Miercom

Lab Testing Summary Report

Product Category:
Branch Router

Vendor Tested:
Cisco Systems

Product Tested:
Cisco 1841 Integrated Services Router

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Key findings and conclusions:

- **New Cisco 1841 modular router can load an E1-rate (2 Mbps) WAN link with 3DES-encrypted, VPN traffic**

- **Delivers high WAN throughput while also running firewall, QoS, IPS and other services**

- **Modular design, supports an array of plug-ins, including WAN-interfaces and switch modules**

- **Various security options including Dynamic Multipoint VPN (DMVPN), Easy VPN server**

Cisco Systems engaged Miercom to independently verify configuration, operational and performance aspects of its new, modular 1841 Integrated Services Router.
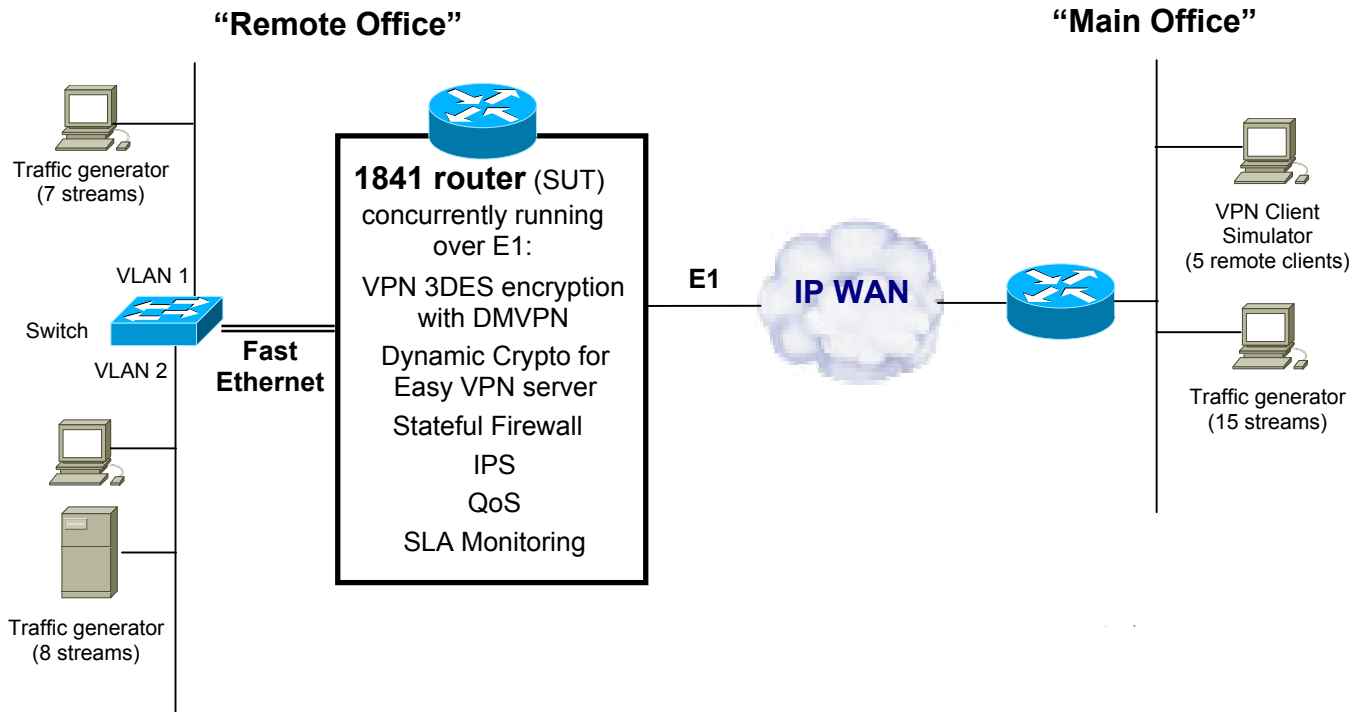
The Cisco 1841 represents a next-generation evolution of the Cisco 1721 router. The Cisco 1841 is designed to deliver multiple services – including stateful firewall, VPN tunneling and encryption, and intrusion prevention system (IPS) in a single compact chassis. Also, various optional modules can augment the system's feature and service repertoire and/or performance. For example, while the 1841 comes with an on-board hardware crypto processor that provides VPN acceleration using an optional IOS security image, encryption performance can be further increased with an Advanced Integration Module (AIM), as was the case in this test bed.

The 1841 ran a late-beta version of IOS 12.3(11)T in the test bed. Miercom verified that, while running various additional services (see table on page 3), the 1841 could sustain a bi-directional, E1-capacity IP WAN link, with a 3DES-encrypted, mixed traffic load (see below). This router is designed to deliver security and data services concurrently at full T1/E1 rates.
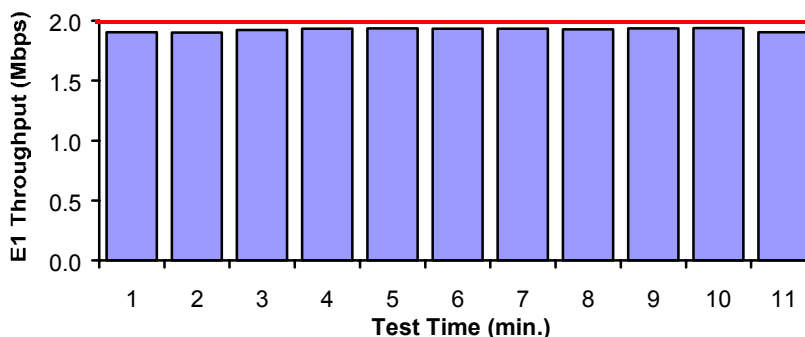
E1 load. Measurements found the 1841 router could process sustained throughput of nearly 2 Mbps over an E1 IP-WAN link. All data was QoS-classified, 3DES-encrypted and secured through Cisco's Dynamic Multi-point VPN (DMVPN). The red line shows the max theoretical link capacity.

"Remote Office"   **"Main Office"**

Traffic generator (7 streams)

VLAN 1

Switch

VLAN 2

Fast Ethernet

Traffic generator (8 streams)

1841 router (SUT)
concurrently running over E1:

VPN 3DES encryption with DMVPN

Dynamic Crypto for Easy VPN server

Stateful Firewall

IPS

QoS

SLA Monitoring

E1

IP WAN

VPN Client Simulator (5 remote clients)

Traffic generator (15 streams)

Mixed concurrent services, traffic flows. The SUT (System Under Test) was the new Cisco 1841 Integrated Services Router. A key objective was to verify that, with various services running, the 1841 could still effectively sustain high throughput – filling an E1 (2-Mbps) IP-WAN link. In the test bed, the 1841 router was connected via a 10/100 Ethernet, IEEE 802.1p/q-based VLAN trunk to a switch, supporting two LAN subnets. The 1841 connected via an IPsec VPN tunnel over an IP-WAN link with the "main office."

A mix of concurrent traffic streams was generated to exercise the services running on the 1841, including QoS classification. All traffic from the LAN headed out to the IP-WAN had to be classified and queued, based on DSCP (DiffServe Codepoint) values. Traffic arriving via the WAN E1 had to be appropriately VLAN tagged and routed.

Traffic flows were generated to provide QoS diversity, and to demonstrate the 1841's ability to load the E1 link, while processing all WAN traffic through "Triple-DES" (3DES)-encrypted, DMVPN tunnels. Ixia IxChariot traffic-generating systems (v4.3) were used, establishing multi-protocol, bi-directional traffic flows on two different subnets.

On one subnet the IxChariot generated: 2 two-way G.729 VoIP RTP streams (24 kbps each), 1 DNS, 1 HTTPS, 1 POP3, 1 SMTP, and 1 FTP sessions. The other IxChariot generated: 3 two-way G.729 VoIP RTP streams, 1 FTP, 1 HTTPS and 3 HTTP sessions.

The 1841 router was also supporting two different VPN configurations: Dynamic Multipoint VPN, which enables multiple site-to-site VPN tunnels, and Cisco's Easy VPN server, where remote users running Cisco VPN Client software set-up up dynamic, IPsec-encrypted tunnels. In the test bed a Cisco "MultiClient Unity Tool," v4.0, running on a Red Hat Linux platform, simulated multiple VPN clients connecting to the 1841.

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 1841 (System Under Test)

Module	Description
HWIC slot 0: WIC-1B-U-V2	ISDN BRI-U-WAN card
HWIC slot 1: VWIC-2MFT-E1-DI (drop and insert)	E1 (2 port) Multi-flex trunk WAN Card
AIM slot 0: AIM-VPN/BPII-PLUS	Advanced Integration Module – VPN hardware encryption module

Concurrent Services Running and Verified on the Cisco 1841 Integrated Services Router While Processing E1 (2 Mbps) load of 3DES-encrypted, IP-WAN Throughput

Services / Features	How 1841 supports	How Tested/Verified
QoS processing, DMVPN with 3DES encryption at sustained 2- Mbps rate	Integrated in IOS, optional AIM	Via multiple test systems, link monitors, CLI
Easy VPN server (dynamic, auto-negotiated, remote-client tunnels)	Integrated in IOS; optional AIM VPN hardware encryption module	Remote simulator set-up five dynamic client VPN tunnels
Stateful Firewall	Integrated in IOS	On E1 IP WAN; viewed sessions via CLI
Traffic Statistics, Load Monitoring	Integrated in IOS	Output viewed via CLI during testing
SLA Monitoring	Integrated in IOS	Receiver mode; output viewed via CLI
Routing and QoS	Integrated in IOS	EIGRP traffic routing; CBWFQ, WRED
Inline IPS (Intrusion Prevention)	Integrated in IOS	Over IP WAN; launched ping assault; monitored alarms via CLI

Modularity and Concurrency

Our test bed validated the 1841, a small-branch-office router, as a compact (1RU) system that can assume many jobs, including those of several otherwise separate security appliances.

As the above table shows, the native IOS of the 1841 offers users key integrated security capabilities. Among them:

- Stateful Firewall
- In-line Intrusion Prevention System (IPS)
- VPN tunneling and encryption
- QoS

1841 Router's Max Firewall Throughput

Separately, we ran a "bench" test to see how much data the 1841 could route under ideal circumstances. Set-up: a single, bi-directional UDP flow between two 10/100 ports, big (1,460-byte) packets, and with firewall and NAT running and logging turned on: Using Spirent Smart-Flow v4.0, we saw over 130 Mbps total. Not a typical environment, but worth noting.

The stateful firewall provides dynamic control over ports and protocols, carefully limiting access from the outside. Also, while not used in this test bed, NAT is a collateral capability, which effectively protects internal IP addresses.

The in-line IPS capability inspects inbound traffic, applying hundreds of known attack "signatures" to spot and suppress threats.

Our test bed highlighted the 1841's VPN capabilities. We verified DMVPN operation. VPN tunnels were set-up and run over the E1 IP-WAN link. We also exercised Cisco's Easy VPN server, which lets remote users running the Cisco VPN Client software set-up dynamic, auto-negotiated IPsec-based tunnels..

With all the security services running, and more – including QoS processing and SLA Monitoring-based network and link monitoring – the 1841 could still sustain bi-directional E1-capacity. The 1841 is a powerful branch router, capable of delivering multiple concurrent services along with high-volume, encrypted WAN throughput.

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 1841's ability to load an E1 link, 3DES-encrypting nearly 2 Mbps of WAN traffic via Advanced Integration Module (AIM)-based hardware encryption module.

- Concurrent provision of key high-level network services to a busy branch or small office, including stateful firewall, and in-line IPS, while under heavy traffic load. Service Level Agreement monitoring was also verified.

- Support for varied VPN topologies and requirements. We verified the 1841's support of Dynamic Multipoint VPN, as well as Cisco's Easy VPN server, where remote clients running Cisco's VPN software establish dynamic, auto-negotiated VPN tunnels.

Cisco 1841
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.