Cisco SCMS Collection Manager User Guide

Version 3.0.5
OL-7208-04

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*Cisco **SCMS Collection Manager** User Guide*

CONTENTS

Preface

This preface describes who should read the *Cisco Service Control Management Suite Collection Manager User Guide*, how it is organized, its document conventions, and how to obtain documentation and technical assistance.

This guide assumes a basic familiarity with the concept of the Cisco Service Control solution, the Service Control Engine (SCE) platforms, and related components.

Document Revision History

Cisco Service Control Release	Part Number	Publication Date
Release 3.0.5	OL-7208-04	November, 2006

DESCRIPTION OF CHANGES

Added the following sections to the document:

- *Managing Users* (on page 4-11)
- *Enabling the Adapters* (on page 4-4)
- *Configuring the Categorizer* (on page 4-6)

Cisco Service Control Release	Part Number	Publication Date
Release 3.0.3	OL-7208-03	May, 2006

DESCRIPTION OF CHANGES

Added the following new features:

- *The* `check_prerequisites.sh` *script* ("Checking System Prerequisites" on page 3-1)
- *The* `monitor.sh` *script* ("Monitoring System Health" on page 4-6)

Removed the following, deprecated feature:

- The `--legacy` flag of the `installsyb.sh` script

Added the following section to the document:

- *Configuring Escape of Nonprintable Characters* (on page 5-11)

Cisco Service Control Release	Part Number	Publication Date
Release 3.0.0	OL-7208-02	December, 2005

DESCRIPTION OF CHANGES

Added the following new feature:

- *HTTPC Adapter* (on page 2-6)

Removed the following, deprecated feature:

- Database Adapter

Added the following sections to the document:

- *Upgrading to CM 3.0 from CM 2.5* (on page 3-12)
- *Code Samples* (on page A-1)

Release 2.5.5	OL-7208-01	February, 2005

DESCRIPTION OF CHANGES

Created the *Cisco Service Control Management Suite Collection Manager User Guide*.

Audience

This guide is intended for the networking or computer technician responsible for the onsite installation and configuration of the Cisco Service Control Management Suite (SCMS) Collection Manager (CM). It is also intended for the operator responsible for the daily operations of the CM, allowing the Service Provider operator to make enhancements in a subscriber-oriented environment.

Document Content

This guide is organized as follows:

Chapter	Title	Description
Chapter 1	*Overview* ("General Overview" on page 1-1)	Provides a functional overview of the Cisco Service Control solution
Chapter 2	*How the Collection Manager Works* (on page 2-1)	Provides detailed information about the functionality of the Collection Manager components
Chapter 3	*Installing the Collection Manager and Getting Started* (on page 3-1)	Describes the procedures for installing the Collection Manager and its database, and explains how to run the Collection Manager
Chapter 4	*Managing the Collection Manager* (on page 4-1)	Explains how to use utility scripts to view and update Collection Manager parameters and other information

Chapter	Title	Description
Chapter 5	*Managing the Database and CSV Repository* ("Managing the Bundled Database and the CSV Repository" on page 5-1)	Explains how to use utility scripts to manage the Collection Manager database and the CSV repository
Chapter 6	*Database Configuration* (on page 6-1)	Explains how to configure the Collection Manager to work with your database
Appendix A	*Code Samples* (on page A-1)	Provides sample listings of code for configuration files

Related Publications

The following publications are available for the ***SCMS Collection Manager***:

- *Cisco Service Control Application for Broadband User Guide*
- *Cisco Service Control Application for Broadband Reference Guide*
- *Cisco SCA BB Service Configuration API Programmer Guide*
- *Cisco Service Control Application Reporter User Guide*

Conventions

This document uses the following conventions:

Convention	Description
boldface font	Commands and keywords are in **boldface**.
italic font	Arguments for which you supply values are in *italics*.
[ ]	Elements in square brackets are optional.
{x | y | z}	Alternative keywords are grouped in braces and separated by vertical bars.
[x | y | z]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
String	A nonquoted set of characters. Do not use quotation marks around the string, or the string will include the quotation marks.
`screen` font	Terminal sessions and information that the system displays are in `screen` font.
`boldface screen` font	Information you must enter is in **`boldface screen`** font.
`italic screen` font	Arguments for which you supply values are in ***`italic screen`*** font.
< >	Nonprinting characters, such as passwords, are in angle brackets.
[ ]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

Note Means *reader take note*. Notes contain helpful suggestions or references to materials not covered in this manual.

Caution Means *reader be careful*. In this situation, you might do something that could result in loss of data.

Obtaining Documentation

The following sections provide sources for obtaining documentation from Cisco Systems.

World Wide Web

You can access the most current Cisco documentation on the World Wide Web at the following sites:

- *http://www.cisco.com*
- *http://www-china.cisco.com*
- *http://www-europe.cisco.com*

Documentation CD-ROM

Cisco documentation and additional literature are available in a CD-ROM package that ships with your product. The Documentation CD-ROM is updated monthly and may be more current than printed documentation. The CD-ROM package is available as a single unit or as an annual subscription.

Ordering Documentation

Cisco documentation is available in the following ways:

- Registered Cisco Direct Customers can order Cisco Product documentation from the networking Products MarketPlace:

  http://www.cisco.com/cgi-bin/order/order_root.pl

- Registered Cisco.com users can order the Documentation CD-ROM through the online Subscription Store:

  http://www.cisco.com/pcgi-bin/marketplace/welcome.pl

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco corporate headquarters (California, USA) at 408 526-7208 or, in North America, by calling 800 553-NETS(6387).

Documentation Feedback

If you are reading Cisco product documentation on the World Wide Web, you can submit technical comments electronically. Click **Feedback** in the toolbar and select **Documentation**. After you complete the form, click **Submit** to send it to Cisco.

You can e-mail your comments to *bug-doc@cisco.com*.

To submit your comments by mail, use the response card behind the front cover of your document, or write to the following address:

Attn Document Resource Connection
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

Obtaining Technical Assistance

Cisco provides *Cisco.com* (on page ix) as a starting point for all technical assistance. Customers and partners can obtain documentation, troubleshooting tips, and sample configurations from online tools. For Cisco.com registered users, additional troubleshooting tools are available from the TAC website.

Cisco.com

Cisco.com is the foundation of a suite of interactive, networked services that provides immediate, open access to Cisco information and resources at any time, from anywhere in the world. This highly integrated Internet application is a powerful, easy-to-use tool for doing business with Cisco.

Cisco.com provides a broad range of features and services to help customers and partners streamline business processes and improve productivity. Through Cisco.com, you can find information about Cisco and our networking solutions, services, and programs. In addition, you can resolve technical issues with online technical support, download and test software packages, and order Cisco learning materials and merchandise. Valuable online skill assessment, training, and certification programs are also available.

Customers and partners can self-register on Cisco.com to obtain additional personalized information and services. Registered users can order products, check on the status of an order, access technical support, and view benefits specific to their relationships with Cisco.

To access Cisco.com, go to http://www.cisco.com.

Technical Assistance Center

The Cisco Technical Assistance Center (TAC) website is available to all customers who need technical assistance with a Cisco product or technology that is under warranty or covered by a maintenance contract.

Contacting TAC by Using the Cisco TAC Website

If you have a priority level 3 (P3) or priority level 4 (P4) problem, contact TAC by going to the TAC website *http://www.cisco.com/tac*.

P3 and P4 level problems are defined as follows:

- P3—Your network is degraded. Network functionality is noticeably impaired, but most business operations continue.
- P4—You need information or assistance on Cisco product capabilities, product installation, or basic product configuration.

In each of the above cases, use the Cisco TAC website to quickly find answers to your questions.

To register for *Cisco.com* (on page ix), go to *http://tools.cisco.com/RPF/register/register.do*.

If you cannot resolve your technical issue by using the TAC online resources, Cisco.com registered users can open a case online by using the TAC Case Open tool at *http://www.cisco.com/tac/caseopen*.

Contacting TAC by Telephone

If you have a priority level 1 (P1) or priority level 2 (P2) problem, contact TAC by telephone and immediately open a case. To obtain a directory of toll-free numbers for your country, go to *http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml*.

P1 and P2 level problems are defined as follows:

- P1—Your production network is down, causing a critical impact to business operations if service is not restored quickly. No workaround is available.
- P2—Your production network is severely degraded, affecting significant aspects of your business operations. No workaround is available.

General Overview

This chapter provides a general overview of the Cisco Service Control solution. It introduces the Cisco Service Control concept and the Service Control capabilities. It also briefly describes the hardware capabilities of the Service Control Engine (SCE) platform and the Cisco specific applications that together compose the total Cisco Service Control solution.

This chapter contains the following sections:

The Cisco Service Control Concept

The Cisco Service Control solution is delivered through a combination of purpose-built hardware and specific software solutions that address various service control challenges faced by service providers. The SCE platform is designed to support classification, analysis, and control of Internet/IP traffic.

Service Control enables service providers to create profitable new revenue streams while capitalizing on their existing infrastructure. With the power of Service Control, service providers have the ability to analyze, charge for, and control IP network traffic at multigigabit wire line speeds. The Cisco Service Control solution also gives service providers the tools they need to identify and target high-margin content-based services and to enable their delivery.

As the downturn in the telecommunications industry has shown, IP service providers' business models need to be reworked to make them profitable. Having spent billions of dollars to build ever larger data links, providers have incurred massive debts and faced rising costs. At the same time, access and bandwidth have become commodities where prices continually fall and profits disappear. Service providers have realized that they must offer value-added services to derive more revenue from the traffic and services running on their networks. However, capturing real profits from IP services requires more than simply running those services over data links; it requires detailed monitoring and precise, real-time control and awareness of services as they are delivered. Cisco provides Service Control solutions that allow the service provider to bridge this gap.

Service Control for Wireless Service Providers

Wireless service providers are successfully rolling out 2.5G and 3G-based data services to their subscribers. These services are expected to significantly increase much needed average revenue per user (ARPU) for sustained business models and rapid rollout of new services.

These data services require new ways of offering services and new ways of billing these services to subscribers. The Cisco Service Control solutions enable:

- Support for multiple billing models
- Elimination of revenue leakage via real-time service control
- Flexible pricing plans—Postpaid, prepaid, MRC, pay-per-use
- Content-based billing for various applications
- Subscription-based and tiered application services

Service Control for DSL Providers and ISPs

DSL providers and ISPs targeting residential and business broadband customers must find new ways to get maximum leverage from their existing infrastructures, while differentiating their offerings with enhanced IP services.

Cisco products add a new layer of service intelligence and control to existing networks They:

- Provide granular visibility into network usage
- Automatically enforce application SLAs or acceptable use policies
- Implement different service levels for different types of customers, content, or applications
- Deploy from network edge to network core for end-to-end service control
- Integrate Cisco solutions easily with existing network elements and BSS/OSS systems

Service Control for Cable MSOs

Cable MSOs have successfully deployed high-speed cable modem services to millions of homes. Now they must move beyond providing commodity broadband access by introducing differentiated services and by implementing the service control necessary to fully manage service delivery through their broadband infrastructure. Cisco Service Control solutions enable:

- Reporting and analyzing network traffic at subscriber and aggregate level for capacity planning
- Identification of network abusers who are violating the Acceptable Use Policy (AUP)
- Identification and management of peer-to-peer traffic, NNTP (news) traffic, and spam abusers
- Enforcement of the AUP
- Limiting or preventing the use of servers in the subscriber residence and the use of multiple (unpaid) computers
- Customer-intuitive tiered application services and guarantee application SLAs
- Full integration with standard or legacy OSS for subscriber management and billing

Cisco Service Control Capabilities

The core of the Cisco Service Control solution is the purpose-built network hardware device: the Service Control Engine (SCE). The core capabilities of the SCE platform, which support a wide range of applications for delivering Service Control solutions, include:

- Subscriber and application awareness—Application-level drilling into IP traffic for real-time understanding and controlling of usage and content at the granularity of a specific subscriber.
  - Subscriber awareness—The ability to map between IP flows and a specific subscriber in order to maintain the state of each subscriber transmitting traffic through the SCE platform and to enforce the appropriate policy on this subscriber's traffic.

    Subscriber awareness is achieved either through dedicated integrations with subscriber management repositories, such as a DHCP or a Radius server, or via sniffing of Radius or DHCP traffic.
  - Application awareness—The ability to understand and analyze traffic up to the application protocol layer (Layer 7).

    For application protocols implemented using bundled flows (such as FTP, which is implemented using Control and Data flows), the SCE platform understands the bundling connection between the flows and treats them accordingly.
- Application-layer, stateful, real-time traffic control—The ability to perform advanced control functions, including granular BW metering and shaping, quota management, and redirection, using application-layer stateful real-time traffic transaction processing. This requires highly adaptive protocol and application-level intelligence.
- Programmability—The ability to quickly add new protocols and easily adapt to new services and applications in the ever-changing service provider environment. Programmability is achieved using the Cisco Service Modeling Language (SML).

  Programmability allows new services to be deployed quickly and provides an easy upgrade path for network, application, or service growth.
- Robust and flexible back-office integration—The ability to integrate with existing third-party systems at the Service Provider, including provisioning systems, subscriber repositories, billing systems, and OSS systems. The SCE provides a set of open and well-documented APIs that allows a quick and robust integration process.
- Scalable high-performance service engines—The ability to perform all these operations at wire speed.

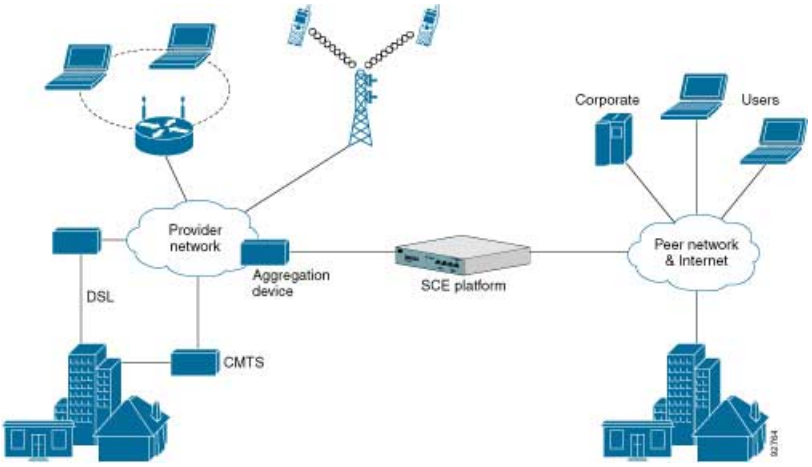
The SCE Platform

The SCE family of programmable network devices is capable of performing application-layer stateful-flow inspection of IP traffic, and controlling that traffic based on configurable rules. The SCE platform is a purpose-built network device that uses ASIC components and RISC processors to go beyond packet counting and delve deeper into the contents of network traffic. Providing programmable, stateful inspection of bidirectional traffic flows and mapping these flows with user ownership, the SCE platforms provide real-time classification of network usage. This information provides the basis of the SCE platform advanced traffic-control and bandwidth-shaping functionality. Where most bandwidth shaper functionality ends, the SCE platform provides more control and shaping options, including:

- Layer 7 stateful wire-speed packet inspection and classification
- Robust support for over 600 protocols and applications, including:
  - General—HTTP, HTTPS, FTP, TELNET, NNTP, SMTP, POP3, IMAP, WAP, and others
  - P2P file sharing—FastTrack-KazaA, Gnutella, BitTorrent, Winny, Hotline, eDonkey, DirectConnect, Piolet, and others
  - P2P VoIP—Skype, Skinny, DingoTel, and others
  - Streaming and Multimedia—RTSP, SIP, HTTP streaming, RTP/RTCP, and others
- Programmable system core for flexible reporting and bandwidth control
- Transparent network and BSS/OSS integration into existing networks
- Subscriber awareness that relates traffic and usage to specific customers

The following diagram illustrates a common deployment of an SCE platform in a network.

Figure 1-1: SCE Platform in the Network



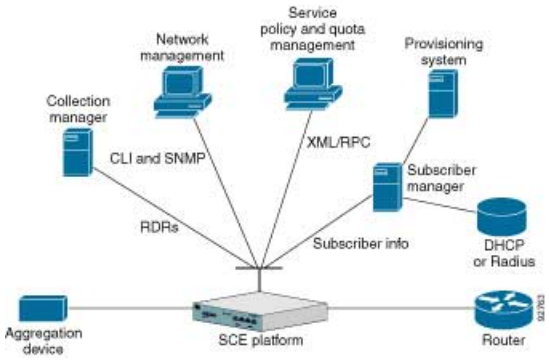
Management and Collection

The Cisco Service Control solution includes a complete management infrastructure that provides the following management components to manage all aspects of the solution:

- Network management
- Subscriber management
- Service Control management

These management interfaces are designed to comply with common management standards and to integrate easily with existing OSS infrastructure.

Figure 1-2: Service Control Management Infrastructure



Network Management

Cisco provides complete network FCAPS (Fault, Configuration, Accounting, Performance, Security) Management.

Two interfaces are provided for network management:

- Command-line interface (CLI)—Accessible through the Console port or through a Telnet connection, the CLI is used for configuration and security functions.
- SNMP—Provides fault management (via SNMP traps) and performance monitoring functionality.

Subscriber Management

Where the Cisco Service Control Application for Broadband (SCA BB) enforces different policies on different subscribers and tracks usage on an individual subscriber basis, the Cisco Service Control Management Suite (SCMS) Subscriber Manager (SM) may be used as middleware software for bridging between the OSS and the SCE platforms. Subscriber information is stored in the SM database and can be distributed between multiple platforms according to actual subscriber placement.

The SM provides subscriber awareness by mapping network IDs to subscriber IDs. It can obtain subscriber information using dedicated integration modules that integrate with AAA devices, such as Radius or DHCP servers.

Subscriber information may be obtained in one of two ways:

- Push Mode—The SM pushes subscriber information to the SCE platform automatically upon logon of a subscriber.
- Pull Mode—The SM sends subscriber information to the SCE platform in response to a query from the SCE platform.

Service Configuration Management

Service configuration management is the ability to configure the general service definitions of a service control application. A service configuration file containing settings for traffic classification, accounting and reporting, and control is created and applied to an SCE platform. SCA BB provides tools to automate the distribution of these configuration files to SCE platforms. This simple, standards-based approach makes it easy to manage multiple devices in a large network.

Service Control provides an easy-to-use GUI to edit and create these files and a complete set of APIs to automate their creation.

Data Collection

All analysis and data processing functions of the SCE platform result in the generation of Raw Data Records (RDRs). These RDRs are processed by the Cisco Service Control Management Suite Collection Manager. The Collection Manager software is an implementation of a collection system that receives RDRs from one or more SCE platforms. It collects these records and processes them in one of its adapters. Each adapter performs a specific action on the RDR.

RDRs contain a wide variety of information and statistics, depending on the configuration of the system. There are three main categories of RDRs:

- Transaction RDRs—Records generated for each transaction, where a transaction is a single event detected in network traffic. The identification of a transaction depends on the particular application and protocol.
- Subscriber Usage RDRs—Records generated per subscriber, describing the traffic generated by that subscriber for a defined interval.
- Link RDRs—Records generated per link, describing the traffic carried on the link for a defined interval.

The Cisco Service Control Application for Broadband

Cisco provides a specific solution that runs on top of the SCE platform and addresses the IP network control challenges that service providers face. This solution is the Cisco Service Control Application for Broadband (SCA BB).

SCA BB allows service providers to detect complex and evasive network application protocols (such as P2P), and to control them according to their business and service delivery requirements. It also enables the creation of differentiated tiered services that the service provider uses to boost revenues and provide competitive services to end customers. SCA BB's programmable application detection and subscriber awareness makes tiered service possible from a central point in the network. SCA BB requires no network changes or upgrades, and it is compatible with all existing IP network switches, routers, and infrastructure.

How the Collection Manager Works

This chapter describes how the Cisco Service Control Management Suite (SCMS) Collection Manager (CM) works. It describes the Raw Data Records (RDRs) that the Service Control Engine (SCE) platforms produce and send to the Collection Manager, and provides an overview of the components of the CM software package. It also gives an overview of the database used to store the RDRs.

This chapter contains the following sections:

The Data Collection Process

Cisco SCE platforms create RDRs whose specifications are defined by the application running on the SCE platform, such as the Cisco Service Control Application for Broadband (SCA BB).

RDRs are streamed from the SCE platform using the simple, reliable *RDR-Protocol*. Integrating the collection of data records with the Service Control solution involves implementing RDR-Protocol support in the collection system (a straightforward development process).

After the CM receives the RDRs from the SCE platforms, CM software modules recognize and sort the various types of RDR, based on preset categories and according to type and priority, and queue them in persistent buffers.

One or more of the CM adapters then processes each RDR. Each adapter performs a specific function on RDRs (stores it in a CSV formatted file on a local machine, sends it to an RDBMS application, or performs custom operations).

You can use preinstalled utility scripts to determine many of the parameters that influence the behavior of the CM.

Raw Data Records

Raw Data Records (RDRs) are reports produced by SCE platforms. The list of RDRs, their fields, and their semantics depend on the specific Service Control Protocol (SCP) application. Each RDR type has a unique ID known as an *RDR tag*.

The following are some examples of RDRs produced by SCP applications:

- Periodic Subscriber usage report—SCE platforms are subscriber-aware network devices; they can report usage records per subscriber.

  These RDRs typically contain a subscriber identifier (such as the OSS subscriber ID), the traffic type (such as HTTP, Streaming, or Peer-to-Peer traffic), and usage counters (such as total upstream and downstream volume). These types of usage reports are necessary for usage-based billing services, and for network analysis and capacity planning.

  The SCA BB application Subscriber Usage RDRs are in this category.

- Transaction level report—SCE platforms perform stateful tracking of each network transaction conducted on the links on which they are situated. Using this statefulness, the SCP tracks a number of OSI Layer 7 protocols (such as HTTP, RTSP, SIP, or Gnutella) to report on various application level attributes.

  These RDRs typically contains transaction-level parameters ranging from basic Layer 3-4 attributes (such as source IP, destination IP, and port number) to protocol-dependant Layer 7 attributes (such as user-agent, host-name for HTTP, or e-mail address of an SMTP mail sender), and also generic parameters (such as time of day and transaction duration). These RDRs are important for content-based billing schemes and for detailed usage statistics.

  The SCA BB application Transaction RDRs are in this category.

- SCP application activity reports—The SCP application can program the SCE platform to perform various actions on network traffic. These actions include blocking transactions, shaping traffic to certain rates and limits, and performing application-level redirections. When such an operation is performed, the SCP application may produce an RDR.

  The SCA BB application Breaching RDRs and Blocking RDRs are in this category. Breaching RDRs are generated when the system changes its active enforcement on a subscriber (because usage exceeded a certain quota). Blocking RDRs are generated when an SCE platform blocks a network transaction (according to rules contained in the current service configuration).

The Collection Manager Software Package

The Collection Manager Software Package consists of a group of processing and sorting modules. These include the following components:

- RDR Server
- Categorizer
- Priority Queues and persistent buffers

RDR Server

As each incoming RDR arrives from an SCE platform, the RDR Server adds an arrival timestamp and the ID of the source SCE platform to it, and then sends the RDR to the Categorizer.

Categorizer

The Categorizer classifies each RDR according to its RDR tag. It decides the destination adapters for the RDR and through which Priority Queue it should be sent.

An RDR can be mapped to more than one adapter. A qualified technician defines the flow in a configuration file based on user requirements.

Priority Queues and Persistent Buffers

Each adapter has one or more Priority Queues; a persistent buffer is assigned to each Priority Queue.

A Priority Queue queues each RDR according to its priority level and stores it in a persistent buffer until the adapter processes it.

A persistent buffer is a non-volatile storage area that ensures that the system processes RDRs even in cases of hardware, software, or power failures.

Adapters

Adapters are software modules that transform RDRs to match the target system's requirements, and distribute the RDRs upon request. At this time, the following adapters are shipped with the system:

- JDBC Adapter
- CSV Adapter
- Topper/Aggregator (TA) Adapter
- Real-Time Aggregating (RAG) Adapter
- HTTPC Adapter

Some of the adapters send data to the database or write it to CSV files. The structures of the database tables, and the location and structures of these CSV files are described in the *Cisco Service Control Application for Broadband Reference Guide*.

Each adapter has its own configuration file; all the configuration files are similar in structure. For a sample RAG Adapter configuration file, see *The ragadapter.conf File* (on page A-4).

JDBC Adapter

The JDBC Adapter receives RDRs, processes them, and stores the records in a database.

This adapter is designed to be compatible with any database server that is JDBC-compliant, and transforms the records accordingly. The JDBC Adapter can be configured to use a database operating on a remote machine.

The JDBC Adapter is preconfigured to support the following databases:

- Sybase ASE 12.5 and 15.0
- Oracle 9.2
- MySQL 4

CSV Adapter

The CSV Adapter receives RDRs, processes them, and writes the records to files on the disk in comma-separated value format. Using standard mechanisms such as FTP, a service provider's OSS or a third-party billing system can retrieve these records to generate enhanced accounting and network traffic analysis records.

TA Adapter

The TA Adapter receives Subscriber Usage RDRs, aggregates the data they contain, and outputs *Top Reports* to the database and aggregated daily statistics of all subscribers (not just the top consumers) to CSV files. Top Reports are lists of the top subscribers for different metrics (for example, the top 50 volume or session consumers in the last hour).

This adapter maintains a persistent saved state (saved to disk) to minimize any data loss in case of failure.

The TA Adapter, which uses the JDBC Adapter infrastructure, can be configured to use any JDBC-compliant database, either locally or remotely.

TA Adapter Cycles

The TA Adapter works in two cycles: short and long. Cycles are fixed intervals at the end of which the adapter can output its aggregated information to the database and to a CSV file. The default interval for the short cycle is 1 hour; for the long cycle it is 24 hours (every day at midnight). The intervals (defined in minutes) and their start and end times are configurable.

Note The long-cycle interval must be a multiple of the short-cycle interval.

The activities in each cycle differ slightly, as follows:

- Short Cycle—At the end of every short cycle, the adapter:
  - Adds the cycle's aggregated Top Reports to the short cycle database table
  - Saves the current state file in case of power failure
- Long Cycle—At the end of every long cycle, the adapter:

- Adds the cycle's aggregated Top Reports to the short cycle database table
- Saves the current state file in case of power failure
- Creates a CSV file containing the aggregated statistics for the long-cycle period

RAG Adapter

The RAG Adapter processes RDRs of one or more types and aggregates the data from predesignated field positions into *buckets*. The contents of the buckets are written to CSV files.

RAG Adapter Aggregation Buckets

A RAG Adapter aggregation bucket is indexed by combining values from fields in the RDR. The indexing relation can be one-to-one or many-to-one.

The values in the bucket-identifying fields are processed using closures (equivalence classes), which are configured per type of RDR.

EXAMPLE

Bucket-identifying field = field number 3
Closures: 4 = 4,5,6; 10 = 8,10,11

Value in field 3 = 4, 5, or 6; field reported as 4
Value in field 3 = 8, 10, or 11; field reported as 10

The adapter can be configured to monitor the values in certain fields for change relative to the values in the first RDR that entered the bucket. For each monitored field, an action is performed when a value change is detected. The supported actions are:

- Checkpoint the bucket without aggregating this RDR into it, and start a new bucket with this RDR
- Issue a warning to the user log

Buckets, closures, triggers, and trigger actions are defined in an XML file. For a sample XML file, see *The ragadapter.xml File* (on page A-5).

Flushing a Bucket

When a bucket is flushed, it is written as a single line to a CSV file.

The trigger for flushing a bucket (a *checkpoint*) is the earliest occurrence of any of the following:

- The time elapsed since the creation of the bucket has reached a configured amount
- The volume in an accumulated field in the bucket has exceeded a configured amount
- The adapter, or the whole CM, is going down
- An RDR having some new value (relative to the bucket contents) in some field arrived at the bucket

The trigger to close a CSV file is the earliest occurrence of one of the following:

- The time elapsed since creation of the file has reached a set amount
- The number of lines in the file has reached a set amount
- The adapter, or the whole CM, is going down

HTTPC Adapter

The HTTPC Adapter receives RDRs, processes them, and sends them to a Policy Server over HTTP.

The HTTPC Adapter can be configured to set the various HTTP requests according to the various Policy Server modes and the required action for a specific flow.

The HTTPC Adapter receives only two types of RDR: one to signal to the Policy Server that a flow has started, the other to signal that the flow has ended.

Databases

The CM can use either a bundled database or an external database to store RDRs supplied by the system's SCE platforms.

Using the Bundled Database

In bundled mode, the CM uses the Sybase Adaptive Server Enterprise database, which supports transaction-intensive enterprise applications, allows you to store and retrieve information online, and can warehouse information as needed.

The Sybase database is located on the same server as the other CM components. It uses a simple schema consisting of a group of small, simple tables. The JDBC Adapter sends converted RDRs to the database to be stored in these tables. Records can then be accessed using standard database query and reporting tools. (Cisco provides a template-based reporting tool that can generate reports on subscriber usage, network resource analysis, and traffic analysis; for information about the Service Control reporting tool, see the *Cisco Service Control Application Reporter User Guide*.)

Database maintenance is performed using operating system commands and scripts. The CM supports automatic purging of old records from the bundled database. By default, the report tables are automatically purged of every record that is more than two weeks old. The records are polled once every hour. Database maintenance can be configured using the `dbperiodic.py` utility script. For more information, see *Managing the Periodic Deletion of Old Records* (on page 5-4).

Using an External Database

Any JDBC-compliant database (for example, Oracle™ or MySQL) may be used with the CM in conjunction with the JDBC Adapter. In this case, the database can be local or remote. You should configure the JDBC Adapter to use this database, and also configure a *database pack* to supply the CM with the parameters of the database (such as its IP address and port). You should also supply a JDBC driver for the database, to be used by the adapter when connecting to it. For more details about configuring the CM to work with an external database, see *Managing the Database and CSV Repository* ("Managing the Bundled Database and the CSV Repository" on page 5-1).

Installing the Collection Manager and Getting Started

This chapter describes how to install the Cisco Service Control Management Suite (SCMS) Collection Manager (CM) and, optionally, its bundled database.

This chapter contains the following sections:

System Requirements

The CM and its database are software components that run on a Server Platform. They can be installed on either of the following configurations:

- Sun SPARC machine running Solaris 8 or Solaris 9. (See *Solaris Requirements* (on page 3-2).)
- IA32 machine running Red Hat Enterprise Linux 3.0 or Red Hat Enterprise Linux 4.0. (See *Red Hat Linux Requirements* (on page 3-4).)

Checking System Prerequisites

The CM distribution contains a script, `check_prerequisites.sh`, located in the `install_scripts` directory, that helps to determine whether a system meets the requirements for installing a CM or the bundled Sybase database.

The script checks overall readiness of the system for a CM or Sybase installation. The main prerequisites checked are:

- CPU speed
- Amount of RAM
- Operating System version (Solaris 8 or 9, Red Hat Enterprise Linux 3.0 or 4.0)

- Additional required and optional packages
- Python installed and executable in path
- Free space for CM and Sybase homes
- Names for all NICs
- Sybase kernel parameters
- Locale and time zone formats

check_prerequisites.sh [--sybhome=*SYBHOME* **] [--cmhome=***CMHOME* **] [--datadir=***DATADIR* **]**

Options

--sybhome=SYBHOME	Intended home directory for Sybase installation
--datadir=DATADIR	Intended data directory for Sybase data files (for the Datadir installation method)
--cmhome=CMHOME	Intended home directory for CM installation

Solaris Requirements

Collection Manager 3.0.0 or later can be installed on any Sun SPARC Machine running Solaris that conforms to the requirements listed in the following sections.

Hardware

- Minimum 500 MHz CPU
- Minimum 1 GB RAM per CPU
- Hard disk:
  - One hard disk, at least 18 GB
  - (Recommended for bundled installations) A second hard disk (at least 18 GB), to store Sybase data
- 100BASE-T network interface

Software and Environment

- Solaris 5.8 64-bit build 04/01 or later (currently only Solaris 5.8 and 5.9 is supported).
- Solaris Core Installation.
- The following additional packages should be installed:

system	SUNWbash	GNU Bourne-Again shell (bash)
system	SUNWgzip	The GNU Zip (gzip) compression utility
system	SUNWzip	The Info-Zip (zip) compression utility
system	SUNWlibC	Sun Workshop Compilers Bundled libC
system	SUNWlibCx	Sun WorkShop Bundled 64-bit libC

- If you are installing the CM in bundled mode with the Sybase database, the following package should also be installed:

  system SUNWipc Interprocess Communication

  (Optional) The following packages may be installed (for sysadmin applications such as sys-unconfig):

  system SUNWadmap System administration applications

  system SUNWadmc System administration core libraries

- To use the Python scripts, a Python interpreter version 2.2.1 or later must be present on the system. One way to get such an interpreter is to install the following package:

  application SMCpythn python

  The Python package requires the installation of two additional packages:

  application SMClibgcc libgcc

  application SMCncurs ncurses

  These packages can be downloaded from http://sunfreeware.com/

  The root (/) partition must have at least 104 MB of free space to install these packages.

- The latest recommended patches from Sun should be applied:
  - For Solaris 8, go to http://sunsolve.sun.com/pub-cgi/show.pl?target=patches/xos-8&nav=pub-patches
  - For Solaris 9, go to http://sunsolve.sun.com/pub-cgi/show.pl?target=patches/xos-9&nav=pub-patches
  - For Java, go to http://sunsolve.sun.com/pub-cgi/show.pl?target=patches/J2SE
- If you are using Sybase, current Solaris patches recommended by Sybase should be installed:
  - Go to http://my.sybase.com/detail?id=1016173
- At least 8 GB free on the partition where the CM is to be installed. (This is used for CSV storage and persistent buffers.)
- (For installations with bundled Sybase) At least 3 GB free on one partition for the Sybase home directory.
- (For installations with bundled Sybase) Free space on a single partition to hold the desired size of the Sybase data and logs (these sizes are configurable at install time).
- (Optional, and only for installations with bundled Sybase) Install the sudo package (from, for example, http://sunfreeware.com), and configure the following line in the sudoers file:

  ```
  scmscm ALL= NOPASSWD: XXX/scripts/dbconf.sh
  ```

  where XXX is the intended home directory for scmscm.

  If you choose not to install sudo: in the rare event of a Sybase crash, the CM will not be able to revive the database by itself.

- (For installations with bundled Sybase where the legacy (pre-3.0) Cisco Service Control Application Suite (SCAS) Reporter is to be used) An FTP server should be listening on port 21 so that the SCA Reporter can authenticate against it.

- (For installations with bundled Sybase) Verify before installation that all IP addresses that are configured for the machine NICs have host names associated with them in */etc/hosts* or in another active naming service. (This is a limitation of Sybase Adaptive Server Enterprise.)
- (For installations with bundled Sybase) The kernel should be configured with at least:
  - 512000000 bytes in shmmax
  - 32 in shmseg (not required for Solaris 9)

  Additionally, the IPC module should be loaded at startup. This is achieved by putting the following lines in the file */etc/system*:

  ```
  forceload: sys/semsys
  forceload: sys/shmsys
  ```
- (For installations with bundled Sybase) If you are using database periodic delete, the scmscm user should be able to schedule and run cron jobs.

Setting the Locale and Time Zone

- For correct CM and Sybase operation, US English locale must be used.

  The easiest way to set the locale is by putting the following line in the */etc/TIMEZONE* configuration file (changes in this file need a restart to take effect):

  ```
  LANG=en_US
  ```

  Solaris also needs to have this locale installed. Verify that the locale is installed by checking that the directory */usr/lib/locale/en_US* exists. If the directory does not exist, install the locale files from the Solaris CDs.
- Setting the OS time zone as an offset from GMT in POSIX format is not recommended, and may lead to problems. Best is to set the time zone in the */etc/TIMEZONE* configuration file by (supported) country name, as in the following example.

  ```
  TZ=Japan
  ```

  Verify that the country name is supported as a time zone setting by checking that it is listed in the directory */usr/share/lib/zoneinfo*.

  If GMT offset must be used, use the zoneinfo format by prepending an `:Etc/` prefix, as in the following example:

  ```
  TZ=:Etc/GMT+5
  ```

Red Hat Linux Requirements

Collection Manager 3.0.0 or later can be installed on any i386 running Red Hat Linux that conforms to the requirements listed in the following sections.

Hardware

- Minimum 800 MHz CPU
- Minimum 1 GB RAM per CPU
- Hard disk:
  - One hard disk, at least 18 GB

  - (Recommended for bundled installations) A second hard disk (at least 18 GB), to store Sybase data
- 100BASE-T network interface

Software and Environment

- Red Hat Linux 3.0 or 4.0.
- Red Hat Enterprise "Base" Installation.
- (For installations with bundled Sybase) The following additional package should be installed:
  - *compat-libstdc++*

  This package is available on the Red Hat installation CD.
- Latest recommended patches from Red Hat should be applied.
- (For installations with bundled Sybase) Current patches recommended by Sybase should be installed.
- At least 8 GB free on the partition where the CM is to be installed. (This is used for CSV storage and persistent buffers.)
- (For installations with bundled Sybase) At least 1 GB free on some partition for the Sybase home directory.Optional, and only for installation with a bundled database) Install the sudo package and configure the following line in the sudoers file:

  ```
  scmscm ALL= NOPASSWD: XXX/scripts/dbconf.sh
  ```

  where XXX is the intended home directory for scmscm.

  If you choose not to install sudo, in the rare event of a Sybase crash, the CM will not be able to revive the database by itself.
- (For installations with bundled Sybase where the legacy (pre-3.0) Cisco Service Control Application Suite (SCAS) Reporter is to be used) An FTP server should be listening on port 21 so that the SCA Reporter can authenticate against it.
- (For installations with bundled Sybase) Verify before installation that all IP addresses that are configured for the machine NICs have host names associated with them in */etc/hosts* or in another active naming service. (This is a limitation of Sybase Adaptive Server Enterprise.)
- (For installations with bundled Sybase) The kernel should be configured with at least:
  - 512000000 bytes in shmmax
- (For installations with bundled Sybase) If you are using database periodic delete, the scmscm user should be able to schedule and run cron jobs.

Setting the Locale and Time Zone

- For correct CM and Sybase operation, US English locale (*en_US*) must be used.

Distribution Content

The Collection Manager installation kit contains installation scripts for installing the CM and the Sybase database.

It also contains:

- Scripts to support file gathering
- Scripts for periodic Sybase maintenance

Installation

This section describes how to install CM version 3.0.0 or later and the Sybase database on a computer running Solaris or Red Hat Linux.

To prepare to install the CM and the Sybase database:

Step 1 Log on as the root user.

Step 2 Make the distribution kit contents available on your system or local network.

Phase 1: Installing Sybase

If you do not want to install Sybase (for example, when working in unbundled mode), go to *Phase 2: Installing Collection Manager Software* (on page 3-8).

Note If at any point during the installation you want to reverse the Sybase installation actions (for example, in the rare case that an installation is interrupted because of a power failure), do the following:
1. Log on as the root user.
2. Kill any Sybase processes by typing **`pkill -u sybase`**.
3. Remove the Sybase user and home directory by typing **`userdel -r sybase`**.
4. Restart the Sybase installation process from the beginning.

To install Sybase:

Step 1 Change directory to *`sybase`* in the distribution kit root.

Step 2 Run the script *`installsyb.sh`*

The script usage is as follows:

```
installsyb.sh --sybhome=SYBHOME { --datadir=DATADIR | --expert }
```

- `SYBHOME` is the home directory of the Sybase user (and should have 1 GB free)

- Select one of the following data location options:
  - Specify `--datadir=DATADIR`, where `DATADIR` is a directory in which all Sybase data is to be stored.

    This location should be in a partition where at least 15 GB is free.
  - Specify `--expert` to respond interactively for file and device location and size (no error checking is performed: use with care!). For further information about the expert option, see *--expert Option: Usage Guidelines* (on page 3-7).

  If you specify a `DATADIR`, all Sybase data is stored as normal files in that directory, with default sizes of 10 GB for data, 3 GB for logs, and 3 GB for Sybase temporary storage. The ownership of the directory is changed to the Sybase user during installation. Although this option is convenient, the `--expert` option provides better database performance.
- Actions performed by the *`installsyb.sh`* script are described in the following section.

Actions Performed by installsyb.sh

The *`installsyb.sh`* script performs the following steps:

Step 1 Verifies the `shmem` setting for Sybase in */etc/system*. If the setting is not there, the script inserts it and reboots (after prompting the user).

Step 2 Adds a user sybase and group sybase.

Step 3 Runs the Sybase installer for your platform.

Step 4 (If using the `--expert` option) Changes ownership of selected files and devices to the Sybase user. Under Red Hat Linux, it also changes ownership of the master raw device */dev/rawctl*, if necessary.

Step 5 Builds a Sybase server including Sybase users and passwords.

Step 6 Starts Sybase.

Step 7 Runs SQL scripts to create the Collection Manager database structure. This is a lengthy process that involves restarting Sybase several times.

--expert Option: Usage Guidelines

The `--expert` option allows you to specify files (or devices) and sizes for the data, log, and tempdb storage areas.

Note The size that you specify for the "sybase device" is expressed in 2048-byte blocks. You should allow for a five percent overhead when creating a Sybase device.

The `--expert` option must be used with care: the installation script performs basic checks on the configuration you select, verifying device types, partition sizes, and so on; however, not all error conditions on the OS level can be anticipated or checked for. If you use devices:

- Verify that each device is a raw (character-special) device.
- Verify that each device has enough space to hold the Sybase device assigned to it.

Caution Sybase overwrites any existing data in the files or devices you specify.
Do not put a Sybase device on a disk partition which contains cylinder 0 of the disk. Doing so may corrupt the disk´s partition table, rendering the whole disk unusable.

Important Note for Linux Users Enabling raw devices in Red Hat Linux and preparing them for use with Sybase involves some additional steps and is described at the following URL: http://sybooks.sybase.com/onlinebooks/group-as/asp1251e/installlnx/@Generic__BookTextView/8022#X.

Phase 2: Installing Collection Manager Software

Note If at any point during the installation you want to reverse the Service Control software installation actions (for example, in the rare case that an installation is interrupted because of a power failure), do the following:
1. Log on as the root user.
2. Kill any Sybase processes by typing **`pkill -u sybase`**.
3. Remove the Sybase user and home directory by typing **`userdel -r sybase`**.
4. Restart the Sybase installation process from the beginning.

To install the Collection Manager software:

Step 1 Change directory to *`install-scripts`* under the distribution kit root.

Step 2 Run the *`install-cm.sh`* script.

For more information about the *`install-cm.sh`* script options, see *install-cm.sh Options* (on page 3-10).

For additional information about the script, see *Actions Performed by install-cm.sh* (on page 3-10).

Step 3 After the script completes, set a password for the scmscm user by running the command **`passwd scmscm`**. Be sure to record the password that you choose.

Step 4 If you are going to run an application that uses the Topper/Aggregator (TA) Adapter, you may need to increase the amount of memory allocated to this adapter. This depends on the number of subscribers to be handled by the CM. To increase the memory allocation:

a) Open the file *`~scmscm/cm/config/cm.conf`*.

b) Locate the setting containing `TAAdapter` in the `[adapter_mem]` section.

c) Change the default value (512 MB) to a larger value. For example, to allocate 1024 MB of memory, set the value to `-Xmx1024M`.

d) Save and close the file.

Step 5 If you are going to run an application that uses the Real-Time Aggregating (RAG) Adapter, you may need to increase the amount of memory allocated to this adapter. This depends on the number of subscribers to be handled by the CM and on your RAG Adapter configuration. To change the setting:

a) Open the file *~scmscm/cm/config/cm.conf*.

b) Locate the setting containing `RAGAdapter` in the `[adapter_mem]` section.

c) Change the default value (512 MB) to a larger value. For example, to allocate 1024 MB of memory, set the value to `-Xmx1024M`.

d) Save and close the file.

Note To use an external database, you must also configure a *dbpack* to enable the CM to connect to the database. See *Managing the Database and CSV Repository* ("Managing the Bundled Database and the CSV Repository" on page 5-1) for details of how to do this.

Step 6 For each adapter that your application will use, configure the adapter to point to the application:

- JDBC Adapter: Edit the file *~scmscm/cm/config/jdbcadapter.conf*, and, in the `[app]` section, change the value of `app_conf_dir` to point to your desired application.

  By default, it is set to `apps/scasbb/3.0`.

- TA Adapter: Edit the file *~scmscm/cm/config/taadapter.conf*, and, in the `[app]` section, change the value of `app_conf_dir` to point to your desired application.

  By default, it is set to `apps/scasbb/3.0`.

Step 7 (Optional, and only for installations with bundled Sybase) Install and activate the periodic delete procedures for the database tables. (For more information about configuring the behaviour of periodic delete, see *Managing the Periodic Deletion of Old Records* (on page 5-4).)

a) Install the periodic delete procedures:

Log on as the scmscm user, start the CM, wait 1-2 minutes for the database tables to be created, and then run the script:

~scmscm/db_maint/create_periodic_del_procs.sh.

b) Activate the automatic invocation of the periodic delete procedures by running the following command:

`~scmscm/scripts/dbperiodic.py --load`

Note If reports are sent to the database and you do not install and activate the periodic delete procedures, the second disk may overflow.

Step 8 Set the Service Control Engine (SCE) device time zone by running the command:

~scmscm/cm/bin/jselect-sce-tz.sh --offset=<*offset-in-minutes from GMT*>.

For example, if the SCE device is located in GMT+2, use:

~scmscm/cm/bin/jselect-sce-tz.sh --offset=120

If the SCE is located in GMT-10, use:

~scmscm/cm/bin/jselect-sce-tz.sh --offset=-600

Step 9 (Optional) Start the CM by running the command:

~scmscm/cm/bin/cm start

install-cm.sh Options

The usage message for the *install-cm.sh* script is:

```
Usage: install-cm.sh [-h] (-d CMDIR | -o)

Options: -d CMDIR   select directory for ~scmscm
                  (must not exist and must be on 8 GB free partition)
         -o   keep an old installation of the software
               (can't be used with -d)
         -h   print this help and exit

Description of the options:

 -d CMDIR
         Used to designate the directory of the newly created
         scmscm user's home. Should be the name of a
         non-existing directory, whose parent resides on a
         partition where at least 8 GB is free.
         As an alternate to this option, you can specify -o :

 -o
         Use the existing scmscm user home
             (can't be used with  -d)
```

Actions Performed by install-cm.sh

The *install-cm.sh* script performs the following steps:

- If needed, creates an scmscm user and an scmscm group
- Optionally, creates the home for this user
- Populates the home of scmscm with CM files and scripts
- Installs the following extra component:
  - private JRE in *~scmscm/cm/lib*
- Creates boot script symbolic links for the sybase and scmscm users in */etc/init.d* and */etc/rcX.d*

Ports Used by the Collection Manager Software

The following table describes the TCP/UDP ports on which the CM software and associated components (such as the Sybase database) listen. This table may help the network administrator understand the behavior of the software and its adherence to the security policy.

The ports listed are those on which the device listens constantly. You should allow access on these port numbers; otherwise, certain operations may fail.

Some operations (such as file transfer) cause a device to *temporarily* open ports other than those listed; however, these ports close automatically when the operation ends.

Table 3-1 Ports that the CM Listens on Constantly

Port Number	Description
33000	Used by the SCE devices to send RDRs for data collection.
21	Used by the legacy (pre-3.0) SCAS Reporter to authenticate against the CM user on the CM machine.
33001	Internal Collection Manager. **Note**: Access is required only from the local machine; external access can be blocked.
9092	HTTP technician interface.
4100	(For installations with bundled Sybase) Sybase database connectivity through ODBC/JDBC. Required for access to the database.
1099—1120	RMI. Used as the management interface between the data collector and the Service Control management server.
22000	FTP server of the CM. **Note**: FTP transactions may listen on other ports (22001 to 22100) for data transfer, as negotiated by the protocol.
7787	Internal logging of the management user log. **Note**: Access is required only from the local machine; external access can be blocked.
14375	Used by the Cisco Service Control Application Suite for Broadband (SCAS BB) Console to send symbol definitions (`values.ini`) to the CM.

Uninstalling the Sybase Database and the Service Control Software

To uninstall Sybase:

Step 1 Log in as the root user.

Step 2 Run the following commands:

```
pkill -u sybase
userdel -r sybase
rm /etc/rc*.d/[SK]*sybase
```

Step 3 (Optional) Edit `/etc/system` and remove the Sybase `shmem` setting.

To uninstall the Service Control software:

Step 1 Log in as the root user.

Step 2 Run the following commands:

```
pkill -u scmscm
userdel -r scmscm
rm /etc/rc*.d/[SK]*scmscm
```

Upgrading to CM 3.0 from CM 2.5

Since the database structures have changed significantly for release 3.0, a special procedure must be followed in order to preserve the data while upgrading.

The upgrade procedure is described in the following sections.

Upgrading when Using the Bundled Sybase Database

To upgrade the CM when using the Sybase database:

Step 1 Stop the CM.

Step 2 Note any configuration changes that you have made to the CM, so that you can reapply them later.

Step 3 Remove the pcube user.

Step 4 Install the new CM using the *install-cm.sh* script.

The new scmscm user is created.

Step 5 Assign a password to the scmscm user.

Step 6 Apply any configuration changes noted in Step 2.

Step 7 If you wish to preserve the pre-3.0 data that is in the database do the following, otherwise go to Step 8

a) Run the script *dbrename_25_300.sh*, available in the */install-scripts/* directory of the installation distribution.

The script renames the old tables that are to be used with the legacy (pre-3.0) SCAS Reporter, creates new database tables in CM 3.0 format, and modifies the periodic delete configuration to match these changes.

b) On the computer where the legacy SCAS Reporter is run, apply the *TemplateUpdate* patch to modify the SCA Reporter templates to use the old, pre-3.0 tables.

The *TemplateUpdate* patch is located on the Collection Manager installation kit in the *install-scripts* directory. The file is named *rpt-tmpl-scas-modifier.exe*.

c) Create a pcube user for authentication of the legacy SCAS Reporter, using the following commands:

- **`/usr/sbin/useradd pcube`** (to be run as the root user)
- **`passwd pcube`** (to be run as root)

The pcube user is needed as long as the legacy SCAS Reporter is being used.

Go to Step 9.

Step 8 To delete all pre-3.0 data from the database:

Delete the 2.5 tables from the database, using the command:

`droptable.sh -f ALLTABLES`

The 3.0 tables will be created automatically when the CM comes up for the first time.

The CM is now upgraded.

Step 9 After completing the upgrade, run the following command:

```
(echo 'sp_configure "enable housekeeper GC", 5' ; echo go ) | ~sybase/OCS-
12_5/bin/isql -Spqbsyb1 -Usa -Ppcube2001
```

Make sure the output contains the message:

`Configuration option changed.`

Upgrading when Using an Unbundled Database

To upgrade the CM when using an unbundled database:

Step 1 Stop the CM.

Step 2 Note any configuration changes that you have made to the CM, so that you can reapply them later.

Step 3 Remove the pcube user.

Step 4 Install the new CM using the *`install-cm.sh`* script.

The new scmscm user is created.

Step 5 Assign a password to the scmscm user.

Step 6 Apply any configuration changes noted in step 2.

Step 7 Do one of the following:

- To preserve the pre-3.0 data that is in the database, see the *Release Notes for Cisco Service Control Management Suite Collection Manager* and make the necessary changes in your database schema.
- To delete all pre-3.0 data from the database:

  Delete the 2.5 tables from your database.

  The 3.0 tables will be created automatically when the CM comes up for the first time.

Getting Started

The Server software is configured to start the CM components automatically on machine startup, and stop them on machine shutdown. To manage, monitor, and configure the CM, use the various utility scripts installed with the CM.

The following chapters explain how to use utility scripts:

- Chapter 4, *Managing the Collection Manager* (on page 4-1) contains information about the use of scripts to configure and monitor certain aspects of the CM
- Chapter 5, *Managing the Database and CSV Repository* ("Managing the Bundled Database and the CSV Repository" on page 5-1) contains information about the use of scripts to manage both the commercial database and the CSV repository that is part of the CM

Default Configuration Settings

Settings for the CM are configured during installation. These settings include which adapters should be enabled and their locations, Priority Queue parameters, the target adapters for each type of RDR (by RDR tag value), and various logging policies. Only qualified personnel should change these settings.

Managing the Collection Manager

This chapter describes how to manage the Cisco Service Control Management Suite (SCMS) Collection Manager (CM) using utility scripts. Any machine connected to the CM via, for example, Telnet or SSH can use utility scripts to monitor and manage the CM. The utility scripts are located in the installation directory of the CM.

For information on managing the database and the CSV repository, see *Managing the Database and CSV Repository* ("Managing the Bundled Database and the CSV Repository" on page 5-1).

This chapter contains the following sections:

Using Utility Scripts

The following are general instructions for using the utility scripts:

- To invoke any script, log in as the scmscm user, except where otherwise noted. An attempt to run these scripts as the root user will result in an error.
- To display a description of the script, with an explanation of all flags and parameters, invoke the script with the help flag.

Note There is a slight variation in the help flag. Scripts for managing the CM use "`--help`"; scripts for managing the database use "`-h`". Consult the specific script definition.

EXAMPLE

The following example shows how to display a description of the *dbperiodic.py* script.

```
> ~scmscm/scripts/dbperiodic.py --help

Usage:

~scmscm/scripts/dbperiodic.py --load
        load configuration from
        /export/home/scmscm/db_maint/dbperiodic.conf

~scmscm/scripts/dbperiodic.py --loadfile=FILE
        load configuration from FILE

~scmscm/scripts/dbperiodic.py --dump
        print the current configuration in INI format to standard output

~scmscm/scripts/dbperiodic.py --help
        print this help message
```

Note Some of the scripts used to control and monitor the data-collector software use the Python scripting language. For more information about Python, go to http://www.python.org.

Configuring the CM

Use utility scripts to:

- Specify which servers are to be activated at startup
- Start or stop the database
- Start or stop an adapter
- Drop a Service Control Engine (SCE) connection

The following scripts are used to configure the CM:

- *~scmscm/setup/on-boot.py*
- *~scmscm/scripts/adapterconf.py*
- *~scmscm/scripts/dbconf.sh*
- *~scmscm/scripts/sceconf.py*

For information about scripts for managing the database and the CSV repository, see *Managing the Database and CSV Repository* ("Managing the Bundled Database and the CSV Repository" on page 5-1).

The following files are also used to configure the CM:

- *cm.conf*—General configuration of the CM, including which adapters will be turned on when the CM starts. See *Enabling the Adapters* (on page 4-4).
- *queue.conf*—Configuration of the adapter queues, including which RDR tags will be associated with a specific adapter. See *Configuring the Categorizer* (on page 4-6).

Activating the Servers

To set which servers (CM or Sybase) are activated at startup, use the *on-boot.py* script:

~scmscm/setup/on-boot.py --cm=*flag* **--sybase=***flag*

Changes take effect the next time the system restarts.

To restart the Collection Manager:

As the scmscm user, type:

~scmscm/cm/bin/cm restart

Run the script with no parameters to see the current startup status of each component.

Options

--cm={ on | off }	Activate/do not activate the CM at startup.
--sybase={ on | off }	Activate/do not activate the Sybase server at startup.

To set the servers to be activated at startup:

Step 1 As the scmscm user, type:

~scmscm/setup/on-boot.py --cm=*flag* **--sybase=***flag*

Step 2 Press **Enter**.

EXAMPLE

The following example shows how to set the CM and Sybase servers to be activated at startup. (This is the default setting of the script.)

```
> ~scmscm/setup/on-boot.py –-cm=on –-sybase=on
```

Controlling the Adapters

To shut down or bring up a configured adapter, or to list the currently running CM adapters, use the *adapterconf.py* script:

~scmscm/scripts/adapterconf.py --op=*action* **[--adapter=***adapter name***]**

Options

--op=start	Bring up the adapter specified in the `adapter` parameter.
--op=stop	Shut down the adapter specified in the `adapter` parameter.
--op=list	List the currently running CM adapters.

adapter=*adapter name*	Identify the adapter to be operated on. Use only with `start` and `stop` actions.
--help	Display these options.

To shut down an adapter:

Step 1 As the scmscm user, type:

~scmscm/scripts/adapterconf.py --op=stop –-adapter=*adapter name*

Step 2 Press **Enter**.

To bring up an adapter:

Step 1 As the scmscm user, type:

~scmscm/scripts/adapterconf.py --op=start –-adapter=*adapter name*

Step 2 Press **Enter**.

EXAMPLE

The following example shows how to bring up an adapter.

```
> ~scmscm/scripts/adapterconf.py --op=start –-adapter=csvadapter
```

Enabling the Adapters

An adapter can be defined to turn on when the CM starts by removing the remark character at the start of the appropriate line in the *cm.conf* file.

EXAMPLE

The following example defines the RAG adapter to turn on when the CM starts.

```
adapter.4 = com.cisco.scmscm.adapters.rag.RAGAdapter
```

EXAMPLE

The following example defines the CSV adapter to remain off when the CM starts.

```
#adapter.2 = com.cisco.scmscm.adapters.CSVAdapter
```

Note The value of the `adapter.<number>` must match the *adapter_id* parameter value defined defined in the *queue.conf* file for the corresponding adapter.

Controlling the Database

To shut down or start the CM database, or to show the operational status of the database, use the *dbconf.sh* script:

~scmscm/scripts/dbconf.sh --op=*action*

The script can only be used with a bundled database.

Note This script only operates when the sudo package is installed. If you did not install sudo, you must log in as the root user and run the */etc/init.d/sybase* script to start or stop Sybase.

Options

--op=start	Start the CM database.
--op=stop	Shut down the CM database.
--op=status	Display the current operational status of the database.

To shut down the CM database:

Step 1 As the scmscm user, type:

~scmscm/scripts/dbconf.sh --op=stop

Step 2 Press **Enter**.

To start the CM database:

Step 1 As the scmscm user, type:

~scmscm/scripts/dbconf.sh --op=start

Step 2 Press **Enter**.

Dropping an SCE Connection

To drop a connection to a particular SCE, use the *sceconf.py* script:

~scmscm/scripts/sceconf.py --op=drop --ip=*IP address*

This script can be used only if the HTTP Adaptor of the CM is running.

This script is also used to display information about the SCE connection. (See *Checking the SCE Connection* (on page 4-9).)

Options

Adapter=*IP address*	Drop the connection at the specified IP address.
--help	Display these options.

To drop an SCE connection:

Step 1 As the scmscm user, type:

~scmscm/scripts/sceconf.py --op=drop --ip=*IP address*

Step 2 Press **Enter**.

Configuring the Categorizer

The Categorizer classifies each RDR according to its RDR tag. An RDR be routed to a specific adapter by adding its RDR tag to the *tags* parameter (a comma-separated list of RDR tags) of the adapter. This configuration is contained in the *queue.conf* file.

EXAMPLE:

The following example configures the RDR tags 4042321920 and 4042321922 to be sent to the Topper/Aggregator Adapter.

```
# Topper/Aggregator Adapter
[topper-hi]
adapter_id=3
priority=3
warning_size=40000
maximum_size=50000
tags=4042321920,4042321922
```

Note The value of the *adapter_id* parameter must match the adapter.<*number*> defined in the *cm.conf* file for the corresponding adapter.

Monitoring System Health

The CM contains a small, expandable framework that monitors the system and issues alerts for predefined, potentially problematic conditions.

The following scripts are used to monitor the CM:

- *~scmscm/setup/monitor/setup-monitor.sh*
- *~scmscm/setup/monitor/monitor.sh*

Installing the Periodic Checker

To make (or remove) an entry for *monitor.sh*, the periodic checker script, in the cron (periodic scheduler) subsystem, use the *setup-monitor.sh* script:

~scmscm/setup/monitor/setup-monitor.sh -a *flag* [**-i** *flag*]

Options

-a { install | uninstall }	Make/remove an entry for *monitor.sh* in the cron.
-i { 30m | 1h | 12h | 24h }	Run *monitor.sh* every 30 minutes, 1 hour, 12 hours, or 24 hours.

EXAMPLE 1

The following example shows how to install *monitor.sh* so that it will run once every 30 minutes.

```
$ ./setup-monitor.sh -a install -i 30m
```

EXAMPLE 2

The following example shows how to uninstall *monitor.sh*.

```
$ ./setup-monitor.sh -a uninstall
```

The Periodic Checker Script

The periodic checker script, *monitor.sh*, calls a series of sub-scripts that monitor different aspects of a running system:

~scmscm/setup/monitor/monitor.sh { **-a** | *TEST NAME* } **[-v] [-d]**

The script is not intended to be run from the command line, although you can do so. Test results are sent to the syslog subsystem and are logged in the file */var/log/messages*.

Options

-a	Run all tests.
TEST NAME	The names of one or more tests. A test name is the test file name, without the leading digits and trailing .sh.
-v	Output results in verbose mode .(Log successful tests.)
-d	Print results to screen. (By default, results are sent to syslog.)

Any test that is run returns a result in the following format:

```
STATUS: Message
```

- STATUS—PASS or FAIL
- Message—A short informative status message

For example, `FAIL: db "apricot" has only 1523 free blocks`

EXAMPLE 1

The following example shows how to run all available tests and print system output to the screen.

```
$ ./monitor.sh -d -a
```

```
Test: 01free_db.sh. Status: PASS. Message: db apricot has 1532 free blocks
Test: 02cm_is_up.sh. Status: FAIL. Message: cm process is not running
```

EXAMPLE 2

The following example shows how to run a single test to check that the installed database has sufficient free space.

```
$ ./monitor.sh -d free_db
Test: 01free_db.sh. Status: PASS. Message: db apricot has 1532 free blocks
```

Tests

The following tests can be run using *monitor.sh*:

- *db_up*—Checks that the bundled Sybase database is running.
- *cm_up*—Checks that the CM application is running.
- *free_db*—Checks that the database has at least 10 percent free space.
- *free_log*—Check that the database transaction log has at least 70 percent free space.
- *cm_persistent_buffers*—Checks that each CM adapter´s persistent buffer contains less than 500 files.

The scripts for all of these tests are located in the *~/setup/monitor/tests* directory.

When calling a test called *test_name*, the script expects to find a file called *NNtest_name.sh*, where NN is a number that denotes the script´s overall priority. For example, the test *free_db* will be mapped to the file *01free_db.sh*.

Monitoring the CM

You can use scripts to monitor system statistics that are relevant to the CM, such as:

- Percentage of free space in the database
- Rate of RDRs entering the CM
- SCE platform connection data

The following scripts are used to monitor the CM:

- *~scmscm/scripts/dbfree.sh*
- *~scmscm/scripts/rdr-rate.py*
- *~scmscm/scripts/sceconf.py*
- *~scmscm/setup/alive.sh*

The following scripts are used to configure the CM (see *Configuring the CM* (on page 4-2)), but can also be invoked to display the relevant configuration:

- *~scmscm/setup/on-boot.py*
- *~scmscm/scripts/adapterconf.py*
- *~scmscm/scripts/dbconf.sh*

Checking the Database Capacity

To display the percentage of free space in the database report tables and the associated transaction log, use the dbfree.sh script:

~scmscm/scripts/dbfree.sh

The script can be used only with a bundled database.

To monitor the database capacity:

Step 1 As the scmscm user, type**:**

~scmscm/scripts/dbfree.sh

Step 2 Press **Enter**.

Checking the RDR Rate

To display the momentary total rate of reports entering the CM, use the *rdr-rate.py* script

~scmscm/scripts/rdr-rate.py

The output is a single floating-point number representing the total rate per second of incoming RDRs (from all sources) that have entered the CM in the past 5 seconds.

This script can be used only if the HTTP Adaptor of the CM is running.

To monitor the RDR rate:

Step 1 As the scmscm user, type**:**

~scmscm/scripts/rdr-rate.py

Step 2 Press **Enter**.

Checking the SCE Connection

To display information about the SCE connections, use the *sceconf.py* script:

~scmscm/scripts/sceconf.py --op=list

This script can be used only if the HTTP Adaptor of the CM is running.

The script is also used to drop a connection from a particular SCE. See *Dropping an SCE Connection* (on page 4-5).

To display information about the SCE connection:

Step 1 As the scmscm user, type**:**

~scmscm/scripts/sceconf.py --op=list

Step 2 Press **Enter**.

EXAMPLE

The following example shows SCE connection output:

```
> ~scmscm/scripts/sceconf.py --op=list

IP                    Rate                  Peak
-------               -------               -------
10.1.6.93             0.71798986            0.718
10.1.9.36             0.14420895            0.1442139
10.1.9.35             0.0                   0.027929332
10.1.12.11            0.0                   0.0
```

Verifying that the Server is Operational

To verify that the Server is functioning correctly, use the *alive.sh* script:

~scmscm/setup/alive.sh

The script verifies that the following components are operational:

- Collection Manager
- Database (in the bundled database case)
- Report tables (in the bundled database case)

If any component is down, the script issues an error message.

To verify that the Server is operational:

Step 1 As the scmscm user, type**:**

~scmscm/setup/alive.sh

Step 2 Press **Enter**.

Note It takes time for the components to initialize after a startup; after a restart, wait five minutes before running this script.

Managing Users

The CM uses the **p3rpc** utility to manage users for authenticated RPC calls.

The command format is: `p3rpc OPERATION [OPTIONS]`

The following table lists the **p3rpc** operations and options.

Table 4-1 p3rpc Operations

Operation	Description
--set-user --username=<username> --password=<password>	Adds and updates the username and password.
--validate-password --username=<username> --password=<password>	Validates the username and password.
--delete-user --username=<username>	Deletes a user configuration.
--show-users	Displays all configured users.

CHAPTER 5

Managing the Bundled Database and the CSV Repository

This chapter describes how to manage the bundled database and the CSV repository using utility scripts.

Note For general instruction on using utility scripts, see *Using Utility Scripts* (on page 4-1).

This chapter contains the following sections:

Managing the Bundled Database

Managing the bundled database includes:

- Generating a list of the database tables
- Deleting a table
- Manually deleting old records from a table
- Defining and applying the schedule for the periodic deletion of old records
- Backing up and restoring a database

Every record stored in the database is given a timestamp indicating the time that the Cisco Service Control Management Suite (SCMS) Collection Manager (CM) received the Raw Data Record (RDR). This timestamp is used when various maintenance operations are performed on the database tables.

The following scripts are used to configure the CM:

- `~scmscm/scripts/dbtables.sh`
- `~scmscm/scripts/droptable.sh`
- `~scmscm/scripts/prunetable.sh`
- `~scmscm/scripts/dbperiodic.py`

- *~scmscm/scripts/sybback.sh*
- *~scmscm/scripts/sybrestore.sh*

Listing the Database Tables

To list all of the tables in the database, use the *dbtables.sh* script:

~scmscm/scripts/dbtables.sh

Where applicable, the number of lines in the table and the earliest and latest timestamps are displayed.

Actual content of the tables can be displayed using the Cisco Service Control Application (SCA) Reporter. For more information, see the *Cisco Service Control Application Reporter User Guide*.

To display a list of all the tables in the database:

Step 1 As the scmscm user, type:

~scmscm/scripts/dbtables.sh

Step 2 Press **Enter**.

EXAMPLE

The following is a sample output of *dbtables.sh*:

```
>~scmscm/scripts/dbtables.sh

        TABLE| NUM_LINES|            MIN_TIME|            MAX_TIME
        -----| ---------|            --------|            --------
      RPT_LUR|     53971| Jul 24 2003  2:52PM| Jul 30 2003  3:28PM
      RPT_NUR|     33350| Jul 29 2003  2:08PM| Jul 30 2003 10:47AM
      RPT_PUR|     42167| Jul 22 2003  5:45PM| Jul 23 2003 11:13AM
      RPT_SUR|     38390| Jul 24 2003  3:08PM| Jul 30 2003  3:37PM
       RPT_TR|     29436| Jul 22 2003  5:27PM| Jul 30 2003  3:37PM
```

Deleting a Table

To delete a single table or all current tables from the database, use the *droptable.sh* script:

~scmscm/scripts/droptable.sh [-f] *tableParameter*

Options

table_name	Drop table_name from the database
ALLTABLES	Drop all tables from the database
-f	Drop by force (no questions asked or errors reported)
-h	Display these options

To drop a table from the database with no request for confirmation:

Step 1 As the scmscm user, type:

~scmscm/scripts/droptable.sh –f *table_name*

Step 2 Press **Enter**.

EXAMPLE

The following example shows how to force a table named SubscriberTable to be dropped.

```
> ~scmscm/scripts/droptable.sh –f SubscriberTable
```

To drop all tables from the database:

Step 1 As the scmscm user, type:

~scmscm/scripts/droptable.sh ALLTABLES

Step 2 Press **Enter**.

Deleting Old Records

To remove records from a database table based on the timestamps of the records, use the *prunetable.sh* script:

~scmscm/scripts/prunetable.sh [-f] *num_days table_name*

Options

num_days	The maximum age (in days) of records that will *not* be deleted.
table_name	The table whose records are to be deleted.
-f	Drop by force (no questions asked or errors reported).
-h	Display these options.

To delete old records from a database:

Step 1 As the scmscm user, type:

~scmscm/scripts/prunetable.sh *num_days table_name*

Step 2 Press **Enter**.

EXAMPLE

The following example shows how to delete all records that are more than seven days old from a table named SubscriberTable.

Since the `-f` flag is not specified, there may be requests for confirmation and errors will be reported.

```
> ~scmscm/scripts/prunetable.sh 7 SubscriberTable
```

Managing the Periodic Deletion of Old Records

To manage the periodic deletion of old records:

Step 1 Edit the periodic delete configuration file.

Step 2 Use the *dbperiodic.py* utility script to apply the new configuration.

Periodic deletion of a table does not begin while a previous periodic deletion is still running. This prevents excessive load on the database, which would degrade insertion performance in the adapters.

When two or more tables are scheduled to be reduced at the same time, the tables are processed in the order in which they are listed in the periodic delete configuration file.

For ease of configuration, you can schedule periodic deletion for all tables consecutively on one schedule.

Note All periodic delete activity is recorded in the system log file (*/var/adm/messages*).

Configuring Periodic Delete

The periodic delete configuration file (*dbperiodic.conf*) is, by default, located at *~scmscm/db_maint/*. The file has a structure similar to an INI file, where each section describes a particular data reduction operation for a specific set of tables, to be performed according to a specified schedule.

Note The name of each section of the file is not used when the file is parsed; use whatever names you wish.

Each section begins with the section name in brackets, and should contain the parameters shown in the following table. (Not all parameters are required in each section of the configuration file.) Separate the parameters and their values by an equal sign (=). Examples of periodic delete configuration files are given following the table.

Table 5-1 Parameters in the Periodic Delete Configuration File

Parameter Name	Explanation	Values	Default	Example
active	Whether or not to use this section of the configuration file	true/false	true	false
tablenames	Names of the tables to which this section applies	Names of tables separated by commas, or * for all tables	* (all)	RPT_SUR,RPT_LUR
daystokeep	Number of days to keep records	Positive integers	14	30
minute	When to perform the deletion in this section of the configuration file	0 … 59, *	0	0
hour		0 … 23, *	* (all)	0,4,8,12,16,20
day		1 … 31, *	* (all)	1
month		1 … 12, *	* (all)	1,3,5,7,9,11

Note Values for all parameters except `active` and `daystokeep` can be either a single value, a list of values separated by commas, a range of values (two values separated by a dash), or an asterisk (*) which signifies all possible values. A range is not possible for `tablenames`.

EXAMPLE 1

In this example, all fields are set to their default values.

```
# This dbperiodic.conf file emulates the legacy style for periodic
# deletion. All tables are processed every hour on the hour, and
# records are kept for 14 days.

[hourly all]
active = true
tablenames = *
daystokeep = 14
minute = 0
hour = *
```

EXAMPLE 2

In this example, all tables are reduced at 4:30 A.M., leaving 10 days of data in each table. In addition, the real-time tables are reduced every hour, leaving three days of data in each table.

```
# This dbperiodic.conf file reduces all tables once a day and
# real-time tables once an hour.

[daily all]
active = true
tablenames = *
daystokeep = 10
minute = 30
hour = 4

[hourly real-time]
active = true
tablenames = RPT_SUR,RPT_LUR,RPT_PUR
daystokeep = 3
minute = 0
hour = *
```

Applying the Periodic Delete Configuration File

To load and apply a new periodic delete configuration file or to view the current file, use the *dbperiodic.py* script:

~scmscm/scripts/dbperiodic.py *[--dump] [--load | --loadfile=path_to_dbperiodic.conf]*

When the script is used to load a new configuration file, it parses the file, verifies its validity, and updates the scmscm user´s crontab to reflect the changes.

Options

--load	Load the periodic delete configuration from */export/home/scmscm/db_maint/dbperiodic.conf*
--loadfile=*path to periodic delete configuration file*	Load the periodic delete configuration file from the specified directory
--dump	Print the periodic delete configuration
-h	Display these options

To print the current periodic delete configuration:

Step 1 As the scmscm user, type:

~scmscm/scripts/dbperiodic.py --dump

Step 2 Press **Enter**.

Note This script prints the *loaded* periodic delete configuration. If the current periodic delete configuration file was not yet loaded, the actual configuration may vary from the script´s output.

To load the periodic delete configuration file from ~scmscm/db_maint/dbperiodic.conf:

Step 1 As the scmscm user, type:

`~scmscm/scripts/dbperiodic.py --load`

Step 2 Press **Enter**.

To load the periodic delete configuration file from a specified location:

Step 1 As the scmscm user, type:

`~scmscm/scripts/dbperiodic.py --`*`loadfile=path_to_periodic_delete_configuration_file`*

Step 2 Press **Enter**.

Backing Up the Database

To create text file backups of all the tables in the database, use the *`sybback.sh`* script:

`~scmscm/scripts/sybback.sh -d` *`path_to_backup_directory`*

The script converts all tables to ASCII files and copies the files to a backup directory.

Options

`-d` *`path_to_backup_directory`*	Write backup text files to the specified directory
`-h`	Display these options

To backup the database to a specified directory:

Step 1 As the scmscm user, type:

`~scmscm/scripts/sybback.sh -d` *`path_to_backup_directory`*

Step 2 Press **Enter**.

Restoring a Database

To restore a database from the backup file that was created by the *sybback.sh* script, use the *sybrestore.sh* script:

~scmscm/scripts/sybrestore.sh -d *path_to_restore_directory*

Options

-d *path_to_restore_directory*	Restore the database using the text files in the specified directory
-h	Display these options

To restore a database from a specified directory:

Step 1 As the scmscm user, type:

~scmscm/scripts/sybrestore.sh –d *path_to_backup_directory*

Step 2 Press **Enter**.

Important Note The scripts *sybback.sh* and *sybrestore.sh* are not a viable backup mechanism for Sybase. They are designed for backing up and restoring small amounts of data; for example, transferring small tables between machines.
In you require a viable backup mechanism, please consult the Sybase *Backup Server* product documentation.

Managing the CSV Repository

You can use a utility script to manage the repository of CSV files output by the CM. These files are written to the disk by the Comma-Separated Value (CSV) Adapter for use by a service provider's operational support system (OSS) or by a third-party billing system. The size of the CSV repository should be monitored to prevent disk overflow.

Note If the backup parameter is set to `true`, failure to delete CSV files may result in disk overflow (No CSV files will ever be deleted.)
The third-party application is responsible for managing the CSV files and deleting them as necessary.

To successfully invoke this script, the HTTP Adaptor of the CM must be running. If the adapter is down, an error message is printed.

CSV Repository File Structure

CSV files are stored in several subdirectories. Each subdirectory is given the number of a Raw Data Record (RDR) tag. (RDR tags define the type of the RDR.) Each RDR is stored in the subdirectory whose name matches its RDR tag number. For more information on RDR tags, see the *Cisco Service Control Application for Broadband Reference Guide*.

The CSV files are (automatically) sequentially numbered, with separate numbering in each directory. You can change the location of the parent directory by editing the *cm.conf* file located in the *cm/config* directory.

Configuring the CSV File Repository

Use the *csvconf.sh* script, *~scmscm/scripts/csvconf.sh*, to:

- List the number of RDRs currently stored in the repository.
- Configure the maximum number of CSV files and the maximum permissible number of reports (lines) in each file.
- Control whether a backup is made whenever an old CSV file is about to be overwritten.
- Control whether each line in a CSV file contains an indication of the IP of the Service Control Engine (SCE) that sent this RDR. (By default, this option is off.)

Note Instead of using this script, you can edit the file *~scmscm/cm/config/csvadapter.conf*. Changes in this file require a CM restart to take effect.

Note The same configuration is applied to all subdirectories in the CSV Repository.

Note Setting these parameters does not change existing CSV files; it affects only files that are created subsequently.

Options

--list	Display the CSV repository contents (the number of RDRs currently stored in the repository).
--clear	Delete all files from the CSV repository. (This option deletes all CSV files, but not the directories in which they are contained.)
--maxlines=*N*	Set the maximum number of RDRs per CSV file to N (an integer between 1 and 20,000).
--maxfiles=*M*	Set the maximum number of CSV files in each subdirectory to M (an integer between 10 and 10,000.)
--backups={**true** | **false**}	Enable or disable backup of old CSV files.

--recordsource={**true** | **false**}	Enable or disable the inclusion of the record source in CSV files.

To set the maximum number of CSV files per subdirectory:

Step 1 As the scmscm user, type:

~scmscm/scripts/csvconf.sh --maxfiles=*M*

Step 2 Press **Enter**.

EXAMPLE:

The following example shows how to set the maximum number of CSV files per subdirectory to 1000.

```
> ~scmscm/scripts/csvconf.sh --maxfiles=1000
```

To set the maximum number of RDRs per CSV file:

Step 1 As the scmscm user, type:

~scmscm/scripts/csvconf.sh --maxlines=*N*

Step 2 Press **Enter**.

EXAMPLE:

The following example shows how to set the maximum number records per CSV files to 10,000.

```
> ~scmscm/scripts/csvconf.sh --maxlines=10000
```

To delete all files from the CSV repository:

Step 1 As the scmscm user, type:

~scmscm/scripts/csvconf.sh --clear

Step 2 Press **Enter**.

To disable backing up of old CSV files in the repository:

Step 1 As the scmscm user, type:

```
~scmscm/scripts/csvconf.sh --backups=false
```

Step 2 Press **Enter**.

Configuring the Comma Escape

When a comma is contained within a field in a CSV file, an escape sequence is used to indicate that the comma does not mark the end of the field.

Three escape methods are supported:

- Single quotation marks—Single quotation marks surround any field that contains one or more commas.There is no special treatment of single quotation marks already present in existing RDRs.
- URL—Each comma contained within a field is replaced by `%2C`. There is no special treatment of such sequences already present in existing RDRs.
- Backslash—Each comma contained within a field is preceded by a backslash (\). There is no special treatment of backslashes already present in existing RDRs.

The first two escape methods are compatible with Microsoft® Excel. The Backslash method is not compatible with Excel, but is retained for backward compatibility.

By default, single quotation marks are used. You can change the escape method by modifying the value of the `escapeMethod` attribute. This attribute is located in the *`csvadapter.conf`* file in the *`CSVAdapter`* directory. The value must be one of: `backslash`, `quote`, or `url`.

Configuring Escape of Nonprintable Characters

Optionally, the CSV Adapter can escape nonprintable characters. Enabling this option incurs a performance penalty for the adapter; by default, the option is disabled.

When the option is enabled, each non-printable character, such as CR and LF, contained within a field is preceded by a backslash (\).

This option can be enabled in the *`csvadapter.conf`* file in the *`CSVAdapter`* directory. Changes in this file require a CM restart to take effect.

CHAPTER 6

Database Configuration

This chapter outlines how to configure the Cisco Service Control Management Suite (SCMS) Collection Manager (CM) to work with your database, and how to use the database infrastructure of the CM to extend its functionality.

This chapter contains the following sections:

Quick Start Guide for Oracle Users

To use an Oracle database with the CM, you will have to change basic connection parameters such as the IP address and port where Oracle is deployed; no other configuration changes are necessary. This Quick Start Guide explains how to make the necessary changes.

To configure the CM to work with Oracle:

Step 1 If the CM is running, stop the CM.

Step 2 Configure the JDBC Adapter to use Oracle:

a) Open the file *~scmscm/cm/config/jdbcadapter.conf* in a text editor.

b) Search for the string `db_template_dir`.

There are two lines containing this string, one for Sybase and one for Oracle. By default, the *Oracle* line is commented out.

c) Uncomment the *Oracle* line.

d) Comment out the *Sybase* line.

e) Save your changes.

This is illustrated in the following code fragment (after the changes have been made):

```
#db_template_dir = dbpacks/sybase
db_template_dir = dbpacks/oracle/9204e/
```

Step 3 Configure the Topper/Aggregator (TA) Adapter to use Oracle:

a) Open the file *~scmscm/cm/config/taadapter.conf* in a text editor.

b) Search for the string `db_template_dir`.

There are two lines containing this string, one for Sybase and one for Oracle. By default, the *Oracle* line is commented out.

c) Uncomment the *Oracle* line.

d) Comment out the *Sybase* line.

e) Save your changes.

This is illustrated in the following code fragment (after the changes have been made):

```
#db_template_dir = dbpacks/sybase
db_template_dir = dbpacks/oracle/9204e/
```

Step 4 Configure your database connection parameters:

a) Open the file *~scmscm/cm/config/dbpacks/oracle/9204e/dbinfo.vm* in a text editor.

b) Change the following lines to reflect your setup:

```
#set ($dbinfo.options.host = "localhost")
#set ($dbinfo.options.port = "1521")
#set ($dbinfo.options.user = "pqb_admin")
#set ($dbinfo.options.password = "pqb_admin")
#set ($dbinfo.options.sid = "apricot")
```

Important Note: The *dbinfo.vm* file is not a shell script; each pound sign (#)is part of the declaration and not a comment sign.

The relevant parameters are:

- The host name or IP address of the machine where Oracle is installed
- The port number on which the Oracle server is listening
- The user name and password for authentication against Oracle
- An existing Oracle SID to be used by the CM

c) Save your changes.

Step 5 Start the CM.

The Velocity Template Language

The JDBC Adapter framework uses macros written in the Velocity Template Language (VTL) to generate all SQL code that is passed to the database server. The following sections describe the configuration file used to control the generation process.

A full reference to VTL, which is part of the Apache Jakarta Project, can be found on the Web at http://jakarta.apache.org/velocity/vtl-reference-guide.html.

The following table briefly describes VTL constructs:

Table 6-1 Summary of VTL Constructs

Directive	Syntax Example	Purpose
#foreach	*#foreach ($item in $collection) item is $item #end*	Iterates over a collection, array, or map.
#if ... #else ... #elseif	*#if ($order.total == 0) No charge #end*	Conditional statement.
#parse	*#parse("header.vm")*	Loads, parses, and includes the specified template in the generated output.
#macro	*#macro(currency $amount) ${formatter.currency($amount)} #end*	Defines a new directive and any required parameters. The result is interpreted when used later in the template.
#include	*#include("disclaimer.txt")*	Includes the specified file, as is, in the generated output.
#set	*#set ($customer = ${order.customer})*	Assigns a value to a context object. If the context object does not exist, it is added; otherwise, it is overwritten.
#stop	*#if ($debug) #stop #end*	Stops template processing.

Database Configuration Files

When you initialize the Database access framework, the first file the Database access framework searches for is *main.vm*, which contains definitions or pointers to all the required database SQL definitions. The location used to search for this file depends on the dbpack used in the CM. A *dbpack* is a collection of configuration files pertaining to a specific database installation. The adapter (in accordance with its configuration file) selects the dbpack. The following code fragment from the *jdbcadapter.conf* file configures it to work with an Oracle dbpack:

```
db_template_dir = dbpacks/oracle/9204e/
db_template_file = main.vm
```

Note The directory location is interpreted relative to the main CM configuration directory (usually *~scmscm/cm/config*).

To make the configuration more modular, the *main.vm* file generally points to other files; however this is not strictly necessary. The files can contain arbitrary definitions that can later be used, for example, in scripts. Some definitions are mandatory because the JDBC Adapter uses them for its operation. These definitions are listed in the following table:

Table 6-2 Mandatory VM Definitions

Object Name	Mandatory Definition
$table.sql.dropTable $table.sql.createTable $table.sql.createIndexes $table.sql.insert $table.sql.metaDataQuery	For each table, these settings control how SQL is generated for the indicated operation
$dbinfo.driverjarfile $dbinfo.driver	Location and class name for JDBC driver
$dbinfo.cmdSeparator	Pattern used to separate multiple SQL statements
$dbinfo.url $dbinfo.connOptions	URL for connecting to the database, and various connection properties

Some objects representing the CM configuration in the VTL parsing context are available to be used in the templates. These objects are described in the following sections.

Context Objects

Before the VM templates are loaded and parsed by any CM components (for instance, a TA or JDBC Adapter, or a script), the parsing context is initialized with the following Java objects:

- The `tables` object
- The `dbinfo` object
- The `tools` object

The tables Object

The `tables` object describes application-related database configuration, such as the structure of RDRs that should be stored in the database, the structure of the database tables and where they are stored, and the structure of any other database tables that the CM might use. The object is an array in which each row represents one of the database tables used by the CM. For each table, the row may contain the following information (not all items are relevant to all tables):

- Logical name
- Physical name
- RDR tag associated with this table

- List of fields/columns in this table, with the following attributes for each:
  - Field ID
  - Field name
  - Field native type
  - Free-form field options
- List of indexes for this table, with the following attributes for each:
  - Index name
  - Names of columns indexed
  - Free-form index options

The contents of the `tables` object can be inspected or manipulated when loading the templates. The `tables` object is initialized using the application-specific XML configuration file. See *Application Configuration* (on page 6-6).

The dbinfo Object

The `dbinfo` object describes configuration that is specific to the database, such as the parameters and the SID or schema to be used when opening a database connection. The object holds database-specific configuration options. It contains the following information:

- The JDBC class name to be used as a driver for this database
- The name of the JAR file containing the driver
- The location of the database expressed as a JDBC URL
- Free-form JDBC connection options, such as authentication data (user and password)

The tools Object

The `tools` object is a container for several utility methods that you might find useful when developing templates or manipulating the context data structures.

You invoke the object's methods by using *$tools.method(arg1, ..., argN)*, where *method* is the name of the method.

The included methods are listed in the following table:

Table 6-3 A Summary of Methods of the tools Object

Method Name and Arguments	Functionality
getTableByName (allTables, *`name`*)	Locates the database table object whose logical name corresponds to `name`.
getTableByDbTabName (allTables, *`name`*)	Locates the database table object whose physical name corresponds to `name`.

Method Name and Arguments	Functionality
assignParams (sql, *list_of_args*)	Replaces question mark characters in the `sql` string with consecutive elements from the `list_of_args` parameter, represented as a String. This method is useful if working with templates that create SQL insert statements using the JDBC PreparedStatement string as a base.
collapseWhitespace()	Converts all instances of more than one consecutive white-space characters to one space, and trims beginning and ending white space. This method may be useful for databases that require SQL with a minimum of newline and other white-space characters. (Sybase and Oracle do not require this.)

For a sample that demonstrates how to use these tools, see *Using the JDBC Framework in Scripts* (on page 6-10).

Application Configuration

All application-related configuration is done in one file (*tables.xml*) that includes the following items:

- Name and version of the application
- Name and properties of each database table, and specifically the structure of application RDRs that are to be stored in database tables
- For each database table:
  - Names and native types of the table/RDR fields
  - Names and properties of the table indexes

This information is used primarily to populate the *tables* object in the template parsing context. See *The tables Object* (on page 6-4).

A Working Sample

The *main.vm* file can contain references to other VM files to support modularization (see *Database Configuration Files* (on page 6-3)). The names of these other files are arbitrary, except for the *VM_global_library.vm* file whose name is predetermined. Any macros that need to be defined should be put in this file, to ensure that they are loaded at the right time. For more details about this special file, see the *Velocity User Guide*.

The following sample illustrates the contents of *main.vm* for an Oracle setup:

```
#parse ('dbinfo.vm')

#foreach ($table in $tables)
   #set ($table.sql.dropTable = "#parse ('drop_table.vm')")
   #set ($table.sql.createTable = "#parse ('create_table.vm')")
   #set ($table.sql.createIndexes = "#parse ('create_indexes.vm')")
   #set ($table.sql.insert = "#parse ('insert.vm')")
   #set ($table.sql.metaDataQuery = "#parse ('metadata.vm')")
#end
```

In this sample, the mandatory database and SQL definitions (see Table 6-2 - Mandatory VM Definitions) are moved to separate files, to be loaded and parsed using the `#parse` directive.

The following sections list possible contents for the various files in the Oracle dbpack. Some of the definitions use macros that are defined in the *`VM_global_library.vm`* file. This file should contain all macro definitions used by any template.

Macro Definitions

The following sample illustrates definitions for the mapping between native types and SQL types, and utility macros such as the *optcomma* macro, which inserts a comma between successive elements of lists.

```
#macro (optcomma)#if ($velocityCount > 1),#end#end
#macro (sqltype $field)
#set ($maxStringLen = 2000)
 #if     ($field.type == "INT8") integer
 #elseif ($field.type == "INT16") integer
 #elseif ($field.type == "INT32") integer
 #elseif ($field.type == "UINT8") integer
 #elseif ($field.type == "UINT16") integer
 #elseif ($field.type == "UINT32") integer
 #elseif ($field.type == "REAL") real
 #elseif ($field.type == "BOOLEAN") char(1)
 #elseif ($field.type == "STRING") varchar2(#if($field.size <=
$maxStringLen)$field.size #else $maxStringLen #end)
 #elseif ($field.type == "TEXT") long
 #elseif ($field.type == "TIMESTAMP") date
 #end
#end
```

dbinfo Configuration

In the following code sample, note that the only required fields are the URL and connection options (for authentication).

Blank lines in the code separate the code into distinct fields for readability and to ease later configuration changes.

```
#set ($dbinfo.driver = "oracle.jdbc.OracleDriver")
#set ($dbinfo.driverjarfile = "ojdbc14.jar")

#set ($dbinfo.options.host = "localhost")
#set ($dbinfo.options.port = "1521")
#set ($dbinfo.options.user = "pqb_admin")
#set ($dbinfo.options.password = "pqb_admin")
#set ($dbinfo.options.sid = "apricot")

#set ($dbinfo.url =
"jdbc:oracle:thin:@$dbinfo.options.host:$dbinfo.options.port:$dbinfo.options
.sid")

#set ($dbinfo.connOptions.user = $dbinfo.options.user)
#set ($dbinfo.connOptions.password = $dbinfo.options.password)
## the vendor-specific piece of SQL that will return the current
## date and time:
#set ($dbinfo.options.getdate = "sysdate")
```

SQL Definitions

Code for "drop table"

The following code sample drops a table using normal SQL syntax

```
drop table $table.dbtabname
```

Code for "create table"

The following code sample creates a table using normal SQL syntax. Any customized database configuration that requires special directives for table creation can be implemented using this definition. For example, you can modify it to create the table in some unique tablespace or to use table partitioning.

```
create table $table.dbtabname (
#foreach ($field in $table.fields)
 #optcomma()$field.name #sqltype($field)
 #if ("$!field.options.notnull" == "true")
  not null
 #end
#end)
```

Code for "create indexes"

The following code creates the indexes using normal SQL syntax. Any customized database configuration requiring special directives for index creation can be implemented using this definition. For example, you can modify it to create the indexes in some unique tablespace.

```
#foreach ($index in $table.indexes)
 create index $index.name on $table.dbtabname ($index.columns)
#end
```

Code for "insert"

The following code creates the JDBC PreparedStatement corresponding to the table structure.

```
insert into ${table.dbtabname} (
#foreach ($field in $table.fields)
  #optcomma()${field.name}
#end)
values (
#foreach ($field in $table.fields)
  #optcomma()?
#end)
```

Code for metadata query

The following code defines a simple query that is used to get the table metadata (column names and types). Any query that returns an empty result set can be used.

```
select * from ${table.dbtabname} where 1=0
```

Testing and Debugging

While you develop a set of templates for your database, it is useful to be able to see the results of parsing directly. To enable, this, the JDBC Adapter supports direct invocation via the CM main script *~scmscm/cm/bin/cm*.

The general syntax for such an invocation is:

```
~/cm/bin/cm invoke com.cisco.scmscm.adapters.jdbc.JDBCAdapter argument
```

where `argument` is one of the flags described in the following sections. You can use this mechanism whether or not the CM is running.

Additionally, the query and update execution methods described in the following section can be used to test the template results against a live database.

Parsing a String

Any string can be parsed as a VTL template with the complete context in place. The result of the parsing is displayed on the standard output. To parse a string, call the adapter with the *-parse* flag. Here are a few examples (the responses are shown in **bold**):

```
$ ~/cm/bin/cm invoke com.cisco.scmscm.adapters.jdbc.JDBCAdapter -parse 'xxx'

xxx

$ ~/cm/bin/cm invoke com.cisco.scmscm.adapters.jdbc.JDBCAdapter -parse
'$dbinfo.url'

jdbc:oracle:thin:@localhost:1521:apricot

$ ~/cm/bin/cm invoke com.cisco.scmscm.adapters.jdbc.JDBCAdapter -parse
'$tools.getTableByName($tables, "LUR").sql.createTable'

create table RPT_LUR (
 TIME_STAMP   date
   ,RECORD_SOURCE   integer
   ,LINK_ID   integer
   ,GENERATOR_ID   integer
   ,SERVICE_ID   integer
   ,CONFIGURED_DURATION   integer
   ,DURATION   integer
   ,END_TIME   integer
   ,UPSTREAM_VOLUME   integer
   ,DOWNSTREAM_VOLUME   integer
   ,SESSIONS   integer
  )
```

Obtaining Full Debug Information

To see a dump of all the contents of the `tables` and `dbinfo` structures as created by the templates, use the `-debug` flag. When this flag is used, a very detailed view of all the fields, properties, and options of these structures is printed to standard output.

Using the JDBC Framework in Scripts

You can send arbitrary SQL commands to the database for execution and view the resulting data. This may be useful for periodic database maintenance, monitoring the contents of database tables, managing extra database tables, or any other purpose.

To perform an `update` operation, call the adapter with the `-executeUpdate` flag. To perform a query and view the results, call the adapter with the `-executeQuery` flag.

Sample - Viewing and Setting the SCE Time Zone Offset

The following sample of an `update` operation demonstrates how to programmatically change the value in the database table holding the Service Control Engine (SCE) time zone offset setting. The name of this table is usually *`JCONF_SE_TZ_OFFSET`*; since the table may be assigned another name, it is referred to here by its logical name *`TZ`*. See the listing in *The tables.xml File* (on page A-1).

To avoid the need to first check that the table exists and then update it, the table is dropped (ignoring the error status if it does not exist) and then recreated, and the proper values are inserted. Since the table contains a timestamp column, you must get the current date from the database. This operation is specific to each database vendor; therefore this example uses the preconfigured `getdate` operation that has been defined in the templates.

Note the use of the tools `assignParams` and `getTableByName` to generate the SQL.

```
#! /bin/bash

this=$0
tableName=TZ

usage () {
    cat <<EOF
Usage:
   $this --status      - show currently configured TZ offset
   $this --offset=N    - set the offset to N minutes (-1440 <= N <= 1440)
   $this --help        - print this message
EOF
}

query () {
        ~/cm/bin/cm invoke com.cisco.scmscm.adapters.jdbc.JDBCAdapter -
executeQuery "$*"
}

update () {
        ~/cm/bin/cm invoke com.cisco.scmscm.adapters.jdbc.JDBCAdapter -
executeUpdate "$*"
}

get_tz () {
    query 'select * from $tools.getTableByName($tables, "TZ").dbtabname'
}

set_tz () {
    update '$tools.getTableByName($tables, "TZ").sql.dropTable'
    update '$tools.getTableByName($tables, "TZ").sql.createTable'
    update '$tools.assignParams($tools.getTableByName($tables,
"TZ").sql.insert, [$dbinfo.options.getdate, '$1'])'
}

case $1 in
    --status)
        get_tz
        ;;
     --help)
        usage
        exit 0
        ;;
     --offset=*)
        n=$(echo $1 | egrep 'offset=[-]?[0-9]+$' | sed 's/.*=//')
        if [ "$n" ]; then
            if [ "$n" -ge -1440 -a "$n" -le 1440 ]; then
                set_tz $n &>/dev/null
                ok=1
            fi
        fi
        if [ ! "$ok" ]; then
            usage
            exit 2
        fi
        get_tz
        ;;
     *)
        usage
        exit 3
        ;;
esac
```

When a result set is returned by an executed query, it is displayed to standard output in tabular form with appropriate column headers.

Scalability - Hints for Oracle

The following two sections demonstrate ways to make your database handling more scalable for the CM. These are specific to Oracle, and are provided merely as hints to illustrate the possibilities.

Using Custom tablespaces

Suppose you have created several tablespaces and wish to distribute the CM tables among them. An easy way to do this is to specify the tablespace to be used for each table in the file *tables.xml*. For one table, the definition looks like this (note especially the code in **bold**):

```
        <rdr name="LUR" dbtabname="RPT_LUR" tag="4042321925"
createtable="true">
            <options>
                <option property="tablespace" value="tspace1"/>
            </options>
            <fields>
                <field id="1" name="TIME_STAMP" type="TIMESTAMP">
                <!-- (other field declarations) -->
                <field id="10" name="DOWNSTREAM_VOLUME" type="UINT32"/>
                <field id="11" name="SESSIONS" type="UINT32"/>
            </fields>
            <indexes>
                <index name="RPT_LUR_I1" columns="END_TIME">
                    <options>
                        <option property="clustered" value="true"/>
                        <option property="allowduprow" value="true"/>
                        <option property="tablespace" value="tspace2"/>
                    </options>
                </index>
            </indexes>
        </rdr>
```

This sample adds the required tablespaces (`tspace1` and `tspace2`) for the index and for the table. There is no preconfigured meaning to the option `tablespace` in the CM; any new option name could have been used. Its meaning is derived from its subsequent use in the templates.

To create the table in the correct tablespace, modify *create_table.vm* as follows:

```
create table $table.dbtabname (
#foreach ($field in $table.fields)
 #optcomma()$field.name #sqltype($field)
 #if ("$!field.options.notnull" == "true")
  not null
 #end
#end)
#if ("$!table.options.tablespace" != "")
 TABLESPACE $table.options.tablespace
#end
```

To create the index in its own tablespace, modify *create_indexes.vm* as follows:

```
#foreach ($index in $table.indexes)
 create index $index.name on $table.dbtabname ($index.columns)
 #if ("$!index .options.tablespace" != "")
  TABLESPACE $index.options.tablespace
 #end
#end
```

Using Table Partitioning

To implement rolling partitioning for a particular table on a weekly basis, you can create a *partitioned* option for the table in the *tables.xml* file in a similar manner to the example in the previous section (*Using Custom tablespaces* (on page 6-12)). Then augment the *create_table.vm* code as follows (note especially the code in **bold**):

```
create table $table.dbtabname (
#foreach ($field in $table.fields)
 #optcomma()$field.name #sqltype($field)
 #if ("$!field.options.notnull" == "true")
  not null
 #end
#end)
#if ("$!table.options.partitioned" != "")
 partition by range (timestamp)
 (partition week_1 values less than (to_date ('01-JAN-2005 00:00:00','DD-MON-
YYYY HH24:MI:SS')),
  partition week_2 values less than (to_date ('08-JAN-2005 00:00:00','DD-MON-
YYYY HH24:MI:SS'))
  partition week_3 values less than (to_date ('15-JAN-2005 00:00:00','DD-MON-
YYYY HH24:MI:SS'))
  partition week_4 values less than (to_date ('22-JAN-2005 00:00:00','DD-MON-
YYYY HH24:MI:SS'))
 );
#end
```

Since Oracle does not accept nonconstant expression for the time boundaries, the values must be hardwired for the time the tables are created.

Create a cron job to roll the partitions (delete an old partition and create a new one) on a weekly basis. This cron job runs a script that calls the command-line interface of the JDBC Adapter (as explained in *Using the JDBC Framework in Scripts* (on page 6-10)) to issue the appropriate `alter table drop partition` and `alter table add partition` SQL commands.

APPENDIX A

Code Samples

This appendix contains samples of files used to configure the Cisco Service Control Management Suite (SCMS) Collection Manager (CM) and the adapters that process the data that the CM receives.

Application Configuration

The following sections list part of the XML file (*tables.xml*) used to configure the database tables, and the DTD file used to verify the structure of the XML file.

The tables.xml File

The following is a listing of a portion of the ***Cisco Service Control Application for Broadband*** *tables.xml* file:

```
<?xml version="1.0" encoding="ISO8859_1"?>
<!DOCTYPE dbtabconf PUBLIC "-//P-Cube//Engage DB RDR Configuration
2.1.0//EN" "dbtables.dtd">
<dbtabconf>
   <fileversion>
      ...
   </fileversion>
   <application name="Engage" version="2.1"/>
   <dbtables>
      <rdr name="SUR" dbtabname="RPT_SUR" tag="4042321922"
createtable="true">
         <fields>
            <field id="1" name="TIME_STAMP" type="TIMESTAMP">
               <options>
                  <option property="source" value="timestamp"/>
               </options>
            </field>
            <field id="2" name="RECORD_SOURCE" type="INT32">
               <options>
                  <option property="source" value="recordsource"/>
               </options>
            </field>
            <field id="3" name="SUBSCRIBER_ID" type="STRING" size="64"/>
            <field id="4" name="PACKAGE_ID" type="INT32"/>
            <field id="5" name="SERVICE_ID" type="INT32">
               <options>
                  <option property="notnull" value="true"/>
               </options>
            </field>
```

```
                  <field id="6" name="MONITORED_OBJECT_ID" type="INT32"/>
                  <field id="7" name="BREACH_STATE" type="INT32"/>
                  <field id="8" name="REASON" type="INT32"/>
                  <field id="9" name="CONFIGURED_DURATION" type="INT32"/>
                  <field id="10" name="DURATION" type="INT32"/>
                  <field id="11" name="END_TIME" type="INT32"/>
                  <field id="12" name="UPSTREAM_VOLUME" type="UINT32"/>
                  <field id="13" name="DOWNSTREAM_VOLUME" type="UINT32"/>
                  <field id="14" name="SESSIONS" type="UINT32"/>
               </fields>
               <indexes>
                  <index name="RPT_SUR_I1" columns="END_TIME">
                     <options>
                        <option property="clustered" value="true"/>
                     </options>
                  </index>
               </indexes>
            </rdr>
            <rdr name="LUR" dbtabname="RPT_LUR" tag="4042321925"
createtable="true">
               <fields>
                  <field id="1" name="TIME_STAMP" type="TIMESTAMP">
                     <options>
                        <option property="source" value="timestamp"/>
                     </options>
                  </field>
                  <field id="2" name="RECORD_SOURCE" type="INT32">
                     <options>
                        <option property="source" value="recordsource"/>
                     </options>
                  </field>
                  <field id="3" name="LINK_ID" type="INT32"/>
                  <field id="4" name="GENERATOR_ID" type="INT32"/>
                  <field id="5" name="SERVICE_ID" type="INT32"/>
                  <field id="6" name="CONFIGURED_DURATION" type="INT32"/>
                  <field id="7" name="DURATION" type="INT32"/>
                  <field id="8" name="END_TIME" type="INT32"/>
                  <field id="9" name="UPSTREAM_VOLUME" type="UINT32"/>
                  <field id="10" name="DOWNSTREAM_VOLUME" type="UINT32"/>
                  <field id="11" name="SESSIONS" type="UINT32"/>
               </fields>
               <indexes>
                  <index name="RPT_LUR_I1" columns="END_TIME">
                     <options>
                        <option property="clustered" value="true"/>
                        <option property="allowduprow" value="true"/>
                     </options>
                  </index>
               </indexes>
            </rdr>
            <aggtable name="TOP_HOURLY" dbtabname="RPT_TOPS_PERIOD0"
aggperiod="0">
               <fields>
                  <field id="1" name="RECORD_SOURCE" type="INT32"/>
                  <field id="2" name="METRIC_ID" type="INT8"/>
                  <field id="3" name="SERVICE_ID" type="INT8"/>
                  <field id="4" name="TIME_STAMP" type="TIMESTAMP"/>
                  <field id="5" name="AGG_PERIOD" type="INT8"/>
                  <field id="6" name="SUBSCRIBER_ID" type="STRING" size="64"/>
                  <field id="7" name="CONSUMPTION" type="UINT32"/>
               </fields>
               <indexes>
```

```
            <index name="RPT_TOPS_PERIOD0_I1" columns="TIME_STAMP">
               <options>
                  <option property="clustered" value="true"/>
                  <option property="allowduprow" value="true"/>
               </options>
            </index>
         </indexes>
      </aggtable>
      <table name="TZ" dbtabname="JCONF_SE_TZ_OFFSET">
         <fields>
            <field id="1" name="TIME_STAMP" type="TIMESTAMP"/>
            <field id="2" name="OFFSET_MIN" type="INT16"/>
         </fields>
      </table>
   </dbtables>
</dbtabconf>
```

For each table (either an RDR table, an aggregation table, or an extra table), the fields, indexes, and so forth are listed.

Note A table, an index, or fields can have arbitrary free text options that can be accessed in the templates.

The XML file is verified at runtime against a simple DTD, reproduced in the following section.

The tables.dtd File

The following is a listing of the DTD file used to verify the `tables.xml` definition file:

```
<?xml version="1.0" encoding="ISO8859_1"?>

<!ELEMENT dbtabconf (fileversion, application, db?, dbtables)>
<!ELEMENT fileversion (#PCDATA)>
<!ELEMENT application EMPTY>
<!ATTLIST application
   name CDATA #REQUIRED
   version CDATA #REQUIRED
>
<!ELEMENT db (options)>
<!ELEMENT dbtables (rdr*, aggtable*, table*)>
<!ELEMENT table (options?, fields, indexes?)>
<!ATTLIST table
   name CDATA #REQUIRED
   dbtabname CDATA #REQUIRED
   createtable (true | false) "true"
   inserttodb (true | false) "false"
>
<!ELEMENT aggtable (options?, fields, indexes?)>
<!ATTLIST aggtable
   name CDATA #REQUIRED
   dbtabname CDATA #REQUIRED
   aggperiod CDATA #REQUIRED
   createtable (true | false) "true"
>
<!ELEMENT rdr (options?, fields, indexes?)>
<!ATTLIST rdr
   name CDATA #REQUIRED
   dbtabname CDATA #REQUIRED
   tag CDATA #REQUIRED
```

```
   createtable (true | false) "true"
   inserttodb (true | false) "true"
>
<!ELEMENT fields (field+)>
<!ELEMENT field (options?)>
<!-- the id attribute below is presumably a numeric index, but it is for
future
     use, we currently don't look at it, as the order is imposed in the XML
-->
<!ATTLIST field
   id CDATA #REQUIRED
   name CDATA #REQUIRED
   type CDATA #REQUIRED
   size CDATA #IMPLIED
>
<!ELEMENT indexes (index+)>
<!ELEMENT index (options?)>
<!ATTLIST index
   name CDATA #REQUIRED
   columns CDATA #REQUIRED
   create (true | false) "true"
>
<!ELEMENT options (option+)>
<!ELEMENT option EMPTY>
<!ATTLIST option
   property CDATA #REQUIRED
   value CDATA #REQUIRED
>
```

The location and name of the DTD and XML files can be set separately for each adapter in the adapter's configuration file.

Adapter Configuration

The following sections list the configuration file (*ragadapter.conf*) and the associated XML file (*ragadapter.xml*) used to configure the Real-Time Aggregating (RAG) Adapter.

The configuration files of the other adapters are similar to the RAG Adapter configuration file. Only the RAG Adapter has an associated XML file.

The ragadapter.conf File

RAG Adapter general maintenance is performed using the file *~scmscm/cm/config/ragadapter.conf*. The following is a sample of the RAG Adapter configuration file:

```
#
# RAGAdapter main configuration file
#

[config]
xml_filename = ~/cm/config/ragadapter.xml

[housekeeper]
interval_sec = 10

[db]
operations_timeout = 60
batch_size = 10
```

```
transaction_size = 15
commit_interval = 6
blocking_connects = true
db_template_file = main.vm
db_template_dir = dbpacks/sybase/ase12.5.1

[app]
app_conf_file = dbtables.xml
app_dtd_file = dbtables.dtd
app_conf_dir = apps/scasbb/3.0.3
```

The ragadapter.xml File

The following code is a sample of the configuration possibilities of the RAG Adapter.

```
<?xml version="1.0"?>
<!DOCTYPE ragadapterconf [
   <!ELEMENT ragadapterconf (fileversion, config)>
   <!ELEMENT fileversion (#PCDATA)>
   <!ELEMENT config (aggregations, sinks)>
   <!ELEMENT aggregations (aggregation+)>
   <!ELEMENT aggregation (bucketident, closures, accumulators, monitors)>
   <!ATTLIST aggregation
     id CDATA #REQUIRED
     intag CDATA #REQUIRED
     outtag CDATA #REQUIRED
     sinkid CDATA #REQUIRED
   >
   <!ELEMENT bucketident (field+)>
   <!ELEMENT closures (closure*)>
   <!ELEMENT closure (closurespec+)>
   <!ATTLIST closure
     field CDATA #REQUIRED
   >
   <!ELEMENT closurespec (equivvalue+)>
   <!ATTLIST closurespec
     type (string | int | long | double) #REQUIRED
     primaryvalue CDATA #REQUIRED
   >
   <!ELEMENT equivvalue EMPTY>
   <!ATTLIST equivvalue
     val CDATA #REQUIRED
   >
   <!ELEMENT accumulators (field+)>
   <!ELEMENT monitors (changemonitor | maxmonitor | timeoutmonitor)*>
   <!ELEMENT changemonitor EMPTY>
   <!ATTLIST changemonitor
     action (warn | checkpoint) #REQUIRED
     field CDATA #REQUIRED
     active (true | false) #REQUIRED
   >
   <!ELEMENT maxmonitor EMPTY>
   <!ATTLIST maxmonitor
     action (warn | checkpoint) #REQUIRED
     field CDATA #REQUIRED
     maxvalue CDATA #REQUIRED
     active (true | false) #REQUIRED
   >
   <!ELEMENT timeoutmonitor EMPTY>
   <!ATTLIST timeoutmonitor
     action (warn | checkpoint) #REQUIRED
     maxsec CDATA #REQUIRED
```

```
      active (true | false) #REQUIRED
   >
   <!ELEMENT field EMPTY>
   <!ATTLIST field
      index CDATA #REQUIRED
      type (string | int | long | double) #REQUIRED
   >
   <!ELEMENT sinks (csvsink | dbsink | generalsink)+>
   <!ELEMENT csvsink EMPTY>
   <!ATTLIST csvsink
      id CDATA #REQUIRED
      classname CDATA #REQUIRED
      filenameformat CDATA #REQUIRED
      dirname CDATA #REQUIRED
      maxagesec CDATA #REQUIRED
      maxlines CDATA #REQUIRED
      usequotes (true | false) #REQUIRED
      active (true | false) #REQUIRED
   >
   <!ELEMENT dbsink EMPTY>
   <!ATTLIST dbsink
      id CDATA #REQUIRED
      classname CDATA #REQUIRED
      active (true | false) #REQUIRED
   >
   <!ELEMENT generalsink EMPTY>
   <!ATTLIST generalsink
      id CDATA #REQUIRED
      classname CDATA #REQUIRED
      active (true | false) #REQUIRED
   >
]>
<ragadapterconf>
   <fileversion>
      $File: ragadapter.xml $ $Revision: #3 $
      $Author: ronv $
      $DateTime: 2005/08/15 15:48:23 $
   </fileversion>
   <config>
      <aggregations>
         <aggregation id="NUR's by subscriber and subs usage counter"
          intag="4042321920" outtag="71070" sinkid="csv1">
            <bucketident>
               <!-- SUBSCRIBER_ID=0, SUBS_USG_CNT_ID=2 -->
               <field index="0" type="string"/>
               <field index="2" type="int"/>
            </bucketident>
            <closures>
               <closure field="0">
                  <closurespec type="string" primaryvalue="GuyM">
                     <equivvalue val="RonK"/>
                     <equivvalue val="OmerT"/>
                     <equivvalue val="GuyM"/>
                  </closurespec>
                  <closurespec type="string" primaryvalue="OdedE">
                     <equivvalue val="NimrodR"/>
                     <equivvalue val="YossiO"/>
                     <equivvalue val="LironL"/>
                  </closurespec>
               </closure>
               <closure field="2">
                  <closurespec type="int" primaryvalue="15">
```

```
                        <equivvalue val="5"/>
                        <equivvalue val="6"/>
                        <equivvalue val="7"/>
                     </closurespec>
                  </closure>
               </closures>
               <accumulators>
                  <!-- up=8, down=9, sessions=10 -->
                  <field index="8" type="long"/>
                  <field index="9" type="long"/>
                  <field index="10" type="long"/>
               </accumulators>
               <!-- nothing to monitor for change in NUR really.
                    For sake of testing, let's warn if DURATION changes. -->
               <monitors>
                  <maxmonitor action="checkpoint" field="8" maxvalue="10000"
active="true"/>
                  <maxmonitor action="checkpoint" field="9" maxvalue="10000"
active="true"/>
                  <changemonitor action="warn" field="6" active="true"/>
                  <timeoutmonitor action="checkpoint" maxsec="60"
active="true"/>
               </monitors>
            </aggregation>
            <aggregation id="NUR's by subscriber only"
             intag="4042321920" outtag="71071" sinkid="dbsink1">
               <bucketident>
                  <field index="0" type="string"/>
               </bucketident>
               <closures/>
               <accumulators>
                  <field index="8" type="long"/>
                  <field index="9" type="long"/>
                  <field index="10" type="long"/>
               </accumulators>
               <monitors>
                  <timeoutmonitor action="checkpoint" maxsec="60"
active="true"/>
               </monitors>
            </aggregation>
         </aggregations>
         <sinks>
            <csvsink id="csv1"
             classname="com.cisco.scmscm.adapters.rag.sinks.CSVSink"
             filenameformat="yyyy-MM-dd_HH-mm-ss-SSS'.csv'"
             dirname="~/cm/adapters/RAGAdapter/csvfiles"
             maxagesec="300" maxlines="1000" usequotes="true" active="true"/>
            <dbsink id="dbsink1"
             classname="com.cisco.scmscm.adapters.rag.sinks.JDBCSink"
active="false"/>
         </sinks>
      </config>
</ragadapterconf>
```

Glossary of Terms

C

CLI

One of the management interfaces to the SCE platform. The CLI is accessed through a Telnet session or directly via the console port on the front panel of the SCE platform.

CM

A software application running on a Solaris or Linux platform that is responsible for receiving RDRs from the SCE platform and processing them.

Command-Line Interface

See CLI.

Q

Quota

A (subscriber's) limit for a specific metric, such as bandwidth or volume.

R

Raw Data Record

See RDR.

RDR

A data record produced by the SCE platform that reports events in the traffic. RDRs produced by the SCE platform are sent to the Cisco Service Control Management Suite Collection Manager and then stored in the Collection Manager database or forwarded to third-party systems. The RDR typically contains a quota (*see* Quota) request or reports service usage.

S

SCA BB Console

The user interface used for controlling the Cisco Service Control Application for Broadband; used to create, modify, and apply service configurations.

SCA Reporter

The Cisco Service Control Application Reporter is a template-based reporting tool used to generate reports on subscriber usage or network resource and traffic analysis.

SCE Platform

The Service Control purpose-built hardware service component. This hardware device is capable of performing smart analysis of the packets at wire speed. It monitors the traffic on the line, producing raw data to be provided to the loaded application, which processes the data for functions such as reporting, policy management, subscription management, and implementation of tiered service subscriber aware traffic policies.

The SCE platform comes in the following models: SCE 1000 2xGBE, SCE 2000 4xGBE, and SCE 2000 4/8xFE. There may be one or more SCE platforms on the provider network.

Service Configuration

The definition of services within the Cisco Service Control solution, the mapping of network transactions to their corresponding services, and the behavior of the SCE platform on them. The service configuration includes the definition of services, packages, Bandwidth Controllers, filter rules, and so on.

Service Control

The basic Cisco concept for enabling service providers to differentiate subscribers, detect real-time events, create premium services, actively control applications, and leverage their existing infrastructure.

Service Control Application

An SML program (*see* SML) that determines how the SCE platform operates.

Service Control Engine platform

See SCE platform.

Service Control Management Suite Collection Manager

See CM.

Service Control Management Suite Subscriber Manager

See SM.

Service Modeling Language

See SML.

SLI (SML Loadable Image) File

A software package (part of a Cisco Service Control Application solution) that contains the SML application that is loaded onto an SCE platform. The SML application determines the behavior of the SCE platform. Different SCE platforms can have different SML applications, even when they are within the same POP. (Operators do not need to access the SLI file.)

SM

A middleware software component used in cases where dynamic binding of subscriber information and service configurations is required. The SM manages subscriber information and provisions it in real time to multiple SCE platforms. It can store subscriber service configurations information internally, and act as a state-full bridge between the AAA system (for example, RADIUS and DHCP) and the SCE platforms.

SML

The Cisco scripting language, which allows the definition of service-related events and the execution of actions on those events.

Subscriber

A Service Provider's client. This can refer to either an individual (single IP address) or a company (range of IP addresses).

Subscriber aware mode

A mode in which actual subscribers are defined in the system, thus requiring no external correlation to subscriber IDs.

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