

DATA SHEET

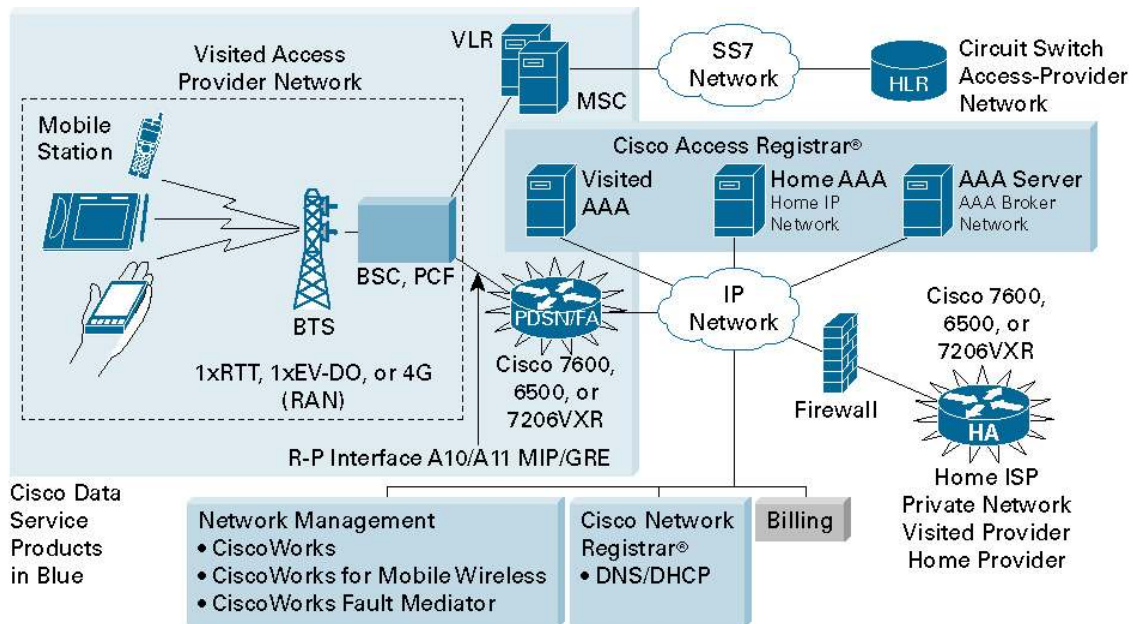
CISCO PACKET DATA SERVING NODE RELEASE 2.1

The Cisco® Packet Data Serving Node (PDSN) Release 2.1 helps mobile operators offer Code Division Multiple Access 2000 (CDMA2000) packet data services. Specifically, it provides gateway services between the CDMA2000 1xRTT and 1xEVDO, as well as third-generation (3G) and fourth-generation (4G) Radio Access Network (RAN) and IP packet networks. The Cisco PDSN supports mobile-station access to the Internet, corporate intranets (through secure VPNs), and Wireless Application Protocol (WAP) servers. Standards-compliant, Cisco PDSN uses proven Cisco Systems® hardware and software and offers several features to enhance availability, scalability, and security.

CISCO PDSN SOLUTION OVERVIEW

The Cisco PDSN solution is a standards-compliant solution that helps enable packet data services in a CDMA environment. The PDSN acts as an access gateway and provides simple IP and Mobile IP access, foreign-agent support, and packet transport for virtual private networking. It acts as a client for authentication, authorization, and accounting (AAA) servers, and also facilitates prepaid billing services. Standalone PDSNs can also be logically tied together in a clustering architecture to provide scalability, redundancy, load sharing, and more. Figure 1 illustrates how the PDSN operates in a CDMA network.¹

Figure 1
CDMA2000 Network with a Cisco PDSN and Other Required Components for Packet Data Services



VLR = Visitor Location Register; MSC = Mobile Switching Center; HLR = Home Location Register; BTS = Base Transceiver Station; BSC = Base Station Controller; PCF = Packet Control Function; RP = RAN PDSN Interface; FA = Foreign Agent

¹ CDMA is one of three primary mobile communication technologies, the other two being Time Division Multiple Access (TDMA) IS-136 and Global System for Mobile Communications (GSM). CDMA2000 is the third-generation CDMA technology that offers packet data.

Cisco PDSN supports all required standards, including the Third-Generation Partnership Project 1 Technical Specification Group P (3GPP2 TSG-P) standard and the Wireless IP Network Standard (also known as TIA/EIA/IS-835), which defines the overall structure of a CDMA2000 network. It includes features such as enhanced Mobile IP, carrier-class accounting, compression, security, and authentication. Cisco PDSN also supports 3GPP2 TSG-A, Interoperability Specification for CDMA2000 Access Network Interfaces, (also known as TIA/EIA/IS-2001). The 3GPP2 TSG-A standard focuses on the RAN and the interfaces between RAN and the PDSN. In addition Cisco PDSN also complies with the Nortel Closed RP interface specification.

CISCO PDSN HARDWARE PLATFORM

Cisco PDSN today is offered on two platforms. The first is the Cisco 7206VXR Router, equipped with a Cisco NPE-G1 Network Processing Engine. Hardware assistance for IP Security (IPSec) is available through the use of the Cisco VPN Acceleration Module 2 (part number SA-VAM2) card for scalable encryption acceleration and the IPSec software bundle. The service adapter can be added to a deployed PDSN as long as a slot is available. The physical interfaces supported on a Cisco 7206VXR for the R-P interface (facing the RAN) can be Fast Ethernet, Gigabit Ethernet, or ATM. The P-I interface (facing the IP network) can be any media. The R-P and P-I interfaces are independent of physical media. Typical physical interfaces used include Fast Ethernet and Gigabit Ethernet.

For deployments requiring a higher density, the Cisco PDSN also runs on the Cisco Multiprocessor WAN Application Module for the Cisco 7600 Series Router and Cisco Catalyst® 6500 Series Switch, where each Cisco Multiprocessor WAN Application Module runs five PDSN images as virtual routers. Hardware assistance for IPSec operations is available with the use of the IPSec VPN services module. The physical interfaces supported on the Cisco 7600 Series and Cisco Catalyst 6500 Series for both the R-P and P-I interfaces can be Fast Ethernet, Gigabit Ethernet, and FlexWAN.

PDSN DETAILS: FEATURES AND SPECIFICATIONS

The Cisco PDSN solution provides all standard interfaces and includes value-added features that enhance the customer experience and improve availability, scalability, and security. Table 1 outlines specific IETF RFCs and features.

Table 1. Cisco PDSN Features and Benefits

Feature	Description	Benefit
Standards compliance	<ul style="list-style-type: none"> Complies with 3GPP2 TSG-P (TIA/EIA/IS-835) and 3GPP2 TSG-A (TIA/EIA/IS-2001) 	<ul style="list-style-type: none"> Provides interoperability with other standards-compliant components
Point-to-Point Protocol (PPP) over generic routing encapsulation (GRE)	<ul style="list-style-type: none"> Complies with packet control functions (PCFs) using a slightly different A10 encapsulation than 3GPP2 	<ul style="list-style-type: none"> Fully interworks with PCFs following 3GPP2 but using a different A10 encapsulation
Nortel compliance	<ul style="list-style-type: none"> Certified and compliant with Nortel Closed RP 	<ul style="list-style-type: none"> Fully interworks with PCFs running Nortel Closed RP interface
Proxy Mobile IP	<ul style="list-style-type: none"> Provides IP mobility for mobile stations that are not capable of Mobile IP node services Allows immobile IP clients to maintain their IP address while changing PDSNs 	<ul style="list-style-type: none"> Improves the customer experience by maintaining IP applications during roaming without having to upgrade the phone Eases migration toward Mobile IP
PDSN clustering and intelligent PDSN selection	<ul style="list-style-type: none"> Selects best PDSN in a cluster, based on current mobile-station session distribution 	<ul style="list-style-type: none"> Helps enable optimal performance Scales without disrupting service Minimizes occurrence of disruptive handoffs Offers logical geographical distribution

Feature	Description	Benefit
Multiple IP flows	<ul style="list-style-type: none"> Offers multiple mobile stations with unique network access identifiers (NAIs) that can share a single PPP connection 	<ul style="list-style-type: none"> Increases the flexibility of the solution by allowing multiple clients (PCs, personal digital assistants [PDAs], etc.) to share a common mobile access device
Prepaid billing (IS-835C)	<ul style="list-style-type: none"> Allows use of prepaid billing service, taking advantage of AAA servers as interface points to billing server 	<ul style="list-style-type: none"> Allows prepaid billing based on quotas, volume, time measurement, or tariff
Standard Cisco hardware platforms	<ul style="list-style-type: none"> Offers Cisco hardware platforms that are proven in some of the largest networks in the world 	<ul style="list-style-type: none"> Minimizes risk; speeds rollout of network
Cisco IOS® Software Feature Set	<ul style="list-style-type: none"> Runs with the standard Cisco IOS Software Feature Set, which includes rich IP, security, Mobile IP, voice and data integration VPN, and Network Address Translation (NAT) capabilities 	<ul style="list-style-type: none"> Helps enable faster time to market with advanced features Provides a more competitive solution
Resource management	<ul style="list-style-type: none"> Offers Mobile IP revocation (IS-835c) Offers Packet of Disconnect (POD) (IS-835c) 	<ul style="list-style-type: none"> Helps enable faster resource release
AAA fine-tuning	<ul style="list-style-type: none"> Offers AAA group, retry, timer Offers broadcast Offers home-agent redirection, enhanced authentication granularity based on Electronic Serial Number (ESN), Mobile Station Identifier (MSID), and service option Offers Mobile IP reauthentication and handoff fine-tuning 	<ul style="list-style-type: none"> Improves AAA availability (groups and broadcast) Minimizes RADIUS messages toward AAA servers Helps provider to migrate customer base using static home-agent address to dynamic home-agent address Helps provider to further authenticate mobile user accounting
Mobile-node address management	<ul style="list-style-type: none"> Offers local pool Offers Dynamic Host Configuration Protocol (DHCP) with AAA Offers on-demand address pools (ODAP) Offers alarms thresholds 	<ul style="list-style-type: none"> Enhances mobile-node address management efficiency and minimizes provisioning
Access control list (ACL) per user	<ul style="list-style-type: none"> Takes advantage of Cisco ACL feature 	<ul style="list-style-type: none"> Per-user access-list information can be retrieved from AAA to fine-tune access to network resources and services
A11 session update	<ul style="list-style-type: none"> As per Cisco IOS Software Release 4.3 	<ul style="list-style-type: none"> Provides ability to update session parameter toward PCF with Always On and RN-PDIT parameter
Always-on feature	<ul style="list-style-type: none"> Offers always-on feature as per IS-835B 	<ul style="list-style-type: none"> Helps enable push-to-talk (PTT) services
Quality of service (QoS) per user	<ul style="list-style-type: none"> Facilitates use of Cisco IOS Modular QoS CLI (MQC) Complies to IS-835B QoS profile Allows traffic shaping and policing 	<ul style="list-style-type: none"> Applies per-user predefined (retrieved from AAA) authorized DSCP marking to enter the network or to be overwritten Provides ability to identify, to classify, and to mark traffic Allows retrieval of per-user (from AAA) traffic policing and shaping information Helps to enhance user experience for services such as voice over IP (VoIP) and PTT
SDB indicator marking	<ul style="list-style-type: none"> Based on 3GPP2 contribution A30-20030818-006 	<ul style="list-style-type: none"> Provides ability to identify specific packets for SDB marking indication Helps to enhance user experience for services such as VoIP and PTT

Relay Layer: R-P Interface Features

The Cisco PDSN supports the A10 and A11 interfaces defined in 3GPP2 TSG-A, including:

- All control messages to establish R-P sessions, dismantle R-P sessions, extend the life of R-P sessions, update session parameter, and receive accounting information.
- Generic routing encapsulation (GRE) to carry data over the A10 interface.
- PDSN selection and load balancing among a predefined cluster of PDSNs using A11 control messages and code 136. Intelligent PDSN selection is a Cisco value-add and is described in Table 1.

The Cisco PDSN also fully complies with Nortel Closed RP interface.

LINK-LAYER PROTOCOLS

- PPP, RFC 1661
- PPP Asynchronous High-Level Data Link Control (HDLC), RFC 1662
- PPP over GRE
- Password Authentication Protocol (PAP), RFC 1334
- Challenge Handshake Authentication Protocol (CHAP), RFC 1994
- IP address assignment—In the simple IP case, the dynamic IP address assignment occurs in the IP Control Protocol (IPCP) phase of PPP setup. The address is obtained from a RADIUS server or can be assigned from a local pool on the PDSN. In the case of Mobile IP, the address is obtained from the home agent through the foreign agent.
- IP Control Protocol (IPCP), RFC 1332
- PPP Compressions Negotiation, RFC 1962
- PPP payload compression 1
 - Stac-LZS, RFC 1974
 - Microsoft Point-to-Point Compression Protocol, RFC 2118
- VPN, including Layer 2 Tunneling Protocol (L2TP) and Point-to-Point Tunneling Protocol (PPTP) (Multiprotocol Label Switching [MPLS] VPN in the future)

Network-Layer Protocols

- IP, RFC 791
- Mobile IPv4, RFCs 2002, 2003, 2005, and 2006
- Network access identifier (NAI) extensions for Mobile IP
- Foreign Agent Challenge Response
- Reverse Tunneling, RFC 3024
- IPSec and Internet Key Exchange (IKE), RFCs 2401, 2402, and 2406
- Van Jacobson TCP/IP Header Compression, RFC 1144

Simple IP Access Methods

- Mobile station identifier (MSID)-based simple IP routing access without PPP CHAP or PAP
- Simple IP routing access based on the username or NAI provided during CHAP or PAP
- Simple IP virtual private dialup network (VPDN) based on the NAI provided during PPP CHAP or PAP
 - L2TP
 - PPTP

Simple IP Services

- Static private and public IP addresses
- Dynamic private and public IP addresses
- Accounting according to the model defined in TR45.6
- Automatic ingress filtering as defined in TR45.6
- Packet filtering using Cisco IOS Software access lists
- L2TP
- PPTP
- Always-on feature per IS.835B

Mobile IP

- Static private or public IP addresses
- Dynamic private or public IP addresses
- Foreign agent CHAP and response, mobile node-foreign agent challenge, mobile node-AAA (RFC 3012)
- Mobile node-home agent authentication
- Mobile node-foreign agent authentication
- Foreign agent-home agent authentication
- IP-in-IP encapsulation, RFC 2003
- GRE, RFC 1701
- Reverse Tunneling, RFC 3024
- Foreign Agent, RFC 2002
- Home-agent redundancy supported in Cisco IOS Software using extensions to Hot Standby Router Protocol (HSRP)
- NAI is required to identify the mobile user and the network the mobile user intended to access
- Proxy Mobile IP client
- Mobile IP extensions to support A11 interface messages to set up GRE tunnels and sessions
- Multiple flows over the single session by registering with the same NAI multiple times with a unique statically assigned IP address for each registration
- Per-Mobile IP flow accounting

- Address overlapping
- Binding update message for clearing the resources after a PDSN handoff (Mobile IP revocation)

AAA

The AAA services provided by the Cisco PDSN follow:

- Acts as a RADIUS client
- Performs user authentication through RADIUS
- Supports TR45.6 accounting model
- Supports AAA services for simple IP
- Supports PAP and CHAP authentication
- Supports accounting-session information
- Supports IP-address allocation for the mobile station
- Supports retrieval of realm for MSID-based access from a RADIUS server
- Supports AAA services for Mobile IP
- Offers a configurable option to skip authentication during PPP upon receiving negative acknowledgement message from the mobile station
- Supports foreign-agent CHAP authentication through Mobile IP registrations
- Simple IP and shared-secret management through a RADIUS server
- Supports service provisioning using an AAA server
- Supports prepaid billing as per IS-835c
- Supports POD as per IS-835c

Network Management

- Cisco PDSN configuration management is through the Cisco IOS Software command-line interface (CLI).
- The Cisco PDSN supports the Cisco platform MIBs in addition to a proprietary MIB called the CISCO-CDMA-PDSN-MIB for PDSN-specific objects and an AHDLC MIB.
- The Cisco PDSN also supports a specific MIB CISCO-CDMA-PDSN-CRP-MIB for Nortel Closed RP support.
- The Cisco PDSN supports the Mobile IP MIB, RFC 2006.
- The Cisco PDSN offers a conditional debugging on a per-user basis.

Mobility Management

The Cisco PDSN supports inter-BSC/PCF handoff and for Mobile IP or proxy Mobile IP users, inter-PDSN handoff.

ORDERING INFORMATION

Detailed ordering information is available in the *PDSN/Home Agent R2.1 Product Bulletin; 12.3(11)YF Release*, located at http://www.cisco.com/en/US/prod/collateral/wireless/wirelssw/ps4341/prod_bulletin0900aecd801e8c2e.html. Software Application Support (SAS) is required for the Cisco PDSN. The Cisco PDSN is not covered by the chassis hardware Cisco SMARTnet® contract.

**Corporate Headquarters**

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters

Cisco Systems International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: 31 0 20 357 1000
Fax: 31 0 20 357 1100

Americas Headquarters

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-7660
Fax: 408 527-0883

Asia Pacific Headquarters

Cisco Systems, Inc.
168 Robinson Road
#28-01 Capital Tower
Singapore 068912
www.cisco.com
Tel: +65 6317 7777
Fax: +65 6317 7799

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