THE TOLLY GROUP

No. 202131 July 2002

VINA Technologies, Ltd.

VINA *e*Router versus ADTRAN Total Access 616-TDM and TA 600R-TDM, Cisco Systems 1720 and Netopia R5300

Competitive Performance Evaluation

Test Summary

Premise: *Customers who deploy enterprise-class access routers have come to expect line-rate throughput and non-blocking architectures as the norm. Customers need to be confident that the access routers they deploy can, in fact, deliver wire-speed, zero-loss throughput over T1 connections.*

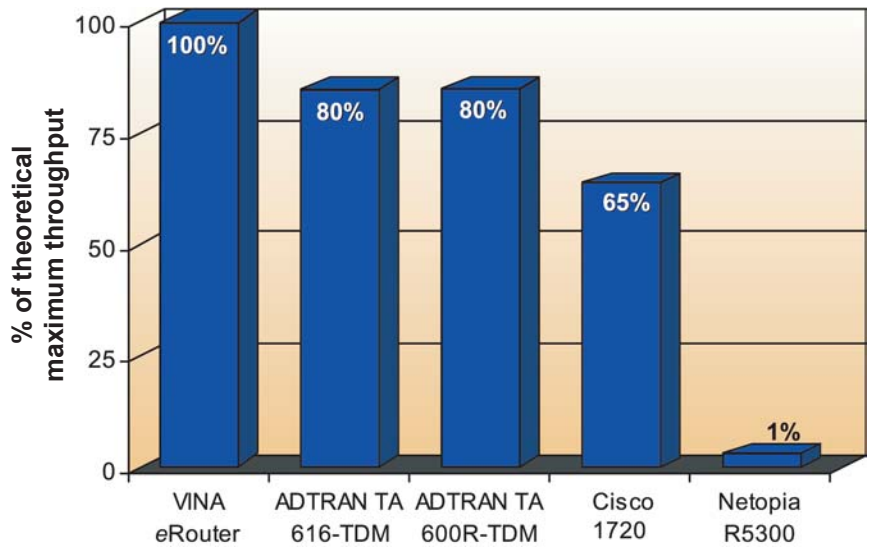
VINA Technologies, Ltd. commissioned The Tolly Group to evaluate its VINA *e*Router, a T1-based router for small and medium businesses that gives multiple users access to the Internet or their wide area networks (WAN) over reliable broadband T1 lines. The Tolly Group tested the *e*Router to determine its steady-state, zero-loss (≤0.001%) bidirectional throughput when transmitting data across T1 connections when handling a variety of standard Ethernet frame sizes.

Tolly Group engineers compared the zero-loss throughput of the *e*Router against four other T1 access routers from three vendors: an ADTRAN Total Access

Test Highlights

- Demonstrates superior performance and higher bandwidth throughput in all test cases
- Delivers full T1 line-rate bandwidth even under the most stringent test conditions, with packet sizes of 64 bytes and Network Address Translation and IP filters active
- Delivers full rate T1 bandwidth regardless of frame size, unlike any of the other systems tested
- Assures clients they can fully utilize an entire T1 connection

Throughput as a Percentage of Theoretical Maximum
Device Throughput Derived from 64-Byte Packet Tests



Source: The Tolly Group, July 2002 *Figure 1*

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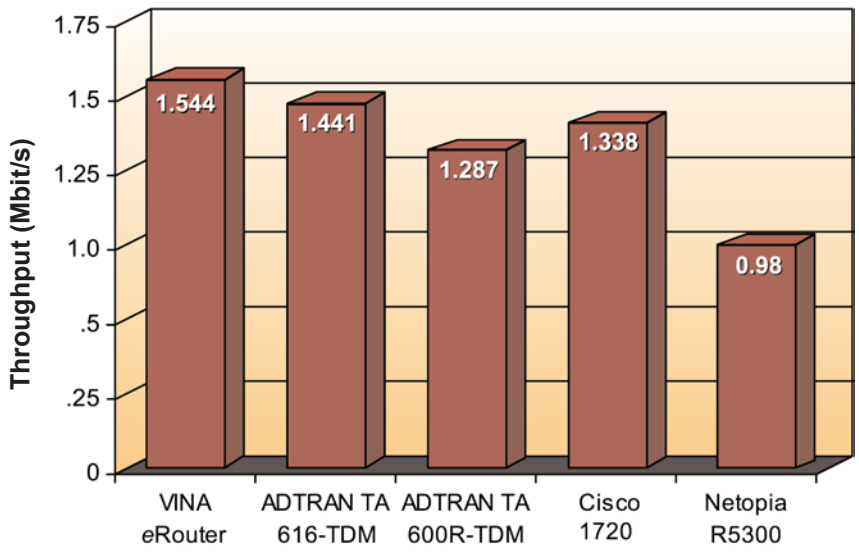
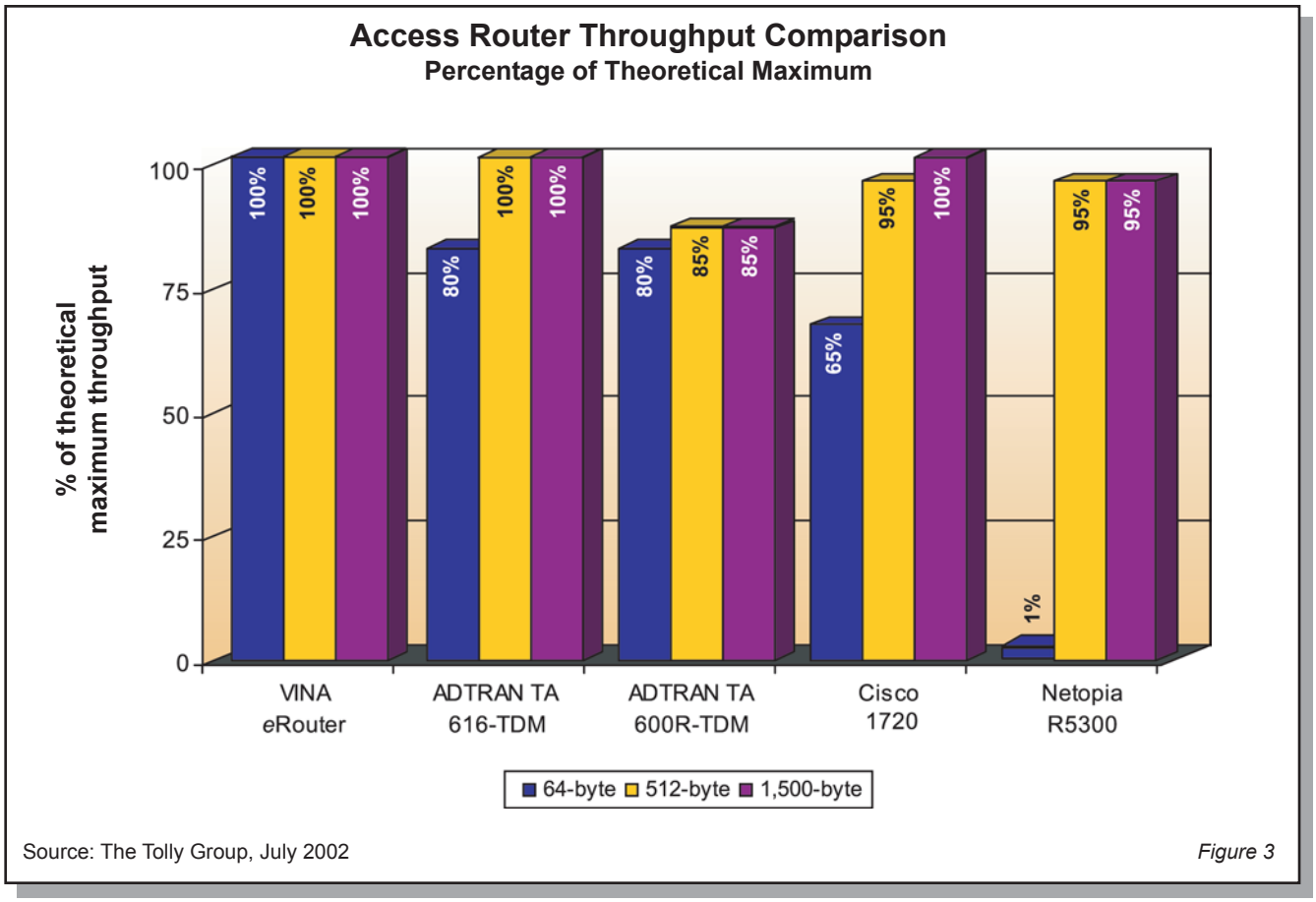
616-TDM and a TA 600R-TDM, a Cisco Systems 1720 and a Netopia R5300. Each device was tested to determine its percent of theoretical maximum zero-loss throughput between a Fast Ethernet LAN and T1 WAN interface. Tests also revealed the Mbit/s throughput rates of the devices under test when processing 64-, 512- and 1,500-byte frames (adding 14-bytes for Fast Ethernet header and four bytes for IP headers). Tests also were conducted in some scenarios with Network Address Translation (NAT) filters enabled to determine the true processing rate of the devices when under load and with NAT overhead factored in. Tests



[1]Throughput results represent the average from 64-byte, 512-byte and 1518-byte tests.

Source: The Tolly Group, July 2002

Figure 2



Source: The Tolly Group, July 2002

Figure 3

were conducted between June 2002 and July 2002.

Test results show that the *e*Router outperformed the competitive products tested in every test scenario. In fact, the *e*Router was the only T1 access router tested to achieve 100% of theoretical maximum zero-loss throughput when subjected to 64-byte frames, the most strenuous test exercise. Also, tests show that the *e*Router delivers up to 36% greater throughput than other devices tested.

Results

Zero-Loss Throughput

The *e*Router and four other competitive devices were tested for zero-loss throughput, which The Tolly Group defines as equal to or less than 0.001% packet loss. This means that for every 100,000 frames transmitted, one frame may be dropped

Results from the zero-loss throughput tests show that the *e*Router delivers an aggregate throughput rate of 1.544 Mbit/s, versus an average link speed of 1.44 Mbit/s for the ADTRAN TA 616-TDM, 1.287 Mbit/s for the ADTRAN 600R-TDM, 1.337 Mbit/s for the Cisco 1720 and 0.986 Mbit/s for the Netopia R5300 (see Figures 1 and 2).

In tests of 64-, 512- and 1500-byte packets, the *e*Router was the only device tested to offer 100% zero-loss throughput in all test scenarios. In fact, during the 64-byte packet tests – the most taxing test scenario on the device processing engine – the *e*Router delivered 20% greater zero-loss throughput than its nearest competitors, the ADTRAN TA 616-TDM and ADTRAN TA 600R-TDM in a frame-relay configuration across the T1 (see Figure 3). Note that these tests were conducted with NAT enabled with eight ingress and eight egress IP filters enabled. The Netopia R5300 did not support NAT in a frame-relay mode and consequently was tested in a PPP configuration with NAT and filters enabled. (Figure 4 shows the packet forwarding rates of each of the devices.)

The ADTRAN TA 616-TDM forwarded 80% of the theoretical maximum IP packets when handling 64-byte packet payloads and 100% of the theoretical maximum zero-loss throughput when tested with 512-byte and 1,500-byte packet payloads.

ADTRAN's TA 600R-TDM forwarded 80% of zero-loss theoretical maximum IP packets in 64-byte packet tests, and 85% of the maximum theoretical zero-loss throughput in 512-byte and 1,500-byte packet tests. The Cisco 1720 forwarded traffic at 65% of the theoretical maximum rate in 64-byte packet tests, 95% of the theoretical maximum for the 512-byte packet tests and 100% of the

VINA Technologies, Ltd.

***e*Router**

Competitive Performance Evaluation

VINA Technologies, Ltd
***e*Router**
Product Specifications*

Performance

- Full rate T1 (1.544 Mbit/s), bidirectional traffic, with packet sizes of 64, 512, or 1,500 bytes, with security features enabled

Features

- One network T1 trunk
- Single Ethernet port, 10/100 Base-T, auto sensing
- Modes: Frame Relay, PPP, HDLC
- Acts as a CSU/DSU
- Frame Relay
  - Up to 30 PVCs with IP
  - IP over Frame Relay
  - LMI T1.17 annex D, LMI Q.933 annex A
  - Point-to-point, Point-to-multipoint
- IP networking
  - Integrated IP routing
  - RIP I, RIP II
  - IP over PPP, HDLC
  - DHCP
  - Telnet, FTP, NTP, DNS, and Ping
  - IP QoS
  - Network Address Translation (NAT) with support for up to 5,000 sessions
  - eNAT, PAT, Backup default routing
- Management: Console port, HTTP, Telnet, and IP over FDL; SNMP version I and version II
- Power: 120 VAC

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* *Vendor-supplied information not verified by The Tolly Group*

LAN/WAN Packet Rate Performance

		% Utilization	LAN Tx	WAN Tx	LAN Rx	WAN Rx	Total Tx	Total Rx	Loss	Loss %	Rate
Vina *e* Router	64-byte	100%	159,957	162,240	161,479	160,715	322,197	322,194	3	0.0000	5,370
ADTRAN TA 616-TDM		80%	127,986	129,792	129,792	127,986	257,778	257,778	0	0.0000	4,296
ADTRAN TA 600R-TDM		80%	127,986	129,792	129,792	127,986	257,778	257,778	0	0.0000	4,296
Cisco 1720		65%	103,986	105,456	105,453	103,986	209,442	209,439	3	0.0000	3,491
Netopia R5300		1%	1,600	1,622	1,622	1,600	3,222	3,222	0	0.0000	54
Vina *e* Router	512-byte	100%	22,140	22,140	22,140	22,140	44,280	44,280	0	0.0000	738
ADTRAN TA 616-TDM		100%	22,140	22,140	22,140	22,140	44,280	44,280	0	0.0000	738
ADTRAN TA 600R-TDM		85%	18,840	18,819	18,819	18,840	37,659	37,659	0	0.0000	628
Cisco 1720		95%	21,060	21,033	21,032	21,054	42,093	42,086	7	0.0002	702
Netopia R5300		95%	21,060	21,033	21,031	21,060	42,093	42,091	2	0.0000	702
Vina *e* Router	1,500-byte	100%	7,620	7,620	7,620	7,620	15,240	15,240	0	0.0000	254
ADTRAN TA 616-TDM		100%	7,620	7,620	7,620	7,620	15,240	15,240	0	0.0000	254
ADTRAN TA 600R-TDM		85%	6,480	6,477	6,477	6,480	12,957	12,957	0	0.0000	216
Cisco 1720		100%	7,620	7,620	7,618	7,620	15,240	15,238	2	0.0001	254
Netopia R5300		95%	7,260	7,239	7,237	7,260	14,499	14,497	2	0.0001	242

Source: The Tolly Group, July 2002

Figure 4

theoretical maximum for the 1,500-byte packet tests.

Since the Netopia R5300 did not support NAT in a frame-relay mode, the device was tested in two configurations: a baseline with NAT and PPP filters disabled, and in a PPP frame-relay configuration with NAT and IP filters enabled. In both scenarios, the Netopia R5300 forwarded just 1% throughput when handling 64-byte packets. However in the 512-byte and 1,500-byte packet tests, the devices forwarded 95% of the theoretical maximum throughput of a T1.

Analysis

The user requirement for full line-rate support is not limited to high-end connections on the LAN, but includes even WAN connections. Remote connections via frame relay or PPP leased lines via T1 continue to be in demand even with the growth of DSL and cable modem connections. The access router market is price-sensitive and this has often resulted in a tradeoff of performance versus price. Users in the small- to mid-sized offices want simplicity of setup and single box solutions (integrated DSU-CSU, NAT and policy control).

With the VINA Technologies *e*Router, the user has a high function wide area router, delivering full line rate for both frame relay and PPP, while performing the NAT function and other control policies. Since a majority of Internet traffic (over 50%) is in the small packet size, the capability of a router to sustain a minimum packet size load with zero-loss is important to the overall performance of the applications within the site.

In this test, VINA Technologies did not take the easy testing route but instead desired to be tested under real-world scenarios with NAT and filters enabled. While this adds processing overhead on top of the

*e*Router's load, and the load of rival devices, it delivers a more realistic performance measurement than products that test under a best case scenario. Despite the additional overhead, the *e*Router delivered the equivalent of a full T1 of bandwidth in all test scenarios while competitive products struggled to provide consistently high bandwidth in all test scenarios.

Readers should note that just prior to publication of this Test Summary, ADTRAN notified The Tolly Group that it was challenging the accuracy of the results concerning its product. The Tolly Group originally shared results with ADTRAN on 15 July 2002. ADTRAN notified The Tolly Group of its challenge on 29 August 2002. The Tolly Group invited ADTRAN to offer an on-the-record comment concerning the performance of its TA 616-TDM and TA 600R-TDM.

ADTRAN says the performance of its devices was affected by the firmware release employed, which ADTRAN says supported half-duplex operation only on the devices' Ethernet port. The Tolly Group had informed ADTRAN previously that the tests were full-duplex (bidirectional) in nature. ADTRAN says it now offers a firmware version that supports full-duplex mode for the Ethernet port; that firmware release was not generally available at the time of testing. The Tolly Group stands by its test results.

Test Configuration and Methodology

For performance tests, The Tolly Group tested a VINA Technologies *e*Router Version 2.0.0 in steady-state, zero-loss (≤0.001%) bidirectional throughput tests. Tolly Group engineers conducted the same test on four other devices: an ADTRAN Total Access 616-TDM Version 3.50, an ADTRAN Total Access 600R-TDM Version 3.56, a Cisco Systems 1720 Version 3.0.0 and a Netopia R5300 4.8.2.

In the test bed, each device under test (DUT) was connected via Fast Ethernet to a SmartBits SMB-2000 chassis that generated test traffic and fed 64-, 512, and 1,518-byte frame traffic across the LAN to the DUT, which forwarded it across a T1 interface back to the SmartBits (see Figure 5). Engineers started the zero-loss throughput tests by first resetting each DUT to its factory defaults, disabling Spanning Tree, flow control and all other ancillary processes. Engineers configured each device port for maximum speed and full-duplex operation. They then configured the SmartBits 2000 for the correct frame size, correct frame rate and test duration. Engineers then initiated the test and recorded the results. In the event of frame loss, engineers re-ran the test and lowered the frame rate until no frame loss occurred. The test was repeated for three iterations and the results were averaged.

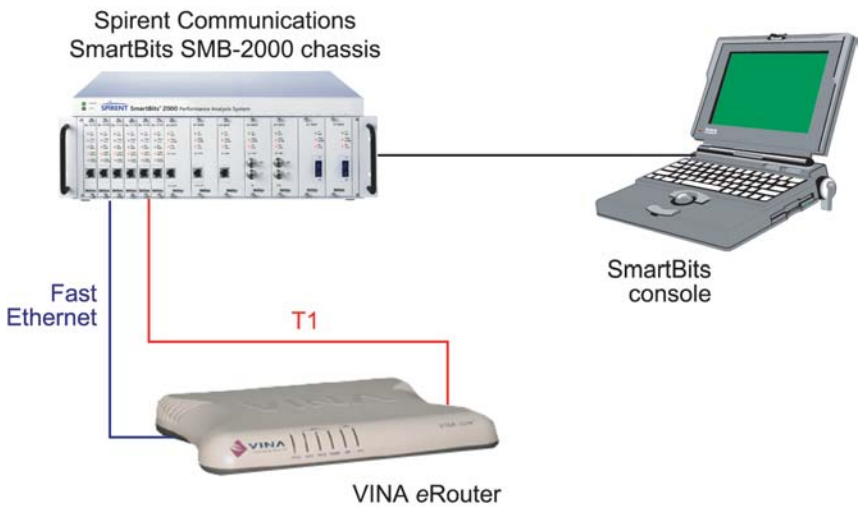
Engineers recorded the aggregate network utilization, according to the total transmitted frames and total received frames as reported by SmartBits (transmitted frames less received frames, divided by transmitted frames). Tests were run for 60 seconds each.

Equipment Acquisition and Support

All four of the competitive products tested were acquired through normal product distribution channels. The Tolly Group contacted executives at the vendor companies and invited them to provide a higher level of support than available through normal channels. Cisco and Netopia declined. ADTRAN provided product support during the tests.

The Tolly Group verified product release levels and shared test configurations with the vendors in order to give them an opportunity to optimize their devices for the tests. Results were shared with the competitive vendors and the vendors acknowledged their accuracy. For a more complete understanding of

Test Bed



Source: The Tolly Group, July 2002 *Figure 5*

the interaction between The Tolly Group, ADTRAN, Cisco and Netopia, check out the Technical Support Diary for Competitive Products Tested posted on The Tolly Group's World Wide Web site at http://www.tolly.com (see document 202131).

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

Vendor	Product	Web address
Spirent Communications	SmartBits SMB-2000	http://www.spirentcom.com

Tolly Group Services

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Project Profile

Sponsor: VINA Technologies, Ltd.
Document number: 202131
Product class: T1 access router
Products/versions under test:
- VINA Technologies *e*Router version 2.0.0
- ADTRAN Total Access 616-TDM version 3.50
- ADTRAN Total Access 600R-TDM version 3.56
- Cisco Systems 1720 version 3.0.0
- Netopia R5300 version 4.8.2

Testing window: June through July 2002
Software status:
- Generally available

Additional information available:
- Technical support diary
- Configuration files
- Data files

For more information on this document, visit our Web site at http://www.tolly.com, send E-mail to info@tolly.com, or call (732) 528-3300.

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