Introduction

Welcome to the Texas Instruments DSP/BIOS workshop.

In this chapter an overall outline of the class is provided.

In addition, an overview of the DVEVM6437 – the board used in the labs in this class – will be presented.

Objectives

At the conclusion of this workshop, you should 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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Workshop Agenda

The outline for this workshop is as listed below. Four to five modules should be covered each day, although the actual pace of the class will vary based on the interests and needs of the class.

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Outside the scope of this workshop are topics such as:
- DSP Theory – textbooks are suggested in the final module
- Processor architectures - taught in C55x or C6x Workshops and via TI technical publications
- Operating System Theory or authoring

While not required, the following prerequisites are recommended for those considering this workshop:
- Familiarity with coding in C language
- Experience with software development and programming methodologies
- Familiarity with CCS development tool
- Helpful - familiarity with:
  - C6x or C5xx Processor Architectures
  - Object-oriented programming methodologies
EVM Overview

EVM Resets

- CCS reset
  - Use most commonly – fast and easy
  - Invoked via: Debug -> DSP Reset
  - Resets DSP (not full board)
  - May not clear all states required for ‘clean’ new debug session

- Reset button
  - More extensive reset operation, still not comprehensive
  - OK to assert when CCS (3.1 or higher) is running

- Absolute reset
  - Provides completely ‘fresh’ starting point
    - Disconnect CCS from target : <alt>C
    - Remove Power and USB plugs
    - Re-connect CCS to the target : <alt>C
  - Best choice to be sure a full reset is obtained
Lab – System Setup

A number of different Evaluation Modules (EVMs) and DSP Starter Kits (DSKs) can be driven by Code Composer Studio (CCS). This first lab exercise will provide familiarity with the method of testing the hardware and setting up CCS to use the selected target. Steps in this lab will include those noted in the diagram below:

### Lab 1 - Objectives

**Software**
- Run CCS Setup
- Start CCS
- Configure CCS Options
- Component Manager
- Close CCS

**Hardware**
- Hook up the EVM
- Supply power

Time: 20 minutes

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**A. Computer Login**

1. If the computer is not already logged-on, check to see if the log-on information is posted. If not, please ask the instructor *(student/student is a common ID/psw to try).*
B. Connecting the EVM to the PC

The software should already be installed on the lab workstation. All that should have to be done is to physically connect the EVM.

2. Connect a USB cable between the EVM’s USB port and a USB port on the PC.

   If you connect the USB cable to a USB Hub, be sure the hub is connected to the PC or laptop and power is applied to the hub.

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**Note:** Note: If, after plugging in the USB cable, a found new hardware message appears indicating that the USB driver needs to be installed, notify your instructor. In most classroom installations, this has already been performed.

3. Plug in the audio cables:
   - Use a stereo mini plug to connect the PC audio line out to the EVM audio **LINE IN**.
   - Use another stereo mini plug to connect the EVM **HP OUT** to the headphones/speaker.
     
     Do **not** connect to the line out, as one of the drivers used does not send signal out to them.

   Assure that the plugs are fully inserted so that the audio will be reliably transferred.

4. Plug the power cord of the power supply into an AC source.

   The power cable must be plugged into AC source prior to plugging the 5 Volt DC output connector into the EVM.

5. Plug the power supply output cable into the EVM’s power receptacle.

   When power is applied to the board, the Power-On Self-Test (POST) will run. LEDs DS501(next to the USB plug) will light briefly, flicker and go off. LEDs DS502 and DS5 will remain on. Do not turn on CCS until DS501 goes off.

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**Note:** At this point, if you were installing the EVM for the first time on your own PC you would now finish the USB driver installation. This step has already been performed on the workshop PCs.
C. CCS Setup

Code Composer Studio (CCS) supports numerous TI processors (including the C6000 and C5000 series) and a variety of target boards (simulators, EVMs, DSKs, and XDS emulators). The CCS Setup utility is used to select the device and board for CCS to work with. For this workshop, the C6416 DSK-USB will be chosen.

1. **Start CCS Setup**: by double-clicking the Setup icon on the PC desktop:
   - Be aware there are **two** CCS icons, one for setup, and the other run CCS itself. Here, the **Setup CCStudio v3.3** icon is the one to select. Note: the program can be run directly from: C:\CCStudio_v3.3\cc\bin\cc_setup.exe

   When CC_Setup opens, a screen similar to this should appear:

   ![CCS Setup Screen](image)

2. **Clear the previous configuration**: If a previous configuration exists, clear it by selecting the **remove all** button in the bottom right hand corner of the left pane. (If no configuration is currently loaded, this button will be greyed out as above.) Confirm when prompted. When finished, the left pane of the setup program should look as above, with nothing listed underneath the MySystem icon.

3. **Pick the desired target**: Select the **DM6437** in the Import Configuration box and click the **<<Add** button. Your options for selecting a board configuration appear in the middle pane. If many board configuration options appear here, use the filtering options to reduce the number. In the following screen, “EVM” was selected from the Platform pulldown list at the top of the pane. The “<< Add” button is located in the lower left corner of the middle pane. Note: there are **two** DM6437 EVM choices. Click on each and observe their file names. Select the one that does not have _v2 in the file name.

4. **Lock in choices**: Click on **Save and Quit**; select **Yes** when prompted to start CCS on exit.
D. Setup CCS Options

To assure an efficient lab environment, a few CCS options will now be verified and/or set.

1. **Component Manager**: A new feature of CCS is the ability to easily choose which release of DSP/BIOS to use. CCS 3.3 ships with BIOS 5.31.02. To upgrade to BIOS 5.31.07, download it via the update advisor (already done here) and apply it via Help | About | Component Manager. Open the Target Content and TMS320C64XX folders and check BIOS 5.31.07. Close the window, then close and restart CCS to make the change complete.

2. **Modify editor properties**: The editor’s properties may be accessed from the Options pulldown via Option | Color | Editor Color…, Option | Font | Editor Font…, and Option | Editor | Properties… As an example, we will modify the properties of the Editor’s demarcation of comments.
   
   • Begin by selecting **Option | Color | Editor Color**…
   
   • In the **colors tab** (which should already be open), click on **comments** in the Window Text section.
   
   • Uncheck the **Italic** check-box amongst the Font style options to the lower right of the dialog box.
   
   • Click OK to close this dialog box.

3. **Set the properties of the Debugger**. Select **Option | Customize**… and click on the **Debug Properties** tab (the leftmost tab). You should see a window like the one below.

4. **Select the options that you would like for the debugger**. The following are recommended:
   
   • **Uncheck** Open the Disassembly Window automatically
   
   • **Check** Perform Go Main automatically
   
   • **Check** Connect to the target at startup
   
   • **Check** Remove remaining debug state at connect
   
   • Leave other options at their default values
5. Specify the Program Load Options: Move to the Program/Project CIO tab. The recommended options are shown to the right. Load program after build automates a step otherwise requiring the use of File→Load Program to load newly built projects.

6. Specify the desired CCS Title Bar Properties via the Control Window Display tab: To reach this tab may require using the scrolling arrows at the end of the tab display) as show below. By selecting “Board Name”, “Current Project”, “Currently loaded program” and “Display Full Path” the CCS title bar will specify all the key information on what CCS is currently set up to do. The last two selections under “Project close” allow for a fast and clean end of a session.

7. Select OK to close the CCS Customization window.