SmartFusion2 MSS

Embedded Nonvolatile Memory (eNVM) Configuration

Microsemi®

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Introduction

The MSS Embedded Nonvolatile Memory (eNVM) configurator enables you to create memory regions (clients) that need to be programmed in the SmartFusion2 device eNVM block(s).

In this document we describe in detail how to configure the eNVM block(s). For more details about eNVM, refer to the Microsemi SmartFusion2 User's Guide.

Important Information About eNVM Reserved Pages

Some eNVM pages are reserved to store the HPMS configuration. These reserved pages are used by the HPMS to store the Peripheral Initialization Configuration Data and the Certificate/Digest. These pages are located at the top of the eNVM address space. The total number of reserved pages in the eNVM is device-dependent, as shown in Table 1.

***Table 1* • Device Type and eNVM Reserved Pages**

SmartFusion2 Device	Reserved Pages for Certificate/Digest
M2S005, M2S010, M2S025,M2S050	16
M2S090, M2S100, M2S150	64

Note: You application should not write into these reserved pages, as it will most likely cause a runtime failure for your design.

The number of Available Pages displayed in the eNVM Configurator is the total number of pages available to you after the Reserved Pages have been taken into account. For example. the M2S050 device data sheet shows a total of 2048 pages in the eNVM, but the eNVM Configurator (Figure 1-1) shows 2032 Available Pages, because 16 pages have been reserved by the HPMS and made unavailable to the user.

1 – Creating Clients

The main page of the eNVM configurator enables you to add clients to your eNVM block.

- **Data Storage client** - Use the data storage client to define a generic memory region in the eNVM block. This region can be used to hold your application code or any other data content that your application may need.

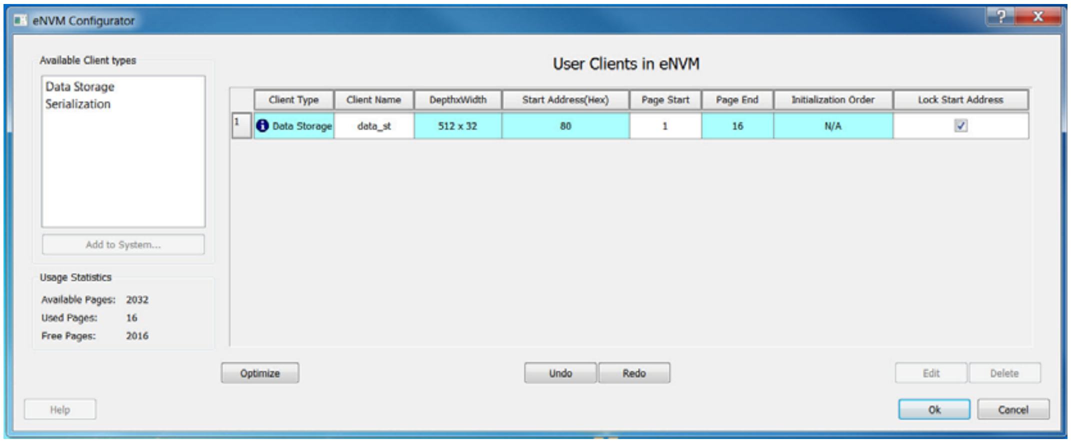
The main grid also displays characteristics of any configured clients. These characteristics are:

- **Client Type** - Type of the client that is added to the system
- **Client Name** - Name of the client. Must be unique across the system.
- **Start Address** - Adresss in hex at which the client is located in eNVM. It must be on a page boundary. No overlapping addresses between different clients are allowed.
- **Word Size** - Word size of the client in bits
- **Page Start** - Page on which the start address begins.
- **Page End** - Page on which the client memory region ends. It is automatically computed based on the start address, word size, and number of words for a client.
- **Initialization Order** - This field is not used by the SmartFusion eNVM configurator.
- **Lock Start Address** - Specify this option if you do not want the eNVM configurator to change your start address when clicking the **Optimize** button.

Usage statistics are also reported:

- **Available Pages** - Total number of pages available to create clients. The number of available pages may vary based on the selected die. This number is the total number of pages available to you after the reserved pages have been taken into account.
- **Used Pages** - Total number of pages used by the configured clients.
- **Free Pages** - Total number of pages still available for configuring data storage and initialization clients.

Use the **Optimize** feature to resolve the conflicts on overlapping base addresses for clients. This operation does not modify the base addresses for any clients that have Lock Start Address checked.



User Clients in eNVM

	Client Type	Client Name	DepthxWidth	Start Address(Hex)	Page Start	Page End	Initialization Order	Lock Start Address
1	Data Storage	data_st	512 x 32	80	1	16	N/A	☑

Usage Statistics

Available Pages:	2032
Used Pages:	16
Free Pages:	2016

Figure 1-1 **• eNVM Configurator**

2 – Configuring a Data Storage Client

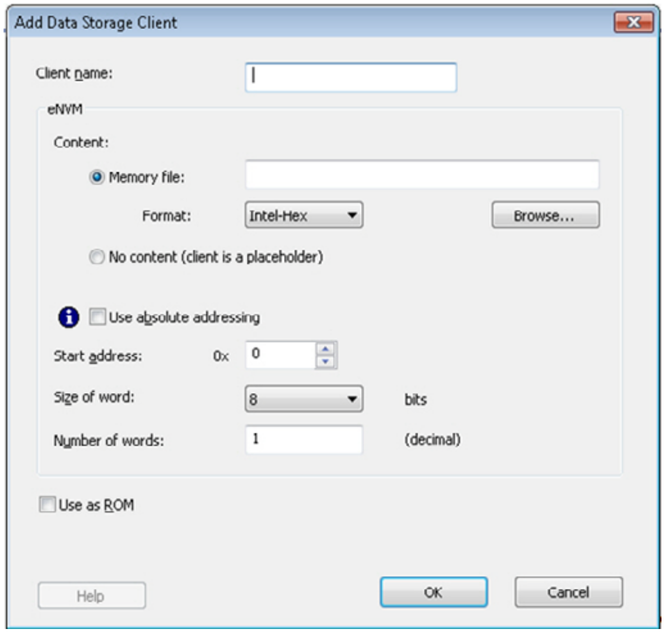
You must specify the following options in the Client Configuration dialog.

eNVM Content Description

- **Content** - Specify the memory content that you want to program into eNVM. Choose one of the following options:
  - **Memory File** - You need to select a file on disk that matches one of the following memory file formats - Intel-Hex, Motorola-S, Actel-S or Actel-Binary - .
  - **No content** - The client is a place holder. You will be available to load a memory file using FlashPro/FlashPoint at programming time without having to go back to this configurator.
- **Use absolute addressing** - Lets the memory content file dictate where the client is placed in the eNVM block. The addressing in the memory content file for the client becomes absolute to the whole eNVM block. Once you choose the absolute addressing option, the software extracts the smallest address from the memory content file and uses that address as the start address for the client.
- **Start Address** - The eNVM address where the content is programmed.
- **Size of Word** - Word size, in bits, of the initialized client; can be either 8, 16 or 32.
- **Number of words** - Number of words of the client.

Use as ROM

If you select this option the data storage client content is protected and its content cannot be overwritten.



Add Data Storage Client

Client name:

eNVM

Content:

● Memory file:

Format: Intel-Hex

○ No content (client is a placeholder)

□ Use absolute addressing

Start address: 0x 0

Size of word: 8 bits

Number of words: 1 (decimal)

□ Use as ROM

Figure 2-1 • **Modify Data Storage Client Dialog Box**

3 – Memory File Formats

The following memory file formats are available as input files into the eNVM Configurator:

- INTEL-HEX
- MOTOROLA S-record
- Actel BINARY
- ACTEL-HEX

An example of how to interpret the memory content is listed below.

INTEL-HEX

Industry standard file. Extensions are HEX and IHX. For example, file2.hex or file3.ihx.

A standard format created by Intel. Memory contents are stored in ASCII files using hexadecimal characters. Each file contains a series of records (lines of text) delimited by new line, '\n', characters and each record starts with a ':' character. For more information regarding this format, refer to the Intel-Hex Record Format Specification document available on the web (search Intel Hexadecimal Object File for several examples).

The Intel Hex Record is composed of five fields and arranged as follows:

```
:llaaaatt[dd...]cc
```

Where:

- : is the start code of every Intel Hex record
- ll is the byte count of the data field
- aaaa is the 16-bit address of the beginning of the memory position for the data. Address is big endian.
- tt is record type, defines the data field:
  - 00 data record
  - 01 end of file record
  - 02 extended segment address record
  - 03 start segment address record (ignored by Microsemi SoC tools)
  - 04 extended linear address record
  - 05 start linear address record (ignored by Microsemi SoC tools)
- [dd...] is a sequence of n bytes of the data; n is equivalent to what was specified in the ll field
- cc is a checksum of count, address, and data

Example Intel Hex Record:

```
:10000000112233445566778899FFFA
```

Where 11 is the LSB and FF is the MSB.

MOTOROLA S-record

Industry standard file. File extension is S, such as file4.s

This format uses ASCII files, hex characters, and records to specify memory content in much the same way that Intel-Hex does. Refer to the Motorola S-record description document for more information on this format (search Motorola S-record description for several examples). The RAM Content Manager uses only the S1 through S3 record types; the others are ignored.

The major difference between Intel-Hex and Motorola S-record is the record formats, and some extra error checking features that are incorporated into Motorola S.

In both formats, memory content is specified by providing a starting address and a data set. The upper bits of the data set are loaded into the starting address and leftovers overflow into the adjacent addresses until the entire data set has been used.

The Motorola S-record is composed of 6 fields and arranged as follows:

```
Stllaaaa[dd...]cc
```

Where:

- S is the start code of every Motorola S-record
- t is record type, defines the data field
- ll is the byte count of the data field
- aaaa is a 16-bit address of the beginning of the memory position for the data. Address is big endian.
- [dd...] is a sequence of n bytes of the data; n is equivalent to what was specified in the ll field
- cc is the checksum of count, address, and data

Example Motorola S-Record:

```
S10a0000112233445566778899FFFA
```

Where 11 is the LSB and FF is the MSB.

Actel BINARY

The simplest memory format. Each memfile contains as many rows as there are words. Each row is one word, where the number of binary digits equals the word size in bits. This format has a very strict syntax. The word size and number of rows must match exactly. The file extension is MEM; for example, file1.mem.

Example: Depth 6, Width is 8

```
01010011
11111111
01010101
11100010
10101010
11110000
```

Actel-HEX

A simple address/data pair format. All the addresses that have content are specified. Addresses with no content specified will be initialized to zeroes. The file extension is AHX, such as filex.ahx. The format is:

```
AA:D0D1D2
```

Where AA is the address location in hex. D0 is the MSB and D2 is the LSB.

```
The data size must match the word size. Example: Depth 6, Width is 8
00:FF
01:AB
02:CD
03:EF
04:12
05:BB
```

All other addresses will be zeroes.

4 – Interpreting Memory Content

Absolute vs. Relative Addressing

In Relative Addressing, the addresses in the memory content file did not determine where the client was placed in memory. You specify the location of the client by entering the start address. This becomes the 0 address from the memory content file perspective and the client is populated accordingly.

For example, if we place a client at 0x80 and the content of the memory file is as follows:

```
Address: 0x0000 data: 0102030405060708
Address: 0x0008 data: 090A0B0C0D0E0F10
```

Then the first set of bytes of this data is written to address 0x80 + 0000 in the eNVM block. The second set of bytes is written to address 0x80 + 0008 = 0x88, and so on.

Thus the addresses in the memory content file are relative to the client itself. Where the client is placed in memory is secondary.

For absolute addressing, the memory content file dictates where the client is placed in the eNVM block. So the addressing in the memory content file for the client becomes absolute to the whole eNVM block. Once you enable absolute addressing option, the software extracts the smallest address from the memory content file and uses that address as the start address for the client.

Data Interpretation Example

The following examples illustrate how the data is interpreted for various word sizes:

For the given data:

```
FF 11 EE 22 DD 33 CC 44 BB 55
```

(where 55 is the MSB and FF is the LSB)

For 32-bit word size:

```
0x22EE11FF (address 0)
0x44CC33DD (address 1)
0x000055BB (address 2)
```

For 16-bit word size:

```
0x11FF (address 0)
0x22EE (address 1)
0x33DD (address 2)
0x44CC (address 3)
0x55BB (address 4)
```

For 8-bit word size:

```
0xFF (address 0)
0x11 (address 1)
0xEE (address 2)
0x22 (address 3)
0xDD (address 4)
0x33 (address 5)
0xCC (address 6)
0x44 (address 7)
0xBB (address 8)
0x55 (address 9)
```

A – Product Support

Microsemi SoC Products Group backs its products with various support services, including Customer Service, Customer Technical Support Center, a website, electronic mail, and worldwide sales offices. This appendix contains information about contacting Microsemi SoC Products Group and using these support services.

Customer Service

Contact Customer Service for non-technical product support, such as product pricing, product upgrades, update information, order status, and authorization.

From North America, call 800.262.1060
From the rest of the world, call 650.318.4460
Fax, from anywhere in the world, 408.643.6913

Customer Technical Support Center

Microsemi SoC Products Group staffs its Customer Technical Support Center with highly skilled engineers who can help answer your hardware, software, and design questions about Microsemi SoC Products. The Customer Technical Support Center spends a great deal of time creating application notes, answers to common design cycle questions, documentation of known issues, and various FAQs. So, before you contact us, please visit our online resources. It is very likely we have already answered your questions.

Technical Support

Visit the Customer Support website (www.microsemi.com/soc/support/search/default.aspx) for more information and support. Many answers available on the searchable web resource include diagrams, illustrations, and links to other resources on the website.

Website

You can browse a variety of technical and non-technical information on the SoC home page, at www.microsemi.com/soc.

Contacting the Customer Technical Support Center

Highly skilled engineers staff the Technical Support Center. The Technical Support Center can be contacted by email or through the Microsemi SoC Products Group website.

Email

You can communicate your technical questions to our email address and receive answers back by email, fax, or phone. Also, if you have design problems, you can email your design files to receive assistance. We constantly monitor the email account throughout the day. When sending your request to us, please be sure to include your full name, company name, and your contact information for efficient processing of your request.

The technical support email address is soc_tech@microsemi.com.

My Cases

Microsemi SoC Products Group customers may submit and track technical cases online by going to My Cases.

Outside the U.S.

Customers needing assistance outside the US time zones can either contact technical support via email (soc_tech@microsemi.com) or contact a local sales office. Sales office listings can be found at www.microsemi.com/soc/company/contact/default.aspx.

ITAR Technical Support

For technical support on RH and RT FPGAs that are regulated by International Traffic in Arms Regulations (ITAR), contact us via soc_tech_itar@microsemi.com. Alternatively, within My Cases, select **Yes** in the ITAR drop-down list. For a complete list of ITAR-regulated Microsemi FPGAs, visit the ITAR web page.

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