


# 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<sup>®</sup> 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.

The newest member of the award-winning Cisco 800 Series, the Cisco 828 G.shdsl router, provides small offices and teleworkers the features they need for mission-critical applications. (See Figure 1.) 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

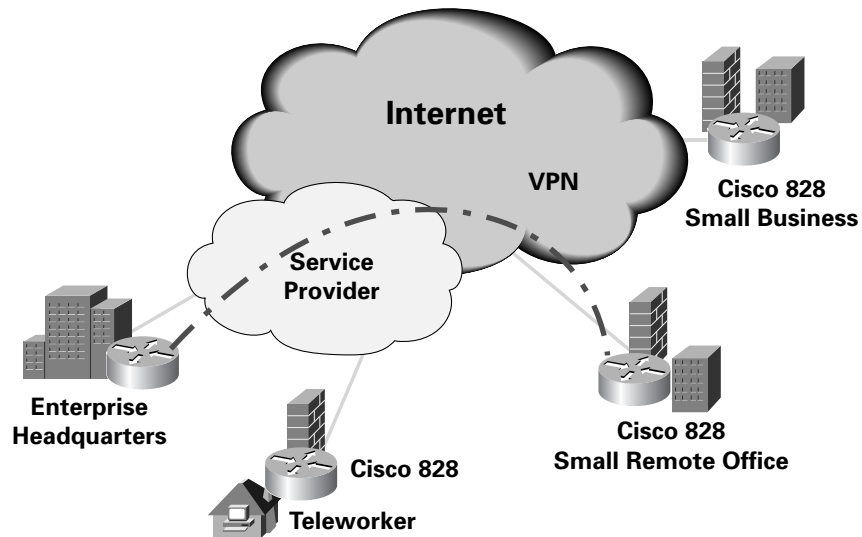
from small offices and teleworkers to branch offices. With the Cisco G.shdsl CPE, service providers can deploy value-added services to an expanded customer base of users who require advanced, business-class features. Additionally, Cisco and its DSL CPE can help service providers reduce their operational 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 1** 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.

### **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 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 provides ATM QoS features including:

- Per-virtual-circuit queuing (ATM QoS)
- Traffic management (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.

### **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 routers, service providers can use tools to provision and monitor these services. The Cisco 828 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**

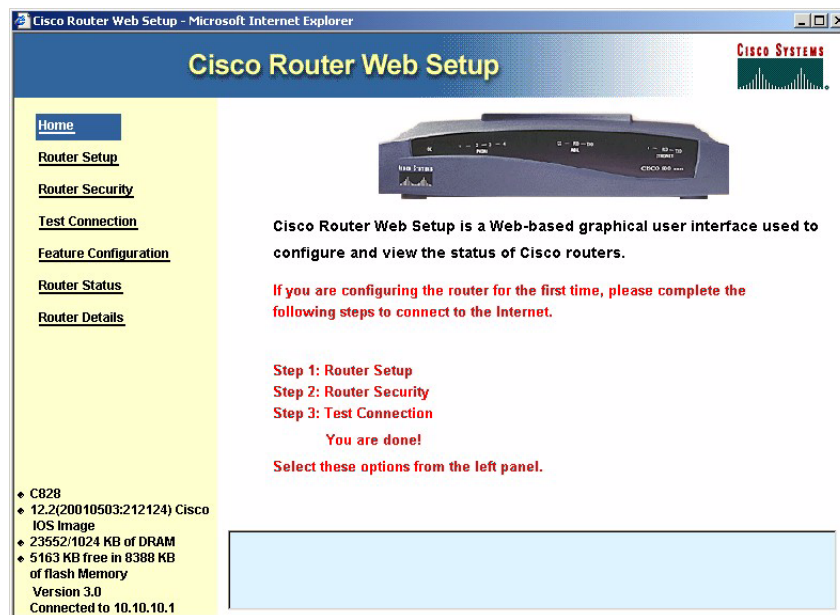
Because Cisco 800 Series routers are based on the same proven Cisco IOS technology used on 80 percent of the Internet and because Cisco IOS Software is the industry-standard application for mission-critical enterprise networks, small-business and enterprise telecommuters can depend on them day after 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 2** Cisco Router Web Set-Up Tool





## Cisco 828 Key Features and Benefits

**Table 1** Key Product Features and Benefits

Key Features	Benefit
<b>Business-Class Security</b>	
ACLs (Basic and Extended)	<ul style="list-style-type: none"> <li>Protects network from unauthorized access through lists that control access to and from the router</li> </ul>
PAP, CHAP	<ul style="list-style-type: none"> <li>Identifies remote users to determine whether users are allowed network access</li> </ul>
Route and Router Authentication	<ul style="list-style-type: none"> <li>Accepts routing table updates only from known routers, ensuring that no corrupt information from unknown sources is received</li> </ul>
NAT/PAT	<ul style="list-style-type: none"> <li>Hides internal IP addresses from external networks</li> <li>Prevents certain denial-of-service attacks from outside networks on internal hosts</li> </ul>
Secure Shell (SSH1)	<ul style="list-style-type: none"> <li>Provides strong encryption for Telnet sessions</li> </ul>
Stateful Inspection Firewall (Cisco IOS Firewall Feature Set)	<ul style="list-style-type: none"> <li>Offers secure, per-application dynamic access control (stateful inspection) for all traffic across perimeters</li> <li>Defends and protects router resources against denial-of-service attacks</li> <li>Checks packet headers, dropping suspicious packets</li> <li>Protects against unidentified, malicious Java applets</li> <li>Details transactions for reporting on a per-application, per-feature basis</li> </ul>
VPNs with 3DES Encryption	<ul style="list-style-type: none"> <li>Ensure data integrity, confidentiality, and authenticity of origin by using standards-based encryption</li> <li>Provide encryption for all users on the LAN without configuring individual PCs</li> </ul>
<b>Differentiated Classes of Service</b>	
IP QoS Low Latency Queuing, Weighted Random Early Detect	<ul style="list-style-type: none"> <li>Ensures consistent response times for multiple applications by intelligently allocating bandwidth</li> <li>Allows for classification of applications and gives the most important applications priority use of the WAN line</li> <li>Averts congestion by telling certain TCP sessions, depending on priority, to throttle down</li> <li>Avoids congestion by managing TCP sessions based on assigned priorities</li> </ul>
ATM Traffic UBR, VBRnrt, VBRrt, and CBR with per-VC Queuing and Traffic Shaping	<ul style="list-style-type: none"> <li>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</li> </ul>
Choice of Encapsulation: PPP over ATM (PPPoATM), PPP over Ethernet (PPPoE), and RFC 1483 Routed or Bridged (RFC 2684)	<ul style="list-style-type: none"> <li>Ensures compatibility with existing network</li> </ul>

Key Features	Benefit
<b>SLA Support</b>	
Cisco IOS SA Agent	<ul style="list-style-type: none"> <li>Provides a way to measure statistics used in analyzing service Level agreements (SLAs)</li> </ul>
<b>Lower Cost of Operations</b>	
Cisco IOS Interactive Debug Features	<ul style="list-style-type: none"> <li>Allow service providers to remotely or locally diagnose network problems in detail (for example, via Telnet or terminal connection into the router)</li> </ul>
Cisco Configuration Express	<ul style="list-style-type: none"> <li>Helps reduce costs for deployment and warehousing of product and results in greater profitability for SP Partners</li> </ul>
Cisco IOS CLI	<ul style="list-style-type: none"> <li>Allows customers to use existing knowledge of Cisco IOS CLI for easier installation and manageability without additional training</li> </ul>
<b>Simplified Setup, Installation, and Management</b>	
Web-Based Configuration Tool (Cisco Router Web Setup Tool)	<ul style="list-style-type: none"> <li>Allows users to complete installation by simply by pointing a browser at the router and providing user information</li> </ul>
NAT/PAT	<ul style="list-style-type: none"> <li>Multiple users share a single IP address (PAT)</li> <li>Lets businesses and service providers conserve valuable IP address space</li> <li>Reduces time and costs by reducing IP address management</li> </ul>
4-Port Hub	<ul style="list-style-type: none"> <li>Allows small offices users to connect without an external hub</li> </ul>
Management	<ul style="list-style-type: none"> <li>Enables remote management and monitoring via SNMP, Telnet, or HTTP and local management via console port</li> </ul>
Dying Gasp	<ul style="list-style-type: none"> <li>Provides the ability to generate error message in the event the power is unexpectedly disrupted</li> </ul>
Named Access Lists	<ul style="list-style-type: none"> <li>Allows easy management of standard and extended access lists</li> </ul>
DHCP Server Import (DNS WINS)	<ul style="list-style-type: none"> <li>Saves time and expense by enabling centralized configuration of Dynamic Host Configuration Protocol (DHCP) pools</li> </ul>
<b>Proven Reliability</b>	
Cisco IOS Technology	<ul style="list-style-type: none"> <li>Offers technology that is used throughout the backbone of the Internet and in most enterprise networks</li> </ul>
<b>Safe Investment</b>	
Field-Expandable Memory	<ul style="list-style-type: none"> <li>Allows customers to add features as networking needs expand</li> </ul>
Advanced Processor and Memory Architecture	<ul style="list-style-type: none"> <li>Ensures the platform can support processor-intensive applications</li> </ul>
World-Class Support	<ul style="list-style-type: none"> <li>Helps customers keep their Cisco 800 Series routers running all the time</li> </ul>



**Table 2** Model Matrix

Hardware Specifications	Cisco 828
Processor	MPC 855T RISC
Processor Speed	50 MHz
Default DRAM Memory	16 MB
Maximum DRAM Memory	32 MB
Default Flash <sup>2</sup> Memory	8 MB
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 Memory Requirements	
	Flash	DRAM
IP	8 MB	16 MB
IP Plus	8 MB	20 MB
IP Firewall	8 MB	20 MB
IP/IPX Firewall Plus IPSec 3DES	8 MB	24 MB

**Table 4** Cisco 828 Software Feature Sets

Protocols and Features Supported by Cisco 828 Software Feature Sets—Basic Protocols/Features	IP	IP Plus	IP Firewall	IP/IPX Firewall Plus IPSec 3DES
<b>Routing/Bridging</b>				
Transparent Bridging	X	X	X	X
IP	X	X	X	X
PPPoE, PPPoA, RFC1483 Routed or Bridged	X	X	X	X

<b>Protocols and Features Supported by Cisco 828 Software Feature Sets—Basic Protocols/Features</b>	<b>IP</b>	<b>IP Plus</b>	<b>IP Firewall</b>	<b>IP/IPX Firewall Plus IPSec 3DES</b>
<b>Routing Protocols</b>				
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
<b>Business-Class Security</b>				
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
<b>Business-Class Quality of Service</b>				
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
<b>Bandwidth Optimization</b>				
STAC Compression	X	X	X	X
<b>Ease of Use and Deployment</b>				
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
<b>Management</b>				
SA Agent		X		X
SNMP, Telnet, Console Port	X	X	X	X



Protocols and Features Supported by Cisco 828 Software Feature Sets—Basic Protocols/Features	IP	IP Plus	IP Firewall	IP/IPX Firewall Plus IPSec 3DES
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
<b>Address Conservation</b>				
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	X	X	X	X
DHCP Server Import	X	X	X	X

## 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)

**Interoperability**

- Cisco 6130/6160/6015/6260 DSL access multiplexers (DSLAMs) with 8-port G.shdsl line cards
- Interoperability expected with other vendors' DSLAMs that use the Globespan chipset (testing to be provided to confirm)

**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:

15W<sub>v</sub>



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