

Deliver More TLS Performance With Less Cores

Combine the Power of Intel® Xeon® With HAProxy Load Balancing



Dylan Murphy
VP of Sales
HAProxy Technologies



Willy Tarreau
CTO / Lead Developer
HAProxy Technologies



Divya Pendyala
Platform Architect, NESG
Intel



Webinar Participants



Presenter

Dylan Murphy is the Vice President of Sales and Business Development at HAProxy Technologies. He oversees the organization's sales, partnerships and alliances efforts globally.

Dylan has a passion for delivering results in complex enterprise technology landscapes while enabling customers and partners to unlock business value.



Presenter

Divya Pendyala is the Platform Architect in Network & Edge Solutions Group at Intel Corporation. She works closely with ISV and CSP partners to understand their network security requirements and add value with Intel technologies.

Divya is specialized in Intel's network and security acceleration technologies including Intel QAT and delivering solutions for customer's business needs.



Technical Q&A

Willy is the CTO/Lead Developer at HAProxy Technologies. He released the first version of HAProxy in 2001, welcomed the first contribution in 2004 and became a Linux kernel maintainer in 2006.

His focus has always been on the lower layers where efficiency can still be improved after everything was squeezed at visible layers, and on reliability, probably because he hates revisiting complex code.

Agenda

- Speaker Introductions
- HAProxy Technologies Overview
- Challenges that HAProxy Solves
- HAProxy Benchmark Testing Results
- 4th Gen Intel® Xeon® Scalable Processors
- Intel® Quick Assist Technology (QAT)
- Customer Benefits

HAProxy Community Project Overview

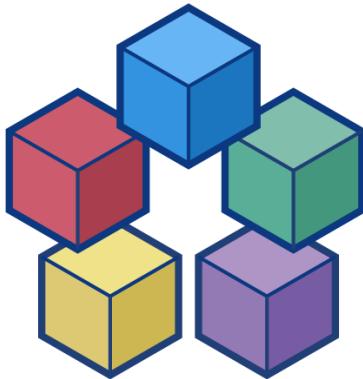
HAProxy is the world's fastest and most widely used software load balancer



2001

Project Launched

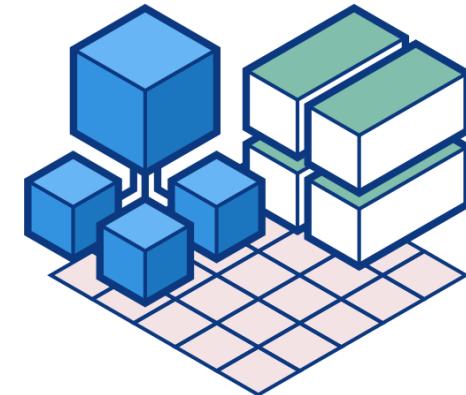
HAProxy 1.0
open sourced



5+

Million Installations

Powering the world's largest
websites



3

Major Projects

HAProxy, Data Plane API,
Kubernetes Ingress
Controller

HAProxy Technologies Overview

HAProxy Technologies is the company behind HAProxy, the world's fastest and most widely used software load balancer



2014

Founded

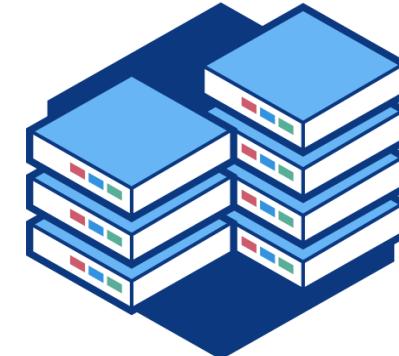
Self-funded and rapidly growing



6

Locations

HQ: Waltham, US
Offices: Paris, Amsterdam,
Zagreb, Rijeka, Sarajevo



1000+

Customers

Serving industries including High-Tech, EDU, FinServ, Commerce, Media & Entertainment, and Government

The Power of HAProxy

Powered by Open Source – Purpose built for the utmost performance, reliability, and security.



Enterprise High Availability

- Layers 4 - 7
- Management of server maintenance cycles and persistence
- Rebalancing server resources based on health-check
- Standby and backup servers / sites
- HTTP redirection



Flexible Management

- Dramatically reduce config complexity
- Manage processes with zero downtime
- Maintenance windows
- Session monitoring
- LB Algorithms
- Powerful observability features



Architecture Optimization

- HTTP routing
- Migration IPv4 <> IPv6
- Full Reverse Proxy
- Route Health Injection



Application Acceleration

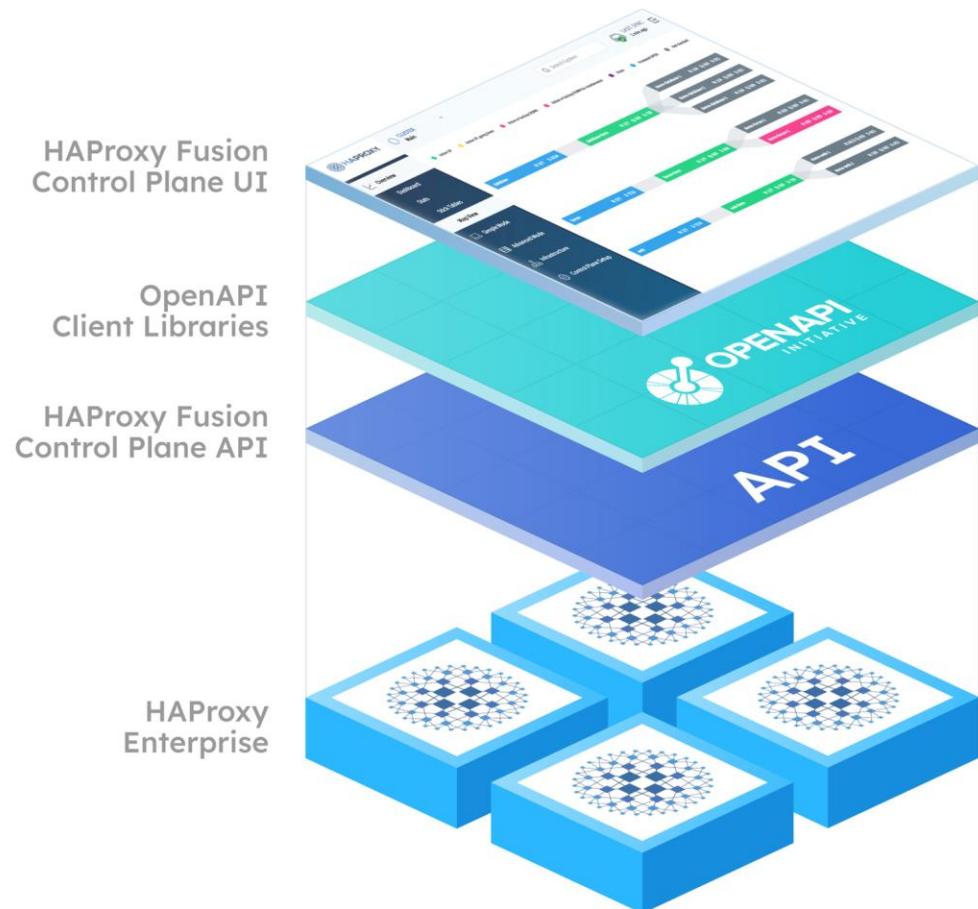
- HTTP compression
- Traffic Management
- Buffering and Extensive logs (AlohaLog)
- SSL Offloading
- Small Object Caching



Security

- Extensible Switch
- Multi-SSL Certs (SNI Support)
- DDoS Protection
- IP mobility
- WAF Module
- QoS features
- ACL/MAP Support

Challenge: Increase Performance & Scalability



Built for scale: from a single cluster to thousands of instances.

Centralized observability and multi-location capability.

Improve efficiency, resilience, and problem-solving at scale.

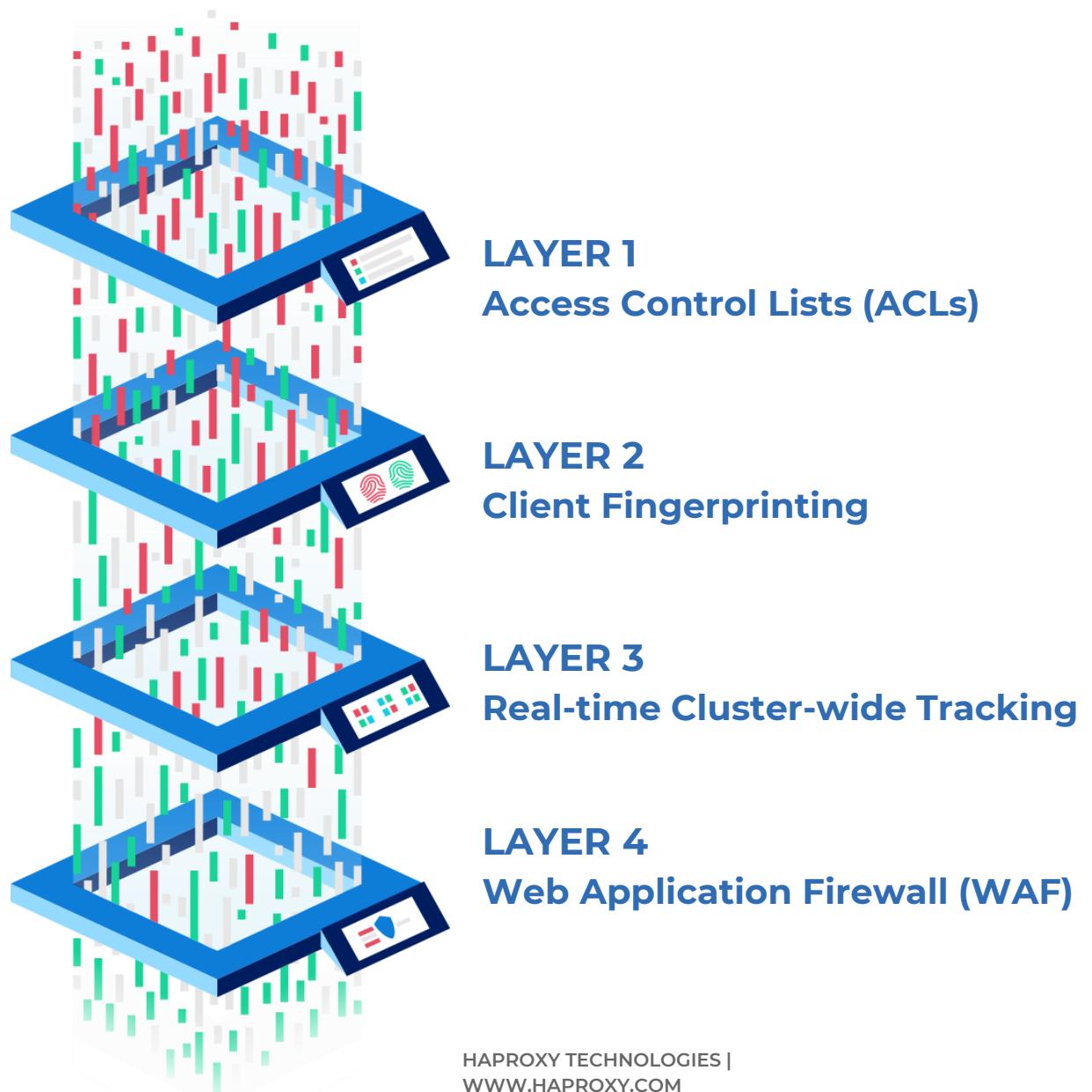
Scale out easily with fast & lightweight software.

Run in any location, environment, and architecture.

Build your way with extensible, open-source design.

Challenge: Ensure Security & Reliability

- Identifying & stopping threats in today's ever-changing security landscape requires a multi-layered approach.
- HAProxy stops threats to your APIs and web applications at the edge without sacrificing the best-in-class performance.
- Market is moving towards AI and ML to improve security policies.



Challenge: Reduce Costs & Improve Efficiency

- Efficient performance matters. Really.
- Recent benchmark achievements are difficult to grasp in real-world context
- So why are these benchmarks important?
- What do they really mean when it comes to cost cutting and energy savings?



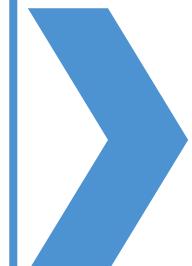
How HAProxy Embraces High-Performance Tech

HAProxy Architecture

Low-level functions designed for high efficiency.

Customer benchmarks show market leading performance at scale.

Multi-layer security is effective against full spectrum of threats.

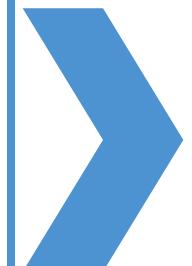


Technology Adoption

Fast to adapt to advances in computing technology.

Adoption of multi-threading was a huge boost.

Prioritize performance in partners and 3rd-party integrations.

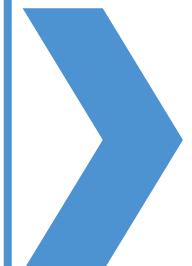


Amplifying Strengths

Integrated Intel QAT on 4th Gen Intel® Xeon® SP amplifies HAProxy's advantages.

Makes the most efficient load balancer *even more efficient*.

Low-cost SSL and DoS protection is now *even cheaper*.



Customer Benefits

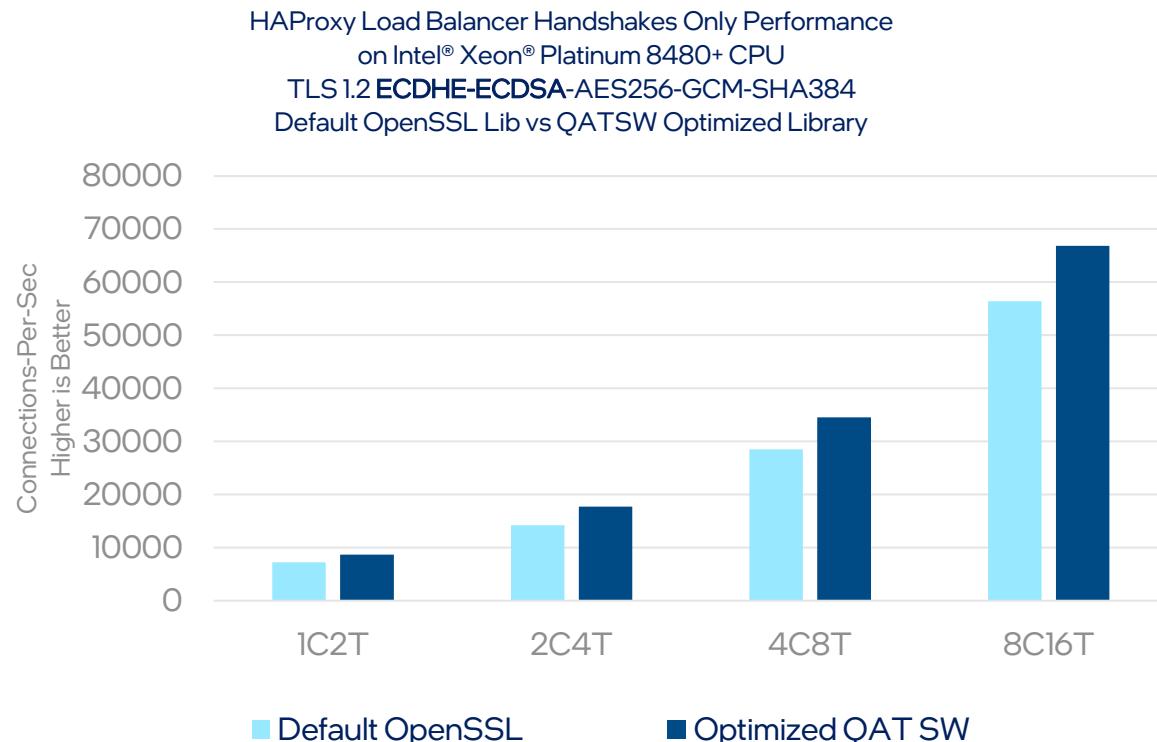
Higher scale with fewer cores & smaller VMs/containers.

Better DoS protection and cheaper SSL with lower latency.

Lower costs for servers, cloud compute, and energy.

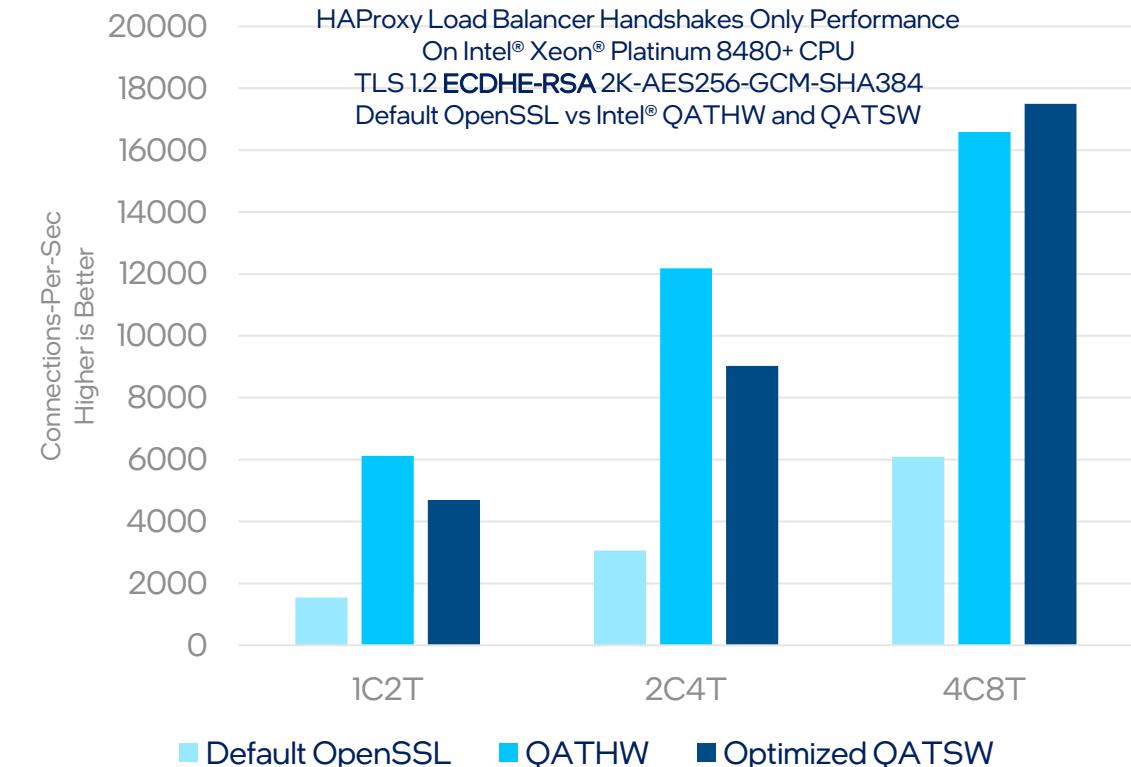
HAProxy Performance on 4th Gen Intel® Xeon® SP

Intel® Crypto Acceleration Instructions in Optimized QAT SW PKE Elliptic Curve Offload



- Offloading from the CPU core to QATSW, ECDA performance gain is up to **1.5x** compared to default OpenSSL
- QATSW performance scales linearly with more no. of cores and there is no max limit.

Intel® QAT PKE w EC & RSA2K Offload



- **4th Gen Intel Xeon SP max perf with 1QAT devices ~16.5K**
- Offloading from the CPU core to QATSW, RSA performance gain is up to **3x** compared to default OpenSSL
- Offloading from the CPU core to QATHW, RSA performance gain is in the range of **2.75x - 4x** compared to default OpenSSL

Performance varies by use, configuration and other factors. See backup for configuration details

Intel NEX

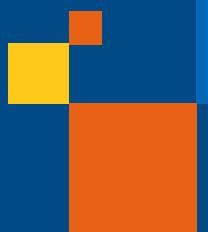
Intel, the Intel logo and Xeon are trademarks of Intel Corporation or its subsidiaries.

intel.

BrightTalk Webinar – Intel & HAProxy

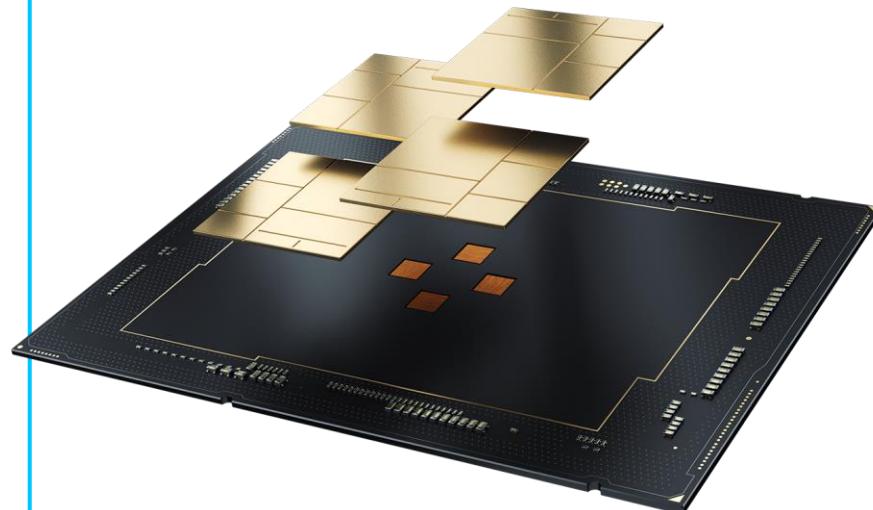
4th Gen Intel® Xeon® Scalable Processors

Divya Pendyala
Platform Architect



intel®

4th Gen Intel® Xeon® Scalable Processors



Workload-first approach to innovation,
design, and delivery

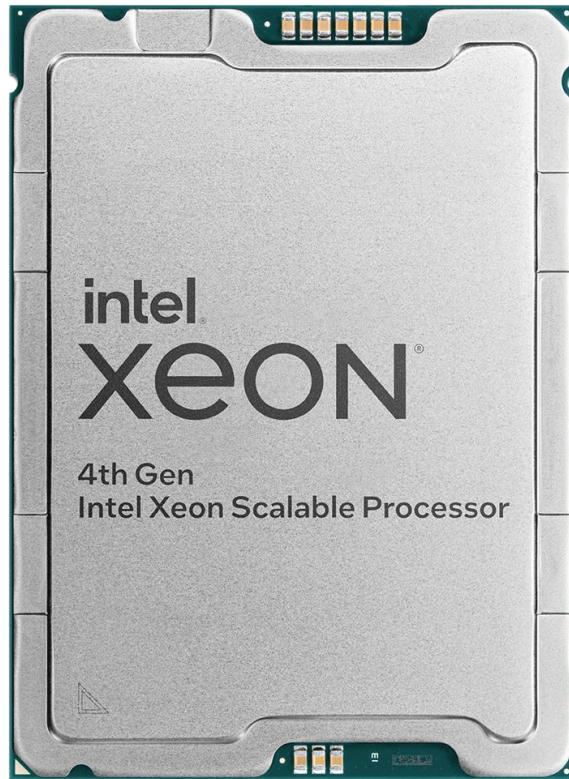
Most built-in accelerators
of any CPU on the market

Leading performance
and efficiency for our customers

Industry's most comprehensive
Confidential Computing portfolio

Intel, the Intel logo and Xeon are trademarks of Intel Corporation or its subsidiaries.

4th Gen Intel® Xeon® Scalable Processors



1 to 8 socket scalability

Up to 60 cores
per processor

Most built-in accelerators of any CPU

Increased memory bandwidth with DDR5

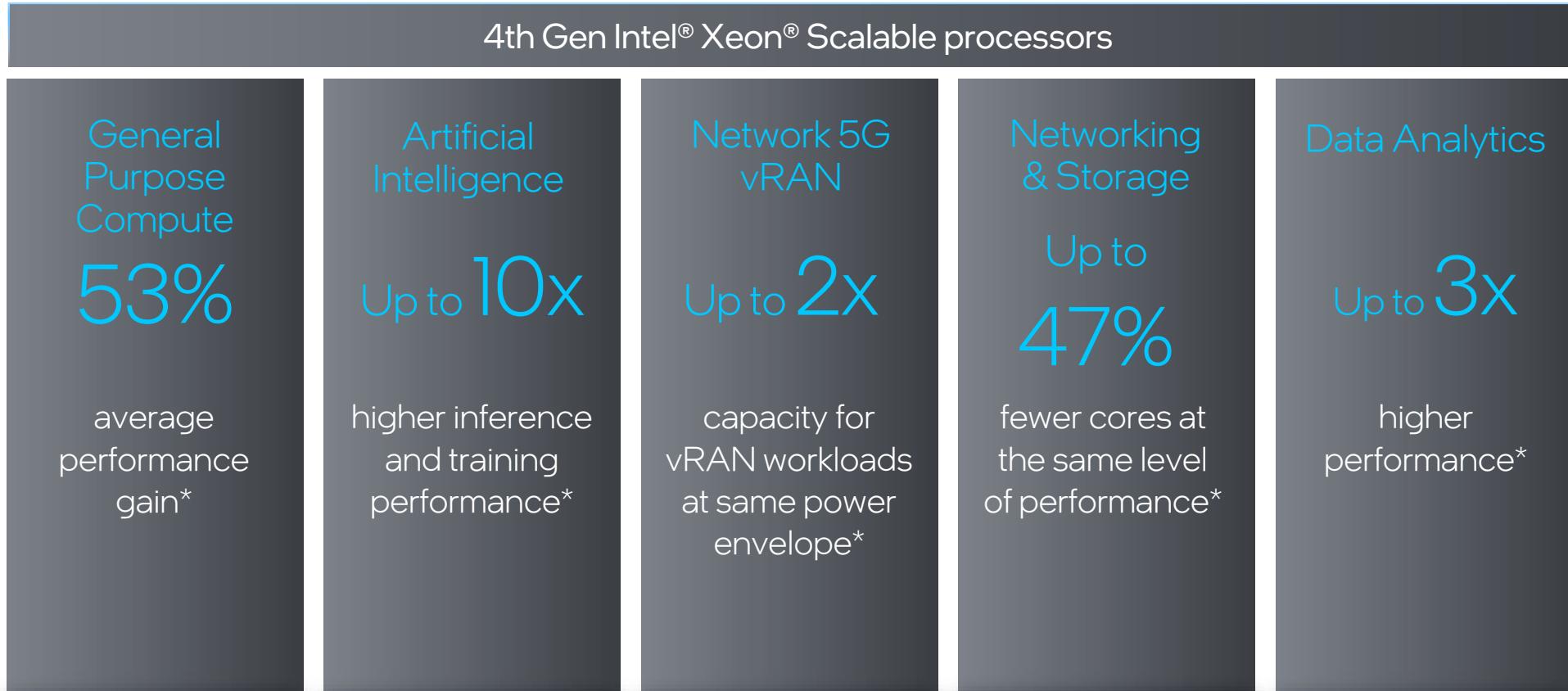
Increased I/O bandwidth with PCIe 5
80 lanes

Increased inter-socket bandwidth with UPI 2.0

Compute Express Link (CXL) 1.1

Hardware enhanced security

CPU + Accelerators: Differentiated Performance On Real Workloads



See [G1, A17, N10, N16, D1] at intel.com/processorclaims: 4th Gen Intel Xeon Scalable processors. Results may vary.

*4th Gen Intel Scalable Processor vs. 3rd Gen Intel Xeon Scalable processors

Maximize the Effectiveness of Every Core

New Integrated IP Acceleration Engines

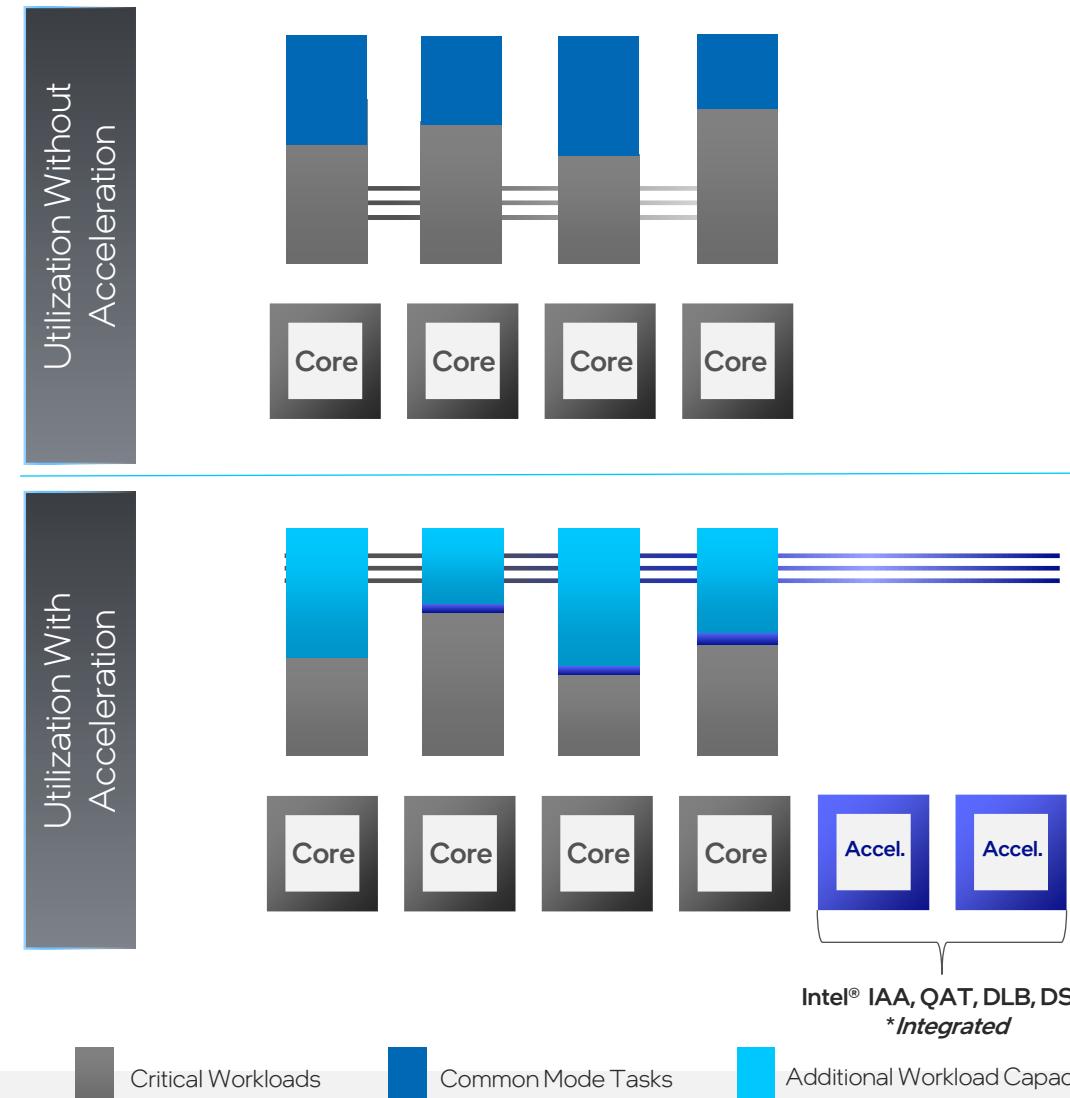
Intel® acceleration engines help free up cores for more general-purpose compute tasks, increasing overall workload performance and power efficiency

Integrated Accelerators

- Intel® QuickAssist Technology (Intel® QAT)
- Intel® Dynamic Load Balancer (Intel® DLB)
- Intel® Data Streaming Accelerator (Intel® DSA)
- Intel® In-Memory Analytics Accelerator (Intel® IAA)

New Instruction Set Architecture (ISA)

- Intel® Advanced Matrix (AMX)
- Intel® Advanced Vector Extensions for vRAN



Intel® Quick Assist Technology

Overview and Value

Intel and the Intel logo are trademarks of Intel Corporation or its subsidiaries

Intel® QuickAssist Technology – Services

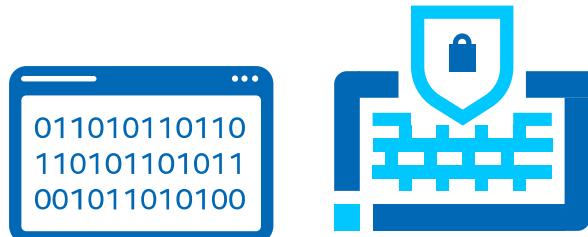
Intel® QuickAssist Technology integrates hardware acceleration of compute intensive workloads.

Accelerates bulk cryptography, public key cryptography & compression by offloading to Intel® QAT hardware

Enables significant gains in CPU efficiency, data footprint reduction, power utilization and application throughput

Intel® QuickAssist Technology

Cryptographic Ciphers, Hash & Authentication



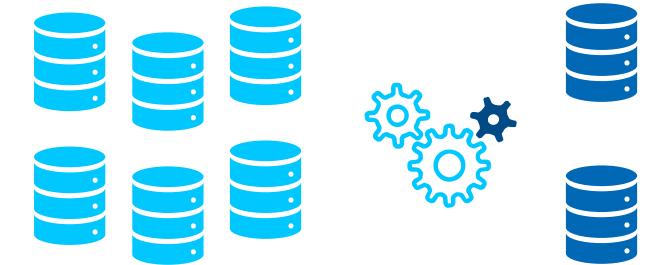
Symmetric encryption & Authentication

Public Key Cryptography



Asymmetric encryption, digital signatures

Compression/ Decompression



Lossless data compression/decompression for data in flight and at rest

Intel and the Intel logo are trademarks of Intel Corporation or its subsidiaries

4th Gen Intel® Xeon® Scalable Processors with Intel® QAT

2S PERFORMANCE GENERAL PURPOSE								
SKU	CORES	BASE (GHz)	ALL CORE TURBO (GHz)	Max TURBO (GHz)	CACHE (MB)	TDP (Watts)	Maximum Scalability	Default QAT Devices
8480+	56	2.0	3.0	3.8	105	350	2S	1
8460Y+	40	2.0	2.8	3.7	105	300	2S	1
8462Y+	32	2.8	3.6	4.1	60	300	2S	1
5415+	8	2.9	3.6	4.1	22.5	150	2S	1

2S MAINLINE GENERAL PURPOSE								
SKU	CORES	BASE (GHz)	ALL CORE TURBO (GHz)	Max TURBO (GHz)	CACHE (MB)	TDP (Watts)	Maximum Scalability	Default QAT Devices
6438Y+	32	2.0	2.8	4.0	60	205	2S	1
5420+	28	2.0	2.7	4.1	52.5	205	2S	1
4416+	20	2.0	2.9	3.9	37.5	165	2S	1

STORAGE & HYPERCONVERGED INFRASTRUCTURE (HCI) OPTIMIZED (-S)								
SKU	CORES	BASE (GHz)	ALL CORE TURBO (GHz)	Max TURBO (GHz)	CACHE (MB)	TDP (Watts)	Maximum Scalability	Default QAT Devices
6454S	32	2.2	2.8	3.4	60	270	2S	4
5416S	16	2.0	2.8	4.0	30	150	2S	2

<https://ark.intel.com/content/www/us/en/ark/products/series/228622/4th-generation-intel-xeon-scalable-processors.html>

IMDB/ANALYTICS/VIRTUALIZATION OPTIMIZED (-H) – SOCKET SCALABLE								
SKU	CORES	BASE (GHz)	ALL CORE TURBO (GHz)	Max TURBO (GHz)	CACHE (MB)	TDP (Watts)	Maximum Scalability	Default QAT Devices
8490H	60	1.9	2.9	3.5	112.5	350	8S	4
8468H	48	2.1	3.0	3.8	105	330	8S	4
8454H	32	2.1	2.7	3.4	82.5	270	8S	4
6448H	32	2.4	3.2	4.1	60	250	4S	2

5G / NETWORKING OPTIMIZED (-N)								
SKU	CORES	BASE (GHz)	ALL CORE TURBO (GHz)	Max TURBO (GHz)	CACHE (MB)	TDP (Watts)	Maximum Scalability	Default QAT Devices
8470N	52	1.7	2.7	3.6	97.5	300	2S	4
8471N	52	1.8	2.8	3.6	97.5	300	1S	4
6438N	32	2.0	2.7	3.6	60	205	2S	2
6428N	32	1.8	2.5	3.8	60	185	2S	2
5418N	24	1.8	2.6	3.8	45	165	2S	2
5411N	24	1.9	2.8	3.9	45	165	1S	2

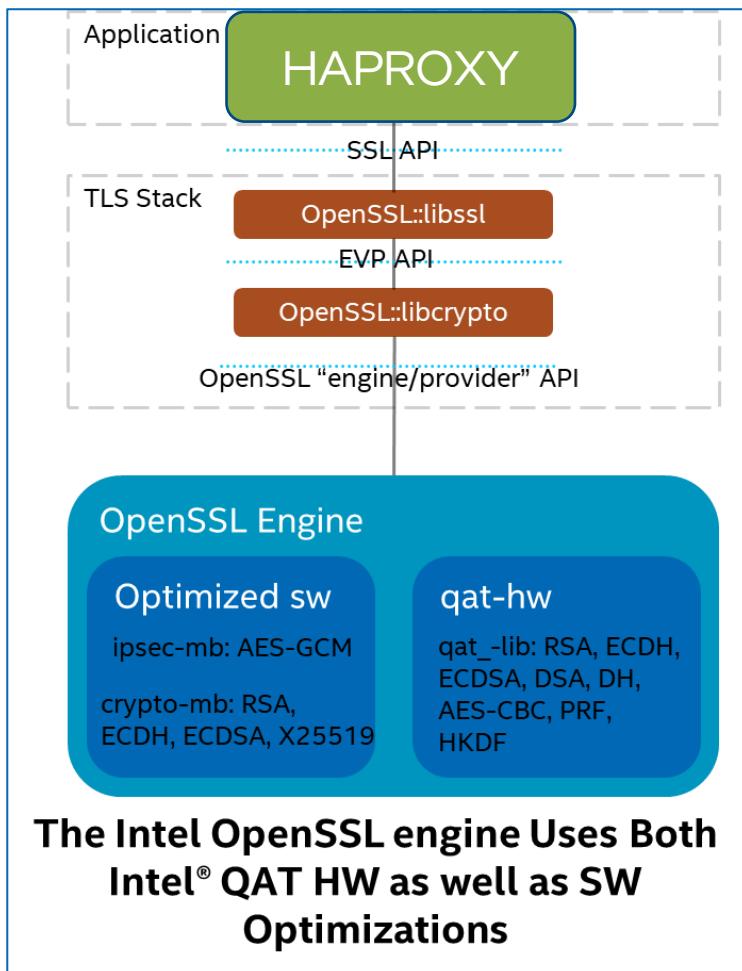
Intel® Crypto Acceleration

The instruction set that supports crypto acceleration

New Instructions for Crypto Acceleration

Instructions	Group Category	Usage	Ciphers
VPMADD52*	IFMA	Big Number Multiplication	RSA, ECDSA, ECDH, SM2
VAES*	Vectorized AES	Process up to 4 AES blocks per instruction	AES (all modes)
VPCLMULQDQ	Vectorized CMUL	Finite Field Computation (General)	AES-GCM, ZUC, Snow3G
GF2P8	Galois Field NI	Finite Field Computation ($GF(2^8)$)	ZUC
SHA	SHA Extensions	SHA Acceleration	SHA-2 256, SHA1

Intel® Crypto Acceleration with Intel® QAT Engine



Application	Crypto Instructions/SW Optimizations	Intel® QAT
High Performance TLS Security Appliance Load Balancer/NGFW		✓
Edge/SDWAN/5G Gateway	✓	✓
Content Delivery Network	✓	✓
WAN Acceleration		✓
Chaining Compression & Crypto		✓
East West Traffic	✓	

Configuration Steps: <https://networkbuilders.intel.com/solutionslibrary/intel-qat-engine-for-openssl-accelerating-openssl-from-appliance-to-public-cloud-technology-guide>

Intel and the Intel logo are trademarks of Intel Corporation or its subsidiaries

Intel CPU in Public Cloud for Optimized Crypto Acceleration

3rd Gen Intel® Xeon® Scalable Processors

AWS: C6i, c6in, m6i, m6in

[Amazon EC2 M6i](#)

[Amazon EC2 C6i](#)

GCP: N2 series with CPU platform as 'Intel Ice Lake'

<https://cloud.google.com/compute/docs/cpu-platforms>

Azure: Dv5, Dsv5 series

<https://learn.microsoft.com/en-us/azure/virtual-machines/dv5-dsv5-series>

The table shows current software and infrastructure pricing for services hosted in **US East (N. Virginia)**. Additional taxes or fees may apply.

Use of Local Zones or WaveLength infrastructure deployment may alter your final pricing.

	Hourly	Annual		
<input type="radio"/> c4.xlarge	\$0.35	\$0.199	\$0.549	▲
<input type="radio"/> c4.2xlarge	\$0.35	\$0.398	\$0.748	▼
<input type="radio"/> c4.4xlarge	\$0.35	\$0.796	\$1.146	▼
<input type="radio"/> c4.8xlarge	\$0.35	\$1.591	\$1.941	▼
<input type="radio"/> c5.large	\$0.35	\$0.085	\$0.435	▼
<input checked="" type="radio"/> c5.xlarge ★Vendor Recommended	\$0.35	\$0.17	\$0.52	▼
<input type="radio"/> c5.2xlarge	\$0.35	\$0.34	\$0.69	▼

HAProxy on Intel Platform in AWS

Intel, the Intel logo, and Xeon are trademarks of Intel Corporation or its subsidiaries

QAT Value Proposition for Networking/Storage/Cloud

➤ Performance

QAT Accelerates Ciphers, Public Key Encryption and Compression/Decompression for best-in-class performance of Networking & Storage, Database Applications

➤ Scalability

You can build your product lines performance scale with the acceleration you need (scaling from 1 to 4 QAT devices on-chip)

➤ Efficiency

Significant Core Utilization Savings translates to Significant Performance/Watt improvements.

Intel and the Intel logo are trademarks of Intel Corporation or its subsidiaries

Intel® QuickAssist Technology Quick Start Guide

Step 1: Get Intel® QAT hardware

- For 4th Gen Intel® Xeon® Scalable Processors hardware, contact your Intel Field Representative
- For previous generations, such as Intel® QuickAssist Adapter 8960/8970 PCIe cards, go [here](#)

Step 2: Get acquainted with the available resources

- Intel® QuickAssist Technology Main/Marketing - www.intel.com/quickassist
- Intel® QuickAssist Technology technical collateral & applications - <https://developer.intel.com/quickassist>
- Visit Network Builders for details on 3rd party solutions: <https://networkbuilders.intel.com>

Step 3: Follow our Getting Started Guide

- For released products: <https://developer.intel.com/quickassist>

Learn more about 4th Gen Intel® Xeon® SP

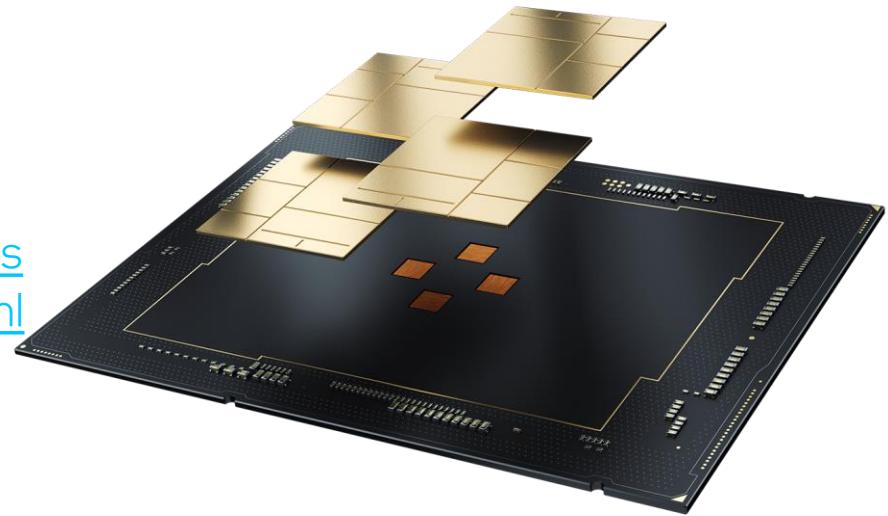
[Intel® Xeon® Scalable Processors](#)

[4th Gen Intel® Xeon® Scalable Processors](#)

[4th Gen Intel® Xeon® Scalable Processor product brief](#)

[Intel® Accelerator Engines](#)

<https://ark.intel.com/content/www/us/en/ark/products/series/228622/4th-generation-intel-xeon-scalable-processors.html>



Intel and the Intel logo are trademarks of Intel Corporation or its subsidiaries

Where To Find Us

HAProxy Technologies

www.haproxy.com

HAProxy Customer Portal

my.haproxy.com

HAProxy Technologies Support

support@haproxy.com

US: (844) 222-4340 (option 3) | EU: +33 1 30 67 60 74

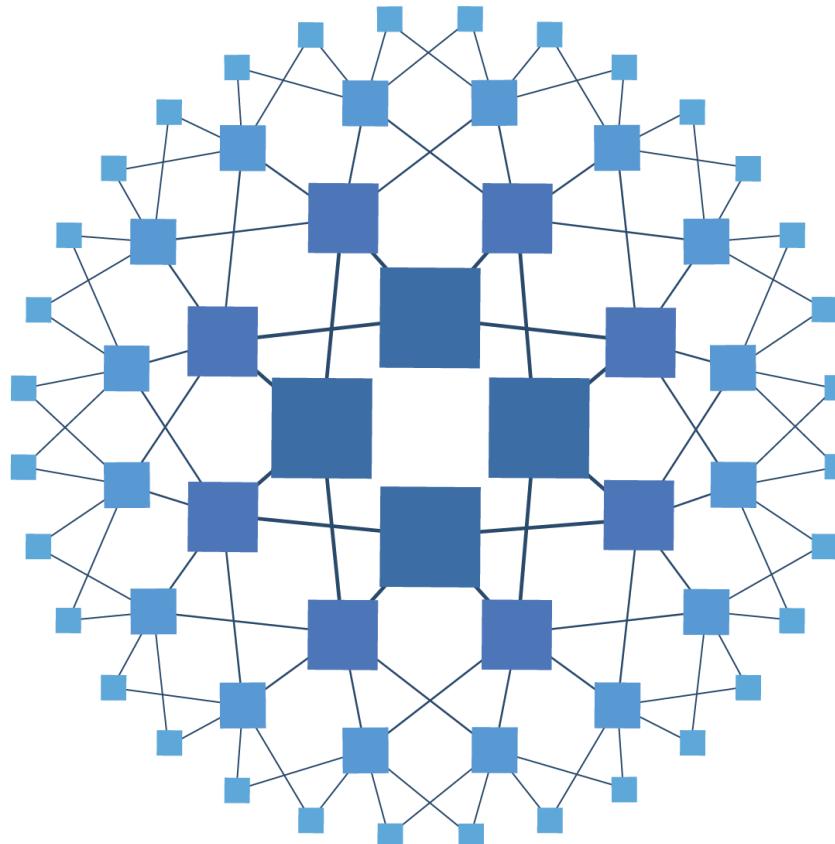
Use-case articles and blog posts

www.haproxy.com/knowledge-base/

They're Talking

<https://www.haproxy.com/user-spotlight-series/>

www.haproxy.com/company/user-references/



The Intel logo is displayed in white on a solid blue background. The word "intel" is written in a lowercase, sans-serif font. A small, solid blue square is positioned above the letter "i". The letter "i" has a vertical stroke on its left side. The letter "t" has a vertical stroke on its right side. The letter "e" has a vertical stroke on its left side. The letter "l" has a vertical stroke on its right side. A registered trademark symbol (®) is located at the bottom right of the "l".

Notices and Disclaimers

Performance varies by use, configuration and other factors. Learn more on the [Performance Index site](#).

Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See backup for configuration details. No product or component can be absolutely secure.

Your costs and results may vary.

Intel technologies may require enabled hardware, software or service activation.

© Intel Corporation. Intel, the Intel logo, and other Intel marks are trademarks of Intel Corporation or its subsidiaries. Other names and brands may be claimed as the property of others.

System Configuration

Software	4 th Gen Intel Xeon Scalable Processor
Workload & version	
HAProxy 2.7	https://github.com/haproxy/haproxy/releases/tag/v2.7.0
Compiler	GCC 11.3.0
Libraries	
Openssl	https://github.com/openssl/openssl/releases/tag/OpenSSL_1_1_1k
qatengine	https://github.com/intel/QAT_Engine (v0.6.15)
QAT Driver	QAT20.1.0.9.6-00024

Name	Intel Xeon
Time	Thu Dec 29 08:46:14 PM UTC 2022
System	Quanta Cloud Technology Inc./QuantaGrid D54Q-2U
Baseboard	Quanta Cloud Technology Inc./S6Q-MB-MPS
Chassis	Rack Mount Chassis
CPU Model	Intel(R) Xeon(R) Platinum 8480+ /stepping 6
Microarchitecture	4 th Gen Intel Xeon SP
Sockets	2
Cores per Socket	56
Hyperthreading	Enabled
CPUs	112
Intel Turbo Boost	Enabled
Base Frequency	2.0 GHz
All-core Maximum Frequency	3.0 GHz
Maximum Turbo Frequency	3.8 GHz
NUMA Nodes	2
Prefetchers	L2 HW, L2 Adj., DCU HW, DCU IP
PPINs	4389aa1f29841ea3, 4385b81fc74d5439
Accelerators	QAT:2 - inbuilt
Installed Memory	256GB
Hugepagesize	2048 kB
Transparent Huge Pages	madvise
Automatic NUMA Balancing	Enabled
NIC	4x Ethernet Controller E810-C for QSFP 2x Ethernet Controller X710 for 10GBASE-T
Disk	960GB- 2xSanDisk SSD PLUS 480 GB
BIOS	American Megatrends Inc., 06.00.05
Microcode	0x2b000081
OS	Ubuntu 22.04.1 LTS
Kernel	5.15.0-52-generic
TDP	350 watts
Power & Perf Policy	Performance
Frequency Governor	powersave
Frequency Driver	intel_pstate
Max C-State	9