Miercom

Lab Testing Summary Report

September 2010

Report 100914B

Product Category:

Session Border Controller

Vendor Tested:

Sonus®

Product Tested:

SBC 5200

Miercom PERFORMANCE VERIFIED™

Key findings and conclusions:

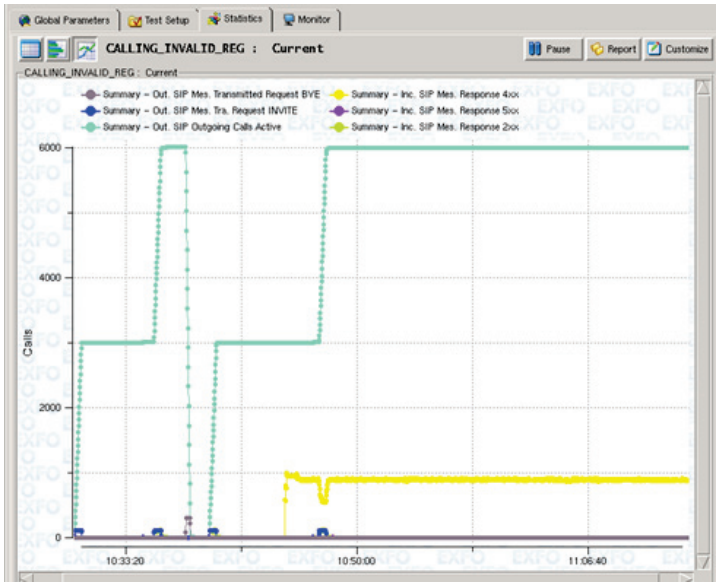
- **Sonus SBC 5200 successfully registered 256,000 user authenticated Total IADs in 16 minutes at a rate of 550 registrations per second during a simulated metro area outage and recovery scenario**
- **The SBC 5200 demonstrated outstanding CPU and Allocated Memory utilization throughout all tests. We observed that these resources were rarely stressed and never maximized**
- **Sonus SBC 5200 maintains scalable call processing while under attack from spoofed IPs. In a maximum configuration, it supports up to 64,000 concurrent calls**
- **Advanced Lights Out Management (ALOM) internal controller allows for device management and reporting during a system outage**

Sonus Networks engaged Miercom to evaluate the call handling capability of the Sonus SBC 5200 Session Border Controller under specific adverse use case scenarios. The SBC 5200, based on the Sonus ConnexIP platform, is a carrier-class switch for VoIP networks, peering connections, international gateways, Class 5 network deployments and enterprise access.

With 256 Gbytes of Solid State Disk (SSD) storage and 12.3 GB Allocated Memory, the SBC 5200 is robust. It can support up to 64,000 simultaneous P2P VoIP calls with media, 256,000 subscribers, and 14,400 transcoded calls.

The SBC 5200 uses two (single active and passive) 10/100 Ethernet management ports, four GbE fiber media ports, two GbE multimode fiber HA ports, single field service port, and occupies a 2U rack space.

Figure 1: Baseline Load with Attacks System Failover



Source: Miercom, September 2010

Graph showing successful system failover for the SBC 5200.

The SBC 5200 is designed for different network environments. The switch is built on the new Sonus ConnexIP architecture as an IP-optimized device that delivers plug-and-play functionality in a carrier-class environment. Featuring embedded DSPs, cryptographic hardware and independent network security processors, the SBC 5200 delivers high performance under complex session requirements, overloads and attacks.

Session border functionality for security, transcoding, call routing and processing is aggregated into a single unit and distributes those functions to embedded hardware within the device. For example, media transcoding on the SBC 5200 is performed on an embedded DSP farm to improve scalability and performance during SIP sessions, while encryption is handled on embedded cryptographic hardware, and security is performed on separate network processors to improve performance during real-world workloads, overloads and attacks for VoIP networks.

The Sonus system provides maximum security for VoIP networks including topology hiding and Network Address Translation (NAT) traversal, Back-to-Back User Agent (B2BUA) services, 802.1Q VLAN segmentation, Split DMZ functionality and toll fraud protection. The SBC 5200 includes enhanced security features including Rogue RTP protection, Secure RTP, TLS signaling authentication, IPsec encryption and dynamic blacklisting. The SBC 5200 delivers steady performance under DoS/DDoS attacks and overload conditions, ensuring high reliability under stress. The Advanced Lights Out Management (ALOM) internal controller allows for device management and reporting during a system outage and is unique to the new Sonus ConnexIP platform.

We examined the performance of the SBC 5200 in a variety of scenarios and were pleased with the overall results. Real-world scenarios were simulated, including registration avalanches following a power outage, and DoS attacks originating from both inside and outside the network. The ability of the SBC 5200 to register all IADs and successfully process calls under load was monitored and the results were recorded. In addition, the maximum capacity of the as-tested configuration of the SBC 5200 was measured using both NATTED and non-NATTED IADs.

A NATTED IAD uses a masking method to hide one or more private IP addresses behind a single public IP address. All outgoing traffic from a NATTED device appears to originate from the single public IP address. As such, NATTED IADs use a varying UDP port strategy to hide behind the NAT device like a wireless router. More resources are used due to high refresh rate to maintain open pin holes in the NAT device to allow signaling and media to pass through it. This is primarily found in SOHO business VoIP phone implementations. The masking requires more resources and affects call volume and utilization.

The Sonus SBC 5200 excels at handling both NATTED and non-NATTED IADS as illustrated in *Table 1 on page 3*.

Registration Avalanche

A registration avalanche can occur when a large number of user devices attempt to register simultaneously. This would typically occur following an outage in a metro area.

To simulate this scenario, a Navtel QA604 network test system was configured to send 256,000 registrations of authenticated IADs at a rate of 550 registrations per second (rps) to the SBC 5200. At the same time, we directed 40 calls per second (cps) to a different port. The time to register all IADs successfully was recorded at 16 minutes, as well as the registration refresh rate of 3,052 and call rate of 40 cps. CPU and memory usage on the SBC 5200 were monitored, along with any alarms triggered during the test.

The SBC 5200 registered 256,000 IADs in 16 minutes, and recorded peak registration of 550 rps. There was a peak simultaneous call rate of 40 cps. CPU utilization was 23.16% or less during the test, and memory utilization was 47.15%.

Throughout the registration avalanche test on the SBC 5200, no calls were dropped and no major or minor alarms were observed.

Baseline Load with Attacks

This test simulates an IP PBX environment. Attacks directed towards the network and the switch have the potential of causing registrations and calls to be dropped, resulting in a Denial of Service. These types of attacks can take the form of registration INVITE floods emanating from invalid peers, and INVITE floods from spoofed valid peers.

The ability of the SBC 5200 to mitigate these attacks and protect the current calls by using IAD Call Access Control (CAC) policing was measured in this test.

Table 1: Registrations per Second Tested

State	IADS	Time to Register (min)	Registration Rate per Second	Registration Refresh	Call Rate per Second	CPU (%)	Memory (GB)
IDLE						0.99	4.90
NATTED	64,000	N/A	N/A	3052	40	N/A	N/A
NON-NATTED	192,000	N/A	N/A	N/A	40	N/A	N/A
TOTAL	**256,000**	**16**	**550**	**3052**	**40**	**23.16**	**5.80**
After Recovery						2.00	6.05

Source: Miercom, September 2010

Table shows the mixed configuration environment and testing results of the registration avalanche test. 256,000 IADS were successfully registered in 16 minutes at a rate of 550 rps and 40 cps.

We established a baseline load, using the Navtel to drive 200cps to the SBC 5200 to achieve a target of 3,000 stable simultaneous calls. CPU utilization at this point was recorded at 34.40% and memory utilization was at 71.54%.

Attack traffic was then directed at the SBC 5200 in the form of registration and call traffic floods coming from invalid peers or unauthenticated IADs. At the same time, call flood traffic was directed at the SBC 5200 from a spoofed IP address. This simulated a valid peer attack.

The SBC 5200 continued to successfully process calls at the same rate of 200cps while the attacks were ongoing, ultimately reaching the target of 3,000 simultaneous calls. Memory utilization on the SBC 5200 during the test decreased to 65.85%, while CPU utilization increased slightly to 38.39%.

Under sustained load for a 12-hour period, successful call completion of 12,095,392 calls was observed. A sustained bidirectional call traffic load of 3,000cps was applied concurrent to the "control" bidirectional call traffic load of 100cps (200cps aggregate).

The System Under Test (SUT) continuously handled a sustained load of 3,000 concurrent calls with 100 inbound cps bidirectional (200cps). The ramp up for applying this load was 30 seconds. Alarm conditions accurately classified the "attack" streams.

No system failure conditions occurred. No false alarms were observed. The attack stream did not significantly increase CPU or memory resources. There was no observed impairment of active calls sustained or failure to place new calls while under attack conditions.

Registration and Call Capacity

A stress test was conducted to determine the capacity of the SBC 5200 in its as-tested configuration. The SBC 5200 was configured for 256,000 total IADs of which 64,000 were NATTED IADS and 192,000 were non-NATTED.

The Navtel QA604 was configured to send 200rps and 100cps to the SBC 5200 until all 256,000 registrations were recorded. The call duration was fixed at 180 seconds.

Prior to commencing the test, memory utilization at idle state was measured to be 36.59% and CPU utilization was 2%.

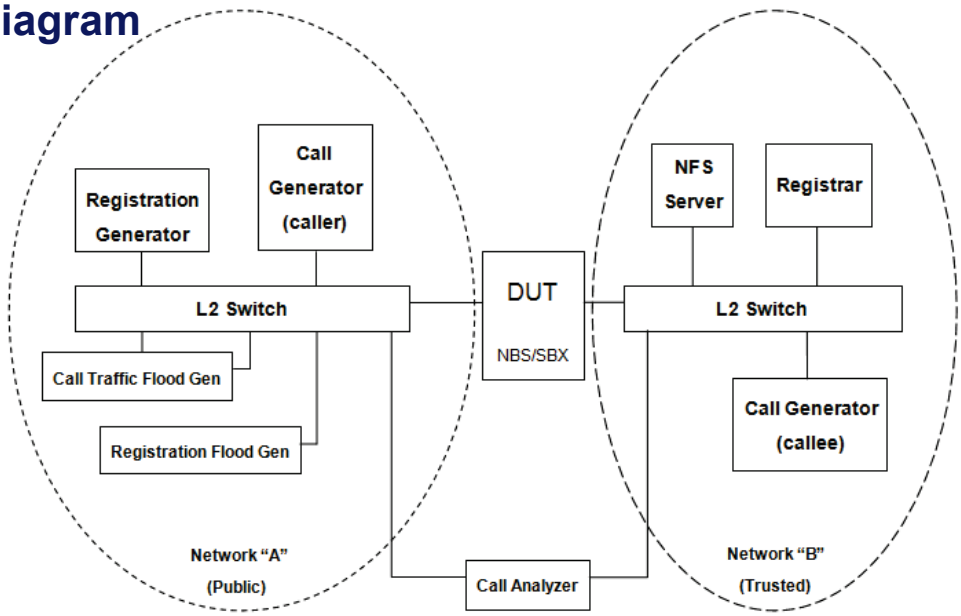
Maximum CPU utilization observed under test was 25.36% with 48.78% memory utilized on the SBC 5200. The system attained a registration rate of 243 registrations per second.

The Sonus SBC 5200 was observed to achieve 256,000 registrations with 1,400 active stable calls processed simultaneously in 23 minutes.

The Sonus SBC 5200 registered all 256,000 IADs at a maximum rate of 243rps, with an effected refresh rate of 2,667 refresh registrations per second; while also successfully processing 100 calls per second.

We continued to stress the switch; however, the target call capacity was not affected. No major or minor alarms were triggered. A successful failover was executed which demonstrates the Telco grade high availability of the architecture of the switch. See *Figure 1 on page 1.*

Test Bed Diagram



How We Did It

The Sonus SBC 5200, running Sonus SBX Release 1.0, was evaluated in a configuration utilizing one SBC 5200 and two L2 Extreme X450a-24x switches running Extreme OS version 12.0.3.16. All fiber and copper interfaces used for signaling or media were located on the Extreme X450a-24x switches.

Navtel QA604 Release 8.3.20100319 and Navtel R14 Release 8.3.1.62 network traffic generators were used to emulate NATTED and non-NATTED access mode scenarios, generating baseline registration and call traffic, registration avalanche, invite and registration floods from invalid peers. For scenarios emulating carrier peering test cases, we used SIPp to generate signaling and attack traffic. SIPp is a free Open Source test tool to generate SIP traffic. It includes user agent scenarios (UAC and UAS) and establishes and releases multiple calls with the INVITE and BYE methods. We used custom XML scenario files to run complex call flows using SIPp.

One interface on the Sonus device was connected through an Extreme Switch to traffic generators for registration generator, call generation (caller), call traffic flood and registration flood. A second interface on the Sonus device was connected through a second Extreme Switch that was configured to traffic generation for registrar, and call generation (callee). The SBC 5200 was controlled by a Sonus SBC 5200 Management console; and the Navtel QA604 was controlled by a Navtel Management console.

Security and DDoS prevention features were configured using the Sonus-issued DDoS Prevention Configuration guide and the SBC 5200 user guide.

The tests in this report are intended to be reproducible for customers who wish to recreate them with the appropriate test and measurement equipment. Contact reviews@miercom.com for details on the configurations applied to the System Under Test and test tools used in this evaluation. Miercom recommends customers conduct their own needs analysis study and test specifically for the expected environment for product deployment before making a product selection.

Bottom Line

The Sonus Networks SBC 5200 platform provides carrier-class performance figures for VoIP networks. In our testing, the switch successfully registered 256,000 user authenticated IADs in a mixed NATTED and non-NATTED environment, in 16 minutes at a rate of 550 rps per second during a simulated metro area outage and recovery scenario.

It was able to maintain call processing of thousands of simultaneous calls while under attack from spoofed IPs, proving the resiliency of its architecture. The SBC 5200 demonstrated outstanding CPU and Allocated Memory utilization throughout all tests. These resources were rarely stressed, indicating to us that this architecture has plenty of processing horsepower to spare.

In the event of a system outage, the Sonus Advanced Lights Out Management (ALOM) internal controller allows for device management and reporting This is a unique feature and key differentiator to other systems in its class.

Miercom Performance Verified

Lab testing of the Sonus Networks SBC 5200 verified the carrier class performance of this network border switch for VoIP traffic.

Hands-on testing proved that the SBC 5200 has a robust architecture, scales successfully to 256,000 IADs, delivers high availability and rapid recovery from network outages.

Sonus Networks SBC 5200 has earned the Miercom Performance Verified Certification.

Sonus SBC 5200

Sonus Networks
4 Technology Park Drive
Westford, MA 01886
1-855-GO-SONUS
www.sonus.net

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