♦ Silverlining 4.59
- ♦ SpeedTree 6.3.2
- ♦ osgEarth 2.8.13.

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 4.5 was built against VR-Link 5.3.1 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 4.5 is compatible with applications that use earlier versions of VR-Link if they support versions of the RPR FOM listed.

The VR-Forces 4.5 front-end is not compatible with RTI-NG Pro because it uses a non-standard version of *xerces_c_2_7.dll*.

DIS only

VR-Forces 4.5 supports DIS 4, 5, 6, and 7, and can therefore interoperate with DIS applications of any of these versions.

Backwards Compatibility

The VR-Forces 4.5 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

The recordings provided with MAK Data Logger 5.4 or later use the new FED file naming conventions ([“New FED File Naming Convention,”](#) on page 1-8). These should work seamlessly with the default HLA configurations in VR-Forces 4.5. If you want to connect VR-Forces 4.5 to recordings made with previous versions of the Logger, you must change the connection configuration to use the old FOM naming convention.

RPR FOM Versions Supported

VR-Forces 4.5 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 4.5 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 *DtRprFomMapper* 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 4.5 relies on the LgrControl and View-Control custom MAK extensions.

New FED File Naming Convention

VR-Forces 4.5 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 file-name 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

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

Old FED File	New FED File
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	
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	

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

Old FED File	New FED File
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	
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 4.5 has the following new features and updates.

Installation and Application Management

- ♦ The installation process has changed slightly. Instead of providing a wizard-style installer for data, the data is in a compressed file. The application installer automatically tries to find the data file. It prompts you to confirm the data file and then uncompresses and installs the data.
- ♦ Saved window layouts. Create and quickly switch between saved window layouts in the GUI, including the preconfigured "Scenario Player" or "Scenario Editor" layouts. All of the toolbars and dockable windows are shown or hidden, and positioned on the UI as they are defined in the saved window layout. You can specify a default layout for startup. For details, please see Section 78.2, "[Saving Window Layouts](#)," in *VR-Forces Users Guide*.
- ♦ Upgrade to Qt 5.5.1.
- ♦ Upgrade to VR-Link 5.3.1.
- ♦ New command-line options:
 - `--mainScreenNum`. Specifies the number of the screen in which the main window should be displayed.
 - `--enableLogFileTimestamps`. Puts time stamps in log files.
 - `--useReverseZBuffer`. Use reverse Z buffering to reduce z-fighting when observing the terrain from a distance. Oculus, simulation object labels, shadows, HUDs, and lightpoints do not work with reverse Z buffering.
 - `--enableVSync`. The `--novsync` option has been removed. VSync is disabled by default.
 - `--disableDynamicTerrain`. Disables the dynamic terrain engine.
 - `--entityDefsDir`. Merges in all *.hier* and *.leaf* files in the specified directory. The directory must be *.appData/definitions/Entity/ElementDefinitions*, *.appData/definitions/Aggregate/ElementDefinitions*, or *.appData/definitions/TacticalGraphics/ElementDefinitions* or be subordinate to one of them.
 - `--mergeHierarchyEntityDef`. Imports the specified *.hier* file.
 - `--mergeLeafEntityDef`. Merges in the specified *.leaf* file.
 - `--mergeHierarchyTacticalGraphicsDef`. Merges in the specified tactical graphics *.hier* file.
 - `--mergeLeafTacticalGraphicsDef`. Merges in the specified tactical graphics *.leaf* file.
 - `--mergeHierarchyUnitDef`. Merges in the specified unit *.hier* file.
 - `--mergeLeafUnitDef`. Merges in the specified unit *.leaf* file.
 - `--mergeModelDefs`. Merges in a model definitions file.

- `--noAppDataModelDefs`. Do not load model definitions at startup.
- `--noAppDataEntityDefs`, `--noAppDataUnitDefs`, or `--noAppDataTacticalGraphicsDefs`. Do not load element definitions at startup.
- ♦ New command line arguments for `vrflauncher`. `--guiArgs` does the same things as `F--`. `--simArgs` does the same thing as `B--`.

Scenario Management

- ♦ Scenarios are now saved in a compressed format (zip) with the extension `.scnx`. All scenario data is saved to the repository. This makes it easy to share scenarios. You can still save scenarios as uncompressed individual scenario files (`.scn`, `.oob`, `.pln` and so on). For more information, please see Section 7.4, “[Saving a Scenario](#),” in *VR-Forces Users Guide*.
- ♦ When you rewind a scenario, plan windows and information dialog boxes that were open before you rewound get opened again if the simulation objects are in the rewound scenario.
- ♦ When you create a scenario, you can disable the global weather settings. For more information, please see Section 7.1, “[Creating a Scenario](#),” in *VR-Forces Users Guide*.
- ♦ When you create a scenario, you can disable the global dynamic terrain processor. For more information, please see Section 7.1, “[Creating a Scenario](#),” in *VR-Forces Users Guide*.
- ♦ You can update a scenario with changes to visual models made in the Simulation Object Editor without shutting down VR-Forces. For more information, please see Section 65.3.10, “[Reloading Visual Models in the VR-Forces GUI](#),” in *VR-Forces Users Guide*.

Tasks and Sets

- ♦ Scripted set data requests. You can now create scripts that function like set data requests. They get executed without interrupting the current simulation object task. For details, please see Chapter 32, “[Creating Scripted Tasks and Sets](#),” in *VR-Forces Users Guide*.
- ♦ The Flee task chooses the point to flee to more quickly. However, there is no longer an option to stop when hidden and fleeing entities do not avoid other entities.
- ♦ New tasks for rotary-wing entities to pick up and drop off cargo. For details, please see Section 27.29, “[Rotary Wing Airlift Cargo to Location](#),” Section 27.31, “[Rotary Wing Retrieve Cargo](#),” and Section 27.32, “[Rotary Wing Unload Cargo](#),” in *VR-Forces Users Guide*.

- ♦ Indirect fire events have a new timing option. Indirect fire event areas can be set to inactive and the indirect fire event does not take place until the area is activated. This allows you to begin the event with the Activation set data request manually or in a plan. For details, please see Section 10.1.1, “[Creating an Indirect Fire Event](#),” in *VR-Forces Users Guide*.
- ♦ Set DI-Guy Characteristics. You can change the head of a DI-Guy character and change the body weight. For details, please see Section 34.18, “[DI-Guy Characteristics \(Appearance, Head, Body Weight\)](#),” in *VR-Forces Users Guide*.
- ♦ New aircraft tasks: Generate Air Traffic From Flight Plans and Land at Airport Near Location.
- ♦ New tasks:
 - Fast Rope Insertion
 - Throw Grenade at Location
 - Throw Grenade at Target
 - Close Cargo Door
 - Open Cargo Door
 - Create Pedestrians
 - Deploy Refueling Boom
 - Stow Refueling Boom
- ♦ New sets:
 - Set Sensor Enabled
 - Set Invulnerable
 - Set Invisible
- ♦ Ability to set the characteristics of tactical graphics using set data request. This allows you to change the state of a tactical graphic from a plan. You can set the following characteristics:
 - Arrowhead style
 - Color
 - Fill style
 - Force
 - Line width
 - Notify level
 - Pen style.

Plans

The Plan dialog box has been significantly changed and improved, as follows:

- ♦ Numbered statements indicate control flow.
- ♦ Ability to name condition blocks to improve readability of the plan.
- ♦ Use of the term trigger to refer to When condition blocks.
- ♦ Ability to register and unregister triggers by name.
- ♦ Ability to reregister triggers.
- ♦ Ability to specify that a trigger cancel the current task or suspend and resume it.
- ♦ A new GUI for building conditional statements.
- ♦ Ability to drag and drop statements within the plan window.
- ♦ Ability to drag and drop statements between plans, including dragging associated triggers and condition blocks.
- ♦ Visual identification of active conditional blocks.
- ♦ Support for two types of variables (simulation object and created object) in plans. For details, please see Section 35.3, “[Plan Variables](#),” in *VR-Forces Users Guide*.
- ♦ The Detect Entity condition no longer has an option for detecting “Self.”
- ♦ The Missile Approach Warning, Receive Text Message, and Resource conditions are no longer available in global plans. They did not make sense because there was no simulation object for them to refer to.
- ♦ A new condition - Wait Until. This condition causes a simulation object to wait until the condition becomes true.
- ♦ The organization and work flow for creating objects from a plan has changed.

For details, please see Chapter 36, [Writing Plans](#) in *VR-Forces Users Guide*.

Simulation Object Modeling

- ♦ Follow behavior for aircraft has been dramatically improved.
- ♦ Many new and improved models.
- ♦ Improved road following behavior.
- ♦ Calculation of munition damage is now based on the generic type of munition - explosive, kinetic, armor-piercing, and fragmentation. Munition types are assigned a power. Simulation objects no longer need to configure damage by every type of munition. They just need to configure damage by the generic types. This makes configuration of munition damage simpler, while at the same time making it more realistic. The previous damage models are still supported. For details, please see Chapter 72, [Configuring Weapon Systems and Munition Damage](#) in *VR-Forces Users Guide*.
- ♦ VR-Forces no longer uses the *character_digest.xml* file to configure DI-Guy characters. This is now handled through the DI-Guy API.

- ♦ Improved DI-Guy characters. You can now configure (in the Simulation Object Editor) the hand items and heads used by specific characters.
- ♦ Support for instanced DI-Guys, DI-Guy variants (Fat/Skinny), new DI-Guy settings page.
- ♦ Fast roping animation. DI-Guy soldiers can disembark from helicopters by sliding down ropes. For details, please see Section 27.5, “[Fast Rope Insertion](#),” in *VR-Forces Users Guide*.
- ♦ Hand grenades. DI-Guy soldiers can throw fragmentation, smoke, and flash/bang hand grenades. For details, please see Section 28.23, “[Throw Grenade Tasks](#),” in *VR-Forces Users Guide*.
- ♦ Human characters can die when hit by vehicles. This feature affects performance and is disabled by default. To enable it, set **is-enabled** and **create-component** to True in `./data/simulationModelSets/EntityLevel/vrfSim/systems/damage/lifeform-default.sysdef`.
- ♦ Helicopters take wind and the weight of cargo into account when they calculate fuel consumption.
- ♦ Randomized simulation objects. A randomized simulation object is an object on the Simulation Objects Palette that references a list of specific simulation objects. When you add a randomized simulation object to a scenario, VR-Forces randomly chooses an object from the list to create. Once they are created, they keep whatever simulation object type is used. For details, please see Section 16.10, “[Creating Random Versions of Similar Entity Types](#)” and Section 65.9, “[Creating Randomized Simulation Objects](#),” in *VR-Forces Users Guide*.
- ♦ Ambient air temperature. You can now set the air temperature on the Weather page of the Environment Conditions dialog box. This information is not used by VR-Forces. It is sent over the network for use by other applications that need the information.
- ♦ Entities can walk or drive onto vehicles and automatically embark if the parent vehicle is configured for this capability. For details, please see Section 65.7, “[Configuring Embarkation](#),” in *VR-Forces Users Guide*.
- ♦ Many new models, including quadcopters and air mule UAV, more DI-Guy characters, and surface and ground vehicles. Simulation object types have been added for specific civilian car models so that they do not randomly change between scenarios.

Tactical Graphics

- ♦ Export point, linear, and areal tactical graphics to shapefiles. You can import shapefiles and the features will be implemented as point, linear, or areal tactical graphics. For details, please see Section 38.3, [“Exporting Tactical Graphics as Shapefiles,”](#) in *VR-Forces Users Guide*.
- ♦ Polygonal, circular, and elliptical weather areas. You can now specify that weather areas not be filled. For details, please see Section 11.5, [“Creating Local Weather Zones,”](#) in *VR-Forces Users Guide*.
- ♦ Terrain Draw Area tactical graphic, which displays polygons known to the simulation engine. For details, please see Section 53.11, [“Using Terrain Draw Areas to View Terrain Polygons,”](#) in *VR-Forces Users Guide*.
- ♦ Pedestrian areas allow you to create an area and have it immediately populated with civilian entities that will wander in the area. For more information, please see Section 21.2, [“Creating Crowds Using a Pedestrian Area,”](#) in *VR-Forces Users Guide*.

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Pedestrian areas work only in navigation areas.

- ♦ Dynamic terrain areas. Dynamic terrain areas allow you to enable dynamic terrain if the global terrain processor is disabled. For more information, please see Section 59.4, [“Creating Dynamic Terrain Areas,”](#) in *VR-Forces Users Guide*.

Terrain

- ♦ Dynamic terrain. Buildings that have appropriate switch nodes can change dynamically in response to scenario events. For example, building can explode and doors and windows can open and close. These changes alter both the visual and simulation terrain, and are published over the network, to all VRV and VRF Sim instances in the scenario. For details, please see Chapter 59, [Dynamic Terrain](#) in *VR-Forces Users Guide*.
- ♦ The ability to debug earth files by turning individual layers on and off. For details, please see Section 61.6, [“Debugging Earth Files,”](#) in *VR-Forces Users Guide*.
- ♦ The ability to cache elevation, image, and feature data through the GUI. For details, please see Section 61.1.2, [“Caching earth File Terrain Data,”](#) in *VR-Forces Users Guide*.

Visualization Changes

- Support for high dynamic range (HDR) lighting. For details, please see Section 43.9, [“Using High Dynamic Range Lighting,”](#) in *VR-Forces Users Guide*.

Simulation Object Editor Updates

- The ability to quickly clear the lists in the Simulation Object Editor. For details, please see [“Clearing the Used By Countries List,”](#) under Section 65.2.1, [“Editing a Simulation Object’s Used By Countries List,”](#) in *VR-Forces Users Guide*.
- You can now edit the icon used for spot reports in at the Full Knowledge level. For details, please see Section 65.3.4, [“Editing a Spot Report Icon,”](#) in *VR-Forces Users Guide*.
- You can now specify that simulation objects in a 3D observer mode be invisible when they are embarked. For details, please see Section 65.7.2, [“Configuring Slots,”](#) in *VR-Forces Users Guide*.
- You can now specify a slot name and slot type when configuring embarkation slots. You can use these attributes to specify a specific slot when embarking entities. For details, please see Section 65.7.2, [“Configuring Slots,”](#) and Section 30.1.3, [“Embark,”](#) in *VR-Forces Users Guide*.
- You can now add new model definitions in the Simulation Object Editor independently of editing simulation objects. For details, please see Section 65.3.5, [“Adding a New Visual Model or Image,”](#) in *VR-Forces Users Guide*.
- You can now regenerate spot report definitions. For details, please see [Regenerating Spot Report Definitions](#), under Section 65.3.2, [“Changing the 2D Icon Using a Font,”](#) in *VR-Forces Users Guide*.
- Model definitions and element definitions for newly created SMSs are now stored in SMSs rather than in the `.appData/definitions` directory. For details, please see Section 64.4, [“Visual Model Definitions,”](#) in *VR-Forces Users Guide*.
- You can now import, prune, and export model and element definitions. For details, please see Section 65.3.7, [“Importing Visual Models,”](#) Section 65.3.8, [“Pruning Visual Models,”](#) and Section 65.3.9, [“Exporting Visual Models,”](#) in *VR-Forces Users Guide*.

Visual Modeling Changes

The Simulation Object Editor continues to be the recommended tool for editing visual models as well as simulation models. The following changes affect the model and element definition files edited in the Visual Model Editors dialog box and Simulation Object Type Mapping dialog box:

- Changes to model definitions are no longer saved automatically. You must manually save them.
- Entity element definitions are no longer stored in .elem files (although legacy .elem files are supported). They are now stored in two files. A hierarchy file (.hier) and a leaf file (.leaf). You must manually save both these file types. Changes to entity element definitions are not saved automatically. For complete information about entity element definitions, please see Chapter 81, *Model and Element Definitions*, in *VR-Forces Users Guide*.
- You can now merge simulation object type mappings files for entities.
- Trailing effects (dust clouds, and so on) can change based on the type of terrain a vehicle is driving over.

API Changes

- CMake-based build system for toolkit customers to generate VR-Forces-based project files.
- If your application or plug-in adds visualizer definitions to entity element definitions in the `initDeModule`, they now need to be added after the `signal_postLoad-Visual` boost signal is sent from the *DtVrfScenarioManager*.
- Scenario rewind now uses the scenario rollback functionality. Previously you would add callbacks for scenario rewind when a scenario was rewound from the GUI. You must now add callbacks for `addPreLoadScenarioCallback()` and `addPostLoadScenarioCallback()` in the *DtCgf* class.
- Added support for appearance bit control of tracks and trails. There are two new parameters for both of those visualizers:
 - `attributecontrolname`. A string that specifies which attribute bit to use to control the visualizer. "trailing_effects" would link the visualizer to the trailing effect appearance bit.
 - `attributecomparevalue`. An integer that specifies what value the attribute bit should trigger the visualizer to turn on. If it is not set then any value greater than 0 will turn on the visualizer.

If neither parameter is specified then the behavior defaults back to the old behavior of always being on.

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.

- ♦ Tutorial videos now have narrative sound tracks. Tutorials for the First Experience Guide and pattern of life have been added.

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The video tutorials for terrain composition and model creation distributed with VR-Forces were created using VR-Vantage. Although there are obvious differences in the overall GUI, the menu options and procedures for these activities are the same in VR-Forces as in VR-Vantage.

- ♦ Screen captures are a mix of Windows 10 and Windows 7 styles, but in all cases they accurately represent the current functions of windows and dialog boxes, except that there have been some slight changes to the Plan dialog box since the documentation was completed.
- ♦ If you specify a DIS port that is less than 3000 or greater than 4000, discovered objects might not be seen as VR-Forces objects. If you want to use a DIS port outside this range, specify it for the front-end and back-end with the `--appIdRange` command-line argument.
- ♦ Hyperlinks from *VR-Forces Release Notes* and *VR-Forces First Experience Guide* to *VR-Forces Users Guide* might not work.
- ♦ *VR-Forces Developers Guide* was not updated to describe the new damage-by-power scheme.

Fixed Bugs

The following problems identified in previous releases have been fixed:

- ♦ Component descriptions in the OPD Editor online help were missing descriptions for many components.
- ♦ Rotary-wing entities did not reach their ordered speed. 57768
- ♦ Periodically, entities will get stuck on some of the trees near the building with the flag in front of it. 57957
- ♦ If you create a plan for a DDG, add a embedded entity move to location task in the plan and then edit the task after you add it the task changes to a send task. This is incorrect it should be a Forwarding Task. Once the change occurs the embedded entity will fail to appear and the task doesn't work because there isn't an entity for the task to be sent to. 58062
- ♦ Importing a scenario and adding a deconflicting name causes play/pause buttons to disable. 57478

- ♦ Modified and saved lua scripts get erased on rewind if you have the edit scripted task window open for that script. 57547
- ♦ Setting full path on layoutSettingsFile causes a save error. 57562
- ♦ The vrfLauncher command line processor had a bug. 57564
- ♦ The logic for showing entity orientation in the entity info panel is incorrect when the units are degrees. 57739
- ♦ Target selection controller does not initialize properly. 57743
- ♦ Rotary wing gains altitude when following fast moving entity. 57759
- ♦ If munition detects a terrain intersection but the surface of that intersection doesn't pass a ground, water, or (perhaps incorrectly used) unspecified check, it will not detonate. 57765
- ♦ Rotary wings do not quite reach ordered speed. 57769
- ♦ Some simulation objects that did not have radios had radio tasks enabled. 57512
- ♦ Can't edit a conditional with an AND. 54861
- ♦ Deleting an aggregate crashed the Simulation Object Editor. 57681
- ♦ A \n in vrf:trUtf8 in a Lua script causes variables to not be substituted. 57732
- ♦ Cannot delete and recreate a DtVrfApp. 57904
- ♦ Global plans to change observer views not working completely. 57976
- ♦ The reactive task that controls the launching of the missiles in the patriot battery object group is not listed in the PatriotECS1's info panel. 57884
- ♦ DtBombController not tracking location properly. 57764
- ♦ Warhead detonator detecting erroneous ground impact when data not available. 57917
- ♦ Fire-at-target quits if terrain is not immediately available. 58055
- ♦ When aiming (or zooming) a sensor gimbal, the GUI has a drop down listing all of sensor IDs. However, when writing a plan this list is not always available. 57922
- ♦ Joystick GUIDs are not really unique. 57960
- ♦ The Interface manipulation example broke GUI settings. 58111
- ♦ Reversing route points does not reverse in dialog box. 58252
- ♦ Bug when using the method setIFF DtVrfRemoteController. 58277

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>
```

- ♦ 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.

