

Software CPU Design Report

CMPE-220: Systems Software

Team Members

(Team 13)

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GitHub Repository

Repository Link:

<https://github.com/JNR-10/software-cpu>

How to Download, Compile, and Run the Program

Note: These instructions are for Linux/Mac

1. Download the Project

```
git clone https://github.com/JNR-10/software-cpu  
cd software-cpu
```

2. Install Required Dependencies

WSL:

```
sudo apt-get install -y jq  
sudo apt-get install -y dos2unix
```

Mac:

```
brew install jq  
brew install dos2unix
```

3. Run the One-Command Demo

```
chmod +x demo.sh  
dos2unix ./scripts/*.sh  
dos2unix ./demo.sh  
./demo.sh
```

Running the demo will:

- Build the entire project
- Run unit tests
- Generate CPU execution traces

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- Launch the interactive web-based trace viewer
 - Automatically open your browser to visualize CPU execution

4. Manual Build Commands

```
make all          # Build everything  
make test         # Run unit tests  
make clean        # Clean build artifacts
```

5. Running and Debugging Programs

```
# Assemble a program  
  
dos2unix ./bin/software-cpu assemble src/programs/fibonacci.asm build/fib.bin  
./bin/software-cpu assemble src/programs/fibonacci.asm build/fib.bin  
  
# Run a program  
  
dos2unix ./bin/software-cpu run build/fib.bin  
./bin/software-cpu run build/fib.bin  
  
# Interactive debugging mode  
  
dos2unix ./bin/software-cpu debug build/fib.bin  
./bin/software-cpu debug build/fib.bin
```

6. Quick Program Testing

```
# Integration test  
  
dos2unix ./scripts/run_general.sh tests/assembly/test_integration.asm  
./scripts/run_general.sh tests/assembly/test_integration.asm
```

```
# Fibonacci example

dos2unix ./scripts/run_general.sh src/programs/fibonacci.asm
./scripts/run_general.sh src/programs/fibonacci.asm

# Full instruction set test

dos2unix ./scripts/run_general.sh tests/assembly/test_phase4b.asm
./scripts/run_general.sh tests/assembly/test_phase4b.asm
```

7. Trace Generation and Viewer

```
# Generate execution trace

dos2unix ./scripts/run_general_with_trace.sh src/programs/fibonacci.asm fib_trace.json
./scripts/run_general_with_trace.sh src/programs/fibonacci.asm fib_trace.json
```

You can view the trace in 2 places:

1. The command line
2. build/traces/programname_time.json

Team Member Contributions

- **Charles Im:** Automation, trace schema, and visualization.
- **Jainil Narendrakumar Rana:** Assembler, emulator (register, memory, ALU, CPU).
- **Mohit Manoj Barade:** ISA implementation, Memory Mapping, Unit tests, and UI.
- **Shrivaikunth Krishnakumar:** CPU Architecture Design, ISA design, assembler definition implementation
- All helped with debugging, Report writing, and Demo Video Prep