EB-SAM9G45 Linux User Manual

Revision History

Rev	Date	Description
1.0	2011-02-10	Initial version

Catalogue

1. Build the development platform

This section focuses on introduce the basic knowledge of embedded Linux development, including how to install the required source code and how to compile it.

1.1 The establishment of working directory

```
# mkdir /home/Embest_SAM9G45
# cd /home/Embest_SAM9G45
```

Copy 05-Linux_Source Document from the CD to /home/Embest_SAM9G45. Don't change the document's name.

1.2 Cross-compilation tools

```
# tar xvjf 05-Linux_Source/Official_Code/CrossTool/arm-2007q1-10-arm-none-linux-gnueabi.tar
  .bz2 –C /usr/local
```

1.3 Install AT91Bootstrap source code and compile

(1) Install source.
```
# unzip 05-Linux_Source/Official_Code/AT91Bootstrap/Bootstrap-v1.14.zip
```
(2) Compile.
```
# cd Bootstrap-v1.14/board/at91sam9g45ekes/nandflash/
# make clean
# make CROSS_COMPILE=/usr/local/arm-2007q1/bin/arm-none-linux-gnueabi-
# ls
```
(3) You can see nandflash_at91sam9g45ekes.bin under this directory.

1.4 Install uboot source

(1) Install.
```
# tar xvjf 05-Linux_Source/Official_Code/U-boot/u-boot-1.3.4.tar.bz2 -C ./
# cd u-boot-1.3.4/
```
  (2) Compile.
```
# make clean
# make at91sam9g45ekes_nandflash_config
# make CROSS_COMPILE=/usr/local/arm-2007q1/bin/arm-none-linux-gnueabi-
# ls
```
(3) You can see u-boot.bin under this directory.

1.5 Install linux kernel source

(1) Install.

tar xvjf 05-Linux_Source/Official_Code/linux_kernel_2.6.30/linux-2.6.30.tar.bz2 -C ./

cd linux-2.6.30/

patch -p1 < ../05-Linux_Source/Official_Code/linux_kernel_2.6.30/2.6.30-at91.patch.gz

tar xvzf ../05-Linux_Source/Official_Code/linux_kernel_2.6.30/2.6.30-at91-exp.4.tar.gz -C ./

for p in 2.6.30-at91-exp/*; do patch -p1 < $p ; done

patch –p1 < ../05-Linux_Source/Embest_Code/embest_all_modify.diff

Add the configure file

LCD type	configure file
LCD_4.3	embest_EM-SAM9G45_4.3lcd_defconfig
LCD_7.0	embest_EM-SAM9G45_7.0lcd_defconfig
LCD_10.2	embest_EM-SAM9G45_10.2lcd_defconfig

cp arch/arm/configs/ configure file .config

(2) Compile.

make ARCH=arm menuconfig

make uImage ARCH=arm CROSS_COMPILE=/usr/local/arm-2007q1/bin/arm-none-linux-gnueabi-

Note:If you can not use "make uImage",please try this command to install it.

   apt-get install uboot-mkimage

(3) You can see uImage under arch/arm/boot/.

2. Download Linux images to ATMEL SAM9G45 ARM9 Board

2.1 Install download tools
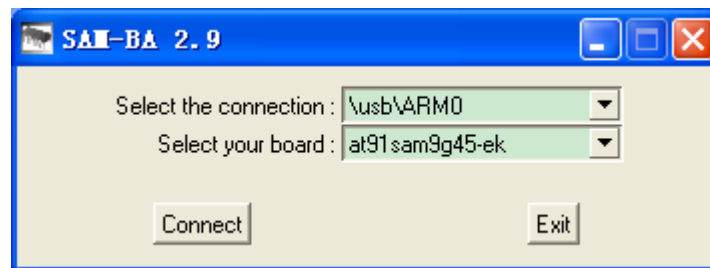
Please refer to the 03-tools\SAM-BA\sam-ba install

2.2 Connect ATMEL SAM9G45 ARM9 Board with SAM-BA

2.2.1 Install EB-SAM9G45's USB driver

Please refer to 03-tools\SAM-BA\the board driver install

2.2.2 Connect the ATMEL EB-SAM9G45 ARM9 Board

First,you should open the JP2 wire,then double click the SAM-BA v2.9 icon in the PC's desktop, then it will display the dialog:

Click 'Connect' to connect the ATMEL EB-SAM9G45 ARM9 Board with PC,and close the JP2 wire.

2.3 Download Linux images

2.3.1 Auto download

After step1 and step2, open the 02-Images\linux image\ EB-SAM9G45_Linux_4.3_LCD, click download.bat. Waiting about 3 minutes, SAM-BA will download the Linux images to the board automatically. After download, connect the development board with the PC using serial port line, then reset the board, you will see the Linux startup information in the HyperTerminal.

2.3.2 Manual download

➢ NandFlash demo Memory map
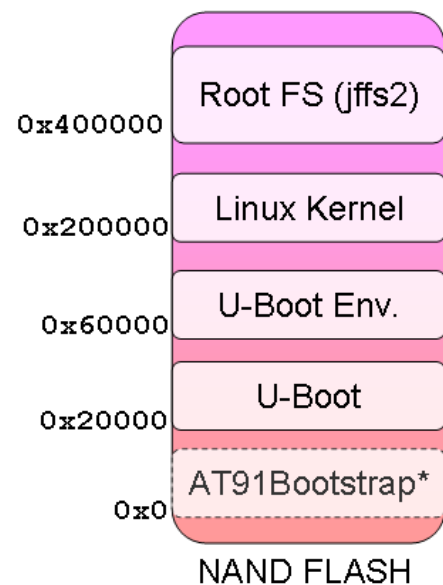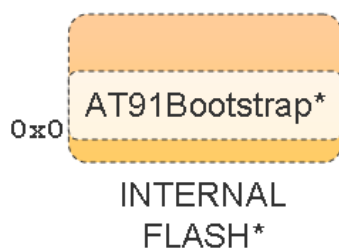
➢ Use SAM-BA to download
  ✓ After step2.1 and step2.2,you can get
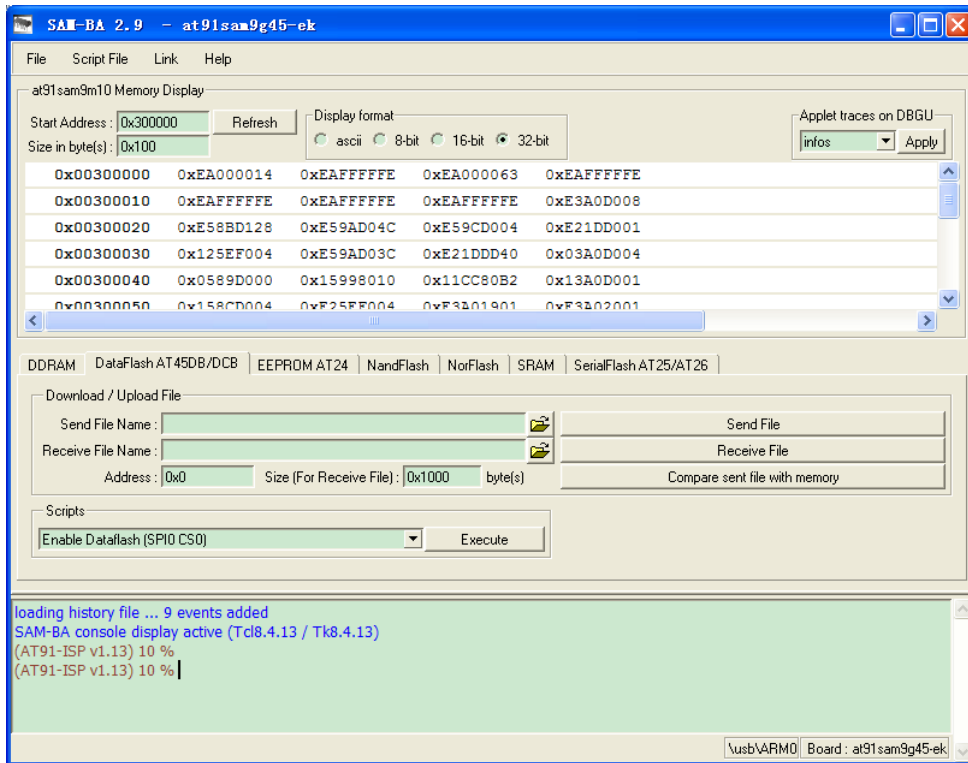
✓ Select NandFlash then enable NandFlash

✓ Download nandflash_at91sam9g45ekes.bin

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✓ Download u-boot.bin

✓ Download ubootEnvtFileNandFlash.bin

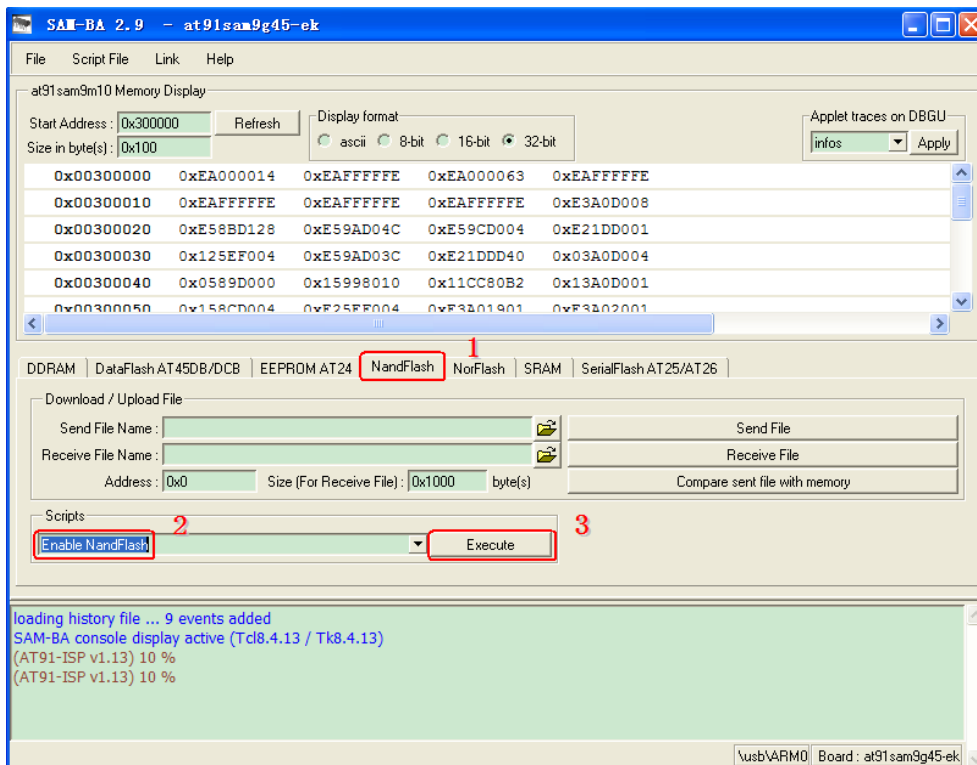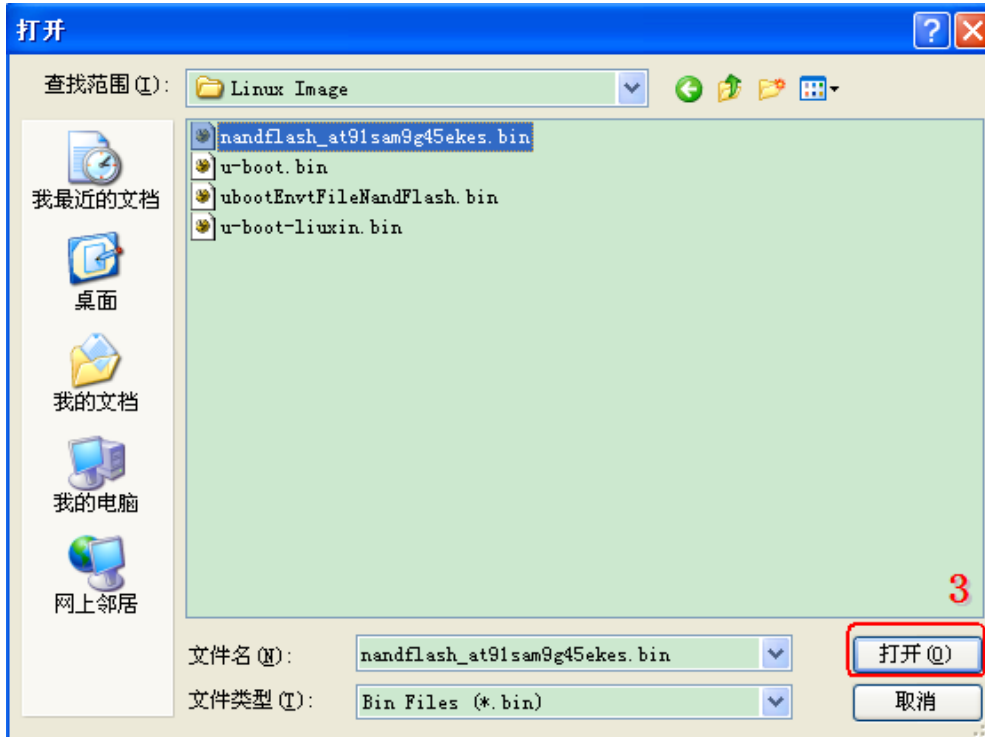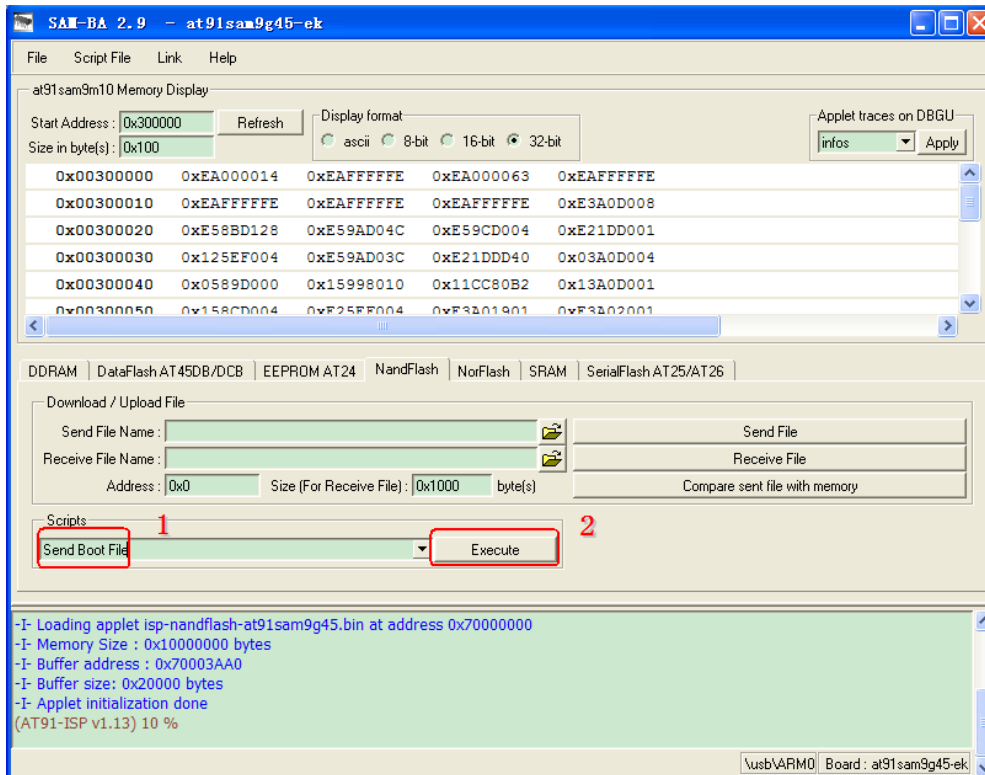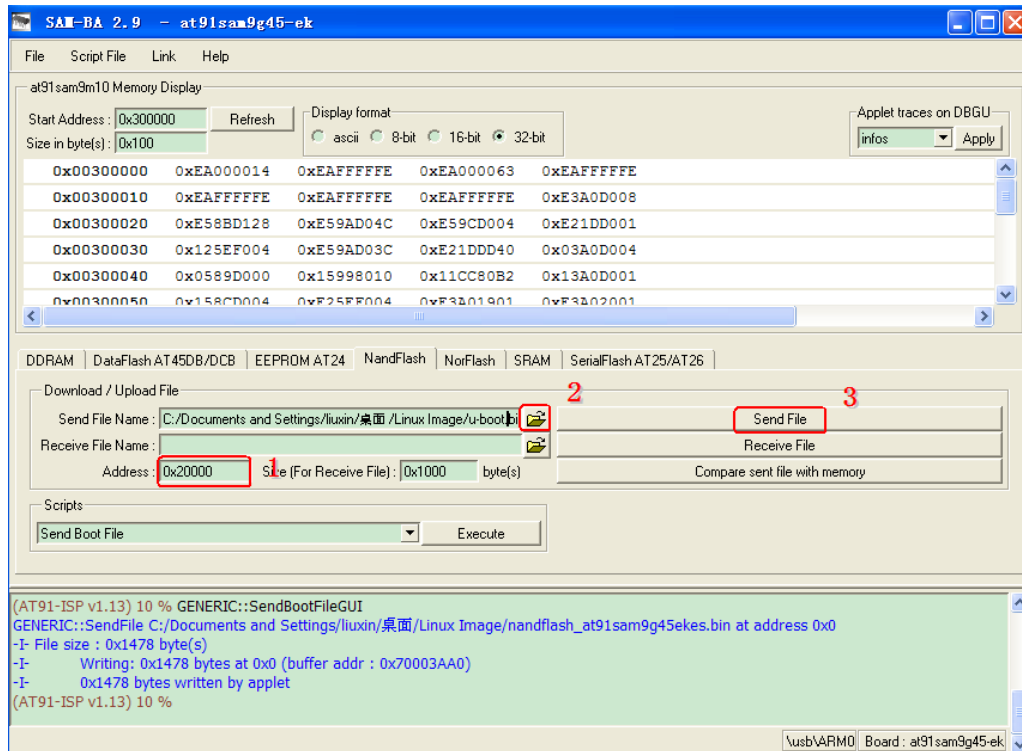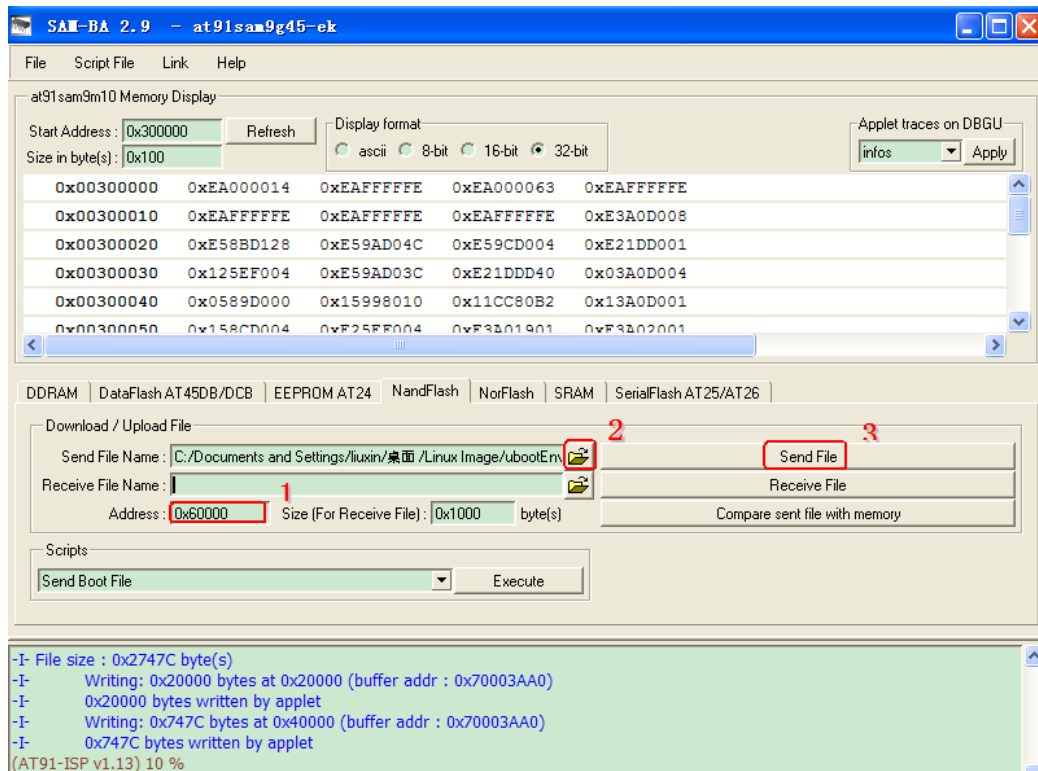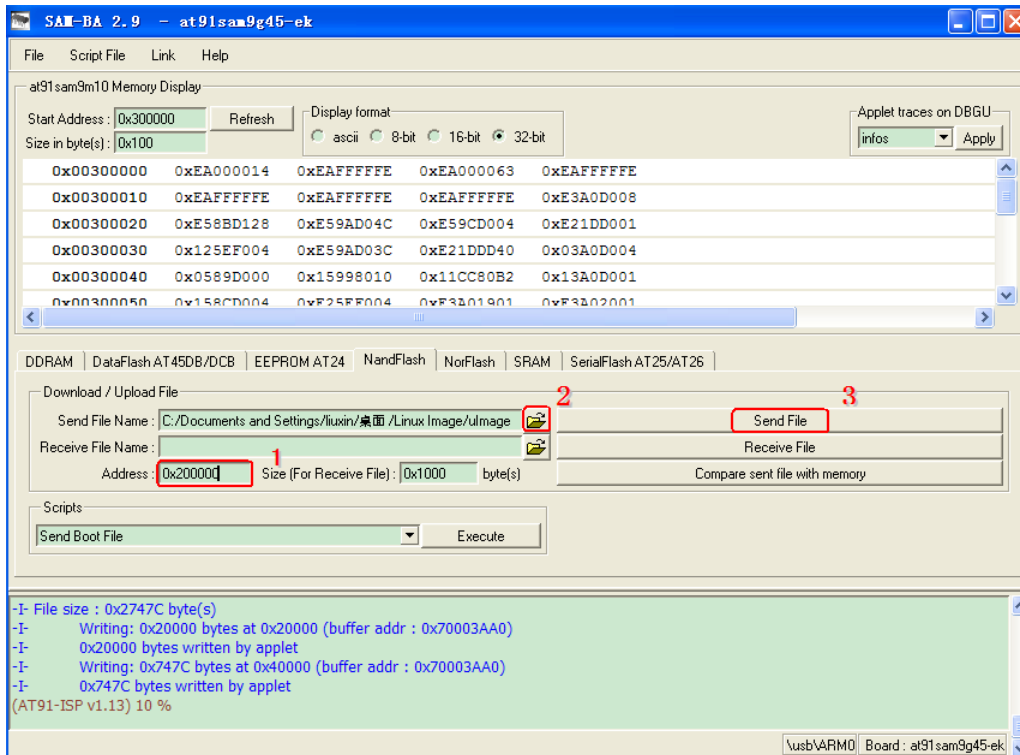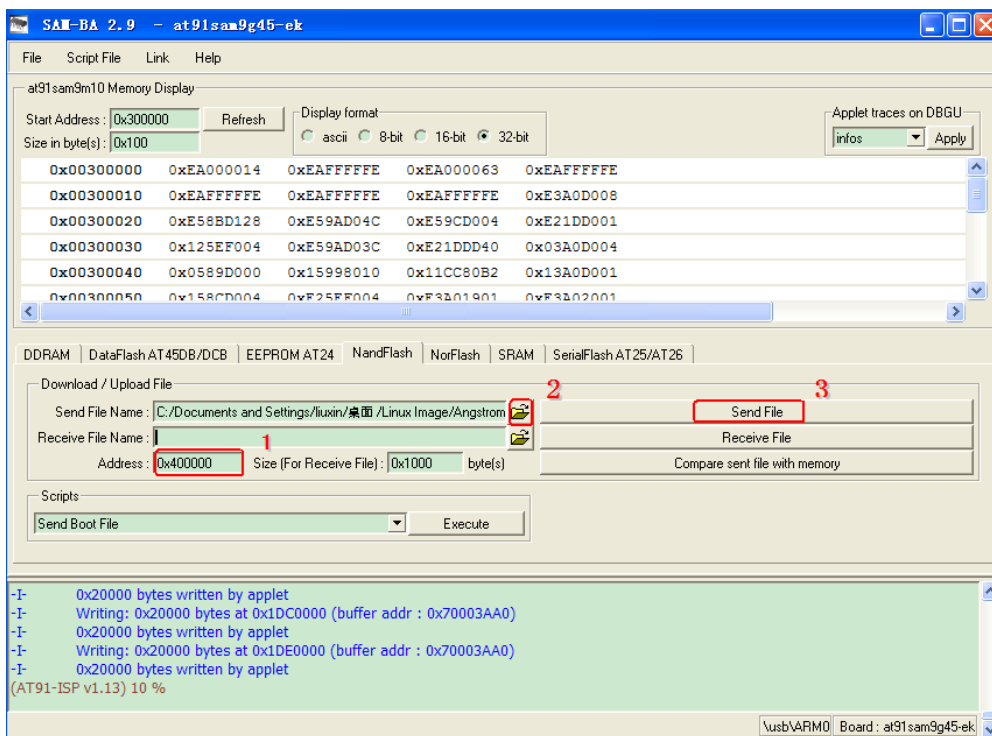✓ Download uImage

✓ Download Angstrom-x11-image-demo-glibc-at91.rootfs.jffs2

3. How to use Linux

We can operate Linux with touchscreen or serial port. But now we use serial port to demonstrate how to use Linux in order to use it more easily. We will show some important operation, such as mount flash disk or SD Card, or test Ethernet, or play mp3 files.

3.1 Touchscreen calibration

1) After power on the board, we must calibrate the touchscreen firstly (only need to calibrate in the first time). The LCD will display some point, and you must press these point accurately. After calibration success, you can enter info the Linux.

2) Before enter into the Linux through HyperTerminal, you must login in, as follows:

at91sam login:root

3.2 How to use flash disk

1) After enter into the Linux through HyperTerminal, insert a flash disk into the USB Host port in the board, then HyperTerminal will display the information:

usb 1-2: new high speed USB device using atmel-ehci and address 3
usb 1-2: New USB device found, idVendor=1005, idProduct=b113
usb 1-2: New USB device strings: Mfr=1, Product=2, SerialNumber=3
usb 1-2: Product: USB FLASH DRIVE
usb 1-2: Manufacturer:
usb 1-2: SerialNumber: 19891C540920
usb 1-2: configuration #1 chosen from 1 choice
scsi1 : SCSI emulation for USB Mass Storage devices
scsi 1:0:0:0: Direct-Access   USB FLASH DRIVE   PMAP PQ: 0 ANSI: 0 CCS
sd 1:0:0:0: [sda] 7831552 512-byte hardware sectors: (4.00 GB/3.73 GiB)
sd 1:0:0:0: [sda] Write Protect is off
sd 1:0:0:0: [sda] Assuming drive cache: write through
sd 1:0:0:0: [sda] Assuming drive cache: write through
  sda: sda1
sd 1:0:0:0: [sda] Attached SCSI removable disk

2) At this time Linux has mounted the flash disk automatically, we can use the command to enter into flash disk, as follows:

root@at91sam:~$ cd /
root@at91sam:/$ cd media/
root@at91sam:/media$ cd sda1

3) We can use ls command to view the files in flash disk, as follows:

root@at91sam:/media/sda1$ ls

3.3 How to use SD Card

1) The board has two SD Card interfaces, one is SD/MMC Card interface, the other is Micro SD Card interface. You can insert any one to the SD Card slot.

2) After insert a SD Card into the board, HyperTerminal will display the information:

mmc1: new SDHC card at address d555

mmcblk0: mmc1:d555 SD04G 3.79 GiB

mmcblk0: p1 p2

3) Enter into the SD Card:

root@at91sam:/media$ cd /media/mmcblk0p1/

4) You can use ls command to view the files in SD Card, as follows:

```
root@at91sam:/media$ cd /media/mmcblk0p1/
root@at91sam:/media/mmcblk0p1$ ls
Don't cry.mp3  boot.bin       linux.bin      liunian.mp3    lost.dir
root@at91sam:/media/mmcblk0p1$ █
```

3.4 How to play a mp3 file

1) Before play a mp3 file, you should insert the headphone to the PHONE interface in the board. And then insert a SD Card which has stored an mp3 file into the slot. Enter into the SD Card using the way in 2.3.

2) Use mplayer command to play the mp3 file, as follows:

root@at91sam:/media/mmcblk0p1$ mplayer liunian.mp3

Then you can listen the music from the headphone. And input any keys will end the music.

3.5 Test the Ethernet

First connect the board and PC with a cross-ruling (or connect the board to a Switch using a straight-through Ethernet cable).
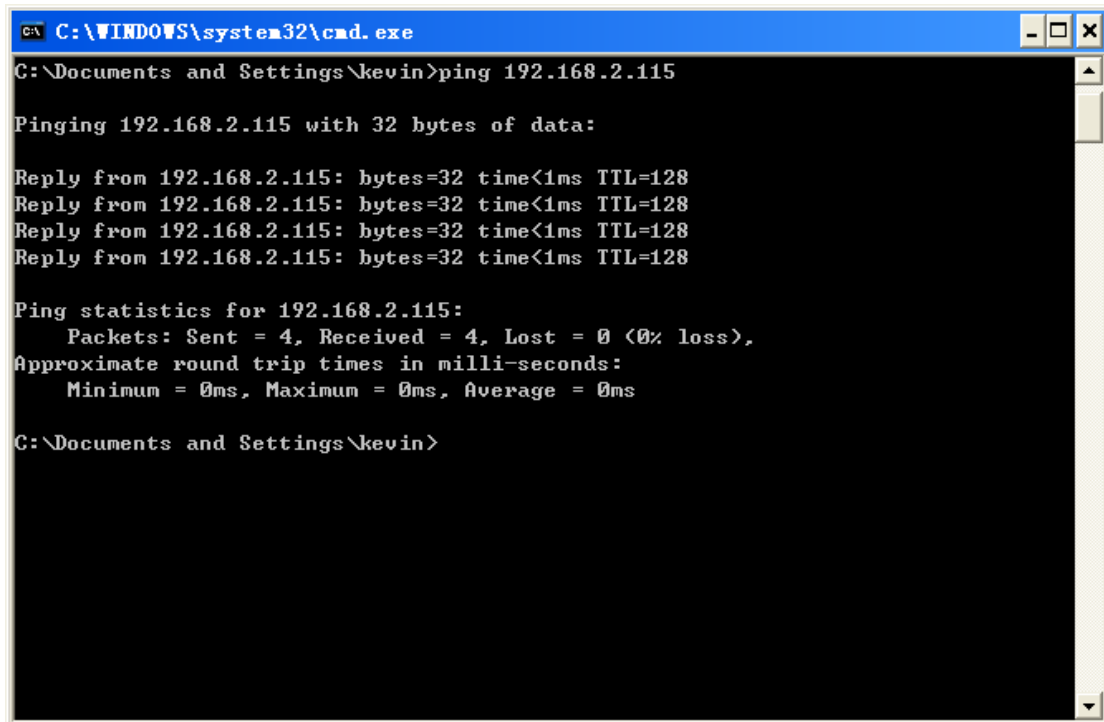
1) Using ifconfig eth0 command to view the Ethernet configuration information, as follows:

```
root@at91sam:/media/mmcblk0p1$ ifconfig eth0
eth0      Link encap:Ethernet  HWaddr 3A:1F:34:08:54:54
          BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
          Interrupt:25 Base address:0xc000
```

2) Using ifconfig eth0 192.168.2.115 command to configure the board's IP to 192.168.2.115, as follows:

```
root@at91sam:/media/mmcblk0p1$ ifconfig eth0 192.168.2.115
root@at91sam:/media/mmcblk0p1$ ifconfig eth0
eth0      Link encap:Ethernet  HWaddr 3A:1F:34:08:54:54
          inet addr:192.168.2.115  Bcast:192.168.2.255  Mask:255.255.255.0
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:7 dropped:0 overruns:0 frame:0
          TX packets:7 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:2070 (2.0 KiB)
          Interrupt:25 Base address:0xc000
```

3) Use ping command in PC to test the network

```
C:\WINDOWS\system32\cmd.exe                                    _ □ ×

C:\Documents and Settings\kevin>ping 192.168.2.115

Pinging 192.168.2.115 with 32 bytes of data:

Reply from 192.168.2.115: bytes=32 time<1ms TTL=128
Reply from 192.168.2.115: bytes=32 time<1ms TTL=128
Reply from 192.168.2.115: bytes=32 time<1ms TTL=128
Reply from 192.168.2.115: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.2.115:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Documents and Settings\kevin>
```

3.6 Telnet test

1) use the command of   ifconfig eth0 to look up

```
eth0        Link encap:Ethernet   HWaddr 3A:1F:34:08:54:54
            BROADCAST MULTICAST   MTU:1500   Metric:1
            RX packets:0 errors:0 dropped:0 overruns:0 frame:0
            TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
            collisions:0 txqueuelen:1000
            RX bytes:0 (0.0 B)   TX bytes:0 (0.0 B)
            Interrupt:25 Base address:0xc000
```

2) According to the step 1),we can see the mac address is 3A:1F:34:08:54:54,then log on the web https://192.168.2.1/   to look up the ip address is 192.168.2.109;So use the command of ifconfig eth0 192.168.2.109 to configure the ip address,input:
root@at91sam:~$ ifconfig eth0 192.168.2.109
Then look up the result:

```
root@at91sam:~$ ifconfig
eth0      Link encap:Ethernet  HWaddr 3A:1F:34:08:54:54
          inet addr:192.168.2.109  Bcast:192.168.2.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:144 errors:9 dropped:0 overruns:0 frame:0
          TX packets:12 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:12207 (11.9 KiB)  TX bytes:3323 (3.2 KiB)
          Interrupt:25 Base address:0xc000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
```

3) Set the gateway

➢ Firstly，use the command of ping 192.168.2.1 to examine the connction of Internet,as follows:

```
root@at91sam:~$ ping 192.168.2.1
PING 192.168.2.1 (192.168.2.1): 56 data bytes
64 bytes from 192.168.2.1: icmp_seq=0 ttl=64 time=11.4 ms
64 bytes from 192.168.2.1: icmp_seq=1 ttl=64 time=1.2 ms
```

➢ Secondly，use route add default gw 192.168.2.1 to configure the gateway
```
root@at91sam:~$ route add default gw 192.168.2.1
```

➢ Use ping 202.112.17.137 to confirm
```
root@at91sam:~$ ping 202.112.17.137
PING 202.112.17.137 (202.112.17.137): 56 data bytes
64 bytes from 202.112.17.137: icmp_seq=0 ttl=51 time=318.5 ms
64 bytes from 202.112.17.137: icmp_seq=1 ttl=51 time=333.1 ms
```

4) Use the command of telnet 202.112.17.137 to access the BBS

```
root@at91sam:~$ telnet 202.112.17.137

华南木棉BBS 最近 (1,10,15) 分钟平均负荷为 0.29 0.12 0.11  [负荷正常]

Entering character mode
Escape character is '^]'.


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※                                                              ※
※                    欢  迎  莅  临                            ※
※          中国教育和科研计算机网(CERNET)华南地区网络中心         ※
※                电子公告牌华南网木棉站                         ※
※                                                              ※
※          本站地址: bbs.gznet.edu.cn (202.112.17.137)          ※
※                                                              ※
◇          Warmly Welcome to Bulletin Board Service(BBS) of     ◇
◇                CERNET Southern Regional Center                ◇
◇                                                              ◇
◇          If you have any problems, please send email to       ◇
◇                    scutbbs@scut.edu.cn                         ◇
※                                                              ※
◎          请用户遵守国家法律和CERNET用户守则，谢谢合作！        ◎
※                                                              ※
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欢迎光临【 华南木棉BBS 】 [ Add '.' after YourID to login for BIG5 ]
目前上站人数: [22/25000]。 最高人数记录: [12970]。
请输入帐号(试用请输入 'guest'): █
```

5) Configre the DNS to access the Internet(decided by the user environment)

> In the PC,use the command of ipconfig –all to look up the DNS is :202.103.24.68

> Use the command of touch /etc/resolv.conf to build the file

```
root@at91sam:/$ touch /etc/resolv.conf
```

> Use the command echo nameserver 202.103.24.68 >> /etc/resolv.conf

```
root@at91sam:/$ echo nameserver 202.103.24.68 >> /etc/resolv.conf
```

> Use ping www.baidu.com to test the Internet

```
root@at91sam:/$ ping www.baidu.com
PING www.a.shifen.com (119.75.218.45): 56 data bytes
64 bytes from 119.75.218.45: icmp_seq=0 ttl=53 time=162.6 ms
64 bytes from 119.75.218.45: icmp_seq=2 ttl=53 time=196.1 ms
64 bytes from 119.75.218.45: icmp_seq=4 ttl=53 time=352.1 ms
█
```

Test OK.

3.7 RTC useage

1) Make sure the board has setup the button cell   3V for the backup power.

2) When the system boot first time,the time will be set to the initial time.So we must set the correct time after first boot.

> Set time.Note: we must set the hwclock either

    root@at91sam:~$ date -s 2011.07.18-17:36:00 ; hwclock –w

> Read time. Read system time and hardware time

    root@at91sam:~$ date

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root@at91sam:~$ hwclock -r

4. The list of software

Type	function	Desciprion
Bootloader	AT91Bootstrap	Guide to Uboot
	Uboot	Version：UBoot1.3.4
		Main function： 1.Support NandFlash to erase ,read and write 2. Support net to dwonload Image 3.Support to set and keep environment variables 4.Support the memory to appear ,compare and modify 5. Support bootm and bootargs to set
Kernel and device driver	Kernel	Kernel version:Linux-2.6.30
	System clock	System frequency：400MHz
	Appearance drivers	Support 4.3/7.0/10.2 inch LCD
	Touchscreen	Touchscreen driver
	DM9161AEP	DM9161 network driver
	HSMMC	SD/MMC/SDIO driver
	IIC	I2C driver
	SPI	SPI driver
	NANDFLASH	Support 512 Bytes small Page、2K bytes big Page，driver is compatible with 128Mbit～8Gbit capacity
	SERIAL	Serial dirver
	WAVEDEV	Audio driver,default driver is IIS（WM8731）
	USB Host	Support U disk driver
	DMA	DMA driver
File system	jffs2 file system	Support jffs2 file system
Cross compiler	arm-none-linux-gnueabi-	cross toolchain
Download tools of PC	terminal	Serial debug terminal ，download image tools of usb
	SAM-BA1.13+USB	SAM-Ba through USB download Bootloader and kernel into NandFlash of board