📌 GDB TUI Mode - Detailed Notes

🟢 What is GDB TUI Mode?

GDB's **Text User Interface (TUI)** mode provides a **graphical-like debugging interface in the terminal**. It helps visualize:

- **Source code**
- **Assembly instructions**
- **Registers and memory**
- **Breakpoints and variables**

🔹 1. Enabling TUI Mode

You can enter TUI mode in **three** different ways:

1️⃣ Start GDB in TUI Mode Directly

```
gdb -tui program_name
```

Example:

```
gdb -tui my_program
```

2️⃣ Enable TUI Mode Inside GDB

If you're already in GDB:

```
(gdb) layout src
```

or

```
(gdb) tui enable
```

3️⃣ Start GDB with Arguments

```
gdb -tui --args ./my_program arg1 arg2
```

🔹 2. Switching Between Layouts

GDB TUI provides multiple **layouts** that you can switch between.

Command	Description
`layout src`	Show **source code** window
`layout asm`	Show **assembly** instructions
`layout regs`	Show **registers**
`layout split`	Show **source + assembly**
`layout next`	Cycle through different layouts
`update`	Refresh the display

💡 **Example**:

```
(gdb) layout asm
```

This switches the view to assembly instructions.

🔹 3. Changing Focus Between Windows

When using TUI mode, you can **change focus** between different windows (source, registers, assembly) using:

Shortcut	Action
`Ctrl + X → 0`	**Cycle through TUI windows**
`Ctrl + X → A`	**Toggle TUI mode on/off**
`Ctrl + X → 1`	Focus **source code window**
`Ctrl + X → 2`	Focus **assembly window**
`Ctrl + X → 3`	Focus **registers window**

💡 **Example**:
Press `Ctrl + X`, then `0` to switch between different sections of TUI mode.

🔹 4. Navigating Inside Windows

Shortcut	Action
`Up/Down`	Scroll source/assembly code
`PgUp/PgDn`	Scroll **faster**
`Ctrl + L`	Refresh display
`tui disable`	Disable TUI and return to CLI

💡 **Example**:
Press `PgUp` or `PgDn` to scroll through the **source code window**.

🔹 5. Setting & Managing Breakpoints

A **breakpoint** pauses execution at a specific point in the program.

```
(gdb) break main
```

or

```
(gdb) break 15   # Break at line 15
```

To **remove** a breakpoint:

```
(gdb) delete 1   # Removes breakpoint number 1
```

🔹 6. Running and Stepping Through Code

Command	Description
`run` / `r`	Start execution
`continue` / `c`	Resume after a breakpoint
`next` / `n`	Step to the next line (without entering functions)
`step` / `s`	Step **inside functions**
`finish`	Execute until the function returns
`until 20`	Run until **line 20**

💡 **Example**:

```
(gdb) run
(gdb) next
```

🔹 7. Inspecting Variables

Command	Description
`print var`	Print **value** of `var`
`display var`	Continuously show `var` in TUI
`info locals`	Show all **local variables**
`info registers`	Show **CPU registers**

💡 **Example**:

```
(gdb) print x
$1 = 10
(gdb) display x
```

🔹 8. Examining Memory

Command	Description
`x/10xw 0xaddr`	Examine memory at `0xaddr`
`x/s var`	View a string variable

💡 **Example**:

```
(gdb) x/10xw 0x555555554000
```

This prints **10 words** from memory at address `0x555555554000`.

🔹 9. Exiting GDB TUI Mode

Command	Description
`quit` / `q`	Exit GDB
`Ctrl + D`	Exit GDB

Command	Description
`tui disable`	Exit **TUI Mode only**

💡 **Example**:

```
(gdb) quit
```

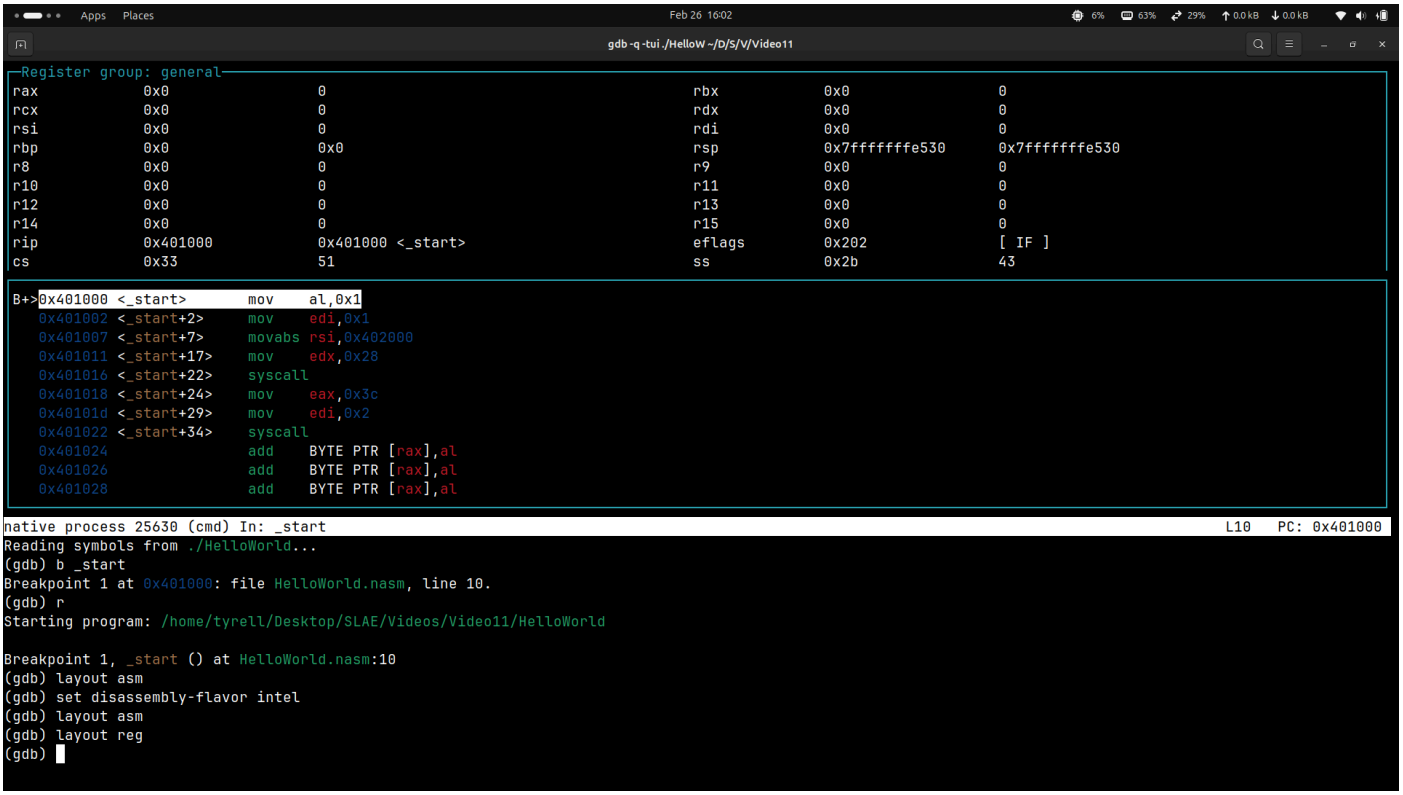
🔹 10. Full Example Debugging Session

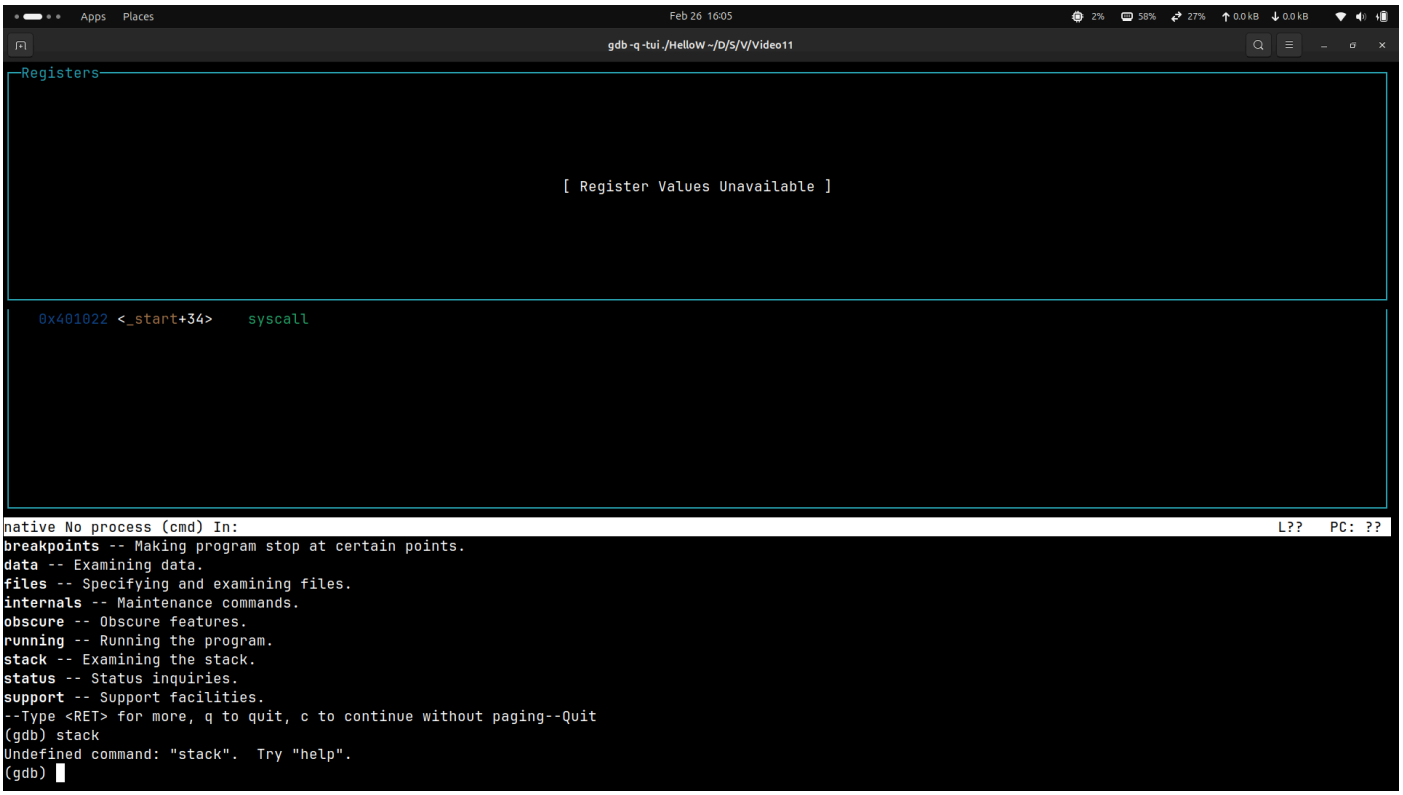
```
gdb -tui ./a.out
(gdb) break main
(gdb) run
(gdb) layout split
(gdb) next
(gdb) print x
(gdb) info registers
(gdb) continue
(gdb) quit
```

🔹 11. Example Output in TUI Mode

```
[Source Code Window]
10   int main() {
11       int x = 5;
12       x = x + 10;  // Breakpoint here
13       return 0;
14   }

(gdb) print x
$1 = 5
```





🔥 Pro Tips

✔️ Use `Ctrl + X → A` to **toggle TUI mode**.
✔️ `layout split` is useful to see **both source and assembly**.
✔️ Use `display var` to **track** variable changes during execution.
✔️ `info registers` helps in **exploit development**.