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Introduction

This user guide provides instructions to flash, setup, and start using a Clara AGX Developer Kit.

**Disclaimer**: The Clara AGX Developer Kit is not an approved medical device and is not intended for clinical use.
Hardware Setup

Checklist for Setting up the Developer Kit

After receiving the Clara AGX Developer Kit, ensure the following actions are taken before developing on the kit. Each action is described in its corresponding section of this user guide.

- Read through the Hardware Setup requirements and precautions.
- Familiarize yourself with the System Overview: the main components and system I/O.
- Power up the system.
- Flash and update the Clara AGX Developer Kit using SDK Manager.
- Switch from iGPU to dGPU mode and reinstall the dGPU mode packages.
- Set up the 250G SSD storage.

Requirements

- A Clara AGX Development Kit
- A compatible power cable
  - A power cable is not shipped with the NVIDIA Clara AGX Development Kit.
  - A compatible cable should meet the following requirements:
    - Certified local 3-prong AC power
    - Provides a C13 connector
    - Supports rating 100-120VAC/6A, 200-240VAC/3A, or higher with Min. 18AWG.
    - In particular, the plug of the cord should support 100-120VAC/7.5A or higher in North America.
- An Ubuntu 18.04 host system (for use during flashing)
- A standard USB-A to USB-C or USB-C to USB-C cable with data enabled (for use during flashing)
- Connection to the internet for the host system before and during flashing, and for the Clara AGX Development Kit after flashing
• A keyboard, mouse, and monitor with HDMI for the Clara AGX Development Kit

**Precautions**

• Only connect and disconnect a PCIe card (e.g., miniSAS or dGPU) when the system is powered down.

• Apply extra care when plugging and removing PCIe cards to avoid stress on the PCIe connectors (wearing, bending, breaking).

• The rightmost USB connector is USB 2.0 (even if the color is blue). The other two USB connectors are USB 3.0.
System Overview

Main Components
The Clara AGX Development Kit contains the following major components:

- Jetson AGX Xavier™ 32 GB Module
- Quadro™ RTX 6000 discrete GPU
- ConnectX-6 IC
- 250GB Removeable SSD

I/O and external interfaces
1) Power cable connection
2) Power switch
3) PCIe slots for customer cards
4) dGPU
   a) Reference the [GPU section](#) below to determine which display output to use.
5) 100 GbE QSFP28 Ethernet connector to NVIDIA ConnectX-6
6) 10 GbE RJ45 Ethernet connector to NVIDIA ConnectX-6
   a) The 10GbE connector only supports 10 GbE speeds.
7) 1 GbE RJ45 Ethernet connector to Xavier module
8) USB 3.0 ports (2x)
9) USB 2.0 port (1x)
10) HDMI out
   a) Reference the [GPU section](#) below to determine which display output to use.
11) HDMI in: Connect to instruments that output HDMI to the platform
12) Debug USB-C port: Connect to the Linux host system for flashing and serial port connections.
13) x8 PCIe slot (x16 physical) for customer card, to Xavier Module
14) x8 PCIe slot (x16 physical) for customer card, to RTX6000  
   a) Used for cards supporting GPU Direct RDMA data transfer to RTX6000 GPU
15) SD card slot
16) Recovery button
17) Reset button
18) Main secondary compartment fan connector (there is an additional system fan inside the chassis)
19) Auxiliary fan connector for card fans

20) Power button
Getting Started

Powering up the System
1. Connect all peripherals to the system before powering up the system.
2. Connect the power cable to the system in the slot labeled (1) in the picture above.
3. Once the power is connected, press the power button (20) for less than 10 seconds. It should light up.
4. If you have a display connected, you might already see the system booting on it. During flashing or re-flashing, use the HDMI out port (10) to connect to the display. Reference the GPU section below to determine how to choose between display outputs.

Flashing and updating Clara AGX Development Kit using SDK Manager
1. Register and activate an NVIDIA Developer Account here.
2. If you are running a VPN on your host system, log off before flashing the Clara AGX Development Kit.
3. From the host system, download and install the latest version of NVIDIA SDK Manager. Instructions for downloading and setting up NVIDIA SDK Manager can be found here.
4. Connect the Clara AGX Development Kit to the host system via USB-C (12).
5. From the NVIDIA SDK Manager, download and flash the Clara AGX Development Kit. See the step-by-step instructions here for more details.
   a) If you joined the Clara AGX SDK program after your initial SDK Manager login, you will need to log out and log in again on SDK Manager for the permissions to take effect.
   b) If the SDK Manager does not see the Clara AGX Development Kit, it may need to be placed in Recovery mode. Follow these steps to place the Clara AGX Development Kit in recovery mode:
      i) Power off the unit.
      ii) Remove the left-hand side cover to expose ports 13-19 by unscrewing the two Phillips screws that secure it at the back.
iii) Hold down the Recovery button (16) while pressing the Power button (20) to turn on the machine.
iv) Release the Power Button, then the Recovery button.
c) If Recovery mode doesn’t help, try resetting the unit:
i) While the unit is powered on, press the Recovery button (16) + Reset button (17), then release both buttons.

6. Use the default credentials (shown below) when the NVIDIA SDK Manager is preparing to flash the Clara AGX Development Kit. If Automatic Setup fails, try switching to Manual Setup.
a) Username: ubuntu
b) Password: ubuntu

Switching between iGPU and dGPU

The Clara AGX Development Kit can use either the Xavier AGX module GPU (iGPU, – integrated GPU) or the RTX6000 add-in card GPU (dGPU, – discrete GPU). You can only use one type of GPU at a time.

By default, the Clara AGX Development Kit uses the iGPU. Switching between the iGPU and dGPU is done using the nvgpuswitch.py script contained in the /usr/local/bin directory.

To switch from the iGPU to the dGPU, follow these steps:

1. Connect the Clara AGX Development Kit to the internet using one of the following methods:
a) An Ethernet cable connected to a router or Wi-Fi extender;
i) The 10 GbE RJ45 Ethernet connector only supports 10 GbE speeds
b) A USB Wi-Fi receiver.
i) Not all USB Wi-Fi receivers will work out of the box on the Clara AGX Development Kit.
ii) The TP-Link Archer T2U Nano USB Wi-Fi Adapter has been tested with the Clara AGX Development Kit.

2. To view the currently installed drivers and their version, use the query command:

   $ nvgpuswitch.py query
   iGPU (nvidia-l4t-cuda, 32.5.0-20201012161040)

3. To install the dGPU drivers, use the install command with the dGPU parameter (note that sudo must be used to install drivers):

   $ sudo nvgpuswitch.py install dGPU

   The install command will print out the list of commands that will be executed as part of the driver install, then continue to execute those commands. This aids with debugging if any of the commands fail to execute for any reason. The following arguments may also be provided with the install command:

   d  Does a dry run, showing the commands that would be executed by the install but does not execute them.
v  Enable verbose output (used with ‘-d’ to describe each of the commands that would be run).
-i Run commands interactively (asks before running each command).
-1 [LOG] Writes a log of the install to the file `LOG’.

4. The dGPU driver install may be verified using the query command:

   $ nvgpuswitch.py query
dGPU (cuda-drivers, 455.32.00-1)

   **Note:** CUDA installs its runtime binaries such as nvcc into its own versioned path that is not included by the default `$PATH` environment variable. Because of this, attempts to run commands like nvcc will fail on dGPU unless the CUDA 11.1 path is added to the `$PATH` variable. To add the CUDA 11.1 path for the current user, add the following line to `$HOME/.bashrc` after the switch to dGPU:

   ```bash
   $ export PATH=/usr/local/cuda-11.1/bin:$PATH
   ```

   After the dGPU drivers have been installed, rebooting the system will complete the switch to dGPU. At this point, the Ubuntu desktop will be output via DisplayPort on the dGPU, so the display cable must be switched from the onboard HDMI (10) to DisplayPort on the dGPU (4). If the output connection isn’t switched, the terminal screen will hang during booting.

   If at any time you want to switch back to iGPU, use the install command with the iGPU parameter:

   ```bash
   $ sudo nvgpuswitch.py install iGPU
   ```

   After the iGPU drivers have been installed, rebooting the system will complete the switch back to iGPU. At this point the Ubuntu desktop will be output via the onboard HDMI, so the display cable must be switched from the DisplayPort on the dGPU (4) to the onboard HDMI (10). If the output connection isn’t switched, the terminal screen will hang during booting.

   **Note:** The GPU settings will persist through reboots until it is changed again with nvgpuswitch.py.

### Reinstalling dGPU Mode Clara AGX SDK Packages

After rebooting the system, refer to “Switching Between iGPU and dGPU; Reinstalling Clara AGX SDK Packages” in the Clara SDK AGX [Documentation] for instructions on how to reinstall the libraries and samples needed to run sample applications.

### Setting up SSD Storage

Make sure you have followed the Storage Setup (m2 SSD) instructions in the Clara AGX SDK [Documentation] to mount the 250 GB SSD onto your system and move the docker storage to the SSD. Without this step, you will likely quickly fill up the root directory with Docker image pull operations, since a complete installation of the Clara SDK leaves only about 10GB of storage remaining in the root 32GB.
Additional Resources

For other documentation, see release notes from Clara AGX SDK Developer portal.
For further Jetson documentation, see L4T documentation.
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