Introduction to the Jasmine OpenSSD Platform

Joohyung Park(joohyungpark@csl.skku.edu)
Computer Systems Laboratory
Sungkyunkwan University
http://csl.skku.edu
Contact TA

• Office: #85557
• E-mail: joohyungpark@csl.skku.edu
• For ‘Copy’
Device Inspection

• You are responsible for your HW damages after today inspection, except flash modules

• The only way to escape from the responsibility for damaged HW
  • Examine your device in detail before this class ends
## Project Groups

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>최동혁</td>
<td>송재현</td>
<td>김태호</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>송원석</td>
<td>고병욱</td>
<td>권진혁</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>이정석</td>
<td>류진명</td>
<td>유다한</td>
</tr>
<tr>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>오재열</td>
<td>조호준</td>
<td>이상현</td>
</tr>
</tbody>
</table>
Indilinx Jasmine Board

- Barefoot Controller (ARM7TDMI-S)
- Power Switch
- NAND Flash Module
- SATA 3.0Gbps
- Power
- Mobile SDRAM
- JTAG
- UART
- Factory Mode Jumper
USB-RS232 Cable
Other 5 Components
For debugging

Power

SATA interface
Software Prerequisites

• ARM EABI cross compiler for windows
  • To build firmware binary for the ARM controller
  • Install the toolchain ‘Win 7’ compatible mode (Win 10)
  • Download it from the link at icampus
  • 2011.03-42 version exe

• Serial Driver (Win 7)
  • Download the proper one by yourselves(CD, googling)

• Putty
  • To debug firmware via serial communication
  • [http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html](http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html)
Firmware / Installer Preparation

• Download Jasmine Firmware (Ver. 1.1.0)
  • [http://www.openssd-project.org/mediawiki/download.php?f=OpenSSD-1.1.0.zip&c=OpenSSD.zip](http://www.openssd-project.org/mediawiki/download.php?f=OpenSSD-1.1.0.zip&c=OpenSSD.zip)

• Edit OpenSSD-1.1.0/target_spw/uart.c

```c
void uart_printf(const char * msg, ...)
{
    char out[256];
    va_list ap;
    int len = 0;

    va_start(ap, msg);
    len = vsnprintf(out, sizeof(out) - 1, msg, ap);
    va_end(ap);

    if (len >= 0) {
        out[len] = '\0';
        uart_print(out);
    }
}
```

• Build firmware(OpenSSD-1.1.0/build_gnu/build.bat)
  • **Without** Admin Permission
  • Edit Makefile to change current FTL with another

• Firmware installer
  • Put the installer into OpenSSD-1.1.0/build_gnu folder
Install Firmware: Factory Mode

- Factory Mode
  - Firmware uploading mode
- Power-down Jasmine board
- Power-up Jasmine board as ‘Factory Mode’

- Run installer (OpenSSD-1.1.0/build_gnu/install.exe)
  - With Admin Permission
Install Firmware: Factory Mode

Scan (bad) list will be saved in block 0 for each flash.

If 2\textsuperscript{nd} process fails, even you’ve done the 4\textsuperscript{th} process. Ignore the error message, try 3\textsuperscript{rd} one, and redo the whole process (1-2-3).
Run Firmware: Normal Mode

• Power-down Jasmine board
• Power-up Jasmine board as ‘Normal Mode’
Diskpart

DiskPart> list disk

<table>
<thead>
<tr>
<th>디스크</th>
<th>상태</th>
<th>크기</th>
<th>사용 가능한</th>
<th>Dyn</th>
<th>Gpt</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>온라인</td>
<td>238 GB</td>
<td>0 B</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>온라인</td>
<td>1863 GB</td>
<td>1742 GB</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>온라인</td>
<td>59 GB</td>
<td>59 GB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DiskPart> select disk 2

2 디스크가 선택한 디스크입니다.

DiskPart> clean

DiskPart에서 디스크를 정리했습니다.

DiskPart> create partition primary

DiskPart에서 지정한 파티션을 만들었습니다.
Format & Mount
uart_printf() for Debugging

• Set OPTION_UART_DEBUG in include/jasmine.h
• Edit OpenSSD-1.1.0/target_spw/uart.c
  • [http://www.openssd-project.org/wiki/Special:AWCforum/sp/id287](http://www.openssd-project.org/wiki/Special:AWCforum/sp/id287)

• Clean(OpenSSD-1.1.0/clean.bat)
• Re-build the firmware
• Debugging log will be sent to host in ‘Normal Mode’

• Example
  • uart_printf(“Total FTL DRAM %d Kb”,dram_size);
Putty Configuration
## Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/9 (Wed)</td>
<td>Intro. to the Jasmine OpenSSD Platform</td>
</tr>
<tr>
<td>3/16 (Wed)</td>
<td>Dummy FTL</td>
</tr>
<tr>
<td>3/23 (Wed)</td>
<td>Tutorial FTL</td>
</tr>
<tr>
<td>3/30 (Wed)</td>
<td>Greedy FTL</td>
</tr>
<tr>
<td>4/6 (Wed)</td>
<td>Reliability Issues</td>
</tr>
<tr>
<td>4/13 (Wed)</td>
<td>Vote for ourselves</td>
</tr>
<tr>
<td>4/20 (Wed)</td>
<td>Project #1 Log Block Scheme</td>
</tr>
<tr>
<td>4/27 (Wed)</td>
<td>Project #2 Competition Starts!</td>
</tr>
<tr>
<td>5/4 (Wed)</td>
<td>Project #2 Progress Report</td>
</tr>
<tr>
<td>6/? (Wed)</td>
<td>Project #2 Presentation</td>
</tr>
</tbody>
</table>
Project Overview

• Project #1. Log block FTL
  • “A Space-efficient Flash Translation Layer for CompactFlash Systems,” 2002
  • Implement on OpenSSD Platform

• Project #2. Performance competition
  • Optimize your FTL for given I/O pattern
    • 10% storage : 4K Random I/O
    • 90% storage : 8M Sequential I/O
Technical Resource

• Download resources from OpenSSD Wiki
  • http://www.openssd-project.org
  • Technical Reference Manual
  • FTL Developer’s Guide
  • Jasmine Firmware
To end up today class

• Put some uart_printf()s in OpenSSD-1.1.0/sata_main to print out the number of read/written sectors
  • Hint: Main()

• Set up Putty to receive debugging log from OpenSSD

• Proceed the diskpart process in page 13

• Save a copy of putty results into “YourStudentID.txt” and e-mail me attaching the txt file
Any Questions?