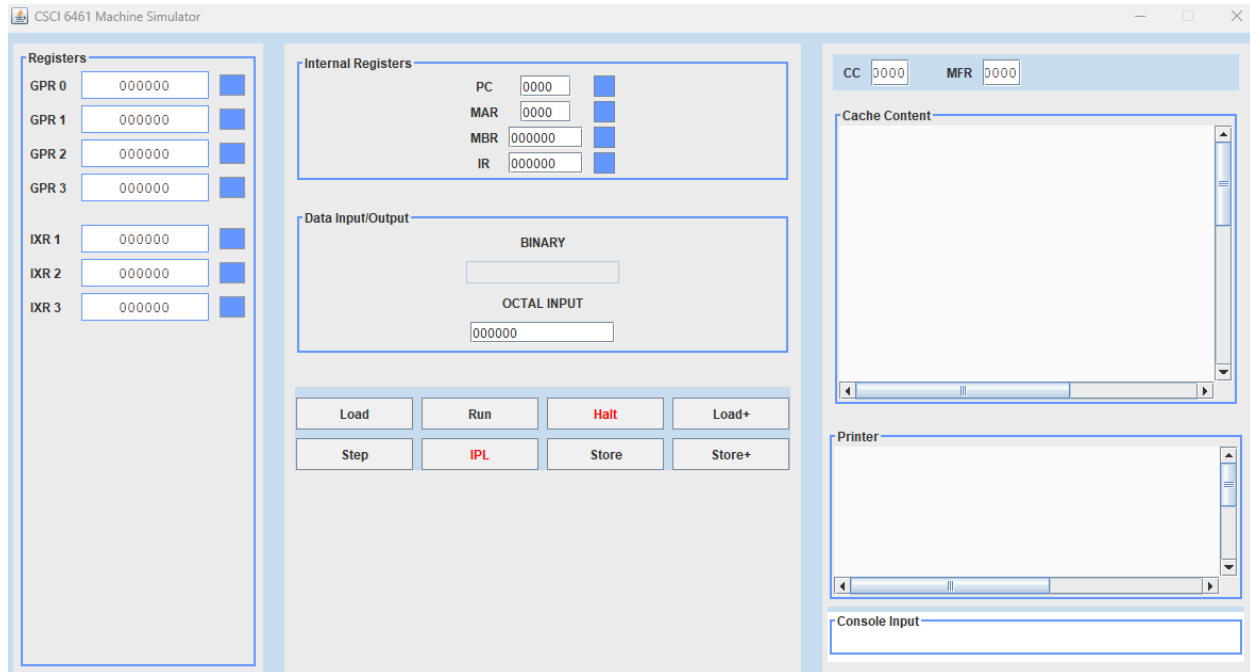


# CSCI 6461 Machine Simulator Documentation - Team 12

## 1. The Console Layout

The simulator interface is divided into three main columns: Registers (left), Operations (center), and I/O (right).



## 2. Left Panel: Registers

This panel displays the primary user-accessible registers.

**GPR 0-3 (General Purpose Registers):** Four 16-bit registers for general data manipulation.

**IXR 1-3 (Index Registers):** Three 16-bit registers used for indexed addressing calculations.

**Register Buttons:** The small blue buttons next to each GPR and IXR are non-functional placeholders. To load a value into these registers, you must use instructions like LDR or LDX from a program.

## 3. Center Panel: Operations & Internal State

This panel contains internal CPU registers, data input fields, and the main control buttons.

### **Internal Registers:**

**PC (Program Counter):** A 12-bit register that holds the address of the next instruction to be executed.

**MAR (Memory Address Register):** A 12-bit register that holds the address of the memory location to be accessed.

**MBR (Memory Buffer Register):** A 16-bit register that holds the data being transferred to or from memory.

**IR (Instruction Register):** A 16-bit register that holds the current instruction being executed.

**Load Buttons:** The small blue button next to each internal register allows you to load a value directly from the OCTAL INPUT field into that specific register.

### **Data Input/Output:**

**BINARY:** A read-only field that displays the 16-bit binary equivalent of the value in the OCTAL INPUT field.

**OCTAL INPUT:** The primary field for manual data entry. All values for registers or memory operations are entered here as octal numbers.

### **Operation Buttons:**

**IPL (Initial Program Load):** The most important button. Click this to open a file dialog and load a program file into the simulator's memory. This resets the machine state.

**Run:** Executes the loaded program continuously until a HLT instruction is encountered or the Halt button is pressed.

**Step:** Executes a single instruction at the address pointed to by the PC.

**Halt:** Stops a continuously running program.

**Load / Store:** Executes a memory load/store operation using the value in the OCTAL INPUT field as the memory address.

**Load+ / Store+:** Similar to Load/Store, but first increments the PC before performing the operation.

## **4. Right Panel: I/O & Status**

This panel displays status information, memory content, and program output.

### **Status Registers:**

**CC (Condition Code):** A 4-bit register that stores the status (e.g., overflow, underflow) of the last arithmetic operation.

**MFR (Machine Fault Register):** A 4-bit register used to identify the type of machine fault that has occurred.

**Cache Content:** A text area that displays the contents of the machine's memory (2048 words). The display is formatted as Address: Value. **(Not Implemented Yet)**

**Printer:** A text area that shows a detailed log of each instruction as it is executed. This is useful for debugging and tracing program flow.

**Console Input:** A field for providing input to a running program when required by an input instruction.

## 5. How to Operate the Simulator (Detailed Steps)

Follow these steps to load and run a program.

### Step 1: Start the Simulator

Run the application. The simulator window will appear with all registers and memory initialized to zero.

### Step 2: Load a Program via IPL

- Click the IPL button. It is highlighted in red for emphasis.
- A file chooser dialog will open. Navigate to and select your program file (e.g., load\_file.txt).
- Click Open.
- The simulator will load the program into memory. The PC will automatically be set to the starting address specified in the program file (e.g., 0006).

### Step 3: Run and Enter the Input

- Once IPL is done, click **Run**.
- Enter the input in the console input box present in the bottom right corner of the GUI.
- The format of the input is as **follows**:

- **Target Num1 Num2 Num3 Num4 Num5 Num6 Num7 Num8 Num9 Num10 Num11  
Num12 Num13 Num14 Num15 Num16 Num17 Num18 Num19 Num20**

- **Example:** -4 9 9 9 9 9 9 9 9 9 -3 -5 9 9 9 9 9 9 9 9
- For more examples, please check the [README.md](#) file
- Once input is typed in the console input, press **Enter** once.
- After a few seconds of processing, you will see the **output** appear in the **Printer tab**.

### Step 4: Halting and Resetting

- To stop a program that is running continuously (e.g., if it's in an infinite loop), click the Halt button.
- To reset the machine and load a new program (or the same one again), simply go back to [Step 2](#) and click the IPL button. The IPL process always resets the machine state before loading the new file.