



# **HERIcraft Server Manual**

WP3

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University College Dublin

# HERIcraft concept

## Introduction

Minecraft, an open-world cross-platform game, offers a virtual environment composed of blocks, with each block representing a volume of 1 m<sup>3</sup> in the real world. Minecraft is a sandbox game, which means it lacks a predefined goal, allowing players the freedom to determine their objectives and learn how to interact with the virtual world. Location within the game holds significant importance in its mechanics, influencing various aspects of gameplay and enabling interpreting players actions in the game based on their spatial decisions. The open-world mechanic of Minecraft grants players the freedom to interact with the virtual environment in a self-directed manner. The distinctive blocky nature of the game possesses inherent potential for fostering the development of spatial skills among players [1].

With over 230 million copies sold [2] and an active monthly player base exceeding 126 million [2], Minecraft has achieved remarkable popularity. The game was released in 2009, and since then, it has influenced generations of players. The average age of a Minecraft player is 24 years old, with mostly male players, considering information from 2019 [3]. The game is also popular among children and is used in schools as a learning tool through its Education Edition.

Its widespread appeal and unique structure have positioned it as a powerful medium for education [4]–[6]. The versatility and accessibility of Minecraft make it an ideal platform for a wide range of applications with serious intent. Notably, it has been successfully employed in diverse fields such as urban planning [7], [8], architectural design [9], and scientific research, solidifying its reputation as an educational and participatory tool [10], [11].

In HeritACT, the Minecraft approach offers a novel method to represent culturally built environments, extending its application to regeneration projects conducted by municipalities seeking active community participation. This solution serves as an innovative tool to raise awareness about the principles of the New European Bauhaus and the objectives of the European Green Deal, fostering environmental education by exploring the sustainability impact of implemented solutions.

The framework comprises two sets of activities:

1. The design of the pre-intervention local area as a school activity. Involving schools enables engagement with families by assigning pupils an active role as local climate ambassadors.
2. Codesign of interventions as family and community activities, providing valuable feedback to local authorities and supporting urban planning.

### **Co-recognition, Co-envision, Co-implementation**

HERIcraft will be utilised in participatory practices with community members to gather information, provide training and education, and engage the public throughout the process. Each pilot will feature a custom version of the game based on a game concept template to achieve specific objectives.

Key focus areas for each pilot include:

- Sense of community and public ownership (Eleusis)
- Online presence, lack of attractiveness, accessibility, generation gap (Milan)
- Lack of understanding/appreciation, forgotten history, underappreciated resources (Ballina)

The use of the game aims to enhance children's engagement and provide them with a platform for their voices to be heard in the heritage reactivation process.

## **1.1 Development**

The development of HERIcraft proceeded through three primary phases. Initially, a framework for geospatial data processing was established to generate the virtual landscapes in Minecraft. Subsequently, an exploratory and collaborative game concept was developed. Finally, a comprehensive set of guidelines was formulated to aid facilitators in effectively organising and conducting HERIcraft workshops.

### **VIRTUAL ENVIRONMENT CREATION**

The virtual representation of the pilot cases was generated using [OpenStreetMap \(OSM\)](#) data, supplemented by additional data from project partners. A Python code was developed to create Minecraft models, available in the GitHub repository: [https://github.com/ItalodeSena/HERIcraft\\_py](https://github.com/ItalodeSena/HERIcraft_py)

The models were created at a 1:1 scale to accurately represent real-world spaces in Minecraft, chosen to align with the scale suitable for players to recreate facades and other urban features.

Urban landscape features such as buildings, streets, roads, rivers, and trees were incorporated into the models, following Kevin Lynch's framework of the five physical elements of a city. According to Kevin Lynch [12], these elements—paths, edges, districts, nodes, and landmarks—contribute to the imageability and legibility of urban environments, influencing how inhabitants perceive and navigate the cityscape. In the context of Minecraft models representing real-world spaces, these elements serve as essential components for creating immersive and recognizable virtual environments.

# HERIcraft Server Guide

## (Version 1.21.4)

This document provides a step-by-step guide on how to download, set up, run, and join a HERIcraft server locally on your computer. This server is being provided as a research output and might contain custom modifications via plugins.

This guide covers the steps for Windows only, as Minecraft is not compatible with Mac or Linux.

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## Tutorial video

[How to run HERIcraft server in your computer](#)

# 1. What is a Minecraft Java Server?

A Minecraft Java server is a dedicated program that allows multiple players to connect and play together in the same Minecraft world. Unlike single-player mode, which runs the world directly on your computer, a server provides a central hub for gameplay. It manages the game world, player interactions, and ensures everyone is synchronized.

In the context of the HeritACT project, the server allows for a controlled environment, data collection efforts, and specific scenarios to be set up for multiple participants.

# 2. What are Minecraft Server Plugins?

Minecraft plugins are small software additions that extend the functionality of a Minecraft server beyond its default capabilities. They are written in Java and loaded by server software like Spigot or Paper (which are optimized versions of the vanilla Minecraft server).

**Think of them like apps for your phone:**

- They can add new commands.
- They can introduce new game mechanics or items.
- They can manage player permissions.
- They can create minigames or unique experiences.

For HERIcraft, plugins are used to implement the game activity design, specific experimental conditions, track player behavior, or automate certain processes within the game.

# 3. System Requirements

To run the HERIcraft server and the Minecraft game client simultaneously on your computer, you'll need a reasonably capable machine.

- **Operating System:** Windows 10/11.

- **RAM (Memory):** At least 8 GB is recommended. The server itself will use a significant portion, and the game client also requires memory. More RAM is better, especially for larger worlds or more players.
- **Processor (CPU):** A modern multi-core processor (e.g., Intel Core i5/i7/i9 or AMD Ryzen 5/7/9) is recommended.
- **Storage:** Enough free space for the server files and the generated world data (can grow large over time). An SSD (Solid State Drive) is highly recommended for better performance.
- **Internet Connection:** Not strictly required to run a *local* server (you can play offline), but needed for initial downloads of Java and the Minecraft Launcher.

## 4. Downloading and Preparing the Server Folder

1. **Download the Server Folder:** Obtain the compressed HERItcraft server folder from the provided source.
2. **Extract the Folder:** Right-click on the downloaded `.zip` file and select "Extract All..." or "Extract here." Choose a convenient location, such as your Desktop or Documents folder.
3. **Locate the Server Files:** Once extracted, you should see a folder containing various files, including a `server.jar` file (or similar, depending on the server software like Spigot/Paper), a `_run.bat` file (for Windows), and other configuration files like `eula.txt`.

## 5. Installing Java (if needed)

Minecraft Java servers require Java to run. Specifically, for **Minecraft 1.21.4**, you'll need **Java 17**. If you don't have it installed, or if you have an older version, you'll need to install it.

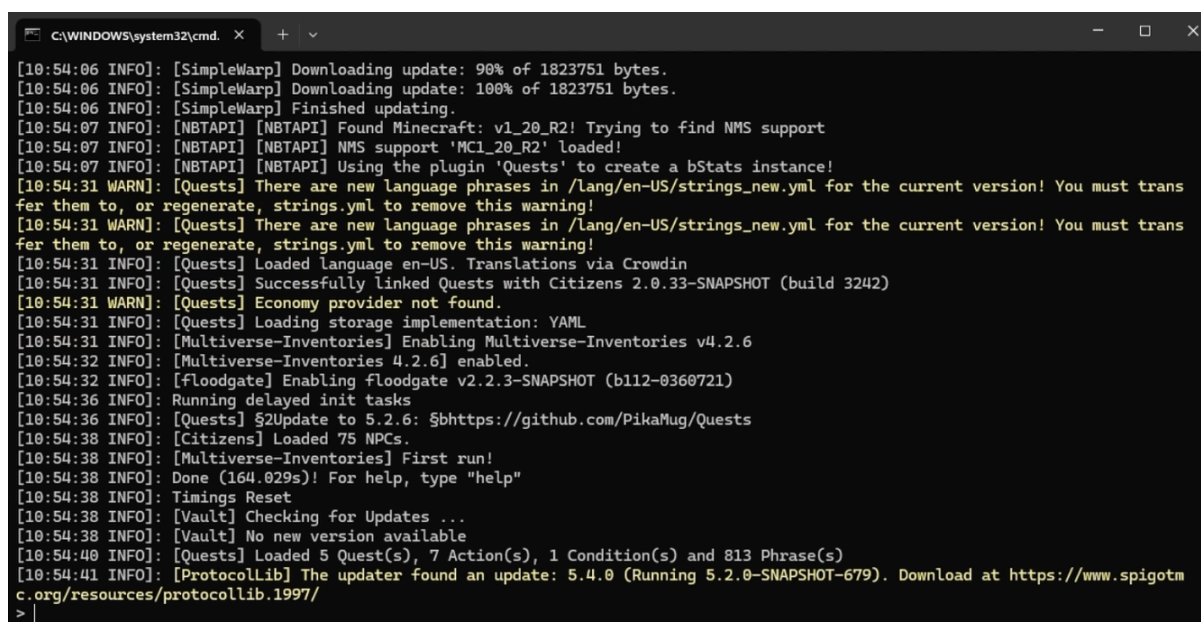
1. **Check if Java 17 is installed:** Open Command Prompt (search for `cmd` in the Start menu) and type `java -version`. Press Enter.
2. **Download Java 17:**
  - Go to the Adoptium website (a common source for OpenJDK builds): <https://adoptium.net/temurin/releases/>
  - Look for **"OpenJDK 17 (LTS)"**.
  - Select the correct installer for your operating system (Windows x64, macOS x64, etc.).

- Download the `.msi` (Windows), `.pkg` (macOS), or `.tar.gz` (Linux) file.
- 3. **Install Java 17:** Run the downloaded `.msi` installer and follow the on-screen prompts. It's generally safe to accept the default settings.
- 4. **Verify Installation:** After installation, open a *new* Command Prompt/Terminal window and run `java -version` again to confirm Java 17 is recognized.

## 6. Running the Minecraft Server

Before running the server for the first time, you **must** accept the Minecraft End User License Agreement (EULA).

1. **Accept the EULA (this step is already completed for the HERItcraft server files):**
  - Navigate to your extracted server folder.
  - Find the file named `eula.txt`.
  - Open `eula.txt` with a plain text editor.
  - Change the line `eula=false` to `eula=true`.
  - Save the file.
  - **Important:** If you don't do this, the server will shut down immediately after starting and tell you to accept the EULA.
  - **The EULA is already accepted in the files you downloaded.**
2. **Run the Server:**
  - In your extracted server folder, locate the `_run.bat` file.
  - **Double-click** the `_run.bat` file.
  - A command prompt window (the server console) will open. You will see a lot of text scrolling by as the server starts up, generates the world, and loads plugins. This can take several minutes the first time.
3. **Monitor the Server Console:**
  - The command prompt/terminal window is your server console.
  - You'll see messages indicating the server's progress.
  - Once you see a line similar to `[Server thread/INFO]: Done (...)! For help, type "help"`, the server is fully started and ready for connections.
  - **Do not close this window** while you want the server to be running. Closing it will shut down the server.



```

C:\WINDOWS\system32\cmd. X + v
[10:54:06 INFO]: [SimpleWarp] Downloading update: 90% of 1823751 bytes.
[10:54:06 INFO]: [SimpleWarp] Downloading update: 100% of 1823751 bytes.
[10:54:06 INFO]: [SimpleWarp] Finished updating.
[10:54:07 INFO]: [NBTAPI] [NBTAPI] Found Minecraft: v1_20_R2! Trying to find NMS support
[10:54:07 INFO]: [NBTAPI] [NBTAPI] NMS support 'MC1_20_R2' loaded!
[10:54:07 INFO]: [NBTAPI] [NBTAPI] Using the plugin 'Quests' to create a bStats instance!
[10:54:31 WARN]: [Quests] There are new language phrases in /lang/en-US/strings_new.yml for the current version! You must trans
fer them to, or regenerate, strings.yml to remove this warning!
[10:54:31 WARN]: [Quests] There are new language phrases in /lang/en-US/strings_new.yml for the current version! You must trans
fer them to, or regenerate, strings.yml to remove this warning!
[10:54:31 INFO]: [Quests] Loaded language en-US. Translations via Crowdin
[10:54:31 INFO]: [Quests] Successfully linked Quests with Citizens 2.0.33-SNAPSHOT (build 3242)
[10:54:31 WARN]: [Quests] Economy provider not found.
[10:54:31 INFO]: [Quests] Loading storage implementation: YAML
[10:54:31 INFO]: [Multiverse-Inventories] Enabling Multiverse-Inventories v4.2.6
[10:54:32 INFO]: [Multiverse-Inventories 4.2.6] enabled.
[10:54:32 INFO]: [Floodgate] Enabling floodgate v2.2.3-SNAPSHOT (b112-0360721)
[10:54:36 INFO]: Running delayed init tasks
[10:54:36 INFO]: [Quests] $2Update to 5.2.6: $bhttps://github.com/PikaMug/Quests
[10:54:38 INFO]: [Citizens] Loaded 75 NPCs.
[10:54:38 INFO]: [Multiverse-Inventories] First run!
[10:54:38 INFO]: Done (164.029s)! For help, type "help"
[10:54:38 INFO]: Timings Reset
[10:54:38 INFO]: [Vault] Checking for Updates ...
[10:54:38 INFO]: [Vault] No new version available
[10:54:40 INFO]: [Quests] Loaded 5 Quest(s), 7 Action(s), 1 Condition(s) and 813 Phrase(s)
[10:54:41 INFO]: [ProtocolLib] The updater found an update: 5.4.0 (Running 5.2.0-SNAPSHOT-679). Download at https://www.spigotm
c.org/resources/protocollib.1997/
>

```

Fig. 1: Server console after it loaded all plugins.

## 7. Setting Up Minecraft Client (Version 1.21.4)

To join your server, you need the official Minecraft Java Edition game client, specifically for version 1.20.2.

1. **Open the Minecraft Launcher:** Start the Minecraft Launcher application on your computer.
2. **Go to "Installations":**
  - At the top of the launcher window, click on the "Installations" tab.
3. **Create a New Installation:**
  - Click the "+ New installation" button.
4. **Configure the New Installation:**
  - **Name:** Give your installation a descriptive name, e.g., "HERIcraft Server 1.21.4".
  - **Version:** Click the "VERSION" dropdown menu. Scroll down and find "release 1.20.2". Select it.
  - Click the "Create" button.
5. **Return to "Play" Tab:** Go back to the "Play" tab in the launcher.



6. **Select Your Installation:** In the bottom-left corner of the launcher, click the dropdown arrow next to the "Play" button. Select the new installation you just created (e.g., "**HERIcraft Server 1.21.4**").
7. **Launch Minecraft:** Click the "Play" button. The game will download the necessary files for version 1.20.2 and then launch.

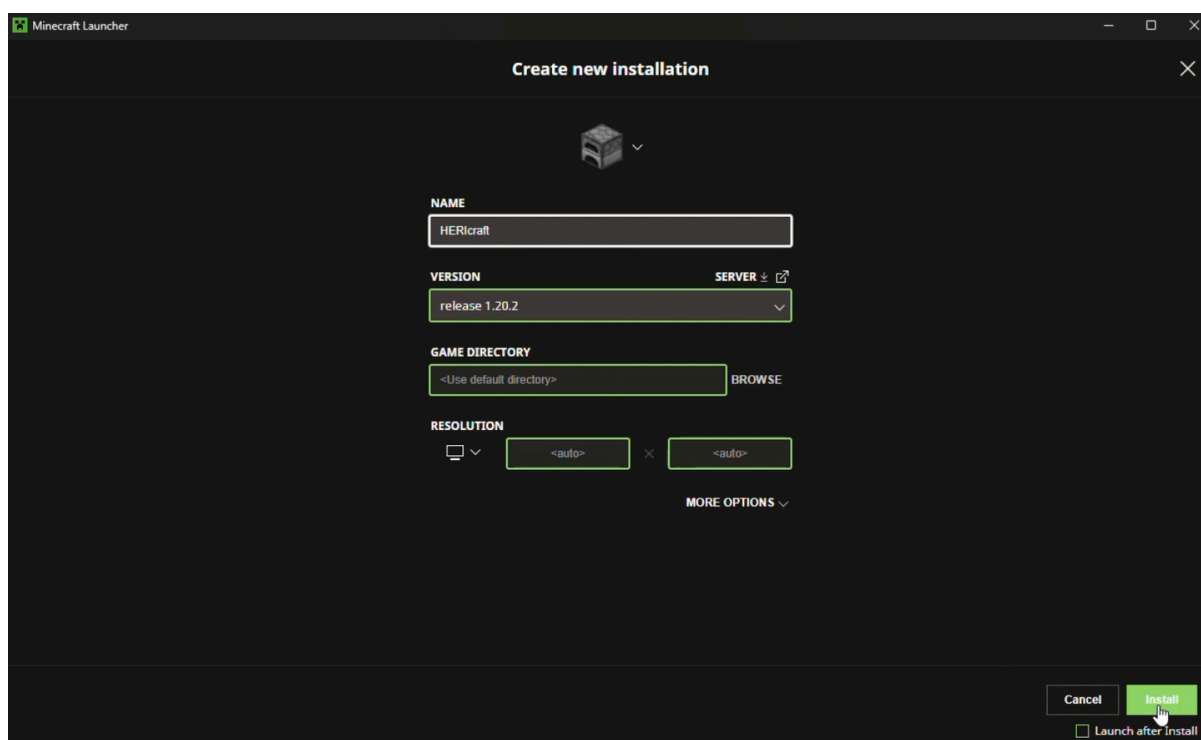


Fig. 2: Select '**release 1.21.4**' version while in Minecraft Launcher.

## 8. Joining Your Local Server

Once both the server and the Minecraft client (version 1.21.4) are running, you can connect.

1. **In the Minecraft Game Client:**
  - From the main menu, click "Multiplayer".
  - You might see a warning about third-party servers; click "Proceed".
2. **Add Server:**
  - Click the "Add Server" button.
3. **Enter Server Details:**
  - **Server Name:** Give it a name, e.g., "HERIcraft Server".

- **Server Address:** This is crucial. Since the server is running on your own computer, you can use:
  - `localhost`
- Click "Done".

#### 4. Connect to the Server:

- Your new server entry ("HERIcraft Server") should now appear in the multiplayer server list.
- You should see a green connection indicator and "Ping: ..." or "Can't connect to server" if there's an issue. Check the server console for any errors or the latest server log file (located in the "logs" folder)
- Click on the server entry and then click "Join Server".

Congratulations! You should now be connected to your local HERIcraft Server.



Fig. 3: Use 'localhost' to join the server offline. This allows you to edit/modify HERIcraft before uploading it to a Minecraft server hosting service.

## 9. Troubleshooting Common Issues

Here are some common problems you might encounter and their solutions:

- "Error: Could not find or load main class" or "Unable to access jarfile":

- **Cause:** Java is not installed correctly, or the server JAR file name in your `_run.bat` (or command line) is incorrect.
- **Solution:** Re-install Java 17 (ensure it's added to your system's PATH environment variables, which installers usually do). Double-check the spelling of `server.jar` in your `_run.bat` file or command. Ensure you are running the command from *inside* the server folder.
- **Server console opens and immediately closes (Windows):**
  - **Cause:** You haven't accepted the EULA, or there's another critical error preventing the server from starting.
  - **Solution:** Open `eula.txt` and change `eula=false` to `eula=true`. If it still closes, try running the `_run.bat` file by opening a Command Prompt, navigating to the server folder, and then typing `_run.bat` and pressing Enter. This will keep the window open and show you any error messages.
- **"Failed to bind to port" or "Port already in use":**
  - **Cause:** Another application on your computer is already using the default Minecraft server port (25565). This could be another Minecraft server, or even a different program.
  - **Solution:**
    1. Close any other Minecraft servers you might be running.
    2. Restart your computer.
    3. If the issue persists, you can change the server port in the `server.properties` file within your server folder. Find the line `server-port=25565` and change `25565` to something else (e.g., `25566`). Remember to specify this new port when joining the server in Minecraft (e.g., `localhost:25566`).
- **"Can't connect to server" or "Connection refused":**
  - **Cause:** The server isn't running, or your firewall is blocking the connection.
  - **Solution:**
    1. Ensure the server console window is open and shows `Done (...)! For help, type "help"`.
    2. Temporarily disable your firewall (Windows Defender Firewall, macOS Firewall, or third-party antivirus/firewall software) to see if that's the issue. If it works, you'll need to add an exception for Java or the Minecraft server to your firewall rules.
    3. Double-check that your Minecraft client version is exactly 1.20.2.

## 10. Hosting Your HERIcraft Server Online (Optional)

While running a server locally is great for personal use or small, contained research, you might want to host it online for wider accessibility, especially if participants are not in the same physical location or if your local machine isn't powerful enough for continuous operation. This involves using a **third-party Minecraft server hosting service**.

### How Third-Party Hosting Services Work

Minecraft server hosting services are companies that provide dedicated servers and infrastructure specifically designed to run Minecraft instances. They offer:

- **Dedicated Resources:** Your server gets its own allocated CPU, RAM, and storage, ensuring stable performance regardless of your local machine's status.
- **24/7 Uptime:** Hosted servers run continuously, meaning players can join anytime without you needing to keep your computer on.
- **Global Accessibility:** Players from anywhere in the world can connect, provided they have the server's IP address.
- **Ease of Management:** Most hosting providers offer user-friendly control panels (often called "Multicraft" or custom dashboards) to manage your server, upload files, configure settings, and even install plugins with a few clicks.
- **Technical Support:** They provide support for server-related issues, which can be invaluable for non-technical users.

These services typically operate on a subscription model, with pricing varying based on the amount of RAM, CPU power, and storage you need.

### How to Upload Your Server Files to a Hosting Service

The exact steps can vary slightly between hosting providers, but the general process is as follows:

1. **Choose a Hosting Provider:** Research and select a reputable Minecraft server host (e.g., Apex Hosting, Shockbyte, BisectHosting, Aternos - for free, but with limitations). Consider factors like price, server locations, available RAM, and customer reviews.

2. **Purchase a Plan:** Sign up for a hosting plan that meets your research server's requirements (especially RAM, which is crucial for performance with plugins and multiple players).
3. **Access the Control Panel:** Once your service is set up, you'll receive login details for their web-based control panel.
4. **Stop the Server (if running):** Before uploading files, ensure your server instance on the hosting platform is stopped.
5. **Locate File Manager / FTP Access:**
  - Most control panels have a **"File Manager"** built-in, which allows you to upload files directly through your web browser.
  - Alternatively, they provide **FTP (File Transfer Protocol)** access. You'll need an FTP client like FileZilla (free) and the FTP credentials provided by your host (host, username, password, port).
6. **Upload Your Server Folder Contents:**
  - **Using File Manager:** Navigate to the main server directory on the host (often `/` or `/minecraft`). Use the upload function to select all the files and folders from your local extracted server folder (e.g., `server.jar`, `eula.txt`, `server.properties`, `plugins` folder, `world` folder, etc.). Upload them to the host's server.
  - **Using FTP Client:** Connect to the host's FTP server using your credentials. Drag and drop all the contents of your local server folder into the remote server's main directory.
  - **Important:** Do *not* upload the entire parent folder (e.g., `MyMinecraftServer`); upload *its contents*.
7. **Select the Correct JAR File:** In your hosting control panel, there will usually be an option to select which JAR file the server should run. Make sure it's set to the `server.jar` (or `paper-1.21.4.jar`, etc.) that you uploaded.
8. **Start the Server:** Once all files are uploaded and the JAR is selected, start the server from your control panel.
9. **Get the Server IP Address:** Your hosting provider will give you a unique IP address (and sometimes a port) for your server. This is what other players will use to connect.
10. **Share the IP:** Provide this IP address to your research participants so they can join the server using the steps outlined in "8. Joining Your Local Server", replacing `localhost` with the provided IP address.

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