P6-2-1A UART

Welcome back to Cypress Academy, PSoC 6 101. In next few videos I will show you the basic building blocks to create our BLE-Controlled robotic arm; this will include a UART terminal interface, PWMs to control the servo motors, EZ-I2C dashboard interface, digital logic-based kill switch, capacitive sensing controls and an advanced technique for debugging RTOS applications. As I go through these videos, I will first create a bare metal implementation so you understand the basics for each peripheral function and then we’ll integrate those functions with an RTOS into the BLE-controlled robotic arm project.

Let’s start with the UART interface to a PC terminal client. The UART interface is great as a rudimentary debug interface when developing an application. It can also be used as a basic communications peripheral for other system ICs.

First, we will add a new project to our previously used workspace. Let’s call this “BasicUART”.

As with our other projects, let’s drag and drop the UART component on to the schematic. Double click again to edit. Let’s call it “UART”. All the other settings look good, so click okay.

Double click on the pins file under the design wide resources and assign the RX and TX to P5[0] and P5[1].

On the back of the PSoC 6 BLE Pioneer board, you can actually see the silkscreen notes regarding the I/Os. This is a nice quick reference as you build out these projects.

So, everybody likes to use printf. How do I make that work? To do that I need to re-target *stdout* to the UART. We’ve built a library that will allow you to re-target which we call *Retarget I/O*. To include this library into your project, open build settings, click on PDL, scroll to down and click the check box next to *Retarget I/O*.

Now let’s generate the application. Once that’s done, you’ll see a file called “stdio\_user.h” that’s been generated in the Shared Files folder. This is where you configure which UART you want *stdout* and *stdin* to point to. Scroll down to the first few lines of code. We need to insert *#include project.h* so we can then reference the appropriate UART below. Next, go to *#define IO\_STDOUT\_UART* and tell it which hardware block is being used (i.e. which SCB you are using). Creator generates a macro that you can use so that you don't need to figure out which specific hardware block is used. In this case, the name is *UART\_HW*, which is your instance name appended with *\_HW*. Then do the same for #define IO\_STDIN\_UART. And now our retarget I/O library setup is complete.

We’re going to control the UART with the Cortex-M4, so let’s open the M4 main application file. Start the UART using the API call. Standard IN is typically buffered, which means characters go into a buffer but you don’t know they’re there until you read. I want to turn that off for this program so we can handle each character as it comes in. To do this, we’ll write a line of text, setvbuf( stdin, NULL, \_IONBF, 0).

For this basic project I just want to echo the characters the PSoC 6 receives back to the terminal client. So, let’s create a character variable called c. Let’s show that printf works by printing out “Started UART example”. Now, in our main loop, let’s get a character, see if anything was returned, then print that character.

And that’s it, now time to build, program and test it.

First I’m going to open the Windows’ device manager to see which COM port the KitProg is attached to. You can see which COM port it’s attached to under Ports. It will be labeled KitProg2 USB-UART.

Now open up your favorite terminal client and attach it to the correct COM port at 115200 baud 8-n-1. I know the baud rate and 8-n-1 setting because they are in the component configuration dialog we saw earlier.

Now in the terminal client whatever I type is now echoed back to me on the screen…in this case, PSoC 6 is awesome! Which I completely agree with!

In the next video I am going to show you how to take this UART Starter project, move it into an RTOS and take the first steps in building the main robot arm controller project

You can post your comments and questions in our PSoC 6 community or as always you are welcome to email me at alan\_hawse@cypress.com or tweet me at @askioexpert with your comments, suggestions, criticisms and questions.