

CISCO 828 G.SHDSL ROUTER

Business-Class Features for Small Offices and Teleworkers through the Power of Cisco IOS® Technology

The Cisco 828 G.SHDSL Router provides business-class functionality for small offices and teleworkers through the power of Cisco IOS® technology. It enables service providers and resellers to increase service revenue by supporting features for business-class security, differentiated classes of service, and managed network services with Cisco IOS Software. These value-added features, along with the manageability and proven reliability of Cisco IOS technology, provide the mission-critical networking that businesses require.

Figure 1. Cisco 828 G.SHDSL Router



The newest member of the award-winning Cisco 800 Series Routers, the Cisco 828 G.SHDSL Router, provides small offices and teleworkers the features they need for mission-critical applications. (See Figure 2.) It also gives service providers a platform that allows them to offer high-margin, value-added business services while helping them reduce the cost of deployment and services.

G.SHDSL is the latest version of DSL technology, and it provides businesses a symmetrical service for bandwidth-intensive applications. G.SHDSL can support speeds both upstream and downstream of up to 2.3 Mbps and can reach customers as far as 20,000 feet from the telco/PTT office. G.SHDSL is a standards-based technology, and the Cisco 828 Router supports the ITU G.991.2 standard.

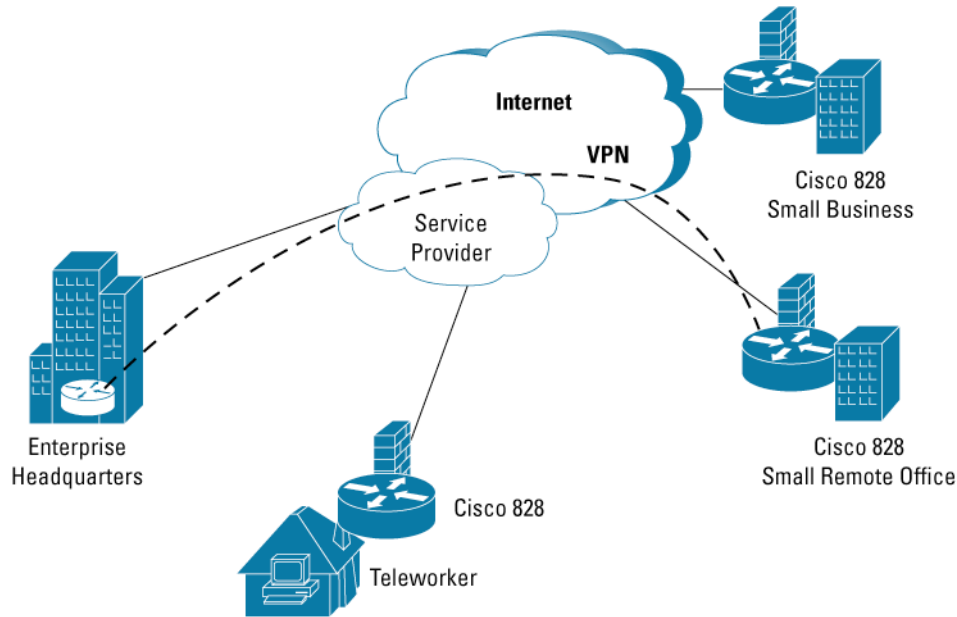
The Cisco Systems portfolio of G.SHDSL customer premises equipment (CPE), all based on Cisco IOS Software, serves all business-customer segments from small offices and teleworkers to branch offices. With the Cisco G.SHDSL CPE, service providers can deploy value-added services to an expanded customer base of users who require advanced, business-class features. Additionally, Cisco and its DSL CPE can help service providers reduce their operational expenses.

BUSINESS CLASS FEATURES FOR VALUE-ADDED SERVICES

The Cisco 828 Router is ideal for users in a small office or for teleworkers, supporting scalable, secure, quality, and proven business solutions such as:

- Business-class security
- Differentiated classes of service
- Managed access with service level agreements (SLAs)

Figure 2. The Cisco 828 Business-Class G.SHDSL Router is ideal for a small office or as a telecommuting solution to provide secure and reliable access to the Internet or corporate offices.



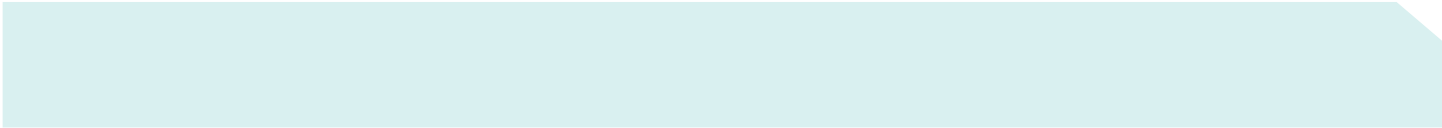
Business-Class Security

To take advantage of the unprecedented opportunities offered by communications and commerce over the Internet, private information must remain secure. With Cisco IOS Software, the Cisco 828 Router provides basic network security features such as standard and extended access control lists (ACLs), generic routing encapsulation (GRE) tunneling, and Network Address Translation (NAT), which hides private IP addresses behind a single public IP address.

With the always-on connection that DSL provides, it is essential to provide perimeter security with a firewall. Beyond simple packet filtering, the Cisco 828 Router provides a stateful inspection firewall with the Cisco IOS Firewall Feature Set. A stateful inspection or dynamic firewall provides a greater level of security intelligence by allowing or preventing network access based on a session's state. The firewall will allow traffic to pass when requested by a user behind the firewall but will prevent unauthorized network access.

Additionally, when using a public network such as the Internet to connect remote offices and teleworkers, additional security measures must be taken to make those connections secure for business communications. Virtual private networks (VPNs) use security encryption and tunneling technology to make connections over a public network secure. The Cisco 828 Router supports VPNs with the strongest form of encryption, 3DES IPSec, to allow businesses to save money by using low-cost connections to the Internet without sacrificing the security that private leased lines provide. Furthermore, firewall and VPN features enable service providers and resellers to offer revenue-generating value-added services beyond simple Internet access.

The Cisco 828 Router supports the Cisco Easy VPN Remote feature which allows Cisco 800 Series routers to act as remote VPN clients. As such, these devices can receive predefined security policies from the headquarters' head-end, thus minimizing the VPN configuration required at the remote location. This cost effective solution is ideal for remote offices with little IT support, or large CPE deployments where it is impractical to individually configure multiple remote devices. For those at remote offices, the Cisco Easy VPN Remote feature can be configured with the Cisco Router Web Set Up tool (CRWS) Web-based GUI. This makes VPN configuration as easy as entering a password, increasing productivity and lowering costs as the need for local IT support is minimized.



The Cisco 828 Router also supports the Cisco Easy VPN Server feature in Cisco IOS Release 12.2(8)T, or later releases. This allows a Cisco 800 Series router to act as a VPN head-end device in site-to-site VPNs where the remote office routers are using the Easy VPN Remote feature. Policies can then be pushed down to the remote office routers. In addition to terminating site-to-site VPNs, a Cisco 800 running Cisco Easy VPN Server can terminate VPN tunnels initiated by mobile remote workers running VPN client software on PCs. This flexibility makes it possible for mobile and remote workers, such as sales people on the road, to access their headquarters' intranet where critical data and applications exist.

DIFFERENTIATED CLASSES OF SERVICE

The Cisco 828 Router enables service providers to increase revenue by building differentiated service options based on premium, standard, or best-effort service classes.

It employs quality-of-service (QoS) features such as application-aware networking with IP QoS features and traffic management with ATM QoS features. This enables the router to expedite the handling of mission-critical or delay-sensitive applications, such as enterprise resource planning (ERP) or videoconferencing, while sharing network resources with lower-priority applications such as Web surfing.

By providing QoS features at the edge of the network, applications such as video or IP telephony can more efficiently use network bandwidth, and users of mission-critical applications in remote locations can gain the benefits of traffic management.

APPLICATION-AWARE NETWORKING WITH IP QoS

Through Cisco IOS Software, the Cisco 828 Router supports the following IP QoS features:

- Low Latency Queuing (IP QoS)
- PPP fragmentation and interleaving (PPP QoS)
- Policy-based routing (IP QoS)
- Weighted Random Early Detection (IP QoS)

Using Low Latency Queuing (often called LLQ or PQCBWFQ), the Cisco 828 Router enables service providers and resellers to guarantee or differentiate bandwidth based on a specific application or a specific user. For example, the order entry department traffic can be given priority over the marketing department traffic. The ability of the Cisco 828 Router to restrict the bandwidth of certain applications or users allows service providers and resellers to manage traffic on the basis of application or user requirements.

TRAFFIC MANAGEMENT USING ATM QoS

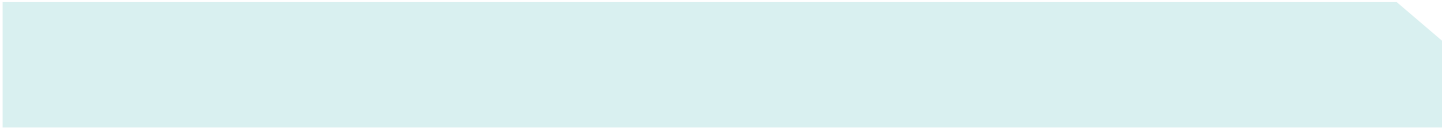
In addition to IP QoS features, the Cisco 828 Router provides ATM QoS features including:

- Per-virtual-circuit queuing (ATM QoS)
- Traffic management (ATM QoS)
- Class based traffic policing with clp tagging (ATM QoS)

These features enable service providers to manage their core ATM network infrastructures to deliver scalable, cost-effective services with QoS guarantees to their customers. Per-virtual-circuit traffic shaping and queuing allow further optimization of the existing bandwidth between customers and various services. Service Providers can use features to mark and drop traffic that exceed service contract limits which can optimize the network during times of congestion.

MANAGED NETWORK ACCESS WITH SERVICE-LEVEL AGREEMENTS

Service providers can offer small-offices and enterprise telecommuters managed network or Internet access with the Cisco 828 Router, providing service-level agreements (SLAs) and response time. SLAs can be a critical requirement in serving the business market that is accustomed to uninterrupted service with traditional WAN services such as T1 lines or Frame Relay.



When deploying business services with multiple Cisco 828 Router, service providers can use tools to provision and monitor these services. The Cisco 828 Router supports the SA Agent feature in Cisco IOS Software that enables the monitoring of SLAs all the way to the customer site. Additionally, in deploying VPNs with multiple Cisco 828 Routers, service providers can use the Cisco VPN Solutions Center software to set up VPN connections between customer sites.

REDUCED OPERATIONAL COSTS

Because the Cisco 828 Router is based on Cisco IOS technology, service providers and resellers can leverage their training and investments in Cisco IOS Software to reduce their overall costs of doing business. With key management and troubleshooting features, service providers and resellers can cost-effectively deploy and manage the Cisco 828 Router at the business customers' premises, thanks to the following advantages:

- Cisco IOS manageability, including interactive diagnostics/debugging features
- Familiar Cisco IOS command-line interface (CLI)
- Proven reliability

CISCO IOS SOFTWARE MANAGEABILITY

The Cisco 828 Router incorporates the same Cisco IOS technologies used by service providers and enterprises, allowing service providers and resellers to use existing knowledge of Cisco IOS Software to reduce training costs when configuring, installing, and deploying a Cisco 828 Router. Additionally, Cisco IOS Software provides many debug features that allow a service provider to diagnose network problems remotely. This can eliminate costly service calls or truck rolls, as well as reduce customer equipment returns when issues cannot be quickly solved.

PROVEN RELIABILITY

Because Cisco 800 Series routers are based on the same proven Cisco IOS technology used on 80 percent of the Internet and because Cisco IOS Software is the industry-standard application for mission-critical enterprise networks, small-business and enterprise telecommuters can depend on them day after day, year after year.

EASY DEPLOYMENT AND SET-UP

The Cisco 828 Router includes the Cisco Router Web Setup tool (CRWS), a Web-based configuration tool that allows users to self-install the router quickly without needing a working knowledge of Cisco IOS Software. Because CRWS is Web-based, no additional software needs to be installed on a user's PC. The user simply needs to point a browser to the router and follow a few simple steps to get the router up and running quickly.

Additionally, Cisco offers its free Configuration Express, a Web-based e-commerce system and customized in-line manufacturing process, for Service service-provider partners who buy directly from Cisco where Cisco ships preconfigured routers to the end user. Service providers can use Configuration Express to save on the cost of deployment logistics, time, and warehousing of products. Cisco Configuration Express is an example of a Cisco e-business application that empowers service providers to deploy products more efficiently while reducing costs and decreasing lead times.

Figure 3. Cisco Router Web Set-Up Tool



Table 1. Key Product Features and Benefits

Key Features	Benefits
Business-Class Security	
ACLs (Basic and Extended)	Protects network from unauthorized access through lists that control access to and from the router
PAP, CHAP	Identifies remote users to determine whether users are allowed network access
Route and Router Authentication	Accepts routing table updates only from known routers, ensuring that no corrupt information from unknown sources is received
NAT/PAT	<ul style="list-style-type: none"> • Hides internal IP addresses from external networks • Prevents certain denial-of-service attacks from outside networks on internal hosts
Secure Shell (SSH1)	Provides strong encryption for Telnet sessions
Stateful Inspection Firewall (Cisco IOS Firewall Feature Set)	<ul style="list-style-type: none"> • Offers secure, per-application dynamic access control (stateful inspection) for all traffic across perimeters • Defends and protects router resources against denial-of-service attacks • Checks packet headers, dropping suspicious packets • Protects against unidentified, malicious Java applets • Details transactions for reporting on a per-application, per-feature basis
VPNs with 3DES Encryption	<ul style="list-style-type: none"> • Ensure data integrity, confidentiality, and authenticity of origin by using standards-based encryption • Provide encryption for all users on the LAN without configuring individual PCs
Easy VPN Remote	Allows the router to be connected to a VPN head end device as a VPN client and have VPN policies pushed to it

Key Features	Benefits
No Service Password Recovery	<ul style="list-style-type: none"> • Prevent users from entering into the Rommon mode when having access to console • Prevent changing of config---register to access NVRAM
Unicast Reverse Path Forwarding (URPF)	Prevent Denial of Service (DOS) attacks such as LAND.C
Differentiated Classes of Service	
IP QoS Low Latency Queuing, Weighted Random Early Detect	<ul style="list-style-type: none"> • Ensures consistent response times for multiple applications by intelligently allocating bandwidth • Allows for classification of applications and gives the most important applications priority use of the WAN line • Averts congestion by telling certain TCP sessions, depending on priority, to throttle down • Avoids congestion by managing TCP sessions based on assigned priorities
ATM Traffic UBR, VBRnrt, VBRrt, CBR with per-VC Queuing and Class Traffic Shaping	<ul style="list-style-type: none"> • Ensure QoS guarantees for real-time traffic, with ability to send traffic over the appropriate virtual circuit to provide ATM level shaping and ensure that no head-of-line blocking can happen between circuits of different or equal traffic classes • Ensure that traffic exceeding the service contract is marked to be dropped in case of network congestion
Choice of Encapsulation: PPP over ATM (PPPoATM), PPP over Ethernet (PPPoE), and RFC 1483 Routed or Bridged (RFC 2684)	Ensures compatibility with existing network
SLA Support	
Cisco IOS SA Agent	Provides a way to measure statistics used in analyzing service Level agreements (SLAs)
Lower Cost of Operations	
Cisco IOS Interactive Debug Features	Allow service providers to remotely or locally diagnose network problems in detail (for example, via Telnet or terminal connection into the router)
Cisco Configuration Express	Helps reduce costs for deployment and warehousing of product and results in greater profitability for SP Partners
Cisco IOS CLI	Allows customers to use existing knowledge of Cisco IOS CLI for easier installation and manageability without additional training
Simplified Setup, Installation, and Management	
Web-Based Configuration Tool (Cisco Router Web Setup Tool)	Allows users to complete installation by simply by pointing a browser at the router and providing user information
NAT/PAT	<ul style="list-style-type: none"> • Multiple users share a single IP address (PAT) • Lets businesses and service providers conserve valuable IP address space • Reduces time and costs by reducing IP address management
4-Port Hub	Allows small offices users to connect without an external hub

Key Features	Benefits
Management	Enables remote management and monitoring via SNMPv3, Telnet, or HTTP, local management via console port and synchronized time kept via NTP
Dying Gasp	Provides the ability to generate error message in the event the power is unexpectedly disrupted
Named Access Lists	Allows easy management of standard and extended access lists
DHCP Server Import (DNS WINS)	Saves time and expense by enabling centralized configuration of Dynamic Host Configuration Protocol (DHCP) pools
Public Wireless LAN Features	
DHCP Authorized ARP	Restricts leasing of IP addresses only to the authorized mobile users
DHCP Secured IP Address Assignment	Secures and synchronizes the MAC address of the client to the DHCP binding table
DHCP option 82	Enables a DHCP relay agent to include information about itself when forwarding client-originated DHCP packets to a DHCP server
DHCP Accounting	Enables Authentication, Authorization, and Accounting (AAA) and Remote Authentication Dial-In User Service (RADIUS) support for DHCP configuration
NAT-Static IP Support	PWLANS require the clients to have the ip assigned dynamically through DHCP. With this feature, clients with statically configured IP address get a public IP address
Proven Reliability	
Cisco IOS Technology	Offers technology that is used throughout the backbone of the Internet and in most enterprise networks
Safe Investment	
Field-Expandable Memory	Allows customers to add features as networking needs expand
Advanced Processor and Memory Architecture	Ensures the platform can support processor-intensive applications
World-Class Support	Helps customers keep their Cisco 800 Series routers running all the time

Table 2. Model Matrix

Hardware Specifications	Cisco 828 Router
Processor	MPC 855T RISC
Processor Speed	50 MHz
Default DRAM Memory	32 MB
Maximum DRAM Memory	32 MB
Default Flash2 Memory	8 MB

Hardware Specifications	Cisco 828 Router
Maximum Flash Memory	16 MB
G.shdsl Port	RJ-11
10 MB Ethernet---Four Port Hub	RJ-45
Console Port	RJ-45
Crossover Hub Switch (To Hub/To PC)	Yes
LEDs	10
Power Supply	Universal 100-240 VAC

Table 3. Memory Requirements and Software Feature Sets of Cisco 828 for IOS Release 12.2(1)XE

Cisco 828 IOS Software Images	Cisco 828 Router Memory Requirements	
	Flash	DRAM
IP	8 MB	32 MB
IP Plus	8 MB	32 MB
IP Firewall	8 MB	32 MB
IP Firewall Plus IPSec 3DES	8 MB	48 MB

Table 4. Cisco 828 Router Software Feature Sets

Protocols and Features Supported by Cisco 828 Software Feature Sets---Basic Protocols/Features	IP	IP Plus	IP Firewall	IP Firewall Plus IPSec 3DES
Routing/Bridging				
Transparent Bridging	X	X	X	X
IP	X	X	X	X
PPPoE, PPPoA, RFC1483 Routed or Bridged	X	X	X	X
Routing Protocols				
Plus IP Enhanced IGRP	-	X	-	X
IP-Policy Routing (also listed in QoS)	-	X	-	X
RIP, RIPv2	X	X	X	X
IP Multicast (relay only)	-	X	-	X

Protocols and Features Supported by Cisco 828 Software Feature Sets--Basic Protocols/Features	IP	IP Plus	IP Firewall	IP Firewall Plus IPSec 3DES
Redundancy				
HSRP (Hot Standby Router Protocol)	X	X	X	X
Business-Class Security				
Route and Router Authentication	X	X	X	X
PAP, CHAP, Local Password	X	X	X	X
GRE Tunneling	-	X	-	X
IP Basic and Extended Access Lists, Named Access Lists	X	X	X	X
Stateful Firewall	-	-	X	X
IPSec 56 Bit and 3DES Encryption	-	-	-	X
SSH1	X	X	X	X
No Service Password Recovery	X	X	X	X
Unicast Reverse Path Forwarding (URPF)	X	X	X	X
Business-Class Quality of Service				
Weighted Random Early Detection	-	X	-	X
LFI, LLQ	-	X	-	X
CBR, VBRrt, VBRnrt, UBR Traffic Classes	X	X	X	X
Per-VC Shaping	X	X	X	X
Per-VC Queuing	X	X	X	X
IP Policy Routing	-	X	-	X
Class Based Traffic Policing with clp Tagging	-	-	-	X
Bandwidth Optimization				
STAC Compression	X	X	X	X
Ease of Use and Deployment				
Cisco Router Web Setup tool	X	X	X	X
Easy IP Phase I and II	X	X	X	X
Configuration Express	X	X	X	X

Protocols and Features Supported by Cisco 828 Software Feature Sets---Basic Protocols/Features	IP	IP Plus	IP Firewall	IP Firewall Plus IPSec 3DES
Management				
SA Agent	-	X	-	X
SNMPv3, Telnet, Console Port	X	X	X	X
Syslog	-	X	-	X
SNTP	X	X	X	X
CiscoView Support	X	X	X	X
TACACS+ (also a security feature)	-	X	-	X
TFTP Client and Server	X	X	X	X
Network Time Protocol (NTP)	X	X	X	X
CISCO-CONFIG-COPY-MIB---Ftp & Rcp Support	X	X	X	X
CISCO-CONFIG-COPY-MIB---Secure Copy Support	X	X	X	X
Address Conservation				
NAT Many to One (PAT)	X	X	X	X
NAT Many to Many (Multi-NAT)	X	X	X	X
IPCP Address and Subnet Mask Negotiation	X	X	X	X
DHCP Client Address Negotiation	X	X	X	X
DHCP Server Import	X	X	X	X
DHCP Server	X	X	X	X
Public Wireless LAN Features				
DHCP Authorized ARP	X	X	X	X
DHCP Secured IP Address Assignment	X	X	X	X
DHCP Option 82	X	X	X	X
DHCP Accounting	X	X	X	X
NAT-Static IP Support	X	X	X	X

Table 5. Cisco SOHO and 800 Series---DSLAM Interoperability

DSLAM	Alcatel ASAM 1000		Alcatel 7300		Cisco 6x60/6015			ECI		
Chipset	AME ADSL	AME ADSL	GSI G.SHDSL	ADI ADSL	GSI ADSL	GSI G.SHDSL	ADI 918 ADSL	ADI 930 ADSL	Metalink G.SHDSL	
Cisco 828	-	-	X	-	-	X	-	-	R	
									-	
									-	
									R	

DSLAM	Siemens Xpresslink 2.0		Fujitsu/Westell		Marconi DSLAM AXH600		Lucent Stinger	
Chipset	TI ADSL	GSI G.SHDSL	AME ADSL	GSI G.SHDSL	AME ADSL	Metalink G.SHDSL	AME ADSL	GSI ADSL
Cisco 828	-	R	-	P	---	R	-	-

Legend

- P** In progress
- P (ext)** In progress
- X** Supported
- R** On roadmap
- No plan/not supported
- * Needs external attenuator
- ? TDB, testing required

REGULATORY AND STANDARDS COMPLIANCE

Safety

- UL 1950
- CSA 22.2 No 950
- EN60950
- AUSTEL TS001
- AS/NZS 3260

EMC

FCC Part 15 Class B	Emissions
EN55022: 1998, Class B	Emissions
EN61000-3-2: 1995	Harmonics
EN61000-3-3: 1995	Flicker
EN 50082-1 (1997)	Immunity
EN55024: 1998	Immunity
EN61000-4-2	ESD
EN61000-4-3	RF Fields
EN61000-4-4	EFT
EN61000-4-5	Surge
EN61000-4-6	Conducted RF
EN61000-4-11	Voltage Dips/Sags/Interruptions

PTT

Cisco supports Telco approvals for SHDSL worldwide as demanded by different countries.

G.SHDSL Specifications

- Downstream and upstream symmetrical data rates 192 K to 2.3 Mbps in increments of 64 Kbps
- Globespan G.SHDSL Chipset
- ITU G.991.2 Annex A and Annex B

Supported RFCs

- RFC 2516 Point-to-Point Protocol (PPP) over Ethernet
- RFC 2364 Point-to-Point Protocol (PPP) over ATM PVCs
- RFC 2684 (formerly 1483) Multiprotocol
- ATM Encapsulation
- RFC 1577 Classical IP over ATM

- RFC 1213 MIB II for IP
- RFC 1695 AToM MIB for ATM
- RFC 1058 RIP1, RIP1-compatible
- RFC 1389 RIP2
- RFC 2131,2132 DHCP server
- RFC 1542,2132 Bootp and DHCP relay agent
- RFC 2132 DHCP client
- RFC 1974 Data compression of up to 4:1 (STACTMLZS)
- RFC 1144 Van Jacobson TCP header compression
- RFC 1631 Network renumbering
- RFC 1334,1994 User authentication (PAP/CHAP) with PPP
- RFC 1631,2663 IP Network Address Translation (NAT)

Physical Specifications

Dimensions and Weight Specifications

- Dimensions (H x W x D) without cables: 2.0 x 9.7 x 8.5 in. (5.1 x 24.6 x 21.6 cm)
- Weight (without power supply): 1.47 lb (0.67 kg)

Environmental Operating Ranges

- Operating temperature: 32° F to 104° F (0° C to 40° C)
- Nonoperating temperature: -4° F to 149° F (-20° C to 65° C)
- Operating humidity: 10% to 85% relative humidity (noncondensing)
- Nonoperating humidity: 5% to 95% relative humidity (noncondensing)
- Operating altitude: 0 ft to 10,000 ft (0m to 3000m)
- Nonoperating altitude: 0 ft to 15,000 ft (0m to 4570m)

Router Power

- AC input voltage: 100 to 240 VAC, 50 to 60 Hz
- Power consumption: 6 to 14W (idle-maximum consumption)
- Power supply rating: 15Wv

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