Conclusions

Introduction

In this chapter a number of design support products and services offered by TI to assist you in the development of your DSP system will be described.

Objectives

As initially stated in module 1, you should now be able to:

- Define key software design challenges in developing real-time systems
- Demonstrate essential skills in the use of Code Composer Studio (CCS) in authoring a real-time system
- Identify and apply the optimal DSP/BIOS constructs to implement a given real-time system
- Analyze and optimize a software solution to meet real-time requirements

Module Topics

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DSP/BIOS Summary ..................................................................................................................................17-2
Development Tools.......................................................................................................................................17-3
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DSP/BIOS Summary

- Object based programming
- Real-time instrumentation
- Preemptive interrupt scheduling
  - Allows for reentrant code to be used by multiple threads (reentrant code cannot modify: global or static variables, or itself without protection)
  - Overhead
    - Memory for stack and objects
    - Context switching
  - Inter-thread communication and synchronization
  - Basic interrupt handling capabilities
- Real-time data communications with the host
- Support for meeting timing requirements
  - Maintains an optional real-time clock
  - Provides a method to trigger periodic functions
  - Threads can invoke API for measuring performance and optimizations
- Minimize run-time overhead
  - Generated optimized runtime code
  - Predictable context switching times
  - Minimizes interrupt latency

CCS: Orthogonal Software Development

- Single Algorithm
- Single Channel
- multi channel
- Persiant or Scratch
- Static or Dynamic

DSP Algorithm Standard
off-the-shelf software...

DSP/BIOS
meet real-time goals...
- concurrent multi algorithm
- Prioritized Preemptive Thread Scheduling
- Real-Time Analysis – Debug w/o halt
- Hardware Abstraction – Easier system s/u

Code Composer Studio - separate tools to independently solve different problems!
Development Tools

DSK Packages...

Documentation
◆ DSK Technical Ref.
◆ eXpressDSP for Dummies

Software
◆ Code Composer Studio
◆ SD Diagnostic Utility
◆ Example Programs

Hardware
◆ 1 GHz C6416 DSP
  or 225 MHz C6713 DSP
◆ TI 24-bit A/D Converter (AIC23)
◆ External Memory
  • 8 or 16M Bytes SDRAM
  • Flash ROM - C6416 has 512K Bytes
    - C6713 has 256K Bytes
◆ LED’s and DIP’s
◆ Daughter card expansion
◆ 1 or 2 additional expansions
◆ Power Supply & USB Cable
For More Information

TI Website: www.ti.com

TI Documentation via ti.com

from Ti.com, select: Technical Documents / App Notes (Users Guides, etc) / DSP

DSP : User Guides

You requested User Guides for DSP

SELECT:
- TMS320C6000™ Platform
- TMS320CS500™ Platform
- TMS320C2000™ Platform
- OMAP™ Platform
- Other TMS320 DSPs
TI Documentation - via “dspvillage”


- DSP/BIOS Link
- DSP/BIOS Kernel
- Multi-Threading Benefits
- Benchmarks
- DSP/BIOS App Notes
- FAQ
- C6000 RTOS
- C2000 RTOS
- Other: DSP/BIOS
- Peripheral Drivers
- Signal Processing Libraries
- Reference Frameworks
- DSP Algorithm Standard
- About xpressDSP Software
- Technical Documents

Software: DSP/BIOS™ Real-Time OS

Provide feedback regarding DSP/BIOS™ kernel by taking our online survey and enter to win a digital still camera.

DSP/BIOS™ is a scalable real-time kernel, designed specifically for the TMS320C6000™ and TMS320C6000™ DSP platforms. DSP/BIOS has been proven in thousands of customer designs and is an integral part of the Code Composer Studio™ Development Tools. DSP/BIOS requires no runtime license fees and is backed by Texas Instruments worldwide training and support organizations.

DSP/BIOS enables you to develop and deploy sophisticated applications more quickly than with traditional DSP software methodologies and eliminates the need to develop and maintain custom operating systems or control loops. Because multi-threading enables real-time applications to be deeply partitioned, an application using DSP/BIOS is easier to maintain and new functions can be added without disrupting real-time response. DSP/BIOS provides standardized APIs across C6000 and C2000 DSP platforms to support rapid application migration.

Related Links:
- Development Tools
- Code Composer Studio
- Development Tools: DSP/BIOS
- DSP/BIOS User’s Guide
- Product Bulletin (DSP)
- FAQs
- Customer Service

---

TI Documentation - via CCS

- From CCS: select “Help” and “Users Manuals”

TMS320C6000 Code Composer Studio Manuals

- Software Documentation
- DSP Foundation Software
- Hardware Documentation
- TMS320 DSP Algorithm Standard Documentation
- Application Reports
- Click here for the latest user guides

Use this document: If you need information about:

- SPRU45: Code Composer Studio IDE Quick Start Getting started quickly.
- SPRU15: Code Composer Studio Online Documentation Getting started quickly.
### Example BIOS & C6000 Documentation

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<td>How to Get Started with the DSP/BIOS Kernal</td>
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<td>SPRA780</td>
<td>DSP/BIOS Kernal Technical Overview</td>
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<td>SPRA640</td>
<td>Programming and Debugging Tips for DSP/BIOS</td>
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### Example C5xxx Documentation

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One Day Workshops Offered by TI

from TI.com, select: Training / By Type / 1-day workshops

Educational programs designed to offer attendees training on DSP products and development tools. Developed as a mini-workshop, this training usually lasts one day and includes a "hands-on" section utilizing a development tool. These workshops are facilitated by TI Field Sales representatives and are ideal for developers who are getting started with DSP technology.

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ARCHIVED 1-DAY WORKSHOPS

| Using FPGAs and DSPs Together for Real-Time Processing                         | DSP                |
| Implementing Signal Processing Applications With Programmable DSPs              | DSP                |
| eXpressDSP (TM) One-Day Workshop                                                | Applications       |
| Implementation of Video Streaming One-Day Application Workshop                 | Applications       |

http://focus.ti.com/docs/training/catalog/events/eventsbytype.jhtml?templateId=5517&navigationId=8460

Full Workshops Offered by TI

from TI.com, select: Training / By Type / Multi-day workshops

Advanced educational programs designed for engineers who need to sharpen their design and development skills. Workshops usually last three to five days and include significant "hands-on" sections emphasizing the demonstration and application of techniques and skills. TI Workshops are given by TI's Technical Training Staff and are highly beneficial in helping developers implement their DSP designs quickly.

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Sign up by clicking on desired workshop / register now / select region / select class

http://focus.ti.com/docs/training/catalog/events/eventsbytype.jhtml?templateId=5517&navigationId=8461
For More Information

Internet

Website: [http://www.ti.com](http://www.ti.com)  
[http://www.dspvillage.com](http://www.dspvillage.com)

FAQ: [http://www-k.ext.ti.com/sc/technical_support/knowledgebase.htm](http://www-k.ext.ti.com/sc/technical_support/knowledgebase.htm)
- Device information
- Application notes
- Technical documentation
- my.ti.com
- News and events
- Training


USA - Product Information Center (PIC)

Phone: 800-477-8924 or 972-644-5580

Email: support@ti.com
- Information and support for all TI Semiconductor products/tools
- Submit suggestions and errata for tools, silicon and documents

Visit the DSP Village for the latest DSP/BIOS info.

Reference Literature on DSP

- "A Simple Approach to Digital Signal Processing"  
  by Craig Marven and Gillian Ewers; ISBN 0-4711-5243-9

- "DSP Primer (Primer Series)"  


- "DSP First : A Multimedia Approach (Matlab Curriculum Series)"  
  James H. McClellan; ISBN 0-1324-3171-8
Thank You For Attending!

Technical Training Organization

Texas Instruments