

Getting Started with Alveo Data Center Accelerator Cards

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Revision History

The following table shows the revision history for this document.

Section	Revision Summary
02/12/2019 Version 1.3	
General	Added support for Alveo U280 ES card.
Upgrading, Downgrading, and Uninstalling XRT and Deployment Shell on RedHat and CentOS Upgrading, Downgrading, and Uninstalling XRT and Deployment Shell on Ubuntu	Updated instructions on upgrading and downgrading XRT and the deployment shell.
Appendix A: Required Dependencies	Updated RedHat and CentOS dependencies.
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.
Upgrading, Downgrading, and Uninstalling XRT and Deployment Shell on RedHat and CentOS	Added new information on upgrading and downgrading deployment software.
Upgrading, Downgrading, and Uninstalling XRT and Deployment Shell 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 Alveo™ Data Center accelerator cards.

Alveo cards are PCI Express[®] (PCIe) Gen3 x16 compliant cards 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 two software installation flows, one for deployment and one for development. The deployment software allows you to deploy pre-compiled applications on your machine, and it consists of the Xilinx runtime (XRT) and a deployment shell. The development software allows you to compile and debug acceleration applications, and it consists of the development shell and the SDAccel™ development environment.

While the development software is critical for application developers who wish to build applications, it is not necessary to install in your deployment environment where the Alveo accelerator cards reside

Through varying combinations of hardware and software installations, there are three different system configurations available for running, developing, and debugging applications on your Alveo accelerator cards:

- **Running Applications:** To run accelerated applications, you can install an Alveo card into a system as described in [Chapter 3: Card Installation Procedures](#), and then install the required deployment software to support running applications as described in [Chapter 4: Installing the Deployment Software](#).
- **Developing Applications:** You can configure a system for developing FPGA accelerated applications by installing the deployment software and the development software as described in [Chapter 6: Installing the Development Software](#). This installs both a development shell and the SDAccel development environment. This configuration does not have an Alveo card installed and is used for development purposes.
- **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.

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-compliant 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 RHEL 7.4, 7.5
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 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)*.

Validated Servers

The Alveo U200, U250, and U280 accelerator cards have been validated for interoperability by Xilinx in the following servers.

Table 2: Validated Servers

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

Table 2: Validated Servers (cont'd)

Manufacturer	Model/Platform ¹
Dell EMC	PowerEdge R740
HPE	ProLiant DL380 G10
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 complete 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. An Auxiliary power connector. This connector is shown in figures 4 and 5.
3. Two QSFP interfaces. Currently these interfaces are not supported by the 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.

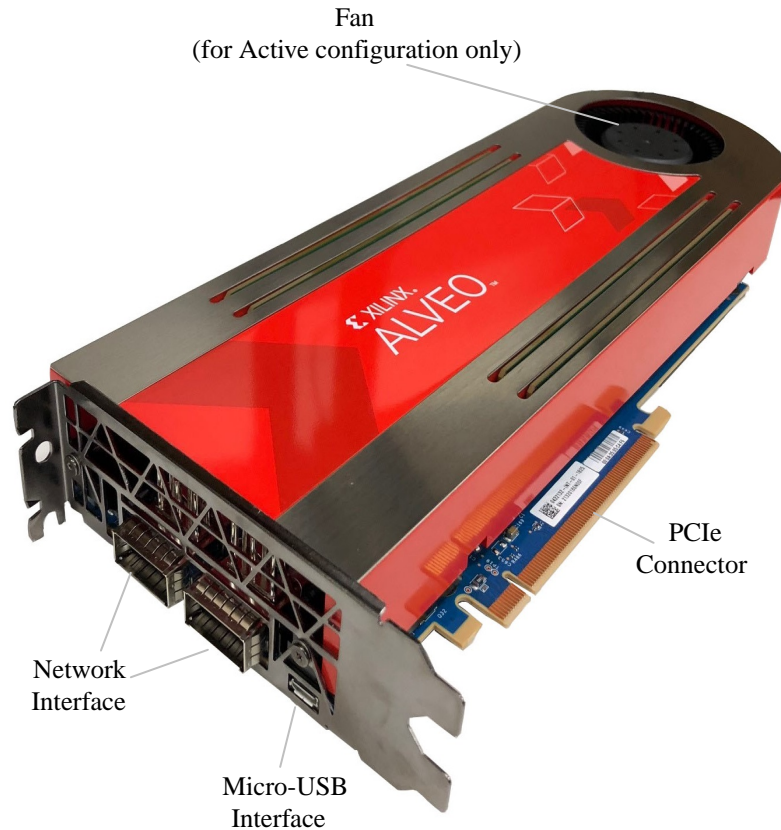


ATTENTION! Pièces mobiles peuvent être dangereuses. Éloignez-vous des lames du ventilateur.



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](#)).

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 \(DS963\)](#)
- 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](#).

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 Karten Alveo im eingeschalteten Zustand nicht (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.

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. Plug AUX Connector after the card has been inserted in PCIe® slot, ensure the plug is mechanically fixed (with the click).



IMPORTANT! *Operation of the Alveo™ cards only with AUX 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 card has an 8-pin female PCIe Aux Power Connector.

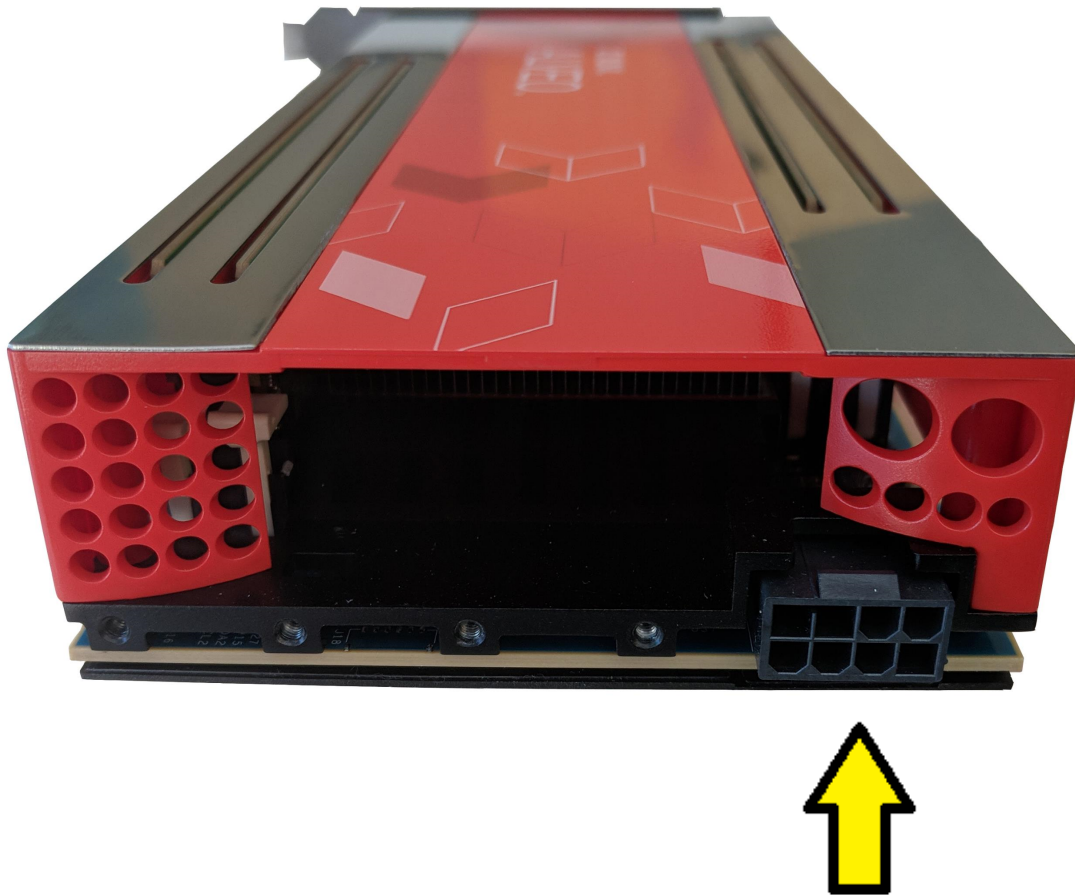
For actively cooled cards, connect the power cable to the Aux power connector at top of the card as shown in the following figure.

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



The power-supply can have an 8-pin or a 6-pin power connector configuration. Some power supplies label this cable *PCIe Aux Power* or *VGA*.

- ★ **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 connector). 215W is available with the 8-pin connector (65 Watts from PCIe connector 12V source, and 150 Watts from the 6-pin 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 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 6-broches).

- ★ **Wichtig!** Mit dem 6-poligen Stecker stehen nur 150 W zur Verfügung. Die vollen 225W stehen mit dem 8-poligen Stecker zur Verfügung.

The following figures show examples of the various connector types:

- For an 8-pin connector, connect the power supply to the card.

Figure 6: **Example of 8-Pin PCIe Aux Power Connector**



- For a 6-pin connector, connect the power supply to the card using the six rightmost pins of the card's 8-pin power supply socket, leaving the two leftmost pins unused, as identified by the red box in the following figures.

Figure 7: **Example of 6-Pin PCIe Aux Power Connector**



Figure 8: 6-Pin PCIe Aux Power Connector Pin Relative to 8-Pin

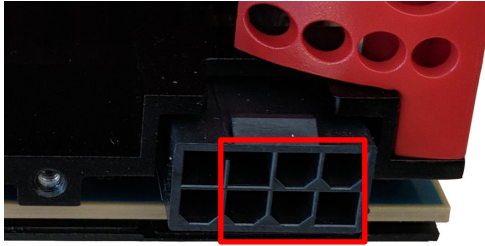


Figure 9: Example of 6-Pin to 8-Pin PCIe Aux Power Connector Cord



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](#)).

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

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

If the card is successfully installed and found by the operating system, a message similar to the one below displays.

If you do not see a similar message, see [Chapter 7: Troubleshooting](#).

For Alveo U200:

```
03:00.0 Processing accelerators: Xilinx Corporation Device d000
Subsystem: Xilinx Corporation Device 000e
Flags: bus master, fast devsel, latency 0, IRQ 11, NUMA node 0
Memory at f6000000 (32-bit, non-prefetchable) [size=32M]
Memory at f8000000 (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
```

For Alveo U250:

```
06:00.0 Processing accelerators: Xilinx Corporation Device d004
Subsystem: Xilinx Corporation Device 000e
Flags: fast devsel, IRQ 29
Memory at f6000000 (32-bit, non-prefetchable) [size=32M]
Memory at f8000000 (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
```

For Alveo U280 ES:

```
65:00.0 Processing accelerators: Xilinx Corporation Device d008
Subsystem: Xilinx Corporation Device 000e
Flags: bus master, fast devsel, latency 0, IRQ 11, NUMA node 0
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: [1f0] Virtual Channel
Capabilities: [e00] Access Control Services
```

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 installation requires installing the following 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 and is significantly smaller than the development shell but cannot be used to compile or create a new application. While you can also install the development software detailed in [Chapter 6: Installing the Development Software](#) on a machine with a card installed, doing so is not necessary to run applications.



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 software using an RPM installation package. For details on upgrading or downgrading the XRT and deployment shell, see [Upgrading, Downgrading, and Uninstalling XRT and Deployment Shell on RedHat and CentOS](#).

Note: In order to successfully install XRT, you need to have kernel-headers and kernel-devel packages installed on your machine. On CentOS/RedHat, XRT supports Linux kernel up to: 3.10.0-862.14.4.el7.x86_64.



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, veuillez 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).

Your operating system might require additional dependencies before installing XRT and the deployment shell. See [Appendix A: Required Dependencies](#) for a list of these packages.

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 command fail because they can't find packages matching your kernel version, you need to setup a Vault repository. For more information, see [Appendix B: Creating a Vault Repository for CentOS](#)

3. After the above command finishes running, 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 required for the card.

- For U200:

```
$ sudo yum install <rpm-dir>/xilinx-u200-xdma-<version>.rpm
```

- For U250:

```
$ sudo yum install <rpm-dir>/xilinx-u250-xdma-<version>.rpm
```

- For U280:

```
$ sudo yum install <rpm-dir>/xilinx-u280-es1-xdma-<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. Note that the `dsa` folder contains the deployment shell installation.

7. After installing the deployment shell, the terminal instructs you to flash the card by running a command listed in the output, as shown in the example below. Do NOT run this command. You will manually generate the correct command in a subsequent step.

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

8. Cold boot your machine by fully powering it off and then on.
9. Follow the instructions in [Appendix C: Generating the xbutil flash Command](#) to manually generate the correct `xbutil flash` command, which includes the `-d` option to specify the card in the server to be flashed, as shown below. The `-a` and `-t` options specify the deployment shell name and timestamp associated with the specific card ID.

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



CAUTION! Not specifying the card ID within the `xbutil flash` command via the `-d` option can result in damage to the card.

10. Run the manually generated `xbutil flash` command.

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

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

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

Flashing will take up to 10 minutes. Successfully flashing a new card results in a message similar to the one shown below. If you do not see one, refer to [Chapter 7: Troubleshooting](#).

```
Updating DSA on card[0]
INFO: ***Found 880 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]: DSA on FPGA is up-to-date
0 Card(s) flashed successfully.
```

12. 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 software using an RPM installation package. For details on upgrading or downgrading the XRT and deployment shell, see [Upgrading, Downgrading, and Uninstalling XRT and Deployment Shell on Ubuntu](#).



IMPORTANT! *The installation packages referenced here are being 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, veuillez 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.

- For U200:

```
$ sudo apt install <deb-dir>/xilinx-u200-xdma-<version>.deb
```

- For U250:

```
$ sudo apt install <deb-dir>/xilinx-u250-xdma-<version>.deb
```

- For U280:

```
$ sudo apt install <deb-dir>/xilinx-u280-es1-xdma-<version>.rpm
```

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.

4. After installing the deployment shell, the terminal instructs you to flash the card by running a command listed in the output, as shown in the example below. Do NOT run this command. You will manually generate the correct command in a subsequent step.

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

5. Cold boot your machine by fully powering it off and then on.
6. Follow the instructions in [Appendix C: Generating the xbutil flash Command](#) to manually generate the correct `xbutil flash` command, which includes the `-d` option to specify the card in the server to be flashed, as shown below. The `-a` and `-t` options specify the deployment shell name and timestamp associated with the specific card ID.

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



CAUTION! Not specifying the card ID within the `xbutil flash` command via the `-d` option can result in damage to the card.

7. Run the manually generated `xbutil flash` command.

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

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

```
Probing board[0]: DSA on FPGA needs updating
DSA on below cards will be updated:
Card [0]
Are you sure you wish to proceed? [y/n]
```

Flashing will take up to 10 minutes. Successfully flashing a new card results in a message similar to the one shown below. If you do not see one, refer to [Chapter 7: Troubleshooting](#).

```
Updating DSA on card[0]
INFO: ***Found 880 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]: DSA on FPGA is up-to-date
0 Card(s) flashed successfully.
```

9. Cold boot the 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.

Upgrading, Downgrading, and Uninstalling XRT and Deployment Shell on RedHat and CentOS

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

To list the currently installed deployment shell package, 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
```

Upgrading Packages

You can upgrade the XRT and deployment shell on your Alveo card by following these steps. Both packages must be upgraded concurrently.

1. Download the desired XRT and deployment shell packages. Both must be from the same release (i.e. both are 2018.2 package releases).
2. Install the XRT installation package using the following command, where `<rpm-dir>` is the directory where the 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 along with any necessary dependencies. Follow the instructions when prompted throughout the installation.

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

- For U200:

```
$ sudo yum install <rpm-dir>/xilinx-u200-xdma-<version>.rpm
```

- For U250:

```
$ sudo yum install <rpm-dir>/xilinx-u250-xdma-<version>.rpm
```

- For U280 ES:

```
$ sudo yum install <rpm-dir>/xilinx-u280-es1-xdma-<version>.rpm
```

The deployment software sources are now installed and deployed on the system.

4. After installing the deployment shell, the terminal instructs you to flash the card by running a command listed in the output, as shown in the example below. Do NOT run this command. You will manually generate the correct command in a subsequent step.

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

5. Cold boot your machine by fully powering it off and then on.

6. Manually generate the correct `xbutil flash` command to include the `-d` option, which specifies the card in the server to be flashed, as shown below. The `-a` and `-t` options specify the deployment shell name and timestamp associated with the specific card ID.

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

To generate the `xbutil flash` command, follow the instructions in [Appendix C: Generating the xbutil flash Command](#).



CAUTION! Not specifying the card ID within the `xbutil flash` command via the `-d` option can result in damage to the card.

7. Run the manually generated `xbutil flash` command.

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

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

```
Probing board[0]: DSA on FPGA needs updating
DSA on below cards will be updated:
Card [0]
Are you sure you wish to proceed? [y/n]
```

Flashing will take up to 10 minutes. Successfully flashing a new card results in a message similar to the one shown below. If you do not see one, refer to [Chapter 7: Troubleshooting](#).

```
INFO: ***Found 880 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.
DSA image flashed succesfully
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]: DSA on FPGA is up-to-date
0 Card(s) flashed successfully.
```

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

Downgrading Packages

You can downgrade the XRT and deployment shell on your Alveo card by following these steps. Both packages must be upgraded concurrently. Note that the deployment shell package must be downgraded prior to the XRT package.

1. Download the desired version of the deployment shell and XRT package files. Both must be from the same release (i.e both are 2018.2 package releases).
2. Run the following command in a Linux terminal. The shell package name is the name of the package file downloaded in step 1.

```
$ sudo yum downgrade <rpm-dir>/xilinx-<desired-depl-shell-version>.rpm
```

3. Cold boot your machine by fully powering it off and then on.
4. Manually generate the `xbutil flash` command by following the instructions in [Appendix C: Generating the xbutil flash Command](#).

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

Note: Not specifying the card ID within the `xbutil flash` command via the `-d` option can result in damage to the card.

5. Run the manually generated `xbutil flash` command.

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

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

```
Probing board[0]: DSA on FPGA needs updating
DSA on below cards will be updated:
Card [0]
Are you sure you wish to proceed? [y/n]
```

Flashing will take up to 10 minutes. Successfully flashing a new card results in a message similar to the one shown below. If you do not see one, refer to [Chapter 7: Troubleshooting](#).

```
INFO: ***Found 880 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.
DSA image flashed successfully
Cold reboot machine to load the new image on FPGA
```

7. Cold boot the machine to load the new firmware image on the FPGA.

The deployment shell package has now successfully been downgraded.

8. Downgrade the XRT package by running the following command in a Linux terminal. The XRT package name is the name of the package file downloaded in step 1.

```
$ sudo yum downgrade <rpm-dir>/<desired_xrt_version>.rpm
```

9. Reboot your machine.

The XRT has now successfully been downgraded.

Uninstalling Packages

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.

Upgrading, Downgrading, and Uninstalling XRT and Deployment Shell on Ubuntu

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

To list the currently installed deployment shell package, 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
```

Upgrading Packages

You can upgrade the XRT and deployment shell on your Alveo card by following these steps. Both packages must be upgraded concurrently.

1. Download the desired XRT and deployment shell packages. Both must be from the same release (i.e. both are 2018.2 package releases).
2. Install the XRT installation package using the following command, where `<deb-dir>` is the directory where the 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.

- For U200:

```
$ sudo apt install <deb-dir>/xilinx-u200-xdma-<version>.deb
```

- For U250:

```
$ sudo apt install <deb-dir>/xilinx-u250-xdma-<version>.deb
```

- For U280 ES:

```
$ sudo apt install <deb-dir>/xilinx-u280-es1-xdma-<version>.deb
```

ForThe deployment software sources are now installed and deployed on the system.

4. After installing the deployment shell, the terminal instructs you to flash the card by running a command listed in the output, as shown in the example below. Do NOT run this command. You will manually generate the correct command in a subsequent step.

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

5. Cold boot your machine by fully powering it off and then on.
6. Manually generate the correct `xbutil flash` command to include the `-d` option, which specifies the card in the server to be flashed, as shown below. The `-a` and `-t` options specify the deployment shell name and timestamp associated with the specific card ID.

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

To generate the `xbutil flash` command, follow the instructions in [Appendix C: Generating the xbutil flash Command](#).



CAUTION! Not specifying the card ID within the `xbutil flash` command via the `-d` option can result in damage to the card.

7. Run the manually generated `xbutil flash` command.

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

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

```
Probing board[0]: DSA on FPGA needs updating
DSA on below cards will be updated:
Card [0]
Are you sure you wish to proceed? [y/n]
```

Flashing will take up to 10 minutes. Successfully flashing a new card results in a message similar to the one shown below. If you do not see one, refer to [Chapter 7: Troubleshooting](#).

```
INFO: ***Found 880 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.
DSA image flashed succesfully
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]: DSA on FPGA is up-to-date
0 Card(s) flashed successfully.
```

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

Downgrading Packages

You can downgrade the XRT and deployment shell on your Alveo card by following these steps. Both packages must be upgraded concurrently. Note that the deployment shell package must be downgraded prior to the XRT package.

1. Download the desired version of the deployment shell and XRT package files. Both must be from the same release (i.e both are 2018.2 package releases).
2. Run the following command in a Linux terminal. The shell package name is the name of the package file downloaded in step 1.

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

3. Cold boot your machine by fully powering it off and then on.
4. Manually generate the `xbutil flash` command by following the instructions in [Appendix C: Generating the xbutil flash Command](#).

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

Note: Not specifying the card ID within the `xbutil flash` command via the `-d` option can result in damage to the card.

5. Run the manually generated `xbutil flash` command.

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

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

```
Probing board[0]: DSA on FPGA needs updating
DSA on below cards will be updated:
Card [0]
Are you sure you wish to proceed? [y/n]
```

Flashing will take up to 10 minutes. Successfully flashing a new card results in a message similar to the one shown below. If you do not see one, refer to [Chapter 7: Troubleshooting](#).

```
INFO: ***Found 880 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.
DSA image flashed succesfully
Cold reboot machine to load the new image on FPGA
```

7. Cold boot the machine to load the new firmware image on the FPGA.

The deployment shell package has now successfully been downgraded.

8. Downgrade the XRT package by running the following command in a Linux terminal. The XRT package name is the name of the package file downloaded in step 1.

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

9. Reboot your machine.

The XRT has now successfully been downgraded.

Uninstalling Packages

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.

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 was previously used in [Installing the Card](#) when verifying that the hardware was installed correctly. In this section, `lspci` and the Xilinx[®] `xbutil` utility are used to validate a successful hardware and software setup.

The second and third commands use the `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. See *SDx Command and Utility Reference Guide (UG1279)* 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 `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 one below. Note that for each card, there will be two different devices found: one for management and one for user.

- For U200:

```
65:00.0 Processing accelerators: Xilinx Corporation Device 5000
Subsystem: Xilinx Corporation Device 000e
Flags: bus master, fast devsel, latency 0, NUMA node 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 211, NUMA node 0
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_xdma
Kernel modules: xocl
```

- For U250:

```
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 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 5005
Subsystem: Xilinx Corporation Device 000e
Flags: bus master, fast devsel, latency 0, IRQ 191, NUMA node 0
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_xdma
Kernel modules: xocl
```

- For U280 ES:

```
65:00.0 Serial controller: Xilinx Corporation Device 5009 (prog-if 01
[16450])
Subsystem: Xilinx Corporation Device 000e
Flags: bus master, fast devsel, latency 0, IRQ 191, NUMA node 0
Memory at de000000 (32-bit, non-prefetchable) [size=32M]
Memory at e0000000 (32-bit, non-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: [1f0] Virtual Channel
Capabilities: [e00] Access Control Services
Kernel driver in use: xocl_xdma
Kernel modules: xocl

65:00.1 Serial controller: Xilinx Corporation Device 5008 (prog-if 01
[16450])
Subsystem: Xilinx Corporation Device 000e
Flags: fast devsel, NUMA node 0
Memory at dc000000 (32-bit, non-prefetchable) [size=32M]
Memory at e0020000 (32-bit, non-prefetchable) [size=64K]
Capabilities: [40] Power Management version 3
Capabilities: [60] MSI-X: Enable- Count=33 Masked-ss
Capabilities: [70] Express Endpoint, MSI 00
Capabilities: [100] Advanced Error Reporting
Capabilities: [e00] Access Control Services
Kernel driver in use: xcldmgt
Kernel modules: xcldmgt
```

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:                                0000:02:00.0
Card type:                               u200
Flash type:                              SPI
DSA running on FPGA:
    xilinx_u200_xdma_201830_1, [TS=0x000000005bece8e1], [BMC=3.1]
DSA package installed in system:
    xilinx_u200_xdma_201830_1, [TS=0x000000005bece8e1], [BMC=3.1]
```

In this example, the card ID is 0.

The name of the DSA and associated timestamp along with the BMC running on the FPGA are found under `DSA package installed in FPGA` while the ones installed in the system are found under `DSA package installed in system`.

In the above output example, the DSA on the FPGA and system are identical; the deployment shell name is named `xilinx_u200_xdma_201830_1`, the timestamp is `0x000000005bece8e1` and the BMC version is `3.1`. Note in these outputs, DSA is referring to the deployment shell, TS is the timestamp and BMC 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 `DSA running on FPGA` and `DSA package installed in system` are identical.
- The BMC version under `DSA running on FPGA` is greater than or equal to 1.8.

If either of these are incorrect, see the [Chapter 7: Troubleshooting](#) section.

xbutil validate

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 via PCIe. For U280-ES, data transfer is between host and FPGA HBM.
 - b. DDR test - Data transfer between kernels and FPGA DDR. For U280-ES, two channels of FPGA DDR and two channels of FPGA HBM are exercised.

To run the `validate` command, enter the following:

```
$ sudo /opt/xilinx/xrt/bin/xbutil validate
```

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, review [Chapter 7: Troubleshooting](#).

```
INFO: Found 1 cards

INFO: Validating card[0]: xilinx_u200_xdma_201820_1
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 = 11346.1 MB/s
Host <- PCIE <- FPGA read bandwidth = 11333.6 MB/s
INFO: DMA test PASSED
INFO: Starting DDR bandwidth test: .....
Maximum throughput: 45374.042969 MB/s
INFO: DDR bandwidth test PASSED
INFO: Card[0] validated successfully.

INFO: All cards validated successfully.
```

Installing the Development Software

Development software installation instructions can be found in *SDAccel Environments Release Notes, Installation, and Licensing Guide* ([UG1238](#)).

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

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> .	<p>Manually install <code>kernel-devel</code> and <code>kernel-headers</code> with <code>yum</code> install:</p> <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.
<p>Run time fails with following message:</p> <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>
<p>When installing XRT, you see the following message:</p> <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:

Table 4: Known Issues

Area	Description	Comments/Recommendations
General	On CentOS 7.5, driver may not be loaded properly after boot up (or reboot).	<p>After boot up (or reboot), run these two commands to load the device driver:</p> <pre>\$ sudo rmmod xclmgmt \$ sudo modprobe xclmgmt</pre>

Table 4: Known Issues (cont'd)

Area	Description	Comments/Recommendations
General	<p>The card is not ready when the server boots up. If this issue is present, the output from <code>xbutil validate</code> will look like the following:</p> <pre>\$ INFO: Validating device[0]: INFO: Checking PCIE link status: FAILED WARNING: Device trained to lower spec. Expect: Gen3x16, Current: Gen2x16</pre> <p>Or the card is not present when running <code>lspci</code></p>	<p>Potential fixes are:</p> <ul style="list-style-type: none"> • Warm reboot • Disable fast boot in the BIOS.
xbutil	xbutil commands do not work. There are no errors indicating this in output.	Reinstall the XRT package.

Required Dependencies

RedHat and CentOS

The following dependencies are required for XRT and shell installation on RedHat and CentOS systems:

Table 5: Required Dependencies for RedHat and CentOS

Package	Minimum Version
ocl-icd-devel	2.2
boost-devel	1.53
boost-filesystem	1.53
libuuid-devel	2.23.2
dkms	2.5.0
protobuf-devel	2.5.0
protobuf-compiler	2.5.0
ncurses-devel	5.9
redhat-lsb-core	N/A
libxml2-devel	2.9.1
libyaml-devel	0.1.4

Ubuntu

The following dependencies are required for XRT and shell installation on Ubuntu systems:

Table 6: Required Dependencies for Ubuntu

Package	Minimum Version
ocl-icd-openscl-dev	2.2.0
libboost-dev	1.58
libboost-filesystem-dev	1.58
uuid-dev	2.27.1

Table 6: Required Dependencies for Ubuntu (cont'd)

Package	Minimum Version
dkms	2.2.0
libprotoc-dev	2.6.1
protobuf-compiler	2.6.1
libncurses5-dev	6.0
lsb-release	2.9.1
libxml2-dev	2.9.1
libyaml-dev	0.1.6

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, create a vault repository 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 to the Alveo™ card, use the `xbutil flash` command, which flashes the deployment shell installed in the system onto the Alveo card.

The format of the `xbutil flash` command is:

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

To obtain the necessary card ID (-d), shell name (-a), and timestamp (-t) 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:

```
Card [0]  
Card BDF:                0000:02:00.0  
Card type:                u200  
Flash type:               SPI  
DSA running on FPGA:  
  xilinx_u200_xdma_201820_1, [TS=0x000000005b891ee3], [BMC=1.8]  
DSA package installed in system:  
  xilinx_u200_xdma_201830_1, [TS=0x000000005bece8e1], [BMC=3.1]
```

Both the shell name and timestamp values need to be taken from DSA 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):**

```
Card [0] DSA package installed in system:  
  xilinx_u200_xdma_201830_1, [TS=0x000000005bece8e1], [BMC=3.1]
```

The shell name is `xilinx_u200_xdma_201830_1`.

- **Timestamp (-t):**

```
DSA package installed in system:
  xilinx_u200_xdma_201830_1,[TS=0x000000005bece8e1],[BMC=3.1]
```

The timestamp is `0x000000005bece8e1`.

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

```
sudo /opt/xilinx/xrt/bin/xbutil flash -a xilinx_u200_xdma_201830_1 -t
0x000000005bece8e1 -d 0
```

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



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

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

These documents provide supplemental material useful with this guide:

SDAccel Documents

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 Environment Getting Started Tutorial* ([UG1021](#))

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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