



VR-Forces 4.9 Release Notes

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Systems Supported

This section describes platform support and system requirements for VR-Forces. To take full advantage of VR-Forces's visualization capabilities and optimize performance, you must use a modern game computer with a high quality NVidia graphics card.

For the most up-to-date information about systems supported, see the Product Versions page on the MAK web site at: <https://www.mak.com/support/product-versions>. For hardware requirements, see <https://www.mak.com/support/hardware-recommendations>.

VR-Forces 4.9 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 10	Microsoft Visual C + + 15.0 (64-bit)
Red Hat Enterprise Linux 8.0 (64-bit libraries)	default compiler

3D Video Cards Supported

VR-Forces 4.9 supports NVIDIA graphics cards that support OpenGL 4.5 VR-Forces does not support AMD (formerly ATI) graphics hardware.

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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 4.5 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. The minimum recommended card is the 9xx series.

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, for Kepler series Quadro you must make this change manually.

Disk Space Requirements

A full installation of VR-Forces requires approximately 35 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, 12.0, and 15.0). 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 5.6.

If you plan to build the VR-Forces GUI, you must download and install Qt 5.10.1 (Windows) or 5.14.0 (Linux). 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 <https://www.qt.io>. This version should be satisfactory for most VR-Forces customers. If you need a Qt commercial license, you must purchase the license from Qt.

MAK Product Compatibility

To build VR-Forces applications, you must link with VR-Link 5.6. 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 4.9 uses FLEXlm 11.13.0.2.

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

- ♦ Windows: <http://ftp.mak.com/out/MAKLicenseManager-win64-setup.exe>
- ♦ Linux: <http://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 Libraries Supported

VR-Forces 4.9 uses the indicated versions of the following libraries:

- ♦ VR-Link 5.6
- ♦ Qt 5.10.1 (VC 15), Qt 5.14.0 (Red Hat 8)
- ♦ OpenSceneGraph 3.6.4
- ♦ Boost 1.63.0
- ♦ FreeGlut 2.4.0 (Windows), 2.6.0 (Linux)
- ♦ GL-Studio 7.0 (VC 15)
- ♦ DI-Guy 13.4 (development version)
- ♦ Triton 3.73
- ♦ Silverlining 5.086
- ♦ SpeedTree 6.3.2
- ♦ CDB API 2.2 (Windows), 2.1 (Linux)
- ♦ osgEarth 3.0
- ♦ CUDA 9.2 (Windows), 10.2 (Linux)

Using MAK Products on Virtual Machines

You can run MAK products on virtual machines. For more information, see the Cloud & Virtualization page on our website at <https://www.mak.com/learn/cloud-virtualization>.

Network Compatibility

VR-Forces 4.9 is compliant with RPR FOM 1.0 and RPR FOM 2.0 and includes FOM mappers for many draft versions of the RPR FOM. It is compliant with RTIs that support the HLA 1.3 specification, the SISO DLC HLA API 1516 version of the IEEE 1516 specification (SISO-STD-004.1-2004), or HLA Evolved.

To use an RTI with VR-Forces it must use the same operating system and be built with the same compiler.

VR-Forces 4.9 supports DIS 4, 5, 6, and 7, and can therefore interoperate with DIS applications of any of these versions.

Backwards Compatibility

The VR-Forces 4.9 APIs are largely compatible with earlier VR-Forces 4.x versions, however some changes are required to migrate to 4.9. See the *VR-Forces Migration Guide* for more information.

Scenarios created with recent releases are usually forward compatible. Updates to tasks, systems, and terrain reasoning may change how simulation objects behave.

Support for MAK Data Logger Recordings

The recordings provided with MAK Data Logger 5.4 or later use the new FED file naming conventions (described in *MAK Products Interoperability Guide*). These should work seamlessly with the default HLA configurations in VR-Forces 4.9. If you want to connect VR-Forces 4.9 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 4.9 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 4.9 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 4.9 relies on the Controlling and ViewControl custom MAK extensions.

New Features and Updates

VR-Forces 4.9 has the following new features and updates.

Data and DLLs

- ♦ makData version 13 has a different structure from previous versions. As in previous releases, you must install the packages because they contain information that VR-Forces requires.

The installation directory is also different from what it was in previous releases. See Section 2.2, “[The VR-Forces Directory Structure](#),” in *VR-Forces Users Guide*. In addition to the top-level changes, the contents of the `./user-Data/servers` directory have been moved to `./userData/terrains`.

- ♦ Entity configuration has been broken up into many files (one for each entity). See Section 12.2.2, “[Entity Configuration Files](#),” in *VR-Forces Migration Guide* to learn about changes you might need to make. Also, if you have any SMSs with custom visuals, you need to make manual changes to the directory. See Section 12.2.1, “[Custom SMS with Visual Models](#),” in *VR-Forces Migration Guide*.
- ♦ VR-Forces no longer includes debug DLLs on Windows systems. The debug versions of the VR-Forces DLLs run very slowly, making it impractical to run the debug version of the application. You can effectively debug applications using release mode DLLs.

Simulation Objects

- ♦ When creating multi-vertex tactical graphics, you now double-click instead of right-click to place the final vertex.
- ♦ There are many new simulation objects available in the entity-level SMS:
 - Aircraft: Beechcraft MC-12 King Air and M-346 Master.
 - Ground Vehicles: BMP-3 AFV, M1028 FMTV Canvas Cargo Truck, M1028 FMTV Cargo Truck w/ Trailer, M1083A1 FMTV Flatbed Truck, M1083A1 FMTV Troop Seat Flatbed Truck, M1089A1 FMTV Wrecker, M1150 ABV, M1157 FMTV Dump Truck, M1157 FMTV Troop Seat Dump Truck, M1A1 AIM (AUS) Mineplow, M1A1 SA Abrams, M1A1 SA Abrams Mineplow, M1A1 SA Abrams Mineroller, M1A2 SEP V2 Abrams, M1A2 SEP V2 Abrams Mineplow, M1A2 SEP V2 Abrams Mineroller, M1A2 TUSK Abrams, M915 Tractor Truck wS/ Patriot Launcher, M983 HEMTT w/ Patriot Launcher, and Volkswagen Type 2 Microbus.
 - Surface: Lifeboat Enclosed Freefall and Liferaft Enclosed.
 - Humans: Canadian Navy, Colombian Airforce, Colombian Armed Forces, Colombian Military Police, Colombian Naval Infantry, Colombian Police Anti Disturb, Colombian Riot Police, Russian Soldier AK47, Russian Soldier PK74, Russian Soldier RPO, Russian Soldier SA7, Russian Soldier Sniper-127, and USMC M9.
 - IEDs: 5 Gallon Container, Ammonium Nitrate Bags, Artillery Shell, Bag in Ground, Cell Phone, Exposed Ordinance, Pile of Boxes Large, Pile of Boxes Single, Pile of Boxes Small, Pressure Cooker Silver, Pressure Cooker White, Tire Pile Box, Tire Pile Large, Tire Pile Medium, Tire Pile Rice Bags, Tire Pile Single, Tire Pile Small, Trash Bags Single, Trash Cans Single, Trash Pile Large, Trash Pile Medium, and Trash Bags Small.
 - Cultural Features: Trash Bag Pile Small, Trash Bag Pile Medium, Trash Bag Pile Large, and Trash Bag Pile Extra Large.
- ♦ The vehicle dynamics model now makes it more difficult for vehicles to drive up slopes. The maximum slope a vehicle can drive up is determined by its `max-slope` parameter, set in the Simulation Object Editor (SOE). When planning movement paths in terrain where there are navigation areas, the planner tends to avoid sloped terrain. You can adjust the additional cost of sloped terrain with the `slope-avoidance-factor` parameter in the vehicle's movement system (`.sysdef` file).
- ♦ Persistent tracks.
 - The tracks from vehicles can now persist on the terrain, rather than fading after a period of time. This is useful for aerial surveillance scenarios. See Section 43.1.2, “[Displaying Persistent Tracks](#),” in *VR-Forces Users Guide*.
 - There are parameters for the Decal schema model definitions that you can use for persistent tracks. See Section 17.6, “[Configuring Persistent Tracks in Model Definitions](#),” in *Adding Content to MAK Applications Reference Manual*.

- ♦ You can now remove simulation objects from custom overlays. Simply right-click on the object and choose **Remove From Overlay**.
- ♦ As part of the improvements to overlays introduced in the previous release, Default Overlays have been removed from the SOE. You can still use the overlay keyword to add a default, custom overlay to a simulation object. See Section 62.1.7, “[Specifying a Default User-Created Overlay](#),” in *VR-Forces User Guide*.

Modeling

- ♦ Bearing and range now display the bearing first and the range second. Bearing displays in degrees and is always three digits with no decimal places. For example, a bearing of 90 degrees displays as 090.
- ♦ Added the MK19 Grenade Launcher system. It uses direct fire.

Tactical Graphics

- ♦ The Information dialog box for each tactical graphic now includes the graphic’s Environmental ID, which is used on the network to uniquely identify the object. The Environmental ID appears in the Detailed Information section on the State Data page.
- ♦ The Spider Web tactical graphic now allows you to specify the spacing of rings in the web, as well as the number of spokes. See Section 40.1.6, “[Drawing Spider Webs](#),” in *VR-Forces Users Guide*.
- ♦ You can set a spider web on a bullseye tactical graphic, displaying sectors and range rings. See Section 40.6.2, “[Attaching a Spider Web to a Bullseye](#),” in *VR-Forces Users Guide*.
- ♦ By default, the distance from an entity or the mouse now defaults to the first (or only) bullseye. You no longer need to open the bullseye toolbar first.

New and Updated Tasks and Sets

- ♦ The Entity Control Panel includes an option to specify whether the heading should use either True North or Magnetic North. See Chapter 26, [Movement Tasks for Entity-Level Scenarios](#), in *VR-Forces Users Guide*.
- ♦ The new Target Priority List - Update set data request allows you to add and remove targets from an entity’s target priority list, as well as adjust each target’s priority. See Section 34.78, “[Target Priority List - Update](#),” in *VR-Forces Users Guide*.
- ♦ The Entity Control panel allows you to direct entities to move around the terrain. See Section 26.1, “[Assigning Tasks Using the Entity Control Panel](#),” in *VR-Forces User Guide*.
- ♦ The Turn to Heading, Fly Heading, Fly Heading and Altitude, and the Sail Heading movement tasks now allow you specify true or magnetic north. The Set Heading data request also lets you to specify true or magnetic north.

- ♦ Because of the changes to headings to support either true or magnetic north, you must update any Search and Rescue tasks in scenarios created before this release: Fly Creeping Line, Fly Expanding Square Pattern, and Fly Parallel Pattern.
- ♦ Rotary-wing aircraft can now perform the Orbit Object task. See Section 26.27, [“Orbit Object,”](#) in *VR-Forces Users Guide*.
- ♦ When setting the ordered speed for aircraft, you can specify whether the speed is the entity’s ground speed, TAS (true airspeed), IAS (indicated air speed), or Mach number. This only applies to the Set Ordered Speed request and the Entity Control Panel.
- ♦ The code for aircraft movement tasks that are used by RT Dynamics has been simplified.
- ♦ Move Along Route With Actions task.
 - There is now a button () for the Move Along Route With Actions task on the Tasks Toolbar and the Last Selected Object Panel.
 - The Move Along Route With Actions task now has better speed control. By default, ordered speed is recommended, not required. When you set ordered speed in Move Along Route with Actions, select the Make Ordered Speed Required check box in the Ordered Speed dialog box to override the current speed and delay the task’s time estimates based on the new required speed. See Section 26.17, [“Move Along Route with Actions,”](#) in *VR-Forces User Guide*.
 - In the Move Along Route With Actions task, you now have better control over the altitude at which an air entity follows a route. Set an ordered altitude for an air entity if the altitude of the route it is following (or any part of the route) is unsuitable. You can specify an altitude at any point in the route; if you do, the entity moves to that altitude and maintains it until it encounters another altitude setting on the route. Please see Section 26.17, [“Move Along Route with Actions,”](#) in *VR-Forces User Guide*.
- ♦ The new Rope Sling Load Pick Up and Rope Sling Load Drop Off tasks enable rotary wing vehicles with the fast roping system to carry and deliver cargo using a rope, also known as underslung cargo. See Section 29.1.7, [“Rope Sling Load Pick Up,”](#) and Section 29.1.8, [“Rope Sling Load Drop Off,”](#) in *VR-Forces User Guide*.
- ♦ The Airdrop from Aircraft task now allows you to specify a Cargo Parachute Type. See Section 29.1.6, [“Airdrop from Aircraft,”](#) in *VR-Forces User Guide*.
- ♦ The Launch Ballistic Missile at Target Object task now allows you to specify the altitude where the missile will detonate. See Section 27.18, [“Launch Ballistic Missile at Target Object,”](#) in *VR-Forces User Guide*.

Weather

- ♦ The Last Clicked Environment Panel (previously the Weather at Location Panel) now includes soil type and elevation.
- ♦ Tactical smoke is now affected by precipitation as well as wind. It dissipates faster at greater intensities of precipitation, thereby reducing its ability to block line of sight when entities are attempting to detect each other.

You can adjust the factor by which tactical smoke dissipates in wind and precipitation by editing the Tactical Smoke object in the SOE.

- ♦ You can now define the sea level air pressure. See Section 11.4.2, “[Setting the Sea Level Air Pressure and Temperature](#),” in *VR-Forces Users Guide*.
- ♦ Wind and blowing dust, sand, and snow.
 - You can now specify different wind speeds and directions for various elevations, giving you the ability to create more realistic simulations for entities moving in the air. See Section 11.4.1, “[Setting the Wind Speed and Direction](#),” in *VR-Forces Users Guide*.
 - Using the new Wind Corridor tactical graphic, you can define a linear area where the wind moves at a different speed and direction than elsewhere in the scenario. For example, wind may move along a valley at a different speed and direction than the wind across the nearby mountain-tops. See Section 11.7.4, “[Creating a Wind Corridor](#),” in *VR-Forces Users Guide*.
 - You can create areas of air turbulence. See Section 11.7.5, “[Creating an Air Turbulence Area](#),” in *VR-Forces Users Guide*.
 - You can now visualize localized areas of blowing sand and dust by adding the appropriate layers in the Cloud Cover Editor page of Scene Settings. The Wind Speed defined in the Environment Conditions Settings page determines how much the sand or dust blows in the defined area. To learn about cloud covers, see Section 11.6, “[Creating and Editing Cloud Covers](#),” in *VR-Forces Users Guide*.

You can also create a Blowing Sand Area or Blowing Dust Area tactical graphic. See Section 11.7.2, “[Creating Blowing Dust, Sand, or Snow Areas](#),” in *VR-Forces Users Guide*.

- You can now visualize localized areas of blowing snow effects by adding a Blowing Snow layer in the Cloud Cover Editor page of Display Settings. The Wind Speed defined in the Environment Conditions Settings page determines how the snow blows in the defined area. To learn about cloud covers, see Section 11.6, “[Creating and Editing Cloud Covers](#),” in *VR-Forces Users Guide*.

You can also create a Blowing Snow Area tactical graphic. See Section 11.7.2, “[Creating Blowing Dust, Sand, or Snow Areas](#),” in *VR-Forces Users Guide*.

Terrain

- ♦ Continued to improve performance. Also improved generation of navigation areas to complete more quickly.
- ♦ VR-Forces now supports rotor wash on grass from rotary-wing entities. Grass is driven by land cover data. The rotor wash is enabled or disabled based on whether the engine is on or off, as well as by the embarked and destroyed states.
- ♦ Terrain Editor panel.
 - Add Feature Layer is now available in the Terrain Editor panel. It is no longer in the terrain settings. See Section 1.4, “[Adding a Feature Layer](#),” in *Adding Content to MAK Applications Reference Manual*.
 - The Terrain Contents page has been removed from Terrain Settings. Manage terrain contents using the Terrain Editor panel. See Section II, [Terrain](#), in *Adding Content to MAK Applications Reference Manual*.

Observer

- ♦ In Plan View, the zooming behavior of the scroll wheel has changed. In previous releases scrolling forward zoomed in on the center of the screen; now scrolling forward zooms in on the point under the mouse cursor. Hold down the **Alt** key and scroll forward to zoom on the center of the screen.

GUI and GUI Configuration

- ♦ Task and Sets Toolbars.
 - VR-Forces now includes tasks and sets on the Last Selected Object panel and on the main toolbar.
 - The Tasks and Sets Toolbars for entity-level scenarios now display buttons only for tasks that the selected simulation object can perform, instead of showing all buttons and graying out the ones that were unrelated to the simulation object. This matches the behavior of the Last Selected Object Panel. For some simulation objects, the toolbars will now be empty. See Chapter 26, [Movement Tasks for Entity-Level Scenarios](#), in *VR-Forces Users Guide*.
 - The Tasks toolbar for aggregate-level scenarios now includes tasks specific to the selected aggregate simulation object. See Chapter 30, [Tasks for Aggregate-Level Scenarios](#), in *VR-Forces Users Guide*.
- ♦ If the observer in the 2D view is oriented north, you can now indicate whether the observer should be oriented to true or magnetic north. See Section 53.9.1, “[Specifying True or Magnetic North](#),” in *VR-Forces Users Guide*.

- ♦ The compass now has two needles: the straight one indicates true north, and the arrow indicates magnetic north. Depending on where the observer is in the world, they can be close together or wide apart ([Figure 1](#)).

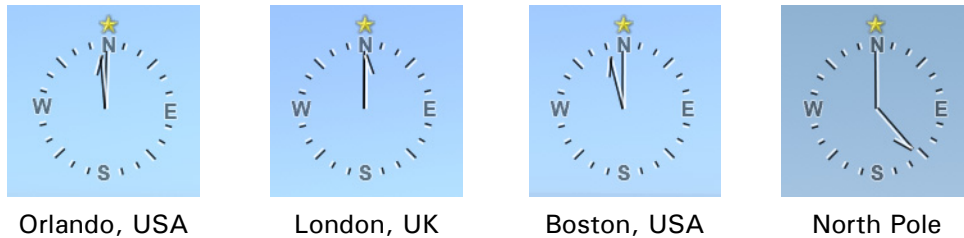


Figure-1. Compass

- ♦ There are a number of improvements to the display of symbol decoration in the 2D (plan) view:
 - When you mouse over or select a simulation object, the symbol decoration text (if displayed) changes from white to bright green. There is also a box around the text and, if there is any overlapping text from other simulation objects, that text is hidden.
 - The symbol decoration data now displays in a simple column instead of a table format, using less real estate. There are no longer redundant labels such as “speed” and “altitude”. In addition, altitude above mean sea level displays for all entities except surface (aircraft, space, ground vehicle, subsurface, and life form), while altitude above ground level displays only for aircraft, space, and life form entities.
 - The spacing of symbol decoration text in the 2D view is also improved. It no longer has extra padding at the top.
 - The default size for 2D icons is smaller. You can still change the size of 2D icons using the Simulation Object Icon Scale slider in Entity Display Settings.
- ♦ Mach speed displays in the Last Selected Object Panel for aircraft.
- ♦ You can now dock toolbars vertically, displaying text labels for each button. See Section 77.1.3, “[Docking a Toolbar Vertically](#),” in *VR-Forces Users Guide*.
- ♦ Grid lines in the 2D view are now more customizable, allowing you to specify whether the labels are detailed as well as the color for the lines. See Section 57.2.1, “[Configuring Grid Lines](#),” in *VR-Forces Users Guide*.
- ♦ In the MAK Radio standalone application, you can now use the **Settings** menu to choose the playback and capture devices. See Section 51.2.1, “[Operating the Radio from the Dialog Box or Application](#),” in *VR-Forces Users Guide*.
- ♦ VR-Forces provides a new window layout called Scenario Controller, which you can use to manage and modify a scenario while it is running. For details, see Section 77.2, “[Saving Window Layouts](#),” in *VR-Forces User Guide*.

- ♦ The Scenario Controller window layout includes the Last Clicked Environment Panel, the Last Selected Object panel, and the Event, Quick Launch, and Task toolbars display vertically on the left.
- ♦ The new Simulation Time Panel displays the time of the simulation in larger text than the Simulation Time Toolbar. You can dock or float the Simulation Time Panel, and the font size adjusts proportionately when you resize the Simulation Time Panel.
- ♦ In the SOE, the number fields in the Physical tab and the Configuration Embarkation editor are now spin boxes.

Tracy Client

- ♦ The Tracy Client is now supported on Linux. See Section 6.4.3, “[Using the Tracy Client](#),” in *VR-Forces Users Guide*.
- ♦ The new back-end command-line option, `--tracyPort`, allows you to specify a back-end port number to profile using the Tracy Client. You can profile different back-ends, and profile them separately from front-ends. To learn about this and other command-line options, see Chapter 5, [Command-Line Options](#), in *VR-Forces Users Guide*.

Configuration and Settings

- ♦ Dynamic lighting is now enabled by default in 3D (stealth) view.
- ♦ There are several enhancements to display units. To learn how to set the display units, see Section 77.8, “[Specifying Display Units](#),” in *VR-Forces Users Guide*.
 - You can now specify display units by object (aircraft, vehicles, ships, and so on) and weather, as well as the application.
 - For the application, you can specify whether to use True North or Magnetic North. By default, heading and orientation indicators show T or M, but you can choose to suppress the M if that should be the assumed heading and show the T only when using True North.
 - You can also set the coordinate system for sensor views separately from the application.
- ♦ When you specify decimal places for a unit type, they are now associated with the grid line type. For example, the decimal precision for degrees can be different for Lat/Lon (Dec), Lat/Lon (DDM), and Lat/Lon (DMS). See Section 57.2.1, “[Configuring Grid Lines](#),” in *VR-Forces Users Guide*.
- ♦ Added experimental support for IFF Mode5 and ModeS to HLA1516 Evolved. This support requires using RPR FOM Version 2.9, as well as adding two experimental FOM Modules: *Enumerations_Experimental_IFF.xml* and *RPR-MAK_Experimental_IFF.xml*. This pulls concepts from RPR 3 while making adjustments to ensure it is compatible with RPR 2.0.

VR-Link

- ♦ For tactical data link (TDL) support in VR-Forces, VR-Link 5.6 has a new FOM file, *L16-RPR_FOM_v2.0_1516-2010.xml* base. This new FOM is the *RPR_FOM_v2.0_1516-2010.xml* FOM with added JTIDS enumerations, JTID-StranmitterStruct, and JTIDS_MIDS_SpectrumType variant for SpreadSpectrumType in RadioTransmitter. There are no related changes to the VR-Link API.

API Changes

Changes were made to support a new API that provides access to physical weather data:

- ♦ We removed a number of functions that were not necessary:
 - Functions that were for setting weather data (setWindDirection, setWindSpeed, setCloudCover, and so on).
 - Functions that would get data directly from the VR-Forces weather objects—including getWindDirection, getWindSpeed, and getcloudCover—where these functions take an object as an argument. The versions of the functions that take a location as an argument are still available.
 - Functions that would get or set VR-Forces implementation options for the environment: get/setPriority, get/setWindDrivenSeaStateEnabled.
 - Functions that would get or set visual attributes: fogHeight, fogColor, surgeDepth, surfaceTransparency, choppiness.
- ♦ There is a new class, DtWeatherStateProvider, that implements an API to physical weather data.
- ♦ We added a new parameter to the *physicalWorldParams.mtl* file, **reduce-visibility-for-precipitation**. This parameter allows precipitation intensity to reduce visibility for visual detection. With this parameter set to true, precipitation has a significant effect on visibility, and hence detection distance. If the physical visibility weather datum already includes a visibility reduction due to precipitation, however, then this parameter should be set to false.
- ♦ The **precipitation-degrades-sensor-performance-by** parameter in sensor descriptors is ignored in the visual sensor since precipitation effects are already accounted for by environmental visibility.
- ♦ The default visibility in clear weather is 25 km. If the value is set to less than that in the environment, this reduces the maximum range at which a target can be detected, even if the visibility range is greater than the range to the target.

Documentation Updates

Documentation has been updated for this release. The guides are provided as PDF files in the *./doc* directory. Online help is available from the VR-Forces Help menu. You can also find the most current PDFs at <https://www.mak.com/support/product-user-guides>. (You must be able to log in to the web site.)

Fixed Bugs

Problems identified in previous releases have been fixed. For a summary, please see the `./doc/FixedDefectsVRF.csv` file.

Known Problems

- ♦ There are a few issues that require you to add the application name to the *BlackApps.dat*:
 - Under certain circumstances, opening VR-Forces on a second display prevents the program from starting.
 - In addition, launching from the main display and then moving the mouse cursor to the other monitor causes the program to freeze and not respond.

If you experience any of these issues, edit the nahimic *BlackApps.dat* file and add the application name (for example, `vrfLauncher.exe`) to the list. This file might be found in `C:\ProgramData\A-Volute\A-Volute.Nahimic\Modules\Scheduled\Configurator`, or `C:\ProgramData\A-Volute\A-Volute.28054DF1F58B4\Modules\ScheduledModules\Configurator`, or something similar. You can search `C:\ProgramData` for *BlackApps.dat* to locate it.

- ♦ There is a known problem with VR-Forces and CentOS 8 running out of memory. When the OS runs out of memory or starts using the swap memory, it can become unresponsive. Here are some potential solutions:
 - Adjust the terrain being loaded in VR-Vantage to have fewer osgEarth layers and simpler models to reduce the memory consumption.
 - Add more RAM to your computer.
 - Upgrade the Linux kernel to at least version 5.7. We have found that the default kernel of 4.18 becomes unresponsive when the swap is being used but the 5.7 kernel does not have this problem.
- ♦ On Linux machines, when you use the built-in screen capture feature, the screenshot is not adjusted for gamma corrected. It appears dark in the default image viewer on Linux but displays correctly in other applications.
- ♦ Feature indexing for model layers in osgEarth terrains is not supported by VR-Forces 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>
```

