

# Using GDB with Ghidra and melonDS

## What you'll need:

- The latest version of [Ghidra](#)
- A build of melonDS that has the GDB enabled
- The easiest way to get this is to grab a GitHub action build of melonDS. You can find that [here](#). (Note: you'll need to be signed into a GitHub account to download these builds)
- The [GNU ARM Embedded Toolchain](#) installed on your system
- A Ghidra database of NSMB DS
- Eventually, NSMB Central will host a shared Ghidra project so we have one centralized project anyone can contribute to. For now, you can generate a Ghidra project using [this tool](#). If you need help, please ask in our Discord!

## Configuring melonDS

To enable the GDB, you need to do the following:

1. Click on the **Config** menu at the top of the emulator, then click on **Emu Settings**
2. Click on the **Devtools** tab
3. Check Enable **GDB stub**
4. If you do not see the Devtools tab, then you have not built melonDS with GDB enabled. Please check the link at the start of the guide to find a download with GDB enabled or build it yourself enabling GDB in CMake

melonDS is ready to go!

## Setting up Ghidra

To begin, open your Ghidra project in the code viewer as you normally would.

1. Click on File -> Configure, which should open a list of tools
2. Check the "Debugger" box



## Debugger

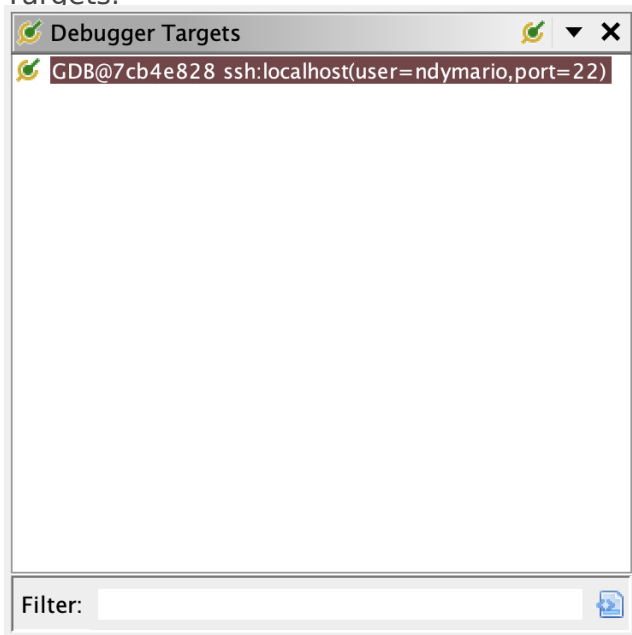
[Configure](#)

This should cause windows to appear in your current project, likely making the following steps redundant. If you are unable to find a window, the following steps will either open the window, or present it to you in the project.

## Creating a Debugger Target

This method has been tested on Linux and macOS. You should be able to follow these steps using WSL on Windows. Follow [this guide](#) if you need help setting up WSL.

To begin, open the Debugger Targets window by navigating to Windows -> Debugger -> Debugger Targets.



As you'll notice, there is an active connection in the

screenshot but nothing on your end...let's fix that!

Click on the  button to open the **connect** window.

If you are on Linux:


- Choose **gdb** in the dropdown
- Set **arm-none-eabi-gdb -ex "set arch armv5t"** as the **GDB Launch Command**

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If you have not added arm-none-eabi-gdb to your PATH, you'll need to provide the absolute path

- Click 

## If you are on macOS

- Choose **gdb via SSH** in the dropdown
- Set **arm-none-eabi-gdb -ex "set arch armv5t"** as the **GDB Launch Command**
- If you have not added arm-none-eabi-gdb to your PATH, you'll need to provide the absolute path
- Set **SSH hostname** to **localhost**
- Set **SSH username** to your username
- You can use the command **whoami** in the terminal to get your username if you don't know it
- Click 


## If you are on Windows

- This still needs to be tested on Windows. This guide will be updated when steps have been made

You have now created a Debugger Target

## Connecting to melonDS

The **gdb interpreter** should have opened for you when you connected to the **debugging target**.

- If you have lost the interpreter window, open the objects window (Window -> Debugger -> Objects) and click on  to bring the menu back
- In melonDS, open your ROM. (You can either boot directly to the game or launch the firmware)

Now, in the interpreter menu, run the command **target remote localhost:[ARM9 Port]** (Where [ARM9 Port] is the ARM9 Port set in the Devtools tab.)

- By default, it should be 3333. The command would be **target remote localhost:3333**

If melonDS pauses after running this command, GDB is now talking to melonDS

- If the connection immediately closes after running the command: change the ARM9 port to something else, restart melonDS, and close the current GDB connection.


You have now connected Ghidra to melonDS

## Using Breakpoints


If you would like to set breakpoints, you'll need to use the **Dynamic PC**

1. Open the **Dynamic PC** window by clicking **Window -> Listing -> Dynamic - Auto PC, [...]**

1. If you do not see this option, you can alternatively open it via **Window -> Debugger -> New Dynamic Listing**

2. Next, open the **Modules** window by clicking **Window -> Debugger -> Modules**
3. Lastly, click on  in the **Modules** window.

Now, setting a breakpoint in your code view should set a breakpoint in the **Dynamic PC**

- Breakpoints will only update if the emulator has hit a breakpoint or has been paused by pressing 

You have now set up Ghidra to debug melonDS. Happy coding!

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