# Start a New Project with Keil MDK-ARM Version 5 and Atmel SAMD21

This tutorial is intended for starting a new project to develop software with Atmel SAMD21 Xplained Pro board (with the device ATSAMD21J18A) using Keil Microcontroller Development Kit for ARM (MDK-ARM) version 5.21a.


## Create a New Project in Keil MDK v5.21

1. Launch Keil uVision IDE by double clicking on the icon 

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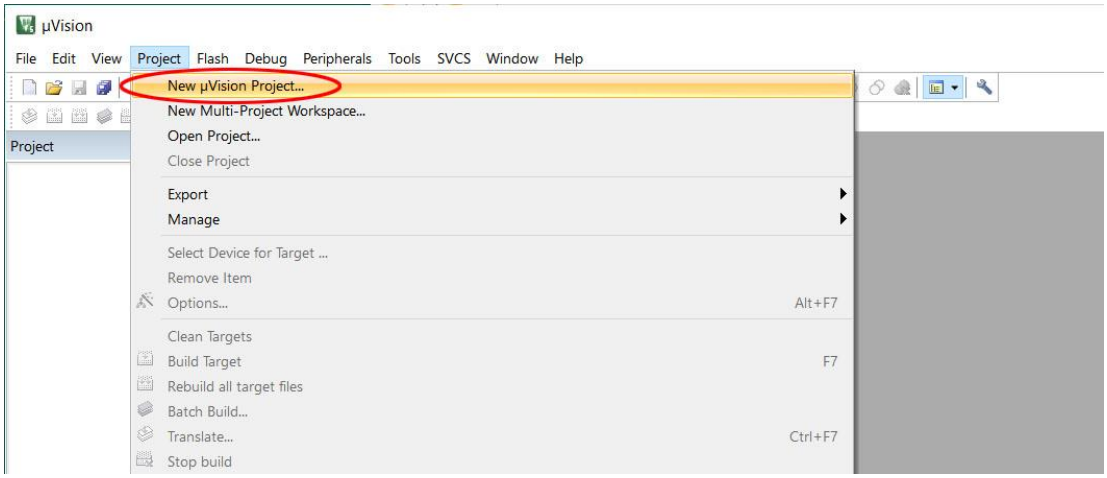
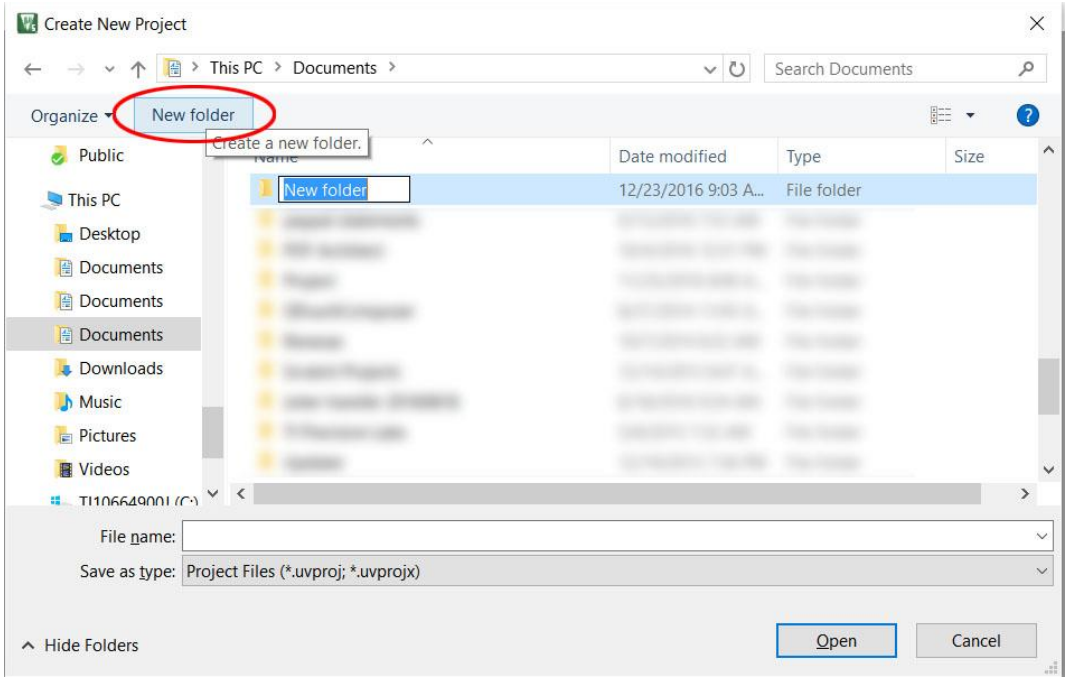
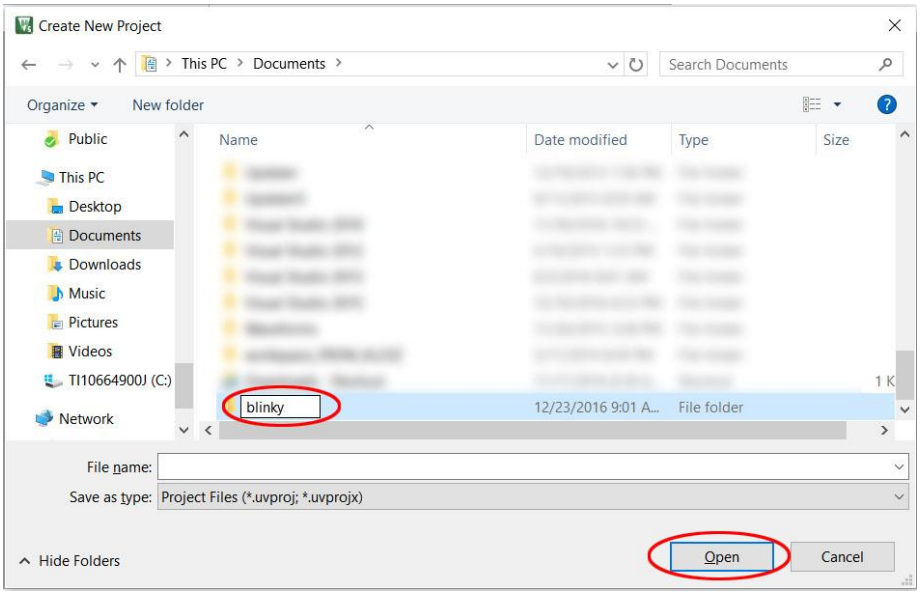
2. From menu, select Project>New uVision Project…



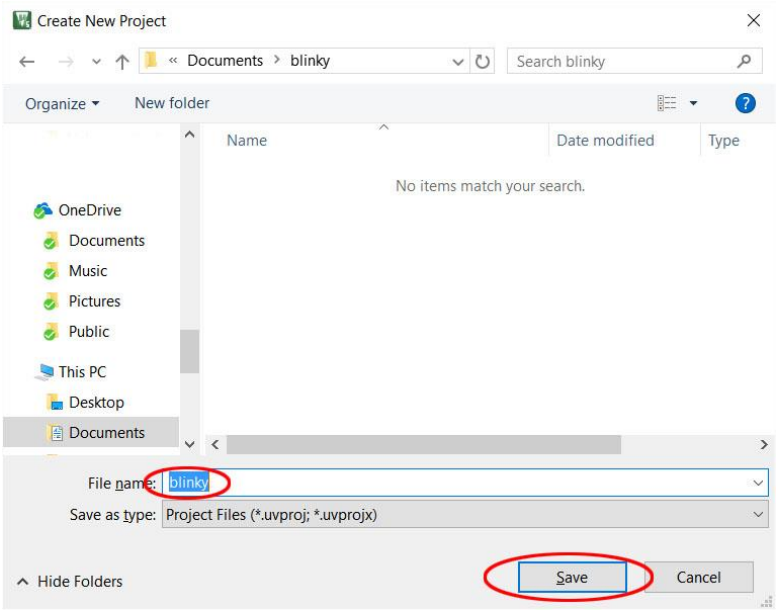
3. In the “Create New Project” dialog box, click “New folder”. Browse to a folder location where you would like to create your project folder.



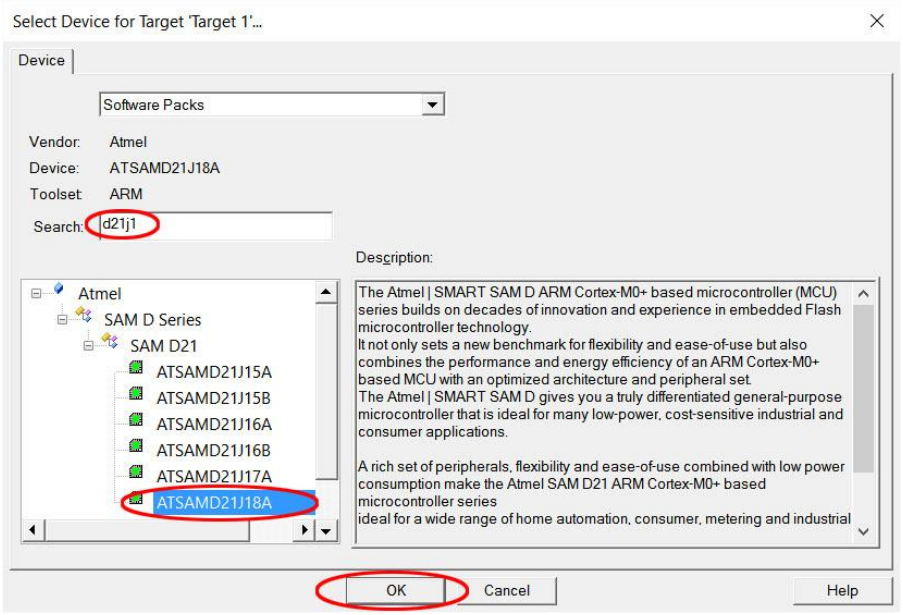

4. Type in the folder name, for example, “blinky”, then click the “Open” button. This will create a folder named “blinky” to hold all the files for the new project. It will also take you inside that folder.



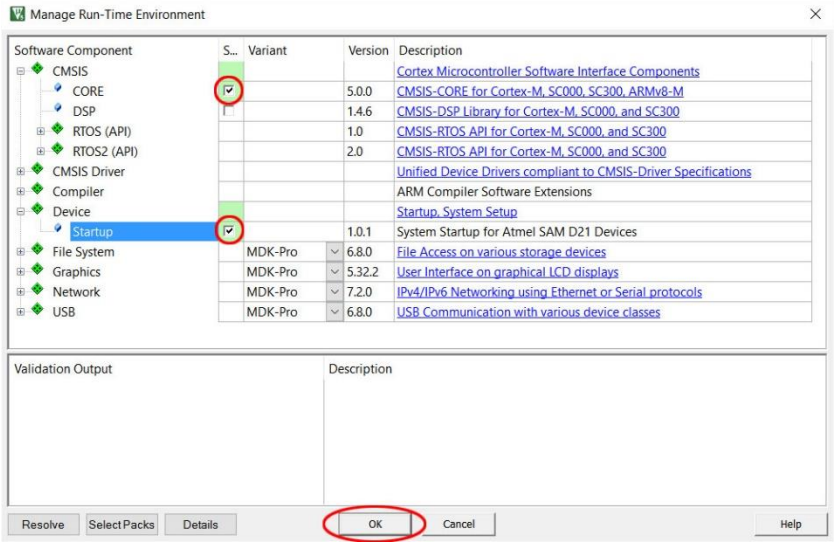

5. While in the project folder, type “blinky” in the File name field and click “Save” button. This creates a project with the project named “blinky”. Although we used the same name for the project folder and the project, they do not have to be identical.



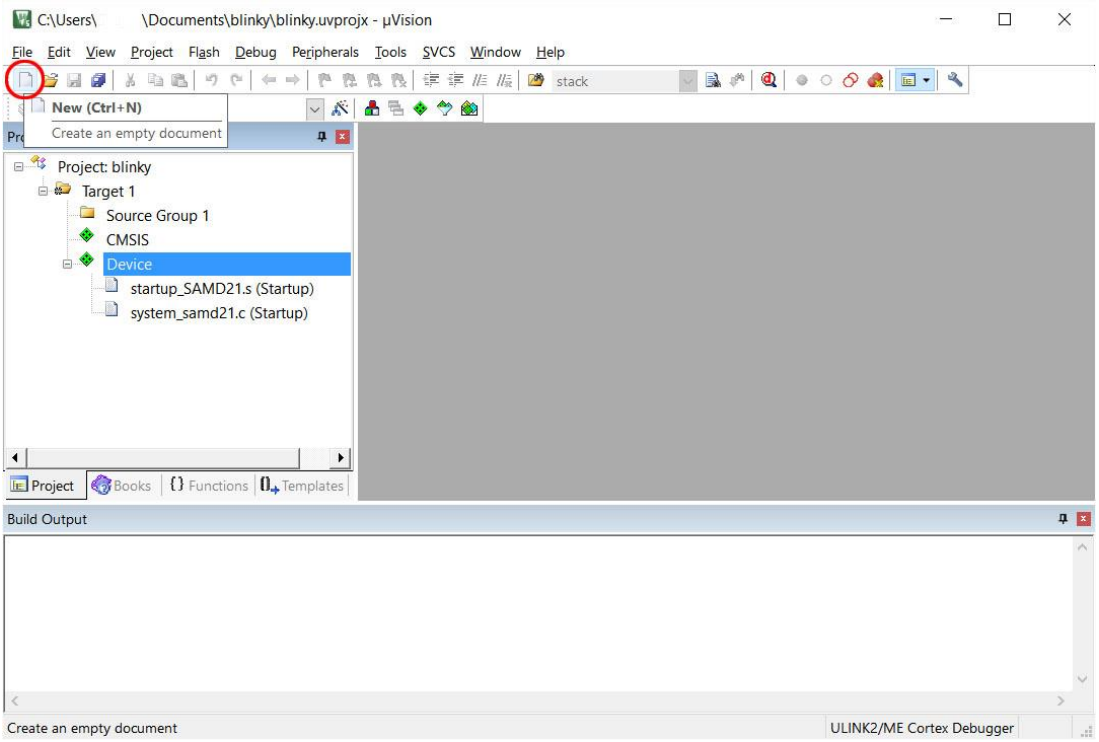

6. The Project Wizard will prompt you to select the device type for the project target. You may drill down the device family tree to find "ATSAMD21J18A". If you installed a large number of supported devices, it may take a while to find the device in the family trees. In that case, type in a unique substring of the device name in the "Search" field and the matching devices will appear in the window below. Click select the device type then click "OK" button.



7. Next, the Project Wizard will help you manage the run-time environment. Expand the Software Component selections, check “CMSIS>CORE” and “Device>Startup” then click “OK” button.



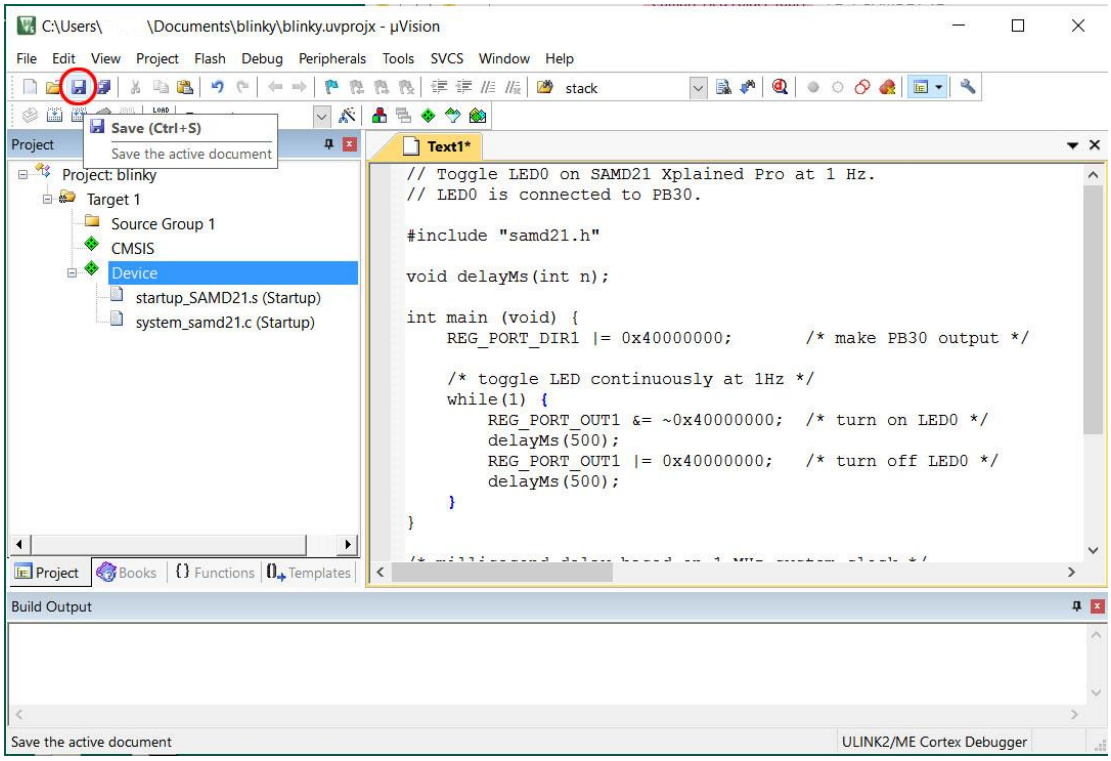

8. You should see a project with a target created in the Project pane. If you click the + signs to open the target, you would see the CMSIS and startup codes for the specific device were created in the project. Click “New” button for a new text file in the editing window.



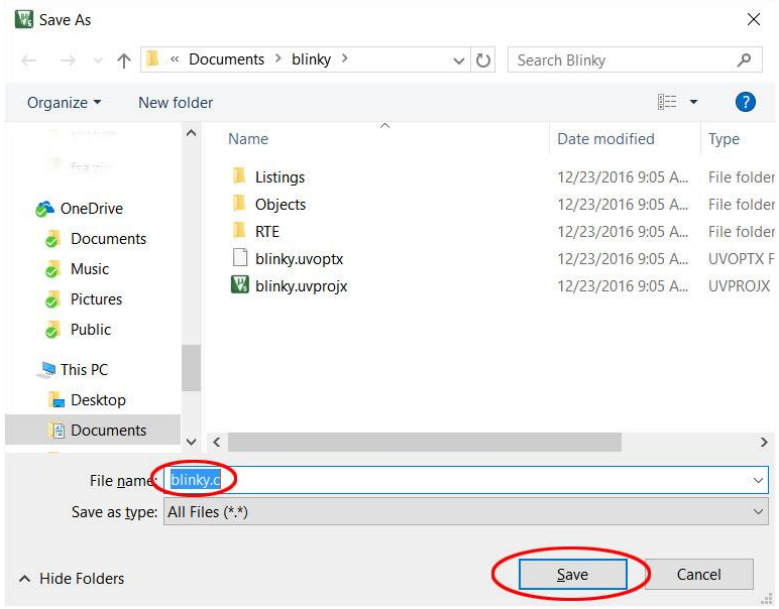
9. Copy the code below into the new text file window. This is a simple program to blink the LED0 on the SAMD21 Xplained Pro board.

```
// Toggle LED0 on SAMD21 Xplained Pro at 1 Hz.
// LED0 is connected to PB30.

#include "samd21.h"

void delayMs(int n);

int main (void) {
    REG_PORT_DIR1 |= 0x40000000;        /* make PB30 output */

    /* toggle LED continuously at 1Hz */
    while(1) {
        REG_PORT_OUT1 &= ~0x40000000;  /* turn on LED0 */
        delayMs(500);
        REG_PORT_OUT1 |= 0x40000000;   /* turn off LED0 */
        delayMs(500);
    }
}

/* millisecond delay based on 1 MHz system clock */
void delayMs(int n) {
    int i;
    for (; n > 0; n--)
        for (i = 0; i < 199; i++)
            __asm("nop");
}
```

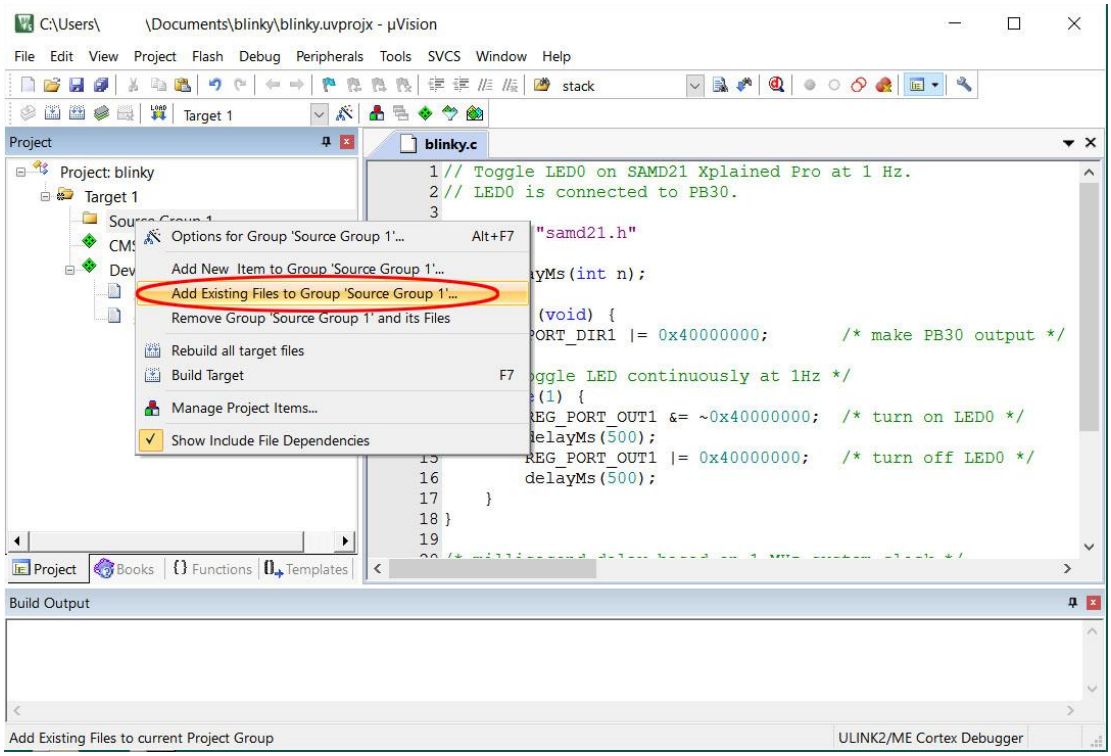
10. Click “Save” button to save the file with the code. By default the file will be saved in the project folder.



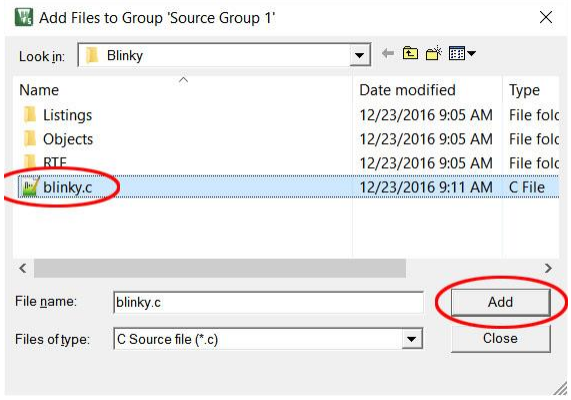

11. Give the file name “blinky.c” and click “Save” button. The editor is context sensitive. Once you make it a C source file, the file content will change the color.



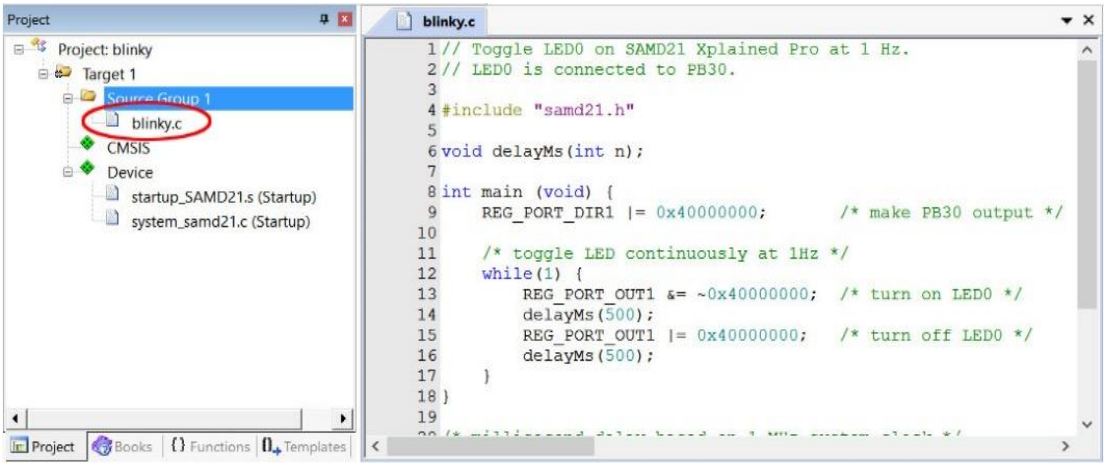
12. Once the source file is saved, it needs to be associated with the project. Right click on "Source Group 1" and select "Add Existing Files to Group 'Source Group 1'…".



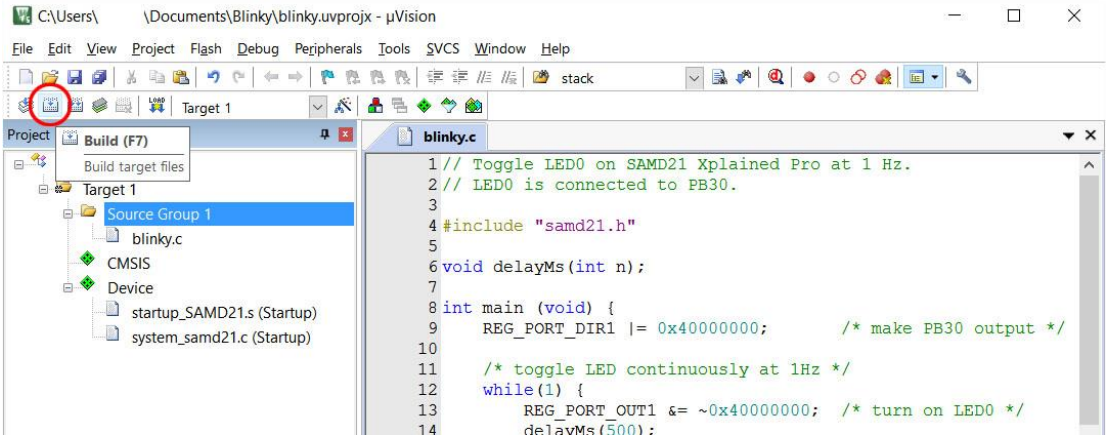

13. Locate the file blinky.c, click select it then click the "Add" button. Click "Close" button to proceed.



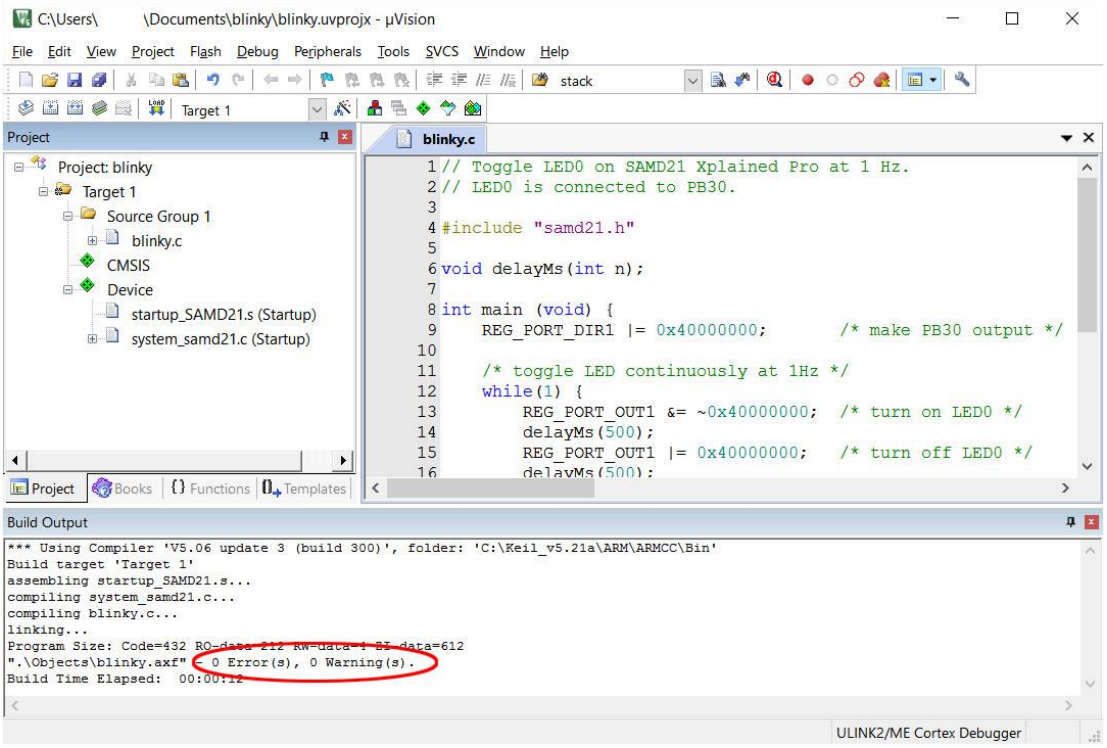
14. Once the file is added to the project, it will appear under “Source Group 1”.




15. Click “Build” button to build the project.

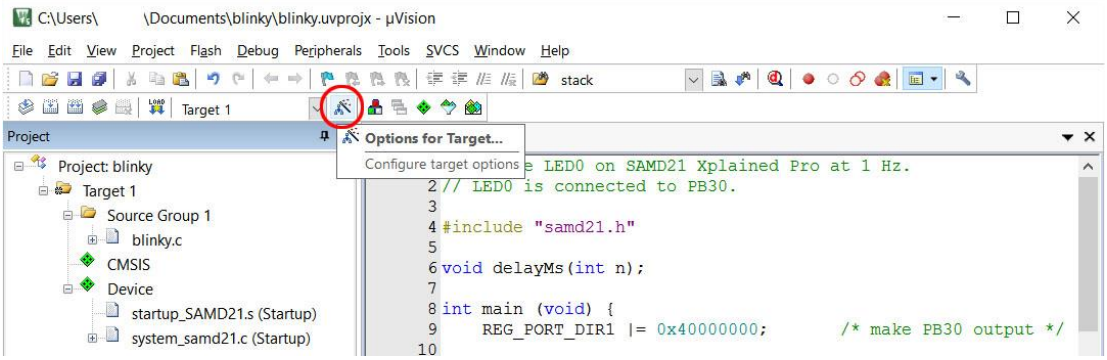


16. You should get a clean build with this project with 0 Error and 0 Warning.

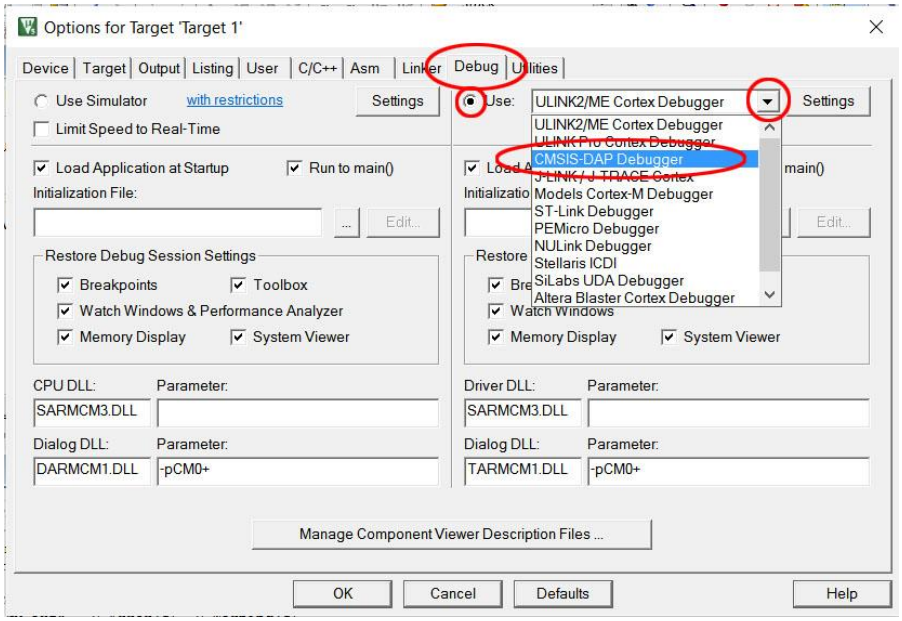



17. Once the project is built, we need to configure the debug interface so that the program may be downloaded to the target. Make sure the Atmel SAMD21 Xplained Pro board is connected to the computer with the USB cable.

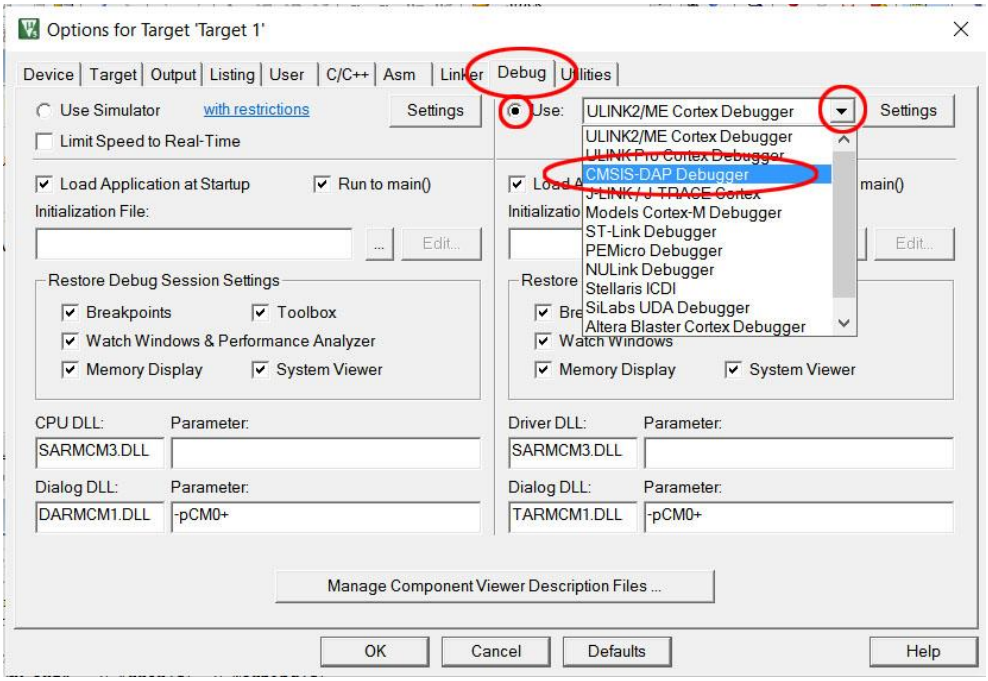
18. Click “Options for Target…” button.



19. Select Debug tab. Click the radio button before “Use:”. Click the pull-down menu on the right and select “CMSIS-DAP Debugger”.

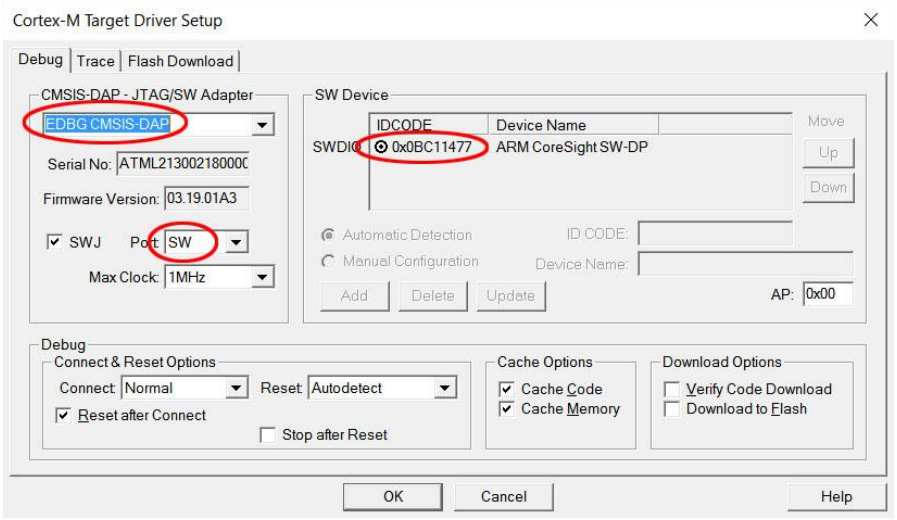



20. Verify that “Load Application at Startup” and “Run to main()” are checked. Click the “Settings” button.

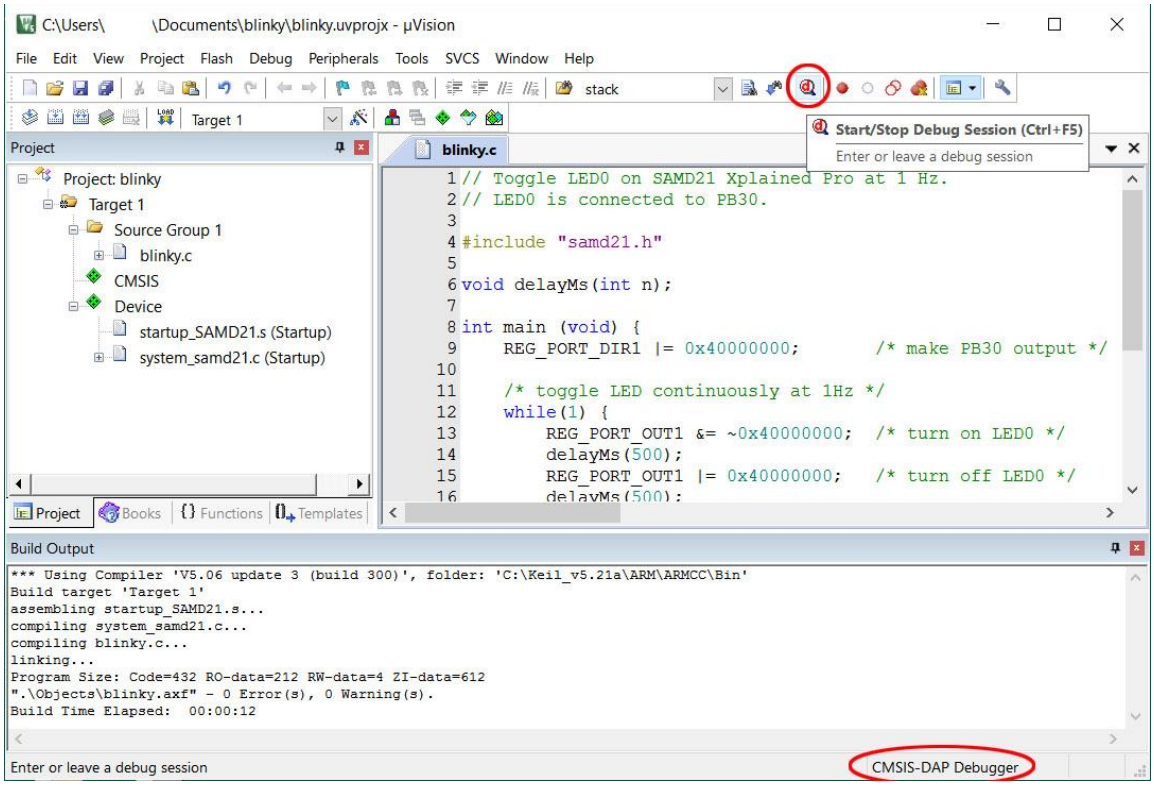



21. In the next dialog box, pull down the Port: and select “SW”. The Atmel SAMD21 Xplained Pro board uses “Serial Wire” debug interface, not JTAG. If the board is properly connected to the computer, the debug interface information should be filled in the dialog box automatically. Click “OK” button to

close it then click “OK” button to close the Options dialog box.

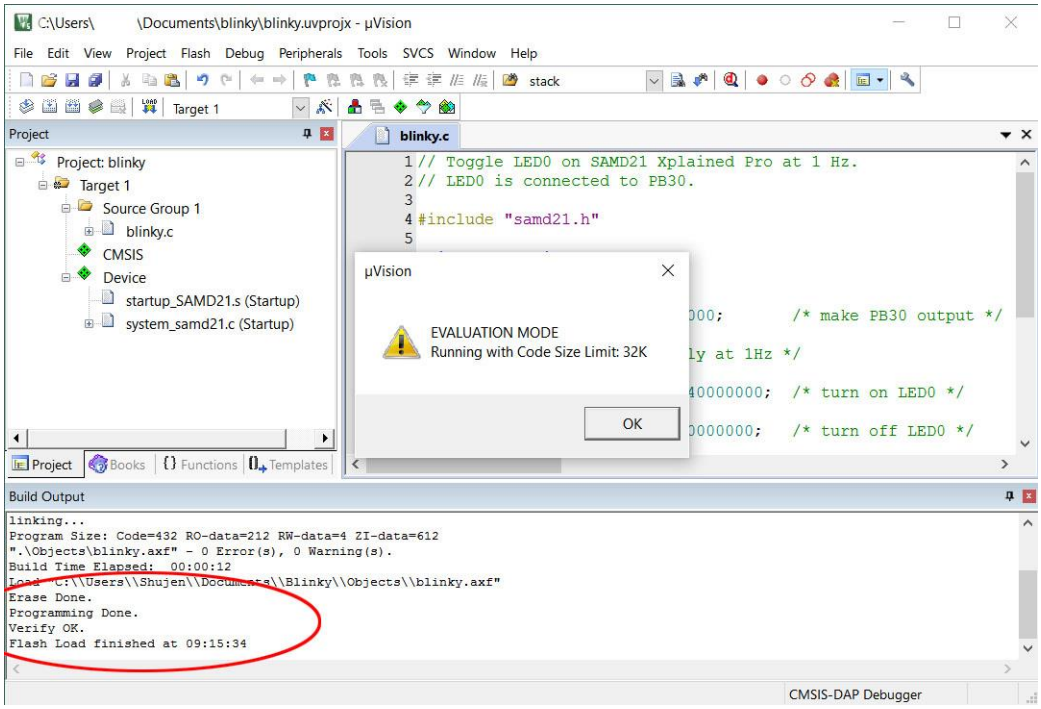



22. The selected debug interface should appear at the lower right corner. Click on the “Start/Stop Debug Session” button to launch the debugger.

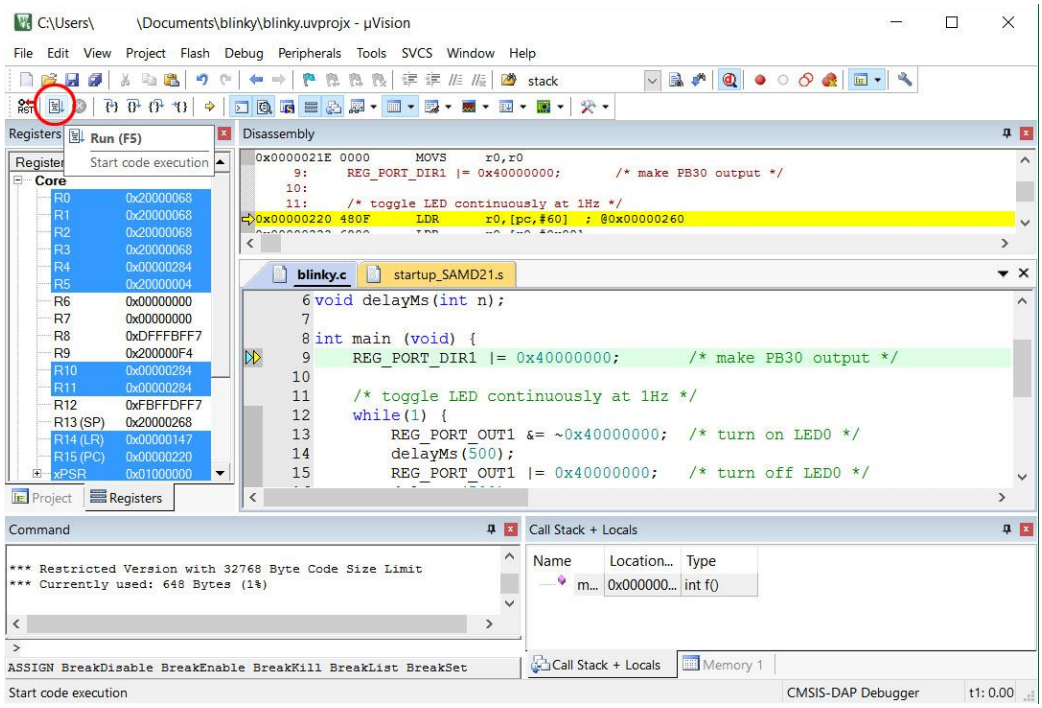



23. The programmer progress bar appears at the bottom of the window. When done, the message should appear in the Build Output pane. If you are using the evaluation version of the Keil uVision, a warning of the code size limitation will pop up after the target device is programmed. Click “OK” to

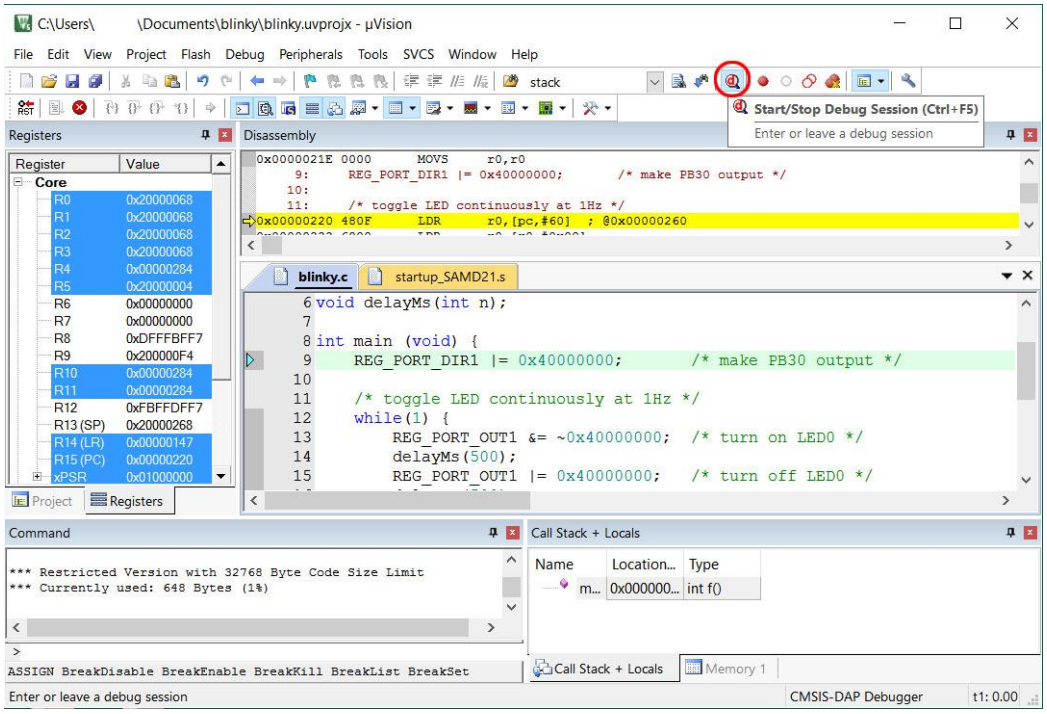
close the size warning message dialog box.




24. The uVision IDE should change to the debug perspective. Click “Run” button and the program will start running and the LED0 blinks.



25. To stop the debug session and return to the build project perspective, click on the “Start/Stop Debug Session” button.




26. Congratulations! You have successfully finished the first programming project for Atmel SAMD21 Xplained Pro board using Keil MDK v5 uVision IDE!