Solution Brief

3rd Gen Intel® Xeon® Scalable Processors
Virtual Session Border Controller

Metaswitch SBC Tests Show 26% Media Transcoding Improvement

Tests using the newest 3rd generation Intel® Xeon® Scalable processors show 26% increase in media transcoding, 15% increase in signaling, and 15% increase in RTP passthrough performance for Metaswitch's Perimeta session border controller[1]

There is a growing need to digitize public switched telephone (PSTN) voice streams to support Voice over IP (VoIP) call volumes that have been surging thanks to increased demand for web and video conferencing systems. Growing demand for 4G and 5G networks will also add additional Voice over LTE (VoLTE) call volumes, requiring interworking between mobile networks and wireline networks.

Media transcoding this data is one of the traditional services of a session border controller (SBC). VoIP traffic often must be decoded and re-encoded as it passes from one service, such as PSTN, to another service, such as web conferencing. The codecs used in this process support different protocols, and the SBC's media transcoding and protocol translating capability enables end-to-end communications.

The increased demand for SBC functionality has resulted in communications service providers (CoSPs) adding virtual SBCs to their networks for increased deployment flexibility and rapid network scalability. Virtualized SBC software runs on commercial off-the-shelf (COTS) servers powered by Intel® architecture CPUs.

SBC functionality is very compute centric and requires a very high performance data-plane function for real-time transport protocol (RTP) forwarding, media transcoding, encryption, and distributed denial of service (DDoS) protection. Other issues include coordinating the distribution of traffic to a large number of SBC instances and cost-effectively managing the lifecycle of those instances, including configuration, software updates, and end of life.

To demonstrate the performance of Metaswitch's Perimeta SBC, the company teamed up with Intel to test the media transcoding, signaling, and passthrough capabilities of the software on a server powered by the latest 3rd generation Intel® Xeon® Scalable processor. These processors give a CoSP a flexible way to scale support for networking workloads and that was demonstrated in these tests results, which show markedly higher performance in all test categories. Upgrading to this solution allows a CoSP to serve its customer base and scale to meet growing demand with fewer servers, which can result in cost savings.

Perimeta vSBC from Metaswitch

Perimeta is cloud-native vSBC software that delivers SIP interworking and security performance to enable IP-based rich communications services. It can be run in a data center or in either a private or public cloud network.

Perimeta vSBC runs on Intel architecture-based servers and is architected for distributed signaling and media, with advanced call admission control (CAC) to prevent oversubscription of VoIP networks.

Perimeta supports Kubernetes containerization, allowing the software's functions to be deployed as microservices that can be combined for any specific operator use case. Additional microservice instances can be added for rapid scaling.

Metaswitch has developed the secure distribution engine (SDE) for Perimeta to address issues related to moving from a legacy environment to a cloud-native SBC. SDE is a layer 7 load balancer for SIP interconnect and trunking traffic. It distributes incoming calls and other SIP traffic between SBCs. The SDE operates on the edge of the network and is the first point of contact for external SIP traffic arriving at the core network. The load balancing capability works seamlessly with multiple session controllers to provide SBC function beyond the scale of a single virtualized session controller.

To help prevent DDoS attacks, Perimeta also features dynamic blocklisting that identifies suspect traffic and blocks it if necessary. This helps protect the core service network from sudden increases in incoming traffic. This type of traffic can, if it is not intercepted, flood the network, consume available resources, and disrupt service levels. Dynamic blocklisting allows the session controller to respond quickly to an unexpected change in traffic patterns—helping block data that is malicious or caused by malfunctioning devices repeatedly attempting to connect to the system.

Support for multiple tenancy gives CoSPs the flexibility to use Perimeta for all customer applications, including mobile, fixed residential, fixed business, and wholesale interconnect.

With the ability to be remotely upgraded, CoSPs can achieve fast repairs and short network upgrade cycles. Perimeta also enables pre-emptive maintenance, finding issues quickly for reduced downtime and risk.

As shown in product tests detailed below, Perimeta can use the compute performance of the 3rd generation Intel Xeon Scalable processor to deliver higher media transcoding, signaling, and RTP passthrough performance.

vSBC Test Setup

Metaswitch and Intel devised tests that measured media transcoding, signaling, and RTP passthrough performance of the Perimeta SBC running on 2nd generation Intel Xeon Scalable processor-based servers compared to 3rd generation Intel Xeon Scalable processor-based servers.

A large CoSP network could need up to 1,000 vSBCs to handle network traffic. Getting the media transcoding and signaling throughput required for this large network using the minimum number of servers is an important criteria.

To determine the performance improvement, the software was tested on two servers:

- Device under test 1: Utilized the 2.1 GHz Intel Xeon Gold 6252 processor that is part of the 2nd generation Intel Xeon Scalable processor family.
- Device under test 2: Utilized the 2.2 GHz Intel Xeon Gold 6338N processor that is part of the 3rd generation Intel Xeon Scalable processor family.

The test results were presented with a 4.76% downward adjustment on the results from device under test (DUT) 2 to account for a higher clock speed on the Intel Xeon Gold 6338N processor. This adjustment was based on the percentage difference in processor clock speeds using the following calculation: 2.2-2.1 = .1, .1/2.1*100 = 4.76%

Both systems utilized VMware ESXi7.0 hypervisor and ran the Perimeta signaling session controller (SSC) and media session controller (MSC) functionality split into separate virtual machines (VMs). The Metaswitch Nero test harness was used to generate traffic and measure the throughput. (Nero is based on SIPp, an open source SIP tester.) Nero simulated both the access and core sides of the network. The tester was connected to the device under test (DUT) using a 100 GbE switch.

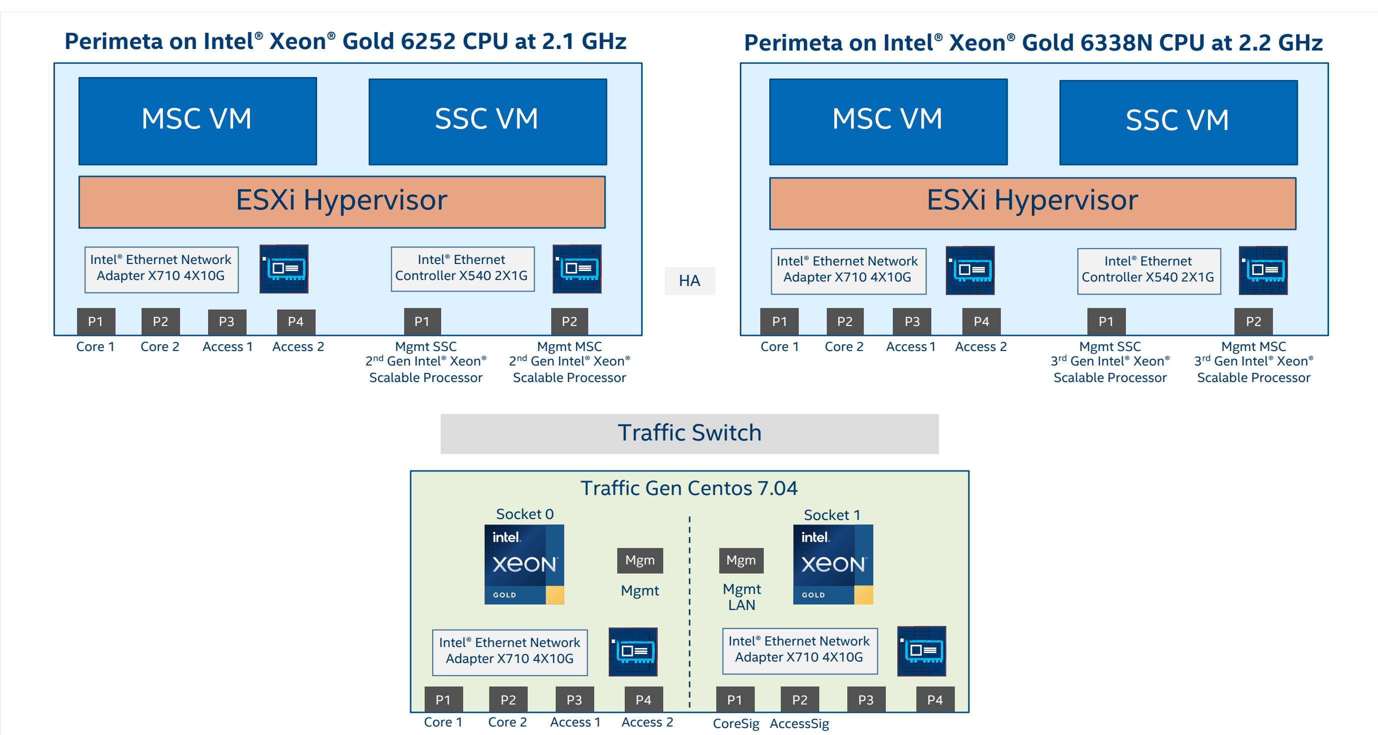

Figure 1. Test bed setup block diagram showing DUT 1 and DUT 2 and traffic generator.

3rd Generation Intel Xeon Scalable Processors

- **Flexibility from the edge to the cloud,** bringing AI everywhere with a balanced architecture, built-in acceleration, and hardware-based security.
- **Part of a complete set of network technology from Intel,** including accelerators, Ethernet adapters, Intel Optane persistent memory, FlexRAN, OpenNESS, Open Visual Cloud, and Intel® Smart Edge.
- **Engineered for modern network workloads,** targeting low latency, high throughput, deterministic performance, and high performance per watt.
- **Enhanced built-in crypto-acceleration** to reduce the performance impact of full data encryption and increase the performance of encryption-intensive workloads.
- **Hardware-based security** using Intel® Software Guard Extensions (Intel® SGX),[2] enhanced crypto processing acceleration,[2] and Intel® Total Memory Encryption.[2]

Media Transcoding Test Results

Benchmark tests of Perimeta's software media transcoding were configured using the Data Plane Development Kit (DPDK) to improve packet processing performance and optimize the system for maximum advanced media capacity. The tests used different codecs on the access and core sides: a SILK/8000 narrowband codec was used on the access, while a codec supporting the G.711 standard (Pulse Code Modulation µLaw—PCMU) was used on the core side of the tests. Performance will vary depending upon the codec used, but the tests are a good indicator of the performance uplift between servers running the two CPUs.

Four cores in each of the CPUs were used for the SBC functionality. Concurrent calls were set up starting at 700 concurrent calls using 20 ms packetization time, resulting in each call corresponding to processing 100 RTP packets per second (50 packets per second each way). The call rate was increased by 100 concurrent calls every 5 minutes until failure was observed. The calls were continuous in duration.

As shown in Figure 2, on DUT 1, the concurrent call media transcoding rate started to have failures at 740 concurrent calls, whereas on DUT 2 call rates increased to 970 concurrent calls before a failure, resulting in a 31% increase in media transcoding performance on DUT 2. When adjusted for clock speed differences, there was a 26% increase in media transcoding performance on DUT 2.

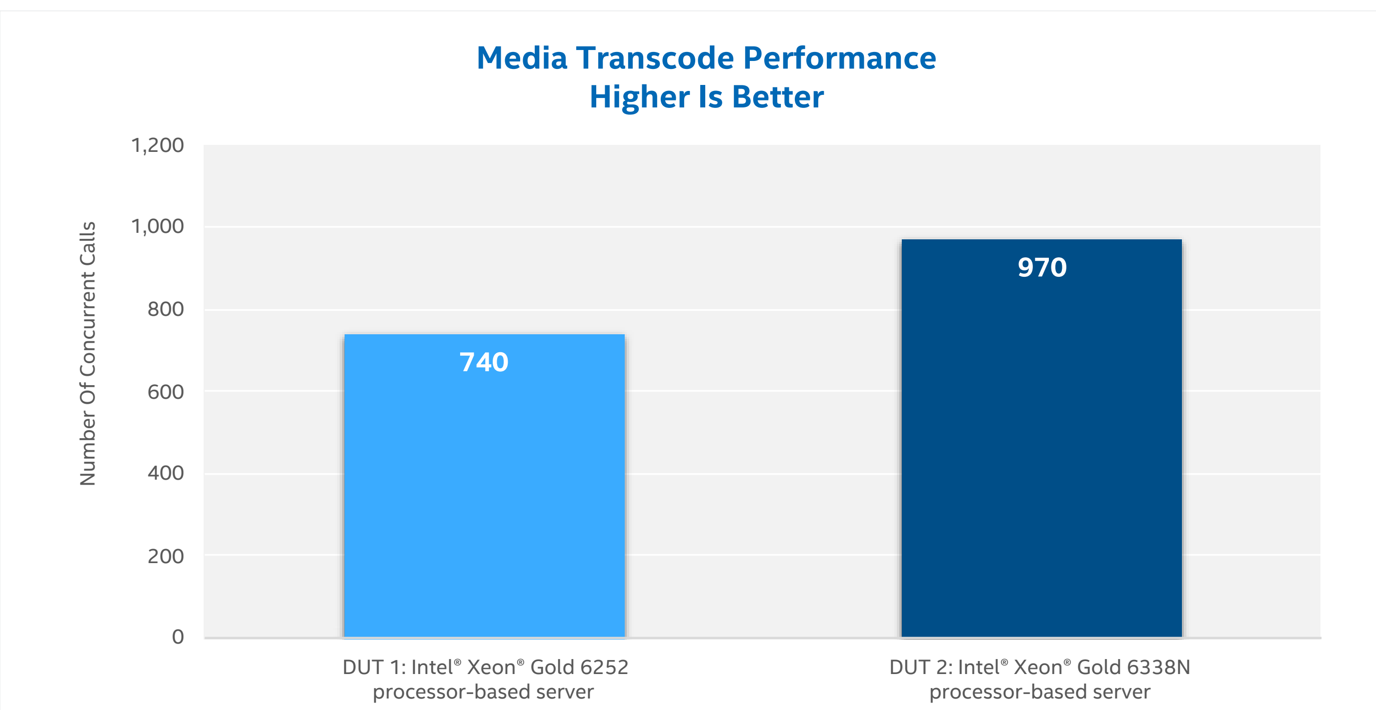

Figure 2. Media transcoding performance improvement between DUT 1 and DUT 2.

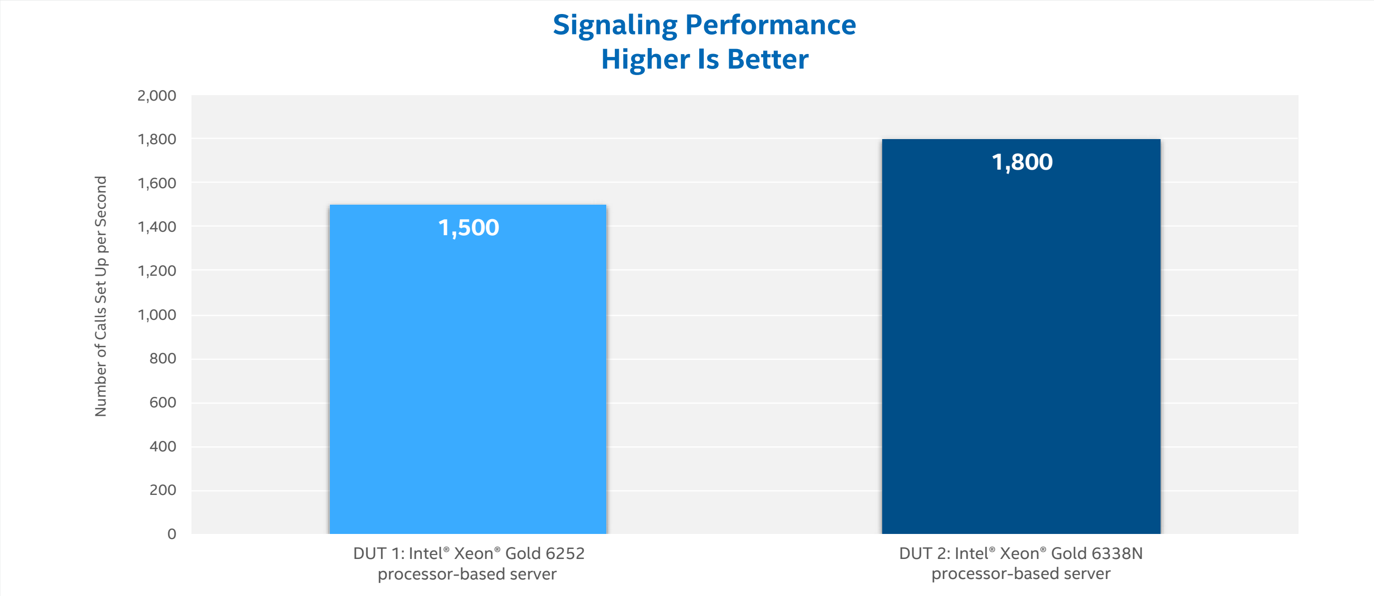

Figure 3. Signaling performance improvement between DUT 1 and DUT 2.

Signaling Test Results

The scenario for testing signaling performance included continuous call set up and tear down until failure to set up new call sessions was observed. The call set up started at 1,400 calls per second (CPS), a rate that was picked because it was close to the failure rate. Each call lasted 30 seconds and the call rate was increased by 100 CPS every five minutes until it reached 2,000 CPS. The number of failed calls was noted at each throughput interval. These tests were conducted on DUT 1 and on DUT 2 to show improvement.

Figure 3 shows that signaling performance on DUT 1 totaled 1,500 before a failure, whereas on DUT 2 that signaling rate went to 1,800 calls per second before a failure. When adjusted for clock speed differences, the tests showed a 15% increase in call signaling rate.

RTP Passthrough Test Results

The RTP passthrough test measures the capacity of the SBC to examine and forward calls through the system without a need for media transcoding. The tests used a 20 ms packetization time; therefore each call corresponds to processing 100 RTP packets per seconds (50 per second each way).

The test was initiated with a starting rate of 38,000 concurrent calls and was ramped every five minutes by 1,000 concurrent calls until a failure was observed. As seen in Figure 4, on DUT 1, the first failure occurred at 40,000 concurrent calls and on DUT 2 the call volume reached 48,000 concurrent calls before a failure occurred. When adjusted for clock speed differences, there was a 15% increase in performance.

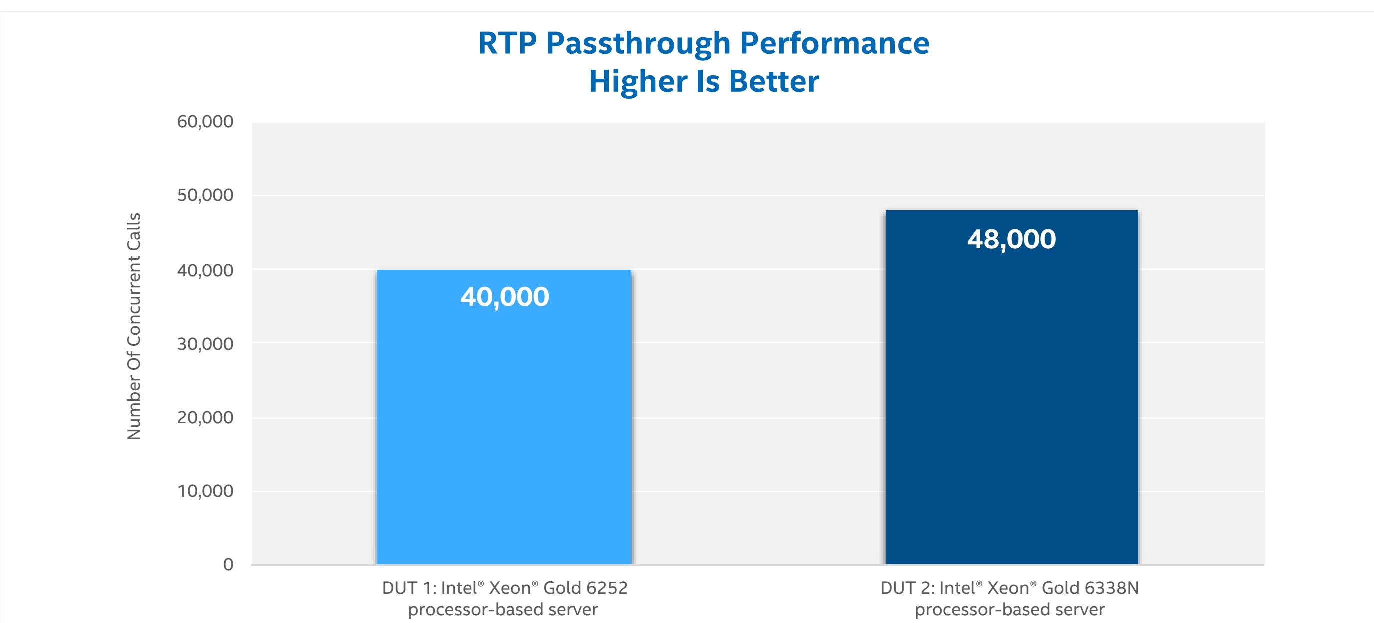

Figure 4. RTP passthrough performance improvement between DUT 1 and DUT 2.

Conclusion

The tests by Metaswitch and Intel show a consistent increase in performance for key SBC metrics when using servers based on the newest 3rd generation Intel Xeon Scalable processors, which deliver flexibility and scalability for compute-intensive applications. This performance increase demonstrated in these tests means CoSPs can support growing VoIP traffic volumes more efficiently by getting more performance out of every server in their network. This performance increase is added to the other benefits of a vSBC, including agile deployment, scaling, and lower cost hardware, to make the technology even more compelling for CoSPs.

Learn More

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Notices & Disclaimers

[1] Testing done by Metaswitch and Intel in April 2021. DUT 1 server configuration featured dual 2.10 GHz Intel Xeon Gold 6252 processors (microcode: 0x500002c). Intel® Hyper-Threading was turned on and Intel® Turbo Boost Technology 2.0 was turned off. Bios version was Intel Corporation SE5C620.86B.02.01.0011.032620200659. The server featured 192 GB of RAM (24 slots of 8 GB 2666 MHz RAM). Intel® Ethernet Converged Network Adapter X710 DA-4 and an Intel® Ethernet Converged Network Adapter X540-T2 were used for networking. Operating system was Metaswitch Networks Linux release 8.1.1911 with kernel 4.18.0-147.8.1.el8.orl.4.5.x86_64. Workload was Perimeta V4.8.10_SU56_P252.00.

DUT 2 server configuration featured dual 2.20 GHz Intel Xeon Gold 6338N processors (microcode: 0xd000270). Intel Hyper-Threading was turned on and Intel Turbo Boost Technology 2.0 was turned on. BIOS version was Intel Corporation SE5C6200.86B.0022.D08.2103221623. The server featured 512 GB of RAM (16 slots of 32 GB 2,666 MHz RAM). Intel® Ethernet Converged Network Adapter X710 DA-4 and an Intel® Ethernet Converged Network Adapter X540-T2 were used for networking. Operating system was CentOS Linux 7 with kernel 3.10.0-1160.15.2.el7.x86_64. Workload was Perimeta V4.8.10_SU56_P252.00.

Client device configuration featured dual 2.20 GHz Intel Xeon E5 2699 v4 processors. Intel Hyper-Threading was turned on and Intel Turbo Boost Technology 2.0 was turned off. The server featured 64 GB of RAM (8 slots of 8 GB 2133 MHz RAM). Dual Intel® Ethernet Converged Network Adapter X710 DA-4s were used for networking.

[2] This technology is not supported when using Intel® Optane™ persistent memory.

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