COMP 3980

Assignment 1 Report

Fereshteh Aghaarabi
A1426237

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Purpose

This program implements a binary-safe ELF file inspection tool.
It validates ELF binaries, extracts metadata from the ELF header (magic number, class, endianness, version, type, machine, entry point), and reports errors for invalid or malformed files.
The focus is on safe file handling, low-level POSIX I/O, and robust error handling.

Requirements

Task	Status
Accept a filename as command-line argument	Fully implemented
Validate file using `fstat` and check minimum ELF header size	Fully implemented
Perform binary-safe reads with short-read handling	Fully implemented
Verify ELF magic number (0x7F 45 4C 46)	Fully implemented
Parse and print ELF header fields (`e_ident`, `e_type`, `e_machine`, `e_entry`)	Fully implemented
Print structured, consistent output	Fully implemented
Handle errors (not regular, too small, bad magic, truncated)	Fully implemented
Use only low-level POSIX I/O (`open`, `read`, `lseek`, `fstat`, `close`)	Fully implemented
Use `<stdint.h>` types	Fully implemented

Bonus: handle big-endian ELF parsing	Fully implemented

Platforms

`elfinspect` has been tested on:

- macOS 14.2 (Apple Silicon/Intel)
- CLion IDE (for editing and debugging, but testing was done in external terminal as required)

Language

- ISO C17 standard
- Compiles with `clang` and `gcc`

Flags used:

```
 -std=c17 -Wall -Wextra -Wpedantic -Wconversion \
-Wsign-conversion -Wshadow -Wformat=2 -Wnull-dereference \
-Wdouble-promotion -Wimplicit-fallthrough -O0 -g
```

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Documents

- **Design Document** (data types, pseudocode, FSM)
- **Testing Report** (Test 1–19)

- **User Guide** (command usage examples)

Findings

- I tested the program with various ELF test files, including intentionally corrupted ones (wrong magic, truncated, invalid headers, etc.).
- On macOS, system binaries such as /bin/ls or /bin/echo are in *Mach-O* format, not *ELF*.
- The program correctly rejects them with the message:
- **Error: Magic number mismatch**

- With real ELF binaries (from Linux), the program outputs structured ELF header information that matches `readelf -h`.

- The program is robust against missing arguments, nonexistent files, small files, and truncated input.