OM-Cube Project
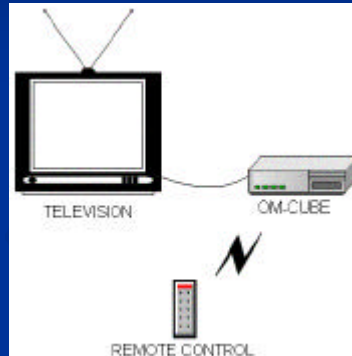
Contents

- Project overview

- Hardware description
- Building a minimal GNU/Linux operating system
- Software selection
- Intermission
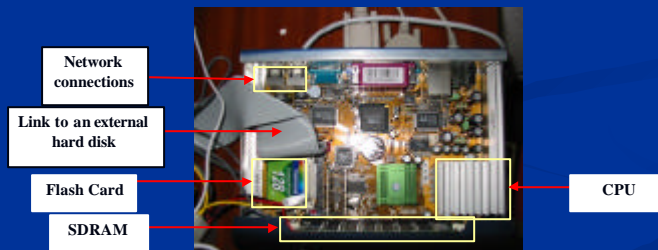- Encountered problems

- Conclusion

Project Overview

- Project aim:

  building an embedded multimedia machine displaying multimedia streams (DVD, MP3, JPEG...) on a TV screen with IR remote control and LCD display

- Embedded system based on a minimal GNU/Linux distribution and an open source multimedia player

Hardware description 1/2

- The barebone contains the same components as a common PC:
  - **Memory (128 Mbytes)**
  - **Trident Cyberblade chipset graphic card**
  - **Processor (Cyrix III clocked at 533 Mhz)**
  - **Compact flash (128 Mbytes)**

- Resources seem to be limited but are quite common for an embedded system

Hardware description 2/2

- More space is needed to build, configure and test a minimal operating system ➔ Use of an hard disk

- No TV-OUT connector
- No IR receiver
- A LCD screen is used to display information about the current multimedia stream

---

Building a minimal GNU/Linux OS

- Main components of the minimal OS:
    - a bootloader (LILO)
    - a 2.4 Linux kernel recompiled and patched
    - a C library (glibc or µClibc)
    - system utilities (init, busybox…) and libraries (ldd command is helpful!)

- Building process:
    - Create a temporary directory with current Linux directories (boot, bin, sbin, usr, lib…) and filling it with the needed files
    - Transfer the distribution on the CF card in an ext3 partition
    - Install the bootloader on the CF card
    - Boot on the CF card

A distribution generator

- **Features**
  - Allows easy choosing and testing of different software configurations
  - Set of main script files and tiny scripts linked to each package
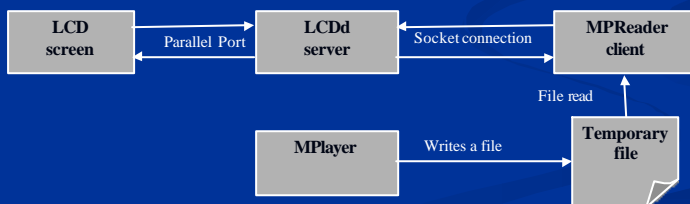
- **Process**
  - Uses a compilation scenario to choose which programs are included
  - Checks some software configuration changes to compile only what is necessary
  - Decompresses the tarballs if needed
  - The tiny scripts configure and compile the packages
  - Fills the destination file system with the useful files

- **Conclusion**
  - Painful to create, all packages are to be carefully studied
  - A first version works, but it had not be used

Software selection

- Choice of the most convenient multimedia player for the project
  - Mplayer or Xine ? What kind of tests have been carried out ?
  - Graphic layers ?
    - Xfree86
    - Framebuffer
    - VESA
  - → Our choice: Mplayer with VESA mode under framebuffer mode
- Interfacing the LCD screen with Mplayer:

LCD screen	Parallel Port	LCDd server	Socket connection	MPReader client

File read

MPlayer	Writes a file	Temporary file

Intermission

OM-Cube in action

Encountered problems

- Compact flash card and data integrity
  - → Difficulties to boot the distribution
  - → Messing of the symbolic links
  - → Modifications of the display fluidity

- Sound disappearance after several tens of seconds
  - → Seems to be due to the hardware limitations

- Compilation time and integration difficulties
  - → Time wasted to correctly tune the kernel

- Framebuffer Mode
  - → Needed to advance, but several work sessions were lost to make it works
  - → Incompatibilities between the hardware and some specific options
  - → Tests with an external working configuration did not worked

Conclusion

- The project keeps taking shape
- A first working distribution has been created
- We were slow down because of limited ressources and a specific hardware
- An infrared control, a TV output and a file navigator are lacking
- A more efficient hardware is needed to continue
- The project is not entirely completed, but it was a very profitable experience:
  - Playing with source compilation
  - Creation of a Linux distribution
  - Adapting to the hardware
  - Driving of a LCD screen
  - Modification of existing source code

Epilogue

We will be glad to answer each of your questions.