VR-TheWorld Server Quick Start Guide

VR-TheWorld Server is MAK Technologies' powerful web-based streaming terrain server that allows you stream in elevation, features, and imagery. This document walks you through the setup.

Document ID: VRW-4.1-4-240122

Installing VR-TheWorld Server Software and Data

VR-TheWorld Server is built on the Docker platform. This allows you to use Linux or Windows as platforms to run VR-TheWorld Server.

A VR-TheWorld Server installation has the following software and hardware components:

- Docker. A web-based application used to deliver the VR-TheWorld Server database structure and data.
- VR-TheWorld Server software.
- VR-TheWorld Server database structure and data files. The database provided by MAK is optional. You can create your own database and use your own data files. You can also add your data files to those provided by MAK.
- Hard drive. MAK provides a hard drive with installation scripts and data files.

The minimum recommended hardware configuration for running VR-TheWorld is:

- Server:
  - Multi-core
  - 32 GB RAM
  - 250 GB hard drive
- Data storage:
  - 4 TB or more of usable space (after configuration).
- Operating system. Preferably the latest versions of Ubuntu, Windows, or Red Hat Enterprise Linux (RHEL), but at a minimum:
  - Ubuntu 20.04
  - Windows 10
  - RHEL 8

Installing and configuring Docker on Windows requires changes to your system's BIOS as well as Windows features. Please follow the instructions closely.

1.1. Considerations for Using Docker

This section discusses the following issues that you may need to consider when using Docker:

- Ports
- Handling crashes and reboots
- Path syntax

1.1.1 Ports

Docker does not bypass firewalls. It creates rules inside the kernel to redirect traffic that comes to the host. The *docker-compose* file lists the used ports in the following format:

```
host_port : docker_port
```

By default, Docker exposes container ports to the IP address 0.0.0.0. (This matches any IP on the system). If you want to, you can tell Docker which IP address to bind on. For example, to bind on localhost port 80 and container port 8080, specify:

```
127.0.0.1:80:8080
```

Some customers may prefer this for security reasons. Otherwise, that host port becomes open to all incoming connections.

1.1.2 Handling Crashes and Reboots

You can implement a restart policy for your Docker container that prevents the need to manually restart the containers in the case of a crash or reboot.

You do this through the `--restart` argument, which can be called within the docker `run` command or the docker `update` command (once containers are running). For our case, the docker `update` command makes more sense because the docker `run` command is not called explicitly during the installation process.

Here is how to set this for a single container:

```
docker update --restart unless-stopped container_name
```

Here is how to set this for all containers:

```
docker update --restart unless-stopped $(docker ps -q)
```

Table 1 lists the potential values for the `--restart` flag. `unless-stopped` is the most commonly used value. It is designed for the use case of handling a server crash / reboot.

Table 1. Values for --restart flag

Command	Description
no	Default value - containers would not be restarted.
on failure	Restarts container in the case of an error (container crashes).
always	Always restart container if it stops.
unless-stopped	Always restart container unless it is manually stopped.

1.1.3 Specifying Paths in Docker

Declare all paths using a forward slash (/), not the Windows-standard backslash (\). Items are appended to Docker paths following a Unix format, therefore a path that mixes backslashes with forward slashes becomes invalid. If you want to declare the

paths in a Windows format, set the COMPOSE_CONVERT_WINDOWS_PATHS environment variable to 1.

Installing VR-TheWorld Server on Linux

This section explains how to install VR-TheWorld Server on Linux operating systems.

Docker is supported for versions of Linux including Ubuntu. For RHEL 8 or later, use Podman.

1.2. Setting Up Your Computer

Variations in Linux systems may create problems installing Docker and running VR-TheWorld Server. Please review the issues discussed in this section to ensure that your system is properly set up.

1.2.1 Partition Setup

It is recommended that you configure */etc/fstab* to point to drives by UUID. If drives are not configured by UUID, the mount locations or order of the drivers might change after you restart the server.

Partitions should use the XFS scheme. Non-XFS partitions may experience problems when copying the contents of the external drive to the internal drive.

1.3. Installing Docker

Download and install Docker. Follow the instructions at https://docs.docker.com/engine/install.

> For RHEL 8 or later, Docker is not officially supported. It is recommended that you use Podman to provide comparable functionality to the Docker environment. See "1.4. Using Podman Instead of Docker for RHEL 8 and Later" on the next page. (You can choose to download and install the compatible CentOS version of Docker but, because that is not a native tool, it is not supported.)

1.3.1 Install docker-compose

Install docker-compose as follows:

```
  sudo curl -L
"https://github.com/docker/compose/releases/download/1.27.4/docker-
compose-$(uname -s)-$(uname -m)" -o /usr/local/bin/docker-compose
```

1.27.4 is the version of docker-compose in this example. If you are installing a different version, use that version number.

1.3.2 Configure the Firewall

Firewall settings may restrict the usage of certain ports through docker.

➤ **To set up the firewall:**

1. Find out which zone the docker interface it bound to, most likely "no zone":

   ```
   sudo firewall-cmd --get-zone-of-interface=docker0
   ```

2. Add the dockero interface to the public zone. Changes will be visible only after firewalld reloads:

   ```
   sudo nmcli connection modify docker0 connection.zone public
   ```

3. Add masquerading, which allows for docker ingress and egress:

   ```
   sudo firewall-cmd --zone=public --add-masquerade --permanent
   ```

4. Reload firewalld:

   ```
   sudo firewall-cmd --reload
   ```

5. Reload dockerd:

   ```
   sudo systemctl restart docker
   ```

1.4. Using Podman Instead of Docker for RHEL 8 and Later

For RHEL 8 or later, Docker is not officially supported because it was replaced with the Red Hat tools *buildah*, *podman*, and *podman-compose*. Although you could manually download and install the compatible CentOS versions of Docker, it's best to use the native tools.

Like Docker, Podman is a tool designed to make it easy to find, run, build, share, and deploy applications using Containers and Container Images. Podman provides a command-line interface (CLI) familiar to anyone who has used the Docker Container Engine. Most users can simply alias Docker to Podman (alias docker=podman) without any problems, or you can use the corresponding podman commands (for example, podman-compose).

For VR-TheWorld, Podman uses the same Docker container and the provided docker-compose.yml.

To install podman and podman-compose on Red Hat, run the following commands:

- `sudo yum -y install podman`
- `sudo yum –y install python3-pip`
- `sudo pip3 install podman-compose`

Continue with the rest of the Linux installation instructions. If you have not aliased docker to podman, use the corresponding podman command (for example, podman-compose instead of docker-compose).

> ⓘ The firewall may also restrict the usage of certain ports through Podman. See "1.3.2 Configure the Firewall" above.

1.5. Installing the Data Drive

You must mount the data drive and create the installation directory. The drive is in XFS format.

➤ **To mount the data drive:**

1. The data drive has a USB connection. Attach it to a USB 3.0 port on your computer.
2. Issue the following command to get the location of the drive:

   ```
   sudo fdisk -l
   ```

   This lists all drives connected to the computer. The MAK data drive is called */dev/sd**, where * is a letter from a–z. The data drive size is 6000 GB. Write down the name of the MAK drive.
3. Create the data directory:

   ```
   sudo mkdir -p /data
   ```

1.6. Copy Data or Mount the Data Drive

You can run VR-TheWorld Server from the data drive or copy the data to your computer's hard drive. For best performance, MAK recommends that you copy the data to your computer's hard drive.

➤ To copy the contents of the MAK data drive to an internal drive, run the following command:

```
xfsdump -J - /dev/NAMEOFDRIVE | xfsrestore -J - /data
```

where *NAMEOFDRIVE* is the name you recorded when you got the location of the disk.

- Copying the data takes 8–10 hours. Do not interrupt the process.
- Partitions should use the XFS scheme. Non-XFS partitions may experience problems when copying the contents of the external drive to the internal drive.

When installing a new version of VR-TheWorld Server and the MAK data over an older version of VR-TheWorld, be aware that the xfsrestore will merge with the existing data, replacing duplicate files but leaving any different files intact. This can result in retaining MAK data that is no longer used, but it also preserves any customer data that you have added.

➤ If you choose to run VR-TheWorld Server from the data drive, rather than copying data, mount the data drive to /data:

```
sudo mount /dev/NAMEOFDRIVE /data
```

where *NAMEOFDRIVE* is the name you recorded when you got the location of the disk.

1.7. Installing VR-TheWorld Server

VR-TheWorld Server organizes data into layers, which reference the data files. You must install the database structure. You can do so automatically or manually.

➤ **To install VR-TheWorld Server:**

1. VR-TheWorld now requires you to add a post-installation license key. Request a license at https://www.mak.com/mak-one/support/portal. Include your contact information, the purchase order for the server, and any relevant program details. You use the license key in step 3.
2. Once you have received the key from MAK support, change directory to the install directory:

   ```
   cd /data/VRTheWorld
   ```

3. Edit the settings file, *docker-compose.yml*. At the end of the file, there is a line `LICENSE_TEXT=`. Copy the license key text that you received and then paste it to the end of that line. Save the file.
4. Optionally, when you edit *docker-compose.yml*, you can configure the options. The file is commented to explain the options. For more information, see "1.7.1 Configuration Options for Docker" below.
5. Load the images for VR-TheWorld Server (you must have elevated permissions to run these commands):

   ```
   docker load < postgis_9.5-alpine.tar.gz
   docker load < redis_5.0-alpine.tar.gz
   docker load < vrtheworld_VERSIONOFVRTW.tar.gz
   ```

   where *VERSIONOFVRTW* is the version of VR-TheWorld Server you are installing.

   > ⓘ If you have RHEL 8 or later and are using Podman, use the podman command-line instead if you have not aliased docker. For example:
   >
   > ```
   > podman load < postgis_9.5-alpine.tar.gz
   > podman-compose up -d
   > ```

6. Start VR-TheWorld Server:

   ```
   docker-compose up -d
   ```

At this point, you can access VR-TheWorld Server using its IP address. The default username and password are `readymap`. Note that the server contains no predefined layers.

1.7.1 Configuration Options for Docker

In the *docker-compose.yml* file, you can pass optional arguments to our docker container to increase your VR-TheWorld Server performance. These are defined in the optional environment section of the file. Table 2 describes the environment variables.

Table 2. Docker environment variables

Variable	Description
NUM_WORKERS	The number of background workers started for processing general background tasks.
NUM_TILERS	The number of background workers started for seeding map tiles via cache jobs.
NUM_TILE_ GENERATORS	The number of background workers started for generating map tiles on demand.
GENERATE_ TILES_IN_ BACKGROUND_ WORKER	Whether to generate tiles on demand in a background process or in the main Apache process. By default, tiles are generated in a background process to avoid bogging down the server during periods of high load. Set this environment variable to False to restore the original behavior of generating tiles in the main Apache process.
USE_LAYER_ NAMES	When set to True, VR-TheWorld Server will expose layers using their name instead of their ID in GIS services. This could make switching between VR-TheWorld Server servers that have similar layer names easier when configuring earth files.

As a general guideline, you should match NUM_TILE_GENERATORS and NUM_ GENERATE_ON_DEMAND_PROCESSES to how you plan to use the server and the number of cores on the system. For example, increasing NUM_TILE_GENERATORS helps if you plan to add and tile new data and layers. Increasing NUM_GENERATE_ ON_DEMAND_PROCESSES helps during server runtime if some layers are not fully tiled and have enabled the **Generate tiles on demand** option. The specific number for each should map to the number of cores on your system, and therefore should be different for 8 versus 16 versus 32 cores. Remember to reserve cores for other processes and the server web services.

To set environment variables in *docker-compose.yml*, read the instructions at: https://docs.docker.com/compose/compose-file/#environment.

1.8. Installing the MAK-Supplied Database

VR-TheWorld Server does not presume any particular data. You can load your own database or the database supplied by MAK. If you are using MAK ONE applications such as VR-Vantage or VR-Forces, the terrain database files provided with these applications presume use of the MAK database structure and data files.

This section explains how to load the MAK database.

> ⚠ If you load the MAK database using readymap_restore, it removes all of the other previously defined layers from the server.

➤ **To install the MAK database:**

1. Change directory to the VR-TheWorld Server install directory:

   ```
   cd /data/VRTheWorld
   ```

2. Shut down the docker containers and restart them:

   ```
   docker-compose down
   docker-compose up -d
   ```

3. Load the database into readymap:

   ```
   docker-compose exec readymap readymap_restore
   /data/backups/vrtw4.db
   ```

Once the installation process is complete, you can log in to the web interface of VR-TheWorld Server. The default username and password is `admin`.

Installing VR-TheWorld Server on Windows

This section explains how to install VR-TheWorld Server on Windows.

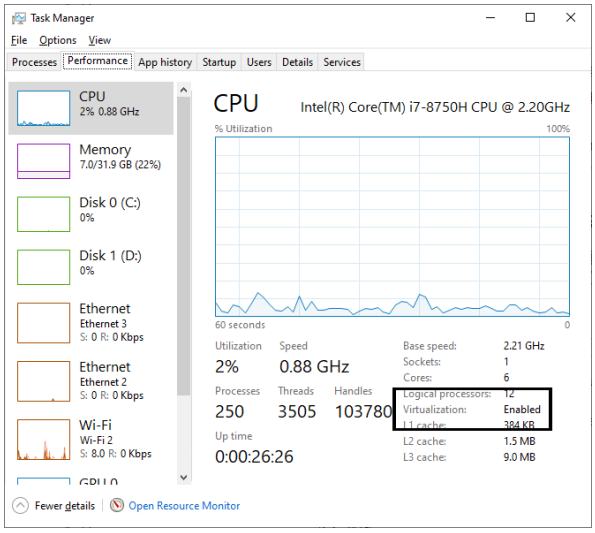
1.9. Prerequisites for Using Docker

To use Docker on Windows, you must enable virtualization, WSL2 (Windows Subsystem for Linux), and Hyper-V. These are all capabilities that are built into Windows, but which might not be enabled.

➤ **To check the status of virtualization:**

1. Open Task Manager.
2. Select the Performance tab.
3. The status of virtualization is displayed under the graph (Figure 1).

Figure 1. Task Manager, Performance tab

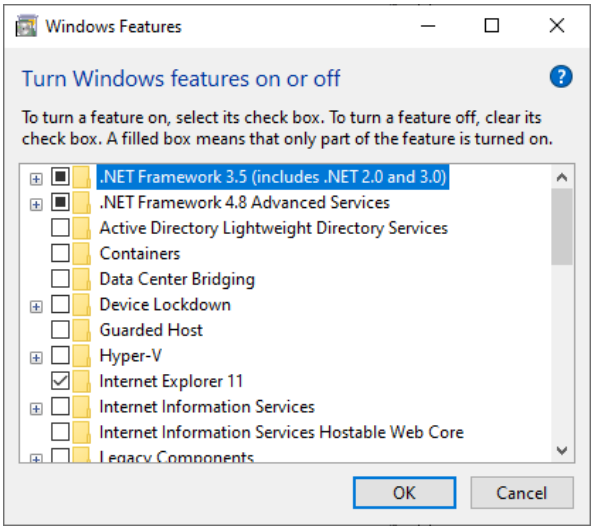


If virtualization is not enabled, you must enable it. Instructions for doing so are readily available using an internet search.

➤ **To enable Hyper-V and WSL2**

1. Right-click the Start menu icon and select Search.
2. In the Search box, type Windows Features. The search results show Turn Windows Features On or Off as the best match.
3. Choose Turn Windows Features On or Off. The Windows Features dialog box opens (Figure 2).

Figure 2. Windows Features



4. Select the check box next to Hyper-V.
5. Select the check box next to Windows Subsystem for Linux.

1.10. Installing Docker

Download and install Docker. Follow the instructions at https://docs.docker.com/desktop/install/windows-install.

1.11. Attach the Data Drive and Copy Data

The drive provided by MAK for Windows is in NTFS format.

➤ **To attach the data drive and copy the data:**

1. Plug the USB cable from the data drive into a USB 3.0 port on your machine.
2. Open a console window.
3. Enter:

   ```
   diskmgmt.msc
   ```

   The screen displays a list of all drives connected to the system.
4. Write down the letter of the data drive provided.
5. In Windows File Explorer, create a directory (folder) called `data` on the target drive. VR-TheWorld Server will use this directory to store all the files it needs to use.
6. Copy the data from the source directory to your data directory.

1.12. Installing VR-TheWorld Server

You can pass optional arguments to our docker container to increase your VR-TheWorld Server performance. These are defined in the optional environment section of the file. Table 2 on page 9 describes the environment variables.

➤ **To install VR-TheWorld Server on Windows:**

1. Open a console window.
2. Change directory to the data drive:

   ```
   cd DATADRIVE:\data\VRTheWorld
   ```
3. In a text editor, open *docker-compose-windows.yml*.
4. Copy all of the content in the file.
5. In a text editor, open *docker-compose.yml*.
6. Replace all of the content with the content you copied from *docker-compose-windows.yml*. (VR-TheWorld Server includes configurations for Linux and Windows. However, Docker only looks for *docker-compose.yml*, so you have to replace the Linux configuration information with the Windows configuration.)
7. Examine the content of the file. If there are any backslashes (\), replace them with forward slashes (/).
8. In lines 15 and 16, replace DATADRIVE with the drive letter on which the data is installed.
9. Save the file and close it.
10. In your console window, in DATADRIVE:\data\VRTheWorld, execute the following commands:

    ```
    docker load -i postgis_9.5-alpine.tar.gz
    docker load -i redis_3.2-alpine.tar.gz
    docker load -i vrtheworld_VERSIONOFVRTW.tar.gz
    ```

    where VERSIONOFVRTW is the version of VR-TheWorld Server that you are installing.
11. Start VR-TheWorld Server:

    ```
    docker-compose up -d
    ```

You can now access VR-TheWorld Server using its IP address. The default username and password is `readymap`.

1.13. Installing the MAK-Supplied Database

VR-TheWorld Server does not presume any particular data. You can load your own database or the database supplied by MAK. If you are using MAK ONE applications such as VR-Vantage or VR-Forces, the terrain database files provided with these applications presume use of the MAK database structure and data files.

This section explains how to load the MAK database.

> ⚠ If you load the MAK database using readymap_restore, it removes all of the other previously defined layers from the server.

➤ **To install the MAK database:**

1. Change directory to the VR-TheWorld Server install directory:

   ```
   cd DATADRIVE:\data\VRTheWorld
   ```

2. Shut down the docker containers and restart them:

   ```
   docker-compose down
   docker-compose up -d
   ```

3. Copy *vrtw4.db* to the *./data/added* directory. (Docker will see this as *./data/vrtw4.db* because our default mount location is *./data/added*, as configured by the *docker.yml* file.)

4. Load the database into readymap (this will take 5 to 10 minutes):

   ```
   docker-compose exec readymap readymap_restore /data/vrtw4.db
   ```

Once the installation process is complete, you can log in to the web interface of VR-TheWorld Server. The default username and password is `admin`.