SideARM Reflash instructions for 2005 upgrade

(Version 0.9, 03/31/05)

Introduction

These instructions will walk you through reflashing the SideARM and preparing it to run with the new kernel, root filesystem and IBM J9 JVM. There is one added task, and that is to put the J9 JVM on the Compact Flash, but one step from the reflash procedure has been removed thanks to the SideARM MTD flash map, which is new to this kernel. Also new to this kernel is mature journalling filesystem support for the compact flash card (ext3), and a revised Exar 16L788 driver.

Image File Locations

Below are the locations of the two image files that you will need for the reflash procedure.

```
moonjelly:{/tftpboot/}sidearm-update/zImage (Linux 2.4.27 kernel)
moonjelly:{/tftpboot/}sidearm-update/root2-beta1.jffs (golden bits)
```

Note that moonjelly's numeric IP address is 134.89.12.225.

Procedure

The following are the 8 steps needed to reflash and prepare a SideARM board to run with the new root filesystem, updated kernel, and updated J9 JVM.

[1] Halt the processor, power cycle the board, and get ready to 'break' into the bootloader using [Ctrl]-[C].

```
-sh-2.05b# halt

Broadcast message from root (ttySA0) Fri Apr  1 00:02:02 2005...

The system is going down for system halt NOW !!
INIT: Sending processes the TERM signal
INITStopping SIAM application: done.
Saving the System Clock time to the Hardware Clock...
Shutting down PCMCIA services: cardmgr.
Deactivating swap... done.
Unmounting local filesystems... done.
flushing ide devices:
Power down.
+
MBARI SideARM v4
IBoot version 1.7
  built on Apr 20 2004 at 15:05:38

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Copyright 2004 MBARI

CS8900A found at 0x08000300
1
```

```
[Ctrl]-[C]
```

[2] Erase the entire flash part, except for the bootloader

```
IBoot> eraseflash 3
Do you wish to erase flash blocks 3-127? [y/n] y
Erasing block 127
```

[3] Download the kernel image. I am downloading it from my machine in this example. Be sure to substitute **`tftp:134.89.12.225 sidearm-update/zImage`** for the tftp server and filename respectively. The target address, `0xc0000000`, does not change

```
IBoot> download tftp:134.89.11.231 zImage 0xc0000000

.Downloading zImage: 0009F684
Downloaded 652932 bytes at 318 kB/s
```

[4] Flash the kernel image. Note that some of the drivers that were previously built into the kernel are now kernel loadable modules. This has decreased the size of the kernel by a good 128K or more. You will notice that the size argument given below is only 0xa0000, which is fine because our downloaded kernel image is 0x9f684 bytes according to the bootloader (see above).

```
IBoot> flash 0x60000 0xc0000000 0xa0000
Flashing: 0x00100000
```

[5] Download the JFFS2 root filesystem image. I am downloading it from my machine in this example. Be sure to substitute `tftp:134.89.12.225 sidearm-update/root2-beta1.jffs2` for the tftp server and file respectively. The target address, 0xc0000000, does not change

```
IBoot> download tftp:134.89.11.231 root2-beta1.jffs2 0xc0000000
Downloading root2-beta1.jffs2: ++00700000
Downloaded 7340032 bytes at 275 kB/s
```

[6] Now flash the root filesystem image. As before, take note of the number of bytes that we have downloaded in order to give the flash command a correct count. In this case, it's 0x700000, which I've put in bold in the bootloader display above. This is the last parameter to the flash command. The other two do not change.

```
IBoot> flash 0x160000 0xc0000000 0x700000
Flashing: 0x00860000
```

[7] Now simply reboot the system. One step has been saved here due to the new and improved kernel image!

```
IBoot> reboot
Restarting...
```

Log messages shown on the console follow. Note that all the kernel modules are now

loaded together instead of by separate init scripts as before. This is much cleaner and less error-prone. You will also see a message `waiting for /mnt/hda...` -- don't worry, this is also an improvement. The SIAM app init file gets executed by the init process while cardmgr (a daemon responsible for PCMCIA/CF peripherals) is initializing and mounting the CompactFlash card. I added some code to the startup script to check, at 1 second intervals, to see if $SIAM_HOME exists. After the card has been properly mounted by cardmgr, this condition is true, and the application is started. Again, this is much cleaner and less error prone than before.

Please ignore the 'Security risk' warnings as these are necessary memory mappings for the on-board flash memory and Cirrus cs8900 ethernet controller.

After the system boots, there is one additional step that I had mentioned before. This follows the boot sequence shown below.

```
+
MBARI SideARM v4
IBoot version 1.7
  built on Apr 20 2004 at 15:05:38

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CS8900A found at 0x08000300
0
Relocating zImage from 00060000 to C0008000 (len=00100000)
Proper ARM zImage ID found. Booting...
Uncompressing Linux..... done, booting
the kernel.
Linux version 2.4.27-vrs1 (timm@seattle) (gcc version 3.3.3) #12 Fri Mar 25
17:35:19 PST 2005
CPU: StrongARM-1110 revision 9
Machine: MBARI SideARM v4
Security risk: creating user accessible mapping for 0x00000000 at 0xe8000000
Security risk: creating user accessible mapping for 0x08000000 at 0xf0000000
On node 0 totalpages: 16384
zone(0): 16384 pages.
zone(1): 0 pages.
zone(2): 0 pages.
Kernel command line: console=ttySA0 root=1f03 rw init=/linuxrc
Calibrating delay loop... 127.38 BogoMIPS
Memory: 64MB = 64MB total
Memory: 63320KB available (1160K code, 253K data, 52K init)
Dentry cache hash table entries: 8192 (order: 4, 65536 bytes)
Inode cache hash table entries: 4096 (order: 3, 32768 bytes)
Mount cache hash table entries: 512 (order: 0, 4096 bytes)
Buffer cache hash table entries: 4096 (order: 2, 16384 bytes)
Page-cache hash table entries: 16384 (order: 4, 65536 bytes)
CPU: Testing write buffer: pass
POSIX conformance testing by UNIFIX
Linux NET4.0 for Linux 2.4
Based upon Swansea University Computer Society NET3.039
Initializing RT netlink socket
CPU clock: 191.700 MHz (59.000-287.000 MHz)
Starting kswapd
JFFS2 version 2.1. (C) 2001 Red Hat, Inc., designed by Axis Communications AB.
ttySA0 at MMIO 0x80050000 (irq = 17) is a SA1100
ttySA1 at MMIO 0x80030000 (irq = 16) is a SA1100
ttySA2 at MMIO 0x80010000 (irq = 15) is a SA1100
pty: 256 Unix98 ptys configured
SA1100 Real Time Clock driver v1.00
RAMDISK driver initialized: 16 RAM disks of 4096K size 1024 blocksize
loop: loaded (max 8 devices)
Uniform Multi-Platform E-IDE driver Revision: 7.00beta4-2.4
ide: Assuming 50MHz system bus speed for PIO modes; override with idebus=xx
SA1100 flash: probing 16-bit flash bus
cfi_cmdset_0001: Erase suspend on write enabled
Using buffer write method
Using static partition definition
Creating 4 MTD partitions on "SA1100 flash":
0x00000000-0x00020000 : "firmware"
0x00020000-0x00060000 : "params"
0x00060000-0x00160000 : "kernel"
0x00160000-0x01000000 : "rootdisk"
Linux Kernel Card Services 3.1.22
  options:  [pm]
SA-1100 PCMCIA (CS release 3.1.22)
```

```
NET4: Linux TCP/IP 1.0 for NET4.0
IP Protocols: ICMP, UDP, TCP, IGMP
IP: routing cache hash table of 512 buckets, 4Kbytes
TCP: Hash tables configured (established 4096 bind 8192)
NET4: Unix domain sockets 1.0/SMP for Linux NET4.0.
NetWinder Floating Point Emulator V0.97 (double precision)
VFS: Mounted root (jffs2 filesystem).
Freeing init memory: 52K
Setting up RAMFS, please wait...
mke2fs 1.25 (20-Sep-2001)
Setting up some devices
ln: `/dev/tty0': File exists
ln: `/dev/tty1': File exists
ln: `/dev/tty2': File exists
ln: `/dev/tty3': File exists
ln: `/dev/tty4': File exists
ln: `/dev/tty5': File exists
ln: `/dev/fb0': File exists
ln: `/dev/ttyC0': File exists
ln: `/dev/rtc': File exists
mknod: `/dev/ppp': File exists
Executing /sbin/init...
INIT: version 2.85 booting
Not recalculating module dependencies
Loading modules: cs8900 Using /lib/modules/2.4.27-
vrs1/kernel/drivers/net/cs8900.o
Cirrus Logic CS8900A driver for Linux (24-Jan-2004)
eth0: Registered cs8900_eeprom char device (major #253)
eth0: CS8900A rev D at 0xf0000300 irq=47, eeprom ok, addr: 00: C:6A: 0:04: 4
sa1100gpio Using /lib/modules/2.4.27-vrs1/kernel/drivers/misc/sa1100gpiSA1100
GPIO v1.3 device (10,222): stencil=0x000FFFF
o.o
sa1100lddio Using /lib/modules/2.4.27-vrs1/kernel/drivers/misc/sa110SA1100
LDDIO v1.0 device (10,224): stencil=0x0000FFF
0lddio.o
sa1100spi Using /lib/modules/2.4.27-vrs1/kernel/drivers/misc/sa110SA1100 SPI
v1.6 device (10,223)
0spi.o
slhc Using /lib/modules/2.4.27-vrs1/kernel/drivers/net/slhc.o
CSLIP: code copyright 1989 Regents of the University of California
ppp_generic Using /lib/modules/2.4.27-vrs1/kernel/drivers/net/ppp_generic.o
PPP generic driver version 2.4.2
ppp_async Using /lib/modules/2.4.27-vrs1/kernel/drivers/net/ppp_async.o
ppp_deflate Using /lib/modules/2.4.27-vrs1/kernel/drivers/net/ppp_dePPP Deflate
Compression module registered
flate.o
bsd_comp Using /lib/modules/2.4.27-vrs1/kernel/drivers/net/bsd_comp.oPPP BSD
Compression module registered

xr788 Using /lib/modules/2.4.27-vrs1/kernel/drivers/serial/xr788.o
Serial: Exar 16L788 driver
kernel 2.4.27, driver v2.0Mar 25 2005 17:37:55
ttySX0 at MMIO 0x10000000 (irq = 2) is a XR788_UART
ttySX1 at MMIO 0x10000020 (irq = 2) is a XR788_UART
ttySX2 at MMIO 0x10000040 (irq = 2) is a XR788_UART
ttySX3 at MMIO 0x10000060 (irq = 2) is a XR788_UART
ttySX4 at MMIO 0x10000080 (irq = 2) is a XR788_UART
ttySX5 at MMIO 0x100000a0 (irq = 2) is a XR788_UART
ttySX6 at MMIO 0x100000c0 (irq = 2) is a XR788_UART
ttySX7 at MMIO 0x100000e0 (irq = 2) is a XR788_UART
xr788-2 Using /lib/modules/2.4.27-vrs1/kernel/drivers/serial/xr788-2.o
Serial: Exar 16L788 driver
```

```
kernel 2.4.27, driver v2.0Mar 25 2005 17:37:55
ttySX0 at MMIO 0x10000200 (irq = 3) is a XR788_UART
ttySX1 at MMIO 0x10000220 (irq = 3) is a XR788_UART
ttySX2 at MMIO 0x10000240 (irq = 3) is a XR788_UART
ttySX3 at MMIO 0x10000260 (irq = 3) is a XR788_UART
ttySX4 at MMIO 0x10000280 (irq = 3) is a XR788_UART
ttySX5 at MMIO 0x100002a0 (irq = 3) is a XR788_UART
ttySX6 at MMIO 0x100002c0 (irq = 3) is a XR788_UART
ttySX7 at MMIO 0x100002e0 (irq = 3) is a XR788_UART
sunrpc Using /lib/modules/2.4.27-vrs1/kernel/net/sunrpc/sunrpc.o

Mounting local filesystems...
devpts on /dev/pts type devpts (rw,mode=0622)
Setting up local devices files... cs8900_eeprom(253) pcmcia(254) done.
Setting the System Clock using the Hardware Clock as reference...
INIT: Entering runlevel: 2
Configuring network interfaces: done.
Generating DSA key, may take a while...
Generating public/private dsa key pair.
Your identification has been saved in /etc/ssh/ssh_host_dsa_key.
Your public key has been saved in /etc/ssh/ssh_host_dsa_key.pub.
The key fingerprint is:
4c:a4:10:3b:8b:b0:81:ba:79:33:a4:16:a5:ae:25:01 root@sidearm
Starting OpenBSD Secure Shell server: sshd.
Starting system logger:
Starting kernel logger:
Starting PCMCIA services: cardmgr.
cardmgr[120]: watching 2 sockets
Starting Boa webserver: boa.

Setting system date/time to 31/03/2005, 16:28:14.
Trying to free nonexistent resource <c4882000-c488200f>
hda: SanDisk SDCFH-128, CFA DISK drive
ide0 at 0xc4882000-0xc4882007,0xc488200e on irq 43
hda: attached ide-disk driver.
hda: 250880 sectors (128 MB) w/1KiB Cache, CHS=980/8/32
Partition check:
 hda: 1 Apr 00:27:12 ntpdate[132]: step time server 134.89.10.65 offset
28737.661684 sec
/etc/rc2.d/S98local: line 17: manageLog: command not found
/etc/rc2.d/S98local: line 18: manageLog: command not found
 hda1
ide_cs: hda: Vcc = 3.3, Vpp = 0.0
waiting for /mnt/hda...
Journalled Block Device driver loaded
waiting for /mnt/hda...
 hda: hda1
 hda: hda1
 hda: hda1
EXT2-fs warning: mounting unchecked fs, running e2fsck is recommended
Starting SIAM application: skipping SIAM auto start
SIAM
sidearm login: root
Password:
-sh-2.05b#
```

[8] Add J9 to the Compact Flash card.

J9 has grown in functionality and size since the v1.5 release. Ironically, the v1.5 release is about 1.5 Mbytes compressed. The v2.2 release is 6.5 Mbytes compressed. While it is possible to fit this into the JFFS2 filesystem, it does not leave that many free blocks for the journaling mechanism to correctly do it's job. The changes involved are actually relatively minimal.

This step assumes that you have a properly formatted flash card inserted and that it is mounted on /mnt/hda. Also, ensure that you are currently in the /mnt/hda directory.

We'll retrieve the J9 distribution from the 'install' directory of the moosmc CVS repository using the cvsweb CGI script on moonjelly. SideARM already has a handy utility called wget, which retrieves a file expressed as a URL. While the URL is a little ungainly, below is the command needed. Type the URL as a long string (the break is inserted here by the document margins) with no spaces or carriage returns.

```
-sh-2.05b# pwd
/mnt/hda
-sh-2.05b# wget -O j9.tar.gz http://moonjelly/cgi-
bin/cvsweb.cgi/~checkout~/moosmc/install/j9-arm-max-22.tar.gz?rev=1.2
Resolving moonjelly... done.
Connecting to moonjelly[134.89.12.225]:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: unspecified [text/plain]

    [                                <=>   ] 6,538,523    828.93K/s

01:21:09 (828.93 KB/s) - `j9.tar.gz' saved [6538523]
-sh-2.05b#
```

Wget writes the file it retrieves as j9.tar.gz. Now, simply extract the J9 distribution...

```
-sh-2.05b# tar zxf j9.tar.gz
```

... and you'll be ready to go. Below is a sample run of the SIAM application from a system setup in this manner.

```
-sh-2.05b# su ops
sidearm:/root$ gosiam
sidearm:/mnt/hda/siam$ nodeTest
Starting at Fri Apr  1 00:28:00 UTC 2005 [ Log Level @  INFO  ]
j9 -jcl:max  -cp /
mnt/hda/j9/lib/jclMax/classes.zip:/mnt/hda/j9/lib/prsnlmot.jar:/mnt/hda/j9/lib/
RXTXcomm.jar:/mnt/hda/siam/classes:/mnt/hda/codebase:/mnt/hda/siam/jars/javax.j
ar:/mnt/hda/siam/jars/gnu_getopt.jar:/mnt/hda/siam/jars/jrendezvous.jar:/mnt/hd
a/siam/jars/log4j-1.2.8.jar -Djava.
security.policy=/mnt/hda/siam/properties/policy -Djava.
rmi.server.codebase=http://sidearm/codebase/ -Dsiam_home=/mnt/hda/siam -Dlog4j.
threshold=INFO moos.deployed.NodeTest
1 INFO   NodeTest [main]: NodeTest.main(): portalHost not specified
345 INFO   NodeManager [main]: Starting NodeManager: $Name: march29_2005-2 $
1967 INFO   PortManager [main]: Found 13 configured ports in properties file
2001 INFO   PortManager [main]: No DPA found at slot: 0
2004 INFO   PortManager [main]: No DPA found at slot: 1
```

```
2008 INFO   PortManager [main]: No DPA found at slot: 2
2011 INFO   PortManager [main]: No DPA found at slot: 3
2014 INFO   PortManager [main]: No DPA found at slot: 4
2018 INFO   PortManager [main]: No DPA found at slot: 5
2991 INFO   SleepManager [main]: SleepManager constructor
2996 INFO   CommsLeaseListener [main]: CommsLeaseListener() complete
2997 INFO   NodeManager [main]: Starting registry...
3029 INFO   NodeManager [main]: registry started.
3030 INFO   NodeManager [main]: binding NodeService to rmi://localhost/node
3366 INFO   NodeManager [main]: NodeService is bound to rmi://localhost/node
PowerManager constructor
3691 INFO   PortManager [main]: Service jar not specified for port /dev/ttySX0
3692 INFO   PortManager [main]: Service jar not specified for port /dev/ttySX1
3693 INFO   PortManager [main]: Service jar not specified for port /dev/ttySX2
3694 INFO   PortManager [main]: Service jar not specified for port /dev/ttySX3
3696 INFO   PortManager [main]: Service jar not specified for port /dev/ttySX4
3696 INFO   PortManager [main]: Service jar not specified for port /dev/ttySX5
3697 INFO   PortManager [main]: Service jar not specified for port /dev/ttySX6
3698 INFO   PortManager [main]: Service jar not specified for port /dev/ttySX7
3699 INFO   PortManager [main]: Service jar not specified for port /dev/ttySX8
3700 INFO   PortManager [main]: Service jar not specified for port /dev/ttySX9
3701 INFO   PortManager [main]: Service jar not specified for port /dev/ttySX10
3702 INFO   PortManager [main]: Service jar not specified for port /dev/ttySX11
4370 INFO   PortManager [main]: Starting service...
6746 INFO   InstrumentService [main]: initializeInstrument() for MSP430
environmental
7533 INFO   InstrumentService [main]: done with initializeInstrument() for
MSP430 environmental
11212 INFO   PortManager [main]: service started
11508 INFO   SleepManager [Thread-2]: SleepManager disabled
11529 INFO   CpuLeaseSleepRollcallListener [main]:
CpuLeaseSleepRollcallListener() constructor
11544 INFO   CpuLease [main]: CpuLease() constructor
11554 INFO   CommsSchedulerTask [Thread-7]: CommsSchedulerTask.run(): Apr 1,
2005 12:28:16 AM
11559 INFO   CpuLease [Thread-8]: CpuLease started
12620 INFO   NodeManager [main]: NodeManager "node" started.
ThreadUtility.printThreads()
ThreadGroup "main" includes about 17 threads
thread: "Thread-10-DBG-0" alive
thread: "Thread-9-DBG-1" alive
thread: "Thread-8-DBG-2" alive
thread: "Thread-7-DBG-3" alive
thread: "Thread-5-DBG-4" alive
thread: "Thread-3-DBG-5" alive  daemon
thread: "RMI-ServerConnection:127.0.0.1-DBG-6" alive  daemon
thread: "RMI-Leaser-DBG-7" alive  daemon
thread: "RMI-ServerConnection:127.0.0.1-DBG-8" alive  daemon
thread: "RMI-ConnectionGC-DBG-9" alive  daemon
thread: "RMI-Accept:1099-DBG-10" alive  daemon
thread: "Thread-1-DBG-11" alive
thread: "RMI-Accept:1026-DBG-12" alive  daemon
thread: "RMI-GC Runner-DBG-13" alive  daemon
thread: "RMI-DGC-DBG-14" alive
thread: "RMI-Ref GC-DBG-15" alive  daemon
thread: "Thread-0-DBG-16" alive
```