Dpdk IPSec security gateway application

Intel NPG PMA, 3/2/2017

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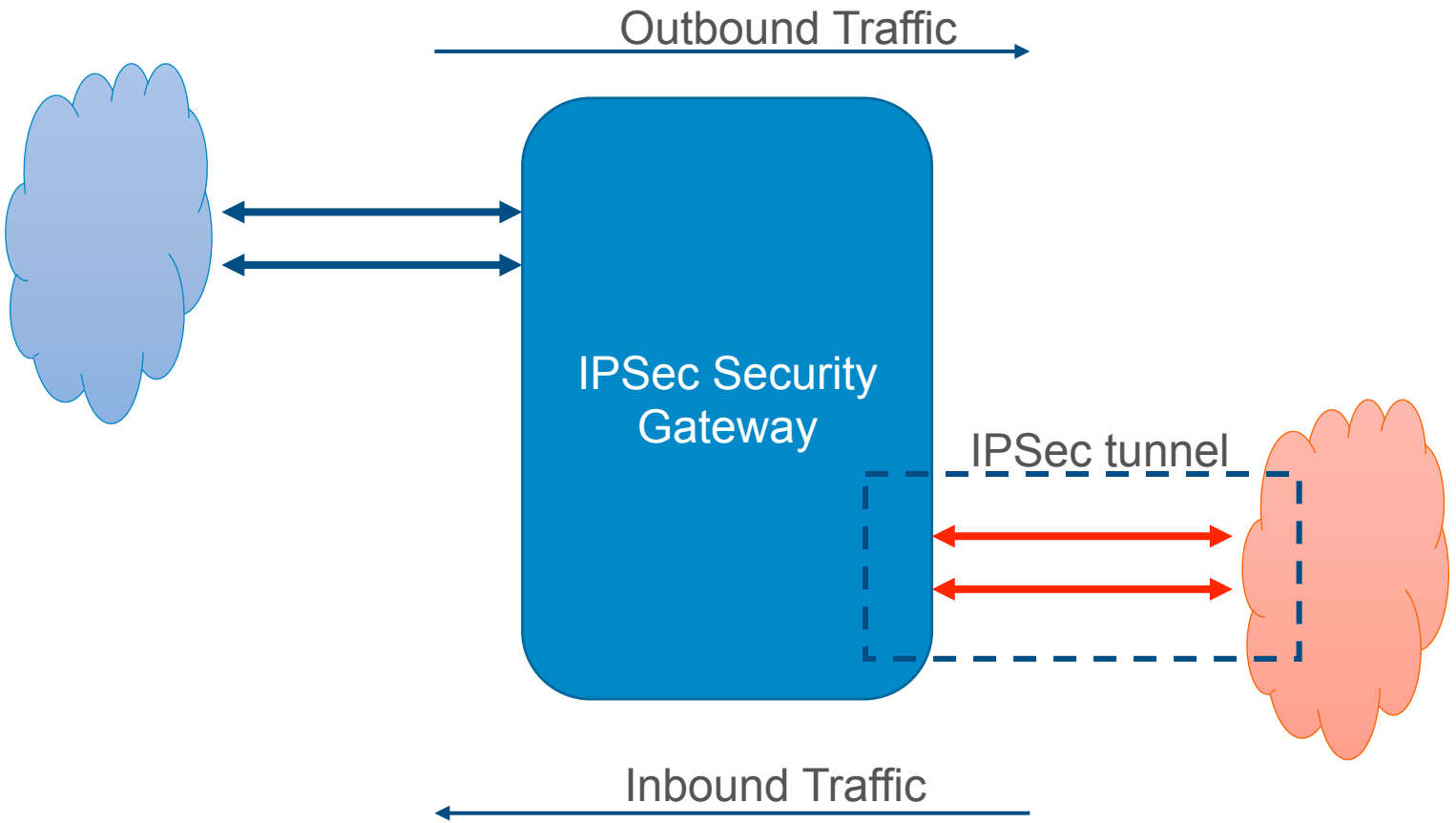
overview

- Example application providing guidelines for using the Cryptography Device Library framework.
- Showcase DPDK cryptodev framework performance with a real world use case scenario.

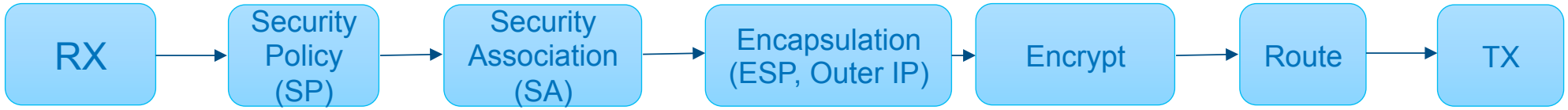
- http://dpdk.org/doc/guides-16.04/sample_app_ug/ipsec_secgw.html (Google DPDK IPSec sample application)

Overview cont.



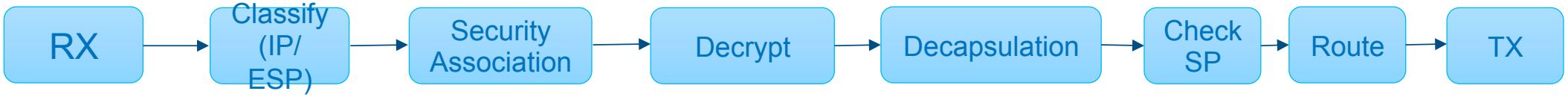
Application Flow

Outbound



- Check destination
- Encrypt, Encapsulate
- Route

Inbound



- Classify
- Decrypt, Decapsulate
- Check SP
- Route

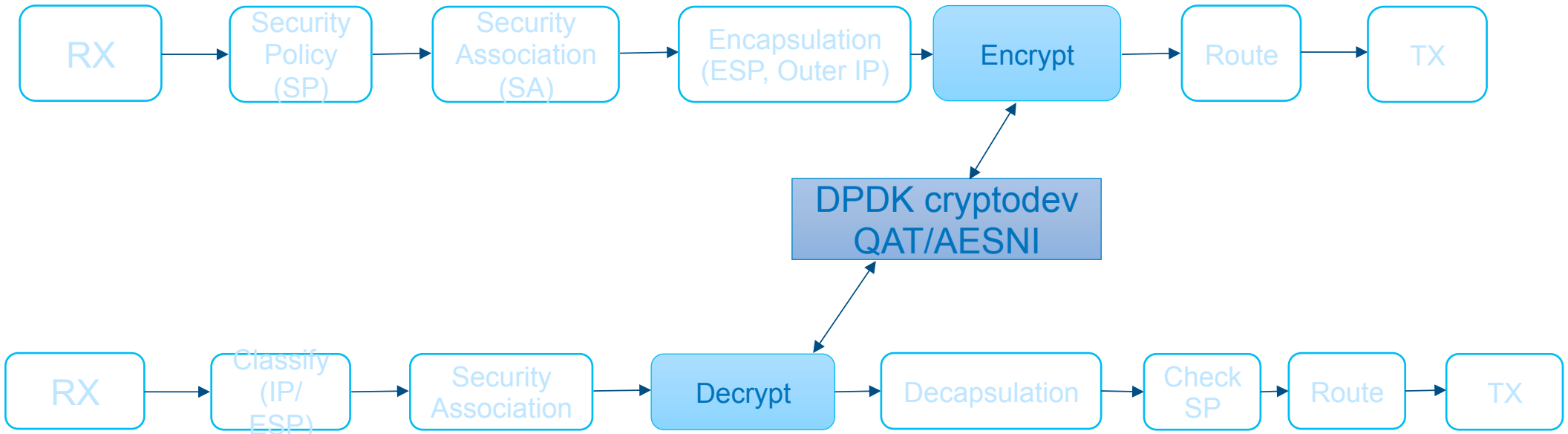
security policy

Src	Dst	proto	SA idx
Any	192.168.115.0/24	Any	5
Any	192.168.116.0/24	Any	6
Any	192.168.117.0/24	Any	BYPASS

security association

SPI	Cipher	Auth	Tunnel src	Tunnel dst
5	AES-CBC	HMAC-SHA1	172.16.1.5	172.16.2.5
6	AES-CBC	HMAC-SHA1	172.16.1.6	172.16.2.6
9	NULL	NULL	172.16.1.5	172.16.2.5

cryptography

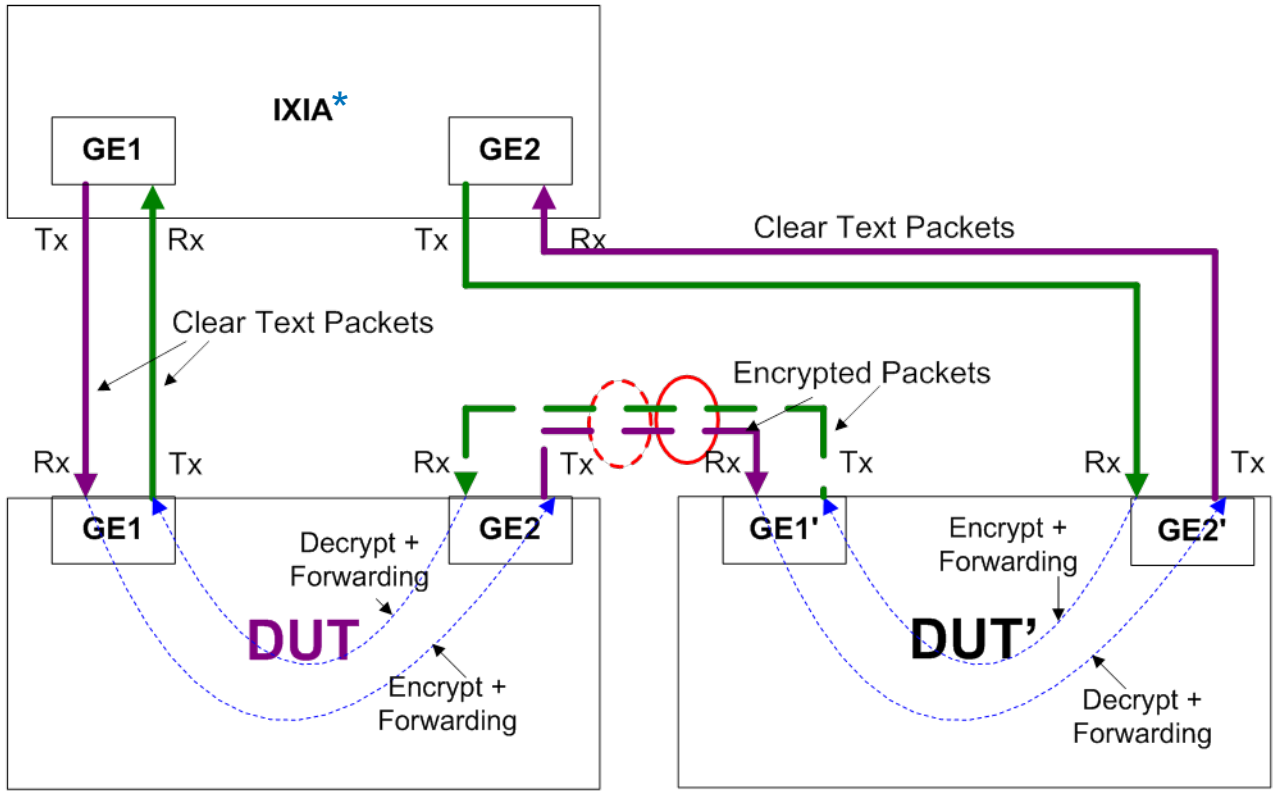


DPDK cryptodev

- Crypto PMD framework – similar to DPDK NIC drivers
- Same generic API for HW and SW crypto devices
  - No change to code to switch between QAT and AESNI libraries
- Supports
  - Symmetric Crypto
  - Authentication
  - Chained crypto/authentication
  - Asymmetric Crypto

http://dpdk.org/doc/guides-16.04/prog_guide/cryptodev_lib.html (Google DPDK cryptodev libraries)

Flow Traffic Configuration



DUT and DUT' are the identical platforms

* Other names and brands may be claimed as the property of others.

running the application

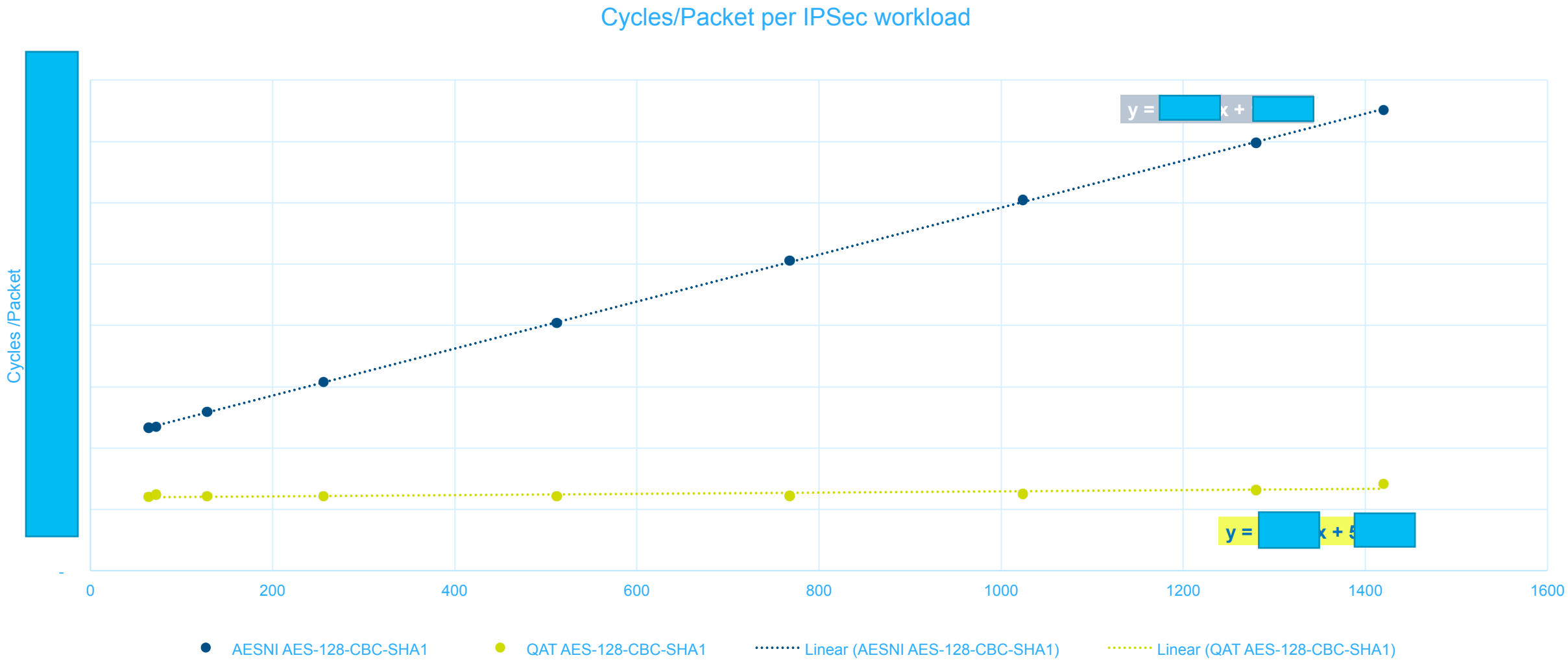
- Pass number of cores
  - -l 1,2-5
- Pass NICs
  - -w 02:00.0 …
- Pass encryption device
  - -w b3:00.0 … or --vdev='crypto_aesni_mb'
- Allocate ports and cores
  - --config=(port,queue,core)
- Provide IPSec config
  - EP0 or EP1

performance considerations

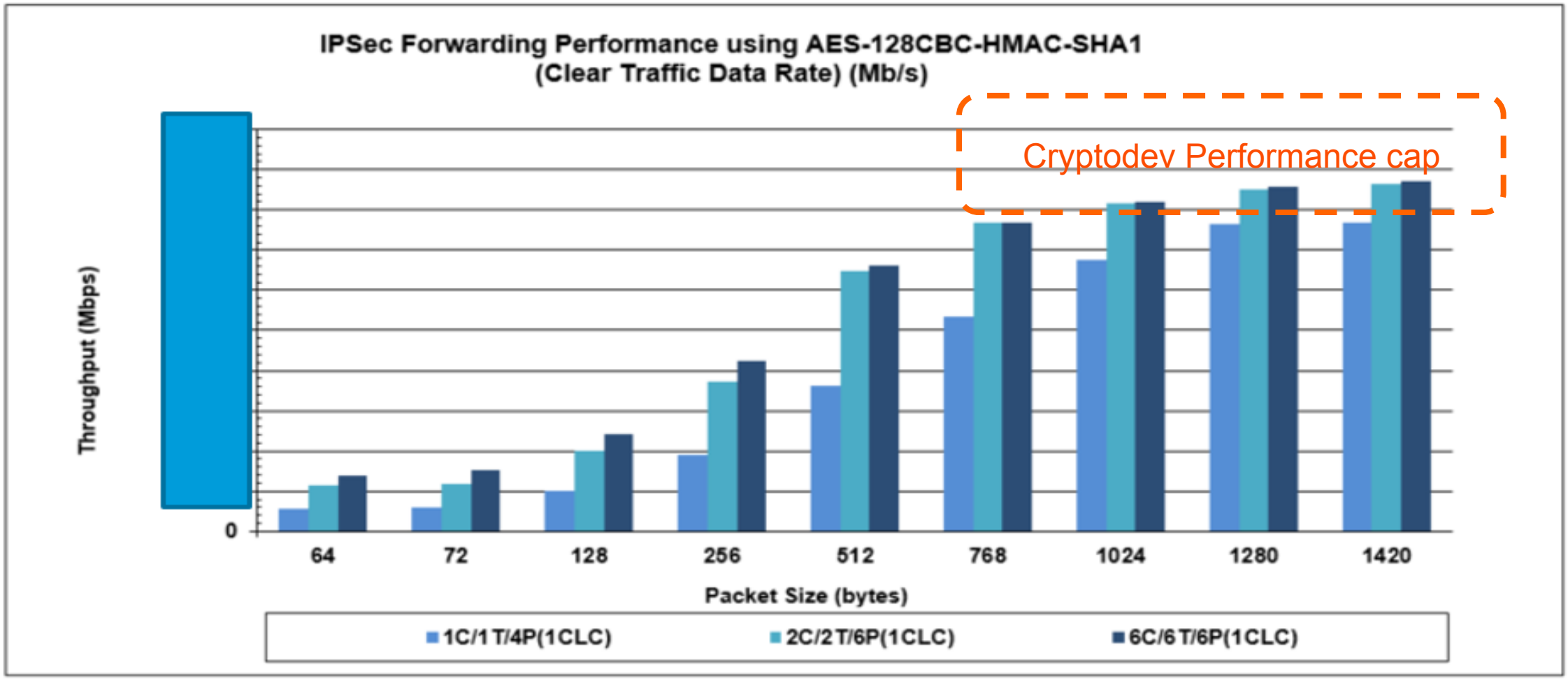
system resources

- **Cores**
  - Run to completion
  - Packets/Sec/Core varies
- **Memory**
  - Large amount of data traveling through memory (2x memory accesses vs L3fwd)
  - Beware of NUMA
- **Cryptodev**
  - QAT has a limit based on packet size
- **NIC line rate**
  - Encapsulated packet is larger than original

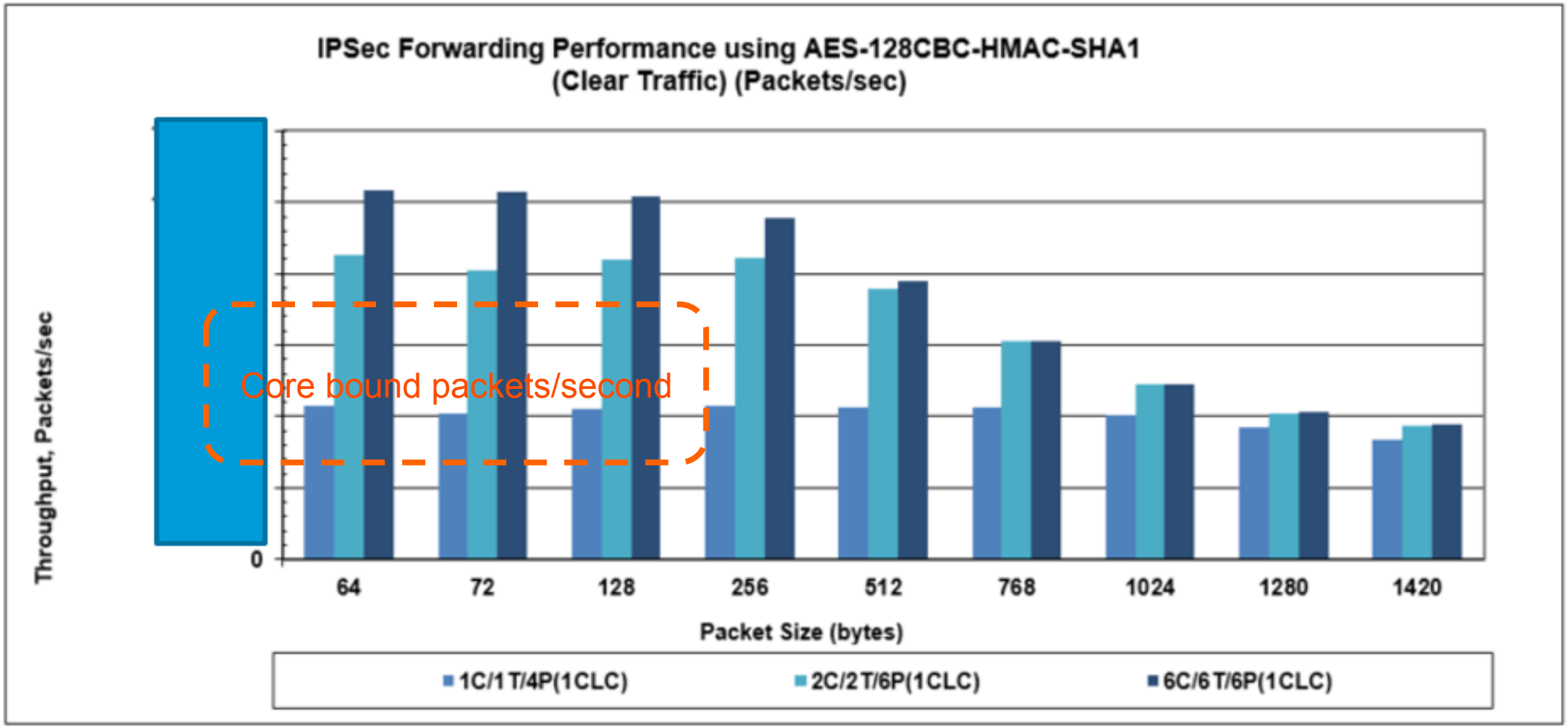
Understanding IPSEC performance numbers



Understanding IPSEC performance numbers

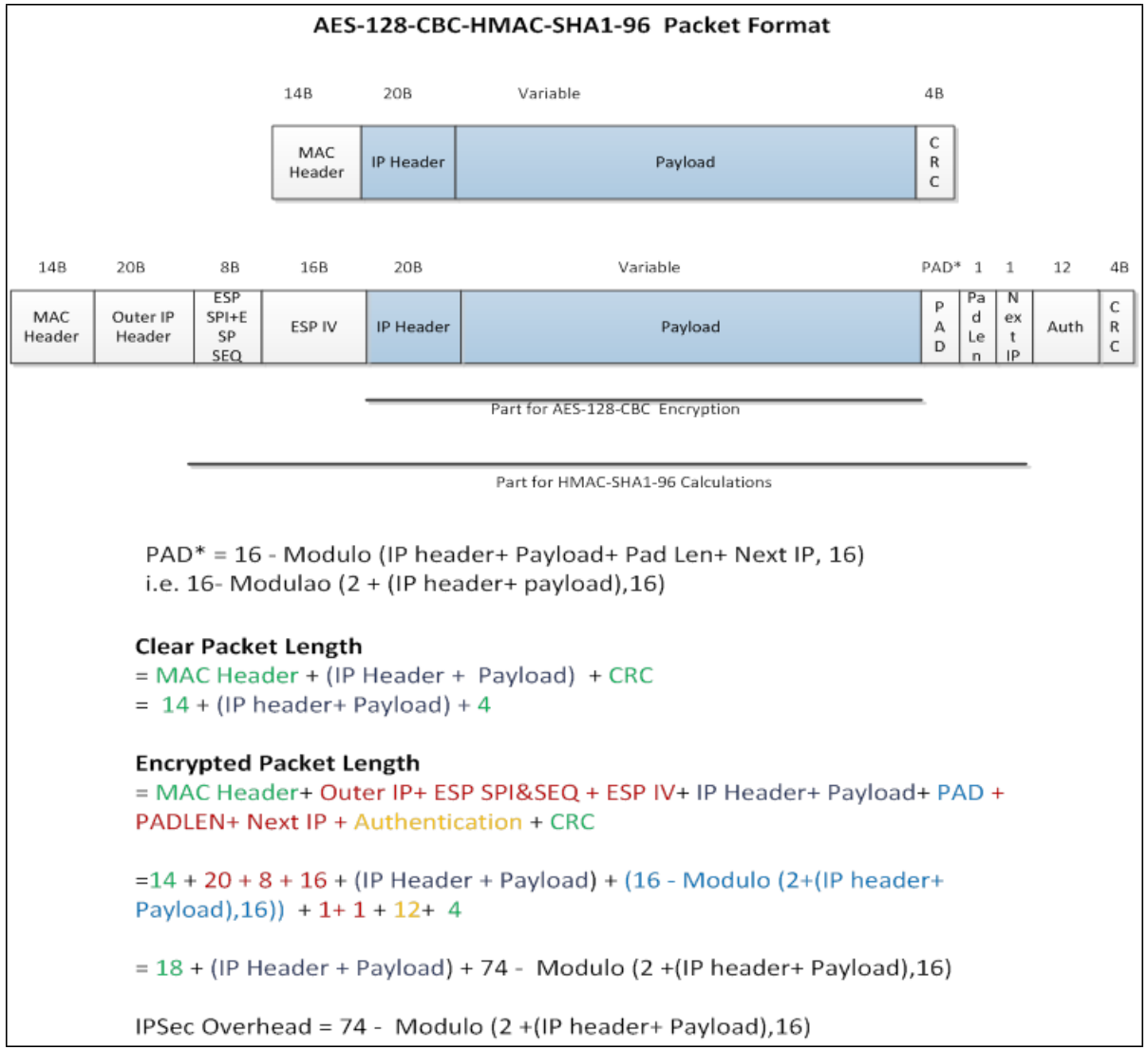


Understanding IPSEC performance numbers



Backup

IPSec Packet Format



PAD* = 16 - Modulo (IP header+ Payload+ Pad Len+ Next IP, 16)
i.e. 16- Modulao (2 + (IP header+ payload),16)

Clear Packet Length
= MAC Header + (IP Header + Payload) + CRC
= 14 + (IP header+ Payload) + 4

Encrypted Packet Length
= MAC Header+ Outer IP+ ESP SPI&SEQ + ESP IV+ IP Header+ Payload+ PAD + PADLEN+ Next IP + Authentication + CRC

=14 + 20 + 8 + 16 + (IP Header + Payload) + (16 - Modulo (2+(IP header+ Payload),16)) + 1+ 1 + 12+ 4

= 18 + (IP Header + Payload) + 74 - Modulo (2 +(IP header+ Payload),16)

IPSec Overhead = 74 - Modulo (2 +(IP header+ Payload),16)