

LSP 1.20 DaVinci Linux NOR Flash Driver

User's Guide



Literature Number: SPRUF10
April 2008

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LSP 1.20 DaVinci Linux NOR Flash Driver

This guide describes the functional scope of the DaVinci NOR Flash Driver and its feature set. Included are details concerning:

- The various deployment environments, hardware and software, on which the NOR Flash Driver is presently supported.
- The system architecture of the driver.
- The functional decomposition and run-time specifics regarding deployment of the driver in user applications.

For LSP 1.20, the NOR Flash Driver is supported on the following EVMs: DM644x.

1 Overview

The NOR Flash Driver provides the following functional services:

- Supports 16MB AMD AM29LV256M NOR Flash chip
- Supports 16MB Intel I128P30T StrataFlash NOR Flash chip
- Read/Write/Erase from/to NOR Flash
- Support for multiple user channels
- Mounting/un-mounting of the partition

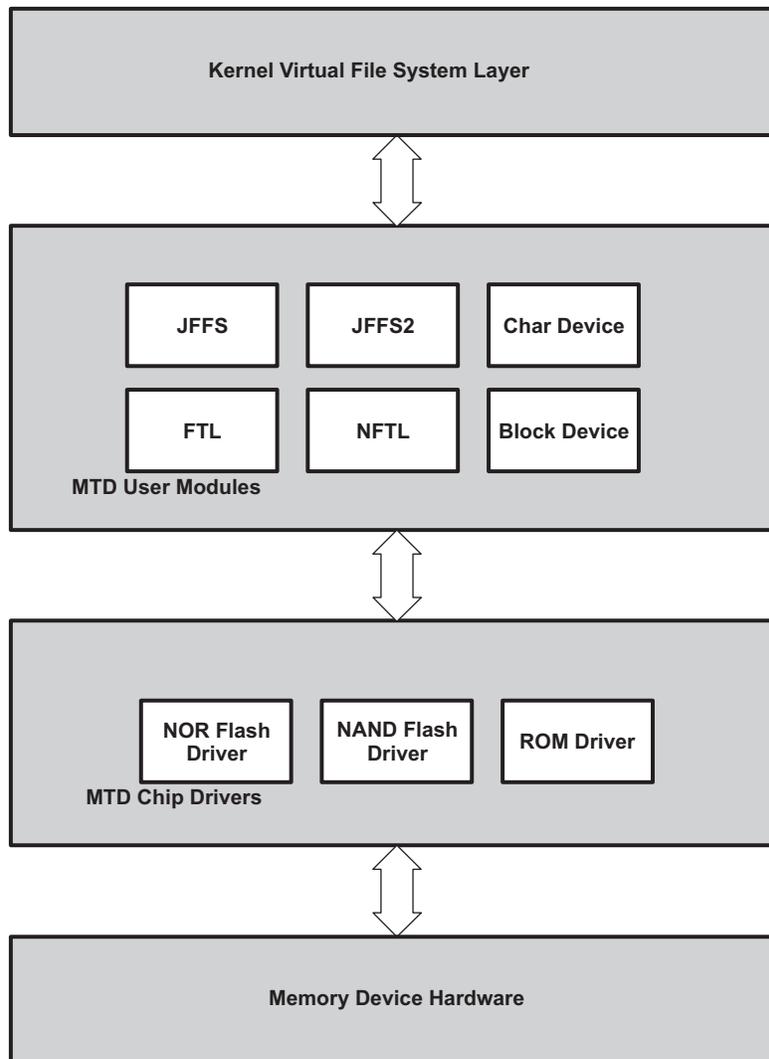
1.1 System Requirements

The NOR Flash Driver is supported on DaVinci EVM (Evaluation Module) Boards with Monta Vista Linux 2.6.10 software.

1.2 Design Overview

This section provides an overview of each layer in the memory technology device (MTD) subsystem. [Figure 1](#) describes layering of the MTD subsystem.

Figure 1. MTD Subsystem



1.2.1 Kernel Virtual File System (VFS) Layer

The Virtual File System (VFS) is the subsystem of the kernel that implements the file system-related interfaces provided to user-space programs. All file systems rely on the VFS to allow them not only to coexist, but also to interoperate. This enables programs to use standard UNIX system calls to read and write to different file systems on different media.

The VFS is the glue that enables system calls such as `open()`, `read()`, and `write()` to work, regardless of the file system or underlying physical medium.

The VFS resides in the `linux-2.6.10_mv1401/fs` directory of the kernel source.

1.2.2 MTD User Modules

To avoid, as much as possible, having different tools for different technologies and to provide common capabilities among the various technologies, the Linux kernel includes the MTD subsystem. This provides a unified and uniform layer that enables a seamless combination of low-level MTD chip drivers with higher-level interfaces called user modules.

The MTD user modules, JFFS and JFFS2, are not configured as part of the MTD subsystem configuration. Rather, they are configured within the *File systems* submenu. Nevertheless, MTD support must be enabled to enable support for either JFFS or JFFS2.

Code for MTD user modules resides in the respective directories of the kernel directory `montavista/pro/devkit/lsp/ti-davinci/fs`. For example, code for JFFS2 is in `montavista/pro/devkit/lsp/ti-davinci/fs/jffs2/`.

1.2.3 MTD Chip Drivers

The MTD chip drivers register with the MTD subsystem by providing a set of predefined callbacks and properties in the `mtd_info` structure in the `add_mtd_device()` function. The callbacks an MTD driver has to provide are called by the MTD subsystem to carry out operations such as erase, read, write, and sync.

The NOR Flash Driver described in this document comes under this category. It is a low-level driver targeted for a specified NOR flash chip. Source code files for AMD NOR Flash are `cfi_cmdset_0002.c`, `cfi_util.c`, and `davinci-nor.c`. Source code files for Intel NOR Flash are `cfi_cmdset_0001.c`, `cfi_util.c`, and `davinci-nor.c`. The files `cfi_cmdset_0001.c`, `cfi_cmdset_0002.c` and `cfi_util.c` are in the `montavista/pro/devkit/lsp/ti-davinci/drivers/mtd/chips` directory, while `davinci-nor.c` is in the `montavista/pro/devkit/lsp/ti-davinci/drivers/mtd/maps` directory of the source tree.

Once the MTD chip drivers are properly configured for a system's memory devices, the storage space available on each MTD device can be managed by an MTD user module. The user module enforces a storage format on the MTD devices it manages and provides interfaces and abstractions recognized by higher-level kernel components.

2 Installation Guide

This section discusses installation of the NOR Flash Driver, what software and hardware components are available, and how to make these components available in order to complete a successful installation of the driver.

2.1 List of Installable Components

NOR Flash Driver code, Makefile changes and Kconfig file changes.

2.2 Component Folder

The NOR Flash Driver can be found in the following directory after final installation into the system:

```
montavista/pro/devkit/lsp/ti-davinci/drivers/mtd/chips
montavista/pro/devkit/lsp/ti-davinci/drivers/mtd/maps
```

2.3 Development Tools

Install the following tools, in the order listed below, to setup the development environment:

- MVL401, version 2.6.10
- MontaVista Linux Toolchain - arm_v5t_le-

2.4 Build

This section describes the steps required to build the device driver.

2.4.1 Build Options

This driver does not require any specific build options at this time.

2.4.2 Build Steps

Use the following steps to enable NOR Flash support in the system:

- Step 1. Choose your default kernel configuration by entering the command:
`make davinci_xxxx_defconfig.`
- Step 2. Choose the driver specific kernel configuration by entering command: `make menuconfig.`
- Step 3. Select the *Device Drivers* option and then, select *Memory Technology Devices (MTD)*. Finally, choose the *RAM/ROM/Flash chip drivers* option.
- Step 4. Detect flash chips by common flash interface (CFI) by selecting one of the following:
 - a. For the static build, choose the option `<*>` *Detect flash chips by Common Flash Interface (CFI)*.
 - b. For build as a module, choose the option `<M>` *Detect flash chips by Common Flash Interface (CFI)*.
- Step 5. To build support for the AMD select one of the following:
 - a. For static build, choose the option `<*>` *Support for AMD/Fujitsu flash chips.*
 - b. For build as a module, choose the option `<M>` *Support for AMD/Fujitsu flash chips.*
- Step 6. To build support for Intel select one of the following:
 - a. For static build, choose the option `<*>` *Support for Intel/Sharp flash chips.*
 - b. For build as a module, choose the option `<M>` *Support for Intel/Sharp flash chips.*
- Step 7. To enable access for NOR flash chips on the DaVinci-based board defining flash platform devices and flash platform data, choose the *Mapping drivers for chips access*, and select one of the following:
 - A. For static build, choose the option `<*>` *TI DaVinci board mappings.*
 - B. For build as a module, choose the option `<M>` *TI DaVinci board mappings.*
- Step 8. Due to the PINMUX conflicts, NOR driver (Intel or AMD) requires the DaVinci NAND and ATA-IDE driver to be disabled.
 - A. Select the *Device Drivers* option and then, select *ATA/ATAPI/MFM/RLL support*. Disable the *Davinci IDE interface support* option.
 - B. Select the *Device Drivers* option and then, select *Memory Technology Devices (MTD)*. Select the *NAND Flash Device Drivers*. Disable the *NAND Flash device on DaVinci SoC* option.
- Step 9. Save your kernel configuration options and build the kernel by entering the following command: `make uImage modules.`

2.5 Steps to Load/Unload the NOR Flash Driver

To run the driver using the dynamically-loadable modules, copy the modules (.ko files) to the target file system. Execute the following commands to load the NOR Flash Driver (AMD) modules:

- `insmod cfi_util.ko`
- `insmod cfi_cmdset_0002.ko`
- `insmod davinci_nor.ko`

Execute the following commands to load the NOR Flash Driver (Intel) modules:

- `insmod cfi_util.ko`
- `insmod cfi_cmdset_0001.ko`
- `insmod davinci_nor.ko`

Execute the following commands to unload the NOR Flash Driver (AMD) modules:

- insmod davinci_nor.ko
- insmod cfi_cmdset_0002.ko
- insmod cfi_util.ko

Execute the following commands to unload the NOR Flash Driver (Intel) modules:

- insmod davinci_nor.ko
- insmod cfi_cmdset_0001.ko
- insmod cfi_util.ko

3 NOR Flash Driver Porting

This section describes the changes made in kernel source code to support NOR Flash chips AMD AM29LV256M and Intel I128P30T StrataFlash.

3.1 Customizing the NOR-flash partitions

In the file `arch/arm/mach-davinci/board-evm.c`, there are partitions defined for the NOR-flash chips of the DaVinci board. The partition information is the default value that the kernel takes during compilation. This partition information can be changed according to the user's needs. For each partition, these fields are available:

- **name:** String that will be used to label the partition's MTD device.
- **offset:** Absolute starting position within the MTD device; if defined as `MTDPART_OFS_APPEND`, the partition will start where the previous one ended; if `MTDPART_OFS_NXTBLK`, at the next erase block.
- **size:** The partition size; if defined as `MTDPART_SIZ_FULL`, the partition will extend to the end of the MTD device.
- **mask_flags:** Contains flags that have to be masked (removed) from the MTD flag set for the corresponding MTD partition. For example, to force a read-only partition, adding `MTD_WRITEABLE` to the `mask_flags` will suffice.

Default partition information for the DaVinci board is shown below:

```

davinci_evm_nor_partitions[] = {
    /* bootloader (U-Boot, etc) in first 4 sectors */
    {
        .name          = "bootloader",
        .offset        = 0,
        .size          = SZ_128K,
        .mask_flags    = MTD_WRITEABLE,
    },
    /* bootloader params in the next 1 sector */
    {
        .name          = "params",
        .offset        = MTDPART_OFS_APPEND,
        .size          = SZ_128K,
        .mask_flags    = MTD_WRITEABLE,
    },
    /* kernel */
    {
        .name          = "kernel",
        .offset        = MTDPART_OFS_APPEND,
        .size          = SZ_4M,
        .mask_flags    = 0,
    },
    /* file system */
    {
        .name          = "filesystem",
        .offset        = MTDPART_OFS_APPEND,
        .size          = MTDPART_SIZ_FULL,
        .mask_flags    = 0,
    }
}

```

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