



Intel[®] Ethernet NVM Update Tool

Quick Usage Guide for FreeBSD

Ethernet Networking Division (ND)

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Revision History

Revision	Date	Comments
1.1	November 19, 2018	Updates include the following: <ul style="list-style-type: none">• Updates for NVM version 6.80 for Intel® Ethernet Controller X710/XXV710/XL710.• Updated for NVM version 2.00 for Intel® Ethernet Controller X550.• Added Section 5.1, "Troubleshooting"• Added Section 5.2, "Recovery Mode"• Added Section 6.0, "Create/Edit <code>nvmupdate.cfg</code> for Custom NVM Images"
1.0	February 10, 2016	Initial release (Intel Public).



1.0 Introduction

This document demonstrates how to update both the Non-Volatile Memory (NVM) and drivers on the Intel® Ethernet Controller X710/XXV710/XL710, the Intel® Ethernet Controller X550, and the Intel® Ethernet Converged Network Adapters using the Intel® Ethernet NVM Update Tool (NVM Update Tool). It is a guide to servicing NVM images, firmware, and drivers of the Intel® Ethernet Controller X710/XXV710/XL710 and Intel® Ethernet Controller X550 by customers and service technicians in the field.

Note: The information in this document is for experienced system administrators who are familiar with server, network, and data center concepts and technologies.

2.0 Update Both NVM and Driver at the Same Time

Keeping up with software changes, performance enhancements, or security updates requires the most current hardware drivers for supported systems. Previous updates to Intel network adapters were driver specific. With the Intel® X710/XXV710/XL710 10/25/40 GbE adapters and Intel® X550 10 GbE adapters, both the firmware (device NVM image) and network drivers are field-serviceable, allowing the NVM image and network driver to be updated as a matched set. Updating the device image and driver together can increase key features including performance, manageability, media types, physical port counts, virtualization, offloads, remote boot options, VLAN support, teaming, and Receive Side Scaling.

Note: Update to the most current i40e driver prior to running the NVM Update Tool to ensure the newest features of the NVM image can be installed.

The NVM Update Tool has a built-in integrity check that ensures only Intel-approved firmware updates on the Intel® X710/XXV710/XL710 and Intel® X550 devices. Integrity validation of NVM updates is provided by a digital signature. NVM updates are validated prior to invalidating the old NVM configuration, so the old NVM and the configuration are still usable should the update fail.

Note: Updating to the most current NVM (with the NVM Update Package) and driver does not update the Option ROM. Intel recommends an Option ROM update after the NVM and driver are updated. Refer to the [User Guides for Intel® Ethernet Adapters](#) page for the most current Option ROM update process version.

3.0 Obtaining New Images

The [Intel Download Center](#) (X710, XXV710, XL710, or X550) is Intel's repository for the latest software and drivers for Intel products. The NVM Update Packages for Windows, Linux, ESX, FreeBSD, and EFI/EFI2 are located at:

<http://downloadcenter.intel.com/download/24769>

Use the Software/NVM matrix tables in the [Intel® Ethernet Controller X710/XXV710/XL710 Feature Support Matrix](#) and the [Intel® Ethernet Controller X550 Feature Support Matrix](#) to ensure firmware image and driver compatibility. These documents are continuously maintained and always up-to-date.



4.0 Verifying Driver, Image Version, and Package Inventory

The FreeBSD version of the NVM Update Tool requires a network driver on the system prior to the NVM update. It is recommended that the most current driver be installed on the system. FreeBSD network drivers can be downloaded from the Intel Download Center.

The first thing to check on the system receiving the update is the most current network driver and NVM image. This can be done with several system commands such as **dmesg** or **sysctl**. For the purposes of this paper, the **sysctl** interface is used to examine network adapter “ixl0” parameters.

```
sysctl dev.ixl.0 (device name)
```

Output of **sysctl** shows the running version of the NVM image, the ETrackID, and network driver, as follows:

```
root@fmsnet30:/usr/home/admin # sysctl dev.ixl.0 (output truncated)
dev.ixl.0.fw_version: nvm 4.53 etid 80001f54 oem 0.0.0
dev.ixl.0.current_speed: 10G
dev.ixl.0.advertise_speed: 0
dev.ixl.0.fc: 0
dev.ixl.0.%parent: pci1
dev.ixl.0.%pnpinfo: vendor=0x8086 device=0x1572 subvendor=0x8086
dev.ixl.0.%location: slot=0 function=0
dev.ixl.0.%driver: ixl
dev.ixl.0.%desc: Intel(R) Ethernet Connection XL710 Driver, Version - 1.4.26
```

The last 4 hex characters in the firmware version denote the ETrackID.

In preparation for the firmware update, update the network driver to the most current version and identify the path to the NVM Update Tool on the target system.

5.0 Running the NVM Update Tool

The NVM Update Tool runs from a Command-Line Interface (CLI). There are optional CLI attributes for specific tasks and are recommended for advanced users only. As CLI syntax, the NVM Update Tool can be scripted to run across large environments. An example of the update syntax is as follows:

```
nvmupdate64e - command syntax
nvmupdate64e -l fileoutput.txt - command with optional attribute
```

Note: For assistance with optional CLI attributes, contact your Intel Representative.

After extracting the tar file, navigate to the location of the NVM Update Tool executable to change the *nvmupdate64e* executable file permissions, as follows:

```
root@fmsnet30:/usr/home/admin # chmod 755 nvmupdate64e
```

Run the tool like any UNIX executable. An example of the UNIX version of the NVM Update Tool update and its output is shown in [Figure 1](#).

Note: A typical update takes several minutes to complete.



```
root@fmsnet30:/usr/home/admin # ./nvmupdate64e

Intel(R) Ethernet NVM Update Tool
NVMUpdate version 1.26.17.09
Copyright (C) 2013 - 2015 Intel Corporation.

WARNING: To avoid damage to your device, do not stop the update or reboot or power off the
system during this update.
Inventory in progress. Please wait [*****1*+..]

Num Description                               Device-Id B:D   Adapter Status
=== =====
01) Intel(R) Ethernet Converged Network      8086-1572 01:00 Update available
    Adapter X710-4

Options: Adapter Index List (comma-separated), [A]ll, e[X]it
Enter selection: a
Would you like to back up the NVM images? [Y]es/[N]o: n
Update in progress. This operation may take several minutes.
[...*****]
Reboot is required to complete the update process.

Tool execution completed with the following status: All operations completed successfully.
Press any key to exit.
root@fmsnet30:/usr/home/admin #
```

Figure 1. Example Update and Output

Note: The NVM update may require a two-step process depending on the initial image revision. Use the Software/NVM Compatibility table to verify the latest image versions.

When the flash image write completes, the tool asks for a reboot of the system to complete the update process and load the new firmware. After the reboot, verify the new firmware with **sysctl**, as follows:

```
root@fmsnet30:/usr/home/admin # sysctl dev.ixl.0 (output truncated)
dev.ixl.0.fw_version: nvm 5.02 etid 800020e1 oem 0.0.0
dev.ixl.0.current_speed: 10G
dev.ixl.0.advertise_speed: 0
dev.ixl.0.fc: 0
dev.ixl.0.%parent: pci1
dev.ixl.0.%pnpinf: vendor=0x8086 device=0x1572 subvendor=0x8086
dev.ixl.0.%location: slot=0 function=0
dev.ixl.0.%driver: ixl
dev.ixl.0.%desc: Intel(R) Ethernet Connection XL710 Driver, Version - 1.4.26
```

Note: When updating from early NVM images, the NVM Update Tool may indicate that a power-cycle of the system is necessary.

Note: The NVM update may be (requires) a two-step process depending on the initial image revision. Use the Software/NVM Compatibility table to verify the latest image versions.

Note: The tool allows for updating one, multiple, or all of the installed adapters. For example, to update NVM firmware for two of the installed adapters, follow the syntax as shown in the example below. Enter selection 02,03 (separated by a commas).



```
Num Description                               Ver. DevId S:B   Status
====
01) Intel(R) Ethernet Converged Network      1.147  1563 00:004 Update not available
    Adatper X550-T2
02) Intel(R) Ethernet Network Adapter        5.81   158B 00:006 Update available
    XXV710-2
03) Intel(R) Ethernet Converged Network      5.05   1583 00:131 Update available
    Adapter XL710-Q2

Options: Adapter Index List (comma-separated), [A]ll, e[X]it
Enter selection:02,03
Would you like to back up the NVM images? [Y]es/[N]o: n
Update in progress. This operation may take several minutes.
[***+.....]
Reboot is required to complete the update process.

Tool execution completed with the following status: All operations completed successfully
Press any key to exit.
```

Figure 2. Example for Updating Multiple Adapters

5.1 Troubleshooting

If there are any errors during the update, use following command to get log file:

```
nvmupdate64e -l nvmupdate.log
```

This is a text file that contains history of the NVM Update Tool's execution, including the success or failure status for each operation, and what adapters and ORMs were discovered. After running this command, the tool creates the *nvmupdate.log* file under the same folder as *nvmupdate.cfg*. The log file is overwritten each time the NVM Update tool is executed.

Note: The NVM Update Tool allows you to successfully upgrade NVM versions. However, it does not allow you to downgrade the NVM Image if Security revisions are incremented.

Note: The NVM version for X550 is NOT shown when using the "sysctl -I <portname>" command. Only the EETrack ID is displayed. If you run **nvmupdate** with **-i**, it should be displayed.

5.1.1 Troubleshooting Using Debug Logs

1. Use the following command to get the log file if there is any error seen.

```
nvmupdate64e -l nvmupdate.log
```

This is a text file that contains history of the NVM Update tool's execution, including the success or failure status for each operation, and what adapters and ORMs were discovered. After running this command, the tool creates the *nvmupdate.log* file under the same folder as *nvmupdate.cfg*. The log file is overwritten each time the NVM Update tool is executed.

2. Use following command to get a little more information on what is in the system by using **nvmupdate** with an inventory mode.

```
nvmupdate64e -i -l inv.log
```

This provides more details about the adapters in the system to help narrow down the debug scope.



3. Use following command(s) to get a superset of debug logs.

First set following environment variables before **nvmupdate** execution. For debugging purposes, it is necessary to set these flags:

```
NUL_DEBUGLOG=1
QV_DEBUG_LOG=0xFFFFFFFF
```

Now the log generated using the following command is much more detailed.

```
nvmupdate64e -l nvmupdate.lo
```

If you continue to have issues, contact Intel support with all these log files.

5.2 Recovery Mode

When using the NVM update tool, it is possible to get a status of "RECOVERY" or messages about Recovery Mode from the tool and/or Base Driver. If this occurs please refer to the *Recovery Mode in Intel® Ethernet Devices/Adapters Application Note* (Doc ID: 338102-001).

6.0 Create/Edit *nvmupdate.cfg* for Custom NVM Images

The goal of this section is to assist Intel Ethernet users to create/edit the *nvmupdate.cfg* file for their custom NVM images. For the Intel® Ethernet Controller XL710/X710/XXV710 and Intel® Ethernet Controller X550 families of products, this allows the use of NVM Update utility to update custom NVM images that are not included in the NVM Updated packages posted by Intel.

6.1 Sample Configuration File Template

The following is an example of a configuration file with one device block:

```
=====
CURRENT FAMILY: 12.1.1
CONFIG VERSION: 1.14.0

BEGIN DEVICE
DEVICENAME: Intel x540 Adapter
VENDOR: 8086
DEVICE: 10C9
SUBVENDOR: 8086
SUBDEVICE: A04C
REVISION: 2
PXE: 1.3.04
EFI: 2.7.06
ISCSI: 3.8.17
FCOE: 4.8.04
SMCLP: 5.8.17
NVM IMAGE: nvmImage.bin
OROM IMAGE: BootImg.flb
EEP SETTINGS: userSet.txt
EEPID: 800007A9
REPLACES: 80000692
EEPLAYOUT: 82599
RESET TYPE: POWER
END DEVICE
=====
```



6.2 Device Block in the Configuration File

A device block in configuration file lists out following information:

- CONFIG VERSION — Version of syntax for the configuration file.
- DEVICENAME — Device name currently in use. For example, Intel X550 Adapter, etc.
- VENDOR — PCI vendor ID 8086 identifies Intel as the manufacturer of the device.
- DEVICE — Device ID. Device IDs for supported retail Intel Ethernet Adapters can be found in here:
<https://www.intel.com/content/www/us/en/support/articles/000005612/network-and-i-o/ethernet-products.html>
- SUBVENDOR — Sub-vendor ID in hexadecimal format. This is optional when EEPROM ID is used.
- SUBDEVICE — Sub-device ID in hexadecimal format. This is optional when EEPROM ID is used.
- NVM IMAGE — NVM Image binary file name with which to update.
- OROM IMAGE — OROM Image file name.
- EEPROM ID — ETrack ID of NVM Image with which to update.
- REPLACES — ETrack ID of NVM Image that with which to replace. Multiple ETrack IDs can be entered, separated by spaces.
- RESET TYPE — Specifies whether reboot/power cycle is required to complete the NVM update process.

6.3 Steps to Create/Edit *nvmupdate.cfg* File to Update Custom NVM Image

1. Include the custom NVM Image binary file under the same folder as the *nvmupdate.cfg* file and *nvmupdate64e* executable file.
2. Open the *nvmupdate.cfg* file as text file.
3. Copy and paste one of the device blocks (or use the example from above) and update following information for custom NVM image update.
 - a. Custom NVM Image binary file name in NVM IMAGE field.
 - b. ETrack ID (in the EEPROM ID field) of the custom NVM Image listed in NVM IMAGE field. This is the image that the device will be update to.
 - c. ETrack ID (in REPLACES field) of NVM Image that an update will be allowed from.

Note: When editing the *nvmupdate.cfg* file, you must ensure the ETrack ID in the *Replaces* field and the *EEPROM ID* field are the same type of image and are both created for the device that is being updated. For example, in X710/XXV710/XL710, a device with CFG_ID 2.4 should be updated with an image with CFG_ID 2.4.

- d. DEVICE, VENDOR, SUBDEVICE, SUBVENDOR must be set correctly to match the device required to update. SUBDEVICE, SUBVENDOR are optional when EEPROM ID is used.

OROM update can be skipped by including the line SKIP OROM: TRUE. Use **bootutil** to update the OROM if necessary. the remaining fields, including CURRENT FAMILY, CONFIG VERSION, DEVICENAME, RESET TYPE, can typically be left as is.

4. Run *nvmupdate64e* executable file.



Following is an example of Device block in the configuration file. This includes the minimum fields required for an update. The fields listed in red should be updated:

```
=====
CURRENT FAMILY: 12.1.1
CONFIG VERSION: 1.7.0

BEGIN DEVICE
  DEVICENAME: Intel x540 Adapter
  VENDOR: 8086
  DEVICE: 10C9
  NVM IMAGE: nvmImage.bin [Include the NVM Image File name to be updated with]
  SKIP OROM: TRUE
  EEPID: 800007A9 [Mention ETrack ID of NVM Image that need to be updated with]
  REPLACES: 80000692 [Looks for Etrack ID of NVM Image that need to be replaced,
                    Multiple Etrack IDs can be entered separated with space]

  RESET TYPE: POWER
END DEVICE
=====
```

7.0 Summary

Updating the NVM and network driver can increase performance, manageability, and reliability of the Intel® X710/XXV710/XL710 and Intel® X550 Ethernet Converged Network Adapters. The update process has a built-in integrity feature to ensure that only Intel-approved firmware code is able to be updated after manufacturing. This procedure is performed each time an attempt is made to update one of the protected modules.

Intel Customer Support Services offers a broad selection of technical and customer support programs. For more information, contact your local Intel representative. Service and availability may vary by country.

For more information on the Intel® Ethernet X710/XXV710/XL710 adapter family go to the following links:

- <http://www.intel.com/content/www/us/en/network-adapters/converged-network-adapters/ethernet-x710.html>
- <http://www.intel.com/content/www/us/en/embedded/products/networking/ethernet-controller-xl710-family.html>
- <http://www.intel.com/content/dam/www/public/us/en/documents/product-briefs/ethernet-x710-brief.pdf>
- <http://www.intel.com/content/dam/www/public/us/en/documents/product-briefs/xl710-10-40-gbe-controller-brief.pdf>
- <https://www.intel.com/content/www/us/en/ethernet-products/network-adapters/ethernet-xxv710-brief.html>

For more information on the Intel® Ethernet X550 adapter family go to the following link:

- <https://www.intel.com/content/www/us/en/ethernet-products/converged-network-adapters/ethernet-x550-brief.html>



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