

HOWTO Linux configuration for Vortex86SX

2007-08-03

Vortex86SX

Vortex86SX is a high performance x86 SoC with ultra low power consumption design. Please visit Vortex86SX web page (<http://www.dmp.com.tw/tech/Vortex86SX>) for detailed information.

Vortex86SX evaluation board

VSX-6190 / VSX-6190S

- DM&P Vortex86SX 300 MHz Processor
- AMI BIOS
- 64 MB of DDR2 SDRAM
- R6040 10/100Mbps Fast Ethernet Controller
- Supports up to 2 IDE devices
- Supports up to 4 USB 2.0/1.1 devices
- XGI Z9s with 32MB of DDR2 SDRAM (*VSX-6190)
- C-Media CM109 USB Audio Controller (*VSX-6190)

BIOS

The BIOS of Vortex86SX evaluation board is not finally ready. Before you continue reading the document, you should check the date of your BIOS version is greater than "06/11/07". It ensures that we are in the same condition. If you have any question about the BIOS version, please contact your service provider or tech@dmp.com.tw for more information.

The Linux Kernel

In this HOWTO, we will concentrate our discussion on kernel 2.6.18. We suppose that you have prior experience of kernel compiling. In other words, you should already know how to configure and compile the Linux kernel. If not, we suggest that you might read some Linux kernel compiling articles before you proceed.

Here is a package which contains a config file and an essential patch file for Linux kernel 2.6.18. Please copy the config file to the kernel directory and apply the patch. Finally, run "**make menuconfig**" to be ready to configure your Linux kernel.

```
(Go to your kernel source directory)
# cd /usr/src/linux-2.6.18-DMP
```

```
(Extract files from our package)
# tar -xzvf xxx.tar.gz

(Copy the configuration file to overwrite .config)
# cp -a xxx.config .config

(Apply the patch file)
# patch -p1 < xxx.patch

(Configure the Linux kernel with a ncurses-based tool)
# make menuconfig
```

CPU

Vortex86SX integrates the RISC core that contains all the features of the 486SX microprocessor, and the instruction set of Vortex86SX is compatible with 486 as well, so please directly select 486 as the processor family in the Linux kernel setting.

```
Processor type and features --->
  Subarchitecture Type (PC-compatible) --->
  Processor family (486) --->
  (For generic optimizations)
  [*] Generic x86 support
```

Vortex86SX doesn't have the math coprocessor, so you have to enable the math emulation of the Linux kernel.

```
Processor type and features --->
  [*] Math emulation
```

You should also take notice of the CFLAGS of the GCC. We suggest using "**-march=i486 -O2**" as your CFLAGS when you compile C programs for release.

```
# gcc -march=i486 -O2 -o hello hello.c
```

IDE

The IDE controller can be configured as the native or the legacy mode in BIOS setting. The default setting is the legacy mode, if you do not alter it, the IDE controller should work fine in most cases except for the IDE DMA mode.

If you have good reasons to switch the default setting to the native mode, you need an IT821X driver with a patch for Linux kernel 2.6.18, even if you did not need the DMA support.

However, no matter which mode you choose, if the DMA mode is required, you need the IT821X driver with our patch and selecting the following options on the kernel configuration menu to enable the DMA support.

```
Device Drivers --->
  ATA/ATAPI/MFM/RLL support --->
    <*> ATA/ATAPI/MFM/RLL support
    <*>   Enhanced IDE/MFM/RLL disk/cdrom/tape/floppy support
    <*>   Include IDE/ATA-2 DISK support
    <*>   generic/default IDE chipset support
    [*]   PCI IDE chipset support
    [*]   Sharing PCI IDE interrupts support
    [*]   Generic PCI bus-master DMA support
    [*]   Use PCI DMA by default when available
    <*>   IT821X IDE support
```

By the way, you cannot use the IDE DMA as well as the native mode under Linux kernel 2.4, because there is no available driver.

```
Device Drivers --->
  ATA/ATAPI/MFM/RLL support --->
    <*> ATA/ATAPI/MFM/RLL support
    <*>   Enhanced IDE/MFM/RLL disk/cdrom/tape/floppy support
    <*>   Include IDE/ATA-2 DISK support
    <*>   generic/default IDE chipset support
```

Note:

The controller supports Ultra-DMA, but at the present time there are some problems of it, so that you will probably encounter a system error when you try to boot from the storage device which support the UDMA mode. For the problem, we have modified the IDE driver to force all UDMA modes to be downgraded to the MDMA2 mode.

Display

XGI Z9s is the graphics controller on the Vortex86SX evaluation board, VSX-6190. It is designed to provide essential functions for embedded applications; moreover, it is easy to be configured under GNU/Linux.

XGI Z9s can work well with native SiS/XGI driver under the Linux kernel or the X Window System. For the frame buffer support of Linux, please enable the following options in the kernel configuration menu.

```
Device Drivers --->
  Graphics support --->
    <*> Support for frame buffer devices
      <*>   SiS/XGI display support
        [*]   SiS 315/330/340 series and XGI support
    ...
  Console display driver support --->
    <*> Framebuffer Console support
```

For the X Window System support, there are three things need to be dealt with.

First, you can use X11R6.8 or higher version, which the internal driver in can work properly. Or the other versions with a modified driver by Dr. Thomas Winischhofer, download it from <http://www.winischhofer.eu/linuxsisvga.shtml>.

Second, we suggest not using X11R7.2, because there is a bug which lead to X server fails to start up, when the X server was enabled MMX checking and CPU didn't support the CPUID instruction.

Third, you should place a driver option in device section of your configuration file:

```
Section "Device"
  Driver "sis"
  Option "BenchmarkMemcpy" "no"
  ...
EndSection
```

It avoids a system error when X server is starting up.

Networking

Vortex86SX contains a R6040 network function. It is a 10/100M Fast-Ethernet controller and it provides full compliance with IEEE 802.3u 100Bast-T specifications and IEEE 802.3x full duplex flow control.

Currently, there is no available driver in the Linux kernel. Therefore, before you configure the kernel, you should already patch the kernel for the device driver. Then, please select the R6040 support, and enable NAPI if you need it.

```
(R6040 need PCI support)
Bus options (PCI, PCMCIA, EISA, MCA, ISA) --->
  [*] PCI support

Device Drivers --->
```

```

Network device support --->
  [*] Network device support
...
Ethernet (10 or 100Mbit) --->
  [*] Ethernet (10 or 100Mbit)
...
[*] EISA, VLB, PCI and on board controllers
  <*> RDC R6040 PCI Fast Ethernet support
    (If needed)
  [*] Use Rx Polling (NAPI)

```

USB

Vortex86SX contains one EHCI host controller and one OHCI host controller, so you need to enable these options:

```

Device Drivers --->
  USB support --->
    <*> Support for Host-side USB
    [*]  USB device filesystem
    <*>  EHCI HCD (USB 2.0) support
    <*>  OHCI HCD support

```

Then, add the following line in your `/etc/fstab` file.

```

none /proc/bus/usb usbfs defaults 0 0

```

Sound

The CM109 chip is a single chip USB audio controller. Before the ALSA setting, you should check the USB setting mentioned as previous section.

Please select the options as below:

```

Device Drivers --->
  Sound --->
    <M> Sound card support
      <M> Advanced Linux Sound Architecture
        <M>  OSS Mixer API
        <M>  OSS PCM (digital audio) API
          [*]  OSS PCM (digital audio) API - Include plugin system

```

```
[*]   Support old ALSA API
USB devices --->
<M>  USB Audio/MIDI driver
```

You may add these entries in `/etc/modules.conf`.

```
alias snd-card-0 snd-usb-audio
alias /dev/mixer snd-mixer-oss
alias /dev/dsp snd-pcm-oss
```

Or execute "modprobe snd-usb-audio snd-pcm-oss snd-mixer-oss" when you want to use this audio function.

Note:

At the present time, you cannot use the internal mixer on evaluation board. It will be fixed in next revision.

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Technical Support

For more technical support, please visit <http://www.dmp.com.tw/tech/vortex86sx> or mail to tech@dmp.com.tw.