Introduction to the OpenSSD Jasmine Platform

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Lab Overview & Notifications
## Lab Overview & Schedule

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Make Groups!

• OpenSSD Jasmine: **Team projects**
• S/W FTL simulator: **Personal projects**
Notifications

• Do not ‘copy’

• Please let me know if (e-mail & hangout)
  – Something goes wrong
  – Stupid questions (Welcome!)
  – Suggestions
  – Someone cheating?
  – “I have better ideas”
  – The course is too easy
Device Inspection
Device Inspection

• You are responsible for your H/W damages after today inspection, except for flash modules

• The only way to escape from damaged H/W
  – Examine your Jasmine board IN DETAIL before CLASS ENDS
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

SATA interface

Power
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
Firmware / Installer Preparation

• Download Jasmine Firmware (Ver. 1.1.0)

• 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

디스크 ## 상태 크기 사용 가능 Dyn Gpt
--- ---- ------ -------- --- ---
디스크 0 온라인 238 GB 0 B *
디스크 1 온라인 1863 GB 1742 GB *
디스크 2 온라인 59 GB 59 GB

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
- 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
Introduction to OpenSSD Jasmine Platform
Storage Device
HDD vs SSD
HDD vs SSD

• HDD
  – Slow Read/Write speed
  – Different Sequential/Random I/O speed
  – In-Place update

• SSD
  – Fast Read/Write speed
  – Similar Sequential/Random I/O speed
  – In-Place update is impossible.
    • Page unit write/ Block unit erase.
  – Wearing.
The OpenSSD Project

• It is an initiative to promote research and education on the recent SSD technology

• Providing OpenSSD platforms on which open source SSD firmware can be developed
Hardware Architecture

- SRAM (96KB)
- NAND Flash
- NAND Controller
- INDILINX Barefoot™ Controller
- Barefoot™ Controller
- Clock Generator
- ARM7TDMI-S Core
- ROM Controller
- Memory Utility
- Buffer
- Buffer Manager
- SATA Device
- SATA Host interface
- DRAM Controller
- DRAM
- PMU
- ICU
- JTAG debug port
- UART
- GPIO
- Timer
- WDT
- APB Bridge
- Code, variable
- Read/write to flash
- For debug

ICE3028: Embedded System Design, Fall 2018, Jinkyu Jeong (jinkyu@skku.edu)
Technical Resource

- Download resources from OpenSSD Wiki
  - [http://www.openssd-project.org](http://www.openssd-project.org)
  - FTL Developer’s Guide
  - Jasmine Firmware
To End up Today…

- 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 15

- Save a copy of putty results into “YourStudentID.txt” and upload it to ‘icampus’
Any Questions?