A Java Implementation of a Kaypro II Microcomputer System

A CSI-426 Senior Project

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Team Members

- Team members
  - Brandon Buist
  - Joe Diethorn
  - Jim Gilmer
  - Shannon Steinmetz
  - Hung To
- Examined strengths of each member
- Tasks assigned according strengths
- All team members participated in design

Project Description
The Assignment

- Kaypro II emulator
  - Debugger
  - Printer emulation
  - Floppy drive emulation
  - Utilize CP/M operating system
  - Runs actual programs under emulated OS
- Implemented as a Java applet (needed to learn)
- Must implement good engineering processes
- Object oriented design and implementation

Requirements Gathering

- Internet
  - News groups
  - Contacts
  - Schematics
  - Data books
- Obtained actual system
  - Kaypro manuals
  - ROM images
  - Floppy images
  - Benefit of using actual system

Requirements Gathering

Hardware Emulation Description

- **What is hardware emulation?**
  - **Simulate hardware components**
    - CPU
    - Floppy controller chip
    - Memory mapping
    - I/O chips
    - Video circuitry
  - **Benefits**
    - **Would run actual software**
    - **Greater compatibility**

Requirements Gathering

Hardware Emulation Challenges

- **Needed to extract system ROM's**
  - EPROM reader
  - Converted into static program tables
  - Emulation booted with actual boot ROM code
- **Needed to extract floppy images**
  - Obtained software that extracted raw disk images
  - Converted into static tables
  - Emulation reads and writes actual Kaypro disk data

Requirements Gathering

Hardware Emulation Challenges Cont…

- **Needed to decipher schematics**
  - Used data books to define hardware interfaces
  - Used schematics to define system architecture
- **Debugging emulation code**
  - Needed to create system debugger

Documentation

- User manual
  - User instructions
  - Written before implementation
- Requirements definition
  - Contract with customer (instructor)
  - High level definition
- Requirements specification
  - Contract with programmer
  - Detailed definition
- Design
  - Previous documents describe what is needed
  - Design describes how to implement

Documentation Cont...

- Test plan
  - What will be tested and how
- Accumulated information and data
  - ROM images
  - CP/M disassembly
  - Kaypro technical manual
- Beta test results
  - System disclosed to internet community
  - Since it was an Java applet, internet users could use
  - Comments were gathered

Documentation Results

- Problems and inconstancies were “squeezed” out
- Team was united
- Many “heads” concentrated on complex issues
- Problems were found ahead of implementation
- Coordination between team members
- Incremental integration
- Shortened implementation cycle

Implementation

- Advantages
  - Up-front documentation made implementation easy
  - Integration was straight forward
  - System “fell together”
  - System worked within one hour of integration
- Unit testing
  - Each member tested their own code before it was implemented
  - Documentation made it easy to unit test code
  - Good unit testing resulted in successful integration and bug-free operation

Testing

- Executed test plan
- Ran actual programs
- Found actual Kaypro II bugs
  - Floppy drive selection bug

Conclusion

- Benefits of properly engineered software
  - Properly engineered product yields seamless integration and compatibility and functionality
- Real world project
  - Far too many schools teach software engineering without exposing the student to a “real” project
  - The focus is often on implementation – not on the process

Conclusion Cont…

- The power is in the process
  - Schools need to understand it. Companies need to understand it. The power is in the process. A well-engineered product will last longer, exhibit fewer bugs, come together more smoothly, and result in an empowered, energized design and implementation team
- Our team
  - The result is total buy-in and total team knowledge
  - Team was excited and empowered
  - The software reflects the team that designed and implemented it