AEROFLEX GAISLER

LEON Linux 2.6 Development

LEON Linux 2.6 development overview

Written by Daniel Hellstrom

LEON Linux 2.6 Development Overview

Daniel Hellstrom
Copyright © 2010 Aeroflex Gaisler AB

Table of Contents

1. Introduction

This document aims to give the reader an overview of the current components and tools used in Linux development for the LEON architecture and how the different components are tied together.

1.1. Component Summary

The table below try the summarize the current LEON Linux components that Aeroflex Gaisler distributes patches for. Of course Linux is not limited to these components, there are lots and lots of other packages out there.

LINUXBUILD tries to tie some of the components below together to provide a rapid starting point for Linux development ion the LEON architecture.

Table 1.1. Component summary

Tool	Components/Options
Toolchain	• prebuilt toolchains • Crosstool-NG (not part of linuxbuild) • Buildroot
Linux Kernel	• Official Kernel Tree • LEON kernel Patches • GRLIB Driver Package (not part of linuxbuild)
Distribution	• Buildroot
Boot Loader	• mklinuximg - LEON Linux RAM Loader • MKPROM2 • U-Boot (not part of linuxbuild)

1.2. Download Location

Patches and build scripts can be downloaded from the Aeroflex Gaisler web server at http://gaisler.com/anonftp/linux/linux-2.6. The official sources can be found via each projects homepage:

Table 1.2. Project homepage

Tool	Homepage
Aeroflex Gaisler patches and tools	http://gaisler.com/anonftp/linux
Linux Kernel	www.kernel.org
Builroot	www.buildroot.org
Crosstool-NG	ymorin.is-a-geek.org/projects/crosstool
U-Boot	www.denx.de, and the SPARC repository of the U-Boot project is located at http://git.denx.de/?p=u-boot/u-boot-sparc.git;a=summary

1.3. Linux Kernel

The current official Linux sources available at kernel.org has support for LEON3 and LEON4. Aeroflex Gaisler actively develops the Linux kernel's LEON support, submitting patches to the official kernel. Patches that hasn't reached the official kernel sources yet are provided in a separate LEON Linux kernel distribution. In this document "LEON Linux" is used to identify the official Linux kernel with the unofficial LEON patches (if any).

The GRLIB IP-cores currently supported by LEON Linux is listed here below.

• LEON3, LEON4, LEON3-SMP and LEON4-SMP
• MMU

- GPTIMER as System Clock Timer
- IRQMP, IRQAMP as interrupt controller
- APBUART as system console
- GRETH 10/100 and 10/100/1000 Network driver using the MDIO layer of the Linux kernel

A separate Linux driver package is also distributed under the name "GRLIB Linux driver package". The intention with the driver package is to provide support for some IP-cores part of the GRLIB IP library that will not be submitted to the official kernel sources in the near future, due to different reasons. The current drivers available for GRLIB cores are listed hereafter.

- GRSPW2 DMA SpaceWire Packet kernel library
- GRSPW2 DMA SpaceWire Packet driver
- SpaceWire Router APB register configuration driver

1.4. Toolchain

The kernel and user application are built using a toolchain either prebuilt and distributed by Aeroflex Gaisler or a custom built toolchain using the crosstool-NG or buildroot packages. The crosstool-NG package distributed by Aeroflex Gaisler contains fixes for GCC and toolchain configurations ready to build custom GLIBC toolchains. Buildroot can be used to build a custom uClibC toolchain, for embedded targets that need a small footprint LibC or for some other reason need uClibC.

1.5. Distribution

There are a lot of different Linux distributions available, however many of them lack support for SPARC or embedded smaller footprint targets. Aeroflex Gaisler have been supporting SnapGear Linux for some time using older unofficial Linux kernel versions. Now that the Linux has official support for the LEON family it is easier to support different distributions, submitting GCC patches are also one important step. Instead of patching all distributions with GCC and Linux patches to source is patched. Currently LEON patches are provided for buildroot.

Buildroot is a very flexible cross-compile build system which can (amongst others) build a major number of user-space applications. The file system image created can be used as root file system mounted via MTD from FLASH or built into the kernel directly using the initramfs support (CPIO image).

1.6. Loader

The resulting Linux kernel (`linux-2.6/arch/sparc/boot/image`) must be loaded into the proper location in RAM, a basic MMU table must be setup and an OpenBoot PROM must be available that the Linux kernel request basic operations from, before the Linux kernel can successfully run. The LEON Linux RAM Loader (**mklinuximg**) is used to wrap the resulting Linux kernel around the above functions. The LEON Linux RAM image can be used to load Linux from GRMON or from PROM using MKPROM2 FLASH image utility.

The LEON Linux kernel can be booted from FLASH by using the MKPROM2 and linuxwrap utilities. It provides an efficient and quite boot FLASH/PROM procedure. The LEON Linux kernel can also be booted using the more complex networked U-Boot (sparc repository).

1.7. Linuxbuild

The Linuxbuild package ties together some of the above components together in one place, using make-scripts to build the separate components. Even though it is recommended to setup a custom development flow that suites your particular development project, LINUXBUILD may serve as an initial setup to get started with Linux development for the LEON architecture. Please see the Linuxbuild documentation PDF.

The Linuxbuild package can be downloaded from Aeroflex Gaisler web server in the linux/linux-2.6/ linuxbuild subdirectory.

2. Support

For Support, contact the Aeroflex Gaisler support team at support@gaisler.com.