AMD
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Getting Started with Alveo Data Center Accelerator Cards User Guide (UG1301)

Introduction

This document provides hardware and software installation procedures for Xilinx® Alveo™ data center accelerator cards U200/U250/U280 and applies to DFX-1RP and DFX-2RP platforms and XRT 2022.1 and greater. For DFX-1RP and DFX-2RP platform features and types for your Alveo card, see *Alveo Data Center Accelerator Card Platforms User Guide* (UG1120). For installation procedures using previous XRT versions, see v1.9 of *Getting Started with Alveo Data Center Accelerator Cards* (UG1301).

The Alveo U200/U250/U280 data center accelerator cards are PCIe® Gen3 x16 compliant featuring the Xilinx Virtex® UltraScale+™ technology. These cards accelerate compute-intensive applications such as machine learning, data analytics, video processing, and more and are available in passive and active cooling configurations.

Different system configurations are available for running, developing, and debugging applications on your Alveo accelerator cards:

Running Applications

To configure a system to run accelerated applications, install an Alveo card into a system as described in Card Installation Procedures along with the required deployment software to support running applications as described in Installing the Deployment Software.

Developing Applications

To develop FPGA accelerated applications, it is necessary to install both the deployment software and the development software. Development software installation, described in Next Steps, consists of installing both a development target platform and the Vitis™ environment. This configuration does not have an Alveo card installed and is used for development along with debugging in emulation modes.

Running, Developing, and Debugging Applications

By installing the Alveo card along with both the deployment and development software on a single machine, you can configure a system for developing and running accelerated applications. With the card installed, developers can debug applications in both emulation modes and on the hardware.

Accelerator Card Overview

Card Features

Features of the production Alveo™ U200/U250/U280 data center accelerator cards are listed in the following table.

Table: Alveo U200/U250/U280 Features

Card Component	U200	U250	U280
FPGA	UltraScale+™ XCU200-2FSGD2104E	UltraScale+ XCU250-2LFIGD2104E	UltraScale+ XCU280-L2FSVH2892E
DDR4	64 gigabyte (GB) 4x DDR4 16 GB		32 gigabyte (GB) 2x DDR4 16 GB
	2400 mega-transfers per second (MT/s), on 64-bit ECC DIMM		
HBM	–	–	8 GB, 32-pseudo channels
PCIe	16-lane PCI™ Express		
	PCIe Integrated Endpoint block connectivity		
	Gen1, 2, or 3 up to x16		Gen1, 2, or 3 up to x16 Gen4 x8
Network Interface	2x QSFP28	2x QSFP28	2x QSFP28
I2C Bus	✓	✓	✓
Status LEDs	✓	✓	✓
Power Management	Power management with system management bus (SMBus) voltage, current, and temperature monitoring		

Card Component	U200	U250	U280
Electrical Design Power	65W with PCIe slot power only		
	140W with 110A max V_{CCINT} current PCIe slot power and 6-pin PCIe AUX power cable connected		
	215W with 160A max V_{CCINT} current PCIe slot power and 8-pin PCIe AUX power cable connected [1]		
Configuration Options	1 gigabit (Gb) Quad Serial Peripheral Interface (SPI) flash memory		
	Micro-USB JTAG configuration port		
UART	UART access through the USB port		

1. Vitis™ unified software platform based applications are only designed to run with electrical design power at 215W.

Minimum System Requirements

The minimum system requirements for running the Alveo™ U200/U250/U280 Data Center accelerator cards are listed in the following table.

Table: Minimum System Requirements

Component	Requirement
Motherboard	PCI Express® 3.0-compatible with one dual-width x16 slot.
System Power Supply	225W via PCI Express Slot connection and 8-pin PCI Express Auxiliary Power cable.
Operating System	For the latest OS support, see *Xilinx Runtime for Alveo Data Center Accelerator Cards - Master Release Notes and Known Issues* .
System Memory	For deployment installations, a minimum of 16 GB plus application memory requirements is

Component	Requirement
	required. For development installations, a minimum of 64 GB of system memory is required, but 80 GB is recommended.
Internet Connection	Required for downloading drivers and utilities.
Hard disk space	Satisfy the minimum system requirements for your operating system.
Licensing	None required for application deployment. For the application development environment, see *Vitis Unified Software Platform Documentation: Application Acceleration Development* (UG1393).

For additional specifications and details on the acceptable environmental conditions, see *Alveo U200 and U250 Data Center Accelerator Cards Data Sheet* (DS962) and *Alveo U280 Data Center Accelerator Cards Data Sheet* (DS963).

Qualified Servers

The Xilinx Qualified Servers Catalog provides a list of servers that Alveo cards are fully qualified.

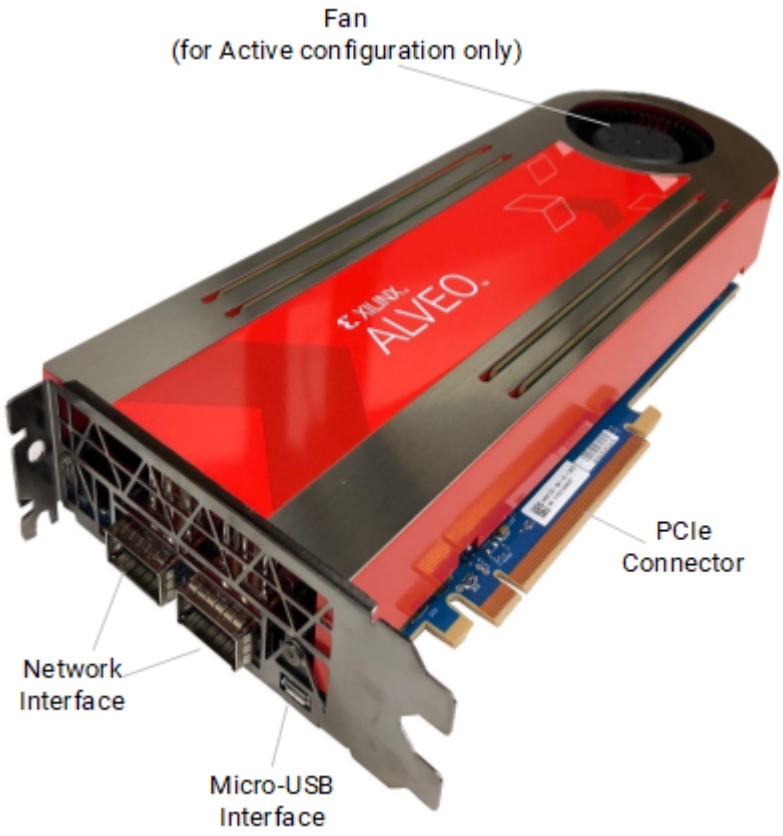
Card Interfaces and Details

Alveo™ U200/U250/U280 cards are available in both passive and active cooling configurations; see Passive and Active Cooling Cards. The interfaces of each are identical, except the fan included on active cooled cards. The card includes the following interfaces.

- A PCI Express® x16 card connector.
- A PCI Express auxiliary power connector. This 8-pin connector is shown in Figure 2 and is not compatible with an ATX12V/EPS12V power cable source.
- Two QSFP28 interfaces. Currently these interfaces are not supported by the deployment platform.
- A micro-USB connector for maintenance purposes.
- A fan for the active cooled card configuration.

Warning: Hazardous moving parts. Keep away from fan blades.
Avertissement : Pièces mobiles peuvent etre dangereuses. Éloignez-vous des lames du ventilateur.
Warnung: Gefährliche bewegliche Teile. Halten sie sich von Lüfterflügeln fern.

Figure: Alveo Card Features



✎ **Note:** On the Alveo U280 card, the micro-USB is located on the opposite end of the card between the PCB board and the enclosure.

Passive and Active Cooling Cards

Alveo™ cards are available in both active and passive cooling configurations, as shown in the following figures. The passive cooling card is designed to be installed into a data center server, where controlled air flow provides direct cooling. The active cooling card is designed to be installed into a PC environment where the air flow is uncontrolled; consequently, this configuration includes a heat sink and fan enclosure cover to provide appropriate cooling.
For card specifications, dimensions, list of card features, and block diagram see *Alveo U200 and U250 Data Center Accelerator Cards Data Sheet* (DS962) and *Alveo U280 Data Center Accelerator Cards Data Sheet* (DS963).

Figure: Active Cooled Card Configuration

Figure: Passive Cooled Card Configuration

Card Installation Procedures

To reduce the risk of fire, electric shock, or injury, always follow basic safety precautions.

⚠ **CAUTION!** You must always use an ESD strap or other antistatic device when handling hardware.

⚠ **CAUTION!** Il est fortement recommandé d'utiliser un bracelet ESD ou autres dispositifs antistatiques.

⚠ **CAUTION!** Beim Umgang mit Hardware müssen sie immer ein Erdungs Armband oder ein anderes antistatisches Gerät verwenden.

Safety Instructions

Safety Information

To ensure your personal safety and the safety of your equipment:

- Keep your work area and the computer/server clean and clear of debris.
- Before opening the computer/system cover, unplug the power cord.

Dispositif de Sécurité

Pour assurer votre sécurité personnelle et la sécurité de votre équipement:

- Maintenez votre zone de travail et l'ordinateur/serveur propre et dégagé de débris.
- Avant d'ouvrir le capot de l'ordinateur/système, débranchez le cordon d'alimentation.

Sicherheitsinformation

Um ihre persönliche Sicherheit und die Sicherheit ihrer Ausrüstung zu gewährleisten:

- Halten sie ihren Arbeitsbereich und den Computer / Server sauber und frei von Ablagerungen.
- Ziehen sie vor dem Öffnen der Computer / Systemabdeckung das Netzkabel ab.

Electrostatic Discharge Caution

Electrostatic discharge (ESD) can damage electronic components when they are improperly handled, and can result in total or intermittent failures. Always follow ESD-prevention procedures when removing and replacing components.
To prevent ESD damage:

- Use an ESD wrist or ankle strap and ensure that it makes skin contact. Connect the equipment end of the strap to an unpainted metal surface on the chassis.
- Avoid touching the card against your clothing. The wrist strap protects components from ESD on the body only.
- Handle the card by its bracket or edges only. Avoid touching the printed circuit board or the connectors.
- Put the card down only on an antistatic surface such as the bag supplied in your kit.
- If you are returning the card to Xilinx Product Support, place it back in its antistatic bag immediately.

Attention aux Décharge Électrostatique (ESD)

L'ESD peut endommager les composants électroniques lorsqu'ils sont mal manipulés, et peut entraîner des défaillances totales ou intermittentes. Suivez toujours les procédures de prévention contre les ESD lors du retrait et remplacement des composants.
Pour prévenir les dommages dus aux ESD:

- Utilisez une sangle de poignet ou de cheville anti-ESD et assurez-vous qu'elle est en contact avec la peau. Branchez l'extrémité du cable de la sangle à une surface métallique non peinte du châssis et a la masse.
- Évitez de mettre en contact la carte de circuit imprimé ou les connecteurs avec vos vêtements. La sangle de poignet protège la carte ou connecteurs contre les ESD du corps seulement.
- Manipulez la carte uniquement par son support ou par ses bords. Évitez de toucher la carte de circuit imprimé ou les connecteurs.
- Ne posez la carte de circuit imprimé ou les connecteurs que sur une surface antistatique telle que le sac anti-statique fourni avec la carte.
- Si vous retournez la carte a Xilinx, remettez-la dans son sac antistatique immédiatement.

Vorsicht Elektrostatische Entladung

Elektrostatische Entladung (ESD) kann elektronische Bauteile beschädigen, wenn sie unsachgemäß behandelt werden, und es kann zu totalen oder zeitweiligen Ausfällen kommen. Befolgen sie beim Entfernen und Austauschen von Komponenten stets die ESD-Schutzmaßnahmen.
So verhindern sie ESD-Schäden:

- Verwenden sie einen ESD-Handgelenk-oder Knöchelriemen und stellen sie sicher, dass er Hautkontakt hat. Verbinden sie das Ende des Riemens mit einer unlackierten Metalloberfläche am Gehäuse.
- Berühren sie die Karte nicht mit ihrer Kleidung. Der Riemen schützt Komponenten nur vor ESD am Körper.
- Fassen sie die Karte nur an der Halterung oder an den Kanten an. Berühren sie nicht die Leiterplatte oder die Anschlüsse.
- Legen sie die Karte nur auf einer antistatischen Oberfläche ab, z.B. dem antistatischen Beutel der mit dem Kit mitgeliefert wurde.
- Wenn sie die Karte an den Xilinx Product Support zurücksenden, legen Sie sie bitte sofort wieder in den antistatischen Beutel.

Before You Begin

‼ Important: Alveo™ cards are delicate and sensitive electronic devices; equipment is to be installed by a qualified technician only. This equipment is intended for installation in a Restricted Access Location.

!! Important : Les cartes Alveo™ sont des appareils électronique sensibles et fragiles; l'équipement doit être installé par un technicien certifié seulement. Cet équipement est destiné à être installé dans un lieu d'accès restreint.

!! Wichtig: Die Karten Alveo™ sind sensible und empfindliche elektronische Geräte. Das Gerät darf nur von einem qualifizierten Techniker installiert werden. Dieses Gerät ist für die Installation an einem Ort mit begrenztem Zugang vorgesehen.

- Verify that the minimum card space is available to install your card. Card specifications and dimensions can be found in *Alveo U200 and U250 Data Center Accelerator Cards Data Sheet* (DS962) and *Alveo U280 Data Center Accelerator Cards Data Sheet* (DS963).
- Check for card compatibility with the system. Also check for proper system requirements such as power, bus type, and physical dimensions to support the card.
- Ensure that appropriate PCIe Auxiliary Power source is available, and not an ATX12V/EPS12V power source. For more details see Xilinx Answer Record 72298.

Installing the Card

!! Important: Do not unplug the Alveo™ AUX power connector while in the power-up state (hot-plug is not allowed).

!! Important : Ne débranchez pas le connecteur auxiliaire d'alimentation des cartes Alveo™ pendant qu'elles sont sous-tension (“hot-plug” n'est pas autorisé).

!! Wichtig: Trennen Sie den Alveo™ -Stromanschluss-Stecker nicht im eingeschalteten Zustand (Hot-Plug ist nicht zulässig).

The following procedure is a guide for the Xilinx® Alveo™ data center accelerator card installation. Consult your computer documentation for additional information. If you encounter any issues during installation, see Troubleshooting.

1. Host power supply must be disconnected.
2. For enclosed computers, open your computer by removing the casing.
3. If necessary, remove the two adjacent PCIe® slot covers corresponding to the PCIe x16 slot in which you are installing the Alveo card.
4. Plug the Alveo card in the PCIe x16 slot on the motherboard.
5. Connect the AUX power connector to the Alveo card, ensure the plug is mechanically fixed (with the click).

!! Important: Operation of the Alveo cards only with AUX power connector is not allowed.

!! Important : Le fonctionnement des cartes Alveo uniquement avec le connecteur auxiliaire n'est pas autorisé.

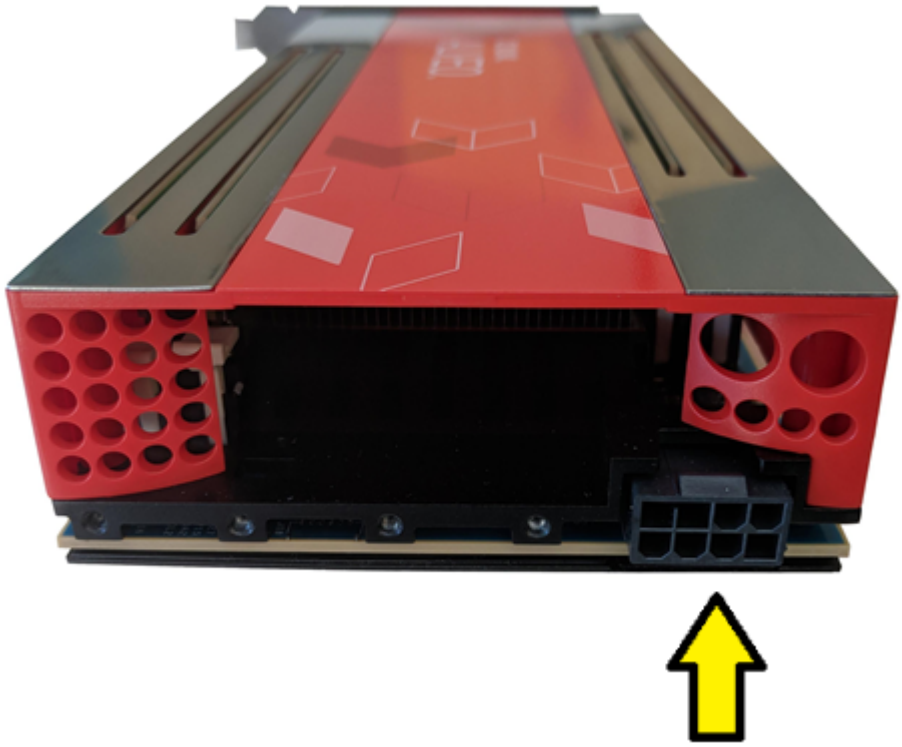
!! Wichtig: Der Betrieb von Alveo-Karten nur mit AUX Connector ist nicht zulässig.

The Alveo card has an 8-pin receptacle PCIe AUX power connector. Depending on your server or computer, an additional PCI Express auxiliary power cable or adapter may be needed. Consult your computer documentation for additional information.
For actively cooled cards, connect the power cable to the AUX power connector at top of the card as shown in the following figure.

Figure: Connecting the Power Cable to Actively Cooled Cards

For passively cooled cards, connect the power cable to the AUX power connector at the side of the card as shown in the following figure.

Figure: Connecting the Power Cable to Passively Cooled Cards



Warning: Alveo cards are not compatible with an ATX12V/EPS12V power source. Do not force connection to a CPU (ATX12V/EPS12V) power source. This will damage the Alveo card and void the warranty.

Avertissement : Les cartes Alveo ne sont pas compatibles avec une source d'alimentation ATX12V / EPS12V. Ne forcez pas la connexion à une source d'alimentation CPU (ATX12V / EPS12V). Cela endommagerait la carte Alveo et annulerait la garantie.

Warnung: Alveo-Karten sind nicht mit einer ATX12V / EPS12V-Stromquelle kompatibel. Erzwingen Sie keine Verbindung zu einer CPU-Stromquelle (ATX12V / EPS12V). Dadurch wird die Alveo-Karte beschädigt und die Garantie erlischt.

The power supply can have an 8-pin or a 6-pin power connector configuration. Some power supplies label this cable *PCIe Auxiliary Power* or *VGA*. These connector configurations are not pin compatible with other power source types. Do not force a connection to any power source other than PCIe Auxiliary Power. See Xilinx Answer Record 72298 for more information.

‼ **Important:** Only 140W of power is available with the 6-pin connector (65 Watts from PCIe connector with 12V source, and 75 Watts from the 6-pin AUX connector). 215W is available with the 8-pin connector (65 Watts from PCIe connector 12V source, and 150 Watts from the 8-pin AUX connector).

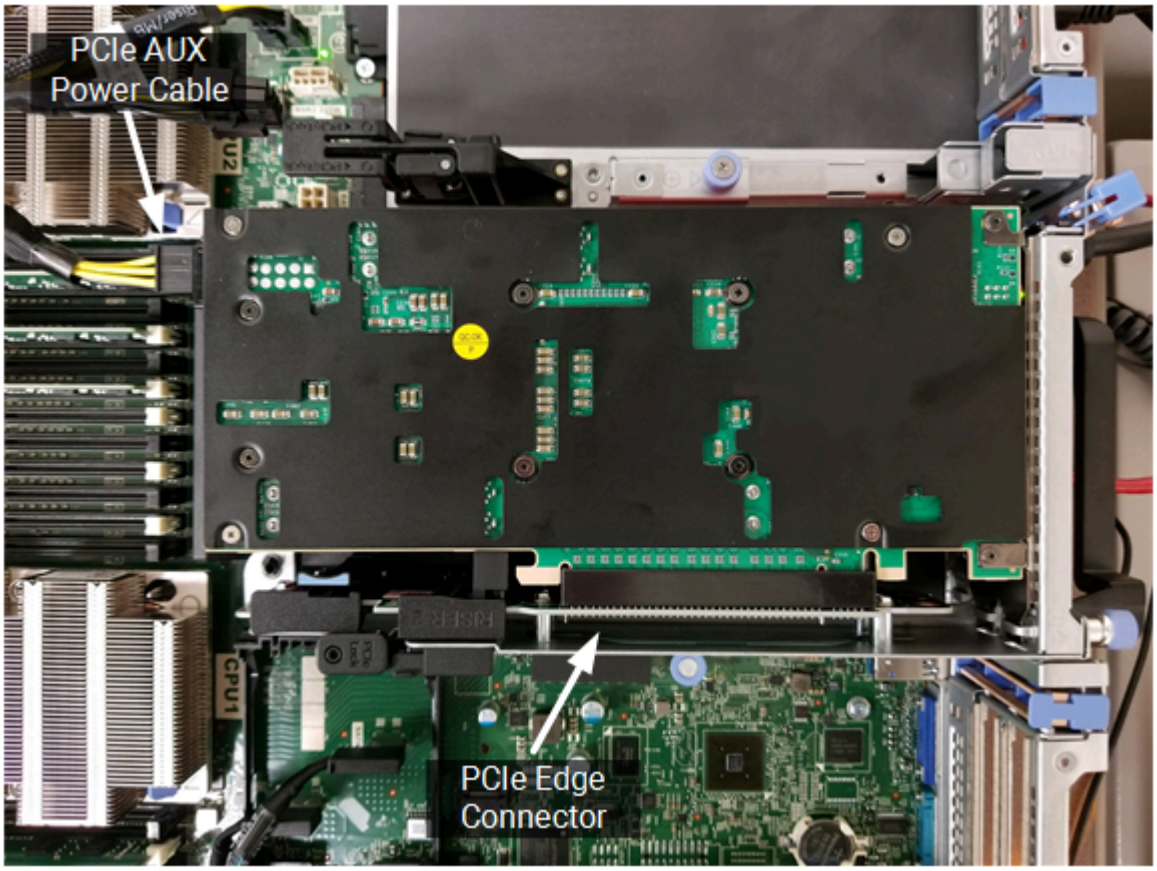
‼ **Important :** La puissance de 140W est uniquement disponibles avec le connecteur 6-broches (65 Watts à partir de la source du connecteur PCIe 12V

et 75 watts à partir du connecteur AUX à 6-broches). 215W est disponible avec le connecteur à 8-broches (65 watts à partir de la source du connecteur PCIe 12V et 150 Watts à partir du connecteur 8-broches).

!! Wichtig: Mit dem 6-Pin-Anschluss stehen nur 140W zur Verfügung (65 Watt vom PCIe-Anschluss mit 12 V-Quelle und 75 Watt vom 6-Pin-Anschluss). 215W ist mit dem 8-Pin-Anschluss erhältlich (65 Watt von 12V-PCIe-Anschluss und 150 Watt vom 8-Pin-Anschluss).

The following example shows a successfully installed passive configuration Alveo card.

Figure: Installed Alveo Card



6. If you previously removed the computer casing, re-install the casing.
7. Connect the power cord and turn on the computer.

✎ Note: Do not power-on a passively cooled card without adequate forced airflow across the card with proper airflow direction, otherwise the card can be damaged. For more information, see *Alveo U200 and U250 Data Center Accelerator Cards Data Sheet* (DS962) and *Alveo U280 Data Center Accelerator Cards Data Sheet* (DS963).

8. To verify that the device has been installed correctly, enter the following Linux command in the terminal:

```
$ sudo lspci -vd 10ee:
```

If the card is successfully installed and found by the operating system, a message similar to the one below will be displayed.
This is a sample output for an installed Alveo U250 card:

```
65:00.0 Processing accelerators: Xilinx Corporation
Device 5004
        Subsystem: Xilinx Corporation Device 000e
        Flags: bus master, fast devsel, latency 0, NUMA
node 0
        Memory at 380072000000 (64-bit, prefetchable)
[size=32M]
        Memory at 380074040000 (64-bit, prefetchable)
[size=256K]
        Capabilities: [40] Power Management version 3
        Capabilities: [60] MSI-X: Enable+ Count=32
Masked-
        Capabilities: [70] Express Endpoint, MSI 00
        Capabilities: [100] Advanced Error Reporting
        Capabilities: [1c0] #19
        Capabilities: [400] Access Control Services
        Capabilities: [410] #15
        Capabilities: [480] Vendor Specific Information:
ID=0020 Rev=0
        Len=010 <?> Kernel driver in use: xclmgmt
        Kernel modules: xclmgmt
```

✎ **Note:** If this card has previously been installed, the `lspci` output will be similar to the one shown in Running lspci.

If you do not see a message similar to either of these, see Troubleshooting.

Installing the Deployment Software

This chapter details the procedures for installing deployment software on RedHat/CentOS and Ubuntu operating systems. All software installations use standard Linux RPM and Linux DEB packages and require root access.
The deployment software consists of the following software packages:

Xilinx® runtime (XRT)

XRT provides the libraries and drivers for an application to run on Alveo™ cards and also includes xbutil and xbmgmt utilities. Utility command line help can always be obtained using the --help option.

Deployment platform

The deployment platform provides the firmware needed to run pre-compiled applications. It cannot be used to compile or create new applications. DFX-1RP platforms consist of a base, while DFX-2RP platforms consist of base and shell partitions. For more information, see Dynamic Function Exchange in XRT Documentation. To create new applications, install the development software detailed in Next Steps. While you can also install the development software on a machine with an installed card, doing so is not necessary to run applications.

All installation packages can be downloaded from the **Getting Started** tab of the respective Alveo card landing page:

- Alveo U200 Product Page
- Alveo U250 Product Page
- Alveo U280 Product Page

✎ **Note:** Select the Vitis Design Flow tool version 2022.1 or greater.

For platform features and details, see *Alveo Data Center Accelerator Card Platforms User Guide* (UG1120).
If you encounter any issues during installation, see Troubleshooting. See Xilinx Answer Record 71752 for additional known issues.

‼ **Important:** Root access is required for all software and firmware installations.

‼ **Important :** L'accès Root est requis pour toutes les installations logicielles et firmware.

‼ **Wichtig:** Root-Zugriff ist für alle Software- und Firmware-Installationen erforderlich.

XRT and Deployment Platform Installation Procedures on RedHat and CentOS

Use the following steps to download and install the XRT deployment platforms. For details on upgrading or downgrading the XRT and deployment platform, see Changing XRT and Target Platform Versions.

1. XRT installation requires Extra Packages for Enterprise Linux (EPEL) and a related repository. If not already installed, install EPEL on your system by following the steps provided here.
2. Run the following two commands to install kernel headers and kernel development packages. Ensure that `uname` is surrounded by backticks (`` ` ``) and not single quotes (`'`):

   ```
   $ sudo yum install kernel-headers-`uname -r`
   $ sudo yum install kernel-devel-`uname -r`
   ```

3. After the previous command completes, reboot your machine.
4. Download both the XRT and deployment platform installation packages associated with your card from the Getting Started tab on the respective Alveo card product page:
   - Alveo U200 Product Page
   - Alveo U250 Product Page
   - Alveo U280 Product Page

   ✎ **Note:** Select the Vitis Design Flow tool version 2022.1 or greater.
5. Install the XRT installation package by running the following command from within the directory where the XRT installation packages reside.

   ```
   $ sudo yum install ./xrt*.rpm
   ```

   This will install the XRT and its necessary dependencies. Follow the instructions when prompted throughout the installation.
6. Unpack the deployment target platform tar.gz file into a single directory. The location of the directory is not important, however the directory should not contain any other files.
7. Install the deployment packages. From within the directory where the installation packages were unpacked, run the following command. This will install all deployment packages.

   ```
   sudo yum install ./*.rpm
   ```

   Alternatively, you can install the deployment platform installation packages individually. If this is the case, install them in the following order.

- Satellite controller firmware
- Card management firmware
- Base partition firmware
- Platform validation
- Shell partition firmware (DFX-2RP platforms only)

The following command is an example of how to install each package individually for a DFX-2RP platform.

```
$ sudo yum install ./xilinx-sc-fw-<version>.rpm ./xilinx-cmc-<cmc_version>.rpm  ./xilinx-u250-<base_version>.rpm ./xilinx-u250-<validate_version>.rpm ./xilinx-u250-<shell_version>.rpm
```

For additional details related to the deployment platforms for your Alveo card, see the *Alveo Data Center Accelerator Card Platforms User Guide* (UG1120).

8. Flash the base partition to the Alveo card. After installing the deployment packages in the previous step, the following message is displayed:

```
Partition package installed successfully.
Flash the card by following the instructions in the installation guide.
```

Use the following command to flash the card. It assumes only one deployment platform is installed on the card. If more than one platform is installed the `--image` option needs to be added. See xbmgmt documentation for details.

!! Important: If you have multiple cards installed in the system, the following xbmgmt program command must be run separately for each card.

```
$ sudo /opt/xilinx/xrt/bin/xbmgmt program --base --device <management BDF>
```

Where management BDF is the card to be programmed. See Displaying Card BDF Values to obtain the device management BDF.

9. You will be asked to confirm the update, as follows. Type y and press the Enter key.

```
Actions to perform:
  [0000:03:00.0] : Program base (FLASH) image
  [0000:03:00.0] : Program Satellite Controller (SC) image
```

```
----------------------------------------------------
Are you sure you wish to proceed? [Y/n]: y
```

Flashing can take several minutes.

!! Important: Do not enter Ctrl + c in the terminal while the firmware is flashing as this can cause the card to become inoperable.

!! Important: N'entrez pas Ctrl + c dans le terminal lorsque le micrologiciel clignote, car cela pourrait rendre la carte inutilisable.

!! Important: Geben Sie im Terminal nicht Strg + c ein, während die Firmware blinkt, da dies dazu führen kann, dass die Karte nicht mehr funktioniert.

Successfully flashing a new card results in a message similar to the following. If the command returns `Card Not Found`, perform a cold boot, and retry. Otherwise, see Troubleshooting.

```
[0000:03:00.0] : Updating base (e.g., shell) flash
image...
Bitstream guard installed on flash @0x1002000
Extracting bitstream from MCS data:
................................
Extracted 34746164 bytes from bitstream @0x1002000
Writing bitstream to flash 0:
................................
Bitstream guard removed from flash
INFO     : Base flash image has been programmed
successfully.
----------------------------------------------------
Report
  [0000:03:00.0] : Satellite Controller (SC) is either
up-to-date, fixed, or not installed. No actions taken.
  [0000:03:00.0] : Successfully flashed the base (e.g.,
shell) image

Device flashed successfully.
****************************************************
Cold reboot machine to load the new image on device.
****************************************************
```

If the card has been flashed with the current platform firmware, you will see a message similar to the following:

```
Device(s) up-to-date and do not need to be flashed.
```

10. Cold boot your machine to load the new base firmware image on the FPGA.

    ‼ **Important:** Be sure to fully power OFF the machine and then power it ON again. The image will not boot from flash if the machine is only rebooted.

    ‼ **Important :** Assurez-vous d'éteindre complètement la machine, puis de la rallumer. L'image flash ne démarrera pas si la machine n'est pas redémarrée.

    ‼ **Wichtig:** Schalten Sie das Gerät vollständig aus und wieder ein. Das Image startet nicht von Flash, wenn der Computer nur neu gestartet wird.

11. Update the SC firmware on the card. Run the following command to update the SC firmware on the card. It is the identical command used to flash the platform firmware on the card.

    ```
    $ sudo /opt/xilinx/xrt/bin/xbmgmt program --base --device
    <management BDF>
    ```

    Where management BDF is the card requiring SC firmware update. See Displaying Card BDF Values to obtain the device management BDF. Updating the SC firmware can take several minutes.

    ‼ **Important:** If you have multiple cards installed in the system, you must run the above `xbmgmt program` command separately for each card.

    You will be asked to confirm the update, as follows. Type y and press the Enter key.

    ```
    ----------------------------------------------------
    Actions to perform:
      [0000:03:00.0] : Program Satellite Controller (SC)
    image
    ----------------------------------------------------
    Are you sure you wish to proceed? [Y/n]: y
    ```

    A message similar to the following will be displayed after a successful SC firmware update, where the device management BDF is given in square brackets.

    ```
    [0000:03:00.0] : Updating Satellite Controller (SC)
    firmware flash image...
    INFO     : found 4 sections
    [PASSED] : SC successfully updated < 37s >
    INFO     : Loading new firmware on SC
    ```

```
.......

INFO: Base (e.g., shell) flash images are the same.
-----------------------------------------------------
Report
  [0000:03:00.0] : Successfully flashed the Satellite
Controller (SC) image
  [0000:03:00.0] : Base (e.g., shell) image is up-to-
date.  No actions taken.

Device flashed successfully.
*************************************************************
*********
Warm reboot is required to recognize new SC image on the
device.
*************************************************************
*********
```

If the card already has the current firmware, a message similar to the following is displayed.

```
Device is up-to-date.  No flashing to performed.
```

12. For DFX-1RP platforms the installation for deployment is complete. For DFX-2RP platforms, it is necessary to program the shell partition. Use the following command to program the shell partition:

```
$ sudo /opt/xilinx/xrt/bin/xbmgmt program --device
<management BDF>
--shell <partition file with path>
```

Refer to Programming the Shell Partition for DFX-2RP Platforms for obtaining the shell path and name. See Displaying Card BDF Values to obtain the device management BDF.

The installation for deployment is now complete. To validate the installation was successful see Card Bring-Up and Validation.

XRT and Deployment Package Installation

Procedures on Ubuntu

Use the following steps to download and install the XRT deployment platforms. For details on upgrading or downgrading the XRT and deployment package, see Changing XRT and Target Platform Versions.

1. Run the following command to install linux headers. Ensure that `uname` is surrounded by backticks (`` ` ``) and not single quotes (`'`):

   ```
   $ sudo apt install linux-headers-`uname -r`
   ```

2. After the previous command completes, reboot your machine.
3. Download both the XRT and deployment platform installation packages associated with your card from the Getting Started tab on the respective Alveo card product page:
   - Alveo U200 Product Page
   - Alveo U250 Product Page
   - Alveo U280 Product Page

   ✎ **Note:** Select the Vitis Design Flow tool version 2022.1 or greater.
4. Install the XRT installation package by running the following command from within the directory where the XRT installation packages reside.

   ```
   $ sudo apt install ./xrt*.deb
   ```

   This will install the XRT along with any necessary dependencies. Follow the instructions when prompted throughout the installation.
5. Unpack the deployment target platform tar.gz file into a single directory. The location of the directory is not important, however the directory should not contain any other files.
6. Install the deployment packages. From within the directory where the installation packages were unpacked, run the following command. This will install all deployment packages.

   ```
   sudo apt install ./*.deb
   ```

   Alternatively, you can install the deployment platform installation packages individually. If this is the case, install them in the following order.

- Satellite controller firmware
- Card management firmware
- Base partition firmware
- Platform validation
- Shell partition firmware (DFX-2RP platforms only)

The following command is an example of how to install each package individually for a DFX-2RP platform.

```
$ sudo apt install ./xilinx-sc-fw-<version>.deb ./xilinx-cmc-<cmc_version>.deb ./xilinx-u250-<base_version>.deb ./xilinx-u250-<validate_version>.deb ./xilinx-u250-<shell_version>.deb
```

For additional details related to the deployment platforms for your Alveo card, see the *Alveo Data Center Accelerator Card Platforms User Guide* (UG1120).

7. Flash the base partition to the Alveo card. After installing the deployment packages in the previous step, the following message is displayed:

```
Partition package installed successfully.
Flash the card by following the instructions in the installation guide.
```

Use the following command to flash the card. It assumes only one deployment platform is installed on the card. If more than one platform is installed the `--image` option needs to be added. See xbmgmt documentation for details.

!! Important: If you have multiple cards installed in the system the following xbmgmt program command must be ran separately for each card.

```
$ sudo /opt/xilinx/xrt/bin/xbmgmt program --base --device <management BDF>
```

Where management BDF is the card to be programmed. See Displaying Card BDF Values to obtain the device management BDF.

8. You will be asked to confirm the update, as follows. Type y and press the Enter key.

```
Actions to perform:
[0000:03:00.0] : Program base (FLASH) image
[0000:03:00.0] : Program Satellite Controller (SC) image
```

```
----------------------------------------------------
Are you sure you wish to proceed? [Y/n]: y
```

Flashing can take several minutes.

!! Important: Do not enter Ctrl + c in the terminal while the firmware is flashing as this can cause the card to become inoperable.

!! Important: N'entrez pas Ctrl + c dans le terminal lorsque le micrologiciel clignote, car cela pourrait rendre la carte inutilisable.

!! Important: Geben Sie im Terminal nicht Strg + c ein, während die Firmware blinkt, da dies dazu führen kann, dass die Karte nicht mehr funktioniert.

Successfully flashing a new card results in a message similar to the following. If the command returns `Card Not Found`, perform a cold boot, and retry. Otherwise, see Troubleshooting.

```
[0000:03:00.0] : Updating base (e.g., shell) flash
image...
Bitstream guard installed on flash @0x1002000
Extracting bitstream from MCS data:
.................................
Extracted 34746164 bytes from bitstream @0x1002000
Writing bitstream to flash 0:
.................................
Bitstream guard removed from flash
INFO : Base flash image has been programmed successfully.
----------------------------------------------------
Report
[0000:03:00.0] : Satellite Controller (SC) is either up-
to-date,
fixed, or not installed. No actions taken.
[0000:03:00.0] : Successfully flashed the base (e.g.,
shell) image
Device flashed successfully.
****************************************************
Cold reboot machine to load the new image on device.
****************************************************
```

If the card has been flashed with the current platform firmware, you will see a message similar to the following.

```
Device(s) up-to-date and do not need to be flashed.
```

9. Cold boot your machine to load the new base firmware image on the FPGA.

   !! Important: Be sure to fully power OFF the machine and then power it ON again. The image will not boot from flash if the machine is only rebooted.

   !! Important : Assurez-vous d'éteindre complètement la machine, puis de la rallumer. L'image flash ne démarrera pas si la machine n'est pas redémarrée.

   !! Wichtig: Schalten Sie das Gerät vollständig aus und wieder ein. Das Image startet nicht von Flash, wenn der Computer nur neu gestartet wird.

10. Update the SC firmware on the card. Run the following command to update the SC firmware on the card. It is the identical command used to flash the platform firmware on the card.

    ```
    $ sudo /opt/xilinx/xrt/bin/xbmgmt program --base --device
    <management BDF>
    ```

    Where management BDF is the card requiring SC firmware update. See Displaying Card BDF Values to obtain the device management BDF. Updating the SC firmware can take several minutes.

    !! Important: If you have multiple cards installed in the system, you must run the above `xbmgmt program` command separately for each card.

    You will be asked to confirm the update, as follows. Type y and press the Enter key.

    ```
    ----------------------------------------------------
    Actions to perform:
      [0000:03:00.0] : Program Satellite Controller (SC)
    image
    ----------------------------------------------------
    Are you sure you wish to proceed? [Y/n]: y
    ```

    A message similar to the following will be displayed after a successful SC firmware update, where the device management BDF is given in square brackets.

    ```
    [0000:03:00.0] : Updating Satellite Controller (SC)
    firmware flash image...
    INFO     : found 4 sections
    [PASSED] : SC successfully updated < 37s >
    INFO     : Loading new firmware on SC
    .......
    ```

```
INFO: Base (e.g., shell) flash images are the same.
--------------------------------------------------
Report
  [0000:03:00.0] : Successfully flashed the Satellite
Controller (SC) image
  [0000:03:00.0] : Base (e.g., shell) image is up-to-
date.  No actions taken.

Device flashed successfully.
*********************************************************
*********
Warm reboot is required to recognize new SC image on the
device.
*********************************************************
*********
```

If the card already has the current firmware, a message similar to the following is displayed.

```
Device is up-to-date.  No flashing to performed.
```

11. For DFX-1RP platforms the installation for deployment is complete. For DFX-2RP platforms, it is necessary to program the shell partition. Use the following command to program the shell partition:

```
$ sudo /opt/xilinx/xrt/bin/xbmgmt program --device
<management BDF> --shell <partition file with path>
```

See Displaying Card BDF Values to obtain the device management BDF. Refer to Programming the Shell Partition for DFX-2RP Platforms for obtaining the shell partition file with path.

The installation for deployment is now complete. To validate the installation was successful see Card Bring-Up and Validation.

Card Bring-Up and Validation

After installing the XRT and deployment platform, the card installation can be verified using the following commands, which are explained in more detail below.

- `lspci`
- `xbmgmt examine`
- `xbutil validate`

The `lspci` Linux command is used to confirm the card is seen by the OS.
The additional commands are used to validate and identify the installed card(s) and report additional card details including memory, PCIe® , platform name, and system information. See xbutil and xbmgmt for more information.

✎ **Note:** Utility command line help can always be obtained using the --help option.

Environment Setup

Set the environment to use the utilities by running the following command. Note that the command is dependent on the command shell you are using.
Use the following command in csh shell:

```
$ source /opt/xilinx/xrt/setup.csh
```

Use the following command in bash shell:

```
$ source /opt/xilinx/xrt/setup.sh
```

Running lspci

1. Enter the following command:

   ```
   $ sudo lspci -vd 10ee:
   ```

2. If the card is successfully installed and found by the operating system, you will see a message similar to the following. Note that for each card, there will be two physical functions found: one for management and one for user. See XRT and Vitis™ Platform Overview for additional details.

   ```
   65:00.0 Processing accelerators: Xilinx Corporation
   Device 5004
           Subsystem: Xilinx Corporation Device 000e
           Flags: bus master, fast devsel, latency 0, NUMA
   node 0
           Memory at 380072000000 (64-bit, prefetchable)
   ```

```
[size=32M]
        Memory at 380074040000 (64-bit, prefetchable)
[size=256K]
        Capabilities: [40] Power Management version 3
        Capabilities: [60] MSI-X: Enable+ Count=32
Masked-
        Capabilities: [70] Express Endpoint, MSI 00
        Capabilities: [100] Advanced Error Reporting
        Capabilities: [1c0] #19
        Capabilities: [400] Access Control Services
        Capabilities: [410] #15
        Capabilities: [480] Vendor Specific Information:
ID=0020 Rev=0 Len=010 <?>
        Kernel driver in use: xclmgmt
        Kernel modules: xclmgmt

65:00.1 Processing accelerators: Xilinx Corporation
Device 5005
        Subsystem: Xilinx Corporation Device 000e
        Flags: bus master, fast devsel, latency 0, IRQ
64, NUMA node 0
        Memory at 380070000000 (64-bit, prefetchable)
[size=32M]
        Memory at 380074000000 (64-bit, prefetchable)
[size=256K]
        Memory at 380060000000 (64-bit, prefetchable)
[size=256M]
        Capabilities: [40] Power Management version 3
        Capabilities: [60] MSI-X: Enable+ Count=32
Masked-
        Capabilities: [70] Express Endpoint, MSI 00
        Capabilities: [100] Advanced Error Reporting
        Capabilities: [400] Access Control Services
        Capabilities: [410] #15
        Capabilities: [480] Vendor Specific Information:
ID=0020 Rev=0 Len=010 <?>
        Kernel driver in use: xocl
        Kernel modules: xocl
```

Confirm Firmware Installation for DFX-1RP Platforms

When a card has successfully been installed and the firmware has been updated, both entries for `Platform` and `SC version` installed on the card and the system must match. If they do not match, the system will be unable to correctly run applications on your card.
To confirm your card is setup correctly to run applications, run the following command and visually compare the 'Platform' and 'SC Version' entries under `Flashable partitions running on FPGA` and `Flashable partitions installed in system` and confirm they match. See Displaying Card BDF Values to obtain the device management BDF.

```
$ sudo /opt/xilinx/xrt/bin/xbmgmt examine --device
<management BDF>
```

In the following example output, the platform (xilinx_u200_gen3x16_xdma_base_1) and SC Version (4.6.18) displayed under `Flashable partitions running on FPGA` and `Flashable partitions installed in system` both match.

```
----------------------------------------------------
1/1 [0000:82:00.0] : xilinx_u200_gen3x16_xdma_base_1
----------------------------------------------------
Flash properties
  Type                : spi
  Serial Number       : 2130048BF01P

Device properties
  Type                : u200
  Name                : AU200P64G
  Config Mode         : 7
  Max Power           : 225W

Flashable partitions running on FPGA
  Platform            : xilinx_u200_gen3x16_xdma_base_1
  SC Version          : 4.6.18
  Platform UUID       : A2D4F3CF-5B7A-0B7B-70F9-DA589CB5B3CD
  Interface UUID      : 15FB8DA1-F552-A9F9-23DE-6DC54AA8968F
```

```
Flashable partitions installed in system
  Platform             : xilinx_u200_gen3x16_xdma_base_1
  SC Version           : 4.6.18
  Platform UUID        : A2D4F3CF-5B7A-0B7B-70F9-DA589CB5B3CD


  Mac Address          : 00:0A:35:05:EB:58
                       : 00:0A:35:05:EB:59
                       : 00:0A:35:05:EB:5A
                       : 00:0A:35:05:EB:5B
```

If the SC version does not match under `Flashable partitions running on FPGA` and `Flashable partitions installed in system`, the SC will need to be flashed. See SC versions do not match to update the SC version on the card.

Confirm Firmware Installation for DFX-2RP Platforms

When a card has successfully been installed and the firmware has been updated, both entries for Platform and SC version installed on the card and the system must match. If they do not match, the system will be unable to correctly run applications on your card.
To confirm your card is setup correctly to run applications, run the following command and visually compare the 'Platform' and 'SC Version' entries under `Flashable partitions running on FPGA` and `Flashable partitions installed in system` confirm they match. See Displaying Card BDF Values to obtain the device management BDF.

```
$ sudo /opt/xilinx/xrt/bin/xbmgmt examine --report platform --device <management BDF>
```

In the following example output, the platform (xilinx_u250_gen3x16_base_3, xilinx_u250_gen3x16_xdma_shell_3_1) and SC Version (4.6.11) displayed under Flashable partitions running on FPGA and Flashable partitions installed in system both match.

```
Flashable partitions running on FPGA
  Platform             : xilinx_u250_gen3x16_base_3
  SC Version           : 4.6.11
```

```
  Platform UUID          : 48810C9D-1786-0EF5-3E9E-529E8B14CE39
  Interface UUID         : 695718EC-21A2-32E4-5E1A-FCB4E558E11F

  Platform               : xilinx_u250_gen3x16_xdma_shell_3_1
  Logic UUID             : BD5FB8AB-AB26-6C32-6591-8257B5048E88
  Interface UUID         : F2F6C5E1-273E-7894-8F2C-4806221462F2

Flashable partitions installed in system
  Platform               : xilinx_u250_gen3x16_base_3
  SC Version             : 4.6.11
  Platform UUID          : 48810C9D-1786-0EF5-3E9E-529E8B14CE39

  Platform               : xilinx_u250_gen3x16_xdma_shell_3_1
  Logic UUID             : BD5FB8AB-AB26-6C32-6591-8257B5048E88
  Interface UUID         : 695718EC-21A2-32E4-5E1A-FCB4E558E11F
```

Under `Flashable partitions installed in system` it displays available shell partition(s) available to program on the FPGA. In this example, only one shell partition is available `xilinx_u250_gen3x16_xdma_shell_3_1`.
The `logic-uuid` and `interface-uuid` are used by the system to ensure compatible base and shell partitions are used for a given application.
If no shell partitions are displayed under `Flashable partitions installed in system` (as shown in the following output), it implies no shell partitions compatible with the base partition have been installed. Download and install a compatible shell partition from the Getting Started tab on the respective Alveo card product page:

- Alveo U200 Product Page
- Alveo U250 Product Page
- Alveo U280 Product Page

```
Flashable partitions running on FPGA
  Platform               : xilinx_u250_gen3x16_base_3
  SC Version             : 4.6.11
  Platform UUID          : 48810C9D-1786-0EF5-3E9E-529E8B14CE39
  Interface UUID         : 695718EC-21A2-32E4-5E1A-FCB4E558E11F

Flashable partitions installed in system
  Platform               : xilinx_u250_gen3x16_base_3
  SC Version             : 4.6.11
  Platform UUID          : 48810C9D-1786-0EF5-3E9E-529E8B14CE39
```

If the SC version does not match under `Flashable partitions running on FPGA` and `Flashable partitions installed in system`, the SC will need to be flashed. See SC versions do not match to update the SC version on the card.

Card Validation

Card installation can be validated using the `xbutil validate` command. This command performs various tests and checks on the card including PCIe link status, SC version status, memory and bandwidth tests and auxiliary power connection where applicable. Full command details can be found in xbutil documentation. Depending on the card tested, not all tests are valid or may require the function to be enabled (i.e., Peer-2-Peer).
Use the following command to run the card validation test:

```
$ /opt/xilinx/xrt/bin/xbutil validate --device <user BDF> --
verbose
```

where user BDF is the card to be validated. See Displaying Card BDF Values to obtain the user BDF value.

!! Important: Prior to running an application on DFX-2RP platform, it is necessary to first program the shell partition on the card or the application will fail to detect the shell and will not run. See Programming the Shell Partition for DFX-2RP Platforms for details.

If the card was installed and validated successfully, a message similar to the following will be displayed. Review the `Validation Summary` section at the end of the output and confirm the device validated successfully. See Card Validation within the Alveo Card Debug Guide for support.

```
Starting validation for 1 devices

Validate Device           : [0000:02:00.1]
    Platform              : xilinx_u200_gen3x16_xdma_base_1
    SC Version            : 4.6.11
    Platform ID           : 0x0
-------------------------------------------------------------
------------------
Test 1 [0000:02:00.1]     : Aux connection
    Description           : Check if auxiliary power is
connected
```

```
    Test Status           : [PASSED]
-------------------------------------------------------------
------------------
Test 2 [0000:02:00.1]     : PCIE link
    Description           : Check if PCIE link is active
    Test Status           : [PASSED]
-------------------------------------------------------------
------------------
Test 3 [0000:02:00.1]     : SC version
    Description           : Check if SC firmware is up-to-
date
    Test Status           : [PASSED]
-------------------------------------------------------------
------------------
Test 4 [0000:02:00.1]     : Verify kernel
    Description           : Run 'Hello World' kernel test
    Xclbin                :
/opt/xilinx/firmware/u200/gen3x16-
xdma/base/test/verify.xclbin
    Testcase              : /opt/xilinx/xrt/test/validate.exe
    Test Status           : [PASSED]
-------------------------------------------------------------
------------------
Test 5 [0000:02:00.1]     : DMA
    Description           : Run dma test
    Details               : Host -> PCIe -> FPGA write
bandwidth = 9160.052688 MB/s
                            Host <- PCIe <- FPGA read
bandwidth = 12070.525345 MB/s
    Test Status           : [PASSED]
-------------------------------------------------------------
------------------
Test 6 [0000:02:00.1]     : iops
    Description           : Run scheduler performance measure
test
    Xclbin                :
/opt/xilinx/firmware/u200/gen3x16-
xdma/base/test/verify.xclbin
    Testcase              :
/opt/xilinx/xrt/test/xcl_iops_test.exe
    Details               : IOPS: 490653 (verify)
    Test Status           : [PASSED]
```

```
-------------------------------------------------------------
------------------
Test 7 [0000:02:00.1]     : Bandwidth kernel
    Description           : Run 'bandwidth kernel' and check
the throughput
    Xclbin                :
/opt/xilinx/firmware/u200/gen3x16-
xdma/base/test/bandwidth.xclbin
    Testcase              :
/opt/xilinx/xrt/test/kernel_bw.exe
    Details               : Maximum throughput: 67188.9MB/s
    Test Status           : [PASSED]
-------------------------------------------------------------
------------------
Test 8 [0000:02:00.1]     : Peer to peer bar

    Description           : Run P2P test
    Details               : P2P bar is not enabled
    Test Status           : [SKIPPED]
-------------------------------------------------------------
------------------
Test 9 [0000:02:00.1]     : Memory to memory DMA
    Description           : Run M2M test
    Details               : bank0 -> bank1 M2M bandwidth:
11995.14 MB/s
                            bank0 -> bank2 M2M bandwidth:
12608.33 MB/s
                            bank0 -> bank3 M2M bandwidth:
12604.45 MB/s
                            bank1 -> bank2 M2M bandwidth:
12609.77 MB/s
                            bank1 -> bank3 M2M bandwidth:
12527.74 MB/s
                            bank2 -> bank3 M2M bandwidth:
12439.32 MB/s
    Test Status           : [PASSED]
-------------------------------------------------------------
------------------
Test 10 [0000:02:00.1]    : Host memory bandwidth test

    Description           : Run 'bandwidth kernel' when host
memory is enabled
```

```
    Details               : Host memory is not enabled
    Test Status           : [SKIPPED]
-------------------------------------------------------------
------------------
Test 11 [0000:02:00.1]    : vcu
    Description           : Run decoder test
    Details               : Verify xclbin not available or
shell partition is not
                            programmed. Skipping validation.
    Test Status           : [SKIPPED]
-------------------------------------------------------------
------------------
Validation completed. Please run the command '--verbose'
option for more details

Validation Summary
------------------
1  device(s) evaluated
1  device(s) validated successfully
0  device(s) had exceptions during validation

Validated successfully [1 device(s)]
  - [0000:02:00.1] : xilinx_u200_gen3x16_xdma_base_1

Validation Exceptions [0 device(s)]

Warnings produced during test [0 device(s)] (Note: The given
test successfully validated)

Unsupported tests [1 device(s)]
  - [0000:02:00.1] : xilinx_u200_gen3x16_xdma_base_1 :
Test(s): 'Peer to peer bar', 'Host memory bandwidth test',
vcu
```

✎ **Note:** The DMA bandwidth can vary depending upon NUMA/CPU affinity.

For DFX-2RP platforms such as u250_gen3x16_base_3, the `xbutil validate` command will skip tests if the shell partition has not been first been loaded. In the output below, Test 4 is skipped with Details given as: `Verify xclbin not available or shell partition is not programmed. Skipping validation'. See Programming the Shell Partition for DFX-2RP Platforms on how to program the shell partition.

```
Verbose: Enabling Verbosity
Starting validation for 1 devices

Validate Device           : [0000:02:00.1]
    Platform              : xilinx_u250_gen3x16_base_3
    SC Version            : 4.6.11
    Platform ID           : 0x0
-------------------------------------------------------------
------------------
Test 1 [0000:02:00.1]     : Aux connection
    Description           : Check if auxiliary power is
connected
    Test Status           : [PASSED]
-------------------------------------------------------------
------------------
Test 2 [0000:02:00.1]     : PCIE link
    Description           : Check if PCIE link is active
    Test Status           : [PASSED]
-------------------------------------------------------------
------------------
Test 3 [0000:02:00.1]     : SC version
    Description           : Check if SC firmware is up-to-
date
    Test Status           : [PASSED]
-------------------------------------------------------------
------------------
Test 4 [0000:02:00.1]     : Verify kernel
    Description           : Run 'Hello World' kernel test
    Details               : Verify xclbin not available or
shell partition
                            is not programmed. Skipping
validation.
    Test Status           : [SKIPPED]
...
```

Next Steps

What you have done so far allows you to deploy and run accelerated applications on your system. Alveo™ Accelerated Solutions page provides information and links

to available Xilinx and third-party accelerated applications. These include video processing, financial computing, machine learning, and data analytics.
If you are an application developer who wants to develop and deliver accelerated applications, visit the Vitis unified software platform page (https://www.xilinx.com/products/design-tools/vitis/vitis-platform.html). It allows you to develop, debug, and optimize accelerated applications for Alveo cards.
For an overview of developing accelerated applications with Alveo with accompanying guided examples, see Get Moving with Alveo: Acceleration Basics.

Troubleshooting

For card installation support, debugging information, and known issues, see the Alveo Card Debug Guide.
For known issues and general information, see Xilinx Answer Record 71752.

Programming the Shell Partition for DFX-2RP Platforms

Some Alveo Cards have DFX-2RP platforms require the shell partition to be programmed after a base partition has been programmed.
For more information regarding DFX-2RP platforms, refer to *Alveo Data Center Accelerator Card Platforms User Guide* (UG1120).
For additional details on DFX technology, see Dynamic Function Exchange in XRT Documentation.
Use the following command to program the shell partition:

```
$ sudo /opt/xilinx/xrt/bin/xbmgmt program --device
<management BDF> --shell <partition file with path>
```

See Displaying Card BDF Values to obtain the management BDF.
Use the following command to get the partition file with path.

```
sudo xbmgmt examine --report platform --format json --output
<output>.json --device <management BDF>
```

Look for the value of the file key in the available_partitions section in the json file.
For example:

```
"available_partitions":
               [
                   {
                       "vbnv":
"xilinx_u250_gen3x16_xdma_shell_3_1",
                       "logic-uuid": "BD5FB8AB-AB26-6C32-
6591-8257B5048E88",
                       "interface-uuid": "695718EC-21A2-32E4-
5E1A-FCB4E558E11F",
                       "file":
"\/lib\/firmware\/xilinx\/bd5fb8abab266c3265918257b5048e88\/p
artition.xsabin"
                   }
               ]
```

For our example the value of partition file with path is:

```
/lib/firmware/xilinx/bd5fb8abab266c3265918257b5048e88/partiti
on.xsabin
```

The following is an example of the command for programing the shell partition and the output:

```
$ sudo /opt/xilinx/xrt/bin/xbmgmt program --device 03:00.0 --
shell
/lib/firmware/xilinx/bd5fb8abab266c3265918257b5048e88/partiti
on.xsabin
Programming shell on device [0000:03:00.0]...
Partition file:
/lib/firmware/xilinx/bd5fb8abab266c3265918257b5048e88/partiti
on.xsabin
Programmed shell successfully
```

After the shell partition is programmed, it is not necessary to reprogram it unless the system is rebooted.

!! Important: Prior to running an application on DFX-2RP platform, it is necessary to first program the shell partition on the card or the application will fail to detect the shell and will not run. See Xilinx Answer Record 75975 for details.

Regulatory and Compliance Information

This product is designed and tested to conform to the European Union directives and standards described in this section.

CE Directives

2014/35/EC, *Low Voltage Directive (LVD)*
2014/30/EC, *Electromagnetic Compatibility (EMC) Directive*

CE Standards

EN standards are maintained by the European Committee for Electrotechnical Standardization (CENELEC). IEC standards are maintained by the International Electrotechnical Commission (IEC).

Electromagnetic Compatibility

EN:55032:2015, *Information Technology Equipment Radio Disturbance Characteristics – Limits and Methods of Measurement*
EN:55024:2015, *Information Technology Equipment Immunity Characteristics – Limits and Methods of Measurement*
This is a Class A product. In a domestic environment, this product can cause radio interference, in which case the user might be required to take adequate measures.

Safety

IEC 60950-1, 2nd Edition, 2014, *Information technology equipment – Safety, Part 1: General requirements*
EN 60950-1, 2nd Edition, 2014, *Information technology equipment – Safety, Part 1: General requirements*

Compliance Markings

In August of 2005, the European Union (EU) implemented the EU Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC and later the WEEE Recast Directive 2012/19/EU. These directives require Producers of electronic and electrical equipment (EEE) to manage and finance the collection, reuse, recycling and to appropriately treat WEEE that the Producer places on the EU market after August 13, 2005. The goal of this directive is to minimize the volume of electrical and electronic waste disposal and to encourage re-use and recycling at the end of life.

Xilinx has met its national obligations to the EU WEEE Directive by registering in those countries to which Xilinx is an importer. Xilinx has also elected to join WEEE Compliance Schemes in some countries to help manage customer returns at end-of-life.

If you have purchased Xilinx-branded electrical or electronic products in the EU and are intending to discard these products at the end of their useful life, please do not dispose of them with your other household or municipal waste. Xilinx has labeled its branded electronic products with the WEEE Symbol to alert our customers that products bearing this label should not be disposed of in a landfill or with municipal or household waste in the EU.

This product complies with Directive 2002/95/EC on the restriction of hazardous substances (RoHS) in electrical and electronic equipment.

This product complies with CE Directives 2006/95/EC, *Low Voltage Directive (LVD)* and 2004/108/EC, *Electromagnetic Compatibility (EMC) Directive*.

Additional Resources and Legal Notices

Xilinx Resources

For support resources such as Answers, Documentation, Downloads, and Forums, see Xilinx Support.

Documentation Navigator and Design Hubs

Xilinx® Documentation Navigator (DocNav) provides access to Xilinx documents, videos, and support resources, which you can filter and search to find information. To open DocNav:

- From the Vivado® IDE, select Help > Documentation and Tutorials.
- On Windows, select Start > All Programs > Xilinx Design Tools > DocNav.
- At the Linux command prompt, enter `docnav`.

Xilinx Design Hubs provide links to documentation organized by design tasks and other topics, which you can use to learn key concepts and address frequently asked questions. To access the Design Hubs:

- In DocNav, click the Design Hubs View tab.
- On the Xilinx website, see the Design Hubs page.

✎ **Note:** For more information on DocNav, see the Documentation Navigator page on the Xilinx website.

References

Vitis Documents

These documents provide supplemental material useful with this guide:

1. *Vitis Unified Software Platform Documentation: Application Acceleration Development* (UG1393)
2. *Vitis Unified Software Platform Documentation* (UG1416)
3. *Vitis Unified Software Platform Documentation: Embedded Software Development* (UG1400)
4. *Vitis Application Acceleration Development Flow Tutorials* (GitHub)

Alveo Documents

1. *Alveo U200 and U250 Data Center Accelerator Cards Data Sheet* (DS962)
2. *Alveo Card Debug Guide* (XD027)
3. *Alveo Data Center Accelerator Card Platforms User Guide* (UG1120)
4. *Alveo U280 Data Center Accelerator Cards Data Sheet* (DS963)

Additional Xilinx Resources

1. Xilinx XRT Release Notes
2. Xilinx licensing website: https://www.xilinx.com/getproduct
3. Vitis Developer Zone: https://www.xilinx.com/products/design-tools/vitis/vitis-platform.html
4. Xilinx Community Forums: https://forums.xilinx.com
5. *Xilinx Third-Party End User License Agreement*
6. *End-User License Agreement*

Revision History

The following table shows the revision history for this document.

Section	Revision Summary
12/23/2022 Version 2.3	

Section	Revision Summary
XRT and Deployment Platform Installation Procedures on RedHat and CentOS	• Updated important note to direct the user to the following command, not the above command. • Added reference to Displaying Card BDF Values section.
XRT and Deployment Package Installation Procedures on Ubuntu	• Updated Kernel to Linux for U200/U250/U280 in step 1 and step 4 for 2rp. • Added reference to Displaying Card BDF Values section.
08/19/2022 Version 2.2	
XRT and Deployment Package Installation Procedures on Ubuntu	Updated information.
04/07/2022 Version 2.1	
Programming the Shell Partition for DFX-2RP Platforms	Updated the uuid path.
02/18/2022 Version 2.0	
General	Card Features, Minimum System Requirements, and Qualified Servers topics moved to Card Installation Procedures section.
Introduction	Updated to include information for DFX-1RP and DFX-2RP platforms.
Minimum System Requirements	Updated to reflect the latest OS support.
Before You Begin	Added a link to Xilinx Answer Record

Section	Revision Summary
	72298.
Installing the Card	Added a link to Xilinx Answer Record 72298.
Installing the Deployment Software	Updated to include references to xbutil and xbmgmt utilities. DFX-1RP and DFX-2RP information added. Added reference to Alveo product pages.
XRT and Deployment Platform Installation Procedures on RedHat and CentOS	Updated installation steps for 2021.1 update.
XRT and Deployment Package Installation Procedures on Ubuntu	Updated installation steps for 2021.1 update.
Card Bring-Up and Validation	Updated to address xbmgmt examine comment. xbmgmt partition and xbmgmt flash commands removed.
Environment Setup	Added topic using content previously located in the Card Bring-up and Validation topic.
Confirm Firmware Installation for DFX-1RP Platforms	Added sections.
Confirm Firmware Installation for DFX-2RP Platforms	
Card Validation	
Running xbmgmt flash --scan	Removed sections.
Running xbmgmt partition	
xbutil validate	

Section	Revision Summary
Appendix A: Changing XRT and Target Platform Versions	Removed sections.
Appendix B: Creating a Vault Repository for CentOS	
Appendix C: Reverting the Card to Factory Image	
Appendix D: Obtaining xbmgmt Command Options	
Programming the Shell Partition for DFX-2RP Platforms	Added section.
04/07/2021 Version 1.9	
Introduction	Added information related to the DFX platforms.
Card Features	Added configuration options.
Troubleshooting	Updated information.
Known Issues	Removed section.
Reverting the Card to Factory Image	Clarified description.
02/05/2021 Version 1.8	
General	Updated example output logs to reflect Alveo U250-2RP platform.
Introduction	Updated platform information and introduced DFX terminology.
XRT and Deployment Platform Installation Procedures on RedHat and CentOS	Updated installation steps, as well as added an additional step to program the shell partition.
XRT and Deployment Package Installation Procedures on Ubuntu	Updated installation steps, as well as added an additional step to program

Section	Revision Summary
	the shell partition.
Creating a Vault Repository for CentOS	Clarified description.
11/24/2020 Version 1.7	
Introduction	Updated platform information.
Card Features	Added network interface information, updated electrical design power, as well as HBM and DDR4.
Minimum System Requirements	Updated operating system.
Card Interfaces and Details	Clarified description.
XRT and Deployment Platform Installation Procedures on RedHat and CentOS	Updated installation steps for the Alveo U200 and U250 cards.
XRT and Deployment Package Installation Procedures on Ubuntu	
Running lspci	Updated output log.
Running xbmgmt flash --scan	Updated description.
Running xbmgmt partition	Added section.
xbutil validate	Updated description and removed note about XRT installation on Ubuntu.
Upgrade	Updated to reflect 2020.2 XRT.
Downgrade	
Upgrade	
Downgrade	
Upgrade from 2018.2 to 2018.3 in RedHat and CentOS	Removed sections.

Section	Revision Summary
Downgrade from 2018.3 to 2018.2 in RedHat and CentOS	
Upgrade from 2018.x to 2019.1 in RedHat and CentOS	
Downgrade from 2019.1 to 2018.x in RedHat and CentOS	
Upgrade from 2018.2 to 2018.3 in Ubuntu	
Downgrade from 2018.3 to 2018.2 in Ubuntu	
Upgrade from 2018.x to 2019.1 in Ubuntu	
Downgrade from 2019.1 to 2018.x in Ubuntu	
Generating the xbmgmt flash --update Command	
Reverting the Card to Factory Image	Clarified description.
Obtaining xbmgmt Command Options	Added appendix.
08/18/2020 Version 1.6	
Card Features	Updated information.
XRT and Deployment Package Installation Procedures on Ubuntu	Added a link to Xilinx Answer Record 75294.
xbutil validate	Added a note about installing XRT on Ubuntu.
Regulatory and Compliance Information	Added appendix.
06/03/2020 Version 1.5	

Section	Revision Summary
Introduction	Updated the information.
Card Features	Added new section.
xbutil validate	Updated information about specifying `-d`.
12/18/2019 Version 1.4	
XRT and Deployment Package Installation Procedures on Ubuntu	Added a note about XRT installation.
Troubleshooting	Updated information about installing packages on RedHat and CentOS.
Known Issues	Added a known issue.
10/31/2019 Version 2019.2	
General	Updated to the Vitis™ unified software platform throughout. Updated outputs throughout document.
Qualified Servers	Provided the web link to the qualified servers.
Installing the Deployment Software	Replaced `xbutil` command with the new `xbmgmt` command for card flashing. Updated output logs.
Known Issues	Added a known issue.
XRT and Deployment Platform Installation Procedures on RedHat and CentOS	Replaced `xbutil` command with the new `xbmgmt` command for card flashing. Updated output logs.
XRT and Deployment Package Installation Procedures on Ubuntu	
Running xbmgmt --scan	Replaced `xbutil` command with the new `xbmgmt` command when

Section	Revision Summary
	scanning card. Updated output logs.
Changing XRT and Target Platform Versions	Replaced `xbutil` command with the new `xbmgmt` command for card flashing. Updated output logs.
Reverting the Card to Factory Image	Added new appendix.
07/23/2019 Version 2019.1	
Upgrade from 2018.x to 2019.1 in RedHat and CentOS	Corrected answer record links
Upgrade from 2018.2 to 2018.3 in RedHat and CentOS	
Upgrade from 2018.2 to 2018.3 in Ubuntu	
Downgrade from 2018.3 to 2018.2 in Ubuntu	
Upgrade from 2018.x to 2019.1 in Ubuntu	
Downgrade from 2018.3 to 2018.2 in RedHat and CentOS	
Introduction	
06/27/2019 Version 2019.1	
Qualified Servers	Updated server requirements.
06/24/2019 Version 2019.1	
General	Added support for Alveo U280 production card.
Changing XRT and Target Platform Versions	Updated upgrade and downgrade steps.

Section	Revision Summary
06/05/2019 Version 2019.1	
General	Updated outputs throughout document.
Qualified Servers	Updated table of validated servers.
Card Interfaces and Details	Added information on status LEDs.
Installing the Card	Added image of an installed Alveo card.
Installing the Deployment Software	Updated installation, upgrade, and downgrade flows for 2019.1 release.
Next Steps	Added information on additional development resources.
Troubleshooting	Updated troubleshooting and known issues.
02/12/2019 Version 1.3	
General	Added support for Alveo U280 ES card.
Modifying the Installation on RedHat and CentOS, Modifying the Installation on Ubuntu	Updated instructions on upgrading and downgrading XRT and the deployment shell.
Generating the xbmgmt flash --update Command	Updated instructions.
01/23/2019 Version 1.2	
XRT and Deployment Platform Installation Procedures on RedHat and CentOS, XRT and Deployment Package Installation Procedures on Ubuntu	Updated instructions on running xbutil flash.

Section	Revision Summary
Generating the xbmgmt flash --update Command	Added new information on how to generate the options needed to run xbutil flash.
12/21/2018 Version 1.1	
Minimum System Requirements	Updated system requirements.
XRT and Deployment Platform Installation Procedures on RedHat and CentOS	Updated installation flow.
Modifying the Installation on RedHat and CentOS	Added new information on upgrading and downgrading deployment software.
Modifying the Installation on Ubuntu	Added new information on upgrading and downgrading deployment software.
Known Issues	Updated known issues.
Creating a Vault Repository for CentOS	Added new appendix.
10/02/2018 Version 1.0	
Initial Xilinx release.	N/A

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