

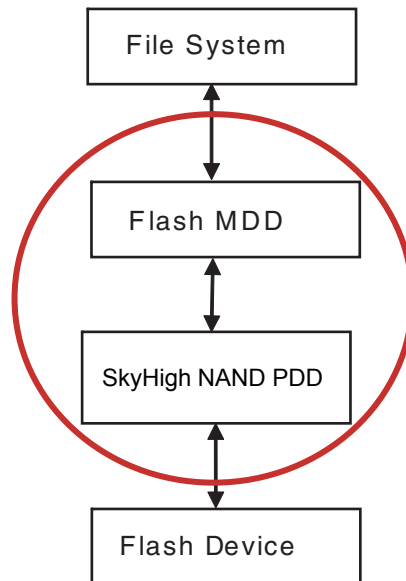
Designing with the SkyHigh NAND PDD for Windows® Embedded CE 6.0R2 and Later

AN98544 describes the features and parameters of the SkyHigh NAND PDD to unlock the maximum potential for SkyHigh NAND devices in Windows Embedded platforms.

1 Introduction

The Microsoft® Flash MDD (Model Device Driver) presents a block device interface to file systems in Windows CE. The SkyHigh NAND Flash PDD (Physical Device Driver) is the low-level driver that enables the flash MDD to operate on SkyHigh NAND devices. The SkyHigh NAND PDD can also be integrated into the OAL (OEM Adaptation Layer). This application note describes the features and parameters of the SkyHigh NAND PDD to unlock the maximum potential for SkyHigh NAND devices in Windows Embedded platforms.

Figure 1. Block Driver



2 Features

- Supports a single x8 or x16 device
- Configures device characteristics from ONFI or device ID codes
- Modular code allows for simple platform customizing

3 Customizing

The SkyHigh NAND PDD can be customized to meet the needs of different systems. Separate libraries are linked together to create the SkyHigh NAND PDD. These libraries include the core PDD logic, the platform interface, and flash parameters. Any one of these modules can be updated without having to rebuild the other modules. Initially, each library must be built before linking the DLL in the project build. Using Platform Builder, the component

libraries can be compiled from the Solution Explorer window by browsing to the applicable component under PUBLIC\SPN_NAND.

```

+---Catalog
+---CESYSGEN
+---NANDCTL
|   +---SpnPci4
|   +---stub
+---NANDPARMS
|   +---oal
|   +---registry
+---NANDPCI
+---oak
|   +---FILES
|   +---lib
|   +---target
+---SPNNANDD
    
```

The NANDCTL tree contains multiple options for code that is specific to the NAND controller. These modules contain the low-level routines to initialize and interface with flash for a given platform. The default code (TemplateCtl.cpp) is a starting point for writing a new NAND controller interface.

The NAND controller options also appear as radio button selections in the catalog. Note that changing this catalog selection does not force a rebuild of the flash driver DLL (spnnand.dll). Rebuild any component library and then build the Windows CE project. This will cause the correct libraries to be linked.

The NANDPARMS tree contains two options for providing flash and system parameters to the core SkyHigh NAND PDD code. The registry example (registryparms.cpp) queries the system registry for most of the parameter values. This code is built by default. The OAL example (oalparms.cpp) shows how to specify these parameters statically. If the SkyHigh NAND PDD is integrated into the OAL, the registry is not available. Parameters for a given platform must be specified with either approach.

Table 1 shows the SkyHigh NAND PDD parameters and the associated registry entries.

Table 1. NAND PDD Parameters

Parameter	Registry Entry
SPN_PARM_BASE_ADDR	"MemBase"
SPN_PARM_BUS_WIDTH_BITS	"BusWidthBits"

4 Registry Entries

Several registry entries are used to configure the SkyHigh NAND PDD.

Table 2. Registry Entries

Registry Entry	Optional	Description
MemBase	No	Physical start of the flash array
MemLen	No	This value is not used directly by the PDD
BusWidthBits	Yes	10h for 16 bits, or 8h for 8 bits

Setting the "BusWidthBits" entry to "10" indicates a single flash device with a 16-bit data bus. The value "8" indicates a device with an 8-bit data bus.

The "MemLen" registry key must exist for the PDD to successfully call MmMapIoSpace, which maps the physical flash address to a virtual address space the PDD can access. The flash size is determined from ONFI or device ID codes. The "MemLen" value is ignored

The remaining registry entries are documented at www.msdn.com. Search for "block driver registry" and "MemBase MemLen".

Below is an example of registry settings for a SkyHigh NAND device.

```
[HKEY_LOCAL_MACHINE\Drivers\BuiltIn\SPNNANDD]
  "Dll"="flashmdd.dll"
  "FlashPddDll"="spnnandd.dll"
  "Order"=dword:0
  "Prefix"="DSK"
  "Ioctl"=dword:4
  "Profile"="SpansionNAND"
  "IClass"="{A4E7EDDA-E575-4252-9D6B-4195D48BB865}"
  "MemBase"=dword:18000000
  "MemLen"=dword:00000000
  "BusWidthBits"=dword:10

; Override names in default profile
[HKEY_LOCAL_MACHINE\System\StorageManager\Profiles\SpansionNAND]
  "Name"="MSFLASH for Spansion NAND"
  "Folder"="Spansion NAND Flash"
  "PartitionDriver"="flashpart.dll"
  "DefaultFileSystem"="FATFS"

[HKEY_LOCAL_MACHINE\System\StorageManager\AutoLoad\SpansionNAND]
  "DriverPath"="Drivers\BuiltIn\SPNNANDD"
  ; LoadFlags 0x01 == load synchronously
  "LoadFlags"=dword:1
  "Order"=dword:0
```

The following optional registry entries can be used to control how the Storage Manager handles the flash disk at boot time.

Table 3. Optional Registry Entries

Registry Entry	Default	Description
AutoMount	1	Automatically attempt to mount, if set to 1
AutoPart	0	Automatically create largest possible partition, if set to 1
AutoFormat	0	Automatically format the store when unformatted, if set to 1

In order to override the Storage Manager default value for a given entry, add the entry to the profile key in spn_nand.reg, for example:

```
[HKEY_LOCAL_MACHINE\System\StorageManager\Profiles\SpansionNAND]
"Name"="MSFLASH for Spansion NAND"
"Folder"="Spansion NAND Flash"
"PartitionDriver"="flashpart.dll"
"DefaultFileSystem"="FATFS"
"AutoPart"=dword:1
"AutoFormat"=dword:1
```

One way to manually format the drive and create a partition is using the Storage Manager Control Panel applet. This approach is useful during integration and development with the flash block driver.

5 Code Execution

In order to demand page the Windows CE OS image from flash, a BinFS partition can be used. This area of the NAND flash would still be managed by the Flash MDD.

6 Example Parameters

This example platform contains an S34ML01G1 device with an 8-bit I/O bus. The NAND page size is 2112 bytes, so the file system sector size will be 2 kB.

The flash array is managed by the flash partition manager, with one partition for storing and demand paging the OS image using BinFS, and one partition for file storage with TFAT.

The following run-time registry entries (spn_nand.reg) configure the SkyHigh NAND PDD to operate with the Flash MDD for both file system partitions.

```
"MemBase"=dword:80000000  
"MemLen"=dword:00000000  
"BusWidthBits"=dword:8
```

The following example parameter values (oalparams.cpp) configure the SkyHigh NAND PDD in the OAL for access at boot time.

Table 4. Boot Time Parameters

Parameter	Value
SPN_PARM_BASE_ADDR	0x80000000
SPN_PARM_BUS_WIDTH_BITS	0x8

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Conclusion

Please consult your flash device data sheet to ensure your platform adheres to the device specifications. To obtain a copy of the NAND PDD, or for questions about using SkyHigh NAND devices, please contact SkyHigh support.

Document History Page

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*A	4979105	MSWI	10/27/2015	Updated in Cypress template
*B		MNAD	06/03/2019	Updated to SkyHigh format