



Cisco ISR 2811 Report

A Broadband-Testing Report

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CISCO ISR 2811 REPORT – EXECUTIVE SUMMARY

- With its new ISR (Integrated Services Routers) range, Cisco is claiming to deliver secure, wire-speed data, voice, video and other advanced services to the SME/branch office market. Our test showed that it is possible to enable multiple features and completely saturate the device with data application traffic, but still be able to fully use real-time applications such as the integrated IP telephony features.
- The 2811 example we tested comes with a very full feature set by class standards, but at an attractive entry price – not always a combination that we associate with Cisco as a premium brand, but a very welcome one.
- The IP telephony features included with the 2811 are an effective product in their own right.
- The new GUI (SDM 2.0) featured with the 2811 is very comprehensive by Cisco standards and easy to use, but a little slow. However, Cisco claims to have resolved this issue with release 2.1 of SDM.
- The choice of optional interfaces and expansion cards is enormous – over 90 are available. This makes the ISR a very flexible product that ought to suit a very wide range of user requirements, both on the LAN and WAN/Internet.
- The ISR family as a whole is a very significant improvement, performance and features wise, on the old 2600 range of multi-service routers offered by Cisco. In many cases, traffic-handling capabilities have been increased by a huge margin.

The Aims Of This Report

Within the scope of this report we're looking to achieve three aims, all relevant to the target market of the product: SME and branch/satellite office users.

1. To examine the feature set of the ISR 2811 with a focus on performance, IP telephony and management features.
2. To test the capabilities of the ISR 2811 to cope with heavy traffic loads and multiple features enabled, while still managing real-time traffic.
3. To gauge how easy the ISR 2811 is to configure and manage on a day-to-day basis, given its intended target user base – SME/branch office – which typically has few technical IT skills to hand. Equally, in a managed services environment, we need to examine what level of support the service provider is likely to need to offer, in order to keep their customers happy.

INTRODUCTION: A MARRIAGE OF CONVENIENCE

For how long now have we been hearing the voice and data convergence story?

“Too long” is what we guess most of you will say. For all the noise, the great promise of a single network – and single device – supporting voice and data traffic and applications hasn’t really been fulfilled, but there is a sound reason for that. As the bad stand-up comedian says, it’s all about, er – timing.

The single source of voice and data really is a great story for the small to medium, or branch, office. One device to manage, one network to worry about... what could be easier? But it has to be both an affordable solution and a deliverable one. For many years this just wasn’t the case; WAN connections were too expensive, as were the devices themselves and the Internet just didn’t cut it.

But now with low-cost broadband connections (almost) everywhere you look, add in an affordable voice and data convergence device at the end, *et voila!* So, along comes Cisco with its new range of Integrated Service Routers (ISRs) offering that very cocktail of affordable data and IP telephony services and the invites can be sent out, the marriage of convenience is officially on. Or should it be the convergence of convenience...

For this report we’ve plucked a product from the lower-middle of the range, the ISR 2811 to see if Cisco’s claims of combining features and performance in one box stand up. We’ll start by taking a look at the feature set on offer.



Figure 1 – The Cisco ISR 2800 Series

ISR 2811 – FEATURES AND FUNCTIONALITY OVERVIEW

The ISR 2811 has a feature set that splits approximately 50:50 between voice and data management and security.

With this product, Cisco's aim has been to provide a very complete set of features in areas that would normally be considered as device specialist; for example security or IP telephony, the idea being that it should not be lacking in any of these areas compared to a device that only does one of these functions. Cisco – being a router company – made a very clear statement about the ISR range of products: here routing is a service, not a product in its own right. This goes beyond marketing-ese, it really does say a lot about the ambitions of this product and the very broad range of features it has on tap. So, all the routing features you would expect – courtesy of the ubiquitous IOS – are present, but these really are just a small part of the story.

Voice And Data Features

The Hardware

With the launch of the ISR range, Cisco has done more than simply polished up its old 2600 multi-service router family, making major architectural improvements inside the box.

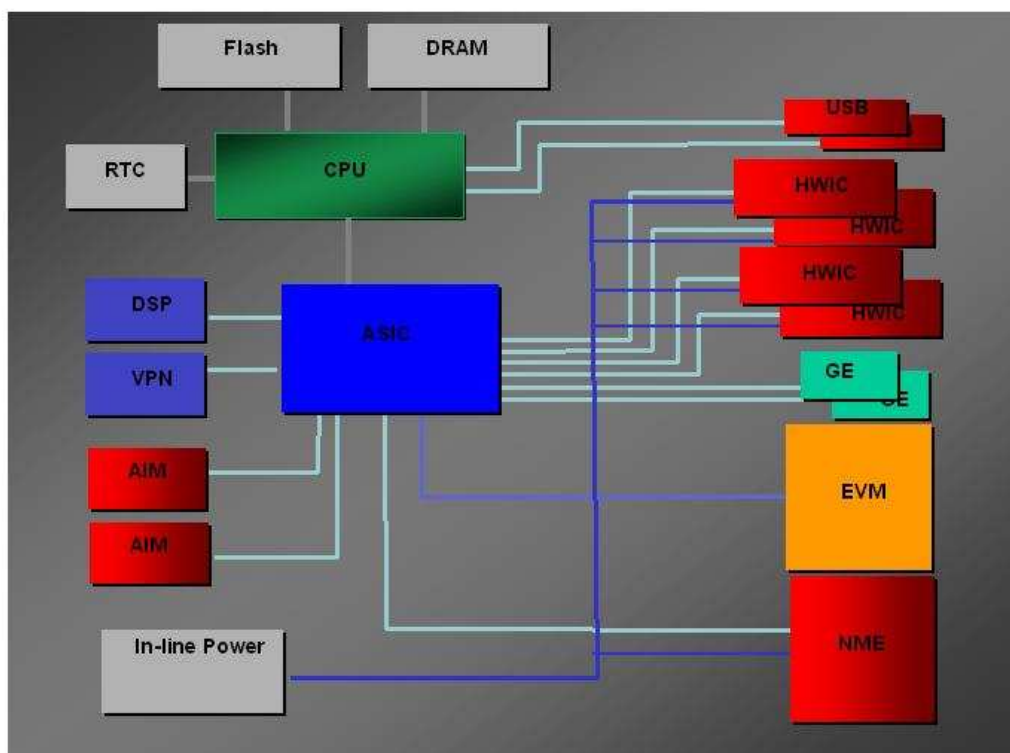


Figure 2 – Cisco ISR Internal Architecture

This has resulted in a very modular architecture with stacks of hardware options available. These are in the form of different types of module, depending on the service type and slot availability.

HWICs (High-performance WAN Interface Cards): The 2811 has four HWIC slots for different types of WIC (data/voice) modules. Ours, for example, came with a choice including ADSL, E1 and G.703 WAN interfaces, a four-port connector for analogue phones or fax devices and a four-port EtherSwitch supporting Power over Ethernet (PoE). A nine-port version of the module is also available.

DSP (Digital Signal Processor) Slots: These (two slots on the 2811) are for voice processing functions, such as transcoding and conferencing.

NME (Network Module Enhanced): These (one slot on the 2811) support a range of network modules. PoE is supported for connections PoE enabled devices.

AIM (Advanced Integration Module): These (two slots on the 2811) support features such as voicemail, compression, higher encryption rates and ATM.

In addition, the 2811 came with two 10/100 Ethernet ports as standard, plus on-board hardware encryption, supporting up to 20Mbps of encryption performance. A flash card interface is also fitted for hosting IOS and running configurations. VLAN plus 802.1q (VLAN tagging) are supported as standard. Two USB ports are also included for future use with security devices such as USB-based security tokens and removable storage. A dedicated management port is also integrated.

Several tasks within the device are dedicated to specific hardware components. This results in a few headline figures:

- Faster CPU giving 500% performance improvement over existing platforms
- HWICs supporting 400Mbps of switched traffic (previously 8Mbps shared)
- NMEs supporting 1.2Gbps of traffic into a dedicated ASIC

Internal memory has also been increased to 256MB as standard (768MB maximum, as installed here) which is now DDR SDRAM with ECC (Error correcting code). The power supply is internal with support for both Cisco in-line power and IEEE 802.3af PoE. This Power over Ethernet capability, which extends to powering IP phones, is ideal for the SME market; fewer power sources required, easily located, no Spaghetti Junction of wires and simple to deploy.

Voice Features

On the voice side, significant advances in voice trunk and station densities and the aforementioned DSP have enabled Cisco to embed the voice technology within the router, without it taking up any module slots.

The DSPs handle all secure voice, voice gateway, conferencing, and transcoding capabilities, combined with call processing integrated within Cisco IOS software, along with optional voice mail and automated attendant in the AIMS. In theory, this means that voice processing should be unaffected by data traffic – regardless of density – passing through the router, something we naturally put to the test (see later).

The 2800 series includes new releases of Cisco's CallManager Express and Cisco Unity Express systems. It means that, with the ISR 2811 you can effectively replace PBXs, especially in a branch office type environment, without losing any features; IP telephony, voice mail and auto attendant solutions are all included. Toll-quality, secure voice over IP is the promise (QoS, cRTP and sRTP are all supported). Up to 36 IP phones are supported by the 2811 – more on upper-range models, over multiple E1 WAN connections, as we explained earlier, depending on the module configuration chosen.

We attached four Cisco 7960 IP telephones to the ISR 2811 in order to evaluate the various IP telephony functions on offer.



Figure 3 – Cisco 7960 IP Telephone

These all are fully operable from the built-in screen and keypad on the phone itself, having performed basic configuration operations first at the ISR's CLI (Command Line Interface). We set up a number of features to test including:

- Automated Attendant (dial by number/name)
- Voicemail
- Directory
- Speed-dial
- Call Waiting
- Call Forward
- On Hold
- Conferencing
- Call Back When Free
- Call Transfer
- Call Pickup
- Paging
- Shared Line With Feature Ring
- Hunt Group
- Call Park

All the services were PIN protected. We found the functions easy to use via the phone – five minutes “practice” was all it took. The IP Telephony functionality was also put to the test in an environment where the ISR 2811 was fully saturated, to see if it worked flawlessly still in a stressed environment (see test section).

Quality Of Service (QoS)

For real-time applications such as VoIP, Cisco provides QoS support. This can be set up using Cisco's Security Device Manager (see later) to specify guaranteed bandwidth allocation to real-time protocols, including video streaming protocols such as RTSP, something we put to the test (see later).

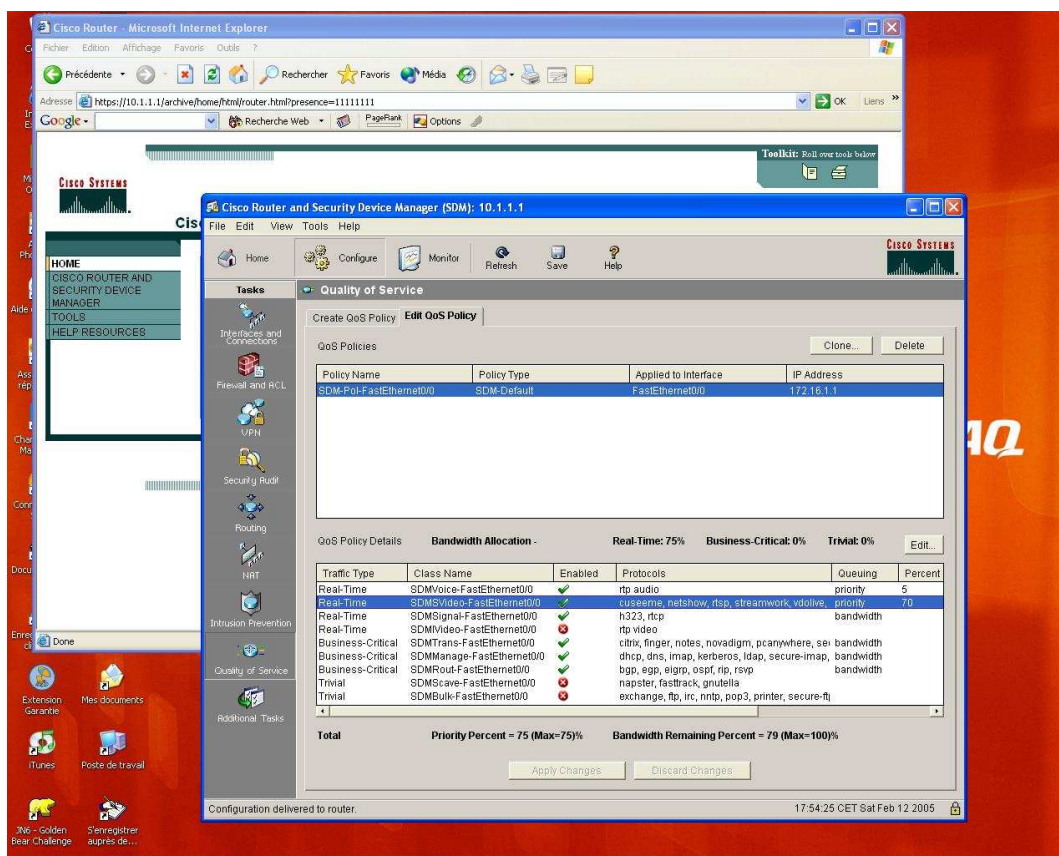


Figure 4 – Editing QoS Settings With SDM 2.0

Both real-time and business critical applications can be allocated guaranteed bandwidth availability/priority settings simply by adding to them from a list of supported protocol types. These can be changed or added to as required, as demands change.

This dynamic configuration of QoS, combined with that of other technologies such as IP Multicast and secure tunneling via VPNs, optimises latency-sensitive applications such as voice and video while securing them at the same time.

Security Features

A wide range of security features are integrated with the ISR 2811, as well as an optional IDS security module which has dedicated processing and storage capabilities.

A one-click option – One-Step Lockdown - enables you to secure the entire network immediately, in the event of a perceived attack or any other emergency state. Otherwise, the SDM GUI (see later) allows you to configure to ISR, feature by feature. A good starting point is the Security Audit option, which lets you run through a step by step examination of the security state of the ISR, creating a report which allows you to then automatically enable or disable any security features, with recommendations.

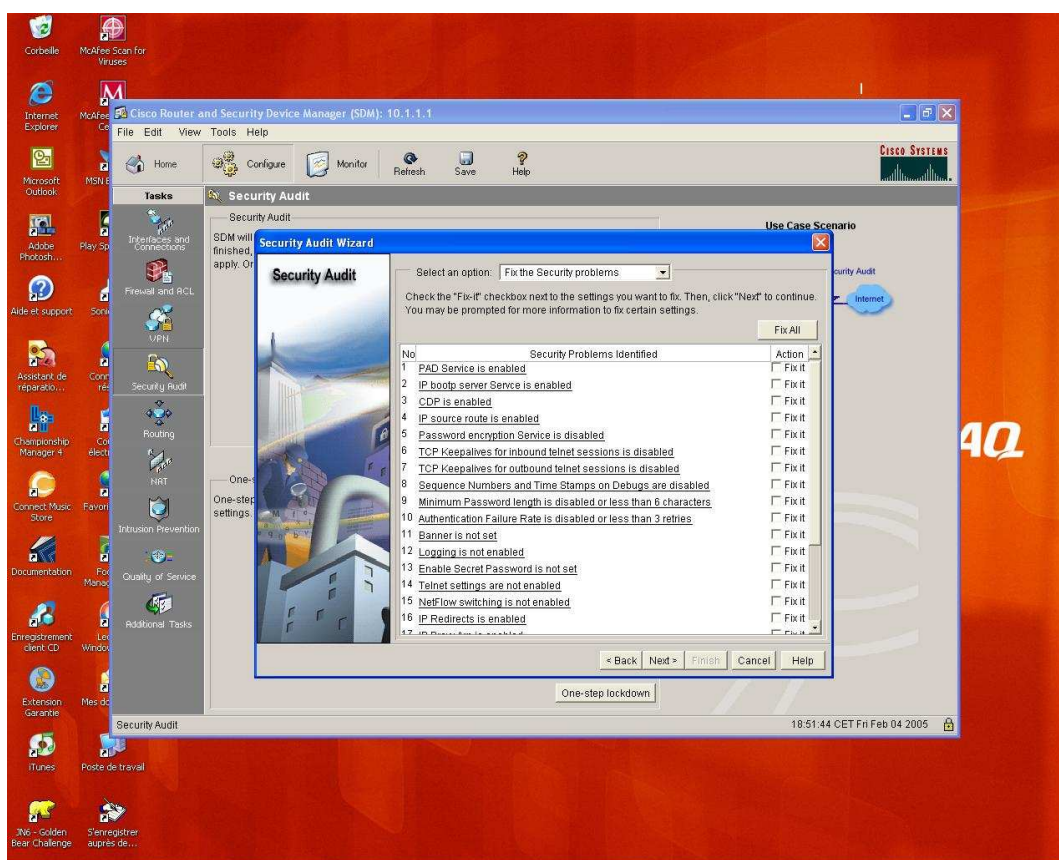


Figure 5 – Security Audit

A number of access control mechanisms are also supported with the 2811. The Network Admission Control, the 1st phase of what Cisco calls its “Self-Defending Network initiative” supports ARP, EAP and Radius ACLs, limiting network access to compliant and trusted endpoints, as defined by the user.

VPN (Virtual Private Networking)

The 2811 supports a broad range of VPN tunneling and encryption options including DMVPN, Easy VPN and V3PN with Multi-Virtual Route Forwarding (VRF) and Multiprotocol Label Switching (MPLS) for secure, routed connections.

Integrated hardware-based VPN encryption acceleration (20Mbps licensed as standard) offloads IPsec encryption and VPN processes to provide increased VPN throughput with minimal impact to the router CPU. IPsec, AES, Digital Encryption Standard (DES), and Triple DES (3DES) encryption are also supported.

Optional VPN encryption AIMS are available to provide additional VPN throughput or scalability. The optional AIM provides up to 10 times the encryption performance over previous models, as well as tunnel scalability.

Cisco DMVPN helps enable on-demand and scalable full-mesh VPN to reduce latency, conserve bandwidth, and simplify VPN deployment. The DMVPN feature builds upon Cisco IPsec and routing expertise by helping enable dynamic configuration of GRE tunnels, IPsec encryption, Next Hop Resolution Protocol (NHRP), Open Shortest Path First (OSPF), and Enhanced Interior Gateway Routing Protocol (EIGRP). DMVPN also eases administrative burden with no configuration at the hub when adding new spokes or when setting up spoke-to-spoke connections.

Secure Voice

Voice conversations terminating on either TDM or analog voice gateway ports are protected from eavesdropping. These provide a secure environment for IP communications over a LAN or WAN.

Media encryption using secure RTP (SRTP) encrypts the voice conversation, rendering it unintelligible to would-be hackers who have penetrated and gained access to the voice domain. SRTP is designed specifically for voice packets and supports the AES encryption algorithm. Media encryption using secure RTP is more bandwidth-efficient than IPsec.

Another option is Easy VPN. This is an IPsec solution designed to support hub-and-spoke VPN topologies with minimal effort and high scalability. Easy VPN simplifies provisioning and management of VPN solutions between Cisco PIX firewalls, the Cisco VPN 3000 Series Client and routers of all sizes. It uses "policy-push" technology to simplify configuration.

The Cisco 2811 also supports V3PN, which provides a VPN infrastructure capable of converged data, voice, and video across a secure, QoS-enabled IPsec network. Cisco claims it allows customers to obtain the same performance for voice and video applications over an IP transport as they would over an alternate WAN link.

Multi-VRF, also referred to as VRF-Lite, provides the ability to configure and maintain more than one instance of a routing and forwarding table within the same physical router. In combination with Ethernet VLAN technologies and WAN VPN technologies such as Frame Relay, Multi-VRF helps enable the provisioning of several logical services using one physical network, extending the privacy and security down to a branch-office LAN.

One Cisco router with Multi-VRF can support multiple organisations with overlapping IP addresses while maintaining separation of data, routing, and physical interfaces.

Firewall

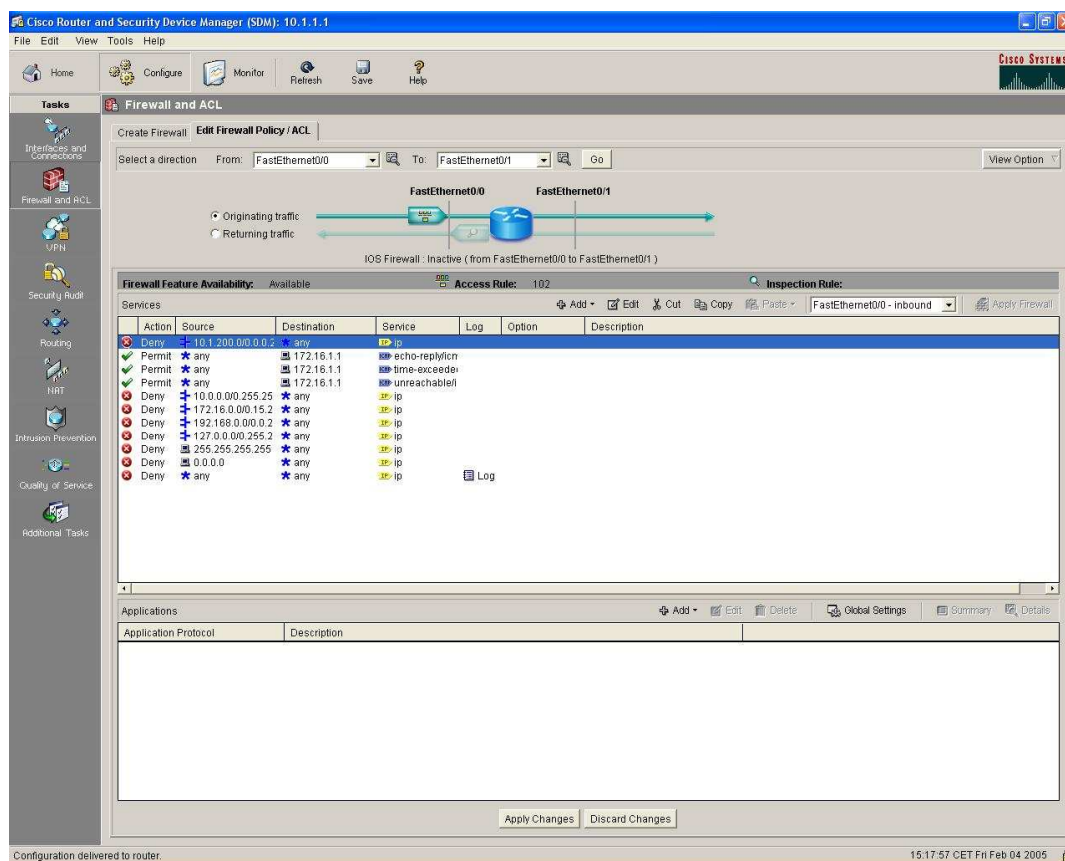


Figure 6 – Setting Up The Firewall

The 2811 includes a stateful inspection firewall which, in addition to Layer 3 stateful firewalling, can support transparent firewalling, which is the ability to provide Layer 3 firewalling for Layer 2 connectivity on the same router. Transparent firewalling provides support for sub interfaces and VLAN trunks, Spanning Tree Protocol, all standard management tools, and Dynamic Host Configuration Protocol (DHCP) pass-through to assign DHCP addresses on opposite interfaces (bi-directional).

Since it does not require IP subnet renumbering or IP addresses on the interfaces, it is a one-click configuration to add it to the network. Child's play...

Inline IPS

The 2811 includes IDS/IPS capabilities.

The Cisco IPS is an inline, deep-packet, inspection-based solution that can drop traffic, send an alarm, or reset the connection, helping enable the router to respond immediately to security threats and protect the network. Working in tandem with the other security features such as IPSec VPN, GRE, and the Firewall, the IPS can allow decryption, tunnel termination, firewalling, and traffic inspection at the first point of entry into the network.

It can load and help enable selected IPS signatures, allowing customers to choose from the signature database supported by Cisco's existing IDS Sensor platforms. Companies also can modify an existing signature or create a new signature to address newly discovered threats, and if they want maximum intrusion protection, they can select a signature file that

contains “most-likely” worm and attack signatures. Traffic matching these high confidence-rated worm and attack signatures is configured to be dropped.

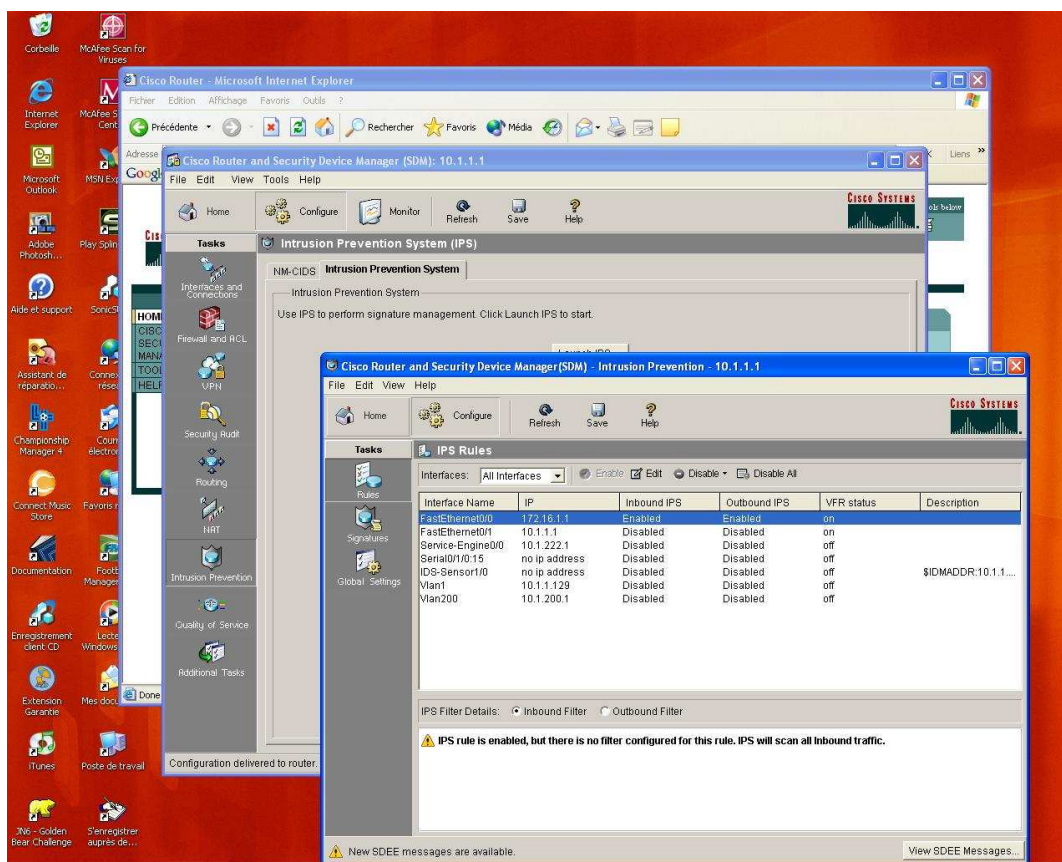


Figure 7 – Configuring The IPS

An IDS hardware upgrade option is supported by the 2811, which can be added as a module. The Cisco IDS Network Module helps enable a complete IDS system that works in concert with other IDS components to efficiently protect data and information infrastructure. It has a dedicated CPU for IDS and a 20-GB hard drive for logging with more than 1000 IPS signatures supported.

URL Filtering (Off-box and On-box Optional)

With the 2811, Cisco offers URL filtering to support the Firewall, allowing customers to use either Websense or N2H2 3rd party URL filter databases in tandem with the ISR, to prevent users from accessing specified websites on the basis of their security policy. The Firewall works with the Websense and N2H2 servers, available either offline as proxies, or on-box optionally, to determine whether to allow or deny (block) a particular URL, based on the policies that have been set.

URL filtering is also available via an optional module, the Content Engine Network Module.

Configuration And Management

The ISR 2811 can be configured either via the classic IOS Command Line Interface or CLI (via direct console connection, Telnet or Secure Shell – SSH) or – for most features – via the Cisco Router and Security Device Manager GUI, provided here in SDM 2.0 format.

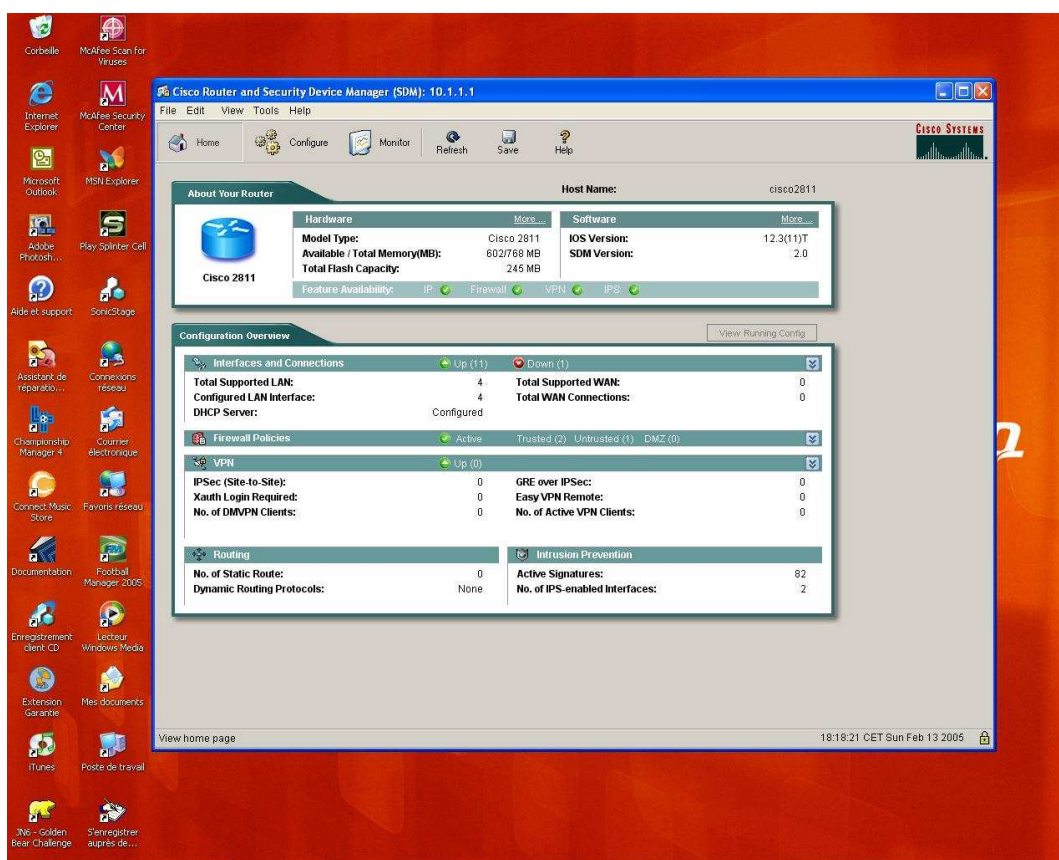


Figure 8 – SDM 2.0 GUI

Most of the basic router functions – configuring the various interfaces, setting up NAT, static routes and similar features – can be set up via the GUI. And – apart from being slow – it is very easy to use. A home page presents you with a summary of the ISR’s configuration and status, using green/red LED simulators to identify the health of the various router components.

A “Configure” option presents a list of feature configuration options: Interfaces and Connections, Firewall and ACL, VPN, Security Audit, Routing, NAT, Intrusion Prevention, Quality of Service and Additional Tasks. A number of wizard options are available to guide you through setting up most of these features. This is a very positive step, compared with Cisco of old, in terms of enabling less specialist users to be able to carry out basic configuration tasks, or at least be easily guided through them via remote support.

For those who prefer to get their “hands dirty” the Cisco CLI is still the best around. We found that when the 2811 was being stress-tested, this was the more reliable (noticeable faster under the release tested – SDM release 2.1 should resolve this problem) method for managing the device. The 2811 can be monitored via either the CLI or the SDM.

With SDM 2.0 you get a dedicated Monitor section that provides a breakdown of statistics across the range of available features enabled on the device.

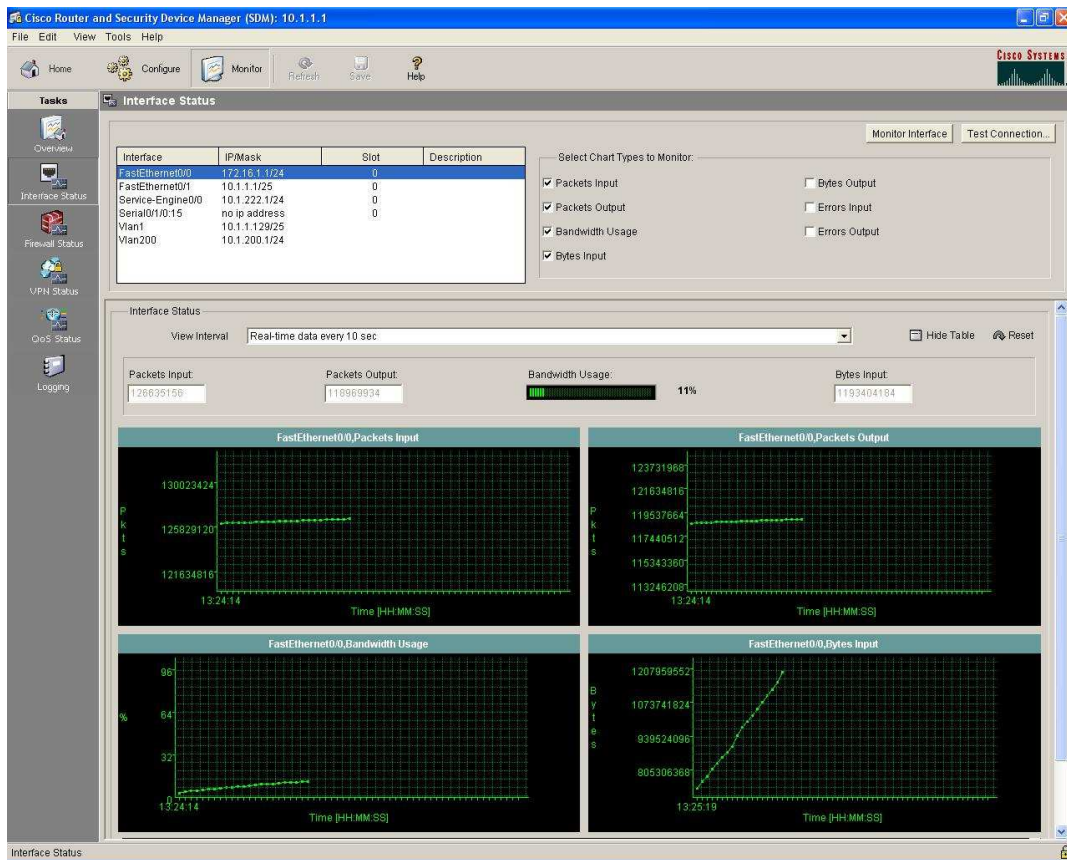


Figure 9 – Monitoring The ISR 2811 With SDM

In addition to providing “snapshot” or trend graphical views of the ISR performance/status, a number of logs are also made available for more detailed analysis.

The ISR 2811 also comes with context-sensitive online help, though we found this to be somewhat limited in the depth of help it was able to give. What was good, however, was that SDM 2.0 was easy enough, most of the time, to use without resorting to any kind of help.

CISCO ISR 2811 PERFORMANCE TESTS

Test Overview

For the test we configured the ISR 2811 with three separate VLANs – internal/external and voice – using an Ethernet switch to simulate the LAN/WAN (Internet) divide. Voice traffic was configured with compression, so that each voice channel would take around 20Kbps of bandwidth. In order to test the IP telephony functionality we attached some Cisco 7960 IP Phones.

Our test bed consisted of Spirent’s WebAvalanche (client) and WebReflector (server) web traffic generators (see appendix) to create simulated web traffic (GETting html pages), peaking at 500 users, building simulated users, step by step. This simulated a typical target user configuration for the 2811, albeit taking it to its absolute extremes. But then, we weren’t in the business of trying to make life easy for the device.

Device Saturation Test

Our primary aim was to see how the 2811 reacted when enabling more and more features on the devices, given the same test and same level of traffic. Starting with only the basic routing functions enabled, we then repeated the test several times, on each occasion enabling another feature, then another, then another – such as Firewall, then VPN, then IPS – and compared performance, across tests, plus the 2811’s CPU and memory utilisation each time.

Each test ran for 2480 seconds and each individual test iteration was repeated several times in order to ensure accuracy.

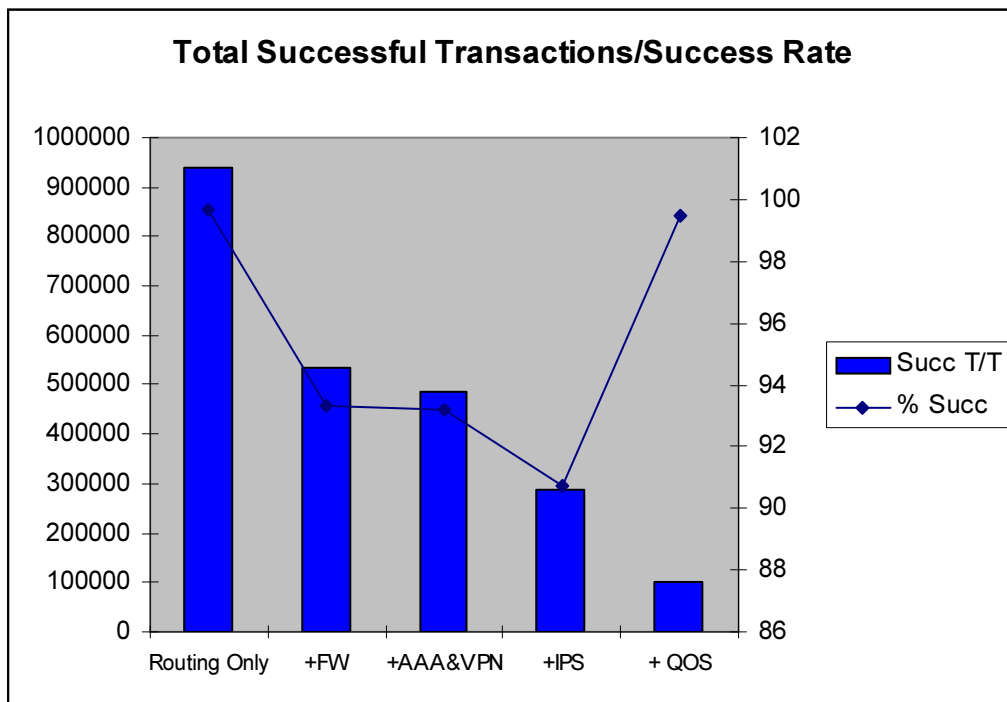


Figure 10 – Successful TPS Figures

From the first graph above, we can see that, as more features were enabled, total successful transactions – effectively the number of simulated users sessions – passing through the ISR went down in a regular pattern. With just routing enabled 940,288 successful transactions were recorded.

At the other extreme, with Firewall, AAA authentication, VPN, IPS and QoS enabled, 103,126 successful transactions were recorded. What is important, however, is that the percentage of successful transactions remained very high throughput, meaning that the router was throttling traffic in a graceful fashion, so few sessions were actually lost. Given that we were loading the ISR 2811 well beyond the levels it has realistically been designed to support, this was very encouraging.

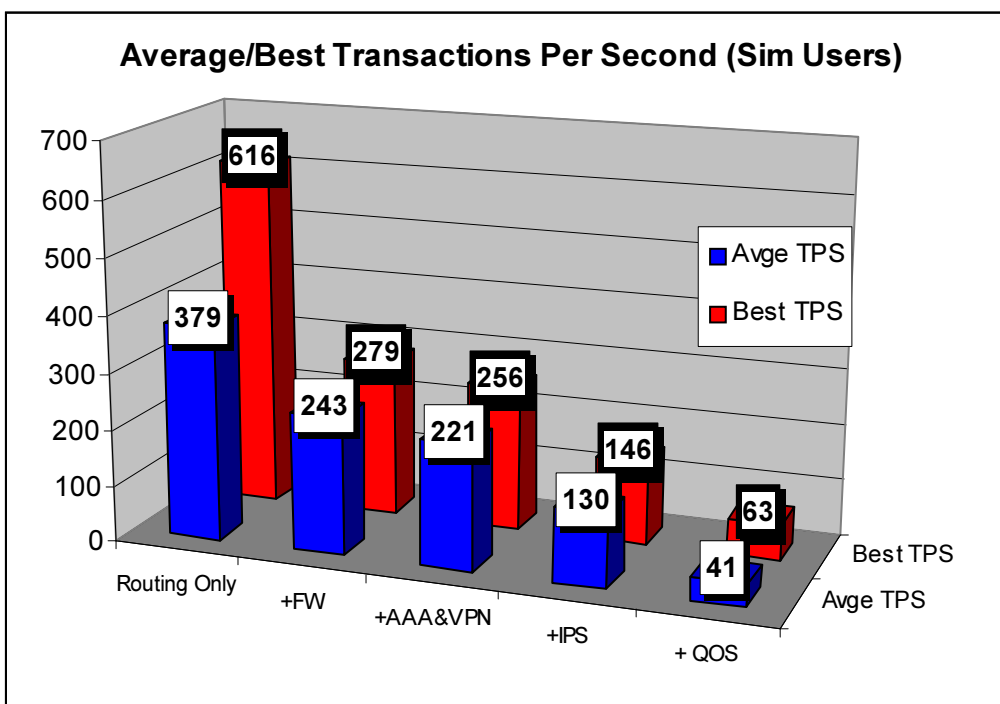


Figure 11 – Best + Average TPS Figures Recorded

During the tests we also measured best recorded and average – over the test – figures for transactions per second, which translates into the number of simulated user sessions (open browser sessions) recorded. Predictably the patterns followed those of the previous graph, but giving us some real figures in terms of what we can expect the 2811 to support; namely that even in the worst case scenario – everything on – it was supporting 41 successful transactions per second on average under excessive device loading. In “normal” conditions we would point you more in the direction of the figures achieved under “routing only”.

A caveat here is that the central CPU of the 2811, despite the wealth of other dedicated hardware elements of the ISR, clearly came under pressure well before the 500 simulated user limits of the test were reached (see over page). However, despite inducing very high CPU utilisation, at no time during our tests did the device lock up – two weeks of non-stop use – nor did we ever experience any problems using the IP telephony functions, mid-test.

In each case, we ran versions of these tests purely to check that IP telephony performance – as Cisco claims – is unaffected by data traffic

passing through the router, thanks to the dedicated DSPs, and each test was passed without a single issue arising. This, despite that CPU being fully loaded early on during the test run, due to all the features being enabled.

We also monitored memory usage throughout the test, but found that this was relatively unaffected by the amount of simulated user traffic being generated. Typically, memory utilisation rarely exceeded 10%. Given that our test example of the 2811 had the full 768MB memory compliment, this means that with the standard 256MB, utilisation would still only be around the 30% mark, which was excellent.

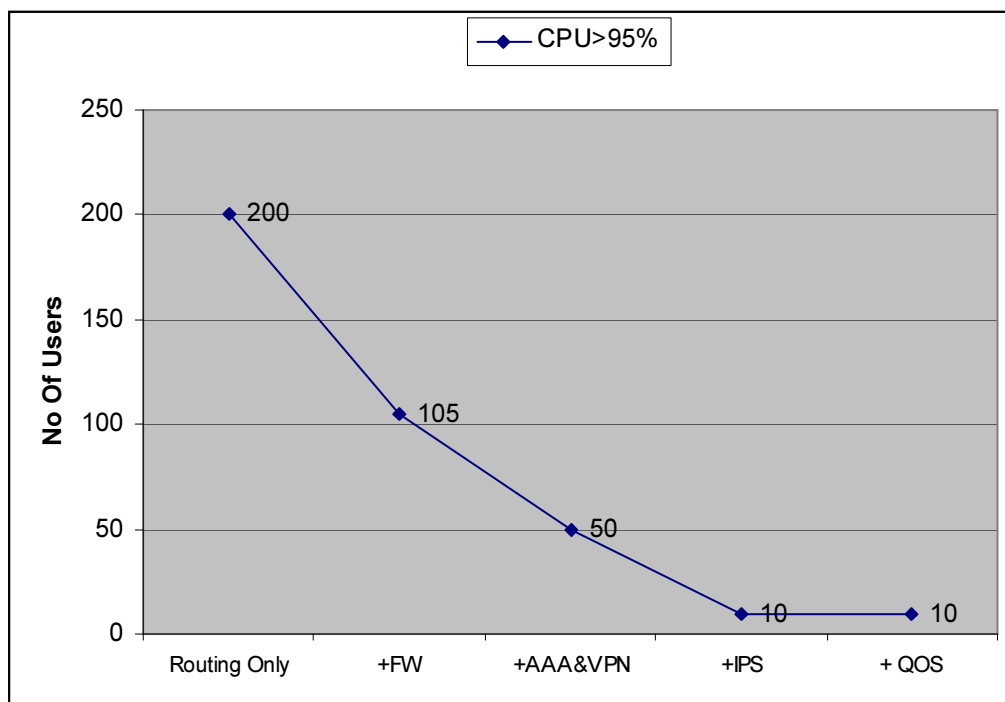


Figure 12 – CPU Utilisations Versus No Of Simulated Users

QoS Test

We also set up QoS on the ISR 2811 for a specific real-time traffic test, using the Spirent WebAvalanche to simulate streaming video sessions (RTSP protocol).

The idea here was to set a bandwidth reservation limit, run a test including the real-time traffic and see how close we could get to using that reserved bandwidth compliment. We set real-time traffic to 70% reserved bandwidth, added the RTSP protocol to this bandwidth reservation, and ran the simulated traffic tests. A maximum of 10 streams per user - with up to 500 users equals 5000 maximum streams – was set up to ensure that we really saturated the 2811.

Overall, we averaged 66% of total bandwidth as RTSP traffic which, given the classic 10% allowance either way, meant we achieved what we set out to – namely to prove that the QoS works for real-time applications and not simply VoIP. We used SDM's QoS traffic monitor during the tests to check real-time versus other traffic, as well as to ensure that we could still use SDM when the 2811 was stressed with streaming video, given that this only adds to the CPU hit.

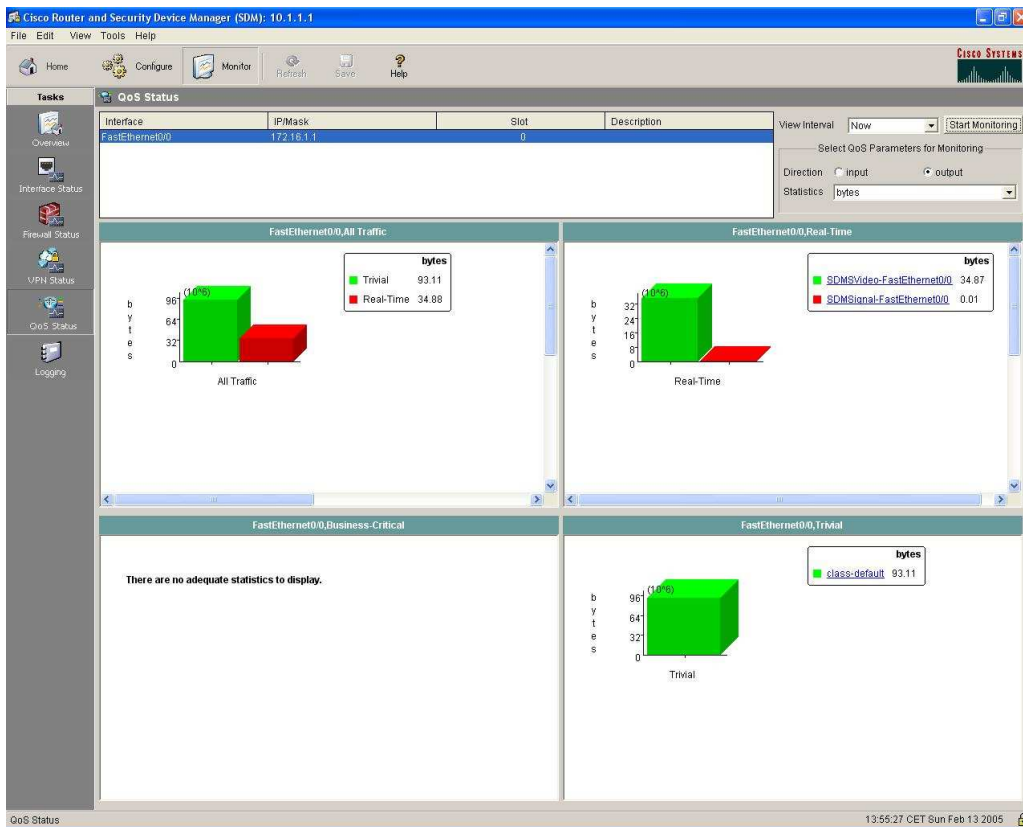


Figure 13 – Monitoring QoS

During the test, we also measured throughput at the Ethernet interfaces we used to create the internal and external networks, measuring peaks of around 193Mbps on each, effectively saturation, given the 200Mbps full-duplex limits of each port.

OVERALL SUMMARY

The aims of our testing were to examine the data performance, IP telephony and management features of the ISR 2811.

Specifically, we wanted to assess its capacity to cope with simultaneous heavy traffic loads with multiple features enabled, while still managing real-time traffic – voice an/or video. We also wanted to assess how easy the ISR 2811 is to configure and manage on a day- to-day basis, given its intended target user base – SME/branch office – which typically has few technical IT skills to hand.

Starting with the latter, we found SDM 2.0 to be very easy to use, the only downside being that it is quite slow to load and refresh. Configuration changes are very easy to make and initial configurations are aided by well-designed wizards.

Onto performance. Adding feature by feature to the mix, we found a gradual degradation in performance as each feature was enabled, but only saw any significant failed connections towards the end of each test run, when the number of virtual users was 400+, well beyond what the 2811 model is expected to realistically support. What we did see was that's the 2811 CPU utilisation quickly went up to 100% with multiple features enabled, though memory usage was very low. Despite this, we tested the IP telephony features during each test, and even at 100% utilisation, had no problems at all, which shows that the architecture works. QoS also worked very effectively with streaming video traffic.

In all, the 2811 was up and running non-stop in our labs for over two weeks and survived a serious hammering without any enforced downtime. With the ISR, Cisco describes routing as being “just another service” and, for once, this isn't mere marketing talk but does sum up the product – routing is indeed just one of many services it offers. As such, this is a device that is equally suited to the branch or satellite office, or bundled as part of a managed service, so would-be service providers should definitely take a serious look at the 2800 series, along with anyone else looking at branch office level multi-service devices currently.

Product: Cisco ISR (Integrated Services Router) 2811

Price: From \$1995

Contact: Cisco – www.cisco.com



APPENDIX: THE TESTBED DETAILS

Internet architectures are becoming increasingly complex.

Whether you're building network equipment or providing a service, you must deliver consistent performance under all conditions. Until now, capacity assessment at high-loads has been a costly and complex process. For this reason Spirent Communications introduced the WebAvalanche and WebReflector appliances to assist with the challenge. At Broadband-Testing we have taken these web application simulation and planning products and integrated them into our test-bed simulating real-life Internet conditions; those that the average user experiences daily.



Figure 14 – Spirent WebAvalanche 2500

WebAvalanche is described by Spirent as a capacity assessment product that challenges any computing infrastructure or network device to stand up to the real-world load and complexity of the Internet or intranets. The system determines the architectural effectiveness, points of failure, and the performance capabilities of a network or system. Using WebAvalanche to generate Internet user traffic and WebReflector to emulate large clusters of data servers, you can simulate even the world's largest customer environments. The system provides invaluable information about a site's architectural effectiveness, points of failure, modes of performance degradation, robustness under critical load, and potential performance bottlenecks. It is able to set up, transfer data over, and tear down connections at very high rates - all while handling cookies, IP masquerading for large numbers of addresses, and traversing tens of thousands of URLs.

WebAvalanche initiates and maintains more than a million concurrent connections, each appearing to come from a different IP address. This allows realistic and accurate capacity assessment of routers, firewalls, load-balancing switches, and Web, application, and database servers. It helps identify potential bottlenecks from the router connection all the way to the database. This accuracy is especially critical for gauging Layer 4-7 performance. The ability to additionally simulate error conditions such as HTTP aborts, packet loss, and TCP/IP stack idiosyncrasies can help anticipate-and avoid-significant and previously unknown impacts on performance.

To enable more accurate load simulations across multi-tiered Web site architectures, the system also supports extremely realistic user modelling behaviours such as think times, click stream, and HTTP aborts that cause Web servers to terminate connections while back-end application servers continue to process requests. Configuring in this way is simple as both WebAvalanche and WebReflector directly from a desktop browser to set up tests, review feedback in real time, and easily reconfigure test parameters.

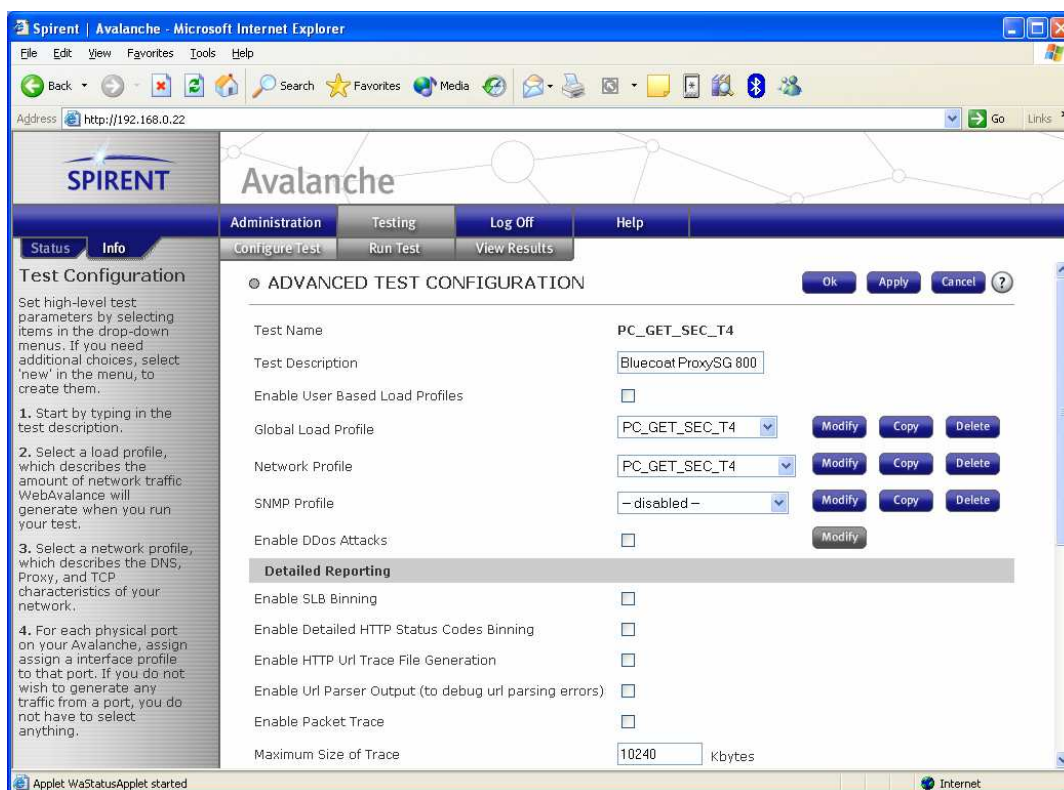


Figure 15 – Creating A WebAvalanche Test

The WebAvalanche also supports browser cookies, html forms, HTTP posts, and SSL-encrypted traffic. The system therefore gives you the flexibility to specify data sources and mix and match data sets to recreate accurate user behaviour at very high performance levels.

It also simulates SSL loads that can stress the world's most sophisticated secure e-commerce platforms. It also includes configurable cipher suites that enable you to emulate different types of browsers. WebAvalanche includes a high-accuracy delay factor that mimics latencies in users' connections by simulating the long-lived connections that tie up networking resources. Long-lived, slow links can have a far more detrimental effect on performance than a large number of short-lived connections, so this approach delivers more realistic test results.

While WebAvalanche focuses on the client activity, WebReflector realistically simulates the behaviour of large Web, application, and data server environments. Combined with WebAvalanche it therefore provides a total solution for recreating the world's largest server environments.

By generating accurate and consistent HTTP responses to WebAvalanche's high volume of realistic Internet user requests, WebReflector tests to capacity any equipment or network you connect between the two systems. Its protocol-level accuracy helps you assure the stability and performance of switches, routers, load balancers, firewalls, caches, and other Layer 4-7 devices. The system is ideal for helping infrastructure service providers validate, enforce, and maintain service level agreements (SLAs).