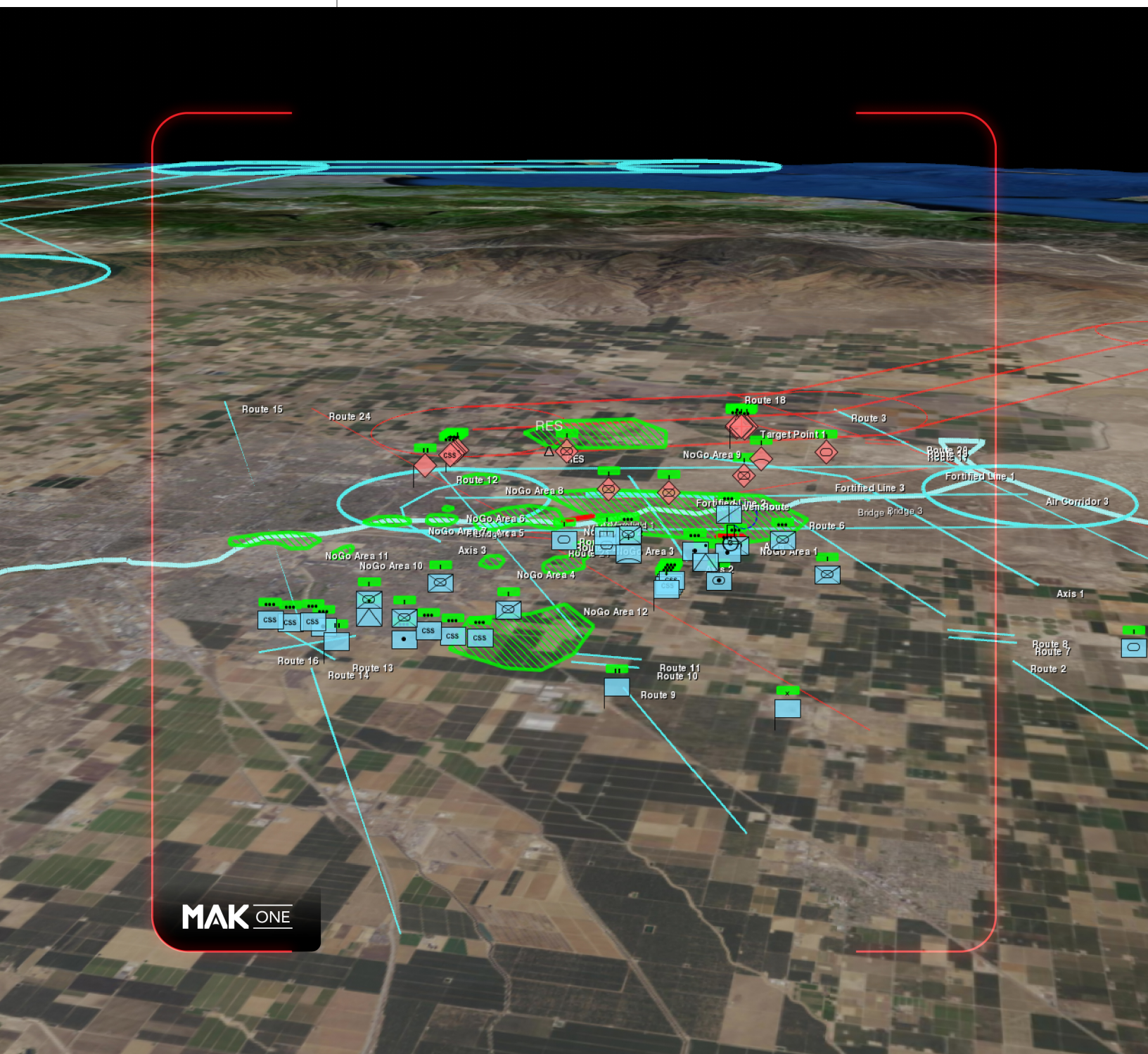




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1. Introduction to VR-Forces

Thank you for deciding to try VR-Forces. VR-Forces is MAK'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. For the full experience, you need the VR-Forces runtime application. (You do not need to install the SDK.)

Before you begin, install and license the software. Please see "Chapter 5. Installation and Licensing" on page 85 for instructions.

When you are ready, this chapter will help you:

- [Start VR Forces.](#)
- [Load a Scenario.](#)
- [Run the Scenario in the 3D View](#)
- [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 the *VR-Forces Developers Guide*.

1.1. Start VR-Forces

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

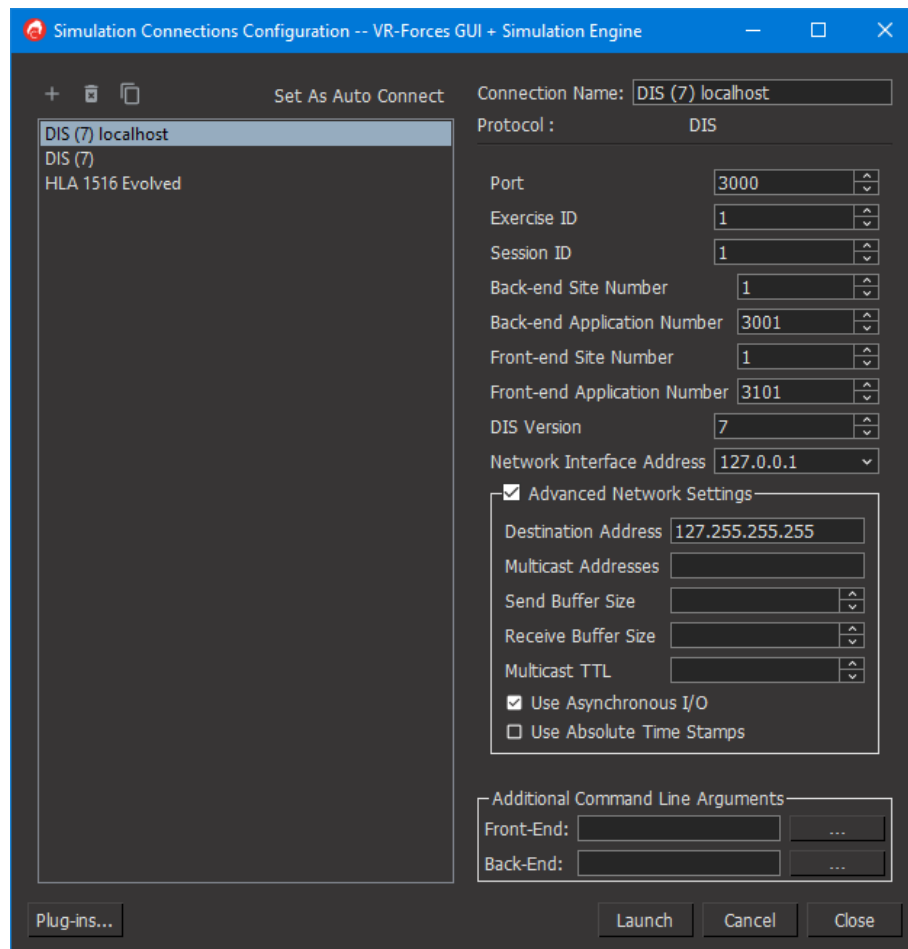
VR-Forces can display terrain, simulation objects, and other simulated objects in 2D or 3D. The default startup mode is 2D. The first part of this guide introduces you to the 2D features. Then it introduces the 3D view.

i Before you start VR-Forces, make sure the license server is running. For details, please see "5.2.3 Run the License Server" on page 89.

1. On the Start menu, choose **MAK Technologies > VR-Forces 5.1.1 GUI + Simulation Engine (64-bit)**.

The Simulation Connections Configuration dialog box opens (Figure 1).

Figure 1. Simulation Connections Configuration dialog box

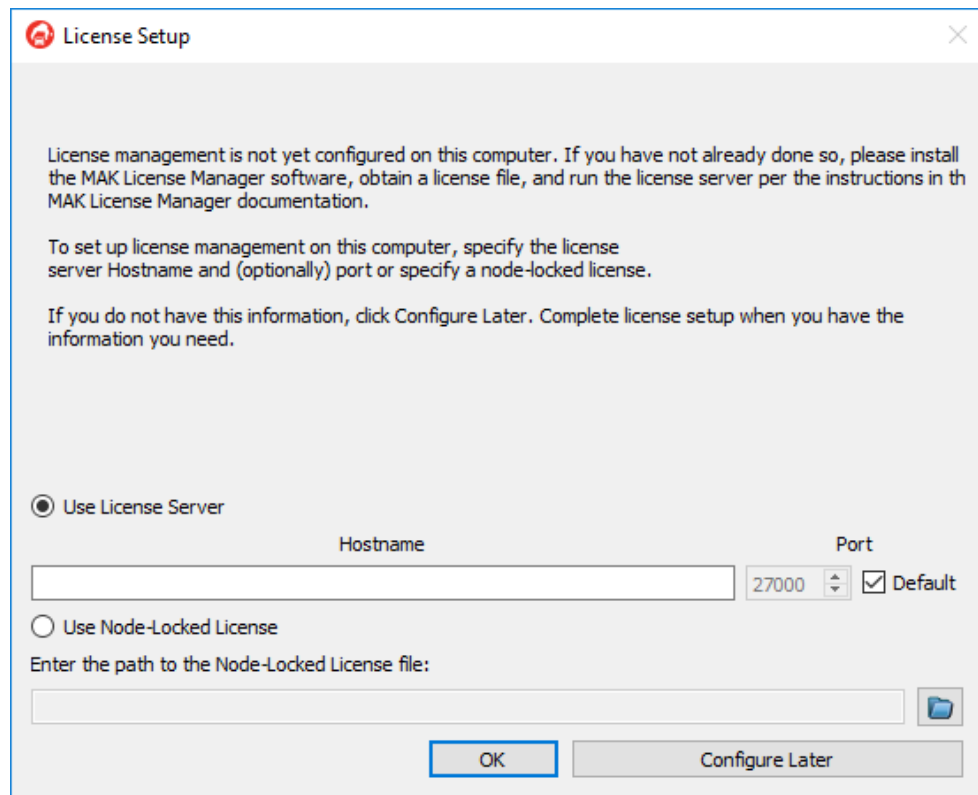


2. In the Simulation Connections Configuration dialog box, select the DIS (7) localhost connection configuration. (If you want to use HLA, you also need to install and configure an HLA Runtime Infrastructure (RTI), so let's stick with DIS for this first experience.)
3. Click Launch. If this is the first time that you have run a MAK 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 3 on the next page).

1.1.1 Specify the License Server

The first time you run a MAK application on a computer, the License Setup dialog box opens (Figure 2). (If you already have other MAK 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 2. License Setup dialog box

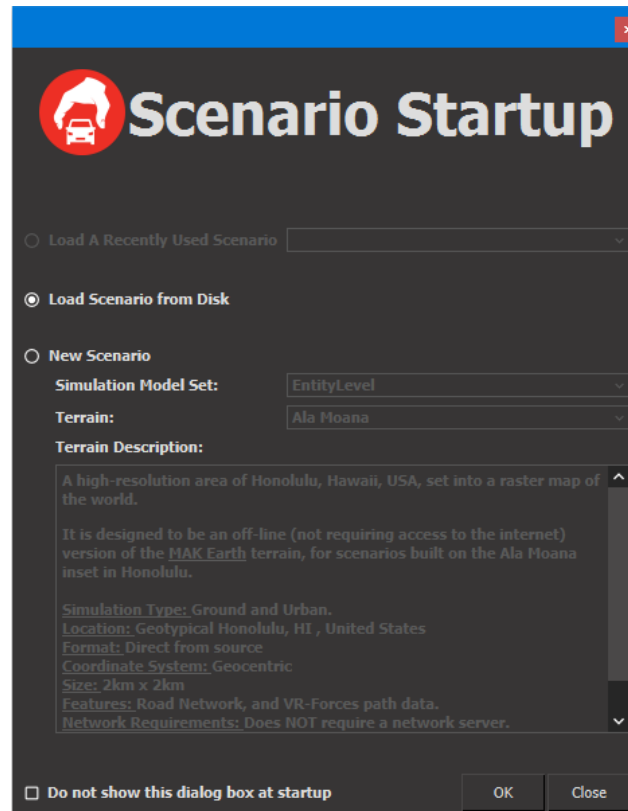


1. Type the hostname in the Hostname box. This is the name you gave your salesperson when you requested the license file.
2. Click Add License Server. VR-Forces starts. The Scenario Startup dialog box opens (Figure 3 on the next page).

1.2. Load a Scenario

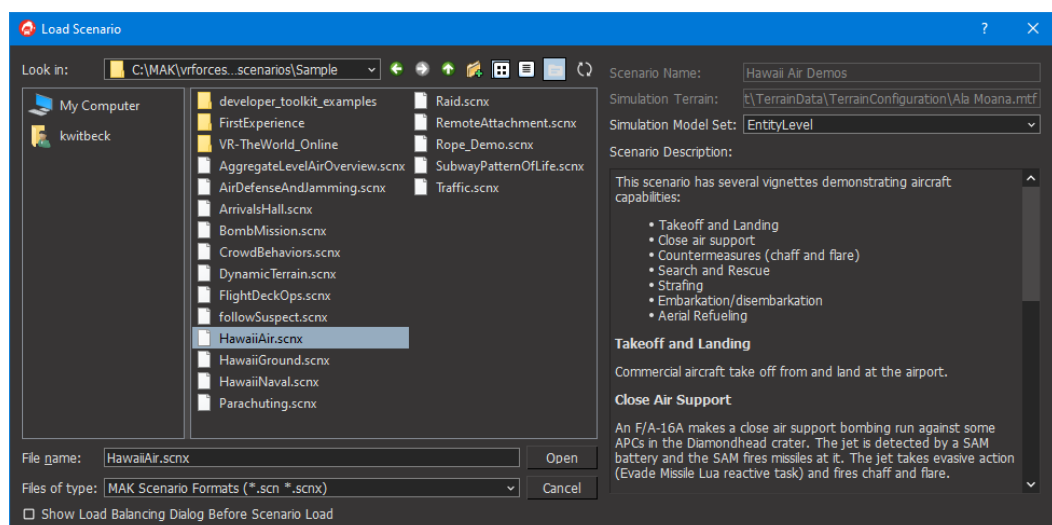
When you start VR-Forces, the Scenario Startup dialog box (Figure 3) lets you quickly load a scenario or create a new one without needing to use the VR-Forces menus.

Figure 3. Scenario Startup dialog box



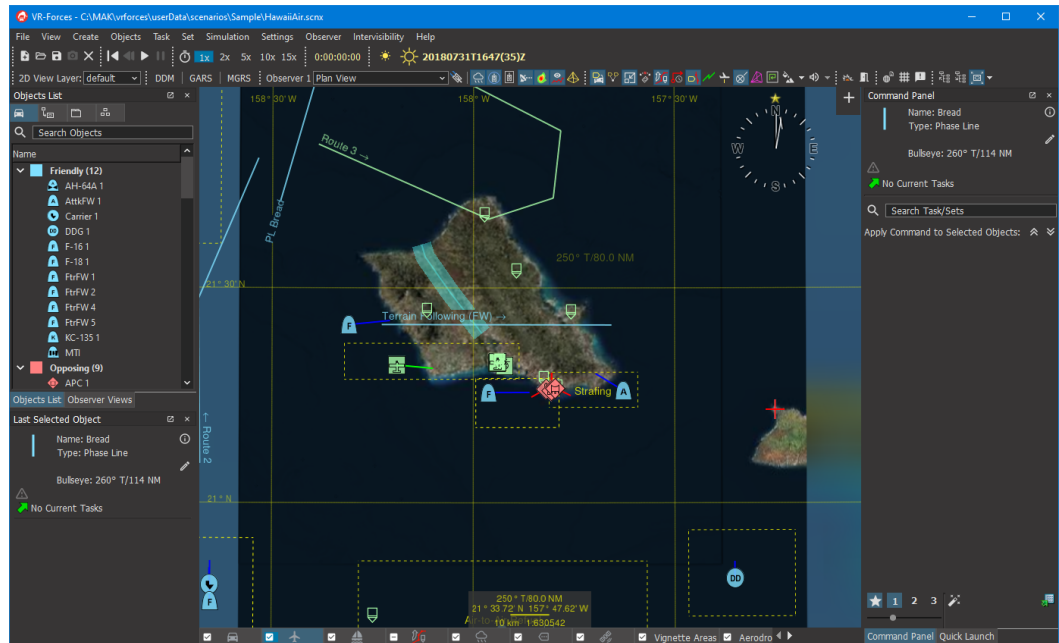
1. In the Scenario Startup dialog box, select the Load Scenario From Disk option.
2. Click OK. The Load Scenario dialog box opens.
3. Open the Sample folder and then select *HawaiiAir.scnx*. Note the description of the scenario on the right-hand side (Figure 4).

Figure 4. Scenario information



- Click Open to load the scenario. You see most of the simulation objects and tactical graphics in the scenario (Figure 5).

Figure 5. HawaiiAir scenario



- Press **E** to zoom in or **Q** to zoom out (or scroll the mouse wheel) 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, see "[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 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 chapter, we 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; if you do not see the boxes, select the Tactical Graphics check box (🔍) at the bottom of the window to display the areas. You may want to zoom in to different vignettes to see the action more closely. You 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, see the *VR-Forces Users Guide*, particularly the chapters [Viewing Information About Objects](#), [Introduction to Tactical Graphics](#), and [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. Choose **Objects > Information**. A dialog box opens (Figure 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.

To expand the pages, click the arrows icon (↕). The Detailed Information includes tabs that provide different details about the object.

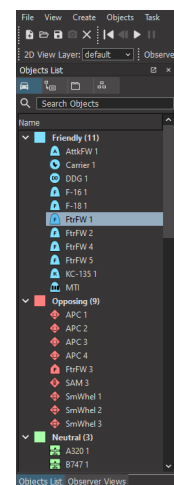
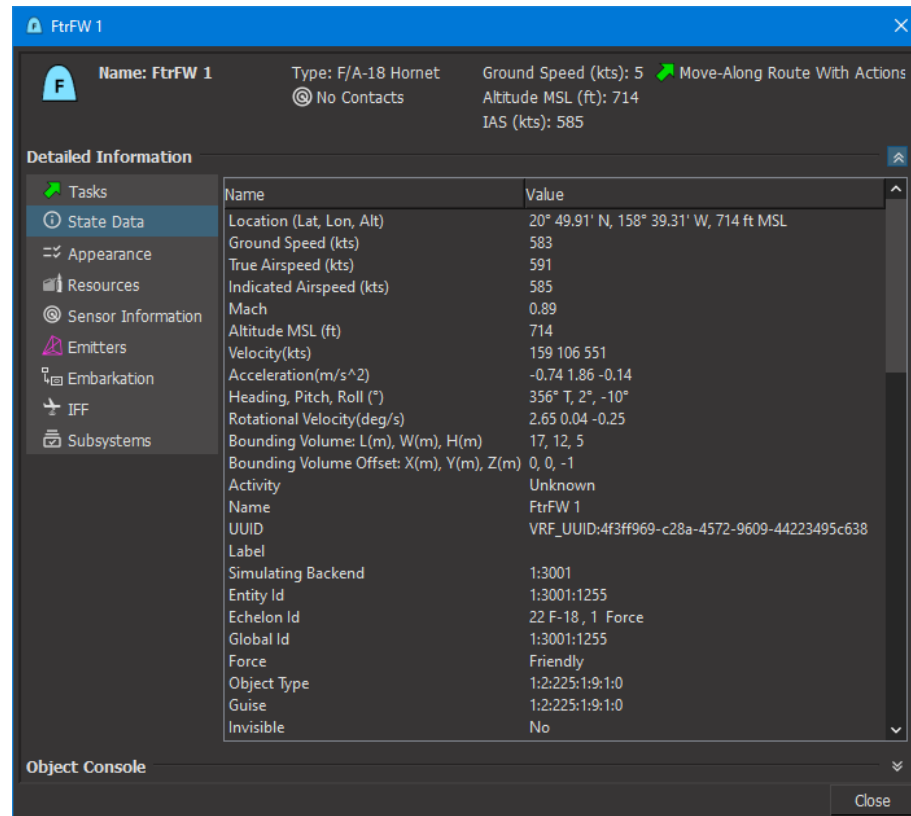


Figure 6. Information dialog box



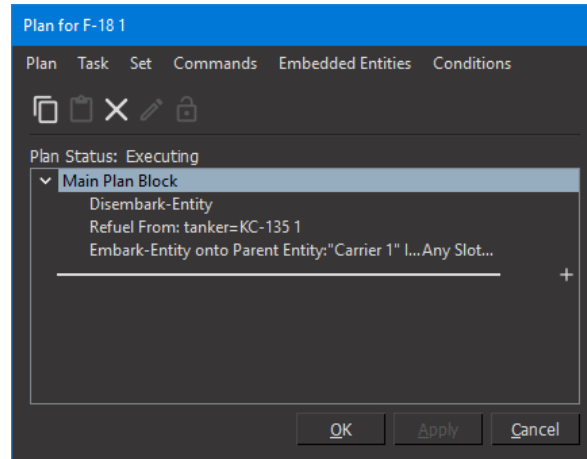
5. Click the Close button to close it.

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 F-18 1.
2. Choose **Objects > Plan**. The Plan window opens (Figure 7).

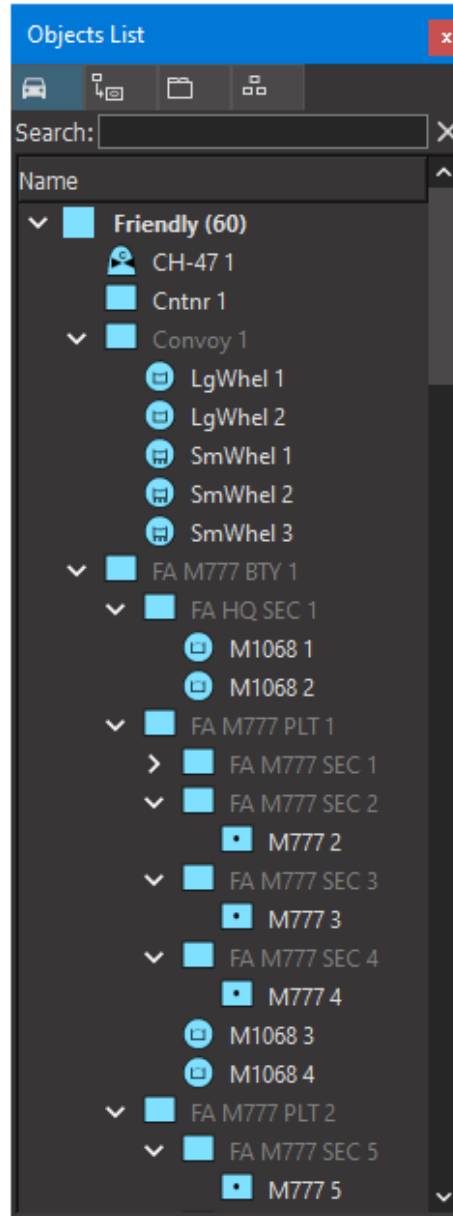
Figure 7. Plan window

This plan is fairly simple. It tells the entity to disembark from a carrier, be refueled by a tanker aircraft, and then return to the carrier.

3. Click OK to close the Plan window.

View Force Hierarchies and Relationships

All simulation objects exist within the context of forces, usually called Friendly and Opposing. Some simulation objects may belong to the Neutral force. (The Friendly, Opposing, and Neutral forces are available by default; you can create up to 255 different forces.) The forces emulate military hierarchies.

Figure 8. Hierarchies in the Objects List

On the Objects List panel, the Objects List View shows the hierarchical arrangement of the simulation objects by force. (HawaiiAir does not have any hierarchical units. Figure 8, which shows how units display, is from a different scenario.)

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. The Objects List View also lists tactical graphics.

1.2.4 Navigating the Terrain

You can change your view of the 2D terrain by panning or zooming in and out. You can do this using 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 9. To zoom in and out with the mouse, move the mouse wheel forward or backward.

Figure 9. Primary movement keys, observer coordinates (2D)



For complete details about moving the observer, see the [Moving the Observer](#) chapter in the *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. Experience the 3D View

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

1.3.1 Load a Scenario in Stealth Observer Mode

If VR-Forces is not running, start it. If the HawaiiAir scenario is not loaded, load it:

1. Choose **File > Load Scenario**. The Load Scenario dialog box opens.
2. Select *HawaiiAir.scnx*.
3. Choose **Observer > Set Observer Mode (Observer 1) > Stealth**. The view changes to the 3D view.

1.3.2 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 F-16 1.
2. Right-click and choose **Observer Attach > Attach Follow**. The observer jumps to the rear of the aircraft.

Figure 10. Follow F-16 1



3. Choose **Simulation > Run Scenario**.
4. Watch the entity move over the terrain. Use the keyboard navigation keys to change the eyepoint's location relative to the entity (see "1.3.3 Navigate the 3D View" below). 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.

1.3.3 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 the online help or the Quick Reference Card in the *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

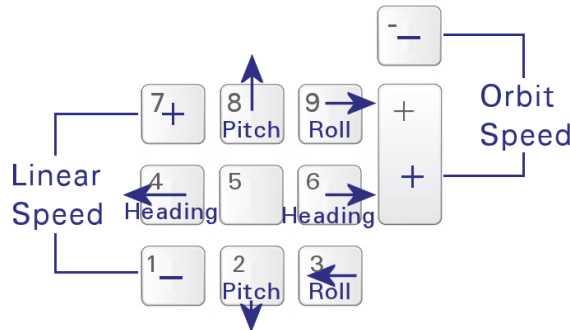
Press **W** or **S** to move forward or backward. Press **E** or **Q** to move up or down. Press **A** or **D** to move left or right.

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 numeric 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.

1.3.4 Try XR Mode

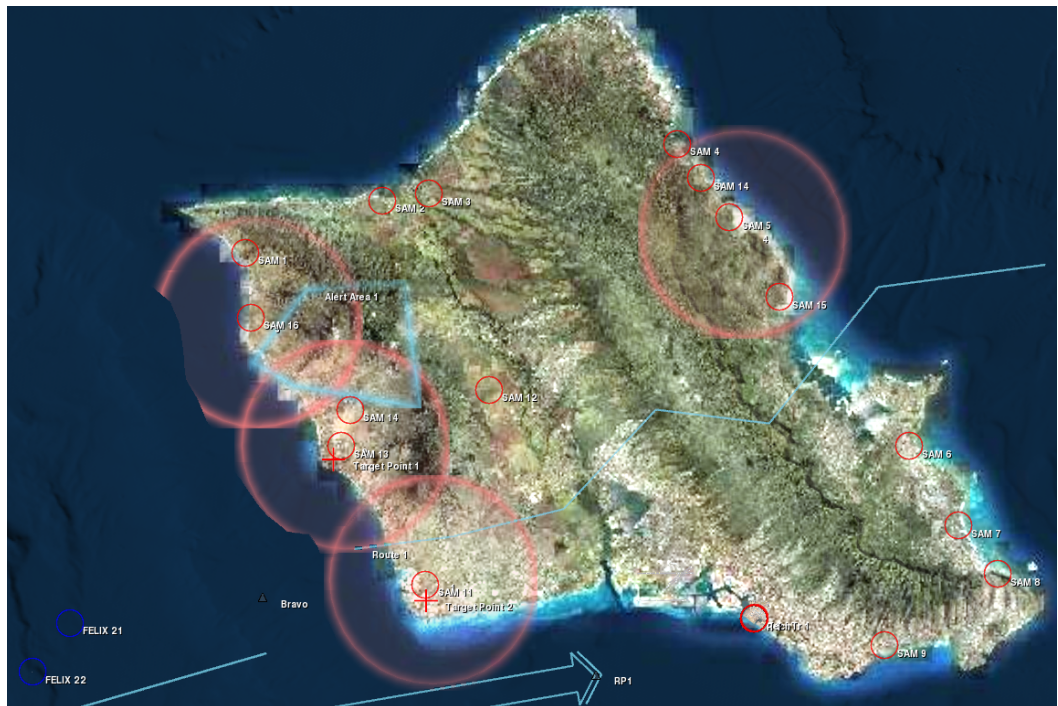
As we mentioned earlier, one of the drawbacks of the 3D view (Stealth observer mode) is that if you zoom out from the terrain, you probably will not be able to see any but the largest entities. VR-Forces has a special observer mode to deal with this problem. In eXaggerated Reality (XR) mode, entities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

1. Choose **File > Load Scenario**. The Load Scenario dialog box opens.
2. Load *BombMission*. By default, it loads in Plan View observer mode.
3. On the Observer Settings toolbar, select Stealth mode (Figure 11). The view looks similar to Figure 12.

Figure 11. Observer Settings Toolbar



Figure 12. BombMission 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 13). Figure 14 shows the same scene from the side. See how the entities are much larger than in a realistic view.

Figure 13. XR mode top-down view



Figure 14. XR mode side view



1.4. Example Scenarios

VR-Forces includes many example scenarios that demonstrate its features in the `./userData/scenarios/Sample` folder. Here is a brief, annotated list of the example scenarios provided with VR-Forces:

- **AggregateLevelAirOverview.** This scenario demonstrates the air combat capabilities of aggregate-level scenarios.
- **AggregateLevelBakersfieldDefense.** Friendly forces are set up in a defensive position to repel opposing force attacks.
- **AggregateLevelSimulationOverview.** This scenario has several vignettes that demonstrate different features of aggregate-level simulation.
- **AirDeepStrikeVignette.** Friendly forces strike an airbase in Australia. It demonstrates air defense and radar jamming, submarine operations, and satellite coverage.
- **AirDefenseAndJamming.** A SAM battery is jammed by a friendly force aircraft, allowing bombers to destroy it. A second SAM battery tries to shoot down cruise missiles launched from two destroyers.
- **AirDrop.** While a C-130 Hercules flies along a route, two vehicles and two paratroopers parachute from the plane.
- **AirOcaVignette.** Shows an Offensive Counter Air Sweep (OCA) supported by a cyber attack.
- **AirTankerVignette.** Demonstrates tankers resetting their Air Refueling orbits based on the current threat picture.
- **ArrivalsHall.** Simulates travelers queuing up and passing through customs booths.
- **BallisticMissileDemo.** Ballistic missiles are fired from the Korean peninsula at several targets. The targets take defensive action.
- **BehaviorGround examples.** These scenarios demonstrate a number of entity-level unit behaviors in the ground domain.
- **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.
- **CrowdBehaviors.** Demonstrates various crowd behaviors: wandering, rioting, protesting, and crowding. It includes scenario events to kick off the protest and the riot.
- **CST Demo Scenario.** An aggregate-level scenario that recreates a battle to defend Tehachapi Pass.
- **DynamicTerrain.** A scenario that demonstrates dynamic terrain and how VR-Forces entities can respond to changes in the terrain.
- **First Experience scenarios.** These scenarios demonstrate the scenarios that users of the *VR-Forces First Experience Guide* create as they work through the guide.
- **FlightDeckOps.** Helicopters and jets take off from and land on a carrier. The carrier is part of the terrain, not a simulation object.
- **FollowSuspect.** In this scenario, a UAV on an ISR mission (intelligence, surveillance, and reconnaissance) tracks detailed human movement in a complex urban environment: People get into and out of cars leading to a weapon exchange. The movement of a key individual is tracked through the UAV sensor.

- **HawaiiAir.** This scenario demonstrates fixed-wing and rotary-wing entity behaviors, including takeoff and landing on both land and an aircraft carrier, bombing, strafing, countermeasures, search and rescue, and aerial refueling.
- **HawaiiGround.** This scenario demonstrates ground entity behaviors, including embarkation and disembarkation, path and road following, ground combat, and artillery.
- **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.
- **IlluminationFlares.** Dawn scenario shows the use of illumination flares launched from artillery to reveal the position of the red convoy moving through the valley. The spotter is unable to see and identify the convoy until it is illuminated, showing the illumination effect in both the simulation and the visuals. Once spotted, an air strike is called in on the red vehicles. Note: Dynamic Lights (Observer Menu) must be turned on in the GUI to view the illumination effect.
- **Parachuting.** Soldiers embark on a helicopter, and then they parachute out of it.
- **Raid.** Friendly forces travel from an aircraft carrier to assault hostile forces that are sheltering inside a warehouse.
- **RemoteAttachment.** This scenario demonstrates how to attach components to remote entities. See the readme.txt file for instructions for running the scenario.
- **Rope_Demo.** Demonstrates how soldiers can embark onto and disembark from rotary-wing vehicles using ropes and ladders.
- **S57-NavalPathPlanning.** This scenario demonstrates how VR-Forces can plan paths for surface vessels using S-57 feature data.
- **SubwayPatternOfLife.** This scenario demonstrates how to create a pattern of life (POL) using automatic creation and removal (spawn and sink) of humans and vehicles.
- **Traffic.** This scenario demonstrates use of the road following feature. It shows vehicles moving along roads in opposite directions and passing each other.
- **Weather.** The weather scenario demonstrates how VR-Forces models weather effects and how they affect simulation objects. Vehicles move through a sandstorm and snow.



- These scenarios are provided to demonstrate the features of VR-Forces. They do not pretend to demonstrate realistic military tactics or strategy.
- Select each scenario and read the description for more information about what the scenario demonstrates.

1.5. Learn More

For complete details about using VR-Forces, see the online help or the [VR-Forces Users Guide](#). 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 linked in the VR-

Forces Documentation shortcuts folder, which you can access from the Start menu. The help is an HTML5 version of the *VR-Forces Users Guide* and the *Adding Content to MAK ONE Applications Reference Manual*.

To proceed with this first experience, continue to "Chapter 2. Create a Simple Entity-Level Scenario" on page 23.



2. Create a Simple Entity-Level Scenario

This chapter shows you how to create a simple scenario. It assumes you have learned how to start VR-Forces, have already configured the license server, and that you understand basic navigation methods, as described in "Chapter 1. Introduction to VR-Forces" on page 5. It teaches you how to:

- Create a new entity-level scenario.
- Create simulation objects.
- Create tactical graphics.
- Write a simple plan.

2.1. 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.

 To see videos for each step of this tutorial, open mak.com/mak-one/support/help/tutorials and click the link for the step you want to view. For complete details about creating scenarios, see the [VR-Forces Users Guide](#).

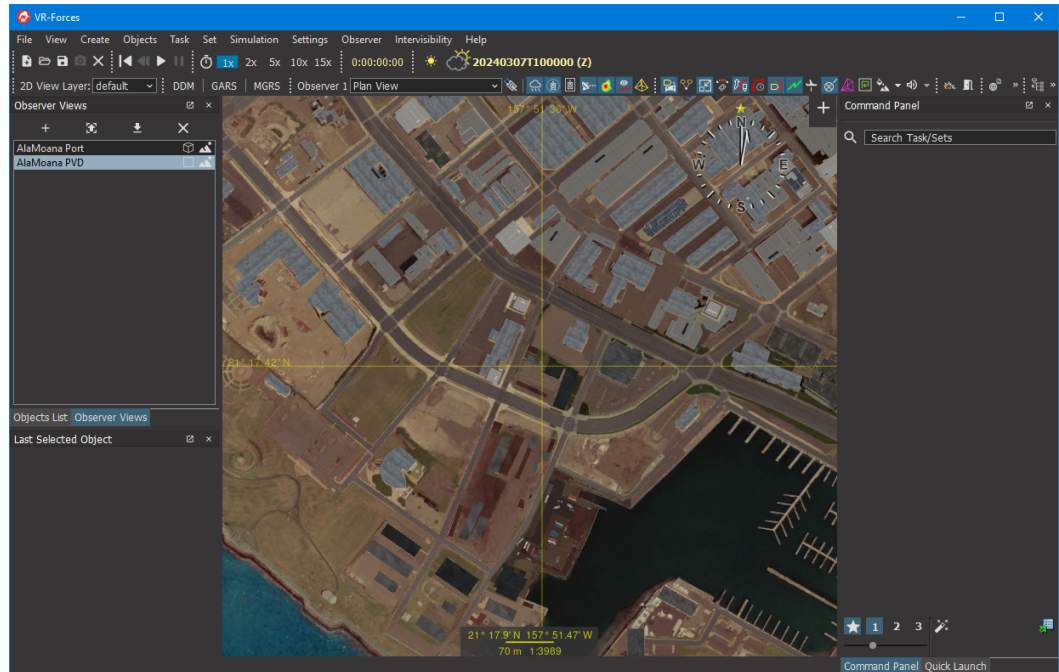
To create a scenario, you must:

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.

2.1.1 Start VR-Forces

1. If VR-Forces is not running, start it now:
 - a. On the Start menu, choose **MAK Technologies > VR-Forces 5.1.1 GUI + Simulation Engine (64-bit)**. The Simulation Connections Configuration dialog box opens (Figure 1 on page 6).
 - b. In the Simulation Connections Configuration dialog box, select the DIS (7) localhost connection configuration.
 - c. Click Launch. VR-Forces starts up and the Scenario Startup dialog box opens (Figure 3 on page 8).
 - d. Click Close. (The Scenario Startup dialog box lets you quickly create a new scenario with default settings but, for this tutorial, we want to show the process of creating a new scenario from the File menu.)
2. Choose **File > New Scenario**. The Initial Scenario Information dialog box opens.
3. Select *Ala Moana.mtf*.
4. Click Open. The New Scenario dialog box opens.
5. In the Scenario Name box, type a name for the scenario, such as myFirstExperience. (Giving a scenario a name is optional, but is good practice.) Notice that the terrain you selected is listed in the Simulation Terrain box and the Simulation Model Set is EntityLevel, which is what we want.
6. Click OK. A new scenario is created and the Ala Moana terrain loads (Figure 15).

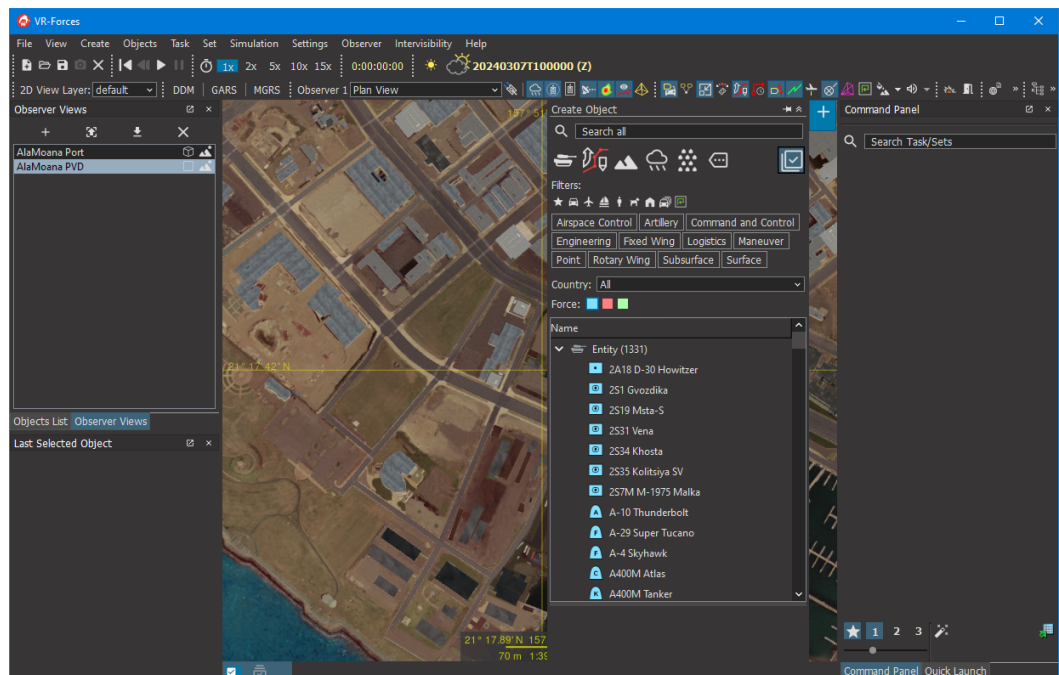
Figure 15. New scenario on Ala Moana terrain (2D View)



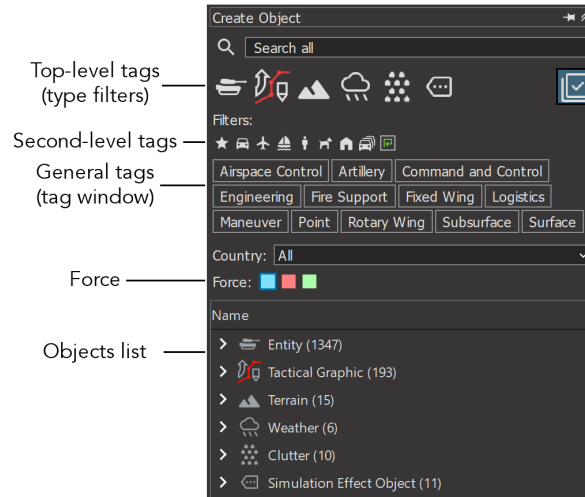
2.1.2 Create Some Entities

1. On the right side of the VR-Forces window, click the Create Object tab (+). The Create Object Palette opens (Figure 16).

Figure 16. Create Object Palette



2. On the Force line, click the blue (Friendly) button (Figure 17).

Figure 17. Create Object Palette filters

3. On the second-level tag line, click the Ground Vehicle button (🚗).
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 18). An icon appears at that location.

i When you place the first simulation object in a scenario, there can be a delay of 5 to 10 seconds before the icon displays. The system is loading the data. You may see an indicator at the position you clicked or at the bottom right, which tell you that VR-Forces is creating the object.

Figure 18. Entities placed on terrain



6. Right-click to exit create entity mode.
7. Open the Create Object Palette.
8. If the Ground Vehicle button is not selected, click the Ground Vehicle button.
9. On the Force line, click the red button (Opposing Force).
10. In the list of simulation objects, select GAZ-66 Utility Vehicle.
11. Click on the map across town from the M2 1, as shown in Figure 18.
12. Right-click to exit create entity mode.
13. Click the Truck 1. The outline changes to white and the label text changes to green, 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 then click OK. The heading changes to 135 degrees from north.

2.1.3 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 Create Object tab (+). The Create Object Palette opens.
2. In the type filters, click Tactical Graphics (TG).
3. On the Force line, click the Friendly button.

4. 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 small triangle at the end of the cursor arrow).
5. Click on the map in front of the Bradley (callout 1 in Figure 19). A vertex appears.

Figure 19. Creating a route



6. Move the cursor toward the location of callout 2 in Figure 19. A line extends from the first vertex to show where you are drawing the route.
7. Add additional route vertices by clicking the locations of callouts 2, 3, and 4 in the figure. Note that each segment shows the heading and length.
8. For the end point, double-click at location 5.
9. The route is created with the default name Route 1 (Figure 20).

2.2.1 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.

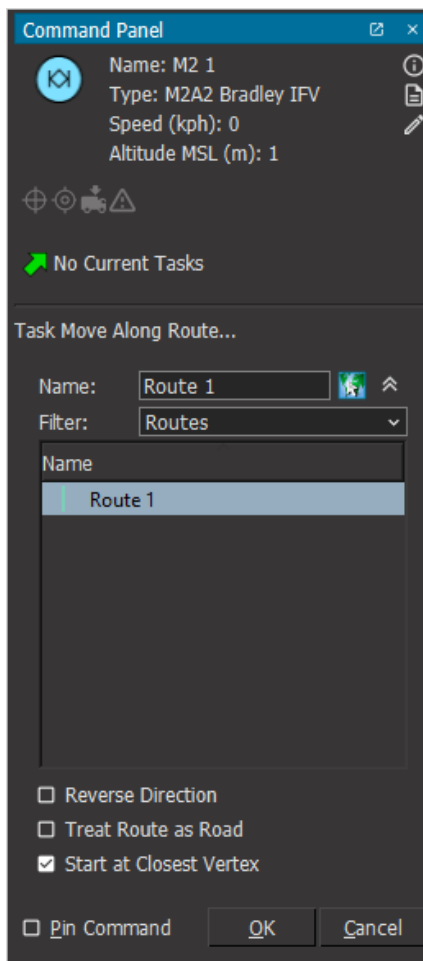
 A few tasks, mostly for sending messages, can execute without stopping the current task.

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 by assigning it an independent task using the Command Panel.

1. Select the Bradley (M2 1).
2. In the Command Panel, under **Movement**, select **Move Along Route**. The Command Panel updates to show the Move Along Route task parameters (Figure 21).

Figure 21. Move Along Route task parameters



3. Click the down arrows to expand the pick list.
4. Select Route 1.
5. Click OK.
6. Choose **File > Save Scenario**.

At this point nothing happens because the scenario is not running.

2.2.2 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-66 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-66 does not fire at the Bradley. In order to fire, an entity needs a weapon system. An entity with a weapon system fires at any entity that it considers hostile and for which its weapon system is appropriate. The GAZ-66 does not

have a weapon system. We picked this entity because we want the Bradley to complete its tasks without risking that it might be destroyed. As you experiment with VR-Forces, feel free to use armed Opposing Force entities that have weapon systems.

2.2.3 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 to Scenario Start**, or click the Rewind Scenario to the Beginning button (◀) on the Simulation Toolbar. The simulation returns to its saved state.

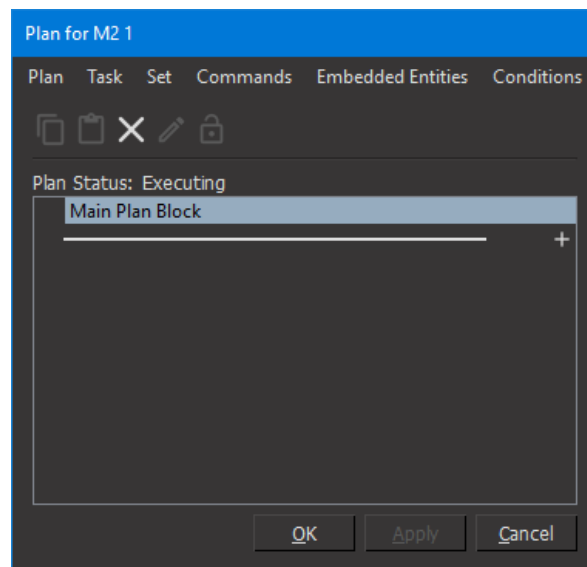
2.3. Write a Plan

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. To highlight the difference between independent tasks and plans, we will give it a second task to execute when the first one is complete.

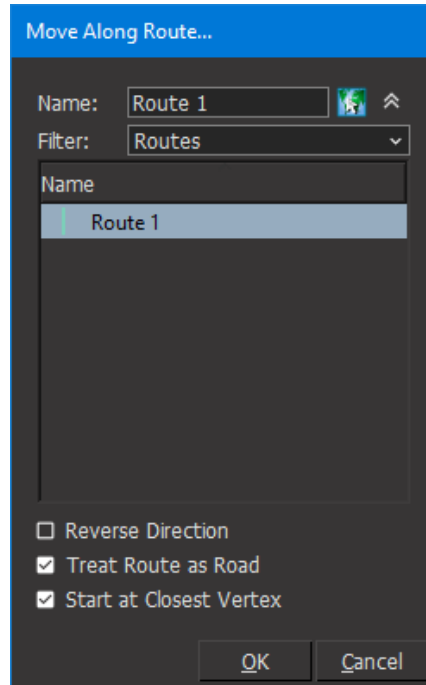
1. Select M2 1.
2. Choose **Objects > Plan**. The Plan dialog box opens (Figure 26 on page 35).

Figure 22. Plan dialog box



3. In the plan window, choose **Task > Movement > Move Along Route**. The Move Along Route dialog box opens (Figure 23).

Note that the Name box is highlighted to show that it is active. This indicates that your selection will populate the field.

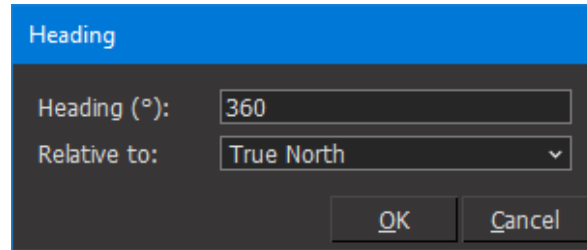
Figure 23. Move Along Route dialog box

4. In the window, select Route 1.
5. Select the Treat Route as Road check box.

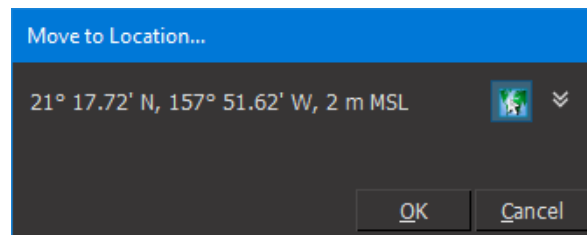
i VR-Forces has a special form of movement called road driving. It is designed to improve vehicle movement when vehicles move along vector road networks in a terrain. VR-Forces can apply this same movement mode to moving along routes. When you run the scenario in a minute or two, note the differences between how the Bradley 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 Bradley 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.

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

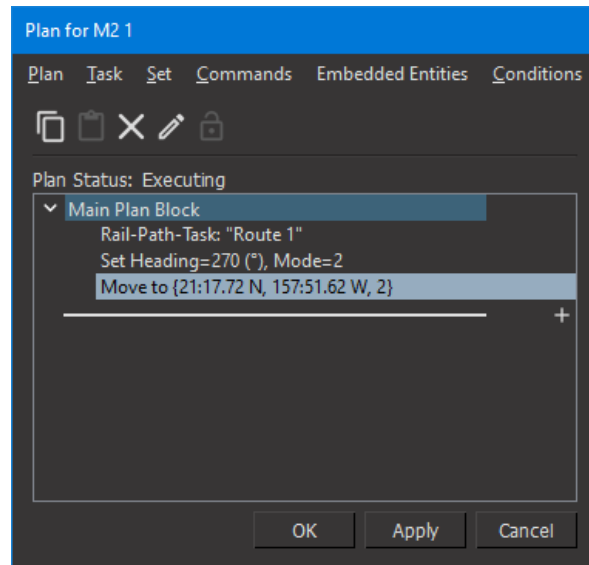
Figure 24. Heading dialog box

8. Delete any numbers you find in the Heading text box, then type 270.
9. In the Relative To list, select Current Heading. (This essentially turns the Bradley 90 degrees counterclockwise.)
10. Click OK. The set data request is added to the plan.
11. In the Plan window, click **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). You might need to drag the Move to Location or Plan dialog box out of the way. The coordinates appear in the dialog box.

Figure 25. Move to Location dialog box

13. Click OK. The task is added to the plan. The completed plan looks like Figure 26.

Figure 26. Plan dialog box



14. In the Plan window, click OK.
15. Save the scenario.
16. 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.

2.4. 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 are exactly the same. In this section we create the same scenario we created 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 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 (). (If you choose New Scenario while a scenario is open, VR-Forces automatically closes the open scenario.) 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 and click OK. The window displays the Ala Moana terrain database.
6. 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.
7. Move the cursor to the location on the road where you created the M2A2 in the first scenario.
8. Hold down the **Shift** key and left-click. The observer teleports to this location.
9. 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, similar to Figure 27.

Figure 27. Observer in 3D view of Ala Moana



10. Press the **E** key to drop the observer down to a few meters above the road. The view should look like Figure 28. If necessary, use the keyboard and mouse to adjust the view.

Figure 28. Observer in 3D view of Ala Moana road



2.4.1 Create an Entity

1. Click the Create Object tab.
2. On the Force line, click the Blue button.
3. Click the Ground Vehicle button.
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 appears at that location (Figure 29).
6. Right-click to exit create entity mode.

Figure 29. 3D view of M2 1



i Notice that the default orientation for the Bradley is due north, while the road leads north-northeast. Later, when you run the scenario, the vehicle aligns itself to follow the route you will create as it did in the previous scenario, but you can also edit the heading to align it with the road if you want.

7. Move the observer so that you see the intersection where you created the GAZ-66 in the 2D version of the scenario (Figure 30). (Hint: Use the **Q** key to raise the observer and the right mouse button to change orientation.)

Figure 30. M2A2



8. On the Create Object Palette, change the force to Opposing (red button).
9. Select the GAZ-66 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 Bradley will be driving.
12. Click to place the entity (Figure 31).

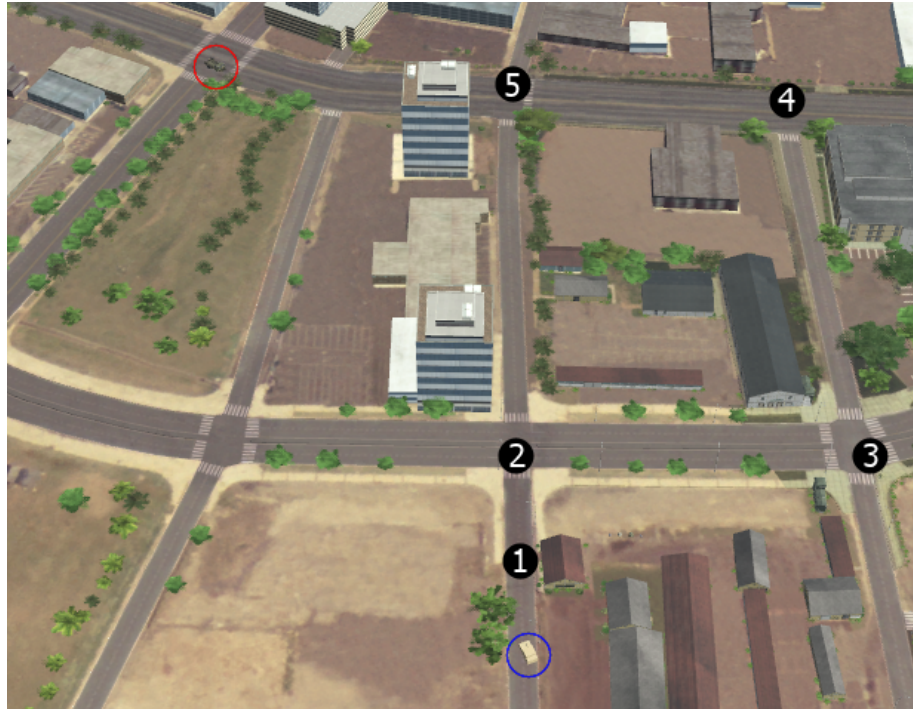
Figure 31. M2A2 and GAZ-66



2.4.2 Create a Control Object

In the previous scenario, you created a route from the Create Object Palette. Here, we see another way to create objects.

1. Choose **Create > Route**.
2. Click on the map in front of the Bradley (callout 1).

Figure 32. Vertex locations

3. Add additional route vertices by clicking the locations of callouts 2, 3, and 4 in the figure.
4. For the end point, double-click at location 5. The route is created.
5. 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 GUI (but stay in Stealth observer mode). Run the scenario and observe the entity behavior.

In this chapter, you learned how to create a simple scenario. To learn how to create a more advanced scenario, go to "Chapter 3. Create an Advanced-Beginner Entity-Level Scenario" on page 43.



3. Create an Advanced-Beginner Entity-Level Scenario

This chapter teaches you how to create a more advanced scenario than the one you created in Chapter 2. It assumes that you have completed the experiences in the previous chapters. Therefore it does not provide as much direction for tasks like starting VR-Forces or creating a new scenario.

In this scenario, a crowd of people is wandering in a park. Terrorists embark on a vehicle and drive to a location near the park. They disembark and find locations from which they can fire on the crowd. When people die, the members of the crowd automatically flee. Several police officers stationed in the park run towards the terrorists and return fire. A SWAT team embarks on a helicopter and flies to a field near the park. They disembark and advance on the terrorists.

In this scenario you will learn how to:

- Create a crowd.
- Create a unit.
- Write a plan that uses triggers.
- Embark entities on a vehicle.
- Create a tactical graphic whose points are elevated.

A version of this scenario is included with VR-Forces. It is `./userData/scenarios/Sample/FirstExperience/first_experience_advanced.scnx`. A set of video tutorials that match the text in this chapter are available at www.mak.com/mak-one/support/help/tutorials.

3.1. Create the Scenario

Start VR-Forces as you have done in previous chapters. Create a new scenario that uses the Ala Moana terrain. Figure 33 shows the default view of the terrain and the primary location for the scenario.

Figure 33. Initial terrain view



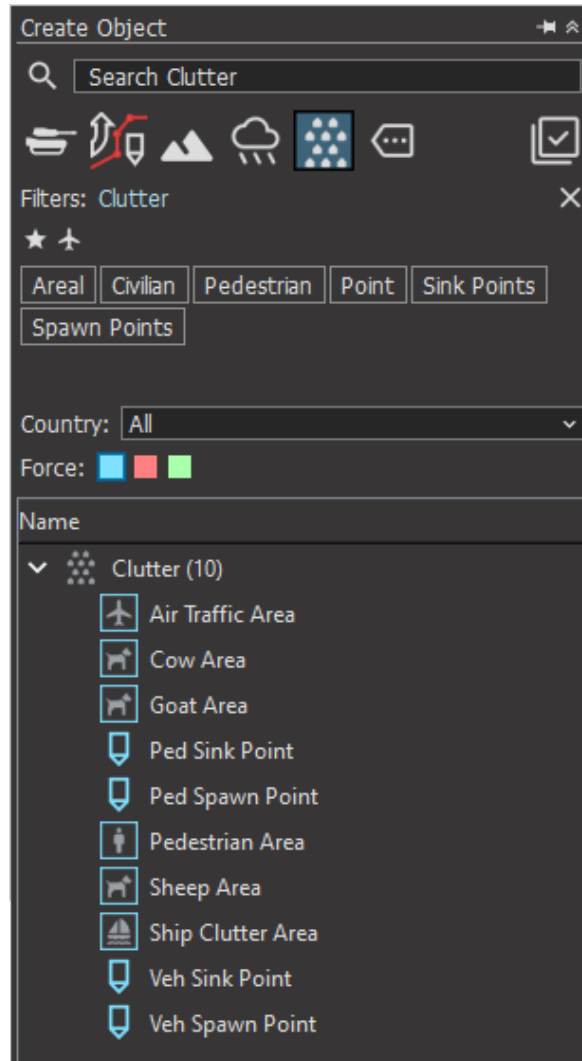
3.2. Create the Crowd

VR-Forces has two ways to create crowds: you can create either a crowd unit or a Pedestrian Area from the Create Object Palette. In both cases, VR-Forces creates a mixture of civilian entities that automatically start wandering. The crowd in a Pedestrian Area is constrained to the area. Crowd units are not constrained. We want to simulate people wandering in a park, so we will use the Pedestrian Area.

► **To create the crowd:**

1. Click the Create Object Palette.
2. Select the Clutter filter (🌿). Clutter objects allow you to easily create entities in the background to simulate "pattern of life".
3. Make sure the Force is set to Friendly (blue) (Figure 34).

Figure 34. Clutter simulation effect objects



4. In the list of simulation effect objects, click Pedestrian Area. The cursor changes to draw mode.
5. Click on one corner of the grassy area identified by the white circle in Figure 33 on the previous page.
6. Click two additional corners of the area to start to create a rectangular areal graphic.
7. Double-click the fourth corner to finish the area. It initially looks like the left screen capture in Figure 35. Then the area fills with entities and looks like the right screen capture.

Figure 35. Pedestrian area



8. Press **E** several times or scroll the mouse wheel to zoom in on the area. You will see that the entities are distributed throughout the area along sidewalks.
9. Open the Create Object Palette.
10. Click the Entity filter (🔍).
11. Click the Human tag button (👤).
12. In the Tags window, click Emergency.
13. In the list, select Police Officer.
14. Click three times within the area to place three police officers. Since you are zoomed in, you can see where there are spaces to place them. (Remember, right-click to exit create mode.)
15. Save the scenario.

3.3. Create the Terrorists

The terrorists start out in a dockyard area. We will create three terrorists and aggregate them into a unit. This allows us to assign them some tasks that are available to units. They embark on an SUV and drive over to the park where the pedestrians are.

When an entity is embarked on another entity, it moves with the parent entity. The SUV is configured with embarkation slots and embarkation ingress and egress points. This allows entities to use the Embark task to walk up to it and embark. (Most civilian vehicles provided with VR-Forces do not support this type of embarkation. You can add slots and ingress and egress points to any vehicle using the Simulation Object Editor.) Some military vehicles, such as the M2A2 Bradley, support embarkation.

i After you finish creating the scenario and start to run it, you might find that some insurgents walk through the car to reach their embarkation ingress point. If that happens, you can edit the scenario and move them to a location that provides a more direct route to the door that they want to enter.

► To create the terrorists:

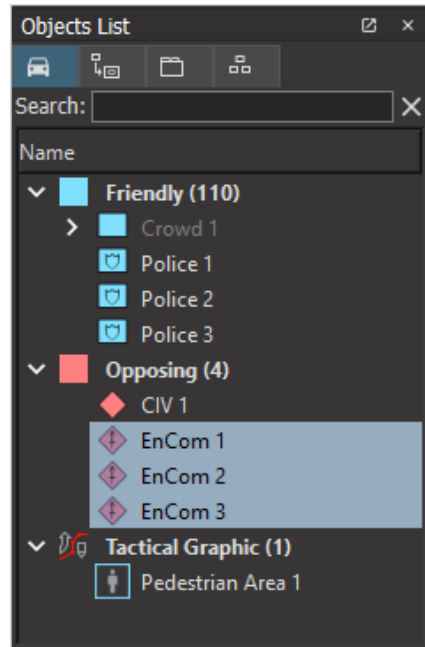
1. Drag the terrain a bit to the southeast so that you can see the dockyard area that is northwest of the pedestrian area (Figure 36).

Figure 36. Dockyard



2. Zoom in on this location.
3. On the Create Object Palette, set the force to Opposing (red).
4. Select the Ground Vehicle button (🚗).
5. Select the Civilian tag.
6. Select the Off-Road SUV vehicle.
7. Click someplace near the road to place the vehicle.
8. On the Create Object Palette, select the Human button (👤). The palette remembers the last set of tags you used, so it reverts to Human > Emergency.
9. On the Filters line, click the Human tag to clear the Emergency tag.
10. In the list of humans, select Insurgent.
11. Click three times near the SUV to place three terrorists.
12. In the Objects List Panel, select the three terrorists (Figure 37).

Figure 37. Objects List Panel



13. Choose **Objects > Unit > Aggregate As**. The Aggregate As dialog box opens.
14. In the aggregate type list, select Infantry Squad (USA USMC) - No Leader. (Although we are not creating an infantry squad, it is the closest preconfigured unit type available for humans. You can create other unit types using the Simulation Object Editor.)
15. Click OK. In the Objects List Panel, a new unit called Inf SQD 1 is created. The terrorists are now subordinate to the squad.
16. Save the scenario.

3.4. Create the SWAT Team

The SWAT team consists of five soldiers. They embark on a helicopter and fly to the location of the terrorist attack.

► **To create the SWAT team:**

1. Zoom out a bit and drag the terrain to the southwest until you can see the area circled in Figure 38.

Figure 38. SWAT team



2. On the Create Object Palette, set the Force to Friendly.
3. Filter the palette for Human > Military.
4. Select US Army M16.
5. Create five soldiers in the area identified in Figure 38. You may want to zoom in on the location to more easily place them.
6. Filter the palette for Aircraft > Rotary Wing.
7. Select the CH-47 Chinook.
8. Place the Chinook near the soldiers.
9. In the Objects List Panel, select the five soldiers.
10. Aggregate them into an Infantry Squad (USA USMC) - No Leader unit the same way you created a unit for the terrorists.
11. In the Objects List panel, select the unit name.
12. Choose **Objects > Edit**. The Edit dialog opens on the right.
13. Change the name to SWAT 1.
14. Click Update.
15. Save the scenario.

3.5. Add Tactical Graphics

When the terrorists attack, the crowd calls for help. The SWAT team embarks on the helicopter and it flies to the park. This scenario needs three tactical graphics: a firing position for the terrorists, a route for the helicopter to follow, and a waypoint specifying where it should land.

► To create the waypoints:

1. On the left, click the Observer Views tab. The panel shows the two observer views that are associated with this terrain.
2. Click AlaMoana PVD. This returns the view of the terrain to the original view and shows the pedestrian area with all its entities. The labels on the entities obscure the location where we want to put the waypoint.
3. At the bottom of the window, there is a set of check boxes for overlays. Click the Humans check box to clear it. (You might need to click it more than once.) VR-Forces hides all the humans in the scenario, including the crowd and the three police officers in the pedestrian area and their labels. You can now see only the pedestrian area (Figure 39).

Figure 39. Overlay bar and hidden simulation objects



4. Create the first waypoint at the corner just to the northeast of the pedestrian area (callout 1). (Choose **Create > Waypoint**. Then click on the terrain. Right-click to exit creation mode.)
5. Create the second waypoint somewhere in the area to the southeast of the pedestrian area (callout 2).

In VR-Forces, rotary-wing aircraft have some ability to look ahead and avoid terrain. In theory, we could simply tell the helicopter to move to the waypoint and it would take off, fly to the waypoint, and land. However, this terrain has some tall buildings and we do not want to take the chance that it might fly too close to them. Therefore, we will create a route for it to follow.

► To create the route:

1. Select the Human overlay check box to display the entities.
2. Zoom out until you can see the terrain between the helicopter and the park (Figure 40).

Figure 40. Terrain between helicopter and park



3. Choose **Create > Route**.
4. Move the cursor to the intersection just south of the helicopter and a bit to the right (pointed to by the start arrow in Figure 40). (There is a very tall building at the intersection and we want to be sure the helicopter avoids it when it takes off.)
5. Hold down the **Alt** key and move the mouse wheel forward. This sets the altitude of the first point of the route. The altitude is displayed next to the cursor. Set it to about 265 feet (or approximately 80 meters).
6. Click to place the starting point of the route.
7. There is a road that runs more or less between the helicopter and the park. Click along the road to create the route. Use the least number of points you can to stay along the route. This will make for a smoother flight. Three intermediate points should be enough.
8. Double-click at the end point of the route (Figure 41).

Figure 41. Helicopter route



9. Save the scenario.

3.6. Write Plans

You have now created all of the simulation objects needed for this scenario. Next, you must write plans for the entities in the scenario.

3.6.1 Write the Plans for the Terrorists

The three terrorists have individual plans and a unit plan. The individual plans are the same plan. The purpose of this plan is to embark them on the SUV. We could give the embarkation task to the unit, rather than the individual members, but the embarkation behavior looks better in Stealth observer mode when they embark individually. As you work with VR-Forces, there will be times when 3D visuals do not matter for your simulation goals and times when they do. You may have to adjust the tasks you assign and how you configure entities accordingly.

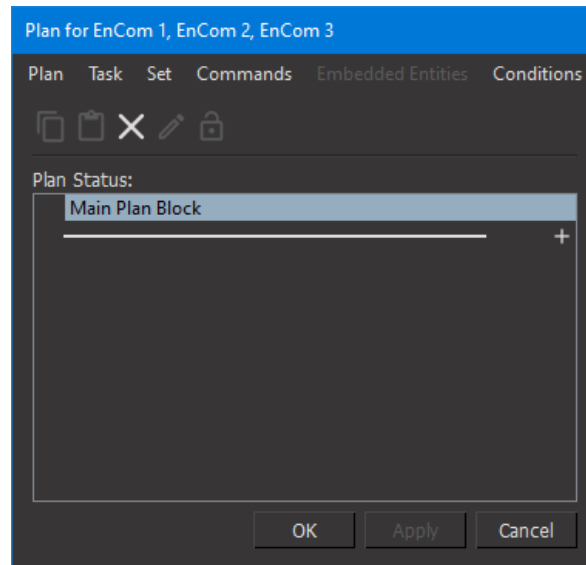
In creating these plans, we take advantage of a VR-Forces feature that allows you to create plans for multiple simulation objects at the same time.

The unit plan goes into effect when the terrorists disembark from their SUV. It tells them to find locations where they can fire on the pedestrians in the park.

► **To create the individual plans for the terrorists:**

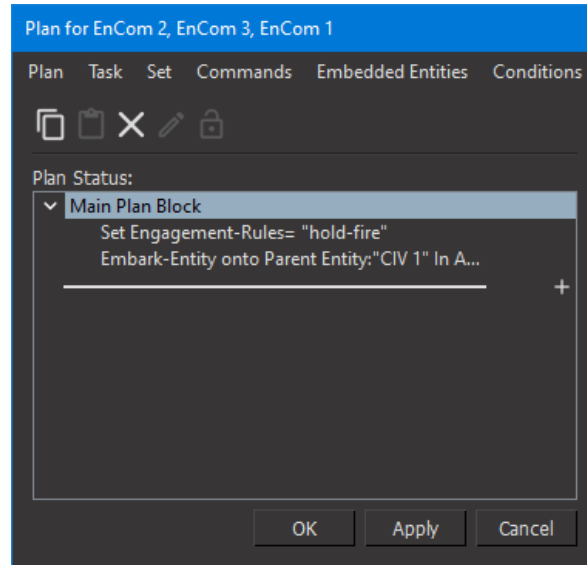
1. In the Objects List Panel or on the map, select the three individual terrorist entities.
2. Choose **Objects > Plan**. A Plan dialog box opens that allows you to create identical plans for all three entities at the same time (Figure 42). (As in many other programs, there are many ways to do common tasks, such as opening the Plan dialog box. As we write the plans for this scenario, we will introduce you to them.)

Figure 42. Plan dialog box



3. Choose **Set > Engagement > Rules of Engagement**. The Rules Of Engagement dialog box opens.
4. In the list, select Hold Fire. We do not want the terrorists to fire at anything until they have taken up position near the park.
5. Click OK.
6. Choose **Task > Embarkation > Embark**. The Embark dialog box opens.
7. In the VR-Forces window, select the SUV, or in the Embark dialog box's list window, select CIV 1.
8. Click OK. The individual plans for the terrorists are finished (Figure 43).

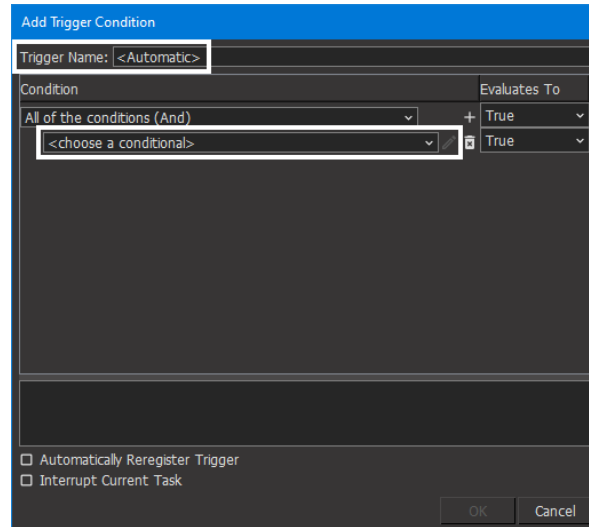
Figure 43. Terrorist individual plan



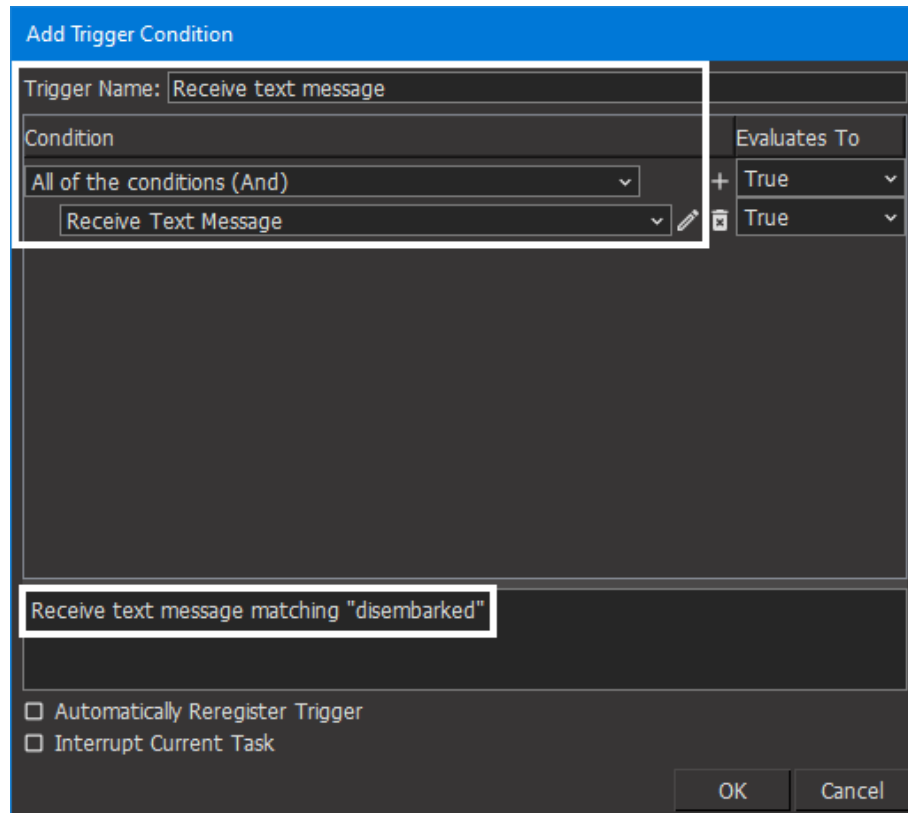
9. In the Plan window, click OK.
10. Save the scenario. (We will not tell you to save the scenario after every plan is written, but it is a good idea to save frequently.)

► **To write the plan for the terrorist unit (Inf SQD 1):**

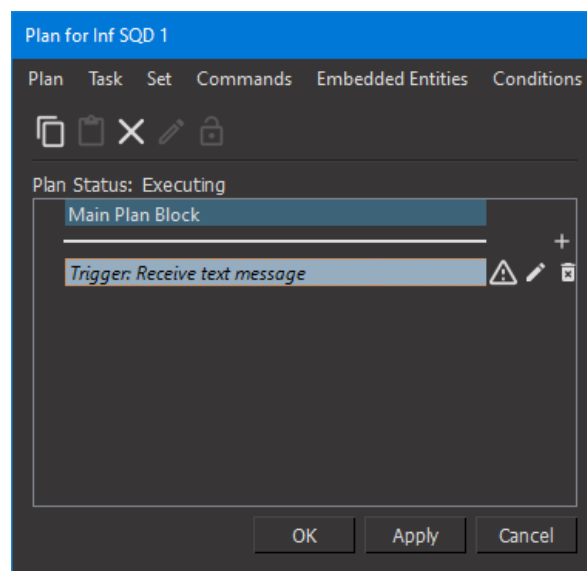
1. In the Objects List Panel, select Inf SQD 1.
2. On the Last Selected Object Panel, click the Has Plan button (📄). The Plan dialog box opens (Figure 42). (The Last Selected Object Panel is one of the panels on the left side of the VR-Forces window.)
3. Choose **Conditions > Add Trigger**. The Add Trigger Condition dialog box opens (Figure 44). A trigger has a condition that VR-Forces checks periodically. When the condition has been met, the simulation object executes the commands in the body of the trigger.

Figure 44. Add Trigger Condition dialog box

4. In the Trigger Name box, delete the default value and type `Receive text` message. Providing a name is optional. However, giving triggers short, descriptive names makes them easier to use. The default naming convention is a potentially lengthy text string with the syntax of the condition.
5. In the Condition window, in the list with the text `<choose a conditional>`, select `Receive Text Message`. The `Receive Text Message` dialog box opens.
6. In the Message Text box, type `disembarked`.
7. Click OK. The condition is finished. Notice that the syntax of the condition is printed below the Condition window (Figure 45).

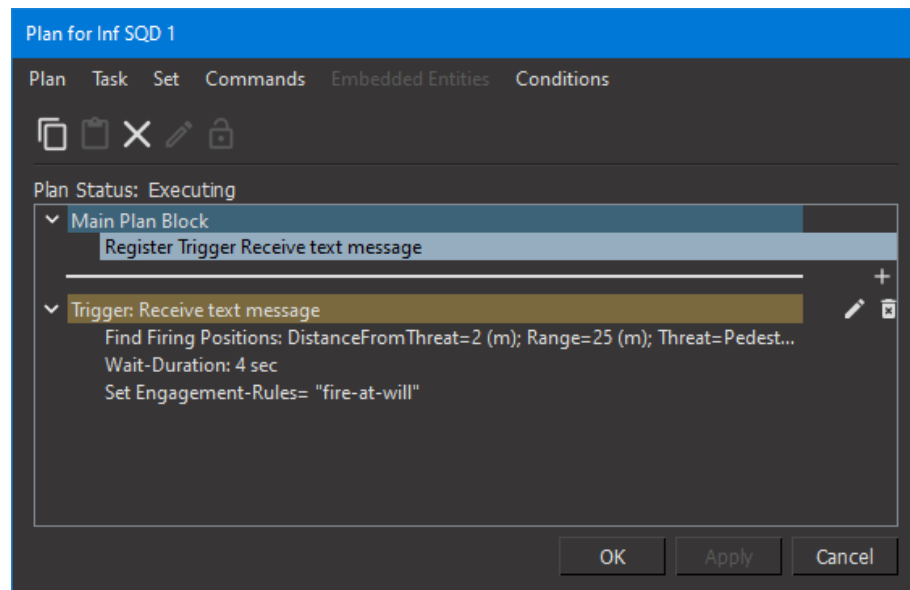
Figure 45. Receive text message condition completed

8. Click OK to close the Add Trigger Condition dialog box. The Plan shows the trigger's name below the Main Plan Block (Figure 46). (It displays in italics and shows a warning because the trigger has not been registered. We will do that after specifying the body of the trigger.)

Figure 46. Plan window with Trigger pane

9. Select the text Trigger: Receive text message.
10. Choose **Task > Movement > Fire Team Occupy Fire Position**. The Fire Team Occupy Fire Position dialog box opens.
11. For the Fire Position, specify the waypoint northeast of the pedestrian area (callout 1 in Figure 39 on page 50).
12. Set the Range to 25. We want the terrorists to be fairly close to the targets. (Do not change the Threat Radius or Distance From Threat.)
13. In the Threat box, select any entity named Pedest. The pedestrians are not really threats. However, the terrorists need an entity to use as the focus for establishing their firing positions.
14. Click OK.
15. Choose **Task > Wait > Wait Duration**. The Wait Duration dialog box opens.
16. Set the duration to 4 seconds.
17. Click OK.
18. Choose **Set > Engagement > Rules of Engagement**. The Rules Of Engagement dialog box opens.
19. In the list, select Fire at Will.
20. Click OK.
21. Select the Main Plan Block.
22. Choose **Conditions > Register Trigger**. The Register Trigger dialog box opens.
23. In the Trigger list, select Receive text message. By registering the trigger, you have included it in the plan.
24. Click OK. The plan is complete. It should look like Figure 47.

Figure 47. Terrorist unit plan



25. Click OK to close the Plan dialog box.

3.6.2 Write the Plan for the SUV

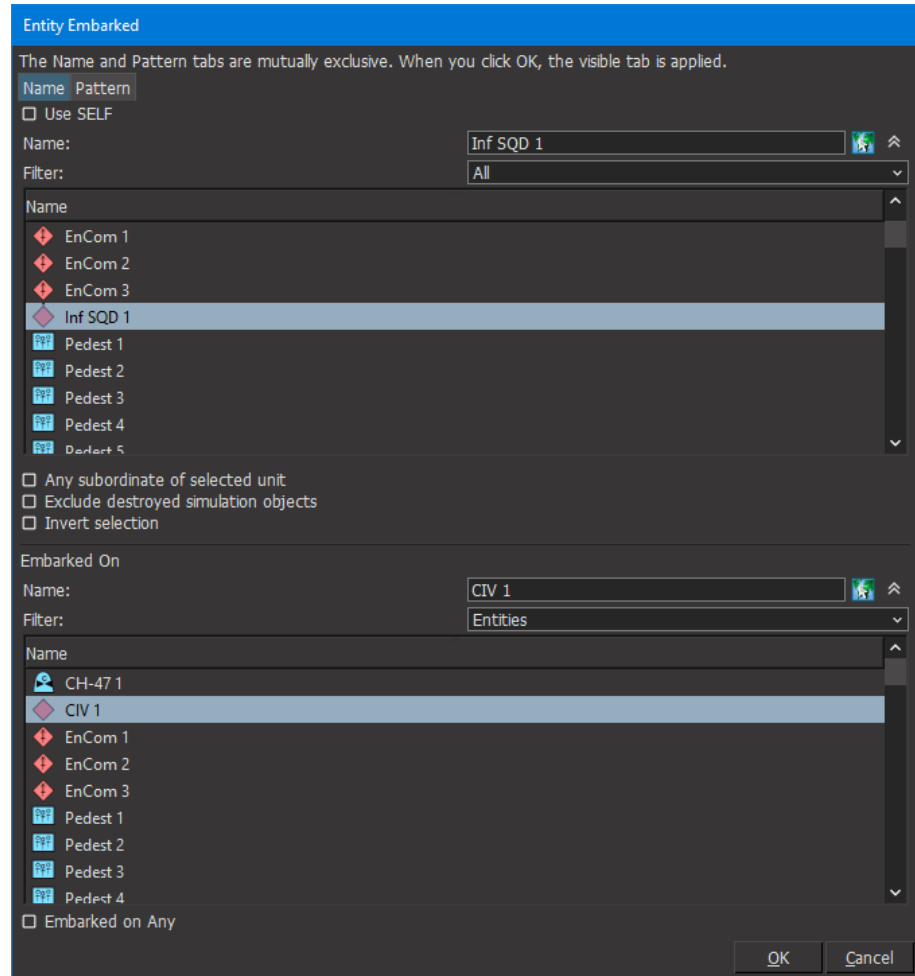
The SUV needs to drive to the drop-off point for the terrorists. When it gets there, they need to disembark. There are a couple of different ways to make that happen. We are going to have the SUV tell them to disembark and then tell the terrorist unit that it is disembarked.

There is a timing issue for the SUV. It cannot start driving until the terrorists are embarked on it, so we need to put its tasks inside a trigger. This trigger checks for when the terrorists are embarked. Then the SUV starts executing its tasks.

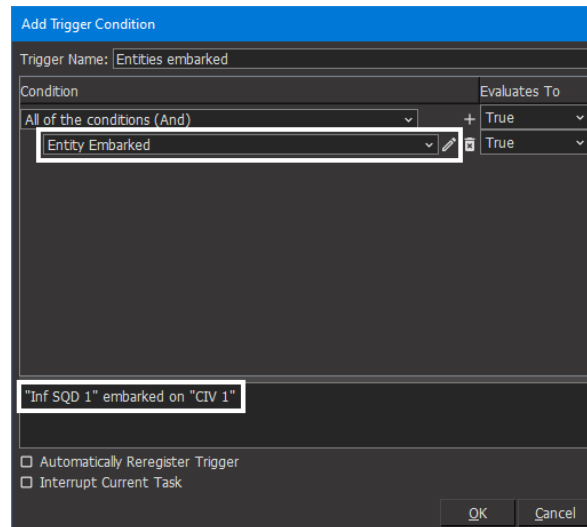
A second timing issue might also occur. Sometimes the SUV might think that the insurgents are embarked before the last one is in the SUV. It might then drive off, leaving that insurgent standing.

► **To write the plan for the SUV:**

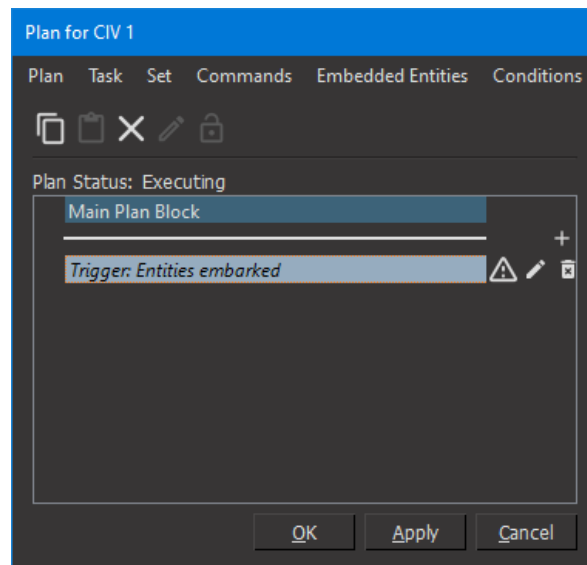
1. Select the SUV (CIV 1).
2. Press **P**. The Plan dialog box opens (Figure 42 on page 53).
3. Choose **Conditions > Add Trigger**. The Add Trigger Condition dialog box opens (Figure 44 on page 55).
4. In the Trigger Name box, delete the default text and type `Entities embarked`.
5. In the Condition window, expand the list that reads `<choose a conditional>`.
6. In the list, select Entity Embarked. The Entity Embarked dialog box opens (Figure 48).

Figure 48. Entity Embarked dialog box

7. In the top window, expand the list and then select Inf SQD 1 (the terrorist unit).
8. In the Embarked On window, select CIV 1.
9. Click OK. The condition is added to the Add Trigger Condition window (Figure 49).

Figure 49. Completed condition

10. Click OK. The condition is complete. The Plan window displays the unregistered trigger (Figure 50).

Figure 50. New trigger

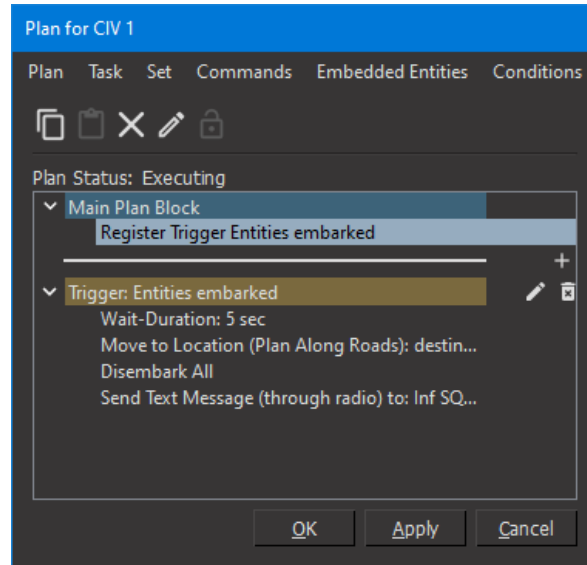
11. In the VR-Forces window, zoom in on the area just to the north and west of the park, as shown in Figure 51.

Figure 51. SUV destination



12. In the Plan dialog box, select the line trigger below the Main Plan Block.
13. Optionally, choose **Task > Wait > Wait Duration**. Set the wait time to 5 seconds. This handles the timing issue mentioned in the introduction to this section. Click OK.
14. Choose **Task > Movement > Move to Location (Plan Along Roads)**. The Move to Location (Plan Along Roads) dialog box opens.
15. Click on the map at the location indicated by the arrow in Figure 51. (We do not have to specify the whole route that the SUV needs to follow because this terrain has road data. The SUV can plan its route based on its starting and ending points.)
16. Click OK. The task is added to the trigger body.
17. Choose **Task > Embarkation > Disembark All**. The Disembark All task is added to the trigger body. This task tells everyone embarked on a vehicle to disembark.
18. Choose **Task > Radio > Send Text Message**. The Send Text dialog box opens.
19. In the list, select Inf SQD 1.
20. In the Message Text box, type disembarked.
21. Click OK.
22. In the main body of the Plan dialog box, select the Main Plan Block.
23. Choose **Conditions > Register Trigger**. The Register Trigger dialog box opens.
24. In the list, select Entities embarked.
25. Click OK. The plan is complete. It should look like Figure 52.

Figure 52. Final plan for SUV



26. Click OK.

3.6.3 Write the Plan for the Crowd

When entities in the crowd are killed by the terrorists, the crowd sends a call for help. Then it sends a Flee From Entities task to all members of the crowd. The Flee From Entities task tells the entities to run away from the threat.

Since this activity does not start until someone is killed, we need to use a trigger. Since you have already learned how to create a trigger, we will streamline the instructions a bit. We also show you how to create a plan using the Command Panel.

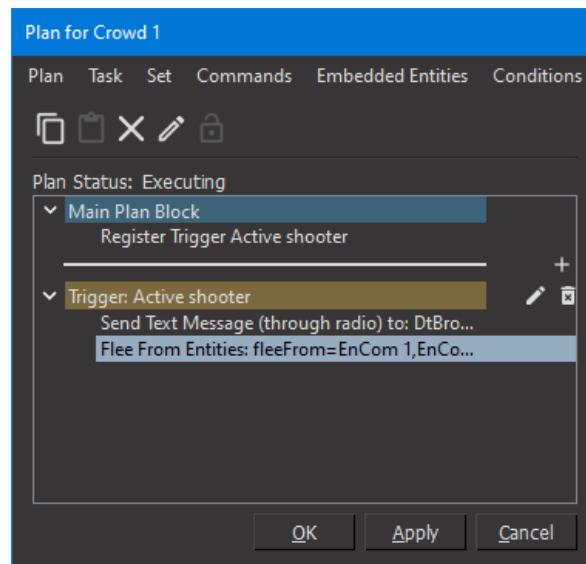
► To write the plan for the crowd:

1. In the Objects List Panel, select the Crowd object.
2. In the Command Panel, click the Has Plan button (📄).
3. Choose **Conditions > Register Trigger**. The Register Trigger dialog box opens. (Using Register Trigger instead of Add Trigger to create a new trigger automatically registers the trigger when it is complete. This is a shortcut for adding the triggers to a plan.)
4. In the Trigger list, select New. (It is actually the only choice at the moment.)
5. Click OK. The Add Trigger Condition dialog box opens.
6. In the Add Trigger Condition dialog box, give the trigger the name **Active Shooter**.
7. In the choose a conditional list, select Entity Destroyed. The Entity Destroyed dialog box opens.
8. At the top of the Name tab, select Use SELF.

9. At the bottom of the dialog box, select Any Subordinate of Selected Unit. These two choices mean that the condition will be true if any member of the crowd (SELF = the simulation object for which the plan is being written) is destroyed.
10. Click OK. The condition is complete.
11. Click OK. The Plan dialog box displays the trigger.
12. Select the trigger.
13. In the Command Panel, select 2. This gives you access to more tasks.
14. Under **Radio**, choose **Send Text Message**. The Command Panel updates to show the Send Text parameters.
15. Select the Broadcast check box. This means the message is sent to everyone in Blue Force.
16. In the Message Text box, enter **Active Shooter**.
17. Click OK. The task is added to the trigger body.
18. In the Command Panel, select 3 to access yet more tasks.
19. Under **Movement**, choose **Flee From Entities**.
20. You can see that the Flee From list is active because of the white rectangle. Click EnCom 1 in the Objects List. It is added to the Flee From list. Repeat for EnCom 2 and EnCom 3.

We want to select all of the terrorists because entities stop fleeing when a threat is killed. If we select only one threat and it is killed before the others, the crowd members stop fleeing but are still vulnerable to the other terrorists.
21. Change the Radius to 300.
22. Click OK. The plan is complete. It should look like Figure 53.

Figure 53. Crowd plan



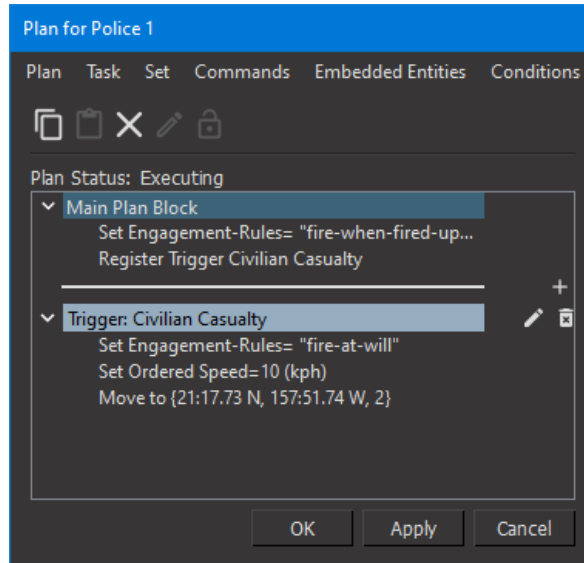
23. Click OK.

3.6.4 Write the Plans for the Police

The police have simple plans. When the terrorists start firing, they run to the corner of the park to return fire. As with the previous plans, this requires a trigger. The plan for each officer is very similar. The only difference is where they each run. We will create a plan for one officer, then copy it to the other officers and change the location for the movement task.

► **To write the plans for the police officers:**

1. Select Police 1.
2. Open the Plan dialog box.
3. Choose **Set > Engagement > Rules of Engagement**. The Rules Of Engagement dialog box opens.
4. In the list, select Fire When Fired Upon. We select this rule of engagement in case the terrorists fire at the police.
5. Create a new trigger.
6. Give the trigger whatever name you want, or leave it set to automatically create a default name.
7. Select the condition Entity Destroyed.
8. In the Entity Destroyed dialog box, select the Crowd entity.
9. At the bottom of the dialog box, select Any Subordinate of Selected Unit.
10. Click OK.
11. In the Add Trigger Condition dialog box, click OK.
12. In the body of the trigger, set the rules of engagement to Fire At Will.
13. Choose **Set > Action > Ordered Speed**. The Ordered Speed dialog box opens.
14. Type 10. We want the police to run to their destination.
15. Click OK.
16. Choose **Task > Movement > Move to Location**. The Move to Location dialog box opens.
17. Click on the map in the northwest corner of the park area, near where the terrorists will be. (You might want to zoom in to see the corner more clearly.)
18. Click OK.
19. If you created the trigger by selecting Register Trigger, then the trigger is ready to be activated in the plan and you can proceed to the next step.
If you created the trigger by selecting Add Trigger, you must register it:
 - a. Select the Set Engagement Rules line in the plan window.
 - b. Choose **Conditions > Register Trigger**. The Register Trigger dialog box opens.
 - c. Select the trigger that you created.
 - d. Click OK.
20. The plan is complete. It should look like Figure 54.

Figure 54. Plan for Police 1

21. In the Plan window, select the line above the plan block that reads Plan.
22. Click the Copy button (📄).
23. Click OK to close the plan.
24. Select Police 2.
25. Open the Plan dialog box for Police 2.
26. Click the Paste button (📄). The plan from Police 1 is pasted into Police 2's plan.
27. Click the arrow to expand the trigger.
28. In the trigger body, double-click the Move to task. The Move To Location dialog box opens.
29. Click on the map on the location where you want Police 2 to run.
30. Click OK.
31. Click OK to close the Plan dialog box.
32. Select Police 3.
33. Paste Police 1's plan into Police 3's Plan dialog box and change the location of the Move To Location task as you did with Police 2. The plans for the police are finished.
34. Click OK to close the Plan dialog box.

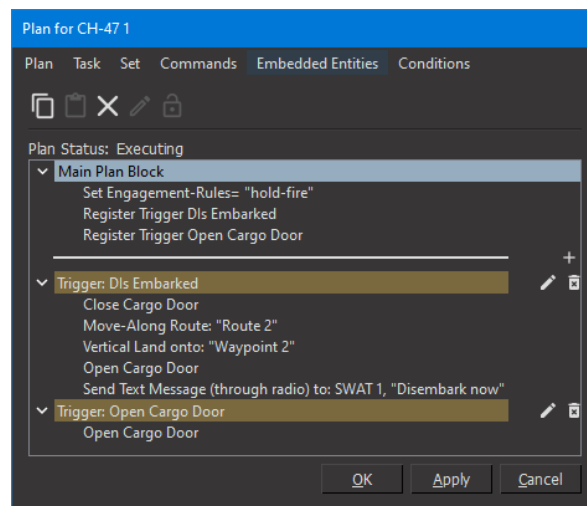
3.6.5 Write the Plan for the Helicopter

The helicopter's plan has two triggers. The first one tells it when to open its cargo door. The second tells it what to do after the SWAT team embarks: (1) close the cargo door, (2) follow the route to the park, (3), land at the waypoint, (4) open the cargo door, and (5) tell the SWAT team to disembark.

► **To write the plan for the helicopter:**

1. Select the helicopter.
2. Open the Plan dialog box for the helicopter.
3. Set the Rules of Engagement to Hold Fire. We do not want the helicopter or anyone on it to fire at the terrorists until the helicopter lands and the SWAT team disembarks.
4. Create a new trigger and call it **Open Cargo Door**.
5. Select the condition **Receive Text Message** with the message text **Active Shooter**. (This is the message that the crowd broadcasts.)
6. In the body of the trigger, add the task **Task > Cargo Door > Open Cargo Door**.
7. Add a trigger called **Dis Embarked**.
8. Select the condition **Entity Embarked** and test for **SWAT 1** embarked on **CH-47 1**.
9. In the trigger body, add these tasks:
 - **Task > Cargo Door > Close Cargo Door**.
 - **Task > Movement > Move Along Route**. Specify **Route 1**.
 - **Task > Movement > Rotary Wing Land**. Specify the waypoint to the southeast of the pedestrian area (callout 2 in Figure 39 on page 50) as the landing location.
 - **Task > Cargo Door > Open Cargo Door**.
 - **Task > Radio > Send Text Message**. Send the message **Disembark now** to **SWAT 1**.
10. Make sure that the two triggers in the plan are registered. It should look like Figure 55.

Figure 55. Helicopter plan



11. Click OK to save the plan.

3.6.6 Write the Plan for the SWAT Team

When the SWAT team receives the broadcast message from the Crowd that there is an active shooter, it embarks onto the helicopter. When it receives a message from the helicopter to disembark, it disembarks, sets its rules of engagement to Fire At Will, and moves to a location where the terrorists are known to be located. If members of the team detect terrorists, they automatically fire at them.

► **To write the plan for the SWAT Team:**

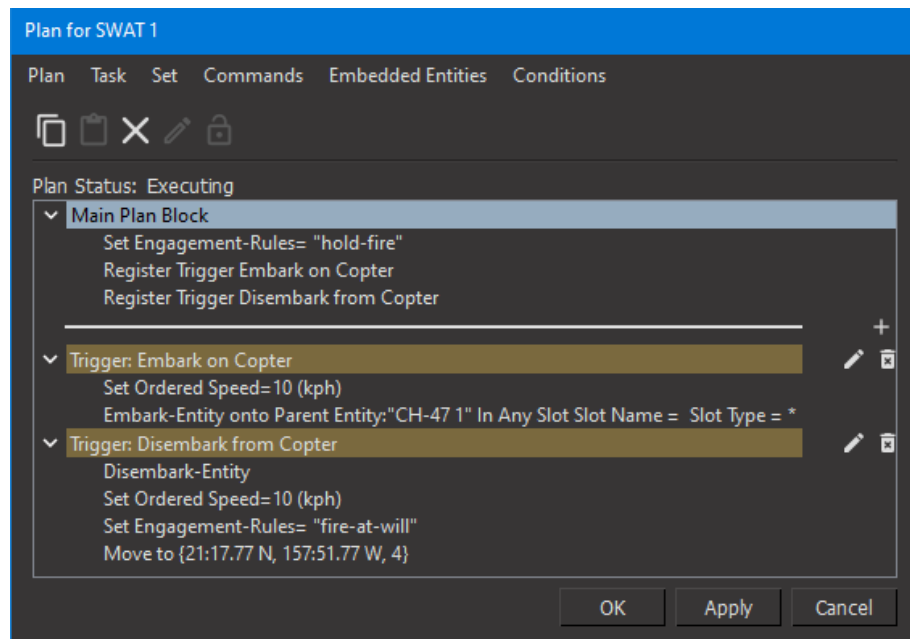
1. Select the SWAT team.
2. Open the Plan dialog box.
3. Choose **Set > Engagement > Rules of Engagement**. The Rules of Engagement dialog box opens.
4. In the Rules of Engagement list, select Hold Fire.
5. Click OK.
6. Create a new trigger.
7. Name the trigger **Embark on Copter**.
8. For the condition, choose Receive Text Message.
9. The message to receive is **Active Shooter**.
10. Click OK in the Add Trigger Condition dialog box.
11. Select the Trigger Body.
12. Choose **Set > Action > Ordered Speed**. The Ordered Speed dialog box opens.
13. Set the ordered speed to 10 and then click OK.
14. In the Trigger Body, add an Embark task onto CH-47 1.
15. If the trigger is not already registered, register it in the Main Plan Block.
16. Create another new trigger.
17. Name the trigger **Disembark from Copter**.
18. For the condition, choose Receive Text Message.
The message to receive is **Disembark now**.
19. Select the trigger body.
20. Choose **Task > Embarkation > Disembark**.
21. Set the Ordered Speed to 10.
22. Set the rules of engagement to Fire at Will.
23. Choose **Task > Movement > Move to Location**. The Move to Location dialog box opens.
24. Click on the map at the location shown in Figure 56. We want the SWAT team to move as fully as possible into the area where the terrorists will be located. They move in a column formation and the head of the column needs to move far enough for the tail to be close to this area, especially if the leader is killed by the terrorists.

Figure 56. SWAT team destination



25. Click OK.
26. Register the trigger if it is not already. The Plan is complete. It should look like Figure 57.

Figure 57. SWAT team plan



27. Click OK to close the plan.
28. Save the scenario.

3.7. Run the Scenario

As the scenario starts, pedestrians wander around the park. The terrorists embark on the SUV. It drives to the drop-off point. The terrorists disembark and find firing positions.

After several seconds, the terrorists start firing on the pedestrians. The police run to the corner of the park and may or may not engage the terrorists. It depends on whether or not they can see them.

The SWAT team embarks on the helicopter. It flies to the disembarkation point. The team disembarks. If they can see the terrorists, they fire at them. The team moves to the specified location. As they move, terrorists that were previously hidden might become visible.

As with all VR-Forces scenarios, there is some randomness built into the simulation. If you run it multiple times, the police and SWAT team may or may not take casualties. The terrorists might all be killed or they might escape detection, depending on where they are hiding.



4. Create an Aggregate-Level Scenario

This chapter is a tutorial for creating a scenario that uses aggregate-level modeling. It assumes you have completed at least one of the entity-level example scenarios and skips some of the parenthetical comments and notes provided in previous chapters. An example of the finished scenario, `first_experience_aggregate_example`, is distributed with VR-Forces (`./userData/scenarios/Sample/FirstExperience/first_experience_aggregate_example.scnx`).

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 the chapter [How Aggregate-Level Modeling Works](#) in the *VR-Forces Users Guide*.

This scenario demonstrates the following aspects of aggregate-level scenarios:

- An engagement between armor companies.
- Creating a combat engineering object as a tactical graphic.
- Breaching a combat engineering object.
- Building a combat engineering object as a task.

i 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 MAK RTI. You can download a fully functional trial version of the MAK RTI at <https://www.mak.com/support/bonus-material>.

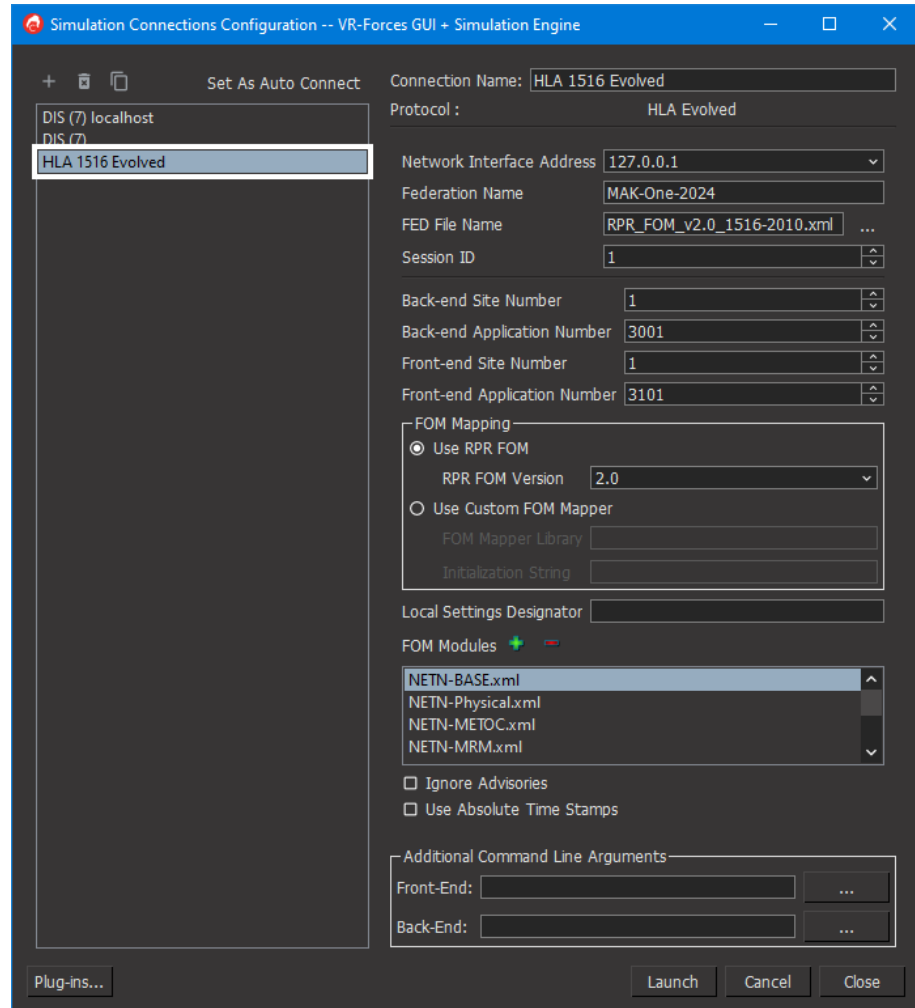
Install and configure your RTI according to the instructions provided with it. If you are using the MAK RTI, it will automatically start when you launch VR-Forces.

4.1. Create the Scenario

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.

i In the previous examples, we used the Ala Moana, a high-resolution area set in Honolulu, Hawaii, USA. For this experience, we use the MAK Proving Ground, which is a terrain designed specifically for testing. It is notional, with simplistic buildings, trees, roads, a runway, different types of soil, slopes, and other environments.

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 **MAK Technologies > VR-Forces 5.1.1 GUI + Simulation Engine (64 bit)**.
The Simulation Connections Configuration dialog box opens (Figure 58).
3. In the Simulation Connections Configuration dialog box, select HLA 1516 Evolved (Figure 58).

Figure 58. Simulation Connections Configuration dialog box

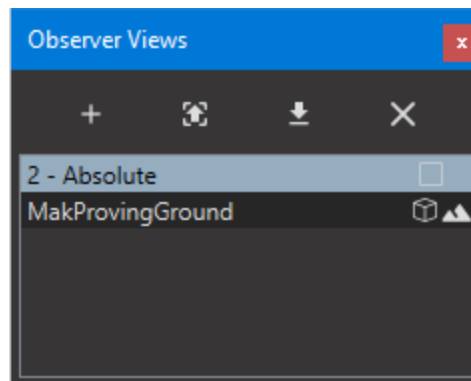
4. Click Launch. VR-Forces starts up. (If you are using the MAK RTI, the Choose RTI Connection dialog box opens. Select the rtiexec connection that you want to use. If you are not using the MAK RTI, you must connect to your RTI as described in its documentation.) The Scenario Startup window opens.
5. Select New Scenario.
6. In the Simulation Model Set list, select AggregateLevel.
7. In the Terrain list, select MAK Proving Ground.
8. Click OK. The scenario loads and the window displays the terrain database.
9. Zoom in or out until the window displays approximately the area highlighted in Figure 59.

Figure 59. MAK Proving Ground



10. Select the Observer Views Panel. By default, this panel is located at the left side of the window with the Objects List Panel.
11. Click the Add button (+). VR-Forces adds an observer view of the area you are looking at to the window. Any time you click the view, VR-Forces changes the window display to match the view you saved.

Figure 60. Observer Views Panel



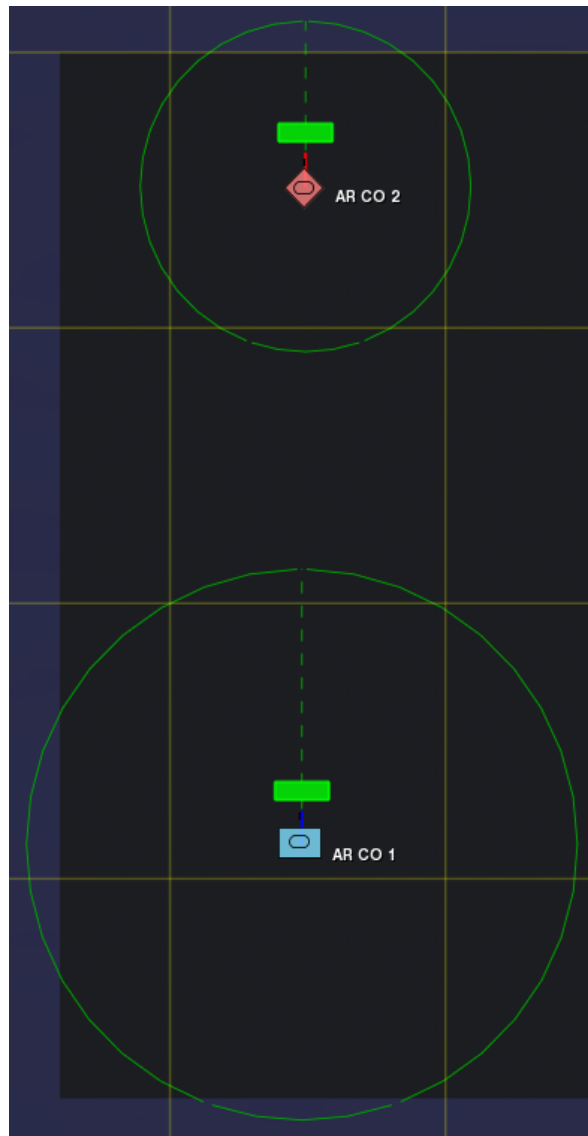
12. Right-click the new observer view. On the shortcut menu, choose **Set Default Scenario View**. The scenario will automatically jump to this view when you open it. This is indicated by a star.
13. Save the scenario.

4.2. 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 Create Object tab.
2. Click the Friendly Force button (blue button).
3. On the row of filter buttons, click the All button (☒). In the Tag window, click Tank.
4. In the object 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 61. A tank company is added with the name AR CO 1.

Figure 61. Tank companies



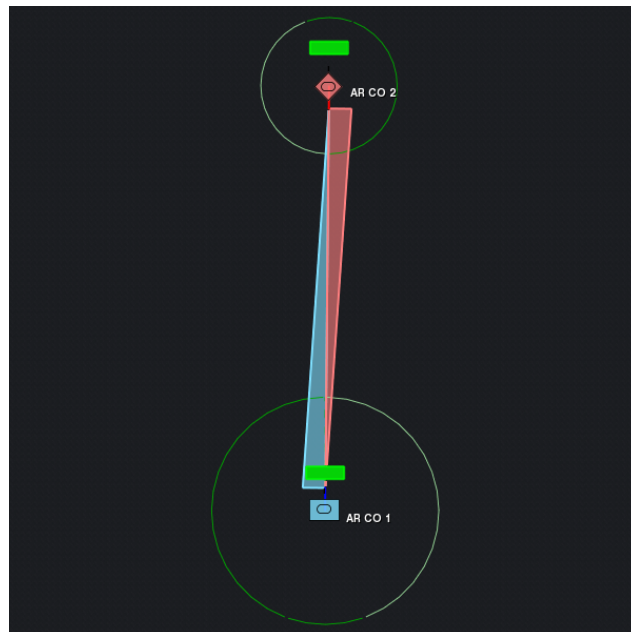
6. In the Create Object Palette, change the Force to Opposing (red button).
7. Add a Tank CO RU north of AR CO 1. A unit is added named AR CO 2. Notice that, in addition to its icon, each unit has a health status bar.

8. Open the Plan window for each unit.
9. Give AR CO 1 a Move to Location task to move north of its current position, to approximately where AR CO 2 is.
10. Give AR CO 2 a Move to Location task to move south to approximately where AR CO 1 is.
11. Save the plans.
12. Save the scenario.

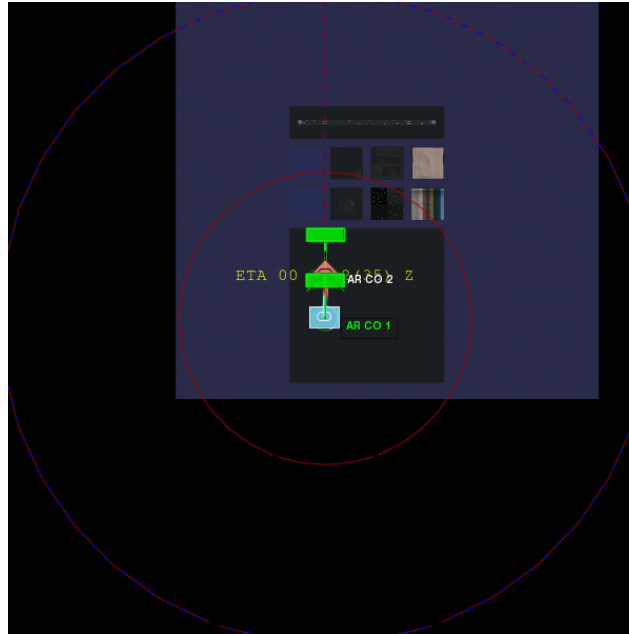
4.2.1 Run the Scenario

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 62). Zoom in to take a better look.

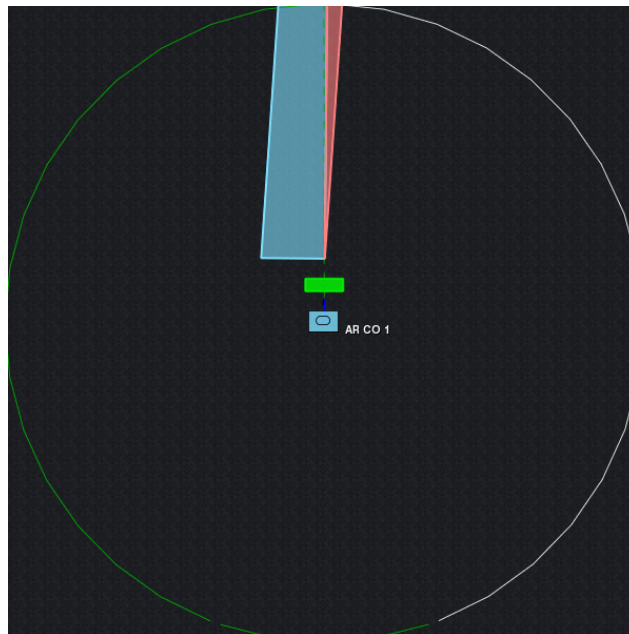
Figure 62. Attack indicators



Select AR CO 1. VR-Forces displays range rings that show the extent of its sensors and weapons as well as task visualizations (Figure 63). (Simulation objects in entity-level scenarios also display range rings.)

Figure 63. Range rings

Zoom in on AR CO 1 until you can see a green ring around it (Figure 64). 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. When part of the footprint is flashing, this indicates where the unit is being attacked.

Figure 64. Footprint

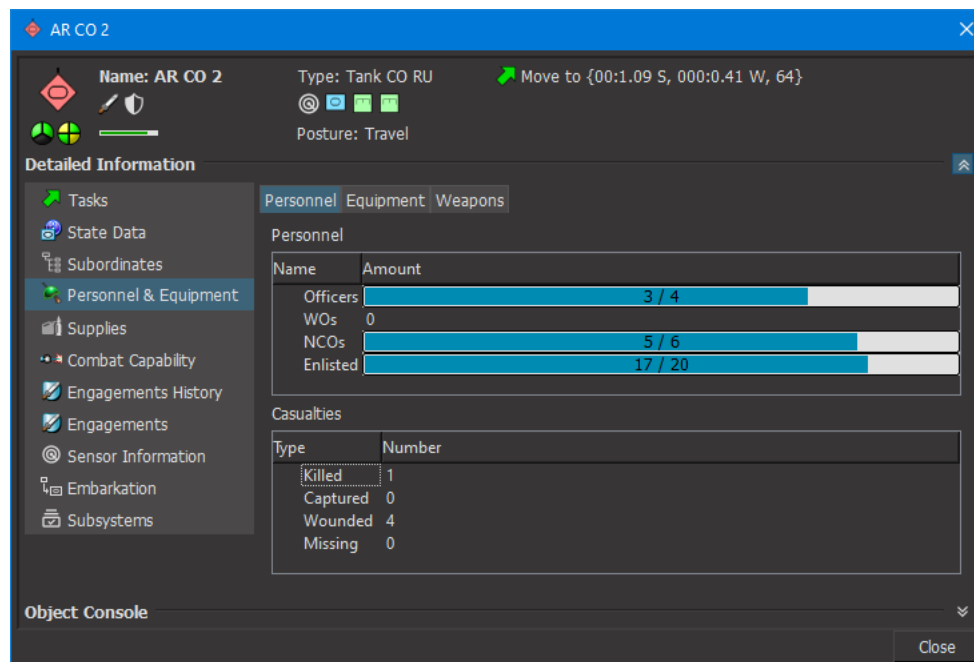
Select AR CO 2. Press **I** to display its Information dialog box (Figure 65). The dialog box has the same layout as the dialog box used for entity-level simulation objects. The summary section at the top has information that is not provided for entity-level

simulation objects. This includes 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 85%, because AR CO 1 is not at full health.

The various pages of detailed information are different from 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 the chapter [How Aggregate-Level Modeling Works](#) in the *VR-Forces Users Guide*. For a description of gumball charts, please see "[Information Dialog Boxes for Aggregate-Level Scenarios](#)" in the *VR-Forces Users Guide*.

Figure 65. Information dialog box for unit



4.3. 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 simulation effect 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.

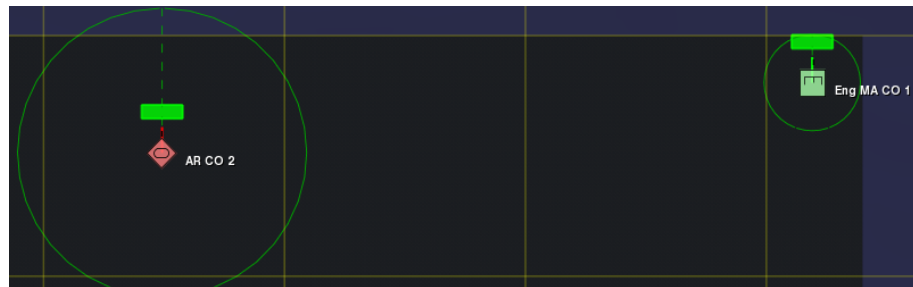
You can add CEOs to a scenario using a method similar to creating tactical graphics, by drawing them on the terrain, or they can be created as part of the simulation by units that have the resources to create them.

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 "[Combat Engineering Objects](#)" in *VR-Forces Users Guide*.

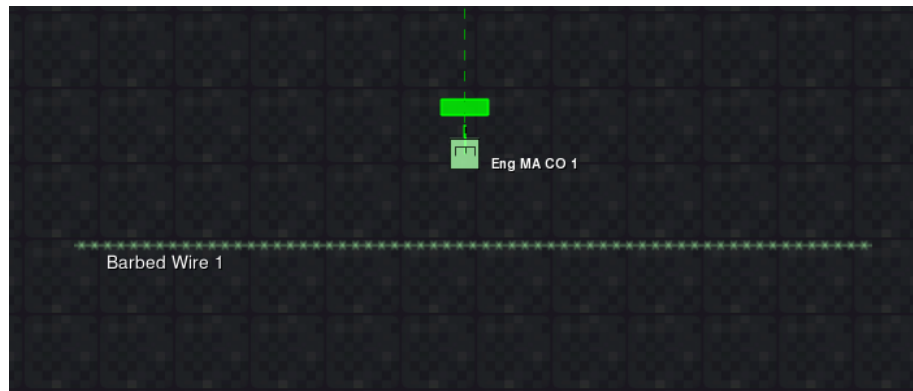
1. If the scenario is running, pause it (**Simulation > Pause Scenario**) and rewind it (**Simulation > Rewind to Scenario Start**).
2. Click the saved view to reset the extents of the terrain.
3. On the Create Object Palette, set the force to Neutral (green button), click the X to clear the Tank filter, and select Eng Mob Aug CO.
4. Place the unit as shown in Figure 66.

Figure 66. Eng Mob Aug CO



5. Zoom in on the engineering company.
6. Click the Create Object Palette.
7. Click the Simulation Effect Object filter (🔍).
8. Filter the palette to show Engineering Objects.
9. Select Barbed Wire.
10. Draw a line as shown in Figure 67.

Figure 67. Barbed wire



11. Save the scenario.

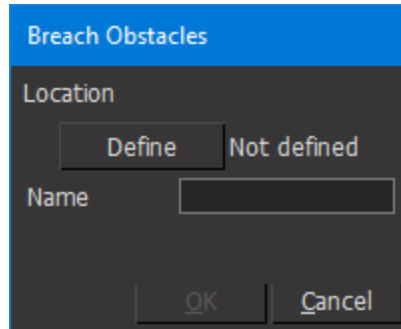
i For these examples, we create the engineering units as neutral entities to ensure that they do not become targets of the other units in the scenario.

4.3.1 Breaching an Obstacle

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

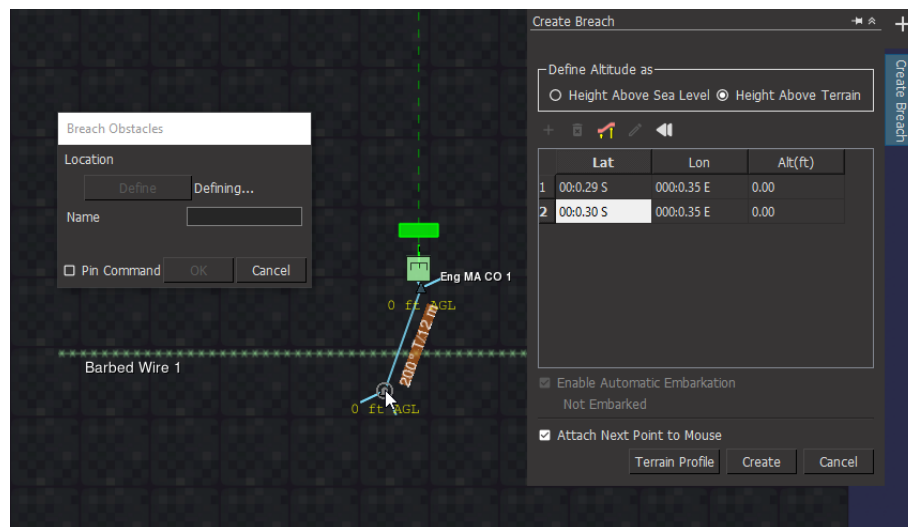
1. Open the Plan window for the engineering company and then move it to the side so you can see the company and the barbed wire obstacle.
2. Choose **Task > Combat Engineering > Breach Obstacles**. The Breach Obstacles dialog box opens (Figure 68). If necessary, move the dialog box to the side.

Figure 68. 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 69). 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 69. Breach line



5. Click OK. The task is added to the plan.
6. In the Plan window, click OK.

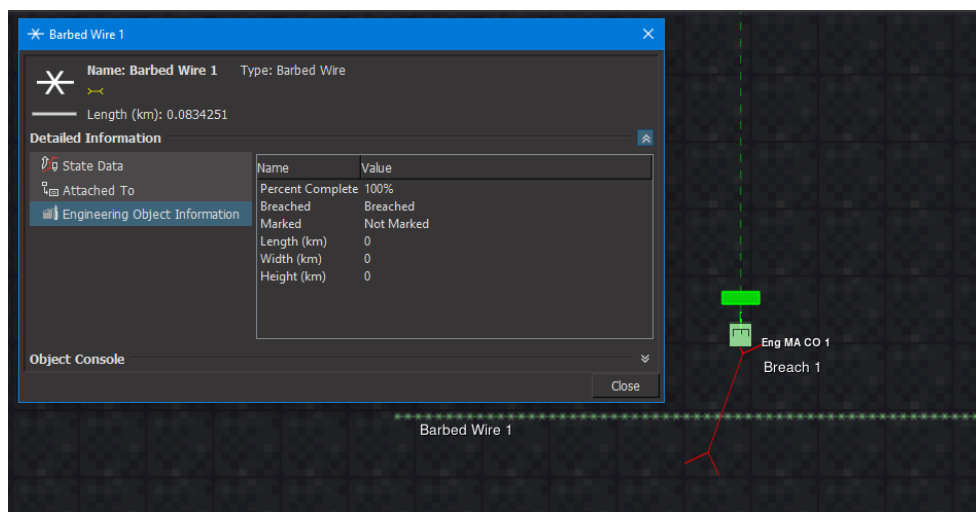
7. Save the scenario.
8. Run the scenario.

The engineering company moves towards the barbed wire. VR-Forces draws a breach line where you defined it (Figure 70).

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 70. Information dialog box for engineering object

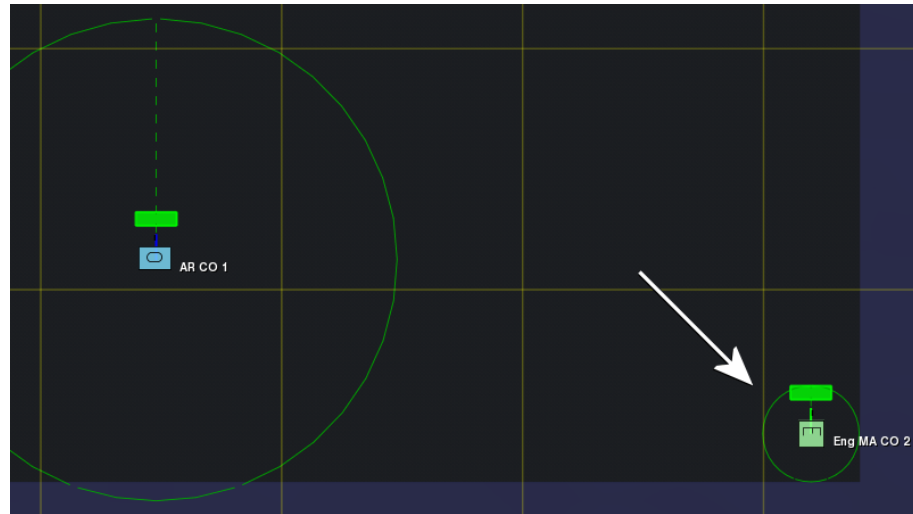


4.3.2 Simulating Creation of a Combat Engineering Object

In the previous section, you created a combat engineering object by hand, as 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.

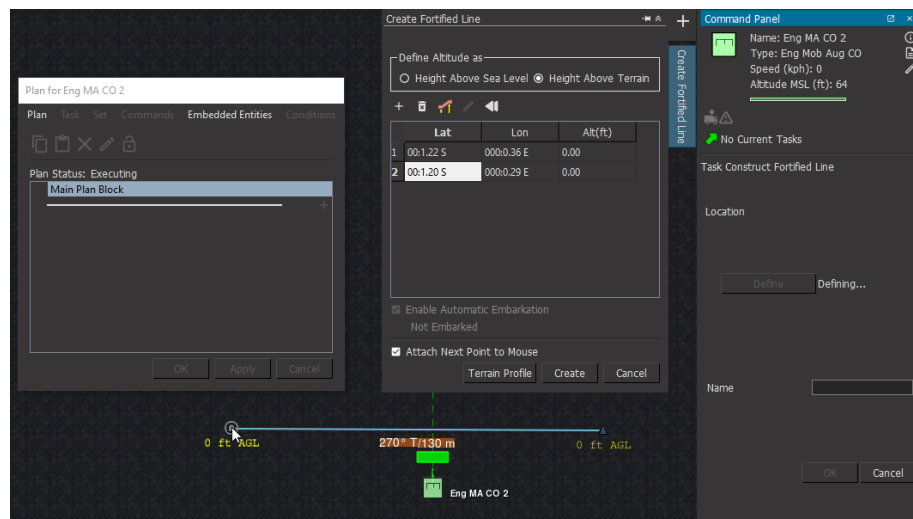
1. If the scenario is running, pause it and rewind it.
2. Click the saved observer view to return to the starting view.
3. On the Create Object palette, click the Entity filter (🔍) and then the Engineering tag.
4. Set the force to Neutral (if it isn't already) and then select Eng Mob Aug CO.
5. Place the engineering company as shown in Figure 71.

Figure 71. Eng Mob Aug CO



6. Zoom in on the new engineering company.
7. Open its Plan window.
8. Choose **Task > Combat Engineering > Construct Fortified Line** (or use the Command Panel). The Construct Fortified Line dialog box opens. The Location is specified as "Not defined".
9. Click Define. The Create Fortified Line dialog box opens and the cursor changes to draw mode.
10. Draw a line as shown in Figure 72.

Figure 72. Fortified line



11. Click Create.
12. Click OK.
13. In the Plan window, click OK.

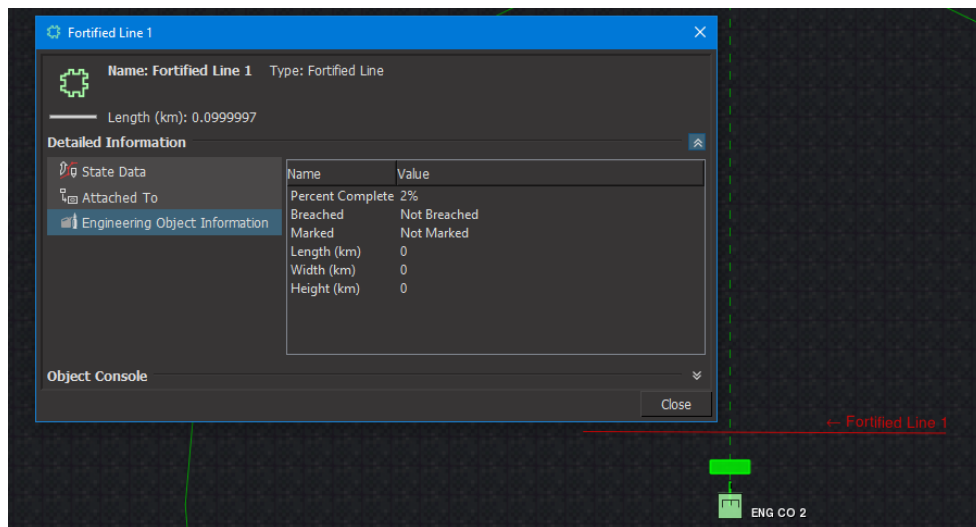
14. Save the scenario.
15. Run the scenario.

The engineering company moves towards the location of the fortified line that it is supposed to construct. A line appears on the terrain.

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 73).

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 18 minutes of simulation time to reach the 2% completion level shown in Figure 73.

Figure 73. 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 and other supplies 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 the *VR-Forces Users Guide* or online help.



5. Installation and Licensing

Your MAK 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 MAK RTI. Before you install the applications, note the following possible issues:

- When you install VR-Forces, 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.

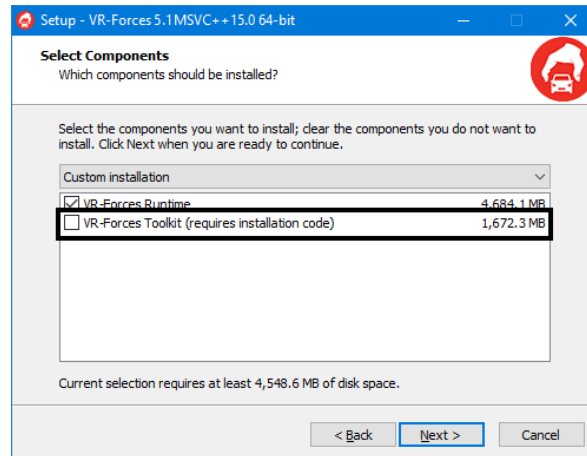
5.1. Install VR-Forces and Data

VR-Forces has an application installer and a data package, which consists of nine compressed zip files. You must install the data or VR-Forces will not run.

► **To install VR-Forces:**

1. Run the application installer. On the Select Components page (Figure 74), clear the VR-Forces Toolkit check box. You do not need the toolkit for the exercises in this guide.

Figure 74. VR-Forces installation wizard



2. Continue with the installation wizard. The installer installs the VR-Forces application.
3. When the installation completes, click Finish.

⚠ You must install the data package. It is not optional. VR-Forces will not run properly without it.

► **To install the data:**

1. Install the MAK ONE Software Manager.
2. Run the MakOneSoftwareManager executable in the `.\bin64` folder.
On Windows 10 and 11, you can also open the Start menu and then choose **MAK Technologies > MAK ONE Software Manager**. (To launch MAK ONE products more easily than the Windows 10 Start menu, please see the *MAK ONE Installation Guide* or this blog entry: [Tech Tip: Starting MAK ONE Applications on Windows 10.](#))
3. Click Select and Install Data Packages in the welcome page.
4. Specify the directory where you saved the data files. The default is your Downloads folder, but you can click the folder icon to navigate to another folder.
5. Select the data files that you want to install.

i MAK Technologies recommends that you install all of the data files if you have the space and are not absolutely sure which files you require.

You must install the Core data for VR-Forces to function. To have access to other terrains and to see anything other than notional models, install the other data packages provided by MAK. If you do not install any other data, it is assumed that you are providing your own models and terrains.

6. Optionally, choose the location where you want to install the data.

MAK recommends that you install the files in the default location. While MAK ONE products allow for diverse installations, the typical use is the standard installation. If you require a more complex installation, refer to the *MAK ONE Installation Guide*.

7. If you have a previous installation of data for the same compatibility version, you are prompted to choose whether to back up the previously installed data, delete it, or overwrite it. See "5.1.1 Options When Installing a Data Package" below.
8. Click Install. The MAK ONE Software Manager shows the progress of the data installation.
9. When the installation is complete, click Exit.

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

5.1.1 Options When Installing a Data Package

When installing a data package using the MAK ONE Software Manager, if you have no preexisting installations of that compatibility version, it simply installs the data files in the `./SharedData/##/latest` folder (where `##` is the compatibility version).

If there is already a previous release of the same compatibility version installed, however, you are prompted to choose whether to back up, delete, or overwrite the data from the previous release.

- **Backup.** If you install a newer release and choose to create a backup the previous release, the files in the *latest* directory are moved to a new directory named for the data version's date in the same compatibility folder and the new files are then installed in the latest folder. For example, the old files move to `./SharedData/18/2024-03-14` and the new files are installed in `./SharedData/18/latest`.

Creating a backup is the recommended option in most circumstances. It allows all MAK ONE applications to use the newest data, while also giving you the option to revert to a previous release using command-line options or setting a Windows environment variable. See the *MAK ONE Installation Guide* for details.

- **Delete.** The installer deletes the old data from the *latest* directory and then installs the new data.
- **Overwrite.** The installer overwrites the previous data files in the *latest* directory with the newer ones you chose to install. It also adds files that are new and ignores files that were previously installed if the package you are installing does not include that file.

5.2. Setting Up the License Manager

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

- To install the MAK License Manager, run the installer.

The general procedure for configuring license management is:

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.

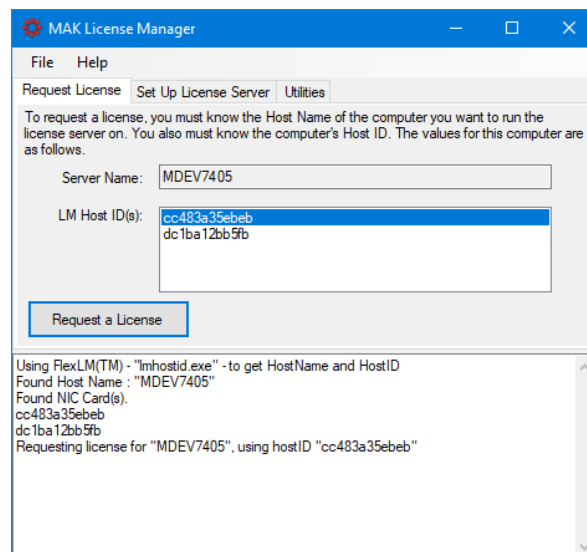
5.2.1 Identify the Host ID and License Server Name

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 in Windows:

1. On the Start menu, choose **MAK Technologies > MAK License Manager**. The MAK License Manager utility opens (Figure 75).

Figure 75. 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 MAK salesperson. MAK will e-mail you a license file.

5.2.2 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.

5.2.3 Run the License Server

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

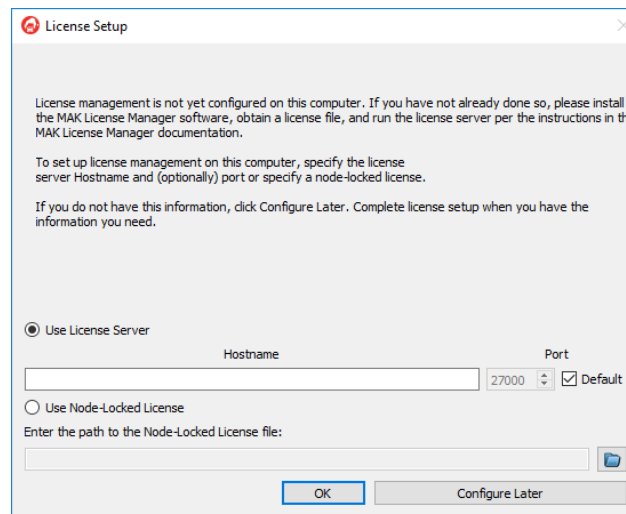
Shutting Down the License Server

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

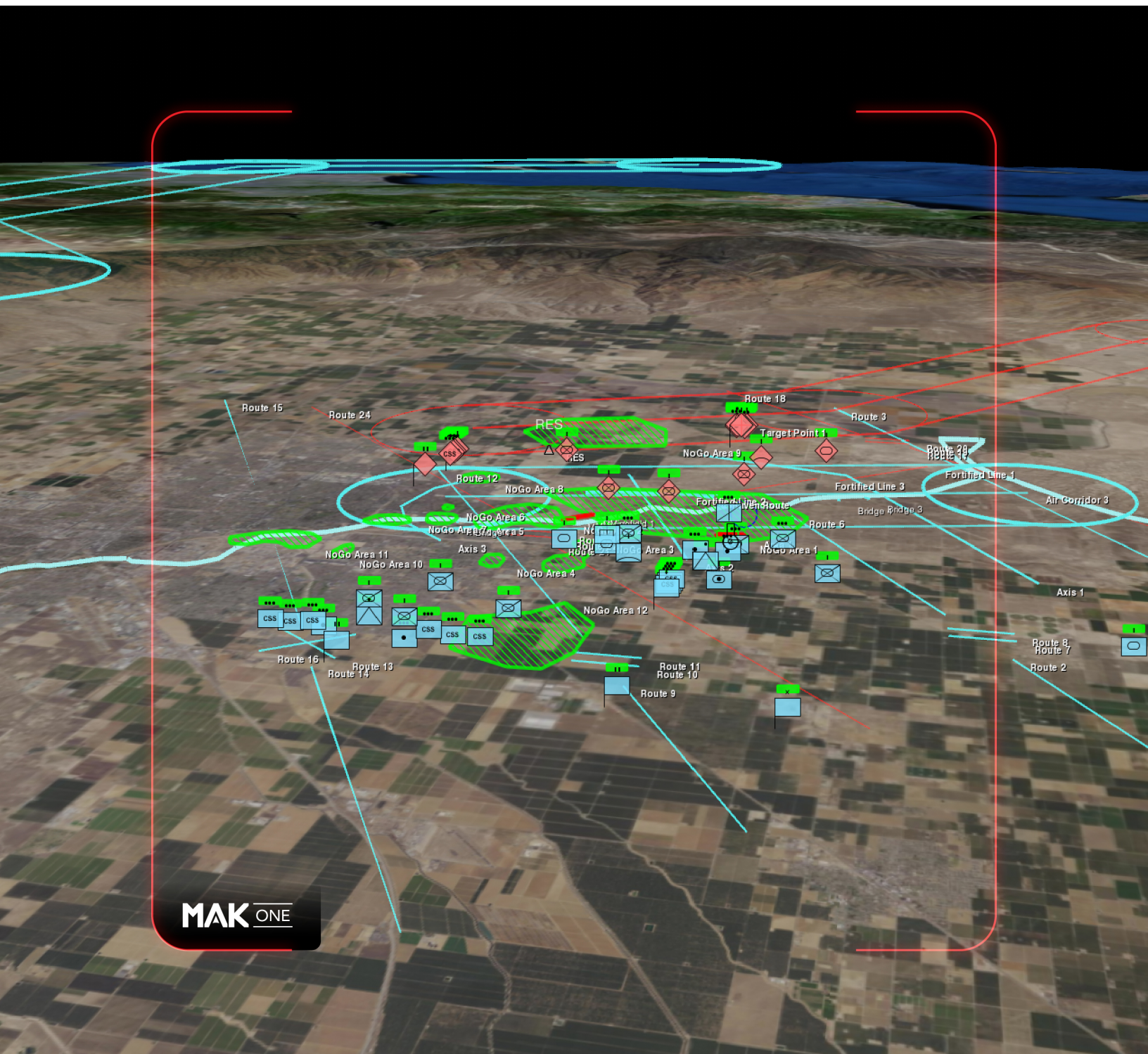
5.2.4 Specify the License Server

The first time you run a MAK application on a computer, the License Setup dialog box opens (Figure 76). It prompts you to enter the hostname of the license server and optionally, a port number.

Figure 76. License Setup dialog box



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



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