Linux Firmware Debug Kit

A convenient way to debug HW code

Merck Hung

COSCUP 2009

Merck Hung (洪豪謙)

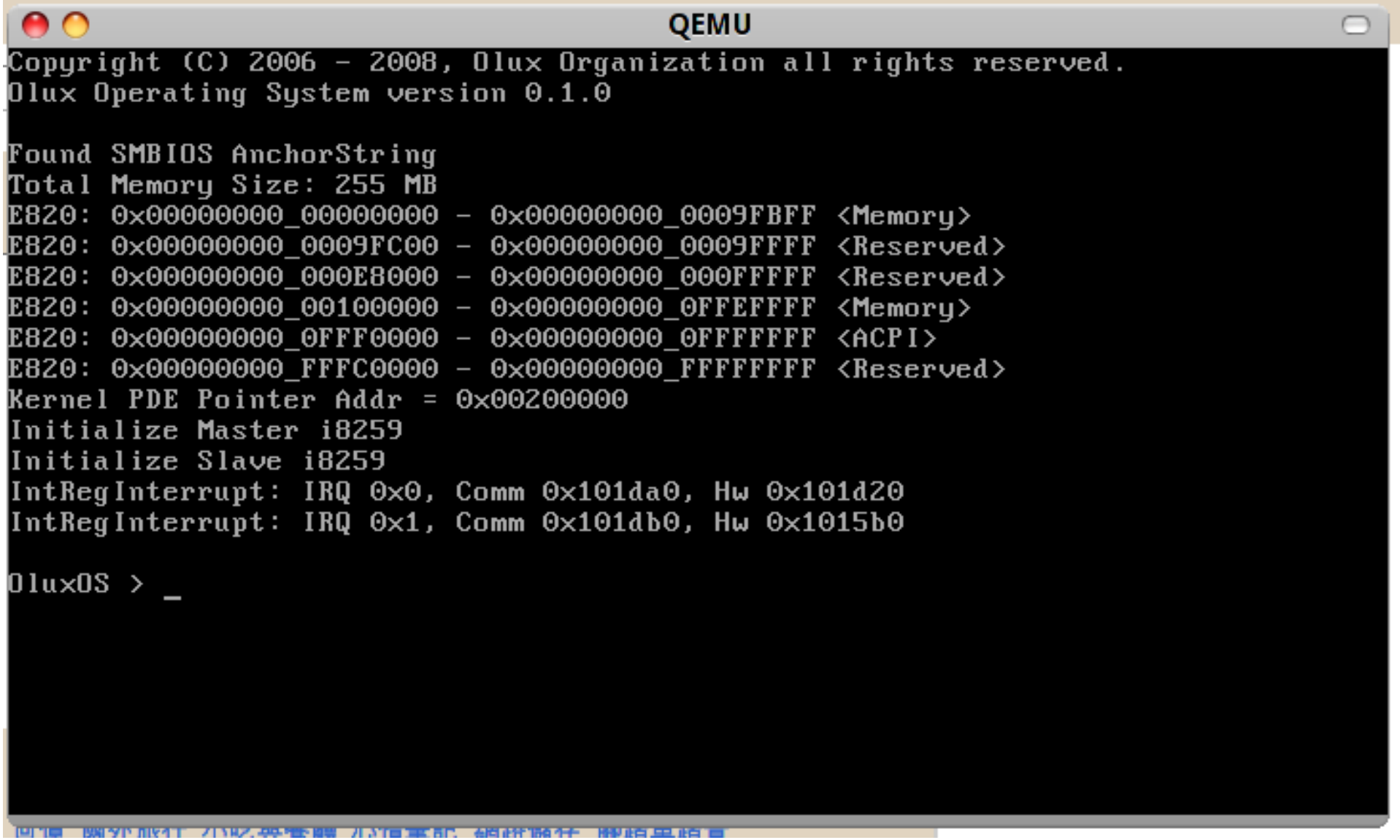
現職於: ASUS (Cell Phone)

歷任於:
MiTAC (Linux Storage)
GIGA-BYTE (Linux & BIOS)

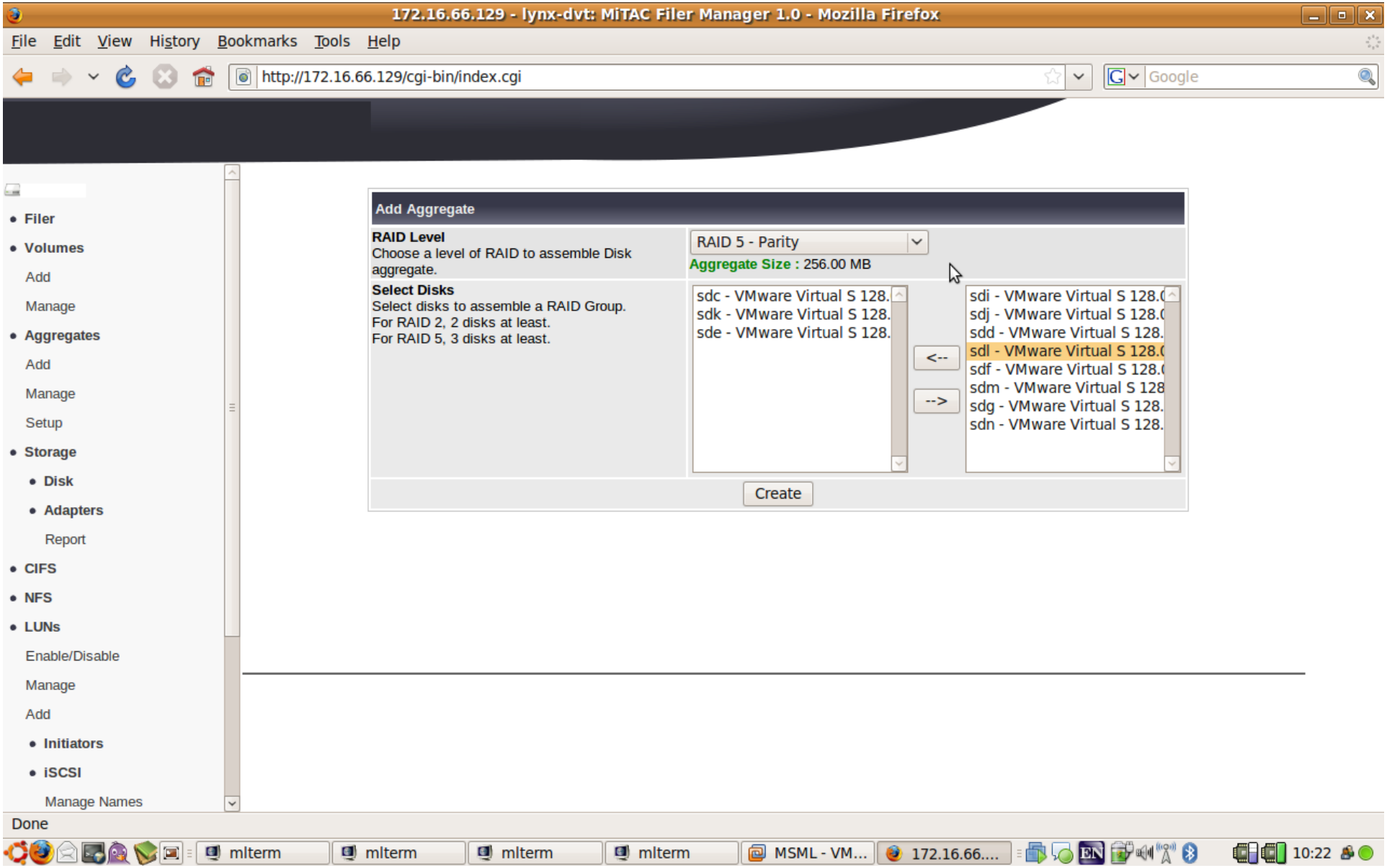
專長與興趣:
x86/ARM Bootloader, Linux Kernel & Driver
, Operating System Development, and Android OS.

作品:
1. OluxOS (http://sourceforge.net/projects/oluxkernel/)
2. LFDK (http://sourceforge.net/projects/lfdk/)
3. Embedded Linux iSCSI/NAS (Undergoing to be Open Source)
4. Embedded Linux Bootloader resided in BIOS (Patent)

OluxOS


QEMU
Copyright (C) 2006 - 2008, Olux Organization all rights reserved.
Olux Operating System version 0.1.0
Found SMBIOS AnchorString
Total Memory Size: 255 MB
E820: 0x00000000_00000000 - 0x00000000_0009FBFF <Memory>
E820: 0x00000000_0009FC00 - 0x00000000_0009FFFF <Reserved>
E820: 0x00000000_000E8000 - 0x00000000_000FFFFF <Reserved>
E820: 0x00000000_00100000 - 0x00000000_0FFEFFFF <Memory>
E820: 0x00000000_0FFF0000 - 0x00000000_0FFFFFFF <ACPI>
E820: 0x00000000_FFFC0000 - 0x00000000_FFFFFFFF <Reserved>
Kernel PDE Pointer Addr = 0x00200000
Initialize Master i8259
Initialize Slave i8259
IntRegInterrupt: IRQ 0x0, Comm 0x101da0, Hw 0x101d20
IntRegInterrupt: IRQ 0x1, Comm 0x101db0, Hw 0x1015b0
OluxOS > _

iSCSI/NAS


172.16.66.129 - lynx-dvt: MiTAC Filer Manager 1.0 - Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://172.16.66.129/cgi-bin/index.cgi
Google
Filer
Volumes
Add
Manage
Aggregates
Add
Manage
Setup
Storage
Disk
Adapters
Report
CIFS
NFS
LUNs
Enable/Disable
Manage
Add
Initiators
iSCSI
Manage Names
Add Aggregate
RAID Level
Choose a level of RAID to assemble Disk aggregate.
RAID 5 - Parity
Aggregate Size : 256.00 MB
Select Disks
Select disks to assemble a RAID Group.
For RAID 2, 2 disks at least.
For RAID 5, 3 disks at least.
sdc - VMware Virtual S 128.
sdk - VMware Virtual S 128.
sde - VMware Virtual S 128.
<--
-->
sdi - VMware Virtual S 128.
sdj - VMware Virtual S 128.
sdd - VMware Virtual S 128.
sdl - VMware Virtual S 128.
sdf - VMware Virtual S 128.
sdm - VMware Virtual S 128
sdg - VMware Virtual S 128.
sdn - VMware Virtual S 128.
Create
Done
mlterm
mlterm
mlterm
mlterm
MSML - VM...
172.16.66....
10:22

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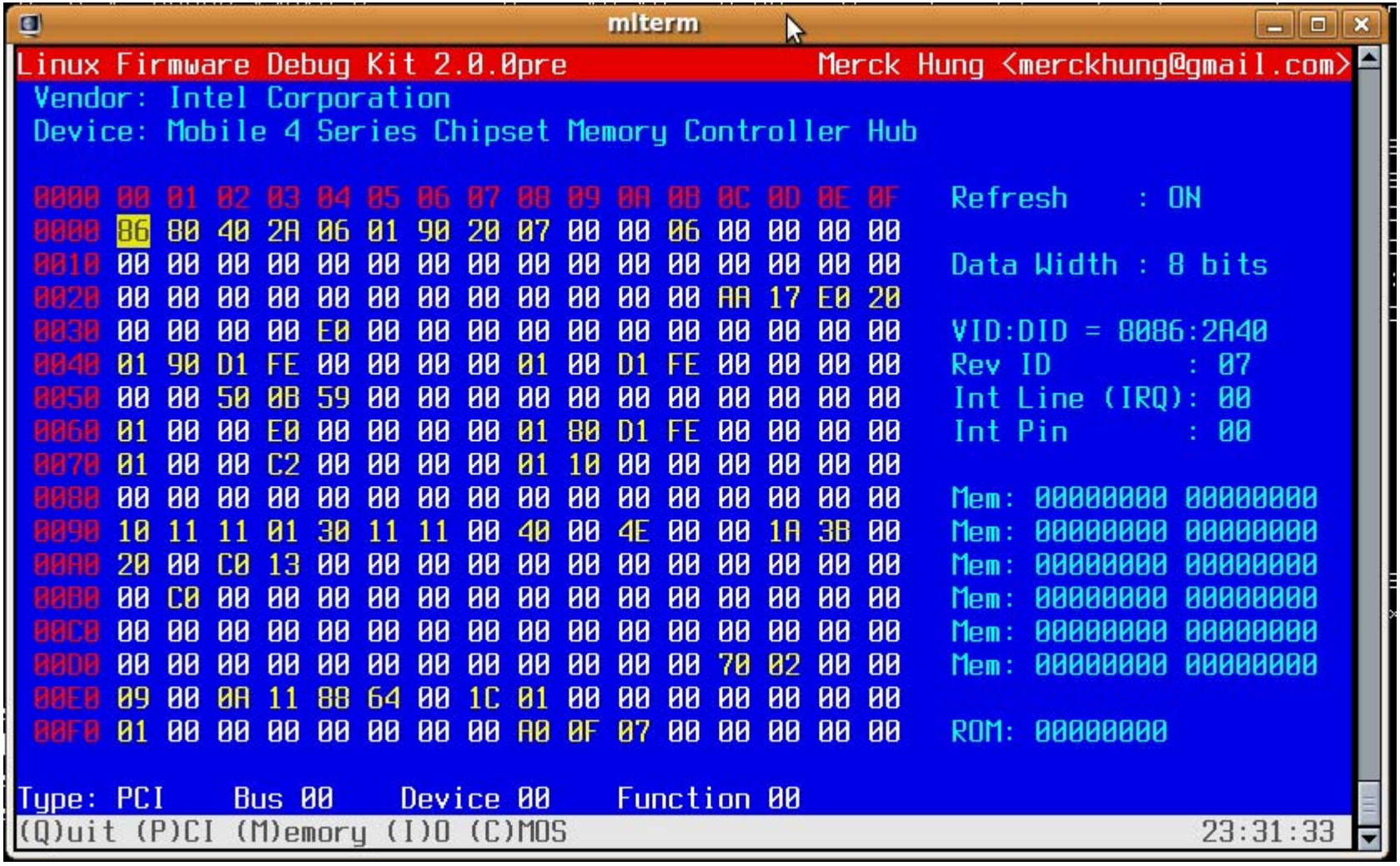

撰寫 LFDK 的動機 ??

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1. 有鑒於 **BIOS** 的 **debug** 工具豐富

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2. 爲了盡量避免 **recompile code**
3. **Embedded Device** 速度較慢
4. 吸引 **BIOS** 正妹的注意

使用 **LFDK** 的時機？

Driver Code 其實區分

1. **Kernel Driver Facilities**
   SpinLock, MutexLock, WorkQueue, KThread, ……
2. **Driver Subsystem**
   Wi-Fi, SCSI, IDE, USB, I2C, SPI, ……
3. **HW Register Operation**
   如何操作 **specific IC chip** 的暫存器**.**

Debug 的方式

1. **Kernel Driver Facilities**
   觀念弄清楚, printk, Remote KGDB, JTAG
   And Recompile the code

2. **Driver Subsystem**
   經驗的累積, printk, Remote KGDB, JTAG
   And Recompile the code

3. 如何操作 **specific IC chip** 的暫存器.
   SPEC.看更仔細, 推敲方法1, 2, 3, 4, 測試驗證
   And Recompile the code

推敲方法1, 2, 3, 4, 測試驗證

Step	LDN	Index	Value	Description
1	All	0x07h	**0x04h**	Select LDN to Environment registers, P.35
2	**0x04h**	0x30h	0x01h	Enable Environment Controller functions, P.55
3	**0x04h**	0x70h	0x0Ch	Select EC interrupt level to GPIO14, P.55
4	All	0x07h	**0x07h**	Select LDN to GPIO registers, P.36
5	All	0x2Bh	Value & 0xEFh	Unlock EC registers, P.45
6	All	0x2Ah	Value | 0x10h	Enable GPIO14 multifunction, P.44
7	All	0x25h	Value | 0x10h	Setup GPO14(EXTSMI) as General Purpose I/O 14, P.41
8	**0x07h**	0xB8h	Value | 0x10h	Internal Pull-up GIPO14
9	**0x07h**	0xC0h	Value & 0xEFh	Set GPIO14 to Alternative function
10	**0x07h**	0xC8	Value | 0x10h	Set GPIO14 to Output mode
11	**0x07h**	0xF4h	0x0Ch	Map SMI# Pin Location to GPIO14, P.64
12	**0x07h**	0xF1h	Value | 0xC0h	Force Clear all SMI# status and set to level trigger, P.63
13	**0x07h**	0xF0h	Value | 0x10h	Enable SMI# due to Environment Controller's IRQ, P.63

Try & Error 要很久
有沒有節省時間的方法呢**?**

YES

答案就是……

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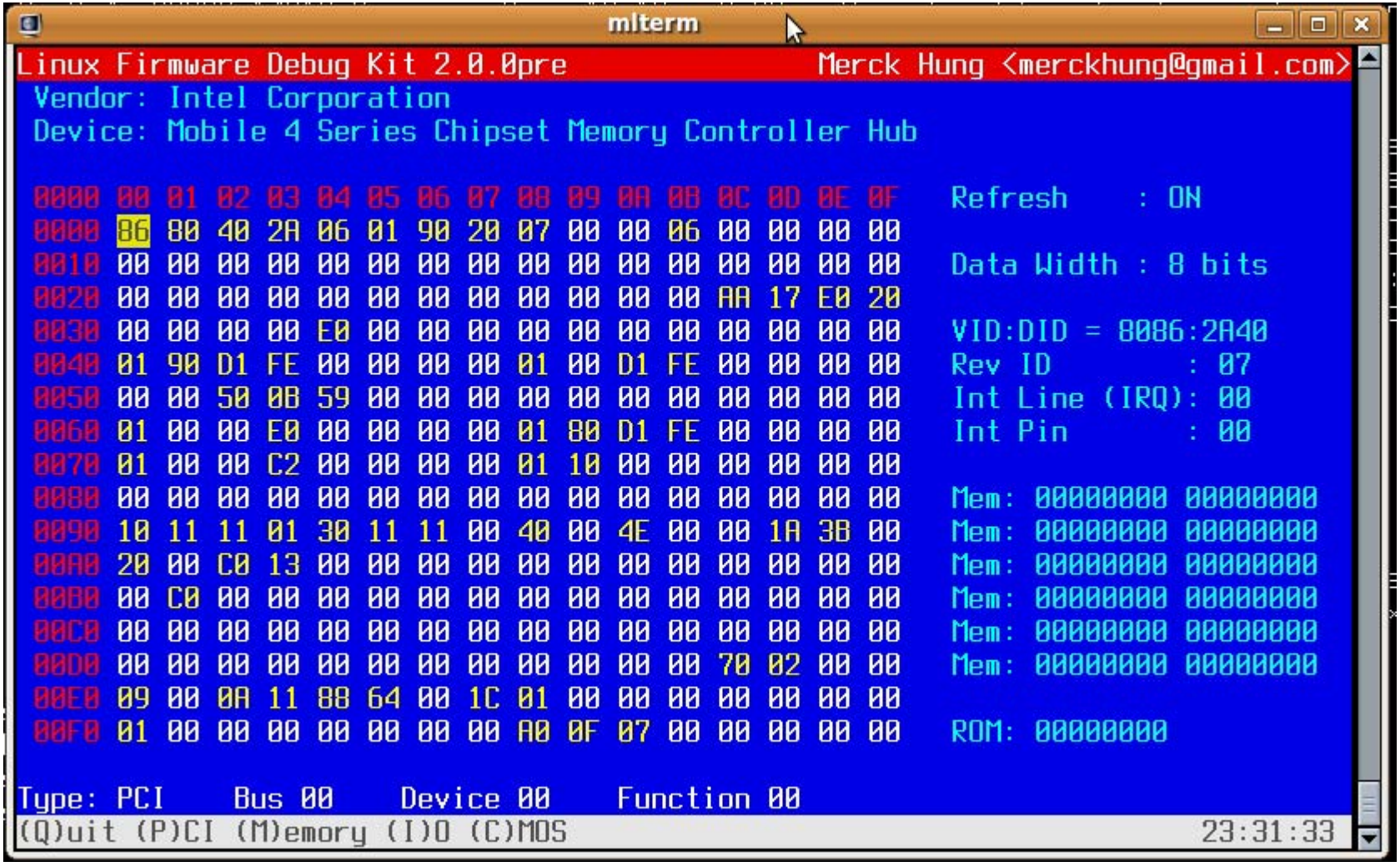
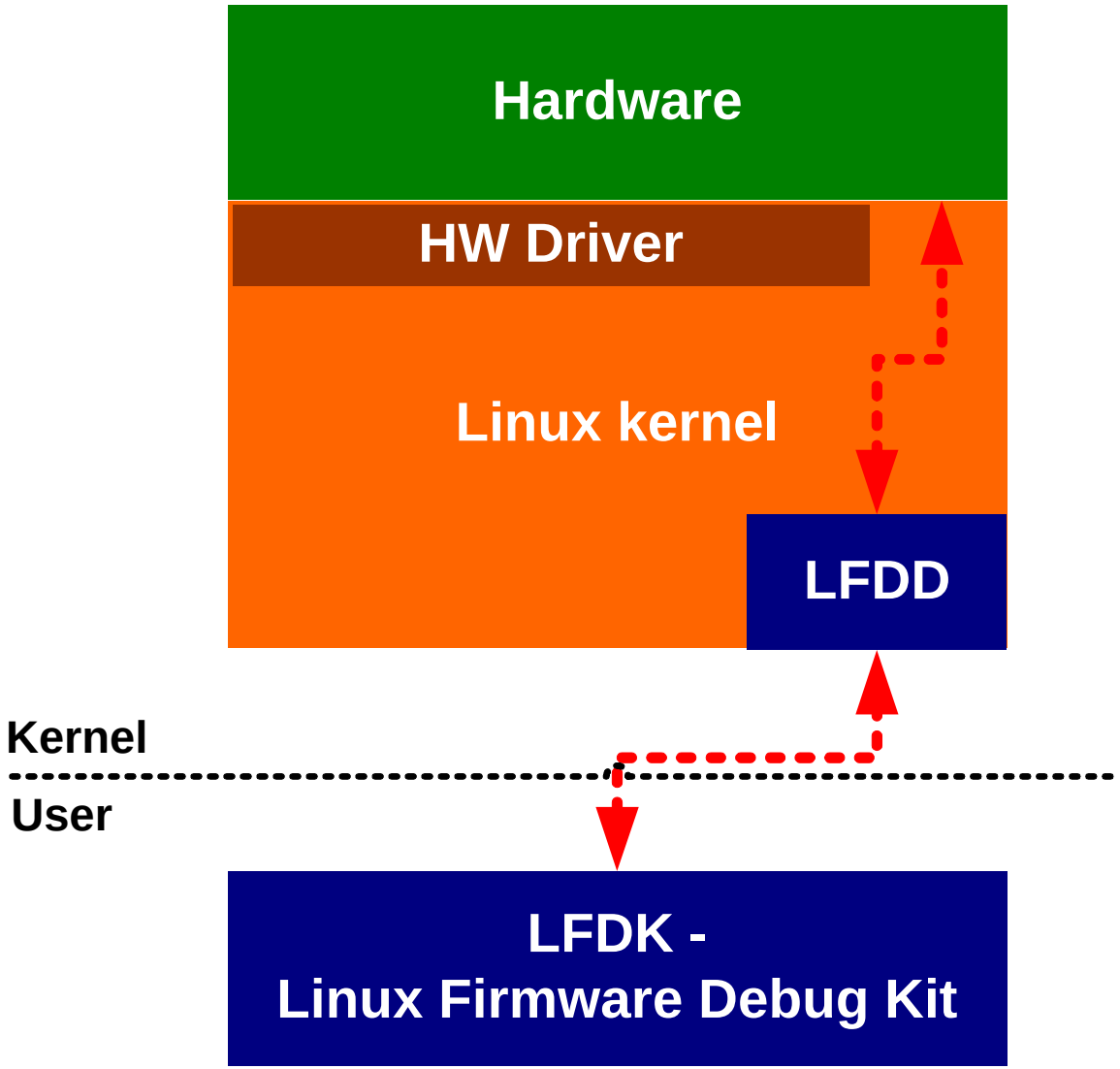


Software Arch of LFDK



DEMO

我一秒鐘都不能等!!!

Thank you

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