CrossLink-NX Human Counting Demo

User Guide

FPGA-UG-02120-1.0

December 2020
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# Acronyms in This Document

A list of acronyms used in this document.

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<th>Definition</th>
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<tr>
<td>FPGA</td>
<td>Field-Programmable Gate Array</td>
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<tr>
<td>ML</td>
<td>Machine Learning</td>
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<tr>
<td>SD</td>
<td>Secure Digital</td>
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<tr>
<td>SPI</td>
<td>Serial Peripheral Interface</td>
</tr>
<tr>
<td>SRAM</td>
<td>Static Random Access Memory</td>
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<tr>
<td>USB</td>
<td>Universal Serial Bus</td>
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1. Introduction
This document provides technical information and instructions on setting up and running the CrossLink™-NX Human Counting demo. This document is compatible with the MobileNet v1, MobileNet v2, and VGG versions of the Human Counting demo.

Refer to the following documents for detailed information on Lattice development boards and kit:
- Lattice CrossLink-NX Voice and Vision Board

2. Functional Description
The CrossLink-NX Human Counting demo is designed to utilize the Lattice CrossLink-NX Voice and Vision Board, as shown in Figure 2.1.

![Figure 2.1. Lattice CrossLink-NX Voice and Vision Board](image-url)
3. Demo Setup
This section describes the demo setup.

3.1. Hardware Requirements
- Lattice CrossLink-NX Voice and Vision Board
  - Micro-USB Cable
  - USB Micro B Cable

3.2. Software Requirements
- Lattice Radiant™ Programmer (refer to http://www.latticesemi.com/Products/DesignSoftwareAndIP/FPGAandLDS/Radiant)
- Video Player such as AMCap or VLC
4. Programming the CrossLink-NX Voice and Vision SPI Flash

4.1.1. Erasing the CrossLink-NX Voice and Vision SRAM Prior to Reprogramming

If the CrossLink-NX Voice and Vision device is already programmed (either directly, or loaded from SPI Flash), follow this procedure to first erase the CrossLink-NX Voice and Vision SRAM memory before re-programming the CrossLink-NX Voice and Vision’s SPI Flash. If you are doing this, keep the board powered when re-programming the SPI Flash (so it does not reload on reboot).

To erase the CrossLink-NX Voice and Vision device:

1. Launch Lattice Radiant Programmer. In the Getting Started dialog box, select **Create a new blank project**.

![Radiant Programmer – Default Screen](image)

**Figure 4.1. Radiant Programmer – Default Screen**

2. Click **OK**.

3. In the Radiant Programmer main interface, Select **LIFMD** for Device Family, **LIFCL** for Device Vendor, and **LIFCL-40** for Device as shown in **Figure 4.2**.
4. Right-click and select **Device Properties**.

5. Select **JTAG** for Port Interface, **Direct Programming** for Access Mode, and **Erase Only** for Operation as shown in **Figure 4.3**.

6. Click **OK** to close the Device Properties dialog box.

7. Click the **Program** button to start the erase operation.

### 4.1.2. Programming the CrossLink-NX Voice and Vision Board

To program the CrossLink-NX Voice and Vision SPI Flash:

1. Ensure that the CrossLink-NX Voice and Vision device SRAM is erased by performing the steps in **Erasing the CrossLink-NX Voice and Vision SRAM Prior to Reprogramming**.

2. In the Radiant Programmer main interface, right-click the CrossLink-NX Voice and Vision row and select **Device Properties**.

3. Apply the settings below:
   a. Under Device Operation, select the options below:
      - **Access Mode** – Direct Programming
      - **Operation** – SPI Flash Erase, Program, Verify
   b. Under Programming Options, select the bitstream file.
   c. For **SPI Flash Options**, select the **Macronix 25L12833F** device as shown in **Figure 4.4**.
Figure 4.4. Radiant Programmer – Selecting Device Properties Options for CrossLink-NX Flashing

d. Click **Load from File** to update the Data file size (bytes) value.

e. Ensure that the following addresses are correct:
   - **Start Address (Hex)** – 0x00000000
   - **End Address (Hex)** – 0x00100000

4. Click **OK**.

5. Press the **SW4** push button switch before clicking the **Program** button as shown in Figure 4.5. Hold it until you see the **Successful** message in the Radiant log window.
6. Click the Program button to start the programming operation.
7. After successful programming, the Output console displays the result as shown in Figure 4.6.

![Figure 4.6. Radiant Programmer – Output Console]
4.1.3. Programming SensAI Firmware Binary to the CrossLink-NX Voice and Vision SPI Flash

4.1.3.1. Convert Flash SensAI Firmware Hex to Crosslink-NX Voice and Vision SPI Flash

To program the CrossLink-NX Voice and Vision SPI flash:

1. Ensure that the CrossLink-NX Voice and Vision device SRAM is erased by performing the steps in Erasing the CrossLink-NX Voice and Vision SRAM Prior to Reprogramming before flashing bitstream and SensAI firmware binary.

2. In the Radiant Programmer main interface, right-click the CrossLink-NX Voice and Vision row. Select Device Properties to open the dialog box, as shown in Figure 4.7.

3. Select SPI FLASH for Target Memory, JTAG2SPI for Port Interface, and Direct Programming for Access Mode.

4. For Programming File, select the CrossLink-NX SensAI firmware binary file after converting it to hex (*.mcs).

5. For SPI Flash Options, follow the configurations as shown in Figure 4.7.

6. Click Load from File to update the data file size (bytes) value.

7. Ensure that the following addresses are correct:
   - **Start Address (Hex)** – 0x00300000
   - **End Address (Hex)** – 0x00400000

8. Click OK.
9. Press the **SW4** push button switch. Click the **PROGRAMN** push button and hold it until you see the *Successful* message in the Radiant log window.

10. Click the **Program** button to start the programming operation.

11. After successful programming, the **Output** console displays the result as shown in Figure 4.8.

![Figure 4.8. Radiant Programmer – Output Console](image)
5. Running the Demo

To run the demo:

1. Cycle the power on the Voice and Visio board.
2. Make sure the position of SWITCH0 is ON to set FX3 to boot from I²C EEPROM.
3. Connect the Voice and Vision board to the PC through the board’s USB3 port.
4. Open the AMCap or VLC application and select the FX3 device as source.
5. The camera image is displayed on monitors, as shown in Figure 5.1.

6. The demo output contains bounding boxes for detected humans in a given frame. It also displays the total number of detected humans in a given frame on the PC.

![Image of running the demo](image_url)
Technical Support Assistance

Submit a technical support case through www.latticesemi.com/techsupport.
## Revision History

**Revision 1.0, December 2020**

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<tr>
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