Hewlett Packard
Enterprise

HPE Cray XD2000 Ansible Firmware Update Tool User Guide

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Overview

The HPE Cray XD Ansible Firmware Update Tool (AFUT) provides a mechanism to quickly update the firmware components of HPE Cray XD Server nodes, whether individually or many at a time. It has support for the XD2000 models. This Ansible based tool can be executed from Linux either from management or administrator nodes to update the components. This tool can also be used to create firmware inventory reports for HPC cluster nodes. It is necessary to install a full Ansible environment and other prerequisites on the management workstation as it is an Ansible script-based tool.

Supported operating system

The tool supports execution from Linux operating system.

1. Ubuntu (22.04)
2. Red Hat Enterprise Linux (RHEL 8, and RHEL 9)
3. SLES Server SP5

Prerequisites

1. Ensure that Ansible is installed.
2. The Ansible collection community.general version 8.2.0 or later must be installed.
3. To install the package, use:
   i. sudo apt install ansible
   ii. ansible-galaxy collection install community.general

To install all the remaining prerequisites, use the setup.yml file based on operating system

4. Ensure request toolbelt version 0.9.1 or later is installed.
   i. To install, run pip install requests-toolbelt

Supported Models for Update

a. HPE Cray XD225v – Inventec using ASPEED/AMI BMC firmware

b. HPE Cray XD295v – Inventec using ASPEED/AMI BMC firmware

c. HPE Cray XD220v - Inventec using ASPEED/AMI BMC firmware

Supported Targets for Update

- HPE Cray XD2000
  - PDBPIC_BMC
  - BIOS
  - MainCPLD
  - HDDBPPIC

Install AFUT

1. You can download AFUT by cloning this repository: HewlettPackard/CrayXD_AFUT_XD220_XD225_XD290
2. Install and unzip the Ansible_Firmware_Update_Tool.zip package at the Management Workstation where you want to deploy the firmware.
3. The unzipped folder contains:
    - `system_firmware_update.yml` – The main Ansible playbook file, consisting of tasks and which is responsible for flashing firmware.
    - `get_system_firmware_inventory.yml` – The Ansible playbook file, which is responsible for report generation with firmware inventory information.
    - `pdb_bmc_update.yml` – This Ansible playbook file, updates the PDBPIC and BMC according to the dependencies. It updates first PDBPIC on master node and followed by BMC on Non-master node later BMC on the master node.
    - `Inventory` – Create an Ansible inventory file that lists the target systems you want to update or retrieve inventory details. This file should contain the IP addresses to connect to the systems.
    - `system_credentials.yml` –This file contains the credentials of the target systems.
    - `config.ini` – Configuration file contains the two sections Target and Image. Under this section, options need to be filled with valid targets and image path. Below is an example for the config file.
    - `Setup playbook` – This playbook can be run to install all pre-requisites on the host system.
        i) `ubuntu_setup.yml` - This playbook is used to install pre-requisites on the ubuntu system. Use the following command to run this playbook. `$ansible-playbook ubuntu_setup.yml --ask-become-pass -i inventory`

        ii) `RHEL_setup.yml` – This playbook is used to install pre-requisites on the RHEL system. Use the following command to run this playbook. `$ansible-playbook RHEL_setup.yml --ask-become-pass -i inventory`

        iii) `SUSE_setup.yml` – This playbook is used to install pre-requisites on the SUSE system. Use the following command to run this playbook. `$ansible-playbook SUSE_setup.yml --ask-become-pass -i inventory`

Notes

- Enter the correct details in config.ini file to start update. If wrong information is given, AFUT might not be able to detect the firmware file of the update or might print the error message on the command line.
- Use the target PDBPIC_BMC to do a complete update of Master and Non-Master nodes according to dependency. Fill the image path in configuration file with PDBPIC image type first followed by BMC image type.
- PDB and BMC cannot be updated individually on any of the nodes.
- IPV6 addresses are not supported with the current AFUT. IP addresses refer to IPv4 only and not IPv6.
- Check the generated CSV output file to confirm the firmware update status.
- AFUT has no explicit limitation on the number of nodes it can handle. This is not specified in the official Ansible documentation, as you can verify here: Ansible Documentation."
- If BIOS firmware upgrade and downgrade fails from AFUT (between 1.xx and 2.xx), then try updating the BIOS firmware through GUI and ensure that the "Preserve configuration settings" option is not enabled. (This enhancement will be included in the later release of AFUT so that it's automatically taken care for multiple systems.)

Firmware files

Download the latest component firmware packs from the HPE Support Centre.

Supported files for the update:

- Use HPM applications or octet-stream files to flash firmware components.

Ensure that the file is present on the local machine and provide the correct file path in the configuration file for execution.

Configuration

- `system_credentials.yml` contains the credentials of the server in the form of its username and password.

  An example of `system_credentials.yml` is as follows:

```
---
inputs:
10.xx.xx.xx:
user: "username"
password: "password"
10.xx.xx.xx:
user: "username"
password: "password"
10.xx.xx.xx:
user: "username"
password: "password"
```

- `inventory.txt` file contains the details of the server's IP, mention all the IP's that needs to be used for execution. If IP is marked with "#", then it will not be considered for execution.

  An example of `inventory` is as follows:

```
[xds]
#10.xx.xx.xx
10.xx.xx.xx
10.xx.xx.xx
```

- `config.ini` – This config file maintains the Target and Image path for the firmware update.

  Following is an example of the configuration file:

```
$ cat config.ini
[Image]
update_image_path_xd220V =
update_image_path_xd225V =
update_image_path_xd295V =
[Target]
update_target =
```

```
   ##Allowed options are:
   #XD220V - BIOS, MainCPLD, HDDBPPIC, PDBPIC_BMC
   #XD225V - BIOS, MainCPLD, HDDBPPIC, PDBPIC_BMC
   #XD295V - BIOS, MainCPLD, HDDBPPIC, PDBPIC_BMC
   ##all targets are case-sensitive. Please follow the exact same cases.
```

Ansible Vault Implementation

Ansible-Vault helps to encrypt files using a password, here we encrypt our system credentials file using a password to make it more secure.

Following are examples for using an Ansible vault

```
cat system_credentials.yml
---
  inputs:
  10.xx.xx.xx:
    user: "username"
    password: "password"
  10.xx.xx.xx:
    user: "username"
    password: "password"
  10.xx.xx.xx:
    user: "username"
    password: "password"

ansible-vault encrypt system_credentials.yml

New Vault password:
Confirm New Vault password:
Encryption successful
```

- cat system_credentials.yml

```
$ANSIBLE_VAULT;1.1;AES256
393134316238356433306239353962326237623662373864623136316565323430313435396666564
333639636136346230336335653831393535396330326534 0a373563656536343136393731616531

663139396330356637343465373033323930333963643165376132623837636539643834376133 63
386461653731656361 0a6236333265646535373236303730653634363033376237656661623333 39
376232643766376332623038393836396634393831613534353335326530613637373133623033 31
666339623162383362393735346232306331643633383332393731623165303839346630356437 35
393236626334323939326137303931356534306365636531393162653061383334663530656366 31
636232316537383633343338313635326164333961313936633035643364333338656532633463 38
643132353434376536633765356266616536663732653662616338376139663231643531656337 30
653539373237363530313132373538633663326237326363343666313039616134313034306264 37
386434336661363330653430633162303938323236356262386137653637363939616364343038 31
616639396234306133363465626531336162323732323737343830316437343232643531333966 35
626431613936386234306635663039393265363334633834373834363832383665633964303234 35
623938646339643233666534616466623962383764373836373 6
```

- ansible-vault edit system_credentials.yml

```
Vault password:
```

- ansible-vault view system_credentials.yml

```
Vault password:
- --
inputs:
  10.xx.xx.xx:
    user: "username"
    password: "password"
```

```
 10.xx.xx.xx:
    user: "username"
    password: "password"
  10.xx.xx.xx:
    user: "username"
    password: "password"
```

- `cat system_credentials.yml`

```
$ANSIBLE_VAULT;1.1;AES256
393134316238356433306239353962326237623662373864623136316565323430313435396666 64
333639636136346230336335653831393535396330326534 0a373563656536343136393731616531
663139396330356637343465373033323930333963643165376132623837636539643834376133 63
386461653731656361 0a623633326564653537323630373065363436303337623765666162333339
376232643766376332623038393836396634393831613534353335326530613637373133623033 31
666339623162383362393735346232306331643633383332393731623165303839346630356437 35
393236626334323939326137303931356534306365636531393162653061383334663530656366 31
636232316537383633343338313635326164333961313936633035643364333338656532633463 38
643132353434376536633765356266616536663732653662616338376139663231643531656337 30
653539373237363530313132373538633663326237326363343666313039616134313034306264 37
386434336661363330653430633162303938323236356262386137653637363939616364343038 31
616639396234306133363465626531336162323732323737343830316437343232643531333966 35
626431613936386234306635663039393265633346338343738343638323836656339643032343 5
623938646339643233666534616466623962383764373836373 6
```

- `ansible-vault decrypt system_credentials.yml`

```
Vault password:
Decryption successful
```

- `cat system_credentials.yml`

```
---

inputs:
  10.xx.xx.xx:
    user: "username"
    password: "password"
  10.xx.xx.xx:
    user: "username"
    password: "password"
  10.xx.xx.xx:
    user: "username"
    password: "password"
```

Below is an example for usage of encrypted file in command execution. “–ask-vault-pass” needs to be used while execution of command if any of the file is encrypted. Vault password is needed during the execution.

```
$ ansible-playbook get_system_firmware_inventory.yml -i inventory --ask-vault-pass -e
   @system_credentials.yml

   Vault password:
```

Commands

usage: ansible-playbook: [-e EXTRA_VARS] [-i INVENTORY] [--ask-vault-password]

options:
 --ask-vault-password, --ask-vault-pass
 ask for vault password
-e EXTRA_VARS, --extra-vars EXTRA_VARS
 set additional variables as key=value or YAML/JSON, if filename prepend with @

-i inventory, --inventory inventory, --inventory-file inventory
specify inventory host path or comma separated host list. --inventory-file is deprecated

Running the Utility for Report

`get_system_firmware_inventory.yml` playbook generates a report consisting of the IP details, Models and the Components version in a csv file.
Before execution the system credentials and the inventory details need to be filled in the respective files.

Following command is used for the execution of Inventory file:

```
$ ansible-playbook -i inventory get_system_firmware_inventory.yml -e @system_credentials.yml

PLAY [version 1.0 Fetches the AFUT supported Cray XD servers System Firmware Inventory Details
along with Model name] *********************************************************************

TASK [Gathering Facts]
*********************************************************************************************
*****************************************************************

ok: [10.xx.xx.xx]

ok: [10.xx.xx.xx]

TASK [All System Firmware Inventory Details will be stored in the below csv file]
*********************************************************************************************
*********

ok: [10.xx.xx.xx]

TASK [Fetching System Firmware Inventory Details]
*********************************************************************************************
****************************************

[WARNING]: Collection community.general does not support Ansible version 2.10.8

ok: [10.xx.xx.xx]

ok: [10.xx.xx.xx]

TASK [Writing inventory details to All_System_FW_Inventory_2024-07-18_07:23:49.csv file]
*********************************************************************************************
**

changed: [10.xx.xx.xx]

changed: [10.xx.xx.xx]

PLAY RECAP
*********************************************************************************************
*************************************************************************

10.xx.xx.xx                : ok=4    changed=1    unreachable=0    failed=0    skipped=0
rescued=0    ignored=0

10.xx.xx.xx                : ok=3    changed=1    unreachable=0    failed=0    skipped=0
rescued=0    ignored=0
```

```
$ cat  All_System_FW_Inventory_2024-07-18_07:23:49.csv

IP_Address,Model,BMC,BIOS,MainCPLD,PDBPIC,HDDBPPIC

10.xx.xx.xx,HPE Cray XD225v,1.60.0,01.60.0000,19.19.0000,1.14.0000,00.00.0000

10.xx.xx.xx,HPE Cray XD295v,1.72.0,01.80.0000,19.19.0000,1.14.0000,00.52.0000
```

Running the Utility for Firmware Update

The "`system_firmware_update.yml`" playbook is used to update HPC nodes. The available update targets depend on the server model, and the supported targets for each model can be found in the supported targets section.

Before performing the update:

- Specify the image path and target details in the playbook.
- Complete the inventory and system credentials.

After the update:

- The status of the update tasks will be saved in a CSV file in the current directory.

Here is an example of the force update for Cray XD2000 BIOS from 1.72 to 1.80

```
$ cat config.ini
[Image]
update_image_path_xd220V =
update_image_path_xd225V = CA2K_5.27_v1.80_03152024_signed.bin.hpm
update_image_path_xd295V = CA2K_5.27_v1.80_03152024_signed.bin.hpm

[Target]
update_target = BIOS
##Allowed options are:
#XD220V - BIOS, MainCPLD, HDDBPPIC, PDBPIC_BMC
#XD225V - BIOS, MainCPLD, HDDBPPIC, PDBPIC_BMC
#XD295V - BIOS, MainCPLD, HDDBPPIC, PDBPIC_BMC
##all targets are case-sensitive. Please follow the exact same cases.
$ ansible-playbook -i inventory system_firmware_update.yml -e @system_credentials.yml

PLAY [version 1.0 System Firmware Update for HPE Cray XD225v, HPE Cray XD295v, HPE Cray XD220v
model systems]
*****************************************************************************************
****************************

TASK [Gathering Facts]
*****************************************************************************************
*****************************************************************************************
******************
ok: [10.xx.xx.xx]

TASK [System Firmware Update Status result will be uploaded to the below csv file]
*****************************************************************************************
*******************************************************

TASK [Running Firmware Update for Cray XD Servers]
*****************************************************************************************
*********************************************************************************
ok: [10.xx.xx.xx]

TASK [Writing Firmware Upgrade status details to System_FW_Update_2024-09-05_05:37:24.csv file]
*****************************************************************************************
****************************************
changed: [10.xx.xx.xx]
```

```
PLAY RECAP
*********************************************************************************************************
*********************************************************************************************************
*****************************
10.xx.xx.xx                : ok=4    changed=1    unreachable=0    failed=0    skipped=0
rescued=0    ignored=0

$ cat System_FW_Update_2024-09-05_05:37:24.csv

IP_Address,Model,BIOS_Pre_Ver,BIOS_Post_Ver,Update_Status,remarks
10.22.28.103,HPE Cray XD295v,01.90.0000,01.90.0000,success,If the update is success and version is
not reflected, kindly do a physical plug out and plug in to get the version reflected
```

Here is an example of update for Cray XD2000 MainCPLD from 19.19 to 20.20

```
$ cat config.ini
[Image]
update_image_path_xd220V =
update_image_path_xd225V = Signed_CA2K_AMD_M_v1919_20230615.hpm
update_image_path_xd295V = Signed_CA2K_AMD_M_v1919_20230615.hpm

[Target]
update_target = MainCPLD
##Allowed options are:
#XD220V - BMC, BIOS, MainCPLD, HDDBPPIC, PDBPIC
#XD225V - BMC, BIOS, MainCPLD, HDDBPPIC, PDBPIC
#XD295V - BMC, BIOS, MainCPLD, HDDBPPIC, PDBPIC
##all targets are case-sensitive. Please follow the exact same cases.

$ ansible-playbook -i inventory system_firmware_update.yml -e @system_credentials.yml

PLAY [version 1.0 System Firmware Update for HPE Cray XD225v, HPE Cray XD295v, HPE Cray XD220v
model systems] ******************************************

TASK [Gathering Facts]
*********************************************************************************************************
*****************************************************************
ok: [10.xx.xx.xx]
ok: [10.xx.xx.xx]

TASK [System Firmware Update Status result will be uploaded to the below csv file]
*********************************************************************************************************
********
ok: [10.xx.xx.xx]

TASK [Running Firmware Update for Cray XD Servers]
*********************************************************************************************************
************************************
[WARNING]: Collection community.general does not support Ansible version 2.10.8
ok: [10.xx.xx.xx]
ok: [10.xx.xx.xx]

TASK [Writing Firmware Upgrade status details to System_FW_Update_2024-07-18_07:08:57.csv file]
*********************************************************************************************
changed: [10.xx.xx.xx]
changed: [10.xx.xx.xx]

PLAY RECAP
*********************************************************************************************************
*****************************************************************************
10.xx.xx.xx                : ok=4    changed=1    unreachable=0    failed=0    skipped=0

rescued=0    ignored=0
```

```
10.xx.xx.xx                : ok=3    changed=1    unreachable=0    failed=0    skipped=0
rescued=0    ignored=0

$ cat  System_FW_Update_2024-07-18_07:08:57.csv
IP_Address,Model,MainCPLD_Pre_Ver,MainCPLD_Post_Ver,Update_Status
10.xx.xx.xx,HPE Cray XD225v,19.19.0000,20.20.0000,success
10.xx.xx.xx,HPE Cray XD295v,19.19.0000,20.20.0000,success
```

Here is an example of the force update for Cray XD2000 HDDBPPIC from 0.52 to 0.52

```
$ cat config.ini
[Image]
update_image_path_xd220V =
update_image_path_xd225V = OTS_BP_PIC_v0.52b00_online.hex.hpm
update_image_path_xd295V = OTS_BP_PIC_v0.52b00_online.hex.hpm

[Target]
update_target = HDDBPPIC
##Allowed options are:

#XD220V - BMC, BIOS, MainCPLD, HDDBPPIC, PDBPIC
#XD225V - BMC, BIOS, MainCPLD, HDDBPPIC, PDBPIC
#XD295V - BMC, BIOS, MainCPLD, HDDBPPIC, PDBPIC
##all targets are case-sensitive. Please follow the exact same cases.

$ ansible-playbook -i inventory system_firmware_update.yml -e @system_credentials.yml

PLAY [version 1.0 System Firmware Update for HPE Cray XD225v, HPE Cray XD295v, HPE Cray XD220v
model systems] ******************************************

TASK [Gathering Facts]
*********************************************************************************************
*********************************************************************
ok: [10.xx.xx.xx]

TASK [System Firmware Update Status result will be uploaded to the below csv file]
*********************************************************************************************
********
ok: [10.xx.xx.xx]

TASK [Running Firmware Update for Cray XD Servers]
*********************************************************************************************
************************************
[WARNING]: Collection community.general does not support Ansible version 2.10.8
ok: [10.xx.xx.xx]

TASK [Writing Firmware Upgrade status details to System_FW_Update_2024-07-18_07:30:31.csvfile]
*********************************************************************************************
changed: [10.xx.xx.xx]

PLAY RECAP
*********************************************************************************************
*********************************************************************************
10.xx.xx.xx                : ok=4    changed=1    unreachable=0    failed=0    skipped=0
rescued=0    ignored=0
10.xx.xx.xx                : ok=3    changed=1    unreachable=0    failed=0    skipped=0
rescued=0    ignored=0


$ cat  System_FW_Update_2024-07-18_07:30:31.csv
IP_Address,Model,HDDBPPIC_Pre_Ver,HDDBPPIC_Post_Ver,Update_Status
10.xx.xx.xx,HPE Cray XD295v,00.52.0000,00.52.0000,success
```

Here is an example of the update for Cray XD2000 with PDBPIC_BMC as target

```
$ ansible-playbook -i inventory get_system_firmware_inventory.yml -e @system_credentials.yml

PLAY [version 1.0 Fetches the AFUT supported Cray XD servers System Firmware Inventory Details
along with Model name] *********************************************************************

TASK [Gathering Facts]
*****************************************************************************************
*****************************************************************
ok: [10.xx.xx.xx]
ok: [10.xx.xx.xx]

TASK [All System Firmware Inventory Details will be stored in the below csv file]
*****************************************************************************************
*********
ok: [10.xx.xx.xx]

TASK [Fetching System Firmware Inventory Details]
*****************************************************************************************
************************************
[WARNING]: Collection community.general does not support Ansible version 2.10.8
ok: [10.xx.xx.xx]
ok: [10.xx.xx.xx]

TASK [Writing inventory details to All_System_FW_Inventory_2024-08-20_23:34:54.csv file]
*****************************************************************************************
**
changed: [10.xx.xx.xx]
changed: [10.xx.xx.xx]

PLAY RECAP
*****************************************************************************************
*************************************************************************
10.xx.xx.xx                : ok=4    changed=1    unreachable=0    failed=0    skipped=0
rescued=0    ignored=0
10.xx.xx.xx                : ok=3    changed=1    unreachable=0    failed=0    skipped=0
rescued=0    ignored=0

$ cat All_System_FW_Inventory_2024-08-20_23:34:54.csv
IP_Address,Model,BMC,BIOS,MainCPLD,PDBPIC,HDDBPPIC
10.xx.xx.xx,HPE Cray XD225v,1.72.0,01.80.0000,20.20.0000,255.255.02,00.77.0000
10.xx.xx.xx,HPE Cray XD295v,1.72.0,00.00.0000,20.20.0000,255.255.02,00.52.0000

$ cat config.ini
[Image]
update_image_path_xd220V =
update_image_path_xd225V = PDB_PSU_PIC_v1.14_online.hpm BMC_13.2_Signed_v1.84.hpm
update_image_path_xd295V = PDB_PSU_PIC_v1.14_online.hpm BMC_13.2_Signed_v1.84.hpm


[Target]
update_target = PDBPIC_BMC
##Allowed options are:
#XD220V - BIOS, MainCPLD, HDDBPPIC, PDBPIC_BMC
#XD225V - BIOS, MainCPLD, HDDBPPIC, PDBPIC_BMC
#XD295V - BIOS, MainCPLD, HDDBPPIC, PDBPIC_BMC
##all targets are case-sensitive. Please follow the exact same cases.

$ ansible-playbook -i inventory pdb_bmc_update.yml -e @system_credentials.yml

PLAY [version 1.0 System Firmware Update for HPE Cray XD225v, HPE Cray XD295v, HPE Cray XD220v
model systems] *****************************************************************************

TASK [Gathering Facts]
```

```
*********************************************************************************************************
*****************************************************************
ok: [10.xx.xx.xx]
ok: [10.xx.xx.xx]

TASK [System Firmware Update Status result will be uploaded to the below csv file]
*********************************************************************************************************
********
ok: [10.xx.xx.xx]

TASK [Running Firmware Update for PDB on Master Nodes]
*********************************************************************************************************
***********************************
[WARNING]: Collection community.general does not support Ansible version 2.10.8
ok: [10.xx.xx.xx]
ok: [10.xx.xx.xx]

TASK [Running Firmware Update for BMC on Non Master nodes]
*********************************************************************************************************
*******************************
ok: [10.xx.xx.xx]
ok: [10.xx.xx.xx]

TASK [Running Firmware Update for BMC on Master Nodes]
*********************************************************************************************************
*********************************
ok: [10.xx.xx.xx]
ok: [10.xx.xx.xx]

TASK [Running Firmware Update for BMC on Master Nodes]
*********************************************************************************************************
*********************************
ok: [10.xx.xx.xx]
ok: [10.xx.xx.xx]

TASK [Writing Firmware Upgrade status details to System_FW_Update_2024-08-20_23:35:25.csv file]
*********************************************************************************************
changed: [10.xx.xx.xx]
changed: [10.xx.xx.xx]

PLAY RECAP
*********************************************************************************************************
*****************************************************************************
10.xx.xx.xx                : ok=7    changed=1    unreachable=0    failed=0    skipped=0
rescued=0    ignored=0
10.xx.xx.xx                : ok=6    changed=1    unreachable=0    failed=0    skipped=0
rescued=0    ignored=0

$ cat System_FW_Update_2024-08-20_23:35:25.csv
IP_Address,Model,BMC,BIOS,MainCPLD,PDBPIC,HDDBPPIC
10.xx.xx.xx,HPE Cray XD295v,1.84.00,00.00.0000,20.20.0000,01.14.0000,00.52.0000
10.xx.xx.xx,HPE Cray XD225v,1.84.00,00.00.0000,20.20.0000,01.14.0000,00.77.0000
```

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