



# SUPERMICRO DUAL-PROCESSOR SOLUTION FOR HIGH PERFORMANCE VISUAL CLOUD DELIVERY NETWORK

*Supermicro X12 1U/2U Ultra Servers Verified as Intel® Select Solutions for Visual Cloud Delivery Network (VCDN)*

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## SUPERMICRO

As a global leader in high performance, high efficiency server technology and innovation, we develop and provide end-to-end green computing solutions to the data center, cloud computing, enterprise IT, big data, HPC, and embedded markets. Our Building Block Solutions® approach allows us to provide a broad range of SKUs, and enables us to build and deliver application-optimized solutions based upon your requirements.

## Summary

Consumer streaming media use is growing exponentially and evolving to richer content. This rapid growth in demand is an opportunity for communication service providers, cloud service providers, and enterprise infrastructure companies to expand or add visual services to their networks.

Supermicro has partnered with Intel to support this rapid growth to develop a first-in-class cloud services delivery platform based on industry-leading technologies. Using this innovative solution, communication service providers, cloud service providers, and enterprise infrastructure companies can efficiently utilize their networks to drive advanced visual services innovations.

The Supermicro X12 dual-socket Ultra 1U/2U systems featuring 3<sup>rd</sup> Generation Intel® Xeon® Scalable processors with versatile and upgradeable processors and storage are verified as Intel Select Solutions for VCDN.

These systems feature high-performance, flexible configurations with well-balanced and optimized hardware for maximum throughput and lowest latency. They also feature support for Intel® Optane™ Persistent Memory (PMem) and Intel® Optane™ SSD technologies and NVMe storage for reduced latency and highest performance. Efficient thermal balancing allows the systems to support up to 270-watt processors.

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## Introduction

The global market for visual content continues to grow exponentially as traditional video content from satellite and cable networks, video on demand (VoD), live streaming, emerging visual gaming, and virtual reality shifts to the internet. Communication service providers, cloud service providers, and enterprise infrastructure companies anticipate that this increasing video traffic means that their content delivery network (CDN) must push further to the Edge using geographically distributed groups of servers working together to meet increasing bandwidth demands, deliver the best Quality of Service (QoS) and Quality of Experience (QoE), with a fast time to market (TTM) and low total cost of ownership (TCO).

To support these needs, Supermicro has partnered with Intel to develop a server platform for the Intel Select Solutions for VCDN. This solution is based on a hardware and software reference design architected to reduce development time and streamline procurement and deployment solutions for network and infrastructure operators. High-quality services are ensured while the risk of introducing advanced technologies is reduced with a proven hardware and software reference design. This reference design focuses on the four primary VCDN applications of web caching, VOD, live streaming, and media transcoding.

## Solution Overview

The Supermicro solution platform verified as an Intel Select Solution for VCDN consists of high-performance, flexible configurations, well-balanced, and optimized hardware resources verified with a software stack residing either on virtualized infrastructure or bare metal. The solution stack can use the most common and popular open source CDN caching frameworks such as NGINX, Apache Traffic Server (ATS), and Varnish. It also leverages open source media libraries such as FFmpeg and Scalable Video Technology for media transcoding. In addition, acceleration is built into the system for key functions such as cryptography, data compression, and transcoding. The Supermicro verified platforms meet the software and hardware stack requirements outlined by the solution reference design specifications in a simple, consistent deployment experience.

## Supermicro X12 Ultra Platform

The Supermicro X12 Ultra 1U/2U SuperServers (Figure 1) support 3rd Generation Intel® Xeon® Scalable processors with versatile and upgradeable features:

- System to support higher core density processors up to 270W TDP
- 3<sup>rd</sup> Generation Intel® Xeon® Scalable processors with 64 lanes of PCI-E 4.0, improving I/O throughput while reducing latency
- 32 DIMM slots support a variety of DDR4-3200/2933/2666MHz ECC DIMM and Intel® Optane™ PMem, offering the best cost-per-performance without worrying about NUMA
- 1U Ultra supports up to 12 Hot-swap 2.5" tool-less drive bays and 2U Ultra Support up to 22 NVMe drives with onboard Intel vROC RAID controller for RAID 0, 1, 5, and 10 (vROC RAID requires an additional license key)
- Flexible on-board 1/10/25G Ethernet options and one dedicated BMC RJ45 LAN port
- Up to 8 PCIe Gen4 expansion slots
- Hot-swappable redundant Titanium Level 1200W/1300W(DC)/1600W/2000W power supplies
- Root-of-Trust implementation for enhanced security



Figure 1: X12 Ultra 2U and 1U SuperServers

With these advanced features, this system offers many benefits for VCDN. For example, it can efficiently support live video web caching with its large high-speed DDR4 memory complement as well as Intel Optane PMem, deliver video on demand effectively by utilizing all-flash NVMe storage resources, offer video streaming live with high-bandwidth networking, and provide rapid media transcoding with the latest high-performance processors.

### VCDN Configuration Test Environment

The following Supermicro X12 Ultra 1U SuperServer hardware configuration (Table 1) was used for the Intel Select Solutions for Visual Cloud Delivery Network testing:

Ingredient	Configuration
Server	Supermicro X12 Ultra 1U SYS-120U-TNR
Processor	2x 3rd Gen Intel® Xeon® Platinum processor 8360Y (2.4GHz, 36C/72T, 250W)
Memory	16x 16GB DDR4-3200, 16x 128GB Intel® Optane™ Persistent Memory 200 Series
Network Adapters	2x 100GbE Intel® Ethernet Network Adapter E810-CQDA2
Storage	10x Intel® Solid State Drive (Intel® SSD) D7-5510 series (3.84TB),
Boot Drive	2x Intel® SATA SSD D3-S4610 (3.84TB)

Table 1: Supermicro VCDN dual-socket Configuration

This white paper outlines the benchmarking setup for the four different VCDN use cases: Web Caching, VOD, Live Streaming, and Media Transcoding. The setup consists of an Origin content node, two client nodes as load generators, and an Ultra 1U SYS-120U-TNR as System Under Test (SUT), connected via a Supermicro 100GbE L2/L3 Ethernet switch (as shown in Figure 2 ). To establish true benchmark value, all of these systems were run on bare metal, although virtualized or containerized environments could also be used depending on the requirement.

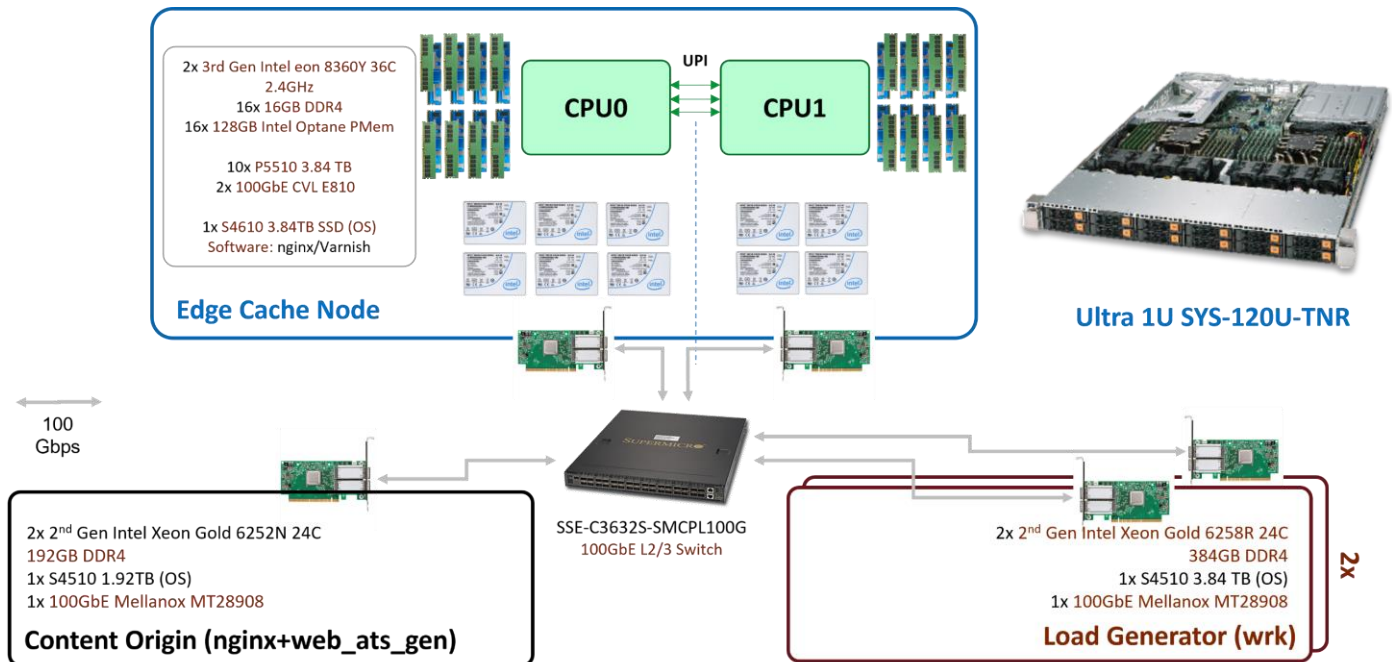


Figure 2: Reference Design Test Architecture

## Benchmarking

The following describes the benchmarking tests for Web Caching, VOD, and Live Streaming. The software stack for these Supermicro reference design benchmarking tests utilizes the *NGINX* framework based on testing software availability. However, the same tests can be run using other popular open source CDN caching frameworks such as Apache Traffic Server (ATS) or Varnish Plus software.

- Origin Server running NGINX 1.16.1 serving the requested files.
- SUT running NGINX Stack 1.16.1, which acts as an edge content caching server.
- Two clients nodes are running wrk, a modern HTTP benchmarking tool capable of generating significant load to simulate HTTPS request traffic sent to the SUT edge content caching server.
- The tests were established to measure and characterize the most relevant criteria and performance parameters for a real world content delivery network.
- The tests measure and demonstrate the number of HTTPS requests per second, the response latency, and throughput the SUT can sustain with the given connections at:
  - 99% cache hit ratio for Web Caching
  - 90% to 99% cache hit ratio for VOD
  - 93% to 95% cache hit ratio for live streaming video

Figure 3 outlines how the end user experience could significantly improve with the low latency and faster response time served by these geographically distributed groups of VCDN servers working together.

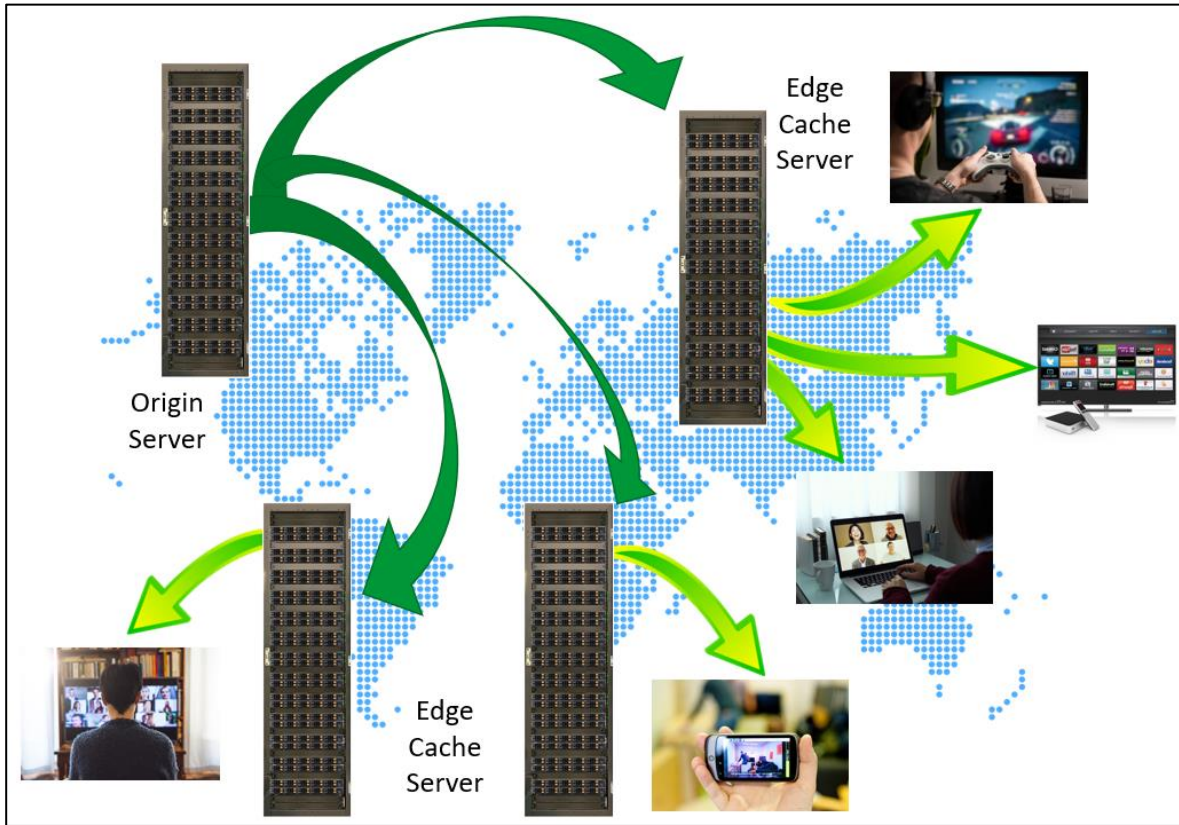


Figure 3: Value of VCDN Cache Servers

### Media Transcoding

Media Transcoding measures the maximum number of simultaneous transcoding streams that the SUT can sustain at the target frame rates. The 1:1 video transcoding performance benchmark was performed using FFmpeg with the SVT-HEVC codec plugin, which is highly optimized for Intel Xeon processors. The test clips used for benchmarking the video transcoding test were 4K 60 FPS and 1080P 30 FPS H.265. The video transcoding test was run on the SUT itself and did not require a client.

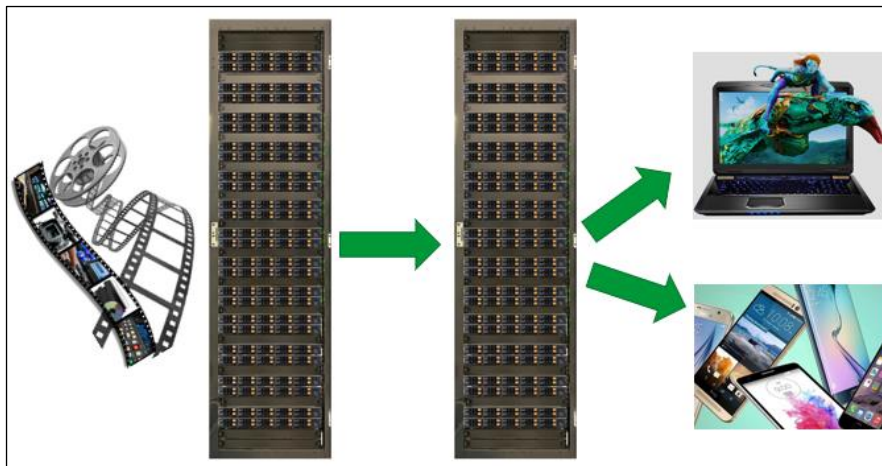


Figure 4: Media Transcoding Example

## Performance

The four tables below show the benchmark results of the Supermicro Ultra 1U SYS-120U-TNR system measured against a series of key performance indicators (KPI) set by Intel Select Solutions for VCDN. On each test case, the Supermicro Ultra 1U SYS-120U-TNR system meets and exceeds the requirements for these reference design performance benchmarks for the Intel Select Solutions for VCDN.

Benchmark	Key Performance Indicators	Ultra 1U SYS-120U-TNR
<b>Web Asset Caching</b>  Keepalive off 512 conns 100% TLS >99% cache hit ratio	HTTPS req/s (10 KB)	40666
	Latency (Time to last Byte) ms	2.70 (avg)
		6.38 (p90)
		13 (p99)

Table 2: Web Asset Caching Benchmark Performance Results

Benchmark	Key Performance Indicators	Ultra 1U SYS-120U-TNR	
<b>VOD</b>  Keepalive on 512 conns 100% TLS 90%-99% cache hit ratio  (cache on NVMe)		90% Cache Hit Ratio	99% Cache Hit Ratio
	HTTPS req/s (1MB)	22552	20923
	Latency (Time to last Byte) ms	32 (avg)	31 (avg)
		64 (p90)	66 (p90)
		248 (p99)	231 (p99)
HTTPS Throughput (Gbps)	161	159.68	

Table 3: Video on Demand Benchmark Performance Results

Benchmark	Key Performance Indicators	Ultra 1U SYS-120U-TNR
<b>Live Linear</b>  Keepalive on 512 conns 100% TLS 93% cache hit ratio  (cache in Intel® Optane™ SSD)	HTTPS req/s (1MB)	22366
	Latency (Time to the last Byte) ms	27 (avg)
		53 (p90)
		207 (p99)
HTTPS Throughput (Gbps)	170.7	

Table 4: Live Streaming Benchmark Performance Results



Benchmark	Key Performance Indicators	Ultra 1U SYS-120U-TNR
<b>Media Transcoding</b>  (Xeon only)	H.265 to H.265 (1080p 30fps)	48 streams
	# of streams	
	H.265 to H.265 (4K 60fps)	10 streams
	# of streams	

Table 5: Media Transcoding Benchmark Performance Results

Optimized for VCDN, the Supermicro X12 Ultra SuperServer meets and exceeds the reference design performance benchmarks for the Intel Select Solutions for VCDN.

- Web asset caching hit ratio reached 40,666 HTTPS requests per second
- Video On Demand HTTPS throughput at 99% cache hit measured at 159.68 Gbps
- Live streaming HTTPS throughput achieved 170.7 Gbps with an average latency of 27ms
- 48 simultaneous Media Transcoding streams of H.265 to H.265 (1080p @30 frames per second)

## Conclusion

The global market for visual services continues to grow exponentially, offering challenges and opportunities throughout the IT visual services delivery industry. Supermicro has partnered with Intel to support this rapid growth to develop a reference cloud services delivery platform to empower communication service providers, cloud service providers, and enterprise infrastructure customers to efficiently drive advanced visual services innovations. Comprised of geographically distributed Supermicro servers working together to meet increasing bandwidth demands, these Visual Cloud Delivery Networks (VCDN) deliver the best Quality of Service (QoS) and Quality of Experience (QoE) for customers.

Verified for the Intel Select Solutions for VCDN, the Supermicro X12 Ultra SuperServer offers the highest quality, best performance, and maximum energy savings. In addition, the system is optimized for high throughput and consistent, low latency, featuring new memory and storage solution options for improved scalability, reduced latency, and cost savings.

As a proven server platform from Supermicro, the X12 Ultra platform allows customers to reduce the risk of advanced technology while eliminating the need for expensive and time-consuming testing, certification, and qualifications while enabling rapid deployment and a low total cost of ownership (TCO). These advantages make this Supermicro platform an ideal VCDN solution.