

PROTECTING DATA REVENUE WITH THE CISCO PERSISTENT STORAGE DEVICE

Introducing the Cisco Persistent Storage Device (Cisco PSD)

With today's volume traffic for wireless data services, an outage to a billing data collector may result in loss of the billing call detail records (CDRs) which in turn can cause many thousands of dollars in revenue loss to an operator in a matter of hours. An outage could be triggered by various reasons beyond the operator's control, such as a natural disaster. In the event of a failure of the network connection to the billing data collectors, a redundant data collector setup could not save the billing records. In addition, billing data collectors might from time to time require system upgrades. While the billing data collectors are being upgraded or taken out for maintenance, the CDRs that are continuously being generated must be safely stored on reliable physical media.

The Cisco Persistent Storage Device (PSD) is an extension to existing storage on the Cisco CSG with the same protocol interface as the one on the billing data collector. In normal operation, the Cisco CSG sends the CDRs to billing data collectors until they become unreachable. At that moment, the Cisco CSG will redirect the CDRs that are not yet acknowledged by the billing data collectors to the Cisco PSD. With 37 gigabytes (GB) of storage space onboard the Cisco PSD multiple days' worth of CDRs from as many as three Cisco CSGs can be properly collected and stored, allowing the operator to avoid revenue leakage.

USING CISCO PSD WITH CISCO MOBILE EXCHANGE

Cisco PSD (Figure 2) is equally at home in wired and wireless networks. Cisco CSG provides the billing component of the Cisco Mobile Exchange. Cisco Mobile Exchange (Figure 1) is a standards-based framework that links the access network to IP networks and their value-added services. The framework includes packet gateways, mobile services, load balancing, and network management services delivered on a range of Cisco platforms and application modules. Together, these components successfully address the many challenges that face mobile network operators as they seek profitability from their second-generation (2G), 2.5G, or third-generation (3G) mobile packet infrastructures and their 802.11 public WLAN hot spots.

Figure 1
Cisco Mobile Exchange Framework

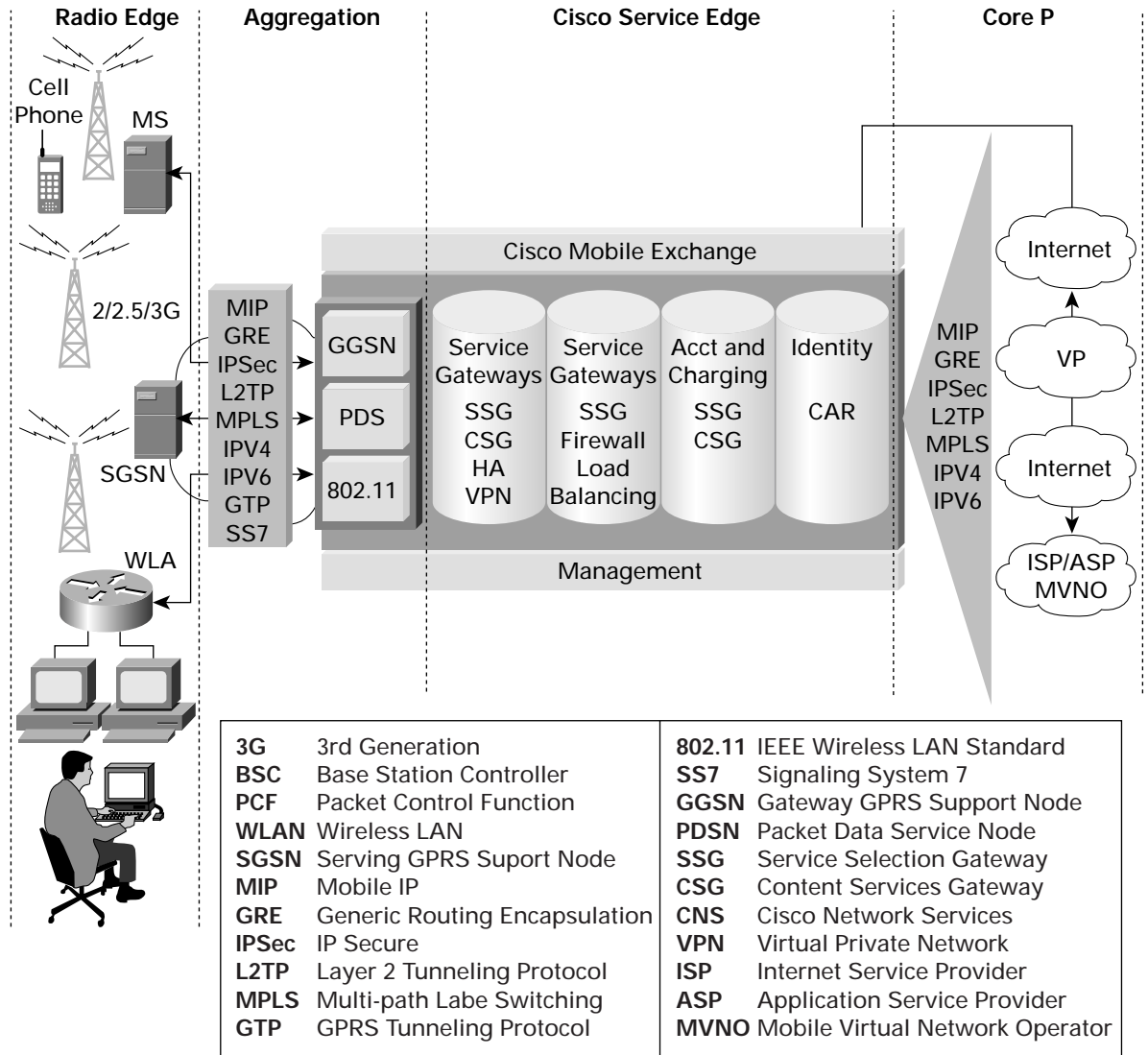
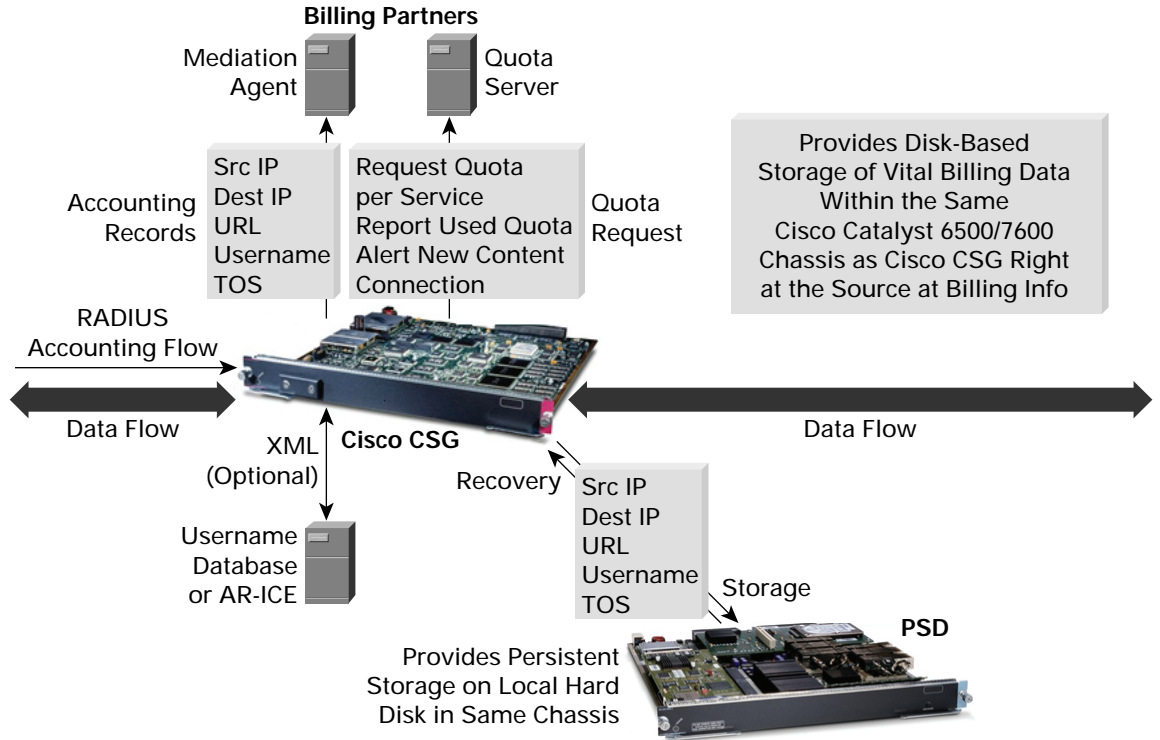


Figure 2
Cisco Persistent Storage Device



| | | | |
|------------|----------------------------|------------|----------------------------|
| URL | Universal Resource Locator | ICE | Identity Cache Engine |
| TOS | Type of Service | PSD | Persistent Storage Device |
| CSG | Content Services Gateway | XML | Extensible Markup Language |
| AR | Access Registrar | | |

PRIMARY FEATURES

In-Chassis Persistent Storage Support for Cisco CSG

The Cisco PSD is implemented as a single Cisco Catalyst® 6500 Series or 7600 Series service module card. A Cisco PSD can support as many as three in-chassis Cisco CSGs. The number of PSDs required can be determined based on expected network traffic and the corresponding billing records the CSGs would generate.

Extend CDR Storage from Hours to Days

The Cisco PSD has onboard storage space of 37 GB) for CDRs, which translates to 264 million CDRs, for multiple days' worth of user traffic, depending on the size of the CDRs.

Ease of Installation and Management

Installation and operation of the Cisco PSD is simple, requiring one-time configuration of the PSD and the CSGs that it supports. Once configured, the PSD runs unattended.

Monitoring of PSD operation is further eased through Simple Network Management Protocol (SNMP) Version 2c, including standard network device management as well as detailed system resource management to provide visibility to processes, their use, disk partitions, and disk usage.

PRIMARY BENEFITS

Protect Critical Billing Information

The Cisco PSD provides protection of critical billing data from single failures such as a failure of billing data collectors and the failure of network connectivity with billing data collectors.

Use Widely Deployed Cisco Catalyst Platforms

The Cisco PSD takes advantage of the high availability of Cisco Catalyst 6500 Series and 7600 Series architectures with in-chassis data transfer through high throughput backplane connectivity with the Cisco CSG. One PSD currently can support as many as three CSGs, providing a more cost-effective solution than deploying redundant billing data collectors.

Allow Flexible Network Operation

Operators using the Cisco PSD need not worry about losing critical billing information during an upgrade of the mediation system, billing data collectors, or backend network. The Cisco PSD allows greater flexibility with regard to routine maintenance of their Cisco CSG networks.

Cost Savings

Reduce the need for expensive and complex redundant mediation systems or billing data collectors as well as the corresponding network provisioning and configuration change.

Future Feature Enhancement Plans

In the future the Cisco PSD is planned to be extended to support more concurrent Cisco CSGs as well as new client types, including Gateway GPRS Support Node and Packet Data Serving Node. Cisco Gateway GPRS Support Node will be supported by the Cisco PSD in the forthcoming release. These enhancements for supporting additional clients need a PSD software upgrade only and no hardware change is necessary.

A potential new function is envisioned for storing memory-consuming system information (run-time user and service-related information, for example) for the Cisco Mobile Exchange solution.

In the future, the Cisco PSD can also potentially be used as an extended buffer for its clients in use even in normal operation to control the CDR transmission rate and reduce the peak CDR processing requirement and thus the cost for mediation system and the billing data collector.

How it Works

Cisco CSG sends CDRs to the mediation partners' servers until they become unreachable for any reason. At that point, the records are sent to the PSD for safekeeping until contact is re-established with the mediation device. Once that contact is established, the Cisco CSG will retrieve the records automatically from the Cisco PSD and forward them to the mediation device. The Cisco CSG controls whether the records are sent in the order that they were generated or if they are to be intermixed with incoming "live" records. In addition, the Cisco CSG allows throttling of the rate at which the CDRs retrieved from PSD are transmitted to the mediation device, so as not to overwhelm the mediation device.

The prevalent configuration with the Cisco CSG would be a chassis with as many as three Cisco CSGs and a single PSD serving those CSGs. The number of PSDs required should be determined based on expected network traffic and the corresponding billing records the CSG would generate.

Therefore, architecturally, the PSD is not in the data transfer path between the Cisco CSG and the mediation device. This architecture was chosen to enhance the availability of the accounting records, rather than putting the PSD inline with the CSG-to-mediation device flow, which would complicate reliability.

FUNCTIONAL DETAILS

Configuration

Configuring the Cisco PSD is accomplished by logging into the PSD blade from Cisco IOS[®] Software on the supervisor card. The Cisco PSD is then configured using command-line interface (CLI), much like Cisco IOS Software. Along with administrative and troubleshooting commands on the Cisco PSD are basic configuration commands that allow the user to create and manage data stores on the PSD and to assign CSGs that may access (read/write) those data stores. Typically, one would configure a data store for each Cisco CSG (or pair of redundant CSGs).

Additional configuration of the CSGs is required to inform them of the location and presence of a PSD. This is accomplished via the Cisco IOS Software CLI interface on the supervisor card.

Storage

Under normal conditions, the Cisco PSD idles and performs self-checks. When the Cisco CSG cannot reach a billing mediation device, it will send the accounting records to the PSD via a well-defined interface between the two devices (GPRS Tunneling Protocol, or GTP). The Cisco PSD stores the payload from the packet in a queue, being unaware of the content of the format of that data, so that it is retrievable exactly as it was sent.

Retrieval

When the Cisco CSG detects that the billing mediation device is again reachable, it retrieves the stored data from the Cisco PSD using GTP. The data is returned to the CSG in the same order and exactly the same payload as it was deposited, effectively being dequeued from the PSD. The CSG is responsible for maintaining order, if required, or mixing with incoming "live" accounting records. Once the Cisco CSG acknowledges to the PSD that it has successfully sent the data to the mediation device, the Cisco PSD deletes that data. The PSD will not delete that data until such acknowledgement is received.

Network Management

The Cisco PSD can be managed through SNMP. An administrator may configure and activate an SNMP agent on the PSD. Support will be available for SNMP v2c support, and the MIBs, read-only, indicated in Table 1. Ciscoview support is available today for Cisco PSD with which, the statistics such as hard-disk capacity available can be obtained.

Table 1 Supported MIBs

| Standard | MIB Name | Description |
|---------------------|-------------------|---|
| RFC1229 | IF-MIB | Manage Cisco PSD network interfaces |
| RFC1213 | MIB-2 | Standard network device management |
| RFC1514, RFC2790 | HOST-RESOURCE-MIB | Detailed system resources management. Provides ability to see all processes and their utilization. Disk partitions are visible and disk usage available. Need net-snmp agent for this support. |

Support by Cisco Mobile Wireless Center is scheduled for late 2004

PERFORMANCE CHARACTERISTICS

The performance figures in Table 2 assume the Cisco CSG is configured to pack multiple CDRs into a single GTP packet destined for mediation devices.

Table 2 Performance Rates for Cisco CSG

| | |
|---------------------------------------|---|
| Total record storage capacity | 37 GB |
| Nominal performance | 1500 CDRs/second sustained; this translates into about 150 GTP packets/second. |
| Peak busy hour data throughput | 1.7 GB/hour, sustained for one hour |
| Peak busy hour performance | 300 GTP packets/second sustained for one hour (3000 CDRs/second) |



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