



Real-Time Billing Solutions

Release 4.6

notification is sent to the destination (single multiple destinations) notifying of the new received VoIP AFTER getting the notification, the message recipient may retrieve the message after using the 'quick dial' feature.

Product Specification



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Manual Revisions

Chapter	Section	Description
2		Added new UR10 features
3	3.15	Added a description and an illustration for DCMP
4	2.1	Added additional Hardware rack configurations for DCMP
4	4	Added additional Hardware component information for DCMP
		Updated all Illustrations to be consistent with corporate standards

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Chapter 1

Introduction

- Structure of this Manual
- Scope and Intended Audience
- Related Manuals

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1. Structure of this Manual

This manual is divided into 7 chapters that focus on all aspects of the Comverse Real-Time Billing (RTB) Solution.

- **Chapter 1, Introduction** – describes the scope and intended audience of this manual. It also provides a list of related manuals.
- **Chapter 2, Product Overview** – describes the purpose of the Comverse RTBS, outlines its major features, and provides a brief overview of how it operates as a billing system for prepaid services.
- **Chapter 3, Platform Architecture** – describes the platform architecture of the Comverse RTBS. The topics that are covered include, Protocols, Component Overview, Network Interfaces and Topology, Redundancy, and Scalability.
- **Chapter 4, Hardware Architecture** – describes the hardware architecture of the Comverse RTBS. The topics that are covered include Rack Configurations, Component Configurations, Additional Hardware Configuration, Physical Specifications, Environmental Specifications, and Regulatory Compliance.
- **Chapter 5, Software Architecture** – describes the software architecture of the Comverse RTBS. The topics that are covered include ISUP & IN Platforms, OMNI, BIP, Oracle, COP, Administration of Services, and Remote Access Software.
- **Chapter 6, Management** – describes the management functions of the Comverse RTBS. The topics that are covered include Implementation, Backup & Restore, Export, Monitoring, and Reports.
- **Chapter 7, Interfaces** – describes the interfaces to the Comverse RTBS. The topics that are covered include signaling, HLR, HIA, OSA, Payment Server and Offline Record Processing.

2. Scope and Intended Audience

This document is written for potential customers as well as those who are simply interested in understanding the concepts and operations of the Comverse RTBS. This audience includes customer care representatives, system administrators, field service engineers, and others who work with the prepaid service.

3. Related Manuals

The documentation set for the Comverse Real-Time Billing (RTB) Solution is listed below by document title. A brief description also accompanies each title.

- *RTB Product Specification Manual* – provides a high-level overview of the Comverse RTB Solutions. Topics include RTB Solutions product overview, platform architecture, hardware architecture, software architecture, management functions, interfaces, and additional services.

- *RTB Service Provisioning Manual* – provides a detailed description of the Comverse Real-Time Billing System including rating and billing information. It also describes the procedures for provisioning the RTBS using the Service Administration Workstation (SAW). Topics include, service description, rating & billing, billing provisioning, system setup, service provisioning, user administration, reports, and card generation.
- *RTB Customer Provisioning Manual* – provides detailed procedures for provisioning Comverse Real-Time Billing System subscriber account information using the Customer Care Client (CCC). Topics include subscriber information, Friends and Family, Call Forwarding, Closed User Groups (CUG), Awards, Periodic Charges, Balances, Reservations, and Recharge Vouchers.
- *RTB Operation and Maintenance Manual* – provides a detailed description of service operations for the Comverse Real-Time Billing System. Topics include preventive maintenance procedures, database export and extract procedures, measurements, alarms, and man pages.
- *RTB External Interfaces Manual* – provides a detailed description of the Comverse Real-Time Billing System external interfaces. Topics include Customer Care Web Service (CCWS), Remote CUG Provisioning, Call Detail Records (CDR), Open Service Access (OSA), and Host Interface for Administration (HIA).
- *RTB Value-Added Options Manual* – provides a detailed description of the value-added options that are available with the Comverse RTBS. Topics include CAMEL 3 GPRS, CAMEL 3 SMS, Circuit Switched Fax/Data Bearer, HLR Notification, MO-SMS, Network Call Forwarding, OSA, Usage-Based Promotions, VPN, Protocols, and Hardware.
- *Signaling Gateway Unit (SGU) Users manual* – describes the operation, and maintenance of the SGU, a layered product within the Comverse Real Time Billing Solution (RTB). The SGU provides the signaling connectivity that allows the RTB and IN SCP/IP to support Intelligent Networking (IN).
- *Remote Maintenance Unit (RMU) Users Manual* – describes the operation, and maintenance of the RMU, a layered product within the Comverse Real Time Billing Solution (RTB). The RMU performs maintenance related activities such as installations, backups, and restores, on any DPM based component.
- *RTB Converged and CRM Documentation* – includes the Converged Product Overview, and related topics including the Postpaid Account Life Cycle, Account States, Accounts Receivable & Credit Control, Postpaid Billing Process, Invoice Treatment, Billing Discounts, and Inventory Control.



The *RTB Converged and CRM Documentation* is only provided to customers who have purchased a converged (prepaid and postpaid) system.

A vertical decorative bar on the right side of the page. It features a dark blue background with several colorful squares in yellow, green, orange, blue, and pink. A large white number '2' is centered vertically. At the bottom, there are faint, light blue text fragments: 'orded (send', 'The desti', 'notifying', 'ng The noti', 'ieve The m', and 'cT access To'.

2

Chapter 2 Product Overview

- Introduction
- Features
- Background
- Overview of the Real-Time Billing (RTB) Solution

1. Introduction

The Comverse Real-Time Billing (RTB) Solution is a high-performance telephony billing and customer relations management system that provides real-time rating for voice and advanced data services in fixed and mobile networks. It is capable of operating as a prepaid-only service or as a unified billing solution for managing both prepaid and postpaid subscriber accounts. The Real-Time Billing (RTB) Solution provides operators with an efficient, total management solution to support their telecommunication-related activities and automate their business processes.

The Real-Time Billing (RTB) Solution is a modular system that is customizable and scalable to meet the needs of network operators in the rapidly changing telecommunications environment. It supports a variety of Intelligent Network (IN) signaling technologies and open standards-based interfaces for the collection of billing data from switching networks and external systems.

The Real-Time Billing (RTB) Solution provides an advanced user interface for provisioning and customer care, and includes the necessary Application Programming Interfaces (APIs) that allow it to be easily integrated into the customer's operational environment.

2. Features

Major features of the Comverse Real-Time Billing (RTB) Solution include:

- Real-time authorization, rating, and charging of billable transactions including voice, enhanced data services, and Web-based information services, supported by a real-time database management system.
- The converged real-time billing system is capable of managing both the prepaid service for account-based and card-based subscribers, and the postpaid service that includes bill generation, accounts receivable, credit control, cashier point supporting activities.
- Prepaid and postpaid service account management and customer care support, featuring an administrative database for storage of customer and subscriber account information, provisioning information, and call detail and activity records.
- User-friendly, customizable GUI interface supporting service and voucher provisioning, administration, and customer care activities.
- Flexible interface to process external service data transactions using account reservation/debit model for billing:
 - TCP/IP-based Open Service Access (OSA) charging implemented with SOAP/XML-based API.
 - CAMEL 3 protocol-based General Packet Radio Services (GPRS) billing based on duration or volume, application, or Quality of Service (QoS).
 - CAMEL 3 Short Message Service (SMS).
 - TCP/IP-based Payment Server interface.

- Object-Oriented multi-tiered platform supports a variety of signaling technologies including CAMEL Phases 1, 2, and 3, WIN Phase 2 (IS.826), IS-41P, INAP CS-1, and ISUP.
- Revenue recovery feature with off-line record processing capable of automatic recovery of billing information if the Real-Time Billing (RTB) Solution becomes unavailable.
- Optionally supports multiple, independent subscriber identities, each with an independent balance, COS, credit limits, and prepaid/postpaid account attribute, allowing subscribers to switch between up to seven identities/accounts on demand.
- Support for virtual private network (VPN) administration, an enhanced telephony service that offers customized dialing features for established closed user groups (CUGs).
- Flexible billing package for account and balance management:
 - Allows configuration of multiple Classes of Service (COS), each with up to nine customizable balances or credit limits that can be configured per subscriber, with each balance targeted for consumption by a specific service.
 - Allows new and emerging 3G services, including data and M-Commerce activities, to be quickly added to the platform along with tariff plans for rate and charging.
 - Enables the network operator to build customized, real-time, usage-based promotion packages by assigning up to five separate balances for promotions.
 - Optional group accounts feature allows multiple subscribers to share a single set of balances in real-time for financial management, reporting, and control of the group.
 - Full cCredit management featuring real-time balance and notification for subscribers.
- Voucher creation and management software for creating, in batch, encryption-protected recharge vouchers and calling cards along with support across the voucher lifecycle.
- Dial-up information server with interactive menu allows subscribers to access account information, recharge their balances, contact customer care, or modify their service.
- Supports the creation, formatting, running, and scheduling of subscriber, voucher, and statistical database reports using Crystal Reports software.



OSA, CAMEL 3 SMS, CAMEL 3 GPRS, and VPN are value-added options that are available with the Real-Time Billing (RTB) Solution.

3. Background

Currently, there are two types of telephony billing services available to service providers in both fixed and mobile networks: postpaid and prepaid. In the traditional postpaid service, subscribers first use the service by making and receiving calls and are later billed for that use, usually on a monthly basis.

With prepaid telephony, subscribers pay before they use the service. Subscribers buy a certain amount of service by prepaying a certain amount of money, and can use the service up to the amount purchased. Once that amount is used, subscribers have to prepay again to continue using the service.

Today, there is increased interest in prepaid services. The number of prepaid subscribers in Europe has more than doubled in the last five years. Wireless prepaid service often accounts for more than 50 percent of a network subscriber base. There are several reasons for the move toward prepaid systems.

Despite the subscriber churn rate, prepaid services offer a higher revenue per user compared to the costs per user. Prepaid billing systems are less expensive to operate than postpaid systems because of, for example, the additional personnel needed to support the handling and accounting associated with bill generation in the typical 30-day billing cycle. That, together with the declining per-minute rates for calls, has forced network operators to consider prepaid service as a means of increasing profitability.

The use of prepaid calling cards in both the wireless arena and in fixed networks provides network operators the added flexibility of offering service in untapped markets where people want data and content services without long-term commitment.

3.1. Real-time Prepaid Billing

Real-time prepaid billing is crucial to prepaid service. With prepaid, carriers must check accounts, credit, authorize and monitor calls, and immediately post charges and update balances – thousands of times each second. To do this requires a robust, flexible, and dynamic system that can handle new services as they appear. However, most operators' systems do not work in real time, but in near-real time, making revenue leakage a problem.

Actual real-time prepaid billing offers direct benefits including reduced revenue leakage from losses, settlement delays, fraud, and bad debt. Indirectly, real-time billing provides the network operator immediate access to usage information that enables more effective marketing.

3.2. Managing Prepaid and Postpaid Billing Services

The goal of certain carriers today is getting Prepaid and Postpaid billing systems to work together. Prepaid billing systems are designed to authenticate and monitor call progress in real time. Call control and monitoring is typically accomplished using some form of network signaling interface to the switch. This enables the prepaid service application to terminate the call in real time (mid-call) as the balance is consumed. This is also known as “real-time” billing, as all subscriber services (calls and data transactions) are rated and charged immediately, and services are only provided if sufficient funds are available.

Postpaid billing systems offer a cyclical, batch approach to billing. These systems use the Call Detail Record (CDR) collection as the means of charging or billing the subscriber. After a call is made, the postpaid billing system collects the relevant network CDRs and determines the charge. Collecting and processing CDRs may take from minutes to weeks depending upon the call, billing system, and/or network.

A standard postpaid system cannot be successfully applied to prepaid subscribers since there is no mechanism to prevent or disconnect calls in progress. There is no possibility to deny service up front due to insufficient funds. Therefore, the network operator wanting to manage a network of prepaid and postpaid subscribers must operate and maintain two independent billing systems, each with its own customer care activity, service provisioning, etc. This is inherently inefficient because of the higher operational expenses over what could be achieved with a single billing system.

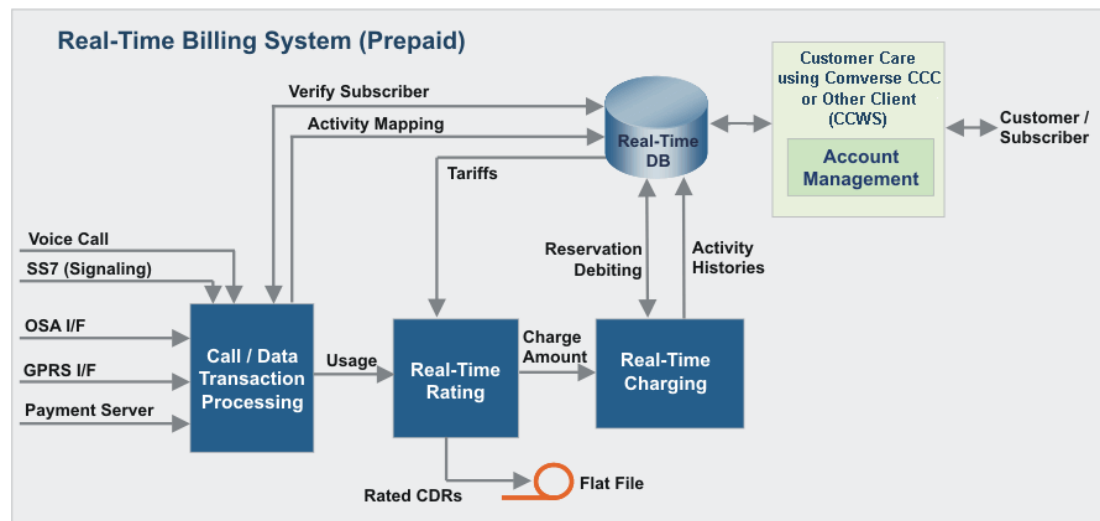
The solution to this problem is a true real-time billing system with both prepaid and postpaid billing services, a common database, and supporting business units integrated on to a single, full-service network platform. The Converse Real-Time Billing System is the implementation of such a “converged” system.

4. Overview of the Real-Time Billing (RTB) Solution

The Real-Time Billing (RTB) Solution is capable of operating as a prepaid-only service or as a unified billing solution for managing both prepaid and postpaid subscriber accounts. The converged solution adds a billing and customer relationship management system to the basic RTB Solution. This provides prepaid and postpaid billing, account services, and supporting provisioning functions on a single, integrated platform to meet the business needs of both fixed network and mobile operators. The Real-Time Billing (RTB) Solution is an open solution that operates in any environment.

A high-level functional block diagram of the Real-Time Billing (RTB) Solution prepaid configuration is shown in Figure 2-1. The RTB prepaid solution provides prepaid service to support true, real-time billing and account services for both account-based and card-based subscribers. It includes a real-time billing engine supported by a real-time database for real-time rating and charging of all subscriber transactions. This database also supports storage of all customer/subscriber account and activity records, network provisioning, call detail records, and reports.

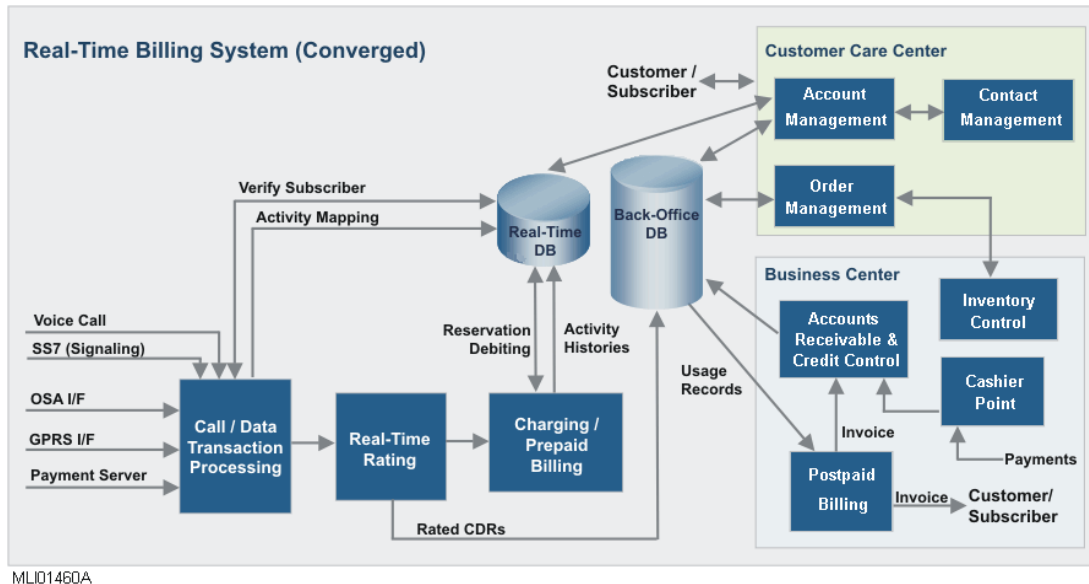
Figure 2-1 Real-Time Billing (RTB) Solution – Prepaid Configuration



In the converged Real-Time Billing (RTB) Solution (functional block diagram shown in Figure 2-2), the Leap postpaid system is integrated into the same real-time billing platform. A dual database system includes a real-time database for real-time rating and charging of transactions and a back-office database for long-term record storage, the bill generation and invoice-based activities supporting account-based subscribers. The two services provide a comprehensive prepaid/postpaid billing solution. Additionally, a single Customer Care Center supports account management for both services.

Converging separate prepaid and postpaid billing, customer care, and marketing systems provides a more consistent approach to billing for all services to all end-users. In addition, it streamlines compartments through which customer details are processed by enabling network personnel in the prepaid area to communicate more effectively with those in the postpaid service so that the two groups can work together efficiently.

Figure 2-2 Real-Time Billing (RTB) Solution – Converged Configuration



4.1. Benefits

Specific benefits of the Real-Time Billing (RTB) Solution to network operators are discussed in the following sections.

4.1.1 Real-Time Control

The Real-Time Billing (RTB) Solution fully supports real-time authorization, monitoring, rating, and teardown of service, upon balance depletion. Every service attempt – voice, data, Web, SMS, external interface, etc., – is authorized in real-time for both prepaid and postpaid subscribers. The Real-Time Billing (RTB) Solution can instantly recognize and impose credit limits on all subscribers, and authorize and deny services, thereby increasing profitability by reduced revenue leakage.

A billing approach based on real-time rating offers other unique advantages. For example, information about account usage is available to the operator immediately. This data can be used to support proactive marketing programs and other enhanced services.

Real-time processing provides a single view of customers in real time, enabling the network operator to understand customer behavior, including what they are buying, as well as what they are most likely to buy, thereby allowing for more creative marketing strategies.

Real-time control over tariff plans reduces the need for expensive customization. Revenues from customers who roam, which are often substantial, can be realized without delay.

4.1.2 Flexible Tariffing Engine

The RTBS uses a real-time database to support real-time rating of all calls, and a back-office or administrative database to support network provisioning, bill generation, reports, and long-term storage of customer and subscriber account records.

Since all subscribers are real-time subscribers, they are all provisioned and located in the real-time database. Therefore, all network services and features can be made available to all subscribers at all times, regardless of their choice of payment method. In addition, only a single unified customer care and provisioning activity is necessary.

Supporting real-time billing for both regular calling and advanced data services, the Real-Time Billing System combines real-time control and monitoring of service use with a wide selection of charging options including fixed periodic charging, usage-based charging, and value-based charging.

Rating schemes can be defined specific to each type of service offered, such as voice, MMS, Web browsing, etc. These can vary from very simple flat-rate charging, to complex usage-based schemes taking into account time, location, content, promotions, loyalty discounts, etc.

The Real-Time Billing (RTB) Solution provides a “future proof” solution, enabling the operator to quickly define new billing models and support new applications and evolving 3G services, including data transfers and downloads (music, digital graphics, etc.), and Web browsing and information services. A wide variety of billing schemes and industry-standard interfaces are supported to ensure that new services can be implemented without a major system upgrade.

Value-based pricing can be used to maximize revenue from these services. Rather than simply charge a monthly fee or adopt a rate solely on data volumes, pricing can reflect the type of data involved and its content.

A flexible interface is provided to support the creation of tariff plans and supporting features. Many different tariff plans and feature packages can be created in order to meet the varied needs of different market segments – youth, business, frequent roamers, etc.

4.1.3 Multiple Billing Interfaces

For the collection of billing data, the Real-Time Billing (RTB) Solution supports a variety of IN signaling technologies, including CAMEL Phase 2 and 3, WIN Phase 2 (IS.826), IS-41P (Nortel Proprietary), and INAP CS-1, as well as mixed signaling interfaces, including IN and Pre-IN (ISUP loop-around) interfaces.

The Real-Time Billing (RTB) Solution supports the following interfaces for the collection of billing data:

- **Open Service Access (OSA) Parlay** – the OSA charging feature allows external value added services such as SMS, MMS, data transactions, etc., to interface with the RTB via TCP/IP. This enables these external services to charge the subscriber’s account using OSA charging methods.

The RTB receives *either* usage or currency information from the OSA network for subscriber services. Since the external network has already done the rating when a currency amount is requested, the RTB can immediately charge the subscriber balance that amount. However, when usage in units such as octets is provided, the RTB must

rate this and converts the usage into currency, as is the case with external GPRS interface transactions.

- **CAMEL 3 General Packet Radio Services (GPRS)** – the RTB supports billing for Third Generation (3G) network packet data services using the CAMEL 3 General Packet Radio Services (GPRS) in GSM networks. GSM data services vary from streaming media to “Internet Web surfing.” The RTB supports charging for these data services by application (APN), volume, duration, and Quality of Service (QoS).
- **Payment Server** – the Payment Server interface is a TCP/IP-based network interface capable of communicating with an external client and the RTB to apply charges or tariffs to the Mobile Originating (MO) subscriber for Short Message Service (SMS) and other transaction activities, and adjust subscriber account balances. The payment server interface is less efficient than the Open Services Access (OSA) and General Packet Radio Services (GPRS) interfaces since both of the latter have prepaid billing for data services built directly into the protocol.
- **CAMEL 3 SMS** – Support for billing of originating SMS services is built directly into the CAMEL 3 protocol, enabling a Service Control Point (SCP), i.e., the RTB, to allow or disallow individual SMS transactions for each subscriber. The RTB includes support for billing originating SMS services over CAMEL 3, including support for location-based billing.
- **IP Probe** for packet sniffing and charging of IP services – the RTB is capable of charging for packet data services captured from a standard network protocol analyzer.

**NOTE**

OSA, CAMEL 3 GPRS, MO SMS Payment Server, and CAMEL 3 SMS are value-added options that are available with the Real-Time Billing (RTB) Solution.

4.1.4 Reservation Balance Management

Multiple account balances or “credit limits” can be configured for subscribers in a Class of Service (COS) with each balance targeted for consumption by a specific service. The RTB manages the subscriber account balances by reservations, i.e., protecting segments of the balance to be consumed or returned unused when the transaction completes, and “nibbling,” that is, charging the subscriber many times during a transaction instead of once at the end.

A reservation is an allocation of money and/or data bytes set aside from the subscriber’s balance to ensure that sufficient funds are available from the start of a chargeable data session or event through to its completion.

Each reservation consists of an amount, or “nibble” from the subscriber’s available balance, and an expiration time or “lifetime,” indicating for how long the reservation may be used. Since the “balance-nibbling” scheme uses the “reservation” of available balances instead of an allocation of the subscriber’s entire balance for a particular (data) service, only part of the available balance(s) is allotted. This process prevents complete drain of funds by one service type and ensures that a negative balance does not occur.

4.1.5 Support for Business Users

The Real-Time Billing (RTB) Solution supports features specifically designed for the business user including the Virtual Private Network (VPN), a service that provides specific service capabilities to members of a closed user group (CUG) or a hierarchy of CUGs.

To further support the business user, the Real-Time Billing (RTB) Solution allows a subscriber to have multiple, independent subscriber identities, each with an independent balance, COS, credit limits, and prepaid/postpaid account attribute. Subscribers may switch between accounts on demand. This permits the convenience of separating corporate account expenses from personal and/or family accounts.

Group accounts, the association of two or more subscribers for the purposes of financial management, allow multiple subscribers to share a single set of balances in real-time. This feature can allow a corporation to set spending limits on groups of employees in order to control expenses.

4.1.6 Service Customization

The Real-Time Billing (RTB) Solution can be packaged in a variety of different ways. For example, the service can be tailored to the needs of families, young people, senior citizens, minority communities, business users, etc. Many service parameters can be set differently from one service package to another, providing the appearance of a suite of different prepaid and postpaid services; while the same real-time billing application delivers the service in each case.

The Real-Time Billing (RTB) Solution employs the concept of Class of Service to offer the service provider a sophisticated service customization environment. Specific features can be selected from a large palette of available options and combined in different ways, for example:

- Numbers that can be dialed or barred, restricting calls to certain types of dialed number to specific times of day.
- Tariff plan details including day/time dependencies, subscriber and called party locations, the use of home zones, Friends and Family list and the allowance of free minutes.
- Periodic charges that may apply to an account.
- Account limits such as the maximum amount of credit allowed in the account, the maximum recharge per session, and the maximum allowed duration of a call.
- Rules associated with account expiration.

4.1.7 Incentive Options

The Real-Time Billing (RTB) Solution supports a variety of incentive options (applied in real-time) in the form of promotions, usage-based discounts and bonus awards for winning new customers, retaining existing customers, and for encouraging customer loyalty. Such incentives encourage the customer to pursue a course of action, e.g., increased use of the service and its features that matches the goals of the operator.

4.2. Converged Billing Services

The Comverse Real Time Billing (RTB) Solution offers converged billing services, meaning that service providers may manage both prepaid and postpaid subscribers using the functionality of the RTB system.

The converged RTB (Figure 2-2) is a comprehensive Billing and Customer Care solution that places both prepaid and postpaid billing, customer care, account services, and supporting provisioning functions onto a single, integrated platform

The converged Real-Time Billing (RTB) Solution is capable of detecting and billing for an extensive variety of voice and data application activities on its interfaces. Each potential activity in the communications network is defined in the database and each will point to an appropriate predefined tariff for charging the prepaid or postpaid subscriber.

The charge for an activity depends on many factors; for voice calls, the duration, time of day, and location of the called and called parties are applicable. Data transactions may typically be charged by parameters such as duration, volume, application, or quality of service. The Real-Time Billing (RTB) Solution takes into account the need for provisioning tariffs to cover all situations. Certain transactions, such as roaming calls, may require application of a service charge or settlement fee from an external network.

Once a tariff has been selected, it can be applied to the ongoing transaction activity as part of the real-time charging process. Reservation and balance management techniques act to apply the charges against actual funds in the prepaid subscriber's account or against the postpaid subscriber's credit limits until the transaction has completed or is terminated in the event of insufficient funds or credit.

4.2.1 Prepaid Billing Service

The rating and billing processes for prepaid subscriber voice call and data transactions are both performed in real-time. Once the transaction activity has been mapped to an appropriate tariff, the reservation process begins debiting the subscriber's prepaid balance with portions or "nibbles" of the charge amount until the transaction completes. An activity history record is generated and stored in the real-time rating engine database, also known as the network Service Data Point (SDP). A call detail record (CDR) for the transaction is written in the RTB Solution main processor, the Service Logic Unit (SLU). CDRs can subsequently be collected and used in post-processing analysis.

This process is repeated for each transaction made by prepaid service subscribers, assuming that the subscriber's prepaid balance is not exhausted. Periodic charges, charges for value-added services, and adjustments are applied to the subscriber's balance as they occur.

4.2.2 Postpaid Billing Service

The Real-Time Billing (RTB) Solution supports postpaid billing of voice and data services. Unlike prepaid billing, where both rating and billing are done immediately, postpaid subscribers are normally billed at the end of a monthly billing cycle for transaction services. While the billed charges are determined from the collection of CDRs for that billing cycle, the reservation mechanism always ensures that the postpaid subscriber's credit balance is sufficient to complete each transaction.

Postpaid billing involves the execution of the Billing Program and the interactivity of several business groups including Accounts Receivable and Credit Control, the Cashier Point, and Inventory Control.

The Billing Program is run at the close of the billing cycle to determine the subscriber's billed charges, taxes, and any adjustments in the form of discounts, bonuses, and recurring charges. It produces an invoice of billed charges.

The Cashier Point is responsible for incoming and outgoing payments to and from subscribers and customers. Inventory Control allows the RTB Solution to manage items such as mobile telephone handsets.

Accounts Receivable performs postpaid account maintenance functions such as recording payments received through the Cashier Point, debit and credit transactions, and transactions that produce invoices from sources such as Billing, one-time debits, and credits. The Credit Control activity involves treatment of accounts including activation and deactivation.

4.2.3 Roaming Support

The Real-Time Billing (RTB) Solution supports real-time billing while roaming (in accordance with Standards IS-826/CAMEL 2 and 3); that is, when mobile phone usage by a subscriber occurs outside of the local coverage area or home calling area served by the subscriber's service provider. Since the RTB is involved in both the call setup process and call progress itself, it is able to individually authorize each call attempt and monitor all active calls made while roaming.

The Real-Time Billing (RTB) Solution supports two types of international roaming:

- **In-roaming (Converged RTB Solution only)** – subscribers from foreign networks roam into the RTB Solution network. In-roaming transactions are processed in non-real time by the RTB Solution postpaid system, including sending Transferred Account Processing (TAP) records and Cellular Inter-carrier Billing Exchange Roamer (CIBER) records to foreign networks.
- **Out-roaming** – RTB Solution subscribers roam into foreign networks. Out-roaming transactions are processed in real time by the RTB Solution, or the Leap system, or a combination of the two, depending on the network configuration.

TAP records, from foreign GSM networks, and CIBER records, from foreign CDMA networks, are collected and formatted by the Leap postpaid system for processing by the RTB's Off-line Record Processing (ORP) application. The subscriber can then be charged based on a configured Markup Rating percentage. Note that the RTB supports currency conversion between the TAP record standard currency unit, the SDR, and whatever currencies are being used on the foreign system. This includes performing the actual conversion, as well as support for the network operator to configure the conversion rate.



TAP and CIBER records are processed and applied by the Leap Postpaid component of the RTB Solution only.

The Real-Time Billing (RTB) Solution supports roaming using global IN standards, such as WIN-2 (IS.826) for CDMA networks, and CAMEL-2/3 for GSM networks. An alternative method is also supported for non-CAMEL2 GSM networks, known as USSD Callback for Roaming.



USSD Callback is a value-added option that is available with the RTB Solution.

For both IN-based roaming and USSD callback roaming, the Real-Time Billing (RTB) Solution supports real-time location-based charging. That is, the charge for the call takes into account the location of both the calling and called parties, as provided by the network.

4.2.4 Number Portability

Number Portability is a network feature that allows phone numbers that previously were in the domain of one network to be “ported” to another network. This enables a subscriber to change service providers within the same local, metropolitan area and still keep the same phone number. The Real-Time Billing (RTB) Solution supports Number Portability for voice calls and Short Message Service (SMS).

The Number Portability feature uses a local or remote database with information on all ported numbers that can be queried by the RTB. This enables the RTB to determine the network owner of ported calls and the location relationships for charging and routing purposes.

4.2.5 Unified Customer Care Support

The Customer Care Center is a single point of contact for both prepaid/postpaid subscribers. It is an integrated RTB Solution support function responsible for creating and maintaining the customers’ (and their subscribers, if applicable) profile and account information in the real-time database, known as the service data point (SDP). It manages customer requests for new fixed, mobile, and Internet service, for changing existing service, and for handling responses to customer inquiries about their account.

The RTB Solution includes the necessary tools and services for managing a wide range of customer care activities used by the RTB) Solution in dealing with its subscribers. It makes the following performance-enhanced Customer Care applications available for network operators whether configured as a prepaid-only service or as a converged system supporting both prepaid and postpaid billing:

- **Customer Care Web Service (CCWS)** – a SOAP/XML-based Web Service that offers a platform and OS-independent interface for building customized customer-care applications using innovative but widely available development tools. The CCWS is used by the Customer Care Client (CCC), Leap CRM application, or other customized user interface to access subscription information stored in the SDP.
- **Customer Care Client (CCC)** – a downloadable Window-based, graphical user interface (GUI) that facilitates the provisioning of subscribers for the Prepaid-only service. The CCC incorporates an online help system that provides various levels of information pertaining to the RTB Solution service, and that is equipped with multiple language support. The CCC uses the CCWS to access subscriber information stored in the SDP.
- **Leap Customer Relations Management (CRM) System** – a graphical user interface (GUI) that uses the CCWS to facilitate the provisioning of subscribers and retrieve subscriber information stored in the SDP. The Leap (CRM) System is used in the converged RTB Solution that manages both prepaid and postpaid accounts.

Network operators can also build their own customized customer care applications in any language or platform (HW, OS, development tools).

4.3. Account Management

The RTB Solution includes the necessary tools for provisioning and managing prepaid and postpaid account services needed by customers, e.g., service providers, for billing their subscribers. It is capable of managing detailed account information for both customers and subscribers. For a customer, the account typically includes identifying and billing information, and their catalog of available services and equipment.

A subscriber's account has a lifecycle that consists of a number of defined states that are configurable by the network operator. The degree to which each subscriber can use the service is determined by account status and the net value of the account balance.

4.3.1 Prepaid Accounts

The RTB Solution supports two types of prepaid service where the subscriber pays for the service before making a call:

- **Account-Based Service** – the subscriber is a listed subscriber of the telephone network (usually a mobile cellular network), and can initiate data transactions or make and receive calls. Account-based prepaid subscribers can make calls until their account balance is reached; the account must then be recharged, usually in the form of a regular payment or recharge voucher.
- **Card-Based Service** – the subscriber is not a listed subscriber of a telephone network, and can only originate calls (usually from a fixed network). Card-based users purchase a card with a specific value and access number. The user makes calls from any telephone and uses the card until its value (or credit limit) is depleted.

4.3.2 Postpaid Accounts

The Postpaid service comprises mostly *account-based* subscribers who are listed subscribers of the telephone fixed or mobile network. Subscribers are billed for a recurring period of time (the billing cycle) for all transactions. Supporting the postpaid service are the postpaid Billing program which produces billing invoices, and the Accounts Receivable and Credit Control activities that record payments, manages credit and debit transactions, and updates the subscriber's account balance.

All postpaid subscribers are also credit limited; the RTB Solution has the ability to disconnect a postpaid subscriber's phone call when this credit limit is exceeded. Postpaid subscribers may recharge their credit limit or pay their bill using a voucher. This adds a real-time capability to the postpaid service.

4.3.3 Hybrid Accounts

A key component of the converged RTB Solution is the ability to allow for a flexible combination of prepaid and postpaid services. With a converged billing platform an individual subscriber may have both prepaid and postpaid services. Such a subscriber account can be described as a "hybrid" account. Coupled with the multiple identities feature, hybrid accounts allow a far greater degree of subscriber personalization of product offerings. For service providers this includes the ability to provide the same service in both

prepaid and postpaid modes, possibly with different tariffs associated with the payment methods.

4.3.4 Multiple Identities



The Multiple Identity feature is a value-added option that is available with the Real-Time Billing (RTB) Solution.

The Multiple Identity feature enables a network operator to allow a subscriber to select up to seven configurable Identities/accounts. Each of these multiple “virtual accounts” have several different sets of operating parameters currently associated with a subscriber record. Therefore, a single subscriber can have multiple Classes of Service (COS), sets of balances, prepaid/postpaid accounts, and subscriber parameters. Subscribers with Multiple Identities can have a single handset from which they can charge their usage to different accounts.

Subscribers with multiple identities have functioning accounts with all of their subscribed identities. The current, or In-focus account, drives all current activity; all other accounts remain operable, and normal periodic activities continue to be processed to operable accounts that are currently not “in focus”.

For example, a subscriber might use a corporate account identity that is the “In-focus” account during normal working hours, then, during off-hours, switch to a personal account for his/her own usage, or to a family prepaid account that the subscriber shares among each family member. At any time the subscriber can switch between account identities using a USSD access code, Feature Request code, or by calling Customer Care.

4.3.5 Group Accounts



Group Accounts is a value-added option that is available with the Real-Time Billing (RTB) Solution.

The Group Accounts feature allows for the association of two or more account-based subscribers for the purposes of financial management, by allowing multiple subscribers to share a single set of account balances in real-time. Group accounts might include sharing a common pool of funds, limiting a group’s or a group member’s consumption, and controlled recharging. Group owners may track group usage and restrict member’s access to certain features at the discretion of the group owner or administrator.

There are four main users in the group accounts feature:

- **Service Provider Representatives** – personnel responsible for the configuration, control and maintenance of group accounts. An SP representative may establish the group’s financial characteristics including the group and group member characteristics.
- **Group Owner** – entity who contracts with the service provider to consume the group account service. The group owner is a group member and is the subscriber account in the group that holds the balances for that group. The group owner may have enhanced privileges beyond typical members. There is only one owner per group.
- **Group Administrator/Manager** – person assigned responsible to administer the group account on behalf of the group owner.

- **Group Member** – subscriber associated with a particular group and who is typically a non-owner. Members consume the service provided by group accounts.

4.3.6 Multiple Balance Management

The RTB Solution provides a unique balance management scheme, whereby multiple balances or “credit limits” can be configured per subscriber; each balance can be targeted to a specific service. The balances are managed by a reservation mechanism that charges the subscriber potentially multiple times during a transaction instead of once at the end.

One balance is designated as the “Core” monetary balance and controls the account state. Up to nine additional balances are available (for each class of service), each with its own unit type (currency, minutes, kilobytes, MP3, MMS, SMS, etc.) and expiration. Which balances are used, and in what order they are used, is fully configurable by the operator.

The balance reservation mechanism is provisioned with predefined reservation amounts that allow segments of a transaction to be completed and billed as long as sufficient “unreserved” funds or credit limits are available. If insufficient funds or credit is available to initiate or continue a transaction activity, the service is denied/terminated.

4.3.7 Recharging the Account

Customers can make payments against their account using a variety of different methods. Some examples of payment methods for either prepaid and postpaid accounts include the use of a recharge voucher, credit card, bankcard, and ATM.

The RTB Solution supports the traditional method of recharging by voucher. The subscriber purchases recharge vouchers of various denominational values over the counter at popular retail outlets, and applies this credit to their account as part of an Interactive Voice Recording (IVR) session. Alternately, an optional Fast Recharge method can minimize IVR resources by relying on non-interactive pre-recorded announcements to the subscriber.

In GSM networks, voucher-based recharge is supported using USSD signaling from the subscriber handset. A standards-based XML/SOAP provisioning interface is also provided, allowing integration of the RTB Solution with a variety of external recharging interfaces, such as credit card companies and banks.

The RTB Solution provides software for creating, in batch, encryption-protected recharge vouchers and calling cards. The voucher generation process produces a file that can be delivered to the card manufacturer, as well as a file that can be read into the real-time billing system, enabling voucher status to be tracked through the voucher lifecycle.

4.3.8 Centralized Voucher Server (CVS)

The Comverse Real-Time Billing (RTB) Solution provides a Centralized Voucher Server (CVS) to facilitate roamers. This centralized system consists of a single dedicated voucher database residing in one special Service Data Point (SDP) with a capacity for at least 200 million vouchers.

The dedicated voucher database holds the vouchers for all RTB Solution systems of the operator so that, independent of the system to which the subscriber belongs, he or she can purchase the voucher from the operator anywhere in the nation and use it to recharge the account.

In each of the RTB platforms, the SDP where the subscriber record is stored will access the dedicated centralized voucher database (and not the master SDP of their system) to validate and use a voucher.

4.3.9 Unified Card

The Unified Card is a recharge voucher that can be used as either a calling card or a recharge card. Once successfully used as a recharge voucher, the card is marked as “used” in the RTB Solution database, and no longer has any value. It may not be used again either as a recharge voucher or as a calling card.

The first time the unified card is used as a calling card, the information from the card is verified in the database, a subscriber account is created, and the card is marked as “used.” The subscriber may now use the account to make calls, and even recharge the account if desired. Once the account is created, the card may not be used to recharge another account.

The face (or backs) of unified cards contains two sets of information: one indicates how to use it as a calling card (including the number for calling card access and for recharging a card-based account), and another indicates how to use it to recharge an existing cellular phone-based account.



The Unified Card feature is not supported in the RTB Solution Loop-Around configuration.

4.3.10 Payment Options

In the converged system, the Real-Time Billing (RTB) Solution is capable of interfacing with external payment systems through the Customer Care Web Service (CCWS) API. Payment options might include, for example, monthly bills and payments, automatic bank transfers, on-line bill pay, and scratch cards purchased in local stores.

4.4. Usage-Based Promotions

The Usage-Based Promotions feature enables network operators to design and implement award plans that encourage subscriber usage and increase customer loyalty. Usage-based awards allow subscribers to be rewarded immediately, in real time, for reaching certain usage levels within a configurable period of time.



Usage-Based Promotions is a value-added option that is available with the Real-Time Billing (RTB) Solution.

The Converse Real-Time Billing (RTB) Solution is capable of monitoring specific usage (i.e., off-peak calls, local calls, Short Message Service (SMS), recharges, etc.), and targeting bonuses and discounts for the usage. It supports two types of awards:

- Balance awards – bonuses added to balances that grant “free usage” when a predefined usage level is reached. Bonus awards can be defined in terms of currency, events (e.g., SMS, local calls, etc.), or charge units (e.g., seconds, bytes, etc).
- Percentage discounts on usage charges – future activities are discounted when a defined usage level is reached; the percent discount is applied against the total monetary charge

for an event. A discount can be awarded to any activity, regardless of what usage is being measured.

4.4.1 Measuring Chargeable Activity

Many different usage patterns may be monitored using configurable Accumulators for tracking purposes. Accumulators are registers capable of counting/measuring all chargeable activity including calls, recharges, data, SMS, etc., except system-initiated activities like periodic charges. A single accumulator is provisioned to count one-type of chargeable activity, e.g., voice call seconds, SMS message count, etc. Each COS can be configured with up to five accumulators.

Monitored usage can range from the number of calls made, to the total minutes of usage for all calls originating from location A and terminating in location B. The duration of bonuses and discounts can be limited. Both the measured usage, and the resultant awards may be applied to either general usage or specific usage.

4.4.2 Award Plans

Each COS can be configured with default Discount and Bonus plans, with the restriction that the plans must use the Accumulators that are assigned to the COS. Any subscriber created in the COS automatically gets the default Discount and Bonus plans configured for that COS.

4.4.3 Award Notifications

The RTB provides two notification event types for the usage-based promotions feature: Award and Near Award. These allow a subscriber to be informed that he or she has been given an award, or is near an award level, thereby encouraging the additional usage required to reach the award.

4.4.4 COS Promotion Plans

The COS Promotion Plan defines each Bonus and Discount Plan configured for a COS. Discount and Bonus plans are configured in the COS based upon the Accumulators defined for the COS.

4.5. Network Call Forwarding

The Network Call Forwarding feature allows the RTB to properly charge for network-initiated call forwarding provided by the operator. The billing model can be provisioned to charge for both, either, or neither legs of the NCF call. Subscribers use call forwarding to have their calls forwarded to a configurable telephone number, for example, when their line is busy or when there is no answer. Network Call Forwarding is distinguished from the service-level Call Forwarding provisioned in the COS.

4.6. Circuit Switched Fax/Data Bearer

The Circuit Switched Fax/Data Bearer feature enables an operator to charge different rates for telephony, fax and other data services. This feature is initially implemented for the IN networks using CAMEL messaging.

The following transaction types can be uniquely identified and charged:

- Telephony (default)
- FAX_GRP_2_3
- FAX_GRP_4
- SYNTAX_VIDEOTEX
- INT_VIDEOTEX
- INTTELEX
- X.400

**NOTE**

The Circuit Switched Fax/Data Bearer feature is a value-added option that is available with the Real-Time Billing (RTB) Solution.

4.7. Announcements and Notification

Real-time billing supports interaction with the user via Interactive Voice Recording (IVR) services. Customizable voice prompts and notification messages in multiple languages can be made available to subscribers by the Real-Time Billing (RTB) Solution. This information can be used, for example, to make subscribers aware of their account status or to notify them of a low balance situation. The messages can be used to warn the subscriber of imminent account expiration or to announce the maximum allowed duration for a call.

The Real-Time Billing (RTB) Solution also provides for the use of Branding announcements, information messages that are associated with the subscriber's Service Provider or Class of Service and that may contain promotional information.

4.8. SMS (Short Message Service) Notification

SMS (Short Message Service) notification based on the activity type allows a subscriber the option of receiving SMS notification at the end of a specified activity. This could be used, for example, to send a notification to a subscriber at the end of each long-distance call with the actual call charges.

This feature allows an operator to announce activity charges to the subscriber via SMS at the end of the activity originated by the subscriber. Note that notification at the end of an activity is NOT limited to SMS notification, as it can support any notification, as determined by the network operator.

**NOTE**

SMS Notification is a value-added option that is available with the Real-Time Billing (RTB) Solution.

4.9. Subscriber Information Services

Execution of the Billing Program produces an invoice of billed charges. The invoice is sent to Account Receivable and the subscriber's postpaid account balance (credit limit) is updated. Completion of the Billing process is confirmed and an invoice is issued to the subscriber. When payment is received, the subscriber's credit limit is reset at the start of the next billing cycle.

The Real-Time Billing (RTB) Solution offers several automated information services that allow subscribers to access menus of available options or directly access interactive services associated with the function by dialing a predefined access number.

This allows subscribers to, for example, inquire about their account status and available balance, change the preferred language for voice prompts (up to eight languages can be offered to subscribers), call customer care, or recharge their account.

Interactive Voice Response (IVR) systems offer the broadest range of functionality in this regard. In addition, for GSM networks, the system offers USSD-based account query (balance/expiration) and USSD-based recharge using a voucher code. In CDMA networks, the Feature Request functionality offers similar account query capabilities, but Feature Request does not support recharging.



USSD Recharge is a value-added option that is available with the Real-Time Billing (RTB) Solution.

4.10. Revenue Recovery

The Real-Time Billing (RTB) Solution employs a configurable backup system to ensure that no billing data from the rating and charging functions is lost when the RTB) Solution becomes partially or completely inoperable due to a hardware or software failure, or because of maintenance.

The RTB is capable of internally creating outage records of all transaction activities and processing the records so that the usage can be rated and charged to the subscriber. The operator has the flexibility of selecting manual or automatic revenue recovery. Additionally, Revenue Recovery provides the operator with the option of setting limits on usage when the database is not accessible and revenue recovery is not desired. Major Revenue Recovery functions include the following:

- **Manual Revenue Recovery** – this method uses outage records that the operator has converted from MSC-generated CDRs to recover revenue when the system does not detect usage as the result of the entire RTB being bypassed; this recovery method may also be used during periods of partial outage or temporary database unavailability.
- **Automatic Revenue Recovery** – when enabled, this method allows the RTB to automatically produce outage records during periods of partial outage or temporary database unavailability.
- **Offline Record Processing (ORP)** – capable of the automated, scheduled processing of internally and externally generated records created during outages for the purpose of recovering revenue.
- **Inaccessible Database** – allows the operator to limit usage during an outage by using a COS that is available in memory if the database becomes unavailable for any subscriber access during processing of the usage.

4.11. Service Management

Service Management involves those administrative and service-related activities that support Real-Time Billing (RTB) Solution operation and affect the overall behavior and features of the service. It includes tasks concerned with setting up and provisioning the

prepaid/ postpaid services provided by the RTB Solution for network providers and their subscribers. This consists of, for example, setting up the billing model, defining the Classes of Service, configuring subscriber access, and setting up and administering users in the customer care and business centers. RTB Solution service provisioning activities are performed from the System Administration Workstation (SAW) and the Leap CRM terminal.

Other Service Management tasks include creating and provisioning recharge-cards and prepaid calling card vouchers, generating reports, and post-processing activities involving the analysis of transaction activity records and CDRs.

4.12. VPN Service

Virtual Private Network (VPN) is an enhanced telephony service that offers customized dialing features in the context of a Closed User Group (CUG) and a Super Closed User Group (Super CUG). Simplified dialing procedures, dialing restrictions and reduced dialing rates can be set up for members of a CUG. An authorized administrator can manage CUGs and Super CUGs, provision new members, and control available VPN features.



VPN is a value-added option that is available with the Real-Time Billing (RTB) Solution.

4.12.1 Closed User Groups (CUG)

Virtual Private Network supports the establishment of Closed User Groups (CUGs) within the carrier network. A CUG might represent members of a company or company department, a business or recreational organization, an affinity group who share a common interest, etc. There is no need for members of the CUG to be collocated; VPN service allows members to inter-communicate using a private numbering plan even if they are spread over a wide geographic area. Private Numbers within a CUG can be up to six digits in length. There is no limit to the number of members who can belong to a Closed User Group.

4.12.2 Partner VPN - Super Closed User Groups (Super CUG)

A Super CUG is similar to a normal CUG in that it has a name and a code. However, instead of having individual subscribers or destination numbers as members, its members are entire CUGs. The Super CUG defines the group of CUGs that will “partner” together, and defines how the partner CUGs will access each other. Along with the list of the member CUGs, the Super CUG is used to define the access code that is used by each CUG to access each partner CUG.

4.12.3 Remote CUG Provisioning

CUG administrators have the option of remotely administrating CUG information. This includes the ability to add and remove members, modify short dial codes and destination numbers, change access levels, and change CUG properties.

Service Providers are responsible for developing their own end-user interface for remote CUG Provisioning. Comverse provides a Web service that allows Service Providers to develop a customized interface.

4.13. Network Architecture

The Converse Real-Time Billing (RTB) Solution is capable of supporting multiple network architectures including those based on the intelligent network (IN) concept, as well as pre-IN (ISUP-based) networks.

IN architecture provides for external service logic and databases known as service control points (SCPs) that communicate with switching system software via the Signaling System 7 (SS7) network.

SS7 is a part of the telephone network that separates the call signaling information from the voice path. The RTB Solution real-time rating engine uses this signaling information to determine whether to allow each call transaction and how much to charge the subscriber's account for the transaction.

4.14. System Architecture

The RTB Solution is a distributed processing system that consists of an integrated group of client and application servers communicating with the database on a 100 Mbps Ethernet High-Speed Backbone Network (HSBN), and interfacing the external SS7 network and external services via the appropriate APIs. The RTB Solution includes a fully integrated graphic user interface (GUI) for administration and provisioning, and a dual Oracle® database for storing real-time and historical data.



Refer to Chapters 3 through 5 for detailed information on the RTB Solution architecture.

A vertical decorative bar on the right side of the page. It features a dark blue background with several colorful squares in yellow, green, orange, blue, and pink. Some of these squares contain white letters: a pink square with a white 'S', an orange square with a white 'e', and a green square with a white 'V'. The number '3' is prominently displayed in white in the upper half of the bar.

3

Chapter 3 Platform Architecture

- Introduction
- RTBS Protocols
- Component Overview
- Network Interfaces and Topology
- Redundancy
- Scalability

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1. Introduction

This chapter describes the platform architecture of the Comverse Real-Time Billing System. The following topics are covered:

- RTBS Protocols (Section 2)
- Component Overview (Section 3)
- Network Interfaces and Topology (Section 4)
- Redundancy (Section 5)
- Scalability (Section 6)

2. RTBS Protocols

The Comverse RTBS is a flexible technology that is capable of adapting to the needs of the local network environment. The platform integrates with all the major switch vendors and supports a variety of protocols, including:

- CAMEL Phase 2
- CAMEL Phase 3
- WIN Phase 2 (IS.826)
- IS-41P (Nortel Proprietary)
- INAP CS-1

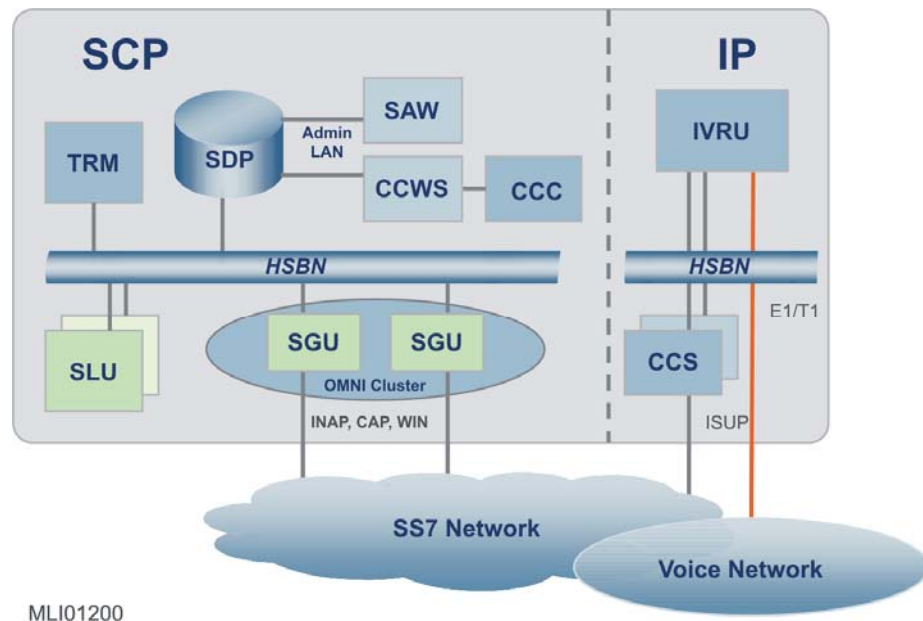
The same platform supports a mixed vendor environment, as well as mixed signaling interfaces - including IN interfaces and Pre-IN (ISUP loop-around) - concurrently.

A traditional pre-IN approach (Loop-around), based on the processing of regular SS7 ISUP messages, is proven and predictable, but consumes ports at a high rate at the switch. An Intelligent Network (IN) approach reduces this added resource burden in the network. The Comverse RTBS can operate in Pre-IN mode, in full IN mode, and can support both modes of operation simultaneously. The very same system hardware, billing application, service and subscriber database are used in each case, and (with minor exceptions) are unaffected by a change in signaling configuration.

2.1. IN Configuration

The IN Protocol Application is responsible for all protocol processing above the SS7 SCCP protocol layer. Call processing logic at the Mobile Switching Center (MSC) is interrupted temporarily at certain predefined points, and an IN-specific signaling message (for example, an INAP message) is sent to the RTBS platform. As a result, service logic is invoked at the platform. A check is made to ensure that the subscriber has sufficient funds available to make the call, and an IN response message is returned to the MSC to direct completion of the call. This call setup scenario is shown in [Figure 3-1](#).

Figure 3-1 RTBS IN Configuration Architecture

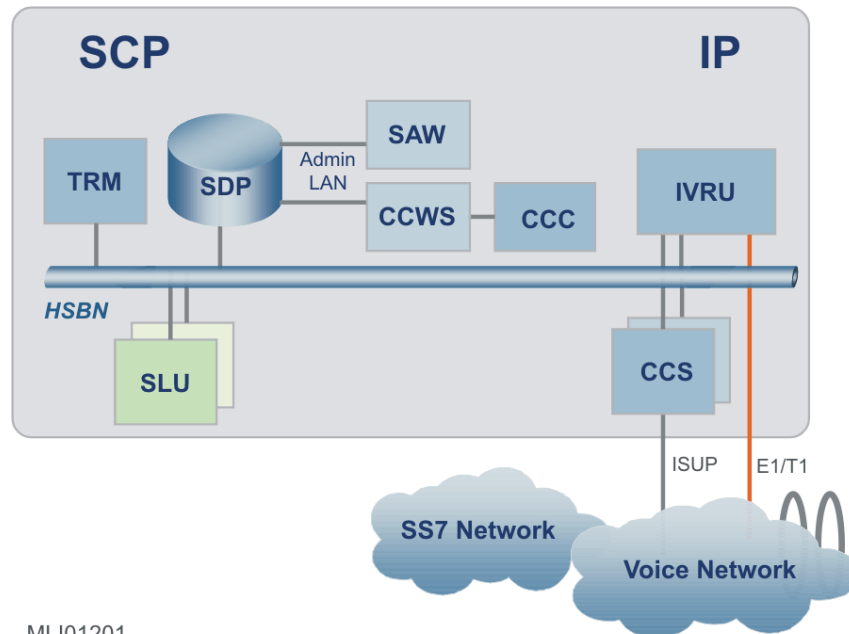


IN affects the protocol used to support the normal mechanics of telephony. Some examples of IN protocols include: INAP (Intelligent Network Application Protocol), CAMEL (Customized Applications for Mobile network Enhanced Logic), WIN (Wireless Intelligent Network), and TCAP (Transaction Capabilities Application Part). The SS7 (Signaling System 7) stack is comprised of these protocols in an IN system and is located on the SLU in a Converse system.

2.2. Pre-IN Configuration

A PRE-IN (ISUP Loop-Around) approach to the RTBS is based on the processing of regular SS7 ISUP messages during call setup. Calls requiring RTBS treatment are recognized in the network and diverted along a specific trunk group. The selected trunk does not terminate at the RTBS platform but is paired to another trunk at the switch. No trunks are required between the RTBS and the Mobile Switching Center (MSC). Only SS7 signaling information is passed to the platform (typically along an assigned E1 channel) from the MSC. RTBS application logic is invoked as a result of the incoming signaling message, and a check is made to ensure that the subscriber has sufficient funds to make the call. Call setup messages are returned to the switch to direct completion of the call using the partner port in the trunk pair. This call setup scenario is shown in [Figure 3-2](#).

Figure 3-2 RTBS PRE-IN Configuration Architecture



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3. Component Overview

The following sections describe the various components of the Comverse RTBS system.

3.1. Service Logic Unit (SLU)

The Service Logic Unit is the main point of control for the Comverse RTBS system. The RTBS application executes at the Service Logic Unit, which directs and coordinates the behavior of resources at other components of the system. The Service Logic Unit consists of two distinct parts:

- The Service Logic Function provides the environment in which real-time application logic can execute. Platform functions are presented to resident applications in a generic and seamless way, and are incorporated in logic programs in the form of library routines.
- The IP Core Function is responsible for managing voice and switching resources at the platform, converting generic requests from the billing application into specific commands that affect specific resources.

The Service Logic Function and the IP Core Function are both implemented using proven OMNI software technology from Ulticom (a Comverse company). The UNIX-based OMNI software platform provides an environment, tailored to the telecommunications industry, that is scalable, distributed, and which protects against a variety of forms of hardware and software failures. The Service Logic Unit runs on a single board computer (DPM) in a CompactPCI back-plane. Depending on the capacity needs of the system, several Service Logic Units can be included in a system configuration. An N+1 redundancy scheme is adopted whereby one more SLU is included in the system than is needed to handle the anticipated traffic load. As an option, the system can be configured with 2N redundancy, whereby a hot stand-by is associated with every active SLU processor.

Several interfaces require separate SLU pools that are dedicated to a specific function. These are:

- Payment Server (section 3.1.1)
- GPRS (section 3.1.2)
- OSA (section 3.1.3)

**NOTE**

Payment Server, GPRS, and OSA are value-added options that are available with the RTBS system.

3.1.1 Payment Server SLU

The Payment Server SLU runs the Payment Server service logic function. The Payment Server interface is a TCP/IP-based network interface capable of communicating with an external client and the RTBS to apply charges or tariffs to the MO (Mobile Originating) subscriber for Short Message Service (SMS) and other transaction activities, and adjust subscriber account balances. The RTBS will receive a usage amount in units which must be rated, or a currency amount of the charge for services from the Payment Server interface.

3.1.2 GPRS SLU

The GPRS SLU runs the GPRS service logic function. The RTBS supports billing for Third Generation (3G) network packet data services using the CAMEL 3 General Packet Radio Services (GPRS) in GSM networks. GSM data services vary from streaming media to pure “internet web surfing”. These data services are fundamentally limited only by mobile handset capabilities and interface bandwidth.

In general, the RTBS receives usage information for subscriber services in the form of octets or seconds from the GPRS network. The RTBS must rate this usage, that is, convert it into corresponding currency units, e.g., dollars.

3.1.3 OSA SLU

The OSA SLU runs the OSA service logic function to serve the charging request from an external application. The OSA SLU consists of 3 subsystems:

- **Apache HTTP Server** – The HTTP server used to allow SOAP/XML as a transport protocol to communicate between an external application and the OSA interface.
- **OSA Task (OSA SLF)** – Manages most aspects of the communication protocol and state machine for the OSA/Parlay application. It functions primarily as an interface to the SDS task and features of the RTBS.
- **SDS** – The process that provides legacy DBO functionality and the charging engine for the new billing infrastructure.

3.2. Call Control Server (CCS)

The Call Control Server is responsible for processing SS7 ISUP messages associated with IVR sessions. It supports all layers of the Signaling System #7 protocol (including MTP and

ISUP) as defined by a variety of international standardization bodies, including ITU and ANSI. Over 30 national variations of the ISUP standard are available from Comverse.

The Call Control Server takes advantage of Ulticom's OMNI middleware platform, in particular its ability to distribute signaling software across multiple computers while maintaining a single system image (i.e., a single point code) to the network. Each computer shares the processing load, assuming responsibility for all call control functions in the event of hardware or software failure at its peer. The Call Control Server can support up to eight signaling links at each computer. A maximum of 16 links per link set is supported, and up to 8 link sets per route set. The Call Control Server runs on SLU hardware, implemented in a standard UNIX environment, with the SS7 software running on OMNI middleware. Depending on capacity needs, several Call Control Server units can be included in a single platform.

3.3. Signaling Gateway Unit (SGU)

The Signaling Gateway Unit (SGU) is the IN message handler. This unit, which shares an architecture very similar to the CCS, is able to process large numbers of IN messages (such as CAP-2 or CAP-3 messages). This unit is able to processing very large numbers of signaling messages while presenting a single point code to the network. When migrating from a pre-IN to an IN configuration, one or more CCS units can be converted to run as Signaling Gateway Units.

3.3.1 Computing Element (CE)

The Computing Element (CE) is the component of the SGU that houses the OMNI Soft platform, SGU applications, and the UnixWare operating system and processes. In addition, each CE carries a copy of all SGU processes and distributed files. The main purpose of the CE is to facilitate SGU service delivery.

The SGUs are configured in a distributed OMNI environment, also known as an OMNI cluster. Each SGU cluster communicates with multiple SLUs. A redundant, loadsharing SGU configuration ([Figure 3-3](#)) contains two CEs.

The SGU CEs are started up without any knowledge of the SLUs. They recognize the SLUs via the DTCAP protocol registration. The SLUs are configured with knowledge of the SGU CEs and are constantly communicating with them. Each SGU is identified to the SLU by UDP socket. If an SGU CE is non-responsive, the SLU considers it to be non-operational.

3.3.2 Distributed OMNI Environment and Loadsharing

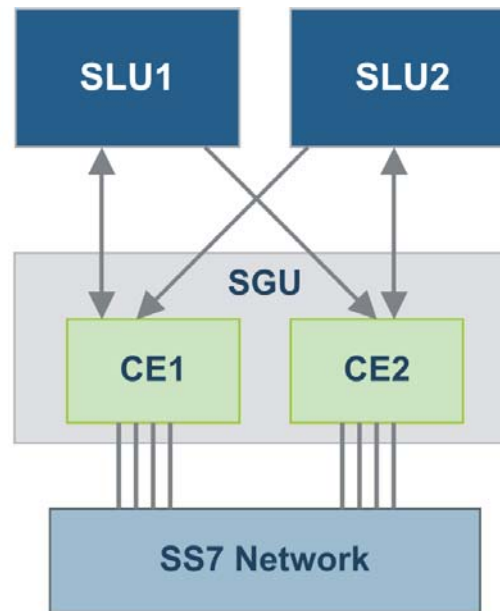
The SGU dual-CE configuration is an implementation of a distributed OMNI environment that provides a loadsharing configuration with operating redundancy. Signaling links that belong to the same linkset can be distributed between both CEs.

SS7 message signal units (MSUs) are received from the SS7 network. The physical signaling link termination determines the CE for which the signal is intended. All critical processes, utilities, and configuration files are duplicated on each CE and the SS7 links are distributed across the CEs. Each CE typically operates at 40 % link utilization.

Redundant CE operation enables the system to survive complete failure of either one of the CEs without loss of service. Because the SS7 links are distributed across two CEs, each

sharing 40% of the traffic load, when a failure occurs, the running CE can assume the additional traffic load from the failed CE and operate alone at 80% link utilization.

Figure 3-3 Dual-CE SGU Loadsharing Configuration



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3.3.3 Active and Standby CEs

In the dual-CE distributed OMNI configuration, a CE can be in one of two DTCAP Router states: Active and Standby. The CE status is determined dynamically. The Active and Standby CEs share the SS7 link traffic and either can assume the full load in the event of a CE failure.

3.4. Service Data Point (SDP)

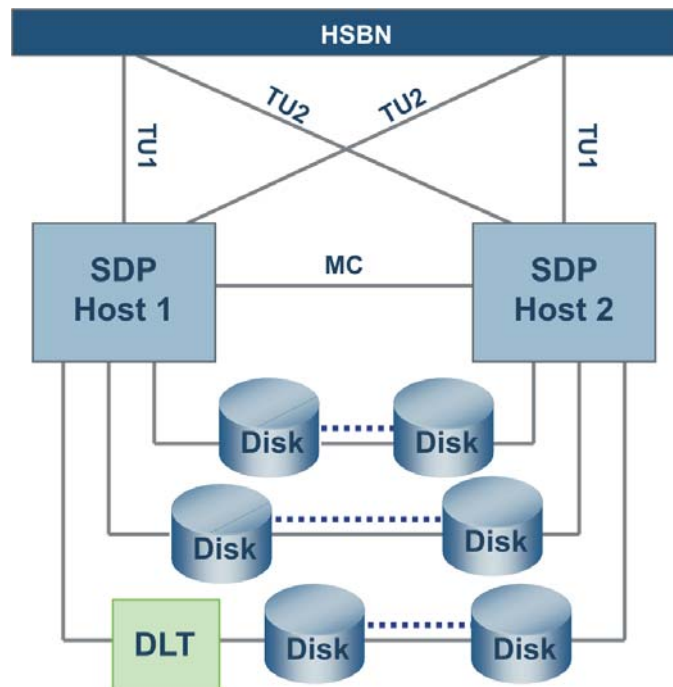
The Service Data Point (SDP) is a powerful database server system for the Converse line of IN value added services. A stand-alone system, it operates in conjunction with one or several PPS components.

The SDP uses advanced database technology and state-of-the-art architecture to deliver the best possible mass data server for IN services. It provides high capacity storage, is fully redundant, and can be scaled to support the most demanding networks and configurations.

3.4.1 SDP Hardware Architecture

Figure 3-4 shows the SDP high-level architecture.

Figure 3-4 SDP Architecture



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Hosts

The SDP architecture is based around two UNIX-based database hosts that serve as active/standby database servers. Based on HP DS25 workstations, the hosts are configured with two CPUs, and 4 GB of memory. The two hosts are connected using a fast-interconnect link, to form a fast "cluster" that is needed for the parallel operation of the database. The fast-interconnect link is implemented with the Memory Channel technology from HP.

Disks

Two arrays of mirrored disks are used for the database mass storage. Each array has up to 14 disks (36 GB or 72 GB). The disks are connected to the hosts via 2 fast wide SCSI buses, allowing each host to have full access to all disks. Redundancy is achieved through RAID 0 +1 mirroring.

The SDP Tru64/TruCluster hardware includes two, DS25 servers, three shared-access storage shelves, and four internal, unshared disks. The SDP hosts an Oracle Parallel Server database configured in primary/secondary mode.

Master/Slave

One of the SDPs strengths is that it can be setup in a Master/Slave configuration. The Master/Slave configuration provides linear scalability to meet increased loads. Scalability means one or more SDPs can be added to a system to share the load. Linearity means that if there are two servers running they can handle twice the load.



For more detailed information on the SDP hardware architecture, please refer to the *RTB Operations and Maintenance Manual*.

3.4.2 SDP Software Architecture

The SDP hosts run the HP Tru64 UNIX, version 5.1, operating system. It provides the execution environment for the database server and all other software modules. HP TruCluster software, which is part of the Unix Operating System, is used to manage the cluster environment and shared hardware resources of the SDP system.

Oracle Enterprise

On top of UNIX, the database management system is Oracle Enterprise Edition with the Parallel Server and Advanced Replication options. The Oracle database provides a robust, high capacity solution for demanding IN applications.

The OPS (Oracle Parallel Server) option allows the two hosts to access the same database simultaneously, exchanging information in order to provide a faster switchover in the event of a failure of the active host.

Checking of Operations Package (COP)

The Checking of Operations Package (COP) is software that is used to manage and monitor the PPS system. COP monitors hardware and software modules and reports alarms when needed.



For more detailed information on the SDP software architecture and COP, please refer to the *RTB Operations and Maintenance Manual*.

3.5. TRILOGUE Manager (TRM)

The TRILOGUE Manager (TRM) functions as an alarm processor, CDR collector, and SMS gateway. The unit is implemented in a standard UNIX environment and runs on a Compaq Alpha DS-10 hardware platform.

3.6. PROGENY Network Interactive Voice Response (NIVR)

The RTBS uses the PROGENY Network Interactive Voice Response System (NIVR) for all announcement and Interactive Voice Response (IVR) capabilities. This includes pre-call and terminating announcements with tokens, as well as all IVR digit collection and announcement capabilities.



In CDMA networks, PROGENY NIVR may only use IVR functionality. The IVRU-T/IVRU-C (section 3.7) or switched-based announcements must be used for pre-call and terminating announcements.

3.6.1 Overview

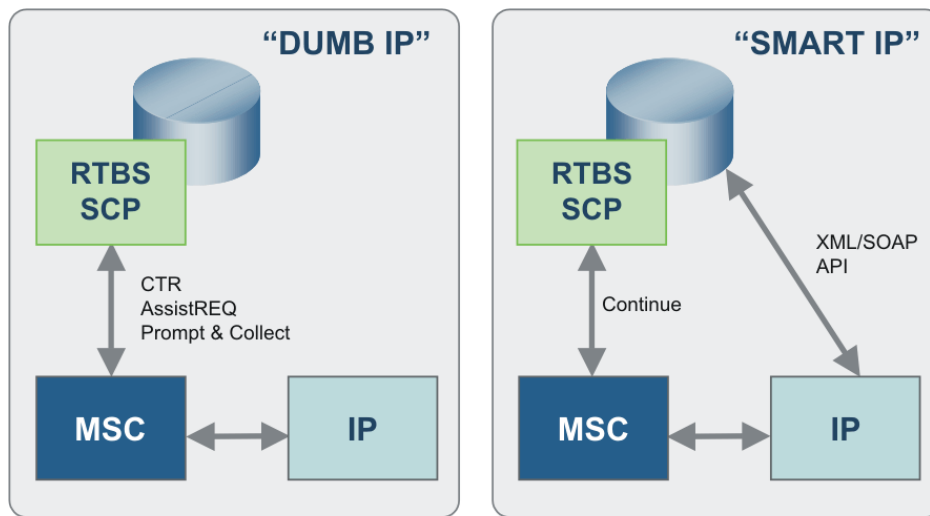
To support the RTBS, PROGENY NIVR operates in two modes (refer to Figure 3-5):

- IP functionality associated with correlated calls (pre-call and terminating announcements). The system operates in what is called “dumb IP” mode; that is, call control and logic for the announcements are not controlled by the IP, but by the RTBS.

- IVR functionality that includes the information server, recharge server, etc. The combined system operates in “Smart IP” mode, that is, the call control and interactive user response logic is controlled by the IP, not the RTBS. For IVR sessions, call control is handed off to the IP, while the IP manages the logic associated with playing the announcement and interacting with the user. The IP utilizes the XML/SOAP interface during this time to query the RTBS for information such as balance and expiration.

PROGENY NIVR offers the flexibility of allowing network operators to easily change, add, delete, and customize call flows.

Figure 3-5 RTBS Call Announcement Modes



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The RTBS is capable of supporting a mixed-mode environment of IP, IVRU (section 3.7), and PROGENY NIVR as shown in Table 3-1. Note that while the different combinations of devices for pre-call and termination announcements are allowed, there is no mixing of devices for IVR (e.g., the RTBS cannot support both a PROGENY NIVR solution and an IVRU solution in the same network).

Table 3-1 Supported RTBS Configurations

Configuration	Precall & Terminating Device(s)	IVR Device(s)
1	External IP, and or embedded IP, and/or PROGENY NIVR and/or IVRU	IVRU-T/IVRU-C
2	External IP and/or PROGENY NIVR	PROGENY NIVR

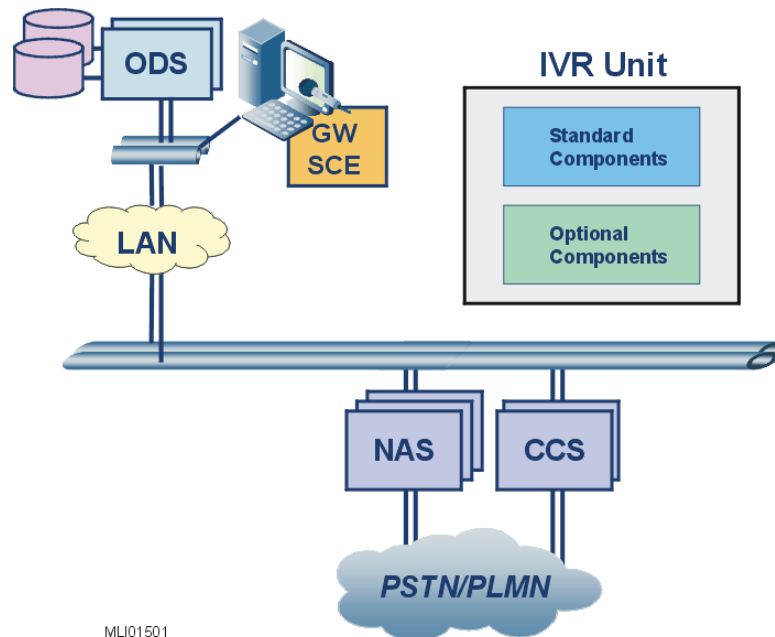
For CAMEL environments, the RTBS uses PROGENY NIVR as a full replacement for IVRU-T/IVRU-C (section 3.7) and supports the following:

- Pre-call and terminating announcement with tokens, supporting Direct Path SCP to IP, and Assist without Relay scenarios
- IVR capabilities using the Smart IP mode with the call flow logic contained within PROGENY NIVR
- Multiple language capabilities

3.6.2 PROGENY NIVR Architecture

The following diagram displays the architecture of the PROGENY NIVR for the RTBS. Each PROGENY NIVR solution is shipped with a NAS and CCS. An ODS is also available as an option.

Figure 3-6 PROGENY NIVR Architecture



Network Application Server (NAS)

The NAS is the voice/telephony front end of the platform. Each NAS connects to the operator's network with up to twelve E1 or T1 trunks. However, depending on the actual application call profile, the number of supported E1 or T1 trunks per NAS can be less. The NAS also hosts the Service Execution Environment, which is responsible for running the Ghost Writer applications.

Object Distribution Server (ODS)

The ODS is the main component of the optional provisioning system. It manages the orderly and synchronized distribution of applications (call plans) and announcements to nodes across the entire platform. The ODS is responsible for node synchronization, and is capable of distributing new services and applications to the entire system without interrupting active services.

Additionally, the ODS manages relationships between all service-related objects to ensure that they are only employed when the correct versions of all associated objects have been distributed and are active. For example, an application cannot be executed until all the announcements it refers to are also available.

Likewise, announcements that are referenced by a live application cannot be deleted.

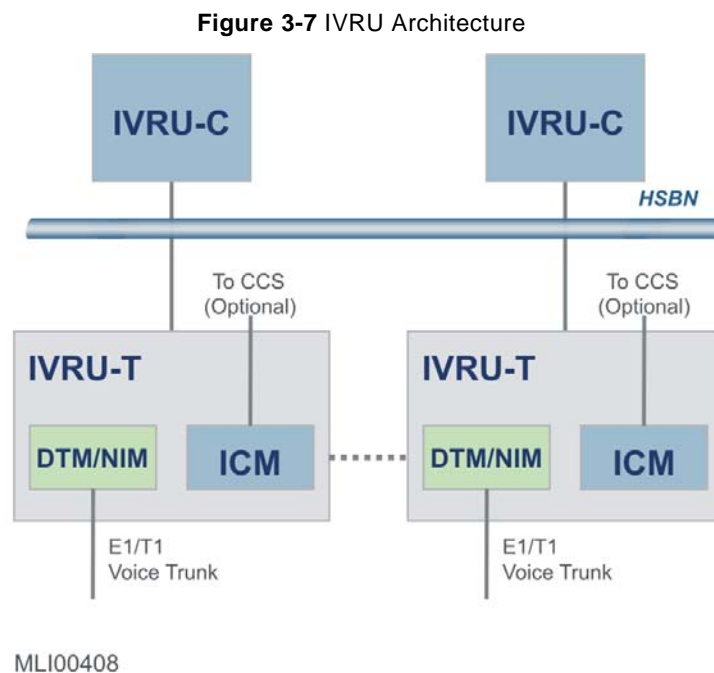
3.7. Interactive Voice Response Unit (IVRU)

As an alternative to PROGENY NIVR, the RTBS can also support an Interactive Voice Response Unit (IVRU) option for voice prompts and announcements.

Each IVRU contains the telephony interface cards and DSP resources needed to implement real-time voice functions. Comverse offers a suite of support tools for the recording, editing and concatenating of voice prompts and announcements. With these tools, an operator can create voice prompts and announcements for RTBS that share the same 'look and feel' as other enhanced service products offered by the company. Up to eight different languages can be supported concurrently at the RTBS platform.

The IVRU supports a strategy of incremental growth. Additional IVR Units can be added to the configuration as increasing service capacity requirements dictate. An 'N+1' redundancy scheme ensures that the failure of an individual unit does not impact the delivery of RTBS Service functionality.

The IVRU is implemented using a regular IVRU-T and an IVRU-C, which operate under SLU control. The IVRU telephony units are simply IVRU-T's that are connected directly to the network via one or two E1/T1 lines. [Figure 3-7](#) is an example of how the various units are connected.



3.7.1 Interactive Voice Response Unit – Telephony (IVRU-T)

The Interactive Voice Response Unit – Telephony (IVRU-T) operates under "SLU control". The SLU has the ability to start an IVRU session on a particular port, connected to an IVRU-T. In to achieve this, the SLU emulates the role of the CCS to the IVRU-Ts. The IVRU-T is configured to believe that the SLU is the "CCS". Communication is via the CCSNET protocol, which the IVRU-T already supports. Hence, a regular CCSNET call setup message from the SLU to the IVRU-T is used to start an IVRU session (informing the IVRU-T of an "incoming call").

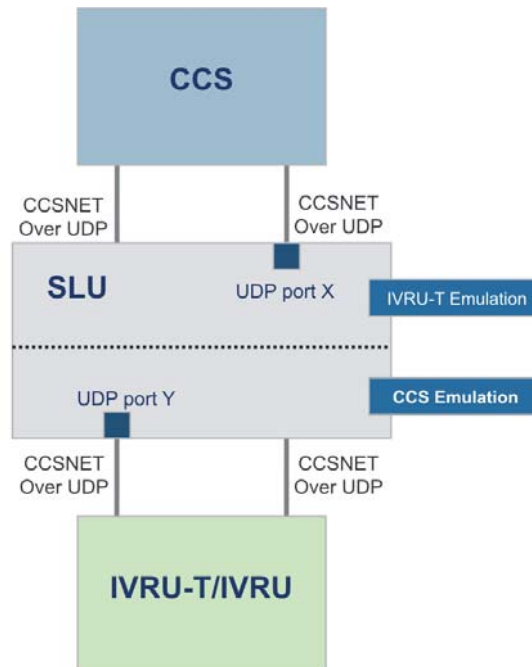
**NOTE**

The IVRU-T is also known as the Multimedia Unit (MMU).

**NOTE**

The SLU uses CCSNET in two different roles. The SLU can emulate a pseudo IVRU-T role, working with the real CCS, to respond to incoming calls from the network. It can also emulate a pseudo CCS role, working with IVRU-Ts to inform them of IVRU sessions. This is shown in [Figure 3-8](#).

Figure 3-8 SLU Emulating the IVRU-T and CCS



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3.7.2 Interactive Voice Response Unit – Control (IVRU-C)

The Interactive Voice Response Unit – Control (IVRU-C) supports the interface to the SLU, allowing the SLU to control the IVRU. The IVRU-C also provides the Syntax and the multiple-language functions for the IVRU. Sentences are assembled on the SLU by using an SLU Syntax file that specifies which IVRU prompts constitute each sentence. The IVRU-C syntax is used to play variable data such as numbers, currency values, and dates.

The IVRU-C is also configured with a special Dialog Box (DBOX) used to enter "IVRU Mode". A DBOX is a GenLogue entity, similar to a mailbox. When an IVRU-T receives a call, it establishes a session with either a mailbox (for regular voice mail processing), or a DBOX, which must have a unique ID number.

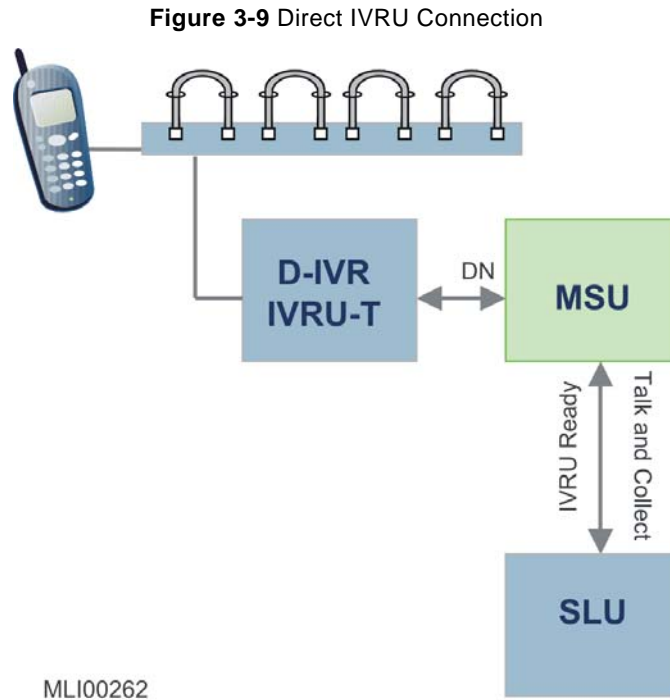
A DBOX is usually used for AudioText applications, where multiple DBOXs are linked to form an interactive dialog with a caller (playing announcements and menus, selecting user options, etc.). A DBOX can also be controlled by an external application to perform basic IVR tasks such as play a given announcement or collect user input.

**NOTE**

The IVRU-C is also known as the MSU (Message Storage Unit).

3.7.3 Direct IVRU

The RTBS can also use the Direct IVRU (DIVRU) feature to play announcements. The Direct IVRU feature allows the SLU to communicate directly with the IVRU-C using a local connection (See [Figure 3-9](#)).



Each SLU is configured with a unique DN (Directory Number). The DN is used to request an IVRU resource for a call and to correlate the call back to the originating SLU. When a system is to be configured with the Direct IVRU feature, a block of DNs are reserved so that each SLU has an original DN. The DNs are defined in a special EMAP file when configuring the IVRU-Cs and provisioning the DBOXes.



NOTE

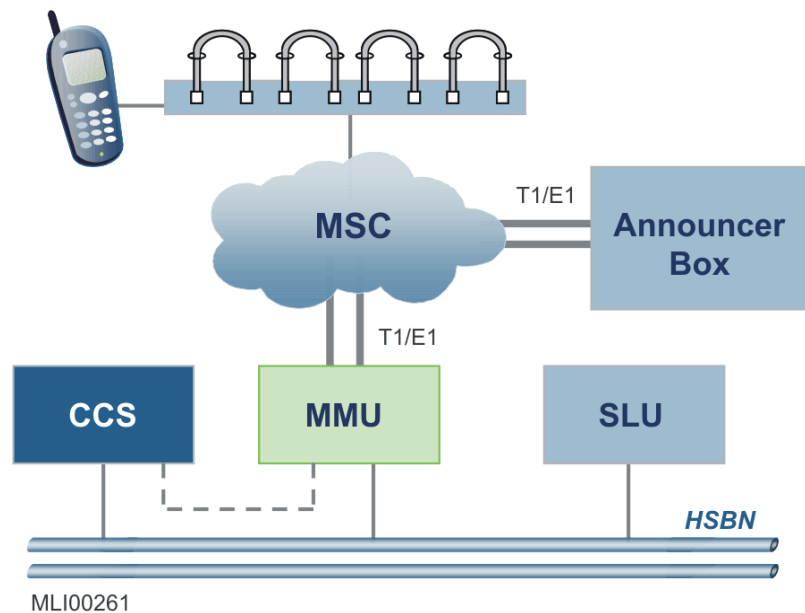
For the purpose of IN and DIVRU, the IVRU-C can reside in a remote location and does not have to be physically located alongside the SLU. Therefore, the IVRU-C can service multiple locations for an IN system.

There are two types of call scenarios within a Direct IVRU environment: Correlated and Non-Correlated. A Correlated IVR session is a call that needs to be returned to the originating SLU. If, however, a call is routed directly to the IVRU-T by the switch, it can be returned to any SLU and does not have to be correlated to the originating SLU.

3.7.4 Announcer Box

The Pre-IN configuration can also use a solution called Announcer Box (A-Box) to play prompts requested by the SLU. The purpose of the Announcer box is to provide a pre-call IVR resource and support both terminating and non-terminating pre-call announcements. The Announcer Box configuration is shown in [Figure 3-10](#).

Figure 3-10 Announcer Box Configuration



The Announcer Box does not support tokens and therefore uses generic prompts to inform the subscriber. These prompts are assigned to a Language ID and Syntax ID instead of a Sentence ID and are used by the IVRU-C to play an announcement. For example, normally a token prompt would play a message similar to “Your balance is <token> dollars.” In an A-box configuration, the same message might instead say “Your balance is too low.”

3.7.5 Remote IVRU

The Comverse platform supports remote IVR functionality, which allows a Service Operator to save on inter-site traffic. With this option, both pre-call announcements and IVR-based Recharge and Information Server calls are provided through the remotely located IVR's.

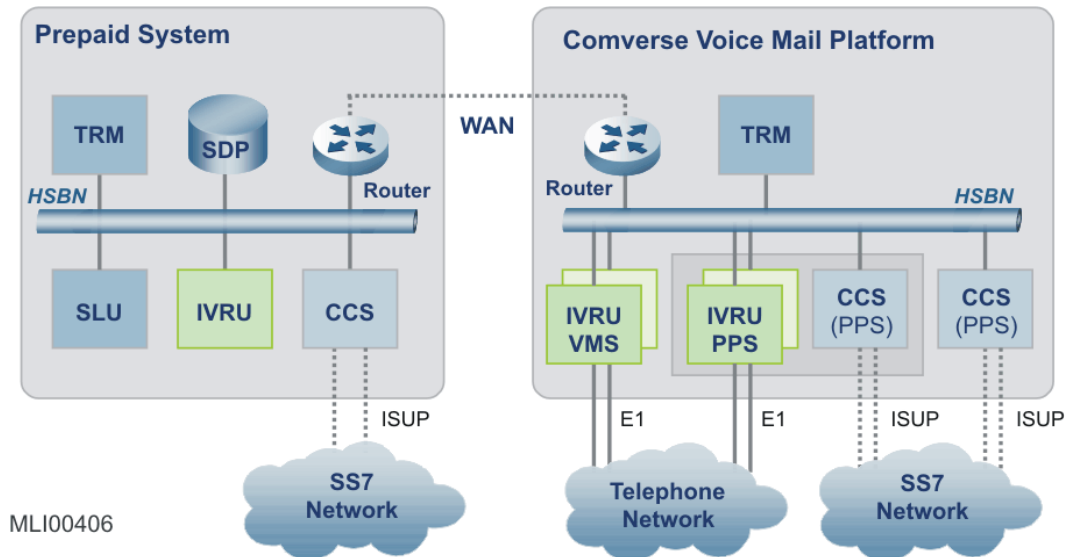
Remote IVRs may be located in various locations in the network. For example, IVRs may be co-located at the Comverse Voice Mail platforms, connected to the RTBS platform via a WAN connection. Additional Call Control Server equipment may also be required, depending on the load of the additional RTBS traffic. Alternatively, remote IVRs may be configured as stand-alone systems. A proprietary interface is defined between the RTBS platform and the IVRs.

For example, a call arrives at the RTBS platform, and it is determined that a pre-call announcement is required. The RTBS platform directs the switch to route the call to the appropriate IVR, using standard ISUP messaging. At the same time, the RTBS platform informs the remote IVR, over the WAN, which announcement is to be played to this subscriber. Upon completion of the announcement, the call is routed to the dialed destination number.

Similarly, when a recharge or information server call arrives at the RTBS platform, the switch is directed to route the call to the remote IVR. As a single Comverse platform currently supports up to eight languages concurrently, the primary advantage of remote IVRU is in potential savings on voice trunk resources.

Figure 3-11 is an example configuration where remote IVRs are co-located with the Comverse Voice Mail Platform:

Figure 3-11 Single Platform, Remote IVRU Configuration



3.8. High Speed Backbone Network (HSBN)

The High Speed Backbone Network (HSBN) is a critical component of the RTBS platform since it allows internal platform components to inter-communicate in real-time. Its dual backbone design is based around a segmented Ethernet hub. Up to eight separate network segments, each capable of 100Mb/s, coupled with a powerful 1.2Gb/s backplane, deliver the required bandwidth. The HSBN design ensures high availability and no single point of failure. Platform components are attached to both backbones, allowing them to intercommunicate even in the case of network failure.

3.9. Administrative LAN

The Admin-LAN is used to transfer administrative data and commands via TCP/IP. The Admin-LAN is implemented on the same switching hub used for the HSBN, but is totally isolated from the HSBN.

3.10. Comverse Intelligent Short Message Service Center

The Comverse Intelligent Short Message Service Center (ISMSC) handles the transmission of short text messages to devices capable of displaying such messages (e.g. pagers and mobile phones). The ISMSC runs on a Pentium platform built on OMNI SignalWare. It receives short message requests from the TRM and transmits them to the Mobile Switching Center (MSC) via the SS7 network, using MAP or IS-41, and the TCAP, SCCP, and MTP layers of SS7.

The ISMSC is fully redundant, based on two CEs operating in an active/standby partnership. When the active CE fails, switchover occurs automatically and the standby CE becomes active and continues to provide service. The signaling traffic works in a load-sharing environment. In normal operation, one Signaling Forward Engine (SFE) is

distributing the SS7 traffic via both Message Application Parts (MAPs); if one MAP stops functioning, the active SFE forwards all SS7 traffic via the surviving MAP.

3.11. Management Agent Unit (MAU)

The Management Agent Unit (MAU) is the focal point for centralized administration and control of the system. To save floor space, a single console can provide an administrative switch for all components connected.

3.12. Service Administration Workstation (SAW)

The Service Administration Workstation (SAW) is the graphical user interface (GUI) that facilitates the provisioning and use of the RTBS service, controlling all of the RTBS administration functions.

To use the SAW, each user must have a unique User Name and password. The User Name is used by the system to determine the level of access each user has to the database, based on each user's job function (e.g., the ability to view, change, add, or delete information on the database).

The SAW is installed on standalone computers that are connected to the SDP via a LAN/WAN. The SAW currently supports the following languages:

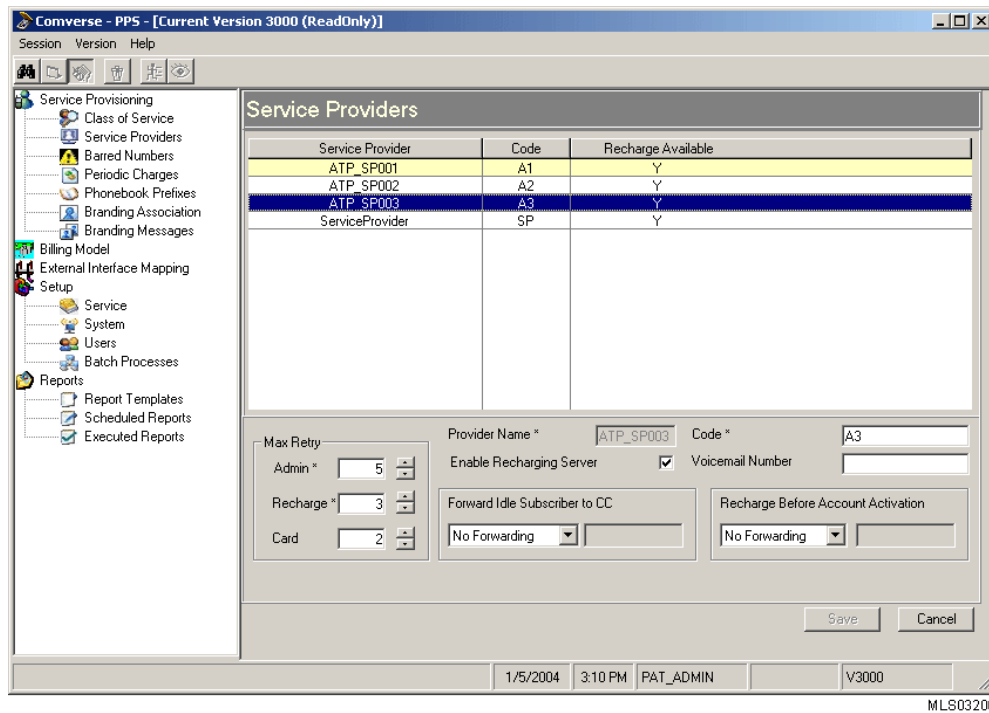
- English
- Spanish
- Portuguese

The SAW also incorporates an online help system that provides various levels of information pertaining to the RTBS service.



For more detailed information on using the SAW, please refer to the *RTB Service Provisioning Manual*.

Figure 3-12 SAW Screen



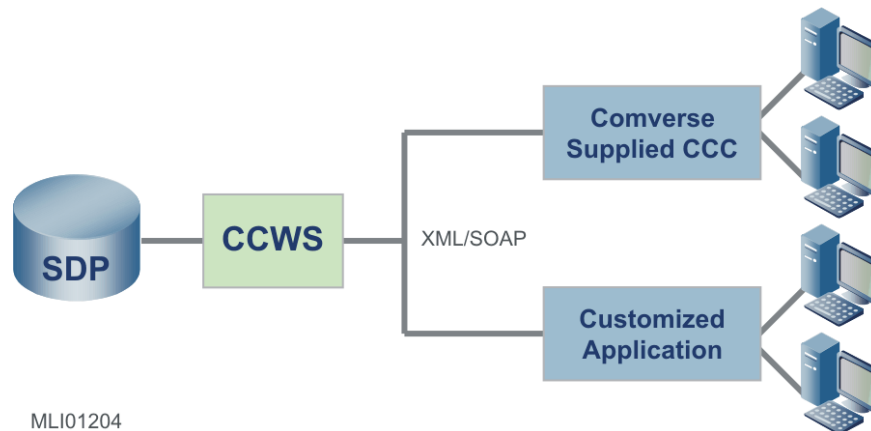
3.13. Customer Care Web Service (CCWS)

The Customer Care Web Service (CCWS) is a SOAP/XML-based Web Service that offers a platform and OS independent interface for building customized customer-care applications using modern, highly-productive, and widely available development tools.

The CCWS uses the Windows Server 2003 Web edition and is fully redundant with load balancing functionality.

Network operators can either download a Customer Care Client (section 3.14) provided by Comverse, or build their own customized interfaces in any language or platform (HW, OS, development tools) that is SOAP-enabled.

Figure 3-13 CCWS Architecture



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3.14. Customer Care Client (CCC)

The Customer Care Client (CCC) is the graphical user interface (GUI) that facilitates the provisioning of subscriber information. The CCC is a Windows client that can be downloaded on demand to standalone computers, significantly simplifying upgrades.

To use the CCC, each user must have a unique User Name and password. The User Name is used by the system to determine the level of access each user has to the database, based on each user's job function (e.g., the ability to view, change, add, or delete information on the database).

The CCC currently supports the following languages:

- English
- Spanish
- Portuguese

The CCC also incorporates an online help system that provides various levels of information pertaining to customer provisioning.



For more detailed information on using the CCC, please refer to the *RTB Customer Provisioning Manual*.

Figure 3-14 CCC Screen

3.15. Data Control and Monitoring Point (DCMP)

The Comverse Data Control and Monitoring Point (DCMP) is a Data Network Probe that uses an OSA interface (section 3.1.3) to provide Network Operators with flexible, user-friendly, and scalable way to support value-based charging for data services. It supports real-time prepaid charging and postpaid credit control for data services on a highly scalable and highly available platform.

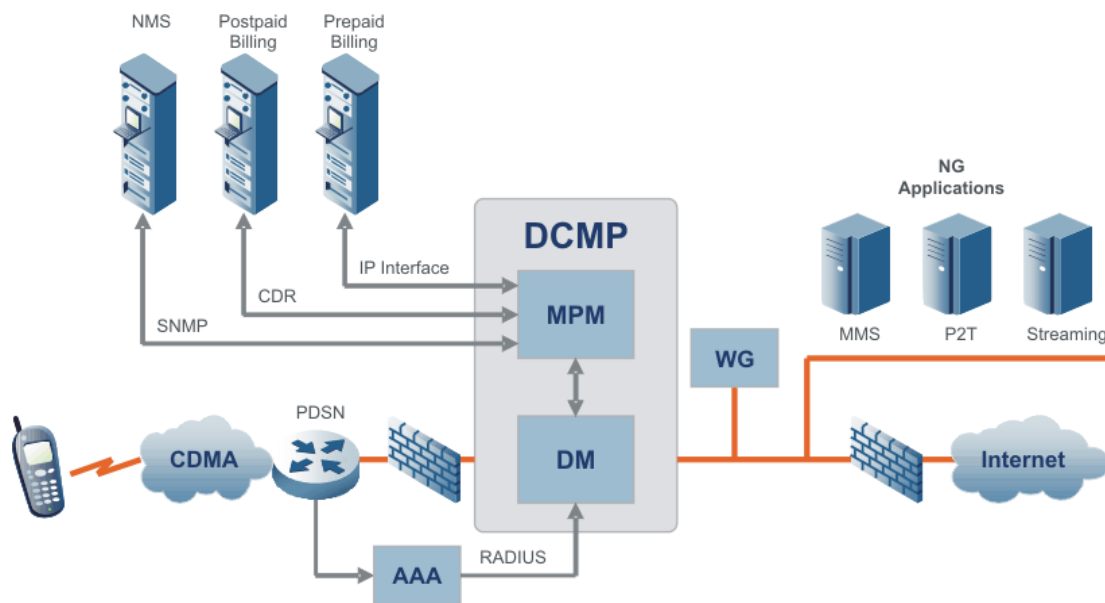
DCMP is an “intelligent” network data probe that sees all of the traffic between the mobile and Internet domains. It has the capability to look into the data packets, categorize them by attributes such as volume (number of bytes), MIME type, direction, etc., count, and report on this usage. This intelligence is further extended to include the capability to block (deny) a data transfer, as well as redirect a data connection to another address.

3.15.1 DCMP Components

The DCMP consists of the following main units:

- Data Monitor (DM)** – This front-end unit deals with the real-time transfer and monitoring of the mobile data packets. It processes every data packet sent from or to the mobile handset, passing it on or blocking it as required. The Data Monitor (DM) monitors the user’s resources, as provided by the billing server, in real time. The DM blocks any data transfer to or from the subscriber unless the subscriber has the necessary balance to pay for such data transfer. The DM has also the ability to redirect the traffic to any predefined URL. The traffic modules within the DM communicate with the PPS using the OSA API via the MPM.
- Mobile Platform Manager (MPM)** – The Mobile Platform Manager provides the interface between the Data Monitor and the Real Time Billing System (RTBS). It contains the system database which holds all system definitions, COS definitions and the system Call Detail Records (CDRs). The MPM provides the data for the billing system and contains the control parameters used by the real-time data monitor to determine subscriber access rights as well as real-time data billing options.

Figure 3-15 DCMP Architecture



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DCMP is a value-added option that is available with the RTBS system.

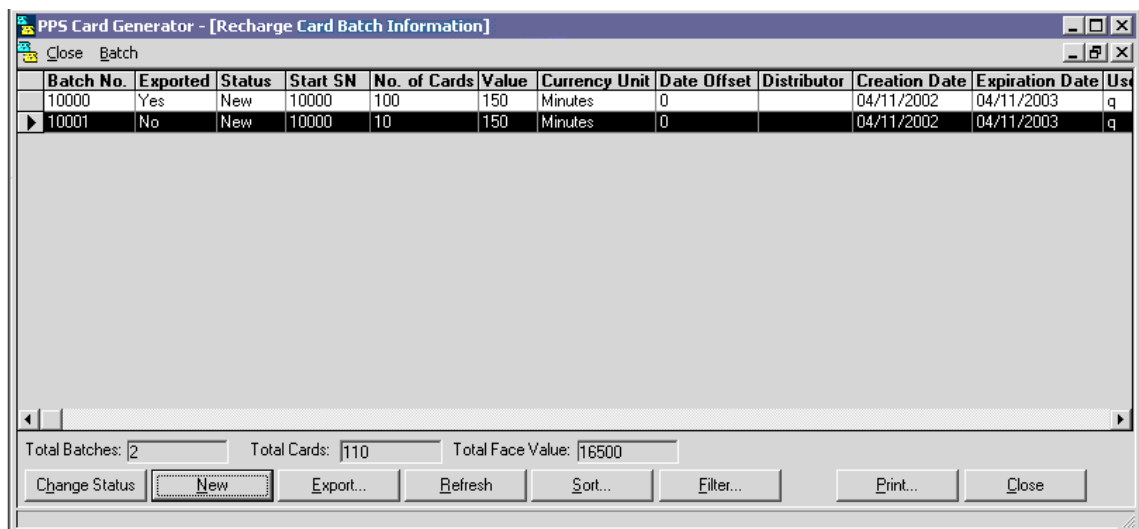
3.16. Card Generator

The RTBS Card Generator is an off-line software package used to create batches of recharge vouchers or prepaid calling cards. The software is used as part of the card management process, especially when random numbers are needed for recharge vouchers.

The card generator is installed on a standalone computer. For security reasons, it is separate from the system, and should be protected from unauthorized access. The card generator can create batch files that are used to load the card data to the RTBS and to other systems.

The card generator uses a sophisticated algorithm to generate pseudo-random numbers for the voucher secret codes. When the software is installed, a unique signature is provided to personalize the algorithm for that specific card generator.

Figure 3-16 Card Generator Screen



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3.16.1 Creating Voucher Batches

The main function of the card generator is to create new batches of recharge vouchers. A batch can contain up to 100,000 vouchers. When a batch needs to be created, the operator specifies the parameters of the batch, including the currency, the voucher face value, and the activity extension period (the number of days by which the expiration date is extended when a subscriber uses that voucher to recharge). All recharge vouchers of the batch share these parameters. They only differ in their serial number and the secret code.

Every batch has a unique batch number. Every voucher in the batch has a unique serial number within the batch. The batch number and the serial number uniquely identify a voucher. The secret numbers are unique across all batches.

Creating the batch in the card generator does not physically create the vouchers. The batch is listed on a local database within the card generator. Later, the batch can be exported, so it can be loaded on to the RTBS or sent to a print house. Only then are individual voucher records generated. See Section 3.16.3 for more information about exporting batches.

3.16.2 Creating Card-Based Accounts

With card-based prepaid service, it is also necessary to create batches of prepaid cards for use in the system. Unlike account-based prepaid, where account numbers are telephone numbers and are allocated in simple blocks by the network (just like any telephone numbers), card numbers need the same security and randomness as recharge vouchers. With card-based service, knowing the card number enables it to be used by anyone from any phone (unless a PIN is used). The card numbers should be kept confidential, and it must not be possible to easily guess valid card numbers.

The card generator can be used to generate batches of card-based prepaid accounts, using the same algorithm for generating the pseudo-random card numbers. Prepaid cards are different from recharge vouchers, and carry a different set of parameters. When the operator creates a batch of prepaid cards, the Class of Service, the Service Provider, and several optional parameters must be supplied.

3.16.3 Exporting Data

After a batch is created, the actual data of the individual cards needs to be exported from the card generator to be loaded on to the RTBS.

The card generator contains a mechanism to export the records of an individual batch to a simple text file. The export file contains a line for each card in the batch. The line's format is fully configurable, containing any text and the order of the card parameters.

Any number of export formats can be defined and used, for various purposes. Normally, cards are exported for the following purposes:

- To be loaded on the RTBS – The export file is configured to contain HIA Create commands.
- To be sent to a print house – where the vouchers need to be actually produced and printed. The actual format depends on the specific customer and print house.
- In some networks, vouchers also need to be loaded on the inventory system, since they are treated like other inventory items (stored, shipped, and invoiced). A separate export file is generated, using a format that is compatible with the inventory system.

3.16.4 Encryption

Because the exported files contain sensitive information, it is necessary to encrypt the data with commercial encryption software to prevent internal fraud.

An executable self-decrypting file is generated and delivered to the print house. Using the correct password, the executable file is run and the file is opened.

Once the file is opened, it contains all the raw information, including the secret card numbers. This information is needed to print the secret numbers on the vouchers (or prepaid cards).

No special software is required at the print house. The encrypted file is self-decrypting. The only thing needed to produce the original file is the password.

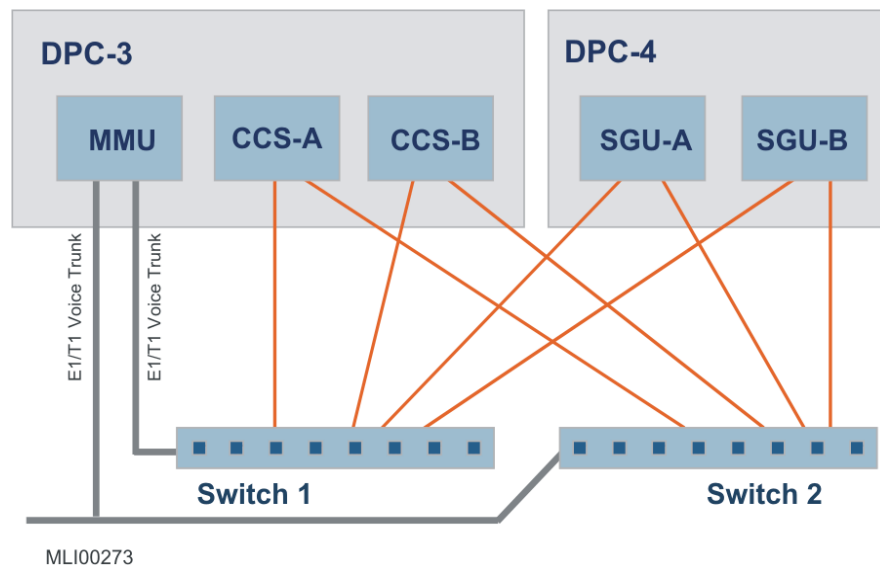


For more detailed information on using the Card Generator, please refer to the *RTBS Service Provisioning Manual*.

4. Network Interfaces and Topology

The Real-Time Billing System connects to the network over several types of interfaces. Figure 3-17 shows the RTBS connected to two network switches. Signaling information is carried on E1/T1 time slots. To ensure redundancy, the pair of signaling links from any one switch is routed to both CCS-A and CCS-B for ISUP signaling. A similar connectivity is established to the SGU for IN signaling.

Figure 3-17 RTBS Service Platform in a Network



4.1. Network Switches

In order to provide service, the Real-Time Billing System needs to be connected to one or several network switches. In some cases, the RTBS is connected to several networks, each one through one or more switches.

Each network switch connected to the RTBS has a Signaling Point Code (SPC). An SPC is an address in the SS7 network. The RTBS has its own SPC.



NOTE

The RTBS may have multiple point codes if the system is very large.

4.2. Trunk Groups

Each switch connected to the Real-Time Billing System has multiple voice channels (usually several hundred channels) that are known to the RTBS and the switch. These channels are organized in the form of Trunk Groups (TGs). The definition of trunk groups here is very general-any collection of voice channels that serve a given purpose.

Each switch may be connected to the RTBS through one or several trunk groups. For instance, two trunk groups may be used, one for incoming calls and one for outgoing calls. The exact number of trunk groups depends on the details of the specific site and on how calls are routed to and from the RTBS.

Note that this general definition of trunk groups is in conflict with some of the uses of trunk groups in the Comverse System, mainly on the CCS. The CCS is different from "standard" trunk groups in that each E1/T1 line (i.e., DTM) is a separate TG.

Trunk groups do not have to be defined using full E1/T1 lines. In actuality, the voice channels carried on an E1 line can be split between trunk groups.

4.3. Circuit Identification Codes

Each voice channel between a given network switch and the Real-Time Billing System has a unique identification code, known as the Circuit Identification Code (CIC). There is no standard convention of how the codes are assigned. All 32 channels of an E1 line (including the D channels) are assigned CICs.

The CIC uniquely identifies a specific channel connected to a given switch. However, it is not unique across the interfaces with several switches. Only the combination of a switch name (or DPC) and a CIC uniquely identify a voice channel.

From a network perspective, trunk groups are defined by specifying which CICs belong to each TG. In order to achieve proper operation, this needs to be consistent on the network switch and the RTBS.

4.4. SS7 Signaling

SS7 signaling links must be supported to carry all control messages between the Real-Time Billing System and the switches to which it is connected. The signaling links do not have to be physically connected to the same switches they support. With SS7, there is no necessary relationship between the physical connection of the voice circuits and the physical connection of the SS7 links.

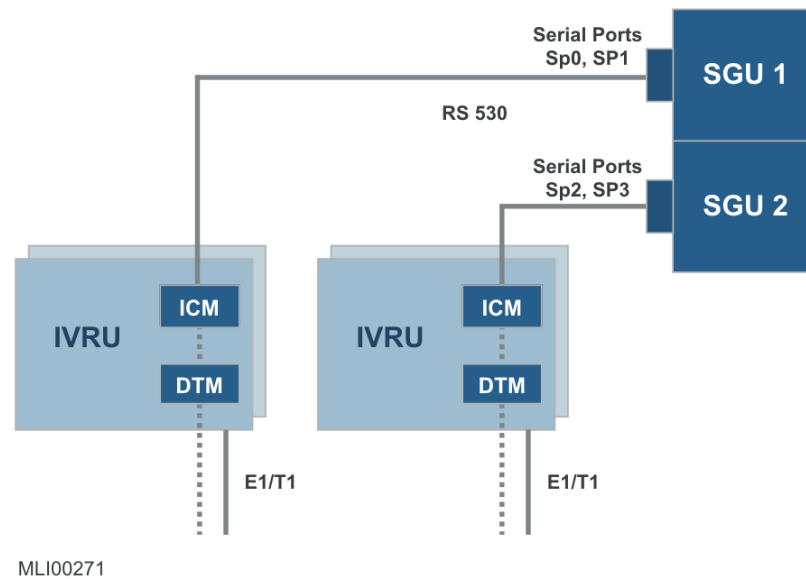
For instance, the links can be connected through a network STP (Signaling Transfer Point), which acts as a "router" for SS7 messages and forwards them to the appropriate switches, based on the SPC number used in each message. In this case, the links will normally be connected via V.35 lines directly to the STP.

Another alternative is to have the links connected directly to the switches, through some of the D channels of the E1 lines (or T1 lines) connected to that switch. There is no need to use every E1 D channel, since a single link over a single D channel can support dozens of E1 lines (hundreds of ports).

There could even be hybrids where one switch also performs an "STP function" for other switches, so that links connected to that switch also serve trunk groups connected between the RTBS and other switches. The switch with the STP function handles its own messages (identified by the SPC) and routes other messages to other switches (also based on the SPC).

There is no mandatory one-to-one correlation between voice channels connected to specific switches and the physical connection of links supporting these voice channels. The only requirement is to have a well-defined path (links) to send SS7 messages to every switch. The SS7 network manages to route messages sent on the proper links to the right destination.

In an IN system, the signaling links are usually carried on E1/T1 lines connected to IVRU units. The signaling links are stripped and forwarded to the SGU. This is illustrated in Figure 3-18.

Figure 3-18 Extracting Signaling Links from the SS7 Network to the SGU

5. Redundancy

Comverse' Real-Time Billing System is fully redundant. No single point of hardware or software failure will result in unavailability of the platform. Further, the platform is able to continue processing even when certain combinations of failure occur. Redundancy is built into every component of the system:

- An 'N+1' redundancy scheme protects against SLU processor failure. One more SLU is deployed than is necessary to handle the anticipated processing load. In the event of SLU failure, no stable calls are dropped and processing at other SLUs is unaffected. As an option, SLUs can be configured with 2N redundancy, whereby a hot stand-by is associated with every active SLU processor. Note the 2N configuration is recommended for Pre-IN configurations. In the event of failure of the primary processor, the backup processor assumes the processing load and continues to monitor and manage active calls.
- A load sharing approach is taken at the Call Control Server and Signaling Gateway Unit. In the event that one processor fails, the redundant processor assumes the entire signaling load. In this case also, the failure of a single unit does not result in any calls being dropped.
- Signaling links are equally distributed between the two load-sharing CE's of the CCS and SGU. Full SS7 redundancy is supported, where the operator defines 'linksets'. If a link in a linkset fails, the load is distributed to the remaining active links of the linkset. If an entire card fails, the links associated with the card are brought down and the load is distributed to the remaining active links of the linkset. Signaling links are engineered at a maximum loading factor of 0.4 Erlang., so that in the event of a failure of upto half of the links, this traffic can be temporarily supported by the associated links at no more than 0.8 Erlang.
- An 'N+1' redundancy scheme is in place for the IP/IVR. The system is sized to ensure that there is one more IP/IVR than is needed to handle the anticipated processing load

for the platform. Since IP/IVRs are exactly equivalent, and since no subscriber-specific data resides at the unit, the failure of one IP/IVR has no effect on system availability.

- Full redundancy is in place at the Platform Manager. Each processing component is replicated.
- The High Speed Backbone Network is configured with two paths between every system component.
- Every component of the Service Data Point is duplicated. The SDP architecture is based around two UNIX-based database hosts that serve as active/standby database servers. Two arrays of mirrored disks are used for the database mass storage (with a third array serving as a backup disk). Each array has up to 6 disks (36 GB each). The disks are connected to the hosts via 2 fast wide SCSI buses, allowing each host to have full access to all disks. Redundancy is achieved through RAID 0+1 mirroring.

6. Scalability

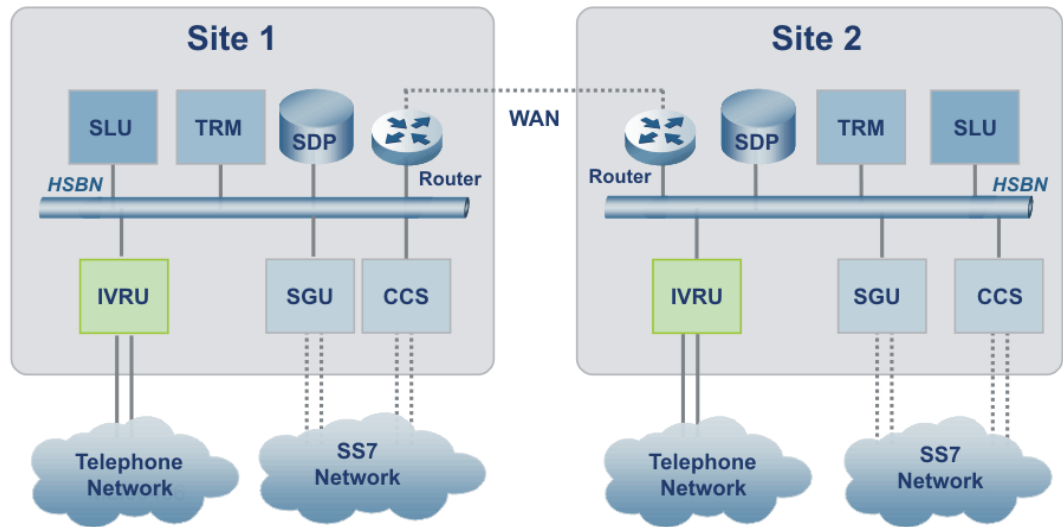
The Real-Time Billing System can be configured to support widely differing numbers of subscribers. In various sites around the world today, the same platform technology supports as few as 10,000 subscribers and as many as several million subscribers, with virtually unlimited scalability. The platform is designed to grow incrementally without the need to replace the initial hardware and software components. This is achieved by replicating components at the platform as service usage increases. The following table displays each component's configuration for the support of additional units:

Table 3-2 Configuration for Support of Additional Units

Component	Configuration for Support of Additional Units
Service Logic Unit (SLU)	N+1 redundancy configuration (IN systems) 2N redundancy configuration (non-IN systems)
Call Control Server (CCS)	2N redundancy configuration
Signaling Gateway Unit (SGU)	2N redundancy configuration
Interactive Voice Response (IVRU)	N+1 redundancy configuration (2CE Load sharing cluster)
Service Data Point (SDP)	2N redundancy configuration

For further growth, a single Real-Time Billing System can be distributed across multiple sites, each HSBN being inter-connected using data routers. In this case, several sites combine to behave as a single, large system. A distributed System can support many millions of active service subscribers and BHCA. The distributed platform approach is also well suited to a geographically dispersed environment, and provides a logical means of expanding the capacity of the system over time. Many configuration options are available – for example, one or more platforms can be deployed in different geographic regions, one or more platforms can be shared between regions, and so on. [Figure 3-19](#) illustrates a typical distributed platform arrangement.

Figure 3-19 Distributed Platform



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RTBS capacity depends on the hardware and software packages of each particular system. For specific capacity analysis information, contact your Comverse support representative.

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4

Chapter 4 Hardware Architecture

- Introduction
- Rack Configurations
- Component Configuration
- Additional Hardware Component Configuration
- IVR Component Configuration
- Additional Hardware
- Physical Specifications
- Environmental Specifications
- Regulatory Compliance

1. Introduction

This chapter describes the hardware architecture of the Comverse Real-Time Billing System. The following topics are covered:

- Rack Configurations (section 2)
- Component Configuration (section 3)
- Optional Features Component Configuration (section 4)
- IVR Component Configuration (section 5)
- Additional Hardware Configuration (section 6)
- Physical Specifications (section 7)
- Environmental Specifications (section 8)
- Regulatory Compliance (section 9)

2. Rack Configurations

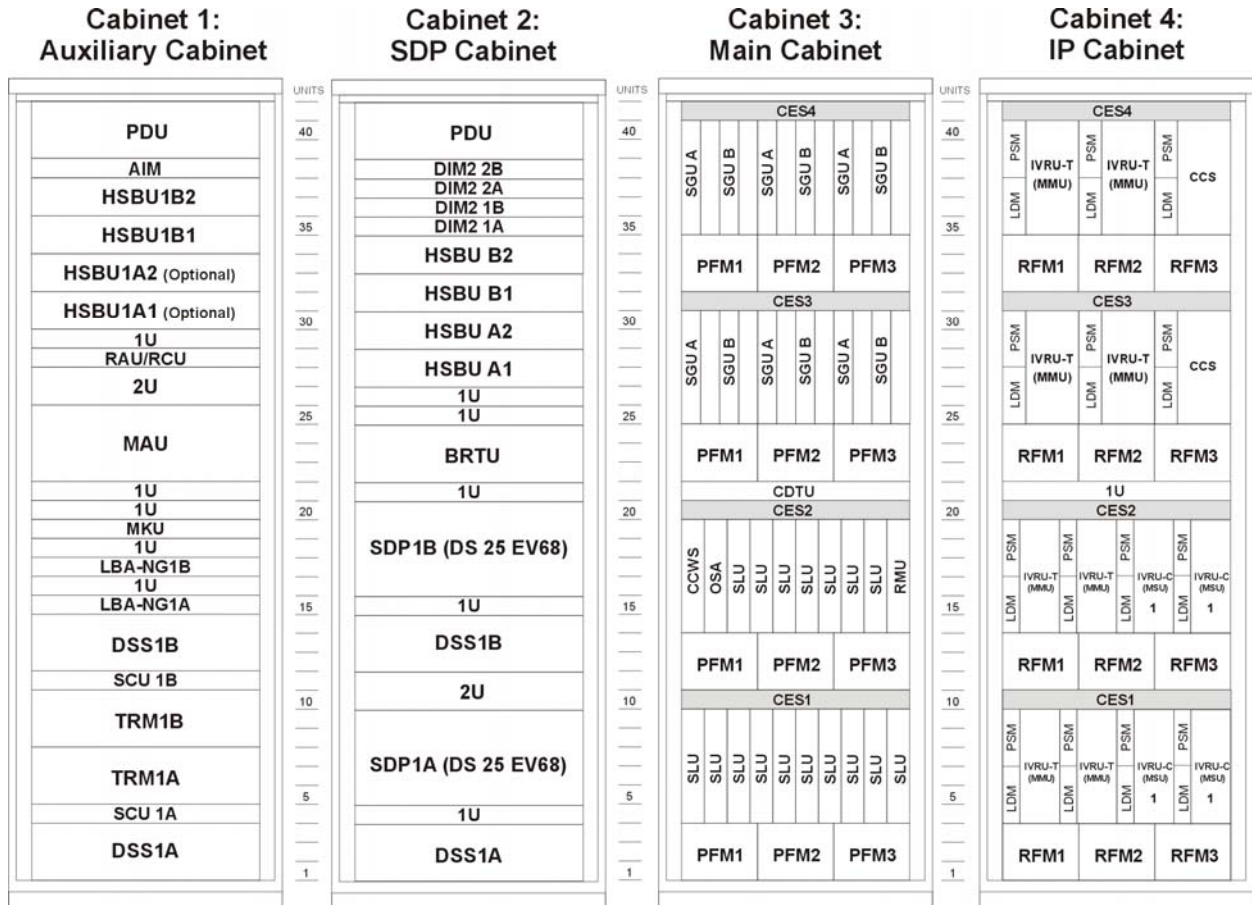
The Comverse RTBS rack configuration is based on INF 3.4 and DPM/DCP technology. The INF 3.4 cage occupies 10U with separate power supplies and disks for 4/3 CE configurations and utilizes a Celeron 400MHz processor. The DCP occupies 10U with embedded power supplies for 10 CE and 6 CE configurations. The DPM is an 850MHz Dual P3 cPCI board with either an 18 or 36 GB disk.

There are 4 different cabinets that are used in the RTBS architecture:

- **Cabinet 1: Auxiliary Cabinet** – This cabinet contains the logical TRM components, which host the service logic functions, and the system networking components, such as the HSBUs and routers.
- **Cabinet 2: SDP Cabinet** – This cabinet houses the database server, mirrored disks arrays, and the tape back-up unit.
- **Cabinet 3: Main Cabinet** – This cabinet is used in an IN configuration and houses components that host the signaling and service logic functions, as well as local and remote network interfaces.
- **Cabinet 4: IP Cabinet** – This cabinet houses telephony interface cards and SS7 signaling cards that provide the interface to the network voice channels.

Each cabinet's layout is displayed in Figure 4-1.

Figure 4-1 RTBS Rack Configuration



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NOTE The layout of Cabinet 3 differs slightly for Loop-around configurations.

NOTE The IVRU-T and IVRU-C in Cabinet 4 represents one of the IVR options that is available for the RTBS. Refer to section 4.1.2 for more information.

2.1. Rack Configurations for Additional Hardware

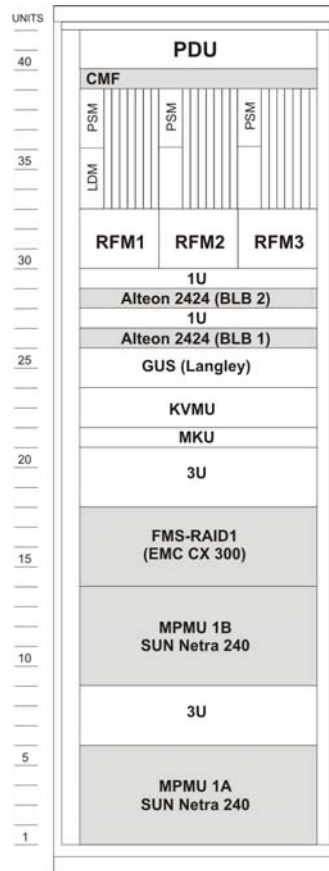
Customers who receive the following optional features will receive additional hardware:

- Data Control and Monitoring Point (DCMP)

2.1.1 DCMP Cabinet

The DCMP’s cabinet layout is displayed in Figure 4-2.

Figure 4-2 DCMP Cabinet



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3. Component Configuration

The following sections contain a brief description of the RTBS components that reside in the cabinets.

3.1. Service Logic Unit (SLU)

The Service Logic Unit (SLU) is the main point of control for the RTBS Service platform. The RTBS Service application executes at the Service Logic Unit, which directs and coordinates the behavior of resources at other components of the system. The SLU is configured on a UPU or DPM.

Table 4-1 SLU Specifications

Feature	Specification
OS version	Unix SCO 7.1.1
Processor	Dual Pentium III 850MHz– based on INTEL 440 BX chipset
Memory	Four 168-pin DIMM Sockets. Up to 1GByte of PC-100 SDRAM
Cache	256 KB integrated cache on die

Feature	Specification
Ethernet Ports	Three Intel PCI Ethernet controllers 10BaseT or 100BaseTX
Serial Ports	The DPM has 4 RS-232 serial port controllers (COM's)
KB, Mouse	Custom interface to Keyboard, SVGA, Mouse, and Mini-Com signals for daughter card
VGA	Video controller providing SVGA (1280x1024 at 256 colors)
SCSI	A Symbiosis PCI SCSI controller providing LVDS Ultra2 support
Hard Disk	One 36 GB SCSI HD
PCMCIA	Front panel PCMCIA style interface for attachment of ATA hard disk card
Dimensions	6U cPCI card
Power	70W

3.2. Signaling Gateway Unit (SGU)

The SGU 3.0 platforms run OMNI 704 software and support dual-CE loadsharing configurations in OMNI clusters of up to two SGUs. The SGU platform is a scalable, UnixWare-based software platform capable of processing thousands of signaling requests per second. The OMNI704 SGU platform provides full SS7 and LAN connectivity.

In the dual-CE configuration, two copies of all management and service-related data are maintained within a cluster, thereby protecting IN services (including persistent applications) from local hardware and software failures and guaranteeing a high level of availability.

3.2.1 SGU Platform

The SGU 3.0 DPM platform employs the Dual Processor Module (DPM) that has an 850 MHz dual-Pentium III processor. Signaling Link Modules (SLMs) are the interface cards that receive and process the SS7 data. Each SLM provides one E1/T1 connection and 8 V.35 serial ports. The TDM connection provides the equivalent of 31 64-Kbps signaling link connections (in non-channelized mode) and up to 16 non-HSL (channelized mode) links for each SLM.

The SGU 3.0 DPM platform is capable of being implemented in configurations of up to 2 CE clusters. SGU modules are shelf-mounted in a DCP chassis.

3.2.2 SGU Components

SGU 3.0 DPM platform components are described in Table 4-2.

Table 4-2 SGU 3.0 DPM Platform Components

Feature	Specification
OS version	Unix SCO 7.1.1 / OMNI 704
Processor	Dual Pentium III Processor (FC-PG) 850 MHz – based on INTEL 440 BX chipset
Memory	Four 168-pin DIMM Sockets. Up to 1GByte of PC-100 SDRAM
Cache	256 KB integrated cache on die

Feature	Specification
Ethernet Ports	Three Intel PCI Ethernet controllers 10BaseT or 100BaseTX
Serial Ports	The DPM has 4 RS-232 serial port controllers (COM's)
KB, Mouse	Custom interface to Keyboard, SVGA, Mouse, and Mini-Com signals for daughter card
VGA	Video controller providing SVGA (1280x1024 at 256 colors)
SCSI Connectors	A Symbiosis PCI SCSI controller providing LVDS Ultra2 support
Hard Disk	One SCSI Hard drive
PCMCIA	Front panel PCMCIA style interface for attachment of ATA hard disk card
FDD	Slim Floppy Disk Drive (FDD): TEAC – FD-05HF-5630; FDD Cable TEAC – 0.44M BLAC FLOPPY DISK; 353MM cable FD-05HF-5

3.2.3 SGU Additional Boards

The SGU 3.0 DPM platform uses the following additional boards:

- Signaling Link Modules (SLM)** – CompactPCI peripheral board running OMNI7-compatible software and capable of supporting 1 E1/T1 High Speed Signaling Link (HSL) at full bandwidth in non-channelized mode or 1 channelized T1/E1 port with up to 16 64k signaling links and/or 8 low-speed signaling links.

The SLM supports configuration of each 64k serial port to V.35 or RS 530 for direct SS7 connectivity. The SLM also supports RS422 for SS7 serial connections via the IVRUT.

- Power Supply Module** – The Power Supply Module supplies the SGU with -48 VDC input power. Jacks on the rear panel provide +5 VDC and +12 VDC output power.

3.2.4 SGU Chassis Configurations

The SGU 3.0 DPM platform is configured in the DCP chassis. One shelf can support a dual-CE configuration, i.e., two DPMs. Supporting boards include up to 2 SLMs for each DPM and the Power Supply Module.

Internal sensors in the DCP chassis continually monitor the unit's internal temperature. The sensor output is used to regulate the speed of the internal fans.

3.2.5 External Interfaces

The SGU 3.0 DPM platform external interfaces are described in Table 4-3.

Table 4-3 External Interfaces

Interface	Type	Location
LAN	Three RJ-45 connectors	DPM board rear panel; rear I/O thru Rear Transition Module (RTM) board
USB	One USB connector	DPM board rear panel
Serial	Eight 10-pin RJ45/48 connectors	SLM board rear panel

Interface	Type	Location
SS7	One 8-pin RJ-45 connector	SLM board rear panel
SCSI	68 pin SCSI connector	DPM board rear panel
VGA	D15 HD connector	VGA PCI Board

3.3. CDTU

CDTU is 1U unit, which consist of DAT Tape and CDROM device. The following tables show the CDTU configuration:

3.3.1 DAT Tape

Feature	Specification
Name	Scorpion 40, DDS4 Tape Drive
Model Number	STD2401LW
Media Format	DDS-4
Interface	68pin Ultra2 SCSI (LVD)
Compressed Capacity	Up to 40GB
Backup Speed	Up to 330MB/sec (compressed)
Jumper Settings	SCSI ID – 3 (default ID is 6)

3.3.2 CDROM

Feature	Specification
Name	TOSHIBA XM _ 6401B with x40 speed
Interface	50pin SCSI2 SE interface
Jumper Settings	SCSI ID – 5, Termination is OFF (pin 5)

3.4. Call Control Server (CCS)

The CCS provides the SS7 signaling interfaces to the Network. The CCS is made up of two Computing Elements (CEs) and uses OMNI SignalWare to perform the interface functions. Adapter boards provide the interface for the signaling links to the network and handle the lower levels of the SS7 protocol. The SS7 protocol stack supports the ITU and ANSI Message Transfer Part (MTP layers 1, 2, and 3) and the appropriate User Part to handle bearer channel call control.

The CCS is based on two load-sharing CEs, operating in partnership. If one CE fails, the remaining CE takes on the additional load of its partner.

3.5. Customer Care Web Service (CCWS)

The Customer Care Web Service (CCWS) is a SOAP/XML-based Web Server that offers a platform and OS independent interface for building customized customer-care applications using modern, highly-productive, and widely available development tools.

Table 4-4 CCWS Specifications

Feature	Specification
OS version	Windows 2003
Processor	Dual Pentium III 850MHz– based on INTEL 440 BX chipset
Memory	Four 168-pin DIMM Sockets. Up to 1GByte of PC-100 SDRAM
Cache	256 KB integrated cache on die
Ethernet Ports	Three Intel PCI Ethernet controllers 10BaseT or 100BaseTX
Serial Ports	The DPM has 4 RS-232 serial port controllers (COM's)
KB, Mouse	Custom interface to Keyboard, SVGA, Mouse, and Mini-Com signals for daughter card
VGA	Video controller providing SVGA (1280x1024 at 256 colors)
SCSI	A Symbiosis PCI SCSI controller providing LVDS Ultra2 support
Hard Disk	One 18 GB SCSI Hard drive (36 GB for RMU)
PCMCIA	Front panel PCMCIA style interface for attachment of ATA hard disk card
Dimensions	6U cPCI card
Power	70W

3.6. Power Supply Module (PSM)

The PSM is a current-sharing DC supply that provides power to each INF 3.4 CE. In the event of a PSM failure, the remaining PSMs (of the other CEs on a given shelf) can supply sufficient current to all modules on the shelf for an indefinite period of time. This is an additional layer of N+1 redundancy below the CE. The PSMs are front-loading and hot-swappable.

3.7. Power Distribution Unit (PDU)

The PDU provides two separate DC power inputs to the Cabinet each supporting voltages of 40.5V to 72V. The PDU also delivers two separate AC inputs, each supporting voltage of 100V to 240V.

3.8. Local Disk Module (LDM)

The LDM provides the local storage medium for the operating system and service application software. It supports up to 18GB of storage and a SCSI interface. The LDM is front-loading and hot-swappable.

3.9. Redundant Fan Module (RFM)

For each shelf, a trio of RFMs provide electronically controlled, dual-speed, fan forced air-cooling for the electronics. Typically, these units run in the slower, silent mode of operation unless a card overheats, whereupon they switch to the higher speed. In the event of a failure of one of the fans, the remaining two in the cage switch to high-speed mode. This provides sufficient cooling until the failed unit is replaced.

3.10. Remote Access Unit (RAU)

The RAU module provides for secure remote operation and maintenance access via dial-up modem and connection through the HSBN. Remote operation is available for any computing element on the LAN (SLU, SDP, or MAU). The high-speed router functionality is combined with remote dial-up modem access capability with eight analog modem ports, and one ISDN modem.

3.11. Remote Connection Unit (RCU)

The RCU is an alternate module for secure remote operation and maintenance access via dial-up modem and connection through the HSBN. Like the RAU, it supports analog line connections, however, it does not support ISDN or X.25.

3.12. Remote Maintenance Unit (RMU)

The RMU performs (via the HSBN) maintenance related activities such as installations, backups, and upgrades, on any DMP based component.

3.13. Monitor Keyboard Unit (MKU)

The Minicom MKU Switch allows several RTBS modules to be controlled from one central keyboard and monitor. A unit to be monitored is selected using the On-Screen Display (OSD).

The rear of the MKU has either 8 or 16 ports that provide cable interconnection to the keyboards, monitors and mouse of each platform.

3.14. Alarm Interface Module (AIM)

The AIM is a high panel with LEDs indicating minor, major, and critical alarms for local (on-site) display. The LEDs are activated by dry contact switches upon command from the MAU. The command interface from the MAU is a serial RS-232 link.

3.15. TRILOGUE Manager (TRM)

The TRM is implemented in a standard UNIX environment and runs on two Compaq AlphaServer TS-10 computers in an Active/Standby redundancy scheme. The Logical Storage Manager (LSM) manages the redundant external hard disk drives. There are SCSI connections for internal (boot) disk and external (database) links.

3.16. High Speed Backbone Network Unit (HSBU)

A High Speed Backbone Network Unit (HSBU) interconnects all RTBS computing elements. The HSBU is implemented through a switched Ethernet backbone, which supports 10BaseT and 100BaseT communication among system modules.

The HSBU is implemented using the AVAYA Technologies Cajun P330 family of switches. Two standalone switches are connected by stack mechanism, while pairs of the switches are cross-connected using redundant full-duplex Fast Ethernet link. Each RTBS processing unit is allocated a switched LAN port on one of the switches. N+1 redundant units (e.g., IVRU-

Ts) connections are evenly distributed between the pair of switches and 2N redundant units are connected to both switches of the pair. Thus, all units get wire-speed connectivity (on their individual segments) at 10 or 100Mbps depending upon performance requirements of that unit. The HSBU switching hubs offer exceptional fault tolerance while their dual-hub implementation provides crucial redundancy. Scalability is achieved by stacking additional pairs of hubs.

The HSBU design and high throughput are key factors contributing to the scalability and extendibility of the RTBS system, as well as to the high availability maintained by the fault tolerant architecture.

3.17. Service Data Point (SDP)

The Service Data Point (SDP) is the database server for the RTBS. Two SDPs operate in a cluster environment using a UNIX operating system, and using Oracle OPS Parallel Server Option. Hot-swappable drives, fans, and power supplies offer superior reliability and availability.

Table 4-5 SDP Specifications

Feature	Specification
OS version	Tru64 Unix 5.1A
Processor	DS25 2X 1Ghz EV68
Memory	16X200-pin DIMM sockets, with 4 GB memory (can be expanded to 16GB)
Cache	8MB dual data @ 333MHz cache
Serial Ports	Two serial embedded ports
KB, Mouse	6-pin miniDIN connectors, embedded on board
Hard Disk	Three 36.4GB 15KRPM Ultra160 SCSI Hard Drives - OR - Three 72GB 15KRPM Ultra160 SCSI Hard Drives
Dimensions	Rack mounted, 5U
Power Supply	Auto ranging 100/240Vac



NOTE

Both an EV68 processor upgrade and a 72 GB disk upgrade are available for the SDP as value-added options.

3.18. SDP Backup Shelf

The Backup Shelf is a third mass storage shelf that houses a shared backup tape drive.

Table 4-6 SDP Backup Tape Drive Specifications

Feature	Specification
Model	HP SDLT 320
Capacity	160GB
SCSI Interface	Ultra2, LVD

Feature	Specification
Buffer	64 MB
Transfer Rate	16MB/s

3.19. SDP Disk Drawers

The SDP database is stored on twenty-two 36GB disks and housed in two shared-access disk shelves. The database is mirrored and is capable of surviving failure of either an individual disk or an entire disk shelf.

3.20. Maintenance Access Unit (MAU)

The MAU hosts the Management Functions for the RTBS. Additionally, a copy of the SAW (Service Administration Workstation) application software is stored on the MAU local disk. This can be invoked in a maintenance operation, for local (on-site) provisioning, and general purpose O&M.

The MAU also provided serial console terminal emulation for the SDP and the TRM.

Table 4-7 MAU Specifications

Feature	Specification
OS version	Windows NT ver.4 OS
Processor	Dual Pentium III – RadiSys P3000 (D) BX2, 550MHz
Memory	Two 168-pin DIMM sockets, supporting 512MB, PC100 DIMM's
Cache	512KB of on-die Level 2 write-back cache
Ethernet Ports	Intel © PRO/100+ Management Adapter Ethernet Adapter
Serial Ports	Two serial RS-232 ports are chassis mounted and connected to SBC
KB, Mouse	6-pin miniDIN connectors, embedded on board
VGA	ATI 3D charger, VGA PCI card
SCSI Connectors	Wide Ultra2 LVD Controller (80MB/sec)
Hard Disk	Two Ultra SCSI 16-bit LVD, 18.2 GB
CD-ROM	SAMSUNG, IDE, SC-152CE x52
Floppy Disk	TEAC FD-235HF, 3.5" 1.44 MB
Dimensions	Rack mounted, 4U

3.20.1 MAU Additional Boards

The MAU has four additional boards:

- **Serial Multiport Card and Panels** – used to support up to 64 serial RS-232 ports. It also supports up to four (4) PM-16RJ connection panels, 16 RS-232 ports each.
- **Minicom ISA cards**
- **Minicom KVB-Master** – controls the entire KVM Switching system. It supports one KVB switching system bus and is connected to the Real keyboard/video/mouse, KVM connectors of its host, and RS-232 of the host for software control.

- **Minicom KVB-Slave** – an ISA expansion board connected internally to the master board, supporting four additional KVB switching buses.

3.20.2 MAU External Interfaces

Table 4-8 MAU External Interfaces

Interface	Type	Location
LAN	Two RJ-45 connectors	UPU I/O filler, PCI Slot 8– embedded on the SBC
Serial	Two D9 connectors Single D26-HD Connector	UPU back side UPU I/O filler, PCI Slot 4- Serial Multiport Board
VGA	D15 HD connector	UPU I/O filler, PCI Slot 8– embedded on the SBC

3.21. DC Inverter Module (DIM)

The SDP and its storage shelves require AC power. This optional unit is used to convert DC to AC power at locations that do not provide a reliable AC power source.

3.22. Power Fan Module (PFM)

The PFM provides cooling and converts DC input power to DC levels required by the system components, N+1 redundant.

3.23. TRM Disk Storage Shelf (DSS)

TRM data redundancy is provided by the same hardware/software configuration as the SDP (section 3.17). Typically 6 to 9 GB disks are used.

3.24. 8-port v.35 - E1 Converter (NAMU)

Used to convert a V.35 signal (from the incoming network) to an E1 signal to be connected to the SGU.



This is a value-added option that is available with the RTBS.

3.25. Load Balancing Agent for OSA

The Load Balancing Agent (LBA) is used to balance the traffic that comes from the external client/application to Converse Open Services Access (OSA) interface. The external application communicates with the OSA interface via the Virtual IP on the LBA. The LBA translates the Virtual IP to Real IP of OSA SLUs.

Converse uses the Radware Web Server Director Pro AS for the LBA.



The LBA is a value-added option that is available with the RTBS.

4. Additional Hardware Component Configuration

The following sections contain a brief description of the RTB components that reside in the additional hardware cabinets.

4.1. Data Control and Monitoring Point (DCMP)

4.1.1 GUS Server

The GUI interface server is used in the system to configure subscriber rules in the database.

Table 4-9 GUS Architecture – Langley II

Feature	Specification
OS version	Windows 2000 server
BIOS version	P11
Processor	Dual Intel Xeon 2.4 GHz 533 MHz Front Side Bus Intel® E7501 chipset
Memory	DDR266 six 168-pin DIMM slots Min 256MB; Max 12GB – 3 banks of 2 DIMMs each
Cache	512KB of on-die Level 2 cache, per CPU
Hard Disk	Up to 2 x 36GB or 73GB SCSI disks
Ethernet Ports	Intel® Fast Ethernet Controller 82546EB supports two 10Base-T/100Base-T/1000Base-TX network subsystems
PCI slots	3 x 3.3V low profile 64-bit/100/66-MHz standard PCI slot 3 x 3.3V full size 64-bit/100/66/33-MHz standard PCI slot
SCSI Controller	Embedded Adaptec AIC-7902W controller providing dual Ultra-320 LVD SCSI (one internal, one external)
Serial Ports	One RJ45 serial RS-232 port Option for two RS-232 with additional cable and I/O filler
KB, Mouse	PS/2 for Keyboard & Pointing Device (Mouse) – Y cable
VGA	ATI RAGE XL PCI graphics accelerator with 8 MB of video SDRAM
CD ROM	IDE CD-ROM Drive (Low-profile)
Dimensions	2U/3.5" (89mm) x 17.5" (445mm) x 20" (508mm)
Weight Max	19 Kg (with two hard drives)
Power DC	DC or AC one or two power supplies. 300W power consumption

4.1.2 SUN Netra 240 Servers

This section describes general specifications of SUN Netra 240 used as MPM server in the system network.

Table 4-10 SUN Netra 240 Server

Feature	Specification
OS version	Solaris 9 4/04
CPU Architecture	One to two 1.28-GHz UltraSPARC® IIIi 64-bit, four-way Superscalar SPARC® V9
Cache	64-KB data, 32-KB instruction, and 1-MB integrated L2
Memory	Four DIMM slots per processor registered DDR-1 SDRAM (PC2100) 128-bit and ECC databus. System configuration from 512 MB to 8 GB
Storage (Internal)	Up to two hot-swap Ultra160 SCSI, 73-GB, 15K-rpm disks slim-line ATAPI DVD-ROM
PC Bus	Expansion bus Three internal PCI 2.2-compliant expansion slots: <ul style="list-style-type: none"> ■ One 64-bit, 33/66-MHz 3.3 V full-length ■ Two 64-bit, 33-MHz 5 V half-length
Serial Bus	Serial - TIA/EIA-232-F asynchronous (DB9) Port Serial management - TIA/EIA-232-F (RJ45) port
SCSI	Ultra160 SCSI multimode (SE/LVD)
USB	Two OHCI-1.0-compliant interfaces, supporting dual speeds of 12- and 1.5-Mbits/sec each
Alarms	Network management One 10 BaseT Ethernet
On-board Ethernet	Four 10/100/1000 BaseT Ethernet

4.1.3 Data Storage Device: EMC CX300

The CX300 configuration for the DPE and the DAE modules are described in the following table.

Table 4-11 EMC CX300

Feature	Specification
Host OS	Solaris, Linux , Windows, and so on.
Hard Disk Drives	Hard Disk Drive 3.5" form factor 1" height. Supported Disk Capacities: 36GB FC/15K(RPM); 73GB FC/15K/10K; 146GB FC/10K; 250GB ATA/5.4K; 320GB ATA/5.4K. Up to 15 Hard disks in enclosure.
Available SW	Navisphere Manager – Management for Clarion storage array. PowerPath – Management for data path. SnapView – Create point in time, pointer based copies. Mirror view – Create point in time, full volume copies. SAN copy (CX500 only) – Remote data replication
DPE enclosure SP - Controller Cards CX300 or CX500	CX300 - Two Storage Processor per DPE, Called SPA and SPB. Each has 2 x 2Gbps fiber channel optical ports for the front end and 1 x 2Gbps fiber channel optical ports for the Back end. 1GB cache memory. CPUs type.

Feature	Specification
DAE enclosure LCC – Link control card	JBOD enclosure. Installed only in DAE units. Provides FC connectivity between SPE to DAE and between DAEs. 2 x LCC card per DAE.
Backup Battery Unit	SPS – 1000W One or two Standby PS in one 1U cage, supplied only with DPE AC. Each unit is connected only to one DPE.
SP Controller firmware	Flare version

5. IVR Component Configuration

The following sections contain a brief hardware description of the two IVR solutions that are available with the RTBS.

5.1. PROGENY Network Interactive Voice Response (NIVR)

The PROGENY Network Interactive Voice Response system (NIVR) is implemented using a Network Application Server (NAS). The NAS is the voice/telephony front end of the platform. Each NAS connects to the operator's network with up to twelve E1 or T1 trunks. However, depending on the actual application call profile, the number of supported E1 or T1 trunks per NAS can be less.

Table 4-12 NAS Server Architecture – Langley II

Feature	Specification
OS version	Red Hat Enterprise Linux 3.0
Processor	Dual Intel Xeon 2.4 GHz 533 MHz Front Side Bus Intel® E7501 chipset
Memory	DDR266 six 168-pin DIMM slots Min 256MB; Max 12GB – 3 banks of 2 DIMMs each
Cache	512KB of on-die Level 2 cache, per CPU
Hard Disk	Up to 2 x 36GB or 73GB SCSI disks
Ethernet Ports	Intel® Fast Ethernet Controller 82546EB supports two 10Base-T/100Base-T/1000Base-TX network subsystems
PCI slots	3 x 3.3V low profile 64-bit/100/66-MHz standard PCI slot 3 x 3.3V full size 64-bit/100/66/33-MHz standard PCI slot
SCSI Controller	Embedded Adaptec AIC-7902W controller providing dual Ultra-320 LVD SCSI (one internal, one external)
Serial Ports	One RJ45 serial RS-232 port Option for two RS-232 with additional cable and I/O filler
KB, Mouse	PS/2 for Keyboard & Pointing Device (Mouse) – Y cable
VGA	ATI RAGE XL PCI graphics accelerator with 8 MB of video SDRAM
CD ROM	IDE CD-ROM Drive (Low-profile)
Dimensions	2U/3.5" (89mm) x 17.5" (445mm) x 20" (508mm)

5.2. Interactive Voice Response Unit (IVRU)

Interactive Voice Response Unit (IVRU) is an alternative to PROGENY NIVR. The IVRU is implemented using a regular IVRU-T and an IVRU-C, which operate under SLU control.

5.2.1 Interactive Voice Response Unit – Telephony (IVRU-T)

Each IVRU-T contains telephony interface cards and Digital Signal Processors (DSPs). They provide the interface to the network voice channels, including DTMF detection and generation.

The new INF 3.4 IVRU-Ts consists of up to four NIMs with 30 ports on each E1 trunk or 24 ports on each T1 trunk. Legacy IVRU-Ts consist of up to two DTMs with 30 ports on each E1 trunk or 24 ports on each T1 trunk.

**NOTE**

The IVRU-T is also known as the MMU (Multi Media Unit).

5.2.2 Interactive Voice Response Unit – Control (IVRU-C)

Each IVRU-C contains telephony interface cards and Digital Signal Processors (DSPs). They provide the interface to the network voice channels, including DTMF detection and generation.

**NOTE**

The IVRU-C is also known as the MSU (Messaging and Storage Unit).

6. Additional Hardware

The customer is required to supply additional hardware for the following RTB software applications; SAW, CCC, and Card Generator.

6.1. SAW and CCC PCs

The Service Administration Workstation (SAW) is the graphical user interface (GUI) that facilitates the provisioning and use of the RTBS service, controlling all of the RTBS administration functions.

The Customer Care Client (CCC) is the graphical user interface (GUI) that facilitates the provisioning of subscribers.

**NOTE**

Network operators have the option of either building their own customer provisioning interface, or using the CCC.

The hardware and software requirements for both the SAW and the CCC are the same.

6.1.1 Recommended Hardware Requirements:

- SAW: 90 MHz Pentium-class PC (1GHz Pentium III for the CCC)
- 96MB RAM (256 MB for the CCC)

- 200MB free disk space
- Video: 1024-768 display, suggested monitor size 17" or greater
- CD ROM Drive
- Network adapter card

6.1.2 Software Requirements:

- Windows 2000 or Windows XP (with Internet Explorer version 5.5 or above)
- Oracle-Client 8.17 or higher (not required for the CCC)
- Microsoft Data Access Components - MDAC 2.6 (not required for the CCC)

**NOTE**

The SAW and CCC do not support Windows 95 and 98.

6.2. Card Generator and Card Decryption Tool PCs

The RTBS Card Generator and Card Decryption software is used to create batches of recharge vouchers or prepaid calling cards. Their hardware and software requirements are the same.

6.2.1 Recommended Hardware Requirements:

- Pentium class PC
- 64 MB RAM
- 100 MB free disk space
- Video: 1024-768 display, 256 colors, suggested monitor size 17" or greater
- 3 1/2" HD floppy drive
- CD ROM Drive

6.2.2 Software Requirements

- Windows 2000 or Windows XP

7. Physical Specifications

The Comverse RTBS platform is housed in standard 19" wide, 41U high, 800mm deep cabinets. The units can be installed free-standing or securely bolted to the floor. The racks and all their included modules are uniformly colored Light Gray (RAL 9002) with the base and roof colored Blue (6.25 PB 4/12 according to Munsell Color Book). Split front and back doors with Dark Gray (RAL 7015) wave perforated sheets give the cabinets an aesthetic, uniform appearance.

All modules have front access, all cabling is from the rear. The cabinets also have rear-vented doors to conceal the cabling.

**SEE**

For information on the DCMP cabinet physical specifications, refer to the DCMP user manuals.

7.1. Mechanical Specifications

The mechanical specifications of the RTBS platform cabinets are shown in Table 4-13.

Table 4-13 Mechanical Specifications

Height	225cm* (*with cable Hood)
Width	61.2 cm
Depth	80 cm
Min. Maintenance Clearance	Front: 100, Back: 100
Maximum Weight (fully loaded Main Cabinet)	450Kg

7.2. Electrical Specifications

The following tables show the power requirements and the recommended site electrical requirements for the RTBS system.

Table 4-14 RTBS Platform Power Requirements

Unit	Power Options
Main Cabinet	40.5 to 72VDC Two Inputs @ 50A per Input Or 40.5 to 72VDC Four Inputs @ 50A per Input
Auxiliary Cabinet	40.5 to 72VDC Two Inputs @ 30A per Input.
SDP Cabinet	40.5 to 72VDC Two Inputs @ 30A+ AC 110-230VAC @ 50 - 60 Hz Two Inputs @ 10A per input

Table 4-15 Recommended Site Electrical Requirements

Input	Main Cabinet	Auxiliary Cabinet	SDP Cabinet
Circuit Breakers	One per Input	One per Input	One per Input
40.5 to 72VDC	Two Inputs @ 50A or Four Inputs @ 50A	Two Inputs @ 30A	Two Inputs @ 30A
AC 230VAC @ 50 - 60 Hz.	N/A	N/A	Two Inputs @ 10A per input

7.3. Power Consumption

7.3.1 Main Cabinet

The total power consumption for the Main IN Cabinet is 2980 watts (DC).

Table 4-16 Main Cabinet Power Consumption

Device	# of Units	DC Power/Watt per Unit	AC Power/Watt per Unit
SGU	4	250	0
DCP Card Cage	2	990	0

7.3.2 Auxiliary Cabinet

The total power consumption for the Auxiliary Cabinet is 2170 watts (DC).

Table 4-17 Auxiliary Cabinet Power Consumption

Device	# of Units	DC Power/Watt per Unit	AC Power/Watt per Unit
AIM	1	15	0
HSBU (Cajun P330)	4	200	0
RAU	1	70	0
MAU	1	200	0
MKU	1	25	0
DSS	2	150	0
TRM (TS-10)	2	380	0

7.3.3 IP Cabinet

The total power consumption for the IP Cabinet is 1596 watts (DC).

Table 4-18 IP Cabinet Power Consumption

Device	# of Units	DC Power/Watt per Unit	AC Power/Watt per Unit
IVRU-T/MMU	8	133	0
IVRU-C/MSU	2	133	0
CCS	2	133	0

7.3.4 SDP Cabinet

The total power consumption for the SDP Cabinet is 2210 watts (AC).

Table 4-19 SDP Cabinet Power Consumption

Device	# of Units	DC Power/Watt per Unit	AC Power/Watt per Unit
Backup	1	0	150
SDP	2	0	880
DSS	2	0	200

7.4. Heat Dissipation

7.4.1 Main Cabinet

The total heat dissipation for the Main Cabinet is 10164 BTUs.

Table 4-20 Main Cabinet Heat Dissipation

Device	# of Units	Heat/BTU per Unit
SGU	4	853
DCP Card Cage	2	3376

7.4.2 Auxiliary Cabinet

The total heat dissipation for the Auxiliary Cabinet is 7401 BTUs.

Table 4-21 Auxiliary Cabinet Heat Dissipation

Device	# of Units	Heat/BTU per Unit
AIM	1	51
HSBU (Cajun P330)	4	682
RAU	1	239
MAU	1	682
MKU	1	85
DSS	2	512
TRM (TS-10)	2	1296

7.4.3 IP Cabinet

The total heat dissipation for the IP Cabinet is 5448 BTUs.

Table 4-22 IP Cabinet Heat Dissipation

Device	# of Units	Heat/BTU per Unit
IVRU-T/MMU	8	454
IVRU-C/MSU	2	454
CCS	2	454

7.4.4 SDP Cabinet

The total heat dissipation for the SDP Cabinet is 8088 BTUs.

Table 4-23 SDP Cabinet Heat Dissipation

Device	# of Units	Heat/BTU per Unit
DIM	1	550
Backup	1	512
SDP	2	3001
DSS	2	512

8. Environmental Specifications

Table 4-24 RTBS Platform Environmental Specifications

Environment	Temperature	Relative Humidity
Equipment Operation	5° to 40° C	5 - 85 %
Equipment Transportation/ Storage	-20° to 70° C	5 - 95%
Recommended Operation Environment	-20° to 25° C	40 - 70%



NOTE

Whenever possible, convection cooling should be used instead of forced ventilation.

9. Regulatory Compliance

The RTBS platform is based on a standardized platform developed by Comverse Network Systems, which has received the following regulatory compliance approvals:

Table 4-25 Regulatory Compliance

Unit	Safety	EMC	GR 63 (NEBS)
Cabinet Auxiliary Cabinet 1:	IEC/EN/CSA-UL 60950	EN 300 386	Compliant
Cabinet SDP Cabinet 2:	IEC/EN/CSA-UL 60950	EN 300 386	N/A
Cabinet Main Cabinet 3:	IEC/EN/CSA-UL 60950	EN 300, 386	Compliant
Cabinet Main Cabinet 4:	IEC/EN/CSA-UL 60950	EN 300, 386	Compliant

Chapter 5

Software Architecture

- Introduction
- ISUP Platform
- IN Platform
- SLF Software
- OMNI Software
- BIP Software
- Oracle Software
- COP Software
- RSM Software
- Administration of Services
- Remote Access Software

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1. Introduction

This chapter describes the software architecture of the Comverse Real-Time Billing System. The following topics are covered:

- ISUP Platform (Section 2)
- IN Platform (Section 3)
- SLF Software (Section 4)
- OMNI Software (Section 5)
- BIP Software (Section 6)
- Oracle Software (Section 7)
- COP Software (Section 8)
- RSM Software (Section 9)
- Administration of Services (Section 10)
- Remote Access Software (Section 11)

2. ISUP Platform

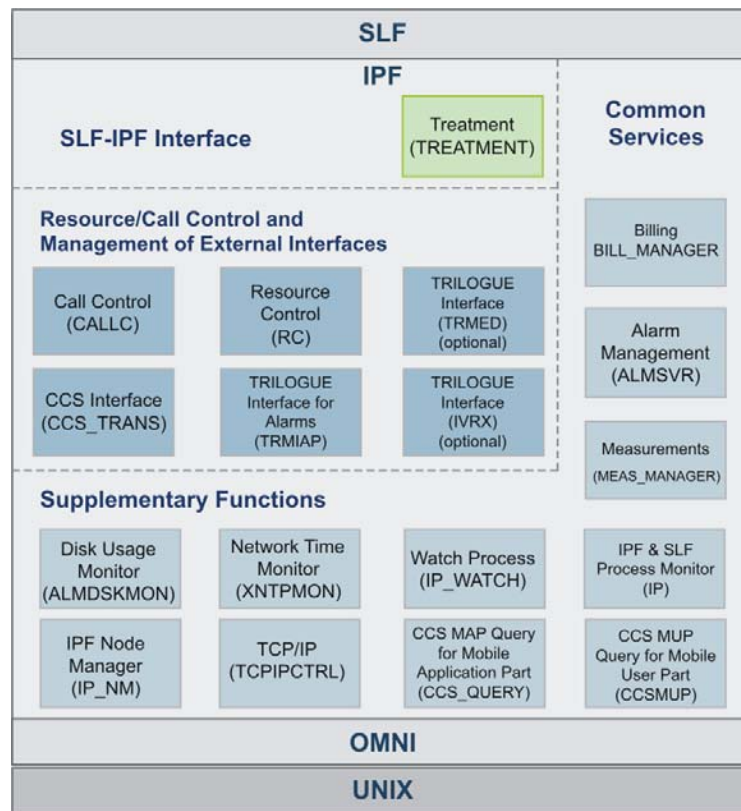
The SLU operates as two separate functional units. The first is the Service Logic Function (SLF), the uppermost layer of the SLU. It encompasses one or more service applications such as the Virtual Private Network (VPN) or Real-Time Billing System.

The second functional unit is the Intelligent Peripheral Function (IPF). The IPF encompasses the processes that manage calls and resources, interface to the other components, and provide services such as billing, statistics collection, and alarm management. The IPF can be viewed as four groups that function as follows:

- **SLF-IPF Interface** – provides an interface between the SLF and the IPF processes that handle Resource and Call Control and Management of External Interfaces.
- **Resource/Call Control and Management of External Interfaces** – processes provide the interface to the other components of the system (e.g. the IVRU-T, the TRM, and the CCS) for accessing, managing and using the resources of these components. This group also provides call management.
- **Supplementary Functions** – provide monitoring and node management for the IPF. This group overlaps somewhat with the Common Services group.
- **Services** – such as billing, accumulation of measurements, and alarm generation are provided by the Common Services group.

The SLU software is built on OMNI SignalWare (Section 5), which provides middleware management of various operating system capabilities, and a UNIX operating system. [Figure 5-1](#) shows the SLU software architecture, with emphasis on the IPF.

Figure 5-1 SLU Software Architecture



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2.1. IPF Software

The IPF software provides a facility for interfacing to the other SLU configured components for the purpose of managing, accessing, and using the resources of these components. The IPF acts as an interface between the SLF and the other components of the SLU.

Some of the actions performed by the IPF are to:

- Route incoming calls to the SLF
- Originate calls requested by the SLF
- Allocate and command IVRU resources to play announcements and collect digits, etc.
- Bridge (cross connect bearer channels) (applicable if an NIU is present)
- Accumulate billing records
- Accumulate IPF, CE, and Service statistics

For ease in understanding, the IPF can be viewed as divided into four functional groups. The software components of these groups are described briefly in Sections 2.1.1 through 2.1.4.

2.1.1 SLF-IPF Interface

The SLF-IPF Interface provides an interface between the service application and the IPF processes that handle Resource and Call Control, and Management of External Interfaces.

Only one process is included in this group: Treatment.

Treatment is the intermediary between the IPF and the SLF. Treatment interfaces with the IPF processes in the Resource/Call Control and the Management of External Interfaces group to carry out call-related requests from SLF application programs. Treatment interfaces with Resource Control to allocate the platform resources required to perform functions requested by the Service Application. For each incoming or outgoing call, Treatment coordinates current call states, allocated resources, and cross-connect information in a Call Context Table, which is updated as the call progresses.

2.1.2 Resource/Call Control and Management of External Interfaces

Resource Control and Call Control, and the Management of External Interfaces is provided by the processes of this group.

- **Resource Control (RC)** – Resource Control is responsible for keeping track of managed resources of the CCS, NIU, and IVRU, the conditions that affect these resources, and their current states. As connected resources come online, they log onto RC via the IPF interfacing software (CCS_Trans, NIU_Trans [optional], and TRI_MED). Resources are provisioned through MML commands.
- **Call Control Process (CALLC)** – Call Control manages the processing and routing of calls to and from the telephone network. CALLC also interfaces with the signaling interfaces in the NIU via the NIU Translator, and in the CCS via the CCS Translator. CALLC uses trunk groups and routing tables defined by MML commands.
- **CCS Translator (CCS_Trans)** – The CCS Translator converts messages exchanged between the CCS and the SLU to/from the internal standardized message format used within the IPF. Refer to the ccstrans(1q) and db.IP.ccsx.\$SHM.pri(5q) Man Pages.
- **TRILOGUE Mediation Software Interface (TRIMED)** – TRIMED translates messages exchanged between the SLU and the MMUs for Voice/Fax Mail and IVRU functions in a non-DIVR environment.
- **TRILOGUE IVRU Translator (IVRX)** – IVRX translates messages exchanged between the SLU and the MMUs for Voice/Fax Mail and IVRU functions in a DIVR environment.
- **TRM IAP Interface Process (TRMIAP)** – TRMIAP forwards critical, major, and minor SLU alarms to the TRM, so they may be displayed on the TRM console. Refer to the trmiap(1q) Man Page.

2.1.3 IPF Supplementary Function Layer

The IPF Supplementary Function layer provides support monitoring and MML routing for the IPF processes.

- **IPF Node Manager (IP_NM)** – The IPF Node Manager is responsible for routing Man-Machine Language (MML) commands to the appropriate IPF process (e.g. Call Control, Resource Control), and for managing the configuration recovery of the IPF after a restart. The IPF Node Manager regularly backs up the current configurations of Call

Control, Resource Control, Resource Platform Interface, Billing Manager, and Measurement Manager. It also maintains a Recent Change Log of MML commands that have been entered since the last backup, and uses this information to perform the configuration recovery when it is required. Refer to the nm(1q) and SCH-BKUP(8q) Man Pages for more information.

- **IPF Logical Node Daemon (IP)** – The IPF Logical Node Daemon monitors all IPF and SLF processes, generating alarms if an IPF or SLF process fails.
- **XNTP Monitor (XNTPMON)** – This process monitors the XNTP daemon, which synchronizes with the system time from the Network Time Protocol (NTP) server on the TRM. If the XNTP monitor detects that the XNTP daemon has stopped, then the monitor restarts the daemon.
- **IPF Watch Process (IP_WATCH)** – This process monitors the IPF and SLF processes for unrecoverable service-affecting failures. If such a failure occurs, IP_WATCH causes a switchover to the standby SLU.
- **Alarm Disk Usage Monitor (ALMDSKMON)** – The Disk Usage Monitor periodically samples one or more mounted file systems to determine the availability of free disk space. By default, the interval between checks is 60 seconds. When usage of a partition exceeds 70%, a minor alarm is issued. When usage exceeds 80%, a major alarm is issued. When usage exceeds 90%, a critical alarm is issued. When the monitored partition usage falls below 85%, 75%, and 65%, the respective critical, major, and minor alarm is cleared.
- **CCS_MUP Process (CCS_MUP)** – The CCS_MUP process converts MUP (Mobile User Part) messages exchanged between the CCS and the SLU in support of an enhanced proprietary HLR query process that determines the roaming numbers of mobile subscribers in the Nordic Mobil Telephone network (NMT). Refer to the ccsmup(1q) and db.IP.ccsM.\$SHM.pri(5q) Man Pages.
- **CCS Query Process (CCS_QUERY)** – The CCS Query process converts MAP (Mobile Application Part) messages exchanged between the CCS and the SLU in support of a generic HLR query process that determines the roaming numbers of mobile subscribers. Refer to the ccsquery(1q) and db.IP.ccsqN.\$SHM.pri(5q) Man Pages.
- **TCP/IP Control Process (TCPIPCTRL)** – The TCP/IP Control Process provides the interface mechanism between the IPF processes and the other SN components. TCPIPCTRL functions in a TCP/IP server mode for interfacing to the TRM, IVRU-T, and CCS. It functions in a TCP/IP client mode for interfacing to the NIU. Refer to the tcpipctrl(1q) Man Page.

2.1.4 Common Services

The processes in this group provide services for the SLF and the IPF. These processes provide provisioning, billing, measurement accumulation, and alarm generation.

- **Billing Manager (BILL_MANAGER)** – The Billing Manager is responsible for collecting and maintaining billing events from the SLF applications. The billing events are recorded in a file that can be retrieved remotely by customer billing systems. Refer to the ipcbm(1q) and IPbill.xxx(5q) Man Pages.
- **Measurement Manager (MEAS_MANAGER)** – The Measurement Manager is responsible for collecting and maintaining measurement counters created by IPF processes and SLF applications. Measurement data is saved in a file which can be

retrieved by other application processes for remote data analysis. Refer to the `ipcmm(1q)` and `IPmeas.xxx(5q)` Man Pages.

- **Alarm Server (ALMSVR)** – The Alarm Server is the process through which SLF and IPF programs generate notifications of events that affect operation of the system. These notifications, categorized as Critical, Major, and Minor Alarms and Events, are formatted, logged to disk files and are also forwarded to the TRM IAP, via the TRMIAP process, and displayed on the TRM console. (Refer to Section 2.1.2)

3. IN Platform

The Converse RTBS Platform uses a proprietary architecture called DTCAP (Distributed Transaction Capabilities Application Part). DTCAP is implemented within the SCP and allows the TCAP protocol messages to be distributed across multiple SLUs. The TCAP protocol resides in the layered network model directly over the SCCP (Signaling Connection Control Part) protocol and directly beneath the IN protocols (Omni TCAP, CAMEL, INAP, WIN, etc.). The TCAP protocol expands the services of the SCCP protocol as well as provides services to the IN protocols. A protocol such as CAMEL, INAP, or WIN which is located immediately above TCAP in the layered network model, uses the services of the TCAP protocol to support communication between TCAP User Protocol Peer Entities.



The DTCAP protocol does not occur as an entity in the SS7 protocol stack. DTCAP does not occur above or below TCAP. Instead, it is interposed in the TCAP data stream internal to the SCP.

The SCCP (Signaling Connection Control Part) provides the ability to communicate with applications using a signaling point. In a basic ISUP call, pre-call messages are viewed by the node as one entity, whereas in IN, messages are used by separate applications within the node. These separate applications are known as subsystems. The SCCP uses a SSN (Sub System Number) to identify each subsystem as its own element.

3.1. Sub-System Architecture for IN User

The IN Protocol Application is responsible for all protocol processing above the SS7 SCCP protocol layer. It can functionally be split into two parts: the DTCAP Protocol and the DTCAP User. The DTCAP Protocol provides the interface to the SCCP layer in the SGU. There is only one IN Protocol Application (e.g. INA) per SLU. The IN Protocol Application interfaces directly with the SLF applications and TREATMENT. The SLF applications register with the IN Protocol Application to receive incoming CAMEL calls. The IN Protocol Application in turn registers with TREATMENT to receive all ISUP calls. The A1129 library is the A1129 ASN.1 message, encode and decode function. This implements ALL messages between the SLF and TREATMENT. The only exception is the TREATMENT Registration message.

The DTCAP User functionality can be split into three parts: the TCAP library, the IN Provider library, and the IN User.

- **TCAP Library** is responsible for TCAP protocol handling. The library closely follows the ITU TCAP architecture. It supports both the ANSI and ITU standards, as specified in relevant documents.
- **IN Provider Libraries** are responsible for IN Provider protocol handling. In this case, it is a CAMEL Provider library. The library is modeled after the ETSI MAP Provider interface. The CAMEL Provider library in turn uses the services of the TCAP library and hence is also referred to as TCAP User.
- **IN User** is responsible for the IN call flow. It interacts with the SLF application using A1129 message set to support application call flow. The IN User is at the center of call processing and is responsible for the IN call handling. It also interfaces to the SLF applications and supports SLF application call flow. The IN User in the ACTIVE IN Protocol Application process is involved in call processing whereas the STANDBY IN Protocol Application process does no call processing. The ACTIVE application is responsible for receiving TCAP messages from the SGU and sending TCAP messages back to the SGU via the DTCAP Protocol. The IN User also interfaces with the TCAP and IN Provider libraries to do low level protocol processing.

3.2. Sub-System Architecture for DistributedTCAP

There are three components that make up the DTCAP: DTCAP Router, DTCAP Application, and DTCAP Protocol.

- **DTCAP Router** – A SCCP application that resides on the SGU and executes under Omni/UNIX. This component is responsible for routing TCAP messages received from the SS7 network to the appropriate DTCAP Application as well as for sending TCAP messages received from the DTCAP Application to the SS7 network. In addition, the DTCAP Router is responsible for flow control of messages in conjunction with the DTCAP Application.
- **DTCAP Application** – A TCAP/IN protocol application that resides on the SLU and executes under Omni/UNIX. This component uses the Omni TCAP library to support the TCAP protocol. Additionally, it can support the IN protocol libraries which use the TCAP library.
- **DTCAP Protocol** – A proprietary protocol application executed between the SGU DTCAP Router and the SLU DTCAP Application.

The DTCAP Router serves an important function in the SGU. It is responsible for routing the TCAP messages received from the SS7 network to the appropriate DTCAP Application as well as for sending TCAP messages received from the DTCAP Applications to the SS7 network. The DTCAP Router is also responsible for flow control of messages in conjunction with the DTCAP Application.

The DTCAP Router process is a designatable Omni process, and can be in an ACTIVE, STANDBY, or IDLE state. There is only one DTCAP Router process per CE (Computing Element). All DTCAP Router processes register with the SCCP Manager as a Data application for specified SSNs (Sub System Numbers) as well as receive data from the SCCP.

One DTCAP Router process, designated as ACTIVE, registers with the SCCP Manager as a Control application and is responsible for sending N_STATE_REQ (User In Service) or N_STATE_REQ (User Out of Service) messages to indicate Sub System status. This process also receives the N_STATE_IND and N_PC_STATE_IND messages. The N_STATE_IND

message indicates whether or not a remote sub system is available. The N_PC_STATE_IND message indicates whether or not the remote point code is available and the amount of congestion on the system.

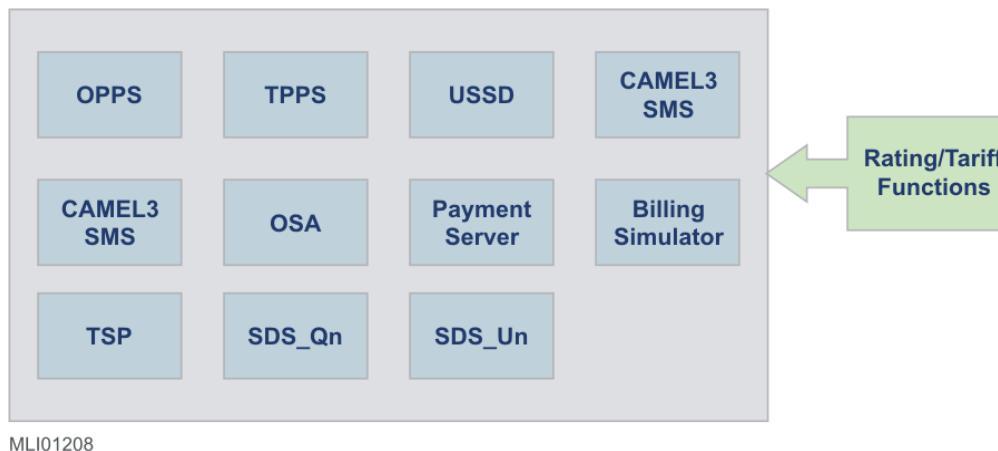
All the DTCAP Router processes maintain a list of SSNs and DTCAP Applications as well as the congestion status. This list allows optimal routing of new transactions and uniform distribution of load across multiple DTCAP Applications.

4. SLF Software

The Service Logic Function (SLF) software can be partitioned into the following functional groups:

1. SLF Database Interfaces:
 - Subscriber Information Handling
 - SLF Service Data Handling
2. Rating/Tariff used by different applications for various activities
3. Applications to handle Voice Calls, Camel3 SMS, USSD, Payment Server, OSA, CAMEL3 GPRS, and SMS message generation.

Figure 5-2 SLF Software Architecture



5. OMNI Software

The following sections provide a discussion of attributes and characteristics of the architecture of the OMNI Signalware System. Also described are major components, with references to service applications (such as the RTBS) that run above OMNI.

5.1. OMNI Computing Elements

The OMNI System may be deployed across multiple hardware platforms (SLUs and SGUs), creating a single distributed system that offers services to a network as if it were a monolithic system.

In particular, the logical node structures and the OMNI Management applications are arrayed across the set of CEs so that they each appear to act as a single entity. The service applications may also be constructed to perform in this manner. In contrast, individual communication devices (links) are necessarily directly connected to each CE. OMNI manages these devices in a manner such that the external networks see all the devices as being terminated on a single system, endpoint, or logical node.

5.2. Distributed Applications

Service applications running on top of the OMNI system are normally distributed across the set of CEs that compose an OMNI Cluster. OMNI, of course, supports multiple service applications on a cluster or a single CE.

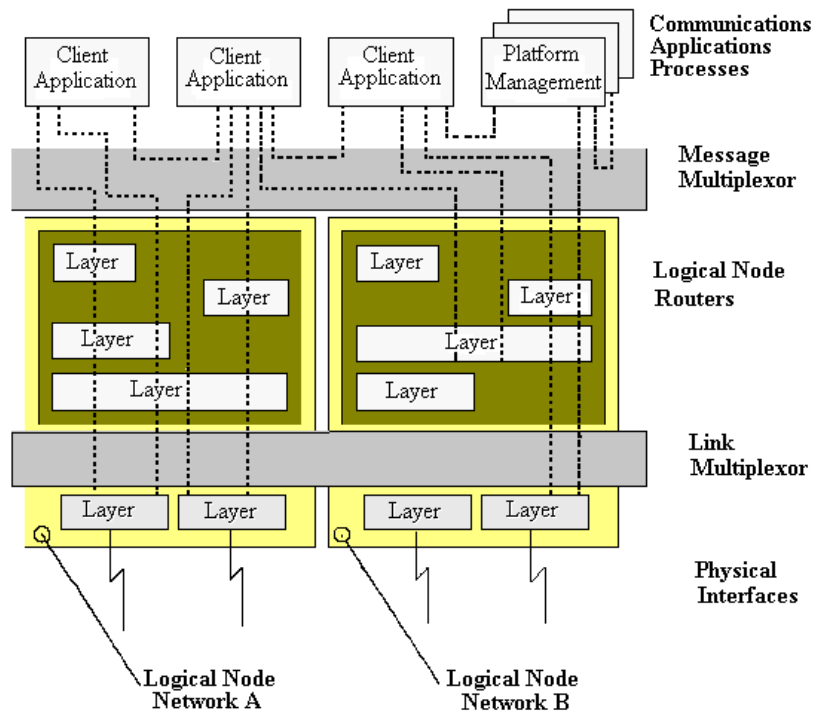
Multiple service application process instances (clones) may be deployed in each CE. Inbound traffic is distributed across the service application instances, based upon the manner in which they register for OMNI system services, and based upon the characteristics of the logical nodes and their protocols.

5.3. Logical Node Architecture

OMNI Logical Nodes are functionally segmented for optimal performance, maximum throughput, and minimum response time. Functionality is placed at three distinct locations within the architecture:

- IO Controller
- Streams
- User Processes

Figure 5-3 OMNI Logical Nodes



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The direct communication between application processes and IO controller (without intervening process context switching) is a key characteristic of OMNI logical node architecture and it is the basis for the high throughput and low response time characteristic of the RTBS.

In the figure above, the physical interfaces terminate on IO controller devices programmatically "below" the Link Multiplexor. The IO controllers are single board computers running under a local real-time executable. They are attached to the UNIX host via an IO driver software component. The software deployed in this environment is defined to be "as much as can be made resident on the device that requires only a single communications link view." In SS7, this includes Level 1, Level 2, and a subset of Level 3.

The Link Operations Multiplexor (LOM) is the software component that provides logical-to-physical mapping of communication links. Logically, the link multiplexor is associated with a non-resident port (NRP) multiplexor, whose function is to route messages (outbound) to links in other CEs to be transferred to the CE upon which they physically reside.

The routing portions of the logical node reside programmatically "above" the link multiplexor. OMNI logical node routers operate in the kernel as UNIX streams modules.

For inbound traffic, the routers are responsible for selecting the specific process instance to which the message will be sent.

For outbound traffic, the routers are responsible for selecting a specific logical link to process the message.

The routers perform both protocol-related functions and load-distribution functions. Functionally, the streams-based portions of the protocol handling are selected to be the smallest possible portion of each protocol layer that was necessary and sufficient to perform routing of normal data messages to applications. Additionally, these portions act as an agent for protocol management functions under direction of the process-based protocol managers.

Programmatically "above" the logical node routers is the Message Operations Multiplexor (MOM). It provides queues for message-oriented communication between processes (process to process) and between the logical nodes and the processes (process to network).

Messages arriving from the network flow from the physical interface via the IO controller to the LOM where they are passed up the appropriate logical node routers following a pre-determined path. The routers ultimately select a message queue associated with a specific process instance. When an application process accesses its message queue, the message is moved from the kernel space to the process space. Outbound messages flow in the inverse manner.

The path of a message through the logical node routers is partially determined by protocol and message content and partially determined by application registration (resulting from attach and bind). For example, in an SS7 logical node, an application may be registered as an ISUP user wherein the message flows (inbound) from MTP to ISUP. Another application may be registered as a TCAP user. In this case, the message flows (inbound) from MTP to SCCP to TCAP. Outbound routing is analogous. Control of message pathing through the routers allows the use of multiple protocol components in a logical node that may be used differently depending upon message originator and destination.

5.4. Cluster Structure

OMNI-based systems can achieve scaleable performance and reliability by operating on multiple CEs in a distributed manner. The Platform is deployed on each CE independently. When started, the individual instances of the Platform contact each other and associate into a single instance of the OMNI system. Management of the communication resources, application resources, and the operations interface are combined so that the result, from the network and service applications view, is that of a single cohesive system.

When CE failures occur, OMNI automatically reconfigures in an appropriate manner. SS7 link sets can be deployed with link set members terminated on multiple CEs so that failure of a device or CE will result in loss of capacity rather than loss of connectivity or service.

6. BIP Software

The Comverse Real-Time Billing Solution (RTBS) rates activities in real time for both prepaid and postpaid subscribers. When enabled, RTBS writes one or more Call Detail Records (CDR) for each activity performed by the subscriber. In postpaid networks, CDRs are used for billing subscribers, while in prepaid networks they may be used for many purposes, including consolidating charges with other networks. The RTBS Billing Interface Package (BIP) collects CDRs and other types of billing records, and distributes them to other networked billing platforms.



For more information on Call Detail Records, refer to the *RTB External Interfaces Manual*.

6.1. BIP Operation

In the RTBS, CDRs are generated by multiple Service Logic Units (SLUs) and then forwarded to the BIP application running on the TRM unit. The BIP acts as a secure centralized point of storage for all CDRs generated within the RTBS. From the BIP the CDR files may be pushed to, or pulled by, an external CDR processing application.

Optionally, RTBS can be configured such that SLUs push CDRs directly to an external CDR processing system, and use the BIP as a backup when the external system is unavailable. In this case, the BIP acts as a temporary buffer, holding CDRs until the external system is again available. When the external system becomes available, the BIP transfers the CDRs it has been holding. Note that this means that for some period of time the external CDR processing system will be receiving CDRs from SLUs and the BIP simultaneously.

Since CDRs are typically not critical in prepaid applications, either of these mechanisms is acceptable. However, for converged billing systems or prepaid systems with IN applications used by the postpaid billing system (such as VPN for postpaid), reliable transport and storage of CDRs for several days is critical.

While CDRs show all rated activities that are performed against a subscriber account, they do not contain information on all balance affecting operations. Customer Care balance adjustments and Periodic Charges, for example, are not reflected in CDRs; they are reflected in Monetary Transaction Records (MTRs).

In addition, not all recharge operations are recorded in CDRs. IVR-initiated recharges are recorded, but any other recharge operation creates only a Recharge History (RECH), not a CDR.

In order to make MTR- and RECH-related events available to external systems, BIP includes utilities that extract the relevant fields from the SDP and deliver them to the external platform in “CDR-like” format.

Finally, both the SLU and external devices, such as switches, generate Outage Record (OR) files. In the event of system outages, the RTB Revenue Assurance feature uses OR files to insure that billable activities are properly rated and charged.

7. Oracle Software

The database management system on the SDP is Oracle Enterprise Edition (version 8.1.7 or later) with the Parallel Server and Advanced Replication options. The Oracle database provides a very robust and high capacity solution for demanding IN applications.

The OPS (Oracle Parallel Server) option allows the two hosts to access the same database simultaneously, exchanging information in order to provide a faster switchover in the event of a failure of the active host.

8. COP Software

Checking of Operations Package (COP) is software that serves as a monitoring engine for the SDP. COP resides on the SDP and monitors hardware and software modules, and reports alarms when needed. COP is made up of the following components:

- **COP Alarm Service Daemon** – The COP Alarm service daemon is a process that establishes a connection with Integrated Alarm Processor (iAP) via UDP, maintains iAP protocol, sends alarms, and sends messages in iAP format.
- **COP Daemon** – The COP Daemon is the heart of COP, running on both SDP Nodes 24/7. The COP daemon is responsible for scheduling and launching monitoring module scripts as well as for reading reports. After the reports are analyzed, alarm information is forwarded to an alarm service process for further delivery to iAP.



Refer to Chapter 6 for more information on the COP monitoring module.

9. RSM Software

The Remote Service Manager (RSM) software automates the maintenance and support of a live Comverse RTB system. This advanced support software proactively monitors and manages systems from a central location. The RSM includes a central control unit, located in Comverse' support offices, and remote units installed at the operator site. Bi-directional data transmission allows real-time communication between the central and remote units for effective system monitoring and planned activities such as preventive maintenance.



Refer to Chapter 6 for more information on RSM monitoring.

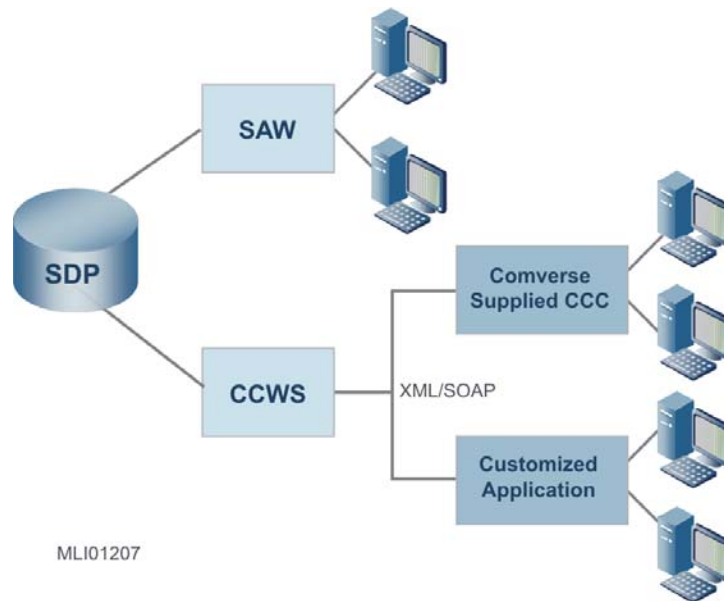
10. Administration of Services

This section reviews the administration of RTB services via the SAW/CCWS and administration of the Virtual Private Network (VPN).

10.1. Administration of RTB via the SAW and CCWS

The RTBS database is located on the SDP. Provisioning is performed by either the Service Administration Workstation (SAW), or the Customer Care Web Service (CCWS).

Figure 5-4 SAW and CCWS SDP Administration



10.1.1 SAW

The SAW is a Visual Basic client workstation on a PC that directly accesses the SDP database. Any modifications to the database are verified immediately. Service data, such as class of service, service provider, tariffs, etc., is more or less static. The initial calls handled by the SLU, upon startup or switchover, cause the SLU to load service data from the SDP, until all the static data is recorded. This results in the SLU maintaining a full representation of the service data as defined in the SDP. When a call comes into the system the SLU uses this data. It does not need to retrieve the system data from the SDP for every call. When modifications are made to the service data (on the SDP), they are not forwarded automatically to the SLU. In the SAW, changes are made to a future service data version. After the changes are completed, the version is scheduled to take effect at a specified time. When the version becomes current, the SLU notification process begins. As new calls come into the system the SLU requests data from the SDP until all the new static values have been recorded in the SLU.

10.1.2 CCWS

The CCWS is a SOAP/XML-based Web Service that directly accesses the SDP. The CCWS offers a platform and OS independent interface for building customized applications to provision subscriber information. Network operators can either download a Customer Care

Client (Chapter 5) provided by Comverse, or build their own customized interfaces in any language or platform (HW, OS, development tools) that is SOAP-enabled.

Subscriber and recharge card data are not stored locally on the SLU. When a call is processed by the SLU, the SLU requests the subscriber information from the SDP, and keeps a copy of the subscriber's records throughout the duration of the call. Upon completion of the call the SLU modifies the subscriber data according to the call, and sends the modified data back to the SDP, which updates the database tables. Individual subscriber data is only maintained by the SLU during that subscriber's call.

10.2. Administration of VPN

The VPN database is located on the SLU. Provisioning of the VPN is performed on a terminal provisioning program (tpp) on the SLU. Modifications to the tpp are performed on the SLU, and effected immediately. The SLU accesses the database directly in order to process calls.

11. Remote Access Software

There are several software solutions that support remote access in the Comverse RTBS.

- **Point-to-Point Protocol (PPP)** provides Internet access for both telnet sessions and data transfer by FTP. The PPP software (along with additional hardware) is installed on the Remote Connection Unit (RCU).
- **Reflection and Exceed for Windows** can provide telnet and FTP connections to all units. Direct connection is also available directly to the TRM or SDP.

The standard method of remote access, using a standard modem and VT100 emulation is also available.

Chapter 6

Management

- Implementation
- Backup and Restore
- Data Export and Extract
- Monitoring
- Reports



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1. Introduction

This chapter describes the management functions of the Comverse Real-Time Billing Solution. The following topics are covered:

- Implementation (Section 2)
- Backup and Restore (Section 3)
- Data Extract and Export (Section 4)
- Monitoring (Section 5)
- Reports (Section 6)

2. Implementation

This section gives an overview of how the Comverse RTB SOLUTION is implemented at a customer site.

2.1. Project Planning

The IN Division program manager completes a Project Planning Document (PPD) for the customer. The PPD document provides the guidelines, responsibilities, definitions and characteristics of an IN Division RTB SOLUTION Project.

Information that is gathered includes site locations, services deployed, number of subscribers, and system architecture.

2.2. Site Survey

A CFD engineer completes a site survey during the planning phase of the installation. The site survey is intended to provide the program manager and CFD engineer with all the technical information required for an installation such as power requirements, cabinet locations, and cabling information. The site survey allows for pre-planning by the engineer and significantly reduces on-site delays.

2.3. Hardware Installation

After the site survey has been completed, the RTB SOLUTION hardware is shipped. The hardware includes all the cabinets, cables, and connectors that are required to operate the RTB system. A mechanical engineer installs the hardware and makes all necessary connections to the customer's network.

3. Backup and Restore

Recovery Manager (RMAN) is the Oracle tool that allows users to back up, copy, restore, and recover data files, control files, and archived redo logs on the SDP database. RMAN is

invoked as a command line utility from the Oracle O/S prompt or the GUI-based Enterprise Manager Backup Manager.

When RMAN is started, the following operations occur:

- The RMAN user session starts on the client.
- RMAN creates two default server sessions that connect to the database. The target database is the database that will be backed up or restored.
- If I/O is performed on a disk or tape, RMAN requires that one channel be allocated for each disk or device. A channel corresponds to a server session.
- If there is no connection to a recovery catalog, RMAN creates a server session on the recovery catalog database.

When connecting to the target database, RMAN uses server sessions to perform the backup and restore operations through a PL/SQL interface. RMAN physically stores its backups and copies on disk or, if media management software is used, on tape. RMAN stores metadata about its backup and restore operations in the recovery catalog, which is a centralized repository of information, or exclusively in the control file.

Typically, the recovery catalog is stored in a separate database. If a recovery catalog is not used, RMAN uses the control file as its repository of metadata.

In order to store the RMAN backup information, a Recovery Catalog (which is created by automated scripts) must be present.

Three methods of backups available from the SDP's Oracle database:

- **Full Backups** – A full backup creates a complete backup of the database excluding archivelog files. Full backups are automatically preformed at night.
- **Archivelog Backups** – Archivelog Backups are the backups of archived redo logs. They are backed up regularly.
- **Resync** – Resync is a process which "resync's" the recovery catalog with the control files. When a resync occurs, RMAN reads the information in the controlfile and compares it with the information in the Recovery Catalog. It then updates the Recovery Catalog with any missing information. A full resync should occur after every full, incremental, or archivelog backup.

3.1. Backup/Restore Reports

The following section shows the available reports for backup and restore:

- **LIST BACKUPSET OF DATABASE** – lists all backups of the database
- **REPORT OBSOLETE** – creates a list of backup files that are obsolete, i.e. older than the latest full backup.
- **REPORT SCHEMA** – list of all the datafiles and tablespaces in the target database at the current time.
- **LIST INCARNATION OF DATABASE** – lists all database incarnations registered in the recovery catalog

4. Data Export and Extract

The SDP database contains information that may be used for generating reports on external systems. This information is located in specific database tables and may be exported or extracted from the RTB SOLUTION. The names of these tables are:

- Subscriber Data
- Recharge Voucher Data
- Account History Data
- Measurements Data
- Event Log Data

4.1. Subscriber Data

Subscriber data is composed of the following database tables:

- **pps_subscriber** – The table in which much of the data can be found. Every subscriber has one record in this table.
- **subscriber_info** – Additional general information fields. Every subscriber has one record in this table.
- **subs_phonebook** – Subscriber phonebook entries used in the "Friends and Family" feature. Every subscriber may have zero or more records in this table.

4.2. Recharge Voucher Data

Recharge Voucher data is composed of the following database table:

- **voucher_definition** – defines the characteristics of large batches of vouchers. In order to normalize the database, multiple vouchers use the same voucher definition and point to a record in this table.

4.3. Account History Data

Account history data is composed of the following database tables:

- **call_history** – lists every call made by (or to) the subscriber, except recharge calls that are recorded in a separate table.
- **recharge_history** – lists every recharge call made by the subscriber.
- **mtr** – the Monitory Transaction Record (MTR) table lists every change in a subscriber balance that was not caused by a billable call or by a recharge call. Thus, the MTR complements the call and recharge history tables.

4.4. Measurements Data

Measurements data is composed of the following database tables:

- **measurement** – prepaid service measurements and statistics
- **system_measurement** – platform measurements and statistics
- **sdp_measurement** – SDP sub-system measurements and statistics

4.5. Event Log Data

Event Log data is composed of the following database table:

- **event log** – contains records for various system and service events.



For more detailed information on these database tables as well as export and extract procedures, refer to the *RTB Operations and Maintenance Manual*.

5. Monitoring

Two software packages are used to manage and monitor the RTB system:

- COP (Section 5.1)
- RSM (Section 5.2)

5.1. Checking of Operations Package (COP)

Checking of Operations Package (COP) is software that serves as a monitoring engine for the Comverse Real-Time Billing Solution (RTBS). COP monitors hardware and software modules, and reports alarms when needed. The COP software resides on the SDP.

COP is made up of the following components:

- COP Alarm Service Daemon
- COP Daemon
- Monitoring Modules

5.1.1 COP Alarm Service Daemon

The COP Alarm Service daemon is a process that establishes a connection with Integrated Alarm Processor (iAP) via UDP, maintains iAP protocol, sends alarms, and sends messages in iAP format.

5.1.2 COP Daemon

The COP Daemon is the heart of COP, running on both SDP Nodes 24/7. The COP daemon is responsible for scheduling and launching monitoring module scripts as well as for reading reports. After the reports are analyzed, alarm information is forwarded to an alarm service process for further delivery to iAP.

5.1.3 Monitoring Modules

Monitoring Modules monitor the various hardware and software components of the SDP. Monitoring modules are scheduled and run by the COP daemon. Each module consists of the following files:

1. **module_name.cfg** – configuration file, mandatory. The format used in the file is:

```
parameter_name=value
```

2. **module_name.chk** – sensor script, mandatory, checks the module it is responsible to check. The script receives an instance name (for example disk name or table name) as first command line argument. The instance name is optional and passed only if explorer script is defined. The following optional messages are printed in the standard output:

STATUS=<numeric value comparable with threshold values>

INFO=<any text as additional information>

ERROR=<any error message>

3. **module_name.xpl** – explorer script, optional, could be started periodically to explore the system and refresh the list of monitored instances of the module. Its purpose is to avoid hard coding names such as disks, file systems, tablespaces, and tables. Upon successful completion the following optional messages are printed in the standard output:

LIST=<comma separated list of the monitored instances>

INFO=<any text as additional information>

ERROR=<any error message>

4. **module_name.fix** – correction script, optional, launched by COP daemon upon discovering alarming condition from the module, receives alarm severity as command line argument. Upon successful completion the following optional messages are printed in the standard output:

INFO=<any text as additional information>

ERROR=<any error message>

For example, the package FSCAPACITY checks the capacity of the file system. The following files are delivered:

- fscapacity.cfg (file, containing configuration parameters)
- fscapacity.xpl (explorer script, identifies file systems to check). Possible output:
- LIST=/,usr,/oracle,/archive/vol1,/backup_vol
- fscapacity.chk (checks FS capacity, returns percentage used) will be started three times (for each file system from the list above). Possible output: STATUS=60
- fscapacity.fix (attempts to free space if close to full)



NOTE

For more information on COP, refer to the *RTB Operation and Maintenance Manual*.

5.2. Remote Service Manager (RSM)

The Remote Service Manager (RSM) is a centralized management platform that automates the maintenance and support of live Comverse RTB systems. This advanced support tool proactively monitors and manages systems from a central location. The RSM includes a central control unit, located at a 24/7 Service Center facility in Comverse' support offices, and remote units installed at the operator site. Bi-directional data transmission allows real-time communication between the central and remote units for effective system monitoring and planned activities such as preventive maintenance.

The RSM solution is made up of three software components:

- Site Servers
- Communication Servers.
- Vendor Servers

5.2.1 Site Server

The RSM Site Server automatically collects a comprehensive set of data directly from each RTBS customer site. The Site Server collects only the data that Comverse support reps need to solve problems.

The system recognizes and supports many protocols, including SNMP, Telnet, Syslog Server, TL1, and FTP. The system also supports the Perl scripting language.

5.2.2 Communication Server

The RSM Communication Server is the communication layer between the Site Server and the Vendor Server. It performs the following functions:

- **Handling clients:** Storing client (Site Server and Vendor Server) information so as to enforce quota policy on a client level, and to help the Communication Server administrator manage the Communication Server system.
- **Handling messages between clients:** Communicating files (such as Product Lines and Problem Reports) and requests between the Vendor Server and the Site Server, storing them and enabling their retrieval. The message transfers are done over the Internet, and all data is encrypted. Posting is seamless, efficient, and highly secure.

5.2.3 Vendor Server

The RSM Vendor Server is comprised of several software components, enabling Comverse to assign specific responsibilities and capabilities to individual TAC engineers. The functions of the Vendor Server include:

- Defining rules such as Collection Routines, Collection Profiles, and Analysis Rules.
- Distributing support knowledge either to specific customers, a pre-defined group of customers, or to the entire installed base.
- Storing data received from the Site Servers.
- Analyzing all data received from the Site Servers. The data is analyzed according to the relevant Analysis Rules
- Generating intuitive reports based on the analyzed data and, through a web browser interface, displaying them automatically to Comverse support reps.
- Creating collection routines to collect additional data about a designated device from the Site Servers, without requiring remote access to the customer site.
- Interfacing to other applications that the service organization uses to further enhance the service and support process.

6. Reports

The Comverse RTB SOLUTION supports a sophisticated mechanism to define, run, and schedule reports against its database.

The report generator uses the Crystal Reports software package, which provides the report creation environment as well as the run-time support.

Except for creating report templates with Crystal Reports, reports are managed and executed from the SAW. The SAW supports the following report-related tasks:

- Adding new report templates to the service
- Defining run-time attributes of reports (e.g., some reports require criteria be entered by the operator when the report is run)
- Running reports
- Scheduling reports to run at predefined times and intervals
- Formatting and printing report results
- Viewing results of previously run reports (e.g., results of scheduled reports)

Reports are run against the system relational database. It is possible to run reports against the following types of data, all of which is stored in the database:

- **Subscriber reports** – A report may list all the subscribers who will become suspended within seven days, or count all the subscribers that have less than \$10.00 in their accounts.
- **Voucher reports** – A report may list expired vouchers, unused vouchers of a given batch, and the sum of all the money kept in the voucher system.
- **Statistical reports** – The system keeps track of various statistics, and stores the sampled numbers in the database. Some of that data is platform-related (like the memory utilization in the system computers) while other data deals with the RTB SOLUTION (e.g., the number of seconds used by RTB SOLUTION subscribers every hour). Reports can be run against the collected statistics to provide an aggregate picture of the system and service behavior. Such data can be used for operational purposes (e.g., to determine when a system expansion is due) or marketing needs (e.g., to measure the effect of a marketing promotion).

6.1. Available RTB Solution Reports

The following is a list of all available RTB Solution reports:

- Subscriber Counts
- Subscriber Lists
- Voucher Counts
- Voucher Lists
- Measurements – Platform
- Measurements – Traffic
- History – Lists
- History – Counts
- Audit
- Table Dumps
- Other



For a complete list of RTB Solution Reports, please refer to the *RTB Service Provisioning Manual*.

6.2. Running Reports

Reports are run by querying one or more SDP databases for specific information. After the information is located and organized, the report can be viewed through various output devices. Reports can be routed to a printer, viewed on screen, or saved to a file for use in other applications.

6.3. Exporting Reports

When a report is viewed on the screen, the user can print the report or export it to a file format (Table 6-1). It can be saved to a file in up to twenty formats (including an Excel spreadsheet or a Word document).

Table 6-1 File Formats

Character-separated values	HTML 3.0 (Netscape 2.0)
Comma separated values (CSV)	Lotus 1-2-3 (WK1)
Crystal Reports (RPT)	Lotus 1-2-3 (WK3)
Data Interchange Format (DIF)	Lotus 1-2-3 (WKS)
Excel 2.1 (XLS)	Rich Text Format
Excel 3.0 (XLS)	Record Style (columns of values)
Excel 4.0 (XLS)	Tab-separated text
Excel 5.0 (XLS)	Tab-separated values
HTML 3.0 (Draft Standard)	Text
HTML 3.0 (Explorer 2.0)	Word for Windows

Chapter 7

Interfaces

- Introduction
- RTBS Supported Signaling Protocols
- SS7 Signaling
- Home Location Register (HLR)
- Host Interface for Alarms (HIL)
- Host Interface for Billing (HIB)
- Customer Care Web Service (CCWS)
- Host Interface for Administration (HIA)
- Remote CUG Provisioning Web Service
- Call Detail Record (CDR)
- Open Services Access (OSA) Charging
- Payment Server
- CAMEL3 GPRS
- External IP Support

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1. Introduction

This chapter describes the interfaces to the Comverse Real-Time Billing System (RTBS). The following topics are covered:

- RTBS Supported Signaling Protocols (section 2)
- SS7 Signaling (section 3)
- HLR (section 4)
- HIL (section 5)
- HIB (section 6)
- CCWS (section 7)
- HIA (section 8)
- Remote CUG Provisioning Web Service (section 9)
- CDR (section 10)
- OSA (section 11)
- Payment Server (section 12)
- CAMEL3 GPRS (section 13)
- External IP Support (section 14)

2. RTBS Supported Signaling Protocols

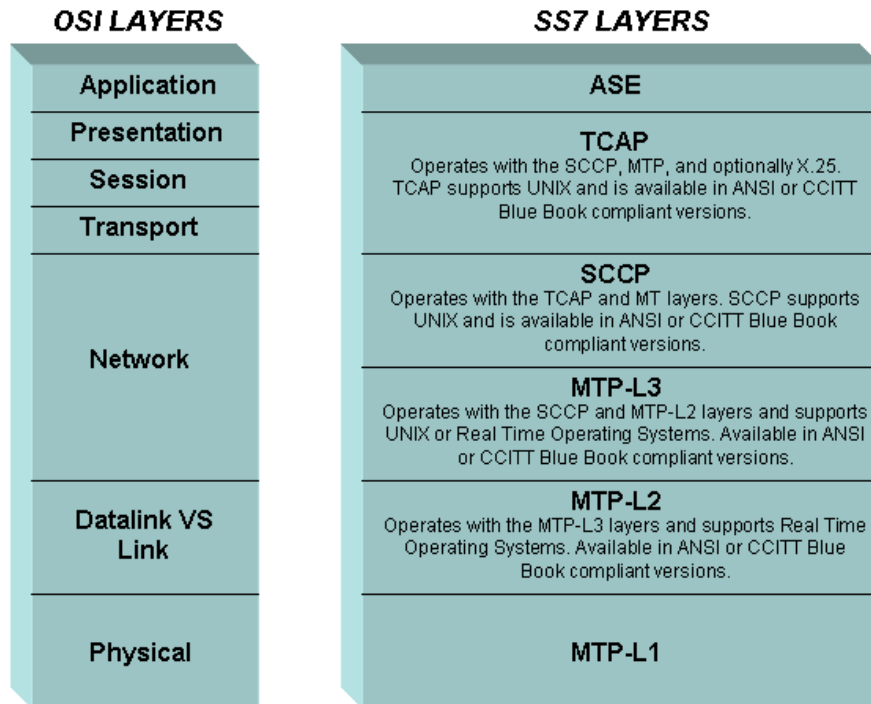
The following protocols are fully supported by the Comverse RTBS:

- **IN Protocol**
 - CAMEL
 - INAP
 - IS-41P (Nortel WIN)
 - IS-826 (includes some portions of IS-41D)
 - MAP
- **In Band Protocol (requires summa)**
 - Feature Group D
 - MF R2
- **SS7 Circuit Based Protocol**
 - ISUP (ITU, Japanese, ANSI)
 - IUP (British standard)
 - TUP (French)

3. SS7 Signaling

The SS7 network is an internationally standardized telephony network specializing in the advanced handling of telephony signaling. It is a packet-switching network protocol that does not utilize trunks, but separates the signaling from the voice to provide a secure, reliable communications infrastructure.

Figure 7-1 OSI and SS7 Layers



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The Service Gateway Unit (SGU) a part of the RTBS SCP, constitutes a logical node in the SS7 network and functions as a terminating Signaling Point (SP). It is assigned a unique point code for its site location. It has no transit exchange capabilities, that is, it can receive incoming calls that are directed to it, but it cannot transfer signaling messages that are directed to another Destination Point Code (DPC).

The following paragraphs describe how signaling information from the SS7 network is received by the SGU and distributed to multiple SLUs for processing.

3.1. SGU - SS7 Communications Interface

SGU - SS7 communication is based upon the OMNI Soft platform. The SGU implements the SS7 stack up to and including the SCCP layer. SCCP is an end-to-end protocol between peer-protocol entities at the Mobile Switching Centers (MSCs) and the SGU.

Signaling information from the SS7 network is transported to the SGU in the form of message-signaling units (MSUs). This information exchange is supported by the TCAP

protocol, an application layer of the SS7 protocol that uses the services of the SCCP. The TCAP protocol carries various IN protocols (CAMEL, WIN, and INAP) that are later extracted by IN applications at the SLUs.

Inbound from SS7, the SGU distributes the SCCP content (TCAP) to multiple TCAP protocol entities at the SLUs. In the outbound direction, the SGU accepts TCAP protocol data from these distributed TCAP protocol entities, as it passes this data outbound to SS7 in the SCCP content.

3.1.1 Transaction Control Application Part (TCAP)

The Transaction Control Application Part (TCAP) is an application level (or layer) of the SS7 protocol. The TCAP protocol resides in the layered network model directly over the SCCP (Signaling Connection Control Part) protocol and directly beneath the IN protocols (CAMEL, INAP, WIN, etc.). It provides a set of tools in a connectionless environment that an application at one node can use to execute a procedure at another node, and then exchange the results.

This part of the SS7 network includes any application-layer protocols, as well as any transport, session, and presentation layer services and protocols that support the TCAP. In a typical SS7 application, TCAP uses the services of the SCCP, which in turn uses the services of the MTP.

3.2. SGU – SLU Communications Interface

The SGU sends messages in the form of DTCAP Protocol Data Units (PDUs) to the SLUs. DTCAP is carried over the User Datagram Protocol (UDP) on the HSBN. The DTCAP protocol carries the TCAP protocol, which in turn, carries the IN protocols (CAMEL, WIN, and INAP). IN applications at the SLUs extract IN PDUs from the TCAP content.

The DTCAP protocol is implemented within the Intelligent Network RTBS SCP to distribute TCAP traffic across multiple SLUs. This protocol is implemented between two or more DTCAP protocol entities, one at the SGU and one or more at each SLU that supports a TCAP application.

The distributed TCAP protocol receives TCAP messages from the SCCP layer at the SGU and distributes them in a round-robin manner to the SLUs. The DTCAP protocol is also responsible for detecting SLU failure, recovery, and overload.

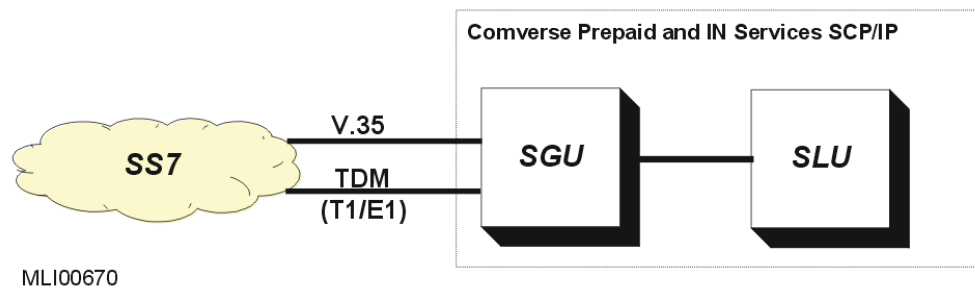
3.2.1 DTCAP Protocol

DTCAP is a Comverse-proprietary protocol inserted in the SS7 stack between the SCCP and the TCAP protocol layers. It can be described as a multiplexor/demultiplexor between the single SCCP protocol entity at the SGU and multiple TCAP protocol entities at the SLUs. As such, it makes the multiple, distributed, TCAP protocol entities appear to the SCCP layer as one, unified, TCAP protocol entity.

3.3. SS7 Signaling Link Connectivity

The SGU enables the RTBS SCP to connect to the SS7 network via a TDM link or through V.35 serial connections (Figure 7-2). The capabilities of the SS7 interface cards used in the two platforms are discussed below.

Figure 7-2 RTBS SCP/IP-SS7 Connectivity



3.3.1 UPU Platform SS7 Card

The Jaguar PCI board provides one E1/T1 port for a connection to a single TDM circuit. Depending on the configuration, 4 ISA slots are available for V.35 serial connections. Each ISA card comes with 2 serial ports each providing the SGU UPU with up to eight 64-Kbps serial data links. The UPU platform does not support mixed mode operation (the concurrent use of TDM links and V.35 serial links).

3.3.2 DPM Platform SS7 Card

The Signaling Link Module (SLM) board provides one E1/T1 TDM port for connection to a single TDM circuit and has 8 serial ports for connecting 8 V.35 64-Kbps serial data links. The SLM supports 2 TDM modes (HSL and non-HSL) and a serial configuration.

3.4. SGU SS7 Interface Card Processing

3.4.1 Time-Division Multiplexed (TDM) Configuration

The SLM and Jaguar PCI boards are capable of demultiplexing TDM data (T1/E1) into a single HSL serial stream or into 16 channels or increments of bandwidth (non-HSL mode). To summarize the two TDM modes:

- **TDM HSL (non-channelized mode)** – the SLM and Jaguar cards support TDM and is running HSL. The SLM pulls off increments of bandwidth (separate 64-Kbps channels) from the TDM circuit, and demultiplexes the data into 1 sequential data stream. The data is presented internally to the SGU as 1 internal port.
- **TDM non-HSL (channelized mode)** – the SLM and Jaguar cards support TDM and is not running HSL. The SLM can pull off up to 16 increments of bandwidth (separate 64-Kbps channels) from the TDM circuit. This data is applied to 16 internal SGU ports. This mode allows connection to up to 16 signaling links.

3.4.2 Serial Configuration

In the DPM platform, the SLM provides 8 V.35 input serial ports (SER1 - SER8) for 64-Kbps serial data links. There is a one-to-one correspondence between the 8 input serial channels and 8 SGU internal ports.

In the UPU platform, depending on configuration, a maximum of 4 ISA cards can provide up to 8 V.35 serial links to the SS7 network.

4. Home Location Register (HLR)

The Home Location Register (HLR) stores and updates a variety of prepaid subscriber account information in its database used to determine call handling. In some cases, it is important to notify the network HLR about special events that occurred in the subscriber account. For example, many networks want to bar terminating calls to prepaid subscribers when their accounts expire, yet do not want to pass all terminating calls through the RTBS, since such calls are free of charge (Calling Party Pays). By notifying the HLR as soon as the subscriber has become suspended, it is possible to bar these incoming calls on the HLR without passing them through the RTBS. If the subscriber recharges and reactivates the account, another message is sent to the HLR, re-enabling incoming calls to that subscriber. There may be other cases when the HLR needs to be notified. Most are related to account state changes (e.g., when the subscriber account is activated for the first time or gets suspended). Other events may also need to be notified.

There is no standard interface to send such messages to the network HLR. Subscriber profile changes, such as barring terminating calls, usually require the use of Man Machine Language (MML) interfaces to the HLR. Unfortunately, every different make of HLR has a different interface and uses different commands to achieve similar results. This requires switch vendor-specific drivers to be implemented on the RTBS, with each driver adapted for a specific HLR interface.

The Comverse RTBS notifies the HLR when certain predefined events occur. Messages that contain updated subscriber data are sent to the HLR and are stored in the database. The HLR sends response and acknowledgement messages to the RTBS.



HLR Notification is a value-added option that is available with the RTBS.

4.1. RTBS Supported HLR Interfaces

The Comverse RTBS supports the following HLR interfaces:

- **Generic SMS** – Used for sending SMS messages to the Comverse SMS gateway via TCP/IP.
- **Ericsson HLR** – Used for sending HLR messages to the Estonia Mediation device via telnet.
- **Siemens HLR** – Used for sending HLR messages to a Siemens switch via a serial port.
- **Nortel HLR** – Used for sending HLR messages to a Nortel switch via TCP/IP.

4.2. Generating Notifications – Events and Conditions

Notifications to the network HLR are generated under very specific conditions and are configurable by COS (COS) through the RTB Service Administration Workstation (SAW), the user interface.

4.2.1 Events

Every notification message starts with one of the following events, which then triggers the message:

- Change of account state (e.g., from Active to Suspended).
- Successful recharge of the account.
- A change of account balance that causes it to reach a predefined threshold (e.g., after a billable call).
- A change of expiration date.
- Award
- Near Award

The event is a trigger for the system to consider sending the notification message to the subscriber. For the message to actually be sent, several additional conditions must be met, as explained below.

4.2.2 Conditions

For every notification message, a selected condition must be met for the message to be sent. The condition can test one of the following subscriber attributes: account state, expiration date, account balance, or the usage based promotion threshold for Award/Near Award.. A notification message will be generated only if the conditions associated with that message are met for the subscriber being processed.

4.3. Sending the Messages

The actual message to be sent is defined in the database along with the conditions as previously explained. The message can contain any text and can include subscriber-specific information, such as the subscriber's current balance or expiration date. Such fields are stored as predefined tokens, and are replaced by the actual subscriber data when the message is sent.

For example, a message text may be "You have \$~balance~ in your account", where the ~balance~ token represents the subscriber balance. When used for a subscriber who has a balance of \$20.00, the actual SMS message will be "You have \$20.00 in your account." Other available tokens include the subscriber ID, the expiration date, the IMSI, and the account state.

In addition to the message text, the message destination is also specified. This can be the SMS Gateway if the message is intended to be sent to the subscriber, or an HLR protocol driver if this message is targeted toward the HLR.

HLR messages contain different text than SMS messages. In fact, they will contain the MML command needed for a given HLR model and make. The message tokens mentioned below, such as the subscriber ID, are used in the messages to let the HLR know which subscriber should be affected by the command (e.g., barred or enabled).

4.4. Tokens

The Comverse RTBS supports the following tokens:

- **Subscriber ID** – the Subscriber's identification number
- **State** – the current state of the subscriber's account
- **Balance** – the subscriber's core balance
- **Expire Date** – the expiration date of subscriber's core balance
- **Balance1 & ExpireDate1** – Balance1 amount and its expiration date
- **Balance2 & ExpireDate2** – Balance2 amount and its expiration date
- **Balance3 & ExpireDate3** – Balance3 amount and its expiration date
- **Balance4 & ExpireDate4** – Balance4 amount and its expiration date
- **Balance5 & ExpireDate5** – Balance5 amount and its expiration date
- **Balance6 & ExpireDate6** – Balance6 amount and its expiration date
- **Balance7 & ExpireDate7** – Balance7 amount and its expiration date
- **Balance8 & ExpireDate8** – Balance8 amount and its expiration date
- **Balance9 & ExpireDate9** – Balance9 amount and its expiration date
- **Balance10 & ExpireDate10** – Balance10 amount and its expiration date
- **Balance Major** – upper threshold of core balance
- **Balance Minor** – lower threshold of core balance
- **IMSI** – the subscriber's International Mobile Subscriber Identification number. This is a number assigned to a telephone that uniquely identifies the phone
- **Call Charge** – the charge for the subscriber's last call
- **Bonus** – the bonus amount awarded to subscriber
- **Discount** – the discount percentage awarded to subscriber
- **Reward Notification** – text to be heard by a subscriber following a usage-based award.

4.5. Latching Conditions

It is possible to “latch” a condition so that once the condition is met and the message is sent (either to the subscriber or to the HLR) the first time, the message is not sent again and again because the condition continues to be matched. If a condition is not latched, the message will be sent every time the condition is met.

For example, suppose a condition states “Balance <= 50”. Obviously, this condition will be met during every call after the subscriber has fallen below the \$50.00 barrier. That may result in multiple messages being generated (one on every event), not really providing any new information to the subscriber.

To prevent this, a notification message condition can be defined as “latched.” That means the condition will generate the message only once after it is met. No additional messages will be generated (by this entry) until the condition is found to be false again, or, the message condition is “unlatched.”

In the example, if the subscriber recharges the account with a \$100.00 voucher, the account balance rises above \$50.00. The condition is now unlatched (the message can be played again) but will become latched again the next time the subscriber drops below \$50.00.

5. Host Interface for Alarms (HIL)

The TRILOGUE Infinity Host Interface for Alarms (HIL) is a host interface for alarm reporting of TRILOGUE Infinity alarms on a host computer. The HIL links TRILOGUE's Integrated Alarm Package (IAP) with network management interfaces resident on host systems.

The HIL is implemented on the TRM platform or on the TMC platform for Distributed Networks, and communicates with the host system over LAN/WAN links. The Alarm Processor (IAP) or the TRILOGUE Management Center (TMC) both send alarm messages to the HIL across communication channels called sockets via the TCP/IP protocol. The HIL then serves as a connector to several host types. It can support up to 10 host interfaces running simultaneously.

The HIL audits alarm reporting across the TRILOGUE INfinity system. If an alarm is activated, the HIL translates the alarm from TRILOGUE internal format to one of several supported formats. To transmit the alarm, the HIL dispatches the alarm message to the host system, handles any errors, and retransmits acknowledgment messages sent by the host.

The HIL sends status messages for Alarm Integrated Modules (AIMs), in much the same way that it dispatches the alarm messages to the host system. Instructions regarding AIM functionality must be present in the host interface file. The AIM feature is supported in multiple distributed sites.

The HIL monitors the TRILOGUE INfinity system or network continuously. If an alarm condition becomes more severe, the HIL upgrades the severity level of the alarm in the host system. If the alarm condition is resolved, the HIL notifies the host system by sending a cancellation message. All information in the TRILOGUE IAP database may be included in the exported reports.

6. Host Interface for Billing (HIB)

The TRILOGUE INfinity Host Interface for Billing (HIB) enables an external host computer to collect billing information stored in the TRM.

There are two methods of HIB operation:

- **Periodic HIB** – During Periodic HIB, the TRM collects billing data from MSUs at defined time intervals. The data within each active MSU is polled and stored by the TRM. This data is available in ASCII format to download to a host computer.
- **Manual HIB** – In cases of an immediate or unscheduled need for billing data, Immediate Data Transfer (Manual HIB) allows the administrator to manually collect and transfer billing information via the Host Interface. The billing format is the same as that of Periodic HIB.

Most of the activities performed by the TRM are controlled by parameters that are user-definable. The remaining parameters are pre-set by Comverse engineers.

7. Customer Care Web Service (CCWS)

The Customer Care Web Service (CCWS) is a SOAP/XML-based Web Service that offers a platform and OS independent interface for building customized customer-care applications.

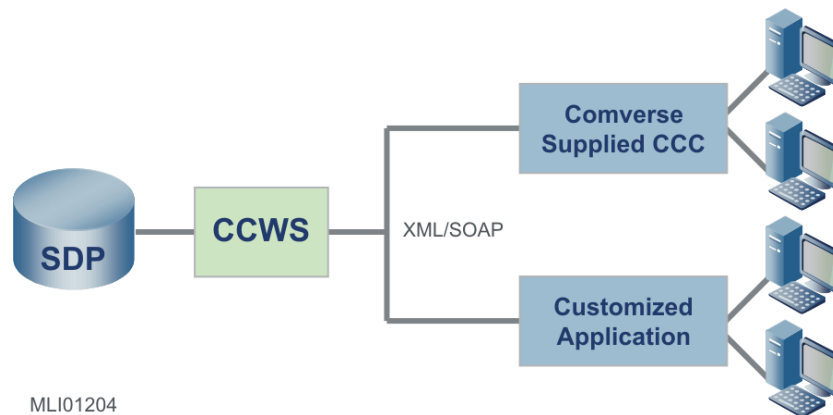
Network operators can either download a Customer Care Client provided by Comverse, or build their own customized interfaces in any language or platform (HW, OS, development tools) that is SOAP-enabled.



NOTE

The CCWS interface will eventually replace HIA (Section 8). The performance of the CCWS interface is more than triple than that of the HIA.

Figure 7-3 CCWS Architecture



The CCWS is implemented through a Windows Web Edition server, separate from the RTBS database. The CCWS server serves as a gateway (or mediation device) for any host connection and can be run concurrently on any number of PCs. Windows Load balancing supports up to 32 dual-processor servers in a single cluster.

The CCWS uses the Internet Information Server (IIS) as the Web Server hosting the Service. IIS listens to HTTP requests and responds with the appropriate file or files.



NOTE

For detailed information on the CCWS SOAP/XML interface, refer to *RTB External Interfaces Manual*.

8. Host Interface for Administration (HIA)

The Comverse Host Interface for Administration (HIA) is an interface protocol used between the Comverse RTBS and the network host to provide centralized host provisioning of subscriber accounts and recharge cards.

Note: HIA will eventually be replaced by the SOAP/XML-based CCWS (section 7). It will continue to be supported in future releases; however no new functionality will be added.

The name HIA is used to refer both to the protocol and to the software package that implements it.

The HIA can be used in two modes: batch mode and interactive mode.

- **Batch mode** – Uses batch files to perform tasks. The batch files contain data and sequential instructions to perform one task after another using the included data. Batch mode requires only initial action by the user. Users must be logged on to the SAW to be able to work in Batch mode. The same PC can run the SAW and the HIA software.
- **Interactive mode** – Uses single, one-way messages between the computer and the user. Interactive mode requires constant interaction between the computer and the user. There are two ways to access the database using the interactive mode: through the SAW or through the HIA Gateway.

8.1. The HIA Gateway

The HIA is implemented through an HIA Gateway, separate from the RTBS database. The HIA Gateway is a PC that serves as a mediation device for any host connection. The HIA can be run concurrently on any number of PCs.

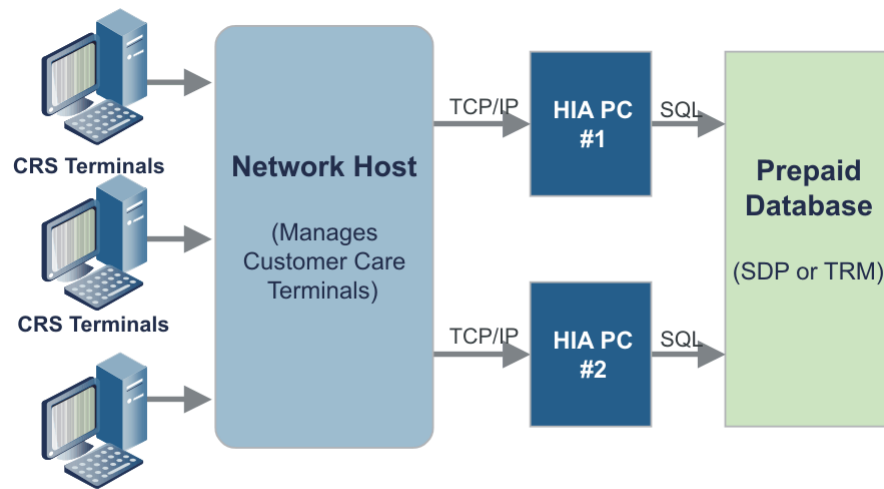
The HIA software can access one or several Service Data Points (SDPs). Each HIA will have a scope defined on the database, which will limit its access to specified SDPs.

The HIA Gateway can be connected directly to a system (Local Area Network (LAN)), or connected to the system via a Wide Area Network (WAN).

The ICC unit (a PC emulating a terminal) carries a copy of the HIA software. This is the preferred place to load HIA batch files.

Hosts will telnet to the HIA Gateway, run the HIA executable, and communicate with it using HIA commands. HIA is invoked when the host telnets to the PC, using a specific HIA user (AR_HIAHost). Multiple telnet sessions can be established to the same PC, working in parallel. There is no switchover or Virtual IP address required-the network host must be aware of multiple IP addresses.

Figure 7-4 shows how a network host uses HIA gateways to access the RTBS database.

Figure 7-4 Network Host Access to RTBS Database

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**NOTE**

The end users work with network-provided terminals (maybe in a foreign language), and have no direct access to the RTBS system database (HIA or other). The host does all the HIA interaction with the RTBS system on behalf of the end users.

8.2. HIA Gateway Access to Databases

The Comverse RTBS supports multiple databases; the HIA also works with multiple databases, especially when it comes to accessing subscriber data (which is split among the databases).

Each HIA Gateway is defined to operate against a given set of databases. For instance, the HIA Gateway running on the ICC will most likely be defined as local, meaning that it has access to only the local database on that system. Another HIA Gateway can be defined to access the whole network.

One benefit of this is that the HIA can operate without having access to the master database. This is important, since the master database may not always be accessible.

8.3. Security

There are two measures of system and data security built in to the HIA system, through the use of user roles and through the optional checking of IP addresses against a list of allowed IP addresses.

8.4. User Roles

Specific roles must be assigned for the HIA to be used with the SAW. These roles not only allow user access, they help ensure system and data security:

**NOTE**

For more detailed information on HIA, refer to the *RTB External Interfaces Manual*.

9. Remote CUG Provisioning Web Service

The Remote CUG Provisioning Service allows for the provisioning of all CUG information. Implemented as a Web Service, the Remote CUG Provisioning service uses the Simple Object Access Protocol (SOAP) over TCP/IP to communicate to consuming applications. The operations and object types of the service are used to access and modify the CUG and CUG Member information. Cumulatively, these operations and types define the public interface for the Remote CUG Provisioning Service.

All value types are defined per the SOAP 1.2 and XML 1.0 specifications. Refer the World Wide Web Consortium (W3C) at <http://www.w3.org> for more information on these technologies.

**NOTE**

For more detailed information on the Remote CUG Provisioning Web Service, refer to the *RTB External Interfaces Manual*.

10. Call Detail Record (CDR)

Call Detail Records (CDRs) are generated by the SLU. CDRs are collected into files that reside on the SLU and are subsequently transferred to the TRM. Such files are generated on a service-level-configurable, periodic basis (as defined by the value of a service-level attribute). The default is one file every hour, and the maximum frequency is one file every minute.

10.1. Call Detail Record Files

System management of RTB service-related billing files on the TRM is provided using the standard system product capabilities, which address intra-system file retrieval, file naming conventions, file transfer to remote network operator and SP host system, file archiving, restoration, backups, and purging.

Files are transferred to remote host systems, using FTP, for subsequent processing by the network operator and service providers (SPs). The network operator and SP can process CDR data for a number of purposes, including the following:

- Auditing administrator activity
- Auditing the accuracy of the system real-time billing process
- Deriving RTBS account-level measurement statistics (such as number of calls, administrative function usage, typical call duration)

The network operator and service providers must provide a host for the TRM, with username and password, so that files can be pushed to the host, using FTP.

The TRM will deposit the files into a configurable path relative to the home directory of the provider user account.

10.2. CDR Generation Examples

The following are examples of CDR generation:

10.2.1 Voice Calls - Normal and USSD Callback

CDRs are generated regardless of the charge, or whether the event is considered billable.

A single CDR is generated for the following voice events:

- For each successful call to or from an account-based subscriber
- For each call attempt to or from a subscriber, which is rejected by the platform
- For a call made directly to an administrative function, such as the Info Server or Recharge Server
- For a call attempt forwarded (intercepted) by the service to an administrative function and then terminated, or connected to a remote called party

Multiple CDRs are generated for voice events under certain circumstances. The CDRs produced contain a common attribute value to correlate them, typically the ASSOC_CDR_REFERENCE or REFERENCE field:

- For card-based subscribers, a CDR is generated for each outbound call within a single invocation of the access number
- For Network Call Forwarding, both incoming and outgoing CDRs are generated
- For a call to the Admin Menu, separate CDRs are generated for each menu invocation, as well as for each outbound event selected. For example, a call to the Admin Menu, followed by a selection of Info Server, then a return to the Admin Menu, and finally, a selection of Recharge Server generates a total of four CDRs: one for the first Admin Menu session, one for the Info Server, one for the second Admin Menu session, and one for the Recharge Server. (A single CDR is issued for the entire Recharge Server session regardless of the number of cards used to recharge the account.)
- For the optional Follow-On Call feature, a separate CDR is generated for each outbound call

10.2.2 Payment Server

When an RTBS subscriber is offered a service which enables the subscriber to send or receive SMS messages, the SMSC sends the transaction information to the Payment Server in order to charge the subscriber using his RTBS account. This occurs before the terminating party receives the message. The Payment Server generates a single CDR for each of these transactions. Because the Payment Server is transaction, not session oriented, multiple CDRs are never generated for a single event.

10.2.3 CAMEL 3 SMS

A single CDR is generated for each successful or unsuccessful SMS event (for a valid subscriber). CAMEL 3 SMS is transaction oriented, like the Payment Server. Therefore, multiple CDRs are never generated for a single event.

10.2.4 GPRS

For each GPRS activity session, depending on the charge type of the activity, there may be one or two CDRs generated. If the charge type is duration only or volume only, then one CDR is generated for that session. If the charge type is both, i.e., duration and volume, then two CDRs are generated for that session. As with voice CDRs, the CDRs produced by GPRS contain a common attribute value to correlate them, typically the ASSOC_CDR_REFERENCE or REFERENCE field.

**NOTE**

For more detailed information on Call Detail Records, refer to the *RTB External Interfaces Manual*.

11. Open Services Access (OSA) Charging

The OSA Charging allows external value added services such as SMS, MMS, etc. to interface with the Comverse RTBS in accordance with the 3GPP OSA/Parlay Charging API, thereby enabling these external services to charge the Subscriber's account using OSA charging methods. This feature implements reservation and debit/credit methods of the Charging Service Capability Feature (SCF). Direct charging and split charging (multiple users getting charged for using an application such as multi-user games) are not supported.

**NOTE**

OSA is a value-added option that is available with the RTBS.

11.1. Charging Model

In the RTBS charging model, the external application makes a reservation either by explicitly stating an amount or by providing sufficient information about the service that is to be charged so that RTBS can compute the relevant tariffs and reserve accordingly. Once a reservation is made, this balance is set aside until some consumption against this reservation is confirmed or the reservation expires. If consumption is confirmed (debit request), the balance is permanently reduced. If a reservation expires, the reserved balance becomes available for other activities. Credit requests can be used to reverse previous charges or to add to a balance (as in the case of a recharge).

In the interfaces of the Charging SCF a "Request Number" is used when invoking operations that operate on the user's account in order to make retries possible after application, service, or communication errors. An operation can be retried by invoking the same operation with the same Request Number. The OSA charging SCF guarantees that Request Numbers are unique within each charging session.

In the callback to the application, the Request Number to be used for the next request operation is returned. This is the only Request Number besides the one in the last request operation that can be used. This mechanism ensures that an application retries an operation when it does not receive an answer.

The use of the Request Number ensures that there can only be one outstanding request per Charging Session. Only after an answer is received (result or error), the next request can be made. Note however that only asynchronous operations that could lead to over or under charging of the user require a request number.

The application must use the same units when making the reservation and when debiting the amount. For example, when after a reservation of 10 octets a debit request for 5 seconds is done, the charging SCF will return an error. For currency based transactions, the currency communicated on the OSA I/F must match the subscriber's provisioned currency, otherwise the transaction will be rejected.

The external applications can issue credit requests to add back an amount to the subscriber's balance(s). In such cases the external application has full responsibility to ensure the integrity of such requests (Ex: external application has to make sure that the credits do not total higher than the original charge that is being reversed, that only a single credit is issued against the same charge, etc.). The OSA charging SCF will make no attempt to validate credits against previous charges.

If the external application provides a timestamp for the activity, the billing engine will use this to calculate tariffs/charges. Otherwise the internally generated timestamp will be used for rating/charging.

Similarly, the external application can provide **LocationA/LocationA Type** and **LocationB/LocationB Type** (via an extension to the charging parameters) and this will be converted internally into a location relationship to be used by the billing engine for rating/charging of location sensitive activities.

This feature supports Converse specific extensions to the charging parameters. Some of these extensions will affect the tariffs/charges calculated by the billing engine. Others will only be for information purposes and will be reflected in the CDRs/activity histories with no charging impact.

The OSA charging SCF supports a flexible method to map a wide range of charging parameters into tariff affecting entities interpreted by the billing engine. Based on an agreement between the external application provider and the network operator, different levels of abstraction and rating complexity can be supported.

11.2. Examples

The following are OSA charging model examples.

11.2.1 Example 1

Network operator X wants to charge different tariffs for downloading the following Madonna albums: The Immaculate Collection, Like a Virgin, True Blue, Like a Prayer, Evita, Ray of Light and American Life. This can be accomplished by communicating this level of detail from the external application to the charging SCF and by defining unique application/application subtypes and different rates for each of these albums. In this model, the application provider's catalogue of items is tightly coupled to the tariffs provisioned in the charging SCF and new entities must be provisioned as the inventory expands.

11.2.2 Example 2

Network operator Y wants to charge a premium rate for downloading any Madonna album, regardless of the title. This can be accomplished by communicating a "Premium download" from the external application to the charging SCF and by defining a unique application/application subtype and rate for this. In this model, the application provider's

catalogue of items is very loosely coupled to the tariffs provisioned in the charging SCF and no additional provisioning is needed as the inventory of “premium music” expands.

All bonus and discount logic supported by RTBS applies to OSA charging as well.

12. Payment Server

The Payment Server interface is a TCP/IP-based network interface capable of communicating with an external client and the RTBS to apply charges or tariffs to the MO (Mobile Originating) subscriber for Short Message Service (SMS) and other transaction activities, and adjust subscriber account balances. The RTBS will receive a usage amount in units which must be rated, or a currency amount of the charge for services from the Payment Server interface.



The Payment Server is a value-added option that is available with the RTBS.

12.1. Transaction Message Types

When an external client communicates with the payment server, the following types of transaction messages are supported:

- Apply Charge Request / Response
- Apply Tariff Request / Response
- Reverse a Previous Charge Request / Response
- Transaction ID Acknowledge Request Message
- Confirm Request / Response
- Disconnect Commands

12.2. Apply Charge Messages

There are two types of Apply charge messages: request and response. The Apply charge request message is sent by an external client to the payment server when the external client wants to charge a subscriber with a predetermined amount. The Apply charge request message enables the external client to communicate, to the payment server, the Charge Amount to be deducted from the subscriber account as well as the Subscriber ID and an Associated Number. The Associated Number is used to identify the transaction when the response message is sent back to the external client once the payment server verifies the Subscriber ID. If the subscriber is active with a sufficient balance, then the charge amount is deducted from the subscriber's account and an Apply charge response message is sent to the external client. The external client then enables a Transaction ID Acknowledge request back to the payment server to complete the process.

If, however, the subscriber is unavailable or has an insufficient balance, the payment server creates a negative response to the external client, indicating the status of the subscriber. In this scenario the charge amount is not deducted from the subscriber's account.

12.3. Apply Tariff Messages

There are two types of Apply tariff messages: request and response. The Apply tariff request message is sent by an external client to the payment server when the external client wants to charge a subscriber for using the RTBS tariff and billing engine. The RTBS validates the subscriber, state, current balance, and permission to perform the transaction. If the transaction is allowed then the RTBS determines the actual cost and enables the payment server to deduct the tariff from the appropriate party.

There are three scenarios in which a tariff can be applied: MO (Mobile Originating) to application, application to MT (Mobile Terminating), or MO to MT.

- A Mobile Originating to application type message deducts the tariff from the originating subscriber's account.
- An application to Mobile Terminating type message deducts the tariff from the terminating subscriber's account.
- A Mobile Originating to Mobile Terminating type message deducts the tariff from the originating subscriber's account.

The tariffs are calculated based on the Bearer Capability and Discount values defined in the COS for the subscriber responsible for the tariff. After the transaction has successfully completed, the payment server sends an Apply tariff response message to the external client. The external client then enables a Transaction ID Acknowledge request or Confirmation request back to the payment server to complete the process. If, however, the subscriber is unavailable or has insufficient balance, the payment server creates a negative response message to the external client, indicating the status of the subscriber. In this scenario the charge amount is not deducted from the subscriber's account and no transaction is recorded in the RTBS.

12.4. Reverse a Previous Charge Message

There are two types of Reverse previous charge messages: request and response. The Reverse previous charge request message is sent by an external client to the payment server when the external client wants to reverse credit for a previous charge. When the payment server receives the request, it validates the Associated Number and Transaction ID of the transaction and then updates the subscriber's status appropriately with the refund. The payment server then sends a Reverse a previous charge response message to the external client. If the Associated Number and Transaction ID of the transaction cannot be validated, then a negative response is sent to the external client, indicating the status of the subscriber. In this scenario, the subscriber's account is not refunded the credit for the transaction.

12.5. Transaction ID Acknowledge Request Message

The Transaction ID Acknowledge request message is sent by an external client to the payment server when the external client wants to acknowledge the receipt of either an Apply tariff or Apply charge response message. When the Apply tariff or Apply charge response message is received, a Transaction ID Acknowledge timer is enabled in the external client. This timer ranges five minutes and dictates whether or not the transaction is finalized. If the timer expires before the Transaction ID Acknowledge request message is received, the payment server reverses the charge associated with that transaction and credits

the amount back into the subscriber's account. An INFO alarm is then generated to alert the external client of the refund.

12.6. Confirmation Messages

There are two types of Confirmation messages: request and response. The Confirmation request message is sent by an external client to the payment server when the external client has successfully or unsuccessfully delivered the Apply tariff message. If the status contained in the Confirmation request message is to reject the transaction, then the payment server reverses the charge associated with that transaction and credits the amount back into the subscriber's account. If, however, the status contained in the Confirmation request message is to accept the transaction, then the payment server remains inactive. After the information in the Confirmation request message is validated, a Confirmation response message is sent to the external client with the Associated number and Status fields.

12.7. Disconnect Messages

When an external client wants to disable its connection to the payment server, it sends a Disconnect message. The payment server, however, only sends a Disconnect message when the heartbeat timer expires. The heartbeat timer maintains the connection when SMS activity is low. If the heartbeat timer expires, the Disconnect message is sent to alert the external client that no transactions can take place until the TCP/IP connection is re-established.

12.8. Transactions

The payment server tracks the history of transactions by maintaining each external client's records, separately, within the RTBS database. Each time the payment server updates the RTBS database of account balances, a record is added to the Payment Server Transaction Table. In addition, records are added to the Payment Server Transaction Table each time the payment server receives a successful charge or tariff message from an external client. The payment server uses the transaction ID field to manage and track the transaction records.

13. CAMEL3 GPRS

The RTBS supports billing for Third Generation (3G) network packet data services using the CAMEL 3 General Packet Radio Services (GPRS) in GSM networks. GSM data services vary from streaming media to "Internet Web surfing." These data services are fundamentally limited only by mobile handset capabilities and interface bandwidth.

The CAMEL 3 (CAP Phase 3) protocol has support for prepaid data services billing built directly into the protocol, such that an SCP (i.e., the RTBS) can allow or disallow and charge for data transactions. The RTBS receives usage information for subscriber services in the form of octets or seconds from the GPRS network. The RTBS must rate this usage, that is, convert it into corresponding currency units, e.g., dollars.

The Reservation-based mechanism is used for charging. A certain amount of usage is authorized and the corresponding balances are set aside when the network requests a reservation. The balances are permanently reduced only after consumption is confirmed. If

a part of the reservation is not used, it can be returned and the balances will be readjusted accordingly. Reservation amounts are configurable.



CAMEL 3 GPRS is a value-added option that is available with the RTBS.

13.1. Billing

The RTBS supports charging for CAMEL 3 data services using a highly configurable, flexible, reservations-based charging scheme. This allows support for data charging by:

- Application (APN)
- Volume (octets)
- Duration (seconds of connection)
- Combination of Volume and Duration
- Quality of Service (QoS)

Additionally, standard prepaid billing features may be applied to data charging, supporting billing options such as:

- Different rates based upon date/time, location, as well as subscriber COS
- Concurrent tariffs
- Telescoping charges
- Grace period
- Settlement tariffs (flag can be used to designate one of the concurrent tariffs as a settlement tariff, in this case this is not charged against the subscriber, but is reflected in the CDR (if the field is selected) for processing by a downstream billing system)
- Free octets and/or seconds
- Bonuses and discounts based on usage (optional feature)

13.2. Data Location Relations

In CAP 3, the APN identifies the particular data service that is being used, and the requirement is to be able to charge different APNs at different rates. The characteristics of the data connection (QoS) can be identified in CAMEL 3, and the RTBS is able to charge different rates based on this information. The QoS refers to the capability of a network to provide better service to selected network traffic. It is identified at the beginning of each session and is used for tariffing. In addition, each APN may be charged based on duration and/or volume, and this is configurable.

Since the InitialDPGPRS message does not contain a destination number, the billing engine assumes a destination of “anywhere” for all of the data services. Note that the Friends and Family and VPN Closed User Group (CUG) discounts are not supported for data charging.

13.3. Data Tariffs

The CAMEL 3 data services can be billed by byte usage and/or duration (time). The RTBS billing infrastructure is flexible and can be configured to support any combination of the two.

13.4. Billing Using the Reservation Mechanism

The Reservation/Balance Nibbling scheme for charging the subscriber is supported by this interface. Each data reservation consists of an amount of money (a “nibble” from the subscriber’s available Balances), and an expiration time, indicating for how long the reservation may be used.

These two attributes are part of the Apply Charging message sent by the RTBS to inform the switch Gateway GPRS Support Node (GGSN) how much activity the subscriber may use before it reports back to the SCP, i.e., the RTBS.

For example, a reservation of 20 Kbytes and 60 minutes means that the GGSN must report back in either 60 minutes, or when the subscriber has consumed 20 Kbytes, whichever comes first.

Example 1

In this example, the subscriber has \$10 available in his Balance, 0 Free Bytes, and attempts to start a browser session.

1. The switch sends a message to the RTBS indicating that this subscriber is attempting to browse the Web, and requests a reservation. The RTBS analyzes the request, and based upon COS parameters, determines that a Web browsing reservation for this subscriber at this date/time, should consist of 100 Kbytes, with a four-hour expiration period.
2. RTBS determines that the subscriber has no Free Bytes available, so the Balance must be used. The RTBS then calculates the charge for this reservation of 100 Kbytes (assume \$2), and “reserves” this amount from the subscriber’s Balance. This means that while the subscriber has \$10 in his Balance, only \$8 is available for other services.
3. A reservation is then sent back to the switch, indicating that the subscriber has 100 Kbytes and four hours, and that the switch must report back when the 100 Kbytes is used, or after four hours, whichever comes first.
4. Assume that after four hours, the subscriber has only used 50 Kbytes. At that time, the switch reports back that the subscriber has used 50 Kbytes of the reservation.
5. The RTBS calculates the value of the 50K unused bytes (assume \$1). The RTBS then debits the subscriber’s account by \$1, and cancels the reservation. The subscriber now has a balance of \$9, of which all is available. Note that Activity histories, and optionally, CDRs, would be generated at this time.
6. If the subscriber continues to surf the Web, steps 1 – 5 are repeated.

Example 2

In this example, the subscriber has \$10 available in his Balance, 200K Free Bytes, and attempts to start a browser session.

1. The switch sends a message to the RTBS indicating that this subscriber is attempting to browse the Web, and requests a reservation. The RTBS analyzes the request, and based upon COS parameters, determines that a Web browsing reservation for this subscriber at this date/time, should consist of 100 Kbytes, with a four-hour expiration period.
2. The RTBS determines that the subscriber has can use Free Bytes to cover this reservation, and “reserves” 100 Kbytes from the subscriber’s Free Bytes. This means

that while the subscriber has 200 Kbytes in his Free Bytes balance; only 100 Kbytes is available for other services.

3. A reservation is then sent back to the switch, indicating that the subscriber has 100 Kbytes and four hours, and that the switch must report back when the 100 Kbytes is used, or after four hours, whichever comes first.
4. Assume that after four hours, the subscriber has only used 50 Kbytes. At that time, the switch reports back that the subscriber has used 50 Kbytes of the reservation.
5. The RTBS then debits the subscriber's Free Byte balance account by 50 Kbytes, and cancels the reservation. The subscriber now has a Free Byte balance of 150 Kbytes, of which all is available. Note that Activity histories and optionally CDRs are generated at this time.
6. If the subscriber continues to surf the Web, steps 1 – 5 are repeated.

13.5. Data Call Types

In CAP 3, the APN identifies the particular data service that is being used, and the requirement is to be able to charge different APNs at different rates. The characteristics of the data connection (QoS) can be identified in Camel3, and the RTBS is able to charge different rates based on this information. The QoS refers to the capability of a network to provide better service to selected network traffic. It is identified at the beginning of each session and is used for tariffing. In addition, each APN may be charged based on duration and/or volume, and this is configurable.

Since the InitialDPGPRS message does not contain a destination number, the billing engine assumes a destination of “anywhere” for all of the data services. Note that the Friends and Family and VPN Closed User Group (CUG) discount is not supported for data charging.

13.6. Data Tariffs

The Camel 3 data services can be billed by byte usage and/or duration (time). The RTBS billing infrastructure is flexible and can be configured to support any combination of the two.

14. External IP Support

The RTB 4.6 release supports the use of external IPs to be used for Pre-Call, terminating, and IVR announcements.

14.1. Pre-Call and Terminating Announcements

The CAMEL 2 and CAMEL 3 protocols can be employed in both SSF Relay and Direct Path SCP to IP modes. The system also offers comprehensive support for tokens and multiple languages.

14.2. IVRU Announcements

The Comverse RTBS uses the PROGENY Network Interactive Voice Response System (NIVR) for all announcement and Interactive Voice Response (IVR) capabilities. This

includes pre-call and terminating announcements with tokens, as well as all IVR digit collection and announcement capabilities.

To support the RTBS, PROGENY NIVR supports:

- IP functionality associated with correlated calls (pre-call and terminating announcements). The system operates in what is called “dumb IP” mode; that is, call control and logic for the announcements are not controlled by the IP, but by the RTBS.
- IVR functionality that includes the information server, recharge server, etc. The combined system operates in “Smart IP” mode, that is, the call control and interactive user response logic is controlled by the IP, not the RTBS. For IVR sessions, call control is handed off to the IP, while the IP manages the logic associated with playing the announcement and interacting with the user. The IP utilizes the XML/SOAP interface during this time to query the RTBS for information such as balance and expiration.



For more information on PROGENY NIVR, refer to Chapter 3.

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