

NVIDIA DOCA with OpenSSL

User Guide

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Chapter 1. Introduction

The doca sha offload engine is an OpenSSL dynamic engine with the ability of offloading SHA calculation. It can offload the OpenSSL one-shot SHA-1, SHA-256, and SHA-512. It supports synchronous mode and asynchronous mode by leveraging the OpenSSL async jobs library. For more information on the async jobs library, please refer to official OpenSSL documentation.

This engine is based on the <code>doca_sha</code> library and the OpenSSL dynamic engine interface API. For more information on the OpenSSL dynamic engine, please refer to official OpenSSL documentation.

This engine can be called by an OpenSSL application through the OpenSSL high-level algorithm call interface, EVP Digest. For more information on the EVP Digest, please refer to official OpenSSL documentation.

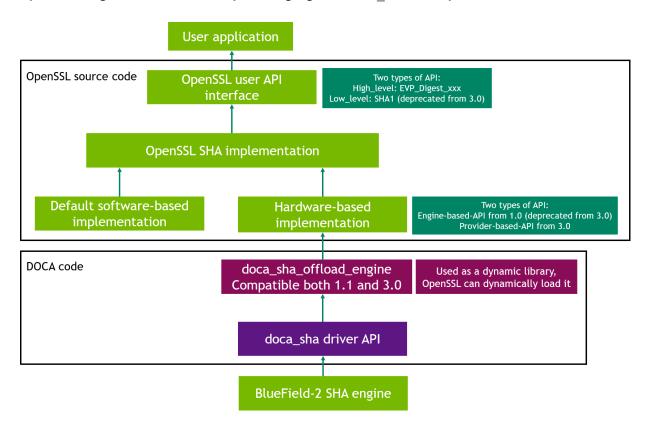
Chapter 2. Prerequisites

- ► Hardware-based doca_sha engine which can be verified by calling doca_sha_get_hardware_supported()
- ▶ Installed OpenSSL version ≥ 1.1.1

Chapter 3. Architecture

The following diagram shows the software hierarchy of doca sha offload engine and its location in the whole DOCA repository.

From the perspective of OpenSSL, this engine is an instantiation of the OpenSSL dynamic engine interface API by leveraging the doca sha library.



Chapter 4. Capabilities and Limitations

- Only one-shot OpenSSL SHA is supported
- ► The maximum message length ≤ 2GB, the same as doca_sha library

Chapter 5. OpenSSL Command Line Verification

Verify that the engine can be loaded:

```
$ openssl engine dynamic -pre NO VCHECK:1 -pre SO PATH:${DOCA DIR}/infrastructure/
doca_sha_offload_engine/libdoca_sha_offload_engine.so -pre LOAD -vvv -t -c (dynamic) Dynamic engine loading support
[Success]: SO PATH: ${DOCA DIR}/infrastructure/doca sha offload engine/
libdoca sha offload engine.so
[Success]: LOAD
Loaded: (doca_sha_offload_engine) Openssl SHA offloading engine based on doca_sha [SHA1, SHA256, SHA512]
     [ available ]
     set pci addr: set the pci address of the doca sha engine
           (input flags): STRING
```

► For SHA-1:

\$ echo "hello world" | openssl dgst -shal -engine {DOCA DIR}/infrastructure/ doca sha offload engine/libdoca sha offload engine.so -engine impl

For SHA-256:

\$ echo "hello world" | openssl dgst -sha256 -engine {DOCA DIR}/infrastructure/ doca_sha_offload_engine/libdoca_sha_offload_engine.so -engine_impl

\$ echo "hello world" | openssl dgst -sha512 -engine {DOCA DIR}/infrastructure/ doca sha_offload_engine/libdoca_sha_offload_engine.so -engine_impl

Chapter 6. OpenSSL Throughput Test

openssl-speed is the OpenSSL throughput benchmark tool. For more information, consult official OpenSSL documentation. doca sha offload engine throughput can also be measured using openssl-speed.

► SHA-1, each job 10000 bytes, using engine:

```
$ openssl speed -evp shal -bytes 10000 -elapsed --engine {DOCA DIR}/
infrastructure/doca_sha_offload_engine/libdoca_sha_offload_engine.so
```

▶ SHA-256, each job 10000 bytes, using engine, async jobs=256:

```
$ openssl speed -evp sha256 -bytes 10000 -elapsed --engine {DOCA_DIR}/infrastructure/doca_sha_offload_engine/libdoca_sha_offload_engine.so -async_jobs
```

▶ SHA-512, each job 10000 bytes, using engine, async jobs=256, threads=8:

```
$ openssl speed -evp sha512 -bytes 10000 -elapsed --engine {DOCA_DIR}/
infrastructure/doca_sha_offload_engine/libdoca_sha_offload_engine.so -async_jobs
256 -multi 8
```

Chapter 7. Using DOCA SHA Offload Engine in OpenSSL **Application**

More information on the dynamic engine usage can be found in the official OpenSSL documentation.

To load the doca sha offload engine (optionally, set engine PCIe address):

```
const char *doca_engine_path = "${DOCA_DIR}/infrastructure/
doca_sha_offload_engine/libdoca_sha_offload_engine.so";
const char *default_doca_pci_addr = "03:00.0";
ENGINE load dynamic();
e = ENGINE by id(doca engine path);
ENGINE_ctrl_cmd_string(e, "set_pci_addr", doca_engine_pci_addr, 0);
ENGINE_init(e);
ENGINE set default digests(e);
```

To perform SHA calculation by calling the OpenSSL high-level function EVP_XXX:

```
const EVP MD *evp md = EVP sha1();
EVP_MD_CTX *mdctx = EVP_MD_CTX_create();
EVP DigestInit ex(mdctx, evp_md, e);
EVP DigestUpdate(mdctx, msg, msg len);
EVP_DigestFinal_ex(mdctx, digest, digest_len);
EVP MD CTX destroy(mdctx);
```

To unload the engine:

```
ENGINE_unregister_digests(e);
ENGINE_finish(e);
ENGINE_free(e);
```

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