Build and debug simple hello world program for ZedBoard using Vitis Unified IDE

ref: https://www.youtube.com/watch?v=a-jD66901-I&t=1s

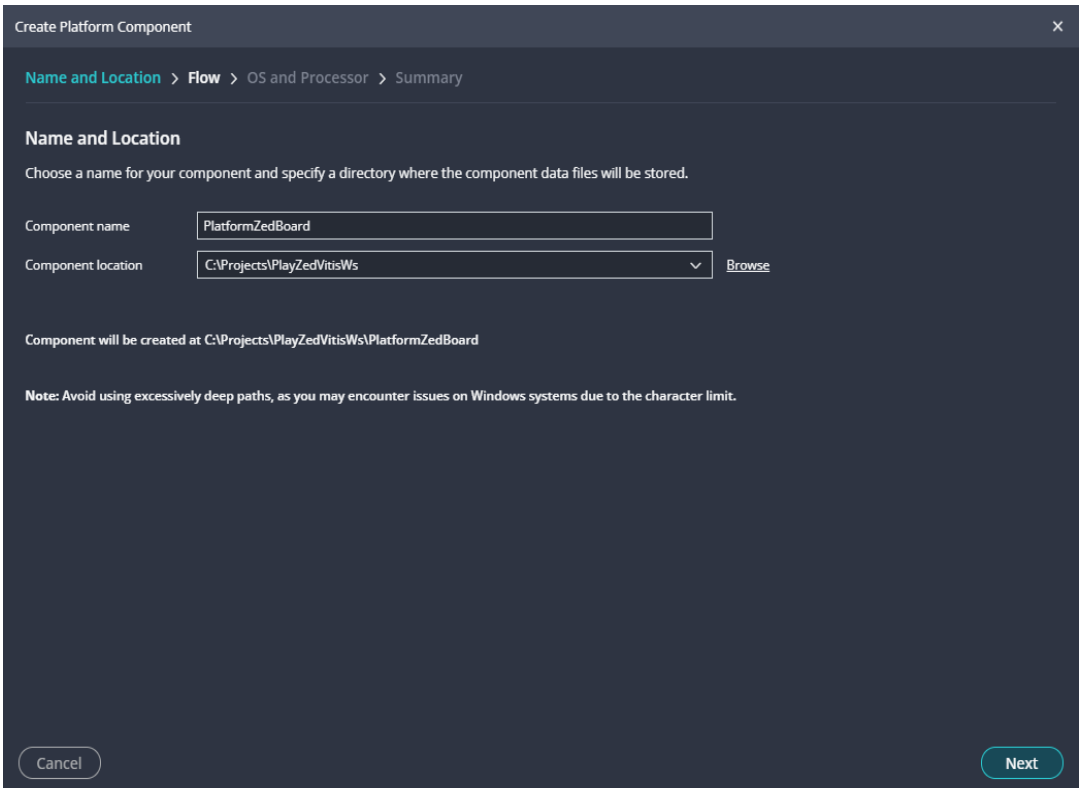
Tools:

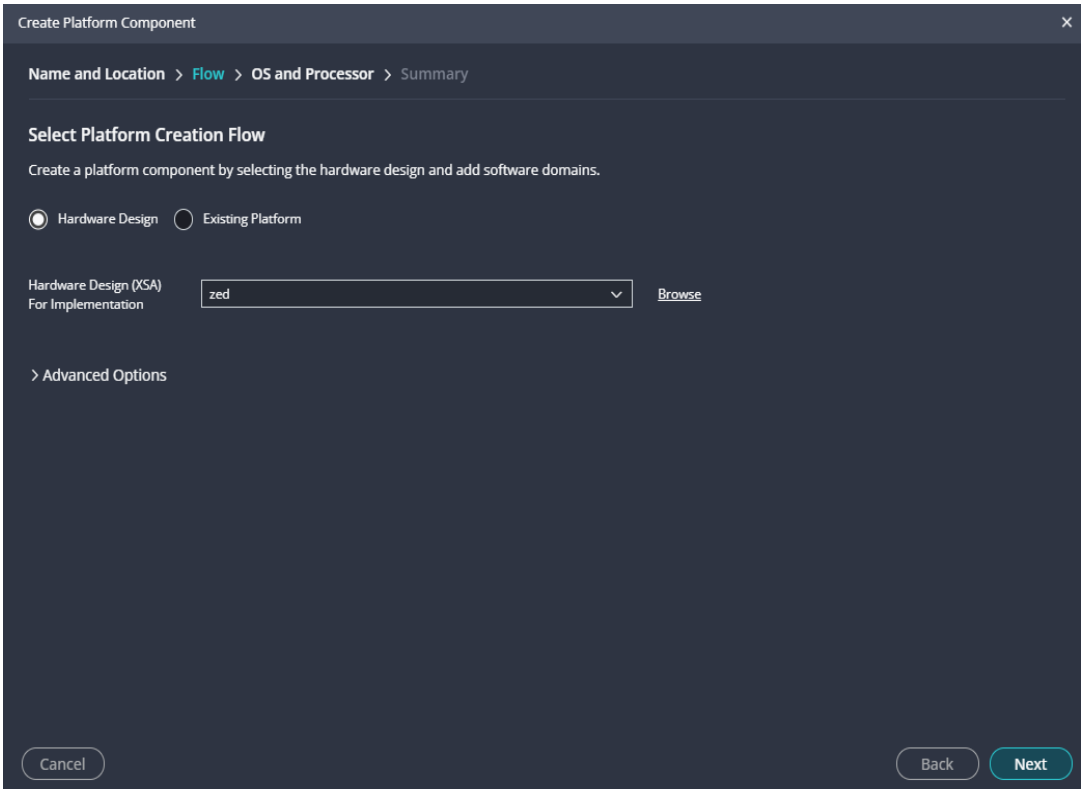
- Vitis Unified 2024.2 to build and debug program on the ZedBoard
- Putty to connect to serial terminal port of ZedBoard

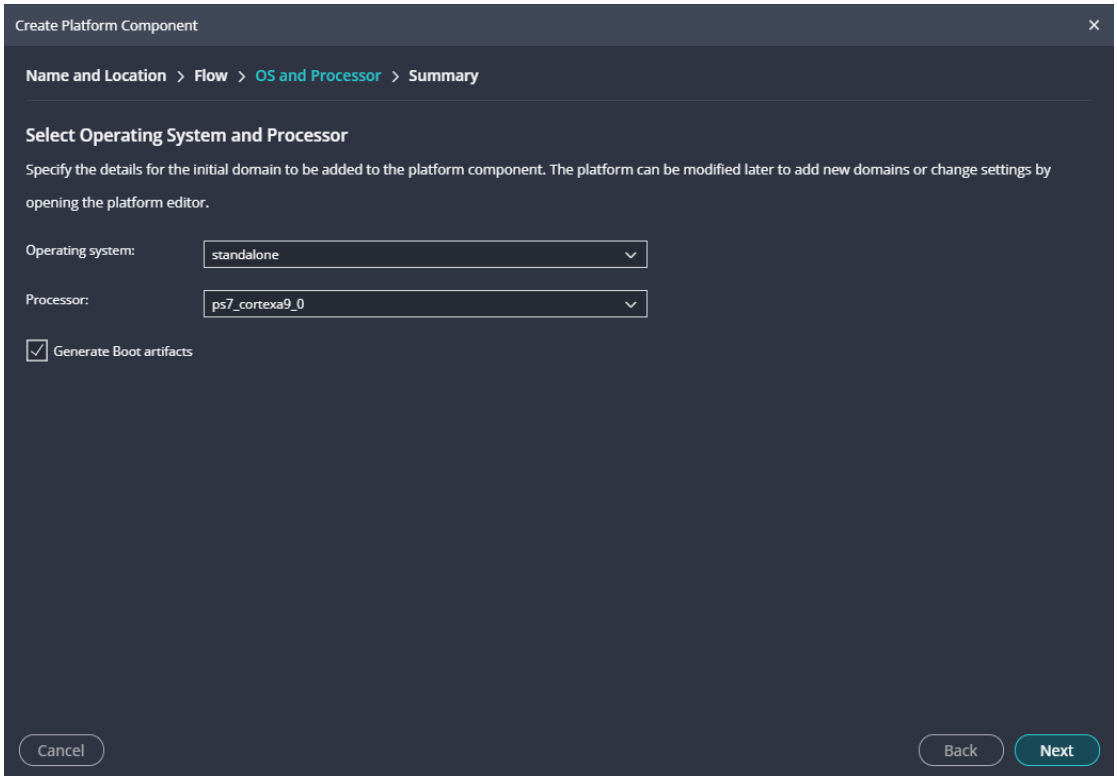
Steps:

1. Connect JTAG adapter included with ZedBoard to "JTAG" header on board
2. Connect USB adapter included with ZedBoard to “J14” on board and setup corresponding virtual COM port to 115200,8N1
3. Launch Vitis Unified and perform steps below:

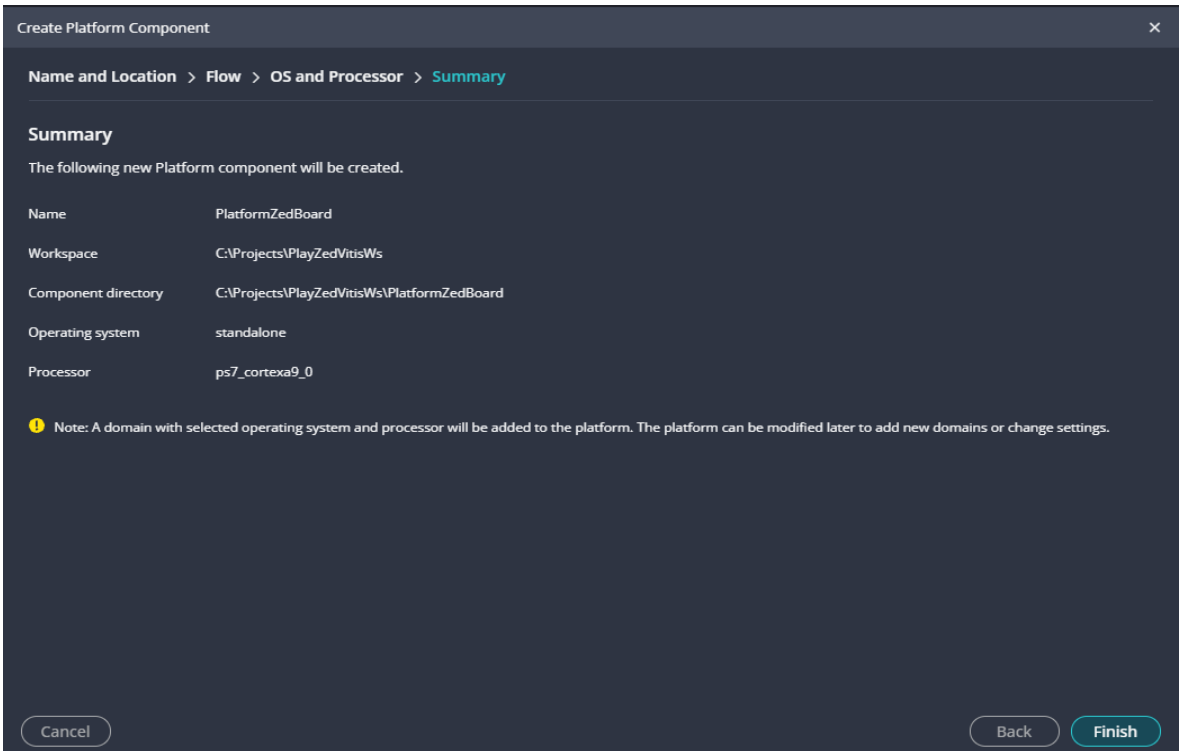
- 'Set Workspace' to a work folder on your PC
- 'Create Platform Component' – Enter/Select info and click 'Next'




Create Platform Component
Name and Location > Flow > OS and Processor > Summary
Select Platform Creation Flow
Create a platform component by selecting the hardware design and add software domains.
Hardware Design
Existing Platform
Hardware Design (XSA) For Implementation
zed
Browse
> Advanced Options
Cancel
Back
Next


Create Platform Component
Name and Location > Flow > OS and Processor > Summary
Select Operating System and Processor
Specify the details for the initial domain to be added to the platform component. The platform can be modified later to add new domains or change settings by opening the platform editor.
Operating system:
standalone
Processor:
ps7_cortexa9_0
Generate Boot artifacts
Cancel
Back
Next

– 'Create Plaform Component' – Review summary and click 'Finish'



– Clicking 'Finish' will cause an automatic platform build in 'OUTPUT' window:

20:01:54 INFO : Found no platform with name 'zed' in install repositories

20:01:54 INFO : Install SDT for given XSA copied Successfully

20:01:54 INFO : cmd.exe, /C, C:\Xilinx\Vitis\2024.2\tps\win64\lopper-1.1.0\env\Scripts\activate.bat && lopper --enhanced --werror -f -O C:\Projects\PlayZedVitisWs\.rigel_lopper -i C:\Xilinx\Vitis\2024.2\tps\win64\lopper-1.1.0\env\Lib\site-packages\lopper\lops\lop-cpu-oslist.dts C:\Projects\PlayZedVitisWs\.rigel_lopper_temp_platform\zed\hw\sdt\system-top.dts && C:\Xilinx\Vitis\2024.2\tps\win64\lopper-1.1.0\env\Scripts\deactivate.bat

20:01:55 INFO : CPU List generated successfully

20:08:41 INFO : Platform PlatformZedBoard creation started.

20:08:41 INFO : Lopper command for cpu List generation: lopper --enhanced --werror -f -O C:\Projects\PlayZedVitisWs\.rigel_lopper -i C:\Xilinx\Vitis\2024.2\tps\win64\lopper-1.1.0\env\Lib\site-packages\lopper\lops\lop-cpu-oslist.dts C:\Projects\PlayZedVitisWs\PlatformZedBoard\hw\sdt\system-top.dts

20:08:41 INFO : cmd.exe, /C, C:\Xilinx\Vitis\2024.2\tps\win64\lopper-1.1.0\env\Scripts\activate.bat && lopper --enhanced --werror -f -O C:\Projects\PlayZedVitisWs\.rigel_lopper -i C:\Xilinx\Vitis\2024.2\tps\win64\lopper-1.1.0\env\Lib\site-packages\lopper\lops\lop-cpu-oslist.dts C:\Projects\PlayZedVitisWs\PlatformZedBoard\hw\sdt\system-top.dts && C:\Xilinx\Vitis\2024.2\tps\win64\lopper-1.1.0\env\Scripts\deactivate.bat

20:08:42 INFO : CPU List generated successfully

20:08:42 INFO : created .gitignore file for the project C:\Projects\PlayZedVitisWs\PlatformZedBoard

20:08:42 INFO : ZYNQ: Using the QEMU args from install at :

C:\Xilinx\Vitis\2024.2\data\emulation\platforms\zynq\sw\a9_linux\qemu\qemu_args.txt

20:08:42 INFO : ZYNQ: Using the QEMU args from install at :
C:\Xilinx\Vitis\2024.2\data\emulation\platforms\zynq\sw\a9_standalone\qemu\qemu_args.txt

20:08:42 INFO : ZYNQ: Using the QEMU args from install at :
C:\Xilinx\Vitis\2024.2\data\emulation\platforms\zynq\sw\a9_standalone\qemu\qemu_args.txt

20:08:42 INFO : lopper command to generate BSP :python
C:\Xilinx\Vitis\2024.2\data\embeddedsw/scripts/pyesw//create_bsp.py -w
C:\Projects\PlayZedVitisWs\PlatformZedBoard\ps7_cortexa9_0\standalone_ps7_cortexa9_0\bsp -p ps7_cortexa9_0 -o
standalone -s C:\Projects\PlayZedVitisWs\PlatformZedBoard\hw\sdt\system-top.dts -t empty_application -r
C:\Projects\PlayZedVitisWs_ide\.wsdata\.repo.yaml

20:08:42 INFO : lopper command to generate BSP :python
C:\Xilinx\Vitis\2024.2\data\embeddedsw/scripts/pyesw//create_bsp.py -w
C:\Projects\PlayZedVitisWs\PlatformZedBoard\zynq_fsbl\zynq_fsbl_bsp -p ps7_cortexa9_0 -o standalone -s
C:\Projects\PlayZedVitisWs\PlatformZedBoard\hw\sdt\system-top.dts -t zynq_fsbl -r
C:\Projects\PlayZedVitisWs_ide\.wsdata\.repo.yaml

20:08:42 INFO : cmd.exe, /C, C:\Xilinx\Vitis\2024.2\tps\win64\lopper-1.1.0\env\Scripts\activate.bat && python
C:\Xilinx\Vitis\2024.2\data\embeddedsw\scripts\pyesw\\create_bsp.py -w
C:\Projects\PlayZedVitisWs\PlatformZedBoard\zynq_fsbl\zynq_fsbl_bsp -p ps7_cortexa9_0 -o standalone -s
C:\Projects\PlayZedVitisWs\PlatformZedBoard\hw\sdt\system-top.dts -t zynq_fsbl -r
C:\Projects\PlayZedVitisWs_ide\.wsdata\.repo.yaml && C:\Xilinx\Vitis\2024.2\tps\win64\lopper-
1.1.0\env\Scripts\deactivate.bat

20:08:42 INFO : cmd.exe, /C, C:\Xilinx\Vitis\2024.2\tps\win64\lopper-1.1.0\env\Scripts\activate.bat && python
C:\Xilinx\Vitis\2024.2\data\embeddedsw\scripts\pyesw\\create_bsp.py -w
C:\Projects\PlayZedVitisWs\PlatformZedBoard\ps7_cortexa9_0\standalone_ps7_cortexa9_0\bsp -p ps7_cortexa9_0 -o
standalone -s C:\Projects\PlayZedVitisWs\PlatformZedBoard\hw\sdt\system-top.dts -t empty_application -r
C:\Projects\PlayZedVitisWs_ide\.wsdata\.repo.yaml && C:\Xilinx\Vitis\2024.2\tps\win64\lopper-
1.1.0\env\Scripts\deactivate.bat

20:08:53 INFO : Successfully created Domain at
C:\Projects\PlayZedVitisWs\PlatformZedBoard\ps7_cortexa9_0\standalone_ps7_cortexa9_0\bsp

20:08:53 INFO : Domain standalone_ps7_cortexa9_0 added successfully.

20:08:53 INFO : Successfully created Domain at C:\Projects\PlayZedVitisWs\PlatformZedBoard\zynq_fsbl\zynq_fsbl_bsp

20:08:53 INFO : Successfully Generated Domain C:\Projects\PlayZedVitisWs\PlatformZedBoard\zynq_fsbl\zynq_fsbl_bsp

20:08:53 INFO : lopper command to create baremetal application :python
C:\Xilinx\Vitis\2024.2\data\embeddedsw/scripts/pyesw//create_app.py -s
C:\Projects\PlayZedVitisWs\PlatformZedBoard\zynq_fsbl -t zynq_fsbl -d
C:\Projects\PlayZedVitisWs\PlatformZedBoard\zynq_fsbl\zynq_fsbl_bsp -n fsbl -r
C:\Projects\PlayZedVitisWs_ide\.wsdata\.repo.yaml

20:08:53 INFO : cmd.exe, /C, C:\Xilinx\Vitis\2024.2\tps\win64\lopper-1.1.0\env\Scripts\activate.bat && python
C:\Xilinx\Vitis\2024.2\data\embeddedsw\scripts\pyesw\\validate_bsp.py -t zynq_fsbl -d
C:\Projects\PlayZedVitisWs\PlatformZedBoard\zynq_fsbl\zynq_fsbl_bsp -r
C:\Projects\PlayZedVitisWs_ide\.wsdata\.repo.yaml && C:\Xilinx\Vitis\2024.2\tps\win64\lopper-
1.1.0\env\Scripts\deactivate.bat

20:08:55 INFO : Successfully validated template zynq_fsbl

20:08:58 INFO : Successfully Created Application sources at C:/Projects/PlayZedVitisWs/PlatformZedBoard/zynq_fsbl

20:08:58 INFO : Platform FSBL Boot domain added successfully.

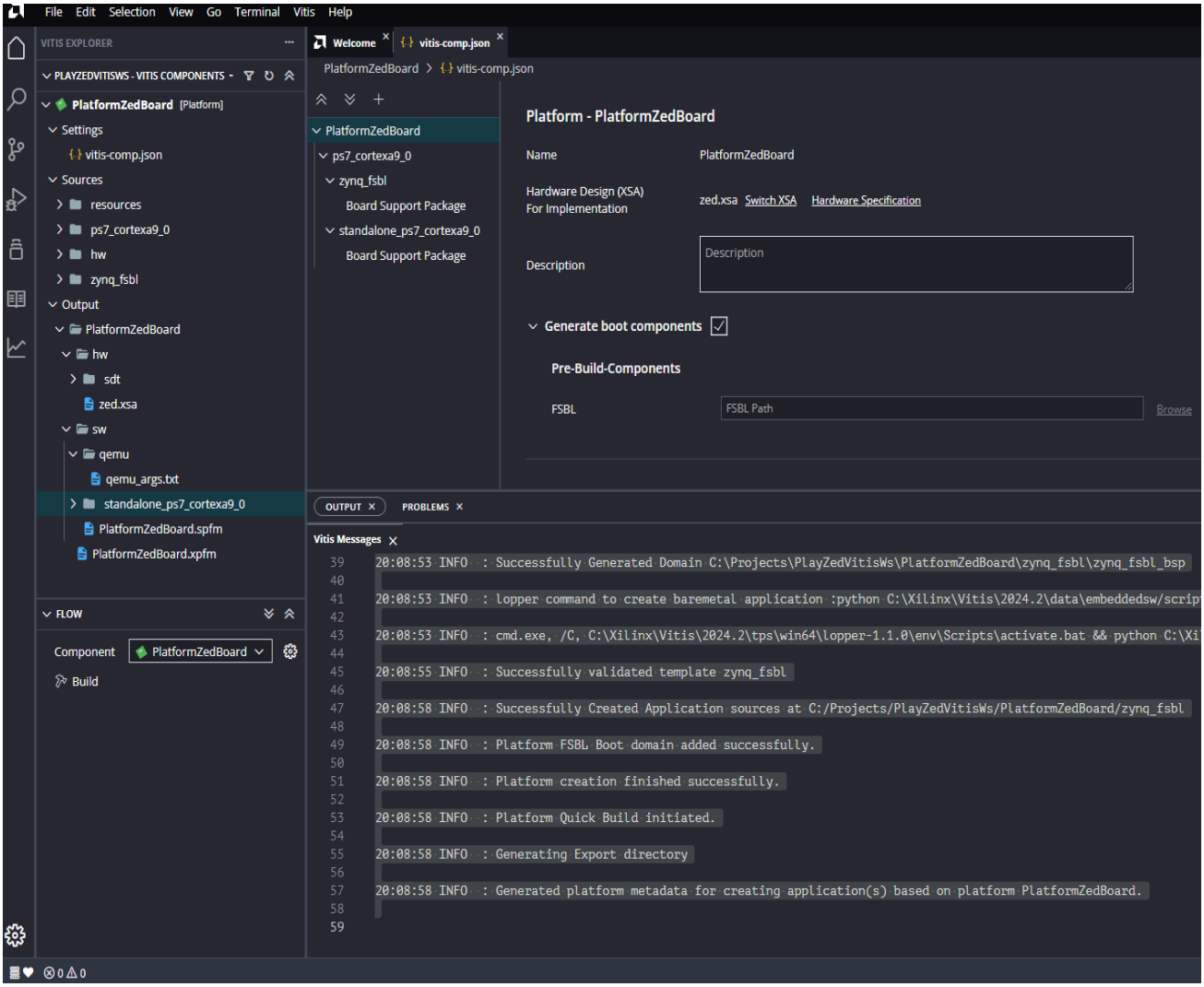
20:08:58 INFO : Platform creation finished successfully.

20:08:58 INFO : Platform Quick Build initiated.

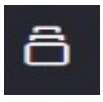
20:08:58 INFO : Generating Export directory

20:08:58 INFO : Generated platform metadata for creating application(s) based on platform PlatformZedBoard

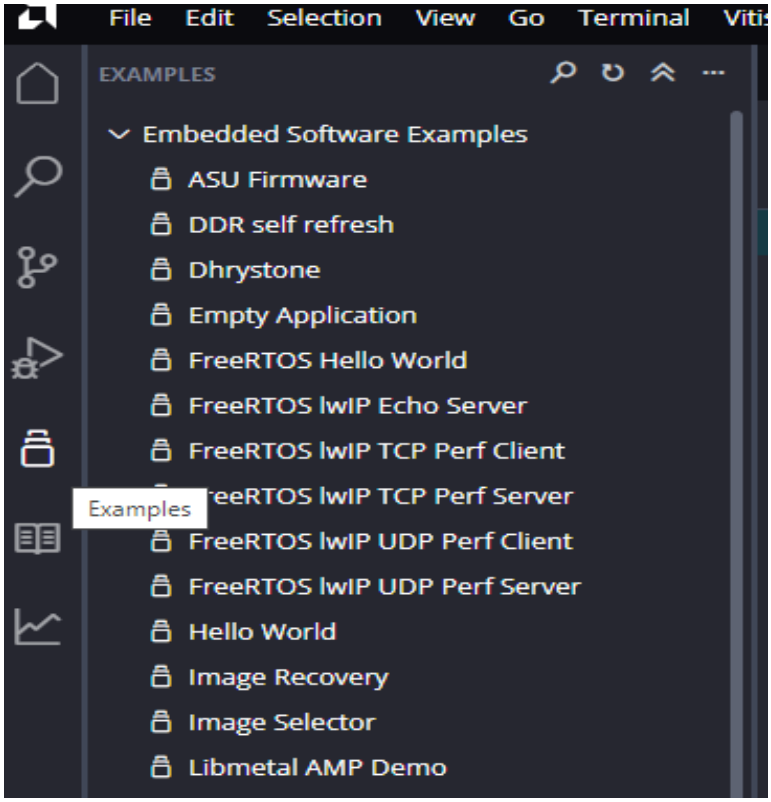
- Updated GUI view after the platform build:



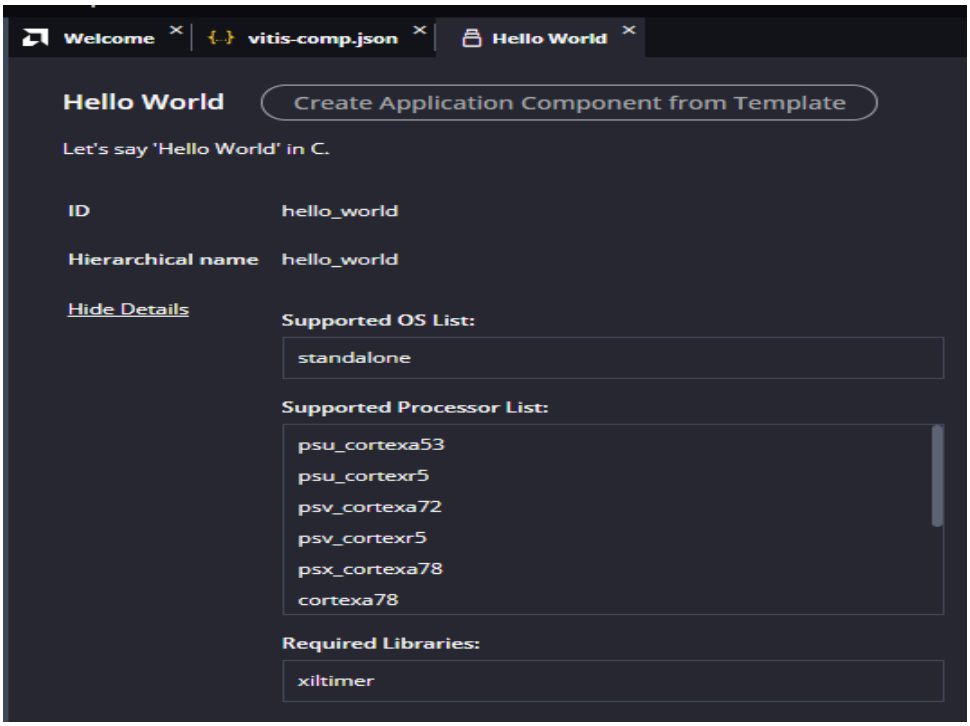
- Create a simple hello world project by clicking on this symbol



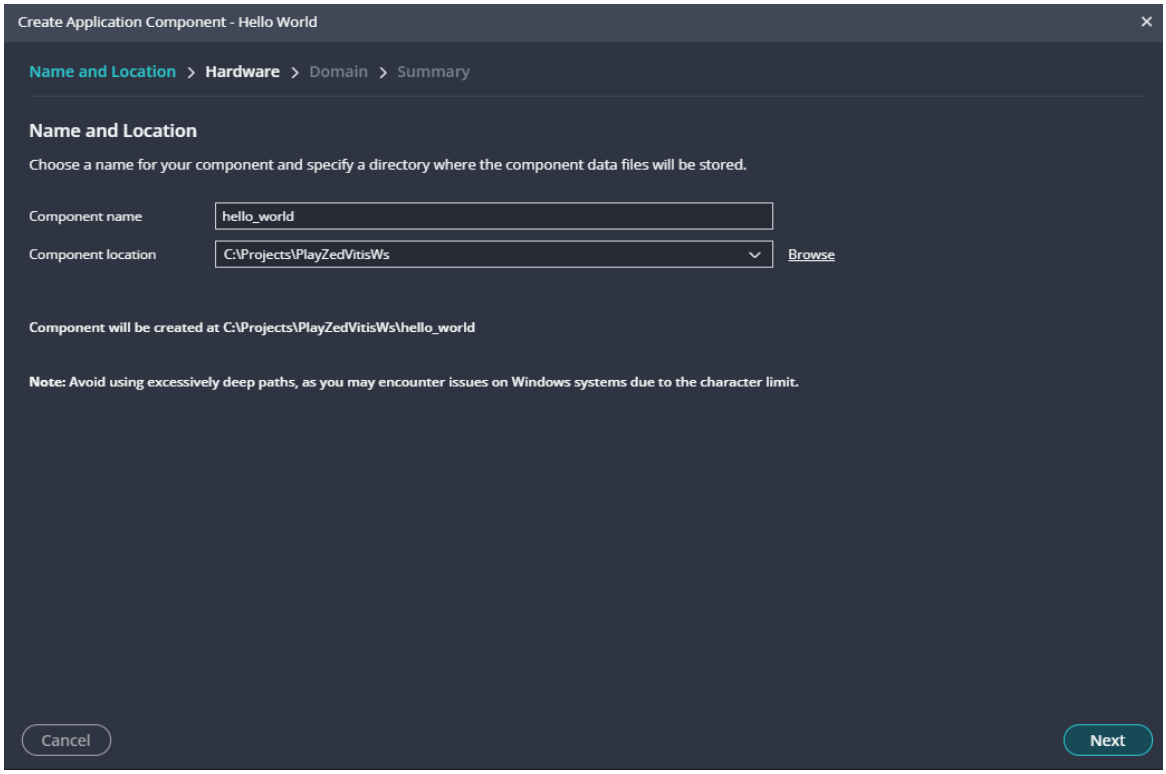
- Click on “Hello World” in the “Embedded Software Examples” list:



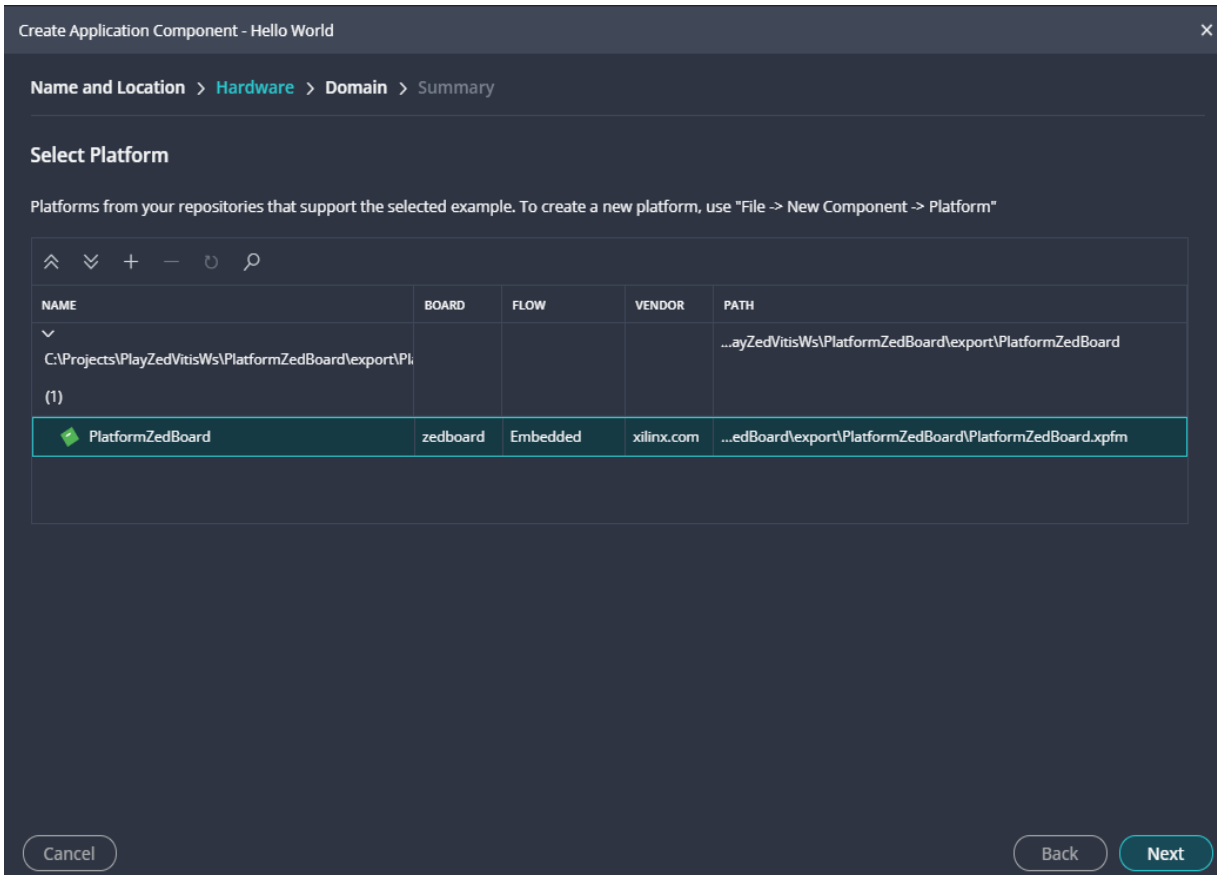
- A new “Hello World” tab should appear
- Click the “Create Application Component from Template” button at top of view



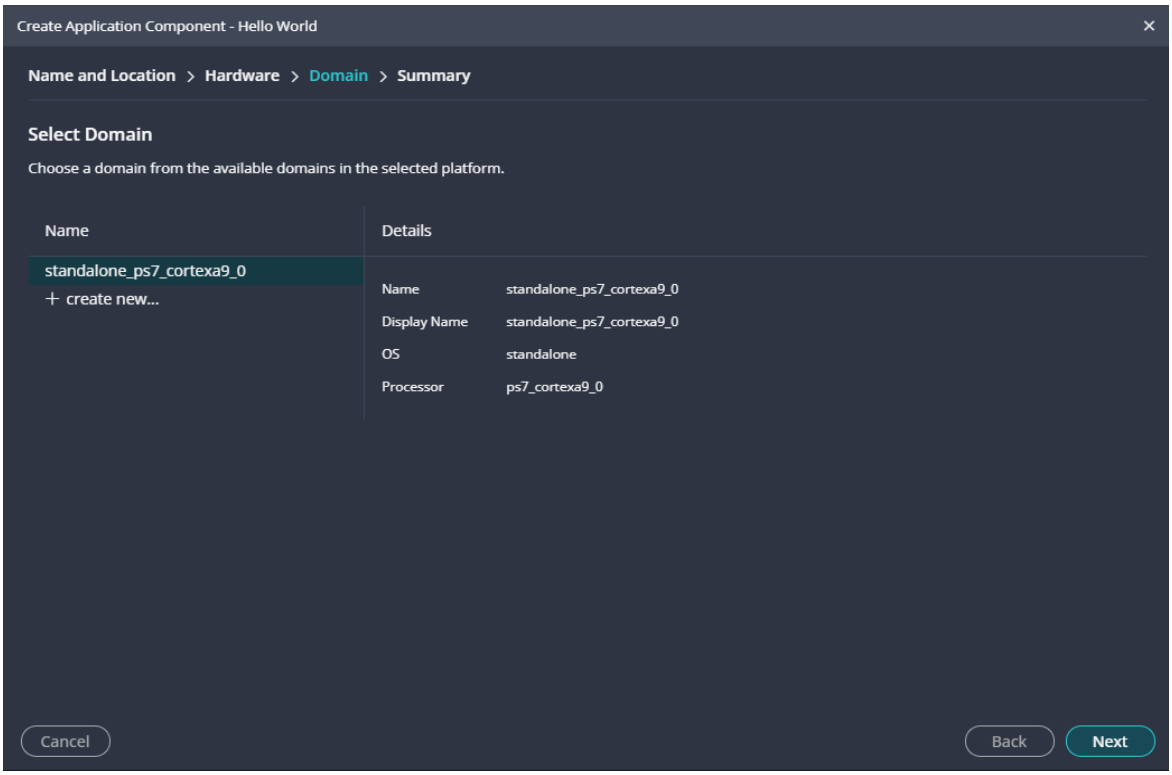
- Click 'Next' button on this view



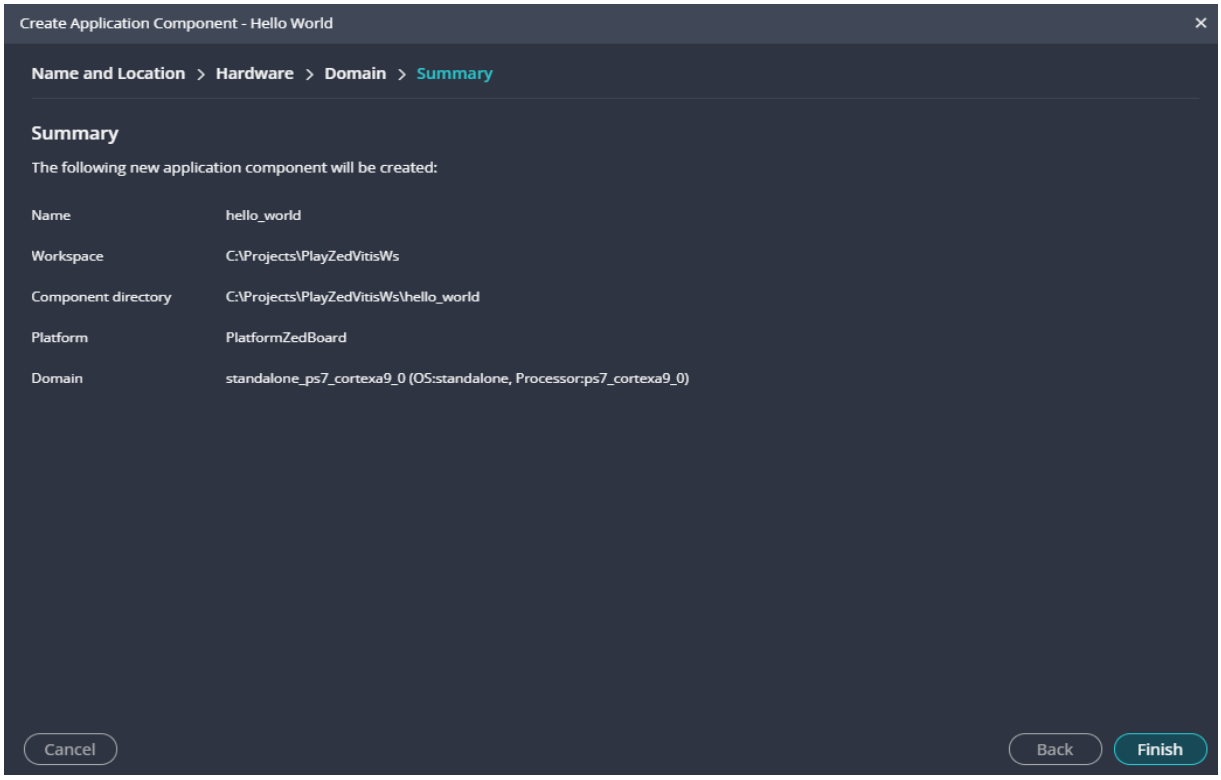
– Select 'PlatformZedBoard' on this view and click 'Next'



– Select 'standalone_ps7_cortexa9_0' domain on this view and click 'Next'



– Review the summary info on this view and click 'Finish'



– Clicking 'Finish' will cause an automatic component build in 'OUTPUT' window:

21:07:12 INFO : cmd.exe, /C, C:\Xilinx\Vitis\2024.2\tps\win64\lopper-1.1.0\env\Scripts\activate.bat && python C:\Xilinx\Vitis\2024.2\data\embeddedsw\scripts\pyesw\\validate_bsp.py -t hello_world -d C:\Projects\PlayZedVitisWs\PlatformZedBoard\export\PlatformZedBoard\sw\standalone_ps7_cortexa9_0 -r C:\Projects\PlayZedVitisWs_ide\.wsdata\.repo.yaml && C:\Xilinx\Vitis\2024.2\tps\win64\lopper-1.1.0\env\Scripts\deactivate.bat

21:07:13 INFO : Successfully validated template hello_world

21:20:35 INFO : lopper command to create baremetal application :python C:\Xilinx\Vitis\2024.2\data\embeddedsw/scripts/pyesw//create_app.py -s C:\Projects\PlayZedVitisWs\hello_world\src -t hello_world -d C:\Projects\PlayZedVitisWs\PlatformZedBoard\export\PlatformZedBoard\sw\standalone_ps7_cortexa9_0 -n hello_world -r C:\Projects\PlayZedVitisWs_ide\.wsdata\.repo.yaml

21:20:37 INFO : Successfully validated template hello_world

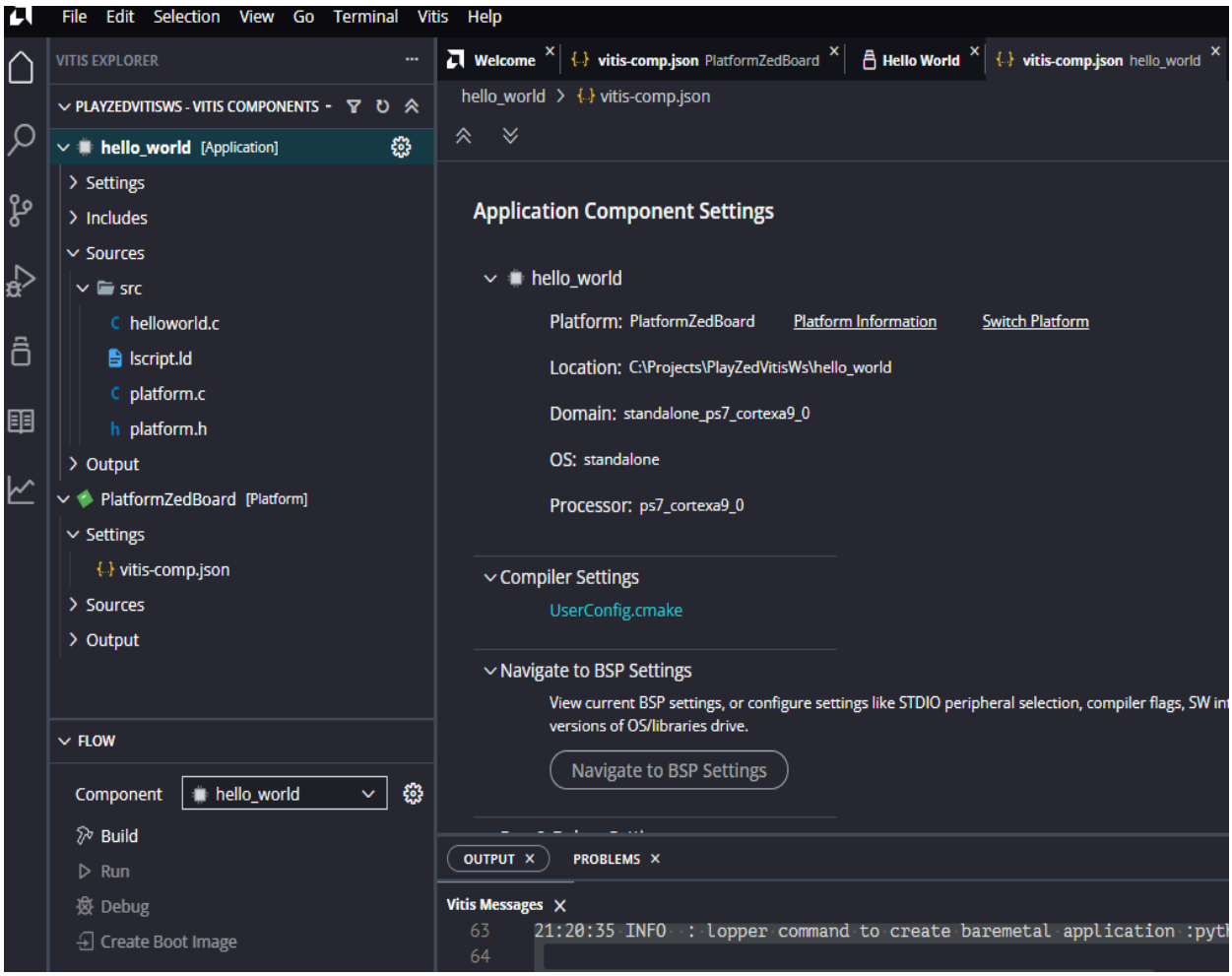
21:20:40 INFO : Successfully Created Application sources at C:/Projects/PlayZedVitisWs/hello_world/src

21:20:40 INFO : The hardware specification used by project 'C:\Projects\PlayZedVitisWs\hello_world' is out of sync with the platform. Resource files extracted from the hardware specification will be updated.

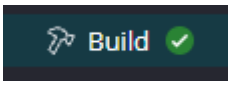
21:20:40 INFO : The updated ps init files are copied from platform to folder 'C:\Projects\PlayZedVitisWs\hello_world_ide\psinit' in project 'C:\Projects\PlayZedVitisWs\hello_world'.

21:20:40 INFO : created .gitignore file for the project C:\Projects\PlayZedVitisWs\hello_world

– Updated GUI view after the component build:



– Selected 'Build' button which proceeded in 'OUTPUT' window:



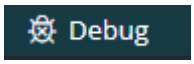

```
----------------------------------------------------------------------------

 [7/7/2025, 9:30:15 PM]: Build for hello_world::build with id '0172c894-8b17-40da-
8d4c-bd5823a25f08' started.

 ----------------------------------------------------------------------------

 -- The C compiler identification is GNU 13.3.0

 -- The CXX compiler identification is GNU 13.3.0

 -- Detecting C compiler ABI info

 -- Detecting C compiler ABI info - done
```

```
-- Check for working C compiler: C:/Xilinx/Vitis/2024.2/gnu/aarch32/nt/gcc-arm-none-eabi/bin/arm-none-eabi-gcc.exe - skipped

-- Detecting C compile features

-- Detecting C compile features - done

-- Detecting CXX compiler ABI info

-- Detecting CXX compiler ABI info - done

-- Check for working CXX compiler: C:/Xilinx/Vitis/2024.2/gnu/aarch32/nt/gcc-arm-none-eabi/bin/arm-none-eabi-g++.exe - skipped

-- Detecting CXX compile features

-- Detecting CXX compile features - done

-- The ASM compiler identification is GNU

-- Found assembler: C:/Xilinx/Vitis/2024.2/gnu/aarch32/nt/gcc-arm-none-eabi/bin/arm-none-eabi-gcc.exe

-- Configuring done

-- Generating done

-- Build files have been written to: C:/Projects/PlayZedVitisWs/hello_world/build

[1/3] C:\Xilinx\Vitis\2024.2\gnu\aarch32\nt\gcc-arm-none-eabi\bin\arm-none-eabi-gcc.exe  -isystem C:/Projects/PlayZedVitisWs/PlatformZedBoard/export/PlatformZedBoard/sw/standalone_ps7_cortexa9_0/include -isystem C:/Xilinx/Vitis/2024.2/gnu/aarch32/nt/gcc-arm-none-eabi/x86_64-oesdk-mingw32/usr/lib/arm-xilinx-eabi/gcc/arm-xilinx-eabi/13.3.0/include -isystem C:/Xilinx/Vitis/2024.2/gnu/aarch32/nt/gcc-arm-none-eabi/x86_64-oesdk-mingw32/usr/lib/arm-xilinx-eabi/gcc/arm-xilinx-eabi/13.3.0/include-fixed -isystem C:/Xilinx/Vitis/2024.2/gnu/aarch32/nt/gcc-arm-none-eabi/aarch32-xilinx-eabi/usr/include -O2 -DSDT -mcpu=cortex-a9 -mfpu=vfpv3 -mfloat-abi=hard  -MMD -MP -specs=C:/Projects/PlayZedVitisWs/PlatformZedBoard/export/PlatformZedBoard/sw/standalone_ps7_cortexa9_0/Xilinx.spec -IC:/Projects/PlayZedVitisWs/PlatformZedBoard/export/PlatformZedBoard/sw/standalone_ps7_cortexa9_0/include -Wall -Wextra      -O0  -g3     -U__clang__ "-D__FILENAME__='__FILE__'" -MD -MT CMakeFiles/hello_world.elf.dir/platform.c.obj -MF CMakeFiles\hello_world.elf.dir\platform.c.obj.d -o CMakeFiles/hello_world.elf.dir/platform.c.obj -c C:/Projects/PlayZedVitisWs/hello_world/src/platform.c

[3/3] cmd.exe /C "cd . && C:\Xilinx\Vitis\2024.2\gnu\aarch32\nt\gcc-arm-none-eabi\bin\arm-none-eabi-gcc.exe -O2 -DSDT -mcpu=cortex-a9 -mfpu=vfpv3 -mfloat-abi=hard  -MMD -MP -specs=C:/Projects/PlayZedVitisWs/PlatformZedBoard/export/PlatformZedBoard/sw/standalone_ps7_cortexa9_0/Xilinx.spec -IC:/Projects/PlayZedVitisWs/PlatformZedBoard/export/PlatformZedBoard/sw/standalone_ps7_cortexa9_0/include -Wall -Wextra      -O0  -g3     -U__clang__  CMakeFiles/hello_world.elf.dir/helloworld.c.obj CMakeFiles/hello_world.elf.dir/platform.c.obj -o hello_world.elf  -Wl,-T  -Wl,"C:/Projects/PlayZedVitisWs/hello_world/src/lscript.ld"  -L"C:/Projects/PlayZedVitisWs/hello_world/src/"  -L"C:/Projects/PlayZedVitisWs/PlatformZedBoard/export/PlatformZedBoard/sw/standalone_ps7_cortexa9_0/lib/"  -L"/"  -Wl,--start-group,-lxilstandalone  -lxiltimer  -lxil  -lgcc
```

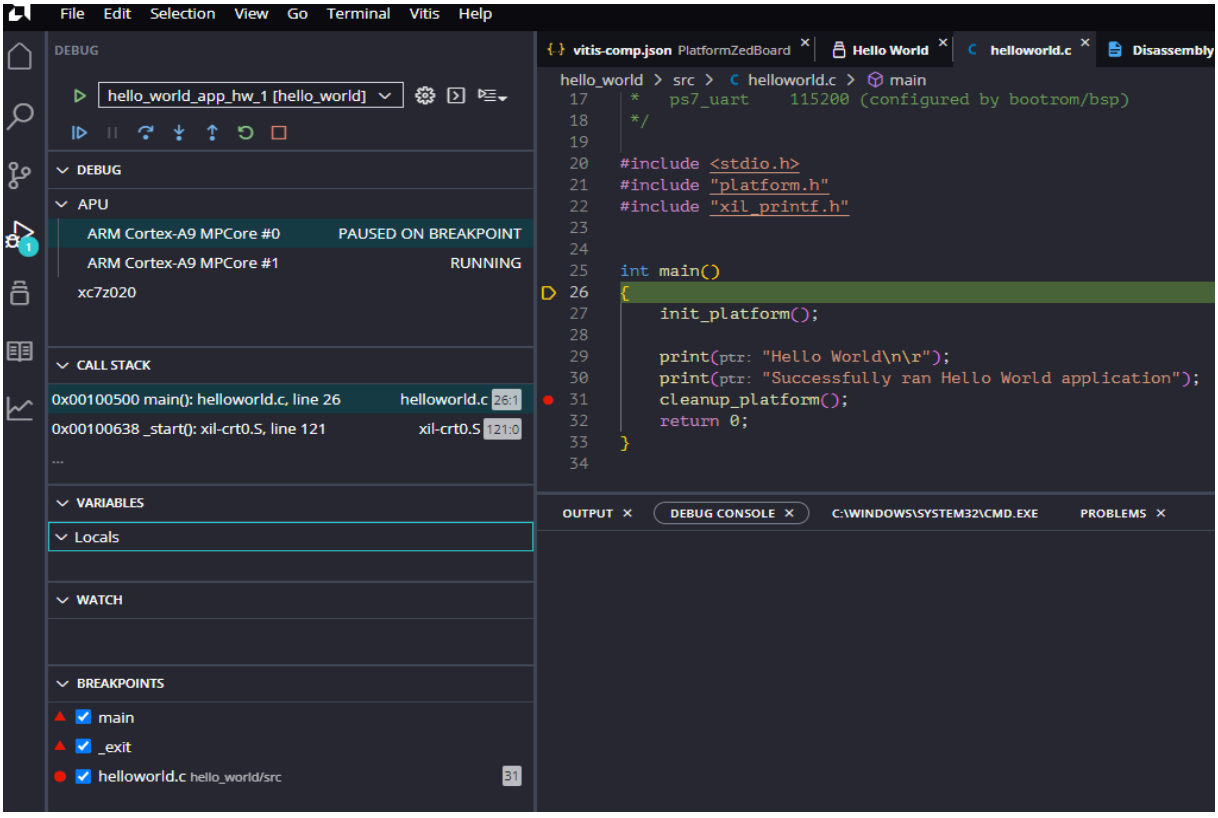
```
 -lc  -Wl,--end-group && cmd.exe /C "cd /D
C:\Projects\PlayZedVitisWs\hello_world\build && arm-none-eabi-size --format=berkeley
hello_world.elf && arm-none-eabi-size --format=berkeley hello_world.elf >
C:/Projects/PlayZedVitisWs/hello_world/build/hello_world.elf.size""

   text       data     bss     dec     hex filename

  24152       1416   22952   48520    bd88 hello_world.elf

 Build Finished successfully

 ----------------------------------------------------------------------------
```

[7/7/2025, 9:30:17 PM]: Build for hello_world::build with id '0172c894-8b17-40da-8d4c-bd5823a25f08' ended.

- Powered on ZedBoard to prepare for debug connection from Vitis IDE
- Clicked 'Debug'

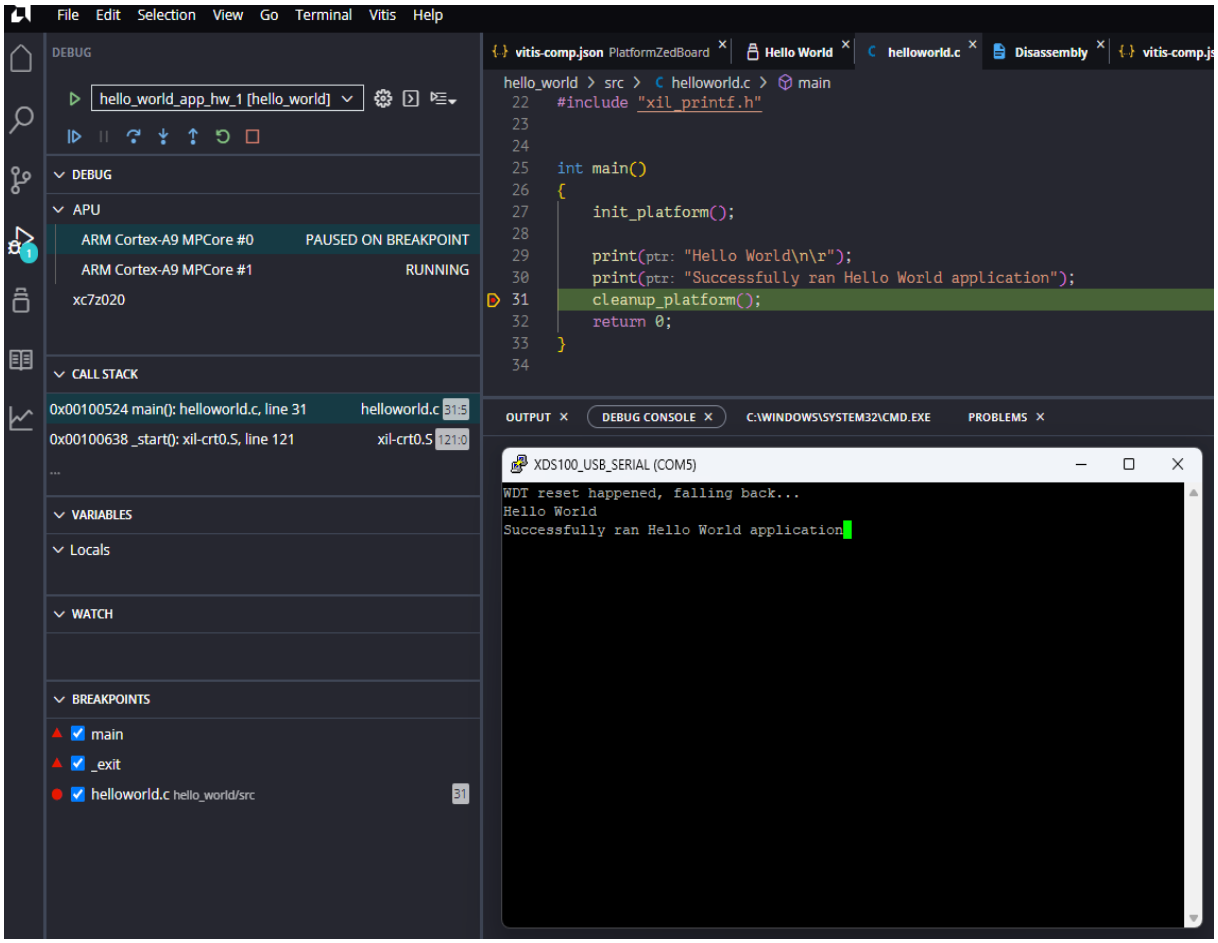


- Vitis connected to the target and updated the view to debug perspective



- Could single step and set breakpoints

- Ran to breakpoint and verified that print messages were displayed on serial terminal:



- Summary: Created a simple hello world program that can build and run on a ZedBoard using Vitis Unified IDE.