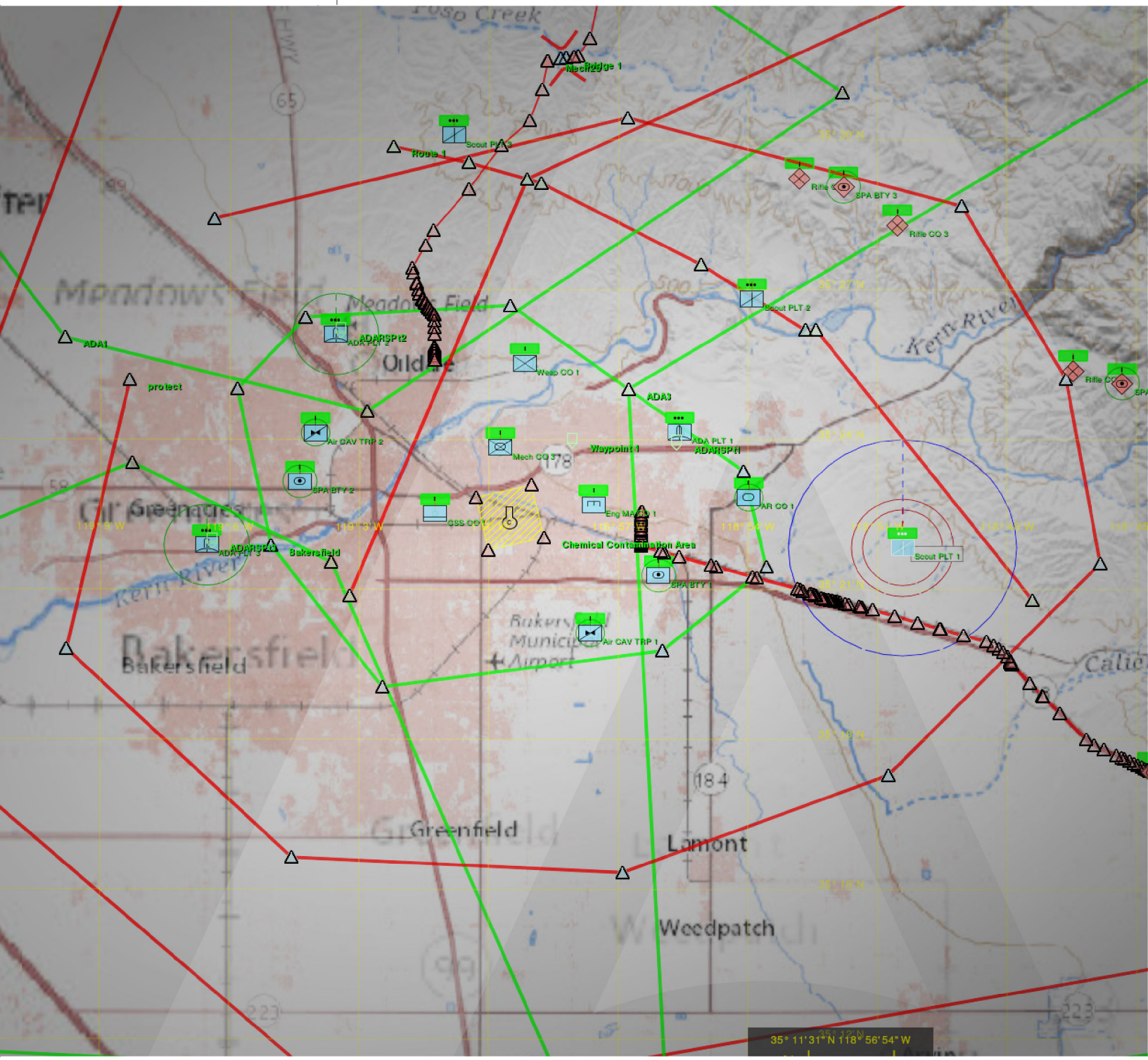
MAK TECHNOLOGIES

VR-Forces First Experience Guide



Version 4.10

ST Engineering North America

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1. Introduction to VR-Forces

Thank you for deciding to try out 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. To get the full experience you will need the VR-Forces runtime application. (You do not need to install the SDK.)

Before you begin, install and license the software. Please see "Chapter 5. Installation and Licensing" on page 83 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 *VR-Forces Developers Guide*.

1.1. Start VR-Forces

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

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

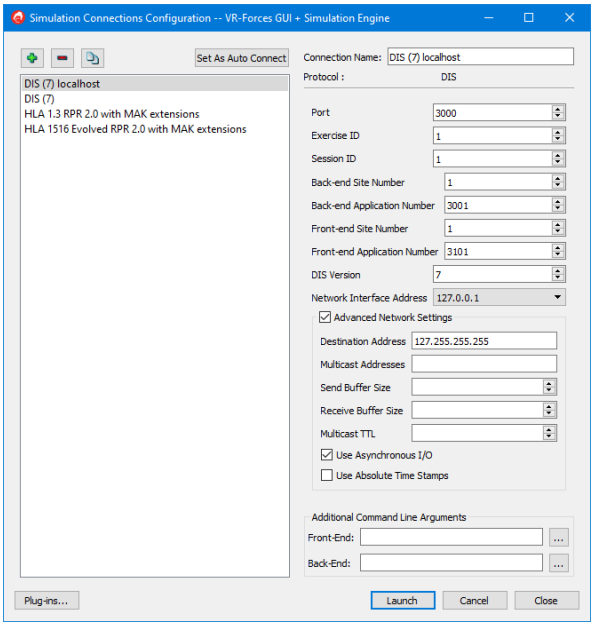
Before you start VR-Forces, make sure the license server is running. For details, please see "5.2.3 Run the License Server" on page 86.

---

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

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

Figure 1. Simulation Connections Configuration dialog box

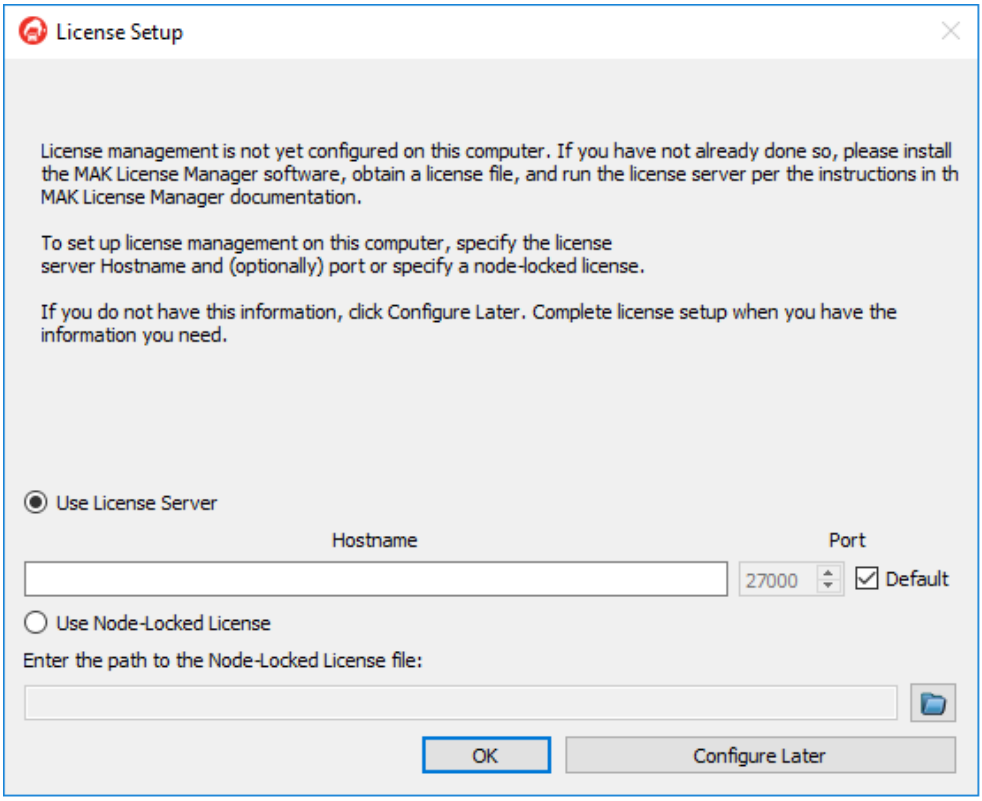


2. In the Simulation Connections Configuration dialog box, select the DIS (7) localhost connection configuration. (If you want to use HLA, you also need to install and configure an HLA Runtime Infrastructure (RTI), so let's stick with DIS for this first experience.)
3. Click Launch. If this is the first 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 page 8).

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

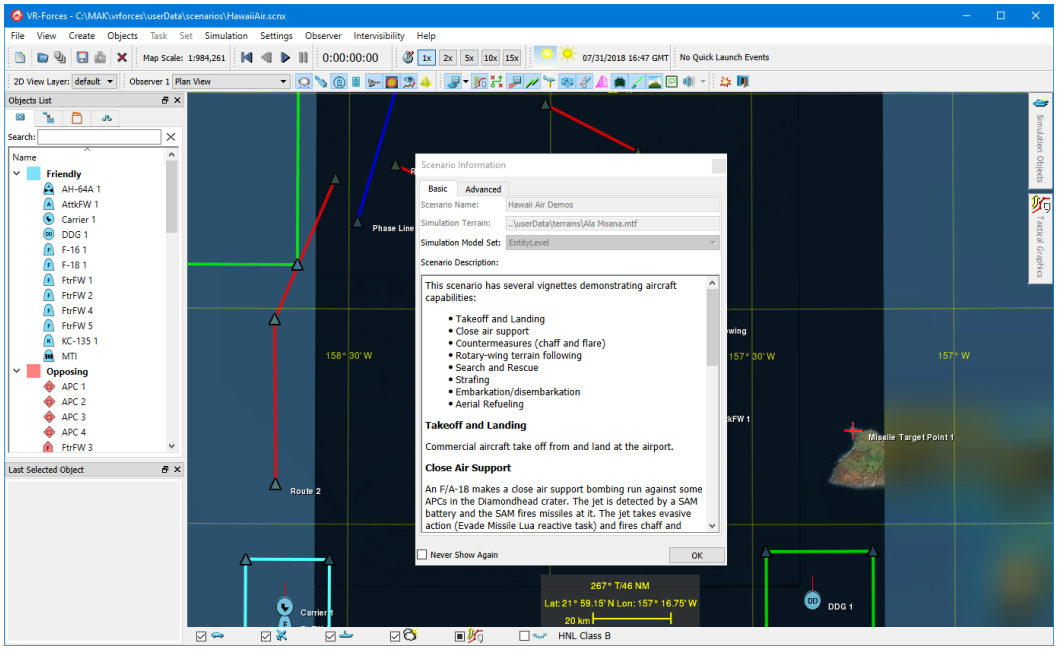
When you start VR-Forces, the Scenario Startup dialog box (Figure 3) lets you quickly load a scenario or create a new one without needing to use the VR-Forces menu system.

Figure 3. Scenario Startup dialog box



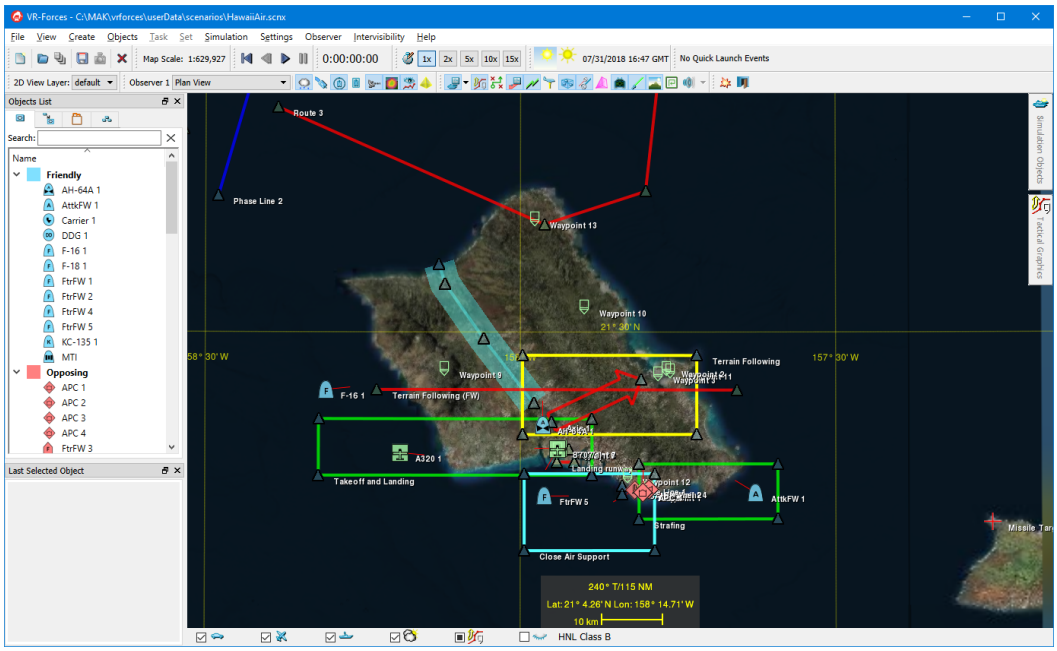
1. In the Scenario Startup dialog box, select the Load Scenario From Disk option.
2. Click OK. The Load Scenario dialog box opens.
3. Select *HawaiiAir.scnx*.
4. Click Open. The scenario loads and the Scenario Information dialog box appears (Figure 4). It has a description of the scenario.

Figure 4. Scenario information



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

Figure 5. HawaiiAir scenario



6. 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, please 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 guide we will look at this scenario in a 3D view.

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

The entity icons begin moving. This scenario takes place over a wide geographic area. The boxes define each vignette; 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, please see *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 arrow icon (▲). The Detailed Information includes tabs that provide different details about the object.

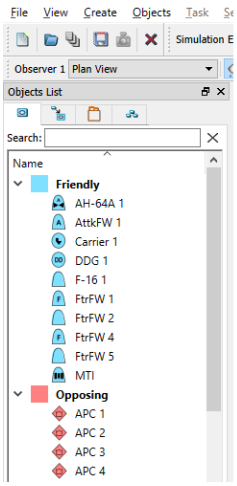
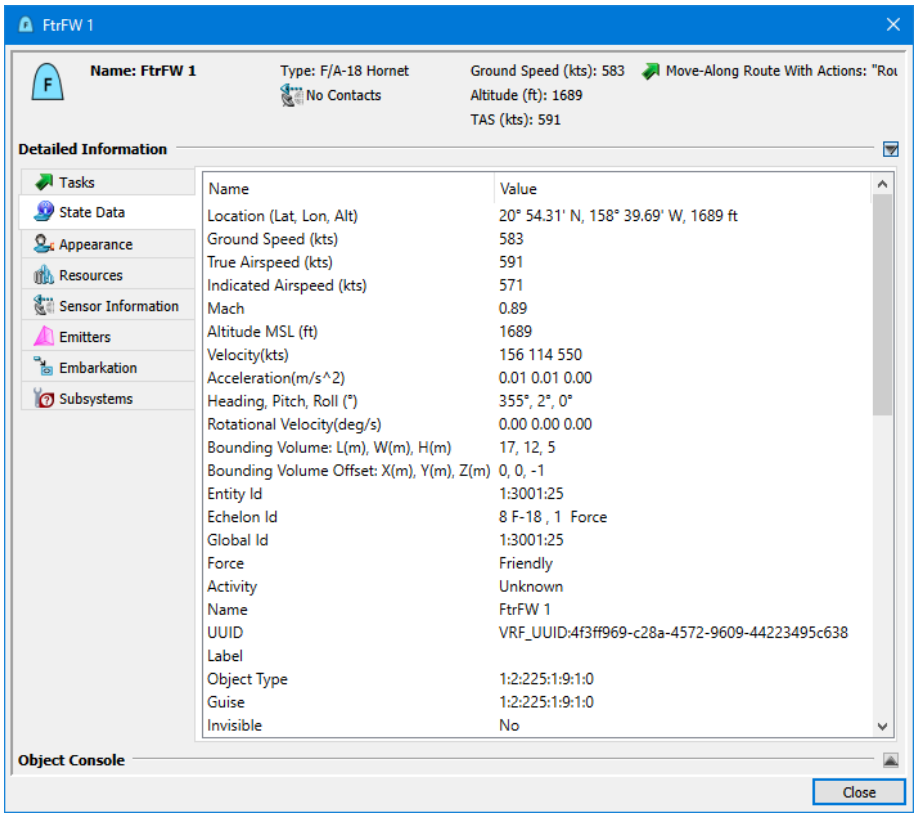


Figure 6. Information dialog box



5. Click the Close button to close it.

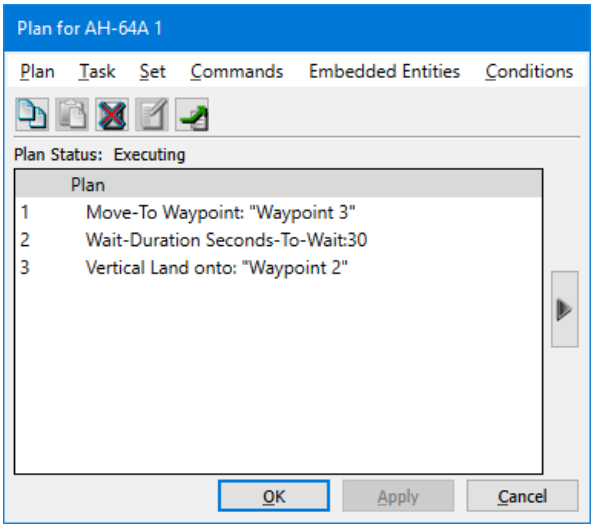
You can display information dialog boxes like this for most objects.

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 AH-64A 1.
2. Choose **Objects > Plan**. The Plan window opens (Figure 7).

Figure 7. Plan window



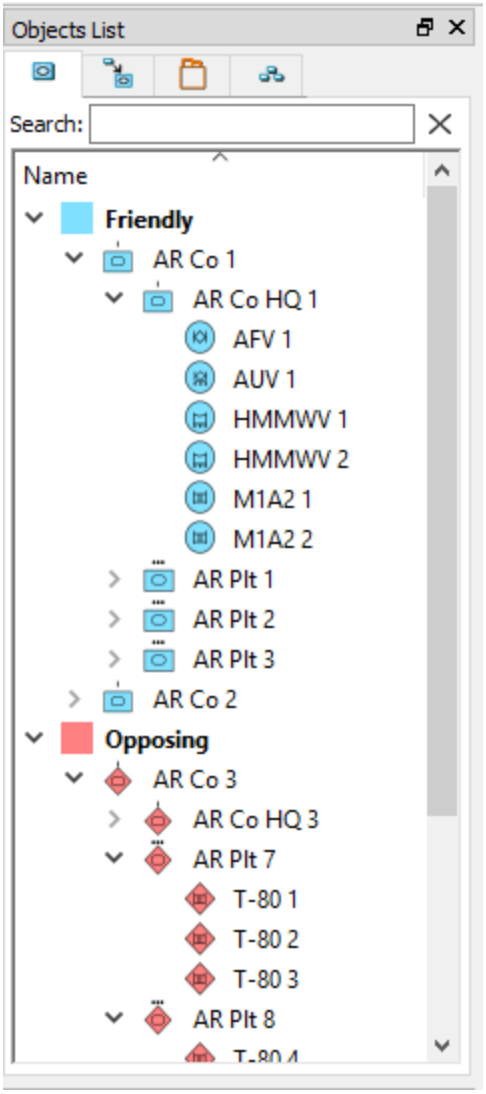
This plan is fairly simple. It tells the entity to move to one waypoint, wait there for 30 seconds, and then land at another waypoint.

3. Click OK to close the Plan window.

View Force Hierarchies and Relationships

All simulation objects exist within the context of forces, usually just 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 and 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, please see the chapter *Moving the Observer*, in *VR-Forces Users Guide*.

Dragging the Terrain

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

➤ **To drag the terrain:**

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

1.3. 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. Click Open. When the scenario loads, the Scenario Information dialog box opens.
4. Close the Scenario Information dialog box.
5. Choose **Observer > Set Observer Mode > Stealth**.

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 AH-64A 1.
2. Right-click and choose **Observer Attach > Attach Follow**. The observer jumps to the rear of the helicopter.

Figure 10. Follow AH-64A 1



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

1.3.3 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 online help or the Quick Reference Card in *VR-Forces Users Guide*.

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

Use the Game-like Keyboard Navigation

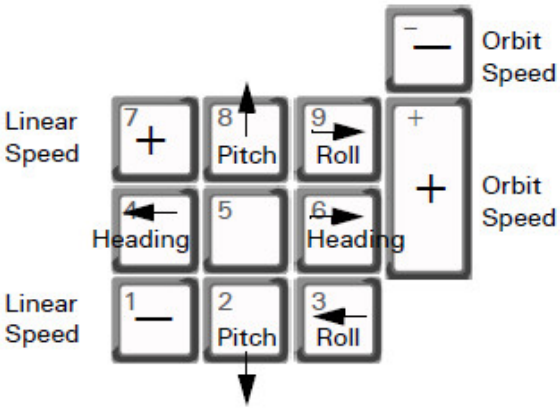
Press **w** and **s** to move forward and backward. Press **e** and **q** to move up and down. Press **a** and **d** to move left and right.

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



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

The 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 MaklandCoordinatedAttack scenario in XR mode.

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

Figure 11. Observer Settings Toolbar



Figure 12. MaklandCoordinatedAttack in Stealth observer mode



4. Choose **Settings > Entity Labels**. This turns off the little circles that show where entities are. Now you can still see tactical graphics, but probably cannot see any entity models.
5. On the Observer Settings toolbar, select XR observer mode. Notice how the entities are now visible (Figure 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

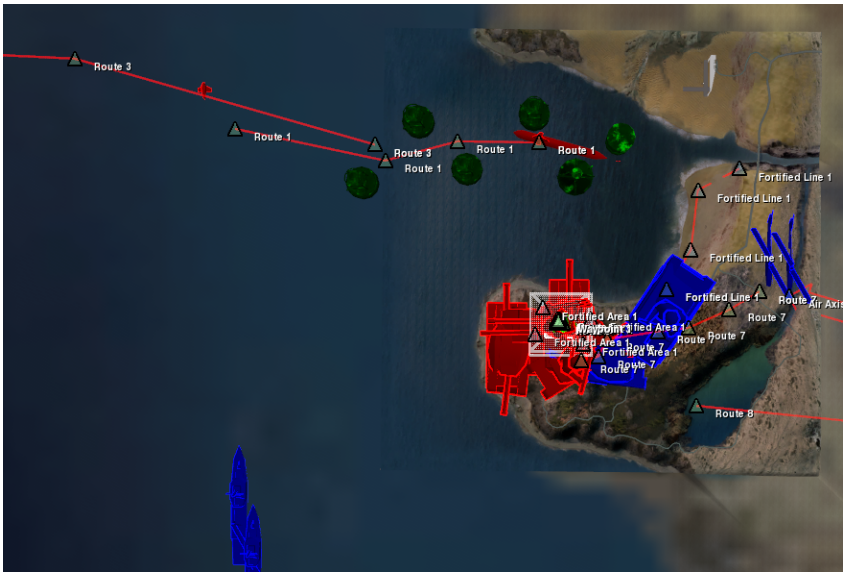


Figure 14. XR mode side view



1.4. Example Scenarios

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

- AggregateLevelAirOverview. This scenario demonstrates the air combat capabilities of aggregate-level scenarios.
- AggregateLevelSimulationOverview. This scenario has several vignettes that demonstrate different features of aggregate-level simulation.

- AggregateLevelBakersfieldDefense. Friendly forces are set up in a defensive position to repel opposing force attacks.
- 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.
- 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.
- 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.
- CivilianAirTraffic. Civilian aircraft follow flight plans based on x-plane data.
- CrowdBehaviors. Demonstrates various crowd behaviors: wandering, rioting, protesting, and crowding. It includes scenario events to kick off the protest and the riot.
- ConvoyAndTraffic. Demonstrates traffic flowing on major roads in Honolulu. A scenario event triggers a convoy of four HMMWVs.
- CoverPoints. Several infantry respond to suppressive fire by finding cover points. They also move to a location using cover points.
- CST Demo Scenario. An aggregate-level scenario that recreates a battle to defend Tehachapi Pass.
- Dynamic Terrain. 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 *VR-Forces FirstExperience 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.
- FormationFlight. Demonstrates four jets flying in formation. For this scenario to look good, you must enable Absolute Timestamps when you start VR-Forces.
- HawaiiAir. This scenario demonstrates fixed-wing and rotary-wing entity behaviors, including takeoff and landing on land and an aircraft carrier, bombing, strafing, and terrain-following.

- HawaiiGround. This scenario demonstrates ground entity behaviors, including embarkation and disembarkation, road following, and convoys.
- HawaiiNaval. This scenario has four vignettes that demonstrate the naval features of VR-Forces, including deploying and clearing mines, sonar dipping, firing torpedoes, using active and passive sonar, and submarine maneuvers.
- Illumination Flares. 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.
- MaklandCoordinatedAttack. This scenario shows air, ground, and naval forces attacking an entrenched opposing force position. Meanwhile, a P-3 drops sonobuoys to try to located a submarine and naval mines to try to destroy a second submarine. A helicopter uses its dipping sonar to locate a submarine and drops a torpedo to attack it.
- Parachuting. Soldiers embark on a helicopter. Then they parachute out of it.
- Raid. Friendly forces travel from an aircraft carrier to assault hostile forces that have taken hostages. They rescue the hostages and return to the carrier.
- RemoteAttachment. This scenario demonstrates how to attach components to remote entities. See the readme.txt file for instructions for running the scenario.
- RopeDemo. 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.
- SquadAssaultKilo. This scenario shows a rifle squad dismounting from a helicopter and advancing on an enemy-held building on the north edge of the Kilo 2 range. The fire teams in the squad use an Occupy Position behavior as well as suppressive fire to advance on the objective in bounds.
- 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.
- UAVSensor. This scenario demonstrates use of gimbaled sensors on a UAV. It has a quick launch plan that automatically moves the sensor to look at different surface entities.
- 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.

1.5. Learn More

For complete details about using VR-Forces, see *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 accessible from the VR-Forces shortcuts on the Start menu.



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 *www.mak.com/support/tutorials* and click the link for the step you want to view. For complete details about creating scenarios, please see *VR-Forces Users Guide*.

➤ **To create a scenario, you must:**

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

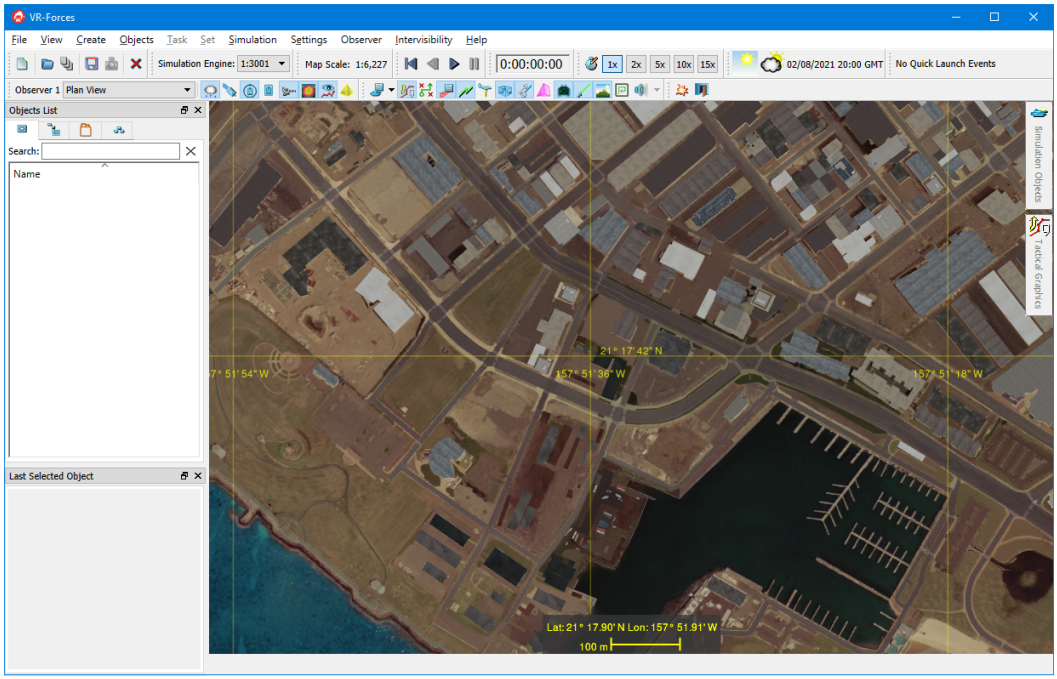
2.1.1 Start VR-Forces

If VR-Forces is not running, start it now.

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

   The Simulation Connections Configuration dialog box opens (Figure 1 on page 6).
2. In the Simulation Connections Configuration dialog box, select the DIS (7) localhost connection configuration.
3. Click Launch. VR-Forces starts up and the Scenario Startup dialog box opens (Figure 3 on page 8).
4. 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.)
5. Choose **File > New Scenario**. The Initial Scenario Information dialog box opens.
6. Select *Ala Moana.mtf*.
7. Click Open. The New Scenario dialog box opens.
8. 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.
9. Click OK. A new scenario is created and the Ala Moana terrain loads (Figure 15).

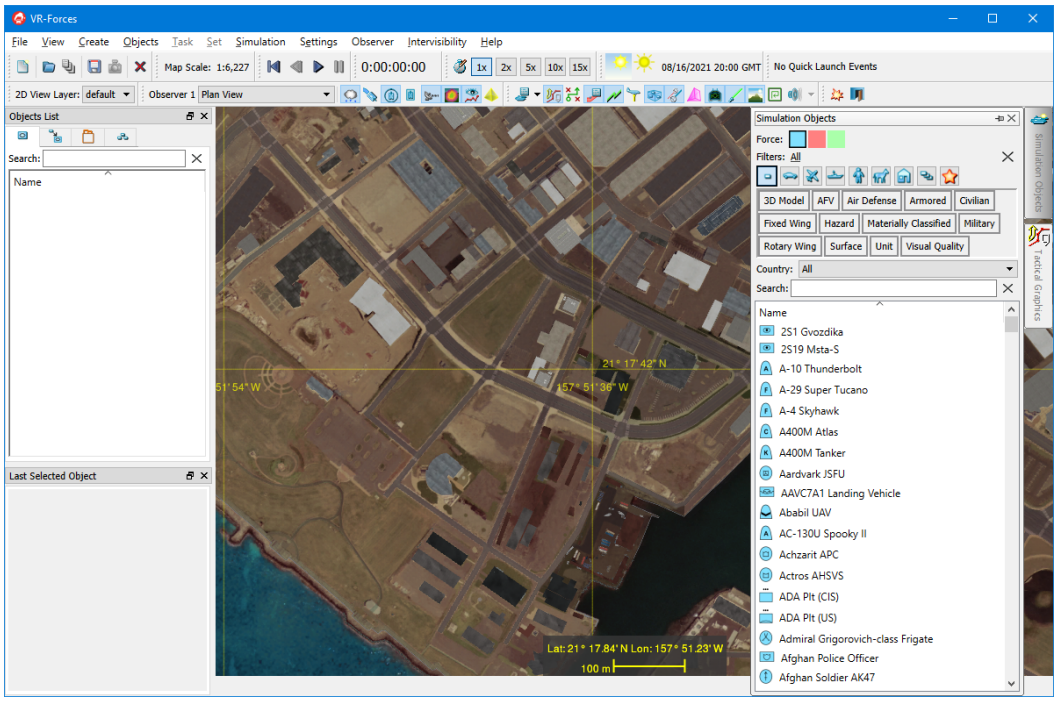
Figure 15. New scenario on Ala Moana terrain



2.1.2 Create Some Entities

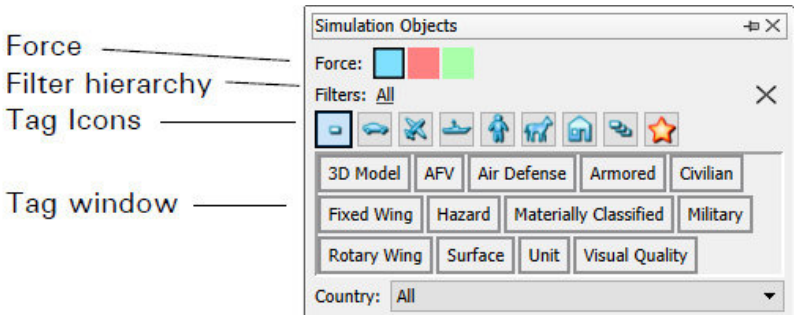
1. On the right side of the VR-Forces window, click the Simulation Objects tab. The Simulation Objects Palette opens (Figure 16).

Figure 16. Entities Palette



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

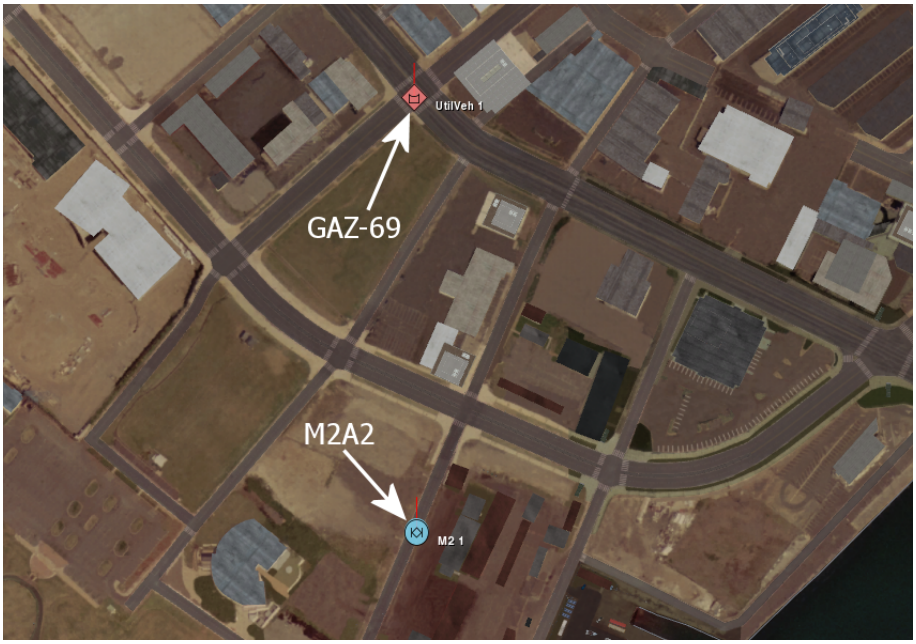
Figure 17. Simulation Objects Palette filtering



3. On the Tag Icon bar, 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.

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.

Figure 18. Entities placed on terrain



6. Right-click to exit create entity mode.
7. Open the Simulation Objects 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-69 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 UtilVeh 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 click OK. The heading changes to 135 degrees.

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 Tactical Graphics tab (on the right margin of the window). The Tactical Graphics Palette opens.
2. In the top level filters list, click the Control Object button ().
3. In the list of control objects, select Route. The Create Route tab is added to the window. The cursor changes to create object mode (it shows a little triangle at the end of the cursor arrow).
4. Click on the map in front of the Bradley (callout 1 in Figure 19). A vertex appears.

Figure 19. Creating a route



5. 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.
6. Add additional route vertices by clicking the locations of callouts 2, 3, and 4 in the figure.
7. For the end point, double-click at location 5.
8. The route is created with the default name Route 1 (Figure 20).

Figure 20. Scenario with route drawn



2.1.4 Save the Scenario

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

2.2. Assign Tasks

You can give a simulation object a task by including it in a plan or by assigning it from the Task menu. We call tasks that are assigned from the Task menu "independent tasks". *VR-Forces Users Guide* discusses tasks in chapters 25 through 30.

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.

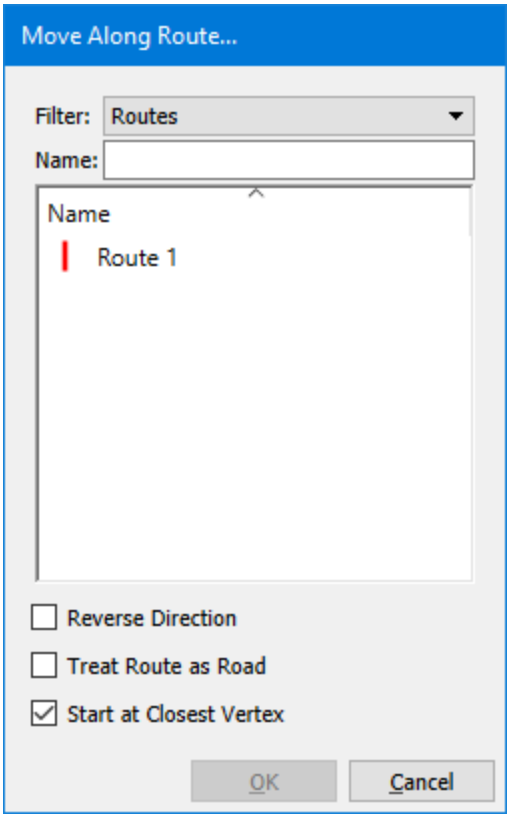
A few tasks, mostly for sending messages, can execute without stopping the current task.

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 using an independent task.

1. Select the Bradley (M2 1).
2. Choose **Task > Movement > Move Along Route**. The Move Along Route dialog box opens (Figure 21).

Figure 21. Move Along Route dialog box



3. Select Route 1.

4. Click OK.
5. Choose **File > Save Scenario**.

At this point nothing is happening, 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-69 vehicle and fires on it. Detecting and firing on opposing force simulation objects is an automatic behavior. Notice that firing does not interfere with the entity's task. It continues to the end of the route.

You might wonder why the GAZ-69 does not fire at the 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-69 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.

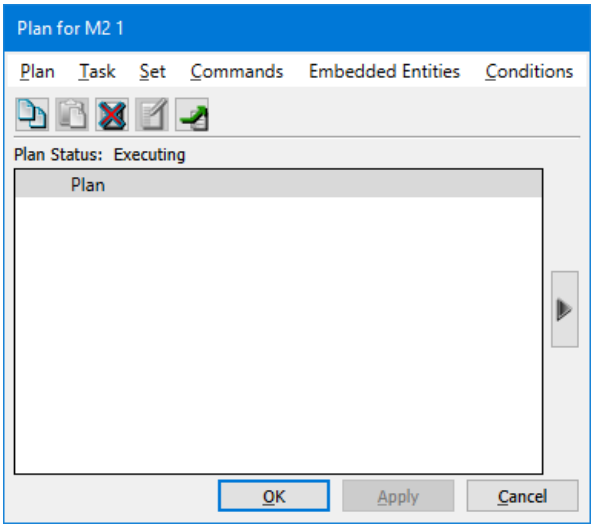
2.3. Write a Plan

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

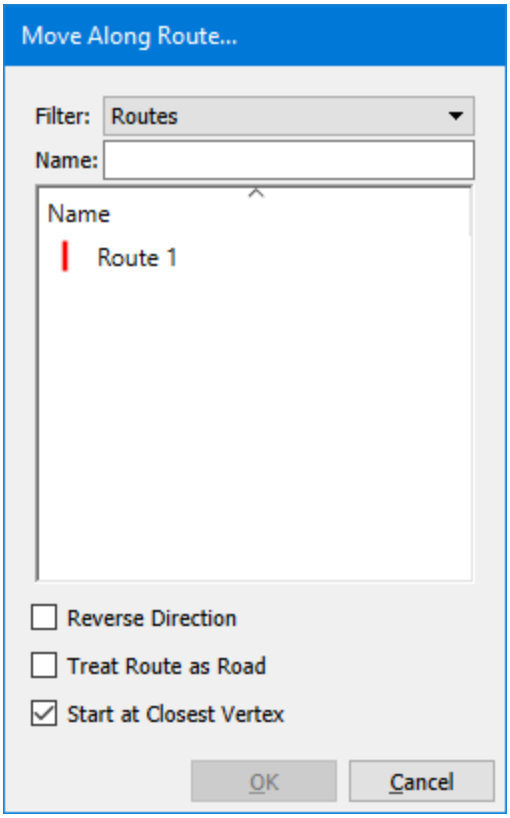
1. Select M2 1.
2. Choose **Objects > Plan**. The Plan dialog box opens (Figure 26 on page 34).

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).

Figure 23. Move Along Route dialog box



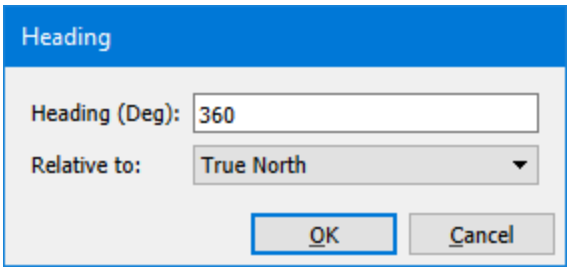
4. In the window, select Route 1.
5. Select the Treat Route as Road check box.

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.

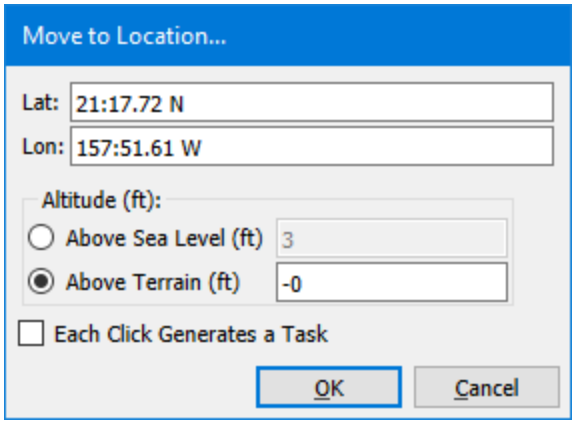
6. Click OK. The task is added to the plan.
7. In the Plan window, choose **Set > Position > Heading**. The Heading dialog box opens.

Figure 24. Heading dialog box



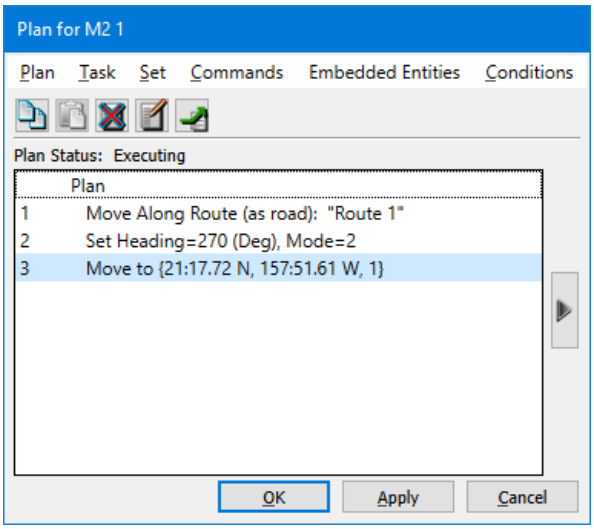
8. Delete any numbers you find in the Heading text box, then type 270.
9. In the Relative to list, select Current Heading. (This essentially turns the Bradley 90 degrees counter clockwise.)
10. Click OK. The set data request is added to the plan.
11. In the Plan window, click **Task > Movement > Move 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 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 view.

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



2.4.1 Create an Entity

1. Click the Simulation Objects 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



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-69 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 Simulation Objects Palette, change the force to Opposing (red button).
9. Select the GAZ-69 vehicle. The cursor changes to show the correct model.
10. Move the cursor so that the model is at the road intersection.
11. Hold down the **SHIFT** key and the left mouse button and move the mouse to rotate the vehicle model until it is aligned with the street, facing towards where the Bradley will be driving.
12. Click to place the entity (Figure 31).

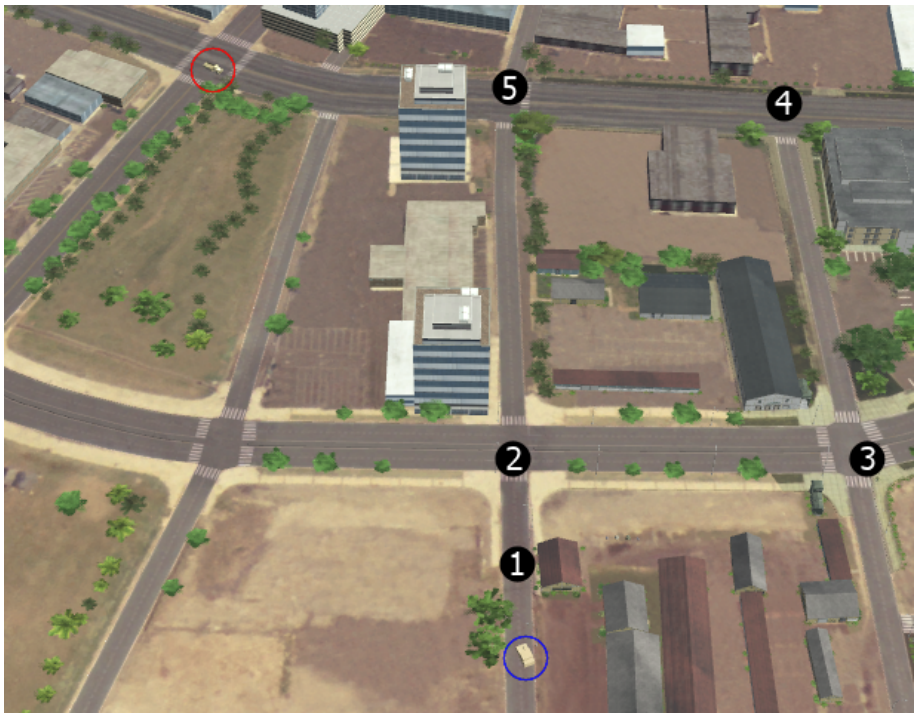
Figure 31. M2A2 and GAZ-69



2.4.2 Create a Control Object

1. Click on the map in front of the Bradley (callout 1).

Figure 32. Vertex locations



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

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

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 41.



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:

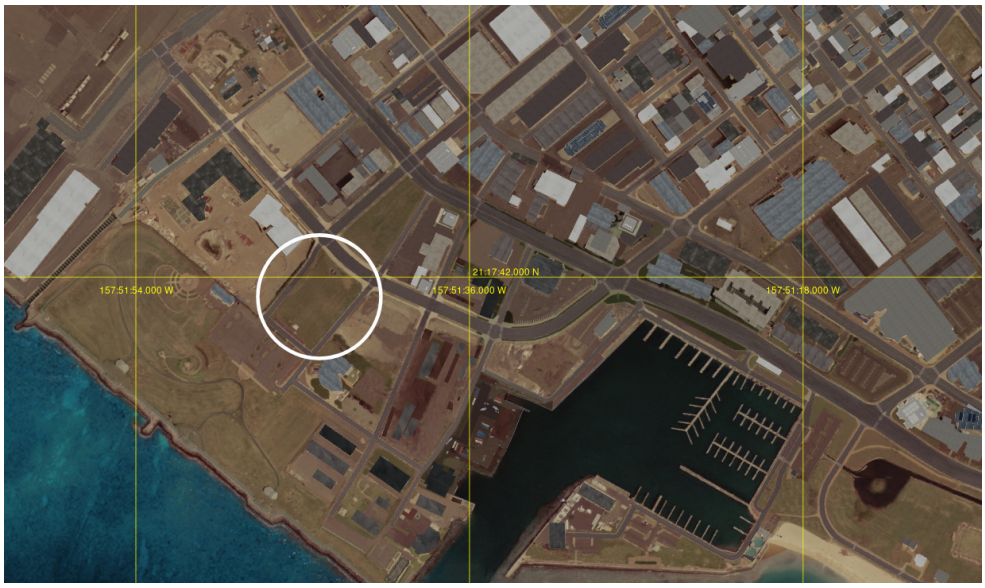
- Create a crowd.
- Create a unit.
- Write a plan that uses triggers.
- Embark entities on a vehicle.
- Create a tactical graphic whose points are elevated.

A version of this scenario is included with VR-Forces. It is *./userData/scenarios/FirstExperience/first_experience_advanced.scnx*. A set of video tutorials that match the text in this chapter are available at www.mak.com/support/tutorials. (The video was created using VR-Forces 4.6 and uses a Chevy Tahoe entity instead of the Off-Road SUV entity that you will create in this version of VR-Forces.)

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



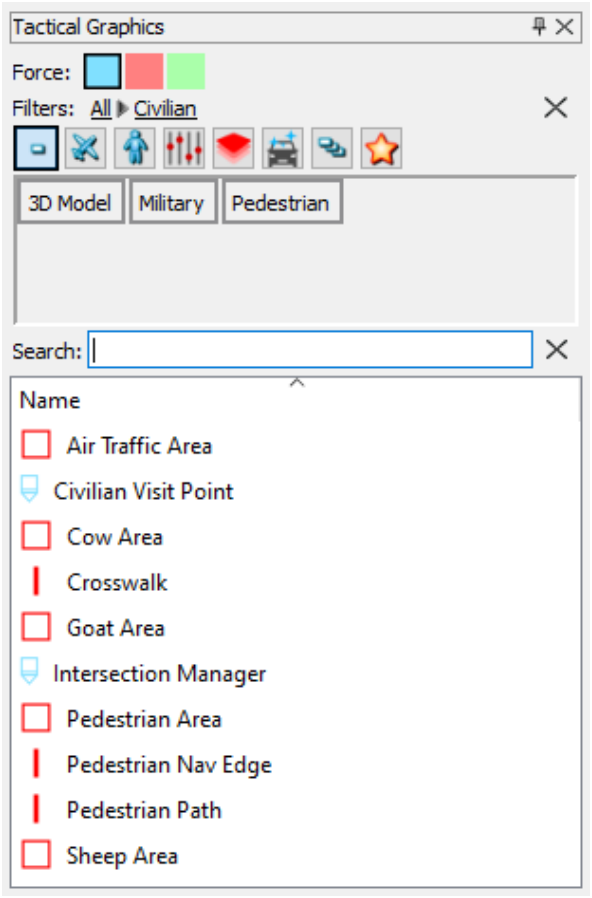
3.2. Create the Crowd

VR-Forces has two ways to create crowds. You can create a crowd unit from the Simulation Objects Palette, or you can create a Pedestrian Area. 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:**

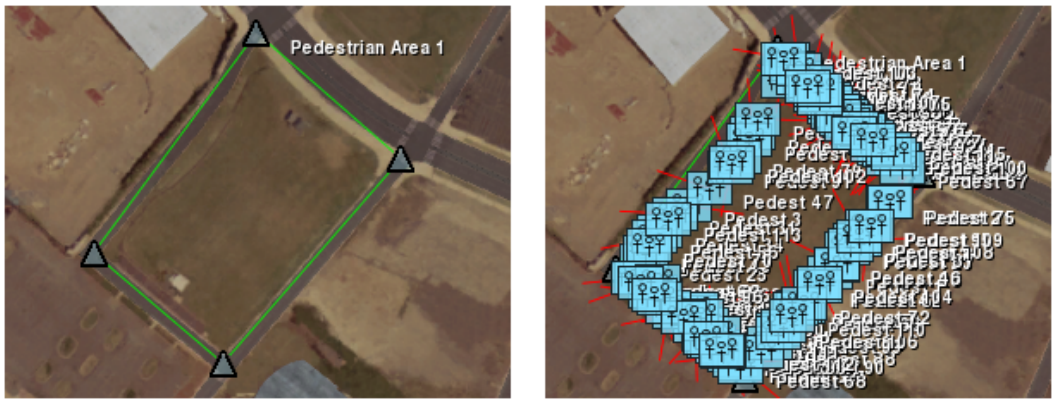
1. Click the Tactical Graphics Palette.
2. Make sure the Force is set to Friendly (blue).
3. In the Tags area, click Civilian (Figure 34).

Figure 34. Tactical graphics tags



4. In the list of tactical graphics, 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.
9. Open the Simulation Objects Palette.
10. Click the Human tag button ( ).
11. In the Tags window, click Emergency.
12. In the list, select Police Officer.
13. 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.)
14. Save the scenario.

3.3. Create the Terrorists

The terrorists start out in a dockyard area. We create three terrorists and aggregate them into a unit. This will allow 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.

After you finish creating the scenario and start to run it, you might find that some insurgents walk through the car to get to 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:**

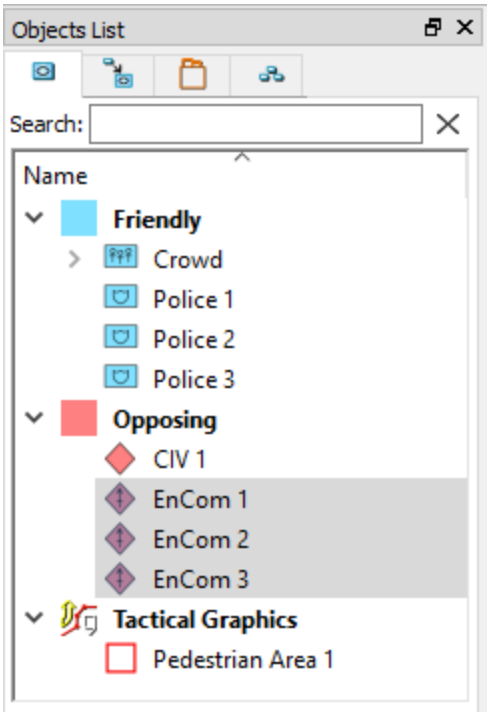
1. Drag the terrain a bit to the southeast so that you can see the dockyard area (Figure 36).

Figure 36. Dockyard



2. Zoom in on this location.
3. On the Simulation Objects 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 Simulation Objects Palette, select the Human button ( ). The palette remembers the last set of tags you used, so it reverts to Human > Emergency.
9. Click the X on the Filters line 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 SQD - No Leader. (Although this is not 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 Simulation Objects 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 SQD - 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 two tactical graphics, a route for the helicopter to follow and a waypoint specifying where it should land.

➤ **To create the waypoint:**

1. Choose **View > Observer Views Panel**. The Observer Views Panel is added to the panels on the left side of the VR-Forces window. The panel shows 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. 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 a waypoint someplace in the area defined by the circle in Figure 39. (Choose **Create > Waypoint**. Then click on the terrain. Right-click to exit creation mode.)

In VR-Forces, rotary-wing aircraft have some ability to look ahead and avoid terrain. In theory we could just 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. Click the Simulation Objects overlay button 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 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.

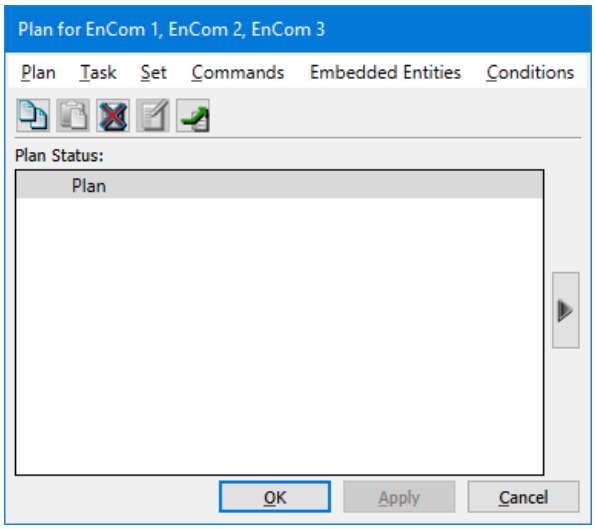
In creating these plans, we take advantage of a VR-Forces feature that allows you to create plans for multiple simulation objects at the same time.

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:**

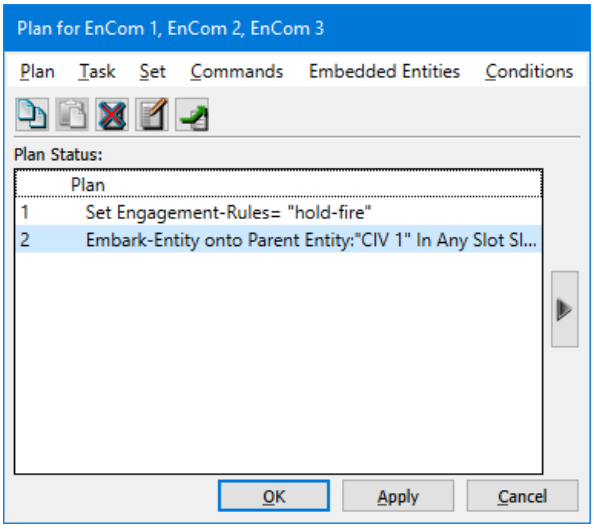
1. In the Objects List Panel or on the map, select the three terrorist entities.
2. Choose **Objects > Plan**. The Plan dialog box opens (Figure 42). (As in many other programs, there are many ways to do common tasks, such as opening the Plan dialog box. As we write the plans for this scenario, we will 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

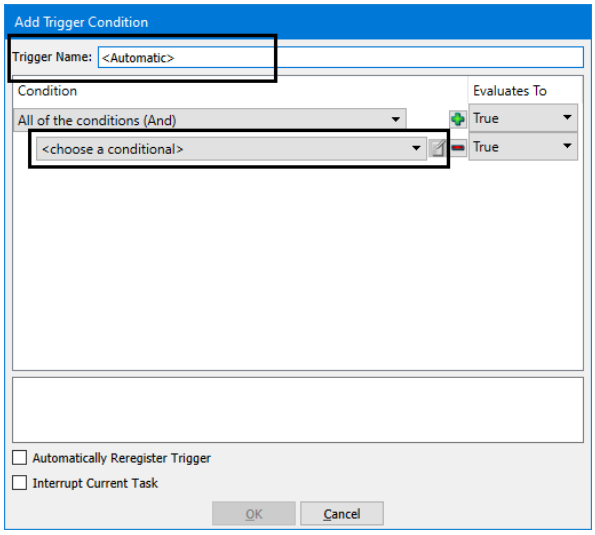


9. In the Plan window, click OK.
10. Save the scenario. (We will not tell you to save the scenario after every plan is written, but it is a good idea to save frequently.)

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

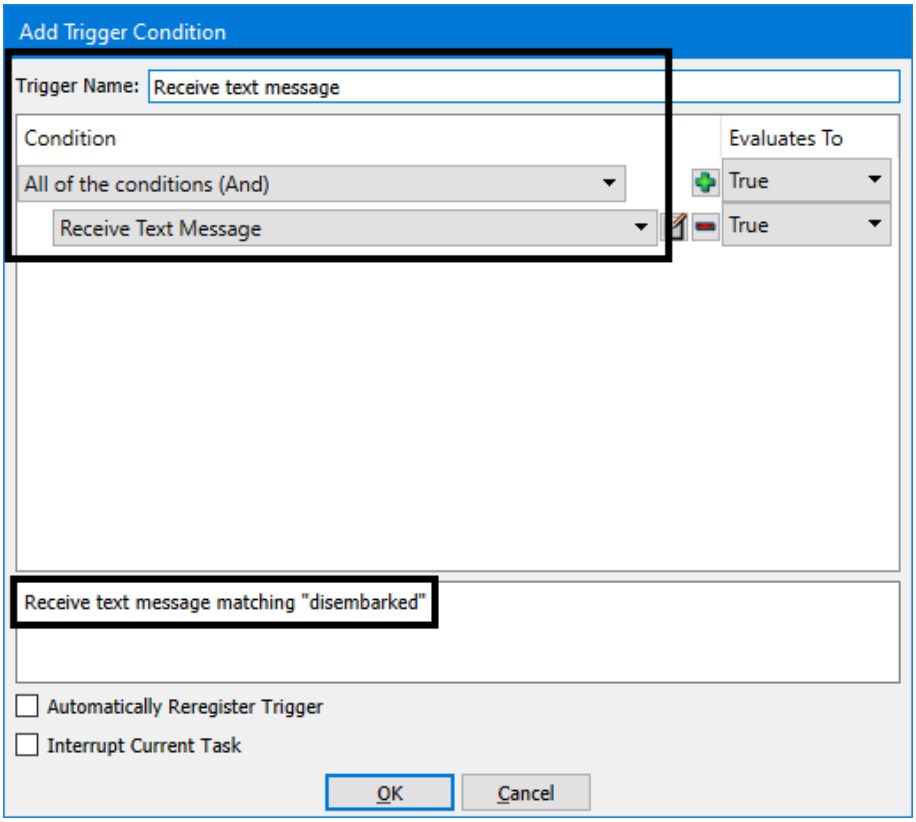
1. In the Objects List Panel, select Inf SQD 1.
2. On the Last Selected Object Panel, click the Has Plan button (). The Plan dialog box opens (Figure 42). (The Last Selected Object Panel is one of the panels on the left side of the VR-Forces window.)
3. Choose **Conditions > Add Trigger**. The Add Trigger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

Figure 44. Add Trigger Condition dialog box



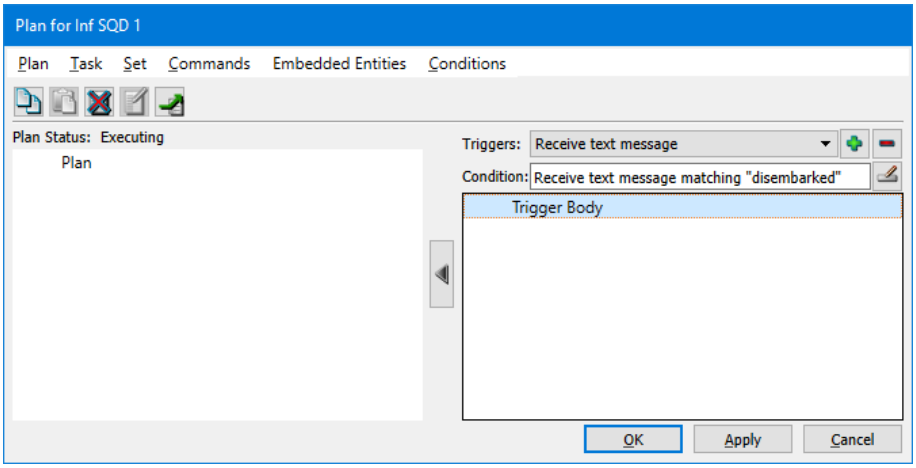
4. In the Trigger Name box, delete the default value and type `Receive text message`. Providing a name is optional. However, giving triggers short, descriptive names makes them easier to use. The default naming convention is a potentially lengthy text string with the syntax of the condition.
5. In the 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 window expands to show a panel that lists the trigger's name, the condition it tests for, and the body of the trigger (Figure 46).

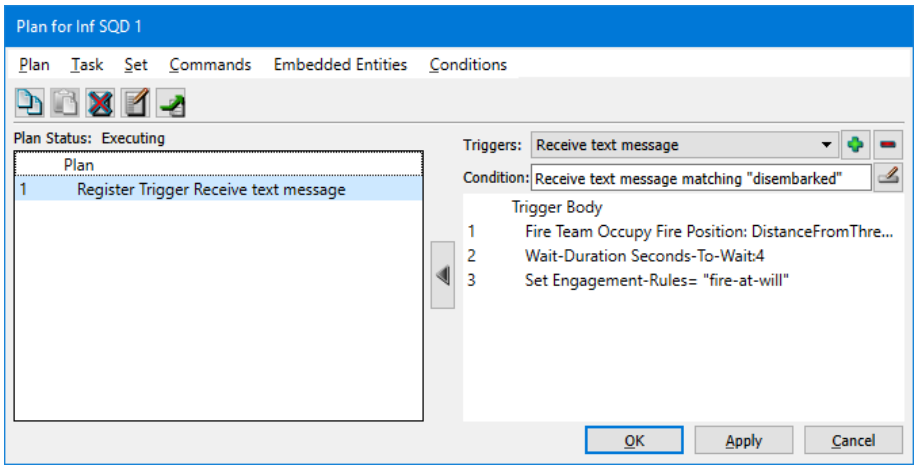
Figure 46. Plan window with Trigger pane



9. In the Trigger Body window, select the text Trigger Body.

10. Choose **Task > Movement > Fire Team Occupy Fire Position**. The Fire Team Occupy Fire Position dialog box opens.
11. In the Threat window, 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.
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. Click OK.
14. Choose **Task > Wait > Wait Duration.**. The Wait Duration dialog box opens.
15. Set the duration to 4 seconds.
16. Click OK.
17. Choose **Set > Engagement > Rules of Engagement**. The Rules Of Engagement dialog box opens.
18. In the list, select Fire at Will.
19. Click OK.
20. In the window on the left side of the Plan dialog box, select the word Plan.
21. Choose **Conditions > Register Trigger**. The Register Trigger dialog box opens.
22. In the Trigger list, select Receive text message.
23. Click OK. The plan is complete. It should look like Figure 47.

Figure 47. Terrorist unit plan



24. 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.

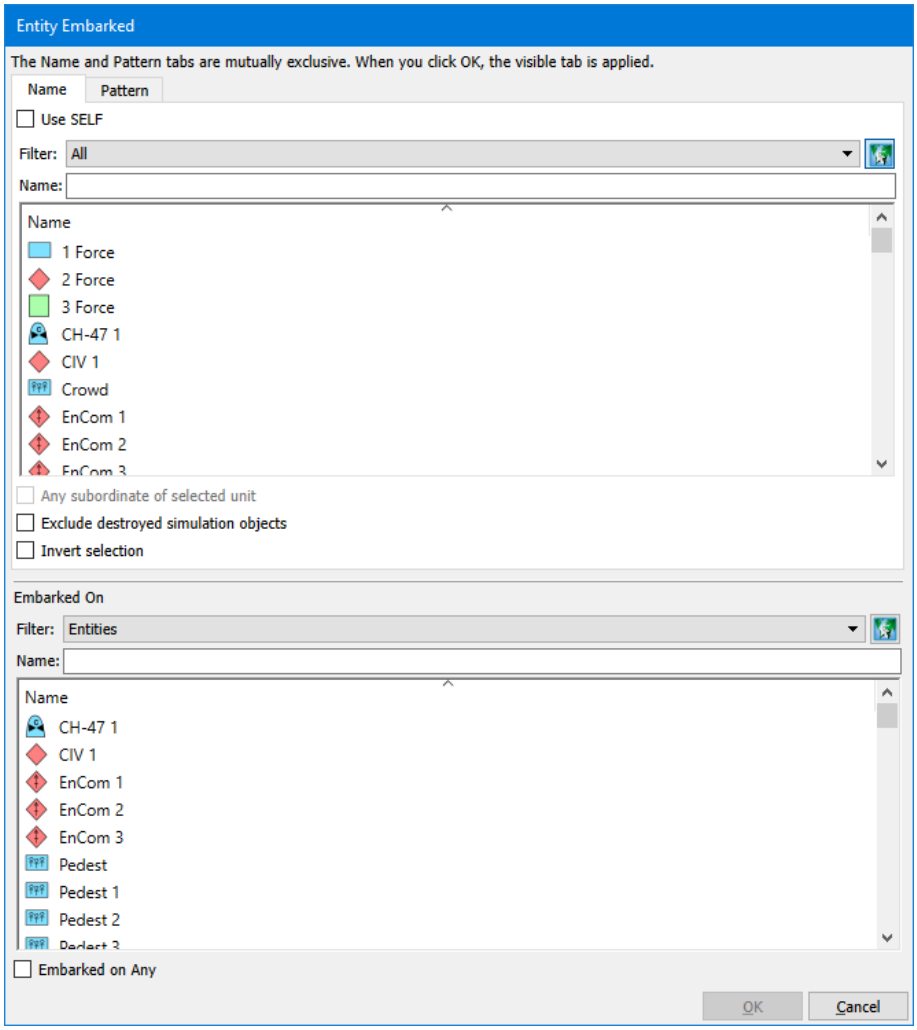
There is a timing issue for the SUV. It cannot start driving until the terrorists are embarked on it. So we need to put its tasks inside a trigger. This trigger checks for when the terrorists are embarked. Then the SUV starts executing its tasks.

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:**

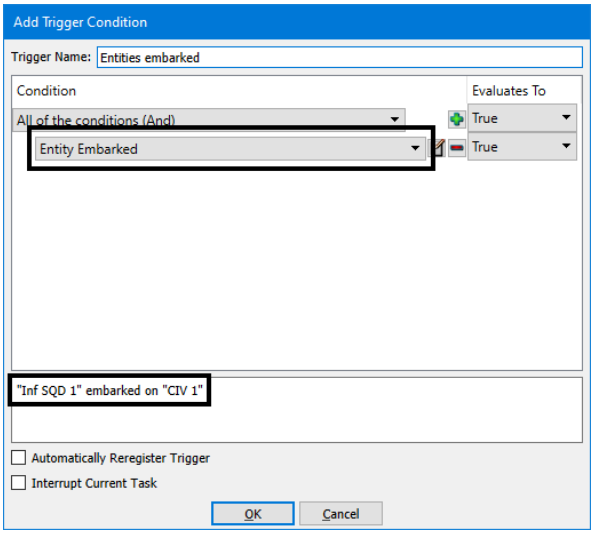
1. Select the SUV.
2. Press **p**. The Plan dialog box opens (Figure 42 on page 51).
3. Choose **Conditions > Add Trigger**. The Add Trigger Condition dialog box opens (Figure 44 on page 53).
4. In the Trigger Name box, delete the default text and type `Entities embarked`.
5. In the Condition window, 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



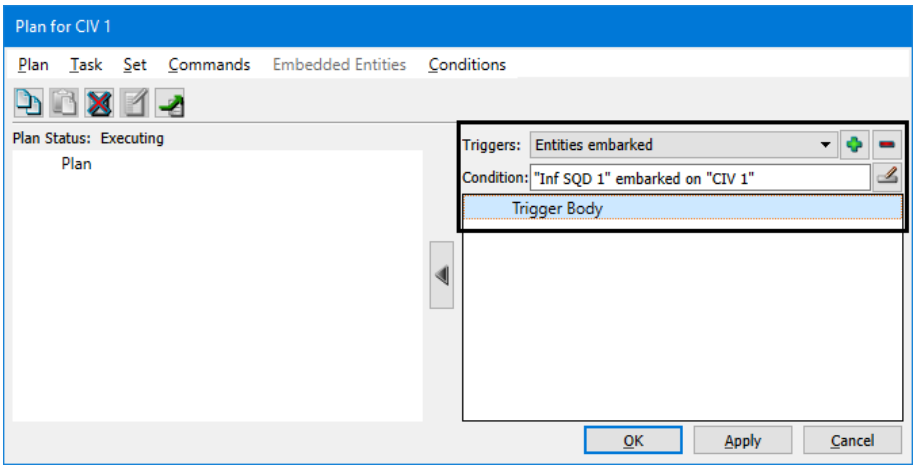
7. In the top window, select Inf SQD 1 (the terrorist unit).
8. In the Embarked On window, select CIV 1.
9. Click OK. The condition is added to the Add Trigger Condition window (Figure 49).

Figure 49. Completed condition



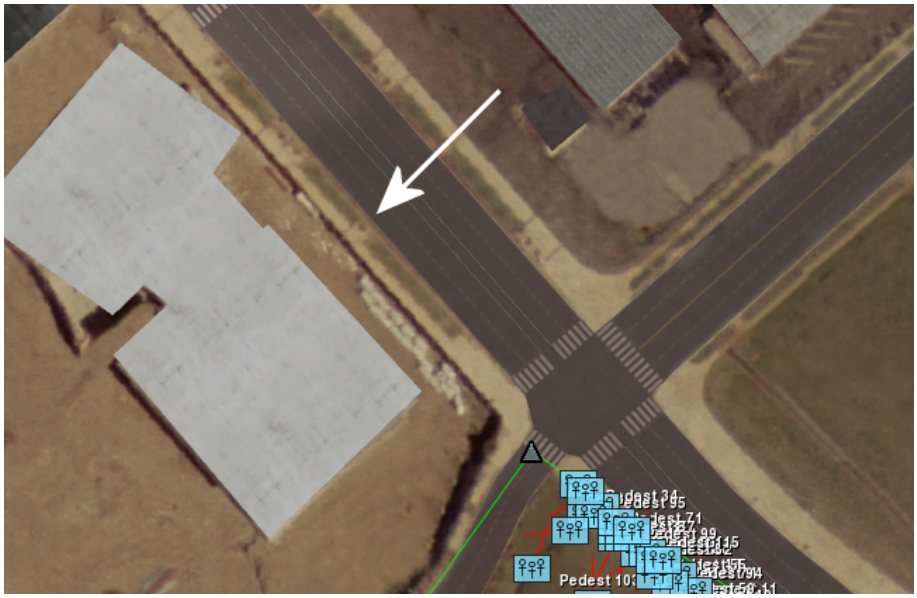
10. Click OK. The condition is complete. The Plan window expands to show the trigger pane (Figure 50).

Figure 50. New trigger



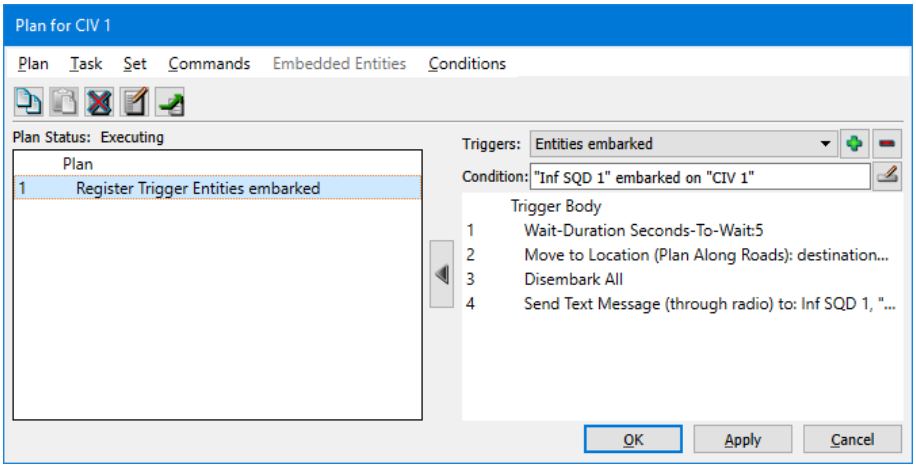
11. In the VR-Forces window, zoom in on the area just to the north and west of the park, as shown in Figure 51.

Figure 51. SUV destination



12. In the Plan dialog box, select the line that reads Trigger Body in the Trigger pane of the dialog box.
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 plan.
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 top line in the window (the word Plan).
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 get 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.

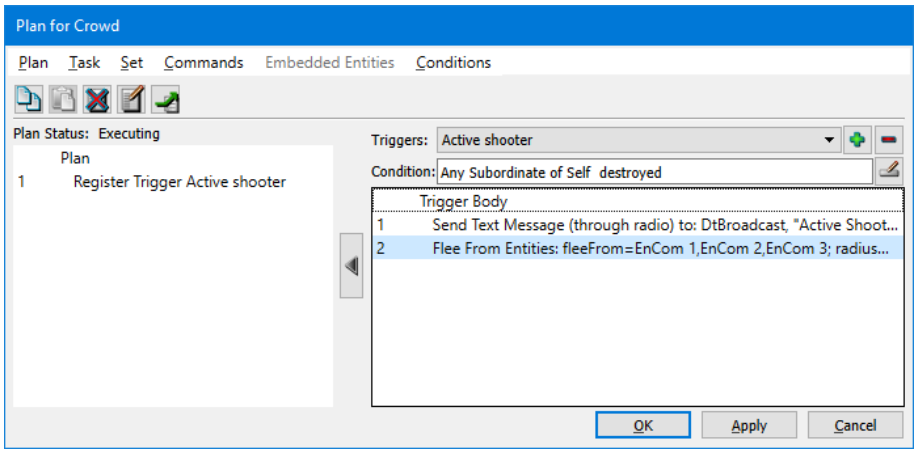
Since this activity does not start until someone is killed, we need to use a trigger. Since you have already learned how to create a trigger, we will streamline the instructions a bit.

➤ **To write the plan for the crowd:**

1. In the Objects List Panel, select the Crowd object.
2. Open a Plan dialog box.
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 little 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 pane.
12. In the Trigger Pane, select Trigger Body.
13. Choose **Task > Radio > Send Text Message**. The Send Text dialog box opens.
14. Select the Broadcast check box. This means the message is sent to everyone in Blue Force.
15. In the Message Text box, type `Active Shooter`.
16. Click OK. The task is added to the trigger body.
17. Choose **Task > Movement > Flee From Entities**. The Flee From Entities dialog box opens.
18. In the Flee From list, select EnCom 1, Encom 2, and Encom 3. (Hold down the **Ctrl** key to multiselect.) We want to select all of the terrorists because entities stop fleeing if the threat is killed. If we just select one threat and it is killed before the others do, the crowd members will stop fleeing, but will still be vulnerable to the other terrorists.
19. Change the Radius to 300.
20. Click OK. The plan is complete. It should look like Figure 53.

Figure 53. Crowd plan



21. Click OK.

3.6.4 Write the Plans for the Police

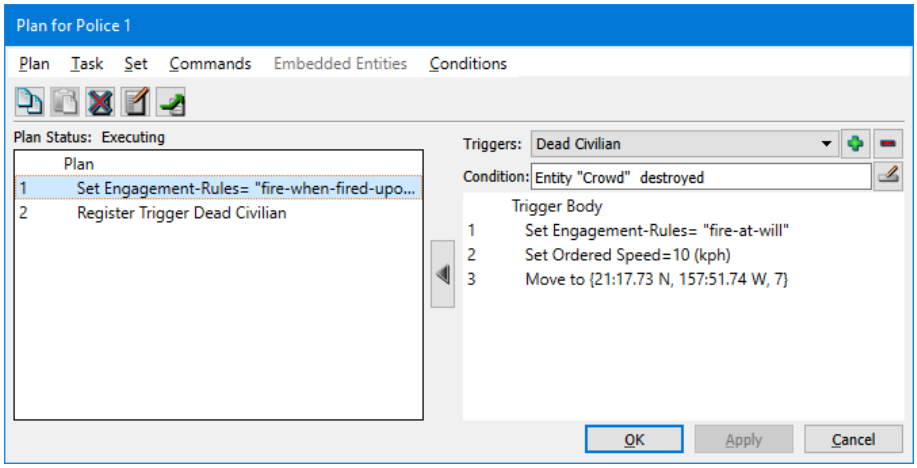
The police have simple plans. When the terrorists start firing, they run to the corner of the park to return fire. As with the previous plans, this requires a trigger. The plan for each officer is very similar. The only difference is where they each run. We will create a plan for one officer, then copy 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 blank.
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 shoot from. (You might want to zoom in to see the corner more clearly.)
18. Click OK.
19. If you created the trigger by selecting Add Trigger, you must register it. Select the Set Engagement Rules line in the plan window.
20. Choose **Conditions > Register Trigger**. The Register Trigger dialog box opens.
21. Select the trigger that you created.
22. Click OK. The plan is complete. It should look like Figure 54.

Figure 54. Plan for Police 1



23. In the Plan window, select the line that says Plan.
24. Click the Copy button ( ).
25. Click OK to close the plan.
26. Select Police 2.
27. Open the Plan dialog box for Police 2.
28. Click the Paste button ( ). The plan from Police 1 is pasted into Police 2's plan.
29. Click the right facing arrow on the right side of the Plan window. The Trigger pane opens.
30. In the trigger body window, double-click the Move to task. The Move To Location dialog box opens.
31. Click on the map on the location where you want Police 2 to run.
32. Click OK.
33. Click OK to close the Plan dialog box.
34. Select Police 3.
35. 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.
36. 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 when the SWAT team embarks:

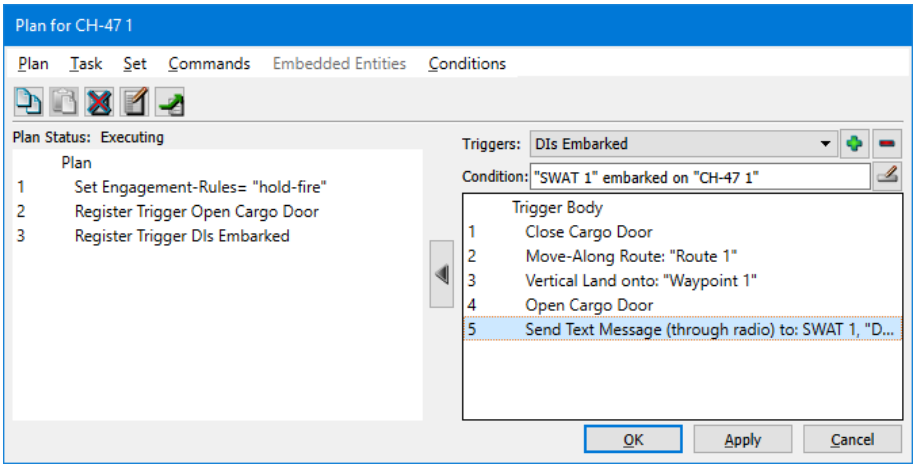
1. Close the cargo door.
2. Follow the route to the park.

3. Land at the waypoint.
4. Open the cargo door.
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 the following tasks:
   - **Task > Cargo Door > Close Cargo Door**.
   - **Task > Movement > Move Along Route**. Specify Route 1.
   - **Task > Movement > Rotary Wing Land**. Specify Waypoint 1 as the landing location.
   - **Task > Cargo Door > Open Cargo Door**.
   - **Task > Radio > Send Text Message**. Send the message `Disembark now` to SWAT 1.
10. Register the two triggers in the plan. 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

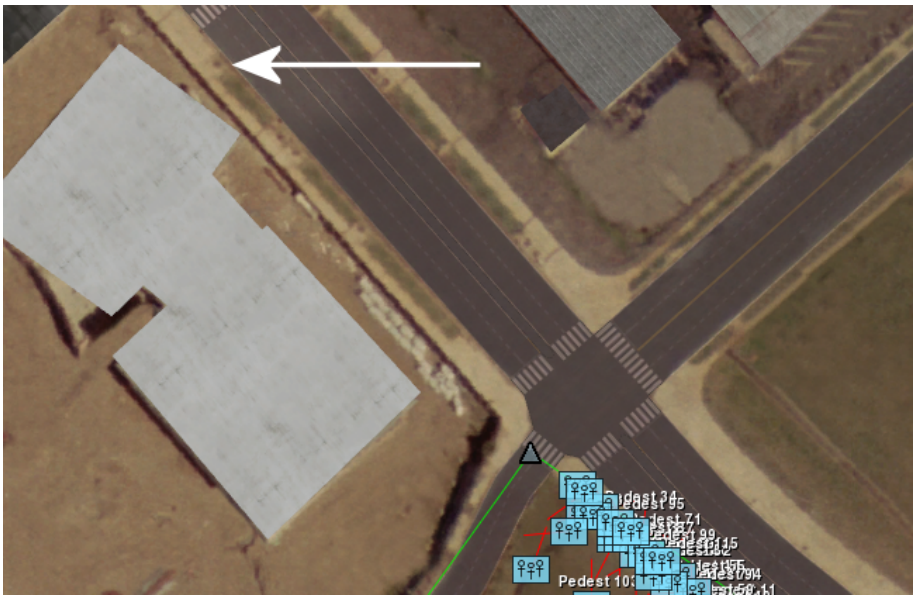
When the SWAT team receives the broadcast message from the Crowd that there is an active shooter, it embarks onto the helicopter. When it receives a message from the helicopter to disembark, it disembarks, sets its rules of engagement to Fire At Will, and moves to a location where the terrorists are 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 km/h.
14. Click OK.
15. In the Trigger Body, add an Embark task onto CH-47 1.
16. In the main Plan window, register the trigger.
17. Create another new trigger.
18. Name the trigger `Disembark from Copter`.
19. For the condition, choose Receive Text Message.
20. The message to receive is `Disembark now`.
21. Select the Trigger Body.
22. Choose **Task > Embarkation > Disembark**.
23. Set the Ordered Speed to 10 km/h.
24. Set the rules of engagement to Fire at Will.
25. Choose **Task > Movement > Move to Location**. The Move to Location dialog box opens.
26. 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

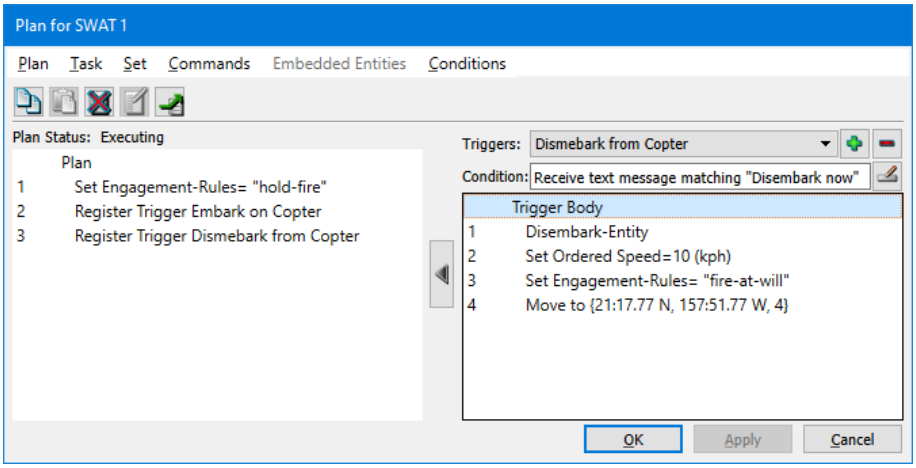
enough for the tail to be close to this area, especially if the leader gets killed by the terrorists.

Figure 56. SWAT team destination



27. Click OK.
28. Register the trigger. The Plan is complete. It should look like Figure 57.

Figure 57. SWAT team plan



29. Click OK to close the plan.
30. 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. The finished scenario, first_experience_aggregate_example, is distributed with VR-Forces (*./userData/scenarios/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 *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.

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.

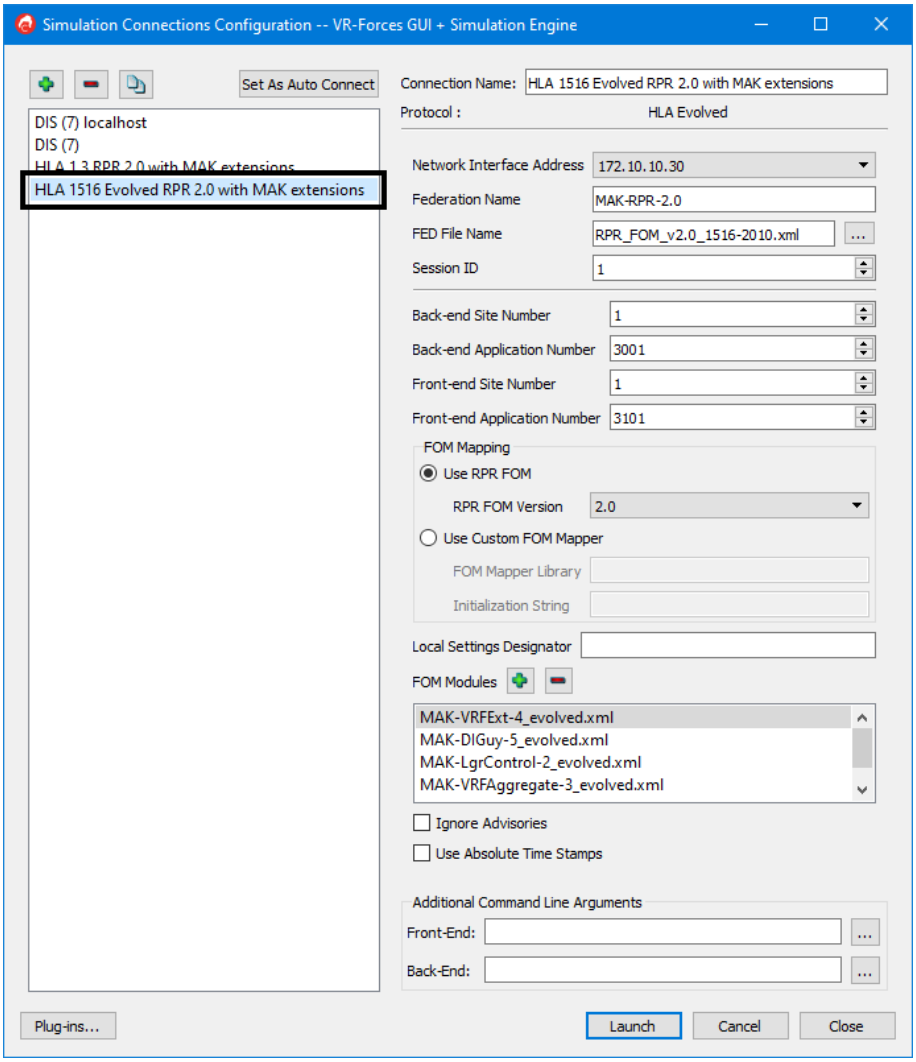
4.1. Create the Scenario

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.

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 GUI + Simulation Engine (64 bit)**.

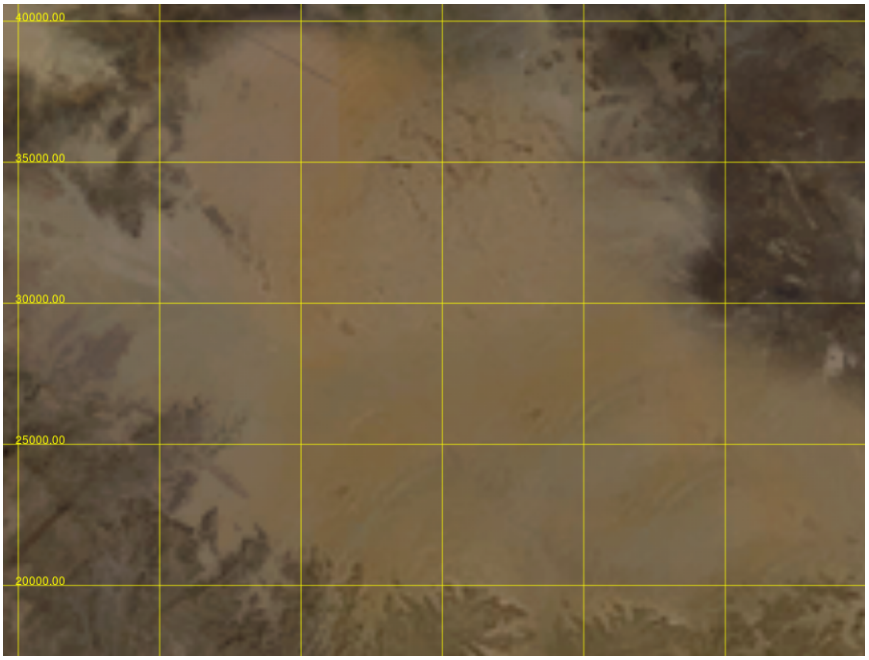
   The Simulation Connections Configuration dialog box opens (Figure 58).
3. In the Simulation Connections Configuration dialog box, select HLA1516 Evolved RPR 2.0 with MAK extensions (Figure 58).

Figure 58. Simulation Connections Configuration dialog box



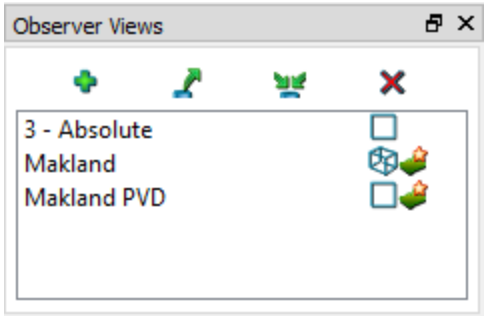
4. Click Launch. VR-Forces starts up. (If you are using the MAK RTI, the Choose RTI Connection dialog box opens. Select the rtiexec connection that you want to use. If you are not using the MAK RTI, you must connect to your RTI as described in its documentation.) The Scenario Startup window opens.
5. Select New Scenario.
6. In the Simulation Model Set list, select AggregateLevel.
7. In the Terrain list, select Makland.
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 shown in Figure 59.

Figure 59. Makland



10. Choose **View > Observer Views Panel**. The Observer Views Panel is added to the left side of the window.
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 will change 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.
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 Simulation Objects tab.
2. Click the Friendly Force button (blue button).
3. On the row of filter buttons, click the All button. In the Tags 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

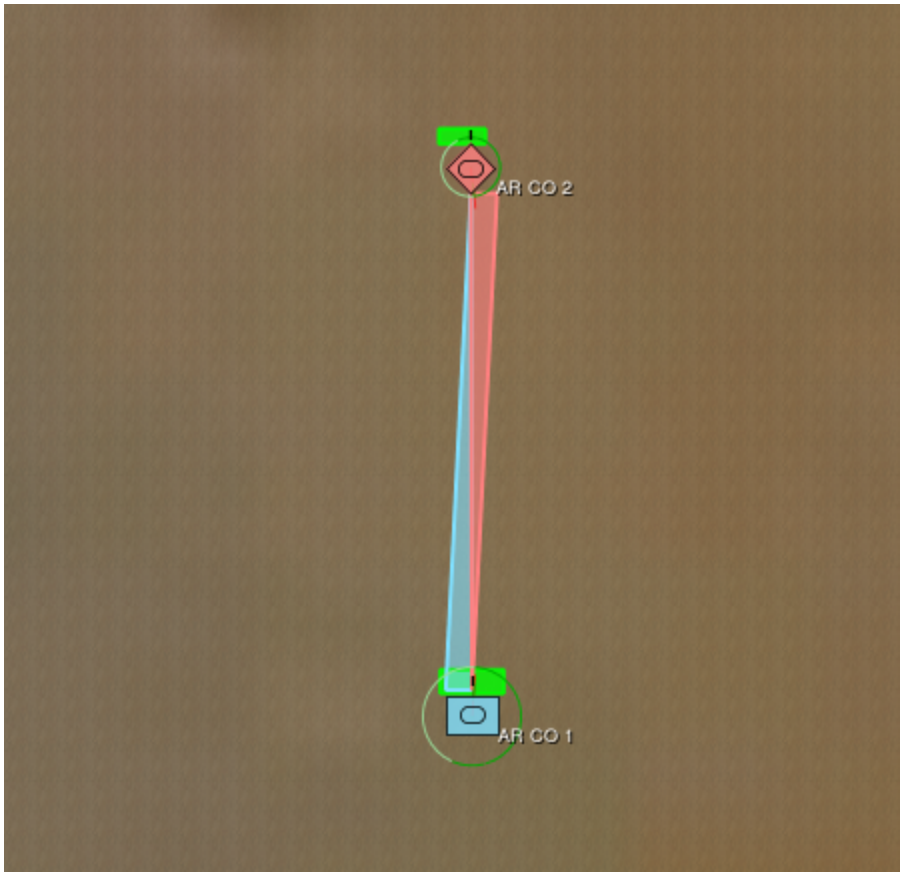


6. In the Simulation Objects Palette, change the Force to Opposing (red button).
7. Add a Tank CO RU north of AR CO 1. A unit gets added named AR CO 2. Notice that in addition to its icon, each unit has a health status bar.
8. Open the Plan window for each unit.
9. Give AR CO 1 a Move to Location task 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

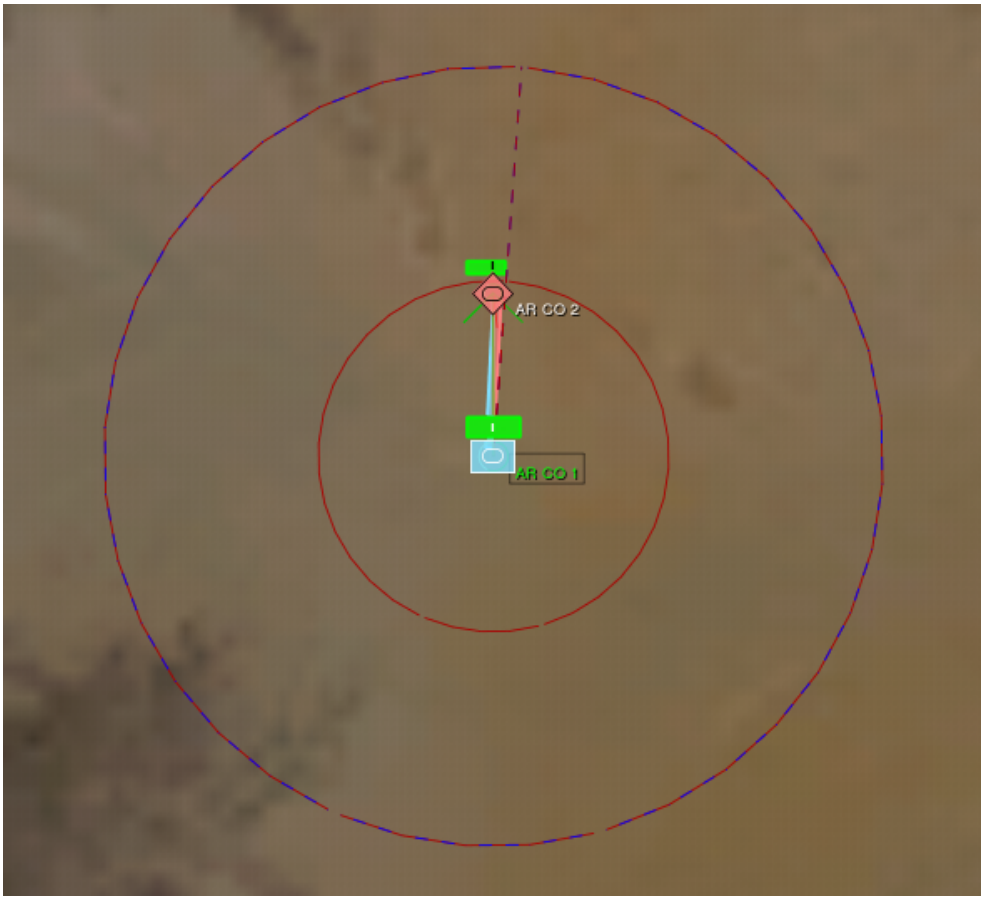
Run the scenario. As it progresses, the units approach each other. When they detect each other, they engage in combat, shown by the attack indicators (Figure 62). Zoom in to get a better look.

Figure 62. Attack indicators



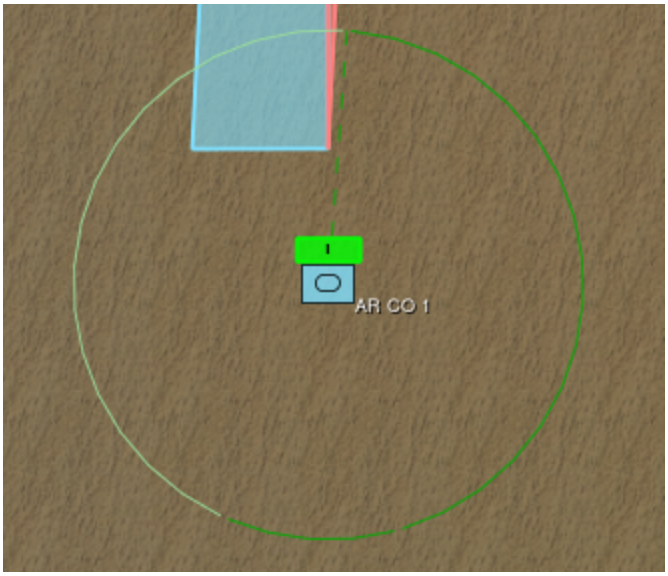
Select AR CO 1. VR-Forces displays range rings that show the extent of its sensors and weapons (Figure 63). (Simulation objects in entity-level scenarios also display range rings.)

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

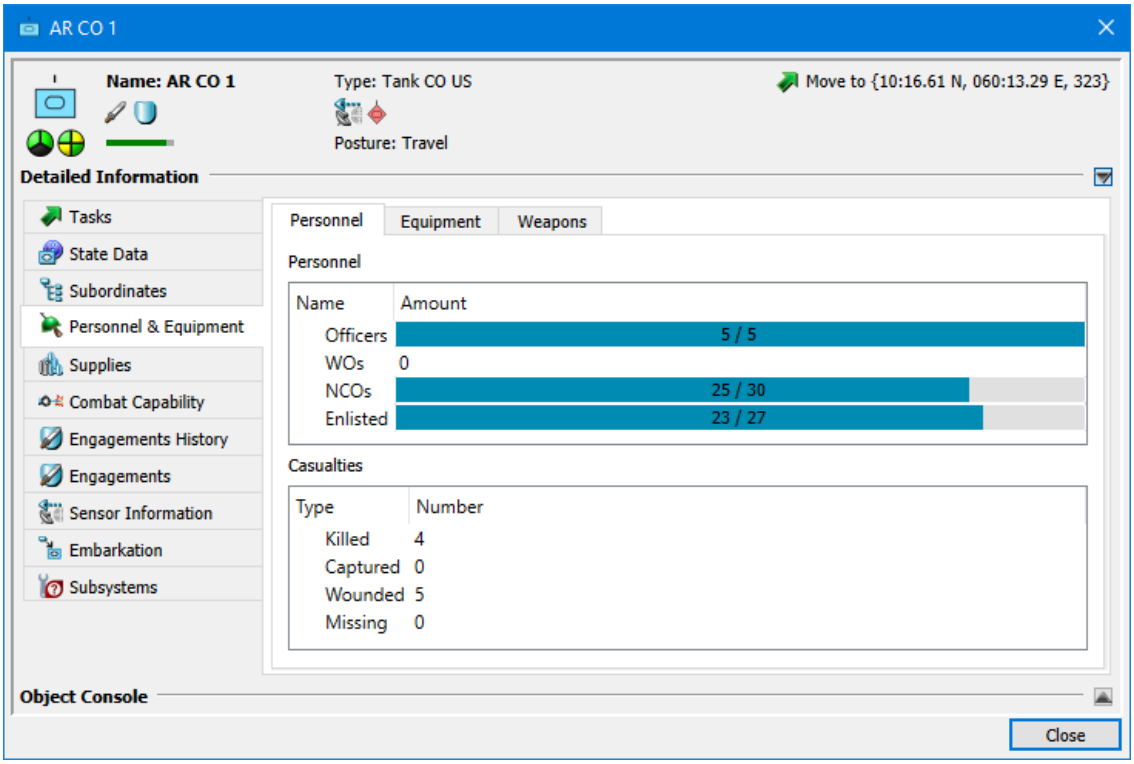


Select AR CO 2. Press **i** to display its Information dialog box (Figure 65). The dialog box has the same layout as the dialog box used for entity-level simulation objects. The summary section at the top has information that is not provided for entity-level simulation objects. This includes gumball charts and a health indicator (the green bar next to the gumball charts). Notice that in this figure the green bar is at about 90%, because AR CO 2 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 *VR-Forces Users Guide*. For a description of gumball charts, please see "Information Dialog Boxes for Aggregate-Level Scenarios", in *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 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.

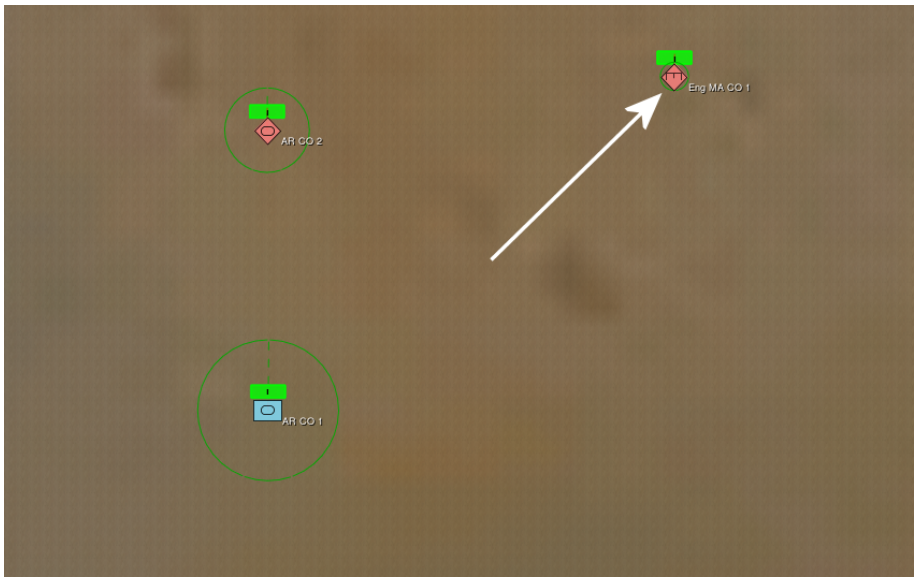
You can add CEOs to a scenario as you would tactical graphics, by drawing them on the terrain, or they can be created as part of the simulation by units that have the resources to create them.

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*.

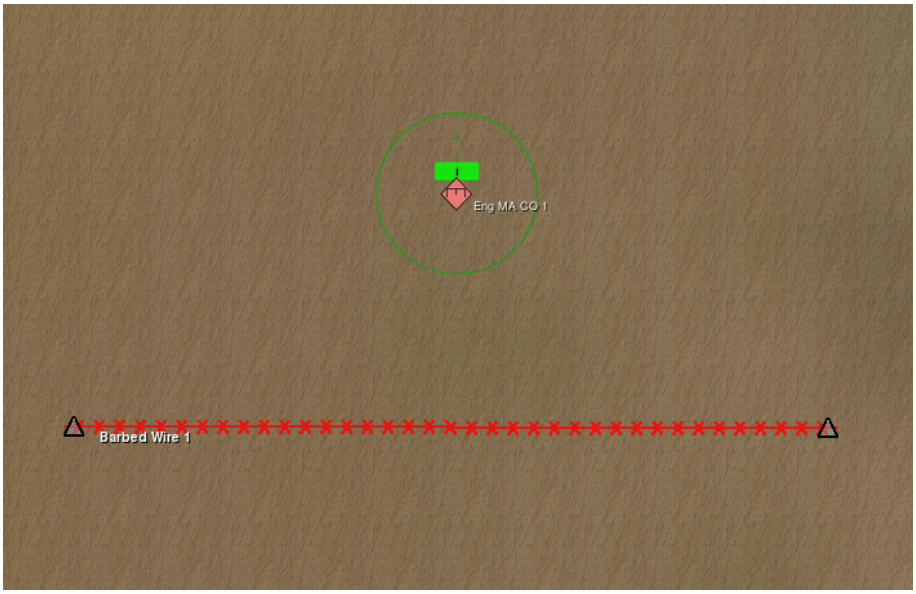
1. If the scenario is running, pause it (**Simulation > Pause Scenario**) and rewind it (**Simulation > Rewind to Scenario Start**).
2. Click the saved view to reset the extents of the terrain.
3. On the Simulation Objects palette, set the force to Opposing, click the X to clear the Tank filter, and 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 Tactical Graphics palette.
7. Filter the palette to show Engineering Objects.
8. Select Barbed Wire.
9. Draw a line as shown in Figure 67.

Figure 67. Barbed wire



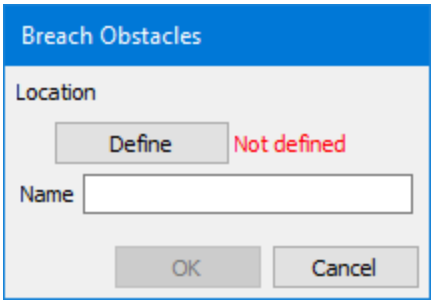
10. Save the scenario.

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.

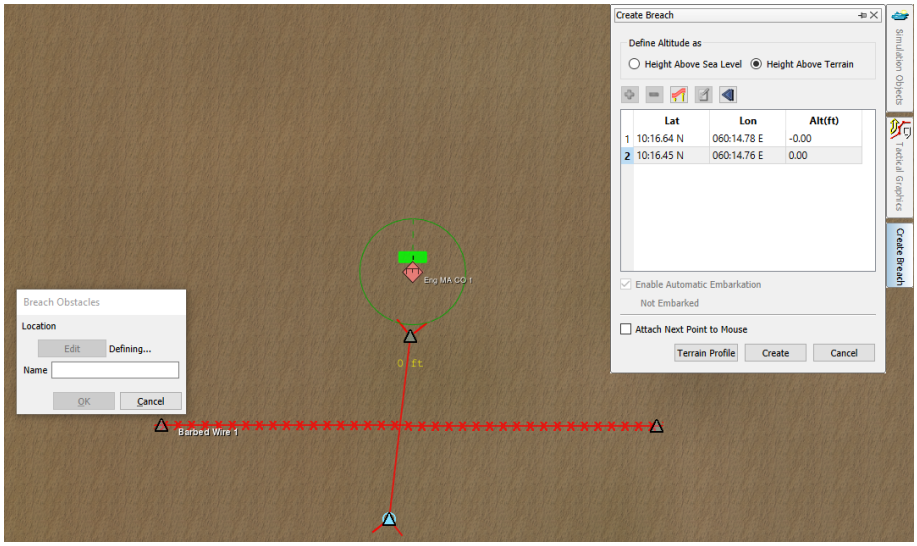
1. Open the Plan window for the engineering company and move it to the side so you can see the company and the barbed wire obstacle.
2. Choose **Task > Combat Engineering > Breach Obstacles**. The Breach Obstacles dialog box opens (Figure 68). If necessary, move the dialog box to the side too.

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



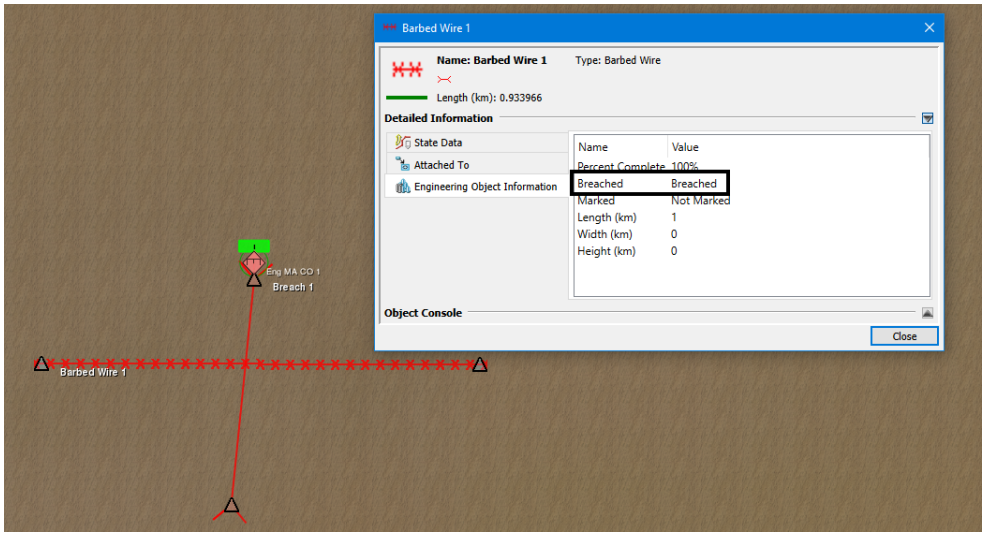
5. Click OK. The task is added to the plan.
6. In the Plan window, click OK.
7. Save the scenario.
8. Run the scenario.

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

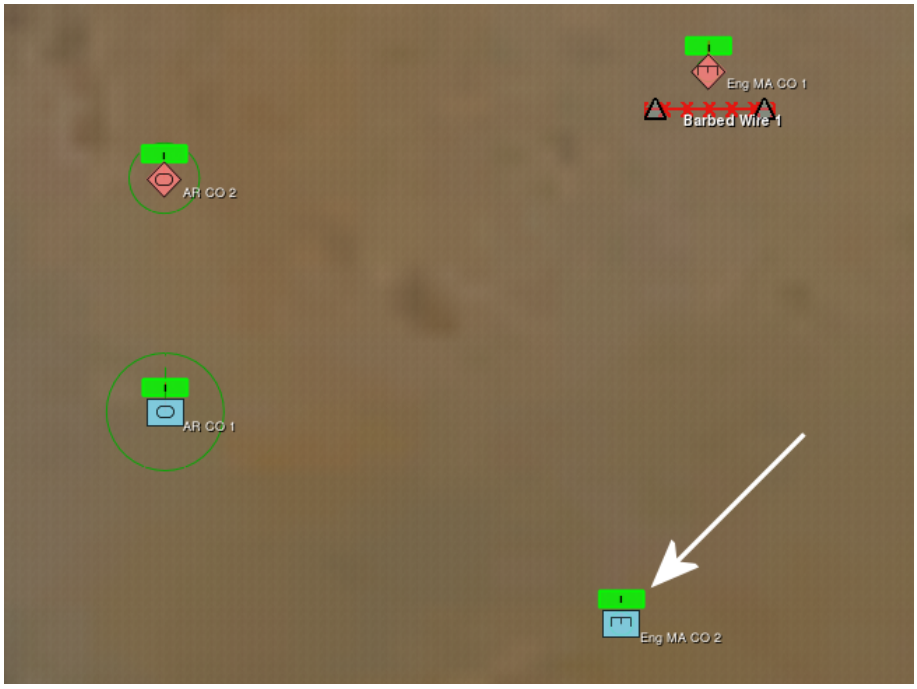


4.3.2 Simulating Creation of a Combat Engineering Object

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.

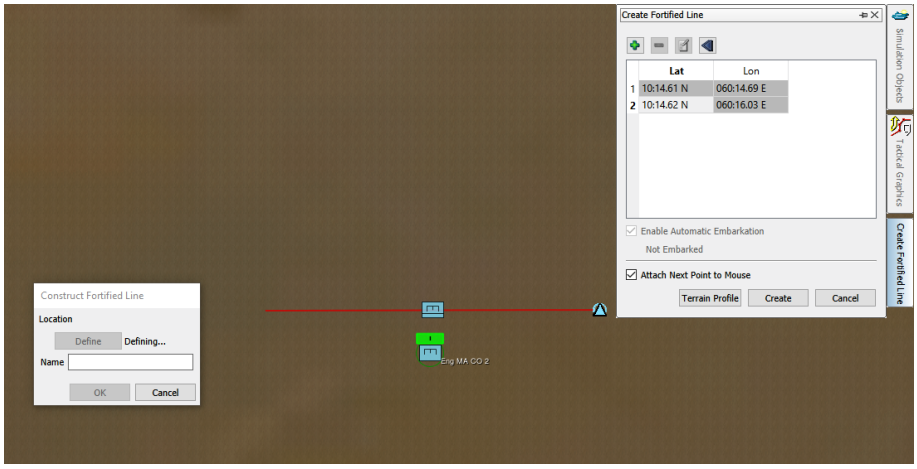
1. If the scenario is running, pause it and rewind it.
2. Click the saved observer view to get back to the starting view.
3. On the Simulation Objects palette, set the force to Friendly and select Eng Mob Aug CO.
4. Place the engineering company as shown in Figure 71.

Figure 71. Eng Mob Aug CO



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

Figure 72. Fortified line



10. Click Create.

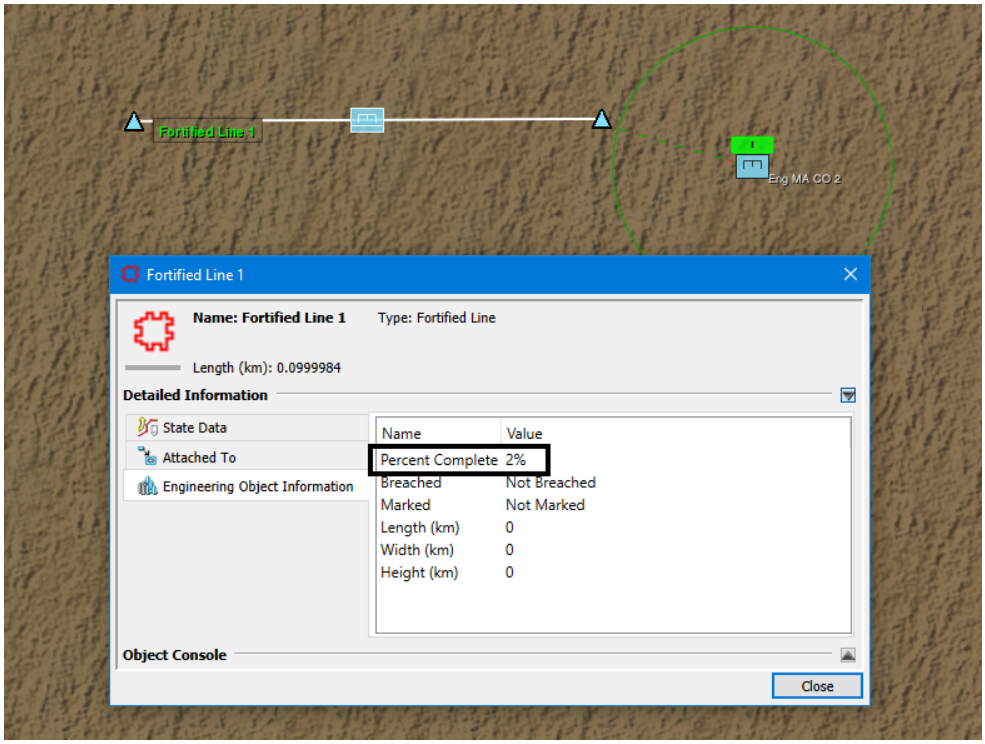
11. Click OK.
12. In the Plan window, click OK.
13. Save the scenario.
14. Run the scenario.

The engineering company moves towards the location of the fortified line that it is supposed to construct. A line 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 20 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 for the unit decreases.

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



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.

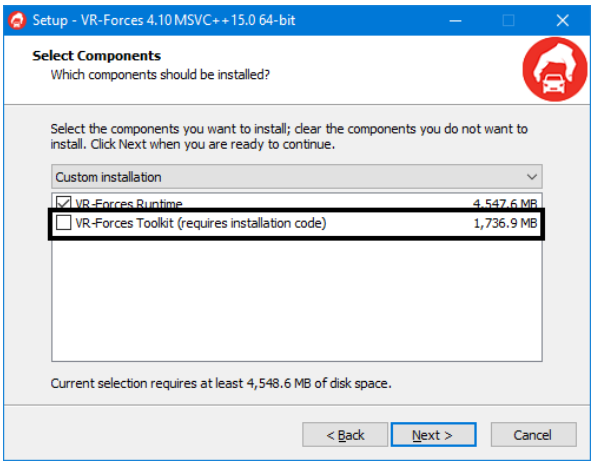
5.1. Install VR-Forces

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:**

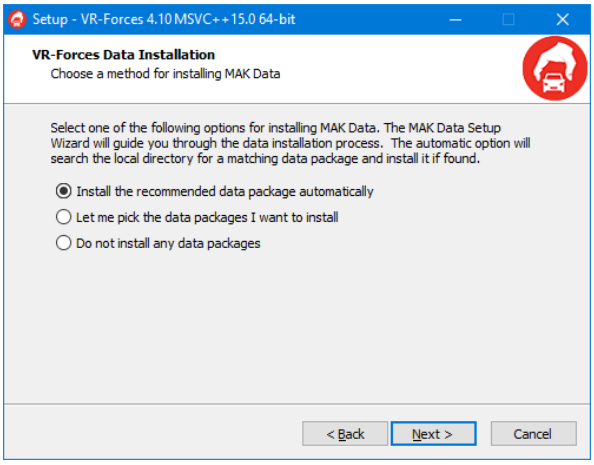
1. Run the application installer. On the Select Components page (Figure 74), clear the VR-Forces Toolkit check box. You do not need the toolkit for the exercises in this guide.

Figure 74. VR-Forces installation wizard



2. When you are prompted to choose an option for installing the data package (Figure 75), select the default — "Install the recommended data package automatically".

Figure 75. Data installer selection page



3. Continue with the installation wizard. The installer installs both the VR-Forces application and the data.

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

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 as follows:

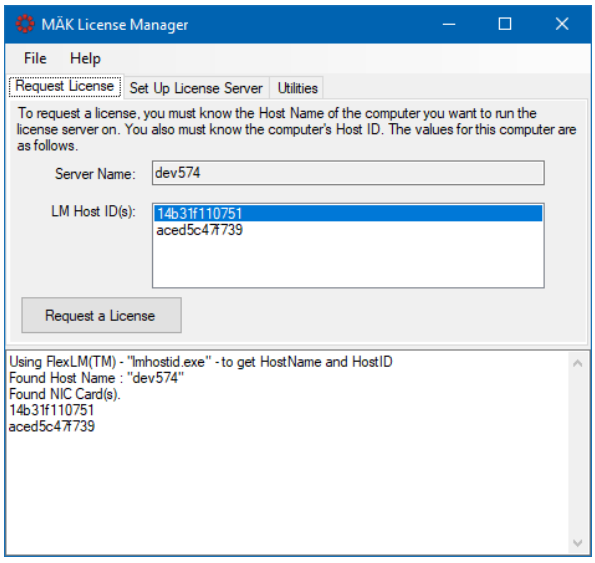
1. Identify the name and ID of the license server and request a license file.
2. Put the license file in the *MAK/MAKLicenseManager* directory on the license server.
3. Run the license server.
4. Specify the license server location.

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:

1. On the Start menu, choose **MAK Technologies > MAK License Manager**. The MAK License Manager utility opens (Figure 76).

Figure 76. 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.

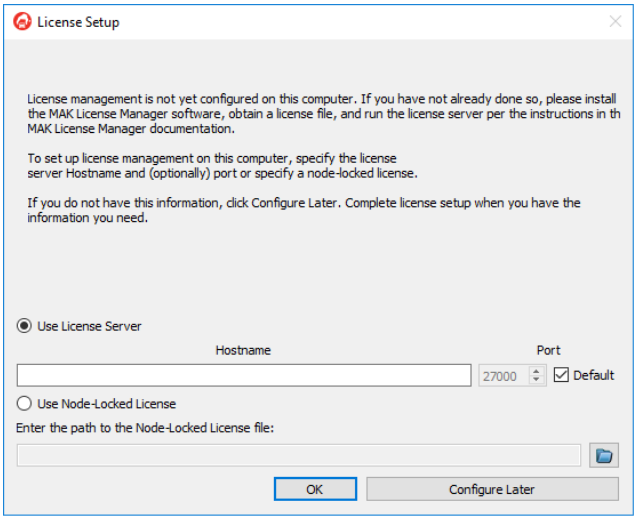
Shutting Down the License Server

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

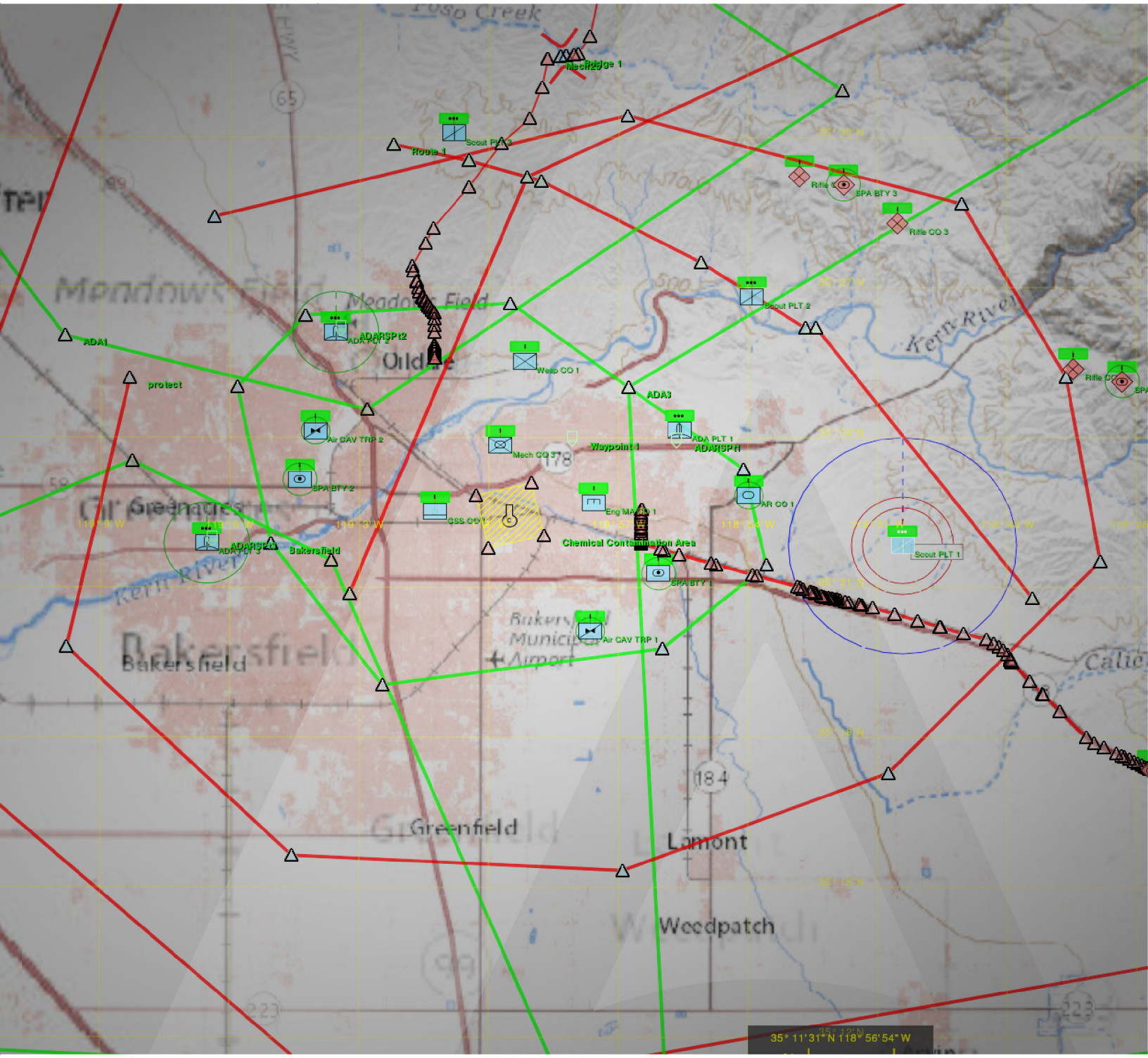
5.2.4 Specify the License Server

The first time you run a MAK application on a computer, the License Setup dialog box opens (Figure 77). It prompts you to enter the hostname of the license server and optionally, a port number.

Figure 77. 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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