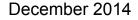
Application Note







## **Revision History**

Date	Revision	Change
22 December 2014	2	Second release
22 August 2014	1	First release

### **Confidentiality Status**

This is a non-confidential document.



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supersonation

#### Purpose

This application note demonstrates how to build single/multiple SoftConsole application executable images in the production release mode, store them into eNVM using eNVM data storage client, and execute them on SmartFusion<sup>®</sup>2 system-on-chip (SoC) field programmable gate array (FPGA) Evaluation Kit.

### Introduction

SmartFusion2 SoC FPGA devices have a maximum of two on chip 256 KB flash memories called eNVM. The eNVM is used to store the application code executable image or store data, which is used by the user application.

Refer to the eNVM chapter of the *SmartFusion2 Microcontroller Subsystem User Guide* for a detailed description about eNVM.

The user application projects are built in Release/Debug mode for execution on SmartFusion2 Evaluation kit through SoftConsole. In the Debug mode, the complete symbolic debug information is emitted to the debugging applications and the code is not optimized. In the Release mode, the complete symbolic debug information is not emitted and the code execution is optimized. The size of the final release mode executable is smaller than the debug executable. It also runs faster than the debug mode.

This application note describes the following:

How to build a single SoftConsole application executable image in production release mode, store the image into eNVM using eNVM data storage client, and execute the image directly from eNVM of the SmartFusion2 Evaluation Kit.

A sample SoftConsole application project fetches factorial of a number from a non-executable image (LookUpTable.hex) stored in eNVM. LookUpTable.hex file contains pre-calculated factorial values. For more information about how to create a LookUpTable.Hex file, see "Appendix B - Creating LookUpTable.Hex File" on page 48.

How to build multiple SoftConsole application executable images in production release mode and store them into eNVM using eNVM data storage client.

The SoftConsole application projects show how the stored executable images in eNVM directly runs from eNVM, and how to remap the images to run from eSRAM. The SoftConsole application projects designed here are to blink LED on the SmartFusion2 Evaluation Kit.

To demonstrate the above two scenarios, two design folders with the SoftConsole application projects are provided with this application note in "Appendix A - Design and Programming Files" on page 47.

## References

The following list of references is used in this document:

SmartFusion2 Microcontroller Subsystem User Guide



## **Design Requirements**

Table 1 lists the design requirements.

#### Table 1 • Design Requirements

Design Requirements	Description
Hardware Requirements	·
SmartFusion2 Evaluation Kit:	Rev C
<ul> <li>12 V adapter (provided along with the kit)</li> </ul>	
FlashPro4 programmer (provided along with the kit)	
USB A to Mini-B cable	
Host PC or Laptop	Any 64-bit Windows Operating System
Software Requirements	
Libero <sup>®</sup> System-on-Chip (SoC)	v11.4
SoftConsole	3.4SP1
Host PC Drivers (provided along with the design files)	USB to UART drivers
One of the following serial terminal emulation programs:	-
HyperTerminal	
• TeraTerm	
• PuTTY	

## Building Executable Image in Release Mode

The following steps describe how to build an application executable image in the release mode:

1. Open the standalone SoftConsole IDE.

SC C/C++ - Welcome to Microsemi SoftConsol	le IDE v3.4 - Microsemi SoftConsole IDE v3.4					- 0 <b>- X</b> -
File Edit Source Refactor Navigate Se	arch Project Run Window Help					
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Project Explorer 🛛 🔍 🗖	🗋 Welcome 🖄				- D)(2	Outli 🕄 🛞 Mak 📄 🗖 🗋
E 😫 🏹	Microsemi SoftConsole IDE	(3.4			An	outline is not available.
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	Problems 🖾 🖉 Tasks 🗟 Consol	Properties				
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	Description	Resource Path	Location	type		
0*						

Figure 1 • SoftConsole IDE



2. Right-click the **Project Explorer** window and choose **Import** as shown in Figure 2.

	ile IDE v3.4 - Microsemi SoftConsole IDE v3.4				00
	earch Project Run Window Help				
	• 🖻 • @ • 🚳 • 🗞 • Ø • Q • Q • 🤷 • 🔟	■ [約・約・% (+ · ·	\$ •		😭 📴 C/C++
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🗏 🐴 🏹	Microsemi SoftConsole IDE v3.4				An outline is not available.
New +	SoftConsols is a fire software development environment enabling the ranging production of C, and C++ acquitables for procession available for use in Microsemi devices. Creating a project inside SoftConso lets you write software that is immediately compiled into a usable binay.	le			
in Import	Start a Project				
Export  Refresh F5	To begin your work, click File > New > C Project Give your project a name, and select a toolchain if you are going to be compiling for a target other than the default choice of the Microse	mi Cortex-M3.			
	Then click Finish. Add an initial source file with File > New > Source File				
	Add code to it, and click the Build All icon.				
	Existing Code     You can also import an existing source tree using     File - Import and Citic     General > File System				
	Additional Information     * Relaxes Notes     http://www.actel.com/download/software/softconsole     * Online documentation     http://www.actel.com/products/software/softconsole#docs				
	Problems      Z      Z Tasks      Console      Properties     O items				
	Description Resource Pa	th Location T	ype		

Figure 2 • SoftConsole IDE - Import

3. Select General > Existing Projects into Workspace as shown in Figure 3.

SC C/C++ - Welcome to Microsemi SoftConso File Edit Source Refactor Navigate Si						
		1.0.1				11 E C/C++
		• 💆 🗸 •		.00.		
Project Explorer 🕄 📃 🗖						" 🗆 🎛 Outli 🛛 🛞 Mak 🔍 🗆
⊟ 🕸 🏹	Microsemi SoftConsole IDE v3.4					An outline is not available.
C	<ul> <li>General production of Can Can Can Can Can Can Can Can Can Can</li></ul>	unables for processors project multis different sector of mer subalvalues of the subalvalues of the subalvalues of the Micro sector file on the subalvalues of the Micro sector file of the subalvalues of the Subalvalues	sole	import source r text eneral Archive Fil Existing Pri Existing Pri File System Preference /C++ VS un/Debug	Fai Projects into Workspice	
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	Description	Resource	Path	Location	n Tvne	
	bucipuon	Nesource	- 841	Location	(Jbe	
0 items selected	JI					
				_		

Figure 3 • SoftConsole IDE - Importing Existing Projects



Import window is displayed as shown in Figure 4 80 CC++- Wetcome to Monument SchConsole IDE +34 - Monument SchConsole IDE +34 File Edit Source Refeter Nangete Search Project Run Window Help T → T L L M M A A B → C M → C - 0 % 😭 📴 C/C++ An outline is not available. Project Explorer Welcome 🖻 🎕 🍸 Microsemi SoftConsole IDE v3.4 SoftConsole is a free software development environment enabling the rapid production of C and C++ executables for processors available for use in Microsemi devices. Creating a project inside SoftCons lets you write software that is immediately compiled into a usable binary SC Import Import Projects Start a Project To begin your work, click. File > New > C Project Give your project a name, and select a toolchain if you are going to be compiling for a target other than the default choice of the Micr Then click Finish. Select a directory to search for existing Eclipse projects Browse. Select root directory Add an initial source file with File > New > Source File Select archive file: Brows Add code to it, and click the Build All icon. Projects: Select All Existing Code
You can also import an existing source tree using
File > Import\_
and click
General > File System Deselect All Refresh tes v.actel.com/d load/software/soft Copy projects into workspac Working sets Add project to working sets Splect... ? Kack Next > Einish Cancel 🖹 Problems 🕴 🖉 Tasks 🖳 Console 🗔 Properties Description Path Type 0 items selected Figure 4 • SoftConsole IDE - Browse SC C/C++ - Welcome to Microsemi SoftConsole IDE v3.4 - Microsemi SoftCon Refactor Navigate Search Project Run Window Help  $| \mathscr{D} = \Delta_1 | \mathscr{D} = \mathfrak{D} = \mathfrak{C} = \mathfrak{C} = | \mathscr{C} = [ \mathfrak{C} =$ Project Explorer Welcome 8

😭 📴 C/C++ An outline is not available. E S T Microsemi SoftConsole IDE v3.4 SoftConsole is a free software development enabling the rapid production of C and C++ available for use in Microsemi devices. Crea lets you write software that is immediately of execution-ing a proje for processors inside SoftCon 0 55 Import Projects Select a directory to search for existing Eclipse projects Start a Project To begin your work, click: File > New > C Project Give your project a name, and select a foolchain if be compiling for a target other than the default ch Then click Finish. Select root directory Browse... Add an initial source file with File > New > Select archive file Add code to it, and click the Build All icon rojects: Browse For Folder Select root directory of the projects to impor File > Import... and click General > File System Local Disk (C:)
 Dell
 dir
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 Se ? 👔 Problems 🕸 🖉 Tasks 📮 Console 🔲 Properties Descript Re Path projects Folder OK Cancel Make New Folder 0 items selected

Figure 5 • SoftConsole IDE - Browsing for Projects Folder



4. Ensure that **Copy projects into workspace** check box is checked as shown in Figure 6. Click **Finish**.

SC Import			ן
Import Projects Select a directory to sear	ch for existing Eclipse projects.		
<ul> <li>Select root directory:</li> <li>Select archive file:</li> <li>Projects:</li> </ul>	C:\eNVM_DataClient\SoftConsole\eNVM_Data(	Browse	
eNVM_DataClien	t_MSS_CM3_app (C:\eNVM_DataClient\SoftCons t_MSS_CM3_hw_platform (C:\eNVM_DataClient\:		20
Copy projects into wo Working sets		Select	

Figure 6 • SoftConsole IDE - Creating Work Space in App Folder

3



The SoftConsole perspective is shown in Figure 7.

C/C++ - eNVM_DataClient_MSS_CM3_app/main.c - Micro	osemi SoftConsole IDE v3.4	- 0 -×
Eile Edit Source Refactor Navigate Search Project	t Bun Window Help	
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© Project Explore: B	<pre>[] @ max [] [] @ max[] [] @ max[] @ max[] &amp; max[]</pre>	Constant of the second se

#### Figure 7 • SoftConsole Workspace

5. Right-click both the project names in the **Project Explorer** view and select **Build Configurations > Set Active > Release as** shown in Figure 8.

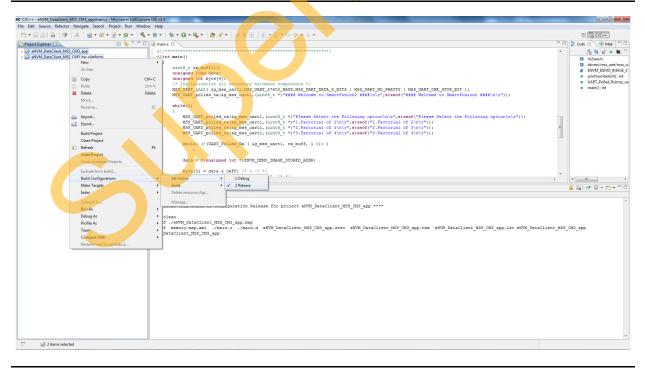


Figure 8 • Building Configurations



6. Go to **Project > Build All** and Build the project as shown in Figure 9. .hex file is generated in the **Release** folder (see Figure 10 and Figure 11 on page 12).

SC C/C++ - eNVM_DataClient_MSS_CM3_app/main.c - Microsemi SoftCons		A Print New York & Multiple	- 0 ×
File     Edit     Source     Refactor     Navigate     Search     Project     Run     Wind <sup>*</sup> • · · · · · · · · · · · · · · · · · ·		<b>○ - Q<sub>2</sub> - (2)</b> 𝔄 𝔄 𝔄 𝔄 𝔄 = 𝔤 - 𝔤 + 𝔤 +	12 Eg C/C++
Close Project Explorer 83			
ENVM_DataClient_MSS_CM3_app     Evident_MSS_CM3_hw_platform     Build Configurat     Build Configurat	Ctrl+B	• • • • • • • • • • • • • • • • • • • •	^ <u>∮<sup>2</sup>2 ≷ % ● ₩ ▽</u> ≝ m2sox.h
Build Project		<pre>:8_t rx_buff(1);</pre>	drivers/mss_uart/mss_u
Build Working St Clean	et 🕨	<pre>gmed long data; gmed int byte[4];</pre>	# ENVM_DEMO_IMAGE_S' printnumber(int) : int
Build Automatic	ally	nitialization all necessary hardware components */ UART_init( &g_mss_uart;MSS_UART_57600_BAUD,MSS_UART_DATA_8_BITS   MSS_UART_NO_PARITY   MSS_UART_ONE_STOP_BIT );	<ul> <li>UART_Polled_Rx(mss_ua</li> <li>main(): int</li> </ul>
Make Target	•	UART_polled_tx(4g_mss_uartl,(uint8_t *)"##### Welcome to SmartFusion2 ####\n\x",sizeof("#### Welcome to SmartFusion2 ####\n\x"));	
Properties	78 4	a(1)	
	80 81	Msg UMsg Polled rx((e_gass_uct), (unit_s')*Please Select the following option/ht*sized("Please Select the following option/ht*)); Msg UMsg Polled rx((e_gass_uct), (unit_s')*)*(forting i d'shuft*, sized("Pleatorial of 3huft")); Msg UMsg Polled rx((e_gass_uct), (unit_s')*)*(forting i d'shuft*, sized("Pleatorial of 3huft")); Msg UMsg Polled rx((e_gass_uct), (unit_s')*)*(forting i d'shuft*, sized("Pleatorial of 3huft")); Mulle(((UMsg Polled_Fx( (e_gass_uct), rx_Forf, 1))))	
	88	<pre>data = *(unsigned int *)EWM_DEMO_INAGE_STORED_ADDR; http://lice.dota.s.00FF://*0.0-7_*/</pre>	
	-00	byte[3] = date & OxFF: /* 0 -7 */ bunc(*) = //dum vv0/ < AwFF: ** 0 = 40 */	
	Problems	Tasks 🖳 Console 🕸 🛄 Properties ataClient_MSS_CM3_app)	
		why build of configuration Release for project eNVM_DataClient_MSS_CMS_app ****	*
	make clean rm -rf ./eNV rm -rf memo	M_DataClient_MSS_CH3_app.map rry-map.mal./Main.o./main.d eNTW_DataClient_MSS_CH3_app.srec eNTW_DataClient_MSS_CH3_app.hew eNTW_DataClient_MS3_CH3_app.jbt eNTW_DataClient ent_MSS_CH3_app.	_YKS_CKS_app
□° 😂 2 items selected			
Figure 9 • Build All			
SC C/C++ - eNVM_DataClient_MSS_CM3_app/main.c - Microsemi SoftCons File Edit Source Refactor Navigate Search Project Run Wind	ole IDE v3.4 low Help		- 0 ×
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eNVM_DataClient_MSS_CM3_app eNVM_DataClient_MSS_CM3_hw_platform	67/*******	n()	^ J <sup>3</sup> <sub>2</sub> ≷ ½ ● ₩ <sup>▽</sup> m2soc.h
	69 ( 70 uint	t8_t rx_buff[1];	drivers/mss_uart/mss_ui
	71 unsi	igned long data; igned int byte[4];	# ENVM_DEMO_IMAGE_S' printnumber(int) : int
	73 /* 1	unari nicialization all necesary hardware components */ _UART_init( 4g_maa_uart).MSS_UART_57600_BAUD.MSS_UART_DATA_8_BITS   MSS_UART_NO_PARITY   MSS_UART_ONE_STOP_BIT );	<ul> <li>UART_Polled_Rx(mss_ua</li> <li>main(): int</li> </ul>
	75 MSS 76	UNAR polled tx(ig mag uart) (uints t *)"#### Welcome to SmartFusion2 ####\n\r",sizeof("#### Welcome to SmartFusion2 ####\n\r"));	
		le (1)	
	79 80	<pre>MST_DATE_polled_tx(cq_use_artl,[uintd_t *]*Fleese Select the Following option n\t*,sizeof("Fleese Select the Following option n\t*)); MST_DATE_polled_tx(cq_use_artl,[uintd_t *]*I.Resortal of 2(h\t*,sizeof("R.Resortal of 2(h\t*)); MST_DATE_polled_tx(cq_use_artl,[uintd_t *]*2.Resortal of 3(h\t*,sizeof("R.Resortal of 3(h\t*));</pre>	
	81	<pre>M85 URAT polled tx(iq ms uart)(uint8 t *)*2.Factorial of 3(n)r*,sizeof(*2.Factorial of 3(n)r*)); M55 URAT polled tx(iq ms uart)(uint8 t *)*3.Factorial of 4(n)r*,sizeof(*3.Factorial of 4(n)r*));</pre>	E
	83	while( (!(UART_Polled Rx ( 4g_msg_uart1, rx buff, 1 ))) )	
	85		
	87	data = * (unsigned int *) ENVM_DEMO_IMAGE_STORED_ADDR;	
	89	byte(3) = data & OxFF: /* 0 -7 */	•
		Tasla 📮 Console 🖄 📄 Properties	· · · · · · · · · · · · · · · · · · ·
	C-Build [eNVM_Da	ataClient, MSS_CM3_app)	
	-T//eNVM	1-gcc -mthumb -mcpu=cortex-m3 -specs=bare.specs -L"C:\eNVM_DataClient\SoftConsole\eNVM_DataClient_MSS_CM3\eNVM_DataClient_MSS_CM3_hw_platform\Rela [DataClient_MSS_CM3_hw_platform/CMSIS/startup_gcc/production-execute-in-place.ld -Wi_MapmeNVM_DataClient_MSS_CM3_app.map =Xlinker -gc-sections	
	C:/eNVH Data	(Lient MSS CM3 app" ./main.o C:/dWMM DataClient/SdfConsold/dWM DataClient MSS CM3/dWM DataClient MSS CM3 hw platform/Release/CMSIS/startup go Client/SoftConsole/dWM DataClient MSS CM3/dWM DataClient MSS CM3 hw platform/Release/CMSIS/startup goc/newlib_stubs.o -leWM DataClient MSS CM3 liding carget: dWM DataClient MSS CM3_gpy'	hw_platform
	0.0		
	actel-map -o	denory map cenerator' ) "memory-map.xml" eNVM_DataClient_MSS_CMS_app arm-none-eabi-qoc -mthumb -mopu⇔cortex-m3 -specs⇒bare.specs MatClientSOttonsole\eNVM DataClient_MSS_CMS\eNVM DataClient_MSS_CMS_hw_platform\Release"	
	-T//eNVM Generated fi	stalien von consusten of passing sources and passing port of planton server Distilen (NSC D) wylatform/NSIS/sarrup_co/production-secure-in-place.id -NI,-MapreNM_DatClient_NSS_CMS_app.map -Xlinker -pc-sections Ia memory-map.xml	
	'Invoking: G	NU Intel Mex File Generator'	
	'Finished bu	u-objoopy -0 ihea KNW [Lascilien_MS] (Mi_app "eNM_DataClient_MSS_CMi_app.hex" illing: eNM_DataClient_MSS_CMi_app.hex" NW 5-Record Generator*	
	arm-none-eab 'Finished bu	Jabjogy -0 zrec ANTM Datallient MSM GMS app "eNTM [Datallient_MSS_GMS_app.arec" Hiding: eNTM [Datallient_MSS_GMS_app.arec' MD Listing Generator'	Ŧ
	arm-none-eab	aw listing demetator Logdump - A stWM BataClient MSS CM3_app > "eWM DataClient MSS_CM3_app.lst" Lising: eWM_DataClient_MSS_CM3_app.lst"	
L			-

Figure 10 • Generating Hex File



Organize 🔻 Include	in library ▼ Share with ▼ Burn Nev	/ folder				=	
Favorites	Name	Date modified	Туре	Size			
🥅 Desktop	eNVM_DataClient_MSS_CM3_app	8/12/2014 5:03 PM	File	128 KB			
🐌 Downloads	eNVM_DataClient_MSS_CM3_app.hex	8/12/2014 5:03 PM	HEX File	13 KB			
🔛 Recent Places	eNVM_DataClient_MSS_CM3_app.lst	8/12/2014 5:03 PM	LST File	106 KB			
	eNVM_DataClient_MSS_CM3_app.map	8/12/2014 5:03 PM	MAP File	54 KB			
🔰 Libraries	eNVM_DataClient_MSS_CM3_app.srec	8/12/2014 5:03 PM	SREC File	13 KB			
Documents	main.d	8/12/2014 5:03 PM	D File	1 KB			
J Music	main.o	8/12/2014 5:03 PM	O File	3 KB			
Pictures	makefile	8/12/2014 5:03 PM	File	3 KB			
🛃 Videos	👚 memory-map	8/12/2014 5:03 PM	XML Document	1 KB			
	objects.mk	8/12/2014 5:03 PM	MK File	1 KB			
퇲 Computer	sources.mk	8/12/2014 5:03 PM	MK File	2 KB			
🏭 Local Disk (C:)	subdir.mk	8/12/2014 5:03 PM	MK File	3 KB			
💼 New Volume (D:) 🙀 Network							

Figure 11 • Hex File in Release Folder

## Loading the Executable Image into eNVM

The following steps describe how to load the generated executable image into eNVM of the SmartFusion2 SoC device using the System Builder eNVM Configurator:

1. Open the Libero SoC hardware project eNVM\_DataClient\_top tab (see Figure 12).

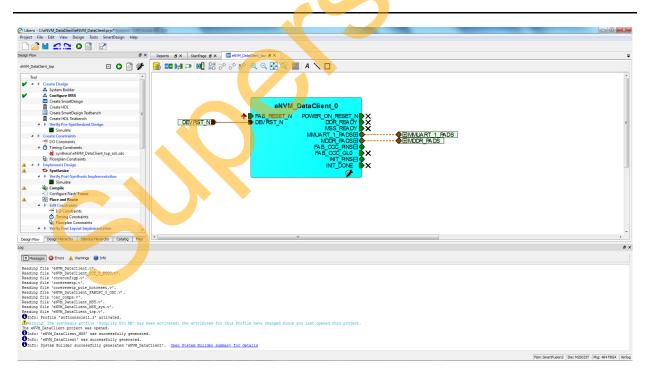


Figure 12 • eNVM\_DataClient\_top Tab

 Double-click eNVM\_DataClient\_0 (see Figure 12) and go to System Builder - Memories page to add the eNVM Data Storage client.



3. Select **Data Storage** under **Available Client Types** tab (see Figure 13) and click **Add to System...** This opens **Add to Data Storage Client** window as shown in Figure 14.

Device Features > Me	Iemories         Peripherals         Clocks         Microcontroller         SECDED         Security         Interrupts         Memory
	Configure your external and embedded memories
Available Client types	User Clients in eNVM
Data Storage Serialization	Client Type Client Name DepthxWidth Start Address(Hex) Page Start Page End Initialization Order Lock Start
Add to System Usage Statistics Available Pages: 2032	
Used Pages: 0 Free Pages: 2032	

Figure 13 • System Builder - Memories Page

3



II Add Data Storage	e Client		? ×	
Client name:				
eNVM				
Content:				
Memory file	:			
Format	: Intel-Hex 🔻			
Use	absolute addressing			
Content fille	ed with 0s			
No Content	(Client is a placeholder)			
Start address:	0x 0			
Size of word:	8 🔻 bits			
Number of Words:	1	(decimal)		
Use as ROM	0			
Use Content for S	imulation			
Help 🔻		Ok	Cancel	

Figure 14 • Add Data Storage Client Window

SX



4. Enter a data storage client name in the Add to Data Storage Client window.

Client name: Ma eNVM	n_App	
Content:		
Memory	file: 3_app/Release/eNVM_DataClient_MSS_CM3_app.hex	
For	mat: Intel-Hex 🔻	
	Use absolute addressing	
Conten	t filled with 0s	
No Con	tent (Client is a placeholder)	
Start address:	0x 0 🔿	
Size of word:	8 v bits	
Number of Wor	ds: 4592 (decimal)	
Use as ROM	0	
Use Content f	or Simulation	

#### Figure 15 • Add Data Storage Client Window

5

 Browse for the .hex file generated in the SoftConsole project after building an executable image in the Release Mode. The generated executable image is in the **Release** folder under SoftConsole project workspace (see Figure 16 on page 16 and Figure 17 on page 17).



Organize 🔻 🛛 Include	in library 🕶 Share with 🕶 Burn Nev	/ folder			iii 🗸 🗖
Favorites	Name	Date modified	Туре	Size	
Desktop	eNVM_DataClient_MSS_CM3_app	8/12/2014 5:03 PM	File	128 KB	
Downloads	eNVM_DataClient_MSS_CM3_app.hex	8/12/2014 5:03 PM	HEX File	13 KB	
Recent Places	eNVM_DataClient_MSS_CM3_app.lst	8/12/2014 5:03 PM	LST File	106 KB	
	eNVM_DataClient_MSS_CM3_app.map	8/12/2014 5:03 PM	MAP File	54 KB	
🗃 Libraries	eNVM_DataClient_MSS_CM3_app.srec	8/12/2014 5:03 PM	SREC File	13 KB	
Documents	main.d	8/12/2014 5:03 PM	D File	1 KB	
J Music	main.o	8/12/2014 5:03 PM	O File	3 KB	
Pictures	makefile	8/12/2014 5:03 PM	File	3 KB	
🛃 Videos	memory-map	8/12/2014 5:03 PM	XML Document	1 KB	
	objects.mk	8/12/2014 5:03 PM	MK File	1 KB	
💺 Computer	sources.mk	8/12/2014 5:03 PM	MK File	2 KB	
🏭 Local Disk (C:)	subdir.mk	8/12/2014 5:03 PM	MK File	3 KB	
👝 New Volume (D:)					
👽 Network					

Figure 16 • Executable Image in Release Folder



Client name: Main_ eNVM	
Content:	
Memory fi	le: 3_app/Release/eNVM_DataClient_MSS_CM3_app.hex
Forma	at: Intel-Hex 🔻
U	se absolute addressing 🚯
Content fi	lled with 0s
No Conter	nt (Client is a placeholder)
Start address:	0x 0 🚖
Size of word:	8 v bits
Number of Words:	: 4592 (decimal)
Use as ROM	0
Use Content for	Simulation



- 6. Click Ok in the Add Data Storage Client window.
- 7. Add LookUpTable.hex file to eNVM Data Storage Client as shown in Figure 18 on page 18 and Figure 19 on page 19.

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Note: LookUpTable.hex file contains the pre-calculated data of the factorial of numbers 2, 3, and 4 (2, 6, and 24 in Hexa decimal format). This is a non-executable image and is stored in eNVM. The factorial data is fetched by the Main application.

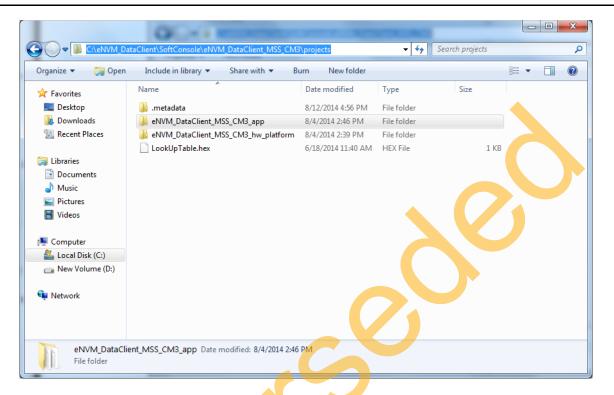


Figure 18 • LookUpTable.hex File



8. Select the Start address as 20000 in the **Add Data Storage Client** window (see Figure 19). This is the address in eNVM, where LookUpTable.hex file is stored. Click **Ok**.

Client name: LookU	Ip_Table	
Content:		
Memory fil	le: NVM_DataClient_MSS_CM3/projects/LookUpTable.hex	
Forma	at: Intel-Hex 🔻	
	se absolute addressing	
Content fil	illed with 0s	
No Conter	nt (Client is a placeholder)	
Start address:	0x 20000 🖨	
Size of word:	8 v bits	
Number of Words:	: 4 (decimal)	
Use as ROM	0	
Use Content for	Simulation	

Figure 19 • Add Data Storage Client Window





9. In the **System Builder - Memories** page (see Figure 20), keep the other settings to default and click **Next**.

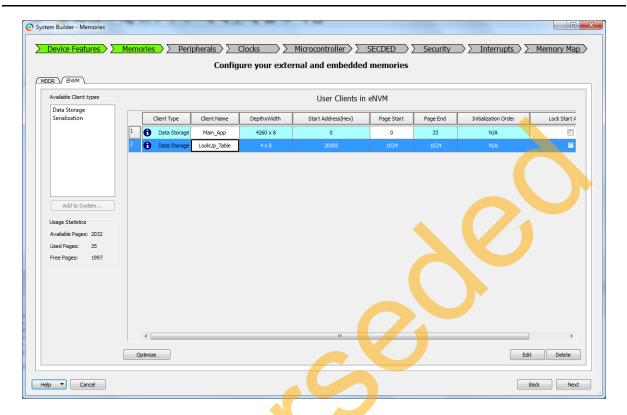
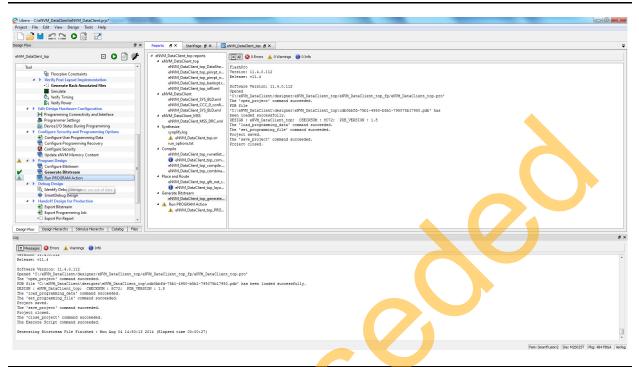


Figure 20 • System Builders - Memories Page

- 10. Save eNVM\_DataClient\_top and regenerate the eNVM\_DataClient\_top component by clicking Generate Component in SmartDesign.
- 11. Click **Generate Bitstream** to complete the remaining steps to generate fdb file (synthesis, placeand-route).



12. Click **Run PROGRAM Action** to program the SmartFusion2 SoC Evaluation Kit (see Figure 21 and Figure 22).



#### Figure 21 • Selecting Run PROGRAM Action

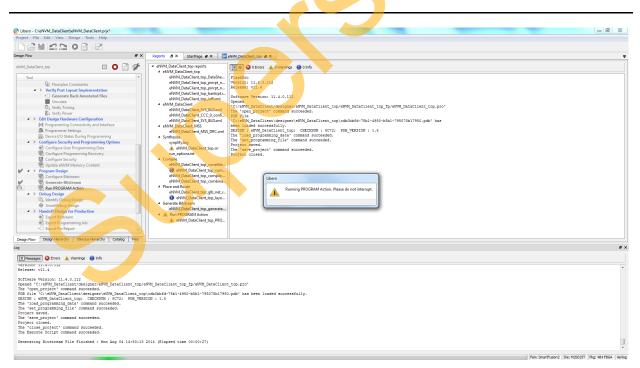


Figure 22 • Programming SmartFusion2 SoC Evaluation Kit



#### Updating eNVM Memory Content

This option is available in Libero design flow to load the updated .hex files after compiling the application code in SoftConsole. Without this option, every time the SoftConsole application is built, System Builder eNVM Configurator is required for updating the eNVM client with the new .hex file generated, which is time consuming.

If the new .hex file generated from the SoftConsole application project is larger than the previous .hex file, **Update eNVM Memory Content** throws an error. Go back to the System Builder and manually update the Hex file.

The following steps describe how to use Update eNVM Memory Content option:

1. Choose Update eNVM Memory Content option from Libero design flow.

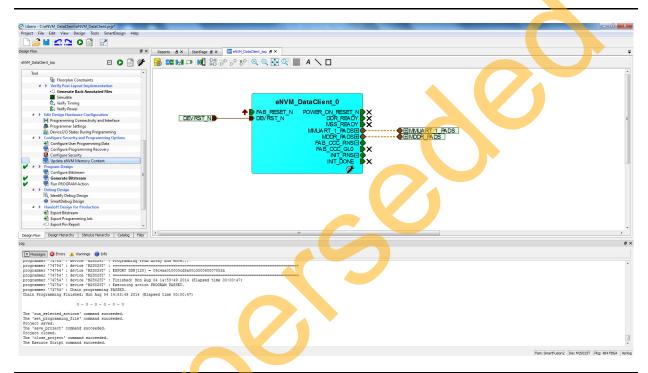


Figure 23 • Choosing Update eNVM Memory Content Option from Libero Design Flow



- ? × Update eNVM Memory Content User clients in eNVM Depth x Width Start Address Program Client Type Client Name Update Content or (Hex) Number of Pages C:\eNVM\_DataClient\SoftConsole\eNVM\_Data 1 Data Storage Main\_App 4260 x 8 0 1 Data Storage LookUp\_Table 4 x 8 20000 C:\eNVM\_DataClient\SoftConsole\eNVM\_D For serialization clients, the maximum devices to program: Help OK Cancel
- 2. Update the eNVM Memory Content window as shown in Figure 24.

#### Figure 24 • eNVM Memory Content Window

3. Click **Update Content** (see Figure 24) and browse through the updated .hex file generated in the Release Mode from the SoftConsole application project (see Figure 25). Click **Ok**.

Organize 🔻 Include in		/ folder				= - 1	
🚖 Favorites	Name	Date modified	Туре	Size			
🧮 Desktop	eNVM_DataClient_MSS_CM3_app	8/12/2014 5:03 PM	File	128 KB			
🗼 Downloads	eNVM_DataClient_MSS_CM3_app.hex	8/12/2014 5:03 PM	HEX File	13 KB			
Recent Places	eNVM_DataClient_MSS_CM3_app.lst	8/ <mark>12/2</mark> 014 5:03 PM	LST File	106 KB			
	eNVM_DataClient_MSS_CM3_app.map	8/12/2014 5:03 PM	MAP File	54 KB			
词 Libraries	eNVM_DataClient_MSS_CM3_app.srec	8/12/2014 5:03 PM	SREC File	13 KB			
Documents	🗋 main.d	8/12/2014 5:03 PM	D File	1 KB			
J Music	🗋 main.o	8/12/2014 5:03 PM	O File	3 KB			
Pictures	🗋 makefile	8/12/2014 5:03 PM	File	3 KB			
🛃 Videos	🔮 memory-map	8/12/2014 5:03 PM	XML Document	1 KB			
	objects.mk	8/1 <mark>2/201</mark> 4 5:03 PM	MK File	1 KB			
Computer	sources.mk	8/1 <mark>2/20</mark> 14 5:03 PM	MK File	2 KB			
🕌 Local Disk (C:)	subdir.mk	8/12/2014 5:03 PM	MK File	3 KB			
New Volume (D:) Network 12 items							

Figure 25 • Updated Hex File in Release Folder

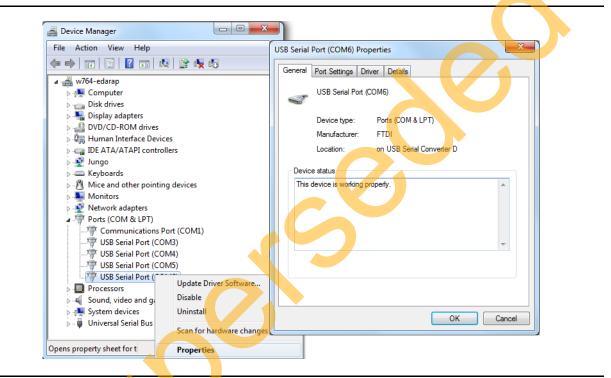
- 4. Click **Generate Bitstream** to complete the remaining steps to generate fdb file (synthesis, placeand-route).
- 5. Click Run PROGRAM Action to program the SmartFusion2 SoC Evaluation Kit.



# Running the Design on SmartFusion2 SoC FPGA Evaluation Kit

The following steps describe how to run the design:

- 1. Connect the FlashPro4 programmer to the J59 connector of SmartFusion2 SoC FPGA Evaluation Kit.
- Connect one end of the USB mini-B cable to the J24 connector provided on the SmartFusion2 SoC FPGA Evaluation Kit.and the other end to the host PC. Ensure that the USB to UART bridge drivers are automatically detected (can be verified in the Device Manager as shown in Figure 26).
- Note: Copy the COM port number for serial port configuration. Ensure that the COM port location is specified as on USB Serial Converter D, as shown in Figure 26.



#### Figure 26 • Device Manager Window

- 3. If USB to UART bridge drivers are not installed, download and install the drivers from www.microsemi.com/soc/documents/CDM\_2.08.24\_WHQL\_Certified.zip.
- 4. Connect the power supply to the J18 connector and change the power supply switch SW7 to ON.
- 5. Start the HyperTerminal program with a baud rate of 57600, 8 data bits, 1 stop bit, no parity, and no flow control. If the PC does not have HyperTerminal program, use any free serial terminal emulation program such as PuTTY or Tera Term. Refer to the Configuring Serial Terminal Emulation Programs tutorial for configuring the HyperTerminal, Tera Term, and PuTTY.
- 6. Program the SmartFusion2 SoC FPGA Evaluation Kit Board with the provided programming file using the FlashPro software (Give the \*.stp file path. Refer to "Appendix A Design and Programming Files" on page 47).
- Note: This step is required if \*.stp file in the design folders is used. In Libero design, **Run PROGRAM** Action programs the \*.stp file to the Board.
  - 7. After successful programming, press SW6 switch to reset the board.
  - The serial terminal program displays the user options as shown in Figure 27. Select option 1 to get Factorial of number 2.

Select option 2 to get Factorial of number 3.



Select option 3 to get Factorial of number 4.

Serial_Output - HyperTerminal	
Eile Edit View Call Iransfer Help	
ርጅ 🔿 🖏 🕒 🛱	
##### Welcome to SmartFusion2 #### Please Select the Following option 1.Factorial of 2 2.Factorial of 3 3.Factorial of 4	

#### Figure 27 • Selecting Factorial of a Number - User Options

The application image fetches the Factorial Value from the Look up table (Non-executable image) and displays it as shown in Figure 28.

##### Welcome to SmartFusion2 ####         Please Select the Following option         1.Factorial of 2         2.Factorial of 3         3.Factorial of 4         Factorial of 2:         2         Please Select the Following option         1.Factorial of 2:         2         Please Select the Following option         1.Factorial of 3         3.Factorial of 3         3.Factorial of 3         3.Factorial of 3:	 _
6 Please Select the Following option 1.Factorial of 2 2.Factorial of 4 Factorial of 4: 24 Please Select the Following option 1.Factorial of 2 2.Factorial of 3 3.Factorial of 4	~

Figure 28 • Displaying Factorial Value Based on User Option



## **Building Multiple Executable Images in Release Mode**

The design files are available for download from the following path in the Microsemi website: http://soc.microsemi.com/download/rsc/?f=sf2\_release\_mode\_programming\_11p4\_DF

This design contains the eNVM data storage clients for Multiple Hex images. It runs the images in eNVM and eSRAM, and the LEDs blink in various patterns. This design demonstrates how to build multiple images in the release mode and store them in eNVM.

The following steps describe how to build multiple application executable image in the release mode:

1. Open the standalone SoftConsole IDE.

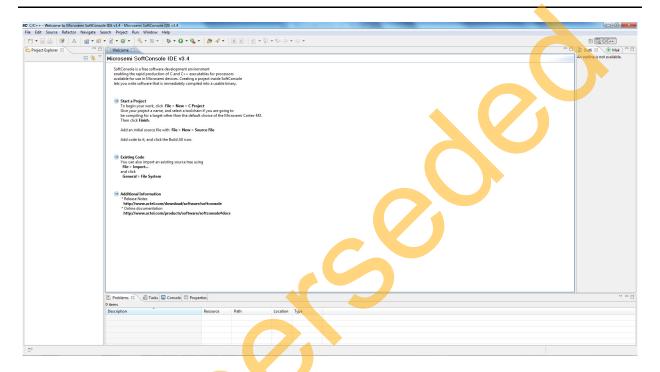


Figure 29 • SoftConsole IDE



2. Right-click the **Project Explorer** window and choose **Import** as shown in Figure 30.

	iole IDE v3.4 - Microsemi SoftConsole IDE v3.4					- 0 -
	Search Project Run Window Help					
a 🖻 爹 🔺 🔞 • 6	s - C - G - K - B - 🕸 - Q - Q - 😕 A	·• 🔲 🕤 🔮 • 🖗 •	$\phi \phi \bullet \phi \bullet \bullet$			😭 📴 C/C++
t Explorer 🕄 👘 🛙	Welcome 🛿					🗆 🎛 Outli 🕄 🛞 Mak 🗎 🖱
E 😫 1	Microsemi SoftConsole IDE v3.4					An outline is not available.
	SoftConsole is a free software development environment enabling the rapid production of C and C++ executables for p available for use in Microsemi devices. Creating a project inici lets you write software that is immediately compiled into a us	e SoftConsole				
New						
🚵 Import	Start a Project					
Export	To begin your work, click File > New > C Project Give your project a name, and select a toolchain if you are					
Refresh F5	Give your project a name, and select a toolchain if you are be compiling for a target other than the default choice of Then click <b>Finish</b> .	going to he Microsemi Cortex-M3.				
	Add an initial source file with File > New > Source File					
	Add code to it, and click the Build All icon.					
	Existing Code     You can also import an existing source tree using     File > Import     and click     General > File System					
	Additional Information     Release Notes     http://www.actel.com/download/software/softconse     "Online documentation     http://www.actel.com/products/software/softconsol					
					05	
	🖹 Problems 🗵 🖉 Tasks 🖳 Console 🔲 Properties					φ. 1
	0 items Description Resource	Path	Location Type			
	Vescription Resource	Four	сосацон Туре			

Figure 30 • SoftConsole IDE - Import

3. Select General > Existing Projects into Workspace as shown in Figure 31.

SC C/C++ - Welcome to Microsemi SoftConsol File Edit Source Refactor Navigate Se			
	• 🖻 • @ • 🚳 • ® • 🕸 • 🛛 • 🎭 • 🗇 🥙		腔 L c/c++
	Welcome 🛙		" 🗆 🎥 Outli 🗵 🛞 Mak 🕛 🗆
😑 😤 🏹	Microsemi SoftConsole IDE v3.4		An outline is not available.
C	Selfcangle is for software devicement environment making the region devices of calling a projection of software tay you in a collection of the software of consistent and the lay you in a collection of the software of the software of the device of the software of the software of the software of the device of the software of the software of the software of the device of the software of the software of the software of the device of the software of the software of the software of the device of the software of the software of the software of the device of the software of the software of the software of the device of the software of the software of the software of the device of the software of the software of the software of the device of the software of the software of the software of the device of the software of the software of the software of the device of the software of the software of the software of the device of the software of the software of the software of the device of the software of the software of the software of the device of the software of the software of the software of the software of the device of the software of the software of the software of the software of the device of the software of the software of the software of the software of the device of the software of the sof	Se Inport Select Crate new projects from an archive file or directory.	
	🖹 Problems 🛛 🖉 Tasks 📮 Console 🔲 Properties		· · · ·
	0 items Description Resource P4	h lastin Ture	
	Description Resource Pa	th Location Type	
L			
0 items selected			

Figure 31 • SoftConsole IDE - General



Import window is shown in Figure 32.

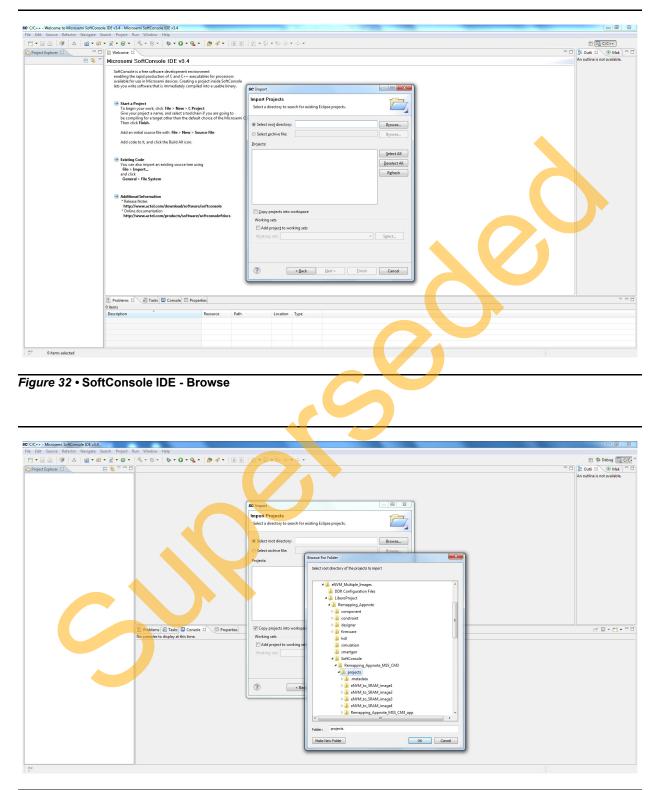


Figure 33 • SoftConsole IDE - Browsing for App Folder



4. Ensure that **Copy projects into workspace** check box is checked as shown in Figure 34. Click **Finish.** 

SC Import			ן
Import Projects Select a directory to sear	ch for existing Eclipse projects.		
<ul> <li>Select root directory:</li> <li>Select archive file:</li> </ul>	C:\eNVM_Multiple_Images\LiberoProject\Rema	Browse	
Projects:	imanal (C) oNVM Multiple Imager/LikereDreig		
<ul> <li>✓ eNVM_to_SRAM_</li> <li>✓ eNVM_to_SRAM_</li> <li>✓ eNVM_to_SRAM_</li> <li>✓ eNVM_to_SRAM_</li> <li>✓ Remapping_App</li> <li>✓ Remapping_App</li> </ul>	image1 (C:\eNVM_Multiple_Images\LiberoProjec image2 (C:\eNVM_Multiple_Images\LiberoProjec image3 (C:\eNVM_Multiple_Images\LiberoProjec image4 (C:\eNVM_Multiple_Images\LiberoProjec note_MSS_CM3_app (C:\eNVM_Multiple_Images\ note_MSS_CM3_hw_platform (C:\eNVM_Multiple VVM_128KB (C:\eNVM_Multiple_Images\LiberoPr	Deselect All	
Copy projects into we	) → b		
Working sets Add project to work Working sets:		Select	

Figure 34 • SoftConsole IDE - Creating Work Space in App Folder

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The SoftConsole perspective is shown in Figure 35.

C/C++ - Microsemi SoftConsole IDE v3.4	
ile Edit Source Refactor Navigate Search Project Run Window Help	
🛅 ㅋ 🔜 👜 🙀 🥵 ㅋ 🔞 ㅋ 🙆 ㅋ 🚱 ㅋ 🗳 ㅋ 🕲 ㅋ 🏇 ㅋ 🕲 ㅋ 🖉 ㅋ 🖉 ㅋ 🖉 ㅋ 🖗 ㅋ 수 ㅋ 수 ㅋ	部 国 c/C++
Project Explorer 2	
> 😂 eNVM_to_SRAM_imsge1	
> 😂 eNVM_to_SRAM_image2	An outline is not available.
> ﷺ eWVM_to_SRAM_image3 > ﷺ eWVM_to_SRAM_image4	
) W Remapping Approte MSS_CMB_app	
Generation Content Conten	
j Sample_image_eNVM_128KB	
Problems (2) Tasks (2) Console 22     C-Build (sample, image, eWVM,128KB)	
C-Build [sample_image_eNVM_128KB]	
0°  i is sample, image, eNWA.128KB	
0° 🧭 sample_image_eWWM_128KB	

#### Figure 35 • SoftConsole Workspace

 Right-click both project names in the Project Explorer view and select Build Configurations > Set Active > Release as shown in Figure 36.

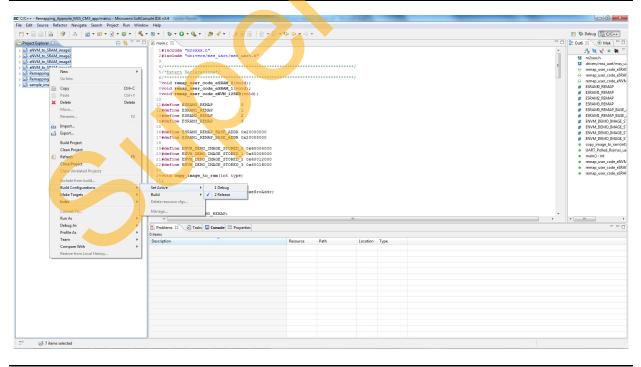


Figure 36 • Building Configuration



6. Go to **Project > Build All** and build the project as shown in Figure 37. .hex file is generated in the **Release** folder created in the project folder.

C/C++ - eNVM_DataClient_MSS_CM3_app/main.c e Edit Source Refactor Navigate Search	Project Run Window	v Help		
• 🔛 🖄 🔗 🗛 🔞 • 🚳	Open Project Close Project		O·Q. · Ø ≁ · JⅢⅡ 型·₽·♀ ↔ ↔ ↔	😭 📴 C/C++
oject Explorer 8	Build All	Ctrl+B		Cutli 🛛 🖲 Mak
5 eNVM_DataClient_MSS_CM3_app 5 eNVM_DataClient_MSS_CM3_hw_platform	Build Configuration	ns +		^ <sup>1</sup> <sup>2</sup> <sub>2</sub> ≷ ≥ <sup>3</sup> ■ m2sox.h
	Build Project		18 p. rx huff(1);	drivers/mss uart/r
	Build Working Set Clean	•	Igned long data:	# ENVM_DEMO_IM/ printnumber(int) : UART_Polled_Rx(n
	Build Automatically	у	<pre>gmed int byte[4]; initialization all necessary hardware components */</pre>	<ul> <li>UART_Polled_Rx(n</li> <li>main() : int</li> </ul>
	Make Target	•	<pre>UART_init( 4g_mss_uart1,MSS_UART_57600_BAUD,MSS_UART_DATA_8_BITS   MSS_UART_NO_PARITY   MSS_UART_ONE_STOP_BIT ); UART_polled_tx(4g_mss_uart1,(uint8_t *)*#### Welcome to SmartFusion2 ####\n\r",sizeof(*#### Welcome to SmartFusion2 ####\n\r"));</pre>	• many: mc
	Properties		Le (1)	
		78 {		-
		80	<pre>MST_URAT_poild_st(cg.se.uert, justs[: ')*Fleese falcet the following option/h/*/steod(*Fleese falcet the Following option/h/*); ST_MAT_poild_st(cg.se.uert, justs[: ')*T_instocial of funty;steod(f1*faccoial of funty)); MST_WAT_poild_st(cg.se.uert, justs[: ')*Z_instocial of funty;steod(f1*faccoial of funty)); MST_WAT_poild_st(cg.se.uert, justs[: ')*Z_instocial of funty;steod(f1*faccoial of funty));</pre>	
		82	<pre>MS_UMAL_DOILed_xx(sg_msg_uart)(uinto_t *)*./:actorial of 3/h/t*/sizeof(*).factorial of 3/h/t*)); MSS_UART_polled_xx(sg_msg_uart)(uinto_t *)*.factorial of 4/h/t*,sizeof(*).factorial of 4/h/t*));</pre>	
		83	while( (!(UART_Polled_Rx ( ig_mss_uart1, rx_buff, 1 ))) )	
		79 80 81 82 83 84 85 86 87 88 88 89		
		87	data = * (unsigned int *)ENVM_DEMO_INAGE_STORED_ADDR;	
		88	<pre>byte(3) = data &amp; OxFF; /* 0 -7 */ humar(3) = //data = vs8; / nuFF; /* 0 -5 */</pre>	
		*		
	1	🔝 Problems 🧟	🗟 Tasks 🖳 Console 🖄 🛄 Properties	🔒 📴 🖬 🖬 🖬 🖬 🖬 🖬
			DataClient_MSS_CM3_app)	
		**** Clean-o	-only build of configuration Release for project eNVM_DataClient_MSS_CM3_app ****	
		make clean		
		rm -rf ./eN rm -rf memo	NW DataClient_MSS_CMS_app.map Dory-map.wal //main.d .Nain.d eNW_DataClient_MSS_CMS_app.arec eNW_DataClient_MSS_CMS_app.hex eNW_DataClient_MSS Lent_MSS_CMS_app	nt MSS CM3 app
		eNVM_DataCl:	Lient_KSS_CK3_app	
😂 2 items selected				
2 items selected				
	All			
° ≌ 2 Rems selected gure 37 • Build	All			
	AII			
	All			
	AII			
	AII			
	All			
	AII			



## Loading Multiple Executable Images into eNVM

Multiple SoftConsole application projects generate multiple executable images. These executable images are stored in eNVM.

The following steps describe how to load the generated application executable images into eNVM of the SmartFusion2 SoC device using the System Builder eNVM Configurator:

1. Open the Libero SoC hardware project Remapping\_Appnote\_top tab.

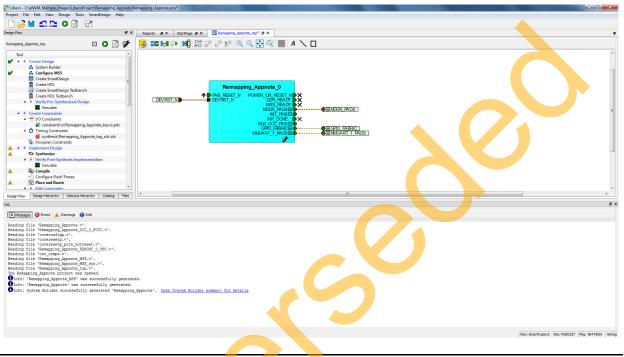


Figure 38 • Remapping\_Appnote\_top Tab

2. Double-click **Remapping\_Appnote \_0** (see Figure 38) and go to **System Builder - Memories** page (see Figure 39) to add the eNVM Data Storage client.



3. Select **Data Storage** under the **Available Client types** (see Figure 39) and click **Add to System...** This opens **Add to Data Storage Client** window as shown in Figure 40 on page 34.

Available Client types	User Clients in eNVM							
Data Storage Serialization	Client Type	Client Name	DepthxWidth	Start Address(Hex)	Page Start	Page End	Initialization Order	Lock Start A
Add to System Usage Statistics Available Pages: 2032 Used Pages: 0							0	

Figure 39 • System Builder - Memories Page

5



Add Data Storage Client	
Client name:	
eNVM	
Content:	
Memory file:	
Format: Intel-Hex	
Use absolute addressing	
Content filled with 0s	
No Content (Client is a placeholder)	
Start address: 0x 0 🚖	
Size of word: 8 v bits	
Number of Words: 1 (decimal)	
Use as ROM	
Use Content for Simulation	

Figure 40 • Add to Data Storage Client Window

S



4. Enter a data storage client name in the Add to Data Storage Client window.

II Add Data Storage	Client		? X	
Client name: eNVM	1_MainApp_HexFile0			
eNVM				
Content:				
Memory file	:			
Format	: Intel-Hex 🔻			
Use	e absolute addressing 🛛 🚹			
Content fille	ed with 0s			
No Content	(Client is a placeholder)			
Start address:	0x 0			
Size of word:	8 🔻 bits			
Number of Words:	1	(decimal)		
Use as ROM	0			
Use Content for S	imulation	.0		
Help 🔻	0	Ok	Cancel	

Figure 41 • Add to Data Storage Client Window





 Browse for the .hex file generated after compiling the SoftConsole project in the Release Modes (see Figure 43 on page 37). The generated executable image is in the Release folder under SoftConsole project workspace (see Figure 42).

Organize 🔻 New fold	er				= -
🔆 Favorites	Name	Date modified	Туре	Size	
🧮 Desktop	Remapping_Appnote_MSS_CM3_app.hex	8/4/2014 5:32 PM	HEX File	14 KB	
🐌 Downloads					
🖳 Recent Places					
<b>-</b>					
Libraries Documents					
Documents Music					
Pictures					
Videos			<b></b>		
La Macos					
🖳 Computer					
📸 Local Disk (C:)					
Local Disk (C:)					
👝 New Volume (D:)					
👝 New Volume (D:)					
💼 New Volume (D:)	ame: Remapping_Appnote_MSS_CM3_app.hex		2	v Intel-He	ex Files (*.hex *.ihx)

Figure 42 • Executable Image in Release Folder

3



eNVM	eNVM_MainApp_HexFile0
Content:	
Me	mory file: pp/Release/Remapping_Appnote_MSS_CM3_app.hex
	Format: Intel-Hex
	Use absolute addressing
Co	ntent filled with 0s
No	Content (Client is a placeholder)
Start addre	ess: 0x 0 🌩
Size of wor	d: 8 v bits
Number of	Words: 5040 (decimal)
Use as	ROM 🕤
Use Cont	ent for Simulation



- 6. Click Ok in the Add Data Storage Client window.
- 7. Add the remaining Hex Files with their corresponding start addresses as shown in Figure 45.

Table 2 lists the SoftConsole application projects in the Release mode, their .hex files, and their mapping to the eNVM Client Name.

ENVM Client Name	SoftConsole Release Mode Path	Hex File Name	Start Address
eNVM_MainApp_Hex File0	Remapping_Appnote_MSS_CM3_app\Release	Remapping_Appnote_MSS_CM3_ app.hex	0x0
eNVM_to_SRAM_He xFile1	eNVM_to_SRAM_image1\Release	eNVM_to_SRAM_image1.hex	0x4000
eNVM_to_SRAM_He xFile2	eNVM_to_SRAM_image2\Release	eNVM_to_SRAM_image2.hex	0x8000
eNVM_to_SRAM_He xFile3	eNVM_to_SRAM_image3\Release	eNVM_to_SRAM_image3.hex	0x12000
eNVM_to_SRAM_He xFile4	eNVM_to_SRAM_image4\Release	eNVM_to_SRAM_image4.hex	0x16000



Table 2 • SoftConsole Application Projects and their Mapping to eNVM Client (continued)
---

eNVM_128KB_HexFi le5	sample_image_eNVM_128KB\Release	sample_image_eNVM_128KB.hex	0x20000
Note: St	tart address is the address in which the executable	e image is stored in eNVM. Provide the	e required

Start address is the address in which the executable image is stored in eNVM. Provide the required memory size based on the total size of the executable image. Otherwise, the images overlap and displays error as shown Figure 44.

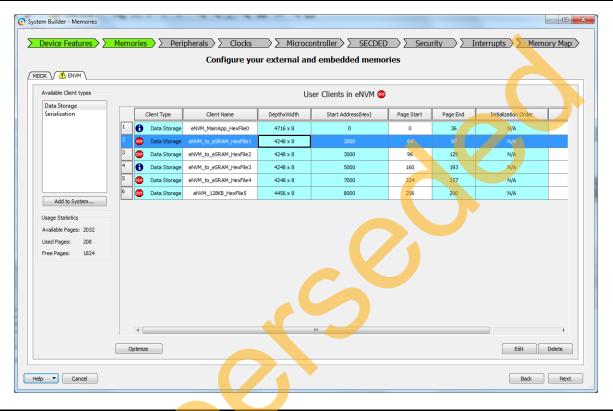


Figure 44 • Error due to Image Overlap



			Configure your	external and e	embedded memories	5		
DR V ENVM			<i>.</i>					
Available Client types				Use	r Clients in eNVM			
Data Storage Serialization		Client Type Client Name DepthxWidth Start Address(Hex) Page Start Page End Initialization Or						Initialization Order
	1	Data Storage	eNVM_MainApp_HexFile0	4716 x 8	0	0	36	N/A
	2	Data Storage	=	4248 x 8	4000	128	161	N/A
	3	Data Storage	eNVM_to_eSRAM_HexFile2	4248 x 8	8000	256	289	N/A
	4	🔒 Data Storage	eNVM_to_eSRAM_HexFile3	4248 x 8	12000	576	609	N/A
	5	Data Storage	eNVM_to_eSRAM_HexFile4	4248 x 8	16000	704	737	N/A
Add to System	6	Data Storage	eNVM_128KB_HexFile5	4456 x 8	20000	1024	1058	N/A
Usage Statistics								
Usage Statistics Available Pages: 2032 Used Pages: 208 Free Pages: 1824		¢		m	-0	2	5	<i>.</i>

Figure 45 shows the correct memory locations chosen. It does not display any error.



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- 8. In the **System Builder Memories** page (see Figure 45), keep the other settings to default and click **Next**.
- 9. Save **Remapping\_Appnote\_top** and regenerate the **Remapping\_Appnote\_0** component by clicking Generate Component in SmartDesign.
- 10. Click Generate Bitstream to complete the remaining steps to generate fdb file (synthesis, placeand-route).





11. Click **Run PROGRAM Action** to program the SmartFusion2 SoC FPGA to initialize the eNVM with the memory file as shown in Figure 46 and Figure 47.

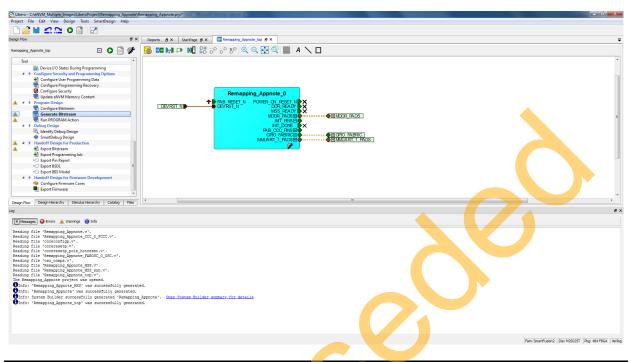


Figure 46 • Regenerating Remapping\_Appnote\_0 Component

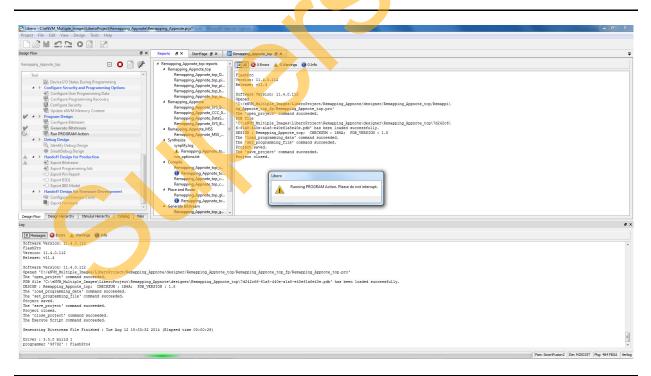


Figure 47 • Programming SmartFusion2 SoC Evaluation Kit



### **Updating eNVM Memory Content**

This option is available in Libero design flow to load the updated .hex files after compiling the application code in SoftConsole. Without this option, every time the SoftConsole application is built, System Builder eNVM Configurator is required to update the eNVM client with the new .hex file generated, which may be time consuming.

If the new .hex file generated from the SoftConsole application project is larger than the previous .hex file, **Update eNVM Memory Content** throws an error. Go back to the System Builder and manually update the Hex file.

The following steps describe how to use Update eNVM Memory Content option:

1. Choose Update eNVM Memory Content option from Libero design flow.

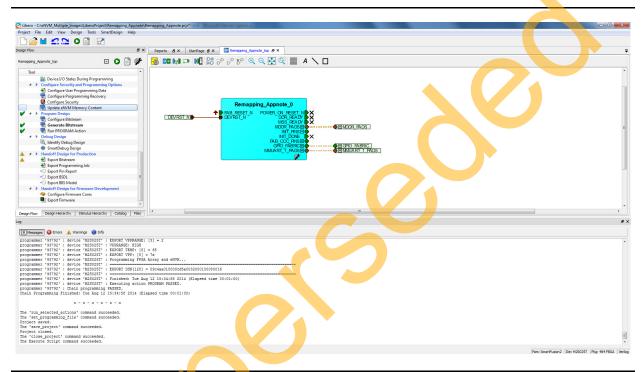


Figure 48 • Update eNVM Memory Content Option



2. Update eNVM Memory Content window as shown in Figure 49.

Image:	Program	Client Type	Client Name	Depth x Width or Number of Pages	Start Address (Hex)	Update Content
		Data Storage	eNVM_MainAp	5040 x 8	0	C:\eNVM_Multiple_Images\LiberoProject\
Image: Data Storage     eNVM_to_eSRA     4576 x 8     8000     C:\eNVM_Multiple_Images\LiberoProject\		Data Storage	eNVM_to_eSRA	4576 x 8	4000	C:\eNVM_Multiple_Images\LiberoProject\
	<b>V</b>	Data Storage	eNVM_to_eSRA	4576 x 8	8000	C:\eNVM_Multiple_Images\LiberoProject\

Figure 49 • Update eNVM Memory Content Window

3. Click **Update Content** (see Figure 49) and browse through the updated .hex file (see Figure 50 on page 42). Click **Ok**.

Organize - New fold	der				)# • E
🚖 Favorites	Name	Date modified	Туре	Size	
E Desktop	Remapping_Appnote_MSS_CM3_app.hex	6/19/2014 2:37 PM	HEX File	13 KB	
<ul> <li>Recent Places</li> <li>Libraries</li> <li>Documents</li> </ul>					

Figure 50 • Browsing through Updated Hex File

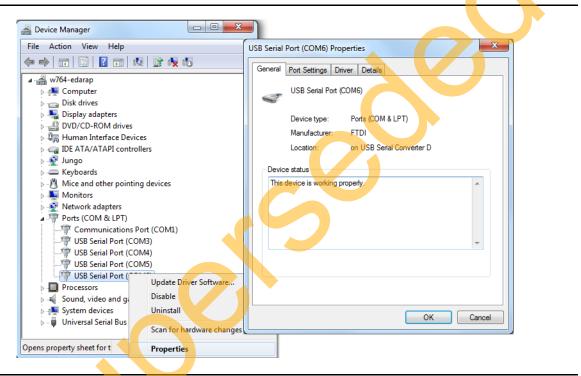
- 4. Update the .hex files for the remaining data storage clients.
- 5. Perform Run PROGRAM Action.



# Running the Design on SmartFusion2 SoC FPGA Evaluation Kit

The following steps describe how to run the design:

- 1. Connect the FlashPro4 programmer to the J59 connector of SmartFusion2 SoC FPGA Evaluation Kit.
- Connect one end of the USB mini-B cable to the J24 connector provided on the SmartFusion2 SoC FPGA Evaluation Kit and the other end to the host PC. Ensure that the USB to UART bridge drivers are automatically detected (can be verified in the Device Manager), as shown in Figure 51.
- Note: Copy the COM port number for serial port configuration. Ensure that the COM port location is specified as on USB Serial Converter D, as shown in Figure 51.



#### Figure 51 • Device Manager Window

- 3. If USB to UART bridge drivers are not installed, download and install the drivers from: www.microsemi.com/soc/documents/CDM\_2.08.24\_WHQL\_Certified.zip.
- 4. Connect the power supply to the J18 connector and change the power supply switch SW7 to ON.
- 5. Start the HyperTerminal program with a baud rate of 57600, 8 data bits, 1 stop bit, no parity, and no flow control. If the PC does not have HyperTerminal program, use any free serial terminal emulation program such as PuTTY or Tera Term. Refer to the Configuring Serial Terminal Emulation Programs tutorial for configuring the HyperTerminal, Tera Term, and PuTTY.
- 6. Program the SmartFusion2 SoC FPGA Evaluation Kit Board with the provided programming file using the FlashPro software (Give the \*.stp file path. Refer to "Appendix A Design and Programming Files" on page 47).
- This step is required if \*.stp file in the design folders is used. In Libero design, Run PROGRAM Action programs the \*.stp file to the Board.After successful programming, press SW6 switch to reset the board.



8. The serial terminal program displays the user options as shown in Figure 52.

Serial_Output - HyperTerminal	
<u>File Edit View Call Transfer Help</u>	
D 😂 🗇 🐉 🖽	
#Welcome to SmartFusion2 - Running HexFile0# Select the below option 1. Run Hex File1 from eSRAM 2. Run Hex File2 from eSRAM 3. Run Hex File3 from eSRAM 4. Run Hex File4 from eSRAM 5. Run Hex File5 from eNVM	

#### Figure 52 • Running Hex File - User Options

- 9. Select option 1 as shown in Figure 53. The application image runs from eSRAM. E1, F4 LEDs blink on the Board.
- 10. Reset the SW6 pin on SmartFusion2 Evaluation Kit, which brings the application to the Main Menu.

#### Figure 53 • LEDs Blink Based on User Option

- 11. Select option 2. The application image runs from eSRAM. F3, G7 LEDs blink on the Board.
- 12. Reset the SW6 pin on SmartFusion2 Evaluation Kit, which brings the application to the Main Menu.
- 13. Select option 3. The application image runs from eSRAM. H7, J6 LEDs blink on the Board.
- 14. Reset the SW6 pin on SmartFusion2 Evaluation Kit, which brings the application to the Main Menu.
- 15. Select option 4. The application image runs from eSRAM. H6, H5 LEDs blink on the Board.
- 16. Reset the SW6 pin on SmartFusion2 Evaluation Kit, which brings the application to the Main Menu.



- 17. Select option5. The application image runs from eNVM. E1, F4, F3, G7, H7, J6, H6, H5 LEDs blink on the Board.
- 18. Reset the SW6 pin on SmartFusion2 Evaluation Kit, which brings the application to the Main Menu.

### Conclusion

This application note describes the step-by-step approach to build single/multiple SoftConsole application executable images in production release mode, store the executable images into eNVM using eNVM data storage client, and execute them on SmartFusion2 Evaluation Kit.

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# **Appendix A - Design and Programming Files**

You can download the design files from the Microsemi SoC Products Group website: http://soc.microsemi.com/download/rsc/?f=sf2\_release\_mode\_programming\_11p4\_DF

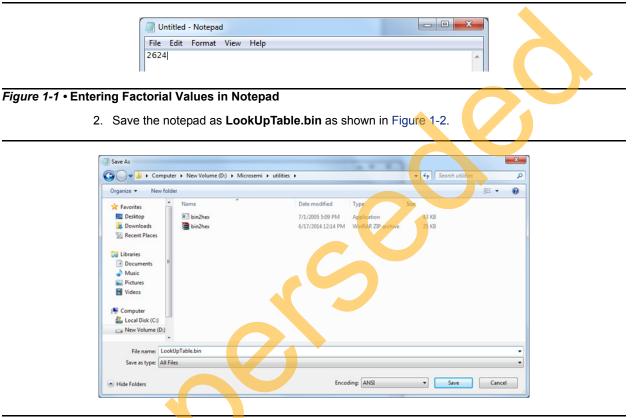
The design file consists of Libero Verilog, SoftConsole software project, programming files (\*.stp) for SmartFusion2 SoC FPGA Evaluation Kit. Refer to the Readme.txt file included in the design file for the directory structure and description.



# **Appendix B - Creating LookUpTable.Hex File**

The LookUpTable.Hex file contains the pre-calculated factorial data and this is a non-executable image. The following steps describe how to create the LookUpTable.Hex file:

1. Open the notepad and enter the factorial of number 2,3,4 as 2,6,24 as shown in Figure 1-1.



#### Figure 1-2 • Saving Notepad

3. The executable file, bin2hex.exe converts the LookUpTable.bin, which is in binary format to LookUpTable.Hex in Hex format. This executable file is available in the following path of the design files provided along with this application note:

http://soc.microsemi.com/download/rsc/?f=sf2\_release\_mode\_programming\_11p4\_DF



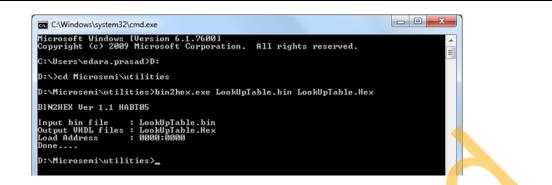


Figure 1-3 • Converting Binary File to Hex File

4. LookUpTable.Hex file is generated as shown in Figure 1-4. This file is copied to SoftConsole project folder of the eNVM Data client SoftConsole project.

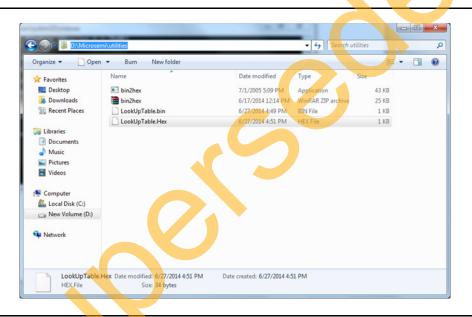


Figure 1-4 • LookUpTable.Hex File



# A – List of Changes

The following table lists critical changes that were made in each revision of the chapter in the application note.

Changes	Page
Added the bin2hex.exe file to the design files and added a link to design files in the "Appendix B - Creating LookUpTable.Hex File" chapter (SAR 63426).	48
Initial release.	NA
	Added the bin2hex.exe file to the design files and added a link to design files in the "Appendix B - Creating LookUpTable.Hex File" chapter (SAR 63426). Initial release.



# **B** – **Product Support**

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### **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.

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The technical support email address is soc\_tech@microsemi.com.



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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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