

Getting Started with Alveo Data Center Accelerator Cards

UG1301 (v2019.1) July 23, 2019



Revision History

The following table shows the revision history for this document.

Section	Revision Summary
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	
Chapter 1: Introduction	
06/27/2019 Version 2019.1	
Validated Servers	Updated server requirements.
06/24/2019 Version 2019.1	
General	Added support for Alveo U280 production card.
Appendix A: Changing XRT and Shell Versions	Updated upgrade and downgrade steps.
06/05/2019 Version 2019.1	
General	Updated outputs throughout document.
Validated 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.
Chapter 4: Installing the Deployment Software	Updated installation, upgrade, and downgrade flows for 2019.1 release.
Chapter 6: Next Steps	Added information on additional development resources.
Chapter 7: 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.
Appendix C: Generating the xbutil flash Command	Updated instructions.
01/23/2019 Version 1.2	
XRT and Deployment Shell Installation Procedures on RedHat and CentOS, XRT and Deployment Shell Installation Procedures on Ubuntu	Updated instructions on running xbutil flash.
Appendix C: Generating the xbutil flash 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 Shell Installation Procedures on RedHat and CentOS	Updated installation flow.

Section	Revision Summary
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.
Appendix B: Creating a Vault Repository for CentOS	Added new appendix.
10/02/2018 Version 1.0	
Initial Xilinx release.	N/A

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Introduction

This document provides hardware and software installation procedures for the U200, U250, and U280 Alveo™ Data Center accelerator cards and applies to SDAccel™ releases 2019.1 and greater. If you are using an earlier release, follow the instructions in v1.3 of *Getting Started with Alveo Data Center Accelerator Cards* ([UG1301](#)).

Alveo cards are PCI Express® (PCIe) Gen3x16 compliant, featuring the Xilinx® UltraScale+™ Architecture. You can use these cards to accelerate compute-intensive applications such as database acceleration, machine learning, data analytics, and video processing.

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

- **Running Applications:** To run accelerated applications, install an Alveo card into a system as described in [Chapter 3: Card Installation Procedures](#) along with the required deployment software to support running applications as described in [Chapter 4: 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 [Chapter 6: Next Steps](#), installs both a development shell and the SDAccel development 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.

Minimum System Requirements

The minimum system requirements for running an Alveo™ Data Center accelerator card are listed below:

Table 1: Minimum System Requirements

Component	Requirement
Motherboard	PCI Express® 3.0-compatible with one dual-width x16 slot.
System Power Supply	225 W
Operating System	Linux, 64-bit: <ul style="list-style-type: none"> • Ubuntu 16.04, 18.04 • CentOS 7.4, 7.5, 7.6 • RHEL 7.4, 7.5, 7.6
System Memory	For deployment installations, a minimum of 16 GB plus application memory requirements is required. For development installations, a minimum of 64 GB of device 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 <i>SDAccel Environment Release Notes, Installation, and Licensing Guide (UG1238)</i> .

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)*.

Note: The specifications in this document apply to production U280 cards. Any differences in U280 ES1 card specifications and capabilities are documented in the U280 ES1 Known Issues Xilinx Answer Record [71925](#).

Validated Servers

The Alveo accelerator cards have been validated for interoperability by Xilinx in the following servers. Not all slots of all server configurations are compatible with the Alveo U200/U250/U280 cards. Ensure that your system is configured with the appropriate Gen3x16 slots. Servers must also have BIOS turned on above 4 GB PCIe addressing.

Table 2: Validated Servers

Manufacturer	Model/Platform ¹
Dell EMC	PowerEdge R7425
Dell EMC	PowerEdge R730
Dell EMC	PowerEdge R740

Table 2: Validated Servers (cont'd)

Manufacturer	Model/Platform ¹
HPE	ProLiant DL380 G10
Inspur	NF5280M5
Inspur	NF5468M5
SuperMicro	SYS-4028GR-TR
SuperMicro	SYS-4029GP-TRT
SuperMicro	SYS-7049GP-TRT

Notes:

1. Servers listed are validated on U200/U250 production and U280 ES1 accelerator cards. Validation with U280 production cards will be completed at a future date.

Unpacking

Product Registration



IMPORTANT! To receive updates, register your product at <https://www.xilinx.com/products/design-tools/software-zone/sdaccel.html#gettingstarted>.



IMPORTANT! Pour recevoir les mises à jour, enregistrez votre produit sur <https://www.xilinx.com/products/design-tools/software-zone/sdaccel.html#gettingstarted>.



WICHTIG! Um Updates zu erhalten, registrieren Sie ihr Produkt unter <https://www.xilinx.com/products/design-tools/software-zone/sdaccel.html#gettingstarted>.

Accelerator Cards Overview

Card Interfaces and Details

Alveo™ 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, and are shown in the following figure:

1. A PCI Express® card connector.
2. A PCI Express Auxiliary Power Connector. This connector is shown in figure 4. Connector is not compatible with an ATX12V / EPS12V power source.
3. Two QSFP interfaces. Currently these interfaces are not supported by the deployment shell.
4. A Micro-USB connector for maintenance purposes.
5. A fan for the active cooled card configuration.



WARNING! Hazardous moving parts. Keep away from fan blades.

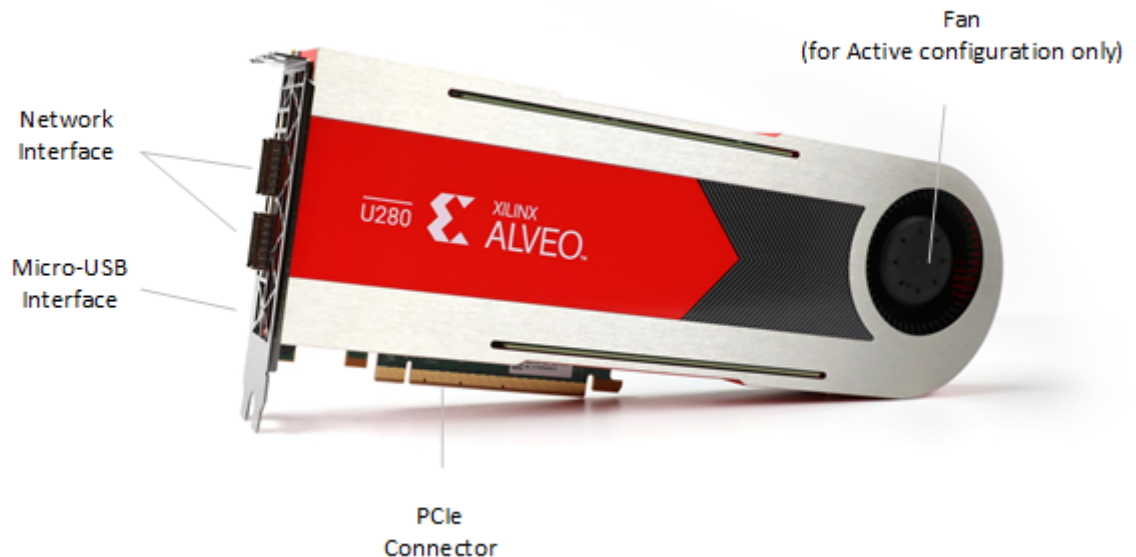


ATTENTION! Pièces mobiles peuvent être dangereuses. Éloignez-vous des lames du ventilateur.



WARNUNG! Gefährliche bewegliche Teile. Halten sie sich von Lüfterflügeln fern.

Figure 1: Alveo Card Features



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)*.

Note: The U280 related specifications in this document apply to production U280 cards. Any differences in U280 ES1 card specifications and capabilities are documented in the U280 ES1 Known Issues Xilinx Answer [71925](#).

Figure 2: Active Cooled Card Configuration



Figure 3: 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.*



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



VORSICHT! *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 câble de la sangle à une surface métallique non peinte du châssis et à 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 à 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 \(DS963\)](#).

Note: The specifications in this document apply to production U280 cards. Any differences in U280 ES1 card specifications and capabilities are documented in the [U280 ES1 Known Issues Xilinx Answer 71925](#).

- 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. See [Minimum System Requirements](#) and [Validated Servers](#).
- Ensure that appropriate PCIe Auxiliary Power source is available, and not an ATX12V / EPS12V power source.

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 [Chapter 7: Troubleshooting](#) and [Known Issues](#). Also see [AR-71752](#) for additional known issues.

1. Host power supply must be powered off.
2. For enclosed computers, open your computer by removing the casing.
3. If necessary, remove the two adjacent PCIe® x16 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 female 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.

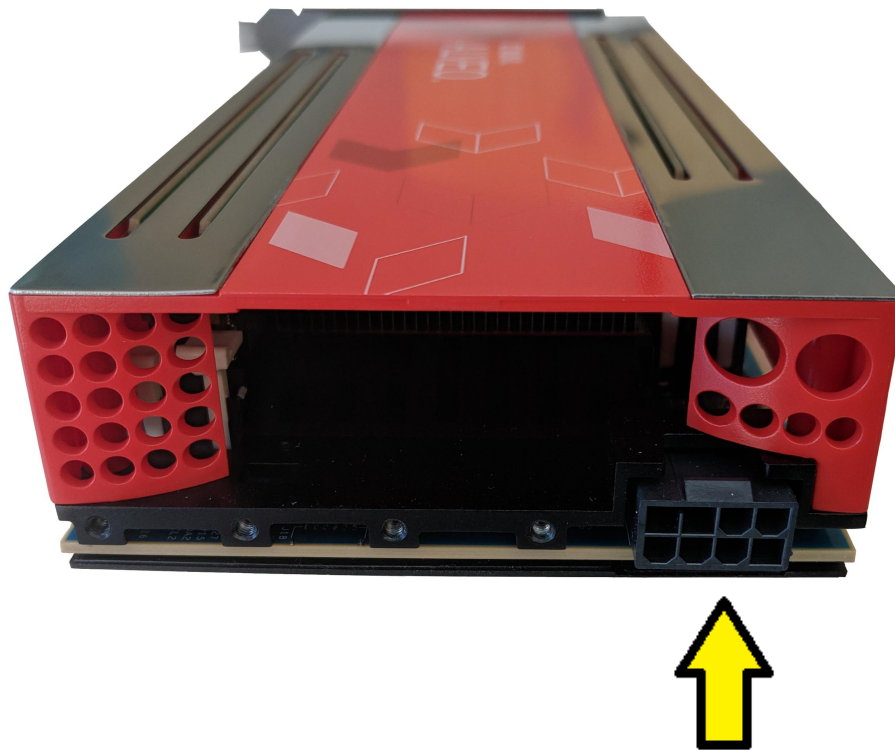
For actively cooled cards, connect the power cable to the AUX power connector at top of the card as shown in the following figure.

Figure 4: 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 5: 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.

ATTENTION! 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*.

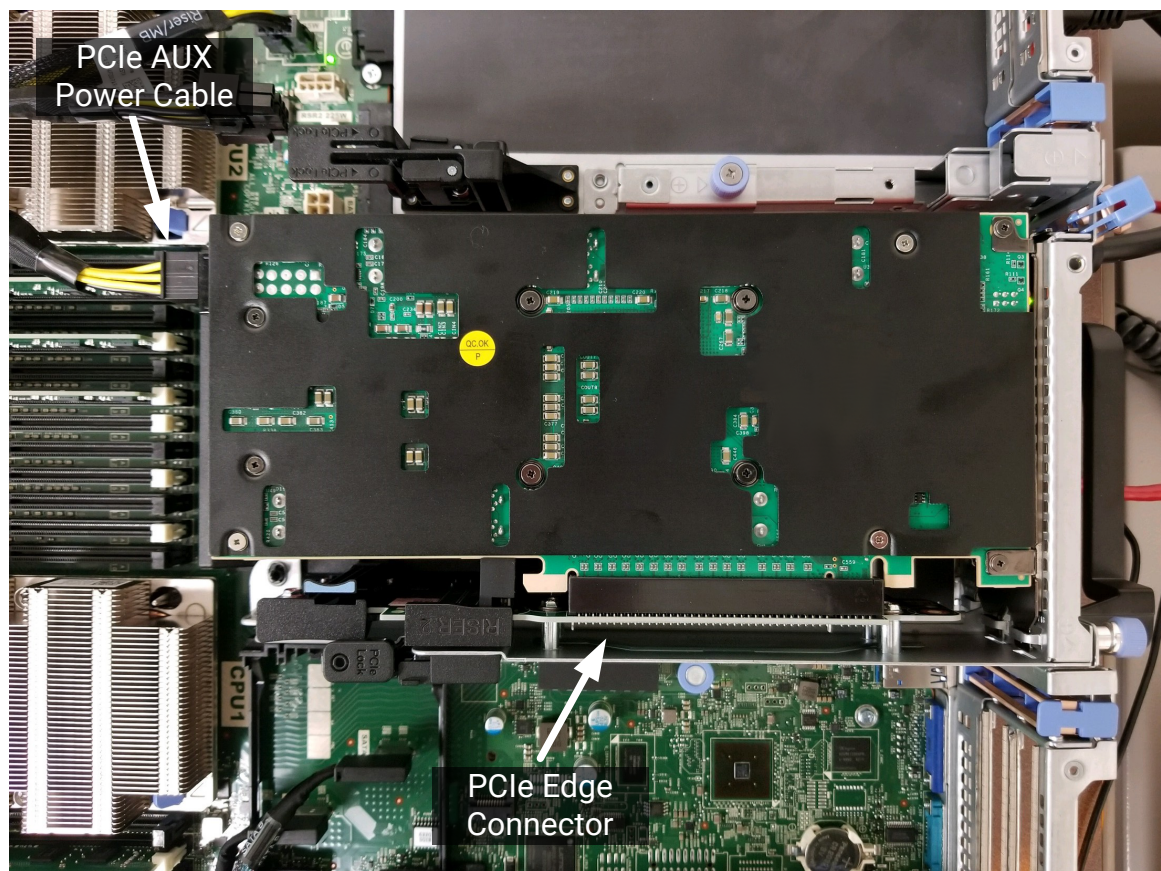
IMPORTANT! Only 140W of power is available with the 6-pin connector (65 Watts from PCIe connector with 12V source, and 75 Watts from the 6-pin AUX connector). 215W is available with the 8-pin connector (65 Watts from PCIe connector 12V source, and 150 Watts from the 8-pin AUX connector).

★ **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 140 W 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 active configuration Alveo card.

Figure 6: 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, 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 U200 card:

```
65:00.0 Processing accelerators: Xilinx Corporation Device d000
  Subsystem: Xilinx Corporation Device 000e
  Flags: bus master, fast devsel, latency 0, IRQ 11
  Memory at de000000 (32-bit, non-prefetchable) [size=32M]
  Memory at e0000000 (32-bit, non-prefetchable) [size=64K]
  Capabilities: [40] Power Management version 3
  Capabilities: [48] MSI: Enable- Count=1/1 Maskable- 64bit+
  Capabilities: [70] Express Endpoint, MSI 00
  Capabilities: [100] Advanced Error Reporting
  Capabilities: [1c0] #19
  Capabilities: [400] Access Control Services
```

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 [Chapter 7: 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.

The deployment software consists of the following two software packages:

- Xilinx® runtime (XRT)

XRT provides the libraries and drivers for an application to run on Alveo™ cards.

- Deployment shell

The deployment shell provides the base firmware needed to run pre-compiled applications. It cannot be used to compile or create new applications. To create new applications, install the development software detailed in [Chapter 6: 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.

Both the Xilinx runtime (XRT) and deployment shell 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](#)

As shown in the following image, there are three releases to choose from under the **Getting Started** tab. These are referred to as the 2019.1, 2018.3, and 2018.2 releases, respectively.

1. 2019.1 XDMA
2. 2018.3 XDMA
3. 2018.2 Archive

Set Up the Alveo U200 Accelerator Card

Download the Xilinx Runtime and Deployment Shell, then follow the Getting Started and Installation Guide to install and setup your card.

2019.1 XDMA

2018.3 XDMA

2018.2 Archive

If you encounter any issues during installation, see [Chapter 7: Troubleshooting](#) and [Known Issues](#). See [AR-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 Shell Installation Procedures on RedHat and CentOS

Use the following steps to download and install the XRT and deployment shell using a .rpm installation package.

For details on upgrading or downgrading the XRT and deployment shell, see [Appendix A: Changing XRT and Shell Versions](#).



IMPORTANT! The installation packages referenced here are updated regularly and the file names frequently change. If you copy and paste any commands from this user guide, be sure to update the placeholders in those commands to match the downloaded packages.



IMPORTANT! Les packages d'installation référencés ici sont mis à jour régulièrement et les noms de fichier changent fréquemment. Si vous copiez et collez des commandes de ce guide, veillez à mettre à jour les espaces réservés dans ces commandes pour qu'ils correspondent aux packages téléchargés.



WICHTIG! Die hier genannten Installationspakete werden regelmäßig aktualisiert und die Dateinamen ändern sich häufig. Wenn Sie Befehle aus diesem Benutzerhandbuch kopieren und einfügen, müssen Sie die Platzhalter in diesen Befehlen entsprechend den heruntergeladenen Paketen aktualisieren.

1. Xilinx® runtime (XRT) installation requires Extra Packages for Enterprise Linux (EPEL) and a related repository. The initial setup depends on whether you are using RedHat or CentOS.

For Redhat:

- a. Open a terminal window and enter the following command:

```
$ sudo yum-config-manager --enable rhel-7-server-optional-rpms
```

This enables an additional repository on your system.

- b. Enter the following command to install EPEL:

```
$ sudo yum install -y https://dl.fedoraproject.org/pub/epel/epel-release-latest-7.noarch.rpm
```

For CentOS:

- Enter the following command in a terminal window:

```
$ sudo yum install epel-release
```

This installs and enables the repository for Extra Packages for Enterprise Linux (EPEL).

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`
```

Note: If these yum commands fail because they can't find packages matching your kernel version, set up a Vault repository. For more information, see [Appendix B: Creating a Vault Repository for CentOS](#)

3. After the above command completes, reboot your machine.
4. Download both the Xilinx® runtime (XRT) and deployment shell installation packages associated with your card from the **Getting Started** tab in one of the following locations:
 - [Alveo U200 Product Page](#)
 - [Alveo U250 Product Page](#)
 - [Alveo U280 Product Page](#)
5. Install the XRT installation package using the following command, where `<rpm-dir>` is the directory where the RPM packages were downloaded in the previous step, and `<version>` is the latter part of the XRT file name.

```
$ sudo yum install <rpm-dir>/xrt-<version>.rpm
```

This will install the XRT and its necessary dependencies. Follow the instructions when prompted throughout the installation.

6. Install the deployment shell installation package:

```
$ sudo yum install <rpm-dir>/xilinx-<card>-<version>.rpm
```

The deployment software sources are now installed on the system. The installation of the drivers, runtime software, and utilities are in the `/opt/xilinx/` directory and contains the `xrt` and `dsa` sub-directories. The `dsa` folder contains the deployment shell installation.

After installing the deployment shell you will see the following message:

```
Shell package installed successfully.
Please flash card manually by running below command:
sudo /opt/xilinx/xrt/bin/xbutil flash -a <shell_name>
```

7. Flash the firmware to the Alveo card using the command displayed in the output of the previous step. It has the following format:

```
sudo /opt/xilinx/xrt/bin/xbutil flash -a <shell_name>
```

If you have multiple cards installed or need to regenerate the command, follow the steps given in [Appendix C: Generating the xbutil flash Command](#).

- You will be asked to confirm the update, as shown below. Type **y** and **enter**.

```
Probing card[0]: Shell on FPGA needs updating
Shell on below card(s) will be updated:
Card [0]
Are you sure you wish to proceed? [y/n]
```

Flashing will take up to 10 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.



WICHTIG! 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 one shown below. If the command returns `Card Not Found`, perform a cold reboot, and retry. Otherwise, see [Chapter 7: Troubleshooting](#).

```
Updating SC firmware on card[0]
INFO: found 4 sections
.....
INFO: Loading new firmware on SC
.....
Updating shell on card[0]
INFO: ***Found 698 ELA Records
Idcode byte[0] ff
Idcode byte[1] 20
Idcode byte[2] bb
Idcode byte[3] 21
Idcode byte[4] 10
Enabled bitstream guard. Bitstream will not be loaded until flashing is
finished.
Erasing flash.....
Programming flash.....
Cleared bitstream guard. Bitstream now active.
1 Card(s) flashed successfully.
Cold reboot machine to load the new image on FPGA.
```

If you have previously upgraded the card, you will see a message similar to the following:

```
Probing card[0]: Shell on FPGA is up-to-date
0 Card(s) flashed successfully.
```

- Cold boot your machine to load the new 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.

The installation for deployment is now complete. You can go directly to [Chapter 5: Card Bring-Up and Validation](#) to validate the installation.

XRT and Deployment Shell Installation Procedures on Ubuntu

Use the following steps to download and install the XRT and deployment shell using a .rpm installation package.

For details on upgrading or downgrading the XRT and deployment shell, see [Appendix A: Changing XRT and Shell Versions](#).



IMPORTANT! The installation packages referenced here are updated regularly and the file names frequently change. If you copy and paste any commands from this user guide, be sure to update the placeholders in those commands to match the downloaded packages.



IMPORTANT! Les packages d'installation référencés ici sont mis à jour régulièrement et les noms de fichier changent fréquemment. Si vous copiez et collez des commandes de ce guide, veillez à mettre à jour les espaces réservés dans ces commandes pour qu'ils correspondent aux packages téléchargés.



WICHTIG! Die hier genannten Installationspakete werden regelmäßig aktualisiert und die Dateinamen ändern sich häufig. Wenn Sie Befehle aus diesem Benutzerhandbuch kopieren und einfügen, müssen Sie die Platzhalter in diesen Befehlen entsprechend den heruntergeladenen Paketen aktualisieren.

1. Download both the Xilinx® runtime (XRT) and deployment shell installation packages associated with your card from the **Getting Started** tab in one of the following locations:
 - [Alveo U200 Product Page](#)
 - [Alveo U250 Product Page](#)
 - [Alveo U280 Product Page](#)
2. Install the XRT installation package using the following command, where `<deb-dir>` is the directory where the DEB packages were downloaded in the previous step and `<version>` is the latter part of the XRT file name.

```
$ sudo apt install <deb-dir>/xrt-<version>.deb
```

This will install the XRT along with any necessary dependencies. Follow the instructions when prompted throughout the installation.

3. Install the deployment shell installation packages required for the card:

```
$ sudo apt install <deb-dir>/xilinx-<card>-<version>.deb
```

The deployment software sources are now installed and deployed on the system. The installation of the drivers, runtime software, and utilities are in the `/opt/xilinx/` directory and contains the `xrt` and `dsa` sub-directories. Note that the `dsa` folder contains the deployment shell installation.

After installing the deployment shell you will see the following message:

```
Shell package installed successfully.
Please flash card manually by running below command:
sudo /opt/xilinx/xrt/bin/xbutil flash -a <shell_name>
```

4. Flash the firmware to the Alveo card using the command displayed in the output of the previous step. It has the following format:

```
sudo /opt/xilinx/xrt/bin/xbutil flash -a <shell_name>
```

If you have multiple cards installed or need to regenerate the command, follow the steps given in [Appendix C: Generating the xbutil flash Command](#).

5. You will be asked to confirm the update, as shown below. Type **y** and **enter**.

```
Probing card[0]: Shell on FPGA needs updating
Shell on below card(s) will be updated:
Card [0]
Are you sure you wish to proceed? [y/n]
```

Flashing will take up to 10 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.



WICHTIG! 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 one shown below. If the command returns `Card Not Found`, perform a cold reboot, and retry. Otherwise, see [Chapter 7: Troubleshooting](#).

```
Updating SC firmware on card[0]
INFO: found 4 sections
.....
INFO: Loading new firmware on SC
.....
Updating shell on card[0]
INFO: ***Found 698 ELA Records
Idcode byte[0] ff
Idcode byte[1] 20
Idcode byte[2] bb
Idcode byte[3] 21
```

```

Idcode byte[4] 10
Enabled bitstream guard. Bitstream will not be loaded until flashing is
finished.
Erasing flash.....
Programming flash.....
Cleared bitstream guard. Bitstream now active.
1 Card(s) flashed successfully.
Cold reboot machine to load the new image on FPGA.
    
```

If you have previously updated the card, you will see a message similar to the following:

```

Probing card[0]: Shell on FPGA is up-to-date
0 Card(s) flashed successfully.
    
```

6. Cold boot your machine to load the new 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.*

The installation for deployment is now complete. You can go directly to [Chapter 5: Card Bring-Up and Validation](#) to validate the installation.

Card Bring-Up and Validation

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

- `lspci`
- `xbutil flash scan`
- `xbutil validate`

The `lspci` Linux command is used to validate the card as seen by the OS, as was done in [Installing the Card](#).

The second and third commands use the Xilinx® `xbutil` utility, which is included during the XRT package installation. This utility includes multiple commands to validate and identify the installed card(s) and report additional card details including DDR, PCIe®, shell name, and system information. This guide uses two, `xbutil flash scan` and `xbutil validate`. See *SDx Command and Utility Reference Guide (UG1279)*, or run `xbutil help`, for a complete list of `xbutil` command options and definitions along with debug information.

Set the environment to use the `xbutil` utility by running the following command. Note that the command is dependent on the shell you are using.

Use the following command in `cs` 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 one below. Note that for each card, there will be two different devices found: one for management and one for user.

```
65:00.0 Processing accelerators: Xilinx Corporation Device 5000
Subsystem: Xilinx Corporation Device 000e
Flags: bus master, fast devsel, latency 0
Memory at 38bff2000000 (64-bit, prefetchable) [size=32M]
Memory at 38bff4000000 (64-bit, prefetchable) [size=128K]
Capabilities: [40] Power Management version 3
Capabilities: [60] MSI-X: Enable+ Count=33 Masked-
Capabilities: [70] Express Endpoint, MSI 00
Capabilities: [100] Advanced Error Reporting
Capabilities: [1c0] #19
Capabilities: [400] Access Control Services
Capabilities: [410] #15
Kernel driver in use: xclmgmt
Kernel modules: xclmgmt

65:00.1 Processing accelerators: Xilinx Corporation Device 5001
Subsystem: Xilinx Corporation Device 000e
Flags: bus master, fast devsel, latency 0, IRQ 156
Memory at 38bff0000000 (64-bit, prefetchable) [size=32M]
Memory at 38bff4020000 (64-bit, prefetchable) [size=64K]
Memory at 38bfe0000000 (64-bit, prefetchable) [size=256M]
Capabilities: [40] Power Management version 3
Capabilities: [60] MSI-X: Enable+ Count=33 Masked-
Capabilities: [70] Express Endpoint, MSI 00
Capabilities: [100] Advanced Error Reporting
Capabilities: [400] Access Control Services
Capabilities: [410] #15
Kernel driver in use: xocl
Kernel modules: xocl
```

Note: For deployment shells earlier than 2018.3, User PF is assigned to function 0 and Management PF is assigned to function 1.

Running xbutil flash scan

Use the `xbutil flash scan` command to view and validate the card's current firmware version, as well as display the installed card details, including card ID, shell name, and timestamp.

1. Enter the following command:

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash scan
```

For each card in the server, you will see an output similar to the example below.

```
Card [0]
Card BDF:          0000:65:00.0
Card type:         u200
Flash type:        SPI
Shell running on FPGA:
  xilinx_u200_xdma_201830_2, [TS=0x000000005cdb19fa], [SC=4.1.0]
Shell package installed in system:
  xilinx_u200_xdma_201830_2, [TS=0x000000005cdb19fa], [SC=4.1.0]
```

In this example, the card ID is 0.

The name of the shell and associated timestamp, along with the SC firmware version, running on the FPGA are found under `Shell package installed in FPGA` while the ones installed in the system are found under `Shell package installed in system`.

In the above output example, the shell on the FPGA and system are identical; the deployment shell name is named `xilinx_u200_xdma_201830_2`, the timestamp is `0x000000005cdb19fa` and the SC version is `4.1.0`. Note in these outputs, `TS` is the timestamp and `SC` is referring to the Satellite Controller.

2. Verify that the deployment shell version installed on the FPGA is identical to that installed on the system. You can do this by making sure the lines under `Shell running on FPGA` and `Shell package installed in system` are identical.

If these shell versions do not match, see [Chapter 7: Troubleshooting](#).

xbutil validate



IMPORTANT! For the U200/U250 EA release, the `xbutil validate` command is not functioning.

The `xbutil validate` command generates a high-level, easy to read summary of the installed card. It validates the correct installation by performing the following set of tests:

1. Validates the device found.
2. Checks PCIe link status.
3. Runs a verify kernel on the card.
4. Performs the following data bandwidth tests:
 - a. DMA test - Data transfer between host and FPGA DDR through PCIe. For U280, data transfer is between host and FPGA HBM.
 - b. DDR test - Data transfer between kernels and FPGA DDR. For U280, two channels of FPGA DDR and two channels of FPGA HBM are exercised.

The `validate` command has the format:

```
xbutil validate -d <card_id>
```

where `card_id` is optional.

Run the `validate` command shown below to validate card 0:

```
$ sudo /opt/xilinx/xrt/bin/xbutil validate -d 0
```

If the card was installed correctly, you will see a message similar to the following output. If the output is not similar to the one shown below, see [Chapter 7: Troubleshooting](#).

```
INFO: Found 1 cards

INFO: Validating card[0]: xilinx_u200_xdma_201830_2
INFO: Checking PCIE link status: PASSED
INFO: Starting verify kernel test:
INFO: verify kernel test PASSED
INFO: Starting DMA test
Host -> PCIe -> FPGA write bandwidth = 11625.4 MB/s
Host <- PCIe <- FPGA read bandwidth = 12155.9 MB/s
INFO: DMA test PASSED
INFO: Starting DDR bandwidth test: .....
Maximum throughput: 47585.078125 MB/s
INFO: DDR bandwidth test PASSED
INFO: Starting P2P test
P2P BAR is not enabled. Skipping validation
INFO: P2P test PASSED
INFO: Starting M2M test
bank0 -> bank1 M2M bandwidth: 12136.2 MB/s
bank0 -> bank2 M2M bandwidth: 12107.5 MB/s
bank0 -> bank3 M2M bandwidth: 12157.5 MB/s
bank1 -> bank2 M2M bandwidth: 12171.3 MB/s
bank1 -> bank3 M2M bandwidth: 12078.9 MB/s
bank2 -> bank3 M2M bandwidth: 12150.6 MB/s
INFO: M2M test PASSED
INFO: Card[0] validated successfully.

INFO: All cards validated successfully.
```

Next Steps

Alveo™ [Accelerated Solutions](#) page provides information and links to available What you've done so far allows you to deploy and run accelerated applications on your system. The Xilinx and third-party accelerated applications. These include video processing, financial computing, machine learning, and data analytics.

For additional information on Alveo cards, see *Alveo U200 and U250 Data Center Accelerator Cards User Guide* ([UG1289](#)) or *Alveo U280 Data Center Accelerator Card User Guide* ([UG1314](#)).

If you are an application developer who wants to develop and deliver accelerated applications, install the SDAccel™ development software. It allows you to develop, debug, and optimize accelerated applications for Alveo cards. Installation instructions can be found in *SDAccel Environment Release Notes, Installation, and Licensing Guide* ([UG1238](#)).

For an overview of developing accelerated applications with Alveo™ with accompanying guided examples, see *Get Moving with Alveo* ([UG1352](#)).

For complete details on the development flow and getting started in SDAccel, see *SDAccel Environment User Guide* ([UG1023](#)). For an introduction to SDAccel methodology, see *SDAccel Methodology Guide* ([UG1346](#)).

Troubleshooting

The following table lists potential issues, causes, and fixes related to card installation.

Table 3: Card Troubleshooting

Issue	Potential Cause	Fix
Card not found.	Card not correctly installed.	Reinstall card following the installation instructions. Check if the card shows up by typing the following Linux command: <code>lspci -vd 10ee:</code>
	Card not compatible with server.	Use qualified server. See <i>Alveo U200 and U250 Data Center Accelerator Cards Data Sheet (DS962)</i> for system compatibilities.
	Maintenance USB cable attached.	Ensure maintenance USB cable is removed before booting system.
	Kernel version is incompatible.	Run <code>uname -r</code> to check the kernel version. Ensure that the kernel version matches the version listed for your OS in Chapter 4: Installing the Deployment Software .
lspci no longer recognizes the card.	Card is overheating.	Ensure that operating ambient conditions do not exceed specifications.
XRT installation incomplete or unsuccessful.	Missing dependent packages.	Contact your Linux administrator.
Deployment shell installation incomplete or unsuccessful.	Missing dependent packages.	Contact your Linux administrator.
xbutil flash returns the error: Specified DSA is not applicable	Correct type of deployment shell package not installed.	Install the correct type of deployment shell package.
Unable to install the packages.	Incorrect permissions for download directory.	Download the packages to a directory where root has read access (for example /tmp).
When running xbutil the following message is displayed: Failed to open device: 0000:3b:00.0 INFO: Found total 1 card(s); 0 are usable.	Driver has not loaded successfully or the card is not flashed successfully.	Perform a cold reboot.

Table 3: Card Troubleshooting (cont'd)

Issue	Potential Cause	Fix
XRT package fails to install in CentOS7.4 or CentOS7.5	Kernel development headers are missing. The XRT package is missing a dependency on <code>kernel-devel</code> and <code>kernel-headers</code> .	Manually install <code>kernel-devel</code> and <code>kernel-headers</code> with <code>yum install</code> : <pre>\$ sudo yum install kernel-headers-`uname -r` \$ sudo yum install kernel-devel-`uname -r`</pre> <p>Note: Do not run <code>sudo yum upgrade</code>. This will update the <code>kernel-headers</code> to an incompatible version.</p>
Flashing the card does not complete after 20 minutes .	The flash operation has failed.	Perform cold-reboot and then re-flash the card.
Run time fails with following message: <pre>Error: Failed to find Xilinx platform</pre>	Failed to source the <code>setup.sh</code> script.	Source <code>/opt/xilinx/xrt/setup.sh</code>
When installing XRT, you see the following message: <pre>N: Can't drop privileges for downloading as file '/root/xrt_201802.2.1.79_16.04.deb' couldn't be accessed by user '_apt'. - pkgAcquire::Run (13: Permission denied)</pre>	This is caused by running <code>sudo apt install</code> as root.	The XRT will install correctly, despite the error. You can find more information about this error on AskUbuntu .

Known Issues

The following table lists known issues. See [AR-71752](#) for additional U200/U250 known issues, or [AR-71975](#) for U280 ES1 known issues.

The following table lists known issues.

Table 4: Known Issues

Area	Description	Comments/Recommendations
General	On CentOS 7.5, driver may not be loaded properly after boot up (or reboot).	After boot up (or reboot), run these two commands to load the device driver: <pre>\$ sudo rmmod xclmgmt \$ sudo modprobe xclmgmt</pre>
General	The card is not present in when running <code>lspci</code> . The card may not have been ready when the server enumerated PCI Express.	Potential Fix: Warm Reboot the server, Disable Fast Boot.

Table 4: **Known Issues** (cont'd)

Area	Description	Comments/Recommendations
General	The card has not trained to the full expected PCI Express link width or link speed. The output from <code>xbutil validate</code> will look like the following: <pre>\$ INFO: Validating device[0]: INFO: Checking PCIE link status: FAILED WARNING: Device trained to lower spec. Expect: Gen3x16, Current: Gen2x16</pre>	Ensure that the Alveo card is plugged into a Gen 3x16 capable slot, and that the power cable is connected. Then cold reboot and see if the card trains to the correct settings.
General	The card is not present in when running <code>xbutil</code> or <code>lspci</code> . The card may not have been ready when the server enumerated PCI Express.	Potential Fix: Warm Reboot the server, Disable Fast Boot
xbutil	<code>xbutil</code> commands do not work. There are no errors indicating this in output.	Reinstall the XRT package.

Changing XRT and Shell Versions

The Alveo™ Data Center Accelerator card shell and XRT revisions can change significantly between releases. To ensure a successful upgrade (or downgrade) of the Alveo card XRT and shell, carefully follow the instructions for your specific release pairing. Failure to adhere to these procedures can result in an unstable installation or other issues.

The procedures for changing between the 2018.2 and 2018.3 releases differ from changing between 2018.x (2018.2 and 2018.3) and 2019.1 due to significant architectural changes in the Alveo card shell and XRT.

Note: For links to the available shell and XRT revisions, see [Chapter 4: Installing the Deployment Software](#).



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.



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

RedHat and CentOS

During upgrading, downgrading, or uninstalling, it can be useful to list the currently installed Alveo packages.

To list all currently installed shell packages, run the following command in a Linux terminal:

```
$ yum list installed | grep xilinx
```

To list the currently installed XRT package, run the following command:

```
$ yum list installed | grep xrt
```

Upgrade from 2018.2 to 2018.3 in RedHat and CentOS

Note: For links to the available shell and XRT revisions, see [Chapter 4: Installing the Deployment Software](#).

To upgrade from the 2018.2 to the 2018.3 release, perform the following steps.

1. Remove the current XRT and shell versions.

```
$ sudo yum remove xrt
```

2. Download the XRT associated with the 2018.3 shell version and install it with the following command:

```
$ sudo yum install < rpm-dir >/xrt_<version>.rpm
```

3. Download the desired deployment shell installation package and install it with the following command:

```
$ sudo yum install <rpm-dir>/xilinx-<card>-<version>.rpm
```

4. Run the following command and confirm that the value in `Shell` package installed in `system` field matches what was just installed, and that the `SC` field for `Shell` running on FPGA is not blank. See [Running xbutil flash scan](#) for an explanation of the output.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash scan
```

If the package does not match, try to install the deployment shell package again.

If the `SC` field for `Shell` running on FPGA is blank, then follow the instructions in Xilinx Answer Record [AR-71760](#).

5. Flash the firmware to the Alveo card.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash -a all
```

6. To load the new firmware image on the FPGA, cold boot the machine.
7. Run the following command to confirm that the output under the `Shell` running on FPGA and `Shell` package installed in `system` fields match.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash scan
```

8. Validate the card as described in [Chapter 5: Card Bring-Up and Validation](#).

Downgrade from 2018.3 to 2018.2 in RedHat and CentOS

Note: For links to the available shell and XRT revisions, see [Chapter 4: Installing the Deployment Software](#).

To downgrade from the 2018.3 to the 2018.2 release, perform the following steps.

1. Remove the current XRT and shell versions.

```
$ sudo yum remove xrt
```

2. Download the 2018.2 version of XRT and install it with the following command:

```
$ sudo yum install < rpm-dir >/xrt_<version>.rpm
```

- Download the desired deployment shell installation package and install it with the following command:

```
$ sudo yum install <rpm-dir>/xilinx-<card>-<version>.rpm
```

- Run the following command and confirm that the value in `Shell package installed in system` field matches what was just installed, and that the `SC` field for `Shell running on FPGA` is not blank. See [Running xbutil flash scan](#) for an explanation of the output.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash scan
```

If the package does not match, try to install the deployment shell package again.

If the `SC` field for `On the FPGA` is blank, then follow the instructions in Xilinx Answer Record [AR-71760](#).

- Flash the firmware to the Alveo card.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash -a all
```

- To load the new firmware image on the FPGA, cold boot the machine.
- Run the following command to confirm that the output under the `Shell running on FPGA` and `Shell package installed in system` fields match.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash scan
```

- Validate the card as described in [Chapter 5: Card Bring-Up and Validation](#).

Upgrade from 2018.x to 2019.1 in RedHat and CentOS

Note: For links to the available shell and XRT revisions, see [Chapter 4: Installing the Deployment Software](#).

To upgrade from either the 2018.2 or 2018.3 release to the 2019.1 release, perform the following steps.

- Remove the current XRT and shell versions.

```
$ sudo yum remove xrt
```

- Download the 2019.1 version of XRT and install it with the following command.

```
$ sudo yum install <rpm-dir>/xrt-<version>.rpm
```

- Restore the card to the original manufacturing state.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash -r
```

- Cold reboot the system.

- To confirm that the shell running on the FPGA is either `GOLDEN_2` or `GOLDEN_5`, review the output from the following command.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash scan
```

For example, you might see `xilinx_u250_GOLDEN_2`.



IMPORTANT! *If the GOLDEN_2 image is running on the FPGA, carefully review the Design Advisory for Alveo Data Center Accelerator Card Golden Corruption, found at Xilinx Answer Record [AR-71915](#). Complete the repair instructions associated with the Xilinx Answer prior to proceeding.*



IMPORTANT! *Si l'image GOLDEN_2 est en cours d'exécution sur le FPGA, consultez attentivement l'avis de conception relatif à la corruption dorée de la carte accélératrice de centre de données Alveo, disponible dans l'enregistrement de réponse Xilinx [AR-71915](#). Suivez les instructions de réparation associées à Xilinx Answer avant de poursuivre.*



WICHTIG! *Wenn das GOLDEN_2-Image auf dem FPGA ausgeführt wird, lesen Sie die Designempfehlung zur Goldenen Beschädigung der Alveo Data Center-Beschleunigerkarte unter Xilinx Answer Record [AR-71915](#). Führen Sie die mit der Xilinx Answer verbundenen Reparaturanweisungen aus, bevor Sie fortfahren..*

- Download the desired deployment shell installation package and install it.

```
$ sudo yum install <rpm-dir>/xilinx-<card>-<version>.rpm
```

- Run the following command and confirm that the value in `Shell package installed in system` field matches what was just installed, and that the `SC` field for `Shell running on FPGA` is not blank. See [Running xbutil flash scan](#) for an explanation of the output.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash scan
```

If the package does not match, try to install the deployment shell package again.

If the `SC` field for `Shell running on FPGA` is blank, then follow the instructions in Xilinx Answer Record [AR-71760](#).

- Flash the firmware to the Alveo card.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash -a all
```

- To load the new firmware image on the FPGA, cold boot the machine.
- Run the following command to confirm that the output under the `Shell running on FPGA` and `Shell package installed in system` fields match.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash scan
```

- Validate the card as described in [Chapter 5: Card Bring-Up and Validation](#).

Downgrade from 2019.1 to 2018.x in RedHat and CentOS

Note: For links to the available shell and XRT revisions, see [Chapter 4: Installing the Deployment Software](#).

To downgrade from the 2019.1 to the 2018.3 or 2018.2 release, perform the following steps.

1. Restore the card to the original manufacturing state by running the following command from XRT 2019.1.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash -r
```

2. Remove the current XRT and shell versions.

```
$ sudo yum remove xrt
```

3. Cold reboot the system.

4. Follow the installation procedures outlined in [Chapter 4: Installing the Deployment Software](#).

Uninstalling Packages in RedHat and CentOS

To completely uninstall the Alveo XRT and deployment shell packages, run the following command in a Linux terminal. Uninstalling XRT also uninstalls the deployment shell.

```
$ sudo yum remove <xrt_package_name>
```

Note: Make sure that all of the shell packages are displayed in the output terminal after running the command. If not, manually list the packages using the `list` command at the beginning of this section, then delete the remaining packages using the `remove` command.

Ubuntu

During upgrading, downgrading, or uninstalling, it can be useful to list the currently installed Alveo packages.

To list all currently shell packages, run the following command in a Linux terminal:

```
$ apt list --installed | grep xilinx
```

To list the currently installed XRT package, run the following command:

```
$ apt list --installed | grep xrt
```

Upgrade from 2018.2 to 2018.3 in Ubuntu

Note: For links to the available shell and XRT revisions, see [Chapter 4: Installing the Deployment Software](#).

To upgrade from the 2018.2 to the 2018.3 release, perform the following steps.

1. Remove the current XRT and shell versions.

```
$ sudo apt remove xrt
```

- Download the XRT associated with the 2018.3 shell version and install it with the following command:

```
$ sudo apt install <deb-dir>/xrt_<version>.deb
```

- Download the desired deployment shell installation package and install it with the following command:

```
$ sudo apt install <deb-dir>/xilinx-<card>-<version>.deb
```

- Run the following command and confirm that the value in `Shell package installed in system` field matches what was just installed, and that the `SC` field for `Shell running on FPGA` is not blank. See [Running xbutil flash scan](#) for an explanation of the output.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash scan
```

If the package does not match, try to install the deployment shell package again.

If the `SC` field for `Shell running on FPGA` is blank, then follow the instructions in Xilinx Answer Record [AR-71760](#).

- Flash the firmware to the Alveo card.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash -a all
```

- To load the new firmware image on the FPGA, cold boot the machine.
- Run the following command to confirm that the output under the `Shell running on FPGA` and `Shell package installed in system` fields match.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash scan
```

- Validate the card as described in [Chapter 5: Card Bring-Up and Validation](#).

Downgrade from 2018.3 to 2018.2 in Ubuntu

Note: For links to the available shell and XRT revisions, see [Chapter 4: Installing the Deployment Software](#).

To downgrade from the 2018.3 to the 2018.2 release, perform the following steps.

- Remove the current XRT and shell versions.

```
$ sudo apt remove xrt
```

- Download the 2018.2 version of XRT and install it with the following command:

```
$ sudo apt install <deb-dir>/xrt_<version>.deb
```

- Download the desired deployment shell installation package and install it with the following command:

```
$ sudo apt install <deb-dir>/xilinx-<card>-<version>.deb
```


- Run the following command and confirm that the value in `Shell package installed in system` field matches what was just installed, and that the `SC` field for `On the FPGA` is not blank. See [Running xbutil flash scan](#) for an explanation of the output.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash scan
```

If the package does not match, try to install the deployment shell package again.

If the `SC` field for `Shell running on FPGA` is blank, then follow the instructions in Xilinx Answer Record [AR-71760](#).

- Flash.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash -a all
```

- To load the new firmware image on the FPGA, cold boot the machine.
- Run the following command to confirm that the output under the `Shell running on FPGA` and `Shell package installed in system` fields match.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash scan
```

- Validate the card as described in [Chapter 5: Card Bring-Up and Validation](#).

Upgrade from 2018.x to 2019.1 in Ubuntu

Note: For links to the available shell and XRT revisions, see [Chapter 4: Installing the Deployment Software](#).

To upgrade from either the 2018.2 or 2018.3 release to the 2019.1 release, perform the following steps.

- Remove the current XRT and shell versions.

```
$ sudo apt remove xrt
```

- Download the 2019.1 version of XRT and install it with the following command.

```
$ sudo apt install <deb-dir>/xrt-<version>.deb
```

- Restore the card to the original manufacturing state.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash -r
```

- Cold reboot the system.
- To confirm that the shell running on the FPGA is either `GOLDEN_2` or `GOLDEN_5`, review the output from the following command.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash scan
```

For example, you might see `xilinx_u250_GOLDEN_2`.



IMPORTANT! If the `GOLDEN_2` image is running on the FPGA, carefully review the Design Advisory for Alveo Data Center Accelerator Card Golden Corruption, found at Xilinx Answer Record [AR-71915](#). Complete the repair instructions associated with the Xilinx Answer prior to proceeding.



IMPORTANT! Si l'image `GOLDEN_2` est en cours d'exécution sur le FPGA, consultez attentivement l'avis de conception relatif à la corruption dorée de la carte accélératrice de centre de données Alveo, disponible dans l'enregistrement de réponse Xilinx [AR-71915](#). Suivez les instructions de réparation associées à Xilinx Answer avant de poursuivre.



WICHTIG! Wenn das `GOLDEN_2`-Image auf dem FPGA ausgeführt wird, lesen Sie die Designempfehlung zur Goldenen Beschädigung der Alveo Data Center-Beschleunigerkarte unter Xilinx Answer Record [AR-71915](#). Führen Sie die mit der Xilinx Answer verbundenen Reparaturanweisungen aus, bevor Sie fortfahren..

- Download the desired deployment shell installation package and install it.

```
$ sudo apt install <deb-dir>/xilinx-<card>-<version>.deb
```

- Run the following command and confirm that the value in `Shell package installed in system` field matches what was just installed, and that the `SC` field for `Shell running on FPGA` is not blank. See [Running xbutil flash scan](#) for an explanation of the output.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash scan
```

If the package does not match, try to install the deployment shell package again.

If the `SC` field for `Shell running on FPGA` is blank, then follow the instructions in Xilinx Answer Record [AR-71760](#).

- Flash the firmware to the Alveo card.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash -a all
```

- To load the new firmware image on the FPGA, cold boot the machine.

- Run the following command to confirm that the output under the `Shell running on FPGA` and `Shell package installed in system` fields match.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash scan
```

- Validate the card as described in [Chapter 5: Card Bring-Up and Validation](#).

Downgrade from 2019.1 to 2018.x in Ubuntu

Note: For links to the available shell and XRT revisions, see [Chapter 4: Installing the Deployment Software](#).

To downgrade from the 2019.1 to the 2018.3 or 2018.2 release, perform the following steps.

- Restore the card to the original manufacturing state by running the following command from XRT 2019.1.

```
$ sudo /opt/xilinx/xrt/bin/xbutil flash -r
```

2. Remove the current XRT and shell versions.

```
$ sudo apt remove xrt
```

3. Cold reboot the system.
4. Follow the installation procedures outlined in [Chapter 4: Installing the Deployment Software](#).

Uninstalling Packages in Ubuntu

To completely uninstall the Alveo XRT and deployment shell packages, run the following command in a Linux terminal. Uninstalling XRT also uninstalls the deployment shell.

```
$ sudo apt remove <xrt_package_name>
```

Note: Make sure that all of the shell packages are displayed in the output terminal after running the command. If not, manually list the packages using the `list` command at the beginning of this section, then delete the remaining packages using the `remove` command.

Creating a Vault Repository for CentOS

On CentOS, `yum install kernel-headers` always installs the latest version of the headers, but might not match your kernel version. This causes the installation of XRT to skip compilation of the driver modules and will silently fail. To correctly install XRT, you must create a vault repository file that points to versions matching the kernel.

The following is an example repository for CentOS 7.4 created in the following file:

```
/etc/yum.repos.d/centos74.repo
```

```
# CentOS-Base-7.4.repo
#
# This repo is locked to 7.4.1708 version
#
# C7.4.1708
[C7.4.1708-base]
name=CentOS-7.4.1708 - Base
baseurl=http://vault.centos.org/7.4.1708/os/$basearch/
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-7
enabled=1
[C7.4.1708-updates]
name=CentOS-7.4.1708 - Updates
baseurl=http://vault.centos.org/7.4.1708/updates/$basearch/
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-7
enabled=1
[C7.4.1708-extras]
name=CentOS-7.4.1708 - Extras
baseurl=http://vault.centos.org/7.4.1708/extras/$basearch/
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-7
enabled=1
[C7.4.1708-centosplus]
name=CentOS-7.4.1708 - CentOSPlus
baseurl=http://vault.centos.org/7.4.1708/centosplus/$basearch/
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-7
enabled=1
[C7.4.1708-fasttrack]
name=CentOS-7.4.1708 - CentOSPlus
baseurl=http://vault.centos.org/7.4.1708/fasttrack/$basearch/
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-7
enabled=1
```

Note: For CentOS 7.5, create the repo file `/etc/yum.repos.d/centos75.repo` and add the above content, replacing "7.4.1708" with "7.5.1804".

Generating the xbutil flash Command

To flash the firmware installed in the system to the Alveo™ card, use the `xbutil flash` command.

The format of the `xbutil flash` command is:

```
sudo /opt/xilinx/xrt/bin/xbutil flash -a <shell_name> -d <card_ID>
```

To obtain the necessary card ID (-d) and shell name (-a) command options, run the following `xbutil flash scan` command. For more information, see [Running xbutil flash scan](#).

```
sudo /opt/xilinx/xrt/bin/xbutil flash scan
```

For each card in the server, you will see an output similar to the example below. In this example, the Shell running on FPGA does not match Shell package installed in system, implying that the Shell running on FPGA needs to be updated using the `xbutil flash` command.

```
Card [0]
Card BDF:                0000:02:00.0
Card type:               u200
Flash type:              SPI
Shell running on FPGA:
  xilinx_u200_xdma_201830_1, [TS=0x000000005bece8e1], [SC=3.1]
Shell package installed in system:
  xilinx_u200_xdma_201830_2, [TS=0x000000005cdb19fa], [SC=4.1.0]
```

The shell name value needs to be taken from Shell package installed in system:. In this output, the `xbutil flash` command options are:

- **Card ID (-d):**

```
Card [0]
```

The card ID is 0. The card ID will change if any cards are installed or uninstalled. Do not assume that the card ID will remain static.

- **Shell name (-a):**

```
Shell package installed in system:
  xilinx_u200_xdma_201830_2,[TS=0x000000005cdb19fa],[SC=4.1.0]
```

The shell name is `xilinx_u200_xdma_201830_2`.

For the example output above, the `xbutil flash` command is:

```
sudo /opt/xilinx/xrt/bin/xbutil flash -a xilinx_u200_xdma_201830_2 -d 0
```

When the Alveo card is successfully flashed, the `xbutil flash scan` output will show the same package information for both `Shell package installed in FPGA:` and `Shell package installed in system:`.

If you have multiple cards installed on the server, you **MUST** run the `xbutil flash` command separately for each card.



IMPORTANT! *Use a separate `xbutil flash` command to flash each card in the system.*



IMPORTANT! *Utilisez une commande `xbutil flash` distincte pour faire flasher chaque carte du système.*



WICHTIG! *Verwenden Sie einen separaten `xbutil flash`-Befehl, um jede Karte im System zu flashen.*

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. DocNav is installed with the SDSoc™ and SDAccel™ development environments. To open it:

- 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

SDAccel Documents

These documents provide supplemental material useful with this guide:

1. *SDAccel Environment User Guide* ([UG1023](#))
2. *SDx Command and Utility Reference Guide* ([UG1279](#))
3. *SDAccel Environment Debugging Guide* ([UG1281](#))
4. *SDAccel Environment Profiling and Optimization Guide* ([UG1207](#))
5. *SDAccel Development Environment Tutorials* ([GitHub](#))

More Resources

1. Xilinx® licensing website: <https://www.xilinx.com/getproduct>
2. SDAccel Developer Zone: <https://www.xilinx.com/products/design-tools/software-zone/sdaccel.html>
3. Xilinx Community Forums: <https://forums.xilinx.com>
4. *Xilinx End-User License Agreement* ([UG763](#))
5. *Third Party End-User License Agreement* ([UG1254](#))

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