

Alveo U50 Data Center Accelerator Card Installation Guide

UG1370 (v1.4) January 7, 2020



Revision History

The following table shows the revision history for this document.

Section	Revision Summary
01/07/2020 Version 1.4	
Installing the Card	Updated to add notes about UL Listed Servers and card handling.
12/18/2019 Version 1.3	
General	Updated output logs.
Qualified Servers	Updated the section and provided the web link to the qualified servers information.
XRT and Deployment Platform Installation Procedures on Ubuntu	Added a note about XRT installation.
10/31/2019 Version 1.2	
General	Updated to the Vitis™ unified software platform throughout. Updated outputs throughout the document.
Chapter 4: Installing the Deployment Software	Replaced <code>xbut il</code> command with the new <code>xbmgmt</code> command for card flashing. Updated output logs.
Running xbmgt flash --scan	Replaced <code>xbut il</code> command with the new <code>xbmgmt</code> command when scanning card. Updated output logs.
Known Issues	Added a link to Xilinx Answer Record 72766. Added a known issue.
Appendix A: Changing XRT and Target Platform Versions	Replaced <code>xbut il</code> command with the new <code>xbmgmt</code> command for card flashing. Updated output logs.
09/18/2019 Version 1.1	
General updates	Updated sample outputs.
Card Interfaces and Details	Added card interface related information and updated images.
Known Issues	Included a link to Xilinx Answer Record 71752. Added information about power.
08/05/2019 Version 1.0	
Initial release	N/A

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Introduction

This document provides hardware and software installation procedures for the Alveo™ U50 Data Center accelerator card and applies to Vitis™ unified software platform release 2019.2 and later.

The half-height, half-length U50 Alveo card is Gen3x16 PCI Express® (PCIe) compliant and Gen4x8 compatible. It features the Xilinx® UltraScale+™ Architecture and is used to accelerate compute-intensive applications such as database acceleration, machine learning, data analytics, financial computing, and video processing.

Different system configurations are 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 target platform and the Vitis environment. This configuration does not have an Alveo card installed and is used for development along with debugging in emulation modes.
- **Running, Developing, and Debugging Applications:** By installing the Alveo card along with both the deployment and development software on a single machine, you can configure a system for developing and running accelerated applications. With the card installed, developers can debug applications in both emulation modes and on the hardware.

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 x16 slot.

Table 1: Minimum System Requirements (cont'd)

Component	Requirement
System Power Supply	75W
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>Vitis Unified Software Platform Documentation: Application Acceleration Development</i> (UG1393).

For details on the acceptable environmental conditions, see *Alveo U50 Data Center Accelerator Cards Data Sheet* (DS965).

Qualified Servers

A list of servers on which Alveo cards are fully qualified on can be found here: <https://www.xilinx.com/products/boards-and-kits/alveo/qualified-servers.html>.

Unpacking

Product Registration



IMPORTANT! To receive updates, register your product at <https://www.xilinx.com/products/design-tools/vitis/vitis-platform.html>.



IMPORTANT! Pour recevoir les mises à jour, enregistrez votre produit sur <https://www.xilinx.com/products/design-tools/vitis/vitis-platform.html>.



WICHTIG! Um Updates zu erhalten, registrieren Sie ihr Produkt unter <https://www.xilinx.com/products/design-tools/vitis/vitis-platform.html>.

Accelerator Card Overview

Card Interfaces and Details

The Alveo™ U50 accelerator card is available in a passive cooling configuration and is designed for installation into a data center server where controlled air flow provides direct cooling to the card. The card includes the following interfaces.

- A PCI Express® card connector.
- The production qualified (PQ) card has one QSFP interface and the Engineering sample (ES) card has two SFP-DD interfaces.
- Maintenance Connector.

Used to program the card in RTL flow through the programming cable. For more information see the *Alveo Programming Cable User Guide* ([UG1377](#)).

Figure 1: Alveo U50 PQ Card with Half-Height Bracket

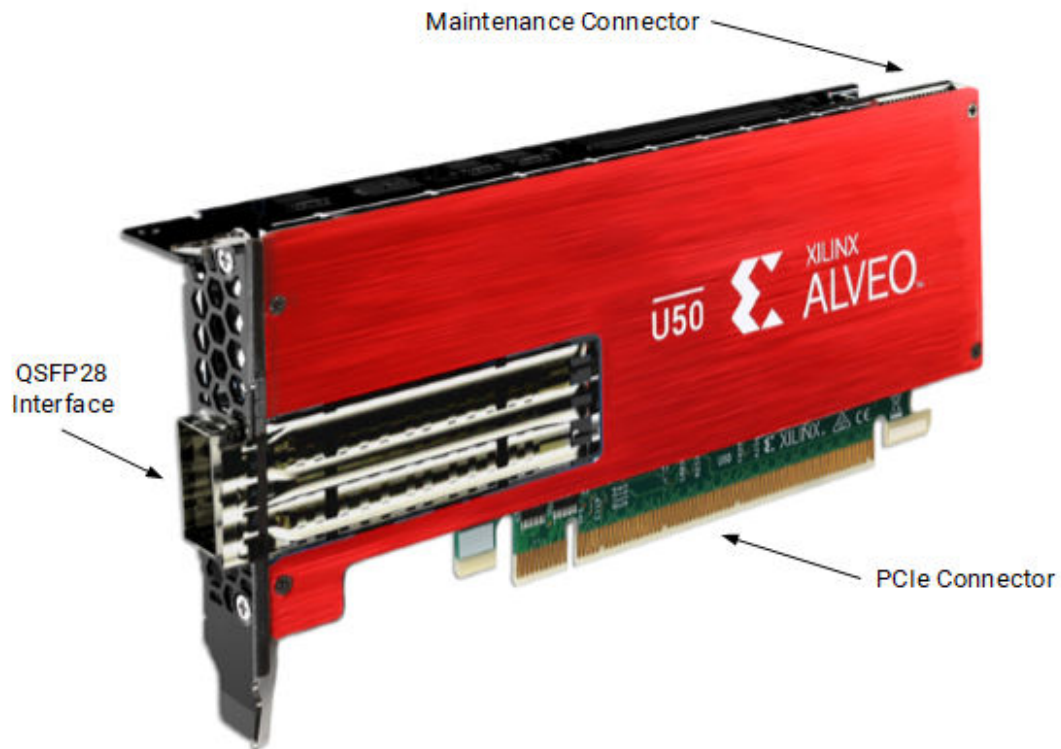
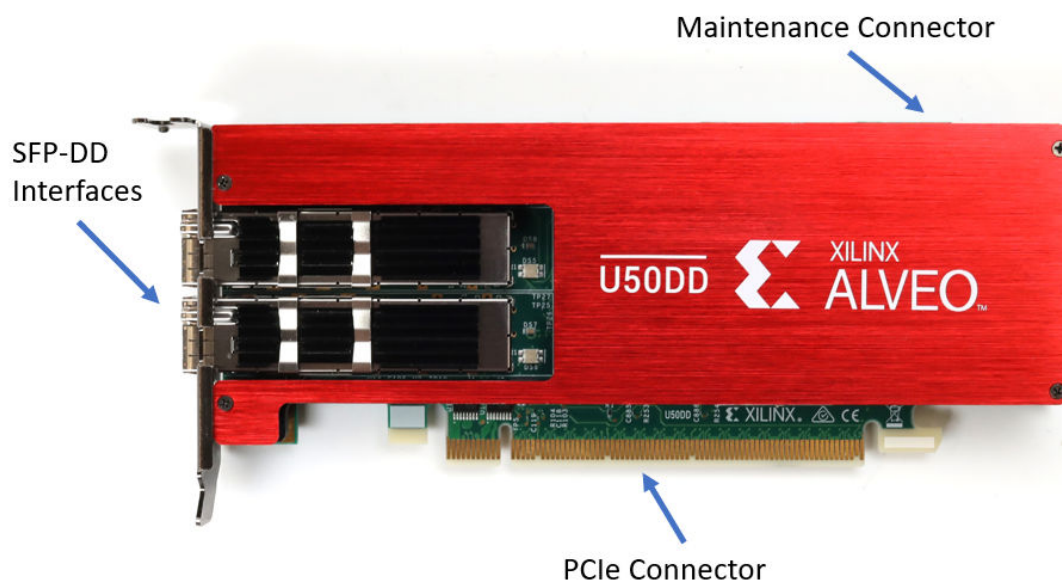


Figure 2: Alveo U50DD ES Card with Half-Height Bracket



For card specifications, dimensions, list of card features, and block diagram, see *Alveo U50 Data Center Accelerator Cards Data Sheet* ([DS965](#)).

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 U50 Data Center Accelerator Cards Data Sheet (DS965)*.
- Determine if a half or full height bracket is necessary for the installation. If the bracket needs to be changed, do this before following the installation steps.
- 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 related topics below for more information.

Related Information

[Minimum System Requirements](#)

[Qualified Servers](#)

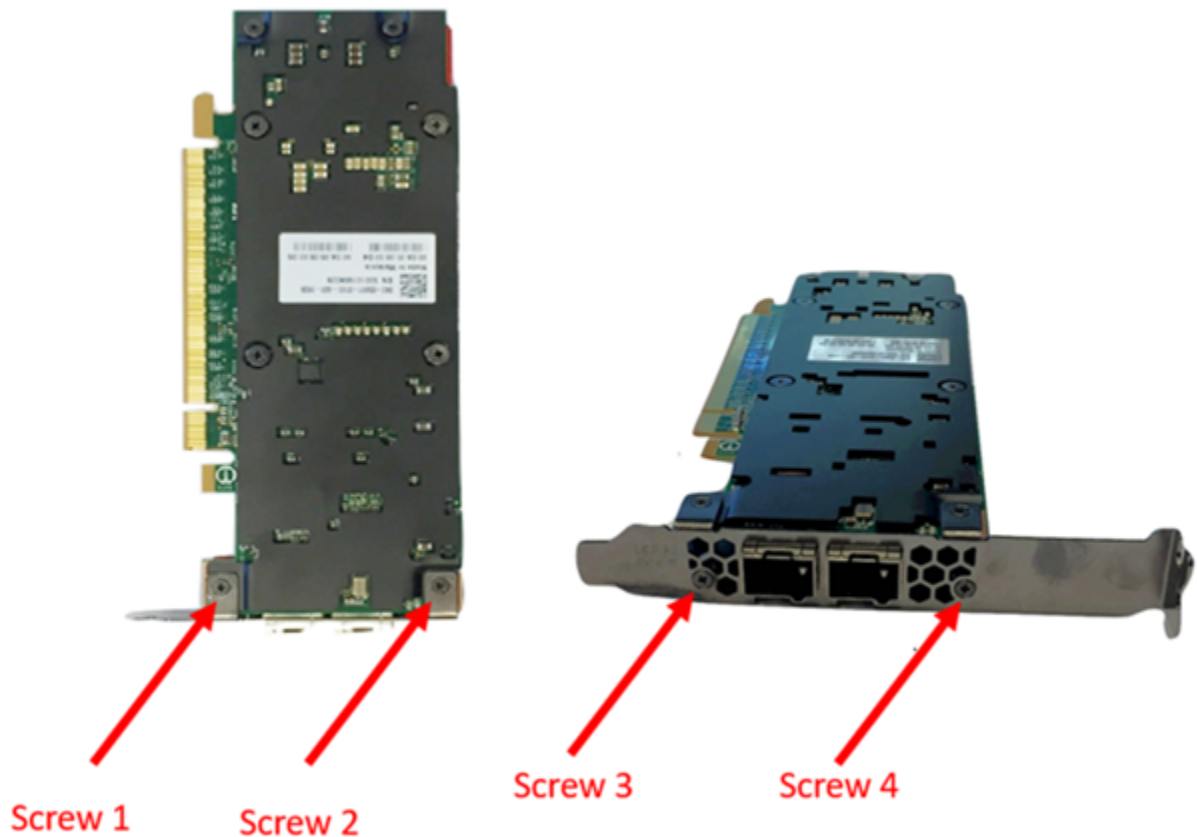
[Replacing the Bracket](#)

Replacing the Bracket

The Alveo U50 card can be used with either a full-height or half-height bracket. Depending on your system, it may be necessary to switch between the full and half-height bracket on the card. The bracket is secured to the card with four screws, as shown in the figure below. To replace the bracket, follow the instructions below.

1. Remove screws 1 and 2 from the card.
2. Remove screws 3 and 4 from the card.
3. Remove the bracket from the card.
4. Place the new bracket on the card and align it with the card's connectors and screw locations.
5. Replace screws 1 and 2 on the new bracket.
6. Replace screws 3 and 4 on the new bracket.

Figure 3: Screw Locations on Bracket



Installing the Card

The following procedure is a guide for the Xilinx® Alveo™ U50 Data Center accelerator card installation. Consult your computer documentation for additional information.

Note: For use with UL Listed Servers or ITE.

If you encounter any issues during installation, see [Chapter 7: Troubleshooting](#) and [Known Issues](#).

1. Shut down the host computer and unplug the power cord.
2. Open your computer by removing the casing.
3. If necessary, remove the adjacent PCIe® slot cover corresponding to the PCIe slot in which you are installing the Alveo card.
4. Plug the Alveo card into the PCIe x16 slot on the motherboard.
5. Re-install the computer casing.
6. 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. This card can heat up after use in the server. Use caution when handling. For more information, see *Alveo U50 Data Center Accelerator Cards Data Sheet* ([DS965](#)).

7. 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 U50 card:

```
65:00.0 Processing accelerators: Xilinx Corporation Device 5020
Subsystem: Xilinx Corporation Device 000e
Flags: bus master, fast devsel, latency 0, IRQ 135
Memory at 38bffc000000 (64-bit, prefetchable) [size=32M]
Memory at 38bffe000000 (64-bit, prefetchable) [size=128K]
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
Kernel driver in use: xclmgmt
Kernel modules: xclmgmt
```

Note: If this card has previously been installed, the `lspci` output will be similar to the one shown in [Running lspci](#).

If you do not see a message similar to either of these, see [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 and requires root access.

Note: For those using RTL flow instead of the Vitis™ application acceleration development flow, see the *Alveo U50 Data Center Accelerator Card User Guide* ([UG1371](#)) for details on programming the card.

The deployment software consists of the following software packages:

- **Xilinx® runtime (XRT):** XRT provides the libraries and drivers for an application to run on Alveo™ cards.
- **Deployment platform:** The deployment platform 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 platform installation packages can be downloaded from the **Getting Started** tab of the respective Alveo card landing page:

- [Alveo U50 Product Page](#)

If you encounter any issues during installation, see [Chapter 7: Troubleshooting](#) and [Known Issues](#).



IMPORTANT! *Root access is required for all software and firmware installations.*



IMPORTANT! *L'accès Root est requis pour toutes les installations logicielles et firmware.*



WICHTIG! *Root-Zugriff ist für alle Software- und Firmware-Installationen erforderlich.*

XRT and Deployment Platform Installation Procedures on RedHat and CentOS

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

For details on upgrading or downgrading the XRT and deployment platform, see [Appendix A: Changing XRT and Target Platform 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, 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).

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 cannot find packages matching your kernel version, set up a Vault repository. For more information, see [Appendix C: Creating a Vault Repository for CentOS](#)

3. After the above command completes, reboot your machine.
4. Download both the Xilinx® runtime (XRT) and deployment platform installation packages from the [Alveo U50 Product Page](#).
5. Install the XRT installation package by running the following command from within the directory where the installation packages reside. <version> is the latter part of the installation package file name.

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

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

6. Install the deployment platform installation package:

```
$ sudo yum install ./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 platform installation.

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

```
DSA package installed successfully.
Please flash card manually by running below command:
sudo /opt/xilinx/xrt/bin/xbmgmt flash --update --shell <shell_name>
```

Note: When installing 2019.1 or earlier deployment platform packages, the displayed instructions use the `xbutil` rather than the `xbmgmt` command to flash. Flashing with `xbutil` is being deprecated and will not be supported in future releases. It is recommended to use the `xbmgmt` command to flash the Alveo card.

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/xbmgmt flash --update --shell <shell_name>
```

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

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

```
Status: shell needs updating
Current shell: <current_platform_name>
Shell to be flashed: <platform_to_be_flashed>
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[0000:65:00.0]
INFO: found 5 sections
.....
INFO: Loading new firmware on SC

Updating shell on card[0000:65:00.0]
INFO: ***Found 497 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.
Successfully flashed Card[0000:65:00.0]

1 Card(s) flashed successfully.
Cold reboot machine to load the new image on card(s)
```

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.
```

9. 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 Platform Installation Procedures on Ubuntu

Note: When installing XRT on Ubuntu, if the 2015 version of `pyopencl` is installed on your system, you must uninstall it. The XRT installation will install the 2019 version of `pyopencl` and will return an error if the 2015 version is installed. For more information, see [Xilinx Answer Record 73055](#).

Use the following steps to download and install the XRT and deployment platform using a `.deb` installation package.

For details on upgrading or downgrading the XRT and deployment platform, see [Appendix A: Changing XRT and Target Platform 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, 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 platform installation packages from the **Getting Started** tab of the [Alveo U50 Product Page](#).
2. Install the XRT installation package by running the following command from within the directory where the installation packages reside. `<version>` is the latter part of the installation package file name.

```
$ sudo apt install ./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 installation packages required for the card:

```
$ sudo apt install ./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 platform installation.

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

```
DSA package installed successfully.
Please flash card manually by running below command:
sudo /opt/xilinx/xrt/bin/xbmgmt flash --update --shell <shell_name>
```

Note: When installing 2019.1 or earlier deployment platform packages, the displayed instructions use the `xbutil` rather than the `xbmgmt` command to flash. Flashing with `xbutil` is being deprecated and will not be supported in future releases. It is recommended to use the `xbmgmt` command to flash the Alveo card.

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/xbmgmt flash --update --shell <shell_name>
```

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

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

```
Status: shell needs updating
Current shell: <current_platform_name>
Shell to be flashed: <platform_to_be_flashed>
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[0000:65:00.0]
INFO: found 5 sections
.....
INFO: Loading new firmware on SC

Updating shell on card[0000:65:00.0]
INFO: ***Found 497 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.
Successfully flashed Card[0000:65:00.0]

1 Card(s) flashed successfully.
Cold reboot machine to load the new image on card(s)
```

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.
```

6. 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.

Card Bring-Up and Validation

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

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

The `lspci` Linux command is used to validate the card as seen by the OS, as was done when installing the card.

The second and third commands use the Xilinx[®] `xbmgmt` and `xbutil` utilities, that are included during the XRT package installation. These utilities include multiple commands to validate and identify the installed card(s) and report additional card details including DDR, PCIe[®], platform name, and system information. This guide uses the `xbmgmt` and `xbutil` utilities. See *Vitis Unified Software Platform Documentation: Application Acceleration Development* ([UG1393](#)) for a detailed list of commands.

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

Use the following command in `cs`h shell:

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

Use the following command in `bash` shell:

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

Related Information

[Installing the Card](#)

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 physical functions found: one for management and one for user. See <https://xilinx.github.io/XRT/master/html/platforms.html> for additional details.

```
03:00.0 Processing accelerators: Xilinx Corporation Device 5020
Subsystem: Xilinx Corporation Device 000e
Physical Slot: 4
Flags: bus master, fast devsel, latency 0, NUMA node 0
Memory at d2000000 (64-bit, prefetchable) [size=32M]
Memory at d4000000 (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: [e00] Access Control Services
Kernel driver in use: xclmgmt
Kernel modules: xclmgmt

03:00.1 Processing accelerators: Xilinx Corporation Device 5021
Subsystem: Xilinx Corporation Device 000e
Physical Slot: 4
Flags: bus master, fast devsel, latency 0, IRQ 26, NUMA node 0
Memory at d0000000 (64-bit, prefetchable) [size=32M]
Memory at d4020000 (64-bit, prefetchable) [size=64K]
Memory at c0000000 (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: [e00] Access Control Services
Kernel driver in use: xocl
Kernel modules: xocl
```

Running xbmgmt flash --scan

Use the `xbmgmt flash --scan` command to view and validate the card's current firmware version, as well as display the installed card details, including card BDF, platform name, and timestamp.

1. Enter the following command:

```
$ sudo /opt/xilinx/xrt/bin/xbmgmt flash --scan
```

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

```
Card [0000:65:00.0]
Card type:          u50
Flash type:         SPI
Flashable partition running on FPGA:
xilinx_u50_xdma_201920_2,[ID=0x5de2bfd3],[SC=5.0.22]
Flashable partitions installed in system:
xilinx_u50_xdma_201920_2,[ID=0x5de2bfd3],[SC=5.0.22]
```

In this example, the BDF is 0000:65:00.0.

The name of the platform and associated ID, along with the SC firmware version, running on the FPGA are found under `Flashable partition running on FPGA` while the ones installed in the system are found under `Flashable partitions installed in system`.

In the above output example, the platform on the FPGA and system are identical; the deployment platform is named `xilinx_u50_xdma_201920_2`, the ID is `0x000000005de2bfd3` and the SC version is `5.0.22`. Note in these outputs, ID is the timestamp and SC refers to the Satellite Controller.

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

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

xbutil validate

The `xbutil validate` command 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.
 - b. DDR test - Data transfer between kernels and FPGA DDR.

The `validate` command has the format:

```
xbutil validate -d <card_bdf>
```

where `-d` is optional and `card_bdf` is the BDF of the card to be validated.

Run the validate command shown below:

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

If the card was installed correctly, you will see a high-level summary of the tests performed 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_u50_xdma_201920_2
INFO: == Starting AUX power connector check:
AUX power connector not available. Skipping validation
INFO: == AUX power connector check SKIPPED
INFO: == Starting PCIE link check:
INFO: == PCIE link check PASSED
INFO: == Starting SC firmware version check:
INFO: == SC firmware version check PASSED
INFO: == Starting verify kernel test:
INFO: == verify kernel test PASSED
INFO: == Starting DMA test:
Buffer Size: 256 MB
Host -> PCIE -> FPGA write bandwidth = 11949.2 MB/s
Host <- PCIE <- FPGA read bandwidth = 11955.9 MB/s
INFO: == DMA test PASSED
INFO: == Starting device memory bandwidth test:
.....
Maximum throughput: 52428 MB/s
INFO: == device memory bandwidth test PASSED
INFO: == Starting PCIE peer-to-peer test:
P2P BAR is not enabled. Skipping validation
INFO: == PCIE peer-to-peer test SKIPPED
INFO: == Starting memory-to-memory DMA test:
M2M is not available. Skipping validation
INFO: == memory-to-memory DMA test SKIPPED
INFO: Card[0] validated successfully.

INFO: All cards validated successfully.
```

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

Next Steps

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

For additional information on the Alveo U50 card, see *Alveo U50 Data Center Accelerator Card User Guide* ([UG1371](#)).

If you are an application developer who wants to develop and deliver accelerated applications, install the Vitis™ software platform. It allows you to develop, debug, and optimize accelerated applications for Alveo cards. Installation instructions can be found in *Vitis Unified Software Platform Documentation: Application Acceleration Development* ([UG1393](#)).

For an overview of developing accelerated applications with Alveo™ with accompanying guided examples, see <https://developer.xilinx.com/en/articles/acceleration-basics.html>.

For complete details on the development flow and getting started in Vitis, see *Vitis Unified Software Platform Documentation: Embedded Software Development* ([UG1400](#)). For an introduction to Vitis methodology, see *Vitis Unified Software Platform Documentation: Application Acceleration Development* ([UG1393](#)).

Troubleshooting

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

Table 2: Card Troubleshooting

Issue	Potential Cause	Fix
Card not found.	Card not correctly installed.	Reinstall the 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. For system capabilities, see <i>Alveo U50 Data Center Accelerator Cards Data Sheet (DS965)</i> .
	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 platform installation incomplete or unsuccessful.	Missing dependent packages.	Contact your Linux administrator.
<code>xbmgmt --flash</code> returns the error: Specified DSA is not applicable	Correct type of deployment platform package not installed.	Install the correct type of deployment platform package.
Unable to install packages on RedHat and CentOS.	Incorrect permissions for download directory, for example, a <code>/home/</code> directory.	Download the packages to a directory where root has read access (for example, <code>/tmp</code>). Use the full path to the RPM package when installing. yum will fail with a relative path to RPM package.
When running <code>xbutil</code> 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 2: Card Troubleshooting (cont'd)

Issue	Potential Cause	Fix
XRT package fails to install on CentOS7.4, CentOS7.5, or CentOS7.6	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.
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 the 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 [Xilinx Answer Record 71752](#) and [Xilinx Answer Record 71975](#) for additional known issues.

Table 3: Known Issues

Area	Description	Comments/Recommendations
<code>xbmgmt</code>	<code>xbmgmt</code> commands do not work. There are no errors indicating this in output.	Reinstall the XRT package.
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>

Table 3: Known Issues (cont'd)

Area	Description	Comments/Recommendations
Power	The Alveo U50 card limits HBM power to 7.8W and FPGA fabric power to 58W. Exceeding these power limits can cause system instability.	<p>To manage power consumption, review design power usage and ensure that it is within the power limits. Design power estimates can be obtained using the <code>report_power</code> Tcl command.</p> <p>After implementing a design in the Vivado® tools or in the Vitis™ environment, open the implementation result, add the <code>set_operating_conditions - design_power_budget 63</code> constraint, and run report power. See <i>Vivado Design Suite User Guide: Power Analysis and Optimization</i> (UG907) for setting up power analysis.</p> <p>Actual application power consumption can be obtained by monitoring the 12V/3V PEX and 12V/3V PEX current measurements provided by the <code>xbutil</code> query—which reports power consumption at the input to the power regulator.</p> <p>For Vivado designs include the CMC IP so that the system controller can communicate with the device.</p>
General	The Alveo 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: \$ INFO: Validating device[0]: INFO: Checking PCIE link status: FAILED WARNING: Device trained to lower spec. Expect: Gen3x16, Current: Gen2x16	Ensure that the Alveo card is plugged into a Gen 3x16 or 4x8 capable slot. Then cold reboot and see if the card trains to the correct settings.
General	The card is not present 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.
General	Alveo Data Center Accelerator Card - U50DD ES3 Known Issues	For U50DD known issues, see Xilinx Answer Record 72766 .
General	Card does not show up when running <code>lspci</code> and the red LED on the card is illuminated.	<p>When card is first installed in server, BIOS may not recognize the card correctly and red LED on card is illuminated, indicating an error.</p> <p>Cold boot the server four times until the blue LED on the card is illuminated, indicating the card is successfully running.</p> <p>If the red LED is still illuminated, disconnect the power to the sever for 5 minutes and repeat the step above.</p>

Changing XRT and Target Platform Versions

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

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 platform 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 platform on your Alveo card by following these steps. Currently, both packages must be upgraded concurrently.

1. Download the desired XRT and deployment platform packages.
2. Install the XRT installation package by running the following command from within the directory where the installation packages reside. `<version>` is the latter part of the installation package file name.

```
$ sudo yum install ./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 platform installation packages required for the card.

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

After the deployment platform is installed on the system, you will see the following message:

```
XSA package installed successfully.
Please flash card manually by running below command:
sudo /opt/xilinx/xrt/bin/xbmgmt flash --update --shell <shell_name>
```

4. Flash the firmware to the Alveo card with the following command where `<shell_name>` is the name of the deployment platform being installed. To display the `shell_name`, see [Appendix D: Generating the `xbmgmt flash --update` Command](#) for details.

```
sudo /opt/xilinx/xrt/bin/xbmgmt flash --update --shell <shell_name>
```

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

```
Status: shell needs updating
Current shell: <current_platform_name>
Shell to be flashed: <platform_to_be_flashed>
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 SC firmware on card[0]
INFO: found 5 sections
.....
INFO: Loading new firmware on SC
.
Updating shell on card[0]
INFO: ***Found 500 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.
```

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

Downgrading Packages

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

1. Download the desired version of the deployment platform and XRT package files. Both must be from the same release (i.e., both are 2019.1 package releases).
2. Run the following command in a Linux terminal. The platform package name is the name of the package file downloaded in step 1.

```
$ sudo yum downgrade ./xilinx-<desired_depl_shell_version>.rpm
```

3. Cold boot your machine by fully powering it Off and then On.
4. Manually generate the `xbmgmt flash --update` command by following the instructions in [Appendix D: Generating the xbmgt flash --update Command](#).

```
sudo /opt/xilinx/xrt/bin/xbmgmt flash --update --shell <shell_name> --card <card_bdf>
```

Note: Not specifying the card BDF within the `xbmgmt flash` command through the `-card` option can result in damage to the card.

5. Run the manually generated `xbmgmt flash --update` command.

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

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

```
Status: shell needs updating
Current shell: <current_platform_name>
Shell to be flashed: <platform_to_be_flashed>
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 platform 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 ./<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 platform packages, run the following command in a Linux terminal. Uninstalling XRT also uninstalls the deployment platform.

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

Note: Make sure that all of the platform 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 the currently installed deployment platform 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 platform on your Alveo card by following these steps. Currently, both packages must be upgraded concurrently.

1. Download the desired XRT and deployment platform packages.
2. Install the XRT installation package by running the following command from within the directory where the installation packages reside. `<version>` is the latter part of the installation package file name.

```
$ sudo apt install ./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 platform installation packages required for the card.

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

After the deployment platform is installed on the system, you will see the following message:

```
XSA package installed successfully.
Please flash card manually by running below command:
sudo /opt/xilinx/xrt/bin/xbmgmt flash --update --shell <shell_name>
```

4. Flash the firmware to the Alveo card with the following command where `<shell_name>` is the name of the deployment platform being installed. To display the `shell_name`, see [Appendix D: Generating the `xbmgmt flash --update` Command](#) for details.

```
sudo /opt/xilinx/xrt/bin/xbmgmt flash --update --shell <shell_name>
```

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

```
Status: shell needs updating
Current shell: <current_platform_name>
Shell to be flashed: <platform_to_be_flashed>
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 SC firmware on card[0]
INFO: found 5 sections
.....
INFO: Loading new firmware on SC
.
Updating shell on card[0]
INFO: ***Found 500 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.
```

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

Downgrading Packages

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

1. Download the desired version of the deployment platform and XRT package files. Both must be from the same release (i.e., both are 2019.1 package releases).
2. Run the following command in a Linux terminal. The platform package name is the name of the package file downloaded in step 1.

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

3. Cold boot your machine by fully powering it Off and then On.
4. Manually generate the `xbmgmt flash --update` command by following the instructions in [Appendix D: Generating the xbmgt flash --update Command](#).

```
sudo /opt/xilinx/xrt/bin/xbmgmt flash --update --shell <shell_name> --card <card_bdf>
```

Note: Not specifying the card BDF within the `xbmgmt flash` command through the `-card` option can result in damage to the card.

5. Run the manually generated `xbmgmt flash --update` command.

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

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

```
Status: shell needs updating
Current shell: <current_platform_name>
Shell to be flashed: <platform_to_be_flashed>
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 platform 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 ./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 platform packages, run the following command in a Linux terminal. Uninstalling XRT also uninstalls the deployment platform.

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

Note: Make sure that all of the target platform 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.

Reverting the Card to Factory Image

The Alveo™ card can be reverted to factory (Golden) image. This requires that XRT 2019.2 release or later is installed on the same system as the Alveo accelerator card. The steps to revert the card using this method are listed below.

Note: If using XRT 2019.1, follow the steps given in v2019.1 of *Getting Started with Alveo Data Center Accelerator Cards* ([UG1301](#)).

1. Open a terminal window.
2. Run the following command.

```
$ sudo /opt/xilinx/xrt/bin/xbmgmt flash --factory_reset
```

3. Enter **y** to continue. The following message is displayed on completion.

```
Shell is reset successfully  
Cold reboot machine to load new shell on card
```

4. Cold-reboot by power cycling the system to complete the reverting process.
5. Validate that the card has been reverted to factory image by running the following command.

```
$ sudo /opt/xilinx/xrt/bin/xbmgmt flash --scan
```

An output similar to the following is displayed.

```
Card [0000:65:00.0]  
Card type: uxx  
Flash type: SPI  
Flashable partition running on FPGA:  
xilinx-uxx-GOLDEN_x,[SC=x.x]  
Flashable partitions installed in system: (None)
```

In the output above, under **Flashable partition running on FPGA**, note **GOLDEN** in the name. This indicates that the card has successfully been reverted to factory image.

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". Similarly, for CentOS 7.6, create the repo file `/etc/yum.repos.d/centos76.repo` and add the above content, replacing "7.4.1708" with "7.6.1810".

Generating the xbmgmt flash --update Command

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

The format of the `xbmgmt flash --update` command is:

```
sudo /opt/xilinx/xrt/bin/xbmgmt flash --update --shell <shell_name> --card <card_bdf>
```

To obtain the necessary `card_bdf` and `shell_name` options, run the following `xbmgmt flash --scan` command. For more information, see [Running xbmgmt flash --scan](#).

```
sudo /opt/xilinx/xrt/bin/xbmgmt flash --scan
```

You will see an output similar to the output below. In this example, the Flashable partition running on FPGA does not match Flashable partitions installed in system, implying that the Flashable partition running on FPGA needs to be updated using the `xbmgmt flash --update` command.

```
Card [0000:65:00.0]
Card type:          u200
Flash type:         SPI
Flashable partition running on FPGA:
xilinx_u200_xdma_201830_1, [ID=0x000000005bece8e1], [SC=3.1]
Flashable partitions installed in system:
xilinx_u200_xdma_201830_2, [ID=0x000000005d1211e8], [SC=4.2.0]
```

- **card_bdf:** Specifies the BDF of the card to flash. In the above example, the BDF is `0000:65:00.0`.
- **shell_name:** Specifies the platform (formerly referred to as shell) that is used to flash the card. The `shell_name` for flashing is provided under Flashable partitions installed in system. In the above example, the `shell_name` is `xilinx_u200_xdma_201830_2`.

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

```
sudo /opt/xilinx/xrt/bin/xbmgmt flash --update --shell
xilinx_u200_xdma_201830_2 --card 0000:65:00.0
```

When the Alveo card is successfully flashed and cold rebooted, the `xbmgmt flash --scan` output will show the same package information for both `Flashable` partition running on `FPGA` and `Flashable` partitions installed in system.

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



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



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



WICHTIG! Verwenden Sie einen separaten `xbmgmt 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. To open DocNav:

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

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

- In DocNav, click the **Design Hubs View** tab.
- On the Xilinx website, see the [Design Hubs](#) page.

Note: For more information on DocNav, see the [Documentation Navigator](#) page on the Xilinx website.

References

Vitis Documents

These documents provide supplemental material useful with this guide:

1. *Vitis Unified Software Platform Documentation: Application Acceleration Development* ([UG1393](#))
2. *Vitis Unified Software Platform Documentation: Embedded Software Development* ([UG1400](#))
3. [Vitis 2019.2 Software Platform Release Notes](#) in the *Vitis Unified Software Platform Documentation* (UG1416)
4. *Vitis Application Acceleration Development Flow Tutorials* ([GitHub](#))

Alveo Documents

1. *Alveo U50 Data Center Accelerator Card User Guide* ([UG1371](#))
2. *Alveo U50 Data Center Accelerator Cards Data Sheet* ([DS965](#))
3. *Alveo Programming Cable User Guide* ([UG1377](#))

Additional Xilinx Resources

1. [Xilinx Answer Record 71752](#)
2. [Xilinx Answer Record 72766](#)
3. Xilinx licensing website: <https://www.xilinx.com/getproduct>
4. Vitis Developer Zone: <https://www.xilinx.com/products/design-tools/vitis/vitis-platform.html>
5. Xilinx Community Forums: <https://forums.xilinx.com>
6. [Xilinx Third-Party End User License Agreement](#)
7. [End-User License Agreement](#)

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