THE TOLLY GROUP

No. 207173 May 2007

Procera Networks, Inc.

Procera PacketLogic 7600

Evaluation of Accuracy and Scalability of Network Traffic and Service Management System

TOLLY Up to Spec CERTIFIED Test Summary

Premise: *Broadband Internet Service Providers should be able to utilize their network bandwidth resources efficiently and be paid according to what they carry over their networks. Charging flat rates for access, and then blocking certain applications and contents are not the optimal method to meet customers' rapidly changing network needs. It is crucial for service providers to utilize an effective traffic management system to maximize revenues.*

Procera Networks, Inc. commissioned The Tolly Group to evaluate the PacketLogic 7600 network traffic and service management system that monitors network traffic flows, and then manages the flows for service quality and bandwidth utilization for Broadband Internet Service Providers (ISPs).

Tolly Group engineers measured the accuracy of traffic recognition provided by the PacketLogic 7600 with varying traffic rates and different numbers of rules.

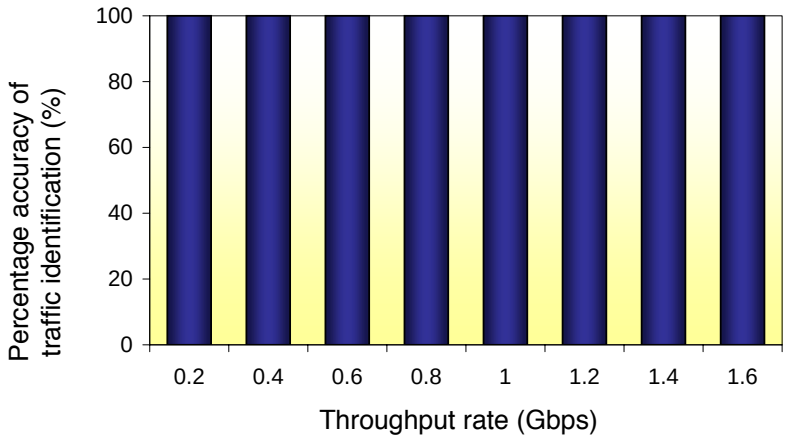
Tests were conducted in April 2007.

Test Highlights

- Identifies 50 different traffic types accurately from a stream of 1.6 Gbps of aggregate throughput cross the device backplane
- Maintains 1.6 Gbps of throughput and 100% detection accuracy even as the number of rules scales from 0 to 20,000
- Generates less than 1 millisecond of one-way average latency while performing Layer 7 Deep Flow Inspection (DFI) at the rate of 1.6 Gbps with 20,000 rules enabled
- Deploys in just four basic steps into an existing network

Traffic Identification Accuracy at Various Throughput Rates (Simulation of 50 Well-known Applications)

as Simulated and Reported by Shenick diversifEye 8400



Note: Engineers used Shenick's "TCP Replay" feature to replay PCAP files which contained the behaviors of 50 well-known applications and generated up to 1.6 Gbps of stateful throughput. While the Procera PacketLogic 7600 is rated at up to 2 Gbps of bidirectional throughput, the test tool used generated up to 1.6 Gbps.

Source: The Tolly Group, May 2007

Figure 1

Executive Summary

The Procera Networks PacketLogic 7600 demonstrated the ability to accurately recognize 50 common application types tested while providing 1.6 Gbps of throughput and generating less than 1 ms. of one-way latency with 20,000 traffic management rules enabled.

Broadband ISPs today are challenged by multiple phenomena in their networks.

First, peer-to-peer applications deliver content but in the process consume a lot of network resources from service providers. This can result in chronically congested network links for service providers and degraded QoS for other network users.

Second, content providers hosting MP3, streaming services or movie downloads to users over the Internet have become the most significant traffic generators. The result of these phenomena has lead to network congestion in many networks.

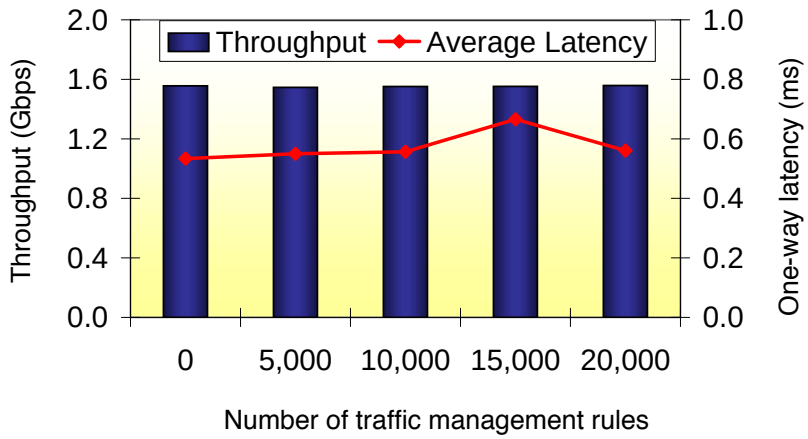
Ultimately, in order for service providers to deliver quality service to customers, they must add bandwidth to compensate, which threatens the business viability in the long term. The solution to these network environmental issues is for broadband ISPs to deliver the best possible utilization of available bandwidth and the best possible performance of user applications. Since user behaviors fluctuate under gigabit-rate traffic loads, accurate and fast traffic management is crucial when ISPs handle the various traffic patterns on a large scale.

Tolly Group tests prove that the PacketLogic 7600 accurately detects application types, even as traffic scales up to 1.6 Gbps.

Results demonstrate that the PacketLogic 7600 is capable of accurately recognizing 50 well-known application traffic types regardless of the traffic rates up to 1.6 Gbps tested. (See Figure 3 for the 50 applications simulated for this test.) Accurate application traffic identification with high traffic load is an important first step in managing traffic and services in broadband ISPs.

The PacketLogic 7600 also shows its scalability by sustaining 1.6 Gbps throughput and less than 1 millisecond of one-way average latency with 20,000 active traffic management rules while it identified 50 applications. This proves that PacketLogic 7600 does not only provide an accurate traffic classification but also delivers

Scalability of Throughput and Latency at Various Number of Rules Enabled
as Reported by Shenick diversifEye 8400



Source: The Tolly Group, May 2007

Figure 2

50 Common Applications Simulated	
BitTorrent Transfer	IRC
BSD Rlogin	Kazza transfer
Buddy Buddy	MMS
Citrix ICA	MSN messenger chat
Club Box	MySQL
CoolDisk	NateOn transfer
CTS hyundai	NetWare
Daum Messenger	OSCAR
DCE RPC	p2pia
Direct Connect transf	RTSP
DiskPot	RTSP media stream
eDonkey	Skype-SSL
FilePia	SMB
FTP	SMTP
Genie	Soribada
Gnutella	Soulseek
Gnutella transfer	SSH
GroupWise	SSL V2
HotDisk	SSL V3
HTTP	Terminal Services
HTTP Media Steam	VDisk
HTTP proxy	VNC
iDisk	World of Warcraft
IMAP4	X11
iPop	Xtoc

Figure 3

Source: The Tolly Group, May 2007

high-performance and scalable traffic handling, which are the two most important aspects for ISPs to consider in order to provide customers with high-level Quality of Service (QoS).

During the test bed setup, engineers identified four basic steps to configure the PacketLogic 7600 and place it into production mode. The PacketLogic 7600 uses Procera Networks-developed DRDL (Data-stream Recognition Definition Language) to identify applications correctly by performing Layer 7 Deep Flow Inspection (DFI). (See the vendor-supplied information section on this page for more on DRDL.) Deep Layer 7 traffic identification is a necessity today when most client software, like P2P file sharing, is customizable to communicate over any given port to avoid port-based firewalls and traffic management systems.

Layer 7 Traffic Identification

Tolly Group engineers verified that the PacketLogic 7600 accurately identifies 50 traffic types at high traffic load. In order to mimic common traffic patterns found in broadband ISP networks, engineers used a Schenick diversifEye 8400 test tool to generate 1.6 Gbps of aggregate throughput by combining 0.2 Gbps of stateless streaming traffic with 1.4 Gbps stateful traffic generated from the 50 simulated applications. The test flows consisted of traffic types that were known to the PacketLogic 7600. Engineers generated this known traffic in 0.2 Gbps increments from 0.2 to 1.6 Gbps and proved that the PacketLogic 7600 accurately recognized all the traffic types simulated regardless of the traffic rates up to 1.6 Gbps. Engineers also measured the latency as the data rates increased and verified that the PacketLogic 7600 maintained less than 1 ms of average latency as traffic increased.

Scalability

Engineers examined scalability as it pertains to the number of traffic management rules applied.

Engineers verified that the PacketLogic 7600 does not degrade the throughput and latency performance up to 20,000 rules tested by sustaining 1.6 Gbps throughput and less than 1-ms of average latency. Maximum latency measurements did not exceed 3 ms.

Engineers implemented 5,000, 10,000, 15,000 and 20,000 rules which managed the traffic generated by the Shenick test tool. The set of rules began with a rule to deny all traffic flows and the rest of the rules allowed traffic flows based upon source IP addresses.

First, engineers measured the throughput and latency with 5,000 rules enabled. Next, engineers increased the number of rules by 5,000 until they reached 20,000 rules. As the number of rules increased, the PacketLogic 7600 accurately applied the policies and did not introduce incremental latency while recognizing 50 application types. Throughout this test, 6,000 active TCP connections were established to simulate 50 application traffic types and deliver 1.4 Gbps of bidirectional

Procera Networks

PacketLogic 7600

Layer 7 Traffic Identification, Scalability and Ease of Use

DRDL

Vendor-supplied information not necessarily verified by The Tolly Group

DRDL (Data-stream Recognition Definition Language) enables a networking product to distinguish certain properties in network traffic. More specifically, DRDL will detect the protocol used by a specific connection. It goes further, and will extract protocol properties for a connection, such as User-Agent, Mime-Type, Filename, URL, etc, depending on the protocol.

The entire detection process is done with complete disregard to the port numbers used by the connection. Port numbers are fixed or seldom changed for some applications, such as SMTP or DNS, but in a lot of protocols today port numbers are either set by the user, or the port allocations are dynamic, effectively making any port-based lookups worthless.

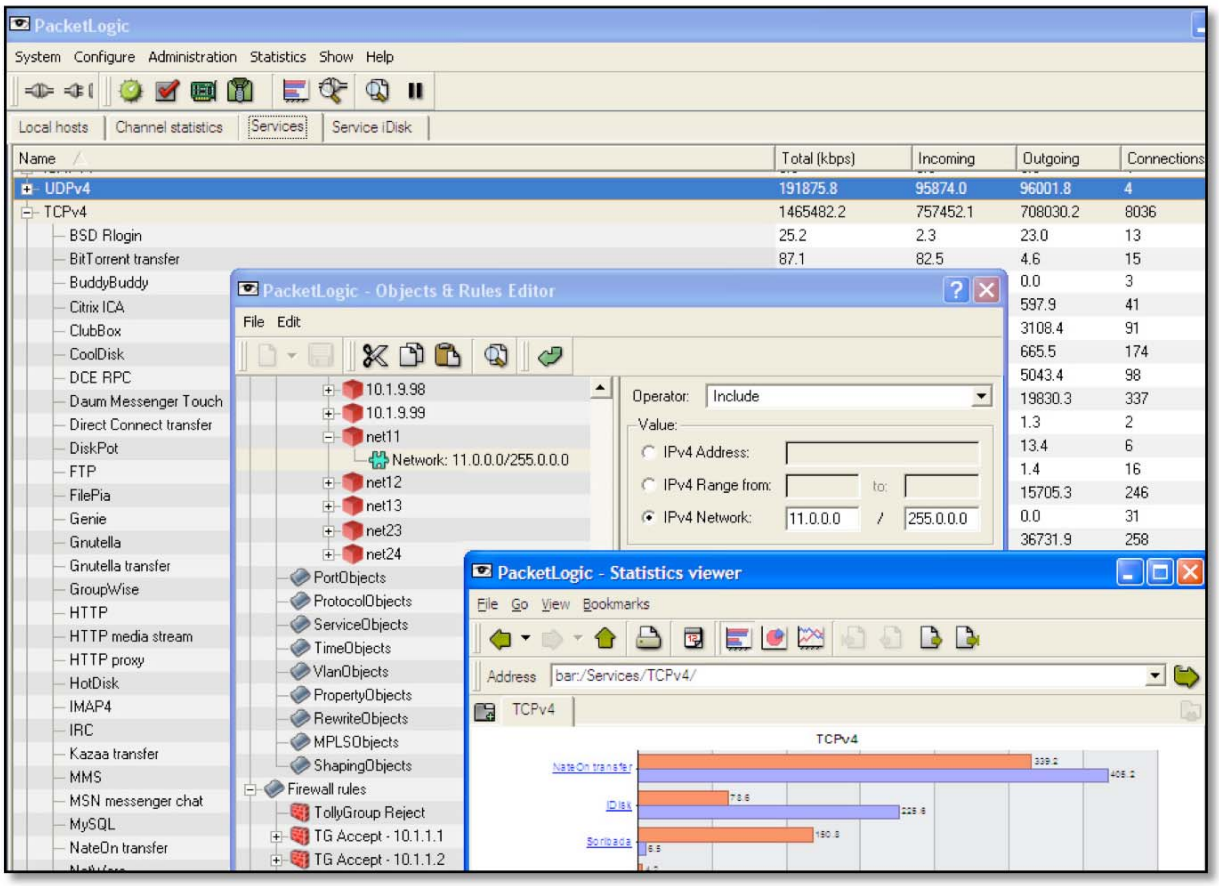
DRDL is not IP specific, or even packet specific. The engine could be used for any type of traffic, or even static files. Some of its features are designed with a packet-based structure in mind, but most of the functionality makes sense in any type of content detection environment. DRDL operates in constant time, and thus adding more protocols to the signature database will not make it consume more CPU resources.

DRDL Features

- Port independent protocol detection
- Layer 7 properties (User-Agent, Filename, URL, chat-channel, etc..)
- Child (related) connection mappings
- Large signature database
- Near constant time algorithm. Resources consumed do not depend on the number of signatures.
- Designed with reliability and scalability in mind.

Procera Networks, Inc.
100C Cooper Court
Los Gatos, CA 95032
Phone: (408) 354-7200
www.proceranetworks.com

Procera Networks PacketLogic Client Software



Source: The Tolly Group, May 2007

Figure 4

stateful traffic and four UDP streams delivered 0.2 Gbps of bidirectional stateless traffic.

Ease of Use

Tolly Group engineers verified that just four basic steps were needed to deploy a PacketLogic 7600 appliance into an existing network. Since the PacketLogic 7600 runs transparent in the network at Layer 2, it starts gathering Layer 7 traffic information by being inserted into the existing network. By default, the 7600 is equipped with 250+ signatures to identify common services used by applications. However, like typical users, Tolly Group engineers changed IP information, enabled the statistics, created new objects and associated the objects with rules/policies.

Engineers used PacketLogic client software to manage the PacketLogic 7600 and to observe the traffic patterns and user behaviors in real time. Its statistics functionality enabled engineers to focus on applications and see which ones were using the most bandwidth during any given time interval. (See Figure 4.)

Engineers also utilized the Web-Statistics module available for the Packet Logic 7600. The Web-Statistics module offers a graphical representation of network traffic statistics in a regular Web browser. Engineers could easily customize the traffic reports and looked back in time to spot trends on how the network resources were being used. (See Figure 5.)

Methodology and Configuration

Tolly Group engineers tested a Procera Networks PacketLogic 7600 running protocol version 10 and build version 324. The PacketLogic 7600 was outfitted with dual 10/100/1000 Base-T Ethernet ports. Engineers set up the PacketLogic 7600 in monitor mode on

the network. (For the test bed diagram, see Figure 6.)

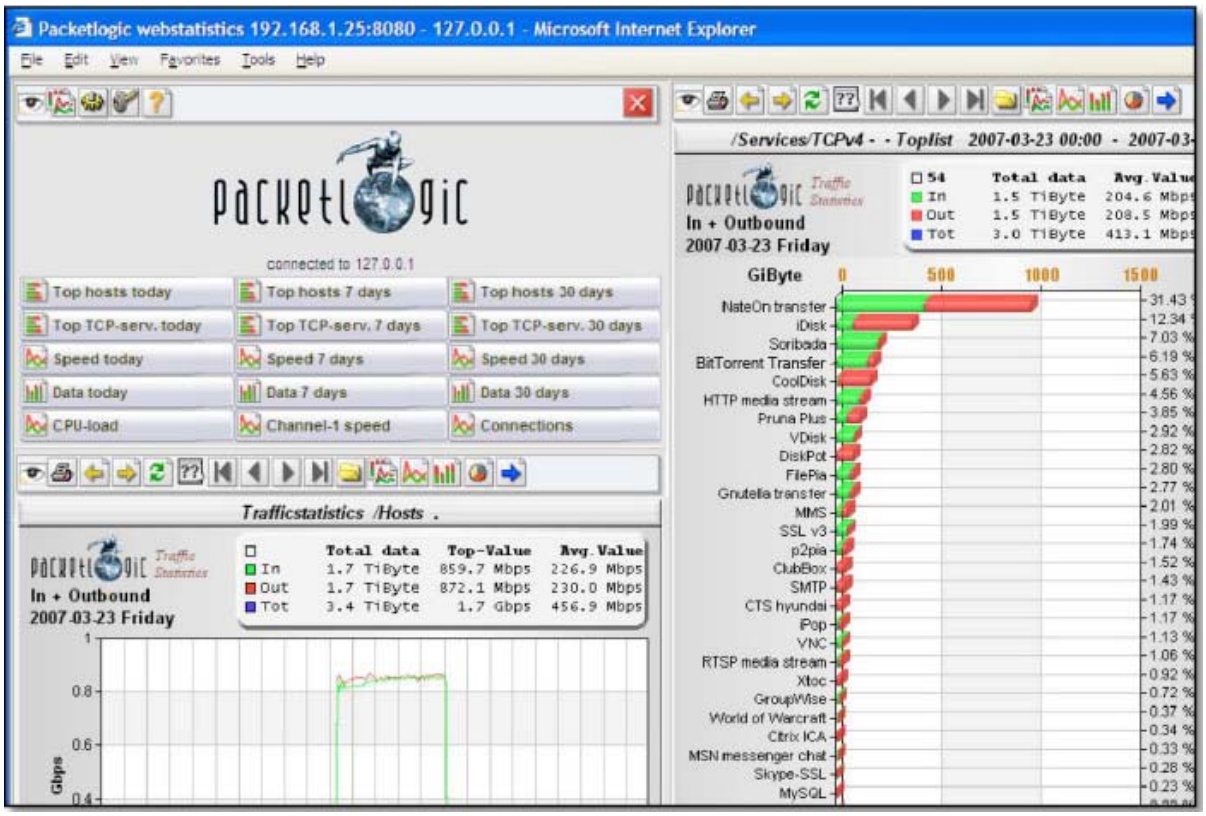
For the Layer 7 traffic identification test, engineers configured a Shenick diversifEye 8400's "TCP Replay" feature to replay PCAP files which captured the behaviors of 50 common applications. These 50 common application traffic types were known to the PacketLogic 7600. Engineers changed the number of concurrent flows generated from the Shenick tool to adjust the traffic rates from 0.2 Gbps to 1.6 Gbps. Due to the statefulness and fluctuation of the traffic, 1.6 Gbps was approximately the maximum throughput rate that engineers could measure using these particular PCAP files with the test equipment.

Throughout the test, engineers measured the latency to verify that the PacketLogic 7600 did not introduce noticeable delay as the traffic increased while it monitored all incoming traffic at different rates. Engineers configured the Shenick test tool to generate bidirectional streams to measure the one-way average, minimum and maximum latency number for both directions using Shenick's "Delay Sensitive" test case.

For the scalability test, engineers configured the PacketLogic 7600 for different numbers of rules to control and manage the traffic generated by the Shenick diversifEye test tool. The number of rules was increased from 0 to 20,000 in 5,000-rule increments. Engineers configured the Shenick test tool to generate the traffic flows with the source IP address allowed by the PacketLogic 7600. Engineers generated a constant level of traffic at 1.6 Gbps — the same traffic as the previous Layer 7 test.

For the Ease of Use test, engineers documented the out-of-box experience, from opening the box, setting up the PacketLogic 7600 in the monitor mode on the networks, to configuring policies to applying firewall/blocking, shaping and the other traffic rules. Engineers counted the number of steps for each phase until the PacketLogic was successfully deployed into the existing networks.

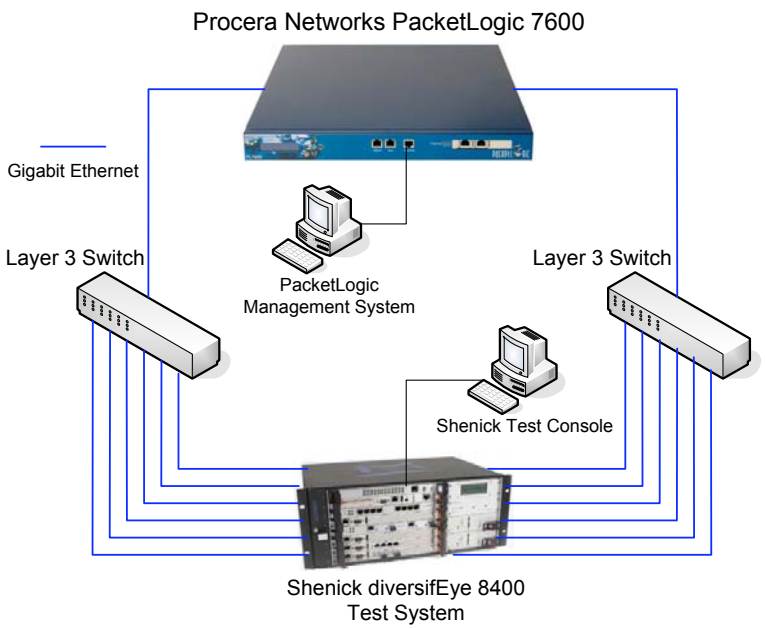
Procera Networks PacketLogic WebStatistics



Source: The Tolly Group, May 2007

Figure 5

Test Bed Diagram



Source: The Tolly Group, May 2007

Figure 6

The Tolly Group is a leading global provider of third-party validation services for vendors of IT products, components and services.

The company is based in Boca Raton, FL and can be reached by phone at (561) 391-5610, or via the Internet at:

Web: http://www.tolly.com,
E-mail: sales@tolly.com

Test Equipment Summary

The Tolly Group gratefully acknowledges the providers of test equipment used in this project.

Vendor	Product	Web
Shenick Networks Systems Ltd.	diversifEye 8400	www.shenick.com

Terms of Usage

USE THIS DOCUMENT ONLY IF YOU AGREE TO THE TERMS LISTED HEREIN.

This document is provided, free-of-charge, to help you understand whether a given product, technology or service merits additional investigation for your particular needs. Any decision to purchase must be based on your own assessment of suitability.

This evaluation was focused on illustrating specific features and/or performance of the product(s) and was conducted under controlled, laboratory conditions and certain tests may have been tailored to reflect performance under ideal conditions; performance may vary under real-world conditions. Users should run tests based on their own real-world scenarios to validate performance for their own networks. Commercially reasonable efforts were made to ensure the accuracy of the data contained herein but errors and/or oversights can occur. In no event shall The Tolly Group be liable for damages of any kind including direct, indirect, special, incidental and consequential damages which may result from the use of information contained in this document

The test/audit documented herein may also rely on various test tools the accuracy of which is beyond our control. Furthermore, the document relies on certain representations by the sponsor that are beyond our control to verify. Among these is that the software/hardware tested is production or production track and is, or will be, available in equivalent or better form to commercial customers.

When foreign translations exist, the English document is considered authoritative. To assure accuracy, only use documents downloaded directly from The Tolly Group's Web site.

All trademarks are the property of their respective owners.

207173-qspvu1-cdb-25May07