How to Debug TrustZone Project on MCUXpresso DIE

This document introduces how to debug TrustZone project on MCUXpresso IDE.

Use the latest version of MCUXpresso IDE v10.3.1.

Project is from SDK_2.5.0_LPCXpresso55S69.

Board is LPCXpresso55s69, use the LinkServer debug probe(on board debugger).

Every TrustZone based application consists of two independent parts - secure part/project and non-secure part/project. The secure project is stored in SDK_2.5.0_LPCXpresso55S69\boards\lpcxpresso55s69\trustzone_examples\<application_name>\ cm33_core0 \<application_name>_s directory. The non-secure project is stored in SDK_2.5.0_LPCXpresso55S69\boards\lpcxpresso55s69\trustzone_examples\<application_name>\ cm33_core0 \<application_name>_ns directory. The secure projects always contains TrustZone configuration and it is executed after device RESET. The secure project usually ends by jump to non-secure application/project.

In this document, we use “hello_world” as example, this project contains both “hello_world_s” and “hello_world_ns” projects. Unlike Keil or IAR IDE, MCUXpresso IDE can’t debug jump directly from secure project to no-secure project, so we need add the no-secure executable file to secure project debug configuration manually(For this version of MCUXpresso IDE v10.3.1, we need do this step, while

for the later new versions, maybe they support jump directly from secure project to no-secure project).

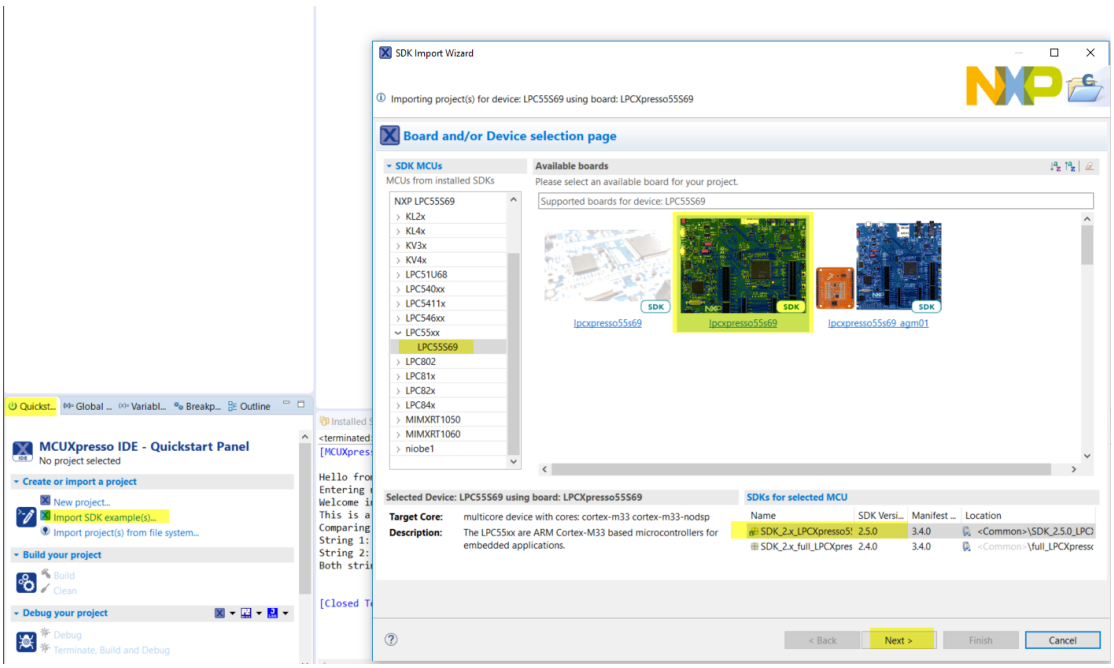
Steps outline:

1. Import “hello_world_s” and “hello_world_ns” project.
2. Build “hello_world_s” and “hello_world_ns”, without any error.
3. Erase flash.
4. Program no-secure project “hello_world_ns ”.
5. Kill active debug.
6. Add the location of file “lpcxpresso55s69_hello_world_ns.axf” to Debugger commands of “hello_world_s” project, and download “hello_world_s” project.
7. After finish download, it stop at “hello_world_s” project, set a breakpoint at “hello_world_ns” project:
8. Debug project

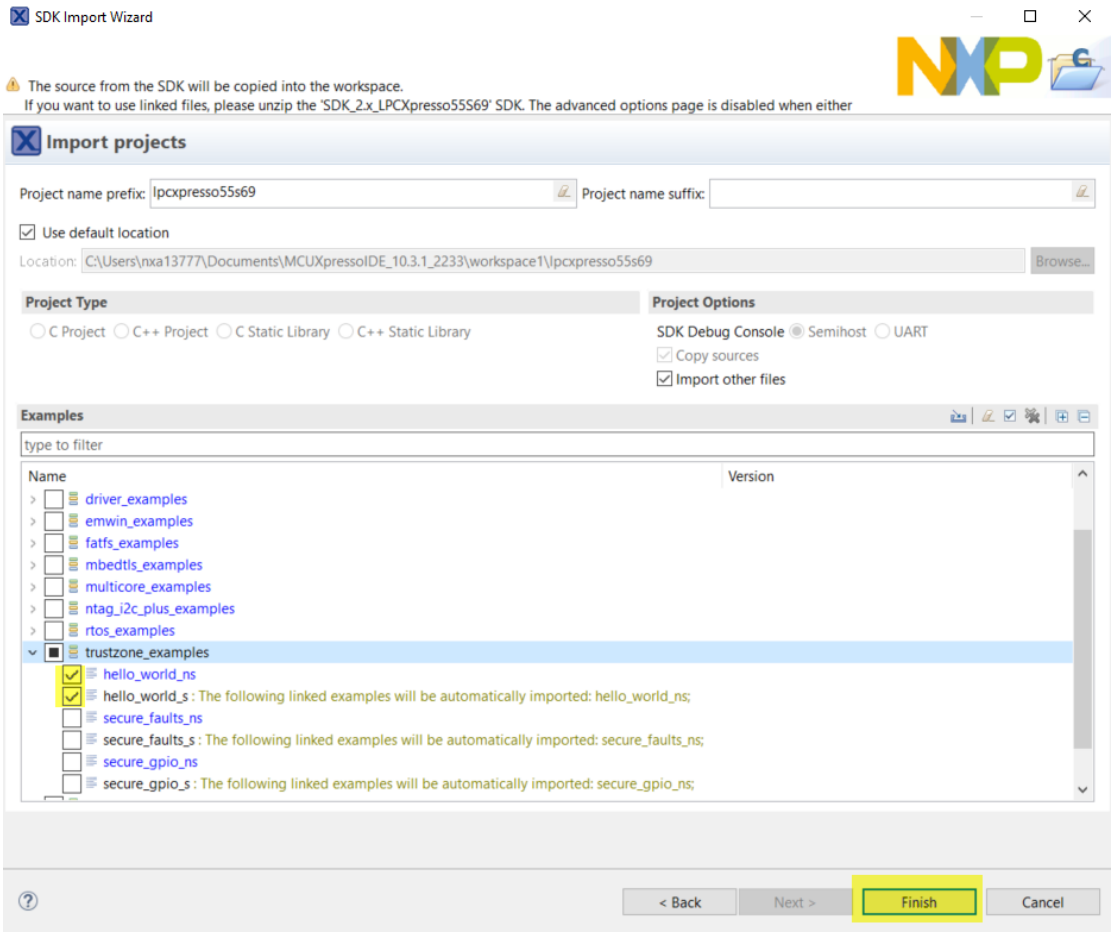
Detailed steps as below:

1. Import “hello_world_s” and “hello_world_ns” project:

Click “Import SDK example(s)…” under “Quickstart Panel”-> choose LPC55s69-> choose SDK 2.5.0 if there is not only one version SDK package->Next.

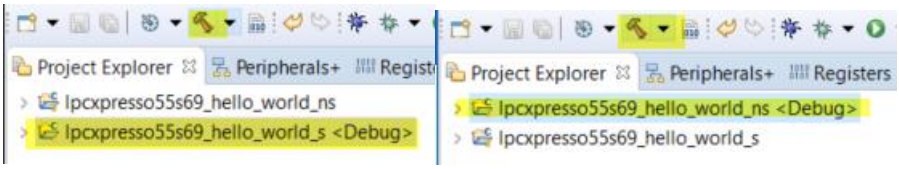


Choose the two projects -> Finish.



2. Build “hello_world_s” and “hello_world_ns”, without any error:

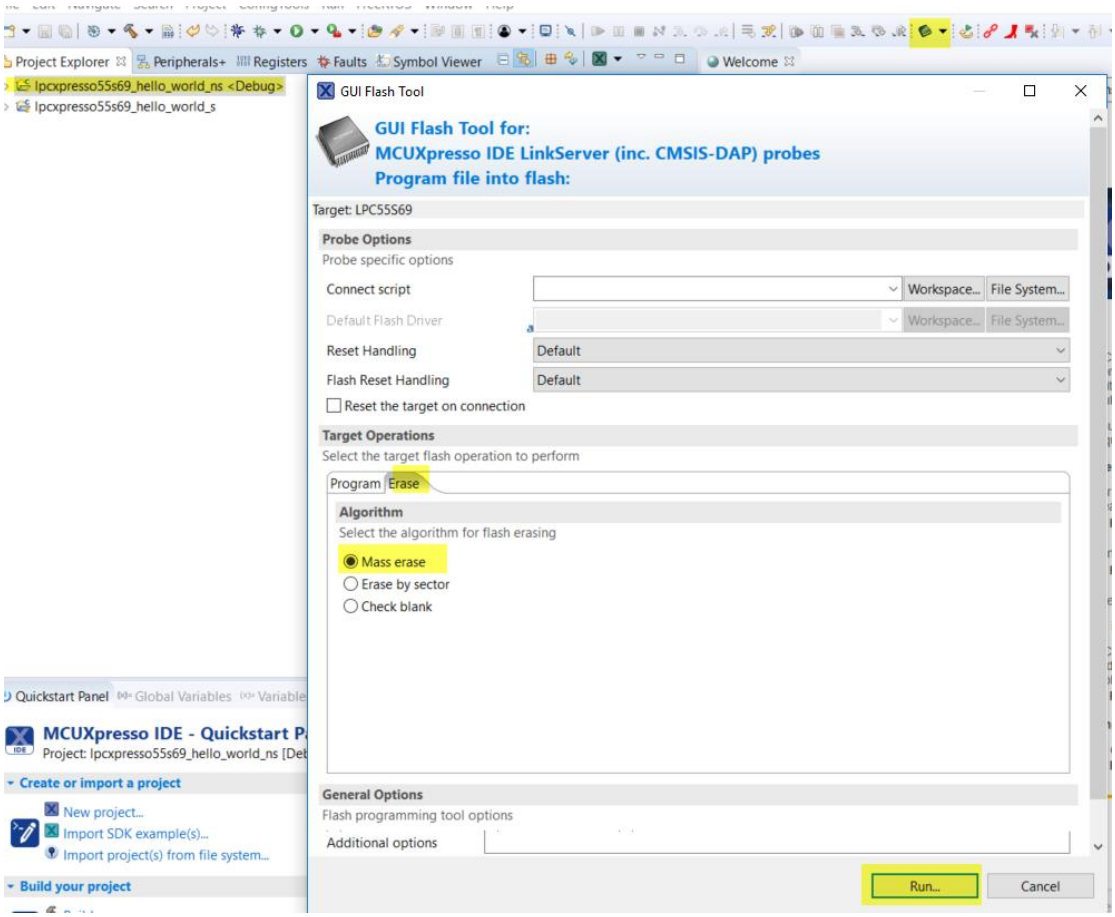
Please pay attention, build “hello_world_s” project first, then build “hello_world_ns”, or there will be error.



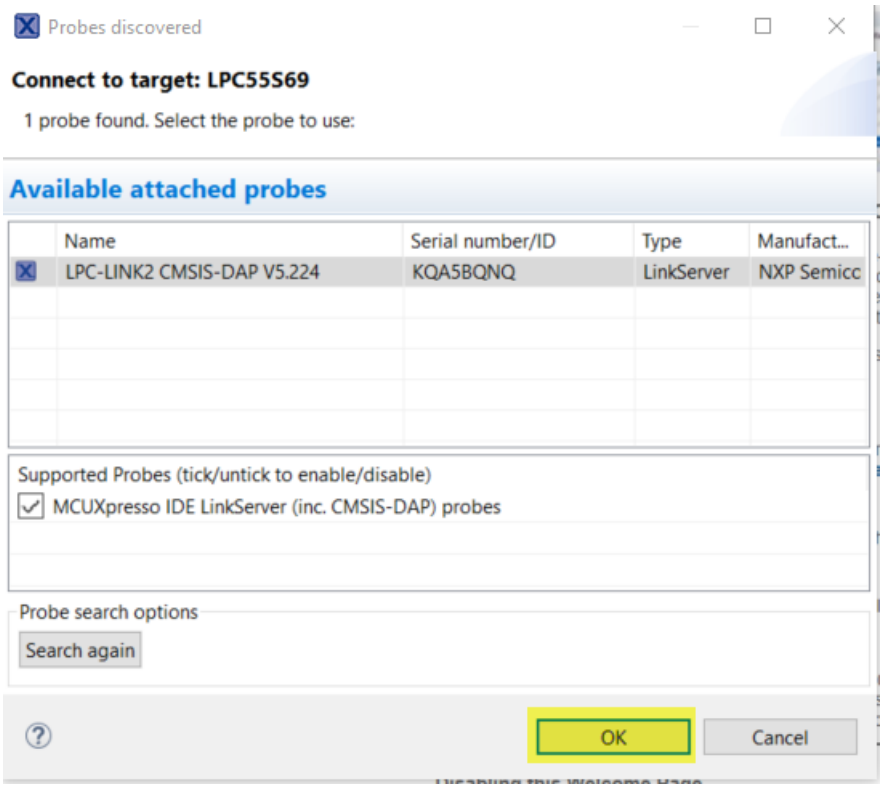
3. Erase flash:

Before debug project, recommend firstly erase flash. Because after debug secure project we need erase flash for next time to debug, or it will fail. Just in case last time your board debug secure project, so please erase it.

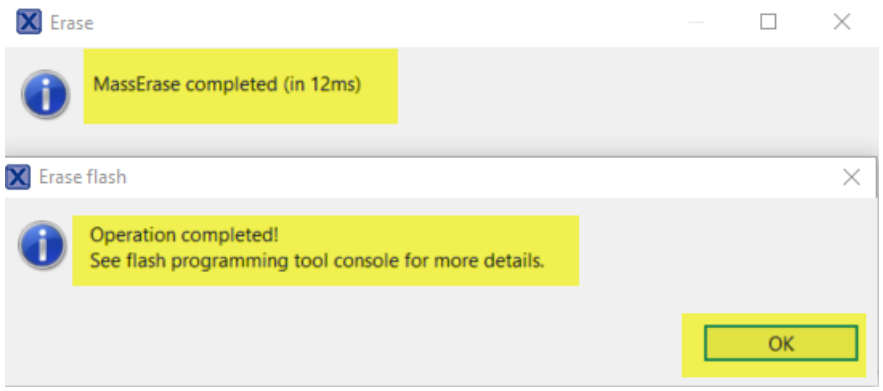
-Short J10(connect p0_5 to ground) while pressing and releasing Reset (S4) to force the LPC55S69 into ISP mode, ->select “hello_world_ns” as active, ->then use the “Mass erae” function of GUI Flash Tool to erase:



- Click Run… button, it will shows the below picture, click OK.



- Finish erase, it shows MassErase completed reminder:

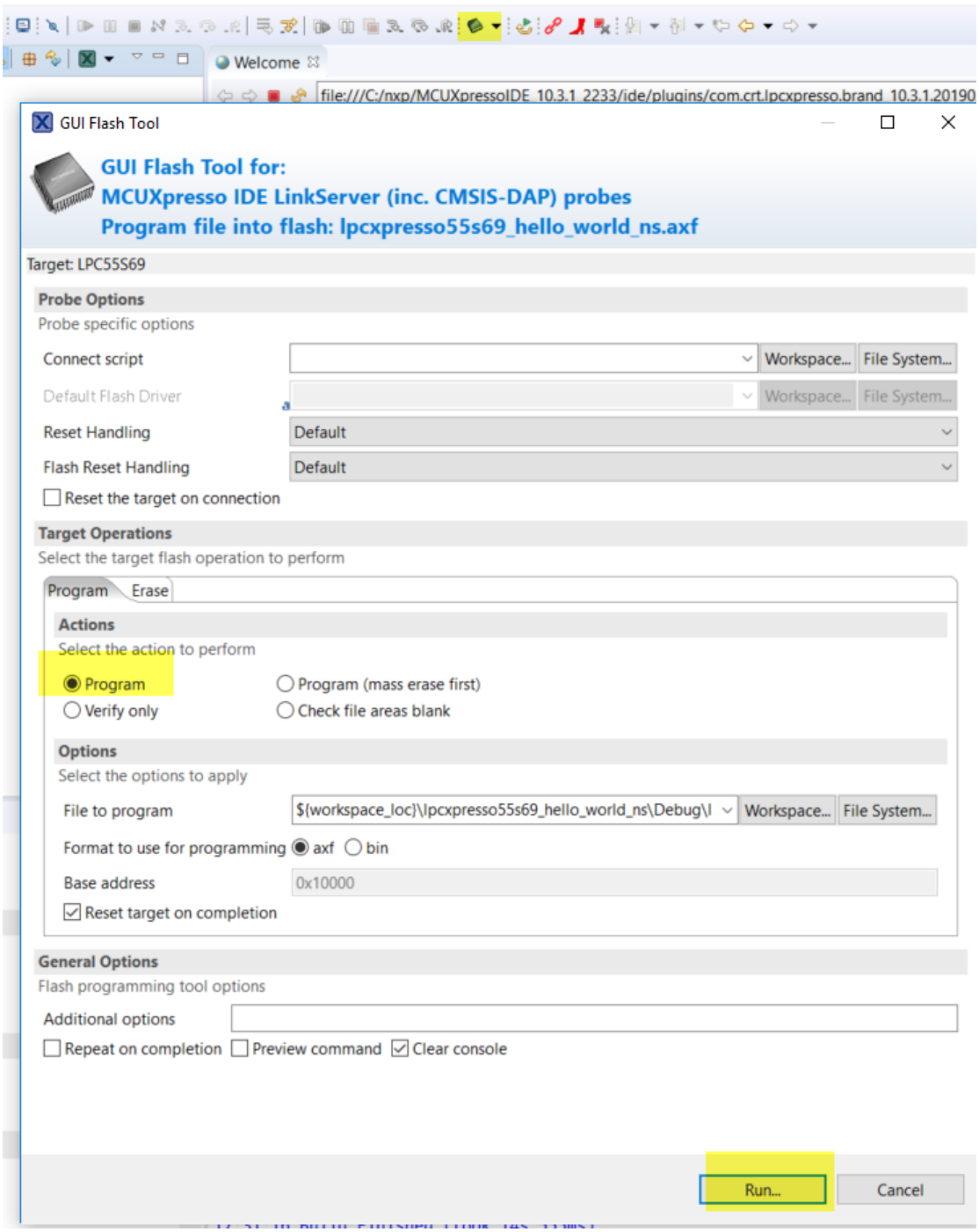


4. Program no-secure project “hello_world_ns ”:

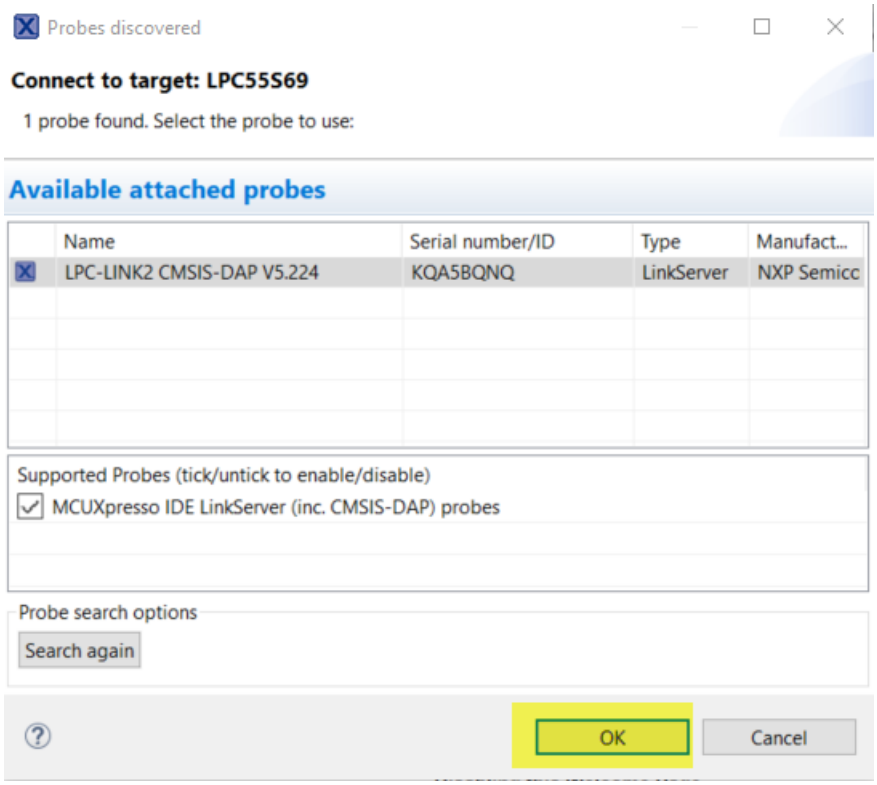
Please pay attention, program “hello_world_ns” first.

-Remove jumper of J10(disconnect), re-connect debug port.

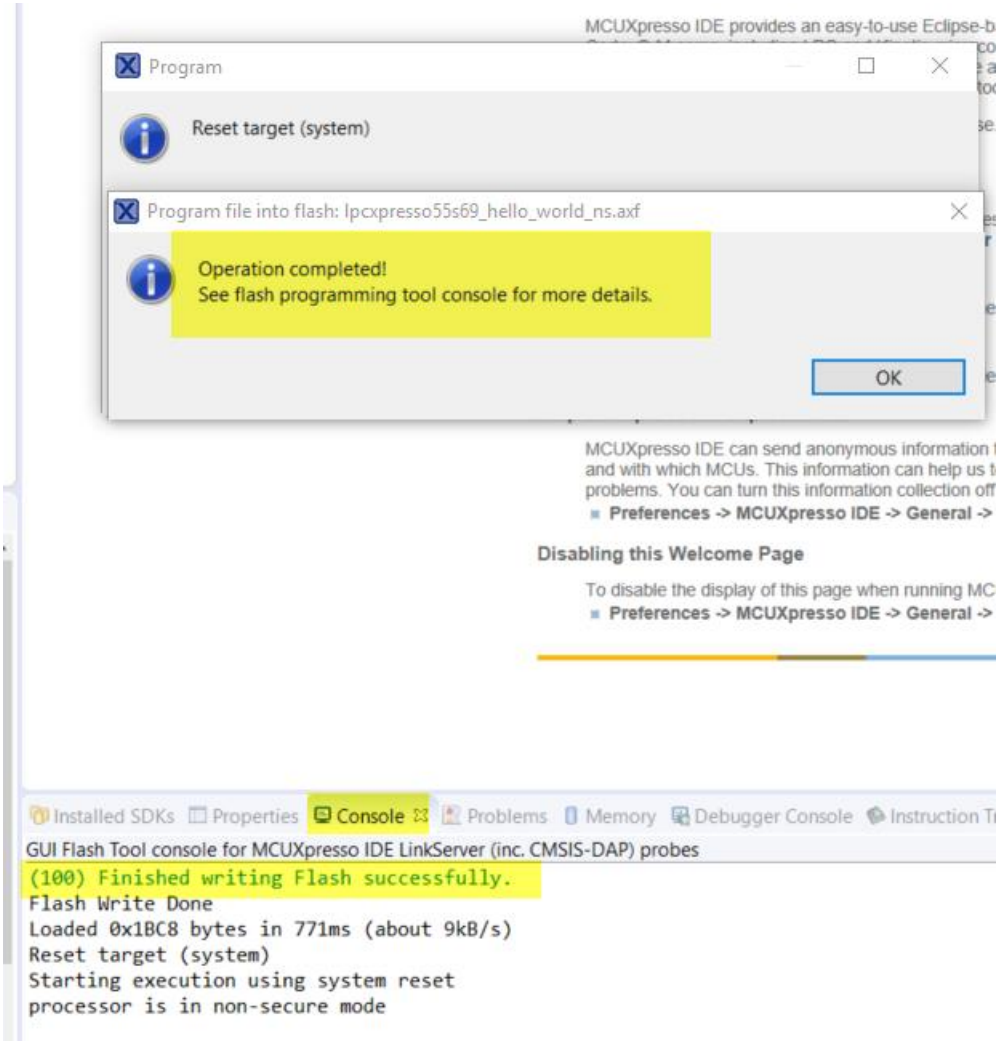
-Select “hello_world_ns” active, open GUI Flash Tool, configure as below, then click Run... button:


Welcome
file:///C:/nxp/MCUXpressoIDE_10.3.1_2233/ide/plugins/com.crt.lpcxpresso.brand_10.3.1.20190
GUI Flash Tool
GUI Flash Tool for:
MCUXpresso IDE LinkServer (inc. CMSIS-DAP) probes
Program file into flash: lpcxpresso55s69_hello_world_ns.axf
Target: LPC55S69
Probe Options
Probe specific options
Connect script
Workspace...
File System...
Default Flash Driver
Reset Handling
Default
Flash Reset Handling
Reset the target on connection
Target Operations
Select the target flash operation to perform
Program
Erase
Actions
Select the action to perform
Program
Program (mass erase first)
Verify only
Check file areas blank
Options
Select the options to apply
File to program
${workspace_loc}\lpcxpresso55s69_hello_world_ns\Debug\l
Format to use for programming
axf
bin
Base address
0x10000
Reset target on completion
General Options
Flash programming tool options
Additional options
Repeat on completion
Preview command
Clear console
Run...
Cancel

- Click “OK”:

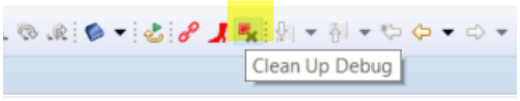


- After finish program, it shows Flash successfully in Console view:



5. Kill active debug:

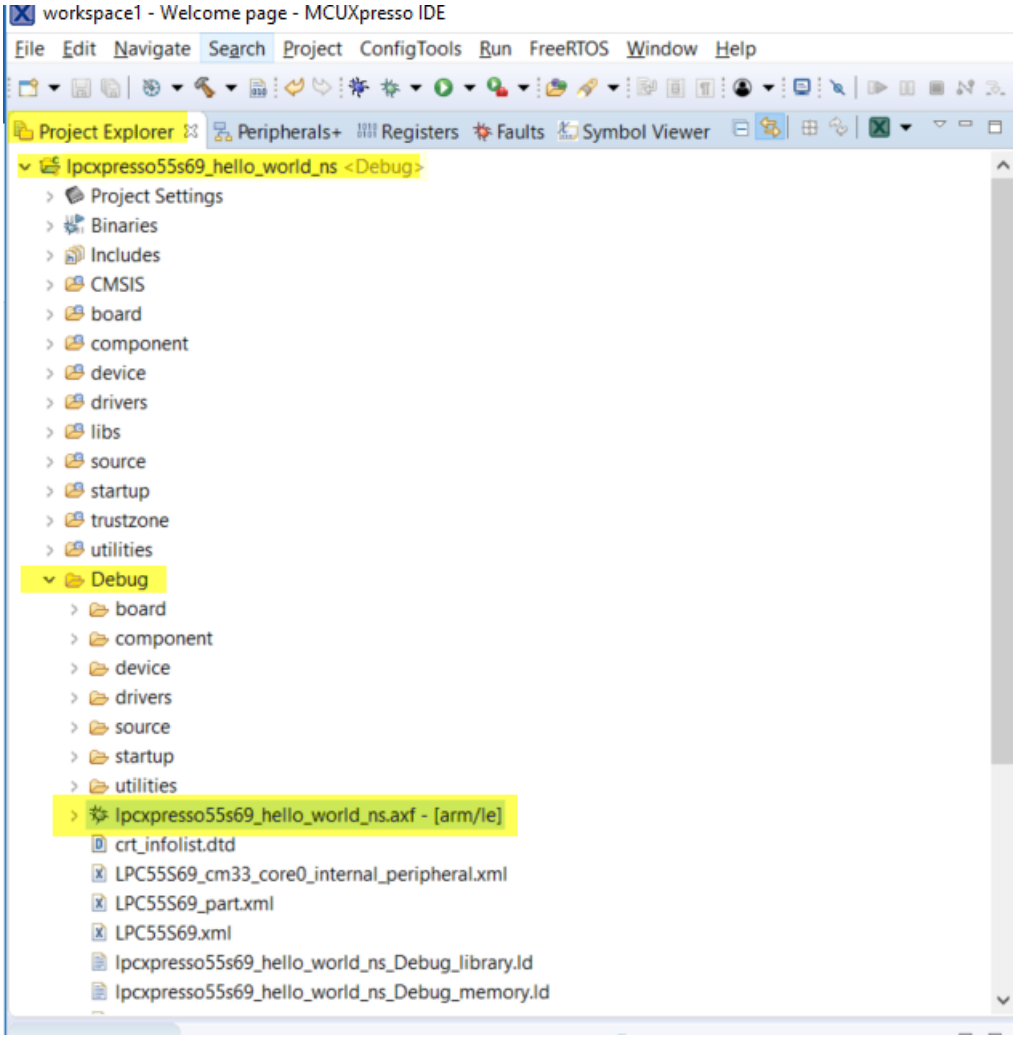
Please do not forget kill up active debug before download “hello_world_s” project using “Clean Up debug” button:

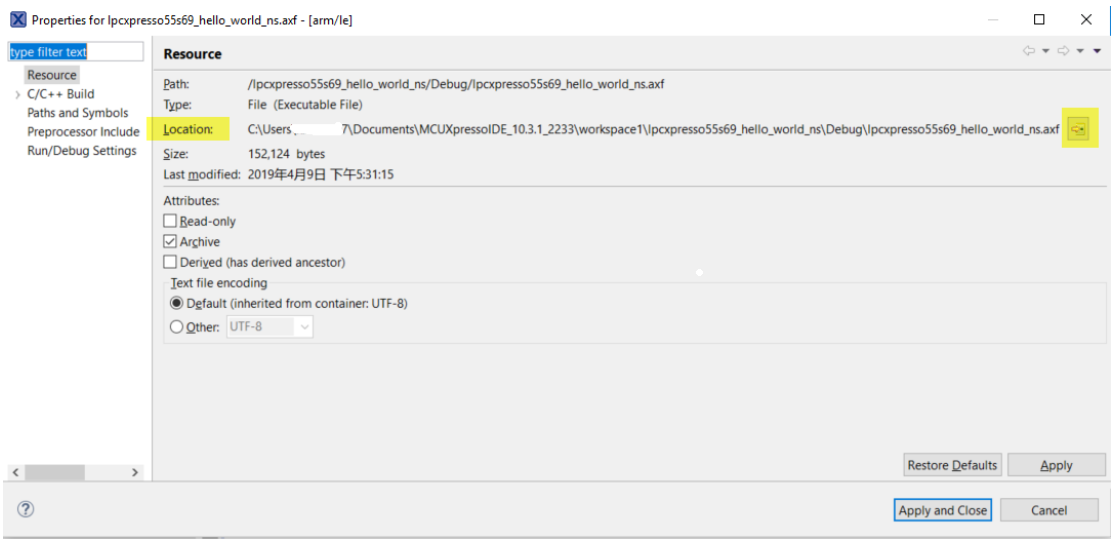


6. Add the location of file “lpcxpresso55s69_hello_world_ns.axf” to Debugger commands of “hello_world_s” project, and download “hello_world_s” project:

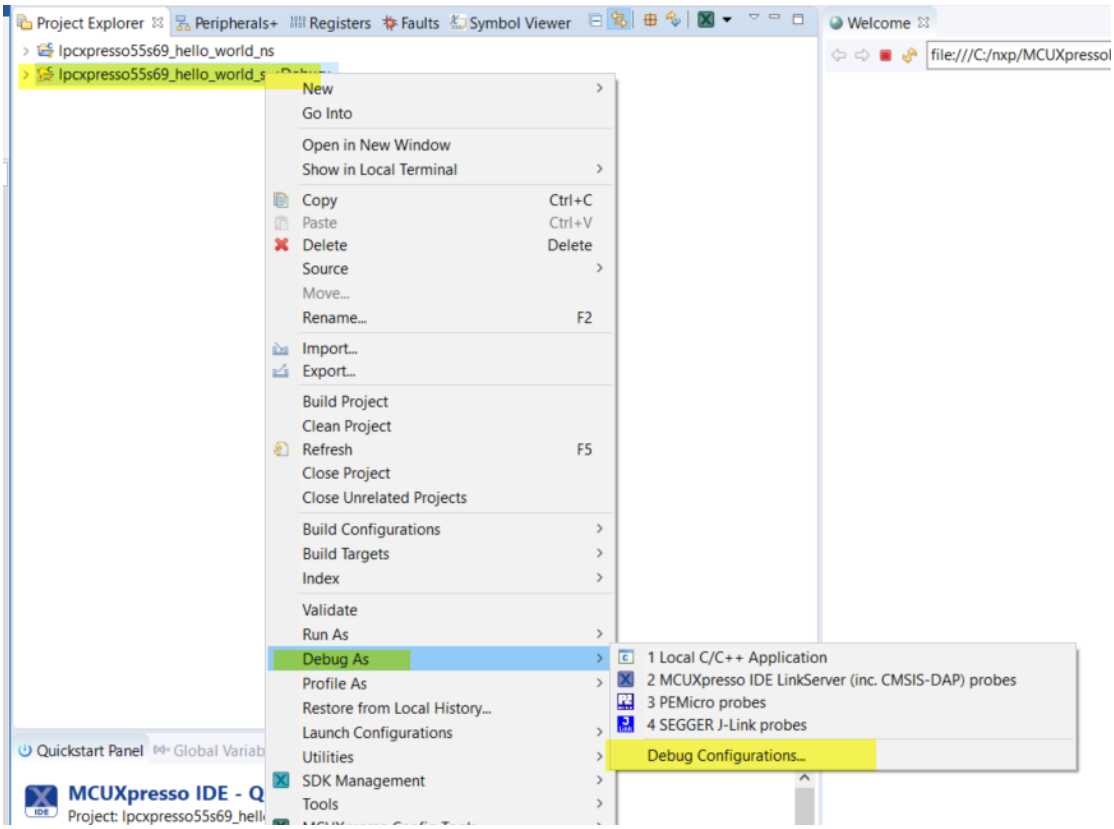
- At the project explorer window expand the “hello_world _ns” project->

expand the Debug folder -> select the lpcxpresso55s69_hello_world_ns.axf using keyboard type **ALT + Enter,** the location of this file will shows, copy and paste it to a text file, we will use it later.

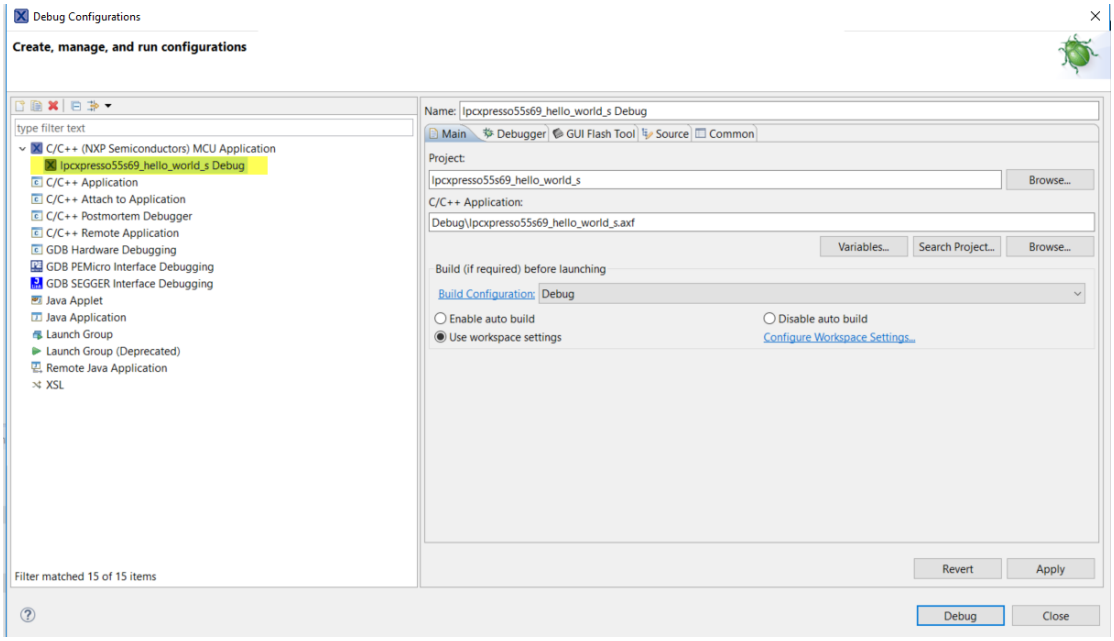




- Select “hello_world_s” project as active, right click the project, choose “Debug As”->”Debug configurations…”



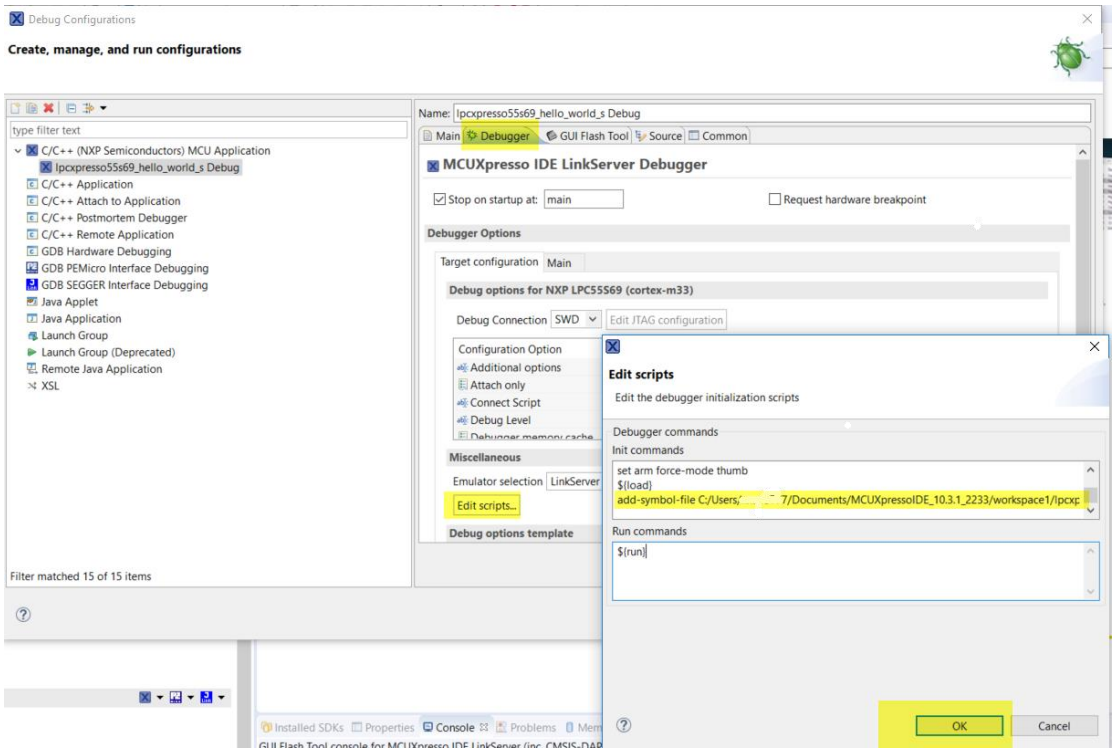
- Double click “C/C++(NXP Semiconductors) MCU Applicaiton”, it shows just like below:



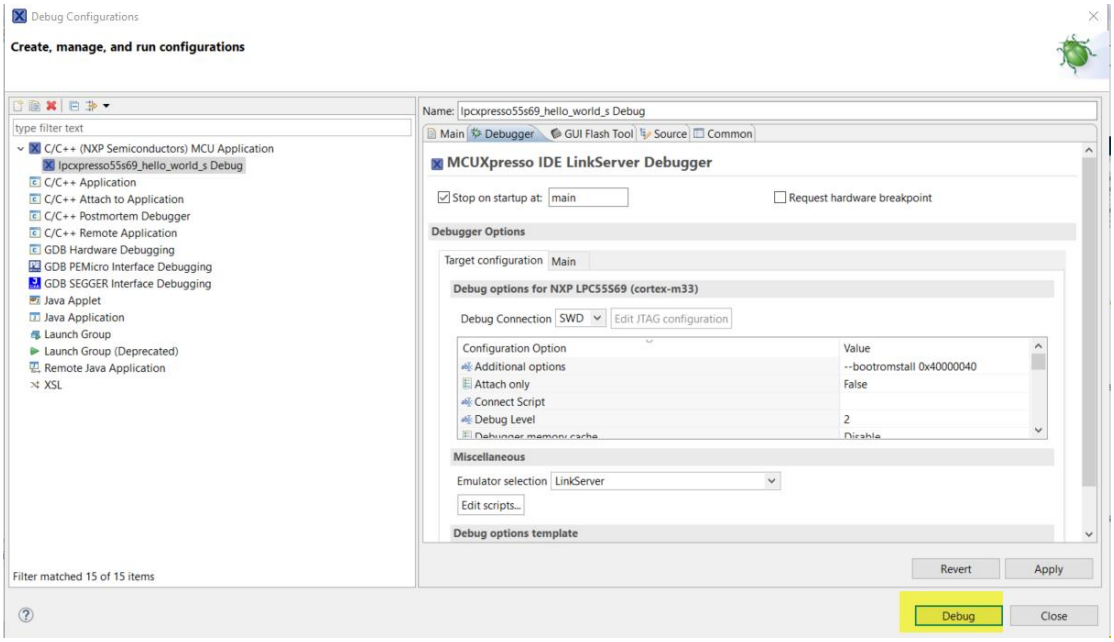
- Choose “Debugger”->”Edit script”, then add

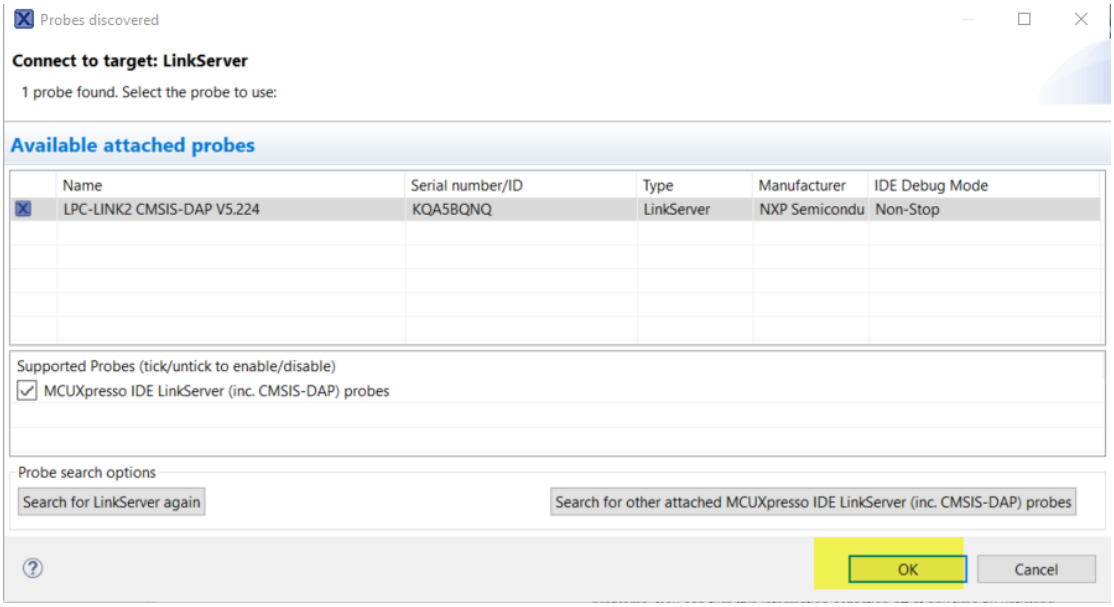
add-symbol-file <paste text from text file> 0x00010000 to the end of Debugger

commands, finally click OK (0x00010000 is the NS flash startup vector).

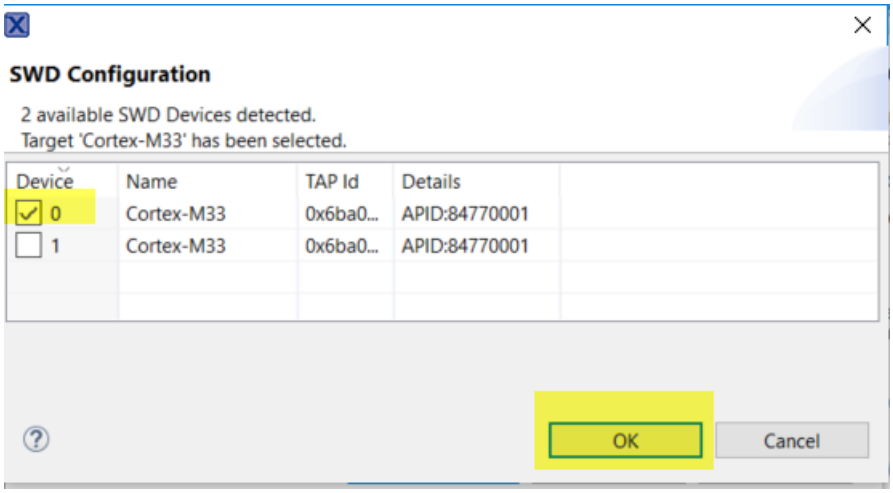


- Click Debug, click OK:

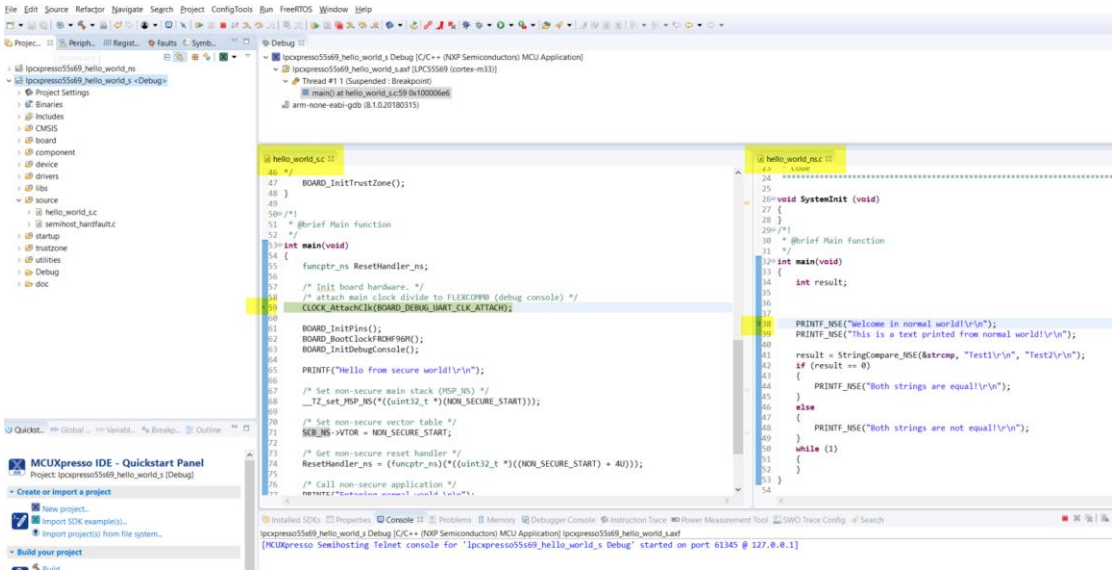




- Choose Device 0, click OK:

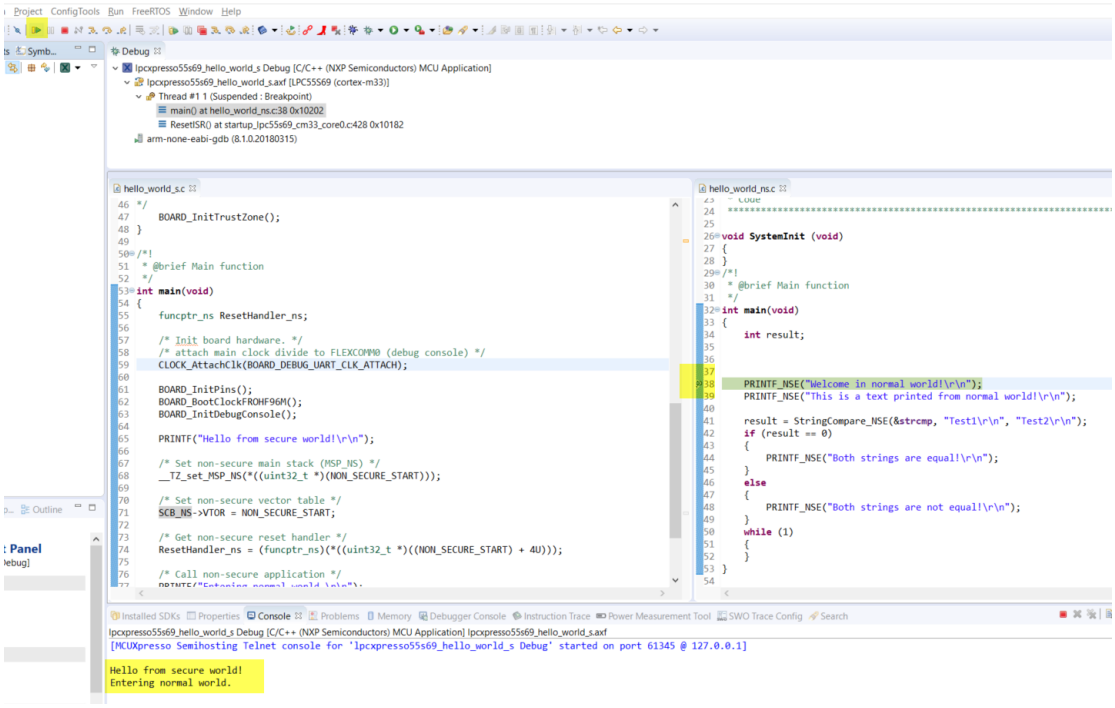


7. **After finish download, it stop at "hello_world_s" project, set a breakpoint at "hello_world_ns" project:**



8. **Debug project:**

-Click "Resume" button, we can see it run into "hello_world_ns" project:



- continue RUN, the PRINTF code from “hello_world_ns” shows in Console view: