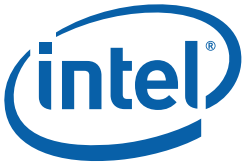

Booting from CompactFlash* on the Intel® EP80579 Development Board

Application Note

April 2009

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Contents

Revision History

Date	Revision	Description
March 2009	1.0	Initial release of document

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1 Introduction

This document describes how to setup and boot the Intel® EP80579 Integrated Processor with Intel® QuickAssist Technology Development Board from a CompactFlash* (CF) card.

During the setup process, the following tasks will be performed.

- Install CentOS to hard disk
- Install CentOS to CompactFlash card
- Create compressed kernel image
- Build embedded drivers
- Create initial Ramdisk image

The “Intel® EP80579 Integrated Processor with Intel® QuickAssist Technology Development Board” is referred to as “development board” throughout this document.

1.1 Purpose

These instructions are provided in order to enable customer evaluation of the feasibility of booting a Linux based operating system from CompactFlash.

1.2 System Requirements

Before you begin, you must ensure the following system requirements are met:

- CompactFlash Memory Card Reader/Writer with USB interface
- 2 GB CompactFlash card
- Clean installation of CentOS* 5.2 on hard drive (requirements for formatting described in instructions below)
- CentOS 5.2 installation DVD/CDs media
- 512MB memory stick installed on development board
- SATA or USB DVD/CD-ROM
- Network connection to internet (required to obtain kernel source files and elilo)

2 Procedure

Pre-boot Firmware

1. Verify BIOS 62 is installed on the development board. The Project Version in the Main BIOS settings should have the value TRXTG 62.00

Note: BIOS 62 is intended for use with this booting from CompactFlash demo. It is strongly recommended to revert to BIOS61 or to a later version when done evaluating booting from CompactFlash.

2. Verify SATA mode is set to AHCI mode in the BIOS. This setting is available on the Advanced tab under IDE Configuration.
3. Update BIOS settings to boot from DVD/CD ROM drive. The setting is available on the Boot tab.

Install CentOS 5.2 from DVD/CD Media onto hard drive

4. Place the CentOS DVD or CD #1 in your DVD/CD-ROM drive and boot the development board from the DVD/CD ROM.
5. Begin installing CentOS to your hard drive.
6. When the "Installation requires partitioning of your drive." page occurs select "Remove all partitions on selected drives and create default layout."
7. Click the "Review and modify partitioning layout" checkbox.
8. Click "Next"
9. Remove Logical Volume Manager partitions. This can be done by:
   a. Select the VolGroup00 and click Delete button.
   b. Select /dev/sda2 LVM PV type partition and click Delete Button
10. Create swap, and "/" partitions.

    The CentOS hard drive partitions should look similar to:

/dev/sda1	/boot	ext3	101
/dev/sda2		swap	996
/dev/sda3	/	ext3	151527 (depends on size of hard disk)

11. Click Next
12. Select "The GRUB boot loader will be installed on /dev/sda"
13. Complete the CentOS installation.
14. Shutdown the development board.

Install CentOS 5.2 from DVD/CD Media onto CompactFlash card

15. Plug in the CompactFlash Memory Card Reader/Writer and connect this to USB port on the development board.
16. Disconnect the SATA hard drive from the development board.
17. Place the CentOS DVD or CD #1 in your DVD/CD-ROM drive and boot the development board from the DVD/CD-ROM.
18. Begin installing CentOS onto CompactFlash media.
19. When the "Installation requires partitioning of your drive." page occurs select "Remove all partitions on selected drives and create default layout."

20. Click the “Review and modify partitioning layout” checkbox.
21. Click “Next”
22. Remove Logical Volume Manager partitions. This can be done by:
    a. Select the VolGroup00 and click Delete button.
    b. Select /dev/sda2 LVM PV type partition and click Delete button.
    c. Repeat for any additional LVM partitions on the drive.
23. Remove the /boot partition. This can be done by:
    a. Select /boot partition and click the Delete button.
24. Create “/’ and “/boot/efi” partitions. “/boot/efi” partition must have Format type set to “vfat”. The CentOS Compact Flash drive partitions should look similar to:

/dev/sda1	/	ext3	1866
/dev/sda2	/boot/efi	vfat	101

Note: This assumes a 2 GB CF.

Note: You will receive a warning notice that a swap partition was not specified. This warning should be ignored and select “Yes” to continue with your requested partitioning.

25. Select “No boot loader will be installed” when prompted for a boot loader.
26. Use a minimal set of packages – it is likely a KDE or GNOME desktop environment will not fit onto CF card. It is highly recommended to deselect any additional packages from the install.
27. After installation to the CompactFlash card, reconnect the hard drive and boot CentOS from the hard drive.

Build Ethernet Driver

28. Create a directory in the root directory called “EP805XX_release”

```
[root@host]$ cd /
[root@host]$ mkdir EP805XX_release
[root@host]$ cd EP805XX_release
```

29. Place and unpack the tarball in the /EP805XX_release directory

```
[root@host EP805XX_release]$ tar -xzvf <tarball name>
```

30. Environmental Setup

```
[root@host EP805XX_release]$ export ICP_ENV_DIR=/EP805XX_release/Embedded
[root@host EP805XX_release]$ export ICP_ROOT=/EP805XX_release
[root@host EP805XX_release]$ ln –s /usr/src/kernels/2.6.18-92.el5-i686
/usr/src/kernels/linux
```

31. Build the GbE driver

```
[root@host EP805XX_release]$ cd /EP805XX_release/Embedded/src/GbE
[root@host GbE]$ make install
```

32. Setup IP address for one the GbE ports. ifconfig, neat, setup are some methods that could be used to obtain/configure IP address.

Install Full Kernel Source

Note: These instructions assume internet access.

33. Log-on as root and install the packages rpm-build and redhat-rpm-config:

```
[root@host]# yum install rpm-build redhat-rpm-config
```

Note: These packages may already be installed.
Note: Proxy servers may need to be configured for external internet access.

34. Create a directory tree based on ~/rpmbuild:

```
[root@host]$ cd
[root@host]$ mkdir -p rpmbuild/{BUILD,RPMS,SOURCES,SPECS,SRPMS}
[root@host]$ echo '%_topdir %(echo $HOME)/rpmbuild' > .rpmmacros
```

35. Install the kernel source rpm:

```
[root@host]$ rpm -i http://mirror.centos.org/centos/5.2/os/SRPMS/kernel-
2.6.18-92.el5.src.rpm
```

36. Unpack and prepare the source files:

```
[root@host]$ cd ~/rpmbuild/SPECS
[root@host SPECS]$ rpmbuild -bp --target=i686 kernel-2.6.spec 2> prep-
err.log | tee prep-out.log
```

The kernel source tree will now be found in the directory ~/rpmbuild/BUILD/

Build Kernel

37. Edit Makefile – update EXTRAVERSION from “-prep” to “-cf”

```
[root@host]$ cd ~/rpmbuild/BUILD/kernel-2.6.18/linux-2.6.18.i686
[root@host linux-2.6.18.i686]$ vi Makefile
        EXTRAVERSION = -cf
```

38. Edit .config file to turn off CONFIG_EFI_VARS. Verify CONFIG_EFI and CONFIG_EFI_PARTITION are enabled.

```
[root@host linux-2.6.18.i686]$ make oldconfig
[root@host linux-2.6.18.i686]$ vi .config
        # CONFIG_EFI_VARS is not set
        ...
        CONFIG_EFI=y
        ...
        CONFIG_EFI_PARTITION=y
```

39. Build the kernel

```
[root@host linux-2.6.18.i686]$ make
[root@host linux-2.6.18.i686]$ make modules_install
[root@host linux-2.6.18.i686]$ make bzImage
```

Note: After typing make, if make asks to CONFIG_EFI_VARS [y/m/n] enter n.

Build LEB and CF Drivers

40. Environmental Setup

```
[root@host EP805XX_release]$ export ICP_ENV_DIR=/EP805XX_release/Embedded
[root@host EP805XX_release]$ export ICP_ROOT=/EP805XX_release
```

41. Build LEB Driver

```
[root@host EP805XX_release]$ cd /EP805XX_release/Embedded/src/LEB
[root@host LEB]$ make
```

42. Build CF Driver

```
[root@host LEB]$ cd /EP805XX_release/Embedded/src/CF
[root@host CF]$ make
```

Create Initial Ramdisk

43. Copy LEB into modules

```
[root@host CF]$ mkdir -p /lib/modules/2.6.18-cf/kernel/drivers/LEB
[root@host CF]$ cp
/EP805XX_release/Embedded/src/LEB/build/linux_2.6/kernel_space/leb.ko
                        /lib/modules/2.6.18-cf/kernel/drivers/LEB/
```

44. Copy CF into modules

```
[root@host CF]$ mkdir -p /lib/modules/2.6.18-cf/kernel/drivers/CF
[root@host CF]$ cp
/EP805XX_release/Embedded/src/CF/build/linux_2.6/kernel_space/leb_cf.ko
                        /lib/modules/2.6.18-cf/kernel/drivers/CF/
```

45. Make initial ramdisk with LEB and CF

```
[root@host CF]$ cd /EP805XX_release
[root@host EP805XX_release]$ mkinitrd --preload=leb --preload=leb_cf
                 initrd-2.6.18-cf.img 2.6.18-cf
```

Populate CompactFlash /boot/EFI partition

46. Plug in CompactFlash Memory Card Reader/Write adapter and connect to development board.

47. Download elilo-3.6-ia32.efi from:
http://sourceforge.net/project/showfiles.php?group_id=91879&package_id=97044
Expand the 3.6 Release to locate file. This download can be performed on the development board.

48. Rename the file to elilo.efi

49. Copy elilo.efi onto /boot/efi (vfat) partition of CompactFlash card. You may need to mount the CompactFlash partition.

50. Copy ~/rpmbuild/BUILD/kernel-2.6.18/linux-2.6.18.i686/arch/i386/boot/bzImage onto /boot/efi (vfat) partition of CF card.

51. Copy /EP805XX_release/initrd-2.6.18-cf.img onto /boot/efi (vfat) partition of CF card.

52. Create elilo.conf file on /boot/efi (vfat) partition of CF.

```
verbose=5
default=linux

image=bzImage
     label=linux
     initrd=initrd-2.6.18-cf.img
     read-only
     root=/dev/cfa1
```

Note: Root is set to /dev/cfa1 because during installation of CentOS 5.2 to CompactFlash the first partition was formatted as /.

Boot from CompactFlash

53. Shut down the development board and disconnect SATA hard drive from development platform.

54. Plug the CompactFlash card into development board (not the CompactFlash Memory Card Reader/Write adapter).

55. Boot to system to the EFI shell. You may need to update the Boot order in BIOS to select EFI shell as first boot device. The setting is located on the Boot tab in the BIOS settings.

56. Switch to fs0

```
Shell> fs0:
```

57. From EFI shell run elilo

```
fs0:\> elilo
```

This command initiates the CentOS boot.

3 Troubleshooting

Below is a list of potential issues that may be observed during these steps along with potential solution for issue.

3.1 Unknown Interrupt or fault at EIP 00000060 c04011ed 000011ec

If this message is observed when attempting to boot CentOS from CompactFlash, verify 512MB of RAM is installed.

3.2 Cannot open root

If this message is observed when attempting to boot CentOS from CompactFlash, verify the initial ramdisk image created in step 45 was performed correctly. If leb and leb_cf are not specified when creating the initial ramdisk this error would be observed.

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