Cisco Service Node for Linksys One

The Cisco® Service Node for the Linksys® One family of products is part of the innovative, end-to-end Linksys One architecture for hosted services delivery for small businesses.

The Cisco Service Node for Linksys One resides in the service provider network, where it acts as a system portal to the overall Linksys One solution and provides services to Linksys One customer endpoints.

The multitiered architecture of the Cisco Service Node allows it to serve as an aggregation point for call routing, customer provisioning, billing and management services, and the hosting and reselling of premium applications and services.

The Cisco Service Node also supports sales by providing value-added resellers (VARs) with secure, portioned branding services, account setup, customer premises equipment (CPE) ordering, service configuration, and partitioning of end-user services for small businesses.

Two models of the Cisco Service Node are available, shown in Figure 1:

- Cisco Service Node for Linksys One SN-100 (part number CISCO-SN-100), which supports 8000 customer sites or 100,000 users
- Cisco Service Node for Linksys One SN-10 (part number CISCO-SN-10), which offers the same functions, but scales to 1000 customer sites or 10,000 users

Figure 1. Cisco Service Node for Linksys One SN-100 and SN-10

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The Cisco Service Node performs a number of functions that support Linksys One CPE.

CPE provisioning—The Cisco Service Node provisioning engine provides automated configuration of CPE for simple and rapid deployment. When a new customer is created or a new service is added to a customer's account, the Cisco Service Node can make any updates on the network side as well as generate the total configuration required for CPE. Services for the customer site work immediately after the CPE downloads the configuration from the Cisco Service Node.

CPE configuration backup and restore—The Cisco Service Node acts as a backup server where CPE can store a copy of the current configuration. If the CPE must be replaced for any reason (for example, a flood or a hardware failure), the existing configuration can be easily restored from the Cisco Service Node.

Call routing—The Cisco Service Node call routing function uses a Session Initiation Protocol (SIP) proxy architecture. No per-user voice feature call processing is performed on the Cisco Service Node. A core SIP proxy handles SIP signaling and call routing from CPE to the public switched telephone network (PSTN), the PSTN to CPE, and CPE to CPE. Therefore, the Cisco Service Node provides a single point for passing calls between the Linksys One environment and the Internet telephony service provider (ITSP) providing PSTN connectivity. The Cisco Service Node uses Internet Engineering Task Force (IETF) standards to define aspects of voice sessions, including ENUM for addressing, BIND Domain Name System 9 (BIND9) for service location, and SIP for call routing. The Cisco Service Node call routing function is an optional component that is used in deployment models only where PSTN calls are transported as voice-over-IP (VoIP) calls across a customer's broadband Internet connection.

Branding services—The hierarchical architecture of the Cisco Service Node supports a variety of flexible business models. Each Cisco Service Node can support multiple secure, discreet partitions that can be used to host a variety of brands. Each brand can control the logos and support contact information that is displayed on CPE belonging to a particular brand. Support for multiple brands can help a hosted service provider (HSP) take advantage of market opportunities with targeted offers, building on brand equity. Brands can also be other hosted providers, allowing the Cisco Service Node operator to support a wholesale service model. An agent level is also supported, allowing multiple agents per brand. Agents have a secure, brand-specific view of their own customers for provisioning and monitoring. Agents receive their own login point and can add and modify customer configurations without support from the HSP or brand. By securely allowing distributed account setup and support, HSPs can reduce their costs.

GUI—The Cisco Service Node includes GUIs for managing resources and customers at the node, brand, agent, and consumer levels. The GUI functions provided at each level reflect the roles and responsibilities of the person operating at that level.

Database services—The Cisco Service Node includes a PostgreSQL database that is used as the repository for all node, brand, agent, and consumer data.

CPE firmware services—The Cisco Service Node provides the tools required to manage the firmware level used by the CPE and centrally distribute new firmware when required.

Cisco Service Node API—The API allows service providers to integrate the Cisco Service Node with their back-end operations support system (OSS) and business support system (BSS).

CPE and Cisco Service Node monitoring—The Cisco Service Node provides tools for monitoring the Cisco Service Node itself and its associated CPE.

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CPE security services—To protect against fraud and denial-of-service (DoS) attacks on the services, the Cisco Service Node provides a VPN function to the CPE. The CPE at each customer site maintains an Internet Protocol Security (IPsec) tunnel back to the Cisco Service Node. Any SIP signaling that leaves the customer site is tunneled across the IPsec tunnel back to the Cisco Service Node. Both the CPE and the Cisco Service Node are designed to accept only SIP packets that arrive through the tunnel, effectively preventing any unintentional SIP traffic from being processed.

Cisco Service Node security services—The Cisco Service Node is designed to be connected directly to the Internet. To protect against Internet threats, the Cisco Service Node is equipped with firewalls and security features that protect against DoS and other attacks.

Call details records—When operating in run mode (a deployment model where PSTN calls are transported as VoIP calls across a customer's broadband Internet connection), the Cisco Service Node generates call detail records (CDRs) for PSTN calls and for calls between Linksys One customers. Intracustomer calls—that is, calls between two phones at the same site—do not generate a CDR.

Hardware Architecture Overview

The Cisco Service Node SN-100 and Service Node SN-10 provide the same functions but scale to different levels.

Cisco Service Node for Linksys One SN-100

The Cisco Service Node SN-100 occupies a single rack. The Cisco Service Node SN-100 hardware components and related functions include the following:

- Two Cisco 7606 Routers with the Cisco Catalyst® 6500 Series Supervisor Engine 720 (part number SUP720-3BXL) provide IP connectivity between the Cisco Service Node and the Internet with no single point of failure.
- One Cisco 2811 Integrated Services Router serves as the terminal server for out-of-band management. The terminal server connects to the console port on the Cisco 7606 Routers and (optionally) to the session border controllers (SBCs).
- Two Cisco VPN Services Modules (VPNSMs)—one for each Cisco 7606 Router—allows the Cisco Service Node to encrypt up to 1.6 Gbps Triple Data Encryption Standard (3DES) IPsec traffic and support up to 8000 simultaneous sites.
- Two Cisco IPsec Firewall Services Modules (FWSMs)—one for each Cisco 7606 Router—provide up to 100 virtual firewalls with a total of 1000 interfaces to protect Cisco Service Node components and customers from external and internally sourced attacks.
- One modular storage array provides dual controllers, 14 drives, and an integrated Fiber Channel switch.
- Six dual-processor servers provide Gigabit Ethernet or Fiber Channel connectivity for databases, call routing, provisioning, software services, and applications on the Cisco Service Node.
- Cisco Service Node software and use licenses are provided.

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Table 1 provides the Cisco Service Node SN-100 specifications.

Table 1. Cisco Service Node Sn-100 Hardware Layout Specifications

Product	Rack Units (RUs)	Quantity	Total RUs
Cisco 7606	6	2	12
Cisco 2811	1	1	1
Servers	2	6	12
Storage array	4	1	4
Total RUs			**29**

Cisco Service Node for Linksys One SN-10

- Two Cisco 3825 Integrated Services Routers provide IP connectivity between the Cisco Service Node and the Internet with no single point of failure. They provide IPsec services through Advanced Integration Module II (AIM-II) processors with hardware acceleration. Cisco IOS® Firewall features are used to protect the Cisco Service Node. Out-of-band management is performed through an asynchronous module.
- Three dual-processor servers provide Gigabit Ethernet for connectivity, databases, call routing, provisioning, software services, and applications on the Cisco Service Node.
- Cisco Service Node software and use licenses are provided.

Table 2 provides the Cisco Service Node SN-10 specifications.

Table 2. Cisco Service Node SN-10 Hardware Layout Specifications

Product	RUs	Quantity	Total RUs
Cisco 3825	2	2	4
Servers	2	3	6
Total RUs			**10**

Network equipment and server, storage, and software elements for the solution can be ordered separately.

Network Management

The Cisco Service Node provides a variety of tools to manage the extended environment that makes up the Linksys One solution. Different tools and capabilities are available at the node, brand, and agent levels.

Node-Level Network Management

Node-level network management tools are provided for managing the Cisco Service Node and extended Linksys One solution:

- Node-level GUI—Node operators can use the GUI to manage resources for the entire Cisco Service Node, including brands, CPE firmware releases, and ITSPs with associated phone numbers.
- Berkeley Software Distribution (BSD) shell—Node operators can access the OS using Secure Shell (SSH), which is intended primarily for troubleshooting. Day-to-day operation and administration is performed through the node-level GUI.

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- Simple Network Management Protocol (SNMP)—The Cisco Service Node can be monitored by an external network management station through SNMP. Cisco routers running Cisco IOS Software support a vast number of MIBs. Consult the Cisco IOS Software documentation for a detailed list. Cisco Service Node servers running FreeBSD also support SNMP. The following MIBs are supported:
  - SNMPv2-MIB
  - IF-MIB
  - RFC1213-MIB
  - IP-MIB
  - TCP-MIB
  - UDP-MIB
  - SNMPv2-MIB
  - HOST-RESOURCES-MIB
  - IPV6-MIB
  - UCD-SNMP-MIB
  - UCD-DLMOD-MIB
  - NET-SNMP-AGENT-MIB
  - NET-SNMP-AGENT-MIB
  - SNMPv2-MIB
  - SNMP-FRAMEWORK-MIB
  - SNMP-MPD-MIB
  - SNMP-TARGET-MIB

Brand-Level Network Management

Brand-level network management tools are provided for management of the brand as well as agents and customers of that brand.

- Brand-level GUI—This interface allows brand administrators to manage resources, agents and customers that belong to that brand.
- Service-node API—This API provides a machine-to-machine interface by which a back-end OSS or BSS system can perform a subset of the functions available through the brand-level GUI. The functions that can be performed relate to provisioning customers and closely resemble the functions available through the agent-level GUI.
- Agent-level GUI—This interface is the only tool available to the agent. Agents can use it to add, modify, delete, and view customers. Agents can view or change data only for their own customers. As an option, an HSP can use the service-node API to build a custom agent portal to replace the one that comes with the Cisco Service Node.

Software

The Cisco 7606 Router, Cisco 2811 Integrated Services Router terminal server, and Cisco 3825 Integrated Services Router run standard Cisco IOS Software images. The versions used by the Cisco Service Node are shown in Table 3.

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Table 3. Cisco IOS Software Versions Used by Cisco Service Node

Product	Cisco IOS Software Version	Feature Set
Cisco 7606 (SN-100)	Release 12.2(18)SXD5	IP Services SSH
Cisco 3825 (SN-10)	Release 12.4(3)	Advanced Enterprise Services
Cisco 2811 (SN-100)	Release 12.4(3)	Advanced Enterprise Services

The Cisco Service Node servers run a collection of open-source and Linksys One software:

- FreeBSD—This is the open-source operating system that runs on all Cisco Service Node servers. FreeBSD provides a mechanism that allows multiple virtual instances of the OS to be spawned and run on the same server, with each virtual OS completely isolated from all other instances. This is the partitioning mechanism used to implement the brand-level services.
- PostgreSQL—This open-source package is used to provide database services on the Cisco Service Node.
- OpenSER—This open-source package is used as the Cisco Service Node SIP proxy.
- BIND—This open-source package is used for Domain Name System {DNS) services. The Cisco Service Node runs its own DNS servers. DNS is used for several functions on the Cisco Service Node, including ENUM-based call routing of SIP calls and branding (each brand is known to the outside world as a separate DNS domain name).
- BIND DLZ—This open-source package allows BIND to use the PostgreSQL database to store its zone information. Dynamically loadable zones (DLZ) allows DNS updates to be reflected immediately when a change is made to zone data in the database. This feature is important because CPE that uses Dynamic Host Configuration Protocol (DHCP) can change its IP address at any time. When this happens, DNS must be updated immediately for the ENUM-based call routing to be able to successfully route calls to the CPE.
- NET-SNMP—This open-source SNMP package runs as an agent on the servers and implements several MIBs.

Environmental Specifications

Table 4 lists environmental specifications for the Cisco Service Node.

Table 4. Environmental Specifications

Product	Power	Redundant Power	Plug	Heat (BTU)
Cisco 7606	20A	Yes	NEMA L6-20	3862
Cisco 3825	3A	No	NEMA 5-15P	1025
Cisco 2811	2A	No	NEMA 5-15P	260
HP DL380-G4	3.6A	Yes	NEMA 5-15P	1393
HP MSA100	6A	Yes	NEMA 5-15P	1876

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Physical Specifications

Table 5 lists physical specifications for the Cisco Service Node.

Table 5. Physical Specifications

Product	RUs	Height (inches)	Width (inches)	Depth (inches)
Cisco 7606	6	12.25	17.37	21.75
Cisco 3825	2	3.5	17.1	14.7
Cisco 2811	1	1.75	17.25	16.4
HP DL380-G4	2	3.38	17.54	26.01
HP MSA1000	4	6.9	19	20.5

Ordering

Table 6 lists ordering information for the Cisco Service Node.

Table 6. Ordering Information

Part Number	Description
CISCO-SN-10	• Cisco Service Node SN-10 ◦ Servers, storage, and use licenses for Cisco Service Node SN-10 ◦ Network equipment sold separately
CISCO-SN-100	• Cisco Service Node SN-100 ◦ Servers, storage, and use licenses for Cisco Service Node SN-100 ◦ Network equipment sold separately
Spares	**Description**
CISCO-SN-SERVER=	Spare server unit for Cisco Service Node SN-10 or SN-100
CISCO-SN-HARDRIVE=	Spare hard drive unit for Cisco Service Node SN-10 or SN-100
CISCO-SN-FCA=	Spare Fibre Channel adapter for Cisco Service Node SN-100
CISCO-SN-GENIC=	Spare Gigabit Ethernet network interface card (NIC) for Cisco Service Node SN-10 or SN-100
CISCO-SN-DISKARAY=	Spare disk array for Cisco Service Node SN-100
CISCO-SN-KVM=	Spare keyboard, video, and mouse switch for Cisco Service Node SN-10 or SN-100
CISCO-SN-SERADPT=	Spare USB-to-serial adapter cable for Cisco Service Node SN-10 or SN-100

Cisco Service Node Sn-100 Network Equipment Required

For the Cisco Service Note SN-100, the Cisco network equipment listed in Table 7 is required.

Table 7. Required Cisco Network Equipment—Cisco Service Node SN-100

Cisco Part Number	Description	Quantity
CISCO7606	Cisco 7606 Chassis Bundle	2
7606-SUP720XL-PS	Cisco 7606 6-slot, SUP720-3BXL and PS	2
SUP720-3BXL	Supervisor Engine 720-3BXL	2
WS-SUP720-3BXL	Catalyst 6500/Cisco 7600 Sup 720 Fabric MSFC3 PFC3BXL	2
MEM-C6K-CPTFL512M	Catalyst 6500 Sup720/Sup32 Compact Flash Mem 512 MB	2
BF-S720-64MB-RP	Bootflash for SUP720-64MB-RP	2
7600-SSC-400	Cisco 7600/6500 Services SPA Carrier Card (6 Gbps)	2
CF-ADAPTER-SP	SP adapter with compact flash for SUP720	2
SPA-IPSEC-SSC400-1	Cisco 6500/7600 IPSec VPN SPA Bundle 1 (system only)	2

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WS-SVC-FWM-1-K9	Firewall blade for 6500 and 7600, VFW License Separate	2
SC-SVC-FWM-2.3-K9	Firewall Module Software 2.3 for 6500 and 7600, 2 free VFW	2
FR-SVC-FWM-VC-T1	Catalyst 6500 and 7600 virtual FW licensing for 20 VF	2
S763AIK9-12218SXF	Cisco 7600-SUP720 IOS ADVANCED IP SERVICES SSH	2
SPA-IPSEC-2G	Cisco 7600 / Catalyst 6500 IPSec VPN SPA - DES/3DES/AES	2
IOS-CVPN-CLIENT-K9	VPN Software Client for IOS Security Bundles	2
SF-PIX-PDM-4.1	PIX Device Manager for FW Module2.3 for Catalyst 6500	2
WS-X6516-GE-TX	Catalyst 6500 16-port 10/100/1000 GE Module, Cross-Bar	2
GLC-SX-MM	GE SFP, LC connector SX transceiver	4
FAN-MOD-6HS	High Speed Fan Module for CISCO7606 Chassis	2
1900W-AC **1900W-DC**	1900W AC Power Supply for 7606 1900W DC option Power Supply for 7606 (for DC configurations)	2
PEM-20A-AC **PEM-DC**	Power Entry Module for CISCO7606 (1900W Pwr Sup) DC Power Entry Module Cisco7606 (for DC configurations)	2
PEM-20A-AC/2 **PEM-DC/2**	Redundant AC Power Entry Module for CISCO7606 (1900W PS) Redun. DC Power Entry Module for Cisco 7606 (for DC configurations)	2 2
PWR-1900-AC/6/2 **PWR-1900-DC/2**	Redundant 1900W AC Power Sup CISCO7606 Redundant 1900W DC Power Sup CISCO7606 (for DC configurations)	2
CAB-GSR16-XX	Cisco AC Power Supply Cord, (Select country cord—for AC configurations)	4
CON-OSP-7606SUPS	ONSITE 24X7X4 Cisco 7606 6-slot, S	2
CON-OSP-CISCO7606	24x7x4 Onsite Svc, 7606- Bndle or Config Options	2
CON-OSP-SSC4001	ONSITE 24X7X4 Cisco 6500/7600 IPSec VPN SPA Bundle 1 (system)	2
CON-OSP-WS-FWM1K9	24x7x4 Onsite Svc, Firewall blade for 6500 and 7600, VFW Lic	2
CISCO2811 **CISCO2811-DC**	2811 w/ AC PWR, 2FE, 4HWICs, 2PVDMs,1NME, 2AIMS, IP BASE, 64F/256D 2811 w/ DC PWR, 2FE, 4HWICs, 2PVDMs,1NME, 2AIMS, IP BASE, 64F/256D	1
MEM2800-64U128CF	64 to 128 MB CF Factory Upgrade for Cisco 2800 Series	1
MEM2800-256D-INC	256MB DDR DRAM Memory factory default for the Cisco 2800	1
S28NIPBK9-12405	Cisco 2800 IP BASE	1
NM-16A	16 port Asynchronous Module	1
CAB-OCTAL-ASYNC	8 Lead Octal Cable (68 pin to 8 Male RJ-45s)	2
PWR-2811-AC **PWR-2811-DC**	Cisco 2811 AC power supply Cisco 2811 DC power supply—for DC configurations	1 1
CAB-AC	Power Cord,110V	1
ROUTER-SDM	Device manager for routers	1
CON-OSP-2811 **CON-OSP-2811DC**	ONSITE 24X7X4 2811 w/ AC PWR, 2FE, 4HWICs ONSITE 24X7X4 2811 w/ DC PWR, 2FE, 4HWICs	1 1

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SN-10 Network Equipment Required

For the Cisco Service Node SN-10, the Cisco network equipment listed in Table 8 is required.

Table 8. Required Cisco Network Equipment—Cisco Service Node SN-10

Cisco Part Number	Description	Quantity
CISCO3825 **CISCO3825-DC**	3825 w/AC PWR, 2GE,1SFP, 2NME, 4HWIC, IP Base, 64F/256D 3825 w/DC PWR, 2GE,1SFP, 2NME, 4HWIC, IP Base, 64F/256D for DC configs	2
CAB-AC **PWR-3825-DC**	Power Cord,110V CISCO3825 DC power supply (for DC configuration)	2 2
S382ASK9-12405	Cisco 3825 Series IOS Advanced Security	2
MEM3800-256U512D	256 to 512 MB DDR DRAM factory upgrade for the Cisco 3800	2
MEM3800-64U128CF	64 to 128 MB CF Factory Upgrade for Cisco 3800 Series	2
NM-16ESW-PWR	1 16 port 10/100 EtherSwitch® NM with In-Line Power support	2
PPWR-DCARD-16ESW	1 Power daughtercard for 16 port EtherSwitch NM	2
HWIC-4A/S	4-Port Async/Sync Serial HWIC	2
AIM-VPN/EPII-PLUS	DES/3DES/AES VPN Encryption/Compression	2
CAB-SS-232FC	RS-232 Cable, DCE Female to Smart Serial, 10 Feet	6
CAB-25AS-MMOD	Male DB-25 Modem Connector	2
ROUTER-SDM	Device manager for routers	2
CON-OSP-3825DC	ONSITE 24X7X4 3825 w/DC PWR,2GE	2

For More Information

- To learn more, visit http://www.cisco.com or http://www.linksysone.com.
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Printed in USA

C78-389914-00 01/07