DPDK IPSEC: A SCALABLE HIGH PERFORMANCE LIBRARY FOR YOUR IPSEC APPLICATION

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- NO COMPUTER SYSTEM CAN BE TOTALLY SECURE

AGENDA

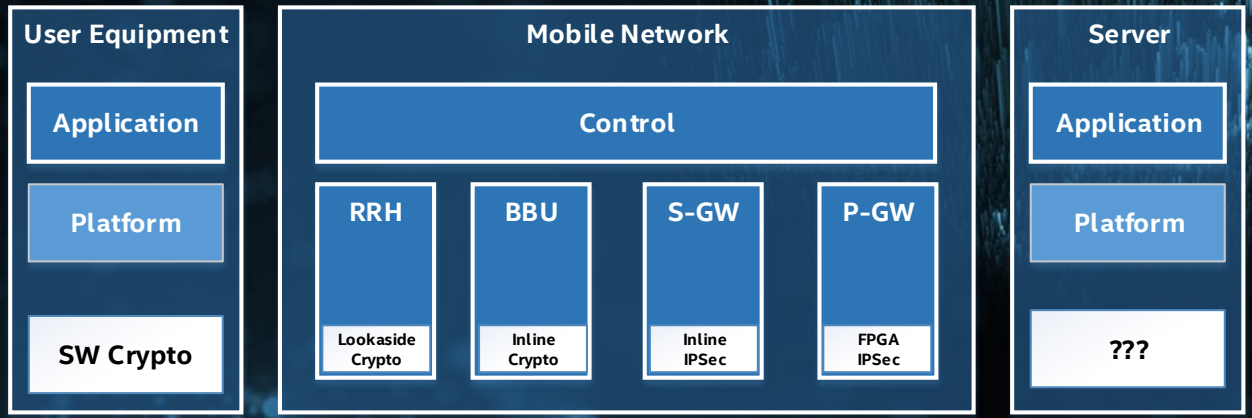
- Motivation
- DPDK and rte_cryptodev brief introduction
- DPDK rte_ipsec deep-dive
- Performance
- Current status and future work

MOTIVATION

Network traffic has to be secured.
IPSec as the popular secure network protocol, is still a very heavy task for modern system.

Large scale network systems, such as 5G Network infrastructure, are likely contained heterogeneous hardware, including crypto/IPSec workload Acceleration methods.

From Cloud Native point of view, we expect the network nodes running same software. Is this possible for IPSec application?



WHAT IS DPDK?

Data Plane Development Kit, includes a set of libraries and user-space device drivers
Accelerates workload on generic computer (Network, Crypto, Compression, Virtualization, and many more)

Data I/O abstraction

Standard API to access hardware from different vendors. **Accelerated**

DumbNIC/SmartNIC, Lookaside/inline Crypto, BBDev, Virtio, AF-XDP, and FPGA ready

How?

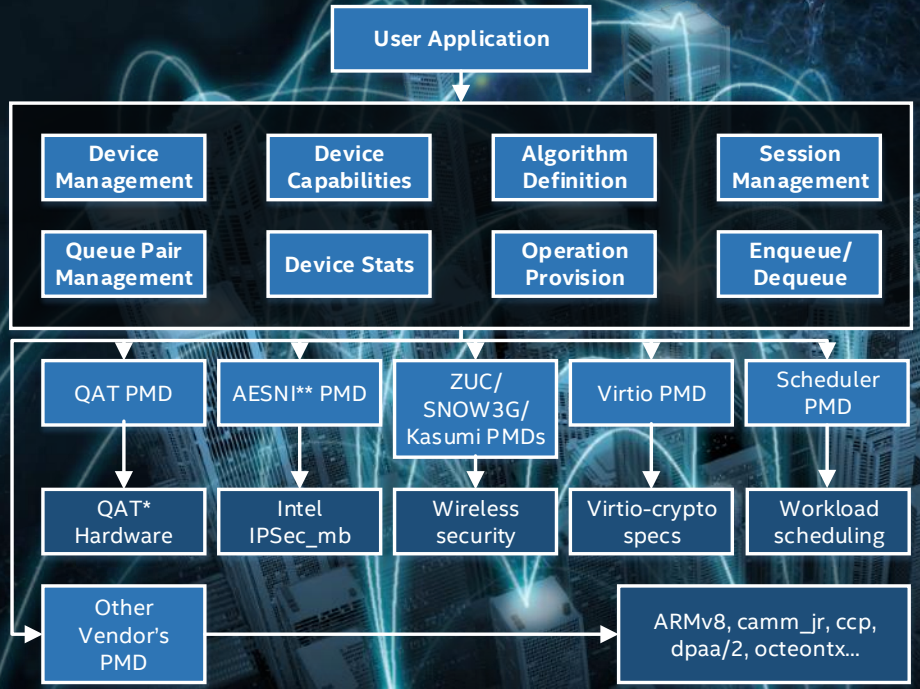
Polling, working in bursts, core affinity, memory/buffer management,
PCI utilization, use of vector instructions.

DPDK RTE_CRYPTODEV BRIEF

CRYPTO FRAMEWORK FOR PROCESSING SYMMETRIC AND ASYMMETRIC CRYPTO WORKLOADS IN DPDK.

Target SW and Lookaside crypto accelerator

- Wide range of SW and HW PMDs
- Standard API supports all PMDs
- Multi-queues for multi-thread sharing



WHAT'S LEFT? OH, IPSEC!

We now have tools we need to access different HW for acceleration.

BUT all IPSec solutions need:

- SA management
- Transport/Tunnel header assembly/strip
- SAD/SPD
- A crypto load-balancer
- Native support of current and future HW/SW acceleration methods

We propose DPDK Rte_ipsec library for community to address common IPSec challenges

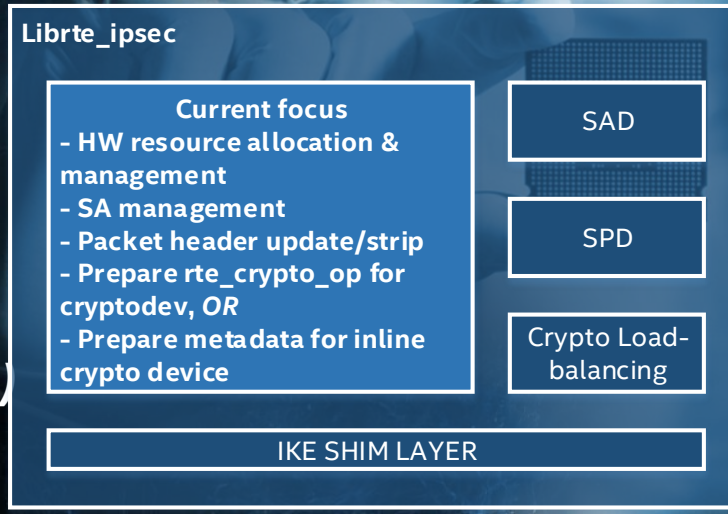
RTE_IPSEC: A LIBRARY TO ADDRESS IPSEC CHALLENGES

A modular library built around a core functionality of data-path processing and SA management.

Optional modules:

- *Scalable and performant SAD and SPD*
- *Crypto load-balancing (host, lookaside, inline)*
- *Integration point for IKE clients*

Automatically handle HW accelerator allocation and resource usage.

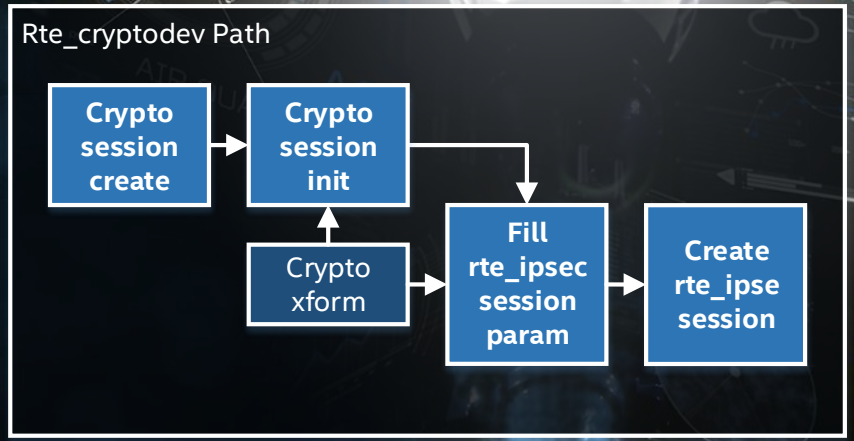


RTE_IPSEC SESSION CREATION

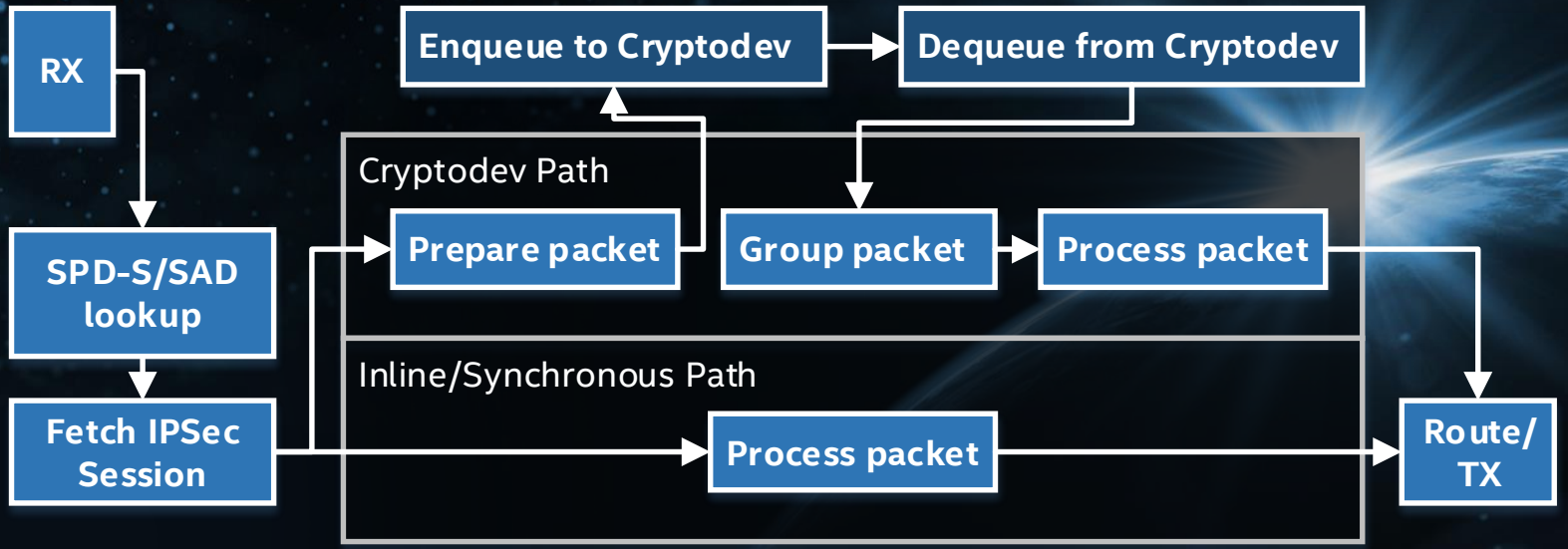
Different paths for rte_cryptodev to create crypto/security session (automatable).

After the session is created, same code path is used to create ipsec session.

Same crypto transform (xform) is reused.

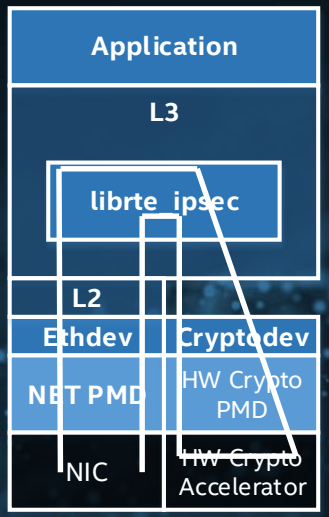


RTE_IPSEC DATA PATH

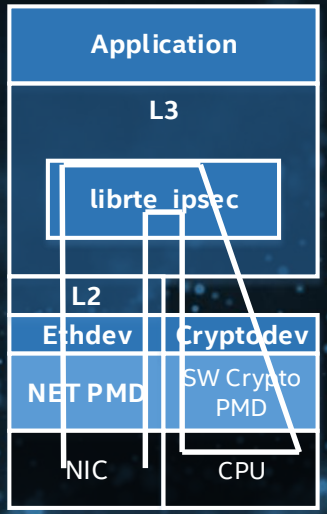


MULTIPLE IPSEC PROCESSING MODES

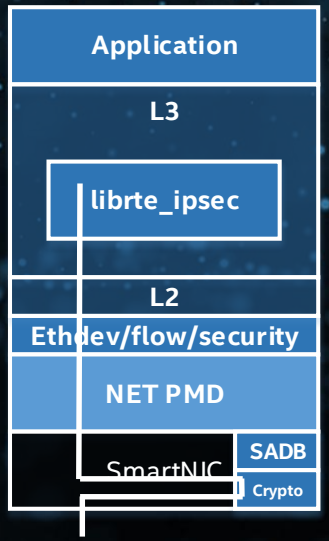
Lookaside HW Crypto Processing



Host based SW Crypto Processing



I/O based inline Crypto Processing



CURRENT ACTIVITY

Transport/Tunnel ESP, IPv4 and IPv6
Supported cipher algorithms: **AES-CBC-128/256, AES-CTR-128, 3DES-CBC, NULL**
Supported authentication algorithms: **HMAC-SHA1/SHA256, NULL**
Supported AEAD algorithms: **AES-GCM-128**
ESN and anti-replay
Multi-segment packets support (DPDK 19.08)
Header reconstruction (DPDK 19.11)
SW/HW lookaside/HW inline crypto accelerator support

Potential Community additions:
SADB/SPDB
NAT
Crypto-load-balancing
IKE client SHIM layer
Integration into VPP, OVS, and other open source projects


THANK YOU