Release Notes - VMware*

Intel® QuickAssist Technology

Hardware Version 2.0

January 2024

Contents

1 Description of Release

This document contains information on the accompanying Intel® QuickAssist Technology (Intel® QAT) Hardware Version 2.0 Driver for VMware ESXi*.

This software enables Intel® QuickAssist Technology (Intel® QAT) accelerator on VMware ESXi. Driver enables sharing of a Physical Function (PF) across multiple guest Virtual Machines (VM) using Single Root I/O Virtualization (SR-IOV) and Intel® Scalable I/O Virtualization (Intel® Scalable IOV) technologies. This is accomplished by exposing Intel® QAT accelerator as Virtual Functions (VFs) in case of SR-IOV or Assignable Device Interfaces (ADIs) as Virtual Devices (VDEVs) in case of Intel® Scalable IOV, to a specific guest VM(s).

This release includes two types of driver packages, each supporting a specific mode for exposing accelerator to guest VM, as listed below:

- DirectPath I/O via SR-IOV: Later in the document referred as SR-IOV driver

- Enhanced DirectPath I/O via Intel® Scalable IOV: This package has *special version convention*

Main difference between these two driver types is what kind of QAT devices are exposed to the VM. SR-IOV driver exposes conventional VFs, but Enhanced DirectPath I/O driver - vQAT VDEV. Drivers have different set of features and limitations, refer to *Features* and *Limitations* sections correspondingly for additional details.

For instructions on loading and running the release software, refer to the `README.txt` file in the corresponding released software package. For instructions on installing the driver in the Guest Operating System (OS), refer to corresponding guest driver's collaterals listed in the *Related Documentation* section.

Refer to the *Revision History* to check the changes in this document.

Note: These release notes may include known issues with third-party or reference platform components that affect the operation of the software.

1.1 Features

- Sym/Asym Crypto

- TLS1.3 elliptical curves Montgomery encryption (curve 25519 and curve 448)

- Data Compression with CnV for Deflate and LZ4/LZ4s algorithms and CnVnR for Deflate and LZ4s

- Chaining support

- SM3/SM4

- Asynchronous E2E support for compression

- Telemetry

- Power Management

- Extended RAS (uncorrectable and fatal error support)

- Ratelimiting (only with Direct Path I/O driver)

- Intel® Scalable IOV (only with Enhanced DirectPath I/O driver)

- VMware vSphere* vMotion* support (only with Enhanced DirectPath I/O driver)

1.2 Limitations

- Symmetric services are not configured by default. Refer to the *Driver configuration - Services* section in `README.txt` for additional information.

- Stateful decompression is not supported.

- Intel® Key Protection Technology (KPT) is not currently supported.

- Auto-select best (ASB) is not supported with rolling *XXHash32*.

- Dynamic Power Management (DPM) is not currently supported.

- Shared Virtual Memory (SVM) and Address Translation (AT) are not currently supported.

- ESXi limitation: number of PCI passthrough devices per VM is limited. Check "ESXi/ESX Configuration Maximums" KB article for exact limits. ESXi will not allow to power on VM if such limit is exceeded.

- Enhanced and non-Enhanced DirectPath I/O drivers are mutually exclusive and cannot be installed simultaneously. Switching from one driver to another is covered in the *Coexistence with Enhanced Direct Path I/O* driver* section of the `README` file.

- VM configuration will be different between Enhanced and non-Enhanced DirectPath I/O drivers, as well as SW stack inside VM. Switching between driver types can cause VM to fail power on, so re-configuration will be required.

- Due to VMware limitations, package for Enhanced DirectPath I/O driver is compatible only with particular version of ESXi. Refer to *Supported ESXi Version* in *package description* to choose right package.

1.3 Packages Information

1.3.1 DirectPath I/O packages

Package Name	qat-2.0_ext_rel_bin_2.5.3.113-7.0.0-15843807.tar.gz
Release Date	02/05/2024
Supported Hardware	4th Generation Intel® Xeon® Scalable Processor (4xxx QAT) 5th Generation Intel® Xeon® Scalable Processor (4xxx QAT)
Supported ESXi Version(s)	7.0 Update 3i and newer 8.0 and newer
Driver Version	2.5.3.113
Package Checksum	SHA256: fa6432cb82748ca0216b5089efd629e5 a7a5d943a0999abfb0056e9fca3b3d1b

1.3.2 Enhanced DirectPath I/O packages

Package Name	qat-2.0_ext_rel_bin_1002.5.3.113-8.0.2-22380479-dvx.tar.gz
Release Date	02/05/2024
Supported Hardware	4th Generation Intel® Xeon® Scalable Processor (4xxx QAT) 5th Generation Intel® Xeon® Scalable Processor (4xxx QAT)
Supported ESXi Version(s)	8.0 Update 2
Driver Version	1002.5.3.113
Package Checksum	SHA256: 79f3327be19d8448af3dab81a82a0728 c352713a7f342c75d6f984aea0ea9ea0

1.4 Version Numbering Scheme

The version numbering scheme is major.minor.patch.build, where:

- *major* is the major version of the software,
- *minor* is the minor version of the software,
- *patch.build* is the patch release and build number.

Major version number is used as a differentiator between the two mentioned package types in the same release. Enhanced Direct Path I/O driver package will be designated with *major* version greater than *1000*. To keep the two package types aligned, the assigned Enhanced Direct Path I/O driver *major* version is the same *major* version associated with the Direct Path I/O release + *1000*. *Minor* and *patch* numbers will match.

1.5 List of Files in Release

File	Description
`qat-2.0_ext_rel_bin_2.5.3.113-7.0.0-15843807.tar.gz`	DirectPath I/O driver (SR-IOV)
`qat-2.0_ext_rel_bin_1002.5.3.113-8.0.2-22380479-dvx.tar.gz`	Enhanced DirectPath I/O driver

Also every package includes `LICENSE.txt` and `README.txt` files with licensing and basic driver installation and configuration information correspondingly.

1.6 Supported Guest Drivers

The software in this release has been validated against the following guest drivers:

- **Linux*:** Intel QAT driver `QAT20.L.1.1.20-*`
- **Windows*:** Intel QAT driver `QAT2.0.W.2.1.0-*`

The actual list of supported guest OS depends on the guest driver compatibility. Refer to the corresponding documentation for more information.

1.7 Technical Support

Intel offers only support for this software at the Application Programming Interface (API) level, defined in the Programmer's Guide and API reference manuals listed in the *Related Documentation* section.

For technical support, including answers to questions not addressed in this document, visit the technical support forum, FAQs, and other support information at Intel Support.

VMware forwards all issues they suspect to be related to Intel QAT to Intel to help triage and resolve with the customer directly.

1.8 Environmental Assumptions

The following assumptions are made about the deployment environment:

- The driver object/executable file on the disk should be protected using the normal file protection mechanisms so it is writable by only trusted users, for example, a privileged user or an administrator.

- The public key firmware image on the disk should be protected using normal file protection mechanisms, so it is writable only by trusted users; for example, a privileged user or an administrator.

- The Intel QAT device should not be exposed to untrusted users through the *user space direct* deployment model.

- The Dynamic Random-Access Memory (DRAM) is considered to be inside the trust boundary. The traditional memory-protection schemes provided by the Intel architecture processor and memory controller, and by the OS, are to prevent unauthorized access to these memory regions.

- Persistent keys were not considered, but the storage media are also considered inside the cryptographic boundary.

- The driver-exposed device file should be protected using the normal file protection mechanisms so that only trusted users can open, read or write it.

1.9 Related Documentation

Title	Number
Intel QuickAssist Technology for Linux* - Getting Started Guide (HW 2.0)	632506
Intel QuickAssist Technology for Linux* - Release Notes (HW 2.0)	632507
Intel QuickAssist Technology for VMware* - Release Notes (HW 2.0)	766469
Intel QuickAssist Technology for Windows* - Release Notes (HW 2.0)	758459
Intel QuickAssist Technology - Programmer's Guide (HW 2.0)	743912
Intel QuickAssist Technology API Programmer's Guide	330684
Intel QuickAssist Technology Cryptographic API Reference Manual	330685
Intel QuickAssist Technology Data Compression API Reference Manual	330686
Intel Device Manager for VMware vCenter Server	773349

2 Release Updates

2.1 Known Issues

2.1.1 QAT20-23616 - [Firmware] Shared Virtual Memory (SVM) and Address Translation (AT) disabled

Title	[Firmware] Shared Virtual Memory (SVM) and Address Translation (AT) disabled
Reference	QAT20-23616
Description	When running QAT workloads with AT enabled under loaded traffic conditions, memory page corruption may occur. Intel is looking at a possible workaround for the problem, and until then the QAT firmware/Driver will not make use of or enable SVM with AT.
Implication	It is not currently possible to run with SVM and AT.
Resolution	Current workaround is disabling SVM and AT.

2.1.2 QAT20-18924 - [MCC] MCC SKUs may consume more power than expected

Title	[MCC] MCC SKUs may consume more power than expected
Reference	QAT20-18924
Description	Due to Power Management changes in MCC platforms one QAT device in every socket is permanently clock gated when not processing requests which leads to inevitable heartbeat failures and device resets. Current FW workaround increases power consumption by keeping QAT in active state. Intel is working on workaround that does not have impact on power consumption.
Implication	Higher power consumption is possible.
Resolution	There is no workaround currently available.

2.1.3 QAT20-20272 - [XCC/MCC] Spurious heartbeat failures may be observed on some SKUs

Title	[XCC/MCC] Spurious heartbeat failures may be observed on some SKUs
Reference	QAT20-20272
Description	Time tracking in FW is inaccurate due to power management causing that frequency of HW counter that is used as reference for time measurements appears lower than expected. This may lead to delayed heartbeat and telemetry updates when devices become idle. Intel is working on workaround that removes dependency on the HW counter.
Implication	No functional impact, these messages can be ignored.
Resolution	There is no workaround currently available.

2.1.4 VQQ-2128 - Driver may leak memory if virtual device creation failed under certain conditions

Title	Driver may leak memory if virtual device creation failed under certain conditions
Reference	VQQ-2128
Description	Under certain conditions if driver fails to create virtual device for Enhanced DirectPath I/O it may leak memory.
Implication	It will be impossible to recover HW from fatal error as described in the README file, without restarting system.
Resolution	There is no workaround currently available.

2.1.5 VQQ-1907 - Virtual device power on inside Guest causing VM crash

Title	Virtual device power on inside Guest causing VM crash conditions
Reference	VQQ-1907
Description	If user will toggle power for virtual PCI device off and then on inside Guest OS, that will cause VM emergency shutdown due issues in VMware ESXi*.
Implication	User may lose unsaved data inside VM.
Resolution	Avoid toggling power for the virtual PCI device. Use latest version of VMware ESXi where this issue will be resolved.

2.2 Resolved Issues

2.2.1 VQQ-1618 - Driver may accept incorrect service mask configuration and treat it as default configuration

Title	Driver may accept incorrect service mask configuration and treat it as default configuration.
Reference	VQQ-1618
Description	Service mask parsing may interpret incorrect service mask passed to driver as a valid mask that matches the default configuration and still proceed with driver attachment.
Implication	User will be not notified about incorrect service mask. Also device will fall back to the default configuration.
Resolution	User should configure service masks as described in the driver's documentation.

2.2.2 VQQ-1553 - Incompatibility between legacy 1.7 and 2.0 drivers

Title	Incompatibility between legacy 1.X and 2.0 drivers
Reference	VQQ-1553
Description	1.7 driver (version 1.1.0.7) couldn't be installed on the same system with 2.0 driver. They are using same namespaces and will conflict, so one of the drivers will fail initialization.
Implication	Only one of the driver could be installed on the system.
Resolution	Use updated 1.X driver, starting from version 1.5.0* it's fully compatible with driver for QAT 2.0.

2.2.3 VQQ-1542 - VM with enabled vIOMMU may crash with IOMMU fault

Title	VM with enabled vIOMMU may crash with IOMMU fault
Reference	VQQ-1542
Description	QAT usecases that require vIOMMU to be enabled for the guest are currently not supported due issue in VMware ESXi*. Running such workload inside VM may cause it's to stop responding and reported in VMware ESXi logs as IOMMU pagefault.
Implication	Workloads that require vIOMMU will crash VM.
Resolution	Avoid enabling vIOMMU. Use the latest version of VMware ESXi where this issue resolved, like 8.0 Update 2 or 7.0 Update 3p.

3 Revision History

Document Version	Description	Date
003	 • Updates for 2.5.3 release - updated resolved and known issues • Information about Enhanced DirectPath I/O driver • Versioning info 	February 2024
002	Updates for 2.4.1 release	October 2023
001	Initial Release	January 2023