Cisco Network Applications Manager (NAM) Product Description

NAM Software Version 5.0

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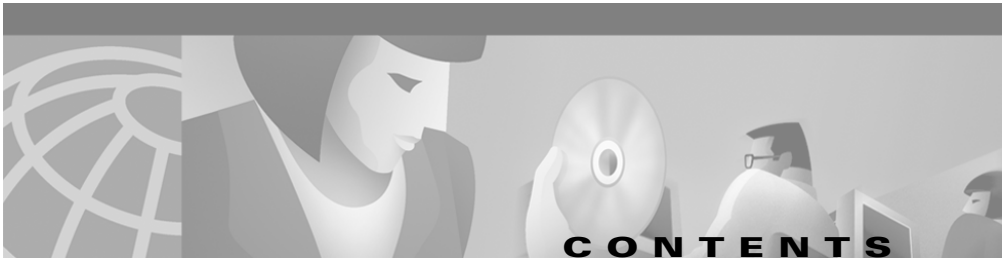

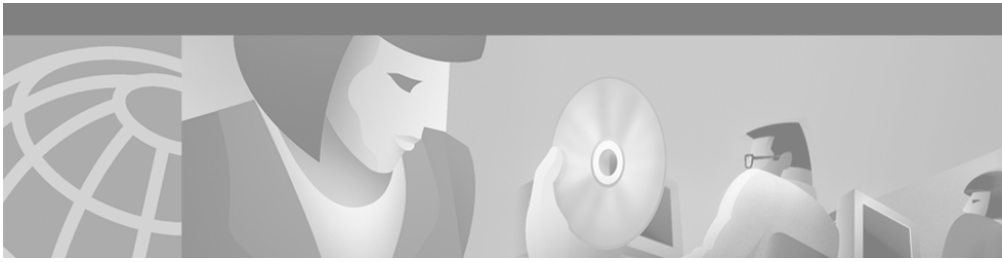

About This Guide

Purpose

This manual provides a functional description of the Cisco Network Applications Manager (NAM). It describes the main features of the NAM and offers details on the individual components of the system.

Audience

This manual is intended for managers and administrators working in a network service provider (NSP) environment. Readers of this manual should have a general understanding of network routing control, toll-free network services, and call center operations and management.

Organization

The manual is divided into the following chapters.

Chapter	Description
Chapter 1, "Introducing NAM"	Provides an overview of the NAM, which is the carrier-class version of Cisco Intelligent Contact Management software.
Chapter 2, "System Components"	Describes how a NAM system fits into the carrier and call center environments. This chapter also describes the role of each NAM process.
Chapter 3, "Deployment Options"	Describes the options for deploying the NAM system in a service provider network.
Chapter 4, "Network Interface Controllers"	Provides an overview of the Network Interface Controller (NIC) process. The NIC is the interface between the service provider network signaling network and the NAM.
Chapter 5, "CallRouter"	Describes the function of the Call Router process within a NAM system. This chapter also provides examples of the types of call routing scripts used in a NAM system.
Chapter 6, "Peripheral Interfaces"	Provides a high-level overview of NAM peripheral interfaces.
Chapter 7, "Management Tools"	Describes the types of Admin Workstations (AWs) used by the service provider and customers. The AW is the user interface to the NAM. It provides tools for managing configurations, creating call routing scripts, and generating historical and real-time reports.
Chapter 8, "Alarm Management"	Describes the tools used to display and analyze ICM alarm and system performance information. This chapter also provides an overview of remote support capabilities.
Chapter 9, "Fault Tolerance"	Describes the fault tolerance architecture in the ICM system.

Conventions

This manual uses the following conventions:

Format	Example
Boldface type is used for user entries, keys, buttons, and folder and submenu names.	Choose **Script > Call Type Manager**.
Italic type indicates one of the following: • A newly introduced term • For emphasis • A generic syntax item that you must replace with a specific value • A title of a publication	• A *skill group* is a collection of agents who share similar skills. • *Do not* use the numerical naming convention that is used in the predefined templates (for example, **persvc01**). • IF (*condition*, *true-value*, *false-value*) • For more information, see the *Cisco ICM Software Database Schema Handbook*.
An arrow (>) indicates an item from a pull-down menu.	The Save command from the File menu is referenced as **File > Save**.

Other Publications

For additional information about Cisco Intelligent Contact Management (ICM) software, see the Cisco web site listing ICM documentation.

World Wide Web

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

http://www.cisco.com

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Inquiries to Cisco TAC are categorized according to the urgency of the issue:

- Priority level 4 (P4)—You need information or assistance concerning Cisco product capabilities, product installation, or basic product configuration.
- Priority level 3 (P3)—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- Priority level 2 (P2)—Your production network is severely degraded, affecting significant aspects of business operations. No workaround is available.
- Priority level 1 (P1)—Your production network is down, and a critical impact to business operations will occur if service is not restored quickly. No workaround is available.

Which Cisco TAC resource you choose is based on the priority of the problem and the conditions of service contracts, when applicable.

Cisco TAC Web Site

The Cisco TAC Web Site allows you to resolve P3 and P4 issues yourself, saving both cost and time. The site provides around-the-clock access to online tools, knowledge bases, and software. To access the Cisco TAC Web Site, go to the following URL:

http://www.cisco.com/tac

All customers, partners, and resellers who have a valid Cisco services contract have complete access to the technical support resources on the Cisco TAC Web Site. The Cisco TAC Web Site requires a Cisco.com login ID and password. If you have a valid service contract but do not have a login ID or password, go to the following URL to register:

http://www.cisco.com/register/

If you cannot resolve your technical issues by using the Cisco TAC Web Site, and you are a Cisco.com registered user, you can open a case online by using the TAC Case Open tool at the following URL:

http://www.cisco.com/tac/caseopen

If you have Internet access, it is recommended that you open P3 and P4 cases through the Cisco TAC Web Site.

Cisco TAC Escalation Center

The Cisco TAC Escalation Center addresses issues that are classified as priority level 1 or priority level 2; these classifications are assigned when severe network degradation significantly impacts business operations. When you contact the TAC Escalation Center with a P1 or P2 problem, a Cisco TAC engineer will automatically open a case.

To obtain a directory of toll-free Cisco TAC telephone numbers for your country, go to the following URL:

http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml

Before calling, please check with your network operations center to determine the level of Cisco support services to which your company is entitled; for example, SMARTnet, SMARTnet Onsite, or Network Supported Accounts (NSA). In addition, please have available your service agreement number and your product serial number.

Introducing NAM

Businesses around the world are increasing their use of the telephone and the Internet as primary sources of customer contact. As a result, the call center has become a critical part of many corporate customer service strategies. As call volumes grow, and customer inquiries become more complex, businesses increasingly will look to the network service provider for customer service products that offer a competitive advantage.

Cisco's Network Applications Manager (NAM) allows carriers, network service providers, and service provider customers who manage multiple ICMs to offer a suite of intelligent call routing and transaction fulfillment services.

With Cisco's suite of services, you can offer call center customers several classes of intelligent call routing, such as:

- Enhanced toll-free, local, and national number services
- Basic translations
- Virtual call center services
- Customer-controlled call routing
- Network VRU prompting and integration
- Network CTI services

This chapter describes how call center customers can mix NAM services to create a network-based virtual call center.

The Distributed Call Center Model

To maintain a high level of customer service, your call center customers have invested in technologies that allow them to concentrate customer representatives into *call centers*. These call centers can be organized in different ways, depending on how a business wants to manage customer contact operations. Many companies have decided that having multiple, geographically distributed call centers is the best way to meet staffing and customer service needs.

While the distributed call center model may be necessary to serve callers, it is a complicated operation to manage. Each call center operates as an island with no knowledge of the rest of the enterprise. Automatic Call Distributor (ACD) and Private Branch Exchange (PBX) systems alone cannot deliver services across all switching systems in a corporation because they know only about the resources connected to the switch. In addition, systems can vary from site to site. Call centers within the same corporate enterprise might be using ACDs of different vendors and network services from different providers.

In a distributed call center model, each call center must be equipped and staffed to handle the unpredictable nature of incoming calls. To ensure that each site is prepared to respond efficiently to a forecasted level of call traffic, call center managers may tend to overstaff each call center. Often, this leads to agents sitting idle in one call center while another call center becomes overwhelmed with calls. This can be frustrating, especially when resources exist that could help correct the situation.

What is Missing?

What is missing in the distributed call center model is an overall call routing and management application that integrates dissimilar call center systems and links distributed call centers throughout a corporation. The NAM completes the distributed call center model by creating a *virtual call center network*.

The NAM is a software-based call processing application that provides call-by-call routing to geographically distributed call centers. The system receives real-time status information from all switching systems in a call center enterprise to create a real-time picture of the status of agents, calls, and peripherals throughout the enterprise. Combine this with the ability to distribute calls through different switching platforms and multiple carriers, and you have a complete intelligent call routing solution.

The complete NAM solution offers:

- Enhanced toll-free services
- Multi-switch support
- Multi-carrier support
- VRU system integration
- CTI integration
- Consolidated reporting
- Internet integration
- Workforce management integration
- Number translation and virtual private network (VPN) services

NAM—The Carrier Solution

What if you could offer Cisco's intelligent call routing and management products as a suite of network services? The NAM gives you this ability. Call center customers can choose the NAM services that meet their current business needs. As call routing and business requirements grow, customers can easily add more advanced NAM services and features.

The NAM allows the customer to purchase a complete intelligent call routing and management solution from a single service provider. By *subscribing* to NAM services, customers avoid having to administer an entire ICM system themselves.

NAM is the carrier-class version of ICM software. It allows a network service provider to offer virtual contact center services to its customers. The *standard ICM* software is a single customer system that resides on the customer premises. The *NAM* software is deployed in the service provider network and can serve many customers.

The NAM can function like a Service Control Point (SCP) by distributing incoming calls to individual network service customers based on the number dialed, point of origin, caller-entered data, and optionally, database lookups. The NAM can also connect to an existing SCP.

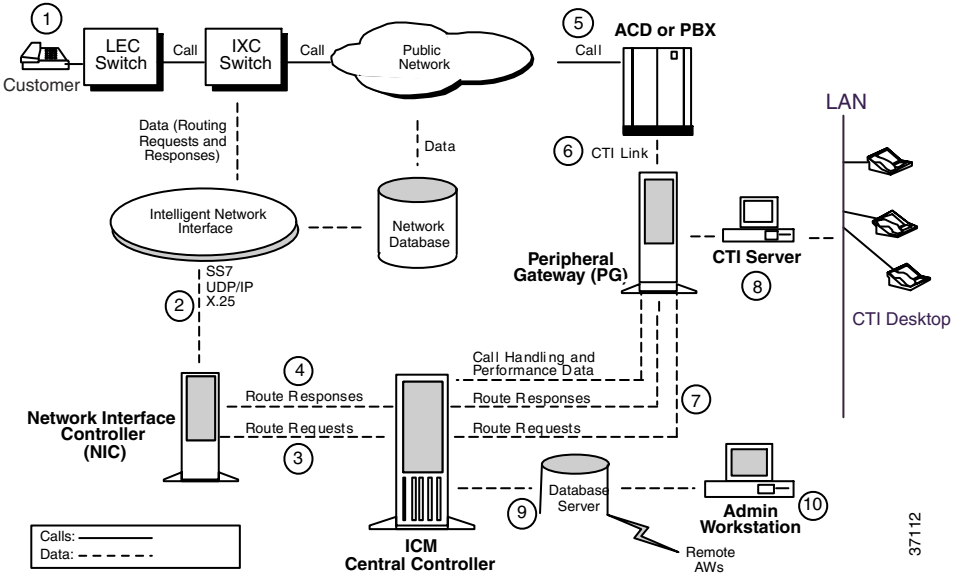
To understand more clearly how NAM fits into the service provider and call center environments, it might help to review standard ICM call routing.

Understanding ICM Software

ICM software makes routing decisions by reviewing the nature of an incoming call and comparing it to the real-time status of call center agents or answering resources. The primary components of the ICM system are a central routing controller, a logger, interface to the IXC network, and interfaces to call answering devices (for example, Automatic Call Distributors (ACDs)).

Figure 1-1 shows how ICM components work together to make intelligent call processing possible.

Figure 1-1 ICM Call Routing Overview



1. ICM software executes call routing decisions before a call terminates at a contact center. This concept is called Pre-Routing. As shown in Figure 1-1, calls to be routed originate in the public telephone network.
2. ICM software is configured in the IXC's intelligent network to receive a route request for each designated incoming call. A subsystem of ICM software, called the *Network Interface Controller (NIC)*, communicates with the carrier's network through an intelligent network interface.

3. The NIC translates the network's description of the call, including point of origin, number dialed, and any customer entered digits, into the language of ICM software. The NIC passes this call information to the CallRouter in the form of a routing request.
4. At this point, the CallRouter may query an ANI or customer profile database before returning a *routing response* to the NIC. The NIC passes a destination for the call back to the IXC network. The IXC is responsible for connecting the call and maintaining the voice path.
5. Each contact center has one or more Automatic Call Distributor (ACD) systems which direct incoming calls to the telephone sets of individual agents.
6. The PG communicates with the ACD over the switch vendor's Computer Telephony Integration (CTI) link. To make optimal decisions, ICM software must know the latest status for every call, agent, and contact center in its network. One purpose of the Peripheral Gateway is to extract this status information from the ACD and forward it to the CallRouter's in-memory database.
7. ACDs can also originate call routing requests. In these situations, the Peripheral Gateway serves the additional purpose of forwarding routing requests to the CallRouter and returning the target destinations to the ACD. PGs also serve as the communications interface between ICM software and Voice Response Units VRUs) that are located at contact center sites or in the network.
8. The CTI Server provides an interface between ICM software and desktop or server applications to seamlessly deliver enterprise-wide call-event and customer-profile information to a targeted agent's desktop. Cisco's CTI solution also provides the tools necessary to create or integrate an agent desktop solution that includes screenpop, softphone and call wrap-up capabilities. All of the data regarding the routing of calls, the specific transactions performed by the answering agent(s) or VRU, and the performance of the contact centers and the network is placed into a database and are accessible from Cisco's Admin Workstations.
9. Real-time and historical data which characterize the virtual contact center are stored in an industry-standard relational database and are available for real-time monitoring and historical reporting. The standard ICM monitoring screens and reports can be easily modified, or the data can be accessed directly with SQL or Open Database Connectivity (ODBC) tools of your choice.

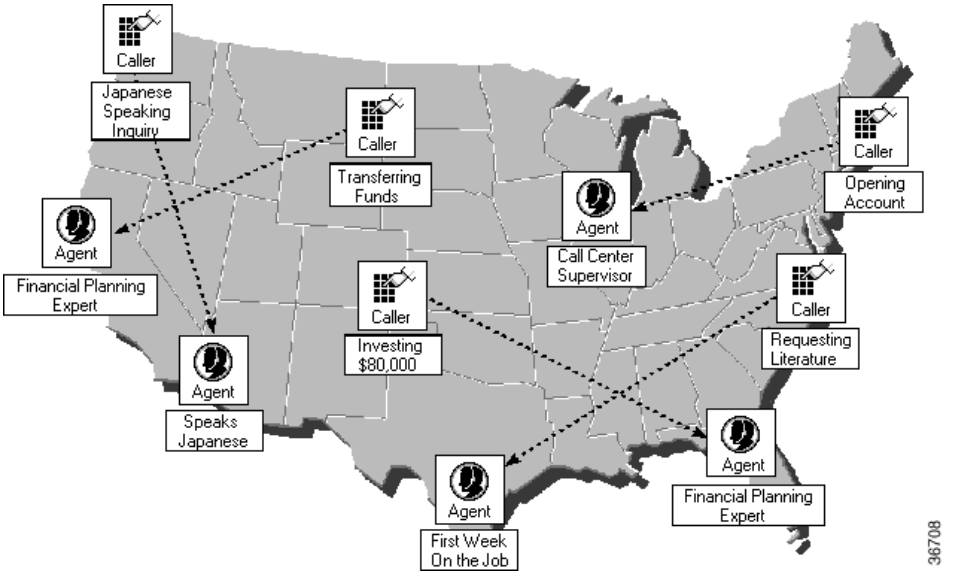
10. The overall operation of ICM software is monitored and controlled from an *Admin Workstation*. ICM software can support multiple Admin Workstations located throughout the contact center network.

Virtual Contact Center Model

In the virtual contact center model, agents from distributed contact centers can be grouped logically according to their areas of expertise. For example, a financial company might have contact centers in several cities across the country. Each contact center has groups of agents that are organized into *skill groups*.

The agents in these skill groups are trained to handle certain types of calls. Basic calls such as literature requests can be routed to skill groups that are trained to provide general services. Callers who have more complicated transactions can be routed to more specialized skill groups. Figure 1-2 shows how calls are routed to the best-skilled agents in the contact center enterprise.

Figure 1-2 ICM Call Routing



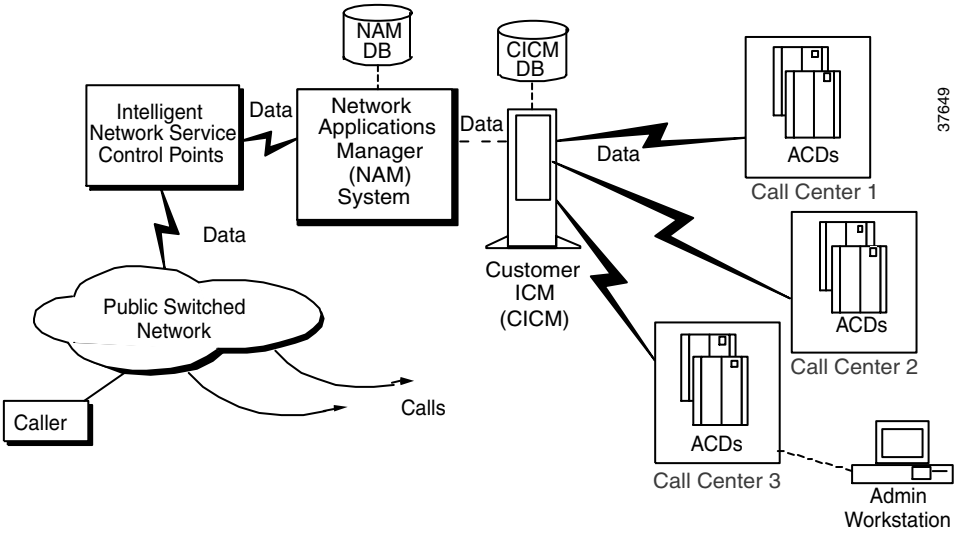
What happens if several callers require the services of a specialized agent? For example, you might have several callers who need the assistance of a Financial Planner. This type of specialized agent may not always be available at one contact center. However, since ICM software is aware of the skills and status of agents in the entire enterprise, it can quickly find Financial Planners at other contact centers and route the calls accordingly.

Network Service Provider Environment

The NAM uses an approach in which multiple instances of ICM software run on a single hardware platform. For example, you might have 25 instances of the ICM. Each instance, in turn, can serve one or more customers. This lets you offer customers a custom set of intelligent call routing features.

The NAM functions much like a Service Control Point (SCP) by distributing incoming calls to individual network service customers based on dialed number (DN), calling line ID (CLID), and caller-entered digits (CED). Figure 1-3 provides an overview of NAM.

Figure 1-3 NAM Overview



Typically, the service provider's *NAM* handles most call routing requests to completion (see Figure 1-3). However, certain requests may be forwarded to a *Customer ICM (CICM)* where they are handled according to the customer's specific rules.

NAMs, and usually CICMs, reside at the service provider premises. A single CICM platform may run multiple instances of ICM software; each instance, in turn, can serve one or more customers.

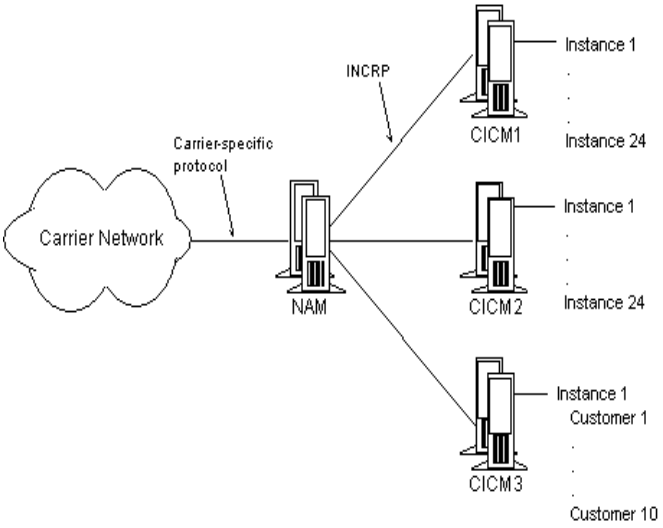
The CICM is connected to peripherals (ACDs, PBXs, and VRU systems) at customer call centers. This allows the CICM to use real-time call and agent status data in making call routing decisions.

Two-Tiered Architecture

The NAM uses a distributed two-tiered architecture that allows one ICM to pass route requests to another ICM. The first ICM, called the NAM, typically receives route requests from the service provider network. The NAM performs enhanced toll-free routing for the dialed number, or it might pass the route request to a Customer ICM (CICM).

Figure 1-4 shows how a single NAM can pass route requests to any of several CICMs. Based on the information it has for the call (DN, CLID, CED, and optionally, database lookup results), the NAM chooses which CICM should receive the route request.

Figure 1-4 Two-Tiered Architecture



The CICM is an instance of ICM software (CallRouter, Database Server, and NIC) that is dedicated to one or more customers. Multiple CICMs may reside on a shared hardware platform. This is sometimes referred to as a *CICM complex*. A CICM complex typically processes calls for one or more instances; each instance, in turn, processes calls for one or more customers.

NAM Call Routing

The NAM distributes calls to CICMs based on dialed number (that is, which customer is being called). The CICM chooses among call centers based on Dialed Number (DN), Calling Line ID (CLID), Caller Entered Digits (CED), and possibly other data.

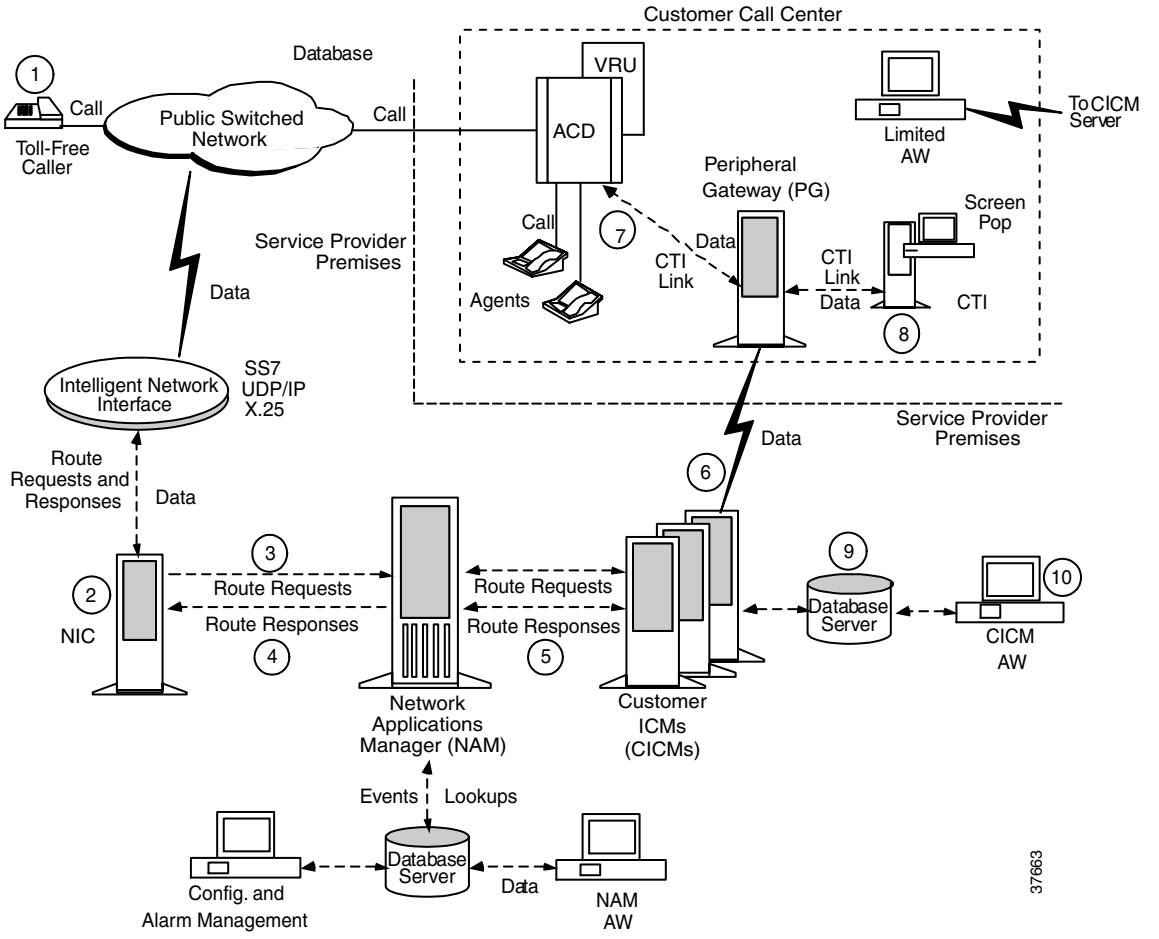
Some customers may be given access to a CICM, which provides individual control over call distribution logic. Customers can develop and implement their own call routing scripts on the CICM by using an Admin Workstation (AW).

There are two important differences between the standard ICM and the NAM:

- All central routing controller functionality is implemented in the service provider's network rather than at the customer site.
- NAM's two-tiered architecture allows one ICM to pass call routing requests to another ICM.

Figure 1-5 shows an example of NAM call routing.

Figure 1-5 NAM Call Routing



1. As shown in Figure 1-5, calls to be routed originate in the telephone network as calls to a toll-free or other number.
2. The NAM is configured in the service provider's intelligent network to handle *initial route requests* for each designated incoming call. A subsystem of the NAM, called the Network Interface Controller (NIC), communicates with the service provider network through an intelligent network interface.
3. The NIC translates the network's description of the call, including point of origin and number dialed, into the language of the NAM. The NIC passes call data to the NAM in the form of a route request.
4. Based on the dialed number, the NAM determines whether to choose a route itself or to pass the route request on to a CICM. The NAM may query a CLID or customer profile database before returning a *route response* to the NIC. The NIC passes the destination for the call back to the intelligent network interface. The telephone network connects the call and maintains the voice path. Typically, most route requests are handled completely by the scripting logic within the NAM. Others may be forwarded to CICMs.
5. For certain route requests, the NAM invokes an appropriate Customer ICM (CICM). For these requests, the CICM determines the network target by using its own scripting logic.
6. Each CICM maintains real-time communications with the ACDs in call centers by using a Peripheral Gateway (PG). To make optimal decisions, the CICM must know the latest status for every call, agent, and call center in its network. One purpose of the PG is to extract this status information from the ACD and forward it to the CICM's in-memory database. The CICM uses this real-time status data in executing routing scripts. The CICM then returns a route response to the NAM. The NAM forwards the responses to the service provider network, which then connects the call.

Note NAMs do not communicate directly with ACDs at the call center. NAMs perform basic and enhanced call routing functions. They also forward route requests to and receive route responses from CICMs.

7. Each customer call center has one or more Automatic Call Distributor (ACD) systems that direct incoming calls to the telephone sets of individual agents. The PG communicates with ACDs over the switch vendor's Computer Telephony Integration (CTI) link. In private network configurations, ACDs

can also originate route requests. In these situations, the PG serves the additional purpose of forwarding route requests to the CallRouter and returning the target destinations to the ACD. This is called Post-Routing.

8. External server or workstation applications can subscribe with the PG for call and agent event data that can be used in screen-pop and other CTI applications. The optional Cisco CTI feature integrates CTI applications from multiple vendors into the call center enterprise.
9. All event data gathered by PGs are stored in an industry-standard relational database on the CICM. These data are available to customers for real-time monitoring and historical reporting on call center and agent activity. The NAM stores historical data on route requests and network activity in a central relational database. These data are used by the service provider to monitor call routing and the performance of the NAM system.
10. The overall operation of the NAM is monitored and controlled from Admin Workstations (AWs). NAM supports four types of AWs, each with capabilities suited to its role in the NAM system. For example, NAM customers use a *Limited AW*, which provides access only to that customer's data.

Intelligent Network Service Continuum

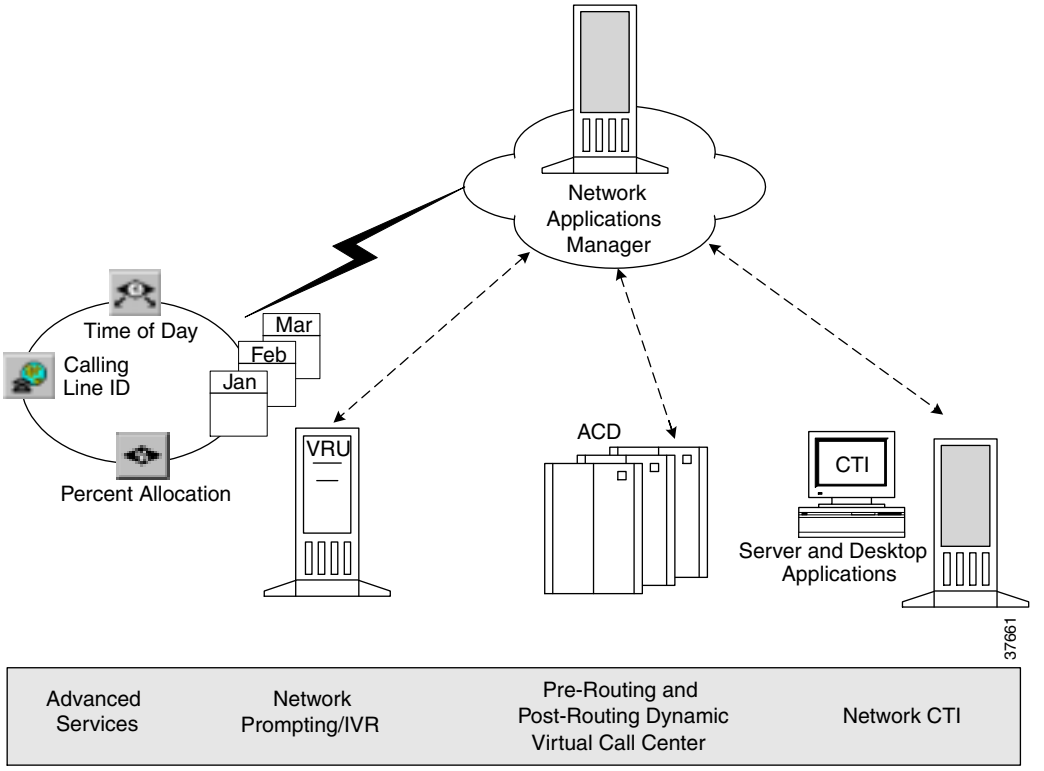
NAM can be implemented with multiple options depending on the number of customers to be supported, call volumes, and the level of system redundancy (fault tolerance) required. A call center customer might start with enhanced toll-free services and add network VRU prompting and virtual call center capabilities as the need arises.

With the more advanced NAM options, customers can use the service provider network to monitor the real-time availability and performance of agents in each call center. At the highest level, customers can be given the ability to control call routing in the network.

In addition to call routing capabilities, the NAM provides options that integrate network- and premises-based CTI applications. The customer can build a virtual call center enterprise that brings together data sources from throughout the corporation. Most importantly, customers can choose a mix of services to match their business goals.

Figure 1-6 shows the continuum of services available to customers through the NAM.

Figure 1-6 Intelligent Network Service Continuum



Enhanced Toll-Free Services

The NAM lets you offer several classic toll-free services:

- Time-of-day routing
- Day-of-week routing
- Percentage allocation routing

- Workforce-based call distribution
- Quota routing
- Regional routing
- CLID routing
- Dealer locator

Network Prompting/VRU Integration

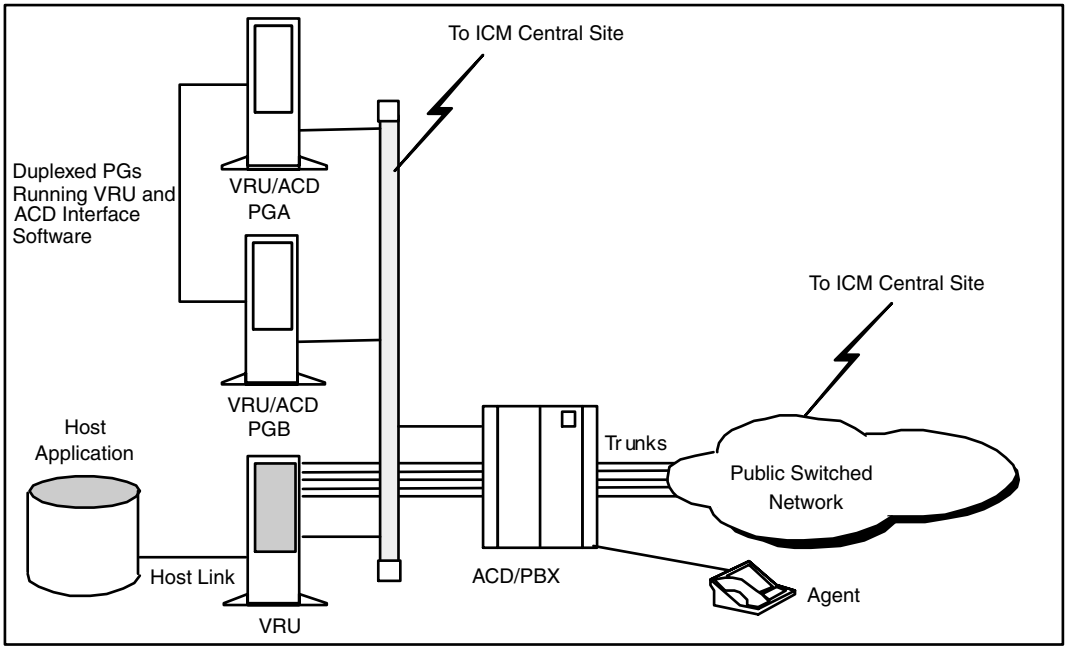
VRU Integration allows the NAM to route calls to applications on Voice Response Units (VRUs). With the VRU Integration option, VRU systems can use NAM call routing features. For example, a VRU system can use Post-Routing capabilities to select targets for calls it needs to transfer. The NAM can also collect data from VRU systems and use the data call routing, real-time monitoring, and historical reporting.

VRU Integration is not specific to a particular VRU system type or manufacturer; rather, it is based on an open interface model. VRU systems that support Enterprise VRU include:

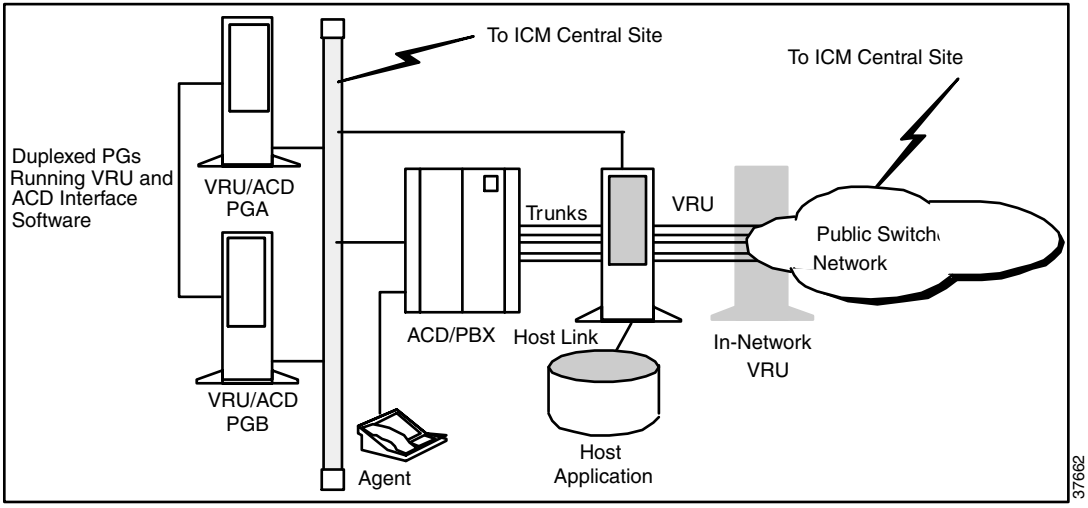
- AT&T Infoworks
- Brite IVR
- Edify Electronic Workforce
- IBM DirectTalk 6000
- InterVoice
- Lucent Conversant
- Periphonics VPS/is
- VoiceTek Generations

VRU Integration works with VRU systems that are located at the customer's call center site or in the service provider network. At the call center, the VRU system might be connected on the network side of the ACD or "behind" the ACD. In the service provider network, the VRU system may be offered as a service (see Figure 1-7).

Figure 1-7 VRU Integration Overview



VRUBehind ACD at Call Center



VRU in Front of ACD (at Call Center or in Network)

Virtual Call Center Capabilities

Cisco NAM software provides a platform for offering customers several intelligent call routing services. Customers can use any of the following options to create a virtual call center:

- Pre-Routing and Post-Routing
- Gateway SQL
- Custom Gateway
- Cisco CTI
- Schedule Link
- VRU Integration
- ICM Web Option
- Web View
- Network Transfer

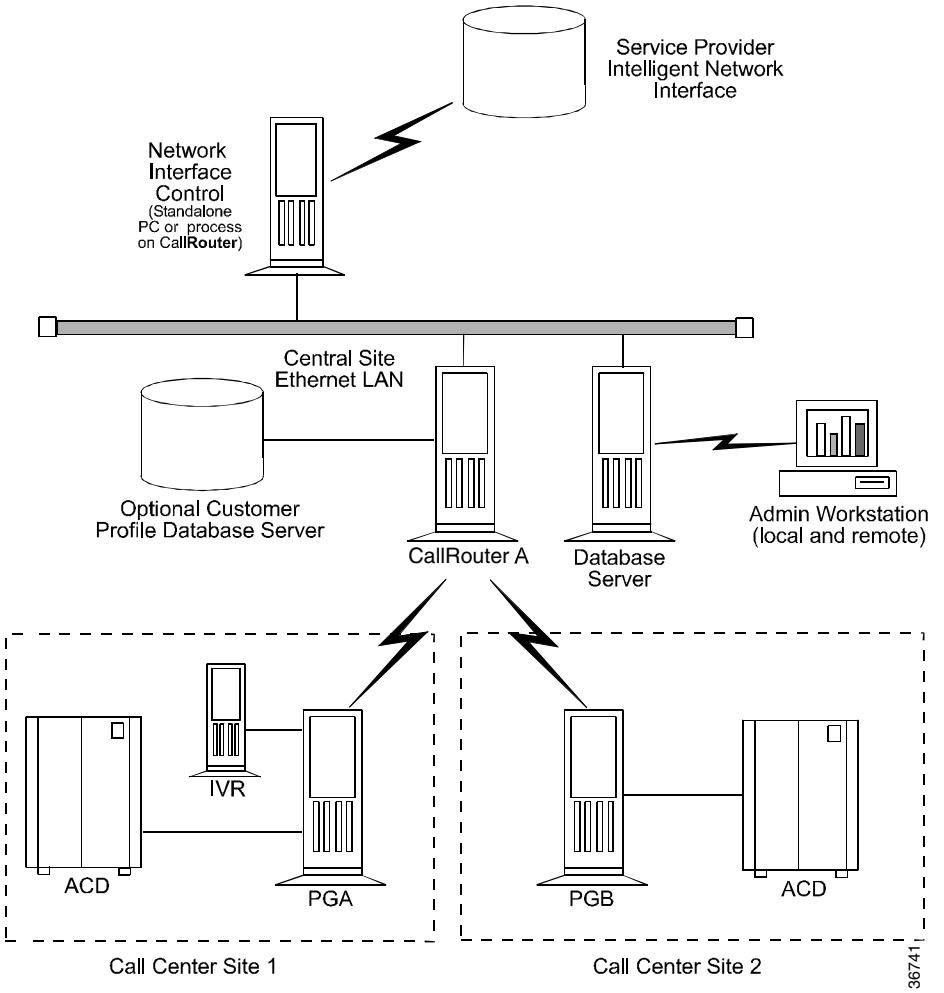
Note These services require a Customer ICM (CICM).

Pre-Routing

Pre-Routing is Cisco's advanced form of call control in which call routing intelligence is applied before the call is sent to a destination (that is, before a call terminates at a contact center). With Pre-Routing, a Network Interface Controller (NIC)on the CICM receives a routing request from the NAM software and passes the routing request through a call routing script. The CICM script defines how the call should be routed.

In making a Pre-Routing decision, the CICM software uses real-time contact center status data that is being continually gathered by PGs at different sites. Figure 1-8 shows an example of a Pre-Routing system.

Figure 1-8 Pre-Routing System



ICM Pre-Routing systems require the following components:

- Network Interface Controller
- CallRouter
- Logger
- Admin Workstation

- Peripheral Gateway

The Pre-Routing capabilities are enabled through the Network Interface Controller (NIC) and CallRouter processes. The service provider network communicates directly with the NIC process. In the case of the AT&T NIC, the NIC process resides on a standalone PC. For clarity, this configuration is shown in Figure 1-8. With other types of network access (for example, MCI and Sprint), the NIC is implemented as a process on the CallRouter platform.

See the *Cisco ICM Software Pre-installation Planning — Central Controller and PG Fault Tolerance* manual for more information on the different Central Controller and Peripheral Gateway configuration options.

Post-Routing

Post-Routing systems have software that allows ICM software to make secondary routing decisions after a call has been received at a contact center. In Post-Routing, the ACD, VRU, or PBX submits a routing request to the CICM software. The CICM runs a script to process the routing request and return a destination address to the ACD. CICM software directs the ACD to send the call to an agent, skill group, or service in the same contact center or at a different contact center in the enterprise.

In making a Post-Routing decision, CICM software can use the same information and script it uses in Pre-Routing. In other words, the same call routing intelligence that is used in the Pre-Routing of calls is applied to calls that are interflowed between contact center sites, transferred between agents, or transferred into or out of VRUs.

Pre- and Post-Routing Systems

A Pre- and Post-Routing ICM system is a complete routing, monitoring, and reporting system. ICM software can execute routing decisions before a call terminates at a contact center. It can also make secondary routing decisions after a call has been received at a contact center. A Pre- and Post-Routing system can be expanded with optional features, such as Gateway SQL or VRU Integration, to create an intelligent call routing and management solution that encompasses all elements of a company's contact center enterprise.

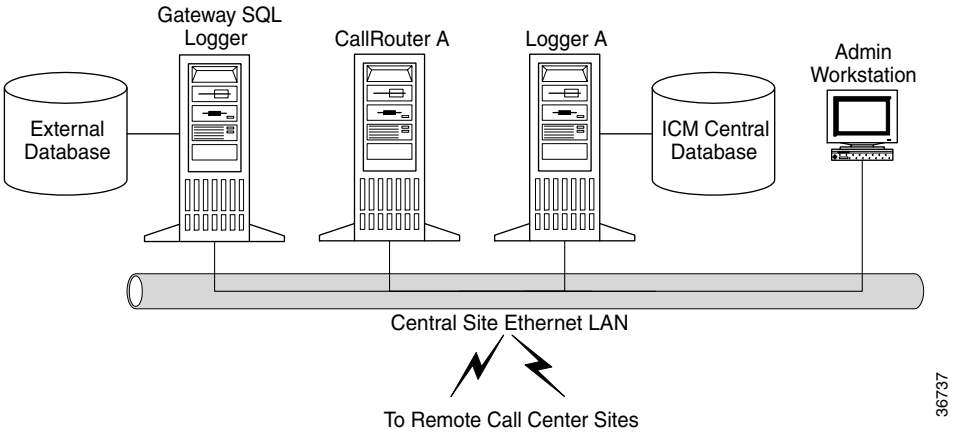
Gateway SQL

The Gateway SQL option allows CICM software to query an external Mircrosoft SQL Server database and use the data in call routing. For example, if you have a database that contains account or customer profile information about your customers, you might perform a database lookup to assist in routing the call. The database lookup can be based on Calling Line ID (CLID), Dialed Number (DN), or Caller Entered Digits (CEDs) such as account or social security numbers.

A typical Gateway SQL application might prioritize callers based on data retrieved from the external database lookup. For example, a call routing script might use the caller's CLID to access a database and retrieve the caller's average monthly bill. Based on this information, the script would route the caller to the most appropriate answering resource.

Figure 1-9 shows a basic Gateway SQL configuration. Note that this configuration requires an additional logger on which to load the external database.

Figure 1-9 Gateway SQL Configuration



See the *Cisco ICM Software Pre-installation Planning — Product Options and System Integration* manual for more information on the requirements for Gateway SQL and the external database. See also Chapter 5, "CallRouter," for a description of the DB Lookup node, which is a script component that comes as part of the Gateway SQL feature.

Custom Gateway

The Gateway option allows CICM software to interact with a host system that is running another contact center application. Within CICM software, the Gateway feature is implemented as a node in a call routing script. You add a Gateway node to a script to instruct ICM software to communicate with an external application, or send information to an external application (such as a predictive dialer). This allows the script to evaluate responses from an external application. ICM software can then base subsequent routing decisions on the results produced by the application.

A typical Gateway application might return a variable to the CallRouter that identifies the caller as having a certain type of account. The script could then use this information to control where and how the call is routed.

See Chapter 5, "CallRouter," for more information on the Gateway node.

Cisco CTI

The Cisco CTI option provides an interface between CICM software and agent desktop or server applications.

The CTI Server component of Cisco CTI runs on the ICM's PG platform. It works with the Peripheral Gateway's ACD and VRU interface software and associated ACDs to track events and transactions and forward call- and transaction-related data to the agent desktop. CTI Server's full third-party call control features allow agents and integrated desktop applications to perform such tasks as transfer, conference and set call data, all within an enterprise framework. Voice and data collected by an agent at the desktop can be transferred, in the form of a screen pop, among agents across multi-vendor switches, allowing customer and transaction data to accompany a call from the VRU or Web Server to the agent and from site-to-site as required. This capability increases the efficiency of a virtual contact center workforce by eliminating time spent verbally soliciting information that is already available.

CTI Desktop component of Cisco CTI is a collection of ActiveX controls that provides desktop applications with full access to CTI Server while abstracting the underlying details of the telephony system. As a result, screen-pops and other CTI operations can be easily generated and integrated with business applications without the need for coding.

You can use the Cisco CTI products to ensure that customer and transaction data "follow" the call from switch to agent, and from site to site, regardless of variations in switch platforms. In a desktop or server applications environment, you can apply Cisco CTI data in screen pop and call wrap-up applications.

See Chapter 6, "Peripheral Interfaces," for more information on the Cisco CTI feature.

Schedule Link

The Schedule Link option allows CICM software to import schedule data from an external workforce management system. ICM software can then use the workforce scheduling data to make call routing decisions and for reporting purposes.

In a simple application, you might use imported schedule data in a script to route calls in anticipation of a shift change at a contact center. ICM software can then begin reducing the size of the call queue at the site in anticipation of the shift change. For example, if a group of agents is scheduled to log off at 6 P.M., you would not allow the expected delay in queue time for calls to exceed the time that remains to the end of the schedule period. This helps to ensure that only an acceptable level of calls are routed to an understaffed contact center.

You can also incorporate schedule data into ICM reports. For example, your adherence reports might compare agents scheduled compared to agents logged in.

See Chapter 7, "Management Tools," for more information on the Schedule Link option.

VRU Integration

VRU Integration provides an option for running a Cisco interface to Voice Response Units (VRUs). The VRU interface software runs on a PG platform. It allows ICM software to route calls to targets on a VRU and collect data from a VRU for use in call routing, real-time monitoring, and historical reporting.

VRU Integration can also provide queuing at a network-based or premises-based VRU. This feature allows calls to be directed to a VRU queue when no other appropriate answering resource is available.

Giving the Cisco platform control over network VRU resources enables a carrier to minimize the number of VRU ports used on calls transferred from a VRU to an agent.

The VRU interface is not specific to a particular VRU type or manufacturer. It is based on an open VRU model. In order for NAM software to interface to a specific type of VRU, the VRU must be programmed to meet the Cisco Open VRU Interface Specification.

VRU systems that support the interface specification include:

- Intervoice/Brite
- Edify Electronic Workforce
- IBM DirectTalk 6000
- InterVoice
- Lucent Conversant
- Periphonics VPS/is
- Aspect Generations

Note If your VRU does not appear on this list, contact Cisco or your VRU provider.

See Chapter 6, "Peripheral Interfaces," for more information on ways you can integrate VRUs with the ICM system.

ICM Web Option

The ICM Web Option provides a Web server interface to ICM software. With the ICM Web Option, calls originating from the Internet are distributed by ICM software in the same way as calls from a carrier network.

The ICM Web Option interface is not specific to any particular type of web server. The interface is base on a generic web model. In order for ICM software to interface to a specific type of Web server, the Web server must be programmed to meet the Cisco Web Interface Specification.

See Chapter 7, "Management Tools," for more information on the ICM Web View Option.

Web View

Web View is the optional web-based monitoring tool of ICM software. Web View provides read-only access to ICM call performance reports and call routing scripts to any computer with access to the web. Using a supported web browser, registered users can access the Web View internal corporate web site to generate ICM reports and view call routing scripts. See Chapter 7, "Management Tools," for more information on Web View.

Network Transfer

The ICM intelligent Post-Routing feature can be used to route a call to a new destination after it has been terminated at a device such as an ACD. However, the ability to transfer calls to off-switch destinations is often limited by cost and/or service availability.

The sophisticated network interfaces currently available provide the ICM with many options for handling a call after it has been terminated at the initial destination. By integrating the ICM's post-routing function with in-network call control, it is possible to provide transfer and conference features capable of accessing destinations *anywhere* in the carrier's network. This ICM software feature is referred to as *Network Transfer.*

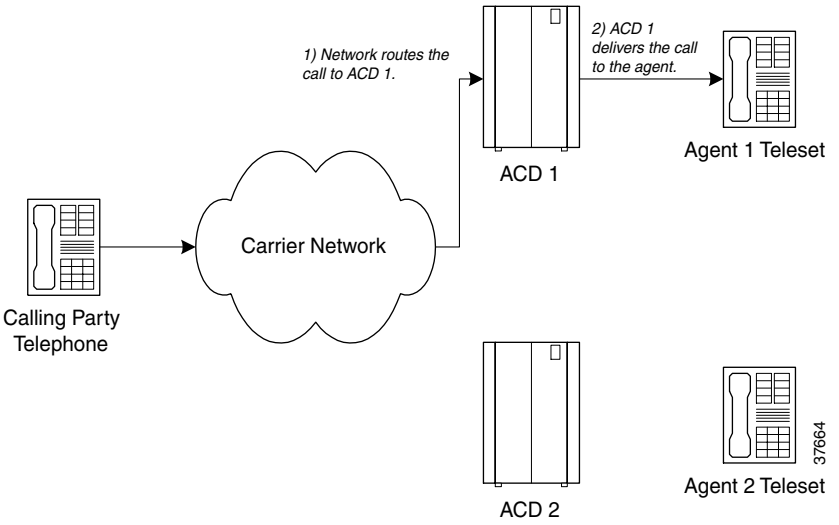
Cisco ICM software currently supports blind transfer only. Blind transfer occurs when a call is transferred from one called party to a second called party without prior consultation between the first called party and the second called party.

The benefits of Network Transfer

In a typical in-bound ACD call, as shown in Figure 1-10, the caller dials a toll-free number that is routed to a customer-premise ACD, which then selects an agent to handle the call:

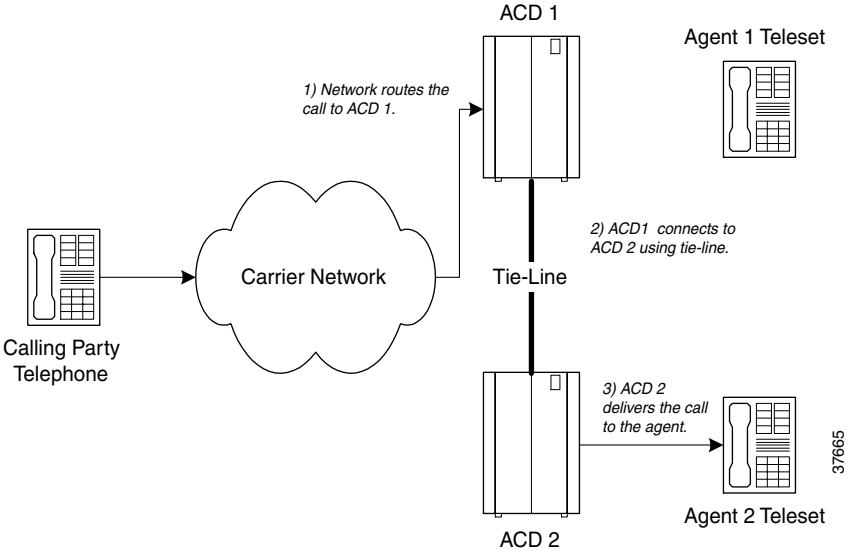
Note An ACD is shown to illustrate the typical usage of inter-site tie lines. Network Transfer features may also be used in a non-ACD environment, as in the Cisco IP Contact Center (IPCC) products.

Figure 1-10 Call Connections Before Transfer



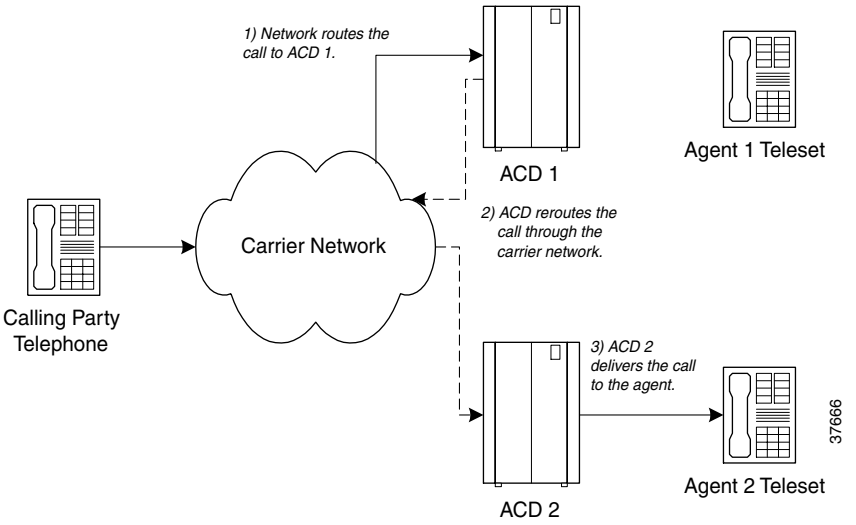
In the traditional inter-site transfer case, shown in Figure 1-11, the first ACD remains connected to the caller and connects to the new destination through dedicated inter-site tie lines:

Figure 1-11 Call Connections After Traditional Inter-Site Transfer



The Network Transfer feature minimizes the cost of such inter-site call transfers by rerouting the call through the carrier network to the new destination, as shown in Figure 1-12. This eliminates the necessity of the tie-line and releasing the resources used by the call on the first ACD.

Figure 1-12 Call Connections After Network Transfer



How Blind Transfer Works

Blind transfers may be requested to satisfy an ACD post-route request or a CTI client application blind transfer request with the post-route option specified.

The Blind Transfer feature transfers a call from one called party to a second called party without prior consultation between the first called party and the second called party.

Note The first or second called party may, in fact, be a VRU and not a person.

For blind transfers in-network, the call is handled as follows:

1. Requests originate from an ACD or from a CTI application.
2. When the CallRouter selects a "normal" Routing Client label (i.e., same-ACD transfer), the selected label is returned to the requesting PG and the message flow is the same as the standard ICM.
3. When the CallRouter selects a network label, the PG's request is "forwarded" to the appropriate NIC.

4. The NIC either accepts or rejects the request. The response is sent to the CallRouter, which relays the response to the requesting PG.
5. The accepted request confirmation received by the PG includes an indication of the action required of the PG, if any (such as the generation of DTMF tones to the network through the called party leg, disconnection, etc.).
6. The NIC proceeds with the request, generating call progress events until the NIC has completed its processing of the request. These event messages are sent to the CallRouter and relayed to the indicated PG, providing call state feedback to the PG and any associated CTI client applications.
7. The Termination Call Detail records will show the in-network call legs with proper linkage to the related records of other legs of the call. The call type and call disposition codes will indicate the in-network calls.

VRU Network Transfer

An VRU may initiate network transfer if it has been enabled to do so by the VRU Service Control Interface. When it is so enabled, the VRU retains call control when it connects a caller to a destination. If the VRU receives a second connection request, it disconnects the call from its previous destination and connects the call to its new destination.

Enabling and Disabling Network Transfer

The Network Transfer feature does not require any special installation. The feature is disabled by default for all PG types.

To change the Network Transfer setting in Script Editor, use the Set node to specify the NetworkTransferEnabled call variable value. If you set this variable to 1, Network Transfer is enabled; if you set it to 0, Network Transfer is not enabled.

Benefits to Network Service Providers

The NAM offers several benefits to Network Service Providers (NSPs):

- **Differentiate your network services**. The NAM provides an opportunity to differentiate your network from competitive offerings by increasing its significance to call center customers. Specifically, the NAM provides a proven platform for deploying critical functions such as caller-segmentation,

resource-allocation, and Network CTI. By hosting a customer's most mission-critical capabilities, the NAM turns a service provider network into a customer's virtual call center applications platform.

- **Leverage the network's infrastructure**. The NAM complements existing network capabilities, giving your customers the combined benefit of two powerful technologies. The network provides robust transport and unsurpassed reach to every answering resource in the customer's enterprise. The NAM adds intelligence to those connections and helps customers more effectively leverage the network to achieve business goals.
- **Scale the solution to customer needs**. The NAM is a highly scalable solution that lets you deliver sophisticated call routing and CTI solutions to every call center customer, from single installations to multi-site environments. The product supports a service continuum that allows customers to progress from basic network routing, to VRU network prompting, to database lookup routing, Pre-Routing, and Post-Routing, and finally to network-level CTI.

Benefits to NSP Customers

NAM can intelligently route every call handled by a customer call center. Because calls can be routed to any agent, anywhere within a call center enterprise, customers can dramatically reduce caller hold times, the number of abandoned calls, and the number of callers having to re-dial. Customers will also realize benefits in the areas of resource management, system support, and reliability.

Improved Resource Management

With NAM software services, call center customers can control expenses and improve resource management.

The physical location of agent and system resources becomes transparent with NAM software. If you choose, you can manage the entire contact center network as a single shared resource pool. With this kind of flexibility, you can organize and reorganize services to meet the changing demands of callers. Agents can be organized functionally, by service offering or skill set, instead of by geographic location alone.

Because NAM software is constantly monitoring call activity, traffic is dynamically shifted between contact centers to ensure that one contact center is not overwhelmed (for example, during a shift change). By using the advanced capabilities of the public network, NAM software automatically routes overflow calls to the best agents with the same skill set, even though they may be located at a different contact center site or on an ACD of a different manufacturer.

The ability to share existing agent resources throughout an operation helps control your single largest contact center expense—people. You can eliminate the need to over-staff contact centers in anticipation of increased call volume. You can also increase agent productivity by eliminating idle time. By using your agents more efficiently, you will find that your contact centers can handle more calls with fewer agents, while providing customers with better service and information.

Multi-Carrier, Multi-Vendor Support

The NAM's open system architecture and use of industry-standard protocols and platforms adds valuable capabilities to the overall contact center operation—all without interfering with the organization's legacy systems. Because the NAM can gather and process call activity data from the industry's leading ACD, PBX, and VRU systems, the systems you have in place can stay in place. In addition, the NAM's ability to interface with multiple carrier networks frees you from dependency on a single carrier. This gives you full latitude in choosing carrier services.

With the NAM, your contact center enterprise supports call routing for all three major North American carriers, many international carriers, and many ACD, PBX, and VRU systems vendors, with more being added on a regular basis. The system also supports a broad range of intelligent telecommunications links, industry-standard MIS tools, computer platforms, and a growing number of vertical business applications.

The NAM extends the existing hardware and networking investment of your organization while accommodating organizational growth and technology evolution. Contact your Cisco representative for a complete list of network interfaces and contact center systems NAM currently supports.

Open System, Client/Server Architecture

NAM software uses the Microsoft Windows operating system as it provides for a highly reliable, 32-bit, preemptive, multitasking operating environment. Furthermore, Windows provides access to hundreds of business applications and vertical business solutions for integration into the ICM product. With Windows , you can pick from a variety of hardware platforms on which to deploy the NAM application, including multiprocessor systems.

NAM software uses Microsoft SQL Server for Windows for its database. Microsoft SQL Server provides an advanced, client-server database management system. SQL Server is tightly integrated with the Windows operating system, which improves operational control and enables SQL Server to work like a natural extension of the operating system.

The data in NAM databases can be accessed by using the NAM-supplied monitoring screens, reports, and report writing tools, or through the DB Library, generic client applications, or Open Database Connectivity (ODBC) tools. These client APIs allow you to use a variety of front-end Microsoft tools, including Access, Excel, and Visual Basic.

The NAM monitoring and reporting system uses Sybase's InfoMaker, which is a Windows-based client/server application development tool. InfoMaker allows you to quickly build sophisticated, graphical applications that can access information from multiple databases.

Open Application Interfaces

NAM software's use of open standards allows you to incorporate data elements that are critical to contact center management into the ICM's management information structure. NAM software offers *open application interfaces* which you can use to integrate third-party contact center applications into the NAM contact center enterprise. ICM software can readily interface with customer profile and workforce management databases, client applications, CTI applications, and peripheral devices.

Specifically, NAM software provides the following options for including external applications and data in the enterprise call distribution process:

- Cisco CTI
- VRU Integration

- Schedule Link
- Gateway SQL
- Gateway
- ICM Web Option

Mission-Critical Reliability

As a mission-critical application, NAM software routes calls continuously and intelligently with no interruption in service. The fault tolerant design of NAM software supports redundancy for all system components, software, and communications paths. The goal of fault tolerance is to provide non-stop call routing.

NAM software is a self-diagnosing and self-healing system. Diagnostics run continuously in background mode, checking the availability of nodes, software processes, and communications paths. If ICM software detects a failure, it automatically switches service to a redundant component without disrupting the system's availability or performance.

NAM software is also resilient to hardware component failures, communications network failures, asynchronous software errors, and the catastrophic loss of a site that supports the ICM Central Controller (CallRouter and Logger). ICM software does not rely solely on a single fault-tolerant computer; rather, the primary and backup call routing systems can be located in separate buildings, either locally or in different parts of the country.

Chapter 9, "Fault Tolerance," provides more information on the NAM's fault tolerant features.

Simplified Strategic Management

NAM software turns the IXC network, ACDs, and VRUs into information servers. You can use data from these systems to organize and refine your service functions. For example, you might combine call handling and performance data with caller transaction data to provide a comprehensive view of the call from the caller's perspective.

NAM software can alert you to exceptions in staffing and call volumes by importing data from forecasting and scheduling systems and comparing it to the actual results. More than just a tool for monitoring and historical reporting, NAM software contributes to the business bottom line by supporting management planning and control.

CHAPTER 2

System Components

The NAM is a software-based call processing system. Each software component of the NAM runs as a process on a Windows computer. In many cases, multiple NAM processes share a single Windows platform. The primary components include:

- **CallRouter**. The CallRouter process contains the call routing logic of the system. The CallRouter executes call routing scripts and collect information about the entire system.
- **Database Server**. The Database Server is the process that manages the NAM central databases.
- **Network Interface Controller (NIC)**. The NIC software provides the interface between the NAM and the service provider network.
- **Peripheral Gateway (PG)**. The PG software provides the interface between the NAM and the CICM interface to the ACD, PBX, and VRU systems that are being monitored and/or controlled.
- **Admin Workstation (AW)**. The AW provides the user interface to the NAM. The AW contains a group of NAM tools that are used to control call routing, monitor call centers, and administer the system.

This chapter describes how the NAM components fit into the service provider and call center environments. It also describes the role of each NAM process in a network-based virtual call center.

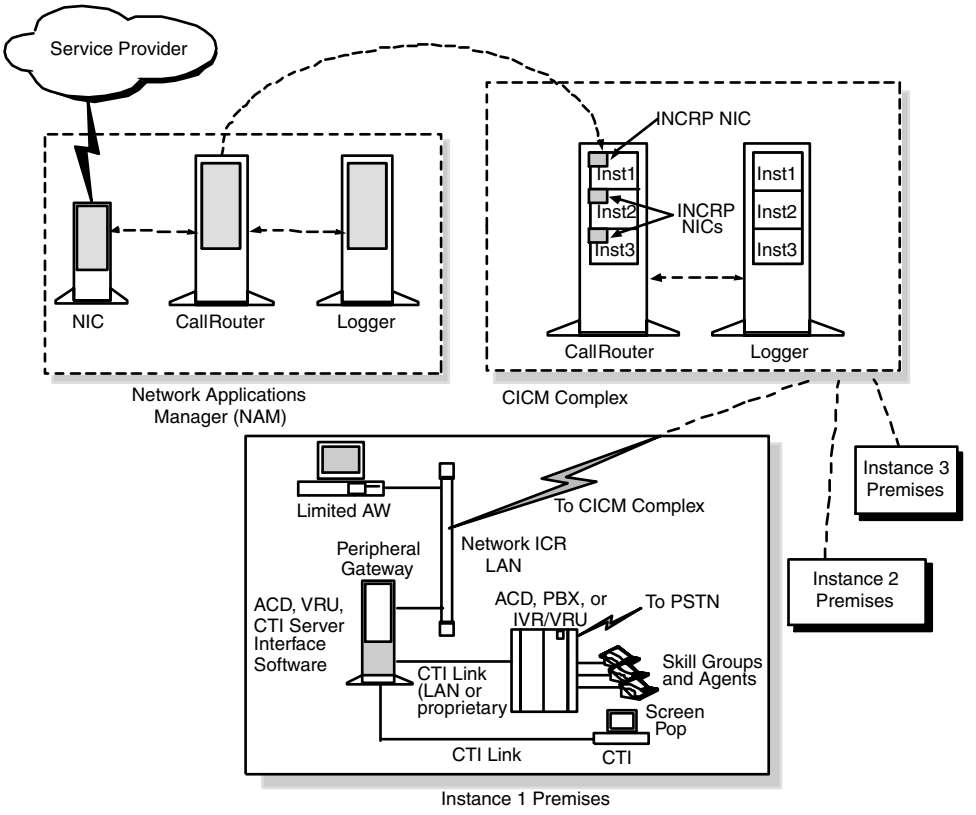
Service Bureau Architecture

In a network service provider (NSP) or service bureau environment, three special components are deployed to make NAM services available to multiple customers:

- NAM
- Customer ICM (CICM)

Figure 2-1 shows how these NAM processes work together.

Figure 2-1 NAM Processes



NAM

The NAM is an ICM system that is configured to handle initial route requests from the service provider network. The NAM typically handles many initial route requests to completion. It uses its own scripting logic to return a network label to the service provider network. This label instructs the network on where to deliver the call. The NAM also forwards some routing requests to Customer ICMs (CICMs).

A NAM platform runs one instance of ICM software and may service many customers. A network service provider might have just a single NAM, or it might divide the call load among multiple NAMs.

Customer ICM (CICM)

The CICM is a single instance of ICM software running on a shared hardware platform. Each CICM instance, in turn, can serve one or more customers. An instance typically consists of several software components (CallRouter, Logger, Peripheral Gateways, Admin Workstations)—some of which may be duplexed—typically installed on several different computers. A single computer may run multiple components of a single instance or components of multiple instances

The CICM supplies custom call routing functions to network service provider customers. For example, customers can create their own call routing scripts to route calls within their call center enterprise.

CICMs typically remain within the service provider's management arena. However, they may also be deployed as dedicated systems on the customer premises. A *Customer ICM complex* consists of several CICMs on a shared hardware platform with each serving a separate instance.

To support a NAM service bureau, components for multiple customers must run on a single ICM machine. For example, a CICM Database Server machine contains multiple instances of the ICM Database Server software, with each dedicated to one or more customers.

INCRP NIC

The Intelligent Network Call Routing Protocol (INCRP) NIC is the network interface for the Customer ICM (CICM). The INCRP NIC is a software process that runs on a CICM's CallRouter machine. The INCRP NIC process receives route requests from and returns route responses to the NAM.

NAM Components and Processes

The NAM is an open-systems product that can be deployed on industry-standard platforms, transforming call centers into open, client/server environments.

Each of its major functions is deployed in a client/server fashion, allowing the system to be scalable and thereby making it cost-effective in both small and large contact center environments. The user interfaces take full advantage of the standard Windows API and are designed to be compatible with other business productivity tools operating in the same environment. The architecture provides fault tolerance through duplication of hardware elements and distributed software control.

The NAM acts as a *routing server*, gathering and processing routing requests and call status information from the *routing clients*—the service provider network and customer ACDs. The NAM achieves this transformation through a suite of intelligent software processes: the *CallRouter* and *Logger* (together referred to as the *Central Controller*), *Network Interface Controller* (NIC), *Peripheral Gateway* (PG), and *Admin Workstation*.

The sections that follow provide summary descriptions of these major architectural elements.

CallRouter

The CallRouter process contains the call routing logic of the system. The CallRouter runs on each NAM and CICM in the NAM system. The CallRouter receives route requests from the NIC or PG, processes the requests through the appropriate call routing script, and returns destination addresses to the NIC for forwarding to the service provider network. Several CallRouter processes may be running on a single CICM complex, each dedicated to a specific instance.

The CICM CallRouter process is able to use real-time call handling and agent status data in making routing decisions. These data are gathered by Peripheral Gateways (PGs) at customer sites and forwarded to CICMs.

It is important to note that NAM software is capable of routing customer queries that arrive through alternative media, such as the Internet, fax, and email. The Internet, fax, and email servers can be routing clients of ICM software in the same way VRU and ACDs can be routing clients. These messages can be routed to the best available answering resource in the same manner as circuit-switch calls.

Logger

The database provides the enterprise with an open information server (called the Logger but also known as the database server), containing customer contact, call handling, planning, and performance data. The open system approach allows for Cisco data to be joined with other data sources, such as ACD data, network data, call transaction data, or workforce management data. NAM software can perform such functions as agent adherence monitoring and the comparison of actual call volumes to forecast.

The Logger is the process that manages the central database. A Logger process runs on each NAM and CICM in the NAM system. Several Logger processes may be running on a single CICM complex, each dedicated to a specific instance.

All the data captured from the ACD and the public telephone network, including the details of the routing decisions made by the CallRouter, are logged into a SQL Server database on the Database Server machine. The Database Server is open in design and is intended to be part of the overall corporate MIS network in which it is deployed. The open design allows any authorized user to access the database.

Network Interface Controller

The Network Interface Controller (NIC) software provides the interface between the NAM and the service provider's intelligent switching network. The NIC receives route requests from the network and forwards them to the appropriate CallRouter for processing.

The Customer ICM (CICM) uses a special NIC to receive route requests from and return route responses to the NAM. This NIC, called the INCRP NIC, allows CICMs to route calls via the Intelligent Network Call Routing Protocol (INCRP).

Chapter 4, "Network Interface Controllers," provides more information about the NICs.

Peripheral Gateway

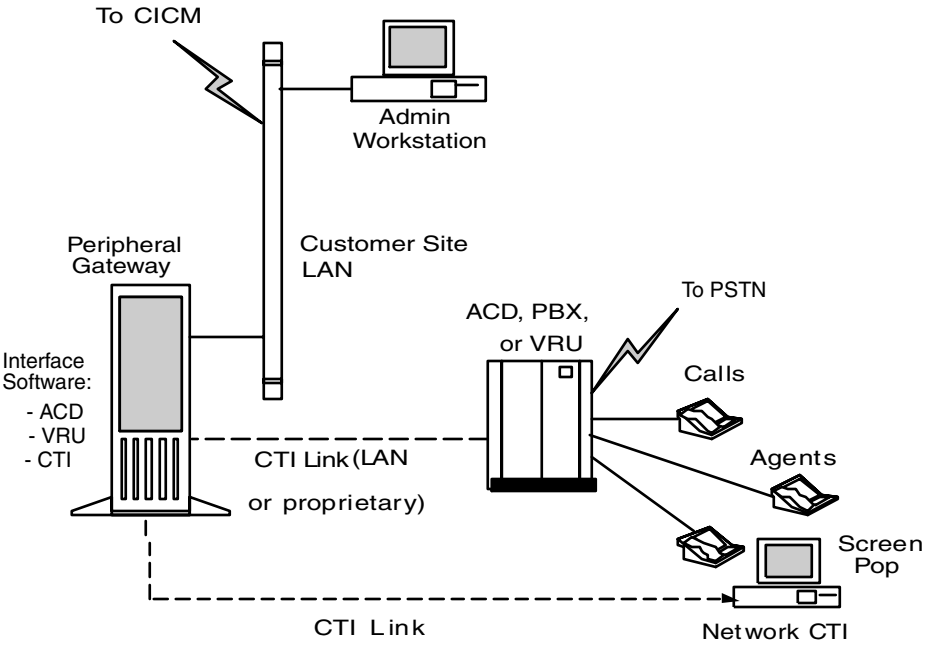
Peripheral Gateways are associated with the Network VRU and are located at the customer site. The PG serves as an intermediary between the Customer ICM (CICM) and the essentially proprietary interfaces provided by the switch, VRU, web server manufacturers, and the routing logic of ICM software. One PG can control multiple ACDs of the same type.

The PG monitors real-time agent status, calculates call handling performance statistics, and forwards the appropriate event and statistical information to the central database. ICM software is event-based and does not rely on aggregated or averaged data originally destined for a supervisor terminal. The PG tracks events on an agent and individual call level, ensuring the most accurate routing decisions possible. This capability allows ICM software to extend call control outside of the traditional contact center environment, including branch offices, workgroup clusters, and telecommuters.

The PG also monitors and responds to routing requests from the switch and/or VRU and enables the intelligent Post-Routing of calls. Examples of Post-Routing include the transfer of calls between agents and the interflow of calls between ACDs/PBXs. With intelligent transfer, agents can make functional transfer requests (that is, transfer this call to a specialist) and ICM software can seek out the most qualified, available agent in the network and instruct the switch, or VRU, to route the call to that destination.

Figure 2-2 shows a sample NAM customer site. In this sample configuration, the CICM is located in the service provider network.

Figure 2-2 Sample Customer Site



Admin Workstation

The Admin Workstation (AW) provides the user interface to the NAM and ICM software. The Admin Workstation is a PC running ICM software on the Microsoft Windows 2000 operating system. Admin Workstations for the service provider can be located with NAMs and CICMs and at remote locations in the network. Customer AWs can be located at any customer site.

Both of the following types of Admin Workstations reside at the service provider site:

- **Network AW (NAM)**. A network Admin Workstation associated with the NAM system.
- **Network AW (CICM)**. A network Admin Workstation associated with the CICM systems.

Both of these Network AWs may reside on the same machine.

A customer site contains one of the following three types of Admin Workstations:

- **Limited AW**. Accesses one instance's data from a CICM.
- **Standard**. A standard ICM AW. Optionally, the service provider can use the ICM Configuration Manager Feature Control facility to define the customer's available tools.

The capabilities of the AWs are described in more detail in Chapter 7, "Management Tools."

CHAPTER 3

Deployment Options

The design of the NAM imposes no restrictions on its deployment within a service provider network. Several deployment options are available depending on the services to be offered and the level of fault tolerance required. This chapter provides an overview of the following NAM deployment options:

- **Network deployment**. The NAM can be deployed completely in the service provider network (that is, both NAMs and CICMs reside in the network).
- **Premises deployment**. A customer-dedicated CICM is placed on the customer premises. The NAM and all shared CICMs (CICM complexes) remain in the service provider network.
- **Service node deployment**. The NAM uses an in-network VRU system as a routing point. The VRU system gathers call information and passes routing requests to the NAM.

Overview

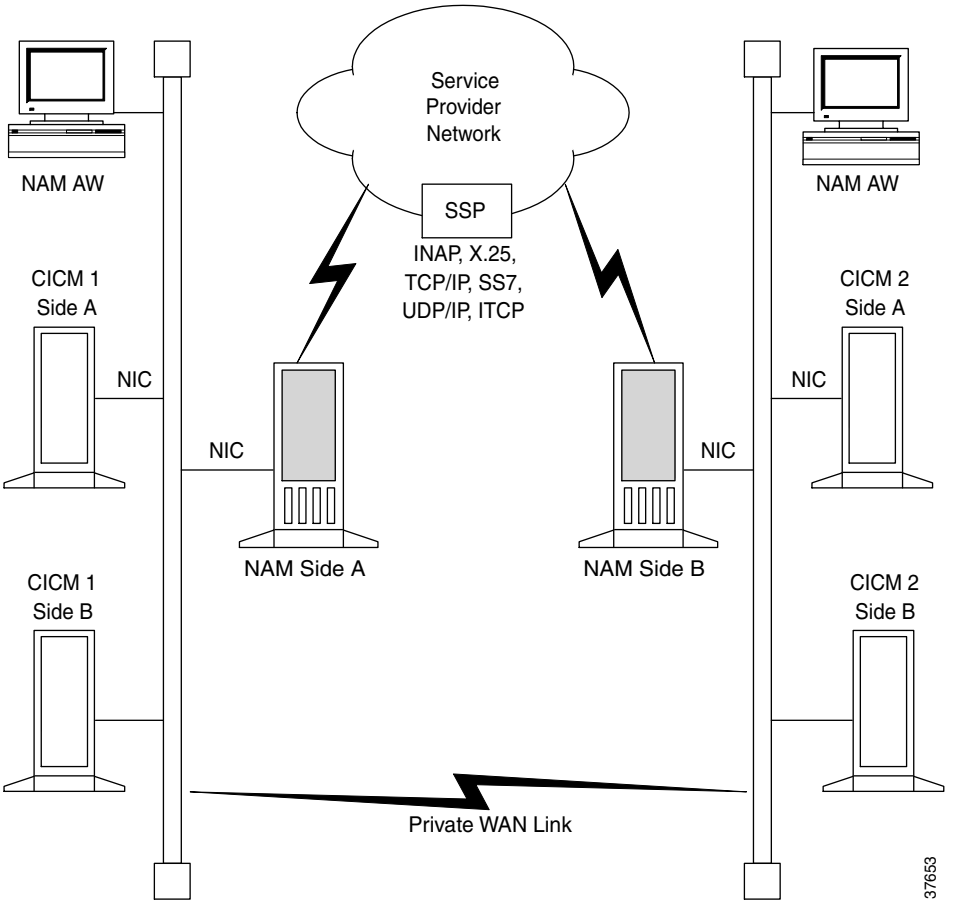
The NAM acts in a manner similar to a Service Control Point (SCP). The NAM component of the system interfaces with the service provider network via either Service Switch Points (SSPs) or an already existing Service Control Point. NAMs are always installed on the service provider premises.

Customer ICMs (CICMs) interface with call center equipment. They may be installed with the NAM in the service provider network or, optionally, at customer sites.

Duplexed NAMs and CICMs

To provide a high level of reliability, the NAM is installed as a duplexed system. In a common configuration, the duplexed NAM is distributed across two sites. One site contains a Side A NAM and the other side contains a Side B NAM. CICMs may also be duplicated for increased reliability and located at the NAM sites (see Figure 3-1).

Figure 3-1 Duplexed, Distributed NAM



The duplexed NAMs operate as a synchronized system. During normal operation, the two sides operate in parallel. The NICs on each NAM handle a part of the total call routing requests received from the SSP. A synchronizer process within each NAM combines the input stream to ensure that both NAMs receive the same routing requests.

Information about each incoming call is processed by both NAM CallRouters. Both CallRouters, using the same call routing scripts and identical information about call center customers, determine the same destination for the call. Optionally, the NAM might use the dialed number, calling line ID, or customer-entered digits to determine that the route request should be passed to a CICM for further processing.

Duplexed CICMs operate in a synchronized manner much like the NAM. An INCRP NIC process on each CICM handles the routing requests. In addition, each side of a duplexed CICM receives the same information from Peripheral Gateways and Admin Workstations at customer sites, although the actual routing request itself is forwarded to only one side of the CICM.

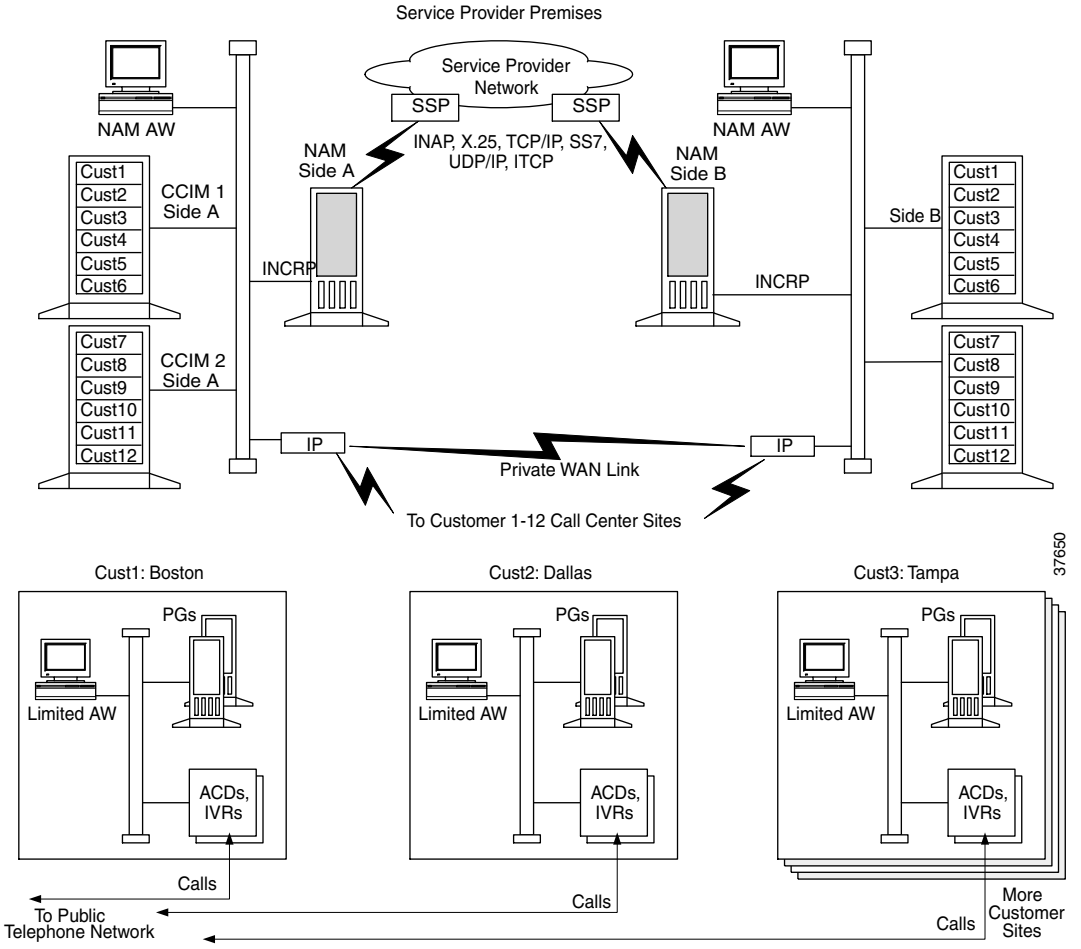
Network Deployment

The configuration of CICMs in a NAM system depends on the call routing requirements of the customer. Some customers may prefer to have a dedicated CICM in the service provider network (that is, the CICM resides with the NAM at a service provider site). A dedicated CICM serves one customer and runs only one instance of ICM software.

Other customer requirements may be satisfied by a shared CICM platform, which is referred to as a CICM complex. The *CICM complex* runs multiple instances of ICM software on one hardware platform. Each ICM instance can be dedicated to one or more customers. The CICMs communicate with PGs and AWs at the call center by using WAN links.

CICM complexes can be duplexed and collocated, or duplexed and distributed. Figure 3-2 shows two duplexed CICM complexes, CICM 1 and CICM 2. Each CICM side resides with one side of the NAM.

Figure 3-2 CICM in the Network

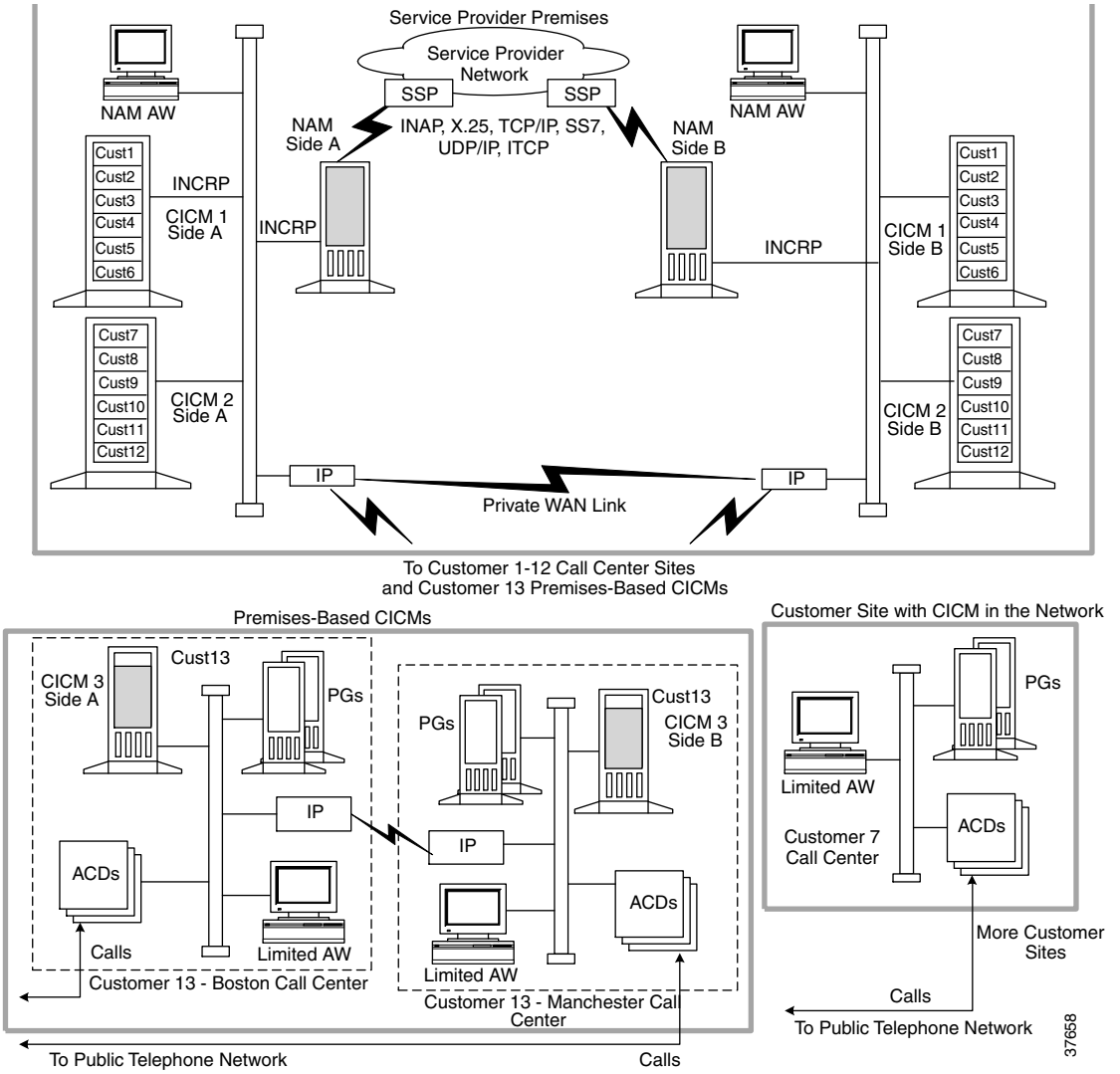


With the CICM located in the network, customers require only Peripheral Gateways (PGs) and Admin Workstations at their call center sites. The dedicated CICM option would appear similar to Figure 3-2, except that each CICM platform would have one CICM instance serving one customer.

Premises Deployment

Your larger call center customers might require a dedicated customer premises CICM platform. Figure 3-3 shows a configuration that has remote customer premises CICMs and in-network CICM complexes.

Figure 3-3 Premises-Based CICMs

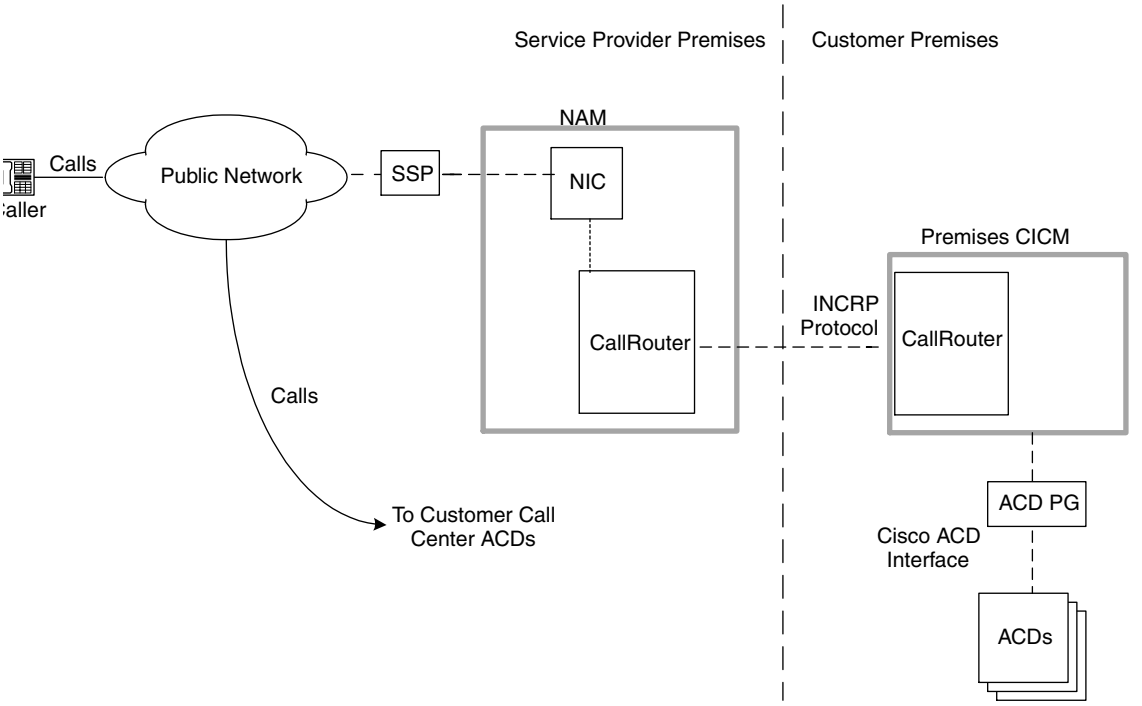


In a premises CICM configuration, the NAM has an independent WAN link to the customer site. Premises-based CICMs can be duplexed across a customer's call centers for a high level of fault tolerance. The duplexed premises CICMs may be

collocated or geographically distributed. For example, Figure 3-3 shows a duplexed premises CICM that is distributed across two sites (the Boston and Manchester call centers). In this case, the NAM requires an independent WAN link to each site.

Customer premises-based CICMs use a NAM option called the Network CIC. The *IN Gateway* runs as a software process on the NAM CallRouter machine. The Network CIC allows NAMs in the service provider network to forward call routing requests to and receive call routing requests from customer premises CICMs. Figure 3-4 shows how the Network CIC communicates with the INCRP NIC process on the premises CICM.

Figure 3-4 Network CIC for Premises CICMs



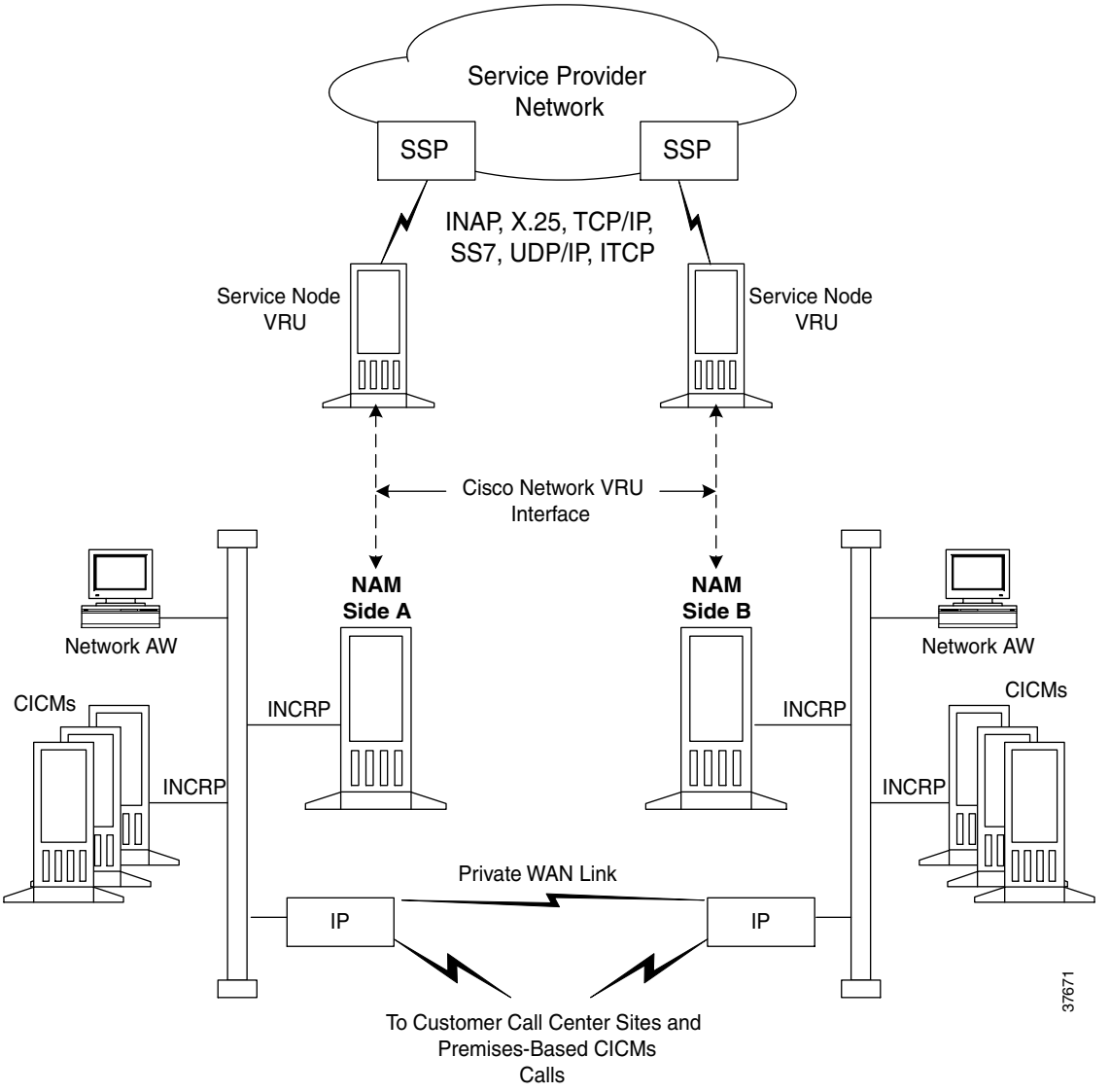
The customer premises CICM runs the standard INCRP NIC process described in Chapter 4, "Network Interface Controllers." Communication between the NAM and CICM takes place over a WAN link.

Service Node Deployment

NAM may also be deployed in a Service Node configuration. The Service Node solution lets you rapidly deploy the NAM system in the network. This solution uses an Voice Response Unit (VRU) system as a routing point in the service provider network.

Figure 3-5 shows an example of the Service Node solution.

Figure 3-5 Service Node Solution



Calls are first delivered to the Service Node (that is, the in-network VRU system) where network prompting can be implemented. The Service Node then forwards a message to the NAM that includes the Dialed Number, Calling Line ID, and any Caller-Entered Digits that were entered in response to voice prompts.

Upon receipt of the message, the NAM runs a script to determine the best destination for the call. The NAM directs the VRU to connect the call to the destination. For calls that do not require NAM processing, the VRU system can "deflect" the call to another resource in the network before the call is actually connected to the VRU system.

The Service Node solution lets you offer enhanced toll-free and VRU network prompting services to your customers immediately (that is, during the initial phases of NAM deployment). Your customers can take immediate advantage of NAM features while you continue rolling out more advanced capabilities such as Virtual Call Center and Network CTI services.

CHAPTER 4

Network Interface Controllers

The Network Interface Controller (NIC) is the software interface between the NAM and the service provider's intelligent call processing network. The NIC communicates with the network by using intelligent network control links.

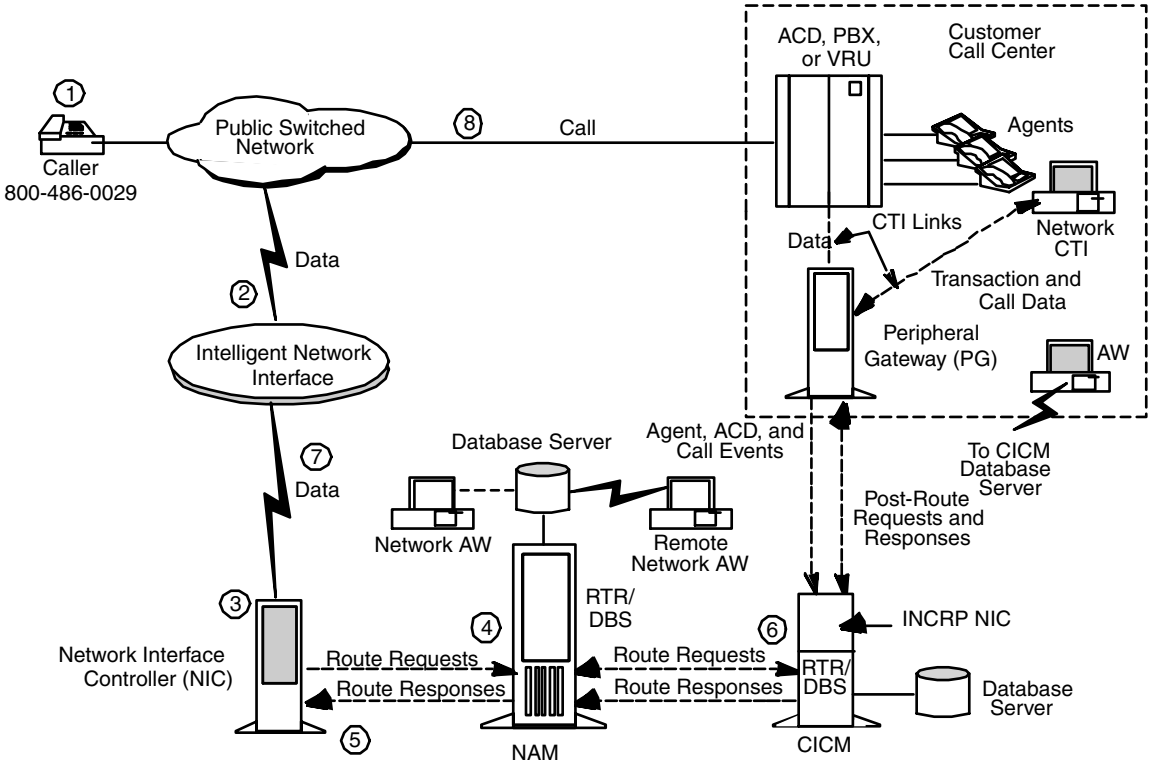
The NIC functions as a gateway to the service provider's intelligent call processing network. It receives call routing requests from the network, forwards them to the NAM's CallRouter, and returns routing responses to the network. In effect, the NIC transforms the service provider network into a *routing client*. The NAM acts as a *routing server.*

This chapter provides an overview of the NIC process used in a NAM system.

Overview

Figure 4-1 shows the interaction between the service provider's intelligent network and the Network Interface Controller (NIC). The function of the CICM's NIC, called the INCRP NIC, is also shown.

Figure 4-1 Network Interface Controller



1. As shown in Figure 4-1, the flow of messages between the network and the NAM begins when a caller dials a toll-free number.
2. The network holds the call momentarily at the originating switch while it queries a network database to determine where to route the call.
3. The query may be sent directly to the NIC or routed via an existing Service Control Point (SCP).
4. The NIC software receives the request, translates it into a standard format, and forwards it to the NAM's CallRouter process.
5. The CallRouter selects the appropriate routing script and returns a destination address for the call back to the NIC.

6. As an alternative, the NAM might forward the routing request to a CICM for further processing based on real-time call and agent status data that are available to the CICM. This processing involves a special NIC process that runs on the CICM called the *Intelligent Network Call Routing Protocol NIC (INCRP NIC)*. The INCRP NIC provides Customer ICMs with the means to process routing requests and route calls.
7. Regardless of whether the NAM or the CICM provides the call's destination label, it is the NAM and the NIC that return the label to the telephone network.
8. The NIC or the SCP instructs the originating switch to connect the call to the destination specified by the NAM system.

Routing Request Elements

The NAM software can receive data elements associated with a routing request from any routing client. Three of these elements are commonly provided with the routing requests received from an interexchange carrier:

- **Dialed Number (DN)**. The number dialed by the caller.
- **Calling Line ID (CLID)**. The caller's telephone number or billing telephone number (also called Automatic Number Identification or ANI).
- **Caller Entered Digits (CED)**. Any digits entered by the caller on a touch-tone phone, or spoken, in response to network prompts.

Destination Labels

The NAM software can use combinations of routing request elements to determine the type of call and select a call routing script to process the request. The script selects a specific target for the call.

Note Targets and routing scripts are described in Chapter 5, "CallRouter."

The NIC communicates the target selection to the network by returning a destination label. A *label* is an identifier associated with a particular termination or branch within an 800 number routing plan. When a Service Control Point (SCP) or Network Elements (NE) sends a routing request to the NAM, it expects

to ultimately receive a reply message that contains a label. The label can specify one of several possible call termination types or, alternatively, can specify continued execution under the current routing plan or a different routing plan. A label is a string of letters, digits, and spaces no longer than 39 characters in length.

The destination labels supported by NAM software include:

- **Announcement**. Causes the network to play a specified announcement to the caller.
- **Destination**. Causes the network to send the call to a specific location and trunk group. The Dialed Number Identification Service (DNIS) digits that are outpulsed to the call center are predetermined based on the destination label.
- **DNIS Override**. Allows the ICM to directly specify what the outpulsed DNIS digits will be without requiring that a specific routing label be pre-provisioned in the network.
- **Ring**. Provides ringback from the network (implies that the Customer Premises Equipment (CPE) will not answer).
- **Busy**. Plays a busy tone back to the caller.

Although the NAM is designed to provide a consistent interface across all the supported networks, there are differences in the features implemented by the various network service providers.

The sections that follow describe the supported protocols in detail.

Network Communication Protocols

The NAM software's Network Interface Controller (NIC) supports a number of carrier network communications protocols:

- INCRP
- INAP
- CAIN
- H.323
- CRSP
- SS7IN
- Proprietary Customer Interfaces (Nortel, CWC, France Telecom)

Note For a list of the protocols supported by Cisco's *ICM* software, see the *Cisco ICM Software Product Description*.

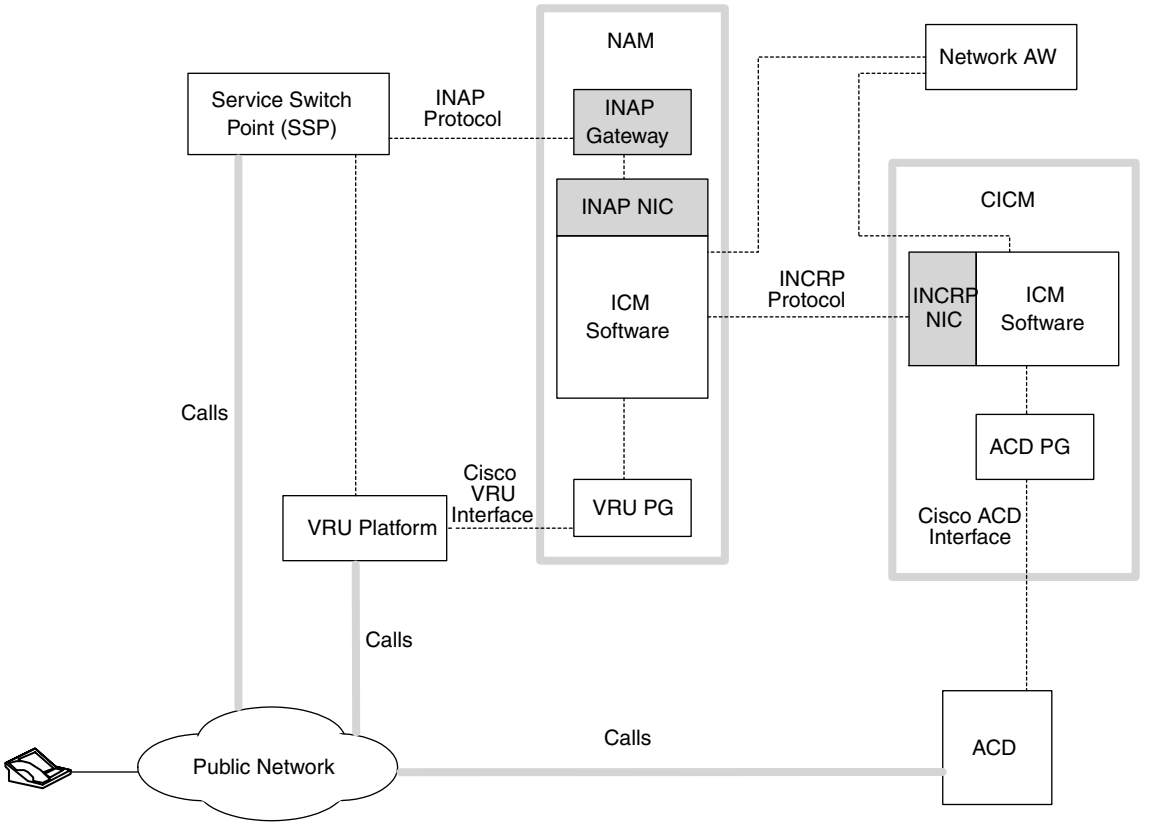
The NAM software's interaction with each of these protocols is described in the sections that follow.

Intelligent Network Application Protocol (INAP) NIC

The Cisco INAP NIC, a member of the SS7 family of protocols, uses the Intelligent Network Application Protocol (INAP) to communicate with Advanced Intelligent Networks (AINs). The function of the Cisco INAP NIC is to translate between the INAP used in the intelligent network and the routing client interface used by the NAM system.

Figure 4-2 shows how the Cisco INAP NIC fits into the NAM system architecture.

Figure 4-2 INAP NIC Overview



INAP NIC and INAP Gateway

The Cisco INAP NIC is a Windows 2000-based process that resides on the NAM CallRouter machine. The INAP NIC obtains access to multiple Service Switch Points (SSPs) in the SS7 network via an INAP Gateway interface. The *INAP Gateway* is a dedicated computer that communicates directly with the SS7 network. The function of the INAP Gateway is to transport INAP messages between the SS7 network and the INAP NIC.

Together, the INAP Gateway and INAP NIC serve as a network Service Control Point (SCP). For greater capacity, a single INAP NIC may connect to multiple INAP Gateways.

In a typical duplexed NAM configuration, one INAP NIC resides on each CallRouter machine (Side A and Side B). The INAP NICs operate independently of each other.

The number of INAP Gateways used is determined by the number of SS7 links required in the NAM configuration. The INAP Gateways maintain connections with the INAP NICs by using a proprietary protocol layered over TCP\IP.

INAP Features

The INAP NIC offers increased flexibility and internetworking for Advanced Intelligent Network (AIN) components. In particular, INAP offers:

- An extended Integrated Voice Response (IVR) interface that allows the NAM to work more closely with IVR systems in the network
- Network information regarding the state of a call
- An integrated interface into the service provider's billing system

Some specific applications available with the INAP NIC are described below.

Select Link

Select Link lets you direct calls to an IVR system that is associated with a routing client. The network-based IVR can perform processing on the call, such as collecting caller-entered digits (CED), while allowing the NAM to continue to process the routing request. The IVR system interacts with the caller, collects the CED, and provides the CED to the NAM via the IVR Integration interface. Using the CED, the NAM routes the call again to a final destination.

Select Link is supported at the NAM level only. However, once the CED has been received by a NAM script, it can be forwarded, along with other call data, in a routing request to the CICM.

Divert on Busy/RTNR Link

Divert on Busy/RTNR (Ring Tone No Response) Link allows the NAM to attempt to route to alternate destinations on call failure. To perform this function, the NAM monitors call progress subsequent to each call routing attempt. In the event

that a busy or ring tone no response (RTNR) condition is encountered, routing to alternate destinations continues until a successful connection is achieved or until all alternate destinations have been exhausted. This feature is primarily for use in non-call center environments.

Divert on Busy/RTNR Link is supported at both the NAM and CICM level.

Scheduled Target

Busy Link allows the NAM to perform load balancing across multiple sites based on the number of busy versus non-busy agents at each site. To do this, Busy Link uses a special type of destination called a *scheduled target*. A scheduled target is not necessarily associated with an ICM Peripheral Gateway.

The NAM has limited information about a scheduled target, specifically:

- **Maximum simultaneous calls a target can handle at a give time (that is, a schedule of agents at the target)**. The total number of calls the target can handle is configured by using the Workforce Management Integration System or Scheduled Target Manager to create a schedule of agents for the target. You can reference this schedule of agents in a routing script.
- **The number of calls currently in progress to each target**. Based on event reports from the NIC, which indicate when calls have been answered and disconnected, the CallRouter tracks the number of calls currently in progress to each target.

Using these two pieces of information, the NAM can load balance calls across multiple sites. This load balancing technique, although less sophisticated than techniques that employ actual agent status, eliminates the need for Peripheral Gateways connected to the customer's ACDs. Busy Link is supported at both the NAM and CICM level.

Carrier Advanced Intelligent Networks (CAIN) NIC

The Cisco CAIN NIC, a member of the SS7 family of protocols, uses the Carrier Advanced Intelligent Networks (CAIN) protocol to communicate with Advanced Intelligent Networks (AINs). The function of the Cisco CAIN NIC is to translate between the CAIN used in the intelligent network and the routing client interface used by the NAM system.

CAIN NIC and AIN Gateway

The CAIN NIC is a Windows 2000-based process that resides on the CallRouter machine. The CAIN NIC obtains access to multiple Service Switch Points (SSPs) in the SS7 network through an AIN Gateway interface. The AIN Gateway resides on a dedicated computer that communicates directly with the SS7 network. The function of the AIN Gateway is to transport AIN messages between the SS7 network and the CAIN NIC.

Together, the CAIN NIC and AIN Gateway serve as a network Service Control Point (SCP). As an SCP, the CAIN NIC and Cisco NAM intercept call control, evaluate call parameters and real-time agent availability, and return a call destination to the SCP. NAM call manipulation optionally includes SSP-directed call control handoff to a network Intelligent Peripheral (IP) for intermediate digit collection and announcement. IP support is provided using CAIN "Connect-Only" mode features.

For greater capacity, a single CAIN NIC may connect to multiple AIN Gateways.The NIC and its corresponding Gateway(s) communicate by TCP/IP; the Gateway synchronous connections to the SS7 network typically use the V.35 physical interface.

In a typical duplexed NAM configuration, one CAIN NIC resides on each CallRouter machine (Side A and Side B). The CAIN NICs operate independently of each other.

The number of AIN Gateways used is determined by the number of SS7 links required in the NAM configuration. The AIN Gateways maintain connections with the CAIN NICs by using a proprietary protocol layered over TCP\IP.

Labels

A CAIN label is a string of characters (0-9, A-F) no longer than 24 characters in length. The CAIN NIC makes the following special allowances for label syntax (each discussed in detail in the sections that follow):

- Dot (".") and underscore ("_") are considered terminators by the CAIN implementation; label characters following either are not forwarded to the network.

- A pound (“#”) label prefix appearing in the first position, in combination with an announcement label type, signifies STR mode or Play Announcement. (For more information, see the “Send_To_Resource (STR) labels” section on page 4-11.)
- An embedded asterisk (*) is used to designate DAL addressing. A DAL address label consists of an 8-digit prefix number (trunk and switch ID), the asterisk as the 9th character, and an optional 1-24 digit Outpulse number (DNIS). (For more information, see the “CAIN Direct Access Line (DAL) Addressing” section on page 4-11.)

Note The NIC will fail call processing for embedded special characters other than the dot (“.”), pound (‘#’), and asterisk (‘*’).

The relationship between the ICM labels and CAIN labels is as follows:

- **Announcement**. In the CAIN environment, network announcements can be routed by the NAM in two forms:
  - As a “standard” routing label.
  - As Send_To_Resource (STR) response.

  For more information, see the “Send_To_Resource (STR) labels” section on page 4-11.
- **Destination Label**. The ICM destination label (type “normal”) maps directly to a CAIN destination label.
- **Network Default**. The ICM Network Default label is not supported by the CAIN NIC.
- **Busy**. The ICM Busy label is supported by the CAIN Intelligent Call Routing interface. The Busy label is assigned a label string (number) which is in turn provisioned on the DMS-250 for the appropriate corresponding tone in the translation for the number. The NIC does no additional busy-specific processing (e.g. treatment code inclusion or AIND routing).
- **Ring**. The ICM Ring label is not supported by the CAIN NIC.
- **Post-Query**. The ICM Post-Query label is not supported by the CAIN NIC.
- **DNIS Override**. The ICM DNIS Override label is not supported by the CAIN NIC.

Send_To_Resource (STR) labels

Since both the standard and STR forms of the network announcement use the NAM network announcement label target (and both label forms are thus "announcement" labels), the distinction between the two forms is made by the label syntax itself. Labels for which network announcement routing should be performed using the STR form must contain a pound ("#") character in the first position of the label, followed by a digit string.

CAIN Direct Access Line (DAL) Addressing

CAIN Direct Access Line (DAL) addressing provides optional "direct termination" routing, whereby the NAM-configured label provides the DMS with an explicit trunk group and switch ID.

The distinction between standard and direct termination routing is made by the CAIN NIC based on the configured label format. DAL labels contain an asterisk ("*") delimiter following an eight-digit trunk group identification. The trunk group identification consists of two sub-fields, a three-digit switch ID prefix, followed by five-digit trunk group number.

In addition to the eight-digit trunk group identification, the DAL label format also provides for the specification of an optional outpulse number (DNIS). The outpulse number is a digit string suffix following the label "*" delimiter, supplied as 1-24 digits.

H.323 Gatekeeper NIC

In the H.323 Gatekeeper environment, Cisco NAM-based routing provides H.323 destination alias and endpoint address translation based on ICM software configuration and routing scripts created through the ICM software Script Editor. Using routing scripts and a dial plan defined for the customer's business model, the NAM provides one or more of the following features on behalf of the Gatekeeper: 800 number lookup, VPN translation, and Least Cost Routing.

Cisco NAM Software does not provide full Gatekeeper and H.323 functionality. However, it accommodates both "Originating GateKeeper" and "Directory Gatekeeper" configurations. The former positions the NAM as a "route server" and the latter as a Gatekeeper location server.

The NAM translates incoming location and admission requests using per-call source and destination alias address information. The resulting translation produces a resolved destination alias or one or more endpoint transport address(es).

Additional features supported by the GKTMP NIC are described below:

- **Multiple Gatekeeper Support**. A given NIC instance supports concurrent connection of up to 64 GKTMP sessions, each presumed to originate from a unique Gatekeeper.
- **NAM Fault Tolerance**. The NAM is normally configured in a duplexed configuration. Each side runs a separate GKTMP NIC.

  In a duplexed NAM configuration, the Gatekeeper's GKTMP sessions are configured at the same priority to each NAM side. As a result, the Gatekeeper load balances requests across both GKTMP NIC sides; should the Gatekeeper detect a failure on either GKTMP session all traffic will be routed to the surviving side. The Gatekeeper will attempt to reinstate the failed session until it has reconnected.
- **Gatekeeper Cluster Support**. Support is provided for Gatekeeper Clusters (multiple Gatekeepers per zone, configured in a cooperative cluster arrangement). In this arrangement, each Gatekeeper is independently configured to address the NAM from its own GKTMP session (or session pair).
- **Multiple Alias-Address Field Type Support**. Support is provided for multiple Alias-Address field types, that is, E.164, H.323-ID, or Email Id. However, the GKTMP NIC does not pass the field type of incoming alias types (dialed number or CLI) to the CallRouter. This means that a dialed number of "E:1234" and "H:1234" would be resolved to the same label by the Call Router.

Labels

For the GKTMP NIC, an ICM label is an identifier associated with *either* a destinationInfo alias resolution *or* an IPV4 address. IP addresses are interpreted by the GKTMP NIC as either H.323 gateway Endpoints (including alternate endpoints) or Remote Zone addresses.

The ICM itself provides for a number of label types, including Destination (type "normal"). However, using any label type other then "normal" with the GKTMP NIC will result in the call being rejected with a NULL message body response being sent to the GateKeeper.

Label strings are defined with Configure ICM and may use upper or lower case. They can be no longer than 32 characters and must include the Alias-Type when defining an Alias-Address label string. Valid Alias-Types are:

- **E**: Indicates that the address is an E.164 address. (Example: E:8005551212)
- **H**: Indicates that the address is an H.323 ID. (Example: H:Cisco Kid)
- **M**: Indicates that the address is an e-mail ID. (Example: M:JackDoe@cisco.com)

Call Routing Service Protocol (CRSP) NIC

The Cisco CRSP NIC uses the Call Routing Service Protocol (CRSP) protocol, an open interface to Service Control Points (SCP) and/or Network Elements (NE). The CRSP protocol enables carriers to develop external applications to access the call routing capabilities provided by Cisco ICM software

Call Routing Service Protocol (CRSP) was defined as an open interface to Network Elements (NE) by Cisco Systems so that carriers can develop external applications to access the call routing capabilities provided by Cisco ICM software. CRSP is used for communications between ICM software and the network element. However, since CRSP is not provided for the NE by Cisco, each NE vendor or owner must develop and support their own version of the protocol and application software that would reside on the NE.

The function of the CRSP NIC is to interface with the carrier and the routing client interface used by the NAM system. The CRSP NIC can support a variety of redundancy options and connection configurations.

Network Elements

The CRSP NIC supports both SCP and VRU-type network elements. Each NIC allows up to 20 such SCP/VRU clients to be connected to it at the same time. (A unique client id must be allocated for each client.)

Currently, the CRSP NIC defines 4 classes of VRUs which map into the various Cisco ICM software VRU Types.

- The Class Zero VRU corresponds to Cisco ICM software VRU types 2 and 8. These are not controlled by the NAM.
- The Class One VRU corresponds to Cisco ICM software VRU types 3 and 7. These are controlled by the NAM through the PG.
- The Class Two VRU corresponds to Cisco ICM VRU type 5. These are controlled by the NAM through the CRSP NIC by way of a SCP.
- The Class Three VRU corresponds to Cisco ICM VRU Type 6. These are controlled by the NAM directly through the CRSP NIC.

Labels

The relationship between the ICM labels and CRSP labels is as follows:

- **Announcement**. The ICM announcement label maps directly to a CRSP destination label.
- **Destination**. The ICM destination label maps directly to a CRSP destination label.
- **Busy Signal or Ring**. These features allow the CRS customer to direct a call to a busy signal or a ring signal that will not be answered.
- **DNIS Override**. The ICM DNIS override label maps to a CRSP destination, and also includes a specific DNIS that overrides the one implied by the destination label. A separate DNIS override label must be configured in the ICM database for each explicit DNIS value to be used.

Divert on Busy

A PSTN that supports this feature may be given a list of up to 10 destination labels. The PSTN will start with the first label and fail-over to subsequent labels if the call cannot be connected or the call is not answered.

RSignaling System 7 Intelligent Network (SS7IN) NIC

The Cisco SS7IN NIC and SS7 Gateway act as a Service Control Point (SCP) between the intelligent network and the routing client interface used by the NAM system. As a SCP, the SS7IN NIC and Cisco NAM intercept call control from the SSP, evaluate call parameters and real-time agent availability, and return to the SSP a call destination for call completion. NAM call manipulation optionally includes SSP-directed call control handoff to a network Intelligent Peripheral (IP) for intermediate digit collection and announcement.

Within Cisco ICM, the SS7IN NIC and SS7 Gateway are dedicated, specialized 2000 processes. The NIC resides on the NAM Router machine, while the Gateway resides on a separate 2000 machine holding one or more SS7 synchronous line adapter cards. More than one Gateway may be connected to a NIC for higher network capacity. The NIC and its corresponding Gateway(s) communicate by TCP/IP; the Gateway synchronous connections to the SS7 network typically use the V.35 physical interface.

Each Gateway PCI synchronous card will support up to four individual SS7 links; each ISA synchronous card supports a single link. With either line adapter card type, multiple links may make up a single SS7 linkset.

Gateways are configured with SS7 point codes, and multiple Gateways may have the same or different point codes from one another. A typical configuration assigns a unique point code to each Gateway, which is the preferred configuration.

Labels

Some SS7IN applications use special non-numeric characters to indicate a specific “Nature of Address.” When Nature of Address is controlled, the following convention shall be used:

- **No Prefix**. Indicates “Unknown” Nature of Address.
- **N**. Indicates “National” Nature of Address. (Example: N4251110000)
- **I**. Indicates “International” Nature of Address.(Example: I4251110000)

The relationship between the ICM labels and other SS7IN labels is as follows:

- **Destination**. The ICM destination label (type “normal”) maps directly to an SS7IN destination label.

- **Announcement.** Support of the ICM Announcement label is a customer specific option. Default behavior is to treat the label as a normal Destination label.
- **Network Default**. The ICM Network Default label is not supported by the SS7IN NIC.
- **Busy**. Support of the ICM Busy label is a customer specific option. Some customers will simply have the Busy label map to a specific number in their network, while others may use a “Release” operation. See specific IN Call Model descriptions for more details.
- **Ring**. Support of the ICM Ring label is a customer specific option. Some customers will simply have the label map to a specific number in their network, while others may use a “Release” operation. Default behavior is to treat the label as a normal Destination label.
- **Post-Query**. Support of the ICM Post-Query label is a customer specific option. Some customers will simply have the label map to a specific number in their network, while others may use a “Release” operation. Default behavior is to treat the label as a normal Destination label.
- **DNIS Override**. The ICM DNIS Override label is not supported by the SS7IN NIC.
- **Divert Label (Divert On Busy.)** The ICM Divert Label is used to enhance the likelihood of a call being connected by providing the SS7IN NIC with a list (usually more than one) of potential destinations. The SS7IN NIC will attempt to connect the call to each label in turn, until the call is successfully connected. Divert Label support is particular to the IN application being used, and not all applications will support the Divert Label.
- **Scheduled Select (Target).** The ICM Scheduled Select target is intended to support agents that are not connected to an ICM maintained resource (ACD). Using IN call monitoring features, the SS7IN NIC can inform the ICM on progress of calls to a particular Scheduled Select target. Scheduled Select support is particular to the IN application being used, and not all applications will support Scheduled Select.
- **Release**. The ICM Release target is used to release a call when further processing is not possible. This might be considered a “soft” error in some script nodes. A normal network response in this case might be to provide a tone (such as a busy tone) to the caller. Release target support is particular to the IN application being used, and not all applications will support Release.

Proprietary Customer Interfaces

For information about proprietary customer interfaces, see the appropriate *System Manager Guide Supplement*.

CHAPTER 5

CallRouter

The heart of the NAM software is a process called the CallRouter. The CallRouter serves as the central source of intelligence for call routing in the NAM system. The CallRouter receives call routing requests, determines the best destination for each call, and collects information about the entire system. The data collected by the CallRouter are stored in a central database for use in call routing, real-time monitoring, and historical reporting.

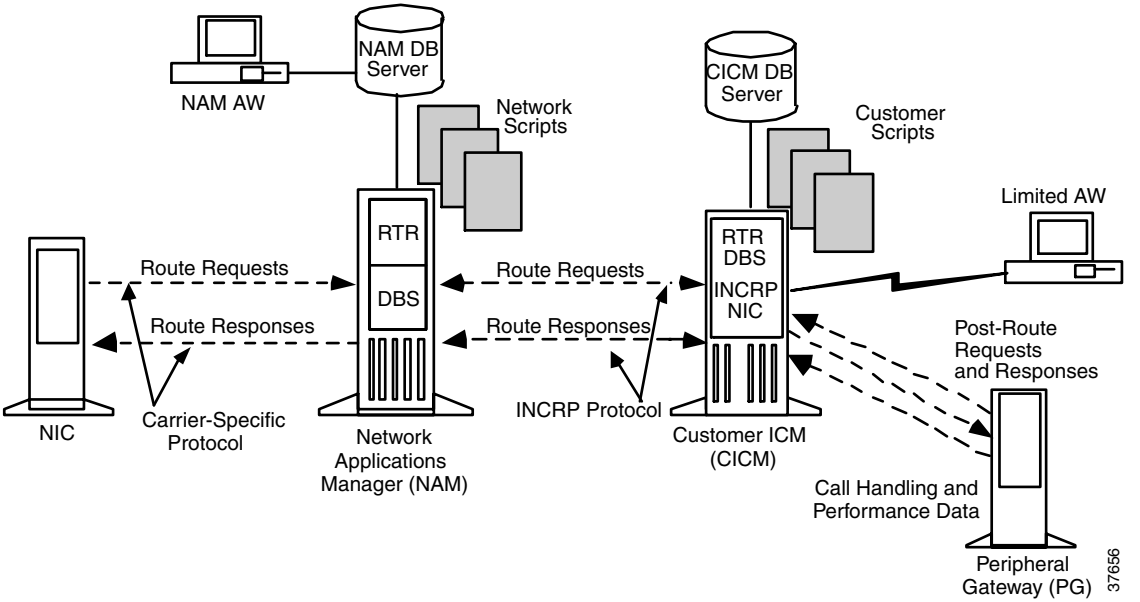
The CallRouter allows you to translate customer business goals into call routing decisions. Customers can define how calls are routed by creating *call routing scripts*. The CallRouter uses these scripts, along with real-time data on call center and agent status, to make call-by-call routing decisions.

This chapter describes how the CallRouter uses scripts and event-driven data to deliver calls to the best answering resource available. It also introduces the Script Editor, which is the graphical tool used to define call routing scripts.

CallRouter Process

The CallRouter process receives and responds to routing requests from the routing clients (NICs and PGs), collects call center event data from the Peripheral Gateways (on CICMs only) and communicates with Admin Workstations. Figure 5-1 shows how the CallRouter works with these NAM system components.

Figure 5-1 CallRouter Overview



The CallRouter plays a slightly different role depending on whether it is running on a NAM or a CICM.

NAM CallRouter

On the NAM, the CallRouter provides the first stage in call routing by handling route requests from the service provider network. The NAM CallRouter interfaces directly with the network via the NIC. It can handle requests for every dialed number in the NAM system. The NAM CallRouter might return a destination label itself or it might pass the request on to a CICM.

NAMs typically have a limited configuration (dialed numbers, labels, basic enhanced services routing scripts, etc.). They also have a set of call routing scripts that can route calls to several CICMs. *NAM scripts* are created on a *Network Admin Workstation* (AW) and are managed by the service provider.

CICM CallRouter

Each CICM typically has a full configuration, storing customer-specific scripts, configuration data, and real-time and historical reporting data. The CICM supports links to ACDs and desktops in the call center; therefore, it can base call routing decisions on real-time data gathered by the Peripheral Gateways at each site.

By using their own set of scripts on a CICM, customers can establish routing decisions for a wide range of agent and service performance metrics, including:

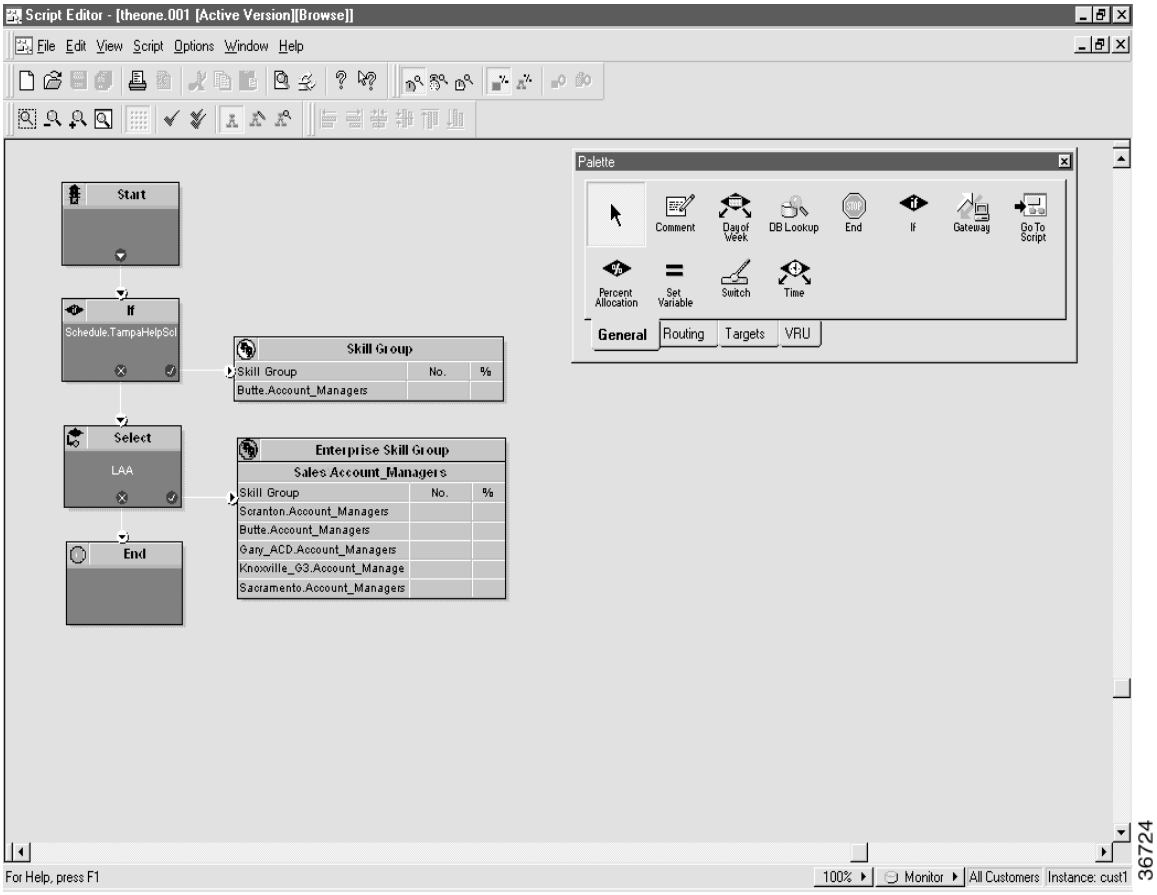
- Agent availability
- The ratio of calls in progress to logged-in/ready agents
- The ratio of calls in queue to staffed/scheduled agents
- Customer profile data

CICM scripts are created at an AW that is located on the customer premises.

The Script Editor

The Script Editor provides a visual, object-oriented environment for defining call routing logic. In appearance, a script resembles a programming flowchart. You define the routing logic by choosing objects from a palette of drag-and-drop objects and placing them in a script window. You then define the relationship between the routing objects with interconnecting lines. Figure 5-2 shows the main Script Editor window with a sample script displayed.

Figure 5-2 Script Editor Window



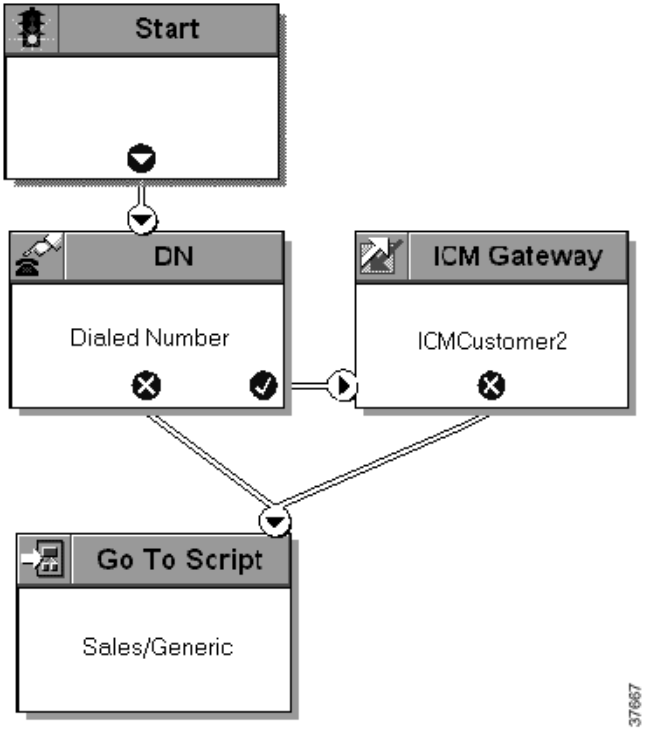
The graphical nature of the Script Editor helps you understand the call flow for a given script based on visual inspection. A script usually has several branches that can be followed depending on current conditions at the call center.

The Script Editor comes with many pre-defined routing objects. Customers simply need to supply the CallRouter with business rules to arbitrate between routing options when the demand for a given skill or resource exceeds availability. Customers can also input threshold parameters to allow for the use of backup agents under certain circumstances or to prioritize call handling for a given class of caller.

Routing to CICMs

NAMs may reference CICMs in scripts. The *ICM Gateway node* in a script serves as a path the NAM can take to access a CICM. If the business rules applicable to the call match those in the script, the route request is forwarded. Otherwise, a failure value is returned and an alternate path is taken. For example, the Go To Script node in Figure 5-3 forwards the route request to a network default routing script.

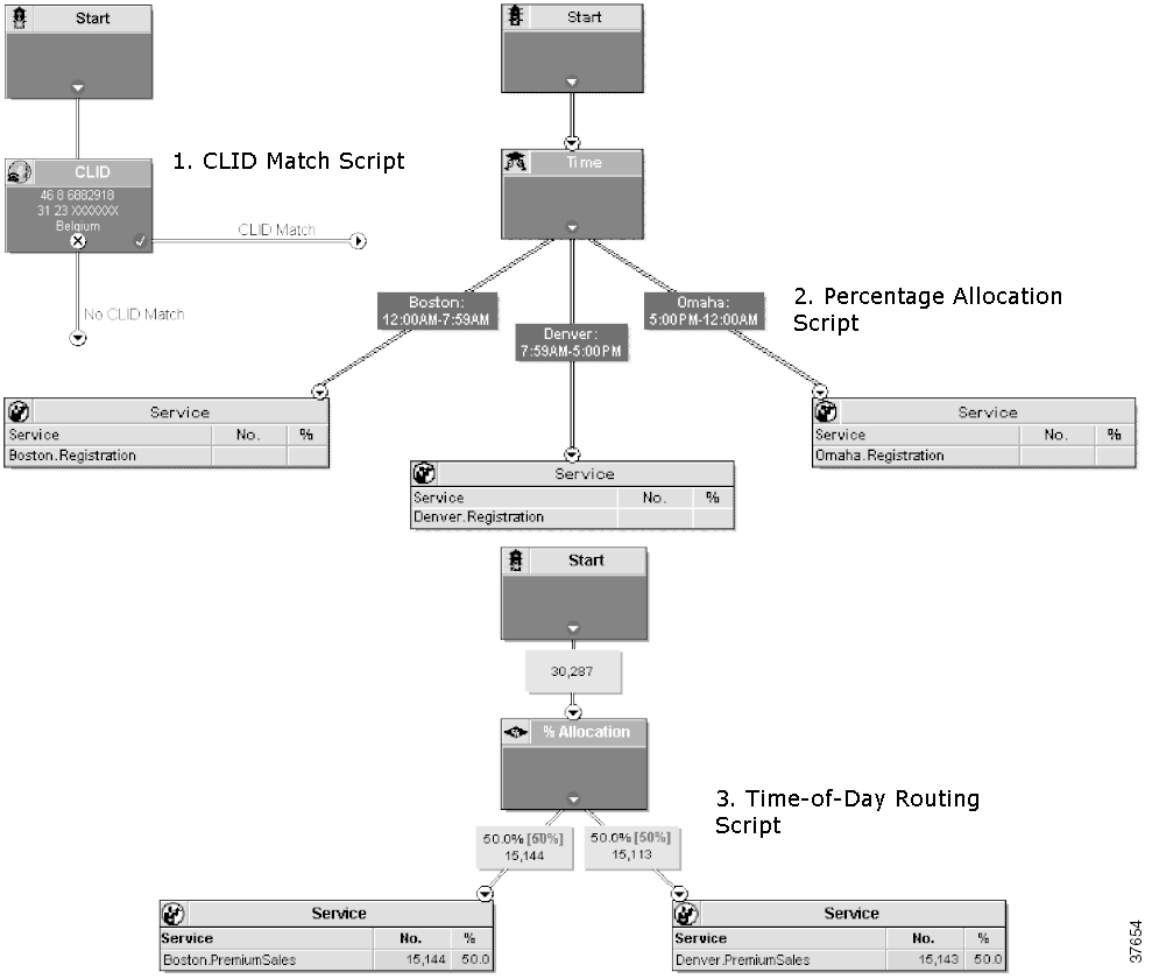
Figure 5-3 ICM Gateway Script



Advanced Service Scripts

The NAM runs scripts that provide enhanced toll-free services such as percentage allocation and time-of-day routing. Most call routing requests are handled to completion by a NAM script. A simple NAM script might map a dialed number to a script that routes calls on a time-of-day basis to a particular customer skill group. Other network scripts might be more complex. Figure 5-4 shows three advanced services script examples: CLID Match, Percentage Allocation, and Time-of-Day Routing.

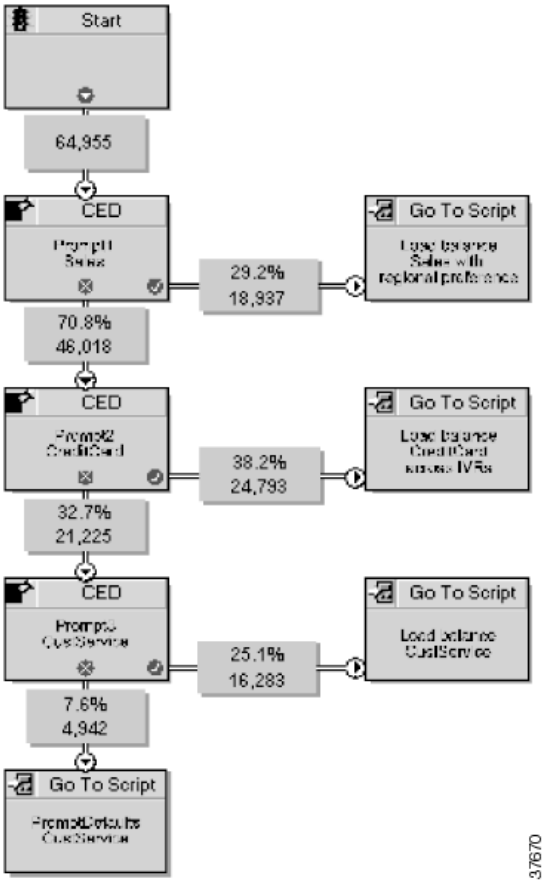
Figure 5-4 Advanced Services Scripts



VRU Network Prompting Scripts

The NAM might also run scripts that prompt callers to enter digits in response to voice prompts. These scripts can be implemented in cases where the customer requires network prompting services. Figure 5-5 shows a sample of the results of a network prompting script where the caller-provided information is forwarded in the Caller Entered Digits (CED).

Figure 5-5 VRU Network Prompting Script



The script in Figure 5-5 takes calls from a general toll-free number and distributes them to other scripts based on the caller's prompt selections. This script is shown in Monitor mode, which is a Script Editor mode that lets you monitor real-time call allocation in percentages and numbers. (See the *Cisco ICM Software Script Editor Guide* for a full explanation of Monitor mode.)

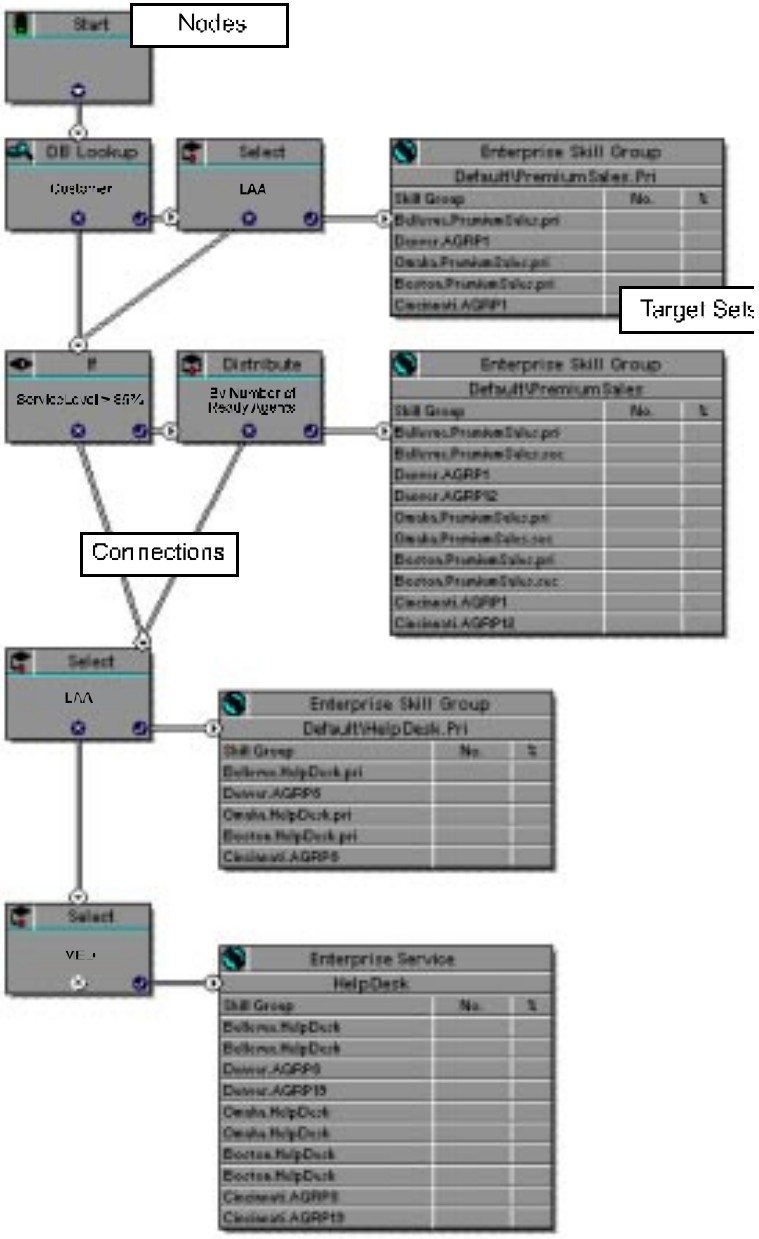
Virtual Call Center Scripts

CICMs have their own sets of routing scripts. These scripts are designed by the customer to meet specific business goals. CICM scripts can pre-route calls based on real-time call and agent data that are collected by PGs at call centers and, optionally, by customer data obtained from database lookups.

Figure 5-6 shows an example of a CICM Pre-Routing script. In this script, the business goals are to:

- Segment high-priority customers and route them to a primary skill group for the highest level of service possible.
- If agents in a primary skill group are not available, distribute the call volume in accordance with service and staffing levels at each call center location.
- Ensure caller satisfaction by balancing the load across all sites in case any of the locations are unable to meet their service level objectives.

Figure 5-6 CICM Pre-Routing Script



Check to see if the caller is listed in the Customer database. If the caller is listed, send the call to the agent who has been available for the longest time in the Premium Sales group.

If the caller is not in the Customer database, or if there are no available agents in the Premium Sales group, route the call based on the sites that are reporting an adequate service level. Calls are distributed in a ratio equal to the number of Ready agents at each location.

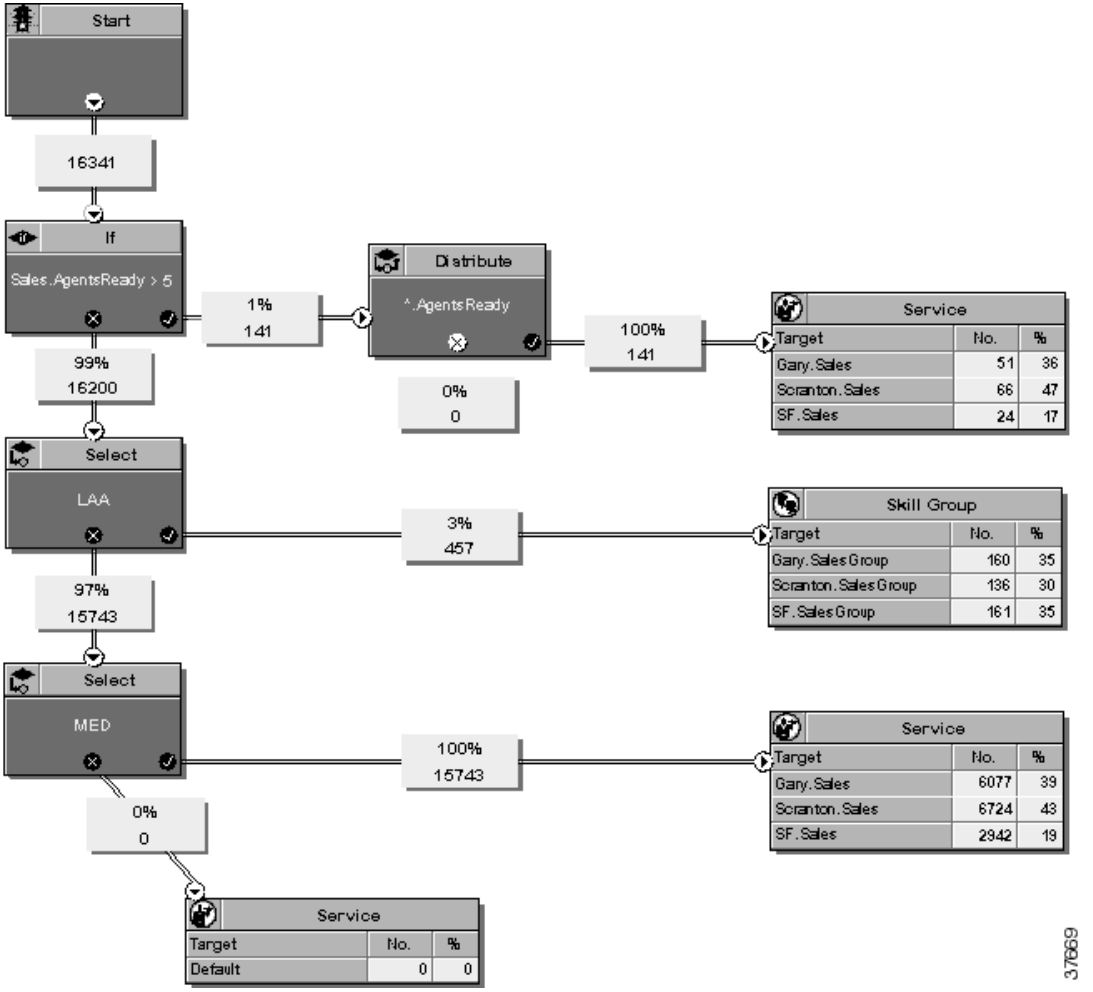
Shift to network load balancing if any of the sites is not providing adequate service to the callers. This Longest Available Agent (LAA) node checks for agent availability in backup skill groups and picks the most available group.

If no agents are available in any location, place the call in the best avaiable queue (that is, the queue with the Minimum Expected Delay (MED)).

Script Monitoring

To determine whether the routing scripts are truly sending calls to the appropriate destinations on a call-by-call basis, the Script Editor displays call volumes and percentages of calls in the context of the script that is routing the calls (see Figure 5-7).

Figure 5-7 Routing Script in Monitor Mode



The script monitoring capability lets you determine precisely how many calls took a given path in the script. You can then compare that data to the conditions that existed in the network during the same interval and expose anomalous behavior that exhibits itself only under specific load conditions.

With the Script Editor's advanced monitoring and editing capabilities, you can identify a potential call load problem, isolate it, make a script change, and rapidly introduce the change into the system.

Routing Targets

After determining the call type, NAM software runs one or more scripts to select a routing target for the call. NAM software can route a call to any of the following target objects:

- **Agent**. An individual at a specific call center who is able to handle the call. Routing to a specific agent is subject to the capabilities of the target ACD/PBX.
- **Skill group**. A group of individuals at a specific call center who are able to handle the call. The local switch at the call center is responsible for eventually picking an agent.
- **Service**. The type of work or information that this caller needs and a specific call center that can provide it. The local switch at the call center is responsible for eventually picking a specific agent to handle the call.
- **Enterprise skill group**. A collection of individual skill groups from several call centers. The CallRouter then further qualifies the target to determine which site has an agent that can best provide these skills.
- **Enterprise service**. A collection of individual services from several call centers. The CallRouter then further qualifies the target to determine which site can best provide this service.
- **Announcement**. A verbal message to the caller. After the caller hears the message, the call may be terminated.
- **Busy**. Play a busy signal for the caller. This effectively terminates the call.
- **Ring**. Play an unanswered ring for the caller. This effectively terminates the call.
- **Label**. A label is a value that the ICM returns to a routing client.

Control Objects

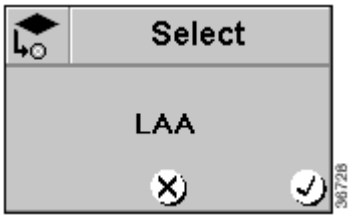
Control objects are components of the Script Editor that control the selection of routing targets, the flow of script logic, script execution delays for a specified period of time, and the re-selection of a script based on current qualifier values.

The following sections describe only a few of the control objects available in the ICM scripting language. For more information, see the *Cisco ICM Software Script Editor Guide*.

Select Object

The Select object allows you to choose among a set of routing targets for a call. The Select object can use predefined rules such as Longest Available Agent and Minimum Expected Delay, or it can use custom rules that you define. A routing target, for example, might be a Service target set that specifies one or more potential services as targets for the call. Figure 5-8 shows a Select object.

Figure 5-8 Select Object



You can also establish acceptance criteria for a Select object or define the order in which ICM software checks the availability of targets in the Select dialog box. The following are some of the options available with the Select object.

Longest Available Agent Group

The ICM uses real-time data on agent status in making its routing decisions. The Longest Available Agent (LAA) algorithm instructs the system to deliver calls to groups of representatives with the appropriate skills based on the agent who has been available for the longest time.

Existing network-based call routing technologies typically rely on percentage allocations or the number of simultaneous calls in progress in order to distribute incoming traffic across call center sites. The LAA algorithm improves the utilization of the agent work force by ensuring that all agents in a group are equally busy. It utilizes the same staff management principles applied within a single call center and applies them across the entire enterprise.

Minimum Expected Delay

The ICM calculates the expected delay across all the selected call queues and deposits the call in the queue with the minimum expected delay. ICM software considers the average queue delay, the number of calls in queue, and the number of positions staffed. Selecting this rule results in more uniform queue times and more consistent service levels so that network operators are not constantly "queue-busting" only to create an imbalance at another site.

ICM routing algorithms allow you to program the system so that it equitably distributes the call load based on expected performance goals. Unlike call routing algorithms that rely solely on call handling rates, the ICM does not have the effect of rewarding a job well done with more work (unless your business objective is to force calls to specific agents).

Next Available Agent

The ICM searches through all skill groups in the target set and finds the number of agents available for each and the number of agents signed on for each. It then chooses the group with the largest percentage of its agents available. The ACD supporting that group must ultimately choose a specific agent within the group. Using this rule tends to keep all skill groups equally busy.

Maximum Calls in Progress

The ICM first checks that the number of calls in progress for each skill group in the target set is less than a specified value. Then for those groups that pass that condition, it chooses the group with the minimum expected delay. Some customers might use this to limit the number of calls in queue and return a busy signal to keep queues manageable.

Minimum Calls in Queue Per Position

The ICM searches all services in the target set to find the number of calls on hold and the number of stations currently staffed. It chooses the service with the lowest ratio of waiting calls to staffed stations.

Enable Target Requery

Checking this box enables the Target Requery feature. The Target Requery feature provides a mechanism that allows the routing client to requery the router for an alternative label (or labels) in case the destination indicated by the original label is unreachable.

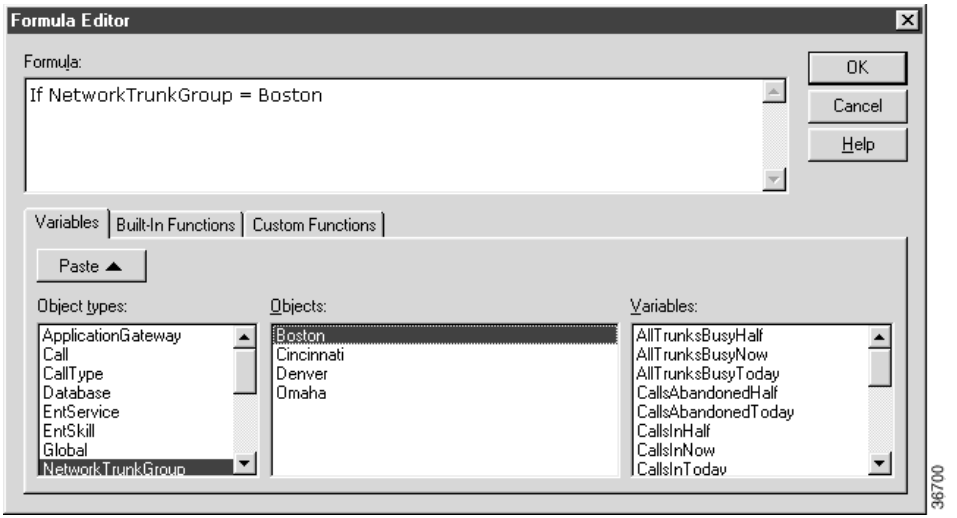
For more information on the Target Requery feature, see the *Cisco ICM Software Script Editor Guide.*

Formula Editor

In addition to pre-defined routing optimization formulas such as Longest Available Agent (LAA), you can define custom criteria. Essentially any of the hundreds of call and agent metrics can be used to define routing criteria. For example, you can define a formula that filters the list of possible call targets. A second formula can then be applied to select among the remaining targets.

The Formula Editor, shown in Figure 5-9, is used to define the routing criteria in the Select dialog box. It allows you to define sophisticated conditional tests in a point-and click environment.

Figure 5-9 Formula Editor Dialog Box



Expressions

The Formula Editor helps you to build expressions. An *expression* is a formula made up of variables, constants, operators, and functions. The ICM evaluates an expression to produce a value. You can use expressions to define custom selection rules or distribution criteria in scripts. To build expressions within the Script Editor, you can use variables, operators, and several built-in functions.

Variables

ICM software supports several groups of variables.

Table 5-1 Variable Types

Entity Type	Description
Application gateway	Real-time statistics about the status of each application gateway.
Call	Information about the current call request such as CallingLineID and DialedNumberString.

Table 5-1 Variable Types (continued)

Entity Type	Description
Database	Values from an external database record referenced in a DB Lookup node. Also, the variable Available indicates whether a record has been retrieved.
Enterprise Service	Information about an enterprise service. These values are derived by combining fields from the Service_Real_Time table for each member service.
Enterprise Skill Group	Information about an enterprise skill group. These values are derived by combining fields from the Skill_Group_Real_Time table for each member skill group.
Network trunk group	Real-time statistics about specific network trunk groups. These variables are taken from the Network_Trunk_Group_Real_Time table.
Peripheral	Information about a peripheral taken from the Peripheral_Real_Time table. The meanings of most peripheral variables depend on the type of peripheral. The Online variable applies to all peripherals.
Region	Information about a geographical region. The only variable is Name which contains the name of the region as a character string.
Route	Information about a route taken from the Route_Real_Time table.
Schedule	Specific field values from an imported schedule.
Scheduled Target	Real-time statistics for each scheduled target.
Service	Information about a service taken from the Service_Real_Time table.
SkillGroup	Information about a skill group taken from the Skill_Group_Real_Time table.

Table 5-1 Variable Types (continued)

Entity Type	Description
TrunkGroup	Information about a trunk group taken from the Trunk_Group_Real_Time table.
User	These are variables that you can define. You can associate these variables with objects such as calls, services, or skill groups. Optionally, you can make variables persistent across scripts.

Call Control Variables

The call control variables provide information about the current call request. They include information about where the request came from, call classification information, and information to be passed to the peripheral that receives the call. Table 5-2 summarizes the call control variables.

Table 5-2 Call Control Variables

Variable	Data Type	Description	Can Be Set
CallerEnteredDigits	String	Digits caller entered in response to prompts.	Via Set node
CallingLineID	String	Billing telephone number of the caller.	No
CustomerProvidedDigits	String	Digits to be passed to the routing client for forwarding to the call recipient.	Via Set node
DialedNumberString	String	Telephone number dialed by the caller.	No
ExpCallVarName	String	Expanded Call Variable value assigned in scripts and passed with call.	Via Set Node
PeripheralVariable1–PeripheralVariable10	String	Value passed to and from the peripheral.	Via Set node
RequeryStatus	Integer	Value that indicates the status of a requery attempt. See the *Cisco ICM Software Script Editor Guide* for information on the Router Requery feature.	No
RouterCallDay	Integer	An encoded value that indicates the date on which the ICM processes the call.	No

Table 5-2 Call Control Variables (continued)

Variable	Data Type	Description	Can Be Set
RouterCallKey	Integer	A value that is unique among all calls the ICM system has processed since midnight. RouterCallDay and RouterCallKey combine to form a unique call identifier.	No
RoutingClient	String	Name of the routing client that made the route request.	No
UserToUserInfo	String	ISDN private network User to User information.	Via Set node
VruStatus	Integer	Indicates the result of a previous Send To VRU or VRU Script node.	Via Set node

Enterprise Skill Group Variables

Skill group variables are taken from selected variables in the Skill_Group_Real_Time table. The values for enterprise skill group variables are derived by summing values for the individual skill groups that make up the enterprise skill group.

Peripheral Variables

ICM software continuously monitors whether it is in communication with the ACD/PBX systems that it is connected to. If communication with a given location is disrupted, this event can invoke backup routing plans. Peripheral values are taken from the Peripheral_Real_Time table.

Route Variables

Route variables let you drill down and observe call performance by individual DNIS number. This “inside” view of a Service can provide insight into the specific types or sources of calls. For example, you can determine if the current surge in call volume is attributable to a certain region of the country, or the result of overflow from another site. Route variables are taken from the Route_Real_Time table.

Service Variables

The service variables that are exposed in the Script Editor include the same performance metrics calculated for routes and some additional variables. Service variables are taken from selected values in the Service_Real_Time table.

Skill Group Variables

In order to implement its skill-based routing capabilities, ICM software tracks a wealth of information regarding agent states. These skill group variables are taken from the Skill_Group_Real_Time table.

Trunk Group Variables

Several metrics of trunk availability are tracked by ICM software. These elements are captured primarily for use in monitoring trunk utilization, but they can also be referenced in call routing formulas.

Operators

Operators allow you to build mathematical and logical expressions. You can use the operators with routing variables to make calculations for a skill group, service, or route. For example, the expression AgentsLoggedOn - AgentsAvail gives the number of agents who are logged on to a skill group, but not currently available.

You can use equality and relational operators to compare two variables. For example, the value of AgentsLoggedOn == AgentsScheduled tells you whether the expected number of agents are currently logged on for a skill group. Or the expression, AgentsLoggedOn < AgentsScheduled is true if a skill group is currently understaffed. On the other hand, the expression AgentsLoggedOn >= AgentsScheduled is true if at least the expected number of agents are logged on.

Table 5-3 lists the operators available in the Script Editor.

Table 5-3 Script Editor Operators

Operator	Description
+	Positive
-	Negative

Table 5-3 Script Editor Operators (continued)

Operator	Description
!	Logical negation
~	One's complement
*	Multiplication
/	Division
+	Addition
-	Subtraction
==	Equal to
!=	Not equal to
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to
&	Concatenation
&&	And
?	Conditional
&	Concatenation (Misc. Operator)
,	Sequential
<<	Shift left
>>	Shift right
&	And (Bitwise operator)
|	Inclusive Or
^	Exclusive Or

Built-in Functions

ICM software provides a number of built-in functions that you can use in expressions. These functions let you manipulate dates and times, perform standard mathematical operations, and so forth. The following tables summarize the functions according to category. Table 5-4 lists the functions that manipulate dates and times.

Table 5-4 Date and Time Functions

Function	Return Value
Date	Today's date as a number of days
Time	Current time as a fraction of day
Now	Date + Time
Year(*date*)	Year of the given date
Month(*date*)	Month (1 – 12) of the given date
Day(*date*)	Day of month (1 – 31) of the given date
Weekday(*date*)	Day of week (1 – 7) of the given date
Hour(*time*)	Hour (0 – 23) of the given time
Minute(*time*)	Minute (0 – 59) of the given time
Second(*time*)	Second (0 – 59) of the given time

Table 5-5 lists the mathematical functions.

Table 5-5 Mathematical Functions

Function	Return Value
Max(*n1, n2* [, *n3*] . . .)	The largest of the operands
Min(*n1, n2* [, *n3*] . . .)	The smallest of the operands
Mod(*n1, n2*)	Remainder of *n1* divided by *n2*
Random()	Random value between 0 and 1
Sqrt(*n*)	Square root of *n*
Trunc(*n*)	Value of *n* truncated to an integer
Abs(*n*)	Absolute value

Table 5-6 lists the remaining functions.

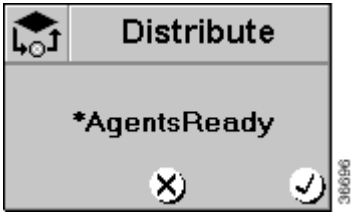
Table 5-6 Miscellaneous Functions

Function	Data Type	Return Value
after(*string1, string2*)	String	That portion of *string2* following the first occurrence of *string1*.
before(*string1, string2*)	String	That portion of *string2* that precedes the first occurrence of *string1*.
ClidInRegion(*string*)	Logical	Indicates whether the CLID for the current call is in the specified region.
if(*condition, true-value, false-value*)	Logical	Value of *true-value* if condition is true; otherwise, *false-value*.
concatenate(*string1, string2, . . .*)	String	The concatenation of the arguments.
find(*string1, string2* [, *index*])	Integer	The starting location of the *string1* within *string2*.
left(*string, n*)	String	Leftmost *n* characters of *string*.
len(*string*)	Integer	Length of *string*.
mid(*string , start, length*)	String	Substring of *string* beginning with *start* character and continuing for *length* characters.
result	Numeric	The selected value in a Select node. (valid only in a Select node).
right(*string, n*)	String	Rightmost *n* characters of *string*.
substr(*string, start* [, *length*])	String	Substring of *string* beginning with *start* character and continuing for *length* characters.
text(*n*)	String	String value of *n*.
valid(*variable*)	Logical	Whether *variable* has a valid value.
ValidValue(*variable*, *value*)	String	If *variable* is valid, returns the value of *variable*; otherwise returns *value*.
value(*string*)	Numeric	Numerical value of *string*.

Distribute Object

The Distribute object, like the Select object, allows you to distribute calls among a set of routing targets using a user-defined condition or an allocation formula that determines the distribution of calls. Figure 5-10 shows an example of a Distribute object.

Figure 5-10 Distribute Object

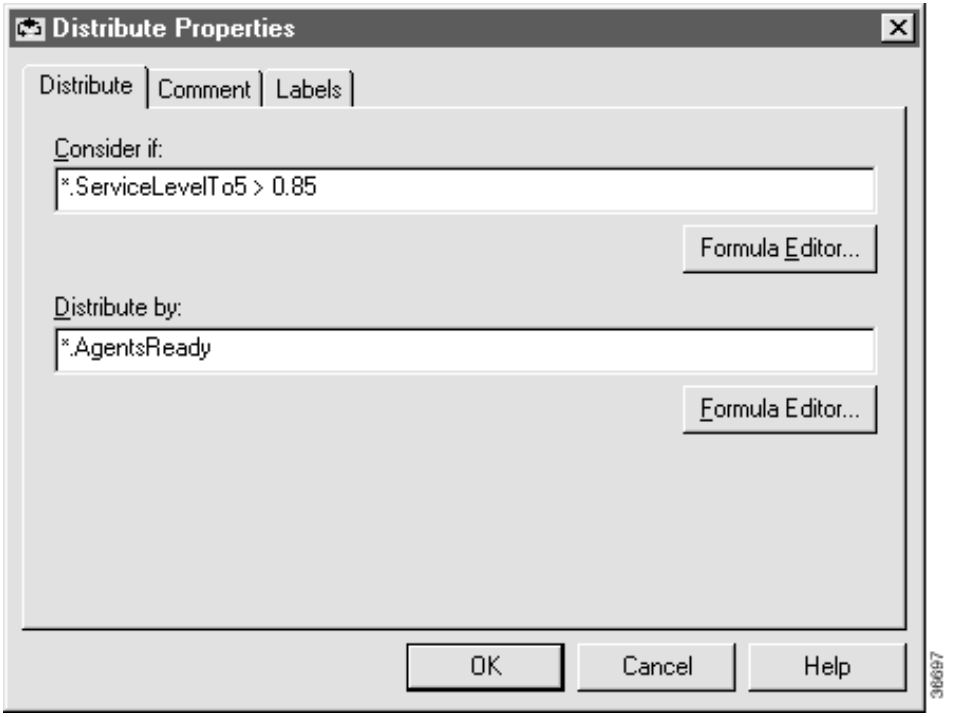


Two formulas can be defined in the Distribute object:

- A Boolean formula that determines whether a specific target is eligible for the distribution. If the value is false, no calls are distributed to that specific target.
- An allocation formula that determines how calls are distributed. If the Consider If expression is false for all targets, then the Distribution node fails.

The Distribute rule in Figure 5-11 distributes calls based on the number of active agents, but only to locations that are currently reporting a service level above 85%.

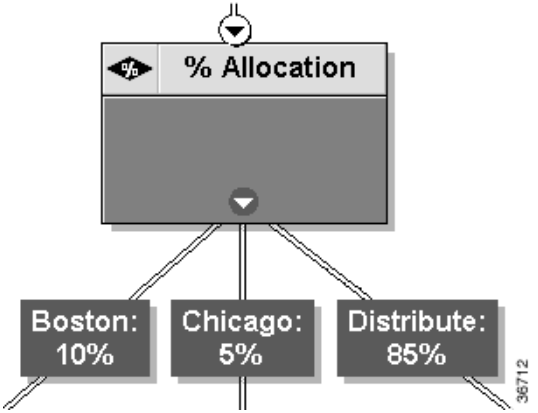
Figure 5-11 Distribute Properties Dialog Box



Percent Allocation Object

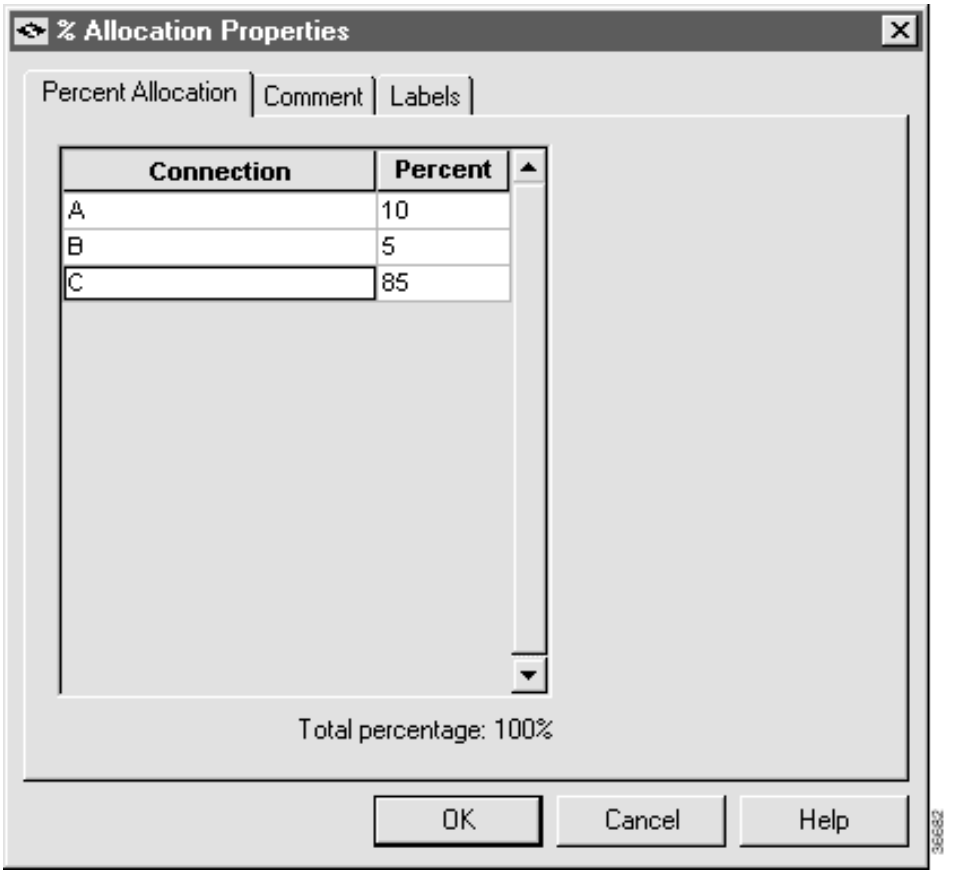
The Percent Allocation object distributes calls among several output branches based on percentages (see Figure 5-12).

Figure 5-12 Percent Allocation Object



You specify the percentages through the Percent Allocation dialog box (see Figure 5-13).

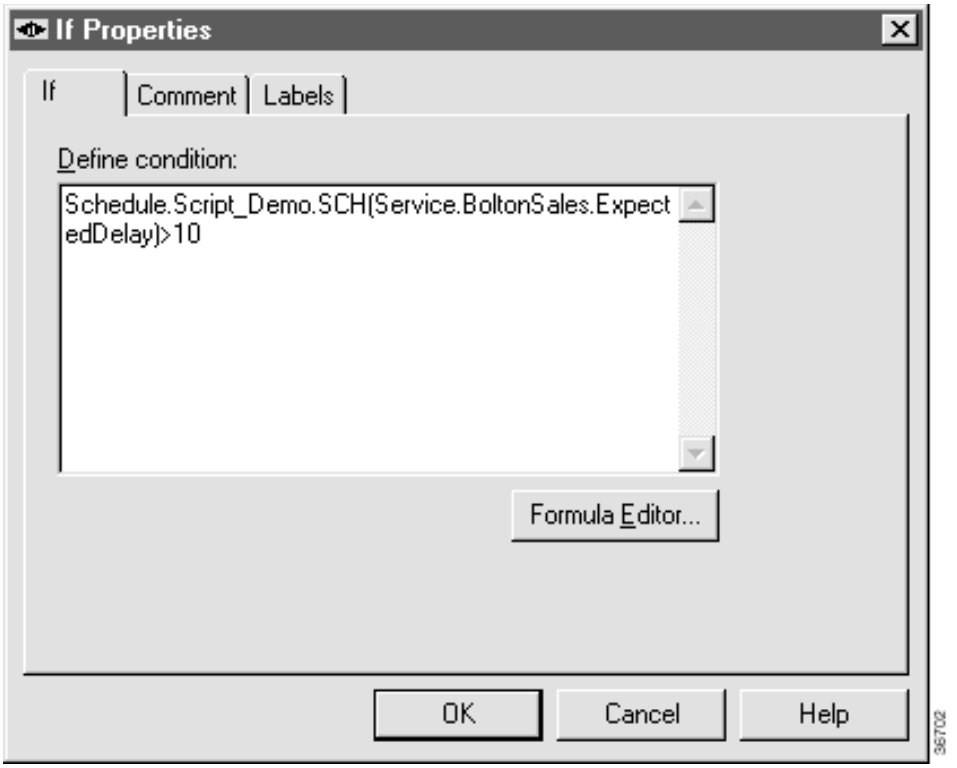
Figure 5-13 Percent Allocation Dialog Box



If Object

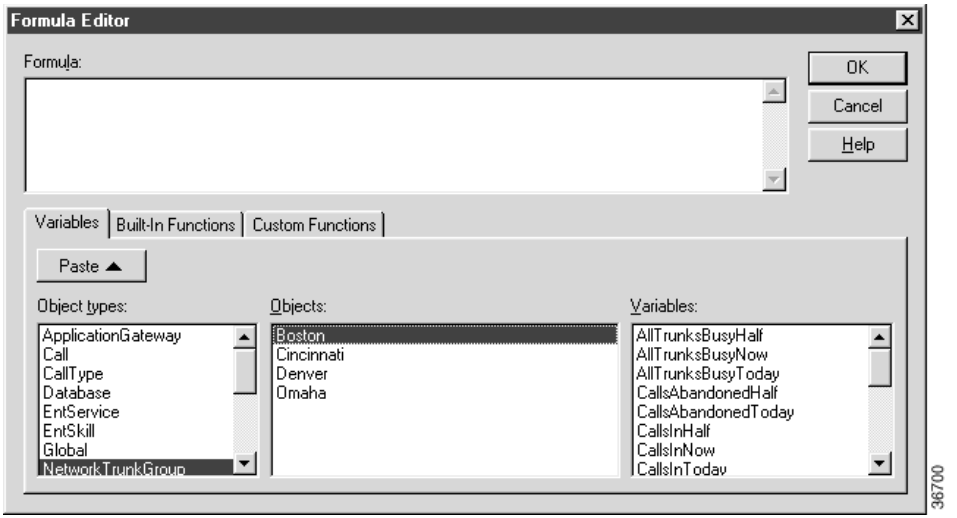
The If object distributes calls based on a Boolean expression. An If object has two output terminals: True and False. ICM software directs a call down the True branch if it satisfies the Boolean condition; if not, the call follows the False (or fail) branch. Figure 5-14 shows an If object.

Figure 5-14 If Object



The Formula Editor (Figure 5-15) can define the specific decision criteria.

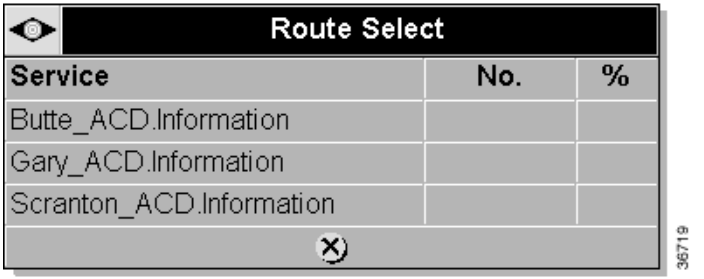
Figure 5-15 Formula Editor Dialog Box for a Routing Object



Route Select Object

The Route Select object combines the functionality of the Select and Distribute nodes while providing you with the flexibility to set different criteria for each target. The Route Select node does not reference a separate routing target. All target information is contained within the node. Figure 5-16 shows an example of a Route Select object.

Figure 5-16 Route Select Object

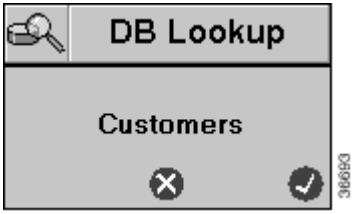


The Route Select dialog box allows you to set the targets and rules for selection or distribution. You can choose the target type associated with the object: agent, enterprise service, enterprise skill group, service, or skill group.

External Database Lookup Object

The DB Lookup object queries an external Microsoft SQL Server database and uses the data in call routing. In order to use the DB Lookup object, you must have the Gateway SQL feature. Figure 5-17 shows an example of a DB Lookup Object.

Figure 5-17 DB Lookup Object



The DB Lookup object allows your scripts to make precise routing decisions. For example, if you have a database that contains information about your callers, you could perform a database lookup based on Calling Line ID (CLID), Dialed Number (DN), or Caller Entered Digits (CEDs) such as an account number or social security number. The CEDs can be obtained from the network, an ACD, or an IVR system.

A typical DB Lookup application might be to classify callers as premium or mid-tier customers based on their average monthly bills. The call routing script would access the external database and retrieve the row of data that contains the caller's average monthly bill. Based on this information, the script could select an appropriate target for the call. Premium customers would be routed to the best resource available, even if the resource is at another call center site. All other callers would be routed to lower cost agent resources.

Performing database lookups of this kind involves:

- Creating and populating an external SQL Server database
- Entering information in Configure ICM about the table and the columns you want to reference

- In the Script Editor, adding a DB Lookup object to a routing script
- In the Script Editor, referencing database columns in the script (for example, in an If object)

The External Database

You can create the external Microsoft SQL Server database using whatever tools you want. The Script_Table Configuration window allows you to add the external database to your ICM configuration (Figure 5-18).

Figure 5-18 Script_Table Configuration Window

Specifying a Table and Lookup Value

Once the external database is defined, you can create a script that queries a specific row of data from the table. You can then reference columns from that row within the script. To query the database table, you add a DB Lookup object to a script. The Database Lookup dialog box allows you to choose the enterprise name of the table and

row you want to query. In the table field, you indicate the enterprise name of the table you want to query. In the Lookup Value, you enter an expression to match the key value in the row you want to retrieve.

Gateway Object

The Gateway object passes call variables to an external application and receives variables in return. This object is part of the Gateway feature. Figure 5-19 shows an example of a Gateway object.

Figure 5-19 Gateway Object

With a Gateway object in your script, you can define the variables that are sent to and received from the application. For example, you might create a routing script in which the Gateway object passes the caller's Calling Line ID to an external application and requests the caller's account number in return. More complex requests might ask for additional account information.

Call and Peripheral Variables

You can pass the following call variables to an external application:

- Caller Entered Digits
- Calling Line ID
- Customer Provided Digits
- Dialed Number String
- Routing Client
- Peripheral Variables 1 through 10

In return, you can request the following variables from the application:

- Customer Provided Digits
- Peripheral Variables 1 through 10

You define the peripheral variables (1-10) to identify the data you want to be available from the application. For example, Peripheral Variable 1 might represent an account number; Peripheral Variable 2 might represent a date; and so on.

Using Data Returned by the Application

ICM software can base subsequent routing decisions on the results obtained from the application. For example, if the application returned a variable that identified the caller as having a certain type of account, the script could use this information to control where and how the call is routed. Optionally, ICM software can pass any data returned by the application along with the call to an answering resource.

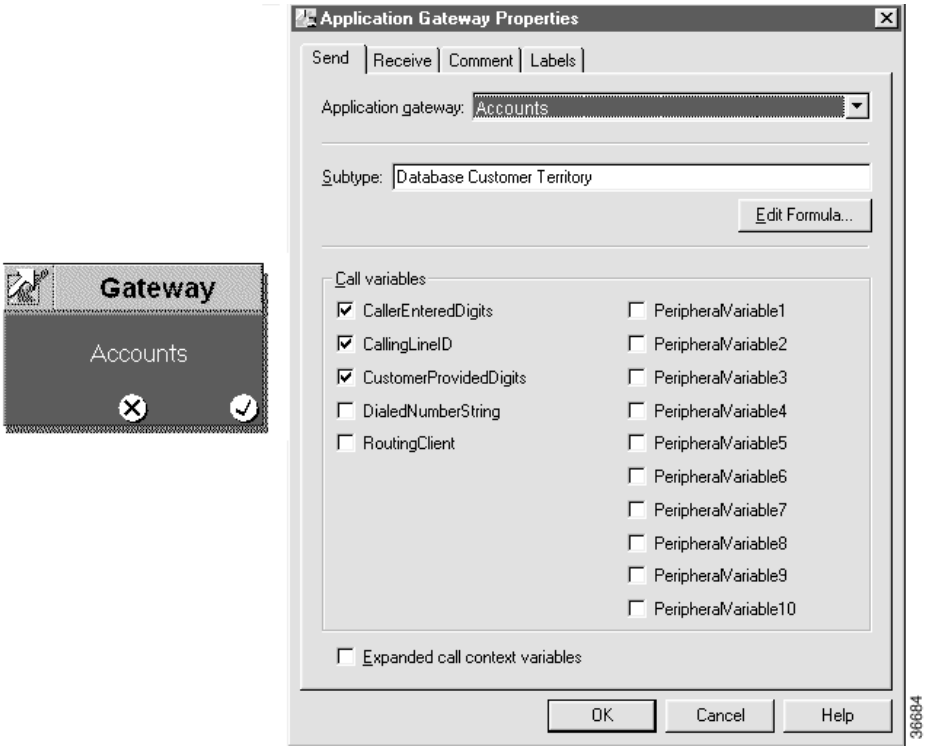
Setting Up an External Application

The Gateway node can query any type of customer application. You need to configure the machine on which the application resides to be able to communicate with the Gateway software. By using the Configure ICM tool, you configure the external application as an Application Gateway. This enables your application to be used by scripts within the ICM system.

Application Gateway Properties Dialog

Within the Script Editor, the Application Gateway Properties dialog allows you to set up the Gateway object. The Send tab allows you to specify the external application to invoke and the data to send to the application.

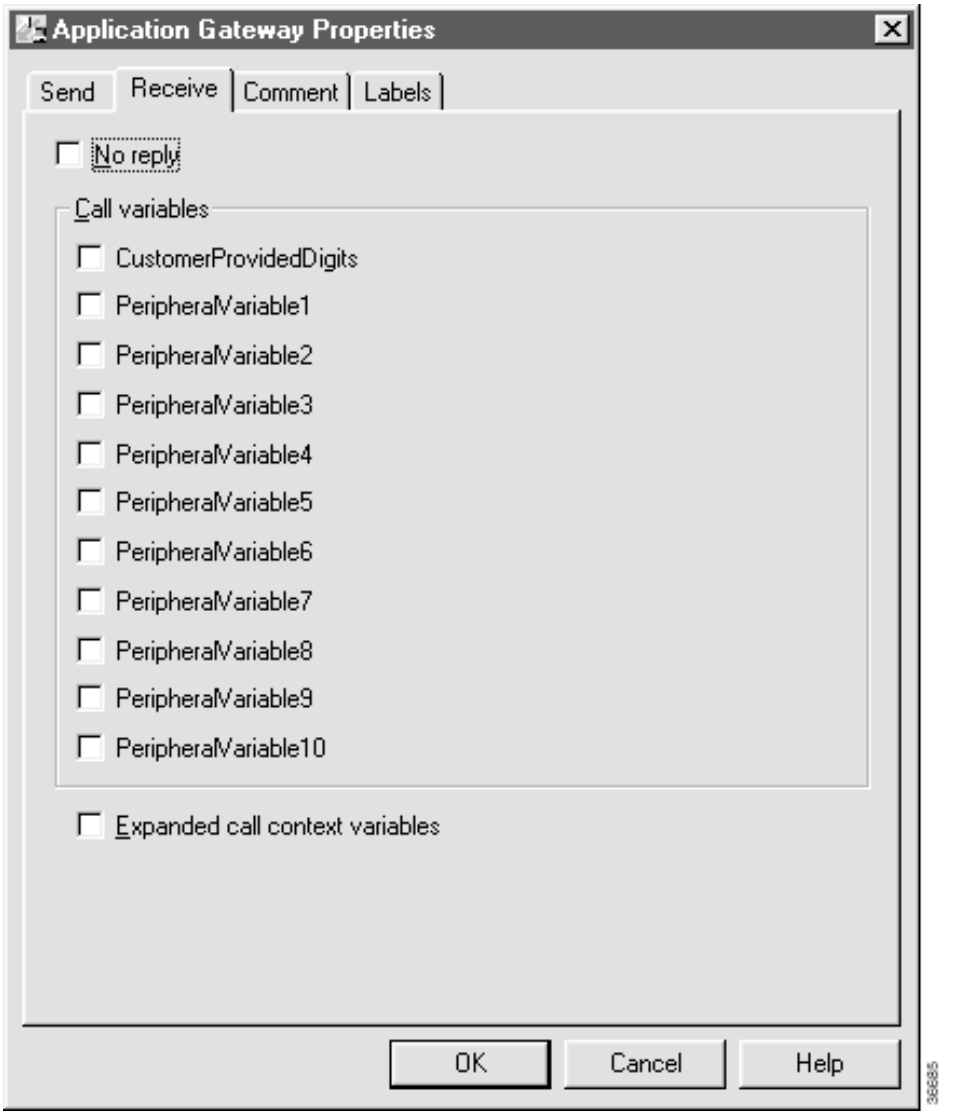
Figure 5-20 Application Gateway Properties



In the example in Figure 5-20, the Application Gateway Properties dialog box is sending Caller Entered Digits, Calling Line ID, and any Customer Provided Digits to an external application called Accounts. You can also specify sending of DialedNumberString, RoutingClient, up to ten call variables, and up to ten expanded call context variables. See the *Cisco ICM Software Script Editor Guide* and the Script Editor help for more information.

The Receive tab of the Application Gateway Properties dialog box allows you to specify the data you want returned from the application (Figure 5-21).

Figure 5-21 Receive Tab



Call Segmentation

The Script Editor provides a mechanism for logically segmenting callers based on the type of service request they are making. For example, a distinction can be made between a caller who wants to open a new account and a caller who already has an account and is simply inquiring about a new product or service. In another example, callers from one region of the country might be segmented from those calling from another region.

Script Scheduling

The Script Editor provides flexibility in scheduling when a given call routing script is used to route calls of a certain type. Some scripts might be active at all times; others might be active only during certain hours of the day or certain days of the week, month, or year. You might even define a script to run only on a specific date during a specific period of time.

Peripheral Interfaces

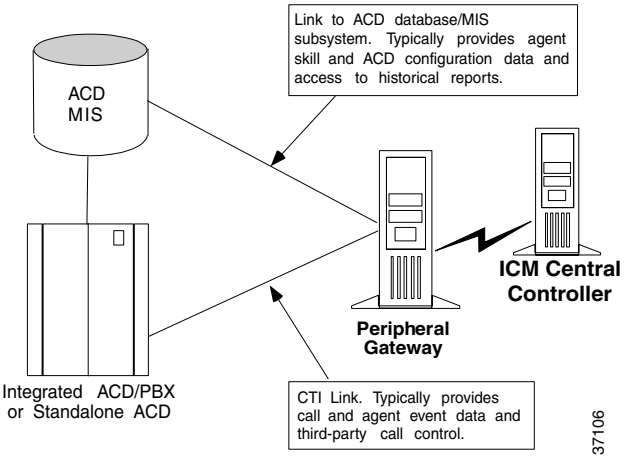
This chapter provides a high level overview of the following NAM Peripheral Interfaces:

- The Peripheral Gateway
- VRU Integration
- Computer Telephony Integration

Peripheral Gateway

The Peripheral Gateway (PG) is the interface between the ACD, VRU, or PBX system and Cisco ICM Software. The PG connects to the switch system through the switch vendor's Computer Telephony Integration (CTI) link. In some cases, the PG may also connect to the switch's MIS (Managed Internet Service) subsystem. This relationship is shown in Figure 6-1.

Figure 6-1 ACD/PBX Interface Overview



The PG monitors changes in agent call status, calculates ACD call handling statistics, and forwards event and statistical information to the CallRouter. The CallRouter uses the data in call routing and forwards it to the Logger for storage in the central database.

MIS Subsystems

The PG may also be connected to the MIS subsystem of the ACD. The MIS subsystem may be integrated with the ACD or it may reside on a separate platform with links to the ACD and the PG (Figure 6-1).

The MIS interface typically provides information concerning the mapping of individual agents to skill types and their current status relative to any given skill (for example, Logged-In and Available). This link may also provide ICM software with ACD configuration data and historical reports, if necessary.

An Event-Based System

Unlike network-based call routing architectures, the ICM architecture is event based. It does not rely on aggregated or averaged data. For every call center, the PG tracks the *call state events* available from the ACD/PBX, including call arrivals, calls placed into queue, and calls connected to agents.

The PG also tracks *agent state changes*. This capability allows an ICM system to make very precise routing decisions—in many cases down to the individual agent or agent group level.

Post-Routing and Intelligent-Transfer

The Peripheral Gateway also monitors and responds to routing requests from call center switches. This gives you the ability to intelligently post-route calls. Examples of Post-Routing include transferring calls between agents and inter-flowing calls between ACDs/PBXs.

The ICM software allows agents to make functional transfer requests such as transferring a call to a specialist. The ICM can seek out the most available and qualified agent in the network and instruct the switch, or the network, to route the call to that destination.

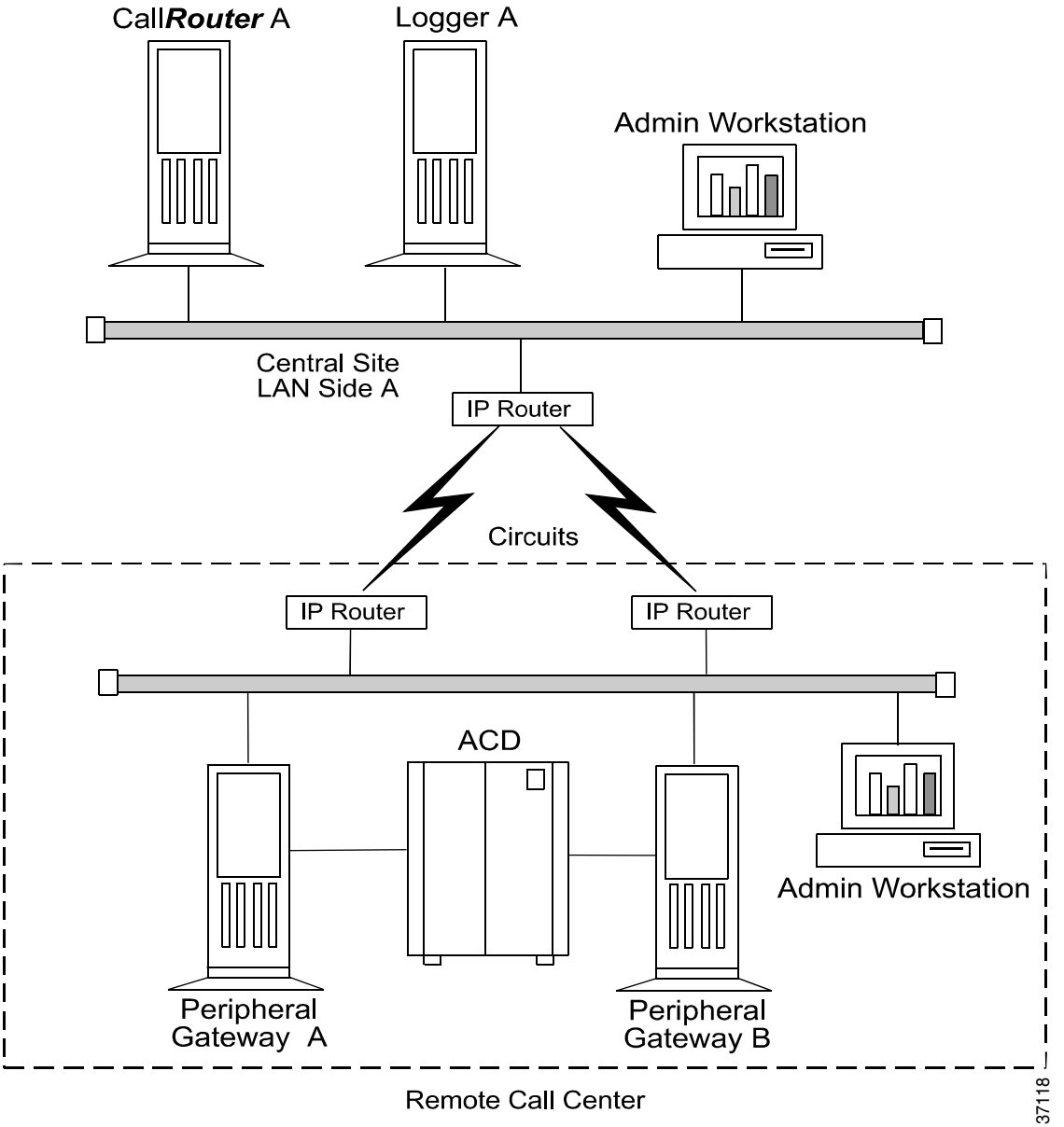
Supported ACDs

See the *Cisco ICM Software Pre-Installation Planning: Switch Preparation* manual for a list of ACDs that the ICM currently supports.

Standard PG Configuration

In a standard PG configuration, the PG is co-located with the ACD at a call center site. The PG and ACD communicate with the ICM system over an ICM visible network. The standard PG configuration allows PGs and Admin Workstations to share the data circuits (see Figure 6-2).

Figure 6-2 Standard PG Configuration



VRU Integration

The VRU Integration option allows you to use Voice Response Unit (VRU) systems in ICM call routing and reporting. The VRU interface is not specific to a particular VRU type or manufacturer; rather, it is based on an open interface model. VRU models that support VRU Integration include:

- Intervoice/Brite
- Edify Electronic Workforce
- IBM DirectTalk 6000
- InterVoice
- Lucent Conversant
- Periphonics VPS/is
- Aspect Generations

This section provides an overview of ICM/VRU integration. It also presents the most common options for integrating VRUs with ICM software.

Overview

Voice Response Unit (VRU) systems interconnect multiple telephone trunks to audio recording/playback units. Most VRUs run on a standard PC platform. They can perform several functions in the ICM system, including:

- Initiating calls
- Answering calls
- Queuing calls
- Playback of pre-recorded announcements and prompts
- Playback of pre-recorded announcements with variable inserts
- Recording of voice messages
- Playback of voice messages
- Collection of caller entered digits
- Holding calls in a wait state
- Transferring calls to an attached switch or network

- Tandem connection of incoming and outgoing calls
- Interaction with a Service computer system over a Service link
- Interaction with an ACD over an ACD-specific CTI link

VRU Integration allows the ICM to route calls to targets on VRU systems. It also allows VRUs to take advantage of ICM call routing features such as Post-Routing. For example, an VRU might use the ICM's Post-Routing capabilities to select targets for calls it needs to transfer.

VRU Peripheral Gateway

Each hardware platform can run two PGs, which can interface to VRUs and ACDs. A single PG hardware platform can run just the VRU Integration software, or it can run the ACD interface and VRU Integration software.

Interfaces

Two interfaces enable communication between the ICM system and the VRU:

- *Service Control Interface*

  Through this interface, ICM software determines the call handling steps to be performed by the VRU and controls the call while it is running on the VRU.

  This interface is also used to report service, trunk, and per-call statistics to the ICM database.

- *Event Feed/Routing Interface*

  Through this interface, the call arrives at the VRU and is controlled by the VRU, not by the ICM. The VRU requests routing information from the ICM and delivers the call to the appropriate destination.

VRU Queuing

VRU Integration supports queueing at a network-based or premise-based VRU. Using the Service Control Interface, calls can be directed to an VRU when no other answering resource is available. Standard call treatments such as

announcements, music, or digit collection can be applied to calls in the queue. When an agent become available, the ICM system directs the VRU to remove the call from the queue and release it to the agent.

In the case of premise-based queuing, a call can be queued even if there is no ACD queue point available within the enterprise. This option is available if you are using VRU Integration with *VRU Queue.*

VRU System and ICM Integration

VRU systems can be located at the customer's call center site or in the service provider network:

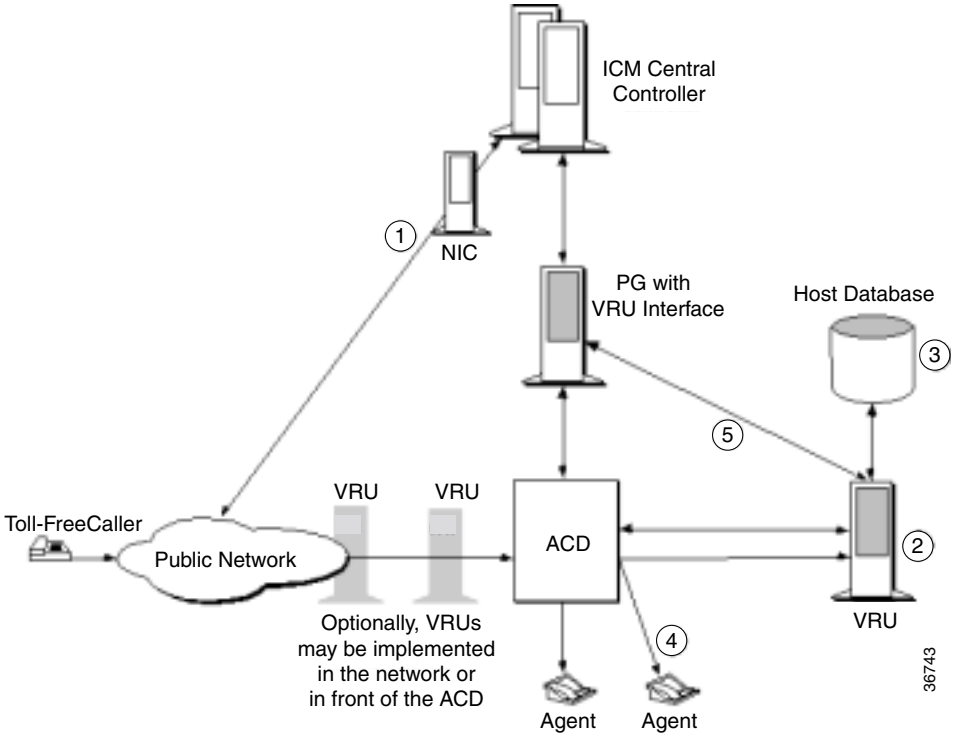
- At the call center, the VRU (called a premised based VRU) might be connected on the network side of the ACD or "behind" the ACD.
- In the service provider network, the VRU (called a network based VRU) may be offered as a service by the network provider.

In a typical ICM call routing scenario, each incoming call is pre-routed before it is sent to an agent or other answering resource. For each call, the service provider network issues a *routing request* to ICM software. The routing request contains the Dialed Number (DN), Calling Line ID (CLID), and any Caller Entered Digits (CEDs).

Based on the information contained in the routing request, ICM software returns a routing label (destination) for the call. The network delivers the call to the specified ACD and DNIS. The ACD then connects the call to a specific agent or answering resource.

An ICM configuration that includes VRU systems is slightly different. The ACD is configured so that it can send calls to agents as well as VRU systems. Figure 6-3 shows some of the capabilities of VRUs in an ICM environment.

Figure 6-3 VRU and ICM Integration Overview



1. In an VRU Integration configuration, calls continued to be pre-routed by an ICM system.
2. When a call is routed to an VRU, the VRU answers the call and interacts with the caller.
3. The VRU may access a host system (for example, a customer profile database) to retrieve more information to help process the call.
4. Often, the caller can get all the information he or she needs through simple interaction with the VRU. In some cases, however, the VRU needs to transfer the caller to an agent or another call resource.
5. In some configurations, the VRU can invoke Post-Routing to select an agent from anywhere in the call center enterprise. To do this, the VRU sends a routing request to the PG. The PG forwards the request to the CallRouter,

which responds with a new destination for the call. The PG returns the new destination to the VRU. The VRU then signals the ACD or network to send the call to the specified destination.

VRU Programming and Application Development

In order for an ICM system to interface to a specific type of VRU system, the VRU must be programmed to meet Cisco's *VRU Integration Interface specification*. VRU application developers can use the VRU interface specification to implement routing client and monitoring capabilities.

The interface specification includes an VRU routing client and an VRU monitoring interface. The *VRU routing client* allows VRU systems to send routing requests to the ICM system via the PG. These requests can include data variables such as Calling Line ID (CLID) and menu selections. The CallRouter can use this data to instruct the VRU on where to send the call. The *VRU monitoring interface* allows VRU systems to send port and application activity data to the CallRouter for use in call routing and reporting.

For more information on developing applications with the VRU Integration Interface specification, contact your Cisco representative.

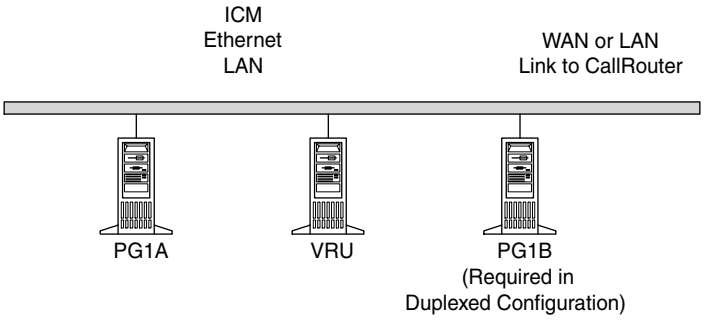
Communications

The Ethernet physical network interface used for communication with ICM software can also be used for other purposes. A dedicated network is not required. TCP/IP transport services are used for communications between the VRU and the PG.

In simplexed configurations, one PG resides on the local network with the VRU system. In duplexed configurations, two PGs are present. There may be other equipment (for example, ACDs) on the network as well. Figure 6-4 shows a typical duplexed VRU PG configuration.

There are two routing clients, each located in one of the duplex PGs (PG1A, PG1B). One client is actively communicating with the VRU at any given time. If there is a problem in the PG or routing client, the inactive client becomes active and begins processing the calls.

Figure 6-4 VRU Peripheral Gateway Interface



Data and Reporting

VRU Integration allows an ICM system to collect data from VRU systems and include the data in call center enterprise reports. The ICM reports on VRU systems in a manner similar to agent reporting. For example, the ICM software might report on the number of on-hook and off-hook VRU ports, the number and type of calls, or the duration of a call.

The Peripheral Gateway can record VRU calling statistics from two perspectives: as viewed by the ACD or as handled by the VRU system. The ICM system can use both of these data sources for routing and reporting. The ACD and VRU statistics are not directly linked.

In configurations where the PG has a direct interface to the VRU system, the PG can monitor the VRU for real-time call event data. This data is forwarded to the CallRouter for use in call routing, monitoring, and reporting.

You can define *service arrays* in instances where you have similar peripheral services defined on multiple VRU systems and the VRUs all share the same network trunk group. By grouping the services of multiple VRUs into a service array, you can send calls to a single target (the service array) and let the network deliver the call to any one of the peripheral services that make up the service array.

Cisco CTI

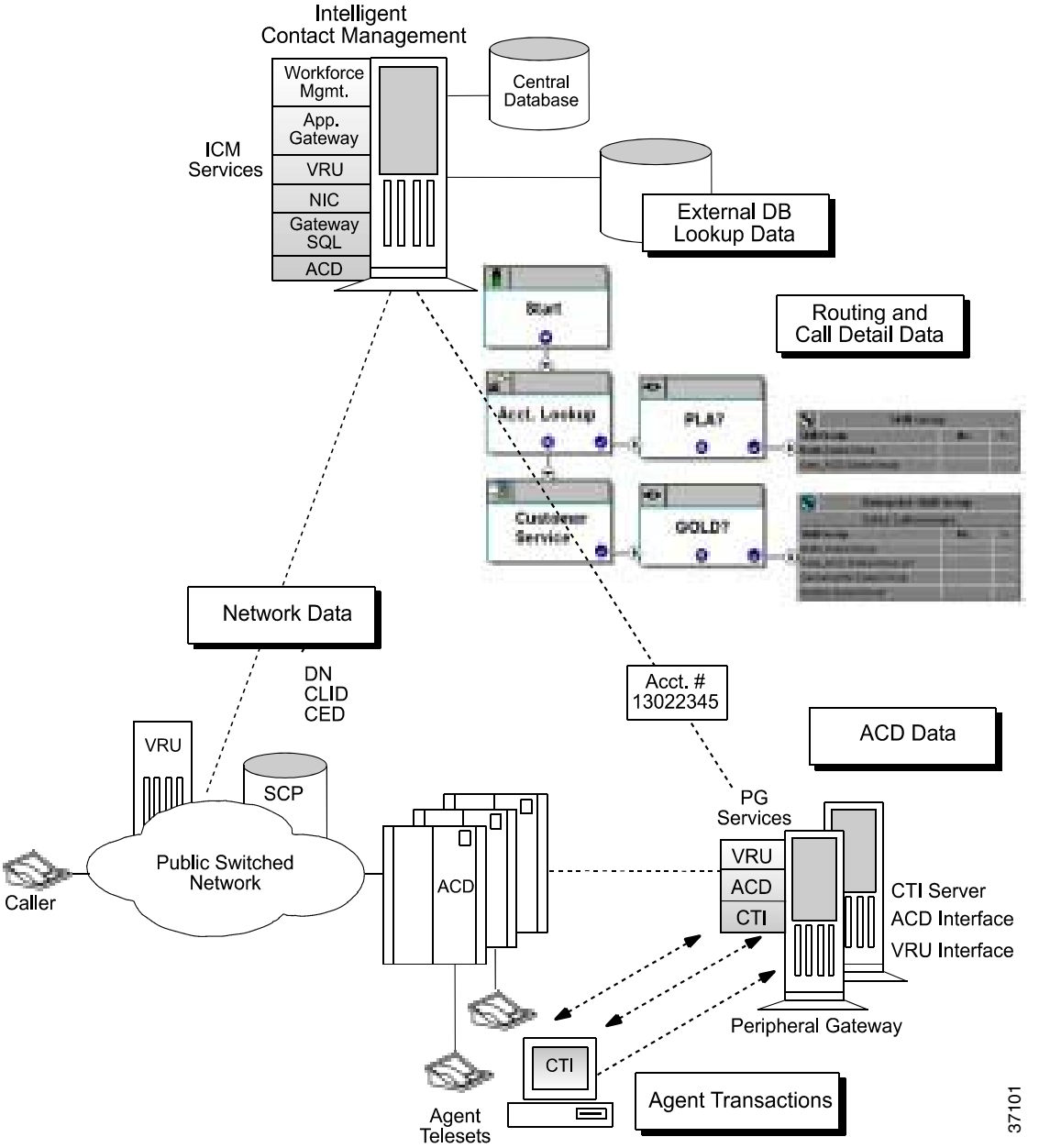
As an enterprise call routing system, an ICM system collects data from different systems and telecommunications environments throughout the call center enterprise. Often these systems are implemented on heterogeneous hardware and software platforms and distributed across multiple sites. Cisco CTI takes enterprise call and transaction data from these dissimilar systems and makes it available to agent desktop or server CTI applications. In a desktop or server CTI environment, ICM enterprise data can be used in a variety of integrated telephony applications.

This section describes how Cisco CTI integrates CTI applications with ICM systems.

Overview

Cisco CTI provides Computer Telephony Integration (CTI) from the service provider network down to the agent's desktop. The virtual call center now encompasses the telephone network, the ICM, external data sources, ACDs, VRUs, and call center CTI applications. Figure 6-5 shows how Cisco CTI brings enterprise data to the agent desktop.

Figure 6-5 Enterprise-Wide Data Access



Cisco CTI increases the efficiency of the virtual call center workforce by reducing or eliminating the time agents spend verbally soliciting information from callers. Call context and transaction data "follows" the call from VRU to agent, and from site to site, regardless of variations in ACD and VRU platforms at each site. The term *call context* refers to the data the ICM system collects about a specific call (for example, Dialed Number, Calling Line ID, Caller Entered Digits, and other call variables).

Network-Enabled CTI Capabilities

The Cisco CTI software provides network-enabled CTI capabilities by integrating data from different sources throughout the enterprise. Data from several types of systems can be used to improve call handling, including:

- **Network data**. Data about the caller that has been collected by the service provider network, including Dialed Number (DN), Calling Line ID (CLID), and Customer Entered Digits (CED).
- **ICM application data**. Data used within the ICM routing application (for example, skill group and service profiles, scripts, real-time ACD and agent data, termination call detail records).
- **Voice processing data**. Data collected by VRUs in response to voice prompts.
- **External database lookup data**. Data collected through external database lookups (for example, customer account profiles or other corporate databases).
- **Agent transaction data**. Data collected by the agent at a desktop.

Cisco CTI Components

Cisco CTI consists of the following components:

- **CTI Desktop**. CTI Desktop consists of the following:
  - CTIClient
  - Desktop Control Server
  - Softphone Controls
  - Softphone

  - CTI Toolkit

  These components provide desktop applications with full access to CTI Server.

- **CTI Server**. Cisco provides this software to serve as an interface between the ICM and client or server CTI applications. The CTI Server software runs on a Cisco PG platform.

Cisco CTI Object Server (CTI OS)

The Cisco CTI Object Server is the component that provides an object-based interface to the CTI Server. It includes COM, C, and C++ interfaces that share the same code base. CTI OS provides developers with the functionality to provide custom softphones, screen pop applications, and other integration applications, using the data delivered by CTI Server. Additionally, CTI OS provides the following benefits:

- Enables developers to build applications that can monitor or control more than one agent
- Facilitates server-to-server integration
- Reduces the need to account for switch-specific behavior

In addition to its programming interfaces, CTI OS includes a fully functional agent softphone as well as a supervisor softphone that enables call center supervisors to monitor the activities of their agents.

Refer to the *Cisco ICM Software CTI Product Description* guide for more information about CTI OS.

Management Tools

In the multi-customer NAM environment, management tools are important to both the network service provider and the customer. Since a NAM serves multiple CICMs, the system collects a large amount of management information data. Each CICM contains at least one customer database with its own set of configuration data, scripts, and report data. The NAM also has a database with its own scripts, configuration, and reporting data.

This chapter describes the types of management tools used within a NAM system. It also introduces the system's database management technology.

Managing a Multi-Customer Environment

The NAM system includes management tools for both the network service provider and the customer. Network service providers use *Network Admin Workstations (AWs)* to manage network and customer configurations and report on activity among the multiple CICMs within the system. Network AWs are equipped with a full suite of Cisco scripting, reporting, and configuration tools.

Customers are provided with *Limited AWs*, which contain a limited set of tools and are intended for use within the customer's own call center enterprise.

Admin Workstations

The Admin Workstation is a PC running NAM software on the Microsoft Windows 2000 operating system. Admin Workstations can be located with NAMs and CICMs and at remote locations in the network.

Admin Workstations reside both at the service provider site and the customer sites.

Both of the following types of Admin Workstations reside at the service provider site:

- **Network AW (NAM)**. A network Admin Workstation associated with the NAM system.
- **Network AW (CICM)**. A network Admin Workstation associated with the CICM systems.

Both of these Network AWs may reside on the same machine.

A customer site contains one of the following types of Admin Workstations:

- **Limited AW**. Accesses one instance's data from a CICM.
- **Standard**. A standard ICM AW. Optionally, a service provider can use the ICM Configuration Manager Feature Control facility to define the customer's available tools.

You have two options when installing the Admin Workstation software:

- **Real-time Distributor**. This configuration includes the real-time distributor and real-time client processes, and all processes that directly manage the local database. A single distributor Admin Workstation can run the distributor processes for multiple customers simultaneously. However, it can run client applications (such as Script Editor and Configure ICM) for only one customer at a time. Use AW Select to change the customer.
- **Client (No Real-time Distributor)**. This configuration includes standard Admin Workstation applications, such as Script Editor and Configure ICM. It does not include the processes that directly manage a database.

Optionally, you can configure a real-time distributor to also act as a Historical Data Server (HDS). The Logger then forwards historical data to a special database on the distributor. Admin Workstations at the local site can then access historical data from the distributor rather than from the central database.

For more information on real-time distributor and client workstations and for instructions on how to configure a Historical Data Server, see the *Cisco ICM Software Installation Guide*.

AW Tools

Each Admin Workstation contains a group of tools. The following tools are available on network AWs:

- **AW Select**. Lets you switch among multiple instances on an Admin Workstation and optionally start and stop the distributor.
- **Call Tracer**. Lets you send test calls to the ICM and see how they are processed and the target chosen.
- **Check Routes**. Lets you validate the configuration of routes referenced by a script.
- **CICM Monitor**. Lets you connect to a CICM server and view real-time call routing performance for all instances installed on that CICM.
- **CMS Control**. Lets you access the CMS Control Console and perform CMS Server functions.
- **Configuration Manager**. Lets you set up and maintain your Cisco environment. The configuration includes the ICM components within the system, the services provided by the system, and the agents who provide them.
- **Custom Screen Builder**. Lets you create your own report templates for use in the Monitor ICM reporting application.
- **Glossary**. Defines terms related to NAM.
- **Initialize Local Database**. (Distributor workstations only). Lets you copy current information from the NAM or CICM central database to the local database on the Admin Workstation.
- **Job Scheduler**. Lets you schedule reports to be generated and printed at a later time.
- **Lock Admin**. Lets you check or change the status of locks in a NAM or CICM central database. Only the holder of the Configuration lock can update configuration data; only the holder of a script lock can update a script.

- **Print Server**. Works with the Job Scheduler to let you automatically print reports at specific times.
- **Router Log Viewer**. Displays information about calls processed by the ICM and any errors encountered in processing them.
- **Scheduled Target Manager**. Lets you create, update, and assign schedules to scheduled targets (routing targets that the NAM does not monitor directly).
- **Script Editor**. Lets you create, modify, and schedule routing scripts. The ICM executes these scripts to determine where to route each call.
- **Service Control**. Lets you stop and start NAM-related services.
- **Setup**. Lets you modify NAM setup parameters.

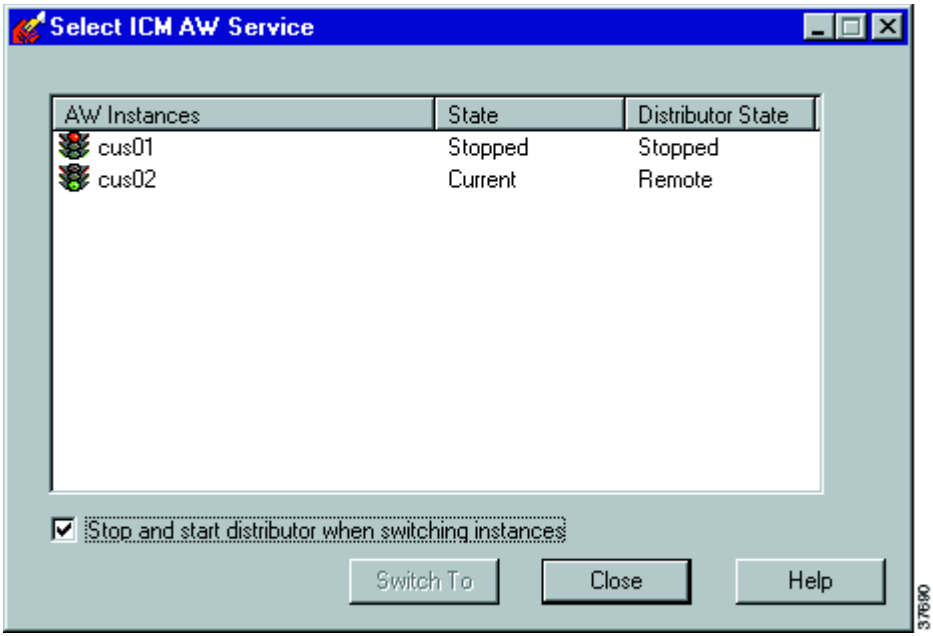
The Limited AW is intended for the network service provider customer. The following tools are not available on a Limited AW:

- AW Select
- Check Routes
- CICM Monitor
- Router Log Viewer
- Schema Help

Switching Between Instances

If the Admin Workstation is associated with a CICM system, several instances of the Admin Workstation software might be installed on a single machine. You can switch between instances by using the Select AW Service tool (Figure 7-1).

Figure 7-1 Select AW Service Dialog Box



The Select AW Service screen lists all the Admin Workstation instances on the current machine. Within this screen, you can choose which instance to use at a network AW and optionally start the distributor for that instance. You can switch to other instances at any time; however, when you switch instances you must close and restart any AW applications such as Script Editor or Configure ICM. In this manner, you can generate reports and view real-time data for multiple instances from a single Admin Workstation. The Select AW Service tool is not included on the Limited AWs since these workstations access only a single ICM configuration.

NAM Database Technology

NAM database technology frees you from the performance constraints normally associated with ACD and network data aggregation. The NAM Logger is the process that stores and manages historical data, Pre- and Post-Routing records, routing scripts, and ICM configuration data. The Logger operates in conjunction with the CallRouter.

The Logger contains a relational database that collects and processes large amounts of call and transaction data, including call handling, planning, and performance data. Its open database design enables an ICM system to link its data with other sources, such as:

- ACDs from different vendors
- Public telephone networks
- Call transaction software packages
- Workforce management software packages
- Any ODBC-compliant database

To achieve an open and flexible design, the NAM uses Microsoft SQL Server for managing its database. SQL Server is an open, relational database management system for multi-user processing networks. This distributed database technology supports a large number of database clients and simultaneously provides enterprise-wide views for all call center locations and network operations centers.

Central and Local Databases

The *NAM central database* resides with the Central Controller (CallRouter/Logger machine). When the Central Controller is duplexed, the database is also duplexed. The central database contains the following types of data:

- Full configuration information for the enterprise
- All routing scripts—current and, if you choose to save them, past versions
- Event data
- Call detail data
- Five-minute summary data
- Half-hour historical data

In addition, some types of Admin Workstations have their own real-time SQL Server databases. The *AW local database* stores real-time data on current activity in the call center enterprise, along with a copy of the configuration information and routing script.

NAM and CICM Data

NAMs and CICMs store different sets of data, mainly because of the different roles they play in the NAM system. NAMs typically have a limited configuration that focuses on public network route requests, ICM gateways, scripts, and routes.CICMs have full configurations, typically with many call center entities defined (for example, services, skill groups, trunk groups, and routes). CICMs store many types of half-hour, five-minute, and real-time data in order to report on individual call center performance. Table 7-1 summarizes the historical, real-time, and other data that are stored by NAMs and CICMs.

Table 7-1 NAM and CICM Reporting Data

	NAM				Customer ICM			
Data	**½ Hr**	**5 Min**	**Real Time**	**Other**	**½ Hr**	**5 Min**	**Real Time**	**Other**
Application Event[1]	-	-	-	X	-	-	-	X
Call Type	-	-	-	-	-	-	X	-
Event[1]	-	-	-	X	-	-	-	X
Network Trunk Group	-	-	-	-	X	-	X	-
Peripheral	-	-	-	-	-	-	X	-
Route	-	-	-	-	X	X	X	-
Route Call Detail[2]	-	-	-	X	-	-	-	X
Routing Client	-	X	-	-	-	X	X	-
Script	-	X	-	-	-	X	X	-
Service	-	-	-	-	X	X	X	-
Skill Group	-	-	-	-	X	X	X	-
Termination Call Detail[3]	-	-	-	-	-	-	-	X
Trunk Group	-	-	-	-	X	X	X	-

1. Events are logged to the central database as they occur. They are not logged in real-time, half-hour, or five-minute tables.
2. Route call detail includes information about routing requests and routes chosen for calls by the NAM. A record is generated in the central database for each routing request processed. These data are not logged in real-time, half-hour, or five-minute tables.
3. Termination call detail includes information about how each call was handled at the peripheral. A record is generated in the central database for each call that arrives at a peripheral. These data are not logged in real-time, half-hour, or five-minute tables.

For information on Event Data, see Chapter 8, “Alarm Management.”

Historical Logger

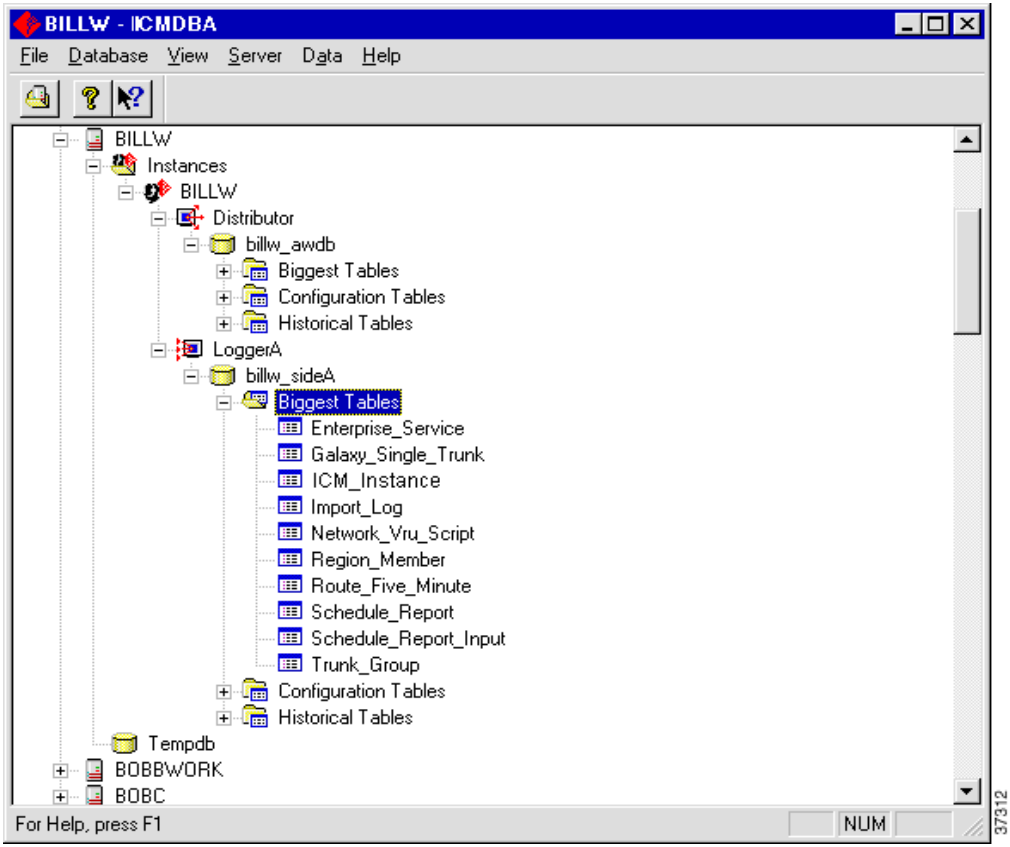
In most cases, ICM historical data are stored in central databases on NAMs and CICMs in summary five-minute and half-hour intervals. The ICM also saves call detail records in the central database for each call routed.

You must set up an Admin Workstation at each customer site as a Historical Database Server (HDS). The CICM feeds historical records to the HDS machine through a secure mechanism. Other Admin Workstations at the customer site can read historical data from the HDS machine rather than directly from the CICM Database Server. The HDS is not an option for a NAM. Customers do not connect to the NAM to retrieve data.

ICMDBA Database Administration Tool

The ICMDBA database administration utility is installed on every Database Server and Admin Workstation. This tool lets you create, delete, expand, and maintain ICM databases on your local network.

To start ICMDBA, enter the command **ICMDBA** in Windows' Run dialog box or a command window. The ICMDBA main window appears as follows:



The window lists all ICM database servers in the current domain. You can expand a server by clicking on the plus sign (+) next to its name. This displays all the ICM instances that have databases on that server. When you expand an instance, you can see the specific ICM node or nodes (Distributor or Logger) on the machines that have databases for that customer. When you expand a node, you can see the specific databases associated with that node. You can expand a database to eventually see the individual tables in the database.

The ICMDBA tool allows you to perform the following operations:

- Create, recreate, or delete a database.
- Display the properties of a database and its related devices.
- Estimate the size needed for a database.

- Expand a database.
- Import data to or export data from a database.
- Synchronize two databases.
- View the size of individual tables in a database.
- Change configuration settings for a database server.
- Stop or start a database server.

If you don't see the server you want to work with, choose **File > Add Computer** from the menu bar. You can then select a computer anywhere on the local network.

CICM Monitor

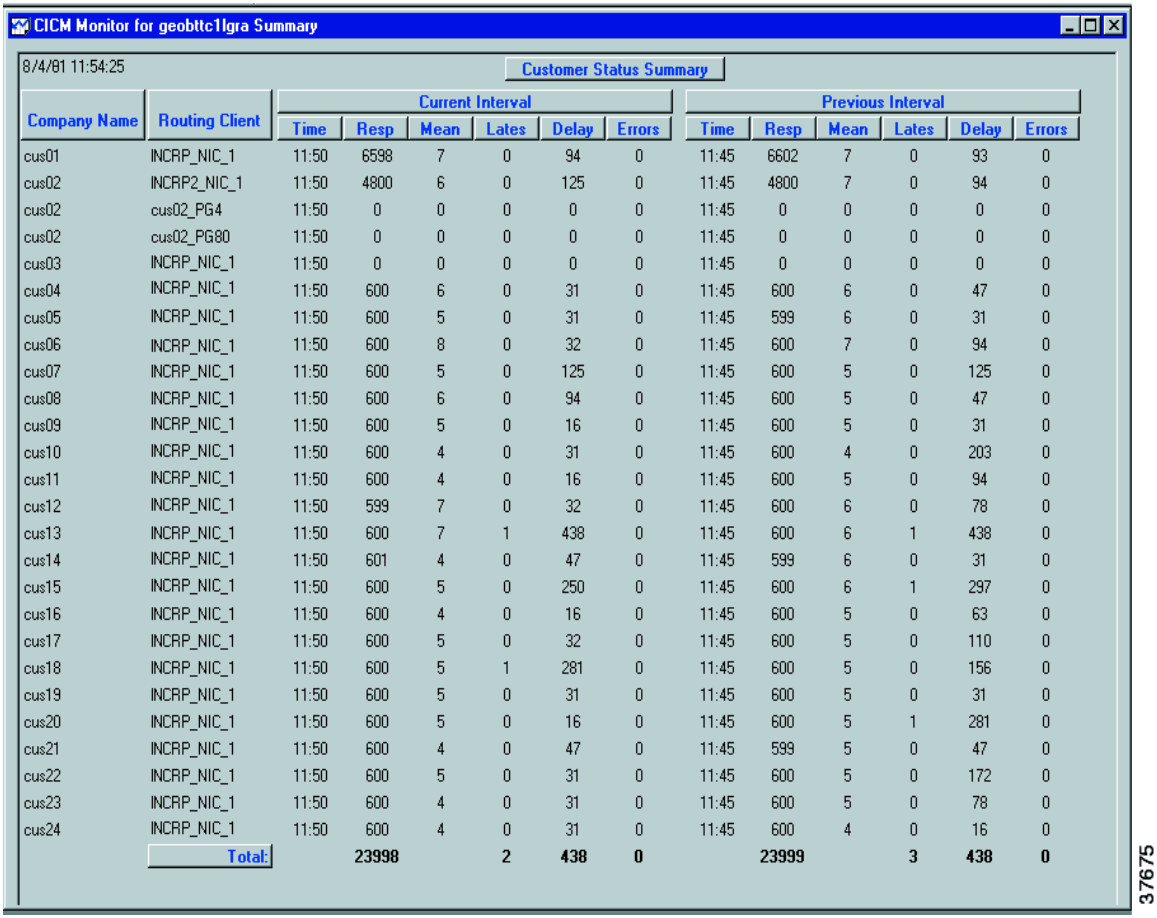
In the two-tiered NAM architecture, multiple configurations can be installed on a single Customer ICM (CICM) machine. For example, several instances of the Intelligent Contact Management software may be running on a single CICM complex. Each instance, in turn, serves one or more specific NAM customers. The CICM complex can route calls for each of the instances configured on the machine.

Rather then focus on an individual instance's call routing data, you might want to view call routing information for all the instances on a CICM. The *CICM Monitor tool* lets you define a profile that describes the instance databases on each CICM complex. Once you define a CICM profile, you can view call routing information for all the instances on the CICM complex.

Note The CICM Monitor tool is installed on Network AWs (that is, NAM and CICM AWs). It is intended for the network service provider and is not installed on Limited AWs. Users on Limited AWs can view data for only one instance.

Figure 7-2 shows an example of a Summary Report created through the CICM Monitor:

Figure 7-2 Summary Report Window



CICM Monitor for geobttc1lgra Summary

8/4/01 11:54:25

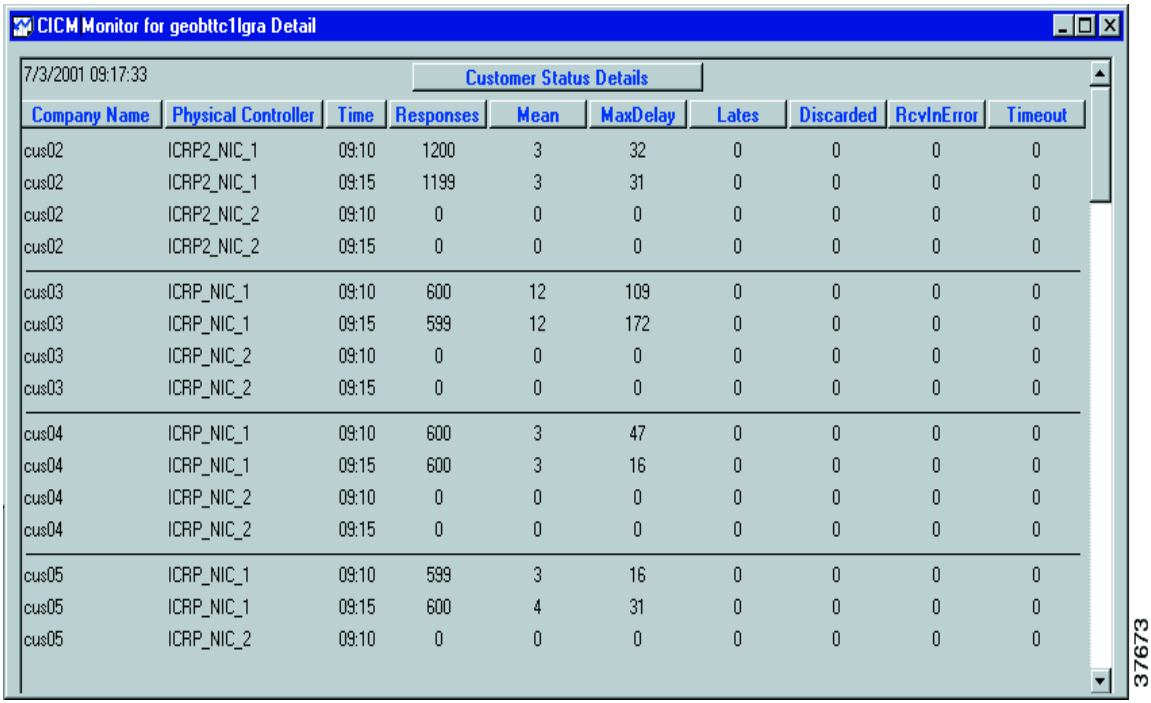
Customer Status Summary

Company Name	Routing Client	Current Interval						Previous Interval					
		Time	Resp	Mean	Lates	Delay	Errors	Time	Resp	Mean	Lates	Delay	Errors
cus01	INCRP_NIC_1	11:50	6598	7	0	94	0	11:45	6602	7	0	93	0
cus02	INCRP2_NIC_1	11:50	4800	6	0	125	0	11:45	4800	7	0	94	0
cus02	cus02_PG4	11:50	0	0	0	0	0	11:45	0	0	0	0	0
cus02	cus02_PG80	11:50	0	0	0	0	0	11:45	0	0	0	0	0
cus03	INCRP_NIC_1	11:50	0	0	0	0	0	11:45	0	0	0	0	0
cus04	INCRP_NIC_1	11:50	600	6	0	31	0	11:45	600	6	0	47	0
cus05	INCRP_NIC_1	11:50	600	5	0	31	0	11:45	599	6	0	31	0
cus06	INCRP_NIC_1	11:50	600	8	0	32	0	11:45	600	7	0	94	0
cus07	INCRP_NIC_1	11:50	600	5	0	125	0	11:45	600	5	0	125	0
cus08	INCRP_NIC_1	11:50	600	6	0	94	0	11:45	600	5	0	47	0
cus09	INCRP_NIC_1	11:50	600	5	0	16	0	11:45	600	5	0	31	0
cus10	INCRP_NIC_1	11:50	600	4	0	31	0	11:45	600	4	0	203	0
cus11	INCRP_NIC_1	11:50	600	4	0	16	0	11:45	600	5	0	94	0
cus12	INCRP_NIC_1	11:50	599	7	0	32	0	11:45	600	6	0	78	0
cus13	INCRP_NIC_1	11:50	600	7	1	438	0	11:45	600	6	1	438	0
cus14	INCRP_NIC_1	11:50	601	4	0	47	0	11:45	599	6	0	31	0
cus15	INCRP_NIC_1	11:50	600	5	0	250	0	11:45	600	6	1	297	0
cus16	INCRP_NIC_1	11:50	600	4	0	16	0	11:45	600	5	0	63	0
cus17	INCRP_NIC_1	11:50	600	5	0	32	0	11:45	600	5	0	110	0
cus18	INCRP_NIC_1	11:50	600	5	1	281	0	11:45	600	5	0	156	0
cus19	INCRP_NIC_1	11:50	600	5	0	31	0	11:45	600	5	0	31	0
cus20	INCRP_NIC_1	11:50	600	5	0	16	0	11:45	600	5	1	281	0
cus21	INCRP_NIC_1	11:50	600	4	0	47	0	11:45	599	5	0	47	0
cus22	INCRP_NIC_1	11:50	600	5	0	31	0	11:45	600	5	0	172	0
cus23	INCRP_NIC_1	11:50	600	4	0	31	0	11:45	600	5	0	78	0
cus24	INCRP_NIC_1	11:50	600	4	0	31	0	11:45	600	4	0	16	0
	Total:		23998		2	438	0		23999		3	438	0

37675

You can also create detailed reports for a CICM complex (Figure 7-3).

Figure 7-3 Detailed Report Window



Once Detailed or Summary reports are displayed, you can print or save the reports, or export the report data in any of several file formats.

Web View

WebView is an application for enterprise contact center reporting. The WebView application is installed on a machine acting as a Web server, and can be accessed and used through client browsers. WebView provides templates that meet standard reporting needs by querying relational databases and formatting report results, and contains tools that you can use to modify, save, and export reports.

Cisco ICM Software WebView reports on ICM system data. The WebView server is installed on the ICM Admin Workstation. Reports can be used to monitor the ACD or IPCC system, including integrated multi-media options, task treatment, agent skill group performance, and individual agents.

WebView provides templates that you use to generate reports. A template is a file that specifies the query used to gather data from the database, the formatting of the report, and the parameters from which you can select.

There are two types of templates and reports:

- Historical templates and reports that display past activity data stored in 30-minute intervals.
- Real-time templates and reports that provide information about what is happening right now. Information in these reports includes data stored since the end of the last five-minute interval. You can update real-time information at 15, 20, 30, or 60-second intervals. Real-time templates are not available in WebView for E-Mail Manager.

When you create a report, you select a template and then may further limit the scope of your report by selecting items to include in the report, such as specific agents. If you are creating a historical report, you also select the date and time range for the report.

You can save report definitions to run the same reports again. When you save a report definition, you store the template, report items, and date and time range used to generate the report in the WebView database.

Using WebView, you can:

- Create reports based on WebView templates.
- Select the scope of the report, such as which agents or skill groups to include in the report.
- Select the time range for historical reports.
- Modify report parameters and rerun reports.
- Print reports.
- Save report definitions in the WebView database so that you can run the same report again. You can also delete report definitions.
- Access the URL of a report opened in a new window to e-mail the URL to a colleague.

- Create thresholds in reports so that you are alerted if contact center conditions approach or reach critical points that you define.
- Export report data in a variety of formats for use in other applications.
- Run drill-down reports. Drill-down reports are detailed sub-reports that further filter report data.
- Set the refresh rate of real-time reports.
- Add reports to the Favorites list so that you can access frequently used reports quickly. You can run multiple reports from Favorites at the same time.
- Use the Job Scheduler to schedule reports to run and either print or save to a file at times that are convenient for you and your enterprise.
- Use the Event Viewer to monitor system events.

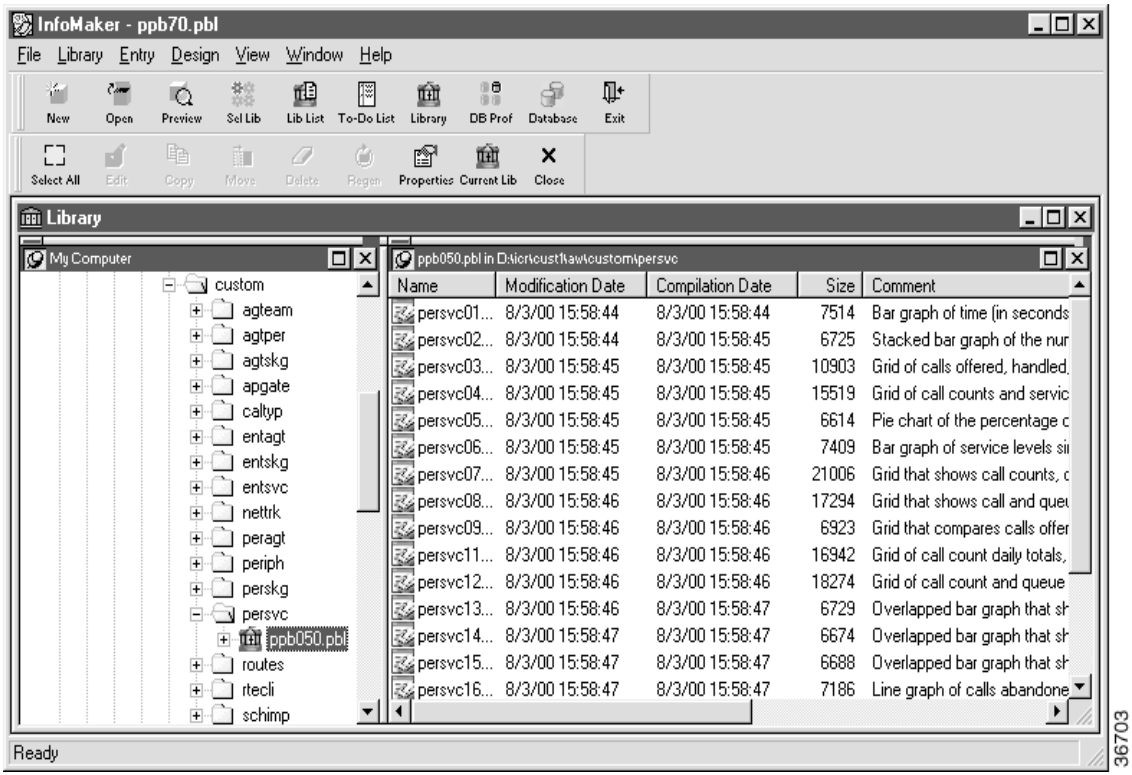
See *Cisco ICM Software WebView User Guide* for complete information on WebView.

Custom Screen Builder

ICM software Custom Screen Builder is an optional Admin Workstation software component. It provides you with open, read-only access to the ICM central database and the real-time local database on the Admin Workstation. With the Custom Screen Builder, you can modify the predefined templates that come with Monitor ICM and Web View or create your own custom report templates.

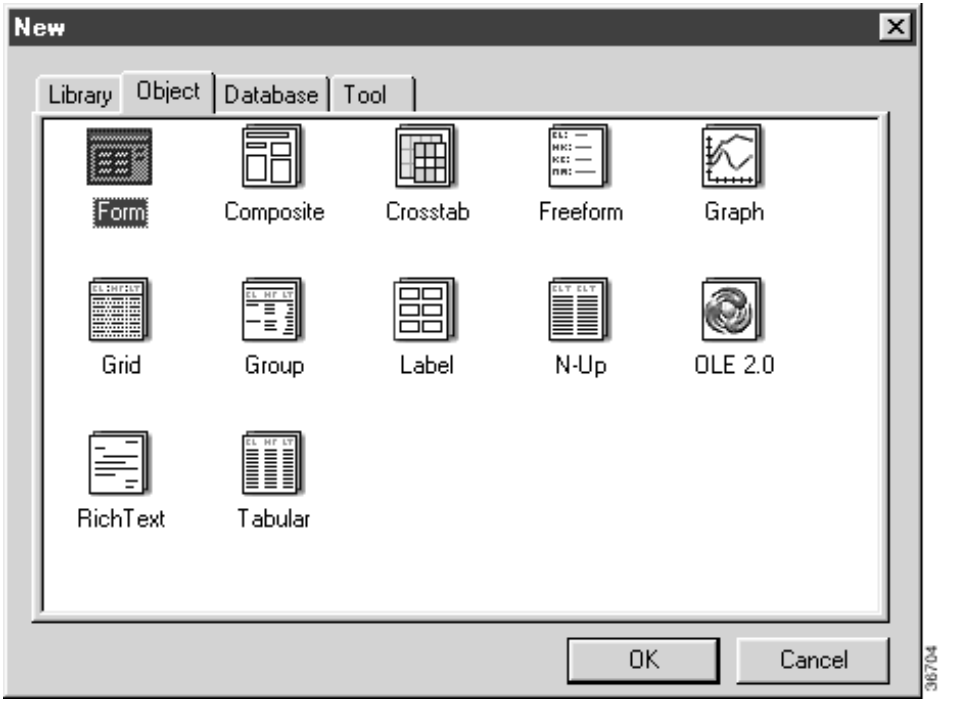
The Custom Screen Builder tools can be used to modify any of the standard report templates. You simply select the report template you wish to modify (Figure 7-4).

Figure 7-4 Library Window



You can create custom report templates in a variety of presentation styles, including graph, grid, and tabular formats (Figure 7-5).

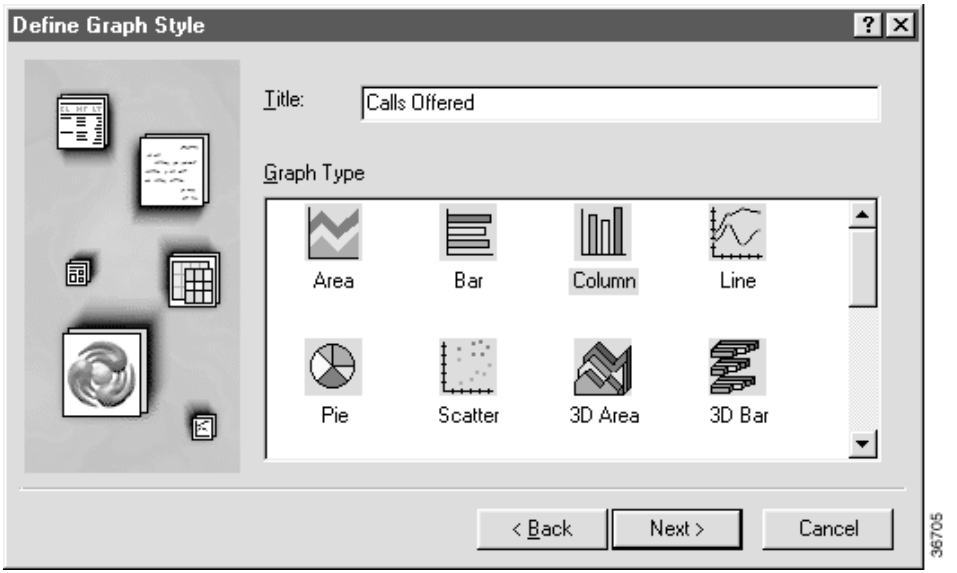
Figure 7-5 New Dialog Box



Any templates you create can be launched through the Monitor ICM and Web View reporting applications.

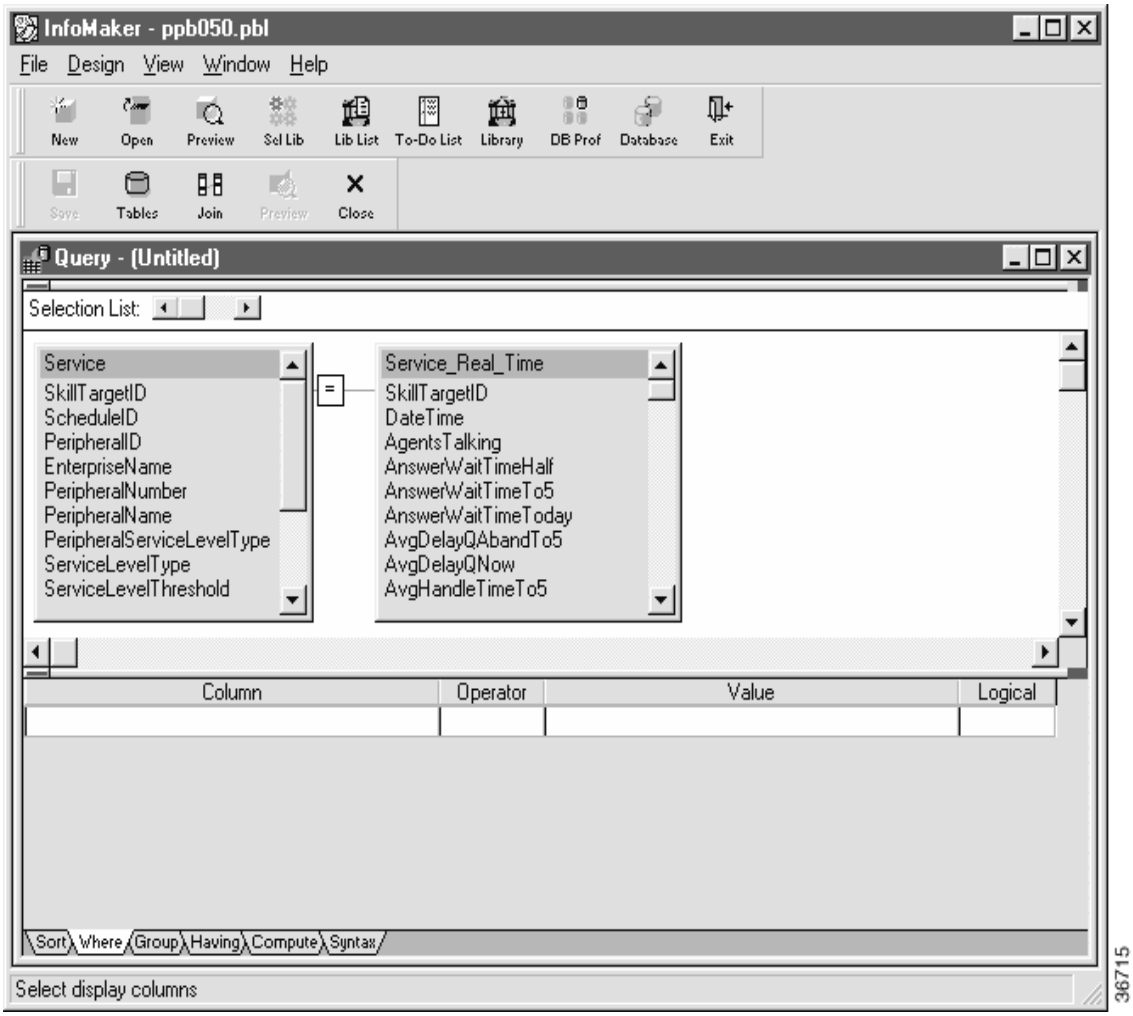
Several graph types are available for displaying real-time monitoring screens and historical reports (Figure 7-6).

Figure 7-6 Define Graph Style Dialog Box



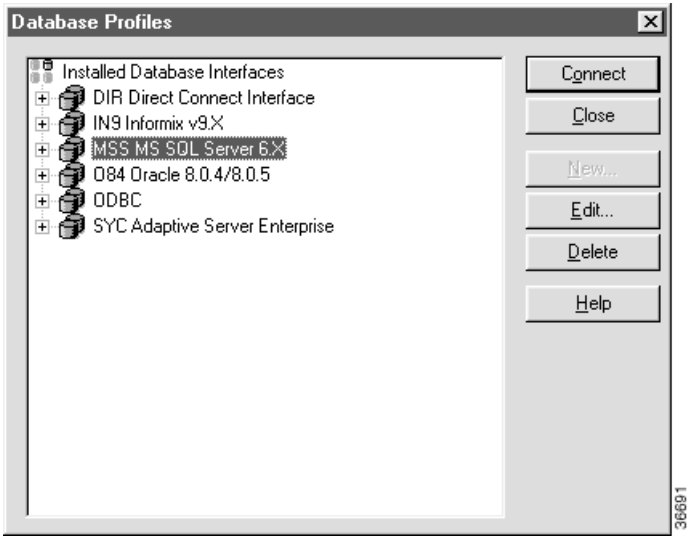
The Custom Screen Builder allows you to define database queries in an easy-to-use graphical interface. Database tables appear as graphical representations that show any relationships between elements (Figure 7-7).

Figure 7-7 Graphical Representation of Database Query



In addition to providing open access to the data collected by ICM software, you can use the Custom Screen Builder to access data from other databases within the enterprise. For example, you might combine agent and customer profile information with call center data (Figure 7-8).

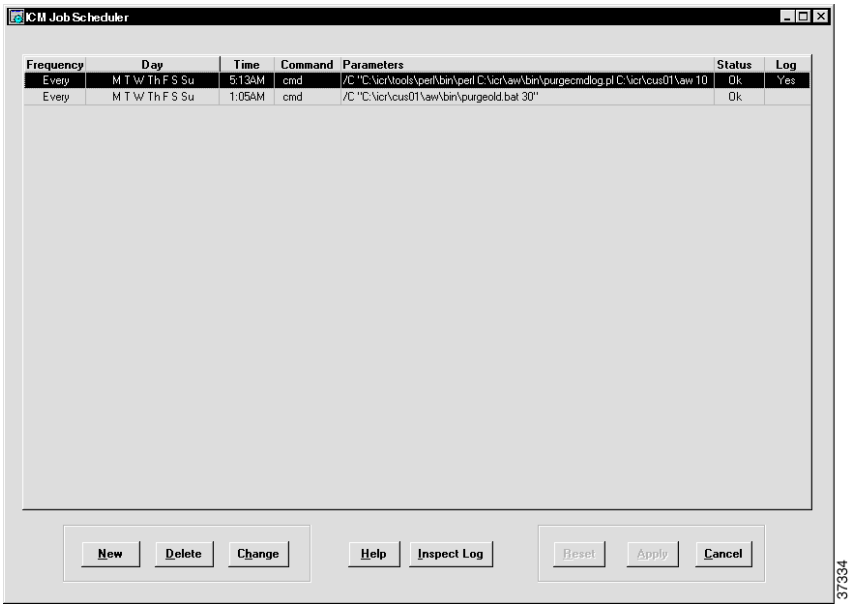
Figure 7-8 Database Profiles Dialog Box



Job Scheduler

The ICM Job Scheduler allows you to schedule reports to print automatically on a regular basis. You can use the Job Scheduler to schedule jobs on a daily, weekly, or monthly basis. In each case, you have the option of specifying the exact time at which the job will run.

Figure 7-9 ICM Job Scheduler



The Job Scheduler works with both historical and real-time reports. It is particularly useful in printing historical reports that use relative dates. For example, you might want to schedule a report of last week's enterprise service levels to print every Monday morning at 8:00 A.M. You can also print real-time reports through the Job Scheduler. Real-time reports printed in this manner contain a "snapshot" of the current data.

Scheduled Target Manager

A scheduled target is a special type of destination for a call. A scheduled target is not necessarily associated with an ICM Peripheral Gateway. The ICM has only limited information about a scheduled target:

- The maximum number of simultaneous calls the target can handle at any given time. (That is, a schedule of agents at the target.)

- The number of calls currently active at the target. The routing client informs the ICM system when a call associated with the target ends. ICM derives the number of calls currently active based on the messages it receives from the routing client and the number of calls the ICM has sent to the target.

Use the Scheduled Target Manager to define the scheduled target and its schedule. Once configured, you can reference the scheduled target in routing scripts.

Note You can also define the scheduled target with the Workforce Management Integration System, available in the ICM Configuration Manager.

Workforce Management Integration System

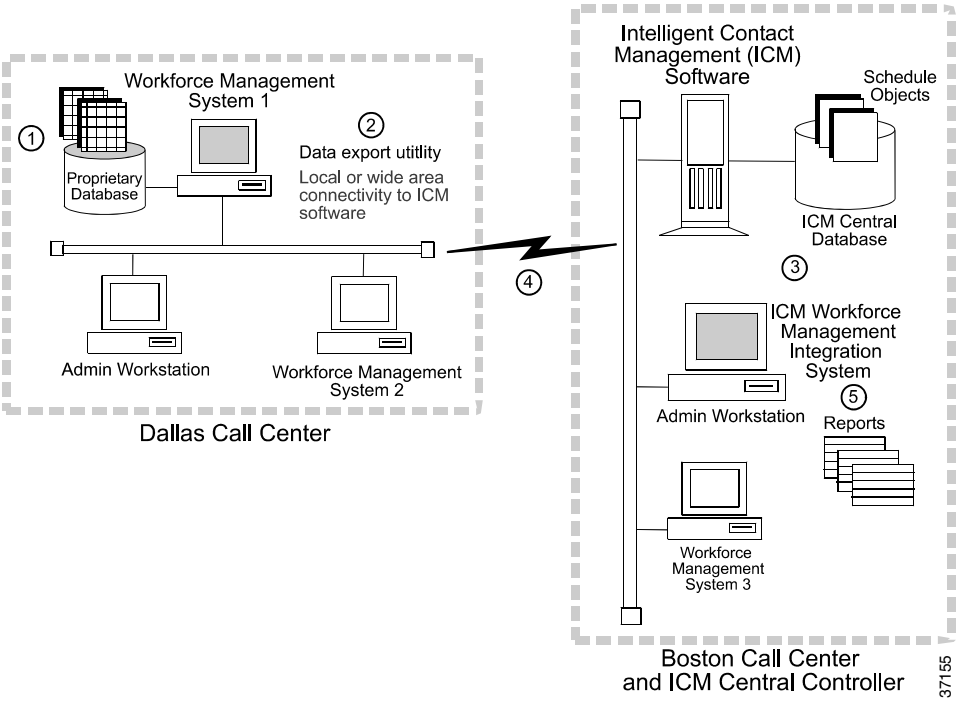
Many call centers use workforce management systems to help maintain optimal staffing levels. *Workforce management systems* are planning tools that allow call center supervisors to forecast call volumes, estimate agent productivity, and schedule the appropriate number of agents. Most workforce management systems produce sets of detailed staffing schedules for the employee groups at a call center. These schedules are typically stored in a proprietary database.

The ICM can import data from one or more workforce management databases and use the data in call routing and reporting. You can also use the workforce integration tool to export data from the ICM central database in the form of a report that can be used by the workforce management system.

The ICM Workforce Management Integration System is installed when you order the *Schedule Link* feature. The workforce integration system allows you to transfer data from a workforce management system to ICM software. You can also export schedule data from the ICM system to an external workforce management system.

The ICM Workforce Management Integration System allows you to import schedule data from third-party workforce management systems. Figure 7-10 shows a typical integration system configuration.

Figure 7-10 System Overview



1. The third-party workforce management system keeps agent and workgroup schedules in a proprietary database.
2. Most workforce management systems have optional utilities for exporting schedule data to other systems. Some systems even allow you to schedule when the data will be exported.
3. The ICM Workforce Management Integration System creates schedule objects in the ICM central database. The *schedule objects* serve as placeholders into which schedule data can be imported.
4. Once the ICM schedule objects are defined, you can import schedule data or set up a task for automatically importing data. The ICM can begin using the data in call routing immediately.

5. You can also use the integration system to export report data from the ICM central database and to import report data into a workforce management system like TCS. Reports can be copied or transferred to any computer in the ICM network. You can set up tasks for automatically exporting reports.

You can also use the Workforce Management Integration System to map schedules to the services and skill groups defined in the ICM system. This allows you to incorporate staffing forecasts and schedule data into ICM reports.

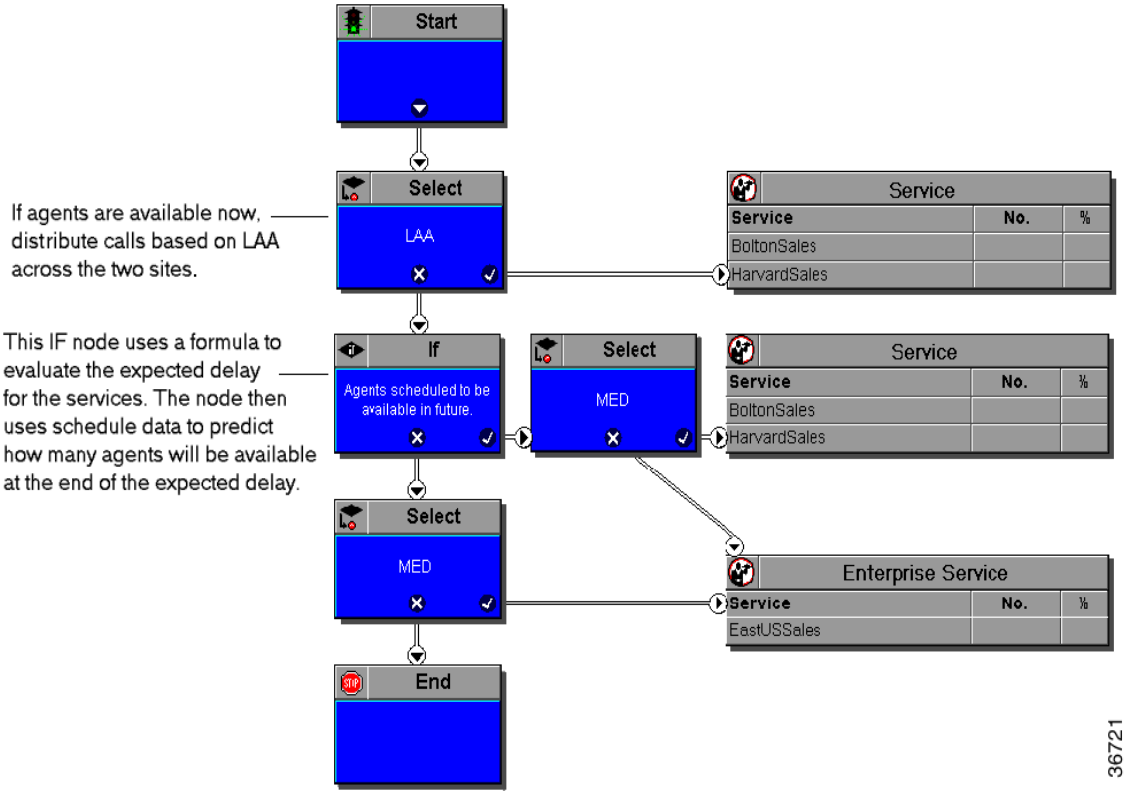
Routing with Schedule Data

The ICM can use workforce scheduling data to make call routing decisions. Some typical applications include:

- **Routing to scheduled and next available agents by using thresholds**. You can route calls based on whether a certain number of scheduled agents are in a particular state (that is, Ready, Logged In, etc.). For example, you might route calls to an agent group only if 25 scheduled agents are in the Ready state. You could further qualify this routing logic by specifying not to route calls to this agent group if doing so would cause an adverse effect on a performance metric such as Average Speed of Answer (ASA) or Service Level.
- **Predictive queue management**. You can use schedule data to begin reducing the call queue for a service or skill group in anticipation of a shift change. For example, if a group is scheduled to log off at 6 P.M., do not allow the expected delay for a service or skill group to exceed the time that remains to the end of the schedule period. If this happens, choose an alternate route for the call.
- **Contingency routing during loss of real-time data feed**. If you cannot get real-time data on the state of agents at your call centers, you can activate a script that routes calls based on imported schedule data. This way, you can continue using skills-based Pre-Routing. The only difference is that you're routing calls on schedule or forecast data rather than actual real-time status data.

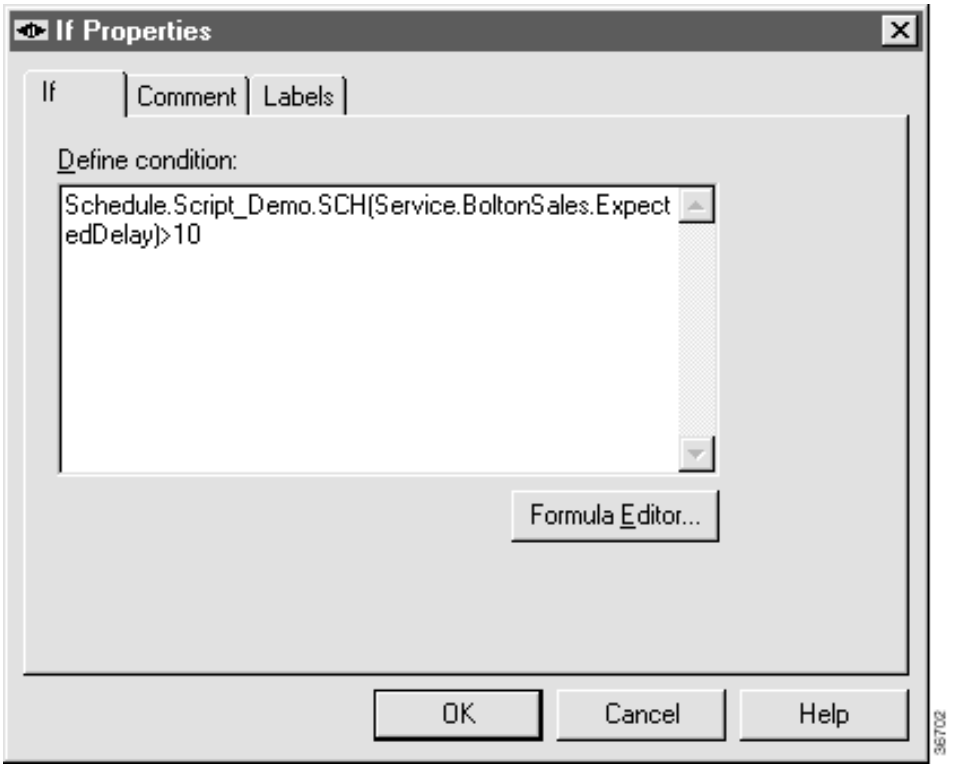
Figure 7-11 shows a sample predictive queue management application.

Figure 7-11 Sample Script



The If object evaluates the expected delay for two services. It then evaluates whether or not an adequate number of agents will be scheduled at the end of the expected delay. For example, if the expected delay is 200 seconds, the script checks to make sure that 200 seconds from now there are at least ten agents scheduled. If this condition is met, the script routes the services call based on Minimum Expected Delay (MED). Otherwise, the script sends the call to an enterprise service. The formula used is shown in Figure 7-12.

Figure 7-12 If Object Dialog Box



Reporting with Schedule Data

The ICM Workforce Management Integration System allows you to incorporate schedule data into reports. For example, through the Monitor ICM tool you could generate the following types of reports:

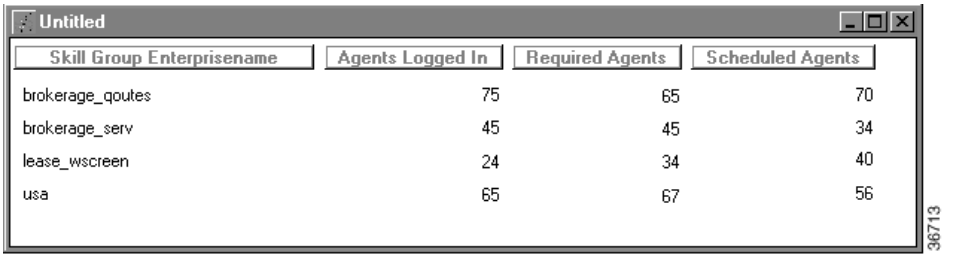
- Historical comparisons of actual agents to scheduled agents.
- Comparisons of the assumptions used in determining staffing plans to the actual ICM data (Average Handle Time, Number of Calls Offered, Primary Position Manned, etc.).

Note To use schedule data in ICM reports, you must associate schedules with the specific services, skill groups, or scheduled targets that are configured in the ICM system.

For more information on scheduling data in ICM reports, see the *Cisco ICM Software Workforce Management Integration User Guide*.

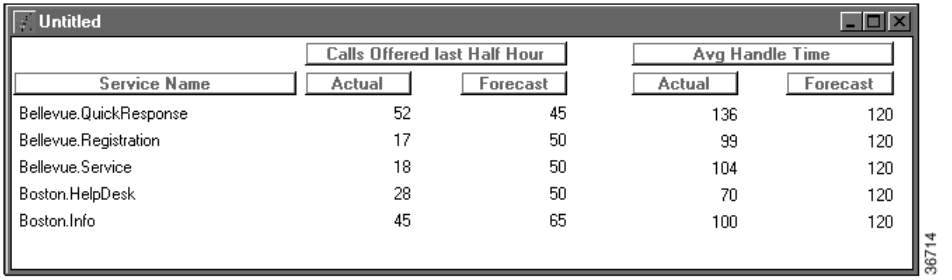
Figure 7-13 shows an example of a report that compares real-time ICM data (Agents Logged In) with imported schedule data (Scheduled Agents and Required Agents).

Figure 7-13 Real-Time and Schedule Data Comparison



Other reports compare actual and forecasted data such as the number of Calls Offered and the Average Handle Time (AHT) for calls during the current interval (see Figure 7-14).

Figure 7-14 Calls Offered and AHT (Actual and Forecasted)



These types of comparison reports can help you improve staffing forecasts within the call center enterprise.

CHAPTER 8

Alarm Management

The ICM tracks events and alarms for the processes and applications running in the system. Events and alarms are recorded on a local and system-wide basis to aid you in system maintenance. An *event* is any significant occurrence within the ICM system that you might want to know about. An *alarm* signals that a process or application has become unavailable.

This chapter provides an overview of alarm management within the ICM system. It also includes an overview of the Distributed Diagnostic and Services Network (DDSN), which is a remote support service that forwards specific events to the Cisco Technical Assistance Center (TAC).

Distributed Diagnostics and Services Network

The ICM is designed to communicate directly with the Technical Assistance Center (TAC). The system includes facilities that communicate automatically with the TAC and tools that allow you to manually send files and messages to the TAC. These facilities are collectively called the Distributed Diagnostics and Services Network (DDSN).

The DDSN allows service representatives to remotely diagnose, and in many cases remotely fix, problems in an ICM system. Specifically:

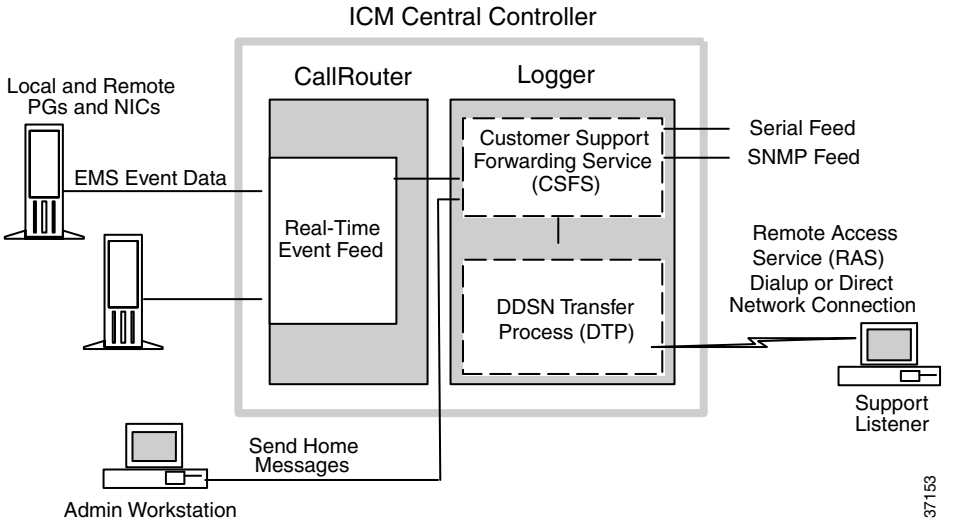
- A representative can connect to either side of an ICM Logger through a dial-in or direct network connection.
- The Logger can dial-out to the TAC whenever the ICM detects an error or other unusual condition.

The DDSN uses the Windows Remote Access Service (RAS). To support the DDSN, each computer running the ICM Logger process must be equipped with a modem to handle outbound DDSN calls.

DDSN Basic Operation

Each Peripheral Gateway, NIC, CallRouter, and Logger runs the ICM Event Management Service (EMS). The EMS facility detects and reports any unusual conditions or events that occur in the system. Each ICM Logger runs processes for the DDSN. These processes collect event reports and forward them to the TAC. Figure 8-1 provides an overview of the DDSN.

Figure 8-1 Distributed Diagnostics and Services Network (DDSN)



Error reporting is handled by two processes that are part of the ICM Logger:

- **Customer Support Forwarding Service (CSFS)** receives events, filters them, and saves appropriate messages in the Logger's \export directory.
- ***DDSN Transfer Process (DTP)*** transfers the events in the \export directory to the TAC through a Remote Access Service (RAS) dial-up connection or a direct network connection.

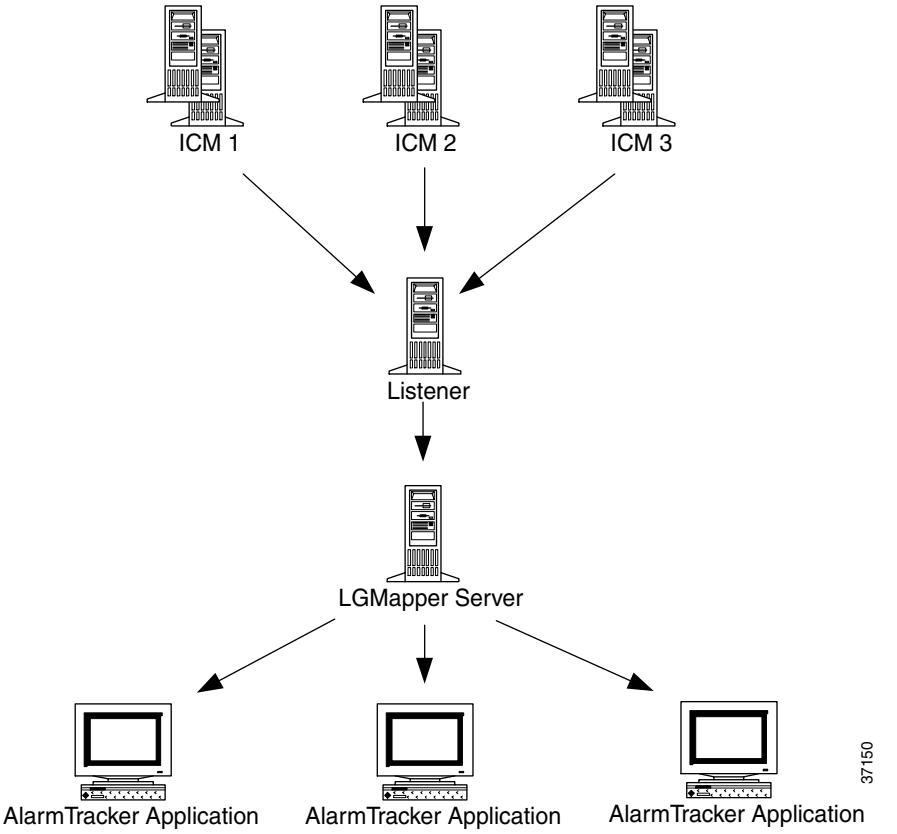
The Listener

The *Listener* is the process at the Customer Support Center that receives events from multiple ICM installations. The events reported to the Listener come from various parts of the system and are of various types. They range from informational messages to reports of serious errors. The event mechanism gives quick notification to customer support representatives when a problem occurs. It also provides a history of activity at each system.

AlarmTracker Alarm Management System

An alarm and event management system called *AlarmTracker* allows customer support personnel to monitor the events received by the Listener. AlarmTracker lets support personnel view events that have been generated from one or more ICM installations. The AlarmTracker client application communicates with an LGMapper Server process that acts as a distributor of Events received from Listener (see Figure 8-2). In addition, the LGMapper creates an object hierarchy so that AlarmTracker users can view Alarms and Events as part of a hierarchical object-oriented set of nodes.

Figure 8-2 AlarmTracker and the Listener

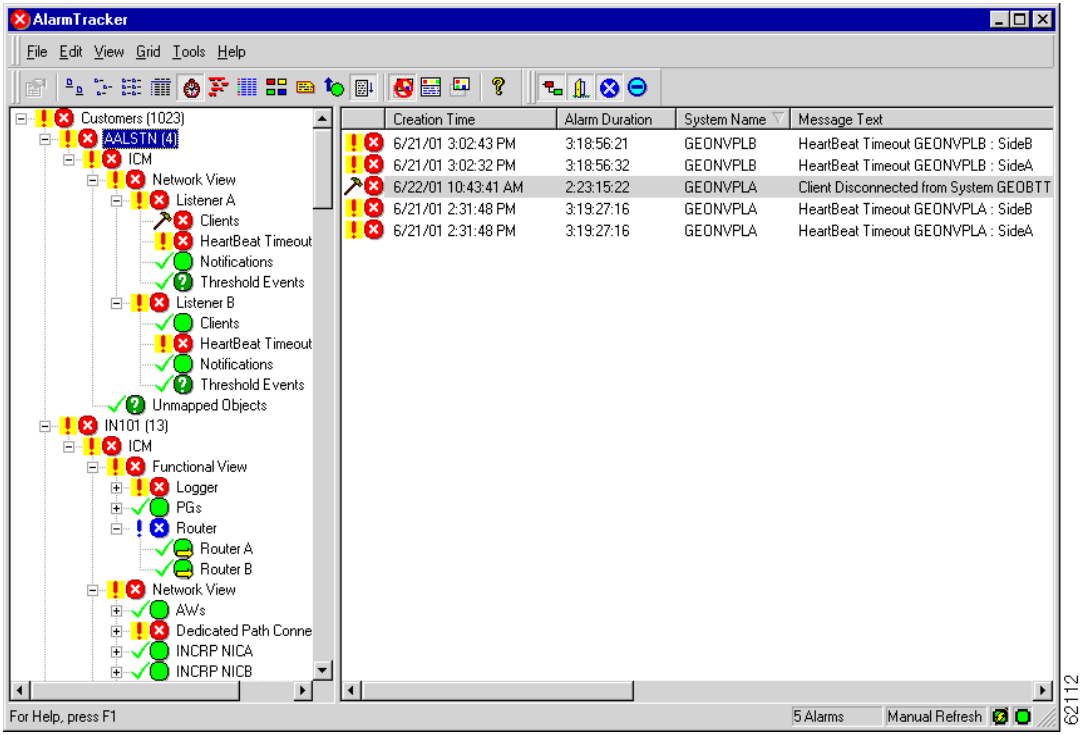


Nodes

Typically a *node* is some key component of ICM software. A node might be an ICM component, such as a Peripheral Gateway or a Database Manager; an external device, such as an ACD or IVR system; a process within the CallRouter, or the communication path between two nodes. For example, an event might report that a peripheral has gone offline. A subsequent event might report that the peripheral is back online.

Each ICM system contains a number of such nodes. A sample of node hierarchy is shown in Figure 8-3. A key role of the DDSN is to allow customer support to track the state of these nodes. The AlarmTracker shows the current state of each node for each ICM system.

Figure 8-3 Partial Node Hierarchy as Shown by the AlarmTracker



States

Different objects have different possible states. For example, a device might be online or offline; a communications path might be active or idle; a process might be running or not running.

The ICM includes a number of facilities to diagnose and correct its own problems. In many cases, a problem that causes an object to fail or become unavailable is corrected automatically by the ICM itself. In other cases, support representatives may need to intervene.

Even if the ICM can correct the problem itself, customer support should be aware of what has happened. The AlarmTracker allows support representatives to recognize when an unusual number of problems occur within an ICM system and investigate further.

Alarms

The event that signals that an object has failed or is unavailable is called an *alarm*. An event *raises* a condition for the object. The condition might be that a specific object is offline, unavailable, or has failed. A subsequent event might report that the object has returned to normal function. This second event *clears* the condition.

The AlarmTracker uses a red icon to denote alarm objects for which a condition is currently raised. In Figure 8-3, four alarm objects are shown. (The red icons may appear as a darker gray on the printed page.)

In addition to displaying the current state (and history) of alarm objects, the AlarmTracker allows a Customer Support team to actively manage alarms. The AlarmTracker can assign alarm objects so that other Customer Support representatives can be aware that someone is working on a particular alarm. The status of what Customer Support is doing about an alarm is shown as the icon on the left of the Alarm Detail View shown in Figure 8-3. For the four alarms shown, the first two and the fourth are currently unassigned which is denoted by a red exclamation mark with a yellow background. The third alarm has been acknowledged by a Customer Support representative and may have been assigned to a support engineer. An alarm that is assigned is denoted by a hammer to the left of the state of the object. More information about a particular alarm can be obtained by double-clicking on the alarm object which presents more details on the alarm.

In summary, the AlarmTracker solution provides a comprehensive real-time alarm monitoring and management system that can be used at a Customer site and/or by the Cisco TAC. It is the primary initial diagnostic tool used at the Cisco TAC for supporting our Customer base.

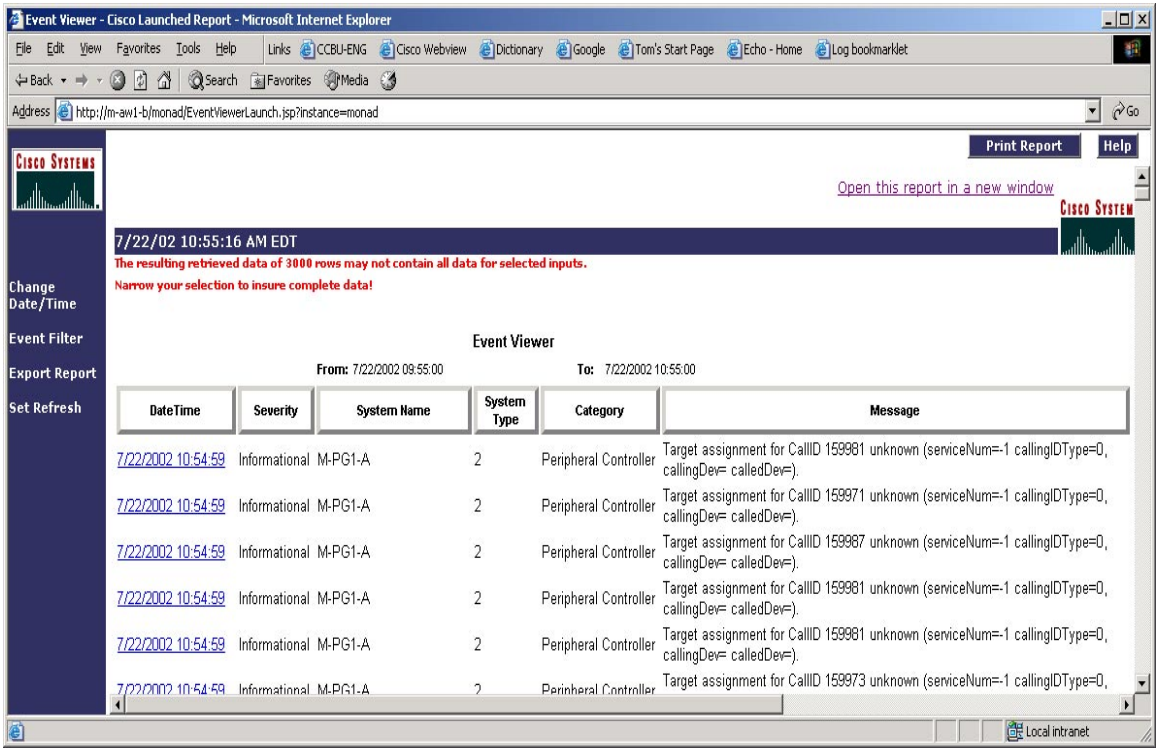
WebView Event Viewer

The Event Viewer is a tool within WebView that lets you view event data (messages) generated by processes within ICM and used in system maintenance. Events are significant occurrences in the system that are documented and stored for use in system maintenance. Events are logged to the ICM central database by each component in the ICM system. To open the Event Viewer, click the Event Viewer option in the opening WebView window.

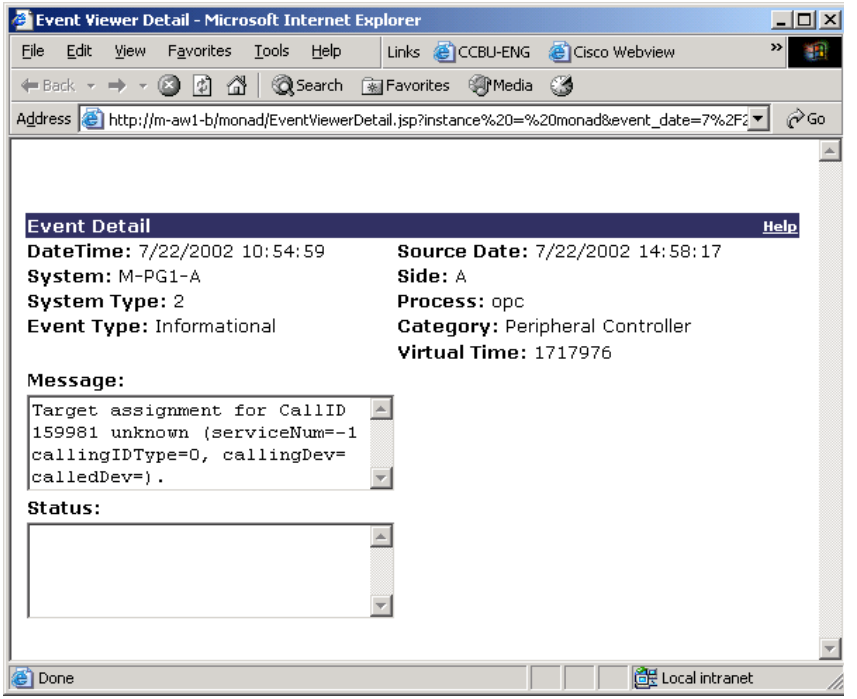
On initial display, the Event Viewer retrieves data from the start of the previous hour up to the current time. For example, if it is 3:45 P.M., the Event Viewer displays data from 2 P.M. to 3:45 P.M. To see event data for a previous period of time, specify your own start and end dates and times by using the Date/Time menu option.

Several options are available for manipulating the events list. You can sort filter events, sort events, and export event data.

The Event Viewer displays general information about each event.



To see more detail about a specific event, double-click on an event entry to open the Event Viewer Detail window.



For more information about WebView Event Viewer, see the WebView online help and the *Cisco ICM Software WebView User Guide* .

Per-Process and Command Log Files

Detailed process-specific log files are created during the operation of the ICM system. These logs are stored in binary format in the logfiles directory on the system. The files are called EMS event source files and are appended with the .ems extension. The files contain specific EMS events as well as trace messages, which are optional detailed records about the operation of a process.

InspectLog Viewing Utility

InspectLog is an EMS viewing utility located in the bin directory on the ICM system. You can use this tool to decode ICM Process logs from the binary format in which they are stored into human readable text. With InspectLog, you can also select various filtering criteria to retrieve only the data that is of interest to Customer Support. Log results can be saved in either text format or in the native InspectLog format for viewing at a later time.

Figure 8-4 shows two processes selected for creating a report from their logs.

Figure 8-4 Selecting a Process to View

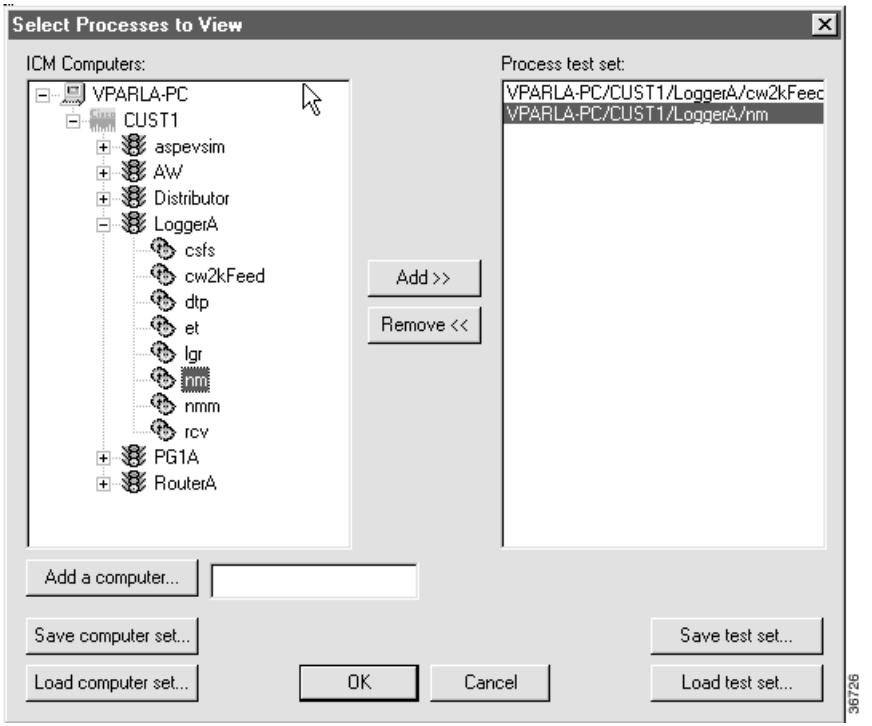


Figure 8-5 Customizing the Report

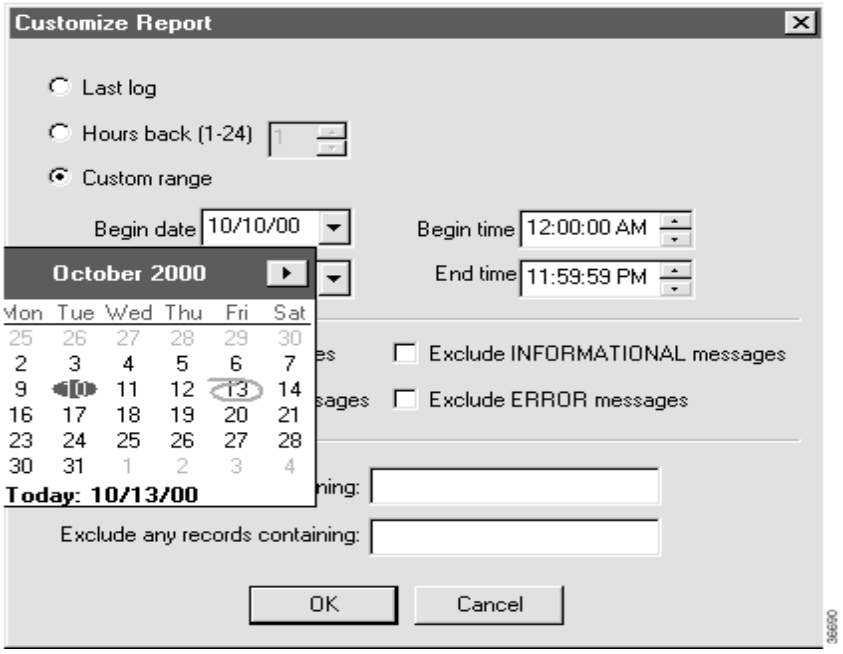
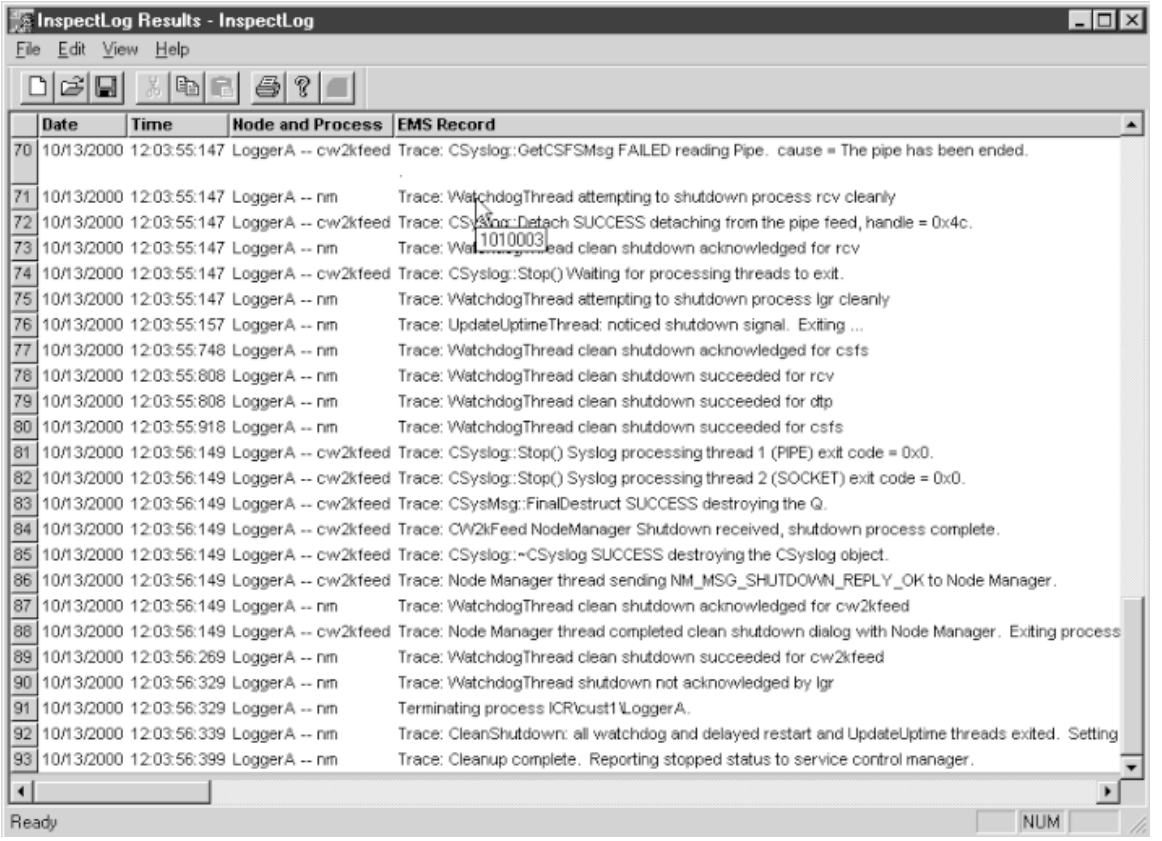


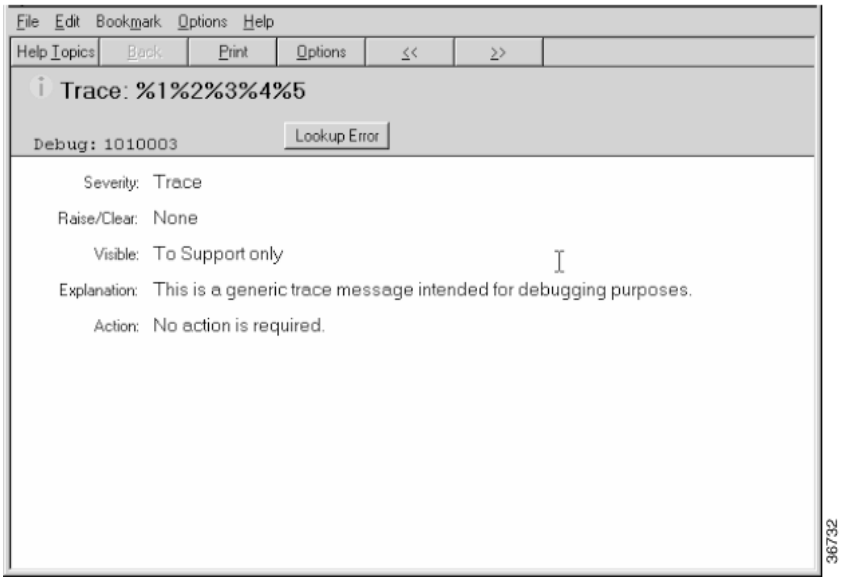
Figure 8-5 shows a date and time range selected for the report while Figure 8-6 shows the report created.

Figure 8-6 Report Created by InspectLog



Clicking on an EMS record in an InspectLog report displays a detailed help message explaining the significance of the log entry. Figure 8-7 shows an example.

Figure 8-7 Example Log Entry Help Message



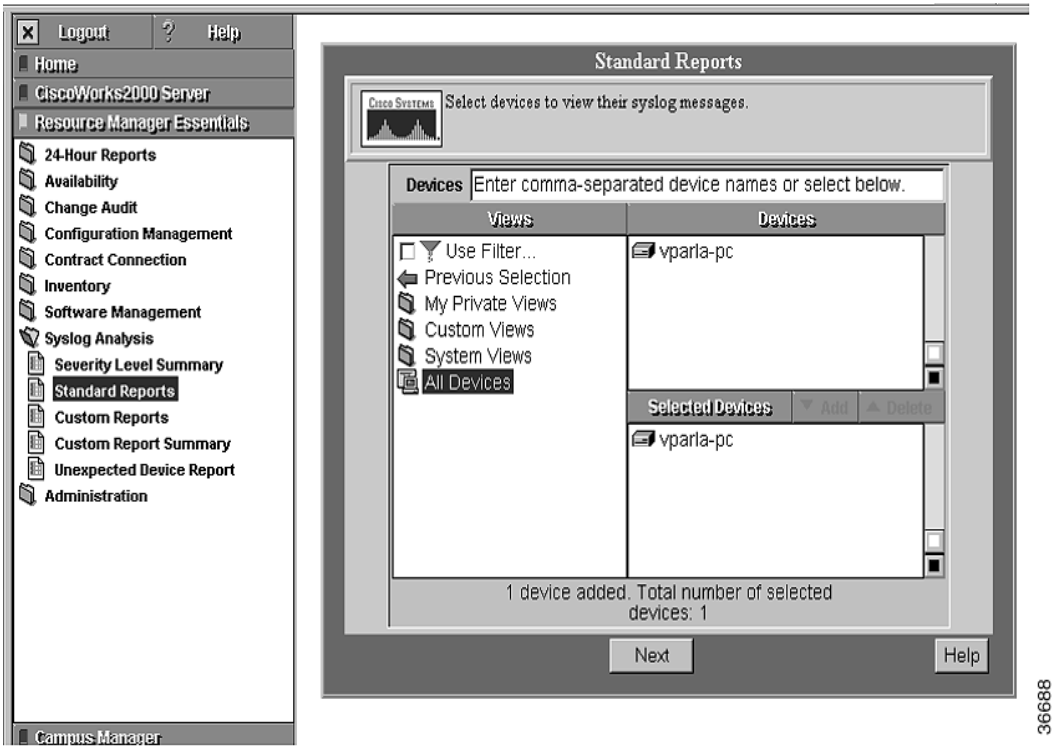
CiscoWorks2000 Support

The ICM system supports the Syslog event reporting mechanism for CiscoWorks2000. If you are using CiscoWorks2000 for monitoring other Cisco products, you can optionally add the ICM system by configuring the ICM logger for CiscoWork 2000 support. Please refer to the CiscoWorks2000 documentation for details on how to add the ICM system as a managed device.

Figure 8-8 shows an example CiscoWorks2000 report setup window.

CiscoWorks2000 Syslog event reports show the EMS event data in a web browser.

Figure 8-8 CiscoWorks2000 Report Setup Window



ICM Job Scheduler

When you use the ICM Job Scheduler tool to schedule report print jobs, you can specify whether to have the job processing information written to a log file. The log file confirms whether the job properly executed and contains any error messages the job generated. You can view these log files through a standard text editor such as Notepad.

Serial Alarm Feed

The ICM provides an optional serial alarm feed that allows you to establish your own alarm/event links to the DDSN. The Serial Alarm Feed process uses the Customer Support Forwarding Service (CSFS) to communicate alarm information to an external system. The Serial Alarm Feed process receives events and sends alarms in ASCII code to a communications port on the Logger. For implementation, consult your sales engineer.

Once the process is started, alarm messages are sent to the communications port as they occur.

The Serial Alarm Feed consists of a series of alarm messages that are sent out over a serial connection. You typically see alarms from the following sources:

- Nodes
- Processes
- Connections
- Peripherals
- Sessions/Links

You can find information about specific alarm traps in the ICM Management Information Base (MIB). The MIB correlates to the driving table used by the Customer Support Forwarding Service (CSFS). You can look up each trap number in the MIB to see the descriptions and appropriate ASN.1 syntax used to generate the SNMP traps.

SNMP Feed

The SNMP feed is an ICM feature that supports an event feed through a SNMP-compliant interface (TCP/IP). With the SNMP feed, you can integrate ICM alarms and events into your corporate network management system.

The Cisco SNMP Extension Agent takes advantage of the Customer Support Forwarding Service (CSFS) event feed. The SNMP Extension Agent is an ICM-supplied Dynamic Link Library (DLL) that is installed on Loggers. The SNMP Extension Agent receives an event feed from the CSFS process and communicates with the Windows NT SNMP Agent to generate SNMP traps when certain “alarmable” events occur.

For more information on the SNMP feed and ICM Alarm MIB, see the *Cisco ICM Software Administrator Guide*.

CHAPTER 9

Fault Tolerance

The routing and CTI integration of customer calls is a real-time, mission-critical application. ICM software is designed to be resilient to hardware component failures, communications network failures, asynchronous software errors, and the catastrophic loss of a site supporting a Central Controller.

This chapter provides an overview of the fault tolerant techniques that are employed in an ICM system. The *Cisco Software ICM Administrator Guide* contains a more in-depth discussion of ICM system fault tolerance.

Overview

The ICM architecture allows the system to continue to function if one component fails. This ability is called *fault tolerance*. To ensure that ICM software continues to operate in the case of a computer failure, all critical parts of the system can be physically duplicated. There can be two separate Network Interface Controllers (NICs), two Peripheral Gateways (PGs) at each call center, and two Central Controllers. In addition, the communication paths between critical components can be duplicated.

When both instances of a component are available to the system, that component is said to be *duplexed*; when only one of the pair is available, the component is running *simplexed*. You might have some components in your ICM system that are simplexed and others that are duplexed. For example, you might have a duplexed Central Controller and simplexed PGs.

Goals of Fault Tolerance

Fault tolerance is built into every aspect of the system. The main goals of the ICM's fault tolerant architecture are to:

- Minimize time periods during which the system is non-responsive to call routing requests (for example, while the system is being reconfigured due to a component failure or recovery).
- Eliminate all single points of failure that would cause the system to stop.
- Provide disaster protection by allowing the major system components to be geographically separated.

The ICM's fault tolerant mechanisms operate in the background and are not visible at the application level (that is, from within the ICM applications).

Standard Fault-Tolerant Configuration

The standard ICM fault tolerant configuration consists of:

- 2 Network Interface Controllers (NICs)
- 1-2 Peripheral Gateways (PGs) at each call center
- 2 CallRouters in separate locations
- 2 Loggers in separate locations

Diagnostics and Testing

The ICM operates as a self-healing system. When an ICM system detects a hardware problem that causes the system to transfer operations to its duplicate, it also initiates diagnostic testing of the failed component. If possible, it fixes the problem and returns the machine to service. If an ICM system cannot automatically repair the problem, the system can issue a service alert that is received at the Cisco Technical Assistance Center (TAC).

Approaches to Fault Tolerance

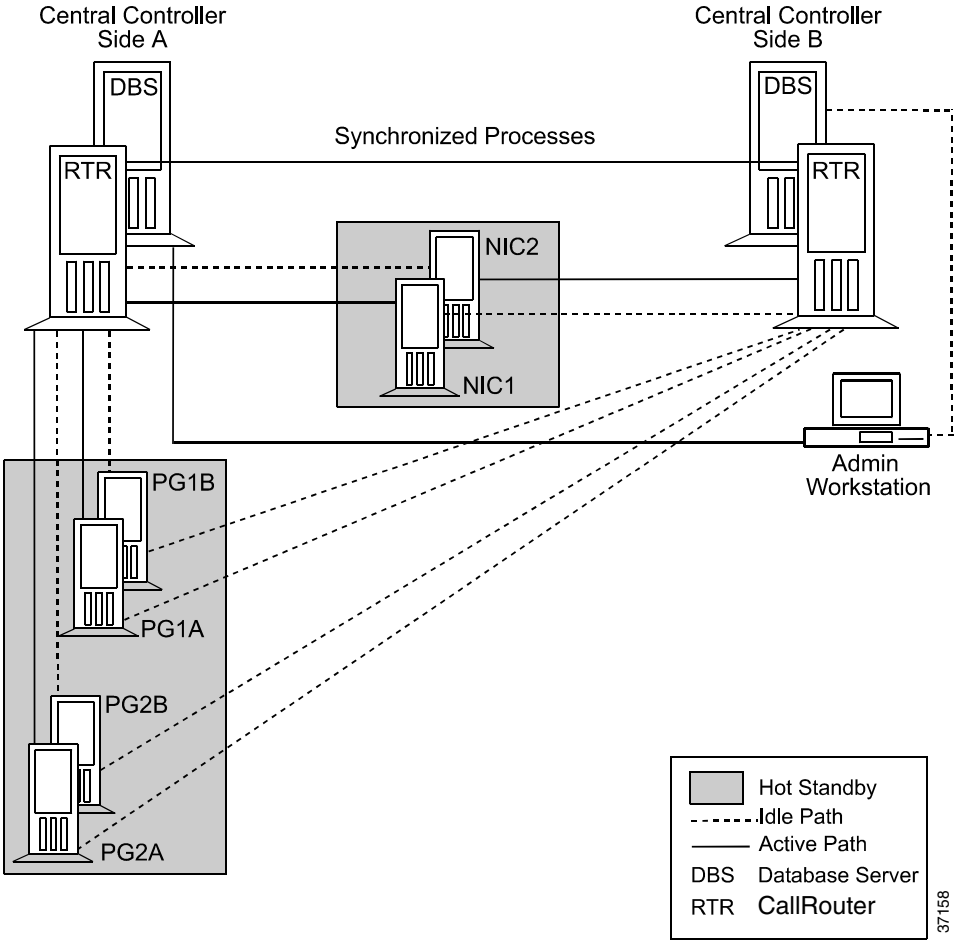
The ICM uses two approaches to fault tolerance, hot standby and synchronized execution:

- In the *hot standby* approach, one set of processes is called the primary, and the other is called the backup. In this model, the primary process performs the work at hand while the backup process is idle. In the event of a primary process failure, the backup process is activated and takes over. For example, the ICM's AT&T Network Interface Controllers (NICs) use the hot standby approach to fault tolerance. Optionally, Peripheral Gateways can also use this approach.
- The ICM Central Controller uses *synchronized execution*. In the synchronized execution approach, all critical processes (CallRouters, Loggers) are duplicated on separate computers. There is no concept of primary or backup processes. Both process sets run in a synchronized fashion, processing duplicate input and producing duplicate output. Each synchronized system is an equal peer. Cisco refers to these equal peers as a *synchronized process pair*.

  In the event that one of the synchronized processes fails (for example, a CallRouter goes offline), the other process continues to run. There is no loss of data. When the failed member of the pair returns to operation, it is resynchronized with its peer and begins to run again as a synchronized process.

Figure 9-1 shows how synchronized execution and hot standby are applied in the ICM system.

Figure 9-1 Duplexed ICM Fault Tolerance



Only AT&T NICs, BT NICs, and PGs use the hot standby approach shown in Figure 9-1. Each AT&T or BT NIC is implemented on its own computer. The other supported NICs are implemented as processes on the CallRouter computer.

Fault-Tolerant Communications

The ICM architecture ensures the fault tolerance of data communications on several levels:

- Within the CallRouter
- Between the CallRouter and peripheral devices (NICs, PGs)
- Within each peripheral device

By duplicating the communication paths between critical components, such as the interface between the Peripheral Gateway and the CallRouter, the system ensures that no single process or computer failure at either end can disable both communication paths.

Each NIC and PG in the ICM system can be implemented with two communication paths to the CallRouter (active and idle). (See Figure 9-1.) The duplicated paths enable the system to achieve fault tolerance at a communications level. If there is a failure over the active communication path, ICM software activates and switches system traffic to the idle path. Following a switch-over, the system automatically realigns traffic between a device and the CallRouter so that it does not lose critical messages.

Even in the unlikely event that the PG and both communication lines between the PG and the CallRouter fail, ICM software continues routing calls by making intelligent estimates of ACD status based on recent history. If the PG does not return to service after a period of time, the system automatically alerts the system administrator and the Cisco Customer Support Center.

The Admin Workstation maintains a separate, read-only communication path with an active CallRouter (see Figure 9-1). The ICM does not duplicate this path for fault tolerance. If the path fails, the Admin Workstation attempts to establish a new link with the other side of the ICM system.

The Node Manager

Each physical node, that is, each computer, is managed by a *Node Manager* process. The Node Manager has responsibility for initializing nodes and for restarting failed processes on the node. The Node Manager is guided by registry values that are stored on each node. These values describe, among other things, which processes must be started and, if necessary, restarted on the node.

Processes can fail in different ways. In the simplest case, a process terminates and the Node Manager is informed of the termination by the operating system on the node. In other cases, a process stops responding to messages, or its responses are unreasonably delayed. To detect these situations, the Node Manager periodically "pings" each process. A standard message type, which is recognized by every ICM process, is used for this purpose.

On receipt of a ping message, a process attempts to verify that it is performing normally. How this is done is specific to each process type. The reply message sent indicates either that the process is performing normally or that an error was detected. In the latter case, the process reports the error details in a process event log before replying to the Node Manager. The Node Manager then takes the appropriate steps to restore the process to normal operation.

Central Controller Fault Tolerance

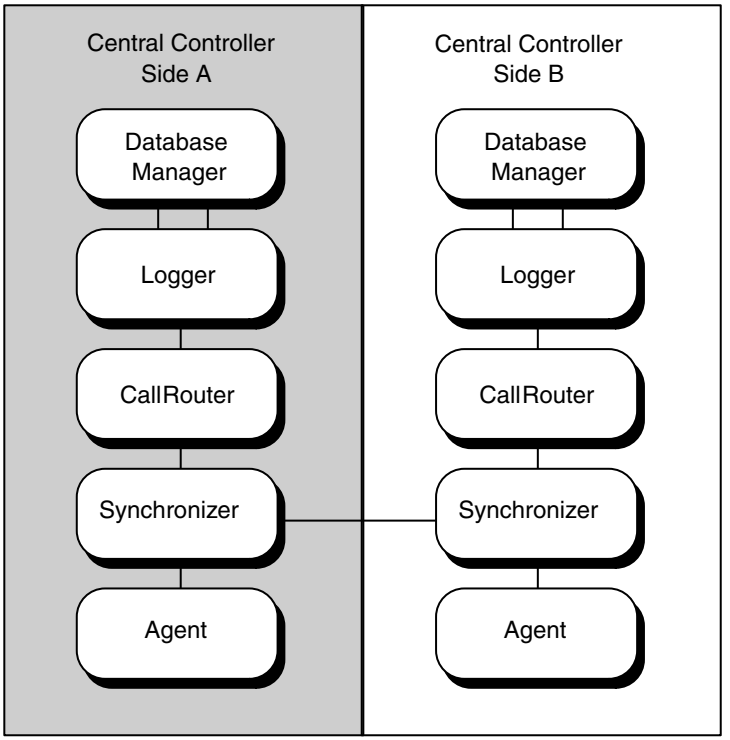
A Central Controller includes the CallRouter, Logger, and the Database Manager. The CallRouter and Logger processes are typically on separate computers. However, in smaller call center configurations, the CallRouter and Logger processes can be on the same computer, The Database Manager works very closely with the Logger. The Logger and Database Manager processes are always on the same computer.

A duplexed Central Controller uses the synchronized execution approach to fault tolerance. The Central Controller processes are duplicated and run as synchronized process pairs. In synchronized execution, if one component fails its duplicate continues running and the system runs without interruption.

All components of the Central Controller, with their duplicates, form one logical duplexed system. The system can be divided into two *sides*, each of which contains one instance of a component. Each side of the Central Controller has a Database Manager (SQL Server), Logger, CallRouter, Synchronizer, and an Agent. By convention, the two sides are referred to as Side A and Side B. All components within a side are co-located (that is, located at the same site). However, Side A might be geographically separated from Side B.

Figure 9-2 shows the two sides of a duplexed Central Controller.

Figure 9-2 Duplexed Central Controller



During normal operation, the two sides run in parallel. For example, information about each incoming call is processed by both CallRouters. Both CallRouters, using the same call routing scripts and identical information about the call centers, determine the same destination for the call. Both sides of the Central Controller receive the same information from the Peripheral Gateways and Admin Workstations.

Call Completion

The ICM system does not directly handle a call. Rather, its roll is to improve the routing of a call. So, if for some reason, despite its fault tolerant architecture and speed, ICM software cannot function within its time threshold, the call is routed through the carrier's default routing plan.

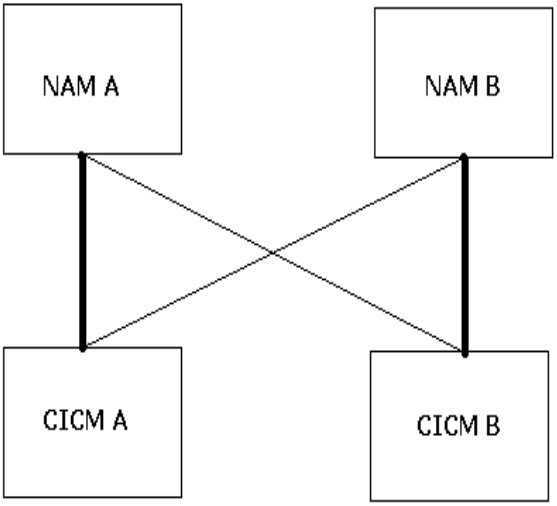
NAM/CICM Fault Tolerance

In a Multiple-NAM configuration, an Application Gateway defines the preferred links for communication between Slave NAMs and CICMs. The actual path selection process employs fault tolerance, as follows:

- The NAM with the greater number of open links is chosen as the preferred NAM. If both NAMs have the same number of open links, NAM A is selected.
- One the NAM is chosen, the preferred CICM is determined from the Application Gateway configuration for the preferred NAM. If the preferred CICM is not open, the link to the other CICM is selected.

Figure 9-3 illustrates this process. The bold lines indicate preferred links.

Figure 9-3 NAM/CICM Fault Tolerance



A

Abandoned call — A call in which the caller hangs up before the call is answered. Calls in which the caller hangs up almost immediately do not have to be counted as abandoned. When configuring each peripheral, you can specify the minimum length of an abandoned call.

About box — A dialog box that displays general information about an application. The About box usually contains copyright and version information. In most applications, you can invoke it from the Help menu.

ABS — See *Application Bridge Server (ABS)*.

ACD — See *Automatic Call Distributor (ACD)*.

Active script — A script that is scheduled for the current date and time. At any time, zero or one routing script is active for each call type. If more than one routing script is scheduled for a call type during a period of time, the ICM chooses the script with the most specific schedule. When the ICM receives a call routing request, it invokes the active script for that call type. If that script terminates without routing the call, the ICM uses the default route associated with the dialed number.

Admin Workstation (AW) — A personal computer used to monitor the handling of calls in the ICM system. The Admin Workstation can also be used to modify the system configuration or scripts.

Administrative script — A script that the ICM executes to perform background processing. For example, an administrative script might set persistent variables or invoke an application gateway. Use the Script Editor to create, modify, and schedule administrative scripts.

Agent A person who handles customer calls. Each agent is associated with a peripheral and can be a member of one or more skill groups. (Some peripheral types limit each agent to one skill group.) Optionally, you can group peripheral agents into agent teams.

Agent distribution The flow of agent data from a specific peripheral to a specific Distributor. You can separately enable and disable each agent distribution.

Agent Reporting See *Cisco Agent Reporting*.

Agent team A group of related agents associated with a single peripheral. An agent team might include agents at the call center and agents who work at home. Members of an agent team can also be members of one or more skill groups.

Agent out call An outbound call made by an agent.

AHT See *Average Handle Time (AHT)*.

Alarm Tracker An ICM software feature that presents a high-level overview of the status of your customers' ICM nodes, events, and alarms, and allows you to monitor them in a single application.

All Trunks Busy (ATB) The state of a trunk group when all trunks are in use. The trunk group cannot accept any new inbound or outbound calls in this state. ICM software tracks the amount of time during which all trunks in a trunk group are busy. You can view this information in real-time or historical reports.

ANI See *Automatic Number Identification (ANI)*.

Announcement A recorded verbal message played to a caller.

Answer wait time The elapsed time from when a call is offered at the peripheral to when it is answered. Answer wait time is the sum of delay time, queue time, and ring time.

Answered call

A call is counted as answered when it reaches an agent or VRU. For example, the CallsAnsweredTo5 field in the Service_Five_Minute table counts the number of calls that reached agents or VRUs during the five-minute interval. The calls might still be in progress when the interval ends.

By contrast, a call is not counted as handled until it is finished. Therefore, the number of answered calls and handled calls during an interval is not necessarily the same, but eventually each answered call is counted in both categories

Application Bridge Server (ABS)

A Cisco software module that allows an ICM system to share the Application Bridge interface from an Aspect ACD with other applications.

Application Gateway

A construct that allows an ICM routing script to invoke an external application. You can configure a gateway in Configure ICM and reference it through the Gateway node in a script. Application Gateways are available only if you purchase the Cisco Gateway product.

Area code

A three-digit prefix used to indicate the destination area for long distance calls. Also known as Numbering Plan Area (NPA). You can use the area code to classify calls into call types. You can also define a region as a collection of area codes.

ASA

See *Average Speed of Answer (ASA)*.

ATB

See *All Trunks Busy (ATB)*.

Automatic Call Distributor (ACD)

A programmable device at a call center that routes incoming calls to targets within that call center. After the ICM software determines the target for a call, the call is sent to the ACD associated with that target. The ACD must then complete the routing as determined by the ICM.

Automatic Number Identification (ANI)

A feature that provides the billing phone number of the phone from which a call originated or the phone number itself. When qualifying calls, the ICM compares the ANI to the calling line ID value specified for a call type. See also *Calling Line ID (CLID)*.

Available state

The state where the agent is ready to accept calls, but is not currently involved in call work.

Average Handle Time (AHT)

The average time it took for calls to a service or skill group to be handled. Handle time includes talk time plus after-call work time.

Average Speed of Answer (ASA) The average answer wait time for calls to a service or route.

AW See *Admin Workstation (AW)*.

B

Basic Rate Interface (BRI) One of two levels of ISDN service. The BRI provides two bearer channels for voice and data and one channel for signaling (commonly expressed as 2B+D). See also *Primary Rate Interface (PRI)*.

Boolean expression An expression that evaluates to TRUE or FALSE; for example, *.ExpectedDelay < 50.

BRI See *Basic Rate Interface (BRI)*.

Business entity A subset of the ICM enterprise that contains its own scripts, enterprise services, enterprise skill groups, and schedules. A business entity may, for example, represent a division within a large corporation or a single customer within a service bureau. You can limit the access of individual users and user groups to specific business entities.

By default, the ICM enterprise consists of only one business entity. If you enable partitioning, you can define multiple business entities.

Busy label A routing label that causes the routing client to play a busy signal to the caller.

C

Call-by-call routing A strategy by which each incoming call is processed separately to determine the optimum destination. The decision for each call can be based on real-time information about the state of each call center as well as historical data. By contrast, simple allocation routing statistically distributes calls among call centers based on historical patterns.

Call center A single site at which incoming phone calls are received and answered. Typically, each call center can provide several services and is staffed by agents from one or more skill groups.

Call control variables A set of variables used by a peripheral to hold information related to a call. For example, an Aspect ACD defines variables A through E. When you define a routing client you can establish how the client's call control variables map to ICM variables such as dialed number, caller-entered digits, and calling line ID.

Call details Data saved by the ICM about every call it routes and calls that terminate at each peripheral. Route call detail describes how the ICM processed the call. Termination call detail describes how a call was handled at a peripheral. *See also* Route Details and Termination Call Details.

Call type A category of incoming calls. Calls are categorized based on dialed number (DN), caller-entered digits (CED), and calling line ID (CLID). Each call type has a schedule that determines which routing script or scripts are active for that call type at any time. Optionally, you can define a default call type for each routing client.

Caller-Entered Digits (CED) Digits entered by a caller on a touch-tone phone in response to prompts. Either a peripheral (ACD, PBX, or VRU) or the carrier network can prompt for CEDs.

Calling Line ID (CLID) Information about the billing telephone number from which a call originated. The CLID value might be the entire phone number, the area code, or the area code plus local exchange.

CallRouter The main part of the ICM system. The CallRouter receives call routing requests and determines the best destination for each call. It also collects information about the entire system.

Carrier A company that provides telecommunications circuits. Carriers include the local telephone company and companies like AT&T, MCI, and Sprint.

CED See *Caller-Entered Digits (CED).*

Central Controller The computer or computers running the CallRouter and the ICM Database Manager. In addition to routing calls, the Central Controller maintains a database of data collected by the Peripheral Gateways (PGs) and data that the Central Controller has accumulated about the calls it has routed.

Central database The relational database stored on the ICM Central Controller, which stores historical five-minute and half-hour data, call detail records, ICM configuration data, and call routing scripts.

Central Office (CO) The switching office of the local telephone company. The local central office receives calls from within the local area and either routes them locally or passes them to an interexchange carrier (IXC). On the receiving end, the local central office receives calls that originated in other areas from the IXC.

A Local CO trunk connects a call center directly with the local phone company's central office.

CICM A single instance of ICM software running on a shared platform.

Cisco Agent Reporting An optional ICM feature that allows you to monitor real-time and historical data about individual agents, rather than groups of agents.

Cisco Schedule Link An optional ICM feature that allows you to import and export data between ICM software and an external force management system. You can use imported information in routing scripts and reports.

Cisco Web View An optional ICM feature that allows you to use a Web browser for monitor-only access to real-time and historical ICM reports and ICM script monitoring.

Classes A security class is a subset of the ICM configuration data. Some classes support only Read access for all users. For other classes, you can assign specific access levels (Read, Reference, or Maintenance) to individual users or user groups.

ICM software supports the following classes: Call, Global, Network Interface, Peripheral, and System.

CLID See *Calling Line ID (CLID)*.

CMS Call Management System. A reporting package used on ACDs and PBXs made by Lucent.

CO See *Central Office (CO)*.

Computer Telephony Integration (CTI) Software that integrates voice communications systems with computers for contact center and office automation applications.

CRP See *Customer Routing Point (CRP)*.

CRSP Call Routing Service Protocol NIC. See *Call Routing Service Protocol (CRSP) NIC* in *Chapter 4, Network Interface Controllers*.

CSFS See *Customer Support Forwarding Service (CSFS)*.

CTI Desktop A suite of Active X Controls that provides a desktop interface to CTI Server and that allows customers to create custom CTI applications at the desktop.

CTI Gateway ICM software process that acts a server for CTI clients to communicate with ICM software. The CTI Gateway process may run on the same computer as the Peripheral Gateway process or on a separate computer.

CTI Object Server (CTI OS) An object-based interface to the CTI Server, which includes COM, Java, C, and C++ programming interfaces that share the same code base.

CTI Server A software process, running on a peripheral gateway, that provides an interface between ICM software and desktop and/or server applications. CTI Server provides agent and call state information, call routing data, pre-route indicators for advanced notification of call arrivals, and customer data.

Custom function A function that you can define in the Script Editor. A custom function is a shorthand for an expression. Optionally, the expression can reference parameters that are passed to the function.

Custom Screen Builder A client database access application that is part of the Cisco Admin Workstation group of applications. The Custom Screen Builder is based on Sybase InfoMaker. You use the Custom Screen Builder to change Web View predefined templates to suit a particular business need. You can also develop your own report templates for use in Web View.

Customer The organization whose calls ICM routes. A customer may have several semi-autonomous units or business entities. Optionally, the ICM can be partitioned so that business entities can operate independently.

In the standard configuration, the ICM routes calls for a single customer. In a service bureau configuration, a single ICM system may service multiple customers.

Customer Routing Point (CRP) AT&T's terminology for third-party processors that accept routing requests from the CCSS7 network. Within the ICM, the Network Interface Controller (NIC) acts as a CRP.

Customer Support Forwarding Service (CSFS) The facility within the ICM Logger that receives events from all parts of the ICM, filters them, and saves appropriate messages. The Data Transfer Process (DTP) sends these messages to Cisco Customer Support.

D

Database Manager The part of the ICM system that stores information about the entire system in the central database. The Database Manager maintains the data that is used in reporting and making routing decisions.

Database schema The organization of information within a database. The schema consists of table, field, and index definitions.

DDSN See *Distributed Diagnostics and Services Network (DDSN)*.

DDSN Transfer Process (DTP) The process on the ICM Logger that connects to Cisco Customer Support and delivers any messages saved by the Customer Support Forwarding Service (CSFS). The DTP is part of the Distributed Diagnostics and Service Network (DDSN) which ensures that Cisco Customer Support is informed promptly of any unexpected behavior within the ICM.

Default call type The call type the ICM uses if a call's qualifiers do not map to any specific call type definition. You can specify a default call type for each routing client and a general default.

Delay in queue The sum of time calls spent in the queue for all calls to a route or service. Delay in queue can also take into consideration abandoned calls. For example, the DelayQAbandTimeToHalf is the sum of time spent in queue for all calls to a route or service abandoned in queue during a half-hour interval.

Delay time The time spent processing a call after it arrives at a peripheral, but before it is either queued or presented to an agent.

Deleted field

Many tables include a Deleted field. This field marks rows that have been deleted but that still have active dependencies. For example, if a script references Agent X and you delete Agent X, ICM software does not actually delete that Agent record; it marks the agent as deleted. The record is actually deleted when the dependency is removed.

Device Management Protocol (DMP)

The session-layer communications protocol used within the Cisco ICM software. Different application level protocols might be running beneath DMP.

Dialed Number (DN)

The number that a caller dialed to initiate a call; for example, 8005551212.

Dialed Number Identification Service (DNIS)

A string (usually four, seven, or ten characters long) indicating the number dialed by a caller and how the call should be handled by the ACD, PBX, or VRU. The ICM uses the DNIS and trunk group to indicate the destination for a call.

DID

See *Direct Inward Dialing/Dialed Number Identification Service (DID/DNIS)*.

Direct Inward Dialing/Dialed Number Identification Service (DID/DNIS)

When a call arrives at an ACD or PBX, the carrier sends a digital code on the trunk line. The switch can read this code to determine how it should dispatch the call. Typically, this value is the specific number dialed by the user. By mapping each possible code with an internal extension, the switch can provide direct inward dialing (DID).

The ICM uses the DID/DNIS value to specify the service, skill group, or specific agent to whom the switch should route the call. The switch reads the value from the trunk line when the call arrives and dispatches the call appropriately.

Distribute

To divide calls among a series of targets based on a numerical formula. You can use a Distribute node to do this within a script. To distribute calls on a strict percentage basis (rather than a formula basis), you can use a Percent Allocation node.

Distributed Diagnostics and Services Network (DDSN)

The facilities that gather events within ICM software and automatically report any unexpected behavior to Cisco Customer Support. The DDSN includes the Customer Support Forwarding Service (CSFS) and DDSN Transfer Process (DTP).

Distributor

See *Real-time distributor*.

DMP

See *Device Management Protocol (DMP)*.

DN See *Dialed Number (DN)*.

DNIS See *Dialed Number Identification Service (DNIS)*.

DNIS Override label A routing label that is sent to the routing client along with a DNIS value. The routing client passes the DNIS value with the call to the destination indicated by the label.

DTP See *DDSN Transfer Process (DTP)*.

Duplexed An arrangement in which two duplicate physical devices act as a single logical device. If one of the physical devices fails, the system continues to run normally by using the remaining physical device. See also *Simplexed*.

E

EAS See *Expert Agent Selection (EAS)*.

EMS See *Event Management Service (EMS)*.

Enterprise An entire company or agency, possibly spanning many call centers. Enterprise refers to the set of call centers served by an ICM.

Enterprise name A character-string name commonly used to identify an object in the ICM database. An enterprise name must be unique among all objects of a specific type. For example, each service must have an enterprise name that is unique among all services.

An enterprise name can be up to 32 characters. The valid characters are upper-case and lower-case letters, digits, periods (.), and underlines (_). The first character of the name must be a letter or digit.

Enterprise service A collection of services, typically from several call centers. While each individual service is tied to a specific peripheral, an enterprise service can span peripherals.

Enterprise skill group A collection of skill groups, typically from several call centers. While each individual skill group is tied to a specific peripheral, an enterprise skill group can span peripherals.

Enterprise-wide call distribution A strategy for allocating calls among several call centers or other answering locations based on real-time information about activity at each location. The ICM implements enterprise-wide call distribution and allows calls to be sent to any network-addressable location within, or outside of, an enterprise.

Event Management Service (EMS) A software module within the Cisco ICM software that processes use to report events within the system.

Expected delay The ICM's predicted delay for any new call added to a service or route queue. The expected delay value is valid only if no agents are available for the route or service.

Expert Agent Selection (EAS) A mode for the Avaya Definity ECS ACD. In this mode, agents are automatically added to pre-assigned skill groups at login. Calls can be routed either to the agent's physical extension or to the agent's login ID. In non-EAS mode, agents must manually add themselves to hunt groups and calls can be routed only to physical extensions.

F

Fault-tolerant architecture A design that allows a system to continue running after a component of the system has failed. The ICM system includes several levels of fault tolerance that minimize time when the system is non-responsive to call routing requests. The ICM's fault-tolerant architecture eliminates single points of failure and provides disaster protection by allowing system components to be geographically separated.

Five-minute interval Certain statistics within the ICM database are updated at five-minute intervals. The first such interval for each day begins at 12:00 midnight and ends at 12:05 A.M. The date and time at the start of the five-minute interval is saved with the data. This allows you to look back at data from previous five-minute intervals.

During a five-minute interval, statistics accumulate in real-time tables (for example, Service_Real_Time). At the end of the interval, the statistics are written to five-minute tables (for example, Service_Five_Minute).

Foreign exchange (FX) A trunk type that connects a call center with a central office in a remote exchange. This allows callers in that remote exchange to directly access the call center without using an interexchange carrier.

G

Gateway See *Application Gateway* and *ICM gateway*.

Gateway SQL An optional ICM feature that allows a routing script to query data from an external database. The script can then use the data to determine the target for a call.

Geographical region See *Region*.

GMT See *Greenwich Mean Time (GMT)*.

Greenwich Mean Time (GMT) The time zone at the meridian at Greenwich, England. This time zone is used as an international standard.

H

Half-hour interval

Half-hour statistics within the ICM database are updated at 30-minute intervals. The first such interval for each day begins at 12:00 midnight and ends at 12:30 A.M. The date and time at the start of the 30-minute interval is saved with the data. This allows you to look back at data from previous 30-minute intervals.

During a 30-minute interval, statistics accumulate in real-time tables (for example, Service_Real_Time). At the end of the interval, the statistics are written to half-hour tables (for example, Service_Half_Hour).

Handle time

The time an agent spends talking on an inbound call and performing after-call work.

Handled calls

A call is counted as handled when the call is finished. For example, the CallsHandledTo5 field in the Service_Five_Minute table counts the number of calls that finished during the five-minute interval. The calls might have been answered before the interval began.

By contrast, a call is counted as answered as soon as it reaches an agent or VRU. Therefore, the number of handled calls and answered calls during an interval is not necessarily the same, but eventually each answered call is counted in both categories.

HDS

See *Historical Data Server (HDS)*.

Historical data

Data collected at five-minute and half-hour intervals and stored in the ICM central database or an HDS database.

Historical Data Server (HDS)

An Admin Workstation with a special database that holds ICM historical data. In a normal configuration, historical data is stored only in the central database. When you use the HDS option, the historical data is also stored on the HDS machine (which must be a real-time distributor). Other Admin Workstations at the site can read historical data from the HDS rather than accessing the central database.

I

ICP — See *Intelligent Call Processing (ICP)*.

ICM — See *Intelligent Contact Management (ICM) software*.

ICM gateway — A construct that allows one ICM system to forward a request to another ICM. You can configure an ICM gateway in the ICM Configure Manager and reference the ICM Gateway node in a routing script. Service bureaus may use ICM gateways to implement a multi-tier architecture.

Incoming call — A call offered to a route or service from an external carrier. See also *Offered call*.

Initialize Local Database — A tool on the Admin Workstation that copies the latest configuration data and scripts from the central database to the local database.

Instance — A single installation of the ICM. An instance consists of several components (CallRouter, Logger, Peripheral Gateways, Admin Workstations), some of which might be duplexed. An instance can be dedicated to a single customer or, in some environments, shared among several customers.

Integrated Services Digital Network (ISDN) — An international standard for telephone transmission. ISDN provides an end-to-end digital network and provides a standard for out-of-band signaling. It also provides greater bandwidth than older telephone services. The two standard levels of ISDN are the Basic Rate Interface (BRI) and the Primary Rate Interface (PRI).

Intelligent Contact Management (ICM) software — The Cisco software that implements enterprise-wide call distribution across call centers. ICM software provides Pre-Routing©, Post-Routing©, and performance monitoring capabilities.

Intelligent Call Processing (ICP) — AT&T's name for the facility that allows third-party products such as the Cisco ICM software to pre-route calls.

Intelligent Network Call Routing Protocol (INCRP) — The communication protocol used by ICM gateways to pass a routing request and response between two ICMs. ICM software sending the request must be set up for remote network routing and ICM software receiving the request must be running an INCRP Network Interface Controller (NIC).

Interactive Voice Response (IVR) A telecommunications computer, also called a Voice Response Unit (VRU), that responds to caller entered touch-tone digits. The IVR responds to caller entered digits in much the same way that a conventional computer responds to keystrokes or a click of the mouse. The IVR uses a digitized voice to read menu selections to the caller. The caller then enters the touch-tone digits that correspond to the desired menu selection. The caller entered digits can invoke options as varied as looking up account balances, moving the call within or to another ACD, or playing a prerecorded announcement for the caller.

Interexchange Carrier (IXC) A long-distance telephone company such as AT&T, MCI, or Sprint.

Internet Protocol (IP) The connectionless-mode network service protocol of TCP/IP. IP enables the entities in a network to communicate by providing IP addresses and by numbering and sending TCP data packets over the network. NICs, PGs, and Admin Workstations in the ICM system use IP to communicate over a wide area network. See also *Transmission Control Protocol (TCP)*.

IPCC IP Contact Center. Three major components form the IPCC system: Cisco Intelligent Contact Management (ICM) software, Cisco CallManager (CCM), and the Interactive Voice Response Unit (IVR).

These combined components provide ACD functionality, including monitoring and control of agent state, routing and queuing of contacts, CTI capabilities, real-time data for agents and supervisors, and historical reporting for management.

IPCC Media Termination The component that provides a soft alternative to the IP hard phone.

IP router See *Router (IP)*.

ISDN See *Integrated Services Digital Network (ISDN)*.

IVR See *Interactive Voice Response (IVR)*.

IXC See *Interexchange Carrier (IXC)*.

J

Job Scheduler A tool that allows you to set up specific commands to be executed automatically at given dates and times. You can schedule a command to execute once, on several specific days, or regularly on a weekly or monthly schedule.

L

LAA See *Longest Available Agent (LAA)*.

Label A value that the ICM returns to a routing client. The routing client maps the label to either an announcement or a trunk group and DNIS value. The routing client then either plays the announcement or delivers the call to the specified trunk group along with the DNIS value.

LAN See *Local Area Network (LAN)*.

LEC See *Local Exchange Carrier (LEC)*.

Local Area Network (LAN) The connection of several computers within a building, usually using dedicated lines.

Local Central Office The switching office of the local telephone company. The local central office receives calls from within the local area and either routes them locally or passes them to an interexchange carrier (IXC). On the receiving end, the local central office receives calls that originated in other areas from the IXC.

A Local CO trunk type connects a call center directly with the local phone company's central office.

Local database A database on the Admin Workstation that contains information copied from the central database. The local database also contains real-time data on the status of the call center enterprise.

Local Exchange Carrier (LEC) The local phone company responsible for delivering calls within a local area.

Log file A file used to store messages from processes within the ICM system. ICM software process-related log files are stored in the logfiles subdirectory under the component directory.

Logged On A state in which agents have made their presence known to the system, but may or may not be ready to receive calls.

Logger The process within the ICM that manages the central database. Each side of a duplexed Central Controller includes a Logger. The Logger may run on the same machine as the CallRouter process or on a separate machine.

Logical deletion If a table includes a Deleted field, then records deleted from the table are not removed from the database. Instead, the Deleted field is set to Y (yes) to indicate that the record is logically deleted. ICM tools treat the record as though it were deleted. After an object is logically deleted, you can choose to physically delete it (destroy permanently).

Logical interface controller An entity that represents a single simplexed or a pair of duplexed physical interface controllers. A physical interface controller is either a Network Interface Controller (NIC) or a Peripheral Gateway (PG).

Longest Available Agent (LAA) The agent that has been continuously in the Available state for the longest time. The ICM can examine services or skill groups from different peripherals and route a call to the service or group with the longest available agent.

M

Message Delivery Service (MDS) The facility used by ICM nodes to communicate with each other. The MDS plays a key role in keeping duplexed components synchronized.

Monitor mode A Script Editor mode in which the number of routing requests that pass through each connection of a script is shown on the screen. You can use this mode to determine whether a script is behaving as expected.

N

NAA See *Next Available Agent*.

NAM See *Network Applications Manager (NAM)*

NCP See *Network Control Point (NCP)*.

Network Control Point (NCP) The process within the AT&T signaling network that sends routing requests to a Customer Routing Point (CRP) such as the network interface controller (NIC) within the ICM system.

Network Applications Manager (NAM) In a two-tier service bureau architecture, an ICM system that receives route requests from the carrier network and forward them to a Customer ICM (CICM). A NAM usually contains only a small configuration that allows it to directly route a subset of calls and dispatch the other requests to the appropriate CICM. The NAM receives route responses from the CICMs and forwards them to the carrier network.

Network Interface Controller (NIC) The computer and process within the ICM software system that communicates directly with the IXC's signaling network. The NIC reads call routing requests from the network and transfers them to the ICM's Central Controller. Subsequently, the NIC passes a routing label from the Central Controller to the IXC signaling network.

Network trunk group A group of trunks to which a routing client can direct calls. A peripheral may divide its trunks into trunk groups differently than the routing client does. Simple trunk groups describe the peripheral's view of the trunks; network trunk groups describe the routing client's view of the trunks.

A network trunk group maps to one or more peripheral trunk groups.

Next Available Agent A strategy for selecting an agent to handle a call. The strategy seeks to maintain an equal load across skill groups or services.

NIC See *Network Interface Controller (NIC)*.

Node An executable element within a script. A script consists of nodes, connections, routing targets, and comments.

Also, a single computer within a network.

Node Manager A process that runs on each physical node (computer) in the ICM system and manages other ICM processes on that system. The Node Manager is responsible for initializing nodes and for restarting failed processes. The Node Manager is guided by a configuration file that is stored on each node. The file describes, among other things, which processes must be started, and if necessary, restarted on the node.

Not Ready state A state in which agents are logged on but are neither involved in any call handling activity nor available to handle a call.

Numbering Plan Area (NPA). See *Area code*.

O

Object palette A Script Editor subwindow that contains template nodes and targets. You can drag a copy of an object from the palette into your script. You can use the Palette command on the View menu to toggle between viewing and hiding the object palette.

Offered call An incoming call or internal call sent to a specific route or service. In real-time data, a call is counted as offered as soon as it is sent to the route or service. However, if the caller hangs up before the abandoned call wait time has elapsed, that call is not counted as offered in the historical (five-minute and half-hour) data. This ensures that the number of calls offered is the same as the number answered plus the number abandoned.

Open Database Connectivity (ODBC) A standard application programming interface (API) that allows a single client application to access any of several databases. Because the ICM's databases support ODBC, you can query them from any third-party client tool that also supports ODBC.

P

PBX — See *Private Branch Exchange (PBX)*.

Percent utilization — The percent utilization is computed by dividing the total time agents spent handling calls by the total time agents were ready. (The ready time is calculated by subtracting the Not Ready time from the total time that agents were logged on.) The value is expressed as a percentage.

Peripheral — A switch, such as an ACD, PBX, or VRU, that receives calls that have been routed by the ICM.

Peripheral Gateway (PG) — The computer and process within the ICM system that communicates directly with the ACD, PBX, or VRU at the call center. The Peripheral Gateway reads status information from the peripheral and sends it to the Central Controller. In a private network configuration, the Peripheral Gateway sends routing requests to the Central Controller and receives routing information in return.

Peripheral Interface Manager (PIM) — The Cisco proprietary interface between a peripheral and the Peripheral Gateway (PG).

Peripheral service — A service that is tied to a specific peripheral (ACD, PBX, or VRU) in the call center enterprise. Peripheral services typically identify a type of processing that the caller requires. For example, a peripheral might have services defined for Sales, Technical Support, or New Accounts. See also *Service*.

Peripheral skill group — A skill group that is associated with a specific peripheral (ACD, PBX, or VRU) in the call center enterprise. For example, a single peripheral might have skill groups defined for agents who can handle technical questions or who can speak Spanish. See also *Skill group*.

Peripheral target — A combination of a trunk group and a DNIS value. A peripheral target is associated with a service, skill group, or agent at a peripheral. Each peripheral target is also associated with a route that can be returned by a routing script.

Note that *peripheral target* refers to a trunk group and DNIS value. *Skill group, agent, and service* refer to the entity at the peripheral to which the call is dispatched.

PG — See *Peripheral Gateway (PG)*.

Physical interface controller — A single Network Interface Controller (NIC) or Peripheral Gateway (PG). A logical interface controller represents either a single physical interface controller or a pair of duplexed physical interface controllers.

PIM — See *Peripheral Interface Manager (PIM)*.

Post-query label — A routing label that causes the routing client to re-enter its call routing plan at a specific point.

Post-Routing — The Cisco routing concept that allows the ICM software to make secondary routing decisions after a call has been initially processed at a call center. Post-Routing enables the ICM to process calls when an ACD, VRU, or PBX generates a route request. The ICM executes scripts to process the route request and return a destination address. This directs the ACD to send the call to an agent, skill group, or service in the same call center or at a different call center. In making a Post-Routing decision, The ICM can use all the same information and scripts used in Pre-Routing.

Pre-Routing — The Cisco routing concept that enables the ICM to execute routing decisions before a call terminates at a call center. With Pre-Routing, the Network Interface Controller (NIC) receives the route request from the IXC and passes the call information along to the ICM. The ICM is then able to process the IXC route request through a call routing script, which defines how calls should be routed. In making its Pre-Routing decisions, the ICM uses real-time data on the status of call centers. This data is gathered by Peripheral Gateways at different call center sites and passed back to the ICM.

Prefix — The leading digits of a telephone number. When defining a call type, you can specify a prefix of any length to match calling line ID values. You can also define a region that is a collection of prefixes. If a calling line ID value matches multiple prefixes, the longest matching prefix prevails.

PRI — See *Primary Rate Interface (PRI)*.

Primary Rate Interface (PRI) — One of two levels of ISDN service. In the United States, the PRI typically provides 23 bearer channels for voice and data and one channel for signaling information (commonly expressed as 23B+D). In Europe, PRI typically provides 30 bearer lines (30B+D).

Private Branch Exchange (PBX) — A device located at a customer's site that switches incoming calls to extensions within that site. A PBX can be used to implement direct inward dialing.

Private network A network made up of circuits for the exclusive use of one customer. Private networks can be nationwide in scope. They typically serve large corporations or government agencies.

Private network routing A configuration in which the ACD sends routing requests to the ICM through the Peripheral Gateway. This is a type of Post-Routing.

PSN See *Public Switched Network (PSN)*.

Public Switched Network (PSN) The public telephone network. The PSN provides the capability of interconnecting any home or office in the country with any other.

Q

Queue time The time a call spends queued at a peripheral waiting for an agent to become available. Queue time occurs after delay time and before ring time.

Queued call A call that has arrived at a peripheral, but that is being held until an agent or other resource becomes available to handle the call.

R

Ready state A state in which an agent is logged on to the system and is currently available to handle a call, is talking on a call, or is involved in after-call work and presumed to be available to handle another call when done.

Real-time data Real-time information about certain entities within the ICM system is updated continuously. Real-time data includes data accumulated since the end of the last five-minute interval (ServiceLevelTo5, for example) and since the last half-hour interval (ServiceLevelHalf). Real-time records themselves do not accumulate in the database as historical records do; each update overwrites the existing record. Real-time records are stored in the local database on the Admin Workstation.

Real-time distributor An Admin Workstation that receives real-time monitoring data directly from the Central Controller. The real-time distributor then passes those data on to other Admin Workstations at the same site. For each site, typically two Admin Workstations are set up as distributors, but only one is active at any time.

Region A collection of prefixes for incoming telephone calls. If the leading digits of a calling line ID value match any of the prefixes, the call is from the region. You use a region in defining call types or branch within a script based on the call's region.

Report The final presentation of data, titles, dates and times, and graphic elements either printed or displayed in a Monitor ICM window. A single report can include components generated by one or more templates. For example, one report can contain a real-time pie chart and a historical grid, each generated with a different template. Report definition files are saved in the custom subdirectories under the aw directory.

Reserved field A reserved database field contains information that might be used internally by Cisco. You must *not* modify the contents of a reserved field.

Reserved state A state in which an agent is awaiting an interflowed call and is unavailable to receive any incoming calls. This state applies to agents on Northern Meridian ACDs only.

Ring label A routing label that causes the routing client to play an unanswered ring to the caller.

Ring time The time elapsed from when a call is presented to an agent until the agent answers it. This occurs after any delay time and queue time. This value is stored in the Termination Call Detail table in the ICM central database.

Some peripherals do not track ring time. For those peripherals, ring time is included within the queue time or delay time.

Route call details Data about routing requests received by ICM software and how calls were routed (that is, the route chosen for each call). This data is stored in the Route Call Detail table in the ICM central database.

Router (IP) A device that dispatches messages to their appropriate destinations within or between IP networks. See also *Internet Protocol (IP)*.

Routing client An entity that sends routing requests to an ICM system. Each logical interface controller can be mapped to one or more routing clients. A routing client typically corresponds to a subsystem within an interexchange carrier or to a peripheral performing Post-Routing.

Routing script A script that the ICM executes to find the destination for a call. A routing script might examine information about several possible targets before choosing the best destination. You can schedule different scripts to execute for different types of calls and at different times and dates. Use the Script Editor to create, modify, and schedule routing scripts.

Routing server The ICM acts as the routing server. For example, when a caller dials your 800 number, the IXC subsystem (routing client) passes a route request to ICM software. As the routing server, the ICM processes the route request, determines where to route the call, and passes a routing label back to the IXC.

Routing target An entity to which the ICM can route a call. A routing target can be an agent, skill group, service, enterprise skill group, or enterprise service.

S

Schema Help A Windows 2000 help file that provides information about the organization of data within the ICM databases.

SCP See *Service Control Point (SCP).*

Script A defined procedure that ICM software can execute. ICM software supports two types of scripts: *routing scripts* to determine where to route a call and *administrative scripts* that perform background processing. A script consists of executable nodes, connections, routing targets, and comments.

Script Editor A tool that lets you create, modify, view, or monitor routing scripts and administrative scripts. A routing script is a defined procedure that is executed by the ICM to determine how a call is routed. An administrative script is a defined procedure that is executed at specific times to perform background processing.

Security classes See *Classes.*

Service A particular type of peripheral target that the caller requires. For example, in a software company's call center, a caller might have a question about installing software. This caller would be directed to the Technical Support service. A service is associated with a peripheral (and is therefore sometimes called a peripheral service). See also *Enterprise service*.

Service array A collection of services that might be associated with different VRUs, but are all associated with the same Peripheral Gateway (PG). You can route calls to a service array and let the PG choose among the member services.

Service Control Point (SCP) A node (computer) in the IXC signaling network. The ICM connects to an SCP within the IXC's network.

Service level The percentage of incoming calls that are answered within a specified threshold. Several slightly different calculations can be used for the service level. Abandoned calls can be accounted in different ways. The ICM keeps track of two different service levels: the peripheral service level is the service level as calculated by the peripheral; the ICM service level is the service level as calculated by the ICM.

Service level event A service level event for a call occurs when the service level time expires while the call is in queue or the call is either answered or abandoned before the service level time expires. When performing service level calculations for a time period, the ICM considers only calls that had a service level event during that period. This ensures that each call is counted only once and during the appropriate time period.

Service level threshold The number of seconds you set as the maximum time a caller should wait before being connected with an agent for a specific service. When you set up a peripheral, you specify a default service level threshold for all services associated with that peripheral. For example, if you set a service level threshold of 30 seconds, you want calls to be answered within 30 seconds. Every call answered within 30 seconds improves the service level. Calls not answered within the 30 seconds reduce the service level. See also *Service level event*.

Simplexed An arrangement in which a physical device does not have a duplicate, paired device. If a simplexed device fails, a part of the system might stop functioning. See also *Duplexed*.

Skill group A collection of agents that share a common set of skills, such as being able to handle customer complaints. A skill group is associated with a peripheral. An agent can be a member of zero, one, or more skill groups (depending on the peripheral). See also *Enterprise skill group*.

Skill target A target at a peripheral to which a call can be routed. A skill target can be a service, skill group, agent, or translation route.

Note that peripheral target refers to a trunk group and DNIS value. Skill target refers to the entity at the peripheral to which the call is dispatched.

Skills-based routing A concept whereby calls are routed to agents based on the skills those agents have. You can construct skill groups that contain agents who share a common set of skills. You can also assign priorities to the skills in each agent profile. For example, an agent might have a priority 1 assignment for handling calls from Spanish-speaking callers; however, that same agent might have a priority 3 assignment for handling Sales calls. Calls can then be routed to the skill group that has the appropriate level of expertise to handle the call. The ICM implements skills-based routing at the network level rather than just within a peripheral. This allows the ICM to examine skill groups on all peripherals before deciding where to route the call.

SQL See *Structured Query Language (SQL)*.

SQL Server The Microsoft relational database product used for the ICM's local and central databases.

Structured Query Language (SQL) A standard database query language in which you can formulate statements that will manipulate data in a database. The statements include SELECT, for data retrieval; UPDATE, for data modification; DELETE, for data deletion; and INSERT, for data insertion. You can access the ICM databases using SQL and any client tool that supports ODBC.

System time The time as used consistently throughout an ICM system. Although parts of the ICM system can be in different time zones, they all use the same clock time. The system time is typically the local time for Side A of the ICM Central Controller.

T

Talk time The total seconds that agents in a skill group are in the Talking In, Talking Out, and Talking Other states.

Talking In state A state in which an agent is talking on an inbound call.

Talking Other state A state in which an agent is talking on an internal (neither inbound nor outbound) call.

Talking Out state A state in which an agent is talking on an outbound call.

Talking state A state in which an agent is talking on a call. This includes the Talking In, Talking Out, and Talking Other states.

TCP/IP See *Transmission Control Protocol/Internet Protocol (TCP/IP)*.

Termination call detail Data that contains information about how each call was handled at a peripheral. This data includes items such as the identifiers for the agent and the peripheral that handled the call, ring time, after-call work time, and the identifier for the route where the call was sent. Termination call detail records are stored in the central database.

Tie line A private trunk line that connects two ACDs or PBXs across a wide area.

Translation route A target at a Peripheral Gateway that does not map to a specific service, skill group, or agent. When a call arrives at a translation route, the Peripheral Gateway (PG) is responsible for determining the ultimate target. When the ICM routes a call to a translation route, it sends a message to the PG. This message contains the ultimate target and further instructions for the PG. For example, the PG might be instructed to coordinate with a host computer so that the caller's account number is displayed on the teleset of the agent who picks up the call.

Translation Route Wizard An ICM tool that makes it easier to configure translation routes and their associated targets. You can also use the Translation Route Wizard to report on or delete translation routes.

Transmission Control Protocol (TCP) A connection-based Internet protocol that is responsible for packaging data into packets for transmission over the network by the IP protocol. TCP provides a reliable flow control mechanism for data in a network.

Transmission Control Protocol/Internet Protocol (TCP/IP) The Internet suite of protocols used to connect a world-wide internetwork of universities, organizations, and corporations. TCP/IP is the protocol used to communicate between the Central Controller and devices in the ICM system. TCP/IP is based primarily on a connection-oriented transport service, the Transmission Control Protocol (TCP); and a connectionless-mode network service, the Internet Protocol (IP). TCP/IP provides standards for how computers and networks with different technologies communicate with each other. See also *Transmission Control Protocol (TCP)* and *Internet Protocol (IP)*.

Trunk A telephone line connected to a call center and used for incoming or outgoing calls.

Trunk Group A collection of trunks associated with a single peripheral and usually used for a common purpose. See also *Network trunk group*.

Turnkey CTI A client-server application providing out-of-the-box CTI functionality for Cisco ICM/CTI.

V

Virtual call center An approach to enterprise-wide call center management that treats several geographically dispersed call centers as if they were a single call center. The virtual call center expands skills-based routing from the ACD to the network level. See also *Skills-based routing*.

Voice Response Unit (VRU) See *Interactive Voice Response (IVR)*

W

WAN See *Wide Area Network (WAN)*.

WATS See *Wide Area Telecommunications Service (WATS)*.

Web View See *Cisco Web View*.

Wide Area Network (WAN) The connection of several computers across a wide area, normally using telephone lines.

Wide Area Telecommunications Service (WATS) A special service provided by an interexchange carrier that allows a customer to use a specific trunk to make calls to specific geographic zones or to receive calls at a specified number at a discounted price.

Work Not Ready state A state in which an agent is involved in after-call work and is assumed not to be ready to accept incoming calls when done.

Work Ready state A state in which an agent is involved in after-call work and is assumed to be ready to accept incoming calls when done.

Workspace The state of a tool at a given time. Some tools let you save your workspace either automatically when you exit or manually at any time.

For example, when you save workspace, the Script Editor saves the following information:

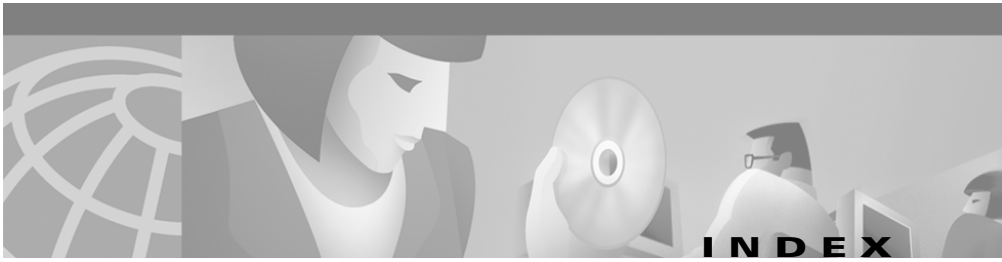
- State, size, and position of the Script Editor main window
- Names and versions of scripts that are currently open
- Mode of each open script
- State, size, and position of each script window or icon
- Current use of grids
- State of the object palette, toolbar, and status bar

The next time you start the Script Editor, it restores the saved state

Wrap-up Call-related work performed by an agent after the call is over. An agent performing wrap-up is in either the Work Ready or Work Not Ready state.

Z

Zoom To shrink or enlarge the appearance of objects on the screen.



Symbols

Numerics

A

B

C

D

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