

CommuniGate Systems



VoIP Performance Test

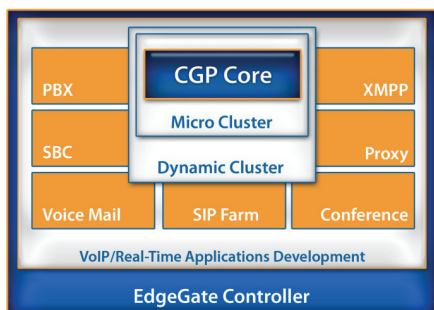
Statement of Test Purpose

CT Labs was commissioned by CommuniGate Systems to perform a series of SIP-based performance tests on the CommuniGate Pro product. This report summarizes the results of tests conducted in October 2006 on a two server cluster configuration.

Product Tested

CommuniGate Pro is an IMS-compliant carrier-class Internet Communications platform for voice and data applications and services with typical deployments in ISPs, IT-SPs, broadband and mobile carriers. The application server is based on open standards and provides a rich, customizable communication platform which includes several APIs for JAVA, Perl, XML and the native CG/PL development environments.

The Real-Time Communications Server provides both infrastructure with an open service creation environment and application functions for standards-based VoIP, video, IM, presence, messaging and real-time collaboration.



SIP Farm is CommuniGate Pro's technology for clustering VoIP delivering 99.999% uptime, regional redundancy, and scalability. Both Dynamic Cluster and Super Cluster deployments can be implemented with the SIP Farm technology. Cluster members allocated to the SIP Farm can be based on traffic type profiles or regional node placements.

CommuniGate Pro's SIP Proxy component enables registration and authentication of subscriber endpoints. The Session Border Controller provides control over the signaling and media streams needed in setting up, connecting and disconnecting VoIP calls. The EdgeGate Controller provides perimeter security, defensive services, and policy management. PBX, conferencing, and voice mail round out the comprehensive feature set.

CommuniGate Pro SIP Farm Version Tested: 5.1c.5ct

Highlights

- *The CommuniGate Pro platform delivered a consistently high level of service while being subjected to demanding CT Labs real-world VoIP traffic flows*
- *Not a single call or application failure was logged during the test, a notable achievement*

Executive Summary

CT Labs staged the CommuniGate Pro software in a two-server cluster with an external network-attached storage device. A mix of real-world SIP traffic was assembled with the purpose of emulating a typical base of residential subscribers: some were idle, some were engaged in voice calls, and some were interacting with voice mail.

CT Labs found CommuniGate Pro to be a flexible, scalable product with an ability to efficiently support large user communities. The CommuniGate Pro SIP Farm call processing engine performed very well even during peak traffic conditions, delivering high levels of call connectivity and reliability. Highly recommended.

CT Labs also found the CommuniGate Systems team to be quite knowledgeable with an unusually high level of attention to detail and high performance.



Test Setup and Methodology

The general testing approach in this project was to emulate an active residential subscriber base engaged in real-world activities. This was accomplished by generating a realistic mix of SIP endpoint registrations, point-to-point VoIP calls, and application-based call traffic.

By adjusting traffic levels, CT Labs discovered the maximum number of subscribers that could be supported without failed or dropped calls, excessive call answer or application navigation latencies, detectable voice or application prompt quality issues, or other types of service degradation that would be deemed unacceptable by a typical user.

To establish a residential VoIP service environment, the following SIP-oriented traffic model was used:

1. *Active subscribers, registrations only*: 95.9% of total subscriber base executing registrations
2. *Active voice calls*: 4% of total subscriber base endpoints conducting calls
3. *Active application calls*: approximately 0.1% of total subscriber base conducting voice mail calls

Using the above mix, test runs were initiated with the goal of arriving at a maximum number of subscribers that could be supported by the CommuniGate Pro configuration. Table 1 below presents selected details of each traffic type.

Table 1: SIP Traffic Mix Details

Traffic Type	Description
Registrations Only	All registrations were performed with authentication. Re-registration interval = 60 minutes.
Voice Calls	Point-to-point voice calls were established between two registered users. All call durations = 180 seconds. All registrations performed with authentication. Re-registration interval = 60 minutes.
Application Calls	Two Hammer FX-IP automation scripts were developed: one to emulate callers leaving messages for inactive users, and another to emulate callers listening to messages in their mailbox. The Hammer computed a real-time PESQ voice quality score for 33% of the retrieved messages.

Figure 1 illustrates the setup used in these tests. The CommuniGate Pro software was installed on two identical Sun Fire X2100 (model 180) dual core servers running Solaris 10. All SIP traffic was routed through a load balancer using the open source Linux Virtual Server package, version 1.2.1.1. A Network Appliance FAS270 Network-Attached Storage (NAS) device¹ was configured as the primary shared storage element. Extreme Networks Summit 400 high performance switches interconnected all equipment in this test.

The Empirix Hammer NXT-IP call generator was used to drive the bulk of the active SIP calls with media. The Empirix Hammer FX-IP call generator was used to place calls that navigated the voice mail application while performing real-time voice quality checks of recorded voice messages.

The registration load for the bulk of the emulated subscribers was provided by the Empirix DEX platform with the registration generator module. Collection of Sun Fire server and Network Appliance NAS performance metrics was consolidated for unified reporting via the Empirix OneSight product.

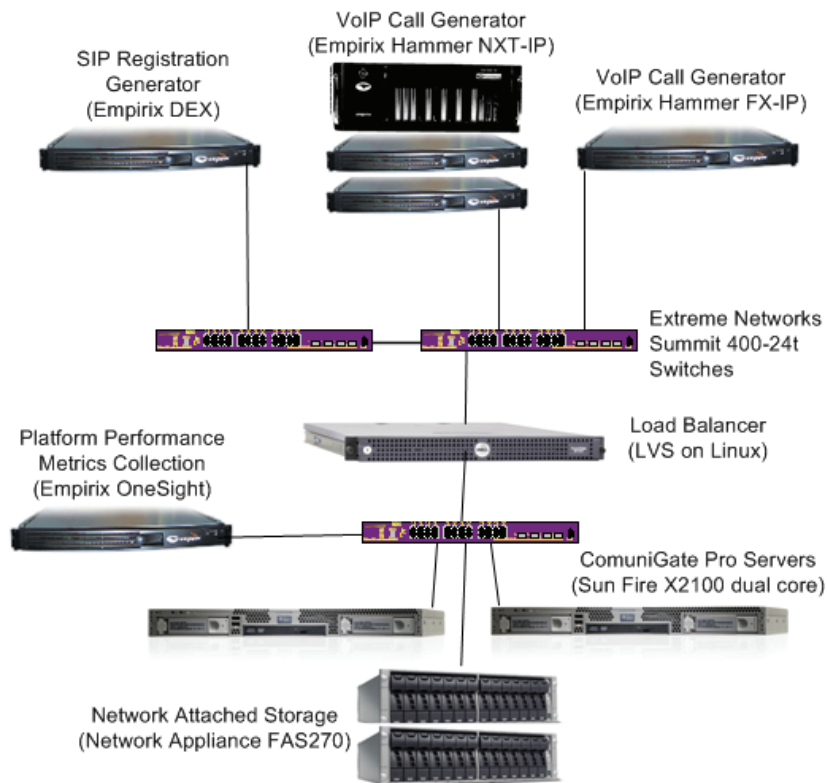


Figure 1: Test Setup Diagram

1. The FAS270 was provided with twenty eight (28) 144 gB 15,000 rpm disk drives (4 tB array, total) and a single disk controller module.

Test Results Summary

The CommuniGate Pro system was found to provide excellent overall performance when subjected to the CT Labs real-world residential traffic model. This two-server configuration, utilizing an external NAS device for shared storage, supported over 220,000 active users without a single call or registration failure during the test run outlined in this section.

Table 2 below presents selected results from this representative test run. Of the 220,000+ subscribers emulated in this test, 8,400 were involved in active SIP calls² while an average of 192 simultaneous calls was continuously accessing the voice mail application. During this run the call traffic achieved a call rate of 20 calls per second³ with a total call throughput of 72,000 calls per hour.

Calls to the voice mail application during this test reached a peak of 210 simultaneous calls. The record-then-playback voice message quality was measured via Empirix Hammer FX-IP calls using PESQ (Perceptual Evaluation of Speech Quality method, ITU-T P.862) and was found to achieve a perfect 4.5 score across all test calls while maintaining an excellent average DTMF command response delay of 259 mSec.

These results have relevance to subscribers with accounts on a busy CommuniGate Pro system: the cluster was found to be a reliable workhorse under sustained traffic loads.

Table 2: Test Run Results, Two Server Configuration

Test Run Duration	Maximum Active Users	Active Reg. Only Endpoints	Active Voice Call Endpoints	Voice mail Application Endpoints	Failures	Notes
2 hours 40 minutes	220,288 ⁴	211,696	8,400	192	0 ⁵	During this test run, CommuniGate Pro serviced 512,000+ successful registrations and 4,200 simultaneous voice calls.

CommuniGate Pro Subscriber Base Size: 1,000,000 users

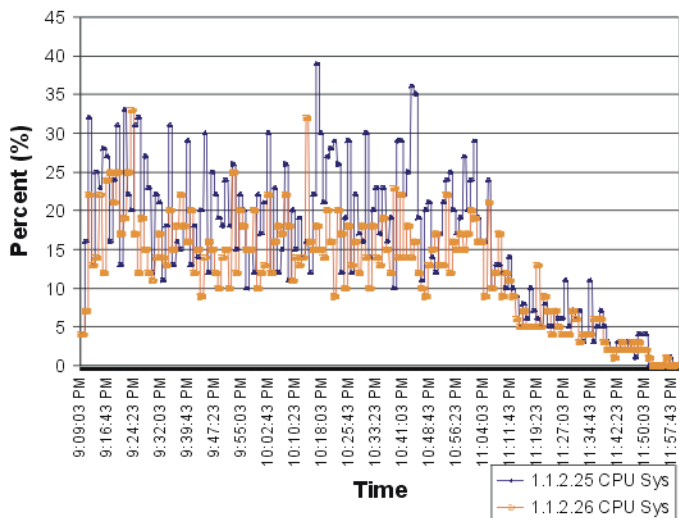
CommuniGate Pro Resource Utilization: Predictable and Solid

The key to CommuniGate Pro's performance lies in the efficiency of the architecture and the product's real-time software. This was no more evident than when monitoring CPU utilization of the Sun Fire platforms during the heaviest traffic loading periods of this test.

As shown in Figure 2, during peak traffic conditions at the very beginning of the test run, neither CommuniGate Pro server exceeded 33% CPU utilization. Both servers maintained a balanced portion of the call processing load and rarely deviated outside the 10-30% range. Considering the number of subscribers supported, this is a significant result.

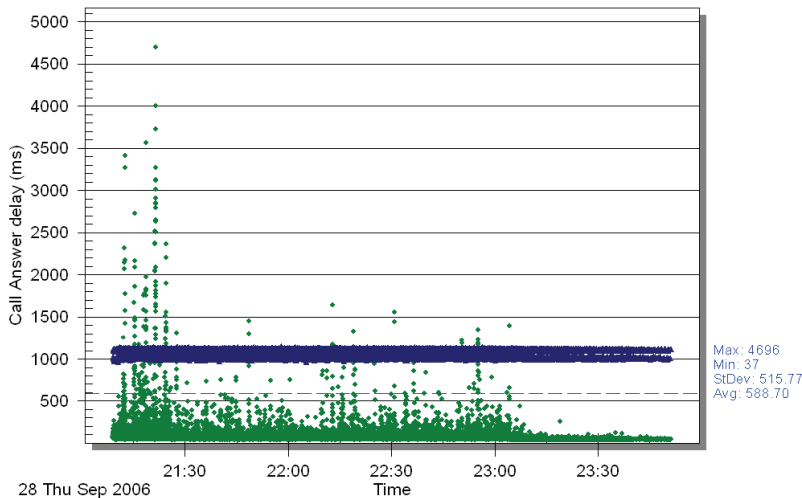
Platform memory usage was also tracked and found to be reliably consistent and free from any indication of problems such as memory leaks or allocation anomalies.

Figure 2: CommuniGate Pro Servers, CPU System Time



2. No SIP call media was routed through the CommuniGate Pro system for this test run.
3. The goal of this test was to replicate real-world subscriber traffic and call conditions, not to test call rate limits.
4. Includes individual registration traffic contributions from the Empirix DEX, Hammer NXT-IP, and Hammer FX-IP call generators.
5. This failure count includes any failed registration-only attempts as well as any dropped voice calls or failed voice call attempts.

Figure 3
Call Answer delays for savemsg
vs. Time



CommuniGate Pro Call Answer Performance

Figure 3 shows the call answer performance for the selected test run. The green plot points represent delays from the initiating SIP INVITE message to SIP call connect; the blue points represent the delays from call connect to receipt of the first application prompt audio as issued by the CommuniGate Pro voice mail application.

CommuniGate Pro's call answer performance was found to be excellent when subjected to significant real-world traffic loads. During the first part of the test run the call answer delays can be seen occasionally reaching above 1000 mSec, a result of the generated call rate not yet adjusted to the optimum level for this configuration. Post adjustment, call answer performance for the duration of this test held steady with an average of just over 500 mSec. The delays to first prompt audio also demonstrated consistent performance throughout the test run.

When the call and registration traffic was ramped down at the end of the test (starting ~23:10), CommuniGate Pro responded predictably.



About CommuniGate Systems

Founded in 1991 and based in Mill Valley, California, CommuniGate Systems develops carrier-class Internet Communications software for broadband & mobile service providers, enterprises, and OEM partners worldwide. Over 125 million end users including 45 million voice customers rely upon CommuniGate Systems products for their voice and data communication needs. CommuniGate Systems maintains the highest customer satisfaction level in the industry and has won more awards than any other IP Communications platform. CommuniGate Systems provides flexibility, performance, scalability, with the benchmark proven architecture that remains un-challenged in the industry. Our open development environment with simple APIs delivers extensible flexibility with a unique clustering technology for 99.999% uptime for the most demanding application environments.

CommuniGate Systems has over 175 members in its partner network worldwide. Download CommuniGate Pro today and join the global initiative to help SIPify and convert nearly 2 billion email accounts to a single identity for all forms of IP communications. For more information, go to www.communigate.com.

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About CT Labs

An independent operating unit of Empirix Inc.

CT Labs was founded in 1998 with the mission of providing outsource Q/A testing and marketing report services to the converged communications industry. The CT Labs team brings with it a wide range of talents and experience that gives us a unique ability to solve the most challenging test projects. Our open testing services philosophy enables us to provide our customers with test plans, test execution, testing reports, and even assistance in setting up specific testing environments in their own testing areas.

Our test lab is well-equipped with tools from our technology partners. In addition, CT Labs has the in-house expertise to develop specialized tools when off-the-shelf solutions are not available. CT Labs prides itself on keeping our lab current, enabling us to perform testing projects on cutting-edge next-generation networking products and technologies.

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