Workload Brief
3rd Gen Intel Xeon Scalable Processor
Content Delivery Network (CDN)

Increasing Throughput per Node for Content Delivery Networks

Intel is helping Content Delivery Network (CDN) providers implement flexible, cost-effective infrastructure to address increasing content demands.

As connected devices proliferate, so does high-resolution content such as live video, cloud gaming, and 360 video. Operators of content delivery networks (CDNs) must respond by shifting from simply meeting peak delivery capacity to delivering rich content at a sustained quality of experience. At the same time, CDN providers are compelled to do more with less, as infrastructure budgets remain relatively flat. As providers evolve their infrastructure, processing performance, memory, and software can play a key role.

3rd Generation Intel® Xeon® Scalable processors and the latest Intel Optane™ persistent memory enable up to 1.63x higher throughput and up to 1.33x more memory capacity,[1] enabling CDNs to serve the same number of subscribers at higher resolution or a higher number of subscribers at the same resolution.

Comprehensive Approach for High-Performance CDNs

To support the CDN transformation, Intel delivers a breadth of hardware including processors, accelerators, persistent memory, SSDs, and Ethernet controllers, invests significantly in the open-source CDN software ecosystem and collaborates deeply with software leaders and solution providers. This provides a strong technology foundation to build flexible infrastructure that is cost-effective for today and able to meet the needs of the future.

Compared to predecessor platforms, nodes based on the 3rd Generation Intel Xeon Scalable processor with the latest Intel Optane persistent memory offer a up to a 1.63x improvement in throughput and a 1.33x increase in memory capacity, as shown in Figure 1.[1]

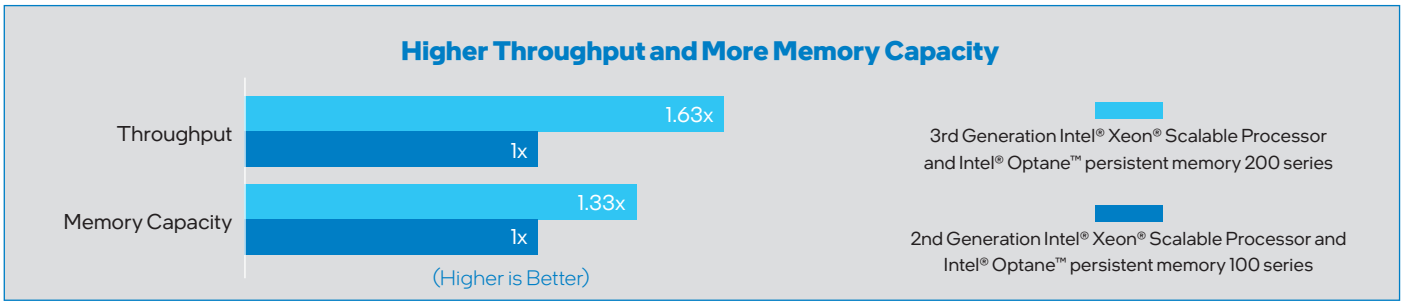

Figure 1. Serve the same number of subscribers at higher resolution or a higher number of subscribers at the same resolution.[1]

3rd Generation Intel Xeon Scalable Processors

Increasing streams-per-node density is a core objective for CoSPs as they deploy next-generation CDNs. 3rd Generation Intel Xeon Scalable processors, based on a balanced architecture with built-in acceleration and advanced security capabilities, deliver significant increases in performance over predecessor platforms, as well as availability over a wide range of core counts, frequencies, and power levels. Increases in per-core compute capacity are balanced by advances in the memory and I/O subsystems, with increased memory bandwidth and capacity, larger L1 caches, and an upgrade to support PCIe 4.0.

The processor enhances cryptographic acceleration with a new instruction set that increases throughput for encrypted data, without the need for dedicated hardware accelerators. Because of the rapid growth in encrypted content and the added encryption requirements posed by 5G, this added efficiency is a critical enabler for CDN operations going forward. For video on demand (VoD) CDNs, Intel® Software Guard Extensions (Intel® SGX) creates isolated memory enclaves to help securely store keys at the edge, retaining custody of content provider SSL/TLS private keys.

Intel Optane Persistent Memory

Live linear video content tends to be transient, meaning that it is only cached or buffered for a brief period of time. Intel Optane persistent memory is well-suited to the constant write cycles of this use case.[2] Intel Optane persistent memory enables providers to increase the amount of memory per node, enabling them to expand CDN capacity with fewer nodes, reducing both CapEx and OpEx.

With lower cost per GB than dynamic random-access memory (DRAM) but similar performance, Intel Optane persistent memory creates a memory capacity tier based on modules that are socket-compatible with DRAM and available in 128 GB, 256 GB, and 512 GB capacities. Memory-intensive workloads associated with caching live media content require CDN systems to be provisioned with large amounts of memory—often at terabyte scale—to achieve optimal density. The CapEx of DRAM at these capacities can be prohibitive, creating untenable tradeoffs between performance and total cost of ownership (TCO).

Open-Source Software

Intel's ongoing investment in open-source software includes both code contributions and stewardship to move the CDN ecosystem forward and lower the barriers to adoption for creating and monetizing Visual Cloud services. Turnkey software-stack images and recipes streamline development of CDN pipeline components such as content caching, transcode, and analytics.

- **Open Visual Cloud** provides reference pipeline recipes for visual cloud services using existing open-source functions with optimizations for Intel technology. The Open Visual Cloud provides high-performance, high-quality, open-source, validated building blocks—across encode, decode, inference, and rendering—as well as reference pipelines that support visual cloud workloads. The goal is to minimize barriers to innovation for quickly and easily creating and monetizing Visual Cloud services. Support for familiar industry-standard frameworks draws from the larger open-source community and include media (FFMPEG and GStreamer), AI (TensorFlow, Caffe, MXNet, ONNX, Kaldi), and graphics (OpenGL, DirectX).
- **Open Network Edge Services Software (OpenNESS)** enables highly optimized and performant edge platforms to on-board and manage applications and network functions with cloud-like agility across any type of network.

Intel's broader commitment to open-source contributions includes upstream enablement of popular open-source caching platforms such as NGINX and Apache Traffic Server (ATS) to provide optimized results on Intel architecture.

Intel® Select Solutions

The complexity of data centers today requires the right mix of hardware and software components to build an infrastructure that meets customer requirements. Intel® Select Solutions for Visual Cloud Delivery Network eliminate guesswork with rigorously benchmark tested and verified solutions optimized for real-world performance. The solution was upgraded with the newest 3rd Generation Intel Xeon Scalable processors, and it features the 100 Gb Intel® Ethernet 800 Series Network Adapter, Intel Optane persistent memory, Intel® Optane SSDs, and the Intel® Server GPU. This solution can help accelerate a range of CDN use cases in support of VoD, live streaming, and live transcoding.

Partner Proof Point: AT&T

Intel and AT&T have been engaged in a strategic technology collaboration since 2016. Engineers from both companies work together closely to develop and perfect new technologies and configurations that drive a scalable, standards-based infrastructure to address the increased demand for live, rich, high-resolution content.

"AT&T has had a long-standing strategic partnership with Intel. Now, with the combination of the latest performance of the Intel Xeon Scalable processors and the flexibility and power savings of Intel Optane persistent memory, AT&T can expand our CDN capacity with fewer nodes, providing significant TCO savings."

–Sunil Maloo, Assistant Vice President, AT&T

AT&T must meet peak CDN delivery capacity while sustaining the quality of the user experience, and it must do so cost-effectively. Migrating to the latest Intel architecture-based systems promises efficiency improvements for AT&T. With this combination of processor performance and persistent memory power savings, AT&T can effectively expand CDN capacity with fewer nodes, providing significant TCO savings. The platform also enables easier scalability to meet emerging needs for higher levels of traffic and new use cases.

At the rack level, AT&T also found that, based on their existing test system configurations, its unit costs were reduced by an estimated 20 percent per GB versus the equivalent DRAM-only configuration.[3] In addition, the flexibility to provision servers in one- or two-socket configurations with components such as Intel Optane persistent memory maximizes their ability to tailor nodes to specific needs.

Conclusion

Advancements in hardware technologies and software can help CDN providers develop solutions to meet the trend toward linear content such as live video. The combined capabilities of the 3rd Generation Intel Xeon Scalable processor, Intel Optane persistent memory 200 series, and optimized open-source software deliver performance gains and increases in memory bandwidth that provide a cost-effective way to expand CDN capacity.

More Information

Intel Visual Cloud: intel.com/visualcloud

Intel Select Solutions for Visual Cloud Delivery Network:
networkbuilders.intel.com/intelselectsolutions/intel-select-solutions-for-visual-cloud-delivery-network

Network and Edge vSummit – CenturyLink (Lumen) and the Global CDN Transformation:
cdn.jwplayer.com/players/EwJonN6F-v2VOXzX8.html

Intel and Rakuten at IBC 2020 – A case for Cloud Native CDN: ibc.org/ibcshowcase/a-casefor-cloud-native-cdn/6650.article

Intel and VMware at VM World – Deploying Scalable Media CDNs:
vmworld.com/en/video-library/search.html#text=%22CDN%22&year=2020

Intel QCT and Robin webinar – Architecture for High-Performance Cloud-Native CDN:
lightreading.com/webinar.asp?webinar_id=1685

Application Note – Intel Optane Persistent Memory-Content Delivery Networks Use Case:
networkbuilders.intel.com/solutionslibrary/intel-optane-dc-persistent-memory-content-delivery-networks-use-case

Intel® Ethernet 800 Series Network Controllers and Adapters: intel.com/Ethernet

[1] Performance varies by use, configuration and other factors. See [91] at www.intel.com/3gen-xeon-config

[2] Intel Optane persistent memory modules have unlimited endurance (write cycles) over a five-year life. This assumes 100 percent write (and other access patterns) at maximum persistent memory bandwidth utilization for five years at the target power of 15 W. Media write cycles would extend well past five years.

[3] TCO improvement measured on 2/11/21, comparing 2nd generation Intel Xeon Scalable Processor with Intel® Optane™ persistent memory (one node, 2x Intel® Xeon® Gold 6238R processors, 28 cores), Intel Hyper-Threading Technology enabled, Intel Turbo Boost Technology enabled, total memory 1216 GB (12 slots/16 GB/2666 MT/s, 8 slots/128 GB Intel Optane persistent memory/2666 MT/s) to 2nd generation Intel Scalable Processor with DRAM-only Memory (one node, 2x Intel® Xeon® Gold 6238R Processor, 28 cores), Intel Hyper-Threading Technology enabled, Intel Turbo Boost Technology enabled, total memory 768 GB (12 slots/68 GB/2933 MT/s).

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