
AMD Geode™ GX Processors

Building a Linux Image



1.0 Scope

This document discusses the materials needed and the steps involved in building a Linux image on a system based on an AMD Geode™ GX processor*. This document is intended to augment the README files that accompany the drivers and patches provided by AMD.

2.0 Discussion

2.1 Materials

This build was performed with the following:

- 1) Redhat v9.0 standard three CD installation set.
- 2) Linux Kernel v2.4.24 source (<ftp://ftp.kernel.org/pub/linux/kernel/v2.4/linux-2.4.24.tar.bz2>).
- 3) AMD patches and drivers (www.amd.com):
 - Kernel Patches ([linux-2.4.24-geode.patch](#)).
 - Audio Driver ([Audio_LinuxOSS_GX2_2.0.6_src.tar.gz](#)).
 - XFree86 Driver/Patches ([Graphics_LinuxXFree86_GX2_2.8.6_src.tar.gz](#)).
- 4) XFree86 Source XFree86-4.3.0-2.src.rpm (Redhat v9.0 Source CD1).

2.2 Overview

- 1) Install Linux with Redhat v9.0.
- 2) Build new kernel with kernel patches and audio:
 - a) Install kernel source.
 - b) Apply AMD kernel patches to stock linux-2.4.24 kernel.
 - c) Install AMD OSS (Open Sound System) drivers into patched kernel.
 - d) Build and install the kernel.
 - e) Verify the new kernel is executing.
- 3) Build XFree86:
 - a) Install GCC (GNU C-compiler).
 - b) Install X development RPMs (Glide3 packages).
 - c) Install AMD XFree86 source code.
 - d) Build XFree86.
 - e) Install XFree86.
 - f) Tune XFree86.

*The AMD Geode GX 533@1.1W processor operates at 400 MHz, the AMD Geode GX 500@1.0W processor operates at 366 MHz, and the AMD Geode GX 466@0.9W processor operates at 333 MHz. Model numbers reflect performance as described here: <http://www.amd.com/connectivitysolutions/geodegxbenchmark>.

2.3 Details

Building the kernel can be performed on any Linux system. This saves time, as a very fast system can be selected, and additionally, the results can be saved and new Linux systems for Geode GX processors can be rebuilt quickly.

XFree86 must be built on a compatible system (i.e., the same distribution (Redhat v9.0 in this case)). Given this constraint, it is advantageous to find a good build system, as XFree86 takes up to eight times longer to build than the kernel.

2.3.1 Install Linux with Redhat v9.0

Install a workstation version of the system with developer tools included.

Follow the distribution instructions and install a stock Redhat system. The system should be operational, if not optimized for operation with the Geode GX processor.

Refer to the Redhat v9.0 Installation Guide if necessary: <http://www.redhat.com/docs/manuals/linux/RHL-9-Manual/install-guide/>

2.3.2 Build New Kernel with Kernel Patches and Audio

The kernel README is a valuable resource: <http://www.kernel.org/pub/linux/kernel/README>

- 1) Install GCC, if not already done, by installing the workstation version of Redhat:
 - This was done on the Redhat v9.0 by going to the RPM (Redhat Package Manager) (System Settings -> Add/Remove Applications), selecting "Development Tools" and updating.
- 2) Install the kernel source:
 - Decompress and restore the bz2 file containing the kernel source, *linux-2.4.24.tar.bz2*. By convention, the source is unwound at: */usr/src*.
 - `cd /usr/src`
 - `bunzip2 -cd linux2.4.24.tar.bz2 | tar -xv`

This step creates the directory: */usr/src/linux-2.4.24*

- 3) Apply AMD kernel patches to stock linux-2.4.24 kernel:
 - Change directories to the path where the kernel source was unwound:
 - `cd /usr/src/linux-2.4.24`
 - Apply the patch:
 - `cat linux-2.4.24-geode.patch | patch -p1`
 - Rename the appropriate configuration file to be the active target at build:
 - `cp gx3_2.4.config /usr/src/linux-2.4.24/.config` → Check this file

At this point, the optimized kernel could be built/installed without the OSS audio drivers.

- 4) Install AMD OSS drivers into patched kernel:
 - Change to the root of the kernel source tree and unwind the tarball, *Audio_LinuxOSS_GX2_2.0.6_src.tar.gz*:
 - Create a directory for the audio source to be unwound
 - `cd` to this new directory
 - `gunzip Audio_LinuxOSS_GX2_2.0.6_src.tar.gz`
 - `tar -xvf Audio_LinuxOSS_GX2_2.0.6_src.tar`
 - Install the drivers into the source tree:
 - `./install`
 - Augment the configuration by running the *menuconfig* routine:
 - `make menuconfig`
 - Select "Loadable module support" and uncheck "Set version information on all modules"
 - Select "Sound" Option and enable "OSS Modules" by pressing the spacebar when the option is highlighted
 - Make any other configuration changes that may be required for your system (Ethernet controllers, etc.)
 - Save and Exit
- 5) Build and install the kernel:
 - Make dependencies:
 - `make dep`

32089A - July 2004 - Confidential

- Make the binary compressed image:
 - make bzImage
 - Rebuild the modules:
 - make modules
 - Install the new kernel components:
 - make install
 - or
 - cp arch/i386/boot/bzImage /boot/vmlinuz-2.4.24
 - cp System.map /boot/System.map-2.4.24
 - cp .config /boot/config-2.4.24
 - Change the symbolic links for vmlinuz and System.map to point at the new files
 - Install modules:
 - make modules_install
 - or
 - Set the environment variable for build path when building on a host and perform the same step
 - Update grub, the boot loader:
 - Change directories to /boot/grub and edit grub.conf. Add a new line to reference to the new kernel and its associated files (2.4.24)
- 6) Verify that the new kernel is executing. Reboot. After the computer reboots, execute:
- `uname -r`
- If installed correctly, the return is:
- 2.4.24-geode-1.0.6

2.3.3 Build XFree86

- 1) Install GCC if not already done by installing the workstation version of the Redhat.
 - This was done on the Redhat v9.0 by going to the RPM (System Settings -> Add/Remove Applications), selecting “Development Tools” and updating.
- 2) Install X development RPMs (Glide3 packages).
 - This was done on the Redhat v9.0 by going to the RPM (System Settings -> Add/Remove Applications), selecting “X Software Development” and updating.
- 3) Install AMD XFree86 source code. Be clear here that the RPM source is not installed but placed.
 - Select a build directory and unwind the AMD XFree86 tarball:
 - `cd ~`
 - `mkdir xBuild`
 - `cd xBuild`
 - `gunzip amd-x-linux-GX2_2.8.6.tgz`
 - `tar -xvf amd-x-linux-GX2_2.8.6.tar`
- 4) Build XFree86:
 - `make >& log`
- 5) Install XFree86:
 - When step 4 is complete, change directories into the top level of the current build and untar the product file:
 - `cd amd-x-linux-GX2-2.8.6`
 - `tar -C / -xzpf XFree86-4.3.0.tgz`
- 6) Tune XFree86:
 - Edit /etc/XF86Config-4 to reflect the execution environment’s monitor and mouse. Use XF86Config to tune the configuration.
- 7) Go /var/log and check the XFree86 logs to look for “AMD” or execute the command:
 - `xcpyinfo`

© 2004 Advanced Micro Devices, Inc. All rights reserved.

The contents of this document are provided in connection with Advanced Micro Devices, Inc. ("AMD") products. AMD makes no representations or warranties with respect to the accuracy or completeness of the contents of this publication and reserves the right to make changes to specifications and product descriptions at any time without notice. No license, whether express, implied, arising by estoppel or otherwise, to any intellectual property rights is granted by this publication. Except as set forth in AMD's Standard Terms and Conditions of Sale, AMD assumes no liability whatsoever, and disclaims any express or implied warranty, relating to its products including, but not limited to, the implied warranty of merchantability, fitness for a particular purpose, or infringement of any intellectual property right.

AMD's products are not designed, intended, authorized or warranted for use as components in systems intended for surgical implant into the body, or in other applications intended to support or sustain life, or in any other application in which the failure of AMD's product could create a situation where personal injury, death, or severe property or environmental damage may occur. AMD reserves the right to discontinue or make changes to its products at any time without notice.



www.amd.com

One AMD Place
P.O. Box 3453,
Sunnyvale, CA 94088-3453 USA
Tel: 408-732-2400 or 800-538-8450
TWX: 910-339-9280
TELEX: 34-6306

TECHNICAL SUPPORT

USA & Canada: 800-222-9323 or 408-749-5703
USA & Canada: PC Microprocessor: 408-749-3060

Latin America Email: spanish.support@amd.com
Argentina: 001-800-200-1111, after tone 800-859-4478
Chile: 800-532-853
Mexico: 95-800-222-9323

Europe & UK: +44-0-1276-803299
Fax: +44-0-1276-803298
France: 0800-908-621
Germany: +49-89-450-53199
Italy: 800-877224
Europe Email: euro.tech@amd.com

Far East Fax: 852-2956-0588
Japan Fax: 81-3-3346-7848

TRADEMARKS

AMD, the AMD Arrow logo, and combinations thereof, and Geode are trademarks of Advanced Micro Devices, Inc.

Other product names used in this publication are for identification purposes only and may be trademarks of their respective companies.
