VR-Forces

First Experience

VT MÄK
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1. VR-Forces First Experience

Thank you for deciding to try out VR-Forces. VR-Forces is MÄK's computer generated forces application and toolkit. This first experience with VR-Forces will be a quick guided tour of some of its most important features. To get the full experience you will need the VR-Forces runtime application. (You do not need to install the SDK.)

Before you begin, install and license the software. Please see Section A.1, "Install VR-Forces," for instructions.

When you are ready, this guide will help you:

- Start VR-Forces
- Load a Scenario
- Create a Scenario that Uses Entity-Level Modeling
- Assign Tasks
- Write a Plan
- Experience the 3D View
- Run the Scenario in the 3D View
- Create a Scenario in the 3D View
- Create a Scenario that Uses Aggregate-Level Modeling
- Learn More.

VR-Forces is a full-featured application built using the VR-Forces SDK. The graphical user interface (GUI), also called the front-end, is based on the VR-Vantage Toolkit. Developers can extend the capabilities of VR-Forces and can create their own applications from scratch using these toolkits. For more information, please read *VR-Forces Developers Guide*.

1.1. Start VR-Forces

To use VR-Forces, you start two executables: a front-end (the graphical user interface, or GUI) and a back-end (the simulation engine). You can start them separately (independent mode) or with one command or menu option (combined mode). In this guide, we use combined mode.

VR-Forces can display terrain, simulation objects, and other simulated objects in 2D or 3D. The default startup mode is 2D. The first part of this guide introduces you to the 2D features. Then it introduces the 3D view.

Before you start VR-Forces, make sure the license server is running. For details, please see Section A.2.3, "Run the License Server,".

1. On the Start menu, choose **Programs** → **MAK Technologies** → **VR-Forces 4.4** → **VR-Forces GUI + Simulation Engine**. The Simulation Connections Configuration dialog box opens (Figure 1-1).

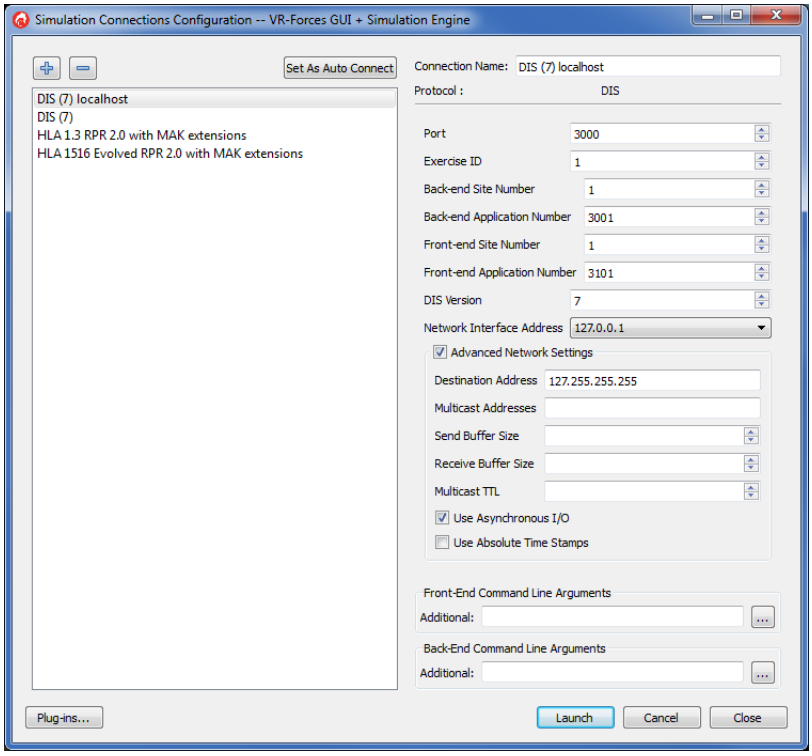


Figure 1-1. Simulation Connections Configuration dialog box

2. In the Simulation Connections Configuration dialog box, select the DIS (7) localhost connection configuration. (If you want to use HLA, you also need to install and configure an HLA Runtime Infrastructure (RTI), so let's just stick with DIS for this first experience.)
3. Click Launch. If this is the first time that you have run a MÄK application on this computer, you must specify the license server. If you have already configured the license server, the Scenario Startup dialog box opens (Figure 1-3 in "Load a Scenario," on page 4).

1.1.1. Specify the License Server

The first time you run a MÄK application on a computer, the License Setup dialog box opens (Figure 1-2). (If you already have other MÄK products installed, this dialog box might not open. If so, skip this section.) It prompts you to enter the hostname of the license server and optionally, a port number.

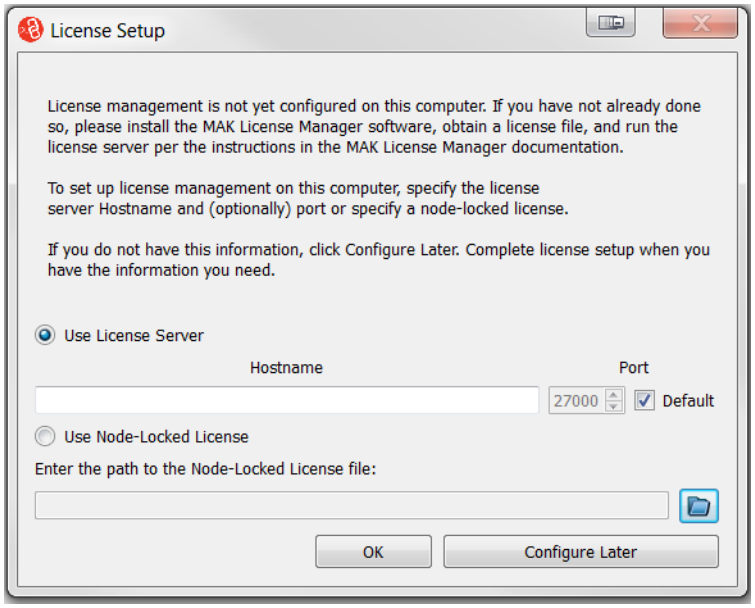


Figure 1-2. License Setup dialog box

1. Type the hostname in the Hostname box. This is the name you gave your salesperson when you requested the license file.
2. Click Add License Server. VR-Forces starts. The Scenario Startup dialog box opens (Figure 1-3 in "Load a Scenario," on page 4).

1.2. Load a Scenario

When you start VR-Forces, the Scenario Startup dialog box (Figure 1-3) lets you quickly load a scenario or create a new one without needing to use the VR-Forces menu system.

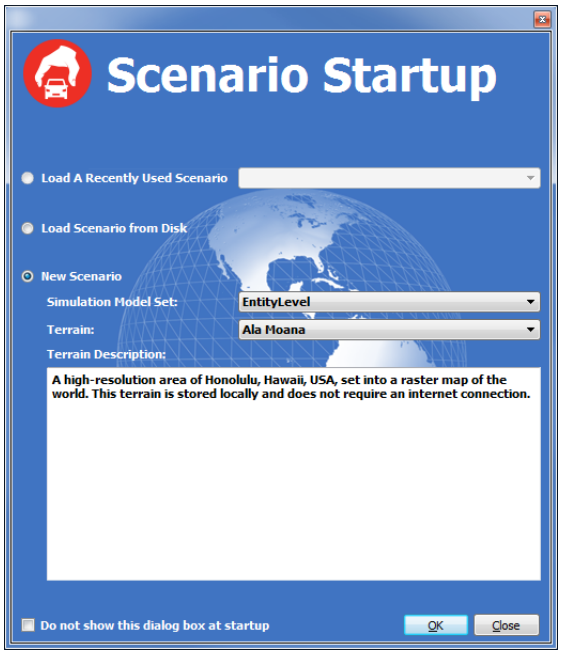


Figure 1-3. Scenario Startup dialog box

1. In the Scenario Startup dialog box, select the Load Scenario From Disk option.
2. Click OK. The Load Scenario dialog box opens.
3. Select the *HawaiiAir* directory.
4. Select *HawaiiAir.scn*.
5. Click Open. The scenario is loaded and the Scenario Information dialog box is displayed (Figure 1-4). It has a description of the scenario.

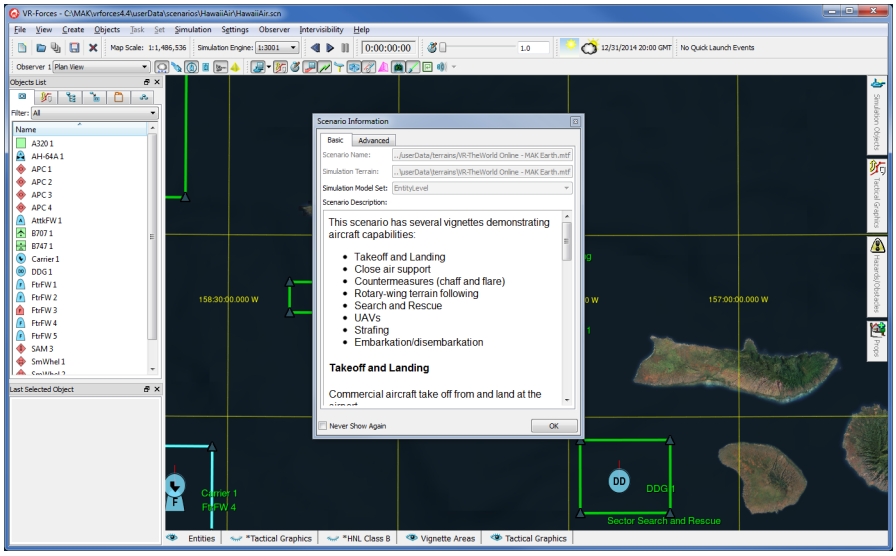


Figure 1-4. Scenario information

6. Click OK to close the Scenario Information dialog box. Now you can see most of the simulation objects and tactical graphics in the scenario (Figure 1-5).

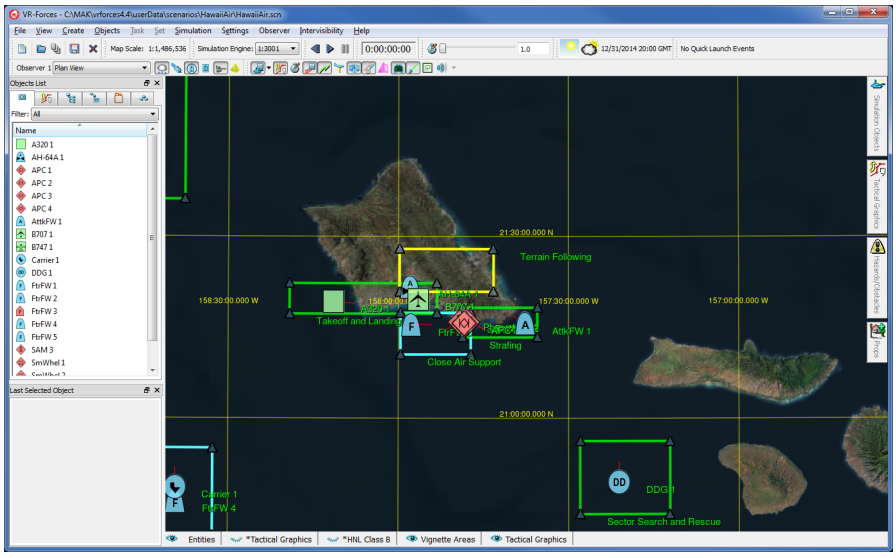


Figure 1-5. MaklandCoordinatedAttack scenario

7. Press **e** to zoom in or **w** to zoom out to see more of the terrain. Use the mouse to drag the terrain around in the window.

1.2.1. Introduction to Scenarios

In VR-Forces, all simulation is done in the context of a scenario. A scenario specifies:

- A terrain.
- Simulation objects, such as vehicles, people, and hierarchical groups (such as platoons and companies). Individual vehicles and people are called entities. Hierarchical groups are called units.
- Tactical graphics, such as points, routes, and areas.

Simulation objects can act in the world. They do this by executing tasks that have been assigned to them by the scenario creator. As they execute tasks they may exhibit built-in behaviors such as avoiding obstacles and firing at opposing forces.

VR-Forces has two distinct ways of modeling vehicles and people – entity-level modeling and aggregate-level modeling. Entity-level modeling focuses on the interactions between individual vehicles and people. Aggregate-level modeling focuses on the interactions of large hierarchical groups, such as companies, brigades and battalions. When you create a scenario you choose the type of modeling you want to use to achieve your simulation objective. You cannot mix the two types of modeling. For a detailed discussion of the two types of modeling, please see Section 3.5, "Entity-Level Modeling and Aggregate-Level Modeling," in *VR-Forces Users Guide*.

The HawaiiAir scenario uses entity-level modeling.

1.2.2. Run the Scenario

The HawaiiAir scenario opens up in Plan View mode. Plan View mode is a 2D view of simulation objects and terrain. It lets you look at large terrains and get a good sense of the overall disposition of simulation objects and their actions. Later in this guide we will look at this scenario in a 3D view.

➤ To run the scenario, choose **Simulation** → **Run Scenario**.

The entity icons begin moving. This scenario takes place over a wide geographic area. The boxes define each vignette. You may want to zoom into different vignettes to see the action more closely. You will see transient icons that represent missiles, lines representing munition fire and detonation, and other graphics.

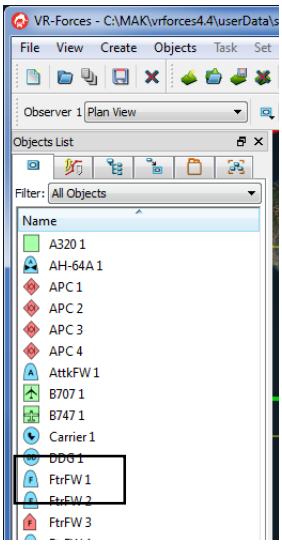
1.2.3. Understand the Scenario

In addition to displaying simulation objects and graphics, VR-Forces provides a lot of information about what is going on as a scenario unfolds. For complete details about how VR-Forces enhances your understanding of a scenario, please see *VR-Forces Users Guide*, particularly Chapter 18, *Viewing Information about Objects*, Chapter 32, *Introduction to Tactical Graphics*, and Chapter 37, *Displaying Tactical Information and Effects*.

Getting Information about Individual Simulation Objects

On the left side of the VR-Forces window is a set of information and control panels.

1. The Objects List panel has tabs that show different views of the objects in a scenario.
2. Select the leftmost tab. It lists all of the simulation objects.
3. Select (click) the entity named FtrFW 1.
4. Press **i**. A dialog box opens (Figure 1-6). It has pages that describe the entity's state and what it is doing. This is an individual entity. If it were a unit, the dialog box would list its subordinates. At the bottom of the dialog box is a console window. It displays messages about the entity.



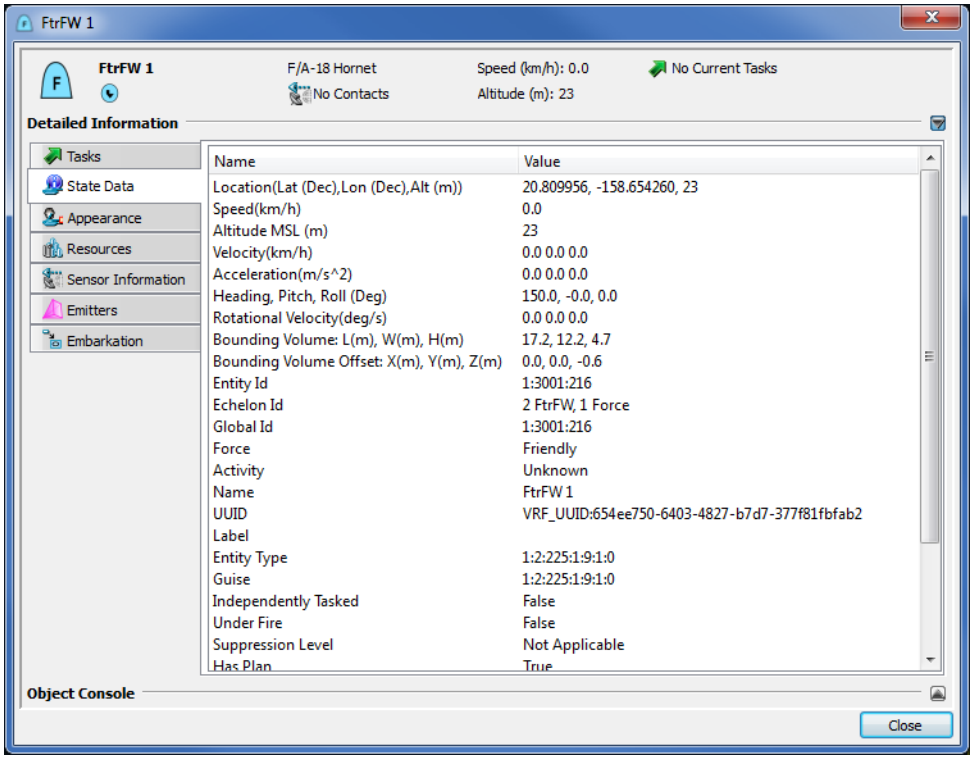


Figure 1-6. Information dialog box

5. Click the Close button to close it.

You can display information dialog boxes like this for most objects.

View Plans

A plan is a list of tasks and set data requests that a simulation object executes in sequence. (Set data requests change the state of a simulation object, such as its heading or ordered speed.) A plan can also contain tasks that are executed only under certain conditions.

1. Select FtrFW 1.
2. Choose **Objects** → **Plan**. The Plan window opens (Figure 1-7).

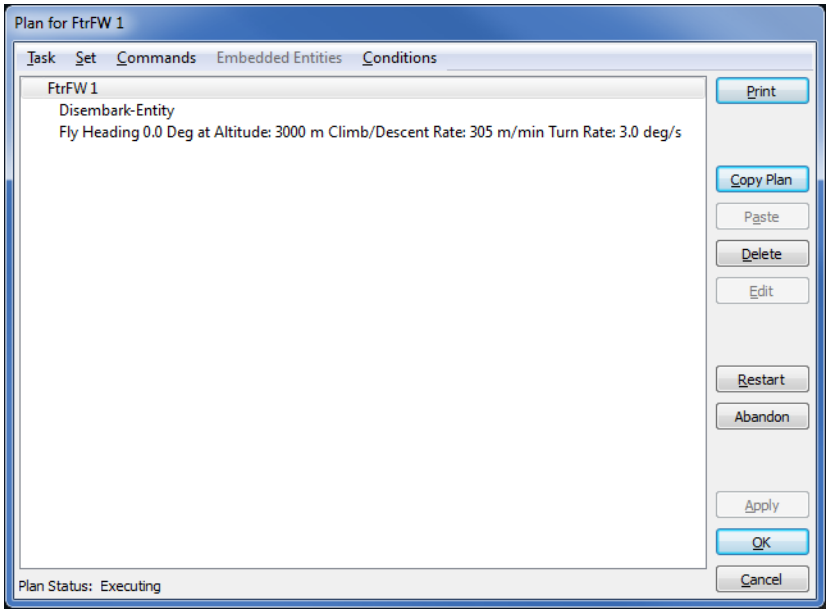
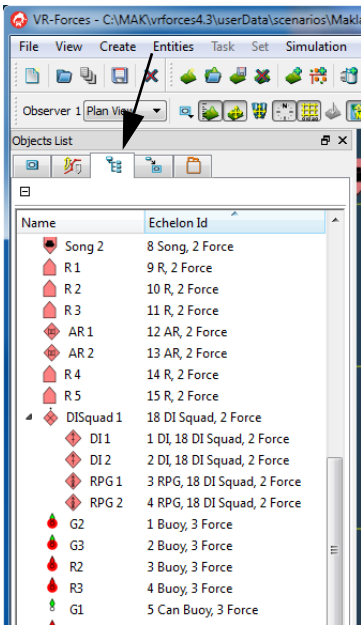


Figure 1-7. Plan window

This plan is fairly simple. It tells the entity to disembark (it is embarked on an aircraft carrier) and then fly away at a specific altitude and heading. In this case, disembarking means it takes off from the carrier deck.

View Force Hierarchies and Relationships



All simulation objects exist within the context of a force, usually just called Friendly and Opposing. Some simulation objects may be Neutral. (You can create up to 255 different forces.) The forces emulate military hierarchies.

On the Objects List panel, select the Echelon View tab. This tab shows the hierarchical arrangement of the simulation objects by force. (HawaiiAir does not have any hierarchical units. This screen capture is from a different scenario, which shows how units are displayed.)

Scenario Objects

In addition to simulation objects, a scenario can contain tactical graphics. Tactical graphics are points, lines, areal objects, text, and symbols. Simulation objects can interact with some types of tactical graphics. For example, a simulation object can move to a point, or follow a route. You can assign tactical graphics to overlays, which mimic clear plastic overlays that you might place over a real map.

1.2.4. Navigating the Terrain

You can change your view of the 2D terrain by panning and zooming in and out. You can do this from the keyboard or mouse. You can also drag the terrain.

To pan or zoom the terrain from the keyboard, use the keys shown in Figure 1-8. To zoom in and out with the mouse, move the mouse wheel forward or backward.

Figure 1-8. Primary movement keys, observer coordinates (2D)

For complete details about moving the observer, please see Chapter 11, *Moving the Observer*, in *VR-Forces Users Guide*.

Dragging the Terrain

Dragging the terrain combines the move forward, backward, left, and right functions.

To drag the terrain:

1. Click a point on the terrain and hold down the left mouse button.
2. Drag the mouse left, right, forward, and backward.

1.3. Create a Scenario that Uses Entity-Level Modeling

In the next few sections, you will create a scenario. A completed version of this scenario is included with VR-Forces. It is called the *firstexperience* scenario. (For complete details about creating scenarios, please see *VR-Forces Users Guide*.

To create a scenario, you must:

1. Choose a terrain.
2. Create simulation objects.
3. Optionally, create control objects and overlay objects.
4. Tell the simulation objects what to do.
5. Save the scenario.

1.3.1. Choose a Terrain

1. Choose **File** → **New Scenario**, or click the New Scenario icon ( ) on the File toolbar. The Initial Scenario Information dialog box opens (Figure 1-9).

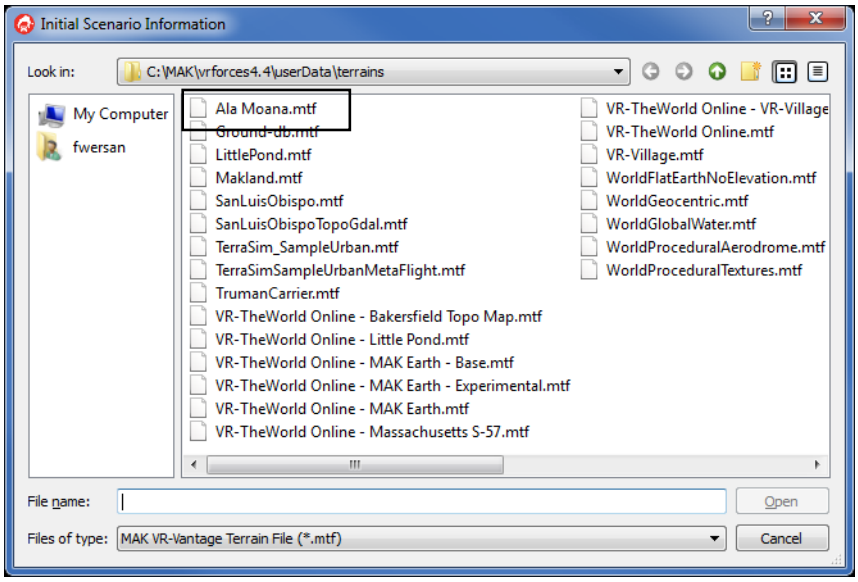


Figure 1-9. Choose Simulation Terrain dialog box

2. In the file list, select *Ala Moana.mtf*. (A MÄK terrain format (MTF) file packages together information about a terrain and related imagery for convenient loading in VR-Forces.)
3. Click Open. The New Scenario dialog box opens (Figure 1-10).

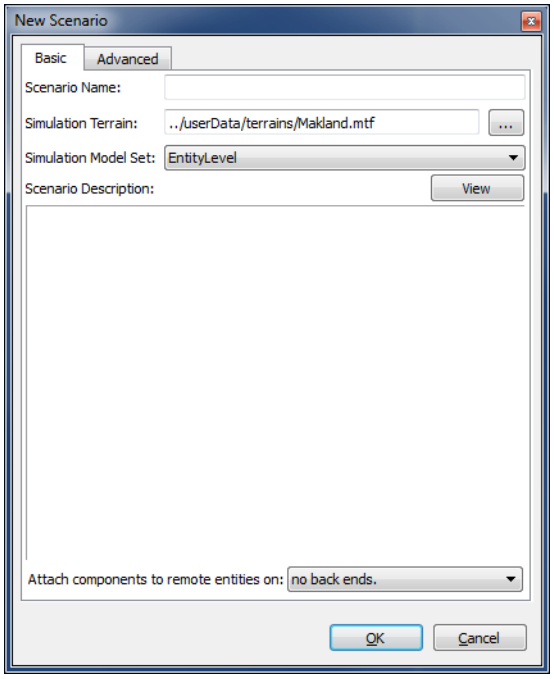


Figure 1-10. New Scenario dialog box

4. Type a name in the Scenario Name text box.
5. Simulation object models are organized into Simulation Model Sets (SMS). The default SMS for new scenarios is *EntityLevel.sms*, which supports entity-level modeling. Since we want to create a scenario that uses entity-level modeling, we can just accept the default.
6. Click OK. The map displays the Ala Moana terrain (Figure 1-11).

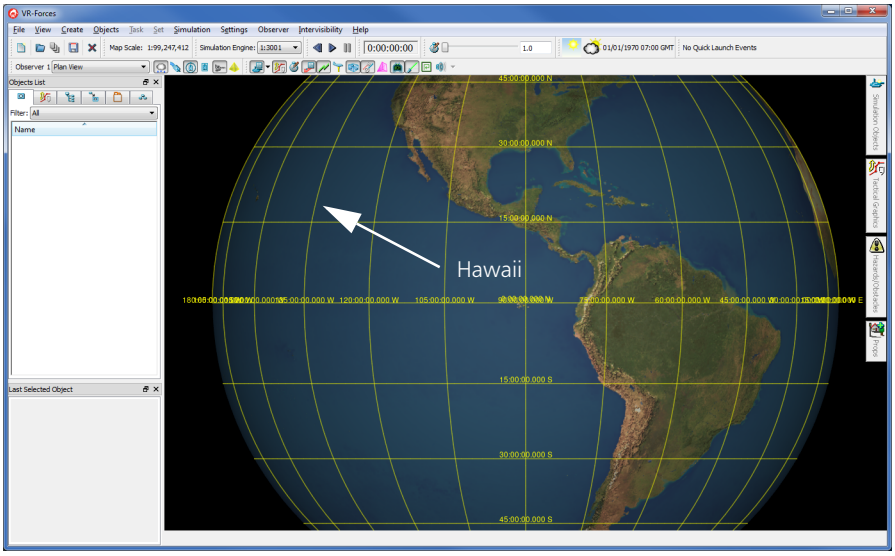


Figure 1-11. Ala Moana terrain

7. Hold down the left mouse button and drag the terrain so that the Hawaiian islands are centered. (Figure 1-12).

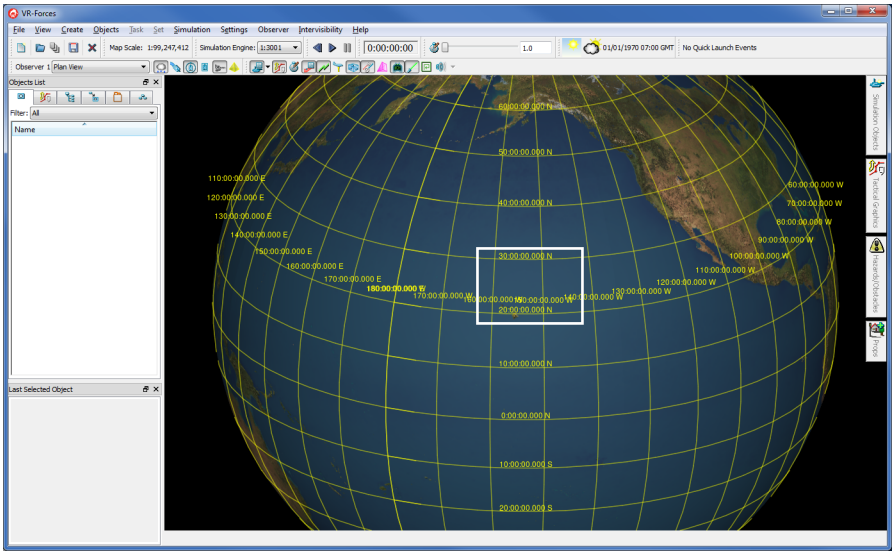


Figure 1-12. Hawaii

8. Press the **e** key to zoom in and drag the terrain to center on the Honolulu area (Figure 1-13).

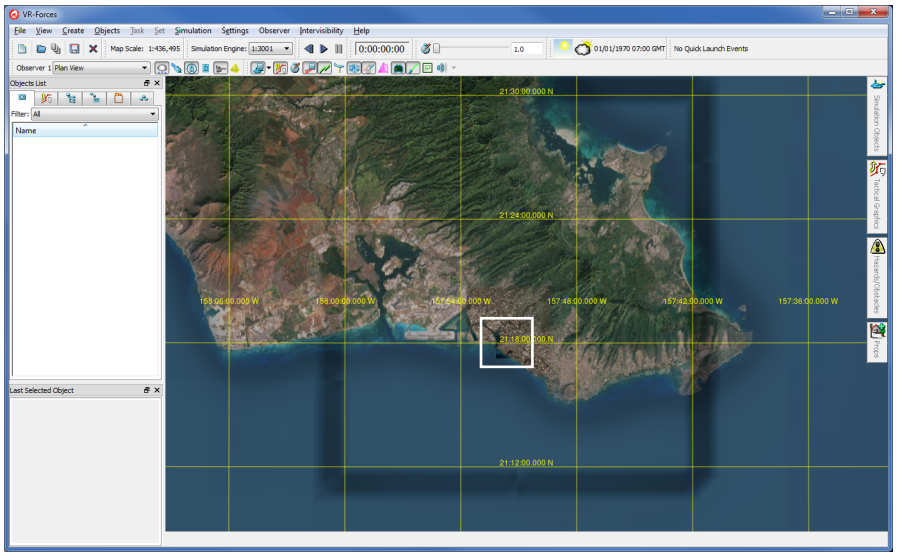


Figure 1-13. Honolulu

9. Finally, zoom in to the high resolution Ala Moana inset outlined in Figure 1-13 and shown in Figure 1-14.

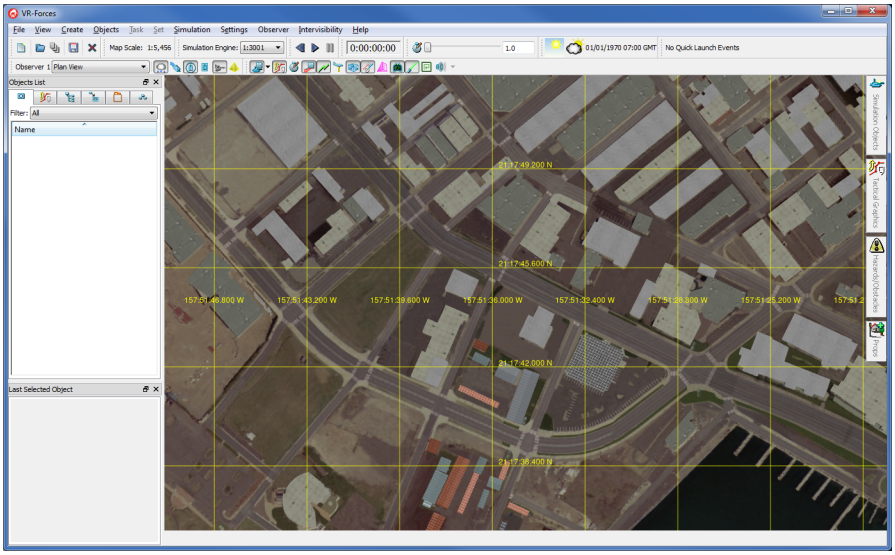


Figure 1-14. Ala Moana inset

1.3.2. Create Some Entities

1. On the right side of the VR-Forces window, click the Simulation Objects tab. The Simulation Objects Palette opens (Figure 1-15).

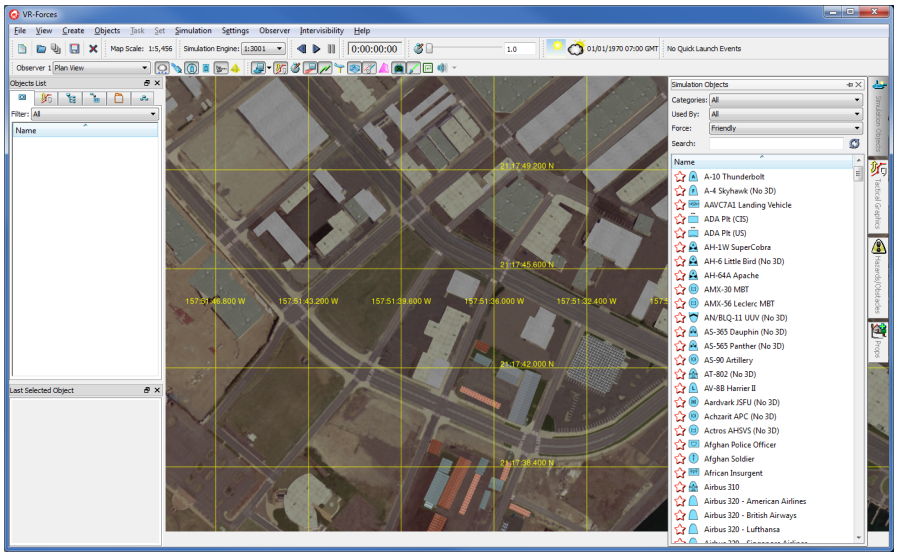


Figure 1-15. Entities Palette

2. In the Categories list, select Ground.
3. In the Force list, select Friendly.
4. In the list of simulation objects, select M2A2 Bradley IFV. The cursor changes to show the icon for an M2A2 Bradley.
5. Click on the map along the road in front of the warehouses at the lower center of the terrain Figure 1-16). An icon is placed at that location.

Figure 1-16. Entities placed on Makland

6. Right-click to exit create entity mode.
7. Open the Simulation Objects Palette.
8. If the category is not Ground, select Ground.
9. Change the Force to Opposing.
10. In the list of simulation objects, select GAZ-69 Utility Vehicle.
11. Click on the map across town from the M2A2, as shown in Figure 1-16.
12. Right-click to exit create entity mode.
13. Click the GAZ-69. The outline changes to white to show that it is selected. The heading indicator is pointing North, the default heading.

14. Choose **Set** → **Position** → **Heading**. The Heading dialog box opens.
15. Type 135 and click OK. The heading changes to 135 degrees.

1.3.3. Create a Control Object

Control objects are points, lines, and areas that identify locations on the terrain. A simulation object can interact with control objects in various ways. One common use for control objects is to have a simulation object move to a point or along a route.

1. Click the Tactical Graphics tab (on the right margin of the window). The Tactical Graphics Palette opens.
2. In the Category list, select Control Objects.
3. In the list of control objects, select Route. The Create Route tab is added to the window. The cursor changes to create object mode (it shows a little triangle at the end of the cursor arrow).
4. Click on the map in front of the Bradley (callout 1 in Figure 1-17). A vertex is placed.

Figure 1-17. Creating a route

5. Move the cursor toward the location of callout 2 in Figure 1-17. A line extends from the first vertex to show where you are drawing the route.
6. Add additional route vertices by clicking the locations of callouts 2, 3, and 4 in the figure.
7. For the end point, right-click at location 5.

8. The route is created with the default name Route 1 (Figure 1-18).

Figure 1-18. Scenario with route drawn

1.3.4. Save the Scenario

1. Choose **File** → **Save Scenario** or click the Save button on the Scenario toolbar. The Save Scenario dialog box opens.
2. Optionally, create a directory in which to save the scenario.
3. Select the directory in which you want to save the scenario.
4. Give the scenario a name.
5. Click Save.

1.4. Assign Tasks

You can give a simulation object a task by including it in a plan or by assigning it from the Task menu. We call tasks that are assigned from the Task menu "independent tasks". *VR-Forces Users Guide* discusses tasks in Chapter 24, *Assigning Tasks*, Chapter 25, *Tasks for Entity-Level Scenarios*, and Chapter 26, *Tasks for Aggregate-Level Scenarios*.

1.4.1. Independent Tasks

You can assign an independent task at any time. When you assign an independent task to a simulation object:

- It stops whatever it is doing and immediately begins to execute the new task.
- If it is executing a plan, the plan is abandoned and the simulation object executes the independent task. When it is finished with the task, it does not return to the plan.

A few tasks, mostly for sending messages, can execute without stopping the current task.

Assign an Independent Task

In our example scenario, the M2A2 Bradley vehicle is on the road doing nothing. Now we will tell it to move along the route using an independent task.

1. Select the Bradley.
2. Choose **Task** → **Movement** → **Move Along Route**. The Move Along Route dialog box opens (Figure 1-19).

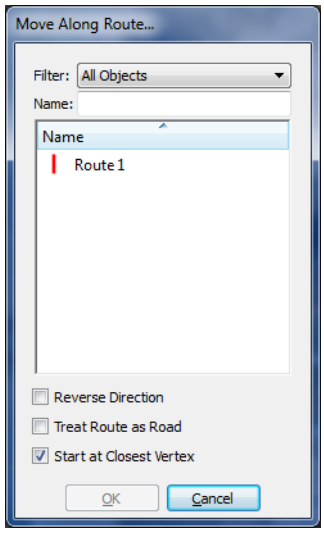


Figure 1-19. Move Along Route dialog box

3. Select Route 1.
4. Click OK.
5. Choose **File** → **Save**.

At this point nothing is happening, because the scenario is not running.

1.4.2. Run the Simulation

➤ Choose **Simulation** → **Run Scenario**, or click the Play button (▶) on the Simulation Toolbar.

The Bradley moves along the route. At some point near vertex 4, it identifies the GAZ-69 vehicle and fires on it. Detecting and firing on opposing force simulation objects is an automatic behavior. Notice that firing does not interfere with the entity's task. It continues to the end of the route.

You might wonder why the GAZ-69 does not fire at the M2A2. In order to fire, an entity needs a weapon system. It will then fire at any entity that it considers hostile and for which its weapon system is appropriate. The GAZ-69 does not have a weapon system. We picked this entity because we want the M2A2 to complete its tasks without risking the possibility that it might get destroyed. As you experiment with VR-Forces, feel free to use armed Opposing Force entities that have weapons systems.

1.4.3. Stop the Simulation and Rewind It

1. After the Bradley vehicle finishes moving along the route, choose **Simulation** → **Pause Scenario**, or click the Pause button ( ) on the Simulation Toolbar.
2. Choose **Simulation** → **Rewind Scenario**, or click the Rewind button ( ) on the Simulation Toolbar. The simulation returns to its saved state.

1.5. Write a Plan

If a scenario has very few simulation objects, or if you are responsible for controlling just one simulation object in a larger scenario, using independent tasks may meet all of your needs. However, if you want to control multiple simulation objects in varying circumstances, you will want to give them plans.

Previously, we assigned the Bradley vehicle a Move Along Route independent task. Now we will do the same thing using a plan. And to highlight the difference between independent tasks and plans, we will give it a second task to execute when the first one is complete.

1. Select M2A2 1.
2. Choose **Objects** → **Plan**. The Plan dialog box opens (Figure 1-20).

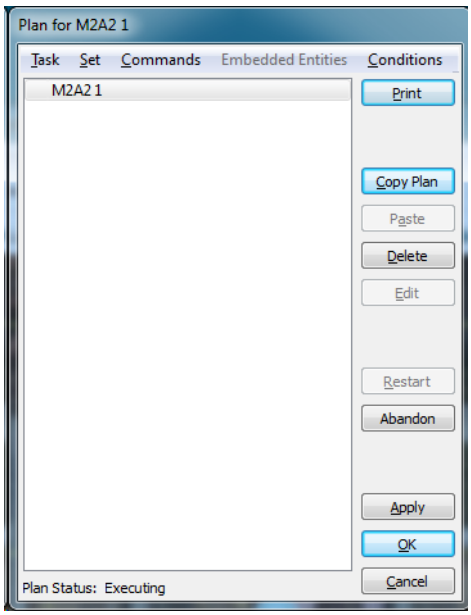


Figure 1-20. Plan dialog box

3. In the plan window, choose **Task** → **Movement** → **Move Along Route**. The Move Along Route dialog box opens (Figure 1-21).

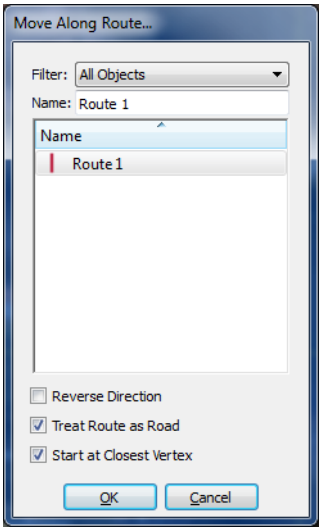


Figure 1-21. Move Along Route dialog box

4. In the window, select Route 1.
5. Select the Treat Route as Road check box. Figure 1-21 shows the completed dialog.

VR-Forces has a special form of movement called road driving. It is designed to improve vehicle movement when vehicles move along vector road networks in a terrain. VR-Forces can apply this same movement mode to moving along routes. When you run the scenario in a minute or two, note the differences between how the M2A2 moves along the route as a road and how it moved along the route the first time you ran this scenario.

There is one potential problem you might experience. For Treat Route as Road to work, the entity must be within 10 meters of the start of the route when the task starts. If the M2A2 does not move along the route when you run this scenario, rewind the scenario, double-click the entity, and drag it closer to the start of the route. Then click to place it. Now it should work.

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6. Click OK. The task is added to the plan.
7. In the Plan window, choose **Set** → **Position** → **Heading**. The Heading dialog box opens.

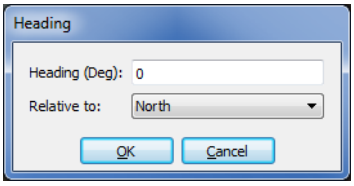


Figure 1-22. Heading dialog box

8. In the Heading text box, type 270.
9. In the Relative to list, select Current Heading. (This will essentially turn 90 degrees counter clockwise.)
10. Click OK. The set data request is added to the plan.
11. In the Plan window, lick **Task** → **Movement** → **Move to Location**. The Move To Location dialog box opens.
12. Click along the road somewhere between vertex 2 and vertex 5 (as numbered in the illustration for creating the route). The coordinates are entered in the Move To Location dialog box.

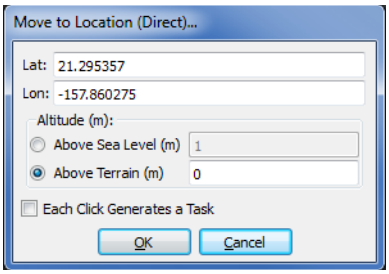


Figure 1-23. Heading dialog box

13. Click OK. The task is added to the plan. The completed plan looks like Figure 1-24.

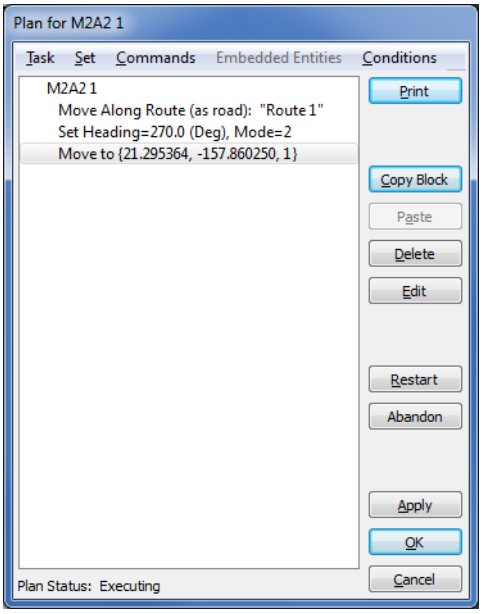


Figure 1-24. Plan dialog box

14. In the Plan window, click OK.

15. Save the scenario.

Run the scenario. The Bradley follows the route. (Remember, if it does not follow the route, you must move it closer to the start of the route.) Then it changes its heading to face south and drives to the location you specified.

1.6. Experience the 3D View

In this section, you will run the first scenario you loaded and explore the similarities and differences between the 2D and 3D view.

1.6.1. Load a Scenario

1. Choose **Observer** → **Set Observer Mode** → **Stealth**.
2. Choose **File** → **Load Scenario**. The Load Scenario dialog box opens.
3. Select the *HawaiiAir* directory.
4. Select *HawaiiAir.scn*.
5. Click Open.

1.6.2. Run the Scenario in the 3D View

In Plan View mode you can see all (or most, depending on your zoom level) simulation objects and graphics at the same time. This is because the size of the icons is exaggerated relative to the terrain. By default, the 3D view shows realistically sized models. If you were to zoom out and up to get the same overall view as the 2D view, you probably would not be able to see any of the simulation objects. In the 3D view, you will probably look at only part of the scenario at any given time and will move the observer (the eyepoint) through the 3D view to observe the action. So, let's attach the observer to an entity before we run it.

1. In the Objects List panel, select AH-64A 1.
2. Right-click and choose **Observer Attach** → **Attach Follow**.
3. Choose **Simulation** → **Run Scenario**.
4. Watch the entity move through the terrain. Use the keyboard navigation keys to change the eyepoint's location relative to the entity. To see other simulation objects, press the period key (**.**) or select them in the Objects List and attach to them from the menu.
5. In addition to all of the simulation objects, you also see many tactical graphics. To simplify the view a bit, turn them off by choosing **Settings** → **Tactical Graphics**.
6. When you are finished attaching to different simulation objects, press **z** to detach the observer.

1.6.3. Navigate the 3D View

You can navigate through the 3D view using the keyboard and mouse. This section introduces the basic keyboard and mouse actions. For a complete list, please see online help or the Quick Reference Card in *VR-Forces Users Guide*.

Use the controls described in the next sections to navigate through the terrain as the scenario runs.

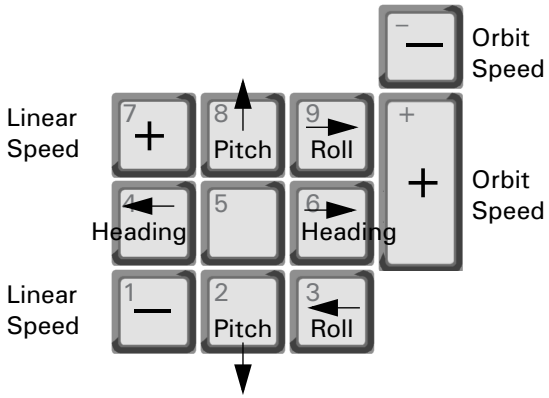
Use the Game-like Keyboard Navigation

Press **w** and **s** to move forward and backward. Press **e** and **q** to move up and down. Press **a** and **d** to move left and right.

Press multiple keys to combine movement modes. Notice that you cannot go through walls or through the ground — unless you want to. Press and hold **x** while moving the observer and you can go through walls and terrain.

Press the Spacebar to move the observer to the default starting point.

The keypad lets you control position and orientation.



Use the Mouse to move the Observer

The mouse has navigation options that are not available on the keyboard.

Drag the Terrain

Dragging the terrain moves the observer forward, backward, left, and right.

1. Click a point on the terrain and hold down the left mouse button.
2. Drag the mouse left, right, forward, and backward.

Drag the View

Dragging the view moves the observer up, down, left, and right.

➤ Hold down the middle mouse button (or wheel) and drag the mouse.

Change the Observer's Orientation

➤ Hold down the right mouse button and drag the mouse.

Teleport the Observer

➤ **`Shift`**+click someplace on the terrain to jump to the location.

1.6.4. Create a Scenario in the 3D View

The main difference between creating a scenario in the 2D view and the 3D view is how you approach creating simulation objects and control objects. Assigning tasks and writing plans is exactly the same. In this section we create the same scenario as we did earlier in this guide, but this time we do it in the 3D view.

The 3D view is very good for placing simulation objects precisely on the terrain in a small area. It is not as good for placing many simulation objects over a large area because in order to see a large area, you have to zoom out to a point where the 3D models are not easily visible. Similarly, the 3D view is very good for placing the vertices of tactical graphics precisely where you want them. However, it is much less convenient for drawing large areas or routes where you need to see a lot of the terrain at one time.

1. Choose **File** → **New Scenario**, or click the New Scenario button on the File toolbar. The Choose Simulation Terrain dialog box opens.
2. In the file list, select *Ala Moana.mtf*.
3. Click Open. The New Scenario dialog box opens.
4. Give the scenario a name.
5. Accept all the default scenario parameters. Click OK. The window displays the Ala Moana terrain database. This time, we will use a saved view to quickly jump to the Ala Moana inset.
6. Choose **View** → **Observer Views**. The Observer Views Panel is added to the left side of the window.
7. On the toolbar in the Observer Views Panel, click the Load Views and Replace button (). A file chooser window opens.
8. Select *AlaMoanaInset.osrx*. The saved views are loaded. Since there is only one view saved in this file, the window immediately redisplays to show the Ala Moana inset in Plan View observer mode.
9. Click Open.

10. Zoom into the town to the same view you had when you created your first scenario (Figure 1-11).
11. Choose **Observer** → **Set Observer Mode** → **Stealth**. The view of the terrain should look approximately the same as it did in 2D. When you switch between 2D and 3D modes, VR-Forces tries to present the same view of the terrain, to the extent possible given the differences in the two modes.
12. Move the cursor to the location on the road where you created the M2A2 in the first scenario.
13. Hold down the **`Shift`** key and left-click. The observer teleports to this location.
14. Hold down the right mouse button and move the mouse forward. This changes the orientation of the observer relative to the terrain. It is now horizontal to the terrain.
15. Press the **`e`** key to drop the observer down to a few meters above the road. The view should look like Figure 1-25.

Figure 1-25. Observer in 3D view of Makland road

Create an Entity

1. Click the Simulation Objects Palette tab.
2. In the Categories list, select Ground.
3. In the Force list, select Friendly.
4. In the list of simulation objects, select M2A2 Bradley IFV. Move the mouse over the terrain. The cursor changes to show the model for an M2A2 Bradley.
5. Click on the road. A model is placed at that location (Figure 1-26).

Figure 1-26. 3D view of M2A2

6. Right-click to exit create entity mode.
7. Move the observer so that you see the road where you created the GAZ-69 in the 2D version of the scenario (Figure 1-27). (Hint: Use the **q** key to raise the observer and the right mouse button to change orientation.)

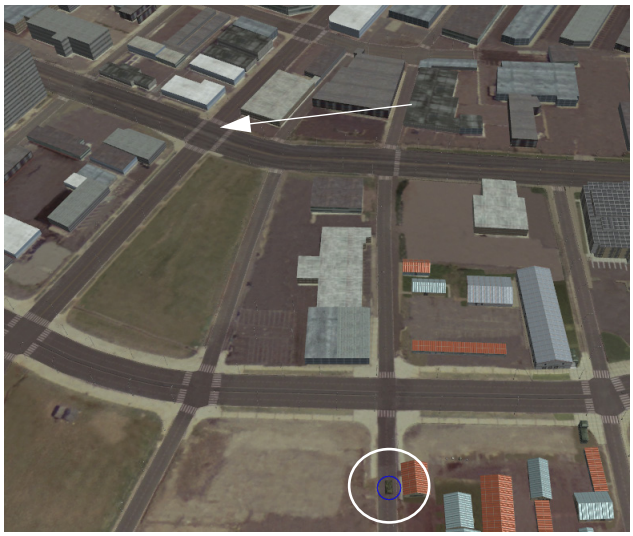


Figure 1-27. M2A2

8. On the Simulation Objects Palette, change the force to Opposing.
9. Select the GAZ-69 vehicle. The cursor changes to show the correct model.
10. Move the cursor so that the model is at the road intersection.
11. Hold down the **`Shift`** key and the left mouse button and move the mouse to rotate the vehicle model until it is aligned with the street, facing towards where the M2A2 will be driving.
12. Click to place the entity (Figure 1-28).

Figure 1-28. M2A2 and GAZ-69

Create a Control Object

1. Use the navigation keys to zoom out and rotate for a top down view of the town.
2. Choose **Create** → **Route**. The cursor changes to create object mode.
3. Click on the map in front of the Bradley (callout 1).

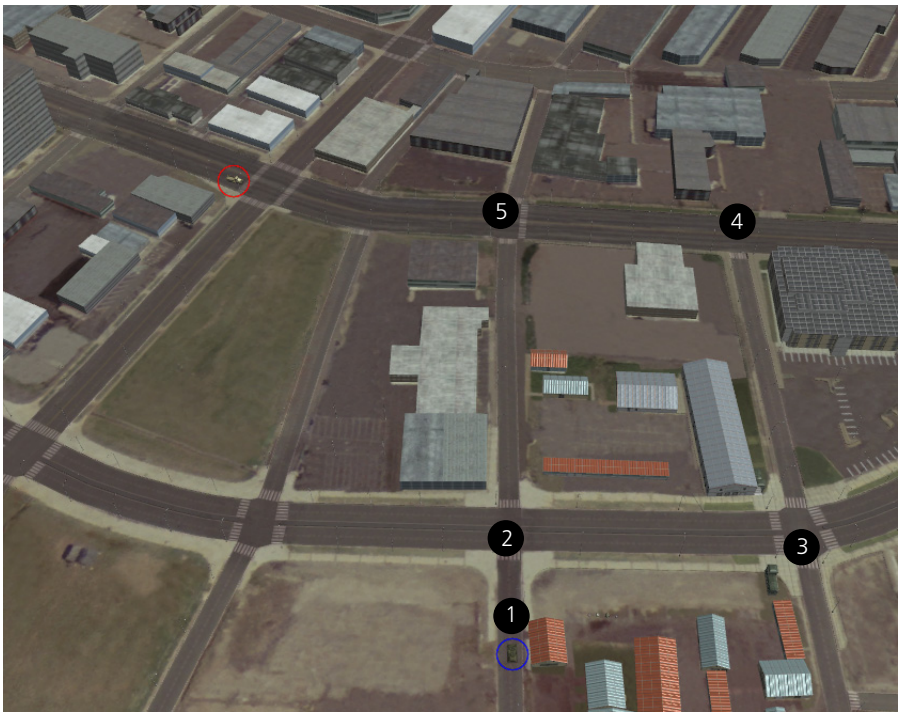


Figure 1-29. Vertex locations

4. Add additional route vertices by clicking the locations of callouts 2, 3, and 4 in the figure.
5. For the end point, right-click at location 5. The route is created.
6. Save the scenario.

If you want to, you can give the Bradley vehicle a plan, as you did in the 2D version of this scenario. Alternatively, close this scenario and load the scenario you created in the 2D front-end (but stay in Stealth observer mode). Run the scenario and observe the entity behavior.

1.6.5. Try Out XR Mode

As we mentioned earlier, one of the drawbacks of the 3D view (Stealth observer mode) is that if you zoom out from the terrain, you probably will not be able to see any but the largest entities. VR-Forces has a special observer mode to deal with this problem. In eXaggerated Reality (XR) mode, entities are represented by oversize, stylized models. Let's take a look at the MaklandCoordinatedAttack scenario in XR mode.

1. Choose **File** → **Load Scenario**. The Load Scenario dialog box opens.
2. Load *MaklandCoordinatedAttack*. By default, it loads in Plan View observer mode.
3. On the Observer Settings toolbar, select Stealth mode (Figure 1-30). The view looks similar to Figure 1-31.

Figure 1-30. Observer Settings Toolbar

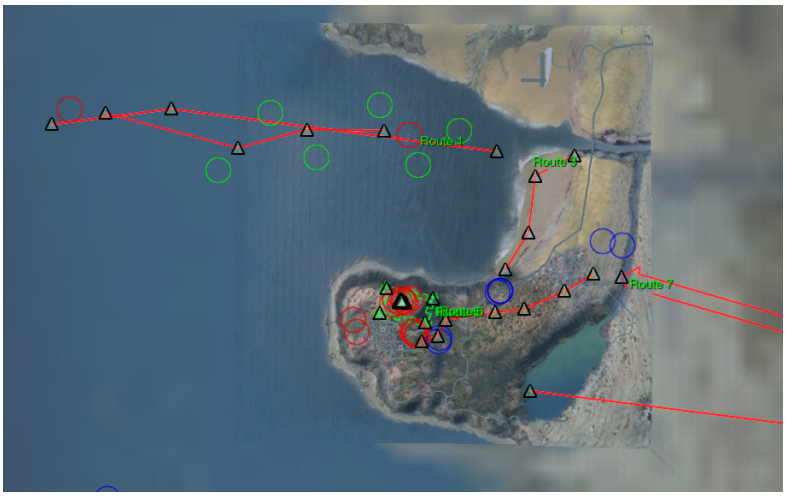


Figure 1-31. MaklandCoordinatedAttack in Stealth observer mode

4. Choose **Settings** → **Entity Labels**. This turns off the little circles that show where entities are. Now you can still see tactical graphics, but probably cannot see any entity models.
5. On the Observer Settings toolbar, select XR observer mode. Notice how the entities are now visible (Figure 1-32). (Figure 1-33) shows the same scene from the side. See how the entities are much larger than in a realistic view.

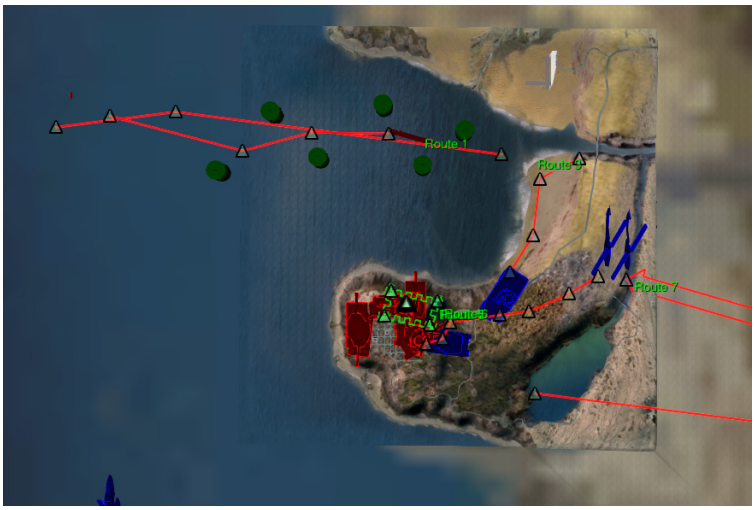


Figure 1-32. XR mode top-down view

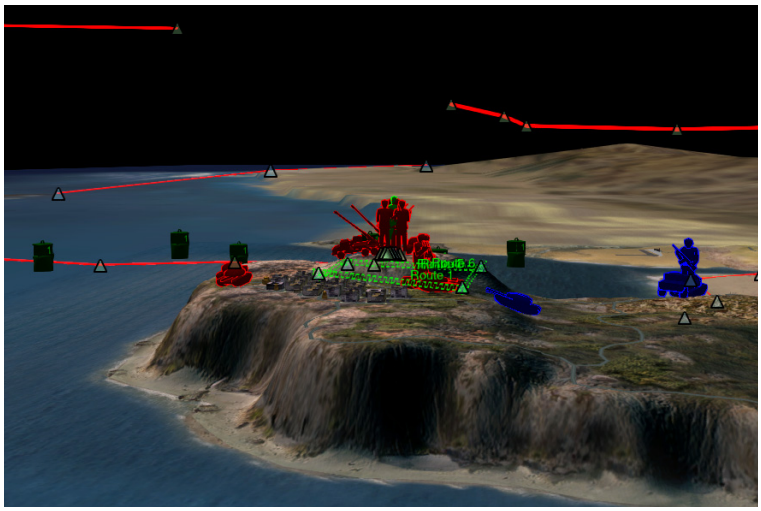


Figure 1-33. XR mode side view

1.7. Create a Scenario that Uses Aggregate-Level Modeling

This section is a tutorial for creating a scenario that uses aggregate-level modeling. It assumes you have completed "Create a Scenario that Uses Entity-Level Modeling," on page 10 and skips some of the parenthetical comments and notes provided in previous chapters. The finished scenario, first_experience_aggregate_example, is distributed with VR-Forces (*./userData/scenarios/FirstExperience/first_experience_aggregate_example.scn*). The simulation objects in an aggregate-level scenario interact differently than those in an entity-level scenario. For complete details about the aggregate warfare model, please see Chapter 21, *How Aggregate-Level Modeling Works*, in *VR-Forces Users Guide*.

The process for creating an aggregate-level scenario is the same as that for an entity-level scenario, except that you choose an SMS that supports aggregate-level modeling.

Aggregate-level simulation requires use of HLA Evolved. If you have not installed an RTI, you must do so to complete this tutorial. We recommend the MÄK RTI. Install and configure your RTI according to the instructions provided with it. If you are using the MÄK RTI, it will automatically start when you launch VR-Forces.

1. If VR-Forces is running, close it. Aggregate-level scenarios require HLA Evolved, so you need to restart VR-Forces with the proper protocol.
2. On the Start menu, choose **Programs** → **MAK Technologies** → **VR-Forces 4.4** → **VR-Forces GUI + Simulation Engine**. The Simulation Connections Configuration dialog box opens.
3. In the Simulation Connections Configuration dialog box, select HLA1516 Evolved RPR 2.0 with MAK extensions (Figure 1-34).

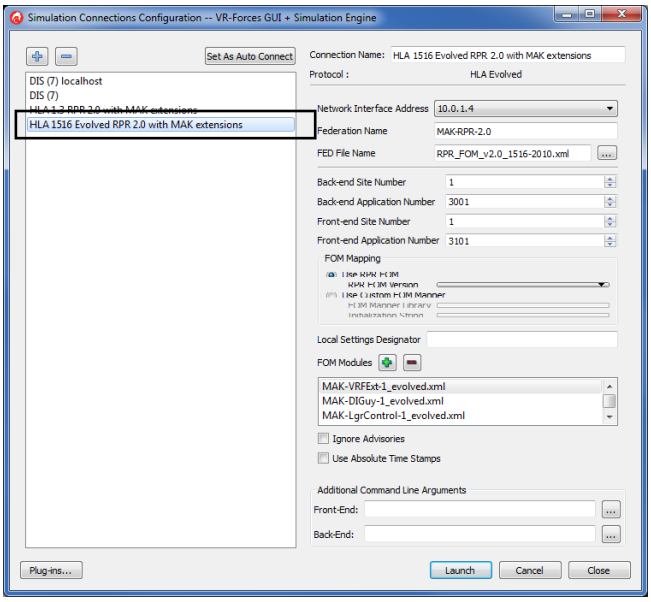


Figure 1-34. Simulation Connections Configuration dialog box

4. Click Launch. VR-Forces starts up. (If you are using the MÄK RTI, the Choose RTI Connection dialog box opens. Select the rtiexec connection that you want to use.) The Scenario Startup window opens.
5. Select New Scenario.
6. In the Simulation Model Set list, select AggregateLevel.
7. In the Terrain list, select *Makland.mtf*.
8. Click OK.
9. Click OK. The scenario loads and the window displays the terrain database.
10. Zoom in or out until the window displays approximately the area shown in Figure 1-12.

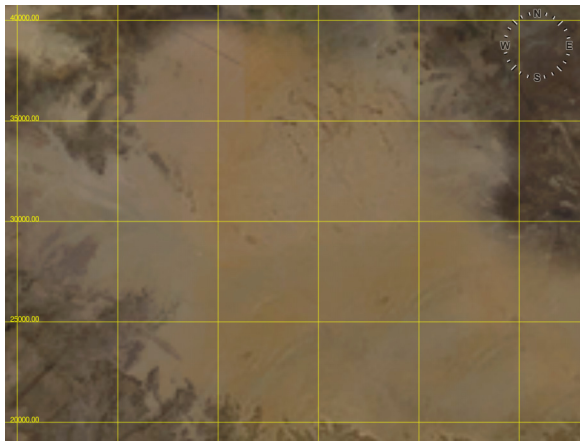


Figure 1-35. Makland

11. Choose **View** → **Observer Views Panel**. The Observer Views Panel is added to the left side of the window.
12. Click the Add button (). A view is added to the window. Any time you click the view, VR-Forces will change the window display to match the view you saved.

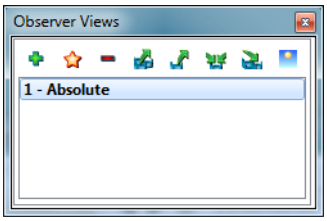


Figure 1-36. Observer Views Panel

13. Select the view.
14. Click the Star button (). The scenario will automatically jump to this view when you open it.
15. Save the scenario.

1.7.1. Create Simulation Objects

The process for creating simulation objects in an aggregate-level scenario is the same as for entity-level scenarios. The list of available simulation objects is different. Most of them are units!

1. Click the Simulation Objects Palette button.
2. In the Categories list, select Ground.
3. In the Force list, select Friendly.

4. In the list, select Tank CO US. This simulation object represents a company, but it cannot be broken down into its individual platoons, squads, tanks, and so on. It is simulated solely at the company level.
5. Click on the terrain approximately as shown in Figure 1-38. A tank company is added with the name AR CO 1.

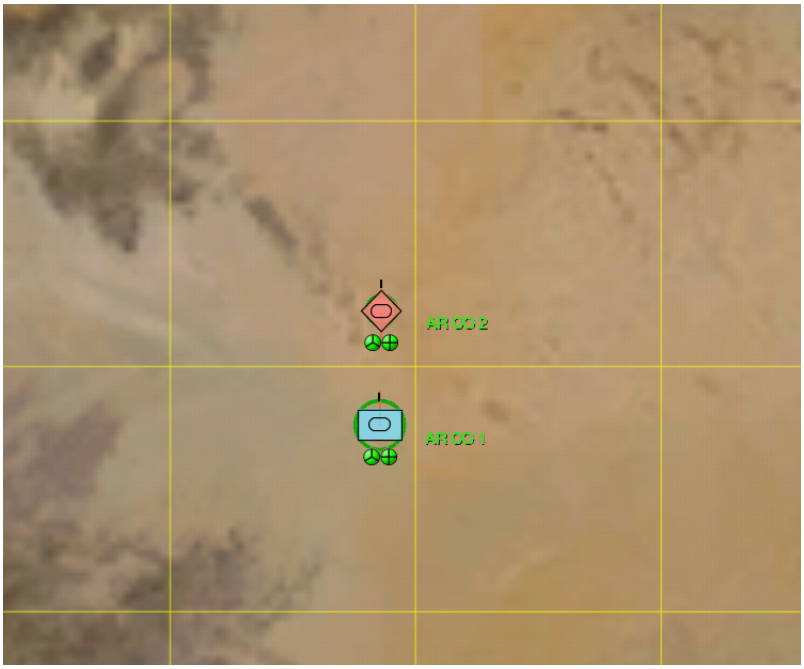


Figure 1-37. Tank companies

6. In the Simulation Objects Palette, change the Force to Opposing.
7. Add a Tank CO RU north of AR CO 1. A unit gets added named AR CO 2. Notice that in addition to its icon, each unit has a set of gumball charts that display status of its health and resources.
8. Open the Plan window for each unit.
9. Give AR CO 1 a Move to Location (Direct) task to move north of its current position, to approximately where AR CO 2 is.
10. Give AR CO 2 a Move to Location (Direct) task to move south to approximately where AR CO 1 is.
11. Save the plans.
12. Save the scenario.

Run the Scenario

Run the scenario. As it progresses, the units approach each other. When they detect each other, they engage in combat, shown by the attack indicators (Figure 1-39). Zoom in to get a better look.

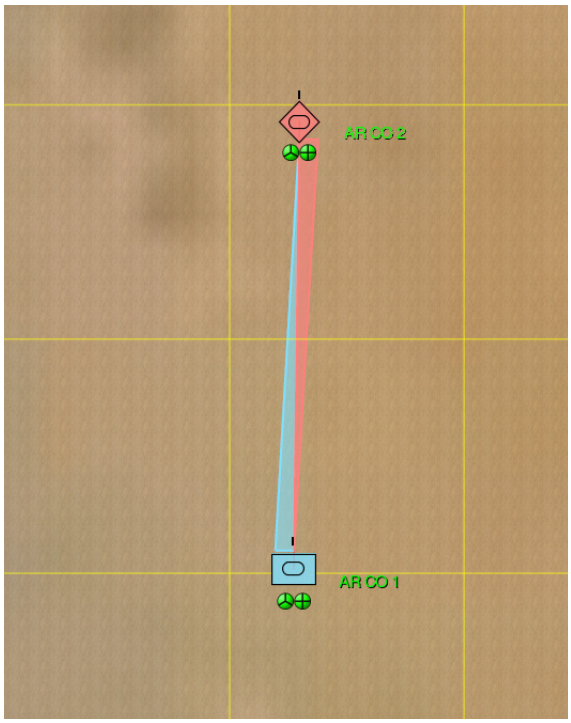


Figure 1-38. Attack indicators

Select AR CO 1. VR-Forces displays range rings that show the extent of its sensors and weapons (Figure 1-40). (Simulation objects in entity-level scenarios also display range rings.)

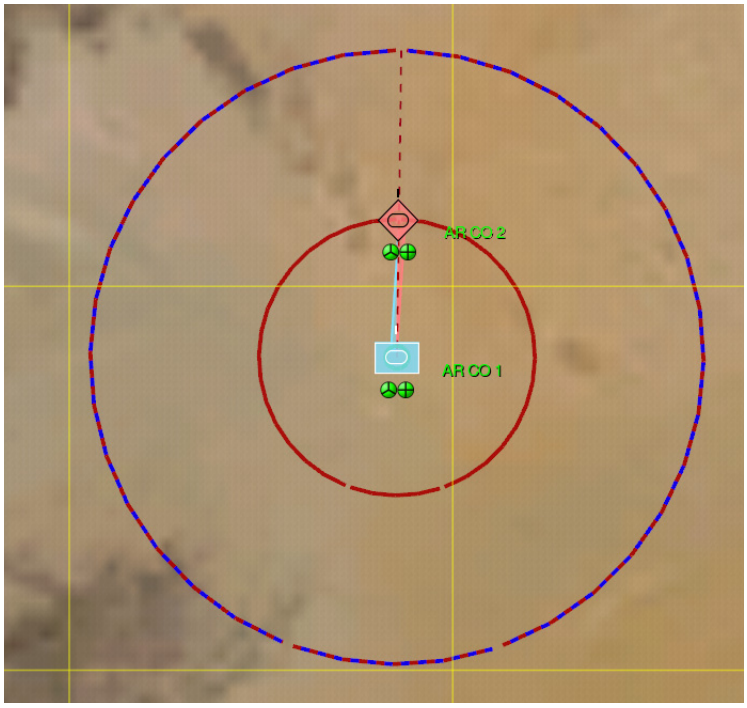


Figure 1-39. Range rings

Zoom in on AR CO 1 until you can see a green ring around it (Figure 1-41). This is its footprint. The footprint represents the physical area that all the subordinate members of the unit would take up if they were being simulated individually. If part of the footprint is flashing, this indicates where it is being attacked.

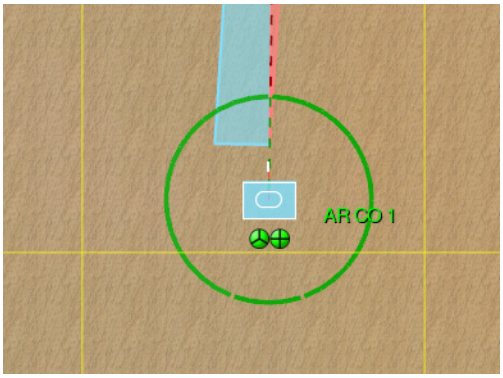


Figure 1-40. Footprint

As the battle progresses, you will notice that the segments of the gumball charts start to change color. Figure 1-42 illustrates the meaning of gumball charts.

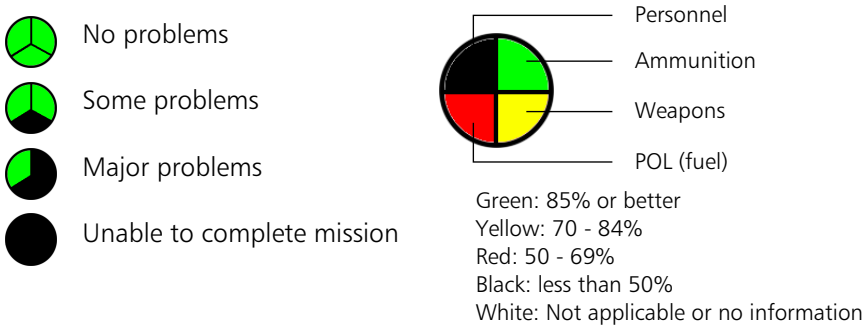


Figure 1-41. Gumball charts

Select AR CO 2. Press **i** to display its Information dialog box (Figure 1-43). The dialog box has the same layout as the dialog box used for entity-level simulation objects. The Summary section has information that is not provided for entity-level simulation objects. This includes the gumball charts and a health indicator (the green bar next to the gumball charts). Notice that in this figure the green bar is at about 80%, because AR CO 2 is not at full health. The various pages of detailed information are different than those in an entity-level scenario. This is because aggregate-level scenarios model resources and combat differently than entity-level scenarios do, so the information you need to understand them is different.

For complete information about aggregate-level warfare, please see Chapter 21, *How Aggregate-Level Modeling Works*, in *VR-Forces Users Guide*.

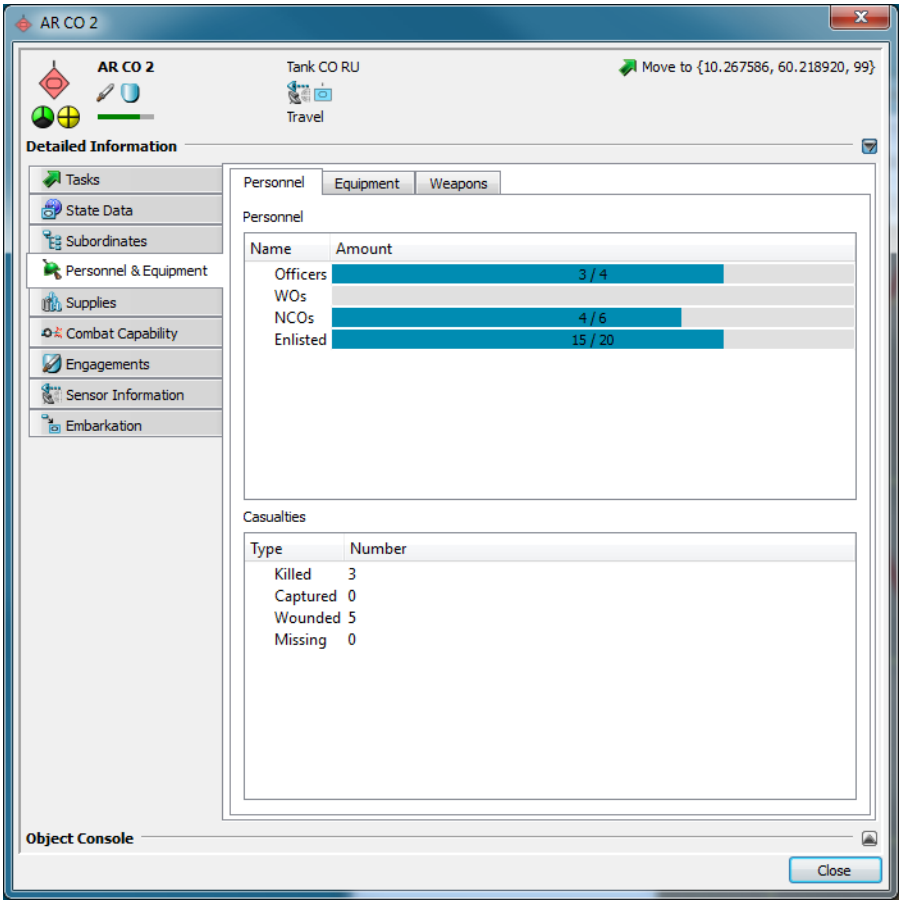


Figure 1-42. Information dialog box for unit

1.7.2. Create Combat Engineering Objects

The aggregate-level SMS supports all of the tactical graphics that the entity-level SMS does. Aggregate-level scenarios also have a completely separate list of objects that you can add to a scenario – combat engineering objects (CEOs). CEOs are objects that can impede or assist the movement of simulation objects. They include objects such as minefields, defensive fortifications, bridges, breaching lanes, and booby traps.

You can add CEOs to scenario like you would a tactical graphic, by drawing them on the terrain, or they can be created as part of the simulation by units that have the resources to create them.

In this part of the tutorial you will learn about both ways to create CEOs. You will also learn how units can breach obstacles.

For complete details about creating CEOs, please see Section 21.2, "Combat Engineering Objects," in *VR-Forces Users Guide*.

1. If the scenario is running, pause it and rewind it.
2. Click the saved view to reset the extents of the terrain.
3. On the Simulation Objects Palette, set the force to Opposing and select Eng Mob Aug CO.
4. Place the unit as shown in Figure 1-44.

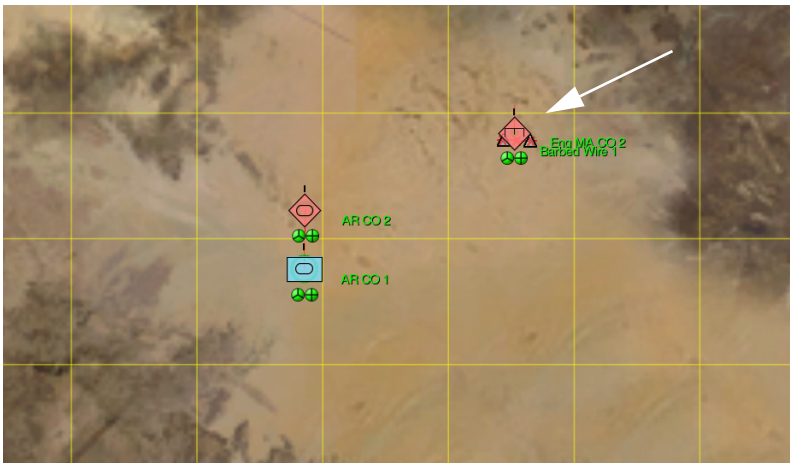


Figure 1-43. Eng Mob Aug CO

5. Zoom in on the engineering company.
6. Click the Hazards/Obstacles Palette.
7. Select Barbed Wire.

8. Draw a line as shown in Figure 1-45.

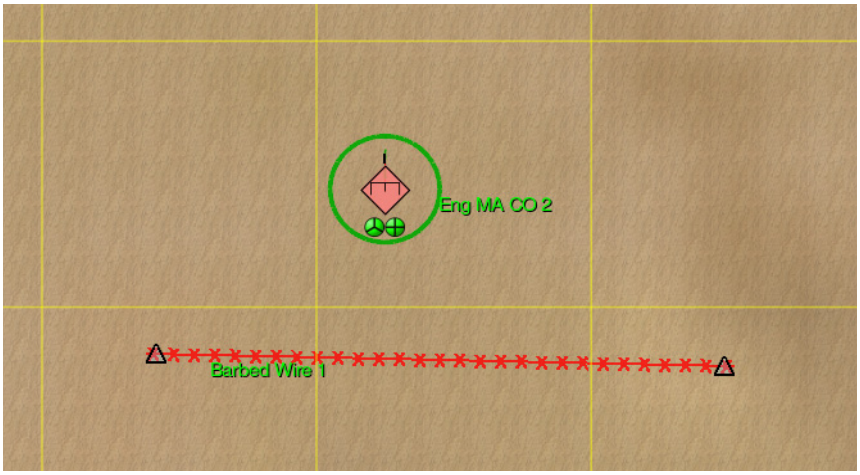


Figure 1-44. Barbed wire

9. Save the scenario.

Breaching an Obstacle

You have now created a combat engineering unit and a combat engineering object. Now we will have the engineering company breach the barbed wire obstacle.

1. Open the Plan window for the engineering company.
2. Choose **Task** → **Combat Engineering** → **Breach Obstacles**. The Breach Obstacles dialog box opens (Figure 1-46).

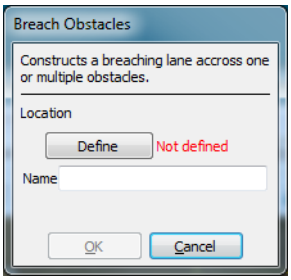


Figure 1-45. Breach Obstacles dialog box

3. Click Define. The cursor changes to draw mode and the Create Breach dialog box opens or becomes available.
4. Draw a two-point line that bisects the barbed wire (Figure 1-47). After the second click the line disappears. This is because it is not being created now; you are specifying where you want the engineering unit to create it when the scenario runs. The dialog box button now says Edit and the text next to it says Defined, so you know the action was successful.

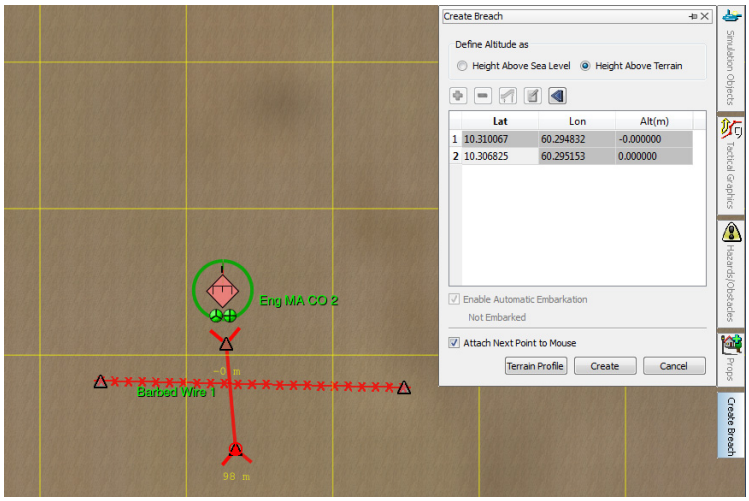


Figure 1-46. Breach line

5. Click OK. The task is added to the plan.
6. In the Plan window, click OK.
7. Save the scenario.
8. Run the scenario.

The engineering company moves towards the barbed wire. VR-Forces draws a breach line where you defined it (Figure 1-48).

1. Select the barbed wire object and open its Information dialog box.
2. Expand the Detailed Information section.
3. Select the Engineering Object Information page.

The Breached status is Not Breached. After about 9 minutes of simulation time, the status changes to Breached. (You can use the Time Multiplier Toolbar to speed things up.)

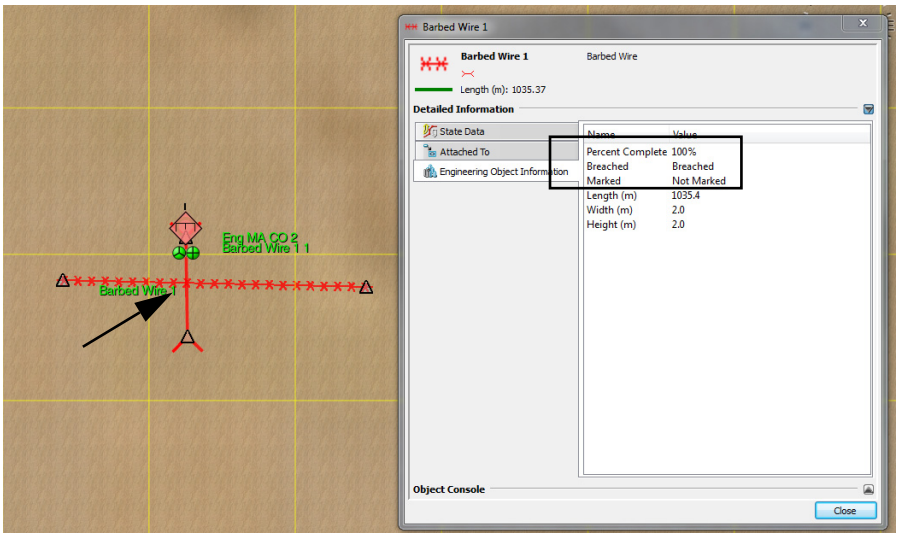


Figure 1-47. Information dialog box for engineering object

Simulating Creation of a Combat Engineering Object

In the previous section, you created a combat engineering object by hand, like you would create a tactical graphic. This is useful if you want to set up a scenario with CEOs in place. However, in the real world, creating CEOs takes time and resources and you may want to simulate the planning and logistics required to create them. VR-Forces units can create CEOs during a simulation using various types of construction materials. This part of the tutorial shows how this happens.

1. If the scenario is running, pause it and rewind it.
2. Click the saved view to get back to the starting view.
3. On the Simulation Objects Palette, set the force to Friendly and select Eng Mob Aug CO.
4. Place the engineering company as shown in Figure 1-49.

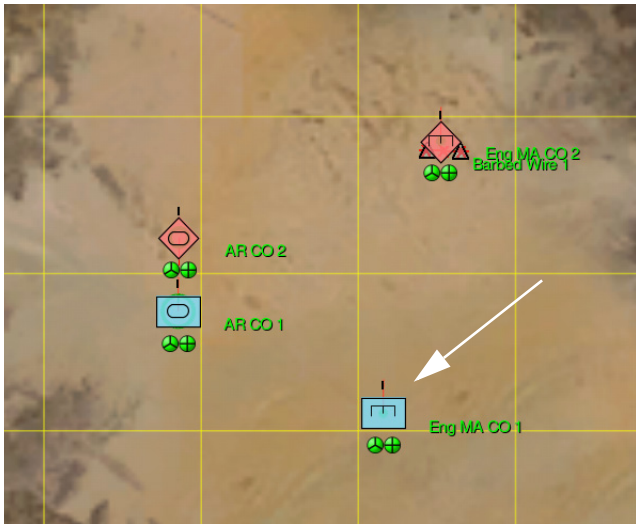


Figure 1-48. Eng Mob Aug CO

5. Zoom in on the engineering company.
6. Open its Plan window.
7. Choose **Task** → **Combat Engineering** → **Construct Fortified Line**. The Construct Fortified Line dialog box opens. The Location is specified as "Not defined".
8. Click Define. The Create Fortified Line dialog box opens and the cursor changes to draw mode.
9. Draw a line as shown in Figure 1-50.

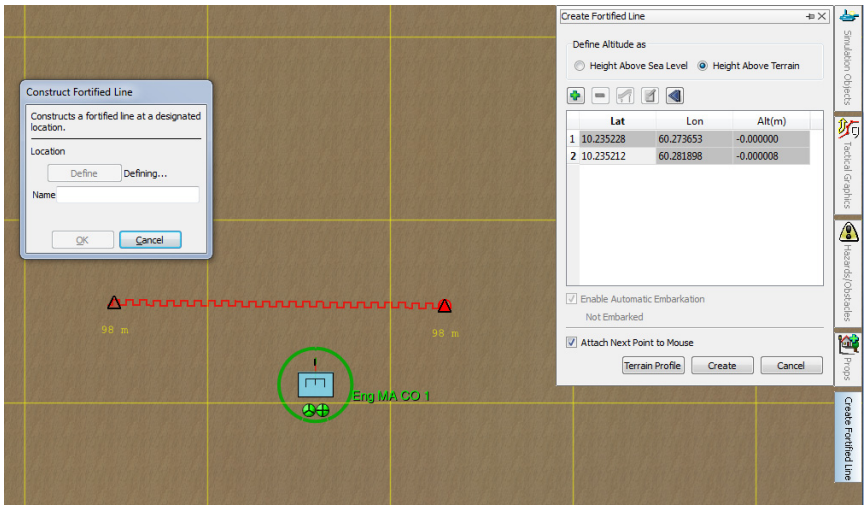


Figure 1-49. Fortified line

10. Click Create.

11. Click OK.
12. In the Plan window, click OK.
13. Save the scenario.
14. Run the scenario.

The engineering company moves towards the location of the fortified line that it is supposed to construct. A line is added to the window.

1. Select the fortified line and open its Information dialog box.
2. Expand the Detailed Information section.
3. Select the Engineering Object Information page (Figure 1-51).

The dialog box displays the completion status. Creating a CEO can take many hours of simulation time depending on its size and complexity. Increase the Time Multiplier to 15. It took about 26 minutes of simulation time to reach the 3% completion level shown in Figure 1-51

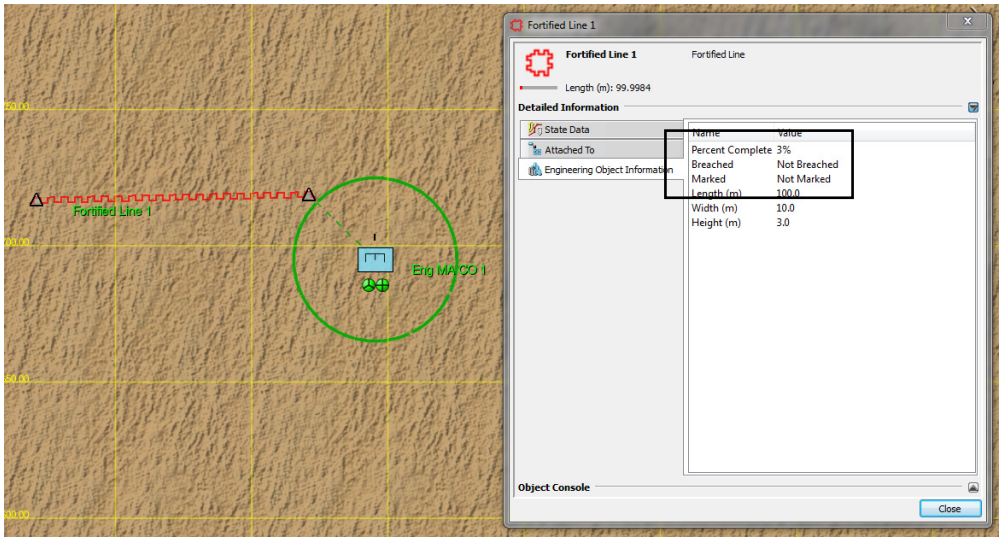


Figure 1-50. Fortified Line Information dialog box

Open the Information dialog box for the engineering unit and select the Supplies page. Note that as the completion percentage of the fortified line increases, the quantity of construction material for the unit decreases.

You have now explored several aspects of aggregate-level modeling. For complete information, see the several chapters devoted to aggregate-level modeling in *VR-Forces Users Guide*.

1.8. Example Scenarios

VR-Forces includes many example scenarios that demonstrate its features. Here is an annotated list of the example scenarios provided with VR-Forces:

- AggregateLevelSimulationDemo. This scenario has several vignettes that demonstrate different features of aggregate-level simulation.
- AggregateLevel_BakersfieldDefense. Friendly forces are set up in a defensive position to repel opposing force attacks.
- AirDefense. A Patriot missile battery shoots down opposing force planes when the simulation event is triggered from the Quick Launch toolbar. This scenario also lets you place a Patriot Missile Battery simulation object group to demonstrate this feature.
- apache_groundDB. Three helicopters attack a convoy. Demonstrates movement tasks, use of routes and waypoints, and a conditional task.
- BombMission. The scenario mission drops a bomb on a high priority target on the island of Oahu, Hawaii. To accomplish the mission, several F-16 decoys are used to distract enemy forces while a B-2 drops a high altitude JDAM on the primary target.
- breaching. Three tank platoons engage opposing forces. Utility vehicles breach a mine field. This scenario contains units. It also demonstrates use of tactical graphics. This scenario is fully explained in Appendix A, *Example Entity-Level Scenarios*, in *VR-Forces Scenario Management Guide*.
- CarrierDemo. Helicopters and jets take off from and land on a carrier. The carrier is part of the terrain, not a simulation object.
- CounterMeasuresDemo. This scenario demonstrates the chaff and flare feature for fixed-wing aircraft.
- embarkexample. An entity embarks and disembarks from a Bradley fighting vehicle. It gets picked up by a helicopter and transported to an aircraft carrier. This scenario is fully explained in Chapter 14, *Example Entity-Level Scenarios*, in *VR-Forces Users Guide*.
- firstexperience and first_experience_aggregate_example. These scenarios demonstrate the scenarios that users of *VR-Forces FirstExperience Guide* create as they work through the guide.
- HawaiiAir. This scenario demonstrates fixed-wing and rotary-wing entity behaviors, including takeoff and landing on land and an aircraft carrier, bombing, strafing, and terrain-following.
- HawaiiGround. This scenario demonstrates ground entity behaviors, including embarkation and disembarkation, road following, and convoys.
- HawaiiNaval. This scenario has four vignettes that demonstrate the naval features of VR-Forces, including deploying and clearing mines, sonar dipping, firing torpedoes, using active and passive sonar, and submarine maneuvers.

- MaklandCoordinatedAttack. This scenario shows air, ground, and naval forces attacking an entrenched opposing force position. Meanwhile, a P-3 drops sonobuoys to try to located a submarine and naval mines to try to destroy a second submarine. A helicopter uses its dipping sonar to locate a submarine and drops a torpedo to attack it.
- marineMissileDefense. This scenario demonstrates the ability of surface vessels to survive multiple hits. An opposing force ship fires cruise missiles at a friendly force ship. The blue ship uses its missile defense system to try to shoot down the incoming missiles. If the blue ship is hit, it does not sink after the first successful strike; it takes multiple hits to successfully sink it.
- NetworkCentricForces. This scenario is an example for use with Network Centric Forces (Qualnet and VR-Forces).
- RaidDemo. Friendly forces travel from an aircraft carrier to assault hostile forces that have taken hostages. They rescue the hostages and return to the carrier.
- remoteAttachment: This scenario demonstrates how to attach components to remote entities. See the readme.txt file for instructions for running the scenario.
- S57-NavalPathPlanning. This scenario demonstrates how VR-Forces can plan paths for surface vessels using S-57 feature data.
- StrafingDemo. This scenario demonstrates strafing and air attack with guns. AttkFW 1 (A-10 1) strafes a tank and some DIs in the middle of the village. AttkFW 2 (A-10 2) shoots an opposing force helicopter using its guns.
- SubwayPOL. This scenario demonstrates how to create a pattern of life (POL) using automatic creation and removal (spawn and sink) of humans and vehicles.
- takeoffandlanding: Two jets take off and then land at an airport. This scenario demonstrates the fixed-wing take off and fixed-wing landing tasks.
- TrafficDemo. This scenario demonstrates use of the road following feature. It shows vehicles moving along roads in opposite directions and passing each other.
- UAVSensorDemo. This scenario demonstrates use of gimbaled sensors on a UAV. It has a quick launch plan that automatically moves the sensor to look at different surface entities.
- WeatherDemo-Raining and WeatherDemo-Clear. The weather scenarios demonstrate how VR-Forces models weather effects and how they affect simulation objects. In WeatherDemo-Raining, the opposing force simulation objects are able to travel much closer to the friendly force simulation objects before they are detected than they do in WeatherDemo-Clear.

These scenarios are provided to demonstrate the features of VR-Forces. They do not pretend to demonstrate realistic military tactics or strategy.

1.9. Learn More

For complete details about using VR-Forces, see the appropriate manual, as listed in Table 1-1. The VR-Forces documentation set is provided to all customers in PDF format. PDF versions of the manuals are in the *./doc* directory and, in Windows, are accessible from the VR-Forces shortcuts on the Start menu.

A. Installation and Licensing

Your MÄK salesperson has given you links to the VR-Forces installers, and may have given you links to other installers. Download the files. If you want to try the aggregate-level modeling scenario, you must install an RTI that supports HLA Evolved, such as the MÄK RTI. Before you install the applications, note the following possible issues:

- You must have administrator privileges to install VR-Forces on Windows Vista.
- When you install VR-Forces on Vista or Windows 7, there may be a delay of up to several minutes from the time you try to run the setup program to the time that an installation dialog box is displayed. If you experience this problem, turning off User Access Control can reduce or eliminate this delay.
- These instructions assume you are familiar with installing Windows applications that use a wizard-style installer. They also assume that you have an unzipping application and know how to use it.

A.1. Install VR-Forces

VR-Forces has two installers. The first installs the application and, optionally, the SDK. The second installs application data. You must install the application data or the application will not run.

To install VR-Forces:

1. Run the application installer. On the VR-Forces License Code page (Figure A-1), click Skip Toolkit Installation.

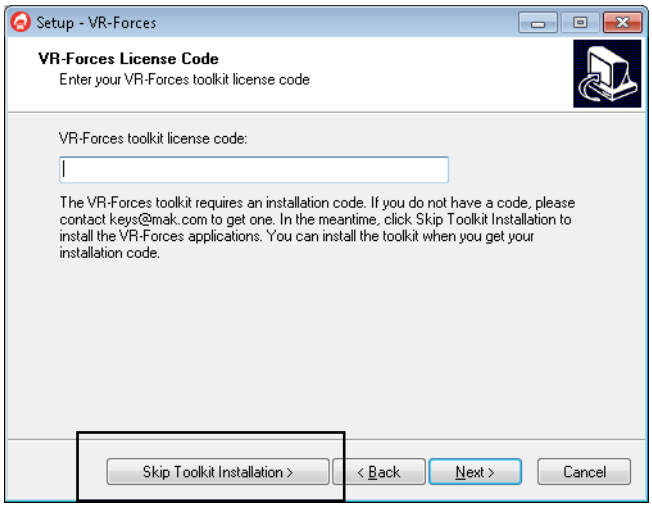


Figure A-1. VR-Forces installation wizard

2. Run the data installer. When the installation wizard asks if it is OK to install in the existing VR-Forces directory, click Yes.

Install any other applications your salesperson has provided from their installers.

A.2. Setting Up the License Manager

To use a MÄK product, you must install the MÄK License Manager and get a license for your product. Before you can use a MÄK product, you must obtain a valid license file and specify the license server.

➤ To install the MÄK License Manager, run the installer.

The general procedure for configuring license management is as follows:

1. Identify the name and ID of the license server and request a license file.
2. Put the license file in the *MAK/MAKLicenseManager* directory on the license server.
3. Run the license server.
4. Specify the license server location.

A.2.1. Identify the Host ID and License Server Name

For simplicity, use the computer on which you installed VR-Forces as the license server. To find out the host ID and license server name:

1. On the Start menu, choose **Programs** → **MAK Technologies** → **MAK License Manager** → **MAK License Manager**. The MÄK License Manager utility opens (Figure A-2).

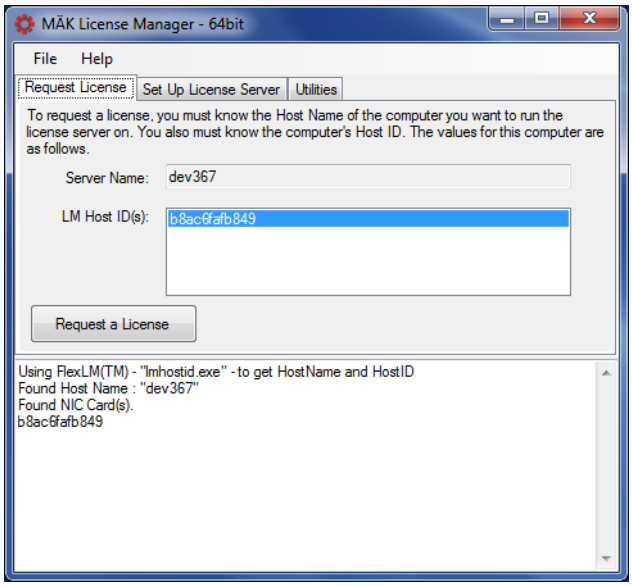


Figure A-2. License Manager

2. Select the Request License tab. It displays the server name and the IDs for your network cards.
3. If you have more than one network card, select the one that you want to use as Host ID.
4. Send the host ID and hostname to your MÄK salesperson. MÄK will e-mail you a license file.

A.2.2. Put the License File in the MAKLicenseManager Directory

When you receive your license file, put it in the *MAKLicenseManager* directory on the license server. The file should have the extension *.lic*. If it does not, please contact keys@mak.com to clarify why it did not follow this convention.

A.2.3. Run the License Server

➤ To start the license server daemon, on the server machine only, execute `runLm` from the *MAKLicenseManager* directory.

Shutting Down the License Server

➤ To force all applications to check in their licenses and shut down the license server daemon, run `lmdown`.

A.2.4. Specify the License Server

The first time you run a MÄK application on a computer, the License Setup dialog box opens (Figure A-3). It prompts you to enter the hostname of the license server and optionally, a port number.

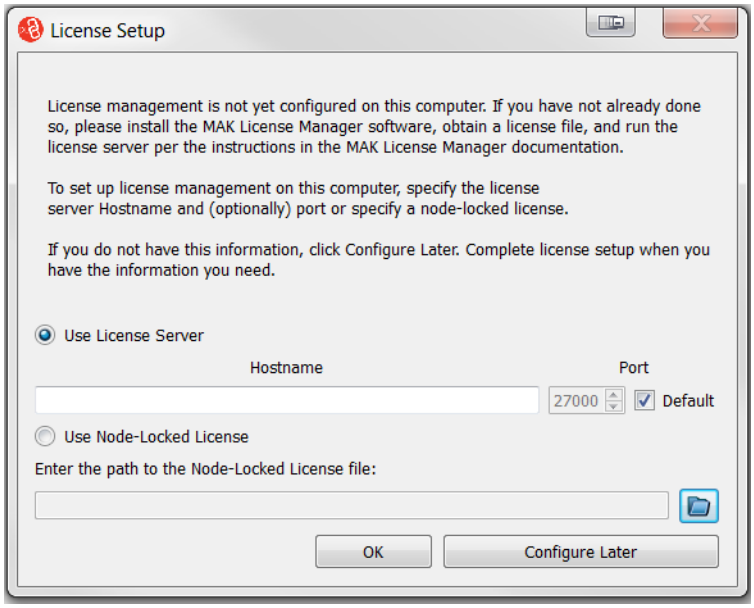


Figure A-3. License Setup dialog box

1. Type the hostname in the Hostname box.
2. Click Add License Server. The application will start.