Section 1: in Vivado HLS： we write a C++ code for GCD function. Two input X, Y. using Euclid's algorithm, each time we use X divide Y, and store the big value to X and small one to Y, until Y is 0, terminate loop and export X. X is the GCD,

```
    val_in1= inStream.read();
    int x=(int)val_in1.data;
    val_in2= inStream.read();
    int y=(int)val_in2.data;
       if( x < y )
          std::swap( x, y );

       while( y > 0 )
       {
          int f = x % y;
          x = y;
          y = f;
       }
     val_out.data=x;
     outStream.write(val_out);
}
```

In Vivado HLS windows, run C_simulation, we can get the GCD of two input.

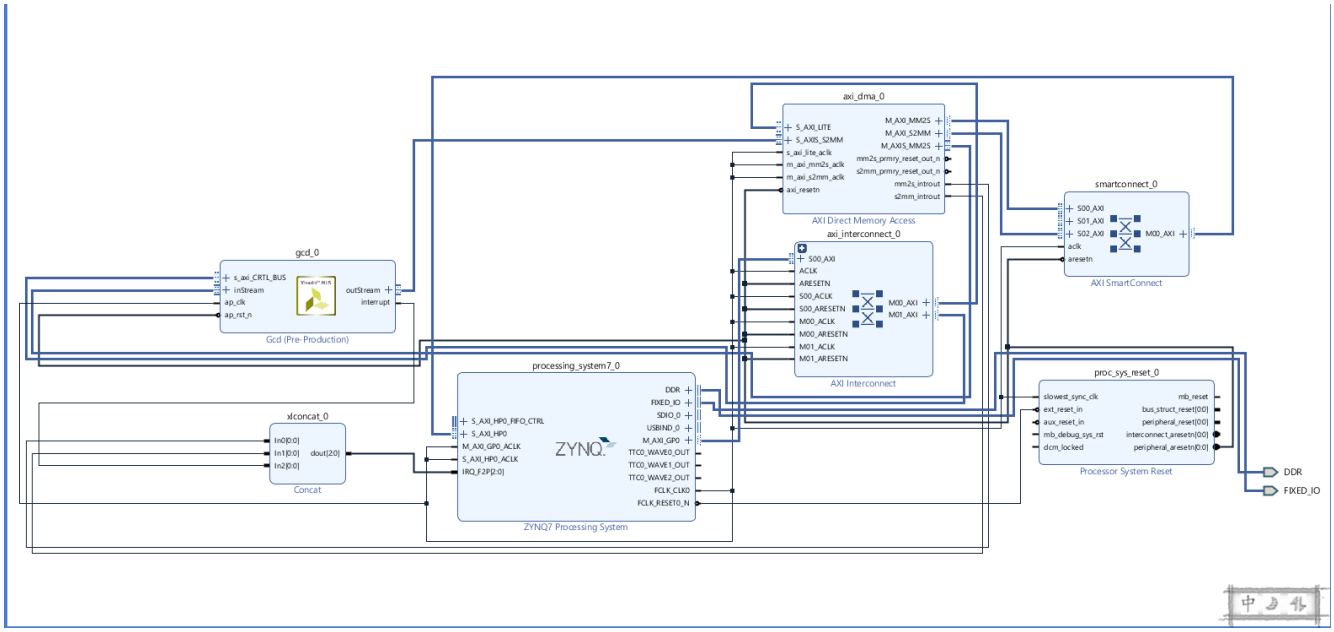
```
INFO: [SIM 2] *************** CSIM start ***************
INFO: [SIM 4] CSIM will launch GCC as the compiler.
   Compiling ../../../testbench.cpp in debug mode
   Generating csim.exe
input1=17input2=85 output = 17
INFO: [SIM 1] CSim done with 0 errors.
INFO: [SIM 3] *************** CSIM finish ***************

```

Then export RTL.

Section 2: in Vivado

Add our IP to the HLS stage. Connect IP to ARM Core.shown below



After all finishing the connection, run synthesis and implementation, then go write bitstream file.

```
Successfully read diagram <design_1> from BD file <D:/VivadoCode/project_2/project_2.srcs/sources_1/bd/design_1/design_1.bd>
open_bd_design: Time (s): cpu = 00:00:13 ; elapsed = 00:00:10 . Memory (MB): peak = 959.375 ; gain = 6.629
```

Then export to Hardware. Launch SDK.

Section 3: SDK

Run on hardware

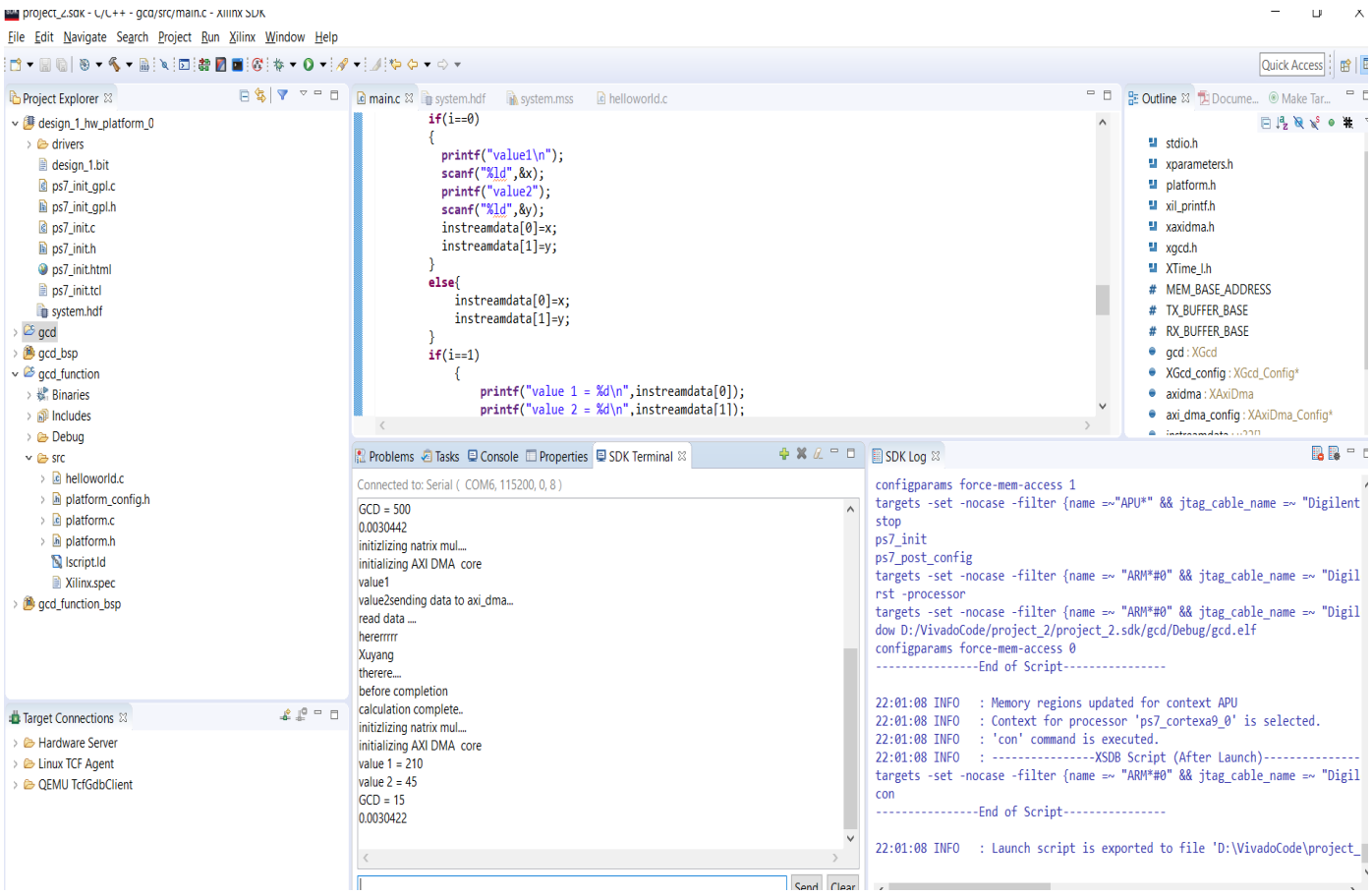
In SDK terminal, we create a new project, I made and name it as gcd.

Write the drive file to execute the function on hardware (under src>>main.cpp).

Run gcd, main drive file as system debugger.

Input 2 numbers, in the SDK terminal window at bottom. Arm core will give u the output automatically.

For our gcd function. The system execute time is 0.0030422S. shown below.



Run on software:

Same as run on HW, just change and re-write the drive function file.

In SDK terminal, we create a new project, I made and name it as gcd_function.

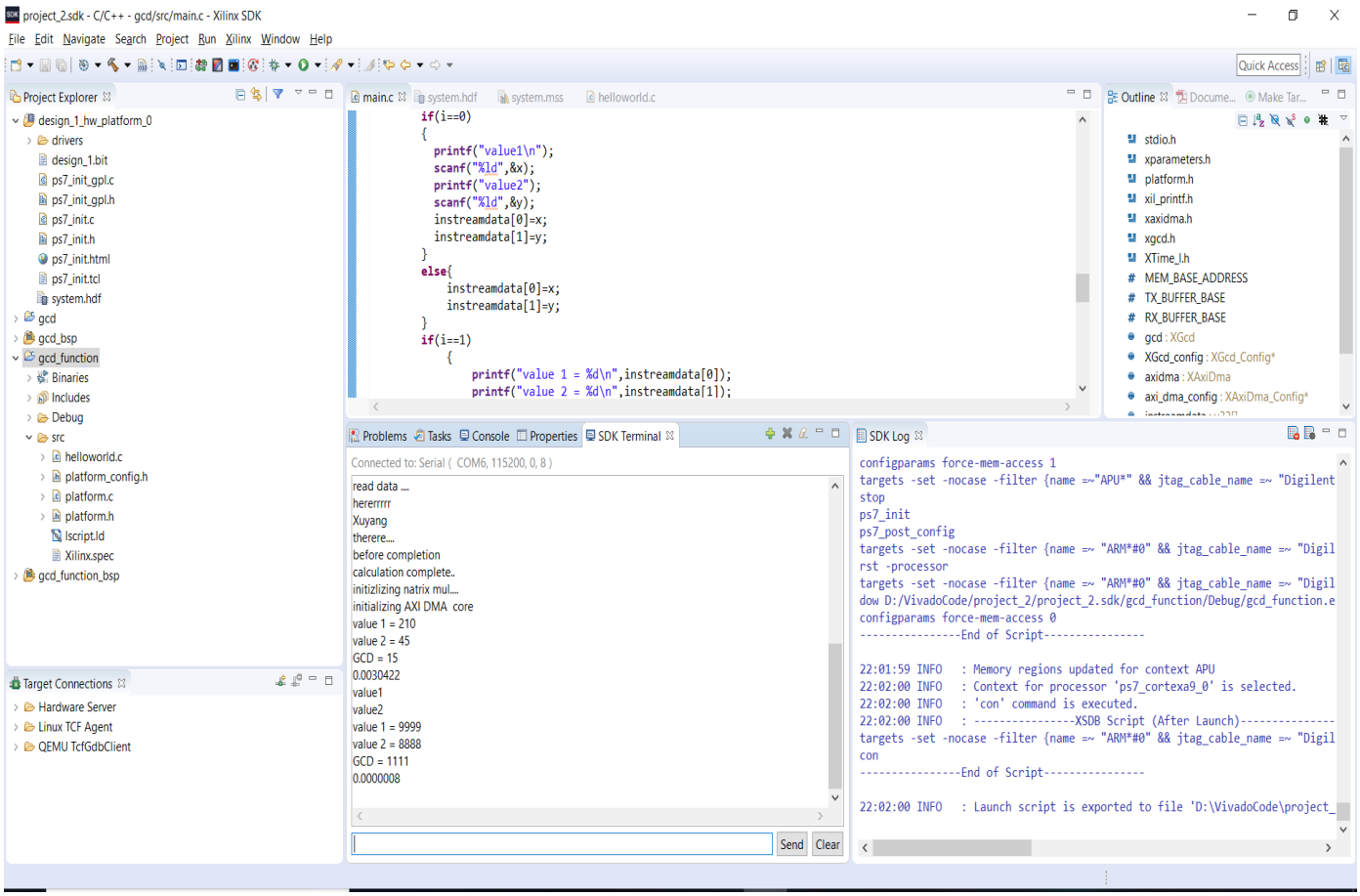
Write the drive file to execute the function on SW (under gcd_function>>src>>helloworld).

Run gcd_function, main drive file as system debugger.

Input 2 numbers, in the SDK terminal window at bottom. system will give u the output automatically.

For our gcd function. The system execute time is 0.000006S. shown below.

S



all the file is attached in the folder.