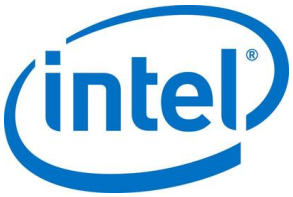

Intel® QuickAssist Technology Software for Free Berkeley Software Distribution* (FreeBSD*)

Release Notes - Software version

Package Version: QAT1.7.B.3.7.0-00008

June 2020

Document Number: 621446-004

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Revision History

Revision Number	Description	Revision Date
004	3.7.0 Product release	June 2020
003	3.6.0 Product release	April 2020
002	3.5.0 Product release	December 2019
001	Initial release, 3.4.0 Product release	September 2019

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1.0 Description of Release

This document describes extensions and deviations from the release functionality described in the Release Notes that support Intel® QuickAssist Technology (Intel® QAT).

This software release is intended for platforms that contain:

- Intel® C62x Chipset
- Intel Atom® C3000 processor product family
- Intel® QuickAssist Adapter 8960/Intel® QuickAssist Adapter 8970 (formerly known as "Lewis Hill")
- Intel® Communications Chipset 8925 to 8955 Series

1.1 New Features Added with this Release

- FreeBSD* v12.1 support with backward compatibility for 11.3.
- Physical Function (PF) to Virtual Function (VF) communication update.
- USDM user-space library location update and performance improvements.

1.1.1 Details of New Features

For this release, this section contains information for PF-VF communication (Single Root I/O Virtualization (SR-IOV)):

- PF-VF communication protocol has been updated to allow block communication. Block message is used to transfer a block of data between the PF and VF driver.
- Currently, extended data compression capabilities of the device are communicated to the VF driver through block messages. It resolves limitation - QATE-39335.
- VF-PF communication debugging via sysctl has been added for the FreeBSD Intel® QAT VF driver `dev.qat.X.pfvf_counters`.
- Counters of all types of messages exchanged by VF and PF can be checked via this interface.

1.2 Limitations with this Production Release

- FreeBSD as a host environment with Intel® QAT is not supported
- Any version of FreeBSD other than v11.3 or v12.1 is not supported
- Symmetric session update feature is not supported
- Non-deterministic Random Bit Generator (NRBG) is not supported

- The HMAC-based Extract-and-Expand Key Derivation Function (HKDF) operational data has to be allocated with the Unified System Diagnostic Manager (USDM) to be pinned in physical memory

Note: There are known issues with this release of the driver, as described in Section 4.1, Known-Issues within this Project.

1.2.1 Package Version

The following table shows the OS-specific package versions for each platform supported in this release.

Table 1. Package Version

Chipset or SoC	Package Version	Checksum
Top-Level Package	QAT1.7.B.3.7.0-00008.tar.gz	70b15772c320944b326363f9582789f6

1.2.2 Licensing for FreeBSD* Acceleration Software

The acceleration software is provided under the following license, as listed in the table below.

Note: When using or redistributing dual-licensed components, you may do so under either license.

Table 2. Licensing for FreeBSDAcceleration Software

Component	License	Directories

User Space Library	Berkeley Software Distribution (BSD)	`./quickassist/build_system`
		`./quickassist/include`
		`./quickassist/lookaside`
		`./quickassist/utilities/osal`

Kernel space driver	BSD	`./quickassist/qat/drivers` `./quickassist/utilities/adf_ctl`
User Space DMA-able Memory Driver	BSD	`./quickassist/utilities/libusdm`
Libcrypto	OpenSSL*	`./quickassist/utilities/osal/src/linux/user_space/openssl`
CPM Firmware	Redistribution	`./quickassist/qat/fw`

1.3 Intel® QAT Application Program Interface (API) Updates

There are no Application Program Interface (API) changes in this release.

1.4 Technical Support

Intel offers support for this software at the API level only, defined in the programmer's guide and API reference manuals listed in Section 2.1.1, Related Documents.

1.5 Environmental Assumptions

The following assumptions are made about the deployment environment:

- The driver object/executable file on disk should be protected using the normal file protection mechanisms so that it is writable only by trusted users, for example, a privileged user or an administrator.
- The public key firmware image on disk should be protected using normal file protection mechanisms so that it is writable only by trusted users, for example, a privileged user or an administrator.
- The Intel® QAT device should not be exposed (via SR-IOV) to untrusted guests.
- The Intel® QAT device should not be exposed (via the "user space direct" deployment model) to untrusted users.
- Dynamic random –access memory (DRAM) is considered to be inside the trust boundary. The standard memory-protection schemes provided by the Intel® architecture processor and memory controller, and by the operating system, prevent unauthorized access to these memory regions.
- Persistent keys were not considered, but the storage media are also found inside the cryptographic boundary. The driver exposed device file should be protected using the normal file protection mechanisms so that it could be opened and read/written only by trusted users.

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2.0 Where to Find Current Software

This chapter provides a list of related documents and location of a list of files provided in this software release.

2.1 List of Files in Release

The Bill of Materials (BOM), sometimes referred to as the BOM, is included as a text file in the released software package. This text file is labeled a file list and is located at the top directory level for each release.

2.1.1 Related Documents

Table 3. Intel® QAT Related Documentation

Document Name	Reference Number
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® QuickAssist Technology Performance Optimization Guide	330687
Using Intel® Virtualization Technology (Intel® VT) with Intel® QuickAssist Technology Application Note	330689
*Intel® QuickAssist Technology Driver for FreeBSD**	https://01.org/intel-quickassist-technology

NOTE: Refer to https://01.org/intel-quickassist-technology for Intel® QAT program documentation.

2.2 Terminology

Table 4. Terminology

Term	Description
AEAD	Authenticated encryption with associated data
API	application program interface
BOM	Bill of Materials
BSD	Berkeley Software Distribution
CNV	Compress and Verify

Term	Description
DRAM	Dynamic random –access memory
ESP	Enterprise Solution Platform program
FreeBSD	Free Berkeley Software Distribution
GPL	General Public License
HKDF	HMAC-based Extract-and-Expand Key Derivation Function
Intel® QAT	Intel® QuickAssist Technology
IPsec	Internet Protocol Security
NRBG	Non-deterministic Random Bit Generator
OS	Operating System
SADB	Security Association Database
SR-IOV	Single Root I/O Virtualization
PF	Physical Function
RAS	Remote Access Service
RDK	Reference Design Kit
RHEL*	Red Hat Enterprise Linux*
SOL	Sign-of-Life
UDP	User Datagram Protocol
USDM	Unified System Diagnostic Manager
VF	Virtual Function

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3.0 Intel® QAT Driver Package Installation on FreeBSD* Environment

The user must have root privileges to perform the compiling of the drivers. Refer to Section 3.1 on how to compile the Intel® QAT Drivers.

3.1 Compiling the Driver

1. Copy package onto the system.
2. Extract package.

```
# cd /root/
# mkdir QAT
# cd QAT
# tar -xzomf <path_to>/ QAT1.7.B.3.7.0-00008.tar.gz
```

3. Set network proxy (if required)

```
# setenv http_proxy http://<proxy_server>:<proxy_port>
```

4. Install dependencies:

   a. gmake:

```
# pkg install gmake
```

   b. Automake and autoconf:

```
# pkg install automake
# pkg install autoconf
```

   c. bash:

```
# pkg install bash
```

   d. pkg-config:

```
# pkg install pkgconf
```

5. Setup the environment to build driver.

```
# cd /root/QAT/
# ./configure
```

6. Build and install driver

```
# gmake install
```

3.2 Compiling and Execute Performance Sample Code

1. Build the application using the following:

```
# cd /root/QAT/
# gmake samples-install
```

2. Use this script to run the application:

```
#  cpa_sample_code signOfLife=1  <- sign of life tests
#  cpa_sample_code               <- full application run
```

3.3 Uninstalling the driver

1. Bring down the driver:

```
# adf_ctl down
```

2. Uninstall the driver:

```
# cd /root/QAT/
# gmake uninstall
```

3.4 Functional Sample Applications

Refer to Table 4, *Intel® QAT Technology API Programmer's Guide* for a copy of the functional sample applications included in the package.

These applications can be built using these steps:

```
# cd /root/QAT
# setenv ICP_ROOT `pwd`
# setenv ICP_OS freebsd
# setenv WITH_CMDRV 1
# cd ./quickassist/lookaside/access_layer/src/sample_code/
# gmake func
```

The functional applications are built and placed in the `./functional/build` directory. Here is an example of how to run the functional sample applications.

```
# cd ./functional/build
# ./eddsa_sample
```

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4.0 Intel® QAT Software - Known Issues

The following are errata Known-Issues, Resolved Issues, and Resolved Enhancements for Intel® QAT v1.7 FreeBSD* release.

4.1 Known-Issues within this Project

The following errata tables are known issues with the Intel® QAT FreeBSD v1.7 release.

4.1.1 QATE-63079 - cpaDcResetSession may not wait until all flights are processed prior to clearing the inflight counters

Title	cpaDcResetSession may not wait until all flights are processed prior to clearing the inflight counters
Reference #	QATE-63079
Description	Excluding the compression session using the Data Plane API, `cpaDcResetSession` does not wait until all flights are processed prior to clearing the inflight counters. This is not correct behaviour since callback counters are reset before all the in-flight requests are processed.
Implication	If the session is reset while there are in-flight requests, segmentation faults and other unexpected application behaviour may be encountered.
Resolution	Ensure that all in-flight/pending requests were processed prior to `cpaDcResetSession` call.
Affected OS	FreeBSD v12.1
Driver/Module	CPM IA - Common

4.1.2 QATE- 30931- Process Exit with Orphan Rings when spawning multiple processes

Title	Process exit with orphan rings when spawning multiple processes
Reference #	QATE- 30931
Description	If multiple processes start a user space service access layer (`icp_sal_userStart`) and they all exist together, the Syslog may show a message "`Process <PID> <NAME>` exit with orphan rings.
Implication	A kernel panic might happen at reboot if an application is using Intel® QAT.
Resolution	The suggested workaround is to fork the process only after the previous child process runs `icp_sal_userStartMultiProcess` successfully.
Affected OS	FreeBSD11.3
Driver/Module	CPM IA - Common

4.1.3 QATE-30360 - Full device pass-through not available on KVM guests

Title	Full device pass-through not available on KVM guests
Reference #	QATE-30360
Description	The new firmware authentication feature requires PF devices to be reset via function level reset (FLR) before firmware download. In KVM guests, all pass-through devices attached to a VM are reset at boot time. Any further device reset is trapped by the hypervisor and not issued. This causes firmware authentication to fail after the first firmware download. Full device pass-through might work in some conditions when using `vfio` and if the host kernel and the platform support it.
Implication	Direct mode feature not available on KVM guests for devices on full pass-through mode.
Resolution	Refer to appendix A of Using *Intel® Virtualization Technology (Intel® VT) with Intel® QuickAssist Technology* (document number 330689-007) for instructions on how to pass through an Intel® QAT PF to a VM. Talk to your Intel® representative for more information.
Affected OS	FreeBSD v12.1
Driver/Module	CPM IA - Common

4.1.4 QATE-40359 - Multiprocess 32 with LimitDevAccess = 0 fails with OpenSSL* Speed tests

Title	Multiprocess failure with NumProcesses > 16 for LBG/DNV and NumProcesses > 32 for CLC and LimitDevAccess = 0
Reference #	QATE-40359
Description	`The multiprocess` application that uses more than 16 processes for LBG/DNV and 32 processes for CLC fails during bundle allocation.
Implication	It is impossible to successfully run the `multiprocess` application with more processes than 16 for LBG/DNV and 32 for CLC.
Resolution	There is a limitation to use up to 16 processes for LBG/DNV and up to 32 for CLC per device.
Affected OS	FreeBSD 11.3
Driver/Module	CPM IA - `Multiprocess`

4.1.5 QATE-39216 - Kasumi test duration issue

Title	Kasumi test duration issue
Reference #	QATE-39216
Description	Sample code benchmark tests included in the software package
Implication	The performance degradation when running the sample code can be observed in case the system runs the excessive number of threads.
Resolution	Avoid calling the `cpaCyInstanceGetInfo2` function if possible (i.e., by caching the info data) and try to tune the FreeBSD scheduler.

Title	Kasumi test duration issue
Affected OS	FreeBSD 11.3
Driver/Module	CPM IA - Crypto

4.2 Resolved Issues

4.2.1 QATE-39335 - Compression instances do not work on Virtual Machine with Linux Host QAT driver without CnVnR support

Title	Compression instances do not work on Virtual Machine with Linux Host QAT driver without CnVnR support
Reference #	QATE-39335
Description	FreeBSD QAT VF driver does not get host capabilities - the `CnVnR` support is enabled by default.
Implication	The driver may fail to start compression instances on Virtual Machine with VF driver if no `CnVnR` support on Host QAT driver firmware.
Resolution	The issue is resolved in 3.7.0 release.
Affected OS	FreeBSD 11.3
Driver/Module	CPM IA - Compression

4.2.2 QATE-41486 - Misleading message observed in `dmesg` on LBG device with `LimitDevAccess = 1` set in the configuration file.

Title	Misleading message observed in dmesg on LBG device with LimitDevAccess = 1 set in the configuration file
Reference #	QATE-41486
Description	When using `LimitDevAccess = 1` with more than one device in upstate, the "`qatX: failed to get NumberCyInstaces value from config!`" message could be observed in `dmesg` for other devices than configured one. This message indicates only that for the other devices, the configuration was not found, which is expected.
Implication	This is an internal message only and should not be a threat as an error.
Resolution	The issue is resolved in 3.7.0 release.
Affected OS	FreeBSD 11.3
Driver/Module	CPM IA - Common

4.2.3 QATE-33751 - GEN - Library, and driver do not support devices enumerated in a PCI domain different than 0

Title	GEN - Library and driver do not support devices enumerated in a PCI domain different than 0
Reference #	QATE-33751
Description	The userspace driver and the Intel® QAT library cannot handle devices enumerated in a domain different than 0.
Implication	It is not possible to use the software in systems where the device is enumerated with a PCI domain different than 0.
Resolution	The issue is resolved in 3.7.0 release.
Affected OS	FreeBSD 11.3
Driver/Module	CPM IA - Common

4.2.4 QATE-59671 - Point Multiplication for Curve25519 and Curve448 not available on FreeBSD guest machine

Title	Point Multiplication for Curve25519 and Curve448 not available on FreeBSD guest machine
Reference #	QATE-59671
Description	The SR-IOV environment uses a Linux driver on the host machine. At the time of the v3.6.0 FreeBSD release, the EC Mont Edwards API is not yet supported on Linux (in v4.8.0 release), which limits these elliptic curves operations to the FreeBSD host.
Implication	Timeout observed on `EcEd` asymmetric crypto requests.
Resolution	The latest release of the Linux Driver (4.9.0) includes support for these algorithms. Ensure Linux driver version 4.9.0 or later is used to support these algorithms in a FreeBSD Guest OS.
Affected OS	FreeBSD 11.3
Driver/Module	CPM IA - Crypto

4.2.5 QATE-52976 – AlgChain and HKDF threads cannot use the same cy instance

Title	AlgChain and HKDF threads cannot use the same cy instance
Reference #	QATE-52976
Description	Possible bus error when symmetric and HKDF operation shares the same instance due to the request being overwritten.
Implication	It is impossible to share the same instance for symmetric and HKDF operations.
Resolution	The issue is resolved in a v3.6.0 release.
Affected OS	FreeBSD11.3
Driver/Module	CPM IA - Common

4.2.6 QATE-31888 – Possible performance degradation

Title	Possible performance degradation
Reference #	QATE-31888
Description	The integrated configuration for the FreeBSD kernel is not optimized for all relevant Intel® QAT driver scenarios (issue with threading and scheduling).
Implication	Degradation of Intel® QAT data throughput can be observed in the deployment with FreeBSD. The use cases: - sharing the same core for the threads using request ring (submission/working thread) and response ring (polling thread) - sharing the same core for among more working threads - an extensive number of threads waiting on mutex queue for responses
Cd /Resolution	The issue is resolved in a v3.6.0 release.
Affected OS	FreeBSD11.3
Driver/Module	CPM IA - Common

4.2.7 QATE-5092 - AES-XTS does not support buffers sizes that are not a multiple of 16B

Title	AES-XTS does not support buffers sizes that are not a multiple of 16B
Reference #	QATE-5092
Description	A single request with a data size that is not a multiple of 16B for AESXTS will fail with an invalid `param` check.
Implication	The user cannot submit AES-XTS Crypto requests with buffers that are not multiples of 16B
Resolution	The issue is resolved in the v3.6.0 release.
Affected OS	FreeBSD11.3
Driver/Module	CPM IA – Crypto

4.2.8 QATE-7325 - AES-GCM operation with zero-length plain text results in an incorrect tag result

Title	AES-GCM operation with zero-length plain text results in an incorrect tag result
Reference #	QATE-7325
Description	Sending an AES-GCM operation with zero-length plain text may generate an incorrect tag result
Implication	Potentially harmful record errors and failing connections
Resolution	The issue is resolved in the v3.6.0 release.
Affected OS	FreeBSD 11.3
Driver/Module	CPM IA - Crypto

4.2.9 QATE-41846 - GEN – Intel® QAT API submissions with bad addresses that trigger DMA to invalid or unmapped addresses can cause a platform to hang

Title	GEN – Intel® QAT API submissions with bad addresses that trigger DMA to invalid or unmapped addresses can cause a platform to hang
Reference #	QATE-41846
Description	This version of the Intel® QAT hardware does not perform request checking. It follows that a malicious application can submit requests that can bring down an entire Intel® QAT endpoint, which can impact other Intel® QAT jobs associated with the hardware. Furthermore, if any Intel® QAT API submission have bad addresses that would trigger DMA to invalid or unmapped addresses, these can induce a platform hang. This presents a risk to be managed by the host and guest operating systems and other system policies. The exposure can extend to other guest operating systems or applications outside of the typical access boundary of the malicious guest or application.
Implication	All guest operating systems or other applications using Intel® QAT must be trusted, and/or other steps must be taken to ensure that an untrusted application or guest cannot submit incorrectly formatted requests.
Resolution	The issue is resolved in the v3.6.0 release.
Affected OS	FreeBSD 11.3
Driver/Module	CPM IA - Crypto

4.2.10 QATE-41745 - Restore and Resize function in PKE code incorrectly freeing memory

Title	Segmentation fault when using inputs on QUAD word boundaries
Reference #	QATE-41745
Description	When using EC's `cpaCyEcPointMultiply` or `cpaCyEcPointVerify` with an aligned size of input parameters to four, eight, or nine `quadwords` (4 * 8B , 8 * 8B or 9 * 8B), a segmentation fault occurs.
Implication	Application crashes, caused by a `segfault`.
Resolution	The issue is resolved in the v3.5.0 release.
Affected OS	FreeBSD 11.2
Driver/Module	CPM IA - Common

4.2.11 QATE-40630 - Hang of asymmetric crypto engines might not be detected by heartbeat.

Title	Hang of asymmetric crypto engines might not be detected by heartbeat
Reference #	QATE-40630
Description	Heartbeat might not detect a hang of an asymmetric crypto engine.
Implication	The device might be reported as responsive even if one of the engines is hung.
Resolution	The issue is resolved in 3.4.0 release.
Affected OS	FreeBSD 11.2
Driver/Module	CPM IA - Common

4.2.12 QATE-40628 - Access to /dev/qat_adf_ctl allows a limited-trust user to reconfigure or reset the Intel® QAT endpoint

Title	Access to /dev/qat_adf_ctl allows a limited-trust user to reconfigure or reset the Intel® QAT endpoint.
Reference #	QATE-40628
Description	The device /dev/qat_adf_ctl provides a number of ioctls. Some ioctls are used by regular users of Intel® QAT for ring reservation and querying the configuration values. Others are used to reconfigure or reset the device. With the current implementation, any user that can use Intel® QAT for crypto or compression service can also reconfigure, bring down, or reset the device. These admin capabilities should be limited to admin users.
Implication	A user with access to /dev/qat_adf_ctl can reconfigure, bring down, or reset the device.
Resolution	The issue is resolved in the v3.4.0 release.
Affected OS	FreeBSD 11.2
Driver/Module	CPM IA - Common

4.2.13 QATE-40627 - Destination buffer is overrun in a Digest Verify + Decrypt that does not reserve output space for the digest

Title	Destination buffer is overrun in a Digest Verify + Decrypt that does not reserve output space for the digest
Reference #	QATE-40627
Description	When the field `verifyDigest` in `CpaCySymSessionSetupData` is set to `CPA_TRUE`, the digest is written back to the destination buffer even if there is not allocated space in the destination buffer for it.
Implication	Unallocated memory can be overwritten
Resolution	The issue is resolved in the v3.4.0 release.
Affected OS	FreeBSD 11.2
Driver/Module	CPM IA - Crypto

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