Program Layout and Execution Report

CMPE-220: Systems Software

Team Members

(Team 13)

Charles Im

Jainil Narendrakumar Rana

Mohit Manoj Barade

Shrivaikunth Krishnakumar

Date: December 6, 2025

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

- 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 Factorial Program

```
# Assemble factorial
dos2unix ./bin/software-cpu assemble src/programs/factorial.asm build/fact.bin
./bin/software-cpu assemble src/programs/factorial.asm build/fact.bin

# Run factorial calculation
dos2unix ./bin/software-cpu run build/fact.bin
./bin/software-cpu run build/fact.bin

# Interactive debugging
dos2unix ./bin/software-cpu debug build/fact.bin
./bin/software-cpu debug build/fact.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
```

```
# Factorial example
dos2unix ./scripts/run_general.sh src/programs/factorial.asm
./scripts/run_general.sh src/programs/factorial.asm
```

7. Trace Generation and Viewer

```
# Generate execution trace
dos2unix ./scripts/run_general_with_trace.sh src/programs/factorial.asm factorial_trace.
./scripts/run_general_with_trace.sh src/programs/factorial.asm factorial_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:** Integration, Implement main, Testing
- **Jainil Narendrakumar Rana:** Algorithm subroutine and logic.
- **Mohit Manoj Barade:** Update Memory Map, Calling Convention and Architecture, User Interface showing the necessary visuals.
- **Shrivaikunth Krishnakumar:** Implement factorial in C and trace generation.
- **All helped with debugging, Report writing, and Demo Video Prep**