Tutorial: How to Deploy a Program on an Electronic Board (e.g., KV260)

**🧰** Prerequisites – Software to Install

* Vitis
* Vivado
* PowerShell (comes with Windows)
* PuTTY
* balenaEtcher

### 1. Create the Hardware Design in Vivado

1. Open **Vivado** and create a new project.
2. This project defines the **hardware configuration** of your board (e.g., FPGA logic).
3. Run the following steps in order:
   * **Run Linter**
   * **Run Synthesis**
   * **Run Implementation**
   * **Generate Bitstream**
4. Then, export the hardware:
   * Go to File > Export > Export Hardware
   * Check **Include bitstream**
   * This generates a .xsa file needed for the next step in Vitis.

### 2. Create the Embedded Application in Vitis

1. Launch **Vitis** and create a new **platform project**.
   * For the hardware design, select the .xsa file generated in Vivado.
   * Choose Hardware Design (XSA) for Implementation.
2. Then, create a new **Application Project**.
   * This is where you'll write your C code (e.g., hello\_world.c).
   * Once ready, **build** the project to generate a .elf file (your program).
   * Fix any compilation errors if they appear.

### 3. Install Ubuntu on the SD Card

1. Download the correct version of Ubuntu for ARM (⚠️ not AMD/Intel):  
   👉 [Ubuntu for ARM boards (Kria/embedded)](https://ubuntu.com/download/arm)
2. Use **balenaEtcher** to flash Ubuntu onto the SD card:
   * Select the .img or .iso file you downloaded.
   * Insert the SD card into your PC.
   * Click **Flash** to install Ubuntu.

### 4. Connect to the KV260 Board

1. Connect the following to your KV260:
   * Power cable
   * USB Serial cable
   * Ethernet cable (to your PC or router)
   * Insert the SD card with Ubuntu
2. On your PC, open **Device Manager** and find the **COM port** associated with the board.
3. Open **PuTTY**, select:
   * **Connection Type**: Serial
   * **Serial line**: COMxx (your detected port)
   * **Speed**: 115200
   * Click **Open**
4. When the terminal opens:
   * If prompted, press Enter to auto-select U-Boot mode.
   * Ubuntu should start booting.
   * Default login credentials:
     + **Username**: ubuntu
     + **Password**: ubuntu
   * You’ll be asked to change the password. Choose a secure one and **don’t lose it**!

### 5. Set a Static IP Address

**Option 1 – On your PC (Windows)**

* Go to:
  + Control Panel > Network and Internet > Network and Sharing Center > Change adapter settings
  + Right-click on Ethernet > Properties > IPv4 settings
  + Set a static IP, e.g.:
    - IP: 192.168.1.1
    - Subnet mask: 255.255.255.0

**Option 2 – On the board (Ubuntu terminal via PuTTY)**

1. First, check your current IP:

ip a

1. If no valid IP is set, edit the netplan config:

sudo nano /etc/netplan/01-netcfg.yaml

1. Example configuration:

network:

version: 2

renderer: networkd

ethernets:

eth0:

addresses: [192.168.1.2/24]

gateway4: 192.168.1.1

nameservers:

addresses: [8.8.8.8, 8.8.4.4]

1. Save and exit:
   * Ctrl+O, Enter, then Ctrl+X
2. Apply the changes:

sudo netplan apply

1. Verify:

ip a

ping 192.168.1.1 # Ping your PC to confirm the connection

### 6. Transfer and Run the Program on the Board

1. Open **PowerShell** on your PC and navigate to the directory containing the .elf file:

cd "C:\path\to\your\project"

1. Use scp to send the .elf file to the board:

scp hello\_world.elf ubuntu@192.168.1.2:~

Replace:

* + hello\_world.elf with your actual filename
  + 192.168.1.2 with the board’s IP address

1. Log in to the board via SSH:

ssh ubuntu@192.168.1.2

1. Make the file executable:

chmod +x hello\_world.elf

1. Run the program:

./hello\_world.elf

# Conclusion

You’ve now successfully:

* Created a hardware configuration using Vivado
* Built and compiled a C program with Vitis
* Flashed Ubuntu on the board
* Configured the network
* Deployed and executed your program on the embedded system