Product Brief

Intel® Network Engines
4th Gen Intel® Xeon® Scalable Processors

Faster, More Flexible Networks with Built-in Accelerators on 4th Gen Intel® Xeon® Scalable Processors

"As software-defined 5G networks become more prevalent, Intel® Network Engines provide more CPU processing cycles, more efficiency, and more intelligence to accelerate the network from core to edge."

—Sachin Katti, VP, CTO, and CSO, Network and Edge Group (NEX), Intel

4th Gen Intel® Xeon® Scalable processors integrate Intel® Network Engines—accelerators targeting key networking workloads—directly onto the processor. This innovation reduces the dependence on external accelerators, speeds up data processing, and frees up CPU cycles for key networking workloads. The result? Networks that are ready for increased virtualization, more traffic, and future workloads at the core and the edge.

Taking advantage of opportunities at the network edge

5G network topologies reach from the cloud to the core to the edge. Software-defined networking (SDN) is making it possible to orchestrate end-to-end virtualization for moving data and running applications across a common architecture that's easier to manage than disparate networks. The main challenges that stand in the way are network complexity, a security perimeter that's harder to protect from more-sophisticated attacks, and persistent growth in data variety and volume.

Managing network expansion across four big categories

To keep up with rapid market changes and evolving competitors, mobile network architects need to accelerate networking workloads across four key categories.

- **Encryption processing:** Two critical elements of network security are data encryption and decryption, which are resource-intensive workloads. If you expend all your CPU cycles on encryption/decryption, you have less processing power for packet forwarding and control plane apps.
- **Control plane:** Control plane activities set behaviors for specific components, such as a network switch, so the components know what rules to follow. Low latency is a top priority for control plane activities, and failure to issue controls in a timely manner can degrade total network performance.
- **Data plane:** Simply put, the data plane or data path refers to moving data around the network across core, cloud, and edge. In 5G networks, data rates are growing from tens of gigabits to hundreds. In data centers, the data rates are pushing into terabit territory.
- **Signal processing:** Signal processing converts radio signals to digital commands and vice versa. Without fast signal processing, cloud-native, virtualized radio access networks (vRAN) wouldn't be possible. As 5G increases data loads, signal processing will require more processing resources to meet demand.

Intel® Network Engines: Built-in accelerators drive network expansion

How do you manage networking workloads flexibly and intelligently while leaving headroom for growth? That's where 4th Gen Intel Xeon Scalable processors really shine. This generation takes several external accelerator technologies and integrates them into the processor. Workloads can be shifted to/from accelerators within the processor through simple code changes, allowing for easy data mobility and scalability as the number of cores increase in edge, cloud, or data center deployments.

Enhanced network performance with 4th Gen Intel® Xeon® Scalable processors

Fewer cores, faster compression

Intel® QuickAssist Technology (Intel® QAT) ›

Up to

95% fewer cores

and up to

2x higher throughput

for Level 1 compression[1]

Better virtual gateway performance

Gen-over-gen improvement

Up to

2x better

virtual broadband network gateway (vBNG) performance[2]

More capacity

Intel® Advanced Vector Extensions (Intel® AVX) for vRAN ›

Up to

2x the capacity

at the same power envelope for vRAN workloads[3]

More efficiency

Intel® vRAN Boost

Up to

20% reduced

vRAN compute power consumption[4]

1. See [N16] at intel.com/processorclaims: 4th Gen Intel® Xeon® Scalable processors. Results may vary.
2. See [N2] at intel.com/processorclaims: 4th Gen Intel® Xeon® Scalable processors. Results may vary.
3. See [N10] at intel.com/processorclaims: 4th Gen Intel® Xeon® Scalable processors. Results may vary.
4. See [N9] at intel.com/processorclaims: 4th Gen Intel® Xeon® Scalable processors. Results may vary.

Encryption accelerators free up CPU cycles for network functions

Previously available as an accelerator on Intel® Ethernet controllers and other Intel® Xeon® processors, Intel® QuickAssist Technology (Intel® QAT) is now a built-in accelerator on the 4th Gen Intel® Xeon® Scalable platform. The processor moves encryption, compression, and public key exchange workloads to Intel QAT, freeing up CPU cycles for other network functions. As network architects look to virtualize more functions and capabilities—such as secure access service edge (SASE)—Intel QAT helps create vital processing capacity that benefits the whole network.

Smarter resource allocation supports low-latency control plane commands

Intel® Dynamic Load Balancer (Intel® DLB) automatically balances workloads across different CPUs so that one CPU isn't overloaded, which can lead to bottlenecks and degrade whole system performance. Even when system loads fluctuate, Intel DLB delivers consistent workload balancing. Intel DLB also helps ensure low latency for control plane commands so that networks stay responsive to orchestration, even in periods of dense traffic.

Faster data movement between processors and networked resources

Intel® Data Streaming Accelerator (Intel® DSA) is an evolution of the direct memory access capability that optimizes data copy and transformation operations. This improvement takes place both within the processor and between the processor and external resources in a network, including add-in cards, memory, storage arrays, and other CPUs. The impact on network performance yields high efficiency for software tools.

More-efficient signal processing for vRAN workloads

Intel has been investing in vRAN capabilities since their inception and has produced years of research, ecosystem collaboration, and commercial deployments. Many of the lessons learned from Intel's experience in 5G and vRAN deployments have been synthesized into technical achievements like Intel® vRAN Boost, which increases the efficiency of vRAN Layer 1 signal processing workloads by fully integrating forward error correction (FEC) acceleration into 4th Gen Intel Xeon Scalable processors. Intel vRAN Boost helps eliminate the need for external accelerator cards, thereby reducing compute power consumption by approximately 20 percent.[4] 4th Gen Intel Xeon Scalable processors with built-in Intel® Advanced Vector Extensions (Intel® AVX) for vRAN provide up to 2x more vRAN capacity than 3rd Gen Intel® Xeon® Scalable processors without increasing power consumption.[3] These innovations help network operators get better performance from their vRAN networks.

More-granular controls for fine-tuning network performance

Not all resources in a network need the same amount of compute performance, nor do they experience the same peak workloads at the same time. Intel® Speed Select Technology (Intel® SST) is a key feature of 4th Gen Intel Xeon Scalable processors that grants communications service providers (CoSPs) more-active, expansive control over CPU performance. CoSPs can use Intel SST to create multiple configuration profiles on each server. Intel SST profiles can prioritize specific workloads across specific time frames or prioritize server utilization and energy efficiency. CoSPs can use Intel SST to offer scalable performance for end customers by setting base or priority frequency to workloads as needed.

How Intel® Network Engines make network operators' lives easier

Challenge	Solution
Encryption processing: CPU-intensive workloads for data security	**Intel® QuickAssist Technology** accelerates encryption and frees up CPU cycles for network functions.
Control plane: Network orchestration requiring low latency	**Intel® Dynamic Load Balancer** helps prevent bottlenecks and delivers low latency for control plane workloads.
Data plane: Data growth in the gigabits (edge) and terabits (core)	**Intel® Data Streaming Accelerator** moves data quickly throughout the network.
Signal processing: More 5G network capacity in a small footprint	**Intel® vRAN Boost** makes vRAN workloads more efficient[4] for high-capacity networks.

Conclusion: Intel Networking Engines deliver more value from essential hardware

By integrating accelerators into the 4th Gen Intel Xeon Scalable processor die, Intel is providing more value to a baseline component that network builders are already buying. Integrated accelerators also reduce the need for external accelerators, which leads to less complexity in the configuration and a more concise bill of materials (BOM). For enterprises that are driving end-to-end virtualization across their networks, this latest generation of processors makes it easier to run core, edge, and RAN workloads on a common platform.

intel XEON®

Learn more

See how built-in accelerators can help improve the performance of your fastest-growing workloads at **intel.com/4thgenxeon**.

Explore how to get the most out of Intel Xeon Scalable processors with built-in accelerators at **intel.com/xeonscalable**.

Learn more about Intel Network Engines

Intel QuickAssist Technology ›

Intel Dynamic Load Balancer ›

Intel Data Streaming Accelerator ›

Intel® vRAN solutions ›

Intel Speed Select Technology ›

1. Up to 95 percent fewer cores and up to 2x higher throughput for Level 1 compression. See [N16] at intel.com/processorclaims: 4th Gen Intel® Xeon® Scalable processors. Results may vary.
2. Up to 2x better virtual broadband network gateway (vBNG) performance. See [N2] at intel.com/processorclaims: 4th Gen Intel® Xeon® Scalable processors. Results may vary.
3. Up to 2x the capacity at the same power envelope for vRAN workloads. See [N10] at intel.com/processorclaims: 4th Gen Intel® Xeon® Scalable processors. Results may vary.
4. Up to 20 percent reduced vRAN compute power consumption. See [N9] at intel.com/processorclaims: 4th Gen Intel® Xeon® Scalable processors. Results may vary.

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