

Lab Testing Summary Report

January 2005
Report 050103

Product Category:
Branch Router

Vendor Tested:
Cisco Systems

Product Tested:
**Cisco 2801
Integrated Services
Router**



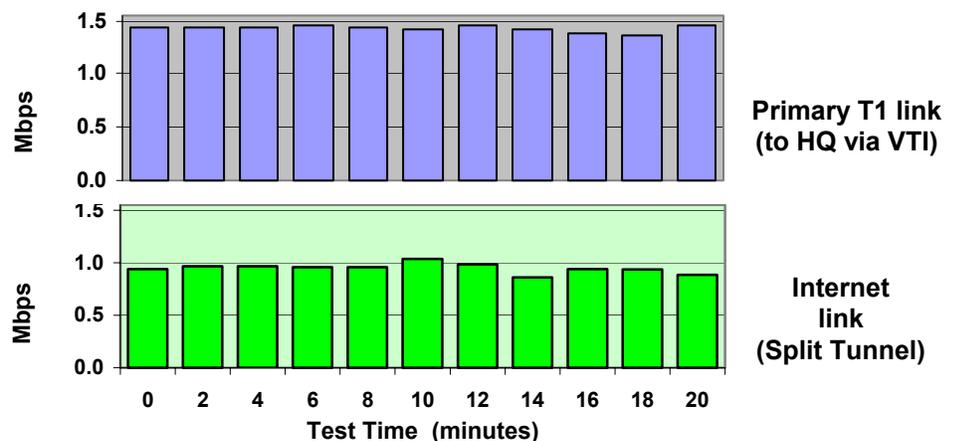
Key findings and conclusions:

- The Cisco 2801 Integrated Services Router router can load a T1 link with two-way, 3DES, IPSec-encrypted, IP-WAN traffic
- Delivers high throughput while also running a mix of telephony, firewall, and IPS services
- New IPSec virtual tunnel interface offers less header overhead, and simplifies configuration on the T1 IP WAN link
- Supports a broad array of plug-ins, including WAN-interfaces, telephony, and switch modules

Cisco Systems engaged Miercom to independently verify configuration, operational and performance aspects of its new, Cisco 2801 Integrated Services Router.

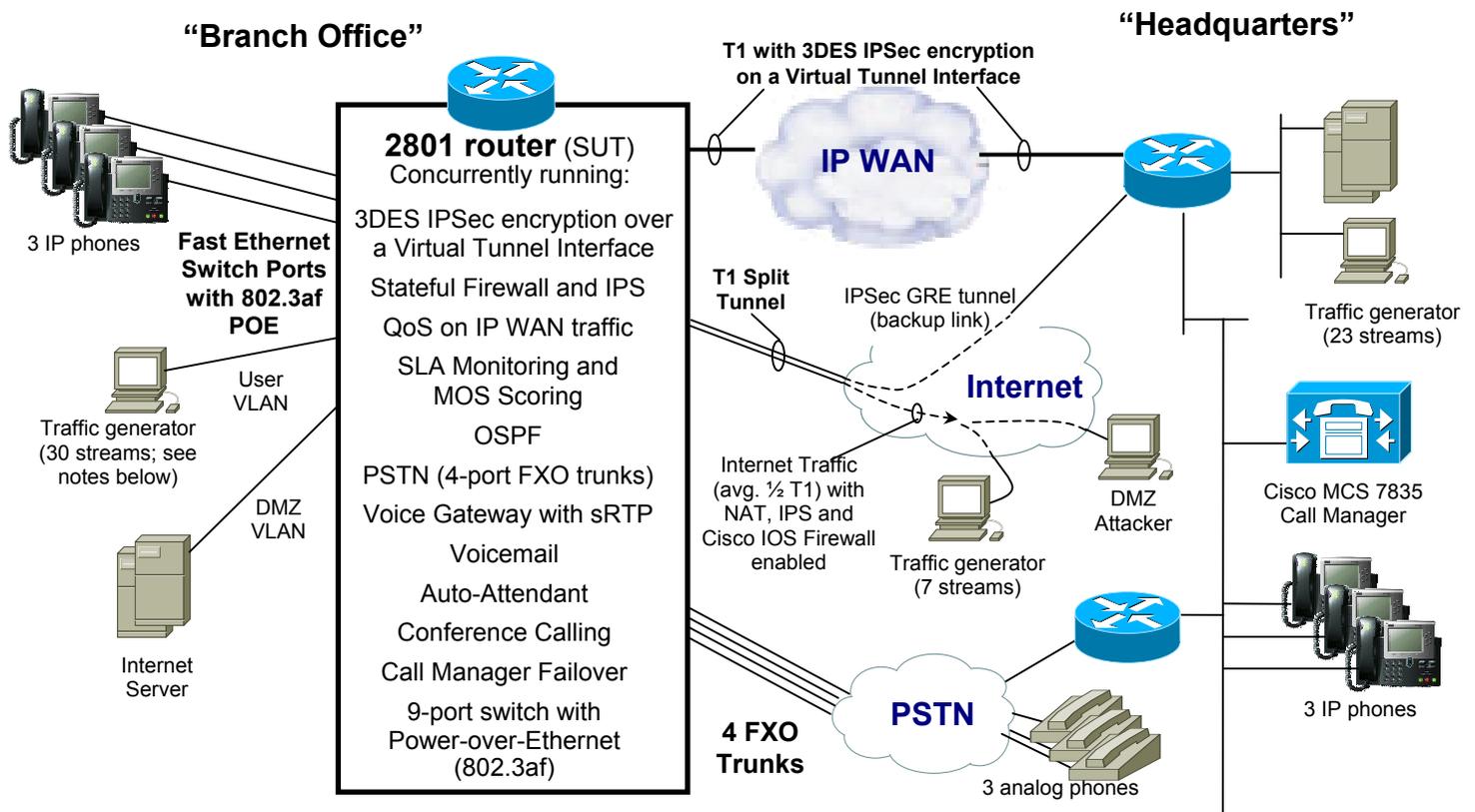
The Cisco 2801 Integrated Services Router, part of the new Cisco Integrated Service Router product line, is designed to deliver multiple services – including stateful firewall, VPN tunneling and encryption, QoS, and intrusion prevention (IPS) – for a branch office in a single compact chassis. Also, various optional modules can further enhance the system's feature and service repertoire. For example, the Cisco 2801 router in the test bed was equipped with optional telephony services, which added conference calling, auto-attendant, voicemail and survivable remote site telephony (SRST).

The Cisco 2801 router ran a late-beta version of Cisco IOS® release 12.3(14)T in the test bed. Miercom verified that, while running a rich set of additional services (see table on page 3), the Cisco 2801 router could sustain bi-directional mixed traffic load on a T1 Virtual Tunnel Interface link with 3DES IPSec encryption and also maintain an Internet traffic stream on a split tunnel interface.



Full T1 plus Internet traffic. The Cisco 2801 router delivered sustained throughput filling the T1 link to the Headquarters site. Additionally, the router filled the Split Tunnel portion of the T1 link to the Internet Service Provider. The total traffic was consistently more than 2.3 Mbps. The T1 link to Headquarters was encrypted on a 3DES, IPSec, Virtual Tunnel Interface.

Test-bed Setup



Mixed concurrent services, traffic flows. The SUT (System Under Test) was Cisco’s new 2801 Integrated Services Router. A key objective was to verify that, with a rich assortment of services running on it, the Cisco 2801 router could also still effectively sustain high throughput – filling more than a T1 of IP-WAN capacity. In the test bed, a primary T1 link was setup between the Cisco 2801 at the Branch Office and Headquarters sites. A second T1 link was setup with a Split Tunnel configuration to the Internet with approximately 1/2 the link used for clear text Internet traffic and the other 1/2 link used as a backup connection for the primary link (using an IPsec GRE tunnel). The test bed simulated an Internet connection which was protected by the Firewall and Intrusion Prevention System (IPS) facilities in the IOS software. The router also applied NAT for all the user traffic to the Internet. The Cisco 2801 router also 3DES IPsec-encrypted all the IP-WAN traffic on the primary link and used an IPsec GRE tunnel for the backup connection through the Internet to the Headquarters site.

A comprehensive mix of concurrent traffic streams were generated to exercise the services running on the Cisco 2801 while implementing QoS to process traffic according to the priority required for each service. All traffic received from the LAN that was headed out to the T1 IP-WAN had to be classified and queued, including voice, voice-call-setup traffic; transactional data, routing-control (OSPF) packets, and email. All else was assigned to a default no-priority class.

Assorted traffic flows were generated to provide QoS diversity, and to demonstrate maximum throughput over the T1 Virtual Tunnel Interface IP WAN link, all of which were 3DES IPsec encrypted. To achieve maximum throughput over the T1 and Internet links (shown in the chart on page 1), an Ixia IxChariot system (v4.3) was used, generating 2 bi-directional FTP file transfers, 6 two-way G.729 VoIP RTP streams (24 kbps each), 2 G.711 VoIP streams, 1 DNS, 5 HTTPS, and 14 HTTP sessions, all over the T1 IP WAN and Internet links.

With the full load of traffic and streams running, the testers then manually established a conference call, with 3 participants in each conference session, comprising callers from a branch phone, and HQ IP phone and PSTN. The testers then placed secured-RTP (sRTP) and unsecured RTP calls from the branch to the PSTN, interacted with the auto-attendant, and placed and retrieved voicemail from the branch router. Simultaneously, we monitored MOS (Mean Opinion Scoring) scores via SLA Monitoring and setting up MOS traps to the syslog server. These confirmed proper working of the services with high traffic loads.

Tests were done to confirm the traffic failover from the primary T1 link to the backup link (part of the split-tunnel). During the failover, faster convergence was facilitated using OSPF fast hellos, and the conference calls continued without disruption. When causing a backup link failure, the SRST functions took over local call handling, providing PSTN call routing, voicemail and auto-attendant support.

See all the Miercom reports of Integrated Services Router models tested:

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
Report 050103: Cisco 2801 Integrated Services Router	

Modules Installed in the Cisco 2801 Router (System Under Test)

Module	Description
HWIC slots 0: VIC2-4FXO	4 port FXO Analog Voice Interface Card
HWIC slots 1: VWIC-2MFT-T1	T1 (2 port) Multi-flex trunk WAN Card
HWIC slot 2, 3: HWIC-D-9ESW-POE	9-port Fast Ethernet Switch HWIC with 802.3af POE. Note: 8 ports support POE, the 9 th is an FE Uplink without POE
DSP slot 0: PVDM2-32	Voice DSP module
DSP slot 1: PVDM2-32	Voice DSP module
AIM 0:	(not used)
AIM 1: AIM-CUE	Cisco Unity Express network module (voicemail, auto-attendant)

Concurrent Services Running and Verified on the Cisco 2801 Integrated Services Router while processing Internet traffic and T1 IP WAN throughput on a 3DES IPsec Virtual Tunnel Interface

Services / Features	How 2801 supports	How Tested/Verified
QoS processing, 3DES IPsec encryption at sustained 1.5 Mbps rate	Integrated in IOS	Via multiple test systems, link monitors, CLI
Stateful Firewall	Integrated in IOS	On T1 IP WAN; viewed sessions via CLI
SLA Monitoring (with MOS traps)	Integrated in IOS	Receiver mode; output viewed via CLI
Routing and QoS	Integrated in IOS	OSPF dynamic routing; OSPF fast hellos for faster convergence WRED, CBWFQ, and LLQ
Inline IPS (Intrusion Prevention System)	Integrated in IOS	On the Internet link; launched four assaults; monitored alarms via CLI
Survivable Remote Site Telephony (SRST)	Integrated in IOS	Failed both WAN links to remote CallManager; calls placed locally and via PSTN
Conference Calling	Integrated in IOS	Manually checked under load
Voicemail (stored locally on AIM-CUE)	Part of AIM-CUE module	Voicemail sent, received under load
Auto-Attendant	Part of AIM-CUE module	Manually checked under load
PSTN, Voice gateway	FXO (PSTN) VIC2-4FXO, and PVDM2-32	FXO (PSTN) voice calls placed
Secure RTP (sRTP)	Part of PVDM2-32	Encrypted calls placed under load
Traffic Statistics, Load Monitoring	Integrated in IOS	Output viewed via CLI during testing, SDM

Modularity and Concurrency

The Cisco 2801 router offers four slots where all slots support WAN, voice and multi-flex trunk cards (VWICs) and two of the four slots support HWICs (High-Speed WAN Interface Cards). Further, two of the four slots can support double-wide HWICs turning two individual single-wide slots into a double wide slot. These let the customer selectively add features and functions, as well as tailor the configuration, and modify it, to suit the network environment.

In our test configuration, we used a double-wide HWIC (9-port HWIC) with Power-over-Ethernet (POE 802.3af) support, so we could directly power our IP phones. We could have augmented the number of ports by connecting another stand-alone switch, but the 9 ports were adequate for our testing. In the other 2 slots, we used a 4-port FXO module (telco trunks) and a 2-port T1 module. A variety of other modules are available, including BRI, FXS, E1, ADSL, G.SHDSL, and many others.

The router can support two Advanced Integration Modules

Cisco 2801 Router's Max Firewall Throughput

Separately, we ran a "bench" test to see how much data the Cisco 2801 router could route under ideal circumstances. Set-up: a single, bi-directional UDP flow between two Fast Ethernet ports, big (1,460-byte) packets, and with firewall and NAT running and logging turned on. Using Spirent Smart-Flow v4.0, we saw about 130 Mbps total. Not a typical environment, but worth noting.

(AIM Cards) on the motherboard. Note: The Cisco 2801 router supports one AIM-VPN card and one AIM-CUE (Cisco Unity Express voicemail module) card. It does not support two of the same AIM cards, i.e., not two AIM-VPNs or two AIM-CUEs. In our test environment we used one of these slots for an AIM-CUE module which delivers a host of telephony services: voicemail and auto-attendant capabilities. Survivable Remote Site Telephony (SRST) as a fail-over feature as well as conference calling capabilities are enabled in Cisco IOS software. Also, this was our first opportunity to test the new PVDM2 (Packet Voice/Data Module) DSP modules, which work with the new Call Manager (v4.1(2)es03) to allow the Cisco 2801 router to decrypt secure RTP streams from local phones – allowing a secure LAN connection even with PSTN calls.

The heart of the Cisco 2801 router is a powerful processor running IOS. And that brings with it ready access to features and services including a stateful firewall with NAT, VPN gateway, and intrusion prevention.

Our testing confirmed the 2801's ability to run an assortment of services – representing a "typical" multi-service, branch-office environment – concurrent with considerable network-transport volumes. We confirmed each service was active and running properly, concurrently the full T1 load of 3DES IPsec encrypted WAN traffic, and over half a T1 load of Internet traffic.

The bottom line: the Cisco 2801 router is a powerful, tailorable, and feature-rich platform.

Miercom Verified Performance

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

- The Cisco 2801 router's ability to load a primary T1 link, with a secondary Internet split tunnel, including 3DES IPsec-encryption of 2.3 Mbps of WAN traffic using the new Virtual Tunnel Interface.
- Concurrent provisioning of key high-level network services to a busy branch office, including stateful firewall, IPS, secure VoIP (sRTP), and analog and digital 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 (and to SRST). The branch router ensured smooth functioning of local voice calls over the LAN, voice calls to PSTN, and voicemail access.



Cisco 2801
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 "NetWORKS 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 "NetWORKS As Advertised™" award and Miercom Labs' testimonial endorsement.



Miercom

379 Princeton-Hightstown Rd., East Windsor, NJ 08512
609-490-0200 • fax 609-490-0610 • www.miercom.com

Report 050103