TMS570LS Microcontrollers:
Blinky Example

Texas Instruments

Overview

- In this example we will:
  - Create a TMS570 HALCoGen Project
  - Generate and import code into Code Composer Studio
  - Write code to blink the LED on NHET pin 1
  - Build, deploy and execute the code to the microcontroller

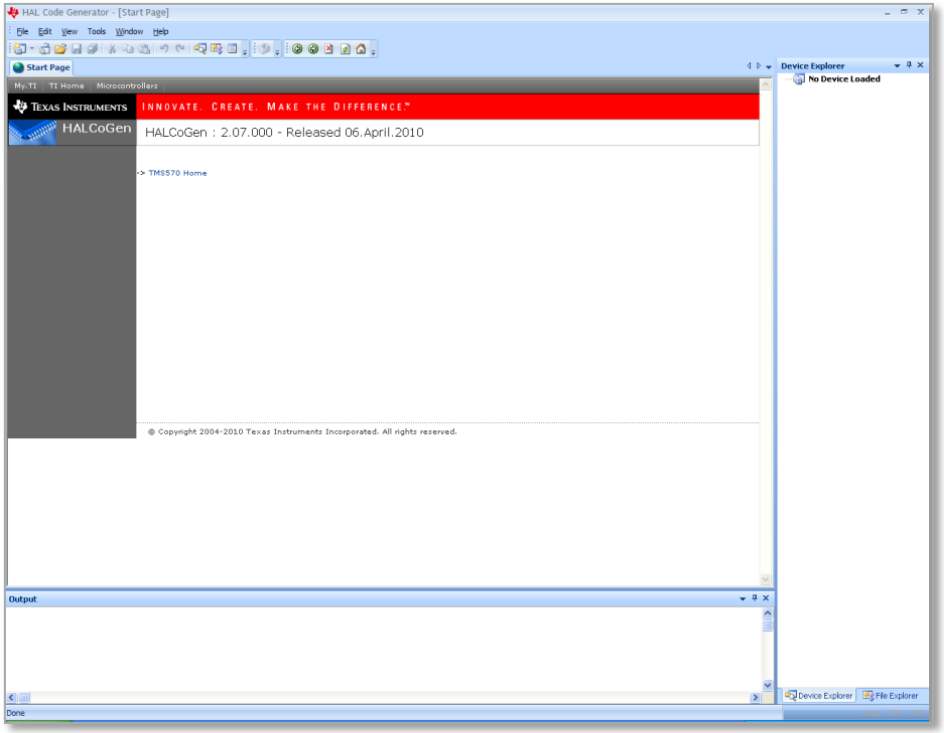
- Required Hardware:
  - Windows Based PC (WinXP, Vista, 7)
  - TMS570LS2x USB Development Stick or Microcontroller Development Kit

- Required Software:
  - TMS570 HALCoGen
  - Code Composer Studio v4.x

Setting up a New HALCoGen Project

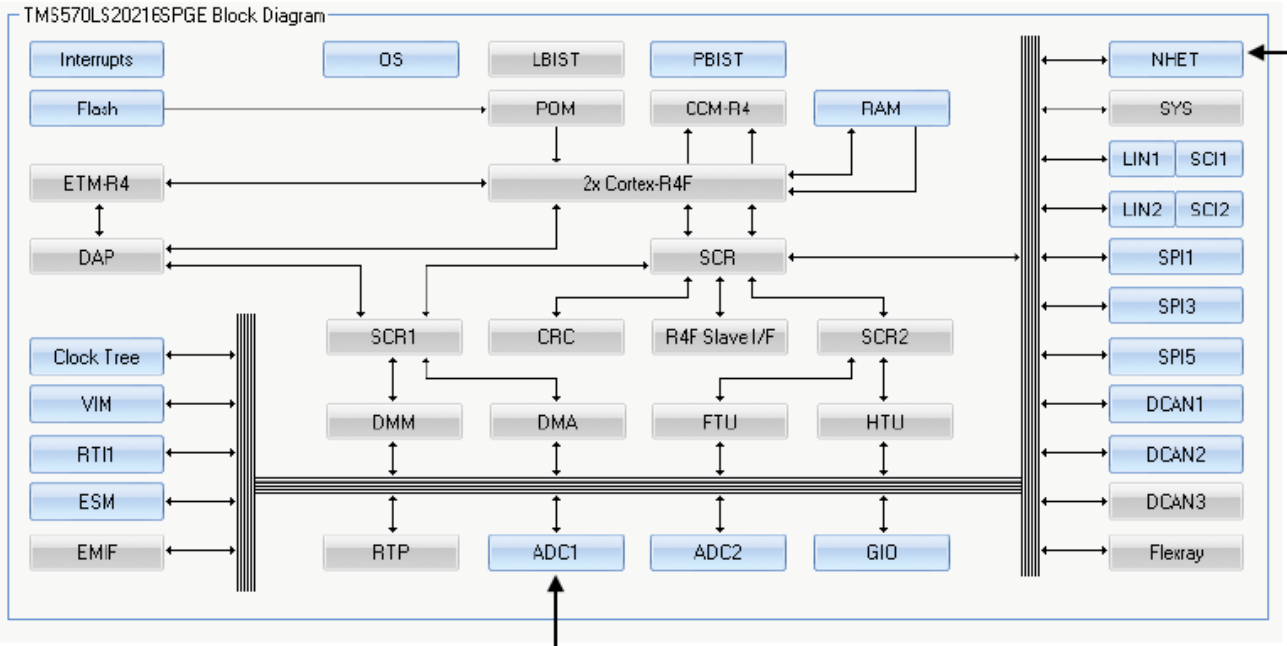
- Launch HALCoGen
  - Start → Programs → Texas Instruments → HALCoGen
- File > New > Project
- Family:
  - TMDX570
- Device:
  - TMDX570LS20USB (for USB Stick)

    OR
  - TMDX570LS20MDK (for MDK)
- Name: TMS570 Blinky
- Location: “C:\myWorkspace”



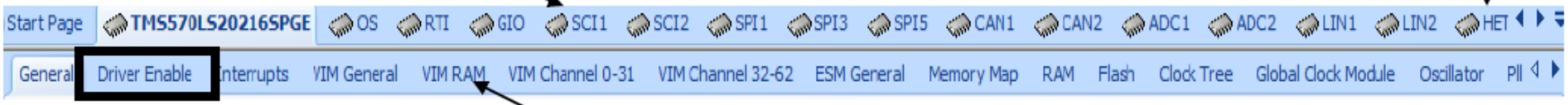
For more help with HALCoGen, see this getting started video: LINK

The HALCoGen Interface



Accessible from the block diagram and the ribbon

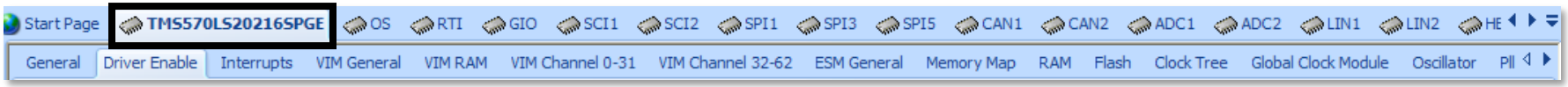
Top Level: Peripherals on the TMS570



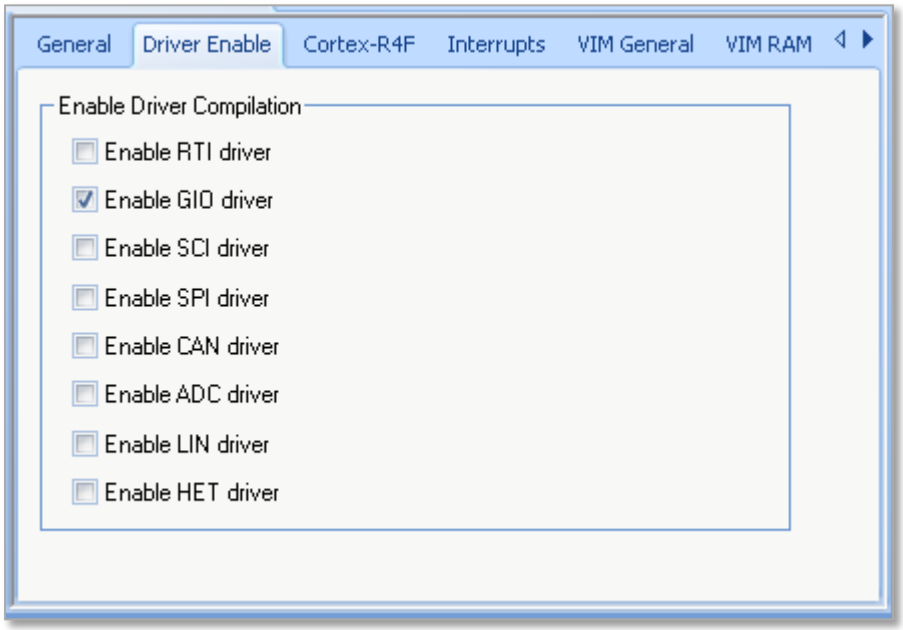
Bottom Level: Settings for each peripheral

Click "Driver Enable"

Configuring the Peripherals

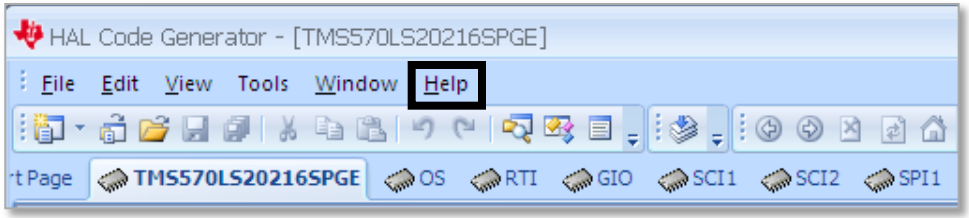


- Select the peripherals that are required for this project.
  - In this lab we need only enable the GIO driver, uncheck all other drivers

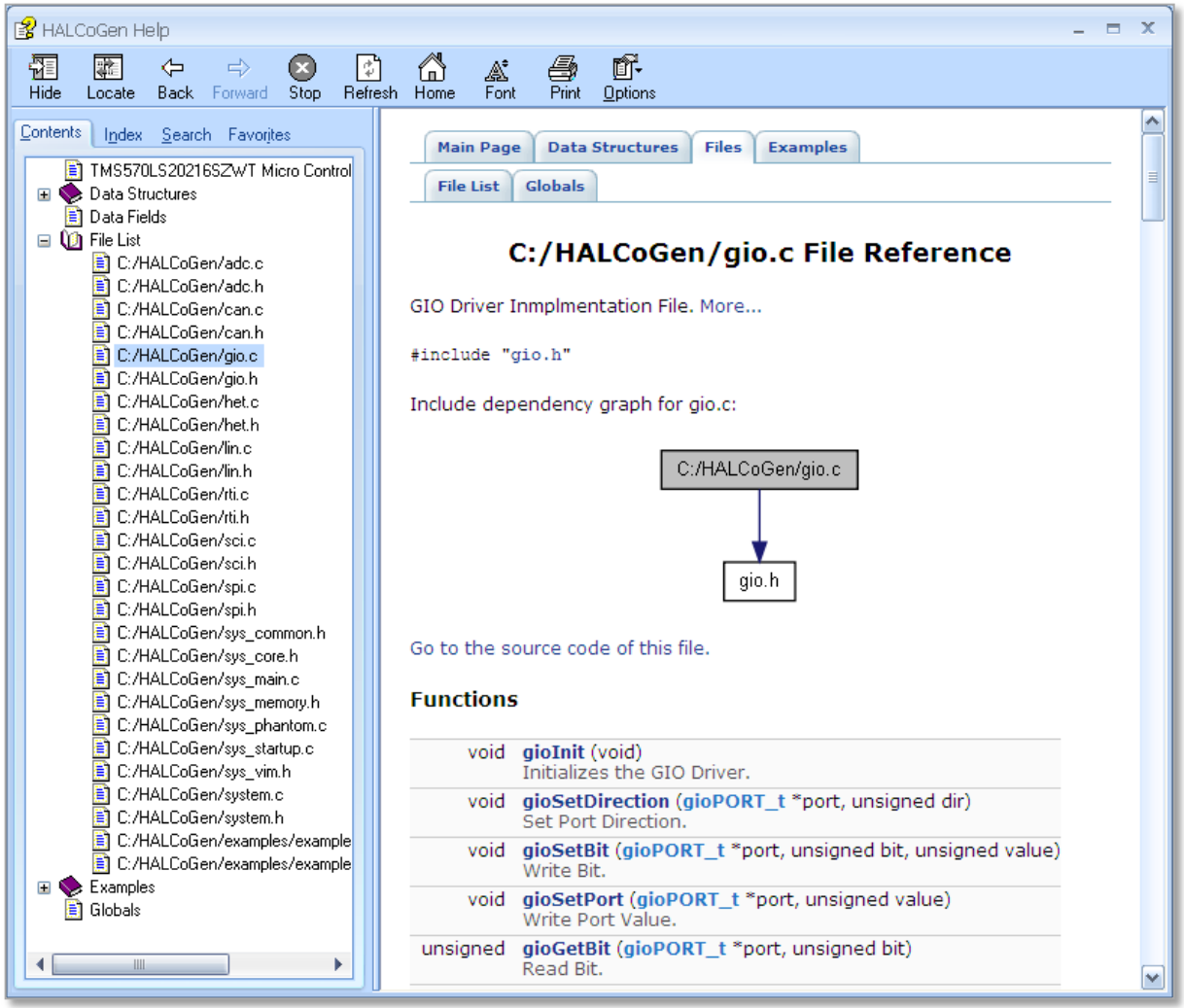


- No further changes should be made, the source code can now be generated.
  - To do this go to File → Generate Code
  - Following, the folders on the right will populate with our new files

HALCoGen Help

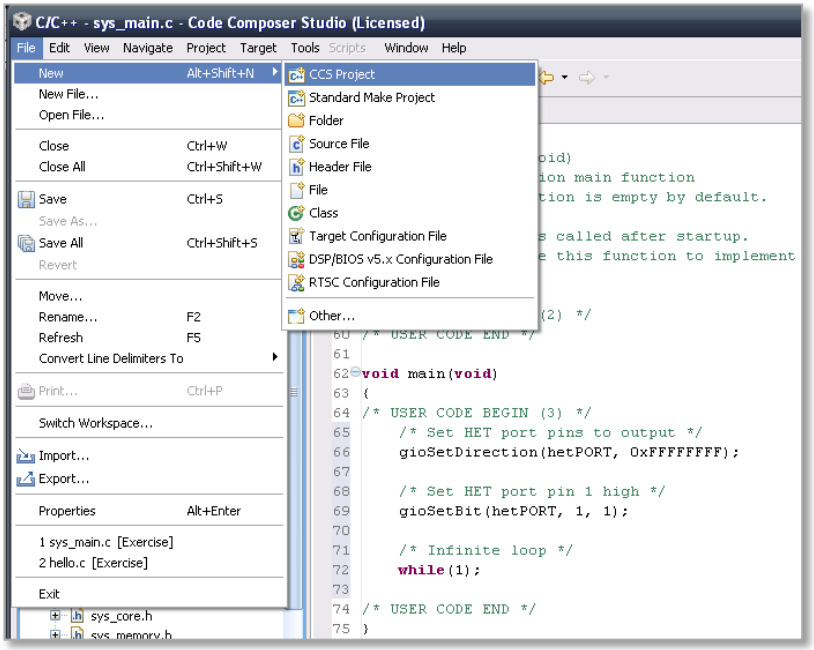


- Information about the files and functions that HALCoGen creates can be found in the HALCoGen 'Help' menu
- Help can be launched from the main title bar under Help → Help Topics



Setting up Code Composer Studio 4

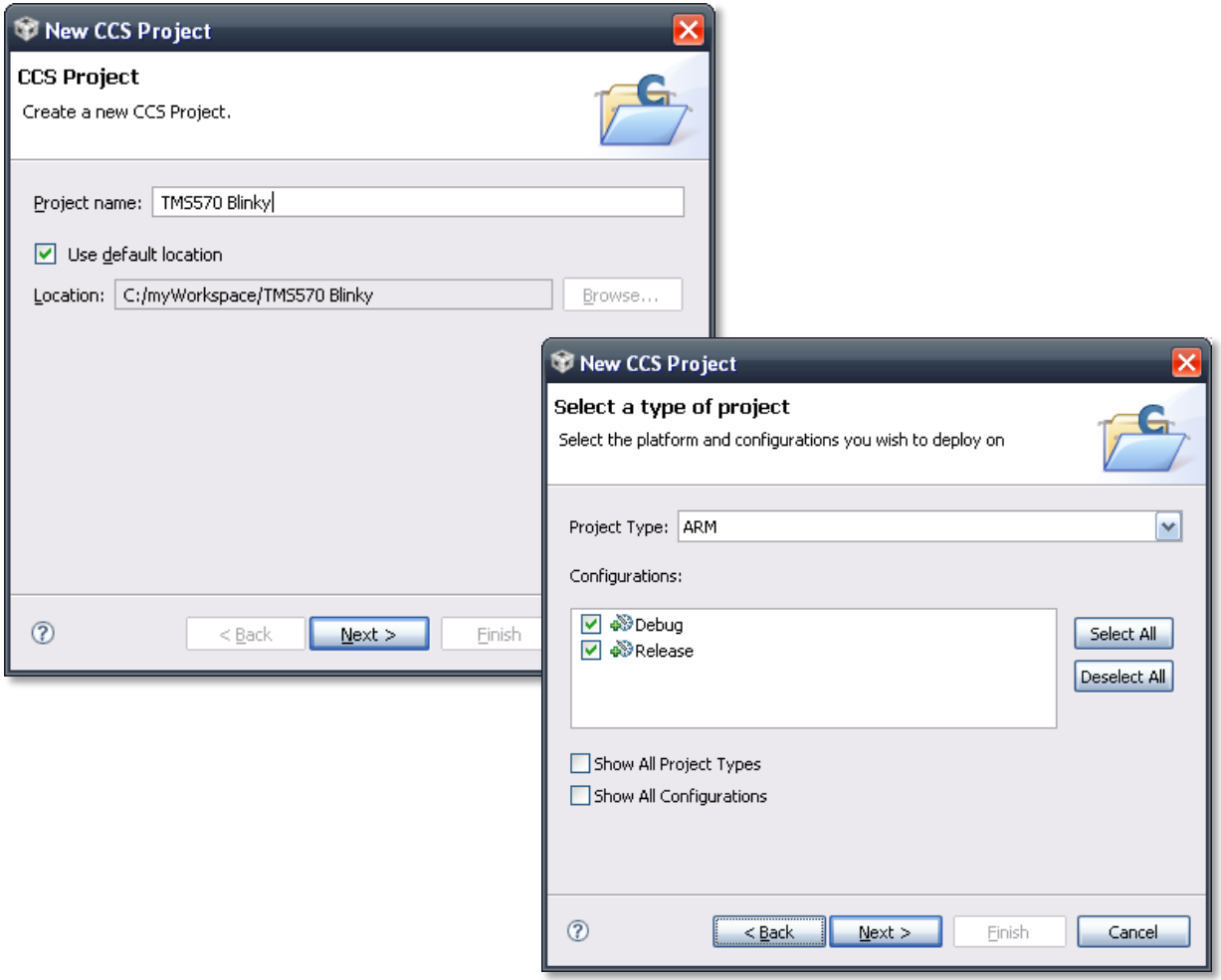
- Launch Code Composer Studio v4.x (CCS)
  - Start → Programs → Texas Instruments → Code Composer Studio v4 → Code Composer Studio v4
- When it launches, CCS will ask you to select a workspace, we will chose "C:\myWorkspace"
- Once it loads, go to File → New → CCS Project



For more help with Code Composer Studio, see this getting started video: LINK

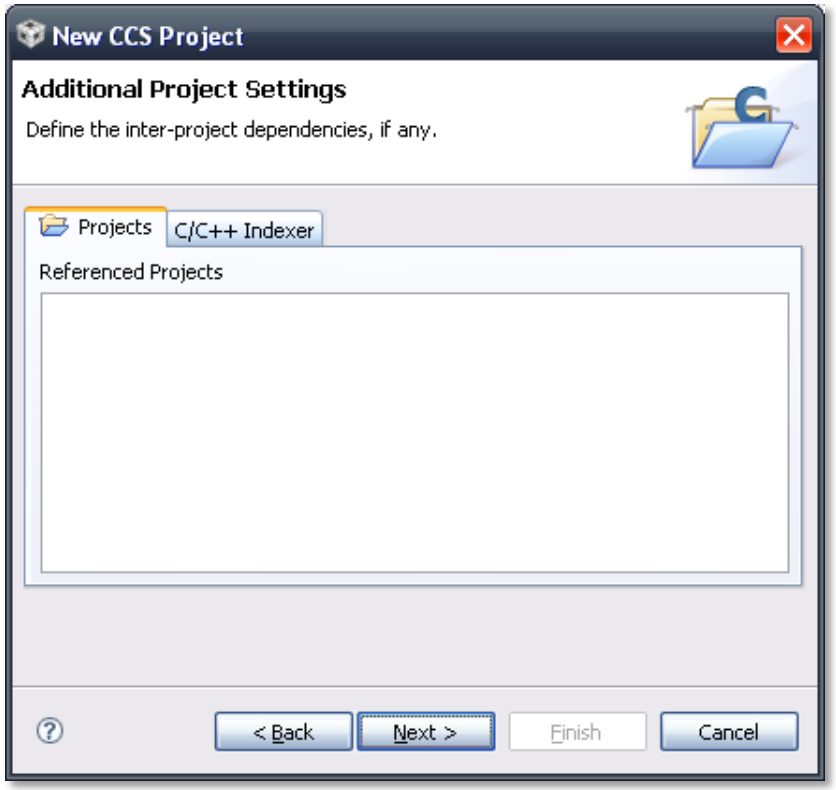
Setting up our Project

- Our project name needs to match the name of our HALCoGen Project, TMS570 Blinky
- Then Click “next”
- On the next page, make sure that your project type is set to ARM and Debug and Release are both checked
- Then Click “next”



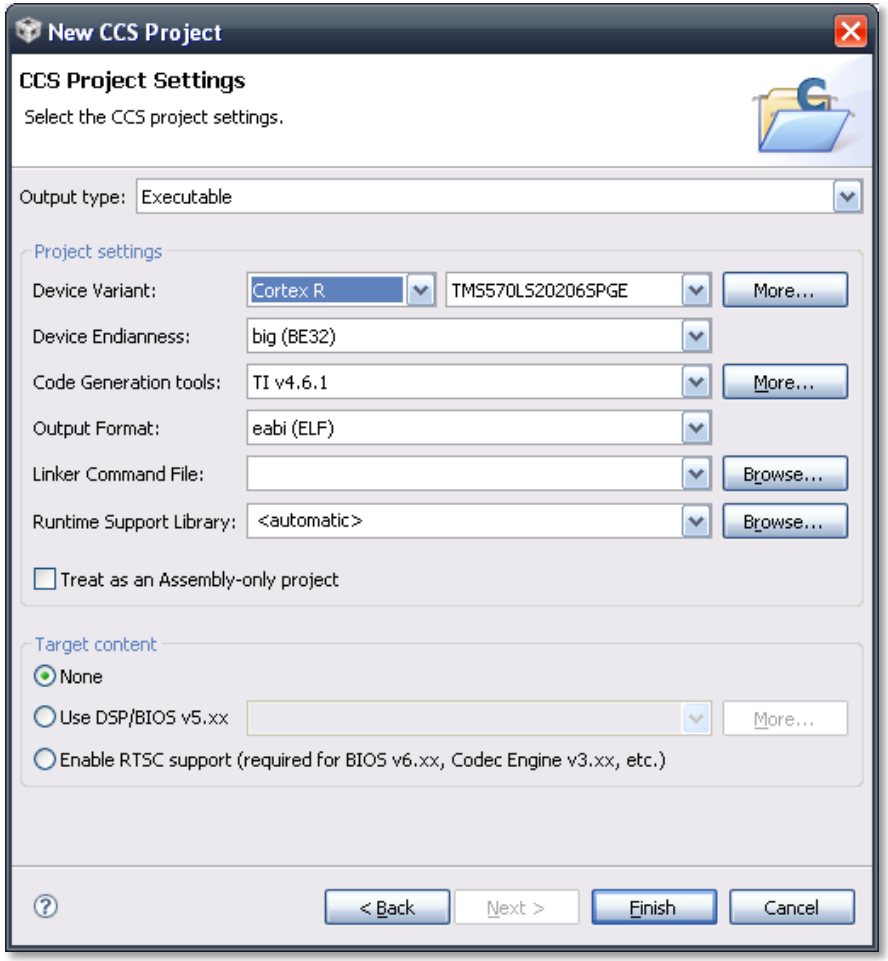
Setting up our Project (cont.)

- We are not using any referenced projects so click “next” again



Setting up the Project (cont.)

- Lastly, set the Device Variant to “Cortex R” and TMS570LS20216SPGE
- Click “Finish”

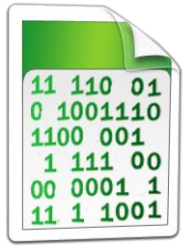


Getting Started

- On the left hand side in the “C/C++ Projects” explorer, open “sys_main.c”
- When ever you generate code in HALCoGen, the program overwrites user code, except specific sections marked by “USER CODE BEGIN (x)” and “USER CODE END”
  - For code placement we will be referring to the number within the User Code block

```
/* USER CODE BEGIN (0) */
/* USER CODE END */
```

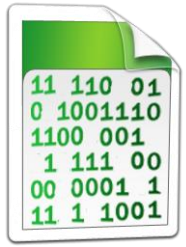
Writing the Code



- Inside User Code 1, copy the code below.

```
/* USER CODE BEGIN (1) */
#include "het.h"
/* USER CODE END */
```

Writing the Code cont…



- Then in User Code 3, copy the code below.

```
/* USER CODE BEGIN (3) */
int temp,delay;
    /** - Delay Parameter */
   delay = 0x200000;
    /* Set HET port pins to output */
    gioSetDirection(hetPORT, 0xFFFFFFFF);
    while(1)
    {
    /* Set HET port pin 1 high */
    gioSetBit(hetPORT, 1, 1);
    /** - Simple Delay */
    for(temp=0;temp<delay;temp++);
   /* Set HET port pin 1 low */
    gioSetBit(hetPORT, 1, 0);
    /** - Simple Delay */
    for(temp=0;temp<delay;temp++);
    }
/* USER CODE END */
```

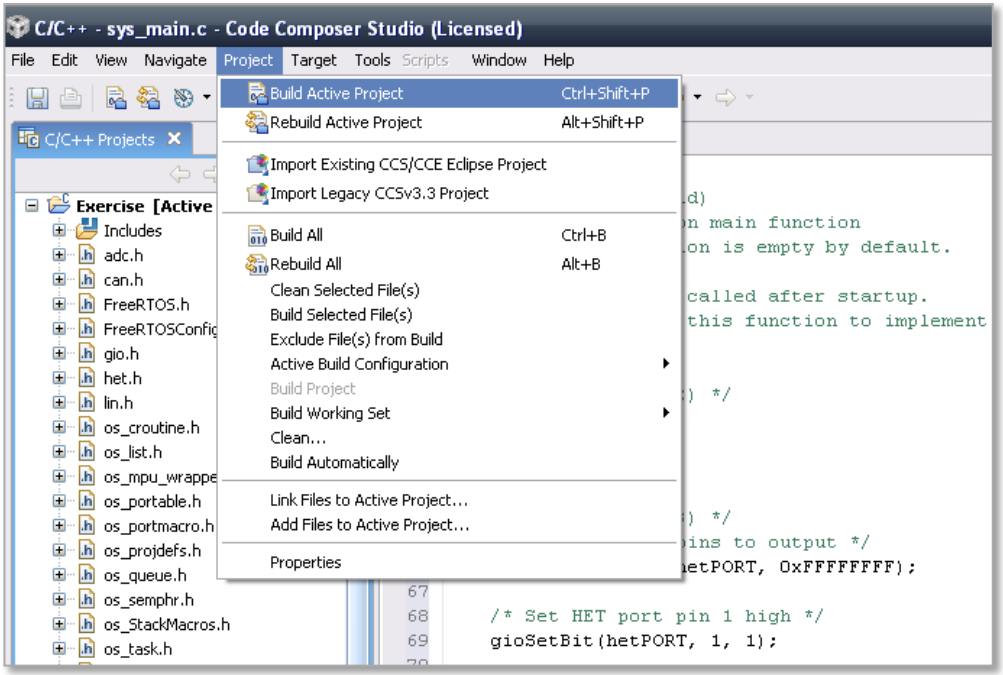
Notifications

- Lastly we must insert a function that would be called if interrupts were enabled. Without these, the code will fail to build

```
/* USER CODE BEGIN (4) */
/* GIO Notification function not used, but required by compiler */
void gioNotification(int bit)
{
    return;
}
/* USER CODE END */
```

Compiling the Project

- The code is now complete and we are ready to build our project.
  - Go to Project → Build Active Project

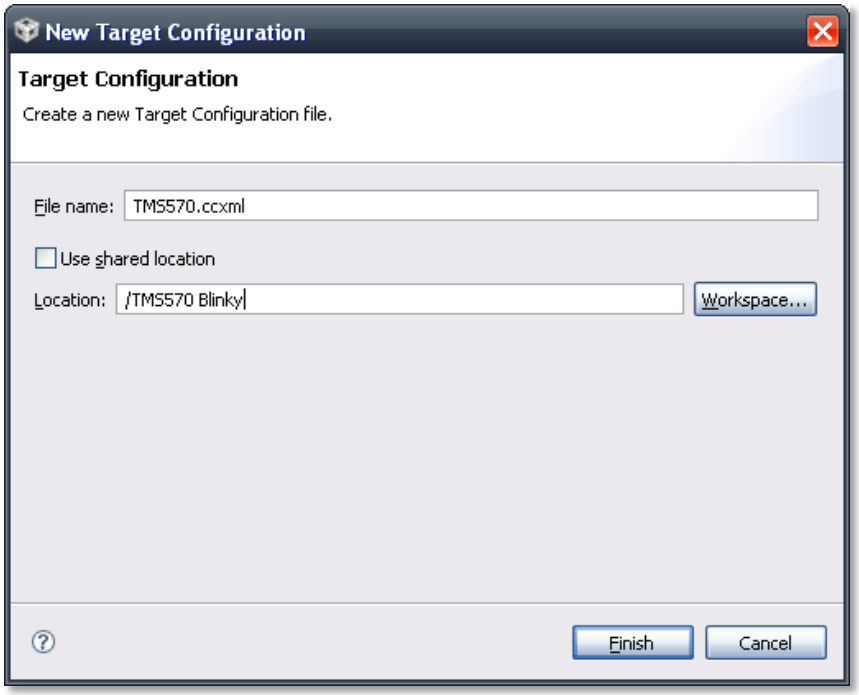


- Now that we have our .out file, we need to program the microcontrollers Flash memory.

Creating a Target Configuration

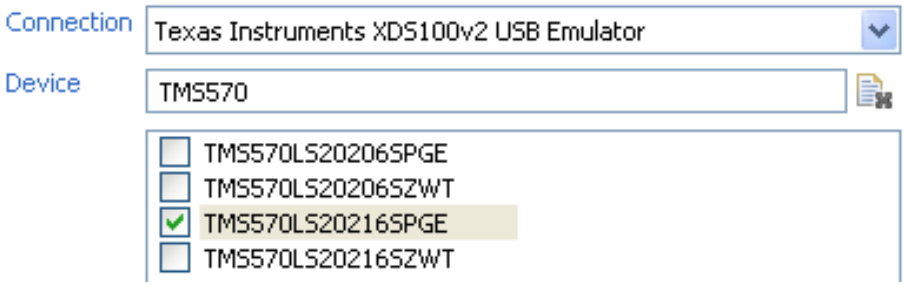
- Before we begin, we must make a new target configuration, this tells CCS4 what device this project is designed for.
  - Target → New Target Configuration

- A new window will appear, we will make our file name “TMS570.ccxml”
- Click Finish



Creating a Target Configuration…

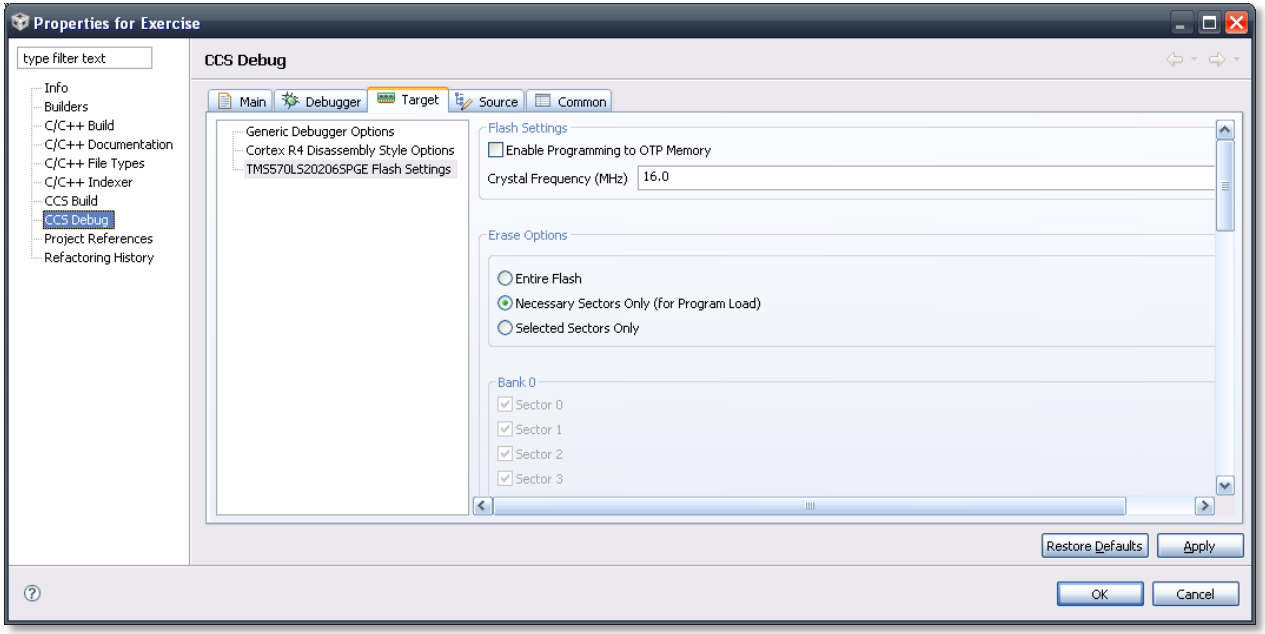
- A new tab will appear with a list of emulators and devices.
  - Connection: Texas Instruments XDS100v2 USB Emulator
  - In the text box labeled “Type Filter Text”, type “TMS570”.
    - This will narrow the search down to just TMS570 devices, select TMS570LS20216SPGE
  - Click “Save” on the right



Flash Programming Configuration

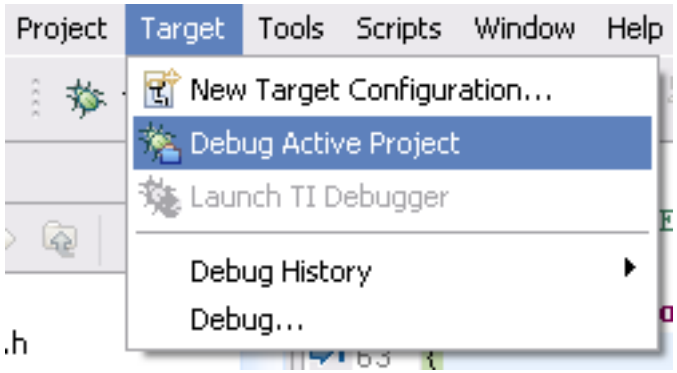
- It is possible to make the flash programming process much faster by only the necessary erasing and programming the necessary regions of flash memory.
  - To do so go to Project → Properties
  - In the window that appears select ‘CCS Debug’
  - In the CCS Debug window select the TMS570LS20216SPGE Flash Settings option in the ‘Target’ tab.
  - Then select the ‘Necessary Sectors Only’ option in the Erase Options area, then click the ‘Apply’ button.

NOTE:
This option is only available in CCSv4.2 and newer



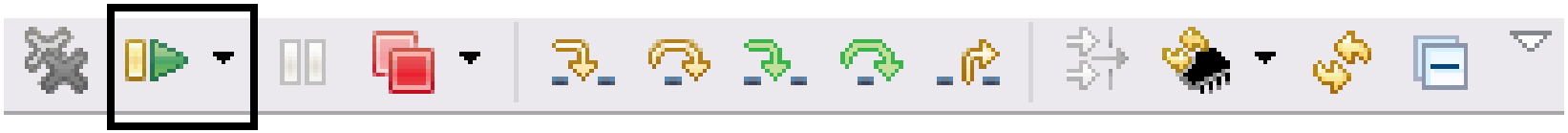
Programming the Flash

- We are now ready to program the flash.
  - Go to Target → Debug Active Project
  - A new window should appear as it programs the flash memory.
    - This may take a few moments.



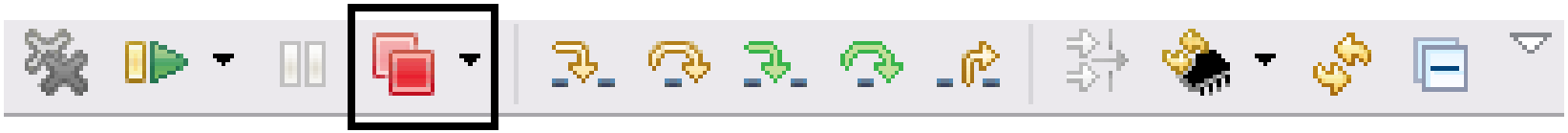
Testing our Program

- Click the green arrow on the debug tab to run our program



  - Alternatively the program can be run without the debugger connected by

- Clicking the red square on the debug tab to terminate the debugger's connection



- Hit the reset button on the board and the NHET[1] LED should blink.

- Congratulations! You have completed the lab.

For More TMS570 Information

- TMS570 Web Page: www.ti.com/TMS570
  - Data Sheets
  - Technical Reference Manual
  - Application Notes
  - Software & Tools Downloads and Updates
  - Order Evaluation and Development Kits

- TMS570 Forum: http://e2e.ti.com/support/microcontrollers/tms570/default.aspx
  - News and Announcements
  - Useful Links
  - Ask Technical Questions
  - Search for Technical Content
- TMS570 WIKI: http://processors.wiki.ti.com/index.php/Category:TMS570
  - How to guides
  - Intro Videos
  - General Information

Thank You!

For completing this TMS570 example