Miercom

Lab Testing Summary Report

September 2004
Report 040901

Product Category:
Branch Router

Vendor Tested:
Cisco Systems

Product Tested:
Cisco 3845 Integrated Services Router

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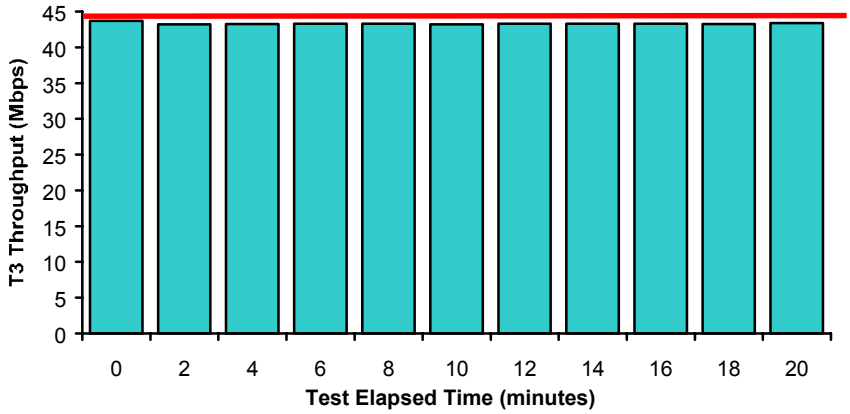
Key findings and conclusions:

- **New 3845 modular router can fully load a T3 IP WAN link, AES-encrypting all traffic in an IPsec VPN tunnel**
- **Confirmed high throughput while running a broad mix of VoIP, firewall, and IPS services**
- **Tested fully loaded with modules including voicemail, Web-caching, net management**
- **Supports a broad array of optional plug-ins, including current 3745/3725 modules**

Cisco Systems engaged Miercom to independently verify configuration, operational and performance aspects of its new, modular 3845 Integrated Services Router.

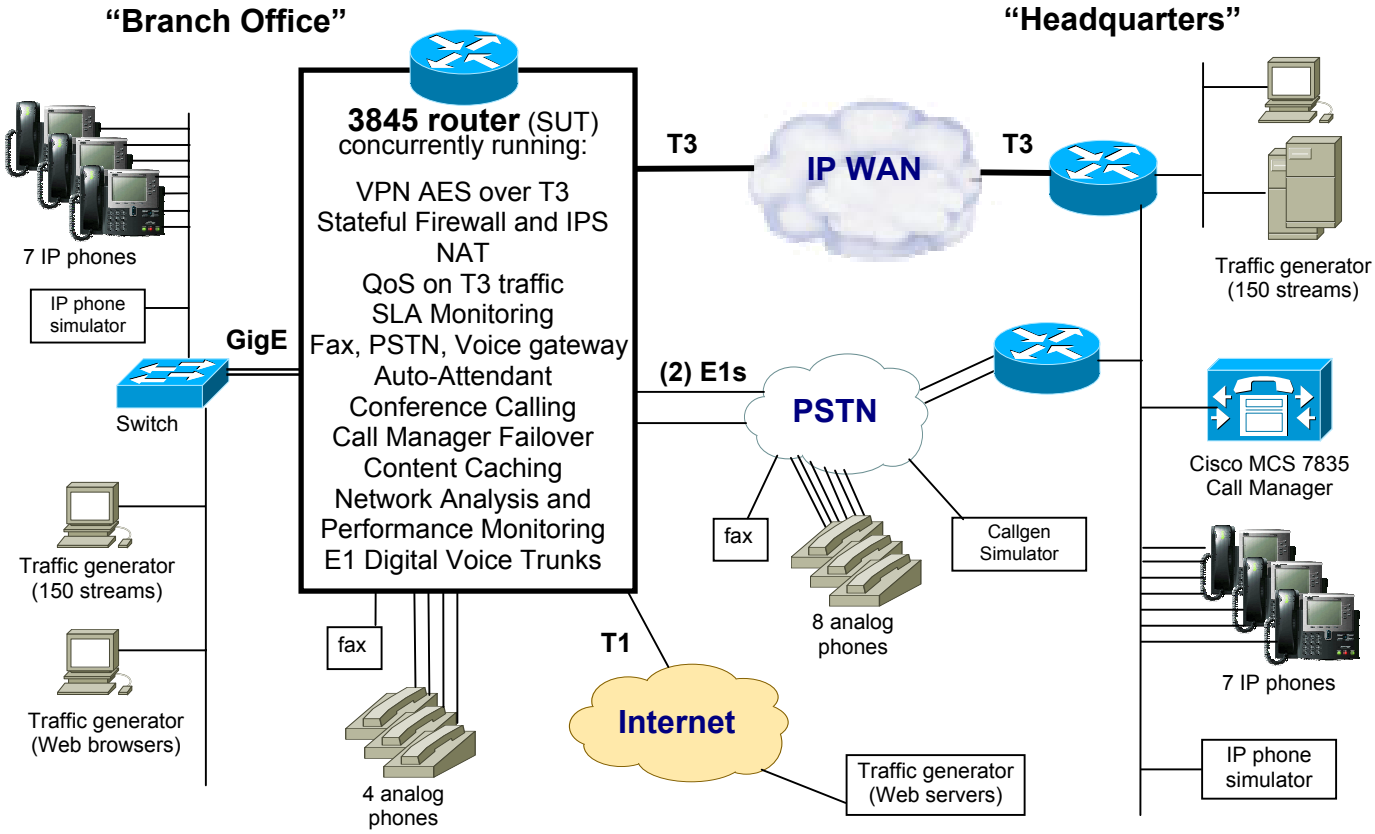
This system, representing the next-generation evolution of Cisco's 3700 line, is designed to deliver multiple services to a branch office, in addition to secure, high-capacity WAN transport, and to reduce the need for multiple, separate appliances – including stateful firewall, VPN tunneling and encryption, and intrusion prevention (IPS). In addition, by adding optional modules from among a broad assortment, the 3845 can provide additional services ranging from voicemail and switching to Web content caching.

The 3845 ran a late-beta version of IOS 12.3(11)T in the test bed. Miercom verified that, while running an impressive array of additional services (see table on page 3), the 3845 could sustain a bi-directional T3-capacity IP WAN link, through an AES-encrypted IPsec VPN tunnel.



Full T3 load. The chart shows actual T3 IP-WAN link loads, a mix of VoIP and data streams, and including all security overhead, which the 3845 QoS-processed, AES-encrypted and sent through an IPsec VPN tunnel over the IP link. The red line shows the link's max capacity. The 3845's embedded, on-board hardware encryption processor handled all the AES encryption.

Test-bed Setup



Mixed concurrent services, traffic flows. The SUT (System Under Test) was Cisco's new 3845 Integrated Services Router. A key objective was to verify that, with a rich assortment of services running on it, the router could also still effectively, and concurrently, sustain high throughput – full T3 IP-WAN capacity – while AES-encrypting all the T3 traffic through an IPsec VPN tunnel.

A comprehensive mix of concurrent traffic streams was generated, to exercise the services running on the 3845 while implementing QoS to process traffic according to the priority required for each service. The SUT classified, queued traffic according to the service priority, and ensured all DSCP and TOS bits were rewritten to the IPSec header for proper QoS handling when sent across the WAN. Voice bearer and signaling traffic were classified by DSCP and transactional data, routing-control (EIGRP) and email were classified by TOS. All other traffic was placed in the default class.

Traffic flows were generated in several "mixes," to achieve QoS diversity, and to demonstrate maximum throughput over the T3 IP WAN, AES-encrypted, IPsec VPN tunnel. To achieve maximum throughput over the T3 IP WAN link (shown in the chart on page 1), an Ixia IxChariot system (v4.3) was used, generating 8 bi-directional FTP file transfers and 30 two-way G.729 VoIP RTP streams (24 kbps each) over the T3 IP WAN.

Otherwise, to exercise the 3845's services, modules and QoS-handling, about 175 discrete, concurrent, traffic flows were generated:

- Ixia's IxChariot system generated 30 two-way G.729 VoIP RTP streams, plus the following, bi-directional protocol flows:
  - DNS (2), HTTPS (14), POP3 (2), FTP (2), HTTP (100). MOS and latency of the VoIP streams were periodically checked.
- Polymix v2.7.6, a freeware tool running on Red Hat Linux 7.3, simulated 8 browser clients at the Branch Office, accessing 50 simulated servers over the Internet. This traffic exercised the 3845's optional Content Engine module and Web-page caching.
- Cisco's SimClient v6.2.2 software tool, running on Windows PCs, continually set-up and tore down 30 concurrent Cisco Skinny-based VoIP connections, each lasting 3 minutes, from the branch office to the HQ network, via the HQ CallManager.
- Cisco's Callgen v4.0.1T, an IOS router-based software tool, continually set-up and tore down 30 concurrent VoIP-analog calls.

With the full load of traffic mixes and streams running, the testers then manually: established 3 real conference calls, with 4 participants in each session comprised of callers from the branch IP phone, branch analog phone, HQ IP phone, and PSTN; placed secure-RTP (sRTP) branch-to-HQ VoIP calls; sent faxes over PSTN; interacted with the auto-attendant; and placed and retrieved voicemail from the branch router. These confirmed proper working of the services with high traffic loads.

See all the Miercom reports of the router models tested as part of Cisco's September 2004 new product roll-out:

Report 040901: **Cisco 3845 Integrated Services Router**	Report 040903: **Cisco 2811 Integrated Services Router**
Report 040902: **Cisco 2851 Integrated Services Router**	Report 040904: **Cisco 1841 Integrated Services Router**

Modules Installed in the 3845 (System Under Test)	
Module	**Description**
HWIC slot 0: VWIC-2MFT-T1-DI	T1 (2 port) Multi-flex trunk WAN Card
HWIC slot 1: VWIC-2MFT-E1-DI	E1 (2 port) Multi-flex trunk WAN Card
HWIC slots 2 & 3: VIC-4FXS	FXS Voice Card (4 ports each, 8 ports total)
DSP slot 0, 1, 2: PVDM2-48	Voice DSP module
DSP slot 3: PVDM2-64	Voice DSP module
NM slot 1: NM-1T3/E3	T3/E3 (clear/subrate) network module
NM slot 2: NM-NAM	Network Analysis Module network module
NM slot 3: NM-CUE	Cisco Unity Express network module (voicemail, auto-attendant)
NM slot 4: NM-CE-BP	Content Engine network module

Concurrent Services Running and Verified on the Cisco 3845 Integrated Services Router While Delivering Full T3 Rate, 128-bit AES-encrypted Throughput		
Services / Features	**How 3845 supports**	**How Tested/Verified**
IPsec VPNs, AES encryption, QoS processing, at full T3 rate	Integrated in IOS	Via multiple test systems, link monitors, CLI
Stateful Firewall	Integrated in IOS	On a T1 "Internet" link; viewed via CLI
NAT	Integrated in IOS	On a T1 "Internet" link; viewed via CLI
SLA Monitoring	Integrated in IOS	Receiver mode; output viewed via CLI
Routing and QoS	Integrated in IOS	EIGRP dynamic routing; CBWFQ, WRED
Inline IPS (Intrusion Prevention)	Integrated in IOS	On a T1 "Internet" link; conducted ping assault; monitored alarm via CLI
Survivable Remote Site Telephony (SRST)	Integrated in IOS	Failed WAN link to remote CallManager; calls placed locally and via PSTN
Voicemail (stored locally on NM-CUE)	Part of NM-CUE module	Voicemail sent, received under load
Auto-Attendant	Part of NM-CUE module	Manually checked under load
Fax, PSTN, Voice gateway	Fax (VIC-4FXS/DID), PVDM2, PSTN (VWIC-2MFT-E1-DI)	Fax and PSTN voice calls placed
Content Engine/ Web caching	Optional CE module (NM-CE-BP)	Simulated Web client-server traffic; caching performance checked via CLI
IP SLA, Network monitoring, analysis, SNMP traps	Optional NM-NAM module; SNMP integral in IOS	Web interface to NAM module; check real-time traffic, SNMP trap log

Modularity and Concurrency

Like the predecessor 3745, the 3845 offers four slots for optional modules. We tested it with a voicemail module (NM-CUE), T3 controller (NM-1T3/E3), network analysis (NM-NAM) and content engine (NM-CE-BP).

The option slots accept many of the 3745 modules, plus new, wider 3845 modules now under development. Also, the many services we ran concurrently (see above table), along with a full, encrypted T3 WAN link, used only the native processing resources of the 3845, including the embedded hardware encryption processor. For added processing power, Cisco offers various optional plug-ins, including Advanced Integration Modules (AIMs), DSPs and WAN interface cards (WICs).

3845 Router's Max Firewall Throughput

Separately, we ran a "bench" test to see how much data the 3845 could route under ideal circumstances. Set-up: a single, bi-directional UDP flow between two Gigabit ports, big (1,460-byte) packets, and with firewall and NAT running and logging turned on. Using Spirent Smart-Flow v4.0, we saw nearly 1.1 Gbps total. Not a typical environment, but worth noting.

Our testing confirmed the 3845's ability to run an assortment of services – representative of the loads of a "typical" multi-service, branch-office environment, we believe – concurrent with high network-transport volumes (T3). We confirmed that each service was active and running properly, concurrent with heavy loads of encrypted WAN traffic. We measured a minimal amount of Jitter (less than 20 ms.) and Chariot reported MOS scores at 4. There were no voice drops in our test cases.

Other aspects were also tested, such as redundant-power fail-over, and all yielded acceptable, expected results. The multi-service hardware and software structure of the 3845 is sound, and the necessary performance, we believe, is integral.

Miercom Verified Performance

Based on Miercom's thorough workout of this system – and examination of its configuration, operation and features, as described herein – Miercom proudly attests to this system's performance, in particular:

- The 3845's ability to load a T3 IP-WAN link, and AES-encrypt (via IPsec VPN) a full T3 of traffic via the system's embedded hardware encryption processor.
- Concurrent provisioning of key high-level network services for a busy branch office, including Firewall/NAT, IPS, transparent content caching, VoIP and analog telephony services, while under heavy transport load.
- Assurance of quality voice service under heavy data load, and smooth failover to local router for call processing during WAN failure (SRST). The branch router ensured smooth functioning of local voice calls over the LAN, voice calls to PSTN, and voicemail access.

Cisco 3845
Integrated Services Router

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134 USA

www.cisco.com

Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

About Miercom's Product Testing Services…

With hundreds of its product-comparison analyses published over the years in such leading network trade periodicals as *Business Communications Review* and *Network World*, Miercom's reputation as the leading, independent product test center is unquestioned. Founded in 1988, the company has pioneered the comparative assessment of networking hardware and software, having developed methodologies for testing products from SAN switches to VoIP gateways and IP PBX's. Miercom's private test services include competitive product analyses, as well as individual product evaluations. Products submitted for review are typically evaluated under the "Net**WORKS** As Advertised™" program, in which networking-related products must endure a comprehensive, independent assessment of the products' usability and performance. Products that meet the appropriate criteria and performance levels receive the "Net**WORKS** As Advertised™" award and Miercom Labs' testimonial endorsement.

379 Princeton-Hightstown Rd., Cranbury, N.J. 08512
609-490-0200 ● fax 609-490-0610 ● www.miercom.com

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