A Guide to CodeWarrior Development Studio

For HCS12(X) Microcontrollers

April 28, 2006

What is new in this release?

All sections have been updated per your requests, check particularly:

- New release supports HCS12(X) and HCS12X architectures (see Software Products Description)
- New derivatives supported (see specifications, service packs)
- New part numbers (see software and hardware products)
- More on licensing, getting started, links, and documentation

1   Software Products Description

CodeWarrior Development Studio for HCS12(X)is an integrated suite of tools containing all the components needed to bring an application from the concept stage to the release to the market of a finished product.

CodeWarrior Development Studio contains the following set of tools:

* Integrated Development Environment (IDE)
* Project Wizard, Project Manager
* Build system with optimizing C/C++/cC++/EC++ compilers for HCS12 CPU, HCS12X CPU and XGATE module
* Macro-assembler (absolute and relocatable) supporting HCS12 CPU, HCS12X CPU and XGATE module
* Linker support for HCS12 CPU code, HCS12X CPU code, or HCS12X CPU and XGATE module code
* Graphical, source-level debugger support for HCS12 CPU or HCS12X CPU and XGATE module concurrently
* Flash programming support
* Cycle-accurate simulator with code coverage, and profile analysis
* Data visualization and I/O stimulation (1)
* C source code encryption support
* Processor Expert® and Bean Wizard™ from Unis (2)

(1) Data Visualization helps save debugging time (especially with the simulator before hardware is available) by providing a graphical display of bit status and byte values. I/O Stimulation provides graphical, real-time control of bit levels or byte values as inputs to the application.
(2) Processor Expert helps save design time by assisting the user in the definition of the application environment and generating support code without having to read and learn a lot about the device, its peripherals, the registers and their bit field settings (see section on Processor Expert).

2   Specifications

2.1   Version of products

Release 4.5   Current release of CodeWarrior Development Studio for HCS12(X) Microcontrollers.

- The S12XEP100 service pack supporting the MC9S12XEx family will be posted on the Freescale CodeWarrior download page in May 2006. It will be on the June Service Pack CD.
- The S12XFR128 service pack supporting the MC9S12XFR family will be posted on the Freescale CodeWarrior download page in May 2006. It will be on the June Service Pack CD.
- The next release (R5.0) is scheduled for Q4 2006. It will have the following features:

  o Add Startup Dialog to give immediate access to Project Wizard, example projects, previous projects and tutorials

o Project Wizard restructured to provide support for simple use case
o More Assembly and C example projects
o Provide "Getting Started" Tutorials
o HCS12(X) device selection is simplified and can be changed after the project is created
o Connection selection is simplified and can be changed after the project is created
o New Device Initialization Tool
o Enhanced build tools
o Encapsulate all the service packs issued for release 4.5

2.2 Processors supported by the current release (without service pack)

CodeWarrior tools support 68HC12, HCS12 and HCS12X derivatives in production at the time of its development. New derivatives are (and will be) supported by 'Service Packs' until the next release. For latest update, visit CodeWarrior Development Studio for HCS12(X) product page.

- MC9S12A32/A64/A128B/A256B/A512
- MC9S12B64/B128
- MC9S12C32/C64/C96/C128
- MC9S12D32/D64
- MC9S12DB128A/DB128B
- MC9S12DG128B/DG256B
- MC9S12DJ64/DJ128B/DJ256B
- MC9S12DP256B/DP512
- MC9S12DT128B/DT256B
- MC9S12E64/E128
- MC9S12GC16/GC32/GC64/GC128
- MC9S12H128/H256
- MC9S12HZ256
- MC9S12KG64/KG128
- MC9S12KT128/KT256
- MC9S12NE64
- MC9S12T64
- MC9S12UF32

- MC9S12XA128/A256/A512
- MC9S12XD64/D128/D256
- MC9S12XDG128
- MC9S12XDP512
- MC9S12XDT256/DT384/DT512

- MC68HC812A4
- MC68HC912B32
- MC68HC912D60/D60A
- MC68HC912DG128/DG128A
- MC68HC912DT128/DT128A

Please note that 68HC12 derivatives will appear in the 'Legacy' stationery and are not supported by Processor Expert. Only HCS12 derivatives have Processor Expert support.

2.3 Service Packs available for new derivatives

Service Packs are packages developed to support new derivatives (full new stationery or complement of the stationery). "New derivatives" are devices introduced after the release of CodeWarrior.
Service packs are available on the Freescale CodeWarrior download page. Whenever possible, these service packs will be integrated into the next release.

Service Packs for Release 3.1:

• CW12 V3.1 B128 Service Pack	(August 9, 2004)	B64, B128
• CW12 V3.1 C128 Service Pack	(August 9, 2004)	C64, C96, C128
• HC12 Processor Expert V2.94 Service Pack	(August 30, 2004)	Adds PE beans for B64, B128, C64, C96, C128, KG128, KT128, KT256, UF32
• CW12 V3.1 UF32 Service Pack	(September 8, 2004)	UF32
• CW12 V3.1 GC128 Service Pack	(September 8, 2004)	GC16, GC32, GC64, GC128
• CW12 V3.1 E32 Service Pack	(September 8, 2004)	E32
• CW12 V3.1 KT256 Service Pack	(September 8, 2004)	KT128, KT256
• HC12 Processor Expert V2.94.01 Patch	(September 9, 2004)	Updates NE64 Ethernet bean
• CW12 V3.1 NE64 Service Pack	(September 20, 2004)	NE64
• CW12 V3.1 H256 Service Pack	(October 6, 2004)	H256, H128
• CW12 V3.1 KG128 Service Pack	(October 6, 2004)	KG128, KG64
• CW12 V3.1 USB 2.0 Service Pack	(January 11, 2005)	Adds support for P&E USB 2.0 BDM Multilink (rev B)
• CW12 Processor Expert Update V2.95	(March 17, 2005)	Adds PE beans for E32, GC128, GC64, GC32, GC16, and H256
• CW12 V3.1 E256 Service Pack	(May 23, 2005)	E256
• CW12 V3.1 HZ256 Service Pack	(December 20, 2005)	HN64, HZ64, HZ128 and HZ256

Service Packs for Release 4.1:

• CWS12X V4.1 XDP512 Service Pack	(June 30, 2005)	Adds support for: DT384, DT256, D256, DG128, D128, D64, A512, A256, A128

2.4 Board supported (see also the hardware section)

We try to have stationery support for evaluation boards that we receive information on (see useful links section.). This support can take the form of a stationery folder generated by Metrowerks or by the vendors themselves (see section on useful links). The support can also be in the form of a tutorial on how to download and run the code.

- **Freescale**   MC68HC9S12DP256 Evaluation Board
- **Technological Arts**   Adapt912xxx boards
- **SofTec Microsystems**   MC9S12XDP512 Evaluation Board, InDART and PK solutions are supported by CodeWarrior (SofTec CD). There are solutions for both HC12 and HCS12 derivatives.
- **Axiom**   CML125-DP256 board, MC9S12XDT512 Demo Board

- **Future Electronics**   9S12 Badge board
- **Electronik-Laden**   HCS12 T-board

2.5   Languages supported (depending on the edition)

All CodeWarrior Development Studio for HCS12(X) support absolute assembly with no limitation. The Standard Edition supports C with options to upgrade to C++ (and compact C++ for small memory footprints). The Professional Edition supports all these languages with no limitation.

2.5.1   Assembly

Develop in the old way with absolute assembly or in a more complex form with multiple relocatable assembly files, cross-referenced labels and variables but still close to the code with full control of the performance.
There is no code size limitation on development in assembly mode.

2.5.2   C

C is code-size limited to 32Kbytes of code in the 'free of charge' Special Edition. There is one upgrade license key from the Special Edition: 64Kbytes. C is unrestricted with the Standard Edition and the Professional Edition.

2.5.3   C++, Compact C++ and EC++

For evaluation purpose only, C++ is limited to 1Kbytes of code in the Special and the Standard Edition. There is an upgrade license key for the Standard Edition. C++ is unrestricted with the Professional Edition.

2.5.4   Language support

Each template in the stationery also contains header files with description of registers, bytes and bits as they appear in the derivatives' user manuals to make easier the writing of the code. Templates have the project entirely set up so that developers can concentrate on writing the application code in the 'main' section of the program as indicated in the source file: " **/* write your code here */** ".
Templates are also prepared for several "**targets**" allowing the developer to select the right set of files and move quickly from full simulation to evaluation board and customer's target without extra work.

3   Unrivaled Features but so easy to use

CodeWarrior for HCS12(X) has been designed to simplify the development of microcontroller-based applications by helping engineers concentrate on the key part of their project: writing the code. CodeWarrior can be made as simple to use as small assembly-code applications require or as feature-full as the most demanding developers can ask for. Furthermore, CodeWarrior for HCS12(X) combines several tools whose features are unrivaled today: The Processor Expert tool at the definition phase of a project with its libraries of basic, advanced and software beans™, and the enhanced Simulator/Debugger with Data Visualization and I/O Stimulation capability to shorten the debugging phase of a project.

3.1   Processor Expert™

Processor Expert is a Rapid Application Design (RAD) tool that combines easy-to-use component based application creation with an expert knowledge system. Functionality of CPU and on-chip peripherals as well as higher levels of specific applications are encapsulated into components called **Embedded Beans**.

This powerful tool frees up developers from the long effort of learning bits and bytes of new peripherals and how to properly set them up to implement the desired functions by allowing the developer to describe how built-in peripherals and their hardware environment will be used and automatically generate the code to properly initialize, write to and read these peripherals.

This tool dramatically saves the time to learn about a new device and the time to correct mistakes and help concentrate on the real part of the application, the added value of a project.

See 'useful links' and 'documentation'

3.1.1   Processor Expert Beans

3.1.1.1   Peripheral Initialization Beans

Peripheral Initialization Beans are a subset of Processor Expert Beans and provide the lowest level of hardware abstraction. With Peripheral Initialization Beans the user is able to configure the control registers for each of the peripherals on the silicon and Processor Expert generates the necessary initialization code.

- Init_ADC_HCS12   Analog-to-Digital Converter (ADC)
- Init_BDLC_HCS12   Society of Automotive Engineers (SAE) J1850 serial communication network. (BDLC)
- Init_BYTEFLIGHT_HCS12   Byteflight communication interface (BYTEFLIGHT)
- Init_ECT_HCS12   Enhanced Capture Timer (ECT)
- Init_EEPROM_HCS12   EEPROM Memory (EEPROM)
- Init_FLASH_HCS12   Flash Memory (FLASH)
- Init_IIC_HCS12   Inter-IC Bus (IIC)
- Init_MSCAN_HCS12   Motorola Scalable Controller Area Network (MSCAN)
- Init_PMF_HCS12   Pulse width Modulator with Fault protection (PMF)
- Init_PWM_HCS12   Pulse Width Modulator (PWM)
- Init_RTI_HCS12   Real Time Interrupt(RTI)
- Init_SCI_HCS12   Serial Communications Interface (SCI)
- Init_SPI_HCS12   Serial Peripheral Interface (SPI)
- Init_TIM_HCS12   Timer Interface Module(TIM)

See 'useful links' and 'documentation'

3.1.1.2   Basic Beans

Basic Beans (or standard beans) refer to the basic blocks such as parallel ports, timers, A/D converters, and simple serial interfaces as well as simple functions using them. The Basic Beans are listed below. Basic Bean support is dependent on the peripherals and pins available on a particular derivative.

© **Freescale**, LRR 9/17/2007 @ 3:32 PM   7
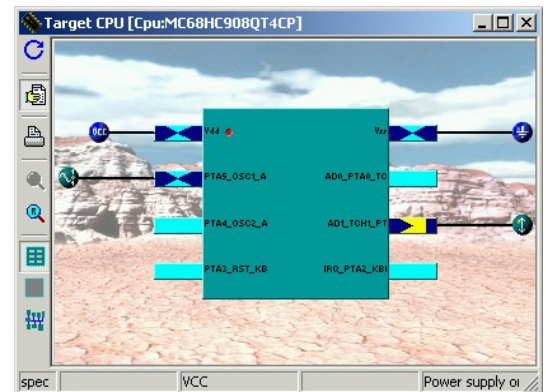
-	ADC	A/D converter
-	AsynchroSerial	Asynchronous serial communication
-	BitIO	General 1-bit Input/Output
-	BitsIO	General Multi-Bits Input/Output (1-8 bits)
-	Bwimage	Black & White image
-	Byte2IO	General Two-Bytes Input/Output
-	Byte3IO	General Three-Bytes Input/Output
-	Byte4IO	General Four-Bytes Input/Output
-	ByteIO	General Byte Input/Output (8 bits)
-	Capture	Timer capture encapsulation
-	COLimage	Color image
-	DAC	D/A converter
-	EventCntr16	Event counter 16-bit
-	EventCntr32	Event counter 32-bit
-	EventCntr8	Event counter 8-bit
-	ExtInt	External interrupt
-	FreeCntr	Free running counter
-	FreeCntr16	Free running 16-bit counter
-	FreeCntr32	Free running 32-bit counter
-	FreeCntr8	Free running 8-bit counter
-	InputPin	General 1-bit Input
-	IntEEPROM	Internal EEPROM
-	InterruptVector	Interrupt vector handled in user code
-	PPG	Programable pulse generation
-	PulseAccumulator	Pulse Accumulator
-	PWM	Pulse width modulation
-	RTIshared	Real Time Interrupt Shareable
-	SW_I2C	SW emulated I2C using two I/O pins
-	SWSPI	Software synchronous serial communication
-	SynchroMaster	Master for synchronous serial communication
-	SynchroSlave	Slave for synchronous serial communication
-	TimerInt	Periodic interrupt
-	TimerOut	Flip-flop output 1:1
-	WatchDog	WatchDog bean
-	WordIO	General Word (16-bit) Input/Output

See 'useful links' and 'documentation'

3.1.1.3   Software Beans

The Software Beans library is a collection of software modules developed to interface to popular external peripherals such as serial SPI sensors, LCD modules, Flash memory modules, A/D and D/A converters as well as implementing low level functions such as keyboard matrix, software SPI function, 7-segment display or simple FFT or FIR functions. These beans are 'free of charge' to customers purchasing the Standard Edition of CodeWarrior.

See 'useful links' and 'documentation'

3.1.1.4 Advanced Beans

Advanced Beans (or complex beans) refer to the beans supporting complex peripherals such as complex A/D conversions. The Advanced Beans are listed below. Advanced Bean support is dependent on the peripherals and pins available on a particular derivative. Advanced Beans are available to customers purchasing the Professional Edition of CodeWarrior.

- AsynchroMaster   Asynchronous serial communication - master
- AsynchroSlave   Asynchronous serial communication - slave
- BDLC   BDLC serial communication
- Byteflight   Byteflight communication interface
- Ext16IO   External 16-bit Input/Output
- Ext32IO   External 32-bit Input/Output
- Ext8IO   External 8-bit Input/Output
- ExtBitIO   External 1-bit Input/Output with Direction Register
- ExtByteIO   External Byte Input/Output (8 bits) with Direction Register
- ExternalFile   External Binary File Converter
- FreescaleCAN   CAN communication for Freescale implementation
- FreescaleEthernetAPI   NE64 ethernet API routines
- InternalI2C   Internal I2C Communication Interface
- IntFLASH   Internal FLASH
- OSEK_OS   Encapsulation of OSEK/VDX compliant OS - HW specific configuration
- PWMMC   Pulse width modulation for motor control
- StringList   String List Converter
- Term   ANSI Terminal
- TimeDate   Time and date

See 'useful links' and 'documentation'

3.1.2 Bean Wizard™

The Bean Wizard™ is the tool that allows you to create your own beans that address the specific needs of an application, like the support of using a generic peripheral in a very specific way.

See 'useful links' and 'documentation'

3.2 Smart Linker

The smart linker is a panel with graphical adjustment of different parameters to optimize the code. No need to remember complex command lines to set multiple parameters during compilation and linking process. More than 50 different optimizations can be achieved with the control panel of the Smart Linker. Adjust for code density, execution speed, compilation time or information available from the tools and the equivalent command line is displayed so you can remember what setting was used.

See 'useful links' and 'documentation'
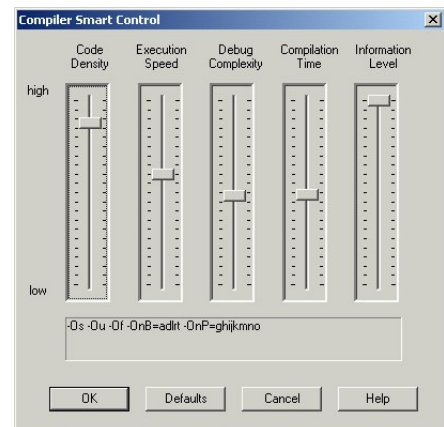
3.3   Data Visualization & I/O Stimulation

The Data visualization, with the complementary function of I/O stimulation is a tool that allows the developer to attach graphical representation of hardware functions to the input and/or output registers of peripherals and display the real-time status of the functions implemented by the peripherals. Typical and simple examples are LEDs and bar graphs displays, switches and potentiometers.
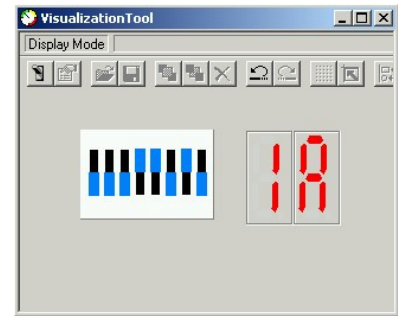
Command files can be attached to these functions to expand the capability to provide stimulation and display of the direct environment of the microcontroller used for the application, getting closer to the final hardware and before code is downloaded in the application.

This tool significantly accelerates the development of an application by allowing the validation of the software part of the application before downloading it to the platform, thus isolating hardware related issues. Another benefit is the ability to test and validate "hardware" changes at the simulation level with the time and product savings such a feature allows.

See 'useful links' and 'documentation'

3.4   High Level Application Design

3.4.1   The MathWorks

The MathWorks Embedded Target for Freescale® HC12 lets you deploy production code generated from Real-Time Workshop® Embedded Coder directly onto the HC12 microcontroller. You can use the Embedded Target for Freescale HC12 to execute code in real time on the Freescale HC12 for rapid prototyping or production deployment of embedded applications.

4   Features of Special, Standard, Professional and Data Expert Editions

CodeWarrior for HCS12(X) is available in different versions to suit customers' needs.

	Special Edition		Standard Edition	Professional Edition
	CWX-HXX-SE		**CWS-H12-STDED-CX**	**CWS-H12-PROED-CX**
		CWS-H12-C64K-CX		
C Compiler object code size	HCS12(X): C - 32K HCS12(X): C++ - 1K XGATE: C - 512 bytes XGATE: C++ - 512 bytes	HCS12(X): C - 64K HCS12(X): C++ - 1K XGATE: C - 512 bytes XGATE: C++ - 512 bytes	HCS12(X): C - Unlimited HCS12(X): C++ - 1K XGATE: C - Unlimited XGATE: C++ - 512 bytes	HCS12(X): C - Unlimited HCS12(X): C++ - Unlimited XGATE: C - Unlimited XGATE: C++ - Unlimited
IDE 5.7	32 files	Unlimited	Unlimited	Unlimited
Macro Assembler	HCS12(X): ASM - Unlimited XGATE: ASM - Unlimited	HCS12(X): ASM - Unlimited XGATE: ASM - Unlimited	HCS12(X): ASM - Unlimited XGATE: ASM - Unlimited	HCS12(X): ASM - Unlimited XGATE: ASM - Unlimited
Pre-configured Projects	Y	Y	Y	Y
Flash Programming	Y	Y	Y	Y
Full Chip Simulator	Y	Y	Y	Y
Data Visualization	1 component, 3 elements		Unlimited	Unlimited
I/O Stimulation	1 component, 3 elements		Unlimited	Unlimited
Decoder			Y	Y
Libmaker			Y	Y
Session Record & Play				Y
OSEK awareness				Y
PC-Lint Plugins				Y

PROCESSOR EXPERT				
Basic Beans	Y	Y	Y	Y
Software Beans			Y	Y
Advanced Beans				Y
Bean Wizard				Y
ENHANCING OPTIONS				
C++, compactC++/EC++	1Kbytes	1Kbytes	CWX-H12-ENHNC-KX	Y
XGATE	CWX-H12-XGATE-KX	CWX-H12-XGATE-KX	Y	Y
TARGETS (parallel, serial or USB)				
HCS12 Serial Monitor	Y	Y	Y	Y
P&E Multilink(s)	Y	Y	Y	Y
SofTec USB	Y	Y	Y	Y
HCS12(X) GDI	Y	Y	Y	Y
HC12 DBG support	Y	Y	Y	Y
Abatron BDI1000				Y

4.1   Technical support

- Technical support gives access to trained applications engineers who can help customers,
- Technical support also entitles customers to purchase new releases with a 70% discount,
- First year of technical support is included in the price,
- Subsequent years of technical support must be purchased to continue coverage and be entitled to discounts mentioned above.

4.2   Special Edition

TARGET: Special Edition is targeted at assembly code projects or small projects with a limited amount of C code. Debugging is mostly done with Evaluation Boards or directly on the target application.

Features: there are some limitations to the Special Edition:
- Unlimited assembler
- C compiler limited to 32Kbytes of object code for HCS12 CPU and HCS12X CPU. C compiler limited to 512 bytes of object code for XGATE module.
  (There is no code size limitation when developing in assembly.)
- Linker limited to 32K of C code
- IDE limited to 32 files and no-sub-projects
- Projects can have up to 4 targets
- Data Visualization/IO stimulation allows for 1 component with 3 instruments

Options available for the Special Edition

For customers developing C based applications and using more than 32Kbytes of code, the 64Kbytes C compiler upgrade option is available.

The C compiler upgrade to the full 64Kbytes offers:
- C compiler object code increased to up to 64Kbytes (1K of C++)
- No file limitation for the IDE

For customers developing C based applications for the XGATE module, the XGATE Tools option is available.

The XGATE Tools option offers:

- Unlimited C/C++ compilers for XGATE module

4.3   Standard Edition

TARGET: Standard edition is targeted at projects developed with C, assembly or a mix of the languages and use the maximum memory size of the HCS12(X)derivatives that today have 128K, 256K and 512Kbytes. It adds the possibility to closely simulate the interfaces to the processor, making the debugging easier and the time to market shorter.

Features: Standard edition has more features than the Special Edition:
- Unlimited Data visualization to improve debugging
- Access to Unis' software beans to accelerate application designs
- Unlimited C compiler / debugger code size for HCS12 CPU, HCS12X CPU and XGATE Module C++ limited to 1Kbytes for HCS12 CPU and HCS12X CPU. C++ limited to 512 bytes for XGATE Module
- No limitation on number of files/Subprojects
- Libmaker to create binary libraries
- Decoder to create a listing from ELF files

Customers can also upgrade from Special Edition to Standard Edition.

Enhancing options available for the Standard Edition

Standard Edition can be complemented with a number of options to improve developers' productivity:
- C++/EC++/Compact C++

4.4   Professional Edition

TARGET: Professional Edition is targeted at professional, short time to market applications. Developers benefit from a number of unrivaled features available in the CodeWarrior tool suite to develop the most complex applications and meet short time to market goals.
Features: Professional Edition includes all the features of the other editions plus:
- C++/Compact C++/EC++ for object-oriented programming
- Code Coverage that allows the user to isolate unused or badly used portions of code,
- Profiler/Performance Analysis to identify and optimize critical portions of code,
- Advanced beans providing higher level software modules and faster code integration,
- Bean Wizard to build a software library that can be retargeted to any HC(S)08 or HCS12(X) silicon
- OSEK awareness for kernel-level debugging
- Session Record and Play for automated testing
- Encryption tools

Customers can also upgrade from Standard Edition to Professional Edition. Upgrading from Special Edition will be charged as 2 upgrades: a Standard Edition upgrade and a Professional Edition upgrade.

5   Additional Support

CodeWarrior for HCS12(X) has the capability to provide additional support for specific functions.

5.1   OSEK

The CodeWarrior Development Studio for HCS12(X) Professional Edition is 'OSEK aware'.

5.2   PC-Lint

PC-Lint is a software package that finds errata in your C programs using the K&R and ANSI standards for C. The purpose of *linting* your programs is to determine potential problems prior to integration or porting, or to reveal unusual constructs that may be a source of subtle errors. PC-Lint often finds problems that the compiler alone cannot.

The CodeWarrior Development Studio for HCS12(X) Professional Edition has PC-Lint plugins. PC-lint(TM) is a product from Gimpel Software. You need PC-lint installed in order to use the CodeWarrior plugin.

5.3   MSCAN

The CAN LLD's were developed with a Toucan interface for HC08, HC12 and MPC5xx.

5.4   LIN

The LIN drivers are available free of charge from Freescale.

6   Why update and upgrade?

There are multiple reasons to upgrade to a new release, upgrade from Special Edition to Standard and Professional Edition but the most important one is that it will save money in the long run by reducing the design time, improve re-use and improve the quality of the product, leading to lower maintenance costs.

6.1   Upgrade to Professional Edition

These new features are ALL available in the Professional Edition. Check out the 'Release Notes' folder (or menu Help * Online Manuals in the IDE).

- Full support for HC12, HCS12 and HCS12X architectures
- Updated XGATE compiler
- Updated HC12/HCS12/HCS12X compiler.
- New version of the IDE 5.7.
- Updated simulator/debugger with improved support for global and XGATE address spaces.
- Support for HCS12X trace functionality
- Processor Expert support for HCS12X CPU and peripherals (excluding XGATE module)
- Updated documentation.
- Updated examples.
- Various bug fixes.

6.2   Upgrade to Standard Edition

Standard Edition adds many features to the Special Edition:

- Data visualization/IO stimulation to improve debugging
- Access to Unis' software beans to accelerate application designs
- No limitation on C code size for HCS12 CPU, HCS12X CPU and XGATE module

- No limitation on number of files the linker can handle
- Libmaker to create binary libraries
- Decoder to create a listing from ELF files

Standard Edition also offers the possibility to add extra features needed for a specific development: C/C++.

6.3 Upgrade C compiler of Special Edition

The C compiler upgrade to 64Kbytes is for users of the Special Edition requiring more than 32Kbytes of code. The use of C code offers portability, faster debugging and design of complex applications that would be very difficult to debug at the assembly level.

The C64 upgrade allows up to 64Kbytes of code to be generated and the C-compiler upgrade allows unlimited code to be generated.

All upgrades remove the file limitation for the linker of the 32Kbyte initial version.

7 Software Products: Part numbers

Base Product	Part number
HCS12(X) Special Edition is now distributed in a 3-CD DVD pack with HC(S)08 Special Edition and Service Pack CD	CWX-HXX-SE
Standard Edition	CWS-H12-STDED-CX
Professional Edition	CWS-H12-PROED-CX
C compiler only	CWS-H12-CC-CX
Debugger only	CWS-H12-DBG-CX
Options for Special Edition	Part number
C compiler/debugger Upgrade to 64 Kbytes for Special Edition	CWS-H12-C64K-CX
XGATE Tools Option	CWX-H12-XGATE-KX
Options for Standard Edition	Part number
C++ / Compact C++ option for Standard Edition	CWX-H12-ENHNC-KX
Product Upgrades	Part number
Upgrade from Special Edition to Standard Edition	CWS-H12-STDED-UX
Upgrade from Standard Edition to Professional Edition	CWS-H12-PROED-UX
Technical Support	Part number
1 year technical support for 64K C upgrade	CWT-H12-C64K-TX
1 year technical support for C Compiler upgrade	CWT-H12-CC-TX
1 year technical support for Standard Edition	CWT-H12-STDED-TX
1 year technical support for Professional Edition	CWT-H12-PROED-TX

8 Hardware Products

There are several hardware connections available to suit the needs of the most demanding. CodeWarrior has built-in drivers to communicate with these different interfaces and make the function transparent to the user. Many connections are now available:

- Standard **RS232 to Serial** monitor (HCS12 devices with flashed monitor)
- Multilink **parallel to BDM** for HCS12 (will be replaced by USB to BDM)
- Multilink **USB to BDM** for HCS12
- CyclonePRO serial/USB/Ethernet to BDM (HC12 and HCS12)
- SofTec inDart **USB to BDM** for HCS12

CodeWarrior Development Studio for HCS12(X) Release 3.x can also support any third party hardware connection compatible with CodeWarrior General Debug Interface (GDI) integrated in the debugger.

8.1 Multilinks

The Multilink is an easy to use, low-cost development tool for Freescale's HCS12(X) Flash MCUs. It provides the interface for in-circuit emulation, debugging and programming through the HCS12(X)'s standard BDM serial debug/breakpoint interface. There are several versions of the Multilink target interface (see above)

8.2 Cyclone and CyclonePRO

The CyclonePRO version is available that supports multiple host-target interfaces: serial, parallel, USB and Ethernet to BDM.

8.3 InDART (SofTec Microsystems)

USB-based inDART-HCS12(X) takes advantage of Metrowerks' CodeWarrior Development Studio for HC12 and the ISP (In-System Programming) feature to program the FLASH memory of the target microcontroller. Together with CodeWarrior, inDART-HCS12(X) provides you with everything you need to write, compile, download, in-circuit emulate and debug user code. inDART-HCS12(X) Design Kits come together with an Evaluation Board to permit an easy and fast start-up. C and Assembly examples are available for a first debugging process. Contact SofTec Microsystems or Metrowerks distributors directly.

9 Hardware Products: Part Numbers

Existing hardware products must be upgraded to be RoHS compliant by June 2006. As the RoHS compliant products become available old part numbers will be marked as "No Longer Manufactured" on the Freescale WEB. The RoHS compliant products can be ordered by adding an "E" to the end of the old part number.

Product	Current Part Number	New Part Number
USB Multilink cable USB to BDM	USBMULTILINKBDM	USBMULTILINKBDME
Cyclone Pro	M68CYCLONEPRO	M68CYCLONEPROE

10 Pricing

For reasons of consistency, pricing is not published in this document. Please consult the Product Availability Guide or contact the nearest Freescale office.

11 Licensing

CodeWarrior Development Studio for HCS12(X) can be licensed in different ways:

- The Special Edition license key is "free of charge" and installed with the product.

- The Standard and Professional Editions require license keys that can be floating licenses, dongle licenses or node locked to a computer.

12 Getting started with Special Edition

12.1 Option 1: Obtaining the CD

There are several ways to obtain the CD containing CodeWarrior Development Studio for HCS12(X).

On-Line buy

CodeWarrior Development Studio for HCS12(X) can be purchased directly from our Web site: Link to Buy Direct

On-line Request

Link to on-line request for an evaluation CD
In case of difficulty, contact your Freescale sales office or distributor.

Request from Freescale LDC

Freescale Literature Distribution Center (LDC): 1-800-441-2447

Request: CWX-HXX-SE

12.2 Option 2: Downloading the software

CodeWarrior Development Studio for HCS12(X)

CodeWarrior Development Studio for HCS12(X) can be downloaded from our Web site:
CodeWarrior Development Studio for HCS12(X) Product Page

Select "**Download**" in the right hand menu. The first time, you will be presented with a questionnaire. Fill in this questionnaire and submit it. Immediately, you can download the .exe file containing the CodeWarrior software.

Service Packs

Freescale is committed to supporting the family of HCS12(X) products with the best possible development tools. New derivatives are also introduced that may require dedicated files or software modules to be supported by the existing version of the tools. Service packs are made available for download on Freescale web site. Visit:

[Link to download HCS12(X) Service Packs](#)

Click on the link for "Updates and Patches", this will take you to the page with the service packs available for a specific CodeWarrior release.

13 Getting started with Standard or Professional Editions

13.1 Ordering

Standard Edition, Professional Edition, yearly technical support packages and upgrade packages can be ordered directly from the Freescale WEB site:

Click on the following [link to on-line store for HC(S)08 products](#)

13.2 Registering and getting a license

You need a license key to activate the Standard Edition or the Professional Edition. You can register your product directly from the CodeWarrior IDE. Select **Help > Register Product** from the main menu — the CodeWarrior IDE starts your browser, taking you to Step 1 of the on-line registration form

Registration Form Step 1

Enter your email address in the appropriate fields. Click on the **Begin Registration** button and the second screen appears. Follow on-screen instructions to complete remaining pages of the form (Thank You page is last) — within a few minutes Freescale will email your license authorization code.

When you receive the email, select **Help > License Authorization** from the CodeWarrior main menu. The **Licence Authorization** dialog box appears. Paste the license authorization code from the email into the **License Authorization** dialog box. When you click the **OK** button — the **License Authorization** dialog box updates and the IDE automatically gets the license key and installs it in the correct location.

NOTE: If you downloaded the software from the Freescale web site, you might not have a registration code. You can request a registration code from license@freescale.com. Special Edition customers do not need to register. The Special Edition license file is automatically installed with the software.

13.3 Manually installing the key

To manually install the license key follow the steps below. You can find the license.dat file in the directory where you installed the CodeWarrior software. The default is: C:\Program Files\Freescale\CW08 V5.0

- **Open license.dat**
    o   Start a text editor such as Notepad
    o   Open license.dat file
- **Copy license key you received from Freescale**
- **Paste license key on new line at bottom of** license.dat **file**
- **Save** license.dat **file**

14 Training

You can access on-line training on the Freescale WEB site at Technical Learning Center.

15 Useful Links

To visit CodeWarrior site or get technical support:

CodeWarrior: http://www.freescale.com/codewarrior

Technical Support: http://www.freescale.com/support

Links to our Processor Expert tool and related beans:

http://www.processorexpert.com

For introduction on the beans
       http://www.processorexpert.com/eb/main.html

For details on beans to support external devices (A/D, displays, other beans)
       http://www.processorexpert.com/eb/hw_beans.html

For details on software only beans (data processing, process control, other beans)
       http://www.processorexpert.com/eb/sw_beans.html

For details on beans related to internal MCU modules (SCI, SPI, A/D, other beans)
       http://www.processorexpert.com/eb/basic_beans.html

When you get to individual beans, the left menu allows you to see details and usage example.

Links to board vendors:

SofTec Microsystems: http://www.softecmicro.com

Axiom: http://www.axman.com

Technological Arts: http://www.technologicalarts.com

Future Electronics: http://www.futureerc.com

Elektronik-Laden: http://www.electronikladen.de

16 Frequently Asked Questions and Technical Notes

Technical notes (TN) with the most recent 'hints and tips' from our software designers can be downloaded from the CodeWarrior Development Studio for HCS12(X) Product Page. Select "8/16-Bit Tech Notes**"** in the right hand menu.

17   Benchmarks

Benchmarking probably is an 'art' unto itself. It may be difficult to find the 'ideal' switches for benchmarking. It heavily depends on the benchmark and the goal you want to achieve. Code density is one thing, and code speed another. The compiler manual already lists an option set for 'general' purpose, and the 'Smart Sliders' in the compiler are helping in this area too.

There are several aspects to consider in optimizing the code and the result will be a best combination of these rather than one only piece. If compiler switches play an important role, the way the linker is used plays a significant role for the final application as well as the programming style and the goals to achieve.
For a very critical benchmark, we suggest that customers work with our engineering team which already has a lot of expertise and, quite important, they know their tools best.

18   Documentation

There is a lot of documentation available:

- Direct 'F1 key' help from inside the CodeWarrior applications,
- Manuals, tutorials, examples in the CodeWarrior software,
- Manuals on the CD.

There is a lot of documentation on the different components of CodeWarrior Development Studio.
All the manuals can be found on the CD and can be installed on the hard drive, depending on the installation chosen. Look for the folder "CodeWarrior Manuals" on the CD or in the directory where CodeWarrior Development Studio is installed.

Printed manuals can also be ordered from the Freescale Literature Distribution Center (LDC): 1-800-441-2447.