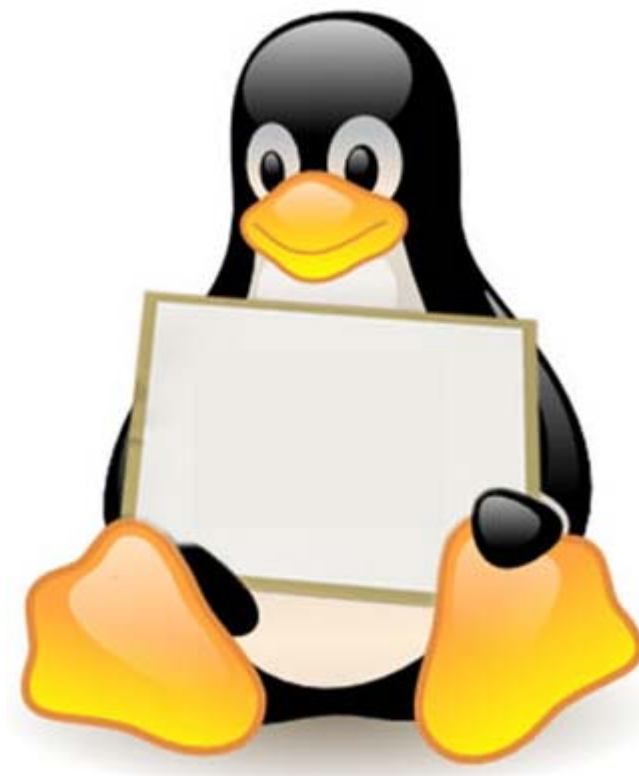
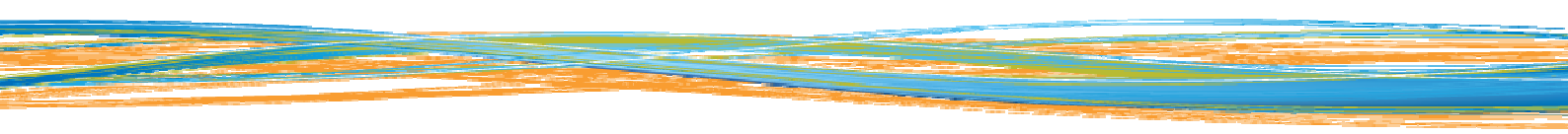

AT91SAM9G45-EVK Linux

User Manual



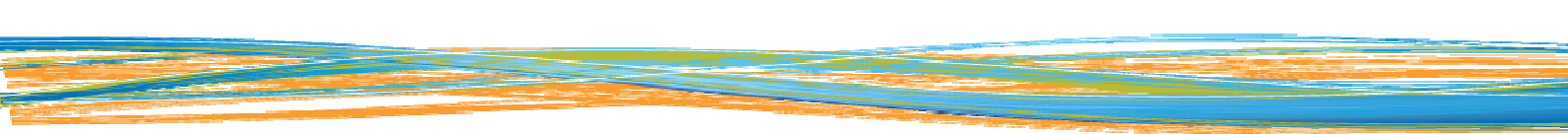
Revision History

Rev	Date	Description
1.0	2011-02-10	Initial version



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1. Build the development platform

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

1.1 Create the working directory

```
# mkdir /home/AT91SAM9G45-EVK  
# cd /home/AT91SAM9G45-EVK
```

Copy 05-Linux_Source Document from the CD to /home/ 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) Now 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 distclean  
# make clean  
# make at91sam9g45ekes_nandflash_config  
# make CROSS_COMPILE=/usr/local/arm-2007q1/bin/arm-none-linux-gnueabi-
```

```
# ls
```

(3) Now 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 xvf ../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.4/*; do patch -p1 < $p ; done
# patch -p1 < ../05-Linux_Source/patch/all_modify.diff
```

Add the configure file

LCD type	configure file
LCD_4.3	AT91SAM9G45-EVK_4.3lcd_defconfig
LCD_7.0	AT91SAM9G45-EVK_7.0lcd_defconfig
LCD_10.2	AT91SAM9G45-EVK_10.2lcd_defconfig

```
# cp arch/arm/configs/configure file .config
```

(2) Compile.

```
# make ARCH=arm menuconfig
# make ulmage ARCH=arm CROSS_COMPILE=/usr/local/arm-2007q1/bin/arm-none-linux-gnueabi-
```

Note: If you cannot use “make ulmage”, please try this command to install it.

```
apt-get install uboot-mkimage
```

(3) Now you can see ulmage 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

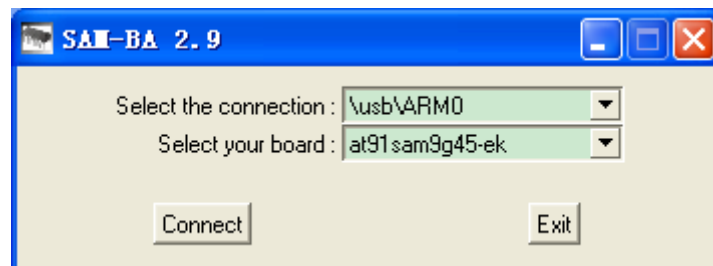
2.2 Connect ATMEL SAM9G45 ARM9 Board with SAM-BA

2.2.1 Install AT91SAM9G45-EVK's USB driver

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

2.2.2 Connect the ATMEL AT91SAM9G45-EVK ARM9 Board

First, you should open the JP2 jumper 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 AT91SAM9G45-EVK ARM9 Board with Scand and close the JP2 jumper wire.

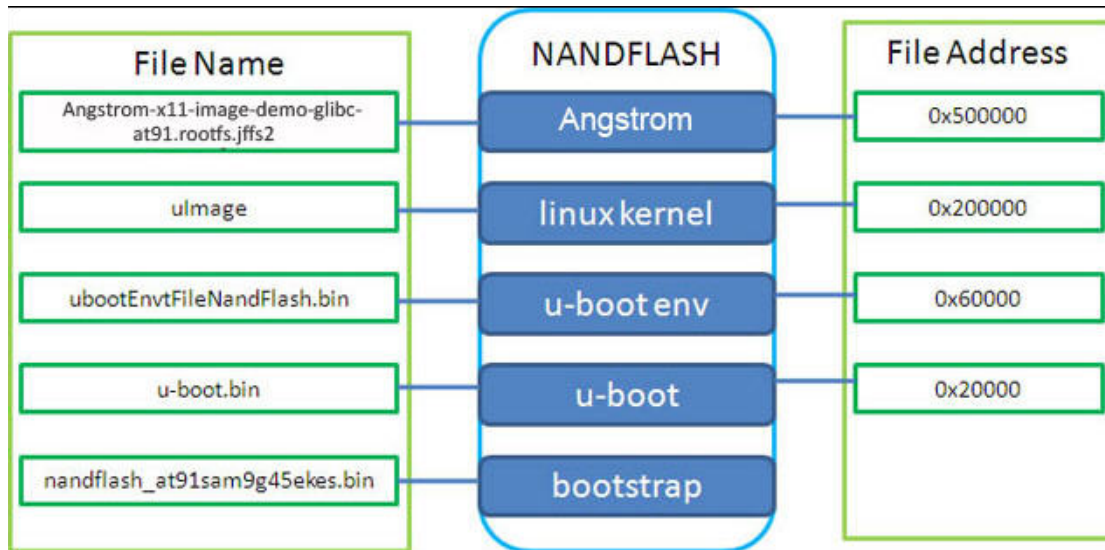
2.3 Download Linux images

2.3.1 Auto download

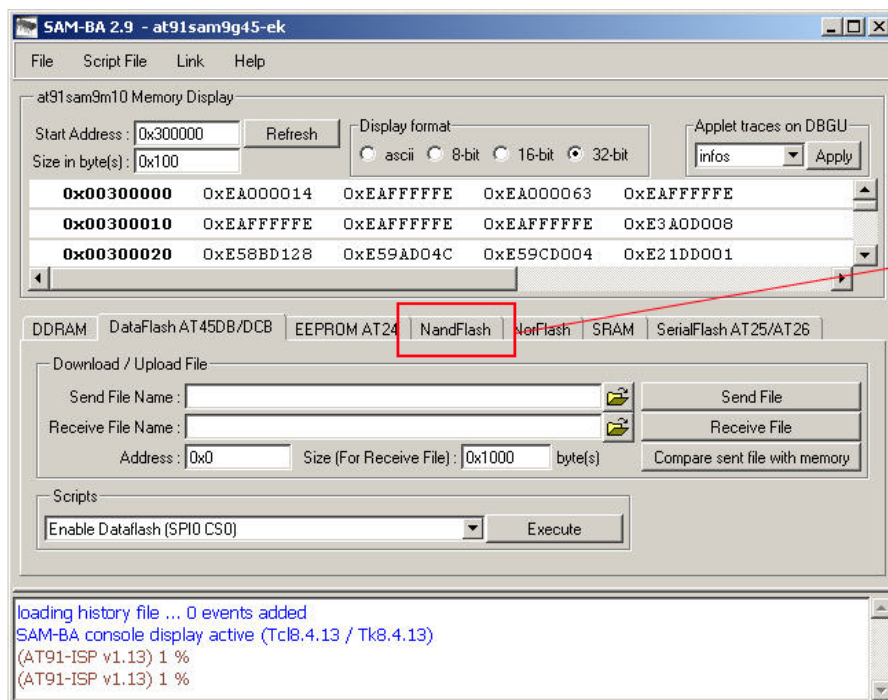
After following step 2.1 and step 2.2, open the 02-Images\linux image\ AT91SAM9G45-EVK _Linux_4.3_LCD, click on download.bat file. By this SAM-BA will start downloading the Linux images to the board automatically (please be patient it may take longer than 3min.). After image download, connect the development board with the PC (Hyper Terminal) using serial port, then reset the board, you will see the Linux startup information in the HyperTerminal.

2.3.2 Manual download

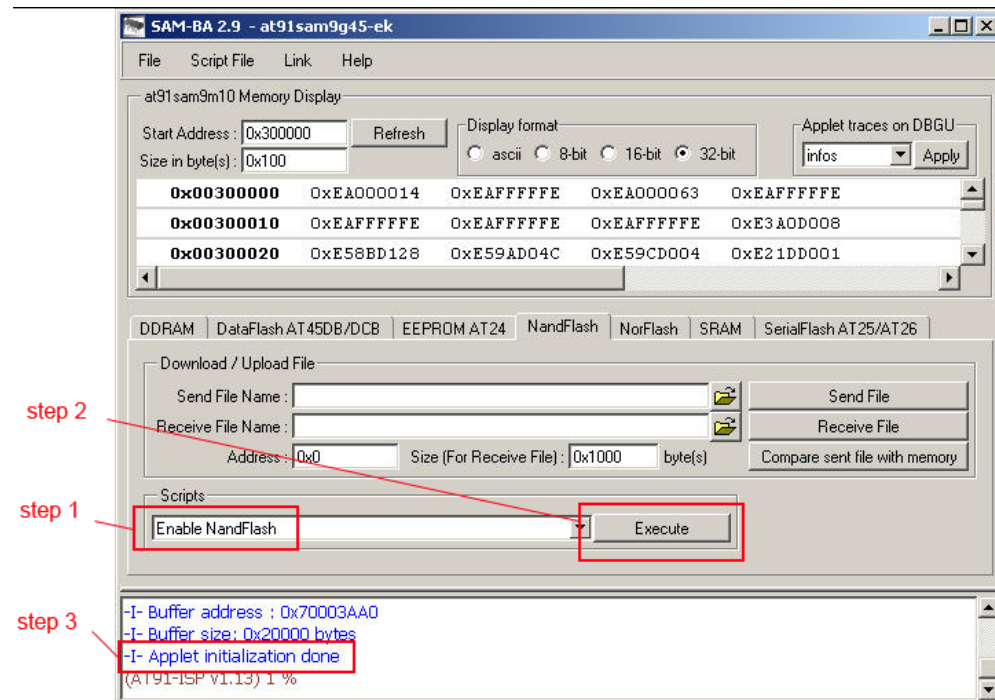
- Under below shows the NandFlash demo Memory map



- Use SAM-BA to download Linux image
- ✓ After following step2.1 and step2.2, you can get SAM-BA compile console as show below, and choose “NandFlash”.



- ✓ From this console select NandFlash then execute the “enable NandFlash” script as shown below.



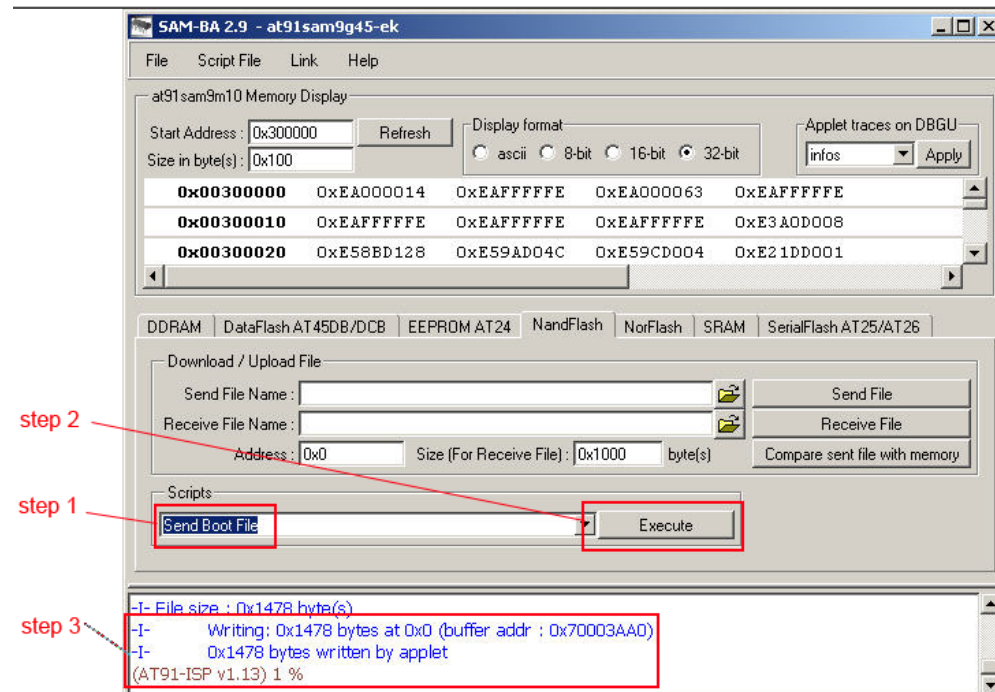
Note:

Step 1: Enable Nandflash;

Step 2: Execute;

Step 3: Successfully Enable NandFlash.

✓ Now follow the below steps to download nandflash_at91sam9g45ekes.bin



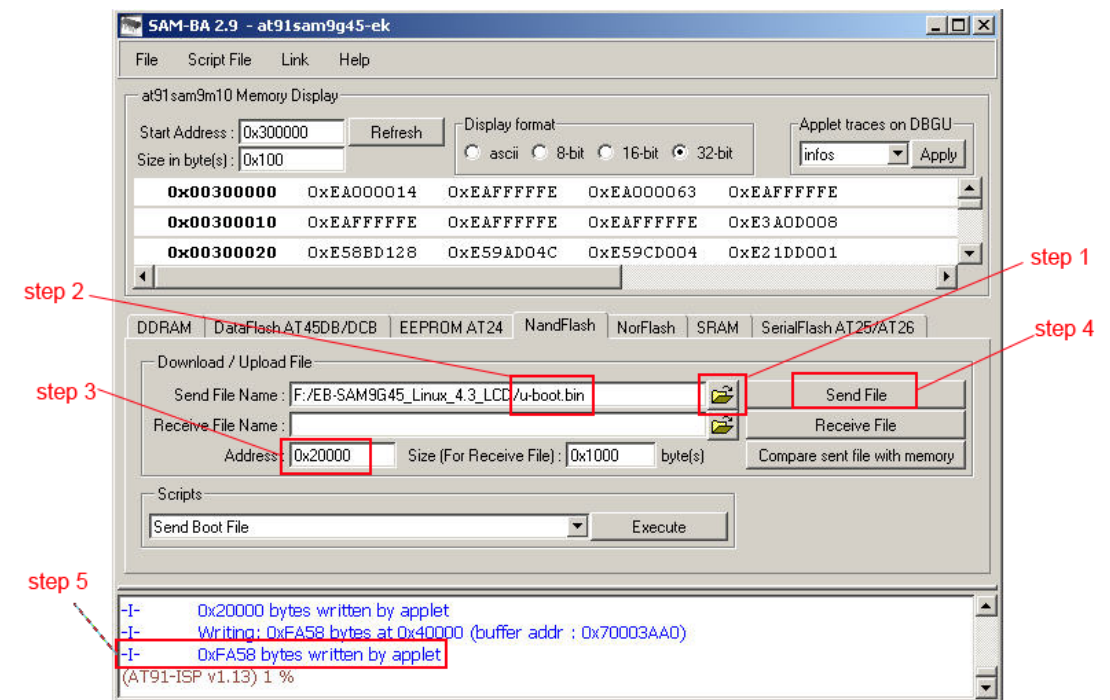
Note:

Step 1: Choose "Send Boot File";

Step 2: Execute, and you can pick up the file "nandflash_at91sam9g45ekes.bin";

Step 3: Download nandflash_at91sam9g45ekes.bin successfully.

- ✓ Follow the below steps to download u-boot.bin

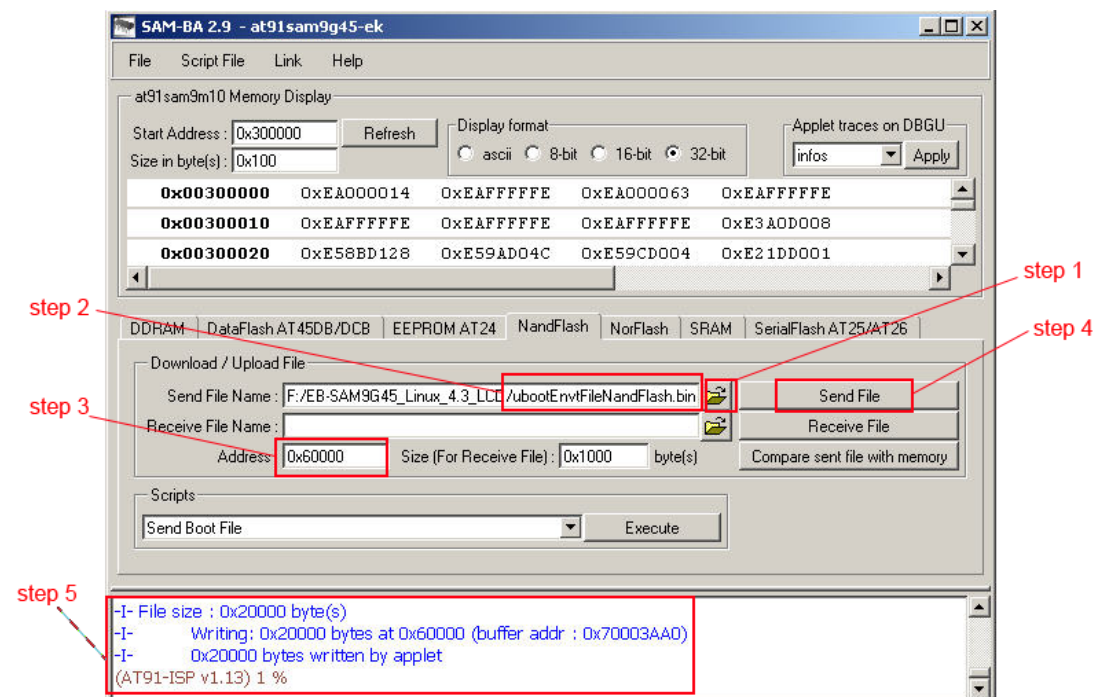


Note:

- Step 1: Open files;
- Step 2: Pick up the file "u-boot.bin";
- Step 3: Add address 0x20000;
- Step 4: Send File;
- Step 5: Successfully download the file u-boot.bin

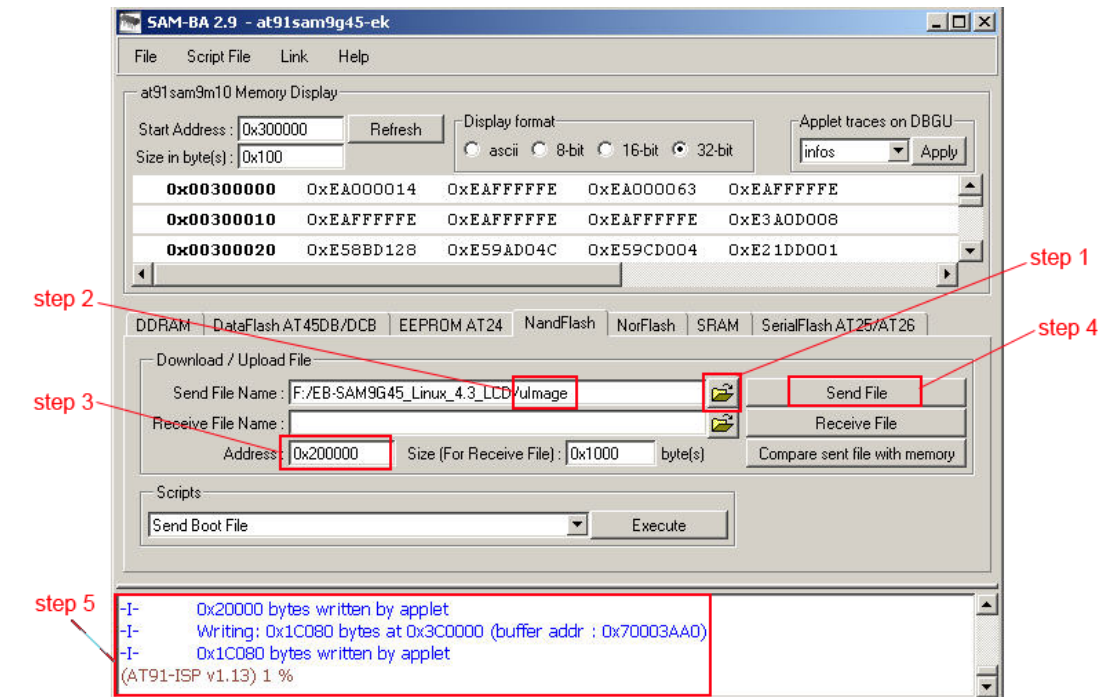
- ✓ Follow the below steps to download ubootEnvFileNandFlash.bin

Address: 0x60000.



- ✓ Follow the below steps to download ulmage

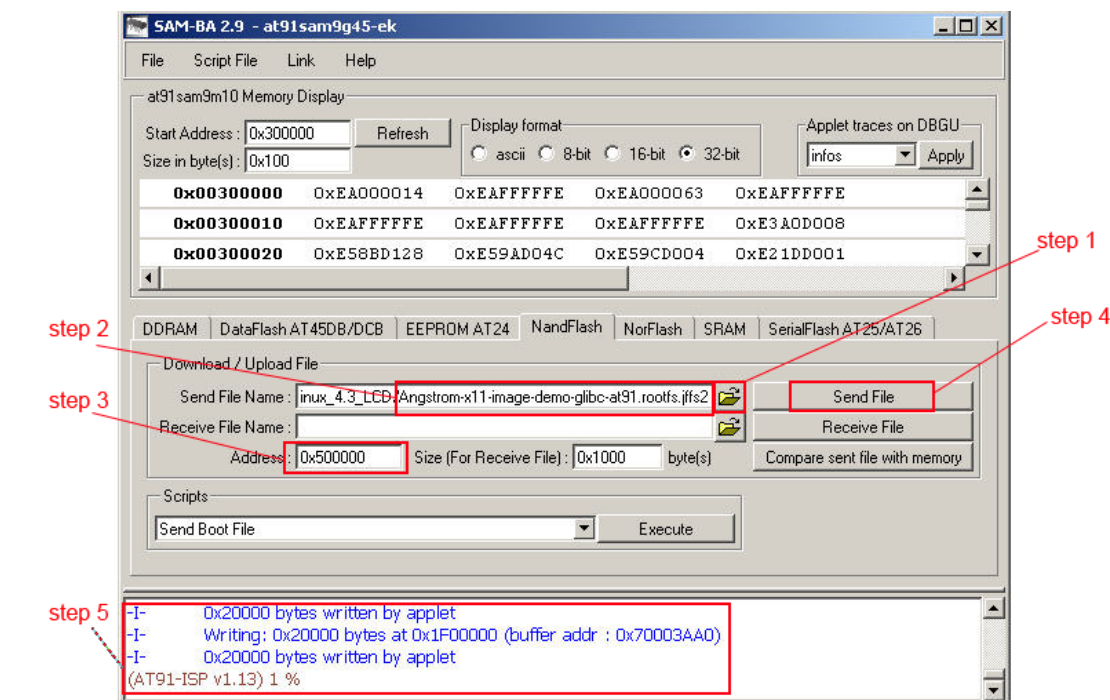
Address: 0x200000.



- ✓ Follow the below steps to download

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

Address: 0x500000.



3. How to use Linux

We can operate Linux with the touchscreen or by serial port. Here we will use the serial port to demonstrate how to use Linux in order to use it more appropriately. Then this section will demonstrate how to use important operations like mount flash disk or SD Card, or test Ethernet, or play mp3 files.

3.1 Touchscreen calibration

1) After powering on the board first time, its highly recommended to calibrate the touchscreen (only need to calibrate it the first time). The LCD will display some point (+), and you must press these point accurately. After calibrating the touchscreen successfully, you can enter into Linux.

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

```
at91sam login: root
```

3.2 How to use flash disk

1) After entering into Linux through the HyperTerminal, insert a flash disk into the USB Host port of the board, then the following information will be displayed on Hyper Terminal screen.

```
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, now we can use the command to enter into the flash disk, as follows:

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

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

```
root@at91sam:/media/sda1$ ls
```

3.3 How to use SD Card

1) The board has two SD Card interfaces: SD/MMC Card interface and Micro SD Card interface. You need to insert the respective SD card into the respective SD slot.

2) After inserting SD Card into the board, HyperTerminal will display the following information:

```
mmc1: new SDHC card at address d555
mmcblk0: mmc1:d555 SD04G 3.79 GiB
mmcblk0: p1 p2
```

3) Use the following command to enter into the SD Card:

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

4) You can use the following commands to view the SD card files :

```
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 playing a mp3 file, you need to insert the headphone into the “HEADPHONE” interface on the board. And then insert a SD Card containing MP3 files.

2) Use the SD Card by following step explained in section 3.3.

3) Use “mplayer” command to play the mp3 file, as follows:

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

You can listen to the music from the headphone and input any key to stop the music.

3.5 How to test the Ethernet

First connect the board and PC with a cross-Ethernet cable (or connect the board to a Switch using a straight-through Ethernet cable).

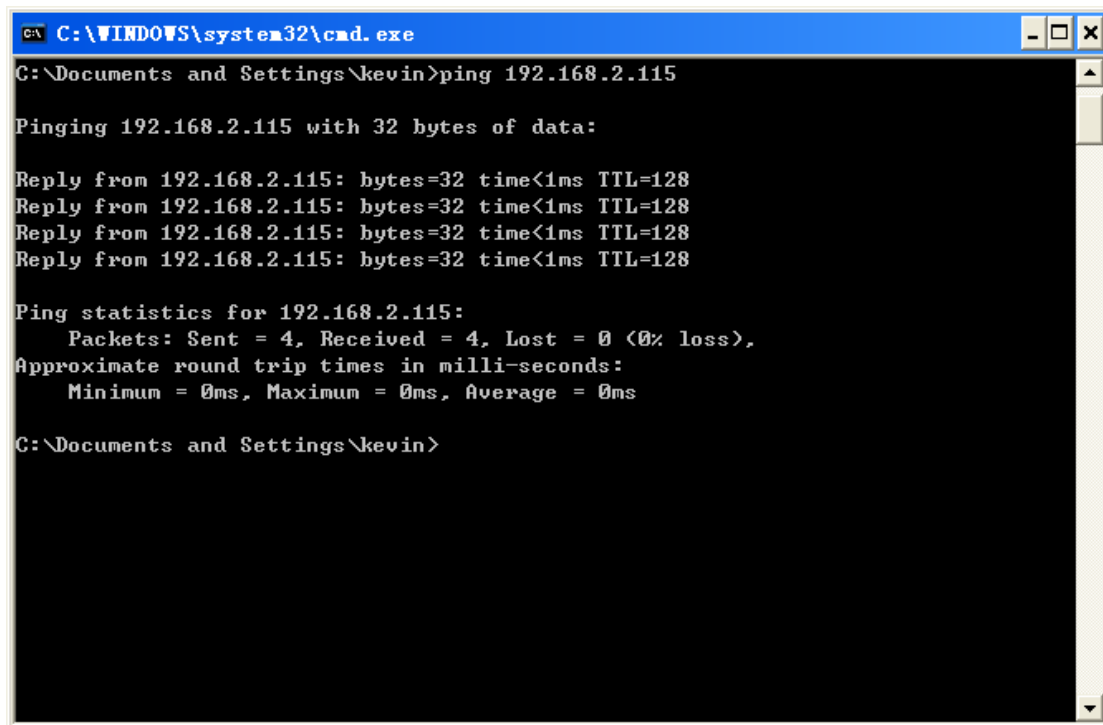
1) Use “ifconfig eth0” command to view the Ethernet configuration information, as follows:

```
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) Use 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 connection between the board and the PC.



```
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 How to test Telnet

- 1) Use the command “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) Following step 1 we can see the mac address as “3A:1F:34:08:54:54”, then open a browser on the PC and enter <https://192.168.2.1/> to look for the ip address “192.168.2.109”. Now use the command of “ifconfig eth0 192.168.2.109” to configure the ip address and enter:
- ```
root@at91sam:~$ ifconfig eth0 192.168.2.109
```



Then look for the result as shown below:

```
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

- First, use the command to ping 192.168.2.1 to examine the connection 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) Now use the Telnet command “Telnet 202.112.17.137” to access the BBS

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

- In the PC, use the command “ipconfig -all” to look up for the DNS :202.103.24.68
  - Use “touch /etc/resolv.conf” to build the file
- ```
root@at91sam:/$ touch /etc/resolv.conf
```
- Use “echo nameserver 202.103.24.68 >> /etc/resolv.conf”
- ```
root@at91sam:/$ echo nameserver 202.103.24.68 >> /etc/resolv.conf
```
- Now try to ping [www.baidu.com](http://www.baidu.com) to test the Internet, if you get ping response then TESTED OK.

```
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
```

### 3.7 RTC usage

- 1) Make sure the board has been installed with 3V button cell 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 as well)  
root@at91sam:~\$ date -s 2011.07.18-17:36:00 ; hwclock -w
- Read time, read system time and hardware time  
root@at91sam:~\$ date  
root@at91sam:~\$ hwclock -r

## 4. The list of software

| Type                     | function                | Description                                                                                                                                                                                                                                                                |
|--------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bootloader               | AT91Bootstrap           | Guide to Uboot                                                                                                                                                                                                                                                             |
|                          | Uboot                   | Version: UBoot1.3.4<br>Main function:<br>1.Support NandFlash to erase ,read and write<br>2. Support net to download Image<br>3.Support to set and keep environment variables<br>4.Support the memory to appear ,compare and modify<br>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 driver                                                                                                                                                                                                                                                              |
|                          | 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                                                                                                                                                                                                  |



## Appendix A: After-sales Service

### Customer Service

Please contact Premier Farnell local sales and customer services staffs for the help.

Website: <http://www.farnell.com/>

### Technical Support

Please contact Premier Farnell local technical support team for any technical issues through the telephone, live chat & mail, or post your questions on the below micro site, we will reply to you as soon as possible.

Centralized technical support mail box: [knode\\_tech@element14.com](mailto:knode_tech@element14.com)

Community: [http://www.element14.com/community/community/knode/dev\\_platforms\\_kits](http://www.element14.com/community/community/knode/dev_platforms_kits)

Please visit the below micro site to download the latest documents and resources code:  
[http://www.element14.com/community/community/new\\_technology/at91sam9g45-evk](http://www.element14.com/community/community/new_technology/at91sam9g45-evk)

### Notes

This board was designed by element14's design partner- Embest, you can contact them to get the technical support as well.

Marketing Department:

Tel: +86-755-25635656 / 25638952

Fax: +86-755-25616057

E-mail: [market@embedinfo.com](mailto:market@embedinfo.com)

Technical Support:

Tel: +86-27-87290817

E-mail: [support.en@embedinfo.com](mailto:support.en@embedinfo.com)

URL: <http://www.embedinfo.com/en/>