CT LABS
TESTING SERVICES

CommuniGate Systems

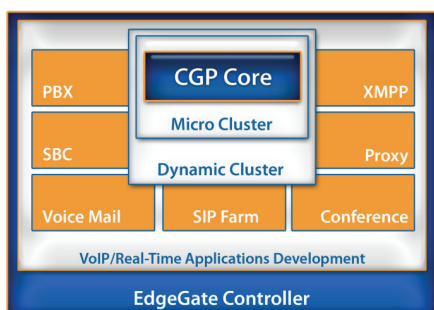## CommuniGate Pro

VoIP Performance Test

Statement of Test Purpose

CT Labs was commissioned by CommuniGate 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 single server 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 infra-structure 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

- *Even on a single server, the CommuniGate Pro platform serviced a large subscriber base while subjected to demanding CT Labs real-world traffic*

- *CommuniGate Pro delivers perfect voice message quality under high combined traffic loads*

Executive Summary

CT Labs staged the CommuniGate Pro software on a single server with an external network-attached storage device. A mix of real-world SIP traffic was created with the purpose of emulating a typical base of residential subscribers.

CT Labs tests verified the CommuniGate Pro product for its ability to support a relatively large subscriber base on a single low-cost server. This was evident through examination of the performance results for call connectivity, registrations, and voice prompt quality. With a resulting call throughput of 7,200 calls per hour, the CommuniGate Pro call processing architecture was found to perform reliably during peak traffic conditions.

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

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 one Sun Fire X2100 (model 180) dual core server running Solaris 10. All SIP traffic was routed through a load balancer using the open source Linux Virtual Server package, version 1.2.1. A Network Appliance FAS270 Network-Attached Storage (NAS) device[1] 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 CommuniGate Pro's 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.
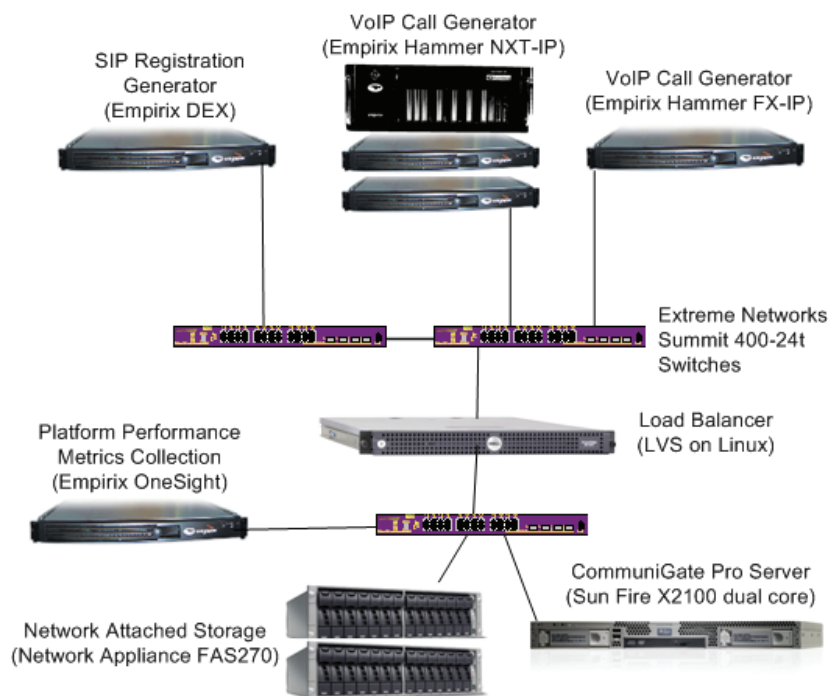

Figure 1: Test Setup Diagram

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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 single server CommuniGate Pro configuration, utilizing an external NAS device for shared storage, supported over 24,000 active users.

Table 2 below presents selected results from this representative test run. Of the total subscribers emulated in this test, 1,920 were involved in active SIP calls[2] while an average of 24 simultaneous calls was continuously accessing the voice mail application.

During this run the call traffic achieved a total call throughput of 7,200 calls per hour. As well, 100% of the attempted calls were properly connected and did not experience any unexpected early call terminations.

For the voice mail call traffic, the record-then-playback 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.

Table 2: Test Run Results, Single Server Configuration

Test Run Duration	Maximum Active Users	Active Reg. Only Endpoints	Active Voice Call Endpoints	Voice mail Application Endpoints	Notes
1 hour 5 minutes	24,334[3]	22,334	1,920	24	During this particular test run, CommuniGate Pro serviced 960 simultaneous voice calls.

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

Table 3 below summarizes the results of the registration load portion of the generated traffic. During this test run the CommuniGate Pro system was found to flawlessly handle the emulated SIP subscriber's registration requests with authentication while CommuniGate Pro serviced the active call and voice mail traffic.

The re-registration interval for this traffic was set to the default value of 60 minutes. No registration or authentication failures were logged for this test. These

results drive home the point that CommuniGate Pro, even when installed on a single server, can deliver reliable voice communication services to a significant number of subscribers.

While typical installations would involve deployment of multiple CommuniGate Pro servers, this test confirms to CT Labs the efficiency of the CommuniGate Pro's real-time architecture.

Table 3: Test Run Results, Single Server Configuration, Registrations Detail

Max. UAC Endpoints, Register-only	Successful Registrations (DEX)	Registration Rate (regs/sec)	Failures	
			Registrations	Authentications
20,000	23,465	6	0	0

Max. UAC Endpoints, Register-only = Subscribers emulated via registration traffic only.

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2.   No SIP call media was routed through the CommuniGate Pro system for this test run.
3.   Includes individual registration traffic contributions from the Empirix DEX, Hammer NXT-IP, and Hammer FX-IP call generators.

Table 4 presents the performance results of the voice mail portion of the generated traffic environment. For this test CT Labs created two Empirix Hammer automation scripts, one that emulated callers leaving messages for a CommuniGate Pro subscriber and another that emulated subscribers retrieving their mailbox voice messages. Retrieved messages were verified in real time for voice quality using the PESQ technique.

CT Labs analysis revealed that the voice mail traffic under peak conditions was handled without dropped calls or voice quality issues. In fact, the CommuniGate Pro media server element performed perfectly while under load on both record and playback operations for all quality-tested calls. As well, the call setup performance returned an average of 85 mSec, an excellent result.

Table 4: Test Run Results, Single Server Configuration, Voice Mail Calls Detail

Maximum Simultaneous VM Calls	Call Setup Delay (mSec)		PESQ Voice Message Quality Scores (range 1-4.5)		Failures	
	Avg	Max	Avg	Min	Voice Mail Calls	Message Voice Quality
24	85	2,248	4.5	4.5	0	0

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 special-ized 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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